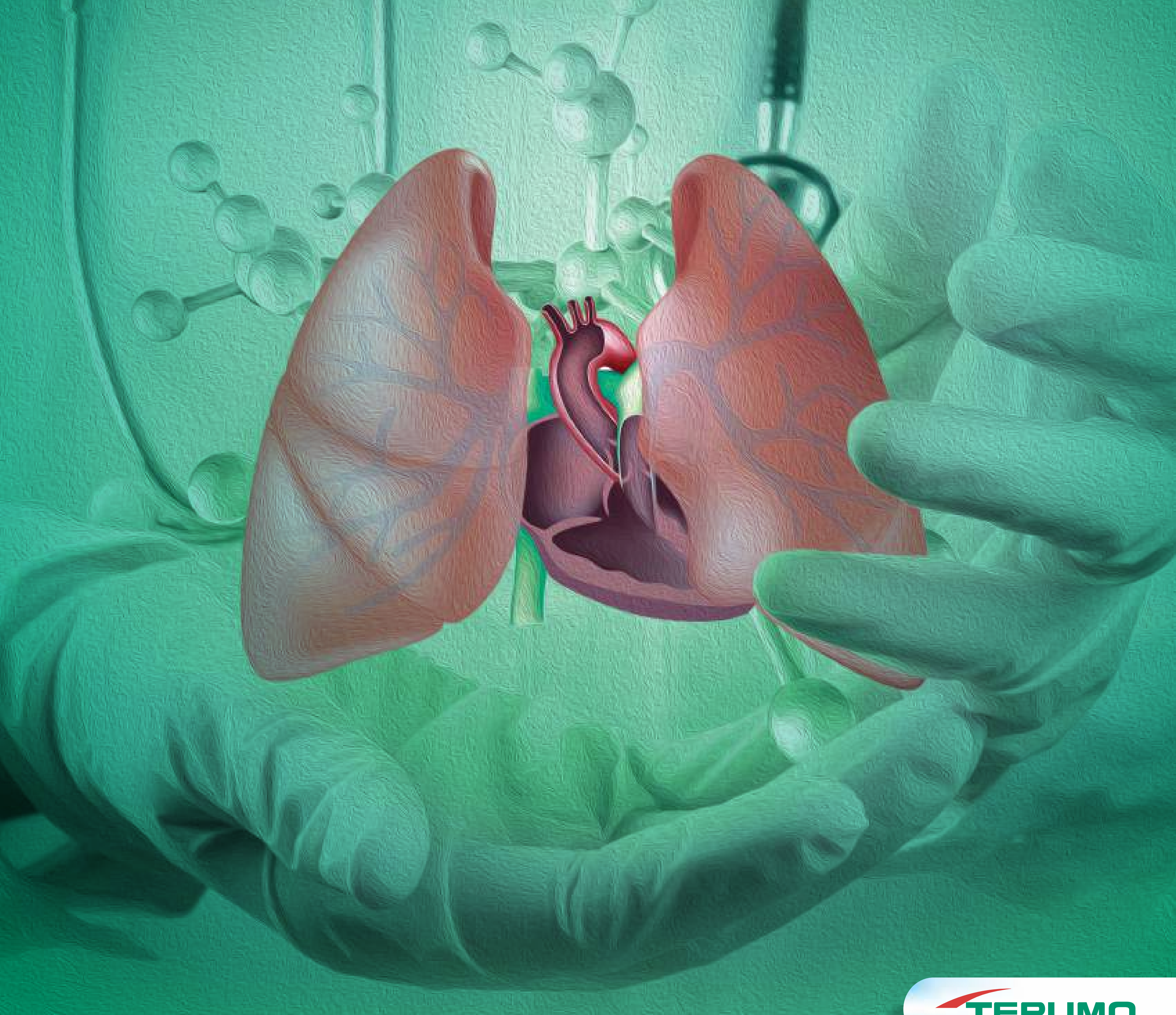
DESIGNED TO PRIME

Perfusion Related Insights - Management and Evidence



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Issue 5

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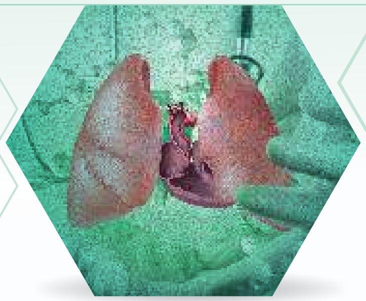

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Editorial Letter

Dear Readers,

We are pleased to present the fifth issue of PRIME to you. PRIME – 'Perfusion Related Insights - Management and Evidence' – is a scientific newsletter published every quarter with the help of our editorial board members, and includes latest reviews, guidelines and expert experiences in relation to perfusion strategies.

