Gazette Issue 05/14

The AUSTRALIAN AND NEW ZEALAND COLLEGE of PERFUSIONISTS GAZETTE

MAY 2014

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The AUSTRALIAN AND NEW ZEALAND COLLEGE *of* PERFUSIONISTS GAZETTE

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EDITOR

Molly Oldeen, *CCP*
Perfusion Department
Mater Children's Hospital
Lvl 5, Raymond Terrace
South Brisbane QLD 4101
Tel: 07 3163 5325
Email: gazette@anzcp.org

ASSOCIATED EDITORS

Carla Zazulak, *CCP*
Mater Children's Hospital
Brisbane QLD
Email: carla.zazulak@mater.org.au

Jane Ottens, *CCP*
Ashford Hospital
Ashford SA
Email: jane.ottens@acha.org.au

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A MESSAGE FROM THE EDITOR

by Molly Oldeen, *CCP.*

I welcome you to my first edition as Editor of the Gazette. It has been a challenging, yet rewarding experience thus far. I acknowledge the fact that I was able to compile this edition in just a few shorts months thanks to the wonderful assistance from the previous editor, Martin Gill, CPP. In addition to the efforts of those before him, he has done an excellent job transforming the Gazette into the print it has become today. I hope to carry on his hard work and dedication to produce a publication that serves as a medium to exchange knowledge and information among members of the College.

As I approach my two-year anniversary, in Australia at the Mater Children's Hospital in Brisbane, I reflect on the whirlwind of experience. After hundreds of hours studying, I passed both the American and Australian perfusion board exams, in addition to completing our ABCP Autotransfusion Course (which I highly recommend). I have attended many local and international perfusion conferences as well as experienced my first cardiac mission trip with Open Heart International just last month. Now, I have the honour of putting together this publication as Editor. It is no wonder time has flown by.

Lately, I have been reminded on my initial decision to become a perfusionist, one of which I will never regret. We all have our stories of how we stumbled into this unique profession. I want to share an experience we all can relate to on some level, the initial discovery of the heart lung machine, as described by a marvellous colleague of mine.

"The first time I ever stepped into a cardiac surgery operating room, I was overwhelmed by the sheer aura of the environment. The scene began by walking through a clear, glass sliding door and placing my shoe covered feet onto the hard, unblemished rubber floor. The air was cold and clean. For a moment, it felt as though I was transported to foreign planet. The centre of the room was covered in blue clothes and the sight of bare-metal instruments made me second-guess my intentions of observing the procedure. With sweaty palms, I slowly tiptoed my way around the circumference of room. As I passed the anaesthetist's station, he greeted me with a grim head-nod. At this time, I was feeling a bit out of place, as most would be when exposed to this new setting. I then rounded the corner of the ventilator and before my heart could pump another erythrocyte, the cardiopulmonary bypass machine mesmerized me. The glistening polyvinylchloride bursting with ruby red serum enthused me as a fifty-foot (15 meter) Western Australian swell does to a sun-bleached surfer. From this point on, the science of perfusion was not only going to be my career but my way of life."

I encourage you to reflect on your own first exposure and remind yourself what drives you to provide the best care for our patients on a daily basis. Early on, success by honing my perfusion skills and techniques was always the primary motive. Later, I discovered to focus on the individual capabilities is a less significant influence in the global scope of reality. The main reason we, as providers, are involved in healthcare revolves around what lays helplessly under those blue clothes in the operating room.

In order to continue to advance and perfect our techniques to provide the best quality of care, we must maintain publications such as the Gazette to educate one another. It is the combined efforts of the members of the College that make the Gazette such a success in our community. I want to sincerely thank those of you that submitted articles in the limited time frame. I encourage you all to start thinking about articles for future editions. We always need more content. Look to past editions for motivation. Schedule time to meet with your colleagues and brainstorm research or case reports you can share. As a reminder and incentive, we offer two $250 prizes to the best case report and the best free original article.

Thank you for taking the time to read my introduction to the Gazette and I hope you enjoy my first edition. I welcome all suggestions or feedback.

Molly Oldeen
The Gazette Editor

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Jane Ottens - Simulation Committee
Tim Wilcox - PIRS Editor

A MESSAGE FROM THE PRESIDENT

by Jane Ottens, *CCP.*

I would like to on behalf of the ANZCP welcome Molly Oldeen as the new ANZCP Gazette Editor. We have just sent out a call for associated editors and hopefully have found volunteers willing to help Molly in publishing the Gazette. The continuation of the Gazette as a forum for College communication was agreed by all those attending the AGM in Melbourne 2103. With that said, it is up to all of us as members to support and submit to the Gazette or help out as an associate editor. It would be great to have associate editors from each state in Australia and at least one from New Zealand to help Molly out with articles.

I came across an article written by Dave Fitzgerald, the current president of Amsect (until March 2014), in their Fall issue of "AMSECT Today" (Nov/Dec 2013). Dave wrote about volunteering and this topic is always appropriate for our college - be it later in the year when we need to elect executive and position holders of the college or now as we need volunteers for Gazette associate editors, interested members to join the registration subcommittee – namely to help Alison Horton with the quest for registration, as well as volunteers to help our revision of the rules and regulations. It is the diversity of many individuals, with their own interests or expertise that we can all learn from.

Organizations like the ANZCP function by the commitment and passion that individuals put into the college, all with a common goal to fulfil a purpose.

Over the past 30 years there have been so many individuals that have directed our profession and College and become leaders in doing so.

While looking from the outside, it may look like this as all too hard- we are too busy at work and home and don't have the time. Volunteering for a professional organisation can be rewarding both at an individual and community level. I can attest to this, in that the many years I have been fortunate to be involved in the college, either as an active member or in my previous (and current) roles on the Executive and Board, it has been a truly rewarding experience. I have had the pleasure to meet and work with so many dedicated and inspirational individuals within our community (and internationally) who have made me appreciate what we do is important to our patients (its not just all about me) and how we can (and should) continually strive to improve and learn.

As this edition goes to print, two of those such volunteers, namely Darryl McMillan and Chris Morley, the organisers of the IMOB meeting (ANZCP's International meeting of Blood) have taken their own personal interests (ie blood management) to organise the first meeting April 4th and 5th in Sydney, that will attract a diverse range of delegates, not just perfusion. This is an exciting meeting and is the foundation for a symbiotic relationship and collaboration with other groups to foster a relationship in blood management.

