



# ISECT CON CHENNAI 2019

22<sup>nd</sup> & 23<sup>rd</sup> February  
2019

IDEAL BEACH RESORT  
Mahabalipuram, Chennai

## MESSAGE FROM THE CHIEF GUEST



**Dr.A.Edwin Joe,M.D.,B.L.,**  
**DIRECTOR OF MEDICAL EDUCATION**

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### MESSAGE

I am happy that city of pride and the most happening place in contemporary period is chosen by the Indian Society of Extracorporeal Technology to have its 19th Annual meeting ISECTCON 2019.

As perfusion technology is rapidly evolving to provide utmost safety in Cardiac surgical procedures is more appropriate to get educated on latest technology, acquire new skills and exchange the new innovative ideas. A highly skilled perfusionist along with anaesthetist will give peaceful and free access to the surgeon to perform delicate procedures on the heart of safety.

I wish ISECTCON CHENNAI all the best to conduct their conference memorable.



**Dr.A.EDWIN JOE**  
**DIRECTOR OF MEDICAL EDUATION**

## MESSAGE FROM THE GUEST OF HONOR



It gives me great pleasure to pen a few lines for the souvenir of the 19<sup>th</sup> Annual Conference of the Indian Society of Extra Corporeal Technology. This meeting is to be held on the 22<sup>nd</sup> & 23<sup>rd</sup> Feb 2019 at Mahabalipuram, Chennai.

Having watched the growth of the speciality over the years the progress has been tremendous. We have grown from no monitoring to monitoring everything from gases to pressures online. The perfusionists are experts in this field having been trained and duly certified by competent bodies. The roles of perfusionists have widened. They now go onto managing life support systems for ECMO, Assist Devices and donor harvest for heart transplant. Managing the circulation during aortic surgery and neonatal heart surgery are complex procedures carried out with finesse. I hope that in this meeting new ground will be broken and efforts made to document, record and publish innovative techniques.

I wish the conference all success.

With regards,

A handwritten signature in black ink, appearing to be 'S. Muralidharan'.

**Dr.S. Muralidharan**  
**Professor & Senior Consultant Cardiothoracic Surgeon**  
**G.Kuppuswamy Naidu Memorial Hospital**  
**P.N.Palayam, Coimbatore – 641 037**

## WELCOME MESSAGE

### *"Preserve the past to live the future"*



On February 16<sup>th</sup> 1961, for the first time in India, open heart surgery was performed using cardiopulmonary bypass machine with disc oxygenator by Dr.K.N.Dastur at B.Y.L Nair Hospital, Mumbai. Same year in May 1961 Dr. Gopinath of CMC Hospital, Vellore closed a VSD using Cardiopulmonary Bypass machine. On April 13<sup>th</sup> 1962. Dr. Radhakanth Padhi corrected a Tetralogy of Fallot in Wanless chest Hospital Miraj which was a TB (tuberculosis) Sanatorium. The Anesthetist was Dr.(Mrs)Padhi. On June 13<sup>th</sup> 1975 1<sup>st</sup> CABG was done in Railway hospital by Dr. K.M.Cherien and team using CPB machine using disc oxygenator and fibrillatory arrest. Dr.K.M.Cherien and his team performed first series of infant cardiac surgery in children weighing less than 7.5kg at Railway hospital Perambur in September 1976. The lesions included ASD, VSD, partial AV Canal, total AV canal, TOF and TAPVC. Among these 11 children there was only one mortality.



Surface cooling

Baby under ice packs

post operative care

Ventilator used was Bird Infant Mark7. In 1978, bubble oxygenator was used for the first time in India again in Railway Hospital. They had used silicon spray for defoaming , silicon tubings and rubber tubings as pump head (Resterilised) for all the cases. The concept of team work Anesthetist, cardiologist, cardiac surgeon, perfusionist and nurses who were the permanent members of the team resulted in a team approach. Since then the progress of Cardiovascular surgery employing different sophisticated methods were adopted and is being practiced all over India. In 1978, July Myocardial preservation employing crystalloid cardioplegia was introduced in Railway hospital for the first time in India .Many technical advancement in myocardial



preservation techniques has provided excellent results. Myocardial preservation employing newer techniques such as use of custodial, perfadex etc., has made it safe for prolonged ischemic time and life comfortable for any surgeon and was practically proved in India when a infant heart was transported from Bangalore by Flight and used for first successful infant heart transplant at Frontier lifeline hospital (Inter state) on January 12<sup>th</sup>, 2009 with the total ischemic time of 2 hours and 25 minutes. Supportive systems such as IABP was introduced first time in Railway Hospital in 1978 . Other supportive systems such as Levitronix, ECMO and other LVAD are all being used now routinely with excellent results.

It is necessary to emphasis the fact that more and more surgeons in India are performing large number of coronary revascularization surgeries using off pump technique making Bypass surgery on pump almost an obsolete procedure. The long term results of revascularization, adequacy of revascularization etc., are all a challenge and we should wait for the final conclusion for some more time.

Perfusionist is an integral and important part of Open Heart Surgical team. I am glad to note that the society is growing from strength to strength and organizing continuous educational programs to improve quality of perfusion and patient care.

Wish you all the best.

Dr.K.M.Cherian

## WELCOME MESSAGE

Dept. of Cardio Vascular & Thoracic Surgery  
**Dr. M.R. Girinath**, MS., M.Ch., FRACS.  
Chief Cardio Vascular Surgeon



Dear Mr Bhaskaran and Emmanuel Rajasingh,

I am delighted that the Indian Society of Extra-Corporeal Technology has decided to hold its Annual Meeting in Chennai this year. Chennai has been at the forefront of Cardiac surgery in India. The cardiac surgical units in the city have pioneered surgery in infants, surgery for Coronary artery disease, surgery for diseases of the aorta, transplantation (heart, Heart-Lungs, Lungs) and ECMO and have led the way for the rest of the country. Chennai has also been involved in the promotion of "Off- Pump" Coronary artery bypass surgery and on a rough estimate more than 50,000 of these operations have been done in the city. Beating heart surgery has not diminished the role of Perfusion Technologists because an alert perfusionist is of utmost importance in this form of surgery.

Perfusion Technologists are key members of the Cardiac surgical team. However, they need to update themselves by reading literature and attending conferences such as this. I am sure you will have a very successful conference and I wish you a very productive exchange of ideas.

DR M R GIRINATH

## WELCOME MESSAGE



### THE MADRAS MEDICAL MISSION

Unit : Institute of Cardio - Vascular Diseases

*Dr. S. RAJAN., M.S., M.Ch.  
Director - Cardiac Surgery*

#### MESSAGE

I am exceptionally proud to give this message on the eve of ISECTCON 2019 to be held on 22<sup>nd</sup> & 23<sup>rd</sup> February 2019 at Ideal Beach Resort, Mahabalipuram, Chennai. I had been witnessing the development of this particular profession over a period of 3 decades. They are the backbone of CTVS. This encourages and fosters the development of clinical perfusion through education, knowledge sharing and academic growth. These conferences aid in upgrading the young career driven Perfusionist. Inviting eminent faculty members to chair sessions and transfer new insights to the next generations is very important. I congratulate the untiring effort of the organizers to conduct a great educational feast.

I wish the conference a grand success.



**Dr. S. Rajan**

## WELCOME MESSAGE



I am very happy to give a message for the 19th Annual conference of ISECT, Chennai.

Perfusionists form an inseparable part of the cardiac surgical team. Since its introduction in 1953, open heart surgery evolved over the decades into a very safe and common procedure. Advancement of perfusion technology and improved myocardial protection techniques allow the surgeons to do perfect operations without haste.

I hope that, this conference will deliberate and discuss the different facets of Extra Corporeal Technology and enhance the knowledge of the Perfusionist fraternity.

I wish the conference great success.

**Dr. Kurian**



## WELCOME MESSAGE

Dept. of Cardiothoracic Surgery  
**Dr. PAUL RAMESH. T**  
FRCS(Edin.), FRCS(Glas), FRCS(Cardiothoracic Surgery)  
Senior Consultant Cardiothoracic Surgeon  
Heart & Lung Transplant Surgeon

Adjunct Faculty, Dept. of Mechanical Engineering  
IIT - Madras



It gives me immense pleasure to welcome you all to the **19th Annual Conference of ISECT** in Chennai, India.

The Indian State of Tamil Nadu in general and the city of Chennai (or Madras) in particular has a deep connection with the history of cardiothoracic surgery and the concurrent introduction of perfusion technology in India. Even in the early 1970s robust CT surgical programs had started using bubble oxygenators and deep hypothermia for performing adult as well as complex congenital surgery. Needless to say that perfusionists were an integral part of this pioneering effort.

The evolution of perfusion technology from those early days to the present use of minimally invasive CPB circuits, use of ECMO in operating theatres, ICUs, cathlabs, transfer of critically ill patients from one medical facility to another and indeed in the increasing use of ECPR in witnessed arrests clearly demonstrates that the field has been one of rapid progress and continual evolution.

I am happy that perfusionists across the length and breadth of this country have kept pace with these changes and not just adapted but innovated in order to deliver these services to an increasing number of patients. The challenges of delivering an efficient perfusion service in India at times involves formidable challenges. The lack of availability of skilled personnel, financial capability of patients and significant comorbidity are some of the important obstacles to the smooth delivery of an optimal clinical perfusion service. In spite of this I can attest to the personal commitment and professionalism of the team I work with and can say that they are second to none globally in their ability to deliver a highly professional service around the clock and I do appreciate that this is the case for the majority of perfusion teams across India.

I hope this conference will provide a forum for you to share your experiences and further enhance your skills and knowledge that in turn will translate into improved patient care. I congratulate the organising committee of the meeting on the content of ISECT 2019 that encompasses current, emerging and potential future trends in perfusion technology.

I wish the conference every success.

  
Dr. Paul Ramesh  
Senior Consultant Cardiothoracic & Transplant Surgeon

**Dr. PAUL RAMESH THANGARAJ,**  
FRCS(Edin.), FRCS(Glas), FRCS(Cardiothoracic Surgery)  
Senior Consultant Cardiothoracic Surgeon  
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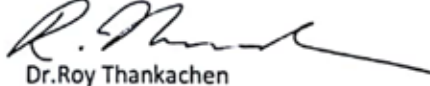
## WELCOME MESSAGE



The field of cardiothoracic surgery has seen immense development over the past few years. What was once seen as very high risk surgical procedures now has become very safe and even routine. Much of the credit for this goes to the field of Perfusion Technology. Amazing developments have occurred in the technology and strategies involved in Cardiopulmonary bypass over the past few years.

The boundaries have been further pushed by the development of technology like ECMO , LVADS , RVADS and IABP, which in most centers around the world are managed by perfusionists. All of this has been possible only because of a consistent desire and drive to progress. The annual conference exemplifies this attitude.

I therefore take this opportunity to wish my colleagues in the Indian Society of Extra Corporeal Technology all the best for their 19<sup>th</sup> Annual Conference. May they continue to drive frontiers of this speciality to even greater heights.

  
Dr. Roy Thankachen  
Professor & Head of Department  
Dept. of Cardio-Thoracic Surgery  
CMC Hospital , Vellore

## MESSAGE FROM THE ISECT PRESIDENT



Dear Friends

I am honored and privileged to extend you a warm welcome to the 19<sup>th</sup> Annual Conference of “Indian Society of Extra Corporeal Technology” in Chennai being held on 22<sup>nd</sup> -23<sup>rd</sup> February, 2019.

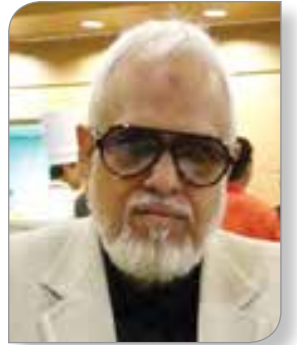
The Scientific Program will focus on most recent and clinically relevant developments in the field of Extra Corporeal Technology. The Organizing Committee is working diligently to make ISECT CON 2019 a wonderful success. The Conference will be an important platform for learning for Perfusionists. Senior Perfusionists will be honored with Life Time Achievement Award.

We look forward to your participation and hope to make it an unforgettable experience for all delegates who visit to Chennai and make it a grand success.

*Kamla Rana*

DR KAMLA RANA  
PRESIDENT ISECT

## MESSAGE FROM THE ISECT SECRETARY



Mr. Chhipa Usmangani Y.  
General Secretary ISECT  
Indian Society Of Extra Corporeal Technology

Dear Colleagues

Best wishes of new year

On behalf of Indian Society of Extra Corporeal Technology (ISECT) office bearers, executive committee members, life members we extend a warm invitation to the 2019 Annual Scientific Meeting i.e. ISECTCON2019 Chennai held this year in Chennai from 22<sup>nd</sup> to 23<sup>rd</sup> February 2019, which includes prompt keynote presentations, oral talks, poster presentations, scientific exhibitions....

Our aims is to aggregate researchers, academicians and scientists from the perfusionists community and create an avenue towards robust exchange of information on technological advances, new scientific achievements and the effectiveness of various regulatory programs towards perfusion. Bringing together the professors, researchers and students in all areas of cardiac surgery and to provide an international forum for the dissemination of original research results, new ideas and practical development experiences which concentrate on both theory and practices.

The focus of this year's meeting is set firmly on the exciting and challenging future ahead for our specialty. The main focus this year is number of teaching hospitals and universities (both government and private) are offering Perfusion Training Programs but without any set standards on eligibility, number of seats, facilities, quality of teaching etc. There is also a mismatch between supply and demand.

GS send set of guidelines for perfusion training programs to so many institutions offering Perfusion Training Programs. ISECT Life Members caution not to take up teaching assignments in such institutes which do not maintain quality.

This year union cabinet approved the “Allied and Healthcare Professions Bill 2018” for regulation and standardization of education and services by allied and healthcare professionals. The Bill provides for setting up of an Allied and Healthcare Council of India and corresponding State Allied and Healthcare Councils which will play the role of a standard-setter and facilitator for professions of Allied and Healthcare. GS appealed PMO, Ministry of Health and Family Welfare, National Human Resources For Health Cell, Director Public Grievance, Honorable 26 Gujarat MPs, Honorable 13 Rajyasabha Members, Honorable Chief Minister Gujarat, Honorable Health Minister Gujarat, Director Health Services, Technical Advisor etc. to consider “Clinical Perfusionists” under the category of Health Care Professions. GS also explained role of “Clinical Perfusionist” personally to Honorable MP Dr. Kirit Solanki and appealed to consider “Clinical Perfusionists” under the category of Health Care Professions.

GS with the help of ISECT office bearers, executive committee members, life members did the state wise survey of perfusion training Institutes running B.Sc. perfusion technology programs.



Out of 35 states in India 14 states running B.Sc. and M.Sc. perfusion technology programs with total 661 (614 seats → B.Sc. perfusion technology and 47 M.Sc. perfusion technology).

As the completion of 2016-2019 tenure of ISECT executive committee, we reflect on the changes brought about since we took office in February 2016. The goals that we set out in this tenure to accomplished were focused on Transparency and accountability in the operations and transactions of the ISECT. ISECT audit report started giving to ISECT office bearers, ISECT EC members and all the life members before ECM / AGBM meeting well in advance. ISECT started Prime Academy Program with the help of Terumo India Private Limited to keep our perfusionists updated with advances in cardiopulmonary bypass. Work on digitalization of our ISECT documents started, prepared guidelines for annual conferences i.e. ISECTCON, formulated rules and regulation for Life Time Achievement Award. Apart from routine secretarial work, all the applications for life membership were scrutinized thoroughly before accepting them and placed it before the AGBM for their approval. Every year renewal of ISECT registration with the registrar's office in Chennai and Mr. Kuppuswamy and Mr. Surender Chennai are entrusted with this work.

I am always in constant touch with the ISECT office bearers, ISECT EC members and all life members to streamline the functioning of ISECT, always in contact with ISECT website moderator and editor IJECT to help them in their work. I extend my thanks to all ISECT office bearers, executive committee members and life members regarding their active participation in day-today activities of ISECT. I put in all efforts to the best of my ability to served ISECT in a responsible way transparently with due accountability.

Now on completion of 2106-2019 tenure of ISECT office bearers and executive committee members, there will be an ISECT election for 2019-2022 during ISECTCON2019 Chennai. My humble request to all ISECT life members to elect those candidates who is trustworthy, honest and faithful to ISECT and don't elect those candidates who is ISECT's defaulter, involved in corruption, didn't believe in discipline.....

My request to ISECT life members that please remain present in large numbers and cast your vote for ISECT office bearers and Executive committee members for the tenure of 2019-2022.

Chennai or Madras as it was called before, on the Coromandel Coast, is the capital city of Tamil Nadu. It is a major industrial, commercial, cultural, economic and educational centre of the Southern India. Chennai City is known as the "Detroit of India" because many automobile industries are located here. A Legend also says, this city was first named Chennai in honour of Damal Chennappa Nayakkar. In 1996, then ruling Government of Madras, renamed it as Chennai and it stands good till date.

Beautiful Beaches, one day leisure outlets, modern sea port and airport, long and beautiful highways, convenient multi-transport system, Theme parks, industrial cities, Hi-Tech software silicon valley parks, sophisticated multi speciality hospitals, world class universities, high rise business and residential complexes are the present days outlook of the great Chennai. Top ten places for tourist interests are Mamallapuram, Arignar Anna Zoological park, Muttukadu Lake, Marina Beach, Elliot's Beach, Gundy National Park, Snake Park, Vedanthangal Bird Sanctuary, Birla Planaturium, Government Museum.....

We look forward to seeing you at the ISECTCON2019 Chennai.....



Mr. Chhipa Usmangani Y.  
General Secretary ISECT

## MESSAGE FROM EDITOR ISECT



Registered Under The Tamil Nadu Society Act.  
Registration No. : 4/1185

**INDIAN JOURNAL OF EXTRA-CORPOREAL TECHNOLOGY**

Official Journal  
Indian Society of  
Extra-Corporeal Technology

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*Greetings!*

*I am glad that the 19th Annual Conference of "Indian Society of Extra Corporeal Technology" is being organized at Ideal Beach Resort, Mahabalipuram, Chennai, from 22nd & 23rd February 2019. It gives me immense pleasure in writing this message through the souvenir on this occasion as Editor of our scientific journal IJECT (Indian Journal of Extra Corporeal Technology).*

*The main objective of the conference is to improve the knowledge base and skills in addressing the issues related to clinical perfusion. The scientific content of this conference focuses on how to incorporate the innovations, techniques, science and principles of networking in perfusion technology. This is an opportunity for all perfusion students, associate members and life time members to have a good overview of the issues related to this subject.*

*"A single flower doesn't have ability to make the garland". Thus, this souvenir too is not the outcome of an individual effort rather a collaborative and immense efforts put forward by the authors and all the members of organizing committee.*

*While technology and social media efficiently delivers daily stories to our desktops, laptops and mobile devices, whereas souvenir is all about bridging the gap between the author and the readers. The scientific committee tried to keep you engaged through this souvenir; hope you, the readers enjoy it enthusiastically.*

*I along with the Editorial Review Committee wish you all the very best in 2019.*

*Mukta*  
Dr. Mukta Tiwari

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## MESSAGE FROM PRESIDENT ISECTCON 2019



Dear Colleagues ,

It gives me great pleasure to welcome you to Cultural City of India ,Chennai on the great occasion of the 19th Annual conference of the Indian society of Extracorporeal Technology.

The conference will be a memorable one for each of you in every aspect of scientific learning. We assure you comfortable stay and the unique Tamil cultural Hospitality.

As organizing president , I take this opportunity to congratulate Mr. Baskaran & Mr.Emmanuel Rajasingh , the organizing secretaries and other dynamic office bearers of various other subcommittees.