There are two articles under the section "Review Articles." The first article encourages the use of minimally invasive extracorporeal circulation over conventional cardiopulmonary bypass and extracorporeal membrane oxygenation systems. The second article aims at answering the question if using air bubble detector for quantification of microbubble activity during cardiopulmonary bypass is imperative.

The "Case Report" section deals with multiple topics such as working of cardioplegic circuit, change in cannulation and perfusion techniques in neonatal arch surgeries, formation of clot in the venous reservoir due to frequent use of cardiotomy suction, and various strategies used in neonatal cardiopulmonary bypass.

The 'Guidelines' section focuses on 'anticoagulant' from the American Society of ExtraCorporeal Technology Standards and Guidelines for Perfusion Practice, 2013. The 'Latest News' deals with the past, present and future use of transcatheter aortic valve implantation.

We hope that perfusionists will find these articles interesting and helpful. We are looking forward to receive your valuable feedback, comments and suggestions to help us work better on our future issues.

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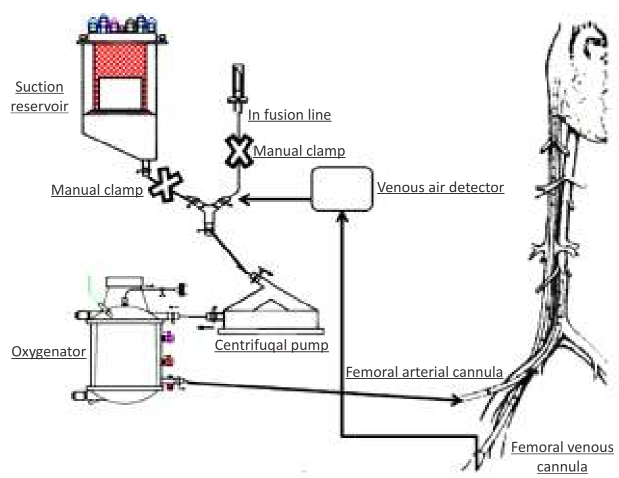
Use of Minimally Invasive Extracorporeal Circulation Resuscitation in Hypothermic Cardiac Arrest

Introduction

Other than initial and sustained cardiopulmonary resuscitation, active core rewarming is imperative for survival. Based on the current algorithms and avalanche victim resuscitation checklist, the patient qualifies for rewarming on an extracorporeal membrane oxygenation (ECMO) circuit or traditional cardiopulmonary bypass (CPB). There is a variation between recommendations for and techniques of active rewarming. Based on the pre-hospital and in-house facilities available, the appropriate extracorporeal life support (ECLS) technique is used. This article provides a rationale and the technical details of the successful use of minimally invasive extracorporeal circulation (MiECC) for ECLS in an exemplary patient with hypothermic arrest and major trauma. The schematic representation of MiECC set up with the femoro-femoral cannulation site has been depicted in Figure 1.

Figure 1: Schematic representation of MiECC set up with the femoro-femoral cannulation site



Use of minimally invasive extracorporeal circulation based perfusion and rewarmin

A 59-year-old patient survived a 15 m fall from a crest onto a glacier, and his access and rescue took more than 5 hours during which the patient became hypothermic. The patient had a Glasgow Coma Scale (GCS) of 14 and was hemodynamically stable, but just before the helicopter evacuation evacuation, his state exacerbated rapidly to asystolic arrest. His core temperature fell to 25.3 ^{0}C. The treatment strategy involved bypassing ER and installing emergency ECLS based on the algorithm of using MiECC system. Sonographic and echocardiographic guidance was used to perform femoro-femoral cannulation, and MiECC was used used for ECLS. Perfusing rhythm was restored at 28 ^{0}C. Trauma surveys were completed as well as the treatment was started at the time of rewarming on the mobile circuits. In the first attempt; normothermic weaning was successful, trauma surgery was completed, and patient was alive and neurologically intact.

CONCLUSION

Minimally invasive extracorporeal circulation offers similar benefits as those linked with conventional CPB and ECMO systems, but it has none of the limitations.

Source: Winkler B, Jenni HJ, Gygax E, Schnüriger B, Seidl C, Erdoes G, *et al.* Minimally invasive extracorporeal circulation resuscitation in hypothermic cardiac arrest. *Perfusion.* 2016 Feb 29.

