Issue: 6 | September 2022
www.fortishealthcare.com

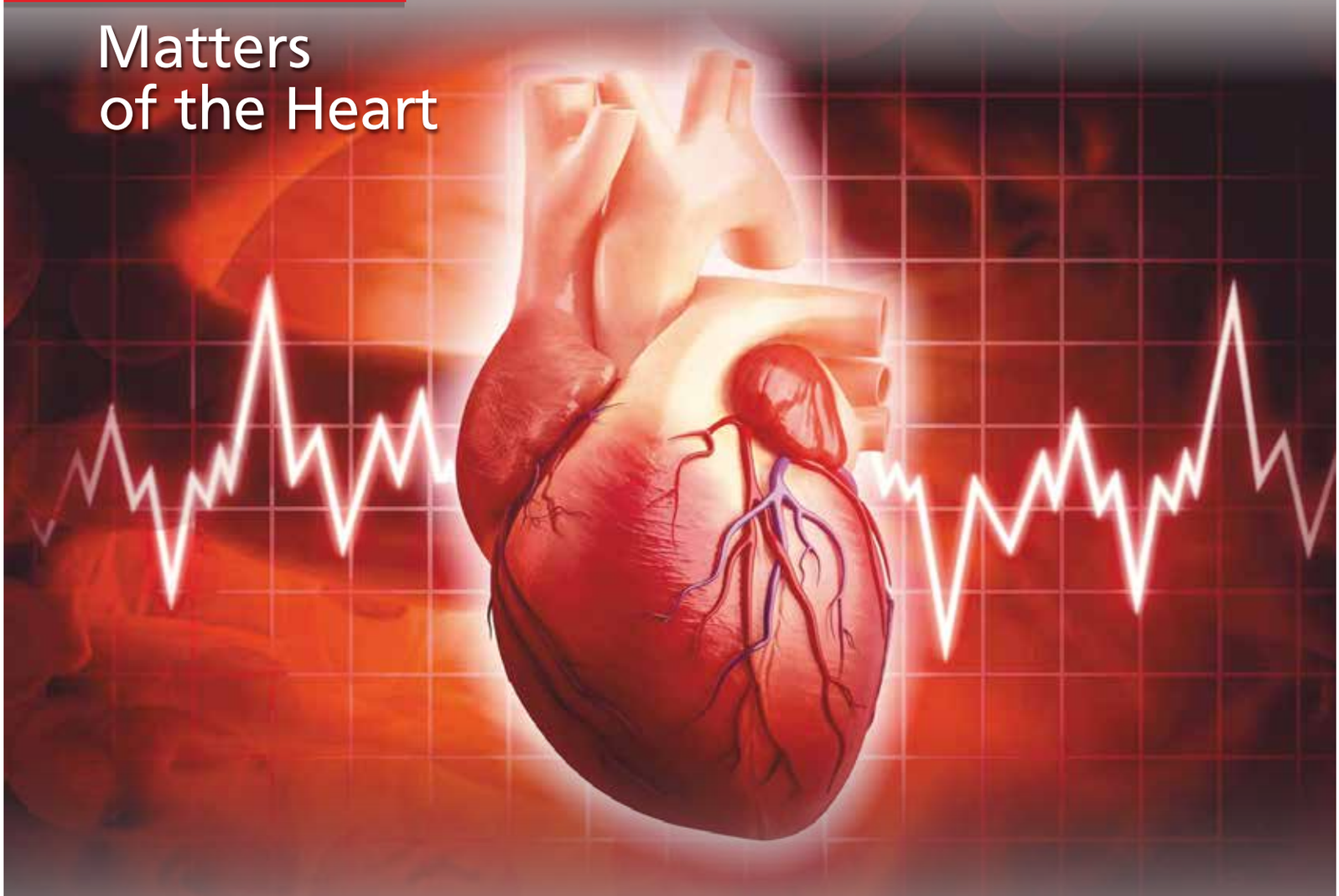
Fortis

Clinical Connect

Fostering a culture of innovation and excellence

Cardiac Sciences Special

Matters of the Heart



IN THIS ISSUE

CONTENTS

Remembrance

Late Professor Savitri Shrivastava
1 July 1935–20 June 2022

On 20th June, 2022, India lost a pioneer and Godmother of Pediatric Cardiology, when the legendary Professor Savitri Shrivastava left for her heavenly abode. Born in Jabalpur to a physician father, it was natural that she took up medicine as a career and completed her MBBS from Agra University. She went on to join the Army Medical Corp for a Short Service Commission between 1960-1967. Her stint in the Army shaped many of her habits in later life – most notably her penchant for punctuality. She made it a point to arrive ten minutes before the start of any lecture, seminar or event, often to the embarrassment of the organizers who were often caught off-guard.

While training in Cardiology at AIIMS, New Delhi Dr Shrivastava was drawn towards pediatric cardiology, which was an unexplored area in the country at that time. She went to Minnesota in the USA to train under the famous cardiac morphologist, Dr Jesse Edwards and returned to AIIMS to join Professor Raj Tandon in setting up the division of Pediatric Cardiology at AIIMS. This was the beginning of a scintillating career devoted to the growth of this fledgling specialty.

I had the great fortune of being associated with her firstly as a medical student in the seventies, as a trainee and young consultant in cardiac surgery in the eighties and finally as a partner in setting up the first dedicated pediatric cardiac unit in the country at Escorts Heart Institute (now Fortis Escorts Heart Institute) in 1995.

Dr Shrivastava's contributions to the field of Pediatric Cardiology are too many to list in this brief obituary. She was part of the evolution of cardiac echocardiography and interventional cardiology and became a master of both. She founded the Indian Society of Echocardiography and authored a superbly illustrated textbook of Pediatric Echocardiography. She was the first in the world to perform a balloon mitral valvotomy, a procedure with has since then saved thousands of patients with rheumatic mitral stenosis. She was quick to pick up and adopt new technologies and therapeutic advances.

Post retirement from AIIMS she set up the Pediatric Cardiology department at Fortis Escorts Heart Institute where she worked till health issues restrained her from active clinical work. She set up the first DNB program in Pediatric Cardiology and trained scores of pediatric cardiologists during her tenure. Due to her efforts the Pediatric Cardiac department of FEHI was recognized internationally as a Center of Excellence. She was a clinician par excellence and a passionate teacher and is warmly remembered by her students for her nurturing ways. She was a strict disciplinarian, yet had a soft interior which cared deeply for the welfare of her students.

At the national level she was instrumental in the founding of the Pediatric Cardiac Society of India which now has become a major platform for the development of the specialty in the country. For her contributions she has been honored with the Lifetime Achievement Award of the PCSI and of the International Pediatric Interventional Cardiac Society to name a few. She travelled extensively nationally and internationally to deliver lectures at CMEs and conferences and was a much sought-after speaker and orator.

Her students and co-workers will always remember her for the way she helped shape their careers. The Fortis family remains grateful to her for putting Fortis on the International map for pediatric cardiology. Madam, may you find eternal peace in your heavenly abode.

By : Dr K.S. *Iyer, Executive Director-*
Pediatric & Congenital Heart Surgery, Fortis Escorts Heart Institute, New Delhi

INSPIRATION

Message

Dr Ashutosh Raghuvanshi
MD & CEO
Fortis Healthcare Limited

Dear Colleagues,

I am glad to know that 'Clinical Connect,' the bimonthly e-newsletter by our clinical fraternity aimed at showcasing all-round clinical excellence across Fortis, is publishing an issue dedicated to Cardiac Sciences. This is especially significant as the publication coincides with World Heart Day. I congratulate the Editorial Team for this laudable initiative. Having been a practising Paediatric Cardiac Surgeon myself, I look forward to relishing this issue and learning more about the clinical as well as research work our doctors are doing.

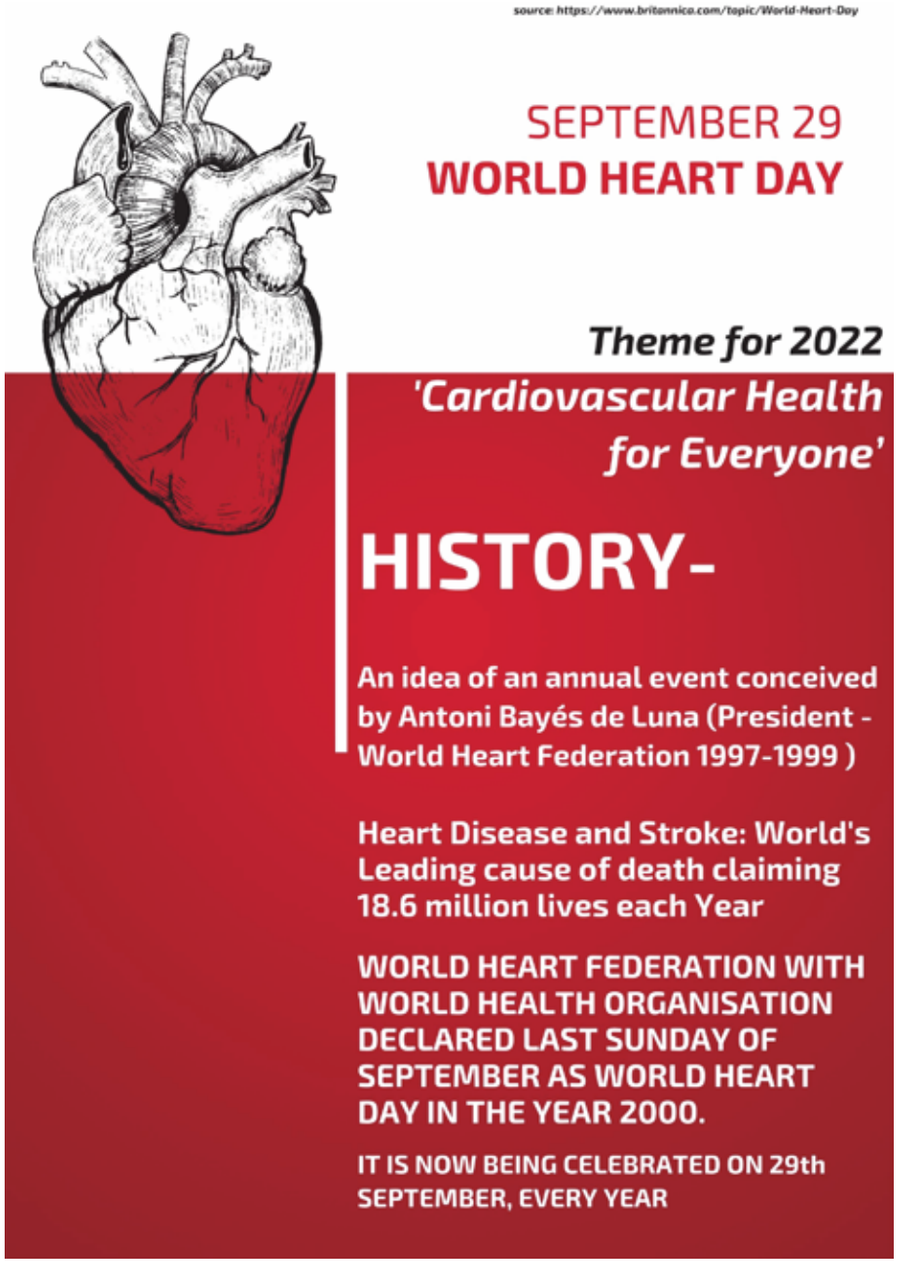
Cardiac Sciences is a vital speciality for Fortis and I am really proud of the fact that today, we have some of the most renowned Cardiac Sciences specialists in the country. Over the past few years, we have been able to build a brilliant team, create the right infrastructure and nurture an ecosystem that inspires our doctors to give their best, every day. The innumerable success stories that we get to hear from all over the network are testament to the path-breaking work being done by our Cardiac Sciences team. I thank the Cardiac Speciality Council for providing the leadership and guidance required for propelling the speciality on its growth trajectory.

I sincerely appreciate all our doctors for making Fortis the undisputed destination for all heart-related ailments. With the growing burden of heart diseases, it is imperative for all of us associated with the speciality to invest in sharpening our skills and staying on top of our game. Let us commit ourselves to continue delivering the best quality of clinical care to all our patients.

Warm regards,

Dr Ashutosh Raghuvanshi

MD & CEO



Message

Dr Bishnu Panigrahi
Head - Medical Strategy and Operations Group

Dear Fortisians,

Clinical Connect, the bi-monthly Fortis newsletter is shaping up very well and is being much appreciated by its readers. The entire Editorial Team is doing a commendable job and must be complemented for their time and effort.

The 6th issue of clinical connect, dedicated to Cardiac Sciences, is a timely recognition of World Heart Day 2022 and its theme of "Cardiovascular Health for Everyone". This issue explores multiple facets of Cardiovascular Disease management, significantly raising awareness within communities and showcasing Fortis capabilities in delivering complex Cardiac care.

Today, Cardiovascular ailments are of concern to every human being, across the globe. Non-Communicable Diseases and Lifestyle ailments are a growing concern, particularly for India. As our country takes care of its huge disease burden, Fortis continues to be a major provider of Cardiac care services in India, with some of the most experienced and skilled Cardiac clinicians in the country. Incidentally, some of our best Cardiac care centres started off as Heart Institutes, Mohali, Escorts and Cunningham Road to name a few. As Fortis and its Cardiac program expand, it is firmly positioned as the destination of choice, a testimony to the exemplary levels of care standards across a wide spectrum, from adult care to pediatric care to transplants.

Fortis has made impressive strides in providing acute care at our hospitals. Stringent protocols along with measurement of care standards has been instrumental in continuous improvement of service delivery. Clinical Pathways, as a clinical protocol, are tools to guide and promote evidence-based medicine by translating clinical guidelines into processes of care. The pathway for management of ST-elevation Myocardial Infarction (STEMI) cases has been implemented across Fortis hospitals. Routine monitoring and evaluation of STEMI cases help us in elevating quality of acute care for Cardiac patients.

Clinical Outcomes are measurable changes in health, function or quality of life that result from patient care. It would be fair to say that Fortis has been a pioneer in this discipline, in India. It all started with development of Coronary Artery Disease (CAD) standard sets for measuring Clinical Outcomes at International Consortium of Health Outcomes Measurement (ICHOM). The standard sets were first piloted at Fortis Escorts and then shared with the CAD Working Group at ICHOM. Fortis Healthcare was the only Indian member of ICHOM Working Group for preparing Coronary Artery Disease (CAD) standard sets. Additionally, over the next two years post its roll-out, Fortis Healthcare, as part of ICHOM Steering Committee for CAD, helped other countries in their Clinical Outcomes journey. In 2016, Fortis was among the first institutes in India to measure and report outcomes for various clinical procedures including CAD. In order to assess patient's health status at a single point in time, Fortis has been recording Patient Reported Outcome Measures (PROMs). PROMs, as an extension of Clinical Outcomes, help measure health-related quality of life and the impact of an intervention carried out.

I believe, this issue will appeal to all its readers and raise further interest in cardiovascular diseases among its readerships. On World Heart Day, let us pledge each heartbeat to defeat Cardiovascular Disease.

Message

Dr Ashok Seth
Chairman -
Fortis Escorts Heart Institute
Chairman -
Fortis Healthcare Medical Council
President - Asian Pacific Society of Interventional Cardiology
Fortis Escorts Heart Institute,
Okhla Road, New Delhi

It gives me great pleasure to write this message for the CLINICAL CONNECT and its issue devoted to Cardiovascular Sciences. Since its conception during Covid times as a 'virtual connection' amongst clinicians across Fortis Healthcare for an educational, academic, and professional activities; thanks to the focus and excellence of the Editorial Board and the purposeful and meticulous execution of MSOG; the 'Journal' has grown into an important platform of show casing and exchanging our professional excellence and research activities. We have come to know each other better, realize and respect each other's excellence and leadership and also learnt to leverage the academic strength of Fortis Clinical Leadership to patients benefit. In fact, every monthly issue is eagerly awaited by all of us. The specialty thematic issues have updated our knowledge and understanding on numerous advancements in management of various disease processes including the seminal contributions of our colleagues and peers across FHC.

This issue of Clinical Connect is devoted to cardiovascular Sciences and is important for all. Cardiovascular diseases have been the centre stage for all healthcare professionals as it remains the biggest cause of death in the country. It needs efforts through the whole spectrum of prevention to treatment to long term follow up from all clinicians in every specialty to be able to slow its vicious upwards path. Furthermore, it has taken a centre stage in the post Covid environment because we realized over time that Covid is not just a lung disease but also a heart disease and long Covid causing Cardiovascular symptoms and complications up to a year after Covid is a reality. It is an area we could have done more systematic studies and contributed to greater knowledge.

This issue of 'Clinical Connect' presents the Scientific publications of Cardiovascular Sciences from the clinical leaders of Fortis Healthcare. The future lies in cohesive working to create collective Scientific research and even prospective registries which are based on large database and real-world experience can provide great scientific knowledge to the world beyond randomized trails.

Finally, this issue on the World Heart Day 2022, reminds us about this year's theme and objectives. Prevention of Heart disease in India is every person's responsibility irrespective of specialization or profession. We all need to consider how best to use our Hearts for Humanity, for Nature and for everyone. It is about beating Heart Disease.

So "Use Heart for Every Heart."

With my best wishes,

Dr Ashok Seth

Message

Dr Vivek Jawali
Chief Cardiac Surgeon and
Chairman of Cardiac Sciences
Fortis Hospital, BG Road, Bangalore

Dear Fortisians,

I would like to thank the "Team Clinical Connect" and express my sincere appreciation and gratitude for their efforts in publishing this "cardiac special" issue of the Clinical Connect.

It is so vital that every Fortisian is aware of the good work going on in his/her Fortis hospitals across India and speak about it to their doctors, teammates, patient families and the community around them. Sharing some of the high-quality clinical work by their fellow Fortisians on their own social pages would also give them some elegant talking points on their own social media. I urge that we all do it in our communities and social media pages.

Word of mouth by our patient families and by knowledgeable medicos is the healthiest and most effective PR for Fortis and for each of us.

Bravo Team Clinical Connect!

Keep up the good work!

MESSAGE FROM THE EDITORIAL BOARD

Fortis the Benchmark of Cardiac Care

Dr T.S. Mahant
Executive Director - Cardiothoracic and Vascular Surgery
Fortis Hospital, Mohali

During the last decade there has been an epidemiological transition from infectious to non-communicable diseases with cardiovascular diseases being the major contributor. During the pandemic cardiovascular disorders remained the leading cause of premature death. Higher Covid related deaths were reported in patients with associated cardiovascular ailments.

Prevalence of coronary artery disease in India has increased four-fold in rural population and 12 folds in urban population. While rheumatic heart disease still remains in epidemic proportion with estimated prevalence 1.5 to 2 per thousand population. The estimated number of children born with congenital heart disease in India is more than 2 lakh per year, of these about 1/5th are likely to have serious defects requiring intervention as early as day one of life.

We being a part of Fortis, the largest healthcare provider in India, our job as cardiac specialists have become challenging due to the increasing burden of the disease and increasing expectation of the masses. In this digital era, we are bound to provide answers to every question raised by our patients about the validity of treatment provided to them. Our 'Heart Team' in which the cardiologist, cardiac surgeon, critical care specialist, referring physician and the patient take a collective and informed decision regarding the best treatment modality.

Cardiac sciences is branching out with highly specialized sub specialities yet integrating and providing hybrid procedures in both adult and paediatric population. The cardiac sciences at Fortis leads in providing cutting edge technology in the form of endovascular invasive procedures, robotic cardiac surgery, advancements in percutaneous management of coronary artery disease like intravascular lithotripsy, FFR.

Continued learning knowledge sharing and firm administrative support has led to Fortis cardiac teams providing their best, affordable treatments with outcomes and results at par with developed nations. This has been reflected with our contribution to medical tourism from both developed and developing nations.

With this current edition of the Clinical Connect we have tried to provide an overview of current practices and standards, upcoming technology and perspective and rare feats achieved by our teams.

Please send your comments, feedback and suggestions to clinical.connect@fortishealthcare.com

CARDIAC SCIENCES SPECIALTY COUNCIL

Cardiology Specialty Council

Dr Ashok Seth
Chairman
Chairman -
Fortis Escorts Heart Institute
Chairman - Fortis Healthcare Medical Council
President - APSIC
Fortis Escorts Heart Institute, Okhla, New Delhi

Dr T S Kler
Chairman- Fortis Heart and Vascular Institute,
Fortis Memorial Research Institute, Gurugram &
Fortis Hospital, Vasant Kunj

Dr Rakesh Kumar Jaswal
Director and HOD-Cardiology
Fortis Hospital, Mohali

Dr Keshava Rao
Director - Interventional Cardiology
Fortis Hospital,
Cunningham Road,
Bangalore

Dr Praveer Agarwal
Executive Director - Interventional Cardiology
Fortis Escorts Heart Institute, Okhla, New Delhi

Dr Sanjay Kumar
Director and HOD - Cardiology
Fortis Escorts Hospital, Faridabad

Dr Zakia Khan
Sr. Consultant- Interventional Cardiology
Fortis Hospital, Kalyan

Dr Shuvanan Ray
Director - Intervention Cardiology/ Transcatheter Aortic Valve Implantation
Fortis Hospital Anandapur, Kolkata

Dr Arun Kumar Chopra
Director - Cardiology
Fortis Escorts, Amritsar

Dr Tapan Ghose
Director- Cardiology
Fortis Flt. Lt. Rajan Dhall Hospital, Vasant Kunj, New Delhi

Dr Hasmukh Ravat
HOD & Sr. Consultant - Interventional Cardiology
Fortis Hospital, Mulund, Mumbai

Dr Atul Limaye
Sr. Consultant - Interventional Cardiology
Fortis Hospital, Mulund

Cardiothoracic and Vascular Surgery Specialty Council

Dr Vivek Jawali
Chairman
Chairman-
Cardiac Sciences & Regional Medical Advisory Council,
Fortis Hospitals, Bangalore

Dr K.S. Iyer
Executive Director - Paediatric Cardiac Surgery
Fortis Escorts Heart Institute, Okhla, New Delhi

Dr T S Mahant
Executive Director - Cardiothoracic Vascular Surgery
Fortis Hospital, Mohali

Dr Sunil Kaushal
Director & HOD - Paediatric Cardio Thoracic Vascular Surgery
Fortis Escorts Hospital, Jaipur

Dr Kayapanda Mandana
Director - Cardiothoracic and Vascular Surgery
Fortis Hospital, Anandapur, Kolkata

Dr Udgeath Dhir
Director and HOD - Cardiothoracic Thoracic Surgery
Fortis Memorial Research Institute, Gurgaon

Dr Z. S. Meharwal
Executive Director & Head - Adult Cardiac Surgery, Heart Transplantation & VAD Program,
Fortis Escorts Heart Institute, Okhla, New Delhi.

Dr Govini Balasubramani
Head - CTVS, Heart & Lung Transplant
Fortis Hospital,
Vadapalani, Chennai

Dr Ajay Kaul
Chairman - Cardiac Sciences
Fortis Hospital, Noida

FROM THE HEART

Development of ST Elevation Myocardial Infarction Programs in Developing Countries Global Challenges and Solutions

Citation:- Salwan R, Seth A. Development of ST-elevation Myocardial Infarction Programs in Developing Countries: Global Challenges and Solutions. Interv Cardiol Clin. 2021 Jul;10(3):401-411. doi: 10.1016/j.iccl.2021.03.010. PMID: 34053626.

Dr Ashok Seth
Chairman -
Fortis Escorts Heart Institute
Chairman -
Fortis Healthcare Medical Council
President - Asian Pacific Society of Interventional Cardiology
Fortis Escorts Heart Institute,
Okhla Road, New Delhi

Introduction

Cardiovascular disease (CVD) continues to be the leading cause of death worldwide; approximately 80% of CVD deaths occur in low-income and middle-income countries (LMICs), and 40% of these are premature resulting in approximately 3 million ST-elevation myocardial infarction (STEMI) case each year.[1,2] The epidemiologic transition to a high burden of ischemic heart disease (IHD) has happened with greater rapidity in LMICs than in high-income countries (HICs). The lifestyle and environment exposures associated with globalization and urbanization have increased cardiovascular risk in the middle-income and lower-income strata. Coupled with a greater population growth in LMIC, the absolute number of individuals with premature IHD has increased substantially. Despite a lower prevalence of traditionally recognized risk factors in LMICs, higher event rates are observed compared with HICs, partially because the populations of these countries have less access to preventive and equitable health care systems.[3] Not only does the inability to afford treatment of acute illnesses and subsequent follow-up make it difficult survive acute but also many falls into poverty each year due to out-of-pocket treatment expenses. Health care essentially is a process of applying the best available medical knowledge-both research and clinical-to solve patients' health problems. The technological capability to do extraordinary things for patients has increased, as has patient demand, in a setting of constrained resources and expensive health care of variable quality. It is relevant to focus on the design and management of the processes and organizations that enable them to deliver proved medical treatments more efficiently and effectively.

Key Points

STEMI management is time sensitive, early diagnosis and timely reperfusion by PPCI or Fibrinolytic therapy and pharmaco-invasive approach reduces morbidity and mortality.

In developed countries, Regional system of STEMI care that integrate EMS, non-PCI hospitals and PPCI hospitals have been shown to increase the number of patients with timely access to reperfusion therapy.

LMIC have a high burden of STEMI in a younger population. With limited resources and a fragmented healthcare system there is an implementation gap of established therapies.

Improvement in STEMI care is a key opportunity to reduce death and disability in this vulnerable, young population.

Healthcare systems in LMIC can benefit by understanding various approaches used to create STEMI networks in developed countries over the last two decades to design care that is affordable, sustainable and scalable.

Clinics Care Points

Early diagnosis and triage to appropriate care - the first responders are often practitioners of alternative medicine, integrating them in the chain of care is important for increasing uptake of treatment, building trust.

Telemedicine has emerged as a cost-effective technology to improve access, accuracy to diagnose STEMI and triage to nearest reperfusion capable hospital.

Standardized protocols for STEMI care, with clearly defined roles and responsibilities, should be prepared in each hospital according to the manpower and infrastructure available, followed by integration of hospitals in a region with clear mapping of PPCI and non PCI hospitals. Non PCI hospitals are pivotal in increasing access to reperfusion.

Data collection and feedback reduces variations in practice and improves patient outcome.

Policy that makes care affordable, promotes cooperation within existing facilities, engages with all stakeholders with clear roadmap for sustainable improvement.

References

1. Prabhakaran D, Anand S, Watkins D, et al. Cardiovascular, respiratory, and related disorders: key messages from disease control priorities, 3rd edition. Lancet 2018;391(10126):1224-36.
2. Vedanthan R, Seligman B, Fuster V. Global perspective on acute coronary syndrome: a burden on the young and poor. Circ Res 2014;114:1959-75.
3. Yusuf S, Rangarajan S, Teo K, et al. Cardiovascular risk and events in 17 low, middle-, and highincome countries. N Engl J Med 2014;371(9): 818-27

Cry of the Children: Congenital Heart Surgery in India- A Journey of Six Decades

Citation:- Iyer, K.S. 'Cry of the children': congenital heart surgery in India—a journey of six decades. Indian J Thorac Cardiovasc Surg 38, 357–365 (2022). https://doi.org/10.1007/s12055-022-01379-2

Dr K.S. Iyer
Executive Director -
Paediatric Cardiac Surgery
Fortis Escorts Heart Institute,
Okhla, New Delhi

(PRESIDENTIAL ADDRESS delivered on 8th April 2022 at the annual conference of the Indian Association of Cardiovascular Thoracic Surgeons, IACTSCON 2022 held in Jaipur)

The article charts the evolution of surgery for Congenital Heart Disease as experienced by the author through his journey in this specialty. It describes the current status of congenital heart surgical facilities in the country, the shortcomings and the way forward towards achieving universal care for these unfortunate victims of cardiac malformations. The title is adapted from a poem titled 'Cry of the Children' by Elizabeth Barrett Browning in 1843 where she refers to the neglect of the children in England, forced to work in the coal mines – 'When we sob aloud, the human creatures near us pass by, hearing not, or answer not a word!'

A status report on congenital heart surgery in India was published by Dr. Anita Saxena in 2019.We still continue to have about 2,40,000 new-borns with CHD born every year of whom at least 50,000 require intervention in the first year of life to avert certain death. All in all, there are anywhere between two to four million patients with CHD in our country in all age groups. There is clearly a huge gap between the supply and demand for CHD surgery. Only one in eight children with CHD manages to get any form of treatment. There is also a wide variation in the regional availability of services with most of the facilities for neonatal surgery being in the private sector; costs for which are largely unaffordable by the majority.

Universal care for CHD would involve a huge increase in the available capacity and resources. The projected need would be about 500 centres with about 1000 cardiac surgeons and 2000 cardiologists along with necessary support staff. Clearly these targets are not achievable in the short term.

There are several reasons for this. First, we have a wide variety of centres that provide CHD surgery with varying fee structures. Secondly, funding for surgery is also very variable. The majority of patients have to pay out of their pocket which is an unfortunate situation. Health insurance for CHD is practically non-existent. There is some support from government schemes, however the pay-outs in these schemes are suboptimal. All in all, there is no uniformity on the source and adequacy of funding for CHD surgeries.

Surgeons also face personal problems. CHD surgery is a high stress specialty. Most pediatric programs are surgeon driven and therefore he or she is responsible for the actions of all members of the team. Then there is constant pressure from the hospital to generate revenues. Fear of litigation makes surgeons risk averse and kills innovation. Thus, it is not uncommon for surgeons to feel isolated when adversity strikes. As a result, many young surgeons now find pediatric cardiac surgery a daunting subspecialty.

Invited Commentary: Survival in Pulmonary Atresia with Intact Ventricular Septum: The Coronaries Hold the Key!

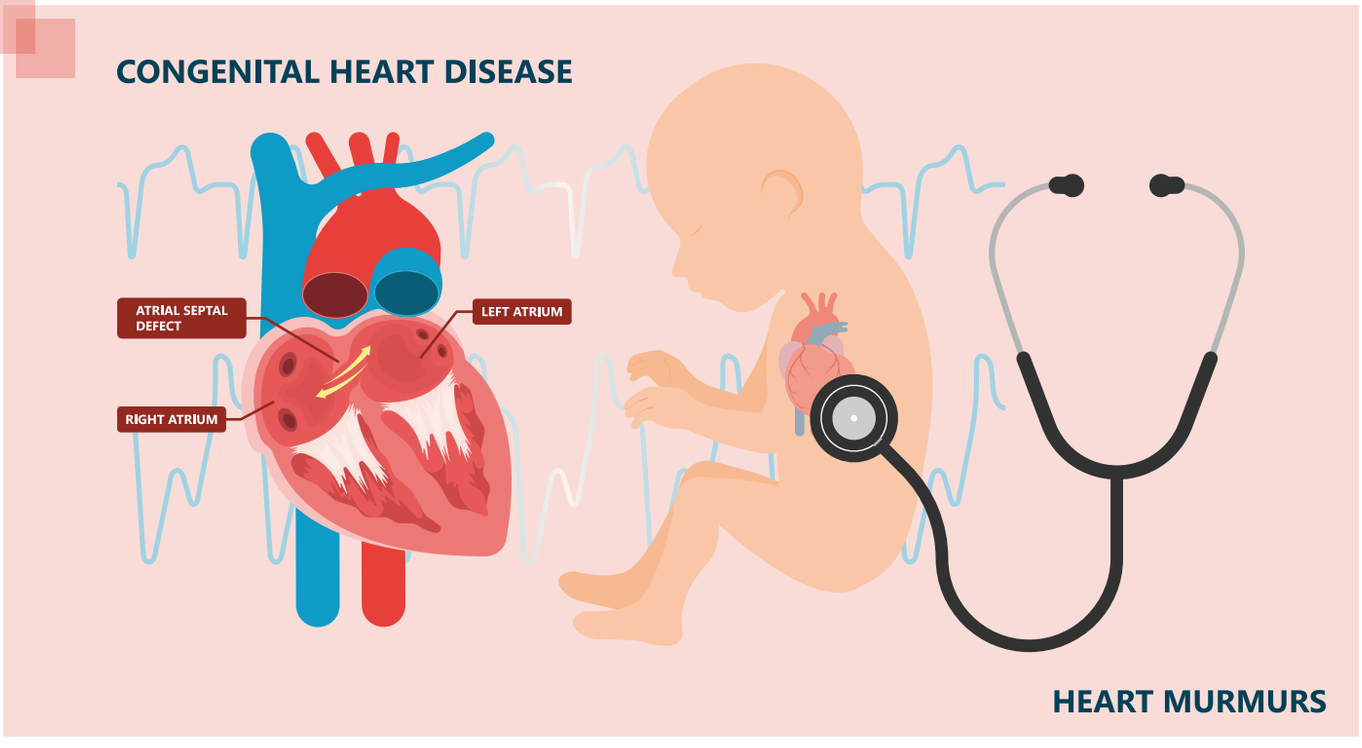
Citation:- Iyer KS. Invited Commentary: Survival in Pulmonary Atresia With Intact Ventricular Septum: The Coronaries Hold the Key! World J Pediatr Congenit Heart Surg. 2021 Mar;12(2):195-196. doi: 10.1177/2150135120979969. PMID: 33684005.

Dr K.S. Iyer
Executive Director -
Paediatric Cardiac Surgery
Fortis Escorts Heart Institute,
Okhla, New Delhi

The congenital heart defect labelled as pulmonary atresia with intact ventricular septum (PA.IVS), is a relatively uncommon defect characterized essentially by a lack of functional continuity between the right ventricular outflow and the main pulmonary artery, absence of any defect in the interventricular septum and varying degrees of hypoplasia of the right ventricle (RV). At the favorable end of the spectrum, the right ventricle and tricuspid valve are normal in size and the right ventricular outflow is blocked by a membranous fusion of the pulmonary valve leaflets. At the less favorable end of the spectrum the right ventricle is severely hypoplastic, the tricuspid valve dysplastic and stenosed and the right ventricular outflow non-existent. Unlike most other congenital heart defects, PA.IVS is associated with a substantial incidence of coronary artery abnormalities. These abnormalities include coronary artery stenosis, coronary interruption, atresia of the ostium and fistulous communications between the coronary arteries and right ventricular myocardial sinusoids. Patients with ostial occlusion of more than one major coronary are at the highest risk of mortality with conventional treatment modalities and are currently best managed by cardiac transplantation.

The presence of coronary abnormalities is an important factor in the management algorithm. Decompression of the right ventricle by opening up the right ventricular outflow is a pre-requisite for eventual biventricular or one and a half ventricular repair. Decompression however mandates the exclusion of so-called RV dependent coronary circulation, where stenosed or blocked coronaries are fed by the RV through fistulous communications.

To summarize, patients with PA.IVS can be expected to have good long-term outcomes with either a bi-ventricular or a univentricular repair as long as there are no significant coronary stenoses or interruptions. RV decompression is desirable at the first intervention for palliation unless the RV is severely hypoplastic. Patients with stenoses or atresia of two or more major coronaries are at high risk for mortality and should be listed for cardiac transplantation. Ligation of RV-coronary fistulas when appropriately done may reduce the risk of myocardial ischemia, but has not been conclusively shown to add any survival benefit.



NEWER TECHNIQUES AND TECHNOLOGIES

Technological Advances in the Armamentarium

The last few decades have seen the healthcare industry adopt and adapt innovations that have improved precision and accuracy both in the field of diagnostics as well as treatment modalities. At Fortis, as an organisation we regularly assess and adapt innovations that will help deliver quality healthcare. Sharing details of the recent additions to our armamentarium for the Cardiac Sciences across the network.

Mr Tarun Deep Katyal
Deputy General Manager - Medical
Strategy and Operations Group
Fortis Corporate Office

Mr Vipin Kumar Singh
Manager - Bio Medical Engineering
Medical Strategy and Operations Group
Fortis Corporate Office

Cathlab: Installed at Fortis Research Memorial Institute; Fortis Hospital, Amritsar; Fortis Hospital, Cunningham Road; Fortis Hospital, Mohali; Fortis Hospital, Anandapur; Fortis Hospital, Vashi; Fortis Hospital, Nagarbhavi

Equipment: Cath Lab | **Make:** Philips | **Model:** Azurion 7F12

Key Features:

1. State of the Art machine with Latest Technology with Low Dose of radiation high Imaging Quality.
2. 3-D tools, Dynamic Coronary Roadmap, Stent Boost Live
3. Echo Machine Integration and IVUS/FFR inbuilt with system giving clean environment to work.
4. 17% procedure time will be decreased and able to treat more patients per day.

ECHO Machine (Epiq CVXi/CVX)- Installed at Fortis Research Memorial Institute, Fortis Escorts Heart Institute; Fortis Hospital, Mohali; Fortis Hospital, Banerghatta Road

Equipment: ECHO Machine (Epiq CVXi)

Make: Philips | **Model:** Epiq CVXi

Key Features:

1. Premium interventional cardiology ultrasound system
2. Dynamic Heart Model- AI based fully automatic 3D Quantification tool which gives LAEF, LAV Min., LAVI, CI, Mass (Left Atrium Ejection Fraction, Volume etc.)
3. EchoNavigator : Smart Fusion and Smart Anatomy A.I.- EPIQ CVxi is a specially configured.
4. AI Based accurate calculations
5. Auto Contour Placement and tracking. Auto strain delivers one-button [1] push fast, and reproducible GLS measurements

OCT Machine (Optical coherence tomography) - Installed at Fortis Hospitals, Bangalore; Fortis Hospital, Shalimar Bagh

Equipment: OCT Machine (Optical coherence tomography)

Make: Abott | **Model:** Optis

Key Features:

1. State of the art new technology offers high resolution imaging and coronary Physiology on a platform to guide PCI with informed decision and improves the outcomes during PCI stent procedure. Increases the percentage of better stent positioning.
2. Lumen morphology
3. Lesion coverage and deployment mapping
4. MLA/MLD measurement and identification
5. Measurement of reference segments Pre-PCI and Lesion Assessment

3D EP Lab System- Installed at Fortis Research Memorial Institute

Equipment: 3D EP Lab System

Make: Johnson & Johnson | **Model:** Carto V7 Prime

Key Features:

1. ARA (Advanced Reference Annotation) is a reference annotation algorithm that uses up to 5 intracardiac bipolar channels of the reference catheter and body surface ECG channels to define the reference timing.
2. CARTOMERGE - you can import segmented CT or MRI image studies into the CARTO® 3 System.
3. Magnetic Based technology for the better accuracy & Lesser fluoroscopy exposure
4. Ripple Images & HD coloring Feature & Glass mode auto calculation with Flow shown.

Issue: 6 | September 2022

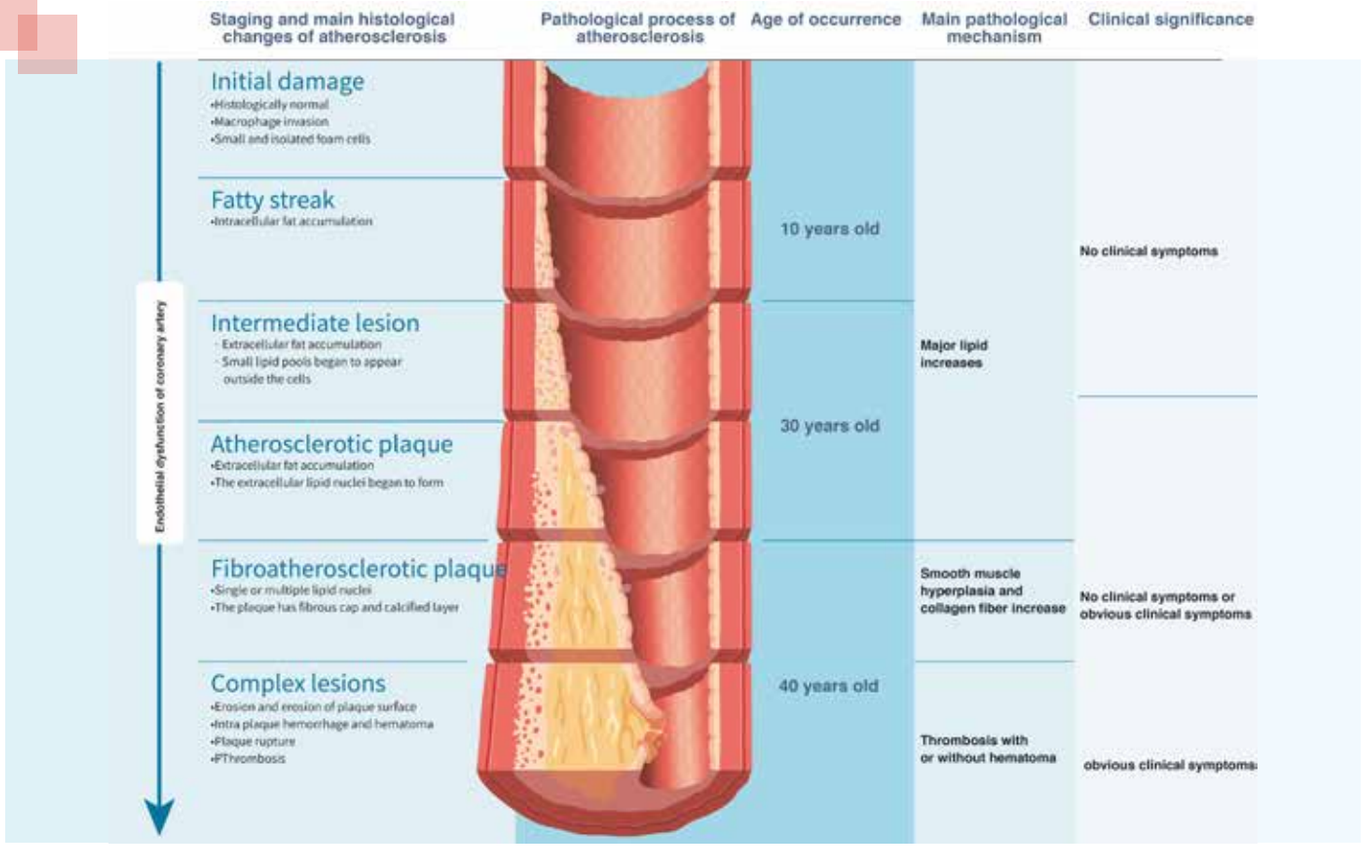
Residual Risk that Remains

Dr Arun Kochar
Additional Director - Interventional Cardiology, Fortis Hospital, Mohali

The prevalence of cardiovascular diseases keeps increasing each year globally. As atherosclerotic cardiovascular diseases (ASCVD) are associated with increased morbidity and mortality, it is important to take ample preventive measures. Despite lifestyle modifications and intensified lipid management, a significant proportion of patients are at "residual risk". This review describes the various residual risk factors and the results of large-scale clinical trials conducted to address the residual risk in ASCVD. The major residual risk factors are classified in the inflammatory, thrombotic, and metabolic pathways. Results from the JUPITER and PROVE-IT TIMI 22 show that serum levels of hsCRP play a vital role in defining the residual inflammatory risk in high-risk individuals with hypercholesterolemia. Apart from hsCRP, IL-1, IL-6 are also crucial in driving the inflammatory risk in patients with atherosclerotic disease. Apart from statins, IL-1, IL-6 and chemokine inhibitors and several other drugs are used in the treatment of patients with residual inflammatory risk. To address the residual thrombotic risk, though aspirin was used to reduce the vascular events, ATLAS ACS-2 TIMI 51 and COMPASS clinical trials demonstrated that rivoroxaban was beneficial in improving the clinical outcome. As increased levels of lipoprotein were associated with increased risk of myocardial infarction, evolocumab and other novel therapies that selectively target Lp (a) are under development. The role of triglycerides and HDL in atherogenesis is yet to be clearly elucidated. The emergence of SGL-2 and GLP-1 RA in diabetes treatment has also proven beneficial in improving cardiovascular outcome. It is essential to address the residual risk component for optimum management of patients with ASCVD.

