



Clinical Connect

Fostering a culture of innovation and excellence

Cardiac Sciences Special

Matters of the Heart



IN THIS ISSUE

FROM THE HEART

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

Page No. 16

NEWER TECHNIQUES AND TECHNOLOGIES

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

Page No. 22

THE WAY WE DO IT AT FORTIS

When LESS is
MORE- MICS at
Fortis, Bangalore

Page No. 30

CONTENTS

• In Memoriam - Late Professor Savitri Srivastava	04	• The Principles of Ultra-Low Contrast Percutaneous Coronary Intervention	29
INSPIRATION		• Safety and Feasibility of Ultrasound-Guided Access for Coronary Interventions Through Distal Left Radial Route	29
• Message from MD & CEO - Dr Ashutosh Raghuvanshi	06	• When LESS is MORE- MICS at Fortis, Bangalore	30
• Message from Dr Bishnu Panigrahi	07	• Composite Valved Conduit for Ascending Aortic Dissections and Aneurysms: Our Experience	32
• Message from Dr Ashok Seth	08	• Recent End Stage Heart Failure Cases at Our Centre to Show the Spectrum of Paediatric Heart Failure	33
• Message from Dr Vivek Jawali	09	• The Left Atrial and Appendage Function Changes Following Successful Electric Cardioversion in Atrial Fibrillation	35
MESSAGE FROM THE EDITORIAL BOARD		• Trans-Esophageal Echocardiography During Off-pump Coronary Artery Bypass Grafting	36
• Fortis the Benchmark of Cardiac Care	11	• Transcatheter Aortic Valve Implantation for Severe Bicuspid Aortic Stenosis - 2 Years Follow up Experience from India	37
CARDIAC SCIENCES SPECIALTY COUNCIL		• The Heart Mind Connect	38
• Cardiology Specialty Council	13	CLINICAL CONVERSATIONS	
• Cardiothoracic and Vascular Surgery Specialty Council	13	• Dextrocardia: TAVR	40
FROM THE HEART		• Prosthetic Valve Thrombosis Secondary to Heparin Induced Thrombocytopenia - Double Trouble	42
• Development of ST Elevation Myocardial Infarction Programs in Developing Countries Global Challenges and Solutions	15	• Heart Failure Secondary to Systemic Condition	44
• Cry of the Children: Congenital Heart Surgery in India – A Journey of Six Decades	16	• Transcatheter Leadless Permanent Pacemaker in Complex Congenital Heart Disease with Interrupted Inferior Vena Cava: A Challenging Implantation	47
• Invited Commentary: Survival in Pulmonary Atresia with Intact Ventricular Septum: The Coronaries Hold the Key!	17	• Double Outlet Both Ventricles - Morphologic, Echocardiographic and Surgical Considerations	47
NEWER TECHNIQUES AND TECHNOLOGIES		• Atrial Pace on PVC Algorithm Inducing Ventricular Fibrillation	48
• Technological Advances in the Armamentarium	19	• Left Main Coronary Interventions in Pediatric and Adolescent Patients	49
• Residual Risk that Remains	20	• Imaging Guided Hybrid Coronary Angioplasty (Using Bioabsorbable Stent & Non-Bioabsorbable Stent) In A Middle-Aged Patient with Ischemic Heart Disease	52
• If Oscar Could, Can't We? – A Commentary on Intraoperative Hypotension - Role of Artificial Intelligence	21	• Snaring Victory from the of Defeat	54
• Intravascular Lithotripsy for Calcified Coronary Arteries in the Real-world: From Rock to Metal	22	• Eroding Pseudo Aneurysm of Ascending Aorta - Case Report	55
• Recent Guidelines for Coronary Artery Bypass Surgery	23	• Challenging Case of Extensive Intramural Hematoma: Exhausting Journey of Successful Management	57
• Nano-Crush Technique in Narrow-Angle (<70°) Bifurcation: Bench Test, CT Reconstruction, Fluid Dynamics, and Clinical Outcomes	24		
• Role of Non-invasive Modalities in Cardiac Assessment - Strengths and Limitations	25		
• 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?	26		
THE WAY WE DO IT AT FORTIS			

• An Anomalous Story of a Rare Percutaneous Intervention to Left Anterior Descending / Right Coronary Artery Bifurcation	59
• Intra Vascular Lithotripsy Facilitated Transfemoral TAVR	60
• Isolated Myocardial Abscess Cavity: An Incidental Finding on Intraoperative Transoesophageal Echocardiography	64
• Redo Tricuspid Valve Replacement Post Mitral Valve Replacement: A Case Study	66
• Interesting Insights from Fortis Hospital, Mulund	67
• Single-Stage Unifocalization and Intracardiac Repair Using Two Tube Grafts	67
• Neo-cusp Reconstruction Procedure for Aortic Regurgitation Induced by Transcatheter Occluder Device for Ventricular Septal Defect Closure	67
• Re-do ALCAPA Repair with Left Subclavian Artery-to-left main Coronary Artery Bypass for Left Coronary Atresia	68
• Fontan Procedure on Deep Hypothermic Circulatory Arrest: Short Term Results and Technique	68
• Giant Right Atrial Aneurysm in an Infant	68
• Combined Aortic and Pulmonary Valve Stenosis in a 28-Year-Old Managed Percutaneously	69
• An Interesting Case of Incessant Tachycardia in a Young Female	71
• Permanent Pacemaker Implantation in a Young Patient of Symptomatic Sick Sinus Syndrome (Tachycardia - Bradycardia Syndrome) with Syncopal Attacks	73
• Stellate Ganglion Block and Neurolysis for Refractory Ventricular Arrhythmia	75
• Hand Sewn Valved Conduit for the Right Ventricular Outflow	77
• Rare Cause of Cyanosis in an Adult and its Transcatheter Treatment: Large Fistula from the Pulmonary Artery to the Left Atrium	78
• A Novel Malignant Anomaly of the Coronary Arteries	79
• Complex EPS and RFA with 3D Electro-Anatomical Mapping (EAM) Through Ensite System	80
TRIVIA	
• ECG Crossword	82
• ECHO Crossword	83