Special thanks to Mr.Manoharan Henry , Mr.Kuppuswamy and Mr.Kanagaraj for their valuable contributions.

Chennai to its credits has the ancient monuments of historic importance and has been one of the pioneer place for the development of cardiac surgery in India. It is continuing its great run as the city which is leading the cardiac transplant program of India.

I heartily welcome you all to this landmark conference at Chennai and also contribute your best to make this an exceptional and memorable event. Your dynamic participation and eminent contribution will greatly boost our energetic efforts in planning and sculpturing this conference.

The Scientific layout will provide all that is required and is designed in the best way. I hope everyone are going to enjoy the blend of Knowledge , science and enjoyment and look forward to more such meetings for the betterment of the society and profession. Do Enjoy the sights of the city as well.

I wish all the very best for the success of the conference.

Sankar.M  
Organizing President – ISECTCON 2019 Chennai  
Chief Perfusionist & Instructor  
Department of Thoracic & Cardiovascular Surgery  
CMCH Vellore - 632004

## MESSAGE FROM ORGANISING SECRETARIES ISECTCON 2019



V. Baskaran



U. Emmanuel Rajasingh

Dear Delegates,

It's a proud privilege for the Tamilnadu perfusion team to host the 19th Annual Conference of Indian society of extracorporeal technology.

This conference is being held in the state of Tamil Nadu after exactly 8 years. The perfusionists of the state are eagerly looking forward to welcome you all from across the country.

We will have academic and wet lab sessions at the venue, Ideal Beach Resort, Mahabalipuram, Chennai

Ideal Beach resort has lush green lawns, spacious area for sponsorship stalls, a big hall which can accommodate 800 delegates and a private beach to relax in the evenings and have social get together. The weather will be pleasant during this time of the year in Chennai.

Mahabalipuram is a tourist destination revealing the pallava architecture, the famous shore temple and the five rathas are a pleasure to visit.

In parallel we have the students' session in "Spictra hall" with the capacity to accommodate 200 students. The wet lab sessions will be held in the same hall after the student lectures. We also have the academic quiz competition for junior perfusionist below 3 years of experience.

Once again we take great pride in inviting you to ISECTCON2019 Chennai.

We hope you to come, learn, make new friends and take some happy memories with you back home.

Regards,  
From the desk of Organising Secretaries  
ISECT CON 2019 Chennai.



## MESSAGE FROM SCIENTIFIC COMMITTEE ISECTCON 2019



M. Malathy



Suni Jose

Dear Members of ISECT, Delegates from India and abroad, Founding members, Pioneers, Students and all attendees of ISECTCON 2019. On behalf of our scientific committee - It's our great pleasure to welcome you all to the 19th Annual Scientific Meet of ISECT to Chennai-The Detroit of India!

When we look back to the history of ISECT, all major milestones like recognition and formation of ISECT, identification of the historical ISECT's logo and registration of this society as clinical entity have occurred here in Chennai-Tamil Nadu, the dynamic land of achievements and cornerstone of many advancements.

In order to self-refine our clinical skills as competitive perfusionists, we the scientific committee incorporated our thoughts-hard work and dedication for several long hours and came-up with a plan of having presentations on various innovative topics received from outstanding abstracts, creating a platform for discussion and would like to give you all a constructive "Take Home Message" to implement in your clinical practice. Guest Lectures and Panel Discussion sessions are going to trigger the knowledge of various specific advancements in clinical perfusion. For perfusion students, special parallel sessions of CME, frontalis-Quizes, Wet-Labs, CentriMag and Simulation sessions by Maquet have been added to the agenda. These sessions would benefit both perfusionists and perfusion students by giving an opportunity to integrate their textual knowledge and clinical applications. It's going to be a memorable meeting with innovative presentations, fruitful discussions and lots of fun.

We are certain that you will enjoy the perfusion-scientific feast of ISECTCON2019 and your stay here in Chennai would be a memorable one, both personally and professionally.

Sincerely,  
Scientific Committee.  
ISECTCON2019

**Know How?**

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## GAME OF FRONTALIS

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Team of 2

Register at <http://www.tinyurl.com/gameoffrontalis>

Further details, Contact : 9843319740

## Lifetime Achievement Awardees



**LM 093**

### **Mr. Thomas Kotty**

Mr Thomaskutty has perfused 5500 plus adult and Pediatric procedures over these 28 fruitful years of service. He is highly skilled at Perfusion for heart, lung, liver transplants; adult as well as Pediatric ECMO; hypothetical Chemoperfusion and so on. He is also an active member of both, the American and the Indian Society of Extra-corporeal technology. He was the Editor, Indian Journal of Extra Corporeal Technology in 1993-1996, Editorial Advisory Board member of Indian Journal of Extra Corporeal Technology, Reviewer for Journal of Extra corporeal technology Amsect, Indian Journal of Extracorporeal technology and an Adjunct Faculty of the famous Manipal University of Allied Health Sciences, Manipal India. He is one of the Board of directors of Washington state perfusion society



**LM 128**

### **Mr. Noor Mohammed Qureshi**

He hails from Jaipur, Pink City of Rajasthan. He joined Santokba Durlabhji Memorial Hospital in 1982. Which was inaugurated by Ex. Prime Minister Late Smt. Indra Gandhi in 1971. Mr. Noor Mohammed Ji started his career in cardiology and six years later he joined CTVS OT. He did his perfusion training program from Indian Association of Cardiovascular and thoracic surgeon's (IACTS). He has credit of over 9000 independent cases to his pocket which includes both adult and paediatric CTVS procedure.



**LM 167**

### **Mr. Daniel Mathew**

Mr. Daniel Mathew currently working as Senior In-Charge Perfusionist at Al Qassimi Hospital, Ministry of Health, Sharjah, United Arab Emirates completed his graduation in science with Physics from the University of Kerala. Subsequently he completed his training in Cardiovascular Perfusion and was awarded the Diploma in Perfusion Technology from CMC, Vellore in 1990. He also was awarded additional credentials (Diploma in Perfusion) from the Indian Association of Cardio-Thoracic Surgeons in 1995. Also completed Phase one Certification Programme, Syncardia Temporary Total Artificial Heart from Germany. Mr. Daniel Mathew has the Unique Distinction of being the commissioning Chief Perfusionist, responsible for establishing Perfusion units in various institutions in India and Overseas.



**LM 119**

### **Mr. Masood Ahmed Qureshi**

Mr. Masood Ahmed Qureshi hails from Jaipur, Rajasthan finished his perfusion training in 1985 and has 34 years of experience in the field of perfusion .



ORGANIZING COMMITTEE - ISECTCON 2019 CHENNAI



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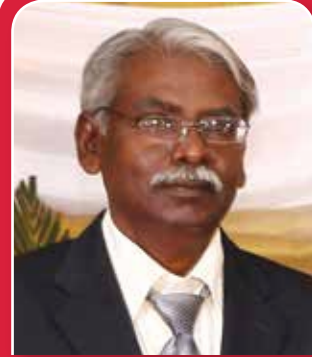
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## DAY 1 22<sup>nd</sup> February (Friday)

8.00 am Onwards  
**REGISTRATION**

### ▶ FOCUS QUALITY AND SAFETY FIRST

#### MODERATORS

♦ *Mr. Simon Richard Pinto* ♦ *Mr. Robert Joseph Benjamin*

- |               |   |
|---------------|---|
| 09:00 - 09:10 | Incorporating Cost Effective Simulation Based Training Method for Cardiopulmonary Perfusion Trainees<br>♦ <i>Ms. Dharani Srinivasan, CMC, Vellore</i> |
| 09:15 - 09:25 | A Survey of Awareness and Actual Physical Activity Amongst Perfusionists In INDIA<br>♦ <i>Mr. Vishal Patel, DDMM Heart Institute, Gujarat</i>         |
| 09:30 - 09:50 | GUEST LECTURE: Terumo Skill Lab<br>♦ <i>Mr. Rahul Sharma, Terumo</i>  |
| 09:55 - 10:15 | GUEST LECTURE: Resetting Attitudes to Safety - Incorporating Safety II<br>♦ <i>Mr. Timothy Willcox, Auckland City Hospital, New Zealand</i>           |

### ▶ MYOCARDIAL PRESERVATION: *Protect, Perfuse and Preserve*

#### MODERATORS

♦ *Mr. Sam Immanuel* ♦ *Mr. Madhusudana Naidu* ♦ *Ms. Kinnari N. Chudasama*

- |               |  |
|---------------|--|
| 10:20 - 10:30 | Custodiol (HTK or Bretschneiders) Cardioplegia - Challenges in Electrolytes (Na, K, Ca) Management<br>♦ <i>Mr. Sundar Rajan, Mediclinic Middle East Hospitals, Abu Dhabi</i> |
| 10:35 - 10:45 | Use of Ringers Lactate as A Substitute to Plasmalyte-A Base Solution in del Nido Cardioplegia<br>♦ <i>Ms. Smita Babariya, MGM Institute of Health Sciences, Navi Mumbai</i>  |
| 10:50 - 11:00 | Modified BSG Cardioplegia Delivery Circuit<br>♦ <i>Mr. Bhagwan Singh, Military Hospital, CTC, Pune</i>   |
| 11:05 - 11:25 | GUEST LECTURE: Myocardial Protection - Recent Advances<br>♦ <i>Dr. Karthik Raman, MMM, Chennai</i>   |

### 11:30 - 12.20 **INAUGURATION**

### **OXYGENATORS:** *Integrated Advantage and Interventional Complications*

#### MODERATORS

♦ *Mr. Loknath Tiwari* ♦ *Dr. Vijaya Vivek Lanje*

- |               |  |
|---------------|--|
| 12:25 - 12:35 | High Pressure Excursion (HPE): Treatment of the Torment<br>♦ <i>Mr. Kamal Das R.G., Kar Medical College, Kolkata</i> |
|---------------|--|



12:35 - 12:55 GUEST LECTURE: Use of Integrated Arterial Filter Oxygenators in Recent Perfusion Practice - Immense Benefits for Superior Patient Outcome  
♦ **Mr. Christian Chlela**, LivaNova

13:00 - 14:00 LUNCH BREAK

▶ **ECMO : Curriculum of Challenges in Extended Life Support**

**MODERATORS**

♦ **Mr. Timothy Willcox** ♦ **Mr. P.V.S.Prakash** ♦ **Mr. Elayaraja**

14:10 - 14:20 ECMO as a Bridge to Heart Transplant in a Single Ventricle Physiology Patient  
♦ **Ms. Blessly John**, Narayana Hrudayalaya, Bangalore

14:25 - 14:35 V-V ECMO for ARDS, H1N1-Challenges Faced by a Peripheral Centre  
♦ **Ms. Aishwarya Prakash**, Narayana Hrudayalaya, Mysore

14:40 - 14:50 Venovenous ECMO for Lung Injury  
♦ **Mr. Sam Immanuel**, Narayana Hrudayalaya, Bangalore

14:55 - 15:05 Challenges in VV ECMO  
♦ **Mr. Siddu S Neginahal**, Fortis Hospital, Bangalore

15:10 - 15:30 GUEST LECTURE: Monitoring of Oxygenator function on ECMO - A stitch in time saves nine  
♦ **Mr. Suresh Robert**, Dubai Hospital, Dubai UAE

▶ **VENTRICULAR ASSIST DEVICES: Last Hope to Retain the Failing Heart**

**MODERATORS**

♦ **Mr. Senthil Kumaran Dhanakotti** ♦ **Mr. Madhan** ♦ **Mr. S. Sundar Rajan**

15:35 - 15:45 Combined Therapy of External Left Ventricular Assist Device and Membrane Oxygenator as A Bridge to Heart Transplant  
♦ **Mr. Harikrishnan**, Fortis Malar, Chennai

15:50 - 16:00 LVAD as A Bridge to Recovery in Post CPB with Severe LV Dysfunction Following ALCAPA Repair - Case Series of 3 Neonates  
♦ **Ms. Santhanalakshmi**, Fortis Malar, Chennai

16:05 - 16:20 GUEST LECTURE: Real World Experience :CentriMag - Mechanical Circulatory Support  
♦ **Ms. Parmita Desai**, CentriMag

16:30 - 16:50 GUEST LECTURE: Future of Perfusion in View of TAVI, MIDCAB and Minimal Invasive Surgical Procedures  
♦ **Dr. Oliver Jagaden**, Mediclinic Middle East Hospitals, Abu Dhabi

17:00 - 18:00 PANEL DISCUSSION

**MODERATOR**

♦ **Dr. Paul Ramesh**, Apollo Hospital

**PANALIST**

♦ **Dr. Ganapathy** ♦ **Mr. Isaac Chinnapan** ♦ **Mr. PVS Prakash** ♦ **Mr. Gopi. K. Thalopathy**  
♦ **Ms. Daphne D.K (Dietician)**

19:00 Onwards GALA DINNER

## DAY 2

23<sup>rd</sup> February (Friday)

▶ **PEDIATRIC PERFUSION: Very Small - be Gentle and Cautious**

**MODERATORS**

♦ **Dr. Adam L. Fernandez, Mr. Manoj MC, Mr. G. Naveen Kumar**

08:25 - 08:40 GUEST LECTURE: Introduction of New BRIZZIO Oxygenator for Neonate  
♦ **Dr. Kazuhisa Lishihara**, R&D Centre, Nipro, Japan

08:45 - 08:55 Correlation of Changes in Fluid Balance During Cardiopulmonary Bypass to the Post-Operative Outcomes in Paediatric Patients Undergoing Congenital Heart Surgery  
♦ **Mr. Saravana Perumal**, Narayana Hospital, Andhra Pradesh

09:00 - 09:10 Comparison of Higher Hematocrit and Lower Hematocrit on Cardiopulmonary bypass for Cardiac Surgery  
♦ **Ms. Rituja Patil**, MGM School of Biomedical Sciences, Navi Mumbai

09:15 - 09:45 GUEST LECTURE: Progressive Advancements in Pediatric Perfusion  
♦ **Mr. Isaac Chinnappan**, Monroe Carell Jr. Children's Hospital, Vanderbilt, USA

▶ **ANEURYSM & ARCH SURGERY:**

*Expecting Clinical Intervention for Unexpected Challenges*

**MODERATORS**

♦ **Mr. Ravinath Swamy, Ms. Subashini, Mr. Krishna Prasad TH**

09:50 - 10:00 A Novel Approach to Complex TYPE A Aortic Dissection with Malperfusion - Perfusionist Aspect  
♦ **Mr. Savio Mathew**, Sunrise Hospital, Kochi

10:05 - 10:15 Determination of Adequacy of Antegrade Cerebral Perfusion Flow During Unilateral Cerebral Perfusion in Hemi-Arch Aortic Surgery  
♦ **Mr. Rajesh Yadav**, All India Institute of Medical Science, New Delhi

▶ **TRANSPLANTATION : Culture of Humanity Never Dies**

10:20 - 10:30 Lung Transplantation Using ECMO Circuit Apollo Hospital Experience  
♦ **Ms. Krithika**, Apollo Hospital, Chennai

10:35 - 10:45 Enbloc Heart and Lung Transplantation - An Institutional Experience  
♦ **Mr. Selvakumar**, Narayana Hrudayalaya, Bangalore

10:50 - 11:00 Use of Irradiated Blood in CPB  
♦ **Mr. Parth Khakharia**, DY Patil Hospital Mumbai

11:05 - 11:25 GUEST LECTURE: Optimizing Perfusion for Long Bypass Time and Complex Surgeries  
♦ **Mr. Mawande Khayaletu Edson**, Livingstone Tertiary Hospital

▶ **PERFUSION: Ancillary Skills and Plans in Special Population**

**MODERATORS**

♦ **Ms. Muktha Tiwari, Mr. Vishal Patel, Mr. Subhash Ramachandran**

11:30 - 11:40 Accuracy of Ngal (Novel Biomarker) in Accurate & Early Diagnosis and Prognosis of On-Pump Cardiac Surgery Associated Aki in Adults  
♦ **Mr. Mrinal Mandal**, NEIGRIHMS, Shillong, Meghalaya

11:45 - 12:05	GUEST LECTURE: Fatigue Management in Relation to Perfusion Safety ♦ <b>Dr. Adam Fernandez</b> , <i>British Columbia Children's Hospital, Vancouver, BC, Canada</i>
12:10 - 12:20	The Subclavian Intra-Aortic Balloon Pump: A Compelling Bridge Device for Advanced Heart Failure ♦ <b>Mr. Rahul Simon</b> , <i>Rajagiri Hospital, Cochin, Kerala</i>
12:25 - 12:35	Innovative Indiginious RBC Washing Technique by Using Dialysis Membranes ♦ <b>Dr. Vishwas Paul</b> , <i>Ashwini Sahakari Rugnalaya &amp; Research Center, Solapur, Maharashtra</i>
12:40 - 13:00	Guest Lecture: NIRS in CPB and ECMO ♦ <b>Dr. Suresh Rao</b> , <i>Malar Hospitals, Chennai</i>
<b>13:00 - 14:00</b>	<b>LUNCH</b>
14:00 - 15:00	GAME OF FRONTALIS - FINALS ♦ <b>Mr. Sounder (GKNM) &amp; Team</b>
15:00 - 15:30	Prize Distribution
15:30 Onwards	General Body Meeting
<b>19:00 Onwards</b>	<b>BANQUET DINNER</b>

### SPICTRA (PEARL) HALL: STUDENTS' SESSION

#### 22<sup>nd</sup> February (Friday)

09:15 - 09:35	Components of CPB <b>Mr. Subash Ramachandran</b> <i>Metromed Internatinal Cardiac Centre, Calicut</i>
09:45 - 10:05	Conduct of Safe Bypass <b>Mr. George Miller</b> <i>SRMC, Chennai</i>
10:05 - 10:25	Hematologic Disorders and its Management During Bypass <b>Ms. Thilagavathy</b> <i>KMCH Hospital, Coimbatore</i>
11:00 - 12:00	Preliminary Quiz <b>Mr. Sounder &amp; Team</b>
12:00 - 13:00	ECMO Simulation Batch 1 <b>Maquet</b>
13:00 - 14:00	LUNCH
14:00 - 15:00	ECMO Simulation Batch 2 <b>Maquet</b>
16:00- 17.30	Wet lab for students: CPB Basics, IABP trouble shooting, ECMO basics <b>Maquet</b>

#### 23<sup>rd</sup> February (Saturday)

09:00 - 09:20	Myocardial Protection <b>Mr. Selvakumar</b> <i>NH, Bangalore</i>
09:25 - 09:45	CPB in Pediatrics <b>Mr. Gopi.K.Thalapathy</b> <i>Royal Hospital, Muscat</i>
09:50 - 10:10	Renal Protection <b>Mr. Sam Immanuel</b> <i>NH, Bangalore</i>
10:15 - 10:35	IABP <b>Mr. Gokul Krishnan</b> <i>Maquet</i>
11:00 - 13:00	Edwards' sponsored Session <b>Dr. Anil Tendulkar</b>
13:00 - 14:00	LUNCH
15:30 - 17:30	Edwards' sponsored Session <b>Dr. Anil Tendulkar</b>

# Guest Lecture





**Timothy Willcox, FANZCP, CCP**  
Green Lane Cardiothoracic Unit  
Auckland City Hospital, New Zealand

## Resetting Attitudes to Safety - Incorporating Safety-II

Safety in healthcare has attracted increasing attention due in part to a focus by influential bodies such as the World Health Organisation and (regionally) the Health Quality and Safety Commissions in both Australia and New Zealand. The approach has focused on reduction of harmful events. Mandatory reporting of sentinel events now appears in the public domain. The perception of trends in harmful events can be misleading due to the frailties and vagaries of reporting systems. International data show a plateau of rates of harm in healthcare around 10% and failures in patient safety are estimated to result in as many deaths as from malaria or tuberculosis(1). Patient harm is the 14th leading contributor to the global disease burden. Past surveys of perfusion accidents similarly have demonstrated a flat line over time(2).

