

Cardiac anesthesia as super-specialty: Need of the hour!

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Introduction

Cardiac anesthesia caters to all patients with diseased cardiovascular system who needs special care with advanced monitoring and excellent knowledge of physiologic changes in the perioperative period. However, cardiac anesthesiology has been recently recognized as a super specialty anesthesia branch in India despite its existence since last few decades.

Development of cardiac anesthesia and its progress is albeit a short duration but a rapid one. Basically, this picked up a pace in late 90's even though it came into existence during 1950's. Many pioneer cardiac anesthesiologists quote that cardiac anesthesia practice has evolved from the era of finger press monitoring method (to assess capillary perfusion) pulse on hand to non-invasive tissue oxygen monitoring to assess peripheral circulation. It has grown leaps and bound considering newer technological improvement in cardiopulmonary bypass as well as invasive hemodynamic monitoring.

Initially cardiac anesthesia was not being perceived as a super specialty in India as cardiac surgery was itself in its nascent stage of development. It was Dr PK Sen who in 1956 established department of cardiovascular and thoracic surgery (CVTS) at Seth GS Medical College and KEM Hospital, Mumbai. Since then, all the pioneer work in this field was done in this institute; notably the first heart transplant in Asia in 1968. But, during all this journey of cardiac surgical development, cardiac anesthesiology as subspecialty was at its primary level and struggled with many issues like absence of cardio stable anaesthetic drugs, invasive hemodynamic monitoring etc. Nevertheless, all these hindrances did not deter previous generation of competent and determined Anesthesiologists to participate in the cardiac surgical care with their limited armamentarium. This was evident when Dr Meena Bhatt and Dr AJ Dhruva as an anesthesiologist during the first heart transplant procedure,¹ did an astonishing job of maintaining haemodynamics of the patient.

During all these years of development, increasing need was felt to develop cardiac anesthesiology as a super specialty branch with the trained, technically sound, skillful and knowledgeable Anesthesiologists having a detailed knowledge of anatomy and physiology of cardiac disease especially in congenital cardiac surgery. With this aim, initially one year fellowship courses in cardiac anesthesia were started across few centers in India including All India institute (AIIMS) Delhi, Shree Chitra Institute (SCTIMST)

Trivandrum, Amrita Institute (AIMS) Kochi, Sanjay Gandhi Institute (SGPGI) Lucknow. Seth GSMC & KEM Hospital also started it in 2008, first in western India. But, considering the extent of horizon of cardiac anesthesia which includes refinement in anesthesia technique and skill in hemodynamic monitoring, newer anesthetic, inotropic and cardiovascular drugs with a better understanding to utilize them for better patient outcome, knowledge of conduction of CP bypass, myocardial protection strategies, comprehensive Transesophageal echocardiography, heart failure assist devices and extracorporeal membrane oxygenation (ECMO) management; mere one year of fellowship duration was not perceived as sufficient to achieve an excellence in this subject. This led to the commencement of full three years of super-specialty course as doctor of medicine (DM) in cardiovascular and Thoracic Anesthesia. Initially this course was started in AIIMS, Delhi but as the need is increasing day by day, many pioneer institutes in Trivandrum, Kochi, Chennai, Bengaluru, Kolkata, Mumbai and Ahmedabad came up with this course. This full time residency program consists of clinical training in cardiac surgical theatre, catheterization laboratory, intensive coronary care unit, post cardiac surgical care unit, dedicated echocardiography teaching, pediatric cardiac intensive care and cardiac radiology. Apart from clinical duties, participation in clinical research is also encouraged during the curriculum. This will train budding young Anesthesiologists not only to become proficient in cardiothoracic anesthesia and cardiac intensive care but also to carry out and help in conducting applied research in the field of cardiac anesthesia and simultaneously to plan and set-up independent cardiac anesthesia unit catering to cardiothoracic vascular surgery, intensive cardiac care and catheterization laboratory. However, the situation is still different in western world where cardiac anesthesia is still being practiced and mastered after completion of fellowship cum training with the duration ranging from one to two years. European association of cardiothoracic Anesthesiologists recently started accredited fellowship in cardiothoracic and vascular anesthesia (CTVA) in 2006/07.

First journal of cardiac anesthesia came into existence in 1987 as 'The Journal of Cardiothoracic Anesthesia.'² First Indian journal of cardiac anesthesia in the form of 'Annals of Cardiac Anesthesia' was published in the year 1998. Since then, horizon of cardiac anesthesia, as a super-specialty, kept on expanding by facing all the challenges on its way and reached to high on the sky to the present date.