ONCO CONNECT

- AFP Producing Endometrial Carcinoma : A rare Case : Dilemma in Diagnosis and Management 85
- Endometrial Carcinoma in Young Nulligravida: Genetic Counselling & Fertility Preservation 85

CLINICAL RESEARCH

- A Global, Multicenter, Prospective, Real World Observational Study for Left Main Disease Treatment, Iris - Main Trial 87
- 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 87
- Rivaroxaban (Xarelto®) for Prevention of Stroke and Systemic Embolism in Indian Patients with Non-valvular Atrial Fibrillation (NVAf) - (XARIN) 88
- Management of Device Detected Atrial Tachyarrhythmia and Impact of Device Treatment Algorithms on Atrial Fibrillation in Indian Population - "MANDATE AF Study" 88
- 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) 89
- International Study of Comparative Health Effectiveness with Medical and Invasive Approaches (ISCHEMIA) 89
- 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) 90

COVID-19

- Venous Sinus Thrombosis Due to Vaccine-Induced Thrombotic Thrombocytopenia (VITT): A Case Report 92
- Consolidating APSIC: A professional and Educational Platform for the Generation of Young Interventional Cardiologists from the Asia-Pacific Region 94
- Medication Safety Update 96
- Answers to ECG Crossword 97
- Answers to ECHO Crossword 98

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.

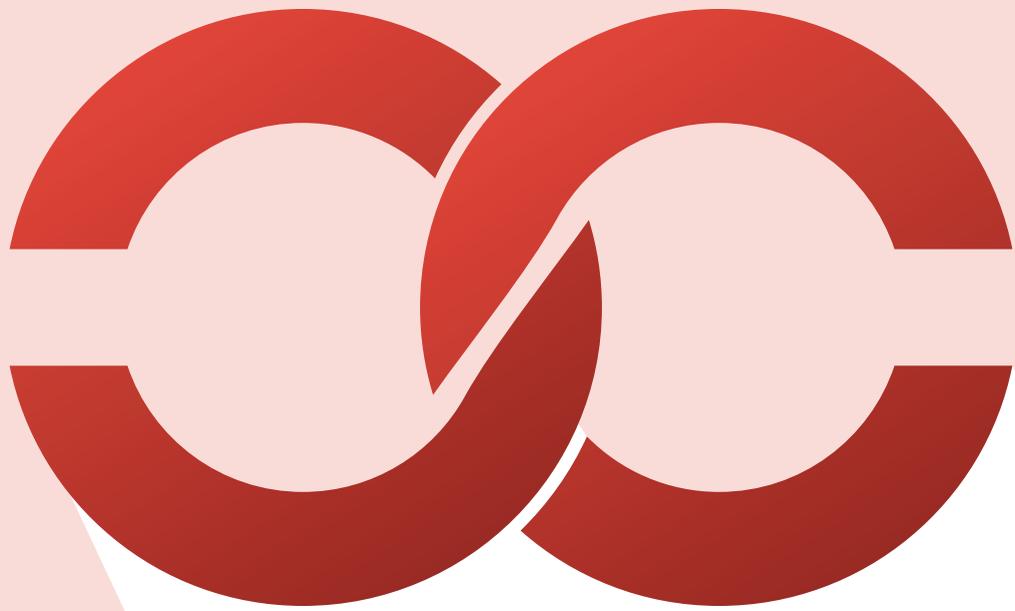
Dr Shrivastava's contributions to the field of Pediatric Cardiology are too many to list in this brief obituary. She was part of the evolution of cardiac echocardiography and interventional cardiology and became a master of both. She founded the Indian Society of Echocardiography and authored a superbly illustrated textbook of Pediatric Echocardiography. She was the first in the world to perform a balloon mitral valvotomy, a procedure which 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.