Dave quoted the World Volunteer Web (2005) that lists the benefits of volunteering being: Be part of your community, Learn or develop a new skill, Sense of achievement, Find a new interest and Meet a diverse range of people and I hope you will all consider volunteering to contribute, support and grow our profession and College

Jane Ottens
ANZCP President

REGISTRATION COMMITTEE REPORT

by Alison Horton, *CCP.*

Dear Members

As discussed earlier with members, there is a deficiency in the area for regulation of allied health practitioners who are not covered under the National Registration and Accreditation Scheme (NRAS), which is managed by the Australian Health Practitioners Regulation Agency (AHPRA). Many self-regulating professions are excluded and the Government does not plan to increase the numbers because of the difficulties and cost of managing the existing fourteen registered health professions.

The report reviewing NRAS is due to be released in April and it has been hinted to contain a proposal for creation of a second layer to regulate other health practitioners. This may only be a code of conduct or hopefully it may be something more meaningful to recognize other professions.

The members of the National Association of Self-Regulating Health Professionals (NASRHP) met in December and eight out of nine members decided to move forward with our original idea to form a company to regulate the NASRHP Associations who currently practice self-regulation. We want to prove to the Australian public that we are proactive to protect their interests rather than reactive once an adverse incident has occurred. The eight founding members who have agreed to form a company are, Audiology Australia, Australian Association of Social Workers, Australian Orthotic Prosthetic Association, Australian Sonographers Association, **Australian and New Zealand College of Perfusionists,** Dieticians Association of Australia, Exercise and Sports Science Australia, and Speech Pathology Australia. However, the long-term plan is to allow other self-regulating Associations who meet the registration criteria to join.

Leigh Clarke and Jackie O'Connor from the Australian Orthotic and Prosthetic Association agreed to take on the task of looking at company governance models within the health industry and an even bigger task, which was to collate all the available data from our Associations and compare in it to current NRAS/AHPRA regulation requirements. Each Association agreed to pay for this work to be done and the amount was proportional to the membership size of the Association. Our contribution was $550. In mid February we were sent a draft proposal of the requirements for registration, definitions and mapping of all Associations against recognized national standards.

Seven of the eight Associations met on Wednesday 12th March to discuss the draft document and reach agreement upon the proposed governance and registration criteria for the Company. This was surprisingly easier than I had thought the task would be, knowing some of the personalities involved. With only a few robust debates, resolved by generalizing statements, allowing the Associations to provide more or less detail we completed our task within 7 hours.

NASRHP is to be an independent body registered as a Company Limited by Guarantee and establish its own standards and operationalize the accreditation process through the Accreditation Council, which will include members of stakeholder groups and include consumer groups. It will oversee the Associations, but it is up to the individual Association to write or determine their own components and to ensure members comply.

The speed at which we all agreed upon the framework the company will adopt, has to be attributed to the groundwork done by Leigh and Jackie. The following headings are the areas that need to be met for registration and require each of us to have policies written up and available for public perusal.

1. Code of Ethics.
2. Codes of Conduct.
3. Scope of Practice.
4. Fitness to Practice.
5. Mandatory Notification.
6. Complaints Procedure.
7. Continuing Professional Development.
8. Recency and Resumption.
9. Competency Standards.
10. English Language Skills
11. Course Accreditation.
12. Professional Indemnity

My email is ali.horton62@gmail.com and I am happy to answer any questions that you may have about what is included in each of these areas but I couldn't fit 150 plus pages of work into 2 pages. However the Executive does have a copy of the full document!

I expect that you can all see that there is a fair amount of work that the college still needs to do with policy and document writing. So please contact the Executive or me, as **we need you** to help us get our policies up to standard.

Alison Horton
(a very lonely registration committee of one)

REMEMBER SUBMIT TO...

PIRS

Perfusion Incident Reporting System

What is PIRS?

PIRS is a voluntary system for reporting perfusion related incidents and accidents, open to the international perfusion community. Confidentiality is assured by de-identification and anonymity. PIRS data will not be passed to any third party or regulatory body. For further information see www.anzcp.org.

TO SUBMIT TO PIRS VISIT

www.anzcp.org

...and hit the PIRS tab.

The SIMULATION REPORT

by Jane Ottens, *CCP.*

The ANZCP owned "Orpheus Simulator" was loaned to three units in 2013.(Westmead NSW, Ashford SA and Flinders Medical Centre SA) and is now currently at St George in NSW.

The RACS had requested its use for a registrar training day in March, but cancelled out due a change of program.

At this year's ASM in Auckland, the ABCP are planning on a simulator day, to be held on the Wednesday prior to the meeting. Details to follow.

As the simulator will be in New Zealand at the end of the year for the meeting, it will also be available to any members that would like to use it within their own unit...something to think about while it is in New Zealand.

A reminder to all members, that the simulator is available for crisis, student training as well as using it to evaluate new equipment within your own unit.

Conference report on the simulation session of the Amsect/ ICEBP Best Practice Meeting, San Antonio, October 2013

Simulator training is quite common with individual role groups such as surgeons, anaesthetists, nurses and perfusionists. We can all use this "tool" to improve and become safer practitioners. Team simulation is less common.

Team training in cardiac surgery is by definition multidisciplinary, so that combined participation from each role group can increase the fidelity, accuracy and realism of simulation. It also has been shown to create a sense of camaraderie, trust and enhance the culture of safety among the team members.

The human factor contribution to cardiac surgery is becoming obvious in the scientific gains in cardiac surgery – the greatest lies in improving human performance. A large part of the Human Factor science involves improving aspects of teamwork to reduce errors and evaluation of clinicians, of equipment and the interaction between the two. Simulation is the perfect vehicle to help show this.

Previously at past Amsect/ ICEBP Best practice meetings, simulation has been a regular topic in the scientific sessions. These have varied from sessions held in "state of the art" simulation suites in Toronto to "hands on" hi and low fidelity simulation workshops for all delegates to be exposed to its use.

"Human factor and team work" using simulation was the direction for this topic at the San Antonio meeting last year.The concept of producing "simulation videos" was devised by the ICEBP and the Amsect planning committee, which could then be used at the conference.

In August 2013, multidisciplinary and multi-institutional groups met in Boston at Massachusetts General Hospital, to film simulation videos, which included:

Surgeons
Anaethetists
Perfusionists
Physician assistants
Scrub technicians
Human factor experts
Nurses
Simulation experts
Videographers
Corporate sponsors (Loan of simulators and disposable equipment)

This mammoth task was coordinated by Kenneth Shann (Chief Perfusionist), and along with the scripts devised by Bruce Searles and Jeff Riley, resulted in 11 hours of filming, generating approximately 30 hours of video to review and edit. The final product was three 20 minute videos with voice over/expert commentary from Steven Yule, Ph.D, a human factors expert, on both technical and non technical skills of the simulation.

