

# ABSTRACTS

## SA HEART CONGRESS 2016

### Initial experience with minimal invasive cardiac surgery via anterior mini thoracotomy: Institutional report

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**Objective:** The mini thoracotomy approach avoids complications of median sternotomy and facilitates early mobilisation of the patient with acceptable early outcomes. The techniques of MICS have been adopted all over the world with availability of cannulae for peripheral cannulation and improved visualisation. We report our experience of various cardiac surgical procedures via anterior mini thoracotomy.

**Methods:** The data of 186 consecutive patients who underwent MICS coronary artery bypass grafting (left anterior third inter costal space), valvular procedures (right anterior 2nd/4th ICS) and closure of atrial septal defects (right anterior 3rd/4th ICS) during the period January 2012 - January 2016 at our institution were analysed retrospectively.

**Results:** Out of 186 procedures, 97 (52.2%) were performed during the last year. Patients who underwent MICS include, mitral valve procedures (replacement/repair) (n=60, 32.2%), aortic valve replacement (n=46, 24.7%), CABG (n=35, 18.8%), ASD closure (n=41, 22%), ASD closure along with MV repair (n=2, 1%), excision of right atrial myxoma (n=1, 0.5%), and AVR and CABG (n=1, 0.5%). Complications experienced were conversion to sternotomy in 3 (1.6%), re-exploration for bleeding 7 (3.7%), RV injury 2 (1%), femoral artery dissection 1 (1.2%), groin site hematoma 2 (1.2%), need for femoral arterial thrombectomy 1 (0.6%), femoral vein thrombosis 1 (0.6%) and postoperative cerebro-vascular accident 1 (0.5%). Internal thoracic artery (ITA) was not used due to harvest injury or sub optimal flow in 6 (17.1%). On table extubation 11 (5.9%), early extubation 70 (37.6%) and median mechanical ventilation time of 5.5 hours, short hospital stay 90 (48.3%) and median hospital stay of 6 days, transfusion rate 65.1%, transfusion index 1.4, acute kidney injury requiring dialysis 1 (0.5%) and no mortality.

**Conclusion:** MICS via anterior mini thoracotomy is gaining popularity in view of better cosmesis and short recovery time. MICS procedures may be performed safely for elective operations with acceptable complications of peripheral cannulation. The incidence of injury to ITA during harvesting was high in the early part of our experience.

### Innovative nanotechnology for treatment of atherosclerosis

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Atherosclerosis is the major cause of cardiovascular diseases.

**Objective:** The objective of this study was to develop hybrid organic-inorganic nanoparticles, which would have properties to interact with the human atherosclerotic plaque and change its structure.

**Methods:** We developed technology for manufacturing carbon-coated iron nanoparticles with a diameter of 70 - 100nm, with the thickness of a carbon coating 3 - 5nm and the technology for chemical modification of nanoparticles using salts of nitrobenzenediazonium tosylate (PCT is submitted). Surface modification with these particles is based on covalent bonds. This allows nanoparticles to interact with cholesterol molecules via noncovalent forces. In the first stage of the study we evaluated interaction of modified and non-modified nanoparticles with the omentum in experimental animals. The second stage was to study this interaction of the aforementioned particles, but in human atherosclerotic plaque material harvested during surgeries of carotid endarterectomy. Treated with the nanoparticles, atherosclerotic plaques were implanted subcutaneously in laboratory animals whose organisms were used as a model of a bioreactor.

**Results:** According to the light and electron microscopy modified nanoparticles, unlike non-modified ones, were able to change the morphological structure of the omentum in experimental animals as well as atherosclerotic plaque material causing its modification in vivo.

**Conclusions:** Modified hybrid organic-inorganic nanoparticles with lipophilic surface modification can be potentially used as an agent in the treatment of atherosclerosis. For instance, this development may be used in the production of new generation coronary stents.

### Knowledge regarding major symptoms and risk factors for ischaemic heart disease among primary health care patients in Riyadh hospitals

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**Objectives:** This study aimed to assess level of knowledge and awareness about IHD, specifically its warning symptoms and risk factors, among primary health care (PHC) visitors in Riyadh hospitals.

**Methods:** We conducted an observational descriptive cross-sectional study in PHC clinics of 4 public hospitals in Riyadh. Convenience sampling was used to select subjects in the chosen hospitals. Sample size was 162 subjects. Level of knowledge was assessed through a new structured, self-administered questionnaire.

**Results:** Level of knowledge regarding IHD in Riyadh hospitals (King Khalid University Hospital, Imman General Hospital, King Salman Hospital, and King Abdulaziz Medical Centre) was 69%, 29%, 56%, and 58%, respectively. Educational level played a significant role, as 63.4% of participants with college and advanced degrees, scored high. Dyspnoea was the most frequently cited symptom with a 80% rate, while smoking and obesity were the most frequently identified risk factors. Interestingly, 32% of the respondents were able to recognise family history as a risk factor.

**Conclusion:** This study highlights that there is inadequate knowledge about IHD among outpatient clinic visitors in Riyadh hospitals. Demographic factors played a significant role in the level of knowledge. This study recommends that health care systems in Saudi Arabia formulate strategies regarding IHD awareness.

## S107 enhances ryanodine receptor calcium-dependant inactivation without impairing sarcolemmal L-type calcium channels

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**Objective:** This study investigated the effects of S107, a ryanodine receptor (RyR)-specific derivative of the RyR-stabilising drug JVT519, on RyR calcium-dependant inactivation (CDI) and sarcolemmal L-type calcium currents.

**Methods:** Left ventricular cardiomyocytes were isolated for patch-clamp recordings from wild-type BL6 mice by enzymatic digestion. Cells were incubated in either 10μM S107 or vehicle for 2 hours. Using an equimolar Cl<sup>-</sup>, Na<sup>2+</sup>- and K<sup>+</sup>-free patch pipette solution, 4 experimental groups were created, by adding: 10mM BAPTA (a potent Ca<sup>2+</sup> chelator that eliminates CDI), or vehicle for the vehicle-incubated cells; and 10μM S107 or S107+BAPTA for the S107-incubated cells, to the pipette solution. I<sub>CaL</sub> currents were recorded by a voltage clamp protocol consisting of a depolarising pre-pulse followed by 10mV steps from -30 to +30 with train conditioning prior to each step. Recordings were performed in Na<sup>2+</sup>- and K<sup>+</sup>-free Tyrode's bath solution maintained at 37°C. Data was captured in Clampex v8 and analysed with Clampfit software. The tau of current's ascending limb, a surrogate marker of CDI, was calculated as the first tau of a bi-exponential fit.

**Results:** S107 significantly reduced I<sub>CaL</sub> tau (S107: 4.2 ± 0.4, n=16, p<0.05 vs. control: 8.3 ± 0.3, n=11), and BAPTA significantly increased I<sub>CaL</sub> tau (BAPTA: 13.8 ± 1.8, n=9, p<0.001 vs. control). The S107 effect was abolished by co-treatment with BAPTA (S107+BAPTA: 10.3 ± 0.8, n=3, p<0.05). There were no differences in peak amplitude among the groups.

**Conclusions:** These preliminary results suggest that S107 may enhance CDI through the proposed prevention of diastolic Ca<sup>2+</sup> leak from the RyR, without affecting sarcolemmal Ca<sup>2+</sup> handling. These findings may have clinical applications, suggesting that S107 can be an effective antiarrhythmic agent that improves intracellular Ca<sup>2+</sup>-handling. It also has the benefit of specificity and not affecting sarcolemmal L-type channel function, a property essential to improving contractility in heart failure.

## Cryoablation of atrial fibrillation associated with mitral valve surgery through superior septal pathway: Medium term results

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**Objectives:** Cryoablation, associated with cardiac surgery, has been established as a safe and effective technique for ablation of atrial fibrillation (AF) in patients undergoing cardiac surgery. The mitral valve surgery with access through the superior septal approach (SSA) (through right atrium, crossing the interatrial septum) allows better exposure and visualisation of the mitral valve. However, this access is used less frequently because it generally involves greater technical difficulty and creates additional suture lines that can interfere with the results of ablative surgery.

**Methods:** We analysed the results of patients undergoing surgery (September 2003 - November 2014) in which mitral valve surgery and cryoablation was performed concomitantly through the superior septal pathway with, or without, association to other surgery.

**Results:** A total of 70 patients were included in analysis. Forty-six women (65.7%) with a mean age of 63 years. Two non-cardiology related deaths were reported. Fifty-three patients (75.7%) in permanent AF preoperatively and 71.7% with severely dilated left atrium, 58.57% patients had moderate-severe pulmonary hypertension. The medium Euroscore-I calculated was =4.20%. Euroscore-II medium was =3.59%. Postoperatively: 34.2% of patients remained in AF or flutter at moment of discharge home. One month after surgery 34.3% remained in AF. During follow up (42 months): 60% was free of AF. In terms of improving functional class after surgery or use of treatment (anticoagulant or antiarrhythmic), the results for both groups were discrete.

**Conclusions:** Cryoablation, associated with mitral valve replacement through via SSA, is possible and has acceptable results. Few references regarding cryoablation technique through this surgical approach exist and results are slightly lower than those published by AF cryoablation through the conventional route of access (left atrium). The incidence of AV block is not significantly high. The size of the left atrium and the type of left atrium greatly influence the outcomes. The correct preoperative patient choice can help improve long-term results of this technique through superior septal approach.

## Predictors of mortality in the preoperative and intra-operative period in patients undergoing delayed sternal closure

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**Background:** Sternal closure after cardiac surgery sometimes can be challenging because closing the sternum can cause serious deterioration of cardiac function specially in patients with haemodynamic instability. The objectives of this study are to identify predictors of mortality in the pre and intraoperative period for patients with delayed sternal closure (DSC).

**Methods:** Observational cohort study, with retrospective record during 1993 - 2000 years and prospective during 2001 - 2012, of all adult patients who needed DSC and died after that. The study period was from 1 January 1993 until 31 December 2012.

**Results:** Fifty one patients died of 130 patients requiring DSC. Forty one point six percent of deaths were women. Forty nine point two percent of patients were older than 70 years. Fifty three point eight percent had a Charlson index >5. Seventy point three percent of patients were diagnosed with chronic renal failure. Forty point six percent had a history of previous cardiac surgery and was NYHA >3 in 46.5%. Forty six point six percent had an infection 2 weeks before surgery. Surgical indications were: cardiac transplantation (70%), endocarditis (40%) and mixed surgery: valve and revascularisation (55.5%) of valvular surgeries. Sixty six point six percent death patients were performed biological valve replacement and mitral valve surgery (54.5%). Sixty nine point three percent of deceased patients received antibiotic prophylaxis for less than 3 days. The total operating time was >320 minutes in 53.9% of cases. Extracorporeal circulation duration was >140 minutes in 55.3%. Ischaemia time was >95 minutes in 47.5%. Forty one percent of patients required blood transfusion. The reason to defer the sternal closure were arrhythmias (60%) and cardiac compression (44.1%). Death occurred 14.7 days after admission in 28.4% of patients. The multivariate analysis revealed as prognostic factors: Charlson index >5 (OR 2.78), chronic renal failure (OR 6.43), preoperative ICU stay (OR 2.65), surgery for aneurysm (OR 1.44), endocarditis (OR 2.26), or cardiac transplantation (OR 5.28). Duration of surgery >320 minutes (OR 3.33), duration of ischaemia >95 minutes (1.99), and duration of pleural drains >3 days (OR 6.18).

**Conclusions:** Multivariate analysis identified as predictors of mortality in DSC the following: Charlson index >5, chronic renal failure, pre-surgical ICU stay, the prolonged duration of surgery, extracorporeal circulation and duration of pleural drainages over 3 days.

## Preoperative and intra-operative risk factors of nosocomial infection in patients undergoing delayed sternal closure

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**Background:** Sternal cerclage, after cardiac surgery, is sometimes crucial because surgical approximation of the sternal edges can cause serious deterioration of cardiac function. The objectives of this study are to identify risk factors of nosocomial infection (NI) associated with delayed sternal closure (DSC) in the pre and intra-operative period.

**Methods:** Observational cohort study, with retrospective record (1993 - 2000) and prospective (2001 - 2012), of all those patients in adulthood undergoing cardiac surgery technique set out from DSC and developed an NI postoperatively. The study period was from 1 January 1993 - 31 December 2012.

**Results:** Sixty percent requiring DSC, developed NI, frequently a respiratory (51.51%), genitourinary (13.13%) and catheter-related bacteraemia (13.1%); 62.5% were women and the mean age was 66.4 (SD 11.6) years. Ninety point ninety percent of patients were diagnosed with chronic liver disease, 77.7% with chronic renal failure and 68.75% with diabetes. Sixty two point nine percent had previous heart valve surgery, 65.38% were anticoagulated and 80% had an infection in the 2 weeks prior to surgery. Surgical indications were: thoracic aneurysm (76.19%), endocarditis (80%), cardiac transplantation (70%), valve replacement (54.76%) and coronary artery bypass graft (36.36%). Patients who were infected received antibiotic prophylaxis for ≥3 days (72.36%). The total operating time was 320 minutes in 66.66%. The extracorporeal circulation time was greater than 140 minutes in 69.23%, and ischaemia time >95 minutes in 75.75% of the series. Sixty four point six percent of patients required transfusion. The reason for deferring the sternal closure was bleeding (68.83%), cardiac compression (53.48%) and arrhythmias (20%). Sterile chiffons were the more frequent involved mediastinal insulation used (68.04%).

**Conclusions:** Risk factors of nosocomial infection in patients with DSC depended primarily on identified factors related to hospitalisation. The presence of an infection 2 weeks prior to surgery, along with receiving antibiotic therapy within 30 days prior to surgery, behaved as preoperative risk factors for nosocomial infection. The following were identified as risk factors in the operative period: Indication of surgery for aneurysm or endocarditis, prolonged ischaemia (>2 hours), mediastinal and pleural drainages more than 3 days, blood transfusion during procedure and if the indication for DSC was bleeding.

## Pulmonary embolectomy after massive pulmonary embolism following percutaneous polymethylmethacrylate vertebroplasty cement: Diagnosis, management and treatment

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**Introduction:** A potential, but rare, complication that can occur during percutaneous vertebroplasty is a pulmonary embolism by cement polymethylmethacrylate (PMMA). While not exceptional, its presentation is variable, depending on the amount of embolised material. In most cases, it can go unnoticed and asymptomatic, given the small pieces of embolised material to the pulmonary territory which makes it an underdiagnosed complication. However, in severe cases, it could cause severe acute respiratory failures, or even be fatal. Nowadays, its treatment is controversial. The current trend is conservative, owing the complexity and high mortality of pulmonary embolectomy.

**Method:** We describe the case of a female patient with a L1 vertebral fracture as a result of a car crash. She was submitted to a transpedicular vertebral fixation with PMMA cement after. During procedure a massive leak of PMMA cement was detected, debuting with an episode of severe respiratory distress requiring endotracheal intubation and connection to mechanical ventilation. Due to the high clinical suspicion, an urgent chest radiograph and CT scan was ordered confirming massive PMMA cement embolisation to the right ventricle and pulmonary arteries. Given the haemodynamic instability and the possibility of thrombosis associated with fragments embolised. Due to the high risk and instability of the patient emergency cardiac surgery was decided upon and performed satisfactorily, allowing the extraction of the main fragments lodged in the right ventricle, pulmonary artery and its branches. The patient evolved favourably and made a complete recovery.

**Conclusions:** Pulmonary embolisms by artificial material such as PMMA cement are infrequent and may go unnoticed, especially when caused by small fragments. The usual treatment is conservative though, may require emergency surgery in exceptional cases of severe respiratory distress with massive cement embolisation. Images describe the diagnostic process, management and surgical treatment of this pulmonary embolism as a result of a massive leak of cement PMMA.

## Recurrent mediastinal paraganglioma of the aortopulmonary window and vascular dependence on the circumflex artery

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**Introduction:** Neuro-endocrine tumours, or paragangliomas, are rare tumours originating in the chromaffin tissue (cells responsible for the synthesis, metabolism and secretion of catecholamines) belonging to the autonomic nervous system and extra-adrenal localisation. Depending on their cellular origin, tumours involve the parasympathetic or sympathetic nervous system. In contrast, depending on the catecholamine secretion or not, they are classified into functional, or non-functional. Fifty percent are hereditary, and onset typically in men from the third to fifth decade of life. The most common are those dependent on the sympathetic nervous system, with central location. They are secretory as pheochromocytomas, resulting in sweating, palpitations, headache or hypertension. However, those of parasympathetic nature are generally non-functional with peripheral location, being exceptional at level of mediastinum. Typically benign, but with a malignant potential, paragangliomas are relatively resistant to chemotherapy and irradiation. They can also invade neighbouring structures, depending on their location. Thus, surgical approach is the treatment of choice whenever possible.

**Methods/results:** We describe a patient, submitted to previous resection of non-functional cervical paragangliomas, which after a year of follow-up presents with a recurrence at the level of the mediastinum detected by CT scan and pentetreotide scintigraphy. Coronary angiography identified a peculiar vascular dependence on the circumflex left coronary artery. This neuroendocrine tumour was located at the level of aorta pulmonary window, and surgical resection was decided upon. After functional preoperative study for determination of catecholamines, through median sternotomy and cardiopulmonary bypass support, it was possible to dry the complete tumour resection, histological analysis confirmed the histological type of paraganglioma. The patient had a satisfactory postoperative course.

**Conclusions:** We describe the complex diagnosis and surgical management of this exceptional tumour originating from neuroendocrine tissue, and its typical characteristics and relationship with great vessels as well as its coronary dependence.

## VA-ECMO as a bridge to surgery in cardiogenic shock due to severe acute prosthetic dysfunction because of complete rupture of Delrin Björk-Shiley prosthesis 4 decades after implantation

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**Introduction:** The number of patients with valvular prostheses has increased in recent decades, given the improvement in life expectancy and cardiological care in recent years. The most frequent complications causing severe prosthetic dysfunction are mainly thrombosis or pannus blockage. These complications can cause refractory cardiogenic shock. Implantation of a VA ECMO support system (venoarterial extracorporeal membrane oxygenation) can provide support in severe cardiogenic shock due to acute prosthetic valve dysfunction as a bridge to surgery when the risk of emergent surgery is prohibitive.

**Method:** Herein we describe a severe prosthetic dysfunction due to complete disk rupture of mitral Delrin Björk-Shiley prosthesis, implanted at the age of 9 years old in a male effected with severe cleft mitral, which after more than 4 decades of implant remaining asymptomatic, debuts with a syncopal episode, dyspnoea and subsequent sudden cardiac arrest. After cardiopulmonary resuscitation, the patient recovered under refractory cardiogenic shock. The echocardiogram showed severe mitral prosthesis dysfunction with massive mitral regurgitation. Given the extreme haemodynamic instability which prevented their transfer to the operating room, implantation of a VA-ECMO system was decided, as a bridge to achieve sufficient stability to allow his transfer to the operating room and subsequent surgery. Through median sternotomy, a complete rupture of the mitral Björk-Shiley Delrin prosthesis was observed, with embolisation of the mitral prosthesis disc, which caused a free mitral regurgitation. Postoperatively, the VA-ECMO support was discontinued 4 days postoperatively and the patient successfully recovered.

**Conclusions:** Complete rupture of prosthesis is exceptional, and should be deemed so, especially in patients after a long period of implantation of prosthesis. We describe the only case of complete fracture of a mitral prosthesis disc Björk-Shiley Delrin in the longest period of implant described. The VA-ECMO implant system can be considered as a bridge to heart surgery in cases of cardiogenic shock prosthetic valve dysfunction, when the surgery cannot be performed immediately.

### Baseline Galectin 3 plasma levels identifies poor clinical outcome in patients with peripartum cardiomyopathy

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**Background/objective:** Peripartum cardiomyopathy (PPCM) is characterised by new onset of heart failure in late pregnancy and up to the first 6 months postpartum. Galectin 3 is a  $\beta$ -galactoside-binding lectin protein that is required for transforming growth factor (TGF)- $\beta$  pathway-mediated myofibroblast activation leading to cardiac fibrosis. This matricellular protein was described as a prognostic biomarker in heart failure patients. We aimed to determine whether galectin 3 and cardiac fibrosis are associated with poor outcome in PPCM patients.

**Methods/results:** In this single centre prospective study, we enrolled 37 consecutive patients with PPCM and 10 age-matched healthy subjects. All patients received ACE inhibitors and beta-adrenergic blocking agents. Plasma NT-proBNP and Galectin 3 levels were measured at baseline. Echocardiograms were performed at baseline and 6 months postpartum. Poor outcome in PPCM patients was defined by NYHA  $\geq 3$  or death at 6 months. At baseline, PPCM patients had significantly higher NT-proBNP and Galectin 3 levels than healthy controls ( $p < 0.001$  and  $p < 0.05$ , respectively). Six months postpartum, 4 patients did not improve their cardiac function (EF,  $26.7 \pm 7.4\%$ ) and 7 had died. Baseline NT-proBNP ( $3865.6 \pm 1039$  vs.  $1730.1 \pm 245$  pmol/l,  $p = 0.035$ ) and Galectin 3 ( $15.72 \pm 0.91$  vs.  $8.75 \pm 0.69$  ng/ml,  $p = 0.02$ ) levels were significantly higher in patients with poor outcome compared to patients that improved their cardiac function (EF,  $45.7 \pm 11.3\%$ ).

**Conclusion:** NT-proBNP and Galectin 3 levels were increased in the plasma of PPCM subjects who had poor outcome 6 months after delivery. Galectin 3 may be a clinically useful biomarker that identifies a subset of PPCM patients at highest risk of myocardial dysfunction due to fibrosis. These findings should be confirmed in a larger cohort and could lead to specific therapeutic intervention.

### Cardiac resynchronisation therapy in patients with Chagas cardiomyopathy in Brazil

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**Introduction:** In Chagas cardiomyopathy, patients that are functional class IV (NYHA) and have Left Ventricular Ejection Fraction (LVEF) less than 35% have only 16% survival at 36 months. Studies have shown benefits of non-Chagasic patients with chronic systolic heart failure undergoing cardiac resynchronisation therapy (CRT).

**Objective:** The aim of this study is to assess the clinical outcomes of patients with Chagas cardiomyopathy undergoing CRT, including functional class and echocardiographic parameters.

**Methods:** Seventy-two patients were selected. Inclusion criteria: positive serology for Chagas's disease, severe heart failure, EKG QRS interval  $> 120$ ms, LVEF  $< 35\%$  and LVED diameter  $> 55$ mm. Patients considered to be responders to CRT: being in functional class I or II or alive at the end of follow-up. Statistical analysis used t-test for paired samples and Wilcoxon test. Significance level ( $p < 0.05$ ).

**Results:** The follow-up after CRT ranged from 4 - 79 months (mean 46.6). Patients underwent CRT and 47.2% had EKG Left bundle branch Block, 15.3% had pacemaker-induced Left bundle branch Block and 36.2% had Right bundle branch Block + left anterior hemiblock. The QRS interval was  $148.1 \pm 17.5$ ms; LVEF Teicholz was  $27.3 \pm 7.7\%$ , Left ventricle end-systolic (LVES) diameter was  $57.5 \pm 7.2$ mm, LVED diameter was  $66.2 \pm 7.6$ mm, mean LVES volume was  $167.8 \pm 50.6$ ml and LVED volume average was  $230 \pm 63.3$ ml. CRT was performed through mini-thoracotomy in 66.7%. At the final follow-up, 45.8% were in functional class I, 41.6% in functional class II, 65.3% responded to CRT. The overall mortality was 34.7%, the causes were worsening heart failure in 60%. LVEF ranged from 27.3% - 44.2% ( $p < 0.0001$ ). The LVES diameter decreased from 57.5mm - 50.8mm ( $p < 0.0001$ ). The LVES volume decreased from 167.8ml - 130.9ml ( $p < 0.0001$ ).

**Conclusion:** In patients with Chagas cardiomyopathy undergoing CRT, statistically significant changes were found: in functional class, improvement in Left Ventricular Ejection Fraction, decrease in left end-systolic diameter and end-systolic volume.

## Overview of academic leagues and residents of cardiovascular surgery in Brazil

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**Objectives:** The objective of the study is to evaluate the profile of Brazilian medical students that are exposed to CVS and the profile of Brazilian residents in CVS.

**Methods:** Medical students from academic leagues and residents in CVS were invited to fill out the questionnaires. The study is classified as transversal, observational and it includes a restricted population who meets the following inclusion criteria: medical students linked to academic leagues of CVS and residents linked to CVS services.

**Results:** We received 54 and 16 responses, respectively, 30% (n=16) of medical students and 3 residents (2%) were female. The average time at university for medical students is 6 semesters ( $6 \pm 2.7$ ) and their average length of participation in academic leagues of CVS is 2 semesters ( $2 \pm 2.18$ ). For residents, the average time in the CVS residence is 2.5 years. Fifty-four percent (n=29) and 42% (n=7) of medical students and trainers agree with a 6 year integrated cardiovascular surgery residency programme, respectively. Thirty-one (57%) of medical students participate in hands-on courses in surgery at the university and 9 (56%) residents have hands-on training in their residence programme. Seventy-six percent (n=41) of medical students have not decided on their specialty yet, but 74% (n=40) of them pointed to financial return as a motivator in choosing a specialisation field. Additionally, 88% (n=14) of trainers chose their specialty during graduation. Seven (44%) residents published articles during their residency and 30 (55%) students are involved in research activities. Twenty-eight (52%) and 4 (25%) medical students and residents intend to pursue an academic career, respectively.

**Conclusions:** Although females represent 30% of participants in academic leagues, they represent only 2% of residents. Fifty-four percent of the students agree with the 6 year integrated cardiovascular surgery residency programme, while 56% of residents do not agree with this model. Seventy-four percent of the students pointed to financial return as motivator in choosing a specialisation field. Eighty-eight percent of residents chose the specialty during graduation. Fifty-two percent and 25% of the students and residents intend to pursue an academic career, respectively.

## Three dimensional (3D) printing of models for surgical planning of left ventricular aneurysms reconstructive surgery

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**Introduction:** Left ventricular aneurysm is a frequent complication of myocardial infarction, occurring in 10 - 15% of patients with myocardial infarction, mostly (90%) in the anterior-apical left ventricle wall. In some cases, aneurysmectomy is indicated and better cardiac imaging techniques are required to surgical planning, as 3D printing models.

**Objective:** The aim of this study is to analyse the impacts of rapid prototyping models of left ventricular aneurysms for surgical planning of aneurysmectomy.

**Methods:** Two patients, with previously diagnosed left ventricular aneurysm showed by cardiac catheterisation, were selected. These patients underwent cardiac tomography in a 64 slice computed tomography (HD 750, General Electric Healthcare, Milwaukee, Minnesota, USA). The images were sent to the PACS<sup>®</sup> platform (Picture Archiving and Communication Systems) and, thereafter, to MIMICS<sup>®</sup> software (Materialise, Leuven, Bélgica) and then saved in STL format (Standard Tessellation Language). The data were then sent to the Objet Studio<sup>®</sup> software of Stratasys<sup>®</sup> and, after receiving researchers' approval, the biomodels were printed.

**Results:** The rapid prototyping biomodels showed the cardiac anatomy and accurately replicated the cardiac volume. The surgeon could reshape the left ventricle and resect all akinetic and dyskinetic tissues, resulting in a left ventricle function improvement.

**Conclusion:** Using 3D rapid prototyping in aneurysmectomy surgical planning helps in surgical planning and surgeon orientation during procedure.

## A simplified model of left ventricular myocardial architecture for the practising cardiac surgeon

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**Introduction:** One of the most difficult operations in adult cardiac surgery is repair of an acute post-myocardial infarction ventricular septal defect. A surgical anatomy study of 30 porcine hearts, after boiling them, using a technique first described in 1669, was conducted.

**Methods:** Pig hearts were boiled in water for 90 minutes and allowed to cool. The myocardial architecture was explored using finger fracturing, but for laying open the layers of the left ventricle, it was necessary to use scissors and instrumental blunt dissection. The dissections were photographed extensively.

**Results:** A thick bundle, lateral to the lateral mitral valve commissure (LMVC) was identified. This bundle passed deep to the circularis muscle layer at the level of the LMVC. We called this the TG Bundle and it continues as a flattened sheet in an apical direction with a spiral orientation, initially directed to the interventricular septum where it comes to lie deep to the attachment of the medial papillary muscle mid-ventricle. At this point, it has turned through 180 degrees from its point of origin at the LMVC. Passing further apically it spirals through the floor of the left ventricle to reach the cardiac apex. It has now completed a full 360 degrees of spiral displacement from its point of origin, the bundle continues beyond the apex in the same direction of rotation but, instead of moving from annulus to apex, they were now winding circumferentially around the LV from apex to



mitral annulus. As they came close to the anterior mitral annulus and the adjacent anterior portion of the aortic root, the muscle fibres deflected towards those structures to insert into them. The 2 layers are now at 90 degrees relative to each other.

**Conclusions:** The anatomy reveals key weak points within the septum and free wall. It also describes the bundle arrangement in a way that preserves the architecture of the muscle bundles and the integrity of the fibrous skeleton.

## Single lobe ventilation for staged lung cancer resections

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**Introduction:** Staged surgical removal of bilateral lung tumours should be considered for patients with synchronous disease, or early isolated recurrence. Surgical removal of a second primary tumour will require ventilation of the previously operated side; so single lung now becomes single lobe ventilation with potentially increased intra-operative difficulties and postoperative risk. This is a case series of 15 patients who underwent single lobe ventilation and their outcomes.

**Methods:** The regional thoracic database and patient records were interrogated for patients with multiple lung resections (2012 - 2015). A hand search of the pathology database and the local McMillan cancer nurse database yielded further patients. Seventy-eight patients were identified with 2 lung resections, however, only patients who had an initial lobectomy followed by a further lung resection were selected. The objective was to assess feasibility and safety. This was evaluated as necessity to abandon the procedure for insufficient ventilation or inability to complete the procedure. Intra-operative stability was assessed by the anaesthetic record looking at the venous saturations and ventilation requirements.

**Results:** Fifteen patients met the criteria. Sixty percent of the patients were female with median age 67. Mean FEV1 before single lobe surgery was 1.82 (78%) and gas exchange 55%. Follow up was 49 months. Second operation: wedge resection 53%, lobectomy 40% and segmentectomy 7%. Only 1 patient had a planned lobectomy changed to a wedge excision because of inability to ventilate adequately. There were no reintubations, median length of stay after first operation was 8 days, second operation was 6 days. The mean time between operations was 9 months. In hospital and 30 day mortality was zero. One death occurred 4 months after surgery.

**Conclusions:** These are technically challenging cases with reduced pulmonary function before the procedure and markedly reduced ventilatory lung volume during, and after, the operation. This study indicates that single lobe ventilation is feasible and safe and can allow anatomic lung resections and even VATS lobectomies to be performed while ventilating a single lobe.

## Thoracic surgeons prefer a 3D camera to 2D during simulation tests

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**Objectives:** Three dimensional (3D) camera systems are becoming more popular in surgery and, whilst the use of 3D in cinema and home entertainment has been established, thoracic surgery is only now beginning to explore its potential. This study explored subjective and objective differences in a 3D camera compared to a two dimensional (2D) system.

**Methods:** A 3D stack system was utilised in a wetlab training day with cardiothoracic surgeons. Five trainees and 1 consultant elected to take part in the trial. The system is capable of switching between 2D and 3D images without any change in the physical system. A laparoscopic simulator was fitted with a bead and peg simulation. One person throughout operated the camera. Half the candidates used 2D and then 3D to complete the task, with the other candidates starting with 3D then rerunning to the simulation with 2D. The 3D was provided with polarising passive glasses. All candidates took an online survey and the results were collated in a spreadsheet.

**Results:** One candidate was an independent VATs operator; 3 had 1 - 5 cases as an operator and 2 had experience manipulating the camera during VATs cases. The mean time for the bead transfer was 41 seconds for the 2D vs. 18 seconds for the 3D. There were lower collisions and drops in the 3D tests and shorter time to acquire an object or move to a location. All (100%) agreed, or strongly agreed, that they prefer the 3D camera, that the 3D camera tests were easier than 2D during the simulations, and they felt more precise when using the 3D camera.

**Conclusions:** The use of 3D cameras reduced the time for the bead transfer test by 55%. Candidates were able to localise in space and directly pick up objects without searching, thereby reducing the time and looking more efficient with their movement. All surgeons indicated a subjective benefit in economy of movement, precision and preferred a 3D camera system. Three dimensional cameras, with the natural haptic feedback and the economy of VATS instruments, may be the next leap forward in Thoracic surgery.

## What happens after Mitraclip implantation: Is it really safe in young patients?

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**Objectives:** Mitraclip is a transcatheter device used for management of severe mitral regurgitation in patients not eligible for surgery. This patient suffered severe mitral stenosis and regurgitation after a Mitraclip procedure, within 1 year of implantation.

**Methods:** A 53-year-old woman, with a history of aortic and peripheral arteriopathy, COPD and previous CABGx3 in 2012 with patent grafts, underwent Mitraclip insertion for severe mitral regurgitation in 2014. Symptomatic benefit was reported for 1 month. Severe mitral regurgitation and stenosis were diagnosed by echocardiography and 10 months following the Mitraclip insertion she had a surgical mitral valve replacement. A 31 bileaflet mechanical valve was inserted through a redo sternotomy without complication.

**Results:** The Mitraclip had caused a severe subvalvular reaction and obliterated the lumen of the valve. The clip appears to have been placed correctly and there was no indication of procedural complication, either from the specimen or the discharge and procedure notes. The valve was removed in 1 specimen and examined. The Mitraclip was in position between the 2 leaflets. The leaflets were thickened and a small orifice was evident.

**Conclusions:** Redo cardiac procedures still have a role in treating cardiac disease. This patient was turned down for surgery because of patent grafts but now required an operation anyway to explant the Mitraclip and implant a mechanical prosthesis. Implanting a Mitraclip is a less invasive procedure but it will preclude a patient from valve repair in the future. The subvalvular reaction associated with the device has not yet been described in the literature, but this is an important complication that needs to be understood further. A recent registry paper with 749 patients the median age of study patients was 76 years; perhaps younger patients may react differently to the device? The longevity of Mitraclip is not established compared to mitral valve replacement or repair. Valve repair was impossible and perhaps, like bioprosthetic valves, we should consider a minimum age for Mitraclip?

## Novel method for ex-vivo preservation of donor heart using blood cardioplegia and the Organ Care System

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**Objective:** In 2013, we initiated the first heart transplant programme in Kazakhstan. Donor hearts are often transported from remote areas (>1 000 km) to be transplanted at our centre. The objective of this study is to assess the feasibility of blood cardioplegia as an alternative method of heart preservation. The main outcomes of interest were 90 day graft survival and serious cardiac adverse events.

**Methods:** We performed a retrospective analysis of prospectively collected data at our centre. Between January 2014 and January 2016, 20 patients with heart failure had heart transplantation at our centre, and the Organ Care System was used in all patients. Of these, we arrested the donor hearts before explant and before implant using blood cardioplegia (BC group) in 9 patients and 9 patients with standard Custodiol (SC group) solution.

**Results:** Preoperative risk factors were comparable in both groups. All patients were alive day 90 after implantation, except for 1 patient, who died in BC group, and 1 patient, who died in SC group due to infection. The mean total warm ischaemic time (87 vs. 86 minutes) and mean ex-vivo Organ Care System perfusion time (275 vs. 238 minutes) were almost similar. Mean venous lactate at the start of perfusion (2.1 mmol/l vs. 3.1 mmol/l) and at the end of perfusion (5.0 mmol/l vs. 7.8 mmol/l) were approximately lower in the BC group. Seven day tissue myocardial Doppler results were normal in both groups, except for 1 patient in SC group, who had right ventricular dysfunction. Median ICU stay 9 days (range 4 - 40) vs. 18 days (range 5 - 42) were significantly lower in BC group.

**Conclusion:** Our observations, while preliminary, show that blood cardioplegia could be an alternative method for myocardial protection in distant procurement and preservation of donor hearts in the OCS.

## How does transmyocardial laser revascularisation intra-operatively impact on the status of the microcirculation and prevent adverse clinical outcomes?

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Successful microcirculatory reperfusion after myocardial revascularisation procedures, in most cases, is associated with improved outcomes in patients with CAD. An increasing percentage of patients with CAD cannot be successfully revascularised by PCI or CABG, TMR has emerged as an alternative for patients not amenable to conventional procedures.

**Material:** The results of 831 CABG operations in 3 groups were evaluated: CABG (group 1: 711 operations in patients without diffuse lesions of CA), isolated CABG in patients with advanced CAD (group 2: 33 operations) and CABG combined with TMR in patients with advanced CAD (group 3: 87 operations). Data evaluation included: intra-operative EchoCG, coronarography, cardiac enzymes, data of intra- and postoperative evaluation.

**Results:** Mortality rate in group 1 was 2.8%, in group 2: 12.1%, in group 3: 1.15%. Critical spasm of CA in group 1 occurred in 1.7% of cases, in group 2: 33.3%, in group 3: 1.15%. Incidence of myocardial infarction was in group 1: 0.6%, in group 2: 20.3%, in group 3: 1.15%. As patients in group 1 and 2 differ ( $p < 0.001$ ), only in presence of diffuse changes of CA, it appears that development (and/or worsening) of critical spasm, high incidence of MI and mortality is the prerogative of patients with advanced CAD. As patients in group 2 and 3 differ ( $p < 0.001$ ) only in extent of operations, it appears that TMR prevents development of critical spasm of CA and significantly improves effectiveness of operations.

**Conclusions:** The appraisal of changes in the coronary microcirculation within the ischaemic vascular bed is absolutely central to the maintenance of cellular viability and restoration of ventricular contractile function. TMR, performed as an adjunct to CABG in patients with advanced CAD, ameliorates vasoconstriction (spasm), improves myocardial runoff (vasodilatation), acutely improves graft and coronary artery flow, and leads to an intra-operative restoration of myocardial function.

## The myocardial microcirculation: A key target for salvaging ischaemic myocardium in patients with TMR

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**Background/introduction:** The mechanism by which transmyocardial revascularisation (TMR) offers clinical benefit is controversial.

**Aims/objectives:** This study was undertaken to demonstrate that TMR in patients with advanced CAD improves results of combined operations CABG+ TMR through reduction of vasoconstriction.



**Method:** We histologically investigated vessels of coronary microvascular network of patients with ENDCAD in 2 groups: with sole CABG (group 1: 8 heart specimens) and in patients who died after combined operations CABG+TMR (group 2: 6 heart specimens). These data are compared with hospital results (deaths, MACE) of patients with ENDCAD operated in 2011 - 2012: with isolated CABG (group 1: 33 operations) and CABG+TMR (group 2: 87 operations).

**Results:** In all hearts, after sole CABG, coronary arteriolar vasospasm was identified that decreases coronary and bypass flow and thus increases the probability of thrombi formation. All cases after CABG+TMR revealed vasodilatation in lased areas. Reduction in the occurrence of vasospasm in cases with CABG+TMR can prevent graft and coronary occlusion. High indices of hospital mortality (12.1%) and morbidity (33.3%) in cases with sole CABG can be explained with coronary spasm in patients with advanced CAD. On the other hand, reduced hospital mortality (1.15%) and morbidity (2.3%) in the group 2 (CABG +TMR) can be explained by laser-influenced vasodilatation of distal coronary bed. Elevated resistance of the coronary bed hinders the effectiveness of the graft and myocardial blood flow (MBF).

**Discussion/conclusion:** Restoration of blood flow after CABG is not universal. Our data suggest that patients with advanced CAD were at risk of significant vasoconstriction of the myocardial microvasculature with elevated resistance of myocardial microcirculation. Today, TMR is the only method to prevent the development of microvascular spasm and to prevent fatal complications after Restoration of blood flow within an infarct-related artery. It leads to an improvement in microvascular flow and contributes to a consequent restoration of myocardial function.

### Open aortic arch replacement: Long-term results for aneurysms and type A aortic dissections are comparable beyond the peri-operative period

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**Background:** Type A aortic dissection (TAAD) is a life threatening disease, if left untreated. Surgery can be performed safely with acceptable operative mortality and neurologic outcomes. However, operative mortality is still higher in TAAD compared to elective open arch surgery for aneurysmal pathologies. Long-term survival of patients with TAAD may be reduced due to complications by the residual dissection in the descending aorta. The objective of this study is to compare the long-term outcome after open aortic arch replacement for TAAD and aneurysmal disease.

**Methods:** Between March 2000 and September 2012, 204 consecutive patients underwent open aortic arch surgery receiving a hemi-arch replacement in 142 patients (69.6%) or a total aortic arch replacement (30.4%) at our institution. Patients were operated using deep hypothermic circulatory arrest in 18 (13.7%), retrograde perfusion in 30 (14.7%), and antegrade perfusion strategies in 156 patients (76.5%). Mean age was  $62.8 \pm 12.2$  years and 130 (63.7%) were male. One-hundred-and-six patients (52%) had acute TAAD and 98 (48%) had aortic arch aneurysm. Mean follow-up was  $4.4 \pm 3.6$  years (range, 0 - 13.5 years) and was complete in 99.5%.

**Results:** Thirty day mortality was 5.1% for patients with aortic aneurysm compared to 27.4% for acute TAAD ( $p < 0.001$ ) and could be significantly lowered to 0.6% in aortic aneurysms and 11.5% in TAAD using antegrade perfusion techniques. Total 10 year survival for patients with aortic aneurysms was 64.3% and 55.5% after TAAD ( $p = 0.005$ ). In 30 day survivors, 10 year survival was 67.4% for patients with aortic aneurysms and 74.7% after TAAD, respectively ( $p = 0.793$ ). Multivariate cox regression analysis identified age ( $HR = 1.05$ ,  $p = 0.013$ ), previous stroke ( $HR = 1.80$ ,  $p = 0.024$ ) and diabetes ( $HR = 2.81$ ,  $p = 0.021$ ) as predictors for long-term mortality in 30 day survivors.

**Conclusion:** Although early mortality is significantly lower in aortic aneurysm pathologies compared to TAAD, long-term survival beyond the peri-operative period of patients with aortic dissection is not inferior compared to patients with complex aortic aneurysm affecting the aortic arch.

### The overall concept of bridging to transplantation by a ventricular assist device in comparison to bridging by conservative treatment: Results using the United Network for Organ Sharing Database

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**Background:** An increasing number of patients are bridged to transplant by continuous-flow left ventricular assist devices (CF-LVAD). Analysis of large registry data sets has demonstrated that post-transplant survival is not different in patients with, and without, VAD at time of transplantation. The purpose of this study is to analyse outcomes of patients after time of listing for heart transplantation bridged to transplantation with, and without, VAD.

**Methods:** The United Network for Organ Sharing Database (UNOS) was reviewed to identify first-time heart transplant candidates who were bridged to transplantation with, and without, CF-LVADs at time of listing (January 2011 - April 2014). Patients with other forms of mechanical circulatory support were excluded.

**Results:** A total of 9 887 patients were listed during the study period, 1 329 of whom were on CF-LVAD support at the time of listing. Of the 8 558 patients with no MCS at the time of listing, 1 238 later required device support. The CF-LVAD cohort had fewer males, diabetics and patients with ischaemic cardiomyopathy than the cohort without mechanical support ( $p < 0.001$ ). Median time from listing until transplant was 235 days (IQR = 124 - 412) for those on CF-LVAD from the time of listing, and 133 days (IQR = 33 - 347) for those without MCS at listing ( $p < 0.001$ ). The incidence of delisting for clinical worsening in the CF-LVAD cohort was 0.171 per patient year compared to 0.087 per patient year ( $p < 0.001$ ). The incidence of VAD implantation in patients primarily medically bridged to transplantation was 0.217 per patient year. Two year survival, after listing, was lower in the CF-LVAD cohort (79.38% vs. 89.01%;  $p < 0.001$ ).

**Conclusions:** The overall outcomes, including post-transplant survival, were lower in the CF-LVAD cohort. The incidence for delisting for clinical worsening from the waiting list was higher in the CF-LVAD cohort. These results help to best inform heart transplant candidates in their overall chance for survival after time of listing.

## Is partial sternotomy suitable for aortic valve and major aortic surgery?

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**Objectives:** The minimal access aortic valve surgery came into use in the late 90s, one decade after the introduction of minimal invasive interventions in general surgery. The most common are partial sternotomy and right superior thoracotomy. In this presentation we aim to report our results on aortic valve and major aortic surgery performed through partial sternotomy.

**Methods:** Since 2013, 95 consecutive patients were operated upon using the technique of partial sternotomy. The patients' ages were between 33 and 86, of which 38 were female and 49 male. The surgery performed in 84 patients was aortic valve replacement for aortic stenosis. In this group, 9 patients received sutureless valves, in 1 case the patient also had an ascending aorta replacement. In 5 patients we performed modified Bentall procedure for bicuspid combined aortic valve disease with more than 4.5cm dilated root and ascending aorta. A further 3 patients received David II procedure and 1 patient Yacoub operation, for aortic regurgitation with dilated root and ascending aorta. In 2 cases we performed aortic valve replacement with aortic homograft, for aortic valve endocarditis. In 5 patients, who had aortic valve replacement, we also performed radiofrequency AF ablation. The sternotomy was either "J" (36), or "V" (59) shaped, to the third intercostal space, with a 6cm skin incision.

**Results:** The follow-up was between 6 weeks and 30 months. There was no mortality in this group of patients. One patient, which received a sutureless valve, required reintervention due to paravalvular leak, performed through the same approach. There was no reoperation for bleeding and no conversion to full sternotomy. One patient suffered a postoperative stroke.

The aortic cross clamp time was between 16 and 105 minutes, varying in accordance with the type of operation and operator (trainee).

**Conclusion:** The partial sternotomy approach, "J" or "V" shaped, offers the possibility of safely performing and teaching almost all type of interventions involving the aortic valve, root and ascending aorta.

## Comparison of single vessel coronary bypass grafting, minimally invasive, direct coronary artery bypass (MIDCAB) vs. off-pump coronary surgery by sternotomy (OPCAB)

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**Background:** Coronary bypass surgery can be performed less invasively by avoiding cardiopulmonary bypass (OPCAB) and by performing a minimally invasive direct coronary artery bypass through a left anterior mini-thoracotomy (MIDCAB). We compared our early results in patients with single vessel disease who underwent OPCAB and MIDCAB without cardiopulmonary bypass.

**Methods:** Forty-four patients who underwent LIMA to LAD, either by MIDCAB or OPCAB (January 2013 - December 2014) were reviewed. Data were obtained retrospectively. Patients undergoing MIDCAB or OPCAB were compared in terms of gender, preoperative risk factors, length of operation, ventilation time, ICU and hospital stay, amount of postoperative bleeding, daily postoperative pain (0 - 10 scale), and troponin and creatinine levels.

**Results:** A total of 20 patients in the MIDCAB group and 24 in the OPCAB group were analysed. There was no mortality in the MIDCAB group, vs. 2 patient deaths in the OPCAB group ( $p=0.186$ ). No significant differences were observed between the 2 groups with respect to gender, preoperative risk factors, ventilation time, ICU and hospital stay, amount of postoperative bleeding, and troponin and creatinine levels. The MIDCAB procedure duration was longer compared to the OPCAB [median (IQR): 151 (139.75 - 176.5) vs. 132 (102 - 162) minutes, respectively;  $p=0.029$ ]. Patients undergoing MIDCAB reported greater pain scores on the second postoperative day [5 (2 - 5) vs. 2 (0 - 3.5), respectively;  $p=0.027$ ], and similar low pain scores on the fifth postoperative day [0.0 (0 - 2) vs. 0.0 (0 - 4), respectively;  $p=0.142$ ].

**Conclusions:** MIDCAB procedures can be performed safely in well-selected patients with low postoperative morbidity and mortality. The higher pain scores during the early postoperative period in the MIDCAB group should be treated more vigorously.

## Effect of retractor type used during open heart surgery on postoperative pain

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**Objective:** Harvesting the mammary artery during CABG requires the use of designated retractor. The 2 most frequently used types of retractors are the rack and pinion retractors; the Favaloro is most commonly used in the USA and the self-retaining retractor (Jostra) is commonly used in Europe. The varied mechanisms the retractors employ apply different forces on the chest wall, which may consequently result in varying amounts of damage and levels of pain. The purpose of the study was (1) to compare the 2 types of retractors with respect to postoperative pain and (2) determine the influence that harvesting 1 or 2 internal mammary arteries has on postoperative pain.

**Methods:** A retrospective study, in which the medical records of 1 063 patients who underwent CABG surgery (2010 - 2012) were reviewed. Comparison of postoperative pain (VAS scale, 0 - 10, 3 times a day), analgesics consumption (morphine, 10mg) and demographic data between the 2 groups, Jostra and Favaloro groups, was assessed.

**Results:** Significant difference in postoperative pain level between the use of the 2 retractors was found; in women on whom the Favaloro type retractor was used ( $1.11 \pm 2.35$  vs.  $1.03 \pm 0.55$ ,  $p=0.007$ ). In the whole study population, a trend towards greater postoperative pain and analgesics consumption was found in the Favaloro Retractor group compared to Jostra, IMR was documented ( $43.1$  vs.  $35.7$ mg respectively,  $p=0.08$ ). In addition,

we found a significant correlation between harvesting two mammary arteries and increased postoperative pain (BIMA VAS 2.02 vs. SIMA VAS 0.66,  $p=0.006$ ) and analgesics consumption (BIMA 9.73mg vs. SIMA 5.35mg,  $p<0.001$ ).

**Conclusion:** Our study provides evidence that retractor type has an effect on the extent of postoperative pain depending on and when considering gender. Therefore, it may be beneficial for surgeons to select retractors with care when operating on female patients.

## Is a patient's cognitive state affected by the number of emboli? Transcatheter aortic valve implantation vs. aortic valve replacement

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**Objective:** Neurological complications and neurocognitive impairment due to cerebral emboli are common complications following heart surgery. This study aimed to (1) compare the number of emboli detected in the middle cerebral artery (MCA) in 3 procedures: open aortic valve replacement (AVR), apical and femoral transcatheter aortic valve replacement (TAVR); and (2) test whether or not an association between the number of emboli captured in each procedure and the changes in the patients' cognitive state exist.

**Methods:** Forty-four patients were enrolled in the study, 36 of whom were incorporated in the final analyses. Fourteen patients underwent open-AVR, 12 underwent TAVR-femoral and 10 underwent TAVR-apical. The number of emboli was detected by an MCA intra-operative transcranial Doppler ultrasound (TCD). All patients underwent neurocognitive evaluations by a Mini Mental Test the day before surgery and 6 - 12 weeks after surgery. The differences in Mini Mental ( $\Delta$ MM) were tested for association with the number of emboli detected during the procedure. The number of emboli in the various surgeries and the MMSE scores are described by medians and percentiles (25th and 75th), according to an abnormal distribution.

**Results:** Open-AVR resulted in a significantly greater number of emboli, median 8 555 (2 999, 12 489) compared to both the apical 1 962 (521, 3 850) and femoral 1 220 (948, 1 946) TAVI approaches ( $p=0.003$ ). Both TAVI approaches yielded a comparable amount of emboli ( $p=0.798$ ). There was no association between the mean number of emboli and the cognitive test results ( $r=0.026$ ;  $p=0.907$ ).

**Conclusion:** These findings suggest that, compared to TAVR, more cerebral emboli are detected during AVR procedures; however, a greater number of emboli do not appear to adversely affect a patient's cognitive state as assessed by the Mini Mental test. The large number of emboli that were detected during the AVR procedure was due to numerous gas bubbles, which the TCD was unable to distinguish from solid emboli.

## Respiratory guard system: New technology

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**Objective:** Ventilator-associated pneumonia is a hazardous complication associated with significant morbidity and mortality. We studied the AnapnoGuard system, a novel respiratory guard system that continuously monitors and controls the endotracheal tube's cuff pressure and allows for periodical secretion rinsing above the cuff. The safety and efficacy of the AnapnoGuard system as an airway management tool in mechanically ventilated patients was evaluated in this prospective, double-arm, randomised-controlled study.

**Methods:** The study population included 41 patients. Study group patients were connected to the AnapnoGuard control unit in which subglottic secretions suction and cuff pressure control were enabled. Control group patients were treated according to the current standard of care. In both groups, the presence of CO<sub>2</sub> levels above the cuff was measured by the control unit. The primary end point of the study was the overall duration and extent of endotracheal tube cuff leakage determined by CO<sub>2</sub> area under the curve (ROC curve). Secondary end points included number of cuff pressure measurements within the safely accepted range (24 - 40cm H<sub>2</sub>O) and number of significant CO<sub>2</sub> leakage readings.

**Results:** The average CO<sub>2</sub> area under the curve representing CO<sub>2</sub> leakage calculated for the study group was significantly lower compared to control group ( $0.09 \pm 0.04$  vs.  $0.22 \pm 0.32$  respectively,  $p<0.001$ ). Measurements of significant leakages (CO<sub>2</sub>  $\geq 2$ mmHg) were significantly lower in the study group (0.056 vs. 0.642 respectively,  $p<0.001$ ). Cuff pressure measurements within the safety range in the study group were almost 3 times higher compared to the control group (99.6% vs. 35.1%,  $p<0.001$ ). The average volume of secretions evacuated was 1.8 times higher in the study group (105ml/day vs. 59ml/day) ( $p=0.1$ ). No serious adverse events were recorded throughout the study.

**Conclusion:** The AnapnoGuard system was found to be safe and effective in reducing CO<sub>2</sub> leaks and maintaining proper cuff pressure. The greater secretion evacuation in the study group may indicate that less secretions leaked down to the bronchial tree.

## Preventive AF ablation in patients with rheumatic mitral valve lesion and left atrial enlargement: A pilot study

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**Objectives:** Atrial fibrillation (AF) after mitral valve (MV) surgery reduces the number of excellent and good results of the procedure. The aim of this prospective, randomised, single-centre pilot study was the comparison of patients without AF scheduled to MV surgery and treated with, and without, preventive ablation.

**Methods:** Between February 2014 and March 2015, 32 patients were enrolled in the study. All patients had MV rheumatic disease and left atrium enlargement more than 6.5cm. Sinus rhythm without any AF paroxysms was present in all cases. Mean age was  $51.5 \pm 3.43$  (31 - 65 years). Patients were randomly assigned to receive preventive ablation (Abl group; n=16) added to MV surgery or undergo MV intervention only (nAbl group; n=16). The ablation pattern was box lesion with pulmonary vein isolation. A loop recorder for continuous ECG monitoring was implanted. The data were collected in post-op period and 3 months after operation.

**Results:** All patients were alive at discharge. No procedure related complications occurred for either the ablation, or the loop recorder implantation. Mean aortic clamping and ablation times were significantly longer in the Abl group than in the nAbl group. The incidence of early AF paroxysm recurrence was significantly higher in the nAbl group than in the Abl group (37.5 vs. 6.3%,  $p < 0.001$ ). At 3 months after surgery, 15 (55.6%) of the 16 patients in the Abl group and 9 (88.0%) of the 16 patients in the nAbl group had no documented atrial arrhythmias ( $p < 0.001$ ) and were considered responders (AF burden  $< 0.5\%$ ). There was no pacemaker implantation in either of the groups during hospital stay, or during the follow up period.

**Conclusion:** Patients with MV rheumatic lesions and left atrial enlargement with normal sinus rhythm before operation may benefit from concomitant ablation for AF prevention.

## Pulmonary artery concomitant ablation technique in mitral valve surgery patients with severe pulmonary hypertension

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**Objectives:** Pulmonary artery hypertension due to left heart disease results in an increased risk of morbidity and mortality. The aim of our study was to evaluate the safety and efficacy of concomitant pulmonary artery ablation in patients with mitral valve disease and high pulmonary hypertension.

**Methods:** Enrolment in the study was based on right heart catheterisation and echocardiographic screening; eligible criteria were mean pulmonary artery pressure  $\geq 40$ mmHg at rest and a positive reactive test with nitric oxide inhalation. From January 2014 - December 2015, 25 patients scheduled for mitral valve surgery underwent concomitant pulmonary artery ablation. Mean patient age was  $53.4 \pm 7.8$  years, and 57.1% of patients were female.

**Results:** After bypass was established, the fibrous fold of the pericardium and ligamentum arteriosum was dissected out, and the branches of the right and left pulmonary arteries were mobilised bilaterally, far out into the hilum of the lungs. Pulmonary artery ablation was performed epicardially at the bifurcation of the main pulmonary artery, 10mm distal to the ostial right and left pulmonary artery, using a dry multifunctional radiofrequency pen (AtriCure® Inc., West Chester, OH, USA). Mean ablation time was  $9.5 \pm 3.1$  minutes. Pulmonary artery pressure decreased significantly from a mean of  $56.5 \pm 9.8$ mmHg to  $32.0 \pm 7.3$ mmHg immediately after the operation ( $p < 0.001$ ), and to  $28.4 \pm 5.2$ mmHg and  $29.7 \pm 4.4$ mmHg on the first and third intensive care unit days, respectively. The mean intensive care unit stay was  $3.1 \pm 1.2$  days. There were no early deaths, and specific complications were not observed.

**Conclusions:** Concomitant pulmonary artery ablation in mitral valve surgery patients with high pulmonary hypertension is a safe technique. Further study with control group and longer-term follow-up is needed to determine procedure effectiveness.

## Bronchoscopic lung volume reduction with endobronchial valves for end-stage chronic obstructive pulmonary disease: A single institution experience

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Over the last decade, several endobronchial lung volume reduction (ELVR) procedures for advanced COPD have been developed. Here we present our institution's experience in ELVR with Endobronchial Valves (EBV).

All patients who underwent ELVR with EBV were recorded in a prospective database. Age, gender, PFTs, postoperative morbidity, mortality, pre and postoperative (6 months) 6 minute walking tests (6MWT), mMRC scores, Hospital Anxiety and Depression Scale (HADS) scores were recorded. Pre and postoperative means were compared.

Between January 2012 and September 2014, 36 patients (all male) underwent 42 EBV procedures (6 bilateral EBV). Mean age was 64 (range: 47 - 74). Statistically significant improvement was shown between the pre and postoperative functional studies and quality of life tests.

Collateral ventilation was positive in 22 cases. Average of 4 (3 - 6) EBV were inserted per lobe (upper lobes in 30, lower lobes in 6 cases). Mean follow up time was 12 months ( $\pm 6$ ). Three patients had COPD flare up, 2 had pneumonia within the first 30 days. Two patients expectorated valves.

EBV placement offers satisfactory COPD palliation for appropriate patients with lower morbidity/mortality rates. Valve placement leads to significant improvement in quality of life and comparable improvements in objective functional measurements.