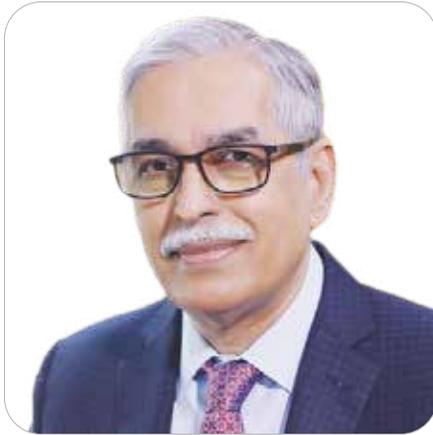
By : Dr K.S. Iyer, Executive Director-
Pediatric & Congenital Heart Surgery, Fortis Escorts Heart Institute, New Delhi



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

source: <https://www.britannica.com/topic/World-Heart-Day>



SEPTEMBER 29
WORLD HEART DAY

Theme for 2022

**'Cardiovascular Health
for Everyone'**

HISTORY-

An idea of an annual event conceived by Antoni Bayés de Luna (President - World Heart Federation 1997-1999)

**Heart Disease and Stroke: World's
Leading cause of death claiming
18.6 million lives each Year**

**WORLD HEART FEDERATION WITH
WORLD HEALTH ORGANISATION
DECLARED LAST SUNDAY OF
SEPTEMBER AS WORLD HEART
DAY IN THE YEAR 2000.**

**IT IS NOW BEING CELEBRATED ON 29th
SEPTEMBER, EVERY YEAR**

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,

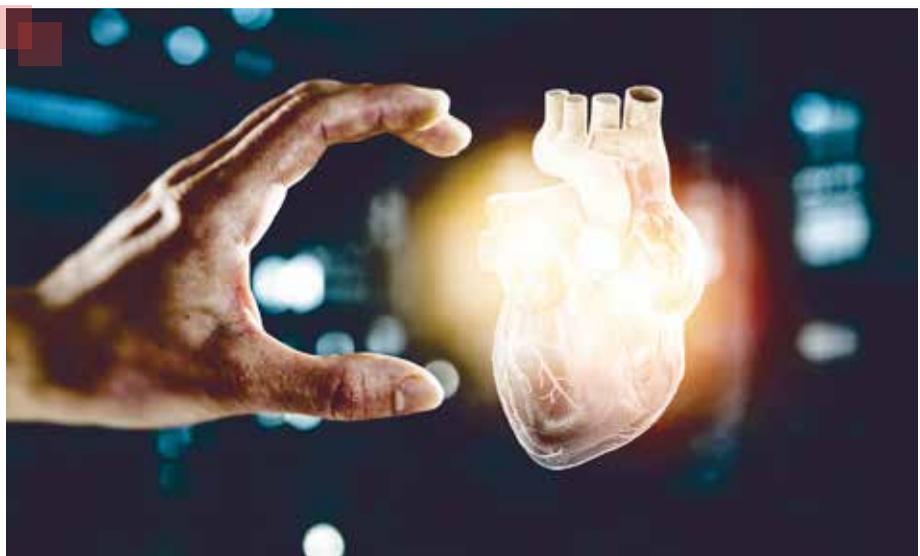
Escorts and Cunningham Road to name a few. As Fortis and its Cardiac program expand, it is firmly positioned as the destination of choice, a testimony to the exemplary levels of care standards across a wide spectrum, from adult care to pediatric care to transplants.

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 Medical Council
Chairperson -
Cardiology Specialty Council
President - Asian Pacific Society of
Interventional Cardiology (APSIC)
Fortis Escorts Heart Institute,
Okhla, 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 showcasing 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 trials.

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!

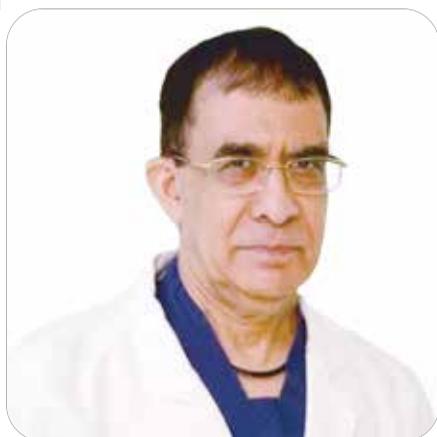
Keep up the good work!