The following videos produced were:

Video Title One: Cardiac Surgery Simulation: Pre-Briefing

The goal was to represent an ideal multidisciplinary briefing for cardiac surgery with cardiopulmonary bypass. The cardiac surgery team used evidence-based principles for cardiac surgical briefing.

The simulation team created two videos, one with poor briefing techniques and one with ideal techniques and highlighting both technical and non technical skills.

Video Title Two: Improper and safe Initiation of cardiopulmonary bypass (CPB) with cardioplegia administration.

The simulation team created two videos, one with poor CPB initiation techniques and one with ideal technique to initiate CPB and administer cardioplegia demonstrating evidence-based safe technical and non-technical (communication) skills

Video Title Three: Aortic dissection with femoral cannulation

Goal: The simulation team w cannulated and initiated CPB. The diagnosis and treatment of an aortic dissection ensued, while the team demonstrated the fundamental principles of crisis resource management.

During the meeting, these videos were played to the audience, (all with an audience response device) and asked questions prior to, during and after watching the videos, to provide a truly interactive session with delegate feedback.

Further to this, group workshops the following day then allowed small groups to discuss how they could take this information home and use the concept in their own unit.

This session was an outstanding success which highlighted the correct way we (perfusion/surgeon/nursing/anaesthesia) all should interact , from the period of time out (when the patient may still be awake) to explaining to all involved, what each other is doing (not assuming) to reduce error and improve safety within the operating theatre.

While the scenarios showed may have been "extreme" behaviour to highlight the faults, it definitely made me think the next time I was in the operating theatre after this session, as we can all take home/learn from the simulation videos.

- A venture that was truly a collaboration and team work extravaganza!

This is something that we as a College could explore presenting at one of our future meetings.

Jane Ottens
Simulator Subcommittee

Below are the list of references for this session courtesy of Jeff Riley and Bruce Searles.

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The BOARD REPORT MARCH 2014

by Clarke Thuys, *Chairman ABCP*

Since the last report the Board started the new term for the Diploma of Perfusion Course and welcomes the three new trainees to the course. One from Perfusion Services in Victoria and two from the Queen Mary Hospital in Hong Kong.

At its last meeting the Board discussed changing the format of the certification exams from short answer, multiple choice and viva to multiple choice and viva with two multiple choice papers. It was decided to retain the current format as it gives the opportunity for the candidates to demonstrate their knowledge across a wider variety of examination processes and thus gives a better account of their depth of knowledge.

Sending of recertification documents should be underway. There was delay was due to a delay in getting the invoices generated as Wendy was busy with her wedding (congratulations). The current certification is valid until the end of June, but it would be prudent to start collating your documentation. If you are having problems with points please contact me ASAP as we have always been able to find a solution to recertification problems. We do not want anyone to lose certification if possible.

Exams were held in Sydney for the first time in many years and we were very pleased to be able to add Andrew Lahanas and Ray Miraziz to our pool of examiners for the viva exams. As I write this I am waiting for the last lots of marking of the short answer papers to come in but can report that all three candidates passed their viva and multiple choice papers.

The first Autotransfusion course for the year has commenced, and the inaugural imob conference has been announced. The conference program will attract 13 CEU points for 635 minutes of structured content. Please support this conference as intraoperative blood management is a critical part of what we do.

A FOND FAREWELL

by Sarah Armarego, *CCP.*

I would like to announce the retirement of Ken Gall, Director of Perfusion at John Hunter Hospital, Newcastle. Ken commenced perfusion training at Prince Charles Hospital, Brisbane. He later established the valve bank in Queensland. This required obtaining donated heart valves and preparing them for reimplantation. One of Kens 'claims- to-fame' is that he prepared Kevin Rudd's first aortic valve replacement!! Ken then returned to perfusion. During this time, certification came into practice. Ken missed out on the grandfather clause and became one of the first students to successfully complete the Diploma of Perfusion. Ken commenced work at JHH in 1997. He worked tirelessly to maintain perfusion services despite being the only clinical perfusionist at JHH for many years. Ken was an active member of the Australian Society of Cardiovascular Perfusionists being the treasurer for many years. Ken helped oversee the process of developing the society into a college. This required many hours behind the scenes reading legal and business documents. Ken was very proud to show off his adopted city in 2009 when he organised the 26th Annual Scientific Meeting of the Australian and New Zealand College of Perfusionists.

Ken is extremely humble. He has an amazing knowledge and practical experience. He has the ability to sort through problems, always bearing in mind patient safety. Despite being a small unit, we were always up-to-date with latest in perfusion management and tried to institute best practise with a limited budget.

It is with both joy and sadness that I announce the retirement of Ken Gall. It is sad because I will miss a fantastic work colleague, mentor and friend. However, I am joyed by the fact that Ken can now pursue his many interests including wood turning, fishing and kayaking without being 'on call' 24/7. I wish him all the best.

Ken Gall was awarded the first "Service Award" by the ANZCP at the Melbourne 2013 ASM. In recognition for his commitment, dedication and the many hours he has given to the ANZCP and our profession,over the past 30 years. We all wish him well in his retirement and will miss his smiling face .

Jane Ottens

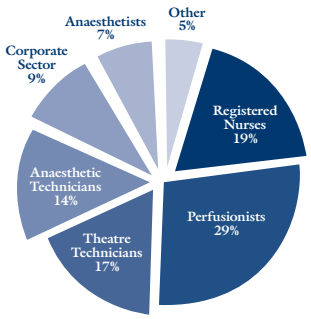
ABCP AUTOTRANSFUSION COURSE UPDATE

by Andrew Lahanas, *CCP.*

As many College members may already know, the ABCP Autotransfusion Course has been running for over a year now. Forty students have completed the 10 week online course so far and the feedback has been very positive.

The weekly material includes Power Point lectures accompanied by topical articles allowing the student to further investigate specific areas of interest. At course completion, students undergo a three hour written examination containing multiple choice and short answer questions to confirm that the material has been adequately covered. Successful students are awarded a certificate of completion and placed on the Autotransfusion registry currently on the ANZCP website, pending the development of the new Autotransfusion website.

The clinical backgrounds of participants have been diverse (see chart) with perfusionists forming the largest group. This was no surprise when you consider that the ABCP administers the course and that ANZCP members register free of charge! Most non-perfusion applicants are registered nurses or anaesthetic and theatre technicians. We have also had some anaesthetists and corporate members participate.