### A huge cardiac hydatid cyst deforming left ventricular morphology and causing significant mitral regurgitation: A case report

**Abdelmalek Bouzid, Salim Chibane, Mohammed Atbi, Boukri Hamouda, Reda Djilali-Saiah, Sami Bouchenafa, Youcef Lararbi, Tarek Hamdi and Ramdane Amar Ould Abderrahmane**

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**Introduction/objective:** The hydatid cyst is an endemic parasitic disease in the Maghreb countries; hepatic and pulmonary locations are the most frequent, cardiac involvement is rare. The onset of mitral regurgitation by a lesion of the mitral valve apparatus, or distortion thereof due to a location in the postero lateral wall of the left ventricle, is a rare complication.

**Methods/case report:** A 26-year-old patient, with a family history of pulmonary hydatid cyst presented, following the onset of chest pain. Radiological exploration (CT and MRI) identified a huge hydatid cyst (8 x 10cm), sitting at the antero lateral wall of the left ventricle, without other locations. Echocardiography confirmed radiological data and objective mitral insufficiency grade III. The patient underwent surgery with CPB, there is a huge hydatid cyst of the antero lateral LV wall extending to the posterior with significant adhesions with the pericardium. The cyst was evacuated; without reducing the residual cavity. The exploration of the mitral valve found an apparently normal valve, with an important restriction on the posterior valve; a Kay-Wooler commis-surlaplasty was performed. The postoperative course was uneventful.

**Results:** Postoperative echocardiography detected mild residual mitral regurgitation at 1, 3, 6 and 12 months.

**Conclusion:** Cardiac involvement in hydatid disease is uncommon, however, it remains a serious problem because of complications caused by mass effect (MR, AVB) but also because of the risk of rupture of the cyst in the pericardium (tamponade) or the heart chambers (anaphylactic shock and embolism).

### A huge liver hydatid cyst simulating a compressive pericardial effusion: A case report

**Abdelmalek Bouzid, Salim Chibane, Mohammed Atbi, Boukri Hamouda, Reda Djilali-Saiah, Sami Bouchenafa, Youcef Lararbi, Tarek Hamdi and Ramdane Amar Ould Abderrahmane**

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**Introduction/objective:** Cardiac tamponade is a frequent emergency encountered in cardiology, the most common causes in our country are tumoural and infectious diseases (viral, tuberculosis). However, other less common causes must be kept in mind, an example of which is the case we are presenting.

**Methods/case report:** A 38-year-old patient presented to cardiac surgery, with orthopnoea, muffled heart sounds tachycardia, with sweating and anxiety. Emergency echocardiography suggested a large pericardial effusion, compressing the right heart and requiring emergency pericardial drainage. The patient could not tolerate the supine position, necessitating surgery in a half-sitting position under local anaesthesia with sedation. The approach was by a mid sub xiphoid approach. The first puncture produced a clear watery liquid, so discovering the presence of a large hepatic hydatid cyst on the left lobe barring access to the pericardial cavity and compressing the right cavities. A larger median laparotomy was performed and the hydatid cyst evacuated. The residual cavity was filled with epiploon under local anaesthesia. The pericardial cavity contained 50ml of serous liquid.

**Results:** The postoperative course was marked by the appearance of a fever of 39°C with chills, leukopenia with 3000/mm<sup>3</sup>, HIV serology is positive. The patient was kept under triple antibiotic therapy and transferred to infectious disease department.

**Conclusion:** Cardio-pericardial hydatidosis is rare, it represents 0.5 - 2% of all the locations. Depending on the location it can cause cardiac tamponade. Other extra pericardial compressions may be the cause of tamponade, it is the case of abundant pleural effusions, even compression of the inferior vena cava can simulate tamponade. However, we did not find any publications about the presence of tamponade due to a compression of a hepatic hydatid cyst. This case adds another possible complication of liver hydatid cysts to those already known, namely cardiac tamponade.

### A rare complication of vitamin K antagonists – a medullary vascular accident: A case report

**Abdelmalek Bouzid, Salim Chibane, Mohammed Atbi, Boukri Hamouda, Reda Djilali-Saiah, Sami Bouchenafa, Youcef Lararbi, Tarek Hamdi and Ramdane Amar Ould Abderrahmane**

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**Introduction:** Vitamin K antagonists (VKA) are oral anticoagulants, used for prevention of thrombo-embolic events, especially in patients with mechanical heart valves or/and Atrial fibrillation. In France, haemorrhagic stroke attributable to AVK are the leading cause of iatrogenic injury. They are responsible for 20 000 hospitalisations/year, with an incidence of serious bleeding events in 5/100 patients/year and fatalities 1/100 patients/year. Intracerebral haemorrhage listed in the literature are subdural hematoma (the most common), subarachnoid haemorrhage and medullar bleeding.

**Case report:** We report the case of a 40-year-old woman, 86kg weight, with severe mitral stenosis and mild tricuspid regurgitation. The patient was operated on and had mitral valve replacement by a mechanical valve with a tricuspid annuloplasty. The postoperative was marked by a difficulty to obtain the target INR until the eighteenth postoperative day, the onset of a left hemiplegia, a cerebral CT shows no lesions, the same day the hemiplegia became a paraplegia, a new cerebromedullary CT objectives a medullar hematoma compressing the spinal cord. The patient received an emergency operation and the postoperative period was uneventful. Three months later the patient recovered total autonomy after active physiotherapy.

**Conclusion:** Haemorrhagic complications of treatment with Vitamin K antagonists remain a serious problem in the early postoperative period, and at discharge. A very tight control of the INR is essential to prevent these events, especially in patients at high risk of bleeding. The medullar location of a haemorrhagic complication must be kept in mind when hemiplegia occurs, a cerebral CT must be extended to cerebrospinal CT if there is any doubt.

## An exceptional emergency, a left ventricular myxoma prolapsing into the aorta, a case report

**Abdelmalek Bouzid, Salim Chibane, Mohammed Atbi, Boukri Hamouda, Reda Djilali-Saiah, Sami Bouchenafa, Youcef Larabi, Tarek Hamdi and Ramdane Amar Ould Abderrahmane**

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**Introduction/objective:** Myxomas are the most frequent cardiac tumours and represent 86% of cardiac tumours operated on. The most common location is the left atrium (87%). Left ventricular involvement is rare (2.5%). Present symptoms include syncope and embolisms. This is a benign tumour that mainly affects the age group between 30 and 60 years and 10% of cases are familial with a post op recurrence of 3%.

**Methods/case report:** A 24-year-old patient, with no particular history, in which we discovered during a prenuptial examination an 3/6 ejection systolic murmur radiating to the neck; an echocardiography performed observed a hyperechoic mass inserted on the anterolateral papillary muscle of the mitral valve prolapsing into the aortic valve and creating a sub aortic gradient of 62/39mmHg. The patient received an emergency operation, the tumour was exposed through the mitral valve after external expression of the lateral wall of the left ventricle; we discovered a myxoid tumour of 3 x 1,5 x 1 cm inserting on the anterolateral papillary muscle between the chordae. The tumour was removed carefully to avoid any chordae lesions. The mitral valve was normal. The CPB time was 77 minutes with a cross clamp time of 61 minutes.

**Results:** The postoperative course was uneventful, the echocardiographic control at 1,3, 6 and 12 months was normal with no recurrent tumour and without mitral regurgitation.

**Conclusion:** Cardiac myxomas are benign tumours with long asymptomatic development. However, when it becomes symptomatic, it often requires emergency surgery.

## Cardiac surgery after a recent ischaemic cerebrovascular accident, is it safe?

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**Introduction:** Fifteen to 20% of strokes have an ischaemic cardiac embolic origin; mitral stenosis and atrial fibrillation - which are often associated - are the primary causes. A period of 3 months, after the stroke is respected before cardiac surgery, given the risk of ischaemic damage in haemorrhagic transformation in the important héparinisation imposed by cardiopulmonary bypass surgery.

**Case report:** We report the case of a 26-year-old patient with severe mitral stenosis and Atrial fibrillation, who had an anischaemic stroke 3 days previously with loss of consciousness and impairment of the haemodynamic status as well as presence of intra atrial thrombus.

**Results:** The patient received an emergency mechanical mitral valve replacement with tricuspid annuloplasty; intraoperatively "ball-like" intra atrial thrombi were found. Postoperatively, the neurological deficit quickly regressed during active functional rehabilitation. The patient presents a month after recovery walking autonomously, but with a drop foot.

**Conclusion:** Operating patients, after a recent ischaemic stroke seems to be feasible with an acceptable risk, especially when the operation is an emergency.

## Is a unique surgical approach for cardiopulmonary hydatid cyst feasible? Case report

**Abdelmalek Bouzid, Salim Chibane, Mohammed Atbi, Boukri Hamouda, Reda Djilali-Saiah, Sami Bouchenafa, Youcef Larabi, Tarek Hamdi and Ramdane Amar Ould Abderrahmane**

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**Introduction:** The hydatid cyst is an endemic parasitic disease in North African countries; the most common site being the liver and lung, the other locations are less frequent. Cardiac involvement in the course of this disease is not uncommon; the classic approach for the multi-organ locations is to begin with the symptomatic ones, priority is given to cerebral and cardiac ones. We describe a single approach by median sternotomy for cardiac and pulmonary locations.

**Clinical case:** We report 2 cases: The first case is that of a 10-year-old boy with a 2 x 3cm hydatid cyst of the interventricular septum, 2 cysts at the right pulmonary apex 1 - 2cm diameter each and 1 - 2cm diameter cyst at the left pulmonary. First the septal cyst was treated under CPB, then the 3 bilateral pulmonary cysts were treated. The postoperative period was uneventful, with no recurrence of the cysts. The second patient is a 9-year-old boy, diagnosed with VSD at birth. Following the onset of motor deficit with intracranial hypertension syndrome; exploration has objectified the presence of multiple cysts intra cranial, for which he was operated. The search for other hydatid disease locations led to the discovery in the heart, lung and kidney locations. The patient benefited from the cure of a hydatid cyst, diameter 3 - 4cm, of the right ventricle under CPB, the VSD closure by direct suture, and treatment of 3 cysts of the right lung. The postoperative period was uneventful. Three months later he was operated for another cerebral locations and 6 months later the liver and kidney locations were treated at the same time.

**Conclusion:** The unique approach of cardiopulmonary localisation of hydatid disease is feasible and safe, it avoids a second operation with a second scar and especially a second psychological trauma in children.



## Results of grown-up congenital heart disease surgery in an adult cardiac surgery centre

**Abdelmalek Bouzid, Salim Chibane, Mohammed Atbi, Boukri Hamouda, Reda Djilali-Saiah, Sami Bouchenafa, Youcef Larabi, Tarek Hamdi and Ramdane Amar Ould Abderrahmane**

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**Introduction/objective:** Congenital heart disease of the adult, include not only malformations treated in childhood decompensating secondarily, as well as asymptomatic heart disease at birth becoming symptomatic late, sometimes in adulthood. In our country the number of these patients arriving to adult cardiac surgery is still high. The aim of our study is to evaluate the results of the GUCH surgery in our department.

**Methods:** Ninety-six patients were operated on for adult congenital heart disease (January 2009 - December 2015). The sex ratio was 0.72. The mean age was 27.5 years  $\pm$  2. The mean follow-up was 45  $\pm$  5 months.

**Results:** Thirty nine point eight percent of patients were operated for atria septal defect (29% OS and 10.9% SV with partial anomalous pulmonary drainage); 19.4% sub valvular aortic stenosis, 9.7% atrioventricular septal defect, 6.5% Tetralogy of Fallot, 6.5% coarctation of the aorta, 4.3% permanent ductus arteriosus, 4.3 VSD 2.2% medio ventricular stenosis, 2.2% pulmonary stenosis, Ebstein tricuspid disease, congenital mitral regurgitation, aortic congenital valve stenosis, pulmonary regurgitation was 1.1% each. The reoperation rate was 2.2%. Early Mortality was 4.3% (2/6 TOF, 1/1 Ebstein, 0/1 ASD with mitral replacement), there was no late mortality at this time.

**Conclusion:** Surgery of congenital heart disease in adults seems to have good results at midterm, however some lesions have worse results, especially TOF and Ebstein anomalies. These lesions must be diagnosed and treated earlier if we are to expect better results.

## Right atrium myxoma, a rare cause of pulmonary embolism. A report of 2 cases

**Abdelmalek Bouzid, Salim Chibane, Mohammed Atbi, Boukri Hamouda, Reda Djilali-Saiah, Sami Bouchenafa, Youcef Larabi, Tarek Hamdi and Ramdane Amar Ould Abderrahmane**

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**Introduction/objective:** The first description of a cardiac tumour was made in 1559 by Realdo Columbo, and the description of a right atrial myxoma was in 1908. In 1931 Hermann Chiari published the first case of right atrium myxoma complicated with pulmonary embolism, and in 1954 Crafford succeeded in a resection of a myxoma. Primary tumours of the heart are rare and account for 0.3% of all open heart surgery, 70% are myxomas. Myxomas rarely cause pulmonary embolism and they are mainly the cause of thromboembolic events that is the major cause of pulmonary embolism.

**Methods/case reports:** The first case is that of a 34-year-old patient. Transthoracic echocardiography showed 3 tumour formations in the right atrium, highly mobile with dilatation of the trunk of the pulmonary artery and pulmonary hypertension (60mmHg). An emergency operation was performed, under circulatory assistance without aortic clamping, CPB time was 29 minutes. Five tumour masses were found. The second patient is 45 year-old, with no particular history, and was treated for pulmonary embolism confirmed by chest CT and thrombo embolic origin was suspected. The patient was placed on anticoagulant therapy (heparin) for 1 month with no improvement. Echocardiography revealed a tumour. • An emergency operation was performed, under circulatory assistance without aortic clamping. CPB time was 30 minutes • There were 2 intra-atrial tumours. • The myxomatous origin of the tumours were confirmed.

**Results:** The postoperative course was uneventful for the first patient, however the second one died 48 hours after. The first patient had pulmonary hypertension with SPAP at 60mmHg.

**Conclusion:** Multiple myxomas present a significant risk of embolism with a risk of recurrence requiring a long-term monitoring of these patients. The delay of the diagnosis of pulmonary embolism can lead to significant morbidity and mortality and therefore echocardiography should be routinely performed once a pulmonary embolism is suspected.

## Surgery of primary cardiac tumours, experience of an emerging country cardiac centre

**Abdelmalek Bouzid, Salim Chibane, Mohammed Atbi, Boukri Hamouda, Reda Djilali-Saiah, Sami Bouchenafa, Youcef Larabi, Tarek Hamdi and Ramdane Amar Ould Abderrahmane**

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**Introduction/objectives:** Primary cardiac tumours are a rare disease; their incidence ranges from 0.0017% - 0.03%; 75% to 90% are benign. Fifty to 87% of these benign tumours are represented by the myxoma. They represent 0.71% of patients undergoing cardiac surgery. The aim of our study is to evaluate the results of cardiac tumours in an emerging country.

**Methods:** Twenty-one patients underwent surgery for primary cardiac tumours between January 2009 and April 2016. Sex ratio was 0.3, the mean age was 38.5 years  $\pm$  16 (minimum 24 years - maximum 71 years), mean follow-up 38.5 months  $\pm$  21 (minimum 4 months - maximum 84 months).

**Results:** Tumours were located in the left atrium on the inter-atrial septum (66.6%), in the right atrium (19%), on the tricuspid valve (9.5%) and in the left ventricle (4.7%). Patients underwent emergency operations due to the obstruction of mitral valve (LA tumor), aortic valve (LV tumor) or tricuspid valve (57.1%). Pulmonary embolism occurred in 14.2% of patients. The tumour was resected on a beating heart in 23.8%. Recurrence occurred in 4.7% after 53 months after the first operation in a patient with tricuspid location, the first time the resection was incomplete, the second time the tricuspid valve was totally resected and replaced with a bioprosthesis. The postoperative course was uneventful in all cases, except 1 patient which had acute distress respiratory syndrome and a 6 day stay in the intensive care unit, discharged 8 days after.

**Conclusion:** The surgery of cardiac tumours depends, as is the case of any tumour surgery, on the nature of the tumour itself. The silent evolution of these tumours makes their early diagnosis difficult, placing the patients at risk for embolism or obstruction. However, when the tumoural resection is complete, the prognosis is good. Recurrence must be kept in mind, especially in patients with multilobular tumour, or a family history of myxoma.

## Very rare association between congenital heart disease and cardiac hydatid cyst in children. A report of 2 cases

**Abdelmalek Bouzid, Salim Chibane, Mohammed Atbi, Boukri Hamouda, Reda Djilali-Saiah, Sami Bouchenafa, Youcef Larabi, Tarek Hamdi and Ramdane Amar Ould Abderrahmane**

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**Introduction:** The hydatid cyst is an endemic parasitic disease in our country; the most common site being the liver and lung, other locations are less frequent. Cardiac involvement in the course of this disease is not uncommon; the occurrence of iatrogenic VSD after surgical repair of a septal Hydatid cyst has been described. However, the combination of a cardiac hydatid cyst and congenital heart disease such as a ventricular septal defect or Tetralogy of Fallot is very rare. To our knowledge, to date, no similar cases have been published.

**Clinical cases:** We report 2 cases: The first patient is a 9-year-old boy, diagnosed with VSD since birth. Following the onset of motor deficit with intracranial hypertension syndrome; exploration has objectified the presence of multiple intra cranial cysts for which he was operated. The search of other localisations of hydatid disease led to the discovery of the heart, lung and kidney locations. The patient benefited from removal of a hydatid cyst diameter 3 - 4cm of the right ventricle under CPB with closure of the VSD by direct suture, and treatment of 3 cysts of the right lung. The duration of CPB was 50 and the aortic cross clamp time of 17 minutes. The postoperative period was uneventful. The second case is an 18-year-old woman with a Tetralogy of Fallot (regular form) and hydatid cyst of the right ventricle, discovered at same time. The patient benefited from the cure of ventricular hydatid cyst and the correction of the TOF (closure of the VSD by a patch and enlargement of the pulmonary infundibulum). The postoperative period was uneventful. The patient had a mild pulmonary stenosis at the last control.

**Conclusion:** The association of congenital heart disease with cardiac localisation of hydatid cyst is rare, however; it must be kept in mind in patients from endemic regions of hydatid disease.

## Frozen elephant trunk technique: What influences early mortality?

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**Objectives:** Frozen elephant trunk (FET) surgery is a modern treatment modality which should be considered for acute type A aortic dissection (ATAAD), for chronic type A and B aortic dissection (CTABD) and for extensive thoracic or thoraco-abdominal aortic disease (TABD). Despite ongoing technical improvements, morbidity and mortality remain high.

**Methods:** Between July 2011 and April 2016, a total of 59 Patients (mean age  $65.3 \pm 10.4$  years, 39% females) underwent FET surgery. In the majority of cases, stent deployment was performed in arch zone 3. In 5 patients (8.1%), a left common carotid artery (LCCA) to left subclavian artery (LSA) bypass was performed followed by proximal stent graft deployment in zone 2 with oversteering the LSA. The underlying pathologies were TABD ( $n=19$ , 32.2%), ATAAD ( $n=24$ , 40.7%), CTABD ( $n=16$ , 27.1%). Of these, 20 patients (32.3%) were emergency, 4 patients (6.5%) urgent, and 13 patients (21%) redo cases, respectively. Connective tissue disease was diagnosed in 7 patients (11.3%).

**Results:** Cardiopulmonary bypass, cross-clamp, circulatory arrest (CA) and selective cerebral perfusion (SCP) times were  $248.6 \pm 54.6$ ,  $151.6 \pm 66.8$ ,  $84.0 \pm 38.5$ , and  $95.4 \pm 41.0$  minutes respectively. Arch zone 2 stent deployment led to reduced CA ( $38.8 \pm 8.3$  minutes,  $p=0.012$ ) and SCP ( $55.4 \pm 9.5$  minutes,  $p=0.039$ ) times. Overall 30 day mortality was 18.7% ( $n=11$  patients). For TABD, ATAAD and CTABD the mortality rates were significantly different: 10.5%, 33.3%, and 6.25%, respectively. In elective cases the mortality was significantly lower compared to emergency operations (11.4% vs. 30.0%,  $p=0.041$ ). None of the redo and the "zone 2" patients died.

**Conclusion:** The FET technique remains a challenging surgical technique. However, early mortality is mainly influenced by the underlying pathology. FET surgery can be performed with acceptable results in both elective and redo cases. Stentgraft deployment in zone 2 may facilitate the procedure.

## An important novel clinical sign in severe acute aortic regurgitation

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Over a 15 year period we have encountered 2 patients with prominent diastolic jugular venous pulsation. Both patients had severe acute aortic regurgitation due to aortic valve endocarditis. Video recordings were made of the clinical findings, and in 1 case simultaneous CVP and systemic arterial pressure tracings were recorded. The findings show conclusively that this previously obscure (or even unknown) clinical sign is easily elicited at the bedside. We have named the prominent diastolic pulse wave a "z" wave as this letter has not yet been used in describing the jugular venous pulse in health or disease. Both patients underwent successful aortic valve replacement. Neither had a cardiac fistula. We explain the CVP findings in terms of diastolic ventricular interaction causing arrest of late diastolic right ventricular filling. This is followed by protosystolic ventricular interaction causing augmented right ventricular filling during isovolumetric systole until the right ventricular pressure rises sufficiently to resist further inflow. When encountered, this physical sign indicates that the left ventricle is operating under conditions of maximal diastolic loading and has little, or no, diastolic reserve. This situation warrants cardiac surgical intervention at the earliest opportunity before hepatic decompensation develops.

## Novel geometric model of left ventricular architecture

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**Introduction:** Torrent Gausp has sensationally described the left ventricular muscle mass of the ox as one large sheet of muscle which can be unwrapped so as to resemble a large steak. His findings suggested that the 3 dimensional anatomy could be described in geometric terms. We set out to do this using a pig heart model.

**Methods:** Thirty hearts were boiled and dissected. They were extensively photographed and a plasticine on wire frame model constructed to illustrate our findings.

**Results:** We were surprised to discover that our findings and subsequent model were different from that of Torrent Gausp. We found that the LV derives its entire muscle mass from 2 distinct muscle tracts which arise from the medial and lateral mitral commissural areas. These bundles spiral in a clockwise direction (as viewed from the atrium towards the ventricle) relative to one another and maintain a 180 degree phase separation from mitral annular level to the LV apex. This inner spiral is quite loosely wound. The 2 strands resemble the DNA double helix over a complete 360 degree turn from atrium to apex. At the apex they continue as a superficial layer of muscle which has a much more tightly wound spiral disposition which we have named the externalis. As viewed from the atrium, the externalis returns from apical to atrial level also in a clockwise direction.

**Discussion:** The surgical implications of this model of left ventricular structure relate to ideal positioning of bileaflet mechanical valves in the mitral position and improved understanding of left ventricular outflow tract pathology. The model also explains why post-infarct ventricular septal defects and mitral annular rupture occur at the sites where they are encountered. Furthermore, it suggests novel approaches to the repair of these defects.

## Can indirect acting anticoagulants reach optimal therapeutic activity?

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**Objectives:** The main purpose of this retrospective study was to estimate how general practitioners prescribe vitamin K antagonists and control their therapeutical activity via observation of international normalised ratio (INR). It was analysed how often patients taking indirect acting anticoagulants check the INR in order to estimate the effectivity of the treatment. One of the aims was to find out the possible reasons preventing achievement of optimal treatment effectivity.

**Methods:** The data was collected over a period of 1 year, with the help of a special questionnaire containing questions about the therapeutical effects of indirectly acting anticoagulants, INR and other clinical diagnostic indicators. One-hundred patients with atrial fibrillation taking Warfarin with high risk were enrolled into this study.

**Results:** INR was within normal range 2.0 - 3.0 for 48% patients who took vitamin K antagonists. For 47% patients, the therapeutical INR range was not obtained (INR <2.0). For 6% patients INR was above therapeutical level (INR >3.0). Forty-three percent of patients checked the INR level once per month, 29% patients checked it once in 2 months and 28% checked it less frequently than every 2 months.

**Conclusions:** More than half of the patients (52%) who took vitamin K antagonists did not reach the therapeutical INR level during the period of the study. The majority of patients had a higher risk of developing stroke, systemic thrombosis and higher mortality because of insufficient anticoagulant therapy. For 6% patients the bleeding risk was higher since anticoagulants dosage was too high. More than half of the patients checked the INR too seldomly.

## The use of intra-aortic counterpulsation balloon pump for the treatment of heart failure

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**Objectives:** The aim of this study was to analyse and summarise the use of intra-aortic counterpulsation balloon pump (IABP) for patients with heart failure. Also, to assess changes in vital signs after IABP and to establish a connection between laboratory and instrumental analysis results and heart failure outcomes.

**Method:** A retrospective analysis of last 300 inputs of IABP in University Hospital Santariskiu Klinikos, Intensive Cardiology Care Department was done.

**Results:** The study included 99 women (33.0%) and 201 men (67.0%). Average age – 69.5 ± 10.4 years, the survivors – 68.3 years, survivors are 4.2 years younger (p=0.002). The average hospitalisation stay was 17.3 ± 14.9 days, while the average IABP insertion duration – 110.7 hours. Patients who survived, had IABP inserted for 9 hours longer (p=0.001). It is statistically determined that no medical history of MI or CABG predicted worse outcome (p>0.05). Cardiogenic shock was the most common indication for use of the IABP (n=124, 41.3%). This indication had the highest mortality (n=63, 50.8%). Patients with acute MI had the highest survival rate (77.98.7%). The average BNP level of the surviving patients was 2.5 times lower (p<0.001). The mean creatinine value was 30% higher (p<0.001) for dead patients. The analysis of vital indicators changes had shown, that after IABP insertion, heart rate, systolic and diastolic blood pressure remain unchanged, however left ventricular ejection fraction has increased up to 4.4% (12.5%, p<0.05).

**Conclusions:** Intra-aortic balloon pump therapy has a beneficial effect on haemodynamic parameters and the complication rate is low. IABP remains a clinically and cost effective preventive and treatment device. Also, the admission BNP and creatinine levels, can reliably predict a negative outcome.

## Pericardial “washer” to reinforce coronary artery buttons anastomoses in Bentall’s procedure

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**Objective:** Replacement of the ascending aorta and aortic valve en bloc and reimplantation of adequately mobilised coronary buttons to the graft is the gold standard treatment of annuloaortic ectasia, aortic valve disease with chronic aneurysm of the ascending aorta or aortic dissection involving the aortic sinuses. Bleeding from anastomotic suture lines, is a potential complication in this procedure. So, with the aim of improving haemostasis, we use implanted coronary buttons in an end-to-side fashion with a running suture incorporating autologous pericardial “washer” to reinforce the adventitial surface of the coronary arteries. The aim of this study was to review outcomes in this cohort of patients.

**Methods:** From June 2004 - August 2015, 69 patients underwent the Bentall procedure at our department. Nineteen patients, aged  $61.4 \pm 10$  years, underwent Bentall operation and additional cardiac surgery procedures, while 50 patients, aged  $62.6 \pm 10$  years, underwent an isolated Bentall operation and so they were included in the study. Pericardial “washer” to reinforce coronary artery buttons anastomoses was used in 38 patients (76%) (group 1), while simple coronary artery buttons anastomoses were used in 12 patients (24%) (group 2).

**Results:** In-hospital mortality was 2.6% (1 patient) in group 1 and 8.3% (1 patient) in group 2. Patients from group 2 showed a higher incidence of postoperative re-exploration rate for bleeding compared to group 1 (3/12, 25% vs. 0/38, 0% respectively,  $p=0.01$ ); in 2 patients, bleeding was observed in correspondence to the aortocoronary suture lines. Group 2, but not the group 1, showed pseudo-aneurysm of the coronary button (1/12, 8.3% vs. 0/38, 0% respectively,  $p=0.54$ ).

**Conclusions:** Our results show that the use of pericardial “washer” to reinforce the adventitial surface of the coronary arteries in patients undergoing Bentall operation is a simple and easy technique. It may improve haemostasis and reduce bleeding and pseudo-aneurysm complications and related morbidity rates of this complex procedure.

## Veno-venous miniaturised extracorporeal circulation to support surgical resection of renal cell carcinoma with associated vena caval tumour thrombus

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**Objective:** Renal cell carcinoma have a natural tendency to form tumour thrombus which can extend into the renal vein, and ultimately, into the inferior vena cava. Surgery to remove vena caval tumour thrombus extending above the hepatic veins is technically challenging with significant morbidity and mortality. We have found the use of veno-venous miniaturised extracorporeal circulation to be a useful adjuvant in the removal of renal cell carcinoma, involving the inferior vena cava. We reviewed our experience.

**Methods:** Over 10 years, 10 patients (mean age of 62.4 years) with renal carcinoma invading the inferior vena cava underwent surgery. The level of tumour thrombus was classified according to the Mayo classification. The extension was at level IV in 4 and level III in 6 cases. All 10 patients underwent operative removal of the renal tumour and tumour thrombus with the help of veno-venous miniaturised extracorporeal circulation.

**Results:** Inferior vena cava reconstruction was performed by direct suture with 4 - 0 polypropylene in all 10 patients. There was no pulmonary embolism. Two patients died; 1 from septicaemia and 1 from multiple organ failure. The mean blood loss was  $860 \text{ mL} \pm 348 \text{ mL}$ , and mean patient hospital stay was 16 days.

**Conclusions:** It is a simple procedure that can easily be adapted for use in patients undergoing surgery to remove renal cell carcinoma involving the inferior vena cava and, in our experience, the technique has proved easy and effective.

## Five year follow-up of haemodynamic performance of the St. Jude Medical Trifecta aortic bioprosthesis

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**Objective:** The St. Jude Medical Trifecta aortic supra-annular bioprosthesis is regarded as the next generation in pericardial stented tissue valves. The unique design of tissue leaflets attached to the exterior of the valve stent provides unrivalled in-vivo mean gradients and haemodynamics. The aim of this prospective study was to evaluate the 5 year haemodynamic performance of the Trifecta valve.

**Methods:** Two-hundred-and-sixty-four consecutive patients undergoing aortic valve replacement using the St. Jude Medical Trifecta valve at a single UK centre, over a 5 year period, were included in this study. Patients undergoing concomitant cardiac procedures were included. All implanted valves were 19, 21, 23, 25, 27 and 29mm in size. Assessment of haemodynamic function was carried out using transthoracic echocardiography preoperatively and at follow-up, as well as transoesophageal echocardiography intra-operatively.

**Results:** The study population consisted of 264 patients (161 male, 103 female). Mean age was  $71.9 \pm 9.1$  years. Implanted valve sizes were 19mm ( $n=20$ ), 21mm ( $n=76$ ), 23mm ( $n=101$ ), 25mm ( $n=54$ ), 27mm ( $n=11$ ) and 29mm ( $n=1$ ). Overall mean postoperative pressure gradients were  $9.26 \pm 4.1 \text{ mmHg}$  (mean) and  $17.7 \pm 7.6 \text{ mmHg}$  (peak). Subgroups mean postoperative pressure gradients were  $11.1 \pm 3.4 \text{ mmHg}$ ,  $10.6 \pm 5.3 \text{ mmHg}$ ,  $9.1 \pm 3.4 \text{ mmHg}$ ,  $8.6 \pm 4.3 \text{ mmHg}$ ,  $6.2 \pm 2.7 \text{ mmHg}$ ,  $6.86 \pm 0 \text{ mmHg}$ , for the 19, 21, 23, 25, 27 and 29mm cohort respectively. Overall mean postoperative left ventricular ejection fraction was  $55.6 \pm 10.1\%$ . Overall mean effective orifice area was  $1.66 \pm 0.49 \text{ cm}^2$ .

**Conclusion:** Our results demonstrate excellent haemodynamic performance of the Trifecta bioprosthetic valve.

## Five year follow-up of haemodynamic performance of the St. Jude Medical Trifecta aortic bioprosthesis: The training perspective

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**Objective:** The St. Jude Medical Trifecta aortic supra-annular bioprosthesis provides exceptional haemodynamic performance, durability and implantability. The unique design of the valve, encompassing a contoured silicone insert within a unique cuff, is specifically designed to conform to the native annulus shape for proper seating and minimal risk of paravalvular leak. The aim of this prospective study was to evaluate midterm haemodynamic performance of valves implanted by cardiothoracic trainees at a single UK centre.

**Methods:** Thirty consecutive patients, undergoing aortic valve replacement using the St. Jude Medical Trifecta valve, performed by trainees at a single UK centre over a 5 year period were included in this study. Patients undergoing concomitant cardiac procedures were included. Assessment of haemodynamic function was carried out using transthoracic echocardiography preoperatively and at follow-up, as well as transoesophageal echocardiography intra-operatively.

**Results:** The study population consisted of 46 patients (25 male, 21 female). Mean age was  $70.3 \pm 19.3$  years. Implanted valve sizes were 19mm (n=3), 21mm (n=12), 23mm (n=16), 25mm (n=14) and 27mm (n=1). Overall mean postoperative pressure gradients were  $7.9 \pm 2.7$ mmHg (mean) and  $15.9 \pm 7.8$ mmHg (peak). Subgroup mean postoperative pressure gradients were  $7.9 \pm 0.6$ mmHg,  $8.9 \pm 0.7$ mmHg,  $7.6 \pm 3.4$ mmHg,  $9.8 \pm 5.4$ mmHg,  $5.7 \pm 0$ mmHg, for the 19, 21, 23, 25 and 27mm cohort respectively. Overall mean postoperative left ventricular ejection fraction was  $59 \pm 12\%$ . Overall mean effective orifice area was  $1.67 \pm 0.42$ cm<sup>2</sup>. All valves were well-seated.

**Conclusion:** Our experience demonstrates excellent haemodynamic performance of the Trifecta bioprosthesis when implanted by surgical trainees. Possibly a result of the innate superior haemodynamic properties of the Trifecta valve and simple implantability.

## Esophageal carcinoma with aberrant right subclavian artery in the era of minimally invasive esophagectomy

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**Objectives:** The retroesophageal space in the upper mediastinum is regarded as relatively safe and is firstly exposed during minimally invasive esophagectomy (MIE). However, when an aberrant right subclavian artery (ARSA) coexists with esophageal carcinoma, MIE will become very challenging, and even life-threatening. The aim of this study is to review our results and experience on treating 7 cases of esophageal carcinoma with ARSA.

**Methods:** From January 2012 - January 2016, among the 3 297 patients admitted with esophageal cancer, there were 7 patients with co-existent ARSA. The surgical protocol was carefully studied. The operative finding, recovery and follow-up were recorded.

**Results:** All ARSAs were identified through preoperative contrast chest CT. As for the surgical approaches, 1 patient had mucosal lesion and underwent endoscopic submucosal dissection (ESD), 2 patients with advanced lesions underwent open thoracotomy (Sweet and Ivor-Lewis procedure, respectively), and the remaining 4 patients had MIE. During operation, the ARSA, a large vessel with a diameter of about 1 - 1.5cm, was clearly observed. It obliquely crossed spinal vertebrae above the azygos vein and behind the esophagus, then ascended along the right side of the esophagus to the thoracic inlet. The thoracic duct was observed in the lower mediastinum, but not so in the upper mediastinum, therefore a prophylactic ligation was performed. The right recurrent laryngeal nerve was not found along the intrathoracic course of vagal nerve. After lymphadenectomy, a tubular stomach was made, and the esophagogastric anastomosis was performed at the left side of the neck. All patients recovered uneventfully and resumed oral intake on the fifth postoperative day.

**Conclusions:** When treating esophageal cancer with ARSA: (1) Contrast chest CT should form part of the routine preoperative examination; (2) MIE or right thoracotomy remains the optimal surgical route; (3) Right recurrent laryngeal nerve is usually absent within thoracic cavity; (4) Prophylactic ligation of the thoracic duct is recommended.

## Positive esophageal resection margin: An independent prognostic factor for esophageal cancer that warrants adjuvant therapy

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**Objectives:** Positive esophageal resection margin (ERM+) following esophagectomy was considered as incomplete or R1 resection. The aim of this study is to assess the clinical significance of ERM+ and its therapeutic option.

**Methods:** From November 2008 - December 2014, 3 594 patients with histological confirmed esophageal carcinoma underwent radical intent resection in our department. Among them 37 patients (1.03%) had ERM+ (Study group). The clinicopathological data and survival of esophageal cancer patients with ERM+ after esophagectomy were retrospectively analysed. ERM+ was defined as carcinoma or atypical hyperplasia (severe or moderate) at the residual esophageal margin. For comparison, another 74 patients with esophageal negative resection margin (ERM-) were propensity-matched at a ratio of 1:2 as control group according to sex, age, location and TNM stages. The possible prognostic factors were investigated by univariate and multivariate regression analysis.

**Results:** The median survival time was 35 months in patients with ERM+, significantly worse than 68 months in those with ERM- (Chi-square=4.064, p=0.044). Survival in patients with esophageal residual atypical hyperplasia (severe or moderate) was similar to those with esophageal residual

carcinoma. Survival rate in stage I-II cancer was higher than that in stage III-IV cancer (Chi-square=5.981,  $p=0.014$ ). Furthermore, in those patients with ERM+, survival was better in patients who had adjuvant therapy, compared to those without adjuvant therapy (Chi-square=5.480,  $p=0.019$ ). There was no significant difference between patients with age >60 years and age <60 years in the study group.

**Conclusions:** Positive esophageal resection margin nowadays is rare, but still an independent prognostic factor for patients with esophageal cancer undergoing esophagectomy. The survival rates are comparable between those patients with ERM- and those with ERM+ but at earlier stages. Advanced stage patients with ERM+ would benefit from adjuvant therapy.

## Which is better in 2-staged hybrid coronary revascularisation – CABG first or PCI first?

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**Objective:** Hybrid approach to coronary revascularisation (HCR) was aspired to bring together the advantages of LIMA-LAD bypass with minimal invasiveness of PCI. Several controlled studies have proven the safety, feasibility, and efficacy of HCR. However, there is still some controversy regarding the optimal order; PCI first vs. CABG first. The purpose of this study is to compare the outcomes of these 2 approaches.

**Methods:** Eighty patients who underwent HCR (May 2010 - December 2015) were enrolled in a retrospective analysis. CABG group I (CABGF) comprised 12 patients and PCI group I (PCIF) included 69 patients. The outcome variables that were compared between the 2 groups were chest tube drainage count, reoperation, postoperative hospital stay, major adverse cardiac and cerebrovascular event (MACCE), and repeated target vessel revascularisation (TVR).

**Results:** The mean age of the patients was  $66 \pm 10$  years. Demographic and basal characteristics of the patients in both groups were not significantly different. No significant differences were found for chest tube drainage and postoperative hospital stay in both groups ( $p=0.24$  and  $0.37$ , in respectively). There was 1 reoperation in each 2 groups due to postoperative bleeding ( $p=0.16$ ). There was no in-hospital mortality in either groups. There were 3 MACCE in PCIF group only. Two patients died due to pneumonia 6 months and 45 months after operation and 1 patient had a stroke postoperatively. There was no cardiac-related death in either groups. Re-intervention was performed in 1 patient in CABGF and 7 patients in PCIF group ( $p=0.84$ ). Target vessel revascularisation was 4 cases in PCIF group only, but there was no significant difference between the 2 groups ( $p=0.39$ ).

**Conclusions:** There was no significant difference in outcomes between CABG group I and PCI group I. Based on our results, we would suggest either CABG or PCI can be safely opted for as a primary procedure in 2-stage hybrid coronary revascularisation. Further investigation with a randomised control study will be necessary to guide proper decision making.

## Long-term results of surgery for mitral paravalvular leak: The benefits of leak site repair compared with re-replacement

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**Objectives:** We compared the early and long-term results of surgical management for mitral PVL according to the surgical methods and evaluated the incidence of recurrence of PVL.

**Methods:** Between September 1995 and November 2013, 87 patients (male: female = 46:41) underwent surgical treatment for mitral PVL. Mean age at the operation was  $59.8 \pm 11.8$  years. Sixty-one patients (70.1%) had a history of multiple cardiac operations before PVL occurred. PVL was treated with leak site repair in 37 patients, and with re-replacement of the mitral valve in 50 patients. Leak site repair was the preferred method, if possible. However, we re-replaced prosthetic mitral valve when patients were diagnosed with infective endocarditis. Mean cardiopulmonary bypass time and aortic cross clamp time were  $223.2 \pm 107.2$  and  $133.2 \pm 65.7$  minutes, respectively. Mean follow-up duration was  $61.7 \pm 47.0$  months.

**Results:** Operative mortality occurred in 11 patients (12.6%). There were no significant differences in operative mortality and postoperative complication between the 2 groups, respectively ( $p>0.999$ ,  $p=0.794$ ). Late death occurred in 17 patients. Five year and 10 year overall survival rates were 78.4% and 36.4% without the intergroup difference, respectively ( $p=0.452$ ). The recurrence of PVL occurred in 26 (29.8%) patients 73.3  $\pm$  43.3 months later, after surgery. Twenty-two patients underwent surgery for recurrence for PVL, among them 5 (22.7%) patients died during immediate post-operative periods. Five year and 10 year freedom from recurrence of PVL were 78.4% and 36.4%, respectively. The recurrence rate was significantly high in re-replacement compared with leak site repair ( $p=0.014$ ).

**Conclusions:** Even though early and long-term results of surgical treatment for mitral PVL were acceptable, the incidence of recurrence of PVL and re-operative mortality was still high. Leak site repair would be a good surgical option for mitral PVL because the recurrence of PVL was significantly lower compared with re-replacement.

## Stimulation of in vivo angiogenesis through growth factor delivery from synthetic heparinised hydrogels

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**Objectives:** Myocardial infarction is one of the leading causes of death. Due to minimal regenerative capability, alternative therapies are being actively sought, such as therapeutic angiogenesis. Engineered biomaterials are being extensively investigated in this area. In this study, biodegradable heparinised polyethylene glycol (PEG-Hep) hydrogels were synthesised and characterised for the binding and controlled release of vascular endothelial growth factor (VEGF) and basic fibroblast growth factor (bFGF), as well as their bioactivity and angiogenic potential in vivo.



**Methods:** VEGF/bFGF were combined into 4% PEG/PEG-Hep hydrogels. The binding and release rates of VEGF and bFGF were analysed via ELISA. Released growth factor bioactivity was measured using an XTT metabolic assay on Human Saphenous Vein Endothelial Cells (HSVECs) and Human Dermal Fibroblasts (HdFBs) under serum free conditions. Neovascularisation was quantified in a subcutaneous rat angiogenesis model in which hydrogel growth factor combinations were implanted within porous polyurethane discs and analysed after a 4 week period.

**Results:** PEG-Hep hydrogels demonstrated substantial growth factor binding ability (500 - 600ng) and allowed sustained release (10 - 20ng/day) for up to 28 days. Bioactivity of the growth factors was retained throughout the release period. The degradation rate of the hydrogels could be controlled in vivo by varying the ratio of hydrolytic and proteolytic monomers in the hydrogels, which allowed for an increase in sustainable growth factor release rate. Quantitative image analysis showed a pronounced angiogenic response in vivo, with a 50% and 66% increased ingrowth of vessels for VEGF and bFGF ( $p < 0.05$ ) respectively.

**Conclusion:** Heparinised PEG hydrogels show significant promise as controlled release vehicles for growth factors and warrant further examination in a myocardial infarction model.

## Review of interventions in children with Takayasu's arteritis at a Southern African tertiary care centre

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**Introduction:** Takayasu's arteritis is a granulomatous, fibrosing arteritis of the aorta and its branches, especially the renal arteries, that may lead to segmental stenosis, occlusion, dilatation or aneurysm formation. Hypertension and pulselessness are common manifestations. The aetiology is unknown, but tuberculosis and an autoimmune component have been invoked. Management includes anti-inflammatory and chemotherapeutic agents, and revascularisation. Percutaneous angioplasty is the commonest palliative treatment with an immediate success rate of 50 - 80%. Both percutaneous and surgical procedures have a high failure rate.

**Objective:** To analyse our experience of interventions and outcomes at a large Southern African Tertiary care centre.

**Methods:** Retrospective analysis of all children diagnosed with Takayasu's arteritis at the Chris Hani Baragwanath Academic Hospital over a 20-year period. All demographic data such as age, sex, Takayasu's classification, percutaneous or surgical management and follow up was documented and analysed.

**Results:** A total of 55 children were diagnosed with Takayasu's arteritis during the study period. Twenty-three patients underwent 30 percutaneous interventions to treat uncontrolled hypertension: 8 stents (aorta 5, renal arteries 3), 22 balloon angioplasties (aorta 6, renal arteries 15, branch pulmonary artery 1) and 7 nephrectomies. The systolic blood pressure decreased from  $153 \pm 23$  to  $133 \pm 24$  mmHg ( $p = 0.005$ ) and the diastolic blood pressure decreased from  $99 \pm 17$  to  $72 \pm 15$  mmHg ( $p = 0.0002$ ) combined with anti-hypertensive treatment. The average age of the intervention group was 10.5 years, the F:M ratio was 5:1, and 7 were lost to follow up, with an average duration of follow up of 3.4 years. Half the patients originated from another province, namely the North West.

**Conclusion:** Takayasu's arteritis is an uncommon acquired disease. Percutaneous intervention, although not curative, does result in better control of hypertension.

## Technical considerations and update on clinical outcomes using 4 different devices for transapical mitral valve-in-valve, valve-in-ring or valve-in-native ring implantation

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**Objectives:** In the absence of dedicated devices for transcatheter mitral valve implantation (TMVI), devices designed for transcatheter aortic valve replacement have been reported for use in mitral position in selected patients. We report results in a consecutive series of patients receiving TMVI using 4 different transcatheter heart valves.

**Methods:** From 2009 - 2016, 23 consecutive patients (69.6% female,  $68.9 \pm 13.3$  years, logEuroSCORE I  $22.8 \pm 14.8\%$ , STS PROM  $10.5 \pm 7.2\%$ ) underwent TMVI using balloon-expandable (BE) ( $n=13$ ), latest generation BE ( $n=5$ ) or 2 different mechanically-expandable (ME) ( $n=5$ ) THV via transapical access for mitral valve-in-valve ( $n=18$ ), valve-in-ring ( $n=3$ ) or valve-in-native-ring ( $n=1$ ). Size of degenerated mitral bioprostheses was  $27.7 \pm 1.4$  mm. In 2 cases concomitant transcatheter aortic valve implantation was performed.

**Results:** TMVI was successful in all cases. Procedure and fluoroscopy times were  $93.4 \pm 26.9$  and  $16.6 \pm 12.1$  minutes. TMVI using ME THV was performed without rapid ventricular pacing and without any intraprocedural haemodynamic compromise. Intentional resheathing before final deployment was performed in 3 cases of ME THV. In 1 case, recapture of ME THV for inadequate sealing was followed by BE THV implantation. Trans-mitral gradients decreased from  $14.9 \pm 6.6$  mmHg to  $6.4 \pm 3.2$  mmHg ( $p < 0.0001$ ). Trace paravalvular leakage was present in 5 patients (21.7%) with completely competent valves in the remaining 18 patients. In all cases, left ventricular outflow tract obstruction (LVOTO) was ruled out by intraprocedural transesophageal echocardiography. Apical bleeding required rethoracotomy in 1 and resuscitation in another patient. Procedural and 30 day mortality in electively treated patients were 0% (0/23) and 8.7% (2/23), respectively.

**Conclusions:** Transapical TMVI was safe and feasible using 4 different types of THV. Haemodynamic results were satisfactory. Use of mechanically-expandable THV has the advantage of performing TMVI without any intraprocedural haemodynamic compromise. In these cases, haemodynamic results can be assessed before final THV deployment to ensure satisfactory outcomes and to rule out LVOTO.

## Infective endocarditis in central South Africa

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**Objectives:** In the last 3 decades, infective endocarditis (IE) has shown significant morbidity and mortality, despite the advances in antimicrobial therapy and postoperative care. Minimal research on surgery for native infective endocarditis (IE) in South Africa has been conducted. The objective of the present study is a retrospective analysis of patients from central South Africa presenting to a tertiary hospital in Bloemfontein for surgery between 2006 and 2015.

**Methods:** This is a retrospective study of patients undergoing surgery for IE at a tertiary-level hospital in South Africa (2006 - 2015). Demographics, diagnosis, intra-operative and postoperative records were analysed and compared to previous studies on IE in South Africa.

**Results:** A 104 patients were operated for IE during this period. The average age of the patients was 43 and there was a male predominance (60%). In total, 132 valve procedures were performed and these were either replacements or repairs. In total, the procedures included repair or replacement of 51 aortic, 63 mitral and 18 tricuspid valves. Organisms were similar to previous studies, with 80% of cases due to Staphylococcus and Streptococcus infections. The predominant underlying cause was found to be rheumatic heart disease in over two-thirds of the patients, with congenital causes being the second most common cause. Interestingly, 18% of patients were HIV positive, although only about a half had been tested.

**Conclusion:** Infective endocarditis remains an important surgical disease in the South African population. Rheumatic heart disease predominates as an important cause and the second most common cause is due to congenital heart disease. This retrospective study also suggests that HIV contributes significantly to infective endocarditis. More research is needed regarding demographics and outcomes for infective endocarditis in South Africa.

## A heart donor score reflects the likelihood of organ acceptance, but not short- and long-term recipient mortality: A Brazilian transplant centre experience

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**Objectives:** Allograft failure is a major concern in heart transplantation. Smits, et al. (2012) proposed a donor scoring system which intends to predict allograft failure. In this study we aim to evaluate this scoring system's capability to predict organ acceptance, primary graft failure and recipient mortality in our population.

**Methods:** Between January 2012 and December 2014, 299 potential adult heart donors were evaluated. Data were retrospectively retrieved from the hospital database and the Donor Scoring System applied. Based on the value of the score, donors were classified into low-risk donors (LRD: <17 points) and high-risk donors (HRD: ≥17 points).

**Results:** Global donor acceptance rate was 45.8%. HRD constituted the majority (71.6%) of the donor population and their acceptance rate was lower than LRD (38.3% vs. 64.7%;  $p < 0.0001$ ). From 137 donors accepted, only 58 were transplanted due to unavailability of means to organ procurement traveling. There was no difference between HRD and LRD groups concerning primary graft failure ( $p = 0.6$ ). Recipients' survival at 1 month, 12 months and 24 months was 90%, 80% and 71.2% respectively for group LRD while for group HRD it was 78.5%, 64.3% and 60% (log-rank 0.4; Kaplan-Meier estimate).

**Conclusions:** The majority of donors were classified as high risk. The evaluated scoring system predicted the likelihood of donor acceptance but did not predict primary graft failure, immediate- and long-term-mortality.

## Cox Maze III procedure in patients with atrial fibrillation and structural heart disease: Immediate and late results

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**Objectives:** Cox Maze III procedure is the gold standard surgical treatment for atrial fibrillation. We aimed to determine immediate and late results for this procedure, emphasising sinus rhythm rates and identification of predictor factors for late recurrence of atrial fibrillation.

**Methods:** Between January 2008 and January 2015, 113 adult patients were submitted to Cox maze III procedure during cardiac surgery for correction of structural heart disease. There were 80 (70.8%) women and the mean age was 49 years. In hospital outcomes were assessed regarding morbidity and mortality. Late follow up >3 months (mean 27.5 months) was achieved in 80 patients that were evaluated using 24 hour Holter monitoring. Procedure success rates and recurring predictors were determined by Cox proportional regression analysis.

**Results:** Persistent atrial fibrillation or longstanding persistent atrial fibrillation, occurred in 85.7% of patients and rheumatic valve disease in 80.7%. The mean cardiopulmonary bypass time and aortic cross clamp time were  $128 \pm 26$  and  $104 \pm 23$  minutes, respectively. Hospital mortality was 1.79%, and need for definitive pacemaker 3.6%. Sinus rhythm maintenance rates were 88%, 85.1% and 80.6% at 6 months, 24 months and 36 months, respectively. The predictors for late recurring atrial fibrillation were female gender (HR 3.52 IC95% 1.21 - 10.25;  $p = 0.02$ ), coronary heart disease (HR 4.73 IC95% 1.37 - 16.36;  $p = 0.01$ ) and increased left atrium diameter (HR 1.05 IC95% 1.01 - 1.09;  $p = 0.02$ ). Actuarial survivals at 12, 24 and 48 months were 98.5% and actuarial survivals free of cerebrovascular events at the same periods were 100%, 100% and 98.5%.

**Conclusions:** Cox Maze III procedure is safe and proved to be effective in keeping sinus rhythm.

## Venoarterial ECMO in adult patients after open-heart surgery: A Brazilian heart centre experience

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**Objective:** ECMO is an important supportive measure in patients with serious cardiopulmonary dysfunctions after open-heart surgery. We aimed to study indications, management and results of ECMO use after open-heart surgery.

**Methods:** Between January 2006 and November 2015, 38 adult patients submitted to open-heart surgery needed venoarterial ECMO implantation as a respiratory and/or circulatory support. Mean age was  $47.7 \pm 15.9$  years.

**Results:** At time of implantation ECMO was indicated expecting recovery and weaning for all patients. Nevertheless, successful weaning was achieved in only 25 (65.8%). In 3 (7.9%) ECMO was used as a bridge to transplantation, in 1 (2.6%) as a bridge to bridge and in 9 (23.7%) it was discontinued at multidisciplinary team judgment. Hospital discharge occurred in 16 (42.1%). ECMO indications were failure to weaning cardiopulmonary bypass in 17 (44.7%), cardiogenic shock in 13 (34.3%), cardiac arrest in 4 (10.5%) and respiratory failure in 4 (10.5%). Types of indication for ECMO implantation ( $p=0.51$ ) and cannulation site ( $p=0.54$ ) were not predictors of weaning success ( $p=0.51$ ). Patients successfully weaned from ECMO had a shorter support duration ( $85.1 \pm 45.9$  hours vs.  $188 \pm 122$  hours,  $p=0.0009$ ) as well as those discharged from hospital ( $72.1 \pm 44$  hours vs.  $154 \pm 105$  hours,  $p=0.009$ ).

**Conclusions:** Venoarterial ECMO proved to be effective in patients with serious cardiopulmonary dysfunction after open-heart surgery. For those patients who cannot be weaned in the first days, intermediate- and/or long- term circulatory support devices should be considered.

## Factors causing a low rate of suitable lungs for donation among brain-dead cases

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**Objectives:** Lung transplantation, as a final treatment for end-stage lung diseases, is one of the most difficult and challenging operations. The result of a lung transplant is effected by many factors; the most important one is the quality of the donor's lungs. Many conditions which result in brain death, such as trauma and spontaneous intracranial haemorrhage, lead to significant pulmonary parenchymal pathological changes. Consequently, the number of suitable lungs for donation significantly diminishes. According to several studies, only 20% of multi-organ donors fulfill the essential criteria for lung donation. This paper illustrates reasons for the low rate of lung harvesting among all brain-dead cases transferred to the organ Procurement Unit (OPU) of Masih Daneshvari Hospital.

**Methods:** All brain-dead cases transferred to the OPU of Masih Daneshvari Hospital (March 2012 - March 2013) were investigated retrospectively. The available data were assessed in accordance with the lung suitability criteria to extract those factors affecting the performance of the lungs and making them unsuitable for donation.

**Results:** Out of 159 brain-dead cases, only 15.7% met the criteria of lung suitability. The main single factor was the poor quality of gas exchange (O<sub>2</sub> Challenging Test). Other issues, such as abnormal chest X-ray, chest trauma, undesirable bronchoscopy results, a smoking history of more than 20 packs/year and age exceeding 55 years were recognised as nugatory factors.

**Conclusions:** The amount of suitable lungs in brain-dead donors in our centre is lower than active pioneering centres around the world. It seems that conducting studies using marginal donors, as well as assigning a national guideline, is needed to improve the management of brain-dead cases and increase the number of suitable lungs for transplant.

## Long-term outcome after sternochondral allograft for anterior chest wall reconstruction

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**Objectives:** Reconstruction of sternum after wide resection for anterior chest wall tumour and large bone loss after deep sternal wound infection post cardiac surgery are mandatory. A search for the ideal material for chest wall reconstruction continues to challenge thoracic surgeons. Here is our long-term outcome of bone allograft for sternal reconstruction.

**Methods:** Between January 2012 and August 2015; 4 cases with sternal tumour including: synovial cell sarcoma, myxoid tumour, fibrous tumour and chondroma, and 2 with post cardiac surgery sternal wound infection were reconstructed with bone allograft. After full evaluation and obtaining consent for bone allograft, the patients were put on the list for an allograft from a beating-heart donor. Sternum was used after processing by serial culture, freezing and sterilised with Ethylene Oxide. Allograft was fixed with locking Titanium microfixation in 4 and 2 without locking screw. Bilateral pectoralis major muscle flaps were used to cover the grafts.

**Results:** The operations were uneventful. First patient with BMI=40; developed infection in deep soft tissue and breast. Her wound was managed with water jet hydrotherapy technique and negative pressure wound therapy with the allograft left in place. CT scan 6 months - 4 years after operation were reported normal with some area of vacuolisation and decreased mineralisation to dislodgement of screws in a few patients. The last patient

had persistent seroma formation and within 9 months she had 2 operations; the first for refixation of allograft to both clavicles because of dislodgement and bone resorption and the second for persistent seroma with partial lower allograft instability. Two obese patients with allograft post CABG died 35 - 45 days post op with cardiac cause.

**Conclusions:** This technique hails a new era in anterior chest wall reconstruction which provides good functional and cosmetic results. It is recommended to monitor the healing process by SPECT/CT scan rather than CT scan and reconstruction. Allograft procurement, body size match, and limitation in donation are major issues.

## Serum Amyloid A exacerbates acute vascular events by activation of the NLRP3 inflammasome

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Serum Amyloid A (SAA) is an HDL associated acute phase protein that can increase a hundred fold during acute cardiovascular events. The increased SAA levels predict early mortality in coronary syndromes. We will present data that SAA is more than a marker; but a mediator of acute vascular events. SAA possesses the ability to induce cytokines, promote phagocyte chemotaxis, and up-regulate genes involved in extracellular matrix remodeling. Under homeostatic conditions SAA is innocuous, partially due to its association with HDL. We propose acute vascular injury unmasks SAA's potential to inappropriately amplify inflammatory responses and enhance tissue damage. Data will be presented that this involves binding of SAA from HDL to cell-surface and matrix proteoglycans. The relevance of this was tested in SAA deficient mice utilising an Angiotensin II model of abdominal aortic aneurysms. The deficiency of SAA reduced inflammation and abrogated subsequent aneurysm formation typical of this model. We determined that SAA induces IL-1 $\beta$  and NLRP3 expression, as well as IL-1 $\beta$  secretion, in J774 macrophage-like cells, consistent with priming and activation of the NLRP3 inflammasome. We determined that reduced AngII-induced AAA in SAA-deficient mice is accompanied by significant reductions in plasma IL-1 $\beta$ , indicating inflammasome activation in AngII-infused mice is dependent on SAA. These mechanisms may be relevant in the unstable atherosclerotic plaque, particularly when SAA levels are increased. More frequent measurement of human SAA in acute vascular syndromes should be explored.