**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.

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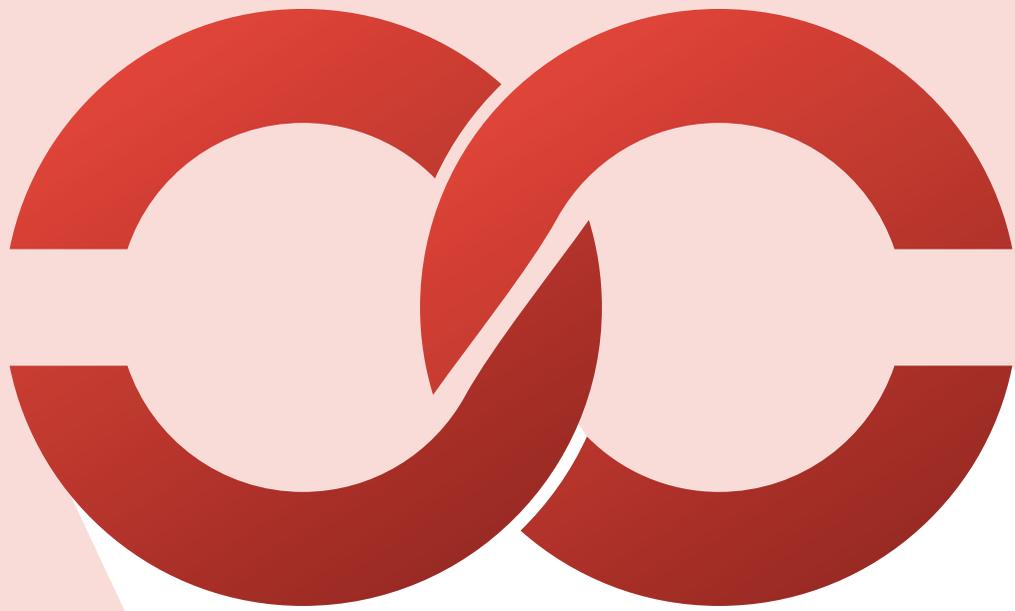
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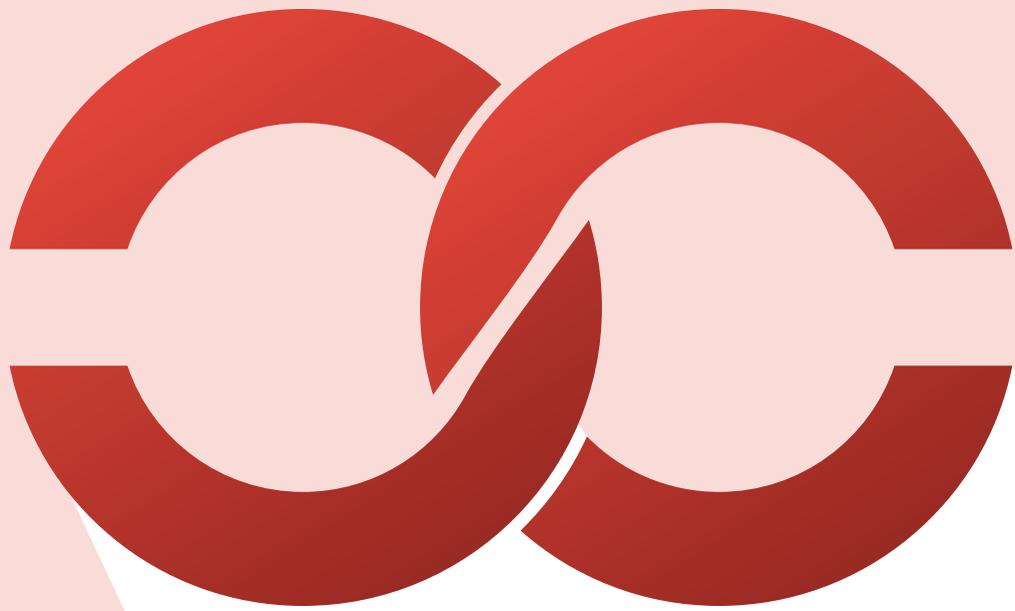
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FROM THE HEART

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.

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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.

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

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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!

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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

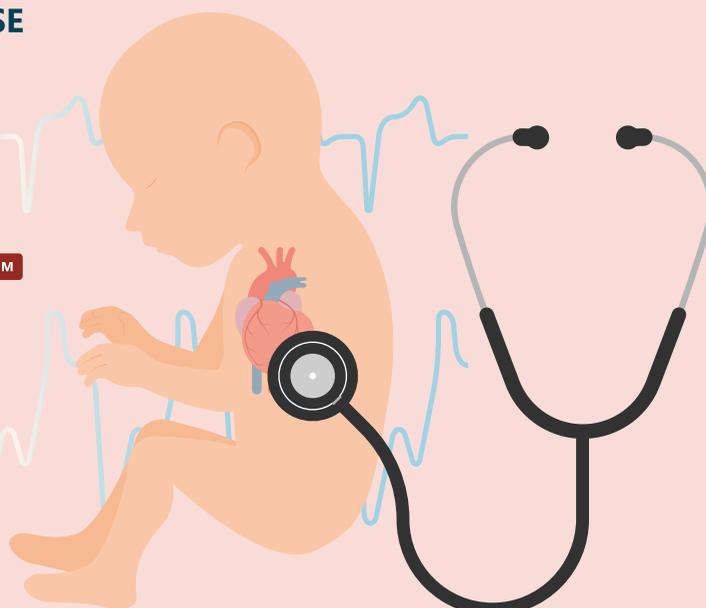
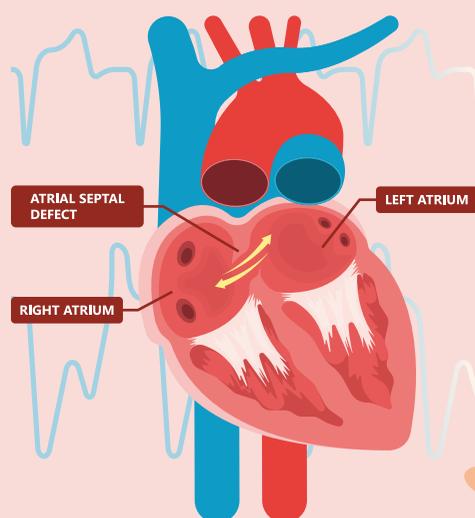
stenosed and the right ventricular outflow non-existent. Unlike most other congenital heart defects, PA.IVS is associated with a substantial incidence of coronary artery abnormalities. These abnormalities include coronary artery stenosis, coronary interruption, atresia of the ostium and fistulous communications 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 biventricular 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.

CONGENITAL HEART DISEASE



HEART MURMURS



**NEWER
TECHNIQUES AND
TECHNOLOGIES**

Technological Advances in the Armamentarium



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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.

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.

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

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

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



Equipment: 3D EP Lab System

Make: Johnson & Johnson | **Model:** CartoV7Prime

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.

