ISSN 2071-4602 (Online)

SA HEART®

Journal of the South African Heart Association

2025
Volume 22 Number 4

Congress of the South African Heart Association

UNIFYING HEARTS AND MINDS
17–19 October 2025

Editorial | Memoriam | Presidents welcome | Message from the Congress Convenor | Meet the International Speakers | Speakers presentation highlights | Congress Abstracts | ECG Quiz | Cardiac Imaging Quiz

SA HEART®
Journal of the South African Heart Association
2025
Volume 22 Number 4

Front cover:
A rare blood moon over South Africa during a total lunar eclipse, where Earth's atmosphere refracts red light onto the Moon. Such events occur roughly every 2.5 years at a given location.
Photo: Dr Piyush Meel

Publisher:
Medical and Pharmaceutical Publications (Pty) Ltd. trading as
Medpharm Publications

Editorial
My reflections on the 2024– 2025 South African Heart® Journal year 206
R Meel

Memoriam
In Memoriam — Professor Patrick Commerford (1947–2025) 208
M Ntsekhe

Welcome Note
Presidential welcome address – SA Heart® Congress 2025 209
M Mpe

Congress Conveners Message
Welcome to the SA Heart® Congress 2025 210
A Vachiat

Meet the International Speakers 211

Speakers Presentation Highlights 213

Index of Abstracts - SA Heart® Congress 2025 218

Abstracts - SA Heart® Congress 2025 219

ECG Quiz 242
RS Millar and A Chin

Answer to ECG Quiz 243

Cardiac imaging quiz 247
R Meel and B Cupido

Instructions for authors 249

EDITORIAL

Editor-in-Chief, Professor Ruchika Meel
Department of Internal Medicine, Faculty of Health Sciences, University of the Witwatersrand and Mediclinic Sandton Hospital, Johannesburg, South Africa

My reflections on the 2024–2025 South African Heart® Journal year

The 2024–2025 editorial year in review for the SA Heart® Journal reflects a dynamic and impactful year in cardiovascular research and clinical practice. Following a brief pause during 2023–2024, the journal successfully returned to regular publication with 4 consecutive issues. Each edition was anchored around key themes: the congress issue (*Cardiology Connections*), valvular heart disease, coronary artery disease, heart failure, and training and research. Educational features, such as the electrocardiography quiz and cardiac imaging quiz, remained integral, continuing to enhance clinical learning and engagement.

The congress issue, featuring the "cardiology connections" theme at the 2024 SA Heart® Congress, spotlighted the vital role of interdisciplinary collaboration in advancing patient care. The "access to healthcare imbizo" was a standout, fostering dialogue between clinicians, funders, and policymakers. A landmark addition to the scientific programme was the inaugural themed session on rheumatology and cardiac disease, which highlighted the complex interplay between systemic inflammation and cardiovascular pathology. Notably, this session marked a historic moment in the Congress's history, with most speakers being female clinicians and researchers – a powerful testament to the rising influence and leadership of women in cardiovascular science.

Valvular heart disease continues to pose a significant clinical challenge in South Africa, where the combined burden of rheumatic, congenital, and degenerative valve pathology reflects both historical and emerging trends. This themed December 2024 issue of the SA Heart® Journal brought together a compelling collection of research, case series, and expert perspectives.

The March 2025 issue of the SA Heart® Journal presented a focused and timely examination of coronary artery disease (CAD) within the South African healthcare landscape. Supported by a guest editorial titled *A contemporary perspective on coronary artery disease in sub-Saharan Africa* by K McCutcheon, the issue explored the shifting epidemiology of CAD, driven by urbanisation, evolving lifestyle patterns, and entrenched health disparities. Based on data from the Tygerberg Registry of Acute Coronary Syndromes (TRACS), the Editor's Pick article titled *The hub and spoke model: Is it out of reach in South Africa?* offered a critical analysis of the feasibility and clinical impact of implementing a hub and spoke model for acute coronary syndrome care.

The June 2025 issue of the SA Heart® Journal centred on the growing burden of heart failure in South Africa, framed by a guest editorial titled *Living with heart failure* by S Allie and K Sliwa. The editorial emphasised the urgent need for holistic, patient-centred care models, particularly in low-resource settings, where comorbidities and late presentations complicate management. This issue reinforced the need for multidisciplinary collaboration, early diagnosis, and locally adapted

guidelines to improve outcomes in heart failure care across South Africa's diverse healthcare landscape. A special tribute article by former copyeditor Ilze de Kock celebrated 20 years of collaboration within the SA Heart® Journal, acknowledging its evolution and contributions to cardiovascular science in the region.

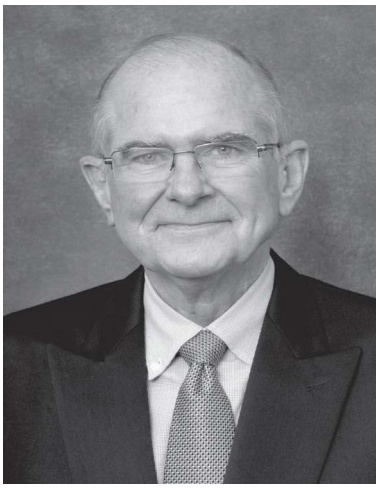
The September issue of the journal emphasised training and research in the South African environment from the perspectives of clinical cardiology and clinician scientists. The articles highlighted the dire need for training posts and the shortfalls in the current training programmes in cardiology in the country. We also emphasised the barriers faced by clinician scientists in South Africa and their potential impact on clinician scientist career pathways. In this issue, we introduced additional educational content in the form of the South African Society of Cardiovascular Intervention (SASCI) and Mayo Clinic fellows webinar, and Statistics Made Easy.

As the SA Heart® Congress 2025 in Sandton approaches, themed "unifying hearts and minds", the journal continues to champion clinical excellence and compassionate care. This year's congress features a comprehensive scientific programme enriched by the contributions of international speakers, offering valuable global perspectives. Further, we pay tribute to Professor Patrick Commerford, a towering figure in the South African Cardiovascular space.

The journal reaffirmed its commitment to being a robust platform for cardiovascular medicine across disciplines, including adult and paediatric cardiology, cardiothoracic surgery, imaging, and basic science. We gratefully acknowledge the dedication of our editorial team, publisher, peer reviewers, readership, and authors, whose collective efforts uphold the journal's quality and relevance. As we celebrate 20 years of the SA Heart® Journal, we honour its legacy and look ahead with a renewed commitment to inclusivity, collaboration, and advancing cardiovascular science.

Ruchika Meel
Editor-in-Chief, SA Heart® Journal

IN MEMORIAM — PROFESSOR PATRICK COMMERFORD (1947–2025)



It is with deep sadness that we announce the death of **Professor Patrick Commerford**, who passed on Thursday 25th September, 5 days before his 78th birthday.

Professor Commerford was a towering figure in South African cardiology, having serviced as President of the SA Cardiac Society (1990–1994) and later as the first Vice President of SA Heart® after its formation in 1997. He was the Helen and Morris Mauerberger Professor of Cardiology UCT, and Head of the Cardiac Clinic at Groote Schuur Hospital, where he trained many cardiologists who went on to excel locally and abroad.

Professor Commerford's contributions extended beyond South Africa, serving on multiple international steering committees for landmark cardiovascular trials and most recently as Editor-in-Chief of ***The Cardiovascular Journal of Africa***. He played a vital role in the development of the South African Medicines Formulary, and provided guidance to national and international health bodies on clinical research and regulation. His life's work stood at the intersection of scholarship, service and a deep concern for public health. His legacy is one of excellence, generosity, and humanity. He will be remembered with deep affection and respect, and profoundly missed by all who had the privilege of knowing him.

He is survived by his devoted wife, Anita, their four children, and seven beloved grandchildren. His family was a source of great joy and strength to him, just as he was to them.

Rest peacefully, Professor Commerford.

Prof Mpiko Ntsekhe
MD, PhD. FCP (SA), FACC, FESC, FRSSAf, MASSAf
The Cardiac Clinic Groote Schuur Hospital/University of Cape Town
SA EMU on Intersection of infectious and Non-Communicable Diseases
University of Cape Town, South Africa

WELCOME NOTE

Dr Martin Mpe
President, South African Heart Association (SA Heart®)
Raslouw Private Hospital and Netcare Pholoso Hospital, South Africa

Presidential welcome address – SA Heart® Congress 2025

Dear colleagues, delegates, and friends,

It is both a great honour and a personal privilege to welcome you to the 25th Annual SA Heart® Congress, a landmark event in our history. This year, we proudly celebrate a quarter century of cardiovascular excellence; 25 years of advancing heart health, scientific innovation, and professional collaboration across South Africa and beyond.

Our 2025 congress theme, "unifying hearts and minds", resonates deeply with the evolving landscape of cardiovascular care. It captures our shared mission to bridge scientific progress with holistic patient care, and to align multidisciplinary efforts – from research to bedside – toward impactful, patient-centred outcomes.

This milestone congress is set against the vibrant backdrop of Johannesburg's Sandton Convention Centre, from 17 to 19 October 2025, and will feature an exceptional programme designed to both challenge and inspire. Together, we will explore cutting-edge cardiovascular research, engage in immersive skills-based workshops, and exchange insights on healthcare innovation and systems strengthening. Importantly, we will also reflect on our journey as a community, how far we've come, and where we aspire to go.

We are deeply honoured to welcome an illustrious international faculty, including global thought leaders, such as Prof Gersh and Dr Roubin, whose contributions have significantly shaped the course of modern cardiology. Their presence, along with our outstanding national experts, ensures that this year's congress will serve as a world-class forum for learning, discussion, and transformation.

As President of SA Heart®, I am deeply mindful of the responsibility and privilege of stewarding this legacy. Our association remains committed to upholding scientific integrity, inclusivity, and leadership development. This congress reflects those values, whether you are a cardiologist, cardiothoracic surgeon, allied health professional, nurse, researcher, or industry partner: your presence and voice matter.

I extend my heartfelt thanks to the Congress Organising Committee, to our Special Interest Groups, to our industry sponsors, and most importantly, to you, our members and delegates, who are the lifeblood of SA Heart®. Your continued engagement ensures that our association remains a powerful driver of cardiovascular excellence.

Let us use this momentous occasion not only to exchange knowledge but to celebrate the power of collaboration. Together, let us unite hearts and minds to advance the health of our nation and reaffirm our shared commitment to improving lives through cardiovascular science.

Welcome to the SA Heart® Congress 2025.
Welcome to 25 years of shared impact.

Warm regards,
Dr Martin Mpe

CONGRESS CONVENERS MESSAGE

Dr Ahmed Vachiat
Wits Donald Gordon Medical Centre, Netcare Milpark Hospital, Parktown, Johannesburg, South Africa
Congress Convenor, SA Heart® 2025

Welcome to the SA Heart® Congress 2025

We would like to welcome all our colleagues in the cardiology community to the 25th Annual SA Heart® Congress in Johannesburg. This year's theme is "unifying hearts and minds". With this shared vision, we wish to expand our knowledge of the link between heart and mind in the ever-evolving field of cardiology. The congress will take place at the Sandton Convention Centre in Johannesburg from 17 to 19 October 2025.

From mental health to stress cardiomyopathy, artificial intelligence in cardiology, and an excellent paediatric parallel programme addressing conditions like diabetes, obesity, and injectables, to interesting cases and complications, we will explore a variety of topics that reflect both the current state and the future horizon of our profession.

We anticipate with excitement a vibrant, local, and international faculty. We welcome guests from Switzerland, Italy, Africa, and the United States, along with great support from our local experts, who have proven time and again to be world-class. The international speakers this year include Profs. Burri (President-elect of EHRA), Gersh, Roubin, McDaniel, Volpe, and Dr. Majani. The Heartbeat Stage, featuring insightful talks and engaging presentations, was a great addition to the congress last year, and we will continue this link with industry and our delegates. This year, we intend to have an interactive SA Heart® quiz on Saturday evening at the Heartbeat Stage.

Cardiovascular disease continues to be one of the leading causes of mortality worldwide. Despite the many breakthroughs we have achieved – from revolutionary imaging technologies to life-saving interventions – our challenges remain vast. Nevertheless, so too is our potential when we come together, not only as scientists and clinicians, but as collaborators and humanitarians. Equally important as the knowledge we share is the spirit in which we gather. "Unifying hearts and minds" invites us to foster greater collaboration across specialities, institutions, and nations.

In an era defined by rapid scientific progress and digital connectivity, it is vital that we also cultivate connection at the human level – sharing not only our expertise, but also our experiences, challenges, and aspirations. The pandemic tested our systems and our spirits, but it also underscored the critical importance of cardiovascular health and the integral role of unity in crisis response. We emerged more agile, more connected, and more aware that healing is both a medical and moral imperative.

In that light, our theme takes on even deeper meaning. To unify hearts is to commit to patient-centred care that recognises not just conditions, but people. To unify minds is to harness collective intelligence, break down silos, and engage in meaningful, multidisciplinary collaboration. Let us pursue not only excellence in science but empathy in practice. Let us unify our hearts and minds to share in the vision of SA Heart® – to improve cardiovascular care for all living in South Africa.

Dr Ahmed Vachiat

SPEAKERS' BIOGRAPHIES

Meet the International Speakers

GS ROUBIN

MBBS, MD, PhD, FRACP, FACC, FAHA, FSCAI, MD (Hons Causa)

Dr Roubin is an internationally renowned interventional cardiologist recognised for his groundbreaking work in the development of coronary stenting and the first Food and Drug Administration (FDA)-approved coronary stent, pioneering work in carotid stenting, embolic protection devices, large-bore vascular closure, and, most recently, catheter-based electrocautery technology for transcatheter aortic valve replacement (TAVR) and myomectomy procedures. He is a native of Queensland, Australia, and moved to the United States in 1984 to work with percutaneous transluminal coronary angioplasty (PTCA) pioneer Andreas Gruentzig.

Dr Roubin has published more than 280 papers in peer-reviewed journals, edited 3 textbooks on interventional cardiovascular medicine, coronary, and carotid artery stenting, and contributed to 20 textbooks on interventional cardiology and vascular medicine. His book, ***The first balloon-expandable coronary stent: An expedition that changed cardiovascular medicine*** (University of Queensland Press), is available on amazon.com. He has been pivotal in the success of several biotechnology startup businesses. He is the named inventor on 10 issued United States and European patents, and 41 additional patent applications worldwide. He lectures extensively in the United States and abroad and has received numerous awards for his notable contributions to cardiovascular medicine.

N MAJANI

PhD, MSc, MMed, MD

Dr Majani is a Consultant Paediatric Cardiologist and Director of Clinical Auditing and Quality Assurance at the Jakaya Kikwete Cardiac Institute (JKCI) in Dar es Salaam, Tanzania. She is part of the pioneering team that established paediatric cardiac surgery services in Tanzania and led the country's first large-scale newborn screening programme for critical congenital heart disease (CCHD).

Dr Majani holds a PhD in cardiovascular research from Utrecht University, Netherlands, and an MSc in epidemiology. She also completed her fellowship in paediatric cardiology at Wolfson Medical Centre in Israel. Her academic and professional work focuses on health equity, early detection, and the strengthening of child heart disease care systems across Africa.

A passionate advocate for local capacity building, Dr Majani leads training programmes to empower healthcare professionals in paediatric cardiac care. She collaborates widely with international organisations to facilitate knowledge exchange, promote resource-sharing, and address gaps in cardiac services in low-resource settings.

Her leadership has earned national and international recognition. She is frequently invited to speak at global conferences, where she presents innovative strategies for improving congenital heart disease outcomes in underserved populations. In addition to her clinical and academic work, Dr Majani plays an active role in fundraising initiatives to support children with heart disease.

She is the cofounder of Heart Team Africa Foundation, a Tanzania-based, non-governmental organisation that provides financial assistance and access to life-saving care for children and adults with cardiovascular diseases. Dr Majani is married and a proud mother of three children.

BJ GERSH

MBChB, DPhil, FRCP, MACC, PhD (honoris causa)

Born in Johannesburg, South Africa, Professor of Medicine at Mayo Clinic College of Medicine, Consultant in Cardiovascular Diseases and Internal Medicine, Dr Gersh received his MB, ChB, from the University of Cape Town in South Africa. He received his Doctor of Philosophy degree from Oxford University, where he was a Rhodes Scholar.

Dr Gersh's broad interests include the natural history and therapy of acute and chronic coronary artery disease, clinical electrophysiology, and, in particular, atrial fibrillation, clinical trials methodology, sudden cardiac death and syncope, cardiac stem cell therapy, the design and analysis of randomised trials, the epidemiology of cardiovascular disease in the developing world, and the impact of socio-economic status on cardiovascular disease. He has approximately 1 357 publications (1 198 manuscripts and 150 book chapters) with a 163 h-index. In 2014 and 2015, he was named in the Thomson Reuters list of individuals with the greatest number of cited scientific papers from 2002 to 2012. Dr Gersh is the editor of 15 books and is on the editorial board of multiple journals, including ***Circulation*** (Senior Advisory Editor), ***Journal of the American College of Cardiology*** (Guest Editor), ***Nature Cardiovascular Medicine***, and the ***European Heart Journal*** (Deputy Editor). He is also Editor-in-Chief of ***UpToDate in Cardiology***, and a Consulting Editor for ***Circulation Research***. Dr Gersh is a member of the Association of University Cardiologists and the Circulatory System Devices Panel of the Medical Device Advisory Committee of the Food and Drug Administration (FDA), ending 30 June 2028.

He is an Honorary Member/Fellow of the South African Heart Association, the Sociedad Chilena de Cardiología Y Cirugía Cardiovascular, the Cardiological Society of India, and the British Cardiovascular Society. He is an Honorary Professor of Medicine at the University of Cape Town, South Africa, and an Adjunct Professor in the Department of Medicine at Duke University School of Medicine. In 2019, Dr Gersh was appointed as an Honorary Clinical Professor at the Centre for Clinical Pharmacology, William Harvey Research Institute, Queen Mary University of London.

Dr Gersh was the 2004 recipient of the Distinguished Achievement Award of the American Heart Association (AHA) Council of Clinical Cardiology and the 2007 recipient of the American College of Cardiology (ACC) Distinguished Service Award, the Hatter Award for "Advancement in the Cardiovascular Science" from University College London and the University of Cape Town in 2009 and 2016. He received the degree of PhD (honoris causa) from the University of Coimbra, Portugal, in 2005. Dr Gersh is the recipient of the 2012 James B. Herrick Award of the AHA, and in 2013, he was designated Master of the ACC. At European Society of Cardiology (ESC) in 2013, he was designated as 1 of the 4 "Legends of Modern Cardiology". Dr Gersh is the 2015 recipient of the Mayo Clinic Distinguished Alumni Award, the René Laennec Invited Lecture and Silver Medal of the ESC (2010) and received the Gold Medal of the ESC in August 2016. Dr Gersh is the recipient of the 2016 Distinguished Scientist Award of the American Heart (AHA). In 2020, he was named a highly cited researcher by Web of Science. Dr Gersh is the recipient of the 2023 AHA Master Clinician Award.

To date he has over 95 peer-reviewed published articles.

Speakers presentation highlights

Dr Gary Roubin
MBBS, MD, PhD, FRACP, FACC, FAHA, FSCAI, MD (Hons Causa)
Interventional Cardiology, Cardiovascular Disease
Birmingham, Alabama, United States of America

HOW STENT TECHNOLOGY REVOLUTIONISED THE TREATMENT OF CARDIOVASCULAR DISORDERS: FROM CORONARY AND VALVE DISEASE, TREATMENT OF PERIPHERAL VASCULAR DISEASE (PVD), TO STROKE PREVENTION AND TREATMENT

Session: Carotid intervention: How stent technology revolutionised the treatment of cardiovascular disease: from the brain to the feet

Andreas Gruentzig launched the discipline of Interventional Cardiology with his groundbreaking work on peripheral and coronary balloon technology. Coronary and peripheral stent technology evolved on "his shoulders" and his balloon.

Roubin and Gianturco developed the first balloon-expandable coronary stent. The science and clinical success of this metal prosthesis in the delicate, constantly moving coronary vessels engendered confidence in stent technology. Palmaz enhanced this work with his balloon-expandable, laser-cut mesh. Gianturco also developed the first clinically applied self-expanding stent. All work that underpinned the remarkable progress made in stent treatments for aortic disease – aneurysm, dissection, and a myriad of stent graft and self-expanding stent devices.

Today, the clinical application of stent technology extends from critical limb ischaemia to disabling claudication, renal and mesenteric stenosis, treatment of acute myocardial infarction and angina, aortic, mitral and tricuspid valve disease, left atrial appendage closure, acute stroke treatment with stent thrombus retrievers, to stroke

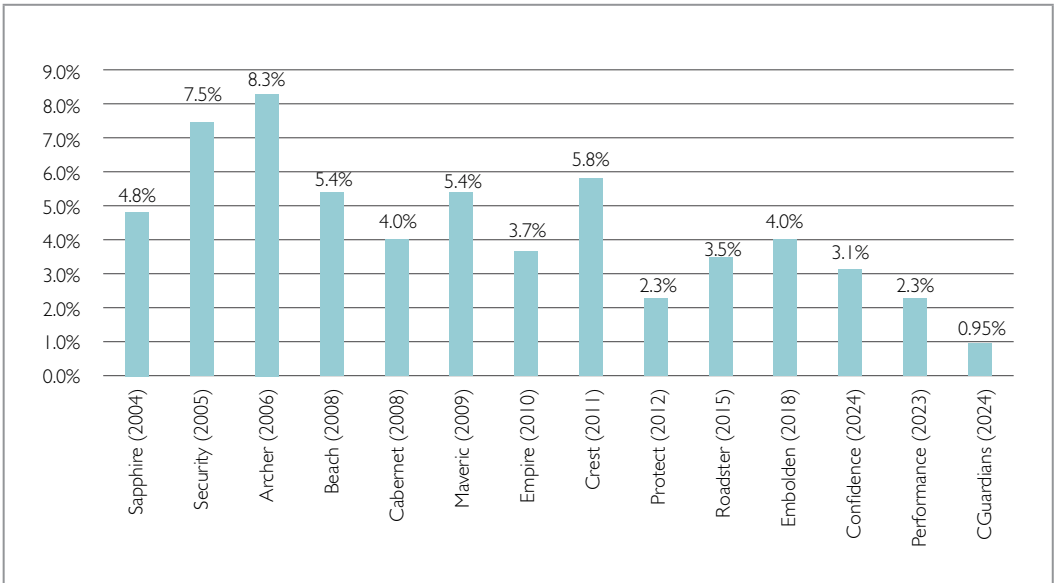


Figure 1: Death, stroke, myocardial infarction (DSMI) rate through 30 day follow-up post carotid artery stenting

prevention with carotid stents. Scientific and clinical progress in all areas of the vasculature has been outstanding; however, none more than the application of carotid stenting to prevent stroke. Over the last 30 years, the evolution of carotid stent technology and technique, backed by rigorous clinical trials, has resulted in a uniquely safe and less invasive treatment for critical carotid artery disease.