The focus on reduction of harmful effects in the hospital setting has been managed by the implementation of policies and procedures and RBPs – recommended best practice. These policies are largely the result of management assessments of safe and efficacious work practices that recommend or dictate how work should be done – or work as imagined. Work as imagined was in essence introduced on the 1930s with time and motion

studies to improve work efficiency (3) . Root cause analyses (RCAs) as a concept of elimination error by identifying a specific cause are widely looked upon as contributing to blame. Failure to comply with policies and procedures in findings of RCAs may result in punitive action. Hospital reporting systems similarly aim to capture less serious error but are frequently cumbersome and not anonymous. This concentration on an absence of harm improving safety is part of Safety-I theory.

The problem with a sole focus on Safety-I is that it is defined by its opposite, by the lack of safety. Accidents are seen to happen due to something going wrong that can be identified, treated and hence further failure prevented. The numerator - the incident - is rare compared to the denominator - the number of times that action went right. Invariably the event we are counting in Safety-I is very rare.

Incident reporting systems are voluntary mechanisms that are designed to capture error so that we can learn from the experience and avoid repetition. The ANZCP Perfusion Incident Reporting System (PIRS) is an attempt to harness the collective experiences of regional perfusion incidents to achieve safety improvements. We are well aware that the perfusion



community is resistant to reporting to PIRS as demonstrated by reporting frequency. The use of hospital incident reporting systems in Australia and New Zealand by Perfusionists is even lower. By comparison the use of reporting systems in a survey of New Zealand Cardiac centres showed anaesthetists and in particular, cardiac surgeons were even less likely to report. The reasons were identified as: ease of reporting, not a reportable event, confidentiality, effecting useful change and timely effective analysis. And yet the majority of reports that do come in to PIRS are near miss. Near miss reporting actually provides opportunity to utilise aspects of Safety-II.

So what is Safety-II all about? Safety-II has been recently popularised by professor Erik Hollnagel (4). Safety-II is defined as a dynamic non-event and a sum of when things go right. This concept looks forward and looks at why things go right and what went well to establish ever improving safety. Safety-II relies on work as done verses work as imagined. Work as done is what happens at the sharp end – how perfusionists as well as other members of the cardiac team, constantly vary practice to adapt to the shifting conditions in the complex system that comprises cardiac surgery. It is these practice variations – that may deviate from RBPs - that we need to understand and share to improve safety. These are constantly occurring in comparison to errors that happen rarely.

The shift from Safety-I to Safety-II is that as many things go right as possible and proactively and continuously trying to anticipate developments and events (5). It requires looking for what goes right as well as what goes wrong and learning from what went well. This not only includes actions performed but

also culture. The impact of culture has been linked to both team performance as well as patient safety (6, 7).

These concepts appear to be more challenging to put into practice than simply documenting the occasional error. How do we count or measure dynamic non-events – the things we consistently do well?

Several options are already in place such as leveraging the WHO safety checklist time-out / sign-out. The former is an opportunity for all the team to engage in a briefing (beyond the checklist bullet points) and the latter similarly can be used for a multidisciplinary discussion on what went well in this case. The Australia New Zealand Collaborative Perfusion Registry already uniquely captures electronic data that is analysed showing what went well, and through quality projects those data have been use to improve outcomes and therefore safety – both regionally and within the individual units. This has enormous potential.

Resilience engineering and anti-fragility engineering are linked to Safety (8). There is a recent example of implementation of resilient healthcare into a New Zealand critical care unit resulted in transformative change(9).

Finally there is an outstanding initiative set up in the Birmingham Children's Hospital in the UK run by Adrian Plunkett and Alison Jones – Learning from Excellence (LFE) . LFE has a raft of resources that can readily be adapted for a unit's use to set up mechanisms to capture everyday smart things that make work go well within the workspace to be shared to enhance patient safety.



**Dr. Karthik Raman, DNB-CTVS**  
The Madras Medical Mission

## Myocardial protection: Recent trends and current practice

### INTRODUCTION

Cardioplegia is a constitutive method of myocardial preservation used for on pump cardiac surgery routinely. The use of Del Nido Cardioplegia was originally developed for use in pediatrics and infant patients. However, the same when used in adults also gave excellent results.

### OBJECTIVE

Due to shortage of the base solution (Plasmalyte-A) in our institute, and as per discussing with our consultants, we advocated the use of isotonic IV fluid (Ringers Lactate) as a base solution for preparation of Del Nido CP. To evaluate by literature and clinical practice the efficiency of the same for use in DelNido was analyzed.

### NOVELTY

To compare the retrospective analysis of using RL as a base solution substitute to Plasmalyte-A solution.

### METHODS

Paper is based on substantial evident analysis involving assorted peri-operative data. We have operated and observed 38 patients which include CABGs, Single and Double valve replacements. The cases were observed for any significant changes in cardiopulmonary functions in trial population.

### RESULTS

Our review analysis could justify the use of RL as base solution of DelNido cardioplegia with an average accuracy of more than 75%. The evaluating parameters were clinical effectiveness, cost-effectiveness, post-operative investigation.

### CONCLUSION

We could conclude from the comparative data of patients receiving Plasmalyte-A and trial population that no significant changes were observed. Hence, the use of RL can be substituted to Plasmalyte-A in DelNido.



**Mr. Suresh Babu Robert***Pradeepkumar Pillai, Mohammed Fayaz Khazi, Tarek Abdel Aziz,  
Obaid Al Jassim*

Department of Cardiothoracic Surgery, Dubai Hospital, Dubai UAE

**Monitoring of Oxygenator function on ECMO - A stitch in time saves nine****ABSTRACT**

Extra Corporeal Membrane Oxygenation (ECMO) has been since its inception, an important component of the concept of mechanical circulatory support (MCS), previously confined to Cardiac Surgical ICUs and/or ORs. MCS has evolved incorporating aspects of critical care medicine, involving other specialities and faculties of medicine to the present day Extra-Corporeal Life Support (ECLS), a multi-disciplinary, poly-angled treatment modality for deserving patients.

At the heart of the ECMO system lies the oxygenator responsible for gas exchange. A fully functional ECMO oxygenator is vital to ensure a favourable outcome of the procedure. This makes monitoring of Oxygenator Function an important clinical responsibility of the ECMO Team, so that any deficiencies can be identified, intervened and redressed to preserve the safety as well as efficacy of the procedure.

Direct and Indirect parameters are used to monitor Oxygenator Function. These factors not only measure gas exchange and transfer, but also certain other phenomena which may influence oxygenator

function. These parameters are direct parameters: Pre-Membrane and Post Membrane Oxygenator Blood Gas Samples, Visual Inspection of the Oxygenator and ECMO circuit

Indirect parameters: Auscultation of Membrane Oxygenator, Pre-Membrane, Post-Membrane and Trans-Membrane Pressures, Anticoagulation profile, Blood Analysis of D-Dimer levels and Levels of Plasma Free Hemoglobin

Details of each parameter and its role in predicting oxygenator performance is discussed in the presentation.

Measures to preserve Oxygenator function like adequate anti-coagulation, judicious administration of blood products, etc are also discussed in details.

To Conclude, a combination of many parameters are used to monitor the functioning of the ECMO Oxygenator enabling the team to identify and intervene to ensure safe, smooth conduct of ECMO, contributing to increased possibility of favourable outcomes.

**Prof. Olivier Jegaden**

Mediclinic Middle East Abu Dhabi UAE, UCLB Lyon 1 France

**Future in perfusion in view of TAVI, MIDCAB and Minimally Invasive Surgical procedures**

The potential benefits associated with minimally invasive and catheter based procedures are now well established. It is generally accepted that cardiac surgeon need to improve their skills to remain relevant in the treatment of cardiac disease in the current area. However, in the “perfusion perspective”, on one hand, minimally invasive procedures require more challenging techniques regarding cannulation, perfusion, cardioplegia techniques; on the other hand, catheter-based procedures are based on “no perfusion required” technology and CPB remains only an option in case of acute complication. These two new orientations could be contrary; but both are based on peripheral perfusion and the advanced technology developed for minimally invasive approach allow to face easily urgent cardiac support in case of complication during catheter-based procedure.

CPB Con  
Chennai 2019



**Mr. Isaac Chinnappan, MS CCP LCP FPP CPBMT**  
Monroe Carell Jr. Children's Hospital at Vanderbilt University

## Progressive Advancements in Pediatric Perfusion

I am delighted to know that The Indian Society of Extracorporeal Technology (ISECT) celebrates its Annual Scientific Meet on the 22nd and 23rd of February 2019 at Chennai, Tamil Nadu - ISECTCON2019!

At the very onset, I would like to extend my deepest thanks to the President, Organizing Secretaries, Members of the organizing committee, Members of all sub-committees for given me the prestigious opportunity to deliver a Guest Lecture on "Progressive Advancements in Pediatric Perfusion".

It is clear that pediatric perfusion is indeed a progressive-evolving science. Today, the practice of pediatric perfusion includes, in addition to cardiopulmonary bypass (CPB) for open-heart Surgery; Long-term extracorporeal membrane oxygenation, Heart transplants, Ventricular Assist Devices and CPB in specialty procedures (ABO Incompatible Transplants). Advancement of CPB and perfusion techniques have catapulted neonatal and infant cardiac surgery into mainstream-standard of care. Progressive advancements in any practice is essential and inevitable. Advancements in clinical practice always parallel with "scientific thesis" and "scientific anti-thesis". When thesis and anti-thesis are merges through evidence-based practice

that results in progressive advancements. One of the greatest challenges in achieving progressive advancements in clinical practice is the existence of huge variations in the standards and approach of clinical aspects and techniques. These clinical aspects are termed as Biomarkers and Quality Indicators for specific applications. Still there are controversies in our routine clinical practice about the concepts of to-do and to-avoid. This debate rages on, but clearly, applications of cardiopulmonary bypass in pediatrics are multifactorial that includes specifications of various biomarkers, therapeutic balance and justification of Quality Indicators.

This topic covers the progressive advancements in a. Identification of physiological biomarkers of prime and perfusate, various specifics of conduct of perfusion, blood conservation, significance of co-oxymetry values, electrolyte abnormalities, true values vs. reference ranges, true blood-gas management, Hyperoxia vs. Normoxia use in Pediatrics and justification of adequacy of safe perfusion; b. How to achieve a therapeutic balance for altered biomarkers; c. concepts of extended life support and d. Justification of Quality Indicators with reference to evidence - based medicine.

I wish ISECTCON2019 for a great success!



**Dr. Adam L. Fernandez, B.Sc (HONS), BS, MPS, DHSc, CCP, LP**  
Senior Pediatric Perfusionist, British Columbia Children's Hospital, Vancouver, BC, Canada

## Fatigue Management and Perfusion Safety

The conduct of Cardiovascular Perfusion is a highly complex task associated with focused concentration and frequent physical and mental performance to a high level for sustained periods of time. Physical fatigue associated with lack of rest or sleep, prolonged duty hours, a high stress workplace and inadequate nutrition or hydration are factors that have been correlated with reduced performance not only in medicine, but have been studied extensively in military and commercial aviation, the armed forces, and the space industry. The aerospace industry and the armed forces have studied the factors associated with reportable safety events attributed to fatigue and have produced protocols and procedures to reduce

the risk to servicemen and women, pilots, passengers and the public. Many aspects of the procedures and protocols developed by the armed forces and aerospace industry can be applied or adapted by the perfusion and the cardiac surgery teams to improve awareness of fatigue among team members, reduce the risk of adverse events caused by fatigue, and mitigate and manage fatigue within a team environment.

The talk will discuss fatigue definitions, potential negative outcomes related to fatigued team members' performance, examples of fatigue identification tools from the military and aerospace industries, and practical examples of fatigue mitigation and management for the practicing perfusionist.





# Sponsors' Talk



**Mr. Rahul Sharma**  
Terumo India Pvt Ltd

## Terumo India - Skill Lab

### OVERVIEW

Terumo India Skill Lab (TISL) is “an educational platform designed to provide advanced clinical solution training and cutting edge techniques to deliver improved patient care”

Launched on 26th Feb 2018, by Japanese Ambassador to India, HE Mr. Kenji Hiramatsu and Mr Shinjiro Sato, President and CEO, Terumo Corporation, TISL boasts of dedicated Knowledge & Experience Sharing Room; SMART-IT and tech-friendly enabled with ability to transmit live sessions; and state of the art simulation room on Cardiac Surgery and Interventional Medicine

The state of medical education in India presents a scenario marked by rhetoric and wishful thinking rather than concrete steps in right direction. The

search for a need-based curriculum is not new. It has been felt for ages, but the curriculum has not really changed. Therefore Terumo India Pvt. Ltd organized and conducted many education programs for medical professionals.

Terumo believes in “Contributing to Society through Healthcare”. A strong need was felt to train the Perfusionists on Cardiopulmonary Strategies to ensure benefits to the patients. Hence, Terumo India Skill Lab (TISL) was launched on 26th Feb 2018 with following main objectives:

- To provide dedicated knowledge & experience sharing room to HCPs
- To provide state of the art simulation room on Cardiac Surgery and Interventional Cardiology for hands on practice





**Mr. Christian Chlela**

Senior Perfusionist

Project Director and Cardio Pulmonary Consultant-LivaNova International



**Integrated Arterial Filter Oxygenators in Perfusion practice -  
a plus for better patient outcome**

Project Director and Cardio Pulmonary consultant at LivaNova International.

The technology behind the new adult oxygenators should provide clinician's new options to improve outcomes in cardiopulmonary bypass and allow to safely and comfortably run perfusion by Minimizing hemodilution, ensuring effective gaseous microemboli (GME) control with the New designed Integrated Arterial Filter and enhancing system's biocompatibility. A complete solution offered with the New Inspire Oxygenator family from LivaNova.



**Ms. Parmita Sagarkumar Desai**

Senior Clinical Manger

Abbott



**Real World Experience: Centrimag - Mechanical Circulatory  
Support**

Cardiogenic shock remains a challenging disease entity and associated with significant morbidity & mortality. It is a critical clinical condition that, despite the usage of the inotropes, pressor, and eventually Intra-Aortic Balloon Pump (IABP) support, has still a high mortality rate.

Mechanical Circulatory Support (MCS) treatment was introduced as a rescue treatment for patients with Cardiac or Cardio Respiratory Failure. This is the only opinion for survival in such patients. As a short term Mechanical Circulatory support, two Options are available: Short Term Ventricular assist devices (VADs) or Extra Corporeal Membrane Oxygenation (ECMO). Mechanical Circularity Support Devices (MCSD) technology has made a significant progress in the last decade.

Centrimag has been accepted as Short-Term Support. Centrimag Pump relies on Full magnetic levitation, bearing less technology with wide gaps creating continuous flow for the support. The system can

generate 5500 Rotations Per Minute (RPM) & 10 Liter Per Minute (L/Min). Various types of cannulas can be connected to Centrimag System.

Absence of mechanical or contact bearings & valves or blood sacs as well as magnetically suspended rotor exposes blood to less stagnation, turbulence and Hemolysis & have nearly eliminated component failure. The flexible configurations, combined with an oxygenator Centrimag has been successfully used an Extra Corporeal Membrane Oxygenation support as well.

Centrimag has been successfully used as a Bridge To Decision (BTD), Bridge To Recovery (BTR), Bridge To Bridge (BTB) & Bridge to Transplantation (BTT).

Real world experience of Centrimag as Left Ventricular Assist Device (LVAD), Right Ventricular Assist Device (RVAD), Bi Ventricular Assist Device (Bi-VAD) & Extra Corporeal Membrane Oxygenation (ECMO), would be shared.





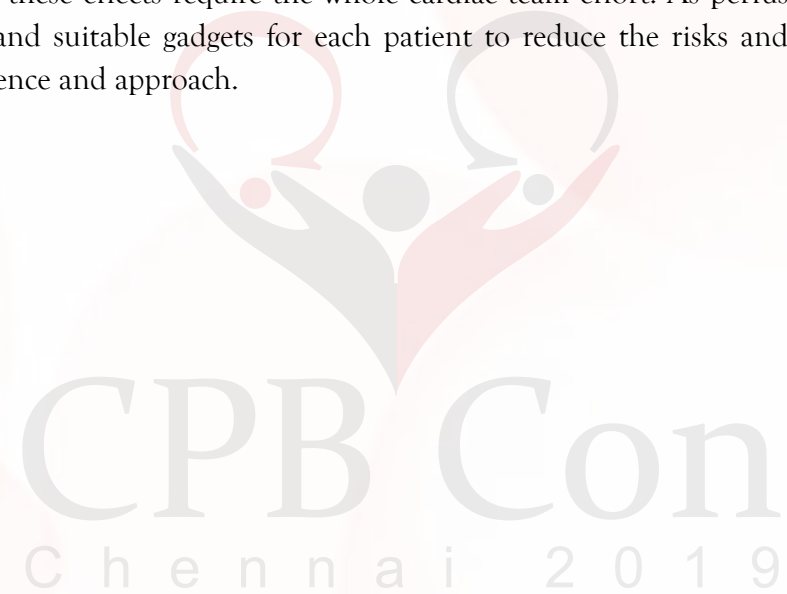
**Mr. Mawande Khayaletu Edson**

Chief Cardiovascular Perfusionist  
Department of Health, Eastern Cape,  
Provincial/Livingstone Tertiary Hospital, South Africa



**Optimizing Perfusion For Long Bypass Time And Complex Surgeries**

Cardiopulmonary bypass has evolved tremendously since its inception, however it still remains an extracorporeal technique with its associated adverse effects and risks. These risks have the potential to cause multi organ dysfunctions especially in prolonged bypass and complex surgeries, thereby increasing the risk of morbidity or mortality. Minimising these effects require the whole cardiac team effort. As perfusionists we need proper monitoring, techniques and suitable gadgets for each patient to reduce the risks and to optimise perfusion during bypass. My experience and approach.



**Mr. Kazuhisa Ishihara**

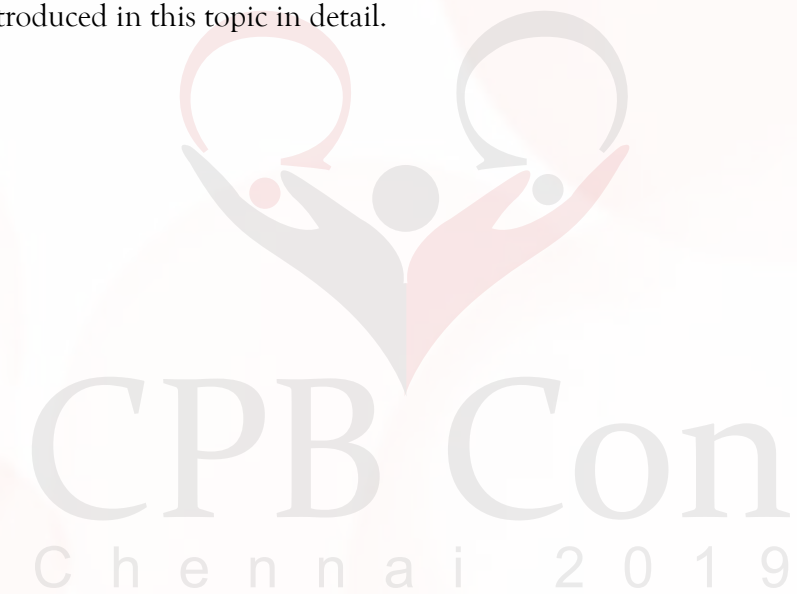
Assistant Manager  
R&D Institute for Artificial Organs, NIPRO CORPORATION, JAPAN



**Real World Experience: Centrimag - Mechanical Circulatory Support**

New BRIZIO brand oxygenator dedicated for neonate patient has been developed. The oxygenator has good balance of functions, 2 chamber system reservoir, and good hemo compatible coating material which are named E8.