Residual Risk that Remains



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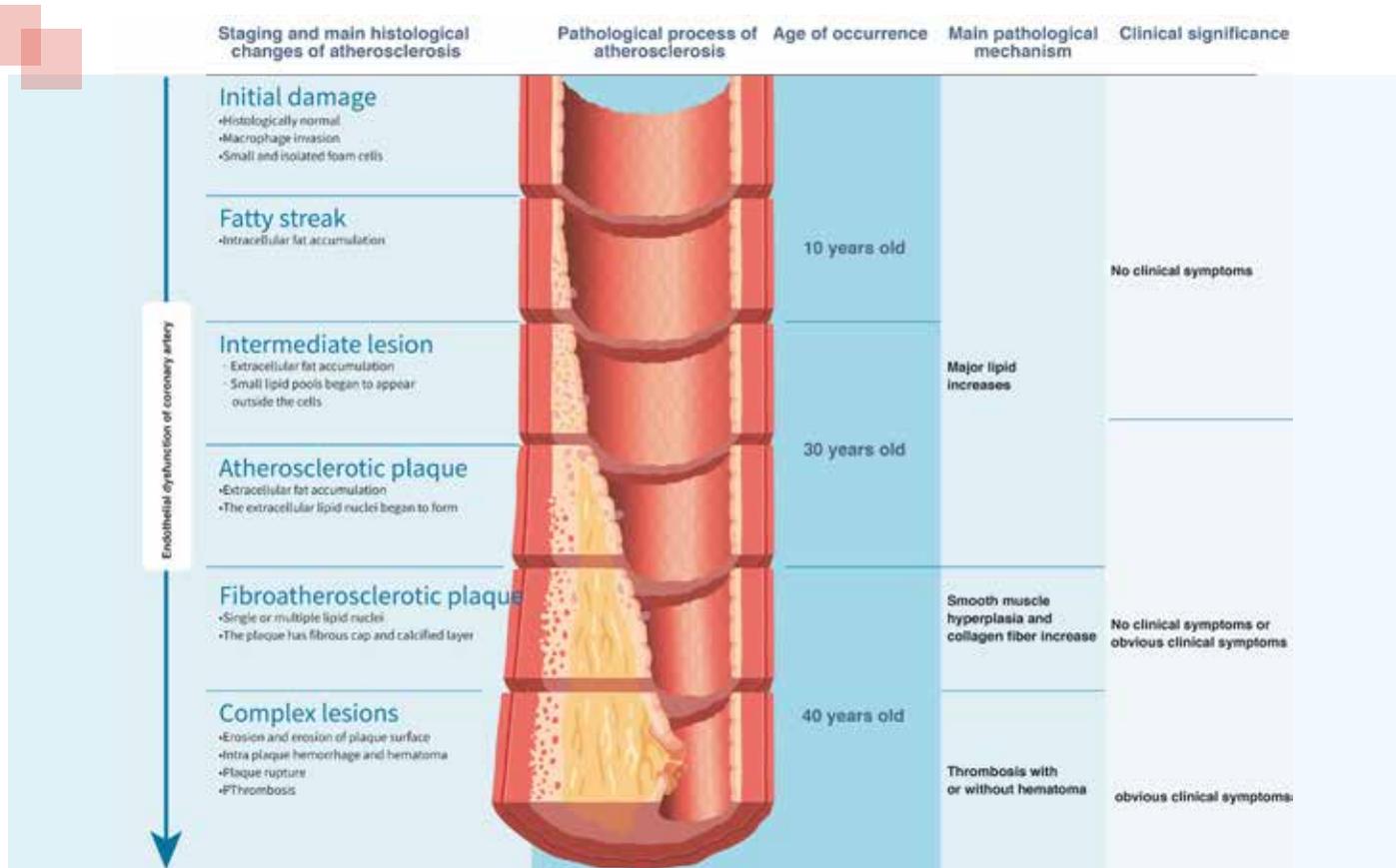
The prevalence of cardiovascular diseases keeps increasing each year globally. As atherosclerotic cardiovascular diseases (ASCVD) are associated with increased morbidity and mortality, it is important to take ample preventive measures. Despite

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

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"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

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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.

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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

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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.

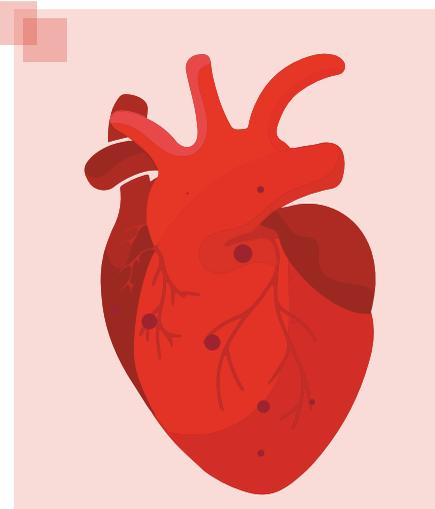
Following are the key major recommendations of these recent guidelines.

- 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.



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



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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.

