TRACK 1: SURGERY, ANAESTHESIA AND INTENSIVE CARE

Abstract no: 8

Synergies in open heart surgery in Zambia in 2011

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Background: Currently heart operations are not done in Zambia due to lack of infrastructure, equipment and skilled manpower. Most patients who had heart operations had it done abroad at very high costs. Even if the government sends patients abroad for heart surgery it cannot afford the prohibitive costs to cover every needy Zambian. Although the Ministry of Health through the University Teaching Hospital ad hoc committee has the responsibility of ensuring that patients requiring specialised treatment either locally or abroad, there is a long and growing waiting list of patients requiring specialised cardiac surgery. Unfortunately most patients on the waiting list die beforehand.
Objectives: To present the results of open heart surgeries done by the Mutima Project in Zambia.
Methods: Fifteen patients were selected for surgery after meeting the criteria for surgery. Seven were operated on. 5 patients had RHD while 1 had a PDA and the other had atrial myxoma. The median age group for the patients was 29 years and all were female.
Results: Seven female patients with age range of 14 - 43 years were successfully operated on with good results. Five patients had valve replacement for RHD, 1 had left atrial myoma excision and 1 PDA ligation. Three patients received tissue valves and 2 had mechanical valves implanted.
Conclusion: Visiting teams offer a short term solution but are unsustainable. These teams help to clear the patient backlog on the waiting list and stimulate interest in local personnel through transfer of skills in cardiovascular medicine and surgery.

Abstract no: 10

The variation in plasma cortisol levels in response to anaesthetic induction with etomidate or ketamine in children undergoing intra-cardiac repair of Tetralogy of Fallot

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Objective: To compare the effect of a single induction dose of etomidate or ketamine on plasma cortisol levels in children with Tetralogy of Fallot (TOF) undergoing intra-cardiac repair on cardiopulmonary bypass (CPB).
Material and method: A prospective randomised trial performed at a tertiary care hospital on 30 children with TOF undergoing intra-cardiac repair on CPB. After random allocation of the children into 2 groups, the children either received etomidate 0.2mg/kg or ketamine 02 mg/kg intravenously for anaesthetic induction along with fentanyl 2mcg/kg and midazolam 100mcg/kg. Anaesthesia was maintained with sevoflurane in air oxygen. Serum cortisol was measured on three occasions: pre-operatively, at the end of surgery and 24 hours post-operatively.
Measurements and main results: The 2 groups were comparable with regard to age 18.86±3.81 months in the etomidate group versus 17.93±4.68 months in the ketamine group bypass times 60.87±6.20 minutes in etomidate vs. 64.35±5.06 minutes in ketamine group. Baseline plasma cortisol (Normal 5-25mcg/dl) in the etomidate group (19.91±3.51mcg/dl) decreased significantly at the end of surgery (5.78±2.0mcg/dl) and rose to significantly higher than baseline values at 24 hours (27.31±8.30mcg/dl). The baseline cortisol levels in the ketamine group (20.91±3.19mcg/dl) increased significantly at the end of surgery (44.02±5.49mcg/dl) and remained significantly higher than baseline at 24 hours (45.93±0.05mcg/dl). Plasma cortisol levels in the etomidate group at end of surgery and at 24 hours post-operatively were significantly lower than the ketamine group.
Conclusions: This study shows that etomidate is a suitable and safe agent for suppression of the increase in serum cortisol associated with the use of CPB in children with TOF undergoing intra-cardiac repair.

Abstract no: 16

Post–operative ICU course of infant below 2.2kg undergoing cardiac surgery

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Introduction: Infants with low body weight (LBW) are major challenges for post cardiac surgery care. We conducted this study to compare post-operative course and outcome of infant weighing 2.2kg or less with matching group of infants with normal body weight who underwent similar cardiac surgery.
Methods: We reviewed retrospectively all infants below 2.2kg who underwent cardiac operation at our institution from January 2001 - March 2011. Cases with LBW (group A) were compared with matching group (group B) of normal body weight infants who had similar cardiac surgery and matching surgical risk category. We compared demographic, ICU parameters, complications and short-term outcome of both groups.

Results: Thirty seven patients were included in group A and 39 in group B. Except for weight (2.13±0.08kg in group A vs. 3.17±0.2kg in group B); there was no statistical difference in demographic data between both groups. Cardiac procedures included coarctation repair, Arterial switch, VSD repair, Tetralogy of Fallot repair, systemic to pulmonary shunt and Norwood procedures. Patients in group A had statistically significant difference from group B in term of bypass time (p=0.01), duration of inotrops (p=0.01), duration of mechanical ventilation (p=0.004), number of re-intubations (p=0.015), PCICU length of stay (p=0.007) and mortality (13.5% in group A vs. 0% in group B, p-value 0.02).
Conclusion: Patients with LBW below 2.2kg can go for cardiac surgery with overall satisfactory results but with increase risk of ICU morbidity and mortality.

Abstract no: 37

S-100B protein and peri-operative brain injury in congenital heart disease infants and children undergoing open heart surgery using cardiopulmonary bypass

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Brain-derived S-100B protein has been shown to be a useful marker of brain injury. Neuro-developmental problems in patients with congenital heart diseases (CHD) have become an increasing concern.
Aim of the study: To assess level of S-100B protein as a brain damage marker in patients with CHD undergoing cardiosurgical procedures involving cardio-pulmonary bypass (CPB) both pre and post-operatively.
Patients and methods: 15 patients (8 with cyanotic and 7 with acyanotic heart disease) with a mean age of 4.8+3.9 years, neurologically free admitted in cardiosurgery department for procedures involving CPB were enrolled in the study and compared to 15 healthy children as a control group. S-100B protein levels were assessed before operation, 1/2 an hour after CPB and 24 hours after operation as well as heart rate, mean arterial blood pressure, hematocrite value, central venous pressure (CVP), PO2 and PCO2.
Results: S-100B protein was significantly elevated in patients 1/2 an hour after CPB, before and after operation than controls with highest values 1/2 an hour after CPB ($p<0.0001$, $p<0.001$ and $p<0.001$ respectively). It was also elevated in the cyanotic compared to with the acyanotic group ($p<0.001$). S-100B protein 1/2 hour after CPB correlated positively with aortic clamping time and negatively with body temperature ($p<0.01$ and $p<0.001$ respectively).
Conclusion: Patients with CHD are liable for subtle brain damage which increases during surgical intervention as evidenced by increased S-100B protein.

Abstract no: 44

Peri-operative assessment of patients with repaired Tetralogy of Fallot undergoing pulmonary valve replacement

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Aim: Pulmonary valve replacement (PVR) is commonly performed in adults with repaired Tetralogy of Fallot (TOF) to avoid late complications related to severe pulmonary regurgitation or residual RVOT obstruction. However, few data are available concerning peri-operative complications. The aim of this study was to evaluate the peri-operative complications and to determine predictive factors of the low-cardiac output syndrome (LCOS) in patients undergoing PVR.
Methods: Thirty patients with TOF who underwent PVR between 2008 and 2009 were retrospectively enrolled. LCOS was defined according to lactate level >3mmol/l, use of inotrope drug for more than 24 hours, and renal dysfunction. Mean age at valve surgery was 29.5 years (range: 6.5 - 56.5). Indications were RVOT stenosis (n=4), severe pulmonary regurgitation (n=25), and mixed lesions (n=1). RVOT replacement was conducted with a beating heart using a normothermic CPB (mean time 77±25 minutes) in 16 patients; 14 patients underwent additional surgery requiring aortic cross-clamp. In these patients, CPB mean time was 113±21 minutes.
Results: Overall survival rate was 97% at 90 days. Post-operative complications were uncommon (ventricular tachycardia in 6%, mechanical ventilation over 24 hours in 6%, renal dysfunction in 10%) except for LCOS (46%). Prolonged duration of CPB over 80 minutes ($p<0.01$) and aortic cross-clamp ($p=0.03$) increased LCOS (OR 33, 95% CI: 3.18-342.2, $p<0.01$) and six (95% CI: 1.15-31.3, $p<0.01$, repectively). Surprisingly, age, right ventricular or left ventricular volume and function, and pre-operative additional lesion (tricuspid regurgitation, residual pulmonary stenosis) were not significatively predictive of peri-operative complications.
Conclusion: These data underline the major role of myocardial protection during PVR in TOF patients. Short-beating heart and normothermic CPB without aortic cross-clamping led to a decrease in LCOS. Additional surgical repair requiring aortic cross-clamping and longer time of CPB should be well balanced with the risk of peri-operative complications.

Abstract no: 52

Retrospective analysis of surgical treatment and long term results in children with Takayasu's Arthritis

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Background: Takayasu's Arthritis (TA) is a subclinical inflammation which affects the aorta and its major branches. There is no consensus on the evaluation of this condition which leads to occlusion, stenosis or aneurysm. Clinical manifestations depend on the location and extension of arterial damage which is irreversible affects organs and requires surgical treatment.
Objective: Evaluate children and adolescents with TA who received surgical treatment in childhood: Evolution, presence or absence of inflammatory activity and patient survival.
Methodology: Retrospective study from 1977 - 2006 of 222 cases with TA, classified according to the American College of Rheumatology criteria. 71 received surgical treatment of which 14 were children. Arterial damage was classified according to Hata; inflammation was evaluated by Dabague-Reyes criteria. The type of surgery used included organ-sparing for lesions with stenosis/occlusion (shunt/replacement), exclusion and cardiac.
Results: 11 women, mean age 13±3 years with arterial lesions Type I (14%), Type III (21%), Type IV (29%) and Type V (36%) the symptoms were: systemic hypertension (64%), dyspnoea (57%), headache (50%), angina pectoris (29%), dizziness (29%), syncope (29%), paresthesias (29%), abdominal pain (29%) and blurred vision (21%).
Surgery was conducted as follows: Organ-sparing (7), bypass (3), exclusion (2), replacement (1) and cardiac (2). Inflammatory activity in 57%. Twelve survived and the median surgical survival time was 12 years (0 - 26). Two patients 7 and 5 years old died. Of those who survived a woman presented terminal renal failure 10 years after surgical treatment; in another 2 surgeries were performed. The 4 cases had inflammatory activity at the time of surgery.
Conclusions: Surgery is safe over the long term. Cardiac and vascular surgery with critical lesions should be performed early. Surgical techniques depend on the affected organ and type of arterial damage. Medical treatment is required be prior, during and after surgery to maintain the remission of inflammatory activity, which requires a consensus for evaluation and thereby improve results in the surgical evolution and survival.

Abstract no: 53

The effect of mechanical periodontal treatment in hyperlipidaemia

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Background: Periodontitis is a bacterial infection which has been classified as a local chronic inflammation. This, as well as cardiovascular disease, may share common risk factors. The study aimed to evaluate whether local non-surgical periodontal therapy may influence plasma lipid level in hyperlipidaemia patients with chronic periodontitis.
Materials and methodology: Thirty patients (11 female and 19 male, age 30 - 70 years) were randomly assigned to the study and control groups. Lipid profile, CRP and dental variables were measured at baseline and at the end of the study in both groups.
Results: In the third month there was significant decrease in low density lipoprotein (LDL), cholesterol and CRP levels of the study group compared with the baseline values. The reduction in pocket depth, attachment loss, plaque index and gingival index were also statistically significant in the study group.
Conclusion: The study indicates that periodontitis causes changes in total and LDL cholesterol and CRP levels and that local non-surgical periodontal treatment resulted in significant decrease in these markers. These results suggest a potential effect of periodontitis-driven systemic inflammation on lipid metabolism.

Abstract no: 56

Right ventricular bypass: Complications and survival in the mid-term follow-up

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Background: The right ventricular (RV) bypass is a palliative procedure with a high incidents of complications.
Objective: To evaluate the mid-term RV bypass events, analyse the long term mortality and compare the classic surgical technique with the Extracardiac Conduit Fontan procedure.
Methods: A total of 191 patients were analysed between 1987 - 2010. They had either atriopulmonar (AP) or extracardiac conduit (EC) surgery, with mid-term follow-up (fup) of 6.5±5 years (1 - 20 years).They were subdivided according to the type of surgery into 2 groups: Group I: AP 39 patients with a median follow-up of 14 years and Group II: EC:152 patients with follow-up of 4 years.
Results: 57% of patients (n=116) suffered complications, as detailed in Table1.

	Group A P	Group CE	P-value
Late events (n=111)	77%	53%	0.0076
Arrhythmias (n=49)	56%	17%	0.0000
Atrial flutter (n=13)	30%	0.7%	0.0000
Thrombi (n=31)	31%	12.5%	0.0058
Cerebro vascular accidents (n=4)	5.1%	1.3%	0.13
Protein-losing enteropathy (n=9)	10.3%	3.3%	0.06
Subaortic stenosis (n=7)	10.3%	2%	0.01
Therapeutic catheterisation (n=43)	7.7%	24.7%	0.05
Reoperations (n=20; reconversions (n=6)	25.6%	6.6%	0.0005
Mortality (n=9)	15.4%	2%	0.0004
Ventricular dysfunction (n=21)	15.4%	10%	0.32
Plastic bronchitis (n=1)	0	0.7%	0.6

The late global mortality was 4,6%(N=9pts).
In the univariate analysis mortality was associated to ventricular dysfunction (p0.0000), protein-losing enteropathy (p0.0000), atrial flutter (p0.0012), reoperations (p0.0006), subaortic stenosis (p0.0024), thrombus (p0.01) and AP's surgical technique (p0.0004).
Multivariable analysis revealed that mortality was related to ventricular dysfunction p0.0003 OR27.7(4.64 - 165.24), AP technique p0.0036 OR0.06 (0.01 - 0.40) and protein-losing enteropathy p0.01 OR9.31 (1.53 - 56.66).
Conclusions: Patients with atriopulmonar surgery presented a higher incidence of arrhythmias, thrombi, reoperations and mortality in comparison to extracardiac conduit. Late mortality was associated to ventricular dysfunction, atrial flutter, protein-losing enteropathy, subaortic stenosis, reoperations, thrombi and atriopulmonary surgical technique. Mortality predictors were ventricular dysfunction, protein-losing entheropathy and atriopulmonar surgical technique.

Abstract no: 66

A 100 cases clinical analysis of reconstruction of pulmonary valve with autologous peri-cardial patch on children with Tetralogy of Fallot

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Objective: In order to reduce postoperative pulmonary insufficiency (PI) a trans-annular monocusp patch was implanted in 100 patients with severe Tetralogy of Fallot (TOF) or double outlet of right ventricular (DORV) with a hypoplastic pulmonary valve.
Method: We developed a method to reconstruct a 3 cusps pulmonary valve ring, the patient's pulmonary valve ring was divided into 2 parts, and a transannular monocusp patch was implanted as the third one. The results of follow-up were obtained within 1 year of the correction and compared to all patients who received a simple transannular pericardial patch. The mean maximal systolic pressure gradient between the right ventricle and the pulmonary artery were compared between pre and post-operation (73.95±30.42mmHg; 15.67±10.62mmHg) and the degree of PI were not significant. The available monocusp patches can prevent or reduce post-operative pulmonary insufficiency in patients with severe Tetralogy of Fallot. No deaths occurred and no low heart output syndrome was observed.
Conclusions: The result of early repair in children with symptomatic hypoplastic pulmonary valve ring was good at mid-term follow-up. Improve the operative technique and emphasise a pericardia made pulmonary valve take an important role in increase the outcome of surgical treatment.

Abstract no: 79

15-minute reinforcement test restores murmur recognition skills in medical students

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Background: Accurate recognition of murmurs is an important skill but is poorly performed by students and practitioners. Current teaching methods are ineffective. We have previously shown that murmur recognition can be rapidly taught to 90% accuracy with auditory training but declines within 2 months without reinforcement. This study examines late reinforcement to restore skills.
Subjects and methods: Thirty six Canadian second year medical students (17 controls and 19 study group). Students performed an online randomised test of 20 recordings, identifying murmurs as innocent or pathological, followed by a 1-hour auditory training programme. The programme presents murmurs in groups of four, each to be identified as normal or abnormal. Difficulty increases through 7 levels. Performance was scored with a 20 item test immediately and after 2 months. Twenty two students had retesting 1 year later on 20 recordings and a mastery-style reinforcement programme: any student scoring less than 90% took another 20 item test and, if that test score was less than 90%, the student took a final 20 item test.

Results: With initial auditory training the study group improved from 79.7 (45 - 100%) to 92.1% (70 - 100%) (p.005) but after 2 months declined to 84.2% (65 - 100%) (p.015), a non-significant increase over pre-test scores. Controls had no change over 2 months. The 1-year follow-up test mean was 81% (55 - 100) a significant decline from the 2 month post test. Only 6 students achieved the 90% level at this test, but after 1st and 2nd reinforcement tests an additional 6 and 2 students respectively reached 90%. The mean final score achieved by all students was 90% (70 - 100).
Conclusion: Murmur recognition is rapidly learned using auditory training but the skill declines within 2 months. Most students restore skills with a brief reinforcement test one year later. The optimal timing is unknown.

Abstract no: 82

Surgical reconstruction of pulmonary stenosis with ventricular septal defect and major aortopulmonary collaterals

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Background: Pulmonary Stenosis with Ventricular Septal Defect and Major Aortopulmonary Collaterals (PS / VSD / MAPCAs) is an extremely rare form of congenital heart defect. Although it has been assumed that PS / VSD / MAPCAs would be similar to Pulmonary Atresia (PA) with VSD / MAPCAs, there is currently no data to support this conjecture. The purpose of this study was to review our surgical experience with reconstruction of PS / VSD / MAPCAs.
Methods: This was a retrospective review of 25 patients who were born with PS / VSD / MAPCAs and underwent surgical reconstruction. All patients had pre-operative pulmonary angiography to define the central branch pulmonary arteries and MAPCAs. There were 14 females and 11 males and the median age at first surgery was 4 months.
Results: There was 1 operative mortality (4%) and no late mortality in this cohort of 25 patients. 96% of the survivors have achieved complete repair. There were 2 distinct sub-groups: 11 patients demonstrated cyanosis and underwent an initial procedure to augment pulmonary blood flow (+PBF). The remaining 14 patients formed the second group (-PBF).

	+PBF	- PBF	
DiGeorge syndrome	36%	7%	*
Age at 1st surgery	0.8mos	5.2mos	*
Complete repair	90%	100%	
Average # of procedures to achieve complete repair	2.8	1.0	*
Survival	91%	100%	

** p < 0.005 compared to + PBF*

Conclusions: Outcomes for PS / VSD / MAPCAs were excellent with a low surgical mortality and high rate of complete repair. There were 2 identifiable sub-groups with distinctive differences. These results provide a prognostic outlook for patients with PS / VSD / MAPCAs which can be compared and contrasted with PA / VSD / MAPCAs.

Abstract no: 86

The application of all-autologous three-sinus repair (Modified Brom or Myers technique) to Supravalvular Pulmonary Stenosis

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Background: Various surgical techniques have been proposed to repair Supravalvular Pulmonary Stenosis (SVPS) in paediatric populations. Whereas growth potential should be promised, excessive expansion under the presence of undiminished high pulmonary arterial pressure should be avoided. We applied all-autologous three-sinus repair, so called modified Brom or Myers technique, to SVPS and examined mid-term outcomes.
Methods: Between March 2010 and March 2012, 15 patients (8 males, median age of 12 months old) with SVPS underwent all-autologous three-sinus repair. Thirteen patients (87%) had previously undergone pulmonary artery banding to treat high pulmonary vascular resistance. Two patients (13%) had Noonan syndrome and associated with valvular pulmonary stenosis. Follow-up was complete in all patients and median follow-up period was 13.5 month (range, 1 month - 2.4 years). The data was presented as mean ± standard deviation (range).
Results: There was no mortality. The diameter of stenotic part at main pulmonary artery increased from 47.0±14.1% (29.1-70.0) of normal pulmonary artery diameter at pre-operative evaluation to 108.4±31.7% (58.9-148.1) at 6 months, then 110.8±15.0% (87.7-134.1) at 1 year after the operation. Estimated pressure gradient across main pulmonary artery decreased from 76.2±12.2mmHg (57.8-108.2) at pre-operative evaluation to 11.3±12.0mmHg (1.4-49.0) at 6 months, then 6.7±5.5mmHg (2.0-19.4) at 1 year after the operation. Only 1 patient who had Noonan syndrome showed more than 25mmHg estimated pressure gradient across main pulmonary artery and was carefully followed up. No pulmonary insufficiency was observed.
Conclusions: Mid-term outcomes after supravalvular pulmonary stenosis by all-autologous three-sinus repair were acceptable. Although long term follow-up is mandatory, application of this technique may provide a symmetric and just enough growth of reconstructed main pulmonary artery.

Abstract no: 96

The longevity of classical Blalock-Taussig shunt for palliation of Tetralogy of Fallot: A case report and review of the literature

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Background: Tetralogy of Fallot (ToF) is a common cyanotic congenital heart disease. Total surgical correction may be preceded by a temporary palliative systemic-pulmonary shunt procedure. We describe here a patient with ToF who has survived on a classical Blalock-Taussig (BT) shunt for 31 years.
Patient and methods: The medical record of a patient who had a BT shunt performed 31 years ago was reviewed. An electronic search was made on the pubmed database of the National Library of Medicine using the search term "Classical Blalock-Taussig shunt". The articles were reviewed and a manual search was performed to review other articles of interest found in their references. The review was to examine other reports on the longevity of the classical BT shunt in the management of ToF.
Results: The patient is a 34-year old male diagnosed with ToF and had a classical BT shunt in 1981 at the age of 3 years with subsequent improvement in symptoms. He has been followed-up since then. The last review on 5.09.11 showed features suggestive of multi-infarct dementia and a mild left-sided cerebrovascular accident with a patent shunt. He was as yet unable to afford total correction. The search yielded 394 articles which were reviewed.
Conclusion: Though the use of the classical BT shunt for palliation of ToF is declining, it may be still be useful in sub-Saharan Africa where access to standard cardiac care is difficult.

Abstract no: 98

Tailor-made bicuspid PTFE valve in RVOT resection: Early experience

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Background: The reconstruction of RVOT using monocusp or bicuspid valve has been shown to reduce degree of early pulmonary regurgitation and help smoothen the postoperative recovery. The long term result with bicuspid PTFE pulmonary valve is claimed to be better than the monocuspid valve. The currently described method of reconstruction requires lot of "eyeballing". We describe a standardised technique of construction of bicuspid PTFE valve tailored to the anatomy of the patient with good early results.
Method: Twenty five patients with diagnosis of TOF had implantation of bicuspid valve whenever they needed transannular patch for RVOT reconstruction. An outflow tract size 2mm more than the recommended size was used to design the valve. A piece of silk which has a small clip as the marker as the required diameter is used to measured the width of the PTFE membrane needed, the 0.1mm PTFE membrane is folded and the silk thread with marker is used to measure the width of the needed bicuspid valve, the length of the PTFE membrane is also measured using a piece of sillk thread form the point of implantation of the valve to the tip of the ventriculotomy incision. The PTFE is sutured using 6-0 prolene suture to the outflow tract the width of the pericardium needed to patch is measured by using a silk thread to measure the required and cutting the length of the posterior wall of the RVOT tract, a rectangular shaped piece of autologous unfixed pericardium is used for the RVOT reconstruction.
Results: 2pts had moderate PR the other 23 patients had trivial to mild PR both early postoperatively and which remained the same at 1 week and at 1 month followup. There was no mortality in this series and all patients were discharged home after a median stay of 2 days in ICU and 5 days in the hospital.
Conclusion: Fashioning of bicuspid PTFE valve using tailored measurements provides gratifying early results, long term followup would be required to look at pulmonary competence in the long run.

Abstract no: 99

Corrected transposition with biventricular outflow obstruction management by relief of subaortic obstruction

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Background: Congenitally corrected transposition of great arteries (CCTGA) is more often associated with subpulmonic obstruction and very rarely, subaortic obstruction. We report a rare variant of CCTGA with both subaortic and subpulmonic obstructions with no intracardiac shunts.
Method: This is a 3-year-old child, predominantly asymptomatic child presented with complaints of ejction systolic murmur grade 4/6 along the left paraternal border. Transthoracic echocardiography nfirmed CCTGA, mitral valve accessory tissue attached to left ventricular outflow tract (LVOT) causing moderate-severe LVOT obstruction (peak gradient 4m/s peak). The mucle-bound right ventricle (RV) showed severe infundibular obstruction (peak gradient 50mmHg). The subaortic obstruction was relieved leaving the subpulmonic obstruction untouched.
Result: The child had uneventful postoperative recovery. The LVOT gradient was now less than 8mmHg, and the RVOT was similar to preoperative value. The child is doing well at 2 year follow up.
Conclusion: We describe a rare presentation of a child with CCTGA and both subpulmonic and subaortic obstruction, relieving the latter before symptoms of systemic obstruction became an issue and deliberately leaving untouched subpulmonic obstruction as a natural PAB. This strategy has the following advantages (1) Leaving the subpulmonary obstruction keeps the LV prepared for a future double switch. (2) Delays the onset of systemic AV valve regurgitation by supporting the septum. (3) Reduces the chances of heart block and rhythm disturbances.Whether this strategy is useful needs to be proved by the long term follow up of the child.

Abstract no: 100

Extension of RVOT patch after TOF repair technique to retain competence of previously placed bicuspid valve

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Background: Limiting the length of ventriculotomy has been an accepted practice to reduce the long term consequence of arrhythmia and Right Ventricular dysfunction following Tetralogy of Fallot repair. Surgeons may increasingly find themselves in situation where extension of previously placed right ventricular outflow (RVOT) patch with a mono/ bicuspid valve may be needed to relieve the RVOT obstruction. We describe a technique where extension of previously placed patch can be done retaining the competence of the valve.

Method: 2 patients who had transannular patches with PTFE bicuspid valve needed extension of patch to relieve infundibular obstruction after TOF repair. The procedure is done on beating heart with a single large RA cannula. The lower portion of the previously placed transannular patch along with PTFE membrane is removed this is fixed at the either end using an interrupted 6 - 0 prolene suture. The incision is extended as required to relieve the obstruction. The previously placed patch and membrane is cut transversely , a new piece of bovine pericardium of required dimension is taken for extension. The superior margin is sutured to the previous PTFE patch and pericardial membrane forming the neo annulus of the bicuspid valve. The rest of the bovine pericardium is sutured to the ventriculotomy using 6 - 0 prolene suture with 13mm curvature needle.

Result: In both the patients the RV pressure which was suprasyst valves af emic fell to 50% of systemic values with competent bicuspid valve with uneventful postoperative recovery.

Conclusion: Extension of previously placed competent transannular patches can be done retaining the competence by creating an neoannulus at the superior margin of the newly placed extension patch. This significantly hastens their postoperative recovery inspite of having a long ventriculotomy incision. Disruption of previously working mono/ bicuspid valve is not necessary for extending a previously placed trans-annular patch.

Abstract no: 116

Left pulmonary artery plasty using main pulmonary artery turndown: A technique in managing LPA stenosis

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Background: 10 - 30% undergoing single or biventricular repair for decreased pulmonary flow have some degree of left pulmonary artery narrowing , attributable to ductal tissue. Surgical relief of LPA stenosis is notoriously recurrent and a variety of approaches have been used, including stenting to tackle this problem. We propose a technique where in the main pulmonary artery tissue is used to plasty the left pulmonary artery origin.

Report: 3-year-old male child with bilateral SVC with right > left and unbalanced AV canal, PS with saturation of 65 - 70% was brought for bilateral Glenn, his CT angio showed severe LPA origin stenosis with well developed main pulmonary artery. During surgery the MPA stump was divided and the good MPA tissue was turned down on the LPA akin to Subclavian arery turndown for coarctation repair. The Glenn pressures postoperatively was 14 - 16 with transpulmonary gradient of 7. His saturations improved to high 80s and he was discharged after an uneventful postoperative course.

Result: The 18 month follow-up of the child has shown good growth of the left pulmonary artery origin with no gradient across the glenn anastomosis.

Conclusion: MPA turn down technique can be a useful alternative to pericardial patch augmentation or stenting of left pulmonary artery especially in the management of single ventricle patients with LPA origin stenosis with well developed MPA.

Abstract no: 117

Management of TOF with absent pulmonary valve with symmetric plication of pulmonary arteries and insertion of bicuspid PTFE valve

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Background: Tetralogy of Fallot with absent pulmonary valve (TOF with APV) is a rare condition which can present in infancy with severe respiratory symptoms, pulmonary anterior translocation and use of homograft valved conduit has been recommended to reduce airway compression, we propose a simpler technique of repair without the use of homograft.

Method: A 10-month-old 7kg child presented to us with previous history of respiratory distress requiring ventilatory support, the child was was diagnosed with TOF with APV and was referred for surgery after weaning from ventilation. The child had branch PA's of 24mm with a narrow annulus. The child underwent intracardiac repair with excision of a portion of anterior wall of right and left pulmonary arteries and insitu plication of the posterior wall over a 7 Hegar dilator. The angles of the branch PA with MPA was opened up and two separate patches were used to enlarge the confluence and RVOT. MPA and RVOT was reconstructed with bicuspid PTFE valve and autologous pericardium.

Result: The child had uneventful recovery with no respiratory issues in the postoperative period, ECHO showed normal sized branch pulmonary arteries with competent pulmonary valve.

Conclusion: Symmetric plication of the pulmonary arteries anteriorly and posteriorly can help tailor the size of branch pulmonary arteries without distortion and without resorting to anterior translocation which would need aortic transaction. Insitu plication posteriorly may prevent bleeding and bicuspid PTFE valve may replace homograft in RVOT reconstruction of TOF with APV.

Abstract no: 118

Pulmonary atresia with severe bifurcation stenosis in adolescence: Surgical consideration and postoperative management issues

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Background: Management of severely cyanotic adolescents can prove both surgical and postoperative challenge, we present our experience with a 16-year-old girl with saturations of 40%.
Method: A 16-year-old girl from Bengal presented to us with severe cyanosis (saturation – 30 - 40%) and severe symptoms of hyperviscosity with functional Class IV. Investigation revealed a diagnosis of Tetralogy of Fallot with Pulmonary atresia with right aortic arch, there was confluent branch Pulmonary arteries with severe bifurcation stenosis which was supplied by a posteriorly located stenotic duct, there were no MAPCA's. During surgery it was noted that there was severe periadventitial fibrosis of branch pulmonary arteries which was supplied by a stenotic duct , the size of the pulmonary arteries looked satisfactory at hilum. Aorta and SVC transaction provided unhindered exposure to the branch PA's at hilum which was reconstructed with 15mm Goretex tube , the VSD was closed with PTFE patch and bovine jugular vein was used to establish RV- PA continuity.
Result: The postoperative course of the child was complicated with bleeding, which was controlled using Factor VIIa , reperfusion lung injury and renal failure which was managed with appropriate ventilator settings and continuous venovenous hemodialysis, the child made gradual recovery and was discharged home at end of 3rd week, postoperative ECHO showed a satisfactory surgical repair.
Conclusion: Management of severely cyanotic adolescents can prove both surgical and postoperative challenge, early institution of supportive therapy with appropriate multidisciplinary input may provide gratifying results. Whether an interim palliation with shunt would reduce the severity of postoperative complications remains debatable.

Abstract no: 122

Cross-border training in paediatric anaesthesia: Challenges and solutions

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A number of countries have the basic infrastructure for performing paediatric cardiac surgery. However, they lack the expertise in various fields to perform complicated surgeries. KK Hospital for Women and Children, Singapore in conjunction with Singapore International Foundation has undertaken a 3-year project to improve the outcomes of paediatric cardiac surgery at Children's Hospital No. 2 at Ho Chi Minh, Vietnam. The paediatric anaesthetic team involved in the project was faced with numerous challenges to fulfil the aims and outcomes of this project.
The challenges faced by the team included language barrier, non-availability of certain equipment, lack of trained manpower, non-availability of certain medications and certain aspects of managing smaller children (<5kgs) on pump.
A total of 3 trips lasting 5 days each have been undertaken. Solutions have been found to all the challenges listed above and the project objectives and outcomes are being evaluated.
WHO's aim of "Health for all by 2020" can only be met if such trainings are carried on-site and by overcoming the challenges faced by the trainers.

Abstract no: 124

Morphology and surgery in atrioventricular septal defect with left ventricular outflow tract obstruction

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Background: Outcome after repair of AVSD may by unfavourably altered by co-existing LVOTO.
Materials and methods: Morphology of 73 heart specimens was examined and compared with morphology and clinical data of operated patients with AVSD. The aim of the study was to determine prevalence of LVOTO and analyse results of the surgical treatment of AVSD with LVOTO.
Results: LVOTO was found in 9 (12.3%) of 73 specimens. It was caused by hypertrophy and anterior displacement of the antero-lateral papillary muscle (5 hearts), septal hypertrophy (3), or fibromuscular membrane (1). In our clinical series LVOTO was found in 19 (2.8%) of 675 patients with AVSD. It was caused by fibromuscular membrane, septal hypertrophy, abnormal valvar attachments and fibromuscular strands which occured in combination. LVOTO was present at the time of AVSD repair in 8 and developed after repair in 11 patients. Membrane excision (9pts), myectomy (6), excision of abnormal valvar tissue (3) and valvotomy (1) were required. Correction of AVSD consisted in 2 or 1 patch repair and individually modified plasty of AV valves. Survivors were examined by ECHO. There was one (5.3%) early and one (5.3%) late death. The cause of death was heart failure and MS respectively and resulted in part from the presence of LVOTO in both cases. 2 survivors required reoperation for LVOTO. Operated patients remain in good condition without LVOTO at mean 6.5±3.8 years after surgery.
Conclusions: The prevalence of LVOTO was 2.8%. Fibromuscular membrane, septal hypertrophy and abnormal valvar tissue represented the most common causes of LVOTO in operated patients. Septal hypertrophy, oblique "cleft', displastic valve and abnormal attachments in LVOT may contribute to LVOTO formation after surgery. LVOTO did not increase mortality but the long term outcome and reoperation rate may be influenced by progression of LVOTO.
(Supported by project No. 00064203.)

Abstract no: 135

Experience with resection of large left ventricular fibromas

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Background: Large LV fibromas are rare tumours with unfavourable prognosis and high risk of ventricular fibrillation. There is not enough experience with their surgical treatment.

Material and methods: Large LV fibromas were observed in 4 children at the age 3.2, 1.7, 0.9 and 1.2 years respectively since 2004. 1 child who was not operated suffered from an attack of ventricular fibrillation which resulted in severe neurological deficit. 3 patients underwent surgical resection of the tumour. The pre-operative diagnosis was set by echocardiography. All fibromas were similarly located at the lateral LV free wall from the base to the apex. The surgery was performed in CPB and blood cardioplegia. It consisted in total excision of the tumour and plication of LV wall. All tumours were large (70 x 40 x 25mm) with similar appearance. They were ovoid, white and stiff. Thin external layer of LV wall was longitudinally incised and the tumour was sharply excised leaving both layers intact. Meticulous inspection for bleeding and injury to the inner layer was necessary. LV wall was plicated.

Results: Total excision without injury to coronary arteries, AV valves or connective tissue was possible in all patients. The diagnosis was confirmed histologically. In 2 operated patients the post-operative course was uneventful. In 1 patient reoperation for bleeding to the LV wall was required on the first post-operative day. All operated patients survived and remain 8.2, 2.4 and 2.2 years, respectively, after surgery without arrhythmias, with good LV and MV function. The un-operated patient remains in unfavourable neurological status, though the deficit is improving. In this child a cardioverter/defibrillator was implanted and resection of the tumour is considered.

Conclusion: LV fibromas can be completely excised. The risk of post-operative complications and arrhythmias is low in surgically treated patients. (Supported by the project of conceptual development of research organisation No. 00064203.)

Abstract no: 141

Experience on the practical use of levosimendan in children in Kuwait - expanded review

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Introduction: Levosimendan is a relatively new calcium-sensitising drug that opens adenosine triphosphate dependent potassium (KATP) channels with the effect of increasing myocardial contraction thus causing vasodilatation. Its main potential advantages are the improvement of myocardial contractility without increasing oxygen requirements, reduction of ventricular pre-load, and an anti-stunning, anti-ischaemic effect by opening KATP channels. We present here a large group of paediatric patient population treated with levosimendan.

Methods: A retrospective observational study in our paediatric intensive care unit, in which more than 80 patients received levosimendan. There were no adverse events attributable to levosimendan and no instances where the clinical condition worsened after administration. Arterial lactate levels decreased significantly following levosimendan administration during cardiopulmonary bypass for anticipated low cardiac output. In those with established low cardiac output, trends toward improved haemodynamics were seen with heart rate reduction, an increase in mean blood pressure, a reduction in arterial lactate and reduced conventional inotrope use.

Results: Levosimendan was safely and successfully used in a significant number of paediatric patients with established low cardiac output state who demonstrated improved haemodynamics and tissue perfusion with a tendency to reduce conventional inotrope usage, which warrants its evaluation as an inotrope in the paediatric population.

Conclusion: Levosimendan is the safeguard drug of choice which could revolutionise the outcome of cardiac surgery in children.

Abstract no: 152

Case report: cardiogenic shock in a post-operative neonate with cyanotic congenital heart disease

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Cardiogenic shock in a post-operative neonate with cyanotic congenital heart disease is a challenging emergency where the cause determines management. Post-operatively, iatrogenic complications can be overlooked especially when invasive monitoring and haemodynamics become the focus of ongoing assessment. We present a male neonate of 34 weeks gestation with pulmonary atresia and ventricular septal defect who received a right modified Blalock-Taussig shunt on day 3 of life.

Post- op he remained ventilator dependent secondary to nosocomial pneumonia. On day 5 post-op he had increasing ventilatory requirements with an acute deterioration due to cardiogenic shock requiring aggressive resuscitation. Chest X-ray revealed progressive cardiomegaly.

Urgent echocardiography confirmed the presence of a large pericardial effusion. Pericardiocentesis yielded 80ml of lipid-rich fluid with immediate clinical improvement. An echogenic focus close to the umbilical venous catheter (UVC) tip was also imaged near the Eustachian valve of the right atrium (RA).

We present a neonate with cyanotic congenital heart disease, post-surgery, who presented with cardiac tamponade due to a pericardial effusion. This was a result of infusion from the UVC tip which - though appropriately positioned - had eroded into the pericardial cavity through the right atrium. The echogenic focus noted on echocardiography marked the site of erosion.

Cardiac tamponade in a neonate post cardiac surgery can occur unrelated to the operative procedure and its complications. A UVC tip, though appropriately positioned, had perforated through the RA into the pericardial cavity and was the unexpected cause of death in this patient. Catheter iatrogenicity is an important cause of morbidity in post-operative cardiac neonates.

Abstract no: 154

Monitoring of outcomes and performances in congenital heart surgery: Complete and verified single-institution data, 16 years of practice

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Background: Analysis of surgical outcomes using raw mortality without risk adjustment is inadequate. The Aristotle Basic Score and EACTS-STS Mortality Score and Categories have been developed based initially on experts opinion and finally on huge amount of multi-continental data. These tools allow for monitoring of team performance over long time period with respect to increase of complexity and risk of procedures.
Materials and methods: Complete and verified data on 8 404 procedures performed between 1995 - 2010 in our institution were collected in our registry using International Nomenclature for Pediatric and Congenital Heart Surgery, and EACTS-STS database format. 6 992 procedures scored by Aristotle Basic Score and EACTS-STS Mortality Score and Categories were included. Procedures with less than 25 occurrences were excluded. Hospital mortality, Aristotle Basic Score, Mortality Score and Categories, postoperative length of stay were used for measurement of team performance defined as Score x Survival/100 and LOS coefficient (100 - LOS (days)/Score). The same calculations were performed using 8 STS benchmark procedures.
Results: Mean annual volume of procedures included in analysis was 437 (388-510). Mean hospital mortality was 4.55% (3.08 - 6.81), mean Aristotle Basic Score - 5.89 (5.60 - 6.67), Mortality Score - 0.59 (0.49 - 0.79), Mortality Categories 1.94 (1.76 - 2.25), mean postoperative LOS was 14.4 days (10.2 - 25.2). During 16 years continuous increase of team performance followed the increasing complexity of procedures. Mortality Score appeared a strongest predictor of death in logistic regression analysis [AUC 0.780 (0.77 - 0.789)] and was used for calculation of performance and LOS coefficient. Team performance increased from 0.47 in 1995 to 0.75 in 2010 ($p<0.001$). LOS coefficient increased from 75.3 - 81.3 ($p=0.85$).
Conclusions: Available quality measures allow for continuous assessment of the team performance in Congenital Heart Surgery. Increasing complexity and risk of procedures is neutralised by accumulated growth of team experience represented as team performance and LOS coefficient.

Abstract no: 168

Bug busters: Themed initiative for the reduction of infection rates in a cardiac intensive care unit (CICU)

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Background: To reduce infection rates by raising awareness of infection risks, types, precautions, preventative measures and treatment options.
Method: Through SWOT analysis we identified strengths, weaknesses, threats to infection prevention and opportunities for reducing infections on CICU. To promote infection awareness we created "Bug busters", a themed acronym to prompt best practices (Bundles; Utility bins; Gadgets; Biopatches; Utilising Housekeepers; Sterilising; Transformation website; Educating colleagues; Reducing errors; Stamping out infections), and recruited key staff to become Bug Buster champions. Staff and parent notice boards were updated and hand hygiene, CVL and SSI compliance audited monthly. CVL route cause analysis highlighted femoral lines as a problem area. A new policy was implemented, introducing Biopatches (antimicrobial dressing) to prevent catheter-related blood stream infections. We organised a study day and created bay leader checklists to disseminate best practices throughout CICU. We also created a Bug Busters newsletter detailing audit results and reiterating our ward policies and protocols. Infection control teaching for new and existing staff in collaboration with educational facilitators highlighted inadequate understanding of infection types. In response we developed a Bug Busters poster displaying viruses vs. bacteria including routes of transmission; isolation precautions; preventative and treatment methods.
Results:

- Hand hygiene compliance has improved from 93% - 100% since October 2011;
- CVL audit compliance has improved from 86% - 100% since July 2011; and
- SSI infections 30 days post cardiac surgery have reduced from 8% - 2% since November 2011.

Conclusions: Our "Bug busters"-themed initiative has led to increased awareness of infection control issues and contributed to a reduction in infection rates of children on CICU.

Abstract no: 173

Controlling oxygenation during initiation of cardiopulmonary bypass: Effect on renal and hepatic systems in cyanotic children undergoing cardiac surgery

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Objective: Cardiopulmonary bypass (CPB) initiated with high oxygen levels expose cyanotic children to reoxygenation injury, which can possibly affect multiple organ systems. Controlling oxygenation during initiation of Cardiopulmonary bypass has been demonstrated to be associated with decreased myocardial injury. This study tested the effect this strategy on renal and hepatic systems.
Materials and methods: Thirty-one cyanotic children were randomised. In group A (intervention), CPB was initiated with fraction of inspired oxygen (FIO2) 0.21, and after 1 minute of full bypass, FIO2 was increased at increments of 0.1 per minute to reach 0.6. In group B (hyperoxemic), CPB was initiated using FIO2 >0.6. Aortic cross clamp and CPB time (minutes) measured. Serum Creatinine (mg/dl), Aspartate Aminotransferase(AST) (U/l) and Alanine aminotransferase(ALT) (U/l) measured preoperatively(Pre-op) and on postoperative day(POD)-1 and 2.

Results: CPB time (group A median=71.5 , IQR=64-100; group B median=95.5, IQR=58-145, P=.71), Cross clamp time (group A mean=59.2, 95% CI=47.6-70.8; group B mean=66.57, 95% CI=47.6-88.5, P=.57), Serum Creatinine [Pre-op (group A median=0.6, IQR=0.53-0.68; group B median=0.6, IQR=0.6-0.7, P=0.11), POD-1 (group A median=0.6, IQR=0.5-0.76; group B median=0.6, IQR=0.5-0.75, P=0.54), POD-2 (group A median=0.5, IQR= 0.43-0.68; group B median=0.6, IQR=0.5-0.77, P=0.11)], AST [Pre-op (group A mean=27.5, 95% CI =24.91-30.09; group B mean=31.31, 95% CI=25-37.64, P=0.37), POD-1(group A median=100, IQR=83-132; group B median=103, IQR=74.75-146, P=0.8), POD-2 (median=66.5, IQR=52-76.25; group B median=82, IQR=62-124.75, P=0.12)] and ALT [Pre-op (group A median=18.5, IQR=15.25-19.75; group B median=17.5, IQR=13.25-22.50, P=0.84) and POD-1 (group A median=21, IQR=19-23; group B median=24.50, IQR=19.5-34.5, P=0.19] showed no significant difference. ALT POD-2 (group A median 19.5, IQR=16-21; group B median=25, IQR=21-33, P =0.044) was significantly lower in group A.
Conclusion: This study suggests possible decreased hepatic injury associated with this protocol.

Abstract no: 184

Impact of afterload reduction on cerebral tissue oxygenation after the Norwood procedure for hypoplastic left heart syndrome

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Background: Lower cerebral tissue oxygenation has been observed by near infrared spectroscopy (NIRS) after the Norwood procedure. Altered cerebral vascular resistance and pharmacological afterload reduction redirecting blood flow away from the cerebral circulation are possible mechanisms. We evaluated the impact of afterload reduction with Milrinone on cerebral (cSO2) and somatic tissue oxygenation (sSO2) in comparison to retrospective controls treated with Sodium-Nitroprussid and Enoximone.
Methods: NIRS and routine intensive care monitoring data were recorded for 24 hours before and 48 hours after the Norwood procedure in 68 HLHS patients (Milrinone n=34, control n=34). Average values of the last 4 pre-operative hours (baseline) and of the first and the last 4 post-operative hours (early and late course) were calculated.
Results: Baseline, early and late post-operative cSO2 values were 58±7%, 52±12% and 61±7% for patients treated with Milrinone and 58±7%, 52±9% and 60±6% for controls; sSO2 values were 58±9%, 78±8% and 69±10% and 59±8%, 76±10% and 67±9%, respectively. Baseline and post-operative NIRS values were not different between groups. cSO2 was below 40% for 45 (0 - 720) minutes in patients treated with Milrinone and for 50 (0 - 1040) minutes in controls (p=1.00). A lower haemoglobin early after operation was associated with cSO2 less than 40% for more than 60 minutes (14.9±1.7 vs. 16.0±1.3 g/dl, p=0.005). cSO2 correlated with pO2 (r: 0.137, p<0.001), with SaO2 (r: 0.223, p<0.001) and with SvO2 (r: 0.404, p<0.001). pCO2 was weakly and negatively correlated with sSO2 (r: -0.165, p<0.001), but not with cSO2.
Conclusions: Early after the Norwood procedure, cSO2 was lowered with both strategies of afterload reduction and the wide difference between cSO2 and sSO2 indicates a mismatch between cerebral and splanchnic perfusion. Other strategies to improve cerebral tissue oxygenation after the Norwood procedure are warranted.

Abstract no: 187

Truncus arteriosus communis repair with or without right ventricle to pulmonary artery conduit: No difference in early and mid-term follow-up

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Background: Implantation of conduit between right ventricle and pulmonary artery is a part of truncus arteriosus communis (TAC) repair in many centres. The repair without conduit was implemented in our centre to decrease the reintervention rate. The aim of the study was to compare early and mid-term results of conduit versus non-conduit repair of TAC and to assess risk factors for mortality and prolonged hospital stay (more than 30 days).
Methods: All patients who underwent two-ventricle repair of TAC between 1995 and 2012 were included in retrospective cohort study and divided into conduit (n=12) and non-conduit (n=20) group. The conduit was implanted at the discretion of the surgeon. Data are presented as median (range).
Results: The age at surgery was 28 days (6-466). The mortality was 21.8% (n=7). There was no difference between the conduit and non-conduit groups in weight, age at surgery, classification according to aortic versus pulmonary dominance, and duration of intensive care, inotropic support, mechanical ventilation and mortality. Cardiopulmonary by-pass time and cross-clamping time were longer in conduit group: 154 minutes (120 - 513) versus 107 minutes (84 - 197), p=0.006 and 91 minutes (48 - 160) versus 65 minutes (31 - 108) p=0.01, respectively. Truncal valve repair with aortic conduit was required in 2 patients in conduit group. 5 patients required 7 surgical re-interventions in non-conduit group and 1 patient required interventional procedure in conduit group until hospital discharge (p=0.27). 1- and 5-year freedom from right ventricle outflow tract reintervention was 80%, 53% in conduit group and 80%, 80% in non-conduit group, respectively (p=0.16). No risk factors for mortality were identified. The needs for mechanical ventilation at the time of surgery and for surgical reintervention were risk factors for prolonged hospital stay.
Conclusions: Truncus arteriosus communis repair with or without right ventricle to pulmonary artery conduit provides similar early and mid-term results.

Abstract no: 209

Congenital portal vein anomaly as a cause of severe pulmonary hypertension

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Background: Congenital absence of the portal vein (CAPV) as a consequence of aberrant venous development in the early embryonic period is an extremely rare condition, with only up to 40 cases published. Due to porto-systemic shunt the mesenteric/splenic venous drainage bypasses the liver and drains directly into systemic circulation.