Although many units have autotransfusion devices, the safe application of the technology requires clinical understanding specific to the area it is being used (ie cardiac, obstetrics, tumour resections, etc) and this is where the objective of the course lies, to educate the operator in using the equipment safely and effectively within their own clinical area. We feel the course may even play a complementary role alongside the corporate sector by allowing the distributors of the devices to direct their efforts towards practical training using their specific equipment while leaving the theoretical training to us.

Chris Morley and I would like to encourage interested Gazette readers to participate in the course. Details are available on the Autotransfusion flyer in this edition.

AROUND THE PUMP ROOM AUCKLAND

by Misty Bean, *CCP.*

The Auckland City perfusion team has been pretty busy the past few months. We have had births and weddings to celebrate as well as gaining some new members. We welcomed three new staff. Mark Greaves came to us from Hamilton, NZ. James Holder from Bristol, UK and Hina Solanki from Birmingham, UK. The entire department has enjoyed working with them the past couple of months. We have also welcomed back Katherine Morris from maternity leave after having her 4th gorgeous little boy. Last July saw our own Tim Willcox beginning a new role as a grandfather. He seems to fit the position perfectly. We will also be saying a brief goodbye to Taryn Evans as she will be going on maternity in the next couple of months. A big congratulations to both her and Alex Peterson. Shuja Zahidani and Ghaz Jabur have both celebrated weddings in the past couple of months.

On a professional note a bit of research has been going on. Ghaz Jabur has spent quite a bit of time researching the differences between the Pall 20 micron and 40 micron arterial filters. His paper was published in Perfusion last year and he has presented his data at three conferences of late. He presented at the Sid Yarrow forum in Auckland, the ANZCP meeting in Melbourne where he won the Sid Yarrow award for best first time presenter, and at CREF in San Diego where he won the Utley award for best abstract, content and presentation. Congratulations to Ghaz on such a great achievement.

The 2013 Friends of Fiji Heart mission was a great success this year. Rachel van Uden, Ghaz Jabur, and Mark Greaves participated this year. It was a busy trip with 20 patients receiving valve surgery. The upcoming trip will be in late August. Hopefully it will not be as hot as years past.

Much work has been put into some upcoming meetings. Tim has put long hours in getting the Perfusion Down Under 2014 meeting together in Queenstown. This year will be to the 10 year anniversary and will prove to be a great one. Taryn has also been working hard on the next ANZCP meeting that will be held in Auckland November this year.

30TH ANNUAL SCIENTIFIC MEETING AWARD WINNERS

The Terumo Award 'Best Scientific Paper'
Steve Botrell, *Royal Children's Hospital, Melbourne*

The Medtronic 'Scientific Encouragement Award'
Viji Vincent, *Royal Perth Hospital, Perth*

Sid Yarrow Award
Ghazwan Jabur, *Auckland City Hospital, Auckland*

The ANZCP Meritorius Award
Rona Steel, *Westmead Public Hospital, Sydney*

The ANZCP Best Trade Display
Terumo Corporation Australia and Cellplex Pty Ltd

The ANZCP Gazette Award
Sarah Varghese, *The Canberra Hospital, Canberra*

Presidential Award
Associate Professor Dr. Rob Baker

Service Award
Ken Gall

INTERNATIONAL CONSORTIUM FOR EVIDENCE BASED PERFUSION (ICEBP)
NEWSLETTER - MARCH 2014

Next Meeting

AmSECT's Quality and Outcomes incorporating Best Practices in Perfusion and New Advances in Blood Management

October 1 - 4, 2014
Sheraton Inner Harbor
Baltimore, MD

For years, perfusionists have raved about AmSECT's two fall meetings - the Annual Symposium on New Advances in Blood Management and Best Practices in Perfusion, but have struggled to get enough time away from their practices to attend both.

Upon recommendation of the 2014-2016 Strategic Planning Committee, AmSECT's Board of Directors agreed to combine two of its conferences into one premier event to bring extra value to the perfusion community.

This fall, we will inaugurate this combined conference, titled "AmSECT's Quality and Outcomes conference".

Mark your calendars now for October 1-4, 2014

at the lovely Sheraton Inner Harbor in Baltimore, Maryland

International Contacts

The ICEBP is a grass-roots initiative that relies upon the support of the perfusion community and it'sorganizations. Whilewe have had some success with teleconferences and web based sessions, our primary method of getting together is by representation at the ICEBP Steering Committee meeting,held as part of AmSECT's Fall Meeting, now called the "Quality and Outcomes Conference". All interested members of the community are invited to this meeting.

We do have ongoingbusiness we traditionally focus on, but we are keen to develop more active participation as a "world-wide" community.

In order to be effective with communication, we seek your assistance in identifying the best method communicating electronically.

Please provide your society's email address and primary contact to Shahna Bronson, slhbronson@yahoo.com:

Organizations

Australian and New Zealand College of Perfusion

Dutch Society for Extracorporeal Circulation

Florida (USA) Perfusion Society

Japan Society of Extracorporeal Technology in Medicine

Minnesota Perfusion Society

Scandinavian Society of Extra Corporeal Technology

The American Academy of Cardiovascular Perfusion

Spanish Association of Perfusionists

The American Society of ExtraCorporeal Technology

The Canadian Society of Clinical Perfusion

The Missouri Perfusion Society

The Society of Clinical Perfusion Scientists of Great Britain and Ireland

Become Involved!!!

Ifyour organization is interested in working with us, please contact the executive committee.

How to get involved

In an effort to increase our international collaboration,The ICEBP Executive Committee seeks your perspective and feedback.

Working with the ICEBP benefits the physician and the patient. The work produced by the group leverages the experience and knowledge of individual contributors while broadening their experience base.

Have the desire to improve our profession? Have you been interested before? Lost contact? Now is the time!!! Your input matters!!!

Standards & Guidelines Progress

We seek your active engagement and participation in these activities!

Currently our group is working on updating the recently revised AmSECT Perfusion Standards & Guidelines (www.amsect.org). We'd like topursue a truly international perspective to ensure these types of documents are relevant, up-to-date and pertinent for our profession.

We know for example the Australian and New Zealand College of Perfusion is currently looking to revise their "Recommendations for the Practice of Perfusion", and have reached out to the ICEBP for opportunities to collaborate.

Be on the forefront of Standards & Guidelines for your society! We would like to work together on the document to prepare a rough draft to discuss during a workshop at AmSECT's Quality and Outcomes meeting, October 2014 in Baltimore, Maryland. Please join us in Baltimore for more discussion at this meeting!