## Development of novel stenting skills at the Red Cross War Memorial Children's Hospital: A review of growing expertise over the past 3 years

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**Objectives:** The past 3 years have seen significant development in the stenting abilities of the interventional catheterisation team at Red Cross War Memorial Children's Hospital (RXH), coupled to a broadening of the scope and complexity of the lesions attempted and the ability to complete these procedures successfully. We review the reasons for and the results of the newly acquired stenting skills of the unit.

**Method:** A retrospective review of all the stenting procedures performed in the interventional cardiac catheterisation suite at RXH, 1 January 2013 - 18 March 2016.

**Results:** A total of 74 stenting procedures were performed on 55 patients (7 patients underwent stenting procedures on more than one occasion). There were 5 complications (all embolised stents) and 1 procedural death. Of significance was the development of an advanced stenting protocol under the direct guidance of an internationally renowned interventional cardiologist from the United Kingdom. With his assistance, a programme of progressively more advanced stenting procedures was developed. This led to the ability of the team to consistently perform complex procedures, safely and successfully. A suite of ancillary stenting equipment has been developed that has become familiar to the interventional team, leading to efficient and safe procedures.

**Conclusions:** With intermittent, yet focused expert training, efficient and safe protocols may be developed to allow the routine performance of complex stenting procedures. Examples of such procedures, and how they are performed with confidence, will be illustrated.

## Emergency surgical removal of an embolised patent ductus arteriosus duct occluder device from left pulmonary artery without cardiopulmonary bypass via left postero-lateral thoracotomy

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**Objective:** Surgical removal of an embolised patent ductus arteriosus duct occluder device from left pulmonary artery (LPA) without cardiopulmonary bypass (CPB) and sternotomy.

**Methods:** An 11-year-old girl was diagnosed to be suffering from persistent patent ductus arteriosus (PDA) of 7mm diameter. She underwent percutaneous transcatheter closure of PDA with Cocoon Duct Occluder device (Vascular Innovations Co., Thailand). The device dislodged immediately after being released across the PDA and embolised into left pulmonary artery. Several attempts to retrieve the embolised device by interventional cardiologists failed. Cardiothoracic surgeons were called to assist. We planned a left postero-lateral thoracotomy approach for retrieval of embolised device and to avoid CPB and sternotomy in this child.

**Results:** The patient underwent successful emergency surgical removal of embolised cocoon duct occluder device from LPA, along with PDA ligation at the same time via left postero-lateral thoracotomy without need for CPB or sternotomy.

**Conclusion:** We present a new innovative technique for removal of embolised PDA duct occluder device into LPA via left postero-lateral thoracotomy, thus avoiding the adverse effects of CPB and sternotomy and at the same time facilitating surgical closure of PDA.

## Staged replacement of the entire aorta for mega-aorta syndrome using hybrid (open and endovascular) approaches. Long-term follow up

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**Objectives:** Hybrid or combined open and endovascular approaches have been successfully employed in many centres for thoraco-abdominal aortic aneurysms (TAAA) and for complex aortic arch aneurysms. However, only a few cases of replacement and exclusion of the entire aorta using hybrid approaches have been reported. The first staged replacement of the entire aorta, using a hybrid approach, was published in 2008.

**Methods:** We report on 2 patients with Marfan syndrome and mega-aorta who presented initially with acute type A aortic dissection (ATAAD) requiring emergent Bentall operation and proximal aortic hemi-arch replacement. At follow-up, their distal aortic arch aneurysm and TAAA increased in size. During the second stage of total aortic replacement, patient A underwent hybrid reconstruction of the aortic arch, consisting of debranching procedure of the aortic arch and thoracic endovascular aortic repair (DTEVAR), without using cardiopulmonary bypass, in 2002. Patient B underwent a similar DTEVAR procedure in 2011.

**Results:** Patient A required additional endovascular stent-grafting (EVSG) for type 1b (distal) endoleak, 3 months after DTEVAR. During the third stage of total aortic replacement, patient A underwent hybrid reconstruction of TAAA with thoracic endovascular aortic repair (TEVAR) and visceral debranching in 2004. Patient A also underwent a right-to-left carotid artery bypass because of proximal left common carotid artery stenosis in 2015. He is currently asymptomatic, 14 years after the initial DTEVAR. Patient B underwent hybrid reconstruction of TAAA with TEVAR and visceral debranching 6 months after DTEVAR. Both patients have residual bilateral internal and external iliac artery aneurysms which may require additional EVSG in the future.

**Conclusions:** We report on 2 patients with Marfan syndrome and mega-aorta who underwent successful replacement of the entire aorta in multiple stages using combined hybrid (open and endovascular) approaches, and have been followed during 14 and 5 years, respectively, since their initial hybrid reconstruction of the aortic arch.

## Efficacy and limitations of transcatheter aortic valve replacement in bicuspid valve stenosis

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**Objectives:** The aim of this study was to evaluate the safety of transcatheter aortic valve implantation (TAVI) in patients with stenoses of their bicuspid aortic valves (BAV).

**Methods:** Fifty-two consecutive patients with stenotic BAV were treated with self-expanding (Core Valve, Symetis) and balloon expandable (Sapien 3, XT) transcatheter aortic valve prostheses, at our institution, from 2011 - 2014. Clinical outcomes were compared to a cohort of patients with tricuspid aortic stenosis (n=891) who received TAVI within the same time frame. Clinical endpoints were procedural complications, device success (VARC II) and 30 day all-cause mortality.

**Results:** The groups were comparable with regards to preoperative data: mean age ( $81.8 \pm 6.2$  years), logistic Euroscore ( $24.2 \pm 12.6\%$ ), STS score ( $6.4 \pm 4.2\%$ ), mean aortic gradient ( $44 \pm 16.8$  mmHg) and effective orifice area ( $0.7 \pm 0.2$  cm<sup>2</sup>). Thirty day mortality was lower in the BAV group (2% vs. 8.4%,  $p=0.12$ ). Device success rate was lower in patients with BAV (73.1% vs. 87.1%,  $p=0.004$ ). Procedural complications were higher in the BAV group with regards to: residual aortic regurgitation >grade II (21.2% vs. 7.8%,  $p=0.001$ ), non-perpendicular deployment (30.2% vs. 16.3%,  $p=0.002$ ), malposition of the prosthesis (10.4% vs. 3.5%,  $p=0.02$ ) and the need for secondary valve in valve procedure (7.7% vs. 2.9%,  $p=0.05$ ). The incidence of annular rupture (1.9% vs. 0.5%) and conversion to open surgery (3.9% vs. 2.5%) was comparable between the groups.

**Conclusions:** Treatment of BAV with TAVI bears significant procedural challenges. Although 30 day mortality and valve function were similar to that of tricuspid aortic valves, BAV had significantly higher rates of procedural complications.

## Small size self-expandable vs. balloon expandable transcatheter aortic valve prostheses. Comparison of early postoperative haemodynamic function and outcomes

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**Objectives:** Several transcatheter systems are available for the treatment of severe aortic stenosis in high risk patients. The aim of this study was to compare the early haemodynamic performance of 2 small (23mm) transcatheter aortic valves: Symetis ACURATE and Edwards SAPIEN 3.

**Methods:** Amongst 168 patients retrospectively identified in our database (March 2000 to August 2015), a total of 140 patients with eligible data were analysed. The access of implantation was transapical (TA) in 71 cases and transfemoral (TF) in 69 cases. The ACURATE valve was implanted in 62% (n=87) and SAPIEN 3 in 38% (n=53). In both groups the mean age was identical (83 years). There was no significant difference between the effective annulus diameter (ACURATE 22.0mm, SAPIEN 3 22.3mm), septum thickness (12.6mm vs. 13.27mm respectively) or ejection fraction (both 59%). The first post procedural echocardiographic assessment, including the mean gradient and the aortic valve area, were compared.

**Results:** The mean gradient for ACURATE – treated patients was 13.33mmHg, for SAPIEN 3, 14.98mm. There was no significant difference between the 2 groups ( $p=0.1$ ). No differences were observed in the aortic valve area (ACURATE, 1.31 cm<sup>2</sup> vs. SAPIEN 3, 1.32 cm<sup>2</sup>,  $p=0.9$ ). In the sub analysis between 2 transapical groups the mean gradient was 14.25mmHg for ACURATE vs. 14.74 for SAPIEN 3 patients ( $p=0.6$ ). The need for post-dilatation was significantly higher in the ACURATE group (26.4% vs. 5.6%,  $p<0.001$ ).

**Conclusions:** In this retrospective analysis, there was no significant difference in the early post procedural haemodynamic performance between the two 23mm transcatheter systems.

## Epicardial pacing in infants and children: Single institutional experience in a Southern African tertiary care institution

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**Introduction:** Epicardial pacemaker systems are still preferred in many centres for young children and infants <10kg because of the small size, somatic growth, increased risk of venous occlusion, associated congenital structural cardiac anomalies with limited access, right to left shunts and increased risk of thromboembolism. On the other hand, the epicardial approach is invasive and the epicardial leads are associated with high rate of fractures, increased pacing threshold and reduced generator longevity.

**Aims and objectives:** To review clinical cases and outcomes of patients with permanent epicardial pacemaker systems seen in a Southern African Tertiary Institution with limited resources.

**Methods:** A retrospective review of cases requiring permanent epicardial pacing presenting to Chris Hani Baragwanath Academic Hospital (1992 - 2015). There are no onsite surgical cardiothoracic services and dedicated pacemaker follow up facilities for the children. Data related to demographics, diagnosis, pacemaker system, surgical approach, lead and generator longevity, mortality and follow up was collected.

**Results:** Epicardial permanent pacemakers were inserted in 45 patients (females, 61.1%). Median age at first implant was 12 months (0.099 - 168 months, IQR=1.81 - 69). Median weight was 8.1kg (2.5 - 36kg, IQR=3.3 - 17.2). The diagnosis was as follows: congenital complete heart block in 25 cases (55.6%), postoperative complete heart block in 13 cases (28.8%) and sinus node dysfunction in 7 cases (15.6%). Ninety-two epicardial leads were implanted in the atria and ventricle while the pacemaker generators (Medtronic and St. Jude's) were either placed in the pleural cavity or rectus sheath via antero-lateral thoracotomy or median sternotomy. Seventeen pacemaker generators were revised due to battery depletion (mean=7.16 years  $\pm$  2.85; 3.0 - 14.75 years) in 14 patients while 21 epicardial leads were replaced (mean=5.13 years  $\pm$  2.53 years; 0.008 - 9.83 years). Leads were replaced due to fracture, exit block, failure to sense, insulation break, increased threshold, dislodgement and infection. Overall mortality was 26.7% and related to the pacemaker in 1 patient (2.2%). Mean follow up was 6.89  $\pm$  5.09 years (0.5 - 17.33 years).

**Conclusion:** Congenital complete heart block was the common diagnosis. Battery depletion and lead malfunction were the common reasons for revision.

## A new approach to left ventricular sub-mitral aneurysms

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**Objective:** This is a single institution review of surgery for congenital left ventricular sub-mitral aneurysms in Namibia.

**Method:** A retrospective study of 17 patients presenting to the Namibia Cardiac Centre (2010 - 2015) with sub-mitral aneurysm. Clinical presentation, pathology, classification, operative findings and surgical techniques are reported.

**Results:** There were 11 male and 6 female patients aged 14 - 44 years (mean 29  $\pm$  7 years). All patients presented in congestive cardiac failure with associated mitral valve regurgitation. Diagnosis was established using trans-thoracic 2D echocardiography (Phillips i-33). Patients are classified with reference to the position of the aneurysm neck relative to the posterior rim or leaflet of the mitral valve (PML) at surgery; Group 1: a single neck (n=9), Group 2: multiple necks (n=2), and Group 3: (n=6) a large neck the length of the commissure or the entire posterior wall beneath the PML. Complete repair was achieved in all patients. An atrial approach through the mitral valve in 6 and combined mitral and aortic approach in 2. These 8 patients had a classic stitch repair. An extra-cardiac or trans-ventricular approach (DOR technique) with bovine pericardium patch closure of the neck was used in the most recent 9 patients. The mitral valve was repaired in 14 patients. Failure to control the neck in the sub-aortic area resulted in reoperation in 1 patient. There was no operative mortality.

**Conclusions:** New insights are presented into this rare condition with satisfactory surgical results. The revised DOR technique produces less anatomic distortion of the mitral valve annulus and is the preferred and definitive approach.

## Back to the future: Fast track or not?

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**Introduction:** "Fast-track" cardiac anaesthesia (FTCA) emerged in the 1990s and has since become a popular approach after heart surgery. FTCA is a management protocol involving early extubation, early mobilisation, decreasing duration of ICU admission and hospital stay.

**Objective:** To review the results with a FTCA Protocol for all patients requiring cardiac surgery at our institution.

**Patients/methods:** Retrospective, single institution, single surgeon review of experience with 835 consecutive patients who presented for surgery in the Namibian Heart Centre (2009 - 2015). Diagnosis, time to extubation, length of ICU and hospital admission, complications and mortality were investigated.

**Results:** Of 835 patients, 473 were male and 362 were female. Average age was 49.73 ( $\pm$  16.95 years) with a range of 1 year - 84 years. Operations performed were coronary artery bypass graft (n=285); coronary plus valve replacement (n=39); valve replacement or repair (n=357); congenital heart disease (n=136) and aortic aneurysm (n=18). The FTCA Protocol could be applied in 647 of the 835 cases (77.48%). Patients were extubated



on average 3.41 hours ( $\pm$  1.32 hours) following ICU admission and the average ICU stay was 46.93 hours ( $\pm$  9.34 hours). ICU discharge criteria were haemodynamic stability, ability to initiate walking within ICU, laboratory investigations within normal limits. Mean duration of hospitalisation was 6.56 days. Sixteen patients (1.8%) who were extubated within the first 6 hours required re-intubation. Four patients (0.45%) developed peri-operative lung infection. Thirty day mortality was 4.9% (n=39).

**Conclusions:** FTCA may be applied in a wide range of cardiac surgical interventions, without undue risk. Incidence of re-intubation, return to intensive care unit and peri-operative pneumonia are low with this approach.

## Button battery ingestion: A disaster

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**Background:** Ingestion of batteries by children has become more frequent in recent years, due to the increasing accessibility of electronic toys and devices. Due to their electro-chemical composition, impacted batteries in the esophagus may cause extensive damage. Following the removal of a battery, the post-esophagoscopy management is still controversial, but absolutely crucial.

**Method:** A retrospective study of 6 patients presenting to the Namibia Cardiac Centre (2010 - 2016) with Button Battery Ingestion. Clinical presentation, pathology, operative findings and surgical techniques of management are reported.

**Results:** There were 3 male and 3 female patients aged 2 - 6 years. All patients presented to our service with history of dyspnea and dysphagia. Diagnosis was established using clinical signs, history and Chest X-rays. Patients are classified with reference to the time of ingestion according to clinical history. Group 1: Early <6 hours post ingestion (n=1) and group 2: Late >6 hours (n=5). Each of the cases was managed in a different way, according to the findings at primary endoscopy when the battery was removed. Endoscopy only (n=1), Primary repair via Thoracotomy (n=3), Defunctioning Esophagostomy (n=2), Mortality (n=1).

**Conclusions:** Battery ingestion-related injury results from direct pressure necrosis, local electrical currents and, in the case of older batteries, alkali leakage. Signs and symptoms of ingested battery are related to impaction duration, size of battery, battery content and peristaltic waves of the esophagus. Appropriate imaging studies should be performed to aid in the identification of the foreign body before esophagoscopy. A very high index of suspicion of perforation and subsequent trachea-esophagela fistula (TOF) should be entertained. Esophageal stenting and adjuvant medical therapy (steroid therapy, antibiotic therapy and anti-reflux therapy) have a low evidence level of clinical benefit. All patients should be managed with aggressive, tailored medical, endoscopic and surgical therapy.

## Speckle tracking echocardiography in acute lupus myocarditis: Comparison to conventional echocardiography

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**Objectives:** Clinically evident lupus myocarditis (LM) is a serious manifestation of systemic lupus erythematosus (SLE) occurring in 5 to 10% of patients. No single feature (clinical or imaging) is diagnostic of LM. Current research focuses on the detection of sub-clinical myocardial dysfunction through speckle tracking echocardiography (STE). Research on STE in clinical LM is sparse. We aimed to give a comprehensive description of conventional echocardiography compared to STE in patients with clinically evident LM.

**Methods:** A retrospective study was done at a tertiary referral centre in the Western Cape, South Africa. Adult SLE patients with LM (clinical and echocardiographic evidence of impaired myocardial function attributed to SLE) were included. Echocardiographic images were reanalysed to include global peak longitudinal strain (GLS) through STE. A poor outcome was defined as LM-related mortality/final left ventricular ejection fraction (LVEF) <40%. A p<0.05 was considered statistically significant.

**Results:** Twenty eight of 457 lupus patients assessed (6.1%) met inclusion criteria: 92.9% were female with a mean age of 28.32 years. Patients had a high SLE disease activity index ( $\geq 12$ ) and 85.6% presented in pulmonary oedema. GLS correlated with global (LVEF:  $r=-0.808$ ;  $p=0.001$ ) and regional (WMS:  $r=-0.715$ ;  $p<0.001$ ) left ventricular function. Following treatment, LVEF improved from 35% - 47% ( $p=0.023$ ) and wall motion score (WMS) from 1.88 - 1.5 ( $p=0.017$ ) with no significant improvement in GLS ( $p=0.47$ ). Five patients (17.9%) died due to LM and 5 had a persistent LVEF<40%. Initial LVEF and GLS were lower in patients with a persistent LVEF<40% ( $p=0.046$  and  $p=0.095$ ).

**Conclusions:** This is the largest reported series and the first known on STE in patients with clinical LM. GLS correlated strongly with both regional and global left ventricular function. Both LVEF and GLS were associated with a persistent poor LVEF despite treatment. STE is a non-invasive, cost effective tool with diagnostic and prognostic value in lupus myocarditis.

## Early and late results of concomitant lung cancer resection and off-pump CABG

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**Objectives:** The aim of this study was to present the early and late results of lung resection for cancer with simultaneous myocardial revascularisation on beating heart (OPCAB).

**Methods:** From 1999 - 2012, 35 patients (26 men and 9 women, mean age 68 years) with resectable lung cancer and unstable angina were operated. All of them underwent coronary angiography and neither coronary angioplasty nor stenting were feasible. Twenty-four lobectomies, 6 pneumonectomies, and 5 wedge resections were carried out together with aortocoronary graft implantation (mean: 2.0 graft per patient). OPCAB preceded the lung resections.

**Results:** There were no postoperative deaths. Five major complications occurred postoperatively: 4 patients required prolonged respiratory support and 1 was in need of rethoracotomy due to bleeding. The most frequent minor complication was atrial fibrillation (24% of patients). None of the patients showed ECG or biochemical evidence of myocardial ischaemia. Patients were followed up for 12 - 72 months. None had acute myocardial infarction. In 2 patients, in the third year of observation symptoms of recurrent, but stable angina were noticed. In 2 patients, who underwent wedge resection, in 1 after lobectomy and 1 after pneumonectomy, local recurrence was found within the first 2 years of follow-up. In another 5 patients, who underwent pneumonectomy or lobectomy, distant metastases occurred in the third year of observation. Overall, the number of patients who died due to cancer relapse was 7.

**Conclusions:** Lung resection carried out simultaneously with OPCAB is an effective method for the treatment of lung cancer and myocardial ischaemia. The late results in this group of patients were mostly effected by lung cancer recurrence.

## Reconstructive surgery for diffuse generalised form of hypertrophic cardiomyopathy

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**Objectives:** About 65% of hypertrophic cardiomyopathy (HCM) cases are caused by mutations in sarcomeric genes. Diffuse generalised form of HCM is a specific anatomical HCM phenotype characterised by diffuse hypertrophy of the interventricular septum and significant hypertrophy of the papillary muscles with their displacement towards the left ventricular (LV) apex.

**Aim:** To study genetic bases of diffuse generalised HCM and to develop complex reconstructive surgery, allowing not only to remove the intraventricular pressure gradient (PGr), but also to increase LV cavity size and to normalise LV diastolic filling.

**Methods:** From 2009 - 2015, 26 patients with diffuse generalised HCM underwent the following reconstructive surgery: transaortic extended septal myectomy; longitudinal resection of the papillary muscles with preservation of annulo-papillary contact; mitral valve replacement through the left atrium, and ICD implantation. Before surgery: PGr  $71.38 \pm 6.7$  mmHg, interventricular septum  $22.7 \pm 0.2$  mm, myocardial mass  $309 \pm 46$  g, severe mitral regurgitation in all patients. Screening of sarcomeric genes and myocardial fibrosis assessment with galectin-3 measurement were performed.

**Results:** Significant normalisation of intracardiac haemodynamics was achieved in 1, 3 and 5 years of follow-up: PGr  $4.75 \pm 1.3$  mmHg, interventricular septum  $15 \pm 0.2$  mm, systolic and diastolic LV volume gained up to 10 - 15% from preoperative measurements. Morphology of the removed mitral valve leaflets had shown connective tissue dysplasia. Five patients (19%) experienced appropriate ICD shocks. Galectin-3 level was increased up to  $13.4 \pm 8.9$  ng/ml in all patients. Sarcomeric gene mutation was detected in 1 patient (4%), non-sarcomeric causes for LV hypertrophy were confirmed in 50% of patients.

**Conclusions:** The reconstructive extended myectomy with parietal resection of papillary muscles and mitral valve replacement with chordal preservation allow us to get the long-term benefits in patients with diffuse generalised HCM. An excessive level of fibrosis may explain the high risk of ventricular fibrillation, and indicate the early reconstructive surgery and primary prevention of SCD. In this variant of HCM, the classic "sarcomeric" mutations are rare but other inherited diseases (progressive myopathies, storage diseases, hereditary syndromes) are often identified.

## Our strategy in a patient with severe mitral valve stenosis undergoing closed mitral valve commissurotomy with a Tubbs dilator, 35 years ago

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**Objectives:** Redo mitral valve surgery with mechanical prosthesis is a factor morbidity and mortality. We present a patient with severe mitral valve stenosis undergoing closed mitral valve commissurotomy with a Tubbs dilator 35 years ago.

**Methods:** A 57-year-old woman, hospitalised in our clinic in March 2016. The preoperative echocardiography and cardiac catheterisation showed grade 2 mitral regurgitation and severe mitral stenosis, grade I tricuspid regurgitation. Left ventricular end-diastolic and end-systolic diameter, and left atrial diameter were 44mm, 32mm, 47mm, respectively. Ejection fraction was 50%.

**Results:** The operation was carried out via a median sternotomy. The anterior, lateral and posterior surface pericardial adhesions of the heart were dissected. Cardiopulmonary bypass (CPB), moderate systemic hypothermia ( $28^{\circ}\text{C}$ ), and antegrade isothermic blood cardioplegia were used. Mechanic mitral valve (29 St. Jude) replacement were performed. CPB time, and cross-clamping time were 90 and 40 minutes, respectively. The patient was discharged 12 days after operation with warfarin and salicylate treatment.

**Conclusions:** Closed mitral valve commissurotomy is now rarely performed. Earlier surgical management before the development of severe heart failure and myocardial dysfunction would improve the results of redo mitral valve surgery.

## Our surgical strategy in a patient with Marfan syndrome with ascending aortic aneurysm and aortic valve regurgitation

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**Objectives:** Cardiovascular complications, such as rupture of aortic root aneurysm and aortic dissection in patients with Marfan syndrome, are the primary cause of death. We present a 19-year-old male with Marfan syndrome with ascending aortic aneurysm and aortic valve regurgitation.

**Methods:** A 19-year-old man was hospitalised in our clinic on 20 April 2016. He had proximal aortic root aneurysm and severe aortic insufficiency. Ejection fraction was 50%. Left ventricle end diastolic diameter was 51mm. The diameters of aortic root and proximal ascending aorta were 56mm and 47mm, respectively. The degree of aortic insufficiency was grade III.

**Results:** Cardiopulmonary bypass was instituted with a cannula for arterial return to the distal ascending aorta and a venous single 2-stage cannula in the right atrium. The systemic perfusion was performed using hypothermic bypass strategy of systemic cooling at 28°C. Isothermic blood cardioplegia was initially administered antegradely via coronary artery ostia and thereafter continuously retrogradely via coronary sinus. The Bentall procedure was performed using a composite graft conduit with mechanical prosthesis. Postoperative period was event free. The patient was discharged on seventh postoperative day with warfarin treatment.

**Conclusions:** The Bentall procedure is an effective surgical procedure in patients with Marfan syndrome having ascending aortic aneurysm, aortic valve regurgitation.

## Our surgical strategy in a smoker patient with severe left internal carotid artery stenosis and coronary artery stenosis receiving clopidogrel

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**Objectives:** Despite the fact that the results of simultaneous surgical interventions of carotid and coronary arteries have gradually improved, morbidity and mortality still remain considerable. Patients receiving clopidogrel, due to coronary artery disease, are at increased risk for transfusion and haemorrhagic complication. We presented a smoker patient with severe left internal carotid artery stenosis and coronary artery stenosis receiving clopidogrel.

**Methods:** A 54-year-old man was hospitalised in our clinic (November 2015). He had hypertension and diabetes mellitus. The electrocardiography showed sinus rhythm. The angiography showed severe left internal carotid artery stenosis and coronary artery stenosis. The angiography again showed left anterior descending, circumflex and right coronary artery segmental stenosis. He is receiving clopidogrel preoperatively.

**Results:** Left carotid endarterectomy and coronary artery bypass grafting were performed with general anaesthesia. An arteriotomy was made on the anterior wall of the left common and internal carotid arteries extending to the region not including plaque. The left carotid endarterectomy was performed without the use of a shunt. Following the median sternotomy, on-pump coronary artery bypass graft was performed with systemic hypothermia (28°C) using 2 stage venous and aortic cannulae. The tranexamic acid (15mg/kg) was given after cardiopulmonary bypass. Three units of erythrocytes were transfused postoperatively. The patient was discharged after 6 days with clopidogrel and aspirin.

**Conclusion:** Simultaneous carotid endarterectomy and coronary artery bypass grafting are effective and safe methods in appropriate patients. Tranexamic acid significantly reduces postoperative bleeding and transfusion.

## Redo-coronary artery bypass grafting in a smoker patient with hypertension and chronic obstructive pulmonary disease

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**Objectives:** Redo-coronary artery bypass grafting still remains a challenging operation and is associated with a significantly higher risk of morbidity and mortality when compared with primary coronary artery bypass grafting.

**Methods:** A 53-year-old man was hospitalised in our clinic in January 2016. He had hypertension, chronic obstructive pulmonary disease and coronary artery stenosis. The angiography showed left anterior descending artery segmental stenosis. Ejection fraction was 50%. He underwent coronary artery bypass grafting (Left anterior descending coronary artery-saphenous vein graft bypass) 5 years previously.

**Results:** The sternum was divided with an oscillating saw. The left internal mammary artery retractor was used for dissection of anterior portion of the heart and left internal mammary artery. The Octopus device was used to stabilise the left anterior descending artery. The left anterior descending artery-saphenous vein graft bypass was performed. The patient was discharged with antiplatelet drug in postoperative 6 days.

**Conclusion:** Off-pump coronary artery bypass grafting can technically be performed safely in patients presenting for reoperative coronary artery bypass grafting.

## Methylene blue, a guanylate cyclase inhibitor, to treat vasoplegias associated with cardiac surgery

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**Objective:** To examine if methylene blue (MB) can counteract, or prevent, protamine (P) cardiovascular effects.

**Methods:** The protocol included 5 heparinised pig groups: Group Sham: without any drug; Group MB: MB 3mg/kg infusion; Group P: protamine; Group P/MB: MB after protamine; Group MB/P: MB before protamine. Nitric oxide (NOx) plasma levels were measured in each of the experimental groups. After the in vivo studies in vitro vascular reactivity studies were conducted using segments of coronary, hepatic, superior mesenteric and renal arteries.

**Results:** (1) Groups Sham and MB unchanged parameters; (2) Group P: (a) Intravenous P infusion (i.v.) caused mean arterial pressure (MAP) decrease after MB injection followed by a recovery trend after 25 - 30 minutes; (b) Cardiac output (CO) decrease and kept stable until the end of protamine injection, and (c) Sustained SVR increase until the end of protamine injection; (3) MB infusion after protamine (Group P/MB): (a) Marked MAP decrease after protamine but recovery after MB injection; (b) CO decreases after protamine infusion recovering after MB infusion, and; (c) Sustained SVR increase after P and MB injections; (4) MB infusion before protamine (Group MB/P): (a) The MAP decrease was less severe with rapid recovery; (b) After MB there was a progressive CO increase to the time of protamine injection when presented CO decrease, and; (c) The SVR decreased after protamine followed by immediate SVR increase. (5) Plasma nitrate values did not differ between the experimental groups. (6) The in vitro study of arterial segments showed no endothelial dysfunction in any of the groups.

**Conclusion:** Reviewing these experimental results and our clinical experience, we suggest that MB prevents and treats haemodynamic protamine complications, with safety from the endothelium function point of view.

## Does a higher society of thoracic surgeons score predict outcomes in transfemoral and alternative access transcatheter aortic valve replacement?

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**Objectives:** Non-transfemoral transcatheter aortic valve replacement (non-TF TAVR) is often associated with worse outcomes than transfemoral TAVR (TF TAVR). We investigated the relationship between increasing STS PROM score and observed mortality and morbidity in TF and non-TF TAVR groups.

**Methods:** Five-hundred-and-ninety-five patients undergoing TAVR at Emory Healthcare (2007 - 2014) were reviewed. Patients were divided into TF (n=337, 57%) and non-TF (n=258, 43%) and clinical outcomes were reported. We created 3 Society of Thoracic Surgeons Predicted Risk of Mortality (STS PROM) score subgroups: <8%, 8 - 15% and >15%. A composite outcome of postoperative events was defined as death, stroke, renal failure, vascular complications or new pacemaker implantation.

**Results:** TF patients were older ( $82.4 \pm 8.0$  vs.  $80.8 \pm 8.7$  years,  $p=0.02$ ), while STS PROM was higher in non-TF patients ( $10.5 \pm 5.3$  vs.  $11.7 \pm 5.7$ ,  $p=0.01$ ). Observed/expected mortality was <1.0 in all groups. The rate of the composite outcome did not differ between STS subgroups in TF or non-TF TAVR ( $p=0.68$  and  $0.27$  respectively). One year mortality was higher for patients with STS PROM >8% in the non-TF group; however, this difference was not observed within TF patients ( $p=0.4$ ).

**Conclusions:** As expected, non-TF patients were at a higher risk than TF patients for procedural morbidity and mortality. While no differences were observed in 30 day mortality or morbidity in different STS PROM subgroups, those undergoing non-TF TAVR at a higher STS PROM (>8%) had higher 1 year mortality. When applicable, TF TAVR remains the procedure of choice in those high- or extreme-risk patients undergoing TAVR.

## Surgical management of mediastinal compression caused by massive thoracic masses with cardiopulmonary bypass: A series of 4 case reports

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**Objectives:** Surgery of compressive thoracic masses on the mediastinum is challenging. Complete airway obstruction and cardiovascular collapse can occur during the induction of general anaesthesia as intubation of the tortuous, compressed trachea is difficult. Also, positive pressure ventilation increases pre-existing superior vena cava obstruction resulting in cardiovascular collapse. Cardiopulmonary bypass (CPB), facilitating the excision of tumours, is controversial. We describe a series of 4 patients with large intra-thoracic masses compressing the mediastinum managed surgically with femoro-femoral CPB.

**Methods:** Patient A (40-year-old female), Patient B (68-year-old male) and Patient C (52-year-old female) all presented with massive solitary fibrous tumours. Patient D (56-year-old male) presented with a large retrosternal goiter and symptoms of superior vena cava syndrome. Femoro-femoral CPB was utilised for all 4 patients. Using a femoral block, the femoral vessels were cannulated while the patient was sedated in a semi-supine position. In 3 patients, the bed was flattened and the patients intubated as soon as CPB was initiated, however Patient D was only intubated after the goiter was removed as intubation was impossible.

**Results:** The major postoperative complication was bleeding, particularly after posterolateral thoracotomy procedures. All patients were managed in the ICU initially and were eventually discharged home in a stable condition.

**Conclusion:** Part of the reluctance to use CPB during excision of tumours is the adverse effects on lung function and haemostasis. Our findings suggest protamine should be administered while the patient is in a lateral decubitus position to inspect the hemithorax for bleeding during a posterolateral thoracotomy. Also, CPB may lead to metastases if the primary tumour histology is malignant, but malignancies that need the facilitation of CPB are advanced. We conclude that CPB can be used in thoracic cases where tumour masses compress the mediastinum and cause critical airway narrowing.

### Multicentre prospective validation of surgical site infection score for coronary artery graft patients: The Brompton-Harefield infection score

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Surgical site infection (SSI), following coronary artery bypass grafting (CABG), is a serious complication associated with significant morbidity and mortality. Despite the substantial impact of SSI there is a lack of a specific risk stratification tool to predict this complication after CABG. This study details the development and multicentre prospective validation of a specific prognostic scoring system, the Brompton-Harefield Infection Score (BHIS), for the development of SSI that could risk-stratify patients undergoing CABG.

Between January 2009 and June 2012, continuous prospective surveillance data on SSI and a set of 41 variables were collected. Using binary logistic regression analysis, we identified independent predictors of SSI. Initially we developed a predictive model in a subset of 769 patients. Dataset was expanded to 4 087 cases and a final model and risk score were derived. Multicentre prospective validation across 3 additional tertiary hospitals occurred between October 2012 and November 2013, involving a final total of 4 308 patients. Calibration of scores was achieved using the Hosmer-Lemeshow test.

The model had a final area under Receiver Operating Characteristic curve of 0.709 (0.827 for preliminary dataset). Baseline risk score incorporated independent predictors of SSI: female gender=2 ( $p<0.0001$ ; RR 2.1), diabetes=1 ( $p=0.0098$ , RR 1.4) or HbA1c  $>7.5\%=3$  ( $p<0.0001$ ; RR 3.4), body mass index  $\geq 35=2$  ( $p<0.0001$ ; RR 2.4), left ventricular ejection fraction  $<45\%=1$  ( $p=0.0255$ ; RR 1.4), and emergency surgery=2 ( $p=0.012$ ; RR 2.4). A risk stratification system, the Brompton and Harefield Infection Score (BHIS) was developed.

BHIS effectively predicts SSI risk for all types of SSI before CABG in a multicentre validation using prospective SSI surveillance, and may help with risk stratification in relation to public reporting and reimbursement as well as targeted prevention strategies in patients undergoing CABG.

### Case report: Sustained ventricular fibrillation for LVAD patient successfully treated with therapeutic hyperkalaemia

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Left ventricular assist devices (LVADs) provide an effective means of managing advanced heart failure. Ventricular arrhythmias are common post-LVAD implantation, but an assist device allows haemodynamic tolerance of malignant arrhythmias. Ventricular arrhythmias are being managed with antiarrhythmic medication and defibrillation if needed. This report describes the treatment of a patient who had likely been in a ventricular fibrillation (VF) for 2 weeks and did not respond to the usual treatment after recognition of VF. Defibrillation under therapeutic hyperkalaemia was successfully used to restore sinus rhythm in this patient. This case report suggests that defibrillation under therapeutic hyperkalaemia is a treatment option for the patients with LVAD and standard treatment resistant VF.

### Aortic arch surgery at 30 degrees

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**Objective:** To present our experience in aortic arch surgery at 30°C body temperature in patients with acute aortic dissection type A.

**Methods:** Between September 2008 and September 2015 we operated on 128 patients (2 groups) for acute aortic dissection type A via a median sternotomy. Group 1 [n=77 patients, circulatory arrest (CA) at body temperature 24 - 26°C and bilateral antegrade cerebral perfusion (ACP)] and group 2 (n=51, CA and ACP at 30°C). Total arch replacement was performed in 14 patients (18%) and 14 patients (27%) in group 1 and 2, respectively. Median systemic circulatory arrest was 31 minutes in group 1 and 26 minutes in group 2 (range, 9 - 102 minutes). In group 1: 3 patients (4%) and in group 2: 6 patients (12%) had had previous sternotomy ( $p=0.021$ ).

**Results:** The 30 day mortality rate was 19% (15 patients) in group 1 and 14% (7 patients) in group 2. No spinal cord ischaemia developed in either of the groups. Temporary postoperative confusion occurred in 8 patients (10%) and 3 patients (6%), respectively. All these patients recovered during

the hospital stay. The incidence of stroke was 6% (5 patients) in group 1 and 6% (3 patients) in group 2. Mean length of ICU stay was significantly shorter in group 2 ( $20 \pm 8$  hours) vs.  $82 \pm 27$  hours in group 1 ( $p=0.013$ ). No respiratory failure and no haemodialysis were documented in group 2 vs. 4 patients (5%) and 6 patients (8%) in group 1, respectively.

**Conclusions:** Conventional open arch surgery is possible at  $30^{\circ}\text{C}$ . In our sample, it appears to be safe and represents no additional risk for ischaemia of spinal cord or lower body. The patients recovered faster and the postoperative morbidity and necessity for transfusion with allogenic blood products tended to be lower. Larger cohorts are necessary to prove the safety and effectivity of this strategy.

## Home-based rehabilitation after cardiac surgery

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**Aims:** Although the American Heart Association and the European Society of Cardiology recommend the postoperative cardio-pulmonary rehabilitation, only few patients are referred for such a programme. Since the year 2000 we idealised and developed a home-based rehabilitation programme for post-operative cardiac surgery patients as an alternative to the classical in-hospital cardiac rehabilitation. By virtue of the cost-effectiveness and safety of the programme the work has been funded by the Italian National Health System since 2003. We show the results of the prospectively collected records of all patients undergoing a cardiac intervention eligible for this new protocol of rehabilitation.

**Methods and Results:** Between January 2006 and January 2016, a total of 791 patients underwent home-based cardiac rehabilitation after any type of cardiac surgery. No deaths were registered during the rehabilitative period. We had 99 new hospitalisation, half of them were treated in a day-hospital setting. Of all the complications, 83% were treated at home at relative low costs. Only 11 patients left the programme for the long lasting in-hospital period; all remaining 780 patients completed the mean 20 days programme with very satisfactory physical and psychological outcomes.

**Conclusion:** By virtue of our experience, we believe that Telemedicine is a feasible and safe method to attain good clinical surveillance at low economic impact to the Health System. This is furthermore important in an era where Healthcare budgets are being placed under increasing pressure. Further observational studies are ongoing to determine the beneficial long-term effects on cardiovascular outcomes and the cost-effectiveness.

## Superficial femoral artery access for transcatheter procedures

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We report the use of the superficial femoral artery (SFA) as the arterial site with surgical cut-down for transcatheter purposes. It may be a reasonable access alternative to the other classical routes, especially in the setting of either very obese patients or in the presence of high femoral artery bifurcation. This approach was successful in all the 3 patients we have treated. All prostheses were correctly positioned. Neither technical, nor vascular, problems were encountered.

The superficial femoral artery is surgically exposed in obese patients through a straight incision starting almost 5cm below the inguinal crease, in order to avoid the abdominal fatty tissue. In the setting of high bifurcation, we make an oblique 3cm incision just under the inguinal crease.

The postoperative result is good; normally the small skin incision (4 - 5cm) is well below the inguinal ligament and the fatty tissue.

## Do Triclosan-coated sutures reduce leg wound surgical site infections following coronary artery bypass grafting?

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**Objective:** Surgical site infections (SSIs) account for 38% of nosocomial infections among surgical patients. The incidence of infection at saphenous vein harvest site has been reported to range from 1% to 24%. The suture knot, which has been hypothesised to be the main site of bacterial colonisation in the wound, led to the development of Triclosan-coated sutures which have been used as an effective antimicrobial agent for more than 3 decades. The purpose of this study was to determine whether or not Triclosan-coated sutures would reduce wound SSIs following saphenous vein harvesting.

**Methods:** This is a prospective, randomised, double-blind, multi-centre study. Patients who underwent elective, or urgent, CABG in 2 major Health care centres, one located in Israel and the other in Croatia, were included in the study between 2011 and 2015. Preoperative, intra-operative and postoperative assessment data were registered prospectively. All leg wounds were inspected by a cardiac surgeon daily, from postoperative day 1 until discharge and in the clinic approximately 15 and 45 days post-surgery. The wounds were evaluated according to the ASEPSIS score and the CDC criteria. The surgeon who inspected the wound was blinded to the group allocation.

**Results:** A total of 344 patients were randomised in this study. Three-hundred-and-fifteen patients completed 45 days of follow up. The overall incidence of SSI was 16.7% in the Triclosan group and 17.6% in the control group,  $p=0.81$ . There was no difference between the groups as relates the use of antibiotics for leg wound SSIs, 17% in the Triclosan group and 19% in the control group,  $p=0.67$ .

**Conclusion:** Triclosan coated sutures were not found to reduce surgical site infections following open saphenous vein harvesting. Moreover, the study did not find any statistically significant advantage to using Triclosan coated sutures in the sub groups. These results contradict former studies which demonstrate benefit to Triclosan coated sutures in cardiac and general surgery.



## Injuries of the diaphragm

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**Background/objective:** Injuries of the diaphragm are not very common. The real problem though is that the diagnosis of this condition in the great majority of cases is not stated correctly in the first hours, or even days, after the trauma, and meanwhile the complications of these injuries can be very acute and morbid. The aim of the study was to evaluate the sensitivity and specificity of different diagnostic tools and the results of the treatment of both: penetrating and blunt diaphragmatic injuries.

**Patients/methods:** Forty-eight patients suffering traumatic injuries of the diaphragm underwent surgery in Vilnius University Emergency Hospital (2000 - 2014). Case histories were reviewed retrospectively. Etiological factors, diagnostic and surgical options were discussed. Seventy-one percent of the patients were male, 29% - female, their age was  $38.29 \pm 11.25$ , 37.5% of the injuries were penetrating and the rest were blunt. In 61% of the cases of penetrating injuries there were chest wounds, and the rest were abdominal wounds.

**Results:** Plain X-ray was performed in 34 cases and its accuracy was 29.4%, sonoscopy was performed in 25 cases and it never revealed diaphragmatic injury. CT was performed in 9 cases and its accuracy was 66.6%. Both, videothoracoscopy and videolaparoscopy were performed in 4 cases and their diagnostic accuracy was 100% and 50% respectively. The overall mortality reached 18.75%, but the study revealed that it was highly dependent on the associated injuries. The main causes of death were haemorrhagic or septic shock.

**Conclusions:** • The sensitivity of common diagnostic tools is relatively poor. • Proper diagnosis of traumatic injuries of the diaphragm depends on a high index of suspicion. • Surgical repair is necessary in all cases. • Both thoracic, and abdominal, approaches are suitable for the repair.

## The assessment of the management results of the patients, suffering from polytrauma, involving the thorax

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**Background/objective:** Thoracic trauma is still one of the leading causes of morbidity and mortality in different countries. It is very important to identify patients who can deteriorate in the first days after the injury, and to start adequate treatment and observation of the latter. The aim of the study was to analyse the results and the possibility to predict the outcomes of the management of polytrauma patients, suffering from thoracic injuries.

**Patients/methods:** Medical charts of 943 polytraumatic patients were reviewed. The inclusion criterion was: polytrauma, involving chest. The exclusion criteria were: (1) minor thoracic injury [AIS (Abbreviated Injury Scale) I], (2) critical or non-survivable pelvic or cerebral injury (AIS 5 or 6). The risk factors influencing the morbidity and mortality were identified. Tube thoracostomy and thoracoscopic revision of the pleural cavity and haemostasis were classified as minimally invasive surgery, thoracotomy and sternal osteosynthesis were classified as major surgery. The complications were identified as follows: pneumonia, respiratory distress requiring ventilation for more than 3 days, tracheobronchitis requiring bronchoscopy, pleural empyema, pulmonary embolism, sepsis, cerebral oedema requiring decompression and renal failure requiring dialysis.

**Results:** ISS score, need of haemotransfusion and presence of COPD or bronchial asthma were found to be prognostic factors of the morbidity at the univariate analysis. Only ISS score was found to be an independent risk factor at the multivariate analysis. No risk factors for the mortality were identified in this study.

**Conclusions:** The overall morbidity rate was 39.3% and mortality was 12.5%. The only single risk factor independently influencing morbidity was found to be ISS score. No independent risk factors for mortality were identified.

## Video assisted anterior spondylodesis in fractures of thoracic spine

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**Objectives:** Evaluation of the possibilities of using a video assisted thoracoscopic approach in the reduction of vertebral body fractures and interbody fusion of the involved segment after implantation of an autogenous bone graft without plate fixation.

**Materials/methods:** The posterior fixation using titanium plates and screws was performed in all cases. In cases of unstable type A3, B and C fractures anterior spondylodesis was indicated. In 12 cases it was performed using video assisted technique. In 9 cases we used mini-open thoracoscopically assisted thoracotomy (MOTA), and the remaining 3 were completely thoracoscopic procedures (VATS).

**Results:** There was no need for conversion to open thoracotomy. We had 4 postoperative complications (morbidity rate 33%). The complications were as follows: 1 postoperative pneumonia, 1 intercostal neuropathy and in 2 cases there was prolonged pleural effusion. There was no peri-operative mortality.

**Conclusion:** A video assisted thoracoscopic approach is appropriate in performing anterior spondylodesis in fractures of thoracic spine. It is safe and its cosmetic advantage is obvious. The influence to overall morbidity and decrease of the use of analgetics should still be investigated.

## Pulmonary tuberculosis presenting as spontaneous pneumothorax

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**Introduction:** Pulmonary tuberculosis presenting as spontaneous pneumothorax is a rare, but well-recognised complication. A pneumothorax implies the presence of air in the pleural space.

**Objectives:** We analyse patients with pulmonary tuberculosis presented as spontaneous pneumothorax treated in the thoracic surgery (2010 - 2015).

**Materials/methods:** During 2010 - 2015 we treated 11 patients with pulmonary tuberculosis presented as spontaneous pneumothorax. Seven males and 4 females with mean age presentation 47 years (average 13 - 65 years old). Clinical presentation was with cough about 3 months (3 days - 5 months) and breathlessness of several days' duration and chest pain, orthopnoea, paroxysmal nocturnal dyspnoea. Cough was initially dry but quickly produced mucoid sputum. They had positive Mantoux Test and sputum was positive for bacillus tuberculosis. An urgent chest radiography was requested and showed right pneumothorax in 6 patients and left side in 5 patients and hydropneumothorax (tuberculous pleural empyema et bronchopleural fistulae in 3 patients).

**Results:** All patients were initially treated with pleural drainage and high concentration oxygen inhalation along with anti-tubercular chemotherapy according to DOTS programme, daily doses of rifampicin 600mg, isoniazid 300mg, pyrazinamide 1.2g and ethambutol 800mg for 6 months. In 2 patients, due to persistent air leak and incomplete expansion of the lung, open surgery was performed. Decortication, aerostases, pleurectomy and adequate pleural drainage was performed. Mean hospital stay was 2 weeks (average 1 - 6 weeks). No operative mortality. Complications was right fibrothorax in 1 case. Following treatment, they were clinically and radiologically improved, and were discharged with the advice to complete the anti-tubercular chemotherapy according to DOTS programme.

**Conclusion:** PTB may present as spontaneous pneumothorax with acute severe dyspnoea and may be confused with that of the other causes of acute dyspnoea, through history and careful examination the diagnosis and response to treatment is often rewarding. Morbidity and mortality of this curable disease is thus reduced.

## Surgical treatment of symptomatic pericardial cysts: A case series and our results (2005 - 2016)

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**Introduction:** Pericardial cysts are rare. These benign intrathoracic lesions are most commonly located either at a cardiophrenic angle, or rarely, in the posterior or anterior superior mediastinum (5%). The majority of pericardial cysts (70%) are asymptomatic and have an uneventful natural course. Symptomatic pericardial cysts present with temperature, fever, dyspnoea, chest pain, or persistent cough; uncommonly a pericardial cyst may present with haemoptysis, effusion, empyema, pneumonia or a pneumothorax.

**Aim of study:** An analysis of our patients treated for pericardial cysts, their diagnosis, treatment and treatment results.

**Materials/methods:** We analysed 11 patients diagnosed and treated with pericardial cysts (2005 - 2016). Eight female patients, and 3 male patients. Average age was 43 years (ranging from 21 - 57 years). Four patients were diagnosed incidentally without clinical signs, while 7 presented with clinical symptoms. One of the patients presented with a giant pericardial cyst in the right mediastinum which was first treated with repeated punctures and later became infected. Diagnosis was performed through history, chest radiography, CT scanner and MRI in 2 patients. No mini-invasive surgery (VATS) or robotic surgery was used.

**Results:** Eleven patients were treated by a surgical thoracotomy approach, and total median sternotomy in 1 patient. Mean size of pericardial cysts 7 × 12cm (ranging 3 - 25cm). Cardiofrenic location 7 patients, and anterior mediastinal superior location 5 patients. All patients received radical extirpation. One case had a sub-total resection because the basal part of the pericardial cyst was adhered to with great vascular structures (ascending aorta). Inner mucosal layer extirpation was performed. Morbidity 1%. Long air leak 3%, pleural empyema 1 patient, hemothorax 1 patient, bilateral pneumothorax 1 patient, treated by bilateral drainage.

**Conclusions:** Pericardial cysts are rare, and usually clinically silent. Occasionally they cause complications, some of which are severe and even life-threatening. Early diagnosis of pericardial cysts play an important role in the results of surgical treatment. Surgical treatment is a better choice.

## Treatment of hydatid cyst and bilio-bronchial and bilio-pleuro-bronchial fistulas via thoracotomy and transdiaphragmal approach (January 2005 - December 2015) in a single unit in Tirana, Albania

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**Study aim:** The aim of this study was to report on the results of surgical treatment of hydatid bilio-bronchial et bilio-pleuro-bronchial fistulas via thoracotomy and transdiaphragmal approach.

**Material/methods:** From January 2005 - December 2015, 18 cases were observed in the same centre. Biliptysis was the main symptom in 80% of cases. The diagnosis was based on chest radiography, thoracic and abdominal CT, and abdominal ultrasonography. Fibrobronchoscopy: all examinations visualised the cyst, intrathoracic collections, a diaphragmatic breach and biliary lesions. All patients were treated by one stage thoracotomy. The procedures consisted of lung resection (lobectomy and/or segmentectomy) (n=17) and decortication (n=7) in the chest, cyst dome resection (n=18) or part pericystectomy (n=4) in the abdomen and suture and plastic of the diaphragmatic defect in all cases after hepato-diaphragmatic deconnection. An additional laparotomy was not necessary in all cases.

**Results:** There were 2 deaths (11.1%): no intra-operative death and 2 postoperative deaths, mostly related to pulmonary complications. Postoperative complications (15.7%) were mainly respiratory. Clinical and radiological results were good with a one year follow-up.

**Conclusion:** Bilio-bronchial and bilio-pleurobronchial fistulas, due to hydatid cyst are rare, but are severe diseases. They are responsible for lesions at 3 levels: abdominal, diaphragmatic and thoracic. A high peri-operative mortality rate was observed. Thoracotomy with transdiaphragmal approach is the best approach for surgical treatment at all 3 levels.

## Assessment of reduction aortoplasty as a management strategy for borderline enlarged aorta in patients with bicuspid aortic valve disease

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**Objectives:** The ascending aorta in patients with bicuspid aortic valve disease is prone to aneurysmal dilatation at the rate of 0.6mm/year and this has prognostic significance. EACTS/AHA/ACC guidelines suggested concomitant replacement of the ascending aorta >5.0cm in patients with significant bicuspid aortic valve disease. However, a grey area exists when the aortic dimension is between 4 - 4.9cm. About 40% of dissection occurs at <4.9cm. For this group we electively performed reduction aortoplasty as a management option. The study assesses the safety and value of reduction aortoplasty in patients with borderline enlarged aorta undergoing aortic valve replacement for bicuspid aortic valve disease.

**Inclusion criteria:** Patients undergoing aortic valve replacement for bicuspid aortic valve disease with ascending aorta size 4.0 - 4.9cm.

**Method:** Seventeen consecutive patients, with borderline enlarged aorta (4.0 - 4.9cm) undergoing Bicuspid aortic valve replacement were prospectively studied and followed up for 3 years after concomitant reduction aortoplasty. Serial Echocardiography and CT scan results were analysed at 3 year follow up to assess aortic dimensions, relative to preoperative value, and any adverse aortic events were noted.

**Results:** Seventeen patients were recruited 77% male (13/17), median age 61 interquartile range 49 - 78 years, 35% (6/19) had tissue aortic valve, median aortic dimension preoperatively 4.6cm interquartile range 4.0 - 4.7cm, median aortic dimension 3 years post reduction aortoplasty 4.0cm interquartile range 3.6 - 4.1cm. There were no mortality or any adverse aortic events noted in the cohort during the study period.

**Conclusion:** Reduction aortoplasty is not associated with significant immediate, or late, adverse complications. It reduces the rate of progression of ascending aorta aneurysm by -0.2mm per year for the first 3 years. It has prognostic value. It is a simple technique and takes about 10 - 15 minutes to perform. Reduction aortoplasty is a reasonable intervention in patients with borderline enlarged ascending aorta, undergoing aortic valve replacement for bicuspid aortic disease. It has prognostic value and is easy to perform with no significant adverse consequences.

## Examining the impact of end organ reserves on the outcome of cardiac surgery: The value of preoperative optimisation

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**Objective:** Prolonged intensive care unit (ITU) stay has resource implications and impacts on morbidity and mortality. It is a marker of adverse outcome. We examine the impact of preoperative organ(s) reserve on prolonged ITU stay following cardiac surgery. Literature on the impact of preoperative organ(s) optimisation on outcome is limited.

**Methods:** Retrospective data analysis of 1 592 consecutive patients admitted to ITU following cardiac surgery (January 2011 - October 2014). Univariate analyses of dichotomous, categorical and continuous variables were done to determine similarities, or differences, between patients who spent <2 days vs. 2 or more in ITU postoperatively. Dichotomous and categorical data were compared using Chi-square or Fisher's exact test.

Multivariate regression analyses were made with all independent categorical and continuous variables that appeared significant for prolonged intensive care stay. Using backward stepwise likelihood ratio logistic regression analysis, the most significant variables that predicted prolonged ITU stay were determined.

**Results:** A total of 1 592 patients were included, of which 1 137 (71.4%) were males, median age of the cohort was 69 years, 566 patients had prolonged ITU stay. Prolonged ITU stay was associated with poor preoperative lung function FEV1 <60% predicted (2.17:2.44,  $p=0.00001$ , OR=0.76), high serum Creatinine (85:105,  $p=0.000001$ , OR=1.01), chronic kidney disease CKD stage 4 (14:1,  $p=0.00001$ ), postoperative stroke [2 (0.2%):30 (5.3%),  $p=0.000001$ ], NYHA 3 - 4 [184 (18%): 194 (34%),  $p=0.0029$ , OR=1.50], impaired left ventricular function EF <50% [120 (12%):123 (22%)  $p=0.0000001$ , OR 2.21], IAPB [7 (0.68%):19 (3.36%),  $p=0.00006$ ], diabetes mellitus [240 (23%):116 (29%),  $p=0.010$ , OR=1.42], systemic hypertension [722 (70%):427 (75%),  $p=0.031$ ], old age >70 years (67:72,  $p=0.000007$ , OR=1.02), arrhythmias [133 (13.0%):131 (23%),  $p=0.000001$ ], pulmonary hypertension >60mmHg [16 (1.6%):32 (5.6%),  $p=0.000005$ ] and arteriopathy [72 (7%):57 (105),  $p=0.03$ ].

**Conclusion:** Sub-optimal preoperative organ(s) reserves is associated with prolonged ITU stay, (an indicator of adverse outcome) following cardiac surgery. Efforts toward preoperative optimisation of organ(s) reserve may shorten ITU stay and improve overall outcome. Further research is needed on the impact of peri-operative optimisation of organ reserve on resource implications and overall outcome of cardiac surgery.

## Influence of preoperative FEV1 on intensive care unit stay following cardiac surgery

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**Objectives:** Prolonged intensive care unit stay post cardiac surgery is determined by various factors, and in this regard we believe that preoperative pulmonary pathology is significant. Prolonged ITU stay has economic and resource implications and impacts on morbidity and mortality. Optimisation of reversible poor lung function preoperatively could reduce ITU stay. Spirometry provides a useful basic assessment of lung function, and is easy to perform. Our experience suggests that there may be an association between FEV1 and length of ITU stay. Prolonged stay defined as  $\geq 2$  days.

**Method:** Retrospective data analysis on 3 395 consecutive patients admitted to ITU following cardiac surgery (January 2011 - October 2014). Of these 1 592 had preoperative spirometry of which 566 had an ITU stay  $\geq 2$  days. The relationship between both groups with respect to FEV1 and ITU stay was determined with backward stepwise Likelihood Ratio Logistic Regression analysis. Multivariate regression analyses were made with all independent categorical and continuous variables that appeared significant ( $p<0.05$ ) for prolonged stay. Backward stepwise Likelihood Ratio Logistic Regression, identified significant variables that predicted prolonged stay.

**Results:** Patients who stayed  $\geq 2$  days on ITU had a lower mean FEV1 (2.17:2.44,  $p<0.05$ ) compared to those who stayed  $\leq 2$  days.

**Discussion/conclusion:** There appears to be an association between sub-optimal preoperative FEV1 and prolonged ITU stay. Efforts should be made to improve FEV1 prior to cardiac surgery where possible. Patients with sub-optimal FEV1 prior to cardiac surgery should be reviewed by a cardiothoracic physician/MDT with a view to obtaining formal diagnosis of co-existing lung disease and efforts should be made to optimise this preoperatively. The patients' survival on the basis of lung disease alone should also be determined and the prognostic and symptomatic benefit of cardiac surgery should be carefully evaluated in the light of this. Where existing lung pathology suggests poor survival, the need for cardiac surgery should be carefully evaluated. This information should be part of patient consent prior to surgery.

## Multivessel off-pump coronary artery bypass via left minithoracotomy

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**Objective:** CABG is traditionally performed by full sternotomy. Although safe, the risk is mediastinitis. Minithoracotomy LIMA to LAD grafting is well established. There are few reports of multivessel complete left sided revascularisation via minithoracotomy.

**Methods:** Seventy six patients were studied from 2007 - 2013. There were 5 female patients (7%). Mean age 63.5 years (36 - 86). Comorbidities: 35 diabetics (46%), renal impairment (21%), on dialysis (5.3%), calcified ascending aorta (9.2%), carotid disease (13.2%), peripheral vascular disease (28.9%), and COPD (30.2%). Previous coronary stents were found in 35.5%. A pre-operative IABP was inserted in 5.3%.