Is the Use of Air Bubble Detector for Quantification of Microbubble Activity during Cardiopulmonary Bypass Necessary?

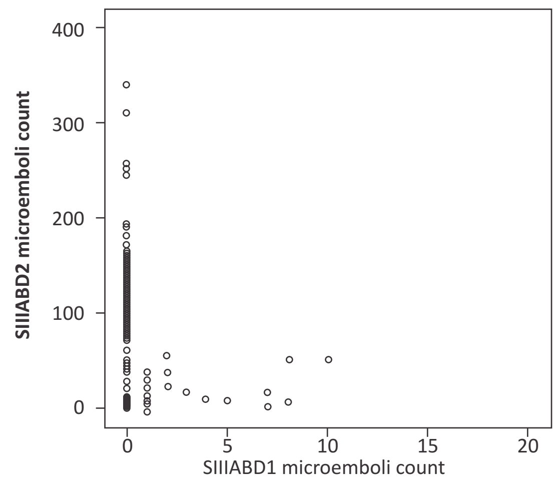
Introduction

During cardiopulmonary bypass (CPB), air bubble detectors (ABDs) are used to alert perfusionists for the presence of air in the arterial line and aid in protection against massive air embolism. The occurrence of massive air embolism has been hindered by the use of contemporary equipment, technology, and perfusion techniques; however, arterial gaseous microemboli (GME) are still a major concern during CPB in reference to postoperative neurological dysfunction. The aim of this study was to determine the reliability of the microbubble counts quantified by ABD, used along with SIII and S5 heart-lung machines.

Description

Emboli detection and classification (EDAC) quantifier in 12 CPB procedures using two EDAC detectors and two ABDs in series in the arterial line were used to measure microbubble counts from the ABD with the SIII (SIII ABD) and S5 (S5 ABD). were determined. Spearman correlation coefficient (r) was used to determine reliability between measurements for each detector type and between ABD and EDCA detector with counts > 300 µm. There was no correlation between the SIII ABD (r = 0.008, p = 0.793) (Figure 1). While a weak negative correlation was observed between S5 ABD (r = -0.16, p < 0.001), a strong correlation was reported between the EDAC detectors (SIII; r = 0.958, p < 0.001) (S5; r = 0.908, p < 0.001). With counts > 300 µm, the SIII ABDs reported a correlation of small-medium effect size between EDAC detectors and ABD1 (r = 0.286; p < 0.001 [EDAC1], r = 0.347; p < 0.001 [EDAC2]). No correlation was observed between ABD2 and any of the EDAC detector (r = 0.003; p = 0.925 [EDAC1], r = 0.003; p = 0.929 [EDAC2]). Due to less bubble count detected by the EDAC > 300 µm, no correlation could be detected between EDAC and S5 ABD.

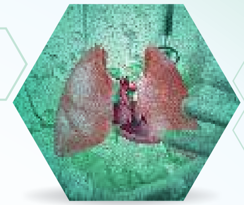
Figure 1: Microbubble counts for every SIII ABD plotted at simultaneous time points during cardiopulmonary bypass



CONCLUSION

As compared to EDAC, both SIII ABD and S5 ABD were reported to be unreliable for the quantification of microbubble activity during CPB. This indicates that it is imperative to ensure that the data included in the CPB report are accurate and clinically relevant, and also that microbubble counts from devices such as SIII ABD and S5 ABD should not be reported.

Source: Newland RF, Baker RA, Mazzone AL, Valiyapurayil VN. Should air bubble detectors be used to quantify microbubble activity during cardiopulmonary bypass? *J Extra Corpor Technol.* 2015 Sep;47(3):174–9.



Implementation of Myocardial Protection Techniques, Blood Gas Management and Oxygenation Strategies in Neonatal Cardiopulmonary Bypass

Contributed by: P. V. S. Prakash, Narayana Health, Bangalore

Considering that the neonatal myocardium varies markedly from the adult myocardium, the myocardial protection technique in neonates is completely different from adults. The neonatal heart is in varying stages of maturity. There are several techniques for myocardial protection. One of the most widely followed techniques is cardioplegia with hypothermia. Cardioplegia may be a multi-dose solution or single-dose solution such as DelNido Cardioplegia and Custodial solution.

How does DelNido work?

The lidocaine present in the DelNido solution acts as a sodium channel blocker, and magnesium hinders calcium from entering the cells. The blood present in the solution acts as a buffer and transforms the hydrogen ion produced into carbonic anhydrase, which dissociates into water and carbon dioxide.