Methods: Although considered rare, in our centre 3 cases of CAPV were detected over of 4 years. These cases presented as severe porto-pulmonary hypertension (PPHT) due to portal vein agenesis with porto-systemic shunting.
Results: Two young adults (34-year-old female; 36-year-old male) and a 34-months-old girl presented with pulmonary arterial hypertension (PAH). Right heart catheterisation confirmed severe PAH in all 3 patients (mean PAP 65/85/47mmHg and PVR 8/13WU, 10.4 WU/m^2 respectively). Due to clinical course and suspicion of PPHT abdominal ultrasonography, MR and CT were performed, the diagnosis of CAPV with porto-systemic shunts to inferior vena cava in all 3 cases was established and the diagnosis of PPHT was confirmed. Due to functional status (WHO II/III/II) specific therapy of PAH was initiated as follows: ambrisentan, sildenafil, bosentan. In 2 adult patients treatment (during 7 and 3 years) improved continually to functional status WHO I and physical performance increased significantly (6MWT: +128m/+68m). The child's follow-up and therapy was interrupted after a year. According to the GP's information, incompliant parents failed to return and the child died 3 months later due to acute respiratory failure.
Conclusions: CAPV is a rare condition with only few cases presented; usually associated with cardiac, skeletal, and visceral malformations. Even more, association of CAPV with severe PPHT is extremely rare. Though, on the hand of our 3 patients, it may be more frequent after all but remains undiagnosed. The prognosis is dependent on early diagnosis as well as management with PAH-specific treatment included in an experienced PH centre.

Abstract no: 215
Modified exposure in surgical repair of total anomalous pulmonary venous connection: 5-year experience

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Objective: Surgery for total anomalous pulmonary venous connection (TAPVC) requires either anastomosing pulmonary venous confluence (PVC) to left atrium (LA) or intracardiac baffling. Limited convenience and lack of space during creation of anastomosis can potentially compromise the repair and outcomes. The aim of this study is to present our experience with a modified approach in the repair of TAPVC which provides superior exposure and facilitates repair.
Methods: 120 patients with isolated TAPVC were operated on in the years 2000 - 2010. Conventional approaches to surgical exposure were used in 72 patients (Group I). Starting from 2006, modified exposure was used in 48 consecutive patients (Group II). In the modified approach the right pleural cavity is widely opened, the heart is rotated around the axis of caval veins into a pleural cavity and this manoeuvre provides better exposure for anastomosis creation.
Results: There were 2 early deaths (4.2%) in modified exposure group. Multi-factorial analysis has shown modified exposure to be among the factors responsible for improved outcomes. Follow-up is 93.1% complete with no late deaths and reinterventions in both groups. All survivors are asymptomatic at a median follow-up of 31.7 months.
Conclusions: Anastomosing LA to PVC is a key component of TAPVC repair. Modified surgical approaches to repair may provide better exposure and superior outcomes. Long-term outcomes are good with all kinds of approaches.

Abstract no: 216
Distinctive haemodynamics in the immediate post-operative period of patients with a longer cardiac intensive care stay post Tetralogy of Fallot repair

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Background: The majority of ToF patients have ≤2 days stay in the cardiac intensive care unit (CICU) while some stay longer. We undertook this study to investigate the differences in immediate post-operative (first 4 hours) variables in patients who had shorter compared to those who had a longer stay in CICU.
Material and methods: Patients who underwent ToF repair at Aga Khan University, Pakistan from July 2006 - December 2011 were considered.
Exclusion criteria: Mortality in the 1st 24 hours, pulmonary atresia, absent pulmonary valve syndrome, infection or other non-cardiac causes of prolonged CICU stay. Clinical parameters were compared between shorter stay group (SSG) (≤2 days) and longer group (LSG) (>2days). Continuous variables are presented as medians.
Results: Eighty nine patients (LSG 57, SSG 32) were included. There was no difference in age at repair (in years) between the groups (LSG 5 vs. SSG 6, p=0.07). LSG had a lower pre-operative saturation (78%) compared to SSG (85%), p=0.04. LSG had a significantly longer total bypass time (150 minutes vs. 137 minutes, p= 0.02). Averaged over the initial 4 post-operative hours, patients in LSG had a significantly higher heart rate (136 vs. 122, p=0.04), central venous pressures (CVP) (11 vs. 9mmHg, p=0.001) and inotropic score (IS) (10 vs. 8, p=0.01). Averaged over the total CICU stay LSG had a significantly higher IS (10 vs. 6, p=0.009), CVP (9 vs. 8, p=0.01) and longer duration on inotropes (2 vs. 1 days, p=0.001), and mechanical ventilation (1 vs. 0.5 days, p=0.001) when compared to SSG.
Conclusion: Patients who end up staying longer in the CICU have features that are distinctive in the immediate post-operative period. These clinical parameters can be used to predict patients who may need more support and longer CICU stay and thus help in parent counselling.

Abstract no: 217
Heartfelt: Mothers experiences of their infants following cardiac surgery

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Background: Many infants with congenital heart disease require major surgery within weeks of birth. Attachment theory and research have emphasised the critical importance of the early mother-infant relationship for the general development and future well-being of the child.
Materials and methods: A prospective longitudinal, staged study was designed to explore the psychological well-being of mothers and babies and the nature of the developing mother-infant relationship following the infants' heart surgery. Complementary qualitative and quantitative research methods were used. Data

was collected when the infant was 2 months and 9 months old. Mothers' perceptions, standardised measures of maternal distress, and observations of infant interaction with the researcher were compiled at each stage. Maternal distress was evaluated using the Edinburgh Post-Natal Depression Scale, State-Trait Anxiety Scale and Parenting Stress Index Short Form. Infants' well-being was tapped using a measure of social withdrawal (ADBB). In-depth interviews with the mother explored experiences of the diagnosis, infant's hospitalisation and treatment, and her perceptions of her developing relationship with her infant; the resulting narratives were subjected to thematic content analysis.
Results: The cardiac diagnoses varied from an isolated VSD to HLHS. Very high levels of maternal distress were found and almost half of the infants were socially withdrawn Maternal distress was associated with infant social withdrawal. Thematic analysis of the maternal interviews revealed shock and acute stress as central to mothers' experience. Also, mothers' perception of infant responsiveness appeared to affirm life, and recognition of these qualities in the infant may help to facilitate mothers' recovery.
Conclusion: Important issues need to be addressed to provide services for facilitating the well-being of both mother and infant over and above improving surgical outcomes. The research was funded by the NHMRC and carried out with the support of Monash University, MCRI, Monash Medical Centre and The Royal Children's Hospital.

Abstract no: 218
Role of fenestration in the Fontan circulation: Haemodynamic responses to cardiac output change

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Backgrounds: Although fenestrated Fontan procedure was developed to assure haemodynamic stability during acute post-operative phase, controversy exists whether fenestration for chronic phase is beneficial and how fenestration works in response to homonymic changes. In this study, we investigated the haemodynamic behaviour of fenestrated Fontan circulation in response to increased and decreased cardiac output.
Methods and results: We studied 15 Fontan patients with fenestration. During cardiac catheterisation, haemodynamic changes in response to dobutamine infusion and atrial pacing were examined both before and after temporal occlusion of fenestration. The trends of changes in cardiac output (CO) and arterial oxygen saturation (SaO_2) by atrial pacing varied in among patients. With the increase in cardiac output, fenestration predominantly provided an increased amount of CO. Because of increased CO, oxygen saturation was preserved during dobutamine infusion. As for atrial pacing, ventricular relaxation could determine CO response to increased HR, irrespective of baseline pulmonary-to-systemic flow ratios (Qp/Qs) and pulmonary arterial resistance. Conversely, SaO_2 was determined by the change in Qp/Qs and change in central venous oxygen saturation. Interestingly, we observed a linear relationship between stroke volume (SV) and Qp/Qs, indicating that SV could determine Qp/Qs during HR variations in fenestrated Fontan. Furthermore, we found that patient age was an independent determinant of individual SV-Qp/Qs relationship by multiple regression analysis ($p = 0.013$).
Conclusions: The Qp/Qs can change with HR variations on the basis of the patient's specific SV-Qp/Qs relationship. Because this relationship varies with the patient's growth and, because oxygen saturation is strongly influenced by central venous oxygen saturation, fenestration showed beneficial and ideal activity especially in younger patients. Fenestration would be active in preserving both oxygen saturation and preload corresponding to cardiac output variations, both in increasing and decreasing cardiac output.

Abstract no: 228
Paediatric ECMO at small paediatric cardiac centres in the Nordic countries

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Background: Paediatric ECMO is a highly specialised treatment and experienced teams are necessary for an acceptable outcome. The five Nordic countries all have a confined background population, resulting in a restricted number of paediatric ECMO runs in each centre. In order to compare the performance of the Nordic centres with the rest of the world we have compared data from a 10-year period with the ELSO register and with selected high volume centres.
Material and methods: A MEDLINE and Pubmed search (2005 - 2012) was done to find results from larger single centre studies. Data will be collected retrospectively and will comprise of children <19 years of age from the six Nordic centres. Cumulative data from all the Nordic centres will comprise sufficient data to perform relevant statistics and evaluate the overall performance of minor ECMO centres.
Results: Mortality and secondary outcome as well as data on demographics, indications and complications will be presented from the Nordic centres. A comparison of indications, outcome and complications associated with ECMO will be performed between data from the Nordic centres and the ELSO register as well as selected single large centre studies.
Conclusion: The analysis will provide insight into the performance of minor centres, and if specific ECMO runs or indications should be improved or referred for larger centres. Furthermore, the analysis will address if there are certain risk factors associated with a poor outcome. As data analysis is still pending any conclusion cannot be made at this point.

Abstract no: 244
Early and mid-term outcomes of sutureless technique for post-operative pulmonary venous stenosis

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Background: Sutureless in situ pericardium repair for the relief of pulmonary venous stenosis (PVS) after the repair of TAPVC is firstly reported by F. Lacour-Gayet in 1996. This technique has been popular because of its potential to avoid recurrent stenosis. However, detailed clinical advantages remain unclear. We retrospectively reviewed our surgical experience, and compared the outcome with that of conventional procedures.

Materials and methods: For the relief of post-operative PVS after TAPVC repair, 5 patients underwent a conventional procedure, such as orifice cutback or resection of a proliferated intima, from 1999 - 2004 (group C, 4 males, median 93-day old, 3.6kg). Thereafter 7 patients with PVS were repaired with sutureless technique from 2005 - 2011 (group S, 5 males, 119-day old, 3.4 kg). Patients with single ventricle were excluded. There were no significant differences regarding patients' characteristics. Follow-up examinations were completed in all.
Results: The cumulative survival rates at 5 years in group C and S were 60% and 85.7%, respectively. Freedom from reintervention for the pulmonary veins at 5 years in group C and S were 60% and 85.7%, respectively. The rate of restenosis after relief of PVS were 100% (10/10) in group C and 31.6% (6/19) in group S (p=0.0088). In bilateral venous stenosis patients, survival was 0% (0/2) in group C and 83.3% (6/7) in group S (p=0.035). Among 3 patients (one in group C and 2 in group S) who developed PVS in all 4 pulmonary veins, only 1 in group S survived.
Conclusions: PVS relief with sutureless technique was superior to conventional procedures particularly in more severe cases such as bilateral PVS or PVS in all 4 pulmonary veins. Sutureless technique for post-operative PVS could be applied aggressively even at the initial repair for TAPVC to decrease the risk of post-operative PVS.

Abstract no: 248
Clinical analysis of orthostatic hypertension in children

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Objective: To study the clinical characteristics of orthostatic hypertension (OHT) in children.
Method: A total of 96 OHT children who met with the diagnostic criteria and clinical manifestations were recruited in the Department of Paediatrics, Peking University First Hospital. Age and sex distributions were observed. The duration of disease, the frequencies of symptoms and the predisposing factors were recorded. The haemodynamic changes from supine to upright positions were also analysed.
Result: There were 50 boys and 46 girls in our study group. The mean age was (11.8±2.7) years old. 32 children were from 6 - 10 years old accounting for 33.3% of all subjects, while 64 patients were from 11 - 17 years old accounting for 66.7%. Durations of symptoms of OHT were less than 1 month in 22.9% children, from 1 month to 1 year in 51.1% children and longer than 1 year in 26.0% children. The most common clinical manifestations were syncope and dizziness with an incidence of 70.8% and 46.9% respectively. Other clinical manifestations included transitional amaurosis, nausea and/or vomiting, pallor and so on. They often happened in position change (24.0%) and long term standing (57.3%) in children. Other predisposing factors included exercise, emotional changes and foggy environment. The baseline systolic and diastolic blood pressure were (103±8) mmHg (1mmHg=0.133kPa) and (59±6) mmHg, respectively, the upright systolic and diastolic blood pressure at 3 minutes were (113±8) mmHg and (73±6) mmHg and the differences were significant (t=27.674, p<0.01; t=17.936, p<0.01). The baseline heart rate in supine position was 81±11bpm and the maximum heart rate in upright position was (113±12)bpm (t=33.092, p<0.01).
Conclusion: OHT is commonly seen in puberty in children. The chief complaints are syncope and dizziness, mostly induced by position change and long term standing.

Abstract no: 260
Late surgical correction of anomalous left coronary artery from pulmonary trunk in children, using autogenous aortic and pulmonary endotheliased tube

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Background: Direct re-implantation of an anomalous left coronary artery into the aorta is the preferred surgical option for creating a dual coronary arterial system in patients in whom the anomalous artery originated from the pulmonary trunk. This technique, however, is applicable only when the anomalous artery arises from the left posterior pulmonary sinus. We report the successfully late follow-up of series of patients employing a new technique using combined autogenous aortic and pulmonary endotheliased tube.
Patients and methods: We have treated 3 patients, aged 2 months, 6 months and 8 months respectively, who presented with anomalous origin of the left coronary artery from the left posterior pulmonary sinus and moderated mitral valve insufficiency by left ventricle dysfunction. We used a trapdoor like coronary artery elongation with autogenous aortic and pulmonary endotheliased tube to connect the left coronary ostium to ascending aorta, avoiding the mitral valve intervention.
Results: There was no early or late death. All patients are in functional class I, with good biventricular function and competent mitral valve at a median follow-up of 94 months, ranged from 108 - 132 months. Post-operative computerised tomogramphy of aorta in our 1st patient showed good arterial flow, without any distortion. A local and distal stenosis of the left pulmonary artery was observed and submitted to stent treatment.
Conclusions: The potential benefits of the trapdoor like and its modification technique are excellent operative exposure. The use of autogenous endothelised tube is a viable tissue capable of further growth, avoidance of injury to the aortic and pulmonary valvar apparatus or production of obstruction within the right ventricular outflow tract.

Abstract no: 264
Cardiac effect of low and high dose idebenone therapy in Friedreich's ataxia patients

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Introduction: Cardiac involvement in Friedreich's ataxia (FRDA) is present in 63% of patients mostly represented by a hypertrophic cardiomyopathy. The use of antioxidants such as idebenone has shown promising results in improving cardiac hypertrophy parameters at low to intermediate dose. Higher doses of idebenone are suggested, but the related long term cardiac effects have not been studied yet, which is the objective of this study.
Methods: A prospective, non-controlled, comparative open label trial of a 12-month regimen of low versus high dose idebenone between 2 cohorts with FRDA. Cardiac evaluation was performed before initiation of therapy, then at 6, 9 and 12 months of therapy.

Results: Significant left ventricular mass reduction from baseline was observed in both groups after 6, 9, and 12 months (p=<0.05). Systolic function parameters where within normal range in all patients, with no significant differences between baseline and last follow-up in either group. Diastolic function was marked by an improved mitral deceleration time in the high idebenone group at last follow-up (p= 0.029), but not in the low idebenone group (p=0.13).
Conclusion: There are comparable effects of high and low idebenone therapy in terms of reduction of left ventricular hypertrophy para-meters. Both therapeutic regimens seem to preserve systolic cardiac function, with an advantage of the high idebenone dose to improve diastolic filling.

Abstract no: 269

Outcomes of extra-corporeal life support following cardiac surgery in children who fail to wean from cardiopulmonary bypass

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Background: Extra-corporeal life support (ECLS) following paediatric cardiac surgery varies according to centre availability and philosophy. We assessed local outcome of patients receiving ECLS for failure to wean from cardiopulmonary bypass (CPB), with the aim of identifying factors associated with outcome.
Methods: Institutional databases from our tertiary-referral centre identified children who received post-operative ECLS. Retrospective medical record review preceded standard statistical analyses, including factors associated with survival.
Results: Between 1 January 2002 - 1 January2011, 65 children (median age 1.5 months) received ECLS for failure to wean from CBP. Extracorporeal membrane oxygenation (ECMO) was utilised for 35 children (median 1 month old); centrifugal left ventricular assist device (LVAD) for 30 (median 2.8 months). Fourteen children (21%) were post-palliation for single-ventricle physiology. Eleven patients (17%) underwent surgical revision on ECLS, and 19 (29%) received multiple ECLS runs. Thirty eight patients (58%) survived to hospital discharge. Survival was not associated with diagnosis, single-ventricle physiology, surgical revision, organ-specific complications or ECMO versus LVAD. Survival occurred after up to 9 days of ECLS. By uni-variable analysis, older age (2.2 versus 0.2 months), lower arterial lactate at 4-hours (2.6mmol/L versus 4.9mmol/L), shorter ECLS (3 versus 6 days), less patient or circuit complications, and single ECLS run were associated with survival (all p<0.05). By multivariable regression model, prolonged ECLS (p<0.001), elevated lactate 4-hours post-support (p<0.02) and repeat ECLS (p<0.03) were associated with hospital death.
Conclusion: Almost 60% of children receiving ECLS for failure to wean from CBP post-cardiac surgery survived to hospital discharge. Inadequate support as represented by higher arterial lactate and multiple runs were associated with worse outcomes. Although prognosis worsens with prolonged ECLS, individual patients survived after up to 9 days of support.

Abstract no: 285

Systemic thrombolysis in children with life or organ threatening thrombosis after cardiac surgery

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Background and objectives: The use of thrombolysis in the post-operative period is relatively contra-indicated because of the risk of serious haemorrhagic complications. The aim of the study was to assess the efficacy and safety of thrombolysis and identify risk factors for major bleeding complications in children with intracardiac or major vessel thrombosis after cardiac surgery.
Methods: Retrospective study included children with clinically significant thrombi confirmed by sonography, angiography or CT scan who were treated with recombinant tissue plasminogen activator (rtPA) in the post-operative period after cardiac surgery between 2000 and 2011. Data are presented as median (range).
Main results: Fourteen patients at the age of 24 months (1 month - 15 years) received 15 courses of systemic thrombolysis for intracardiac (6) or major vessel (9) thrombosis. Thrombolysis was initiated on post-operative day 9 (36 hours - 40 days after surgery). Duration of therapy was 6 hours (2 hours - 3 days) with cumulative dose of rtPA 2.7mg/kg (0.3 - 18.2mg/kg). Complete clot resolution, partial effect, and no effect were achieved in 9 (60%), 4 (26.7%), and 2 children (13.3%), respectively. Major bleeding required blood transfusion in 5 patients (33.3%) and surgical intervention in 2 patients (13.3%). 1 patient died of inferior vena cava thrombosis after Fontan procedure. All-cause hospital mortality for the whole group was 35%. Higher International Normalised Ratio immediately after thrombolysis discontinuation was associated with haemorrhagic complications (p=0.01). Other factors were not identified as predictors for outcome.
Conclusions: Thrombolysis can be used as a treatment modality for symptomatic thrombosis in children after cardiac surgery. The risk-benefit ratio should be assessed for each individual patient.

Abstract no: 292

Congenital cardiac surgery through minimally invasive midaxillary right lateral muscle-sparing thoracotomy approach in infants weighting 6kg and more

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Background: Nowadays there's a growing interest in minimally invasive cardia surgery techniques in and a legitimate desire to adopt these approaches for the little weight and early age patients. We used right lateral thoracotomy (RLT) to repair congenital heart defects (CHD) for infants weighing 6kg and more.
Materials and methods: Between May 2009 and June 2012, 384 patients aged from 6 months - 18 years underwent correction CHD through RLT with the use of direct cannulation aorta, caval veins and cardioplegia. Of them 59 patients were infants younger than 1 year (group 1). This approach was compared to median sternotomy done to 78 infants till 1 year (group 2).

Results: CHD that could be approached through the right atrium (atrial septal defect, partial anomalous pulmonary venous drainage, atrial component of atrioventricular septal defect, ventricular septal defect) we operated through RLT in infants weighing at least 6kg. Mean patient age was 0.82±0.15 (range 0.5 - 1.0) and 0.76±0.16 (range 0.5 - 1.0) years in group 1 and group 2 ($p>0.05$), the proportion of CHD was the same. Exposure to the intracardiac anatomy in RLT group was good. No need for conversions to another approach. The mean time of operations was 122.4±32.2 in group 1 and 142.8±57.5 minutes in group 2 ($p<0.05$). There was no operative or late mortality or major morbidity. The follow-up was 1.7±0.6 years. All patients in RLT group had gratifying cosmetic results. There was no any scoliosis, deformity of a chest or a breast.
Conclusions: RLT can be used as an alternative to median sternotomy for a wide range of CHD that could be approached through the right atrium in infants weighing at least 6kg. RLT cosmetic results are much better than standard median sternotomy.

Abstract no: 293
Lateral atrial tunnel and extracardiac conduit: Comparison of early results. A single-centre experience

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Background: After a history of over 40 years of Fontan operations (FO) 2 modifications are currently used for cavopulmonary anastomosis: lateral atrial tunnel (LT) or extracardiac conduit (EC). The aim of the study was to compare the hospital outcomes of LT and EC at a single institution over the same period of time.
Materials and methods: Between June 2007 and June 2012, a series of 149 consecutive children at the mean age of 3.6±2.1 years underwent FO. 56 (37.6%) patients after hemi-Fontan operation underwent fenestrated LT and 91 (61.1%) patients after bi-directional Glenn anastomosis underwent EC. 2 (1.3%) patients underwent other variants of FO and were excluded from the study. The most common malformations were: hypoplastic left heart syndrome (55.1%), hypoplastic right heart syndrome (10.2%), double inlet left ventricle (10.2%) and double outlet right ventricle with hypoplastic left ventricle (8.8%). Haemodynamic, electrocardiographic and clinical peri-operative data were retrospectively analysed.
Results: The hospital mortality was 0%. There were no differences between the groups regarding age, weight, morphology of the single ventricle, pre-operative cardiac catheterisation values and post-operative intubation time (15.4±28.2h vs. 11.5±17.6h; $p=0.313$). Children after EC tended to stay longer in hospital (18.4±9.6 days vs. 15.5±8.2 days; $p=0.061$) and had significantly longer right pleural drainage for effusions (9.2±7.1 days vs. 5.9±5.0days; $p<0.01$). Patients after LT had more frequently junctional or ectopic atrial rhythm on the day of the operation ($p<0.01$) and at discharge ($p=0.016$).
Conclusions: Fenestrated lateral atrial tunnel seems to facilitate the early adaptation to Fontan physiology, but in our experience this operative technique caused higher incidence of atrial rhythm disturbances, which can influence the late functional status of the patients.

Abstract no: 320
Mid-term outcome of extracardiac Fontan operation using Contegra conduit

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Background: Reports have shown increased risk of thrombotic occlusion of Fontan circulation with the use of the Contegra conduit. We intended to retrospectively compare the outcome of Fontan completed using Contegra conduit with those using Dacron tube.
Methods: Medical records, echocardiograms and catheterisation data of all patients undergoing Fontan completion from 2002 through 2010 were reviewed. Outcome of Contegra group was compared with Dacron tube group. All patients were anti-coagulated by using heparin in the immediate post-operative period and later with Coumadin to maintain therapeutic INR. The primary outcome was the prevalence of thrombotic complication and the survival in the 2 groups. Chi-square analysis was used to compare the categorical variables. Independent 2 sample t-test was used to compare the pre-operative and post-operative variables. Log Rank test was performed and Kaplan-Meier curves were generated to compare primary outcomes in the 2 groups.
Results: Seventy six patients underwent Fontan procedure: Contegra conduit (n=47), Dacron tube (n=29). The 2 groups matched with regard to demographic variables, pre-operative haemodynamic data, intra-operative and post-operative outcome. Within 30 days: thrombotic complications occurred in 6/47 (13%) in Contegra and 3/29 (10%) in Dacron groups ($p=0.983$). Relative risk of thrombosis in Contegra group was 0.949 (95% CI=0.8-1.3). The mean follow-up for the whole group was 87 months, (Contegra=70, Dacron=95) ($p=0.304$). Nine patients died: 7/47 in Contegra and 2/28 in Dacron groups ($p=0.486$). Relative risk of dying in Contegra group was 0.909 (95% CI=0.8-1.1).
Conclusion: This is so far the largest series evaluating the outcome of extra-cardiac Fontan procedure using Contegra conduit. Our results suggest that using Contegra conduit for Fontan completion does not increase the risk of thrombotic complication or death compared to Dacron tube.

Abstract no: 335
Plasma exchange for cardiogenic shock in dilated cardiomyopathy

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Background: Auto-immunity is suggested as one of the causes of dilated cardiomyopathy (DCM). The sera of many patients with DCM are positive for several antibodies directed against cardiac antigens. These antibodies play a role in the pathophysiology of cardiac dysfunction. We performed slow plasma exchange plus continuous haemodiafiltration (SPE+CHDF) to eliminate of these antibodies for a DCM patient with cardiogenic shock using extracorporeal life support (ECLS).
Case presentation: He was diagnosed with idiopathic DCM at 2 years of age. His heart failure became worse gradually. He began oral administration of carvedilol from 6 years of age. However, his heart failure worsened (NYHAIII). Left ventricular ejection fraction (LVEF) was reduced to 28%. At the age of 13 years, he rapidly deteriorated due to heart failure and developed multiple organ failure. His antibeta1-adrenergic receptor antibody titer and anti-muscarinic M2 receptor antibody titer was 80 times the background density on enzyme-linked immunosorbent assay. We planned to register for heart transplantation and performed

ECLS using a combination of SPE+CHDF in order to rescue him. Daily PE with CHDF was performed for 2 days. PE was performed over 8 hours, using 1.2 times the circulating plasma volume of fresh frozen plasma. After SPE+CHDF, his blood pressure and LVEF were dramatically improved. He could discontinue catecholamine infusion and end the ECLS in 3 days. He had no complication with performing SPE+CHDF.
Conclusion: The patient with DCM using ECLS for cardiogenic shock could be weaned from the ECLS by performing SPE+CHDF. In the patients with DCM, SPE+CHDF treatment for elimination of anti-myocardial antibody is very effective and useful for improving cardiac function. This therapy is a new strategy for helping a patient's recovery from heart failure in DCM.

Abstract no: 339
A 20-year comparison of simple TAPVR and complex TAPVR

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Background: Total anomalous pulmonary venous return (TAPVR) frequently requires neonatal surgery. Two of the largest determinants of surgical timing and mortality in TAPVR patients are other complex cardiac lesions and/or pre/post-operative pulmonary vein obstruction (PVO). Simple TAPVR refers to TAPVR associated with an ASD and/or PDA and complex TAPVR refers to TAPVR associated with other complex cardiac lesions. In this study we compare our outcomes with simple and complex TAPVR with a focus on the influence of pulmonary vein obstruction on the outcomes.
Materials and methods: Since 1966, 216 children have undergone simple and complex TAPVR repair at our institution. The first 105 were previously reported. This study reviews the most recent 111 patients from 1990 to 2011. The mean age was 5.2 months ranging from 1 day - 16 years. Sixty one of the patients had simple TAPVR and 50 (45%) had complex TAPVR.
Results: Early and late mortality was at 1.6% and 6.6% respectively in the simple TAPVR group and 14% and 18% respectively in the complex TAPVR patients. Pre-operative PVO was more frequent in the complex TAPVR group than the simple TAPVR group (36% vs. 23%). Reintervention rate for post-operative PVO was also higher in the complex TAPVR group than in the simple TAPVR group (12% vs. 7%). Pre-operative PVO occurred at a higher rate in mixed type TAPVR patients and lowest in Cardiac type TAPVR patients. Reintervention for post-operative PVO was highest for infracardiac TAPVR group and lowest in supracardiac TAPVR group. Other risk factors for poor outcomes were low birth weights, young age, need for pre-operative ECMO and single ventricle physiology.
Conclusions: Outcomes for simple TAPVR are quite favorable. Complex TAPVR with and without pulmonary vein obstruction remains a vexing problem. Improving the management of PVO is the key to improving outcomes.

Abstract no: 348
A comparison of Blalock-Taussig shunts with and without closure of the ductus arteriosus in neonates with pulmonary atresia and intact ventricular septum

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Background: Neonates with pulmonary atresia and intact ventricular septum (PA IVS) who have a right ventricle that is deemed not suitable for decompression undergo single-ventricle palliation. Early survival after the modified Blalock-Taussig shunts (MBTs) for these infants is disproportionately low compared with other lesions. The aim of this report was to compare the results of closure versus nonclosure of the patent ductus arteriosus (PDA) during MBTs surgery in neonates with PA IVS.
Methods: This retrospective study included neonates with PA IVS who underwent a single ventricle pathway with primary MBTs through a sternotomy approach at a single institution between January 2000 and May 2012. Post-operative hospital mortality, need for early reintervention, time to extubation, maximum vasoactive-inotropic score and length of hospital stay were studied as primary outcomes.
Results: 20 neonates (median age 5 days; range 3 - 14 days) with PA IVS underwent a MBTs procedure (shunt size 3 - 3.5mm). The PDA was closed surgically in 10 patients and left open in 10 patients. Compared with patients in whom the PDA was left open, neonates with surgically closed PDA had a higher operative mortality (40% vs. 0%, p=0.02). A trend toward a higher vasoactive-inotropic score in the group with a closed PDA was observed (17 vs. 10.2, p=0.08). The need for reintervention and length of hospital stay did not differ between the 2 groups (p=0.63 and p=0.59, respectively). Higher diastolic arterial pressures and lower arterial oxygen saturation to fraction of inspired oxygen ratio (SatO2/FiO2) were observed in the group with a closed PDA during the first 24 post-operative hours.
Conclusions: In our limited retrospective cohort, PDA closure during MBTs in newborns with PA IVS is associated with increased hospital mortality.

Abstract no: 360
Morbidity and mortality in paediatric heart transplants: A 25-year single-centre experience

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Background/hypothesis: The outcomes of paediatric cardiac transplantation continue to improve. We retrospectively reviewed our outcomes over the last 25 years to determine the risk factors for poor outcomes in our patient population.
Materials and methods: Since 1985, 126 heart transplants in 120 patients (69 males) were performed. Median age at transplantation was 3.6 years (range: 4 days - 17.8 years). The primary indications for transplantation included CHD (n=61), cardiomyopathy (n=58) and re-transplantation (n=7). Pre-operatively 40% (n=51) had previous surgical interventions. Pre-operative, peri-operative and post-operative data was analyzed to identify risk factors.
Results: Early and late mortality was 7% (n=9) and 39% (n=49) respectively. Actuarial survival at 1, 5, 10, and 20 years was 86%, 73%, 62%, and 46% respectively. The diagnosis of CHD and transplantation prior to the year 2000 were independent risk factors for early mortality. At median follow-up of 76.7 months (range 0-294 months), 17% (n=22) required further cardiac intervention including the 5% (n=6) who needed subsequent re-transplantation. There were no risk factors associated with late mortality or need for further surgical intervention.
Conclusions: Paediatric patients transplanted for CHD and those transplanted prior to the year 2000 were independent risk factors for early mortality. Further review of the specific CHD diagnoses and immunosuppression management protocols will be compared to see if they affected outcomes.

Abstract no: 387

Management of wound infections post cardiac surgery in paediatrics

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Background: The spectrum of sternal wound infections after cardiac surgery ranges from superficial infections to a deep sternal infection known as mediastinitis. Mediastinitis is an uncommon and clinically relevant source of post-operative morbidity and mortality in paediatric patients after cardiac surgery.
Methods: A retrospective observational study in our paediatric intensive care unit, in which more than 800 patients post cardiac surgery were assessed for risks of SWI. With identifying all patients diagnosed with mediastinitis after cardiac surgery from January 2009 - June 2012. Staging of wound care using standard protocol of antibiotics and selected dressings.
Results: Major risk for sternal wound infection was associated with delayed sternal closure. Chest wound infection developed in 40 of 800 (5%) children after median sternotomy or lateral thoracotomy. Superficial wound infection developed in 30 (3.751%) children and 10 (1.25%) had deep infection. Children with sternal wound infection had lower age, delayed sternal closure, longer period of ventilation and inotropic support, longer intensive care unit and total post-operative hospital stays. Staging of wound care proven effective and successful.
Conclusion: Infections continue to be a significant cause of morbidity in paediatric cardiac surgery patients. Knowledge of risk factors for infection could be useful in preventive and treatment strategies for these high-risk groups. Paediatric plans differ from adult programmes. Standardised protocol, timely diagnosis, timely wound debridement and liberal use of specific antibiotics mix with selected dressings can potentially minimise the morbidity and mortality in paediatric post-operative cardiac patients.

Abstract no: 390

Evaluation of two-stage arterial switch as a treatment strategy in the management of delayed presentation of transposition of the great arteries with a regressed left ventricle

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Background and objectives: Management of transposition of the great arteries with intact ventricular septum (TGA/IVS) is currently an arterial switch operation (ASO) performed in the first 2 weeks of life. Two-stage ASO is one form of treatment in infants with TGA presenting late.
Methods: From December 2009 - date a total of 8 patients with TGAIVS presented late and were not deemed to be suitable for immediate ASO due to left ventricle regression and were selected for a two-stage ASO. Serial echocardiography was used to assess the increased thickness of LV posterior wall. A stage II ASO was done a few weeks later. Retrospective review of patient charts was done. Effects of variables such as age, BSA and the time interval between 2 procedures on mortality were analysed. Data was formulated into a structured database and statistical analyses were performed with the statistical package SPSS for Windows.
Results: Eight patients underwent Stage I. Stage I had an in hospital mortality of 12.5%(1/8), while the interval mortality between both stages was also 12.5% (1/8). Both patients died from non-cardiac complications due to aspiration related pulmonary sepsis. 1 patient had a failed Stage I (12.5%) due to acute LV failure and had to undergo a Senning atrial switch as a salvage operation. 1 patient is currently waiting for Stage II definitive repair after a successful Stage I. The mean interval between the 2 stages was 3±1 weeks. 4 patients have undergone a successful Stage II ASO. Stage II mortality was zero. All patients had remarkably rapid recoveries and short hospital (6±2 days) stay.
Conclusion: Early experience indicates that in a developing country like Pakistan with a rapid two-stage arterial switch is an acceptable treatment option. Patients who survived Stage I and the interval period have excellent results with Stage II.

Abstract no: 397

Total anomalous pulmonary venous connection: Management and outcome, experience from Children's Hospital, Lahore, Pakistan

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Background: We report a retrospective analysis of the demographic, morphological and clinical profiles of patients along with results of operative repair for total anomalous pulmonary venous connection.
Methods and results: In the last 5 years, 65 patients (45 males and 20 females) underwent repair for total anomalous pulmonary venous connection. Ages ranged from 2 days - 9 years (median 6 and mean 17 months) and 46 of them were less than 1 year. Weight ranged from 2.4 - 18kg (median 5kg). The anomalous connection was supracardiac in 35 (54%), cardiac in 18 (27%), infracardiac in 7 (10%) and mixed in 5 (8%) patients. 25 (38%) patients had obstructed drainage and 40 (61%) had moderate or severe pulmonary arterial hypertension. 21 patients (32%) had to be operated upon on an emergency basis.
Mortality was higher in obstructed drainage patients (26%), compared with patients without obstruction (8%). The major causes of early death were weight <10%ile (OR 1.1; 95% CI: 0.1-6.5, p=0.009), obstruction (OR 9.8; 95% CI: 1.6-60, p=0.006) and sepsis (OR 23.3; 95% CI: 3-177, p=0.002). Follow-up ranged from 1 - 45 months (median 24 months). There were one late death due to late pulmonary vein stenosis where the patient was reoperated but died.
Conclusions: In a developing country like Pakistan, mortality continues to be high in infants with total anomalous pulmonary venous connection. Weight <10 percentile, obstruction, severe pulmonary arterial hypertension and post-operative sepsis appears to be the most important predictor of operative mortality.

Abstract no: 408

Mortality outcomes up to 1 year following paediatric cardiac surgery in Western Australia (2001 - 2010)

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Background: Paediatric cardiac surgical outcomes have been traditionally described as 30-day or in hospital mortality. There are limited reports of late deaths up to one year after surgery. This study aimed to determine the mortality outcomes for cardiac surgeries performed on patients from Western Australia (WA) from 1 January 2001 - 31 December 2010 up to 1 year following the procedures and to ascertain possible causes.
Methods: Data was obtained and cross-linked from the Department's customised surgical and clinical databases and medical records were reviewed. Inclusion criteria: (1) Paediatric cardiac surgical cases operated between 1 January 2001 - 31 December 2010 in WA and Interstate. (2) Deaths occurring up to 1 year post surgery. Thoracic, non-cardiac surgeries and pre-term neonates with PDA ligation were excluded.
Results: 1198 cardiac surgical procedures were performed on WA children of which 128 surgeries were performed Interstate. 30 day (early) and 1 year (>30 <365 day/late) mortality were 2.3% and 1.4% respectively. In hospital mortality was 2.6%. The cause of majority of the late deaths (10/17) was cardiac, but non-surgical related, with pulmonary hypertension and pulmonary venous obstruction being common. 2/17 late deaths appeared to be directly related to cardiac surgery. The remainder (5/17) were unrelated to the cardiac problem or unknown. Other high risk factors included indigenous children living in remote locations, and Trisomy 21 following AVSD repair.
Conclusions: The overall mortality rate at 1 year following all paediatric cardiac surgeries between 2001 and 2010 on WA children was 3.7%. The 30-day mortality was 2.3%. Late mortality to 1 year added 1.4%. Some of the high risk factors identified for late death are being approached by specific changes in management and follow-up. Parents should be informed regarding the potential for ongoing risk of mortality in high risk situations.

Abstract no: 411

29 years of follow-up in the Damus-Kaye-Stansel procedure: Anastomosis revision and need for valve repair

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Background: While the Damus-Kaye-Stansel (DKS) procedure has been used for complex congenital heart disease and systemic outflow tract obstruction, limited data is published on late outcomes. This study examined the incidence of surgical intervention in patients with >1 year of follow up after DKS over 29 years.
Methods: A retrospective study on 54 patients who underwent DKS (not including Norwood) from 1983 - 2007. Patients were excluded if there was no follow-up beyond 1 year post-operatively (3), or if death occurred within one year of surgery (14). Survival was calculated from date of DKS to last known follow-up or time of death from 1984 - 2012.
Results: Thirty seven patients met study criteria with a median follow-up of 12.9 years (2 - 28 years). Diagnoses included double inlet ventricle (16), double outlet right ventricle variants (12), tricuspid atresia (6) and others (3). 7 patients (18.9%) experienced death >1 year after DKS (4.6 - 24.2 years). Five deaths were sudden, at age 13 - 30 years. 1 death occurred due to sepsis complicating a MRSA infected pseudo-aneurysm of DKS. 1 death occurred while awaiting transplant. The mean number of cardiac surgeries was 3, median 3.5 for the 37 patients reviewed. Twenty eight patients (75.7%) obtained Fontan status. 8 patients (21.6%) required DKS anastomosis revision due to aneurismal DKS connections in 4 and outflow tract stenosis in 4. 5 patients (40.5%) required repair/replacement of a semilunar valve.
Conclusions: Our review demonstrates a high incidence of aneurismal DKS connections, stenosis of the systemic outflow tract, valvular insufficiency and sudden death. These patients warrant close long term surveillance with imaging, arrhythmia and heart failure assessments.

Abstract no: 443

Heart transplantation in patients with single ventricle: A single-centre experience

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Background: In the 90s heart transplantation was a common first line therapeutic option for many single ventricle congenital heart diseases. The aim of this study was to present our centre's experience with heart transplantation in these patients.
Materials and methods: A retrospective review of 105 children and adult patients with congenital heart malformation who underwent cardiac transplantation between 1988 and 2012, revealed 22 patients who were transplanted for a single right (n=18) or left (n=4) ventricle. Group 1 (n=13) had not been operated before transplantation or undergone preliminary palliative surgery. Group 2 (n=9) had undergone a partial (n=3) or total (n=6) cavopulmonary anastomosis. Median age at transplantation was 0.2 years (5 days - 21.2 years) in group 1 and 15.2 years (2.4 - 34.6 years) in group 2.
Results: The median follow-up in the study series was 8.3 years (3.5 - 18.1 years) and was complete in 100%. The overall mortality rate was 45% (n=10) with a hospital mortality rate of 27% (n=6). 3 patients had to be retransplanted. The 5-year survival rates after transplantation were 69% in group 1 and 53% in group 2. Kaplan-Meier analysis showed no significant difference between the 2 groups in the log rank test (p=0.39) and an overall median survival of 11 years. For comparison, the 5-year survival rate of all 105 patients was 82%.
Conclusions: The outcome after transplantation for patients with or without previous cavopulmonary anastomosis is comparable. Taking into account the higher median age at transplantation in the group with cavopulmonary anastomosis regarding life expectancy it seems to be reasonable to do the palliative surgery instead of early transplantation.

Abstract no: 446

Operating room safety in developing countries: The importance of language independent diagrams, checklists and time-outs

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Background: In July of 2009 the International Children's Heart Foundation piloted a quality improvement initiative implementing operation room time-outs as a standard on all medical mission trips. Through this process safety initiatives, standardised teaching and process improvement initiatives have been developed. We describe a qualitative evaluation of a multi-faceted OR safety and education initiative in a multi-national assistance programme.
Material and methods: Intra-operative nursing checklists were introduced in addition to the time-out process. OR volunteers are asked to note OR complications in a database sheet. Language independent diagnostic documentation (heart diagrammes) followed patients from pre-op cardiology through post-op phase and were utilised in the OR as part of pre-op timeout and for teaching.
Results: Time-outs were performed on 86% of trips in 2012. Complications found and dealt with during pre-surgical time outs included: Suboptimal antibiotic timing, blood availability, wrong procedure prepared for by local staff, wrong patient brought to OR, implant not on field, no definitive diagnosis/or understanding of prior to incision, change of plan based on an in-OR ECHO review and equipment issues/ availability. Language independent diagrams ensure that the entire team agrees with and understands the plan of care. Intended to ensure diagnostic ECHO accuracy and right patent in the OR, the diagrams are also used in staff and family education.
Conclusions: Checklists are proven methods of improving patient safety. Compliance of performing and tracking time-outs is greater in which an ICHF OR staff member is present at time of incision. Issues that arose were recognised and fixed in a timely fashion, usually due to the implementation of a "standard" process prior to incision. Heart diagrams are an indispensible language independent resource and aid in patient care when language barriers exist for safety of diagnosis and understanding.

Abstract no: 447

Challenges in diagnosis and management of pulmonary arteriovenous malformations in a resource poor setting: A case report

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Background: Pulmonary arteriovenous malformations (PAVMs) are rare vascular anomalies resulting in abnormal direct communications between pulmonary arteries and veins. Most PAVMs are congenital but acquired cases also occur. PAVMs results in right to left shunts and are an unusual cause of chronic cyanosis with consequent polycythemia. The direct connection between arteries and veins causes impairment of normal filtering function of lungs with potential paradoxical embolism and systemic infections.
Materials: A young male with PAVMs and complications, highlighting challenges in diagnosis and management in resource poor settings.
Methods: Report of an adult with congenital cardiovascular malformation.
Results: P.C. an 18-year old male has been on evaluation and management for polycythemia from chronic cyanosis since age 8. Cyanosis was variable noticed by mother from age 5 for which she sought no treatment until he presented at age 7 with multiple chronic discharging fistulae of the left thigh.
He was treated for chronic bacterial osteomyelitis with some relief, but defaulted on follow-up. Five years later (now aged 12 years); he was rushed into the emergency unit with a day's history of recurrent convulsions culminating in coma. CT-scan showed left frontal lobe abscess suggestive of tuberculosis abscess, CXR revealed vague opacities in right middle lobe. He was commenced on anti-tuberculosis therapy, regained consciousness and the fistulae healed. However due to persisting cyanosis and polycythemia, chest MRI was done and revealed abnormal connection between the right pulmonary artery and pulmonary veins of right middle lobe. An interventional pulmonary angiogram could not be done due to lack of skill and facility. His need for further intervention where facilities exist is hampered by financial constraints.
Conclusion: PAVMs with complications are challenging to diagnose and manage in resource-poor settings resulting in chronic morbidity. Provision of skilled manpower and facilities in these centres is imperative to avert mortalities.

Abstract no: 471

Mentoring paediatric cardiac surgery in developing countries: 5-year progress report and exit strategy

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Background: Establishment of stable cardiac surgical centres in developing countries includes: training of personnel in established foreign centres; visits of mission teams to do multi-specialty on-site training and donation of equipment and supplies. This usually suffices to form a sustainable programme, but some countries require further assistance. We report the results of a 5-year mentoring project in one such country.
Methods: Following a "scout" trip with a small medical team, a surgeon relocated to work full time with the local surgeon, mentoring him in surgical technique, patient evaluation and care, and programme administration, as well as working closely with other team members and the local fund raising organisation. After 4.5 years, a transition period was initiated in which the visiting surgeon began to spend progressively increasing amounts of time out of the country, leaving the programme in the hands of the local surgeon. The local database was examined for RACHS complexity, primary and assistant surgeon, mortality and fundraising. Statistical significance was defined as $p<0.05$.

Results: From January 2007 - June 2012, 282 operations were performed with 21 deaths (mortality 7.4%). Case complexity increased over time (RACHS 2/3 cases 44% in 2011 vs. 22% in 2007, p<0.001). Overall mortality decreased to less than 7.5%/yearr after the first year (p<0.01). The fraction of operations performed by the local surgeon steadily increased (p<0.001); all 2012 operations were done by the local surgeon. Local fund raising increased progressively, from $10 909 in 2006 to $97 554 in 2010 (p<0.01).
Conclusions: Placement of a full time "mentoring" surgeon in a developing country can effectively promote the safe establishment of a sustainable congenital heart surgery programme when other methods of aid have failed. Good surgical results can be obtained and maintained while simultaneously increasing case complexity and experience for the local surgeon.

Abstract no: 475

Influence of pulmonary artery size on early outcome after the Fontan operation

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Objective: Since Fontan stated his criteria for patient selection undergoing the total cavopulmonary anastomosis small pulmonary arteries (PAs) are sometimes considered as contraindication for the operation. Aim of this study was to evaluate if the size of the PAs is still one of the major impact factors on early outcome after the Fontan operation (FO).
Materials and methods: Data of 146 patients (mean age of 3.6±2.4 years, mean weight of 14.3±6.9kg) who underwent a modified FO at our clinic between 2007 and 2012 were retrospectively analysed with respect to traditional McGoon ratio, Nakata index as well as modified indices (measuring the narrowest diameters) and with respect to the early postoperative course.
Results: Patients with a McGoon ratio ≤1.6 (modified ≤1.2) or a Nakata index <150mm²/m² (modified <100 mm²/m²) were not at a higher risk of prolonged hospital stay (p=0.078 (0.157) and p=0.220 (0.178), respectively) or effusions (p=0.323 (0.723) and p=0.289 (0.703), respectively). Children with persistent (>14 days) effusions tended to have smaller PAs in comparison to other patients, but McGoon ratio and Nakata index did not differ significantly (p=0.220 and p=0.069, respectively). The need for interventional dilatation before FO did not adversely influence the time of mechanical ventilation (p=0.652), ICU (p=0.778) or hospital stay (p=0.130) and pleural effusions (p=0.166). Younger and smaller children tended to have smaller PAs, but younger age (<24 months) and lower weight (<12kg) were not predictive for poor early postoperative outcome.
Conclusion: Small pulmonary arteries do not significantly affect the early postoperative period after FO. In our opinion there is no need to postpone the Fontan operation due to "smaller" pulmonary arteries. The pre-Fontan palliative procedures to augment the size of PAs at the expense of ventricular overload are not recommended.

Abstract no: 476

Outcomes of inflow occlusion open pulmonary valvulotomy plus central shunt in pulmonary atresia with intact ventricular septum

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Background: Pulmonary atresia with intact ventricular septum (PA-IVS) patients plus tri-partite right ventricle (RV) have a great opportunity to live with biventricular circulation. Direct vision open pulmonary valvulotomy under inflow occlusion is safe and provide good pulmonic valve opening.
Material and methods: Between August 1999 and September 2010, 18 patients with PA-IVS underwent inflow occlusion open pulmonary valvulotomy with concomitant central shunt. All of them had tripartite RV with a tricuspid valve Z-score of -1.17±0.99 (-0.08 to -3.5). The mean inflow occlusion time was 2.5±0.4 minutes (1.6 - 3.0 minutes).
Results: The primary operation was successful in all patients. There was only one (5.6%) in hospital death. At a median follow-up of 5 years (2 - 13 years), survival was 100%. Of the remaining 17 survivors, 16 (94.12%) patients achieved biventricular circulation and one (5.88%) patient survived with one and a half circulation. There were 5 (29.4%) patients of the survivors need percutaneous balloon pulmonary valvulotomy and all of them had good results. There were 4 (23.5%) patients of the survivors need surgical right ventricular outflow tract (RVOT) reconstruction. Bidirectional Glenn was performed concomitant with RVOT reconstruction in 1 patient.
Conclusions: Inflow occlusion open pulmonary valvulotomy plus central shunt is safe and precise opening of the pulmonary valve in PA-IVS patient with tripartite RV. Almost all patients achieved biventricular circulation with this technique.