Keywords

Atherosclerosis, residual risk, inflammation, thrombosis, metabolic risk.



If Oscar Could, Can't We? – A Commentary on Intraoperative Hypotension - Role of Artificial Intelligence

Source:- Indian Journal of Anaesthesia, November 2019 - Volume 63 - Issue 11 - p 875-876

Dr Murali Chakravarthy
Director -
Department of Anesthesia,
Critical Care and Pain Relief,
Chairman - Central Infection
Prevention and Control Committee
Fortis Hospital, Bannerghatta Road,
Bangalore

"Oscar jumps onto her bed and sniffs the air. He pauses to consider the situation, and then turns around twice before curling up beside Mrs. K. Thirty minutes later, Mrs. K. takes her last earthly breath." Since he was adopted by staff members as a kitten, Oscar the Cat has had an uncanny ability to predict the death of the residents of Steere House Nursing and Rehabilitation Center in Providence, Rhode Island, USA [1]. If a cat could predict death, can't we predict clinical events – with the help of artificial intelligence (AI)?

Intraoperative hypotension is not infrequent during anesthesia. The etiology may be one or combination of the following: induction of general anesthesia itself, or use of vasodilator techniques, or sympathetic block (as in central neuraxial blocks), or cardiac depression, or fluid loss, or hemorrhage. Hypotension may produce organ dysfunctions that manifest in the postoperative period; the degree of dysfunction depends on the duration and intensity of hypotension [2]. Considering this, it may be worthwhile if one could predict and prevent episode/s of hypotension. The event of hypotension is preceded by a set of logically predictable minute physiological events, which at times are subtle, that an ordinary human mind may fail to take note.

Machine learning algorithms have been pressed into detecting such changes (that may ultimately culminate in intraoperative hypotension). Machine learning is a discipline within computer science used to analyze large data sets and develop predictive models—has evident applications to other branches of health care too. A few risk factors contributing to post induction hypotension have been described (old age, emergency surgery, pre-induction hypotension). Similarly, hypotension later in the surgery is said to be associated with the male gender, supplementary neuraxial anesthesia or increasing American Society of Anesthesiologist grading. Physiologically, hypotension occurs due to decrease of either preload or afterload or cardiac output. Observing the changes in the conventionally monitored parameters such as central venous pressure or mean arterial pressure may be too late to prevent occurrence of hypotension. The ability to prevent intraoperative hypotension would exponentially decrease the occurrence of complications [3]. The sympathovagal balance has been utilized as a predictor of hypotension among women who received spinal anesthesia while undergoing caesarian section and found significant contribution of RR interval variability. This is one method of applying AI in predicting hypotension. [4]

In a recent publication, Hatib and coworkers [5] commented that "the key steps in development of the algorithm are summarized as follows:

1. Data conditioning, including signal preprocessing, heartbeat detection, and data selection
2. Featurization of the arterial pressure waveform (extraction of key features or signatures)
3. Annotation of the training data set for periods of hypotension and non-hypotension
4. Model training "

AI devices mainly fall into two major categories. The first category includes machine learning techniques that analyze structured data such as imaging, genetic and electrophysiological data. In the medical applications, the machine learning procedures attempt to cluster patients' traits, or infer the probability of the disease outcomes. [6]. The second category includes natural language processing methods that extract information from unstructured data such as clinical notes/ medical journals to supplement and enrich structured medical data. Many workers have put AI to use in the areas of cancer, cardiology and neurology [7]. "The hypotension prediction index", is one such commercially available algorithm, which reliably predicts hypotension up to fifteen minutes prior to its occurrence; it has the potential to change our practice from reactive to proactive blood pressure management[5].

With new innovations come hitherto unknown medico-legal issues. The legal circles are now discussing who will own up computer generated erroneous decisions causing patient harm? [8]. The task force that was set up to assess this matter, implied that the AI system would be liable for any medical negligence claim, this certainly would complicate the vendor client engagement laws!

Using AI in medical interpretation and treatment is just the beginning. In future AI in hemodynamic predictions in particular and medical therapeutics in general is likely to impact the way we practice medicine enormously. Though AI appears to be hugely supportive at the outset, there are still issues in real life implementation. AI as a 'product' has not been defined in many countries, Federal Drug Administration has classified AI as a 'general wellness product' [9]. Clinicians must remain alert and overrule the computer-generated warning, should it be obviously erroneous. Continuous data exchange is necessary and will make the AI system robust. A big data revolution is about to happen and clinicians have to be aware to realize its arrival. Who knows? Many 'Oscars' may be around the corner to assist healthcare professionals!

Intravascular Lithotripsy for Calcified Coronary Arteries in the Real-world: From Rock to Metal

Dr Ashok Seth
Chairman -
Fortis Escorts Heart Institute
Chairman -
Fortis Healthcare Medical Council
President - Asian Pacific Society of Interventional Cardiology
Fortis Escorts Heart Institute,
Okhla Road, New Delhi

Co-Author
Dr Vijay Kumar

Heavily calcified coronary lesion is one of the worst enemies for interventional cardiologists. These difficult to dilate lesions consume time and equipment, require proficiency with adjunctive calcification modifying tools like rotational atherectomy (RA), and are associated with higher rates of dreaded procedural complications namely perforation, dissection and stent under expansion leading to unfavorable short- and long-term outcomes. In recent years, a variety of devices for modifying calcified lesions have become available. The easy to use cutting and scoring balloons perform best for mild to moderately calcific lesions. Severely calcified lesions can only be treated effectively using rotational/orbital atherectomy or ultra-high pressure (up to 40 atm) non-compliant (NC) OPN balloons. The athero-ablative techniques not only require acquired skill-set and a learning curve but also carry an increased risk of vessel perforation, slow flow, dissection, and vessel closure. The latest addition to our armamentarium of devices to treat severely calcified lesion is Intravascular Shockwave Lithotripsy (IVL). This device uses sonic waves to fracture calcium within the vessel wall. It also provides a number of inherent advantages, being a balloon catheter-based device. It is intuitively user friendly, has a short learning curve and is safe with very little risk perforation, distal embolization or slow flow. It has the ability to create circumferential fractures in superficial and deep calcium at low pressure thus making the lesion more uniformly compliant to achieve optimal stent expansion. The prospective, single arm, multicenter, non-randomized DISRUPT CAD studies (I, II, III, IV) enrolled a total of 628 patients with denovo severely calcified lesions and demonstrated excellent safety (no IVL associated perforation, vessel closure or no reflow) and high effectiveness.1 However, these studies were performed principally for regulatory approvals and excluded many 'real-life' lesions like tortuous vessels, undilatable lesions, ostial lesions, total occlusions, unprotected left main lesions, in stent restenosis and true bifurcation lesions. Thus, 'real-world' data for IVL is sparse and very much needed.

Key Points

- The safety and effectiveness of IVL has been demonstrated in DISRUPT CAD studies in selected severely calcified coronary lesion.
- 'Real-world use' of IVL extends to more complex calcified lesions not evaluated in the above studies.
- Understanding best practices when using IVL ensures optimal outcomes for the patients.

References

1. Kereiakes DJ, Di Mario C, Riley RF, et al. Intravascular lithotripsy for treatment of calcified coronary lesions: patient-level pooled analysis of the disrupt CAD studies. JACC Cardiovasc Interv. 2021;14(12):1337-1348.

Citation: Seth A, Kumar V. Intravascular lithotripsy for calcified coronary arteries in the real-world: From rock to metal. Catheter Cardiovasc Interv. 2021;1–2. https://doi.org/10.1002/ccd.29853

Recent Guidelines for Coronary Artery Bypass Surgery

Dr Arun Kochar
Additional Director - Interventional
Fortis Hospital, Mohali

History of coronary revascularisation has been amazingly stupendous and has revolved around evidence-based medicine over last many decades. Both coronary-artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) have evolved to be present state of the art treatment options for all facets of coronary artery disease (CAD). Central to this development of both procedures had been lively, intense and often fierce debate of superiority of one procedure over other. Also, ideal patient population most suited for particular patient had also been debated, argued and contested over and over again.

Despite all such ambiguities and conflicts of opinions, there had been two generally agreed patient populations where clear edge of CABG over PCI has been accepted and recognised.

1. Patient with higher burden of disease and increasing lesion complexity.
2. Patients with diabetes mellitus.

There had been numerous other newer perspectives in the management of CAD as well, namely functional assessment of the lesions, elaborate imaging techniques, improved PCI hardware and usage of arterial conduits. Combined with improving learning skills of operators along with these technological advances has placed modern coronary revascularization on a stable and firm pedestal.

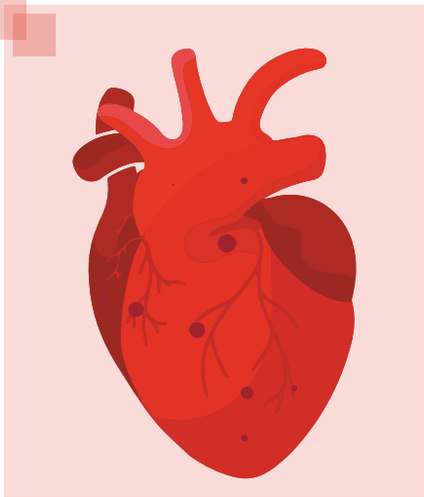
There had been expert guidelines from time to time regarding indications of CABG. These guidelines had been regularly updated time and again to accommodate newer clinical evidence that is being observed constantly.

Recently the ACC, AHA, and SCAI have updated 2011 coronary artery bypass grafting (CABG) guideline. These newer guidelines have paved the way to include recent available information and facts for indications of performing CABG.

Following are the key major recommendations of these recent guidelines.

- It is important to recommend CABG based on clinical decisions regardless of sex, race, or ethnicity. It has been noted that women, blacks, Asians and lower socioeconomic strata patients are less advised surgery despite clear indications and available facilities. This inequality needs to be corrected.
- A multidisciplinary "Heart Team" should be formed in each capable institution comprising experts from cardiovascular and allied fields. The decision of the team should be on clinical merit alone for patients who might benefit from CABG or when the optimal strategy is unclear. These patients fall in the grey zone in the middle of extreme indications for CABG and PCI. This includes most patients with multivessel CAD, left main disease, and diabetes, among others.
- Left main disease needs to be vascularized with sense of urgency depending upon clinical profile. CABG is recommended over PCI when high-complexity CAD is present. However, PCI is reasonable in selected patients if equivalent revascularization is possible and disease is less complex.
- Recommendations are very clear that Diabetic patients with multivessel CAD involving the left anterior descending artery should undergo CABG instead of PCI.
- In selected patients who are post-surgery with stable CAD especially when they are on high bleeding risk, aspirin may be safely stopped in favour of P2Y12 monotherapy after 1 to 3 months.
- Radial artery should be used as conduit for the second most important graft during CABG.
- Wherever possible total arterial revascularization should be done and minimal access surgery be performed.

Finally, a word about medical treatment as well! Role of drug treatment has witnessed a boost from the International Study of Comparative Health Effectiveness with Medical and Invasive Approaches (ISCHEMIA). This trial has shown no benefit of PCI or CABG over medical therapy in patients with coronary artery disease and moderate-to-severe ischemia. There had been much criticism of the approach, but nonetheless role of medical treatment should never be underemphasized. There is a definite patient subset who derives long term benefits from this approach.



Issue: 6 | September 2022

Nano-Crush Technique in Narrow-Angle (<70°) Bifurcation: Bench Test, CT Reconstruction, Fluid Dynamics, and Clinical Outcomes

Citation;- Ray S, Bandyopadhyay S, Bhattacharjee P, Mukherjee P, Karmakar S, Bose PK, et al. Nano-crush technique in narrow-angle (<70°) bifurcation: bench test, CT reconstruction, fluid dynamics, and clinical outcomes. Minerva Cardiol Angiol 2022;70:459-67. DOI: 10.23736/S2724-5683.21.05834-8)Keywords: Coronary artery disease; Percutaneous coronary intervention; Stents)

Dr Shuvanan Ray
Director - Intervention Cardiology/
Transcatheter Aortic
Valve Implantation
Fortis Hospital, Anandapur, Kolkata

ABSTRACT

Background

Bifurcation stenting techniques are still refining and under testing. Nano-crush is a novel technique which allow minimum protrusion of side branch struts at the ostium. To demonstrate the efficacy of Nano-crush technique in narrow-angle bifurcation (<70°) using bench test model, 3D reconstruction of the stent structure, computational fluid dynamics study and a clinical follow-up.

Methods

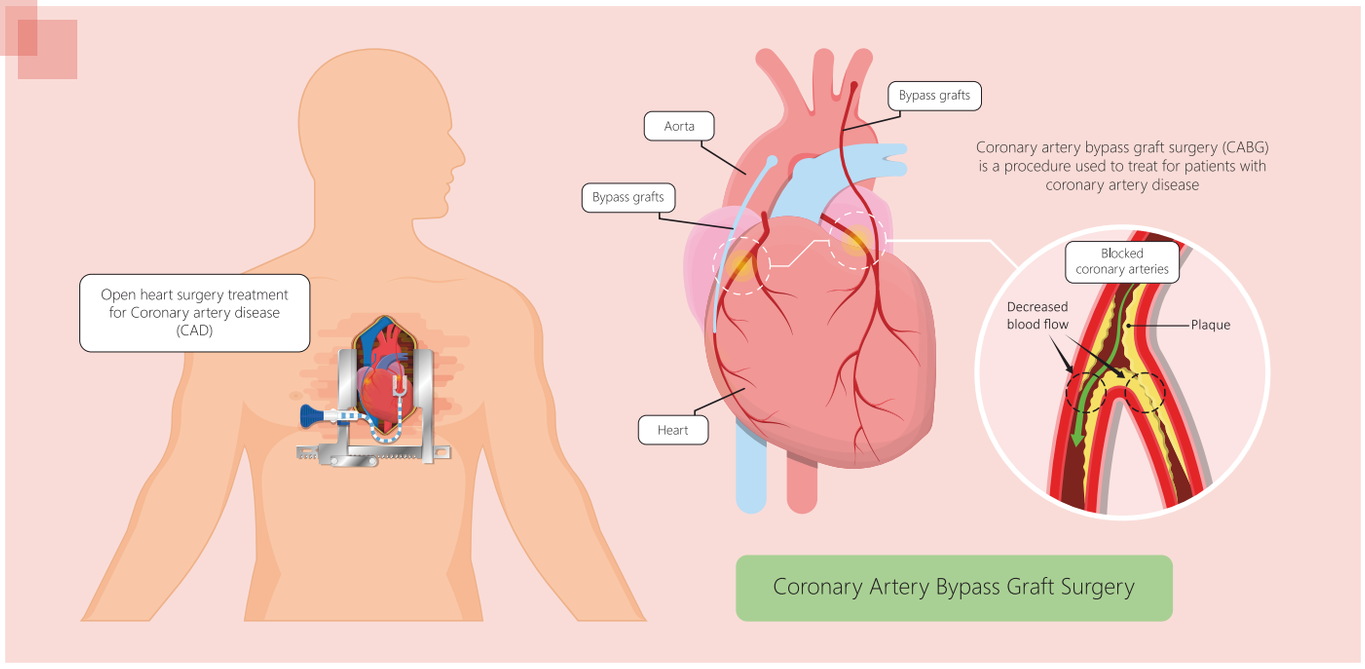
This was a retrospective observational single-centre study which included 40 patients who underwent angioplasty using Nano-crush technique for de-novo complex coronary bifurcation lesions with narrow bifurcation angle (<70°) between April-2016 to March-2019. The in-vitro bench test and computational fluid dynamics analysis were performed using a bifurcation model designed. The clinical primary endpoint was major adverse cardiac events (MACE), defined as a composite of cardiac death, myocardial infarction, and target lesion revascularization (TLR) at one-year angiographic follow-up.

Results

The reconstructed results of in-vitro bench test showed minimum length of stent struts moving away from the rounded side branch ostium. The mean age of patients was 62.8±7.98 years (32 male) and presented 100% procedural success. The mean bifurcation angle was 47.3±9.2°. The MACE was reported in four (10%) patients which included one (2.5%) death and three (7.5%) TLR at the mean follow-up of 35.54±12.31 months. No significant correlation between occurrence of MACE and gender, age, comorbidities and bifurcation angle were reported.

Conclusions

The Nano-crush technique demonstrated least metal load around carina and abnormal flow dynamics in narrow angle (<70°) bifurcation lesions and also reported favourable long-term clinical outcomes.



Role of Non-invasive Modalities in Cardiac Assessment- Strengths and Limitations

Dr Mona Bhatia
Director and Head -
Radiology and Imaging
Fortis Escorts Heart Institute,
Okhla, New Delhi

- **Role of Computed Tomography and Magnetic Resonance Imaging in the Diagnosis of Coronary Artery Disease: Indications and Applications**

Coronary artery disease (CAD) is the leading cause of death worldwide. The diagnosis of CAD relies on the clinical history, electrocardiographic changes, and imaging findings. The available imaging methods include transthoracic echocardiography, computed tomography (CT), cardiac magnetic resonance (CMR) imaging, and invasive angiography. Over the last two decades, cardiac CT and CMR have emerged as promising non-invasive modalities in the assessment of patients with suspected and established CAD. Both the modalities have their own advantages and disadvantages which complement each other in comprehensive evaluation of CAD aiding in the diagnosis, guiding clinical decision-making, and improving risk stratification. In this article, we provide an overview of the techniques and clinical applications of cardiac CT and CMR imaging in the assessment of patients with CAD.

- **Cardiac Magnetic Resonance in Rheumatology to Detect Cardiac Involvement Since Early and Preclinical Stages of the Autoimmune Diseases: A Narrative Review**

Autoimmune diseases (ADs) encompass multisystem disorders, and cardiovascular involvement is a well-known feature of autoimmune and inflammatory rheumatic conditions. Unfortunately, subclinical and early cardiovascular involvement remains clinically silent and often undetected, despite its well documented impact on patient management and prognostication with an even more significant effect on severe and future MACE events as the disease progresses. Cardiac magnetic resonance imaging (MRI), today, commands a unique position of supremacy versus its competition in cardiac assessment and is the gold standard for the non-invasive evaluation of cardiac function, structure, morphology, tissue characterization, and flow with the capability of evaluating biventricular function; myocardium for edema, ischemia, fibrosis, infarction; valves for thickening, large masses; pericardial inflammation, pericardial effusions, and tamponade; cardiac cavities for thrombosis; conduction related abnormalities and features of microvascular and large vessel involvement. As precise and early detection of cardiovascular involvement plays a critical role in improving the outcome of rheumatic and autoimmune conditions, our review aims to highlight the evolving role of CMR in systemic lupus erythematosus (SLE), antiphospholipid syndrome (APS), rheumatoid arthritis (RA), systemic sclerosis (SSc), limited sclerosis (LSc), adult-onset Still's disease (AOSD), polymyositis (PM), dermatomyositis (DM), eosinophilic granulomatosis with polyangiitis (EGPA) (formerly Churg-Strauss syndrome), and DRESS syndrome (DS). It draws attention to the need for concerted, systematic global interdisciplinary research to improve future outcomes in autoimmune-related rheumatic conditions with multiorgan, multisystem, and cardiovascular involvement.

- **Coronary Artery Disease Reporting and Data System: A Comprehensive Review**

The Coronary Artery Disease Reporting and Data System (CAD-RADS) is a standardized reporting method for coronary computed tomography angiography (CCTA). It summarizes the findings of CCTA in 6 categories ranging from CAD-RADS 0 (complete absence of coronary artery disease) to CAD-RADS 5 (total occlusion of at least one vessel). It is applied on per patient basis for the highest grade of the stenotic lesion. The CAD-RADS also provides category-specific treatment recommendations, helping patient management. The main objectives of the CAD-RADS is to improve consistency in reporting, facilitate the communication between interpreting and referring clinicians, recommend the best course of patient management, and produce consistent data for quality improvement, research and education. However, CAD-RADS has many limitations, resulting into the misclassification of the observed findings, misinterpretation of the final category, and misguidance for the treatment based upon the single score. In this review, the authors discuss the CAD-RADS categories and modifiers, along with the strengths and limitations of this new classification system.

Issue: 6 | September 2022

Expert Article Analysis for: Usefulness of Oral Anticoagulation in Patients with Coronary Aneurysms: Insights from CAAR Registry Oral Anticoagulants for Coronary Artery Aneurysm: For Few or For All?

Dr Ashok Seth
Chairman -
Fortis Escorts Heart Institute
Chairman -
Fortis Healthcare Medical Council
President - Asian Pacific Society of Interventional Cardiology
Fortis Escorts Heart Institute,
Okhla Road, New Delhi

Coronary artery aneurysms (CAA) are uncommon and seen in less than 1% of the coronary angiograms. The commonest cause of CAA is atherosclerosis, though vasculitis, connective tissue disease, trauma, infection, and drug eluting stent implantation have all been known to cause CAA. Kawasaki disease is an important cause of CAA in children and young adults in some regions of the world. The diagnosis of CAAs is usually incidental during invasive coronary angiography or computed tomography angiography, which therefore reflects of the often-subclinical nature of the condition. When symptomatic, the commonest presentation is acute coronary syndromes including myocardial infarction because of thrombus formation. n the aneurysmal sac and distal embolization. Rare presentations of pressure symptoms, pericardial effusion, and tamponade and rupture of aneurysm have been described. The incidental finding of CAA coupled with the knowledge gap regarding natural history and treatment options based on small case series or reports only makes it confusing for treating clinicians to devise management strategies. There is also a rather glaring deficit in of prospective randomized studies making it difficult to establish guidelines.[2] In a state-of-the-art review Kawsara et al, put forward an algorithm for treatment of CAA with medical management, percutaneous coronary intervention, or surgical strategies.[2] While it is understandable that symptomatic canes of CAA may require aggressive treatment, the long-term benefits remain uncertain. Furthermore, it is also unclear whether even drug therapy with oral anticoagulants though often prescribed, has any definite role in improving outcomes.

CAAs by disrupting the normal laminar flow of blood promote thrombus formation in their cavity leading to cardiac events. Thus, it is logical that CAA patients could benefit from dual antiplatelet therapy or even more likely from anticoagulation. This has been suggested through small studies but robust evidence of risk versus benefit of oral anticoagulation treatment (OAT) has been lacking. In this issue of Catheterization and Cardiovascular Interventions, the study by D'Ascenzo et al[3] provides important evidence for medical management strategy for CAA. They looked at 1331 patients with CAA included in the multicentre "Coronary Artery Aneurysm Registry" who were discharged with or without OAT with warfarin. Over a median follow up of 3 years, the rate of the major cardiac event was significantly lower in the OAT group as compared to that of the non-OAT group, resulting from significant reduction in unstable angina (4.6% vs 10%, p < 0.01), aneurysm thrombosis (0 % vs 3.1 %, p=0.03); and there was a non-significant reduction in the myocardial infarction (4.1% vs 7.7%, p=0.13). There were significantly more heart failure hospitalizations in the OAT group (17.9% vs 9.7%, p=0.04) and there was no significant difference in all-cause or cardiovascular mortality. The authors suggest that the higher rates of heart failure could have been because of more arterial fibrillation patients in the OAT groups. A non-significant increase in BARC bleeding mainly type 1 was found in OAT group (10.3% vs 6.2%, p=0.08).

The study is important because it is the first large prospective registry of CAA which also includes 30% patients with giant CAA) to demonstrate improved outcomes wit medical management using oral anticoagulation (warfarin) in CAA patients. However, the study is fraught with limitations of a prospective registry where a number of variables have not been collected and therefore leaves numerous questions unanswered eg, criteria for selection of patients for anti-coagulants? Targets INR and in time therapeutic range in the OA group? Single antiplatelets versus dual antiplatelets and use of new P2Y12 inhibitors in the non-OAT group?

It is also possible that direct acting oral anticoagulants (DOACs), which have been demonstrated to be safer and more effective than warfarin in prevention and treatment of thromboembolism, may also be an attractive treatment for CAA with better compliance. There are a few case reports related to use of rivaroxaban in this scenario.[4]

The favorable results of anticoagulation for CAA in this large database question the need for surgical or percutaneous intervention-based treatment options which by no means are easy or perfect. It should also be kept in mind that treatment strategies are also based on etiology, CAA location, morphology, patient characteristics and clinical presentation.

Patients with post DES implantation aneurysms may be at higher risk of having CAA thrombosis and cardiac events. Future studies should relate CAA etiology and presentation to outcomes[5]

The rarity of coronary artery aneurysms makes randomized controlled trials difficult; the CAAR registry is a step in the right direction and will continue to provide valuable insights into the management strategies for CAA. For the present, it defines a greater role for medical therapy with anticoagulation at least for those who present with unstable angina or AMI or are increased risk of thromboembolic events.

Key Points

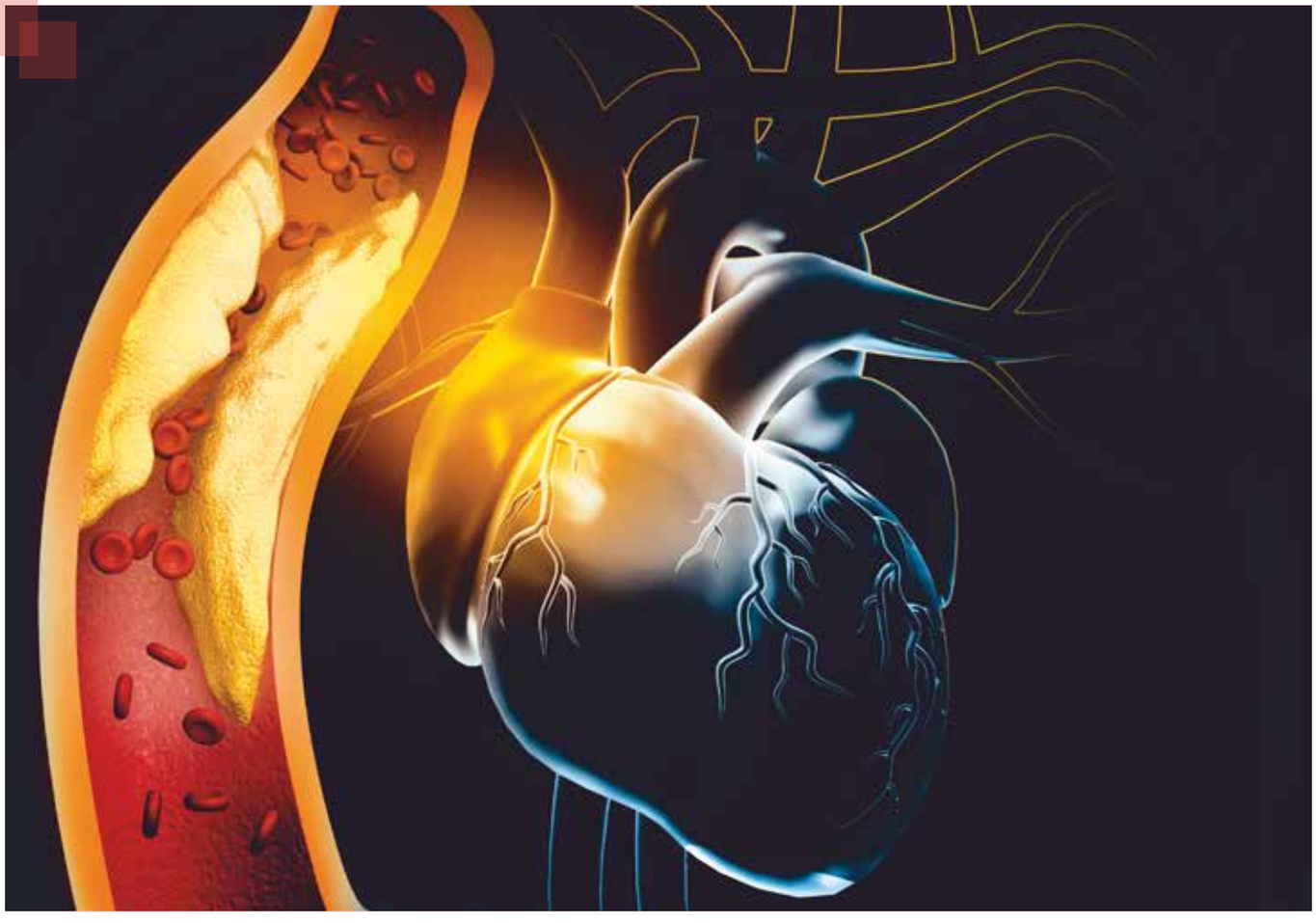
The management of coronary artery aneurysm (CAA) by medical treatment, percutaneous coronary intervention, or surgery remains arbitrary due to lack of large case series or trials.

The "Coronary Artery Aneurysm Registry" represents the largest database and demonstrates decreased cardiac event rates with non-significant increase in bleeding risk at intermediate term follow up by warfarin treatment.

This strengthens the case for medical management of CAA and provides the basis for future follow-up studies.

References

1. Nüler-G U Conato E. Bolla M. et a Coronary artery aneurysms, insights from the International coronary artery aneurysms, registry (CAAR). Int J Cardiol.2020;299:49-55. Doi:10.1016/j.ijcard.2019.05.067
2. Kawsara A, Nunez Gil IJ, Alqahtani F, Moreland J, Rihal CS, Alkhouli M. Management of coronary artery aneurysms. JACC Cardiovascular Interv.2018;11(13): 1211-1223. doi:10016/j.jcin.2018.02.041
3. D'Ascenzo F, Noña CI U. Aigshtani F, Moraland, al CE. ARneull MHang of ylary nyre, JACC Condo Inte 20161113) 1211-1223, doi:10.1016/j.2018.02.041 3. D'Ascenzo F. Suglietto A. Ramakrista H. et al. Usefulness of oral anti coagulation in patients with coronary aneurysms insights from the CAAR meistry Catheter Cardiovasc Interv 2021:98864-871
4. Yan Q, Ning 1. Aan Y, Yang W, Yuan Q. Du Z. Could the novel oral anti colants be uned for coronary artery aneurysm? Ce Rey Med 2020 20205073814, do 10.1155/2020/5073814 A&N A Le MB, Dan G.



THE WAY WE DO IT AT FORTIS

The Principles of Ultra-Low Contrast Percutaneous Coronary Intervention

Source:- Indian Journal of Anaesthesia, November 2019 - Volume 63 - Issue 11 - p 875-876

Dr Babu Ezhumalai
Senior Consultant -
Interventional Cardiologist
Fortis Malar Hospital, Adyar, Chennai

Abstract

Ultra-low contrast percutaneous coronary intervention (ULCPCI) can be performed electively in advanced chronic kidney disease. Engage guide catheter and advance guidewire into the coronary artery without using contrast. IVUS-guided PCI can reduce the contrast load. Perform co-registration of distal and proximal radio-opaque marker bands of intravascular ultrasound (IVUS) catheter. Deploy the stent at the target lesion under fluoroscopic guidance of these co-registered position of the IVUS-marking images. Complete the ULCPCI procedure with a final angiography using minimal contrast. Newer contrast sparing techniques and intravascular imaging technologies provide opportunities to perform ULCPCI efficiently with good results and the least complications.

Safety and Feasibility of Ultrasound-Guided Access for Coronary Interventions Through Distal Left Radial Route

Citation:- Ghose T, Kachru R, Dey J, Khan WU, Sud R, JabeenS, Husain S, Pant A. Safety and Feasibility of Ultrasound-Guided Access for Coronary Interventions through Distal Left Radial Route. J Interv Cardiol. 2022 Mar 25;2022:2141524. doi: 10.1155/2022/2141524. PMID: 35401064; PMCID:PMC8975628.

Dr Tapan Ghose
Director - Cardiology
Fortis Flt. Lt. Rajan Dhall Hospital,
Vasant Kunj, New Delhi

Left distal transradial arterial approach (ldTRA) is a new interventional route that spares right radial artery (RRA) for use in haemodialysis and as bypass graft. Vasant Kunj Left distal Transradial Artery approach (VKLITE) study aimed to assess the feasibility and safety of ldTRA access during coronary angiography (CAG) and percutaneous coronary intervention (PCI). Methods and Results. Between April 2018 and June 2020, 108 patients were enrolled and underwent CAG ± PCI via ultrasound guided ldTRA. Arterial puncture, CAG, and PCI were successful in 96.3% (104/108), 92.1% (93/101), and 94.1% (32/34) patients, respectively. Access site crossover rate was 14/108 (13.0%). Mean puncture, procedure, and haemostasis time (minutes) were 6.7 ± 7.1, 55.7 ± 32.8, and 23.1 ± 11.9. Median total fluoroscopic time was 6.6 minutes (IQR-14.2), and median total radiation dose was 39.2 Gy-cm2 (IQR-97.0). Local haematoma occurred in 11 patients (10.2%) with major haematoma in 1.9%, all recovering within three weeks. Mean pain score was 2.4 ± 2.3, and patient satisfaction score was 9.0 ± 1.3. LdTRA access compared with RRA access (n = 121) showed significantly increased mean procedure time (55.7 ± 32.8 vs. 43.9 ± 26.0 minutes, p = 0.01) and median total fluoroscopic time (6.6 [IQR-14.2] vs. 4.7 [IQR-8.2] minutes, p = 0.02), with similar median total radiation dose (39.2 [IQR-97.0] vs. 43.8 [IQR-54.5] Gy-cm2, p = 0.56). No radial artery loss, dissection, pseudoaneurysm, arteriovenous fistula, or nerve injury was noted. Conclusions. LdTRA access is feasible with few complications during CAG/PCI. Patient comfort and satisfaction, makes it a desirable route for coronary interventions.

When LESS is MORE- MICS at Fortis, Bangalore

Dr GT Sudarshan
Consultant - Cardiothoracic Vascular Surgery
Fortis Hospital, Cunningham Road

Co-Author
Dr Vivek Jawali
Chief Cardiac Surgeon &
Chairman of Cardiac Sciences
Fortis Hospital, Bannerghatta Road, Bangalore

Abstract

Throughout the modern era of cardiac surgery, most operations have been performed via median sternotomy with cardiopulmonary bypass. Dr Vivek Jawali at Fortis Hospital Cunningham Road performed the Austral-Asia's first minimally invasive CABG on 28th September 1995. Since then this paradigm is changing. However, as cardiovascular surgery is increasingly adopting minimally invasive techniques. Advances in patient evaluation, instrumentation, and operative technique have allowed surgeons to perform a wide variety of complex operations through smaller incisions and, in some cases, without cardiopulmonary bypass. With patients desiring less invasive operations and the literature supporting decreased blood loss, shorter hospital length of stay, improved postoperative pain, and better cosmesis, minimally invasive cardiac surgery should be widely practiced. Here, we review the results of our MICS cases in the last 3 years.

Introduction

Along with the broader surgical community, cardiovascular surgery is in the midst of an ongoing evolution in technique. What began in the 1990s with the first reports of minimally invasive valve surgery has spread to influence nearly every type of cardiovascular operation performed today, and this evolution is being further spurred by recent developments in percutaneous valve technology. Minimally invasive techniques have been applied to a wide range of cardiac procedures. In the intervening two decades, numerous reports in the literature have demonstrated the feasibility, safety, and efficacy of minimally invasive cardiac surgery and supported its integration into clinical practice. With increasing patient demand for less invasive surgical options and the ongoing development of percutaneous technologies, it is essential that cardiovascular surgeons remain familiar with the most widely used approaches.

Method

From May 2019 till date, we have done around 220 cardiac procedures through minimally access route. These included single and multivessel MIDCABs, MICS mitral valve repairs and replacements, right anterior thoracotomy aortic valve replacement, MICS ASD closure, atrial myxomas, redo mitral valve replacement, redo tricuspid valve replacements among others.

An important component was an anesthesiology team skilled in the peri operative assessment and management of patients with particular emphasis in maintaining single lung ventilation through bronchial blockers, TEE guided peripheral cannulations and managing post-operative pain with regional analgesia. All patients were comprehensively assessed for the suitability of MICS with preoperative lung function assessment.

The operations were performed with 6 cm incisions through the intercostal spaces, left 4th intercostal spaces for the MIDCAB, right 4th for ASD and MVR and right 2nd space for AVR. All MIDCAB were performed off pump using Octopus Nuo stabilizer inserted through the subxiphoid space. Cygnet partial clamps were used for proximal anastomosis of reversed vein graft to aorta. Total arterial revascularizations were done composite grafts using the left mammary and the radial artery.

The cardiopulmonary bypass for the open-heart cases was established through peripheral cannulations using right femoral artery and femoral vein with additional neck cannulation of the IJVfor SVC drainage for ASD and MVR. The pediatric ASD cases and for those with small peripheral vessels, central cannulation was done through the incision. 10 mm 30-degree scope was used to let the other team visualize the procedure. Endoscopic knot pusher and Corknot in the last few cases were used for knot tying in the depth. CO2 was used as a deairing strategy.

All patients received paravertebral analgesia and regular post-operative management protocol was followed.

Results

The average ventilation time was four hours, with mean post-operative blood loss of 260 ml. Around 91% were shifted out of ICU within 24 hours and discharge on the 4th post-operative day was achieved in 75% of patients.

There were three 30-day mortalities, one was due to Covid infection in the post op period and the other due to the sepsis due to lung infection and the third due to delayed tamponade. The conversion to sternotomy was 3/220 (one due to post op bleeding, one MIDCAB as the LIMA was densely adherent due to lung adhesions and another due to the poor exposure of densely calcified aortic valve). The incidence of post-operative complications includes re-exploration due to bleeding (1.8%, 4 patients), post op AF (11.36%), AKI not needing dialysis (3.6%), atelectasis (4.5%), prolonged post op ventilation beyond 24hrs (6.8%), low cardiac output 3.6%, re-intubations (1.3%), excess blood transfusions (9%). There were no stroke or vascular complications.

Late complications were wound infections 4.8%, pericardial collection needing drainage (1.8%) and persistent operative site pain (6.8%).

Discussion

Unlike in general surgery where laparoscopy has become the standard of care (for example the laparoscopic cholecystectomy), minimally invasive cardiac surgery (MICS) has been slow to develop. There appear to be several barriers to the adoption of MICS techniques:

The surgery is technically more demanding and there is a steep learning curve with typically no standardized training programs.

Studies tend to show that bypass and ischemic times are prolonged-particularly during the learning curve.

There are higher costs associated with the equipment and instruments required-without any demonstrable mortality benefit, nor reproducible evidence of other superiority making it challenging for surgeons to set up new services.

From the surgeons' point of view, the adoption and evolution of new techniques and technologies fulfill the learning prospect of the profession, excel to excellence, and may contribute to the patient's welfare. From the viewpoints of health industries, new practices imply innovation, investment, and business. However, surgeons face obstacles to the development of less invasive approaches. Initiatives are hindered by limited surgical exposure, unfamiliar environments, prolonged operative time, unexpected troubleshooting, etc. Nevertheless, with enabling technologies, refined instruments, and pioneers' lead, cardiac surgery is now heading towards less invasive approaches.

With increasing patient interest in minimally invasive procedures, it is more important than ever for surgeons to be current on the most common minimally invasive techniques in cardiac surgery. Why has it been difficult to demonstrate the superiority of MICS? One consideration is that of 'invasiveness'. In cardiac surgery the access route is only a minor component of the invasiveness, unlike in general surgery. It is of course important to recognize that MICS is a multidisciplinary endeavor, and it is essential to be surrounded by a supportive team who are ideally trained together, and all contribute to the local guidance, before embarking upon new techniques.

In the future, the continued evolution of endoscopic, robotic, and percutaneous technologies will only increase the ability of surgeons to address cardiovascular disease with decreasing operative trauma.

Composite Valved Conduit for Ascending Aortic Dissections and Aneurysms: Our Experience

Dr Sanjay BS
Senior Consultant -
Cardiothoracic Vascular Surgery
Fortis Hospital, Bannerghatta Road,
Bangalore

Co-Author
Dr Vivek Jawali
Chief Cardiac Surgeon &
Chairman of Cardiac Sciences
Fortis Hospital, Bannerghatta Road,
Bangalore

Composite valved conduit is an accepted treatment modality for the treatment of Aortic Root and valvular problems and for diseases of the ascending aorta. This surgery has always been a challenge for the cardiac surgeons.

In this study we analysed our experience of using valved conduits in patients of aortic dissections and aortic root aneurysm.

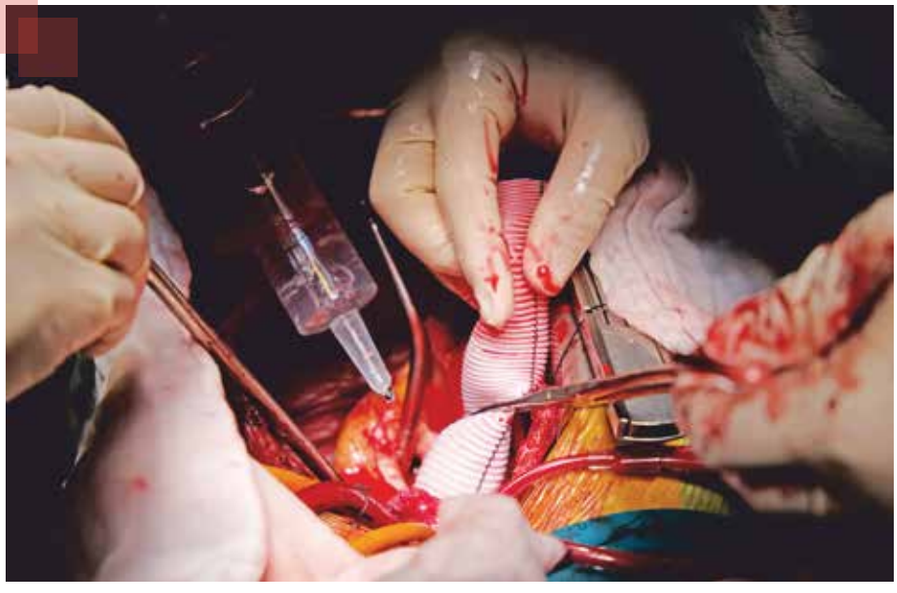
Between May 2015 to 2022, 45 patients underwent a composite valve replacement at Fortis Hospitals. The indication was root enlargement with aortic stenosis or regurgitation in 19 patients and acute aortic dissection with aortic regurgitation in 26 patients. Of the 45 patients, 33 (73.33%) were male patients and 12 (26.66%) female patients with mean age of 63_+13 years. 23 patients (53.33%) had diabetes, 35(77.77%) of patients had hypertension, 4(8.88%) patients had renal dysfunction, 22(48.88%) were in NYHA Class III and IV and 9(20%) patients had Marfan's syndrome while 22(48.88%) patients had a bicuspid aortic valve.