Alpha-stat blood gas management

It consists of maintaining PaCO2 at 40 mmHg and pH at 7.40 as measured at 37 ^{0}C, regardless of the patients' body temperature. It maintains an autoregulation of cerebral blood flow, where flow is matched to the metabolic needs. The strategy is particularly useful in older patients with acquired vascular disease and atheromatous plaques who are susceptible to embolic events.

pH – stat blood gas management

Keeping blood pH constant at hypothermia is referred as pH stat and it is essential to add CO2 to achieve constant pH. This is very beneficial in hypothermic CPB. Carbon dioxide moves oxyhemoglobin curve to the right. The benefits of pH management in neonates receiving hypothermic CPB include enhanced offload of oxygen at the tissue level, elevated cerebral blood flow, enhanced cooling of the brain, reduced run off to the pulmonary circulation, and decreased aortopulmonary collaterals.

The best oxygenation strategy

The oxygenation strategy should be based on the requirement. Hyperoxygenation prior to deep hypothermic circulatory arrest will take advantage of the increased oxygen solubility and loading the tissue with excess oxygen.

CONCLUSION

Cardiac surgery in the neonate and infant is a different process with several variations from cardiac surgery in adults. In neonates, myocardium can be effectively and safely protected by DelNido cardioplegia. Additionally, pH-stat management is the preferred method in CONGENITAL HEART SURGERY, since the cerebral blood flow is optimized.

References : 1. Gravlee GP, Spiess B. Cardiopulmonary bypass: Principles and practice. 3rd edition. Philadelphia: Lippincott Williams and Wilkins;2008. Chapter 25, Pharmacologic prophylaxis for post-cardiopulmonary bypass bleeding; p. 522–42. **2.** Matte GS. Perfusion for congenital heart surgery: Notes on cardiopulmonary bypass for a complex patient population. New Jersey. 215. Chapter 3, The bypass plan; p. 33–65. **3.** Clark CM. Characteristic of glucose metabolism in the isolated rat heart during fetal and early neonatal development. *Diabetes.* 1973;22:41–49. **4.** Doenst T, Schlensak C, Beyersdorf F. Cardioplegia in pediatric cardiac surgery: Do we believe in magic? *Ann Thorac Surg.* 2003 May;75(5):1668–77.

Frequent Use of Cardiotomy Suction may Lead to a Clot in the Venous Reservoir

During cardiopulmonary bypass (CPB), a perfusionist may encounter an unexpected clot in the venous reservoir.

Case report

A 22-year-old man, with a history of patent ductus arteriosus (PDA) ligation undergone in 16/6/2004, was admitted. He was symptomatic with chest pain of atypical nature in the left side of the chest, hemoptysis, and episodes of hemostasis. He had been suffering from fever with breathlessness on exertion, had no history of syncope/loss of consciousness (LOC)/seizures, and had no history of TB/DU/HTN. Large aneurysm arising from the aorta opposite to the region of PDA with flow into the aneurysm was seen on echocardiogram. No dilation of ascending aorta/arch was noted. The patient was scheduled for Aortic arch pseudoaneurysm repair

Extracorporeal circuit components were devised on AIIMS procedure for 54 kg body weight of patient circuit component, which included Affinity oxygenator and Sarns roller pump. The total prime volume was 1600 ml (consisting of NAHCO3, 200 ml mannitol and 75 mg heparin).The baseline activated clotting time (ACT) of patient was 106. Systemic anticoagulation was achieved using 400 units/kg heparin, and anticoagulation was meticulously monitored using surgery. There was an elevation in the blood level during CPB in the cardiotomy unit, and was unable to pass through the filter. In order to compensate for the level of venous reservoir and regulate blood flow, additional volume was supplemented in the reservoir. The total perfusion time was reported as 162 minutes.

Discussion

During surgery, liquid fat accumulates on the surface of blood. A clot in venous reservoir, as a result of the effect of fat contamination and cell debris, is of prime focus and requires attention with respect to the management of CPB. An alternative method for suction blood recycling is cell saver device during CPB. The methodology removes major part of fat and cell debris present in suction blood.

Cell saver efficiently cleans and processes the shed blood by removing cytokines, S-100 ß plotting, platelet and fibrin aggregates, and coagulation activation products. Removal of these factors reduces clots in venous reservoir. In his study, Kaza, *et al.* reported that fat particle as small as 10–50 µm can effectively be removed using cell saver, as compared to cardiotomy suction.

CONCLUSION

The above case has few particularities that should be used to alert perfusionist about the possibility of dealing with an unexpected clot in venous reservoir by using cell saver continuous flow.