The currently unprecedented outcomes for the stenting of high-grade asymptomatic carotid stenosis – 0.4% risk of death/stroke and myocardial infarction – change the therapeutic paradigm (Figure 1). The landmark NHLBI CREST 2 trial will provide comparative outcomes in the cohort of patients managed with optimal medical management alone.

LIFETIME MANAGEMENT OF TAVR PATIENTS – THE EVOLVING SCIENCE IN LEAFLET TECHNOLOGY AND MANAGEMENT TO OPTIMISE PATIENT OUTCOMES

Session: Lifetime management of TAVI valves: Methods to prolong leaflet function

Percutaneous TAVR treatment of aortic stenosis has revolutionised the management of this important disorder. Rigorous science has demonstrated that this interventional, less invasive approach is as safe and effective as surgical aortic valve replacement (SAVR). TAVR is not only effective in patients at high risk for surgery, but also shows efficacy for younger, low-risk patients. Recent evidence also indicates that previously considered benign stages of aortic stenosis have poorer outcomes than previously thought. Accordingly, a dramatic increase in the use of TAVR has occurred in an increasingly younger patient population.

Consequently, there has been an intense interest in the bioprosthetic valves' longevity for both TAVR and SAVR. Good data demonstrate that bioprosthetic valve dysfunction for both TAVR and SAVR is comparable. These valves may deteriorate in as little as 4 years, although current outcome data suggest acceptable longevity for 8–12 years or longer. Fortunately, a percutaneously placed second prosthesis, either transcatheter aortic valve (TAV)-in-TAV or TAV-in-surgical aortic valve (SAV), can be done safely and effectively in the majority of failing valves.

Valve modification to enhance the safety, efficacy, and longevity of subsequently placed prosthetic valve leaflets is undergoing extensive study. Coronary obstruction and/or access caused by the prior leaflets is a potential immediate problem. Nonetheless, there is an important question of subsequent valve function and the effect of the thickened and often calcified leaflets that are currently retained behind the second stent/valve "cage". Included in the issues being studied are the deformity of the second prosthesis affecting leaflet function, the effect of the still biologically active residual leaflets (Sodium Fluoride labelled with fluorine18 [18F-NaF] positron emission studies) on the new leaflets, the effect of protruding calcium nodules on new leaflet longevity, and a potential problem with the abnormal "neo-sinus" that is created.

Evolving technology has been developed to remove or modify these effects. This involves cutting and splitting the leaflets or percutaneously excising a large amount of the leaflet before transcatheter aortic valve placement. While currently focused on TAV-in-TAV and TAV-in-SAV procedures, this technology may evolve for use in native aortic valves prior to an index procedure.

Dr Naizihijwa Majani
PhD, MSc, MMed, MD
Consultant Paediatric Cardiologist and Director of Clinical Support Services, Jakaya Kikwete Cardiac Institute, Dar es Salaam, Tanzania
Senior Lecturer, Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania
Academic Collaborator, Utrecht University, The Netherlands

RESEARCH IN CHILDREN'S HEART DISEASE IN AFRICA
Session: Paediatric cardiology – Unifying hearts and minds

Despite being the most common birth defect globally, congenital heart disease (CHD) remains underdiagnosed, undertreated, and under-researched across most of Africa. This presentation will explore the current landscape of CHD research in African children, highlighting major gaps in data, equity, and health system integration. Drawing on landmark work from Tanzania, including the Tanzania POX Screening Study and the development of a paediatric cardiac surgery programme at Jakaya Kikwete Cardiac Institute (JKCI), the session will showcase how African-led research is transforming child survival. The talk will conclude with a proposed research agenda focused on early detection, longitudinal outcomes, quality of life, and sustainable local solutions.

QUALITY ASSURANCE IN PERI-OPERATIVE CARE
Session: Paediatric surgical and critical care pathways

This session will focus on how quality assurance frameworks can be effectively applied to improve outcomes in peri-operative care for children undergoing cardiac surgery in low-resource settings. Drawing from institutional experience at JKCI, the presentation will outline practical strategies to strengthen monitoring systems, clinical audits, multidisciplinary team coordination, and infection prevention in paediatric cardiac intensive care units (ICU). Emphasis will be placed on context-appropriate indicators, data use for continuous improvement, and how local leadership can drive culture change toward safer, more reliable peri-operative care.

NEWBORN SCREENING FOR CRITICAL CONGENITAL HEART DISEASE
Session: Innovations in neonatal cardiac diagnosis

Early detection of critical congenital heart disease (CCHD) remains a challenge in Africa, where routine postnatal screening is rare. This presentation shares Tanzania's experience in piloting the first large-scale implementation of pulse oximetry screening for over 10 000 newborns, highlighting the diagnostic yield, implementation feasibility, and frontline health workers' perspectives. The session will discuss lessons learned from integrating screening into routine maternal and newborn care, addressing barriers, and using data to advocate for national policy change. The experience underscores the importance of implementation science and systems thinking in making life-saving early diagnosis a reality.

Prof Bernard J Gersh
MBChB, DPhil, FRCP, MACC, PhD (honoris causa)
Professor of Medicine, Mayo Clinic College of Medicine, Minnesota, United States of America

THE "TWIN EPIDEMICS" OF HFPEF AND AF: EPIDEMIOLOGY AND MANAGEMENT
Session: The "twin epidemics" of HFpEF and AF: epidemiology and management

Regarding the epidemics of heart failure with preserved ejection fraction (HFpEF) and atrial fibrillation (AF), current demographic trends and risk factors point to a "perfect storm", with obesity playing a pivotal role. Obesity is integrally linked to HFpEF, with approximately 80% of individuals with HFpEF being either overweight or obese. The relationship is multifactorial, including interactions with comorbidities and hypertension, diabetes, sleep apnoea, and chronic kidney disease. Moreover,

the associations between obesity and AF incidence and prevalence in response to therapies are well-documented and indisputable. From the prognostic standpoint, the development of AF in patients with HFpEF is an adverse prognostic feature, and HFpEF in turn accelerates the progression of AF from paroxysmal to persistent/chronic, possibly by causing annular dilatation and left atrial enlargement due to increased filling pressures. From a therapeutic standpoint, the control of hypertension, exercise, and weight reduction are essential adjuncts to newer pharmacological agents. A diverse array of non-pharmacological approaches is currently under investigation. Catheter ablation is promising and the focus of current and future trials.

POLYPHARMACY, DEPRESCRIBING, AND THE NEED FOR NEW TRIALS OF OLD DRUGS

Session: Cardiology for Non-Cardiologists Workshop

The issue of polypharmacy is highly relevant clinically, given the growing number of elderly patients with chronic conditions, and the fact that polypharmacy is not only common but a major cause of non-compliance and drug-related side effects. Recently, 2 reviews in the ***European Heart Journal*** and ***Nature Reviews Cardiology***, by myself and colleagues, addressed the topics of deprescribing and the need for new trials of old drugs. A particular focus was the role of angiotensin-converting enzyme inhibitors (ACEI)/angiotensin II receptor blockers (ARBs) in acute and chronic cardiovascular disease (CVD) and beta blockers in survivors of myocardial infarction. Regarding the former, the trials took place in the 1990s, and the beta blocker trials by and large antedated the reperfusion era. Moreover, most trials have a relatively short follow-up (1–42 months for the ACE inhibitor trials). However, in practice, the same drugs may be prescribed for years, during which the effects of age, renal function, and comorbidities may heavily impact the risks versus benefits, warranting continued reassessment. Trials of beta blockers in myocardial infarction survivors are ongoing and will be discussed. In general, polypharmacy could be considered as "less may be more".

RISK STRATIFICATION IN CHRONIC CORONARY SYNDROMES: ANATOMY, ISCHAEMIA, OR BOTH? THINGS MAY NOT BE AS THEY SEEM

Session: Risk stratification in chronic coronary syndromes: Anatomy, ischaemia or both

The results of revascularisation in patients with acute coronary syndromes, and particularly ST-elevation myocardial infarction (STEMI), have been dramatic. However, in patients with chronic coronary syndromes (CCS), the benefits of revascularisation over medical therapy have been more difficult to demonstrate, especially in patients with normal left ventricular function. A presumption that the extent and severity of ischaemia would identify patients at higher risk of CCS who would benefit from revascularisation was the emphasis of the ISCHEMIA Trial. The trial was neutral about the comparison between an invasive strategy and optimal medical therapy, but, somewhat to our surprise, the relationships between the severity of ischaemia and the extent and severity of coronary artery disease were weak. This data suggests that a new approach is needed to identify therapeutic targets in patients with CCS. Perhaps we are now entering the era of plaque and endothelial characterisation, as well as plaque vulnerability, as new targets in addition to the role of the microvasculature. This presentation will focus on these new targets and the role of imaging in detecting inflammation, plaque burden and vulnerability, and their potential impact on prevention.

THE FUTURE OF CARDIOLOGY

Session: Artificial Intelligence | AI: The Heart of the Matter

"The history of medicine is that what was inconceivable yesterday, and barely achievable today, often becomes routine tomorrow." This reflection from the late Dr Starzl (transplant pioneer) came after decades of pioneering work, including the first 2 liver transplant attempts in 1963, and subsequent advances that overcame initial failures and challenges.

Rapid changes in imaging, technology, and messenger ribonucleic acid (mRNA) therapeutics make predictions particularly difficult. Nevertheless, I will focus on a few trends in cardiology that I believe will soon be important. The first is the emphasis on prevention, encompassing primary, secondary, and primordial. New approaches to risk stratification, combining imaging and "omics", with potential therapeutic revolutions such as mRNA-targeted therapeutics and gene editing, will likely lead to identifying an increasing number of younger patients who could benefit from early and aggressive risk factor modification. Perhaps the epidemic of atherosclerosis can eventually be reversed.

We have entered the disruptive and exciting era of artificial intelligence (AI), with its promises, potential, and pitfalls. Nonetheless, AI will undoubtedly change the face of medicine and research, and we will have to learn to live with it and use it.

Percutaneous structural interventions could profoundly change the natural/unnatural history of valvular heart disease, leading to earlier interventions and, hopefully, improved outcomes. The explosion of knowledge and technology will inevitably shift towards departments of cardiovascular medicine, away from traditional concepts in departments of internal medicine, surgery, radiology, and others.

The future is exciting, but there are dark clouds on the horizon. These are the epidemic of obesity and diabetes, the effects of climate change on cardiovascular health, the concerning impact of disinformation, and growing disparities in socio-economic status, which is increasingly recognised as a key factor underlying optimal healthcare access and utilisation. Another consistent barrier to therapeutic success is the problem of patient non-compliance, possibly related to socio-economic circumstances. Perhaps the digital age can provide us with new tools to combat this widespread and frustrating issue.

INDEX OF ABSTRACTS
SA HEART® CONGRESS 2025
ALPHABETICAL LISTING OF FIRST AUTHORS

Aarthi Singh 236, 237

Adila Dawood 221

Akshay Manga 225

Amori Engelbrecht 239

Andre Vosloo 237

Annemarie Wentzel 238

Arlene Mazaza 226

Blessing Chingwaru 220

Christina Hongella Mung'ong'o 228

Damian Smith 219

Dean Mitchell 227

Dewald Naudé 230

Dhesan Pillay 232, 233

Dylan Dias 221

Guido Schroeder 234

Jessica Abrams 219

John Lawrenson 224

Kayla Lourens 225

Kheya Mokoena 227

Laylah Ryklief 234

Linda Pin-yi Wu 238

Louis Jonas Giliomee 222

Marguerite Blignaut 220

Megan Rajah 240

Monique Knoetzen 223

Nakita Naran 229

Nnedima Nkado 231

Parvina Kazahura 223

Peter Schwellnus 235

Sajana Nagessur 229

Shenaaz Ghulam Hoosain 241

Siyolise Sibeko 235

Taahirah Boltman 239

Thiemuli Ramanenzhe 233

Thokozani Mwase 228

Vernice Peterson 232

Testing the efficacy of a rheumatic heart disease education programme in Babati, Tanzania: A controlled quasi-experimental study

J Abrams,[1,2] L Ryklief,[1] R Muttagaywa,[3] D Nkya,[3] A Kamuhabwa,[3] M Bakari,[3] S Marwa,[3] J Mlay,[3] S William,[4] M Engel,[5,6] L Zühlke[1,7] and P Chillo[3]

[1] Division of Cardiology, Department of Paediatrics and Child Health, Red Cross War Memorial Children's Hospital, Cape Town, South Africa
[2] REACH, Geneva, Switzerland
[3] Department of Cardiology, Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania
[4] Babati District Hospital, Babati, Tanzania
[5] Cochrane South Africa, South African Medical Research Council, Cape Town, South Africa
[6] Cape Heart Institute, Department of Medicine, University of Cape Town, Cape Town, South Africa
[7] South African Medical Research Council, Cape Town, South Africa

Background: Rheumatic heart disease (RHD) is endemic in Tanzania, affecting between 1.7% and 3.4% of children and young adults. The lack of community awareness and limited knowledge among primary healthcare workers (HCW) are critical barriers to RHD control.
Objectives: We aimed to test the efficacy of a health education programme in improving knowledge and practice towards group A *Streptococcus* (GAS) sore throat, rheumatic fever (RF), and RHD among Tanzanian primary HCWs and a high-risk community in Babati, Manyara. We present the effects of the HCW education intervention at 3 months.
Method: A pretest–post-test, non-equivalent control group, quasi-experimental study design was used. Within Babati, 8 wards, comprising 40 health centres, were evenly split into intervention and control groups from which HCWs were enrolled. The intervention group (n = 40) received a 5-day interactive in-class education programme covering all aspects of GAS, RF, and RHD prevention and control, as well as training on a RF management algorithm and RHD education flipchart. The control group (n = 40) was reminded of existing national guidelines. A paired t-test measured the change in group knowledge scores between baseline and 3 months post-intervention.
Results: Trained HCWs scored significantly higher than the control group 3 months post-intervention ($p < 0.001$). At baseline, HCW knowledge scores were similar between intervention (10.05) and control (9.58) groups; 93% of HCWs in both groups reported never having received formal RF/RHD education. Among HCWs in the intervention group, 88% reported using the RF algorithm, and 90% had used the RHD flipchart at follow-up. Knowledge of anticoagulant prescription improved from 53% to 100% among intervention HCWs, while the control remained the same (65%) over time.
Conclusion: Despite serving a high-risk population, HCWs had low rates of knowledge at baseline, which significantly improved following the intervention and was sustained at 3 months. Further follow-up is required to determine long-term knowledge retention and referral rates.

Prenatally diagnosed congenital heart disease in a Western Cape tertiary facility: Outcomes and diagnostic discrepancy

D Smith,[1] T Aldersley,[2] A Osman,[3] J Lawrenson,[2] A Boutall,[3] L Nell[3] and L Zühlke[2,4]

[1] Department of Paediatrics and Child Health, University of Cape Town, Red Cross War Memorial Children's Hospital, Cape Town, South Africa
[2] Division of Paediatric Cardiology, University of Cape Town, Red Cross War Memorial Children's Hospital, Cape Town, South Africa
[3] Department of Obstetrics and Gynaecology, University of Cape Town, Groote Schuur Hospital, Cape Town, South Africa
[4] Vice President, Extramural Research & Internal Portfolio, South African Medical Research Council, Cape Town, South Africa

Background: Diagnostic discrepancy (DD) measures congruency between pre- and postnatal congenital heart disease (CHD) diagnoses. Accurate prenatal diagnosis informs prenatal counselling, termination, mode and site of delivery, and immediate neonatal management, improving outcomes.
Objectives: We aimed to describe the cohort prevalence of prenatal CHD, outcomes in affected pregnancies and neonates, the DD rate, and associated factors.
Method: A retrospective observational study of structural CHD cases diagnosed at the Groote Schuur Hospital (GSH) Maternal and Foetal Medicine Unit (MFMU) in the Western Cape, South Africa, between January 2018 and December 2019. Group comparisons were conducted to examine the associations between the dependent variable (DD) and maternal age, maternal body mass index (BMI),

gestational age (GA) at prenatal diagnosis, the total number of MFMU scans, and both pre- and postnatal diagnosis. Group comparisons were tested with the Student's t-test or the Wilcoxon rank-sum test for continuous variables, and Fisher's exact test for categorical variables. The significance level was set at 0.05 for all tests.

Results: Structural CHD was identified in 106/7 177 pregnancies (1.4%). Median gestation at presentation was 21 weeks (interquartile range [IQR] 19–25), and the maternal BMI was 28.1 kg/m^2 (± 6.8). Predominant CHD-subtypes were atrioventricular septal defects (AVSDs) (27/106, 25.5%), septal defects (20/106, 18.9%), conotruncal lesions (20/106, 18.9%), and left ventricular outflow tract obstruction (LVOTO) lesions (11/106, 10.4%). Amniocentesis was performed in 43/106 cases (40.6%), with a genetic abnormality detected in 23/43 (53.5%). There were 62/106 live births (58.5%), with postnatal echo results available in 47/62 cases. The overall DD rate was 34% (16/47) and was highest for AVSDs and LVOTO lesions (both 57.1%). Only the postnatal diagnosis of complex CHD was found to be significantly associated with DD (odds ratio [OR] 20.86; $p < 0.01$).

Conclusion: The distribution of CHD subtypes in this cohort is consistent with published literature, although with a lower prevalence of conotruncal lesions and a higher prevalence of AVSDs. This likely reflects selective referral patterns, where routine referral of pregnancies with advanced maternal age may contribute to an overrepresentation of AVSDs. The discrepancy rate observed aligns with published reports; however, comparisons are limited by the varying definitions of DD across studies. The relatively higher discrepancy rates for septal defects, AVSDs, and LVOTO lesions highlight the need for caution when establishing these diagnoses prenatally.

Bridging the gap: Alternative in vitro cardiovascular models for drug screening

M Blignaut, JA Du Plessis and N Mlaba

Centre for Cardio-Metabolic Research in Africa, Division of Medical Physiology, Department of Biomedical Sciences, Stellenbosch University, Tygerberg, South Africa

Background: The US Food and Drug Administration (FDA) recently announced a significant policy shift aimed at reducing animal testing and using alternative methodologies, including in silico models, and spheroid and organoid toxicity testing for drug development and screening. However, affordable, easy-to-implement cardiovascular spheroid and organoid models are still largely lacking.

Objectives: This study aimed to establish and characterise a rat and human cardiovascular spheroid model.

Method: Rat cardiomyoblast cells (H9c2) were cultured under standard conditions and seeded at 4 ×105 cells/spheroid in ultra-low adherence plates with 25 mM glucose Dulbecco's Modified Eagle Medium (DMEM), 10% foetal bovine serum (FBS), and 1% pen/strep. Human ventricular cells (AC16) were cultured in DMEM/F12 media with 12.5% FBS and 1% pen/strep, and seeded in media containing 2.5% FBS or horse serum. Additionally, spheroids were treated with either 1.4 nM or 100 nM insulin and a combination of fatty acids. Rat cardiac spheroids were harvested 96 hours after seeding. The AC16 spheroids were cultured for 14 days. Spheroids were characterised by measuring messenger ribonucleic acid (mRNA) expression levels and protein levels for metabolism, mitochondrial dynamics, and autophagy with western blotting. Surface and cellular ultrastructure were imaged with scanning and transmission electron microscopy (SEM and TEM).

Results: This study produced reproducible spheroids for both cell types. Metabolic manipulation of H9c2 spheroids decreased the spheroid size and impacted the extracellular matrix morphology on the surface. At a cellular level, metabolic manipulation significantly decreased insulin-stimulated phosphorylation of mTOR and Akt while increasing mitochondrial biogenesis and fragmentation. Seeding of AC16 spheroids in 2.5% FBS increased differentiation but had no impact on size or morphological stability. Seeding the cells with an additional 100 nM insulin and a combination of fatty acids significantly increased viability and metabolic activity.

Conclusion: This study established and characterised 2 cardiovascular spheroid models that are stable, require little infrastructure to establish, and respond to different treatment conditions. The novel AC16 cardiovascular model offers a promising human cardiovascular spheroid model suitable for high-throughput drug screening and cardiotoxicity testing.

In-hospital mortality post-surgical aortic valve replacement for severe aortic valve stenosis at a quaternary hospital in South Africa

B Chingwaru,[1] R Meel,[2] I Taunyane[3] and A Mutyaba[4]

[1] Department of Internal Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

[2] Department of Internal Medicine, Faculty of Health Sciences, University of the Witwatersrand and Mediclinic Sandton Hospital, Johannesburg, South Africa

[3] Department of Surgery, Division of Cardiothoracic Surgery, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

[4] Department of Internal Medicine, Division of Cardiology, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Background: Surgical aortic valve replacement (SAVR) remains critical for severe aortic stenosis (AS), yet outcomes in resource-constrained settings are poorly characterised. This study addresses this gap by analysing SAVR outcomes at a quaternary referral centre in a resource-constrained setting.

Objectives: This study aimed to evaluate in-hospital mortality, identify predictors of adverse outcomes, and characterise the complications following isolated SAVR for severe AS.
Method: This retrospective cohort study included 165 patients who underwent isolated SAVR for severe AS at Charlotte Maxeke Johannesburg Academic Hospital between 2010 and 2020. Data were collected from hospital medical records. The primary endpoints were in-hospital mortality and complications post-SAVR.
Results: The mean age of patients was 59.3 ± 13.3 years, and 56.3% were female (93/165). Of the 165 patients, 120 (72.7%) had hypertension. The most common aetiology was calcific AS in 57.5% of cases (95/165). The median left ventricular ejection fraction was 60% (interquartile range 45–66%). The in-hospital mortality rate was 15.2% (25/165). Bleeding was associated with a higher likelihood of dying (odds ratio [OR] 38.44, 95% confidence interval [CI] 3.34 to 443.0; $p = 0.003$). Sepsis was associated with a twelvefold increase in the odds of in-hospital mortality (OR 12.80, 95% CI 1.23 to 124.33; $p = 0.028$).
Conclusion: This cohort demonstrates a disproportionately high in-hospital mortality rate post-SAVR at a quaternary referral centre in South Africa, driven by bleeding and sepsis. These findings underscore the need for protocolised haemostasis management and antimicrobial stewardship in resource-limited settings. Future initiatives should prioritise peri-operative bundles to mitigate these risks.