These features will be introduced in this topic in detail.





# Oral-Presentation



*Focus Quality and Safety First*



**Dharini.S**

*Sankar.M, Raj.S, Korah Kuruvilla, Dr. Roy Thankachen*  
Christian Medical College, Vellore

## Incorporating Cost Effective Simulation Based Training Method For Cardiopulmonary Perfusion Trainees

Cardiopulmonary Bypass is an adjunctive technique that allows lifesaving surgical procedure, but it also has the potential to injure a patient due to equipment malfunction or operator error.

Since its inception, the operation of the Heart Lung machine has become progressively safer.

This is due to many factors, such as improvements in Technology, Education and Training. However it is not completely safe.

In many professions, Simulation training has been used to improve safety. Airline pilots, Nuclear plant operators, nurses and physicians use simulations to train and manage emergencies in a standardized manner.

The perfusion Profession has a small number of practitioners, but because of the risks involved, the need for standardization and competency assessment is critical in reducing medical errors and improving patient outcomes.

The purpose of this paper is to provide details about the simulation room we have created in our setup (with limited, yet innovative usage of available resources) for perfusion trainees and to illustrate an example of how recorded scenarios in simulation environment can be used to promote the assets of good communication, team work and surgical awareness.

Initially our Simulation scenarios started with the help of gloves (to mimic heart) used disposables and a single roller unit

Recently we brought a innovative idea of bringing a bovine heart and inserted gloves inside the chambers and shunted them in such a way that when pressure was exerted by flow, the beating movements of the heart could be mimicked.

The details of the simulation setup and the impact it had on our training program will be discussed in the paper.

**Vishal Patel**

DDMM Heart Institute, Nadiad, Gujarat

## A survey of awareness and actual physical activity amongst perfusionists in India

### AIM

The perfusionist has a key role in the conduct of open heart surgery. Having a busy schedule, stressful work can affect the quality of life (QoL) affecting even social life. The aim of the paper is to ascertain awareness of this phenomenon amongst medical professionals and find out of how much it concerns us and to see if any steps have been taken to address this issue.

### BACKGROUND

Physical activity is important to maintain good health. This not only prevents the various non - communicable diseases but also has role in secondary prevention of diseases. The rising prevalence of diabetes and obesity in India can be attributed, at least in part, to decreasing levels of physical inactivity. It is also proven that the growing epidemic of obesity mostly in children is linked to recent decline in

physical activity levels both at home, in school and at the work place. Social class is thought to have a bearing on physical activity.

On basis of this, the survey will be done to assess the physical activity levels among the perfusionists in India. Being in the field directly related to cardiovascular diseases, a glimpse of their lifestyle can give us an idea of medical professionals.

### MATERIALS AND METHODS

A Questionnaire was used to determine the necessary data. There is no experiment or bias in data collection. Questions were specifically related to physical activities at home and also in workplace. In addition medical history was also collected confidentially to correlate the findings.

Results will be discussed in presentation.



*Myocardial Preservation:  
Protect, Perfuse and Preserve*



**Sundar Rajan**

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## Custodiol (HTK Or Bretschneiders) Cardioplegia - Challenges In Electrolytes (Na, K, Ca) Management - Evidence Based Experience In Our Institutions In Abu Dhabi - U.A.E

**AIM**

The HTK cardioplegia is very attractive for minimally invasive cardiac surgery, as a single dose provides a long period of myocardial protection. A better understanding of its action and the correction of the electrolytes in the systemic circulation remains a major challenge for everyone. In our Evidence based study we have formulated the correction of electrolyte imbalance.

**METHODS**

From May 2009 to December 2018 we have analyzed 253 patients ( Valve procedure & Combined procedures) using HTK or Custodiol in two institutions in Abu Dhabi - U.A.E. The Electrolytes changes were analyzed through ABG.

**OBSERVATIONS**

HTK Cardioplegia (Hyper Polarized Arrest), HTK solution is based on the principle of inactivating organ function by withdrawal of extracellular sodium and calcium. The removal of Na<sup>+</sup> does not alter the resting membrane potential of the cell. The removal of extracellular Ca<sup>2+</sup> results in a decreased contractile

force, and eventual arrest in diastole. Reduction of the ionic movement (Na<sup>+</sup> and Ca<sup>++</sup>) means very low, or even, no energy consumption during arrest. Since we are measuring the Extra Cellular electrolyte values in our ABG, our Na & Ca levels low and the K levels high.

**CONCLUSION**

1. Na<sup>+</sup>: For Na<sup>+</sup>ions, addition of 10 ml NaCl 23.4% (or 15ml of NaCl 20%) for 1 lit of HTK Solution, during CP Delivery can brings back the Na levels to normal. If the patient weighs Less than 60kgs (<60Kg), then 15ml of Nacl 23.4% ( or 20ml of Nacl 20%) for 1 lit of HTK solution can prevent hyponatremia during CPB.
2. K<sup>+</sup>ions: Even though the pottasium levels increases (upto 6.5 mEq/l) during cross clamp period, it comes back to normal after the release of aortic cross clamp & reperfusion period.
3. Ca<sup>++</sup> : Addition of CaCL (10ml for adults) after releasing the aortic cross clamp facilitates better contactility of the heart.

**Smita Babariya**

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## Use of Ringers Lactate as a Substitute to Plasmalyte -A Base Solution in del Nido Cardioplegia

**INTRODUCTION**

Cardioplegia is a constitutive method of myocardial preservation used for on pump cardiac surgery routinely. The use of Del Nido Cardioplegia was originally developed for use in pediatrics and infant patients. However, the same when used in adults also gave excellent results.

**OBJECTIVE**

Due to shortage of the base solution (Plasmalyte-A) in our institute, and as per discussing with our consultants, we advocated the use of isotonic IV fluid (Ringers Lactate) as a base solution for preparation of Del Nido CP. To evaluate by literature and clinical practice the efficiency of the same for use in DelNido was analyzed.

**NOVELTY**

To compare the retrospective analysis of using RL as a base solution substitute to Plasmalyte-A solution.

**METHODS**

Paper is based on substantial evident analysis involving assorted peri-operative data. We have operated and observed 38 patients which include CABGs, Single and Double valve replacements. The cases were observed for any significant changes in cardiopulmonary functions in trial population.

**RESULTS**

Our review analysis could justify the use of RL as base solution of DelNido cardioplegia with an average accuracy of more than 75%. The evaluating parameters were clinical effectiveness, cost-effectiveness, post-operative investigation.

**CONCLUSION**

We could conclude from the comparative data of patients receiving Plasmalyte-A and trial population that no significant changes were observed. Hence, the use of RL can be substituted to Plasmalyte-A in DelNido.



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## Modified BSG Cardioplegia Delivery Circuit

### ABSTRACT

We designed a simplify & cost effective circuit for delivery of cardioplegic solutions during cardiopulmonary bypass surgeries and as well as for MUF.

It Is Cost Effective Circuit, It Can Be Used Instead Of Kole's Chamber & BCDs (4:1)

For Patients Body Weight Less Than 50kg.



*Oxygenators: Integrated Advantage and  
Interventional Complications*



**Kamal Das**

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## High Pressure Excursion (HPE): Treatment of the Torment

### INTRODUCTION

HIGH PRESSURE EXCURSION (HPE) is an important issue to a perfusionist and any up and down is always a torment. High Pressure Excursion is a phenomenon of rising membrane pressure (pre membrane and delta) for a significant period during CPB. Though it is not so much common phenomenon but still can be catastrophic if neglected. Many perfusionist consider change while some do not. In our centre we got 4 cases of HPE where we didn't change the oxygenator but observed and completed the case without any significant complication.

### CASE REPORT

Last year in our centre among 193 cases we got 4 such cases where premembrane and delta pressure suddenly increased above normal. No absolute cause

was diagnosed. As neither oxygenator performance was not hampered nor the post membrane pressure increased we went against oxygenator change. In 3 cases pressure subsided after a certain period of time but in one case high pressure continued till completion of CPB.

### RESULT

Intraoperative and post-operative organ functions were normal and all 4 cases survived and were discharged.

### CONCLUSION

High Line Pressure not always mandates oxygenator change which is a very hectic job for set up with single perfusionist and can also be catastrophic for beginners without experience.

*ECMO*

*Curriculum Of Challenges in Extended Life Support*



**Blessly John**

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## ECMO as a bridge to heart transplant in a single ventricle physiology patient - A Case Report

**OBJECTIVE**

To present a case report on a single ventricle physiology patient (post - fontan) who was supported on ECMO as a bridge to heart transplant and managed effectively later underwent successful transplant.

**CASE DETAILS IN BRIEF**

A 17 year old patient with a history of post BDG for a single ventricle physiology was admitted with adverse signs and symptoms of congestive heart failure. He arrested in the CCU and was put on emergency ECMO as ECPR. After the ECPR his CT revealed sub-acute infarct in the bilateral frontal lobes and left parietal lobe. But he showed signs of neurological recovery after few days. He was stabilized on ECMO with a LV vent in place and listed for emergent heart

transplant. After one week of ECMO he received a suitable donor heart for transplant. He underwent successful heart transplantation and did not require ECMO in the post-operative period.

**DISCUSSION**

The successful resuscitation of ECPR, cannulation strategy, placement on ECMO and the management of ECMO will be discussed in the presentation. The post-transplant management and his successful rehabilitation to recovery will be discussed.

**CONCLUSION**

ECMO/ ECPR as a bridge to transplant played a significant role in the recovery of this patient.

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## V-V ECMO for ARDS, H1N1-Challenges Faced by a Peripheral Centre

**INTRODUCTION**

V-V ECMO has gained wide scale acceptance as a bridge to recovery in cases of ARDS and with H1N1 outbreak. Here, we would like to discuss the challenges faced by a peripheral centre and the outcome in its first ever ECMO.

**CASE REPORT**

35 year old, female, 70kg, presented with C/O fever, sore throat, cough, breathlessness since 6 days, put on NIV. Due to the worsening condition, intubated on 27/10/2018, followed by prone ventilation for the next two consecutive days. Progressing hypoxemic respiratory failure called for V-V ECMO as a bridge to recovery. ECMO was initiated on 31/10/2018 at the primary centre with femoro-jugular cannulation using Maquet PLS circuit and shifted to NH via a twenty minute journey. ECMO was decannulated on 07/12/2018, a run for 38 days. She was shifted to ward on Day 43, followed by discharge on Day 52 of hospital stay.

**DISCUSSION**

ECMO was initiated with RPM 2700, Flows 4.0 LPM, Sweep Flow 3 Litres, ACT 180-200 SEC, Hb 10-12 gm/dL, rest lung settings on ventilator. The challenges were numerous including carbon dioxide retention of unknown cause for the first three days, clot formation in pre membrane side of oxygenator from day3, persistently low ACTs with higher heparin requirements, haematuria. She went into sepsis with questionable CNS status and confirmed for H1N1. On day18, circuit change due to oxygenator failure and switching to Bivalirudin, suspecting HIT. Vigorous chattering, unexpected complications as alveolar derecruitment on day28, short circuit of console on day32, escalated antibiotics, all tampered with smooth progress. Despite this, she was mobilized on bed, encouraged for oral intake, and successfully weaned.

**CONCLUSION**

Effective communication, strategies and “not giving up” will always be behind each successful ECMO.



**Sam Immanuel**

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**Veno-Venous ECMO For Lung Injury**

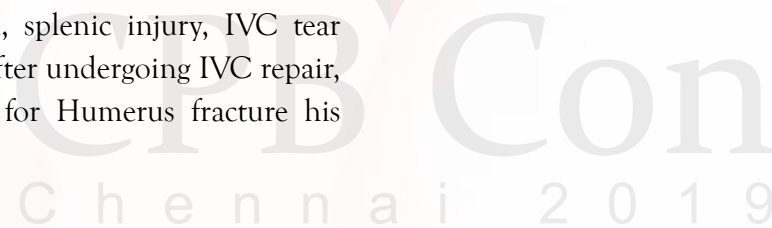
Extracorporeal membrane oxygenation (ECMO) is in boom of provide cardiopulmonary support. ECMO support to aid reversible aspects of the disease process and to allow recovery by giving time to breath. ECMO is a supportive therapy but not treatment therapy of the underlying disease. The indications for ECMO support have wide spread from acute respiratory failure to acute cardiac failure involving neonates to adults. The modes of support are either veno-venous or veno-arterial ECMO. In this article we put forth our exposures of VV ECMO support are outlined.

A 21years old male met with an RTA, which led to extensive lung contusion, splenic injury, IVC tear and Humerus fracture. After undergoing IVC repair, Splenectomy and ORIF for Humerus fracture his

condition did not improve because of his severe lung injury. His condition worsened as he progressed to ARDS. He was put on VV ECMO in order to support his lung parenchymal injury. In this course his condition improved in the ITU and he was successfully weaned off from VV ECMO.

**CONCLUSION**

VV-ECMO is a useful and promising tool of management for lung injuries. As it provides adequate recovery phase for the lung injury.



**Siddu S Neginahal**

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**Challenges in VV ECMO Programme**

**INTRODUCTION**

Extracorporeal membrane oxygenation is life saving procedure used for both cardiac and pulmonary dysfunction. Gradually the utilization of ecmo is increasing in ICU's for the patients acute distress syndrome, poisoning, toxic inhalation and also in the cathlab and emergency units for ecpr.

**BODY**

As a tertiary care hospital we have conducted 69 ecmo from 2014 in both adult and pediatric patients and being 60 % of this is vv ecmo, so here we would like to share our challenges faced in managing

vv ecmo. Some of the major challenges faced are patient selection, cannulation, bleeding, availability of standby circuit, infection and transporting the patient with ecmo.

**CONCLUSION**

We feel these challenges often be vital for the patient so we should always be prepared for prompt actions on these challenges. As we went through the challenges we would like to share with everyone how we managed these challenges and what precautions we have taken will be a take home message for all.





*Ventricular Assist Devices:  
Last Hope to Retain the Failing Heart*



**Harikrishna S**

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## Combined therapy of external left ventricular assist device and membrane oxygenator as a bridge to heart transplant

**INTRODUCTION**

In the heart transplant procedure, the addition of a membrane oxygenator (MO) into an external left ventricular assist device (e-LVAD) has been increasing worldwide. This case study is to determine the outcomes of combining a membrane oxygenator with external LVAD.

**CASE REPORT**

Here we present the case of a 66 year old male who had a history of acute myocardial infarction. Subsequently, he developed severe LV dysfunction with refractory pulmonary edema. He was stabilized with ventilation, inotropes and IABP support. Weaning from ventilator support was not possible with this patient due to worsening of lungs, gradually he developed XDR Pneumonia. To reduce pulmonary congestion and since the function of RV was adequate, unloading of LV was necessary. Further, due to the worsening of hemodynamics and end organ dysfunction it was decided to put an

LVAD. The decision of incorporating an oxygenator in LVAD circuit was made, because the lung function was not satisfactory to maintain a good oxygenated gas exchange.

**DISCUSSION**

External ventricular assist device have been effective in treating the patient with refractory cardiogenic shock as bridge to decision making (for either recovery, LVAD, transplantation). Membrane oxygenator can be added to the circuit for acute cardiopulmonary failure in addition.

**CONCLUSION**

With appropriate antibiotic therapy and lung protective strategies his lungs slowly improved to wean him off the oxygenator, but since his heart failure was refractory hence he was listed for heart transplantation, which was performed successfully after 8 days of LVAD.

**Santhana Lakshmi**

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## LVAD as a bridge to recovery in post CPB with severe LV dysfunction following ALCAPA repair - case series of 3 neonates

**INTRODUCTION**

Anomalous left coronary artery from pulmonary artery (ALCAPA) is a rare congenital heart disease that affects one in 300 000 live births and accounts for 0.24 - 0.46% of cases of congenital heart disease. Severe LV dysfunction and ischemic Mitral regurgitation contributes to morbidity and mortality in this condition. Mechanical circulatory support may be required in some children who are unable to be weaned off cardio pulmonary bypass following ALCAPA repair.

**CASE REPORT**

The present report describes our experience with the use of a Mechanical Circulatory Support (LVAD) using a centrifugal pump in 3 Neonates who were unable to be weaned off from Cardio pulmonary bypass with high dose of inotropic support. The

inflow cannula was established through the left atrial appendage. The outflow cannula was performed with goretex graft through the ascending aorta. The LVAD was initiated successfully. The LV function improved gradually over few days of LVAD support. The LVAD removed successfully. Ventilator support was gradually weaned off and extubated, inotropic support tapered off. The children remained hemodynamically stable, afebrile and discharged.

**RESULT**

All patients were successfully managed with LVAD as a bridge to recovery following ALCAPA repair.

**CONCLUSION**

LAVD was successfully used as a bridge to recovery in patients who were unable to wean from cardio pulmonary bypass after operative repair of ALCAP.



*Pediatric Perfusion:  
Very Small - be Gentle and Cautious*

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**Correlation of Changes in Fluid Balance During  
Cardiopulmonary Bypass to the Post Operative Outcomes in  
Paediatric Patients Undergoing Congenital Heart Surgery****INTRODUCTION**

In open heart surgery edema acquired during the peri-operative period has long been associated with increased mortality. The Aim of this retrospective study was to test the premise that edema in the form of a positive Fluid Balance Change (FBC) acquired during CPB is correlated to mortality. However, during the intermediate period, while on CPB, the Perfusionist has control over most of the patient's intake and output (I & O) fluid volumes by adding or removing excess fluid to achieve a specific goal at the end of CPB/MUF.

**MATERIALS AND METHODS**

This study includes thirty paediatric patients who underwent cardiac surgery with cardiopulmonary bypass and moderate hypothermia during June 2017 to May 2018 at Narayana medical college & Hospital. During this study various pre-op, intra-op, post-op parameters have been collected.

**DISCUSSIONS**

In this paper we would like to correlate the FBC to various hypothesis which includes,

- A Positive FBC Caused by the Perfusionist

- A Positive FBC and Circulatory Failure
- A Positive FBC and Increased Mortality
- A Positive FBC and Circulatory Enhancement
- A Zero or Negative FBC and Decreased Mortality
- The Ready Reservoir
- Excessive Fluid Removal and Increased Mortality
- Native Reservoir Encroachment, Increased Mortality, and Fluid Balance Target
- Third Spacing
- SIRS Mediated Fluid Retention

**CONCLUSION**

The FBC on CPB should be monitored and measured by the perfusionist, to achieve a zero or negative FBC without encroaching on the native reservoir fluid. This is possible in the majority of patients and, when optimized, it correlates directly to a decreased mortality. A positive FBC should be avoided if possible unless it is beneficial in specific situations. Otherwise, a positive FBC may signal a decreased cardiac function leading to an increased mortality.

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**Comparison of Higher Hematocrit and Lower Hematocrit on  
Cardiopulmonary Bypass for Cardiac Surgery****INTRODUCTION**

Maintaining ideal hematocrit during the period of cardiopulmonary bypass is vital parameter for effective perfusion of organs.