Abstract no: 487

Cardiac stroke volume and sympathetic/parasympathetic measurements increase the sensitivity and specificity of head up tilt-table tests (HUTT) in children and adolescents

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Head up tilt-table test (HUTT) is gold standard in evaluating autonomic dysfunction and syncope in children and adolescents. Limitations of conventional HUTT, cycling blood pressure (BP) every one - 2 minutes, with heart rate (HR) correlated with patient symptoms, has low sensitivity and specificity. Investigators have evaluated more reliable and sensitive physiological parameters to increase predictability of HUTT.
From May 2009 - May 2012 we performed 422 HUTT evaluations on children and adolescents. The first group of 152 patients had conventional HUTT, including HR, arm cuff BP, and oxygen saturation recorded every minute for 10 minutes while supine, for 30 minutes while head up 70° and for 10 minutes with supine reposition while recording patient symptoms. The second group included 270 patients with HUTT using Task Force Monitor® with display and storage of continuous BP, HR, cardiac stroke volume (SV) by trans-thoracic impedance and calculated sympathetic and parasympathetic activity correlated with symptoms

and signs. Median ages were 12.5 years and 13.2 years in group 1 and 2, respectively. Patients from both groups were referred by pediatric neurologists, cardiologists, gastroenterologists and rheumatologists with syncope (63%), dizziness (88%), light headedness and headaches (52%), chronic nausea and stomach pains (32%), chronic fatigue (42%), convulsions (6%), fibromyalgia (2%), palpitations and chest tightness (12%) and metabolic disorders (10%).
A positive test was defined in group 1 as severe symptoms of syncope, blackout, vomiting, severe headache, excessive fatigue and tremors or convulsions accompanied by changes in HR (tachycardia, bradycardia) and/or blood pressure. In group 2, similar symptoms were accompanied by significant changes in HR, BP, cardiac SV and sympathetic/parasympathetic activity. There was increased ability to correlate clinical manifestations with physiological abnormalities on HUTT in the second cohort of subjects and also an increased sensitivity of the test to determine whether there was orthostatic intolerance.

Abstract no: 493

Ultra-fast track anaesthesia with early extubation in resource limited settings: results of a large international cohort

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Background: Very early extubation [in the operating room (OR) or on ICU admission] has been routinely practiced by our group in countries with delayed access to cardiac care, older presentation and limited resources. We describe the ventilation data for a sequential cohort of 2 300 children in a programme spanning 19 countries and 26 centres over 4.5 years.
Material and methods: The database of the International Children's Heart Foundation was analysed for the period January 2008 - May 2012. Outcomes of interest were ventilation times, reintubation rates, mortality, by RACHS-1 complexity category and age.
Results: Deaths in OR or ICU without extubation (64), incomplete data (190) and reoperation on same admission (217) were all excluded. 1 829 extubations were analysed with a median age/wt of 3.5y/12kg. Reintubation rate and mortality decreased with decreasing duration of post-operative tracheal intubation and mechanical ventilation (P=0.005 R^2 =0.89, and P=0.00 and R^2=0.93 respectively). (Figure 1 and 2)

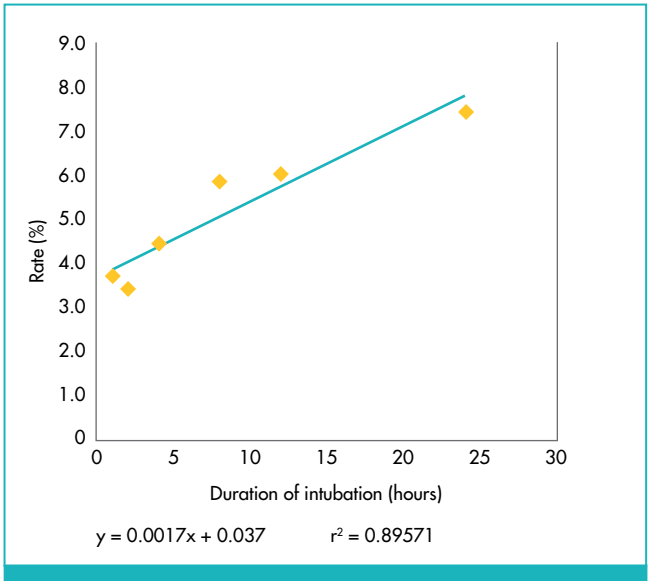

FIGURE 1: Reintubation rates vs. duration of intubation

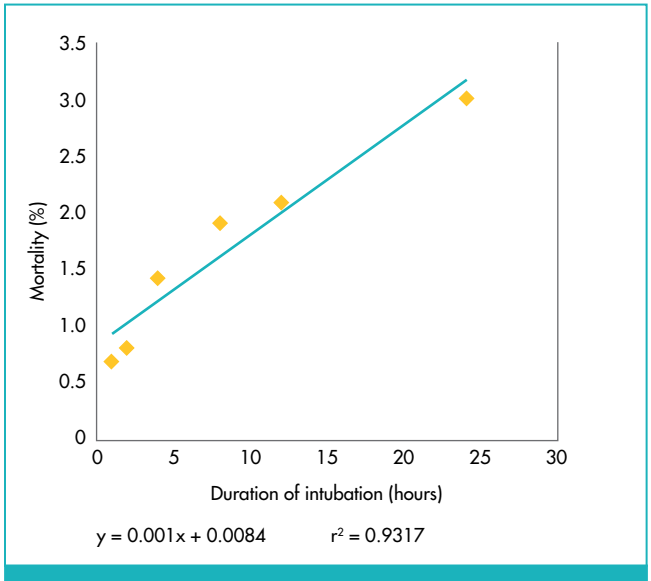

FIGURE 2: Mortality vs. duration of intubation

Median ventilation time was 1.5 hours, with 1 363 (73%) extubations in under 4 hours. Extubation under 1 hour was possible in 42% overall, and by RACHS (R) category R1 (70%), R2 (42%), R3 (29%) and R4 (19%). Median ventilation time increased with increasing RACHS category, ($p<0.05$): R1 (n=327) 0.1h, R2 (n=827) 1.5h, R3 (n=466) 3h, R4 (n=114) 5.9h. Ventilation times (reintubation rates) were increased in the smallest children <3 months; 12 hour, (12%), 3 months 1year; 4 hour, (14%).
Conclusions: This is the largest such series analysed in children. Age and weight are typical of many developing world populations awaiting surgery. Mechanical ventilation need not be a standard part of post-operative cardiac surgical management; significant numbers in all age and RACHS groups can be safely extubated in OR or under 1 hour post-operatively in ICU.

Abstract no: 506

Impact of VSD enlargement with d-TGA or DORV for post-operative cardiac function and arrhythmia in Rastelli procedure

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Introduction: Restrictive VSD with TGA or DORV may cause LVOTO in the late period and simultaneous VSD enlargement is mandatory, in that case. However it may cause cardiac dysfunction and arrhythmia. We separated our patients who underwent Rastelli procedure into 2 groups; Group A with VSD enlargement (46 cases) and Group B without enlargement (28 cases). We evaluated the long term outcomes.

Patients: Since 1983, Rastelli procedures were performed in 74 patients (d-TGA (56 cases) or DORV (18 cases) at our institute.

- mean age at operation 7.0 years
- mean body weight at operation 18.5kg
- mean follow-up period 13.7 years

Indication of VSD enlargement in our institute.

(1) existence of pressure gradient between the two ventricles. (2) the VSD diameter below the diameter of aortic valve.

Post-operative assessment: Rhythms were assessed in ECG and Holter. Pacemaker implantaion or medication for anti-arrhythmia was searched. Post-operative LVEF, CVP and pressure gradient at intraventricular conduit were assessed in catheterisation.

Results: There were no early death and 5 late deaths in A and 2 in B. Replacement of intraventricular conduit were performed in 2 cases in A and 2 in B. In ECG, 42 cases in A and 26 in B kept sinus rhythm. No significant PVC was recognised in both groups. Pacemaker implantation was performed in 3 cases in A and 1 in Group B. Need of anti-arrhythmic agency were 2 cases in A and 2 in B. Mean LVEDV were 150.6% of N in A and 144.8% of N in B. Mean LVEF were 57.0% in A and 57.9% in B. There were statistically significant differences between the 2 groups.

Conclusion: (1) VSD enlargement at Rastelli procedure was performed safely without cardiac dysfunction and arrhythmia. (2) VSD enlargement should be performed, if necessary, to prevent LVOTO later.

Abstract no: 513

Congenital cardiac surgery through minimally invasive mid-axillary right lateral muscle-sparing thoracotomy approach: 3-year experience in 384 patients

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Background: Median sternotomy has been the conventional approach for correction of congenital heart defects (CHD) despite poor cosmetic results. Minimally Invasive Mid-axillary Muscle Sparing Right Lateral Thoracotomy (RLT) was assessed as an alternative procedure with better cosmetic outcome.

Materials and methods: Between May 2009 and June 2012, 384 patients aged from 6 months - 18 years underwent correction CHD through RLT with the use of direct cannulation aorta, caval veins and cardioplegia (group 1). This approach was compared to median sternotomy done to 135 patients (group 2) from the position of exposure to the intracardiac anatomy, post-operative period and cosmetic results.

Results: CHD that could be approached through the right atrium (atrial septal defect, partial anomalous pulmonary venous drainage, atrial component of atrioventricular septal defect, ventricular septal defect, mitral or tricuspid valve regurgitation) were operated through RLT. Mean patient age was 6.0±5.1 (range, 0.5 - 18) and 3.1±6.3 (range, 0.2 - 18) years in group 1 and group 2 ($p<0,05$), the proportion of CHD was the same. Exposure to the intracardiac anatomy in RLT group was good. There was no need for conversions to another approach. The mean time of operations was 132.3±36.2 in group 1 and 151.4±52.7 minutes in group 2 ($p<0.05$), mean cardiopulmonary bypass time was 49.7±27.3 and 58.5±28.7 minutes ($p<0.05$), mean aortic cross-clamping time was 32.4±19.1 and 36.7±21.4 minutes accordingly ($p>0.05$). The advantage of RLT included absence of any pericardial effusion. The follow-up was 1.8±0.8 years. Cosmetic results of RLT were good in all patients. There was no any scoliosis, deformity of a chest or a breast.

Conclusions: RLT is a safe and effective alternative to median sternotomy for correction CHD that could be approached through the right atrium. Its cosmetic results are highly satisfactory.

Abstract no: 524

Assessment of recovery in children on Berlin Heart Excor ventricular assist device support

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Background: Ventricular assist device (VAD) support is being used more often in paediatrics, mainly as a bridge to transplant, although use as a bridge to recovery is increasingly described. In 2007 we developed a protocol to assess recovery of ventricular function in children on Berlin Heart Excor VAD support. We aimed to review the effectiveness of this protocol in assessing which patients can have the VAD safely removed.

Methods: Patients with myocarditis were initially assessed after 2 weeks of support, and those with cardiomyopathy after 4 weeks. Testing involved echo-cardiographic and haemodynamic assessment over 90 minutes with the VAD paused and measurements taken at predetermined intervals. If haemodynamic stablility was maintained with fractional shortening >25% and normal response to dobutamine, explantation was subsequently performed. A retrospective review was performed of patients assessed using this protocol.

Results: Ten of 55 (18%) supported patients in 2007 - 2011 showed recovery of ventricular function on this protocol and underwent explantation. Primary diagnoses were dilated cardiomyopathy (n=4), hypertrophic cardiomyopathy (n=1), post-transplant acute graft failure (n=1), myocarditis (n=3), and congenital heart disease (n=1). Median age was 1.1 years (range 0.5 - 17 years) with median time on support 31 days (range 7-120 days). 3 patients underwent early testing or "forced" testing not in keeping with the protocol outlined due to complications on support and the need to explant early if possible. There was 1 non-cardiac death post-explantation and two patients needed to go back on support (1 after 8 days and 1 had 3 VAD runs with 2 successful explantations each over a year apart). Both were subsequently transplanted.

Conclusions: Long-term support to recovery is achievable even in small children. A protocol which demonstrates normal cardiac output and ventricular function on echocardiography with a positive inotropic response may be used to predict which patients can successfully undergo VAD explantation.

Abstract no: 531

Going down, going slow: Esmolol as potent myocardial protector in rescue cardiac extracorporal membrane oxygenation

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Introduction: Cardiac failure or arrest post elective cardiac surgery in neonates and children are rare events. However, their occurrence during a highly vulnerable period of myocardial recovery imply immediate expert support. Timing, efficiency of resuscitation and duration of cannulation for ECMO are crucial. Equally important is the subsequent cardiovascular management to optimise myocardial recovery. Beside volume unloading, optimal coronary perfusion has to be maintained to protect cardiomyocytes from oxidative stress. Beta blockers combine cardioprotective mechanisms such as improved myocardial relaxation, coronary perfusion and also anti-oxidative activity.
Methods: Patients (n=6) requiring rescue ECMO post elective cardiac surgery. They were started on Esmolol infusion as soon as stabilised (full flow ECMO ≥150ml/kg/min). Serial transthoracic echocardiography was performed to assess myocardial contractility.
Results: Six patients (2 male, 4 female), age 2.2±4.1 years with single ventricle physiology (n=3), complex cyanotic heart disease (n=2), coronary anomaly (n=1). All patients had myocardial stunning. ECMO 8.8±1.9 days, maximum dose Esmolol 106.7±50.1µg/kg/min, maximum heart rate (HR) prior to Esmolol 168.3±11.7 beats per minute (bpm), maximum heart rate during Esmolol 73.3±8.2bpm, fractional shortning shortening (FS) prior to Esmolol 9.2±4.9 %, FS post-Esmolol 33.3±7.5 %. Weaning of ECMO successful in 4 patients.
Conclusions: In this small pilot study without case control, all patients showed significant improved myocardial contractility. Esmolol appears to provide cardioprotection for paediatric patients post cardiac failure/arrest requiring ECMO. Its combined anti-oxidative effect may support recovery of myocytes by increased glutathione peroxidise and superoxide dismutase activity.

Abstract no: 540

Incremental risk factors for mortality and morbidity after infant heart surgery in the developing world

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Background: We examined our institutional paediatric heart surgery database to determine impact of low birth weight, malnutrition, need for pre-operative intensive care support or mechanical ventilation on outcomes of 447 consecutive heart operations in children <2 years.
Methods: Data on paediatric heart surgery (January 2010 - December 2011) was collected prospectively as a part of the International Quality Improvement Collaborative. Stepwise logistic regression analysis was performed and all pre-operative variables with p<0.05 were allowed to enter into the model.
Results: There were 90 newborns (20.1%) and 359 (80.3%) were <1 year. Mean weight Z-score was -2.7±1.7 at surgery and 112 (25%) had low birth weight. Prior to surgery, 59 (13.2%) needed intensive care, 44 (9.8%) were ventilated and 13 (2.9%) had positive blood cultures. Mortality (5.1%) was significantly associated with RACHS-1 risk category (1, n=10: 0%; 2, n=237: 1.3%; 3, n=148: 8.8%; 4 and above, n=52: 13.5%; p<0.001). After adjustment for RACHS-1 category, pre-operative intensive care and pre-operative mechanical ventilation emerged as significant determinants of mortality, duration of mechanical ventilation and post-operative sepsis. Pre-operative sepsis was strongly associated with post-operative sepsis alone (Odds ratio: 34.65; 95%CI, 7.35-163.4; p<0.001). Low birth weight and malnutrition were not associated with any of the outcome measures. On stepwise logistic regression analysis the following variables emerged as significant predictors of outcome (Table).

Pre-operative variables	Outcome variables	Odds ratio	95% CI	P-value
Pre-operative ICU stay	Mortality	3.60	1.44-8.99	0.006
	Post-operative ventilation >48 hrs	2.9	1.53-5.49	0.001
Pre-operative ventilation	Post-operativesepsis	2.81	1.36-5.80	0.005

Conclusions: The need for preperative intensive care and mechanical ventilation are strongly associated with poor outcomes after infant cardiac surgery in this large single-centre experience from a developing country. It is worth exploring the utility of these additional variables in refining existing risk-adjusted scores for congenital heart surgery.

Abstract no: 556

A pilot phase I/II trial of erythropoietin neuro-protection in neonatal cardiac surgery

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Background: Acute neurological injury and longer term neuro-developmental problems are common in neonates undergoing cardiac surgery with up to 50% of patients affected.(1) Erythropoietin (EPO) has anti-apoptotic, anti-inflammatory and anti-excitatory cell death properties, protecting the brain against cerebral injury in animal models and birth asphyxiated neonates. (2) This phase I/II trial was designed to assess safety and indicate efficacy with EPO treatment for neonatal cardiac surgery.

Materials and methods: This was a prospective, randomised, blinded, placebo-controlled trial of EPO vs. normal saline control. (U.S. FDA IND 100011, NCT00513240) Neonates (<30 days) scheduled for cardiac surgery with hypothermic CPB were enrolled. EPO doses were 1000 units IV (or placebo equivalent) in 3 doses: (1) 12-24 hours pre-operatively; (2) Immediately after CPB; (3) 24 hours after dose 2. Brain MRI was performed pre-operatively, and at 7 days post-operatively. Primary outcome was Bayley Scales of Infant and Toddler Development III (BSID III) at 12 months of age.
Results: Fifty nine patients received study drug. Five patients had dural sinovenous thrombosis (2 EPO, 3 placebo); 6 patients died before age 12 months (3 EPO, 3 placebo); 11 patients declined 12 month follow-up (7 EPO, 4 placebo, p=0.48), leaving 42 patients with 12-month BSID III (79% of survivors). BSID scores were not different with EPO (Table 1). Anatomic subgroup analysis is presented in Table 2.

TABLE 1: Patient/operative characteristics and study outcomes

Parameter	EPO group, n=22	Placebo group, n=20	P-value
HLHS (no., %)	11 (50%)	6 (30%)	0.298
D-TGA (no., %)	6 (27%)	10 (50%)	-
AA+VSD/other 2V (no., %)	5 (23%)	4 (20%)	-
CPB time (min)†	189 (159-247)	204 (178-269)	0.262
Aortic cross-clamp time (min)†	102 (77-126)	113 (96-155)	0.195
DHCA time (min)†	8.5 (7.5-10) (n=12)	12 (9-14) (n=9)	0.151
RCP time (min)	61.5±28.3 (n=14)	66.1±36.3 (n=10)	0.730
Lowest CPB temp (°C)†	18.0 (17.6-24.4)	18.9 (17.5-25.0)	0.762
OR fentanyl dose (mcg/kg)†	185 (167-242)	194 (159-307)	0.900
OR midazolam dose (mg/kg)	1.00 (0.61-1.18)	1.09 (0.86-1.36)	0.208
Aprotinin use (no., %)	8 (54%)	8 (42%)	0.808
Isoflurane MAC-hours	1.80±1.02	1.96±1.01	0.607
Pre-op MRI injury (no,%)	9 (41%)	4 (20%)	0.129
NEW post-op MRI injury (no., %)	8 (36%)	11 (55%)	0.226
12-Month Bayley III Cognitive	101.1±13.6	106.3±10.8	0.187
12-month Bayley III Language	88.5±12.8	92.4±12.4	0.329
12-month Bayley III Motor	89.9±12.3	92.6±14.1	0.506

HLHS: hypoplastic left heart syndrome, D-TGA: dextrotransposition of the great arteries, AA+VSD: hypoplastic aortic arch/ventricular septal defect, CPB: cardio-pulmonary bypass, DHCA: deep hypothermic circulatory arrest, RCP: regional cerebral perfusion, MAC: minimum alveolar concentration. Data are mean ± standard deviation if normally distributed. †Non-parametric if not normally distributed: median. (25th-75th percentiles).

TABLE 2: Bayley III scores by anatomic/surgical group: single ventricle and 2 ventricle lesions

Parameter	EPO group	Placebo group	P-value
12-month Bayley III Cognitive HLHS (n= 11 EPO, 6 placebo)	100.9±15.8	100.0±3.2	0.892
12-month Bayley III Language HLHS	90.3±15.1	90.0±9.7	0.969
12-month Bayley III Motor HLHS	90.0±13.1	90.3±19.8	0.967
12-month Bayley III Cognitive D-TGA/AA+VSD/other 2V (n= 11 EPO, 14 placebo)	101.4±11.9	108.9±11.8	0.126
12-month Bayley III Language D-TGA/AA+VSD/other 2V†	89 (83-91)	94 (89-94)	0.195
12-month Bayley III Motor D-TGA/AA+VSD/other 2V	89.7±12.2	93.6±11.6	0.430

†Non-parametric.

Conclusions: EPO treatment was not associated with a difference in 12-month BSID III. Complications, including major intracranial thrombosis, MRI brain injury, and death were not more common with EPO treatment. An optimised study design, likely in a multicentre setting, is required to define the utility of EPO neuro-protection in neonatal cardiac surgery. We advocate such a study because of the many desirable properties of EPO for neuro-protection and its demonstrated efficacy in other neonatal settings of cerebral injury.
References: 1. Paediatrics 2010;125:e818-27. 2. Paediatrics 2009;124:e218-26.

Abstract no: 558

The association of volatile anaesthetic exposure with neuro-developmental outcomes at age 12-months after neonatal cardiac surgery

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Introduction: Volatile anaesthetic agents (VAA) cause neuro-apoptosis in neonatal animals and human data demonstrates an association between early anaesthetic exposure and neuro-behavioural problems.[1-3] This study quantitated VAA exposure in the first 12 months in neonates undergoing cardiac surgery to determine association with neuro-developmental outcomes.
Methods: 93 neonates (<30 days) undergoing surgery with hypothermic CPB had prospective data collection for both cardiac and non-cardiac anaesthetics. End-tidal VAA was recorded every 15 minutes and inspired VAA concentration in the CPB sweep gas recorded every 10 minutes. Age adjusted minimum alveolar concentration (MAC)-hours were calculated. The primary outcome was the relationship between MAC hours of VAA, cognitive, language and motor composite scores of the Bayley Scales of Infant Development III (BSID) at age 12-months.
Results: 93 patients had neonatal cardiac surgery, 10 of these patients died and 24 did not return for 12-month follow-up, leaving 59 undergoing BSID (71% of survivors) (Table 1). After unadjusted linear regression analysis higher MAC hours VAA exposure was associated with lower 12-month BSID cognitive score (Cog = 107.7 - (1.5 x MAC-hours), R=0.33, R2=0.11, p=0.01). There was a trend towards lower language (p=0.18) and motor (p=0.09) scores with higher MAC hours. After backward stepwise multivariable analysis, increasing total MAC hours was associated with lower cognitive score (p=0.01). Higher MAC hours were associated with lower language score (p=0.02) but were not associated with lower motor score (p=0.49).

TABLE 1: Patient and clinical data 1st 12 months, n=59

Parameter	Value
Single vs. two ventricles (no.,%)	27/32 (46/54)
Chromosome anomaly (no.,%)	12 (20)
Pre-operative MRI injury (no.,%)	17 (29)
New post-operative MRI injury (no.,%)	26 (44)
Mean rSO_2c post-op neonatal surgery (%)	66.5±10.0
rSO_2c AUC <45% post-op neonatal surgery (%-min)	0 (0-377)
Total number anaesthetic exposures	Median 3, range 1-12
Total number cardiac surgeries	Median 2, range 1-3
Total CPB time (min)	272±106
Total intra-operative fentanyl dose (mcg/kg)	300±202
Total intra-operative midazolam dose (mg/kg)	1.6±0.9
Total MAC hours 1st 12 months	4.13±3.00, range 0.39-14.30
Maternal IQ	101.3±16.1
12-month BSID cognitive	101.5±13.4
12-month BSID language	88.0±12.6
12-month BSID motor	89.1±14.2

Normally distributed data expressed as mean ± SD, non-normally distributed as median (25-75%), or median, range.
rSO2c: regional cerebral oxygen saturation, AUC: area under the curve.

Discussion: We demonstrated an association between increasing exposure to VAA, and lower BSID III scores at age 12-months independent of covariates including cardiac anatomy, CPB time, regional cerebral oxygen saturation and MRI brain injury. Each additional MAC hour of VAA exposure was associated with a 1.5 point decrease in cognitive score. Anaesthetic technique may be an important factor in adverse neuro-developmental outcomes after neonatal cardiac surgery.
References: 1. Paediatrics 2011;128:e1053-61. 2. Paediatrics 2010;125:e818-27. 3. Paed Anaesth 2011;21:932-41.

Abstract no: 562

Early outcomes from a new regional programme for the surgical management of HLHS in Australia

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Introduction: Early survival and quality of outcome after surgery for hypoplastic left heart syndrome (HLHS) are influenced by patient specific factors, the quality of surgery and peri-operative care. Some skills are common to the care of other complex neonatal presentations but integrating this expertise is a key challenge for new programmes. We began offering surgery for HLHS from 2006 and provided a regional service from January 2009 and report early outcomes.
Methods: Prospectively collected data for neonates with HLHS undergoing surgical palliation from January 2006 - June 2011 were analysed. Standard definitions of high risk and standard risk presentations were utilised.
Results: Thirty neonates underwent surgical palliation of HLHS with a modified Norwood procedure with an overall survival to stage II palliation of 80%. 46.7% of our patients were categorized as high risk, mostly on the basis of low birth weight. Survival to stage II palliation was 100% in standard risk patients and 57.1% in the high risk group. Survival at one year was 67% and comparable to the SVR study at 69%.
Conclusion: Outcomes for this new programme are comparable to reported outcomes. Excellent outcomes can be achieved in standard risk patients. Outcomes in the high risk group may be improved by alternative approaches and rigorous case selection. Providing information about local outcomes is an important element in counselling of families with antenatal diagnosis of HLHS.

Abstract no: 564

Two-ventricle repair for complex congenital heart defects that are palliated towards single ventricle repair

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Background: Complex congenital heart defects that present earlier in life are sometimes channeled towards single ventricle repair, because of anatomical or logistic challenges involved in 2-ventricle correction. Given the long term functional and survival advantage, we have been consciously exploring the feasibility of a biventricular repair when these patients present later for Fontan completion.
Methods: Since June 2009, 71 patients were referred for staged completion of Fontan. Following detailed evaluation that included 3-D echo and MRI, 10 patients (Group I: median age 6 years) were identified and later underwent complex biventricular repair with take down of Glenn shunt. Non-routable VSD, straddling tricuspid valve, requirement of complex repair using conduit at a young age, ventricle being too small to support the systemic or pulmonary circulation were the reasons to defer biventricular repair initially. In 2 patients the decision for palliation with Glenn shunt was taken on the surgical table during previous failed attempts at biventricular correction. Completion extracardiac Fontan repair was done in 61 patients (Group 2- median age 7 years).
Results: 2-ventricle repair was accomplished in all 10 group 1 patients. The mean cardiopulmonary bypass time (362±93 vs. 155.9±95.7 minutes, $p<0.0001$); and mean ICU stay of 7±3.6 vs. 5.4±3 days) were longer in group 1 patients, but were not statistically significant. One patient developed complete heart block requiring a permanent pacemaker. Late patch dehiscence occurred in another (awaiting repair). At a median follow-up (15 months) there was no mortality among group 1 patients and all except for 1 were symptom-free. There were 2 early deaths (3.2%) in group 2.
Conclusion: 2-ventricular repair, although surgically challenging, should be considered in all patients with 2 functional ventricles who come for Fontan completion. Comprehensive pre-operative imaging and meticulous planning helps in identifying suitable candidates.

Abstract no: 567

Short-term results of Tetralogy of Fallot repair in the Hospital Infantil de Mexico Federico Gamez

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Hospital Infantil de Mexico Federico Gamez, Mexico

Background: Tetralogy of Fallot (ToF) accounts for 3.5% of all the patients with congenital heart defects. Complications associated with the repair vary by surgical technique and patient-specific factors. The present study was conducted to investigate the short-term clinical outcomes of ToF repair and to identify risk factors associated with complications and death.
Methods: Between 2006 and December 2010 we retrospectively reviewed the outcomes of 78 patients operated for Tetralogy of Fallot at the Hospital Infantil de Mexico Federico Gómez.
Results: Seventy eight patients were operated during the period of study. The mean age at diagnosis was 1.2 years and the mean age at surgery was 2.7 years. Fifteen patients had received a previous systemic-pulmonary fistula (19%). The type of surgery was infundibuloplasty in 44 (55.7%); a transannular patch in 27 (34.2%); a valved conduit in 2 (2.5%); valve replacement in 2 (2.5%); homograft in 2 (2.5%); and 1 patient underwent a monocusp valve formation (1.3%). The extracorporeal circulation mean time was 133 minutes and the aortic clamp of 79 minutes. The mechanical ventilation time was 2.29 days. The mean time in intensive care unit was 5.39 days. 24 patients had complications (31%); 15 required some type of re-intervention and 5 died before hospital discharge (6.3%). The main cause of death was infection. The length of hospital stay before surgery was a risk factor for infection and death.
Conclusions: In our country the reference to congenital heart surgery is delayed. Children often arrive with associated infections or acquire an infection in the hospital awaiting corrective surgery. It is imperative to educate primary care physicians for an earlier referral and to improve our referral system to avoid long periods of hospitalisation before surgery.

Abstract no: 587

The process and execution of multi-institutional cross-sectional follow-up studies: The Congenital Heart Surgeons' Society Data Centre Experience

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Background: The Congenital Heart Surgeons' Society (CHSS) Data Centre (DC) serves as the coordinating centre for multi-institutional, cross-sectional follow-up studies of children with complex and rare congenital heart defects (CHD). The success of our studies relies on our ability to follow patients long term. Recent trends show a decline in follow-up. The DC has developed new strategies to improve long term follow-up.
Methods: Our annual cross-sectional follow-up process extends over a 3-month period which entails questionnaire mail-out, reminder calls and dedicated time to locate patients with wrong addresses.
A variety of options exist for patients to complete follow-up forms including mail, email or telephone. Locating patients with wrong addresses continues to be challenging despite the use of death registries, internet searches, Facebook and Twitter. New strategies to address these issues include creation of a 1-page form sent to participating institutions verifying patient information as well as decreasing follow-up to 2 months, utilising the third month to solely address these issues. The DC team continuously explores additional ways of completing and submitting annual follow-up including a secure website that patients can log into which would adhere to current privacy laws.
Results: The implementation of the patient update form has been somewhat effective in obtaining current patient information essential to follow-up. The use of social media has not been as successful as we had anticipated. The DC staff and members of the Research Institute at The Hospital for Sick Children continue to collaborate on developing a secure website for patients to complete online annual follow-up.
Conclusions: Although these strategies have been somewhat effective in improving our follow-up, we are continuously exploring other strategies to improve the success of our long-term follow-up. To ensure the success of multi-institutional, cross-sectional follow-up studies, continuous evaluation and implementation of new strategies is critical.

Abstract no: 590

Effectiveness of contrast-enhanced computed tomography as a supportive measure for treatment of mediastinitis after paediatric cardiac surgery

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Objectives: Mediastinitis after cardiac surgery is a serious complication; however, there is no consensus of the treatment strategy of mediastinitis in paediatric cardiac surgery.
Methods: Paediatric patients who showed post-operative infectious signs (e.g., fever up, wound swelling, redness, pain, draining pus and abnormal laboratory data) were evaluated using 320 multi-detector row contrast-enhanced computed tomography (CECT) for diagnosing mediastinits. We defined that a typical CECT image of mediastinitis showed fluid collection with ring enhancement behind and between the sternums. Aggressive debridement followed by primary sternal closure was performed when typical findings of CECT were confirmed.
Results: From January 2007, 533 paediatric patients underwent median sternotomy. 13 cases (2.4%) had performed CECT for evaluating mediastinitis. The typical findings were obtained in 12 of the 13 cases. In one case without typical findings, pus flowed out from infectious site before CECT. Aggressive debridement followed by primary sternal closure was performed in all cases. There were no operative and hospital deaths. Re-exploration was required in 1 case due to the placement of a polytetrafuoloethylene membrane after the initial debridement. In 14 times of debridement for the 13 cases, the median mechanical ventilation time was 16.0 hours (range, 0 - 116.6 hours), and length of intensive care unit stay after primary sternal closure was 4 days (range, 1 - 21 days). The median post-operative hospital stay from primary sternal closure was 23 days (range, 15 - 53 days).
Conclusion: Primary sternal closure is feasible surgical treatment for mediastinitis in paediatric patients. The image of CECT is helpful for aggressive debridement to precisely detect the inflammatory area of mediastinitis. CECT should be a useful supportive measure for improving the outcome of primary sternal closure.

Abstract no: 603

Cardio-pulmonary exercise testing in patients with primary pulmonary hypertension

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Background: Cardiopulmonary exercise testing (CPX) has been widely used for assessing heart failure severity in children and adolescents with cardiac disease. However, little CPX-derived data on those with primary pulmonary hypertension (PPH) are available.
Purpose: Our purpose was to clarify relationships between CPX-derived variables and haemodynamics obtained by cardiac catheterisation in children and adolescents with PPH.
Methods and results: Since 1995 through 2011, 18PPH patients (age: 18.1±6.2 years) underwent 48 CPXs and the results were compared with the haemodynamics. Ventilatory equivalent for carbon oxide production at peak exercise (peak VE/VCO2) closely correlated with the pulmonary to systemic artery pressure and resistance ratios ($r=0.5$, $p<0.001$, and $r=0.6$, $p<0.001$, respectively). When patients were divided into 2 groups according to the peak VE/VCO2, i.e., high-VE/VCO2 vs. low-VE/VCO2, the high-VE/VCO2 group showed significantly higher pulmonary arterial pressure and resistance, lower cardiac index, smaller left ventricular size, and shorter distance of 6 minute walk ($p<0.05$). In contrast, the other CPX-derived variables, including peak oxygen uptake or heart rate, did not correlate with the haemodynamics.
Conclusions: Peak VE/VCO2 was the best CPX-derived variables for predicting haemodynamic severity in children and adolescents with PPH, indicating an importance of exercise ventilatory abnormality in PPH pathophysiology.

Abstract no: 605

Heart rate variability in children with vasovagal syncope during asymptomatic periods

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Objective: To do retrospective analysis the heart rate variability parameters in children with vasovagal syncope (VVS) during asymptomatic periods.
Methods: 45 children with a typical history of VVS were enrolled as a study group, among them, 38 patients had positive response to HUTT while 7 tested negative. 20 healthy children with similar characteristics without syncope matched as a control group. HRV was calculated over a 24-hour period for the time-domain indices and frequency-domain indices.
Results: (1) The study group had lower time-domain indices of SDNN ($P<0.01$), SDANN ($p<0.05$), and higher frequency-domain indices of LF ($p<0.05$) and LF/HF ($p<0.01$) than the control group. (2) There were no significantly differences in time-domain and frequency-domain indices between HUTT(+)VVS patients and HUTT(-)VVS patients. (3) VVS patients with vasodepressor responses had lower SDNN ($p<0.01$), SDANN ($p<0.05$), rMSSD ($p<0.05$) and PNN50 ($p<0.05$) and higher frequency-domain indices of LF ($p<0.05$) and LF/HF ($p<0.01$) when compared with cardio inhibitory responses patients. And the same, in VD group, rMSSD ($p<0.05$)), PNN50 values ($p<0.05$) were lower and LF ($p<0.05$), LF/HF ($p<0.01$) were higher when compared with mixed responses patients. In CI and MX groups there were no significant differences of HRV values. (4) Compared with the controls, rMSSD, PNN50 declined obviously in VD group while LF increased significantly.
Conclusion: There was different alteration in baseline autonomic activity in VVS children with different haemodynamic types during asymptomatic periods. Alteration in RMSSD, PNN50 and LF parameters may be as a predictor to identify vasodepressor type of VVS in clinical trials.

Abstract no: 607

Successfultreatment of therapy-resistant left ventricular outflow obstruction in childhood hypertrophic cardiomyopathy using short atrioventricular-delay dual chamber pacing with a left ventricular epicardial electrode

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Background: In hypertrophic obstructive cardiomyopathy (HOCM) left ventricular outflow (LVOT) gradient is caused by septum bulging into LVOT and systolic anterior movement of the mitral valve's anterior cusp. Unrelieved LVOT-obstruction is a risk factor for death. Primary treatment for gradient reduction is pharmacological with beta-blockers, calcium antagonists and disopyramide. Optimal management of myectomy – and drug-refractory LVOT gradient is unknown. In adults short atrioventricular (AV)-delay dual chamber (DDD) right ventricular (RV) pacing has been used. Results are modest, with some non-responders.
Materials and methods: We report 2 consequtive paediatric patients with HOCM and therapy resistant LVOT gradient after short AV-delay DDD pacing with an epicardial ventricular electrode placed at LV apex. Age at pacing was 7 months and 16 years respectively. Both had maximal pharmacotherapy with propranolol and disopyramide and had been through surgical myectomy of LVOT without any significant relief of outflow obstruction. For optimal AV-delay velocity through LVOT was measured by continuous wave Doppler from apical view. The AV-delay producing the least gradient was chosen. Mitral inflow signal was then recorded and care was taken that the atria would not contract against a closed mitral valve. Both patients remained on their medical treatment during pacing.
Results: Before pacing the peak gradient was 81 and 61mmH. AV-delay producing smallest gradient was 80ms in both patients. After pacing 12 and 3.5 months the gradients were 7 and 9mmHg respectively.
Conclusions: Short-term results in our 2 paediatric patients who failed medical treatment and myectomy show complete relief of the gradient. Pacing LV apex with short AV-delay activates papillary muscles before the outflow septum. Mitral valve apparatus moves posteriorly and LV-apex has time to empty before septum bulges into the outflow tract. Pacing from LV apex seems to be more effective than RV pacing. It however requires thoracotomy.

Abstract no: 610

Aortico-left ventricular tunnel: Case report and literature review

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Objectives: The purpose of this case report was to review the literature about aortico-left ventricular tunnel (ALVT) and describe a case that was misdiagnosed as ventricular septal defect (VSD).
Background: ALVT is a rare congenital anomaly. Echocardiography can identify the ALVT and associated lesions. Catheterization should be reserved for patients with unclear non-invasive findings or percutaneous closure. Neonatal surgery has been advocated in all patients due to long-term concern of aortic regurgitation (AR).
Methods: We describe an ALVT case that was misdiagnosed initially as a VSD. A 2-year-old boy presenting with heart failure and murmur was investigated by echocardiography that misdiagnosed a VSD Clinical, echocardiographic and surgical case details as well as literature were reviewed.
Case: Congestive heart failure and a murmur were diagnosed in the physical examination and furosemide, enalapril and digoxin were prescribed. Pre-operative echocardiogram revealed peri-membranous VSD with 4.6mm with moderate repercussion, aortic dilatation and mild AR. Patient underwent surgery to occlude VSD that was not detected. A right Sinus of Valsalva aneurysm was detected and aortotomy revealed an ALVT that was corrected by patch closure of the aortic end of the ALVT and a plasty of the sinus aneurysm. At 6-months follow-up patient was asymptomatic, without AR and a distal tunnel flow in interventricular peri-membranous septum was observed.
Conclusion: Aortico left ventricular tunnel is a rare cardiac malformation. Literature shows a good post-operative long term outcome and surgery correction is recommended soon after diagnosis in symptomatic patients. In our case 2-dimensional and pulsed colour-flow Doppler imaging did not establish the diagnosis. 3-dimensional or transoesophageal echocardiogram and more clinical suspicion could be helpful in its diagnosis. This article is to remind one that sometimes the diagnosis of rare congenital heart diseases could be necessary in the operating room if not diagnosed pre-operatively.

Abstract no: 614

Scimitar Syndrome: Surgical direct connection between right pulmonary anomalous vein and left atrium

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Objectives: The purpose of this was to review a Scimitar Syndrome case that underwent surgery to connect the right pulmonary anomalous vein (RPAV) directly to the left atrium (LA).
Background: Scimitar Syndrome is a rare congenital heart disease. Different surgical approaches have been described.
Methods: We describe a Scimitar Syndrome case that was operated on to connect the right pulmonary anomalous vein to the left atrium. A 4-year-old girl presenting with pneumonia was investigated by means of computed tomography which diagnosed RAPV connected to the inferior vena cava. Clinical, echocardiographic, computed tomography and surgical case details as well as the literature were reviewed.
Case: A 4-year-old girl presented with symptoms of pneumonia. Pre-operative echocardiogram revealed an enlargement of the right atrium (RA) and right ventricle (RV) with an anomalous connection from right pulmonary vein to inferior vena cava. Patient was submitted to surgery and a direct connection between right pulmonary anomalous vein and left atrium was done. At 10 months follow-up she was asymptomatic. Right phrenic nerve paralysis was observed.
Conclusion: In this case a direct connection between RAPV and LA was feasible because of anatomic features.

Abstract no: 620

Safety and tolerance of oral enoximone in paediatric myocardial failure

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Background: Continuous intravenous administration of phosphodiesterase 3 inhibitors has proven to be a valuable and successful therapy in paediatric patients with acute or chronic myocardial dysfunction. Intravenous treatment is associated with risk of infection and considerable patient discomfort. There is currently no specific oral preparation available. Weaning from intravenous medication to oral angiotensin-converting enzyme (ACE) inhibitors and beta-blockers can be challenging. We examined our experience with using the intravenous preparation of enoximone as an oral medication in this setting.
Methods: We reviewed retrospectively hospital records of 33 patients receiving oral enoximone in a single tertiary paediatric cardiac centre between November 2005 and December 2011. Indications for oral enoximone were inability to wean from intravenous milrinone infusion and/or intolerance of ACE inhibitor therapy.
Results: Patient age at start of oral enoximone was 0.5 - 191 months (median 8.5 months). Seven patients (21%) had left ventricular dysfunction due to myocarditis/cardiomyopathy and 26 (79%) had myocardial dysfunction complicating congenital heart disease, 25 (75%) following cardiac surgery. Of this latter group 12 (48%) had left ventricular, 9 (36%) had right ventricular and 4 (16%) had biventricular dysfunction. All patients received oral enoximone at 1mg/kg 3 times per day. Enoximone was well tolerated at this dose without adverse haemodynamic effect. Due to alkaline nature of this solution there were 2 (6%) patients with blood stained gastric content aspirates when enoximone was administered without milk, which subsequently resolved when given with milk. No other adverse effects were encountered and the families tolerated the inconvenience of using an intravenous preparation orally well. Results of outcome data analysis will be presented.
Conclusions: Oral enoximone is a safe alternative to protracted intravenous treatment of severe myocardial failure in children. Based on our experience it is a well tolerated and promising alternative when ACE inhibitors and beta-blockers are not tolerated.

Abstract no: 622

The Nikaidoh surgical procedure: Initial experience and mid-term results

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The Nikaidoh procedure is a recent surgical approach to repair TGA and DORV with VSD and PS.
Objective: To review our experience using the Nikaidoh procedure.
Methods: Between 2005 - 2012,10 patients (pts) underwent a modified Nikaidoh procedure at our institution, median age: 2.9 years (CI25%-75%=1-5.6) and median weight:12.5kg (CI25%-75%=8.7-19). Two anatomic variants were identified: TGA with VSD and PS (7pts) and DORV with PS (3pts). All pts had a VSD distant from the great arteries (inlet type 6 and muscular 4).
Results: The mean CPB time was 244 minutes (SD±50) and aortic cross-clamping was 181 minutes (DS±44).The median length of stay was 11 days (CI25%-75%=8-45), MV 6 days (CI25%-75%:4.5-22) and inotropic requirement was 8 days (CI 25%-75%=5.5-23.5).
Early outcome: No mortality occurred; 3pts suffered transient arrhythmias (1AVB,2JET). 1 patient developed infective endocarditis and needed mitral valve and RV- PA homograft replacement. Six patients presented some degree of ventricular dysfunction controlled with medical treatment, except in 1 who needed ventricular assistance. There was no obstruction to either RV or LV outflow tracts. None presented aortic insufficiency more than trivial or pulmonary incompetence more than moderate.
Mid-term results: The median follow-up was 4.3 years (2-5.6 years). No mortality occurred. All patients were free from reoperation and reintervention. All patients are in NYHA functional class I, with no arrhythmias, no LVOTO and a good biventricular function. The aortic valve is competent in 40%. In 6 patients the aortic insufficiency is mild. Regarding the RV-PA conduit, there was a mild stenosis in 6 and moderate in 1. Mild pulmonary insufficiency was found in 4 and it was moderate in 6 patients.
Conclusions: Mid-term actuarial survival was 100% after the Nikaidoh procedure. This surgical technique provides complete freedom from significant insufficiency and left or right ventricular outflow tract obstruction. The Modified Nikaidoh operation is a good surgical option in patients with TGA, VSD and PS and with DORV and PS, particularly when some anatomic features, such as the anatomic position of the VSD, are considered inadequate for a Rastelli procedure. Its long term benefits need to be evaluated with a larger number of patients and longer follow-up.

Abstract no: 626

Role for immune-monitoring to tailor induction prophylaxis in paediatric heart recipients

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Background: Rabbit antithymocyte globulin (rATG) is routinely used for induction, but is costly and associated with increased risk of infection and post-transplant lymphoproliferative disorder (PTLD).
Hypothesis: We hypothesised that CD3 monitoring to tailor rATG induction would cause less infection, reduce costs as well as rejection.
Methods: Heart transplant (Htx) recipients who received rATG between June 2011 - July 2011 were reviewed. We compared patients with CD3 monitoring used to adjust medication (Group 1, n=16) vs. Group 2 (pts with standard rATG dosing). Absolute CD3 count <25 cells/mm^3 was used to adjust rATG in Group 1. Outcomes included 1st year incidence of infection and rejection, direct costs of rATG, and incidence of PTLD and all death. STATS: Fisher's exact test, Wilcoxon rank sum and Wilcoxon sign rank test.
Results: Demographics, cardiac diagnoses were similar between study and control cases. Compared to controls, the study cases received fewer daily doses of rATG [median 3 (3-7) vs. 4 (2-7) p=0.005] and less total rATG (median 3.1mg/kg vs. 7.4mg/kg p<0.001). Compared to a fixed dose regimen of 1mg/kg/day x 5-7 days, the drug cost savings for study cases were significant (total cost $58,432 vs. $93,627, p=0.001); a 37% reduction in total cost. There was no difference in the incidence of infection (29% vs. 44%), rejection (53% vs. 31%), or mortality (6% vs. 6%) during the 1st year following Htx. There was 1 late death and 1 late case of PTLD in Group 2 (p=ns).
Conclusions: CD3 monitoring to tailor rATG induction in Htx recipients is associated with reduced drug costs and similar rates of rejection and infection. Longer follow-up will determine if there is extended benefit from tailored immunotherapy.

Abstract no: 641

Livosemendan vs. milrinone in prevention and treatment of low cardiac output in children undergoing corrective open heart surgery for congenital heart disease

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Abstract: Low cardiac output (LCO) state is a well-known complication in children undergoing corrective open heart surgery; it usually occurs 8-10 hours after surgery. Milrinone has shown to be superior to conventional inotropes in prevention and treatment of LCOS in children. Recently, levosimendan a Ca2+-sensitiser, has shown its superiority in various clinical trials conducted in adult cardiac surgery. However, its efficacy and safety in prevention of treatment of LCOS in children undergoing surgery for congenital heart disease has not been extensively studied.
Aims: In children less than 2 years of age after corrective open heart surgery for congenital heart disease: (1) Compare the efficacy of Livosemendan to Milrinone for prevention and treatment of low cardiac output state; and (2) Compare the safety of Livosemendan vs. that of Milrinone.
Methods: Case control study, in which Livosemendan was used in place of Milrinone in children undergoing total correction for congenital heart disease. Both the drugs were used prophylactically while coming off bypass with other inotropes as deemed necessary. The babies were monitored in the paediatric cardiac ICU over the next 72 hours for evidence of low cardiac output state, in form of heart rate, blood pressure, urine output, serum lactate levels, vasotropic ionotropic score and ventricular function by echocardiography.
Results: Both the groups did not differ significantly in development of LCOS and its recovery in the 72 hours. There were no serious adverse events or unexpected adverse drug reactions during the study.
Conclusion: Livosemendan is as safe and effective as Milrinone in prevention and treatment of LCOS in children undergoing total correction for congenital heart disease.

Abstract no: 645

Early and intermediate-term outcomes after transplantation for restrictive cardiomyopathy in children

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Background/Hypothesis: Restrictive cardiomyopathy (RCM) has the worst outcome of all cardiomyopathies with >50% mortality within 2 years of diagnosis. Heart transplantation (Htx) in this patient population has acceptable early mortality, however no studies of intermediate-term outcomes exist. We hypothesize that RCM has excellent early and midterm survival.
Materials and methods: We reviewed our experience with paediatric Htx for RCM from May 1988 - August 2012. Clinical data, support while waiting, recipient and donor variables and explant pathology were analyzed. Outcomes were examined via Kaplan-Meier survival curves.
Results: Of 198 transplants in 189 patients during the study period, 17 (9%) had RCM. Median age at Htx was 7.7 (range 0.89 - 16.2 years). Most common presentation was tachypnea/cough (11), FTT (3) and syncope (1). No patients had a dysmorphic syndrome; however, 1 was diagnosed with a desmin cardiomyopathy and another mitochondrial disorder after Htx. Only 2 had familial cardiomyopathy. Between listing and Htx, 5 patients were ventilated, and 2 were on mechanical support; 11 patients were status 1 or 1a. Median time from listing to Htx was 16 days (range 1 - 81). 2 had ABO incompatible Htx at ages 8 and 10 months. 30 day, 1 year, and 5 year survival were 100.100 and 73% respectively, with 7 deaths at 3.3 - 13.7 years post Htx. 1 patient was retransplanted 8.9 years post Htx (CAV), and died 4 years later of rejection. Other deaths were from rejection and/or sudden death (4), rejection/infection (1), CAV (1) and PTLD (1). Non-adherence was suspected in 5 of these patients.
Conclusions: Heart transplant is an effective therapy for children with RCM providing excellent early and mid-term survival. Late mortality was primarily due to rejection.