The classic Bentall technique was used in all these cases, with surgery done through median stenotomy, cardiopulmonary bypass and cooling, replacement of the valve and ascending aorta with valved conduit and re-implantation of the coronaries on the conduit. Axillary cannulation was used in all patients with dissection. In patients of dissection with arch involvement, the arch was also replaced in five patients. Concomitant CABG (2 patients) and mitral valve replacement (1 patient) was also done when indicated.

The mean duration of cardiopulmonary bypass was 158min +_ 36 min. Cross clamp time was 83+_24min and selective cerebral perfusion when used was 28+_ 12 min. Average blood loss during surgery was 1200 ml +_ 800 ml. Drainage in the postoperative period was around 300+_ 150ml. Total duration of ICU stay was 4.6+_ 3.3 days.

Early mortality was seen in four patients; the cause of death being uncontrolled bleeding in two patients and multi organ failure in the other two patients. Early morbidity included bleeding and re-exploration in three cases, renal failure in three, neurological insult and strokes in three, prolonged ventilation in five and wound infections in two cases. Late morbidity included one patient having wound infection which needed surgery, two readmissions with deranged prothrombin time, bleeding and thromboembolic events, and one patient required a permanent pacemaker

Despite all modern treatment options for aortic dissection or aneurysm, the treatment presents a challenge to the surgeon. Although patients are operated with low surgical risk, long term prognosis remains a challenge. Progression of the disease of the remaining aorta and the dissected segment, thromboembolic complications following a mechanical valve, readmission for pseudo aneurysm of the suture line and coronary buttons all remain a nightmare for the surgeon.



Recent End Stage Heart Failure Cases at Our Centre to Show the Spectrum of Paediatric Heart Failure

Dr Dhananjay Malankar
Consultant - Paediatric Cardiothoracic Vascular Surgery
Fortis Hospital, Mulund

Dr Swati Garekar
Senior Consultant - Cardiology
Fortis Hospital, Mulund

Dr Bharat Soni - Pediatric Cardiovascular Surgeons, **Dr Ronak Sheth** - Pediatric Cardiologists, **Dr Shivaji Mali, Dr Shyam Dhake** - Pediatric Cardiac Anesthesiologists and Intensivists, **Dr Dilip Bind, Dr Amit Mhatre, Dr Komal Kamdi** - Pediatric Cardiac Intensivists **Mr K Dinesh and Mr S Sathish** - Physician Associates, **Mr Sujit Bamne** - Perfusionist, **Mansi Gharat and Sonal Chogale** - Registered Nurses, **Mr Phil** - Social worker, **Mr Vijay Sawant** - Coordinator **Ms Vidya Shetty** - OPD coordinator

Miss A* was a 10yr old child with dilated cardiomyopathy (Figure 1) with end staged heart failure characterized by multiple hospitalizations for intravenous milrinone/ levosimendan therapy. The etiology of her dilated cardiomyopathy was genetic. She was listed for a heart transplant which is the standard of care for paediatric end stage heart failure, with the zonal transplant coordination committee. She received a heart transplant with us a month later. Her post-operative course was smooth and at last follow up she is doing well and looking forward to starting school again.

Master B was a 7yr old boy with Ewing's sarcoma of the femur. He presented to our team 4 months post completion of chemotherapy with tachycardia and cardiomegaly. His echocardiogram showed a dilated LV and severe global dysfunction. Anti-heart failure medications were started. His condition failed to stabilize; he was shifted to our paediatric cardiac ICU and started on IV inotropes, and he was listed for emergent heart transplant. Due to his worsening condition, we placed a left ventricular assist device (LVAD) (Figure 2a, 2b). He stabilized on it and was well enough to be extubated. He remained on it for 6 weeks but ultimately succumbed without getting a donor heart in time to save his life.

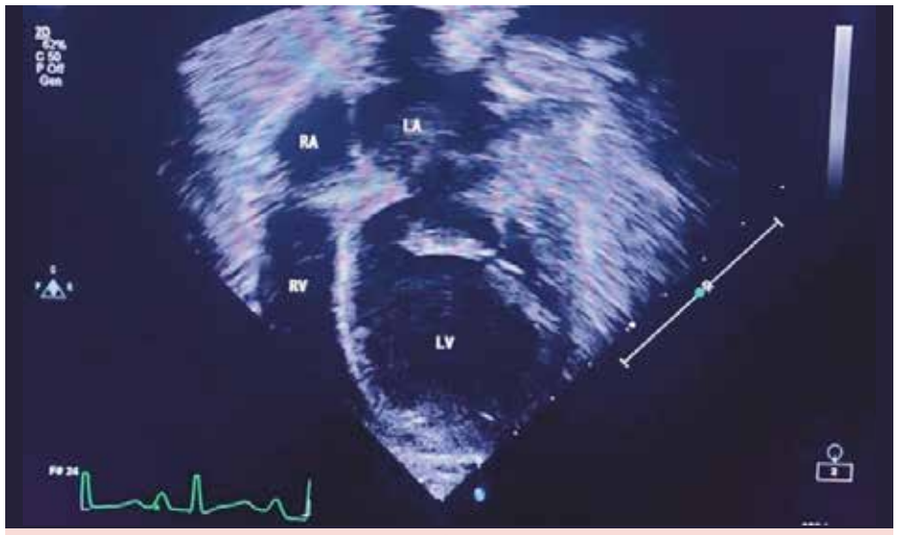


Figure 1: Echocardiogram showing Left atrial (LA) and left ventricular (LV) dilatation. EF was 10%

Figure 2a: LVAD Cannulae (Inserted in the OR)

Figure 2b: Extubated patient with LVAD support ongoing

Master C (Figure 3a, 3b, 3b) was a 4yr old boy who presented with anasarca and diagnostic work up revealed restrictive cardiomyopathy of unknown etiology. The echocardiogram had the typical appearance of bi atrial enlargement with abnormal diastolic function indices. A cardiac catheterization showed elevated ventricular end diastolic pressures (LV-22mm Hg). An endomyocardial biopsy was also performed and this showed Masson's trichromatic stain positive for extensive fibrosis in the myocardium (endomyocardial fibroelastosis). He was listed for an emergent heart transplant (highest category in view of universally grave prognosis of paediatric restrictive cardiomyopathy).

Master D was a 10yr old boy who was diagnosed with dilated cardiomyopathy. Even after a year, he had no improvement in his left ventricular ejection fraction and dimensions. Additionally, he had low energy levels and hence could not engage in usual activities of a 10-year-old despite being on optimized anti-heart failure medication (valsartan-sacubitril + carvedilol + Aldactone + dapagliflozin). He was listed for a heart transplant and received one with us. There were concerns of "big heart syndrome" post operatively as he had an oversized (donor) heart but his recovery was uneventful. He is doing well today.

*The specific patient identifiers have been changed in this write-up.

The future is bright for Indian children with end stage heart failure as heart transplant is no longer an exotic option for them. With each passing year, heart transplant as a viable option becomes more plausible even with regard to long term care and prognosis post-transplant.

• Life-Saving Norwood Surgery on a Neonate at 1 Hour of Life: IMPACT Procedure: Immediate Post-Partum Access to Cardiac Therapy

A couple came to the paediatric cardiac OPD with their foetus diagnosed with Hypoplastic Left Heart syndrome (Figure 5 a, 5b). The foetus had the rare variant (4% of HLHS babies) where the patent foramen ovale (PFO) was restrictive. Anticipating immediate worsening of the baby once placental circulation ceased, the multi-disciplinary (Obstetrics-Anaesthesia-Neonatology and Paediatric Cardiac) team had a plan ready. An elective C section was conducted and the baby's screening echocardiogram was done after delivery of the baby but before placental separation. Since there was no PFO, the neonate was shifted to the cardiac OT kept ready next door, after initial resuscitation in the labour OT. By the time (45 minutes post birth) the sternal incision was made, the blood gas showed severe acidosis with a lactate of 8mmol/L. Norwood stage I cardiac surgery was carried out successfully on her. The post-operative course was tumultuous as expected as prolonged pulmonary venous hypertension in-utero meant that her lungs were injured and ventilator dependent for a long time. She was extubated on POD 10 and sent home on day 21 of life. At last follow up, she is doing well and will need 2 more cardiac surgeries to complete her palliation.

Figure 3a:
Child with anasarca and peripheral cyanosis due to poor perfusion

Figure 3b:
Radiograph of the chest and abdomen showing pleural effusions, cardiomegaly, hepatomegaly and ascites

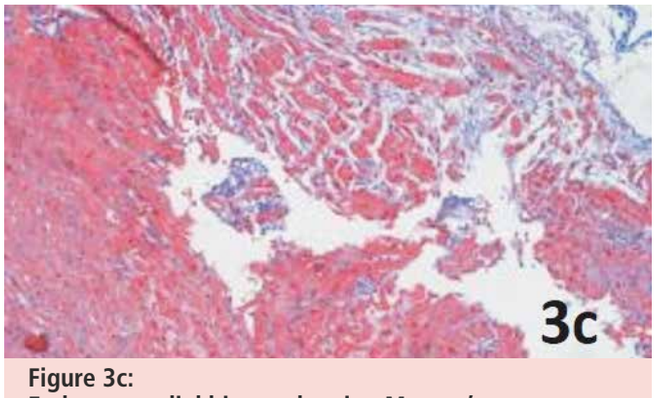


Figure 3c:
Endomyocardial biopsy showing Masson's trichrome stain where fibrosis stains blue, indicating endomyocardial fibrosis that causes restrictive cardiomyopathy

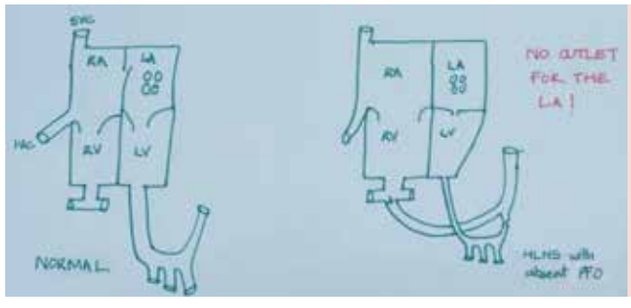


Figure 5a:
Normal heart line diagram versus heart with HLHS

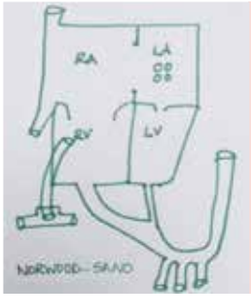


Figure 5b:
Norwood stage 1 surgery

The Left Atrial and Appendage Function Changes Following Successful Electric Cardioversion in Atrial Fibrillation

Citation: Rajat Sharma, The left atrial and appendage function changes following successful electric cardioversion in atrial fibrillation, Heart Rhythm 2020, 3rd World Heart Rhythm Conference; Webinar- November 09-10,2020.https://heartrhythm.cardiologymeeting.com

Dr Rajat Sharma
Consultant - Cardiology
Fortis Hospital, Mohali

Dr Honey Sharma
Attending Consultant - Cardiology,
Fortis Hospital, Mohali

Co-Authors: Rajat Sharma[1] , Honey Sharma[2] , Jagmohan Singh Varma[2], Ashita Sharma[3] , Deepali[4]

1. Cardiac electrophysiology division, Fortis Hospital, Mohali, India 2. Cardiology division, Fortis Hospital, Mohali, India 3. Clinical biochemistry and research. Medical writer, India 4. Observer department of cardiology, Fortis Hospital, Mohali, India

Background

External direct current cardioversion remains the most widely used and cost-effective method to restore sinus rhythm (SR).[1] Successful cardioversion of atrial fibrillation usually results in left atrial (LA) and LA appendage (LAA) stunning that may last up to a few weeks and is observed after all methods of cardioversion. It is responsible for an increased incidence of thromboembolic events following DC cardioversion, this despite restoration of sinus rhythm.[2]

Materials and Methods

This prospective observational study was conducted starting from July 2017 to September 2018 on 50 consecutive patients with non-valvular AF who underwent successful CV to sinus rhythm. The Echocardiographic assessment of LA by TTE and TEE was done pre and post direct current cardioversion at 0, 1, 3- and 6-months interval and various parameters of LA function were analyzed. Parameters assessed on TTE were LVEF, LAEF, A wave velocity, A velocity, LArV, LA peak systolic strain and LAFI. TEE was done to rule out LA/LAA clot and assess LAAeV and SEC.

Results

The LVEF improvement was linear and from a baseline value of 48.55% it improved to 50.08% immediately following successful ECV and it improved further to 52.00 % at 1 month, 53.57% at 3 month and 55.45 % at 6 months (p=0.000).

Conclusion

The Systolic function of left atrium (left atrial emptying fraction) improved after a successful cardioversion and continued thereafter. LAFI which combines analogues of LA volume, its reservoir function and the LV stroke volume, is an expression of atrial function independent of baseline rhythm. LAFI showed significant increase after successful cardioversion.

Trans-Esophageal Echocardiography During Off-pump Coronary Artery Bypass Grafting

Dr T. A. Patil
Director & Head -
Department of Anesthesiology,
Fortis Hospital, Bangalore, Karnataka

Introduction

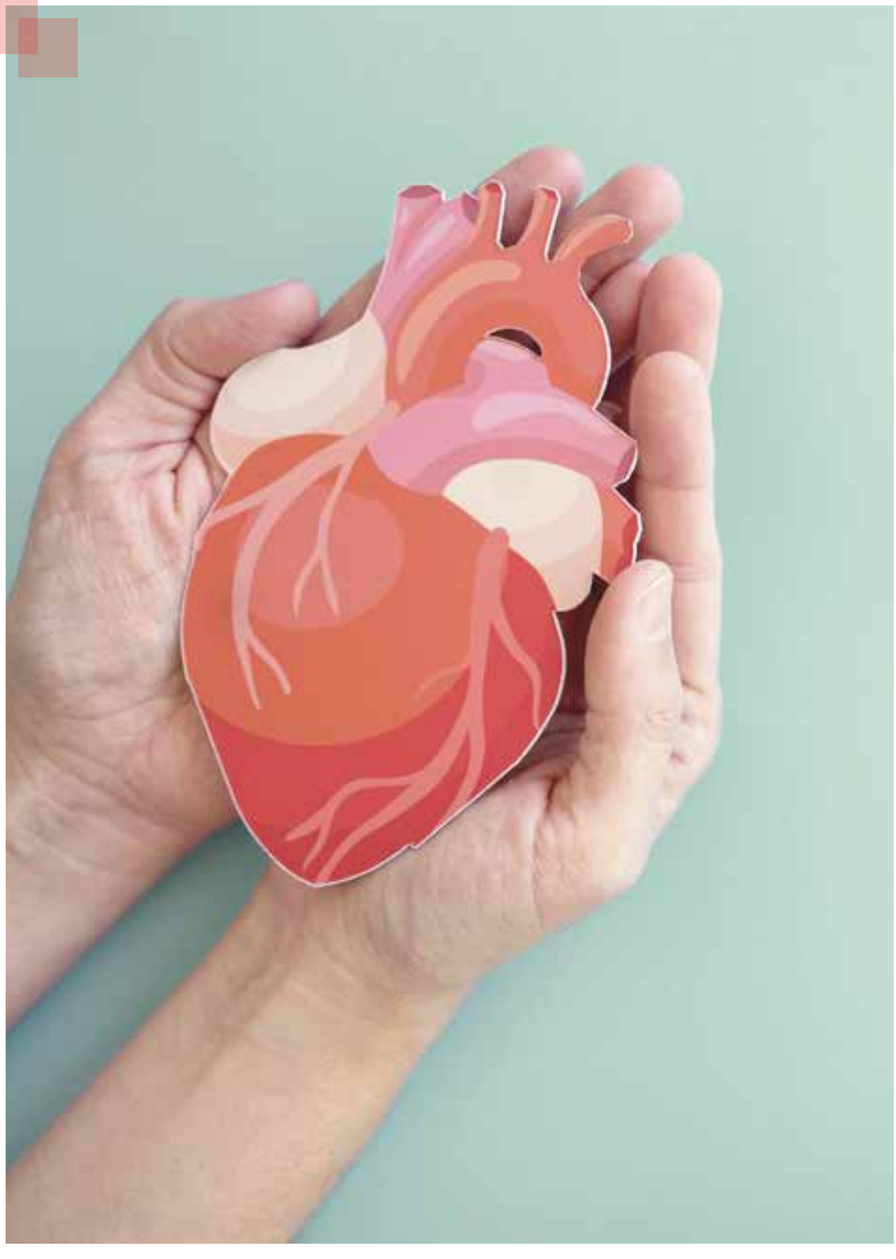
Off-pump coronary artery bypass grafting (OPCABG) is fast becoming widely adopted technique for surgical revascularization of the heart. However, OPCABG presents with unique technical and hemodynamic challenges which require additions to conventional monitoring techniques. Transesophageal echocardiography (TEE) provides reliable and real-time information to monitor these challenges during OPCABG.

Routine TEE during cardiac surgery has shown to reduce patient morbidity and mortality and improve patient outcome. [1] It is beneficial in high - risk patients undergoing CABG. Savage et al. have shown that TEE changed surgical management in 57% and anesthetic management in 73% of CABG patients.[2] Skinner et al. and Klein et al. have also shown that preoperative studies alone may not accurately reflect patient pathology due to inadequacies of transthoracic echo, an inaccurate or incomplete report, and/or disease progression.[3,4]

Assessment during OPCABG can be conveniently divided into three phases as assessment before grafting, during grafting, and after grafting. Assessment before grafting should be focused on the primary pathology, but a comprehensive study should be completed in all patients. Baseline assessment of cardiac function before grafting by TEE provides vital information to formulate and manage hemodynamics during OPCABG. It also provides a template with which further assessments can be compared. However, assessment after grafting is solely focused on assessing the results and complications of OPCABG.

Conclusion

TEE is an invaluable diagnostic tool for real-time imaging during OPCABG. It is beneficial not only in the intraoperative period but also in the postoperative care units for better patient outcomes.



Transcatheter Aortic Valve Implantation for Severe Bicuspid Aortic Stenosis - 2 Years Follow up Experience from India

Dr Ashok Seth
Chairman -
Fortis Escorts Heart Institute
Chairman -
Fortis Healthcare Medical Council
President - Asian Pacific Society of Interventional Cardiology
Fortis Escorts Heart Institute,
Okhla Road, New Delhi

Vishal Rastogi[1], Vijay Kumar[1] ,
G. Sengottuvelu[2] , Vivudh P. Singh[1],
Ashok Seth[1] * [1] Fortis Escorts Heart Institute, New Delhi, India, [2] Apollo Hospitals, Chennai, India

Background

Transcatheter aortic valve implantation (TAVI) is challenging in bicuspid aortic valve (BAV) anatomy. The patients are young, morphological phenotypes are many, calcium burden is high and there are technical challenges for best outcomes. Observational studies and registries are available with favorable data and experiences from around the world sharing methodologies and algorithms for sizing and implantation. We, therefore, analyzed our data of procedural and in-hospital outcomes of TAVI in Bicuspid Aortic Valve cases performed at two high volume centers in India and their follow up for two years.

Methods and Results

The data were collated and analyzed from two centers (Fortis Escorts Heart Institute, New Delhi and Apollo Hospitals, Chennai) in India for patients who underwent TAVI in a BAV anatomy. It included a total of 70 cases from 2 centers. All symptomatic severe AS patients more than and equal to 65 years having bicuspid anatomy were included in the study irrespective of their STS score.

Patients under 65 years of age were advised TAVI only if they were at high risk for open heart surgery. These patients were followed for a period of 2 years and the data were analyzed. Pre TAVI-imaging tools utilized were 2D echo, transthoracic echocardiography (TTE), trans esophageal echocardiography (TEE), and ECG gated multi slice CT (MSCT) scan imaging. MSCT was utilized for confirmation of the anatomy and classifying the morphological type of valve, measuring, and evaluating all anatomic determinants of aortic root complex for planning the procedure and choice of the valve and its size. Sizing in balloon expanding valve (BEV) and self-expanding valve sizing (SEV) were based primarily on annulus area and perimeter, respectively. The SEV used in our study were the Core Valve and Evolut R (Medtronic, United States) and the BEVs included Sapien3 (Edwards Lifesciences, United States) and Myval (Meril Lifesciences, India).

The BAV cohort constituted 24.4% of the total 287 TAVI cases, followed up for 2 years. The mean age of these patients was 72 years. The incidence of male patients was 68.57% and female patients was 31.4%. The Sievers type 1 included 78.5%, type 0 were 21.4% of the cases and there was no case of type 2 in the study. The procedural success was to the tune of 98%. Patients with normal left ventricular ejection fraction (LVEF) improved their symptoms class after TAVI and remained so at 2 years follow up. The poor LVEF subset of patients did not have heart failure admissions and also had improvement in their symptom status. The peak-to-peak aortic valve gradient decreased to 0 mmHg at the end of the procedure in most of the cases. The mean pressure gradient (PG) across the new valve ranged between 0 and 15 mmHg and the aortic valve area (AVA) was close to 2 cm2 . These numbers were consistent at 2 years follow up. Significant paravalvular leak (PVL) 24.28% was seen immediately after deployment of the valve in heavily calcified anatomy but it reduced to mild or trivial PVL after post-dilation and one patient needed a second valve to treat PVL. No patient had more than mild PVL with either type of valve at the end of the procedure. Permanent pacemaker implantation (PPI) was required in 11.4% of the patients within 24 h to 7 days of the procedure. No one needed a PPI in the 2 year follow up. Coronary occlusion did not happen to any patient. No patient had a disabling stroke. Non-disabling stroke was seen in 10% of cases and mostly in the first week or 30 days of the procedure and the incidence was more with BEV (14%) as compared to SEV (8%). There was one case of valve embolization after 24 h of the procedure, which needed a surgical valve replacement. There was no case of annular injury or injury to other parts of the aortic root complex. Two cases had access vessel (femoral artery) thrombosis at end of the procedure and a third patient had proglides related residual stenosis. Two cases had acute kidney injury and needed dialysis. There was no major bleeding complication in any patient. Peri procedural mortality occurred in two patients. Valve thrombosis was seen in one patient after 3 months, which was treated with oral anticoagulation. Valve degeneration and failure or infective endocarditis were not seen in any patient.

Conclusion

The patients with BAV stenosis who underwent TAVI in this study had good procedural success rates and clinical outcomes. The hemodynamics achieved with both SEV and BEV were good at 2 years. The rates of PVL, PPI, and stroke are similar to that of many other studies and registries. PPI rate and non-disabling stroke incidence appear to be higher similar to many studies done. There was no case of coronary occlusion in the study. Meticulous CT analysis of the aortic root complex, selection of appropriate type and size of the valve, and best implantation practices along with cerebral protection will probably be the key to safer and more successful TAVI in this population.

Keywords

Aortic stenosis, bicuspid aortic valve, bicuspid aortic stenosis, Indian population, TAVI – transcatheter aortic valve implantation.

The Heart Mind Connect

Dr Samir Parikh
Director - Fortis National
Mental Health Program
Fortis Healthcare

To think of a life without stress is unimaginable. In fact, some amount of stress is important to even motivate and energize us to perform or protect ourselves more effectively. However, it's when the stress is extreme, chronic, or badly managed that it begins to impact our physical and mental health.

Our mind and body are very closely connected, and stress impacts them both. At a psychological level, it makes us worry, feel anxious or irritable, and impact our ability to think clearly or make effective decisions. Its physical manifestations can include increased heart rate, difficulty breathing, headaches, stomach upsets, and an overall reduced immunity. Stress is also accompanied by behavioural changes in eating and sleeping, and many a times people may resort to unhealthy coping mechanisms like alcohol, cigarettes and other substances, which further impact our health negatively.

When managing stress, it's important to remember that stress is not caused by the situation itself, but by our response to the situation. It's here that a positive, rational and solution focused mindset can help cope with the challenges that come our way. At the same time, certain life style changes can go a long way in improving our overall quality of life and building our resilience. Ensure that you get adequate sleep, anywhere between 6 – 9 hours. Don't skip meals or overeat in response to stress. Avoid substances to cope with pressures. Get some exercise or play a sport to stay physically fit and enhance your mood. Take regular breaks and establish a work-life balance to give importance to your personal and professional life. Take up a hobby, it can be art, music, gardening, cooking, reading, or any other, that can serve as an 'alternate stressor'.

Most importantly, there's no stress buster as effective as spending time with the people you care about. Don't bottle up your feelings. Reach out and talk.

CLINICAL CONVERSATIONS

Case Reports

Dextrocardia: TAVR

Dr Atul Mathur
Executive Director - Interventional Cardiology & Chief of Cath Lab,
Fortis Escorts Heart Institute, Okhla, New Delhi

A 75-year-old gentleman presented to the Fortis Escorts Heart Institute emergency with complaints of breathlessness on exertion NYHA II since last one and half year and retrosternal discomfort since last 1 week. He was a known type 2 diabetic, hypertensive, dyslipidemic, morbidly obese, with chronic obstructive airway disease and obstructive sleep apnea. X-Ray chest PA view showed dextrocardia (Figure 1). Transthoracic echocardiogram revealed left ventricular hypertrophy, a LV ejection fraction of 60% and severe aortic stenosis with AVA of 0.7 cm with a mean PG of 46 mmHg. (Figure 2). This was also confirmed with transesophageal echocardiogram. Coronary angiography documented noncritical coronary artery disease. CT aortogram was done which also confirmed dextrocardia with a moderately calcific tricuspid aortic valve (Calcium score of the valve - 3420 H.U) with mildly calcific aortic annulus (mean diameter of 25.1 mm and area derived - 25.3 mm), along with adequate height of both the coronaries (right- 14.1 mm and left- 15.2 mm) and minimal calcification at LV outflow tract.

Figure1: X Ray Chest PA View

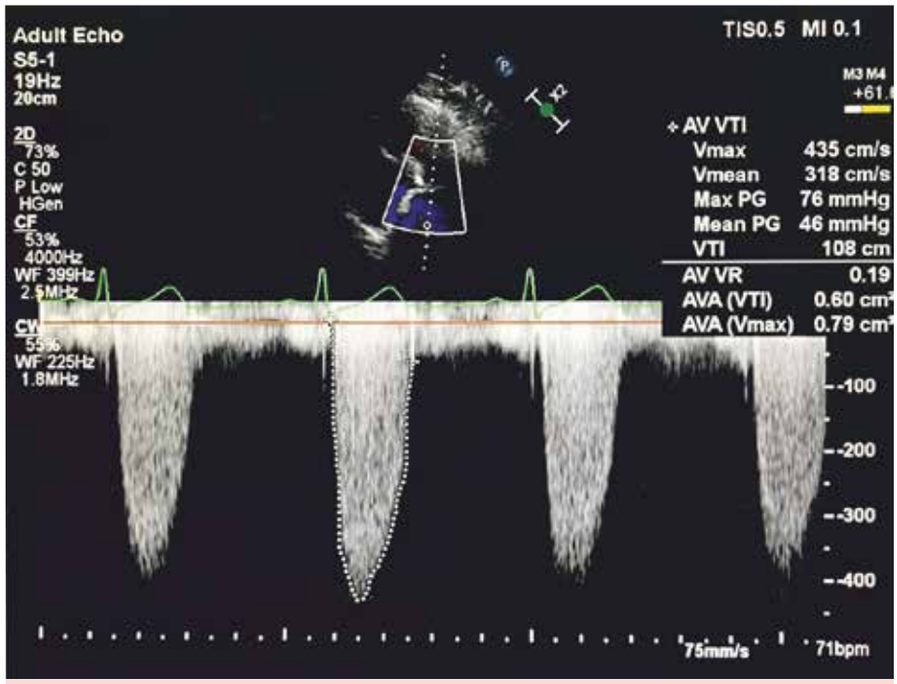


Figure 2: Transthoracic Echo Finding

(Figure 3) After the Heart Team met (group comprising of interventional cardiologist, echocardiographer, anesthetist and cardio-thoracic surgeon), based on his STS Score 4.2%, his history of COAD, OSA, and morbid obesity, it was decided for TAVR as he would fare better versus SAVR. The patient as well as the relatives were counselled regarding the same and consent was taken. Based on the CT aortogram guidance, (Figure 4) access for the TAVR sheath was taken from the right femoral artery. A 6-F pigtail catheter was parked at the noncoronary cusp which was used for aortography in the coplanar view. By using the "prone position" acquisition mode, the image was reversed, which allowed the procedure to be continued in a standard fashion. The valve was crossed using an Amplatz left (AL-1) catheter and a 0.038 straight wire. A 29-mm Core Valve Evolut Pro (Medtronic, EvolutPro-29, Minnesota) was advanced over the Confida guidewire (Medtronic). Parallax of the valve was adjusted by rotating the image-intensifier to a more RAO with slight caudal angulation (contrary to the usual left anterior oblique and caudal angulation). After ensuring adequate placement, the Core Valve was successfully deployed. Post the procedure the patient had developed left bundle branch block, which recovered subsequently on post TAVR day 2 to a narrow QRS. Patient was discharged from the hospital in stable condition after 4 days with transcatheter aortic PHV mean gradient of 5 mmHg and no paravalvular leak.

The uniqueness of this case was that our patient had dextrocardia. This meant that implantation of the valve had to be done in its mirror image view of the usual situs solitus heart with which we are quite familiar. (Figure 5) Hence, we had changed our implantation view accordingly. "Prone position" imaging helps to normalize TAVR procedure in such situations where the patient has dextrocardia.

We have documented this to be the first case in our country where TAVR has been done in a dextrocardia patient and is globally the first TAVR case with isolated dextrocardia.

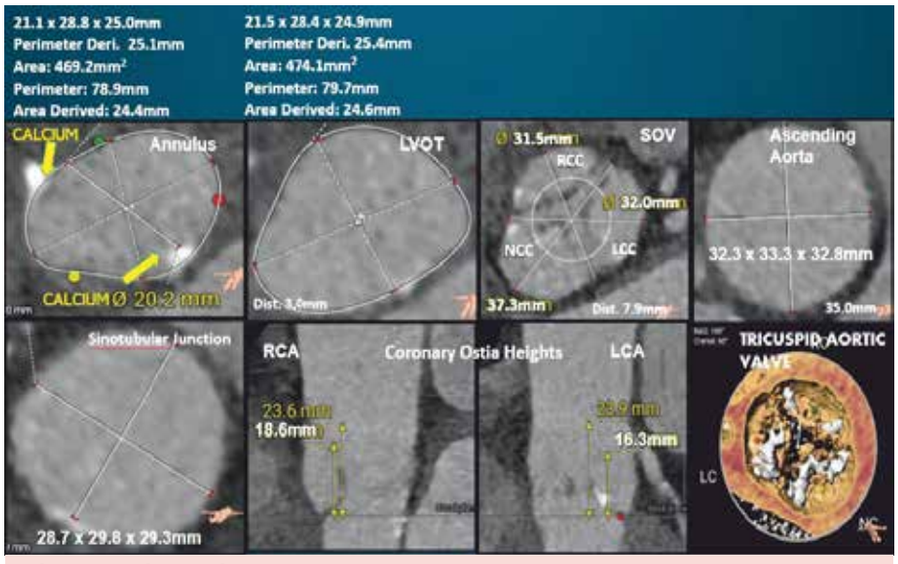


Figure 3: Dimenssions

Figure 4: Femoral Access

Figure 5: Implanter's View

Prosthetic Valve Thrombosis Secondary to Heparin Induced Thrombocytopenia – Double Trouble

Dr Nishith Chandra
Principal Director -
Interventional Cardiology
Fortis Escorts Heart Institute,
Okhla, New Delhi

Background

Prosthetic valve thrombosis (PVT) is a dreaded complication of mechanical heart valves, which is associated with significant morbidity[1]. Prompt recognition and management is of utmost importance. Herein, we describe a case of prosthetic valve thrombosis in a perioperative scenario which was complicated by heparin induced thrombocytopenia.

Case

A 45-year-old gentleman had undergone triple valve replacement (St Jude bileaflet valve at aortic and mitral position whereas Starr-Edwards valve at tricuspid position) in 2006. He had tricuspid valve thrombosis in 2012, for which he had undergone fibrinolysis. Currently, he was shifted from oral to parental anticoagulation (Heparin) for umbilical hernia repair. Preoperative prosthetic valve and ventricular function was normal. After an uneventful surgery, he was restarted on OAC (post-operative day 3) after bridging anticoagulation.

On post-operative day (POD) 5, he developed acute heart failure with elevated mitral valve gradients (28/15 mmHg) and restricted leaflet motion on transthoracic echocardiography(TTE). Transesophageal echocardiography(TEE) revealed mobile thrombus on atrial side of mitral prosthesis. Fluoroscopy revealed that one leaflet of mitral prosthesis was completely stuck in closed position (Figure 1A). The patient was started on heparin infusion and planned for fibrinolysis, in view of prohibitive risk for redo surgery. However, a significant decline in platelet counts (145,000 -30,000/µL) was noted in the interim period.

Considering the possibility of heparin induced thrombocytopenia(HIT), he was shifted to Bivalirudin infusion (1.75 mg/kg/h). Functional assay for HIT was strongly positive, confirming the diagnosis of HIT. There were no bleeding episodes despite platelet counts reaching a nadir of 25,000/µl (Figure 1B). Considering persistently high mitral valve gradients, the patient underwent fibrinolysis using alteplase(75mg) once the platelet counts improved (110,000/µL). Post fibrinolysis, there was immediate reduction in mitral valve gradients with normal mitral leaflet motion on fluoroscopy. The patient received bridging therapy with Bivalirudin + OAC followed by OAC monotherapy (target INR 3.5-4). TTE prior to discharge showed mitral gradient of 12/7 mmHg.

Discussion

The present case highlights the challenges involved in managing prosthetic valve thrombosis in the background of HIT. Surgery is recommended in patients with left sided obstructive PVT with large thrombus (>0.8 cm2)[2]. In patients with high surgical risk, fibrinolysis and heparin therapy are considered. HIT is a rare complication arising from heparin exposure, with an incidence of 3% [3]. The clinical diagnosis of HIT relies on the Warkentin's 4T clinical scoring system[4] whereas confirmatory diagnosis is made by functional platelet reactivity assay. The incidence of PVT in a background of HIT is uncommon. Severe thrombocytopenia in these settings precludes surgery and fibrinolysis. Early post-operative PVT with HIT have been successfully managed with lepirudin and danaparoid[6]. Prosthetic valve thrombosis was also noted in 11% of HIT patients, after valve surgery[7]. There is scarce data regarding use of bivalirudin prosthetic valve thrombosis. In our

Figure 1A

case, we successfully used bivalirudin to manage PVT with a dose equivalent to that used in percutaneous coronary interventions (PCI). High dose infusion of bivalirudin is required to maintain optimal anticoagulation levels before OAC effect takes over.

Conclusion

Prosthetic valve thrombosis in the background of HIT presents a clinical conundrum. Newer parenteral anticoagulants like bivalirudin can be effectively used to manage PVT.

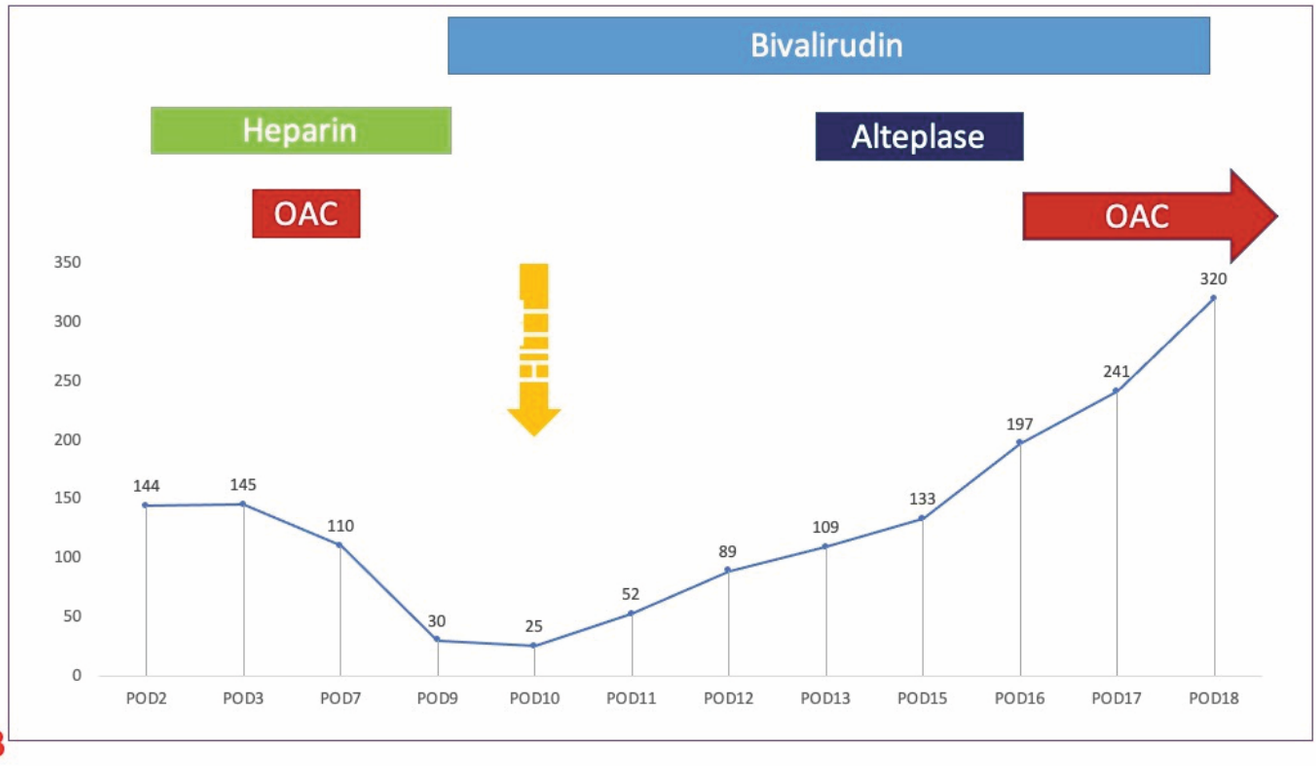


Figure 1B

Issue: 6 | September 2022

Heart Failure Secondary to Systemic Condition

Dr Keshava R
Director - Interventional Cardiology
Fortis Hospital, Cunningham Road,
Bangalore

Dr P.R.L. N Prasad, Dr Anusha.S.Rao,
Dr Lavanya , Dr Arvind Bansal

A 37year old gentleman presented to our outpatient department with history of numbness of both hands, associated with weakness, with frequent dropping of objects and difficulty in gripping, radiating pain in both forearms for the past eight months which was aggravated since a fortnight. He also had breathlessness on exertion (NYHA class ¾). His past history was unremarkable, there was no significant family history. On evaluation, his vitals were stable and cardiac examination was not significant. Nervous system examination revealed weak hand grips and he was diagnosed as bilateral carpal tunnel syndrome.

Investigations-ECG showed sinus rhythm, normal rate with low voltage complexes, ECHO showed dilated left atrium, concentric LV hypertrophy with speckled appearance, LV global hypokinesia with an ejection fraction of 45 percent and a Global Longitudinal Strain (GLS) of -8% with apical sparing, features suggestive of Amyloidosis. His hemogram, renal and liver function tests were normal, NT pro BNP was elevated 1888pg/ml (135 pg/ml normal). Nerve conduction studies showed bilateral sensory and motor, demyelinating and axonal neuropathy at wrist suggestive of carpal tunnel syndrome.