References : 1. Wang G, Bainbridge D, Martin J, Cheng D. The efficacy of an intraoperative cell saver during cardiac surgery: A meta-analysis of randomized trials. *Anesth Analg.* 2009 Aug;109(2):320–30. **2.** Kaza AK, Cope JT, Fiser SM, Long SM, Kern JA, Kron IL, *et al.* Elimination of fat microemboli during cardiopulmonary bypass. *Ann Thorac Surg.* 2003 Feb;75(2):555-9; discussion 559. **3.** Djaiani G, Fedorko L, Borger MA, Green R, Carroll J, Marcon M, *et al.* Continuous-flow cell saver reduces cognitive decline in elderly patients after coronary bypass surgery. *Circulation.* 2007 Oct 23;116(17):1888–95.

How to Use Two-in-One Cardioplegic Circuit?

Contributed by: Mathavan P, Santha Kumar, Department of CTVS, JIPMER, Puducherry, India

Cardioplegia is an alternative method available to provide cardiac surgery while limiting intraoperative myocardial injury. Several cardioplegia solutions and delivery methods have been developed.

Materials and methods

It consists of ¼ inch tube, 1/8 inch tube, Y connectors: 1/8x1/8x1/4 - 1no., 1/4x1/4x1/8 - 2no., 1/4 Y-1no., 1/8 Y - 1no. Four different color coded pinch clamps and roller pumps. The varied cross sectional regions of the tubes provide a constant ration of blood and crystalloid solution of 4:1 (St. Thomas)/ 1:4 (del Nido) of the differential flow rates. In order to adjust the temperature of cardioplegia circuit before delivery, a disposable heat exchanger is required.

4:1 circuit

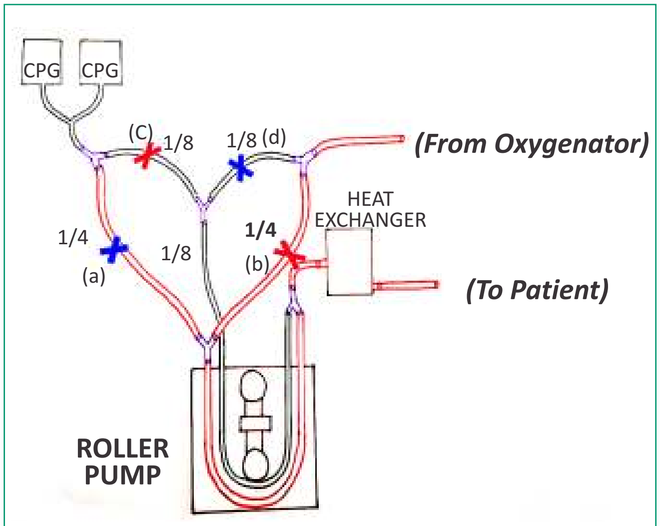
The ¼ inch tube is used for the transportation of blood from the oxygenator, and the 1/8 inch tube for the transport of cardioplegia solution. Prior to reaching the heat exchanger, blood and cardioplegia are mixed.

1:4 circuit

For delNido (1:4) delivery, the ¼ inch tube is used for the crystalloid transport and the 1/8 inch tube for the blood transport from the oxygenator. Before reaching the heat exchanger, blood and crystalloid get mixed.

How does it work?

The cardioplegic circuit consists of single-headed roller pump. Both the ¼ inch tube and 1/8 inch tube are connected via the 1/4x1/4x1/8 connector in the outlet of the pump, and the blood and crystalloid are mixed for delivery. In the pump inlet, ¼ inch tubes are connected through ¼ Y connector, and further ¼ Y connector divides into two limbs, which have 1/4 inch tubes with pinch clamps (blue a & red b) each. The ¼ inch line (blue pinch clamp a) is further connected to 1/4x1/8x1/8 connector, and the 1/4 inch line is further connected to 1/4x1/4x1/8 (red pinch clamp c). The 1/8 inch clamp (blue clamp, d) line is attached to the 1/8x1/4x1/4 Y connector, which is further attached to ¼ inch line to aspirate the blood from the oxygenator. For 4:1 delivery, apply the two blue pinch clamps (a and d) and open the two red pinch clamps (b and c). For 1:4 (del Nido) delivery, apply the two red pinch clamps (b and c), and then open the two blue pinch clamps (a and d).



CONCLUSION

No complications were reported with the use of two-in-one cardioplegia circuit.