**OBJECTIVE**

To monitor the effects of lower hematocrit and higher hematocrit on cardiopulmonary bypass with regards to circulatory advantages and it's benefits in patient undergoing cardiac surgery on cardiopulmonary bypass. This study was derived from observing patients of different ages ranging from paediatric to adult population in our institute. The aim remains to maintain hematocrit within a range that minimizes end organ injury and to make cardiopulmonary bypass more beneficial to the patient

**NOVELTY**

An ideal range of hematocrit on bypass ensures effective microcirculation and organ perfusion and simultaneously not affecting the oxygen carrying

capacity with regards to the metabolic demands

**METHOD**

Our observation and study reported effects on changes in pump flow rate, hematocrit, Mean Arterial Pressure, oxygen delivery and consumption and the lactate level. Hematocrit in relation to temperature was also taken into consideration. Also different causes of high hematocrit or low hematocrit and management for the same were thoroughly observed

**RESULT**

Both higher hematocrit or lower hematocrit has its own beneficial or deleterious end organ perfusion effect. The advantages and disadvantages of both parallel each other and hence a more discreet and case based novel approach should be applied to make Cardiopulmonary Bypass more and more effective as a methodology





*Aneurysm & Arch Surgery: Expecting  
Clinical Intervention for Unexpected Challenges*



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## A Noval Approach to complex TYPE A Aortic Dissection with Malperfusion - Perfusionist Aspect

Aortic Aneurysm/Dissection cases accounts 1-2% mortality in India. In complex Type A dissection with malperfusions, variety of surgical and endovascular approaches have been tried. Here we present an interval approach in a specific situation.

### BACKGROUND

A 28 years old lady with Marfanoid features admitted to Emergency department having abdominal and back pain for 2 days. She had also developed acute leg weakness and parasthesia. Evaluation revealed complex Type A aortic dissection with malperfusion of right common iliac artery. She also had severe LV dysfunction, renal dysfunction and metabolic acidosis. In view of the co-morbidities a decision was made to defer the aortic dissection repair and go ahead with femoro-femoral cross over grafting.

### METHODS AND TREATMENT

Over the next few days the clinical condition, biochemical parameters and LV contractility made

dramatic improvement. She underwent planned surgical repair of Aortic Dissection (Bentall's + Hemiarch). In view of the complex aortic arch dissection bilateral subclavian cannulation was done (because one subclavian is from true lumen and other is from false). NIRS evaluation showed the equal perfusion of cerebral arteries. Went on SACP and cooled to 24C.

### RESULT

The surgery was successfully done and came out from CPB normally. Next day extubated and neurological parameters were normal. Patient has discharged and coming for routine follow up.

### CONCLUSION

Contrary to the popular belief, a carefully planned interval approach can be considered in complex Type A dissections. Bilateral subclavian cannulation is a viable option when cerebral perfusion pattern is unpredictable.



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## Determination of adequacy of antegrade cerebral perfusion flow during unilateral cerebral perfusion in hemi-arch aortic surgery

### INTRODUCTION

Cerebral protection using unilateral antegrade cerebral perfusion (UACP) is gaining interest during aortic arch surgery due to its simplicity. Near Infrared Spectroscopy (NIRS) now become an integral part of perioperative non-invasive neuromonitoring during aortic arch surgery.

### OBJECTIVE

To determine the adequacy of antegrade cerebral perfusion flow during unilateral cerebral perfusion in hemi-arch aortic surgery based on NIRS.

### METHOD AND MATERIAL

The study was conducted in 20 patients undergoing ascending aorta and hemi-arch aortic surgery. In all patients UACP was performed under moderate hypothermia (30°C) based on NIRS inputs. The decision for UACP strategy was based on changes in NIRS values assessed during a test clamp on left common carotid artery for 3 minutes with hemodynamic optimization (MAP >90 mm Hg, PaCo<sub>2</sub>- 45 mm Hg, haemoglobin concentration >10

gm/dl). After 3 minutes if the NIRS value on the side of carotid clamping did not fall > 20 % of its baseline value, then UACP strategy was used. Otherwise bilateral cerebral perfusion strategy was used. UACP was initiated by translocation of ascending aortic cannula into innominate artery with flow equivalent to 30 % of the calculated normothermic CPB flow. The NIRS was monitored throughout this period. And any asymmetric fall in NIRS value was noted.

### RESULT

The mean age of patients (n =20) was 41.65 ± 15.6 years. Cardiopulmonary bypass time and aortic cross clamp time were 141.65 ± 14.23 and 87.65 ± 9.12 and UACP time was 17.8 ± 3.32 minutes. None of the patient showed asymmetrical fall in NIRS value during UACP. All the patients were awake in 2-4 hours and there was no focal neurological deficit.

### CONCLUSION

30 % of the calculated normothermic blood flow seems to be adequate during UACP. NIRS predicts the adequacy of cerebral blood flow effectively.



*Transplantation :  
Culture of Humanity Never Dies*



**Kiruthikkadevi**

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## Lung Transplantation using ECMO Circuit - Apollo Hospital Experience

**AIM**

Lung transplant using VA-ECMO our hospital experience with 20 cases.

**MATERIALS AND METHODS**

Initiate VA-ECMO via clamshell incision and SVC, IVC, Aorta selective cannulation using rotaflow, PLS kit and sorin cardiotomy venous reservoir.

**CONCLUSION**

We have experienced benefits in post operative ICU stay, minimal bleeding, less requirement of ventilator support, decreased rate of re-exploration and primary graft dysfunction.

CPB Con  
Chennai 2019

**Selvakumar R**

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## Enbloc Heart and Lung Transplantation - an Institutional Experience

**INTRODUCTION**

Enbloc heart and lung transplantation is the recommended ultimate option of surgery for candidates suffering from irreversible end stage heart and lung disease. This major surgery requires a cohesive multidisciplinary teamwork approach to yield a favourable outcome. The role of perfusionist is vital in this complex operation, who is an active participant in the preoperative period, intraop and postoperative period. Our Enbloc heart and lung experience - case report highlights the key elements of this surgery from the perfusionist perspective.

**CASE DETAILS**

A 68 year old male patient was suffering from end stage heart and lung disease refractory to medical therapy due to worsened interstitial lung disease and coronary artery disease. His life style was restricted and required heart and lung transplantation at the earliest. He got a suitable donor and successfully underwent Enbloc heart and lung transplantation. The donor was a 24 year old male who was in comatose state due to traumatic brain injury. The donor specific antibody test was performed and the report was negative. Cold custodial and Perfadex Plus

was administered to the donor heart and lungs and was harvested.

**DISCUSSION****(SURGERY AND PERFUSION STRATEGIES)**

The gold standard approach for enbloc heart and lung transplantation is the median sternotomy. Standard Bicaval and Aortic cannulation was done cardiopulmonary bypass was instituted. The total CPB time was 250 minutes. Cold cycle was 147 minutes and warm cycle was 60 minutes. Continuous zero balanced ultrafiltration was done to eliminate the inflammatory mediators and to keep the Sr.Lactate within the normal limits. The various perfusion strategies involved in Enbloc heart and lung transplantation and the involvement of perfusionists in the management of these patients will be discussed in detail during the presentation.

**CONCLUSION**

Enbloc heart and lung transplantation is the treatment of choice for endstage heart and lung disease. These type of surgery demands multidisciplinary teamwork and the role of perfusionist in treating these patients remains vital throughout the hospital stay.





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## Use of Irradiated Blood in CPB

### INTRODUCTION

Irradiation is process of depletion of T-lymphocytes in blood. It is done to prevent “Transfusion-Associated-Graft-Versus-Host-Disease”(TAGVHD). In TAGVHD lymphocytes of healthy donor blood damages the lymphocyte of recipient blood which can damage the skin, liver, GIT, mucous membrane & bone marrow. Typically it occurs 10-15 days of post transfusion.

### METHODS

Irradiation is main stay to prevent TAGVHD. In this process gamma rays are passed through blood for depletion of leucocytes. Blood product that are irradiated can be identified using radsure system . The lable NOT IRRADIATED is applied to blood bag & after irradiation word RADDIATED remains visible. This process can increase rate of efflux of intracellular potassium hence this blood should be transfused with in 24 hours to prevent hyperkalemia. Prewashing of this blood can be done to prevent such effects.

### DISCUSSION

Patients undergoing cardiac surgery having Digeorge syndrome needs transfusion of irradiated blood .This syndrome is caused by depletion of segment of chromosome 22. Patients with this syndrome may have rashes, fever, diarrhea, pancytopenia, liver failure, elevated liver enzymes. This can be associated with congenital cardiac disorders like ASD, VSD, TOF, IAA, PTA. Such patients have delayed growth, breathing problems, frequent infection, heart murmur, learning delays . Other associated problems are cyanosis, hypocalcemia, renal abnormalities, growth hormone deficiencies, immune disorders, skeletal abnormalities, hypoparathyroidism etc.

### CONCLUSION

Special care for blood transfusion should be taken in patients with Digeorge syndrome undergoing cardiac surgery to prevent TAGVHD and deleterious effect of immune system.

## *Perfusion: Ancillary Skills and Plans in Special Population*





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## Accuracy of NGAL (NOVEL BIOMARKER) in accurate & early diagnosis and prognosis of on-Pump Cardiac Surgery associated AKI in Adults

### BACKGROUND

Open heart surgery under CPB is recognized as an important malefactor of acute kidney injury (AKI) and postoperative AKI is still diagnosed by the conventional biomarker such as serum creatinine. However increase of Serum creatinine is not sensitive enough to detects AKI early until a significant decline in GFR has occurred. Urine or blood neutrophil gelatinase-associated lipocalin( NGAL) is one such early, sensitive and noninvasive biomarker whose concentration is increased in urine & serum released by injured renal tubules after any nephrotoxic and ischemic insult.

### OBJECTIVE

- To investigate CPB-related serum & urine NGAL secretion in correlation to postoperative renal function
- Predictive power of NGAL on the severity of postoperative AKI

### DESIGN

A prospective cohort study in a multispecialty hospital.

### PARTICIPANTS

Fifty Patients (33 male and 17 female) of post-operative Cardiac Surgery (Valvular, CABG, Aortic aneurysm cases) under cardiopulmonary bypass Mean age of the patients was  $51.8 \pm 12.8$  years.

### MATERIALS AND METHODS

The following measurements: Serum & urine NGAL and creatinine were measured at preoperatively and postoperatively (at 4, 8, 24, 48 and 72 h). We assessed such biomarkers in relation to the development of AKI (defined as an increase in creatinine of at least 50% from baseline or  $>0.3$  mg/dl within 48 hours postoperatively or a reduction in urine output to  $<0.5$  ml/kg/h for  $>6$  h.) and to a composite end point (need for renal replacement therapy and in-hospital mortality).

The NGAL Test is a particale- enhanced turbidimetric immunoassay for the quamtative determination of NGAL in human urine and serum by using commercially available NGAL Kit036, BioPorto, Denmark. The mean NGAL concentration in samples from healthy donors was 63ng/ml (range 37 - 106 ng/ml). Analysis of variance (ANOVA) was done to compare the variation in serum creatinin and serum NGAL & urine NGAL over a period of 72 H.

### CONCLUSION

Plasma and urinary NGAL expression had higher correlation power for risk stratification and early detection of AKI .Concentration of NGAL in urine than serum represents sensitive, specific, and highly predictive early biomarkers for AKI post cardiac surgery.



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## The Subclavian Intra-Aortic Balloon Pump: A Compelling Bridge Device for Advanced Heart Failure

### INTRODUCTION

A subclavian intra-aortic balloon pump (SC-IABP) can help to optimize patients with advanced congestive heart failure & act as a bridge to definitive therapy.

### METHODS

The SC-IABP was placed through a Seldinger technique into subclavian artery under Sonosite guidance. The intended therapeutic goals for SC-IABP were bridge to recovery & mechanical circulatory support. Success was defined as stroke-free survival, achievement of therapeutic goal, and maintenance & improvement in renal function, hemodynamics, and physical conditioning through ambulation and rehabilitation. Weaning & removal of SC-IABP done under fluroscopic guidance in hybrid cath-lab.

### RESULTS

Duration of SC-IABP support was 7 days. Left ventricular ejection fraction improved to 20-25 % & successfully bridged to the next therapy. Specific complications of SC-IABP including exchange/repositioning, subclavian artery thrombosis, re-exploration for hematoma and infection were absent. No distal thromboembolic events were observed.

### CONCLUSION

An intra-aortic balloon pump inserted through the subclavian artery is a simple, minimally invasive approach to mechanical support and is associated with limited morbidity and facilitates ambulation in patients. Therefore, SC-IABP is a compelling bridge device for patients with advanced congestive heart failure.





**Dr. Vishwas.Kiran.Paul**

*Dr. Kishore.C.Yadhav, Dr. Sanjay.R.Gaikwad, Dr. V.M.Chavan*  
Ashwini Sahakari Rugnalaya & Research Center, Maharashtra



## **Innovative Indiginious RBC Washing Technique by using Dialysis Membranes**

### **PURPOSE**

This study is designed to determine if point-of-care washing of allogeneic Leukocyte-Reduced Red Blood Cells reduces pulmonary complications when compared to standard-of-care Leukocyte-Reduced Red Blood Cells in cardiac and other surgical fields using Dialysis membranes for RBC Washing technique.

### **METHOD**

Saline-washed RBCs are units of whole blood or RBCs that have been washed with 1 to 2 liters of saline manually or in an automated cell washer. These units have a hematocrit of 90% and have been depleted of 90% of the plasma proteins and 95% of the leukocytes. The residual potassium concentration is 0.2 mEq/L. Other RBC metabolites are almost entirely removed. Washing also removes cytokines that cause febrile reactions. Saline washed RBCs must be used within 24 h after washing since the

original collection bag has been entered. Removal of the anticoagulant-preservative solution also limits cell viability and function. Saline washed red blood cells have limited medical indications.

### **CONCLUSION**

Blood transfusions alter humoral and cellular immunity in the recipient Whether the cells themselves, the supernatant, or both, contribute to inflammation and poor clinical outcomes attributed to transfusion-related immunomodulation remains unknown Bioactive substances and micro particles in the supernatant of stored RBCs likely serve as a secondary inflammatory insult, Whether removal of these bioactive substances by washing can attenuate the recipient's inflammatory and immunogenic response, and improve post-operative clinical outcomes. Washed transfusions have been associated with reduced cardiopulmonary complications and improved survival in adults.

# Poster Presentation

**Glory Mini Mol.A**

Sri Ramachandra Institute of Higher Education and Research, Chennai

## A study on oxygen consumption and oxygen extraction ratio between mixed venous and central venous blood during cardiopulmonary bypass in patients undergoing valvular heart surgeries

### INTRODUCTION

The aim of this study is to observe the oxygen consumption and oxygen extraction ratio between mixed venous and central venous blood during cardiopulmonary bypass in patients undergoing valvular heart surgeries.

### METHODS

This study includes 44 patients who underwent valvular heart surgeries for the period of June 2016 to March 2017 at Sri Ramachandra Institute of Higher Education and Research. Mixed venous samples were taken from Pulmonary Artery. Central venous samples were taken from jugular line and arterial samples were taken from arterial line of the patient.

### RESULTS

Results showed that there is a significant difference ( $p=0.0032$ ) between central venous and mixed venous oxygen consumption before CPB which shows higher

oxygen consumption in mixed venous than central venous samples. Mixed venous consumption during post CPB decreases drastically from pre CPB and consumption during rewarming phase is higher than cooling phase. Similarly, central venous oxygen extraction ratio shows significant difference of  $p=0.0183$  which shows higher oxygen extraction in pre CPB than post CPB ( $P=0.001894$ ). There is no significant difference between cooling and rewarming phase ( $P=0.3682$ ) indicating that brain and total body oxygen extraction remains almost same after termination of CPB.

### CONCLUSION

From this study we found that hypothermia and CPB had effects on oxygen consumption and extraction ratio. This resulted in lower oxygen consumption and extraction ratio after termination of CPB in both central venous and mixed venous blood, when compared with pre CPB values.

**Mahak Rani**

*Rajeev Gupta, Parag Gharde, Prof. Sachin Talwar*  
All India Institute of Medical Sciences, New Delhi

## Perfusion strategies at Re-operation after multiple prior sternotomies

### OBJECTIVE

To describe an optimal perfusion and surgical strategy in two patients undergoing reoperation for conduit change after multiple prior sternotomies

### PATIENT AND METHOD

First patient, (27 years, 70 Kg) undergone a Ross Procedure in 2003 for bicuspid aortic valve with severe aortic stenosis. In 2012, he underwent change of the right ventricle to pulmonary artery (RV-PA) conduit, and currently presented with severe stenosis and calcification of the RV-PA conduit that required its replacement. The perfusion and surgical strategy is the subject of description here and detailed pictures and a video will be presented.

Elective femoral artery-femoral vein cardiopulmonary bypass (CPB) was instituted prior to sternotomy with core cooling using pH stat strategy to 20 degrees Celsius to be able to achieve circulatory arrest (and optimal neuroprotection), if the aorta or conduit were to be damaged during sternotomy. This did happen and the RV-PA conduit was accidentally opened. The heart fibrillated and was kept so. The right ventricular outflow was reconstructed with a woven polyester graft and a mechanical heart valve on the fibrillating heart without cross clamping the aorta.

The total CPB time was 150 minutes, cooling time was 45 minutes and rewarming time was 73 minutes.

Conventional ultrafiltration was performed during rewarming. He was weaned off CPB uneventfully on minimal inotropic support.

The 2nd patient was a 19 year old male who had undergone a Rastelli operation in 2004. He now presented with severe conduit obstruction, requiring a conduit replacement. A similar perfusion strategy was used in this patient. This patient had aortic entry while performing stenotomy and sternotomy was performed after a short period of circulatory arrest in which the aortic rent was repaired. After terminating circulatory arrest, the valve was replaced as above. The total CPB time was 132 minutes, cooling time was 45 minutes and rewarming time was 73 minutes, circulatory arrest time was 7 minutes. Conventional ultrafiltration was performed during rewarming. He was weaned off CPB uneventfully on minimal inotropic support.

Near red infrared spectroscopy was achieved to assess intraoperative brain function in both scenarios.

### CONCLUSION

Optimal CPB strategy aimed to prevent unexpected problems such as inadvertent cardiac entry during re-sternotomy with its attendant risk of brain damage yielded a satisfactory result. The surgical exposure was optimal, there were no technical difficulties and the outcome was good. This report, therefore stresses the need for optimizing the perfusion strategy to an individual patient.

**Mainak De**

R. G. Kar Medical College, Kolkata

## Vasoplegic Syndrome: The Causes & Management in Cardiac Surgery

### INTRODUCTION

Organ homeostasis is maintained by providing adequate systemic blood flow and perfusion pressure which again depends upon balance of vasoconstrictor and vasodilator influence. Vasoplegic Syndrome is recognized and relatively common complication of CPB characterized by significant hypotension due to vasodilatation with high or normal cardiac output. There are many pharmacological agents which can also influence VS e.g ACE inhibitors, Beta blockers, Amiodarone etc.

### METHOD

Last year in our centre among 86 cases we observed 6 cases of intraoperative and post-operative vasoplegic syndrome. We successfully treated all the patients

intraoperatively with Nor-Adrenaline and post operatively with Nor-Adrenaline and/or Vasopressin. We took the total medical history of the patients.

### RESULT

Need for Nor-Adrenaline and/or vasopressin were directly proportional to the dose and duration of preoperative use of Angiotensin-converting inhibitors and Beta blockers. All the cases survived without complication.

### CONCLUSION

ACE inhibitors and beta blockers promotes VS.





**Christy Kurian**

*Banupriya Ravi, Umapathy Jagannathan, Soundararajan Srinivasan,  
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G.Kuppuswamy Naidu Memorial Hospital, Coimbatore

### **ECMO made easy and affordable - saving the life with simple circuit**

**ABSTRACT**

A 16 years old female with diagnosis of D-Transposition of great arteries with large inlet VSD and severe pulmonary stenosis underwent RASTELLI procedure using RV-PA conduit on 21 Nov 2018. Patient had long cardiopulmonary bypass and long cross clamp time 421min and 166min respectively. She was shifted to ICU with open chest and a stiff inotropic support. She was maintaining hemodynamics and having adequate urine output with stiff inotropic support. On the 2nd post op day, patient developed cardiac arrest due to atrial arrhythmias and needed CPR. She was revived with CPR and planned for ECMO. Due to financial constraints, we have decided to use routine oxygenator with closed circuit to bring her out from crises. The case was uneventful.