Abstract no: 646

Prevalence, associated factors and outcomes of acute kidney injury among children and adolescents undergoing cardiopulmonary bypass surgery in Nairobi, Kenya

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Background: AKI is a serious complication associated with cardiopulmonary bypass surgery. The development of AKI is associated with substantial morbidity and mortality. This study was done to determine the prevalence, risk factors of AKI, and outcome of children and adolescents with AKI following cardiopulmonary bypass surgery at Kenyatta National Hospital and Mater Hospital.
Methods: This was a prospective cohort study of 89 participants aged from birth to 17 years recruited consecutively as they were admitted for cardiopulmonary bypass surgery. Creatinine measurements were obtained in the week before surgery, 8 hourly intervals in the first 24 hours post-operatively and then at 48 hours. A decline in creatinine clearance of ≥25% from baseline was used as the threshold to define AKI. Kidney Injury was classified according to the RIFLE system where patients are categorised as being at risk, having injury and complete failure.
Results: The overall prevalence of AKI was 37.1%. According to the RIFLE system, risk occurred in 34.8%, injury in 11.2%, and failure in 1.1% of patients. Patients with AKI were older, median age 9 years (IQR 3 - 12), compared to 4 years (IQR 1.5 - 8) for those without AKI. 55% of AKI patients had moderate to severe malnutrition compared to 34% of patients without AKI (OR 2.00, p=0.17). The median length of ICU stay in AKI patients was 4 days (IQR 2 - 6). The mortality rate in AKI vs. non-AKI patients was 15.2% and 9% respectively (OR 1.8; 95% CI: 0.5-6.8, p=0.37). Up to 18.2% of AKI patients required dialysis compared to 5% of non-AKI patients (OR 3.9; 95% CI: 0.9-16.9, p=0.06).
Conclusion: The prevalence of AKI following cardiopulmonary bypass surgery in children and adolescents at the KNH and Mater hospital is high (37.1%) and was found in older patients. Malnutrition was associated with 2-fold odds of developing AKI.

Abstract no: 649

Invasive pulmonary blood flow restriction in pre-operative management of patients with hypoplastic left heart syndrome in a single low-volume institution

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Background: For patients with HLHS it is optimal to be in stable condition prior to Norwood procedure. In the setting of limited resources the Norwood procedure sometimes has to be postponed for several days, which may expose the patient to negative effect of systemic hypoperfusion due to runoff into pulmonary circuit. In order to balance pulmonary and systemic blood flow different non-invasive measures can be used, but their effectiveness and durability of effect are limited and invasive measures may be necessary to restrict pulmonary blood flow.
Materials and methods: Short-term ligation of right pulmonary artery (rPA) (in 2007) or bilateral banding of pulmonary arteries (PAs) (from 2008 onward) were used as methods of invasive pulmonary blood flow restriction (iPBFR). Indications for iPBFR were as follows: systemic hypoperfusion with lactate level more that 5mmol/l and oliguria together with ineffectiveness of non-invasive measures to limit pulmonary blood flow. Nine out of 29 HLHS patients required invasive pulmonary blood flow restriction since 2005 till 2011. Three temporary rPA ligations and 6 bilateral bandings of PAs were performed. Blood gas and metabolites' level analyses were performed on a regular basis before and after iPBFR.
Results: The patients' mean body weight was 3.1±0.56kg. iPBFR was performed at 5.3±0.7 day of life. Mean blood lactate level prior to iPBFR was 7.8±1.9mmol/l, and mean arterial oxygen saturation was 89.8%±7.6%. Mean blood lactate level after iPBFR was 1.8±0.8mmol/l and mean arterial oxygen saturation was 77.8%±5.3%. 1 patient died 20 hours after the procedure due to progression of organ dysfunction. The rest of the patients remained stable and underwent Norwood procedure at 5.6±2.8 day after the initial palliation.
Conclusions: Invasive pulmonary blood flow restriction reduces systemic hypoperfusion, improves the metabolic status, and stabilises patients' condition before Norwood procedure.

Abstract no: 652

Long-term survival in piglets after sectioning and re-suturing vessels mimicking the arterial switch procedure for transposition of the great arteries

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Background: Children born with transposition undergo arterial switch operation (ASO) in the neonatal period. The ASO sections the sympathetic nervous inflow along the aorta and coronary arteries. Experiences of long term follow-up after ASO indicate that the autonomic nervous system consequences of the ASO need to be addressed. We developed a protocol for cardiopulmonary bypass (CPB) surgery in piglets allowing long term survival after sectioning and resuturing vessels as in the ASO. Post-operative care without intensive care unit facilities was a challenge.
Methods: Female piglets of Yorkshire-Hampshire crossbreed, aged 8.5 weeks were operated. Anaesthesia combining pqediatric anaesthetic/ICU and veterinarian experience included pre-operative sedation with midazolam/ketamine, induction and maintenance with propofol and fentanyl in combination with isoflurane

inhalation. Lidocaine was infused to prevent arrhythmias. Standards for neonatal monitoring were applied. CPB equipment; oxygenators, circuit and pumps were adapted to the range of flow and venous drainage, and cross-matched pigblood was added to the prime. Surgical technique had to be adapted to the different position of the piglet's heart and large vessels. The protocol was approved by the local animal research ethics committee. Animal welfare rules forbidding division of the manubrium in pigs that must be able to stand after the operation added surgical difficulties. Special rigging of the aortic arch was necessary for cannulation and access. In addition fragile tissues resulted in suturing difficulties. Re-warming to body temperature of 38 before extubating was essential.
Results: Fourteen out of 19 piglets that underwent the mimicked "ASO" survived for long term follow-up and later in-vivo and in-vitro analysis of the physiological consequences of sympathetic denervation of the heart caused by the sectioning of large vessels and the re-implantation of coronaries.
Conclusions: This model can be used to enhance the knowledge of the short and long term consequences of paediatric cardiac surgery.

Abstract no: 656
Variability in response to amlodipine in hypertensive paediatric cardiac transplant recipients

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Background: 57% of paediatric cardiac transplant patients develop late-onset hypertension. Amlodipine, a calcium channel blocker, is the most commonly used first line anti-hypertensive agent.
Objective: Analyse the efficacy of amlodipine as first-line therapy for hypertension in paediatric cardiac transplant recipients.
Methods: Paediatric cardiac transplant recipients prospectively enrolled through the heart centre bio bank were studied. 24 hour, daytime and night time mean systolic and diastolic blood pressure (BP) were captured from serial ambulatory BP measurements. Hypertension was defined as being above the 95th percentile in BP for gender, age and height. Amlodipine dose and BP indexed to amlodipine dose (in mg/kg/mmHg*100) was assessed.
Results: Of 124 heart transplant patients in the bio bank, 53% were male (mean age, 11.8 years at enrolment; 74% White, 11% Asian, 4% Black, 10% other). Ninety seven received amlodipine during follow-up. Of 97 patients in whom ambulatory BPs were available, 21 were analysed. Mean dose of amlodipine was 0.165mg/kg/day (range 0.054-0.355). The BP indexed to amlodipine dose was highly variable as shown in the Table.

Indexed BP (mg/kg/mmHg*100)	Daytime Systolic	Daytime Diastolic	Night time Systolic	Night time Diastolic	24 hours Systolic	24 hours Diastolic
Mean	0.139±0.07	0.221±0.12	0.161±0.08	0.260±0.14	0.145±0.08	0.232±0.13
Range	0.059-0.28	0.075-0.43	0.055-0.30	0.094-0.49	0.051-0.29	0.077-0.46

Conclusions: There was large variability in amlodipine dose requirements and dose-adjusted response to amlodipine in hypertensive paediatric transplant patients. Genetic testing is underway to determine the contribution of pharmacogenetic variation to amlodipine response. This knowledge will help in optimising the choice and dose of first-line antihypertensive therapy in this cohort.

Abstract no: 661
Pulmonary valve implantation using self-expanding tissue valve

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Introduction: Significant pulmonary regurgitation is a common problem after surgical or percutaneous treatment of congenital cardiac defects like Tetralogy of Fallot, negatively affecting long term prognosis and necessitating re-interventions. The Biointegral No-react Injectable Pulmonic (NRIP) valve allows pulmonary valve replacement with or without cardiopulmonary bypass (CPB) minimising the impact of surgery. The aim of the works is to describe our multi-institutional experience with the clinical use of this device.
Methods: Between January 2006 and June 2012, 35 symptomatic patients, mean age 20.0±12.5, with severe pulmonary regurgitation and progressive right ventricular dysfunction after Tetralogy, received NRIP in 11 European different institutions. All patients underwent magnetic resonance (MR) before and after the implant and trans-oesophageal 2-D echocardiography during the surgical procedure and the follow-up.
Results: Valve insertion, delivery and placement were successful in all patients but 2 required the repositioning of the same valve in CPB. Of these, 5 patients had the valve implanted in CPB to allow repair of intracardiac defects. Early recovery was uneventful and all the patients were discharged home after a mean length of hospital stay of 6.3 (±2.4) days. Intra-operatively, transoesophageal echocardiography was the unique tool to guide device positioning and verify early surgical results. In 3 patients echo documented a valve displacement after delivery and guided the repositioning. In the post-operative course serial echocardiographic and MR studies documented right ventricle reverse remodelling and excluded later complications. The mean follow-up was 3.8 years.
Conclusions: The NRIP valve allows safe and easy pulmonary valve replacement without CPB in selected cases. Its mode of implantation offer less invasive approach with less blood loss and shorter hospital stays. Trans-oesophageal echocardiography plays an important role in the intra-operative management and the MR permit an adequate selection of the patients. Longer follow-up is required to assess the valve performance.

Abstract no: 671

Low-volume blood sampling tubes can be used for thrombelastometry in paediatric patients

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Background: Minimising the volume of blood used for diagnostic procedures in children undertaking congenital heart surgery is desirable. We investigated to what extent the size and the type of sample tube affects the results of thrombelastometry (RoTEM®).
Materials and methods: In 20 healthy individuals, we compared 4 sampling tubes (evacuated 0.109 M sodium-citrate plastic tubes): Venosafe® 1.8, 2.7 and 3ml and BD Vacutainer® 1.8ml. Using 4 parallel RoTEM® devices we studied clotting time, maximum velocity and maximum clot firmness in 3 assays: ExTEM®, InTEM® and FibTEM®.
Results: No difference was found in any of the RoTEM® parameters using 4 different tubes for blood sampling (Table 1). Intra- and inter-individual variation was acceptable. When comparing the 2 low-volume tubes, we found that the technical design of the tube did not influence RoTEM® results.

TABLE 1: RoTEM® results, presented as mean (SD)

	Venosafe® 3.6ml	Venosafe® 2.7ml	Venosafe® 1.8ml	BD Vacutainer® 1.ml	P-value*	P-value**
Clotting time (s)						
ExTEM	64 (7)	62 (7)	62 (12)	65 (10)	0.58	0.18
InTEM	204 (29)	191 (19)	190 (22)	189 (24)	0.13	0.94
Maximum velocity (mm/s)						
ExTEM	13 (2)	13 (2)	14 (3)	13 (3)	0.60	0.50
InTEM	16 (3)	16 (3)	17 (3)	16 (3)	0.72	0.27
Maximum clot firmness (mm)						
ExTEM	59 (4)	59 (4)	58 (4)	59 (4)	0.87	0.84
InTEM	61 (4)	61 (4)	61 (4)	61 (4)	0.96	0.28
FibTEM	13 (3)	14 (3)	12 (3)	13 (3)	0.58	0.14

**One-way ANOVA for repeated measurements. **Paired t-test comparing Venosafe® 1.8ml and BD Vacutainer® 1.8ml.*

Conclusion: RoTEM® results were not affected by the size and the type of the sampling tube. Therefore, to minimise the volume of blood draws, smaller tubes of 1.8ml should be preferred in paediatric patients.

Abstract no: 672

Idebenone in Friedreich Ataxia: Improved function and reduced myocardial hypertrophy

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We present a patient at the age of 9 who suffers from Friedreich ataxia with hypertrophic cardiomyopathy. She was born from normal pregnancy and delivery. She began walking by 13 months but with difficulties. At the age of 3 she often complained of pain in the legs while walking and she was often falling down. She was sweating a lot and in every respiratory infection symptoms got worse.
Friedreich ataxia was diagnosed and cardiological e1xamination was done. Ultrasound showed hypertrophic cardiomyopathy with depressed contractility and there were repolarisation disturbances in the electrocardiogram. We treated her with idebenone after which cardiac muscle contractility was normalised.
Friedreich ataxia is an autosomal recessive multisystem progressive disease characterised by disturbances in walking and extremity ataxia caused by deterioration of the rear column and spinocerebellar tracts in the spinal cord. Mutation of the gene for frataxin (FXN) causes disease.
In most patients, the disease affects the heart and in combination with the neurological problems significantly reduces the patient's abilities. It often causes premature death, particularly in patients who had the disease before the age of twenty. The hypertrophic cardiomyopathy with normal ejection fraction is the most frequent ultrasound finding in the heart in 75% of the cases. Unfortunately, the cure for this disease is still not discovered and the function of fraxatin protein is unknown. The present studies show that frataxin protein is important in regulating the transfer of iron in mitochondria. Idebenone is a short chain bensoquinon similar to coenzyme Q10. It is a powerful anti-oxidant and electron carrier in the respiratory chain and helps the creation of ATP. The recent studies have shown that idebenone is effective in doses of 5-10mg/kg/day in patients with FA and cardiomyopathy.

Abstract no: 674

A newborn with high output cardiac failure due to a large vein of Galen malformation

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Neonatal heart failures in newborns are often caused by asphyxial cardiomyopathy, left-sided obstructive lesions, large mixing cardiac defects and myocarditis. The most frequent haemodynamically significant extracardiac arterio–venous shunt found in newborns is a vein of Galen malformation. However, it is not such a frequent cause of severe cardiac failure in infancy. Effective treatment has not yet been found.
We report a patient with a large vein of Galen malformation which presented itself with a high output cardiac failure, pulmonary artery hypertension and respiratory distress soon after the birth. During an emergency cardiac catheterisation we diagnosed a large vein of Galen malformation. A cardiac status was improved after partial embolisation.
Nine months later the echocardiographic finding was normal and further therapy was discontinued. Unfortunately, as in similar cases, hypertensive hydrocephalus developed, a ventriculoperitoneal shunt was placed and there were major neuro-developmental delays.

Abstract no: 676

The case of neonatal lupus syndrome: Transient complete congenital AV block in a newborn

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The congenital heart block in neonatal lupus is a form of passively acquired auto-immune disease in which maternal auto-antibodies to the intracellular ribonucleoproteins Ro (SS-A) and LA (SS-B), cross the placenta and injure the fetal heart. The studies show that AV block in the neonatal lupus is irreversible. The aim was to present the patient who had spontaneous recovery from complete heart block.
The patient was born from normal, controlled pregnancy. In the 36th week of gestational age she was delivered by emergency Caesarean section because of the fetal bradycardia in cardiotocographic recording, BW 2 750g, Apgar score 9/9. After the birth, electrocardiography results showed the complete AV dissociation with atrial frequency around 150bpm and ventricular around 55 - 60bpm. Echocardiography showed normal heart structure and function.
Serology of auto-immune diseases was performed and has shown that the newborn has maternal anti-Ro-SSA and anti-La- SSB antibodies in the circulation. Anamnesis of the mother showed that she had years of dermatological treatment due to skin lesions on legs and occasional pain in the joints. We advised her to do rheumatology tests. During her stay the newborn had no cyanosis crisis and no signs of loosing heart function. The values of the pulse ranged from 65 - 90bpm and ECG showed a persisting complete atrioventricular block.
At the age of 3 months the patient was re-admitted to the clinic to run control tests. During the 24-hour ECG she was in sinus rhythm, with average frequency of 133bpm. The lowest frequency was recorded while sleeping, at 67bpm. There were no episodes of complete AV block or other arrhythmias. There was a spontaneous recovery of the cardiac conduction system.

Abstract no: 690

A retrospective review of palliative systemic-to-arterial shunts in a resource-scarce African environment

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Background: Due to the lack of cardiac surgical programmes undertaking corrective surgery in the neonatal period in resource-scarce African countries, the vast majority of patients presenting with cyanosis in the newborn period are palliated by a systemic-to-pulmonary arterial shunt.
Materials and methods: We reviewed the case records of all patients who underwent systemic-to-pulmonary arterial shunting over a 7-year period (2005 - 2011) at a tertiary cardiac surgical centre with a referral base of 14 million people.
Results: 98 patients underwent systemic-to-pulmonary arterial shunting over a 7-year period, of which only 23 ultimately underwent correction of their primary cardiac lesion. A significant number of patients were lost to follow-up or demised due to diarrhoeal and respiratory disease.
Conclusions: In a resource-scarce environment, the primary palliation of cyanosed neonates with systemic-to-pulmonary arterial shunts has a sub-optimal long term result, and resources should be put into the development of centres specialising in early neonatal corrective surgery.

Abstract no: 696

A retrospective review of HIV-infected patients undergoing congenital cardiac surgery in KwaZulu-Natal, South Africa

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Background: South Africa has one of the highest prevalences of HIV infection in the world (30%), with the perinatal HIV infection rate in KwaZulu-Natal over 40%. HIV-exposed neonates and infants undergoing congenital cardiac surgery (either palliative of corrective) in Sub-Saharan Africa remain an unstudied population. We have formulated institutional guidelines based on clinical experience in order to manage these patients.
Materials and methods: We reviewed the case records of all HIV-exposed patients who underwent congenital cardiac surgery over a 7-year period (2005 - 2011) at a tertiary cardiac surgical centre with a referral base of 14 million people.
Results: No significant difference in in-hospital morbidity or mortality was noted in HIV-exposed patients undergoing congenital cardiac surgery, when compared to non-exposed patients with similar risk stratification. However, the late mortality and long term outcome following surgery remains unclear.
Conclusions: Whilst HIV-exposed patients undergoing congenital cardiac surgery have an acceptable in hospital morbidity and mortality, the late mortality (particularly related to opportunistic infections) requires further evaluation. In addition, patient access to and compliance with highly active antiretroviral therapy (HAART) is variable. In undertaking congenital cardiac surgery in HIV positive patients, a sound knowledge of drug interactions, immunology, risks of mother-to-child transmission (MTCT) and the manifestations of opportunistic infections is required in order to formulate institutional guidelines.

Abstract no: 743

Sustained biventricular pacing may improve cardiac index, blood pressure and cerebral blood flow in infants with electrical dyssynchrony after surgery for congenital heart disease

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Background: Cardiac index (CI) decreases in the initial post-operative period after congenital heart disease (CHD) surgery, exposing infants to adverse haemodynamics. Electrical dyssynchrony, manifest by prolonged QRS duration (QRSd) may be an important factor. We hypothesised that continuous simultaneous left and right ventricular pacing (BiVp) after CHD surgery improves cardiac index and haemodynamics in the early post-operative period.
Methods and materials: We prospectively recruited infants with biventricular CHD <4 months of age undergoing surgery on cardiopulmonary bypass. Infants were randomised, regardless of QRS duration, to receive standard of care or standard of care +BiVp for 48 post-operative hours or until extubation if sooner. Infants randomised to BiVp received atrial, right ventricular and left ventricular leads. Continuous BiVp (atrial tracking) was initiated upon return to ICU. Haemodynamics were assessed at least every 3 hours for the 1st 24 hours and at least every 6 hours thereafter up to 48 hours. CI was measured by Fick using mass spectroscopy for oxygen consumption. Near infrared spectroscopy was used to measure cerebral saturation. Primary outcome was change in CI over the 1st 48 post-operative hours.
Results: 42 infants (21 Control, 21 Bivp; 3.8±0.9kg, 50% transposition of the great arteries) were randomised. Infants with prolonged baseline QRS (>98th percentile) experienced decreased CI, which was prevented by BiVp. Controls with normal QRS durations for age had consistent improvement in CI in the 1st 48 hours, while those with prolonged QRS durations showed delayed CI recovery. BiVp tended to improve CI recovery (+0.118 (0.374)ml/min/m^2, p=NS), blood pressure (BIVP+8 (3) mmHg, p=0.01) and cerebral blood flow in infants with wide QRS (Fig), but did not improve CI in infants with narrow QRS.
Discussion: Continuous BiVp may be useful to improve CI, blood pressure and cerebral flow in infants with electrical dyssynchrony after CHD surgery.

Abstract no: 756

Complications and outcomes of chylothorax following cardiac surgery

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Background: To review the experience of post-cardiac surgery chylothorax at our institution over a 6-year period with emphasis on complications and mortality.
Materials and methods: Episodes of post-operative chylothorax from 1 June 2005 - 31 May 2011 were identified from Intensive Care and Cardiac Surgical databases. Demographic, operative, haemodynamic, laboratory and outcome data were collected from the medical record and electronic databases. A multivariate model was constructed to define predictors of death.
Results: 116 episodes of chylothorax were confirmed, yielding an incidence of 2.2% in post-operative patients. The median age of patients was 57 days (range 1 day - 16 years). One third of episodes occurred following 1 of the 3 stages of single ventricle palliation. The highest specific incidence occurred following neonatal repair of anomalous pulmonary venous drainage (17.4% of such operations). Maximum daily chyle drainage (median 46ml/Kg/day, 2 - 617) was negatively correlated with age and positively with duration of chylothorax. Initial feeding was parenteral in 49.5%, and enteral in 50.5%. Patients treated with parenteral nutrition at any time had higher mean daily drainage (p<0.001). Laboratory consequences of protein loss were common: Lymphopaenia 92.2%; Hypoalbuminaemia 87.1%; Hypoproteinaemia 85.3%; Hypogammaglobulinaemia 67.2%. 31% developed sepsis; these patients were younger and had lower immunoglobulin levels than those who did not develop sepsis. Median ICU stay was 10 days with a median hospital stay of 116 days. The mortality rate was 15.6% with a median time to death from the day of surgery of 68 days (9 - 296). The lowest blood lymphocyte count and the lowest serum albumin were independent predictors of death.
Conclusions: Chylothorax is an infrequent complication of cardiac surgery but is associated with high morbidity and mortality. Minimum blood lymphocyte count and serum albumin are independent predictors of death in patients with this complication.

Abstract no: 758

Periodontal disease in children with congenital heart disease and its correlation with levels of LDL cholesterol

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Hypothesis: The number of children and adults with congenital heart disease has increased in recent years, but there are few studies correlating changes in oral mucous and mouth in this patient group. Moreover, recent research in adults has shown that a relationship exists between the oral cavity diseases, especially periodontal infections and systemic diseases, including arthrosclerosis. The aim of our study was to correlate the levels of LDL cholesterol in patients with congenital heart disease and periodontal disease.
Materials and methods: We have evaluated 33 patients with congenital heart disease (Group I - average age of 9 years and 7 months) and compared them with a control group of 28 patients without cardiac disease (Group II - average age 9 years and 8 months). We analysed the clinical periodontal parameters of plaque index, clinical attachment level and bleeding on probing and blood level of LDL cholesterol.
Results: The LDL cholesterol levels were slightly higher in the control group (Group II -87.23mg/dL±23.94) than in the cardiac group (Group I -85.49mg/dL±19.83), with enough similarity between the groups regarding clinical attachment level (Group I 1.91mm±0.31, Group II -1.93mm±0.28), but only when there was an analysis of patients with LDL higher than expected in these groups, the level of clinical attachment was greater in Group I (2.11mm±0.31) than Group II (1.84mm±0.32).
Conclusions: Patients with congenital heart disease followed-up in our service have improved plaque control compared to the control group, but the more developed periodontal disease is in this group of patients, the more the control of LDL cholesterol can be changed. As the percentage of hypercholesterolaemic patients was 24.59%, we believe further studies should be performed to better assess this correlation in paediatric patients.

Abstract no: 761

Simultaneous repair of pectus excavatum and congenital heart defects. A good surgical option of a one-stage procedure

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Background/hypothesis: Simultaneous repair of the pectus excavatum and congenital heart defect is highly efficient and reduce the number of operative procedures in children to 1.
Materials and methods: Case report of 2 patients operated in a one-stage procedure consisting of a simultaneously pectus excavatum correction and congenital heart defect repair.
Results: Between 2007 - 2010, 2 patients each aged 7 received a simultaneous pectus excavatum repair with modified Ravitch technique and congenital heart defect repair by a multi-disciplinary team of cardiac and thoracic surgeons. Both patients received a transverse linear submamary incision. Deformed cartilages were subperichondrially bilaterally resected and the sternum lifted anteriorly. Through a pericardiotomy the cardiac lesion was fixed. One patient received an aortic valve sparing and ascending aorta replacement (Tirone David operation) for a severe aortic insufficiency and aortic anuloectasic disease. And in the 2nd patient an atrial septal defect was repaired with an autologous pericardial patch. After the cardiac defect repair, the sternum was positioned back to the original position, pectoral muscle was fixed to the sternum, xiphoid was fixed to the abdominal rectus and subcutaneous tissue, and the skin was closed in a regular way. A vacuum system and pericardial tube were placed subcutaneously. Patients were ventilated for 13 hours (12 - 13) in order to avoid tension during the first hour of the post-operative period. The intensive care stay was 2.5 days (2 - 3). No complications or mortality were observed. Esthetical results are good after 23 month of follow-up, and the cardiac repair is still satisfactory.
Conclusions: Simultaneous repair of pectus excavatum and congenital heart defect is a good option of treatment since it reduces to the operative event one. There is no increased risk of complications, both patients tolerated the procedures very well, and the short term results are good.

Abstract no: 773

The Konno aortoventriculoplasty procedure is an excellent alternative to relive severe left outflow-tract obstruction at all ages

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Background/hypothesis: Aortic root enlargement (ARE) procedures are believed to allow implantation of larger valve prostheses; however, little evidence exists to support the specific efficacy of various techniques. The Konno procedure is the best technique used to enlarge the aortic root and increase the size of the aortic valve implanted.
Materials and methods: Case series of 6 patients: 3 children and 3 adults since January 2009 - March 2012. Patients had an aortic root enlargement surgery "Konno aortoventriculoplasty". We presented continuous variables in means o medians and SD or IQR, and categorical variables in absolute and relative frequencies; paried t test was used to compare continuous pre- and post-operative haemodynamics variables.
Results: Median age 19.5 years (3 - 56), 57.1% ($^{4}/_{7}$) women. The 83.3% ($^{5}/_{6}$) of patients had symptoms at the diagnosis; all patients had a previous cardiac procedure. The underlying anatomic diagnoses were valve and subvalvar aortic stenosis in 2, subaortic fibromuscular tunnel with moderate aortic stenosis in 2, severe aortic stenosis and insufficiency in 1 patient and dehiscence of a previous Konno operation in one. Mean ejection fraction 65.7±16.9%, aortic valve peak gradient mean 74.2±61.1mmhg and mean aortic ring diameter 17.7±3.4mm. Mean aortic clamp time 107.6±20.0 minutes. 83.3% (5/6) of patients received a new mechanic valve. No mortality events, 1 re-operation for bleeding, 1 new complete AV blocks. Post-operative aortic valve peak gradient mean was 22.1±7.3mmhg (p=0.08), and ejection fraction 55.5±15.3 (p=0.08). At the follow-up all patients were alive.
Conclusions: Konno aortoventriculoplasty is a safe operation. Excellent results may be achieved despite previous aortic root enlargement procedures, and may even reduce the risk of reoperation in children by allowing placement of a larger prosthesis.

Abstract no: 779

Construction and validation of an instrument to determine the degree of understanding of postoperative care on caregivers of paediatric patients undergoing cardiovascular surgery

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Introduction: The importance of post-operative care is widely described in the literature, however little has been published about a scale that measures the level of understanding of the information given by the nursing service to patients and caregivers in the post-operative period of cardiac surgery.
Objective: To develop and validate an instrument to measure the degree of understanding of post-operative care in cardiovascular surgery given by the nursing service of the Fundación Cardioinfantil to caregivers of paediatric patients undergoing cardiac surgery.
Methodology: A cross-sectional study was conducted between August and November 2011. The nursing team carried out the construction of the instrument based on the instructions of post-operative care following the guidelines of self-care model of Dorothea Orem. The instrument has 5 categories: (1) Appointment with cardiovascular surgeon. (2) Daily activities. (3) Drug administartion. (4) Endocarditis prevention. (5) Warning singnals. Construc Validation was performed by 10 experts in cardiovascular medicine. We performed content validity, reliability through Cronbach's alpha test statistic and calculated in Stata 8.0.
Results: 100 caregivers evaluated, 92% (92/100) female. Instrument was applied by a nurse from service after receiving information of post-operative care as the service protocol. The instrument was applied at 30 - 60 minutes after surgery. The average time of application was 4±2.3 minutes. Content validity 0.85, Reliability 0.70.
Discussion: The construction and validation of an instrument to assess the degree of understanding of post-operative care in cardiovascular surgery, indicates that educational interventions made by the nursing service provide clear concepts for achieving patient care at home.

Abstract no: 780

Improvements in results of neonatal and infant cardiac surgery: A journey of a small centre

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Background: Mortality in congenital cardiac surgery (CCS) in centres world wide is very low. Every new centre has to match the benchmark in a faster time. This requires a team effort. We describe our efforts to improve the results of CCS at our centre.
Methods: Our centre was the first to start CCS in central India. The surgeon carried out the roles of cardiologist, surgeon and intensivist. The anaesthesiologist carried out the roles of anaesthetist, perfusionist and intensicist. We operated on 350 patients with congenital heart diseases. Initially, we started with hypothermic perfusion, blood prime, cold blood cardioplaegia, conventional and modified ultrafiltration. We did intra-operative epicardial echocardiography to confirm proper surgical correction. Our intubation times, reintubation rates and tracheostomy rates were high. After a visit to 2 centres, we modified our prime by increasing the albumin content, changing the modified ultrafiltration circuit. We introduced bubble CPAP (Continuous Positive Airway Pressure) as a step down from mechanical ventilation in neonates and infants less than 4kg in weight. We improved our neonatal nursing care with emphasis on hand hygiene.
Results:

Category	Patients	Average Aristotle basic complexity Score	Mortality (%)
Total Patients	350	6.3	45 (12.85%)
Weight <8kg	181	6.7	40 (22.09%)
Closed heart surgery	50	4.5	5 (10%)
Initial period	37	4.4	5 (13.51%)
Post modification	13	4.7	0 (0)
			(p=0.19)
Open heart surgery (CPB)	131	7.6	35 (26.71%)
			(p<0.04)
Initial period	97	7.6	32 (32.98%)
Post modification	34	7.5	3 (8.82%)
			(p<0.02)
Weight ≥ 8kg	169	5.9	5 (2.95%)
			p<0.0000023

Conclusions: Our mortality rate for patients with weight <8kg is significantly higher. But there is significant improvement in our results after the modifications that were done in our practice.

Abstract no: 785

Modified single patch repair of complete atrioventricular septal defect is performed more efficiently with no detrimental effect on left ventricular outflow size and atrioventricular valve coaptation reserve

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Objectives: Concerns have been raised about left ventricular outflow tract (LVOT) narrowing and increased left atrioventricular valve regurgitation (LAVV) following atrioventricular septal defect (AVSD) repair with a modified single patch technique. Therefore, we sought to compare the effects of modified single and 2-patch surgical repair of complete AVSD on the LVOT diameter and the LAVV coaptation.
Methods: We reviewed retrospectively post-operative 2-dimensional echocardiograms of all AVSD patients who underwent modified single patch or 2-patch repair between 2005 and 2011. We measured leaflet coaptation length and tenting height of the LAVV in the apical 4 chamber view. The LVOT was measured in the long axis view.
Results: 51 patients underwent AVSD repair (single patch n=29, 2-patch n=22) with 46 having adequate images for analysis. 5 patients were re-operated after single patch repair (3 residual ventricular septal defect (VSD) and LAVV regurgitation, 1 residual VSD and right AVV regurgitation, 1 pacemaker implantation). One patient after 2-patch repair had reoperation for a residual VSD. The difference in reoperation rates was not significant (p=0.22). Patient characteristics, LVOT and leaflet findings are summarised in the Table.

Variables	Modified single patch repair (n=24)	Two-patch repair (n=22)	p-value
Ventricular septal defect (mm)	7.9±2.3	8.6±1.9	0.28
Age (month)	4.8±1.7	3.4±1.7	0.0067
Body weight (kg)	4.9±0.9	4.7±1.1	0.35
Cardiopulmonary bypass time (minute)	92.4±20.8	149.6±37.2	<0.01
Aortic cross clamp time (minute)	63.4±15.2	104.8±28.6	<0.01
Post-op grades oflLeft-sided atrioventricular valve regurgitation	1.8±1.0	1.8±1.1	0.82
Left ventricular outflow tract diameter index (mm/m^2)	26.1±5.2	28.5±7.1	0.22
Coaptation length index of septal leaflet (mm/m^2)	3.1±2.3	4.1±3.1	0.25
Coaptation length index of lateral leaflet (mm/m^2)	2.3±2.3	3.3±3.0	0.21
Tenting height index (mm/m^2)	3.9±2.9	3.7±4.5	0.86
Tenting area index (mm^2/m^2)	24.8±20.2	27.0±35.2	0.80

Conclusions: The modified single patch repair was performed with significantly shorter bypass time and myocardial ischaemic time without significant difference in post-operative LVOT diameter or LAVV leaflet coaptation length. Further investigation of reoperation rates may be warranted.

Abstract no: 802

Risk of procedural sedation and anaesthesia in children with idiopathic pulmonary arterial hypertension

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Background: Children with IPAH are at high risk of complications while undergoing general anaesthesia (GA) or procedural sedation (PS). We aimed to determine the incidence of related complications.

Methods: A retrospective review of patients with IPAH undergoing GA or PS at a single tertiary paediatric centre from 1980 - 2012. Data collected included measures of disease severity, clinical management and complications occurring within 30 days from GA or PS. Era of management (1980 - 1999 and 2000 - 2012), was based on availability of PAH specific therapies. Major complications were defined as need for cardiopulmonary resuscitation or death within 30 days.

Results: A total of 26 patients (15 current and 11 historic) underwent intervention with GA or PS. Of these, 11 patients, age at diagnosis median 11.2 years (IQR 5.6, 11.9) underwent 17 procedures at median age 9.6 years (IQR 7.5, 11.9) in the historical era. In the current era, 15 patients median age 6.9 years (IQR 4.8, 11.3; p=0.5) underwent 59 procedures at median age 11.3 years (IQR 7.26, 14.44 p=0.45). Duration of follow-up was limited in the historical control group to median 0.75 years (IQR 0.1, 2.77) compared to current era 5.1 years (IQR 3.1, 9.6, p=0.006). Historic patients underwent an average of 1.55 procedures vs. 3.93 for current patients (p=0.1). Severity of PAH and WHO functional class were similar between the two eras. Major complications occurred in 3/59 (5%) procedures in the current era compared to 7/17 (41%) procedures in the historic era (p<002). Nine of 10 patients with complications had features consistent with acutely elevated pulmonary arterial pressures. 3 of the 4 deaths occurred under GA and 1 after.

Conclusions: Children with IPAH undergo more interventions using GA or PS in the current era. The risk of major complications has reduced significantly but remains unacceptably high in this vulnerable patient group.

Abstract no: 805

Evaluation of nutrition support delivery in critically ill infants and children on extra corporeal membrane oxygenation

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Background: Early nutrition support (NS) is an essential component of care in the paediatric intensive care unit (PICU), particularly for patients on extra corporeal membrane oxygenation (ECMO) where considerable nutritional and metabolic burdens exist. Our study is the 1st to systematically audit NS within a paediatric ECMO population and proposes the hypothesis that NS is suboptimal in this patient group.

Methods: A retrospective audit was conducted in all patients receiving ECMO between October 2008 and August 2011 in our tertiary care PICU. Medical records were reviewed to collect data, including: demographics, ECMO type, nutrition fluids and hours to NS initiation. Protein and calorie delivery were calculated and compared to international consensus guidelines or age specific recommendations where available.

Results: Fifty five subjects were analysed, 42 (76%) cardiac and 13 (24%) respiratory ECMO patients. 5 (9%) patients received no NS during their ECMO period. 85% of patients received NS within 24 hours of starting ECMO, with a mean time (±SD) to feed initiation of 8±17 hours. In all age categories recommended target calorie and protein requirements were not met. There was no significant difference in protein (p=0.4) and calorie (p=0.08) delivery within or between any age group. However, "respiratory" ECMO patients received significantly more calories than the "cardiac" group (44±18 vs. 29±23 kcal/kg, p=0.04). Furthermore, enteral nutrition (EN) delivered significantly less protein (0.55±0.39g/kg) than parenteral nutrition (PN) (1.28±0.55g/kg, p=0.02) and combined PN and EN (1.13±0.67g/kg, p=<0.01).

Conclusion: We have shown that despite early feed initiation the delivery of NS is suboptimal in paediatric patients on ECMO. Future research focusing on prioritising and optimising NS practice, with emphasis on EN as the preferred feeding route in this population should be considered.

Abstract no: 818

An initial experience of surgical correction of total anomalous pulmonary venous drainage in a new paediatric cardiac surgery centre

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Background: A low mortality with surgery for Total Anamolous Pulmonary Venous Drainage (TAPVD) is reported worldwide these days. But there still have been controversies regarding ligation of vertical vein in supracardiac and infracardiac TAPVD, and keeping a small PFO. We report our small initial series of 20 patients.

Material and methods: We operated 20 patients for TAPVD from August 2009 - July 2012. A standard protocol of moderate hypothermia, blood prime, blood cardioplegia, conventional and modified ultrafiltration was used in these surgeries. We ligated the vertical vein in 3 of the 6 supracardiac type of TAPVD patients and 1 infracardiac type of TAPVD patient. A small PFO was left in 17 patients.

Results:

Parameter	Number of patients	Mortality
Total TAPVD	20	4
Supracardiac	6	0
Cardiac	5	2
Mixed	4	2
Infracardiac	5	0
Pre-operative ventilation	5	1
Pre-operative ICU admission without ventilation	6	3
Pre-operative positive blood culture (Pseudomonas aeruginosa)	1	0
Postoperative positive blood culture (Klebsiella pneumoniae)	2	1

Parameter	Median	Range
Age	30 days	12-180 days
Weight	3.6kg	2.3-5.6kg
ICU stay	8.5 days	4-50 days
Hospital stay	14.5 days	9-56 days

Conclusions: We preferred keeping a small PFO in our patients, especially those who had severe RV dysfunction due to late presentation and repeated chest infection. These patients had persistent right to left shunt across PFO for few post-operative days which then reversed to left to right shunt. Vertical vein was ligated only if patients had stable haemodynamics post-operatively. Our high mortality might be due lack of Nitric Oxide at our centre and also due to the lack of paediatric cardiologist and intensivist (SSD joined in the last month). The primary surgeon (SDK) himself performed echocardiography and managed ICU as well.

Abstract no: 857

Successful beating heart surgery in congenital heart disease in Indonesia

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Background: Reperfusion injury is a well known phenomenon that can occur in cardioplegic techniques with cardiopulmonary bypass. Therefore great effort is made to prevent reperfusion injury. Beating heart continuous coronary perfusion (BHCCP) surgery is one of the alternative techniques to improve an ischaemic reperfusion injury in open heart surgery either in paediatric or in adult. It divided into antegrade perfusion and retrograde perfusion. By keeping the heart beating there is less myocardial oedema and improved myocardial function.

Method: To report 8 patients with congenital heart disease (from December 2011 - June 2012): 5 patients suffered from secundum ASD, 1 patient with VSD, 2 patients with TOF. Pre-operative diagnoses were established by echocardiography and cardiac catheterisation if necessary. All the patients underwent beating heart continuous coronary perfusion (BHCCP) surgery. Echocardiography examinations play a significant role to evaluate the heart immediate after surgical repair.

Result: All the patients who underwent correction using BHCCP techniques showed good outcomes such as: (1) reduced ventilator time (mean±10 hours), (2) length of stay in ICU (mean±2 days); and (3) less inotropes. Our results indicate that BHCCP surgery is safe and reliable technique for treatment of cardiac diseases and it is a good option in patients with poor LV function.
Conclusion: During follow-up after 1 - 2 months all our patients showed no significant complications: no mortality; no neurological deficit; and only 1 patient with ToF showed a 2mm residual VSD.

Abstract no: 871

Pre-treatment before coronary artery bypass surgery improves post-operative outcomes in moderate chronic obstructive pulmonary disease patients

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Hypothesis: Aim of this study was to analyse the impact of different COPD stages, on the early surgical outcomes in patients undergoing primary isolated non-emergent CABG.
Material and methods: According to the protocol applied by Department of Pulmonary Diseases, 2 different treatment protocols were used before and after 2010. Before 2010 no treatment was applied to patients with moderate COPD patients before the CABG procedure. After 2010 pretreatment protocol was began. Due to this change in the pre-CABG treatment protocol, we organised the study groups. Patients who underwent surgery between 2008 and 2010 formed Group 1 (no pretreatment group, n=51) and patients who underwent surgery between 2010 and 2012 formed Group 2 (pretreatment group, n=53). These 2 groups were compared according to the post-operative morbidity and mortality rates retrospectively from medical reports.
Results: Mean age of the patients in both groups were 62.1±7.6 and 64.5±6.4 years respectively. Mean Euroscore of the patients were 5.5±2.3 and 5.9±2.5 respectively in 2 groups. Average number of the grafts were 3.1±1.0 and 2.9±0.9. Mean extubation times were 8.52±1.3 hours in Group 1 and 7.41±1.1 hours in Group 2 ($p<0.05$). The number of patient who need pharmacological inotropic support were 12 in Group 1 and 5 in Group 2 ($p<0.05$). Duration of hospital stay of the patients was also shorter in group 2 (9.29 days, $p<0.05$). While there were 7 patients who have pleural effusions requiring drainage in Group 1, there only 2 patients with pleural effusions requiring drainage in Group 2 ($p<0.05$). There were no in hospital or early mortality in both groups.
Conclusion: Pretreatment in moderate risk COPD patients improve post-operative outcomes while decreasing the adverse events and complications. Therefore in patients undergoing elective CABG we recommend the use of medical treatment.

Abstract no: 883

Fluid dynamics and flow profiles in the great arteries in TGA patients after arterial switch operation with or without Lecompte maneouvre on long term follow-up

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Background: The fluid dynamics (shear stress and vorticity) of the blood in the transposed great arteries in TGA patients after arterial switch operation (ASO) with spiral course or anterior branching of the pulmonary arteries (Lecompte) is unknown. The aim of this study was a comprehensive assessment of blood flow profiles in the great arteries utilising advanced MRI techniques 2 decades after ASO.
Material and methods: Twenty four TGA patients (Lecompte: n=12, 19.2±3.9 years post ASO; non-Lecompte, spiral: n=12, 24.1±4.3 years post ASO) were studies with high field MRI at 3 Tesla. All patients underwent a comprehensive cardiovascular MRI, including anatomical and functional cardiovascular evaluation. Additionally, 13 patients and 5 healthy volunteers received time-resolved 3-D flow measurements (4-D flow) using novel phase contrast MR-techniques (FOV 250 - 337mm^2, venc 150cm/s in 3 orthogonal directions, true spatial resolution: 2.5mm^3 isotropic, temp. resol. 35ms, TR/TE 4.6/3.2; α 5 - 10°). A dedicated software was used for colour coded 4-D visualisation of blood flow profiles and streamlines (GT-Flow™, Gyrotools Inc., Zurich). Fluid dynamics were calculated with customised in-house software.
Results: In patients with a spiral course (non-Lecompte) of the great arteries, vorticity index and shear stress were more favourable as compared to the Lecompte group (aorta: 234.51±35 vs. 289.36±24 m^2/s, pulmonary artery: 72.54±15 vs. 93.53±13m2/s; $p<0.01$ respectively aorta: 0.35±0.14 vs. 0.54±0.21N/m^2 pulmonary artery: 0.31±0.09 vs. 0.42±0.17N/m^2; $p<0.01$). In both groups we found 1 patient with an occluded left coronary artery. A sinus valsalva aneurysm was present in the non-Lecompte group.
Conclusions: On long term follow-up a spiral course of the great arteries in TGA patients post-ASO showed more physiological blood flow dynamics compared to anterior branching of the pulmonary arteries (Lecompte). Therefore, in elegible patients, a spiral course should be considered.

Abstract no: 889

Extracellular matrix graft for cardiac and vascular reconstructive surgery: Preliminary clinical results

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Background: Porcine extracellular matrix graft (Cormatrix®ECM) has been widely used in clinical settings to repair the pericardium, but no reports exist to date showing its use and efficacy in vascular and cardiac repair.
Hypothesis: To evaluate Cormatrix®ECM material as a possible patch for clinical use in reconstructive cardiac surgery.
Methods: We reviewed the report of the last clinical and echocardiographic evaluation of 23 patients in whom Cormatrix® ECM patch was used during reconstructive surgery. This group was affected by: ToF, PV stenosis isolated or in association with other CHD, AS, PAPVD other CHD and operated on at our Institution since December 2009. We included only patients in whom Cormatrix® ECM patch was employed for RVOT or PV/PAs reconstruction, with at least 1 echo examination after discharge home in our evaluation .
Results: 14 patients met the enrolment criteria, affected by ToF 10 cases, DORV subpulmonary VSD + sub AoS + AoCo, complete A-V septal defect, PS and RV hyoplasia, asplenia syndrome + single RV + PS 1 case each. Median age at operation was 4.8 months (1 - 66). Cormatrix® ECM patch was used for RVOT reconstruction in ToF patients, PV reconstruction in 2 cases, PAs patch augmentation in 2. At a mean follow-up of 15.3months (2 - 24) severe RVOT stenosis requiring treatment was present in 2 ToF patients, 1 in association with signs of persistent inflammation and pulmonary haemorrhage requiring pneumonectomy. Absent or trivial pulmonary regurgitation was recorded in 2 ToF, mild in 2, moderate in 4, in 1 associated with moderate stenosis, the last 4 with RV dilatation. 1 patient each in the group of PV reconstruction and PAs augmentation presented severe recurrent stenosis, requiring haemodynamic manoeuvres.
Conclusion: We conclude that at a short term follow-up the performance of Cormatrix® ECM patch seems suboptimal. Further clinical experience and longer follow-up are needed to judge the adequacy of this material.

Abstract no: 911

Treatment of pulmonary arterial hypertension in patients with congenital heart disease

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Background: Pulmonary arterial hypertension with Eisenmenger syndrome as its most advanced form is an important complication of congenital heart disease. In the recent years advanced therapy for pulmonary arterial hypertension has been introduced. Efficacy and safety of the advanced therapy in our patients with pulmonary arterial hypertension associated to congenital heart disease was analysed.
Methods: We have analysed results of the advanced therapy in patients treated between November 2007 and December 2011. Clinical status, systemic oxygen saturation measured by systemic pulse oximetry, 6 minute walking distance and laboratory parameters were assessed. Results at 3, 6, 12 and 24 months of the treatment were compared to baseline parameters.
Results: In the observed period 23 patients were treated with PAH specific therapy. As a first line drug bosentan was used in 19 and sildenafil in 4 patients. Due to clinical worsening a 2nd and a 3rd line drug had to be added on during a study period in 4 and 1 patients, respectively. Eighteen patients (78.3%) reported improvement in functional capacity. 2 patients (8.6%) died. The mean 6 minute walking distance significantly increased over time from 334.7±87.7m at baseline to 348.5±89.1m at 3 months (p=0.002); 373.2±74.4 m at 6 months (p=0.005); 383.2±62.3 m at 12 months (p=0.017) and 396.3±92.8m at 24 months of treatment. No significant adverse events were reported.
Conclusions: Advanced therapy for pulmonary arterial hypertension is beneficial in patients with congenital heart disease. Significant improvement in exercise capacity is observed. The therapy is safe and no significant adverse effects were reported.

Abstract no: 935

Adjustable bilateral pulmonary artery banding aiming at staged biventricular repair for infants with unbalanced ventricles and coarctation of the aorta

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Background: Bilateral pulmonary artery banding (bPAB) is a surgical option for infants with unbalanced ventricles and coarctation of the aorta (CoA), who are borderline candidates for biventricular repair. However, it is not easy to know the optimal length of the bands in early infancy, because we have to consider their growth and changes in pulmonary vascular resistance during follow up. We applied a unique treatment strategy which consisted of adjustable bPAB using pliable ePTFE bands combined with staged percutaneous balloon dilation on the banding sites for three critical infants. We report one of the cases who had been successfully treated based on this strategy.
Case report: A newborn girl was diagnosed as having unbalanced complete atrio-ventricular defect (cAVSD), CoA and hypoplastic aortic arch, associated with 21-trisomy. The small LV volume and the higher pulmonary vascular resistance related to chromosomal anomaly were difficult issues, to be discussed in the initial treatment. Subsequently, we performed bPAB using handmade banding tapes, made of double-layered ePTFE membrane, 0.1mm in thickness, on the 10th day of life. The bands were tightly fixed using 7-0 polypropylene sutures. The lengths of the bands were 9.0mm and 9.0mm, respectively. As she gained weight under medical treatment with continuous lipo-prostaglandin E1 infusion, her saturation had gradually declined to 70%. Percutaneous balloon dilation was performed to

increase pulmonary blood flow using 3.5- and 4.0-mm balloon catheters at 80 and 133 days old. At 169 days old, CoA repair was carried out via a left thoracotomy. She had repeatedly undergone balloon dilation until she reached a definitive operation. Catheter study at one year after bPAB showed the adequately increased LV volume. Thereafter she underwent biventricular repair with a successful outcome. No peripheral pulmonary arterial patch angioplasty was required.