Further evaluation done such as serum protein electrophoresis showed no M band with elevated kappa light chains. Bone marrow showed plasma cell dyscrasia with 32% plasma cells. Cardiac MRI showed normal LV size with mildly depressed systolic function, severe burden of non-ischemic scar, because of global late gadolinium enhancement, with altered kinetics, elevated extracellular volume fraction (ECV) with decreased GLS -8, the differential of amyloidosis was

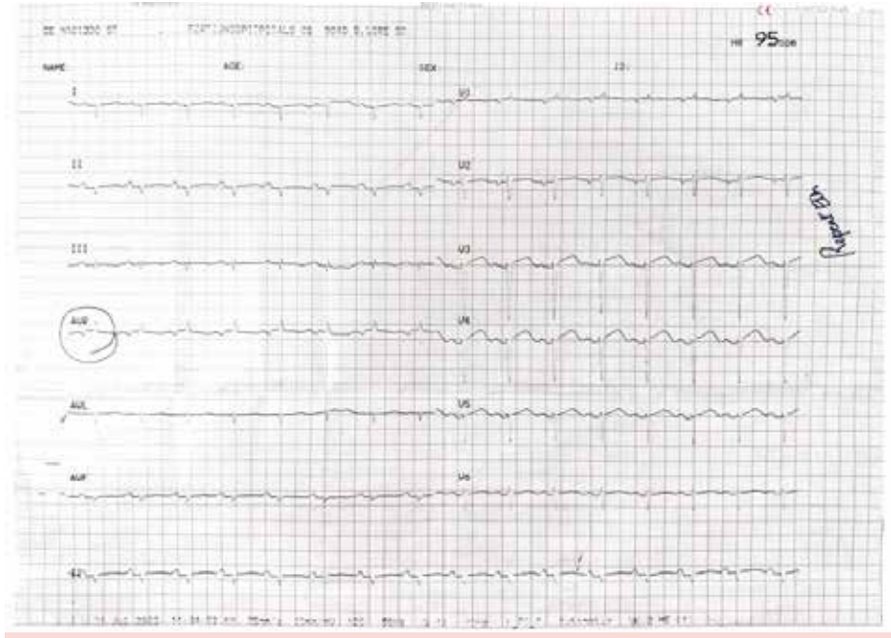


Figure 1: ECG

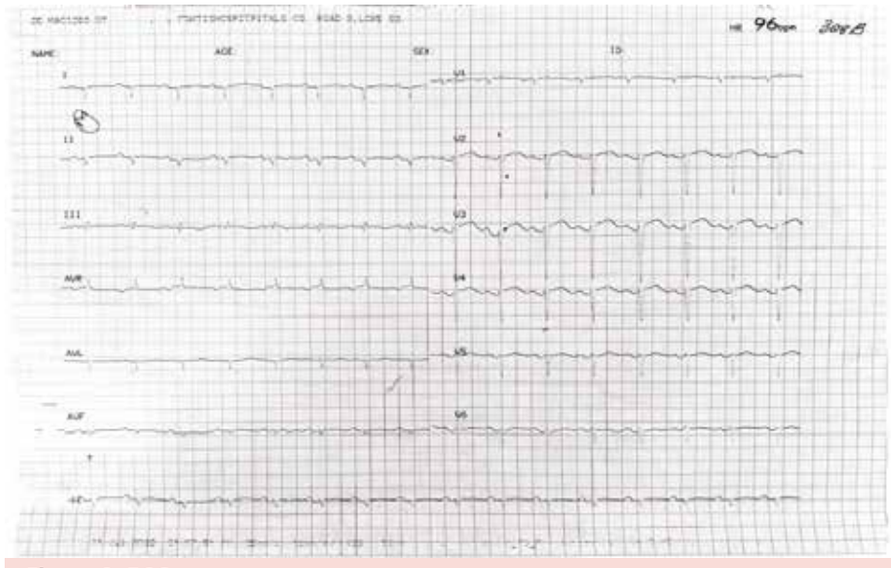


Figure 2: ECG

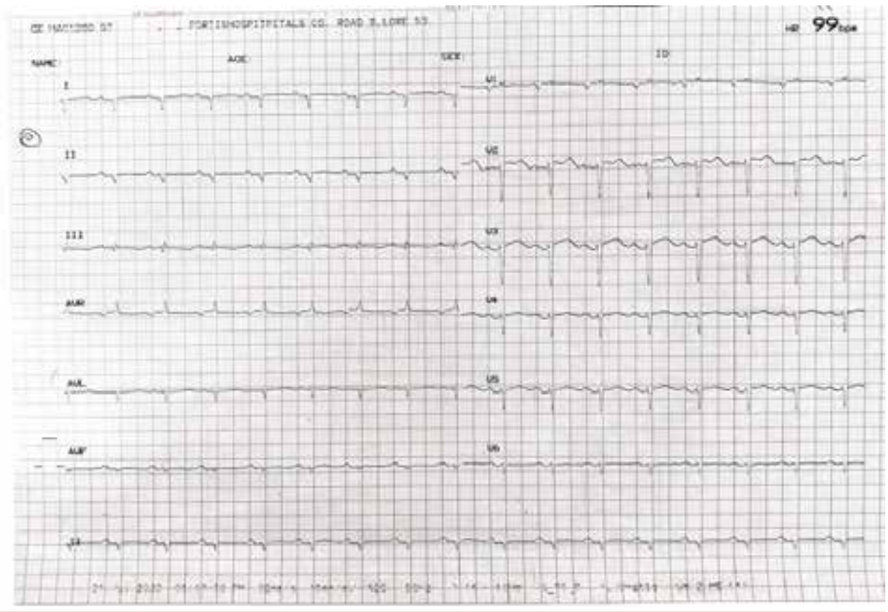


Figure 3: ECG

CLINICAL DIAGNOSIS: FOR CARDIAC EVALUATION

MEASUREMENTS

Vital Signs and Body Measurements													
HR	104	bpm	B.Pr		mmHg	Height		cm	Weight		kg	BSA		m²
M – Mode (Parasternal view)							Conventional and Tissue Doppler						
AO	2.9	cm	LVID - d	3.6	cm		Mitral Valve		E : 0.61		A : 0.45		m/sec
LA	4.3	cm	LVID – s	2.9	cm		Aortic Valve		0.82		-		m/sec
IVS - d	1.5	cm	EDV	55	ml		Pulmonary Valve		0.67		-		m/sec
IVS - s	1.7	cm	ESV	27	ml		E' Septal (TDI)		5		E/E12		cm/sec
LVPW - d	1.3	cm	FS	23	%		E' Lateral (TDI)		7		-		cm/sec
LVPW - s	1.9	cm	LV MASS	210	gm		RV Function						
2 – Dimensional (A4C View) by Biplane Simpsons							TAPSE	1.8	cm	PSV RV (TDI)		9	cm/sec
LV EDV	-	ml	LV ESV	-	ml		RA Size	3.7	cm	RV Size		2.6	cm

DESCRIPTIVE FINDINGS: Technically Adequate Study. Normal sinus rhythm During Study

RIGHT ATRIUM	Normal in Size
LEFT ATRIUM	Dilated
RIGHT VENTRICLE	Normal in Size
LEFT VENTRICLE	Hypertrophied with speckled appearance
WALL MOTION ANALYSIS	LV global hypokinesis(basal and mid segments hypokinetic, LV apex hyperkinetic)
MITRAL VALVE	Normal
TRICUSPID VALVE	Normal
AORTIC VALVE	Normal
PULMONARY VALVE	Normal
IAS & IVS	Intact
AORTA & PA	Normal in Size
SYSTEMIC & PULMONARY VEINS	Normally Draining
COLOR FLOW	Trivial MR/ Mild TR
DOPPLER STUDY	PASP:28mmHg
PERICARDIUM	Normal
OTHERS	No Intra Cardiac Thrombus, Tumour or Vegetation

IMPRESSION:

Concentric LVH / Dilated LA
LV global hypokinesia
Mild TR
No Pulmonary Artery Hypertension
Mild Left Ventricular Systolic Dysfunction (LVEF-45%)
GLS AVG: -8%
Features Suggestive of ? Amyloidosis

D[illegible]AVA R. MD, DNB
[illegible]ERVENTIONAL CARDIOLOGIST

ECHO TECHNICIANS

Fortis 30 YEARS 1989 2019

EMERGENCY HELPLINE 96860 96860 080 4199 4401

Regd. Office : Fortis Escorts Heart Institute and Research Centre, Okhla Road, New Delhi - 110 025 (India)
www.fortishealthcare.com | www.fortisbangalore.com

Figure 4: Clinical Diagnosis Cardiac Evaluation

considered first, others were probably myocarditis or sarcoidosis.

Positron emission tomography with 2-deoxy-2- [fluorine- 18] fluoro- D-glucose integrated with computed tomography (18F-FDG PET/CT) scan showed no abnormal or metabolically enhancing lesions in the body. SPECT-CT scan with injection of Technetium Pyrophosphate 99m showed features suggestive of TTR Amyloid (focal uptake in myocardium and more concentration in heart (>1.5 times compared to the contralateral lung). In view of increased light chains, bone marrow abnormality, he was diagnosed as having AL Amyloidosis.

Management

He was subsequently started on therapy for AL Amyloidosis (Bortezomib, Lenalidomide, Dexamethasone).

Discussion

Cardiac Amyloidosis is a rare cause of restrictive cardiomyopathy, causing heart failure with preserved ejection fraction (HFpEF). It is caused by the deposition of amyloid fibrils in the myocardium. These are abnormal, unstable proteins that misfold, aggregate and deposit as amyloid fibrils.

Their classification is based on the precursor proteins, with two main types, variety caused by abnormal clonal proliferation of plasma cells (AL) and transthyretin (ATTR).

The ATTR variety has two subgroups, a genetically inherited Autosomal Dominant type ATTRv or a denovo mutation wild type ATTRw.

Though it can involve peripheral and autonomic nervous system (as happened in this patient) the main determinant of prognosis is the cardiac involvement.

Patients may have features of heart failure with preserved ejection fraction, dyspnea, fatigue and edema, the ECG may have low

voltage (50% in AL, 25-40% in ATTR) which is discordant with the LV hypertrophy seen on ECHO. Anterior and inferior pseudo infarct patterns in AL, Atrial dysrhythmias are common in wtATTR types. Differentials may include hypertrophic cardiomyopathy, aortic stenosis and Fabry's disease. ECHO may further show small LV cavity, thick RV, impaired GLS with sparing of apex as shown in our case.

In AL type plasma cell dyscrasia (lambda more than kappa) is common, though it can occur in 40-50% of ATTR variety too.

MRI may show elevated native T1, increased extracellular volume fraction, late gadolinium enhancement pattern (diffuse, sub endocardial, or transmural), abnormal gadolinium kinetics. Bone scintigraphy might show normal light chain assays and grade 2/3 cardiac uptake or a heart to contralateral lung (H/CL) quantitative uptake ratio of >1.5. False positives may occur from AL-CM amyloidosis, previous myocardial infarction, diffuse myocardial scarring observed in chronic renal disease and mitral valve calcification, overlying previous rib facture.

In the absence of a light chain abnormality, the 99mTechnitium-PYP scan is diagnostic of ATTR-CM if there is grade 2 to 3 cardiac uptake or a heart/contralateral chest ratio >1.5. Single-photon emission computed tomography is assessed in all positive scans to confirm that uptake represents myocardial retention of the tracer, not blood pool signal.

Endomyocardial biopsy may be necessary to establish the diagnosis: (1) a positive 99mTc- PYP scan and evidence of a plasma cell dyscrasia by serum/urine IFE or serum free light chain analysis to exclude AL type amyloid (2) a negative or equivocal 99mTc-PYP scan despite a high clinical suspicion to confirm ATTR-CM; and (3) unavailability of 99mTc-PYP scanning.

If TTR is confirmed, a genetic sequencing is necessary to distinguish the wild and family variants for genetic counselling of family members and the type with Val122Ile has an aggressive clinical course.

Management involves treating the heart failure and other complications.

Congestion is treated with loop diuretics, aldosterone antagonists, either alone or in combination.

There is not much data to support the use of regular heart failure medications like angiotensin converting enzyme inhibitors, angiotensin receptor blockers, angiotensin receptor neprilysin Inhibitors, beta blockers.

These patients are prone for atrial arrhythmias and are managed with amiodarone and oral anti coagulation.

For those with conduction defects permanent pacemaker implantation is done and for those with recurrent ventricular arrhythmia and aborted sudden death an AICD implantation is done.

Use of disease modifying therapies, TTR stabilizers (Tafamidis, Diflunisal, AG10) bind to the TTR tetramer and prevent misfolding and thus deposition of amyloid fibrils. TTR silencers (patirisan, Inotensen) target TTR hepatic synthesis. TTR disruptors (Doxycycline, monoclonal antibodies) target the clearance of amyloid fibrils from tissues.

In patients with predominantly cardiac disease resulting from ATTRv or ATTRwt, tafamidis is indicated, in those with NYHA class I to III symptoms, an early initiation appears to slow disease progression. The benefit of tafamidis has not been observed in patients with class IV symptoms, severe aortic stenosis, or impaired renal function (glomerular filtration rate <25 mL·min−1·1.73 m−2 body surface area).

Patients with ATTRv and polyneuropathy should be considered for TTR silencing therapy with patisiran35 or inotersen.

Diflusinal (250 mg orally twice daily) may be considered with caution for off-label therapy for asymptomatic ATTR carriers, for patients with ATTR-CM who are not eligible for TTR silencers, or for patients with ATTR-CM who are intolerant of or cannot afford tafamidis.

Heart transplantation may be considered in patients with stage D heart failure, heart-liver transplantation is performed in patients with ATTRv-CM at risk for neuropathy because neuropathy may progress with heart transplantation alone.

Our patient is a young male with AL Amyloid with features of nervous and cardiac systems involvement with classical changes in the ECG, ECHO, SPECT. Previously most cases needed confirmation by endomyocardial biopsy but nowadays more definitive findings of SPECT with Tc PYP scan has substituted the invasive procedure. He had many classical features ot AL Amyloid. He was started on chemotherapy and is being followed up.

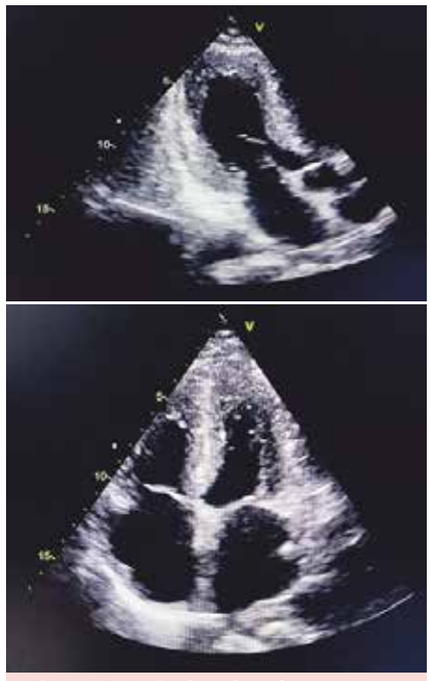


Figure 5: Apical 4 chamber view showing dilated LA

Transcatheter Leadless Permanent Pacemaker in Complex Congenital Heart Disease with Interrupted Inferior Vena Cava: A Challenging Implantation

Source:- https://www.sciencedirect.com/science/article/pii/S0972629222000493?via%3Dihub

Dr Babu Ezhumalai
Senior Consultant -
Interventional Cardiologist
Fortis Malar Hospital, Adyar, Chennai

Abstract

31 years lady with complete atrioventricular canal defect, large primum atrial septal defect (ASD), inlet ventricular septal defect (VSD) and Eisenmenger syndrome, presented with atrial flutter and complete heart block. She was not suitable for corrective cardiac surgery and not yet indicated for heart-lung transplantation. She was advised single chamber permanent pacemaker and eventually Micra VR transcatheter leadless pacemaker was finalised for her. Transcatheter leadless pacemaker was deployed in her RV septum despite some unforeseen technical problems. This patient had intrahepatic interruption of IVC with Azygous continuation draining into SVC but this altered venovascular course was detected only fluoroscopically midway during the pacemaker implantation procedure and this was not detected in the preprocedural transthoracic echocardiography. This abnormal venous course was clearly demonstrated in the cardiac CT which was performed only after completion of the pacemaker implantation procedure in this patient. The technical challenges encountered mainly were mostly during the manipulation of the 27F delivery catheter of Micra through this altered cardiovascular anatomy via transfemoral approach and also due to the presence of septal defects. Thus, transcatheter leadless permanent pacemaker was implanted successfully through transfemoral access in this complex congenital heart disease with interrupted IVC and azygous continuation. Besides transthoracic echocardiography, it may be better to perform transesophageal echocardiography or even preferably radiological imaging like cardiac CT or MRI prior to transcatheter leadless pacemaker implantation in patients with complex congenital heart disease to understand the cardiovascular anatomy and plan the procedure.

Double Outlet Both Ventricles - Morphologic, Echocardiographic and Surgical Considerations

Dr K.S. Iyer
Executive Director -
Paediatric Cardiac Surgery
Fortis Escorts Heart Institute,
Okhla, New Delhi

Abnormalities of ventriculo-arterial connection are one of the features producing so-called complex congenital heart diseases. From a surgical stance, these abnormal connections fall into three reasonably well-defined groups, the first group is made up of discordant connections, or transposition, where the arterial trunks arise from morphologically inappropriate ventricles. The second group is characterized by double outlet from the right ventricle, where more than half (or three-quarters for some) of both arterial roots are supported by the morphologically right ventricle. The third group is very much rarer, being found when the morphologically left ventricle supports the majority of both roots – the double outlet left ventricle.

There is then a less recognized situation wherein the inter-ventricular communication is located such that both arterial roots override the crest of the inter-ventricular septum in equal measure, producing the arrangement of both the ventricles seemingly connected in equal fashion to both arterial trunks. The term Double Outlet Both Ventricles (DOBV), which aptly describes this condition, was first used by Brandt et al in 1976. To the best of our knowledge, no further clinical or surgical description of this entity has been published. When found, preoperative identification is important, as it has relevance to the surgical technique required to achieve a satisfactory biventricular repair. We describe seven patients of Double Outlet of Both Ventricles presenting with similar anatomical findings, but in varied fashion. We achieved successful intra-cardiac surgical repair in six while one patient was lost to follow-up after diagnosis. We present a two-patch technique for the correction of this defect, which we feel is the optimal strategy for repair. We believe that this is the first large detailed case series that explores the clinical aspects, implications for surgery and post-operative management of this unusual entity. We also recommend that this entity be incorporated into the classification of disorders of ventriculo-arterial connections.

Coronary Arteriovenous Fistula

Dr Rajat Gupta
Consultant - Pediatric Cardiology
Fortis Hospital, Mohali

Case

We present a case of a 4-year-old boy from Yemen, who was suspected to have congenital heart disease in view of presence of a heart murmur and low weight for age. Echocardiography and CT angiography showed a large coronary arteriovenous fistula from the left main coronary artery to the coronary sinus. All the four cardiac chambers were dilated.

Plug/device occlusion of this fistula was planned and the same was done under monitored sedation. Angiography showed a large fistulous tract from the left main coronary artery to coronary sinus. This was then closed with an Amplatzer vascular plug 8.0 mm. Angiography after plug occlusion showed no residual shunt. The child was discharged two days after the procedure.

Discussion

Coronary fistulae are rare anomalous communications from one or more coronary arteries to a cardiac chamber or a great vessel. These are called coronary cameral fistula when the fistula terminates in cardiac chamber and coronary arteriovenous fistula when it terminates into a venous structure. This anomaly more frequently arises from the right coronary artery (55%) but can arise from left coronary artery (35%) or bilaterally (5%). Drainage site of these fistulae in decreasing order of frequency are the right ventricle, the right atrium, the pulmonary artery, the left atrium and the left ventricle.

The pathophysiology of coronary cameral fistulae depends upon the size and site of termination. Small fistulae are usually asymptomatic and are detected incidentally while large fistulae may lead to heart failure, growth retardation and all the features of left to right shunt. Coronary fistulae can also cause disturbance in coronary hemodynamics by producing a coronary steal phenomenon.

Current guidelines recommend intervening on all the large fistulae and small to medium fistulae if they are symptomatic. Treatment options for coronary artery fistula include surgery or catheter intervention. Catheter closure of these fistulae is now considered to be effective and safe alternative to surgery. Treated patients need long-term antiplatelet or anticoagulation depending upon the size and morphology of the fistula.

References

1. Qureshi SA. Coronary arterial fistulas. Orphanet J Rare Dis. 2006;1:51.
2. Siobhan B, Lalith S, Carly J et al. Coronary Cameral Fistula. Circulation: Cardiovascular Imaging.2019; 12:e008691.

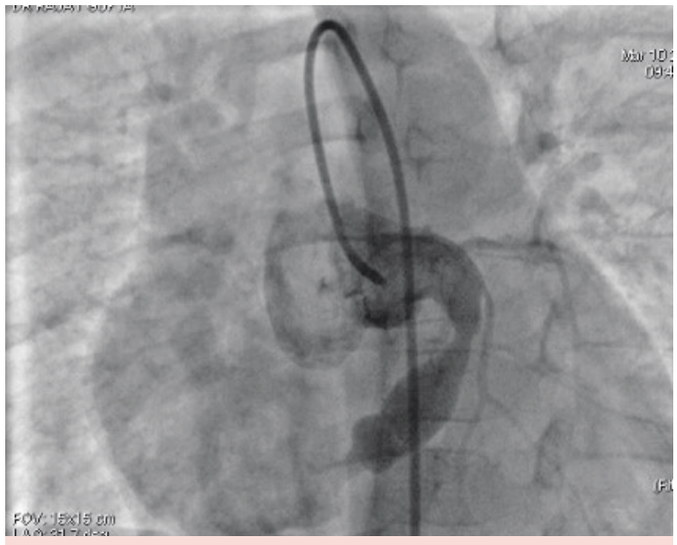


Figure 1: Coronary angiogram in LAO angulation showing large fistula from left main coronary artery to coronary sinus. Left anterior descending coronary artery and circumflex artery are normal

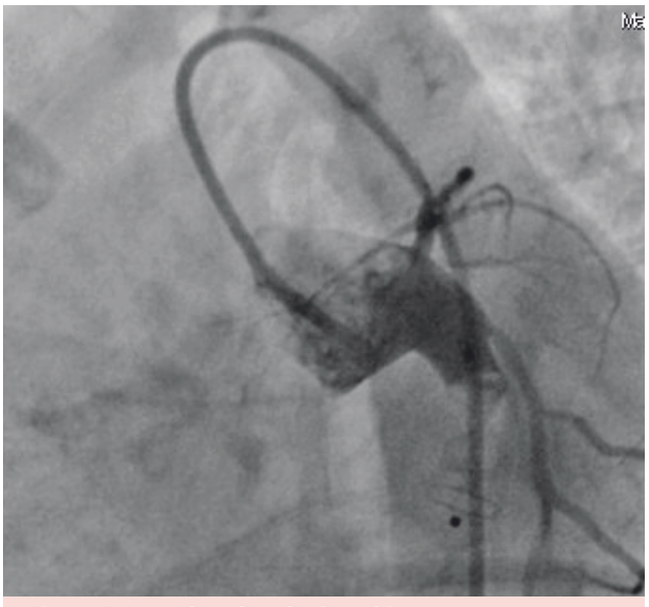


Figure 2: Vascular plug deployed in coronary arteriovenous fistula

Left Main Coronary Interventions in Pediatric and Adolescent Patients

Dr Hasmukh Ravat
Director - Cardiology
Fortis Hospital, Mulund, Mumbai

Percutaneous coronary intervention (PCI) is commonly used in adult patients with coronary artery disease, but data on PCI in children and adolescents remain limited. Herein, we describe our experience with the use of PCI in the three pediatric and adolescent left main coronary artery disease patients (LMCA). Each of these cases is unique and first of its kind.

Case 1

This is the first case in literature as youngest to receive coronary angioplasty for atherosclerotic CAD. Youngest to receive LMCA angioplasty. Youngest to receive bioresorbable stent at LMCA.

Anine year-old girl (weight 24 kg., BSA 0.9 m2), presented to our pediatric cardiac clinic with 3 months history of exertional angina and dyspnea (NYHA class II–III). Her family history was significant as her elder sister had similar complaints and expired undiagnosed at the age of five years. On physical examination, multiple xanthomas of varying size (1 mm–40 mm) were observed. An electrocardiogram revealed mild elevation of ST segment in lead avR with ST segment depression in the anterior leads. Her 2D Echo showed anterior wall hypokinesia with ejection fraction of 40-45 %. The fasting lipid profile revealed total cholesterol of 23.19 mmol/L (897 mg/dL), low density lipoprotein (LDL) of 15.12 mmol/L (585 mg/dL), triglyceride of 5.18 mmol/L (459 mg/dL), and elevated apo-lipoprotein. Her blood tests for renal, liver, and thyroid function were normal.

Considering the lipid profile suggestive of Familial Hypercholesterolemia, premature atherosclerosis was possible. Patient was put on regular anginal medicines and dual antiplatelets, The CT Coronary angiogram was performed which revealed stenosis of 90 % severity of mid Left Main Coronary artery disease. (Figure1)

A coronary angiogram was performed under deep sedation and local anesthesia. A sub selective angiography of the left coronary artery (LCA) catheter was performed which showed mid LMCA 90% stenosis and mild LCx disease. The gold standard for LMCA stenosis is coronary artery bypass surgery but this was ruled out, considering the age of the patient, just nine years old! There were lot of practical difficulty in doing angioplasty in a nine- year old child. By chance if she collapses, it was impossible to put in an IABP. In spite of so many hurdles and difficulty, coronary angioplasty to LMCA in the nine-year old child was performed successfully (Figure 2 & 3).

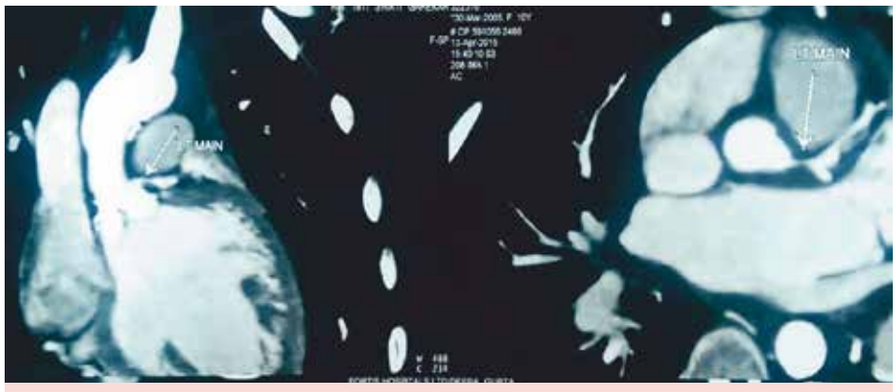


Figure1: CT coronary angiogram showed stenosis of 90% severity of mid Left Main Coronary artery disease

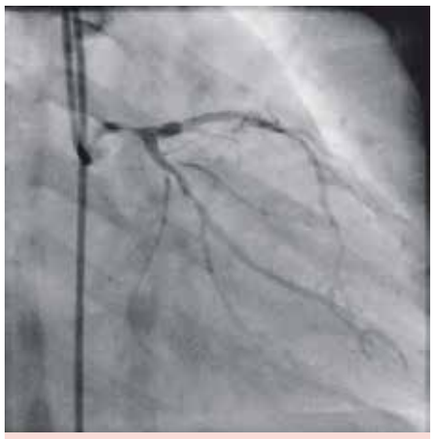


Figure 2: Non-selective Left coronary angiogram showing mid LMCA 90% stenosis and mid LCx disease

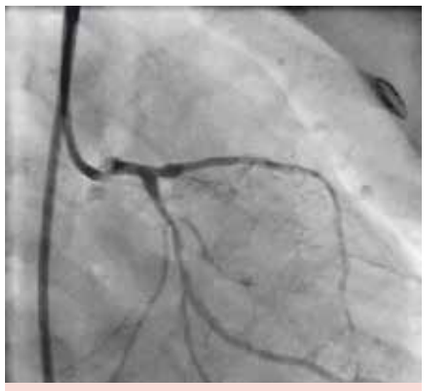


Figure 3: The Bioresorbable vascular scaffold (stent) 3.0x12mm was prepared and deployed to the LMCA just before the bifurcation and covering LMCA ostium

Case 2

A 13year old boy was suffering from dilated cardiomyopathy with a very low ejection fraction. He had a history of repeated hospitalization and was admitted in a critical state of cardiac failure with shock. He was put on a LV support device and the plan was to do a heart transplant. In spite of a long wait, no suitable donor heart was available. Ultimately, one elderly donor of a road accident became available. As the child's condition was deteriorating, after discussing with the relatives and proper consent, the elderly gentlemen's heart was transplanted.

The child did well for one year but then he started developing breathlessness. His non-invasive tests revealed LMCA ostial/proximal significant 80% lesion. He started developing ischemic LV dysfunction.

The challenge was to treat a 13year old boy for CAD in a transplanted heart. We performed an Intra Vascular Ultra Sound guided ostial/Proximal LMCA angioplasty with drug eluting stent successfully. (Figure 4 & 5)

Figure 4: Left Coronary Angiogram in post heart Transplant Patient showing ostial/proximal LMCA lesion of 80%

Figure 5: Left coronary angiogram in post heart transplant patient after ostial/proximal angioplasty/stenting

Case 3

A 19year old female, had sudden onset chest pain with a syncopal episode while at college. She was a known case of single ventricle; Fontan procedure done at the age of 4 years. She was asymptomatic till date but had stopped anticoagulants. She was conscious, afebrile with PR-126; BP-80/60 mm Hg; RR-20/min. Saturation was 80%. On admission ECG was as follows.

The ECG was suggestive of infero-posterior myocardial infarction (Figure 6). However, in a single ventricle (Double Inlet Left Ventricle - DILV) anatomy with absent septum, it could be misleading. She was taken for coronary angiography, which itself was difficult because of lack of clarity in anatomy. The CAG was performed which revealed LMCA totally occluded with thrombus.

Aspiration of thrombus LMCA to LAD artery and LMCA-LCx artery was performed with good result. (Figure 7 & 8) Unfortunately, because of the complications and the underlying heart condition of single ventricle, she could not make it. She was given the option of heart transplant which was refused by the relatives.

Conclusion

PCI in children and adolescents can be utilized to improve coronary blood flow in a variety of special clinical situations. There are multiple challenges in performing coronary interventions in the paediatric age group. The size of vascular access, choice of hardware, administration of immediate and long-term antiplatelet therapy are some of the core issues which needs further clarification. Close angiographic follow-up is critical as these patients are at risk for in-stent restenosis. To tackle the CAD in new subsets of patients like those with heart transplants and adult congenital heart disease is a challenge.

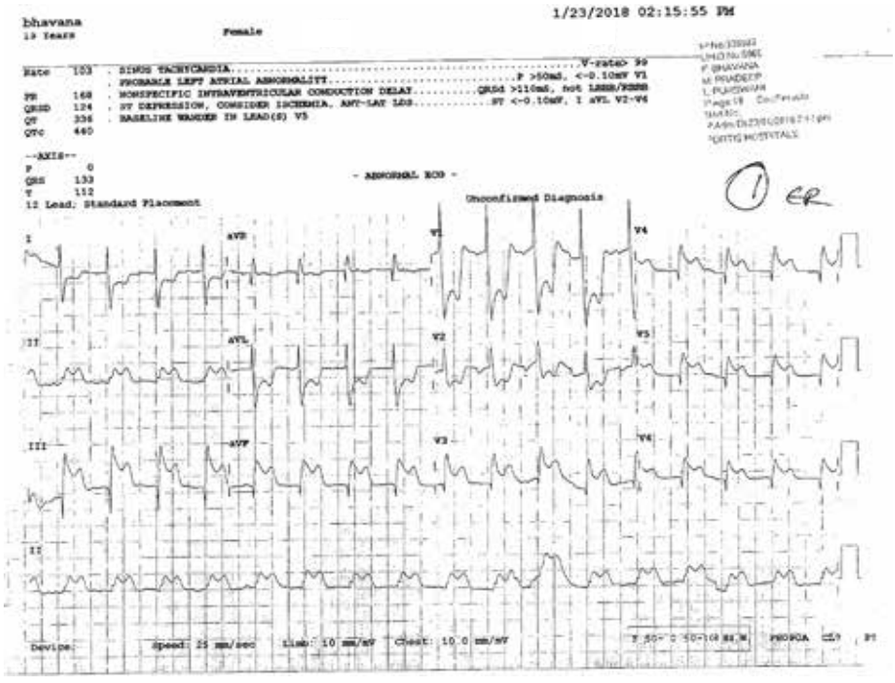


Figure 6: ECG was suggestive of Infero-posterior myocardial infarction

Figure 7: Nonselective coronary angiogram showing LMCA totally occlude with thrombus

Figure 8: LCA angioplasty after LMCA-LAD and LMCA-LCx artery thrombus aspiration

Imaging Guided Hybrid Coronary Angioplasty (Using Bioabsorbable Stent & Non-Bioabsorbable Stent) In A Middle-Aged Patient with Ischemic Heart Disease

Dr Amit Singhal
Senior Consultant - Cardiology
Fortis Escorts Hospital, Jaipur

Abstract

Ischemic heart disease is the leading cause of death worldwide. Coronary angioplasty & stenting have revolutionized the management of ischemic heart disease in the last few decades. However, in-stent restenosis (ISR) & loss of endovascular (auto-regulatory) properties of stented vessel due to metal cage (stent) lead to efforts to invent self-absorbable stents which dissolve completely over a period of time, after restoring vessel patency and thus leaving the vessel in native form with restored endovascular properties. Herein, I am describing a case of a middle-aged patient with ischemic heart disease (unstable angina) who underwent coronary angioplasty of the left circumflex coronary artery with a bioabsorbable drug eluting stent under Optical Coherence Tomography (OCT) guidance & stenting of the posterior descending artery (PDA) with non-bioabsorbable drug eluting stent in the same sitting. This hybrid stenting strategy using different types of stents, depending upon lesion anatomy and offering advantages of bioabsorbable stent to patients with suitable lesions, especially young & middle-aged patients can improve the patient outcomes in the long run.

Key Words

Coronary Angioplasty, Bioabsorbable Stents, Non-Bioabsorbable Stents, Optical Coherance Tomography (OCT)

Introduction

Coronary interventions have gone through several milestones since the introduction of coronary angioplasty by Andreas Gruntzig in 1977.Drug eluting Stents[1] were first introduced in 2002.Due to the limitations of drug eluting stents like ISR & loss of vascular properties of stented vessel, the first bioabsorbable stents[2] were introduced in 2012,with the optimism of restoring endovascular properties of stented vessel after dissolution of stent over a period of time, after restoring vessel patency. However due to the thicker strut size, a higher incidence of late stent thrombosis was encountered and interest in these stents [5] waned. Recently, the second generation bioabsorbable stents have been launched with better safety profile & thinner strut size. These stents have overcome major limitations of the first generation bioabsorbable stents and have documented encouraging results in studies so far [3,4]. These bioabsorbable stents spontaneously dissolve after deployment in the vessel over a period of one to two years after providing patency and restored lumen in the atherosclerotic vessel. This helps the restoration of the endovascular flow auto-regulatory properties of the vessel after disappearing and uncaging the vessel from the stent cage. Not all lesions are suitable for deploying bioabsorbable stents due to thicker strut size & lesser flexibility, issues of trackability etc. of these stents. Therefore, stenting suitable lesions with bio-absorbable stents & non-suitable lesions with non-bio-absorbable drug eluting stents should be the strategy. Using combinations of bio-absorbable & non-bio-absorbable stents in the same patient, based on lesion morphology helps in implanting minimum amount of metal in the coronary arteries and thus helps in restoring the endovascular properties in the larger coronary tree over a period of time. The present case report is one such case where two different stents (bio absorbable & non-bio absorbable) were deployed in a middle-aged patient with IHD-unstable angina, as dictated by the lesions, in the same sitting, under OCT, guidance with good final results. Such hybrid stenting cases are now coming into the lime light and should be accepted & encouraged, in the interest of the patients.

Case History

47 year- old Patient presented with complaints of chest pain (crescendo symptoms) along with uneasiness & sweating since last two days. The Patient was hypertensive & diabetic. Recent CTMT was positive for inducible ischemia. ECG revealed non-specific ST-T changes, the Troponin-T was in the normal range. There was no RWMA on 2D Echocardiography. After giving loading doses (Aspirin, Ticagrelor, Rosuvastatin), the patient was taken for coronary angiography. The CAG revealed 95% discrete tubular stenosis in the LCX (Figure 1) after Major OM branch & 85% discrete tubular stenosis in the PDA (Figure 2) In view of suitable vessel anatomy & vessel diameter of 3 mm, after proper

bed preparation, 3x29 mm Bio-Absorbable DES was implanted in the LCX (Figure 3), followed by post dilatation with 3.5 mm NC balloon. OCT imaging was performed & proper stent deployment was confirmed (Figure 4). Another lesion in the PDA was 2.5 mm in diameter, the proximal vessel was tortuous and the smallest available bio absorbable stent was of 2.75 mm in diameter. Therefore, a non-bio absorbable stent of 2.5x18 mm was deployed successfully in the PDA (Figure 5). The patient remained stable thereafter and was discharged the next day.

Discussion

The second-generation bio absorbable stents have overcome limitations of the first-generation bio absorbable stents like late stent thrombosis which were primarily due to thicker strut size of the first generation bioabsorbable stents [3,4,5]. Recent research data has also documented safety & efficacy of second generation bioabsorbable stents [3,4]. Given the advantages of these stents like dissolution over a period of time & thus uncaging vessel & restoring auto-regulatory properties of vessel, these stents should be utilized in suitable anatomy lesions, especially in young & middle-aged patients. In patients with lesions of different coronary anatomy, using combinations of bio absorbable & non -bioabsorbable stents (hybrid stenting) should be explored so that minimum metal is deployed in the coronary bed and more and more coronary tree can be restored to normalcy after dissolution of the bio absorbable stent.

Summary

Using combinations of different types of available stents, depending upon lesion anatomy & morphology, with emphasis on second generation bioabsorbable stents, especially in light of available safety & efficacy data, should be encouraged to provide optimum benefits to the patients in the long run. Imaging modalities like OCT should be used more often in coronary interventions for lesion assessment and to ensure optimum stent deployment.

References

1. Bare Metal & Drug-Eluting Coronary Stents-Gregg W Stone,Ajay J Kirtane-Eric J Topol, Paul S, Tierstein-Textbook of Interventional Cardiology-6th Edition-Pages 171-196
2. Bioabsorbable Stents-Debabrata Mukherjee-Eric J Topol,Paul S. Teirstein-Textbook of Interventional Cardiology-6th Edition-Pages432-441
3. MeRes-1 trial-Euro PCR 2019-Dr Ashok Seth et al
4. The MeRes-1 extend Trial -Alexandre Abizaid et al-Catheter Cardiovasc Interv-2020;1-9
5. ABSORB III Trial-Stephen G Ellis et al-American College of Cardiology-October 2017

Figure 1: Pre PTCA LCX

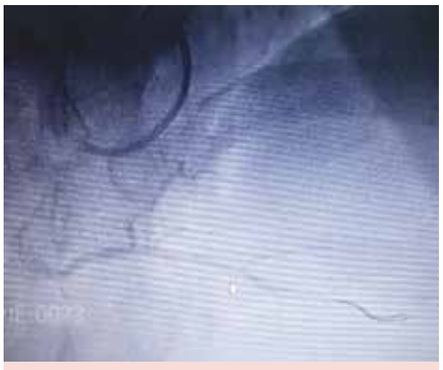


Figure 2: Pre PTCA PDA

Figure 3: Post PTCA LCX

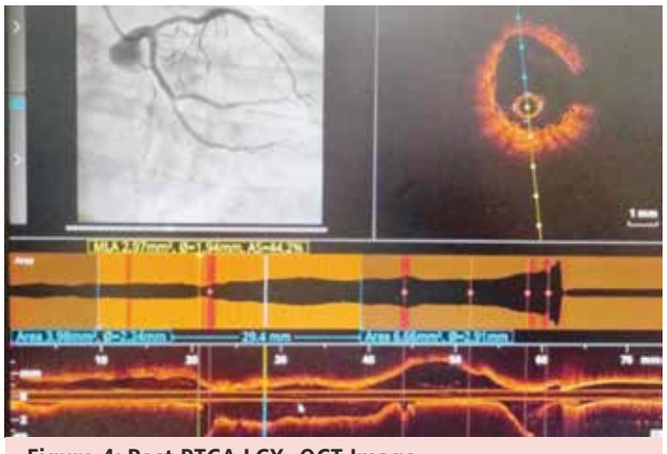


Figure 4: Post PTCA LCX- OCT Image

Figure 5: Post PTCA PDA

Snaring Victory from the Jaws of Defeat

Source:- J Am Coll Cardiol Case Rep.2022 Aug,4 (15) 987–989

Dr Hiteshi K C Chauhan
Associate Consultant - Critical Care
Fortis Hospital, Mohali

Moses Mathur , Chad J. Zack , Hiteshi K.C. Chauhan

Case Report: Clinical Case: Percutaneous Ventricular Assist Device Fracture in the Right Ventricle and its Retrieval

In this issue of JACC: Case Reports, Alhasan et al describe their management of a patient with submassive bilateral pulmonary embolism (PE) using catheter-directed thrombolysis. Unfortunately, the patient then experienced progress to right ventricular (RV) failure and cardiogenic shock, prompting escalation to RV mechanical circulatory support (MCS) with the Impella RP device (Abiomed).

Recognition of acute RV failure is important because it is a major determinant of clinical severity and outcomes. The use of MCS devices can make a critical impact in such scenarios and is recommended as a final rescue step in current PE rescue team (PERT) treatment algorithms. Common percutaneously delivered RV MCS options currently include extracorporeal membrane oxygenation, the micro-axial flow pump–based Impella RP catheter, and double lumen single-cannula based devices such as the ProtekDuo (LivaNova) and the Spectrum Medical dual-lumen cannula (Spectrum Medical).

In the choice between these options, attention should be paid to differences in approved indications, implantation durations, and device-specific technical nuances.

Ideally, considerations surrounding access size and approach (eg, femoral vs internal jugular), location(s) of concomitant thrombus burden, and ability to oxygenate through the circuit should also be carefully weighed. More realistically, however, the choice of MCS is often dictated by institutional availability and operator expertise.

Advancements over recent years have brought forth the advent and maturation of specialist teams such as PERT and shock teams. But, as highlighted here, cross-team training is just as important as cross team collaboration. With the growing technical complexities of our field, it is likely that each of us will occasionally find ourselves in uncharted territory, where improvising on a borrowed trick may become necessary. It is in these situations that personal creativity, intuition, and fortitude form the difference between success and failure. Much is said about the "art of medicine." Cases like these exemplify what that looks like in real-life practice.

Eroding Pseudo Aneurysm of Ascending Aorta - Case Report

Dr Satish Javali
Senior Consultant -
Cardiothoracic Vascular Surgery
Fortis Hospital, Mulund, Mumbai

A 22-year old female patient had undergone intra cardiac VSD (Ventricular Septal Defect) repair in 2016. She had upper sternal wound infection and was in the hospital for 3 weeks after the surgery. Recently she presented with a palpable pulsating mass in the upper part of the chest. A CT scan revealed a large mass (pseudoaneurysm) arising from the ascending aorta 2 cm above the aortic valve and extending into the right hemithorax measuring 12cm x 10cm in size. It had also eroded through the sternal bone and was palpable just below the skin & subcutaneous tissue.

Repair of the pseudoaneurysm with a redo stenotomy and sternal reconstruction with the pectoralis major myocutaneous (PMMC) flap was planned.

Anticipating difficulty in performing a redo sternotomy, a 8mm graft was sutured to the right axillary artery and cannulated with a 22 Fr arterial cannula, the right femoral vein was cannulated with a 25 Fr venous ECMO cannula and bypass was commenced. The temperature was kept at 37 degrees. Redo sternotomy was done. The upper manubrium and lower sternum were divided and the pseudoaneurysm dissected to open the sternum. After brief dissection of the right ventricle to access the right superior pulmonary vein to vent the LV (failed due to dense adhesions) it was decided to dissect around the ascending aorta so as to get space to cross clamp the aorta above the pseudoaneurysm. At this stage the pseudoaneurysm ruptured and even on bypass it was difficult to maintain the blood pressure.

Attempt to close the sternum or close the aortic rent with finger failed. A 14 Fr Foley catheter was inserted and inflated. The balloon gave control over the bleeding and allowed continuation of the bypass. Cooling of the patient was initiated to achieve circulatory arrest. When the temperature decreased to 32 degrees, the heart fibrullated. Both, the attempts to shock with the external defibrillator and pacing with the RV pacing wire failed. On TEE LV looked non-distended but with lot of stasis (seen on ECHO). The Foley's balloon was actually obstructing the whole ascending aorta. Cardioplegia was attempted through the' Foley's as it was acting like an ascending aortic clamp. Del neido cardioplegia was given through the catheter channel of Foley and the heart arrested.

The patient was cooled to 20 degrees and TCA achieved. On TCA, the Foley's was removed and the, defect in the ascending aorta was assessed. The coronary ostia and aortic valve were examined. Bovine pericardial patch was used to close the ascending aortic defect. (TCA time was -13 min; a) cannula was inserted in the distal ascending aorta for LV venting. Circulation was restarted. Patient was warmed and weaned off successful. Clots and necrotic material were removed from the remaining cavity of the pseudoaneurysm.

Sternum was sutured back together with steel wires and defects in the sternum closed with subcutaneous sutures. The patient was shifted to the ICU in stable condition and the patient was extubated the next day morning.

With meticulous planning, involvement of the whole team- the anaesthesiologists, the perfusionists nurses and assistants along with smooth execution of circulatory arrest and sheer luck, we could achieve a good result. The patient was discharged home on POD7.