Registry

In addition to improving communication in the world wide perfusion community, we would like to leverage the PERForm (http://performregistry.org/) and other perfusion registries as ways of benchmarking perfusion practices.

We imagine joint quality assurance reports and publications will aid in:

1. engaging our colleagues,
2. understanding variation in existing practices, and
3. identifying opportunities to enhance patient safety and outcomes.

A number of perfusion registries have emerged in and outside of the United States. The registries offer perfusion teams and societies with critical information for assessing the quality and safety of the care we provide.

PERForm now has more than 30 contributing medical centers, and nearly 16,000 submitted records!

We will again have a pre-conference registry workshop at AmSECT's Quality and Outcomes conference where the use of PERForm will be discussed.

Please let us know if you are open to working together to jointly design this workshop. This workshop could cover how to leverage the existing information derived out of our collective registries.

Guideliner

One of the obstacles discovered early was being able to manage the large volume of work and large number of workers needed to actually achieve our goals of developing guidelines fashioned on the strict ACC/AHA methodology. (Affordable Care Act andAmerican Hospital Association)

We needed to actually develop some tools to aid us in each facet of the work.

The Flinders Medical Centre group in Australia has developed an online tool, "Guideliner" to help in this endeavor.

Simply put, "Guideliner" helps us organize the review of the abstracts and structures our paper reviews, electronically filing all of the responses enabling the final synthesis of the vast literature to be organized and structured. We are now starting to see some output from groups using "Guideliner", including 2 guideline documents under review by journals.

PEDS Subcommittee

We are delighted that a group of interested individuals, led jointly by Brian Mejak and James Reagor are embarking on developing a pediatric module for the PERForm registry. Brian and Jim and working in collaboration with a number of perfusionists from across our profession, and are leveraging the infrastructure embeddedwithin the adult PERForm registry. We hope to have more updates to come in thenear future.

Recent Publications

Check out what we've been up to!

JECT.2013; 45:156-166

The Journal of Extracorpeal Technology

Report from AmSECT's International Consortium for Evidence-Based Perfusion: American Society of Extracorporeal Technology Standards and Guidelines for Perfusion Practice:2013

Future Work

To reiterate, our goals are to:

1. Communicate with international societies about what being involved with ICEBP may look like.
2. Develop an International resource for the development of clinical Standards & Guidelines.
3. Identify opportunities to work together to enhance the value of clinical perfusion registries.
4. Broaden the ICEBP community

Please join us in the desire to improve patient care by combining efforts with the International Consortium for Evidence-Based Perfusion (ICEBP).

Volunteers Needed

The work is never done!!!

We are always in need of your help!!!

All are welcome to contribute, including students, and practicing perfusionists. Volunteering could include both short and long-term commitments related to any of the topics listed above.

If you're interested, please contact Rob Baker or David Fitzgerald for further assistance.

The PUMPERS QUIZ

Paediatric and Congenital

Questions courtesy of the editorial team

1. Approximately what percentage of all live newborns are affected by congenital heart disease?

a. 0.25%
b. 0.5%
c. 1.0%
d. 5.0%

2. Which of the following is required for a patient with hypoplastic left heart syndrome to maintain the ductus arteriousus as a conduit for oxygenated systemic blood flow?

a. Nitric oxide
b. Prostacyclin
c. Prostaglandin
d. Endothelin-1

3. The current repair of choice for hypoplastic left heart syndrome (HLHS) is:

a. Pulmonary Artery Banding
b. Blalock Hanlon
c. Senning
d. Norwood procedure

4. A defect that allows communication between the atria is:

a. PDA
b. ASD
c. VSD
d. PA Banding

5. Which of the following is NOT characteristic of a total AV canal?

a. Ostium Primum ASD
b. Common AV valve
c. VSD
d. Sinus venosus ASD

6. Which of the following is a palliative procedure to reduce pulmonary blood flow and control congestive heart failure in left to right shunts?

a. Gott Shunt
b. Pulmonary Artery Banding
c. Rashkind Procedure
d. Blalock-Taussig Shunt

7. Right Ventricle to Pulmonary Artery conduit best describes this kind of corrective procedure:

a. Glenn shunt
b. Rastelli
c. Blalock Taussig Shunt
d. Waterston Shunt

8. An appropriate palliative procedure for Tetrology of Fallot would be:

a. Blalock-Taussig shunt
b. Pulmonary Artery Banding
c. Gott shunt
d. All of the above

9. The most common type of ASD is:

a. Sinus Venosus
b. Ostium primum
c. Ostium secundum
d. Muscular

10. All are cyanotic heart defects, except _____?

a. Tetrology of Fallot.
b. Total anomalous pulmonary venous connection.
c. Transposition of great arteries
d. Tricuspid atresia or Truncus arteriosus (persistant)
e. Double outlet right ventricle

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For the correct answers turn to page 49

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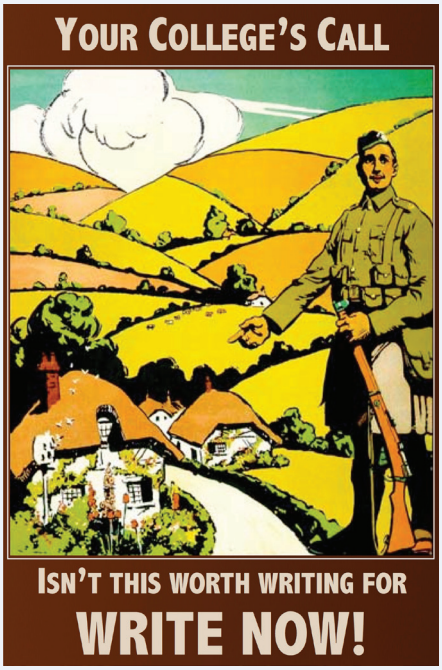

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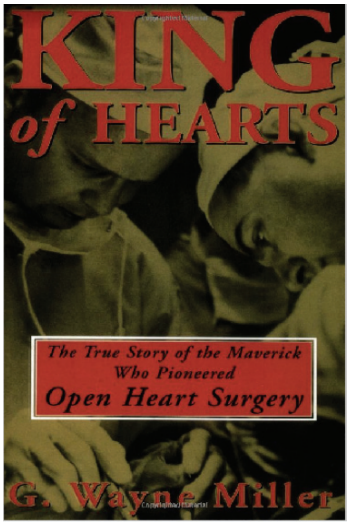
Opinion BOOK REVIEW

by Charles McDonald



Think you know the history of the beginnings of cardiac surgery …….then think again.