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**Swagata Giri**

*Kamal Das*

R. G. Kar Medical College, Kolkata

### **Debate on optimal cardioplegia temperature**

**ABSTRACT**

During cardiac surgery myocardial protection is one of the most important factors for a good surgical outcome. There are several techniques to protect myocardium from ischemic injury during surgical procedure. Mainly we use potassium rich solution to arrest the heart and also a certain level of hypothermia to decrease the myocardial oxygen demand. The debate over the optimal temperature of cardioplegia during cardiac surgery has been one of the most important aspects of myocardial protection. The aim of this presentation is to compare the beneficial and harmful effects of normothermic cardioplegia and cold cardioplegia. We collect the data from internet and different research papers and also from our institutional working experience.

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**Rohit Saxena**

Fortis Escorts Hospital, Jaipur, Rajasthan

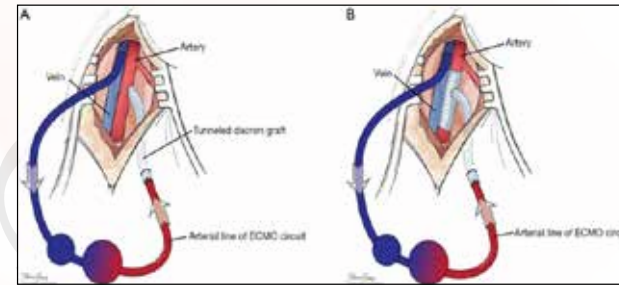
**Distal Limb Perfusion  
- A Necessary Third Cannula in VA ECMO****ABSTRACT**

VA-ECMO is a temporary mechanical circulatory assist method that offers circulatory as well as respiratory support via peripheral access; however, it is liable to complications. Limb ischemia is one of the notorious complications of VA-ECMO but can be avoided utilizing a proper distal limb perfusion method.

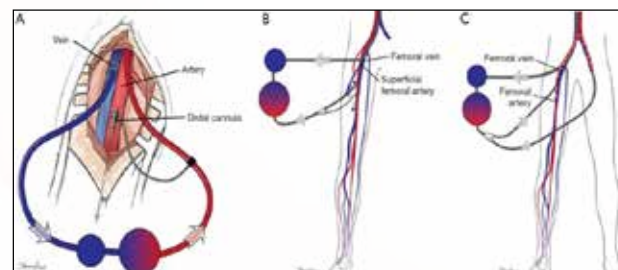
**WHY IT NEEDS**

- Reduce lower-limb ischemia: cold limb
- hypo perfusion in lower limb
- Thrombosis
- Chance of amputation
- vascular complications

All these complications related to less perfusion in lower limb. Less blood supply less oxygen made leg ischaemia blue leg. Limb ischemia complications in VA-ECMO may be decreased by prophylactic placement of DPC. There are some methods for lower limb perfusion. Which may reduce complication or problems in lower part of body in VA-ECMO. Let's discuss some methods here.

**METHOD 1**

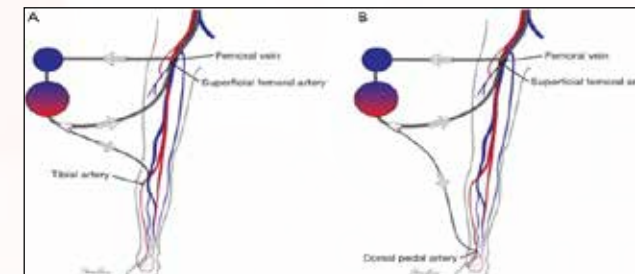
- In this method inserting the arterial cannula directly into the artery lumen by using end-to-side DACRON graft or T graft
- With this technique, the cannula avoids obstructing the artery. This also allows tunneling the graft to exit in separate incision which may decrease infection.
- If you c this figure a Dacron graft was used and connected direct to arterial line, in 2nd picture a T graft was used to make better lower limb perfusion.

**METHOD 2**

- Providing blood infusion through distal perfusion cannula (DPC): this may be either antegrade or retrograde perfusion.
- The DPC is mainly percutaneously inserted, but it can be performed in open technique with direct vessel cut-down
- Different parts of distal limb arterial tree can be used as cannulation sites, including common femoral artery
- Most of the time we use 7/8fr sheath for the distal limb as shown in figure in next 2 picture Y connection was used for the Open common femoral artery; (B) percutaneous common femoral or superficial femoral artery (C) contralateral femoral for better perfusion in lower part of body.

**METHOD 3**

- By cannulation of the posterior tibial or with retrograde perfusion dorsalis pedis .
- The contralateral femoral artery can be used also.
- the DPC inserted through the contralateral femoral artery and is directed into the ipsilateral femoral artery distal to the cannula.



- As shown in pictures separate cannula used by putting Y Connector in tibial artery or in dorsal pedal artery retrogradly.

**RESULTS**

- In all cases the sooner the distal perfusion is initiated, the better results we got.
- As per reports by doing distal limb perfusion patients got less problems in lower limb.

- All patient underwent distal perfusion in less than 6 hours of ECMO initiation time didn't have any ischemic limb injury.

**CONCLUSION**

- Use of distal perfusion in VA-ECMO helps to reduce one of the versatile complications which patients suffer in extracorporeal life support.
- Limb ischemia could be reduced significantly using a sheath or a distal-perfusion cannula.
- These are more reliable methods of limb perfusion in peripheral VA-ECMO and should be established in every patient.



**Shivani R**

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## Does blood cardioplegia provide enhanced myocardial protection when compared to crystalloid cardioplegia?

### BACKGROUND

Experimental studies suggest that Blood Cardioplegia is superior to Crystalloid Cardioplegia for myocardial protection for which there is insufficient clinical data available. Hence, this study analyses the clinical outcome of patients undergoing Valve Replacement Surgery using Blood vs Cold Crystalloid Cardioplegia for myocardial protection.

### METHODS

Forty patients were randomly assigned into two groups, Group A (Blood cardioplegia, n=20) and Group B (Cold Crystalloid Cardioplegia, n=20) respectively. Parameters like CK-MB, cross clamp period, CPB time, urea & creatinine trend, need for RBC transfusion, mechanical ventilator time and hospital stay were noted.

### RESULT

Forty cases were analysed based on CK-MB values - pre and post op, average Cross Clamp time, Cardiopulmonary Bypass time and mechanical ventilator time in which both Group A and Group B showed no significance ( $p > 0.05$ , NS). The post-operative Blood consumption ratio, Renal failure, sepsis and intra-hospital mortality were similar in both the groups.

### CONCLUSION

In terms of clinical outcomes, functional recovery and the degree of ischemic injury, Blood cardioplegia does not show any superiority over Crystalloid Cardioplegia with shorter Cross Clamp time ( $46 \pm 14$  mins).

**Aswathy Rajan**

*Sai Preethi N, Dr. Sanjay Theodore, Dr. Siva Kumar*  
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## Cardiopulmonary bypass technique in minimally invasive cardiac surgery

### BACKGROUND

Minimally Invasive Cardiac Surgery (MICS) is defined as a less invasive method using modified surgical techniques often through smaller surgical incisions for the correction of cardiac defects. These techniques will alter the conduct of Extracorporeal Circulation and methods of monitoring the circuit and patient during MICS.

### METHODS

The conduct of Cardiopulmonary Bypass during MICS will vary from the standard method of perfusion in a number of ways. MICS involves various approaches like upper mini sternotomy, right and left mini thoracotomy. This approach was applied on valvular heart surgeries (MVR, AVR, DVR, TV repair), atrial septal defects, and coronary artery bypass grafting surgeries. Smaller incisions will require alternative methods of cannulation as well as the use of assisted venous return.

### RESULT

On comparing MICS patients with corresponding conventional patients, we observed that there was a statistical significant difference in CPB and Cross Clamp time. There was significant reduction in transfusion, ICU stay, hospital stay, requirement of ionotropes were comparatively less. There is no conversion phase in any of the patients. Major morbidity included stroke and femoral artery injury in one patient with no mortality.

### CONCLUSION

Modifications may be necessary for patients who present with anatomical or physiological abnormality, which cannot be managed using these techniques and will require perioperative modifications.

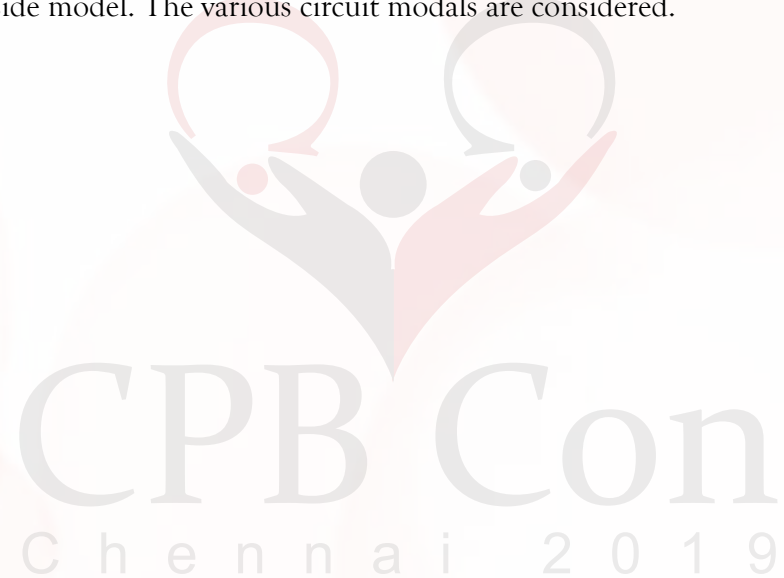


**Suresh Chand Yadav**

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**Modification of Integrated ECMO-CPB & it's circuits****ABSTRACT**

The requirement of ECMO support have been updated from the patients data. Modern integrated circuit configuration has become less cumbersome, safer and more efficient. Advance technology allow prolonged support with fewer complications compared to the past eras and facilitate in operation theatre as integrated transition to a single bedside model. The various circuit modals are considered.

**Manisha Halder**

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**Myocardial Injury During Cardiac Surgery****ABSTRACT**

The very term myocardial protection implies the potential for myocardial injury of some type & in regards to cardiac surgery i.e, manifested as ischemia-reperfusion injury. The pathophysiology & underlying molecular biology of myocardial injury is complex. Ischemia-reperfusion injury can be broadly divided into two distinct categories reversible & irreversible. Reversible injury is manifested by transient depression of cardiac performance, myocardial oedema, & resolves without long term sequel. Irreversible cardiac injury involves apoptosis or myocardial necrosis & results in electrocardiographic changes, release of myocardium specific enzyme such as creatinin phosphokinase (CPK) or Troponin into circulation & lasting abnormalities of ventricular function, either in hypokinetic or dyskinetic segments of ventricle.

Two major theories leading to ischemia- reperfusion injury - i) putative mechanism of calcium ii) free radical hypotheses & inflammation.

The inability of myocyte to modulate intracellular & intraorganellar calcium homeostasis during ischemia & during early reperfusion is the basis of the calcium hypothesis for ischemia reperfusion injury. Increased intracellular calcium induces a cascade of events culminating in increased mitochondrial & nuclear calcium accumulation & cell injury & death.

According to another hypothesis the reactive oxygen species (ROS) formation cause myocellular injury through microsomal peroxidation of the cellular phospholipids leading to loss of cellular integrity & function.

**CONCLUSION**

It is always a perfusionist's duty to invent a standard cardioprotective strategy to minimize risk & adverse outcome associated with ischemia-reperfusion. An increased understanding of molecular players of ischemia reperfusion injury offers potential for new and more efficient cardioprotective strategies.



**Chandran.S**

*Sankar.M, Raj.S, Sathish.D, Dharini.S, Korah Kuruvilla,  
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## Importance of Near Infrared Spectroscopy as a Safe Neuromonitoring tool in Cardiopulmonary bypass under Total Circulatory Arrest

**ABSTRACT**

Cerebral oximetry monitoring using near infrared spectroscopy (NIRS) is a potentially important modality for detection of cerebral ischemia. Despite several studies showing improvements in patient outcome with applied NIRS for cardiac surgery, there has been steady but not yet widespread adoption of this technique. However, for patients undergoing aortic arch surgery—a procedure in which direct interruption of flow to cerebral vessels is an inherent risk—a majority of high-volume centers are using cerebral NIRS on a routine basis. This review examines the rationale and efficacy of such applied

neuromonitoring and consider factors instrumental in modifying clinical practice in evolving standards of care.

We herewith describe a case report of a patient who underwent Bentall and Hemiarch repair under CPB support and TCA. We used NIRS and TCD for cerebral monitoring. The safety in using these modalities in cases requiring TCA are described in the poster.

The Details of the patient, procedure and perfusion techniques will be described in the poster.

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**Sam Immanuel S**

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## Designing a new scoring system (PerfSCORE) correlating the management of cardiopulmonary bypass to postoperative outcomes to know the Adequacy of Perfusion

**ABSTRACT**

The aim of this study was to ascertain a score (PerfSCORE), directly derived from CPB records, could correlate to major postoperative outcomes. An additive score (PerfSCORE) was created from Multivariable parameters: peak lactate value during CPB, peak VCO<sub>2i</sub>, lowest DO<sub>2i</sub>/VCO<sub>2i</sub>, peak respiratory quotient, CPB time, cross-clamp time, lowest CPB temperature, circulatory arrest, ultrafiltration during CPB, number of packed red cells transfused intraoperatively.

The PerfSCORE was calculated, as well. Multivariable logistic regression models were built to detect the independent predictors of: all the Multivariable parameters like peak lactate >3mmol/L; the incidence of acute kidney injury network (AKIN); respiratory insufficiency; morbidity can be predicted by the PerfSCORE.

PerfSCORE may help to provide a quality marker of perfusion, emphasizing the need for goal-directed perfusion strategies.

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**Prakash Krishna Moorthy**  
Medanta, Ranchi

## Segmental Aortic Bypass as alternative to left heart bypass for Thoraco Abdominal Aortic Aneurysm

### ABSTRACT

Various techniques have been used to avoid the complications of thoracoabdominal aneurysm repair among these left heart bypass technique is commonly and widely accepted technique.

### MATERIAL & METHOD

Two cases of Thoraco abdominal aneurysm and pseudo aneurysm have been repaired. In these cases, we decided to use segmental Aortic bypass. In this technique no ox`genator was used only cardioplegia reservoir was used, and one Aortic cannula was inserted in normal proximal aortic segment after that

aorta was looped to apply clamp then another arterial cannula was put in left femoral artery.

After clamping the aorta above and below the aneurysm controlled circulation achieved in distal segment of Aorta with drifting down temp of 34 degree Celsius .once repair and reimplantation done. Then circulation resumed and decannulation sites repaired.

### RESULT

Both the cases recovered without any deficit and doing well and their thoracoabdominal aorta replaced with their LFT was with in normal limit on first POD.



**Dhishani Kennedy**  
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## A Study on Changes in Serum Sodium Concentration in Pediatric Patients Undergoing Cardiopulmonary Bypass with Hemofiltration

### INTRODUCTION

The objective of this study is to investigate the degree of serum sodium changes and its association with patient outcomes in pediatric patients undergoing heart surgery with cardiopulmonary bypass (CPB).

### MATERIALS AND METHODS

The study was conducted on 60 pediatric patients who underwent cardiac surgery with cardiopulmonary bypass at Sri Ramachandra Institute of Higher Education and Research from June 2016 to May 2017. Arterial blood samples were collected prior to CPB, during CPB and at the end of CPB. Hemofiltration was done in all 60 patients

### RESULTS

Prior to cardiopulmonary bypass, hyponatremia ( $\leq 135$  mmol/L) was observed in 17 out of 60 patients. After initiation of cardiopulmonary bypass with conventional Hemofiltration, serum sodium decreased significantly and severe hyponatremia ( $\leq 130$  mmol/L) subsequently developed in 36 out of 60 patients. At the end of cardiopulmonary bypass,

however, hypernatremia ( $\geq 145$  mmol/L) developed in 44 out of 60 patients. The degree of acute serum sodium change during CPB was not associated with patient outcomes. However, the patients with preoperative hyponatremia and those with hypernatremia at the conclusion of cardiopulmonary bypass had longer hospital stays and higher postoperative complication rates. Lower serum sodium prior to CPB and higher serum sodium at the end of CPB, along with age and duration of the operation, were independently associated with worse in-hospital outcomes.

### CONCLUSION

The results suggest that acute and transient hyponatremia occurred frequently after initiation of CPB, and then serum sodium immediately increased above preoperative levels at the end of CPB. Also we concluded that fluid removal by hemofiltration was associated with a decrease in serum sodium levels compared to diuretic treatment. Caution is required to avoid serum sodium overcorrection on the conclusion of CPB, since hypernatremia causes post-operative complication.



**Banuppriya Ravi**

*Christy Kurian, Sumathi Maheshwaran, Umapathy Jagannathan,  
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## Conventional and Zero balance Ultrafiltration in Infants undergoing cardiac surgery - Our Experience

**ABSTRACT****INTRODUCTION**

Ultrafiltration during CardioPulmonary Bypass (CPB) in Infants undergoing cardiac surgery has many advantages and remains the standard of care in pediatric cardiac surgery. Various techniques of ultrafiltration are available including Conventional, Modified and Zero balance. We reviewed our Ultrafiltration strategies in infants undergoing cardiac surgery at our centre.

**MATERIALS AND METHODS**

A total of 50 infants underwent cardiac surgery from Jan to Oct 2018 were analysed retrospectively. The median age was 60 days (range 1-240days) and the median weight was 3.1kg (range 2-5.1kg). 23 of them were neonates. The diagnosis includes Ventricular septal defect in 19 infants (38%), Total anomalous pulmonary venous return in 14 (28%), Transposition of great arteries in 10 (20%) and others (ALCAPA in 2, AP window in 2, Truncus arteriosus 1, Complete AV canal in 1, TOF in 1) Preoperative shock with multiorgan failure was seen in 4 patients. The median preoperative haemoglobin was 11.9. Median priming volume was 287ml. Priming consist

of packed cell and Fresh frozen plasma. Fresh Frozen plasma was added during rewarming. All patient had "conventional ultrafiltration" during CPB and Zero balance ultrafiltration during rewarming. The hemoglobin was maintained about 12g/dl. Modified ultrafiltration was not carried out in any one of them.

**RESULTS**

The median CPB time was 90mts (range 53-328mts). The median Aortic Cross Clamp time was 56mts (range 31-192mts). The median ultrafiltration volume and the median haemoglobin during CPB was 1000ml, 11.3g/dl respectively. The median amount of urine output in the CPB was 50ml. Chest was open in 56% in pts. The median duration of post-operative ventilation and inotropic usage was 42.5hrs, and adrenaline 18hrs, milrinone 33.5hrs, simenda 26hrs, dobu 20.5hrs respectively. The median amount of blood transfusion was 105ml. The Median lactate at 8 hours, 16 hours and 24 hrs after surgery was 32, 24, and 13 respectively. Renal dysfunction needing dialysis was seen in 7 pts (14%). 8 pts were died (16%) after surgery. Presence of preoperative shock and development of renal failure after surgery are strong risk factors for mortality. The median hospital stay and ICU stay was 3days and 8days respectively. No perfusion related adverse events were occurred in all these patients.