**Results:** No conversion to sternotomy or bypass. Complete revascularisation in all. Stents as part of a hybrid procedure were present in 18.4%. The mean amount of distal grafts 2.53 (2 - 4). LIMA used in (94.7%), veins (53.9%), and radial artery (30.2%). Proximal graft site was proximal descending aorta 69.1%, subclavian artery in 16.1%, LIMA in 13.2% and distal aorta in 1.5%. An indwelling subpleural catheter was placed in 71 patients (93.4%), and local anaesthetic infusion gave excellent pain relief. Mean blood loss in the first 24 hours was 326mls (120 - 1 830). One patient required re exploration for surgery. Mean ventilation time was 6.3 hours (0 - 18), ICU stay 3.7 days (2 - 8), and stay in hospital 6.4 days (3 - 12). Complications included transient phrenic nerve palsy in 2 patients, pleural effusion requiring chest drain in 3, and chylothorax requiring exploration in 1.

**Conclusion:** This is safe; the learning curve is steep, so the procedure should be attempted by surgeons regularly performing OPCAB via sternotomy. With standard techniques, it is reproducible. Recovery is faster than sternotomy technique, with minimal pain. Activities, such as driving a car, can be resumed after a week. The risk of mediastinitis is eliminated. The off-pump technique preserves cardiac and pulmonary function. The in hospital death rate (1.4%) compares well with the EuroSCORE (6.1%). Most cardiologists are not aware of this procedure, so the site of the proximal graft on the descending aorta is marked with a formal coronary marker.

## Increased vagal tone associates with left ventricular hypertrophy in beta-blocker naïve hypertension-treated males

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**Background:** Beta Blockers (BB) are often prescribed as anti-arrhythmic and anti-anginal agents. Common side effects include impotence, new-onset diabetes and reduced effort tolerance. In the ASCOT-BPLA trial, atenolol-usage associated with increased mortality, but despite these negative results, atenolol continues to be prescribed in the South African state sector and low cost medical schemes.

**Objective:** We postulated that additional beta-blocker therapy would exacerbate reflex bradycardia in male patients with echocardiographic-confirmed hypertensive left ventricular hypertrophy (LVH).

**Methods:** We analysed resting heart rate (RHR) and heart rate recovery at 1 minute post exercise (HRR) in 188 BB-NAÏVE hypertension-treated males who underwent a Bruce protocol exercise stress test and transthoracic 2D echocardiogram during a routine visit to a cardiology practice. Patients had to be in sinus rhythm, have normal thyroid function, no valvular heart disease and normal renal function. LVH was defined as an LVMI  $>115\text{g/m}^2$ .

**Results:** The cohort had 88 cases with confirmed LVH. None of the 100 controls had LVH. Age, body mass index, resting systolic blood pressure and average number of anti-hypertensive drugs did not differ significantly. Compared to controls, cases had significantly slower RHR [ $68 \pm 10.9$  beats per minute (bpm) vs.  $73.7 \pm 13\text{bpm}$ ;  $p=0.005$ ], more prevalent sinus-bradycardia (30% vs. 11%,  $p=0.001$ ) and quicker HRR ( $33.7 \pm 13.3\text{bpm}$  vs.  $30.0 \pm 12.9\text{bpm}$ ;  $p=0.05$ ).

**Conclusion:** These heart rate changes are probably mediated by the baro-receptor reflex and suggest that higher vagal tone accompany LVH in BB-naïve males. Clinicians should exercise caution when prescribing atenolol to male patients with hypertensive LVH, as it may induce further bradycardia and result in unnecessary pacemaker placement.

## Renal denervation prevents atrial fibrillation in hyperstensive heart disease

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**Background:** Atrial fibrillation (AF), the most prevalent sustained cardiac arrhythmia, associates with embolic strokes and tachy-cardiomyopathy. Hypertensive heart disease (HTHD), with left ventricular hypertrophy (LVH) and/or left atrial enlargement (LAE), is an important AF-substrate. Renal denervation (RD) prevents incident AF when added to pulmonary venous isolation (PVI), but it remains unknown if RD can successfully prevent AF without the need for patients to undergo PVI.

**Objective:** We tested the hypothesis that RD would prevent incident HTHD-associated AF when added to medical therapy.

**Methods:** Consenting patients aged  $\geq 55$  years, with an indication for coronary angiography, an office BP  $\geq 160/90\text{mmHg}$  or  $\geq 150/90\text{mmHg}$  in diabetics on  $\geq 3$  anti-hypertensives including a diuretic, with LVH and/or LAE or paroxysmal AF were randomised to RD or sham-RD. Patients with impaired renal function ( $\text{eGFR} < 45\text{ml/min}$ ), untreated thyroid disease and significant valvular heart disease were excluded.

**Results:** Thirty-five patients were randomised, 2 males withdrew informed consent and 2 died during follow up (1 patient in each arm). All patients had a subcutaneous Reveal-XT loop recorder implanted. There were no procedural complications. One of 16 in the RD arm (6.25%) and 7 of 17 (41%) in the sham-RD arm developed incident AF paroxysms after 3 year median follow up (Fisher exact test:  $p=0.0391$  for incidental difference).

**Conclusion:** In this small prospective, randomised sham-controlled trial, RD significantly reduced incident AF in patients with HTHD, but larger studies are needed to test its anti-arrhythmic potential as stand-alone therapy in AF prevention.

## Left atrial appendage obliteration reduces stroke following mitral valve surgery with atrial fibrillation

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Left atrial appendage plays an important role in the development of intracardiac thrombus. Surgical closure of Left atrial appendage in patients undergoing mitral valve replacement with atrial fibrillation may be a good choice for reducing stroke. The aim of this study is to evaluate whether left atrial appendage ligation in patients undergoing mitral valve replacement with atrial fibrillation reduces embolic events. We retrospectively studied 120 patients with previous mitral valve replacement with bioprosthetic valve, among them 45 patients underwent left atrial appendage obliteration by endocardial running suture. Embolic events within 2 years following procedure were documented. Postoperative atrial fibrillation was observed in 72 patients (23 patients with Left atrial appendage obliteration and 49 patients without obliteration). The incidence rate of embolic events was 15.27% for postoperative AF subjects. Among them the incidence rate of embolic events was 8.6% (2/23) and 18.3% (9/49;  $p=0.48$ ) respectively with, and without, left atrial appendage obliteration for postoperative AF patients. Left atrial appendage is the predominant source of emboli in patients with atrial fibrillation. Our study shows that left atrial appendage obliteration at the time of mitral valve replacement reduces embolic events.

## The role of HbA1c in predicting outcomes in type 2 diabetic patients following coronary artery bypass graft surgery

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Patients with diabetes mellitus (T2DM) have an increased risk of coronary heart disease and death. We investigate the association between preoperative haemoglobin A1c (HbA1c) levels and outcome after coronary artery bypass grafting (CABG) among patients with T2DM. A total of 230 patients (206 males, 24 females; mean age  $57.2 \pm 11.9$  years; range 39 - 75 years), who underwent coronary artery bypass grafting surgery in our hospital (April 2012 - June 2013) were enrolled in this study prospectively. Diabetes mellitus was defined as the fasting blood sugar concentration  $\geq 126$ mg/dL, or the use of an oral hypoglycaemic agent or insulin at the time of admission. All patients undergoing coronary artery bypass surgery had haemoglobin A1c levels determined preoperatively. Every patient, including non-diabetics, were managed with Portland protocol in the preoperative period. Data was taken up to 2 years following CABG. One-hundred-and-twelve of 115 (97.3%) diabetic patients had elevated A1c levels ( $\geq 6.0\%$ ), with 77 of 115 (66%) having inadequate control - A1c levels  $\geq 7.0$ . Twenty-four of 115 (20.8%) non-diabetic patients had elevated A1c levels ( $\geq 6.0\%$ ), with 7 (6.0%) having levels  $\geq 7.0\%$ . The patients who had elevated HbA1c had higher incidence ( $p=0.016$ ) of mediastinitis, local sternal infection ( $p=0.002$ ) and minor infections ( $p=0.006$ ). Elevated HbA1c was associated with prolonged stay in hospital and in intensive care unit (ICU) in patients, irrespective of previous diabetic status ( $p<0.001$ ). HbA1c was associated with an increased mortality. Higher HbA1c was associated with an increased risk of postoperative superficial sternal wound infections and a trend for higher mediastinitis rate and significantly higher mortality within 2 years after CABG. So, HbA1c may be a marker for poor outcome after CABG in undiagnosed diabetic patients.

## Desmopressin influences the bleeding after surgery in patients undergoing CABG

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**Introduction:** Patients undergoing CABG has a potentially increased risk of developing bleeding. This bleeding is often corrected with blood transfusions or possibly with surgical re-exploration. The haemostatic effect of desmopressin in patients undergoing CABG has drawn considerable interest. However, the initial promise suggested by preliminary studies has never been confirmed by more extensive testing.

**Objectives:** To identify effects of desmopressin on postoperative bleeding and the need for blood products for transfusion in patients undergoing CABG.

**Methods:** A prospective, randomised, single-centre consecutive study that evaluated 50 patients with CABG. Candidates were divided into 2 groups, designated desmopressin group (25 patients) and placebo group (25 patients). The allocation was randomised. Desmopressin group underwent infusion 0.3mcg/Kg of desmopressin intravenously or placebo group underwent infusion of 1mL of 0.9% saline solution. After admission to the ICU, variables were evaluated relating to the amount of bleeding and need for blood products.

**Results:** The mean age was 62.3 years in the control group and 59.8 in the DDAVP group. The groups had no significant difference in relation to gender. The groups were not significantly different regarding the number of arterial grafts. With respect to venous grafts, the control group had a higher percentage of cases with 2 grafts and the DDAVP group, the highest percentage with 3 grafts ( $p=0.0407$ ) with respect to bleeding, change was observed significant during the evaluations ( $p<0.001$ ), both in the control group as in the DDAVP group, noting that the immediate Poi differs from the first and second PO presenting significantly higher. The non-parametric Mann-Whitney noted that the groups did not differ in Poi time ( $p=0.260$ ), first PO ( $p=0.669$ ) and second PO ( $p=0.184$ ).

**Conclusions:** Postoperative bleeding was higher in Poi, compared to the first, second PO, in both groups, with statistical significance. There was, in this sample, differences in postoperative bleeding between the groups.

## The acute atrial fibrillation in CABG and valve surgery

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**Introduction:** Atrial fibrillation (AF) is the most common arrhythmia in the postoperative period of cardiac surgery, with an incidence of 10 - 40%. The development of AF in the PO still has unknown etiology. The presence of atrial fibrillation is associated with an increased occurrence of complications such as heart failure, stroke and pulmonary oedema.

**Objective:** To evaluate risk factors for atrial fibrillation in patients undergoing cardiac surgery evaluated in ICU.

**Patients:** We studied 40 patients after cardiac surgery, 20 underwent CABG and 20 underwent valve replacement. After admission to the intensive care unit, following the protocol established by the service, we evaluated the occurrence of AF in the immediate postoperative period, the first and second postoperative day. The following predictive variables were: left atrial diameter, end-diastolic diameter of the left ventricle, ventricular ejection fraction, CPB time, myocardial ischaemia time and inotropic drugs.

**Results:** Regarding the occurrence of AF, there was no difference between sex ( $p=0.481$ ) and age ( $p=0.058$ ), and the AF occurred in 5 (29.41%) and 8 (34.78%) patients undergoing CABG and Valve Replacement respectively, with significant difference ( $p=0.025$ ). The variables: CPB time, anoxia time, ejection fraction and diastolic diameter of the left ventricle was not related to the occurrence of AF, but the diameter of the left atrium in the non-AF group was  $38.8 \pm 9.3$ mm, we noted significant difference in the group with AF who was  $50.2 \pm 12.2$ mm ( $p=0.020$ ). The use of dobutamine and the amount of postoperative bleeding did not affect the occurrence of AF. Patients with AF remained longer in the ICU ( $3.3 \pm 0.8$  days vs.  $5.2 \pm 1.8$  days) ( $p<0.001$ ).

**Conclusions:** Atrial fibrillation after cardiac surgery is more prevalent in valve replacement surgeries than CABG. The increased diameter of the left atrium is predictive variable of atrial fibrillation. The incidence of AF increases the ICU period.



### Percutaneous management of mediastinal pseudo aneurysm following surgical replacement of the ascending aorta for acute type A aortic dissection

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**Objectives:** Mediastinal pseudo aneurysm formation is a potentially life threatening complication following aortic surgery. Conventional repair with open surgery is technically demanding – particularly if carried out in the early postoperative period – and a high risk procedure. We report a case in which this complication was successfully treated using a percutaneous approach.

**Methods:** A 67-year-old female, with past history of bioprosthetic aortic valve replacement, was admitted to hospital with the diagnosis of acute type A aortic dissection. She underwent redo surgery for aortic valve and ascending aorta replacement, with reimplantation of coronary arteries (Bentall – de Bono technique) on emergency basis. A control angio CT scan performed on the third postoperative week demonstrated a 4.5cm pseudo aneurysm, adjacent to the ascending aorta, with its entry site located at the right coronary artery – aortic graft anastomosis. Aortography was performed, via right femoral artery with a 6F introducer, and CT findings were confirmed. Pseudo aneurysm entry site could be crossed with a JR4 coronary guiding catheter, which permitted the deployment of a 6 x 11mm Amplatzer (AGA Medical Corporation, Plymouth, MN) vascular occluding device.

**Results:** Control contrast injection revealed only a minimal blood leak into the pseudo aneurysm immediately after the procedure. A further control angio CT scan, performed 1 week later, demonstrated complete pseudo aneurysm occlusion and thrombosis.

**Conclusions:** In our experience, percutaneous management of post-surgical aortic pseudo aneurysms is a feasible, less aggressive and effective option that may be considered when technically possible.

### Heart rate as a novel target for peripartum cardiomyopathy?

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**Objectives:** Peripartum cardiomyopathy (PPCM) is a condition affecting pregnant women where they rapidly develop symptoms of heart failure late during pregnancy, or within 6 months of delivery. One of the characteristics of the disease is an elevated heart rate (HR) outside normal recovery time periods (an elevated HR is normal during pregnancy and recovery to a normal rate usually occurs within 4 weeks of delivery). Experimental studies suggest that reducing HR by inhibition of the sino-atrial node may be a beneficial complementary therapy in treating acute-onset heart failure conditions such as PPCM. In this study we aimed to examine the efficacy of current standard therapy for PPCM in normalising heart rate after 6 months of treatment.

**Methods:** Retrospective data analysis was conducted on clinical records of PPCM patients. HR results were obtained at baseline and at 6 month follow-up from patients enrolled at the Cardiac Maternity Clinic at Groote Schuur hospital (2012 - 2015). Poor outcome was defined as HR above 75 beats per minute (BPM) after 6 months of standard heart failure therapy.

**Results:** Poor outcome was observed in 19 out of 24 patients (74%) at 6 months on standard therapy with diuretics ( $78 \pm 8$ mg/day), ACE inhibitors ( $12 \pm 2$ mg/day) and beta-blockers ( $22 \pm 3$ mg/day). Average HR values were  $95 \pm 3$  BPM at baseline (n=27), and  $83 \pm 12$  BPM at 6 months (n=24, 1 deceased).

**Conclusion:** Standard therapy for PPCM did not satisfactorily improve HR in PPCM patients. This result supports that modifying HR, without targeting the sympathetic nervous system or blood pressure in PPCM, may be a beneficial additive therapy. Further exploration of this hypothesis in a mouse model of PPCM is required to test this novel concept.

### Saving papillary muscles contractility in the correction of mitral insufficiency

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**Objectives:** Defining the role of the papillary muscle contractility in left ventricle function and assessment of the possibility to preserve it in mitral valve (MV) replacement in patients with mitral insufficiency and secondary cardiomyopathy.

**Methods:** Twenty-five patients with mitral insufficiency and secondary cardiomyopathy were included in the study. Traditional MV replacement was performed in 15 patients (group 1). In 10 patients (group 2) MV replacement was performed with posterior leaflet preservation and left ventricle remodelling with fixation of papillary muscles bases. Etiological factors were rheumatic heart disease (12 patients), infective endocarditis (9) and congenital dysplasia of the leaflets (4). All patients were classified as NYHA class IV. Clinical stage was preceded by experimental anatomical study of mammalian hearts. It has been proven that the papillary muscles, which are part of the subvalvular apparatus, together with trabecular muscle from the "inner core" of the heart ventricle are important structures which participates in myocardial contraction.

**Results:** There were no fatal outcomes. According to the postoperative echocardiography mean end diastolic volume decreased in both groups (from  $180 \pm 11.3$ ml -  $150 \pm 8.9$ ml in group 1, and from  $211 \pm 12.1$ ml -  $154 \pm 7.8$ ml in group 2); stroke volume decreased in group 1 (from  $101 \pm 7.7$ ml -  $68 \pm 9.8$ ml), and increased in group 2 (from  $65 \pm 10.2$ ml -  $110 \pm 12.7$ ml). Ejection fraction decreased slightly in all cases of group 1, while it increased in group 2.

**Conclusions:** Mitral valve replacement with the modelling of natural connections of the papillary muscles improves myocardial contractility. This operation is indicated in patients with reduced myocardial contractility, including patients with dilated cardiomyopathy.

## Medium term outcome of mitral valve repair in a South African population

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**Objective:** The study objective was to examine the short and medium term outcome of mitral valve repair in a South African population.

**Methods:** From 2006 - 2015, 124 patients with mitral regurgitation (MR) had mitral valve repair. This represented 18% of all mitral valve procedures (630) in the same time period. Most rheumatic valves were not repairable and needed a valve replacement. The cause for mitral regurgitation was myxomatous (58%), rheumatic (18%), ischaemic (11%), congenital (8%), traumatic (3%) and functional (2%). Patients' mean age was 43 years (15 - 73), and 56% were men. Posterior leaflet repair was done in 38% and anterior leaflet repair was done in 48% of patients. An annuloplasty ring was placed in 93% of patients. Preoperative MR was moderate and more in 95% of patients and 51% of patients was in New York Heart Association functional classes III and IV. The mean follow-up was 24 months (0 - 78 months) with 17% lost to follow up.

**Results:** There were 3 (2.4%) early and 3 (2.4%) late deaths. At 3 years, freedom from reoperation on the mitral valve was 94.5% and freedom from moderate or severe mitral regurgitation was 87% (74% for rheumatic valves and 91% for myxomatous valves), 95% of patients were in New York Heart Association functional classes I and II.

**Conclusion:** Mitral valve repair in selected patients have a good functional and echocardiographic midterm outcome.

## Anaesthetic management of patients undergoing trans apical implantation of artificial chordae to correct mitral regurgitation

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**Objectives:** Trans apical implantation of NeoChord is an emergent beating heart technique for correction of mitral regurgitation through minimal invasive left minithoracotomy. The purpose of this study was to evaluate the anaesthetic management of patients undergoing this procedure.

**Methods:** Observational bioethics committee approved prospective study. From December 2011 - November 2015, 65 patients underwent mitral valve repair with NeoChord system at our institution. Balanced anaesthesia with fentanyl-propofol-sevofluran was used in all cases. Patient core temperature was attempted to be kept above 36°C with warming blanket and warm infusion fluids. A 2D and 3DTEE was used in all patients to navigate the NeoChord deployment instrument, mainly to posterior mitral valve leaflet (63 cases out of 65). Following effective leaflet capture artificial chordae were deployed. Optimal placement of artificial chordae was evaluated by placing them under tension and observing significant contribution to MR reduction. Cell saver was used in all cases. Following surgery all patients were transferred to the ICU.

**Results:** Mean age of the patients was  $61.2 \pm 12$  years (range 33 - 84), male/female ratio 45/20. Most patients had severe mitral regurgitation [grade IV - 19 (29%), grade III - 45 (69%)]. The average preoperative Euroscore II -  $1.25 \pm 1.1\%$  (range 0.43 - 3.14). Mean duration of the procedure was  $127 \pm 25$  minutes. Average reduction of mitral regurgitation was from pre-procedural grade  $3.3 \pm 0.4$  to  $0.3 \pm 0.5$  immediately following the procedure. One patient was converted to conventional mitral valve repair due to failure to effectively deploy neochords. All patients underwent uneventful postoperative course. The average time to extubation was  $4.2 \pm 2.3$  hours and length of ICU stay was  $29 \pm 41.8$  hours. Blood products were used in 4 patients (6.1%), including 1 patient who was converted to conventional MV repair.

**Conclusions:** Anaesthesia for trans apical NeoChord implantation could be performed safely under beating-heart conditions, with short procedural time and minimal peri-operative patient morbidity. Two dimensional and three dimensional TEE play a vital role during the NeoChord implantation.

## Short-term and long-term outcomes of elderly patients treated with ECMO following cardiac surgery

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**Objectives:** An increasing number of elderly patients are being accepted for cardiac surgery. The age limit for the use of extracorporeal membrane oxygenation remains controversial. The aim of our study was to evaluate the outcomes of the elderly patients who needed ECMO treatment following cardiac surgery in our institution.

**Methods:** This was single centre retrospective study. We reviewed records of 69 consecutive adult patients who were treated with ECMO for cardiac failure, following surgery from January 2009 - December 2014. Indications for ECMO use were inability to wean from cardiopulmonary bypass or postoperative cardiac failure refractory to medical treatment. Patient short-term and long-term outcomes were assessed.

**Results:** ECMO was used in 22 patients older than 70 years (32% of all ECMO treated patients during this time frame). Sixteen (72%) elderly patients survived the ECLS and 6 (27.2%) were discharged from the hospital alive. Thirty-four (72%) younger patients survived the ECLS and 13 (27.6%) were discharged alive from the hospital. Follow-up was available in 16 patients (4 in the elderly and 12 in the younger patient group). Four elderly patients were alive at the median follow-up of 63 months. In the younger patients group, 10 patients were alive at a median of 48 months follow-up, 2 patients died: 1 in the first and another in the second year after surgery.

**Conclusions:** ECMO can be effectively used in the elderly postcardiotomy patients with acceptable in-hospital mortality and long-term outcomes similar to the younger patients group.

## In patients with acute flail chest, does surgical rib fixation improve outcomes in terms of morbidity and mortality?

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**Objectives:** It is not known which population would benefit from rib fixation following flail chest. As an emerging treatment we sought to evaluate its role in the management of patients.

**Methods:** We conducted a review of the world literature and found 137 papers, of these 11 represent the highest level of evidence. Data from 1712 patients represented the best evidence, including 1 meta-analysis, 2 randomised controlled trials (RCT), 5 retrospective cohort studies and 2 case control series.

**Results:** In-hospital mortality was lower for the surgical group [n=582, odds ratio (OR) 0.31 (0.20 - 0.48), risk difference (RD) 0.19 (0.13 - 0.26), number needed to treat (NNT) 5] as well as significant decreases in ventilator days (mean 8 days, 95%CI 5 - 10 days) and ICU stay (mean 5 days, 95% CI 2 - 8 days). A reduction was found for septicemia [n=345, OR 0.36 (0.19 - 0.71), RD 0.14 (0.56 - 0.23), NNT7], pneumonia [n=616, OR0.18 (0.11 - 0.32), RD0.31 (0.21 - 0.41), NNT3, p=0.001], tracheostomy (OR 0.06, 95% CI 0.02 - 0.20) and chest wall deformity [n=228, OR0.11 (0.02 - 0.60), RD0.30 (0.00 - 0.60), NNT3]. Eight studies (n=1015) had a shorter duration of mechanical ventilation following surgery. A reduction in ICU stay was demonstrated in 4 papers (n=389, 3.1 - 9.0 days), while a further 3 papers described a reduction in the duration of hospitalisation (n=489, 4 - 10.6 days). Three studies (n=166) showed a lower risk for tracheostomy. One retrospective cohort study estimated lower total treatment costs in surgically treated patients (\$32 300 vs. \$37 100) although not statistically significant. One retrospective case-control study described a lower risk for re-intubation (n=50, p=0.034) and home oxygen requirements (n=50, p=0.034).

**Conclusion:** Surgical stabilisation of flail chest in thoracic trauma patients has beneficial effects with respect to reduced ventilatory support, shorter intensive care and hospital stay, reduced incidence of pneumonia and septicemia, decreased risk of chest deformity and an overall reduced mortality when compared with patients who received non-operative management.

## Minimally invasive beating heart mitral valve replacement using conventional instruments: An experience from a remote government institute, India

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**Background/introduction:** The challenge of beating heart mitral-valve surgery has been taken up with limited resources in a remote government institute of India with encouraging success.

**Aim/objective:** Analyse the outcomes of MVR by this approach compared to the conventional approach.

**Method:** Thirty patients (M Group), 20 female and 10 male, underwent minimally invasive beating heart mitral valve replacement (MVR). Another 30 patients, 14 female and 16 male, underwent MVR via conventional approach (C Group). Age ranged from 15 - 45 years in both the groups. Right anterior fourth intercostal space thoracotomy. Aorto-bicaval cannulation. Patient position 20 degree reverse Trendelenburg. Aortic root suction at 100mmHg, perfusion pressure kept at 70mmHg and heart rate maintained at 70 - 90 beats per minute. A Medtronic prosthetic valve was used. Patients with left atrial dimension over 55mm are approached through LA (12 in M group and 16 in C group).

**Results:** There was no conversion in M group to arrested heart. The average cardiopulmonary bypass time for C group was 80 minutes and 107 minutes in case of M group. There was no significant difference in time of extubation in either of the groups, nor major neurological events. Two patients had postoperative confusion which needed delayed extubation after 24 hours in M Group. The average units of blood transfusion in M group was 0.8 units and 1.4 units in C group. There was no mortality in either group at 30 days. The average days to resume in work in MG is 26.5 days and CG group is 43.3 days.

**Discussion/conclusion:** The advantage of minimally invasive mitral valve surgery on beating heart is its simplicity, cost effectiveness and no sternal complications while providing the same quality of surgery. Patient can return to normal activity quicker. The potential for air embolisation is eliminated with sound surgical technique. Moreover, reperfusion injury is avoided as cardioplegic arrest of the heart is not done.

## Early and midterm results of hybrid coronary revascularisation

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**Objectives:** Hybrid coronary revascularisation means the planned combination of bypass surgery with LITA to LAD and PCI to non-LAD lesion. We investigated the early and midterm result of hybrid coronary revascularisation (HCR).

**Method:** From May 2010 - March 2016, multiple peri-operative factors including operative mortality, major and minor complication, MACE, repeated and target lesion revascularisation were studied retrospectively.

**Results:** Ninety-nine cases were enrolled. Mean number of revascularisation was 2.28 per case. There was no operative mortality and 1 stroke case in the early period. All the patients visited the out-patient clinic and mean follow up period was 30 months. There were 2 late deaths and midterm survival was 93.4%. Repeated revascularisation was 9.5% and target lesion revascularisation was 6.3%. Propensity score matched study with the variables of age, sex and preoperative LV ejection fraction was done and there were no significant differences between the 2 groups of early and late mortality.

**Conclusion:** HCR could be the optimal option for treatment for multivessel disease, but prospective study and long term follow up will be needed.

## Congenital Dandy Walker malformation associated with first trimester warfarin

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**Introduction:** While the warfarin embryopathy is well defined, central nervous system abnormalities associated with gestational warfarin exposure require further definition. Based on the timing of warfarin exposure, it has been proposed that second- and third-trimester exposure predisposes to CNS abnormalities while first-trimester exposure is more typically associated with the warfarin embryopathy. Patients with mechanical heart valves require long-term anticoagulant therapy. Patients whose warfarin doses during pregnancy were  $>5$  mg show increased probability of foetal complications.

**Case report:** A Gravida 4 para 1 abortions 2 with one normal delivery of a healthy male baby was booked for her antenatal care. She was a known case of mitral valve replacement on 10mg warfarin daily. At 16 weeks she was admitted with repeated episodes of bleeding per vaginum and INR of 5.55. Patient was advised to stop warfarin and injectable heparin was started. Her obstetric ultrasound was normal for her gestational age.

She reported back after 2 weeks with a target scan showing radiological features of Dandy Walker malformation. DWS features seen were antero-posterior enlargement of the posterior fossa, large cystic lesion of approximately  $42 \times 40 \times 37$  mm in posterior fossa and cystic dilatation of the fourth ventricle. Foetal mid face hypoplasia, depressed nose and single umbilical artery was also present. She opted for medical termination of pregnancy. It occurs slightly more frequently in females than in males, recognised chromosomal abnormalities associated with DWS include trisomy's (trisomy 18, 13, 21 or 9) and triploidy. Associated environmental factors include first-trimester exposure to rubella, cytomegalovirus, toxoplasmosis or warfarin.

**Conclusion:** This case offers evidence that Dandy Walker malformation may represent a distinct complication of in utero first-trimester exposure to warfarin, there is a close dependency between warfarin dosage and foetal complications.

## Results of valve replacement in juvenile rheumatic heart disease

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Rheumatic heart disease (RHD) has been documented in Indian medical literature since the early nineteenth century and has, in the past 50 years, emerged as a major contributor to cardiovascular mortality and morbidity. Younger age of onset (juvenile RHD) is seen in developing countries and is a peculiar subset of both public health and clinical importance. To study the results of valve replacement in juvenile rheumatic heart disease.

One-hundred-and-forty-eight consecutive subjects, between the ages of 6 and 14 years (average  $11.6 \pm 2.5$  years), underwent surgery for valvular heart disease from January 2008 to October 2015. Subjects in normal sinus rhythm (60%) were offered a choice of bioprosthesis or mechanical valve, only 3 opted for bioprosthesis.

Sixty point seven percent subjects were in normal sinus rhythm, 74.7% subjects were in New York Heart Association class III and 25.3% were in class IV. One-hundred-and-nineteen (80.4%) had mitral valve replacement, 15 (10.1%) had aortic valve replacement and double valve replacement was done in 14 (9.5%) of the total 148 subjects. Thirty day operative mortality was 9.6%, 10.2% children were lost to follow up and 7.8% died within first year of surgery. The mean survival after surgery was 5 years (95% CI=4.6 - 5.4 years). Compliance with oral anticoagulation was a major issue and was a major cause of late mortality (90%). Post-surgery growth in height, weight, development of secondary sexual characters and menarche in females was seen. NCHS parameters showed higher percentage of improvement when the patients were younger than 10 years of age, but this was not statistically significant. Three female patients late in follow up were discovered to be pregnant.

Despite these data, valve replacement, undertaken when attempts to repair mitral valve have failed, continues to be a standard modality of treatment for juvenile RHD.

## How does plantar hyperhidrosis improve following thoracic sympathectomy?

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**Background:** Primary hyperhidrosis, a condition which affects mostly palms, armpits, face and feet, results in social embarrassment and impairs quality of life. Thoracic sympathectomy remains the permanent choice of treatment in the management of primary hyperhidrosis. Patients with palmoplantar hyperhidrosis show improvements of up to 60% in their plantar sweating following sympathectomy, however the neurophysiological reasons remain unclear.

**Patients/methods:** A total of 51 patients with palmoplantar hyperhidrosis with varying degrees of facial hyperhidrosis, 23 (45.1%) male and 28 (54.9%) female with a mean age of  $22.3 \pm 7.2$  (median=20) underwent a T2 - T4 videothoracoscopic sympathectomy. The patients were evaluated for preoperative and postoperative electrophysiological changes in their face, hands and feet.

**Results:** The pre-postoperative means of latency and amplitude values of both sides of the face and the hands showed significant differences in all patients, these were more significant for hands ( $p < 0.0001$ ). A total of 33 (64.7%) patients had dry feet in the postoperative period, however no significant differences regarding sympathetic skin response (SSR) were observed in the feet of these patients. The means of pre-postoperative latencies of right foot ( $p = 0.677$ ) and left foot ( $p = 0.270$ ) did not show a significant difference in patients with feet improvement. Similarly, the means of pre-postoperative amplitudes of right foot ( $p = 0.977$ ) and left foot ( $p = 0.367$ ) were not significantly different.

**Conclusions:** Although a thoracic sympathectomy may result in clinical improvement of plantar hyperhidrosis, sympathetic skin responses of the feet obtained by electrophysiologic examination do not show any improvement in these patients. Clinical improvement of plantar hyperhidrosis, following thoracic sympathectomy, might be attributed to the emotional relief and elimination of anxiety factors provided by the improvement of sweating in other parts of the body.

## Higher inclination of LVAD outflow graft correlates with presence of aortic root thrombosis: A patient-specific computational fluid dynamics study

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**Background:** Computation fluid dynamics (CFD) can model the effect of LVAD outflow tract orientation on adverse haemodynamic alterations in the ascending aorta related to aortic root thrombosis (AT), a serious complication for end-stage heart failure LVAD patients.<sup>(1,2)</sup>

**Methods:** Patient-specific CFD simulations were performed for 17 Heartmate II LVAD patients [12 controls (CTRL), 5 AT patients] based on computed tomography angiographic (CTA) and flow information from echocardiograms done at the time of the CTA (LVAD flow = RVOT-LVOT flows if aortic valve opened, otherwise LVAD flow = RVOT flow). Blood velocity, pressure, LVAD velocity and retrograde velocity proximal to the anastomosis site were quantified and related to LVAD outflow graft by a vertical and a horizontal angle measured relatively to the centreline of the ascending aorta.

**Results:** The vertical angle was significantly smaller in the AT group ( $p=0.03$ ) as was the sum of both vertical and horizontal angles ( $p=0.005$ ). Blood velocity in the ascending aorta correlated significantly with the vertical angle ( $R=0.5$ ,  $p=0.05$ ) and was lower in the AT group ( $0.08 \pm 0.08$  m/s vs.  $0.14 \pm 0.08$  m/s) while LVAD velocity was higher ( $0.72 \pm 0.24$  m/s vs.  $0.46 \pm 0.15$  m/s). Pressure was lower for the AT group ( $25 \pm 3$  Pa vs.  $65 \pm 65$  Pa). Linear discriminant analysis revealed LVAD velocity and vertical angle as most significant determinants of measured parameters between the CTRL and AT group while total blood velocity and retrograde flow velocity were most the significant determinants regarding differences in the simulation results.

**Conclusion:** Higher inclination of the LVAD outflow graft at the anastomosis site reduces overall blood velocity and pressures in the ascending aorta possibly promoting aortic root thrombosis.

**References:** 1. Callington A, Long Q, Mohite P, et al. J Thorac Cardiovasc Surg. 2015 Sep;150(3):696-704. doi: 10.1016/j.jtcvs.2015.05.034. Epub 2015 May 15. PMID: 26092505. 2. Karmonik C, Partovi S, Loebe M, et al. ASAIO J. 2012 Nov-Dec;58(6):562-7. doi: 10.1097/MAT.0b013e31826d6232. PMID: 23013842.

## Outcomes of resected small sized ( $\leq 2$ cm) non-small cell lung cancer with pathologic N2 disease

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**Objectives:** Frequency of diagnosis of small-sized ( $\leq 2$ cm) non-small cell lung cancer (NSCLC) has been increased with the development of computed tomography techniques (CT). It is controversial whether a mediastinal lymph node dissection (MLND) needs to be performed in all patients with small-sized lung cancer.

**Methods:** We retrospectively evaluated pT1a NSCLC patients ( $n=210$ ) who underwent curative surgical pulmonary resection with systematic mediastinal node dissection at Ankara University School of Medicine Thoracic Surgery Department (1994 - 2013).

**Results:** Positive N2 nodes were identified in 9% (19/210) of the patients, 94.8% of patients were male and median age was 53 years. The histology of tumours consisted of squamous cell carcinoma in 12 (63%), adenocarcinoma in 7 (37%) of the patients. Median survival was 49.7 months, 5 year survival rate was 57%. Skip N2 metastases were found in 10 patients (25%) without N1 nodal involvement, 52% (10/19) of the patients had single station N2 disease and 48% (9/19) of the patient had multistation N2 disease. Age was found as a significant prognostic factor in Cox regression analysis [HR 1.11 (1.007 - 1.223) ( $p=0.03$ )]. Sex, histology of the tumour, cT and cN status, single/multi-station pN2, skip/non-skip pN2, adjuvant therapy were not identified as significant predictive factors.

**Conclusions:** Possibility of N2 disease is not lower in small-sized NSCLC, even stage Ia patients. So, systematic MLND must be performed rather than lobe-specific lymph node dissection in these cases. Precise assessment of mediastinal lymph node metastasis is important in determining the adjuvant therapy for patients with NSCLC patients.

## Surgical management of pulmonary sequestrations: An institutional experience with 32 cases

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**Background:** Pulmonary sequestration is a rare bronchopulmonary abnormality. In this study, we evaluated the diagnosis, surgical treatment and outcomes of pulmonary sequestration in 32 cases from a single institution.

**Methods:** A review of 32 cases who underwent surgical resection for pulmonary sequestration (1987 - 2015) was performed. The patients were evaluated according to demographics, symptoms, diagnostic methods, type, localisation and vascular characteristics of pulmonary sequestration, type of resection, complications and outcomes.

**Results:** Thirty-two patients with pulmonary sequestration were operated on. Of the 32 cases, 87.5% were intralobar and 12.5% were extralobar sequestration. The intralobar sequestration was located in the lower lobes in 89.3% of the cases and in the upper lobes in 10.7% of the cases. All extralobar sequestrations were located in the left hemithorax; 75% were located at the base of the hemithorax and 25% was at the apex. Lobectomy was performed in 53.1% of the cases, wedge resection in 25%, mass excision in 12.5% and segmentectomy in 9.4%. Postoperative complica-



tions occurred in 18.8% of the cases; prolonged air leak in 3 patients, wound infection in 2 patients and empyema in 1 patient. No mortality was observed. Median follow-up was 42 months (range: 3 - 105 months) and patients remained asymptomatic.

**Conclusion:** Although pulmonary sequestration is benign in nature, it should be removed, even in asymptomatic patients owing to its hazardous complications. Computed tomographic angiography is a surgeon-friendly method for the management of pulmonary sequestrations.

## Well differentiated papillary mesothelioma with peritoneal and pleural involvement: Case report

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**Background:** Well differentiated papillary mesothelioma (WDPM) is a variant of mesothelial tumour and in the 2015 World Health Organisation Classification of Mesothelial Tumours it is defined as a tumour without invasion, or with a limited invasion of sub mesothelial layer. It is common in women of reproductive age. Peritoneum, pleura and tunica vaginalis can be involved.

**Case:** A 18-year-old woman was admitted to gynaecology clinic with abdominal pain. The analysis of the laboratory tests was normal. Abdominal ultrasound showed the existence of intra abdominal fluid. Peritoneal biopsy was performed and it was reported as WDPM. X-ray radiography showed massive pleural effusion. The thoracoabdominal CT showed pleural effusion in the right hemithorax and nodularity in the surface of peritoneum and omentum. Diagnostic and curative video-assisted thoracoscopic surgery was performed and serous pleural effusion, diffuse pleural irregularity and nodularity were seen in the hemithorax. Multiple punch biopsies were taken. Microscopically, an exophytic, superficial tumour composed of papillary structures, having wide fibrovascular cores with edematous or myxoid stroma, surrounded by cubic mesothelial cells, without significant atypia, and without submesothelial invasion, was observed. Medical Oncology planned systemic chemotherapy for the patient.

**Results:** WDPM very rarely involves the pleural and peritoneal surfaces simultaneously. It is generally considered of low malignant potential, but requires long-term surveillance and is within a clinicohistological spectrum of papillary peritoneal/pleural tumours in women, ranging from mesothelial hyperplasia to papillary carcinoma.

## Coronary artery bypass grafting in patients with end stage renal disease: On-pump vs. off-pump strategies

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**Objectives:** The optimal surgical strategy regarding the use of cardiopulmonary bypass (CPB) during coronary artery bypass grafting (CABG) in patients with end-stage renal disease (ESRD) depending on dialysis remains controversial.

**Methods:** Among consecutive 6 577 patients undergoing elective isolated CABG (1997 - 2013) we identified 141 patients with ESRD depending on haemodialysis. Of these, on- and off-pump CABG were performed in 58 and 83 patients, respectively. Postoperative outcomes between the 2 groups were analysed after an adjustment with propensity score based on 26 baseline covariates.

**Results:** Early mortality occurred in 7 (12.1%) in the on-pump group, whereas there was no early mortality in the off-pump group ( $p=0.004$ ). The off-pump group patients tended to have fewer distal anastomosis than the on-pump group did ( $3.0 \pm 0.9$  vs.  $2.7 \pm 1.1$ ;  $p=0.086$ ). After an adjustment, the off-pump group showed a significantly lower risk of prolonged ventilation ( $>24$  hour) [odds ratio (OR), 0.23; 95% CI 0.07 - 0.63;  $p=0.006$ ], and tended to be at a lower risk of mediastinal bleeding (OR, 0.14; 95% CI 0.02 - 1.30;  $p=0.147$ ). During the study period, 90 patients died and the risk of overall mortality [hazard ratio (HR), 0.83; 95% CI 0.55 - 1.26;  $p=0.383$ ], major cardiac adverse events (MACE) (HR, 0.82; 95% CI 0.40 - 1.66;  $p=0.581$ ), and the composite of death and MACE (HR, 0.79; 95% CI 0.53 - 1.19;  $p=0.267$ ) did not differ significantly between the 2 groups.

**Conclusions:** The on-pump strategy for patients with ESRD on dialysis tended to be at higher risks of early mortality and morbidities, which may be particularly attributable to a greater risk of CPB use in the early postoperative period.

## Case of familial myxoma

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**Introduction:** Carney Syndrome is a rare autosomal dominant inherited disorder comprising of myxomas, cutaneous manifestations and endocrine abnormalities. The condition arises due to a deactivating mutation to the PRKARIA gene located on the long arm of chromosome 17. The atrial myxomas in this syndrome present at a younger age, are often multiple and involving more than one chamber; are more invasive and are more likely to recur after resection. The cutaneous lesions may be present at birth, but generally appear around the onset of puberty and regress in the fourth or fifth decade. A wide spectrum of endocrine disorders may be present and are usually characterised by over activity. Genetic testing can detect approximately 60% of cases. Clinical criteria has been set for use in diagnosing the condition.

**Case:** We present a case of familial myxoma, and possible Carney Syndrome, seen at our hospital. The index case is a 12-year-old boy presenting with a right sided hemiplegia. CT brain demonstrated multiple acute, subacute and chronic infarcts. Cardiac investigation revealed a large left atrial myxoma which prolapsed through the mitral valve. Investigation of the patient's family history revealed that the patient's mother had also been diagnosed with multiple myxomas, as well as cutaneous and endocrine abnormalities. Although genetic testing was not done, the clinical picture was highly suggestive of Carney Syndrome.

**Discussion:** The aim of this case is to review this unusual inherited disorder; and highlight the clinical and management aspects specifically focussing on cardiac involvement.



## Prolonged cold ischaemia followed by warm reperfusion reduces smooth muscle contraction in older spontaneously hypertensive stroke-prone rats

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**Objectives:** Vascular grafts are essential therapeutic materials for arterial bypass surgery (ABS). However, age and arterial hypertension may cause vascular damage which may be further aggravated by hypothermic preservation/reperfusion during ABS. We investigated the effects of both hypertension and ageing on vascular graft responsiveness in normoxic and prolonged cold ischaemia/warm reperfusion (IR) conditions.

**Methods:** Haemodynamic changes were evaluated and aortic morphometry was studied in haematoxylin and eosin stained sections in 18-month-old spontaneously hypertensive stroke-prone rats (SHRSP)(n=8) and age-matched normotensive Wistar rats (n=8). Whereas thoracic aortic rings of the control- and SHRSP-groups were immediately mounted in an organ bath (normoxia-group), aortic segments in the control-IR and SHRSP-IR groups underwent 24 hours of cold ischaemic preservation, followed by warm reperfusion injury.

**Results:** Increased intima-media thickness, intima-media cross-section area, and the lumen are normalised to body weight, and increased wall:lumen area ratio were seen in SHRSP displaying systolic blood pressure of  $205 \pm 16$  mmHg. Even though aortic rings from the SHRSP-group showed significantly greater maximum contraction to phenylephrine compared to the control, the SHRSP-IR group showed impaired contraction (control  $2.2 \pm 0.1$  g vs. SHRSP  $2.9 \pm 0.1$  g vs. control-IR  $2.6 \pm 0.2$  g vs. SHRSP-IR  $0.9 \pm 0.1$  g,  $p < 0.05$ ). In contrast to phenylephrine, all groups showed significantly reduced vasoconstrictive responses to high K<sup>+</sup>-induced depolarisation when compared to the control. Additionally, both IR-groups showed significantly weaker tension compared to the SHRSP-group, and IR in SHRSP further impaired high K<sup>+</sup>-induced contraction. Endothelial NOS and heme oxygenase (HO)-1 expression quantified by Western Blot was significantly upregulated in both SHRSP and SHRSP-IR groups compared to the controls, and IR in SHRSP down-regulated hypoxia-inducible factor (HIF)-1 $\alpha$  expression.

**Conclusions:** IR reduces smooth muscle contraction in older hypertensive rats. Structural changes and alterations in eNOS, HO-1 and HIF-1 $\alpha$  expression might be associated with vascular dysfunction. Targeting these proteins may represent a promising therapeutic approach to protect older grafts in hypertensive patients undergoing ABS.

## Long-term outcome and EuroSCORE II validation in native-valve surgery for active endocarditis in a South African cohort

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**Objectives:** To evaluate the major risk factors for adverse short and long-term outcomes in patients with active native valve infective endocarditis needing cardiac surgery and to validate the EuroSCORE II in our cohort of patients.

**Methods:** We retrospectively studied 149 patients with valve surgery for infective endocarditis (June 2000 - May 2011) at our referral centre. Ninety-six patients met the inclusion criteria for the study.

**Results:** Mechanical valves were implanted in 68 patients (70.8%), bioprosthetic valves in 16 (16.7%), mitral annuloplasty rings in 12 (12.5%). Cox proportional hazard model showed that the most important risk factors for early 30 day mortality were critical preoperative state, emergency surgery, EuroSCORE II >12%, low cardiac output state (LCOS), HIV positive status, preoperative embolic episodes, vegetation size >1cm and postoperative ventilation >24 hours. The EuroSCORE II underestimated early mortality for the entire cohort. The discriminatory ability was evaluated with the receiver operating characteristic (ROC) curve with an area under the curve of 0.796. The discriminatory ability in the subgroup analysis showed that the AUROC curve was poorer for MVR (0.696), 0.837 for DVR and better for AVR group (0.92). The EuroSCORE II cut point of 12% was confirmed with a maximal Youden's index. Kaplan Meier analysis of patients with a EuroSCORE II >12% vs.  $\leq 12\%$  showed that the former had significantly lower early to midterm survival and similar late survival ( $55.0 \pm 11.1\%$  vs.  $94.7 \pm 2.5\%$  at 90 days;  $55.0 \pm 11.1\%$  vs.  $83.3 \pm 4.7\%$  at 5 years; and  $45.8 \pm 12.5$  vs.  $39.1 \pm 27.8$  at 10 years with  $p=0.0001$ ).

**Conclusions:** The EuroSCORE II underestimated mortality in the highest risk groups and overestimated mortality in the lowest risk groups. The discriminatory ability and model fit were evaluated to be good and a EuroSCORE II >12%, predicted a significantly higher early and medium term mortality.

## Spectrum of cardiovascular diseases in Ethiopia: It is time for health policy change

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**Objectives:** Non-communicable disease, including cardiovascular diseases (CVDs) are leading causes of death globally, and are rapidly increasing in sub-Saharan Africa. However, there is a lack of large population data that describes the prevalence of CVDs in this region. The primary study objective was to supplement community-based surveys by examining the current pattern of CVDs in 6 referral hospitals and to identify treatment gaps among those with CVDs in Ethiopia, the second most populous country in Africa.

**Method:** A prospective cross-sectional, descriptive analysis was conducted using clinical and sociodemographic data from paediatric and adult cardiac patients seen at 6 major hospitals in Ethiopia (January 2015 - June 2015).

**Results:** A total of 6 275 patients were included in the study. The majority were female (58.5%), urban residents (60.9%), with a mean age of 34.7 years (range of 0.6 years - 95 years). Of the study participants, 31.1% were younger than 18 years of age. Valvular heart disease was the primary diagnosis in 40.5% of the cases, with rheumatic heart disease accounting for 86%. The next diagnoses were: congenital heart disease (17.8%), hypertensive heart disease (13.6%), ischaemic heart disease (9.6%), cardiomyopathy (8.0%) and pulmonary hypertension (4.1%). Those with congenital and severe valvular heart disease, most (96.3%) did not receive surgical or percutaneous interventions due to the lack of available facilities and trained personnel.

**Conclusions:** Cardiac valvular heart disease remains the leading cardiovascular diagnosis in Ethiopia. Unfortunately, most of those diagnosed are not receiving treatment for their disease due to a combination of limited healthcare resources, access and lack of trained personnel. Governmental and health care agencies must prioritise healthcare spending to improve the prevention and treatment of these highly treatable conditions.

## Transcatheter valve-in-valve implantation for failed cardiac bioprostheses

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**Objectives:** Emerging technologies in transcatheter interventions are changing the treatment options for valvular heart disease. A distinct subset of patients in whom these new devices are being employed are those with a failed surgical bioprosthetic valve. The purpose of this study was to review our early experience to aid in device and procedural selection.

**Methods:** The first 16 patients receiving valve-in-valve (ViV) procedures for a failed surgical bioprosthesis (April 2014 - December 2015) were included for analysis. Data was prospectively gathered and retrospectively reviewed and analysed.

**Results:** More than 500 Transcatheter heart valves (THV) have been implanted at our institution since 2011, with the majority during the past 2 years. During that latter period, ViV has been performed in 16 patients. These were deployed in the aortic (62.5%) and mitral (37.5%) positions. Mean age for Aortic valves was 76.2 years and for mitral valves 69 years. Mean preprocedural STS mortality scores were 7.98% for aortic and 7.08% for mitral valves. THVs used were Medtronic CoreValve/Evolut® (in all aortic patients), and Edwards Sapien XT/3® (in all mitral patients). Mean Interval from index procedure was 8.5 years (range 4 - 17 years). Access was transfemoral in all aortic patients and transapical in all mitral patients. There were no procedural (<72 hours) mortalities, and all cause 30 day mortality was 6.25% (1/16). Post ViV implantation paravalvular leak was trace, or less, in all patients. After aortic ViV, mean gradient was 15mmHg (range 8 - 23mmHg). After mitral ViV, mean gradient was 6.1mmHg (range 5 - 9mmHg). All patients had relief of symptoms.

**Conclusions:** THV is a viable treatment option for patients with failed cardiac bioprostheses. Acceptable haemodynamic and clinical results can be achieved. Post ViV gradient is dependent upon size of surgically implanted bioprosthesis.

## Artificial intelligence, system analysis and simulation modeling in optimisation of management for esophageal cancer patients

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**Objective:** Search for best management for esophageal cancer (EC) patients (ECP) (T1-4N0-2M0) was realised.

**Methods:** We analysed data of 499 consecutive ECP (age  $56.3 \pm 8.9$  years; tumour size  $6.3 \pm 3.4$ cm) radically operated and monitored in 1975 to 2016 [m=365, f=134; esophagogastrectomies (EG) Garlock=280, EG Lewis=219, combined EG with resection of pancreas, liver, diaphragm, aorta, VCS, colon transversum, lung, trachea, pericardium, splenectomy=147; adenocarcinoma=284, squamous=205, mix=10; T1=92, T2=113, T3=171, T4=123; N0=234, N1=69, N2=196; G1=140, G2=123, G3=236; early EC=73, invasive=426; only surgery=382, adjuvant chemoimmunoradiotherapy-AT=117: 5 -FU+thymalin/taktivin+radiotherapy 45 - 50Gy]. Multivariate Cox modeling, clustering, SEPATH, Monte Carlo, bootstrap and neural networks computing were used to determine any significant dependence.

**Results:** Overall life span (LS) was  $1\,763.2 \pm 2\,213.7$  days and cumulative 5 year survival (5YS) reached 47.3%, 10 years - 40.7%, 20 years - 29.8%. Hundred-and-forty-eight ECP lived more than 5 years ( $LS=4\,382.9 \pm 2\,551$  days), 80 ECP - more than 10 years ( $LS=6\,027.2 \pm 2\,445.6$  days). Two-hundred-and-twenty-three ECP died because of EC ( $LS=630.2 \pm 320.5$  days). AT significantly improved 5YS (67.7% vs. 43.1%) ( $p=0.00002$  by log-rank test). Cox modeling displayed ( $\chi^2=283.82$ ,  $df=18$ ,  $p=0.0000$ ) that 5 years of ECP significantly depended on: phase transition (PT) N0 - N12 in terms of synergetics, cell ratio factors (ratio between cancer cells and blood cells subpopulations), T, G, age, AT, localisation, blood cells, prothrombin index, coagulation time, residual nitrogen ( $p=0.000 - 0.047$ ). Neural networks, genetic algorithm selection and bootstrap simulation revealed relationships between 5 years and PT N0 - N12 (rank=1), PT early-invasive EC (rank=2), T (3), AT (4), prothrombin index (5), glucose (6), healthy cells/CC (7), thrombocytes/CC (8), erythrocytes/CC (9), segmented neutrophils/CC (10), lymphocytes/CC (11), monocytes/CC (12). Correct prediction of 5 years was 100% by neural networks computing.

**Conclusions:** Optimal management for ECP are: (1) screening and early detection of EC; (2) availability of experienced thoracoabdominal surgeons because of complexity of radical procedures; (3) aggressive en block surgery and adequate lymph node dissection for completeness; (4) precise prediction and (5) adjuvant chemoimmunoradiotherapy for ECP with unfavourable prognosis.

## Aortic pseudo aneurysm due to aspergillus fumigatus with initial presentation as bilateral loss of vision

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**Objective:** An Aspergillus pseudo aneurysm following aortic valve replacement (AVR) has not been reported on earlier.

**Methods:** A 79-year-old woman presented with right eye vision loss with progression to the left eye over a 2 week period. She received antibiotic eye drops and Vancomycin and ceftazidime injection for endogenous endophthalmitis. Pars plana vitrectomy was done with vitreous tap for cytology and culture of the right eye. She had been taking Avelox, Amiodarone, Toprol and Coumadin. She denied recent illnesses, fever, headaches, loss of consciousness, seizures, chest pain, palpitations and paroxysmal nocturnal dyspnoea. MRI identified a right lateral cerebellar lesion and the CSF profile was bland. A CT scan, to rule out systemic malignancy or occult infection, found a 4.3 x 4.3cm pseudo aneurysm or dissection with intra-luminal thrombosis of the ascending aorta was seen and confirmed by echo. It was noted to be arising, presumably, at the site of previous aortotomy. In the pre-op echo the aorta was noted to have a frank perforation with Doppler evidence of flow into a possible pseudo aneurysm and a large (2.2 x 1.2cm) mobile echo density attached to the anterior aspect of the opening into the aneurysm. Intraoperative TEE confirmed the same.

**Results:** The patient underwent a redo sternotomy. The mycotic pseudo aneurysm was debrided and replaced with a homograft. After the patient was taken off bypass following the procedure, TEE showed successful grafting of the aortic pseudoaneurysm. She was extubated the following day. The culture from the operating room showed aspergillus, and so the patient was started on Amphotericin B. Her vision was stable, and it was noted that the vision loss was likely secondary to aspergillus endophthalmitis. She was subsequently discharged on voriconazole on day 7.

**Conclusions:** This is a rare case of an elderly lady who presented with acute bilateral vision loss, secondary to aspergillus endophthalmitis, originating from an aspergillus positive aortic pseudo aneurysm resulting from previous AVR.

## Intercoronary bypass grafting in radiation induced mediastinal vasculitis

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**Objective:** Incidental cardiac irradiation during treatment of thoracic neoplasms has increased risks for subsequent coronary artery stenosis. We present a rare case of radiation induced coronary artery disease (CAD) successfully revascularised surgically by performing intercoronary bypass using saphenous vein graft.

**Methods:** A 59-year-old female presented with unstable angina, secondary to high grade ostial lesion in proximal right coronary artery. Her symptoms had escalated to substernal pain at rest. She had associated dyspnoea on exertion. In the past she was treated for Hodgkin's lymphoma by mantle field radiotherapy. Subsequently she developed CAD, bilateral subclavian stenosis, an extremely calcified ascending aorta, carotid arteries and internal mammary arteries. She also received treatment for bilateral breast cancer and thyroid cancer, secondary to radiotherapy by surgical resection. She had 3 right coronary artery interventions by angioplasty and stents, but continued to have chest pain. She had left subclavian arteries (SCA) stented. Right SCA had 3 failed interventions with no palpable pulse in right radial artery. She underwent median sternotomy. Left radial artery was harvested but was not of good quality. The left greater saphenous vein was harvested. A pericardectomy and opening of right pleura was done. CABG was performed with configuration of Proximal anastomosis using saphenous vein to diagonal and distal anastomosis was done with RCA proximal to bifurcation.

**Results:** On table postoperative Echo revealed increased Cardiac output from 3L - 5L with Cardiac Index of 2.2 without inotropes. She developed atrial fibrillation on day 3. She was discharged home on day 6 in sinus rhythm.

**Conclusions:** There was limitation in choice of conduit as IMAs and radials were not suitable. For the proximal site for CABG, ascending, descending aorta or the extra-anatomical sites, e.g. Right/Left Subclavian/Innominate/Axillary were unsuitable. Hence it was decided to use the native Diagonal branch of left coronary artery for proximal grafting site. The issue regarding the natural history of vein grafts remain, as does the possibility of a steal syndrome from the diagonal.

## Percutaneous pericardioscopy in a population with a high prevalence of tuberculous pericarditis: Improving the diagnostic yield and advancing the time to diagnosis

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**Objectives:** Tuberculous pericarditis remains an important cause of morbidity and mortality in the developing world. Definitive diagnosis, via direct identification of the mycobacterium bacillus, is challenging and not always possible via conventional investigations. Previous studies have demonstrated a low yield of acid fast bacilli (AFB) or Mycobacterium tuberculosis culture on pericardial fluid alone. We set out to evaluate the potential advantage and safety of minimally invasive percutaneous pericardiocopic biopsy of the pericardium in tuberculous (TB) pericarditis.

**Methods:** All patients presenting with a moderate-to-large pericardial effusion (epicardial separation distance >10mm) were offered participation. Each patient underwent pericardiocentesis via a standard procedure followed by percutaneous pericardioscopy and pericardial biopsy via a flexible

fiber-optic pericardioscope. Pericardial fluid evaluation included biochemistry (including adenosine deaminase level), cell count, AFBs and TB culture. Pericardial biopsy specimens were evaluated for AFBs, TB culture and histologically for granulomas.