Figure 1: Preop XRay Chest

Figure 2: Preop CT Scan showing the defects in sternum

Figure 3: Sternum approximated with defects in the manubrium and sternum

Figure 4: Introp photo of closed defect in ascending aorta

Figure 5: Clots and necrotic material removed from the sac of pseudoaneurysm

Figure 6: Preop CT scan

Figure 7

Figure 8

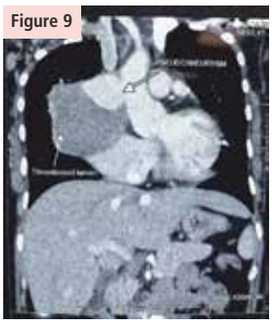


Figure 9

Figure 10

Figure 7,8,9,10: Preop CT scan showing origin and extent of pseudoaneurysm, eroding thro' the sternum

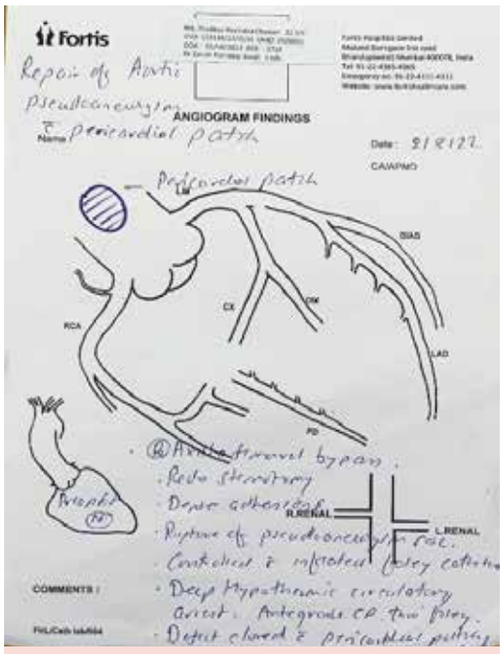


Figure 12: Operative details

Figure 11

Figure 12

Figure 13

Figure 11, 13, 14: Preop CT scan showing origin and extent of pseudoaneurysm, eroding thro' the sternum

Challenging Case of Extensive Intramural Hematoma: Exhausting Journey of Successful Management

Dr Ashwani Kumar Sharma
Consultant - Cardiology
Fortis Escorts Hospital, Jaipur

Mrs S D, 56- year- old lady without other co- morbidities was admitted in the emergency with severe angina pectoris associated with perspiration. Her ECG revealed ST segment elevation in the inferior leads (III > aVf > II). 2 D echocardiography revealed moderate hypokinesia in the basal-mid anterolateral and inferolateral segments. With the diagnosis of acute coronary syndrome in the form of acute inferior ST- segment elevation myocardial infarction, she underwent coronary angiography (figure 1a, b) through right distal transradial access (snuff box approach). There was thrombotic 100% occlusion of the left circumflex coronary artery (LCx) 15 mm distal to the origin of high obtuse marginal (OM) branch with short left main coronary artery (LMCA). Primary percutaneous coronary angioplasty (PTCA) was started after informed consent. BMW wire was advanced with the support of corsair micro catheter, but this micro catheter could not be advanced across the lesion. Hence, focal serial pre-dilatation was performed with 1.5 mm, 2.0 mm and 2.5 mm balloons. Check angiogram revealed long spiral dissection just distal to that focal segment extending into mid segment of second OM along with smooth luminal narrowing extending into proximal non-dilated segment (figure 1c-d). To resolve the enigma intra vascular ultrasound (IVUS) and optical coherence tomography (OCT) imaging were performed which showed extensive intramural hematoma (IMH) encircling more than 270-degree arc in maximum dimensions with luminal collapse at places (figure 2 a-h). As the patient was pain free with electrical and hemodynamic stability along with so much extensive IMH without distal landing zone, stenting was deferred. The plan was to perform interval angiography after resorption of IMH and sealing of the dissection. She had exertional angina and dyspnea NYHA class III despite maximum goal directed medical treatment (GDMT).

Coronary angiography performed after 6 weeks had showed extensive spiral dissection extending into the mid segment of the second OM (figure 1e, f) so intervention was again deferred. She had to live poor quality of life with limited physical activity.

Coronary angiography was performed at an interval of 6 months and then there was discrete 99% stenosis at the corresponding segment with distal TIMI I flow. With the help of corsair micro catheter Runthrough NS could be advanced easily across the lesion, however, cineangiogram revealed its sub intimal course in spiral manner. Keeping it as landmark (parallel wire), Whisper ES, Pilot 50 and Gaia II were used successively but failed to cross. Ultimately Conquest pro 8-20 wire crossed the lesion and parked in distal second OM (figure 4a). Luminal course confirmed by selective contrast injection though distally advanced micro catheter followed by IVUS.

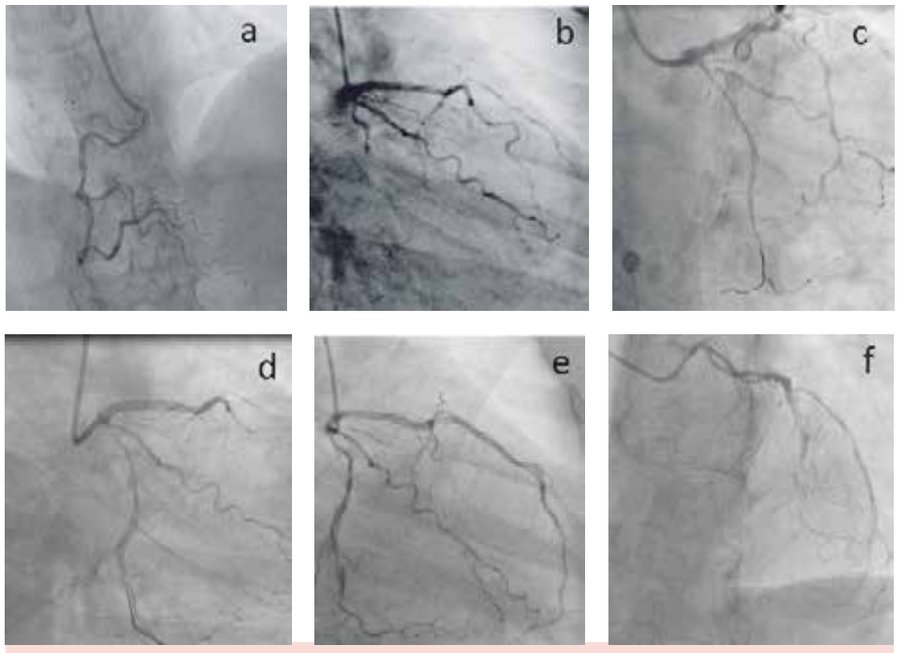


Figure 1: Angiogram performed in January 2022 revealed anomalous RCA with noncritical plaque (a), proximal thrombotic occlusion of LCx (b), smooth narrowing proximal to focal dilatation and distal long spiral dissection (c, d) Coronary angiography performed after 6 week revealed same extensive spiral dissection extending into second OM (e, f)

Sequential pre dilatation performed with 2.0, 2.5 and 3 mm balloons and DES 3 x 38 and 2.25 x 32 were deployed with adequate overlap. After proximal optimization (POT) to high OM with 3.5 mm balloon there was ostial pinching (figure 4b) which was successfully managed with kissing balloon inflation (3 and 2.5 mm in LCx and OM respectively) followed by rePOT with 3.75 mm balloon (figure 4c). After post dilatation TIMI III flow (figure 4d) and good results were achieved in IVUS run. Next day morning the very first exclamatory comment of the patient was that she had been feeling alright then.

IMH is a type of dissection where there is accumulation of blood in tunica media displacing internal elastic membrane inward and external elastic membrane outward. Most of the time it arises in eccentric lesions at the junction of healthy and unhealthy media. The most common location is distal to the lesion followed by proximal with least common being at the lesion site. There might be gradual absorption and resolution without intervention or progression causing various short (myocardial infarction, repeat revascularization) or long term complication (stent mal apposition). There might be gradual absorption and resolution without intervention or progression causing various short term (myocardial infarction, repeat revascularization) or long term complication (stent mal apposition). There is no common consensus for management of intramural hematoma. Focal hematomas causing poor distal flow or angina are usually first decompressed by micro fenestrations created with cutting or scoring balloon followed by relatively longer stent deployment.

The given case was truly complicated by extensive and voluminous IMH which was extending distally as well as proximally despite focal dilatation. In absence of distal landing zone further intervention was to be deferred for six months until sealing of dissection and resorption of hematoma.

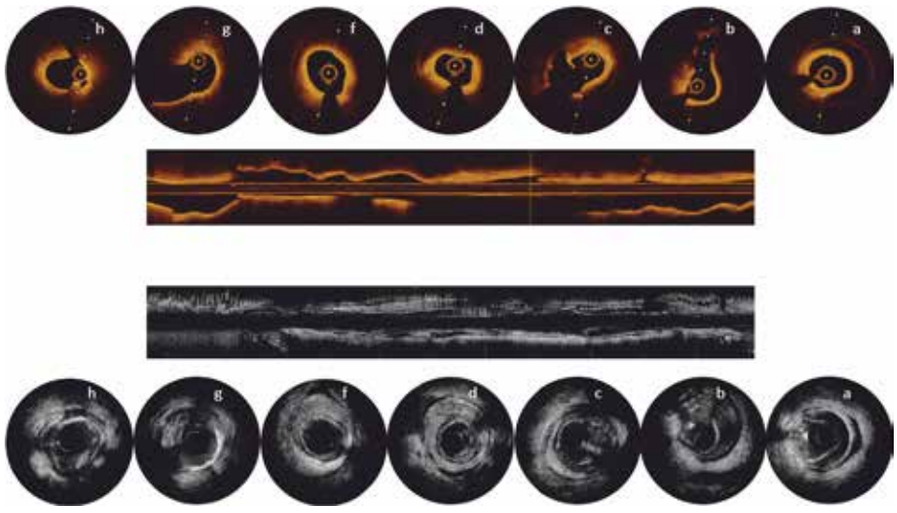


Figure 2: Imaging run from distal to proximal LCx (right to left) in OCT (upper panel) and IVUS (lower panel) showing IMH (10 to 6 o'clock in a), ostium of distal LCx from true lumen at 12 o'clock (b), entry point of IMH at 7 to 9 o'clock (c), IMH outside the diseased intima (d, e), origin of high OM (g) and diseased ostium of LCx (h)

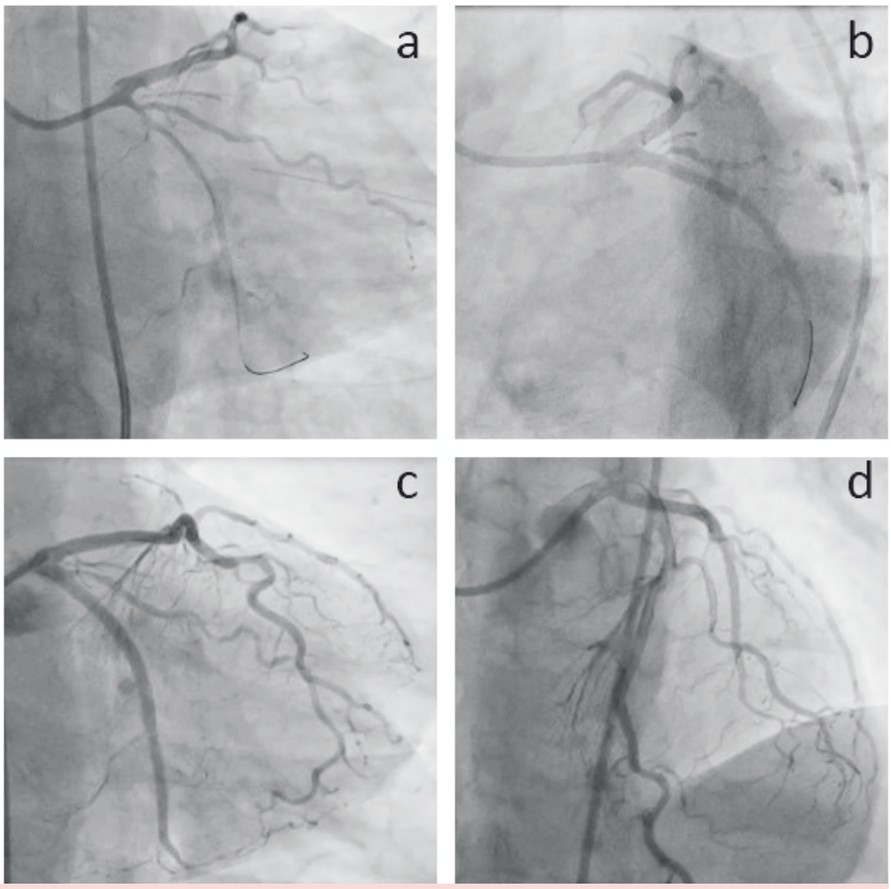


Figure 4: Work horse wire advanced was subintimal and finally conquest pro could enter distal lumen (a). There was ostial pinching of first OM after POT (b) which was managed with KBI with good angiographic outcomes (c,d)

An Anomalous Story of a Rare Percutaneous Intervention to Left Anterior Descending / Right Coronary Artery Bifurcation

Dr Amreen Dhindsa
Associate Consultant - Cardiology
Fortis Hospital, Mohali

Authors:
Harinder Kumar Bali, Sankalp Bharti

A single coronary artery arising from the left coronary sinus, with the right coronary artery arising from the left anterior descending artery, is an extremely rare coronary artery anomaly. Usually benign, it may result in ischemia by various mechanisms including atherosclerotic involvement of the vessels, rendering a critical area of myocardium at at risk. Percutaneous intervention in anomalous coronary arteries is particularly challenging. Use of nonstandard hardware may be required for adequate access and support. We describe a complex and rare percutaneous intervention to the left anterior descending and right coronary artery bifurcation in a 77-year-old patient with anomalous origin of the right coronary artery from mid-left anterior descending artery and Medina 1,1,1 disease at the bifurcation. The Left anterior descending artery (LAD)/Right coronary artery (RCA) bifurcation lesion was successfully treated using the mini-crush technique.

Reference

Bali, HK, Dhindsa, A, Bharti, S. An anomalous story of a rare percutaneous intervention to left anterior descending/right coronary artery bifurcation. Clin Case Rep. 2021; 9:e03764.

https://doi.org/10.1002/ccr3.3764

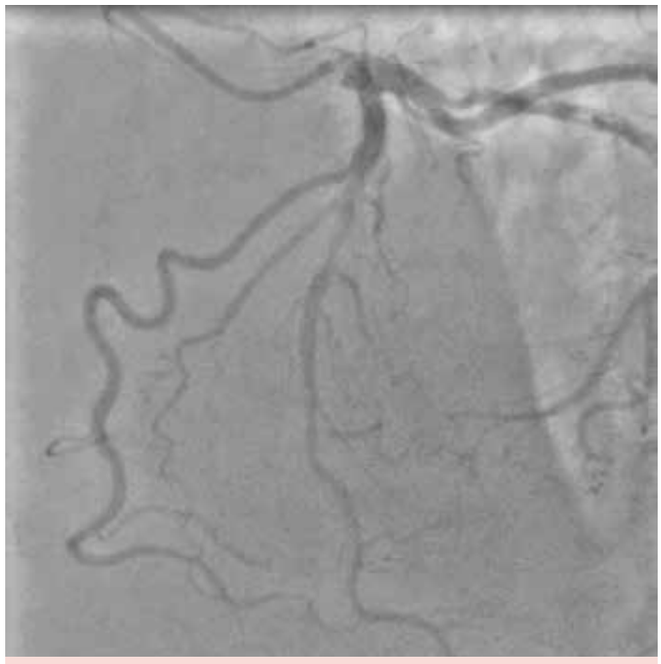


Figure 1: Left coronary angiogram showing a heavily calcific LAD with ostio-proximal patent LAD stent and diffuse 70%-80% stenosis in mid-LAD, a dominant RCA with anomalous origin from mid-LAD and ostial 90% stenosis (Medina 1,1,1 disease at the mid-LAD and anomalous RCA bifurcation)

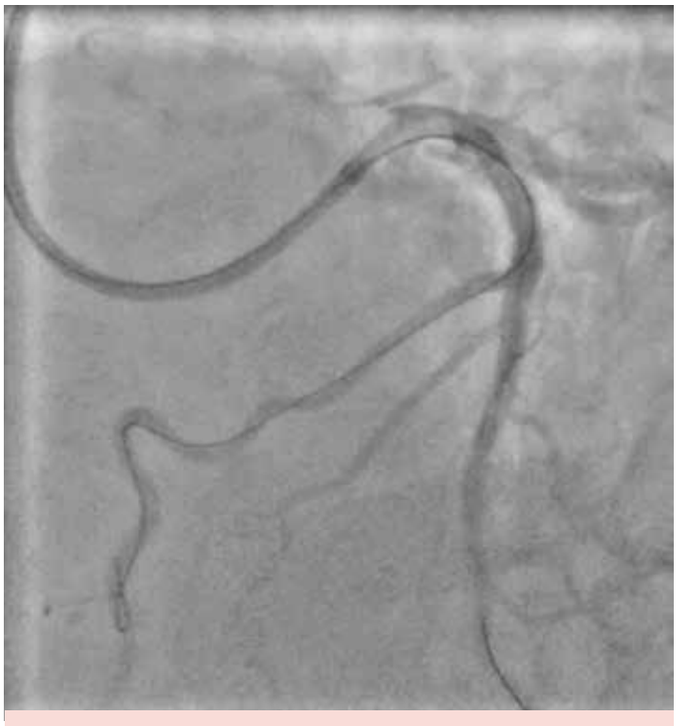


Figure 2: After complex percutaneous intervention, a satisfactory angiography results with TIMI three flow in both LAD and RCA seen with no residual stenosis and no dissection

Intra Vascular Lithotripsy Facilitated Transfemoral TAVR

Dr Ashok Seth
Chairman -
Fortis Escorts Heart Institute
Chairman -
Fortis Healthcare Medical Council
President - Asian Pacific Society of Interventional Cardiology
Fortis Escorts Heart Institute,
Okhla Road, New Delhi

Co-Authors
Vijay Kumar, Vivudh Pratap Singh, Dhananjay Kumar, Vishal Rastogi

Abstract

Transcatheter aortic valve replacement (TAVR) is now the standard of therapy for elderly population with severe aortic stenosis. Several studies have established that the outcomes of TAVR are superior when compared with Surgical aortic valve replacement (SAVR), especially when the access route is transfemoral arterial approach. In the elderly population with advanced age and numerous comorbidities, iliofemoral arterial disease (IAD) is not uncommon and it precludes the use of this route for TAVR. Peripheral Intravascular lithotripsy (IVL) has been previously established as an excellent safe and efficient modality to treat symptomatic occlusive calcific iliofemoral artery disease. The same principle of IVL has been recently used successfully to modify the vascular compliance of heavily calcified iliofemoral arteries thereby enabling large bore sheath advancement and safe passage of TAVR delivery catheter systems. We report the first case of Intravascular lithotripsy facilitated Transfemoral TAVR (TF-TAVR) in India. This case was done in December 2020 by the "femoral route" in order to keep the TAVR procedure simple straightforward and discharge the patient back home quickly in Covid times. The use of Intravascular Lithotripsy (IVL)was based on evidence of good outcomes in trials of peripheral vascular disease of lower limbs as well as from the good outcomes of few registries on IVL facilitated TAVR.[1,2,3,4,5,6,8] The second case was done in August 2021 by us for another patient successfully.

A 76-year male patient who had severe aortic stenosis, low STS score was planned for TAVR. The pre TAVR - MSCT analysis of aortic root complex was without any challenges but the femoral -iliac arteries were unsuitable due to heavy calcification. The mean lumen diameter (MLD) was 3.6mm in the right external iliac and left external iliac artery had a MLD of 3.3mm (Figure 1). The length of the lesion was tightest focally but the calcium was present all along the segment from bifurcation of iliac up to the femoral head (Figure 1). The angle of calcification was 270-360 on both sides. It was thus a non-feasible access vessel for large bore sheath needed in TF-TAVR. Conventionally an alternative access is chosen in this anatomy, but the other option was to do a lithotripsy treatment of the femoro iliac artery by cracking the calcium and making the vessel accommodative and suitable for a larger sheath and then perform the transfemoral TAVR. In our case, the right side iliofemoral system was chosen for IVL treatment and then inserting the large bore sheath for TAVR was planned. Femoral arterial puncture was done above the femoral bifurcation using an ultrasound guidance identifying a calcium free segment in the anterior wall. A 7 French sheath was then inserted. 2 proglides were preplaced at 10' clock and 2' clock position. A 0.014" extra support coronary wire was used to cross and park in the ascending aorta. A shockwave balloon (6.5mm wide x 60mm long) (Shockwave Medical Inc, Santa Clara, California) (Figure 6) was prepared using a 50:50 saline-contrast and tracked over the wire across the lesion and then parked in the iliacs using the marker bands for alignment with the lesion (Figure 2). The balloon was inflated to 4mm and one cycle of 30 IVL pulse was given, the inflation was then done to 6 atm in order to achieve maximum lumen gain. The balloon was then deflated. Shockwave was administered in 30 pulses per cycle. The cycle was repeated along the length of iliac and femoral artery. The total dose given in the case was 270 pulse (Figure 2). The IVL balloon treatment was done all the way from the iliofemoral bifurcation level down to femoral artery (Figure 2). The vessel lumen appeared bigger as compared to the pre IVL treatment size. The shockwave catheter was then taken out and a stiff amplatz wire was exchanged for the 0.014 guide wire. The large bore 14 French TAVR sheath was then inserted. The standard stiff confida wire was then taken through the sheath and parked in Left ventricle. The EnVeo delivery catheter system was then tracked with gentle rotation and twisting over the confida wire (Figure 3). The 29mm Evolut R valve was tracked along the arch of aorta to the aortic root, positioned in the usual manner and implanted successfully (Figure 4). The delivery catheter system was then removed and the haemostasis of access vessel achieved with the 2 preplaced proglides. The check angiogram and Digital subtraction angiography (DSA) of the IVL modified femoral iliac artery showed no disruption, perforation, thrombus formation or any other complication of the access vessel (Figure 5). The patient was discharged the third day as any patient would be after a coronary intervention.

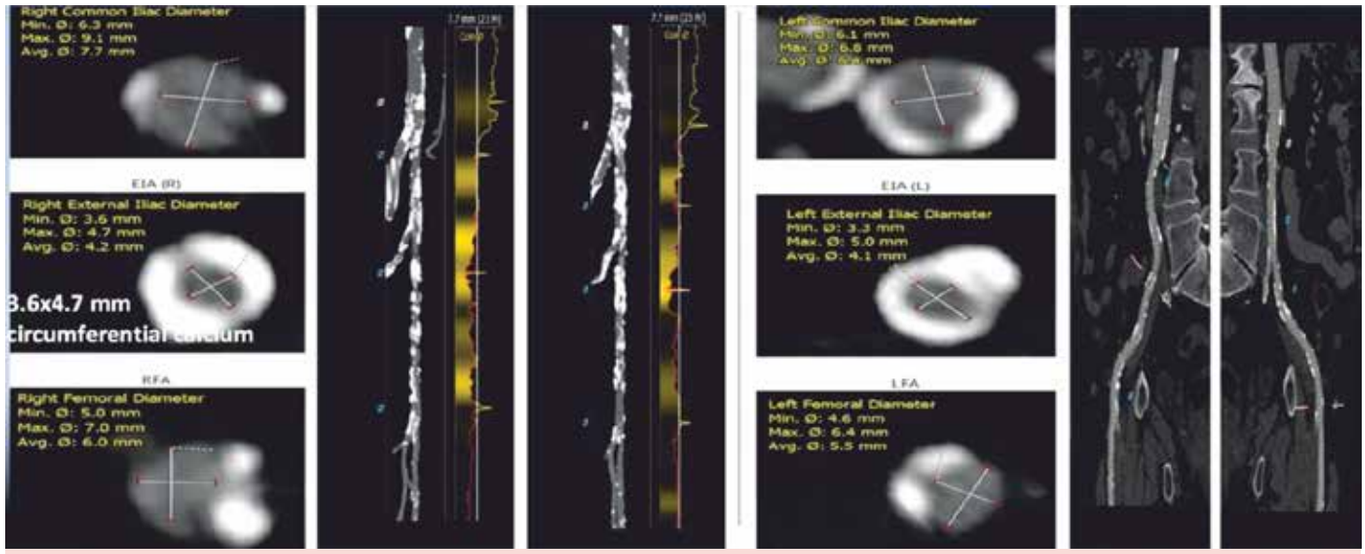


Figure 1: MSCT scan images iliofemoral artery system a) Severe stenosis of right external iliac artery (3.6 × 4.7mm); horseshoe calciumb b) Calcium over the femoro iliac systemic c) Left femoral artery stenosis: Circumferential 360 calcium, Calibre (3.3 × 4.1mm) d) Stretched view of both iliacs and femoral arteries

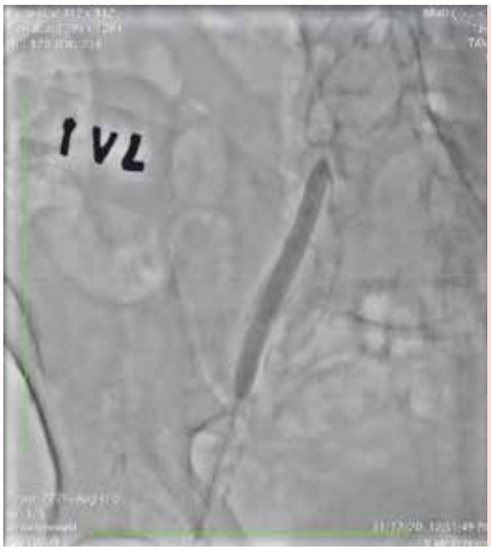


Figure 2: IVL with shockwave balloon 6.5 £ 60 mm and 270 pulses for treating stenotic ileo-femoral artery of right side

Figure 3: Gentle rotation and navigation of catheter delivery system

Figure 4: 26 mm Evolut R deployed successfully at aortic position

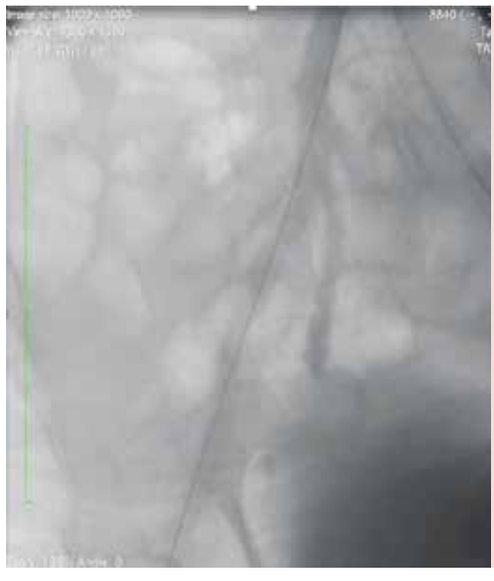


Figure 5: Final DSA of access Vessel post IVL and end of TAVR procedure shows no complication

Case 2 :

75 years lady with severe aortic stenosis, similarly, had a bilateral severely narrowed bilateral iliac arterial system making it unsuitable for TF -TAVR (Figure 7). The access vessel chosen here was right femoral artery. It was treated with IVL successfully using an IVL balloon 6.0 × 60 mm and 270 pulses were delivered at the target site following the same steps as described in the previous case (Figure 8). A 16 French sheath was introduced safely in the IVL treated vessel and the EnVeo Pro delivery catheter system was then successfully navigated through right femoral iliac artery system (Figure 9). Evolut Pro 23 mm valve was then implanted successfully (Figure 10). There was no complication in the IVL treated vessel (Figure 11) and the TAVR procedure was successfully completed by the transfemoral approach. Both the patients are doing well in their follow up till date and have no clinical or doppler evidence of occlusion of their IVL treated vessels.

Conclusion

Significant Calcific femoral iliac arterial system is not an uncommon challenge in patients planned for TAVR, there by resorting to alternate access approach. IVL is a great tool to address this prohibitive calcific iliofemoral artery anatomy and make it possible to be used as the access vessel for Transfemoral TAVR. Peripheral IVL appears to be safe and effective in patients with severe disease and has high success and low rates of complications. IVL facilitated TF-TAVR cuts down the need of alternate access and thereby helps preserving the established best outcomes of TAVR therapy.

References :

1. Brodmann M, Werner M, Brinton TJ, et al. Safety and Performance of lithoplasty for treatment of calcified peripheral artery lesions. J Am Coll Cardiol. 2017;70:908–910. https://doi.org/10.1016/j.jacc.2017.06.022.
2. Brodmann M, Werner M, Holden A, et al. Primary outcomes and mechanism of action of intravascular lithotripsy in calcified, femoropopliteal lesions: results of disrupt pad ii. Cathet Cardiovasc Interv. 2019;93:335–342. https://doi.org/10.1002/ccd.27943.
3. Ristalli F, Dini CS, Stolcova M, et al. Role of lithotripsy for small calcified iliacs in the era of big devices. Curr Cardiol Rep. 2019;21:143. https://doi.org/10.1007/s11886-019-1245-2.
4. Price LZ, Safir SR, Faries PL, McKinsey JF, Tang GHL, Tadros RO. Shockwave lithotripsy facilitates large-bore vascular access through calcified arteries. J Vasc Surg Cases Innov Tech. 2020;7:164–170. https://doi.org/10.1016/j.jvscit.2020.09.002.
5. Armstrong EJ, Soukas PA, Shammas N, et al. Intravascular lithotripsy for treatment of calcified, stenotic iliac arteries: a cohort analysis from the disrupt PAD III study. Cardiovasc Revascularization Med. 2020;21:1262–1268. https://doi.org/10.1016/j. carrev.2020.02.026.
6. Di Mario C, Goodwin M, Ristalli F, et al. A prospective registry of intravascular lithotripsy-enabled vascular access for transfemoral transcatheter aortic valve replacement. JACC Cardiovasc Interv. 2019;12:502–504. https://doi.org/10.1016/j. jcin.2019.01.211.
7 Blanke P, Weir-McCall JR, Achenbach S, et al. Computed tomography imaging in the context of transcatheter aortic valve implantation (tavi)/transcatheter aortic valve replacement: an expert consensus document of the society of cardiovascular computed tomography. JACC Cardiovasc Imaging. 2019;12:1–24. https://doi.org/ 10.1016/ j.jcmg.2018.12.003.
8. Staniloae Cezar S, Hasan Jilaihawi, Amoroso Nicholas S, et al. Systematic transfemoral transarterial transcatheter aortic valve replacement in hostile vascular access. Struct Heart. 2019;3:34–40. https://doi.org/10.1080/24748706.2018.1556828.
9. Holmes DR, Nishimura RA, Grover FL, et al. Annual outcomes with trans- catheter valve therapy: from the STS/ACC TVT registry. J Am Coll Cardiol. 2015;66: 2813–2823. 10 Branny M, Branny P, Hudec M, et al. Alternative access routes for trans- catheter aortic valve implantation (TAVI). Cor Vasa. 2017;59:e10–e16.

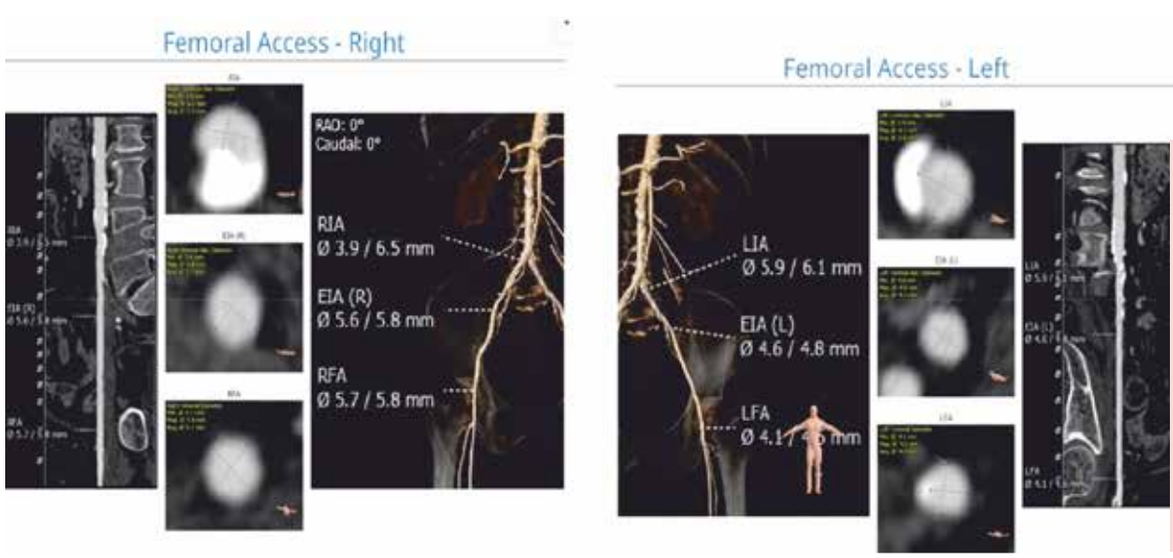


Figure 7: Bilateral narrow and calcified iliac arterial system unsuitable for TF TAVR

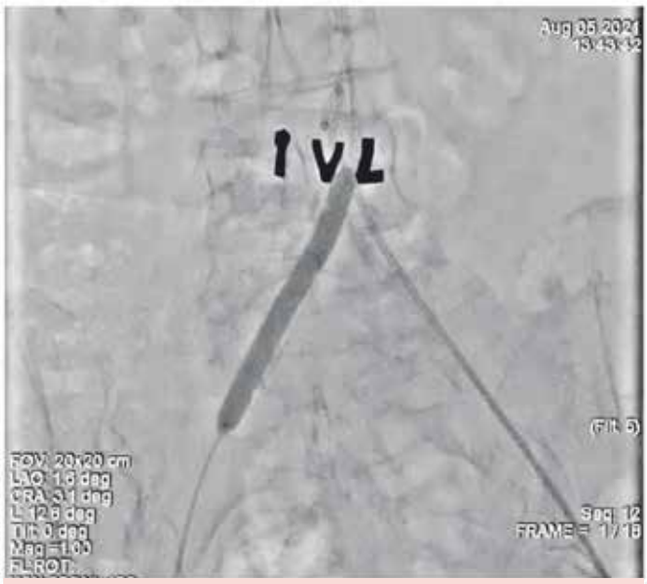


Figure 8: IVL treatment using 6.0 £ 60 mm IVL balloon, 270 pulses delivered

Figure 9: Navigation of the EnVeo Pro catheter delivery system

Figure 10: Successful deployment of Evolut Pro 29 mm valve in aortic position

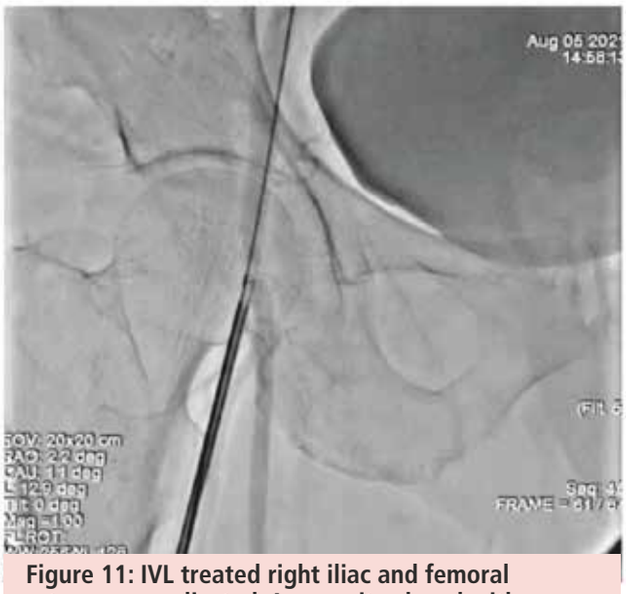
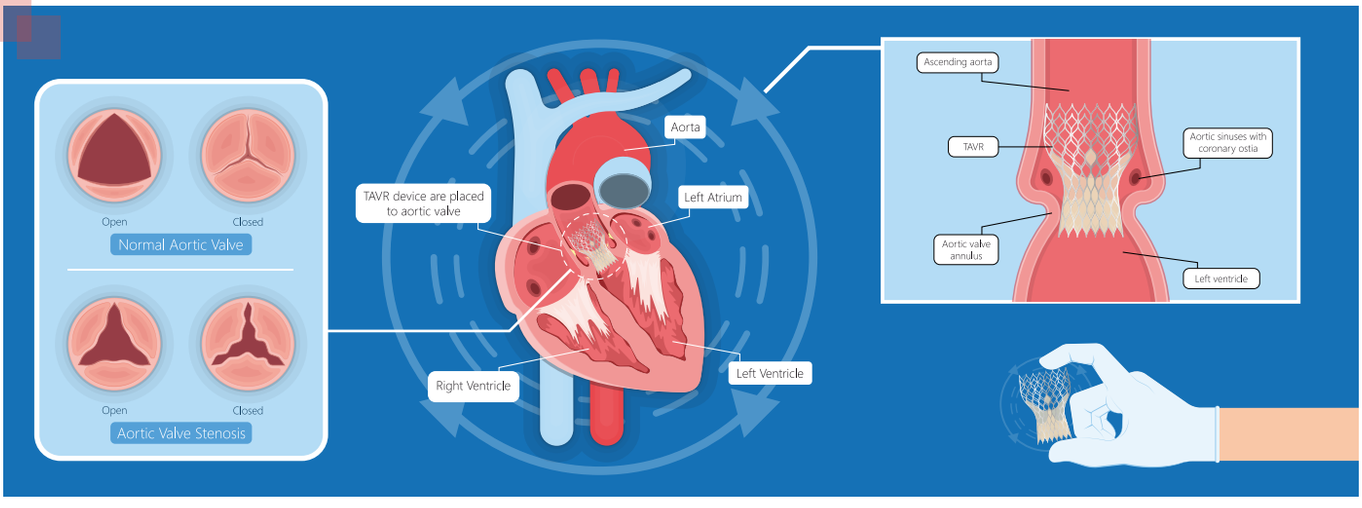


Figure 11: IVL treated right iliac and femoral artery uncomplicated. Access site closed with preplaced proglide suture system



Issue: 6 | September 2022

Isolated Myocardial Abscess Cavity: An Incidental Finding on Intraoperative Transoesophageal Echocardiography

Citation: Garg M, Bhargava J, Garg M, Garg S. Isolated myocardial abscess cavity: An incidental finding on intraoperative transoesophageal echocardiography. Ann Card Anaesth 2021;24:411-4

Dr Jyotsna Bhargava
Additional Director - Anesthesiology
Fortis Escorts Hospital, Jaipur

Mukesh Garg, Madhuri Garg[2], Sukhdev Garg[3]

Introduction

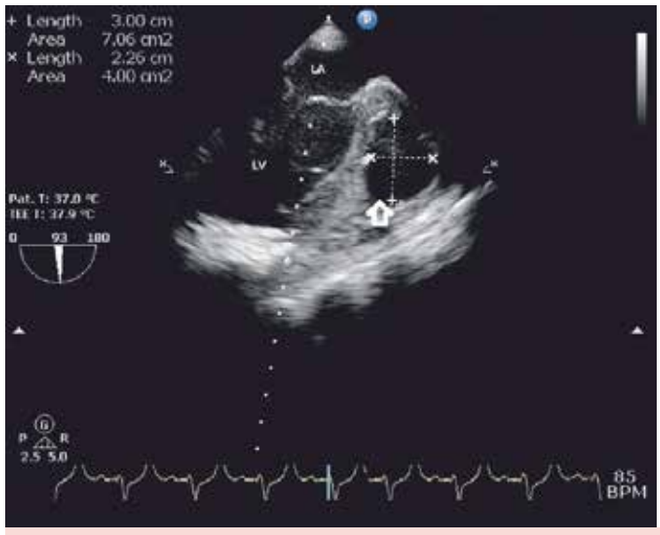
Myocardial abscess is a rare and potentially fatal condition. It has been reported in about 20% patients of infective endocarditis, which is the most common predisposing factor. Occurrence of myocardial abscess without any evidence of infective endocarditis is a rare finding and infrequently reported in medical literature. We report a case of myocardial abscess within the anterior wall of the LV that was incidentally detected during intraoperative transesophageal echocardiography (TEE), in a patient scheduled for stenotic Aortic Valve (AV) replacement.

Case Report

A 47yearold man presented with the complaints of progressive breathlessness and chest discomfort. Preoperative transthoracic echocardiography (TTE) showed a bicuspid AV with severe stenosis and moderate regurgitation. The LV was dilated with mild systolic dysfunction (ejection fraction: 45–50%), with no other abnormality. Coronary angiography revealed normal coronary arteries. AV replacement surgery was planned.

Patient was induced with titrated doses of intravenous fentanyl, rocuronium, and propofol. Depth of anaesthesia was maintained with intermittent doses of intravenous fentanyl, vecuronium, and midazolam, in addition to sevoflurane as an inhalational agent. Intraoperative TEE confirmed preoperative findings. The mid-esophageal two chamber view showed a hypoechoic abnormality in the basal anterior segment of the left ventricle. It was approximately 30–22.6 mm echo free space [Figure 1]. The echo lucent defect with well- defined margin looked like an old healed myocardial abscess cavity. The same abnormality was also appreciated in the trans-gastric two chamber view [Figure 2].

A communication underneath the left coronary cusp of AV was found by the surgical team. The abscess cavity was debrided of friable margin and closed with Dacron patch. The diseased valve was replaced with a bi-leaflet mechanical valve, and patient weaned off the cardiopulmonary bypass uneventfully. The hemodynamic parameters were maintained within normal range with inotropic infusions of epinephrine (0.08 µg/kg/min) and dobutamine (2 µg/kg/min). Three sets of blood cultures were drawn



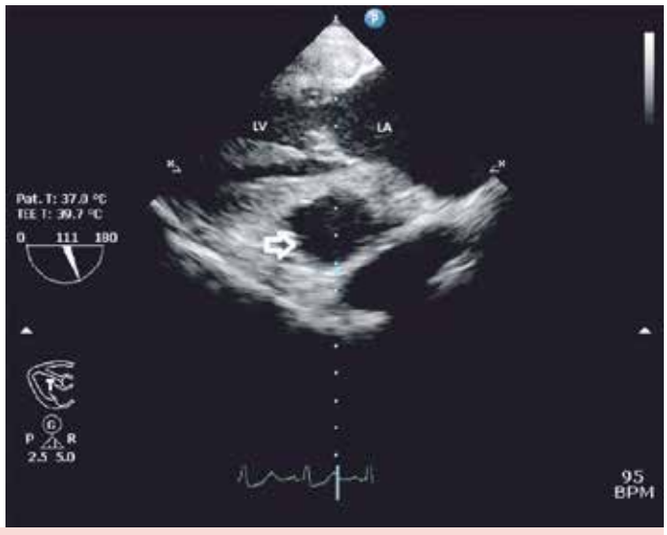


Figure 1&2: Midesophageal two-chamber view showing echolucent lesion (arrow) with well-defined border of myocardium at the basal segment of left ventricle anterior wall (maximal size 30-22.6 mm). LA: Left atrium, LV: Left ventricle

from different sites of the patient. Considering the abscess cavity, antibiotic coverage was stepped up to intravenous cefoperazone sulbactam (1.5 g twice a day) and amikacin (500 mg twice a day). Although, all three blood cultures did not show any growth and reported negative, the empirically commenced antibiotics were continued for 10 days. Postoperative course of the patient remained uneventful.