**CONCLUSION**

Conventional and Zero balance Ultrafiltration during rewarming is very useful strategy in pediatric cardiac surgery especially in reducing fluid overload and improving overall hemodynamics. It reduces the operative time and post CPB hemodynamic instability as compared to the modified Ultrafiltration. Poor preoperative status and Development of renal failure after surgery are the strongest risk factors for mortality. Further trials are needed to compare between Conventional and modified ultrafiltration.



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Chennai 2019



**Kebin Chacko**

*Prakash PVS, Sam Immanuel, Selvakumar, Arun R, Dr. Riyan Shetty*  
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**ECMO In Children Post Cardiac Surgery - Our Experience****INTRODUCTION**

Post cardiovascular surgery myocardial dysfunction in children is a known entity and about 0.5- 1.0% of them require mechanical circulatory support in the post-operative period. The use of extra corporeal membrane oxygenation (ECMO) as a rescue therapy in pediatric ITU has enabled improvement outcomes of children post cardiac surgery.

**OBJECTIVE**

To describe our experience with ECMO in children following surgery for congenital heart defects (CHD) and analyse the outcomes.

**MATERIALS AND METHODS**

Single Center, Retrospective study from January 2017 - August 2018

**RESULTS**

- Total number of congenital heart surgeries = 4399 in this period.
- Total Number of Patients put on ECMO = 97 (2.2%) (Male - 58, Female - 39)
- Number of patients weaned off ECMO: 68 (69.1%) Males - 41, Females - 27)
- Survival to discharge: 39 (40.2%) (Males - 23, Females - 16)

- Average ECMO hours in ECPR: 90.6 (1.5 - 157)
- Average ECMO hours in Semi-Selective: 123.4 (24 - 331.5)
- Average ECMO hours from OT: 112.5 (58.5 - 184)
- LENGTH OF STAY: ITU Stay: 23.5 + 21 days
- HOSPITAL STAY: 37.9 + 29 days

**CONCLUSION**

The ECMO support renders adequate time for the heart and lungs to recuperate by maintaining optimal perfusion to end organs in the postoperative sick patients. CPR has favorable outcome in the post-operative period for congenital heart defects, with no residual lesions.

**Loknath Tiwari**

*Subhajit Biswas, Chittaranjan Dash, Tanmay Acharia, Dr. Saikat Bandhyopadhyay, Dr. Ashima Bhelotkar, Dr. Soumen Paul, Dr. K.M.Mandana*  
Fortis Hospitals, Kolkata

**Arrow Trauma Surgery****CASE REPORT**

A 35 yrs old citizen of Bhutan presented with penetrating arrow injury (Fig-1) over anterior chest wall at Punakha while playing an archery match. He was rushed to the nearby hospital with the arrow stuck at the site & lifted to Fortis Kolkata by chartered flight.

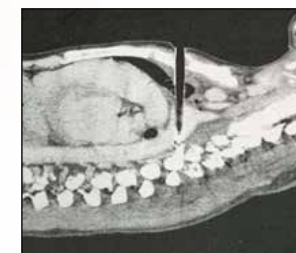


Fig-1

Penetrating injury to the major vessels like aorta is life threatening & patient is expected to die in minutes. In our case the arrow injury was through the sternum which made it immovable & fixated which ensured no further damage to the wall of the aorta with any small movement ie due to transport from the hospital to hospital. Since the entry point of the arrow was through the sternum, sternotomy was not an option. Furthermore left thoracotomy (Fig-2) approach allowed the surgeon to visualize both anterior and posterior walls easily which would not be possible

with sternotomy approach. Also choosing TCA allow avascular condition to carefully examine and repair the injury and obtain adequate haemostasis.



Fig-2

TEE also was very helpful in sharing a big thrombus attached to the arrow lying in the lumen of aorta adherent to the arrow head. It was also under TEE guidance we could remove not one but actually three clots which could have embolized to brain. After following all safeline protocol the arrow & clot successfully removed from chest & aorta.



Fig-3





### Sujithkumarkalla

*Dr. Ch. Eshwar, Dr. Rakshay Shetti, Sandeep Kumar Raju*  
e-ECMO Solution



## Case Study (LRTI with severe pneumonia) ECLS

### BACKGROUND

A baby girl aged of 1yr. 9months was admitted in the hospital due to lower respiratory tract infection (LRTI) with severe pneumonia. Baby was done with elective intubation kept on HFO and decided to keep on ECMO and within 6hrs of span we kept the baby on ECMO. Due to the smaller femoral cannula on third day we have changed the cannula and within 7days we have seen the baby in maintaining on ventilator so on 7th day we have weaned off ECMO.

### METHODS

We have insitated ECMO with percutaneous and femoral cannulation (femoral 14fr and Rt IJV 12fr) at starting we have we have done femoral cannula of 14fr due to low flows and we have not got a adequate flow on 3rd day we have changed cannula to 15fr and before insitation of ECMO the baby was having 4 ICD drain catheters before weaning off of ECMO we have removed all drain catheters and weaned off ECMO. We have daily done with ultrasound, echo cardiogram, and chest X-ray also hourly ACT & second hourly ABG and regular lab reports with all parameters.

### RESULTS

After insitation of VV ECMO to the patient. We got a obstruction of cannula and bleeding near the femoral cannula site and we have changed the cannula On 3rd day after that on 4th day there was a pnemothorax on left lung and on 5th day that pnemothorax was drained out and 6th day we have removed one drain from either side of lungs and on 7th day we have remove another drain's and baby was maintaining on ventilator on that evening we have weaned off ECMO.

### CONCLUSION

VV ECMO is the treatment of choice for patient with respiratory failure refractory to optimal mechanical ventilation and conventional medical treatment. A baseline echo evaluation of paramount importance in such critically ill patient to rule out the presence of concomitant cardiac dysfunction. LRTI, while often used as a synonym for pneumonia, can also be applied to other types of infection including lung abscess and acute bronchitis. Symptoms include shortness of breath, weakness, fever, coughing and fatigue.

You Know  
But .....  
Do You Know???



# HISTORY

This timeline has been elaborated in order to mention the fundamental contributions that led to the creation, development, and clinical use of cardiovascular perfusion. Some citations are not specifically related to cardiovascular perfusion but they represent contributions that increased case load or allowed for a better perioperative management and care of cardiac patients undergoing cardiopulmonary support. As most timelines, this is not complete or absolute; it rather registers some of the information that has been reported on the specific literature.

- ◆ 1628 - William Harvey - First description of blood circulation; published in his epic book "De Motu Cordis".
- ◆ 1666 - Robert Lower - Performed a direct exchange blood transfusion on a dog.
- ◆ 1667 - Robert Lower - Performed the first successful direct blood transfusion on a human being
- ◆ 1774 - Joseph Priestley - Discovered oxygen and described its role in combustion and respiration.
- ◆ 1789 - Lavoisier - Considered the founder of modern chemistry, published his book "Traite Elementaire de Chimie".
- ◆ 1813 - Le Gallois - First promulgated the concept of an artificial circulation.
- ◆ 1828 - Kay - Showed that artificial circulation of venous blood was capable of re-establish muscular excitation.
- ◆ 1832 - Hall - Described the status of hibernation as a contribution to the study of hypothermia.
- ◆ 1848 - Brown-Sequard - Demonstrated the necessity of oxygenated blood to be used as a "perfusate".
- ◆ 1849 - Loebell - Firstly perfused an isolated kidney.
- ◆ 1850 - Oto Funke - Discovered hemoglobin.
- ◆ 1868 - Ludwig and Schmidt - Described an apparatus to infuse a solution under constant pressure from a reservoir.
- ◆ 1869 - Ludwig and Schmidt - First artificially oxygenated blood by using defibrinogenated blood.
- ◆ 1881 - Von Schroder - Developed the method of bubbling air through venous blood.
- ◆ 1882 - Guilio Cesare Bizzozero - Describes the action of platelets.
- ◆ 1882 - Von Schroder - Introduces the first bubble oxygenator.
- ◆ 1883 - Ringer - Demonstrates that potassium inhibited and calcium stimulated the heart.
- ◆ 1885 - von Frey and Gruber - Introduced the first film oxygenator.
- ◆ 1885 - John Duncan - Reported the use of intraoperative autotransfusion following a leg amputation.
- ◆ 1888 - Hamel - Devised an apparatus with a pendulum to periodically interrupt the blood flow to the tissues.
- ◆ 1890 - Jacobj - Designed a perfusion apparatus able to create pulsatile pressure to perfuse an organ.
- ◆ 1895 - Jacobi - Passed blood through an excised animal's lung that was aerated by artificial respiration.
- ◆ 1895 - Wilhelm Conrad Roentgen - Discovered "X-Rays." Enabled the study of heart on fluoroscopes.
- ◆ 1896 - Dubois - Induced hypothermia in marmots through a mixture of carbon dioxide and oxygen.
- ◆ 1900 - Karl Landsteiner - Described the ABO system and blood biocompatibility and rejection.
- ◆ 1903 - Brodie - Designed a pump oxygenator circuit to perfuse an animal isolated organ.

- ◆ 1903 - Willem Einthoven - Invented the electrocardiograph by using a string galvanometer.
- ◆ 1905 - Carrel and Guthrie - Implanted a heart into the neck of a dog.
- ◆ 1908 - Alexis Carrel - Sewed a father's artery to the vein of his newborn daughter who was hemorrhaging.
- ◆ 1910 - Hooker - Postulated that pulse pressure was a necessary factor in perfusion.
- ◆ 1916 - McLean - Discovered heparin making controlled anticoagulation possible.
- ◆ 1921 - Dale and Schuster - Developed a double perfusion pump intended to carry out whole-body perfusion.
- ◆ 1926 - Brukhonenko - Described the artificial perfusion of an isolated animal head.
- ◆ 1929 - Forssman - Developed the technique of cardiac catheterization. Used his own arm to insert a catheter.
- ◆ 1930 - Forssman - Used a catheter to inject opaque dye into his heart to view on X-Ray photographs.
- ◆ 1931 - John H. Gibbon, Jr. - Conceived the idea of the heart-lung machine for extra-corporeal circulation.
- ◆ 1934 - Michael DeBakey - Design the DeBakey roller pump.
- ◆ 1935 - Carrel and Lindberg - Developed a device that perfused the thyroid gland of a cat for more than two weeks.
- ◆ 1935 - John H. Gibbon, Jr. - First successful application of the heart-lung machine in an animal (cat).
- ◆ 1937 - Bernard Fantus - Created the first blood bank at Cook County Hospital in Chicago.
- ◆ 1939 - John H. Gibbon, Jr. - Created the second generation heart-lung machine with a DeBakey pump.
- ◆ 1941 - Cournand - Performed the first cardiac catheterization on a human.
- ◆ 1944 - Kolff - Observed blood oxygenation across a cellophane membrane in an artificial kidney.
- ◆ 1948 - Bjork and Crafoord - First disc oxygenator design and construction.
- ◆ 1949 - John H. Gibbon, Jr. - Used protamine to reverse the anticoagulation effects of sodium heparin.
- ◆ 1949 - Drew - Used profound hypothermia to correct cardiac lesions.
- ◆ 1949 - John Gibbon and Thomas Watson (IBM) - Developed the Gibbon Model I heart-lung machine with DeBakey Pumps and film oxygenator.
- ◆ 1950 - Demikov - Performed the first experimental orthotopic transplant.
- ◆ 1950 - Walton Lillehei - Successfully applies cross circulation technique. Surgical community is not impressed.
- ◆ 1950 - Bigelow - Performed laboratory experiments with animals using hypothermia.
- ◆ 1950 - Clark, Gollan and Gupta - Introduced the use of silicones (antifoam A) as an aid to remove air bubbles.
- ◆ 1951 - Clarence Dennis - Performed the first human open heart surgery case with extracorporeal circulation. The patient did not survive.
- ◆ 1951 - John Gibbon and Thomas Watson (IBM) - Developed the Gibbon Model II heart-lung machine.
- ◆ 1951 - Karlson - Laboratory evaluation of a cellulose membrane oxygenator.
- ◆ 1952 - Clark - Builds its first model of a bubble oxygenator - Described the principles for gas removal.
- ◆ 1952 - Gollan - Builds the first concentric bubble oxygenator with a spiral heat exchanger immersed in the inner space.

- ◆ 1952 - Paul Zoll - Developed the first cardiac pacemaker.
- ◆ 1952 - John Lewis and Tauffic - First hypothermic application on humans to close ASDs.
- ◆ 1952 - Charles Hufnagel - Inserted an artificial valve into a patient's aorta.
- ◆ 1952 - Wesolowski - Experimented cardiac surgery with animal lungs as oxygenators. 1952 - Andreasen and Watson - Described the principle of perfusion with low flow called "azygos flow".
- ◆ 1953 - Frank F. Allbritten - Developed the left ventricular vent to solve intra-cardiac air complications.
- ◆ 1953 - John H. Gibbon, Jr. - First successful application of extracorporeal circulation in a human. Corrected an ASD under direct vision. The machine was constructed (and sponsored) by IBM engineers.
- ◆ 1953 - Michael DeBakey - Implanted a seamless dacron tube for surgical repair of occluded vessels and aneurysms.
- ◆ 1954 - Art McDonald - Constructed the Sigmamotor pump used for heart surgery with cross circulation.
- ◆ 1953 - Lillehei - Controlled cross-circulation using live human donor lungs for oxygenation of patients' blood during infant and pediatric surgery.
- ◆ 1954 - John Gibbon and IBM developed the Gibbon Model III heart-lung machine.
- ◆ 1955 - Melrose - Suggested the deliberate manipulation of ionic environment of the myocardium (potassium cardioplegia).
- ◆ 1955 - Clowes - Developed a large flat multi-layered ethylcellulose membrane oxygenator used clinically on several patients.
- ◆ 1955 - Mustard - Used excised lungs from rhesus monkeys to oxygenate blood during pediatric surgery.
- ◆ 1956 - Kay and Cross - Improved the disc oxygenator for clinical cardiac surgery.
- ◆ 1956 - De Wall - Constructed the first clinically successful helix reservoir bubble oxygenator.
- ◆ 1956 - Gott, De Wall and Lillehei - First disposable bubble oxygenator as a plastic sheet single unit.
- ◆ 1956 - Rygg and Kyvsgard - First disposable bubble oxygenator in Europe.
- ◆ 1956 - Kirklin - First series of open-heart cases performed using the Mayo-Gibbon heart-lung machine.
- ◆ 1957 - Wild - Reported the use of ultrasound to visualize the heart non-invasively.
- ◆ 1957 - Walton Lillehei and Earl Bakken - Developed the first portable pacemaker. Bakken later forms the Medtronic Corporation.
- ◆ 1957 - Willem Kolff and Tetsuzo Akutzu - Implanted the first artificial heart in a dog. The animal survived for 90 minutes.
- ◆ 1958 - Cooley - Designed and used the first stainless steel reusable concentric bubble oxygenator.
- ◆ 1958 - Junqueira de Moraes - First successful clinical use of hemodilution with homologous plasma.
- ◆ 1958 - Schumway and Lower - Started a series of animal experiments for heart transplantation.
- ◆ 1958 - Mason Sones - Developed coronary angiography.
- ◆ 1958 - Brown - Constructed the widely used Brown-Harrison heat exchanger.
- ◆ 1960 - Albert Starr - Developed the Starr- Edwards heart valve. One of the most successful early heart valves.
- ◆ 1960 - Zuhdi - First application of clinical intentional hemodilution with crystalloids.

- ◆ 1961 - Callaghan - Developed an artificial placenta for extracorporeal support of newborns with RDS.
- ◆ 1961 - Peirce - Developed a membrane lung for use with hypothermia.
- ◆ 1962 - Mouloupoulos - Suggested the use of a single chambered intra-aortic balloon in the descending thoracic aorta to accomplish the same hemodynamics as did arterial counterpulsation.
- ◆ 1964 - Dotter and Judkins - Used tapered Teflon dilating catheters during arteriography to dilate occluded peripheral arteries.
- ◆ 1964 - Bretschneider - Introduced cold crystalloid cardioplegia.
- ◆ 1967 - Rene Favaloro - Performed the first coronary bypass operation using the patient's native saphenous vein as an autograft.
- ◆ 1967 - Christian Barnard - Performed the first heart transplant.
- ◆ 1968 - Kantrowitz - Performed the first clinical trial in man of intra-aortic balloon pumping.
- ◆ 1968 - Kolobow and Zapol - Performed partial extracorporeal gas-exchange in alert newborn lambs with a membrane artificial lung, perfused via an A-V shunt for periods up to 96 hours.
- ◆ 1969 - Denton Cooley - Implanted a total artificial heart designed by Domingo Liotta. The device served as a "bridge" for cardiac transplantation until a donor heart was found.
- ◆ 1969 - Dorson - Performed long-term partial bypass support of a 1.6 Kg. premature infant with RDS for 20 hours.
- ◆ 1970 - Robert Jarvik - Designed the Jarvik series of artificial hearts.
- ◆ 1971 - White - Started ECMO on newborn babies using veno-venous bypass for up to 9 days.
- ◆ 1972 - Hill - Started adult ECMO for shock-lung syndrome; perfusion for 75 hours. Survived.
- ◆ 1972 - Kolobow - Performed ECMO on an 11 year old boy for 10 days. Survived.
- ◆ 1974 - Gerald Buckberg - Advocated the use of blood/ crystalloid cardioplegia with substrates.
- ◆ 1975 - Willem Kolff - Designed a nuclear-powered artificial heart (Westinghouse Corporation).
- ◆ 1976 - Bartlett RH - Performed the first neonatal ECMO with success.
- ◆ 1977 - Andreas Gruntiz - Experimented with transluminal coronary angioplasty.
- ◆ 1980 - Michel Mirowski - Developed the automatic implantable cardiac defibrillator.
- ◆ 1980 - Bergman - Described femoral artery percutaneous insertion of an intra-aortic balloon using a modification of the Seldinger technique.
- ◆ 1981 - Denton Cooley - Implanted another pneumatically- driven artificial heart designed by Dr. Akutsu. This artificial heart was used for 27 hours as a "bridge" to cardiac transplantation.
- ◆ 1984 - Leonard Bailey - Replaced baby girl Faye's native heart with a baboon heart. She survived for 3 weeks.

#### ► 5 THINGS TO CHECK WHILE GOING ON CPB

- ◆ Arterial Line Pressure
- ◆ Decompression Of Heart
- ◆ Venous Drainage
- ◆ Systemic Arterial And Venous Pressure
- ◆ Arterial Blood Oxygen Concentration

► DIFFERENCE BETWEEN ADULT AND PAEDIATRIC CPB

No.	PEDIATRIC CPB	ADULT CPB
1.	Exposed to biologic extremes which includes, deep hypothermia(15 - 20°C), hemodilution 3 - 15 fold great dilution of circulating blood volume	Normally with crystalloid prime & rarely with blood, hemodilution is moderate
2.	Low perfusion pressure ( 20 - 30 mmHg )	Maintained between (50 & 80 mmHg)
3.	Wide variation in pump flow rates ranging from 200 - 250 ml/kg/min	Higher flow rates are maintained at 60 - 80 ml/kg/min
4.	Circulatory arrest is common	Rare
5.	Differs from blood pH management (ã stat or pH stat)	pH stat is less influential because of moderate hypothermic perfusion
6.	Prime volume is 100 - 150% more of blood volume	25 - 33% of more blood volume
7.	Colloid & albumin are mandatory	Can be managed with colloid & rarely albumin
8.	Often low blood flows are needed	Rarely needed
9.	Variable levels of electrolytes/glucose/calcium. Lactate may be high because of blood prime	Moderate
10.	Hemofilter & MUF mandatory	When needed

► TUBING PACK SELECTION

Patient weight (Range)	Max. Blood Flow	TUBING PACK	Race Way	Venous line	Arterial line	ECC Prime Volume
Up to 3 kg	800 ml/min	NEONATAL	1/4 "	1/4 "	3/16"	270 ml
3 – 8 kg	1200 ml/min	INFANT	1/4 "	1/4 "	1/4 "	375 ml
8 - 22 kg	2500 ml/min	PEDIATRIC	3/8"	3/8"	1/4 "	600 ml
22 – 45 kg	3500 ml/min	SMALL ADULT	3/8"	3/8"	3/8"	800 ml
45 kg & above	3500 ml	ADULT	1/2"	1/2"	3/8"	1650 ml

PUMP BOOT SELECTION

SIZE	¼" TUBING	3/8" TUBING	½" TUBING
FLOWS in L/Min	<1.20	1.20-2.70	>2.70

► ROLLER PUMP CALIBRATION CHART

BOOT DIAMETER (Inch)	STROKE VOLUME (CC/RPM)	PRIME VOLUME (CC/Ft)
1/8"	3.7	2.5
3/16"	7	5
1/4"	13	9.65
3/8"	27	21.7
1/2"	45	38.6

► PHYSICS OF VENOUS RETURN

- ♦ In the normal circulation, venous reservoir towards the heart is the result of the pressure difference between the mean circulating filling pressure & the pressure in the RA
- ♦ This pressure difference is approx. 7 mmHg
- ♦ VR reaction time determines the reservoir volume & the flow rate
- ♦ Normal negative pressure for VAVD between -30 & - 80 mmHg are reported

► FLUID DYNAMIC PARAMETERS NEEDED TO OBTAIN A VENOUS DRAINAGE OF 5000 ml/min.