**Results:** Sixty-two patients participated. Thirty-one presented in cardiac tamponade and 35 were HIV positive. Pericardial biopsy could be obtained in 51 patients, all of which were uncomplicated. Thirty-one (60.7%) were found to have definite pericardial TB, and a biopsy was achieved in 28 of these. A definite diagnosis of pericardial tuberculosis was made in 26 of the 28 (92.8%) via biopsy, whilst fluid missed the diagnosis in 7 (25%). Eleven (39.2%) of the 28 were AFB positive on pericardial biopsy and 6 (21.4%) had histological evidence of granulomas. Only 1 of the 28 was AFB positive on fluid, and 21 fluid samples subsequently cultured TB within 41 days (mean time 22 days). An alternative diagnosis was made in 13 of the remaining 20 patients.

**Conclusions:** In contrast to the assessment of pericardial fluid where a definite diagnosis of TB is dependent on culture, pericardial biopsy enables a more reliable and rapid diagnosis.

## Unroofed coronary sinus defects (CSD): The added value of multimodality imaging

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**Introduction:** CSD are the least common cause of left-to-right shunting at atrial level. We report on our recent experience of 2 cases with a type I Kirklin and Barratt-Boyes CSD diagnosed in adulthood.

**Cases:** A 38-year-old female presented in severe right heart failure. Transthoracic echocardiography (TTE) demonstrated a dilated right heart and a low-lying atrial septal defect (ASD) thought to represent an inferior sinus venosus defect. Transoesophageal echocardiogram (TOE) confirmed the secundum septum to be intact without the inferior vena cava overriding the defect. Unroofing of the CS was diagnosed with an associated CS-ASD. Repeat TTE with agitated saline contrast injection (ASI) from the left arm confirmed a PLSVC. Surgical correction was expedited without access to multimodality imaging due to severe heart failure. The entire CS was found to be unroofed with an associated CS-ASD. Without the preoperative delineation of a possible bridging vein between the PLSVC and right SVC, surgical correction involved complex baffling to redirect blood flow from the PLSVC to the right atrium (RA) and closure of the ASD. The second case was that of a 40-year-old female with Turner's syndrome and surgical aortic coarctation repair at age 7. TTE revealed a dilated right heart and CS without recurrence of coarctation. ASI via the left arm opacified the CS first, followed by direct spilling into the left and then the RA confirming a PLSVC and unroofed CS. Detailed CMR scan proved the CS to be completely unroofed with a good calibre bridging vein between the PLSVC and right SVC. This allowed for ligation of the PLSVC and patch closure of the CS-ASD, leaving an insignificant right-to-left shunt at atrial level.

**Conclusion:** CSD are notoriously challenging to diagnose as the CS is posteriorly situated. TOE and CMR offer a detailed evaluation of posterior cardiac structures compared to TTE. CMR also provides for accurate planning towards surgical correction by delineating the presence, or absence, of a bridging vein.

## Challenges in preclinical validation of new valves devices

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The validation of a new device on a relevant model from the early innovative stage, to the submission for first in man, requires a research programme which adheres to the highest professional standards. With more than 20 years' experience of in vivo preclinical medical device testing, done in a cutting edge surgical and housing facility, we describe the necessary steps to help the research teams bring their devices to market, in a timely and cost effective manner, with robust data and well-illustrated reports. We have a strongly grounded know-how of cardiovascular surgery and interventional cardiology research and especially sutureless valves, tissue engineering valves, TAVR (>2 000 tests implants), TMVR (>600 tests implants). For all these reasons we describe the way to conduct early R&D studies, following the Good Laboratory Practices environment, to assume the highest quality standards required by the competent European authorities and the FDA.

Proof of concept, feasibility, reproducibility, safety and efficacy are the gold standard. Steps will focus on the behaviour of the 2 major device components: biological tissue and metallic part. Durability tests in vitro are conducted before in vivo tests. The in vivo part requires, in order to make sense, the use of the same technics and equipment as for human. The initial questions are: which model, which approach, the size of the groups and the follow-up duration? Consequently, the study will analyse clinical and biological findings, echocardiographic aspects and mobility, angiography and 3D angio analyse the haemodynamic profile. Cardioscopy highly contributes to provide dynamic studies. The last step is dedicated to the ex-vivo analytical focus on X-ray, high resolution imaging with Faxitron, Microscopic evaluation according to ISO 10993-part 6 study tissue and metal with resin embedding to assess morphometry, deposit and tissue aspect.

The data gathered during these experimental steps (hydrodynamic and haemodynamic performances, resistances, possible migration or failures) will form part of the final report to be submitted.

## Early results of Trifecta bio-prosthesis aortic valve replacement: A single centre analysis

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**Introduction:** The Trifecta bio-prosthesis is a new-generation pericardial tissue valve purported to have very low trans-valvular gradients. We report our early results of aortic valve replacement with this implant.

**Methods:** A retrospective analysis of the institutional database to identify patients undergoing aortic valve replacement with this bio-prosthesis was performed. Concomitant procedures were coronary artery bypass (CABG) (30.2%) and Maze procedure (9.5%). Preoperative demographics, intra-operative data including valve sizes, early postoperative haemodynamics and clinical events are presented. All peri-operative data were collected prospectively.

**Results:** During a 2 year period, 63 patients (all male, age  $68 \pm 6$  years) underwent aortic valve replacement. Preoperative peak pressure gradient was 24mmHg (14.6 - 135mmHg) and preoperative valve area was  $0.5\text{cm}^2$  ( $0.2 - 2\text{cm}^2$ ). Valve sizes implemented were predominantly 23mm (33%) and 25mm (46%). Preoperative estimated mortality and morbidity were 6% and 16% respectively. The early (30 day) mortality was 1.6% (1/63) and total in-hospital death was 4.8% (3/63) from complications not related to the valve. Postoperative respiratory failure and wound infection were present in 10% and 3% of cases, respectively. There were no major strokes. On first follow-up, mean postoperative valve pressure gradient was  $9 \pm 4\text{mmHg}$ , effective orifice area was  $2 \pm 0.6\text{cm}^2$  and indexed effective orifice area was  $0.95 \pm 0.3\text{cm}^2/\text{m}^2$ . Postoperative hospital stay was  $10 \pm 2$  days.

**Conclusion:** Aortic valve replacement with the Trifecta bio-prosthesis is safe and durable with excellent early postoperative haemodynamics.

## Single centre experience with the Bentall procedure with biological valve conduit

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**Objective:** We retrospectively analysed 9 years of experience with the Bentall procedure using a biological valve in patients with aortic root aneurysms at a single centre performed by a single surgeon.

**Methods:** Between 2006 and 2015, 42 patients (100% males, age =  $61 \pm 7.2$  years) with aortic root and ascending aortic aneurysms underwent Bentall procedure with a stentless bioprosthetic valve conduit (Medtronic Freestyle bioprosthesis, Medtronic Corp.) at a single centre by the same surgeon. All peri-operative data were collected prospectively and analysed retrospectively.

**Results:** Concomitant procedures were coronary artery bypass (CABG) (36%), mitral valve surgery (17%), and Maze procedure (20%). Most procedures (92%) were performed using deep hypothermic circulatory arrest (DHCA) with antegrade cerebral perfusion (ACP). The mean CPB time was  $218 \pm 47$ ; mean DHCA with ACP time was  $22 \pm 16$  minutes. A bicuspid aortic valve was present in 24% of cases. Majority of valve conduit sizes were 29mm (42%), 27mm (24%) and 25mm (17%). Postoperative mean pressure gradient was 7mmHg and mean AI grade was 0.24. There were no peri-operative or hospital deaths or massive peri-operative strokes. There was one re-exploration for bleeding and 1 patient developed renal failure requiring temporary dialysis. Mean ventilator support after surgery was  $23 \pm 13$  hours; average ICU and hospital stays were  $2 \pm 1$  and  $8 \pm 3$  days respectively. Mean follow-up was  $4.7 \pm 2.8$  years. There were no deaths or reoperations during follow up.

**Conclusion:** Bentall procedure with Freestyle biological valve conduit can be performed with excellent short-and long-term results in patients with aortic root aneurysm combined with ascending aortic aneurysm.

## Cardiac surgery without electrocautery: Is it possible?

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**Objectives:** Since the introduction of electrocautery in 1926 it has become the standard method of haemostasis and tissue dissection. Alternative, newer energy sources, which function at much lower wattage and do not rely on the conduction of electrical energy through the patient may offer advantages. Advantages include lower risk of electrical burns, less tissue damage from thermal spread and reduced risk of cardiac arrhythmias. One such alternative energy source is helium plasma.

**Methods:** Twenty-three patients undergoing surgery for congenital heart disease were studied in early 2016. Helium plasma was used exclusively for dissection and cautery. Electrocautery was not used. Outcome measures include operative time, time to extubation, chest tube output, reoperation for bleeding, hospital length of stay, operative mortality and readmission within 30 days of discharge home.

**Results:** Median operative time (incision to skin closure) was 192 minutes [Interquartile range (IQR) 138 - 252 minutes]. Over 75% (18/23) were redo valve operations, 7 were pulmonary valves. Twenty-one patients (91%) were extubated in the operating room. The remaining 2 patients were extubated within 24 hours. Median chest tube output at 8 hours, 24 hours and at time of chest tube removal was 4mL/kg (IQR 3 - 10mL/kg), 7mL/kg (IQR 4 - 14mL/kg) and 9mL/kg (IQR 5 - 19mL/kg). No patients underwent reoperation for bleeding or required drainage of a postoperative effusion. No patients required a pacemaker. The median hospital length of stay was 2 days (IQR 2 - 3 days). All patients were discharged home. One patient was readmitted.

**Conclusions:** Cardiac surgery is possible without electrocautery. The use of helium plasma cautery is associated with acceptable operative times, early recovery, low level of complications and short length of stay after congenital cardiac surgery. Helium plasma energy should be further evaluated to determine its wider efficacy and further determine the potential benefits of undertaking surgery without adverse effects associated with electrocautery.

## A review of congenital pulmonary vein stenosis at an African tertiary care centre over a 25 year period

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**Background:** Congenital pulmonary vein stenosis is a rare condition, which is thought to result from abnormal incorporation of the common pulmonary vein into the left atrium. It may occur in association with other congenital cardiac lesions, or in isolation, and results in varying degrees of pulmonary hypertension. Only a few case reports/series are documented in the literature with little data on outcomes.

**Aim:** To describe the characteristics and outcome of children with congenital pulmonary vein stenosis at Chris Hani Baragwanath Academic Hospital (CHBAH) over a 25 year period.

**Methods:** Patients were identified using the computerised paediatric cardiology database, which was initiated in the early 1990s - January 2016. Medical and surgical information was extracted from the database for analysis. Children with secondary pulmonary vein stenosis were excluded.

**Results:** Five patients with congenital pulmonary vein stenosis were identified. Eighty percent of the cases were females. The age at diagnosis ranged from 12 months - 13 years. All the cases of pulmonary vein stenosis were unilateral and right sided. Interestingly, 2 patients presented with recurrent haemoptysis as a result of the unilateral pulmonary vein stenosis. Pulmonary hypertension and elevated capillary wedge pressures were documented at cardiac catheterisation. All patients had associated congenital cardiac defect/s, requiring surgical intervention. Only 2 patients had surgical interventions for the pulmonary vein stenosis. Three of the 5 patients are still alive. One death occurred following lobectomy and was infection related. The cause of death for the second patient is unknown.

**Conclusion:** Congenital pulmonary vein stenosis is a rare condition at our centre. All cases were associated with other congenital cardiac defects. Moreover, haemoptysis is part of the presenting clinical spectrum, in keeping with the published literature.

## Repair of anomalous coronary artery from the pulmonary artery: A single centre 20 year experience

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**Objectives:** Anomalous origin of coronary artery from the pulmonary artery (ACAPA) is a rare congenital coronary malformation with a high mortality, whether in infants or adult patients. There are many surgical procedures to repair it. This study reviews 20 years of surgical treatment in a single centre and aims to establish the optimal surgical strategies for this rare pathology.

**Methods:** From April 1994 - March 2015, 96 consecutive patients aged 3 months - 60 years underwent coronary repair surgery. Eighty cases were anomalous origin of the left coronary artery from the pulmonary artery (ALCAPA) and 16 were anomalous origin of the right coronary artery from the pulmonary artery (RCA). The surgical procedures included ligation (3 cases), ligation with CABG (6 cases), transpulmonary baffling (Takeuchi Procedure, 14 cases) and direct implantation of the anomalous coronary artery (ACA) into the aorta (73 cases). Postoperative extracorporeal mechanical circulatory support (ECMO) was necessary in 4 cases. Mitral valve repair was performed in 40 patients with moderate or severe mitral regurgitation (MR). Mitral replacement was performed in 1 patient with severe MR.

**Results:** There was 1 early, and 2 late deaths. One patient died from lung infection during the hospital stay. Two late deaths happened 4 and 6 months after hospital discharge with ligation procedure. One patient underwent a second operation due to Baffle leaks. During mean  $10.45 \pm 8.96$  year follow-up (1 month - 18 years), both early and late improvement of left ventricular function was observed in most patients (8 patients were lost to follow-up).

**Conclusions:** The establishment of a 2 coronary system is the main goal of surgical therapy today. In different procedures, the direct implantation of the ACA into the ascending aorta is the best method and has good long-term results. ECMO as a bridge to recovery that will play an integral part in modern surgical treatment.

## Risk factors of peri-operative mortality of repair of "simple" total anomalous pulmonary venous connection

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**Objective:** To analyse the risk factors of peri-operative mortality after repair of "simple" total anomalous pulmonary venous connection retrospectively.

**Methods:** From October 1996 - September 2012, a total of 563 patients underwent simple TAPVD surgery in Fuwai Hospital. Data collection occurred retrospectively.

**Results:** Overall peri-operative mortality for simple TAPVC was 6%. Univariate analysis showed that age less than 1-year-old ( $p=0.008$ ), emergent surgery ( $p=0.002$ ), CPB time ( $p=0.000$ ) and cross-clamp time ( $p=0.001$ ) were the high risk factors. Multiple factor analysis showed that age less than 1 year ( $OR=3.802$ ,  $p=0.013$ ) correlated with peri-operative death and selective surgery ( $OR=0.234$ ,  $p=0.027$ ) is identified as the conserved factor.

**Conclusions:** It is suggested that age less than 1 year should be considered as an independent risk factor for mortality and selective surgery is the conserved factor.



## Surgical treatment after failure of simple congenital heart disease (CHD) intervention

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**Objective:** This study reviewed a group of surgical treatments for patients who went through failed congenital cardiac catheterisation (CCC), including patent ductus arteriosus (PDA), atrial septal defect (ASD), and ventricular septal defect (VSD), and aimed to establish optimal surgical strategies for failed CCC.

**Methods:** Thirty-five CCC patients managed over 14 years were retrospectively studied, follow-up results recorded for each patient by telephone and outpatient follow-up reviewed.

**Results:** There were no deaths. The average age of the patients was  $18.4 \pm 18.3$  (3 - 67) years old. The median time of the intervals between interventions and surgeries was 26 days (2 hours - 10 years). The average length of hospital stay was  $11.5 \pm 4.3$  days (7 - 21 days). The average cardiopulmonary bypass (CPB) time was  $73.9 \pm 43.6$  minutes (0 - 206 minutes). The average cross-clamping time was  $41.6 \pm 26.3$  minutes (0 - 99 minutes). The median time of mechanical ventilation was 8 hours (0 - 88 hours). The median ICU stay was 10 hours (2.4 hours - 6 days). The average follow-up period was  $75.5 \pm 58.8$  months (7 days - 182.4 months). The surgical results were satisfactory.

**Conclusions:** Interventional treatment of simple congenital heart disease (CHD) was safe after all, but the indications should be strictly controlled. If there were complex complications, surgical treatment had to be undergone, and the results were satisfactory.

## Needlescopic sympathectomy for palmar hyperhidrosis in a tropical climate

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**Introduction:** Palmar hyperhidrosis, although benign, can cause significant distress and social disability. Needlescopic sympathectomy can be offered when conservative treatment options such as antiperspirants, iontophoresis and botulinum toxin injections have failed. Surgical risk is low but includes compensatory hyperhidrosis and gustatory symptoms. The aim of our study is to review our experience with needlescopic sympathectomy at our institution.

**Methods:** We performed a retrospective review of all patients undergoing ablative needlescopic sympathectomy (2000 - 2014). Data collected include demographics, operative data, post-operative complications, and resolution of symptoms.

**Results:** Forty-nine patients underwent needlescopic sympathectomy during the study period. Six patients had incomplete data and consequently 43 patients were analysed. The median age was 24 years (range 15 - 45) and 29 were male. All patients had palmar hyperhidrosis; 3 had concomitant plantar hyperhidrosis, 1 facial and neck hyperhidrosis. Sympathectomies involved were performed at T2 - T3 levels in 39 patients. Six patients developed a pneumothorax post-operatively that did not require a chest tube. Median length of stay was 1 day (range 1 - 5); 30 were discharged on the same day, and 12 discharged on post-operative day 1. Patients were reviewed within 6 weeks then given the option to return within the subsequent year. Median follow up time was 22.3 days (range 2 - 188). Two patients were lost to follow up. Symptom improvement was noted in 39 patients. Compensatory hyperhidrosis commonly involving the feet and trunk occurred in 19 patients. No patients developed gustatory symptoms.

**Conclusion:** Our results demonstrate that needlescopic sympathectomy is a safe, effective procedure which can be performed as a day case procedure.

## Long-term experience with CTEPH treatment in the Czech Republic

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**Background:** Chronic thromboembolic pulmonary hypertension (CTEPH) is caused by chronic obstruction of pulmonary vessels by organised thromboembolic material. The majority of CTEPH patients are potentially candidates for surgical therapy – pulmonary endarterectomy (PEA). Final diagnosis, operability assessment and therapy of CTEPH should be concentrated in specialised centres with an experienced CTEPH team.

**Patients/methods:** We studied the charts from all consecutive patients with CTEPH (2003 and 2014) who were referred to our centre from the Czech Republic and Slovak Republic for consideration of PEA. Operability was assessed based on V/Q scintigraphy, haemodynamic parameters, pulmonary angiography, CT angiography and clinical data. PEA programme was initiated in 2004. Residual/recurrent pulmonary hypertension was assessed by echocardiography at month 6 during follow-up (PASP estimation  $\geq 40$  mmHg). Standard Kaplan-Meier methodology was applied in the analysis of patients' survival.

**Results:** The CTEPH population included 437 patients, the mean age was 61.6 years, female: male ratio was 0.87, mean pulmonary artery pressure, cardiac index and pulmonary vascular resistance were  $49.5 \pm 12.02$  mmHg,  $2.2 \pm 0.51$  l/min/m<sup>2</sup>, and  $9.6 \pm 4.3$  Wood units, respectively, 75.8 % of patients were considered as operable, and 55.1% patients underwent surgery. Following PEA at month 6, there were significant improvements in NYHA class

(pre  $2.9$  vs. post  $1.4$ ,  $p < 0.001$ ), right ventricular systolic pressure (pre  $84.4 \pm 37.4$  mmHg vs. post  $37.4 \pm 19.76$  mmHg,  $p < 0.001$ ), 6 minute walk distance (pre  $310.0 \pm 121.8$  m vs. post  $506.9 \pm 228.0$  m,  $p < 0.001$ ). The 1, 3, 5 and 8 year survival rates after PEA were 89%, 87%, 82% and 73%, respectively. The 1, 3, 5 and 8 year survival rates in inoperable patients were 81%, 60%, 50% and 42%, respectively.

**Conclusions.** PEA is curative therapy for the majority of CTEPH patients. Residual pulmonary hypertension rate is relatively low and long-term survival of operated patients is excellent in experienced centre.

## Pulmonary artery endarterectomy combined with Cryo-MAZE procedure: Five year follow-up

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**Objective:** Pulmonary artery endarterectomy (PEA) is the most effective treatment for chronic thromboembolic pulmonary hypertension (CTEPH). Ten percent of our patients with CTEPH were additionally diagnosed with atrial fibrillations (AF) or flutter. The aim of this study is to analyse our early results in patients that underwent PEA combined with MAZE procedure.

**Methods:** In September 2004 - December 2015, we operated on 269 patients with CTEPH. Additional cardiac procedures were carried out during cooling and rewarming time intervals in 89 patients (33%). In 37 patients atrial septal defect (ASD) was closed, 32 patients underwent aortocoronary bypass (CABG), 18 patients underwent MAZE procedure, and 8 patients underwent valve repair or replacement surgery. The MAZE procedure was carried out as follows: right and left side MAZE procedure in 11 patients, right side MAZE procedure in 6 patients, and left side MAZE procedure with mitral valve annuloplasty in 1 patient.

**Results:** Early hospital mortality (4.8%) was identical in patients that underwent PEA and PEA combined with MAZE procedure. At the time of hospital discharge 12 (70%) out of 17 patients had sinus rhythm (SR). One year after the initial surgery, 66% of the patients had SR and 80% of the patients had not had AF. Average follow up time period is currently 62 months in 15 surviving patients with SR present in 73% of the patients. After the surgery, there was a considerable improvement in haemodynamic parameters (mPA, CI, PVR), functional classification and 6 minute walking test (6MWT) in all patients.

**Conclusions:** Pulmonary endarterectomy can be safely combined with MAZE and other cardiac procedures. We believe that PEA, combined with MAZE procedure, is an effective therapeutic approach for treating patients suffering from CTEPH and AF or flutter.

## Early and long-term results of off-pump coronary artery revascularisation: 12 years' experience

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**Objective:** To determine the postoperative outcome and long-term results (residual angina, further myocardial and cerebrovascular events and need for coronary re-intervention) after off-pump coronary artery revascularisation.

**Methods:** Retrospective analysis of prospectively collected data for all isolated off-pump coronary artery bypass (OPCAB) performed in our institution by a single surgeon in the last 12 years ( $n = 210$ ). Follow-up [mean  $6.5 \pm 3.5$  (0 - 12) years] was done by telephone interviews or clinical visits. Late mortality and further cardiac events requiring re-intervention were also registered. The conversion rate from OPCAB to cardiopulmonary bypass was only 0.8%.

**Results:** Mean of anastomosis performed was 3.5, with 60% of the cases receiving a single internal mammary artery (IMA) and 29% a bilateral IMA. Nineteen percent received total arterial revascularisation. Early outcome was excellent, with an in-hospital mortality of 2%, despite 48% of the cases being urgent referrals and a mean Logistic EuroScore of  $6.3 \pm 7.7$  (1 - 32) for the whole cohort. One and 5 year mortality were 2% and 11%, respectively. Amongst the survivors, the incidence of myocardial infarction and cerebrovascular events were 3% and 90% of the patients who remained free from angina. A total of 81 coronary angiographies (8%) were performed during the follow-up. Only 3% of the patients required percutaneous revascularisation during the follow-up. One case underwent re-do OPCAB.

**Conclusion:** Our results demonstrate that OPCAB can be performed safely in expert hands, achieving complete revascularisation using a complement of grating strategies with low conversion rates. It also provides good long-term survival and freedom from symptoms as well as cardiac and cerebrovascular events.

## Long-term results after tricuspid annuloplasty according to severity of preoperative regurgitation and technique used

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**Objective:** To determine longer-term outcomes of durability after tricuspid annuloplasty (TA) according to preoperative degree of tricuspid regurgitation (TR) and annuloplasty technique. Our primary hypothesis was that the use of a Cosgrove band in patients with significant annular dilatation, but less than moderate regurgitation, may reduce the incidence of postoperative heart block and permanent pacemaker implantation.

**Methods:** Retrospective analysis of patients who underwent concomitant TA in our centre (2002 - 2012) ( $n = 441$ ). Two groups were defined based on the indication for the repair: "Therapeutic TA" for moderate or severe regurgitation ( $n = 355$ ) and "Prophylactic TA" for annular dilatation and

less than moderate regurgitation (>40mm, n=86). The type of annuloplasty was decided by the surgeon's preference: Therapeutic group - rigid ring (Medtronic Contour/Edwards MC3) in 69% and Cosgrove Band or De Vega in 30%; Prophylactic group - Cosgrove band or De Vega in 55% and rigid ring in 45%. Mean follow up was 6.2 years, and 6% of the patients were lost to follow.

**Results:** In-hospital mortality was 6% ("Therapeutic TA" 7%, "Prophylactic TA" 5%, p=NS). One year mortality was significantly higher in the Therapeutic group (9% vs. 6%, p=0.05). Five year mortality was similar in both groups (25% vs. 27%, p=0.17). Postoperative pacemaker implantation rate was 12%, not related to the degree of preoperative regurgitation, nor the annuloplasty technique. Recurrent moderate/severe TR was identified in 10% of cases, without differences with respect to the annuloplasty technique, but associated with preoperative severe TR, p=0.02.

**Conclusions:** Contradicting our initial hypothesis, the annuloplasty technique did not influence the need for pacemaker implantation, nor the presence of residual TR. However, the technique used was to an extent "tailored" to the preoperative degree of TR with fewer bands used for moderate or severe TR. Preoperative severe TR was associated with increased mid-term mortality and a higher incidence of residual TR.

## Use of Celsior® crystalloid cardioplegia in elective valvular cardiac surgery: Single centre experience from 1 099 valvular procedures

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**Objective:** Crystalloid cardioplegic solutions (CCS) allow for the performance of complex heart surgery procedures without interruption. Previous studies have analysed different CCS for myocardial protection, but none of them evaluated the routine use of Celsior® as CCS.

**Methods:** This work was an observational retrospective study, in which we analysed the performance of Celsior® as CCS. The study included all the patients operated in our Institution (March 2006 - May 2014), in whom crystalloid cardioplegia with Celsior® was the only myocardial protection strategy employed. The primary end-points for this study were: (1) Mortality at 30 days. (2) Surrogates for myocardial protection (maximum cardiac enzyme release, use of inotropes/intra-aortic counter pulsation balloon) and rhythm disturbances (spontaneous recovery of heart rhythm, number of attempts for defibrillation). The secondary end point was the analysis of the safety of the intravenous use of Celsior®.

**Results:** 1 776 heart surgery procedures were performed using exclusively Celsior® for myocardial protection. Postoperative mortality during the study period was 7% (Logistic Euroscore I 7.33%). Medium maximum Troponin T release was 0.58ng/dL (range 0.01 - 33ng/dL). Seventy point six percent had initial spontaneous recovery of heart rhythm. Eighty seven point five percent of the patients did not require postoperative inotropic support. There were no allergic reactions to Celsior®. We found no other toxicity (coagulopathy, renal dysfunction, liver dysfunction or encephalopathy).

**Conclusions:** Isolated crystalloid Celsior® is an optimal myocardial protection strategy in conventional heart surgery. Intravenous use of Celsior® is safe, with no unexpected allergic reactions or systemic toxicity after its routine use as CCS.

## A suction-drainage system to treat anastomotic leakage after totally minimally invasive esophagectomy with intrathoracic anastomosis (Ivor Lewis procedure)

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**Objectives:** Worldwide, either open or minimally invasive esophagectomy is the cornerstone of curative treatment for esophageal cancer. Anastomotic leakage is one of the most life threatening postoperative complications with an incidence of 5 - 25% and a mortality rate of 20 - 40%. Strategies to treat leakage are divers. A therapy system to treat leakages is controlled suction-drainage via nasogastric route. This system is relatively cheap and can be employed in both hospital and ambulant settings. The aim of this study was to evaluate the efficacy of controlled suction-drainage as treatment of anastomotic leakages after totally minimally invasive esophagectomy (tMIE) with intrathoracic anastomosis (IA).

**Methods:** All patients who were treated with curative intent for esophageal cancer with tMIE with IA were included. Anastomotic leakage was diagnosed with either a CT-scan or endoscopy and treated with endoluminal tube Thopaz suction-drainage system (20cm H<sub>2</sub>O suction), endoscopic stenting or clipping or a combination of these. VATS was used to drain thoracic empyema.

**Results:** From July 2013 until May 2016, 107 tMIEs with IA were performed in a single tertiary referral centre. Male-female ratio was 93:14 with a median age of 67 (36 - 83). Twenty-seven patients (25%) developed an anastomotic leakage. Of these, 11% (n=3) was treated with antibiotics only, 81% was treated using Thopaz drainage system. In 11 patients (42%) suction drainage alone was enough to treat the dehiscence. The other 39% received endoscopic stenting, or clipping, after the drainage-period. Two patients (8%) received endoscopic treatment without suction drainage. The median recovery period of the anastomotic leakage was 47 days (2 - 156). Reoperation (VATS) to drain thoracic empyema was necessary in 12 patients (46%). Two patients (8%) died as a consequence of the anastomotic leakage.

**Conclusion:** Controlled suction drainage is an effective treatment in the majority of patients with anastomotic leakages after tMIE with IA. Although anastomotic leakages occur, failure to rescue the patient is low.

## Robot-assisted Ivor Lewis esophagectomies with hand sewn anastomosis: Short-term outcome

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**Objectives:** A few years ago, open esophagectomy was the preferred surgical approach in patients with esophageal cancer. In recent years, minimally invasive esophagectomy is becoming popular with less pulmonary complications and a shorter hospital stay. Nonetheless, thoracoscopically creating the intrathoracic anastomosis is very challenging. The use of a robot could help in this technical demanding part of the esophagectomy. The aim of this study was to evaluate the short-term outcome after robot-assisted esophagectomy with a hand sewn intrathoracic anastomosis (RAMIE Ivor Lewis) in patients with esophageal cancer.

**Methods:** All data were prospectively collected into a SPSS-database. Patients who were treated with curative intent for esophageal cancer with RAMIE Ivor Lewis, from January 2015 - March 2016, were included. The abdominal phase was performed laparoscopically and the thoracic phase was robot-assisted with a hand sewn anastomosis.

**Results:** In total, 36 patients received RAMIE Ivor Lewis, with a male-female ratio of 34:2 and a median age of 65 years (minimum - maximum: 36 - 83). Neoadjuvant chemoradiotherapy was given to 97% of the patients. Conversion to an open thoracic or abdominal procedure was not necessary. Median operation time was 360 minutes (minimum - maximum: 290 - 450) with a median blood loss of 100ml (minimum - maximum: 50 - 200). Median postoperative ICU stay was 2 days (minimum - maximum: 1 - 42) and median hospital stay was 11 days (minimum - maximum: 8 - 54). Cardiac complications were seen in 31% (mainly atrial fibrillation) and pneumonia was seen in 39%. One patient (3%) developed a chylothorax which was treated with dietary changes only. Twenty-three percent (8 patients) developed an anastomotic leakage of which 2 patients received a Video-Assisted Thoracoscopic Surgery (VATS). In hospital mortality was 0%. A radical resection was achieved in 94% with a median number of lymph nodes of 21 (minimum - maximum: 8 - 50).

**Conclusion:** Robot-assisted Ivor Lewis esophagectomy in patients with esophageal cancer is safe and effective in the short-term. A hand sewn robot-assisted anastomosis is a feasible option with a low postoperative mortality.

## Prevalence of impaired glucose regulation in patients presenting with an acute myocardial infarction

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**Background:** Blood glucose homeostasis represents a continuum which extends from euglycaemia to diabetes mellitus. Between the 2, is a pre-diabetic state of impaired glucose regulation. This encompasses both impaired glucose tolerance (IGT) and impaired fasting glucose (IFG). These entities, despite their association with adverse outcomes, are often undiagnosed and therefore unmanaged. The glycometabolic state at hospital admission in patients with acute myocardial infarction is a recognised predictor of morbidity and mortality. It is therefore paramount to adequately assess these individuals, in order to accurately diagnose not only unknown diabetes mellitus but also other, subtler forms of impaired glucose regulation, all of which are associated with adverse outcomes.

**Objective:** To determine the prevalence of newly diagnosed impaired glucose regulation, including diabetes mellitus, amongst patients with an acute myocardial infarction.

**Methods:** This was a single centre retrospective analysis of all patients admitted to the R.K. Khan Hospital Coronary Care Unit with an acute myocardial infarction (January 2006 - December 2011). Patients known to have diabetes mellitus were excluded, and in total 896 patients were enrolled. All patients had their glycaemic status assessed by means of a fasting plasma glucose (FPG), glycosylated haemoglobin (HbA1c) and an oral glucose tolerance test (OGTT). For each diagnostic test individuals were then classified as having: diabetes mellitus, impaired glucose regulation (IGT and or IFG) or euglycaemia.

**Results:** The majority of individuals had a normal FPG with only 21.32% having IFG and 14.84% diabetes. When utilising the OGTT, 33.48% were euglycaemic whilst 39.84% had IGT and 26.67% diabetes. Via the HbA1c, 47.66% had IGT, 31.58% diabetes and 20.76% euglycaemia.

**Conclusion:** The accuracy of assessing the glycaemic status following an acute myocardial infarct is improved by utilising the HbA1c and OGTT. These should become standard of care in the comprehensive risk stratification, in order to detect undiagnosed dysglycaemia.

## Minimally invasive cardiac surgery using lower hemisternotomy approach: Our initial experience with 51 cases

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**Introduction:** We describe our initial experience and short term follow up of minimally invasive direct access cardiac surgery in 51 cases using lower hemisternotomy approach.

**Material/methods:** Patients not included with morbid obesity, emergency or urgency in surgery, severe pulmonary arterial hypertension with dilated MPA and redo surgery. Primary median Lower hemisternotomy performed without any lateral extension. Slow and gradual opening a crucial step in preventing sternal fracture. Roberts's retractor used to pull the Aorta for cannulation. Straight high flow aortic cannula preferable. CPB established (aortic and bicaval) with routine instruments and cannula.

**Results:** Between January 2013 - December 2014, 51 patients (23 male and 28 female, age ranges: 15 - 62 years) with ASD (n=21) mitral valve (30), Mitral and aortic valve (1), tricuspid valve diseases (5) predominantly due to rheumatic heart disease have been operated on by this technique. Mitral valve replacement was done in all 30 valvular patients. One patient underwent DVR, 3 patients TV repair with Teflon ring annuloplasty, large LA clot removal in 2 patients and LA plication in 5 patients. There was no peri-operative mortality. Two patients required conversion to full sternotomy. Mean ACC time 27.5 minutes (18 - 45) and mean CPB time 45.7 minutes (35 - 65). Total drainage: 200ml (80 - 460). Average ICU and hospital stay was 1.3 and 5.5 days. Follow up of the remaining 49 patients' ranges from 12 months - 36 months (mean 18 months). No procedure related complication observed in this group of patients.

**Conclusion:** Minimally invasive surgery through lower hemi-sternotomy is safe, effective, and a cosmetically acceptable procedure which does not require extra financial burden as it can be done using routine instruments. The advantages are (1) central cannulation, (2) easy access to ventricle, (3) ease of extension if required, (4) cosmetically acceptable, (5) preserves manubrium and shoulder function, (6) prevents sternal dehiscence in case of infection. This procedure is easily reproducible with equal efficacy and safety in comparison with conventional techniques.

## Endoscopic management of tracheoesophageal fistula: A bridging treatment in the unfit patient

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**Objectives/introduction:** Tracheoesophageal fistulas (TOF) in adults can prove difficult to manage, with patients often in critical care and unfit for definitive corrective surgery. We discuss a 69-year-old gentleman with a TOF requiring endoscopic management, via an Amplatzer Septal Occluder (ASO) device. He was admitted to a district general hospital with a presumed community acquired pneumonia. Co-morbidities included schizophrenia, emphysema and chronic kidney disease. He also had severe Barrett's oesophagus with a stricture; treated using a stent, but then removed. Despite treatment with broad spectrum antibiotics he deteriorated, was intubated and transferred to ICU. Later, staff noticed "gurgling" from the endotracheal tube and a bronchoscopy revealed the TOF at the orifice of the left main bronchus.

**Methods:** Because of increasing ventilator and vasopressor support and renal replacement therapy, he was deemed unfit for oesophageal diversion. Endoscopic management using an ASO was performed, aiming to preserve the airway and control reflux. The procedure involved simultaneous bronchoscopy, oesophagoscopy and radiological guidance. A guidewire was passed from trachea to oesophagus, through the 10mm defect. A cardiologist assisted with the deployment of the Size 10 ASO.

**Results:** There were no immediate complications after deployment. In time, the patient's condition improved and ventilation weaned. He was fed via a naso-jejunal tube. On initial bronchoscopy the device encroached on the orifice of the left main bronchus but after 72 hours and full expansion the bronchus was widely patent. Oesophageal diversion will eventually be planned.

**Conclusions:** There are 5 reports in the literature, on the use of the Amplatzer device. It was originally used to close atrial septal defects with good results. Complications include stent migration; stressing the need for the larger disc on the oesophageal side, reduced airway diameter; enlargement of the fistula and mucostasis. Our experience using an ASO to treat TOF is in its infancy, it proved useful in bridging an otherwise unfit patient to definitive surgery.

## Tetralogy of Fallot with absent pulmonary valve syndrome: A 34-year African single centre experience

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**Introduction:** Tetralogy of Fallot (TOF) with absent pulmonary valve syndrome (APVS) is a rare congenital heart defect characterised by features of TOF with either rudimentary ridges, or complete absence of the pulmonary valve tissue. This is often associated with severe pulmonary regurgitation with massive dilatation of the proximal branch pulmonary arteries resulting in compression of the tracheobronchial tree. Hence, respiratory symptoms are a common presenting feature in this condition.

**Objectives:** To review an interesting case of TOF with APVS and to describe the characteristics of patients with this condition seen at Chris Hani Baragwanath Academic Hospital (CHBAH) over a 34-year period.

**Methods:** Cases of APVS were extracted from the paediatric cardiology database at CHBAH (1 January 1981 - 30 April 2016). Hospital records of these patients were retrieved and information extracted onto a standardised data collection form.

**Results:** A total of 15 patients with APVS, including the index case to be highlighted, were seen at CHBAH over the 34-year study period. APVS comprised 3% (15/514) of all TOF patients diagnosed over the study period. Of the 15 patients, 10 (67%) were male. Ten (67%) patients presented before 1 year of age. Ten (67%) patients had respiratory symptoms as their cause of presentation to hospital. Four (27%) patients were suspected to have DiGeorge syndrome of which 2 were confirmed on genetic studies. Fourteen (93%) patients were described to have the characteristic systolic and diastolic (to-and-fro) murmur at presentation. Only 5 (33%) patients were documented to have had surgical intervention.

**Conclusions:** APVS comprised 3% of all TOF patients and DiGeorge syndrome was suspected in 27% of patients in our setting, both in keeping with the literature. APVS should be strongly considered in children, younger than 1 year, presenting with respiratory symptoms and a characteristic to-and-fro murmur.

## Outcomes of isolated aortic valve replacements over a 10 year period at Groote Schuur Hospital

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**Objectives:** Our review seeks to assess the long term survival and clinical outcomes of all patients who underwent an isolated aortic valve replacement during a 10 year period at our institution.

**Methods:** A retrospective cohort analysis was conducted of 306 patients who underwent isolated aortic valve replacement (AVR) at Cape Town's Groote Schuur Hospital (2003 - 2013). The mean follow-up period was  $3.4 \pm 3.4$  years (median 2.5 years, range 0 - 12.1 years). The primary end points were survival and freedom from valve related morbidities (mechanical vs. bioprostheses).

**Results:** The underlying valvular pathology included rheumatic heart disease (39.5%,  $n=121$ ), calcific degenerative disease (35.6%,  $n=109$ ), congenital/bicuspid valves (8.2%,  $n=25$ ), endocarditis (13.1%,  $n=40$ ) and other (3.6%,  $n=11$ ). A mechanical prosthesis was selected in 64.4% ( $n=197$ ) and a bioprosthesis in 35.6% ( $n=109$ ) of patients. The mean age of patients receiving mechanical vs. bioprosthetic prostheses was  $44.9 \pm 12.7$  vs.  $67.9 \pm 9.4$  years respectively ( $p<0.0001$ ). The 30 day mortality of the entire cohort was 7.8% ( $n=24$ ). Freedom from valve related morbidities for the mechanical and bioprosthetic groups was  $94.5 \pm 1.8\%$ ,  $86.6 \pm 3.2\%$ ,  $81.0 \pm 4.4\%$ , and  $96.8 \pm 1.9\%$ ,  $92.3 \pm 3.7\%$ ,  $92.3 \pm 3.7\%$  ( $p=N.S.$ ); overall actuarial survival was  $89.7 \pm 2.4\%$ ,  $81.7 \pm 3.4\%$ ,  $64.3 \pm 7.0\%$ , and  $82.2 \pm 3.8\%$ ,  $69.1 \pm 5.4\%$ ,  $43.1 \pm 8.6\%$  ( $p=0.005$ ) and freedom from death and valve-related morbidity was  $86.3 \pm 2.7\%$ ,  $72.4 \pm 3.9\%$ ,  $53.5 \pm 6.7\%$  and  $79.2 \pm 4.1\%$ ,  $63.5 \pm 5.6\%$ ,  $39.6 \pm 8.1\%$  ( $p=0.058$ ) at 1, 5 and 10 years respectively.

**Conclusion:** Although a mechanical prosthesis is the preferred choice for the majority of patients in need of AVR at our institution, the incidence of valve related morbidities and suboptimal survival rates in these younger patients remains concerning. Therefore, continuous efforts in search of a better prosthesis for our context should be sought to alleviate the shortcomings of the current prosthesis.

## Evaluation of the prognostic value of intra-operative cerebral near-infrared spectroscopy in on-pump coronary artery bypass patients in central South Africa

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**Objectives:** Cerebral desaturation during on-pump coronary artery bypass grafting (CABG) is associated with adverse organ systemic outcomes. Considering the brain as an index organ, which reflects the adequacy of tissue perfusion/oxygenation of other vital organs, we evaluated the relationship between changes in intra-operative cerebral oxygenation ( $rSO_2$ ), blood lactate and postoperative outcomes.

**Methods:** We conducted a retrospective cohort study involving 302 adult on-pump CABG patients with data prospectively collected between June 2007 and July 2015 for the Acute Coronary Syndrome study project at Universitas Academic Hospital, South Africa. Intra-operative cerebral oximetry was monitored using an INVOS™ oximeter. Blood Lactate levels were assessed intra-operatively and at 4 time-points postoperatively (1, 2, 4 and 8 hours respectively). Comparisons were made between study group 1 ( $n=69$ ), patients with satisfactory cerebral oxygenation ( $rSO_2 \geq 50$  or  $<20\%$  drop from baseline), and group 2 ( $n=233$ ), those with significant cerebral desaturation ( $rSO_2 <50$  or  $\geq 20\%$  drop from baseline).

**Results:** Significant cerebral desaturation in group 2 patients was associated with a lactate response intra-operatively and at 1 hour postoperatively. Group 2 patients also developed significantly higher rates of overall complications (24.0% vs. 11.6%; RR 2.07, 95% CI 1.04 - 4.13;  $p=0.026$ ), major organ morbidity and mortality (15% vs. 2.9%; RR 5.18, 95% CI 1.28 - 21.00;  $p=0.011$ ), reoperation for bleeding (10.3% vs. 1.4%; RR 7.14, 95% CI 1.04 - 51.81;  $p=0.018$ ), and longer postoperative length of hospital stay ( $p=0.031$ ). Group 2 patients with complications experienced significantly longer median duration of cerebral desaturation compared to those without complications [49 minutes (IQR 20.0 - 102.0) vs. 15 minutes (IQR 8.0 - 42.0);  $p<0.0001$ ].

**Conclusion:** The study demonstrated that cerebral desaturation during on-pump CABG is associated with a lactate response and high incidence of postoperative complications.

## The role of Epac (exchange protein directly activated by cAMP) in obesity-induced cardiovascular dysfunction

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**Introduction:** The strong association between obesity and cardiovascular diseases stresses the necessity of elucidating the underlying molecular mechanisms linking these pathologies. Thus detailed knowledge of intracellular events is required to develop therapeutic regimes aimed to protect the vasculature. One such candidate mechanism is a novel sensor for cAMP namely Epac (exchange protein directly activated by cAMP). Our aim was to evaluate the role of Epac in the vasculature of an obesity-induced rat model.

**Methods:** Wistar rats on a high fat diet (HFD, supplementing normal rat chow with condensed milk and Holsum fat) for 16 weeks were compared to age-matched controls. Thoracic aortas from euthanised rats were excised, cleaned and incubated with Krebs buffer at  $37^\circ\text{C}$ . Aortic ring function was evaluated by precontraction with cumulative phenylephrine (PE: 100nM-1  $\mu\text{M}$ ), followed by cumulative acetylcholine (ACh)-induced relaxation (30nM-10  $\mu\text{M}$ ). Aortas were preincubated for 15 minutes with beta-adrenergic agonist, isoproterenol (ISO, 0.1  $\mu\text{M}$ ) or Epac selective-agonist, 8-pCPT-2'-O-Me-cAMP (CPT, 2  $\mu\text{M}$ ) or novel Epac inhibitor, ESI-09 (5  $\mu\text{M}$ ), respectively. Data was analysed using two-way ANOVA with Bonferroni's post test.

**Results:** Intra-peritoneal (IP) fat was significantly increased in HFD animals compared to control (IP/body weight ratio: HFD:  $5.45 \pm 0.2$  vs. Control:  $4.09 \pm 0.2$ ,  $p<0.001$ ). No differences were observed in the PE-induced vasoconstriction between HFD and control groups. ISO significantly decreased maximal vasoconstrictor ( $E_{\text{max}}$ ) response of aorta to phenylephrine in HFD ( $E_{\text{max}}$ : HFD+ISO:  $75.9 \pm 8.6\%$  vs. HFD:  $86.3 \pm 11.5\%$ ,  $p<0.05$ ). This effect



was abolished by ESI (HFD+ISO+ESI:85.6  $\pm$  12.7%). Moreover, CPT significantly decreased vasoconstriction in HFD (HFD+CPT:69.0  $\pm$  7.1 vs. HFD,  $p<0.05$ ). The maximal vasorelaxant (Rmax) effect of ACh in HFD was significantly reduced compared to control (Rmax: HFD:75.0  $\pm$  5.5% vs. Control: 89.3  $\pm$  3.9%,  $p<0.05$ ). ISO significantly enhanced relaxation in HFD (HFD+ISO:93.4  $\pm$  5.2% vs. HFD,  $p<0.05$ ) which was reduced by ESI (HFD+ISO+ESI: 88.6  $\pm$  4.7%). Furthermore, CPT significantly improved vasorelaxation in HFD (HFD+CPT:98.1  $\pm$  3.3% vs. HFD,  $p<0.05$ ).

**Conclusion:** Agonist-induced Epac activation was anti-contractile and pro-relaxant in diet-induced obese vasculature, which suggests that this signalling pathway has therapeutic potential.

## Cardioplegia infused indexed rate, a new tool to minimise the myocardial stunning after aortic clamping

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**Objectives:** To explore the relationship between the volume of cardioplegia, ischaemia time, left ventricular mass indexed by body surface with the emergence of myocardial stunning, measured by the emergence of low cardiac output syndrome (LCOS) in patients undergoing coronary artery bypass graft (CABG) with cardiopulmonary bypass (CPB).

**Methods:** The main independent study variable was cardioplegia indexed infused rate (CIIR), this rate is the sum of the cardioplegia infused per time unit of ischaemia and left ventricular mass index by body surface unit. All patients received blood cardioplegia. Regression and correlation between the rate of cardioplegia, the accumulated dose of inotropes and biomarkers of myocardial damage were made. The point of optimum cutting of such rate in the ROC curve for the non-appearance of postoperative low output was calculated.

**Results:** Three-hundred-and-sixty-two analysed patients, 280 (77.3%) males, 68  $\pm$  9 years, logistic Euroscore 9.2  $\pm$  12.5, 225 (62.2%) elective surgeries, 127 (35.1%) urgent surgery, 10 (2.8%) surgery of emergency, 68  $\pm$  39 minutes ischaemia time and CPB 114  $\pm$  78 minutes. Nine (2.5%) patients were in critical situation preoperative. Postoperative LCOS 116 (32%) was present. The CIIR showed an area under the ROC curve of 0.77 (95% CI: 0.70 - 0.83),  $p<0.001$ , for the non-appearance of postoperative low cardiac output, being the point of optimum cutting 23.6ml/min/ every 100g/m<sup>2</sup> of left ventricle (LV), with a sensitivity of 78%, a specificity of 71%, a predictive value positive 83%, a negative predictive value of 64%, positive likelihood ratio 2.7 and negative likelihood ratio 3.27. For the calculation of the LV mass we used the Devereaux formula, considering the size of the ventricular septum, the back wall of the LV and diastolic LV diameter.

**Conclusions:** Ischaemia/reperfusion phenomena in CABG surgery undergoing CPB, perhaps for an incorrect cardio protection, contribute to myocardial stunning and for this reason, to LCOS in the postoperative period. Optimisation of the cardioplegia infused indexed rate (CIIR) may contribute to its prevention. The optimum cardioplegia volume must be bigger than 23.6ml/min/ every 100g/m<sup>2</sup> of LV.

## Effective aortic orifice is not the main cause for left ventricular mass regression after aortic valve replacement for aortic stenosis

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**Objectives:** Many papers on the outcome of aortic valve replacement (AVR) argue that the regression of the mass of the left ventricle (LVMR) is related to the degree of mismatch patient/prosthesis (PPM). We present our experience in a referral hospital for one million people.

**Methods:** A cohort study retrospective of 56 patients operated (2009 - 2010) for aortic stenosis (AVR), who has been able to perform full tracked, including echocardiography 15.91 days (echo1), 84.39 days (eco2) and 139.32 days (eco3). For homogeneity purposes of the implanted prosthesis, has been used effective aortic orifice (EAO) standardised for each model for every size. Analysed with the statistical package SPSS 18, including the correlation of Pearson, Chi-square and Kolmogorov-Smirnov tests with Tukey hinges; T, Friedman and Wilcoxon tests. For the calculation of the LVMR Devereaux's formula was used considering the size of the ventricular septum, the back wall of the left ventricle (LV) and diastolic LV diameter.

**RESULTS:** The LVMR/m<sup>2</sup> preoperatively was 158.58gm; becoming 134.09 in eco1, 117.84 in eco2 and 111.32 in eco3. There is no relationship between the LVMR regression and age, sex, BMI, body surface, EUROSCORE, preoperative haemoglobin, the preoperative or postoperative area or aortic gradients. The EAO/m<sup>2</sup>, becomes preoperatively 0.55 - 1.10 in eco3.

**CONCLUSIONS:** The retrogression of the mass of the left ventricle (LVMR) post replacement valvular aortic (AVR) is precocious and progressive and independent from the type of prosthesis and from its normalised size, as well as from other preoperative parameters.

## Q Fever endocarditis surgery: A single centre study

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**Objectives:** Q fever (QF), caused by *Coxiella Burnetti* (CB), has an incidence in the Canary Islands of 5 cases/100 000 inhabitants. Infective Endocarditis (IE) in the QF is an uncommon complication in that disease (seating on aortic bicuspid valves or prosthetic valves usually). We reviewed our experience of the last 10 years in a surgical reference centre serving 1 million people.

**Methods:** From 2007 - 2015 we operated 4 IE due to QF. All males, aged 43, 51, 60 and 72. Three of them, were on valve bicuspid aortic valve - BAV - (in 1 also on the mitral with ascending aorta and femoral artery pseudo aneurysms). The 72-year-old presented it on mitral prosthesis (MP) for 14 years. All received antibiotic doxycycline with hydroxychloroquine, except 1, in which the latter was replaced by levofloxacin for hepatotoxicity.

**Results:** In 3 cases (2 BAV and the MP) large warts existed. There was annular and ventricular septal abscess in a BAV. This case needed surgery 4 times in a year, but prolonged antibiotic therapy at discharge was not well followed, in all cases the IgG for CB was positive and the C-reactive protein (CRP) of histological material was positive to CB. All values were high. The patient operated for a pseudo aneurysm re-presented with tamponade.

**Conclusions:** In endemic areas of CB, this etiology must be sought in all cases of IE, especially in BAV and prosthetic valves. They can be operated with good results. We must take care in aortitis or pseudo aneurysm associated. Antibiotic therapy should be followed for a very long time after discharge.

## HeartMate 3 left ventricular assist device implantation: Astana experience

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**Objectives:** Astana Centre established a mechanical circulatory support programme in our country in 2011 performing 45 - 50 VAD (ventricular assist devices) implants per year. Our centre was 1 of the enrolling centres in the HeartMate 3 CE Mark Study. Post-approval use of HeartMate 3 started in January 2015. The objective of this study was to determine outcomes of patients with pre- and post-approval HeartMate 3 assist device.

**Methods:** The total number of cases with the HeartMate 3 assist devices was 39 patients (8 patients were within the CE Mark Study and 31 patients - in the HeartMate 3 post-approval period). Most of them (97%) were male. Mean age was  $49.1 \pm 14.2$  years old. The median duration of support is 251 days. Maximum duration of support is 567 days (patient remains ongoing).

**Results:** The patients were a mix of BTT (69%) and DT (31%) patients. Patients were in INTERMACS profiles 3 - 4 in most of the cases ( $n=38$ , 97%). Currently, 31 patients are continuing with HeartMate 3 support, 5 transplanted (days 50, 75, 231, 314 and 501) and 2 expired (day 12, due to multi-organ failure and day 48, at home). One patient was explanted on post implant day 233 due to outflow-graft thrombosis secondary to infection, placed on ECMO. Actual 30 day survival is 97%. Estimated 6 month survival is 95%. Four patients (10%) experienced bleeding requiring surgery, arrhythmia was observed in 7 patients (18%), driveline infections - in 3 patients (7.7%), sepsis - in 1 patient (2.6%). Right ventricular assist device support in 1 case (2.6%). There have been no strokes, haemolysis or pump thrombosis in the patients.

**Conclusions:** Overall experience with the HeartMate 3 has been positive with high rates of survival. We did not observe strokes, haemolysis or pump thrombosis. Long-term patient follow-up is necessary to confirm these preliminary findings.

## An epidemic of infective endocarditis

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**Introduction/objectives:** Infective endocarditis (IE) secondary to intravenous drug abuse (IVDA) is rare in the African population. We have recently described 3 cases of IE secondary to IV Nyaope (variable mixture of heroin, cannabis, antiretrovirals, metamphetamines) use. Since then we have encountered an additional 47 cases and have systematically documented their clinical and echocardiographic findings.

**Methods:** Patients presenting with IE due to IVDA at Chris Hani Baragwanath Academic Hospital (2014 - 2016) were included in this prospective case series. All underwent echocardiography and additional investigations, as deemed necessary by the treating physician.

**Results:** Mean age was 23 years (48 males). Majority presented with dyspnea (88%), symptoms of withdrawal (30%), peripheral suppurative infection (22%) and right ventricular (RV) failure (14%). Most were HIV reactive (88%) and not on ARVs. Five patients had a CD4 count  $\leq 200$  cells/ $\mu$ l. Renal failure requiring dialysis was present in 2 patients. Four patients had evidence of prior Hepatitis B infection and Hepatitis C antibodies were detected in 58%. *Staphylococcus aureus* was cultured in 68%. *Pseudomonas aeruginosa* in 1 patient and *enterococcus faecalis* in 3 patients. Polymicrobial infection was found in 6 patients. Sterile blood cultures were present in 8 patients. Tricuspid valve endocarditis was present in the majority (88%). Mean vegetation size was 14mm and 34% had pulmonary hypertension and RV dysfunction. Septic pulmonary emboli were documented in 40% of patients. All were treated with antimicrobials and only 4 patients underwent surgery. Three patients died secondary to respiratory failure.

**Conclusion:** IE secondary to IVDA among young black South Africans is responsible for morbidity and mortality in this group. A high degree of suspicion must be maintained in order to make an early diagnosis and initiate treatment.

## Assessment of fibrosis by late gadolinium enhancement imaging and biomarkers of collagen metabolism in chronic rheumatic mitral regurgitation

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**Introduction/objectives:** Fibrosis on late gadolinium enhancement (LGE) cardiac magnetic resonance imaging (CMR) is prognostic in various cardiovascular disease states. There are limited studies which have explored the prevalence of myocardial fibrosis on LGE cardiac MRI and collagen biomarker patterns in rheumatic MR. Therefore, we sought to study the presence of fibrosis by LGE CMR and biomarkers of collagen turnover in CRMR.

**Methods:** Twenty-two patients, with isolated moderate or severe CRMR, underwent echocardiography and CMR with LGE on the same day. Blood for serum procollagen I carboxyterminal propeptide (PICP), N-terminal propeptide of Type III procollagen (PIIINP), matrix metalloproteinase-I (MMP-I) and tissue inhibitor of metalloproteinase-I (TIMP-I) were drawn at the time of echocardiography.

**Results:** The mean age was  $36.3 \pm 13.9$  years with 81% females. Four patients had fibrosis on LGE CMR. Serum PICP and PIIINP were similar to controls, except for MMP-I, which was increased compared to controls ( $\log$  MMP-I  $3.5 \pm 0.68$  vs.  $2.7 \pm 0.9$ ,  $p=0.02$ ). There was increased MMP-I activity, as the MMP-I to TIMP-I ratio, was higher in CRMR compared to controls ( $-1.2 \pm 0.6$  vs.  $-2.1 \pm 0.89$ ,  $p=0.002$ ). No correlation was noted between collagen biomarkers and CMR parameters ( $p>0.05$ ).

**Conclusion:** LV myocardial fibrosis in CRMR is rare. CRMR is a state characterised by predominance of collagen degradation, rather than synthesis. This finding may have implications in terms of therapy in CRMR.

## Atrioventricular function assessment in chronic rheumatic mitral regurgitation: Looking beyond the left ventricle

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**Introduction/objectives:** Severity of mitral regurgitation (MR) and indications for surgery have classically been based upon the impact on left ventricular (LV) function. We hypothesised that changes in left atrial (LA) mechanics may precede LV dysfunction and therefore serve as a more sensitive marker of the severity of MR and the need for surgical intervention.

**Methods:** The study comprised 77 patients with isolated moderate, or severe, MR and 40 controls. All underwent transthoracic echocardiography on a Philips iE33 system. Standard LA and LV measurements were performed, according to American Society of Echocardiography guidelines. LA function was assessed in the reservoir, conduit and contractile phases with conventional echocardiography and 2D strain imaging (QLAB 9 speckle tracking software).

**Results:** The mean age was  $44 \pm 13.6$  and 83% were females. LA static volumes were higher in MR, compared to controls ( $p<0.05$ ). LA stiffness index was greater in MR than controls ( $0.95 \pm 1.89$  vs.  $0.16 \pm 0.13$ ,  $p=0.009$ ). LA dysfunction was noted predominantly in the reservoir and contractile phases, compared to controls ( $p<0.05$ ). Conduit function parameters, except left atrial passive emptying fraction, were still preserved when compared to controls ( $p<0.05$ ). LA peak left atrial strain in the reservoir phase ( $\epsilon_R$ ), LA peak strain in the contractile phase ( $\epsilon_{CT}$ ) and LV peak systolic strain (PSS) were decreased in CRMR compared to controls ( $p<0.05$ ). Eighty-six percent of the patients had decreased LA  $\epsilon_R$  and 58% had depressed LV PSS. Decreased  $\epsilon_R$  and normal LV PSS was noted in 42%. Thirteen percent had normal  $\epsilon_R$  and LV PSS. Only 1 patient had normal  $\epsilon_R$  with decreased LV PSS. On multivariate linear regression analysis, the main determinants of LA  $\epsilon_R$  were age, LV PSS and LA volume indexed ( $p<0.001$ ).