Discussion

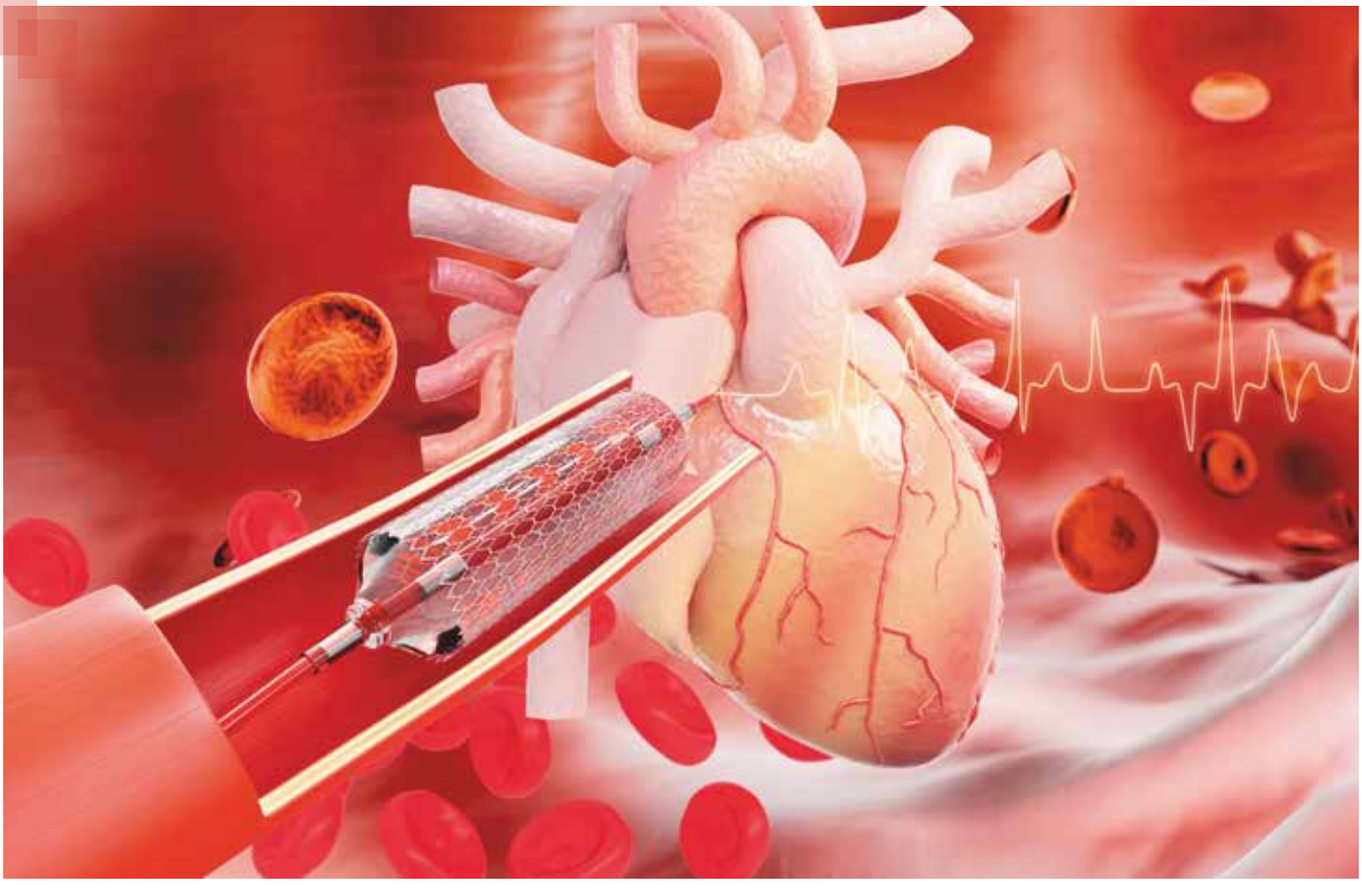
Nonvalvular isolated mural abscess is a rare condition and can be found in the setting of septicaemia without infective endocarditis. It has been found in relation to septic foci such as decubitus ulcer, infected burns, bronchiectasis, and thrombophlebitis in patients with immunodeficiency. One case report demonstrated myocardial abscess at the site of infarcted myocardium. None of the aforementioned conditions existed in our patient.

Despite advances in diagnostics, identification of myocardial abscess still remains a challenge. Echocardiography is accepted as a non-invasive gold standard technique to detect infective endocarditis and myocardial abscess. TEE has an improved sensitivity (90%), in comparison to the TTE (50%). Trans-oesophageal approach provides better detection of perivalvular abscesses, associated vegetations, valvular perforations, fistulae and rupture of chordae tendineae; especially in mitral prosthetic valves. The complications of myocardial abscess, like pseudoaneurysm and fistulisation, may also be diagnosed by TEE. However, both approaches are complimentary to each other and mandatory in suspected patients.

The clinical picture of a patient with myocardial abscess may vary from an asymptomatic state to myocardial wall rupture. ECG usually does not show any specific changes. However, few cases have presented with fatal arrhythmia (ventricular tachycardia or fibrillation); PR prolongation, and complete heart block. Management varies from intensive medical treatment with antibiotics to surgical abscess drainage and repair of the defect, depending upon clinical findings and imaging.

These patients must be monitored closely, with serial TEE at intervals of 2, 4, and 8 weeks after completion of antimicrobial therapy. As 40% of cases involve more than one microbial etiology, we used third generation cephalosporin with lactamase inhibitor along with aminoglycoside as an empirical antibiotic.

The case demonstrates utility of intraoperative TEE in detection of additional findings during open heart surgery, which are often overlooked during preoperative TTE.



Issue: 6 | September 2022

Redo Tricuspid Valve Replacement Post Mitral Valve Replacement: A Case Study

Dr Rakesh Chittora
Director & Unit Head -
Cardiothoracic Vascular Surgery,
Fortis Escorts Hospital, Jaipur

The incidence and prevalence of tricuspid regurgitation is very high in patients with mitral valve surgery (commonly rheumatic in origin). The incidence of tricuspid stenosis after mitral valve replacement is around 12-15%.

Redo cardiac surgery carries a risk of 6-8 % mortality as per literature' while isolated redo tricuspid valve surgery carries a risk of 16-20%. In our case, the redo isolated tricuspid valve replacement was done mainly for tricuspid surgery which is not so common after pervious valve surgery. Our patient was in age group of 65-70 years.

Case Presentation

A 57 year-old female was admitted with complaints of abdominal distention following meals with pedal edema off and on. She was operated for MVR in 2007, using a tilting disc prosthesis. Her 2D ECHO showed a normal functioning mitral valve prosthesis. Her 2D echo showed normal functioning mitral valve with severe tricuspid stenosis (peak gradient 8-10. mmHg) and severe tricuspid regurgitation with a low-pressure jet. She was in atrial fibrillation.

After routine work up and CT chest, she was taken for surgery using a femoral by-pass. Median sternotomy was done, and adhesions were removed. The tricuspid valve was severely stenotic with commissural fusion and sub-valvular stenosis. Tricuspid valve commissurotomy was done and chordal elongation with papillary muscle splitting was done. Tricuspid valve replacement was done using a 31epic valve with all leaflets preservation.

Post operatively intermittent heparin was given with oral anticoagulants (due to presence of functioning mitral valve).

Patient was discharged uneventfully on the 6th POD.

Conclusions

Patients undergoing redo isolated tricuspid valve surgery carry a high risk of early mortality. Satisfactory results are achievable in redo tricuspid valve surgery. Tricuspid stenosis is difficult to manage medically and surgery is the best option for these patients. Redo surgery carries a high mortality risk but is better done before the development of RV failure.

Reference

1. Buzzatti N, Iaci G, Taramasso M, et al. Long-term outcomes of tricuspid valve replacement after previous left-side heart surgery. Eur J Cardiothorac Surg. 2014;46:713-719.
2. Chen J, Hu K, Ma W, et al. Isolated reoperation for tricuspid regurgitation after left-sided valve surgery: technique evolution. Eur J Cardiothorac Surg. 2020;57:142-150.

Figure 1

Interesting Insights from Fortis Hospital, Mulund

Source:- Ann Thorac Surg. 2022 Apr;113(4):e299-e302

The Paediatric Cardiac Team - Fortis Hospital, Mulund

Dr Dhananjay Malankar, Dr Bharat Soni - Pediatric Cardiovascular Surgeons
Dr Swati Garekar, Dr Ronak Sheth - Pediatric Cardiologists
Dr Shivaji Mali, Dr Shyam Dhake - Pediatric Cardiac Anesthesiologists and Intensivists
Dr Dilip Bind, Dr Amit Mhatre, Dr Komal Kamdi - Pediatric Cardiac Intensivists
Mr K Dinesh and Mr S Sathish - Physician Associates
Mr Sujit Bamne - Perfusionist
Mansi Gharat and Sonal Chogale - Registered Nurses
Mr Phil - Social worker
Mr Vijay Sawant - Coordinator
Ms Vidya Shetty - OPD coordinator

Single-Stage Unifocalization and Intracardiac Repair Using Two Tube Grafts

Abstract

Unifocalization of the major aortopulmonary collaterals (MAPCAs) followed by intracardiac repair with ventricular septal defect (VSD) closure and restoration of right ventricle-to-pulmonary artery continuity is the ultimate treatment goal in a case of VSD with pulmonary atresia and MAPCAs. It may be achieved in a single stage or may require multiple surgeries. We present a case of a 2-year-old boy with VSD with pulmonary atresia who underwent single-stage unifocalization of MAPCAs through the midline followed by intracardiac repair using 2 polytetrafluoroethylene tube grafts: one for unifocalization and other as a bicuspid valved right ventricle-to-pulmonary artery conduit.

Neo-cusp Reconstruction Procedure for Aortic Regurgitation Induced by Transcatheter Occluder Device for Ventricular Septal Defect Closure.

World J Pediatr Congenit Heart Surg. 2022 Jul;13(4):495-498.

Abstract

Aortic regurgitation after transcatheter device closure of a peri membranous ventricular septal defect is a known complication. We present the case of an 11-year-old boy with severe aortic valve regurgitation due to cusp perforation complicating previous device closure of a ventricular septal defect. The patient underwent successful aortic valve repair (neo-cusp reconstruction technique) by replacement of a cusp and shaving off of a rim of the device 5 years after device closure.

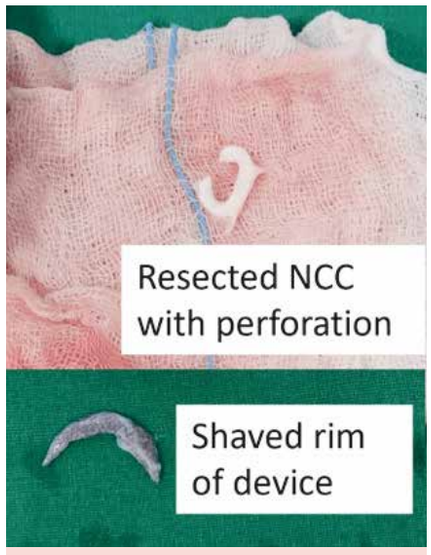


Figure 8:
Resected cusp and shaved off rim of device

Re-do ALCAPA Repair with Left Subclavian Artery-to-left Main Coronary Artery Bypass for Left Coronary Atresia.

World J Pediatr Congenit Heart Surg. 2022. Accepted for publication.

Abstract

Different surgical techniques have been described for the primary repair of anomalous left coronary artery arising from the pulmonary artery (ALCAPA). However very few techniques are described for management of coronary artery occlusion following repair for ALCAPA. We present a case of 7 year old girl with left main coronary atresia status post left coronary button transfer for ALCAPA in infancy. She underwent redo-sternotomy and left subclavian artery to left main coronary bypass grafting with mitral valve repair.

Fontan Procedure on Deep Hypothermic Circulatory Arrest: Short Term Results and Technique

Annals of Pediatric Cardiology. Accepted; to be published in the next issue.

Abstract

Various operative strategies are described for the Fontan procedure. In this study, we describe our short term results and technique of Fontan procedure on cardiopulmonary bypass (CPB) and deep hypothermic circulatory arrest (DHCA). This was a retrospective study of 32 patients, median age of 6 years (4–19 years) and median weight of 20 kg (13–51 kg), who underwent Fontan procedure on CPB and DHCA from July 2016 to July 2021. The median CPB time was 125 min (77–186 min), the median DHCA time was 42 min (27–50 min), and the median Fontan pressure was 14 mmHg (10–18 mmHg). The median time to extubation was 4h (1–20h), the duration of chest tube drainage was 8 days (5–24 days), and the median intensive care unit stay was 4 days (3–8 days). The presence of heterotaxy was associated with longer duration of pleural drainage (P = 0.01). There was no operative mortality and no major adverse events such as seizures, gross neurological deficits, or arrhythmias in the postoperative period. Fontan procedure can be safely performed on CPB and DHCA with good operative results. This operative strategy may be used in special circumstances like in patients with situs and systemic venous anomalies and those requiring repair of a complex intracardiac defect. Long term follow up will be required to evaluate if this strategy has any impact on the neuro-developmental outcome and the long term sequelae of Fontan.

Giant Right Atrial Aneurysm in an Infant

World J Pediatr Congenit Heart Surg. 2022 Mar 15;21501351221085529. Published online prior to print

Abstract

Right atrial aneurysm (RAA) is a rare congenital anomaly with a diverse clinical spectrum. We present a case of antenatal detection of a giant RAA. The infant had 3 episodes of staring spells presumed to be thrombo-embolic phenomena originating from the RAA. The infant underwent successful RAA resection with preservation of the right coronary artery that was displaced from its usual position due to invagination of the RAA in the subepicardial space of the right atrio-ventricular groove.

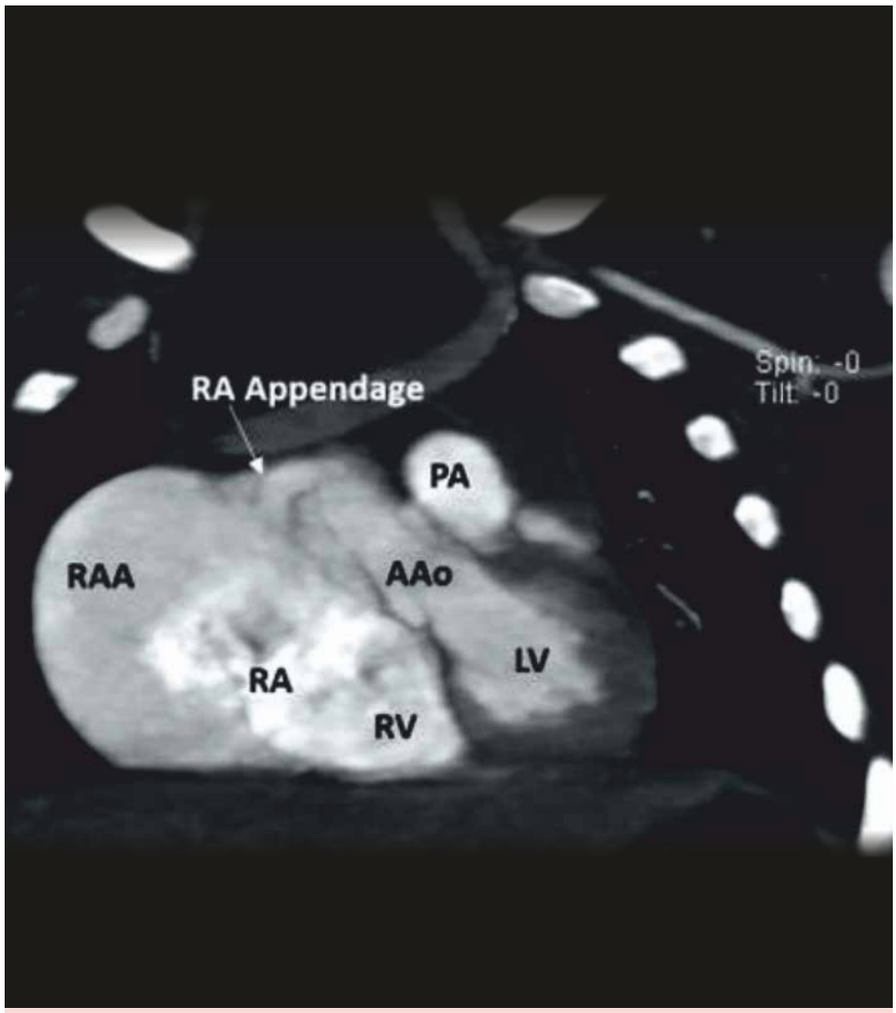


Figure 9: Pre-operative CT scan showing giant right atrial aneurysm (RAA)

Combined Aortic and Pulmonary Valve Stenosis in a 28-Year-Old Managed Percutaneously

Dr Sanjay Khatri
Additional Director - Pediatric and Interventional Cardiology
Fortis Escorts Hospital, Jaipur

Abstract

Combined valvar aortic and pulmonary stenosis is an extremely rare entity and few case reports exist in current literature describing this condition. We present the case of a 28-year-old woman who presented with symptoms of breathing difficulty, chest pain and syncope and was found to have combined severe valvar aortic and pulmonary stenosis. She underwent balloon valvuloplasty for both valves during the same interventional procedure and the obstruction was successfully relieved on both sides.

Key Words

Pulmonary stenosis, aortic stenosis, balloon valvuloplasty.

Introduction

Isolated stenoses of aortic or pulmonary valve are common conditions, however, combined valvar aortic and pulmonary stenoses is a very rare entity with few case reports existing in current literature [1, 2, 3, 4]. The precise diagnosis of this entity is extremely important as it can have fatal repercussions for a patient if only one of the obstructions is relieved. We present a case of combined severe valvar aortic and pulmonary stenosis which was managed successfully with balloon valvuloplasty of both valves during the same interventional procedure. The case discusses management dilemmas and risks involved with the combined procedure.

Case Report

A 28-year-old female, presented to the emergency department with symptoms of recurrent exertional dyspnea, chest pain and syncope. She was normotensive, had a regular heart rate of 90/minute, had a single S2 and a grade III/VI ejection systolic murmur heard best at the second left sternal border, radiating to the second right sternal border. Cardiac troponins were within normal range. She underwent an echocardiogram on the day of admission in view of her cardiovascular examination findings, which demonstrated situs solitus levocardia, secundum atrial septal defect measuring 7-8 mm and shunting left to right, bicuspid, thickened and doming pulmonary valve (annulus 25 mm) with a peak instantaneous gradient of 156 mmHg. The aortic valve was bicuspid as well (annulus 22 mm) with a peak instantaneous gradient of 100 mmHg and a mean gradient of 60 mmHg across the valve. There was biventricular hypertrophy with normal ventricular function.

Given the favorable morphology of the aortic and pulmonary valves it was decided to take the patient to the catheterization laboratory and attempt balloon dilation of both valves, under conscious sedation. Right and left heart catheterization demonstrated the peak-to-peak gradients across the aortic and pulmonary valves of 68 mmHg and 96 mmHg respectively. The aortic valve was balloon dilated first with a 20x40 mm Tyshak II balloon, followed by the pulmonary valve which required a 23x50 mm Tyshak II balloon. At both valves, the balloons were dilated twice until there was a complete disappearance of the stenotic waist. On catheter pullback post intervention, the peak-to-peak gradients across the aortic and pulmonary valves were recorded as 6 mmHg and 16 mmHg respectively. There were no complications during the procedure and the post procedure echocardiogram showed mild AR and mild to moderate PR.

Discussion

Isolated aortic or pulmonary valve stenosis is a common congenital as well as acquired lesion, with an incidence of 3-8% for the aortic valve and 8-10% for pulmonary valve stenoses[5]. A combination of the two in a single patient is very rare and has been mentioned in literature via few case reports[1, 2, 3, 4,] which have described patients from neonates to an octogenarian, and some with associated septal defects[6,7,8].

Despite its rare occurrence, it is vital to recognize and correctly diagnose this entity as incomplete management can be catastrophic. Relief of obstruction at either one valve has been reported in literature to be fatal[4]. If only the left sided obstruction is relieved, the right sided obstruction will cause decreased pulmonary venous return and low cardiac output, followed by shock and death. Similarly, relieving the pulmonary obstruction without relieving left outflow obstruction can lead to increased pulmonary blood flow and pulmonary edema[4]. While planning our case, we decided to

balloon the aortic valve before the pulmonary valve to avoid a sudden increase in pulmonary blood flow and possible pulmonary edema. However, in one case report with similar lesion, the pulmonary valve was dilated prior to the aortic valve with successful results[8].

Although, ours is not the first reported case of combined aortic and pulmonary valvar stenoses, this entity remains very rare and requires a high index of suspicion when isolated aortic or pulmonary valve stenosis are seen on echocardiogram. The importance of correctly diagnosing this lesion cannot be underscored enough, given the fatal consequence of relieving just the left or right sided obstruction. It is also vital to relieve these obstructions during a single procedure and not perform them in a staged manner due to the complications cited above.

Balloon valvuloplasty has become the standard first line procedure for isolated pulmonary or aortic valve stenosis, however given that combined obstruction of both valves is extremely rare, there are no specific treatment guidelines for the same. We decided to attempt balloon valvuloplasty for our patient before subjecting her to surgery, given the favorable appearing valve morphology, age of the patient and our experience with the procedure. The procedure successfully relieved both obstructions and the patient has not developed any restenosis as seen on follow up echocardiograms. She had a small secundum atrial septal defect, which is being followed and is not hemodynamically significant yet.

Our patient had severe obstruction at both valvar levels, however, there might be cases with milder obstruction at one valve more than the other with the potential to increase. Therefore, it cannot be stressed enough that combined stenoses of aortic and pulmonary valve should not be missed on echocardiogram and when an isolated stenosis of one semilunar valve is encountered, the other valve should be completely and thoroughly examined.

References

1. Steinberg I. Holswade GR. Combined congenital valvular pulmonic and calcified aortic stenosis: angiocardiographic diagnosis and surgical treatment of an adult. Am J Roentgenol Radium Ther Nucl Med. 1967; 100:290–298.
2. Morgan JR. Combined aortic and pulmonic valvular stenosis with an ostium primum atrial septal defect. Chest. 1972; 61:510–512.
3. Velasco C1, Bautista-Hernandez V, Sacristán F, et al. Combined aortic and pulmonic stenosis in an octogenarian: findings from echocardiography, catheterization, and pathology. Circulation. 2014 Feb 4;129(5):614-5.
4. Nadas AS, Van Der Hauwaert L, Huck AJ, et al. Combined aortic and pulmonic stenosis. Circulation. 1962 Feb; 25:346-55.
5. Hoffman JI, Christianson R. Congenital heart disease in a cohort of 19,502 births with long-term follow-up. Am J. Cardiol 1978;42(4):641–7.
6. Horlick L, Merriman JE. Congenital valvular stenosis of pulmonary and aortic valves with atrial septal defect. Am Heart J 1957;54(4):615–20.
7. Shemin RJ, Kent KM, Roberts WC. Syndrome of valvular pulmonary stenosis and valvular aortic stenosis with atrial septal defect. Br Heart J 1979;42(4):442–6.
8. Chandrashekhar Y, Sen S, Bidwai PS, Khattri HN. Syndrome of combined aortic and pulmonary valve stenosis: successful treatment with balloon dilatation. Am Heart J 1994;127(6): 1631–3.

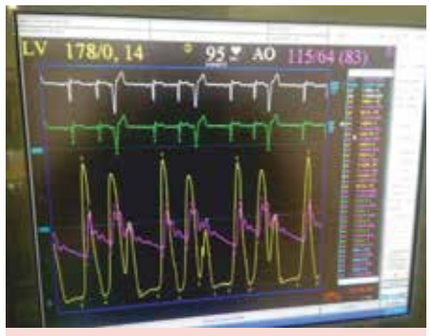


Figure 1: Post Aortic Balloon Valvotomy Left Ventricular and Aortic pressure trace

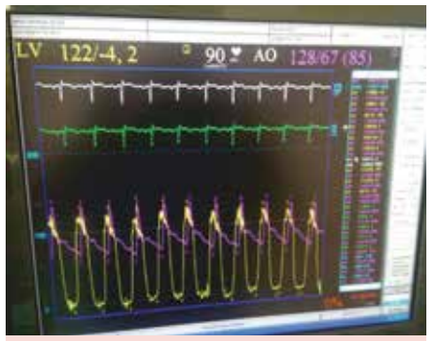


Figure 2: Pre-Aortic Balloon Valvotomy Left Ventricular and Aortic pressure trace

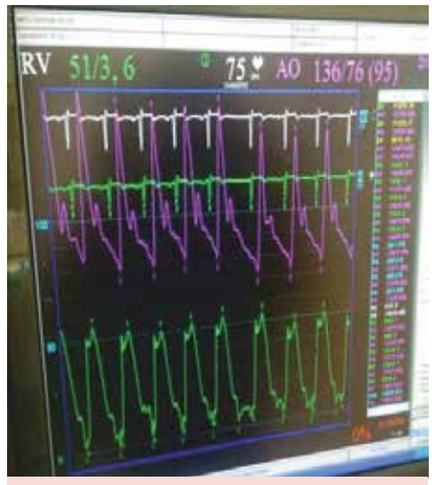


Figure 3: Post Pulmonary Balloon Valvotomy Right Ventricular and Aortic pressure trace

Figure 4: Pre-Pulmonary Balloon Valvotomy: Right Ventricular and Aortic pressure trace

An Interesting Case of Incessant Tachycardia in a Young Female

Dr Anil Saxena
Executive Director -
Electrophysiology & Cardiac Pacing,
Fortis Escorts Heart Institute,
Okhla, New Delhi

Dr Aparna Jaswal
Director - Electrophysiology
& Cardiac Pacing
Fortis Escorts Heart Institute,
Okhla, New Delhi

Dr Ravikant Telikicherla
Associate Consultant - Cardiology, Fortis Escorts Heart Institute, Okhla, New Delhi

An 18year old student presented to us with recurrent palpitation since 1 year. There was no history of presyncope or syncope. She had a small Patent Ductus Arteriosus (PDA) which closed spontaneously during childhood. A 12 lead electrocardiogram during tachycardia showed a narrow complex tachycardia with long RP interval, P wave morphology being negative in the inferior leads, V1; positive in Lead I and aVL and biphasic in V2-V6 (Fig1). Baseline 12 lead ECG showed an ectopic atrial rhythm with P wave morphology being similar to that of the tachycardia.

A 2D echocardiogram and Cardiac MRI showed structurally normal heart with no evidence of PDA. 24 hour holter study revealed incessant supraventricular tachycardia (63% of the time in tachycardia) and tachycardia being initiated with a sinus beat. Carotid sinus massage terminated the tachycardia. A differential diagnosis of atrial tachycardia or Paroxysmal Junctional Re-entrant Tachycardia (PJRT) was made. She was symptomatic despite maximum tolerable doses of medication; a trial of medication was given for 6-9 months.

Thereafter, she was taken up for electrophysical study with 3D electroanatomical mapping. She was in incessant tachycardia during the study which was similar to the clinical tachycardia. The tachycardia cycle length was 425msec with long VA interval (273msec) with concentric atrial activation (Proximal to distal CS activation). Ventricular overdrive pacing showed VAAV response with VA dissociation. His refractory VPC did not pre excitate or post excitate the tachycardia. Tachycardia was induced spontaneously (Fig 3).

During sinus rhythm, basal intervals were normal with no evidence of preexcitation on rapid atrial pacing. There was concentric atrial activation on ventricular pacing suggesting no evidence of any accessory pathway. Even it was confirmed with Ventricular pacing after giving adenosine which showed VA block at 500msec. The diagnosis of Ectopic atrial tachycardia was confirmed.

3D mapping of the Right Atrium (RA) was done with CARTO 3 version 7 system using NAVISTAR unidirectional catheter. Activation mapping of the right atrium showed earliest activation point at the inferior part of the Crista Terminalis region (Figure 4).

Propagation velocity mapping revealed the tachycardia to be focal in origin (with early not meeting Late) arising from the same point. Lesion given at the target site with NAVISTAR unidirectional catheter at 40°C, 30W for 8 seconds. Tachycardia was terminated (Figure 6).

On follow up, she was asymptomatic and holter showed no runs of SVT or atrial ectopics with echo showing normal LV function.

Focal AT represents 3-17% of SVT referred for ablation1.8-10% of focal AT develop Tachycardia Induced Cardiomyopathy (TIC)2. Typically seen in structurally normal hearts. Adenosine response can differentiate focal AT from re-entrant At3. Right atrial focal tachycardias are far more common than left atrial tachycardias (73% vs 27%). Crista terminalis is the commonest site in the right atrium. However, lower part of crista is a rare site for the origin of focal atrial tachycardias (Figure 7).

Our patient had focal atrial tachycardia arising from the lower part of the crista terminalis which is a rare site. Successful ablation was done in our patient. Success rate of catheter ablation of focal atrial tachycardia is 90% (acute) with electro anatomical mapping with a recurrence rate of 8% over 6 months[4].

References

1. 2015 ACC/AHA/HRS Guideline for the Management of Adult Patients With Supraventricular Tachycardia: Executive Summary: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society Richard L Page, José A Joglar
2. Pathophysiology, diagnosis and treatment of tachycardiomyopathy, BMJ 2017, Claire A Martin and Pier D Lambiase
3. Mechanism of Adenosine-Induced Termination of Focal Atrial Tachycardia Satoshi Higa, C. Tai,
4. Radiofrequency ablation of focal atrial tachycardia: Benefit of electroanatomical mapping over conventional mappingN Szegedi [1],E Zima[1]etal.. https://doi.org/10.1556/ 036.102.2015.3.3

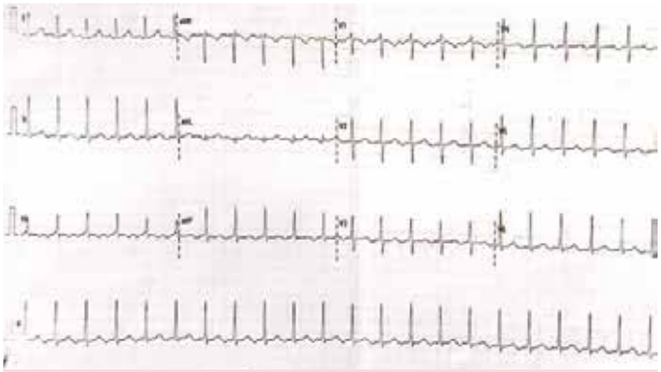


Figure 1: 12 Lead ECG during Tachycardia showing Long RP tachycardia with the P wave morphology as discussed above

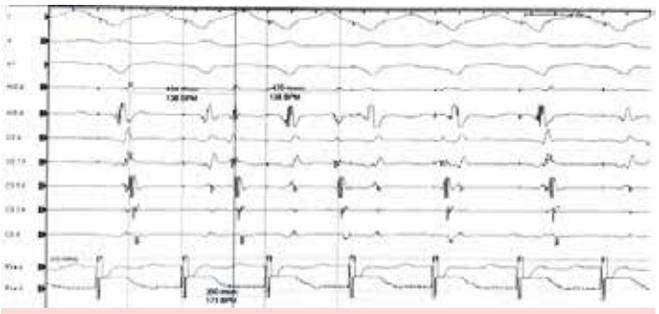


Figure 2: On ventricular overdrive pacing during tachycardia - There was VA dissociation. CS-coronary sinus, ABL-ablation catheter, RVa- Right Ventricular apex

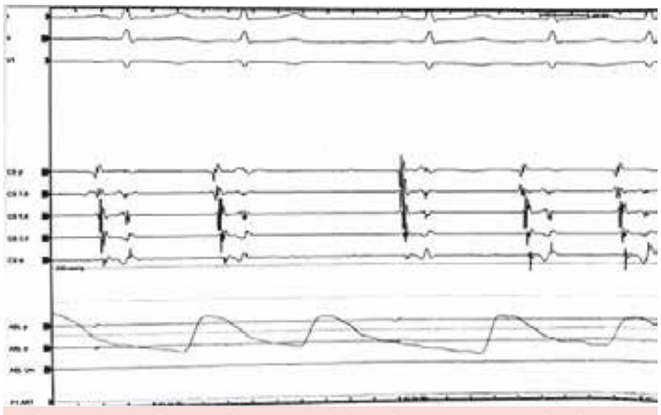


Figure 3: Tachycardia was initiated spontaneously during the EP study. The activation pattern in CS being the same during the sinus rhythm and tachycardia

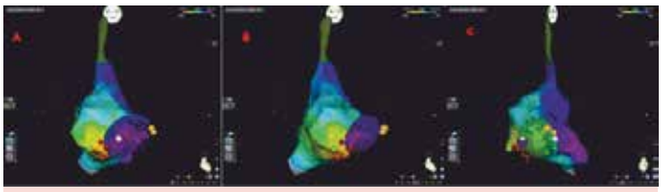


Figure 4: Activation mapping of Right Atrium (RA) showing earliest activation site at the inferior part of the Crista Terminalis in A. AP view B. RAO view C. LAO view. Red shows earliest activation points and Blue shows latest activation point. In this figure, earliest activation point is noted in the Inferior crystal region. Unidirectional electrodes showed QS at the point of the earliest activation (Figure 5)

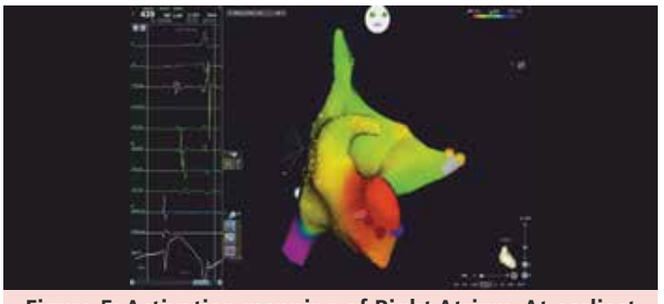


Figure 5: Activation mapping of Right Atrium. At earliest point tagged, QS noted in the unipolar electrode

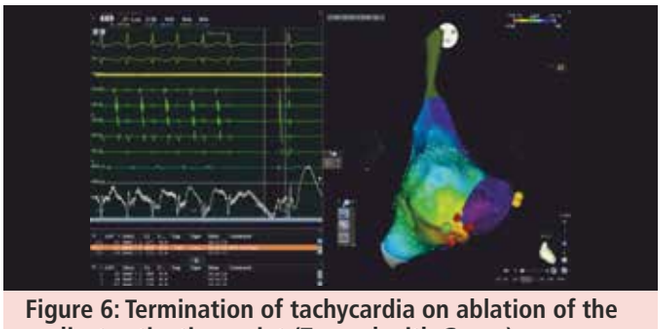


Figure 6: Termination of tachycardia on ablation of the earliest activation point (Tagged with Green)

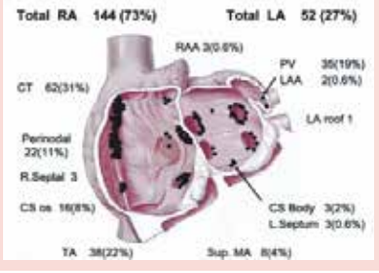


Figure 7: Site of origin of Focal atrial tachycardias adopted from Peter M Kistler, Kurt C Roberts - Thomason etal

Permanent Pacemaker Implantation in a Young Patient of Symptomatic Sick Sinus Syndrome (Tachycardia – Bradycardia Syndrome) with Syncopal Attacks

Source:- This Case Report is under review for publication in the Journal of Indian College of Cardiology (Reference number "jicc_28_22". (https://www.joicc.org)

Dr Amit Kumar Singhal
Senior Consultant - Cardiology
Fortis Escorts Hospital, Jaipur

Topic

Permanent Pacemaker Implantation in a young Patient of Symptomatic Sick Sinus Syndrome (Tachycardia-Bradycardia Syndrome) with Syncopal Attacks

Abstract

Symptomatic Sick Sinus syndrome (Tachycardia Bradycardia Syndrome) in otherwise healthy young patients, leading to syncopal attacks & requiring pacemaker implantation is an uncommon entity. Herein I describe a case of a 27-year-old otherwise healthy female who presented with complaints of recurrent syncopal attacks since last two months. Evaluation (Holter monitoring) revealed episodes of inappropriate sinus bradycardia during syncopal attacks along with episodes of atrial fibrillation leading to palpitations off & on (Tachycardia Bradycardia Syndrome) with normal sinus rhythm in between. No other correctable cause was detected during evaluation. Patient responded dramatically after dual chamber permanent pacemaker implantation. Rhythm abnormalities can lead to syncope or other neuro-cardiac symptoms & can occur in otherwise normal people with a structurally normal heart. Proper assessment with high index of suspicion can detect such manageable symptomatic intermittent arrythmias.

Introduction

Sino-Atrial (SA) node is the default pacemaker in the heart. Congenital, acquired, degenerative and idiopathic causes [1,2,5] can lead to dysfunction in the conduction system including the SA & AV nodes. Sick Sinus Syndrome is a constellation of different combinations [1,2,3,4] of the cardiac conduction system disorder that includes sinus pauses, inappropriate sinus bradycardia, variable degrees of SA & AV nodal blocks, sinus arrest & tachycardia-bradycardia syndrome [1,2,5]. The present case report is a rare case of symptomatic sick sinus syndrome (Tachycardia-Bradycardia Syndrome) with syncopal attacks in a young patient requiring pacemaker implantation. These cases are rarely reported in literature and helps the medical fraternity in understanding the diversity of diseases associated with the conduction system of heart.

Key Words

Sick Sinus Syndrome, Syncopal attacks, Tachycardia-Bradycardia Syndrome, Permanent Pacemaker

Case History

27 year old female patient presented with complaints of episodes of loss of consciousness & palpitations off and on since last 2 months. Patient evaluated for the cause thoroughly. Patient was averagely built & nourished with no major abnormalities on General Physical Examination & Systemic evaluation, except for pallor. Blood investigations revealed anaemia with normal liver & renal functions, normal thyroid profile & serum electrolytes. No family history of similar illness, normal antenatal & perinatal course with normal childhood milestones. No evidence of collagen vascular diseases were detected, ANA were not detected in serum. CXR, USG abdomen were normal as do 2D Echo with normal LV ejection fraction & structurally normal heart. Patient was not on any drugs with negative chronotropic effects. Holter monitoring revealed episodes of extremely slow heart rate (inappropriate sinus bradycardia) coinciding with episodes of giddiness & syncope & episodes of atrial fibrillation coinciding with episodes of Palpitations. Patient diagnosed as case of Symptomatic Sick Sinus Syndrome (Tachycardia-Bradycardia Syndrome) with Syncopal attacks & managed accordingly.

Discussion

Symptomatic Sick sinus syndrome in young patients requiring Pacemaker Implantation is an uncommon entity. Rhythm abnormalities, specially brady arrythmias can lead to impaired cerebral perfusion, leading to fainting, giddiness & syncope. Differential diagnosis of syncope in young patients involves seizures, cyanotic spells in Patients with Cyanotic CHD, hysterical reaction, Neuro Cardiogenic Syncope (Vasovagal reaction), stenotic valvular heart disease, tachy-arrythmias & idiopathic ones. Brady arrythmias in young Patients as cause of syncope is lesser appreciated in clinical practice & often missed as a cause, especially when it is intermittent in nature with normal rhythm in between episodes of syncope. High index of suspicion with rhythm monitoring for appropriate durations (Holter, Loop recorders) can help in detecting intermittent symptomatic brady arrythmias.

Summary

Symptomatic Sick Sinus Syndrome (Tachycardia Bradycardia Syndrome) in otherwise healthy young Patients is an uncommon entity. Patients with structurally normal heart & without any other comorbidities can develop this disorder. High index of suspicion & proper assessment using rhythm monitoring with Holter/ILR can detect these arrythmias. It is amenable to treatment with suitable devices.

References

1. Kristen K Patton & Jeffrey E Olgin-Braunwald's Heart Disease-12th Edition-Pages 1313-15
2. Adan V, Crown LA-Diagnosis & treatment of Sick Sinus Syndrome-Am Fam Physician-2003 Apr 15;67(8):1725-32
3. Dobrzynski H, Boyett MR, Anderson RH-New insights into Pacemaker activity: promoting understanding of Sick Sinus Syndrome-Circulation 2007
4. Semelka M,Gera J,Usman S -Sick Sinus Syndrome: a review-Am Fam Physician-2013 May15;87(10):691-6
5. Gary Tse,Tong Liu,et al-Tachycardia-Bradycardia Syndrome: Electrophysiological mechanisms & future therapeutic approaches (Review)-International Journal of Molecular Medicine 2017 Mar;39(3):519-526.

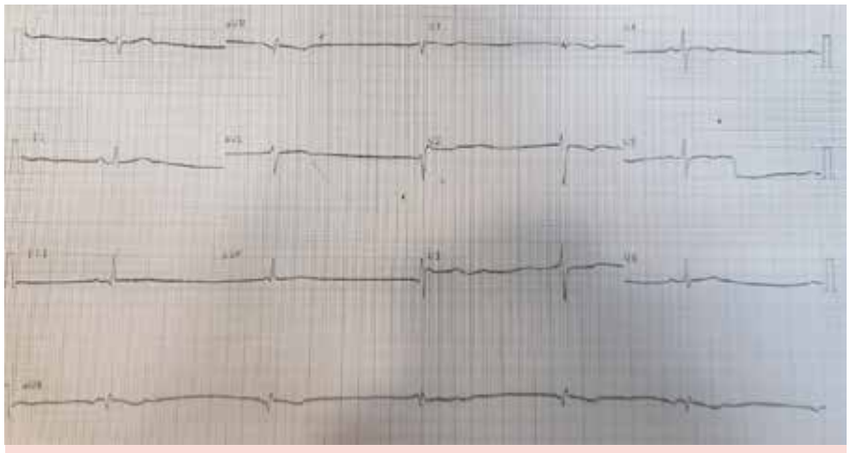


Figure 1: Bradycardia

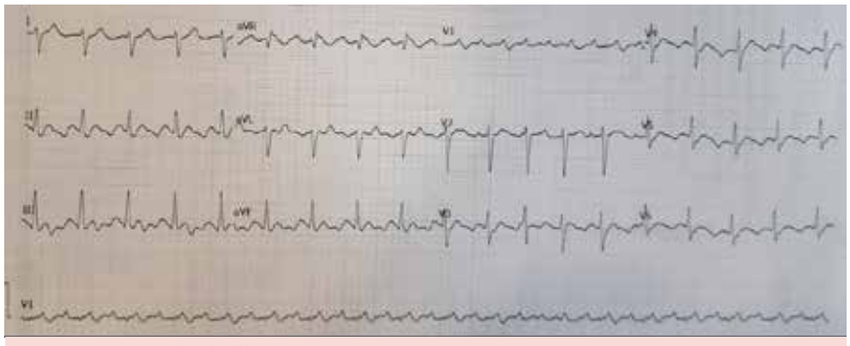


Figure 2:Atrial Fibrillation

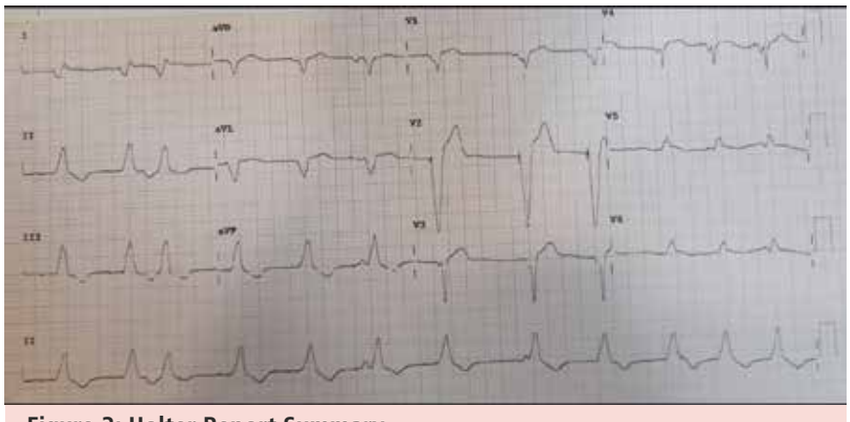


Figure 3: Holter Report Summary

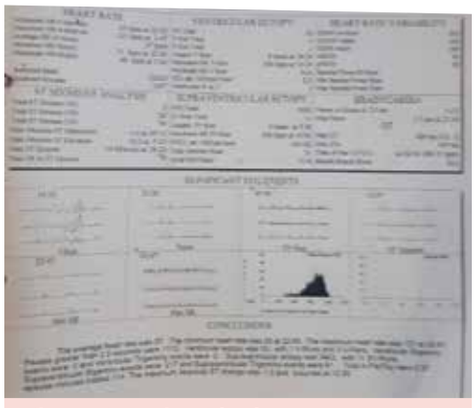


Figure 4: Pacing Rhythm

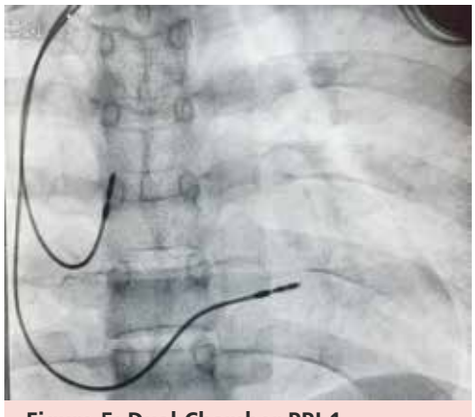


Figure 5: Dual Chamber PPI 1

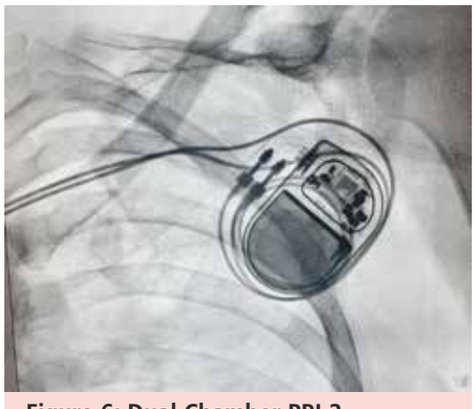


Figure 6: Dual Chamber PPI 2

Stellate Ganglion Block and Neurolysis for Refractory Ventricular Arrhythmia

Dr Anurag Aggarwal
Senior Consultant and HOD - Emergency Medicine
Fortis Hospital, Noida

Co-Authors:
Rohit Balyan, Varun Suresh, Bhavna Gupta

Abstract

Enhanced electrical activity, ventricular arrhythmia (VA), and cardiac instability due to increased sympathetic tone may be refractory to standard medical treatment and ablation procedures. Stellate ganglion block (SGB) has been used to treat refractory VA; however, there is insufficient information in the literature on its long-term outcome. Herein, we described three patients that were successfully treated with ultrasound-guided left SGB (LSGB) and chemical neurolysis. Ultrasound-guided LSGB may be considered as rescue or bridge therapy for stabilizing ventricular rhythm before a definitive procedure is planned.