Aetiology and outcomes of paediatric pericardial effusions at a quaternary-level facility in Cape Town, South Africa

A Dawood,[1] T Aldersely,[2] J Lawrenson[2] and L Zuhlke[2,3]

[1] Department of Paediatrics and Child Health, University of Cape Town, Red Cross War Memorial Children's Hospital, Cape Town, South Africa

[2] Division of Paediatric Cardiology, University of Cape Town, Red Cross War Memorial Children's Hospital, Cape Town, South Africa

[3] Vice President, Extramural Research & Internal Portfolio, South African Medical Research Council, Cape Town, South Africa

Background: Paediatric pericardial effusions are common, but research into the aetiology, management, and outcomes in South Africa is limited. We describe the clinical profile, aetiology, and outcomes of non-traumatic pericardial effusions in children admitted to a quaternary hospital in Cape Town, South Africa.
Objectives: This study aimed to describe the primary aetiologies of pericardial effusion and its outcomes at Red Cross War Memorial Children's Hospital (RCWMCH), with attention to size, severity, and management.
Method: We conducted a retrospective observational study of children with pericardial effusions admitted to RCWMCH from 2015 to 2019. All patients with echocardiogram-confirmed pericardial effusion (0.3–4 cm) were included. Patients within 6 weeks post-cardiac surgery or with traumatic/iatrogenic effusions were excluded. Patients were stratified by aetiology and management. Statistical tests included the t-test or Mann–Whitney U test for continuous variables, and the chi-square or Fisher's exact tests for categorical variables.
Results: Forty-nine patients (median age 26 months, interquartile range [IQR] 9–85) were included; 87.8% had comorbidities. Most effusions were moderate or large (44% each), and 10.2% were mild. Tamponade on echocardiography was present in 18.8%. Diagnoses included cardiovascular (46.9%), infectious (32.7%), neoplastic (12.2%), autoimmune (6.1%), and respiratory (2%) disease. Effusion size was significantly associated with diagnosis ($p < 0.05$). Notably, infectious aetiologies were more frequently associated with large effusions (69% of infectious cases) than other causes. Pericardial drainage was performed in 51% of patients (25/49), with 68% (17/25) undergoing open surgical drainage and 32% (8/25) undergoing percutaneous drainage. Intervention was significantly associated with diagnosis ($p < 0.05$), with higher intervention rates observed for cardiovascular (15/23, 65.2%) and infectious (9/16, 56.2%) diagnoses. The mortality rate was low (1/49, 2%). However, complications were common (40/49, 81.6%), with sepsis (29, 59.2%) and respiratory complications (25, 51.0%) predominating. Three cases (6.1%) were complicated by recurrent pleural effusion. Complications were not associated with diagnosis ($p = 0.70$) or management ($p = 0.87$).
Conclusion: This study demonstrates the varied causes and clinical outcomes of non-traumatic paediatric pericardial effusions at a quaternary hospital. Non-traumatic paediatric pericardial effusions are commonly due to cardiovascular and infectious aetiologies, associated with larger effusions and the need for intervention. Despite low mortality, a complicated course was common, highlighting the need for close monitoring and multidisciplinary care.

Renal denervation: Impact of access site and ablation count on long-term blood pressure outcomes in a randomised sham-controlled trial

D Dias[1] and M Heradien[2]

[1] Mediclinic Panorama Hospital, Cape Town, South Africa

[2] Division of Cardiology, Mediclinic Durbanville Hospital, Cape Town, South Africa

Background: Renal denervation (RD) lowers blood pressure (BP), but randomised trials have not adequately described the factors of ablation count or the site of arterial access (radial vs. femoral) on long-term BP control.
Objectives: This study aimed to determine the RD ablation count needed for sustained BP reduction (office, ambulatory, nocturnal) at 6-year follow-up. Secondary objectives were to compare ablation counts, BP response, fluoroscopy time, and contrast volume across radial, femoral, and sham groups.

Method: Patients with a 24-hour ambulatory systolic BP (SBP) > 130 mmHg on ≥ 3 antihypertensives (including a diuretic) were diagnosed with resistant hypertension and randomised to RD (n = 29) or sham (n = 22). The SYMPLICITY HTN-3 trial cut-offs for significant follow-up reductions were used: office SBP (OSBP) ≥ 5 mmHg and ambulatory SBP (ASBP) ≥ 2 mmHg. Nocturnal SBP responders had ≥ 5 mmHg reductions. Responders and non-responders were compared by ablation count.

Results: Fifty-one patients were randomised to RD (n = 29) or sham (n = 22). RD lowered ASBP more than sham (-7.0 vs. +9.1 mmHg, between-group difference [BGD] -16.2 mmHg, 95% confidence interval [CI] -28.6 to -3.8; p = 0.011). Radial access yielded greater ASBP reduction (-10.9 mmHg) than femoral (-5.0 mmHg), though not significant (p = 0.385). Radial access was associated with more ablations (32.5 vs. 23.4; p = 0.023). Responders had consistently higher ablation counts: OSBP: 15.9 versus 11.7 (BGD 4.2, 95% CI -4.9 to 13.3; p = 0.36), ASBP: 18.8 versus 10.4 (BGD 8.4, 95% CI -0.76 to 17.6; p = 0.071), Nocturnal SBP: 19.6 versus 10.2 (BGD 9.4, 95% CI 0.1 to 18.7; p = 0.047)

Fluoroscopy time (26.4 vs. 6.2 minutes; p = 0.0001) and contrast volume (209.7 vs. 140.6 ml; p = 0.067) were greater in RD than in sham. No significant differences were seen between radial and femoral access: fluoroscopy time was 28.9 versus 24.6 minutes (p = 0.37), and contrast volume was 212.9 versus 207.7 ml (p = 0.90).

Conclusion: RD significantly improves long-term ASBP compared with sham. Radial access results in more ablations than femoral, with higher counts linked to greater BP reductions, especially in nocturnal and ASBP responders. OSBP responders also showed this trend, though not significantly. Despite increased fluoroscopy time and contrast volume in RD, access site differences were minimal. Ablation count and access site may influence BP outcomes and merit further study.

Quantifying pericardial fibrosis burden in constrictive pericarditis using CMR – Application of the SUNHeart pericardial segmentation model

LJ Giliomee,[1] AF Doubell,[1] P-PS Robbertse,[1] J Verster[2] and PG Herbst[1]

[1] Division of Cardiology, Department of Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University and Tygerberg Hospital, Cape Town, South Africa

[2] Division of Forensic Pathology, Department of Anatomy, Faculty of Medicine and Health Sciences, Stellenbosch University and Tygerberg Hospital, Cape Town, South Africa

Background: Parietal pericardial adhesion to the underlying epicardium, which includes its covering visceral pericardium, with or without chronic fibrotic change, is commonly referred to as pericardial tethering. This plays a central role in the pathophysiology of pericardial constriction. Cardiac magnetic resonance imaging (CMR) offers the unique ability to detect pericardial tethering in vivo using tissue-tagged sequences. The SUNHeart pericardial segmentation model, developed from post-mortem cardiac specimens, consists of 11 equal-sized left ventricular (LV) and 9 equal-sized right ventricular (RV) pericardial segments. This model enables reproducible quantification of the total tethered pericardial disease burden, similar to the 16-segment American Heart Association (AHA) model used for assessing myocardial disease.

Objectives: This study aimed to demonstrate the use of the pericardial segmentation model to assess the distributive extent of pericardial tethering in a case of constrictive pericarditis.

Method: The SUNHeart model was used to quantify the tethered pericardial burden in tissue-tagged 2-chamber, 3-chamber, 4-chamber, and RV 2-chamber sectioning planes. Each pericardial segment, as defined in the model, was evaluated for relative motion between the parietal and epicardial layers. Segments with no relative motion were labelled as tethered. Finally, the total number of tethered LV segments was multiplied by the percentage pericardial area represented by each of the 11 LV pericardial segments. Similarly, the number of tethered RV segments was multiplied by the percentage pericardial area represented by each of the 9 RV pericardial segments. These values were then summed to determine the total percentage of tethered pericardium.

Results: In the illustrated example, 7 LV and 7 RV segments were tethered. Using the SUNHeart model, the extent of tethered pericardium was quantified as 70.63%, resulting in the constriction haemodynamics observed.

Conclusion: The SUNHeart pericardial segmentation model is an anatomy-validated segmentation model that empowers clinicians and researchers to comprehensively assess the distributive extent of pericardial disease. This model may provide a deeper, more mechanistic understanding of the distribution and extent of tethered pericardium required to cause constrictive haemodynamics. It also serves as a sensitive research outcome of constrictive pathology, through assessing the tethered pericardial disease burden, typically related to inflammatory adhesion acutely and fibrosis chronically, even before constriction haemodynamics are present.

A 1-year experience of computed tomography angiography in congenital heart diseases at a tertiary cardiac centre

P Kazahura, C Mungòngò and H Ntsinjana
Department of Cardiology, Nelson Mandela Children's Hospital, Johannesburg, South Africa

Background: Echocardiography and catheter-based angiography are considered the gold standard imaging tools for diagnosing congenital heart disease (CHD); however, they are limited in assessing the complex anatomy of intrathoracic cardiovascular structures. Computed tomography (CT), including CT angiography (CTA), is a sophisticated imaging tool that provides three-dimensional (3D) reconstructions of cardiovascular structures, making it particularly advantageous when evaluating patients with complex CHD. CTA offers superior spatial resolution and can be performed quickly, sometimes without requiring anaesthesia, providing excellent visibility of stents, conduits, and other metallic items.
Objectives: This study aimed to describe the role of CTA in CHD regarding indications, diagnosis, and radiation dose, with an echocardiographic comparison of the findings.
Method: A retrospective, hospital-based, cross-sectional descriptive study of 44 children who underwent CTA after an echocardiogram over 1 year (2024) at the newly established children's hospital in Johannesburg. Data were sourced from both paper and electronic patient records for echocardiograms and CTA scans, including radiation dose and basic characteristics, which were analysed using basic statistical methods.
Results: A total of 44 patients (59% female) underwent CTA following echocardiography. Most patients had CTA to delineate great vessel anatomy; 43% were performed for aortic arch anomalies, and 32% for pulmonary arteries. There was good diagnostic agreement between echocardiography and CTA (70%), with CT providing additional diagnostic information in 7%. The mean radiation dose was within the normal range in most patients.
Conclusion: CTA is a good non-invasive diagnostic modality for assessing complex congenital heart defects, providing exquisite anatomical delineation to facilitate surgical or catheter-based interventions. It plays an augmentative role to echocardiography, owing to its 3D capabilities that afford additional diagnostic information to help guide intervention. All these attributes are achieved at doses of acceptable international standards.

Predicting non-ischaemic dilated cardiomyopathy in HFrEF: A risk-based approach aimed at reducing angiographic burden in resource-limited settings

M Knoetzen,[1] A Doubell,[2] A Pecoraro[2] and T Esterhuizen[3]
[1] Postgraduate Masters in Medicine trainee, Department of Internal Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa
[2] Specialist Cardiologist, Division of Cardiology, Department of Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa
[3] Associate Professor of Biostatistics, Division of Epidemiology and Biostatistics, Department of Global Health, Stellenbosch University, Cape Town, South Africa

Background: Ischaemic heart disease is a common cause of heart failure with reduced ejection fraction (HFrEF) and a dilated left ventricle not due to a volume-loading condition. The prevalence of coronary artery disease (CAD) in high-income countries supports the guideline recommendation to delineate coronary anatomy. Given the resource limitations in low- to middle-income countries, combined with the lower incidence of CAD in HFrEF, identifying patients unlikely to have CAD becomes a key consideration.
Objectives: Using coronary angiography as the gold standard, this study aimed to identify parameters that predict a non-ischaemic cardiomyopathy and conserve the use of coronary angiography in HFrEF.
Method: This retrospective cohort study analysed patients referred to the SUNHeart cardiology outreach programme with newly diagnosed HFrEF and a dilated left ventricle not due to a volume-loading condition. Using coronary angiography as the gold standard, clinical history, cardiovascular risk factors, electrocardiogram (ECG), blood results and echocardiographic features were analysed to differentiate ischaemic from non-ischaemic aetiologies.
Results: A total of 159 patients were included, with a median age of 55 years (interquartile range [IQR] 46–61) and a male predominance (126, 79%). After angiography, 114 patients (72%) were classified as non-ischaemic in aetiology. There were no significant differences in the prevalence of hypertension (56% vs. 62%; $p = 0.43$), diabetes (38% vs. 40%; $p = 0.3$), and smoking (56% vs. 47%; $p = 0.35$) when comparing the ischaemic and non-ischaemic groups. Patients with an ischaemic cardiomyopathy were more likely to have 1 or more of the following 4 features: a history of angina (odds ratio [OR] 2.27, 0.87–5.87), dyslipidaemia (OR 2.17, 0.85–5.55), regional wall motion abnormalities (RWMA) on echocardiography in a coronary artery distribution (OR 13.98, 5.60–34.91), and/or segment of left ventricular wall thinning (OR 4.85, 1.29–18.19). Multivariate analysis generated a predictive odds model with a 95% probability of a non-ischaemic aetiology in the absence of all 4 features.
Conclusion: In patients presenting with HFrEF and a dilated ventricle not due to a volume-loading condition, the absence of angina, dyslipidaemia, RWMA in a coronary distribution, and left ventricular thinning on echocardiography favours a non-ischaemic cause. These findings support a more judicious use of coronary angiography in our resource-limited setting.

A 5-year retrospective review of outcomes in children with interrupted aortic arch and aortic coarctation in the Western Cape Province

J Lawrenson,[1] C Adu-Takyi,[2] T Aldersley,[1] G Comitis,[3] L Zühlke[4] and A Brooks[5]

[1] Children's Heart Disease Research Unit, University of Cape Town, Cape Town, South Africa

[2] Directorate of Child Health, Komfo Anokye Teaching Hospital, Kumasi, Ghana

[3] Paediatric Cardiology Service of the Western Cape, Red Cross War Memorial Children's Hospital and Tygerberg Hospital, University of Cape Town, Cape Town, South Africa

[4] South African Medical Research Council and University of Cape Town, Cape Town, South Africa

[5] Chris Barnard Division of Cardiothoracic Surgery, University of Cape Town, Cape Town, South Africa

Background: We described the clinical features and outcomes of patients with interrupted aortic arch (IAA) and aortic coarctation (CoA). Short-term mortality for IAA is typically higher (10–20%) than in all forms of coarctation (1–2%).

Method: A retrospective database review was conducted on patients with IAA and CoA who underwent surgery between 1 January 2019 and 31 December 2023. Short- and medium-term outcomes were extracted, including mortality and the need for redo surgery or catheter-based intervention.

Results: There were 12 cases of IAA (67% male) and 87 cases of CoA (62% male). The clinical presentation was similar in both lesions, with most patients requiring prostaglandin and inotropic therapy. Four IAA patients had 22q11.2 deletion syndrome. Surgery for IAA was undertaken in 11/12 patients. One patient with a complex lesion died after the procedure was abandoned. The median age at surgery was 28.5 days (interquartile range [IQR] 22.5–51.5). The most common IAA type was type B (*n* = 8, 67%), followed by type A (*n* = 4, 33%). Complex interruption (e.g. IAA plus double outlet right ventricle (DORV)) was present in 9/12 cases. Arch repair with pericardial augmentation was the most common surgical repair (58%), followed by end-to-end anastomosis (EEA) (33.3%). The 30-day mortality rate was 8.3%. Of the patients, 7/11 underwent balloon angioplasty after surgery; 4/7 required additional repair later.

All 87 CoA patients underwent corrective surgery. Their median age at surgery was 27 days (IQR 14–75). Simple CoA was present in 52 cases, CoA with a ventricular septal defect in 17, and complex CoA in 18. Resection and EEA were the most common repairs (*n* = 63, 72.4%), followed by extended resection with arch augmentation (*n* = 24, 27.6%). Of the patients, 17 (19.5%) required balloon angioplasty for recoarctation at a mean of 162.4 days (standard deviation [SD] 334.2) post-surgery. Two patients (2.3%) died within 30 days.

Conclusion: This study highlights the distinct clinical profiles and outcomes of patients with IAA and CoA, with IAA patients facing higher complexity and mortality. Patients in our series had a short-term mortality rate comparable to that in published series. The substantial need for reintervention among CoA and IAA patients suggests that early identification and tailored surgical strategies are essential to optimise outcomes.

A Retrospective Analysis Of Interventional Cardiac Catheterisation Procedures Performed At Red Cross War Memorial Children's Hospital, Western Cape 2017 – 2019

J Lawrenson,[1] E Mulendele,[2] T Aldersley,[1] B Fourie,[3] G Comitis,[4] L Swanson,[4] R De Decker,[4] L Zuhlke[5]

[1] Children's Heart Disease Research Unit, University Of Cape Town, Cape Town, South Africa

[2] National Heart Hospital, University Of Zambia, Zambia

[3] Department Of Pediatrics And Child Health, Stellenbosch University, Cape Town, South Africa

[4] Department Of Pediatrics And Child Health, University Of Cape Town, Cape Town, South Africa

[5] South African Medical Research Council and University of Cape Town, Cape Town, South Africa

Background: To date a review of the interventional cardiac catheterization procedures done at Red Cross Memorial Children Hospital has not been performed.

Method: A retrospective review of paediatric interventional cardiac catheterization procedures performed at Red Cross War Memorial Children's Hospital in the Western Cape Province, South Africa for a period of 3 years (2017–2019).

Results: 253 interventional studies were performed in 241 patients. A further 76 studies in 75 patients were considered as 'intention to treat' where an intervention had been planned but abandoned after vascular access, haemodynamic/angiographic assessment without opening interventional devices. 279 diagnostic catheterization studies were performed. 37 patients had various procedures such as pericardial drainage or temporary pacing performed, but these were not included in any further analysis.

Median age at intervention was 35 (IQR 12–86) months. The most common interventions were occlusion of a patent ductus arteriosus 83 (32%), balloon dilatation or stenting of one or more pulmonary artery branches 40 (16%), balloon dilatation of pulmonary valve/RVOT 26 (10.3%), closure of VSD 19 (8%), balloon dilation or stenting of coarctation of the aorta 21 (9%) and ASD closure 11(4%). Interventions were unsuccessful in 21 of 253 procedures (8.3%.) In 2 of 83 patients a PDA device embolized but was retrieved. In 2 of

3 patients undergoing PDA stenting, the stent migrated or was placed too peripherally. In one patient undergoing pulmonary valvuloplasty (1/26) a tear occurred in the RVOT.
Most interventions (81%) were not associated with any adverse events. Most AEs were generally Class 3 or less (Boston Children's Hospital Classification). Younger age was a predictor for the development of complications ($p < 0.05$).
Conclusion: Interventional cardiac catheterization procedures in our institution were achieved with a high level of success, and no on-table mortality.

Identifying candidate electrocardiography (ECG) leads to develop improved ECG criteria for left ventricular hypertrophy in overweight patients: A cardiac magnetic resonance imaging analysis of heart–lead distances and cardiac orientation across body mass index groups

K Lourens,[1] W Nel,[2] S Nagessur,[3] R Mmope,[3] O Disaitsanyeng,[3] J Steyn[3] and A Doubell[2]

[1] Bachelor of Medicine and Bachelor of Surgery student, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa
[2] Division of Cardiology, Department of Medicine, Faculty of Medicine and Health Sciences, University of Stellenbosch and Tygerberg Hospital, Cape Town, South Africa
[3] Division of Cardiology, Tygerberg Hospital, Cape Town, South Africa

Background: Left ventricular hypertrophy (LVH) is an independent risk factor for adverse cardiovascular outcomes and has an increased incidence in obese individuals. Traditional voltage-based electrocardiography (ECG) criteria (Sokolow–Lyon, Cornell voltage, Peguero–Lo Presti) face limitations in obese patients due to signal attenuation and anatomical axis changes caused by excess adipose tissue. A concurrent study in Tygerberg Hospital's Division of Cardiology found reduced sensitivity of the listed criteria in detecting LVH in patients with a body mass index (BMI) ≥ 25 kg/m^2 at 32%, 25%, and 38%, compared with 54%, 33%, and 59% in patients with a BMI < 25 kg/m^2. The sensitivity decrease in overweight patients may result from an increased heart–electrode distance, which attenuates the recorded chest lead signals, and a shift in cardiac axis that affects the limb leads. Cardiac magnetic resonance imaging (CMR) remains the gold standard for LVH diagnosis and enables the precise assessment of the cardiac anatomical axis and heart–electrode distance variation.
Objectives: This study aimed to utilise CMR to identify which ECG leads are optimally positioned for detecting LVH in the overweight population.
Method: This retrospective CMR analysis from Tygerberg Hospital's Division of Cardiology included 275 patients. Distances from the heart to each of the 6 chest lead electrode positions (HLD) were measured from 2 cardiac landmarks: the crux (HLDcrux) and the centre of the left ventricle (HLDcentre). The anatomical cardiac axis was also measured in the frontal plane.
Results: Of the 275 patients, 111 had a normal weight (BMI < 25 kg/m^2) and 164 were overweight/obese (BMI ≥ 25 kg/m^2). For the HLDcrux, V2 showed the shortest mean distance: 78 mm (normal weight) and 98 mm (overweight). The HDLcentre indicated V3 as the shortest: 76 mm (normal weight) and 94 mm (overweight). The frontal plane anatomical cardiac axis shifted from 42° (normal weight) to 33° (overweight).
Conclusion: CMR findings suggest that V2 or V3 is the best-positioned precordial lead for detecting LVH in both weight groups. Standard lead I or aVR are optimal limb leads, given the leftward axis shift in overweight patients. Based on these findings, a study is underway in the Division of Cardiology, Tygerberg Hospital, to develop new ECG criteria for LVH detection in overweight patients.

Vascular and bleeding complications associated with transcatheter aortic valve implantation (TAVI) for aortic stenosis

A Manga,[1] A Mutyaba,[2] F Mohamed,[3] and A Vachiat[4]

[1] Department of Internal Medicine, University of the Witwatersrand, Johannesburg, South Africa
[2] Department of Cardiology, Charlotte Maxeke Johannesburg Academic Hospital, University of the Witwatersrand, Johannesburg, South Africa
[3] Department of Endocrinology and Metabolism, Charlotte Maxeke Johannesburg Academic Hospital, University of the Witwatersrand, Johannesburg, South Africa
[4] Department of Cardiology, Wits Donald Gordon Medical Centre, Milpark Hospital, University of the Witwatersrand, Johannesburg, South Africa

Background: Vascular and bleeding complications are some of the most frequent complications associated with transcatheter aortic valve implantation (TAVI), as well as an increase in morbidity and mortality. However, there is a lack of data describing these severe events in South Africa.

Objectives: This study aimed to evaluate the vascular and bleeding complications of patients who underwent TAVI in a South African context.
Method: A retrospective cohort study of 105 patients who underwent TAVI for aortic stenosis at a private hospital in Johannesburg from January 2019 to December 2023. The Valve Academic Research Consortium 3 (VARC-3) criteria defined vascular and bleeding complications.
Results: Vascular and bleeding complications occurred in 12.4% and 9.5% of patients, respectively. The mortality rate before discharge was significantly higher for patients with bleeding complications (20.0%, 95% confidence interval [CI] 2.5 to 55.6) than those without (2.1%, 95% CI 0.3 to 7.4) (p = 0.045). Patients with a bleeding complication had a significantly longer median length of hospital stay (3 days, interquartile range [IQR] 3–9) than those without (2 days, IQR 1–3) (p = 0.0096). Both vascular and vascular/bleeding complications combined demonstrated similar longer median lengths of hospital stay. Surgical vascular access closure had a significantly higher rate of vascular complications (29.4%) compared with device closure (9.1%) (p = 0.035). Within the group that underwent device closure, the use of a large-bore collagen plug-based vascular closure device (MANTA®, Teleflex) had significantly higher rates of vascular complications than other closure devices. Patients with diabetes mellitus had a substantially higher rate of bleeding complications (22.7%) than non-diabetics (6.0%) (p = 0.032).
Conclusion: Bleeding and vascular complications resulted in higher rates of extended hospital stay, while patients with bleeding complications had an almost tenfold higher risk of death. This study emphasises the importance of choosing appropriate closure techniques and considering comorbidities, like diabetes, to enhance safety and reduce complications in vascular access procedures. Active strategies to minimise these complications are essential.