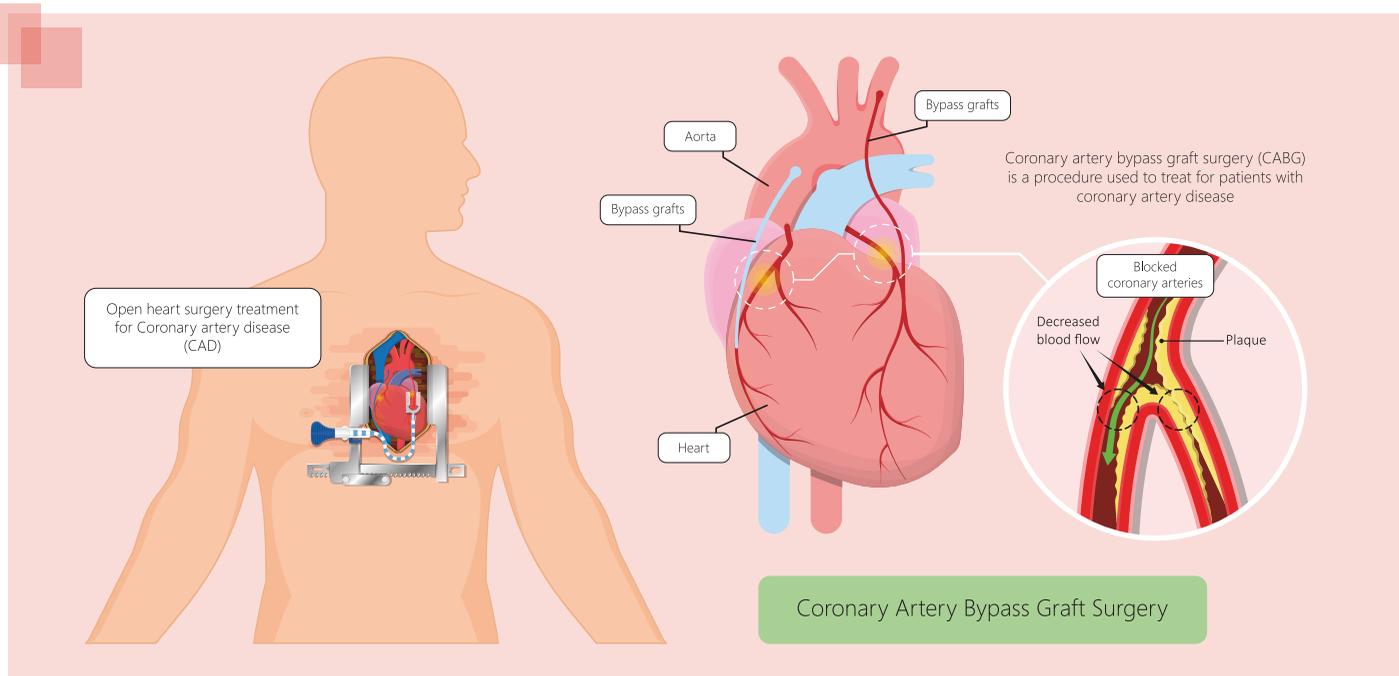
Results

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.

(Cite this article as: 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



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



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• 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 (LSs), 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.



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?

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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 in 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 al³ 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 with 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 outcomes⁵

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.

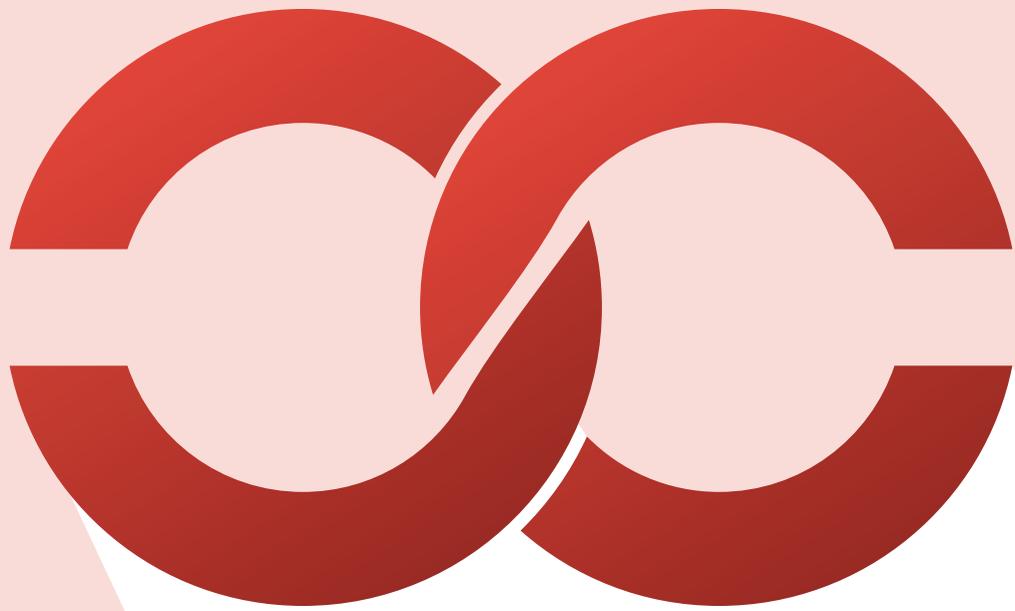
The "Coronary Artery Aneurysm Registry" represents the largest database and demonstrates decreased cardiac event rates with non-significant increase in bleeding risk at intermediate term follow up by warfarin treatment.

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

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**THE WAY WE DO
IT AT FORTIS**

The Principles of Ultra-Low Contrast Percutaneous Coronary Intervention

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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.