The "king of Hearts" traces the exhilaration and tragedy of Walt Lillehei's career with a sense of excitement, urgency and adventure, describing complex medical procedures in an easy to read, yet suspenseful style. Walt Lillehi; the flamboyant man from Minnesota who pioneered open heart cardiac surgery is often labeled the father of cardiac surgery, yet the real story of his accomplishments deserve much broader accolades. With the modern technology that surrounds open heart surgery it is easy to take for granted the giant chasm that was crossed by these early pioneers. Miller keeps the reader enthralled by conveying the dogged perseverance shown by those racing to explore the inner workings of the human heart. The "King of Hearts" is written in a way that also shows compassion to those many unfortunate young lives lost in the struggle to bring techniques perfected in the animal laboratory to the operating room. It also makes the reader appreciate the enormity of the task undertaken by Lillehei and his colleagues. Labeled by some as a "murderer", Lillehei's failures are covered with equal candor as his successes and one can't help but feel some empathy for a pioneer whose career was cut short in surprising circumstances. Alongside the story of Lillehei, Miller also gives an informative and entertaining account of Lillehei's collaborators and rivals. Men such as Dennis, Gibbon, DeWall, Cooley, DeBakey, Gross, Shumway and Bernard were all racing to find a technique that would allow open heart cardiac surgery possible. Anyone interested in medicine, heart problems, medical history or medical technology will find this book an informative and riveting account of those early years. This book should be put on the must read list for any student enrolled in a perfusion course as well as those currently practicing perfusion.

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Original Article

A TRAINEE EXPERIENCE

by Jessica Ozdirik

"Dr Peter Grant and I dissecting a sheep's heart"

People often ask me how I entered the perfusion profession and I reply with a story which includes a little luck combined with some effort. I first visited the cardiac operating theatres during my Medical Science undergraduate studies. I was fascinated by the whole intraoperative procedure and was really impressed by the important role of the person sitting behind the fancy blood-pumping machine connected to the patient. I needed to know how I could do that and after some homework I decided I would enrol into the Swinburne Perfusion course, only to discover it had been discontinued (…NOOOOOO!!). Not being easily discouraged, I returned to Prince of Wales Hospital to ask Andrew Lahanas for some advice and learnt that the unit was advertising for another perfusionist, a trainee! "I'm going to go for it", I said to myself. The rest is history.

"One of the Rwandan kids and I post-op"

My traineeship over the past three years has been an incredible experience for me. Over this period I have managed to learn so much and have become a valuable member of a great team. Early on, one of the highlights was dissecting a sheep's heart with Dr Peter Grant, who really helped me apply my anatomy knowledge while also visualising the surgeon's view when making the incision into the heart. It was exciting, feeling the various anatomical components and appreciating how delicate, yet resilient, they are. I was also glad to be on the other side of the operating table!

I have attended a number of conferences and have had the pleasure of meeting many of you. It's nice to know that I'm a part of a group of true professionals, who share an incredible wealth of knowledge. Presenting my NIRS research project at the 2013 AGM in Melbourne was a nerve-racking experience but something I considered a personal challenge. It was also good to hear many of my points reiterated in other presentations by more experienced colleagues. I have always felt supported as a trainee, even from colleagues from other units where I have seen various set-ups and techniques. I was fortunate to visit Andrew Dinale and his team up the road at St Vincent's Hospital. I gained an insight into how tough it is to work around the clock with ECMOs, TransMedics retrievals and heart/lung transplantations.

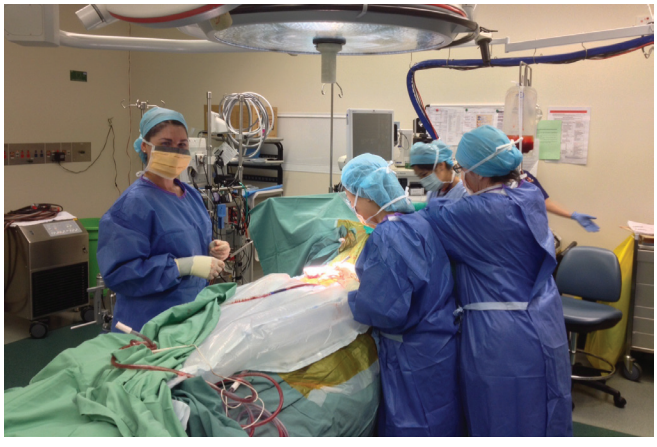
"The giant wall of perfusion boxes I was greeted with in Rwanda"

From a training perspective, we are a unique department here at POW, servicing adult and paediatric patients. Paediatric perfusion is an area that I really enjoy, especially when learning about the complexity associated with various stages of congenital disease. There are so many additional aspects to consider when managing extracorporeal circulation within the paediatric population. The exposure to paediatric perfusion has taken me further than I thought possible, literally, all the way to Rwanda! When I was approached about joining the Open Heart International team on their upcoming mission to the tiny African country last year, I jumped at the opportunity, although a little reluctant initially (I hadn't finished my traineeship yet). Do I really know enough to be going on a trip like this? – I was reassured by my colleagues and the OHI team that, although I would be out of my comfort zone, I would be working alongside another experienced perfusionist and a supportive team. The first day in Rwanda was overwhelming for me. I was alone for the first 36 hours and had an entire wall of

perfusion boxes to sift through, not to mention having to set up a heart-lung machine from scratch that I'd never seen before, with two local Rwandan guys that I was meant to train! Eventually we were ready to proceed with the first case. But of course, it couldn't have just been just another routine case, could it? Just prior to cannulation, trouble with the oxygenator required a change-out. Talk about pressure! Nevertheless, the trip was a great experience. Removed from my comfort zone, I was required to work with a different team, forced to think outside the box and adapt to diverse conditions while overcoming stress. Ultimately, I believe this experience has made me a better perfusionist.