PARAMETERS	3/8" TUBING	1/2 " TUBING
Blood flow	5.0 l/m	5.0 l/m
Pressure difference	68 mmHg	16 mmHg
Velocity ( cm/s )	117	66
Reynolds Number	4686	3514
Wall shear stress ( dynes/cm <sup>2</sup> )	108	34

► BLOOD FLOW RATE CHART

Patient weight in Kilograms	Blood flow rate
0 - 3 Kg	225 - 250 ml/kg/min.
3 - 5 kg	200 - 225 ml/kg/min.
5 - 10 kg	150 ml/kg/min
Over 10 kg	BSA × 2.4 – 3.2

► ADEQUATE FLOW & TEMPERATURE

TEMPERATURE	FLOW (l/min/m <sup>2</sup> )
32 – 37°C	2.2 to 2.4
28 – 32°C	1.8 to 2.2
24 – 28°C	1.4 to 1.8
20 – 24°C	1.0 to 1.4
< 20°C	50ml / kg(Low flows)
<18°C	T.C.A or 25ml/kg(Critical flow)

► Dr. M. J. ELLOTT's CHART FOR SAFE DURARION UNDER LOW FLOWS

NP (Temp ° C)	FLOW	SAFE DURATION in MINUTES
37	2.4 l/min/m <sup>2</sup>	?
28	1.6 l/min/m <sup>2</sup>	120 min.
28	0.5 l/min/m <sup>2</sup>	20 min.
26	0.5 l/min/m <sup>2</sup>	30 min.
22	0.5 l/min/m <sup>2</sup>	45 min.
17	0.5 l/min/m <sup>2</sup>	<60 – 90 min

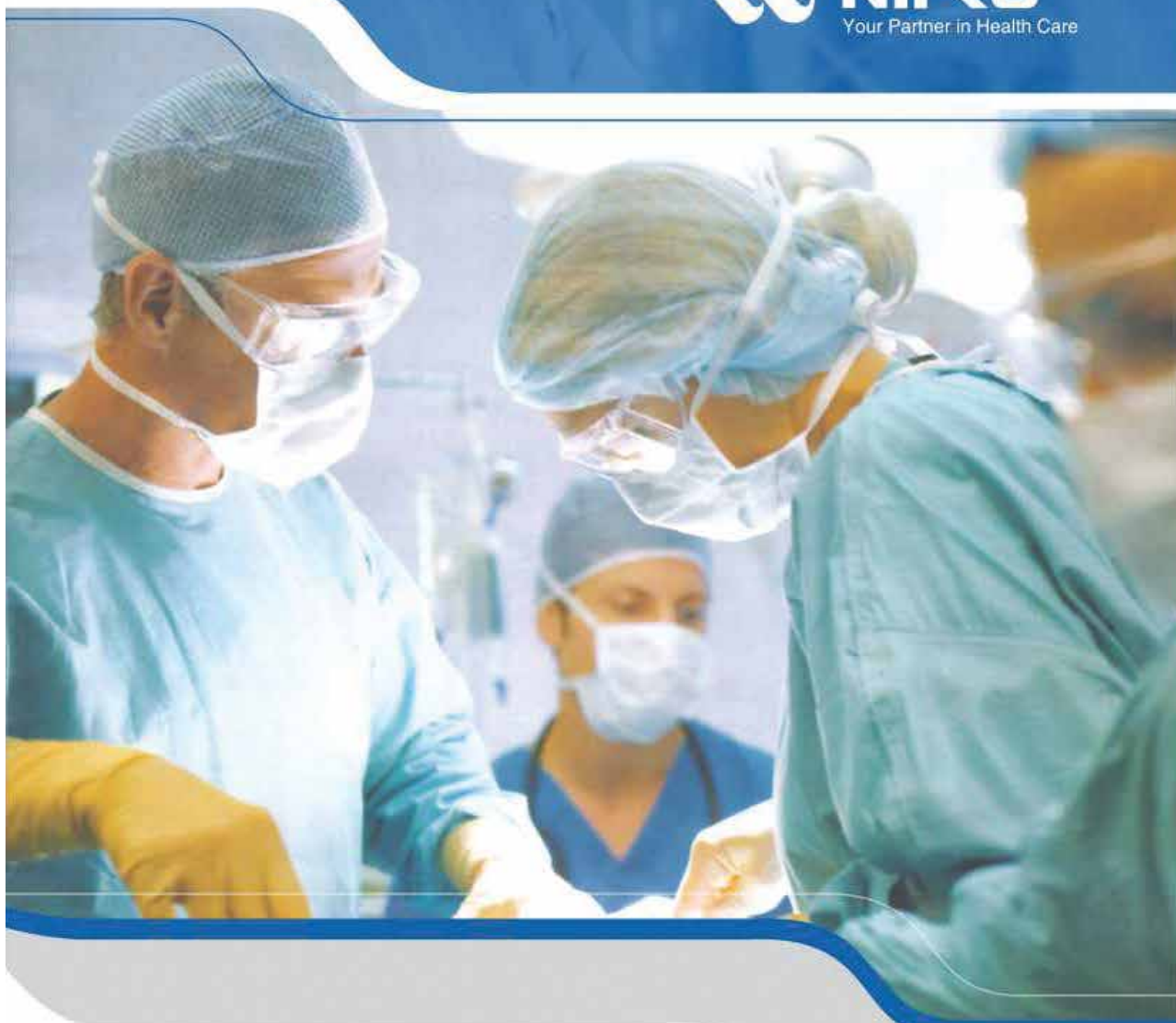


► **COMPLICATIONS OF CPB**

Adverse effect	Solutions	Advantages
Haemodilution, blood transfusion	Minimize circuit and prime volume. Incorporate haemofilter to remove water from blood. Mini bypass. Retrograde autologous prime	Maintenance of safe haematocrit and reduction of homologous blood use
Consumption of coagulation factors	Heparin and phosphorylcholine coating	Reduced inflammatory mediators release. Improved post-CPB platelet count. Reduced blood loss
Roller pump-induced haemolysis	Centrifugal pump	Less haemolysis in longer cases
Fat embolization	Avoid cardiotomy suction. Cell salvage	Improved postoperative neurological outcome
Activation of leucocytes, increase in complement and cytokines	Leucocyte filter. Ultrafiltration	Reduced inflammatory response
Polypropylene microporous membrane wets out after 5hrs	True membrane technology developed	Reduced need for exchange of oxygenator during ECMO
Poor control of acid–base balance and oxygenation	Continuous in line blood gas and electrolyte monitoring	Rapid intervention and alteration of oxygen therapy, CO2 removal and pH balance
Uncontrolled blood loss	Cell salvage	Reduced blood transfusion
Micro and macro air embolism	Use safety devices, automatic clamps, and vented blood filters	Reduction of neurological injury

COMPLICATION	AETIOLOGY	MANAGEMENT
Pump Failure	Electrical Failure Mechanical Failure Runaway Pump	Hand Crank Availability Of Backup Equipment Frequent Servicing (Amc) Battery Backup
Oxygenator Failure	Clogging Of Oxygenator Manufacturer Defect Distruption Of Membrane	Availability Of Backup Equipment Oxygenator Change Out
Oxygen Supply Failure	Inadequate Gas Flow Or Hypoxic Mixture Blender Failure	Connect Portable Oxygen Supply Cool Patient Ventilate With Room Air
Air Embolism	Low Venous Return Open Heart Surgery Presence Of Asd Improper Venting	Steep Trendelenburgs Position Retrograde Cerebral Perfusion Hypothermia
Air Lock In Venous Line	Cannula Exposing Atmosphere Non-Occlusive Purse String Suture Presence Of Asd	Slow Down Pump Remove Cannula Fill With Fluid And Reinstigate Cpb
High Arterial Line Pressure	Kink In Cannula Clamp Too Near The Cannula Cannula Too Small Block In Arterial Filter	Slow Down Pump Flow Check And Reposition Cannula

Low Venous Return	Limited Access Surgery Peripheral Cannulation Kink In Venous Line Air Lock In Venous Line Oxygenator Mispositioned	Assisted Venous Drainage Remove Air Lock Adjust The Height Of The Oxygenator
Heparin Resistance	Pregnancy Oral Contraceptives Shock Dic At-3 Deficiency	Additional Heparin
Pregnancy	Low Uterine Blood Flow Placental Ischemia	High Flows Perfusion Pressure 60-70Mmhg /Pulsatile Flows Maintain Metabolic State Adequate Blood Glucose Level Tocolytic Drugs
Malposition Of Arterial Cannula	Cannula Orifice Touching Aortic Wall Lumen	Discontinue Cpb Surgical Reposition Of Cannula
Jehovahs Witness	Religious Objection	Low Prime Oxygenators Cell Salvage Erythropoietin Pre Operatively Antifibrinolytic Post Operatively
Hyperkalaemia	Repeated Dose Of Cardioplegia Blood Administration & Potassium Content Iv Fluids	Give Lasix Add Calcium Perform Hemofiltration



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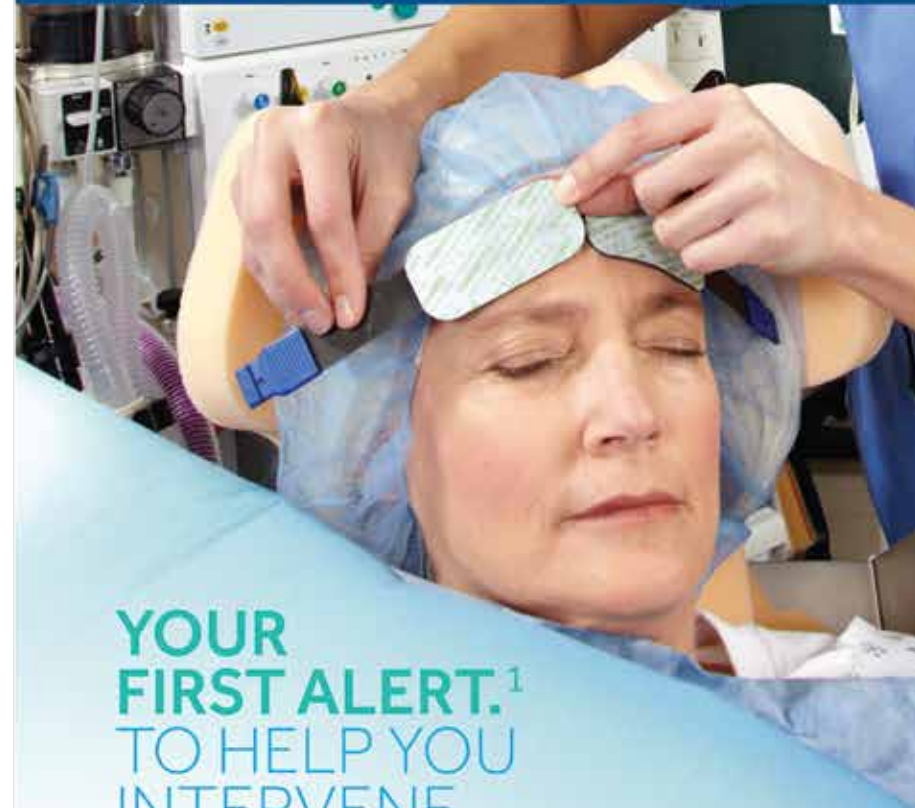


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2. JAMA. 2012;307(12):1305-1312. doi:10.1001/jama.2012.111111.  
3. JAMA. 2012;307(12):1305-1312. doi:10.1001/jama.2012.111111.

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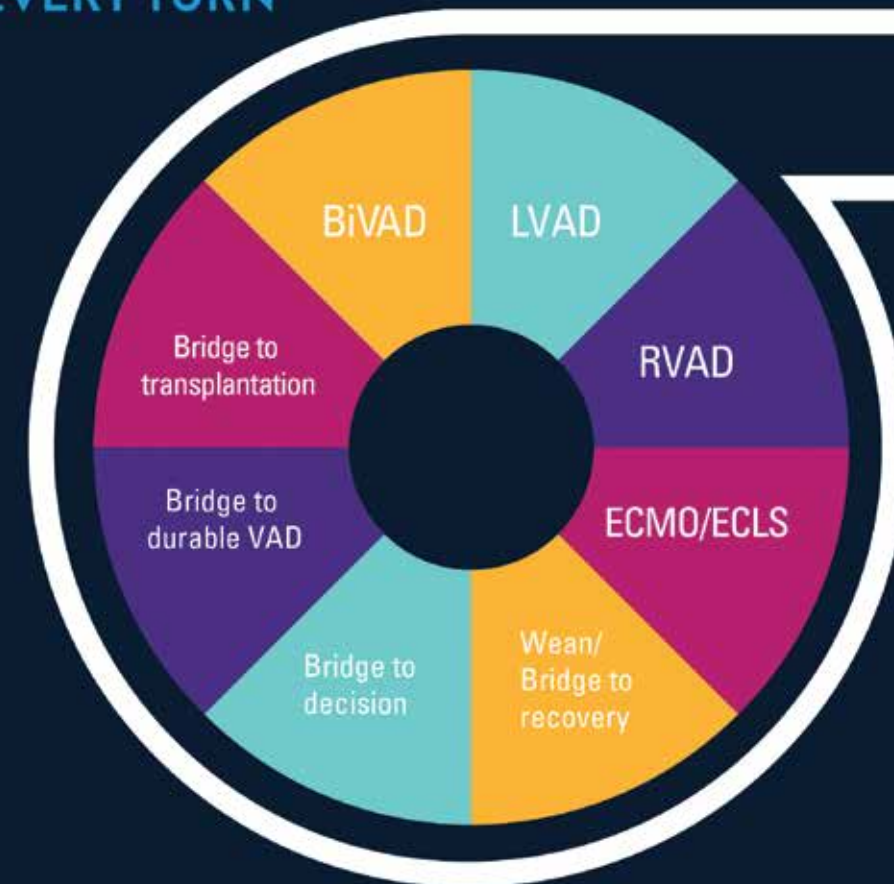
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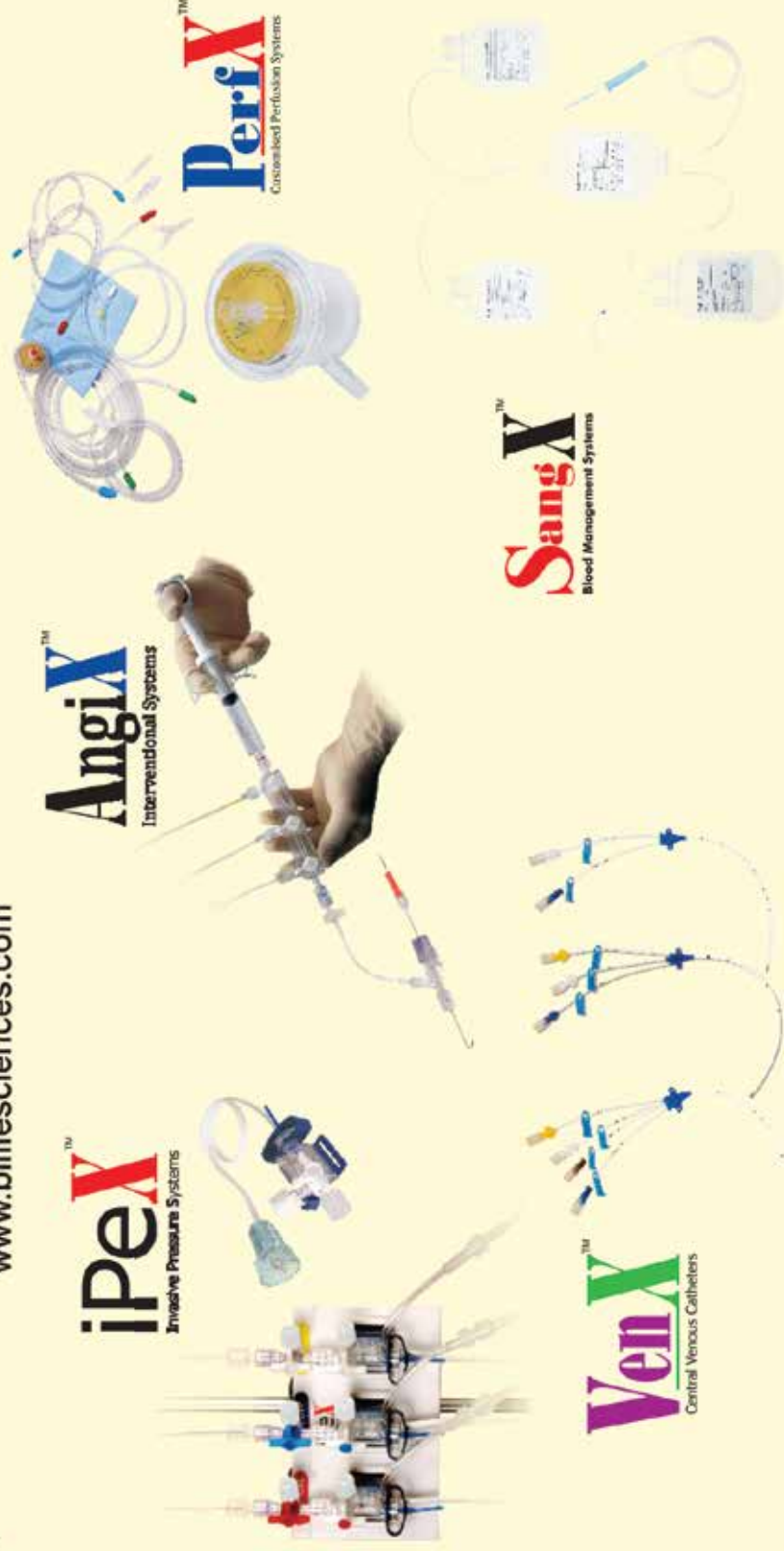
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### Cannulae

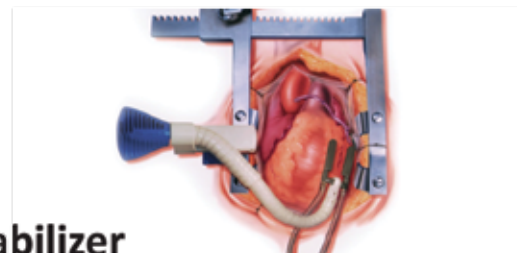
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Venous Cannulae



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