References : 1. Colangelo N, Moriggia S, Kieser T, De Simone F, Vescovo A, Palumbo L, *et al.* A cardioplegia circuit with versatility: The 'ReVerse' system. How to do it. *Perfusion.* 2008 Jul;23(4):205–7. **2.** Matte GS, del Nido PJ. History and use of del Nido cardioplegia solution at Boston Children's Hospital. *J Extra Corpor Technol.* 2012 Sep;44(3):98–103. **3.** Satyanarayana PV, Rao PS, Rao KM, Rao KS, Sudhakar K, Reddy KV. Continuous normothermic blood cardioplegia: Simplified delivery circuit. *Ann Thorac Surg.* 1992 Oct;54(4):810.

Change in Cannulation and Perfusion Techniques in Neonatal Arch Surgeries

Contributed by: Jinil Raj TS, Manoj MC, DR Kamlesh Tailor, Dr Shankar Kadam, Dr Bipin Radhakrishnan, Dr. SR Mohanty, Dr Suresh G Rao

Perfusion for aortic arch in neonate is difficult to perform due to challenges in cannulation, total circulatory arrest, and need of deep hypothermia. Minute changes in the cannulation and perfusion techniques will make surgery easier and will provide good outcomes.

Case report

An 18-day-old male child diagnosed with with severe coarctation of the aorta, hypoplastic transverse arch, and subpulmonic ventricular septal defect with posterior deviation of the conal septum was taken for surgery. The patient weighed 2.2 kg, and had height of 45 cm, BSA of 0.17 m, and hemoglobin of 12.5 g/dL.

Perfusion circuit

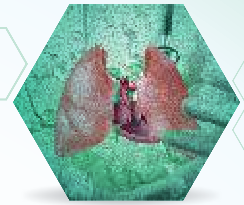
The perfusion circuit was assembled using Maquet quadrox 10000 oxygenator and neonatal custom pack. The hemofilter circuit was modified for arterio-venous modified ultrafiltration and cardioplegia delivery. The perfusion circuit was primed and deaired with sterofundin 150 ml. The aortic cannulation was done using an 8 Fr Biomedicus cannula in the innominate artery through 3-mm gortex graft in order to conveniently repair the aortic arch and give antegrade cerebral perfusion. An aortic cannula was to be used for cardioplegia delivery. A single stage medtronic dlp light house tip cannula was used for venous cannulation in the right atrial appendage.

The aortic line pressure was below 140 mmHg, with mean right radial pressure of 45 mmHg and femoral pressure of 30 mmHg. The cooling gradient between patient and hemotherm, and between patient' nasopharyngeal and temperature were 6 to 8 degree and 5 degrees respectively, due to coartation of aorta. On attaining the nasal temperature of 20 degree and rectal temperature of 25 degree, aorta was clamped distally to the innominate artery and descending aorta to perform the distal aortic arch. Aneurysm clips were used to clip left carotid and subclavian artery. The pump flow was adjusted at 50 ml/kg to perfuse the innominate artery and coronaries.

Once distal repair was complete for delivery of cardioplegia, a clamp was placed in the innominate artery above the level of cannula position. Cardioplegia was delivered via 100 cm extension with 3 way attached to the aortic cannula. After the cardioplegia delivery, the clamp in the distal innominate artery was shifted proximal to the graft to start antegrade cerebral perfusion through the isolated innominate artery. On completion of arch repair, the discending aortic clamp was taken off and deairing was done retrogradely. Aortic cross clamp was placed normally, clips in the arch vessels were removed, and the systemic perfusion resumed. A short TCA was taken after 6 minutes of systemic perfusion to determine the deviated conal septum and ventricular septal defect. After VSD closure, cross clamp was released. Pulmonary artery incision was sutured while slowly rewarming to 35.8 degree of nasopharyngeal and 35.3 degree of rectal temperature. During this time Conventional ultrafiltration (CUF) was conducted. The patient was weaned off from CPB with stable hemodynamics. In addition, modified ultrafiltration (MUF) was performed for 15 minutes, and no hemodynamic disturbance was observed during MUF. During MUF, the patient was given 170 mL and a total volume of 225 mL was taken out. The transmembrane pressure was kept between 150 mmHg to 230 mmHg.

CONCLUSION

The use of an innominate graft cannulation in aortic arch repair is beneficial to both the surgeons and perfusionists. It averts long TCA time during the arch surgery and the complications of pushing the cannula into the innominate artery. The above strategy reported less resistance in the aortic cannula. Using the aortic cannula for delivering cardioplegia will avert another cannulation in the aorta and at the same time MUF circuit can be used for cardioplegia delivery. Performing arteriovenous MUF in innominate cannulation increases the susceptibility of cerebral stealing, so venoarterial MUF is ideal in those patients in whom innominate cannulation is used.