Conclusion: Our adjustable bPAB strategy provides great benefits for treatment of borderline infants for biventricular repair.

Abstract no: 939

Single port subxiphoid approach without femoral cannulation for ASD closure

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Aim: To present the technique and results of single port subxiphoid approach without femoral cannulation for ASD closure in children.

Methods: ASD closure can be performed through mini sternotomy or subxiphoid approach which small skin incision. Femoral arterial cannulation in generally used to minimise the length of incision. We present our experience with small incision (averaging 2cm) subxiphoid approach for ASD closure without femoral cannulation. We establish CPB with an aortic cannula and venous cannulation with a RA cannula and IVC cannula. We use reinforced arterial cannula and right angled reinforced venous cannula for IVC and straight reinforced cannula for RA. Core cooling done to 32°C. ASD closure done under fibrillatory arrest. We use autologous pericardial patch for ASD closure in majority of patients. After de-airing LA, fibrillator is removed. Internal defibrillator is used if the heart does not pickup sinus rhythm spontaneously. After rewarming, patient is weaned off CPB.

Results: We perfomed single port subxiphoid ASD closure in 137 patients during a 3 year period from May 2009 - April 2012 of which 73 were female and 64 male. The mean CPB time was 41 minutes. The mean fibrillatory arrest time was 10 minutes. In 3 patients, it was converted to full sternotomy. The mean length of skin incision was 2cm. The mean ventilation time was 83 minutes. All patient had a very short ICU stay and short hospital stay.

Conclusion: We conclude that the single port subxiphoid ASD closure without femoral cannulations can be performed in all patients efficiently and safely and the technique is reproducible.

Abstract no: 942

Recurrent respiratory papillomatosis complicated by intracardiac extension

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Introduction: Intracardiac masses are rare in children. Normal structures and variants may mimic a cardiac mass. Abnormal cardiac masses commonly include tumours, thrombi and vegetations.

Case report: We present an unusual case of recurrent respiratory papillomatosis with malignant progression and intracardiac extension. An 8-year-old male presented with a chronic history of recurrent respiratory papillomatosis initially involving the larynx but which later spread distally to involve the trachea and bronchi. He subsequently developed bronchiectasis. He has had regular ENT consultations and required laser treatment for the papillomas; in addition he had a tracheostomy at a young age.

His acute presentation was a threatened right upper limb due to right axillary artery and brachial artery occlusion. Echocardiography demonstrated a mass within the left atrium. Despite anticoagulation, antibiotics and antifungal treatment this mass progressively enlarged and further proceeded to embolise to the distal aorta resulting in an acutely threatened lower limb. Surgical resection of the intracardiac mass was undertaken after the second embolic event and at surgery the mass was noted to arise from a pulmonary vein. The final diagnosis of the intracardiac mass was made on histology which showed a well differentiated squamous cell carcinoma which had arisen in the context of the antecedent history of human papilloma virus induced laryngeal and bronchopulmonary papillomatosis.

Conclusion: The above confirms that intracardiac tumours in the paediatric population are more likely to be metastatic. Even though echocardiography allows dynamic evaluation of intracardiac masses allowing delineation of the anatomic extent and the physiologic consequences of the mass, histology provides the definitive diagnosis.

Abstract no: 949

Congenital cardiac anaesthesia database results 2010 - 2011

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The Congenital Cardiac Anaesthesia Society (CCAS) has partnered with the Society of Thoracic Surgeons (STS) to include fields relevant to our specialty as part of the STS Congenital Surgery Database. This cooperative effort was launched in January 2010. Since then participation has grown to include data from over 30 sites in the United States. The locations include representation from a wide range both geographically and in programme size. The Spring 2012 Harvest, from 1 January 2010 - 31 December 2011 includes data from 20 226 discrete anaesthetics. 13 796 of these cases are Cardiac Surgical (CPB, no CPB, support devices), 3 354 are from the Cardiac Cath Lab and 3 076 are thoracic procedures, minor procedures or non-CV/non-thoracic on CV patients requiring CV anaesthesia (such as G-tube placement or Ladd's procedure). Data is being harvested on a wide variety of anaesthesia topics such as airway and medication management, monitoring modalities and anaesthesia-related adverse events. The overall adverse event rate was 2.1% and ranged from relatively minor (line placement requiring more than 1 hour) to severe (cardiac arrest unrelated to surgical events). The overall adverse events are detailed in the Table.

Adverse events reported: 1 January 2010 - 31 December 2011

	CPB/No CPB Case	Cardiology	Total**
No adverse event recorded	12 923	1 303	19 805
Any adverse event reported	333(2.5%)	19(1.2%)	421(2.1%)
Dental injury	2(0.0%)	0	2(0.0%)
Respiratory arrest	5(0.0%)	2(0.2%)	11(0.1%)
Difficult intubation/reintubation	47(0.4%)	3(0.2%)	66(0.3%)
Stridor/subglottic stenosis	27(0.2%)	3(0.2%)	32(0.2%)
Inadvertent extubation	12(0.1%)	1(0.1%)	14(0.1%)
Endotracheal tube Migration/ malposition	8(0.1%)	2(0.2%)	10(0.0%)
Airway injury	4(0.0%)	1(0.1%)	7(0.0%)
Arrhythmia - CVL related	6(0.0%)	0	6(0.0%)
Myocardial injury - CVL related	0	0	0
Vascular compromise - CVL related	19(0.1%)	1(0.1%)	20(0.1%)
Pneumothorax - CVL related	1(0.0%)	0	1(0.0%)
Vascular access	80(0.6%)	1(0.1%)	87(0.4%)
Haematoma	4(0.0%)	0	4(0.0%)
Inadvertent arterial puncture	41(0.3%)	0	44(0.2%)
Intravenous/Intra-arterial air embolus	1(0.0%)	0	1(0.0%)
Bleeding - regional Anaesthesia site	1(0.0%)	0	1(0.0%)
Inadvertent intrathecal puncture – regional	0	0	0
Local Anaesthetic toxicity - regional	0	0	0
Neurologic injury - regional	0	0	0
Anaphylaxis/anaphylactoid reaction	14(0.1%)	1(0.1%)	15(0.1%)
Non-allergic drug reaction	8(0.1%)	0	13(0.1%)
Medication administration (wrong drug)	7(0.1%)	0	8(0.0%)
Medication dosage (wrong dose)	7(0.1%)	0	8(0.0%)
Intra-operative recall	1(0.0%)	0	1(0.0%)
Malignant hyperthermia	0	0	0
Protamine reaction	14(0.1%)	0	15(0.1%)
Cardiac arrest unrelated to surgery	17(0.1%)	4(0.3%)	40(0.2%)
Oesophageal bleeding/rupture - TEE related	6(0.1%)	0	6(0.0%)
Oesophageal chemical burn - TEE related	0	0	0
Airway compromise - TEE related	16(0.1%)	0	28(0.1%)
Extubation - TEE related	7(0.1%)	0	8(0.0%)
Patient transfer event	4(0.0%)	0	4(0.0%)
Neurologic injury - positioning	7(0.1%)	0	11(0.1%)

Abstract no: 950

Surgical repair of total anomalous pulmonary venous connection in emerging economies: Are good outcomes possible sans inhaled Nitric Oxide and ECLS?

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Background: Peri-operative management of sick infants with total anomalous pulmonary venous connections (TAPVC) remains a challenge especially in emerging economies where many present with unstable haemodynamics. Post-operative pulmonary hypertension (PH) and secondary low cardiac output state (LCOS) may be refractory needing expensive therapeutic modalities like inhaled nitric oxide (iNO) and or mechanical support.
Objective: To evaluate the early outcome of TAPVC repair without recourse to mechanical support or inhaled nitric oxide.
Design: A prospective observational study (2001 - June 2012).

Patients And methods: 203 patients underwent re-routing of pulmonary veins for TAPVC during this period - median age 89 days (1 day - 34 years). 127/203 had varying degrees of obstruction at different levels (supracardiac-76, cardiac-25, infradiaphragmatic - 17, mixed 9). 5/203 operations were re-do surgeries for obstruction at the anastomotic site. 42/127 obstructed TAPVC presented with circulatory collapse needing pre-operative resuscitation. No patient was refused surgery. Management strategies included (1) Urgent surgery irrespective of haemodynamic status. (2) Quick and accurate surgery. (3) Deferred sternal closure. (4) Epicardial echo in all to confirm accuracy of repair. Peri-operative pulmonary hypertension and associated low cardiac output was managed pre-emptively using multiple, simple, inexpensive conventional strategies (intra-operative ultra filtration, fluid restriction, peritoneal dialysis, lung recruitment, milrinone, calcium infusion, corticosteroids in refractory cases and elective non-invasive ventilation after extubation) with limited use of catecholamines.
Results: In-hospital mortality was 4/203 (1.97%). There were 2 late deaths after hospital discharge due to non-cardiac causes. Median ventilatory requirement was 52 hours and median length of stay 11.2 days.
Conclusion: Successful re-routing of TAPVC in sick infants with pulmonary hypertension and severe right ventricular dysfunction is feasible without ECLS or inhaled nitric oxide with minimum morbidity.

Abstract no: 953

Comparison of three inotropic strategies in the newborn after stunning of the right ventricle

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The immature myocardium has significantly different beta-receptor kinetics, metabolism and enzyme activity. We therefore undertook a piglet study to investigate the efffect of 3 different inotropic strategies.
Materials and methods: 28 pigs aged 4 days were prepared to measure cardiac output (CO), central venous and arterial pressures. Stunning of the right ventricle (RV) was induced by 10 cycles with ischaemia/reperfusion injury. Animals were randomised to 1 of 3 inotropic protocols or placebo: (1) (AM): Adrenaline: 0.09μg·kg^{-1}·min^{-1} and Milrinone: 50μg·kg^{-1} bolus and 0.4μg·kg^{-1}·min^{-1}. (2) (DM): Dopamine: 6 μg·kg^{-1}·min^{-1}, Milrinone: 50μg·kg^{-1} bolus and 0.4μg·kg^{-1}·min^{-1}). (3) (Dob): Dobutamine (8μg·kg^{-1}·min^{-1}). (4) Saline: (2ml·kg^{-1}·hour^{-1}). 1-way ANOVA with Tukey's Multiple Comparison Test was used to test differences between groups.
Results: Cardiac output (CO) had decreased by 29% in the placebo group 60 minutes. following RV stunning. CO was significantly higher in AM and DM treated animals, compared to placebo ($p<0.05$), whereas Dob remained unchanged. CO in DM treated animals was even significantly higher compared to Dob. MAP was maintained in DM animals, but decreased by more than 35% in AM, Dob and placebo treated animals after RV stunning. MAP decreased after 180 minutes in AM (-37%) and Dob (-44%) treated groups and to the same extent in the control group (-41%) (n.s.). In the DM group MAP remained stable throughout the observation period (-5%), in contrast to the other intervention groups ($p<0.001$). SVRI decreased 14% ($p=0.1$) during I/R. During the observation period SVRI decreased further by approximately 46% ($p=0.01$) with no difference between control and any intervention group.
Conclusions: Following I/R injury of the right ventricle, optimal haemodynamics in newborn piglets was significantly better maintained in the DM treated animals compared to AM and Dob.

Abstract no: 956

Mechanisms of exercise intolerance in adolescents with repaired pulmonary atresia with intact ventricular septum: A congenital heart surgeons' society study

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Background: Among patients with pulmonary atresia with intact ventricular septum (PAIVS) for whom optimal repair type is unclear, there are some for whom selection of biventricular repair diminishes survival and may impair late functional outcomes. We sought to determine the late patterns of exercise intolerance and associated factors.
Methods: From 1987 - 97, 448 neonates with PAIVS were enrolled at presentation. 79/271 survivors underwent exercise testing in a cross-sectional follow-up study. An expert reviewed blinded exercise test results and grouped patients by the mechanism of exercise intolerance. Groupings were then related to demographics, neonatal morphology and repair type.
Results: Study participants (median age 17.2 years) included 44 biventricular, 22 univentricular, and 13 1.5-ventricle repairs. Mechanisms of exercise intolerance were: 18 (23%) reduced stroke volume, 3 (4%) chronotropic insufficiency and 3 (4%) desaturation, with1 patient having all 3 mechanisms; 32 (41%) were unclassifiable due to submaximal effort or missing data, and 25 (32%) were normal. Exercise intolerance by any mechanism was associated with lower body mass index (BMI) z-score at testing (OR=2.17, $p<0.05$) and smaller birth weight (OR=1.02, $p<0.05$). Exercise intolerance showed a trend of association with larger initial right ventricular size (OR=1.64, $p=0.08$) and higher pre-operative left ventricular systolic pressure (OR=1.07, $p=0.09$). Lower BMI z-score at exercise testing (OR=1.79, $p<0.05$) and absence of coronary-cameral fistulae (OR=13.28, $p<0.05$) were associated with exercise intolerance due to reduced stroke volume. Repair type and initial tricuspid valve z-score had no association or interaction with exercise intolerance.
Conclusions: Late exercise intolerance after repair of PAIVS is common. Although not directly associated with repair type, exercise intolerance is associated with morphologic surrogates for biventricular repair. Failure to augment stroke volume during exercise appears to equally affect patients with Fontan physiology and patients' status post biventricular repair, perhaps due to ongoing right heart hypoplasia, non-compliance or impaired ventricular interaction.

Abstract no: 962

Reconstruction of the right ventricular outflow tract with a transannular patch and monocusp polytetraflourethylene valve

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Background: Corrective surgery of a hypoplastic RVOT often requires transannular patching, followed by pulmonary incompetence, right ventricular dysfunction, arrythmias, etc. Different techniques have been tried to restore valve function often with disappointing results. More recently, use of PTFE monocusp valve has been suggested as a better alternative with yet limited data on long term results.
Methods: Between 2003 and 2011 a total of 58 patients (54 Fallot, 2 AVSD with Fallot, 1 PA,VSD and 1 PS) underwent RVOT reconstruction with PTFE monocusp and transannular patch. Twenty five had previous shunt palliation. Data on post-operative complications, long term outcome of valve function and frequency of reoperation were assessed. Data are expressed as mean and range.
Results: All patients survived surgery, 1 patient with AVSD and ToF died 2 months after surgery due to sepsis. Age at operation was 9.9 months (1 month - 11.1 years), median 5.3 months. After surgery the RV/LV pressure ratio was 0.52 (0.32 - 0.77). Post-surgical time on ventilator was 2.1 days (1 - 3 days). Stay in ICU was 2.9 days (1-10 days). 2 patients developed junctional ectopic tachycardia. 6 patients needed reoperation (10%), with implantation of valved conduits either homograft (2) or Contegra (3), 1 patient had enlargement of the RVOT with a new transannular patch. Freedom from reoperation was 96% at 2 years, 89% at 5 years, and 72% at 8 years. Retraction and stiffness of the monocusp was revealed in most reoperation cases. No signs of calcification or pulmonary embolisation and no risk of development of pulmonary stenosis at valvular level were observed.
Conclusions: The PTFE monocusp valve can safely be used in combination with a transannular PTFE patch, with low risk of developing pulmonary stenosis or incompetence in the early and mid-term post-operative period.

Abstract no: 969

Anaesthetic management of pleuropulmonary blastoma in a child: Case report

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Pleuropulmonary blastoma (PPB) is a rare malignancy of childhood arising from the lung or pleural cavity. Surgery is the mainstay of treatment with the aim of resecting the neoplasm completely. Anaesthesia management for surgical resection of PPB is challenging because of the risk of respiratory and cardiovascular collapse due to the diminished respiratory reserves, possible invasion into the mediastinal structures and likelihood of a concurrent lung infection. We report a case of a massive PPB in a 3-year-old child and discuss an effective strategy of anaesthesia management for this high-risk surgical resection.
This 3-year-old girl had mild respiratory distress on pre-anaesthetic examination. The chest X-ray showed diffuse opacification of right hemithorax and significant mediastinal shift to left. The lab tests were essentially within normal limits.
The anaesthetic technique involved induction with IV Ketamine, gradual deepening with sevoflurane, intubation and manual assisted ventilation. The monitoring included arterial line, cvp, urine output and nasal temperature. IV Fentanyl and morphine were used for providing analgesia. IV Atracurium was given after surgical exposure was completed, and the child was connected to ventilation with pressure control mode.
There were many episodes of transient hypotension during surgical resection and manipulation which were managed by co-coordinating with surgical team to release traction/pressure on chest/lung and bolus administration of albumin and packed cells.
The total blood loss was approx 600mls. The child was kept intubated at the end of surgery and was transferred to ICU. She was extubated 24 hours later and had BIPAP for next 24 hours. The rest of her stay in the hospital was uneventful and she was discharged from the hospital on 8th post-op day.The consent for presenting this case has been taken from the parents.

Abstract no: 1004

Tricuspid valve repair in paediatric patients with Ebstein anomaly: The Mayo Clinic experience in the current era

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Background: Historically, tricuspid valve (TV) repair for paediatric patients with Ebstein anomaly (EA) had varied results. Cone reconstruction (CR) has revolutionised TV repair since it is at the "true" anatomic annulus. We report our recent experience with TV repair in EA pts <21-years-old.
Methods: Medical records were reviewed for all patientss <21-years-old with EA having surgery at Mayo Clinic from June 2007 - June 2012. 79pts (41 males, 52%) had TV repair. Mean age = 10.0±5.9 years. (5 days-20.8 years). Echo showed severe TR in 72 (91%). 6 patients had prior TV repair elsewhere.
Results: Initial CR was successful in 75 patients (95%). There was 1 early death (a 19-day-old). There were 3 (3.8%) early (before discharge) CR breakdowns. These patients had repeat surgery [re-repair (2), replacement (1)] prior to discharge. 77/79 (97%) were discharged with TV repair. Mean CPB was 107±23 (51 - 162) minutes, cross-clamp time (CX) was 84±17 (48-125) minutes. Length of hospitalisation was 6±3 (3-16) days. Age, gender, CPB and CX times were not associated with early CR failure. Use of an annuloplasty ring correlated with successful initial CR (p=0.01). There were no early CR breakdowns since 2010. Follow-up was available in 65pts (83%). Mean follow-up = 0.9±1.3 years. Longest follow-up = 5.1 years. There was no late mortality or reoperation. Follow-up echo demonstrated: trivial/mild TR 66/77 (90%), moderate 6 (8%) and severe 2 (2%). 2 patients had TV stenosis (mean gradients >6mmHg).
Conclusion: 97% of paediatric pts with EA were discharged with TV repair. All CR failures presented before discharge. Since, current TV repair results for EA and durability are excellent, intervention for younger patients is recommended.

Abstract no: 1017

Mid-term results after aortic valve repair

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Background: Aortic valve repair (AVR) is considered to be a good temporary solution as it offers reduction of regurgitation (AR) and stenosis (AS), and stabilisation of the ventricular dimensions until the patients grow older, at which time the full range of possible treatment options, including mechanical valve or the Ross procedure might be used. The aim of the study was to analyse mid- term outcomes of AVR.
Methods: From 2004 - June 2012, 167 AVR's were performed. Mean age at operation was 109±88 months. 107pts had predominantly AS, 17pts had pure AR, and combined lesion was noted in 43pts. Majority of patients (n=134) had a primary repair (PR) and the remaining 33pts had balloon dilation before surgery. Various surgical techniques were used including cusp extensions (CE) n=41 resulting in bicuspid (BC) n=51 or tricuspid (TC) n=116 morphology. In TC group 46% (n=53) had one cusp replaced (CR) while preserving 2 native cusps.
Results: There were 2 early deaths. Mean follow up was 48±24 months. Results are shown in Table 1.

Kaplan Meier freedom from aortic valve replacement at:	3y	4y	5y	p=<0.01
All patients	84.1%	74.8%	71.4%	
Neonates	80.0%	80.0%	80.0%	
Infants	65.9%	65.9%	65.9%	n.s.
>20y	100%	100%	100%	
AS	84.5%	75.8%	67.4%	n.s.
AR	100%	100%	100%	
TC	90.6%	83.3%	83.0%	p=0.0095
BC	69.5%	54.0%	46.3%	
CE	97.2%	83.3%	74.1%	n.s.
CR	88.3%	88.3%	80.9%	
PR	96.2%	92.9%	92.9%	p=0.0001
BVP	59.1%	44.3%	38.0%	

Discussion: Valve repair is safe. The best results with reconstruction are obtained by tricuspidalisation of aortic valve, with cusp replacement technique and with primary repair. Trend for longer durability after AVR was noticed in older patients and AR, which might reflect the importance of growth potential and quality of tissue.

Abstract no: 1020

Good intermediate to long-term results of the switchback Ross operation: A report of 2 cases

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Background: Neo aortic (NeoAo) valve regurgitation (NAVR) and neo aortic root dilatation (NARD), albeit infrequent, are a matter of concern. Late complications of the Jatene operation may progress over time and require surgical intervention. The switch back Ross operation (SBRO) was introduced by Hazekamp, et al., in 1997 as an innovative technique to address these conditions when neoAo valve preservation is deemed unfeasible. Although the technique looked compelling by bringing the anatomical aortic root (pulmonary autograft) back to the LVOT, the single case published by the authors developed post-operative Ao valve dysfunction that required aortic valve replacement. This lead to generalized skepticism towards the SBRO. We, however, decided to apply the SBRO and herein report the 1st 2 cases worldwide with good medium to long term results.
Materials and methods: Case 1: A child with TGA + LVOT stenosis was submitted to the Jatene operation + LVOT obstruction resection at age 8 years. Moderate NAVR was noticed post-operatively. In 2002, at age 16 he became symptomatic on moderate physical exertion. Significant NARD + severe NAVR + gross LV dilatation were diagnosed and a SBRO was performed. Case 2: On day 35 of life had the Jatene operation and transpulmonary VSD closure for a Taussig-Bing heart. In 2007, at age 5 he was diagnosed with severe NAVR + Sinus of Valvalsa aneurysm + subneoAo valve obstructive membrane + tight pulmonary anastomotic line stenosis. The SBRO + subneoAo membrane resection were carried out.
Results: By-pass and aortic X-clamp times were, respectively, 300 minutes and 202 minutes, and 235 minutes and 164 minutes. Both patients are presently asymptomatic with normal sized left heart structures and only trace aortic valve insufficiency.
Conclusion: The SBRO, although challenging, needs renewed consideration as a possibly definitive solution for NAVR and/or NARD after the Jatene operation.

Abstract no: 1023

Intra-uterine exposure to maternal diabetes is associated with increased aortic stiffness in early infancy

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Background: Infants of mothers with diabetes (IDM), the most common complication of pregnancy, have an increased risk of adult cardiovascular disease (CVD). Although the etiology and timing of onset of the cardiovascular changes remain unclear, recent studies have shown that IDM have increased aortic intimal-medial thickness in early infancy, which may be an early feature of CVD. Experimental models also suggest the intra-uterine diabetic environment structurally and functionally alter the aorta of affected offspring. We sought to determine if there is increased aortic stiffness, a feature of CVD in adults with diabetes, in IDM.
Methods: Diabetic pregnancies were recruited prospectively to examine the role of diabetes in fetal cardiovascular programming. For this aspect of the study, their infants were evaluated at 3 - 6 weeks by echocardiography for assessment of aortic stiffness, and the findings were compared to those of healthy infants from uncomplicated pregnancies. The pulse wave velocity (PWV) was calculated as [D/(T2 - T1)]; where D was the distance of blood flow through the arch; T1, the time measured from QRS to onset of ascending and T2, onset of descending aortic systolic flow.
Results: 25 maternal-infant pairs were assessed including 7 IDMs and 18 controls. No statistical difference was observed in age at exam, BSA and systolic blood pressure between IDMs and controls. Haemoglobin A1C (HbA1) of the diabetic mothers during pregnancy ranged from 6 - 10.3 (mean 7.1±1.2). Aortic PWV were significantly higher among IDMs compared to control (mean 5.6±1.5M/s vs. 3.7±1.2M/s respectively, p=0.008). IDM PWV in this small cohort tended to correlate positively with maternal HbA1 (r=0.59, p=0.068).
Conclusion: IDM have evidence of increased aortic stiffness in early infancy, which may relate to maternal glycaemic control. Whether the aortic stiffness persists later in life and contributes to adult CVD is not clear.

Abstract no: 1027

Cardiology in silico: Use of an electronic medical record and ECG database in an integrated healthcare system to identify individuals with undiagnosed Noonan Syndrome

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Background: Noonan syndrome (NS) is autosomal dominant, characterised by short stature, dysmorphology, pulmonic stenosis (PS) and hypertrophic cardiomyopathy (HCM). These and other features can be coded in an electronic medical record (EMR) using ICD-9. Left axis deviation (LAD) on ECG, found in 1% of healthy children, is found in 50% of those with NS (independent of structural heart disease).
Aim: Use an EMR and ECG database to identify previously undiagnosed NS.
Methods: An EMR serving 954 650 individuals <19 years old identified 73 patients with NS (ICD-9 759.89), prevalence 7.6/100.000. Of these 73, 60 (82%) had an ECG, 32 (53%) revealed LAD. Then, to identify previously undiagnosed NS, we screened the EMR for a combination of commonly coded NS features (short stature, PS, etc.). Using the ECG database, we identified those with ECG LAD (-30° to -90°). Lists were cross-referenced. Of the 73 individuals with known NS, 7 (9.6%) would have been identified by the outlined in silico process.
Results: Two or more NS features and LAD on ECG were identified in 65 individuals (study group). These EMR were reviewed by both a Cardiologist and Geneticist to identify those with additional documented features (e.g. hearing loss, ptosis) warranting further evaluation for NS. Of these, 4 carried a diagnosis of NS, 1 cardiofaciocutaneous syndrome (CFC), and 1 Kabuki syndrome. Of the remaining 59, 18 were felt to warrant further clinical evaluation. Of these 18, 8 thus far have sufficient documented features to establish a clinical diagnosis of NS.
Conclusions: Using an EMR and ECG database, undiagnosed patients with NS can be identified. This is the first demonstration of an integrated healthcare system's EMR being used to identify previously undiagnosed rare genetic disorders. ECG may be of utility in evaluating individuals with short stature and other NS associated clinical features.

Abstract no: 1044

Surgical repair of ventricular septal defects in children with elevated pulmonary vascular resistance: The double-patch technique

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Background: Children with ventricular septal defects frequently have a delay and treatment in developing countries. The result in this delayed presentation is frequently elevated pulmonary vascular resistance. The result is that in those countries where paediatric cardiac surgery is performed these children are considered too high risk to undergo an operation because of post-operative pulmonary hypertension. We have pioneered the use of a fenestrated uni-directional double patch closure technique in such children since 1996.
Methods: We reviewed our database and contacted all sites where the procedure has been performed to our knowledge. The database was searched for catheterisation data, pre- and post-operative echo data, extubation time, survival upon discharge and use of sildenafil pre- or post-operatively. All values are expressed as mean ± standard deviation. P-values of 0.05 were considered significant.

Results: A total of 219 patients underwent double patch operation. 139 patients had isolated VSD closure and 80 received the double patch as part of a more complex repair. Pre-operative pulmonary vascular resistance was 11.4±.7 wood units in the VSD group and 9.2±3.1 in the complex group (p<0.02). The ratio of pulmonary to aortic systolic pressures was 0.97±0.08 in the isolated VSD and 0.91±0.1 in the complex group (p<0.01). The Qp/Qs in the VSD group was 1.4±0.5 and 1.7±0.9 (NS) in the complex group. Pre-operative saturation was 90±4 in the VSD group and 85±9 in the complex group (p<0.05) and sildenafil use was not significantly different. Survival in the isolated VSD was 95.9% and 83.7% in the complex group (p<0.01). Recent sildenafil use improved survival in both groups (p<0.05).
Conclusion: Double patch VSD closure provides operative intervention in developing countries at reasonable mortality, complex defects remain difficult.

Abstract no: 1048

Are extremely high brain natriuretic peptide (BNP) levels an indicator of catastrophic outcomes in paediatric patients?

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Background and objectives: BNP is known to be increased in patients with clinical heart failure and correlates with the severity. It's unknown if BNP has predictive value regarding prognosticating outcomes or mechanical circulatory support (MCS) requirements. Current literature hints towards this possibility. We attempted to quantify at which critical BNP-level patients are likely to need MCS in a non-homogeneous paediatric population.
Methods: Single centre retrospective review of all patients that had a BNP-level, drawn between 2009 and September 2011. Chart reviews of all patients with a value >600pg/ml were undertaken. Primary outcomes included: urgent/emergent surgical intervention, MCS and transfer for MCS, sudden cardiac death. Fisher's exact test was used to predict likely hood of primary outcome at BNP-levels >1500pg/ml. Sensitivity, specificity, positive and negative predictive values were calculated for BNP >1500pg/ml.
Results: Eleven (Surgical interventions = 4; MCS = 3; emergent transfer for MCS = 2; sudden cardiac death = 2) patients had a primary outcome, 9 with a BNP-level >1500pg/ml compared to 2 patients that didn't have the primary outcome (one with neonatal hypertension and congestive heart failure (CHF) and 1 diabetic keto-acidosis with CHF). (Odds ratio = 209.25, 95% CI = 26.25-1668.18, p<0.001). BNP >1500pg/ml had sensitivity and positive predictive value of 82%, while specificity and negative predictive value was 98%.
Conclusions: BNP levels >1500pg/ml is predictive of poor outcomes and alerts the clinician to the seriousness of the patient and potential need of MCS, even when other parameters of perfusion seem normal. We recommend following BNP-values serially to assist in determining changes in cardiac function/reserve in selected patients' i.e. stable dilated cardiomyopathy versus viral myocarditis. As low levels of BNP showed good negative predictive value, low results should be reassuring.

Abstract no: 1089

Assessment of left ventricular function and mitral valve regurgitation after creation of a dual-coronary system for anomalous left coronary artery originating from the pulmonary artery in infants

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Background: Anatomical correction seems to be an ideal method of surgical treatment of the anomalous left coronary artery arising from the pulmonary artery (ALCAPA) at infancy. The medium-term outcome was investigated for infants with the ALCAPA following creation of a dual-coronary arterial circulation.
Material and methods: Between April 1995 and July 2012, 23 infants with a median age of 4 months underwent aortic reimplantation of the ALCAPA at our department. Direct implantation of the anomalous coronary artery into the ascending aorta was feasible in 16 patients. A trapdoor flap method was used in 5 infants and a tubular extension technique in 2 patients. No infant underwent mitral valve repair at the time of the ALCAPA surgery. Left ventricular function and degree of mitral regurgitation were assessed during a 10-year follow up.
Results: 4 patients died in early post-operative period. There were no independent predictors associated with post-operative mortality. During follow-up, both early and late improvement of myocardial function was observed in all patients. There was only one improvement of severe mitral regurgitation in post-operative period. Later, 2 children needed mitral valve replacement. There were no early or late reoperations of the reimplanted coronary arteries.
Conclusions: Anatomical correction is an effective method of surgical treatment of the ALCAPA in infants burdened with a low risk of reoperation due to coronary artery stenosis. There is a favourable potential for myocardial recovery within 1st year after surgery. Primary mitral valve repair should be associated with coronary revascularisation in infants with severe mitral regurgitation.

Abstract no: 1098

Initial palliation of complex interrupted aortic arch with a "hybrid" approach

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Background: Successful neonatal surgical treatment of complex interrupted aortic arch (CIAA) remains challenging. This report constitutes our experience with the "hybrid" approach for palliation of these patients prior to elective definitive repair to facilitate concomitant treatment of the associated lesions and to decrease morbidity.
Materials and methods: This report is a single institution, retrospective review of consecutive patients with CIAA treated by the "hybrid" approach. Complex IAA defined as, weight <2.5kg, multiple VSDs, multi-organ system failure and diminutive left ventricular outflow tract. All patients were palliated via median sternotomy with bilateral branch pulmonary arterial bands and ductal stenting. Left heart structural dimensions were measured pre-palliation and prior to surgical repair and are reported.

Results: From July 2007 - December 2010, 8 patients underwent "hybrid" palliation. Weights were 1.7 - 3.4 (mean of 2.6) kg. Mean aortic valve annulus was 4.63mm. Associated complexity; weight <2.5kg (n=5), multiple VSD (n=2), shock with multi-organ failure (n=1), aorto-pulmonary window (n=1). All patients were discharged home after "hybrid" palliation. One patient died 2 weeks post palliation from necrotising enterocolitis. All other patients underwent successful biventricular definitive repair at a mean age of 4.4 months. One patient underwent trans-catheter device closure of a muscular VSD and another per-ventricular device closure at the time of definitive biventricular repair. Somatic growth and growth of the left heart structures are shown in the Table.

	Mean pre-hybrid	Mean pre-definitive repair	p-value
Weight (kg)	2.6	4.7	p=0.0007
BSA (m^2)	0.17	0.26	p=0.0006
LV Volume (ml)	2.9	4.5	p=0.002
LV Volume z-score	-2.54	-2.84	p=0.006
Aortic Valve Annulus (mm)	4.63	5.92	p=0.005
Aortic Valve Annulus z-score	-2.64	-2.75	p=0.5
Mitral Valve Annulus (mm)	9.53	11.40	p=0.025
Mitral Valve Annulus z-score	-0.14	-0.39	p=0.35

Conclusions: "Hybrid" palliation of CIAA with bilateral branch PA banding and ductal stenting is feasible and provides adequate palliation with excellent somatic growth. Although LV structures did not "grow" relative to somatic growth, final repair is facilitated especially in the presence of additional VSDs. This approach provides a safe alternative strategy in complex patients with IAA.

Abstract no: 1111
The relationship between heart dysfunction and gastric residue as a manifestation of neonatal sepsis

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Background: In neonates with heart dysfunction the risk for sepsis and possible death doubles when the patient has a disorder of the digestive system. In adults myocardial dysfunction accompanied by gastric residue is defined as a diagnostic criterion for severe sepsis. Gastric residue is the indicator for sphlancnic and mesenteric hypo-perfusion impact disorder of the digestive system which heightens the risk of sepsis in all patients with heart dysfunction.
Objective: To analyse the relationship between gastric residue and heart dysfunction amongst neonates at risk for sepsis.
Method: This cross-sectional study was conducted from January 2011 - October 2011 on neonates with suspected sepsis who were hospitalised at Neonatal-HCU Moewardi General Hospital, Surakarta. Sample was selected by quota sampling. Sepsis was assessed by clinical major-minor criteria. Gastric residue was defined when the volume of gastric aspiration 4 hours after feeding reached 20% for 2 days. Heart dysfunction was measured using 2-D Doppler echocardiography. A Chi square test was performed to analyse the data using SPSS 17.0.
Results: Among 48 septic risk neonates, we found 27(56.3%) manifested as gastric residue, 25 (64.1%) having heart dysfunction which 17 (70.8%) is the systolic function disorders. Impaired heart function, especially disorders in the systolic function, are at risk of undergoing gastric residue significantly (OR=6.25; CI95%:1.14 - 34.29 and OR=3.40; CI95%:Â 1.03 - 11.26, respectively). Neonates whose gastric residue is milk are at risk of heart dysfunction compared with no gastric residue insignificantly (OR=8.00; CI95%:0.87 - 73.27).
Conclusion: There was a relationship between gastric residue and heart dysfunction among neonates at risk of sepsis. The presence of gastric residue can become a marker of heart dysfunction among septic risk neonates.

Abstract no: 1128
Multiple ventricular septal defects: A new strategy

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Objective: Multi-centre prospective study to evaluate a new strategy for infants with multiple Ventricular Septal Defects (VSDs).
Methods: From 2004 - March 2011, 15 consecutive infants, mean age 3.6 months (9 days - 9 months), mean weight 4.2kg (3.1 - 6.1kg), with multiple VSDs underwent Pulmonary Artery Banding (PAB) with adjustable FloWatch-PAB®. Associated cardiac anomalies: patent ductus arteriosus (9), aortic coarctation (2), hypoplastic aortic arch (1) and left isomerism (1). Mean duration of pre-operative mechanical ventilation: 22 days (0 - 240 days).
Results: There were no early or late deaths during a mean follow-up of 45 months (12-89 months). FloWatch-PAB® adjustments were required in all patients, a mean of 4.7 times/patient (1 - 9) to tighten the PAB, and a mean of 0.8 times/patient (0 - 3) to release the PAB with the patients growth. After a mean interval of 32 months (8 - 63 months) 5/15 patients underwent reoperation: 3/5 PAB removal and closure of a remaining peri-membranous VSD and 2/5 only PAB removal. All muscular multiple VSDs had closed in all 5 patients. PA reconstruction was never required. In 6/10 of the remaining patients all muscular VSDs had already closed.
Conclusions: This reproducible new strategy with adjustable PAB simplifies the management of infants with multiple VSDs providing the following advantages: (1) good results (0% mortality); (2) delayed surgery with high incidence (11/15=73%) of spontaneous closure of multiple muscular VSDs; (3) facilitated closure of residual peri-membranous VSD at older age and larger body weight; (4) PAB application and late removal remains the only procedure required for Swiss cheese multiple VSDs without associated peri-membranous unrestrictive VSD.

Abstract no: 1129

Concomitant anterior and posterior tricuspid leaflets augmentation with a single patch: Respect the geometry

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Objectives: Isolated tricuspid anterior leaflet extension is a used option to increase leaflet coaptation. Nevertheless the posterior leaflet and the commissure between septal and posterior leaflets, could lead to residual valve regurgitation. We describe the augmentation of both the anterior and the posterior tricuspid leaflets with a single patch.
Methods: In the last years, 4 patients (mean age 37 years) presented with severe tricuspid regurgitation with leaflet tethering and coaptation deficit. Mean coaptation dept was 19.5mm. They received concomitant anterior and posterior leaflets augmentation with a single patch. In 1 patient an extracellular matrix patch was used while in the others an autologuous patch was implanted. The patch was trimmed using a 32mm ring sizer. After detaching of the leaflets from the annulus secondary chordae were removed. In all of them an anuloplasty was performed using a prosthetic ring CE n° 32.
Results: No death or any major complications occurred during in hospital stay. No early residual regurgitation could be observed. After a mean follow-up of 8 months all patients demonstrated absence of recurrent regurgitant jet. Mean gradient across the valve was 1.5mmHg. After combined leaflets augmentation the valve acts as a single leaflet valve abolishing the effect of the septal leaflet tethering.
Comments: Anterior leaflet augmentation to treat tricuspid valve regurgitation might induce geometry disarray between anterior and posterior, and posterior and septal valve leaflets. In the last year we introduced the anterior and posterior leaflets augmentation using a single patch, thus reducing possible residual regurgitant jet in the commissure between the anterior and the posterior leaflet. The patch size was identical to the prosthetic ring in order to have a functional single leaflet valve and abolishing the detrimental effect of the posterior leaflet tethering. Immediate and early results are encouraging.

Abstract no: 1130

Cannulation of the brachiocephalic trunk and antegrade cerebral perfusion in aortic arch repair in neonates

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Introduction: Cannulation of the brachiocephalic trunk (BCT) with interposition of a Goretex conduit, allows easy antegrade cerebral perfusion (ACP) and possibly coronary artery perfusion during arch surgery. ACP is advocated as a factor protecting abdominal organs which are supposed to be perfused through collaterals. We describe our series of aortic arch repair in neonates.
Methods: Between April 2005 and June 2012, 18 neonates presented with aortic arch hypoplasia (age 2 - 27 days, mean weight 3.39kg). 11 patients presented with an associated VSD: 7 received pulmonary artery banding while 5 had a concomitant VSD surgical closure. The BCT was cannulated through a Goretex conduit in all patients. The arch was clamped distally to the BCT, distal to the isthmus and then both left carotid artery and left subclavian artery were clamped. The arch was reconstructed under cardio-cerebral perfusion with beating heart with a body temperature of 25°C. A short period of cardioplegic arrest was used to enter with the patch in the ascending aorta. A Homograft patch was used in all patients but 2, where a porcine extracellular matrix patch was preferred. Mean cross-clamp time in isolated arch repair was 21 minutes.
Results: One patient experienced a cardiac arrest in the 1st post-operative day, he was resuscitated and sustained with the ECMO and he died on 5th post-operative day. One patient who received pulmonary artery banding required further increase in the banding. None experienced neurological damage or new onset of seizures. None required further arch surgery after 38.6 months follow-up (1 - 87 months).
Conclusions: BCT cannulation in neonates allows one to perform arch surgery under cardio-cerebral perfusion thus reducing the cross-clamp time. The results of our series are encouraging and evidenced that this technique is safe and effective.

Abstract no: 1132

Telemetric FloWatch pulmonary artery banding- single centre experience and outcomes

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Background: An assumed advantage of FloWatch pulmonary artery band (PAB) is that it has a low incidence of pulmonary artery (PA) distortion and requirement for PA reconstruction after its removal. We describe our experience with FloWatch PAB with regard to pulmonary artery distortion needing patch reconstruction and admission stay in a large single-centre population.
Materials and methods: A study over nearly 10 years of retrospective analysis of all patients who underwent FloWatch PA banding to control pulmonary blood flow for initial single ventricle or bi-ventricle palliation at our centre. In a total of 70 patients, the diagnosis was multiple VSDs in 30, complete AVSD in 10 and 30 had mixed complex congenital conditions.
Results: Seventy patients needed FloWatch PAB between December 2003 and June 2012. 19/70 (27%) had single ventricle morphology, and 51/70 (73%) biventricular morphology. Median age at time of PAB was 88 (range 7 - 1486) days and median weight 4.2 (range 2.6 - 15.9) kg. There were 7 deaths in our series, 6 were late deaths and were not associated with PA band. There was 1 early death. 34/70 (48%) had their band removed for next stage surgery and 36/70 (52%) still have the band in place. 23/34 (67%) did not have any PA distortion and did not require any patch enlargement. However, 11/34 (32%) had PA distortion needing patch enlargement. Of more concern, in 2/34 (6%) the FloWatch was found to have eroded through the MPA at time of its removal. The mean duration of PICU stay after PAB insertion was 5.8 days: 46% patients were discharged within 3 days and 76% within 7 days.
Conclusion: Telemetric FloWatch PA banding does have undoubted advantages over conventional banding in terms of adjustability of pulmonary flow without reoperation and limited hospital stay. The majority of patients did not require any patch reconstruction of the pulmonary artery.

Abstract no: 1149

Root replacement with aortic valve sparing in pediatric patients

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Background: Aortic root and ascending aortic aneurysm in children is a rare entity usually associated with connective tissue disorders. Aortic valve sparing with ascending aortic replacement (TD) is the ideal treatment in these patients.
Objective: To evaluate the short and medium term results of valve sparing aortic root replacement in paediatric patients.
Methods: Historic cohort between January 2006 and June 2010. Included patients under 15 years treated with aortic valve reimplantation for aneurysm or dissection between post-operative clinical and echocardiographic follow-up was performed.
Results: Four patients with annuloaortic ectasia had Marfan syndrome and one had a type A dissection. Mean age of 10 years (7 - 14), 75% male. Functional class I (50%) and class II (50%). No bicuspid valves. Two had aortic regurgitation 1+, and 2 patients 3-4+. Aortic annulus 23.7 (18 - 30mm), aortic root 60.7mm (40 - 90mm). 3 patients received TD IV (75%), 1 (25%) TD V. Aortic graft diameter was 28mm (18 - 30); the TD V was done with 30/22mm tubes.
Complications: Three patients presented coagulopathy without reoperations for bleeding. Echocardiogram showed residual 1+ regurgitation in 2 patients.

Variable	Pre-operative	At follow-up
Ejection fraction	69%	66.3%
Shortening fraction	39.6%	37%
End-diastolic diameter	47.8mm	48.3mm
Aortic ring	24mm	20mm

*Follow-up echocardiographic average: 168 days. Clinical follow. **Average: 1 123 patient days.

At the end of follow-up, there was no progression of aortic regurgitation, function and ventricular dimensions were preserved. All patients are in functional class I and there were no reoperations or mortality.
Conclusions: The aortic root replacement with valve sparing is useful in the management of aortic root aneurysms and dissection in children, preserving ventricular geometry and function, with low post-operative morbidity and eliminates the risks of chronic anticoagulation. Studies of long term monitoring will allow statistical power to evaluate the durability of the anatomic and functional results.

Abstract no: 1160

Extended thoracic aorta repair in children via left thoracotomy with deep hypothermic circulatory arrest and cervical cannulation

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Background: Repair of the thoracic aorta via median sternotomy can be difficult due to the limited exposure, particularly in older patients, or during re-do surgery. We are reporting a novel approach via left thoracotomy with cervical cannulation for CPB.
Materials and methods: The patient is positioned supine and both RCCA and RIJV are cannulated as per V-A ECMO. CPB is commenced and the patient positioned to perform a left thoracotomy. The pericardium is opened and a vent inserted in the LA appendix. The aortic arch, head-and-neck vessels and the descending aorta are dissected while cooling systemically. At temperature the circulation is arrested, aorta cross-clamped between the innominate and LCCA, head-and-neck vessels occluded, and cardioplegia is delivered into the ascending aorta through the arterial cannula. Antegrade cerebral perfusion is commenced directly in the LCCA or via the arterial cannula clamping between the LCCA and the LSA. The repair is performed with extensive patch enlargement of the diseased aorta, after which systemic circulation is restarted and the patient rewarmed. CPB is weaned off and protamine given. The thoracotomy is closed and the patient is repositioned supine for neck decannulation with primary vessels reconstruction.
Results: Between June 2011 and August 2012, 3 patients were operated. Median age and weight was respectively 14 months and 9.7kg. Two patients had previous aortic surgery and represented with severe hypoplastic distal aortic arch and recoarctation, 1 of whom had also long descending aorta hypoplasia. The 3rd patient had severe aortic coarctation with long hypoplastic descending aorta.
Perfusion times minute (median): CPB=209; aortic cross-clamp=39; antegrade cerebral perfusion=25; peripheral body ischaemia=39; mean-DHCA=20 minutes. No hospital mortality. Post-operative echocardiography showed laminar flow in the descending aorta. No neurological symptoms were detected at follow-up with US patency of the vessels.
Conclusions: This technique offers good cerebral and body perfusion during circulatory arrest and optimal exposure of the aortic arch and descending aorta.

Abstract no: 1161

The circadian rythm of blood pressure in normotensive children with a family history of essential hypertension

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Background: A family history of hypertension is a primary predictor of high blood pressure (BP). In children and adolescents some changes in cardiovascular structure and function may be seen independent of level of the blood pressure and even before the blood pressure increases.
Aim: To evaluate blood pressure circadian rhythm of normotensive children with a family history of essential hypertension and to investigate the relation between target organ damage, future adult hypertension and this rhythm.
Materials and method: Thirty two healthy children (19 girls, 21 boys) with hypertensive parents (HP) and 20 controls (10 girls, 10 boys) with normotensive parents (NP) were recruited. Mean age was 14±3.5 years in girls and 15±4.5 years in boys (range 8 - 22 years). Age, gender and body mass index did not differ between the 2 groups.
Results: No difference was found in casual BP between the 2 groups. In contrast, during ambulatory blood pressure monitoring (ABPM) daytime systolic BP and systolic load were elevated in children with HP ($p<0.05$). Also mean systolic and diastolic blood pressures were higher in children with HP compared to control group but it was not significant statistically. Increased thickness of left ventricular posterior wall and left ventricular mass index have been observed in children with HP ($p<0.05$). BP circadian rhythm in the children with family history of hypertension has more non-dipper status especially starting from the ages of 20 ($p<0.05$).
Conclusion: Non-dippers have significantly higher values of left ventricular mass index than dippers and also a positive correlation has been found between night systolic blood pressure and left ventricular mass index ($p<0.001$). Early changes in ambulatory BP parameters were present in healthy children of HP. The non-dipper normotensive children with family history of hypertension are thought to have target organ damage especially starting from the ages of 20 before clinical findings of hypertension have been made.

Abstract no: 1172

Right ventricular apical exclusion as a treatment of large apical ventricular septal defect

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Background: Optimal management of apical muscular ventricular septal defect (VSD) remains a challenge, especially when there is a large apical defect inappropriate to be closed with a device. Left apical ventriculotomy offers a good guarantee of a correct closure but has several middle and long-term complications such as left ventricular dysfunction, arrhythmias or apical aneurysms.
Material and methods: Two patients with diagnosis of large muscular apical VSD, aged of 13 and 2 months were submitted to a technique of right ventricular apical exclusion. Two heterologous pericardial patches were used in each case. The first 1 sutured between the upper edge of the apical VSD and the septomarginal band and the second 1 between the septomarginal band and the free edge of the right ventricle (RV). The apex of the RV was then left on the left ventricle side and the initial apical VSD didn't communicate anymore the 2 ventricles. This was performed through a right atriotomy and through the tricuspid valve.
Results: Both patients had a normal postoperative evolution and were discharged without any complicaction. There was no residual communication between the 2 ventricles. Normal RV function parameters were found during postoperative control echocardiography. No echographic data indicating right ventricular disfunction were demonstrated after extensive examination, including lower cava diameter respiratory changes, M-mode tricuspidal plane excursion (TAPSE), E-wave peak velocity on tricuspidal annulus (tissue doppler imaging mode), standard doppler and bidimensional echocardiography.
Conclusion: This technique for correction of apical complex VSD offers very good initial results, avoiding complications associated to the left ventriculotomy or the necessity of a palliative approach before surgery on low weigh patients. The short-term follow-up doesn't show any disturbance in the RV function.