Introduction

Recurrent and refractory ventricular arrhythmias (VAs) are major hemodynamic events that predict morbidity and mortality in cardiac disease patients.[1] Medical and cardiac-electrophysiological therapies aimed at downscaling these arrhythmias can significantly improve the patient outcomes.[2] The role of the autonomic nervous system (ANS) in the escalation of cardiac arrhythmogenicity must not be overemphasized; however, down-regulatory ANS therapies are not without systemic adverse effects.[3] Novel therapies such as cardiac sympathetic denervation, catheter ablation of arrhythmia trigger zone, thoracic epidural blockade (TEB), spinal cord stimulation (SCS), and stellate ganglion blocks (SGB) assume relevance in this context.[4] SGB, a widely used diagnostic/treatment modality for vascular insufficiency and sympathetically mediated upper extremity pain, has gained considerable acclaim for managing highly selected cases of refractory VA.[5] We report three patients with refractory VA management due to varied etiology, who were treated with left SGB (LSGB) under ultrasonography and fluoroscopy guidance. Written informed consent was obtained from all the participating patients or their legal representatives.

CASE REPORTS

Case 1:

A 54-year- old male patient diagnosed with hypertrophic obstructive cardiomyopathy, with left ventricular ejection fraction (LVEF) 45% presented to us with episodes of recurrent symptomatic ventricular tachycardia (VT) [Table 1]. The patient had undergone alcohol septal-ablation and implantable cardioverter-defibrillator (ICD) placement 3 months prior. Subsequently, the patient had undergone radiofrequency ablation of VT trigger zone with 3-dimensional mapping using the CARTO mapping system. Under fluoroscopic and ultrasonographic guidance, we performed an LSGB with bupivacaine 0.5% and subsequently left stellate ganglion chemical neurolysis with phenol [Figure 1c]. Sinus rhythm with intermittent sinus tachycardia was achieved immediately after the procedure. Thereafter, on 8 months periodic follow-up, the patient remained free of VA, and medical management was de-escalated to single oral anti-arrhythmic.

Case 2

A 62-year-old female patient with acute myocardial infarction (LVEF 25%) underwent percutaneous coronary intervention (PCI). Post PCI, the patient was mechanically ventilated (MV) because of ongoing congestive heart failure. The patient sustained recurrent VT intractable to lignocaine and amiodarone intravenous (IV) infusions in the intensive care unit. Check coronary angiogram revealed no residual or subacute thrombus. We conducted LSGB [Figure 1a and b] using a local anaesthetic (LA) after which, anti-arrhythmic infusions were tapered and discontinued and block repeated after 48 h with similar dose of LA [Table 1]. The patient was serially weaned off from MV and anti-arrhythmic infusions.

Case 3

A 68-year-old patient with triple-vessel coronary artery disease developed recurrent VT with cardiogenic shock immediately following coronary artery bypass graft surgery [Table 1]. Arrhythmia is resistant to medical management (IV amiodarone, lignocaine, and esmolol infusion) and electrical cardioversion. Bedside ultrasound-guided LSGB

[Figure 1a and b] terminated VT, however the patient was on mechanical ventilation and hemodynamic was supported with noradrenaline and intra-aortic balloon pump and arrhythmia were controlled on amiodarone infusion. However, on the 5th postoperative day, this patient succumbed to a resistant cardiogenic shock.

Conclusion

LSGB may serve as a rescue option in refractory cases to standard treatment protocols for patients with VA. It can reasonably be recommended as an alternative therapy or as part of combination therapy for the management of ES or recurrent VA.

References

1. Gao D, Sapp JL. Electrical storm: Definitions, clinical importance, and treatment. Curr Opin Cardiol 2013;28:72 9.
2. Albert CM, Stevenson WG. The future of arrhythmias and electrophysiology. Circulation 2016;133:2687 96.
3. Shen MJ, Zipes DP. Role of the autonomic nervous system in modulating cardiac arrhythmias. Circ Res 2014;114:1004 21.
4. Shivkumar K, Ajijola OA, Anand I, Armour JA, Chen PS, Esler M, et al. Clinical neurocardiology defining the value of neuroscience-based cardiovascular therapeutics. J Physiol 2016;594:3911-54.
5. Fudim M, Boortz-Marx R, Ganesh A, Waldron NH, Qadri YJ, Patel CB, et al. Stellate ganglion blockade for the treatment of refractory ventricular arrhythmias: A systematic review and meta-analysis. J Cardiovasc Electrophysiol 2017;28:1460-7.

Figure 1: (a and b) Lateral axial view of the ultrasound neck Image at the C7 vertebral level. (a) Showing identification of C7 transverse process and surrounding structures for giving stellate ganglion block at an appropriate level. (b) Showing echogenic needle trajectory approaching the target point toward cervical sympathetic chain and stellate ganglion. (c) Oblique and anti-posterior fluoroscopic images of the stellate ganglion block's performance. The stellate ganglion, composed of the inferior cervical ganglion and the first thoracic ganglion, is anterior to the first rib's neck, extending to the lower side of the transverse process of the 7th cervical vertebrae. C-arm was obliquely rotated to the left to allow adequate visualization of the neural fortamine. The needle was directed at the uncinate process's junction with the vertebra

Variable	Case 1	Case 2	Case 3
Age (years)	54	62	68
Gender	Male	Female	Male
Type and frequency of VA	Recurrent VT, 3-4 episodes per day	Recurrent VT, 4-5 episodes per day	Recalcitrant VT in the postoperative period after CABG Ischemic
Underlying pathology	Hypertrophic obstructive cardiomyopathy	Ischemic heart disease after PCTA	cardiomyopathy after CABG on IABP
LVEF	45	25	20
Possible trigger	No triggers	Inadequate sedation	Inadequate sedation
Anti-arrhythmic medications used	Oral-amiodarone and sustained release metoprolol	Intravenous-lignocaine and amiodarone infusion	Intravenous-amiodarone, lignocaine, esmolol
Procedure/treatments received before or after SGB	Alcoholic septal ablation with implantable cardioverter defibrillator in situ	Nil	Nil
Interventional technique	Left SGB with bupivacaine under fluoroscopic guidance followed by left SG chemical neurolysis with 6ml of 8% phenol under ultrasonography and fluoroscopic guidance	Left SGB with bupivacaine 0.25% under ultrasonography guidance, repeated with same dose after 48 h	Left SGB with bupivacaine under ultrasonography guidance
Type and volume of LA Immediate follow-up	12 mL of 0.5% bupivacaine plain Arrhythmia-free for 48 h immediately after SGB	8 mL of 0.25% bupivacaine plain Arrhythmia-free for 48 h on Amiodarone infusion	10 mL of 0.25% bupivacaine plain Left SGB ceased VT for 48 h
Reduction of VA and defibrillator shocks	No shockable rhythm post-SGB	No shockable rhythm post-SGB	No shockable rhythm post-SGB
Long-term follow-up	Arrhythmia free on periodic follow-up up to 8th postprocedural month; continued on oral metoprolol only	VA controlled on oral amiodarone and metoprolol	Mortality

CABG: Coronary artery bypass grafting, IABP: Intra-aortic balloon pump, LA: Local anesthetic, LVEF: Left ventricular ejection fraction, PTCA: Percutaneous transluminal coronary angioplasty, SGB: Stellate ganglion blockade, VA: Ventricular arrhythmia, VT: Ventricular tachycardia

Table 1: Demographic and patient characteristics of the cases studied

Hand Sewn Valved Conduit for the Right Ventricular Outflow

Dr Nischal R. Pandya
Consultant - Paediatric Cardiac Surgery
Fortis Hospitals, Bangalore

Introduction

A right ventricular (RV) to pulmonary artery (PA) conduit is an integral part of the operation for the correction of many conotruncal anomalies that include Tetralogy of Fallot physiology or even a right ventricular outflow tract (RVOT) obstruction (RVOTO) at various valvar/sub valvar levels. The options for reconstructing the RVOT lesions is not always permanent and may be very expensive at times. We would like to highlight the use of hand sewn valved conduits in such cases and some of their advantages.

Case 1

A two-year old male child presented with the diagnosis of Tetralogy of Fallot-pulmonary atresia and confluent branch PAs with fair sized branch pulmonary arteries (left smaller than right). He underwent intra-cardiac repair (ICR)with MAPCA take down for the same and a hand sewn valved Gore-Tex (Gore-Tex, WL Gore and Associates Inc, Flagstaff, Ariz) tube graft created and sutured in place of the RVOT.

The child was extubated the next day and echo showed good biventricular function with no residual shunts, mild+ pulmonary regurgitation and an outflow gradient of less than 30 mmHg. At one year, the child is growing well with no symptoms. The valved conduit is still functioning well, with no significant gradient and moderate pulmonary regurgitation with preserved right ventricular dimensions.

Case 2

A 16-year-old girl presented with the diagnosis of TOF, severe infundibular and valvar stenosis. Intraoperatively she was found to have a narrow pulmonary annulus (Z less than -2.5) with severe infundibular tubular stenosis and she underwent an ICR and a hand sewn valved Gore-Tex graft was sutured into the RVOT.

The patient was extubated the same evening and weaned off supports over the next 48 hours. Post-operative echo showed mild pulmonary valvar regurgitation with a gradient of 24 mm Hg.

Discussion & Conclusion

Gore-Tex valved conduits are tailored to the individual and are being used more frequently now a days. The tube and valve are made of polytetrafluoroethylene (PTFE) which is inert. Valve leaflets are made of 0.1mm PTFE which is pliable as well.

Use of this conduit helps in cases where other conduit options like homografts/Contegra/Medtronic freestyle valved conduits are not available for want of appropriate size or availability. Also some of these are quite expensive and not affordable by all. Since the PTFE material is inert the risks of calcification in the long run are less in these hand sewn PTFE valved conduits. It provides a valved RVOT which is helpful in the immediate postoperative management of these children with stiff right ventricles and also prevents the necessity of large transannular patches.

Although it does not have growth potential, it is a viable option in situations involving cases where a valved conduit is not available for various reasons. It would be interesting to see the long term follow up and how these valves perform in different situations in our settings.

Figure 1: Inverted Gore-Tex graft with sutured valves

Figure 2: Graft everted back showing valves (pulmonary confluence end)

Figure 3: Post op echo showing mild PR

Rare Cause of Cyanosis in an Adult and its Transcatheter Treatment: Large Fistula from the Pulmonary Artery to the Left Atrium

The Paediatric Cardiac Team - Fortis Hospital, Mulund

Dr Dhananjay Malankar, Dr Bharat Soni - Pediatric Cardiovascular Surgeons
Dr Swati Garekar, Dr Ronak Sheth - Pediatric Cardiologists
Dr Shivaji Mali, Dr Shyam Dhake - Pediatric Cardiac Anesthesiologists and Intensivists
Dr Dilip Bind, Dr Amit Mhatre, Dr Komal Kamdi - Pediatric Cardiac Intensivists
Mr K Dinesh and Mr S Sathish - Physician Associates
Mr Sujit Bamne - Perfusionist
Mansi Gharat and Sonal Chogale - Registered Nurses
Mr Phil - Social worker
Mr Vijay Sawant - Coordinator
Ms Vidya Shetty - OPD coordinator

A 29year old man presented for the evaluation of significant exertional fatigue. He had central cyanosis (saturation 80%), grade 3 clubbing and a Hb of 24g/dl. He had been evaluated on multiple occasions at other centres and treated for Kochs and pneumonia. On detailed cardiac evaluation at Fortis Hospital, Mulund, echocardiography showed a large fistula from the right pulmonary artery communicating with a dilated left atrium. The passage of blood from RPA to the LA was confirmed by agitated saline contrast echocardiography (filling of LA through the fistula within 3 cardiac cycles). A CT scan (Figure 6 chest radiograph and CT image) showed the detailed anatomy. We proceeded with transcatheter device closure of the fistula and an 18mm device (the one designed to close vsds) was deployed under (Figure 7 angiograms) under fluoroscopic and angiographic guidance to occlude it. The patient had a remarkable improvement of symptoms (normal pulse oximetry) post-procedure and at 3 months follow-up, he continues to do well.

Figure 6a: Frontal Chest Radiograph showing no cardiomegaly, normal pulmonary vascularity and rounded radio opacity at right mid cardiac border-outline marked by white arrows

Figure 6b: CT Angiography Image delineating the RPA-LA fistula

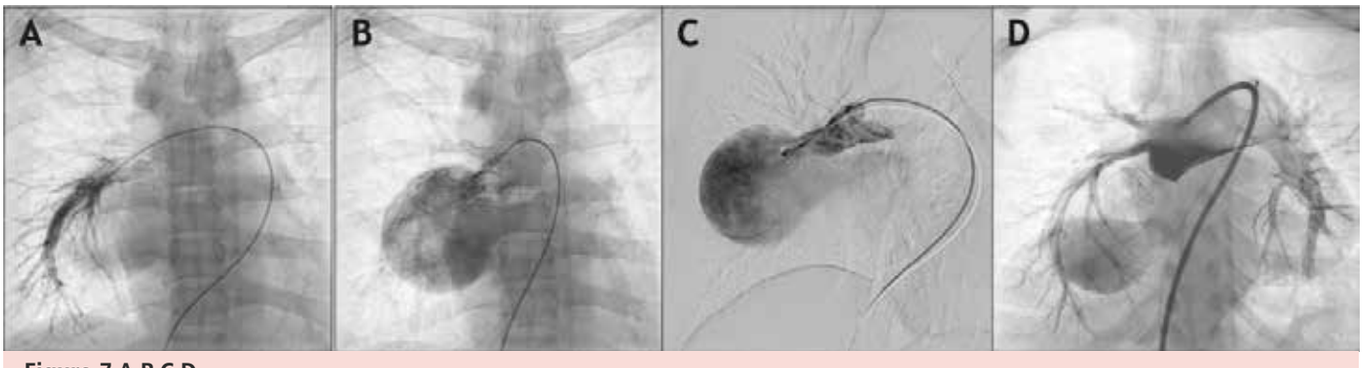


Figure 7 A,B,C,D

A Novel Malignant Anomaly of the Coronary Arteries

Dr Amreen Dhindsa
Associate Consultant - Cardiology
Fortis Hospital, Mohali

Authors:
Harinder Kumar Bali,
Surinder Kumar Bali,
Kapil Kumar Chattree

Published In:
European Heart Journal-Case Reports

A 58-year-old man presented with complaints of retrosternal chest pain and diaphoresis. Electrocardiogram revealed ST depressions in leads V2–V5. Two- dimensional echocardiography revealed an ejection fraction of 45% with moderate mitral regurgitation. Troponin-I levels were 24.1ng/mL (normal 0–0.4 ng/mL). A diagnosis of non-ST-elevation myocardial infarction was made. Coronary angiography revealed triple vessel coronary artery disease along with a unique coronary artery anomaly. The left anterior descending (LAD) had an anomalous high origin above the aortic sinus. The right coronary artery (RCA) originated from the left coronary sinus (LCS), close to the LAD ostium. The left circumflex (LCx) arose as a proximal branch of the anomalous RCA. Multidetector computed tomography (MDCT) was done. The examination was carried out by a 128-slice computed tomography with 0.8 mm acquiring thickness and 0.35 s rotation time. 100 mL of non-ionic contrast was injected at 5 mL/s. In view of atrial fibrillation, image quality was reduced. However, MDCT further confirmed the anomalous origin of RCA from LCS, close to the origin of LAD (Figures 1 and 2). The RCA had a slit-like orifice. It followed an inter-arterial course between the great vessels and continued in the right atrioventricular groove (). The LCx arose as a proximal branch of this anomalous RCA. It followed a retro-aortic course coursing behind the aortic annulus, into the left atrioventricular groove, such that the RCA and LCx formed a girdle around the aorta. The patient underwent coronary artery bypass grafting with saphenous venous graft to LAD and RCA. He later underwent percutaneous intervention to native LCx.

Figure 1: Multidetector computed tomography coronary angiography (two-dimensional axial) showing the anomalous origin of the right coronary artery from the left coronary sinus, close to the origin of the left anterior descending. The proximal part of right coronary artery is seen to follow an inter-arterial course between the aortic root and pulmonary trunk, and continues in the right atrioventricular groove. The left circumflex is seen to arise as a proximal branch of this anomalous right coronary artery and has a retroaortic course, with the proximal right coronary artery and left circumflex forming a loop around the aorta

Reference

Harinder Kumar Bali, Amreen Dhindsa, Surinder Kumar Bali, Kapil Kumar Chattree, A novel malignant anomaly of the coronary arteries (Bali's girdle), European Heart Journal - Case Reports, Volume 5, Issue 6, June 2021, ytab138, https://doi.org/ 10.1093/ehjcr/ytab138

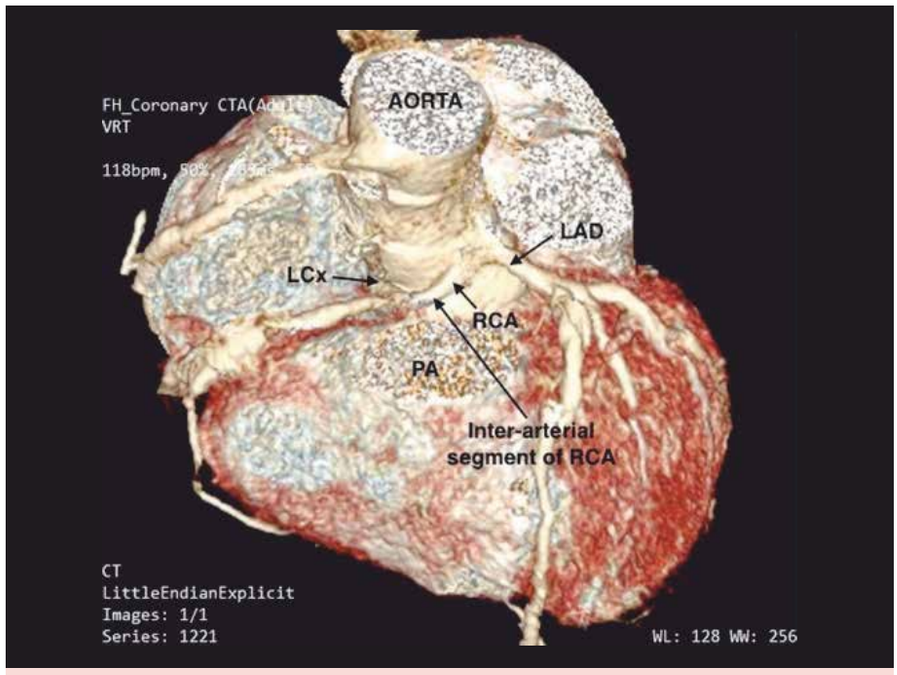


Figure 2: Three-dimensional reconstruction of multidetector computed tomography coronary angiography showing the separate origins of the right coronary artery and left anterior descending from the left coronary sinus. The proximal right coronary artery is seen to follow an inter-arterial course and the left circumflex arises as a proximal branch of the right coronary artery

Complex EPS and RFA with 3D Electro- Anatomical Mapping (EAM) Through Ensite System

Dr Rahul Singhal
Additional Director - Cardiology
and Cardiac Electrophysiology
Fortis Escorts Hospital, Jaipur

A 58 years old female, hypertensive and having non-critical CAD had undergone EPS and RFA in past for typical AVNRT. This time she presented to Fortis Hospital with recurrent palpitations to the extent she was not able to sleep at night with perspiration and ghabrahat.

Her ejection fraction was normal and the ECG revealed Atrial Tachycardia (AT). The patient was planned for EPS and RFA by 3D EAM.

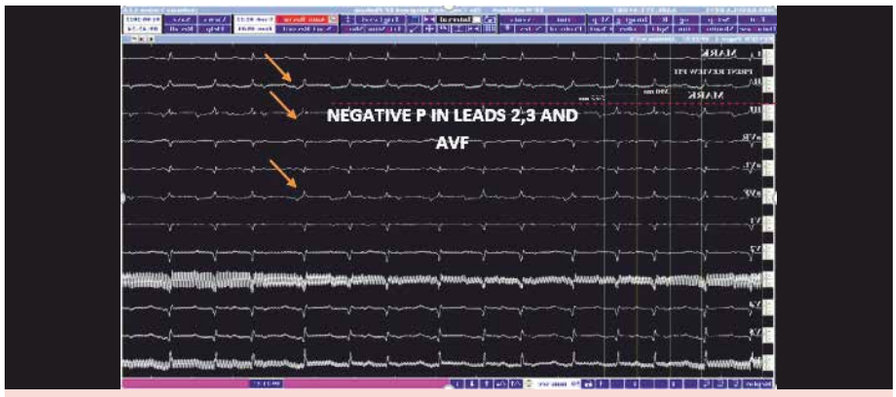
At baseline patient was in sinus rhythm. However, she continued to have episodes of spontaneously induced non-sustained episodes of AT. The catheters were placed in appropriate locations and 3D electro-anatomical geometry of RA, SVC and IVC was created with the help of mapping catheter during tachycardia. HIS area was tagged.

TACHYCARDIA 1

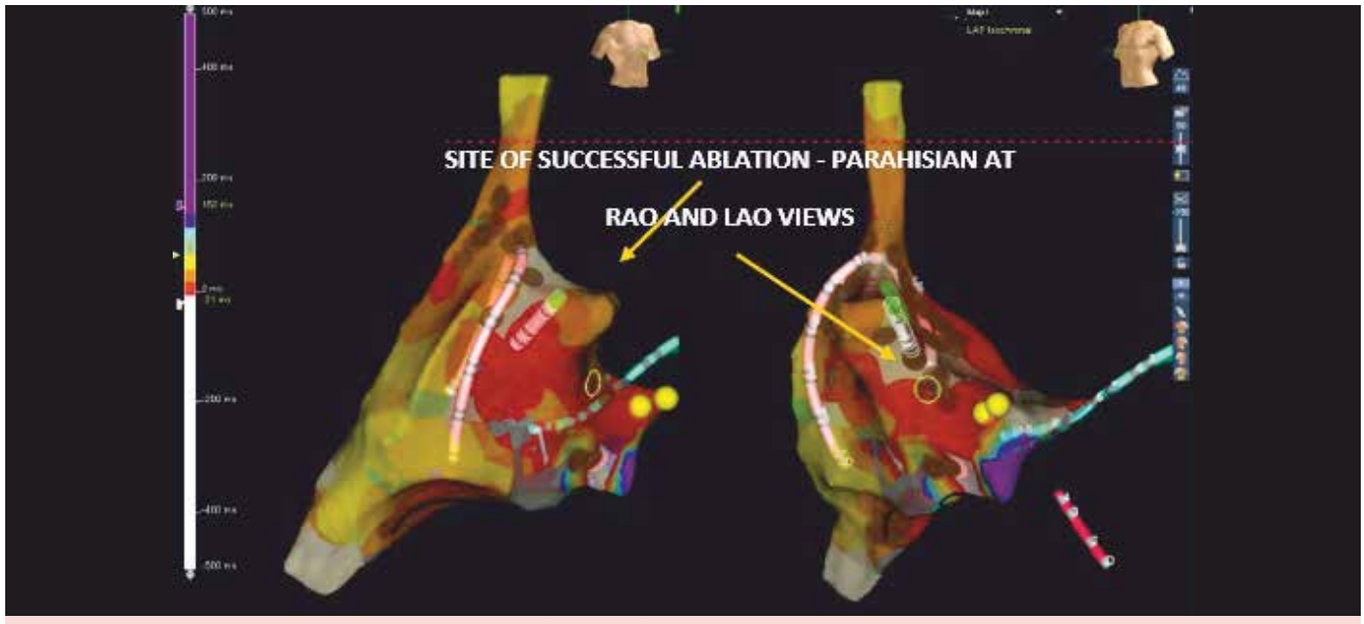
The earliest point of activation was found to be anterior septal area very close to HIS bundle. The tachycardia cycle length was 370 msec with variable 1:1 AV conduction; negative P in the inferior leads and negative/ positive in V1 (Fig.1A). The HIS area was tagged and RF ablation lesions were given at power of 40 W and temp 550 C with thermo-cool irrigation catheter. The tachycardia got terminated during RF application after 8-10 lesions. (Fig 1B).

After the termination of tachycardia (AT 1), programmed electrical stimulation of Right atrium induced another tachycardia

Figure 1: Atrial Tachycardia 1 Para-hisian AT



(A) 12 lead ECG



(B) 3D Right Atrial geometry showing the site of successful ablation

TACHYCARDIA 2

Got induced with different QRS axis. This tachycardia with TCL of 363msec; has inferior axis with positive P in L2,3 and aVF, negative in aVR, isoelectric in aVL and negative component in V1(Fig.2A). Activation mapping of this tachycardia revealed focal point of activation in the RA appendage area on the septal side. RF ablation applications were given in and around this area with power of 45 W and Temp 550 C. The tachycardia terminated during ablation, however returned back after few secs. The line of ablation was further extended down to the area around anterior septum close to previously tagged HIS region. Few lesions around this area finally terminated the tachycardia with no recurrence later on (Fig 2B).

Final Impression

3D Electro-anatomical mapping has become the time tested strategy for EPS and RFA in present era. From simple to complex procedures it makes a very difference. This patient with recurrent severely symptomatic palpitations has totally become asymptomatic at present.

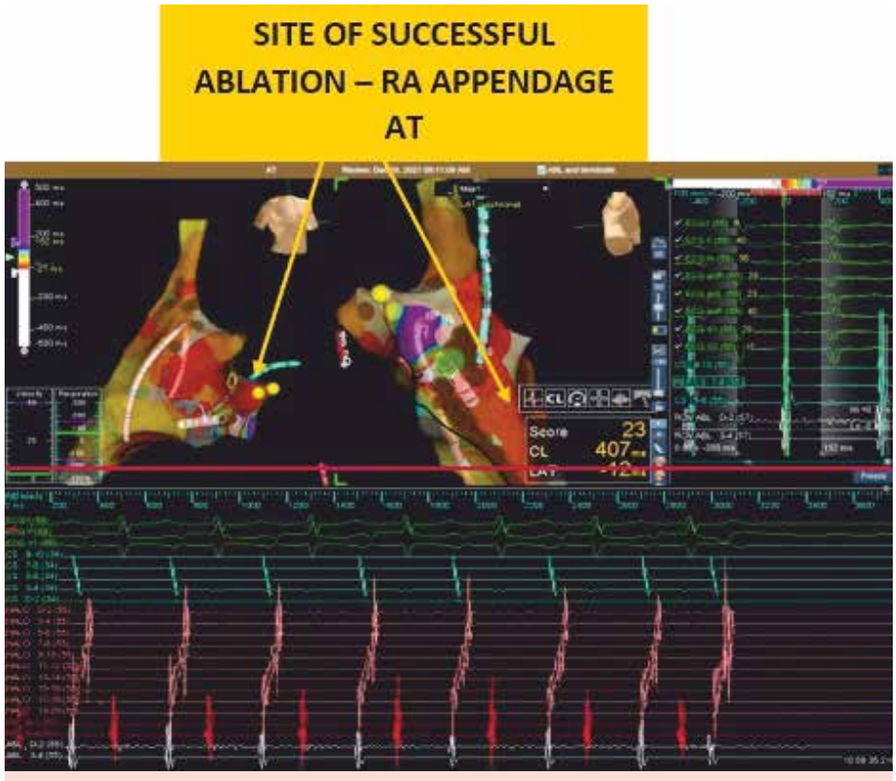
With 3D Electro-anatomical mapping complex procedures get not only more accurate but also safe and less time consuming with dramatic results.

Key Words

Dual Tachycardia, 3D EPS RFA, Ablation, Complex

Figure 1: Atrial Tachycardia 2 RA Appendage AT

(A) 12 lead ECG



(B) 3D Right atrial geometry showing the site of successful ablation

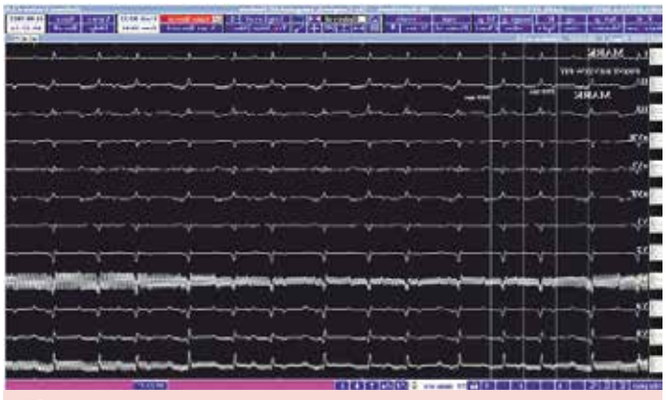


Figure 1

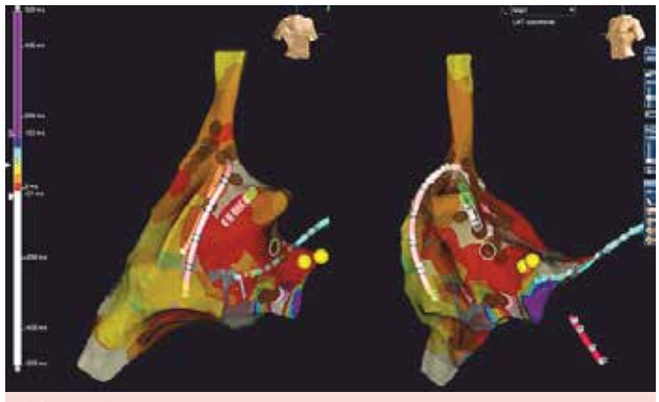
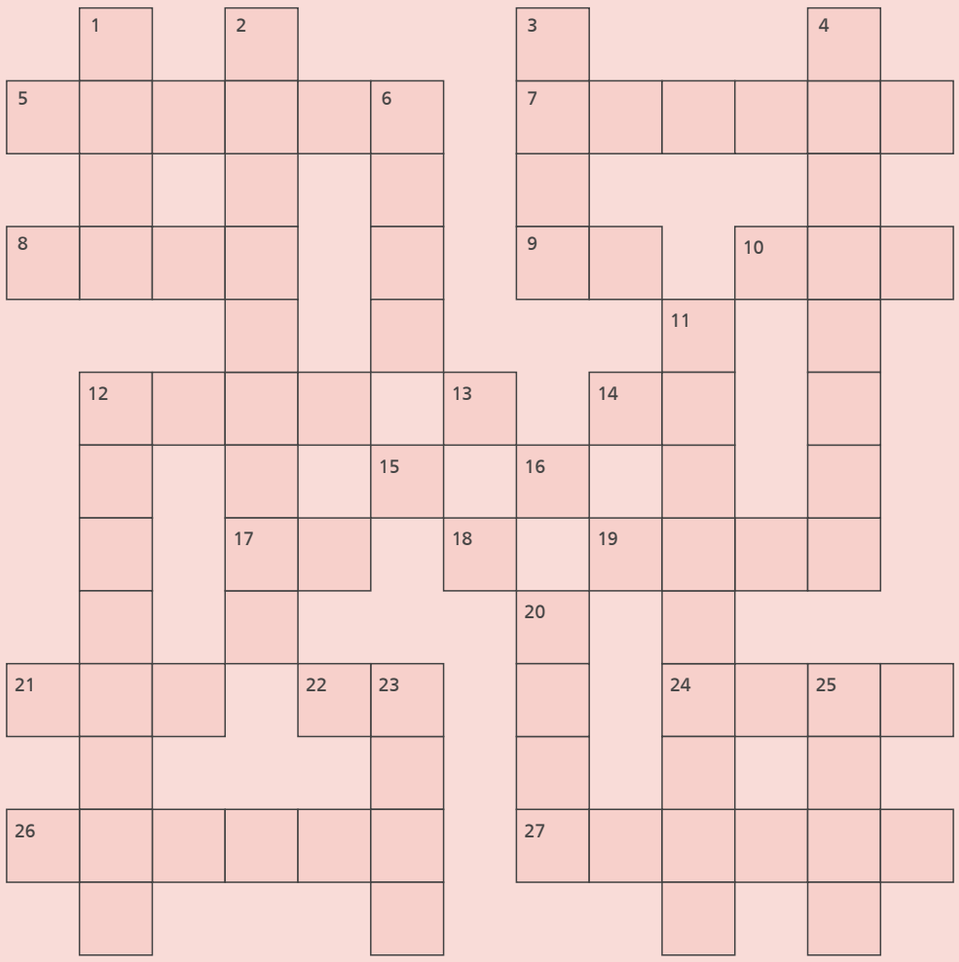


Figure 2

TRIVIA

ECG Crossword

Crosswords for this issue shared by:
Dr Bipinkumar V Daxini
Senior Consultant - Cardiology, Fortis Hospital, Mulund



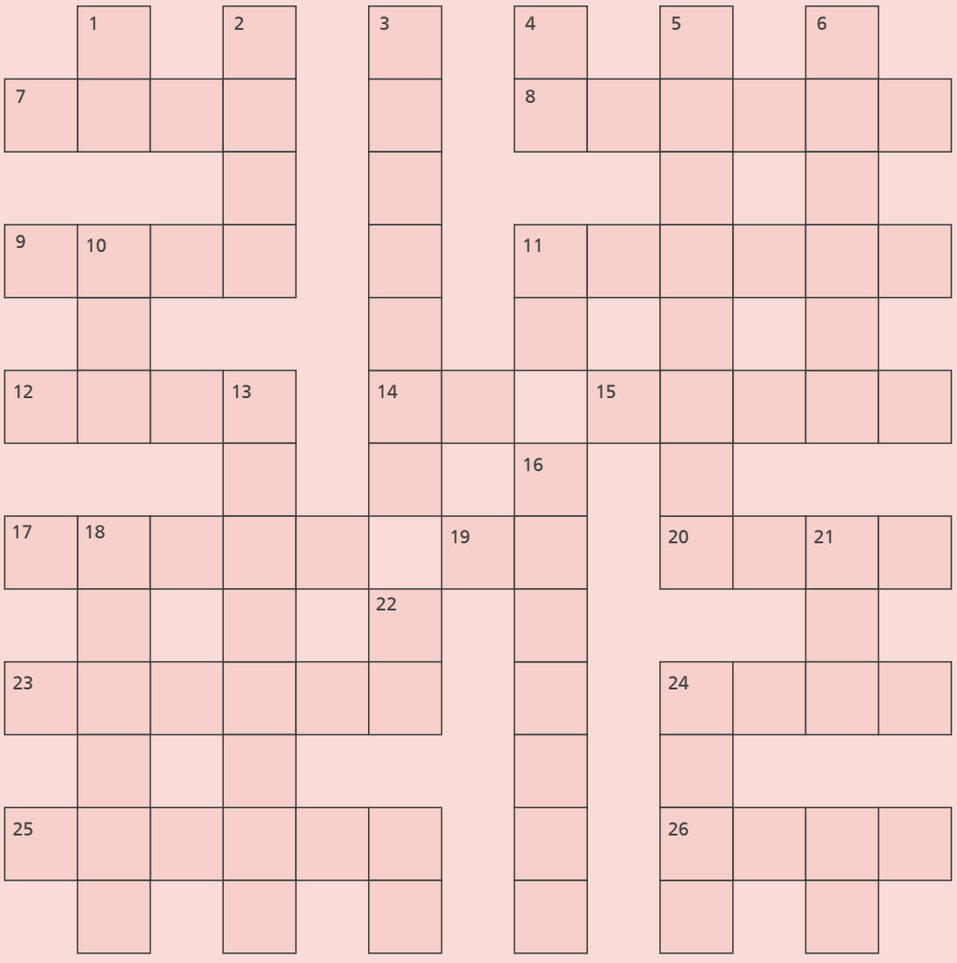
DOWN

1. The sinus _____ initiates the heart beat (4)
2. Invented first practical electrocardiogram in 1903 (9)
3. A device that performs cardioversion, defibrillation & pacing of the heart (4)
4. Electrical interferences that may distort normal ecg tracing (8)
6. The vector sum of amplitude of all 3 standard limb leads is equal to _____ (4)
11. Electrical conduction pathway between atria and the ventricle in WPW syndrome (9)
12. RBBB with coved ST elevation in V1 to V3 is referred to as Brugada_____ (8)
15. A negative deflection preceding an R wave (1)
16. The wave due to ventricular repolarisation (1)
20. Electrical mapping of heart is done by _____ polar catheter (4)
23. In Wellens syndrome T waves are _____and symmetrically inverted (4)
25. Superimposition of an ectopic beat on preceding T wave likely to initiate ventricular tachycardia (1,2,1)

ACROSS

5. The second degree AV blocks are named after him (6)
7. Flow of current from damaged to normal area of heart is called current of _____ (6)
8. Accessory conduction pathway between atria and ventricle (4)
9. Cardioversion that is life-saving in terminating ventricular fibrillation ,abr (2)
10. The bundle that transmits electrical impulses from AV node to ventricles (3)
12. AVNRT occurs due to reentrant circuit involving_____ and fast pathways in AV node.(4)
13. The wave of atrial depolarization (1)
14. This electrical interference that is displayed as a thick baseline on ecg waveform (2)
17. Study to map the electrical activity of the heart, abr (2)
18. The wave due to repolarisation of purkinje fibers (1)
19. RF ablation is the _____ treatment for AVNRT (4)
21. The ecg complex of ventricular depolarization (3)
22. Umbrella term for different causes of sudden cardiac arrest in young people, abr (2)
24. Electrophysiological parameter prolonged in sick sinus syndrome (4)
26. Right atrium receives_____ blood (6)
27. White coats worn by doctors (6)

ECHO Crossword



DOWN

7. Pulmonary-systemic flow ratio (4)
8. Its asymmetric hypertrophy occurs in HOCM (6)
9. One of the 4 pulmonary veins draining into left atrium (4)
11. Dobutamine_____ echo is used for assessing myocardial ischemia (6)
12. Plural of axis (4)
14. Stroke volume ,abr (2)
15. _____ repetition frequency is the number of pulses/sec (5)
17. Echocardiography uses high frequency sound _____ (5)
19. Aortic regurgitation, abr (2)
20. Distance between anterior mitral valve peak & the ventricular septum on M-mode tracing (4)
23. In valvular stenosis, gradients _____ the valve is increased (6)
24. The act enacted to stop female feticides (4)
25. On echocardiography aortic valve closure resembles an _____ down Mercedes benz sign (6)
26. Basic echo view showing all 4 chambers (4)

ACROSS

1. Blood pressure, abr (2)
2. Results in shunt from aorta to other heart chambers mostly right atrium, abr (4)
3. Doppler term which specifies maximum velocity that can be recorded without aliasing (7)
4. Aortic stenosis, abr (2)
5. Synthetic _____ echo imaging is better than phased array in studying anatomical details (8)
6. Assists doctors in patients care (6)
10. Short axis view, abr (3)
11. Sinus node, abr (2)
13. Rheumatic affection may cause valvular regurgitation or_____ (8)
16. Its Piezoelectric effect is the basis of echocardiography (7)
18. Other name of Bland-White-Garland Syndrome (6)
21. Sudden unexpected death due to cardiac arrest (3)
22. Narrowing of mitral valve,abr (2)
24. Basic parasternal echo view (4)

ONCO CONNECT

AFP Producing Endometrial Carcinoma : A Rare Case : Dilemma in Diagnosis and Management

Dr Rama Joshi
Principal Director - HOD Department of Gynecologic Oncology and Robotic Fortis Memorial Research Institute, Gurugram

Presenter : Dr Mala Sinha, DrNB Trainee

A 70 years old female presented with post menopausal bleeding ,evaluated for the same and Clinical diagnosis of advanced stage carcinoma ovary/carcinoma endometrium was made. Her CA125 was 105.8 and AFP was 4296ng/ml. Radiological imaging and upper GI endoscopy and colonoscopy did not reveal evidence of any primary in the liver and gastrointestinal tract.Ascitic fluid reported as mucinous adenocarcinoma with intestinal differentiation , primary of ovarian origin.Primary cytoreductive surgery with type II hysterectomy, excision of bilateral ovarian masses, fallopian tubes, diseased pelvic and abdominal peritonectomy including bilateral undersurface diaphragm peritonectomy , total omentectomy , appendectomy, excision of mesenteric disease deposits and bilateral pelvic lymphadenectomy done. Intraoperative PCI was 14.Optimal status with disease of <2.5mm scattered over bowel serosa and its mesentry at places as residual. Post operatively her recovery was good.There was pathological diagnostic dilemma and final histopathology of AFP producing endometrial carcinoma with fetal gut like and hepatoid morphology,FIGO stage IV B was made.