Characteristics and outcomes of patients hospitalised with acute heart failure at a tertiary hospital in South Africa

A Mazaza, H Weich and A Doubell
Division of Cardiology, Department of Medicine, Faculty of Medicine and Health Sciences, University of Stellenbosch and Tygerberg Hospital, Belville, South Africa

Background: Acute heart failure (AHF) remains a major cause of hospital admissions and mortality, yet data on its characteristics and outcomes in sub-Saharan Africa remain limited. While sodium-glucose cotransporter 2 (SGLT2) inhibitors, angiotensin receptor-neprilysin inhibitors (ARNI), and cardiac resynchronisation therapy (CRT) have reduced heart failure (HF)-related morbidity and mortality in high-income settings, robust data on accessibility and utilisation in Africa remain poorly understood.
Objectives: This study aimed to evaluate the epidemiology, clinical presentation, treatment patterns, and outcomes of patients with AHF at a tertiary academic hospital in South Africa in the era of modern HF therapies.
Method: A single-centre, retrospective study was conducted at Tygerberg Hospital, Cape Town, including 339 patients admitted with AHF between January and December 2022. Data on demographics, comorbidities, aetiology, management, and outcomes were collected from electronic patient records with a discharge International Classification of Diseases, Tenth Revision (ICD-10) diagnosis of dilated cardiomyopathy (DCMO) (I42.0), unspecified HF (I50.9), unspecified left ventricular failure (I50.1), systolic (congestive) HF (I50.2), unspecified cardiomyopathy (I42.9), and acute systolic (congestive) HF (I50.21). Echocardiographic data, coronary angiographic records, and discharge medications were analysed.
Results: The mean age was 53 ± 15.4 years, with 51.9% males and 48.1% females. HF with reduced ejection fraction (HFrEF) accounted for 91% of admissions, with idiopathic DCMO being the most common aetiology in 72%. Hypertension (74%) and diabetes mellitus (43.4%) were prevalent comorbidities. The in-hospital mortality was 3.9%, with a 2-year case fatality rate of 27.7%. Guideline-directed medical therapy (GDMT) prescription at discharge was high for beta blockers (88.7%) and angiotensin-converting enzyme (ACE) inhibitors/angiotensin receptor blockers (ARBs) (87.5%), but access to SGLT2 inhibitors and ARNIs was limited. CRT eligibility was identified in 36 HFrEF patients (11.6%), with 42.9% receiving CRT implants. The 30-day re-admission rate was 44.3%.
Conclusion: This study highlights the unique profile of AHF in sub-Saharan Africa, characterised by a younger population, significant comorbidities, and a high burden of non-ischaemic cardiomyopathies. Despite improvements in GDMT prescription, access to advanced HF therapies remains limited. High re-admission rates and premature discharges underscore the need for better post-discharge care and policy changes to improve outcomes in this resource-limited setting.

Bifascicular block: Predictors of mortality or requiring the insertion of a permanent pacemaker

D Mitchell, A Doubell and J Moses
Division of Cardiology, Department of Medicine, Faculty of Medicine and Health Sciences, University of Stellenbosch and Tygerberg Hospital, Bellville, South Africa

Background: Patients with bifascicular block (BFB) are at risk of progressing to high-degree atrioventricular block (AVB), which requires pacing and has a higher risk of mortality. However, no studies have been conducted in Africa that assess predictors of such endpoints.
Objectives: This study aimed to identify predictors of mortality and/or indications requiring the insertion of a permanent pacemaker (PPM) in patients with BFB to better risk-stratify and appropriately investigate patients at the time of diagnosis in a resource-limited setting.
Method: This is a descriptive study conducted via retrospective review of all patients who underwent electrocardiography (ECG) in 2014 at Tygerberg Hospital, South Africa. A total of 11 881 patient ECGs were assessed, and those with BFB were identified. Patients' records were assessed at the time of diagnosis and followed over 10 years to identify predictors of mortality or pacemaker implantation.
Results: In total, 16 280 ECGs were assessed (11 881 patients), with 140 patients identified as having BFB. The mean age at diagnosis was 62 years. Of these patients, 37 (26%) died and 9 (6%) required a PPM. The mean age at diagnosis of the patients who died was 66 years ($p = 0.07$). Predictive factors for mortality included diabetes mellitus (DM) ($p = 0.04$) and a lower left ventricular ejection fraction (LVEF) ($p = 0.05$); age and hypertension were predictive at a lower level of significance ($p = 0.07$ and $p = 0.06$, respectively). The only predictive factor for requiring a PPM was the presence of symptoms at diagnosis ($p \leq 0.01$).
Conclusion: BFB, DM, hypertension, age, and a reduced LVEF are predictors of mortality, with only the presence of symptoms being predictive of requiring a pacemaker. When addressing the risk of progressing to high-degree AVB in a resource-limited setting, pacemaker insertion is a reasonable alternative to extensive and invasive investigations for patients with BFB and unexplained symptoms. Mortality in patients with BFB is more likely related to standard risk factors, such as DM, hypertension, age, and a reduced LVEF, rather than the conduction defect per se.

People living with human immunodeficiency virus and cardiometabolic disease present with altered mitochondrial oxygen consumption and H_2O_2 production

K Mokoena, I Webster, A Genis, T Boltman, J Cambell, C Kruger, J Holm, V Mbombela, J Adoga, F Everson, G Maarman and H Strijdom
Centre for Cardio-Metabolic Research in Africa, Division of Medical Physiology, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa

Background: Cardiometabolic disease (CMD) in people living with HIV (human immunodeficiency virus) (PLWH) is a global concern. Both HIV-related factors and antiretroviral therapy have previously been shown to cause mitochondrial dysfunction. However, mitochondrial function in PLWH and CMD is poorly described, especially in sub-Saharan African populations, which are uniquely exposed to both endogenous and external mitochondrial risk factors.
Objectives: This exploratory study aimed to investigate the relationship between mitochondrial function, HIV status, and CMD in a South African cohort.
Method: This cross-sectional study consisted of 158 participants divided into 2 main groups, HIV negative (-) and HIV positive (+), which were further subdivided into HIV- with ($n = 39$) and without ($n = 33$) CMD, and HIV+ with ($n = 44$) and without ($n = 42$) CMD. Clinical and demographic data, blood, and urine samples were collected. Participants were deemed to have CMD when ≥ 3 cardiometabolic risk factors were present. Mitochondrial function was assessed in isolated peripheral blood mononuclear cells (PBMC) by high-resolution respirometry (O2k-FluoRespirometer, Oroboros Instruments). Data were statistically analysed with the Statistical Package for the Social Sciences (SPSS) version 29.0 software.
Results: The cohort was relatively young (< 42 years) and consisted mostly of women (74.7%) with high smoking rates. Routine respiration (O_2 consumption: pmol/s/ml) was significantly lower in HIV+ than HIV- (0.001 [0.001–5.767] vs. 1.694 [0.001–8.050]; $p < 0.001$), whereas residual oxygen consumption (ROX) was higher in HIV+ than HIV- (0.312 [0.001–6.330] vs. 0.157 [0.001–4.798]; $p = 0.036$). The calculated cytochrome c response was suppressed in HIV+ compared with HIV- (0.001 [0.001–1.554] vs. 0.127 [0.001-1.902]; $p = 0.051$). Maximal electron transfer system (ETS) capacity was significantly suppressed in CMD+ compared with CMD- (0.469 [0.001–5.214] vs. 0.767 [0.079–5.170]; $p = 0.009$). H_2O_2 production (μM) observed at complex IV activity was lower in HIV+ than HIV- (0.055 [0.010–2.468] vs. 0.205 [0.010–2.003]; $p < 0.001$).
Conclusion: The findings of this exploratory study indicate a greater degree of altered mitochondrial oxygen consumption and H_2O_2 production in PLWH and CMD compared with their respective controls. Although changes were observed in both HIV+ versus HIV-

and CMD+ versus CMD-, the results suggest that, overall, mitochondrial function was more profoundly affected by HIV status. These findings pave the way for longitudinal studies with more diverse and larger cohorts, which may ultimately benefit the future management of PLWH at risk of mitochondrial dysfunction and CMD.

The impact of respiratory viral infection on outcomes of surgery for congenital heart defects at a tertiary centre, Johannesburg, South Africa

CH Mung'ong'o,[1] K Vanderdonck,[2] P Kazahura,[1] E Lumngwena[3] and H Ntsinjana[1,4]

[1] Nelson Mandela Children's Hospital, Department of Paediatric Cardiology, Johannesburg, South Africa

[2] Nelson Mandela Children's Hospital, Department of Paediatric Cardiothoracic Surgery, Johannesburg, South Africa

[3] School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

[4] Division of Paediatric Cardiology, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Background: Respiratory viral infections (RVI) are common in the paediatric population, often presenting with severe illness in those with congenital heart defects (CHD). These infections are associated with poor peri-operative outcomes in children undergoing open-heart surgery for CHD repair. Therefore, RVI is considered a relative contraindication to elective cardiac surgery. There is a paucity of data from sub-Saharan Africa investigating the impact of respiratory viruses on the outcomes of CHD repair.

Objectives: This study aimed to assess the impact of RVIs on the peri-operative outcomes of children managed surgically for CHDs at a tertiary centre in Johannesburg, South Africa.

Method: A retrospective analysis of electronic and paper-based records of all patients who underwent open-heart surgery for CHD repair at a tertiary hospital was conducted. These patients had a nasal swab for RVI, measured by polymerase chain reaction (RVPCR), performed pre- and immediately post-surgery. We performed a descriptive analysis of basic patient characteristics, disease profile, and the impact of RVI on peri-operative outcomes. The records analysed span from January 2023 to December 2024.

Results: A total of 123 children with CHDs who underwent surgical intervention were tested pre- and post-surgery for RVPCR. The median age was 3 years (interquartile range [IQR] 1–4). There were more males (59%) than females (41%); 24% of the children tested positive for RVI peri-operatively. Notably, 70% of the infected children had a single virus infection, while 30% had a polymicrobial infection with 2 or more viruses. The most common single viral pathogen isolated was enterovirus/rhinovirus (30%), followed by adenovirus (20%). Other isolates included parainfluenza, coronavirus, respiratory syncytial virus, bocavirus, and metapneumovirus. Pre-operative screening was performed 5–15 days before the operation. The most virulent organism was adenovirus, with a prolonged intubation time of more than 10 days. Those infected by multiple viruses did not show poor outcomes. In patients with other isolates, peri-operative outcomes resembled those who tested negative, and no mortality was recorded.

Conclusion: Enterovirus/rhinovirus and adenovirus are the most common viral infections among children with CHDs admitted for surgical management at our centre. Besides a prolonged intubation period and longer intensive care unit (ICU) stay for adenovirus-infected patients, peri-operative RTIs did not result in poor outcomes.

Temporal trends of transcatheter aortic valve implantation practice in South Africa

T Mwase,[1] A Doubell,[1] E Schaafsma,[2] M Ntsekhe,[3] J Sherman,[4] N Tsabedze[5] and H Weich[1]

[1] Division of Cardiology, Department of Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University and Tygerberg Hospital, Bellville, South Africa

[2] South African Heart Association non-profit company, Stellenbosch, South Africa

[3] Department of Cardiology, University of Cape Town and Groote Schuur Hospital, Cape Town, South Africa

[4] Chris Barnard Division of Cardiothoracic Surgery, Groote Schuur Hospital, University of Cape Town, Cape Town, South Africa

[5] Department of Internal Medicine, Division of Cardiology, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Background: The temporal trends in transcatheter aortic valve implantation (TAVI) practice and the procedural benefits have been clearly documented for high-income countries (HIC); however, the data for upper middle-income countries are sparse.

Objectives: This study aimed to describe the evolution of TAVI practice in South Africa regarding procedural and patient characteristic profiles and outcomes from 1 September 2014 to 31 December 2023.

Method: The South African SHARE-TAVI registry is a web-based, all-comers prospective registry. The 18 centres that were involved from the outset of the registry in September 2014 are included in the current analysis.

Results: A total of 2 532 TAVIs were performed across the 18 centres. There was a steady increase in TAVI procedures done, with the majority done in private hospitals (n = 2 251), where waiting times were shorter, with a median of 52 days (interquartile range [IQR] 29–82) compared with public hospitals with a median of 70 days (IQR 61–85). Over time, the median age remained stable at 81 years (IQR 75–85). The EuroSCORE II showed a continuous and significant decline from 4.9% (4.4–8.6%) in 2014/15 to 3.5% (1.9–6%) in

2023 ($p < 0.001$). Transfemoral access was the most prevalent access route utilised throughout the study period. There was a trend towards an increased use of percutaneous closure devices over time, with lower vascular complication rates (11% in 2014/5 to 5% in 2023; $p < 0.001$). There was also a notable reduction in peri-procedural strokes (10% in 2014/15 to 2% in 2023; $p < 0.0001$). Kaplan–Meier survival curves showed a gradual decrease in mortality risk over the years ($p = 0.0344$). Accordingly, the 1-year mortality fell from 17% in 2014/15 to 6% in 2022 ($p < 0.001$).

Conclusion: This data showed a steady rise in the number of TAVI procedures during the study period, with a reduction in the risk profile over time, despite the mean age remaining stable, in keeping with international recommendations. The technical aspects of the procedures evolved, which were associated with a reduction in various complications.

The performance of electrocardiography criteria for detecting left ventricular hypertrophy in overweight individuals with a known cardiac mass determined by cardiovascular magnetic resonance imaging

S Nagessur,[1] RM Mmope,[1] OF Disaitsanyeng,[1] J Steyn,[1] E Nel[2] and AF Doubell[2]

[1] Division of Cardiology, Stellenbosch University and Tygerberg Hospital, Cape Town, South Africa

[2] Division of Cardiology, Department of Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University and Tygerberg Hospital, Cape Town, South Africa

Background: Left ventricular hypertrophy (LVH) requires early detection, both as a feature of potentially serious underlying cardiac pathology and an independent risk factor for adverse cardiovascular outcomes. While cardiac magnetic resonance imaging (CMR) is the diagnostic gold standard, electrocardiography (ECG) remains the most accessible and affordable screening tool. ECG remains a widely used, non-invasive tool for LVH detection, relying on voltage-based criteria, such as Sokolow–Lyon, Cornell, and Peguero–Lo Presti (PLP). Obesity poses a unique challenge in detecting LVH, as signal attenuation due to adipose tissue can affect ECG accuracy.

Objectives: This study aimed to compare the sensitivity of Sokolow–Lyon, Cornell, and PLP voltage criteria in detecting LVH among normal-weight and overweight individuals.

Method: A retrospective, comparative and descriptive study was conducted at the Division of Cardiology at Tygerberg Hospital, Cape Town, South Africa. ECGs of 283 patients were analysed, using the 3 criteria listed. CMR of a left ventricular (LV) mass served as the reference standard for LVH, where LVH was defined as > 153 g in males and > 103 g in females. Sensitivity and specificity for each ECG criterion were calculated and compared between body mass index (BMI) groups, categorised into a normal weight group (< 25 kg/m^2) and an overweight group (≥ 25 kg/m^2).

Results: The overall sensitivity for LVH detection was low across all BMI groups. PLP (59%) and Sokolow–Lyon (54%) had the highest sensitivity in the normal weight subgroup (< 25 kg/m^2) compared with Cornell (33%). ECG criteria sensitivity declined with increasing BMI. In the overweight subgroup (163/283 patients with ≥ 25 kg/m^2), Cornell (25%) and Sokolow–Lyon (31%) depicted similar sensitivity, while PLP remained the most sensitive (38%). The results suggest that while PLP is consistently the most sensitive, all ECG criteria are significantly less effective at detecting LVH in overweight populations.

Conclusion: The sensitivity of ECG voltage criteria for detecting LVH decreases significantly in individuals with a higher BMI in the South African population. Among the 3 methods evaluated, the PLP criterion consistently demonstrated superior performance across all BMI groups compared with the Sokolow–Lyon and Cornell criteria. Despite this, the overall reduction in ECG criteria performance among overweight patients emphasises the need for improved or BMI-adjusted ECG criteria for more accurate LVH detection.

Paediatric echocardiograms at a regional hospital in the Western Cape, South Africa

N Naran,[1] J Murray,[3] B Fourie,[1] T Esterhuizen[4] and J Lawrenson[2]

[1] Department of Paediatrics and Child Health, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa

[2] Senior scholar at Children's Heart Disease Research Unit, University of Cape Town, Cape Town, South Africa

[3] Head of Department, Paediatric Department, Paarl Regional Hospital, Paarl, South Africa

[4] Division of Epidemiology and Biostatistics, Department of Global Health, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa

Background: Echocardiography performed by specialists is the gold standard for diagnosing congenital heart disease. In South Africa, access to paediatric cardiologist-performed echocardiography is largely restricted to tertiary centres or private specialists, often delaying diagnoses in rural settings.

Objectives: This study evaluates the impact of echocardiography performed by a general paediatrician at a regional hospital, enabling earlier diagnosis and paediatric heart disease management.

Method: We conducted a retrospective descriptive study of children referred for echocardiography at a regional hospital in Paarl, South Africa, from 2017 to 2021. A general paediatrician performed echocardiograms following physical examination. A subset of

patients had a second echocardiogram by a paediatric cardiologist. We recorded patient demographics, referral indications, time from referral to assessment, diagnoses, and outcomes. Diagnostic agreement between the general paediatrician and paediatric cardiologist was assessed.

Results: Echocardiograms were performed on 397 children. The primary referral indication was an audible murmur (65%), followed by suspected genetic syndromes (14.9%). The mean time from referral to assessment was 1.2 days for inpatients and 41.7 days for outpatients. Cardiac defects were identified in 243 children (61.2%). Of the children, 280 (70.5%) were infants under 1 year, of whom 201 (71.8%) had structural abnormalities. Of all the children with structural anomalies, 58.4% were managed as outpatients, 11.1% were admitted to the regional hospital, and 17.7% were referred to a tertiary centre. A paediatric cardiologist reviewed 130 children (33.6%). Identical diagnoses were made in 64.6% of cases. Discordant (3.85%) or incomplete diagnoses (15.38%) were more common in complex lesions. Diagnostic agreement between the general paediatrician and cardiologist improved from 62% in 2017 to 92% in 2021.

Conclusion: Echocardiography performed by a general paediatrician facilitates timely diagnosis and paediatric heart disease management in resource-constrained settings. While discordant diagnoses occurred primarily in complex cases, diagnostic accuracy improved significantly over time.

Identifying unique neuroendocrine signatures in acute mental stress-induced alpha- and beta-adrenergic reactivity profiles

D Naudé,[1] W Smith,[1,2] R von Känel[3] and A Wentzel[1,2]

[1] Hypertension in Africa Research Team, Faculty of Health Sciences, North-West University, Potchefstroom, South Africa

[2] Medical Research Council Unit on Hypertension and Cardiovascular Disease, North-West University, Potchefstroom, South Africa

[3] Department of Consultation-Liaison Psychiatry and Psychosomatic Medicine, University Hospital, University of Zurich, Zurich, Switzerland

Background: We previously categorised stress-induced haemodynamic reactivity as predominant alpha (α)- and beta (β)-adrenergic reactivity profiles, both linked to unique cardiometabolic signatures. These haemodynamic response patterns are mediated by an interplay between various neuroendocrine markers. However, it is unclear whether these markers can be used to identify specific adrenergic response profiles.

Objectives: We aimed to determine the odds of resting neuroendocrine markers relating to a predominant α- or β-adrenergic reactivity profile.

Method: We included 118 teachers (aged 20–65 years) and recorded 1-minute beat-to-beat haemodynamic reactivity during the Stroop colour-word conflict test. Participants were categorised as predominant α-responders (lowest quartile of both cardiac output [Δ%CO] and Windkessel arterial compliance reactivity [Δ%Cwk], n = 49) or predominant β-responders (highest quartile of Δ%CO and Δ%Cwk, n = 69). Baseline fasting serum adrenocorticotropic hormone (ACTH) and cortisol were measured, while the urinary norepinephrine-to-creatinine ratio (u-NE/Cr) and epinephrine-to-creatinine ratio (u-EPI/Cr) were determined. Odds ratios (OR) of neuroendocrine markers (in highest or lowest population quartile ranges) relating to either haemodynamic reactivity profile were determined, independent of age, sex, ethnicity, abnormal glucose tolerance (AbnI-GT), hypertensive status, and self-reported alcohol use and smoking.

Results: Predominant α-responders were older, of black ethnicity, had higher 24-hour mean arterial pressure, and greater hypertension and AbnI-GT prevalence than β-responders (all $p \leq 0.023$). Resting neuroendocrine marker levels were comparable between α- and β-responders. The odds of a predominant α-adrenergic reactivity profile were higher when u-NE/Cr (OR 1.94 [1.18–2.28]; $p = 0.004$), ACTH (OR 2.75 [2.36–3.71]; $p < 0.001$), and cortisol (OR 2.25 [1.78–3.14]; $p = 0.001$) levels were in the highest population quartile. In contrast, the odds of a β-adrenergic reactivity profile were higher when u-NE/Cr levels (OR 2.45 [1.98–3.15]; $p = 0.001$) were within the highest population quartile, and when ACTH (OR 1.25 [1.09–1.55]; $p < 0.001$) and cortisol (OR 1.45 [1.05–1.98]; $p = 0.006$) levels were in the lowest population quartile.

Conclusion: The predominant α-adrenergic reactivity profile appears to be characterised by a combination of higher u-NE/Cr, ACTH, and cortisol levels, whereas predominant β-responders may be identified by higher u-NE/Cr levels alone. This may suggest that, in the presence of higher u-NE/Cr, hypothalamic-pituitary-adrenal axes markers (ACTH, cortisol) may serve as key differentiators between these 2 reactivity profiles. These neuroendocrine signatures could reflect the predominant stress axes active in these haemodynamic reactivity profiles, informing stress-related risk based on a patient's adrenergic reactivity profile.