Abstract no: 1207

Surgical management of pulmonary artery sling

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Objectives: Pulmonary artery sling is frequently associated with tracheal and/or bronchial stenosis. A number of patients receive only re-implantation or relocation of the left pulmonary artery while other patients may require tracheoplasty for stenosis of the airway. We study the clinical outcomes with or without tracheoplasty.
Methods: A total of 20 patients with PA sling who received surgery in our institute was included in this study. We reviewed the clinical outcomes and the severity of trachea stenosis, and evaluated various surgical strategies.

Results: Among the 20 patients, all patients received left pulmonary artery (LPA) re-implantation, and tracheoplasty were performed in 12 (60%) of them. For the 12 patients that received LPA reimplantation and tracheoplasty, 9 received slide tracheoplasty and 8 of them survived, 1 patient died of cytomegalovirus infection despite patent airway. Two patients had pericardial patch augmentation and both died. One patient received a resection and end-to-end anastomosis and survived. The patients without tracheoplasty all survived, but the trachea diameter remain stenotic in the follow-up period.
Conclusions: In this study cohort, approximately 60% of the patients with PA sling received tracheoplasty. Slide tracheoplasty provided acceptable good results for patients with PA sling and tracheal stenosis.

Abstract no: 1215
Use of inhaled treprostinil in ventilator dependent infants

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Background: Inhaled treprostinil is a tricyclic benzidine prostacyclin analogue utilised in adults with pulmonary hypertension and NYHA FC III and IV symptoms. We present two infants with pulmonary artery hypertension treated with inhaled treprostinil.
Results: SB is a 10-month-old male with repaired right-sided CDH s/p tracheostomy and is ventilator and iNO dependent. Chest CT at 5 months revealed small areas of scar and air trapping in the left lung with overall normal aeration. His right lung was hypoplastic with changes of CLD and air trapping. Serial echocardiograms demonstrated elevated PAP. By 8 months, despite treatment with sildenafil, SB developed right ventricular (RV) dysfunction by echocardiogram with iso-systemic PAP. Because of the high potential for V:Q mismatch with systemic therapy, SB was treated with inhaled iloprost 2.5mcg q2h. Over the next week SB was weaned off iNO and his ventilator support was decreased by 50%. Cardiac catheterisation revealed mPAP 40mmHg and PVRi 6.58 units*m^2 with normal RV function. He was transitioned to inhaled treprostinil 3 breaths q6h in an effort to provide an acceptable regimen for a step down unit. SB tolerated the transition without systemic side effects or bronchospasm. Echocardiogram at 10 months reveals mild elevation of PAP and normal RV function.
NH is a 2-month-old male with partial monosomy 10q26, partial trisomy 10p12.2, PDA, and PPHN who developed suprasystemic PAP and RV dysfunction on sildenafil and iNO. At 1 month he was started on iloprost 2.5mcg q2h after severe hypotension with milrinone and subsequently transitioned to inhaled treprostinil 3 breaths q6h. At 2 months he underwent cardiac catheterisation with mPAP of 49mmHg and PVRi 5.6 units*m^2 with normal RV function. NH's PDA was uneventfully closed. He continues to tolerate inhaled treprostinil without side effects.
Conclusions: Inhaled treprostinil may be safely and effectively administered to ventilator dependent infants.

Abstract no: 1219
Comparison of results of autologous versus homologous blood transfusion in open-heart surgery

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Background: In this randomised controlled study we investigated the effects of autologous blood transfusion and allogenic blood transfusion in adult on-pump cardiac surgery.
Methods: 304 patients who underwent surgery between January 2009 and April 2012 were randomised into 2 groups. The group A (n=164) consisted of patients who received autologous blood transfusion, and the group B (n=160) consisted of patients who received allogenic blood transfusion. All patients underwent on pump cardiac surgery via sternotomy. The time to extubation, chest tube drainage volume, post-operative red blood cell counts, amount of blood transfusion, post-operative temperature, post-operative haematocrit level were recorded in the intensive care unit and post-operative 14th day.
Results: Intra-operative bleeding and fluid resuscitation were similar in the 2 groups there were however significant decreases in post-operative blood loss, extubation period, post-operative red cell counts and fever in group A compared with group B. Drainage volume in group A was 397±77.6ml with a mean haematocrit value of 29.3±3.5%. There were no deaths. No patients needed re-expoloration for bleeding. There were no post-operative complications. 64 patients (40%) did not receive any blood or blood products and 24 patients (7%) needed only 1 unit of homologous red cell transfusions in retransfusion group; whereas 40 patients (26%) needed 1 unit and 3 patients received 2 units of homologous red cell transfusions in control group B (p=0.008). At discharge, the mean haematocrit value was statistically higher in group A compared with group B.
Conclusion: The use of autologous blood in patients having undergone open heart surgery not only attenuates side effects and complications of transfusion but also positively affect post-operative recovery process. Therefore, it can be considered to be an easy, effective and a cheap technique securely.

Abstract no: 1227
Routine closure of the ventricular septal defect through the left ventricle outflow tract during arterial switch operation for D-transposition of the great arteries/ventricular septal defect

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Background: Arterial switch operation (ASO) and VSD closure for d-TGA-VSD is performed with excellent surgical results, worldwide. Traditionally, VSD closure has been proposed from transtricuspid or transventricular (in Taussig–Bing-anomaly) approach. We present our experience with VSD closure through the left ventricle outflow tract (LVOT) as an easy and reproducible technique.
Objective: To study safety and feasibility of VSD closure via LVOT during ASO.
Methods: Operations were performed with continuous, moderately hypothermic CPB, cardioplegia. Having the great arteries divided, VSD was closed through the LVOT with PTFE-patch, running suture. ASO then continued in the usual manner. Double-clamshell device was applied to close additional apical-VSDs. Results were evaluated with intra-operative TEE.

Results: Neonates (9SD4.8 days) undergoing ASO (n=102) had their VSDs closed (38) via LVOT. Aortic/pulmonary diameter ratio was: 0.64. Morphologically: malalignment-VSD with (21), without (5, sutures anchored superficially on remnants of peri-membranous septum) post-eroinferior muscular rim; Taussig–Bing-anomaly (9); additional apical-VSD (3) were repaired. Coexisting LVOTO (8), neo-aortic valvotomy/plasty (4), aberrant MV chords (3) were addressed from the same approach.TEE proved no significant residual shunt. All patients had normal AV conduction post-operatively. No surgical morbidity/mortality occurred.
Conclusions: Larger neo-aortic/LVOT diameter in d-TGA-VSD offers a safe and reproducible technique for VSD closure during ASO. This approach obviates restricted transtricuspid visibility and/or the need of ventriculotomy (Taussig–Bing-anomaly). Associated LVOT anomalies can simultaneously be addressed. Concerns of injuring the AV conduction can readily be avoided by appreciating the morphology and anchoring superficial sutures on the fibrous remnants of the perimembranous septum and/or applying a sutureless flap-extension of the patch in the area of the penetrating bundle.

Abstract no: 1235
Prevalence and correlates of left ventricular hypertrophy in the paediatric hypertensive population

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Background/hypothesis: Hypertension (HTN) is common in childhood, yet the diagnosis is frequently delayed. Prior literature shows that up to 35% of children diagnosed with HTN have left ventricular hypertrophy (LVH) at presentation. Therefore, echocardiogram (ECHO) is recommended at initial evaluation. In recent years however, awareness of paediatric HTN has improved. We hypothesise the current prevalence of LVH in paediatric hypertensive patients is lower than previously reported.
Materials and methods: A single-site retrospective chart review was performed from 1 July 2009 - 20 February 2012. Charts with ICD-9 code of "hypertension" were identified in the ECHO server and appointment database. Patients were considered at risk for LVH if ECG voltages (S in V1, R in V6) were ≥98%, or if LVMI was >95g/m^2 (females) or 115 g/m^2 (males) as per American Society of Echocardiography (ASE) guidelines.
Results: 140 children (age 3 - 17 years) with untreated HTN were identified; 33 were excluded due to incomplete data. Mean age was 13.6 (SD 3.2) years; 78.5% of the cohort were male; 51.4% were obese, 33.6% had stage 1 HTN and 47.7% had stage 2 HTN. Mean LVMI was 79.6 (SD 20.7) g/m^2, and 4.7% (95% CI:0.6%, 8.7%) met ASE LVH criteria. LVMI correlated positively with age (r=0.43, p<0.001), SBP (r =0.29, p=0.001), black vs. white race (r=0.24, p=0.009), male gender (r=0.30, p<0.001). 18.7% (95% CI:11.2%, 26.2%) of patients demonstrated ECG LVH evidence. ECG LVH indicators did not correlate with LVMI (r=0.1, p=0.32) or any other variables (all r<|0.10|). ECG voltages and LVMI showed poor agreement (kappa=2.1, p=0.93).
Conclusion: In our single institution cohort of 140 patients, LVH incidence was <5% in untreated hypertensive children, which is significantly lower than prior literature reports. Our findings also suggest that ECG LVH criteria do not correlate with LVH findings by ECHO. We suggest that ECG may be redundant for initial evaluation of hypertension.

Abstract no: 1237
The $ScvO_2$/lactate ratio following surgery for hypoplastic left heart syndrome

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Introduction: Mortality following stage I hypoplastic left heart syndrome (HLHS) surgical repair is variable and may be as high as 25%.[1] Post-operative low cardiac output is a significant risk factor for mortality and has been shown to be associated with a low central venous oxygen saturation ($ScvO_2$) and high lactate level. In cases where a $ScvO_2$/lactate ratio is <5, major post-operative adverse events have been previously reported in a heterogeneous group of patients.[2]
Hypothesis: The $ScvO_2$/lactate ratio <5 is a predictor of major adverse post-operative events following stage I HLHS repair.
Methods: Following IRB approval, 37 infants having undergone HLHS stage I repair at one institution from 2004 - 2009 were examined retrospectively. Outcomes for subjects with a $ScvO_2$/lactate ratio ≥5 or <5 were compared using a Mann Whitney U test and a Chi square test. A 2-tailed P-value <0.05 was considered significant. Analyses were performed using Stata 12.0 (College Station, TX).
Results: Overall 30-day mortality was 19% (7/37). 6/36 infants had an $ScvO_2$/Lactate ratio <5 within 24 hours following surgery. One of 7 deaths (14.3%) occurred after hospital discharge. ECMO was required in 3/37 infants (8%) and 1/3 survived to hospital discharge. Prolonged mechanical ventilation (>14 days) was necessary in 10/37 (27%).) The $ScvO_2$/lactate ratio was not significantly correlated with overall mortality (p=0.6), need for ECMO (p=0.7), hospital LOS (p=0.3), ICU LOS (p=0.3). However, a $ScvO_2$/lactate ratio <5 was associated with need for prolonged mechanical ventilation (83% vs. 25%, p=0.01).
Conclusion: A $ScvO_2$/Lactate ratio <5 was not significantly associated with outcomes following Stage I repair for HLHS except for the need for prolonged mechanical ventilation. Further studies of markers of post-operative low cardiac output syndrome are needed in this patient population.
References: 1. Pearl JM, Nelson DP, Schwartz SM, Manning PB. First-stage palliation for hypoplastic left heart syndrome in the twenty-first century. Ann Thorac Surg 2002;73(1):331. 2. Seear MD, Scarfe JC, LeBlanc JG. Predicting major adverse events after cardiac surgery in children. Pediatr Crit Care Med 2008;9(6):606.

Abstract no: 1243
Development of a novel congenital cardiac anaesthesia database

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The Congenital Cardiac Anaesthesia Society (CCAS) partnered with the Society of Thoracic Surgeons' Congenital Heart Surgery Database (STSCHSD) from 1 January 2010. The CCAS chose to collaborate with the STSCHSD because of the interconnected nature of our patient populations and the multiple data fields of interest to both groups. This combined dataset would minimise the duplication of efforts in entering data such as patient demographics, diagnoses and procedures for those cases occurring in the operating room. In addition, for the 1st time the STSCHSD was opened up to procedures occurring outside of the operating room on patients with congenital cardiac lesions undergoing non-surgical procedures such as cardiac catheterisations, radiologic procedures (Cardiac

MRI, CT and interventional radiology), and non-cardiac operations on patients requiring cardiovascular anaesthesia because of their underlying physiology. Anaesthesia is one of the common denominators in the care of these patients throughout their hospitalisations and it has been well-established that this subset of patients experiences cardiac arrests at a great far higher than comparably-aged children undergoing similar procedures without congenital heart defects.[1,2,3] By the Spring 2012 Data Harvest, representing January 2010 - December 2011, a total of 30 institutions from a wide geographic and programme size in the United States had submitted data on over 20 000 discrete anaesthetics. The breakdown of patients is outlined below:

Case volume reported by case type: January 2010 - December 2011

Total cases reported = 20 226		n	%
Cardiac Surgery		**13 796**	**68.2%**
	CPB	10 029	72.7%
	No CPB	3 227	23.4%
	Support devices (VAD, ECMO)	540	3.9%
Cardiology		**3 354**	**16.6%**
	Diagnostic	615	18.3%
	Interventional	1 665	49.6%
	Electrophysiology	1 074	32.0%
Other (Thoracic, non-cardiac, non-thoracic, ICU, radiology)		**3 076**	**15.2%**

Data submitted includes information on patient demographics, pre-operative medications, intra-operative anaesthetic management and monitoring and anaesthesia-related adverse events. As this data set grows it can serve as a model for other anaesthesia populations as well as act as an enormous "data sink" that can be mined for both care and outcomes analysis.

References: 1. Flick, Sprung & Harrison, 2007. 2. Odegard, DiNardo, Kussman, et al., 2007. 3. Ramamoorthy, et al., 2010.

Abstract no: 1258

Utility of arginine vasopressin in neonates with persistent pulmonary hypertension of the newborn retrieved for extra corporeal membrane oxygenation

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Background: Our institution uses Arginine Vasopressin (0.06-0.09units/kg/hr) in the stabilisation of PPHN infants with high inotropic requirements (0.1mcg/kg/min of adrenalin or more) for potentiation of adrenalin and sparing pulmonary vascular resistance. This application of vasopressin is unpublished.
Methods: Retrospective chart review of neonatal ECMO retrieval January 2010 - August 2012. Inclusion criteria: echo-proven PPHN, structurally normal heart, vasopressin used for transport, complete dataset at pickup and on return (before ECMO).
Exclusion criteria: Congenital diaphragmatic hernia. Paired t-Test (2-tailed) was used to analyse data.
Group characteristics: Fourteen term neonates, 5 girls, age 1 - 4 days, mean weight 3.8kg, 10 had meconium aspiration, 8 proven or suspected sepsis, 6 received hydrocortisone, and all inhaled nitric oxide. Transport times 2 - 4 hours (mean 2 hours 50 minutes), 11 were given ECMO (7 veno-arterial, 4 venovenous). All survived, back-transfer to referring unit at median 6 days.
Results:

	A: At pick-up mean (StDev)	B: On return mean (SD)	A-B mean (95% confidence int.)	P- value
Vasoactive inotrope score*	79 (51)	51 (25)	30.5 (13.49:47.51)	0.002
Mean arterial pressure	49 (6.5)	56.5 (8.1)	-7.5 (-2.86:-12.14)	0.004
Heart rate	153 (22)	148 (23)	5 (-1.46:12.46)	0.11
Oxygenation index (on NO)	33.6 (9.5)	27 (19.3)	3.7 (-6.05:13.55)	0.42
Lactate mmol/l	3.9 (2.2)	5.3 (3)	-1.5 (-3.24:0.24)	0.09
PaCO2 kPa	6.2 (1.8)	5.4 (2.1)	0.8 (0.05:1.42)	0.04
[H+] nmol/l	48.5 (13.7)	44.7 (14)	3.8 (-2.7:10.3)	0.23

**VIS Validation Davidson J, et al.: Intensive Care Med. 2012 Jul;38(7):1184-90.*

Conclusions: Despite small numbers, retrospective design, and patients as own controls this data suggests vasopressin improves blood pressure and reduces vasoactive inotrope score in PPHN. A larger prospective study is warranted.

Abstract no: 1263

Ffect of cardiopulmonary bypass on nerve conduction velocites in infants

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Objectives: To report on the effect of cardiopulmonary bypass (CPB) induced systemic inflammatory response syndrome (SIRS) on nerve conduction velocities (NCV) in infants undergoing elective cardiac surgery.
Methods: A pilot study with prospective recruitment of 6 infants admitted to the hospital requiring elective cardiac surgery under bypass. Non-syndromic infants aged between 3 and 12 months who were to undergo elective ventricular septal defect or Tetralogy of Fallot repair were consented for study at the pre-admission clinic. On the morning of surgery initial nerve conduction study (NCS) was performed under anaesthesia before administration of any muscle relaxants. After surgery patients were shifted to the paediatric intensive care unit where a second study was performed 24 hours after the initial study if infants remained intubated for 24 hours or longer.
Preliminary results: Critical illness polyneuropathy (CIPN) and critical illness myopathy are commonly reported in the intensive care setting. SIRS, induced by various mechanisms, is a known risk factor for development for both. Our aim was to study whether SIRS induced by CPB alters NCV in any detectable way. Five of 6 patients underwent a 2nd NCS 24 hours after the 1st study. None had any clinical change in their neurological exam or NCV as assessed by a paediatric neurologist proficient at performing this procedure in young infants.
Conclusions: Preliminary findings suggest that NCV abnormalities are undetectable in the early period after CPB. Further studies are required to investigate early features of CIPN in sick children on the intensive care unit.

Abstract no: 1275

Scimitar Syndrome: A 20-year single institution experience

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Objectives: To review our experience in management of Scimitar Syndrome over the last 20 years.
Material and method: Clinical records, echocardiographic images, catheterisation data, operative reports and follow-up information were recorded and reviewed. The patients (pts) were divided into infant (<1 year) and adult (>1 year) forms. Those who had complete repair of the anomalous vein were subdivided into baffling or reimplantation of the anomalous scimitar pulmonary vein to the back of the left atrium.
Results: Between 1986 - 2006, 36pts presented with Scimitar Syndrome. There were 20 females and 16 males (mean age 29 months) with 22pts in the infant group. Higher proportion of infants had right lung hypoplasia and 4 had primary right pneumonectomy as sole therapy with good outcome. Thirty pts had systemic collateral supply to the right lung; 20 had coil embolisation. Coil embolisation was the only intervention in 5pts. Surgical repair of the Scimitar vein was accomplished in 21pts with 10% mortality. No major differences encountered in the incidence of pulmonary hypertension, early mortality and late survival of the 2 age groups. Also no differences in the early mortality, late outcome and rates of obstruction between different methods of surgical repair.
Conclusion: Comparable good results are achievable in infants and older children with Scimitar Syndrome with aggressive approach comprising liberal coil embolisation of collateral vessels and early surgical repair of the anomalous pulmonary vein. Primary pneumonectomy may be an option in selected pts. Both baffling and reimplantation techniques provide similar outcomes.

Abstract no: 1281

Beating heart aortic arch repair with mild hypothermia: Our experience with 3 cases

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Introduction: Aortic arch repair surgery can be performed by various techniques. Selective antegrade cerebral perfusion with continuous coronary perfusion at mild hypothermia has been discussed here.
Material and methods: From March 2009 - date, 3 patients had been operated with this technique.

- Case: 9-year-old child with supravalcular aortic stenosis, diffuse variety involving aortic arch and arch vessels;
- Case: 8-year-old male child with Shone's complex, hypoplastic aortic arch, severe coarctation of the aorta; and
- Case: 11-year-old male child with hypoplastic arch. Severe coarctation of aorta, single ventricle PDA, severe PAH.

Result: All 3 patients had innominate artery cannulation for antegrade cerebral perfusion and ascending aortic cannulation for coronary perfusion. Total CPB time was mean 85 minutes. Arch isolation time 40 minutes and mean temp was 28°C All patients recovered well without any neurological complications, hospital stay was 8 days, and on 2 year follow-up all patients are doing well.
Conclusion: Aortic arch repair can be done safely with selective antegrade cerebral perfusion technique.

Abstract no: 1282

Brom's technique for supravalvular aortic stenosis: Our experience

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Introduction: Supravalvular aortic stenosis is a rare form of left ventricular outflow obstruction. Commonly seen in William's Syndrome with diffuse variety or localised narrowing at sinotubular junction. This is our study of management of supravalvular aortic stenosis with Brom's 3-patch enlargement technique.
Material and method: Total 4 patients had supra valvular aortic stenosis 2 with localised varity, and1 with diffuse varity involving ascending aorta and arch vessel origin. Mean age of patient was 8.4 years. 3 patients had William's Syndrome while 1 patient had Shone's Complex component (Parachute mitral valve without significant gradient). All 4 patients had supravalvular aortic stenosis repaired with Brom's technique. (Individual patch augmentation of each sinus). Patient with diffuse varity along with Brom's technique, ascending aorta and arch vessels origin enlarged with pericardial patch. Mean CPB time was 190 minutes; aortic cross-clamp time 116 minutes; no hospital mortality; mean ICU stay 2.5 days; hospital stay 7.6 days; discharge echo on 7th post-op day suggest no gradient at sinotubular junction; 3 patients had 3 year follow-up without any complications.
Conclusion: Brom's technique is a good simple and safe technique for supravalvular aortic stenosis with good surgical outcome.

Abstract no: 1283

Case report: Extensive arch repair with PA banding for DORV, large VSD, single ventricle

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Case summary: Six-year-old boy presented with frequent lower respiratory tract infections since early infancy needing frequent hospitalisations. Clinically, child had cyanosis, clubbing, precordial bulge, Harrison's ulcus indicating high pulmonary blood flow situation with loud P2, soft pansystolic murmur and a mid-diastolic flow murmur at apex. Clinically he appeared operable. Echo examination revealed DORV, large Inlet VSD, subaortic extension, apical Swiss cheese defects, straddling tricuspid valve, normally related great arteries with hugely dilated, confluent branch pulmonary arteries, hypoplastic aortic arch with interruption, PDA supplying the descending aorta. CT angiogram revealed hypoplastic transverse arch with post-subclavian, pre-ductal coarctation of the aorta. Child underwent extensive arch repair with coarctoplasty and PA banding. Post-operatively, child got extubated within 24 hours. He was discharged in 10 days. On 1 year follow-up Pa band gradient 70mmHg with room air saturation 84%.

Abstract no: 1285

Case report: Modified Glenn in a case of PAPVC to SVC and single ventricle

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Introduction: Many procedures have been reported for the repair of partial anomalous pulmonary venous connection (PAPVC) with return to the high superior vena cava (SVC), and total cavo-pulmonary connection (TCPC) has been a common procedure. However, the anatomical complexity of pulmonary veins and systemic venous return in a splenic heart makes the definitive repair more difficult. The PAPVC repair concomitant with Glenn anastomosis and shift of the inferior vena cava (IVC) orifice has been rarely reported. We present a novel technique, in which the pulmonary artery (PA) translocation was performed to avoid obstruction of the pulmonary veins when Glenn anastomosis was established.
Discussion: A 4-year-old cyanotic boy diagnosed to have unbalanced AV septal defect, transposed great arteries and severe pulmonary stenosis underwent modified superior cavopulmonary anastomosis after wide mobilisation of the branch pulmonary arteries up to hilar level by using the translocated main pulmonary artery. The proximal SVC stump receiving the 3 pulmonary veins was left behind draining into the atrium.
Results: The post-operative course was uneventful and the post-op Echo revealed unobstructed flow in the modifi ed BDG anastomosisand well-flowing unobstructed pulmonary veins. The child recovered well and could be discharged in 7 days. This case report is for highlighting the rarely described technique of using MPA stump for completing the Glenn anastomosis while the lower stump of SVC is left connected to the heart which is receiving the pulmonary veins. A more generous dissection and mobilisation of the branch pulmonary arteries upto hilar level is needed to avoid the kinking of the left pulmonary artery after translocation of the main pulmonary artery.

Abstract no: 1286

Role of tissue glue in paediatric cardiac surgery: Our experience

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Introduction: Complex congenital cardiac surgery involving multiple suture lines at arterial level increasse morbidity due to bleeding and transfusion-related complications. The appropriate use of tissue glue in proper site and with the proper method is being discussed in this article.
Material and method: Study period between March 2011 to date in 11 patients: tissel (5), coseal (4) and flow seal (2). We used the rapid method for tissel and coseal in neonate and infant aortic surgery. Tissel was used just before aortic cross-clamp removal while the use of coseal is mainly for redo. Aortic surgery and coarctation of aorta. In case of a post-clamp removal bleeding scenario we used flow seal along with surgical packing.
Result: Tissel was used in 4 patients, but was ineffective in the 1st patient due to inappropriate application. Coseal worked well in drop technique. In 1 patient we used the spray technique, which was not satisfactory due to low volume. No suture hole bleeding in 10 patients which has reduced OT time ventilation time, blood and blood products suture usage and helped speed-up post-op recovery and prevented blood product-related complications.
Conclusion: Appropriate type of glue application in indicated patient with proper amount and technique improves patient outcomes by reducing mobidily related to bleeding and it is cost-effective as well.

Abstract no: 1292

Cardiac arrest as a consequence of cardiac fibroma in a previously healthy infant: Case report

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Background: Cardiac tumours are very rare and mostly benign. Cardiac fibroma ranks 2nd in frequency and clinical manifestations depend on the degree of ventricular filling and obstruction of the left ventricular outflow tract.
Case report: MMC, a previously healthy 14-month-old male infant, was admitted to the emergency room of a nearby hospital in cardiac arrest and was promptly resuscitated after cardiopulmonary manoeuvres. The patient developed heart failure and low cardiac output in the following days. The chest X-ray revealed cardiomegaly and pulmonary congestion. The echocardiogram with Doppler showed an image suggestive of cardiac tumour with regular margins occupying the middle part of the interventricular septum with extension to the apex and anterior wall of the left ventricle, measuring 4.9cm x 4.8cm and displaying signs of dynamic obstruction of left ventricular outflow tract. Computerised tomography and magnetic resonance imaging (MRI) of the chest also showed an image suggestive of a large cardiac tumour. Cardiac surgery was undertaken via transaortic approach and the presence of a tumour affecting most of the left ventricular cavity compromising the left coronary bed was visualised thereby restricting its total resection. So it was opted for partial resection of left ventricular outflow tract. Pathology of the material revealed cardiac fibroma. The child had progressive clinical improvement in the post-operatory period and was discharged from the hospital within 3 weeks with no signs of left ventricular obstruction or heart failure and is doing well as an outpatient on a low dosage of beta-blocker.
Conclusions: Cardiac tumours can lead to cardiac arrest and heart failure, and must be included in the diagnostic hypothesis.

Abstract no: 1297

Biventricular outflow tract reconstruction: The aortic translocation (Nikaidoh) procedure vs. the Rastelli procedure

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Objective: To compare the Rastelli (R) and the Nikaidoh (N) procedures in terms of early and mid-term results.
Methods: Between January 2000 - 2012, 23 patients (p) underwent a biventricular outflow tract reconstruction at our institution: mean age of 3.8 years old (SD±2.7) and mean weight 14kg (SD 4.6). The anatomic variants were transposition of great arteries (TGA) and double outlet right ventricle (DORV) with noncommittal ventricular septal defect (VSD) and pulmonary stenosis (PS). Patients were divided in group I=Nikaidoh (10p) and group II=Rastelli (13p).
Results: The mean CPB perfusion time 227 minutes (SD±64) and aortic cross-clamping was 150 (SD±46), which was more prolonged in group I (p=0.006). The mean mechanical ventilation, inotropic requirement and hospital stay was 5 days (QI25%-75%=2-19), 6 days (QI25%-75%=3-28) and 10 days (QI25%-75%=7.7-30). During the immediate post-operative period: 9 experienced ventricular dysfunction and 9 arrhythmias, without significant differences amongst both groups. There was no mortality in group I, whereas 4 patients died in group II (p=0.05).
The mean follow-up was 4.6 years (QI25%-75%=2-7). Arrhythmias (p 0.04) and right ventricular outflow tract obstruction (RVOTO)(p=0.03) were more frequent in group II; all of the Nikaidoh were free from LVOTO, whereas 3 in the Rastelli group developed subaortic stenosis. None developed aortic insufficiency larger than mild. In group II: 5 interventional procedures (p=0.01) and 9 reoperations (p=0.004) were required.
Conclusions: Even though cross-clamping time was prolonged, patients in the Nikaidoh procedure remained free from major events and mortality.
- In the Rastelli with a noncommitted VSD group: mortality, arrhythmias, RVOTO, interventional procedures and reoperations were more frequent.
- Aortic translocation techniques such as the Nikaidoh procedure seem promising especially in the presence of inadequate anatomy for a Rastelli repair, but further studies and with a larger number of patients will be required to confirm this in the long term.

Abstract no: 1298

Southampton preliminary experience in the use of an extra cellular matrix to repair congenital and acquired heart defects

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Background: Surgical corrections of congenital heart defects are performed early in life. An ideal material for these corrections would encourage tissue regeneration with growth potential. The quest for an optimal material for vascular and intra cardiac tissue repair is still ongoing. Here we describe our experience with an Extra Cellular Matrix (ECM).
Materials and methods: From April 2011 - June 2012, 109 CorMatrix patches were used in 89 operations on 82 patients aged 1 day - 81 years. In 82 cases the ECM was used for cardiac or great vessel repair: pulmonary arterioplasty (34), intra cardiac tissue repair (16), pulmonary monocusp valve creation (10), ascending aortoplasty (5), aortic arch augmentation (5), right ventricular outflow tract patch (5), superior vena cava patch (4) and valve leaflet augmentation (4). In 27 cases the ECM patch was used for pericardial closure. Follow-up was complete.
Results: There were no deaths, and at a mean follow-up of 7.1 months (1.1 - 15.4 months), there was no evidence of ECM-related intracardiac or intravascular thrombosis. Two patients had pericardial effusions due to bleeding from the anastomosis. 6 patients who underwent pulmonary arterioplasty had some element of restenosis but later had successful balloon dilatation in the cath lab. 8 of 10 monocusp valves were competent and none were stenotic.
Conclusions: Repair of congenital and acquired heart defects using CorMatrix ECM is feasible and safe. We particularly like this product due to the way it curves and conforms to the native tissue. It is also amenable to balloon angioplasty. These early results are encouraging, but a longer follow-up is required to evaluate the ability to grow and determine the material's full potential.

Abstract no: 1299

Cardiac output monitoring using femoral arterial thermodilution during levosimendan infusion in a newborn with myocarditis

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Background: The pulse-induced continuous cardiac output (PiCCO) system is a method for continuous measurement of cardiac output by thermodilution in the femoral artery and analysis of the pulse contour curve. Levosimendan (Levo) is a calcium sensitiser that exerts inotropic actions by binding to cardiac troponin C and increasing the sensitivity of the contractile apparatus to calcium. There are few reports on the use of Levo in children with myocarditis and no data exist on cardiac monitoring using PiCCO during Levo infusion. We analysed haemodynamic variations with PiCCO during Levo administration in a newborn with myocarditis.
Methods: A 10-day-old term baby with acute myocarditis and severe cardiac dysfunction (FS 15%, FE 25%) received a Levo loading dose of 12µg/kg over 10 minutes. followed by an infusion of 0.2µg/kg/min for 24 hours. The femoral artery was catheterised using a 3 Fr PiCCO arterial thermodilution. A catheter and a femoral central venous line were inserted. A total of 10 haemodynamic measurements before and during Levo infusion were performed using a 3ml bolus of cold normal saline injected rapidly through the central venous catheter. Cardiac index (CI), cardiac function index (CFI), stroke volume index (SVI), systemic vascular resistance (SVR) and global ejection fraction (GEF) were recorded. Indicators of blood volume were also measured. Mixed venous saturation (SvO2), NIRS and serial measurements of Troponin I (pro-BNP) were obtained.
Results:

Parameters	Baseline	6h	12h	18h	24h
CI (L/min/m^2)	1.6	1.9	1.89	2.7	3.49
CFI (L/min)	8	7.8	7.8	13	11.5
SVRI (dynxcm^5/m^2)	2 170	1 990	1 795	1 160	1 090
SVI (ml/m^2)	12	10	14	19	27
GEF (%)	23	20	20	36	38

Conclusions: To our knowledge this is the 1st report of continuous haemodynamic monitoring with PiCCO during Levo administration. Levo improved significantly cardiac output. No side-effects secondary to PiCCO were observed.

Abstract no: 1300

Defibrillator surgery in patients with congenital heart disease

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Introduction: Congenital heart diseases (CHD) may develop significant arrhythmias resulting in the implantation of a cardioverter-defibrillator device (ICD). In this study, we analysed the procedures and the indications for ICD surgery.
Patients and methods: In a 12-month period (January 2010 - December 2010) ICD surgery was performed in 28 patients with CHD: 15 male, 13 female; aged from 3 - 50 years.
Results: Twenty patients (71%) had undergone surgery for the underlying CHD. A new ICD device was implanted in 15 patients (54%); 1-chamber device (7); 2-chamber device (5); and 3-chamber device (3). A previously implanted device was changed in 4 patients (1-chamber device n=3; 2-chamber device n=1). In 3 patients the complete 2-chamber device including electrodes had to be exchanged (in 2 cases by staged approach). An upgrade of an implanted pacemaker was performed in 4 patients (1-chamber device n=1; 2-chamber device n=3). A previously implanted ICD was upgraded in 2 patients (from 1- and 2-chamber device to 3-chamber device respectively).
Conclusion: Surgery for ICD in patients with CHD is challenging and increasingly complex. Careful follow-up is therefore mandatory.

Abstract no: 1304

Haemodynamic effects of weaning from positive pressure ventilation in preterm newborns

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Background/hypothesis: To study haemodynamic and echocardiographic changes during weaning from synchronized conventional ventilation (sCV) to nasal continuous positive airway pressure (nCPAP) (T1) and from nCPAP to spontaneous breathing (T2) in uncomplicated preterm newborns
Methods: We conducted a prospective study on preterm infants with gestational age (GE) ≤32 weeks. Each subject had an echocardiographic evaluation (ECHO) respectively 1 hour before and after T1 and T2 for assessing left and right ventricular output (LVO and RVO), superior vena cava (SVC) diameter and flow, left ventricular end diastolic diameter and shortening fraction (SF). Cardiorespiratory vital parameters and emogasanalysis were also collected, just before each ECHO performed. Patients with hemodinamically relevant PDA and/or needing for pharmacological closure were excluded.

Results: We identified 16 patients (mean GE 27.6±1.9 week). We observed a significant increase of RVO, superior vena cava flow and SVC diameter, both at T1 and T2. There were no significative variations of ductal morphology and flow patterns nor significant association between different ventilatory support and both LVO and SF. No significative variations were found in cardiorespiratory parameters and emogasanalysis as shown in the Table.

Variable	T1pre (average)	T2post (average)	p(<0.05)*	T2pre (average)	T2post (average)	p(<0.05)*
iLVO (cm/min)	999±210	982±160	0.8	1080±158	1089±159	0.9
LVEDd (cm)	1.2±0	1.2±0.3	0.7	1.3±0.2	1.4±0.2	0.4
SF (%)	37±3	38±2	0.3	37±2	38±2	0.4
iRVO (cm/min)	1262±292	1583±383	0.003*	1437±258	1667±291	0.002*
SVCd (cm)	0.23±0.03	0.25±0.03	0.003*	0.26±0.03	0.28±0.03	0.001*
SVC flow (ml/kg/min)	62±19	98±41	0.003*	83±37	110±38	0.001*

iLVO: left ventricular output index (aortic VTI x heart rate), supposing unchanged aortic annulus diameter between pre and post echocardiographic assessment. iRVO: right ventricular output index (pulmonary VTI x heart rate), supposing unchanged pulmonary annulus diameter between pre and post echocardiographic assessment. LVEDd: left ventricular end diastolic diameter.

Conclusion: T2 is associated with significant increase in pulmonary output and superior vena cava flow, as previously reported. We found that weaning from sCV produces significant haemodynamic effects as well, influencing the same ECHO parameters. All studied variations resulted clinically well tolerated with no changes in cardiorespiratory parameters and systemic perfusion; further studies are expected for showing the haemodynamic changes and any clinical deterioration, both at T1 and T2, in more "complicated" preterm newborns (i.e. large PFO or PDA, reduced left ventricular function).

Abstract no: 1316

Does intervention closure of isolated atrial septal defects with severe pulmonary hypertension improve the long term clinical outcome in adult patients?

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Objective: To examine whether closure of isolated ASDs (secundum and sinus venosus type) in adults with severe pulmonary hypertension improves their long-term clinical outcome.

Methods: In a retrospective study there were 1 423 adult patients with ASD. We examined the major cardiovascular events and overall mortality of 68 adult patients with isolated ASDs and severe pulmonary hypertension without Eisenmenger change. Sixty two of them underwent intervention closure either by means of percutaneous transcatheter occluder or by open surgical repair. The remaining 6 were under medical treatment. We compaired the major cardiovascular events including death, stroke or paradoxical embolism, new onset atrial fibrillation or atrial flutter, infective endocarditis, progressive pulmonary hypertension, pneumonia requiring hospitalisation, and functional class deterioration in these 2 groups. Severe pulmonary hypertension was defined as right ventricular systolic pressure ≧60mmHg measured by transthorasic echocardiography. Follow-up period was between 1 - 214 months.

Result: The survival analysis did not reveal significant differences in overall mortality (p=0.805) and major cardiovascular events (p=0.308) between the interventional-closure group and the medical treatment group. Among the interventional-closure group, the risk of having major cardiovascular events was significantly higher in patients aged between 18-30 years (p=0.019) and >40 years (p=0.022) compared with patients between 30 - 40 years, though there is no significant differences in overall mortality between these 3 age groups (p 0.108).

Conclusion: Interventional closure might not be superior to medical treatment in improving the major cardiovascular events and overall mortality for the adults with isolated ASD and severe pulmonary hypertension. In the interventional group, age played an important predictor of later cardiovascular events. It might be due to early development of pulmonary hypertension in the younger group (between 18 - 30) and chronic change of pulmonary vascular hypertension in the older group (>40 years).

Abstract no: 1317

Repair of congenital mitral valve malformations in infants

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Objectives: Due to the wide spectra of morphological abnormalities, associated cardiac anomalies and body size, the surgical treatment of congenital mitral valve malformations in paediatric patients remains a therapeutic challenge. We reviewed our experiences with mitral valve repair in infants.

Methods: All consecutive patients with congenital mitral valve disease who underwent surgery between 1998 and 2010 were studied retrospectively. Patients with atrioventricular septal defects, atrioventricular discordance and functional single-ventricle anomalies were excluded.

Results: Between 1998 and 2010, 12 children (7 boys, 5 girls) with a median age of 5.2 months (interquartile range, 2.1 - 8.1 months) underwent surgery. The median follow-up time was 3.9 years (interquartile range, 1.2 - 8.9 years). 12 patients (52.2%) were <1 year old. 10 patients (83.3%) were diagnosed with mitral valve incompetence, while 2 (16.7%) were diagnosed with stenosis. We attempted to repair the mitral valve in all patients, except 1 with Shone's complex and a hammock valve. Associated cardiac lesions were presented in 8 patients (66.7%). Five patients (41.7%) required reoperation, including 3 patients during the

initial hospitalisation and 2 during the follow-up period. All patients who required reoperation needed mitral valve replacement with a mechanical prosthesis and the mitral valves appeared extremely malformed in these patients during the first operation (hammock valve in 2, parachute mitral valve in 1). Overall, the success rate of mitral valve repair was 58.3% (7 patients). There were no early or late deaths, and all survivors were categorised according to the New York Heart Association classification system as class I or II, with mild or less mitral dysfunction.
Conclusion: Although mitral valve repair in infants with congenital mitral valve disease is a challenging procedure, low surgical mortality can be obtained. Despite the severity of mitral valve dysplasia, mitral valve repair should always be attempted. Patients with extremely malformed mitral valves have a significantly higher risk of requiring reoperation (p0.03, odds ratio = 9.33). Initial mitral valve repair can provide time for future mitral valve reoperations.

Abstract no: 1318

Handmade Goretex valved conduit for right ventricular outflow tract reconstruction for patients with severe pulmonary regurgitation after total correction of Tetralogy of Fallot

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Background: Surgical management of Tetralogy of Fallot (ToF) results in anatomic and functional abnormalities in the majority of patients. Although right ventricular (RV) volume load due to severe pulmonary regurgitation (PR) can be tolerated for years, there is now evidence that the compensatory mechanisms of the right ventricular myocardium ultimately fail and that if the volume load is not eliminated or reduced the dysfunction might be irreversible.
Material and method: This is a retrospective chart review study. From 2008 - 2012 there were 32 patients receiving pulmonary valve replacement surgery due to severe pulmonary valve regurgitation and RV failure decades after total correction for ToF. Among them, 15 patients received hand-made valved Goretex conduit reconstruction.
Results: Thirteen patients received our handmade tri-leaflet conduit reconstruction with tissue valve and 2 patients received monocuspid valved conduit reconstruction with the outflow tract diameter around 20 - 24mm. Three received intra-operative radiofrequency ablation for pre-operative arrhythmia. There was no surgical morbidity or mortality in our series. During follow-up, they all remained in New York Heart Association Functional class I. The echocardiography revealed mild residual pulmonary regurgitation.
Conclusion: Pulmonary valve replacement with handmade valved tricuspid Goretex conduit provides similar short term outcomes when compared with traditional bioprosthesis and may avoid early graft calcification in growing adolescents. With this design, we can also provide a better landing area for later transcutaneous pulmonary valve implantation. However, we still need further follow up to analyse our long term surgical result.

Abstract no: 1319

Trends in early results after Fontan surgery: The entire Australian and New Zealand experience of 1 030 patients

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Objectives: To examine changes in Fontan surgery practice in a population-based dataset and analyse factors impacting early outcomes.
Methods: The databases of all congenital cardiac centres in Australia and New Zealand were screened for patients who had undergone a Fontan procedure. A total of 1 087 patients were identified and 1 030 had sufficient available peri-operative data to be included in the audit. Peri-operative characteristics were analysed for their impact on mortality in hospital or within 30 days, Fontan failure (death, revision, takedown or mechanical support), prolonged or significant pleural effusion (lasting >30 days or requiring reoperation) and prolonged length of stay (>30 days).
Results: Since its introduction in 1975, the Fontan procedure has been increasingly performed in Australia and New Zealand with a peak of 2.5 Fontan procedures per 1 million inhabitants in 2006. The extracardiac technique (EC) has now been exclusively adopted: 234 atriopulmonary (AP) connections 1975-1995; 288 lateral tunnel (LT) 1988 - 2006; and 508 EC 1997 - 2011. The proportion of patients with hypoplastic heart syndrome (HLHS) rose throughout the study period (1% <1991, 3% 1991-2000, 17% >2000). After risk adjustment, early outcomes were similar between LT and EC and worse for AP. The only additional independent risk factors for mortality and Fontan failure were dextrocardia (OR 3.2, p=0.06 and OR 2.7 p=0.03) and pulmonary artery pressure (PAP) ≥15mmHg (OR 3.2, p=0.02 and OR 2.4, p=0.01). HLHS morphology was an independent risk factor for prolonged hospital stay and significant effusions (OR 3.4, p<0.001 and OR 3.2, p=0.01 respectively).
Conclusion: The Fontan procedure is increasingly performed and is consuming a larger proportion of resources because its rise is driven by the larger proportion of patients surviving with HLHS. HLHS patients stay longer in hospital because of prolonged effusions. Early outcomes are similar after the LT and EC techniques.

Abstract no: 1332

Postoperative results of seconderly repair of recurrent right ventricular outflow tract lesion using the eptfe monocusped outflow patching for older children and adults

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Background: Chronic pulmonary insufficiency is a common problem after relieve right ventricular outflow tract obstruction. The importance of a competent pulmonary valve to preserve cardiac performance has been emphasised. However, controversy remains with respect to the best prosthesis to implant. We have expanded the uses of the ePTFE monocusp for reoperation on recurrent right outflow tract lesion in older children and adults.
Objective: The aim of this study is to evaluate the long term results of ePTFE monocuspid pulmonary valve and to show the validity of the use of the ePTFE monocuspid older children and adults.
Method: From 1997, 24 patients at our institution (mean 16.9+6.8 years, range 11 - 36 years) underwent redo RVOT reconstruction using ePTFE monocusp. The primary diagnosis were (13), PA VSD (3), DORV (2), TGA (3), truncus (1), PA IVS (1) and LTGA (1). 7 have had valved conduit repair and 2 in-situ PVR. The patients underwent reoperation at early post-operative period (within 5 years), and pre-adolescents (under 10 years old at reoperation) were excluded. Follow-up period were 11.2+3.3 years.
Results: There was 1 late death due to non-cardiac disease. 1 patient had RVOT revision due to IE. Another patient had BCPS followed by RV aneurysmectomy and CRTD implantation due to RV failure. The ePTFE monocusp of both patients functioned well at re-intervention. Except for the patient having BCPS, all patients showed good QOL at the last follow-up. Actuarial freedom from re-intervention for RV lesion was 91.4+5.7%, and freedom from ePTFE valve related reoperation was 100% at 10 years.
Conclusions: Long term results after pulmonary valve repair using the ePTFE monocusp were satisfactory. The ePTFE monocusp could be the first choice even for older children and adults.

Abstract no: 1336

Chronic thoracic pain in children after cardiac surgery

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Background/hypothesis: Chronic pain after cardiac surgery in adults is common but has attracted little attention in children. The aim was to investigate the prevalence and character of chronic pain in children after cardiac surgery via median sternotomy.
Materialsand methods: A prospective clinical examination with quantitative sensory testing 3 months after surgery, and a retrospective survey of children who underwent cardiac surgery 10 - 60 months earlier. The questionnaire assessed pain descriptors, situations or activities that could worsen pain and analgesic consumption. Faces pain scales (Bieri) were used to rate the pain intensity.
Results: Fourteen children were examined 3 months after surgery. 1 child reported pain. Brush allodynia and pin-prick hyperalgesia were present in 5 and 9 children respectively, hypoesthesia to cold (20°C) was present in 3 and 1 child had cold allodynia in the scar area. The average pressure pain threshold was 80.4kPa (range 34.3 - 127.7 kPa).171 questionnaires were sent out and 121 questionnaires (70.8%) were eligible for analysis. Worst pain intensity in the week after surgery was 5.6 (mean). Pain "during the recent week" was rated positive by 26 children. Pain was evoked by pressure against the wound in 23 and by physical activity in 15 children. Itch and pressing were the most frequent pain descriptors chosen by 25 and 20 children, respectively. One child used paracetamol once a week. A history of 2 sternotomies increased the risk of complaints of pain - 15 complaints in 26 children compared with 28 complaints in 79 children who had undergone sternotomy only once. More than 2 sternotomies did not relatively increase the amount of complaints.
Conclusions: The prevalence of chronic pain following cardiac surgery via median sternotomy in children is lower than in the adult population. The pain may have a neuropathic component, but appears to be mild.

Abstract no: 1348

The arterial switch operation for complex transposition of the great arteries: Outcomes in adult patients

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The arterial switch operation (ASO) is the leading procedure for treatment of complex forms of transposition of the great arteries (TGA) associated with ventricular septal defect with/without aortic arch obstruction. This prospective study evaluates the status of survivors at adult age.
Among 688pts who were operated on at our hospital for complex TGA between 1982 and 2011, 103 had reached adult age (>18 years). All had a hemodynamically significant ventricular septal defect, 23 had an aortic arch obstruction including coarctation (22pts), and interrupted aortic arch (1 pt). In 20pts (19.4%), a 2 stage management was performed after an initial palliative pulmonary artery banding and aortic arch repair when necessary. During a mean follow-up of 19.2±4 years, 2 late deaths occurred (1.94%, 95CL:1.92 - 2.02), respectively at 5 and 10 months postoperatively, both patients awaiting reoperation for severe aortic valve insufficiency. Actuarial survival was 97.1% at 10, 20 and 25 years. Permanent pacemaker implantation was required in 4pts. Reoperations were performed in 22 patients (21.4%, 95CL:17%-52%), mainly for pulmonary stenosis (7pts), aortic valve insufficiency (4pts) and left ventricular outflow tract obstruction (3pts). Freedom from reoperation at 10, 20 and 25 years were 90.2%, 76.9% and 65.7%. At last follow-up, all pts were asymptomatic with normal left ventricular function. Aortic root diameters were collected in 52pts of whom 29 (55.8%) had an aortic root dilatation (>2 SD) which occurred more frequently in those with initial aortic arch obstruction compared to those without (respectively 86.7% vs. 43.2% of pts, p=0.0043).
Close to 20 years after ASO for complex TGA, late outcome was encouraging with no death after the first year of life. However, aortic root may dilate with time, more likely in pts with initial aortic arch obstruction who justify a close follow-up.