**Conclusion:** In chronic moderate to severe MR, LA dysfunction predominates in the reservoir and contractile phases. LA dysfunction precedes LV dysfunction and may therefore be a better marker of the need for surgical intervention.

## Is there a role for combination anti-remodelling therapy for heart failure, secondary to chronic rheumatic mitral regurgitation?

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**Introduction and objectives:** No study has looked at the value of combination anti-remodelling therapy in heart failure (HF) secondary to MR. We thus studied the effect of anti-remodelling therapy in terms of clinical outcome, and echocardiographic parameters in patients with severe chronic rheumatic mitral regurgitation (CRMR) who presented in HF.

**Methods:** Thirty-one patients (29 females) treated with combination therapy for HF at Chris Hani Baragwanath Hospital secondary to CRMR with ejection fraction  $<60\%$  and NYHA II-III were followed prospectively over a 6 month observational period.

**Results:** The mean age was  $50.7 \pm 8.5$  years. There was no change in clinical symptoms and functional status, as assessed by 6 minute walk test and Minnesota HF questionnaire at baseline and 6 months of maximal therapy [ $265.5 \pm 103.0$  metres vs.  $275.4 \pm 71$  meters,  $p=0.6$ ;  $34$  (18 - 61) vs.  $32.5$  (13 - 48),  $p=0.3$ ]. None of the patients died or were hospitalised for HF during the study period. Left and right ventricular structural and functional indices remained static ( $p>0.05$ ). There was no difference in right (RA) and left atrial (LA) volumes before and after maximal therapy [RA -  $26.5$

(21.7 - 32) mL/m<sup>2</sup> vs. 24.7 (7.4 - 33.8) mL/m<sup>2</sup> (p=0.6); LA - 60.2 (47.1 - 89.4) mL/m<sup>2</sup> vs. 59.5 (44.2 - 82.4) mL/m<sup>2</sup> (p=0.8)]. Right (RV) and left ventricular (LV) strain did not show a significant change on treatment [-15.6 ± 5.0% vs. -16.4 ± 5.9% (p=0.56); -13.9 ± 4.3% vs. -15 ± 4.0% (p=0.28)]. However, the peak LA systolic strain improved at 6 months (18.7 ± 7.7% vs. 23.6 ± 8.5%, p=0.02). Furthermore, no difference in CRMR severity was noted at the end of therapy.

**Conclusion:** This study demonstrates that there may be a role of combination anti-remodelling therapy in HF secondary to CRMR. It minimally serves to stabilise the disease process with no HF-related admissions or deaths. Further, larger studies, with longer follow-up periods, are needed to confirm the aforementioned findings.

## Unmasking right ventricular dysfunction in chronic rheumatic mitral regurgitation

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**Introduction and objectives:** In chronic rheumatic mitral regurgitation (CRMR) right ventricular (RV) function may be influenced by, amongst others, left atrial and left ventricular (LV) mechanics, neuro-hormonal abnormalities, and pulmonary hypertension. No studies have documented RV dysfunction, on conventional or speckle tracking echocardiography (STE), in CRMR. We utilised RV peak systolic strain (PSS) to assess RV function in patients with CRMR, compared STE with traditional RV systolic function indices, and determined predictors of RV PSS.

**Methods:** We prospectively enrolled 77 patients with moderate or severe CRMR. All underwent transthoracic echocardiography using a Philips iE33 system. RV PSS and LV PSS were measured offline using QLAB 9 speckle tracking software (Philips).

**Results:** The mean age was 44 ± 13.6 years with 83% females. No difference was noted in tricuspid annular plane systolic excursion and RV S' in patients with CRMR and controls (2.1 ± 0.4cm vs. 2.2 ± 0.3cm, p=0.78; 13.2 ± 11.8cm/s vs. 11.6 ± 2.0cm/s, p=0.39). There was no difference in RV systolic function between patients with moderate MR or severe MR [RV S' 11.6 (9.9 - 14.6) cm/s vs. 11.4 (9.4 - 13.4) cm/s, p=0.29]. The RV PSS was lower in CRMR patients compared to controls (-16.8 ± 4.5% vs. -19.2 ± 3.4%, p=0.003). Severe MR predicted greater reduction in RV PSS compared to moderate MR (-14.3 ± 4.23% vs. -18 ± 4.18%, p<0.0001). Patients with LV systolic dysfunction had a greater decline in RV PSS and LV PSS, and higher pulmonary artery systolic pressures, compared to those with preserved LV systolic function (p=0.001 and p<0.02). However, no difference in conventional RV systolic function parameters was noted between those with preserved or impaired LV systolic function (p>0.05). On multivariate linear regression analysis, after adjusting for covariates, LV PSS was an independent predictor of RV PSS (p=0.01).

**Conclusion:** In CRMR, RV PSS is a sensitive marker of subclinical RV systolic dysfunction and, in addition to LV systolic function, may be important in timing surgical intervention.

## Is current real world outcomes of aortic valve surgery in accordance with EuroSCORE II? Results from a novel, prospective, multi-centre cohort of patients with prevalence of rheumatic heart disease

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**Objective:** The aim of this study was to evaluate the current outcomes of Aortic Valve Surgery (AVS) in patients with low, intermediate, and high-risk, according to the EuroSCORE II stratification, where there is prevalence of RHD.

**Methods:** Between November 2013 and October 2015, 600 consecutive patients who underwent AVS were included in the study, from the Cardiac Surgery Registry for the State of São Paulo, Brazil (REPLICCAR). Patients were risk-stratified by EuroSCORE II as low-risk (<5, group 1), medium-risk (5 - 10, group 2) and high risk (>10, group 3). The majority of patients were considered at low risk (89%) and only 3.6% were classified as being at high risk. Calibration of the EuroSCORE II was assessed by comparing predicted and observed in-hospital mortality together with the Hosmer-Lemeshow chi-square test. Discrimination performance of the model was evaluated with the receiver operating characteristic (ROC) curve analysis.

**Results:** The mean age of patients was 60 years in group 1, 66 in group 2, and 67 in group 3 (p<0.001). The median EuroSCORE II for the entire population was 2.72% ± 4.83; 1.67% ± 1.07 in group 1, 7.01% ± 1.49 in group 2, and 20.35 ± 15.65 in group 3 (p<0.0001). Compared with EuroSCORE II, in-hospital mean mortality was close to expected in all patients (4.7% vs. 4.7%) but when analysed within risk groups, it was lower in group 1 (1.7% vs. 3.4%), slightly lower in group 2 (7% vs. 7.1%), and lower in group 3 (20.4% vs. 32%) (p<0.0001). Hosmer-Lemeshow results were p=0.37 (χ<sup>2</sup> = 8.7004, DF: 8) and the AUC for the ROC curve was 0.77 (CI 95%, 0.667 - 0.873, p<0.001).

**Conclusions:** In a contemporary cohort of patients submitted to AVS, the EuroSCORE II had an adequate discriminatory and calibration validation. These findings can assist us in the decision making process regarding different available therapies for aortic valve disease, in populations with a prevalence of RHD.

## Outcomes of patients with severe ventricular dysfunction undergoing incomplete vs. complete myocardial revascularisation surgery: Can less be more?

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**Rational:** Available evidence in the literature points to the importance of performing a complete myocardial revascularisation (CR) in patients with ischaemic cardiomyopathy. However, in a specific subgroup of high risk patients, with severe ventricular dysfunction (EF <30%), the question of prioritising a shorter surgical procedure was raised.

**Objective:** Assess the impact of incomplete revascularisation (IR) in patients with severe ventricular dysfunction (SVD).

**Materials/methods:** We analysed data from a prospective and multi centre statewide database including 2 276 consecutive patients submitted to CABG (November 2013 - July 2015). Of these, 62 had SVD. The definition of CR followed 2 014 ESC Guidelines on Myocardial Revascularisation. Primary endpoints were occurrence of MACE in 30 days, with up to 2 year follow-up, where patients received a telephone call and were asked to answer a structured and objective questionnaire.

**Results:** Six patients died before discharge, 3 (8.3%) in the CR group and 3 (13.6%) in the IR,  $p=0.664$ . There were no statistical differences between Euroscore II,  $p=0.417$ ; number of compromised vessels,  $p=0.182$ ; CPB time,  $p=0.086$ ; morbi-mortality within 30 days,  $p=0.594$ , and follow-up,  $p=0.781$ . Likewise, there was no difference regarding recurrence of Angina,  $p=0.145$ ; Re-intervention,  $p=0.526$ ; and Acute Myocardial Infarction,  $p=0.388$ . However, a significantly greater number of patients who received IR presented with dyspnoea ( $p=0.027$ ) upon follow-up. There was a greater number of anastomoses in the CR group,  $p=0.003$ , and patients in the IR group received grafts to the LAD in 100%, Cx territory 79%, and RC 76%.

**Conclusion:** Patients with SVD submitted to IR presented with greater dyspnoea upon follow-up. A CR did not increase complications within 30 days. However, other studies correlating improvement of dyspnoea with probable improvement of ventricular dysfunction after CR are necessary.

## Peri-operative assessment of mortality in low-risk patients undergoing cardiac surgery: Where did we go wrong?

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**Objective:** To assess in which phase of peri-operative healthcare the sentinel event (SE) occurred in which resulted in the death of low-risk patients who underwent open heart surgery.

**Materials/methods:** Retrospective analysis of a prospective database with 4 640 patients. All deaths in low risk patients (Euroscore II  $\leq 2$ ) were selected and their data scrutinised regarding preoperative phase (POP), intraoperative phase (IOP), intensive care unit (ICU) and infirmary (IF) phase. The classification of a potentially avoidable death and the origin of the SE were performed according to the POCAS (Phase of Care Mortality Analysis). Deaths classified as inevitable were excluded from the study.

**Results:** A total of 2 954 patients were considered low-risk, where 42 (1.4%) deaths occurred, and of these 37 (88%) were considered avoidable. The SE originated in the POP in 17 patients (46%), IOP in 10 (27%), ICU in 9 (24%) and IF in 1 (3%). Twenty deaths (54%) occurred after CABG surgery, 5 (13.5%) after aortic valve surgery, 4 (10.8%) after combined CABG + Valve surgeries, 4 (10.8%) after multiple valve surgeries and 4 (10.8%) after mitral valve surgery.

**Conclusion:** There is a significantly greater number of SEs occurring in the POP and less in the IF. Nearly 3/4 of all deaths cannot be avoided by the surgical staff. A thorough multidisciplinary peri-operative assessment of the patient could provide a good opportunity to improve results in cardiac surgery.

## Validation of Papworth bleeding risk score in predicting re-exploration for bleeding after cardiac surgery: Impact on red blood cells transfusion and mortality

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**Objective:** Validation of Papworth Bleeding Risk Score (PBRs) in predicting re-exploration for bleeding (RB) in patients undergoing coronary and/or valve surgery.

**Methods:** Cross-sectional observational study on the São Paulo State Cardiovascular Surgery Registry (REPLICCAR). A total of 4 156 patients, operated between November 2013 - October 2015, were analysed. The PBRs was calculated for each one and had its effect predicting RB evaluated. Model discrimination was calculated by measuring the area under the ROC-curve and the calibration done by the Hosmer-Lemeshow (H-L) test. Data was analysed up to 30 days after surgery.

**Results:** One-hundred-and-eight patients (2.6%) were RB. Although there was no difference between the re-exploration group vs. non re-exploration group ( $p=0.104$ ), the re-exploration group was more likely to receive over 2 red blood cell units ( $p=0.0003$ ). RB was associated with mortality ( $p<0.0001$ ). H-L test demonstrated adequate calibration between observed RB/predicted RB in the groups established by the model. ROC-curve for individual prediction was 0.624 ( $p<0.001$ ).

**Conclusion:** The PBRs proved to be a simple and adequate instrument for the stratification of patients at risk for RB after cardiac surgery. We recommend the application of the PBRs, as an auxiliary tool, in identifying groups with higher RB risk and the adoption of strategies aiming at reducing multiple transfusion, re-exploration and mortality.

## Cadaveric training for cardio-vascular and thoracic surgical procedures: Ivorian experience (West-Africa)

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**Objective:** To perform main cardio-vascular and general thoracic surgical techniques on human cadavers.

**Material/methods:** From June 2013 - July 2015, we performed 148 surgical procedures on human cadavers, obtained according to the Ivorian law. Cadavers were preserved in formaldehyde 10% and cryopreservation. There were 48 specimens (31 males and 17 females), 30 children and 18 adults. The modes of death were unknown.

**Results:** We performed 61 cardiac surgical operations via sternotomy ( $n=31$ ), or postero-lateral thoracotomy ( $n=12$ ): atrial and ventricular septal defects repair ( $n=16$ ), 4 pulmonary artery banding, patent arterial ductus closure ( $n=12$ ), 7 Brock operations and 9 pulmonary or aortic stenosis repairs; 13 acquired valve diseases corrections including 10 mitral and aortic valvulectomies, 3 mitral and tricuspid valve repairs. For Vascular Surgery, we performed 3 cervicotomies, 2 laparotomies and 4 incisions in the Scarpa area to perform 14 carotid and femoral arterials' controls and repairs, and 5 aortic repairs. For General Thoracic Surgery, we performed 8 lung resections, 2 diaphragmatic repairs through 4 postero-lateral thoracotomies and 2 tracheotomies.

**Conclusion:** Training on cadavers for cardio-vascular and thoracic surgical procedures can be an important means of strengthening the skills of young surgeons.

## An unusual case of middle aortic syndrome

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Middle aortic syndrome (MAS) is a rare condition that may be congenital or acquired, affecting the abdominal aorta in children and young adults. It is characterised by a narrowing of the distal thoracic and/or abdominal aorta and its branches. It is also referred to as "Abdominal aortic coarctation". The disorder usually presents as uncontrolled hypertension and intermittent claudication of the lower limbs. Abdominal angina is a less frequent, but well documented symptom. Radiologically, mid aortic syndrome is characterised by severe constriction of the abdominal aorta and its branches. Large collateral channels may be evident on digital subtraction angiography, notably the Arcade of Riolo, or Marginal artery of Drummond. A typical finding is the pseudo cauda equina sign. Most of these patients usually die before the age of 50 due to the complications of severe, untreated hypertension. Surgical treatment is challenging and requires careful assessment and planning. We present an unusual case of middle aortic syndrome in an asymptomatic 55-year-old gentleman diagnosed at Mater Dei Hospital's Cardiothoracic Unit, Malta.



## Application of intra-operatively prepared autologous bio-regenerative fibrin sealant improves postoperative haemostasis in elective coronary artery bypass surgery and reduces the rate of allogeneic blood transfusion

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**Background:** It has been proven that transfusion of allogeneic blood products, during coronary artery bypass surgery, leads to poorer patient outcomes. This kind of procedure still carries a significant risk of postoperative haemorrhage, redo surgery and wound healing disturbances. None of the commercial sealants proved to be efficient and their use carries a significant risk of inflammatory reactions. Our study investigated the feasibility of reducing allogeneic blood transfusion rates by applying an autologous, anti-microbial bio-regenerative fibrin sealant from the patient's own blood during elective coronary artery bypass surgery.

**Methods:** We performed a prospective and consecutively executed study in 72 patients undergoing CABG procedures. In treatment group patients (n=31), a strict blood management application protocol was employed using a novel bio-regenerative fibrin system.

In control patients (n=41) no sealant application protocol was used.

**Results:** Patient groups were not significantly different. No safety issues were identified during the preparation process and the application procedure. Postoperative chest tube drainage was significantly lower in the treatment group when compared to the control group. In the treatment group, 2 of 31 patients (7%) required an allogeneic blood transfusion, and in the control group 17 of 41 patients (40%) required an allogeneic blood transfusion. Red blood cell transfusion was significantly reduced in treated patients when compared to control patients, respectively,  $p < 0.001$ . The discharge haemoglobin content was not statistically different for both patient groups.

**Conclusions:** Concentrated autologous fibrin sealant and bio-regenerative fibrin sealant can be safely prepared without any risks for patients. The procedure had no effect on total surgical time and the system revealed no adverse effects and demonstrated to be a useful adjunct to improve postoperative haemostasis following CABG surgery, resulting in significantly less allogeneic blood transfusions.

## Occurrence of high levels of D-dimers in antiretroviral therapy naïve HIV+ patients

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**Introduction:** HIV+ patients have a relatively high prevalence of cardiovascular diseases and thromboembolic complications, both with serious implications in the quality of life of patients and their prognosis. As health services for HIV expand in Mozambique, so does the need for diagnostic tests that are essential in identifying patients at risk of cardiovascular events. This study seeks to determine the occurrence of d-dimers in newly diagnosed HIV patients in a low-income setting.

**Population/methods:** We studied consecutive HIV+ patients recently diagnosed and without antiretroviral therapy who came for initiation of therapy at a peri-urban hospital in Maputo city. We collected data on age, gender, body mass index, CD4 count. Full cardiac evaluation was performed including clinical examination, electrocardiogram and abbreviated transthoracic cardiac ultrasound. Rapid tests were used to assess the blood levels of troponin I and d-dimers. Informed consent was obtained from all participants.

**Results/discussion:** We evaluated 70 patients; 42 (60%) women, all black. The mean age was 37.4 years and mean BMI was 23.5. The mean CD4 count was 509.7 (range 28 - 2107); 60% had CD4 counts below 350. High blood pressure was present in 10 (14%) patients. The mean value of D-dimers levels was 740.8 (SD); only 10 patients had levels below 250. High levels of Troponin I were found in 3 patients (4%); Troponin  $< 0.05$  was found in only 10 patients. Linear regression showed correlation between absolute D-dimers values and age ( $p < 0.0045$ ) and CD4 ( $p < 0.000048$ ).

**Conclusions:** High levels of d-dimers were found in ART naïve patients. The significance of these markers of thrombotic tendency in HIV+ patients needs to be understood so that screening tests and protective drugs can be used to alter their cardiovascular prognosis.

## Point-of-care abbreviated ultrasound by residents as a useful tool to assess heart failure: Changing the paradigm for training medical doctors in Africa

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**Introduction:** The pattern of heart failure (HF) in sub-Saharan Africa is unique. Ultrasound performed by nurses has been introduced in some teaching hospitals in Mozambique as part of the strategy to reduce maternal mortality. We designed a study to assess the feasibility of training residents in focused point-of-care ultrasound (POCUS) for management of HF.

**Methods:** Residents of the Internal Medicine Department (IMD) were taught to perform thoraco-abdominal POCUS using bidimensional and M-mode and following a standard protocol for image acquisition. The training activity included lectures, hands-on tutorial sessions, supervised one-to-one training

sessions, and self-training phase with distance monitoring by tutors, using e-resources. Patients involved were those on the IMD waiting for a scheduled specialist ultrasound. Tutors were 2 emergency care specialists and 1 cardiologist. Of the initial 40 residents, 12 met criteria for admission to hands-on supervised tutorials, and of these 4 advanced to e-supervised phase.

**Results and discussion:** The 4 residents performed 96 ultrasounds on 41 patients; 5 POCUS were excluded (no readable images recorded). The mean age of patients was 44.7 years (SD 20.8); 22 females. The percentage of cardiac scans correctly performed was 83.6%; all patients had multiple components of the cardiac scan performed; the less commonly performed being assessment of valves. Presence of global wall motion abnormality, or pericardial effusion, were more often correct. An additional request for evaluation by other specialist was requested for 10 exams.

**Conclusions:** Training of residents on POCUS for Heart Failure using tailored management algorithms is feasible and may be a useful adjunct to physical examination in settings with difficult access to specialists and limited availability of ultrasound machines. Training programmes, involving e-health tools, may allow non specialists to perform these exams and send them for review, improving quality of care in peripheral areas and fostering research into locally relevant cardiovascular conditions.

## Underlying rheumatic disease: An important determinant of outcome in tricuspid valve repair

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**Background:** Tricuspid regurgitation, accompanying severe left-sided valve disease, occurs on a functional basis, secondary to pulmonary hypertension and tricuspid annular dilatation. In the context of endemic left-sided rheumatic heart disease, non-recognition of organic disease of the tricuspid valve may adversely influence surgical decision-making, resulting in suboptimal outcomes.

**Materials/methods:** A retrospective analysis of the peri-operative and follow-up data of 30 patients who underwent tricuspid valve surgery with concomitant left-sided valve replacement was undertaken. Preoperative evaluation by 2 dimensional transthoracic echocardiography was routinely employed. Outcomes were analysed by evaluation of the peri-operative and 2 year follow-up clinical and echocardiographic data.

**Results:** All subjects had severe tricuspid regurgitation. Mixed tricuspid valve disease occurred in 36.7% of subjects. Tricuspid valve repair was performed in 28 patients. A significant improvement ( $p < 0.05$ ) in the following parameters occurred at 6 weeks postoperatively: New York Heart Association functional class, tricuspid annular diameter; pulmonary artery systolic pressure, severity of tricuspid regurgitation and tricuspid transvalvular gradient. Severe residual postoperative tricuspid regurgitation occurred in 26.7% of patients but there were no identifiable predictors for this phenomenon. Severe residual postoperative tricuspid regurgitation was not associated with major adverse cardiovascular events. Preoperative ( $p < 0.013$ ) and postoperative ( $p < 0.002$ ) pulmonary hypertension were associated with the development of major adverse cardiovascular events. The technique of tricuspid valve repair was not associated with the occurrence of major adverse cardiovascular events or with the development of severe residual postoperative tricuspid regurgitation. A satisfactory outcome was observed in only 40% of the study population.

**Conclusion:** The co-existence of mixed tricuspid valve disease in rheumatic patients undergoing left-sided valve surgery is an important determinant of outcome in tricuspid valve repair. The persistence of severe tricuspid regurgitation contributes to poor long-term outcomes and its incidence may be lowered by the adoption of appropriate peri-operative imaging techniques to delineate valve morphology.

## Pulmonary hydatid disease: Experience of tertiary hospital in Palestine

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**Background:** Hydatid disease is a parasitic disease caused by *Echinococcus granulosus*. It is considered to be a common problem in Palestine, as well as in all Mediterranean regions. This study was conducted to ascertain the incidence, presentation and the outcome of management of patients presented with pulmonary hydatid disease.

**Methods:** A single-centre retrospective analysis of collected database of all patients undergoing treatment for lung hydatid disease (2012 - 2016).

**Results:** One-hundred-and-fourteen patients with pulmonary hydatosis were included in the study. Sixty patients (53%) were males and the rest were females (47%). Their mean age was 30.2 years. The most common presentation was dyspnoea (53%), chest pain (40%) and cough (39%). Seventeen patients (15%) were asymptomatic and discovered incidentally. The majority of patients (64%) were diagnosed to have isolated pulmonary hydatid disease. Multiple hydatid cysts, affecting both the lung and liver, were seen in 33 patients (30%). The cysts were located in the right hemithorax in 91 (80%) patients, in the left hemithorax in 22 (19%) patients and bilaterally in 5 patients (1%). The most commonly affected lung lobes were the right lower lobe in (67 patients - 59%). Various procedures were performed; enucleation in 69 patients (60%), cystectomy in 29 patients (25%), segmentectomy or lobectomy was done in 6 patients (5%), thoracotomy and phrenectomy as one stage were used in 18 patients (15%) with combined cyst in the right lung and liver. Postoperative complications were seen in 25 patients (21%). Recurrence during follow up was seen in 12 patients (10%). Mortality occurred in 1 patient after 6 months.

**Conclusion:** Hydatid disease of the lung can be treated surgically with different techniques depending on anatomic location, the status of cyst and the general condition of the patient. Combined lung and liver cyst can be treated safely through a single incision in the chest.

## Sphingosine kinase and melatonin: A potential interaction for cardioprotection

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**Objectives:** Recent evidence indicates that both endogenous and exogenous sphingosine 1 phosphate (S1P) and melatonin protect the heart against ischaemic heart disease. However, their mechanisms of action are not yet fully understood. In this regard, melatonin is also reported to modulate sphingosine kinase (SPHK), the rate-limiting enzyme for S1P production; but it remains unclear whether SPHK/S1P pathway plays a role in melatonin-induced cardioprotection. The present study investigated the role of SPHK in melatonin-induced cardioprotection.

**Methods:** H9C2 cardiomyoblast cells were treated with/without SPHK inhibitors [N, N-dimethyl sphingosine (DMS, 10 $\mu$ M) for 15 minutes or SKI (15 $\mu$ M) for 45 minutes] followed by melatonin administration at physiological levels (75ng/L for 1 hour) and subjected to 8 hour stimulated ischaemia. At the end of experiment, cell viability and morphology were evaluated.

**Results:** Simulated ischaemia reduced cell viability ( $50.9 \pm 6.8\%$ ,  $p < 0.01$ ) and size ( $57 \pm 3.1\%$ ,  $p < 0.01$ ). Melatonin treatment protected the cells against ischaemic injury by significantly increasing their viability compared to untreated cells ( $77.9 \pm 8.2\%$ ,  $p < 0.05$ ). This protection was also associated with a concomitant increase in cell size ( $76.3 \pm 6.2\%$  vs. untreated cells,  $p < 0.05$ ), an effect that was lost when melatonin was administered to the cells treated with either DMS or SKI ( $p < 0.05$ , vs. melatonin treated-cells).

**Conclusion:** Taken together, these results suggest that exogenous melatonin targets endogenous SPHK/S1P to mediate cardioprotection. Understanding the cell survival signalling pathways, associated with melatonin-induced cardioprotection, may lead to safe and novel therapies against ischaemic heart disease.

## Patient-specific computational modeling to plan trans-catheter intervention on a coarctation of the aorta: A goal towards customised medical therapy

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**Objectives:** Transcatheter therapy, using balloon angioplasty and/or endovascular stent implantation, is emerging as the primary treatment for Coarctation of the aorta. Computational simulations can aid in pre-procedural planning to assist the interventionalist in avoiding unwanted complications. In this context, patient-specific models allow for procedural planning by virtual testing of different therapeutic approaches which can assist in predicting the outcome of the procedure. In this study, we report on the use of patient-specific modeling in optimising stent implantation in a case of aortic re-coarctation, specifically to avoid obstruction of the left main bronchus which is in close proximity to the coarctation area.

**Methods:** A 4-year-old male, weight 13kg, with HLHS, bicuspid aortic valve, DORV, and a hypoplastic transverse-arch underwent pulmonary artery band and reconstruction of the aortic arch soon after birth. The arch was patched with glutaraldehyde treated autologous pericardium. A follow-up catheterisation study showed a 28mmHg pressure gradient across the area of re-coarctation and a computed tomography (CT) angiography was used to create a 3 dimensional model of the patient's anatomy, including the coarctation which appeared to be encroaching on the airway. Computational analyses were performed to simulate different scenarios of balloon angioplasty and stent implantation of various diameters to assess the stent contact with the left main bronchus.

**Results:** The physical model aided in understanding implantation site anatomy and the proximity to the left main bronchus. The computer simulations suggested a maximum expansion of the stent up to 10mm in order to relieve the stenosis whilst avoiding contact with the left main bronchus. CFD showed adequate reduction of the gradient across the coarctation.

**Conclusions:** Integrating the results of advanced patient-specific modeling techniques into conventional decision making processes has assisted in guiding our interventional approach to this patient.

## Acute evaluation of a trans-apical mitral valve repair device in a porcine animal model

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**Introduction:** Rheumatic Heart Disease (RHD) is the single most neglected health tragedy outside industrialised nations, thus in areas where 80% of the world's population live. Without treatment, RHD will lead to early death in millions of patients. Apart from prevention, the only treatment for RHD involves invasive heart valve replacement, or repair. Current devices are ill-suited and extremely overpriced for the vast majority of those afflicted.

**Objectives:** The objective of this study is to prove that the trans-apical mitral valve repair device ((MVRD) can successfully capture the mitral valve leaflets.

**Methods:** The MVRD was tested preoperatively ex-vivo in explanted heart rigs to ascertain feasibility of the concept. Intra-operative invasive haemodynamic monitoring (aortic pressure, left atrial pressure and left ventricular pressure) was done. Intra-operatively all 6 pigs underwent trans-

oesophageal echocardiography/epicardial echocardiography and fluoroscopy for accurate positioning and location of the cardiac chambers pressure (atrial, ventricular, aortic) monitoring. Access was via a median sternotomy and left ventricular apex in all 6 pigs.

**Results:** There was correct axial and commissural location in all 6 pigs. There was correct pressure based (pressure differential between the left atrium and the left ventricle) anterior and posterior mitral leaflet approximation in 4 of the 6 pigs. The MVRD captured the mitral valve leaflets in 4 of the 6 pigs. There were mechanical failures in 2 pigs.

**Conclusion:** This is proof of concept that trans-apical capture of the mitral leaflets is feasible and a low cost MVRD is possible for use in developing countries. Further research is needed into the actual repair of the mitral leaflets.

## Comparison of bovine vs. porcine pericardial tissue anticalcification treatments in a rat subcutaneous model

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**Objectives:** To compare efficacy of anti-calcification treatments in bovine and porcine pericardial tissue.

**Methods:** Three treatments: glutaraldehyde (GA-0.7%), glutaraldehyde-lysine-glutaraldehyde (GA-Lys-GA) and glutaraldehyde-lysine-sodium borohydride (GA-Lys-NaBH<sub>4</sub>), were tested and distributed among decellularised (D) and non-decellularised (ND) porcine pericardium (PP) and bovine pericardium (BP) respectively thus;

GA: D-PP (10 samples), ND-PP (10 samples), D-BP (10 samples), ND-BP (10 samples).

GA-Lys-GA: D-PP (10 samples), ND-PP (10 samples), D-BP (10 samples), ND-BP (10 samples).

GA-Lys-NaBH<sub>4</sub>: D-PP (10 samples), ND-PP (10 samples), D-BP (10 samples), ND-BP (10 samples).

Twenty Long Evans rats had subcutaneous implantation of pericardial samples. Each rat was implanted with 6 pericardial samples (120 samples in total). The rats were euthanised after 6 weeks and the pericardial samples explanted. The pericardial samples then had atomic absorption spectroscopy (AAS) to measure calcium scores (8 samples of each group) as well as histology (2 samples of each group) to evaluate the degree of calcification.

**Results:** The most susceptible to inflammatory infiltration was ND-PP-GA-Lys-GA, while the least susceptible was the ND-PP-GA. There were higher ratios of foreign body giant cells (FBGC) in porcine than bovine pericardium, irrespective of the treatment. There were higher ratios of macrophages and lymphocytes in porcine than bovine pericardium. The D samples showed less calcification than the ND samples. The highest calcium scores were ND-BP-GA (127.080 µg/mg) and ND-PP-GA (125.315 µg/mg), while the least were D-BP-GA-Lys-GA (1.022 µg/mg) and DP-PP-GA-Lys-GA (2.970 µg/mg),  $p < 0.001$ . Comparison of the calcification amongst treatments showed: GA vs. GA-Lys-GA ( $p < 0.064$ ), GA vs. GA-Lys-NaBH<sub>4</sub> ( $p < 0.015$ ) and GA-Lys-GA vs. GA-Lys-NaBH<sub>4</sub> ( $p < 0.31$ ) with GA-Lys-GA being the best, and GA being the worst.

**Conclusion:** The decellularised pericardium showed significantly less calcification than the non-decellularised pericardium. There was no significant difference between bovine and porcine pericardium. The low levels of calcification suggest that decellularised GA-Lys-GA pericardium may be used long-term in vivo for bioprosthetic valves.

## Off-pump coronary artery bypass grafting (OPCAB) vs. coronary artery bypass grafting (CABG) with cardiopulmonary bypass (CABG-CPB) in a South African patient population

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**Introduction:** Off-pump coronary artery bypass grafting (OPCAB) was developed to avoid the negative effects of CPB. The literature reveals some peri-operative advantages of OPCAB, with few studies showing these in Africa.

**Objective:** To compare OPCAB to CABG-CPB in our institution dealing with a South African patient cohort and to determine preoperative characteristics and short-term outcomes in a developing country.

**Methods:** A retrospective review of patients undergoing OPCAB and CABG-CPB by 2 surgeons at Christian Barnard Division of Cardiothoracic Surgery, Cape Town, South Africa (January 2001 - June 2015). Fields determined include: preoperative patient characteristics, intra-operative data and postoperative variables.

**Results:** The records of 585 patients were reviewed. Of these, 250 had OPCAB (1) and 335 had CABG-CPB (2). The significant findings between groups 1 and 2 include; no difference in age, coronary artery disease risk factors, New York Heart Association (NYHA) class, ejection fraction and proportion of urgent/emergent surgery. Other results include: Similar number of distal anastomoses (A: 3.13 vs. B: 3.23,  $p = 0.22$ ), conversion rate from A to B (3.2%), more mean red blood cell transfusion in B (1.72 units vs. 1.22 units,  $p = 0.024$ ) and more peri-operative blood loss in B (852.6mls vs. 724.6mls,  $p = 0.0031$ ). Group 2 had longer postoperative ward stay (7.6 vs. 5.7 days,  $p = 0.009$ ) and worse peri-operative mortality rate (7.67% vs. 3%,  $p = 0.018$ ). No significant difference in major adverse cardiac events (MACE) during follow-up. The mean follow-up duration for A and B was 15.5 and 13.8 months respectively ( $p = 0.4$ ).

**Conclusion:** The preoperative characteristics in both groups were similar. There was less ICU blood loss, less usage of blood and shorter hospital stay in the OPCAB group. Peri-operative mortality was higher in the CABG-CPB group, and without any difference in MACE during follow up.

## Bleeding, transfusion and the risk of stroke after coronary surgery: A prospective multicentre European study

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**Objective:** This study aimed to investigate the impact of severe bleeding and blood transfusion on the development of stroke after coronary surgery.

**Method:** This cohort study includes 2 357 patients undergoing isolated CABG from a prospective multicentre European Registry. Severity of bleeding was categorised according to the Universal Definition of Perioperative Bleeding (UDPB), E-CABG and PLATO definitions.

**Results:** Thirty patients (1.3%) suffered postoperative stroke. The amount of transfused red blood cell (RBC) (OR 1.10, 95%CI 1.03 - 1.18), pre-operative use of unfractionated heparin (OR 4.49, 95%CI 1.91 - 10.60), emergency operation (OR 3.97, 95%CI 1.47 - 10.74), diseased ascending aorta (OR 4.62, 95%CI 1.37 - 15.65) and use of cardiopulmonary bypass (p=0.043, OR 4.85, 95%CI 1.05 - 22.36) were independent predictors of post-operative stroke (Tabs 1 - 3). Adjusted analysis showed that UDPB classes 3 - 4 (crude rate: 3.6% vs. 1.0%; adjusted OR 2.66, 95%CI 1.05 - 6.73), E-CABG bleeding grades 2 - 3 (crude rate: 6.3% vs. 0.9%; adjusted OR 5.91, 95%CI 2.43 - 14.36), and PLATO life-threatening bleeding (crude rate: 2.5% vs. 0.6%, adjusted OR 3.70, 95%CI 1.59 - 8.64) were associated with an increased risk of stroke compared with no, or moderate, bleeding.

**Conclusions:** Bleeding and blood transfusion are associated with an increased risk of stroke after CABG, which is highest in patients with severe-massive bleeding.

## “Full-polarising” adenosine-lidocaine-magnesium blood cardioplegia better ameliorates early postoperative diastolic function after elective coronary artery bypass grafting when compared to traditional “depolarising” ipekalemic blood cardioplegia

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**Objectives:** Suboptimal myocardial protection and ischaemia-reperfusion injury induce transient diastolic dysfunction after coronary artery bypass grafting (CABG). We compared the peri-operative diastolic functional recovery between “polarising-membrane” adenosine-lidocaine-magnesium (ALM-POL) vs. “depolarising-membrane” ipekalemic (K-DEPOL) blood cardioplegia.

**Methods:** Left ventricular diastolic (LVDd) and systolic (LVDs) diameters, ejection fraction (LVEF), E wave/A wave trans-mitral ratio (E/A-ratio), E wave/E' wave (E/E'-ratio) and isovolumic relaxation time (IVRT) were measured preoperatively (T0), at cardiopulmonary bypass discontinuation (T1), and 3 hour postoperatively (T2) in 208 CABG patients randomly allocated to ALM-POL (n=104) or K-DEPOL (n=104). Coronary sinus blood was investigated for troponin-I leakage, oxidative metabolism and myocardial anaerobic index (MAI) preoperatively (T0cs) and 10 minutes after reperfusion (T1cs). Clinical outcome was also recorded.

**Results:** ALM-POL reported lower coronary sinus troponin-I leakage (T0cs 0.9 ± 0.7ug/L - T1cs 1.3 ± 0.7 vs. K-DEPOL: T0cs 0.9 ± 1.0 - T1cs 2.3 ± 2.6; between-group p=0.002), lower lactate production (T0cs 1.0 ± 0.4 mmol/L - T1cs 1.5 ± 0.5 vs. K-DEPOL: T0cs 0.9 ± 0.3 - T1cs 1.8 ± 0.5; between-group p<0.001), higher SvO2 values (T0cs 51.4 ± 10.8% - T1cs 62.9 ± 12.3 vs. K-DEPOL: T0cs 53.2 ± 12.2 - T1cs 51.1 ± 11.5; between-group p<0.001) and lower B.E. consumption (T0cs 0.5 ± 2.8 - T1cs -0.1 ± 1.4 vs. K-DEPOL: T0cs 0.7 ± 3.0 - T1cs -0.9 ± 2.2; between-group p=0.001), translating in a better peri-operative MAI (0.02 ± 0.02 vs. K-DEPOL: 0.04 ± 0.01, between-group p=0.003). LVDd, LVDs, and LVEF changes were similar (between-group p=NS.), but ALM-POL demonstrated an improved E/A-ratio (T0:1.07 ± 0.28 - T1:1.17 ± 0.25 - T2:1.10 ± 0.37 vs. K-DEPOL T0:0.97 ± 0.32 - T1:1.09 ± 0.51 - T2:0.87 ± 0.34; between-group p<0.001), E/E'-ratio (T0:6.29 ± 2.04 - T1:7.53 ± 2.43 - T2:7.30 ± 1.44 vs. K-DEPOL T0:6.24 ± 2.02 - T1:8.63 ± 2.73 - T2:8.60 ± 3.50; between-group p<0.001) and IVRT (T0:82.5 ± 24.2 - T1:118.4 ± 29.1 - T2:117.3 ± 21.4 vs. K-DEPOL T0:88.2 ± 20.8 - T1:133.9 ± 14.0 - T2:122.6 ± 24.3; between-group p<0.001). Clinical outcome was comparable (p=NS).

**Conclusions:** Despite similar “rough” clinical outcome, ALM-POL achieves lower troponin-I leakage and less myocardial anaerobic metabolism during aortic cross-clamping, translating in a globally better myocardial protection. ALM-POL should be considered the first-choice cardioplegia in CABG.



## Safety and efficacy of ticagrelor compared to aspirin only in acute coronary patients undergoing isolated coronary artery bypass grafting

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**Objective:** To evaluate the safety and efficacy of preoperative use of Ticagrelor in acute coronary syndrome (ACS) patients undergoing isolated coronary artery bypass grafting (CABG) as compared with aspirin alone.

**Methods:** Seven-hundred-and-eighty-six ACS patients receiving preoperatively aspirin alone or Ticagrelor ± aspirin undergoing isolated CABG in 15 centres, were enrolled in a prospective Registry. Primary endpoint was severity of bleeding, defined by Universal Definition of Peri-operative Bleeding (UDPB), E-CABG severity bleeding classification, and PLATO major/life-threatening bleeding criteria. Secondary end-points were chest drain output at 12 hours following surgery, re-exploration for bleeding/tamponade and blood product requirement. Propensity-score analysis adjusted for differences in baseline and operative characteristics.

**Results:** Ticagrelor, with or without aspirin, was administered to 290 (36.1%) patients, 496 (63.9%) received aspirin alone. Twenty-nine (10%) patients received Ticagrelor 1 day before or until surgery. Chest tube output ( $470 \pm 389$  vs.  $454 \pm 273$  ml,  $p=.08$ ), RBC transfusion (43.8% vs. 39.0%,  $p=.19$ ), FFP/Octaplas<sup>®</sup> administration (5.4% vs. 7.2%,  $p=.31$ ) and re-exploration for bleeding/tamponade (3.4% vs. 3.1%,  $p=.806$ ) were similar in the aspirin and Ticagrelor groups. Patients receiving Ticagrelor required more platelet transfusions (13.1% vs. 5.6%,  $p<.001$ , and  $0.7 \pm 3.7$  vs.  $0.2 \pm 1.3$  units,  $p<.001$ , respectively). Propensity score one-to-one matched analysis showed that Ticagrelor was associated with a significantly higher risk of platelet transfusion (incidence, 13.5% vs. 6.0%,  $p=0.009$ ; mean units= $0.4 \pm 1.8$  vs.  $0.1 \pm 0.4$ ,  $p=0.006$ ), whilst bleeding-related and other adverse endpoints were similar. A significantly higher risk of severe bleeding according to the UDPB grades 3 - 4 ( $p=0.023$ , OR 3.53, 95%CI 1.19 - 10.48), PLATO ( $p=0.015$ , OR 3.23, 95%CI 1.25 - 8.29), E-CABG bleeding grades 2 - 3 ( $p=0.052$ , OR 3.28, 95%CI 0.99 - 10.85) was observed when Ticagrelor was administered 1 day before, or until surgery.

**Conclusions:** Ticagrelor in ACS before CABG appears to be safe compared with aspirin alone if discontinued >24 hours before surgery. When administered 1 day before, or until, surgery Ticagrelor significantly increases the risk of severe bleeding.

## Evolution of care in Kazakhstan for newborns with congenital heart diseases: impact of adoption of standard nursing procedures

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**Objectives:** JSC "National Research Centre for cardiac Surgery" performs approximately 100 cardiac surgeries per year on newborns (<30 days) with congenital heart diseases. The aim is to improve the postoperative care after cardiac surgery and minimise the risk of respiratory complications after prolonged mechanical ventilation, we implemented standard postoperative nursing procedures for these newborns.

**Methods:** In 2015, our nursing staff received training from international colleagues and subsequently we developed procedures intended to reduce the incidence of postoperative respiratory complications in newborns. Main outcomes of interest were incidence of pneumonia, general atelectasis and laryngitis within 2 weeks following surgery. Procedures included transfer of mechanical ventilation monitoring responsibility to nurses, standard administration of bronchodilators and suctioning. We performed a retrospective analysis of prospectively collected data and compared postoperative outcomes in newborns the year before (2014) and after (2015) the implementation of these standard procedures.

**Results:** In 2014 and 2015, 86 and 76 newborns with congenital heart disease, respectively, underwent cardiac surgery at our centre. The mean weight of all newborns ranged from 500 grams - 3kg, where the proportion of premature newborns in the 2 groups is 8% and 11% respectively. The following data were obtained during the comparative analysis. In group 1, 23 (26.7%) of children had the following complications: atelectasis - 15 (17.4%), pneumonia - 2 (2.3%), laryngitis - 6 (6.9%). In group 2, 11 (14.4%) of children had the following complications: atelectasis 8 (10.5%), pneumonia - 1 (1.3%), laryngitis - 2 (2.6%). The analysis showed that with the implementation of new procedures, the percentage of complications in 2015 decreased almost in 2 fold.

**Conclusion:** While there are some limitations to our retrospective analysis, the development of standard postoperative nursing procedures for newborns with congenital heart disease appears to have improved postoperative respiratory outcomes in our centre.



## Evolution of nursing care in Kazakhstan in the context of a nascent heart transplantation programme. Percutaneous site infections in patients with implanted left ventricular assist device

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**Objective:** In 2012, the "National Research Centre for Cardiac Surgery" JSC initiated the first heart transplant programme in Kazakhstan. Unlike western countries, where the procurement organisations coordinate a country's organ transplant activities, there are no such organisations in Kazakhstan. Since Kazakhstan is the ninth largest country in the world, and many regional donor sites are >1 000km from our centre, donor hearts are often transported from distant regions to be transplanted at our centre. In this regard, physicians and nurses at our centre seek to actively participate in performing both organ harvest and implantation procedures which contributed to developing nursing standard preoperative procedures de novo.

**Methods:** The procedures to nursing preoperative cardiac transplantation involve two main steps: (1) transporting the heart and (2) preoperative preparation of the operating room. In 2012, at the beginning of the transplant programme, the disinfection procedures were simpler and operating room nursing time took approximately 3 hours.

**Results:** We implemented a training programme and developed protocols for transplant nurses. Currently, 12 trained nurses, along with surgeons, are able to perform both the harvest and implantation procedures. The trained nurses travel to remote areas by plane for heart recovery. Improvements to the preoperative processes included the use of equipment for disinfection, standardised surgical tool lists, routine time-out with surgical team and obtaining a bacteriologic culture of the donor heart. Preoperative preparation of the operating room has been reduced to less than one hour. As a result, there was a significant increase in the number of heart transplantations from 1 in 2012, to 20 in 2015.

**Conclusion:** Implementing standard preoperative heart transplantation procedures has improved the effectiveness of the multidisciplinary transplant team which has led to an increased number of heart transplantations in Kazakhstan.

## Percutaneous site infections in patients with implanted left ventricular assist device

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**Objective:** To assess risk factors of local cable exit site infections in patients with implanted left ventricular assist device.

**Methods:** The total number of patients examined was 145. The patients were divided into 4 groups according to the way in which the cable was secured: group 1: 94 patients, who had their suture removed on day 21 - 30; group 2: 20 patients, on day 31 - 90; group 3: 18 patients, on day over 90; group 4 consisted of 30 patients, who were put an additional sleeve on a wound. Seventy-six of all patients examined had the driveline associated percutaneous infections.

**Results:** In group 1, the percutaneous site infections totalled 41 (43.6%) patients. In group 2: 10 (50%) patients, in group 3: 11 (61%) patients, and in group 4: 4 (13.3%) patients developed infection respectively. We identified risk factors for percutaneous site infections in the study groups as follows: Cable exit site injury in group 1 totalled 10 (24.3%), group 2: 2 (20%), group 3: 6 (54.5%), and group 4: 2 (50%). Non-compliance of antiseptic use: group 1: 11 (26.8%), group 2: 3 (30%), group 3: 4 (36.3%). Prolonged stay in intensive care unit: group 1: 2 (4.8%). Increased body mass index (BMI): group 1: 4 (9.8%), group 2: 5 (50%), group 3: 1 (9.1%), and group 4: 1 (25%). Diabetes before surgery: group 1: 2 (20%), group 2: 2 (20%). Allergy: group 4: 1 (25%). Suturing technique and timing of suture removal play a significant role in developing percutaneous site infection. Patients in group 4 had fewer complications (13.3%) when compared to other study groups. Cable exit injury and non-compliance of antiseptic use are the most common factors for developing infection.

**Conclusion:** Additional sleeve on wound, cable injury prevention and compliance of antiseptic use are the most effective preventive measures against percutaneous site infections in patients with implanted LVAD.

## Comparison of thrombus aspiration as with vs. without preceding balloon angioplasty in st-segment elevation myocardial infarction: A 6 month composite endpoint analysis of INTERSTELLAR registry

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**Objectives:** There are unanswered questions about whether preceding ballooning (PB) before thrombus aspiration (TA) will be better, or not, in ST-segment elevation myocardial infarction (STEMI). We compared clinical outcomes of TA with PB vs. without PB in STEMI.

**Methods:** STEMI patients from the INTERSTELLAR cohort, 2009 - 2014, were screened. Patients were grouped on the basis of whether they received TA [TA (+) group] or not [TA (-) group]; subgroups of TA with PB [PB (+) group] and TA without PB [PB (-) group] were also evaluated. The clinical endpoint was composite major adverse cardiovascular (MACE), defined as cardiovascular (CV) death, non-fatal MI, non-fatal stroke, and ischaemia-driven TLR, during 6 months.

**Results:** All 1 434 STEMI patients who had primary percutaneous coronary intervention (PPCI) were analysed. TA was used in 571 patients (39%). No significant MACE difference was noted between the TA (+) and TA (-) groups at 6 months (MACE 9.0 vs. 9.6%,  $p=0.70$ ). After propensity score matching (PSM) (571 patients per group), MACE also similar with both strategies ( $p=0.24$ ). In subgroup analysis of TA (+) group following to use of PB, MACE (14.9 vs. 8.5%,  $p=0.04$ ) and stroke (3.0 vs. 0.2%,  $p=0.02$ ) were significantly higher in PB (+) than PB (-) group. In comparison with PSM TA (-) group, hazard ratio of PB (-) strategy for MACE and stroke were 1.11 (CI 0.71 - 1.74,  $p=0.63$ ) and 1.53 (CI 0.89 - 2.60,  $p=0.11$ ) and hazard ratio of PB (+) strategy for MACE and stroke were 2.08 (CI 1.11 - 3.91,  $p=0.02$ ) and 2.05 (CI 0.93 - 4.51,  $p=0.07$ ).

**Conclusions:** In patients with STEMI who were undergoing PPCI, thrombectomy with PB, when compared to TA without PB, was associated with an increased rate of MACE and stroke at 6 months.

## The effectiveness of Veriset™ haemostatic patch in intraoperative pulmonary artery injuries

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**Background:** Pulmonary artery (PA) injury represents a significant complication of Thoracic Surgery associated with increased morbidity and mortality risk. Different techniques have been applied to repair a PA injury and various topical agents have been developed to promote intraoperative haemostasis. The Veriset™ haemostatic patch is a topical haemostat comprised of an absorbable backing made of oxidised cellulose and self-adhesive hydrogel components. It is designed to achieve haemostasis quickly and adhere to tissues without fixation.

**Methods:** Purpose of the study is to assess the safety and effectiveness of the Veriset™ Haemostatic Patch after direct application to an intraoperative pulmonary artery injury. A 2 x 2cm patch was applied in 10 patients undergoing major lung resection with a PA bleeding point larger than 2.0mm. Time to haemostasis was monitored and adverse events were monitored postoperatively.

**Results:** In all cases, complete haemostasis occurred within 3 minutes in 8 out of 10 patients (80%) and within 1 minute in 2 patients (20%). Median time was 1.6 minute. This result was independent of bleeding severity and surface area of the PA injury. No bleeding complications occurred in the postoperative period.

**Conclusions:** Regardless of bleeding severity or surface area, the Veriset™ haemostatic patch represents a safe, quick and effective haemostat for controlling PA injuries in Thoracic Surgery.

## Rhythm outcome predictors after concomitant surgical ablation for atrial fibrillation: 10 year single centre experience

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**Objectives:** Concomitant surgical ablation is a safe and feasible procedure, recommended in guidelines for patients with atrial fibrillation (AF) undergoing cardiac surgery. We performed a single centre data analysis to identify predictors of rhythm outcome in such a patient cohort.

**Methods:** Between January 2003 and September 2012, 586 patients with persistent (n=342, 58.4%) or paroxysmal (n=244, 41.6%) AF underwent concomitant surgical AF ablation. The lesions were either limited to a pulmonary vein isolation (n=94, 16.0%), a more complex left atrial lesion set n=373 (63.7%), or biatrial lesions (n=119, 20.3%). All follow-up rhythm evaluations were based on either 24 hour Holter ECG or event recorder interrogation at 3, 6, and 12 months postoperatively. Sinus rhythm (SR) immediately postoperative was defined as first documented rhythm after weaning from extracorporeal circulation.

**Results:** Mean patient age was  $68.3 \pm 9.9$  years, 374 (63.8%) were men. There were no major ablation related complications. After 1 year follow up 63.7% of all patients were in SR, showing significantly better results in patients with paroxysmal AF compared to those with persistent AF (70.7% vs. 57.9%,  $p=0.0047$ ). Additional statistically significant factors influencing SR, after 1 year, were left atrial diameter ( $p=0.002$ ), duration of AF ( $p=0.034$ ), and immediate postoperative SR ( $p<0.001$ ). Regarding only patients with persistent or longstanding persistent AF, those with biatrial lesion set showed significantly higher rates of conversion to SR compared to solitary left atrial ablation (SR: 67.9% vs. 50.4%,  $p=0.028$ ) after 12 months.

**Conclusion:** Statistically significant predictors for SR after 1 year were left atrial diameter, duration of AF, preoperative paroxysmal AF, immediate postoperative SR and biatrial ablation for persistent AF.

## Surgery for bronchiectasis in HIV positive children: Indications, complications and outcome

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**Background:** Bronchiectasis in human immunodeficiency virus (HIV) infected children remains a significant cause of morbidity and mortality, especially in tuberculosis endemic countries. Currently the treatment modalities for bronchiectasis in HIV positive children focus mainly on prevention of subsequent infections and management of symptoms, while surgical management is seldom considered. In contrast to this, the surgical management in non-cystic fibrosis bronchiectasis is well established. This study aims to describe the indications and complications of surgical resection for bronchiectasis in HIV-infected children and to identify variables influencing outcome.

**Methods:** A retrospective medical records review was conducted of all HIV-infected children, 14 years and younger, who underwent surgical resection for bronchiectasis at Tygerberg Hospital, South Africa, between 1 January 2007 and 30 September 2014. The variables collected included: immune status, anti-retroviral treatment, previous Mycobacterium tuberculosis treatment, operative and postoperative complications and postoperative symptom relief.

**Results:** Twelve HIV positive children on anti-retroviral treatment with symptomatic bronchiectasis underwent surgical resection. The mean age was 7 years (1 year 10 months - 13 years 3 months). Indications for surgery included recurrent infections, chronic cough and persistent lobar collapse. The most common procedures were left lower lobe lobectomy (42%), left pneumonectomy (17%) and right bi-lobectomy (17%). Complications were limited to a persistent pneumothorax in 1 child. There were no deaths. Ten children (83%) showed significant improvement of symptoms at follow-up.

**Conclusions:** Surgical resection for bronchiectasis in HIV positive children can be safely performed with a low complication rate resulting in significant improvement of symptoms postoperatively.

## Use of Impella in off-pump myocardial revascularisation with EF below 30%

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**Introductions:** The profile of patients undergoing coronary surgery has changed in the last years, posing a challenge to the cardiac surgeon in not only the quality of the coronary artery involved in the disease, but also in the general status of patients. Low ejection fraction, elderly patients, COPD, kidney failure and diabetes are often found in patients with coronary artery disease undergoing CABG. Beating heart myocardial revascularisation is a well-established surgical technique, but in case of very low EF (below 30%) there is a particular high surgical risk of conversion to on-pump surgery. The recently developed Impella device (Abiomed, Danvers, MA) represents a compromise between circulatory support and limited invasiveness.

**Materials/methods:** Five patients, male, admitted for acute coronary syndrome with 3 vessels CAD with low ejection fraction were operated upon in our department. After preliminary lower limb duplex ultrasound to exclude peripheral artery disease, an Impella Recover LP 5.0 device was inserted via surgical exposure of the right femoral artery in one case, and an Impella recover LP 4.5 via percutaneous insertion of the femoral artery in 4 cases.

**Results:** The myocardial revascularisation was performed using a complete arterial revascularisation: Left internal mammary artery on the LAD and the radial artery "T" anastomosed from the LIMA to the other vessels (diagonal, intermedius ramus, OM and PDA). The device was left in for 48 hours after the operation. All patients were discharged after 9 - 10 days after admission. A follow up echocardiography, performed 6 month up to 2 years after the operation, showed an increase of the ejection fraction of up to 40 - 45%.

**Conclusions:** Use of the the Impella Recover device for patients undergoing off-pump CABG is feasible and safe, and appears a promising strategy to improve short- and long-term outcomes.

## The Twist Technique: An innovative surgical treatment to remodel the left ventricle apex in patients affected by ischaemic cardiomyopathy

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**Background:** Since 1996, we have developed an innovative technique of ventriculoplasty, the "Twist Technique" (TT). The procedure performed has the purpose of preserving not only the volume and the shape of the LV but, above all, to restore the physiologic counter clockwise (CCW) twist of the cardiac apex through a rearrangement of its fibres, rebuilding the natural apical vortex of the LV. We present our experience in LV remodelling and long term follow-up results.

**Methods:** From 1996 - 2015, 289 patients with post-infarction LV aneurysm underwent reconstructive procedures. Mean age was  $56.4 \pm 7.3$  years. Average LV ejection fraction (EF) was  $38.9\% \pm 11.6\%$ . LV reconstruction was performed by using the TT in 265 patients (91.7%). The LV is opened in the middle of the aneurysmal area. A single circular suture is placed on the border between normal and fibrous tissue (Jatene technique). Afterwards, the orifice closure is obtained performing the TT: a running 2 - 0 polypropylene suture orients cardiac fibres remodelling heart apex in a cone shape; stitches are outdistanced of 1cm on the lateral side of the endocardial wall and of 1/2cm on the endocardial septum. The distal and akinetic portion of the septum is folded and therefore excluded. In 24 patients (8.3%) reconstruction was done by linear closure. In 257 patients (88.9%) concomitant myocardial revascularisation was performed. Mitral valve procedures were performed in 41 patients (14.1%).

**Results:** Peri-operative mortality was 2.4%. Mean follow-up was  $8.45 \pm 4.2$  years. Actuarial survival rate at 13 years was 73%. The physiological movement of the new apex, that unfolds in a natural CCW twist, considerably improved LV EF. Mean post-operatively EF was  $46.1 \pm 9.3\%$ .

**Conclusion:** LV remodelling using the TT reproduces physiological CCW torsion of the cardiac apex, it is a safe surgical procedure with low peri-operative mortality and excellent long-term survival.

## Excellent 10 year outcome after MVR and removal of 550g left atrial thrombus. Efficiency of own technique of reducing atrioplasty

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**Objectives:** Presentation of a spectacular case of mitral valve disease, complicated with giant left atrium (LA) and thrombus (LT). Focus on method of treatment.

**Methods:** In 1970, a 27-year-old woman underwent classic mitral commissurotomy. After 10 years, slow development of mitral restenosis, LA enlargement and LT formation was observed. Later on FA, circulatory insufficiency with pulmonary oedema and hydrothorax, myocardial infarction, and TIA occurred. At last, in 2006 when the patient was 63, she was operated upon CEC, moderate hypothermia and crystalloid cardioplegia. She presented NYHA class IV, MVA 0.8cm<sup>2</sup>, LA diameter 19cm, RVSP 70mmHg, LVEF 50%, normal coronaries. LT, weighing 550g, was completely removed. Mitral valve was replaced with SJM 27M mechanical prosthesis. LA was reduced to 6 - 7cm using own method, consisting of placement of continuous mattress there-and-back sutures, excluding significant part of LA wall: (1) between mitral valve and left pulmonary veins (PV), (2) between left and right PV, (3) right to right PV. The aorta cross-clamping time was 107 minutes.