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graft. Vasant Kunj Left distal Transradial Artery approach (VKLITE) study aimed to assess the feasibility and safety of IdTRA 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 IdTRA. 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 . IdTRA 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. IdTRA access is feasible with few complications during CAG/PCI. Patient comfort and satisfaction, makes it a desirable route for coronary interventions.

Left distal transradial arterial approach (IdTRA) is a new interventional route that spares right radial artery (RRA) for use in haemodialysis and as bypass

When LESS is MORE- MICS at Fortis, Bangalore



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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 IJV for 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



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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%)

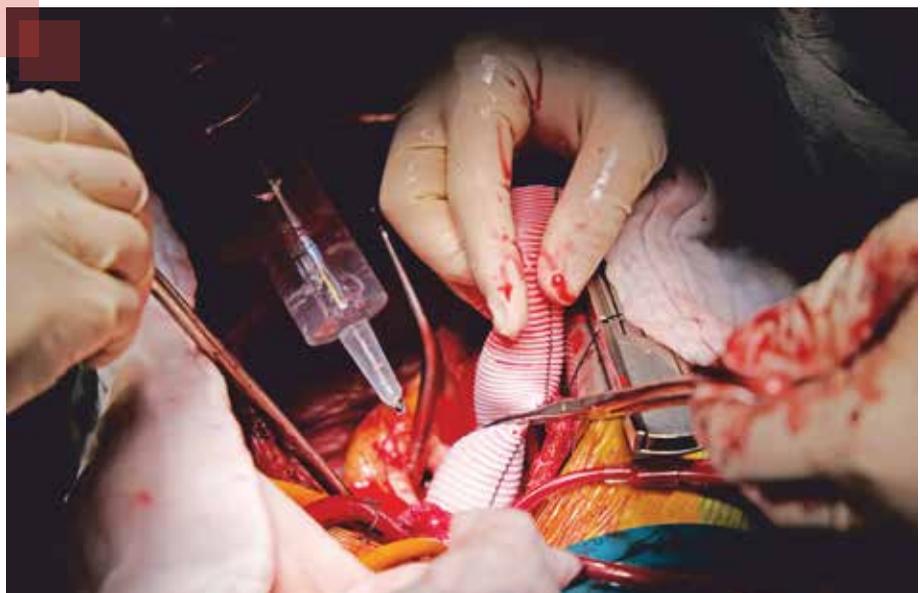
patients had renal dysfunction, 22(48.88%) were in NYHA Class III and IV and 9(20%) patients had Marfan's syndrome while 22(48.88%) patients had a bicuspid aortic valve.

The classic Bentall technique was used in all these cases, with surgery done through median sternotomy, 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



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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.

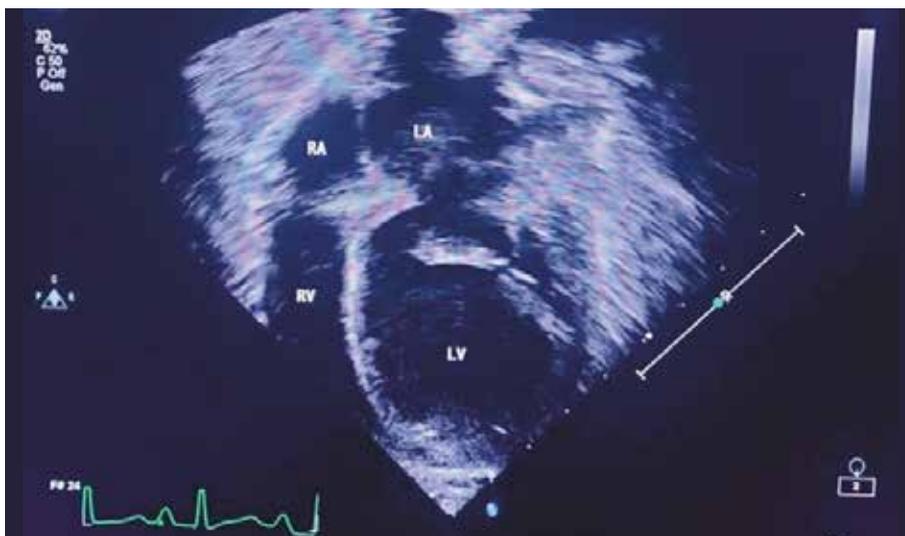


Figure 1: Echocardiogram showing Left atrial (LA) and left ventricular (LV) dilatation. EF was 10%



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

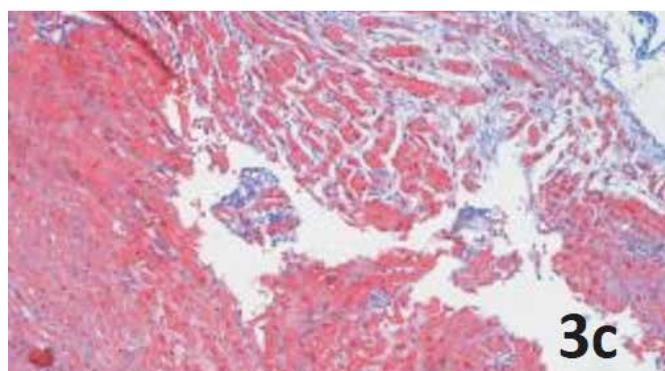


Figure 3c: Endomyocardial biopsy showing Masson’s trichrome stain where fibrosis stains blue, indicating endomyocardial fibrosis that causes restrictive cardiomyopathy