Predicting hypertension and abnormal glucose tolerance using acute mental stress-induced alpha- and beta-adrenergic reactivity profiles alone: A 3-year follow-up study

D Naudé,[1] W Smith[1,2] and A Wentzel[1,2]

[1] Hypertension in Africa Research Team, Faculty of Health Sciences, North-West University, Potchefstroom, South Africa

[2] Medical Research Council Unit on Hypertension and Cardiovascular Disease, North-West University, Potchefstroom, South Africa

Background: Acute mental stress-induced alpha (α)- and beta (β)-adrenergic reactivity profiles are independent, distinct cardiometabolic risk factors. In cross-sectional observations, predominant α-adrenergic responders have shown a more vascular-related risk, with hypertension as a cross-sectional outcome. In contrast, β-adrenergic responders showed a more metabolic-driven profile, with a higher prevalence of abnormal glucose tolerance (AbnI-GT) – a term that combines prediabetes and diabetes. However, the predictive nature of these adrenergic-haemodynamic reactivity profiles is unknown.

Objectives: In predominant α- and β-adrenergic reactivity profiles, we compared 3-year changes in hypertension and AbnI-GT and investigated the relative risk of developing both outcomes over 3 years.

Method: We classified 329 participants (baseline ages 20–65 years) as predominant α-responders (lowest quartile of both cardiac output reactivity [Δ%CO] and Windkessel arterial compliance reactivity [Δ%Cwk], $n = 43$), predominant β-responders (highest quartile Δ%CO and Δ%Cwk, $n = 59$), or mixed α/β-responders (remaining $n = 227$) at baseline. At baseline and follow-up, hypertensive status was defined by International Society of Hypertension guidelines, increased central adiposity according to International Diabetes Federation waist circumference reference ranges, hypercholesterolaemia by total cholesterol ≥ 5.0 mmol/L, AbnI-GT by HbA1c ≥ 5.7%, and/or fasting glucose ≥ 5.6 mmol/L, and/or using antidiabetic medication. Hazard ratios (HR) independent of sex, ethnicity, follow-up age, and baseline values of each outcome variable were calculated.

Results: Greater hypertension, AbnI-GT, and increased central adiposity prevalence were observed in α-responders compared with β-responders at baseline (all $p < 0.001$). Over 3 years, the prevalence of participants with hypercholesterolaemia increased in α- and β-responders (all $p \leq 0.003$), whereas increased central adiposity cases mainly increased in β-responders ($p < 0.001$). Predominant α-responders had a greater risk for hypertension (HR 1.66 [1.42–1.81]; $p < 0.001$) and hypercholesterolaemia (HR 1.58 [1.36–1.84]; $p < 0.001$) than β-responders (hypertension: HR 0.32 [0.14–0.48]; $p = 0.036$, and hypercholesterolemia: HR 0.47 [0.21–0.70]; $p = 0.024$). However, predominant β-responders had a greater risk for developing AbnI-GT (HR 3.69 [3.10–4.35]; $p < 0.001$) than α-responders (HR 1.34 [1.11–1.61]; $p = 0.047$).

Conclusion: Supporting previous cross-sectional findings, predominant α-responders had a greater risk for hypertension, which might be attributed to a baseline, sustained high-pressure system and greater atherosclerotic risk. Conversely, predominant β-responders had a greater risk of AbnI-GT, suggesting a more metabolically driven risk profile, combined with increased central adiposity.

A rare case of neonatal lupus erythematosus

N Nkado,[1] CN Makiwane,[1] L Sepeng[3] and H Ntsinjana[1]

[1] Nelson Mandela Children's Hospital, Johannesburg, South Africa

[2] Department of Paediatrics and Child Health, School of Clinical Medicine, University of the Witwatersrand, Johannesburg, South Africa

[3] Department of Paediatrics and Child Health, School of Clinical Medicine, University of the Witwatersrand, Johannesburg, South Africa

[4] Netcare Park Lane Hospital, Johannesburg, South Africa

Background: Neonatal lupus is a rare immune-mediated condition caused by the transplacental transfer of maternal autoantibodies, specifically Sjögren syndrome-related antigens A (Ro/SSA) and B (La/SSB). Its clinical spectrum ranges from mild cutaneous and haematological manifestations to severe complications, with autoimmune congenital heart block being the most serious. It occurs in approximately 2% of exposed foetuses and carries a reported mortality rate of 12–43%.

Objectives: This case report describes the presentation of a newborn with features of neonatal lupus erythematosus. The neonate was first reported to have foetal bradycardia of unknown cause at 28 weeks of gestation. A foetal anomaly scan by the foetal medicine team at the time confirmed foetal bradycardia with a heart rate (HR) of 66 beats per minute (bpm) and small pericardial effusion. On advice, the mother was sent for an immunology workup, and the results were positive for anti-Ro/SSA and anti-La/SSB antibodies. An emergency caesarean section (CS) was scheduled at 31 weeks of gestation, as indicated by severe foetal bradycardia complicated by hydrops foetalis, with ascites and pleural effusion.

Results: At 31 weeks of gestation, a 2 kg hydropic, premature baby was delivered via CS with HR 60–67 bpm. A 12-lead electrocardiogram (ECG) confirmed a complete heart block (CHB). Echocardiography showed a severely hypertrophied heart with mild endocardial fibroelastosis (EFE), mild pericardial effusion, and ejection fraction (EF) of 74%. Cardiac biomarkers were elevated: troponin T 941 ng/L, reatine kinase-muscle/brain (CK-MB) 14.8 ng/ml, and creatine kinase (CK) 535 U/L. There was severe pancytopaenia with concomitant hepatic and renal dysfunction. Autoimmune testing revealed positive antinuclear antibodies, anti-Ro/SSA, and anti-La/SSB antibodies. Management included high-frequency ventilation, inotropes, intravenous immunoglobulin, and packed red cell and platelet transfusions.

Conclusion: Despite aggressive supportive care, the patient demised. This case highlights a rare, severe form of neonatal lupus with multisystem involvement and 4 poor prognostic features: prematurity, hydrops foetalis, profound bradycardia, and tricuspid regurgitation. It underscores the importance of multidisciplinary prenatal care and early intervention, including foetal echocardiography, maternal steroids, intravenous immunoglobulin (IVIG), and beta-agonist therapy to mitigate disease severity.

Impact of proximal aortic characteristic impedance on forward wave pressures beyond brachial blood pressure in patients with angiographically proven coronary artery disease

V Peterson,[1] D Els,[1] D Da Silva Fernandes,[1] J-L Kinsey,[2] C Dos Santos,[2] E Sadiq,[3] R Naran,[1] T Monareng,[3] T Abdool-Carrim,[3] I Cassimjee,[3] G Modi,[3] GR Norton,[1] F Peters[1,2] and AJ Woodiwiss[1]

[1] Cardiovascular Pathophysiology and Genomics Research Unit, Department of Physiology, School of Biomedical Sciences, Faculty of Health Sciences, University of the Witwatersrand, Parktown, South Africa

[2] Westrand Cardiovascular Centre, Life Flora Hospital, Johannesburg, South Africa

[3] School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

Background: Although indexes of aortic stiffness increase the risk for coronary artery disease (CAD), the extent to which increases in proximal aortic stiffness enhance central arterial forward wave pressures beyond changes in peripheral pressures is uncertain.
Objectives: We aimed to determine whether increases in proximal aortic stiffness, as indexed by aortic characteristic impedance (Zc), translate into an enhanced central arterial pressure for a given brachial blood pressure (BP).
Method: From central pressure (SphygmoCor), aortic velocity, and outflow tract diameter measurements (echocardiography), we determined Zc and arterial pressure wave morphology in 71 patients with angiographically proven CAD. All other cardiac pathologies were excluded. We compared central arterial function in these patients with 210 age- and sex-matched controls from a community study, and with patients with alternative arterial diseases (stroke or critical limb ischaemia [CLI], n = 287) diagnosed in a hospital setting.
Results: With adjustment for confounders, including mean arterial pressure and aortic root diameter, Zc was increased in patients with CAD compared with controls and patients with stroke or CLI ($p < 0.0001$). The early systolic pressures generated by the product of peak aortic flow (Q), Zc (product of peak aortic flow (Q) and Zc (PQxZc)), and forward pressure waves (Pf) were also increased in patients with CAD compared with controls and patients with alternative arterial diseases ($p < 0.0005$). Enhanced PQxZc at peak central pulse pressure (PPc), rather than increases in re-reflected wave pressures, accounted for increases in Pf. After further adjustments for brachial pulse pressure (PP) or systolic BP (SBP), the higher Pf values in patients with CAD were retained ($p < 0.01$ - $p < 0.0005$). Although peak PPc was higher in patients with CAD or alternative arterial diseases compared with controls ($p < 0.05$ - $p < 0.0005$), these differences were abolished by further adjustments for brachial BP.
Conclusion: Independent of confounders and aortic root diameter, a marked increase in proximal aortic Zc occurs in patients with CAD compared with both controls and patients with alternative arterial diseases. Hence, the pulsatile load responsible for CAD exceeds brachial BP and is poorly indexed by PPc. This data may support the need for intense brachial BP lowering in CAD.

Up to 11 years follow-up of percutaneous pulmonary valve implantation in central South Africa

D Pillay, S Brown and D Buys

Department of Paediatric Cardiology, Universitas Academic Hospital, University of the Free State, Bloemfontein, South Africa

Background: Excellent mid-term outcomes are well-established for percutaneous pulmonary valve implantation (PPVI) in treating right ventricular outflow tract (RVOT) dysfunction. Despite this success, long-term data assessing PPVI performance are limited, especially within low- to middle-income country contexts.
Objectives: This study aimed to report on patient characteristics and long-term outcomes after PPVI.
Method: This retrospective study describes the outcomes of 31 PPVI patients treated from 2012 to 2023 at the paediatric cardiology department of Universitas Academic Hospital, Bloemfontein.
Results: The predominant underlying diagnosis was tetralogy of Fallot (n = 20, 64.5%). The primary indications for PPVI were pulmonary insufficiency (PI) (n = 15, 48.4%), followed by mixed PI and RVOT stenosis (n = 10, 32.3%), and isolated pulmonary/RVOT stenosis (n = 6, 19.4%). Most implants (n = 22, 71%) were placed within homograft conduits. One early death occurred during the study period, yielding a procedural mortality rate of 3.2%. At 10 years, the Kaplan–Meier estimated valve survival was 77%, freedom from stent fracture was 85.3%, and freedom from infective endocarditis (IE) was 81%. The annualised incidence of IE was 1.9%.
Conclusion: These findings contribute long-term data on PPVI outcomes from a middle-income country setting. The results demonstrate favourable durability and performance, comparable to benchmarks for surgical pulmonary valve replacement. However, IE remains a significant long-term complication, underscoring the potential importance of implementing and adhering to stringent prophylactic protocols.

Case report of tricuspid valve-in-valve replacement in a young patient

D Pillay, S Brown and D Buys
Department of Paediatric Cardiology, Universitas Academic Hospital, University of the Free State, Bloemfontein, South Africa

Background: Transcatheter valve implantations in the tricuspid position are infrequent.
Objectives: To report a case of the Edwards SAPIEN 3 (S3) implantation in the tricuspid position as a transcatheter valve-in-valve procedure in a 12-year-old patient considered at high risk for surgical reintervention for tricuspid stenosis.
Method: The procedure was performed under general anaesthesia with transoesophageal echocardiography (TOE) guidance. The patient was heparinised, and prophylactic antibiotics (cefazolin) were administered. Femoral vascular access was obtained under sonographic guidance. A 6 Fr and 5 Fr sheath was inserted in the left femoral vein and artery, respectively. The right femoral vein was cannulated with a 12 Fr Cook sheath. Haemodynamic data were collected pre- and post-valve implantation. The tricuspid valve was crossed with a 6 Fr wedge catheter. Using a 0.035-inch Amplatz Super Stiff™ guide (Boston Scientific), a good guide wire position was obtained in the distal right pulmonary artery (RPA). The 12 Fr sheath was up-dilated to accommodate the Edwards 14 Fr eSheath. A 20 × 4 mm Atlas™ PTA Balloon (Bard) was inflated at 16 atm to dilate and size the tricuspid valve. The delivery system was tracked over the wire, and the valve was aligned with the previous bioprosthetic valve in a coaxial position. An Edwards S3 26 mm valve was placed in the Perimount ring during rapid pacing at 140 bpm using the patient's epicardial pacemaker. Following valve implantation, the patient showed an immediate improvement in haemodynamics. Haemostasis at the right femoral vein access was achieved percutaneously using the Perclose ProStyle™ (Abbott Laboratories). The patient was discharged 2 days after the procedure on aspirin and diuretics.
Results: The post-implantation peak-to-peak tricuspid gradient improved from 17 mmHg to 0 mmHg, while transthoracic peak instantaneous gradient (PIG) was 7 mmHg, and the mean gradient was 3 mmHg. The echocardiogram at 1-month follow-up showed normal right heart chamber dimensions and function, with good flow across the competent tricuspid valve at a mean gradient of 6 mmHg.
Conclusion: The current case contributes to the growing body of literature demonstrating procedural safety and good efficacy in young patients with post-operative tricuspid pathology.

The prevalence of congenital heart disease in children and adolescents with Down syndrome at Dr George Mukhari Academic Hospital in Pretoria, Gauteng

T Ramanenzhe, CM Rangaka, EM Honey and MPB Mawela
Department of Paediatrics and Child Health, Sefako Makgatho University, Pretoria, South Africa

Background: Congenital heart disease (CHD) is a common congenital anomaly, commonly found in patients with Down syndrome (DS). CHD can cause increased morbidity and mortality if not detected early and managed accordingly. The prevalence of CHD and the type of cardiac lesions in children with DS are well-documented in the literature, but not in our setting.
Objectives: We aimed to determine the prevalence of CHD in children and adolescents at Dr George Mukhari Academic Hospital (DGMAH).
Method: The study was a retrospective review of children and adolescent patients with DS and CHD at DGMAH over 3 years (2016–2019). A total convenience sampling approach was used.
Results: The total number of patients registered as live births during the study period was 32 089. A total of 148 DS patients were followed up, of which 102 had CHD (68%); 22 patients (21.6%) were born at DGMAH, and 78.4% were referrals. Therefore, the prevalence of children with DS and CHD at DGMAH during the study period was 0.7 per 1 000 live births. There were 52 males (51%) and 50 females (49%), with no statistical difference in CHD between the 2 genders. A total of 48 patients (47.1%) had an atrioventricular septal defect (AVSD), 20 (19.6%) had patent ductus arteriosus (PDA), 17 (16.7%) had a ventricular septal defect (VSD), and 10 (9.8%) had an atrial septal defect (ASD). There was a co-occurrence of AVSD and PDA (*n* = 1), pulmonary stenosis (PS) and VSD (*n* = 1), PDA and VSD (*n* = 1), ASD and VSD (*n* =1), mitral regurgitation (MR) and tricuspid regurgitation (TR) (*n* =1), and isolated patent foramen ovale (PFO) (*n* =1), transposition of great arteries (TGA) (*n* =1) and tetralogy of fallot (TOF) (*n* =1).
Conclusion: The prevalence of DS with CHD at DGMAH was 0.7 per 1 000 live births. Of the DS patients, 68% had CHD, with AVSD being the most common (47.1%), which aligns with the literature.

Rheumatic heart disease in South Africa: The impact of 3 decades of democracy

L Ryklief,[1] K Rampersadh,[1] ME Engel,[2,3] J Lawrenson[1] and L Zuhlke[1,4]

[1] Department of Paediatrics and Child Health, University of Cape Town, Cape Town, South Africa

[2] Department of Medicine, Cape Heart Institute, University of Cape Town, Cape Town, South Africa

[3] Cochrane South Africa, South African Medical Research Council, Cape Town, South Africa

[4] Office of the Vice-President, South African Medical Research Council, Cape Town, South Africa

Background: Post-apartheid South Africa has made steady progress towards the 2030 targets of Sustainable Development Goal 3, seeking to ensure healthy lives and promote well-being for all ages. Rheumatic heart disease (RHD), a post-sequela of group A *Streptococcus* (GAS) infection, is a major contributor to cardiovascular mortality and morbidity, particularly in low- to middle-income countries. In 1997, RHD mortality estimates were 1.27 per 100 000.

Objectives: This review assesses the national burden of disease estimates and key components of South Africa's approach to RHD control over the last decade.

Method: We searched 6 databases (2014–2025) for South African studies on GAS infections, rheumatic fever, and RHD. Screening, data extraction, and critical appraisal were conducted independently by 2 reviewers. Analyses encompassed the Core Conceptual Framework for Comprehensive RHD Control Programmes.

Results: We included 181 studies. For domain 1, RHD mortality was reported to be 0.34 per 100 000 in 2020 (Statistics South Africa). Pooled estimates for post-operative mortality for valve surgery were 2.83% at 30 days (n = 366, 4 studies) and 10.68% at > 60 days (n = 234, 3 studies). RHD accounted for 40% of infective endocarditis (n = 766, 8 studies) and 11.29% of heart failure (n = 417, 3 studies). Definite RHD had a pooled prevalence of 6.18 per 1 000 (n = 9 901, 5 community-based studies). Across the remaining domains, adequate information was found for GAS diagnosis/treatment guidelines, secondary prophylaxis, and medical management. There were 22 studies that provided significant but incomplete or limited information. Only 1 domain was unrepresented in the literature.

Conclusion: South Africa remains a high-risk population for RHD, but the decline in mortality and the presence of data across most Core Conceptual Framework domains suggest that post-apartheid efforts to address social determinants of health have reduced its impact. A more comprehensive approach – beyond published reports – is needed to accurately assess and address major gaps in key programmatic areas, thereby strengthening South Africa's approach to RHD control.

Smoking cessation in patients with established atherosclerotic cardiovascular disease: Are we doing enough?

G Schroeder[1] and T Asmal[2]

[1] Department of Internal Medicine, Faculty of Medicine, University of the Free State and Universitas Academic Hospital, Bloemfontein, South Africa

[2] Department of Cardiology, Faculty of Medicine, University of the Free State and Universitas Academic Hospital, Bloemfontein, South Africa

Background: Tobacco use remains a major modifiable risk factor for atherosclerotic cardiovascular disease (ASCVD). Despite this, many patients with established ASCVD, including coronary artery disease (CAD), continue using tobacco products, thereby increasing their risk of adverse outcomes. In South Africa (SA), limited data exist on tobacco use and cessation rates within this population.

Objectives: This study aimed to determine the prevalence of tobacco use and cessation rates among patients with established ASCVD attending the outpatient department of a tertiary hospital in central SA. Secondary objectives included evaluating the role of healthcare workers (HCW) in facilitating cessation and assessing the prevalence of mental health conditions (MHC) in this cohort.

Method: A prospective descriptive study was conducted over 3 months at a tertiary-level cardiology clinic. Patients with established ASCVD and a self-reported history of tobacco use were identified using a screening tool. Consenting participants completed a structured questionnaire and a validated mental health screening instrument.

Results: A total of 131 participants were enrolled, of whom 109 (83.2%) had previously attempted to quit tobacco use. The mean age of these patients was 63 years (standard deviation [SD] 7), and 84 (77.1%) were male. Over 90% of participants had initiated cessation attempts independently. Among the 109 who had attempted to quit, 45 (41.3%) continued tobacco use; most had been advised by a medical practitioner to stop, but received no further support. Of the participants, 22 (20.1%) reported a known MHC, with a higher proportion (59%) among those who continued tobacco use.

Conclusion: Tobacco cessation rates among patients with established ASCVD in SA are comparable to international findings. Clinical advice alone is insufficient to support sustained cessation. HCWs should be aware that underlying MHCs may influence the success rate of cessation in patients who failed to quit tobacco use. MHCs should be screened for in all patients who attempt to quit tobacco use, and HCWs need to individualise strategies for successful cessation.

The impact of non-cardiologist cardiac point-of-care ultrasound on the management of children with suspected congenital or acquired heart disease at a rural hospital in South Africa

P Schwellnus,[1] B Fourie,[1] J-D Lotz,[2] A Redfern,[1] D Mashishi[3] and J Murray[4]

[1] Department of Paediatrics and Child Health, Faculty of Health Sciences, Tygerberg Hospital, Stellenbosch University, Cape Town, South Africa

[2] Department of Family Medicine and Rural Health, Faculty of Health Sciences, Madwaleni District Hospital, Walter Sisulu University, Elliotdale, South Africa

[3] Department of Global Health, Division of Epidemiology and Biostatistics, Faculty of Health Sciences, Stellenbosch University, Cape Town, South Africa

[4] Department of Paediatrics and Child Health, Faculty of Health Sciences, Paarl Hospital, Stellenbosch University, Paarl, South Africa

Background: Despite the increasing public health burden of paediatric cardiac disease, diagnostic and therapeutic resources remain inadequate, particularly in rural settings where access to cardiac services is limited.

Objectives: This study aimed to describe how abnormal non-cardiologist cardiac point-of-care ultrasound (POCUS) findings influence bedside management and referral decisions for children with suspected cardiac disease at a rural hospital.

Method: A retrospective, cross-sectional, descriptive study of all cases with clinically significant abnormal POCUS assessments among paediatric service admissions to Madwaleni District Hospital between 1 January 2020 and 31 July 2023 was conducted. Previously known cardiac cases and minor functional disturbances (e.g. sepsis-associated ventricular dysfunction) not requiring paediatric cardiology referral were excluded. Eligible cases were identified through a local inpatient POCUS database, and corresponding clinical notes and cardiologist consultation records were analysed.

Results: A total of 35 abnormal POCUS assessments were identified. Of these, 20 (57%) were confirmed as congenital heart disease (CHD), 10 (29%) as acquired heart disease (AHD), and 5 (14%) had no apparent cardiac pathology. The most frequent CHD was a ventricular septal defect (n = 6, 17%), and AHD was dilated cardiomyopathy (n = 4, 11%). The median time from admission to POCUS was 1 day (interquartile range [IQR] 0–2.75). POCUS impacted bedside management in 63% of cases (n = 22), most often through initiation of antifailure therapy (n = 16, 35%) and penicillin prophylaxis for suspected rheumatic fever (n = 4, 11%). The frequency of bedside management impact was similar for CHD (n = 14/20, 70%) and AHD (n = 6/10, 60%). POCUS influenced referral decisions in 40% of cases (n = 14). Cardiologist reviews were delayed in 20% of cases (n = 7), avoided in 14% (n = 5), and expedited in 3% (n = 1). In 1 case (3%), a device closure of a patent ductus arteriosus was scheduled based on POCUS findings. POCUS changed referral plans more frequently in AHD (n = 6/10, 60%) than in CHD (n = 7/20, 35%).

Conclusion: This single-centre study demonstrates that non-cardiologist cardiac POCUS findings can play a role in bedside decision-making and referral triage for children with suspected cardiac disease in rural hospitals. A broader investigation into the use of POCUS for improving paediatric cardiac care in Africa is warranted.

Left ventricular remodelling in hypertensive patients with episodes of hypertensive emergency

S Sibeko, M Rajah, A Doubell and P Herbst

Department of Internal Medicine, Division of Cardiology, Stellenbosch University, Cape Town, South Africa

Background: The development of left ventricular (LV) systolic dysfunction in patients with systemic hypertension is believed to be driven primarily by interval myocardial infarction (MI). However, a significant proportion of young hypertensive individuals present with eccentric remodelling and systolic dysfunction without interval MI. Whether hypertensive emergency (HE), as a form of severe hypertension, is a risk factor for such adverse remodelling is unknown.