Coronary artery bypass grafting (CABG) is the core of cardiac surgery which has revolutionized the life of patients with critical and multiple coronary artery disease. The biggest advancement occurred with the advent of off pump CABG which avoids the use of cardiopulmonary bypass machine and its serious consequences.³ The art and craft of off pump CABG is well established nowadays, with all the advanced hemodynamic monitoring and management. With improved surgical technology and advanced hemodynamic monitoring tools, safety of CABG surgery has drastically increased. Earlier pulmonary artery catheter was used to measure cardiac output during the procedure but this practice has been superseded by newer semi-invasive to completely non-invasive cardiac output monitors like FLOTRAC and NEXFIN (Edwards life sciences) respectively.⁴

Apart from cardiac output monitoring, cardiac anesthesia care has been benefitted by cerebral tissue oxygen monitoring too. This new modality is called as Near Infrared Spectroscopy (NIRS) which detects focal cerebral oxygen saturation and helps in timely intervention to keep a check on this vital parameter.⁵ This monitoring tool has been immense value in pediatric cardiac surgery due to extreme physiological variations like deep hypothermic circulatory arrest and profound hemodilution.⁶

Another vital monitoring tool like Transesophageal echocardiography (TEE) has been added to the armamentarium of cardiac anesthesiologists who has not only mastered this skill but also perform it at par with contemporary cardiologists. Nevertheless it is a major tool to monitor critically ill patients and all the anesthesiologists should learn this skill because TEE is helpful not only in cardiac surgeries but also for cardiac patients undergoing non-cardiac surgery, critical care unit patients, cardiac catheterization procedures and many catheter based cardiac interventions.^{7,8}

Cardiac surgery was notorious for the humongous requirement of blood and its products. This also led to wastage of these precious assets apart from transfusion related serious health hazards. Bleeding and deranged coagulopathy, are very common in cardiac surgeries because of resultant contact activation with the extracorporeal circuitry, platelet activation, hypothermia, hemodilution, and fibrinolysis and anticoagulation. But, point of care (POC) tests have changed this perception and drastically changed transfusion practice owing to the availability of an excellent transfusion algorithm. POC gives us an idea about how well the various coagulation components are working together in harmony. Most widely used coagulation POC tests include Thromboelastography (TEG) and Rotational thromboelastometry (ROTEM).⁹ Both these tests provide global coagulation monitoring right from clot initiation till clot dissolution including fibrinolysis.

TEG is a hemostatic assay which can be used to predict hemorrhagic risk of the patient and treat them accordingly. Rapid TEG is also used sometimes where tissue factor is added to whole blood in addition to kaolin.¹⁰ This speeds up the reaction and graph is obtained faster. ROTEM is a

robust test as compared to TEG and the advantage lies in acquiring quick results for early decision making. Additionally, it can be used with different reagents for assessing intrinsic (INTEM), extrinsic (EXTEM) pathways. Effect of heparin is very well negated using HEPTTEM assay. Similarly, FIBTEM assay is used to establish qualitative analysis of functional fibrinogen contribution to the clot formation. APTEM assay incorporates aprotinin to inhibit fibrinolysis. These practices have definitely reduced the requirement of blood products during cardiac surgery.¹¹

As far as technological advances in cardiopulmonary bypass concerned, Indian brain has discovered the art of modified ultrafiltration (MUFF).¹² This has proven to reduce many undesirable consequences of CP Bypass. It reduces congestion arising out of hemodilution and capillary leak syndrome, increases hematocrit, removes inflammatory cytokines, interleukins. It has contributed in reducing duration of postoperative ventilation too especially in congenital cardiac surgeries.¹³

Goal directed therapy (GDT) in cardiac surgery is focused on tissue hypoxia prevention which may manifest despite normal conventional parameters like heart rate, CVP, mean arterial pressure, urine output etc. The objective of goal directed therapy is to guide fluid and inotrope administration to maintain adequate circulating volume, tissue blood flow and oxygen delivery.¹⁴

In this era of painless surgeries, cardiothoracic surgical patients also being offered thoracic epidural, paravertebral and latest one in the list includes Erector spinae block for postoperative pain relief.¹⁵ These procedures are boon for excellent postoperative analgesia which leads to early mobilization and fast tacking of these patients ¹⁶ This has also reduced the cost factor considerably.

In today's era, it is essential to breed an intellectual next generation of Anesthesiologists with the help of modern simulation technology. Simulation is an educational tool that improves trainees' knowledge and skills in cardiac critical care such as invasive procedures, management of medical and surgical emergencies, hemodynamic monitoring, and communication skills.¹⁷ It needs to provide evidence based training experience and give stimulus to enrich their minds with knowledge. This will definitely improve surgeon –Anesthesiologists interaction which will be translated into better patient care. In this context, Indian Association of Cardiothoracic Anesthesiologists (IACTA) and its state level branches are continuously encouraging academic excellence in the form of periodic continuing medical education (CME) meets, workshop conduction for hands on training, different scholarships to promote research in this field and a grant towards observer ship in some of the esteemed cardiac centers within and outside the country for young enthusiastic cardiac Anesthesiologists.