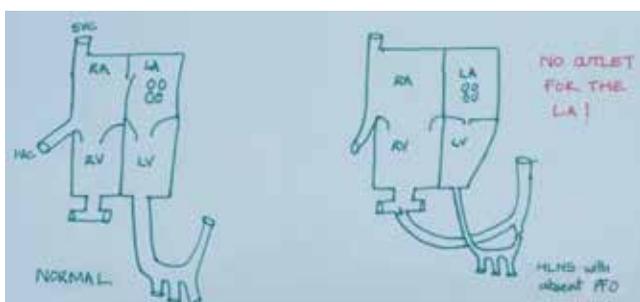


Figure 5a: Normal heart line diagram versus heart with HLHS

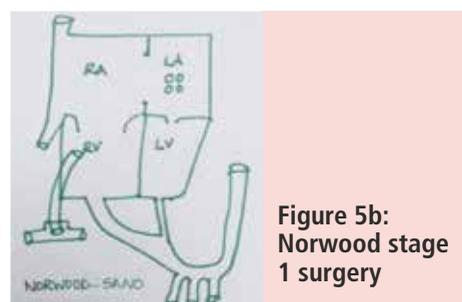


Figure 5b: Norwood stage 1 surgery

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



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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.

Abstract 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>



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



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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]

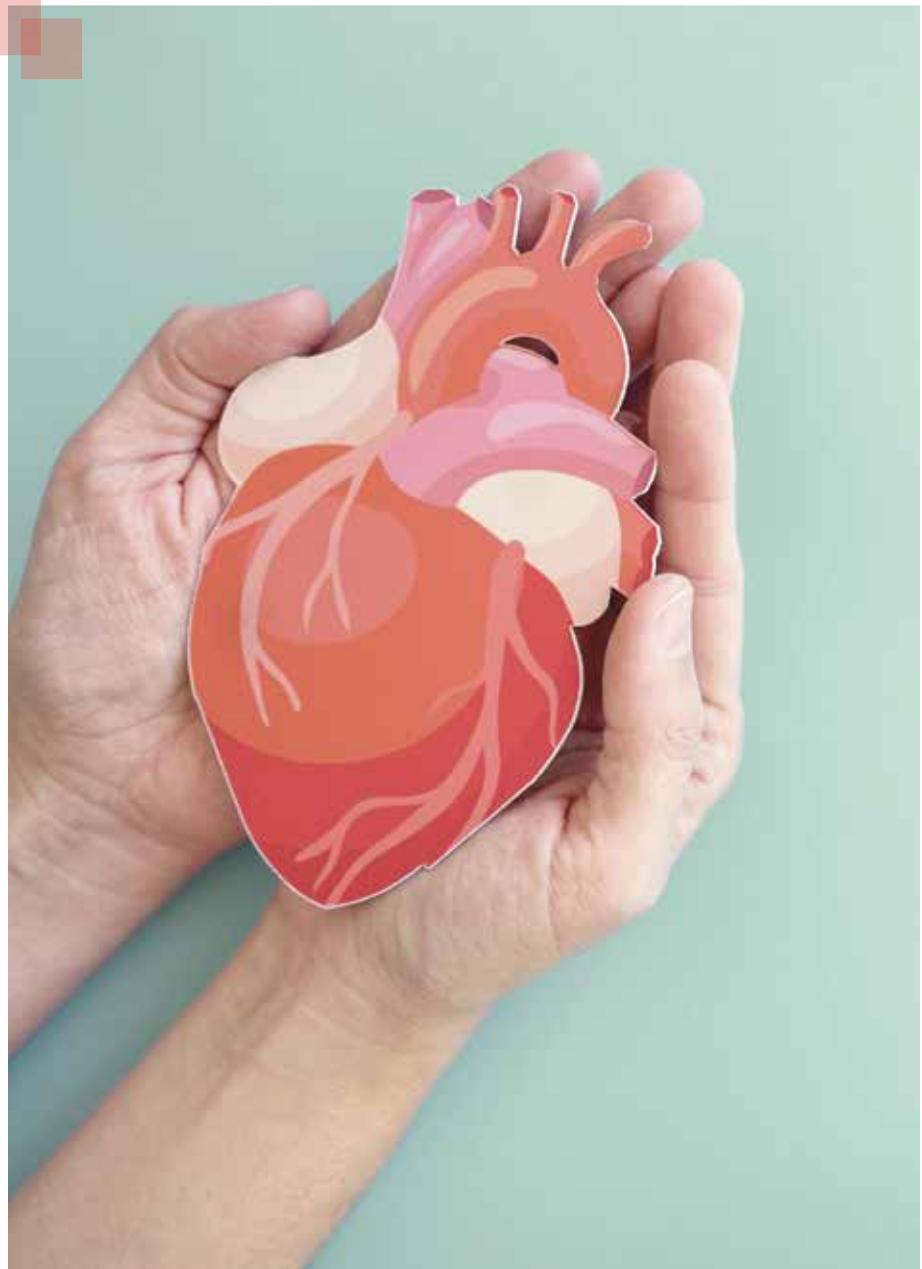
Assessment during OPCABG can be conveniently divided into three phases as assessment before grafting,

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

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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), transesophageal 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



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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.