Objectives: This study aimed to evaluate cardiac remodelling in patients with episodes of HE.

Method: A cross-sectional, observational study was performed in 2 groups of patients with severe hypertension. A cohort of patients with chronic resistant hypertension (RH) was compared with a cohort presenting with episodes of HE, using cardiac magnetic resonance imaging (MRI). The pattern and degree of LV remodelling were described and compared between the 2 cohorts.

Results: A total of 32 patients were analysed, 17 with HE (53%) and 15 with RH (47%). The mean patient age was 49.3 ± 14.27 versus 53.7 ± 12.75 years, and 78% versus 53% of patients were male in the HE and RH cohorts, respectively. Baseline characteristics did not differ significantly between the 2 groups. HE patients had higher indexed LV mass (100.7 ± 34.7 vs. 74.05 ± 33.83 g/m^2; p = 0.04) and indexed LV end-diastolic volumes (108.5 ± 34.1 vs. 79.11 ± 16.2 cm^3/m^2; p = 0.004), with more impaired LV ejection fraction (43.4% ± 16.9% vs. 54.1% ± 10.8%; p = 0.04). Systolic blood pressure at presentation did not differ significantly between the groups (212.27 ± 32.7 vs. 199.2 ± 29.4 mmHg; p = 0.23).

Conclusion: HE patients had adversely remodelled left ventricles that were heavier, more dilated, and demonstrated more impaired systolic function compared with RH patients. No evidence of interval MI was identified, suggesting that HE is an important risk factor for developing LV systolic dysfunction and adverse remodelling (heart failure with reduced ejection fraction) in the severe hypertension population.

The prevalence of left ventricular dilatation in competitive professional footballers – Linear versus volumetric measurements

A Singh, A Haines, V Peterson, A Singh, A Becker and F Peters
Life Flora Hospital, Cardiovascular Pathophysiology and Genomics Research Unit, University of the Witwatersrand, Johannesburg, South Africa

Background: Left ventricular dilatation (LVD) is an important indicator of appropriate left ventricular remodelling in competitive athletes with a predominant dynamic left ventricular volume overload, and may aid in differentiating normality from pathology. We hypothesised that left ventricular remodelling in such individuals may occur to a greater extent in a vertical direction than transversally and, thus, linear dimensions may underestimate the true degree of LVD.
Objectives: The retrospective study aimed to determine the prevalence of LVD in competitive professional football players using linear versus volumetric echocardiographic-based cut points defined by the 2015 American Society of Echocardiography (ASE) chamber guidelines.
Method: A total of 92 professional adult football players underwent FIFA pre-World Cup screening echocardiography between 2020 and 2024. All studies were performed and measurements made according to the appropriate ASE guidelines. Exclusion criteria included known or newly diagnosed cardiac or systemic disease and a technical inability to obtain adequate linear and volumetric data from the appropriate echocardiographic views. The ASE recommended cut points for left ventricular end-diastolic diameter (LVEDD) are 52 mm for females and 58 mm for males. The left ventricular end-diastolic volume index (LVEDVI) is 61 ml/m^2 for females and 74 ml/m^2 for males.
Results: The cohort comprised 54 males (58.69%) and 38 females (41.30%). Concerning male football players, the mean age was 24.1 ± 4.9 years, with a left ventricular ejection fraction (LVEF) of 56.5% ± 7.6%. The LVEDD was 50.4 ± 4.3 mm, with 1 individual (1.85%) fulfilling the criteria for LVD using linear cut points. LVEDVI was 85.9 ± 12.6 ml/m^2, with 47 (87.1%) fulfilling the criteria for LVD utilising volumetric cut points. Regarding female football players, the mean age was 24.6 ± 4.1 years, with a LVEF of 61.6% ± 6.6%. The LVEDD was 43.9 ± 3.2 mm, with no individuals meeting the LVD criteria using linear cut points. The LVEDVI was 75.2 ± 12.1 mm, whereas 33 (86.8%) fulfilled LVD utilising volumetric cut points.
Conclusion: LVD was identified more frequently using volumetric indexed measurements than linear measurements in competitive football players based on ASE cut points.

The prevalence of clopidogrel resistance in patients following complex percutaneous coronary intervention

A Singh, A Becker, A Singh, A Haines, V Peterson and F Peters
Life Flora Hospital, Cardiovascular Pathophysiology and Genomics Research Unit, University of the Witwatersrand, Johannesburg, South Africa

Background: Clopidogrel resistance (CR) can be identified by the platelet VASP (vasodilator-stimulated phosphoprotein) test and is associated with subacute stent thrombosis and adverse outcomes. Routine testing for CR is not advocated in clinical practice, and there is a paucity of local data regarding CR in South Africa.
Objectives: This retrospective study aimed to determine the prevalence of CR in patients who underwent complex percutaneous coronary intervention (PCI).
Method: A single-centre, retrospective study evaluating all patients who underwent complex PCI involving left main PCI or non-left main multivessel PCI between January 2024 and April 2025, received adequate clopidogrel loading, and a minimum of 3 days' subsequent dual antiplatelet therapy. Exclusion criteria were poor compliance/discontinuation of clopidogrel, inability to fund ticagrelor, ad hoc use of ticagrelor, and inability to take dual antiplatelet therapy. The commercially available platelet VASP assay from Lancet Laboratories was used in all cases. A platelet reactivity index (PRI) of either 50–70% or > 70% was defined as CR.
Results: A total of 61 patients were identified. The mean age was 65.7 ± 10.6 years, with 48 males (78.7%). PCI occurred within the context of an acute coronary syndrome (ACS) in 34 patients (55.7%); 14 (41.2%) with unstable angina, 12 (35.3%) with non-ST-elevation myocardial infarction (NSTEMI), and 8 (23.5%) with ST-elevation myocardial infarction (STEMI). CR was identified in 43 patients (70.5%), with 17 (27.9%) having a PRI between 50% and 70%, and 26 (42.6%) having a PRI > 70%. CR was most frequently observed in 21 Indian patients (34.4%), followed by 16 white patients (26.2%), 4 coloured patients (6.6%), and 2 black patients (3.3%). All cases identified as CR were treated with ticagrelor, and no cases of subacute stent thrombosis were documented at follow-up 1 month thereafter.
Conclusion: The prevalence of CR (PRI > 50%) in this cohort was 70.5%, with no subsequent subacute stent thrombosis with ticagrelor initiation. These preliminary findings require future multicentre validation.

The non-inflammatory phenotype in patients with recurrent post-viral/idiopathic pericarditis – A case series

A Singh, A Singh, V Peterson, A Haines, A Becker and F Peters
Life Flora Hospital, Cardiovascular Pathophysiology and Genomics Research Unit, University of the Witwatersrand, Johannesburg, South Africa

Background: Recurrent pericarditis may be associated with a non-inflammatory phenotype (NIRP), which has been recently proposed. This clinical phenotype is characterised by a normal c-reactive protein (CRP) with a more resistant clinical course.
Objectives: This single-centre case series aimed to identify NIRP in patients diagnosed with recurrent pericarditis.
Method: All patients who fulfilled the 2015 European Society of Cardiology (ESC) criteria for the diagnosis of recurrent pericarditis were considered, provided they had persistent symptoms despite conventional anti-inflammatory therapy. Exclusion criteria included secondary systemic disease or infectious processes, and absent cardiac magnetic resonance (CMR) data. A CRP level < 5 mg/ml was used to delineate NIRP.
Results: Between January and April 2025, 6 patients fulfilled the criteria for NIRP. The mean age was 29.3 ± 12.50 years, with 66.7% being female. A pericardial effusion was detected in all cases on both echocardiography and CMR (1 trivial [16.7%], 5 small [83.3%]). The CRP was < 1 mg/ml in all cases. The blood neutrophil-to-lymphocyte ratio (NLR) was < 1 in 3 cases (50%), between 1 and 2 in 2 cases (33%), and > 2 in 1 case. All patients exhibited evidence of delayed enhancement of the pericardium on CMR, with 4 (66.6%) also showing delayed enhancement of the myocardium.
Conclusion: In this series, NIRP was characterised by a female preponderance, a low CRP, and normal or low blood NLR, despite pericardial inflammation identified by CMR.

Real-time monitoring of oral antibiotic adherence in infective endocarditis patients using the Wisepill® electronic adherence device: A prospective cohort pilot study

AF Vosloo,[1] AF Doubell,[2] AJK Pecoraro[2] and A Engelbrecht[2]
[1] Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa
[2] Division of Cardiology, Department of Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa

Background: The European Society of Cardiology (ESC) guidelines for treating infective endocarditis (IE) promote oral step-down therapy following 10 days of intravenous antibiotics. This protocol has not yet been tested in low- to middle-income countries, like South Africa. Various electronic medication adherence devices, such as the Wisepill® device, are available, but evidence supporting their efficacy remains limited. These devices, especially when paired with SMS reminders, have shown improved adherence across multiple chronic diseases; however, they have not been studied for oral step-down therapy for IE.
Objectives: This study aimed to provide a comprehensive description of the patient experience regarding oral step-down therapy for IE. A secondary aim was to assess the impact of SMS reminders on adherence in this cohort.
Method: To capture the patient experience, a qualitative questionnaire was completed at the 2-week follow-up, exploring patients' perceptions of adherence and the device's influence. Each patient who stepped down to the oral regimen received a Wisepill® device containing their medication for the oral step-down phase of their treatment. Each opening was registered, and a signal containing the time of opening was sent to a server. Patients had a 2-hour time window to take their medication. If the box was not opened within the time frame, an SMS reminder was sent.
Results: Of the included patients, 13 perceived improvement in adherence by using Wisepill®. A sense of responsibility for their own health was reported. None of the patients experienced stigma associated with using the device. Suggestions to improve the physical appearance of the device were made. Only 1 dose was taken after receiving a SMS reminder. The average percentage of adherence was 93.92%, with an average of 92.64% of these doses taken on time.
Conclusion: The primary aim was achieved by capturing a range of patient experiences. Most feedback was positive, and patients felt good about taking responsibility for their own therapy. They perceived the SMS reminder to assist them with this responsibility. The small patient number and lack of a control group limited the ability to assess the device's impact on adherence. A larger randomised controlled study is required.

Self-reported stress overload experience, autonomic tone, and acute mental stress cardiovascular reactivity: The African-PREDICT Study

A Wentzel[1,2] and EJ van Vuren[1,2]

[1] Hypertension in Africa Research Team, North-West University, Potchefstroom, South Africa

[2] South African Medical Research Council Unit for Hypertension and Cardiovascular Disease, North-West University, Potchefstroom, South Africa

Background: Stress, stress perceptions, appraisals, and the perceived individual ability to manage stress significantly impact cardiovascular health in humans; however, this relationship is complex and multifactorial. The Stress Overload Scale (SOS) and its subdomains, Event Load (EL) and Personal Vulnerability (PV), may identify individuals at a higher risk of stress-related cardiovascular health concerns. Whether the cardiovascular reactivity patterns, autonomic tone, and cardiovascular risk differ based on these self-reported stress subdomains is unknown.

Objectives: We investigated the relationship between the SOS and its subscales with acute stress-induced cardiovascular reactivity markers and markers of autonomic tone.

Method: In 610 South Africans (46% men, 45% black African, aged 20–30 years), the SOS and subscales (EL and PV) assessed stress overload. We identified individuals with a total SOS score, and combinations of high-EL-high-PV, low-EL-low-PV, low-EL-high-PV, and high-EL-low-PV, using established subdomain cut points for the SOS. An acute mental stress task was administered for 1 minute, and haemodynamic reactivity for systolic and diastolic blood pressure (BP), heart rate (HR), stroke volume (SV), cardiac output (CO), total peripheral resistance (TPR), arterial compliance (Cwk), and left-ventricular ejection fraction (LVEF) were measured. Ambulatory BP and HR variability (HRV) were assessed.

Results: Of the 610 participants, 25% (n = 151) were high-EL-high-PV, 27% (n = 163) low-EL-low-PV, 29% (n = 174) low-EL-high-PV, and 19% (n = 122) high-EL-low-PV. Within each group, sex and ethnicity did not differ significantly. Depressed HRV was the highest in the high-EL-high-PV group ($p < 0.01$), with the low-EL-high-PV group also indicating depressed HRV compared with the low-PV groups (all $p < 0.02$). High-EL-low-PV had greater acute haemodynamic reactivity than the other groups (all $p < 0.05$). In the 2 high-PV groups, increases in CO and TPR, and decreases in CwK, were associated with the PV continuous subscale (all $p < 0.03$). In the high-EL-low-PV group, increases in CO, HR, SV, and Cwk, and decreases in TPR, were associated inversely with the PV continuous subscale ($p < 0.001$) and positively with the EL continuous subscale ($p = 0.014$).

Conclusion: Perceived PV was consistently associated with autonomic tone and acute haemodynamics, with greater PV adversely impacting acute haemodynamics and possible future cardiovascular risk. However, a low PV despite a high EL was linked to compensatory, physiologically advantageous autonomic tone and acute haemodynamic stress responses.

Biomarkers of collagen metabolism and correlation with aorta strain in HIV aortopathy

P-Y Wu, T Dix-Peek and R Meel

Faculty of Health Sciences, Department of Internal Medicine, University of the Witwatersrand, Johannesburg, South Africa

Background: Human immunodeficiency virus (HIV), independent of traditional risk factors, is associated with a fourfold higher risk of aortic aneurysm; however, the pathophysiology remains understudied. Thoracic aortic aneurysms (TAA) are often asymptomatic and convey high morbidity and mortality burdens.

Objectives: The role of collagen metabolism biomarkers in the pathophysiology of HIV-associated TAA and their correlation with aortic circumferential strain (CS) and ß2-stiffness index (surrogates for aortic stiffness) were explored.

Method: A retrospective, descriptive, cross-sectional study was conducted from April 2017 to March 2018 at Chris Hani Baragwanath Academic Hospital. It comprised 57 patients with HIV-associated TAA, age- and gender-matched normal controls (n = 56), and HIV-reactive patients (n = 57) without aneurysms. Clinical, echocardiographic, and data regarding collagen metabolism biomarkers were analysed and compared within the HIV group and among the 3 groups.

Results: The study population's mean age was 45.23 ± 9.07 years, with a 2:1 female predominance. The median left ventricular ejection fraction of the HIV-TAA group was 47.90% (38.40–55.40%). Severe aortic regurgitation (AR) was found in 77.2% of patients, and 10.5% and 5.3% of patients had moderate and mild AR, respectively. Aortic CS in the HIV-TAA group was significantly lower ($p < 0.001$), and the ß2-stiffness index was higher ($p < 0.001$) than in the 2 control groups. Matrix metalloproteinase-1 (MMP-1) levels were higher in the HIV-TAA group than in the controls ($p = 0.006$), with no statistically significant difference in tissue inhibitor of metalloproteinase-1 (TIMP-1) levels. The MMP-1-to-TIMP-1 ratio was higher compared with controls ($p < 0.001$), indicating a net collagen degradation effect. Procollagen III N-terminal peptide (PIIINP) was greater in the HIV-TAA group compared with controls ($p = 0.001$). No significant difference in procollagen I carboxy-terminal propeptide (PICP) was found among the 3 groups. No correlation was found between collagen metabolism biomarkers and CS of the aorta in the HIV-TAA group. TIMP $r = 0.2$ ($p = 0.12$), MMP-1 $r = 0.07$ ($p = 0.5$), PIIINP $r = -0.05$ ($p = 0.33$), and PICP $r = -0.003$ ($p = 0.6$).

Conclusion: HIV-TAA is predominantly characterised by collagen degradation as suggested by increased MMP-1 activity, impaired TIMP-1 activity, and an increased MMP-1-to-TIMP-1 ratio. It is associated with an increased PIIINP turnover and potential increased type III collagen degradation, resulting in weakening and dilatation of the aortic wall, whilst normal values of PICP imply less involvement of type I collagen.

Mitochondrial Function And Subclinical Atherosclerosis In HIV: Preliminary Findings From The MitoSAKen Study

T Boltman, K Mokoena, I Webster, A Genis, J Cambell, A Oueslati, C Kruger, J Holm, V Mbombela, J Adoga, F Everson, G Maarman, H Strijdom

The Department of Biomedical Sciences, Division of Medical Physiology, Stellenbosch University, Cape Town, South Africa

Background: People living with HIV (PLWH) are at increased risk of atherosclerosis, but the underlying mechanisms remain unclear. Mitochondrial dysfunction has been proposed as a contributing factor; however, the relationship between mitochondrial function and early vascular changes is unclear in Sub-Saharan African populations.

Objectives: To investigate the association between mitochondrial function and subclinical atherosclerosis (carotid intima-media thickness (c-IMT)) in PLWH on antiretroviral therapy compared to HIV-negative (HIV–) controls in a study population from the Western Cape.

Method: This cross-sectional study enrolled 146 participants [HIV–: n=68; HIV positive (HIV+): n=78]. Medical history, sociodemographic, and anthropometric data were collected. Fasting blood and urine samples were analysed. Mitochondrial respiration was assessed in peripheral blood mononuclear cells using the Oroboros O2k-FluoRespirometer. c-IMT was measured using ultrasound. Linear regression analysis was used to explore independent associations ($p < 0.05$).

Results: The study cohort was relatively young (~40 years), HIV+ participants had significantly higher levels of FIB-4 (liver fibrosis marker) [Median (range): 0.95(0.19–4.19) vs. 0.74(0.20–4.04); $p < 0.001$] and elevated C-reactive protein (hsCRP) levels [73% vs. 57%; $p = 0.046$] compared to HIV– controls. HIV+ individuals showed lower haemoglobin [13.43±1.69 vs. 14.17±1.63 g/dL; $p = 0.019$], estimated glomerular filtration rate [101.69±21.1 vs. 122.22±13.8 mL/min/1.73m^2; $p < 0.001$], and percentage carotid intima-media thickness (%c-IMT, expressed relative to average carotid diameter) [8.15±1.34 vs. 9.14±1.90%; p=0.006]. Mitochondrial routine respiration (pmol/s/mL) was reduced in HIV+ individuals compared to HIV– controls [0.00(0.00–5.77) vs. 1.69(0.00–8.05); $p < 0.001$]. Both cytochrome-c (Cyt-C) response [0.28(0.00–3.01) vs. 0.11(0.00–3.28) $p = 0.025$] and residual oxygen consumption (ROX) [0.31(0.00-0.63)) vs. 0.16(0.00-0.79)); $p = 0.036$] were higher in the HIV+ group. In the total population, succinate [Standardised β (95%CI): 0.289(0.137-0.440); $p < 0.001$] was positively associated with average carotid diameter (mm) and triglyceride levels were positively associated with %c-IMT [β: 0.225(0.064-0.385); $p = 0.006$]. HIV status was inversely associated with average c-IMT (μm) [β: –0.169 (–0.328 to –0.010); $p = 0.038$], whereas ROX showed a positive association [β: 0.193(0.035-0.351); $p = 0.017$]. Within the HIV+ group Cyt-C response [β: 00.226(0.007-0.445); $p = 0.044$] was positively associated with average carotid diameter.

Conclusion: While HIV-infection was not associated with increased subclinical atherosclerosis, the observed links between altered mitochondrial function and elevated c-IMT underscore the need for further investigation.

Infective Endocarditis: Writing The Script For Oral Step-down Therapy In South-Africa

A Engelbrecht, AJ Kemp Pecoraro, AF Doubell

Division Of Cardiology, Department Of Medicine, Faculty Of Medicine And Health Sciences, University Of Stellenbosch And Tygerberg Hospital, Bellville, South Africa

Background: Infective endocarditis(IE) has traditionally been treated with prolonged intravenous(IV) antibiotics, based on historical assumptions regarding the poor efficacy of oral antibiotics in IE. Oral antibiotic step-down regimens are effective and guideline-recommended in high-income countries. However, their feasibility remains uncertain in low- and middle-income countries (LMICs), where distinct causative pathogens may be prevalent. Additionally, there is a paucity of data regarding the outcomes of oral step-down therapy in blood culture-negative IE(BCNIE).

Objectives: To assess the feasibility and outcomes of oral step-down therapy in the South African healthcare system

Method: This prospective observational study is conducted at an IE referral centre in South Africa. Adult patients with IE who fulfil predefined stability criteria are transitioned to oral antibiotics after 10 days of IV antibiotics(or 7 days post-surgery). A transoesophageal echocardiogram(TOE) is performed before step-down. Compliance is optimised with a portable electronic medication dispenser. The primary outcome is a composite of all-cause mortality, unplanned cardiac surgery, embolic events, or relapse within 3-months of treatment completion.

Results: Fourteen patients(14/32;44%) met the criteria for oral step-down therapy. The most common reason for exclusion was patient mortality before enrolment(6/18;33%). In the oral step-down group, a causative pathogen was identified in 79%($n = 11$), with 43%($n = 6$) having blood culture positive IE(BCPIE). The predominant pathogen in BCNIE was Bartonella spp., which also emerged as this cohort's most common causative organism(29%, $n = 4$). Eight patients required surgical intervention before transitioning to step-down therapy. The TOE performed before step-down therapy did not preclude any patients from oral therapy. Oral step-down therapy was initiated after a median of 19 days (IQR 13–24). Patient adherence to the oral regimen was 96%, with a median of 1 missed dose (IQR 0.25–2.75). The primary composite outcome was not observed in any patients receiving oral therapy. In one patient, the oral regimen was modified due to a drug interaction. Outcomes in patients with BCPIE and BCNIE were similar.

Conclusion: Despite unique challenges and causative pathogens, oral step-down therapy to consolidate the antimicrobial treatment of IE is achievable in a LMIC, regardless of whether the patient has BCPIE or BCNIE. Inaccessibility to TOE should not disqualify patients from receiving oral step-down therapy.