Point of Interest

These are rare tumors and standard line of adjuvant chemotherapy is not defined as per guidelines.

Question to the Board

Opinion regarding adjuvant and systemic chemotherapy .

Board Opinion

Chemotherapy _FOLFOX

Endometrial Carcinoma in Young Nulligravida: Genetic Counselling & Fertility Preservation

Dr Rama Joshi
Principal Director - HOD Department of Gynecologic Oncology,
Fortis Memorial Research Institute, Gurugram

Presenter :
Dr Tarini Sonwani, DrNB Trainee

A 26 years old nulligravida presented with complaint of heavy menstrual bleeding for one year and was evaluated for the same. She underwent D&C twice (outside) and the histopathology revealed endometrioid carcinoma, grade 2 (IHC- ER/PR+, Her2-, Ki67-50%, p53-wild type in most of the glands and mutant in few glands). Clinical examination and imaging showed uterus confined disease with 50% myometrial invasion. She was obese and had no medical comorbidities and no family history of malignancy. Serum Ca 125 was 104.5.

Point of Interest

Endometrial carcinoma diagnosed in very young patient,where fertility is of concern.

Question to the Board

As the disease is clinically IB endometroid carcinoma endometrium, can patient be given the advantage of oocyte preservation? As patient wish to have biological child.

Board Opinion

Germline testing for Lynch syndrome,when negative can opt for oocyte and embryo preservation followed by definitive treatment.

CLINICAL RESEARCH

Important Research Projects at Fortis

A Global, Multicenter, Prospective, Real World Observational Study For Left Main Disease Treatment, Iris - Main Trial

Dr Sanjay Kumar
Director and HOD - Cardiology
Fortis Escorts Hospital, Faridabad

Introduction

Coronary artery bypass grafting (CABG) is the standard procedure for patients with unprotected LMCA disease. However, because of anatomic accessibility and other characteristics, percutaneous coronary intervention (PCI) for LMCA disease was attractive to the interventional cardiologist.

However, recent improvements in interventional techniques and adjunctive pharmacology have challenged the conventional wisdom that significant LMCA stenoses should be treated surgically. The introduction of coronary stenting has led to a re-evaluation of the role of PCI as a viable treatment option for LMCA disease, and the widespread availability of drug-eluting stents (DES), together with improved stenting techniques, has lowered the threshold for use of PCI, instead of CABG, in patients with LMCA disease.

Total number of sites in Asian-pacific region - 26

Total Sample size from India - 156

Dr Sanjay Kumar from FHL Faridabad has successfully **enrolled 41 patients**.

Primary Objective

To observe clinical courses for long-term in patients with unprotected LMCA disease and to evaluate comparative results of medical treatment, coronary stenting with drug-eluting stents, and CABG for the treatment of an unprotected LMCA stenosis in the "real world" daily practice.

Potential Benefits

This registry outcome will be used to improve knowledge and treatment of LMCA disease and this knowledge may benefit patients with this disease in the future.

Opinion of PI

With newer generation DES & availability of IVUS/OCT. Left main bifurcation stenting is a feasible option even with higher syntax scores.

A Real-world, Prospective, Multicenter, Observational, Investigator-Initiated Study to Evaluate the Outcomes in Patients Undergoing Percutaneous Coronary Intervention (PCI) with Crush Technique as Compared to Culotte Technique for Coronary Bifurcation Lesions

Dr Shuvanan Ray
Director - Interventional Cardiology/
Transcatheter Aortic Valve Implantation
Fortis Anandapur, Kolkata

Introduction

Coronary bifurcation lesions (CBLs) is one of the most complex lesion subsets, and it is still a challenging area in the field of percutaneous coronary interventions (PCIs). Culotte, mini-Culotte, mini-crush, DK-Crush, T-stent and Protrusion (TAP) are currently the most used double stenting techniques. Crush or Culotte is technically complicated and the treatment results may be affected by many factors such as stenting technique per se, operator's experience, device's performance, cardiovascular imaging evaluation, patients' characteristics, and so on.

Total Number of Sites in India - 8

Total Sample size from India - 156

Dr Shuvanan Ray from Fortis Anandpur has successfully enrolled 26 patients

Study Phase- Real-World Observational Exploratory study

Study Objective

1. To evaluate long-term outcomes in patients undergoing percutaneous coronary intervention (PCI) with Crush technique as compared to Culotte technique for coronary bifurcation lesions.
2. Evaluate the Target Vessel Failure before discharge and at 12 months post discharge

PI Opinion

Complex Coronary Bifurcation disease is still an unanswered question to the interventional community. The older crush & culotte technique has been modified to mini crush, D.K. crush, Nano crush, micro culotte & D.K mini culotte. This is a multicentre study to compare the effectiveness of the technique after completion. Each centre is given a freedom to do such cases (50 in number +) by a technique (accepted internationally) which is most comfortable with and compere the results after one year.

Rivaroxaban (Xarelto®) for Prevention of Stroke and Systemic Embolism in Indian Patients with Non-valvular Atrial Fibrillation (NVAF) - (XARIN)

Dr Rajat Sharma
Consultant - Cardiology
Fortis Hospital, Mohali

Introduction

Embolic stroke: Embolic stroke are usually caused by a clot that forms elsewhere in the body and travels through the bloodstream to the brain. Embolic strokes often result from heart disease or heart surgery and occur rapidly and without any warning signs. About 15% of embolic strokes occur in people with atrial fibrillation, a type of abnormal.

Total Number of Sites in India - 50

Total Sample size from India - 1000

Dr Rajat Sharma from Fortis Hospital, Mohali has successfully enrolled 84 patients.

Primary Objective

1)The safety of Rivaroxaban regarding the rate of major bleeding in treatment naïve NVAF patients in routine clinical practice.

2) To monitor treatment emergent adverse events and serious adverse events.

Potential Benefits

To understand the safety and efficacy of the Rivaroxaban in Indian population which will guide the physician in the prevention of NVAF.

PI Opinion

Although the interim analysis is due, the NOAC's has been quite effective and safe as well in the preventive strategy for stroke on NVAF patients.

Management of Device Detected Atrial Tachyarrhythmia and Impact of Device Treatment Algorithms on Atrial Fibrillation in Indian Population - "MANDATE AF Study "

Dr Rajat Sharma
Consultant - Cardiology
Fortis Hospital, Mohali

Atrial fibrillation (AF or A-fib) is **an abnormal heart rhythm (arrhythmia) characterized by rapid and irregular beating of the atrial chambers of the heart.** It often begins as short periods of abnormal beating, which become longer or continuous over time.

Total Number of Sites in India- 9

Total Sample size from India - 758

Dr. Rajat Sharma from Fortis hospital, Mohali successfully enrolled the 20 patients.

Primary objective

1. The primary objective of this study is to demonstrate that reduced ATP sequence programming is non-inferior to Minerva study ATP programming with respect to time to persistent AF and their impact on the progression of AT/AF.

Potential Benefits

To evaluate the ATP in the management of AF, which resembles a trend toward the improved efficacy in the MANDATE AF. ATP programming, which is less aggressive strategy than the prior MINERVA study.

PI Opinion

The study however, was prematurely terminates due to non- recruitment of desired patients due to COVID-19.

Use of Machine Learning and Statistical Inference Methods for Identification of Risk Factors Associated with the Development of Incident Atrial Fibrillation (AF) in Indian Patients in the Tertiary Care Settings (ML-Study)

Dr Arun Kochar
Additional Director -
Interventional Cardiology,
Fortis Hospital, Mohali

Introduction

Atrial Fibrillation is the most common sustained heart arrhythmia, Stroke is considered one of the most devastating complications of AF, it may cause permanent disability and cognitive dysfunction, which may financially and emotionally impact the families of the affected individuals

People with undiagnosed AF are at an increased risk of stroke-related death or disability. Early detection and effective management can improve the patient outcome and lessen the economic burden of AF

Total Number of Sites in India - 10

Total Sample size from India - 10,000

Dr Arun Kochar from, Fortis hospital, Mohali has successfully provided the data for 600 retrospective subjects in the study.

Primary Objective

To identify the risk factors for development of incident AF in Indian patients in the tertiary care settings.

Potential Benefits

Machine learning can identify non-linear associations and complex interactions between variables and does not require pre-specifying these relationships a priority. The use of machine learning is a data-driven approach for the prediction of diseases that will help physicians in quick decision making and will also improve efficiency and accuracy.

PI Opinion

To identify the risk factors for the development of incident AF in Indian patients in the tertiary care settings, may result in the reduction of their risk of systemic embolism or stroke.

International Study of Comparative Health Effectiveness with Medical and Invasive Approaches (ISCHEMIA)

Dr Atul Mathur
Executive Director -
Interventional Cardiology &
Chief of Cath Lab,
Fortis Escorts Heart Institute,
Okhla, New Delhi

Introduction about the study

Study compares two standard ways to treat ischemia.

1. One treatment method uses medicines and lifestyle changes along with initial heart procedures consisting of cardiac catheterization followed by stent placement or surgery to improve blood flow, when feasible.
2. The other treatment method uses medicines and recommended lifestyle changes. Heart procedures were only used if symptoms could not be controlled with medication

Total number of sites Globally – 20

Total number of Patient randomized Globally - 941

Dr Atul Mathur from FEHI has successfully screened 81 patients and randomized 44 patients.

Primary objectives

Primary objective is to determine whether an initial invasive (INV) Strategy of cardiac catheterization and optimal revascularization ,if feasible in addition to optimal medical therapy (OMT) in patient with stable ischemic heart Disease and least moderate ischemia on ischemia testing reduces the incidence of the composite of cardiovascular death or nonfatal MI compared with a conservative strategy of optimal medical therapy alone with cardiac catheterization and revascularization reserved for failure of OMT

PI opinion

This landmark study will be a game changer in clinical management of CAD patients. Our centre has enrolled significant number of patients in this trial and are following very closely.

A Prospective, Observational, Single Arm, Multicenter Registry of the Shockwave Coronary Intravascular Lithotripsy (IVL) C2 Coronary Catheter System in Calcified Coronary Arteries in Real World Indian Population (Shock India Registry)

Principal Investigator-
Dr Ashok Seth
Chairman -
Fortis Escorts Heart Institute
Chairman -
Fortis Healthcare Medical Council
President - Asian Pacific Society of Interventional Cardiology
Fortis Escorts Heart Institute,
Okhla Road, New Delhi

Co-Investigators-
Dr Atul Mathur, Dr Vijay Kumar Dr Praveer Aggarwal, Dr Vishal Rastogi, Dr Nishith Chandra Dr Dhananjay Kumar

Introduction About the Study

Calcified coronary lesions are associated with advanced age, diabetes, and chronic kidney disease. Approximately 38% and 73% of all lesions display calcification as detected by angiography and Intravascular ultrasound (IVUS), respectively. As IVUS is not routinely used as a diagnostic modality, coronary calcification is most likely underestimated.

Coronary artery calcification impacts interventional outcomes by adversely affecting stent delivery damaging the drug-eluting polymer and impairing stent expansion and apposition Current therapies used to overcome these limitations include high-pressure balloon dilation and atherectomy.

However, balloon angioplasty is limited in its ability to modify calcific plaque Dilatation in eccentric calcium may be biased by the guidewire towards the non-calcified segments of the artery; in concentric calcium, the pressure-generated force may be insufficient for calcium fracture and vessel expansion.

Primary objectives

The Primary objective of this study is to evaluate the performance of the Shockwave Coronary Intravascular Lithotripsy (IVL) System in severely calcified, stenotic coronary arteries followed by stent implantation in Real World Indian Population.

Total number of sites in India - 54

Targeted Patient Enrollment - 1000

Duration of the Study - 1 Year

Dr Ashok Seth from FEHI has successfully **enrolled 24 patients till date.**

Potential Benefits

Benefits of this study is that the study will provide performance data from IVL treatment of calcified, stenotic, coronary lesions prior to stenting. These clinical results will give physicians valuable information of using IVL in Real World Indian Population.

PI Opinion About the Study

Intravascular Lithotripsy (IVL) is a huge advancement in the treatment of heavily calcified lesions in Coronary and Peripheral Vascular Disease. It uses the principles of shockwaves to fracture calcium similar to the lithotripsy used for renal stones. However, it is now miniaturized into a balloon form which is inserted in the coronary arteries across the calcified lesion and shockwave emitted to fracture the calcified lesions at low pressures prior to stent implantation with safe, predictable and good outcomes in the very difficult subset of patients. IVL was introduced by Dr Seth into India on Jan 2020 To date randomized studies of IVL have proven its safety, efficacy and advantages. However, these were done with select inclusion criteria which omitted complex coronary artery disease.

Hence, 'Shock India' is the largest 1000 patient Registry in the world enrolling Real World patients from 54 centres in India looking at safety and efficacy data points in unselected complex real-world patients and lesion subsets. The result of 'Shock India Study' will provide major additional information of the utility of this innovative device in complex calcified lesions. Approx. 500 patients have already been enrolled into the study. This is an investigator-initiated registry and the National Principal Investigator is Dr Ashok Seth.

IVL Device 1

IVL Device 2

COVID-19

Issue: 6 | September 2022

Venous Sinus Thrombosis Due to Vaccine-Induced Thrombotic Thrombocytopenia (VITT): A Case Report

Dr Neetu Ramrakhiani
Director - Neurology
Fortis Escorts Hospital, Jaipur

Authors:
Neetu Ramrakhiani[1], Palak Mamodia[1], Devang Sharma[1] and Nitesh Agarwal[2]

Abstract

Patient, 19-year-old male, presented with fever, abdominal pain, headache, and vomiting presented after vaccination with ChAdOx1 CoV-19 (AstraZeneca, University of Oxford, and Serum Institute of India, and adenoviral-based vaccine) with alteration in sensorium and thrombocytopenia. He was diagnosed to have extensive venous sinus thrombosis with mass effect, midline shift, and underwent decompressive hemi craniotomy. He had a good outcome.

Keywords

VITT, Oxford vaccine, Venous sinus thrombosis

Introduction

Vaccine-induce immune thrombotic thrombocytopenia (VITT) is a very rare syndrome (1 case per 26,500 to 1 case per 1,27,300 first doses of AstraZeneca/COVISHIELD administered)1 associated with COVID-19 vaccines.

Case History

A 19-year-old young male was admitted to our hospital with a history of seizures and alteration in sensorium preceded by fever, abdominal pain, and thrombocytopenia. The patient with no prior morbidity has a history of vaccination on June 9, 2021 with ChAdOx1 CoV-19 vaccine (AstraZeneca, University of Oxford, and Serum Institute of India, an adenoviral vector-based vaccine). Post vaccination, he initially developed a persistent fever from day 2 onward accompanied by body aches, vomiting, and abdominal pain which was not investigated initially and treated on lines of gastritis at a local dispensary. In view of lack of relief, he consulted a gastroenterologist; when ultrasonography abdomen was found to be unremarkable, liver function test did not show any major abnormality. The platelet count was recorded to be 27,000 (Figure- 1). Treatment was continued with antibiotics (levofloxacin, cefixime, ornidazole, and rabeprazole). He continued to worsen and suffered from seizure-related headaches when neurology opinion was taken and non-contrast computed tomography (NCCT) and magnetic resonance venography revealed venous sinus thrombosis of right internal jugular vein, sagittal and transverse sinus. At the time of admission, the patient was dull, drowsy, complaining of persistent abdominal pain without any neck stiffness, or focal neurological deficit. Platelet count was low (70,000), hence considering other differential diagnoses, a workup for dengue and malaria was done and found to be negative. To evaluate further causes of thrombocytopenia, antinuclear antibody test was sent which was negative. There was no underlying malignancies or drug on board causing thrombocytopenia. The 4T score which is a modified score for heparin-induced thrombosis (HIT) for diagnosis of VITT was 7 out of 8 indicating a very high possibility of VITT. Keeping the possibility of VITT, intravenous immunoglobulin (IVIG) was started (Figure 2). On the night of admission to our hospital, patient had an episode of seizure and

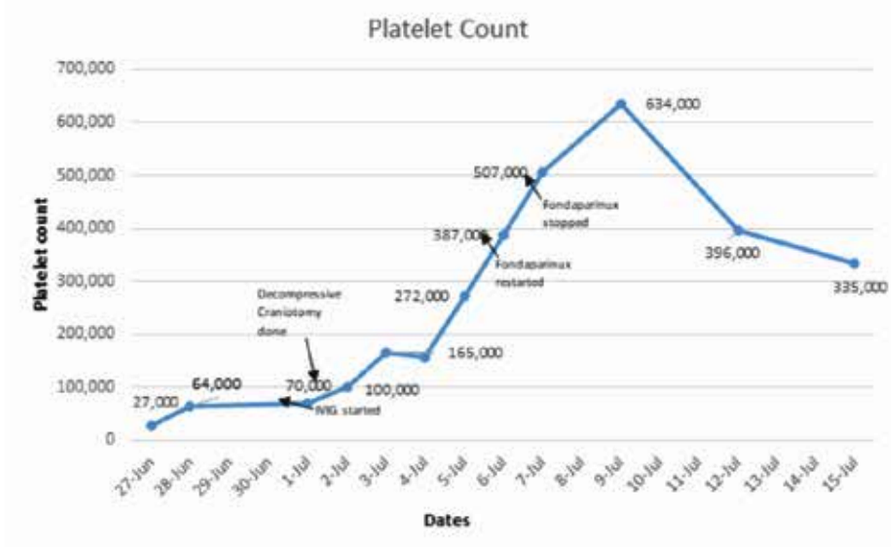


Figure 1: Showing Serial Platelet Count with Timeline

developed anisocoria. The patient became unresponsive to deep pain stimulation. Urgent magnetic resonance imaging was done which showed worsening of mass effect with midline shift (Figure 3). Neurosurgical consultation was taken and the patient underwent urgent decompressive craniotomy. Patient was started on IVIG and temporary discontinuation of fondaparinux was done. His platelet counts significantly improved on the second day (1,50,000) and third day (1,65,000) The patient was extubated and restarted on fondaparinux and later switched to dabigatran. NCCT was repeated 32 days' post-vaccination which did not indicate any significant worsening and midline shift. The patient was switched from intravenous antibiotics to oral antibiotics. The patient was stable, tolerating feed, and able to walk independently. He was finally discharged with optimized medication.

Discussion

VITT is a rare clinical syndrome observed in a small number of individuals who have received ChAdox1 CoV-19 and Ad26-Cov2S Vaccine (Johnson & Johnson). Both the vaccines contain an adenoviral vector. Although rare in view of mass vaccination, clinicians need to be aware of this clinical syndrome so that appropriate management can be unveiled. It is caused by immunoglobulin-G and antibodies that recognize platelet factors. 2 They cause platelet activation and are not heparin-dependent. 3,4 Thrombus can occur at any site including pulmonary embolism that is adrenal, cerebral, and ophthalmic thrombosis. They are believed to be similar to HIT. Risk factors are unknown but younger age and female gender are found to be affected more. The syndrome begins within 5 to 10 days' post-vaccination and the syndrome may take a longer time in 1 case (21 days). Although male gender CVT can sometimes be seen, the presence of simultaneous thrombocytopenia and thrombosis at an appropriate time window following vaccination leads to this diagnosis. The typical platelet counts between 10,000 and 1,00,000 with median count 20,000 to 2,50,000/μL. D-dimer was significantly elevated in 1 patient with proven venous sinuous thrombosis and venous infarct. VITT is caused by antibodies that recognize platelet factor 4 (PF4) bound to platelets. PF4 antibody testing was not done due to the non-availability of the ELISA PF4 assay. His 4Ts score was 7 out of 8.5 Due to rapid recognition, IVIG was immediately started, and doing craniotomy in presence of thrombocytopenia was challenging. Heparin was avoided because early reports in which patients were treated with heparins described clinical worsening, including death, and early recommendations were to avoid heparin because of the resemblance of VITT to HIT. Only fondaparinux (x-a inhibitor) and dabigatran were used. The patient had a good outcome complete recovery on follow-up.

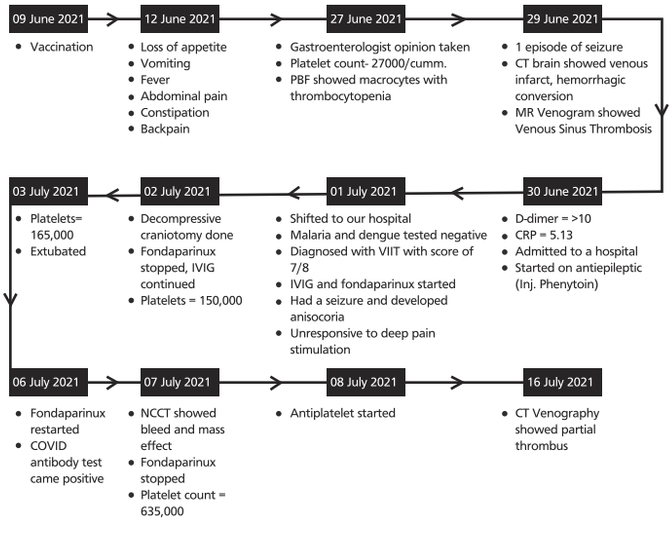


Figure 2: Timeline of Important Clinical Events and Investigations in our Patient

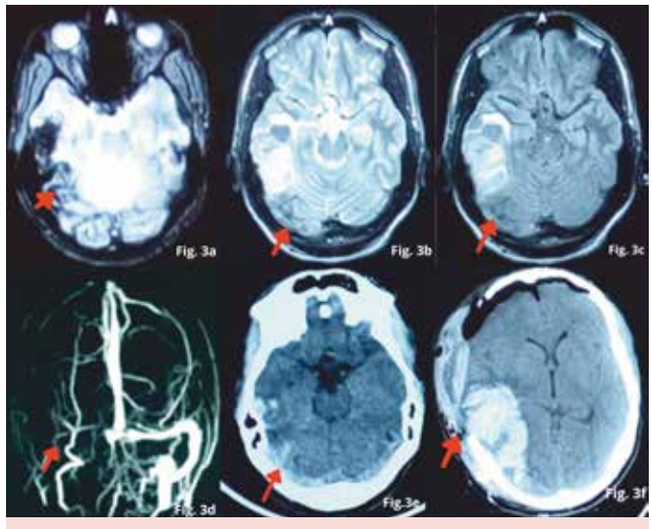


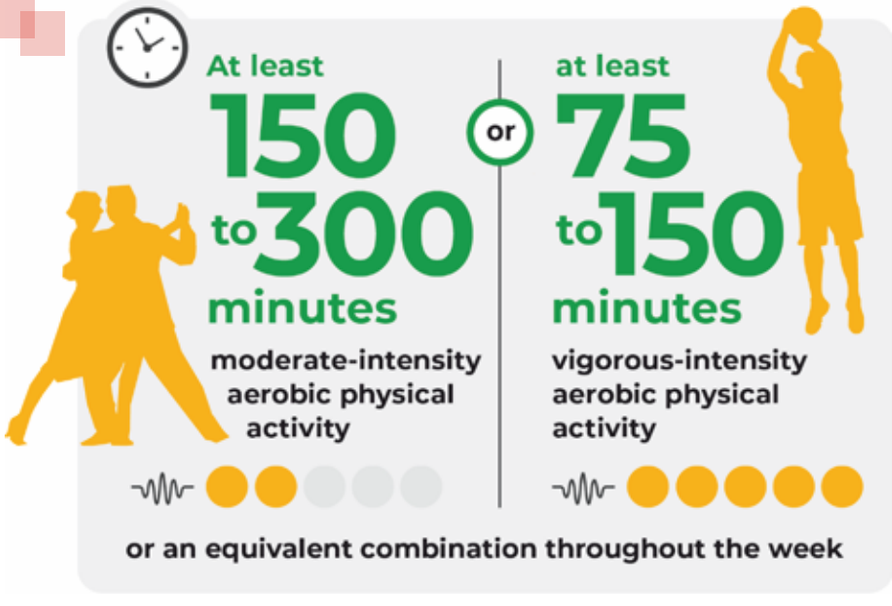
Figure 3 : (a to f). (a) Axial GRE Image Shows Abnormal Blooming in Right Transverse Sinus and Adjacent Right Temporo Parietal Lobe with Widening of Sinus Consistent With Sinus Thrombosis With Hematoma. (b and c) Axial T2W and Flair Images Shows Absence of Flow Void in Right Transverse and Sigmoid Sinus. (d) Frontal MIP Image From Coronal TOF MRV Shows Lack of Flow in Right Transverse and Sigmoid Sinus. (e) Axial Unenhanced CT Image Shows Area of Abnormal Hyper Attenuation in Right Transverse and Sigmoid Sinus Consistent with CVT. Also Noted Right Temporal Shift with Mild Edema. (f) Axial Unenhanced CT Image Shows Right Front Parietal Craniotomy Defect with Large Intraparenchymal Hematoma and Subgaleal Hemorrhage with Pneumocephalus

Consolidating APSIC: A Professional and Educational Platform for the Generation of Young Interventional Cardiologists from the Asia-Pacific Region

Dr Ashok Seth
Chairman -
Fortis Escorts Heart Institute
Chairman -
Fortis Healthcare Medical Council
President - Asian Pacific Society of Interventional Cardiology
Fortis Escorts Heart Institute,
Okhla Road, New Delhi

The last 18 months have been unprecedented in our lifetime. The COVID-19 pandemic has affected the entire world and has, at times, brought humanity and its activities to a standstill. It not only created new ways of living in the world but introduced previously unimagined virtual interactions. All this happened soon after I took over the Presidency of the Asian Pacific Society of Interventional Cardiology (APSIC) in November 2019. Despite the numerous limitations for in-person meetings, there was an opportunity to broaden the paarticipation and the reach of the virtual meetings. And so, in April 2020, we started conducting virtual board meetings and bimonthly scientific sessions, leading to a virtual Asian Interventional Cardiovascular Therapeutics (AICT) Asia PCR session in December 2020. The vicious second wave of the Delta virus, however, brought the worse form of contagion we had ever seen.

The rapidity and seriousness of the second wave of COVID-19 overwhelmed our healthcare system. Hospitals overflowed with patients on oxygen and ventilators. It was both morally and physically exhausting; most families in India were affected, with close friends or relatives succumbing to COVID-19. This gave us no time to advance a number of ambitious plans that we had for APSIC this year. We worked hard to create a new format, a new edition of AICT-Asia PCR 2021, with virtual sessions transmitted from three studios located in Singapore, New Delhi and Kuala Lumpur, and in-person attendance. This educational and interactive event, held 8-9 October 2021, was exciting, especially for the young generation of interventional cardiologists of the Asia-Pacific region. This year we have also been able to "refresh" Asia Intervention, the official journal of APSIC, with a new editorial board led by Prof. Upendra Kaul. This has led to the journal now being on track for possible PubMed indexation. We have an ambitious agenda to complete over the next year as we emerge from the wrath of the COVID-19 pandemic and gradually start to normalize. In terms of virtual education, monthly virtual scientific symposia, primarily targeting a generation of young cardiologists, are planned. We need to encourage research and hence will create APSIC scholarships for worthy applicants who may want to spend time at other centers in the Asia-Pacific region for research or skill enhancement. Partnerships are planned with other interventional societies across the world, both for collaboration in "consensus statements", as well as for scientific sessions. Reconstituting the APSIC board to include representatives of various national interventional societies of the Asia-Pacific region will be an important step in cementing these relationships and working together. We also need to encourage and create greater opportunities for participation of women in interventional cardiology. Hence, we will create a subcommittee for this purpose and hope that we can work to overcome the gender inequality in interventional cardiology, where fewer than 5% are women. There is a lot of work to do over the next year, but I am sure we will be able to accomplish new dimensions by working together with focus and determination. We are cut out for the task before us, the vision is clear, and the time is right to strengthen APSIC as its mission is "Transforming lives through advancing innovation and global partnerships."



MEDICATION SAFETY UPDATE

MEDICATION SAFETY UPDATE
SEPTEMBER 2022

PHARMACO-VIGILANCE

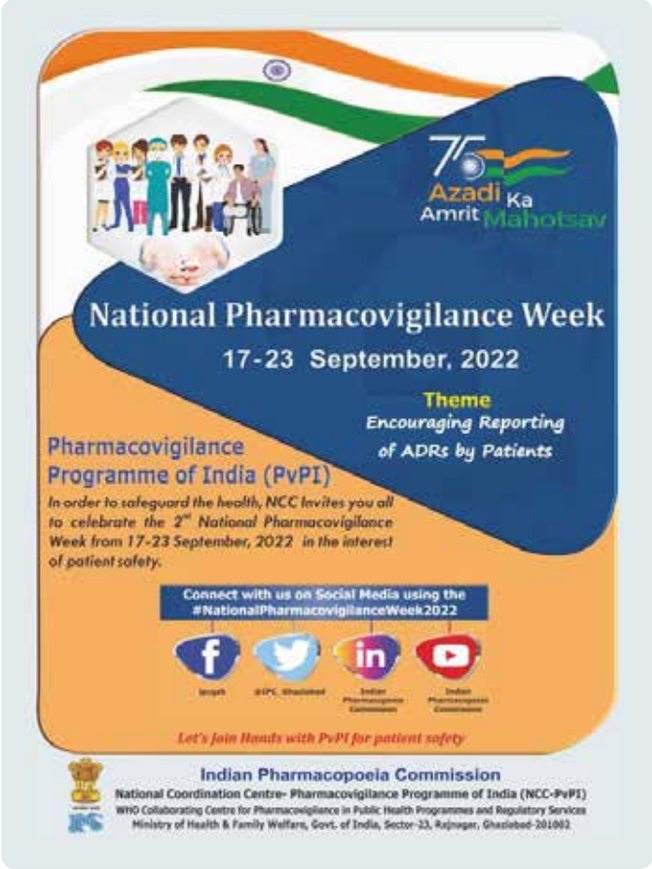
Encouraging Reporting of Adverse Drug Reactions

WHY PHARMACOVIGILANCE ?

- To monitor Adverse Drug Reactions (ADR)
- To optimize safe and effective usage of medicines
- To monitor benefit-risk profile of medicines
- Generate independent, evidence based recommendations on the safety of medicines
- Support CDSCO for formulating safety related regulatory decisions for medicines
- Create a national centre of excellence at par with global drug safety monitoring standards

WHO CAN REPORT?

All healthcare professionals (Clinicians, Dentists, Pharmacists and Nurses) can report adverse drug reactions



WHAT TO REPORT?

A reaction is serious when the patient outcome is:

- Death
- Life-threatening
- Hospitalization (initial or prolonged)
- Disability (significant, persistent or permanent)
- Congenital anomaly
- Required intervention to prevent permanent impairment or damage

SOME RECENT DRUG SAFETY ALERTS

Cefoperazone Induced Coagulopathy, August 2022

The Indian Pharmacopoeia Commission (IPC), has flagged drug safety alert in Aug 2022 revealing that Injection Cefoperazone, a third-generation cephalosporin antibiotic, is associated with adverse event known as coagulopathy which may cause uncontrolled internal or external bleeding and may be life-threatening. The reason for coagulopathy is a side chain of N-methylthiotetrazole in the struture of cefoperazone which can inhibit vitamin K metabolism resulting in hypoprothombinemia.

Itraconazole Induced SDRIFE in May 2022

Symmetrical Drug Related Intertriginous and Flexural Exanthema (SDRIFE) also known as Baboon Syndrome, it is a symmetrical erythematous rash on the flexures after systemic exposure to Itraconazole, flagged by IPC drug safety alert, in May 2022.

Itraconazole is an antifungal drug used for Systemic aspergillosis and candidiasis, cryptococcosis, sporotrichosis, Paracoccidioidomycosis, blastomycosis and other rarely occurring systemic or tropical mycoses, Empiric therapy of febrile neutropenic patients with suspected fungal infections.

Losartan Induced Muscle Spasm

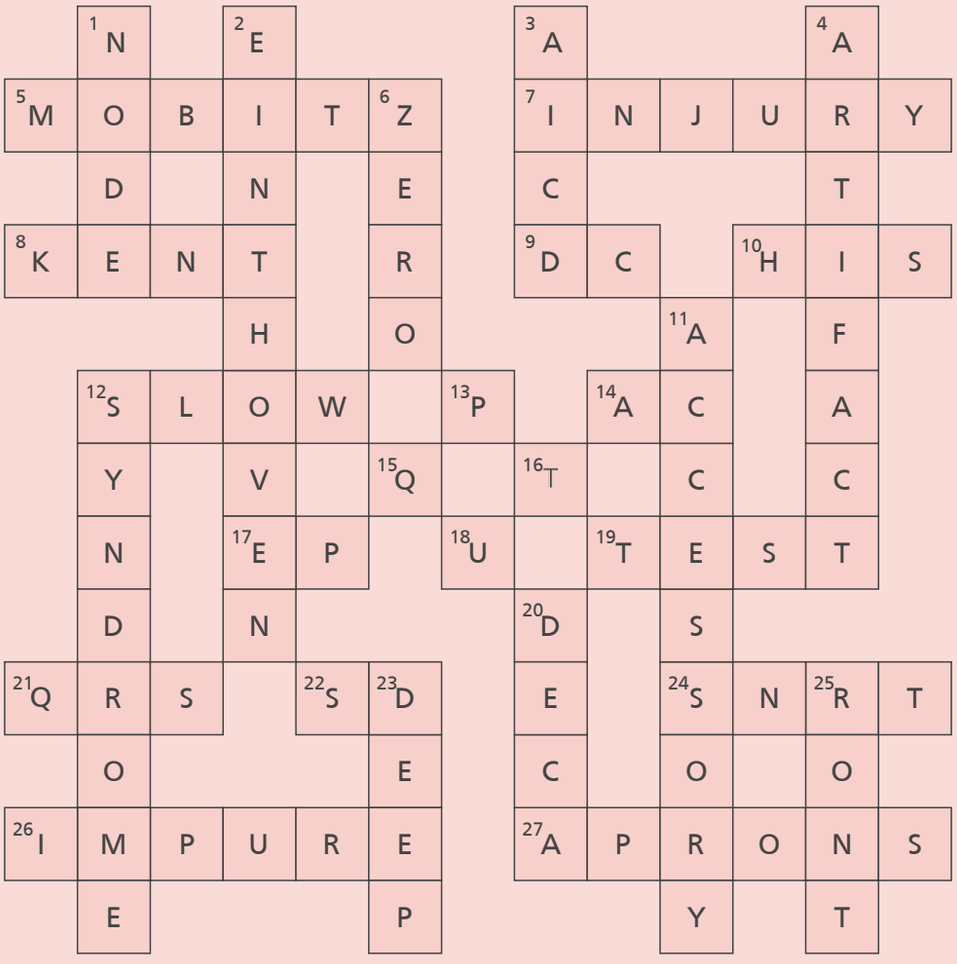
The Indian Pharmacopoeia Commission (IPC) through its recently issued drug safety alert on February 2022, has revealed that the popular antihypertensive drug, losartan is linked with adverse drug reaction, muscle spasm.

Tacrolimus Induced Gingival Hypertrophy

Drug safety alert issued by IPC in July 2022, tacrolimus is linked with gingival hypertrophy or hyperplasia, a condition that refers to an overgrowth of gum tissue around the teeth. The exact mechanism of this gingival hyperplasia is not known. It was hypothesized that the long-term use of the drug may have a direct or indirect impact on gingival fibroblasts and collagen metabolism.

Tacrolimus used for Prophylaxis of organ rejection in adult and paediatric patients receiving allogeneic liver, kidney, heart, or lung transplants and immunodisorder.

Answers To ECG Crossword



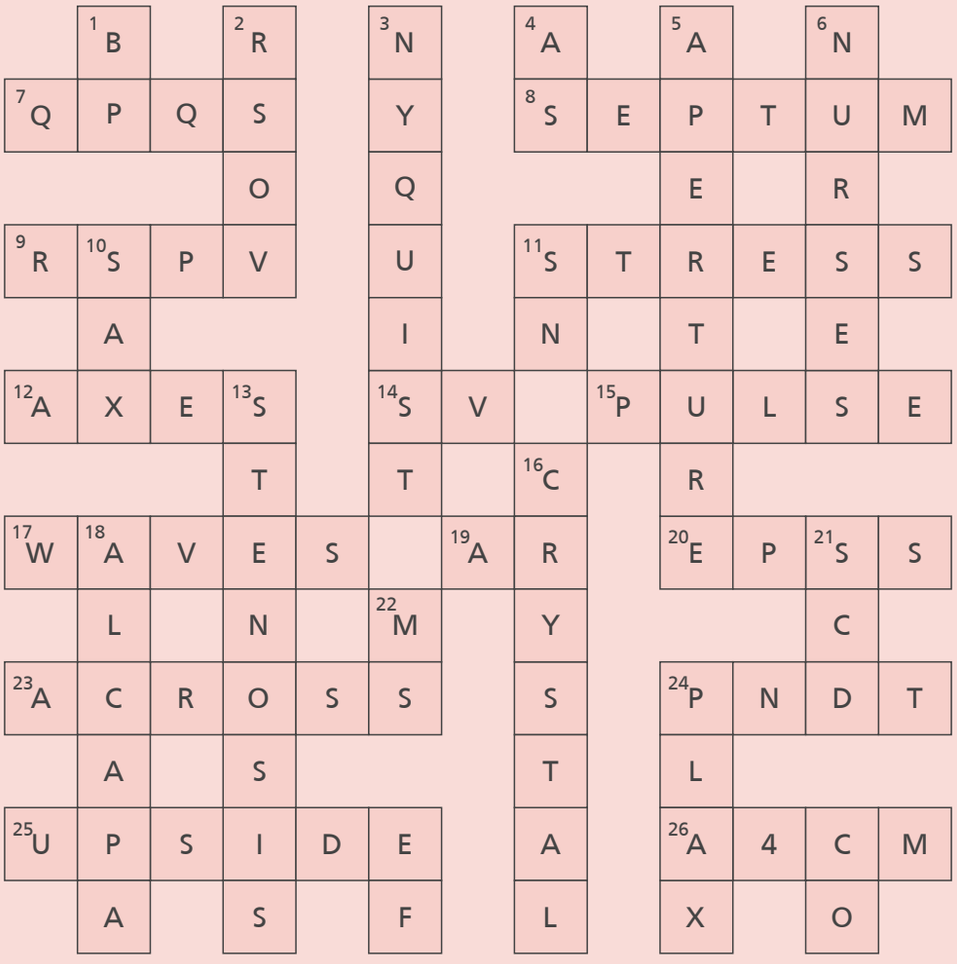
DOWN

1. The sinus _____ initiates the heart beat (4)
2. Invented first practical electrocardiogram in 1903 (9)
3. A device that performs cardioversion, defibrillation & pacing of the heart (4)
4. Electrical interferences that may distort normal ecg tracing (8)
6. The vector sum of amplitude of all 3 standard limb leads is equal to _____ (4)
11. Electrical conduction pathway between atria and the ventricle in WPW syndrome (9)
12. RBBB with coved ST elevation in V1 to V3 is referred to as Brugada_____ (8)
15. A negative deflection preceding an R wave (1)
16. The wave due to ventricular repolarisation (1)
20. Electrical mapping of heart is done by _____ polar catheter (4)
23. In Wellens syndrome T waves are _____and symmetrically inverted (4)
25. Superimposition of an ectopic beat on preceding T wave likely to initiate ventricular tachycardia (1,2,1)

ACROSS

5. The second degree AV blocks are named after him (6)
7. Flow of current from damaged to normal area of heart is called current of _____ (6)
8. Accessory conduction pathway between atria and ventricle (4)
9. Cardioversion that is life-saving in terminating ventricular fibrillation ,abr (2)
10. The bundle that transmits electrical impulses from AV node to ventricles (3)
12. AVNRT occurs due to reentrant circuit involving_____ and fast pathways in AV node.(4)
13. The wave of atrial depolarization (1)
14. This electrical interference that is displayed as a thick baseline on ecg waveform (2)
17. Study to map the electrical activity of the heart, abr (2)
18. The wave due to repolarisation of purkinje fibers (1)
19. RF ablation is the _____ treatment for AVNRT (4)
21. The ecg complex of ventricular depolarization (3)
22. Umbrella term for different causes of sudden cardiac arrest in young people, abr (2)
24. Electrophysiological parameter prolonged in sick sinus syndrome (4)
26. Right atrium receives_____ blood (6)
27. White coats worn by doctors (6)

Answers To ECHO Crossword



DOWN

7. Pulmonary-systemic flow ratio (4)
8. Its asymmetric hypertrophy occurs in HOCM (6)
9. One of the 4 pulmonary veins draining into left atrium (4)
11. Dobutamine_____ echo is used for assessing myocardial ischemia (6)
12. Plural of axis (4)
14. Stroke volume ,abr (2)
15. _____ repetition frequency is the number of pulses/sec (5)
17. Echocardiography uses high frequency sound _____ (5)
19. Aortic regurgitation, abr (2)
20. Distance between anterior mitral valve peak & the ventricular septum on M-mode tracing (4)
23. In valvular stenosis, gradients _____ the valve is increased (6)
24. The act enacted to stop female feticides (4)
25. On echocardiography aortic valve closure resembles an _____ down Mercedes benz sign (6)
26. Basic echo view showing all 4 chambers (4)

ACROSS

1. Blood pressure, abr (2)
2. Results in shunt from aorta to other heart chambers mostly right atrium, abr (4)
3. Doppler term which specifies maximum velocity that can be recorded without aliasing (7)
4. Aortic stenosis, abr (2)
5. Synthetic _____ echo imaging is better than phased array in studying anatomical details (8)
6. Assists doctors in patients care (6)
10. Short axis view, abr (3)
11. Sinus node, abr (2)
13. Rheumatic affection may cause valvular regurgitation or_____ (8)
16. Its Piezoelectric effect is the basis of echocardiography (7)
18. Other name of Bland-White-Garland Syndrome (6)
21. Sudden unexpected death due to cardiac arrest (3)
22. Narrowing of mitral valve,abr (2)
24. Basic parasternal echo view (4)

Fortis Hospital, Greater Noida

OPENING SOON

The Fortis Network

Amritsar


Anandapur, Kolkata


Bannerghatta Road, Bangalore

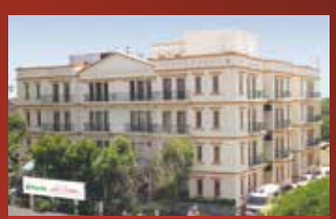
Chirag Enclave, New Delhi


Cunningham Road, Bangalore


Faridabad


FEHI, New Delhi


FHKI, Kolkata


FLF Greater Kailash, New Delhi


FMRI, Gurugram


Jaipur

Kalyan


Ludhiana


Malar, Chennai


Mohali


Mulund, Mumbai


Nagarbhavi, Bangalore


Noida


Raigarh, Chhattisgarh

Rajajajinagar, Bangalore


Richmond Road, Bangalore

Shalimar Bagh, New Delhi


SL Raheja, Mumbai

Vadapalani, Chennai


Vasant Kunj, New Delhi


Vashi, Mumbai

Please send your comments, feedback and suggestions to
clinical.connect@fortishealthcare.com