**Results:** Cardiac function spontaneously recovered. Moderate inotropic support was necessary. The patient presented gradual, significant improvement, sinus rhythm dominating. In 2010 VVI pacemaker was implanted. Actually, the patient aged 73, is efficient, active, in NYHA class II. Echo presents normal function of mitral prosthesis, no thrombi, LVEF 55%, RVSP 40%, LA diameter still 6cm.

**Conclusions:** Despite extreme pathology, including giant LA and LT, the outcome was successful, maybe due to preserved LV function. The LT is the greatest known. The mega atrium must be treated to prevent haemodynamic and embolic complications. Own technique of atrioplasty, similarly to that used in other patients, allowed permanent LA reduction. The recovery of sinus rhythm may be explained with decrease of LA pressure and centrifugal forces, as well as maze-like positioning of excluding sutures.

## The use of the MiniLap Percutaneous Surgical System in minimally invasive sub lobar lung resections: A novel technique

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**Objectives:** Surgery for sub-lobar lung resection has advanced dramatically over the last decade, moving away from large, painful and unsightly thoracotomies to minimally invasive video assisted thoracic surgery (VATS). Ultra-minimally invasive sub-lobar lung resections are the future of thoracic surgery, being both safe and effective. The introduction of the MiniLap Percutaneous Surgical System (PSS) device will cause less trauma, eliminate a three-port approach, negate the need for a stitch and produce aesthetically pleasing scars.

**Methods:** During a three-month period 15 patients who underwent a sub-lobar lung resection were operated on using a MiniLap PSS 2.3mm clutch grasper. Five patients underwent a bullectomy, 10 patients underwent a wedge resection. All 15 operations required two-port access, rather than three-ports (no longer requiring a grasper port). The device allowed for better control of the lung parenchyma allowing the surgeon to pull without losing control. There was zero lung damage caused.

**Results:** All 15 patients reported positive patient experience and satisfaction. The use of the MiniLap PSS clutch grasper eliminated the need for an extra port resulting in reduced pain and minimal scarring. There was an overall improvement in the aesthetic appearance of the scars. The 2.3mm diameter incision did not need suturing. The reduction to two-ports resulted in reduced pain. No complications occurred.

**Conclusion:** Using the MiniLap PSS 2.3mm clutch grasper in minimally invasive thoracic surgery, specifically wedge resection, allowed for better retraction of the lung parenchyma causing zero lung damage. Using the MiniLap PSS achieved better outcomes for the patients. Improved patient satisfaction, early post-operative mobility and reduced pain. All 15 patients had a nearly unnoticeable scar. This novel technique in minimally invasive thoracic surgery promises to become an integral component in lung resection surgery.

## A retrospective review of post intubation tracheal strictures treated by tracheal resection in the Department of Cardiothoracic Surgery at Inkosi Albert Luthuli Central Hospital: 1 July 2003 - 31 July 2014

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**Objectives:** The surgical treatment of tracheal stenosis following endotracheal intubation or tracheostomy is well described in the developed world. We present our surgical experience with this pathology, and highlight the nuances in diagnosis and management in sub-Saharan Africa.

**Method:** We retrospectively studied the clinical records and archived imaging of all patients who underwent tracheal resection and reconstruction for post-intubation tracheal stenosis (1 July 2003 - 31 July 2014) in the Department of Cardiothoracic Surgery at Inkosi Albert Luthuli Central Hospital, Durban, South Africa.

**Results:** During the study period 42 patients underwent tracheal resection, 36 (85.7%) via a cervical approach and 6 (14.3%) via a right thoracotomy approach. There was no early mortality and surgery was complicated by vocal cord palsy in 4 cases, restenosis in 2 cases, infection in 1 case, and paraparesis in 1 case. We evaluated the endoscopic characteristics of the tracheal stricture in all patients, and computed tomography was used as an adjunct in the latter 28 (66%) patients. We also studied the number of inpatient tracheal dilatations undertaken in each case prior to tracheal resection.

**Conclusions:** Tracheal resection for the treatment of post-intubation tracheal stenosis can be undertaken safely with no mortality and minimal morbidity in the developing world. The vast majority of lesions are treated via a cervical collar approach, and preoperative endoscopic evaluation of the stenosis remains the most accurate technique of planning resection. The role of repeated palliative tracheal dilatation in patients with fibrous concentric strictures is limited and early definitive surgical repair is recommended.

## Cardiac surgical practice in South Africa: An ethical perspective

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In resource-scarce environments, such as sub-Saharan Africa, difficult bioethical decisions regarding the distribution of resources and the selection of patients for surgery are often deferred to the cardiothoracic surgeon for the final word. Further ethical considerations include access to cardiac surgical care, interdisciplinary relations, remuneration practice and clinical research. Hospital administrators, funders and policymakers rely on our guidance with regard to policy and planning, and these decisions should be based on sound biomedical ethics principles.

## Translational research in pulmonary tuberculosis: from the operating room to the laboratory

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The role of the thoracic surgeon in the treatment of pulmonary tuberculosis has evolved over time, from the era of sanatoria and collapse therapy, to the present era of minimally invasive lung resection. The South African tuberculosis epidemic allows the thoracic surgeon a unique opportunity to partner with basic science researchers in the field of tuberculosis research, to carefully study the distribution of disease, drug level penetration, mycobacterial characteristics and potential innovative therapeutic options in the advancement of care of tuberculosis patients.

## Triple valve replacement in a single surgical procedure: Short and long-term outcomes of an infrequent intervention

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**Introduction:** Triple valve replacement (mitral, aortic and tricuspid) in the same surgical procedure is usually associated with high morbidity and mortality rates. These patients usually have a large number of comorbidities, not to mention a long history of advanced heart failure. As it is not a very common procedure, little medical evidence has been published on this matter.

**Methods:** We analysed all the patients that have undergone triple valve replacement in the same surgical procedure (2000 - 2015). We described peri-operative patients' characteristics. A long-term follow-up was conducted, and we analysed long-term prognosis of this complex procedure.

**Results:** Twenty-eight patients had triple valve replacement during the study period. Mean age was 62, 25 (12, 36). Mean logistic Euroscore I was 15, 5 (17, 87). Rheumatic disease was the most frequent etiology (75% of the cases), followed by endocarditis (10.7%). Most of the patients had advanced heart disease: 28.6% had left ventricle systolic dysfunction and 35.7% were in NYHA IV functional class. Up to 96% of all patients had moderate or severe pulmonary hypertension, 64.3% of patients had a previous cardiac surgery. The most frequently implanted valves were a tricuspid biological prosthesis with aortic and mitral mechanical valves. The implant of 3 mechanical valves was performed in 8 patients. Nine of the 28 patients died during hospitalisation (32.14%). Mean follow-up was 32.75 months. One patient died during follow-up, and 3 patients were readmitted due to heart failure. The incidence of stroke or major bleeding after discharge was 10.3%.

**Conclusions:** Triple valve replacement is usually performed in high risk patients, with a large number of comorbidities and a very advanced heart disease. In-hospital mortality is high, and it is associated with a high rate of peri-operative complications. On the other hand, the patients discharged from hospital had a favourable long-term prognosis.

## Single centre experience and outcome of minimally invasive assist device implantation up to 28 months

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**Objective:** Avoiding full sternotomy and opening of the pericardium could reduce invasiveness of left ventricular assist device (LVAD) implantation. We present our single centre experience of minimally invasive implantation of the Heartware® VAD (HVAD) up to 28 months.

**Methods:** From July 2012 - February 2016, 26 patients [mean age 52 ± 14 years; 25/26 male patients; 21/26 ischaemic and dilated cardiomyopathy; Interagency Registry for Mechanically Assisted Circulatory Support (INTERMACS) Level I/II: 8/26, III/IV: 18/26] underwent minimally invasive HVAD implantation. Apical cannulation was performed via left lateral minithoracotomy. In 22 patients the outflow graft anastomosis to the ascending aorta was done via a right minithoracotomy in the second intercostal space; 4 patients received an anastomosis to the descending aorta because of redo-operations. All extracorporeal membrane oxygenations were implanted percutaneously. Due to reduced right heart function, 12 patients were treated with temporary right ventricular assist devices (RVAD) implanted through left minithoracotomy. Three patients had concomitant surgery: TAVI in 1 patient and DOR procedures in 2 patients.

**Results:** The minimally invasive approach was feasible in all patients. Three patients died within 30 days due to cardiac related complications (n=2) and cerebral bleeding (n=1). Nine patients were successfully weaned from RVAD with an average time on the device of 17 days. Overall survival was 79% and 66% after 6 and 12 months, respectively. Comparing INTERMACS level III/IV vs. I/II, the overall survival was 91% vs. 51% after 6 months and 77% vs. 38% after 12 months. Patients treated without temporary RVAD showed a superior outcome compared to patients treated with temporary RVAD. Two patients were successfully transplanted.

**Conclusions:** Minimally invasive LVAD implantation is feasible and safe. We believe in a better preservation of right ventricular function using this approach. In addition, the sternum remains intact in case of further cardiac surgery.

## Optimisation and mid-term clinical outcome of minimally invasive direct coronary artery bypass grafting

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**Objectives:** Minimally invasive direct coronary artery bypass grafting (MIDCAB) is an established treatment for single vessel disease of left anterior descending artery (LAD). With this study, we present our single centre experience of 92 patients, who underwent MIDCAB procedures (2004 - 2015).

**Methods:** In-hospital management, early postoperative outcome and follow-up data set of up to 11 years were analysed. In the beginning endoscopic harvesting of left internal mammary artery (LIMA) was performed by using the robotic DaVinci-System (74% of all cases). During the more recent cases manual IMA harvesting was preferred. Median follow-up was 57 months (1 - 134) with a 96% completeness of follow-up and an overall survival of 98%.

**Results:** Mean age at time of operation was  $59 \pm 10$  years, 85% of patients were male and mean SYNTAX score was  $17 \pm 4$ . All patients were operated off-pump and anastomoses were performed via antero-lateral minithoracotomy. Mean overall operation time was  $209 \pm 33$  and  $180 \pm 33$  minutes in the DaVinci-group and non-DaVinci-group, respectively ( $p < 0.05$ ). Forty-eight percent of patients were extubated in the operating room following surgery. Only 18% of the patients needed blood transfusions. Median duration of postoperative hospital stay was 6 days (3 - 47). There was no in-hospital mortality. Early-postoperative complications were occurrence of rib fracture ( $n=2$ ) and need of reoperation due to thoracic hernia ( $n=1$ ). Twenty-eight patients received PCI prior to or following MIDCAB. Of these, PCI was performed in a planned staged hybrid approach in 13 cases. Except for 1 case, PCI was done before MIDCAB. Two patients needed a LAD-reintervention because of recurrent angina pectoris at 28 and 124 days after the index procedure.

**Conclusion:** The non-DaVinci-MIDCAB shows lower logistic effort, shorter operation time and similar results compared to robotically-assisted MIDCAB. MIDCAB is an alternative to PCI in complex LAD lesions with low incidence of reinterventions and postoperative morbidity or mortality. Hybrid procedures of MIDCAB plus PCI may be adequate in selected cases of multi-vessel coronary disease.

## Carotid artery stenting: Is this a good alternative to carotid endarterectomy?

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**Objectives:** The surgical treatment (endarterectomy) of carotid artery disease has an effect in reducing annual incidence of stroke in patients with critical stenosis and symptomatic patients. More recently, stenting has become an alternative to conventional surgical treatment. Many trials have shown inconsistent results between angioplasty vs. open surgery and, to our knowledge, there is no data about carotid artery stenting results in Brazil. Our aim is to report our experience in carotid stent implantation, evaluating the composite end point: mortality, incidence of cerebrovascular accident (CVA) and myocardial infarction (MI) up to 30 days after de procedure.

**Methods:** Retrospective analysis of a database of consecutive patients submitted to endovascular treatment of carotid disease by 1 group in Brazil, in 2 institutions (June 2011 - December 2015). The results were analysed during the procedure and up to 30 days postoperative. Primary outcomes: Any stroke, myocardial infarction, or death during this period.

**Results:** Ninety-five stents were implanted in 91 patients. Of these, 60 were male, and 31 were female, with 4 patients having bilateral stenting. The incidence of stroke during the procedure, and up to 30 days after, was 1.05% and there was no MI or death in this series. In 30 days, all patients were without neurological deficit.

**Conclusions:** Endovascular treatment with carotid stenting and distal protection device of critical carotid stenosis has shown excellent results in our centres, and should be considered as an alternative to conventional carotid endarterectomy.

## Endovascular correction of thoracoabdominal aneurysms

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**Objectives:** Thoracoabdominal aneurysms are one of the most challenging diseases for the cardiovascular surgeon. Conventional open surgery remains the gold standard but the mortality and the morbidity are still high. Just a few centres of excellence with high volume are able to achieve good results. The endovascular treatment with customised or "off the shelf" endoprosthesis emerge as an alternative. We report our initial experience with endovascular treatment in patients with thoracoabdominal aneurysms.

**Methods:** In the period 15 June 2012 - 31 July 2015, 9 patients which presented with thoracoabdominal aneurysms were consecutively treated by total endovascular therapy, with fenestrated/branched customised or "off the shelf" endoprosthesis. The fenestrated/branched endoprosthesis was used to revascularise the 4 visceral branches segment (celiac trunk, superior mesenteric, right and left renal arteries). It was delivered by right and/or left femoral arteries. The fenestrated/branched devices were implanted retrogradely and the bridging stents were inserted by femoral or left axillary artery.

**Results:** The average time of hospitalisation was 5 days. There was 1 death (11%) and no paraplegia up to 42 months follow up. One patient presented with paraparesis 14 days after procedure which reversed spontaneously when the blood pressure was increased. Angiotomography was



performed in all the patients. It showed a type II endoleak and increasing diameter of the abdominal aneurysm in 1 patient, which was treated by endovascular embolisation with onyx. All other devices were well placed, without endoleaks, and every branch patent, with the exception of 1 internal branch thrombosed for one left renal artery.

**Conclusions:** In this initial experience the endovascular treatment of thoracoabdominal aneurysms showed to be feasible, safe and effective in the short and middle term. There was 1 death, no paraplegia or renal insufficiency. One patient developed occlusion of one left renal inner branch and another one had a type II endoleak treated. This new treatment modality is an alternative to conventional surgery.

## Endovascular treatment of the ascending aorta: The last frontier

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**Objectives:** Endovascular treatment has broadened aortic therapeutics and some of them have been validated and standardised, such as endovascular treatment of the abdominal (EVAR) and descending thoracic aorta (TEVAR), and even the aortic arch. However, the ascending aorta represents a challenge, with open surgery still being the gold standard. The endovascular option has been proposed in very limited and selected patients. We report our initial experience with endovascular ascending aorta repair.

**Methods:** May 2009 - March 2014, TEVAR of the ascending aorta were performed consecutively in 12 patients. There were 6 patients with acute type A dissections treated, 4 with pseudoaneurysm, 1 with true aneurysm and 1 with intramural hematoma.

**Results:** There were no in hospital or 30 day deaths. There was 1 late (16 month) death related to open surgery for endograft removal to treat a persistent type I endoleak. There were 3 concomitant planned percutaneous coronary interventions and 2 patients needed chimney technique. In the follow up, up to 5 years, there is no device related complications.

**Discussion:** We present the criteria of patient selection and the planning of the procedures. We also discuss the anatomical, technical and physiological challenges, as well as the potential complications.

**Conclusions:** Our initial results suggest that the endovascular treatment of the ascending aorta is feasible in selected patients, including type A acute aortic dissection (proof of concept). There are still many limitations in this segment of the aorta and several technical challenges should be addressed. We will need dedicated devices, clinical trials and long-term follow-up to confirm the safety and efficacy of this novel therapy.

## Total percutaneous access for endovascular treatment of aortic diseases

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**Objectives:** Endovascular treatment has been the first option for many thoracic and abdominal aortic diseases in the last years. The access is usually the surgical exposure of the common femoral arteries to introduce the delivery system. Recently the "preclosing technique" with vascular closure devices for bigger sheaths allows a total percutaneous approach as an alternative to surgical cutdown. Our aim is to evaluate a series of patients submitted to endovascular treatment of aortic diseases with total percutaneous repair using vascular closure device (PercloseR-Abbott).

**Methods:** Registry of 75 consecutive patients submitted to percutaneous endovascular procedures, using 247 PercloseR to treat aortic diseases (November 2013 - August 2015). The puncture site was evaluated by angiotomography in order to identify the bifurcation level, the size and the grade of calcification of the common femoral artery. In sheaths 12 F, or bigger, 2 PercloseR were pre-loaded. All the patients underwent angiotomography in the postoperative period to evaluate the aortic correction and the access site.

**Results:** All the 247 vascular closure devices (PercloseR) were successfully inserted. There were 2 acute arterial occlusions (2.6%) in the access site diagnosed at the end of the operation. Both patients had more than 50% calcified femoral artery, used sheaths 20 F or more and were operated immediately with common femoral artery exposure and bypass with good results. This occurred early in our experience. There was just one late complication (1.3%). An asymptomatic small pseudo aneurysm (4mm) was detected in an angiotomography and is being followed with no increase in size. There were no other acute, or late complications.

**Conclusions:** Our initial experience shows that total percutaneous endovascular repair (PEVAR) of aortic diseases with the use of 2 pre-loaded vascular closure device (PercloseR) is safe and effective. There is a high rate of success and few complications in well selected patients. It is a good, less invasive alternative to surgical cutdown of the femoral arteries.

## Non-occlusive, self-homing deployment of durable TAVIs in compliant aortic roots: A proof of concept study

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#Strait Access Technologies (SAT), Chris Barnard Building, Faculty of Health Sciences, University of Cape Town, Observatory, South Africa

**Objective:** As a disease of poverty and poor socio-economic circumstances, rheumatic heart disease (RHD) is prevalent in the developing world. Recent estimates suggest an annual need of 200 000 valve replacements in Africa alone in largely young patients with limited access to open heart surgery. Inspired by the success of closed mitral valvotomy (CMV) half a century ago, we developed a non-occlusive, self-homing trans-apical delivery system for an "easy-to-perform" trans-catheter aortic valve replacement under suboptimal conditions prevalent in non-industrialised countries.

**Methods:** The valve deployment system consisted of a non-occlusive “hollow-balloon” with integrated balloon-based annular location and stabiliser concepts. Gradients across 2 different sizes (23 and 26mm) of the non-occlusive delivery systems were determined during the deployment of SAT’s polymeric TAVI valve before final deployment tests (n=12) were performed in-vivo using a trans-apical access in the sheep model.

**Results:** The orifice areas for the self-sustaining hollow-balloons were 1.4cm<sup>2</sup> and 2.2cm<sup>2</sup> for the 23 and 26mm deployment systems, respectively. Successful annular location was achieved in n=9/12 animals (75%) and successful deployment of the SAT TAVI valves in the optimal position was accomplished in n=7/12 animals (58%). The average deployment time (measured from balloon expansion to balloon collapse) was 54.6 ± 11.5 seconds. Correspondingly, the mean gradients during the entire deployment time were 19.4 ± 9.3mmHg, with peak gradients of 32.0 ± 6.5mmHg. On transoesophageal echo, the mean annulus size of the compliant aortic roots was measured to be 20.3 ± 2.1mm. Oversizing of 18.7 ± 8.7% was applied in order to assure a firm, non-leaking TAVI seat.

**Conclusion:** We could successfully demonstrate the feasibility of non-occlusive, self-homing and root-stabilising transapical deployment systems for transcatheter aortic valve replacements. In analogy to the successful use of trans-apical CMV in developing countries, transcatheter aortic valve replacement may offer life-saving surgeries for the large number of rheumatic patients who have no access to cardiac surgery.

## The SternaLock 360 First-in-Man study: A prospective, randomised controlled trial of a novel device for sternal closure

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**Objective:** Sternal closure in patients with poor bone quality represents a challenge. We evaluated sternal healing and outcomes following closure with a novel device specifically designed for patients with poor bone quality.

**Methods:** This prospective, single-blinded trial (NCT02686099) is a First-in-Man study (n=50) of a sternal closure device that combines a polymer coated, titanium band for approximation with rigid plate fixation into a single implant (SL360). Patients undergoing elective cardiac surgery, following a median sternotomy, were randomised at the time of sternal closure to either SL360 or wire cerclage (WC). The primary endpoint, sternal healing, was evaluated using validated methods with computed tomography. Sternal complications, pain (VAS) and functional outcomes were also collected at 1 month, 3 months and 6 months.

**Results:** Between July and November 2015, 15 patients were randomised to SL360 (n=8) or WC (n=7). Patients were well matched for baseline demographics. Isolated CABG was performed in 62.5% of SL360 patients and 85.7% of WC patients (p=0.569). Sternal closure was achieved using Figure of 8 (WC) or 3 SL360 implants (SL360). Intra-operative bone quality assessment demonstrated poor sternal bone in 37.5% of SL360 patients and 28.6% of wire cerclage patients (p=1.0). At 1 month, there was a trend towards less pain in SL360 patients. More SL360 patients reported no pain at rest (100% vs. 57.1%, p=0.192) and after forced coughing (71.4% vs. 28.6%, p=0.286) compared to WC patients. Upper extremity functional scores were improved in SL360 patients compared to WC patients (78.9 ± 1.9 vs. 72.0 ± 5.4, p=0.016). CT scans at 3 months demonstrated sternal approximation and stability. There were no sternal complications or reoperations in either group.

**Conclusions:** Early results from this First-in-Man study of a novel sternal closure device demonstrated safety, sternal stability, and reduced pain. Six month follow-up is ongoing.

## Complication of the short bars in the Nuss procedure for repair of pectus excavatum

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**Purpose of the study:** I am presenting a complication to the use of the “short bar technique.” This is a discussion of 2 cases. The first case returned after 6 years, complaining of a depression of the left hand side. The second returned after one year with the same complaint. In both cases the patients were very happy after the initial operations, but less so after a few months. Both cases had the procedure repeated with longer bars being inserted.

**Results:** This is a report of 2 cases where the use of the short bar technique has led to a sub-optimal long-term cosmetic result. Insertion of new bars worked well in the one patient, but less so in the other.

**Conclusion.** The short bar procedure is not without complications (as with any operative procedure).

## Familial atrial myxoma: Three related cases at an Australian tertiary institution

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Carney complex accounts for up to 2 thirds of familial cardiac myxoma. It is a rare autosomal dominant syndrome, which is also characterised by multiple mucocutaneous lesions and endocrine tumours. We report on 3 first-degree relatives who underwent surgical resection at the same Australian tertiary institution for 4 instances of left atrial myxoma over a 6 year period. Patient medical records were reviewed retrospectively. A family pedigree across 3 generations was constructed, based on personal communications with the patients. In this context, the role of interval surveillance, family screening and genetic testing are explored. A comprehensive review of the literature was performed. We recommend interval echocardiographic surveillance for affected individuals and first-degree relatives given the high risk of recurrence and the morbidity and mortality associated with cardiac tumours in any location.

## Sleeve lobectomy vs. lobectomy for stage I or II squamous cell carcinoma: Implication for pulmonary complication and local recurrence

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**Objectives:** The present study is to determine the implication of sleeve lobectomy on postoperative pulmonary complication and local recurrence.

**Methods:** Between 2008 and 2012, 94 patients underwent sleeve lobectomy and 418 patients underwent lobectomy for pathologic stage I or II squamous cell carcinoma. We compared the surgical and oncologic outcomes between the 2 groups, 4.1% in the lobectomy group and 6.4% in the sleeve lobectomy group. The incidence of stump recurrence was not significantly different between the 2 groups ( $p=0.405$ ).

**Results:** In total, 114 (22.3%) patients had pulmonary complications. Among them, prolonged air leakage (10.5%) and pneumonia/ARDS (9.2%) were the 2 most frequent pulmonary complications. Overall incidence of pulmonary complication was 22.7% in the lobectomy group and 20.2% in the sleeve group. There was no significant difference between the 2 groups ( $p=0.596$ ). The rate of pneumonia/ARDS were significantly higher in the lobectomy group compared to the sleeve resection group. While therapeutic bronchoscopic toileting was more frequently performed in patients undergoing sleeve resection. The 30 and 90 day mortality was 1.8% ( $n=9$ ) and 3.7% ( $n=19$ ), respectively, and there was no significant difference between the 2 groups.

**Conclusions:** The incidence of postoperative pulmonary complication and local control rate after sleeve lobectomy was comparable to that of lobectomy in patients with stage I or II squamous cell carcinoma.

## Topical vancomycin: A new method of use in cardiac surgery

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**Background:** Sternal wound infections are associated with increased morbidity and mortality. Infections result in prolonged hospital stay and may raise hospital costs. There is growing interest in the local delivery of antibiotics. The aim of this study is to evaluate the effect of topical vancomycin applied to the sternal edges in conjunction with peri-operative cefazolin 2gr intravenously every 8 hours (on induction of anaesthetic and continuing for 48 hours).

**Methods:** In our centre 233 patients, (mean age  $64 \pm 12$  years, Male 70%, BMI  $1.8 \pm 0.2$ , Mean Euroscore I: 6, Mean NYHA II) undergoing cardiac surgery (February 2015 - February 2016) had topical vancomycin (2gr in 2.5ml of normal saline) applied to the sternal edges, at the opening of the chest and again at the closure of the sternum. We applied the vancomycin after the normal bone wax. The inclusion criteria were one of the following: CABG, combined procedures, diabetes and redo surgery.

**Results:** We observed one deep sternal wound infection (0.4%), in a patient with a long ICU stay. Superficial wound infections developed in 9 patients (3.8%) who were immediately treated with oral antibiotics, with the resolution of the problem. Six patients (2.5%) received surgical revision for bleeding but none of them had sternal wound infections.

**Conclusion:** We observed that topical vancomycin, in combination with peri-operative cefazolin, was associated with a very low incidence of sternal wound infections. In light of that, we suggest the use of topical antibiotic in all patients undergoing cardiac surgery procedures.

## Comparative analysis of autonomic heart regulation in the early postoperative period after CABG

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**Objectives:** There are few data in the literature comparing the functional status of the cardio-vascular system in settings of different modes of revascularisation: thrombolysis (TL), coronary stenting (PCI) and coronary artery bypass (CABG). In this study we investigate the features of autonomic cardiac control (ACC) in patients with coronary artery disease (CAD) in the early postoperative period.

**Methods:** To evaluate ACC we used heart rate variability (HRV): SDNN (ms) to evaluate total variability and rMSSD (ms) to evaluate vagus activity. Data for TL and PCI are taken from the literature in settings of acute coronary syndrome or stable angina. The CABG group consists of 26 patients with multivessel (2 - 4; mean 3 arteries affected) CAD. HRV is studied just before revascularisation and at the end of first postoperative week.

**Results:** Mean values in these 3 modes of revascularisation are: (1) preprocedural - for TL ( $n=29$ ): SDNN= $89.9 \pm 6.5$ , rMSSD= $72.4 \pm 8.1$ ; for PCI ( $n=32$ ): SDNN= $85.1 \pm 6.7$ , rMSSD= $61.9 \pm 5.9$ ; for CABG ( $n=26$ ): SDNN= $43.7 \pm 30.4$ , rMSSD= $25.7 \pm 24.5$ . (2) controls - for TL: SDNN= $94.7 \pm 4.9$ , rMSSD= $63.5 \pm 10.1$ ; for PCI: SDNN= $100.1 \pm 4.7$ , rMSSD= $69.4 \pm 6.2$ ; for CABG ( $n=26$ ): SDNN= $20.7 \pm 15.9$ , rMSSD= $17.1 \pm 18.5$ . In TL and PCI SDNN significantly ( $p<0.005$ ) increases from preprocedural to control value, and it is a sign for moderate prevalence of sympathetic activity with a tendency towards adaptation of functional status of cardiovascular system (CVS). This tendency is best seen in PCI, where the change of rMSSD significantly ( $p<0.005$ ) points towards vagus activity. In CABG there is a significant ( $p<0.00$ ) descending trend of SDNN even in low starting levels, which means high and uprising sympathetic activity.

**Conclusions:** In patients with multivessel CAD, after CABG in early postoperative period, there is not functional adaptation of CVS at the same level which is observed in patients treated with TL and PCI.

## T wave alternans in the electrocardiogram associated with coronary artery bypass grafting (CABG)

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**Introduction:** T wave alternans (TWA) in the ECG is an electrophysiological phenomenon, a proven risk factor for occurrence of malignant arrhythmias and cardiac death. The TWA are microvolts, invisible to the naked eye, and can only be detected by a computer ECG analysis.

**Materials/method:** ECG recordings of patients who had undergone CABG were collected at the City Hospital of Sofia: number of patients 20 (men 95%, age  $64.4 \pm 8.4$ ). The recordings are pre- and post-surgery, from 2 - 10 days postoperatively. The method of Bortolan and Christov was used for the detection of episodes of TWA.

**Results:** TWA episodes were detected  $2.5 \pm 2.8$  times in the pre-operative group and  $3.8 \pm 3.4$  times in the postoperative group ( $p=0.080\%$ ). Comparing TWA\_pre with TWA\_post, there is a clear upward trend.

**Discussion:** The increase of the TWA\_post episodes compared to TWA\_pre was neither due to the patients' age, nor to the number of bypasses. A fading away effect – reduction of TWA\_post related to the days passed from the coronary artery bypass surgery was not observed at a sufficient rate. The increase of TWA episodes, after coronary bypass surgery, raises the risk of occurrence of malignant arrhythmias. Possible explanation of the TWA\_pos increase is the high volumes of intravenous fluid – an accompanying effect of the surgery. Dependence between the TWA and the intravenous fluid was detected in post-haemodialysis patients having lower intravenous fluid, compared to pre-haemodialysis. The increased post surgery risk (indicated by an increase of TWA\_post) contradicts to previous studies, which have found an improvement in the patient's condition, expressed by the heart rate variability after coronary artery bypass surgery.

**Conclusion:** We tend to assume that the TWA\_post increase is an effect of the high volumes of intravenous fluid and post-surgery trauma. We speculate that this effect will fade away a month or more after surgery, and we intend to conduct such research in the future.

## Valve sparing excision of left atrial myxoma originating from mitral annulus

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We present a case of a 64-year-old female presenting with a spherical mass in left atrium with dimensions  $15 \times 15$ mm, originating from anterolateral commissure of mitral valve annulus.

The patient was operated with median sternotomy approach using heart-lung machine with standard aortic and bicaval cannulation. The approach to the left atrium was through interatrial groove which provided excellent exposure of the tumour and mitral valve. The tumour was attached on a narrow base to the mitral annulus in anterolateral commissure. We excised the tumour with its attachment, including the annulus, and 5mm from anterior and posterior mitral leaflets. The chordae left from excised segments of the leaflets were preserved and reattached to mitral annulus using 5/0 polipropilen sutures. Four stitches were placed to resuture the commissure and anuloplasty band Medtronic CG Future 28 was placed using 8U stitches to reinforce the mitral annulus. The transoesophageal echocardiography showed competent mitral valve (vena contracta 1.7mm) and mean gradient 4mmHg. The patient was followed up with echocardiography on first and sixth month and on first year, after the operation. These studies revealed competent valve without significant stenosis and regurgitation and no tumour recurrence.

## An assessment of telemetry in predicting clinical decompensation in the inpatient setting: From the Mayo Registry for telemetry efficacy in arrest (MRTEA)

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**Background:** Telemetry is often used in the inpatient setting to help identify and prevent patient decompensation. Our study assesses the utility of telemetry in identifying clinical decompensation.

**Methods:** A retrospective review of all inpatients that experienced a cardiopulmonary arrest (1 May 2008 - 30 June 2014) was performed. Changes in telemetry at 24 hours prior to and immediately preceding cardiopulmonary arrest was recorded. Comparisons were made between subsets of patients that experienced telemetry changes at both time periods and those who did not.

**Results:** A total of 242 patients were included in the study. A minority experienced telemetry changes at both the 24 hour ( $n=75$ , 31.0%) or immediately ( $n=110$ , 45.5%) preceding arrest periods. Of the telemetry changes, the majority were classified as non-malignant ( $n=50$ , 66.7% and  $n=66$ , 55.5% at 24 hours prior and immediately preceding, respectively). No difference in the presence of telemetry changes was seen between ICU and non-ICU patients, patient stratifications based on American Heart Association telemetry indications, and surgical vs. medical admissions. No difference in survival outcomes was noted in patients with telemetry changes immediately preceding and at 24 hours prior to an event ( $n=30$ , 27.3% and  $n=15$ , 20.0%) compared to those without telemetry changes at both time periods ( $n=27$ , 20.5% and  $n=42$ , 25.2%;  $p=0.22$  and  $0.39$ , respectively).

**Conclusions:** Telemetry has limited utility in predicting clinical decompensation in the inpatient setting.

## Experience with veno-venous ECMO in patients with severe ARDS

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**Objectives:** Extracorporeal membrane oxygenation (ECMO) is often the last resort for serious acute respiratory distress syndrome (ARDS) when all non-invasive treatment options have failed to improve the patient's pulmonary condition.

**Methods:** We retrospectively evaluated all patients who underwent veno-venous ECMO in the observation period (2010 - 2012) at our university hospital. Our main focus was in particular the indication, the runtime, the weaning protocol and the outcome.

**Results:** Veno-venous ECMO was performed in 39 cases at our centre in the past 3 years. Twenty-seven patients were men with a mean age of  $53.4 \pm 16.4$  years (range 26.5 - 75.0 years) at the time of ECMO implantation. The mean age for the 12 females was  $44.8 \pm 15.2$  years (range 24.6 - 69.7 years). The main reason for ECMO support was severe pneumonia ( $n=33$ ; 84.6%), in 6 cases multiple traumas were the implantation causes. The middle runtime of the ECMO lay with  $12.7 \pm 10.9$  days (range 0.5 - 46 days). The 30 day mortality was 24/39 (61.5%); the 1 year mortality was 29/39 (74.4%).

**Conclusions:** Our data in this study were comparable to the literature regarding the most favourable timing for the initiation and the weaning of ECMO, as well as the outcome. There are many reports on ECMO therapy from other cardiac centres, nevertheless the role and adequate use of ECMO for patients with ARDS have not been definitively established.

## Inflammatory thoracic aortic aneurysm

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**Objectives:** Aortic aneurysms represent 1 of the major causes of cardiovascular surgery. Their etiology varies greatly based on patient's age and other clinicopathologic determinants. In addition, to common atherosclerotic vascular diseases, an inflammatory etiology, in particular IgG4-related disease (IgG4-RD) has increasingly emerged as a cause of dissecting inflammatory aortic aneurysms (IAA).

**Methods:** To assess the frequency and types of IAA, we reviewed all cases of aortic aneurysms resected at our Erlangen Heart Centre (2000 - 2013). Three-hundred-and-seventy-six patients underwent resection of aortic aneurysms in the study period. These are further categorised as ascending aortic aneurysms (45%), aortic arch aneurysm (2%), descending aortic aneurysm (3%), type A dissection (46%) and type B dissection (4%).

**Results:** Fifteen cases (4%) showed variable lymphoplasmacytic inflammation, thus qualifying as IAA. Affected were 9 females and 6 males (female to male ratio=1.5:1). None was known to have IgG4-RD and serum IgG4 and/or IgG levels (known in 6 cases) were normal. Variable sclerosing lymphoplasmacytic inflammation was seen either confined to the adventitia (peri-aortitis; mainly in males) or extending through all layers (mainly in females). A wide range of IgG4 plasma cells were detected. Lymphoid follicle and variable fibrosis were common, but obliterative phlebitis was not seen.

**Conclusions:** IgG4-rich sclerosing lymphoplasmacytic thoracic aortitis is a constant histological feature of thoracic IAA. Normal serum IgG4 in most patients, predilection for women and absence of other features of IgG4-RD all suggest a tissue-specific localised autoimmunological process and argue against a systemic disorder. The relationship of IgG4-rich lymphoplasmacytic thoracic aortitis in those patients with IAA lacking other organ manifestations or an elevated serum IgG4 level to systemic IgG4-RD remains unclear and merits further studies.

## HIV-infection, cardiovascular risk and vascular endothelial function in a Cape Town study population

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**Objectives:** HIV-infection and antiretroviral treatment (ART) are associated with endothelial dysfunction and increased cardiovascular risk; however, data are lacking in South Africa. This study investigated the association between HIV-infection ± ART, traditional cardiovascular risk factors and endothelial function in adult study participants visiting health clinics in Cape Town.

**Methods:** The study groups were: HIV-negative (HIV-), HIV-positive without ART (HIV+), and HIV-positive with ART (HIV+/ART). Participants were screened for traditional cardiovascular risk factors and endothelial function was assessed by flow-mediated dilatation (FMD).

**Results:** The total population size was  $n=78$  (HIV-,  $n=22$ , HIV+,  $n=17$  and HIV+/ART,  $n=39$ ). Most participants (79%) were of mixed ancestry. A high overall incidence of smoking (59%), increased waist circumference (49%), systolic hypertension (32%), diastolic hypertension (53%), and low HDL-cholesterol (49%) was observed; whereas hypertriglyceridaemia and hyperglycaemia rates were low. Mean GGT levels were significantly higher in the HIV+ groups vs. HIV- ( $p=0.0002$ ), particularly in the treated vs. untreated group ( $p=0.006$ ). Mean systolic and diastolic blood pressure measurements were lower in the HIV+ groups vs. HIV-. Mean HDL-cholesterol levels were higher in HIV+/ART vs. HIV+ ( $p=0.03$ ). The HIV+/ART group showed a 59% increase in mean % FMD vs. untreated ( $p=0.05$ ). Paradoxically, multiple linear regression analysis indicated an inverse association between HDL-cholesterol and FMD% in all groups, and positive associations between LDL-cholesterol, GGT and FMD% in HIV+, although the latter disappeared in HIV+/ART. Fasting glucose was inversely associated with FMD% in HIV- and HIV+ groups, but not in HIV+/ART. Waist-Hip-Ratio (WHR) was inversely associated with FMD% in the HIV- group.

**Conclusions:** Overall, participants presented with high traditional cardiovascular risk factor rates. HIV-infection was associated with higher mean GGT levels and lower blood pressure. ART seemed to improve endothelial function (%FMD) in HIV-infected participants. Although increased WHR and plasma glucose levels were associated with reduced endothelial function in HIV- participants, blood lipids showed mixed associations.

## The evolution to single port VATS lung resection does not compromise surgical standards: A complete audit cycle

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**Objective:** As practices in the approach to anatomical lung resection evolve and new techniques are adopted, evaluation of the quality of resection in primary lung cancer becomes increasingly important. An initial audit assessing both R1 resection rates and lymph node dissection in patients undergoing video-assisted thoracoscopic surgery (VATS) highlighted scope for improvement in our institution. We conducted a repeat evaluation of our VATS anatomical lung resections following the results of our first audit.

**Methods:** All patients who underwent VATS lobectomy or segmentectomy for primary lung cancer (January 2013 - March 2016) were identified. Relevant clinical and pathological data was collected for analysis from a prospectively maintained database, operative notes and histopathology reports. Data was separated into 2 study groups, pre- and post-audit, and encompassed operations performed January 2013 - April 2015 and May 2015 - March 2016, respectively.

**Results:** We identified a total of 320 anatomical lung resections in the study period, 184 patients pre-audit and 136 patients post-audit. Single port VATS comprised the primary surgical approach throughout the study period with similar numbers of cases performed between the groups. Operations performed via multiple port VATS declined in the post-audit group (81 cases vs. 27 cases). There were equivalent rates of R0 resection between the 2 groups (95.1%, pre-audit; 94.9%, post-audit;  $p=0.917$ ). Significant improvements were found in the total number of lymph node stations (mean 3.78, pre-audit; 4.41, post-audit;  $p=0.004$ ) and number of N2 stations sampled intra-operatively, with most cases having  $\geq 3$  N2 stations in the post-audit group (41.3%, pre-audit; 65.2% post-audit,  $p<0.001$ ).

**Conclusion:** Evaluation of operative practices and completion of the audit cycle can bring about positive change, improving surgical standards. With increased awareness and training, the universal adoption of single port VATS in our institution has produced superior operator outcomes.

## Apixaban for postoperative nonvalvular atrial fibrillation in cardiothoracic surgery: Short-term results

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**Objectives:** Apixaban was recommended by NICE Guidelines in 2013 as an option for preventing stroke and systemic embolism in nonvalvular atrial fibrillation (AF). This study reviews short-term outcomes in patients with postoperative AF treated with apixaban in both cardiac and thoracic surgery.

**Method:** Prospective analysis of all patients treated with apixaban in the immediate postoperative period after cardiothoracic surgery in our centre (September 2015 - March 2016) ( $n=26$ ).

**Results:** The majority of patients had cardiac surgery ( $n=21.81\%$ ). Cardiac procedures include CABG and aortic valve replacement with a biological prosthesis (11 patients, 52%). The indication for starting apixaban was AF in the immediate postoperative period (first episode in 77% of the cases, and previous paroxysmal or permanent AF in 23% of the cases). Ninety-two percent of patients were not anticoagulated prior to surgery. Mean hospital stay after starting apixaban was 5 days (range 0 - 20 days). Ten patients (38%) were discharged in sinus rhythm, with the remaining still in AF (62%,  $n=16$ ). On review, at 6 weeks after discharge, apixaban was stopped in 23% of patients as they were back in sinus rhythm. The remaining patients (77%,  $n=20$ ) continued the anticoagulation with apixaban. No major bleeding, stroke or embolic complications were reported, however 2 patients (8%) reported minor bleeding (haematuria and nose bleed) which resolved on stopping apixaban.

**Conclusions:** Apixaban is shown to be a safe alternative to warfarin in the immediate treatment of postoperative AF in cardiothoracic surgical patients, even in those with a biological prosthesis. No major adverse outcomes were reported in our small group of patients. Apixaban also reduced the length of stay compared to warfarin, as there is no need to stabilise INR prior to discharge.

## Incidence of peri-operative myocardial infarction following coronary artery bypass grafting (CABG)

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**Introduction:** Myocardial infarction, following coronary artery bypass grafting, is a serious complication and one of the most common causes of peri-operative morbidity and mortality.

**Aim of the study:** To determine the incidence of peri-operative myocardial infarction and to detect predictors, in hospital and 30 day clinical outcome related to peri-operative myocardial infarction by using hs-TnI and evaluate the utility of adding to the troponin criteria new Q waves or imaging evidence of new wall motion abnormality, as suggested in the Universal Definition of MI.

**Methods:** The study enrolled 250 consecutive patients which underwent isolated CABG at the National Heart Institute, Cairo, Egypt and Benha University Hospital, Benha, Egypt (November 2013 - May 2014), thus 6 months. A threshold of 700ng/l (10 times 99th percentile upper reference limit) of hs-TnI was set in addition to ECG and/or echocardiographic evidence of new wall motion abnormalities.

**Results:** Peri-operative MI was reported in 11% of patients after CABG with worse in hospital and 30 day clinical outcome. The study showed that, Body Mass Index, prior heart failure, EuroScore, Left main coronary artery stenosis  $>50\%$ , lesion type, % diameter stenosis and length, Aortic cross clamping time and Extracorporeal circulatory time were significant independent predictor of peri-operative MI,  $p<0.05$ . Peri-operative MI was associated with increased risk of arrhythmias, heart failure and death.

**Conclusion:** Peri-operative myocardial infarction is an important adverse event with worse clinical outcome after CABG.



## Pregnancy outcome in women with mechanical prosthetic heart valves treated with unfractionated heparin (UFH) or enoxaparin

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**Objective:** This study was carried out to determine the maternal (including thromboembolic and haemorrhagic complications) and foetal outcomes (including miscarriage, stillbirth, baby death and live birth) in women with mechanical heart valves managed with therapeutic doses of unfractionated heparin (UFH) vs. enoxaparin during pregnancy.

**Methods:** This is a prospective comparative, nonrandomised study. Pregnant women, with mechanical heart valves, presenting to the high-risk pregnancy unit of Benha University Hospital, Egypt were treated with UFH 15 000U/12 hours vs. enoxaparin 1mg/kg SC/12 hours during pregnancy and the results were analysed.

**Results:** Forty pregnant women were included in the study. In 20 pregnant women, anticoagulation was with UFH, and 20 pregnant women received enoxaparin. One (3 %) thrombotic complication occurred with enoxaparin treatment. Noncompliance, or sub therapeutic levels, contributed to the outcome in this case. Antenatal haemorrhage occurred in 4 (10%) and postpartum haemorrhagic complications in 5 (12.5%) pregnancies. Of the 32 pregnant women who continued after 20 weeks' gestation, 100% (17/17) of the women taking predominantly UFH had a surviving infant compared with 93% (14/15) of the women taking primarily enoxaparin ( $p=0.25$ ). One intrauterine foetal death occurred in the enoxaparin group. There was no significant difference in the live birth rates between the 2 groups ( $p=0.31$ ).

**Conclusions:** Compliance with therapeutic dose of UFH during pregnancy in women with mechanical heart valves is associated with a low risk of valve thrombosis and good foetal outcomes, but meticulous monitoring is essential.

## The role of arteriovenous shunt on increased prevalence of unexplained pulmonary hypertension in haemodialysis patients

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**Background:** Recent studies have shown a high incidence of unexplained pulmonary hypertension (PHT) in end-stage renal disease (ESRD) patients with, or without, haemodialysis (HD) therapy. The aim of this study was to evaluate the prevalence of unexplained PHT among patients with ESRD on regular HD and possible role of arteriovenous (AV) shunt as an etiological factor.

**Materials/methods:** We enrolled 80 consecutive patients with ESRD on regular HD via AV shunt. Forty random chronic kidney disease (CKD) (pre-dialysis) patients were taken up as a control. All patients underwent transthoracic echocardiography to assess the pulmonary artery pressure and cardiac output (CO). Pulmonary hypertension was defined as pulmonary artery systolic pressure (PASP) greater than 35mmHg at rest. In HD patients with PHT, we reassessed CO and PASP before, and after, 1 minute of temporary compression over the AV shunt.

**Results:** Patients on HD had higher PASP in comparison to the control group. Out of 80 HD patients studied, 16 patients (20%) had PHT ( $PASP=46 \pm 2$  mmHg) while the rest had a normal PASP ( $29 \pm 1$  mmHg) ( $p<0.0001$ ). HD patients with PHT had significantly longer duration of dialysis ( $p<0.001$ ), Higher CO in comparison to patients with no PHT ( $p<0.05$ ). During AV shunt compression, the mean CO significantly decreased from ( $9.256 \pm 1.7538$ ) L/min to ( $7.775 \pm 1.7842$ ) L/min ( $p<0.001$ ) and the mean PASP significantly decreased from ( $59.1644 \pm 17.28545$ ) mmHg to ( $49.6300 \pm 14.91912$ ) mmHg ( $p<0.001$ ).

**Conclusion:** Our study demonstrated a high prevalence of PHT among patients with ESRD receiving long-term HD with surgical AV shunt. Both ESRD and long-term HD may be involved in the pathogenesis of PHT by effecting pulmonary vascular resistance and CO. Pathological elevation of PAP occurs in those patients whose pulmonary circulation cannot compensate for AV access-related high CO. This unrecognised complication of HD therapy is not uncommon.

## Early outcomes of the arterial switch operation in children of more than 1 month of age

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**Objectives:** Though results of arterial switch operation (ASO) in children presenting early have been encouraging, late presenters continue to pose a challenge. This study therefore aims to evaluate the early results ASO in such children, more than 1 month of age.

**Methods:** Records of 488 patients undergoing ASO (1 January 2005 - 30 April 2016) at All India Institute of Medical Sciences (AIIMS), New Delhi, India, were analysed. They were divided into 3 groups, group 1 [TGA with intact ventricular septum (IVS)], group 2 (TGA with VSD) and group 3 (Taussig-Bing Anomaly).

**Results:** Of the 488 children reviewed, records of 470 were available. A total of 268 (57%) had associated VSD, 183 (37.9%) had intact IVS and 24 (5.1%) presented with DORV. Other associated conditions found were left ventricular outflow obstruction (10/470, 2.1%), coarctation of aorta (3/470, 0.6%), right ventricular outflow obstruction (3/470, 0.6%), pulmonary stenosis (2/470, 0.4%), aortopulmonary window (1/470, 0.2%), total anomalous pulmonary venous drainage (1/470, 0.2%) and hypoplastic aortic arch (1/470, 0.2%). Overall early hospital mortality was 11.7% (55/470). In group 1, 2 and 3 early hospital mortality was 10.7% (19/178), 13.1% (35/268) and 4.2% (1/24) respectively. ECMO was instituted in 8.9%

(42/470) patients. Requirement of ECMO was significantly higher ( $p < 0.005$ ) for children having IVS (38/42 i.e. 90.5%) than for children having VSD (4/42 i.e. 9.5%). On detailed evaluation the possible incriminating risk factors for deaths, in such children, presence of associated conditions such as arch abnormalities, presence of CoA, preoperative infections were found.

**Conclusion:** In developing countries, late presentation of TGA is not uncommon. However, acceptable results can be obtained in these patients.

## Factors determining early outcomes after the bidirectional superior cavopulmonary anastomosis

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**Objective:** Glenn (BDG) procedure is an established procedure for palliation of single ventricle (SV) anomalies.

**Methods:** Two-hundred-and-fifteen consecutive children, with variable SV pathologies, underwent BDG (2003 - 2013). Clinical records were reviewed retrospectively. Chi square and Student t-test was used to analyse the data.

**Results:** There were 155 males; mean age and weight at surgery was 5.29 months and 5.2kg respectively. Seventy-eight (36%) had double outlet right ventricle, d-transposition of great arteries in 17, heterotaxy in 5, tricuspid atresia in 87, pulmonary atresia in 16, isomerism in 8, SV in 37, mitral atresia in 5, double inlet left ventricle in 5, hypoplastic left heart syndrome in 9, Ebstein's anomaly in 5, dextrocardia in 21 (9.86%). Mean left and right pulmonary artery diameters were 6mm and 7mm respectively. One-hundred-and-seventy-three (80%) had cardiac catheterisation. Thirty-four underwent occlusion of aortopulmonary collaterals before BDG. One-hundred-and-sixty-two (77%) received unilateral and 45 bilateral BDG, ante grade flow was closed in 199, it was left open in 15. 178 of BDG was done on-pump 23 on off-pump, median CPB time was 47 minutes. Concomitant procedures were [LPA plasty - 28, atrial septectomy - 15, AVV Repair 12 (5%) PAPVC repair - 4 (1%)]. Thirty-seven percent of patients had postop saturation of 90%. Five (2.4%) patients died. Mean Glenn pressure was 14, inotropic score and Vasotropic Inotropic Score was 1.64 and 2.2. Mean drain output was 140ml, diaphragmatic fenestration was done in 1 patient, 2 patients needed tracheostomy, chylothorax in 9 (4.31%). Mean ICU stay was 24 hours and duration of hospital stay was 7.1 days, on discharge saturation was 90% mean, follow up saturation was 92%. Follow-up cardiac catheterisation was available in 123 (64%), 33% of patients underwent completion Fontan, and 135 patients are awaiting fontan.

**Conclusions:** BDG procedure can be performed in late presenters. Age at presentation, pulmonary artery size, vasoactive inotropic score was not related to mortality.

## Endovascular intervention in a complicated aortic coarctation case

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**Background:** Aortic coarctation confirms 5 - 9% of congenital heart diseases. The standard treatment is surgery. With the beginning of balloon angioplasty and the advancement of endovascular interventions, the new treatment options are performed with success. In this case report, we present an endovascular intervention in a 44-year-old aortic coarctation patient.

**Methods:** A 44-year-old patient was admitted to the outpatient clinic with the finding of an arterial pressure difference between right and left upper extremity. He was hypertensive without any other complaints. The laboratory tests were normal. The computed tomography angiography showed stenosis of the beginning of left subclavian artery, coarcted segment with a 4 - 5mm opening at the distal of the left subclavian artery, multilobulated and saccular aneurysm formation at the proximal of the subclavian artery, post stenotic dilatation and increased collateral formation. The increased interval between left common carotis and left subclavian artery was like an interrupted aortic arch anomaly. With the preoperative evaluation the patient was suitable for interventional therapy.

**Results:** Under general anaesthesia, 6F sheath was inserted into the right brachial artery and the angiography (arteriography) of the aorta was performed. The right femoral artery was explored. The 22F, 24 x 152mm sized Medtronic Valiant Thoracic stent-graft was placed here and deployed to close the left subclavian artery entrance. The stenotic segment of the system across the coarcted aorta was observed. It was dilated twice with the Medtronic Reliant stent-graft balloon (AB 46 cm<sup>3</sup>, 12F). No stenosis was observed at the control angiography. The patient was discharged without any problem on the third postoperative day. Control CT angiography was normal at 1 month later.

**Conclusions:** We performed the endovascular intervention with success in this patient. This enabled us to actualise therapeutic option with more ease when compared to more complex standard surgery.

## Successful surgical treatment of Shamblyn Type III paraganglioma

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**Background:** Paraganglioma, formerly known as carotid body tumour, is a rare benign neuroendocrine neoplasm. Surgical resection is a curative therapy in the majority of the patients.

**Methods:** We present a 47-year-old female patient with glomus body tumour. She applied to the hospital with a painless neck mass. She was complaining of dysphagia, headache and hypertensive attacks. Ultrasonography detected a left carotid body tumour. Magnetic resonance angiography (MRA) was performed to investigate the extension of the tumour. The size of the mass which was located at the bifurcation of the left carotid artery was 36 x 45mm in MRA.

**Results:** At operation we observed that the tumour surrounded the carotid bifurcation (Shamblin Type III) and it was extending to the trachea. But, there was no intravascular invasion and metastasis to the lymph nodes. The tumour was gradually removed via dissection at sub adventitial plane. The vascular structures were protected totally and there was no need for revascularisation of internal carotid artery. Cerebral perfusion was monitored with near infrared spectroscopy (NIRS) during the operation. Haemodynamic stability was supported with pharmacological agents. The vagus and hypoglossal nerves were gently separated from the tumour, without causing any damage. The operation was completed with minimal blood loss. The pathological diagnosis was paraganglioma. The patient was discharged from hospital without major clinical problems.

**Conclusions:** The case was of major importance in terms of complete resection of a large carotid body tumour accomplished by the sub adventitial resection technique, without any damage to important nearby structures like cranial nerves and vascular branches.

## Uniportal VATS lung resection: Early experience from a single institution in North America

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**Objective:** Uniportal Video Assisted Thoracoscopic Surgery (U-VATS) is a relatively new technique with very few cases reported from North American institutions. We report our early experience with U-VATS done at a single institution in the United States.

**Methods:** We retrospectively reviewed all elective U-VATS lung resections performed for diagnostic or therapeutic purposes at our institution (January 2014 - December 2015).

**Results:** One-hundred-and-six U-VATS lung resections were performed in 101 patients. The most common indication was proven, or suspected, malignancy (101/106). There were 4 patients with interstitial lung disease and 1 with extralobar sequestration. There were 70 females. Median age was 68 years (range 42 - 89); median FEV1: 87.5 (range 39 - 139) and median DLCO: 79 (24 - 119). Median Charlson co-morbidity score was 6 (0 - 13). One patient had undergone induction chemotherapy. U-VATS was successfully completed in 101 cases (95%). Conversion to a mini-thoracotomy was required in 5 patients. There were 65 anatomical resections, including 12 segmentectomies and 1 bilobectomy. Median size of the lesion was 2.7cm (range 0.5 - 7cm). Tc-99m radiotracer localisation of small nodules and ground-glass opacities was used in 16 patients with 100% success. Median length of stay was 2 days (range 1 - 16) for the entire group and 3 days (range 1 - 16) for anatomical resection subgroup. Median active follow-up time was 299 days (10 - 758). There were no 90 day mortalities. Two patients had reoperations for prolonged air leaks. Median operative time for anatomical resections was 169 minutes (79 - 314). For primary lung cancers, the median number of mediastinal lymph node stations biopsied was 5. One or more in-hospital complications occurred in 11 patients, including 7 with prolonged air-leaks. The 30 day readmission rate was 5.7%.

**Conclusion:** U-VATS lung resections can be safely performed with very low morbidity and mortality. Long-term outcomes including 5 year survival in cancer patients should be carefully monitored.

## Perventricular closure of ventricular septal defects: Single centre experience

**Ivan Tkachev, Mikhail Plotnikov, Alfiya Drozdova, Margarita Tungusova, Sergey Smirnov and Dmitriy Tarasov**

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**Objectives:** To present results of perventricular closure of ventricular septal defects (VSD).

**Methods:** Fifty-five patients with VSD underwent perventricular closure without cardiopulmonary bypass (CPB) under the guidance of transoesophageal echocardiography (TEE) in the paediatric cardiac surgery department (November 2013 - January 2016). Mean age of the patients was  $32.5 \pm 35.5$  months (5 - 175 months). There were 11 children under 1 year; 30 (1 - 3 years) and 14 (older than 3 years). Mean body weight was  $13.2 \pm 8.4$ kg (4.8 - 52.5kg). Defect's size measured by intraoperative TEE was from 4 to 14mm ( $6.01 \pm 1.7$ mm). Most VSDs were perimembranous (52) with only 3 muscular VSDs. Twelve patients had VSD in aneurism. In 5 cases VSD was multiple.

**Results:** Successful closure of VSD was performed in 93.6%. There were 3 conversions due to the underestimating of the size and localisation of the defects. Duration of the procedure was from 25 - 90 minutes ( $45.4 \pm 15.6$  minutes). Mean device size was 1mm more than VSD size measured by TEE. Residual intraoperative shunt has been identified in 42% of patients, at the time of discharge – in 27% and at 3 months after operation (43 patients were examined) in 18.6% (all  $\leq 2$ mm). In most of cases tricuspid regurgitation after operation was the same as before, or less. In 24% cases after operation trivial aortic regurgitation was shown (in 16.3% patients 3 month after; not progressing). Mean duration of mechanical ventilation was  $238.6 \pm 160.5$  minutes (30 - 730 minutes). There were no cardiotonics. Mean stay at hospital was  $6.73 \pm 2$  days (4 - 15 days). There were no intra-operative rhythm disorders. One patient had late complete atrioventricular block 2 months after operation with implanted pacemaker.

**Conclusions:** The method of transventricular closure of VSDs provides excellent cosmetic effects, fast rehabilitation of patients and has a certain place in surgical treatment of VSDs.

## Surgical correction of Carpentier type II mitral regurgitation in children

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**Objectives:** Degenerative mitral valve disease often leads to Carpentier-Type II regurgitation that can appear even at a young age. Mitral valve repair is the treatment of choice for paediatric patients because of the short period of anticoagulation and potential freedom of reoperation. The aim of this study was to evaluate early and intermediate-term results of mitral valve repair in children with degenerative mitral valve disease.