Role Of Myocardial Fibrosis On Afterload Mismatch In Severe Aortic Stenosis

M Rajah, A Doubell, P Herbst
Division Of Cardiology, Department Of Medicine, Tygerberg Hospital, Stellenbosch University, Cape Town, South Africa

Background: Afterload mismatch in severe aortic stenosis (AS) refers to the high-gradient (mean gradient > 40 mmHg) subset of patients with a reduced LVEF (< 50%). The maintenance of a high gradient implies that intrinsic myocardial contractility is likely preserved and that other mechanisms such as myocardial fibrosis are likely responsible for the low LVEF.
Objectives: To evaluate the role of myocardial fibrosis in the development of left ventricular (LV) systolic dysfunction in afterload mismatch.
Method: High-gradient severe AS patients with and without LV systolic dysfunction were prospectively recruited for evaluation by cardiovascular magnetic resonance (CMR) imaging. Diffuse interstitial fibrosis was evaluated using pre- and post-contrast T1 mapping. Replacement fibrosis was evaluated using late gadolinium enhancement (LGE) imaging.
Results: Of 58 recruited participants, 25 had afterload mismatch [mean AVA 0.5 ± 0.2 cm^2, mean gradient 55 (46–66) mmHg, mean LVEF 28 ± 8%] and 33 had a normal LVEF [mean AVA 0.7 ± 0.2 cm^2, mean gradient 48 (41–69) mmHg, LVEF 65 ± 9%]. Diffuse interstitial fibrosis and replacement fibrosis were significantly higher in afterload mismatch [global T1 relaxation time: 1061 ± 22 vs. 1041 ± 33 ms, p = 0.008; extracellular volume fraction (ECV): 26 ± 3 vs. 24 ± 3%, p = 0.02 and LGE mass: 14.3 vs. 5.3 g, p = 0.008]. Non-invasive end-systolic wall stress (ESWS) was also significantly higher in afterload mismatch (263.6 ± 82.2 vs. 118.3 ± 49.5x103 dynes/cm^2, p < 0.0001). Both diffuse interstitial and replacement fibrosis correlated poorly with LVEF in the total cohort (T1: r = -0.35, p < 0.01; ECV: r = 0.34, p = 0.03 and LGE mass: r = -0.42, p = 0.001). On univariate analysis, T1 time and ESWS were significantly associated with LVEF. At multivariate analysis, ESWS rather than CMR markers of fibrosis was the best predictor of LVEF (beta-coefficient 0.8, 95% confidence interval 0.63–0.96, p < 0.01).
Conclusion: Although the myocardial fibrosis burden was significantly higher in those with afterload mismatch, its association with systolic function and its predictive utility for LVEF were weak. Rather than a mechanistic role on systolic function, it may be more reflective of disease chronicity.

Transforming Growth Factor-beta 1 As A Potential Biomarker Of Diffuse Interstitial Myocardial Fibrosis

M Rajah, E Marais, G Maarman, A Doubell, P Herbst
Division Of Cardiology, Department Of Medicine, Tygerberg Hospital, Stellenbosch University, Cape Town, South Africa

Background: Diffuse interstitial and replacement myocardial fibrosis are independent predictors of mortality in aortic stenosis (AS). Myocardial fibrosis, evaluated clinically on cardiovascular magnetic resonance (CMR) imaging may therefore be useful for risk stratifying patients for earlier valvular intervention. Access to CMR in Africa, however, remains limited and cheaper, more accessible fibrosis biomarkers are required.
Objectives: To establish the potential utility of transforming growth factor-B1 (TGF-B1) and the propeptides of procollagens I and III (PICP and PIIINP respectively) as serum biomarkers of myocardial fibrosis in AS.
Method: Participants with severe AS (aortic valve area < 1.0 cm^2, mean gradient > 40 mmHg) were prospectively enrolled into this pilot study. All participants underwent CMR with T1 mapping and late gadolinium enhancement (LGE) for the quantification of diffuse interstitial and replacement fibrosis respectively. Serum was isolated from peripheral venous blood samples for enzyme-linked immunosorbent assays (ELISA) using commercially available kits for the abovementioned biomarkers.
Results: Twenty-one participants were recruited [mean age 60 ± 11 years, 62% females, mean AVA 0.7 ± 0.2 cm^2, mean gradient 50 (41–56) mmHg]. The mean T1 relaxation time (1040 ± 24 ms) and extracellular volume fraction (25 ± 3%) confirmed the presence of diffuse interstitial fibrosis in the cohort. The mean replacement fibrosis mass was 10.7 (5.2–14.2) g. The serum concentrations of TGF-B1, PICP and PIIINP in the cohort were 10.7 (7.6–14.4) ng/mL, 235.8 (134.5–327.9) ng/mL and 169.7 (107.9–216.3) pg/mL respectively. In a simple correlation analysis, a significant moderate association was observed only between T1 relaxation time and serum TGF-B1 concentration (r = 0.5, p = 0.04) prompting further analysis of the cohort divided by T1 time. In 11/21 patients with an abnormal T1 time (1056 ± 18 ms), advanced left ventricular remodeling and systolic dysfunction was observed together with a trend towards higher TGF-B1 concentration [13.0 (9.0–15.2) vs. 10.3 (5.4–11.2) ng/mL in those with a normal T1 time, p = 0.08]. No meaningful associations were found for the biomarkers and replacement fibrosis, or between PICP/PIIINP and diffuse interstitial fibrosis.
Conclusion: Serum TGF-β1 may be a potential marker of diffuse interstitial fibrosis measured by T1 relaxation time on CMR in severe AS.

A "Fluttering" Block

SG Hoosain
Department Of Paediatrics And Child Health At The University Of The Witwatersrand, Department Of Cardiology At Nelson Mandela Children's Hospital, Johannesburg, South Africa

Background: Congenital complete heart block (CCHB) and Atrial flutter (AF) rarely occur within the paediatric population. CCHB is commonly associated with maternal autoimmune disease and occasionally associated with congenital structural heart defects. In contrast, AF can occur in isolation or secondary to structural and acquired heart disease.
Objectives: There is insufficient data available regarding the occurrence of AF in conjunction with CCHB, with literature exploring only one paediatric case. Despite the rarity of these arrythmia's, I present an infant with CCHB complicated by AF who was successfully managed with electrical cardioversion and pacemaker implantation.
Results: Case: An 11-month-old boy, born prematurely at 32 weeks gestation, was diagnosed with a CCHB at birth. The mother had gestational diabetes mellitus and was later diagnosed with systemic lupus erythematosus. Echocardiography showed a 3 mm patent foramen ovale and mild left ventricular hypertrophy without obstruction. The infant was asymptomatic with a heart rate of 70–80 bpm, thus, he did not require permanent cardiac pacing. At the age of 11 months, during a routine clinic visit, the infant presented with AF. The electrocardiogram had an atrial rate of 300 bpm with a regular sawtooth pattern and a ventricular rate of 60 bpm. The atria did not appear dilated and there were no observed intracardiac thrombi or ventricular dysfunction on echocardiogram. Prophylactic intravenous anticoagulation was administered for 24 hours, prior to aborting the AF successfully using electrical cardioversion in the cardiac catheterization laboratory. Subsequently, an epicardial pacemaker was implanted. There was no recurrence of the AF on follow up.
Conclusion: CCHB and AF rarely occur in conjunction. However, together it has the potential to cause cardiovascular compromise. The AF can be treated with synchronised cardioversion once intra cardiac thrombi are excluded. The indication for permanent cardiac pacing remains individualised to the patient's clinical presentation.

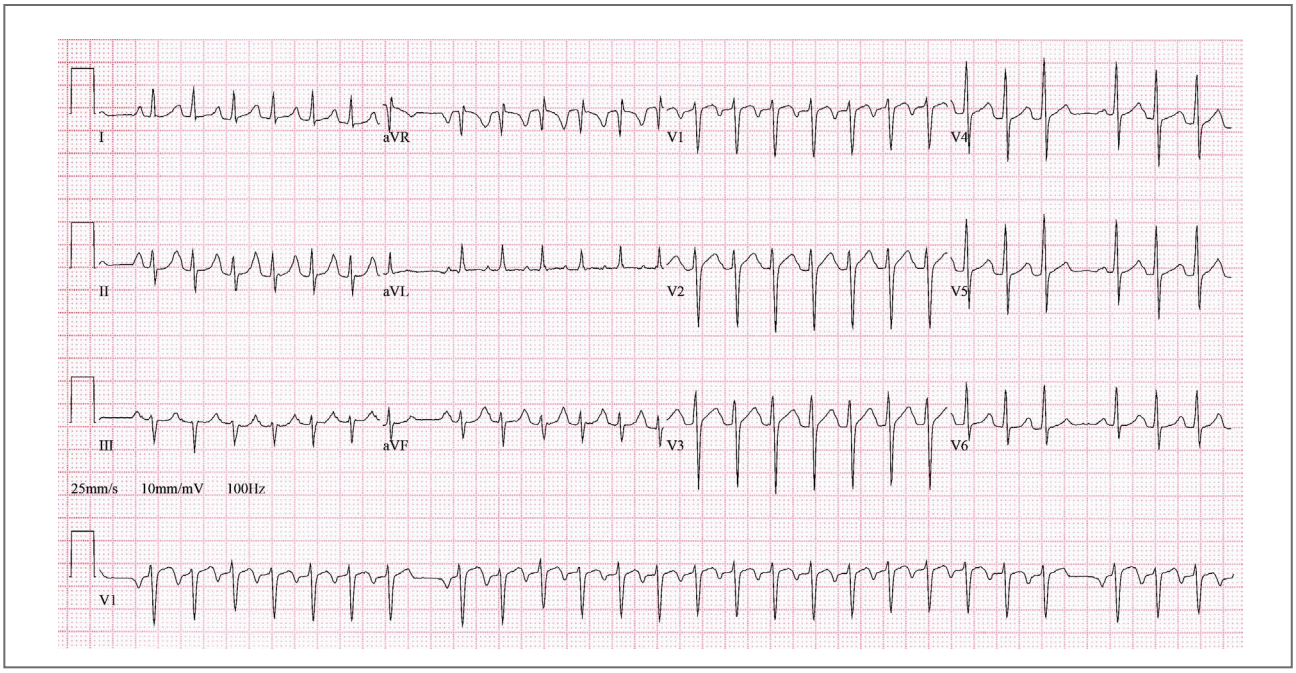
ECG Quiz 70

CASSA
CARDIAC ARRHYTHMIA SOCIETY OF SOUTHERN AFRICA
A SPECIAL INTEREST GROUP OF SA HEART®

RS Millar and A Chin
Cardiac Clinic, University of Cape Town / Groote Schuur Hospital
Cardiac Arrhythmia Society of Southern Africa (CASSA)

RS Millar https://orcid.org/0000-0002-5608-0623
A Chin https://orcid.org/0000-0001-6930-3673
DOI: https://doi.org/10.24170/22-4-7749 | https://doi.org/10.24170/22-4-7750

This 49-year-old man had a history of intermittent, fast, irregular palpitations. Which ONE of the following is the best electrocardiogram (ECG) diagnosis?



QUESTION: What is the best ECG diagnosis?

a. Sinus tachycardia with an intermittent 2:1 exit block.
b. Repetitive atrioventricular junctional re-entry tachycardia.
c. Atrial tachycardia with an intermittent 2:1 exit block.
d. Repetitive atrial tachycardia.
e. Atrial tachycardia with variable atrioventricular block.

Please analyse the ECG carefully and commit yourself to an answer before checking the explanation.

ANSWER on page 243

ECG Quiz 70

CASSA
CARDIAC ARRHYTHMIA SOCIETY OF SOUTHERN AFRICA
A SPECIAL INTEREST GROUP OF SA HEART®

ANSWER

OVERVIEW OF THE ECG

This is a narrow QRS tachycardia, with an average rate of 150 per minute and regular, apart from 2 gaps. A P wave is visible before the QRS that ends the gap. Aside from this, P waves are less easy to distinguish.

More detailed analysis of the ECG

The T waves in leads II and aVF are peaked, suggesting that there are P waves superimposed on the T waves. In V1, there is a sharp negative deflection, which is too high a frequency to be part of the T wave. This is borne out by the 2 P waves after the gaps, which are negative, and the negative deflections in V1 correspond with the peak of the T waves in II and aVF. The negative deflection after the T wave is absent in the complex before the pause. Therefore, there is a 1:1 atrioventricular/ventriculoatrial (AV/VA) relationship. It is a long RP tachycardia (Figure 1).

The R-R interval of the tachycardia is 345 ms, equivalent to a rate of 174 per minute. The P-P interval in the 2 gaps is 660 ms, slightly shorter than 2 tachycardia cycle lengths (Figure 2). The PR intervals before and after the gaps are the same, about 140 ms. The P wave axis is about +50° (using the single visible P wave in the augmented limb leads). The QRS duration is normal (80 ms). The QT interval cannot be measured accurately because of the superimposed P wave. The differential diagnosis of a long RP tachycardia is listed in Table I.

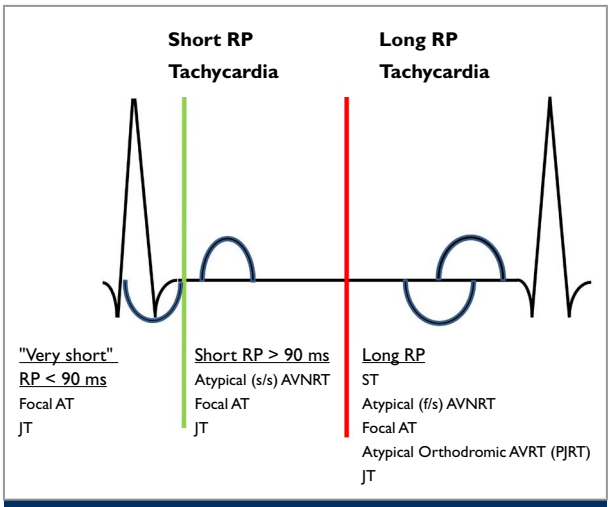


FIGURE 1: Regular narrow QRS tachycardias can be divided into short or long RP, depending on the relationship of the P wave to the QRS complex. A short RP describes P waves in the first half of the R-R interval and can be further divided into short and very short. In the latter case, the P wave may be hidden completely or partially within the QRS. Depending on this relationship, the differential diagnosis varies. However, note that focal atrial tachycardias and junctional tachycardia can have P waves in any of these positions. ***AT: atrial tachycardia, AVNRT: atrioventricular nodal re-entry tachycardia, AVRT: atrioventricular re-entrant tachycardia, f/s: fast-slow, s/f: slow-fast, s/s: slow-slow, JT: junctional tachycardia, PJRT: permanent junctional reciprocating tachycardia***

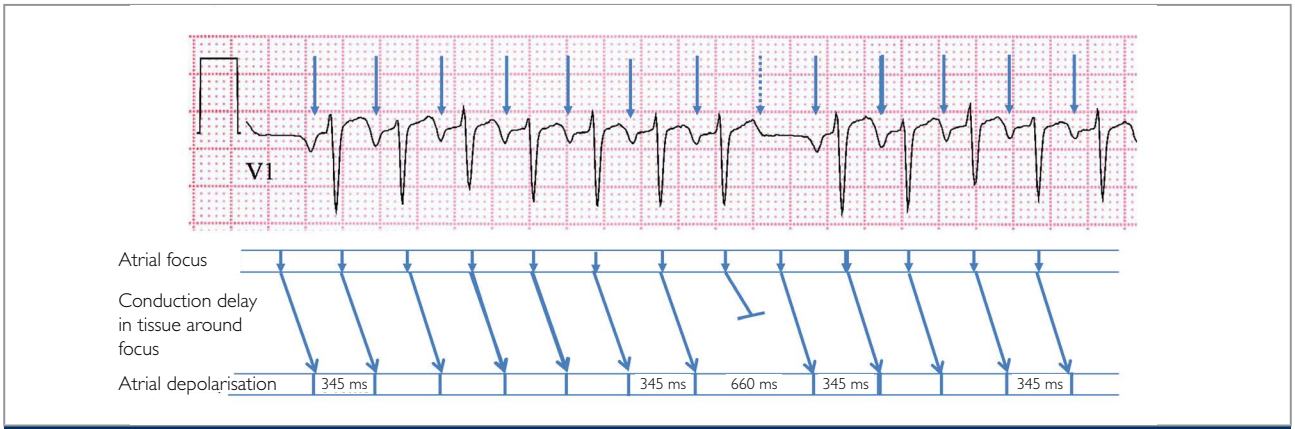


FIGURE 2: The ladder diagram shows the relationship between the origin of the tachycardia and the resultant P waves. The degree of conduction delay through the tissue surrounding the focus is unknown; however, the resulting P-P interval reflects the discharge rate of the focus. The dotted arrow shows the presumed discharge, which is blocked in the tissue around the focus. The resulting pause is 30ms shorter than 2 P-P intervals. A possible explanation is the slightly faster conduction through the surrounding tissue after the pause, analogous to Wenckebach atrioventricular block.

TABLE I

- Sinus tachycardia
- AV junctional re-entry tachycardia:
  - Atypical AV nodal re-entry tachycardia
  - AV re-entry tachycardia with a slowly conducting accessory pathway
- AT
- Junctional ectopic tachycardia with retrograde P waves

AT: atrial tachycardia, AV: atrioventricular

DISCUSSION

This is highly unlikely to be sinus tachycardia. The electrocardiogram (ECG) was done at rest. The predicted maximum heart rate for a 49-year-old man is about 170 per minute (220-age). This will only occur during maximum exercise or other extreme physiological stress. Sinus rates above 130 per minute at rest are uncommon, even with conditions such as thyrotoxicosis or shock. If the rate had been much slower, a diagnosis of sinus rhythm with intermittent exit block could be considered, as the P wave axis is normal.

Atrioventricular (AV) junctional re-entry tachycardia is not usually interrupted for brief periods, roughly equal to 2 R-R intervals. Termination and restarting are usually random. AV nodal re-entry tachycardia (AVNRT) is triggered by an atrial premature complex, which blocks in the fast AV nodal pathway (Figure 3) and conducts via the slow pathway, resulting in a prolonged PR. This may then return retrogradely via the fast

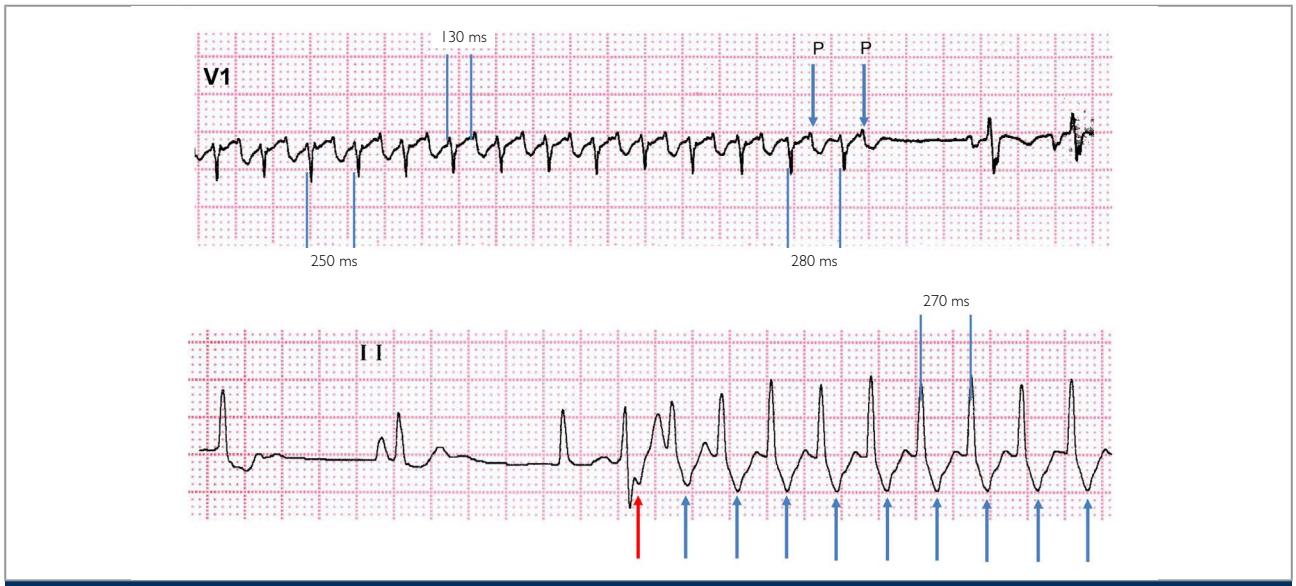


FIGURE 3: An example of a borderline long RP tachycardia due to atypical (fast-slow or slow-slow) atrioventricular nodal re-entry tachycardia (AVNRT).
Upper strip (V1): The tachycardia stops spontaneously and ends with a P wave not followed by a QRS due to block in the antegrade fast pathway. This pattern excludes an atrial tachycardia as it is doubtful that the tachycardia would stop simultaneously with atrioventricular block.
Lower strip (lead II): The tachycardia restarts spontaneously, following a junctional escape beat and a premature complex of undetermined origin, probably junctional. This complex is followed by a retrograde P (red arrow) with a short RP interval, which re-enters the circuit to restart the tachycardia. In this strip, the RP has shortened slightly to 120 ms, so it is now a short RP (cycle length 270 ms). While this is an unusual form of AVNRT, it illustrates the difference between an atrioventricular junctional re-entry tachycardia and a focal atrial tachycardia. In atrioventricular junctional re-entry tachycardia, the RP interval is usually fixed (RP linking), which is not the case with an atrial tachycardia.

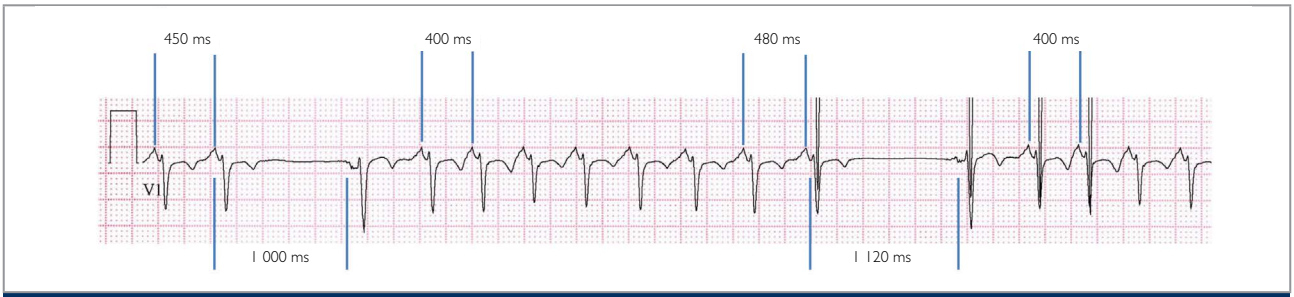


FIGURE 4: A repetitive atrial tachycardia with brief pauses. Note that the pauses are unequal and bear no relation to the tachycardia cycle length. The triggering P wave has a different morphology. Each cycle terminates with a QRS, not a P wave, consistent with an atrial tachycardia, which, in this case, arose from the left atrium. Also, note that the atrial tachycardia slows before it stops.