Sickle Cell Anemia

Contributed by: V. Baskaran, Angeline, Malathy, Azarudeen, Varuna, Dr. Kanagarajan, Dr. Sujatha, Dr. B. Ninan, Dr. Ravi Agarwal, Dr. Roy Varghese
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This study focuses on a 20-month-old homozygous sickle cell baby with Down's syndrome, large perimembranous ventricular septal defect (VSD) (17 mm) with left-right shunt, severe hyperkinetic pulmonary arterial hypertension (PAH) and moderate mitral regurgitation.

Profile

The patient has a history of recurrent respiratory tract infections (RTIs) every 10–15 days, poor weight gain, forehead diaphoresis, fever, cold, cough and tachypnea. The patient also has anasarca with tachypnea, she was admitted in hospital at 1 year of age due to cough and was diagnosed to have sickle cell disease. Sickle cell disease pattern was observed during hemoglobin (Hb)-electrophoresis (HbF: 20.5%, Hb-S: 65.9%, HbAo: 6.3%, HbA2: 3.5%). The patient was advised to undergo total Atrioventricular (AV) canal repair. Sickle cell disease patients undergoing cardiopulmonary bypass (CPB) are at an increased risk.

Strategy

A meticulous planning of preoperative care can increase the success rate of the procedure. On admission, the HbSS level was 65.9%, which can be decreased to 24.1% prior to surgery. Before bypass, the HbSS level was 6.4%. The HbSS level during bypass was 4.1%, and during discharge the HbSS levels were 4.6%. Exchange transfusion is the main tool for sickle cell disease patients undergoing CPB. Before bypass, the prime was hyper-oxygenated, and pumps were kept off until initiation of bypass. High flow rates were maintained, CPB was started along with warm induction followed by cold dose. The patient temperature was maintained at 33–34 ^{0}C during the main surgical procedure. transatrial Gore-Tex patch was used to close VSD and suture annuloplasty was used to repair mitral valve. After rewarming to 36.5 ^{0}C the patient was weaned from CPB. On transesophageal echocardiogram it was observed that the heart started beating in sinus rhythm, no residual shunts and trivial mitral regurgitation were observed.

CONCLUSION

In sickle cell disease patients, increasing HbA and reducing HBSS level can be achieved using exchange transfusion and by the avoidance of hypothermic CPB.

The American Society of ExtraCorporeal Technology Standards and Guidelines in Individuals with Perfusion Practice (2013)

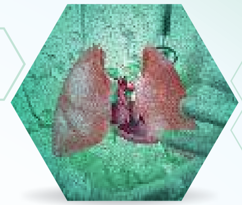
Standards and guidelines for anticoagulant

The treatment algorithm for anticoagulant management (heparin) shall be defined by the perfusionist and the physician-in-charge. An alternative treatment algorithm shall be defined when heparin cannot be utilized. The perfusionist shall work in close network with the surgical care team to monitor and correct the patients' anticoagulation status before, during and after cardiopulmonary bypass period.

The target activated clotting time should be estimated by the surgical care team based on certain factors, including variation in the measurement of activated clotting time (ACT) depending on the performance of the device. The patient-specific initial heparin should be estimated using weight, dose response curve (automated or manual), blood volume, and body surface area.

Anticoagulation monitoring should involve testing of ACT, heparin level measurement, partial thromboplastin time, thrombin time, and anti Xa. Activated clotting time and/or heparin/protamine titration should be used to determine the additional dose of heparin during CPB. Activated clotting time and/or heparin/protamine titration should be used to confirm heparin reversal.

Source: Baker RA, Bronson SL, Dickinson TA, Fitzgerald DC, Likosky DS, Mellas NB, *et al;* International Consortium for Evidence-Based Perfusion for the American Society of ExtraCorporeal Technology. Report from AmSECT's International Consortium for Evidence-Based Perfusion: American Society of Extracorporeal Technology Standards and Guidelines for Perfusion Practice: 2013. *J Extra Corpor Technol.* 2013 Sep;45(3):156–66.



The Past, Present and Future Prospects of Transcatheter Aortic Valve Implantation

The prevalence rate of aortic stenosis is > 4% among adults over the age of 65 years, and even higher in much older individuals. Due to the aging population, aortic stenosis is a serious health epidemic in western countries. The paradigm of transcatheter aortic valve implantation (TAVI) provides an alternative, less invasive method.