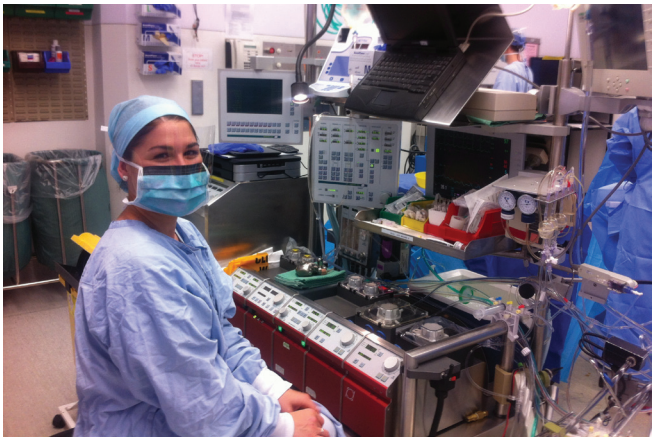
"Rwandan perfusionist I had to train and I on bypass in Rwanda"

Last year was an exciting year for our department, with the acquirement of a new CardioHelp ECMO machine. It was something we needed for a while so I decided to organise a fundraiser in an attempt to raise some of the money to purchase the machine. Although originally planning a small raffle, the event somehow evolved into a full blown trivia night with live auctions, monster raffles, a band, and over 120 attendees! We raised almost $20,000 which far exceeded our expectations! It's wonderful to see how generous people can be, coming together and digging deep to support such a great cause. We've all since completed our training with the CardioHelp system and have found the most noticeable differences to be the reduced priming time and the portability of the unit.



"Scrubbed in theatre here at POWH"

I had a full year of work before the new ABCP perfusion course was re-introduced. It was great to have experience before diving into the course work, as I was able to apply the theoretical knowledge to practical training already gained. In early March this year, another two students and I underwent our final exams. It was a demanding last few months for me, trying to complete modules, studying, working and still trying to maintain somewhat of a normal life outside of work! It has all paid off though, I passed (phew)! I feel lucky to be amongst the first cohort of students to complete the new Board endorsed course. I would like to express thanks to those who devoted their own time writing modules and constructing the framework for a great course. Hopefully I will also be able to play a role in contributing to the course in the future. I would like to finish off by thanking my colleagues here at the Prince of Wales and Sydney Children's Hospital, not only for showing me the ropes but for always being available to answer questions. They have been an amazing support network that I definitely could not have done without.



"My visit to St. Vincent's Hospital, Sydney"

Original Article

RATIONALISING RED BLOOD CELL TRANSFUSION IN CARDIAC SURGERY: A MULTICENTRE QUALITY IMPROVEMENT INITIATIVE.

Submitted by Richard Newland, Rob Baker, Alan Merry, on behalf of the Perfusion Downunder Collaboration.

The Perfusion Downunder Collaboration has initiated a quality improvement initiative that aims to rationalise red blood cell transfusion in our patients. This article provides an outline of the project that is currently underway.

Introduction

Red blood cell (RBC) transfusion is often used during cardiac surgery to increase oxygen carrying capacity in the setting of blood loss or anaemia, but has been associated with an increase in risk of bacterial infections, low-output failure, longer intensive care unit stay and increased mortality (Chelemer 2008, Corwin 2004, Koch et al. 2006, Surgenor et al. 2006).

A single centre study on reducing variation in the number of perioperative transfusions associated with cardiac surgery demonstrated a reduction in transfusion rates in a three phase initiative, involving understanding current processes, implementing new protocols and monitoring progress of protocol implementation (Likosky 2010). The most frequent indication for transfusion was anaemia, with 90% of intraoperative and 43% postoperative transfusions given for actual or predicted low haematocrit.

We plan a a multicenter study using the Perfusion Downunder Collaboration registry to monitor progress. This will show how institutional variation in the process of care influences the incidence of anaemia and transfusion. We will aim to drive quality improvement initiatives through benchmarking. We have previously reported baseline data for various cardiopulmonary bypass (CPB) process of care that highlight the potential for process improvement in this way (Baker et al 2012). We aim to reduce overall RBC transfusion in a multicenter setting, through reducing the incidence of anaemia and improving adherence to institutional protocols in sites contributing to the Perfusion Downunder Collaboration.

Methods

This study will follow the SQUIRE publication guidelines for reporting healthcare quality improvement research [Davidoff et al., 2008] and the approval of local ethics committees will be obtained.

Setting

Collaborating perfusionists collect data routinely from procedures performed in the nine Australian and New Zealand cardiac centres currently contributing to the Perfusion Downunder Collaborative Database (PDUCD), as previously described (Baker at el, 2012). Data collected from Jan 2007 – Feb 2013 will be used to report baseline measures of outcome.

Interventions

This quality improvement initiative will be undertaken in three phases;

Phase I:

The initial phase focused on understanding current protocols and processes of care in relation to perioperative blood management, the incidence of perioperative anaemia and RBC transfusion. Each centre was given the opportunity to present their current protocols and data collected since participation in the PDUCD. Presentations were given at a dedicated session at the Perfusion Downunder Meeting, September 1st – 3rd, 2013. Using benchmarking, discussion during this session was focussed towards identification of best performing centres and the lessons to be learnt from these – their processes of care, unit culture and protocols. Results of the session were summarised and provided to each centre for dissemination at unit level.

Phase II:

The second phase will involve: firstly, dissemination of information at individual centres to guide adoption or modification in processes of care; and secondly, the prospective collection of information on indications for RBC transfusion over a three month period in order to determine adherence to institutional protocols. This phase will be implemented once approval has been granted from institutional ethics committees. Clinical interventions will be considered at each centre based on the clinical practice guidelines for blood conservation published by the Society of Thoracic Surgeons (STS) and the Society of Cardiovascular Anesthesiologists (SCA) (Ferraris et al 2011). A local quality improvement (LQI) team at each centre comprising of cardiothoracic surgeons, anaesthetists, perfusionists and nursing staff will be responsible for co-ordination of the project, and implementation of protocols for RBC transfusion. Each institution will be required to

determine appropriate indications for RBC transfusion. Specifically, at the beginning of the phase, the LQI team will aim to educate staff with the evidence base for perioperative blood conservation according to the STS/SCA guidelines and RBC transfusion according to the Australian National Blood Authority patient blood management guidelines, provide the summary of the benchmarking results from the PDUCD and ensure RBC transfusion protocols are implemented. At the end of the Phase, the team will feedback the individual centre results for incidence of transfusion, summary of the indications for transfusion and adherence to protocols during phase II.

Phase III:

In the final phase we will continue monitoring indications for transfusion and feeding back data to staff regarding incidence of intraoperative and postoperative RBC transfusion on a monthly basis. Data integration from the PDUCD will be utilised over three month periods to track comparative progress for benchmarking. Final analysis will take place after 6 months of data collection and feedback.

Measures

The primary outcomes of this study will be incidence of RBC transfusion, minimum haemoglobin during CPB, and rate of adherence to institutional protocols. Secondary outcome measures will include length of postoperative stay, and mortality.

Analysis

Standard statistical methodology will be used to compare proportional and continuous data variables.