Abstract no: 1351

Modified Nikaidoh operation for d-transposition of the great arteries with a ventricular septal defect and pulmonary stenosis using "oversized" conduits

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Objective: Our 7 minute film demonstrates the surgical technique of aortic root translocation with arterial switch procedure and coronary arteries reimplantation (modified Nikaidoh operation) for d-transposition of the great arteries with VSD and left ventricular outflow tract obstruction on a 4-month-old patient (5.5kg) previously palliated with systemic to pulmonary shunt.
Methods: The surgical approach consisted of harvesting the aortic root from the right ventricle, the coronary arteries were excised as circular buttons. The pulmonary valve was excised and the conal septum was divided completely. The VSD was closed with triangular shaped patch. The aortic root autograft was then rotated 180° and was sewn to the LV outflow. Reimplantation of the coronaries and Lecompte manoeuver were done as in the arterial switch procedure. The right ventricular to pulmonary artery continuity was re-established using a pulmonary homograft.
Results: The bypass time was 227 minutes, the cross-clamp time 147 minutes. The patient was extubated in the operating room and had uneventful post-operative period and excellent ECHO results.
Conclusion: Aortic translocation results in a more normal anatomic repair compared with the Rastelli procedure. It is always possible to place an oversized conduit (homograft) with little risk of sternal compression. Individual coronary artery transfer during translocation may prevent coronary insufficiency.

Abstract no: 1365

Truncus arteriosus, early vs. late initial intervention: A single centre experience, outcomes and management >10 years

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Background: Truncus arteriosus (TA) continues to be associated with significant morbidity and mortality. Neonatal primary complete repair has progressively become treatment of choice for TA with encouraging survival. Our aim is to compare and contrast initial and late outcomes following surgery during the neonatal period (<30 days) and infancy (>30days).
Materials and methods: Between 2001 and 2012 51 patients with TA at a tertiary cardiac centre were reviewed in terms of staged vs. primary complete repair, early vs. late mortality and re-intervention rates. Associated cardiac anomalies were severe truncal regurgitation (n=4), non-confluent pulmonary arteries (n=5), interrupted aortic arch (n=5), coarctation of aorta (n=1) and double aortic arch (n=1).
Results: Fifty one patients presented with TA between 2001 and 2012. Median weight was 3.14 (1.7 - 4.4) kg and median age 22 (7 - 265) days. 49/51 were operated with 2/51 pre-operative deaths (7, 13 days). Table 1 shows comparison of outcomes following surgery. 5 patients had staged repair with subsequent surgeries within 6 months and none required further re-intervention. In the primary complete repair group, 3 patients had severe residual truncal regurgitation, while 2 patients had blocked conduits with infective endocarditis. 9/33 (27%) required re-intervention – 3 conduit replacements, 2 truncal rerepairs and 4 trans-catheter pulmonary artery dilatations. The mean duration of PICU stay post-operatively was 10 (2 - 152) days – 43% discharged within 7 days and 32% within 15 days.

TABLE 1: Mortality outcomes after surgery

	Alive	Death	Early death (<30 days)	Late death (>30 days)
Neonatal repair (n=31) (63%)	23	8 (25%)	4 (50%)	4 (50%)
Infancy repair (n=18) (37%)	15	3 (16%)	1 (33%)	2 (67%)
Total (n=49)	38	11 (22%)	5	6

Conclusion: There is no significant difference (p=0.72) in early or late mortality in either repair strategy. Alternative strategy like staged repair will need to be explored for possible improved outcomes.

Abstract no: 1383

Serum concentrations of procalcitonin after Tetralogy of Fallot correction

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Background: Cardiopulmonary bypass in paediatric cardiac surgery may cause a systemic inflammatory response syndrome (SIRS). Clinical and laboratory signs of SIRS may mimic sepsis. An increase in procalcitonin (PCT) has been known as a potential biomarker of post-operative infection, but may also increase in children after cardiac surgery.
Aim: To establish the baseline levels of PCT after open heart surgery in order to analyse a possible induction of the inflammatory response that might interfere with the diagnosis of infection by PCT.

Methods: Serum samples of 9 out of a total of 32 patients with Tetralogy of Fallot who had total correction and showed signs of SIRS 24 hours post-operatively were collected. Blood, sputum and urine specimen for culture were also studied. Patients were followed for the development of post-operative complications.
Results: The mean PCT values was 89.55ng/mL (range value 1.69-371ng/mL) (reference value <0.1ng/mL). Only 2 patients had positive sputum culture (patient with PCT 2.74ng/mL showed Acinetobacter pneumoni, and patient with PCT 7.05ng/mL showed Streptococcus viridans plus Klebsiela pneumoni).
Conclusions: An increase in PCT levels was observed in the first post-operative day after cardiac surgery in all patients with SIRS, however, only 22% showed proven infection.

Abstract no: 1388

The dissociation of cerebral tissue and central venous oxyhaemoglobin saturation in low flow states during ECMO: Evidence for cerebral autoregulation

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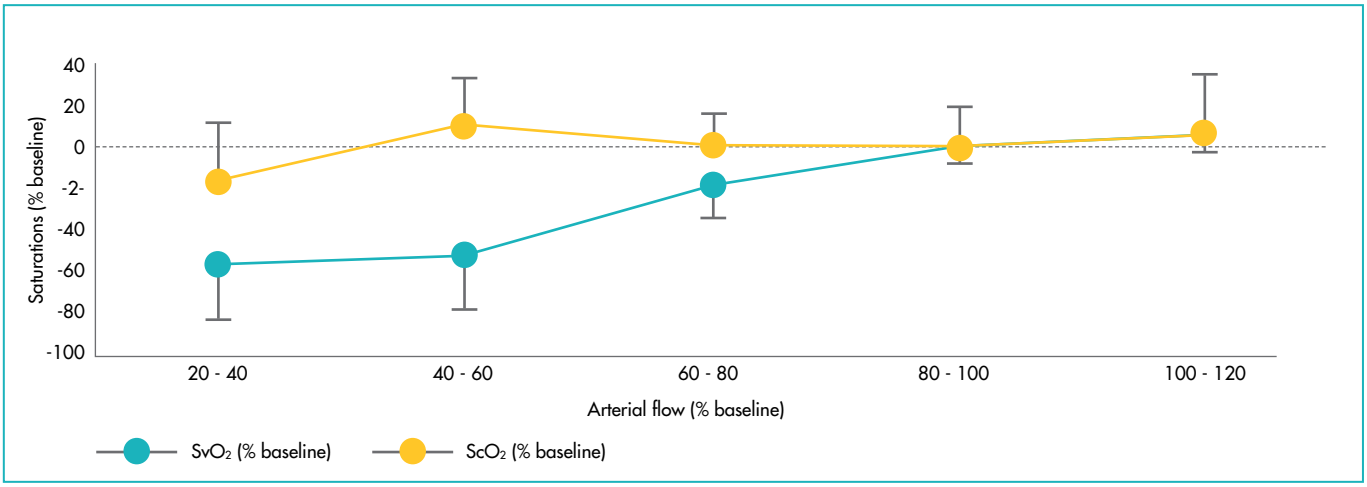
Background: We report the relationship between central venous (SvO_2) and cerebral tissue (ScO_2) oxyhaemoglobin saturation during a case of venoarterial ECMO. Problems with the arterial cannula resulted in periods of low systemic blood flow, conditions in which this relationship has not previously been studied. Transcranial near infra-red spectroscopy (NIRS) provides a non-invasive measurement of ScO_2, which correlates positively with SvO_2 and has been used in its lieu to detect inadequate systemic oxygen delivery in neonates with hypoplastic left heart syndrome. NIRS is non-invasive, continuous and avoids the complications of indwelling catheters. However, its relationship with SvO_2 is not well understood and may have wide limits of agreement, especially at lower values (SvO_2 <50%). This observation may represent the influence of cerebral autoregulation.
Materials and methods: A 6kg, 14 month old child underwent repair of mitral stenosis. At the end of surgery, it was not possible to wean her from bypass due to severe pulmonary hypertension. Venoarterial ECMO was instituted, which was initially complicated by excessive bleeding and cannula malposition. Data were collected retrospectively. Cerebral oximetry was compared to continuous monitoring of the ECMO venous drainage cannulae (SvO_2) over the first 500 minutes.
Results: There were 20 epochs (median duration 150 seconds) of acute severe reduction in arterial ECMO flow (>10% from baseline). The median drop was 58%. This was associated with a much more pronounced fall in SvO_2 (median 55% from baseline) compared to ScO_2 (median 14% from baseline). A comparison between SvO_2, ScO_2 and arterial flow is shown in the graph below.



Discussion: There is dissociation of SvO_2 and ScO_2 during low flow states. This suggests oxygen delivery to the brain is preserved and supports the concept of cerebral autoregulation. ScO_2 maybe maintained when global oxygen delivery is critically low and should not be used in lieu of SvO_2.

Abstract no: 1390

Anesthetic technique for transoesophageal electrophysiological studies in paediatric patients with Wolff-Parkinson-White syndrome

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Objective: All patients with Wolff-Parkinson-White syndrome require risk assessment to determine their potential for rapid conduction down the accessory pathway during atrial fibrillation which can result in sudden cardiac death. Trans-oesophageal electrophysiology studies (TEEPS) are an effective risk stratification tool. The purpose of this study is to describe the least invasive and most effective anaesthetic technique for trans-oesophageal electrophysiology studies.

Methods: A retrospective review of anaesthetic techniques utilised during TEEPS. Inclusion criteria; pre-excitation on ECG; age <18 years; and no history of tachycardia, palpitations or syncope; and patient had TEEPS under anaesthesia either as IV sedation, monitored anaesthesia care (MAC) or general (GA). Anaesthetic technique (MAC vs. GA) and airway management decisions were left to the anaesthesiologist. Midazolam, fentanyl, and propofol were used in various combinations Sevoflurane was used during the induction period in all GA cases and stopped 10 minutes prior to initiation of TEEPS.
Results: Inclusion criteria were met by 20 patients with an average age of 11.9 years, average weight of 48.9kg and average height of 149.2cm. IV-sedation was performed on 15%, MAC on 10% and GA on 75% of patients. Airway management techniques included 13.3% LMA, 20% Endotracheal tube (ETT) and 66% mask. IV sedation, initial anaesthetic, was found to be cumbersome and uncomfortable. Next was ETT and LMA, but trouble was encountered with pacing due to a positional change of the oesophagus relative to the left atrium during positive pressure ventilation. Mask induction was then performed in the remaining 10 patients with TEEPS probe inserted through a nare while the anaesthesi-ologist continued mask ventilation. All were successful without complications.
Conclusions: Mask anaesthesia was the preferred method due to its overall simplicity and minimal interference with the TEEPs procedure.

Abstract no: 1396

Truncus Arteriosus: Review of surgical repair of cases done at the Witwatersrand Group of Hospitals from 1974 - 2012

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Background: Truncus arteriosus is an uncommon cardiovascular anomaly characterised by a single arterial trunk with a single semilunar valve and supplying blood flow to the aorta, pulmonary and coronary arteries. Associated complex cardiac lesions and pulmonary hypertension lead to high morbidity and mortality.
Methods: A retrospective review of 53 cases that had surgical repair of truncus arteriosus between 1974 and 2012. Data related to clinical features diagnosis, operative procedures, pre-operative and post-operative follow-up was collected.
Results: Fifty three patients (23 male, 30 female) had surgery to repair truncus arteriosus. The most common presenting features were dyspnoea, tachypnoea, cardiac murmurs, congestive cardiac failure, shock and cyanosis. At surgery median age was 8 months (range: 3 weeks - 7 years), and median weight 4.8kg (range: 2.1kg - 14.8kg). Diagnosis was made with echocardiography in all patients and confirmed on angiography in 31 patients. Patients were classified according to Collert and Edwards as follows: type I (26); type II (24); type III (2) and 1 was unclassified. Additional surgery undertaken during primary repair included interrupted aortic arch repair in 3 patients and truncal valve repair in 2 patients. Seven patients (13.2%) had moderate to severe truncal valve regurgitation. The median cross-clamp time was 91 minutes and the median cardiopulmonary bypass time 134 minutes. The right ventricular outflow tract was reconstituted using a bioprosthesis in 32 (60.4%) and a homograft in 21 (39.6%). Eight patients had subsequent surgery: 7 required 2nd pulmonary outflow and 1 truncal valve replacements. Early mortality post primary repair was 24.5% including 2 patients that required interrupted aortic arch repairs. The major cause of early mortality was pulmonary hypertensive crisis.
Conclusion: Truncus arteriosus is associated with a high operative mortality if primary repair is delayed. A delay in the presentation associated with established pulmonary hypertension may be contributing factor.

Abstract no: 1403

The care of a VAD patient, on a ward HDU; a multidisciplinary perspective

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Background: Mechanical circulatory support is an important adjunct to the treatment of children with advanced heart failure. We are currently the 2nd largest centre in the world for mechanical support and have been implanting the Berlin heart (our institutions preferred support device) since 2005. The research undertaken looks at the most suitable environment in which to nurse the stable paediatric VAD patient by comparing PICU, ward care and HDU ward care.
Materials and methods: A questionnaire was designed to look at 4 key issues:

- Child development;
- Emotional and psychological wellbeing;
- Staffing/education; and
- Cost implications.

These questionnaires were completed by children, parents and carers. All the other members of the MDT involved in the care of this patient group also completed questionnaires or were interviewed.
Results: This study is ongoing we are currently gathering data.
Conclusions: As this study is currently ongoing it is difficult to conclude. However, the research so far shows that a ward HDU is the most suitable environment in which to nurse this patient group. The availability and access to other service providers is better. The children nursed in this area also have more access to play and education facilities which provide improved development. Emotionally the children and their families can adapt to a more "normal" routine, parents become more involved in the care of their child, and the need for night time sedation is less frequent. The data we are currently gathering relates to funding and cost implications.

Abstract no: 1418

Post-operative feeding practice and weight gain in neonates post arterial switch operation

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Background: The progression of nutrition and its impact on feed tolerance and weight gain in post-operative Transposition of the Great Arteries (TGA) infants is not widely studied.
Methods: A retrospective chart review was conducted to observe feeding practice in post-operative TGA infants from 2007 - 2012. A standardised feeding programme was not in place during the study period. 65 infants aged 39±2 (36-42) weeks gestation underwent an arterial switch procedure at a median age of 9 (3 - 88) days. The progression of feeds in the post-operative period was documented.
Results: Total fluid intake (TFI) progressed to demand feeding (breast and/or bottle) by ward day 2±2 (0-11) and by post-operative day 12±11 (3 - 63). On transfer from intensive care to the ward, TFI was 131±14 (100 - 150)mls/kg/day, of which 60% of infants were fed naso-gastrically (NG), 28% naso-jejunally (NJ) and 12% either parenterally or orally. There was no observed impact on incidence of feeding intolerance in NJ vs. NG fed or those receiving hyper caloric feeds versus standard concentrations. 37% of infants received one or more feeding-related referrals. It took 11±6 (5 - 29) days until weight gain was achieved post-operatively. Age-appropriate weight gain (15 - 30 grams/day) was achieved in 47% of infants by the time of discharge (11 days±6 (5 - 29), but 58% of patients were discharged below birth weight. Infants were discharged home on oral (46%) or enterally supported (54%) feeds. Feeds consisted of mother's milk (49%), formula (14 %), hypercaloric mother's milk (28%) or hyper caloric formula (6%).
Conclusions: More than half of infants were transferred or discharged home below birth weight. This suggests that more aggressive feeding may improve weight gain outcomes post TGA surgery. Standardised feeding progression to establish age-appropriate weight gain may be beneficial.

Abstract no: 1420

Surgical intervention in patent ductus arteriosus in Nigeria

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Background: Congenital cardiac diseases are not uncommon in the Nigerian population and patent ductus arteriosus (PDA) accounts for a significant proportion of this burden. The management thereof is still a challenge due to late presentation, financial constraints and the availability of expertise and facilities. This surgically amenable anomaly can be dealt with in Nigeria with currently available expertise and facilities. This audit was done to review the division's experience and determine outcomes.
Materials and methods: Retrospective review of patients with PDA operated between July 2006 and June 2012. Data obtained included: demographics, echocardiographic features, intra-operative and post-operative data.
Results: There were 9 cases done during this period, 3 male and 6 female. Median age at presentation and at surgery was 3.5 months and 9 months respectively. Most (89%) had recurrent chest infections and failure to thrive. 3 patients (33.3%) had associated anomalies. The median pre-operative weight was 5.6kg. All the patients had left thoracotomy and PDA ligation under general anaesthesia. The median PDA size intra-operatively was 5.5mm and 66% (6) had short and stout PDA morphology. All had chest tubes inserted intra-operatively. One patient had a lacerated PDA intra-operatively with primary haemorrhage. 5 patients (55.5%) stayed in the intensive care unit (ICU). The median hospital stay was 9 days and all were discharged home alive and well.
Conclusion: Patent ductus arteriosus can be safely managed with currently available expertise and facilities and have excellent outcomes.

Abstract no: 1423

Left thoracoscopic sympathectomy for cardiac denervation in children with life-threatening ventricular arrhythmias

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Background: The sympathetic nervous system plays a prominent role in the development of many life-threatening ventricular arrhythmias. In recent times, a small number of limited case series have reported good long-term benefit using video-assisted thoracoscopic (VATS) for left cardiac sympathetic denervation (LCSD) in patients with drug refractory ventricular arrhythmias; predominantly those with long-QT syndromes and catecholaminergic polymorphic ventricular Tachycardia (CPVT). It remains unclear how effective this minimally invasive surgical treatment is and whether it might be indicated in all paediatric patients with symptomatic ventricular arrhythmias.
Materials and methods: We conducted a retrospective clinical review of all patients who underwent left cardiac sympathetic denervation by means of video-assisted thoracoscopic surgery at our institution. From August 2000 - December 2011, 24 paediatric patients (13 long-QT syndrome, 9 catecholaminergic polymorphic ventricular tachycardia, and 2 idiopathic ventricular tachycardia) were identified from the cardiology database and surgical records.
Results: There were no intraoperative complications, and blood loss was minimal. Median post-operative length of stay was 2±6 days. There were no major perioperative complications. Longer-term follow-up was available in 22 of 24 patients at median follow-up time of 28 months (range, 4 - 131 months). Sixteen (73%) of the 22 patients experienced a marked reduction in their arrhythmia burden, while 12 (55%) became completely arrhythmia-free after sympathectomy treatment.
Conclusions: Video-assisted thoracoscopic left cardiac sympathetic denervation can be safely and effectively performed in most children with life-threatening ventricular arrhythmias. This minimally invasive procedure is a promising adjunctive therapeutic option that achieves a beneficial response in the majority of symptomatic patients.

Abstract no: 1434

Hybrid strategies for high risk non-HLHS patients: Role of bilateral pulmonary artery banding with and without stenting of PDA

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Background: Hybrid procedures involving bilateral pulmonary artery banding (bPAB) and stenting of the PDA in HLHS are well described, but their use in other diagnostic categories is rarely reported.
Patients and methods: Three neonates with IAA+Truncus arteriosus, IAA+extreme prematurity and IAA+Tricuspid atresia+DOLV, respectively, underwent a staged repair with initial palliative procedure.
Results: Patient 1 presented with a birth weight of 2.6kg and diagnosis of persistent truncus arteriosus (Van Praagh type A4). Due to poor response to Prostaglandin it was decided to proceed on day 3 of life with PDA stenting and bPAB, using sections of a 3mm Gore-Tex™ tube. Five months later underwent complete repair that included reimplant of an occluded left subclavian artery. At 3 months, normal biventricular function, mild AR and no pulmonary artery stenosis were demonstrated. Patient 2, a 28 week twin baby with birth weight 1.2kg, presented with IAA and underwent bPAB while on NICU using sections of a 3mm Gore-Tex™ tube, to a mean systemic pressure of 30mmHg and oxygen saturations in the 70s. Four months later, having reached the weight of 4.2kg underwent successfully a full repair. At 2 years the baby is well and thriving although has required balloon dilatation of both pulmonary arteries. Patient 3 presented with background of DiGeorge syndrome, IAA, HRHS, TGA and severe systemic AV valve regurgitation. On day 7 underwent bPAB while on Prostaglandin infusion. Five weeks later underwent complete repair. Despite repeated attempts at correcting the persistent AV valve insufficiency the child died due to low cardiac output aged 3 months.
Conclusions: Manoeuvres aimed at limiting blood flow and maintaining patency of the duct can be used successfully in neonates with complex anomalies and prohibitive operative risks. More accurate patient selection might improve survival rates.

Abstract no: 1436

Single-stage 2-incision technique for the management of coarctation with intracardiac defect

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Background: Management of coarctation and intracardiac defect present with technical options which are not without complications.
Introduction: The optimal surgical strategy for the management of the neonate and infant with coarctation of the aorta and intracardiac defect is highly debated. The risks of the various surgical options need to be considered in the choice of technique.
Materials and methods: Retrospective review of case notes, operation reports and intensive care unit (ICU) charts of neonates and infants admitted with the above diagnosis. A 2-incision, single procedure strategy is utilised: 1st a left thoracotomy to repair the coarctation and then, with the patient supine, a median sternotomy to correct the intracardiac defect. This is preferred to concomitant pulmonary artery banding or a median sternotomy with circulatory arrest.
Results: Eight patients were enlisted into the study with a male: female ratio of 1:0.6: median age 21.2 weeks (range 5 - 315) and median weight 5.5kg, (range 3.3 - 21). Median cardiopulmonary bypass time was 51 minutes (range 44 - 77) and median aortic cross clamp time of 33 minutes (range 27 - 55). Median length of stay in the ICU was 11 days (range 3 - 17). The intracardiac defects were ventricular septal defects (VSD) in 4 patients (50%), VSD, patent ductus arteriosus (PDA) and patent foramen ovale (PFO) in 2 patients (25%) whilst 1 patient each (25%) had VSD, PDA and double outlet right ventricle, (DORV), VSD, PDA and atrial septal defect (ASD) respectively. There were no early or late deaths.
Conclusions: Single-stage 2-incision technique for the repair of coarctation and intracardiac defect achieves good results whilst avoiding the risks of pulmonary artery banding and circulatory arrest.

Abstract no: 1442

The effect of acute angle correction angioplasty (left pulmonary artery bed extension) for left pulmonary artery stenosis in patients with Tetralogy of Fallot

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Background: Left pulmonary artery (LPA) stenosis with acute angulation is the most common indication of reoperation following total correction of Tetralogy of Fallot (TOF). We investigated the surgical outcome of acute angle correction angioplasty in this study.
Methods: Among 183 patients who received the total correction of TOF for recent 11 years, 53 patients underwent the surgical repair for LPA stenosis as a concurrent procedure (M:F=28:25). The type of LPA stenosis was classified into 2 groups; LPA os acute angle (n=29) (group I) [os focal (juxtaductal) (n=20) and diffuse stenosis (n=9)] group and os obtuse angle (n=24) (group II) [os focal (n=14) and diffuse stenosis (n=10)] group. Acute angle correction angioplasty (LPA bed extension technique to turn acute angle of os into obtuse angle) in group I and conventional patch angiography in group II was performed for stenosis relief.
Results: There was no early and late mortality. Median follow-up duration was 1.8 years. There was no statistical difference [os focal stenosis (group I: 41.0% (n=19), group II: 41.2% (n=11), p=0.952), diffuse stenosis (group I: 25.4% (n=7), group II: 36.8% (n=7), p=0.113) in latest left lung perfusion scan. Z-score improvement of os after surgery did not reach the statistical significance between 2 groups [os focal stenosis (group I: 2.0 (n=9), group II: 2.9 (n=7), p=0.615), diffuse stenosis (group I: 2.5(n=8), group II:3.1(n=7), p=0.694)]. There was no statistical difference in reoperation or intervention [os focal stenosis(group I(n=1, 5%), group II (n=1, 7.1%), p=1.00), diffuse stenosis (group I (n=4, 47.4%), group II (n=4, 40.0%), p=1.000)
Conclusions: Acute angle correction angioplasty carries prognostic implications for surgical outcome in patient with TOF undergoing surgical repair for LPA stenosis with acute angulation.

Abstract no: 1448

Experience with Nunn's polytetrafluoroethylene (PTFE) bicuspid valves in right ventricular outflow reconstruction for Tetralogy of Fallot and related anomalies

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Background: Much attention and innovation have been focused increasingly on minimising post-operative pulmonary regurgitation in the repair of Tertralogy of Fallot (ToF). Various valved outflow patches have been developed with variable beneficial, but limited effects.
Subject and method: We employed a bicuspid polytetrafluoroethylene (PTFE) valve developed by Nunn (published in JTCS in 2008) in 20 cases with ToF or similar anomalies since 2007. Patients were between 8 months - 14 years (median: 18 months) and weighed from 6.3 - 36.8kg (median: 9.4). This valve which is made intra-operatively on the table consists of seagull-shaped, wide bicuspid leaflets of 0.1mm thick PTFE with its middle of free margin fixed to the posterior wall of the main pulmonary artery (MPA). Valve competency was assessed with ratio between velocity-time integrals of regurgitant and forward flows at the pulmonary annulus level.
Results: Reconstructed annulus size was 122% of expected normal (91 - 186%). Echocardiographic evaluation in the early and mid-term results showed satisfactory valve function with regurgitant/forward flow ratio of 24% (5 - 85%), subgrouped as trivial (1), mild (17) and moderate (2). Median peak gradient cross the valves was 20mmHg (range; 0 - 43). Cusp motion and trans-valvar flow characteristics were well demonstrated on 2-D E-imaging.
Discussion: Mid-term result so far was satisfactory in terms of valve competency. This valve has the benefit of simple reproducibility, easy handling, good function and is expected to offer better long term outcomes than the conventional monocuspid patch. Should the valve become stenotic due to somatic overgrowth the posterior fixation is amenable to be ablated with balloon catheter, although substantial regurgitation could evolve.
Conclusion: This novel Nunn's bicuspid valve can be a good alternative with satisfactory mid-term function at least when compared to other conventional valves for ToF and similar anomalies requiring trans-annular patch, although close observation and further evaluation warranted.

Abstract no: 1457

Double-root switch: Total anatomical correction for transposition of the great arteries

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Introduction: Aortic and pulmonary root translocation are alternative surgical procedures used to correct several congenital defects. To correct transposition of great arteries, ventricular septal defect and pulmonary stenosis (TGA/VSD/PS), we proposed the double root translocation with preservation of the pulmonary valve (DRTPV). We are now proposing the double root switch (DRS) to correct transposition of great arteries (TGA).
Patients and methods: From March 2006 - September 2011, 10 children with TGA/CIV/PS were subjected to some kind of translocation root. Group A: 5 patients underwent Nikaidoh procedure (5 male, 3 newborn) where the reconstruction of the right ventricle outflow tract (ROVT) was done with valved conduit. Group B consisted of 5 patients that had DRTPV procedure (3 male, 1 newborn). Group C consisted of 2 neonates with simple TGA that was submitted to DRS. The DRS procedure consists of aortic translocation of the aortic valve and coronary arteries from the right to the left ventricle and pulmonary root translocation with the pulmonary valve to the right ventricle.
Results: In Group A there was1 death (20%), Group B also had one (20%). The remainder had excellent clinical outcomes in the ICU and were discharged from in good clinical condition and with good echocardiography control. In Group C there no deaths occurred.
Conclusion: The DTPPV can be theoretically be considered a better option to correct TGA/CIV/PS as it corrects the RVOT and LVOT anatomically. We also believe that DRS anatomically corrects all the structures of the heart with TGA including the aortic valve and root positioned to the LV, and the pulmonary root and valve positioned to the RV.

Abstract no: 1458

Effect of human umbilical cord blood-derived mesenchymal stem cell transfusion in a monocrotaline-induced pulmonary hypertension rat model

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Background: Pulmonary arterial hypertension (PAH) causes right ventricular failure and possibly even death due to progressive increase in pulmonary vascular resistance. Human umbilical cord blood-derived mesenchymal stem cells (hUCB-MSCs) are regarded as an alternative source of bone marrow-derived mesenchymal stem cells because collection of cord blood is less invasive than that of bone marrow. HUCB-MSCs have recently been studied for evaluation of their potential as a source of cell therapy. However, it is rare to study hUCB-MSCs in PAH.
Aim: Purposes of this study were to investigate changes in haemodynamics, pulmonary pathology and gene expressions of ET (endothelin)-1; ET receptor A (ERA); endothelial nitric oxide synthase (NOS) 3; matrix metalloproteinase (MMP) 2; tissue inhibitor of matrix metalloproteinase (TIMP); interleukin (IL) 6; and tumour necrosis factor (TNF) α in monocrotaline (MCT)-induced PAH rat models after hUCB-MSCs transfusion.
Material: The rats were grouped as follows: Control (C) group, subcutaneous (SC) injection of saline (0.1mL/kg); M group, SC injection of monocrotaline (MCT); and U group hUCB-MSCs transfusion. hUCB-MSCs (3x106/mL/cm^2) were transfused by intraperitoneal injection 1 week after MCT injection.

Results: The mean right ventricular pressure (RVP) significantly decreased in the U group compared with the M group in week 2 and week 4. Right ventricle (RV) weight and the ratio of RV/left ventricle (LV) + septum significantly decreased in the U group compared to the M group in weeks 2 and 4. Gene expressions of ET-1, ERA, NOS 3, MMP 2, TIMP, IL-6 and TNF α significantly decreased from week 2 in the U group compared with group M.
Conclusion: After hUCB-MSCs transfusion, there was an improvement of RVH and mean RVP. Decreases in several gene expressions were observed. Additional research on the dose and frequency of hUCB-MSCs infusion is needed to better determine the optimal parameters for PAH treatment.

Abstract no: 1465

Resource utilisation and 1-year outcomes in infants with single ventricle lesions

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Background: Infants with single ventricle (SV) circulations utilise a significant proportion of hospital resources. These children account for the largest group of long-stay patients in ICU at our institution (20% staying >28 days). We reviewed our resource utilisation and 1-year outcomes in infants with SV physiology.
Methods: From 2005 - 2011, 130 infants with SV lesions were admitted to ICU; 121 received surgical palliation. Data was collected on this group.
Results: One-year survival after stage1 palliation was 76% (95% CI 67-83). Median (IQR) ICU length of stay was 11 (7.3 - 21.6) days; 24 (20%) stayed in ICU for ≥28 days [40 (34 - 56)]. Mortality was higher in those who stayed >28 days than those who did not: 12/24 (50%) vs. 17/97 (17.5%)(p=0.001). In the 1st year of life, SV infants averaged 3 ICU admissions, utilised 8.7% ICU bed days, accounted for 16% of ICU long-stay admissions and had a average stay of 55 (38 - 83) days in hospital. 38 (31%) received mechanical support. The risk factors for long-stay were: lower birth weight (OR 0.29/kg, 95% CI 0.11-0.76); early re-operation after stage1 (OR 3.7, 95% CI 1.2-11.4); and ECMO (OR 6.1, 95% CI 2-18.3). Risk factors for 1-year mortality were: smaller ascending aorta diameter (OR 0.65/mm, 95% CI 0.42-1); associated cardiac lesion (OR 3.8, 95% CI 1.1-13.2); and ECLS requirement (1 run: OR 22.1, 95% CI 6.0-81.4 and 2 or more runs: OR 59.4, 95% CI 5-709).
Conclusion: Mortality associated with SV operations remains high and these children utilise considerable hospital resources. Requirement for mechanical support after stage 1 operation is associated with a poor outcome: No ECMO: 92% survival; 1 run of ECMO: 48 % survival; 2 runs of ECMO: <15% survival.

Abstract no: 1480

Long term function of homografts used in infants for reconstruction of the right ventricular outflow tract (RVOT)

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Aim: Assessment of the outcome of homografts used to reconstruct the right ventricular outflow tract (RVOT) in infants in a single unit.
Material and methods: Between September 1995 and April 2011, 48 consecutive patients <age 1 were identified from the department's surgical database. Mean age at time of operation was 111 days, ±109, 51% female. Diagnoses include Tetralogy of Fallot with absent or severely stenosed pulmonary valve (n=16); Truncus arteriosus (n=26); and complex pathology (n=9). These patients received 52 homografts (20 pulmonary, 31 aortic; 7/52 homografts were bicuspidised) for reconstruction of the RVOT. Homografts were procured and stored locally at the New Zealand Heart Valve Bank from cadavers or organ donors. They were treated in antibiotic solution for up to 62 hours (mean 49.2±7.7) and stored for a mean of 7.2 days (±4.8) at 4°C (39.2°F) before they were placed in liquid nitrogen for 0.5 - 62 months (mean 16.7±17.1). The primary endpoint was homograft failure, defined as operative replacement for stenosis (RV pressure >60mmHg on echocardiogram) or severe pulmonary regurgitation with right ventricular dysfunction. Follow-up was complete. No early mortality but 3 late, non-homograft related deaths occurred in the study period. Kaplan-Meier analysis demonstrated a homograft failure rate of 12% at 1 year, 32% at 3 years, 40% at 5 years, 60% at 8 years and 80% at 10 years. Significant branch pulmonary artery stenosis (flow acceleration >2m/sec on echocardiogram) was associated with early homograft failure (p=0.04). Patient age, weight and homograft type and size were not associated with early failure.
Conclusion: In New Zealand aortic or pulmonary homografts are the preferred conduit for RVOT reconstruction in the infant and give excellent durability.

Abstract no: 1485

Outcomes of single ventricle palliation in patients with arch obstruction

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Background/hypothesis: Outcomes of patients undergoing single ventricle palliation and arch repair are unknown.
Materials and methods: The follow-up of 70 consecutive patients undergoing single ventricle palliation and arch repair, excluding HLHS, between 1983 and 2008 were reviewed. Dominant diagnoses were DILV (28), tricuspid atresia (16), DORV (6), AVSD (7), mitral stenosis/atresia (5), TGA hypoplastic RV (3) and other (6). Arch anomalies were coarctation (48), interrupted arch (10) and arch hypoplasia (12). A strategy of performing a neonatal Stage 1 Damus procedure with arch repair and shunt became the dominant approach being performed in 1/70 (1%) in the initial years of 1983 - 1989, 9/70 (13%) in 1990 - 1999 and 23/70 (33%) in the recent 2000 - 2008 period.

Results: All patients underwent an initial procedure at a median of 6 days (4 - 12) consisting of PA banding (4), PA band and arch repair (31), Damus and shunt (33) and other (2). A total of 26 patients died before Fontan completion. Three survivors were denied Fontan completion, and 2 are still awaiting discussion. Thirteen of the 35 patients who had initial banding later required a Damus and only 3 required outflow tract obstruction relief. Thirty-nine patients underwent Fontan completion at a median of 5 years (2 - 6). There was no hospital mortality, and after a mean follow-up of 5±6 years there was one death and no further adverse outcomes. Overall survival at 10 years was 60% (95% CI: 45 - 70).
Conclusion: Patients born with single ventricle physiology and arch obstruction have a high risk of mortality in the first two years of life. Their outcomes seem excellent once they reach Fontan status. It is likely that in patients with single ventricle and arch obstruction strategies to avoid systemic outflow tract obstruction should be implemented in early life.

Abstract no: 1493

Does limited right ventriculotomy prevent right ventricular dilatation and dysfunction in patients who undergo transannular repair of Tetralogy of Fallot? Analyses of MRI data in 113 patients

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Background: In the hope of decreasing the long term complications of conventional transannular repair with a large right ventriculotomy (RV-tomy) in patients with Tetralogy of Fallot (ToF), transatrial and transpulmonary approach with limited (<1cm) transannular RV-tomy has been adopted by many centres. However, long term benefits of this technique have not been demonstrated.
Materials and methods: Between June 2002 and April 2012, 113 patients (mean age 18.5±6.6 years) with transannular repair of ToF underwent magnetic resonance imaging (MRI)to evaluate pulmonary regurgitation (PR). Patients were divided into limited RV-tomy group (n=39) and conventional RV-tomy group (n=74). We compared the MRI parameters of the 2 groups to test the hypothesis that limited RV-tomy in the setting of transannular ToF repair would result in less right ventricular (RV) dilatation and dysfunction compared with conventional RV-tomy.
Results: The interval between ToF repair and MRI examination was shorter in limited RV-tomy group (limited: 12.7±3.8 years vs. conventional: 17.2±4.7 years, p<0.001). There was no difference in PR fraction between groups (43±10% vs. 45±9%, p=0.270). Indexed RV volumes were similar between groups (RV end-diastolic volume index: 149±31ml/m^2 vs. 152±42mL/m^2, p=0.704, RV end-systolic volume index: 70±24mL/m^2 vs. 77±38mL/m^2, p=0.313). There was no difference in RV ejection fraction between groups (54±9% vs. 51±9%, p=0.160).
Conclusions: We could not demonstrate long term benefits of limited RV-tomy compared with conventional RV-tomy in patients who underwent transannular ToF repair, at least in terms of RV size and function. Further studies are necessary to define the role of limited RV-tomy in patients who undergo transannular ToF repair.

Abstract no: 1525

Deep sedation versus general anaesthesia in children undergoing percutaneous cardiac intervention in the catheter laboratory

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Background/hypothesis: Paediatric patients require sedation/anesthesia more often than adults during both diagnostic and therapeutic procedures. Moreover the paediatric population represents the highest risk, lowest error tolerance subgroup. The safety and efficacy of deep sedation versus general anesthesia in children undergoing percutaneous cardiac intervention in the catheterisation laboratory was rarely discussed in the literature.
Methods: All patients below 18 years of age who were referred for elective percutaneous cardiac intervention during a period of 6 months were included in the study. The patients were divided into 2 subgroups; group 1 who were subjected to deep sedation using Ketamine infusion and group 2 who completed the procedure under general anesthesia. Different numerical and categorical data were collected using a custom made sheet and anesthesia related complications were analysed and compared between the 2 subgroups.
Results: Anesthesia related complications occurred in 14.1% of the study group, all these complications were self limited and none of them was life threatening. The commonest complications were delayed recovery (n=2) and post procedural vomiting (n=2). There was no significant difference between the 2 subgroups as regard; age, body weight, height, body surface area, procedure duration, anesthesia duration and recovery time. There was also no significant difference between the 2 subgroups as regard the occurrence of anesthesia related complications (p=0.551)
Conclusion: Both deep sedation and GA were as safe and effective as each other in establishing adequate sedation/anesthesia in children with congenital cardiac malformations undergoing percutaneous cardiac intervention in the catheterisation laboratory.

Abstract no: 1526

Outcomes of intra-atrial baffling for partial anomalous pulmonary venous connection

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Background: Intra-atrial baffling for partial anomalous pulmonary venous connection (PAPVC) has been performed with excellent outcomes. However, there is the risk of superior vena cava (SVC) or pulmonary venous obstruction, as well as sinus node dysfunction. We studied the long term results for this procedure.
Materials and methods: From January 1992 - July 2012, 18 patients underwent intra-atrial baffling for anomalous right-side pulmonary vein draining to SVC. The

median age was 10 years (45 days - 66 years). Two patients had bilateral PAPVC and the left side anomalous pulmonary vein drain was repaired simultaneously. Two patients had intact atrial septum and the remaining 16 patients had atrial septal defect. The PAPVC was baffled to the left atrium through ASD using single-patch in 11 patients (61.1%) and 2-patch in 7 patients (38.9%). The duration of mean follow-up was 47.4 months (1.0 month - 15.8 years) and 2 patients were lost to follow-up. Medical records and echocardiographic data were retrospectively reviewed.
Results: There was no early or late mortality. Transient sinus node dysfunction occurred in 3 (16.7%) patients, but all patients were in normal sinus rhythm in the latest follow-up. SVC stenosis and thrombosis was noted in 1 patient who required stent insertion. Right superior pulmonary venous stenosis and thrombosis and subsequent pulmonary infraction developed in a patient. In the other patients, there was no evidence of pulmonary vein or SVC stenosis.
Conclusions: Intra-atrial baffling of right side PAPVC draining SVC does not affect the sinus node function. However, there is a risk of pulmonary vein or SVC stenosis. So, other surgical option should be considered for patients requiring long tunnel for the intra-atrial baffling.

Abstract no: 1527
Outcomes for simple transposition in the current era

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Background: We report outcomes for simple transposition of the great arteries (TGA) in a contemporary cohort.
Materials and methods: 96 patients were diagnosed between 2004 and 2011. 5 did not undergo operation because of associated severe congenital anomalies (n=1, antenatal diagnosis), hypoxic encephalopathy (n=3, one antenatal diagnosis) or intracranial bleed (n=1). 91 neonates underwent surgery with preservation of the neo-aortic sino-tubular junction where possible.
Results: Mean age at operation was 8.1 days. There was 1 operative mortality in a premature low birth weight neonate in circulatory shock prior to operation. There were 2 late mortalities. 1 child had complicated coronary anatomy (operation involved pericardial patch augmentation of the left main coronary artery), died suddenly at home 52 days after surgery. The other had unexplained severe pulmonary hypertension and died 169 days after the operation. Coronary artery pattern was Leiden 1LCx2R (63%) and 2 intramural coronary arteries were encountered. The sinotubular junction was preserved in 57 (63%). Follow-up ranged from 6-96 months (median - 39 months), 81% complete. Neo-aortic regurgitation was mild to moderate (3), mild (10) and trivial (16). 2 of the children with mild to moderate neo-aortic regurgitation had a single coronary origin implanted using a trapdoor. Otherwise, there was no specific coronary pattern or transfer technique identified as a risk factor for the development of neo-aortic regurgitation. Six required re-intervention for relief of supra valvar pulmonary stenosis or right pulmonary artery narrowing at a median of 18 months. There were no aortic root or coronary arterial re-interventions.
Conclusions: In this series 5% of patients with TGA did not reach operation, highlighting the need for planning of delivery to optimise outcomes. Mortality in the operated group at 1 year was 3%. Re-operations for pulmonary artery stenosis are the most important late re-intervention (7%). Clinically apparent coronary problems are uncommon at mid-term follow-up.

Abstract no: 1528
Preliminary study of intra-operative changes in respiratory and haemodynamic parameters in the modified Blalock-Taussig surgery

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Context: The modified Blalock-Taussig surgery has a high mortality especially in neonates with low birthweight.
Objectives: To compare changes in haemodynamic and respiratory parameters in patients with cyanotic congenital heart defects undergoing modified Blalock-Taussig surgery.
Methods: Five consecutive patients submitted to modified Blalock-Taussig Surgery were sampled for 3 arterial blood gas analysis (ABG): 1 in the beginning of the surgery as a control, followed by 2 more ABG taken 5 minutes after clamping the right pulmonary artery and 5 minutes after removal of the clamp to obtain acid-base, ventilation and systemic perfusion parameters. We used the T Test, Wilcoxon Test or the Mann-Whitney U Test to compare the same variable in 2 different instances. A P-value <0.05 was established as statistically significant.
Results: The mean age was 29.2±35.8 days (range 2 - 86 days) and the mean weight was 3.11±0.58kg (range 2.66 - 4.05kg). The mean arterial blood gas parameters 5 minutes after pulmonary artery clamping were: pH: 7.20±0.12/pCO_2: 53.9±20.0mmHg/HCO_3: 16.5±1.7mEq/L/pO_2: 30.3±10.6mmHg/SaO_2: 48.1±23.1%. The haemodynamic variables were: mean arterial pressure: 30.2±7.4mmHg and arterial lactate: 3.2±2.6mmol/L. The mean pulmonary artery clamping time was 8.4±0.5 minutes.
Conclusions: In these patients submitted to modified Blalock-Taussig surgery we find the following statistically significant changes in haemodynamic and ventilator parameters during the clamping of the pulmonary artery: decreased blood concentration of bicarbonate ions, decreased arterial oxygen partial pressure and decreased mean arterial pressure.

Abstract no: 1534

Do it yourself: Defining institutional predictors of major adverse events early after paediatric cardiac surgery

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Background/hypothesis: Few reported predictors of major adverse events (MAE: cardiac arrest, cardiopulmonary resuscitation, emergency extracorporeal life support, or death) early after paediatric cardiac surgery have stood the test of time and shown universal applicability. Each institution needs to identify its own predictors, and define local thresholds for intervention.
Materials and methods: Over a 3 year period, a range of reported clinical and laboratory predictors was assessed in patients following bypass surgery on admission to our tertiary care Paediatric Intensive Care Unit (PICU). Peri-operative data was retrieved from our institutional Aristotle database, automated extraction of clinical and laboratory data from our clinical information system applied. Generalised estimating equations (GEE) were used to determine variables and their thresholds predictive of MAE.
Results: 505 procedures in 483 patients [median age 40.8 (0 - 217) months, weight 9.8 (2.2-110) kg] were analysed. MAE occurred in 21(4.2%) patients within 48 hours after surgery. The odds ratio (OR) for presence of pre-operative risk factors as defined by the Aristotle Institute was 3.4 (p=0.02) for MAE. For continuous variables, GEE calculates the OR for any increase from the mean of the population by a predefined scale, e.g. the mean±SD heart rate on admission to PICU was 133.7±30 minutes, and for any increased heart rate by 20 minutes the OR for MAE was 2.11 (p<0.001). Further identified predictors were: lactate, bypass time, vaso-active-inotropic score, pO_2-FiO_2 ratio, end-tidal CO_2-pCO_2 difference, and systolic arterial pressure.
Conclusions: Although not the most powerful outcome model, for units with low paediatric cardiac surgical patient volume, GEE is a validated and pragmatic tool for this purpose. However, while dealing with missing data, GEE is unable to examine interactions and combinations of predictors. In summary, we identified our institutional predictors of MAE, and defined clinically useful local thresholds for early intervention. Remodelling is warranted at defined intervals, allowing for changes in our practice over time.

Abstract no: 1541

Predictive value of Aristotle Complexity Score for risks of congenital heart surgery in Korea

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Background: The Aristotle Complexity Score was developed to predict the risks of congenital heart surgery and evaluate the surgical performance. However, every country has different healthcare environments, so we evaluate the predictive value of Aristotle Complexity Scoring System in our country based on our institutional outcomes.
Materials and methods: Aristotle Basic Complexity Score and Comprehensive Scores were prospectively assigned to all consecutive surgical procedures for congenital heart surgery between January 2008 and August 2012. We defined the major morbidity based on the Society of Thoracic Surgeons National Database. The discriminator power of the scoring system for mortality and major morbidity was analysed by Goodness-of-fit test using Logistic Regression model.
Results: 821 surgical procedures were performed for congenital heart defects. Aristotle Basic Score was 6.8±2.2 and Comprehensive Score was 8.2±3.0. There were 31 surgical mortalities and major morbidities developed in 223 cases. The P-value of Goodness-of-Fit test for surgical mortality and major morbidities were 0.742 and 0.488 respectively. C-index was 0.782 (95% CI: 0.69-0.874) and 0.711 (95% CI: 0.671-0.751).
Conclusions: Aristotle Complexity Score is an adequate model to predict the surgical mortality and morbidity in our country. The system can be used to stratification of the risks of congenital heart defects.

Abstract no: 1557

No blood transfusion during cardiac surgery (institutional experience)

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Background: Perioperative bleeding during and after cardiac operations is usually the result of hemodilution and coagulopathy caused by cardiopulmonary bypass which commonly require correction by blood products transfusions which may result in increased morbidity and mortality. We conducted a combined prospective observational comparative study of morbidity and mortality in children undergoing open-heart surgery who were not transfused (group=1) any blood product during/after the surgery or those, who were transfused (group=2) blood or blood products.
Material and method: 396 children under the age of 13 years (excluding neonates) underwent open-heart surgery in our institute during June 2009 - 2012. Similar numbers and types were compared and contrasted from another unit who did not follow the No Blood Transfusion Protocol in the institution. Blood transfusion criteria followed for group=1 was; Hb less than 7gms%. Types (numbers) of surgeries were; ASD (n=158),VSD (n=114),TOF (n=85), TAPVC= (n=12), RVOT reconstructions (=5), BD-Glenn/Fontan (=12) others (=10). Similar numbers and surgery types (from another unit receiving transfusion) were compared and contrasted (group=2). Morbidity and mortality was analysed between the groups. Cox proportional hazard models and Kaplan-Meier survival plots obtained for survival data.
Results: Thirty three patients in group=1 required crossover to blood or product transfusion during received hospitalisation. Analysis revealed that transfusion was required more often in sicker patients in heart failure, those who had prolonged CPB >90 minutes, with preoperative coagulopathies with liver congestion. Interestingly, all patients in another unit, following Empirical Transfusion Protocol (group =2) received some blood or blood products during their hospital

stay irrespective of the operation performed or hemoglobin levels. Early ICU discharge (p=0.001) and from the hospital (p=0.001) was noted in patients where transfusion was not received. Mortality in group=1 patients was 11/396 compared to 79 in group=1 with 79 during hospital stay (95% confidence interval = 1.4 - 2.0; p=0.001).

Conclusion: Blood or products transfusion in perioperative period adversely affects the hospital recovery and survival in the same unit following similar operative and recovery environment.

Abstract no: 1564
Ventricular-arterial coupling in children with Still's murmur

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Background: Still's murmur is the most common innocent heart murmur in children, but there is no reliable explanation to its origin. Ventricular-arterial coupling (VAC) is an index describing the cross-talk between the left ventricle (left ventricular contractility ELV) and the arterial system (effective arterial elastance EA). It serves as an important measurement of cardiac performance and cardiac energetics.
Methods: In our exploratory study, data of 43 children with Still's murmur and of 42 healthy children without murmur aged 2 - 10 years (mean age with murmur: 5.17±2.0 years; controls: 5.8±2.5 years), were analysed regarding blood pressure (BP) and heart rate (HR), echocardiographic measurements of aortic-root (AoD) and left-ventricular end-diastolic (LVIDd) and end-systolic (LVIDs) dimensions indexed to body-surface-area, and VAC, thereby including the arterial system into the investigation of Still's murmur and its possible origin.
Results: While there was no significant difference regarding BP, HR, AoD, LVIDd and LVIDs or their relative proportions, significant differences could be found in VAC (p0.005). There was a tendency toward higher EA (p0.39) and lower E_{LV} (p0.14) in children with Still's murmur. Also, there was a significantly higher ejection fraction (EF%) (P<0.005) and a larger stroke volume (SV per kg bodyweight) (P<0.05) in children with murmur. All differences were more pronounced in children aged 2 - 6 than in those aged 6 - 10.
Conclusion: The low frequency vibratory murmur seems to be caused by a combination of lower EA, higher ELV, and higher ejection fraction and stroke volume as compared to children without murmur. The fact that all differences are more pronounced in young children is reaffirmed by the decreasing prevalence of Still's murmur in older children.