All these advancement, achievement, curiosity, enthusiasm and promising attitude are taking this subspecialty towards recognized super specialty. Near future will really revolutionize cardiac anesthesia practice with newer concepts, developments, conceptual thinking and expertise with technical capabilities.

References

1. Bhatt MM, Dhruva AJ, Mehta SS. Two clinical cases for heart transplant. *Indian J Anaesth* 1969;11:445-451.
2. Rosseel PM, Kaplan JA. EACTA-JCVA: cooperation to partnership. *J Cardiothorac Vasc Anesth* 2015;29:253-254.
3. Jongman RM, Zijlstra JG, Kok WF, van Harten AE, Mariani MA, Moser J et al. Off-pump CABG surgery reduces systemic inflammation compared with on-pump surgery but does not change systemic endothelial responses: a prospective randomized study. *Shock* 2014;42:121-128.
4. Hendy A, Bubenek S. Pulse waveform hemodynamic monitoring devices: recent advances and the place in goal-directed therapy in cardiac surgical patients. *Rom J Anaesth Intensive Care* 2016;23:55-65.
5. Yu Y, Zhang K, Zhang L, Zong H, Meng L, Han R. Cerebral near-infrared spectroscopy (NIRS) for perioperative monitoring of brain oxygenation in children and adults. *Cochrane Database Syst Rev* 2018;1:CD010947.
6. Şahan C, Sungur Z, Çamcı E, Sivriköz N, Sayin Ö, Gurvit H et al. Effects of cerebral oxygen changes during coronary bypass surgery on postoperative cognitive dysfunction in elderly patients: a pilot study. *Rev Bras Anesthesiol* 2017;17:30546-30549.
7. Hahn RT, Abraham T, Adams MS, Bruce CJ, Glas KE, Lang RM et al. Guidelines for performing a comprehensive transesophageal echocardiographic examination: recommendations from the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists. *J Am Soc Echocardiogr* 2013;26:921-964.
8. Flachskampf FA, Wouters PF, Edvardsen T, Evangelista A, Habib G, Hoffman P et al. European Association of Cardiovascular Imaging Document reviewers: Erwan Donal and Fausto Rigo. Recommendations for transoesophageal echocardiography: EACVI update 2014. *Eur Heart J Cardiovasc Imaging* 2014;15:353-365.
9. Ichikawa J, Osada Y, Kodaka M, Nishiyama K, Komori M. Association Between Platelet Count and Postoperative Blood Loss in Patients Undergoing Cardiac Surgery With Cardiopulmonary Bypass and Fresh Frozen Plasma Administration Guided by Thromboelastometry. *Circ J* 2018;82:677-683.
10. Hernandez CA, Perotti D, Farac L. Thromboelastography (TEG) Is Still Relevant in the 21st Century as a Point-of-Care Test for Monitoring Coagulation Status in the Cardiac Surgical Suite. *Semin Cardiothorac Vasc Anesth* 2017;21:212-216.
11. Zaky A. Thromboelastometry Versus Rotational Thromboelastography in Cardiac Surgery. *Semin Cardiothorac Vasc Anesth* 2017;21:206-211.
12. Naik SK, Knight A, Elliott M. A prospective randomized study of a modified technique of ultrafiltration during pediatric open-heart surgery. *Circ* 1991;84 Suppl 5:III422-431.
13. Naik SK, Knight A, Elliott MJ. A successful modification of ultrafiltration for cardiopulmonary bypass in children. *Perfusion* 1991;6:41-50.
14. Ferguson BD, Manecke GR Jr. Goaldirected therapy in cardiac surgery: Are we there yet? *J cardiothorac Vasc Anesth* 2013;27:1075-1078.
15. Adhikary SD, Pruet A, Forero M, Thiruvankatarajan V. Erector spinae plane block as an alternative to epidural analgesia for post-operative analgesia following video-assisted thoracoscopic surgery: A case study and a literature review on the spread of local anaesthetic in the erector spinae plane. *Indian J Anaesth* 2018;62:75-78.
16. Cheikhrouhou H, Kharrat A, Derbel R, Ellouze Y, Jmal K, Ben Jmaa H et al. Implication of early extubation after cardiac surgery for postoperative rehabilitation. *Pan Afr Med J* 2017;28:81.
17. Kapoor PM, Irpachi K. Simulation in cardiac critical care: New times and new solutions. *Ann Card Anaesth* 2016;19:385-388.

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