**Methods:** Twenty-one patients with symptomatic severe mitral valve regurgitation from type II Carpentier's functional classification of mitral valve lesion underwent mitral valve repair (January 2011 - January 2016). The mean age and weight of patients were  $10.1 \pm 5.1$  years and  $35.1 \pm 19.4$  kg. A quarter of patients were under 5 years. In addition to chordae elongation and polysegmental prolapse in all patients, 15 (71%) had annular dilation and 1 (4.7%) chordae rupture. Right lateral thoracotomy approach was used in 17 of these patients, and sternotomy in 4 patients.

**Results:** Annuloplasty was performed in 15 patients (71%), posterior leaflet resection in 11 (52%), suture plastic in 7 (33%), Alfieri technique in 2 (9.5%) and chordae transfer, neochordoplasty, sliding plasty technique in single patients. In 75% of patients, a multicomponent approach was applied. Tricuspid valve suture annuloplasty was performed in 5 patients because of associated tricuspid regurgitation. There were no hospital deaths or major postoperative morbidity. Mean follow up was  $23.5 \pm 17.3$  months (3 - 65 months). Two patients (7- and 11-year girls, 9.5%) had immediate mitral valve repair failure and required mitral valve replacement within 30 days after operation. One patient (2-year-old girl, 4.7%) required reoperation during follow-up. In 2 patients mitral valve regurgitation has become moderate to severe.

**Conclusion:** Mitral valve repair with various techniques can be successfully applied in paediatric patients with degenerative mitral valve disease and the frequency of recurrent regurgitation is low.

## Root inclusion technique alleviating wall stress on autograft

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**Background:** Root inclusion technique, as 1 of the 3 techniques for the Ross operation, has been developed for the purpose of preventing extensive dilation and reoperation of the pulmonary autograft. The inclusion cylinder technique, using autologous aortic support, has been reported to have a low rate of reoperation. Compared to autologous support, dacron may function as a better inclusion support. We previously developed a patient-specific model of the Ross operation based on preoperative and postoperative magnetic resonance imaging and compared pre- and postoperative autograft wall stresses. In the current study, we further investigated the ability of Dacron to alleviate wall stress on the autograft.

**Methods:** Pulmonary autograft geometry, obtained from a patient who underwent the Ross procedure in the previous study, was used. Dacron, 26mm in diameter, was attached at the sinotubular junction and the annulus, and the autograft and Dacron were exposed to systemic pressure. Finite element analysis was used to determine wall stress on the autograft wall. The interface between the outer surface of the autograft and the Dacron wrap was defined as cohesive contact to prevent penetration and reduce friction. The stress from the virtual Dacron model was compared to stress in the acute and postoperative models.

**Results/discussion:** The root inclusion technique provides an outer stiff material that constrains the autograft growth to the diameter of the graft. The distensibility of autograft was also confined. Peak stress was determined and compared to the Ross operation without dacron immediately post-operatively. Furthermore, wall stress distribution and magnitude in the dacron-included autograft was described in the 1 year postoperative model as compared to the autograft without Dacron.

## Clinical outcomes after transventricular restrictive mitral valve annuloplasty and transatrial ring annuloplasty in patients with left ventricle restoration

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**Background:** Postinfarct left ventricular (LV) aneurysm associated with mitral valve (MV) regurgitation is resistant to medical treatment and often requires surgical repair. A transventricular approach to the MV in such a patient can enable the surgeon to avoid incision of the right or left atrium, and can provide for safe and reliable surgical intervention.

**Aim:** The purpose of this study is to compare clinical outcomes of transventricular suture annuloplasty and transatrial annuloplasty with a ring in patients with LV restoration.

**Methods:** Between January 2013 and January 2016 we prospectively collected data from a consecutive cohort of 225 patients who underwent CABG with LV restoration. Ninety-five (42.02%) patients with LV restoration and MV repair were included in the study. The method of MV repair was based on the surgeon's decision.

**Results:** Group 1: 53 patients underwent transventricular mitral suture annuloplasty and group 2: 42 patients underwent transatrial mitral ring annuloplasty. There was no significant difference in age, sex, EF, EDV LV between the groups. Complicated postoperative period was observed in 15 (28.3%) patients from group 1 and in 18 (42.9%) from group 2 ( $p=0.031$ ). Postoperative mitral regurgitation was absent, or minimal, in 100% of

cases in both groups; A significant difference was observed between the 2 groups in the length of CPB time ( $107.5 \pm 37.5$  vs.  $133.6 \pm 45.7$ ,  $p < 0.02$ ), cross clamp time ( $51.6 \pm 17.8$  vs.  $68.5 \pm 29.4$ ,  $p = 0.001$ ) and length of ICU stay ( $38.1 \pm 29.1$  vs.  $59.1 \pm 56.9$ ) ( $p < 0.05$ ). No significant difference was found in mortality: 1 (1.9%) patient from group 1 and 1 (2.4%) patient from group 2 ( $p = 0.74$ ). Follow up has commenced in order to evaluate quality of life, durability of MV repair, cumulative survival and this will be available very soon.

**Conclusion:** Clinical outcomes of transventricular restrictive MV annuloplasty seem to be beneficial when compared to conventional MV annuloplasty. Follow up data will enable us to evaluate 2 methods of mitral valve repair.

## Results of Ross procedure in paediatric cardiac surgery. Single centre experience

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**Background:** The Ross procedure has been increasingly used to treat aortic valve (AV) disease in children and young adults. Benefits include the lack of anticoagulation after surgery and the potential growth and durability of the autograft.

**AIM:** The purpose of this study was to determine outcomes of Ross procedure with particular emphasis on survival, complications, and short term and midterm results.

**Methods:** Between January 2011 and January 2016, 1 925 open heart procedures were performed in paediatric cardiac surgery department of our institution. Thirty-nine (2.0%) children have been operated with congenital AV disease. Twenty-seven children (mean age  $11.4 \pm 4.1$  years) underwent Ross procedure. Factors associated with the choice of Ross procedure were lack of coagulation after the surgery, potential growth and durability of the autograft.

**Results:** Ross procedure was performed due to stenosis of AV in 23 (85.2%) cases and due to insufficiency in 4 (14.8%) cases. Twenty-four (88.9%) children have been operated with bicuspid AV. Duration of operation was  $216.1 \pm 30.8$  minutes, ICU stay was  $23.1 \pm 10.3$  hours and hospital stay was  $9.5 \pm 2.8$  days. Necessity of plasma transfusion was registered in 21 (77.8%) cases and blood transfusion in 24 (88.9%) cases. Maximum  $\Delta p$  on autograft was  $7.6 \pm 3.9$  mmHg and no significant regurgitation was determined after the procedure. Absence of 30 day mortality was registered. Twenty-six patients were 26 (96.3%) complication free. Myocardial infarction developed in 1 (3.7%) case.

**Conclusion:** The Ross procedure can be performed with acceptable outcomes with low mortality in children. Results of the follow up will show durability of autograft and freedom of reoperations.

## TAVI vs. surgical aortic valve replacement: Pro and contra

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**Objectives:** The technique of transcatheter aortic valve implantation is becoming highly popular in Western Europe and the United States.

**Methods:** Analysis of present literature about TAVI and various governmental and industry reports about the TAVI technique.

**Results:** European population is aging rapidly and one can expect more than 25 million octogenarians living in the European Union by 2020. In patients above 75 years of age, incidence of aortic stenosis is 13%, and severe aortic stenosis occurs in 3%. In several prospective randomised studies comparing AVR with TAVI, similar operative risk and survival has been demonstrated. Meta-analysis of all studies comparing TAVI vs. surgical AVT demonstrates that:

- Early and late mortality is similar, albeit slightly higher for TAVI (13%, NS)
- Pacemaker implantation is 3.5 times more common in TAVI
- Paravalvular AI is 6.8 more common in TAVI
- Cerebrovascular insult is equal in both groups

Several TAVI studies demonstrate a 2 year survival of approximately 70%, which can be considered adequate in high-risk patient group (>80-years-old, STS risk score >10). Unresolved problems in TAVI:

- TAVI in patients with coronary disease
- High incidence of AV Block: >20% with CoreValve
- Paravalvular aortic incompetence
- TAVI in younger patients (<75 years)
- Peri-procedural embolisation in heart and brain
- Uncertainty regarding long-term functioning of TAVI prosthesis
- Post-procedural anticoagulation?
- Necessity of cardiosurgical stand-by?
- Costs of the procedure

**Conclusions:** Presently surgical aortic valve replacement is preferred in following patient categories:

- Low-risk patients (<70 - 75 years)
- Aortic stenosis with significant coronary disease
- Bicuspid aortic valve
- Aortic incompetence, where valve repair can be possible
- Enlarged ascending aorta (>5cm)
- In absence of significant comorbidities (Cirrhosis Childs B, COPD stage 3/4)
- In patients with significant peripheral vascular disease

## The fate of the aorta late after unifocalisation for pulmonary atresia, ventricular septal defect and systemic-to-pulmonary arteries

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**Objectives:** During unifocalisation procedures for PA with VSD and SPCAs collateral arteries arising from the aorta are either ligated, or detached. Not much is known regarding the fate of the remaining aortic spots in the long-term. Available CT or MR imaging of the (descending thoracic) aorta were examined to investigate possible abnormalities and diameter changes at the former position of the collateral arteries.

**Methods:** From 1989 - 2010, we performed 55 unifocalisation procedures in 33 patients. One-hundred-and-twelve collateral arteries were ligated or detached. In 60% (15) of the surviving patients (with a total of 55 ligated or detached collaterals) sufficient imaging of the aorta from CT (11) and/or MR (9) was available for evaluation.

**Results:** The mean interval between unifocalisation procedure and imaging was 15 years (range 3 - 24 years). In 14 patients (93% of the scanned patients), 18 blunt ends were detected at the location of a former collateral artery. No aneurysm formation of the descending aorta was observed. The mean diameter of the ascending aorta was 35mm (range 24 - 51mm).

**Conclusions:** Aortic imaging late after unifocalisation showed abnormalities in 93% of the scanned patients. Abnormalities consisted mostly of blunt ends of the former collateral artery. Although aortic aneurysm formation was not observed, we recommend to include routine imaging of the aorta during late follow up to detect eventual future abnormalities and monitor aortic diameters.

## Factors that contribute to conversion in minimally invasive cardiac surgery

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**Objective:** This study presents the first comprehensive report on factors that contributed to sternotomy conversions in patients scheduled for minimally invasive robotic enhanced coronary artery bypass- (RE-MIDCAB), aortic valve- (MI-AVS), endoscopic port access atrioventricular valve- (MI-PAAVVS) and left ventricular assist device (MI-LVAD) implantation surgery.

**Methods:** We analysed our institutional minimally invasive cardiac surgery (MICS) database for factors that contributed to sternotomy conversion. In total, 4 471 consecutive patients underwent MICS (1 February 1997 - 31 March 2016) of which 687-, 908-, 2 872- and 4 patients underwent RE-MIDCAB (mean age  $65.7 \pm 10.0$  years, 24.9% female, 7.0% older than 80 years, 1.3% redo-cardiac surgery, 27.7% planned hybrid, 95.9% single internal mammary artery use, 13.4% multi-vessel anastomosis), MI-AVS (mean age  $69.2 \pm 11.3$  years, 45.2% female, 16.7% >80 years, 19.1% body mass index >30, 6.2% redo-cardiac surgery, 98.7% aortic valve replacement), MI-PAAVVS (mean age  $64.1 \pm 13.3$  years, 46.7% female, 7.7% older than 80 years, 12.2% redo-cardiac surgery, 11.0% body mass index >30, 76.0% isolated mitral valve surgery, 28.5% cryo-ablation, 1.7% morrow myomectomy) and MI-LVAD implantation (mean age  $51.3 \pm 16.5$  years, 25% female, 100% bridge to transplant) procedures respectively.

**Results:** In total, sternotomy conversion was required in 26 (3.8%), 28 (3.1%) and 86 (3.0%) of RE-MIDCAB- (including lung adhesions 1.4%, inadequate exposure 0.2%, internal mammary artery dysfunction 1.2%, anastomosis dysfunction 0.5%, arrhythmia 0.2%), MI-AVS- (including porcelain ascending aorta 0.4%, inadequate visualisation 0.3%, intra-operative complications 2.3%) and MI-PAAVVS- procedures (including lung adhesions 1.2%, inadequate visualisation 0.1%, intra-operative complication 0.9%) respectively. There were no MI-LVAD conversions.

**Conclusion:** MICS is evolving and increasingly becoming recognised as the future "gold-standard" approach. Surgeons need to be aware of factors that contribute to sternotomy conversion to ensure that patients enjoy the maximum benefit of MICS and to encourage safer- and sustainable- MICS programmes and prevention strategies.

## Mitral valve disease in the setting of a bicuspid aortic valve: Will looking back influence the future?

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**Objectives:** Bicuspid aortic valves (BAV) causing left ventricular outflow obstruction often forms one of the components of the rare Shone complex, a disease involving the left ventricular outflow (valvular or subvalvular stenosis or coarctation) and left ventricular inflow (parachute mitral valve or supravulvar mitral membrane). In the TAVI era, new questions have arisen about BAV associations and their implications for treatment. We evaluate the spectrum of mitral valve (MV) disease in the setting of BAV.

**Methods:** A retrospective analysis of echocardiograms, done at a large referral hospital over a 4 year period, was conducted in patients with BAV focusing on congenital abnormalities of the MV. Clear congenital abnormalities of the MV and minor variations, including anatomical measurements of the valve and evaluation of the papillary muscles, were assessed. Findings were compared with age and gender matched controls.

**Results:** One-hundred-and-forty patients with BAV were included. A congenital mitral valve abnormality was present in 8 (5.7%,  $p=0.01$ ) with a parachute mitral valve in 4 (2.8%), an accessory mitral valve leaflet in 1 (0.7%), mitral valve prolapse in 1, a cleft in 1 and the novel finding of a trileaflet mitral valve in 1. Minor abnormalities included an elongated anterior mitral valve leaflet ( $p<0.001$ ), the increased incidence of physiological mitral regurgitation ( $p<0.001$ ), additional papillary muscles ( $p=0.004$ ) and an additional chord or tendon in the left ventricle cavity ( $p=0.007$ ).

**Conclusion:** Mitral valve abnormalities occur more commonly in patients with BAV. The spectrum is wide and includes subtle functional changes such as an increased incidence of physiological mitral regurgitation, morphological abnormalities including an increased anterior mitral valve leaflet length or additional papillary muscles to clear congenital abnormalities, including parachute mitral valve. While supporting the hypothesis that abnormalities in these patients extend beyond the aorta, none of these abnormalities impacted on management.



## FTY720 (Fingolimod) exhibits both cardioprotective and cardio-damaging effects in a model of ischaemia/reperfusion injury: Timing is everything

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**Introduction:** Although sphingosine-1-phosphate (S1P) confers cardioprotection against ischaemia/reperfusion injury (IRI), FTY720 (Fingolimod; an analogue of S1P) has also received attention as a pro-apoptotic agent in cancer cells via a protein phosphatase mediated mechanism.

**Objective:** The aim of this study was to determine the effect of FTY720 on the outcome and molecular events associated with IRI. We hypothesised that FTY720 would exert a detrimental effect through the activation of protein phosphatase 2A (PP2A).

**Methods:** Isolated rat hearts were exposed to either 35 minutes regional ischaemia [RI; for infarct size (IFS) determination], or 20 minutes global ischaemia [GI; for Western blotting analysis of the signaling molecules Protein kinase B (PKB); extracellular signal regulated kinase (ERK); glycogen synthase kinase 3 $\beta$  (GSK3 $\beta$ ); p38 mitogen activated protein kinase (p38 MAPK) and PP2A] in combination with FTY720 (1  $\mu$ M) administration directly before, or after, sustained ischaemia.

**Results:** If anything FTY720 pretreatment extended IFS, while reperfusion administration exerted an infarct sparing effect. FTY720 reduced the inhibitory phosphorylation of PP2A [Control:  $1.00 \pm 0.14$  arbitrary units (AU) vs. FTY720:  $0.57 \pm 0.04$  AU,  $n=2-4$ ;  $p<0.05$ ], while also unexpectedly activating PKB and ERK prior to the onset of ischaemia. Pretreatment reduced the ischaemia-induced phosphorylation of p38 and GSK3 $\beta$  at 20 minutes GI, and delayed the phosphorylation of PKB at 5 minutes reperfusion. As reperfusion treatment it had no effect on the kinases studied, except to increase the phosphorylation of PKB at 30 minutes reperfusion.

**Conclusion:** The timing of FTY720 administration, relative to ischaemia, determines its final effect: As pretreatment FTY720 favours a reduced phosphorylation of GSK3 $\beta$  (at the onset of reperfusion) and PKB (at 5 minutes reperfusion) which could contribute to the development of IFS. These results implicate PP2A as a negative regulator of pro-survival signaling in IRI. Reperfusion administration however increased PKB phosphorylation in late reperfusion with an associated reduction in IFS.

## Long-term survival after surgical treatment of infectious endocarditis: Analyses of prognostic factors

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**Objectives:** Although cardiac surgery is a life-saving procedure in patients diagnosed with infective endocarditis (IE), surgical risk and long-term life-expectancy are difficult to predict. The decision whether to indicate surgery remains a challenge, because of the high mortality rate associated with this procedure.

**Methods:** Retrospective observational study, that included all the patients operated for active IE (January 2003 - February 2016). The objectives were to determine long-term survival rates and delineate IE-specific risk factors for early and late mortality. EI specific variables were recorded in each patient, such as EI pathogen, abscess and vegetations.

**Results:** A total of 169 patients underwent surgery for IE during the study period. Median follow-up time was 51 months (IQR 16 - 127 months). In-hospital mortality was 26% and overall mortality (including peri-operative mortality) was 47%, with a median of survival of 108 months. Seventy percent of the late mortality was related to cardiovascular origin. Mortality was significantly higher in mitro-aortic IE (71%; log-rank  $p<0.001$ ). The implanted prosthesis type (mechanical in 74.6% and bioprosthesis in 23.1%) did not significantly affect late mortality (56.2% vs. 46.9%), although patients with biologic valves were significantly older (Mean age 72 vs. 61;  $p=0.02$ ). During follow-up, 16 patients (9.8%) suffered a new reinfection. Reinfection occurred in 5.7% of the implanted bioprosthesis, and in 13% of mechanical valves. Median time to reinfection was 22 months after surgery (IQR 2 - 57 months). The bacteria that caused the IE, size of the vegetation or the presence of abscess did not have influence on late mortality.

**Conclusions:** Cardiac surgery for active IE has a high postoperative mortality, nevertheless the patients that survived the early peri-operative period have a good life expectancy. Mitro-aortic involvement is associated with a worse prognosis. Late reinfection of the implanted valve, although infrequent, is more likely to occur in mechanical prosthesis.

## Postpneumonectomy empyema: Treatment and prognosis in patients with lung cancer

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**Objectives:** Postpneumonectomy empyema (PPE) is a life-threatening morbidity that affects 1 - 10% of patients and carries a 9 - 13% mortality risk. Treatment usually takes a long time and prognosis is uncertain. Forty years ago, improved survival was reported among patients with lung cancer and pleural empyema compared to those with lung cancer and no empyema. We investigated this potential association among patients with post-pneumonectomy empyema.

**Methods:** The study included 38 patients who underwent pneumonectomy between 1995 and 2007 (7 females and 31 males; median age 62 years) and then developed PPE, which was treated in the acute phase by drainage, needle puncture or both methods. Finally, PPE patients were treated by repeated open pleural lavage, described by the Walter Weder team as an accelerated treatment method. Duration of PPE reached 1 - 47 months (average 213 days). Thirty-five of these patients had been diagnosed with lung cancer (squamous cell cancer and adenocarcinoma), of whom

31 (group 1) were matched with 31 lung cancer patients who underwent uncomplicated pneumonectomy at the same centre (1997 - 2009) (group 2). The 2 groups did not differ significantly regarding sex, age, histology, TNM, FEV1, major co-morbidities, or receipt of neoadjuvant or adjuvant therapy.

**Results:** Thirty-five (92.1%) patients were treated successfully, preserving chest symmetry and good condition. The 5 and 10 year survival rates for the entire cohort were 69% and 51%, respectively. Comparison between the matched groups revealed longer survival rates in the empyema-group (5 year; 70%; 10 year; 49%) compared to the group without empyema (5 year; 38%; 10 year; 18%). Compared to the group without empyema, the empyema-group showed significantly longer survival for all-cause mortality ( $p=0.0048$ ) and lower incidence of cancer unrelated mortality ( $p=0.024$ ). The 2 groups did not differ significantly regarding cancer related mortality ( $p=0.092$ ).

**Conclusions:** Lung cancer patients with postpneumonectomy empyema demonstrated longer survival compared to lung cancer patients after uncomplicated pneumonectomy.

## Changes in high density lipoprotein composition in hypertensive patients

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**Objectives:** Hypertension related complications account for 9.4 million deaths worldwide, causing at least 45% of deaths due to heart disease. Contributory pathophysiological factors include endothelial dysfunction and changes in high-density lipoprotein cholesterol concentrations, but little is known about possible changes in HDL composition. We therefore aim to investigate HDL composition in 61 Nigerian healthy, or hypertensive, with/without heart failure patients admitted to the University of Abuja Teaching Hospital.

**Methods:** Patients were divided into healthy controls with no pre-existing cardiac or metabolic conditions, hypertensive patients and hypertensive patients with heart failure. HDL functionality was assessed in isolated HDL from patient sera using differential ultracentrifugation. HDL composition was determined using Western blot techniques to quantify levels of apolipoprotein A1 (ApoA1) and M (ApoM) whilst mass spectroscopy was used to quantify levels of sphingosine-1-phosphate (S1P).

**Results:** There was no difference in ApoA1 content between groups. ApoM content was lower in hypertensive and heart failure patients compared to controls ( $3.57 \pm 0.37\text{AU}$  vs.  $4.75 \pm 0.43\text{AU}$ ,  $p=0.05$ ). Additionally, hypertensive and heart failure patients had lower HDL-associated S1P content compared to controls ( $178 \pm 9.9\text{pmol/mg}$  vs.  $209 \pm 9\text{pmol/mg}$ ,  $p<0.05$ ).

**Conclusions:** Our data show that hypertension, particularly hypertension with heart failure, is associated with changes in HDL composition. It is likely that the decrease in ApoM content results in a reduced binding of S1P to HDL, an important component for HDL to confer cardioprotection. Changes in HDL composition may therefore result in an alteration of HDL functionality in hypertensive patients with heart failure.

## Results of treatment of haemoptysis in bronchiectasis by thoracoscopic bronchial artery ligation: A case series

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**Objectives:** Acute massive haemoptysis is a life-threatening condition. Traditionally, bronchial artery embolisation and lung resection are the treatment options. But there is high recurrence rate after bronchial artery embolisation and some patients are not suitable for lung resection. This is the first case series to report the results of bronchial artery ligation in treatment of haemoptysis in bronchiectasis.

**Methods:** From November 2010 - August 2015, 19 patients presented with symptoms of haemoptysis and received bronchial ligation with, or without, combined lung resection. Seven cases were excluded, which included the diagnosis of aspergillosis, lung abscess and operative death. Only 12 cases were collected in this case series. The engorged bronchial artery was disclosed by standard CT, or reformatted by axial CT.

**Results:** The mean age was 61.3 years. The mean length of postoperative stay was 5.5 days. The complications were 1 persistent hoarseness and 1 intra-operative hypoxia due to blood clots stuck in the bronchus. Five patients received only thoracoscopic bronchial artery ligation with endoclips and the others received simultaneous definite lung resection. The recurrent rate was 2/12 (16.6%).

**Conclusions:** Thoracoscopic bronchial artery ligation is a safe and effective procedure. This procedure alone, or combined with pulmonary resection, may become a new option in the treatment of haemoptysis in bronchiectasis.

## Mitral valve repair in rheumatics in the current era

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Rheumatic heart disease (RHD) is the most common valve problem in developing countries. It was previously thought that rheumatic valvular disease can only be amended reliably by valve replacement. That has greatly influenced the timing of referral for surgery, which is generally late.

Experience with mitral valve repair in the rheumatic population is limited. Major hindrances to the less-frequent repairs in this population have been the unpredictability of long-term results and, more importantly, it involves complex repair techniques.

Data of valve repairs from our database of mitral repairs (1992 - 2010) were prospectively analysed. There were a total of 1 458 mitral valve repairs during that period of which 748 cases of repairs were in chronic rheumatic heart disease (CRHD). This accounted for 51.3% of the total repairs.

The feasibility of rheumatic mitral repair in predominant mitral regurgitation since 2001, improved to 80% and the feasibility of repair in mixed mitral (mitral regurgitation/mitral stenosis) disease was 50%. The hospital mortality was 2.5% and late mortality 4.0%.

The freedom from reoperation at 5 and 10 years for rheumatics was at 90.4% and 79.1%. The freedom from valve failure at 5 and 10 years for rheumatics was at 85.3% and 69.6%. Repair at younger age (<20 years of age); mixed mitral disease, leaflet procedure and residual MR >2+ were independent predictors of valve failure in rheumatic mitral repair on both univariate and multivariate analysis.

The adoptions of leaflet augmentation using treated autologous pericardium, and the use of PTFE artificial chordae, have extended the feasibility of repair in complex rheumatic valve lesions.

The durability of mitral valve repairs in chronic rheumatic valve disease in the current era has improved significantly and is now approaching the durability of repairs in degenerative disease. The use of artificial chordae, leaflet augmentation to improve leaflet coaptation, and a stringent quality control using intra-op transesophageal echocardiography are among factors that have contributed to improved long-term results.

## A senile patient with 2 different localised dissections in the abdominal aorta

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**Objective:** Symptoms of aortic dissection are more prominent when dissection is localised proximal aorta. More conservative treatment modalities may be considered if the pathology is localised at descending or distal aorta.

**Method:** Our patient was an 82-year-old female. She was hospitalised by the Nephrology department with abdominal pain, vomiting with bile and deterioration of renal functions. Contrast thoraco-abdominal CT was achieved after appropriate measures for kidney protection. CT revealed 2 different tear zones. The first one was a 2cm segment located at 1cm distal to renal artery and the second was a 1cm segment located at left common iliac artery. Patient was consulted to our department afterwards.

**Results:** Patient's constitutional status was concordant with her advanced age. Bowel sounds were normoactive. Distal pulses of both extremities were powerful and with equal amplitude. Patient's medical history revealed that she was followed-up for cholelithiasis. CT images of both aortic tears were considered as chronic. Metoprolol was recommended for reducing pressure stress of arterial tension at aorta. Also, a consultation to the general surgery department was recommended. Patient was called for follow-up and abdominal ultrasonography was planned. Abdominal ultrasonography was the method of choice because it was not invasive and was without radiation.

**Conclusion:** Tears of descending and abdominal aorta at senile patients should be investigated for chronicity. If there is not a sign of malperfusion and symptoms are present for a long time, then close follow-up with medical treatment will be a better option rather than an operation with high mortality risk. This approach will increase survey of patients significantly.

## Anaesthetic method and preferred insertion side in our venous port catheter series

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**Objective:** Achieving a central line with ease of use, low infection rate and long effective usage time is very important for oncologic patients who require chemotherapy.

**Methods:** Between January 2013 and December 2015, 109 permanent port catheters for chemotherapy were placed in 98 patients with malignancy in our clinic. Mean age of patients were  $51.63 \pm 11.45$ , 57 of the patients were male (58.1%) and 41 female (48.9%).

**Results:** Total of 109 port catheters were inserted. Local anaesthesia was preferred in 102 (93.6%) patients. Sedo-analgesia (sedation + analgesia) was preferred in 7 patients (6.4%) due to poor cooperation and agitation. Right subclavian vein was preferred in 91 (83.5%) patients and left subclavian vein was preferred in 18 (16.5%) patients. In the patient group with left port catheter, 6 had right mastectomy and severe oedema was evident. Skin lesion, or scar formation due to radiotherapy, was evident in 3 patients. Eight patients had previous venous port access from right subclavian vein and 1 patient had venous thrombosis history for right subclavian vein.

**Conclusion:** Port catheters may easily be positioned by using local anaesthesia. Port catheters are the central venous line of choice because of complete insertion of reservoir and they are widely used because patients are not restricted in their daily activities while being treated for chemotherapy.

## Approach to cases with post traumatic extremity combined arterial and venous injuries

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**Objective:** In this study, we retrospectively investigated our modalities and assessed, with up-to-date literature of patients admitted to Emergency Department at our hospital with combined arterial and venous injuries of extremities (January 2013 - December 2015).

**Method:** Between January 2013 and December 2015, 34 patients who were treated surgically for peripheral vascular injury by the same surgical team were investigated retrospectively. Twenty-nine patients were male (85.3%) and 5 patients were female (14.7%). Mean age of patients was  $32.00 \pm 14.67$  (between 10 to 68 years).

**Results:** Fourteen (41.1%) patients had venous injury. We preferred saphenous vein of the opposite leg for repair in five (14.7%) of these patients. Saphenous vein was used as a patch in 3 and was used for graft interpositioning (popliteal vein) in 2 patients. In 9 patients (26.5%), reconstruction or repair of venous segment was impossible due to heavy damage or thin vessel calibres. These vessels were tied-up.

**Conclusion:** Venous injuries may occur simultaneously with arterial injuries. Bleeding vessels must be successfully exposed in exploration. Bleeding may be controlled quickly by tying-up the bleeding veins in haemodynamically unstable patients. This will increase the oedema of the extremity, due to impaired venous return. This situation is known to not be critical in causing ischaemia or amputation in literature. None of the 9 patients in which we ligated veins, had consistent extremity oedema. As concordant with the literature, we believe that vein repair is not mandatory for saving extremity.

## Cardiac pathologies and atrial fibrillation in elder patients (70 and older) treated with femoral embolectomy for acute arterial obstruction

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**Objective:** Aging is a process which directly affects arterial structure, or by leading to additional diseases affecting arterial structure. These pathologies cause atherosclerosis. Thromboembolic events are more commonly evident in atherosclerotic vessels.

**Methods:** Forty-five patients, 70 years, or older, admitted to our emergency department or out-patient clinic with partial functional loss, coldness, pain and discoloration (January 2007 - December 2015). Mean age of patients was  $78.53 \pm 5.85$ . Thirty-one of these patients were male (68.9%) and 14 were female (31.1%).

**Results:** Atrial fibrillation was evident in 11 patients (24.4%). Three of these patients had pure atrial fibrillation. Coronary artery disease and atrial fibrillation was evident in 4 patients. Coronary artery disease, congestive heart failure and atrial fibrillation was observed in 2 patients. One patient had peripheral arterial disease and atrial fibrillation, and another had coronary artery disease, peripheral arterial disease and atrial fibrillation. None of these patients revealed serious mitral valve pathology or massive intracardiac thrombus at preoperative echocardiography. Atrial fibrillation was more common in female gender ( $p=0.020$ ). Thirty-two patients (71.1%) had coronary artery disease but none had a medical history or positive blood tests for recent myocardial infarction. Eight patients had coronary artery disease and congestive heart failure. Ejection fractions of these patients were below 30% at their transthoracic echocardiography.

**Conclusion:** Elderly patients tend to have more comorbidities and peripheral vascular diseases. Cardiac rhythm and additional pathologies must be assessed quickly at admittance to hospital. Initiation of optimal treatment is essential.

## Complex treatment protocol for a patient treated with plasmapheresis for Guillain-Barré Syndrome and deep vein thrombosis of lower extremity caused by central venous catheter

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**Objective:** Complication rates have increased with the increase of medical interventions. Deep vein thrombosis is one of the most important complications and its treatment may alter with additional diseases.

**Method:** A 55-year-old male patient was followed-up by Neurology outpatient clinic for Guillain-Barré syndrome. Central venous catheter was inserted for plasmapheresis 3 weeks previously by our clinic. Patient refused our suggestion for subclavian venous catheter; therefore right femoral vein was preferred for temporary haemodialysis catheter and plasmapheresis was successfully performed. DVT occurred at right femoral vein, 5 days after intervention. Patient was transferred to our clinic and treated for 1 week. Ambulatory warfarin treatment was planned with optimal posology at discharge.

**Results:** Patient was checked by our outpatient clinic a week after discharge. His INR level was 5.51 and he was living in a rural area. Patient was hospitalised for a day due to warfarin overdose. Two units of fresh frozen plasma was infused and INR level was reduced to 3.32. Patient was consulted to Haematology department. Low molecular weight heparin was suggested during plasmapheresis period. Also, Haematology department suggested that ending time of plasmapheresis should be considered by Neurology department and oral warfarin treatment may be initiated afterwards. He is still followed up by Neurology and Cardiovascular surgery outpatient clinics.

**Conclusion:** Deep vein thrombosis is treated successfully with routine treatment protocols. A multidisciplinary approach is essential in patients with multi-systemic pathologies. On-going treatment modalities should be revised for each patient to increase safety and efficacy of the treatment.

### Difficulties at medical treatment of lower extremity deep vein thrombosis of a patient with Behcet's disease suppressed with azathioprine

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**Objective:** Conventional treatment modalities of deep vein thrombosis may alter significantly in patients with serious chronic morbidities.

**Method:** A 24-year-old male patient admitted to our outpatient clinic. Three weeks previously he was hospitalised for acute deep vein thrombosis at his left lower extremity. His medical treatment was performed and he was discharged with optimal oral anticoagulant medication with warfarin. Patient had Behcet's disease in his medical history which was suppressed with azathioprine treatment.

**Results:** Ten days after his discharge, patient admitted to our outpatient clinic. His INR level was 7.52. Patient was re-hospitalised and 2 units of fresh frozen plasma was infused with appropriate speed. INR level regressed to 4.55 and an additional 2 units of fresh frozen plasma was infused. Four units of fresh frozen plasma was spent in total. Patient's INR level regressed to 2.76 at his second day of hospitalisation. Patient was consulted to Rheumatology department. Due to his treatment with immunosuppressive therapy, low molecular weight heparin was suggested for anticoagulation. Daily single doses of enoxaparin 120IU were planned for ease of use in this prolonged situation. He is still followed up by Cardiovascular surgery outpatient clinic and significant regression is observed in control duplex ultrasonography.

**Conclusion:** Warfarin levels should be checked very closely in patients with deep vein thrombosis and treated with immunosuppressive therapy. Multidisciplinary approach is inevitable if bleeding profile is altered. Anticoagulant therapy should be revised for increasing safety and efficacy of the treatment.

### Do we always have to perform urgent femoral embolectomy to delayed lower extremity arterial thrombosis occurring on basis of chronic atherosclerosis in senile patients?

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**Objective:** The only absolute contraindication for thromboembolectomy is obvious gangrene.

**Method:** Our patient was an 82-year-old female. She admitted to emergency department with pain, coldness, discoloration and complete loss of motor functions in her left lower extremity for 20 days. Patient's pulses were absent after left femoral artery. Foot drop was evident and sensorial functions were suboptimal. Marbleisation-like discoloration was inspected at the level of knee and below. Patient had senile type diabetes mellitus in her medical history. Her oral intake was reduced due to pain and her complaints.

**Results:** Patient's creatinine level at time of admission was 1.8mg/dl. Metabolic acidosis was evident and corrected. Cardiac rhythm was atrial fibrillation. Transthoracic echocardiography revealed enlargement of right atrium and ventricle. Patient was consulted to cardiology department for rhythm control and amiodarone was initiated according to their recommendation. Patient was consulted to Chest department due to findings relevant to COPD on transthoracic echocardiography and X-ray. Combined bronchodilator therapy with optimal dosage was added to medication. Duplex ultrasonography was performed urgently. Superficial femoral artery was visible up to Hunter's channel. Superficial femoral artery was only visible for 3 centimetres after exiting Hunter's channel. CT angiography revealed similar results with addition of severe calcifications of all arterial structures. Patient underwent urgent left femoral embolectomy. Catheter reached approximately 70cm distally. Quite an amount of organised thrombi was extracted. Samples were sent for histopathologic and microbiologic investigation. Distal segments were irrigated by heparinized isotonic serum for reducing micro-thrombi risk. Continuous heparin infusion was initiated and activated clotting time was kept around  $225 \pm 25$  seconds. Iloprost, pentoxifylline, dextran 40 and calcium channel blocker were other medications for vascular pathology. Control duplex ultrasonography revealed monophasic flow pattern at left posterior tibial artery. Syme's amputation was performed by Orthopaedic surgery department for foot drop. Patient is still followed up by our outpatient clinic. She is using an appropriate prosthesis.

**Conclusion:** We believe that performing embolectomy to delayed arterial occlusions without serious necrosis or muscular rigidity and treating additional morbidity factors in a multidisciplinary fashion will salvage the extremity, or at least reduce the amputation level.

### Does the use of N-butyl-2 cyanoacrylate in the treatment of lower extremity superficial varicose veins cause systemic acute inflammation and allergic reactions?

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**Objective:** This study attempted to establish whether an early systemic inflammatory response and an allergic reaction was formed with the administration of NBCA, including dimethyl sulfoxide (DMSO), in patients for the treatment of superficial venous insufficiency.

**Method:** A total of 102 patients were treated with endovenous medical ablation in 2 centres (October 2015 - February 2016). The mean age of the patients was  $51.16 \pm 1.17$  years (minimum: 25, maximum: 74) and 72 (70.6%) of them were females and 30 (29.4%) were males. The mean diameter of the saphenous vein was  $7.72 \pm 2.02$ mm (minimum - maximum: 6 - 14mm). Ablation treatment with endovenous NBCA was applied to

patients with C3 - C4b grade according to the CEAP classification, with sapheno-femoral junctional (SFJ) insufficiency and a reflux of 0.5 seconds and longer in the duplex ultrasonography. Preoperative whole blood, erythrocyte sedimentation rate, C-reactive protein (CRP) and blood chemistry was studied in all patients on admittance to the clinic. Whole blood, erythrocyte sedimentation rate, CRP, and blood chemistry examinations were repeated at the second hour post-intervention.

**Results:** One hundred percent of the patients were treated successfully. Preoperative white blood cell count (WBC) was  $6.82 \pm 1.67$ , while it was  $6.57 \pm 1.49$  after the intervention, the difference was not statistically significant ( $p=0.68$ ). In addition, the neutrophil count before the intervention was  $4.09 \pm 1.33$ , while it was  $4.09 \pm 1.33$  with no statistically significant difference ( $p=0.833$ ). Pre-intervention eosinophil count was  $0.64 \pm 1.51$ , while it was  $0.76 \pm 1.65$  after the intervention and the difference was statistically significant with a negative correlation ( $p=0.01$ ). Pre-intervention sedimentation and CRP values were  $18.92 \pm 9.77$  and  $1.71 \pm 1.54$ , respectively. Among the postoperative values, sedimentation and CRP values were  $19.78 \pm 15.90$  and  $1.73 \pm 1.59$ , respectively, and the differences were not statistically significant ( $p=0.480$ ;  $p=0.714$  respectively). Although the change in WBC and CRP values was not statistically significant in males, the difference in the eosinophil count was statistically significant with a negative correlation ( $p=0.002$ ). Also, the change in the sedimentation rates was statistically significant with a positive correlation ( $p=0.005$ ). The decrease in the postoperative sedimentation rate was statistically significant ( $p<0.05$ ).

**Conclusion:** Cyanoacrylate causes no systemic allergic or acute inflammatory reaction, its use is even safer.

### Effects of ischaemia degree and metabolic acidosis in elderly patients (70 and older) treated with femoral embolectomy for acute arterial obstruction

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**Objective:** Acute peripheral arterial obstruction may lead to a wide range of clinical situations, from mild ischaemia to tissue necrosis.

**Methods:** Forty-five patients, 70 years or older, admitted to our emergency department or out-patient clinic with partial functional loss, coldness, pain and discoloration (January 2007 - December 2015). After confirmation of acute femoral artery obstruction, all of these patients were treated with emergent femoral embolectomy by the same cardiovascular surgery team of our Cardiovascular surgery department. Mean age of patients was  $78.53 \pm 5.85$ . Confirmation was achieved by bilateral duplex arterial ultrasonography after anamnesis and physical examination. Ischaemia degrees at the time of admittance were classified by this scale: Grade I: Mild ischaemia, Grade II: Advanced ischaemia, Grade III: Serious ischaemia and Grade IV: Severe ischaemia

**Results:** Distribution of ischaemia levels at the time of admittance were as follows: 8 patients (17.8%) were Grade I, 19 patients (42.2%) were Grade II, and 18 patients (40%) were Grade III. Metabolic acidosis was evident in arterial blood gas samples of 11 patients (24.4%) at time of admittance. All of the patients (100%) with time interval of 48 hours or more between onset of symptoms and admitting to hospital had metabolic acidosis. Metabolic acidosis did not show any significance ( $p=0.337$ ) when comparing the amputated 3 patients (6.7%) and the rest (93.3%).

**Conclusion:** Haemodynamic instability and multi-organ failures are more likely to happen if the treatment of acute leg ischaemia is delayed. This is caused by anaerobic metabolites which are accumulated and then participated to systemic circulation. Metabolic state must be assessed quickly at admittance to hospital. Initiation of optimal treatment is essential and should be done as quickly as possible.

### Efficacy and preoperative value of urgent computerised tomography angiography in elder patients (70 years and older) treated with femoral embolectomy for acute arterial obstruction

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**Objective:** Additional to many comorbid diseases, peripheral vascular disease must always be kept in mind when dealing with elder patient groups. Vascular structure must be evaluated by one of the peripheral angiography techniques. If CT angiography reveals acute arterial embolus in chronic atherosclerotic vascular bed, providing enough perfusion, which is the main purpose, may only be achieved by using surgical embolectomy and appropriate medical treatment. In this way, extremity may be saved and amputation level may be lower. Also, multi-organ failure or functional losses may be minimised.

**Method:** Forty-five patients, 70 years and older were evaluated retrospectively. Mean age of patients was  $78.53 \pm 5.85$ . Thirty-one patients were male (68.9%) and 14 were female (31.1%).

**Results:** CT angiography was the method of choice in all patients with creatinine levels lower than 2mg/dl. If creatinine level was over 2mg/dl, the Nephrology department was consulted and their recommendations followed. CT angiography was not performed in 6 patients. Abdominal aorta of these patients were evaluated with abdominal ultrasonography in the postoperative period. None of the patients had complete revascularisation indication after embolectomy. In addition, each patient was consulted to the Cardiology department. Echocardiographic examination was performed and their suggestions were performed.

**Conclusion:** We suggest that if renal functions are suitable, CT angiography should be provided at admittance to hospital. This may lead the complete evaluation of thoracic aorta, abdominal aorta and their peripheral branches. Also, narrowing sites and collateral vessels may be revealed in lower extremities.



## Our insertion technique of venous port catheter for chemotherapy

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**Objectives:** Insertable venous port catheters are widely preferred for oncologic patients who require chemotherapy, or long-term parenteral nutrition.

**Methods:** In this study we investigated patients who were operated for venous port catheter (January 2013 - December 2015). One-hundred-and-nine permanent port catheters for chemotherapy were placed in 98 patients with malignancy in our clinic. Local anaesthesia was preferred in patients with cooperation and consciousness. If platelet count was lower than  $70.000/\text{mm}^3$  or international normalised ratio (INR) was higher than 1.5; surgery was postponed. Patients who had white blood cell count lower than  $5.000/\text{mm}^3$  were treated with intravenous 1gr cefazolin sodium for prophylaxis about 30 minutes before operation.

**Results:** All interventions were performed in a sterile operation room with non-invasive screening and 4 l/minute nasal oxygen. Right subclavian vein was the most common operation site. Left subclavian vein was preferred in patients who had right mastectomy, severe oedema, erythema or radiation scar; recent infective port extraction from right side or if puncture of right subclavian was not possible. Infiltration anaesthesia was performed by using bupivacaine at puncture site and place where port pocket will be prepared. By using 18G needle, subclavian vein was targeted right under the clavicle. Seldinger's method was used for positioning of sheath superior vena cava. Catheter was advanced in the sheath to entry of right atrium. A pocket, big enough to handle reservoir; was prepared between upper ¼ medial part of breast and sternum. Reservoir and catheter was united and immobilisation was achieved. Unit was controlled and irrigated by 0.9% NaCl solution including 100U/ml heparin by using a Huber needle. Chest X-rays of first and 24 hours were examined in all patients' pneumothorax and hemothorax.

**Conclusions:** Local anaesthesia may be the method of choice for port catheter interventions. Patients may continue with their daily lives and chemotherapy afterwards. Because of the complete insertion of reservoir; port catheters are widely preferred. Experienced surgeons and extreme caution are essential for this intervention.

## Principles of first-step examination of a patient with posttraumatic extremity vascular injury

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**Objective:** In this study, we aimed to present our key principles for patients with vascular injuries of extremities from admittance to emergency department to diagnosis and treatment (January 2013 - December 2015). We reviewed our experience and current literature.

**Method:** Between January 2013 and December 2015, 34 patients who were treated surgically for peripheral vascular injury by the same surgical team were investigated retrospectively. Twenty-nine patients were male (85.3%) and 5 patients were female (14.7%). Mean age of patients was  $32.00 \pm 14.67$  (between 10 - 68 years).

**Results:** We classified signs of vascular trauma as strong and weak according to Advanced Trauma Life Support Guidelines' at first examination in emergency department. All patients with strong signs of vascular trauma underwent emergency operation for reducing ischaemia period. Tetanus and parenteral antibiotic prophylaxis were performed prior to every operation. Active bleeding was managed by external pressure or tourniquet until surgical bleeding control is achieved. Vital findings were refined by blood and fluid replacements. All patients were assessed by physical examination and continuous wave Doppler. Duplex ultrasonography was performed on each patient with appropriate vital findings and injury site. All patients with blunt trauma had Computerised Tomography Angiography because all patients' renal tests were normal. These patients were consulted to related departments, in accordance with trauma site. Patients with appropriate indications were treated with iloprost trometamol (continuous intravenous infusion), dextran and pentoxifylline combination intravenously. If there is not a contraindication (like bleeding risk due to multiple traumas), continuous heparin infusion was administered.

**Conclusion:** In penetrating trauma, physical examination is usually diagnostic. Rapid diagnosis and surgery reduces the ischaemia period and amputation rate. Urgent operation must be considered in patients with one or more of these findings: active bleeding in trauma site, loss of extremity distal pulses, coldness and/or discoloration. Twenty patients in our series underwent urgent operation with these findings.

## Successful repair of right ventricle perforation after stab wound with our modified technique

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**Objective:** Intrapericardial penetrating trauma may cause different levels of damage in cardiac structures.

**Method:** Our case was a 35-year-old male. He was admitted to emergency department with multiple stab wounds which took place 45 minutes previously. He had hypotension (TA: 80/60mmHg) and tachycardia, 1500cc of volume expanding colloid fluid was infused. After stabilisation of vital signs, extensive physical examination was performed. There was an incision including skin and subcutaneous tissue at right gluteal area and was located about 3cm to anus. There was a 3cm incision at mid-sternal area, including skin and subcutaneous tissue. Transthoracic echocardiography revealed a 10mm of dense pericardial effusion surrounding the heart. There was no sign of right ventricle compression. Also, transthoracic echocardiography revealed a more concentrated partial collection consistent with hematoma at anterior aspect of right ventricle.

**Results:** The patient was investigated in emergency service using a multidisciplinary approach. Emergent mediastinal exploration was planned by Cardiovascular surgery department.

Patient underwent emergent operation with median sternotomy. Native pericardium was damaged and intrapericardial haemorrhagic collection was evident. Pericardiotomy was performed. There was an active bleeding wound located at mid portion of anterior aspect of right ventricle with a length of 3cm. This wound penetrated through the myocardium and it was away from coronary vascular structures. Three 4/0 polypropylene sutures with double pledgets were used in a U-suture fashion for primary repair. Bioglue was not applied because wound was located in a low-pressure chamber and it did not include major coronary arteries or dense muscular tissue. A large Surgicel was laid out to improve haemostasis and reduce adhesion in case of mediastinal re-exploration. Bioglue was applied to projection of repair site with sandwich technique. Patient recovered uneventfully and he is still followed-up by our outpatient clinic.

**Conclusion:** An urgent, dynamic and multidisciplinary approach is essential in patients with multiple stab wounds in different locations. Our technical modality is safe for myocardial repair in emergency surgery.

## Venous port catheter positioning technique, details of our series and early and late complications after the procedure

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**Objective:** Port catheter has serious advantages when compared to other central venous catheters, due to lesser infection rates, longer functionality and less reduction of patient's daily activities.

**Methods:** Between January 2013 and December 2015, 109 permanent port catheters for chemotherapy were placed to 98 patients with malignancy in our clinic. Mean follow-up term for ports was  $386.46 \pm 268.713$  days and mean length of stay, of the port was  $553.29 \pm 234.051$  days.

**Results:** Two patients (2%) had intervention related to complication of pneumothorax. One patient was followed-up for 48 hours with oxygen therapy and discharged after determining that there was not any progression. The pneumothorax was totally resorbed on chest X-ray after one week. The other patient had a chest tube. The catheter was repositioned (to jugular vein in 2 patients and to reciprocal subclavian vein in 1 patient) to vena cava superior and right atrium conjunction due to detection of malposition in control chest X-ray after first hour of operation in 3 patients (3.1%). Catheter and reservoir conjunction was separated in 2 patients (2%). In 1 patient, catheter was separated from reservoir and migrated to right ventricle and positioned to pulmonary artery ostium. Catheter's end at right atrium was caught and catheter was extracted from right femoral vein under fluoroscopy. New permanent port catheter was positioned to left subclavian vein 1 week later. In the other patient, catheter was located under the skin and only reservoir part was replaced. Permanent port catheters of 9 patients (9.1%) were replaced due to thrombosis. Permanent port catheters of 2 patients were extracted after blood cultures and intravenous antibiotherapy for 48 hours due to infection of suture line and reservoir location. There was not any growth in cultures of both patients.

**Conclusion:** There are many studies which depict that venous port catheters may be positioned safely and with low complication rates. We believe that each part of catheter application, and use, is very important and must be handled with extreme caution.

## A pig model for donor lung contusion to study lung healing with ex-vivo lung perfusion

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**Background:** Pulmonary contusion, due to blunt chest trauma, is an exclusion criterion for selecting lung grafts in lung transplantation. The aim of this experimental study is to develop a pig model of contused lung due to blunt chest trauma as a first step and to test whether a contused donor lung could be reconditioned with an ex-vivo lung perfusion system as a second step.

**Material/method:** In the preliminary study we used sheep lungs, obtained from a slaughterhouse, to establish ideal trauma model to create contusion in the lungs. We used the results of the preliminary study in order to make contusion in the pig lungs. After creating contusion in the lungs, we retrieved the lungs and placed them in an ex-vivo lung perfusion (EVLP) system for healing.

**Results:** The results of the preliminary study revealed that the ideal contusion could be created with 700 grams of weight dropping from a height of 100cm to a metal plate on the lung. Blood gas analyses confirmed the contusion in pig lungs. After creating the desired contusion in the pig lungs, by using the data obtained from the preliminary study, lungs were retrieved and resuscitated with EVLP system. Blood gas analyses that were taken in the first and second hours revealed healing of the lungs.

**Conclusion:** In this study we created a lung contusion model (Gulhane trauma model). After creating a contused lung, we tried to heal it with our modified EVLP system. We demonstrate the success of our contusion model and the modified EVLP system.

## SBRT is not an appropriate treatment for operable stage I non-small cell lung cancer

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**Introduction:** SBRT is an accepted treatment modality for patients with early stage NSCLC who are inoperable because of comorbidities, or unwilling surgery. Obtaining data from these patients, there are publications which show SBRT as an alternative treatment to surgery for early stage NSCLC. In this study we aimed to analyse pathologic data of operated patients eligible with SBRT criteria.

**Methods:** Between 1994 and 2013 in Ankara University School of Medicine, 1 976 patients were operated for NSCLC. We included 817 patients with clinical stage T1-2aN0M0. For preoperative staging we use cranial CT/MRI, thorax CT and PET/CT. When there is pathological diameter or SUVmax value for mediastinal lymph nodes on CT or PET/CT, we performed EBUS/mediastinoscopy for invasive mediastinal staging. Staging is done according to 7<sup>th</sup> TNM classification. Patients were analysed statistically by clinical T and pathologic N condition.

**Results:** Eight-hundred-and-seventeen patients' clinical T distribution are respectively T1a: 171 (21%), T1b: 234 (28.6%), T2a: 412 (50.4%). Pathological N positivity rate is 26.4%. With progression of T stage pathological N positivity rate is increased and the difference between groups is statistically significant (p=0.017).

**Conclusions:** Lymph node positivity is one of the most important prognostic factors in NSCLC and determines the need for adjuvant therapy. In our cohort of clinical stage I patients, p N 1 + 2 ratio is 26.4% of these patients adjuvant chemotherapy and/or RT was administered. This indicates the importance of pathological staging and SBRT is not an appropriate treatment for operable stage I non-small cell carcinoma.

## The relation of inflammatory markers to idiopathic pericardial effusion

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**Background:** With growing evidence regarding the role of inflammation on cardiovascular disorders, studies have focused on inflammatory markers for the evaluation of risk and the monitoring of the disease activity. The aim of this study was to investigate whether inflammation has a role in idiopathic pericardial effusion (PE) and to reveal its correlation with the disease activity.

**Patients/methods:** The study population consisted of 107 patients with PE and age, sex matched to 35 healthy volunteers. Each patient underwent a comprehensive clinical evaluation to identify the probable underlying systemic diseases or other potential causes for PE.

**Results:** High sensitive C-reactive protein levels (Hs-CRP), neutrophil/lymphocyte ratio (NLR) and platelet/lymphocyte ratio (PLR) (p<0.001 for each) were significantly higher in PE group than in healthy volunteers. The patients with PE were divided into 3 groups, according to the size of pericardial effusions. Hs-CRP, NLR and PLR significantly increased correlated with the amount of PE. In the multivariate logistic regression model NLR (OR 1.513, 95% CI 1.144 - 2.000; p=0.004) and Hs-CRP (OR 1.077, 95% CI 1.024 - 1.133; p=0.004) remained as independent predictors of severe PE in patients who have PE.

**Conclusion:** Hs-CRP, NLR and PLR may be used for monitoring the disease severity, response to treatment and in the risk stratification of patients with PE.

## Descending mediastinitis: An African experience

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**Objectives:** Descending mediastinitis is a potentially life threatening disease, especially in those presenting late. The aim of this retrospective study is to show that aggressive surgical management has a potentially good outcome in an otherwise lethal disease.

**Methods:** We studied 51 patients presenting late over a 9 year period (2007 - 2016). All patients were operated on after the maxilla facial and ear nose and throat surgeons had controlled the primary source and drained the neck. The thoracic surgery was performed in the same session. Anterior mediastinal collections were drained via a small mediastinotomy. Posterior collections were approached via a thoracotomy. Chest computed tomography was essential to delineate the extent of disease.

**Results:** All patients presented late with advanced descending mediastinitis. A thoracotomy approach was used in 25 patients. Mediastinotomy was done in 22 cases, 3 required a bilateral mediastinotomy. After repeat CT computography, 37 cases were re-explored for suspected new locations. Tissue oedema caused false positive imaging in 5 cases. There were 3 mortalities.

**Conclusion:** Early eradication of the primary source, including the pathways to the mediastinum with aggressive and early exploration, effective gravity drainage with good antibiotic targeted and a repeat CT computography after 3 days postoperatively, in our experience, is an effective approach to a highly fatal disease.

## Mitral paravalvular leak. Retrospective comparison of surgical treatment modalities in 50 patients: Single centre experience

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**Background/introduction:** Paravalvular leak may occur after mitral valve replacement. Patients present with symptoms of mitral regurgitation, heart failure and/or anaemia. Conventional redo surgery is associated with high morbidity and mortality. Transcatheter closure has been introduced into the clinical practice with reasonable results. Published experience to compare the efficacy and safety between surgical and catheter-based paravalvular mitral valve leak closure is limited.

**Aims/objectives:** To analyse and compare early efficacy and safety between two surgical treatment options of mitral valve paravalvular leak.

**Method:** A retrospective analysis of the patients' medical records treated for mitral paravalvular leak from 2005 - 2016 was performed. Fifty patients were identified. Thirty-one patients underwent conventional redo surgery. Nineteen had catheter-based procedure (trans apical approach). Patients' data, operative variables, postoperative complications, 1 and 4 month postoperative results were analysed.

**Results:** Patients in a catheter-based paravalvular leak closure group were older ( $68 \pm 7$  years vs.  $63 \pm 8$  years,  $p=0.024$ ), had higher BMI ( $27 \pm 4$  vs.  $25 \pm 4$ ,  $p=0.03$ ) and incidence of essential hypertension [13 (68%) vs. 10 (32.3%),  $p=0.008$ ]. Patients in a catheter-based paravalvular leak closure group had a higher rate of chronic renal insufficiency [5 (26%) vs. 2 (6.5%),  $p=0.049$ ]. Procedure was longer in surgical group ( $270 \pm 98$  minutes vs.  $185 \pm 93$  minutes,  $p=0.025$ ). An incidence of atrial fibrillation early after the treatment was higher in catheter-based paravalvular leak closure group [10 (53%) vs. 7 (23%),  $p=0.03$ ], postoperative bleeding was lower ( $158 \pm 89$  ml vs.  $450 \pm 277$  ml,  $p=0.03$ ). In the catheter-based group 8 patients (42%) had remaining mild or moderate regurgitation early after surgery. In conventional redo surgery group 1 (3.45%) patient had remaining severe regurgitation.

**Discussion/conclusion:** Catheter-based closure of a paravalvular leak is a promising treatment modality in selected patients. Catheter-based paravalvular leak closure could be a possible alternative to the conventional operation.

## Papillary muscle rupture: Different treatment modalities and outcomes

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**Objectives:** Rupture of papillary muscle is a rare cardiac event, in most cases requiring prompt surgical correction. Different methods of treatment and outcomes for this pathology have not been reviewed in the past decade. The aim of this study is to analyse and compare treatment methods of papillary muscle rupture.

**Methods:** A search of case reports published from 2000 - 2015 was conducted and the result was a list of 110 case reports of mitral valve papillary muscle rupture, after the exclusion of cases which did not meet our criteria. The survival rate, following different treatment modalities, was then analysed.

**Results:** Overall survival was 75% with follow-up of 13 (0 - 52) days. Ten patients (9%) received only medical treatment, in 4 (4%) cases treatment was undefined, 96 (87%) patients received surgical treatment. The survival in the medical group was 20% with follow-up of 0 (0 - 7) days. The survival of surgically treated patients was 83%, follow-up 19 (0 - 60) days. Mitral valve was replaced in 81% and repaired in 19% of surgically treated patients. There was no difference in follow-up between groups: 14 (0 - 51) vs. 41 (10 - 180) days respectively ( $p=0.145$ ). The survival rate was greater in the repair group (94%) when compared to 82% in the replacement group ( $p<0.05$ ).

**Conclusions:** In patients with papillary muscle rupture, surgical treatment has better outcomes than medical. In terms of survival, mitral valve repair is superior to replacement.