Abstract no: 1568
30 years of paediatric cardiac surgery in Serbia and 10 years of the arterial switch operation at the Mother and Child Institute of Serbia

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Introduction: The Department for paediatric Cardiac Surgery has been founded officialy in Belgrade in 1982. Individual attempts to operate patients with congenital heart disease prior to 1982 have been performed at adult cardiac surgical centres in Belgrade. The Senning and Mustard modifications of the atrial switch technique were the techniques of choice for treating D-TGA. Until 2001, there were 13 attempts of arterial switching with 3 survivors. From 1998 - 2001, the majority of D-TGA patients were routinely sent abroad for treatment. The arterial switch procedure has commenced and has been the standard operative procedure for patients with D-TGA in our hospital since May 2003.
Materials and methods: In the period from May 2003 - June 2012, a total number of 65 children with D-TGA or D-TGA+ VSD patients had the arterial switch technique. Other diagnoses were excluded from the study. There were 2 surgeons performing the operation: senior surgeon performed 57 operations the 2nd one only from 2010 (5 patients). Routine pre-operative treatment was applied to all children. The youngest patient was 7 days old, the oldest 95 days, the body weight varied from 2 300 grams - 4 900 grams. The coronary artery patterns were identified as normal in 40 patients, inverted in 4 patients, single coronary artery anatomy was diagnosed in 3 patients and other forms in 15 patients.
Results: The overall mortality has fallen from 42% in the 1st 2 years to 3% in the last 24 months. The identified risk factors were bleeding and coagulation disorders, clinical conditions of the children and surgical errors.
Conclusion: In a 10 year period the arterial switch procedure has become a sucessful technique in our hospital.

Abstract no: 1597
Vacuum-assisted closure in the treatment of deep post-sternotomy wounds in newborns

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Introduction: Deep sternal infections after paediatric open-heart surgery are rare. Mortality for post-sternotomy mediastinitis continues to be high. Treatment includes antibiotics, frequent change of wound dressing and surgical debridement. The vacuum-assisted closure (VAC) therapy is a new treatment option. Nevertheless, especially in newborns experience in deep wound treatment is limited.
Patients and methods: In the 5-year period from 2007 - 2011, 2 newborns developed deep sternal infection after cardiac surgery and were treated with a vacuum-assisted closure system.
Results: After the primary cardiac surgery both infants received circulatory support (ECMO) and delayed sternal closure. The duration of the VAC therapy was 21 and 8 days. After good granulation was obtained, the patients underwent conventional wound dressing. Plastic surgery with muscle flap or skin graft was not required.
Conclusions: The VAC therapy is an effective alternative treatment in post-sternotomy mediastinitis in neonates reducing the infection and providing good wound healing.

Abstract no: 1617

Post-operative transport: Multi hazard risk mitigation to improve patient safety & outcomes

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The risk of hazardous, potentially life-threatening events during the post-operative transport of pediatric patients to the Cardiovascular ICU (CVICU) increases exponentially with the distance and time the patients are in transport. If infrastructural or financial limitations prevent shortening the distance between Operating Room and CVICU, an alternative is to mitigate the risk to eliminate process variation and pro-actively prevent defects from occurring.
This abstract describes how the team at Levine Children's Hospital in Charlotte, North Carolina applied Lean Six Sigma to reduce the risk of the post-operative transport by 77% while improving the transition of care.
The team developed a detailed process map of the current state transport process (Distance: 750ft; 2 Story Transition; Average Transport Time: 7:30 minutes) and applied Lean thinking to eliminate non-value added activities before conducting a Failure Modes & Effects Analysis to identify all potential failure modes of the remaining process steps, and to translate the risk into a measurable metric. The team determined a baseline Risk Priority Number (Occurrence x Severity x Detectability | low: 1 - high: 10) of 5 477 of the post-operative transport process.
A root cause analysis of 38 potential failure modes allowed the team to develop recommendations to decrease the baseline Risk Priority Number (RPN). Improvement activities were prioritized based on the RPN. Improvements to decrease the risk included the removal of hazardous environmental traps; development of a standardised process for the preparation, move and transportation of patients; fixed roles, responsibilities and positions as well as an OR exit checklist. The team simulated the standardised process and checklist to verify improvements and the final round of simulations was recorded for training and knowledge sharing purposes.
The implementation of the team's recommendations resulted in a 3 931 points (77%) reduction of the baseline RPN from 5 477 to a current RPN of 1 546.

Abstract no: 1618

Necessity of biomedical engineering support for humanitarian medical missions in developing countries

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Background: Due to less complex medical equipment technology in the past, little emphasis was placed on the importance of biomedical engineering support for humanitarian medical missions. However, as the evolution of medical equipment technology progressed at a rapid pace and the complexity of procedures increased, it is evident the role of biomedical engineering has expanded. An education in this field is not enough. A discipline in computer engineering, anatomy and physiology, and knowledge of equipment that is procedure specific must be incorporated. In under developed countries it is quite common for these disciplines to simply not exist.
Material and methods: Data was analysed from ICHF's (International Children's Heart Foundation) database over the past 5 years.
Results: The analysis provides a common link between the various types of equipment needed across all developing countries where humanitarian medical programmes have been started. During this 5 year period a total of 677 pieces of medical equipment was sent to 23 locations in 16 different countries. Some specific types of medical equipment included patient monitors, anaesthesia machines, cardiopulmonary bypass machines, ventilators, defibrillators, electro surgical units, syringe pumps, hypo/hyperthermia units and cardiac echo ultrasound units. ICHF biomedical engineering staff/volunteers have made 49 trips to provide biomedical engineering support and emergency repairs.
Conclusions: ICHF has created a paradigm shift and raised the bar of expectation on the level of education and expertise for biomedical engineering support. This support is defined as installing, servicing, repairing and providing staff training on biomedical equipment. The end result has allowed ICHF medical programmes in developing countries to grow at an accelerated pace, ensuring better patient safety, and improved surgical results.

Abstract no: 1632

Use of homograft tissue for paediatric and adult cardiac surgical disease on international compassionate missions

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Background: International visiting cardiology and cardiac surgery teams that carry out paediatric and acquired cardiac surgery, face serious limitations in scope of surgery with regard to possible and restricted valve choices. These are complicated by late clinical presentations, accelerated anatomical distortion from growth and rheumatic valve disease. The lack of effective primary care in many locations risks forcing a turn from a conceptually good operative decision into a temporizing and unsatisfactory, short-term fix.

Method: In an attempt to address some of these issues and increase the operative choice available, CardioStart International teams have carried 2 homograft valves (donated by Cryolife Inc., Georgia, U.S.A.) on many 2-week missions, since 1996. In 3 countries receiving cardiothoracic surgical assistance, 18 patients, between 4 - 56 years, underwent conduit reconstructions to the aortic (5) or pulmonary (13) position; 2 patients had the Ross procedure. Six conduits were later implanted by the local surgical team based on the intense learning experience they had gained during the mission.
Results: Recent follow-up information is available in 15 patients (indirectly, in a further in 3). One adult patient (Ross) died at 15 days from a chest infection. All remaining patients are known to be alive, extending this small series follow-up experience to 16 years. Six patients have now reached adulthood and are in gainful employment. None currently need revision/reoperation of their primary operation. Ten patients are being tracked by a full international database evaluation already in operation (University of Minnesota and Oregon Health & Science University, Portland, Oregon, U.S.A.).
Conclusions: Despite limitations of supply, homograft technology can be logistically provided to the diverse patients groups seen; conduit implantation can be readily taught to local teams with excellent initial outcome. In 2 of these countries, local surgical teams have since developed local competence and limited availability, but proper follow-up remains a priority in assisting new programmes to grow successfully.

Abstract no: 1646

A technique to correct severe stenosis of left coronary artery as a late complication of direct re-implantation for treatment of anomalous left coronary artery from the pulmonary artery

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Background: An 11-year-old was admitted with unstable angina while an 8-month-old underwent a correction of ALCAPA using the technique of re-implantation of the left coronary artery to the aorta with a button of pulmonary artery. The early and medium term outcomes of the operation were good. However, the patient developed angina and deterioration in ejection fraction in the last 6 months.
Method and materials: Cardiac catheterisation revealed severe stenosis of the coronary artery from anastomosis with the ascending aorta to the bifurcation and distal poor opacification of both anterior descending and circumflex arteries. At re-operation the left coronary artery was stenotic, less than 1mm in diameter and solidly adhered to the posterior wall of the pulmonary artery. The technique used to correct stenotic coronary artery was: Transection of the aorta distal to the origin of the left coronary artery. Longitudinal incision of the aortic wall down to the anastomic orifice and the left coronary artery all the way past to the bifurcation by 3 - 4mm. Using a segment of the left subclavian artery opened longitudinally as a flap, the aortic wall, the new ostia and the left coronary artery were enlarged. Both the ascending aorta and the left subclavian artery were reconstructed, the 1st with end-to-end anastomosis and the 2nd with a polyester graft.
Results: The patient had an uneventful post-operative course. A cardiac catheterisation performed 1 month after re-operation revealed an adequate flow through the left coronary artery and branches and improved segmental contractility of the left ventricle. The enlargement of stenotic coronary arteries with autologous arterial grafts is feasible and with good results.
Conclusion: The technique of direct implantation of the left coronary artery in the aorta could lead to excessive tension. The compression of the bovine pericardial graft could also have been another possible cause of coronary obstruction.

Abstract no: 1652

Strictly posterior thoracotomy (SPOT) for modified Blalock-Taussig shunt (MBTS)

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Background: In resource-poor settings, the modified Blalock-Taussig shunt (MBTS) is often performed for symptomatic relief in patients unable to afford the out-of-pocket expense for primary complete correction. Posterolateral thoracotomy and sternotomy are valid approaches for creation of the MBTS. However, in populations predisposed to keloids and hypertrophic scars, the aesthetic insult from either approach form the basis of complaint for many patients. The strictly posterior thoracotomy (SPOT) may yield a cosmetically superior result with a short posterior scar not evident to the patient.
Materials and methods: From August 2011, we adopted the SPOT approach to create a MBTS. The MBTS is preferably performed on the right side. The patient is placed in a left lateral decubitus position with a slight counter-clockwise chest rotation. The incision extends 6 - 8cm between the scapular spine and posterior axillary line, 2cm parallel to the vertebral border of the scapula. Limited division of the trapezius and lattisimus dosi may be required beneath the skin incision to facilitate exposure. The chest is entered through the bed of the 4th rib. We used this approach in 23 patients.
Results: There were 15 males, 8 females with symptomatic Tetralogy of Fallot, aged from 16 months - 17 years (median 4 years). Shunt sizes used ranged from 4 - 6mm. Mean post-operative SPO2 was 84%. No shunt failures were encountered. Hospital stay was 7 - 10 days. There was one re-operation for clotted haemothorax; and this 17 year-old patient was the only mortality (4.3%) from sudden cardiac death on the 7th post-operative day. The cosmetic result has been very appealing.
Conclusion: The SPOT approach is a safe alternative for creation of a MBTS; it yields a cosmetically superior result to both posterolateral thoracotomy and sternotomy.

Abstract no: 1662

Double switch procedure for CTGA: Is it worth doing?

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Aim: To present our limited experience with the double switch procedure in SRMC over a period of 15 months from April 2010 - Jun 2012.
Materials: Five patients with a diagnosis of corrected TGA (CTGA) had the double switch procedure. The surgical options for CTGA are anatomical and physiological repair. The anatomical repair includes the double switch procedure as either ASO + Senning or Rastelli + Senning. All our patients underwent Rastelli + Senning as they were unuitable candidates for ASO anatomically.
Results: Four patients performed well in the immediate post-operative period and were discharged. 1 patient died on the 4th post-op day.
Conclusion: Though the double switch procedure is complex, we believe the immediate post-op results were satisfactory. However, long term follow-up is needed in these patients. Hence we conclude that double switch procedure should be considered in patients with CTGA.

Abstract no: 1682

Kommerell diverticulum should be removed when operating symptomatic children with aberrant right subclavian artery (vascular ring)

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Background: Right aortic arch with aberrant left subclavian artery is the most frequent cause of vascular ring. Usual treatment in symptomatic children is ligamentum arteriosus division, leaving the Komerell diverticulum in place with potential risk of residual compression, aneurysmal dilation and dissection or even rupture. Translocation of the aberrant left subclavian artery to the left carotid artery together with removal of the Kommerell diverticulum and division of the ligamentum through a left thoracotomy is currently advocated to avoid those complications.
Results: Between September 2009 and August 2011, 11 patients underwent this procedure. Mean age at time of surgery was 8.1 year (median 5, range 0.9 - 18.9), mean weight 27.4kg (median 18, range 8.4 - 59). All had respiratory symptoms, associated with dysphagia in 5. CT scan and/or MRI had demonstrated the arch anomaly and the dilated Komerell diverticulum in all. Surgery consisted of left postero-lateral thoracotomy followed by arterial ligament division to release compression, diverticulum resection and finally left subclavian artery reimplantation on the left carotid artery. Post-operative complications included transient chylothorax in 4 and phrenic palsy in 1 patient. Mean follow-up reached 5.6 months (median 2.3, range 0.2 - 29.1). Residual symptoms were noted in 3 patients, all with short follow-up (less than 7 months). Echo-Doppler analysis (n=8) showed a patent left subclavian to carotid artery anastomosis in all but 1 (vessels not seen). Histo-pathological analysis of the resected diverticulum, available in 4 patients, showed cystic medial necrosis and inflammatory tissue in 2, no specific histological findings in 1 and hyperplastic myo-intimal lesions in 1.
Discussion: Translocation of the aberrant subclavian artery together with Komerell diverticulum resection and ligamentum division is a safe and efficient procedure for symptom relief. The observation of profound wall abnormalities such as medial necrosis in the diverticuli that were analysed encourages us to maintain this strategy.

Abstract no: 1686

Early and late complications following Fontan surgery - 20 years experience

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Fontan operation provides excellent palliation for single ventricle defects although many patients experience problems in the early and late postoperative period. We looked at our patients to determine factors associated with most frequent morbidity and mortality.
After preliminary procedures, a group of 330 patients underwent intraatrial lateral tunnel Fontan surgery over the 20 years period. Multiple data were analysed including clinical data, hepatic and haemostatic indices, neurohormonal factors, echocardiographic, hemodynamic and ergospirometric assessment. Relevant statistical methods were used including basic tests, logistic regression, multiple regression, repeated measures ANOVA and Kaplan Mayer analysis to determine factors contributing to disturbances after successful creation of Fontan circulation.
The mortality rate after Fontan procedure was 5.4%. In the early post-opearative period, a disfunction of the single ventricle was significantly associated with pleural effusions, neurologic disturbances, hepatic and hemostatic disfunction. Signifficant neurohormonal activation (angiotensin, vasopressin and proBNP), dysfunction of liver and hemostatic system were observed and correlated with hemodynamic factors. In the long term follow-up disturbances of chronotropic response, anaerobic threshold achievement and ventilatory equivalent of carbon dioxide at peak exercise were observed. This was correlated with neurohormonal factors (endothelin, proBNP). Development of entheropaty was related to level of liver disfunction in the early postoperative period. Significant deficiency of body mass index was observed during follow up period.
The intra atrial lateral tunnel Fontan procedure is associated with low early and late mortality however patients are burdened with many complications worsening the quality of life. The fundamental factor related to mortality and postoperative complications is single ventricle function. Triggered adaptive mechanisms contribute to neurohormonal activation and stress response causing disadvantageous hemodynamic changes and exercise capacity limitation.

Abstract no: 1698

Contemporary surgical approach to Scimitar Syndrome; Using direct right pulmonary vein to left atrial anastomosis via sternotomy

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Background: There is no consensus about the optimal surgical technique for the repair of the Scimitar Syndrome, an anomalous right pulmonary venous connection to inferior vena cava. We report our experience with an anatomical approach involving a direct anastomosis of the right pulmonary vein to the left atrium, performed under conventional cardiopulmonary bypass without the need for circulatory arrest through a sternotomy.
Materials and methods: This is a retrospective review of 9 patients operated in 2009 - 2011 for anomalous pulmonary venous connections from right lung to IVC. The age of patients at presentation varied between 3 months and 27 years (mean 16 months). Through a median sternotomy, the anomalous right pulmonary vein was mobilised and disconnected close to the diaphragm and the caval end was secured. The pulmonary end of the vein was brought superiorly through a generous pericardial opening behind the right phrenic nerve without tension. Via a natural or surgically created atrial septal defect a wide opening was created on the right side of the posterior left atrium, wherein the scimitar vein was directly anastomosed.
Results: Eight out of 9 patients were primary venous repair and 1 patient had a previous failed repair using an intra-atrial baffle. There were no operative deaths. The median cardiopulmonary bypass time was 109 minutes and median cross-clamp time was 47 minutes. The median ventilator time was 16.8 hours and the median stay at the intensive care unit was 2.4 days. There were no re-explorations in the post-operative period, no instances of pulmonary venous obstruction, and no late deaths within a follow-up of 1 year.
Conclusions: Anatomical repair of the scimitar vein based on re-implantation onto the left atrium via sternotomy, results in safe, reliable repair in patients with a wide age-spectrum including re-operation.

Abstract no: 1701

Haemodynamic characteristics of porcine decellularised xenografts for aortic valve replacement in children

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Objectives: Aortic valve repair and the Ross procedure are both not always applicable in aortic valve disease in children. We want to demonstrate as an alternative a preliminary study on the performance of decellularised porcine xenografts in children when implanted into the systemic circulation.
Methods: Between January 2010 and March 2012, a total of 9 aortic valve replacements with Matrix decellurised porcine xenografts was performed. Operative results and postoperative hemodynamics were evaluated.
Results: The mean patient age was 6.4 years (range, 3 - 15 years), and mean weight 15.2kg (range, 11 - 45kg). The underlying diagnoses were isolated aortic valve disease (6), common arterial trunk (2) and single ventricle type CHD with obstructed systemic outflow tract (1). Three children had additional procedures: lateral tunnel Fontan operation, Damus-Kaye-Stansel procedure and pulmonary homograft replacement. All children with isolated aortic valve disease had previous balloon valvuloplasty or surgical valvulotomy. The diameter of aortic grafts used in children were 1mm (2), 14mm (2), 17mm (3) and 19mm (2). Post-operative echocardiography demonstrated a mean transvalvular gradient 19mmHg (range, 10 - 27mmHg) that did not tend to increase over time. No significant valve insufficiency was observed. Follow-up time varies between 3 - 24 months.
Conclusion: Our preliminary results suggest that porcine decellurised tissue-engineered xenografts may be the alternative option for children who require aortic valve implantation or replacement.

Abstract no: 1709

Management of post-operative chylothorax in paediatric patients with congenital heart disease

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Background: Chylothorax is a well known post-operative complication affecting patients with congenital heart disease (CHD). No clear consensus has been reached regarding the management strategy to date.
Materials and methods: Data were collected retrospectively regarding the diagnosis and management of chylothorax. The cardiac database and dietetic records were used to identify the paediatric population with CHD that underwent cardiac surgery at the Yorkshire Heart Centre.
Results: Between July 2005 and June 2012, 2290 operations were performed in paediatric patients with CHD. Chylothorax was diagnosed in 117 of them, an incidence of 5.1% (95% CI 4.2% - 6%) of which 69 (59%) were <1 year of age. The average time to diagnosis was 6 days post-operatively. All patients were commenced on medium chain triglyceride diet (MCT) and 33 of them (28.2%) were treated with octreotide, when drainage was refractory. Surgical intervention was performed in 7 patients. Chest drains remained for an average of 11 days, 9 (range 3 - 22 days) for those on MCT only and 15 days (range 6 - 32 days) for those on octreotide. 14 patients died. Among the survivors 33 (32%) were on a 6-week MCT diet (our policy until the beginning of 2008), one was treated for 5 weeks, 59 (57.3%) had a 4-week diet, and the rest (9.7%) had less than 4 weeks (range 2 days - 3 weeks) mainly for nutritional reasons. There were 2 recurrences (1.9%, six-week regime).
Conclusions: Chylothorax is a rare complication following paediatric cardiac surgery. The MCT diet remains the gold standard in the management of chylothorax. A maximum of 4 weeks has proven to be sufficient for our patients. A shorter duration of MCT diet could be considered. Octreotide can be reserved for the more persistent cases. Surgical intervention is required in a limited number of patients.

Abstract no: 1710

Transition of surgical repair from "conventional" to "primary sutureless" technique for total anomalous pulmonary venous connection

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Background: Sutureless repair has been described for post-repair pulmonary vein stenosis. It has since been reported as a modified technique for the primary repair of infracardiac total anomalous pulmonary venous connection and recently for the primary repair of other types as well.
Methods: 102 consecutive patients (median age, 60 days; median weight 3.5kg) underwent conventional or sutureless total anomalous connection repair between July 2009 and July 2012.
Results: Types of total anomalous pulmonary venous connection included supracardiac in 54 patients (53%), cardiac in 24 patients (23%), infracardiac in 17 patients (16%) and mixed type in 7 patients (6%). Median follow-up time was 6 months. Vertical vein obstruction was found pre-operatively in 43 patients (40%). A primary sutureless repair was carried out in 19 patients (18.6%: supracardiac (n=4); cardiac (n=1); and infracardiac (n=14). A proportionately greater number of patients with high risk infracardiac total anomalous pulmonary venous connection underwent the sutureless technique (73% vs. 3.6%). There were 7 early operative deaths of which 4 were from noncardiac causes. Early outcomes for death and re-operation for pulmonary venous stenosis were not significantly different between these 2 disparate groups.
Conclusion: The sutureless group had more infracardiac total anomalous pulmonary venous connection and a higher rate of decline in post-operative right ventricular systolic pressure with a shorter ICU stay and earlier hospital discharge. Early results of sutureless repair has led to a change in our practice from conventional to primary sutureless repair for all cases of infracardiac total anomalous pulmonary venous connection and for selected cases of supracardiac, cardiac and mixed types with pre-operative pulmonary vein stenosis or confluence obstruction.

Abstract no: 1712

Dobutamine does not offer sustained contractility in a piglet model of right ventricular failure

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Background/hypothesis: The immature myocardium has significantly different receptor kinetics, metabolism and enzyme activity. Previous haemodynamic studies have primarily focused on inotropic effect on left ventricular function. A piglet study was planned to investigate the effect of 3 different inotropic strategies on right ventricular failure.
Materials and methods: Twenty one pigs, aged 4 days were prepared to measure right ventricle pressures. Stunning of the right ventricle (RV) was induced by 10 cycles of ischaemia/reperfusion injury. We randomised animals to placebo or 1 of 3 inotropic protocols: AM: Adrenaline: 0.09μg·kg^{-1}·min^{-1} and Milrinone: 50μg·kg^{-1} bolus and 0.4μg·kg^{-1}·min^{-1}; DM: Dopamine: 6μg·kg^{-1}·min^{-1}, Milrinone: 50μg·kg^{-1} bolus and 0.4μg·kg^{-1}·min^{-1}; Dob: Dobutamine (8μg·kg^{-1}·min^{-1}) for 240 minutes. We used maximum pressure development over time (dP/dtmax) as a marker of contractility and minimum pressure development over time (dP/dtmin) to evaluate diastolic function. Arterial elastance in relation to end systolic pressure volume was calculated to evaluate arterioventricular coupling (Ea/ESPVR). One-way ANOVA was used to analyse differences between area under the curve (AUC) and mean values from specified time points.
Results: Maximum response was fastest in the Dob group: 30 minutes, followed by DM: 40 minutes, and AM: 80 minutes. After 180 minutes dP/dTmax decreased to a level indistinguishable from baseline in the Dob group (n.s.), whereas dP/dtmax in the AM and DM groups continued to increase throughout the study period ($p<0.01$ and $p=0.03$, respectively). AUC did not differ between groups ($p=0.48$). dP/dtmin improved in all groups and remained stable in all groups. Only DM improved Ea/ESPVR compared to control ($p<0.05$).
Conclusions: In the stunned RV, Dob effectively increased contractility. However the effect was not sustained over the infusion period in comparison with the AM and DM groups. Only DM improved the arterioventricular coupling after right ventricular failure. The 3 inotropic interventions improved diastolic function to a similar degree.

Abstract no: 1715

Transitioning paediatric heart surgery in Mongolia from hypothermic surgery to cardiopulmonary bypass: Lessons learned

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Introduction: Mongolian paediatric cardiac and cardiac surgery care faced a growing need to develop a new cardiac programme after its 1990 independence from the U.S.S.R. This was due in part to budgeting constraints and a lack of advanced cardiac surgery care and infrastructure. Hypothermic cardiac surgery without cardiopulmonary bypass was therefore instituted as the standard approach to congenital defect repair.
Methods: In 2005 a visiting paediatric team composed of a cardiothoracic surgeon, cardiologists, cardiac anaesthesiologists, a perfusionist, cardiac intensivists and cardiac intensive care nurses started systematically training the Mongolian cardiac team in all aspects of paediatric cardiac surgery utilising cardiopulmonary bypass.
Results: From 2005 - 2011 the visiting cardiac team visited 8 times and performed 30 closed and 50 open heart surgeries with the Mongolian team. During that time the Mongolian team successfully transitioned from hypothermic surgery to cardiopulmonary bypass surgery. In 2011 the total number of bypass cases was 176 with a 30-day operative mortality rate of less than 5%.
Conclusions: Our institution has safely and cost-effectively transitioned to the surgical repair of congenital cardiac defects using cardiopulmonary bypass. We will discuss the procedures and lessons learned from this transition to more advanced cardiac surgery technique that can be used as a model for other developing countries like Mongolia.

Abstract no: 1717

Mitral valve replacement in infants and children: A single-center experience

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Background: Mitral valve replacement (MVR) is a rare procedure in children, compared to mitral valve plasty. Previously associated to a high morbidity and mortality, recent studies have demonstrated, however, better short and long term results.
Objective: Analyse our recent experience for mitral valve replacement in children at our Institution.
Materials and methods: We reviewed retrospectively the files of the patients that required MVR at our Institution in the last 10 years.
Results: Between August 2002 and August 2012, 13 patients underwent mitral valve replacemente (MVR). Two where under 2 years of age. Median weight was 27.9kg. Mitral valve prothesis sizes ranged from 21 - 31mm. The cause of mitral dysfunction was considered congenital in 12 and rheumatic in 1. Mitral insufficiency was predominant in 8 cases, combined stenosis and insufficiency in 3, and stenosis in 1. Mean left ventricular ejection fraction was 63% prior to surgery. A mechanical prothesis (St. Jude) was used in 12 cases. Only 1 patient received a biological (Perimount) prosthesis. Two patients died in the immediate postoperative period, one secondary to respiratory failure and the second one because of ventricular fibrillation. No thromboembolic events were recorded on follow up (7 - 120 months). One patient had an episode of non severe GI bleeding, and 2 patients had some form of atrial arrhythmia. No patient has required reoperation.
Conclusions: MVR seems a good option for those patients that can not benefit from mitral valve repair, with acceptable results on short and long term follow-up.

Abstract no: 1728

Paediatric cardiac tumours: A 43-year review

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Background/Hypothesis: Cardiac tumours in children are rare. Of the 800 cases reported in the literature, 97% were benign. The most common paediatric cardiac tumor is rhabdomyoma; most are asymptomatic, regress over time, and often are only observed. When benign tumours become obstructive and produce symptoms, they should be resected. We retrospectively reviewed our experience over the last 40 years to evaluate presentation, management and outcomes in this patient population.
Materials and methods: Since 1969, 67 children were diagnosed with paediatric cardiac tumours: 33 (49%) were surgically managed and further analysed. Twelve (39%) presented with symptoms of CHF. Mean age at the time of diagnosis and surgery was 8.9 years (range: 1 day - 27 years).
Results: Rhabdomyoma was the most common tumour (Table 1). Although there were only 8 (24%) malignant cardiac tumors, 5 of the 6 deaths in our series had malignant tumours. Two malignancies, however, a teratocarcinoma and a rhabdomyosarcoma, were successfully excised and treated with chemotherapy. These 2 patients have survived tumour-free for 15 and 25 years, respectively. At a mean follow-up of 4.6 (range: 0 - 26) years, 21 (91%) survivors of all tumorus remained free from lasting, post-operative cardiac symptoms. Four (12%) had minimal follow-up.

TABLE 1: Pathological distribution of paediatric cardiac tumours

Pathology	Total, n(%)	Surgically-managed, n(%)
Rhabdomyoma	35 (52)	7 (22)
Myxoma	6 (9)	6 (18)
Sarcoma	6 (9)	5 (15)
Teratoma	5 (7)	5 (15)
Fibroma	4 (6)	3 (9)
Secondary tumour	4 (6)	2 (6)
Other	4 (6)	4 (12)
Unknown	3 (5)	1 (3)
Total	**67 (100)**	**33 (100)**

Conclusions: Cardiac tumours are rare in children. Surgical excision or de-bulking should be carried out for rhabdomyomas and fibromas causing significant obstruction. Myxomas and teratomas require complete excision because they can embolise or recur locally. Malignant cardiac tumors should undergo radical excision, if possible, followed by adjuvant chemoradiation therapy. An aggressive surgical approach can yield long-term survival in some patients.

Abstract no: 1738

Ultrasonography for vocal cord mobility after Paediatric cardiac surgery

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Objectives: Upper airway obstructions after paediatric cardiac surgery are not uncommon and have many reasons. Vocal cord paresis or paralysis is not unusual causes for airway obstruction or failure of extubation after cardiac surgery. In this study we aimed to evaluate the feasibility and accuracy of ultrasonography (US) assessment of the vocal cords mobility and compare it to fibre-optic laryngoscope (FL).

Methods: A prospective pilot study has been conducted in Paediatric Cardiac ICU (PCICU) from the 1 June 2009 - 31 July 2010. Patients who had cardiac surgery and manifested with significant signs of upper airway obstruction were subjected to US screening of vocal cords mobility followed by FL assessment. All operators were blinded to each other reports. Results of invasive (FL) and non-invasive (US) investigations were compared.

Results: Ten patients developed persistent significant upper airway obstruction after cardiac surgery and were included in the study. Their mean weight and age were (4.6+2.5) (2.7 - 9.4) kg and (126.4+162.4) (8 - 480) days respectively. All Patients were referred to bedside US screening for vocal cords mobility. The results of US were compared subsequently with FL findings. Results were identical in 9 (90%) patients and partially different in 1 (10%). 6 patients showed abnormal glottal movement while the other 4 patients demonstrated normal vocal cords mobility by FL. Sensitivity of US was 100% and specificity of 75%.

Conclusion: US assessment of vocal cord is simple, non-invasive and reliable tool to assess vocal cords mobility in the critical care settings. This screening tool requires skills that can be easily obtained.

Abstract no: 1742

Defining neurodevelopmental outcomes following mechanical circulatory support using Standardised Care Assessment and Management Plan (SCAMP) methodology

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Background: ECMO support for cardio respiratory failure increases survival but neurodevelopmental outcomes remain ill-defined. Currently no national/international level consensus on neurological follow-up exists.

Aims to:

- Establish a collaborative Standardised Clinical Assessment and Management Pathway (SCAMP) for neurodevelopmental outcome between ECMO centres in England; and
- Identify surveillance, screening and early interventions to improve the level of functional neurodevelopment, quality of life and family satisfaction in children post mechanical support.

Methods: Published literature, international recommendations and local guidelines were reviewed. Expertise from the fields of Neurology, Neuroradiology and Neuropsychology was sought. Consensus was evolved through a series of local and national specialist group meetings. A background position Abstract outlining prevalence, uncertainties in follow-up, and appraisal of available neuropsychological assessment was developed. Evidence-based management algorithms were agreed incorporating plausible hypotheses pertaining to "knowledge gaps". A framework for cyclical analysis allowing variability in outcomes to emerge alongside refinements in care and resource utilisation was defined.

Results: The incidence of neurodevelopmental sequelae is 20 - 35% in neonatal populations and up to 50% in children supported post cardiac surgery with limited literature on paediatric respiratory ECMO patients. Risk factors for neurological injury have been identified, however few are modifiable. Neuro-imaging can help categorise risk but cannot predict the degree of neuro-disability. An algorithm was developed after consensus meetings between ECMO centres in England standardising baseline assessment, follow-up, neuro-imaging and sequential, age-appropriate, neuropsychological testing. Multiple plausible outcomes for future evaluation based on prospectively collected data were identified.

Conclusion: There is a clear need for uniformity in early identification, risk evaluation and structured follow-up of these children. Timely, relevant and nationally resourced tests may minimise neurological morbidity and maximise potential by the introduction of early interventions. Using SCAMP methodology, it is possible to seek national consensus, formulate evidence based practice and achieve a national framework to provide the longitudinal screening of neurological deficits.

Abstract no: 1754

Critical ultrasound, the new essential skill in paediatric cardiac ICU (PCICU)

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With the recent introduction of high-quality, reasonably priced, and completely portable neonatal ultrasound machines, a new paradigm shift also emerged in the philosophy on ultrasound imaging in PCICU which is one of "critical ultrasound". This is a shift from an organ-based, systematic, comprehensive exam done by radiologists to a new concept of a problem-based, goal-directed, focused, multi-organ, time-dependant exam done by the treating neonatologist. The new paradigm is not trying to describe an organ pathology but rather involves "focused, simple yes/now" exams for the airway, lung, heart, abdominal or limbs which aim to answer specific clinical problems (like hypoxia, hypotension, etc.). These are performed not only for diagnosis but also for monitoring the management of the critically ill paediatric cardiac patient.

The presentation will give the results of 4 years' experience at our centre with regard to this new essential skill in PCICU in obtaining hour-by-hour information to help the management of the critically ill paediatric cardiac patients, in addition to the multiple procedures that was guided by ultrasound such as vascular access, lumbar puncture or pleural tap. It will also shed light on its important application in the telemedicine filed.

Abstract no: 1765

Identifying the risk factors for chylothorax following cardiac surgery in children with congenital heart disease

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Background: Chylothorax is a rare, but well recognised complication following cardiac surgery in paediatric patients with congenital heart disease (CHD).
Materials and methods: We retrospectively studied the paediatric patients with CHD that developed chylothorax following cardiothoracic surgery at the Yorkshire Heart Centre. Data regarding the age, diagnosis, type of surgery, management and outcome were collected from the cardiac database and the dietetic records of the department over a 7 year period (July 2005 - June 2012).
Results: A total of 2 290 cardiothoracic operations were performed in our centre in paediatric patients with CHD during the above period. Chylothorax complicated 117 of these procedures, an incidence of 5.1% (95% CI 4.2% - 6%). The age ranged from 1 day - 14 years: 59% (<1 year), 31.6% (between 1 - 5 years), and the rest were older. The incidence of chylothorax was higher following the repair of Tetralogy of Fallot (n=22, 18.8%); Atrioventricular Septal Defect Repair (n=16, 13.7%); Glenn (n=14, 12%); Ventricular Septal Defect closure (n= 11, 9.4%); arch repair (n=11, 9.4%;, arterial switch (n=8, 6.8%); Fontan (n=6, 5.1%); and Totally Anomalous Pulmonary Venous Drainage (n=5, 4.3%). Previous cardiac surgery was performed in 40 (34.2%) patients. Median sternotomy was the approach in 103 (88%) patients whereas a left thoracotomy was performed in 14 (12%). There was no difference in the percentage of patients requiring further treatment with octreotide (n=29, 28.2% for the median sternotomy group, n=4, 28.6% for the left thoracotomy group). Death occurred in 14 patients, 12<1 year of age.
Conclusions: Younger age, median sternotomy and certain types of operations (TOF, AVSD repair, Glenn) seem to constitute risk factors for the development of chylothorax. Increased mortality was observed in infants. The type of sternotomy did not correlate with the need for the use of octreotide.

Abstract no: 1776

Ultrasound-guided vascular access in critically ill cardiac children

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Vascular access in the paediatric age group is a challenging procedure especially in compromised children and those who require multiple vascular cannulations. Paediatric critical cardiac patients are particularly in frequent need of vascular access. We reported our experience in vascular access under ultrasound guidance in children with congenital heart disease and we discussed the technique of line insertion and its difficulties in small infants.
Methods: In paediatric cardiac intensive care unit we enrolled prospectively all the trials of vascular access (central lines or arterial lines) guided by ultrasound from January 2010 - September 2010. Age, weight, the time from first needle puncture to wire insertion, site of insertion, number of attempts, type of the line and complications were documented.
Results: 77 vascular access trials were performed in 43 patients. They included 15 arterial and 62 venous cannulations (32 femoral and 30 internal jugular veins). Mean age and weight of patients were 15 months (6 days - 11 year, median 2.5 months) and 7.2kg (2 - 46kg, median 3.8) respectively. Success rates were 93% and 95% for arterial and venous cannulation respectively. Mean time from first needle puncture to wire insertion was 3.9 minutes (0.5-15 minutes, median 2 minutes). 55 central line cannulations (75%) were successful from the 1st puncture, 17 (23%) were successful from the 2nd puncture and 1 case (2%) required 3 punctures. Lower body weight did not affect success rate as 30 patients (45%) were less than 3.5 kg with 96.6% success cannulation rate. There were no associated complications.
Conclusion: Ultrasound-guided vascular cannulation in critically ill paediatric patients is very useful. It is associated with high success rate and minimal complications.

Abstract no: 1779

Stress response and stem cells mobilisation in patients with congenital heart disease undergoing surgical correction

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Stem cells can be mobilised by many stressors accompanying correction of CHD (tissue damage, ischemia, hypoxia, hypothermia, inflammatory response) and take part in specific regeneration processes. We looked at the hematopoetic stem cells (HSC), mesenchymal stem cells (MSC), endothelial progenitor stem cells (EPC) and very small embryonic-like cells (VSELs) mobilisation in patients with CHD undergoing surgical correction.
Methods: Blood samples were drawn before surgery, during the procedure, and 4, 8 12 and 24 hours after the surgery from 21 children (aged 8 days - 10 years). Numbers of HSC, MSC, VSELs, and EPCs were measured. The image stream methods were used to identify stem cells. Relevant statistical methods were used and p=0.05 was considered as significant.
Results: The level of VSELs (p=0.0006) EPC (p=0.02) and HSC (p=0.01) mobilisation before the operation was related to younger age of the patient. During the operation significantly greater mobilisation of HSC was noted in younger patients, whereas during the post-operative period significant correlation of VSELs (0.023) and EPC (0.03) with older age at operation were noted. Post-operatively, level of EPC mobilisation was positively correlated with ECC time (0.03) and aortic cross clamp time (p=0.03) and negatively correlated with catecholamine index (r=-0.87, p=0.009). In patients with preoperative cyanosis significantly larger mobilisation of HSC (p=0.014) and VSELs (p=0.03) was noted after correction of the defect.
Conclusions: Factors related to the pathophysiology of the defect can mobilise stem cells. In preoperatively cyanotic patients larger mobilisation of VSELs and HSC were noted in the post-operative period after correction of cyanosis. Age of the patient can influence stem cells mobilisation and in younger patients better mobilisation of stem cells was observed before the operation. During the postoperative period better response of VSELs and EPC was noted in older patients.

Abstract no: 1802

Combined ECMO and CRRT in children

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Background: Venous-arterial/Venous-venous extracorporeal circulatory membrane oxygenation (VA/VV-ECMO) is needed in case of severe respiratory and/or circulatory failure. Reported mortality rates for ECMO-treated paediatric patients are high and even higher when combined with renal failure (>80%). These children are often grossly fluid overloaded and oliguric. Successfully CRRT in infants depends on good vascular access which can be impossible to achieve. We therefore we have incorporated connections for CRRT apparatus as a standard in our paediatric ECMO circle.
Methods: Seven PICU patients (age median 10 (3 - 665) days; weight median 3.4 (2.9 - 10) kg). Six of the patients were on VA ECMO after surgery for congenital heart disease and 1 oncological patient with Aspergillum pneumonia was on VV-ECMO. We used the Prismaflex device (Gambro, Lund, Sweden). Dialysis filters were HF-20 filters except for 1 patient where M60 was used (Gambro Industries, Lyon, France). The dialysis filters were primed with blood apart from the M60 filter which was primed with fresh frozen plasma. Blood flow targeting 7.5 - 10ml/kg/min; modi CVVHDF/CVVHF using dialysis/effluent fluid doses targeting 2000ml/1.72m^2/hour. All patients received heparin infusion aiming at APTT range 60 - 80s. Both the in- and outlet connections for the blood flow to the Prisma apparatus were placed after the ECMO pump head and before the oxygenator to minimise the risk of air embolism.
Results: CRRT treatment time was median 89 hours; range 0.8 - 328 hours. A precise filter lifetime was not recorded but there was no report that a filter had to be stopped due to clotting. The CRRT treatment was without impact on haemodynamic parameters. We obtained intended negative fluid balance, was able to administer TPN and reduce azotaemia levels. Unfortunately all 7 seven patients died in hospital.
Conclusion: In infants CRRT using Prismaflex with HF20 and M60 filters inserted into the ECMO circle was technically feasible. Incorporation of preformed connections for CRRT in ECMO circles had no impact on ECMO treatment and provided steady blood flow for the CCRT.

Abstract no: 1807

Validation study of a clinical heart failure severity scoring scale in children, using brain natriuretic peptide and echocardiographic profiles

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Background: The New York Heart Association (NYHA) heart failure severity grading scale has stood the test of time in serving as a useful clinical grading scale for the severity of heart failure particularly in adults but has its limitations as a useful scale in children. The Ross grading scale on the other hand has its usefulness in infants for whom it was designed and it has no use in older children. The Ibadan Heart Failure Grading Scale (IHFGS) (Table 1), applicable in children (age 1 day - 12 years) derived from bedside elicitable parameters without the use of sophisticated tools has been designed. The severity grading scale needs to undergo validation studies involving the use of known "gold standards".

TABLE 1: Ibadan Heart Failure Grading Scale (IHFGS) for children

Parameters	0	1	2
Resting heart rate			
0 - 1 months	<160bpm	160 - 180bpm	>180bpm
>1 - 24 months	<140bpm	140 - 160bpm	>160bpm
>2 - 5 years	<130bpm	130 - 150bpm	>150bpm
>5 -10 years	<120bpm	120 - 140bpm	>140bpm
>10 - 12 years	<100bpm	100 - 120bpm	>120bpm
Resting resp. rate			
0 - 1 month	<60cpm	60 - 80cpm	>80cpm
>1 - 24 months	<40cpm	40 - 60cpm	>60cpm
>2 - 5 years	<30cpm	30 - 40cpm	>40cpm
>5 - 10 years	<28cpm	28 - 36cpm	>36cpm
>10 - 12 years	<25cpm	25 - 30cpm	>30cpm
S_3 or diastolic rumble	Absent	Present	Marked
Capillary refill time	<2sec	2 - 4sec	>4sec
Tender haematomegaly	<2cm	2 - 4cm	>4cm

No HF: 0 - 2. Mild HF: 3 - 4. Mod. HF: 5 - 6. Severe: 7 />7. HF: heart failure

Methodology: A clinical team using the IHFGS, an echocardiographic team using 2-D and M-mode derived standard parameters and a clinical chemistry team measuring plasma BNP levels, evaluated 100 consecutively recruited children aged 1 - 120 months with a clinical diagnosis of congestive heart failure from a variety of causes along with 100 age and sex matched apparently healthy controls. Each team, blinded to the findings of other teams and separate from the primary care team evaluated each child within half an hour of the others at presentation. Findings were compared between study subjects and those of the controls. Specificity and sensitivity of the IHFGS were determined. Correlation coefficients were determined between the IHFGS scores and the echocardiographic parameters and plasma BNP levels correcting for age and body surface area and other confounding variables.
Results: Causes of heart failure included acute respiratory infections (35%), severe anaemia (30%); congenital heart disease (25%) dilated cardiomyopathy (10%). High coefficient of correlation +0.85 between IHFGS and plasma BNP levels and echocardiographic parameters were recorded. High specificity and sensitivity were recorded in respect of the IHFGS definition of no HF, and the three grades of HF.
Conclusion: The IHFGS is proposed for use in grading severity of heart failure in children especially where sophisticated facilities are lacking.

Abstract no: 1834

Surgical repair of hypoplastic distal aortic arch and coarctation in neonates: A tailored enlargement technique

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Background: Extended end-to-end anastomosis or reversed subclavian flap angioplasty are established techniques to correct hypoplastic distal aortic arch associated with coarctation (CoA). Residual gradients, particularly in neonates, are frequent due to the presence of a "crestlike" protrusion of the superior aortic wall between the origins of the arch vessels.
Methods: From 1998 through 2011, 91 consecutive neonates (median age, 9 days) underwent distal arch hypoplasia repair and CoA resection or type A IAA (n=3) using a technique combining carotid-subclavian angioplasty and extended end-to-end anastomosis (Figure 1). There were 32 patients with isolated lesions (group 1), 32 associated VSD (group 2) and 27 associated complex cardiac lesions (group 3). Mean follow-up was 60 months (0.2 - 159).
Results: Repair was performed via left thoracotomy in 97%. There were no instances of paraplegia. Five patients died during index admission (5.5%), all in group 3 and following repair of the associated cardiac anomaly. Seven deaths were recorded at follow-up, all resulting from associated lesions. Actuarial 5-year survival for the entire cohort was 86% (97% in group A, 93% group 2 and 65% in group 3). Recurrent CoA (invasive gradient >20mmHg) developed in 11 patients (12%), all but 1 successfully corrected by balloon dilation. No residual gradients across the reconstructed arch segment were detected. Freedom from any reintervention (PTA or surgery) at 5 years was 85%. No patient was on antihypertensive drugs at last follow-up.
Conclusions: This combined technique to correct hypoplastic distal arch and CoA results in acceptable mortality and low recurrence in neonates. It preserves the left subclavian artery and enhances a tailored surgical enlargement of the distal arch diameter, precluding the late onset of arterial hypertension.

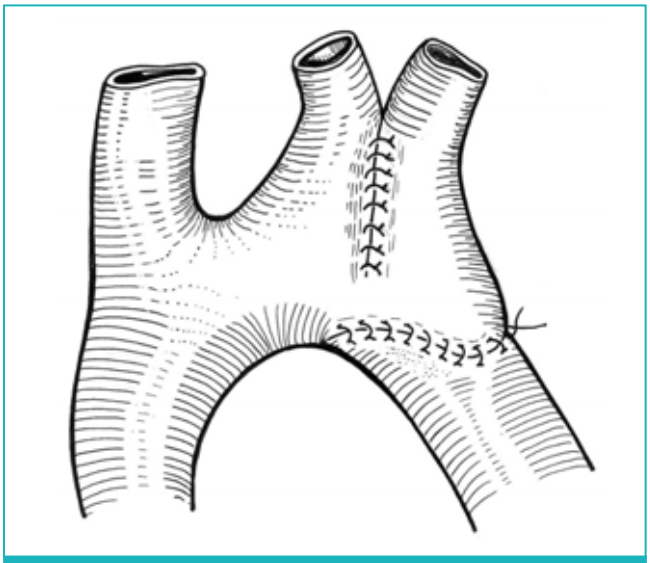

FIGURE 1: technique combining carotid-subclavian angioplasty and extended end-to-end anastomosis.

Abstract no: 1837

Coordinating care for long term post-operative PICU cardiac patients

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Introduction: Cardiac patients in the PICU at the Royal Children's Hospital (RCH) Melbourne account for approximately 50% of bed occupancy. Of these patients >50% have a length of stay (LOS) >7 days. The PICU care manager role is a nursing position introduced in 2008 to provide coordination and consistency in communication and care for all long term and complex PICU patients. The following case study of a complex post-operative cardiac patient, provides an example of how the role supports the complex care needs of a patient during the PICU admission.
Method: A 13-year-old with a past history of Tetralogy of Fallot (ToF) and Alagille Syndrome, presented to the PICU post R) and L) pulmonary artery plasty and redo of RV to PA conduit of which a L) main bronchial injury was sustained intra-operatively. Surgical complications and projected prolonged ICU stay led to the inclusion as a managed care patient. Support to enable consistent and coordinated care is tailored to specific patient needs according to the age of the patient, surgical pathway, illness acuity, social situation and post-operative complications. A close working relationship with all members of the multi-disciplinary team including medical, nursing and allied health, along with pre-established professional relationships and processes, enable the PICU care manager to be a link between patient and family and the hospital team.
Results: Consistent communication was maintained with weekly multi-disciplinary team minuted meetings; detailed daily and weekly bedside care plans and daily booked interpreter sessions (English was 2nd language). Complex care needs were met with regular bedside support including care plans for allied health sessions, ventilation weaning, analgesia and sedation weaning, mental health management and inotrope rotation management. Bedside education, designated nursing care teams and the provision of clinical support were all instigated for ongoing nursing consistency of care.
Conclusion: Care coordination instigated and supported by a singular service for complex and long term PICU patients at RCH provides a consistent and focal service for holistic and thorough patient management. The role enables a singular service provider overview of the patient to improve patient-centred care and to provide the ongoing perspective for all teams (which are often varied due to shift structure) to utilise.