Transcatheter aortic valve implantation versus medical therapy

In the PARTNER 1B trial, 358 patients who were considered to be unsuitable for surgical valve replacement due to extreme surgical risk were randomized to treatment with TAVI using the first-generation Sapien 22 or 24F system and medical treatment. The all-cause mortality rate in the TAVI arm was 30.7%, while it was 50.8% in the medical therapy arm, thus the number of people requiring treatment to prevent single death were 5 ($p < 0.001$). The number of people requiring treatment decreased further to 4.1 at two years, and mortality rates were 43.3% and 67.6% for TAVI and medical therapy, respectively. The patients not only lived longer, but they also had a markedly lower rate of re-hospitalization (72.5% vs. 35%; $p < 0.001$). The reduction in morbidity and mortality was noticed even though aggressive treatment was used in medical therapy arm, including aortic valvuloplasty in 83.8%.

Transcatheter aortic valve implantation registry data

The effectiveness and safety of this technology are determined by using registries. An American registry tied for procedural funding is the Society of Thoracic Surgeons/ American College of Cardiology Transcatheter Valve Therapy (TVT) registry. At ACC 2014, the results of the first 5,980 patients present at 224 commercial sites were reported. At one year, the stroke rate and mortality were 3.6% and 26.2%, respectively. The real world results are equivalent to highly selected PARTNER trail if not better.

The registry data are imperative, as they help in determining device function and stability. Substantial data supporting the safety and effectiveness of TAVI have been acquired from the Australian and New Zealand Interventional communities. The ANZ CoreValue Registry enrolled 540 subjects at 10 centers with an all-cause mortality rate at 30 days, one year, and two years as 4.1%, 11.9%, and 21.2%, respectively. The rate of stroke was 5.3% and pacemaker implantation occurred in 28.4% at 30 days.

Transcatheter aortic valve implantation versus

At present there are only two randomized trials comparing the effectiveness and safety of TAVI to current standard of care, surgical valve replacement (SVR). The PARTNER 1A study compared the Sapien device to SAVR among 699 patients at 25 centers. Depending on the STS risk score > 10 and agreement between 2 study site surgeons that the estimated 30-day mortality risk was greater than 15%, all patients were at an increased probability of surgical risk. Only 34% of site-identified patients were accepted for trial enrollment.

CONCLUSION

Transcatheter aortic valve implantation is extensively used as an alternative treatment strategy for patients with symptomatic severe aortic stenosis. Health and government agencies along with device producers and healthcare providers should work together to ensure that TAVI can be used in timely fashion among patients.

Source: Gooley R, Cameron JD, Meredith IT. Transcatheter aortic valve implantation - Yesterday, today and tomorrow. Heart Lung Circ. 2015 Dec;24(12):1149–61.

MULTIPLE CHOICE QUESTIONS

1. If during cardiopulmonary bypass, blood is left in the pericardial cavity for a long duration of time before being sucked into the cardiotomy suckers, what is the harmful effect?

a) Increased chances of thrombosis ☐
b) Increased chances of bleeding ☐
c) Induction of hypothermia ☐
d) Familial type-Medullary carcinoma thyroid ☐

2. What is the device used in cardiopulmonary circuit to reduce need for blood transfusion called?

a) Hemoconcentrator ☐
b) Roller pump head ☐
c) Centrifugal pump head ☐
d) Cell saver ☐

3. What does double-stage venous cannulation mean?

a) Separate venous cannulae are inserted into superior and inferior vena cava ☐
b) Superior and inferior vena cava are cannulated one after the other ☐
c) One venous cannula is inserted that has drainage holes in the superior and inferior vena cava ☐
d) One venous cannula is inserted that has drainage holes in the right atrium and inferior vena cava ☐

4. Problems with the heat exchanger can be identified using?

a) Visible clots ☐
b) Blood leak ☐
c) Hypothermia ☐
d) All of the above ☐

5. What to do if the cannula is blocked?

a) Cannula should be reinserted at a different site ☐
b) ECMO should be restarted ☐
c) The bleeding site should be resutured ☐
d) All of the above ☐

6. Keeping blood pH constant at hypothermia is referred as pH-stat and it is essential to add ----------to achieve constant pH.

a) CO_2 ☐
b) O_2 ☐
c) NO_2 ☐
d) None ☐

7. Other than initial and sustained cardiopulmonary resuscitation, active core rewarming is imperative for survival

a) True ☐
b) False ☐

Answers: 1-b, 2-c, 3-d, 4-d, 5-d, 6-a, 7-True

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