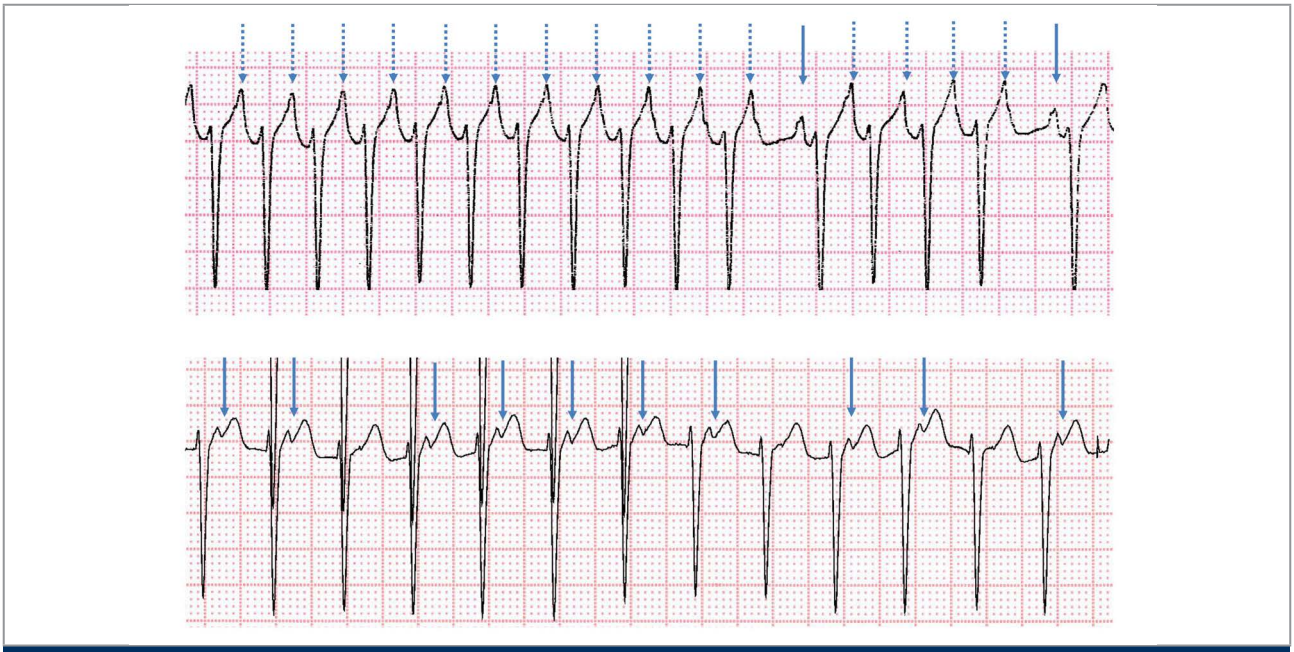


FIGURE 5
Top panel: The P waves in this atrial tachycardia interrupt the peak of the T waves (dotted arrows). Occasional P waves fail to conduct (2:1 atrioventricular block), but there are no missing Ps. This observation excludes junctional re-entry tachycardias, which require a 1:1 atrioventricular relationship.
Bottom panel: This is a short RP tachycardia due to an ectopic focus in the atrioventricular junction (JET). There are retrograde P waves (solid arrows) with intermittent retrograde atrioventricular block. This excludes both atrioventricular junctional re-entry tachycardias (1:1 atrioventricular relationship) and atrial tachycardias, which require 1 or more P waves per QRS.

pathway, if it is no longer refractory. The PR intervals after the pauses are only 140 ms. In orthodromic AV re-entry tachycardia (AVRT) (Wolff-Parkinson-White Syndrome), the initiating premature atrial complex (PAC) blocks in the refractory accessory pathway. In repetitive atrial tachycardia (AT), the gaps are not necessarily a multiple of the tachycardia cycle length (Figure 4). AT with variable AV block is characterised by intermittently blocked P waves (Figure 5).

AT with intermittent exit block is characterised by the intermittent absence of a P wave with no or minimal disturbance of the rhythm, such that the pause is a multiple of the tachycardia cycle length. In this case, the P-P interval in the pauses is 660 ms, slightly shorter than 2 tachycardia cycle lengths (345 ms x 2 = 690 ms). The likely cause is a shortening of the conduction time from the discharging atrial focus to the surrounding atrial tissue after the brief rest engendered by the block, analogous to Wenckebach (Type I) AV block. Importantly, the R-R intervals of the 2 pauses are identical. The exit block is convincing evidence that this is a focal AT or possibly micro-re-entry, surrounded by a zone of atrial tissue with variable conduction properties. It is doubtful that a repetitive AT would restart with exactly the same P-P and R-R intervals. While the P waves resemble sinus Ps, they are sharply negative in V1, which is not the case during sinus rhythm in the same patient (Figure 6).

Therefore, the correct answer is (c): Atrial tachycardia with an intermittent 2:1 exit block.

Focal ATs spread centrifugally from their site of origin, which can be anywhere in either atrium. Those that occur close to the sinus node or in the crista terminalis may be mistaken for sinus tachycardia. While the P wave morphology may mimic sinus rhythm, the key difference is that the rate is physiologically inappropriate. There are several possible underlying mechanisms for focal AT. Triggered activity due to afterdepolarisations is related to calcium shifts across the cell membrane. Micro-re-entry is confined to a small area and is therefore focal. Automatic discharge of cells in a small area acts as a pacemaker, if the rate exceeds that of the sinus node. Focal ATs are commonly incessant and can result in tachycardia-induced cardiomyopathy.

Adenosine is useful for terminating a suspected AV junctional re-entry tachycardia if vagal manoeuvres fail to terminate it. However, while the termination with a vagal manoeuvre is highly specific for tachycardias involving the AV node as part of the circuit (AVNRT and AVRT), adenosine is much less so. About 50–60% of focal ATs can terminate with adenosine.[1] Termination with adenosine appears to be specific for focal ATs that are due to triggered activity. Focal automatic ATs do not terminate but tend to slow or be transiently suppressed.[1]

Intravenous verapamil should not be used, even for narrow QRS tachycardias. If it does not restore sinus rhythm, which it will not with AT, it can cause haemodynamic collapse.[2] This is particularly likely if the tachycardia is incessant and has resulted in tachycardia-induced cardiomyopathy.

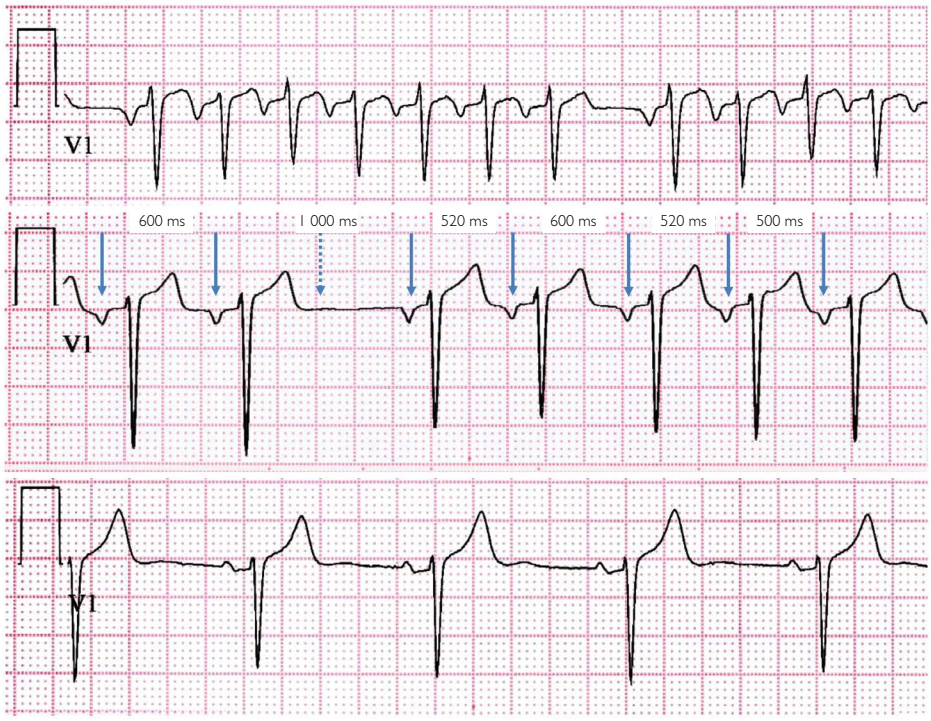


FIGURE 6
Top panel: Shows the presenting ECG with intermittent 2:1 exit block.
Middle panel: Shows the same P wave morphology, but much slower after treatment with propranolol. The atrial rate is now fluctuating between 100 and 120 beats per minute. This fluctuation makes it difficult to prove that the gap is due to the exit block, but it still seems likely.
Bottom panel: Shows a later ECG in sinus rhythm. The P waves are now clearly different, upright as opposed to inverted in V1. This sequence of ECGs and the response to propranolol suggest that the underlying mechanism is an automatic focus, rather than micro-re-entry.

This patient was successfully treated with oral propranolol. The tachycardia initially slowed without a change in the P wave morphology (Figure 6) and, subsequently, sinus rhythm was restored. While adenosine was not used, the slowing on propranolol implies a focal, automatic tachycardia. An intermittent exit block persisted at a slower rate, with pauses equal to, or close to, 2 P-P intervals.

LESSONS AND CONCLUSIONS

- The distinction between exit block and random pauses depends on the consistent relationship between the length of the pause and the cycle length of the basic rhythm.
- Exit block can occur with any focus acting as a pacemaker:
  - Sinoatrial node (most common) – a form of sinus node dysfunction.
  - Atrial focus.
  - Ventricular focus, e.g. accelerated idioventricular rhythm.[3]
- The differential diagnosis of long RP tachycardia includes all in Table I.
- AT can also be short RP, as the unphysiological fast atrial rate will prolong AV nodal conduction in the absence of catecholamine stimulation.
- ATs are commonly incessant and can lead to tachycardia-induced cardiomyopathy.

REFERENCES

1. Liu CF, Cheung JW, Ip JE, et al. Unifying algorithm for mechanistic diagnosis of atrial tachycardia. Circ Arrhythm Electrophysiol. 2016;9(8):e004028. https://doi.org/10.1161/CIRCEP.116.004028.
2. Lawrenson JB, Okreglicki AM, Millar RN. Cardiovascular collapse due to intravenous verapamil in two patients with persistent atrial tachycardia. S Afr Med J. 1995;85(11 Suppl):1236-8.
3. Okreglicki A. ECG Quiz no. 28. SA Heart J. 2012;9(3).

CARDIAC IMAGING QUIZ

R Meel[1] and B Cupido[2]

[1] Department of Internal Medicine, Faculty of Health Sciences, University of the Witwatersrand, and Sandton Mediclinic, South Africa

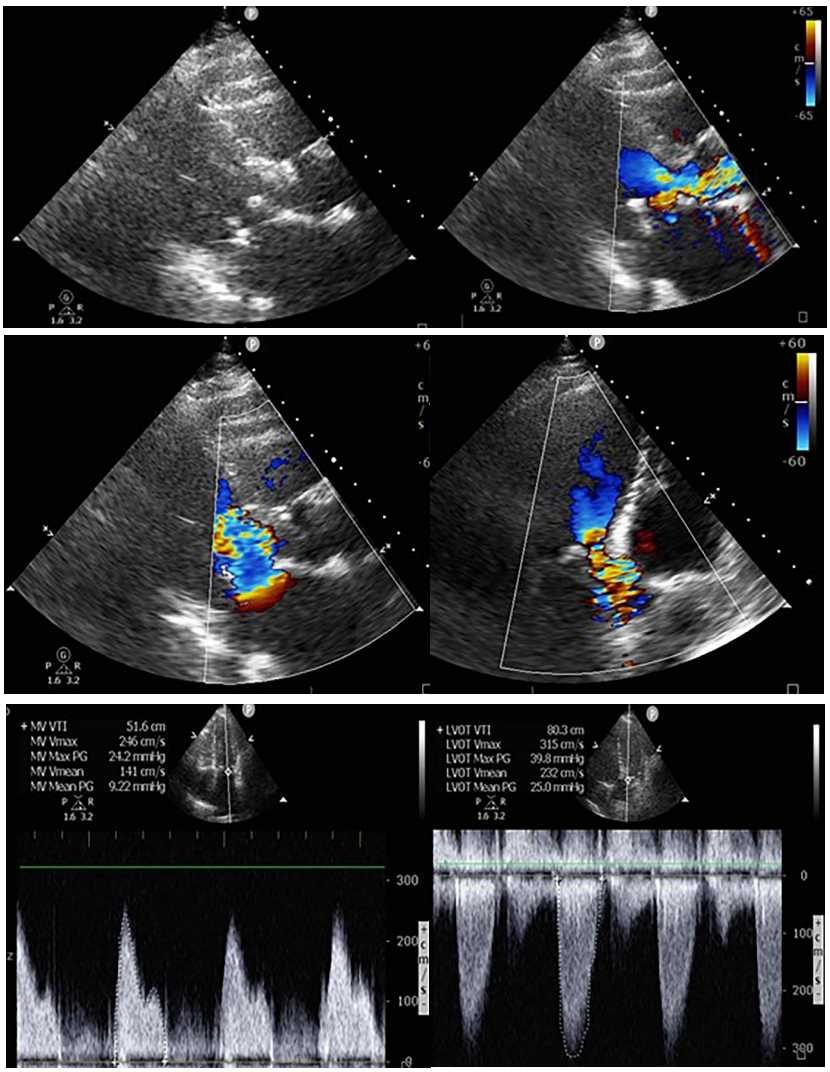
[2] Groote Schuur Hospital and University of Cape Town, Cape Town, South Africa

Email: ruchikameel@gmail.com

R Meel https://orcid.org/0000-0002-1405-4259

B Cupido https://orcid.org/0000-0002-6263-7192

DOI: https://doi.org/10.24170/22-4-7746



QUESTION: What is the diagnosis?

A. Hypertrophic cardiomyopathy.

B. Aortic valve degenerative stenosis and mitral valve stenosis.

C. Subaortic membrane.

D. Patient-prosthesis mismatch and left ventricular outflow tract obstruction.

ANSWER

(D) Patient-prosthesis mismatch and left ventricular outflow tract obstruction.

These images belong to a 70-year-old overweight female who underwent mitral valve replacement for severe rheumatic mitral valve stenosis. A month after mitral valve replacement, she presented with fatigue and shortness of breath. She was not anaemic, her septic markers were not elevated, and a thyroid function test was normal.

Transthoracic echocardiographic images show a bioprosthetic mitral valve implant, identified by the echogenic struts, abutting the left ventricular outflow tract (LVOT) (top panel). On colour images, turbulence can be noted in the LVOT (top panel, long axis view), with flow convergence at the level of the valve strut basal interventricular septum (middle panel, apical 3 chamber view, right image) and across the mitral valve prosthesis (middle panel, long axis view, left image). The aortic valve leaflets, though poorly delineated, are thin (top and middle panels), implying the gradient is not at the level of the valve. There is a high mean gradient of 9 mmHg and increased E wave velocity > 2 m/s across the mitral valve bioprosthesis, suggestive of patient-prosthesis mismatch (PPM) (bottom panel, left image). The gradient across the LVOT is also elevated at 25 mmHg (bottom panel, right image) and results from the protrusion of the mitral valve prosthesis into the LVOT. The mitral valve effective orifice area (EOA) measured 1.1 cm^2/m^2.

PPM occurs when the EOA of a valve prosthesis is disproportionately small relative to the patient's body size, leading to an abnormally elevated post-operative pressure gradient.[1] In the mitral position, PPM is defined by an effective orifice area index (EOAI) ranging from ≤ 1.2 to 1.25 cm^2/m^2, with severe PPM characterised by an EOAI ≤ 0.9 cm^2/m^2.[2] This mismatch is associated with adverse outcomes, including elevated transvalvular gradients, pulmonary hypertension, heart failure, and atrial fibrillation.[2] Older patients are particularly vulnerable due to smaller mitral annuli and the presence of comorbidities. Therefore, a patient's body size must be carefully considered before valve replacement.[3]

In some cases, the struts of a bioprosthetic mitral valve may extend into the LVOT.[4,5] The degree of protrusion is influenced by the aortomitral annular angle (AMA) – the angle between the mitral and aortic valve annuli.[5] A narrower AMA, closer to 90 degrees, increases the likelihood of LVOT obstruction, which impairs blood flow from the left ventricle to the aorta, resulting in a pressure gradient and reduced cardiac output.[4,5] Risk factors for LVOT obstruction include a small LVOT, high-profile prosthesis, improper valve sizing or orientation, septal hypertrophy, and a narrow AMA.[4,5]

Fixed LVOT obstruction needs to be differentiated from dynamic LVOT obstruction, which is due to systolic anterior motion of the mitral valve and occurs in approximately 1–2% of patients undergoing mitral valve repair.[5] Mechanical valves, being low-profile, typically do not interfere with LVOT flow.[6] Conversely, bioprosthetic valves have a higher profile and are more likely to cause obstruction, especially when the native mitral valve apparatus is preserved – a practice associated with better post-operative left ventricular function.[6]

Echocardiography serves as an important imaging modality for assessing the structure of the valve prosthesis, measuring gradients, EOA, and LVOT area, especially on three-dimensional (3D) imaging.[4,5,7] It also serves as an effective tool for assessing and identifying high-risk features on echocardiography for PPM and LVOT obstruction.[5,7]

Conflict of interest: none declared.

REFERENCES

1. Pibarot P, Dumesnil JG. Prosthesis-patient mismatch in the mitral position: Old concept, new evidences. J Thorac Cardiovasc Surg. 2007;133(6):1405-8. https://doi.org/10.1016/j.jtcvs.2007.01.059.
2. Hwang HY, Kim YH, Kim K-H, Kim K-B, Ahn H. Patient-prosthesis mismatch after mitral valve replacement: A propensity score analysis. Ann Thorac Surg. 2016;101(5):1796-1802. https://doi.org/10.1016/j.athoracsur.2015.10.032.
3. Lam B-K, Chan V, Hendry P, et al. The impact of patient-prosthesis mismatch on late outcomes after mitral valve replacement. J Thorac Cardiovasc Surg. 2007;133(6):1464-73. https://doi.org/10.1016/j.jtcvs.2006.12.071.
4. Christia P, Lee S, Lyuba O, Silbiger JJ. Malaligned bioprosthetic valve causing left ventricular outflow tract obstruction. Echocardiography. 2019;36(3):602-4. https://doi.org/10.1111/echo.14255.
5. Asgar AW, Ducharme A, Messas N, et al. Left ventricular outflow tract obstruction following mitral valve replacement: Challenges for transcatheter mitral valve therapy. Structural Heart. 2018;2(5):372-9. https://doi.org/10.1080/24748706.2018.1494397.
6. Antunes MJ. Commentary: Left ventricular outflow tract obstruction by mitral bioprostheses. Still a problem? JTCVS Open. 2021;8:259-60. https://doi.org/10.1016/j.xjon.2021.06.027.
7. Narula J, Kapoor PM, Balasubramanium U, Kiran U. Prosthetic mitral valve strut masquerading as left ventricular outflow tract obstruction: 3D transesophageal echocardiography comes to the rescue. J Cardiothorac Vasc Anesth. 2018;32(1):e6-e8. https://doi.org/10.1053/j.jvca.2017.04.032.

SA HEART® IS AN OFFICIAL JOURNAL OF THE SOUTH AFRICAN HEART ASSOCIATION AND APPEARS ON A QUARTERLY BASIS

Instructions for authors

SA Heart® publishes peer reviewed articles dealing with cardiovascular disease, including original research, topical reviews, state-of-the-art papers and viewpoints. Regular features include an ECG quiz, image in cardiology and local guidelines. Case reports are considered for publication only if the case or cases are truly unique, incorporates a relevant review of the literature and makes a contribution to improved future patient management. All articles will have a DOI number.

Publication policy

Articles must be the original, unpublished work of the stated authors. Written permission from the author or copyright holder must be submitted with previously published material including text, figures or tables. Articles under consideration elsewhere or previously published (except as abstracts not exceeding 400 words) may not be submitted for publication in SA Heart®. On acceptance transfer of copyright to the South African Heart Association will be required. No material published in SA Heart® may be reproduced without written permission. Permission may be sought from the Editor (Email: ruchikameel@gmail.com).

Disclosures

Authors must declare all financial disclosures and conflicts of interest in the cover letter and on the title page of the manuscript.

Ethics

All studies must be in compliance with institutional and international regulations for human and animal studies such as the Helsinki declaration (2008) (https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects) and the South African MRC ethics guidelines (https://www.samrc.ac.za/research/ethics/guideline-documents). Human studies require ethics committee approval and informed consent which must be documented in your manuscript. Animal studies require ethics committee approval and must conform to international guidelines for animal research. Compliance with these requirements must be documented in your manuscript.

Content

1. Title page: It should contain the title of the manuscript, the names of all authors in the correct sequence, their academic status and affiliations. If there are more than 4 authors, the contribution of each must be substantiated in the cover sheet. The main author should include his/her name, address, phone, fax and email address. All authors must supply their ORCiD ID upon submission of the manuscript.
2. Authors are solely responsible for the factual accuracy of their work.
3. Articles should be between 3 000 and 5 000 words in length.
4. A 200-word abstract should state the main conclusions and clinical relevance of the article.
5. All articles are to be in English.
6. Abbreviations and acronyms should be defined on first use and kept to a minimum.
7. Tables should carry Roman numeral, I, II etc., and figures Arabic numbers 1, 2 etc.
8. References should be numbered consecutively in the order that they are first mentioned in the text and listed at the end in numerical order of appearance. Identify references in the text by Arabic numerals in superscript after punctuation, e.g. …trial.[13]

The following format should be used for references:

Articles
Kaplan FS, August CS, Dalinka MK. Bone densitometry observation of osteoporosis in response to bone marrow transplantation. Clin Orthop 1993;294:73-8. (If there are more than six authors, list only the first three followed by et al.).

Chapter in a book
Young W. Neurophysiology of spinal cord injury. In: Errico TJ, Bauer RD, Waugh T (eds). Spinal Trauma. Philadelphia: JB Lippincott; 1991:377-94.

Online media
Perreault, L. (2019). Obesity in adults: Role of physical activity and exercise. UpToDate. Retrieved January 12, 2020, from https://www.uptodate.com/contents/obesity-in-adults-role-of-physical-activity-and-exercise

9. Articles are to be submitted on the online SA Heart® platform https://tinyurl.com/y9prlopt. The text should be in MS Word. Pages should be numbered consecutively in the following order wherever possible: Title page, abstract, introduction, materials and methods, results, discussion, acknowledgements, tables and illustrations, references.
10. Where possible all figures, tables and photographs must also be submitted electronically. The illustrations, tables and graphs should not be imbedded in the text file, but should be provided as separate individual graphic files, and clearly identified. The figures should be saved as a 300 dpi jpeg file. Tables should be saved in a MS Word or PowerPoint document. If photographs are submitted, two sets of unmounted high quality black and white glossy prints should accompany the paper. Figures and photographs should be of high quality with all symbols, letters or numbers clear enough and large enough to remain legible after reduction to fit in a text column. Each figure and table must have a separate self-explanatory legend.
11. Remove all markings such as patient identification from images and radiographs before photographing.
12. Include 3 challenging questions on the content of the manuscript relating to the key messages. The questions will be included in a questionnaire for CPD accreditation purposes. Please supply each question with a choice of 4–5 possible answers of which only one is correct (multiple correct answers not allowed) and highlight the correct answer. Please do not supply questions with a simple yes/no option.

Submission of manuscripts

The manuscript should be submitted online on the SA Heart® Journal open access platform https://tinyurl.com/y9prlopt. Follow further instructions on this website.

COMPREHENSIVE CARDIAC CARE

26th Annual SA Heart® Congress
CTICC, Cape Town
30 October – 1 November 2026