Current status and action plan to progress to Phase II

Progression to Phase II at each institution is dependent on ethics and clinical governance approval at each institution; however, some preliminary planning may take place in preparation for implementation of the project and prior to making changes to practice. Some resources have been prepared to assist this process, including this project outline, a Powerpoint presentation outlining the project and its implementation, the main background literature documents (NBA and STS/SCA blood management guidelines) and a summary document for each institution to review current and future adoption of each guideline.

An outline of the process for progression of the project is as follows;

Whilst awaiting ethics approval, formation of a multidisciplinary team at each centre each centre to:

- Provide the project outline to the local relevant stakeholders and present the project
- Disseminate guidelines and evaluate compliance
- Determine whether modifications to practice should occur,
- Develop peri-operative and post-operative transfusion protocols

Following ethics approval:

- Implement modifications to practice and transfusion protocols
- Over a three month period monitor indications for RBC transfusion to evaluate compliance
- Monthly feedback of results.

Whilst the implementation of these processes will occur at the institutional level, progress of each institution will be discussed at the PDUC Data Managers teleconferences each month to enable co-ordination of the project at a multicentre level and to facilitate the benchmarking process for progression to phase III of the project.

Further updates on the status of the progress will be presented at the Perfusion Downunder Meeting in Queenstown, 6-9th August, 2014.

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Original Article

REDUCED EMBOLIC LOAD DURING CLINICAL CARDIOPULMONARY BYPASS USING A 20 MICRON ARTERIAL FILTER

as originally published by SAGE Publications - DOI: 10.1177/0267659113504445
The online version of this article can be found at: http://prf.sagepub.com/content/early/2013/09/05/0267659113504445

GNS Jabur,[1] TW Willcox,[1,2] SH Zahidani,[1] K Sidhu[1] and SJ Mitchell[1,2]

Abstract

Objective: To compare the efficiency of 20 and 40 µm arterial line filters during cardiopulmonary bypass for the removal of emboli from the extracorporeal circuit.

Methods: Twenty-four adult patients undergoing surgery were perfused using a cardiopulmonary bypass circuit containing either a 20 µm or 40 µm arterial filter (n = 12 in both groups). The Emboli Detection and Classification system was used to count emboli upstream and downstream of the filter throughout cardiopulmonary bypass. The mean proportion of emboli removed by the filter was compared between the groups.

Results: The 20 µm filter removed a significantly greater proportion of incoming emboli (0.621) than the 40 µm filter (0.334) (p=0.029). The superiority of the 20 µm filter persisted across all size groups of emboli larger than the pore size of the 40 µm filter.

Conclusion: The 20 µm filter removed substantially more emboli than the 40 µm filter during cardiopulmonary bypass in this comparison.

Keywords

cardiopulmonary bypass; cerebral protection; arterial line filter; gaseous microemboli

Introduction

The sources of emboli in cardiopulmonary bypass (CPB) have been investigated for several decades. The majority of relevant studies have been conducted using in vitro models of CPB. Such work has drawn attention to avoidable sources of emboli, including device design problems and entrained venous air.[1] Whilst knowledge of these problems may have reduced the passage of emboli into the arterial line, contemporary data demonstrate that emboli generated in the CPB circuit still reach the patient.[1,2]

The "final line of defense" against emboli in a CPB circuit is the arterial line filter. Arterial filters are an optional addition to the CPB circuit and have been available and evolving since the 1960s.[3] Modern devices are most commonly "screen filters", with pore sizes ranging from 20 – 40 µm. There is some evidence that the use of arterial filters improves neurological outcomes after cardiac surgery;[3,4] other benefits from their use may include a reduction in the inflammatory response to CPB and protection of other organs such as the lungs and heart.[5] Whilst these potential benefits must largely relate to removal of emboli from the circuit, there remains controversy over the optimal pore size for the most efficient filtration. This study aimed to evaluate the relative efficacy of arterial filters with 20 and 40 µm pore sizes for emboli reduction during clinical CPB.

Material and Methods

This investigation was a continuation of a non-randomized clinical audit of emboli in contemporary adult CPB circuits. Ethics Committee approval was obtained to measure emboli in our standard CPB circuits (which include a 40 µm arterial filter) during routine clinical use and, also, in circuits used during a routine pre-purchase product assessment where the same circuit componentry included a 20 µm arterial filter instead of the 40 µm device. Patients were 24 adults undergoing cardiac surgery requiring CPB (Table 1). They were selected consecutively, based on the availability of an operator for the emboli detector. Twelve cases were monitored during the use of each filter. Other than the use of the emboli detector, the conduct of CPB was strictly according to normal practice.

Table 1. CPB procedure type.

	40 micron arterial filter	20 micron arterial filter
CABG	7	3
AVR	2	4
MVR	0	1
AVR + CABG	1	4
Bentalls + CABG	1	0
Mitral Valvotomy + Tricuspid Annuloplasty	1	0
Totals	**12**	**12**

CABG: coronary artery bypass grafting; AVR: aortic valve replacement; MVR: mitral valve replacement.

The CPB circuits consisted of: an Avant 903 hollow-fiber membrane oxygenator and hard-shell venous reservoir (HSVR) (Sorin Group, Mirandola, Italy), either a Pall AL6 or AL20 arterial filter (Pall Corp., Portsmouth, UK), a MYOtherm XP cardioplegia delivery system (Medtronic, Minneapolis, MN), SMARxTTM polyvinyl chloride (PVC) tubing (COBE Cardiovascular, Arvada, CO) and silicone replacement tubing (Natvar, City of Industry, Los Angeles, CA). A Stöckert S3 heart lung machine (Sorin Group GmbH, Munich, Germany) was used. The circuit was flushed with CO^2 through the arterial filter for approximately 5 minutes at 1 L/min prior to priming. The circuit prime consisted of 950 ml Plasma-Lyte 148 (Baxter International Corporation, Old Toongabbie, NSW, Australia), 500 ml Voluven® 6% (Freeflex®, Fresenius Kabi Ltd., Pymble, NSW, Australia), 150ml mannitol 15% (Baxter Healthcare Corporation, USA) with the addition of 100 IU/kg of heparin and 1000 mg cephazolin.

Institutional clinical practice for the conduct of CPB consisted of non-pulsatile flow (2.0-3.0 L.m–2.min–1), mild hypothermia 34-

32°C, a target hematocrit on CPB of >0.22, mean arterial pressure (MAP) >50 mmHg and venous oxygen saturations maintained above 70%. The activated clotting time (ACT) was monitored during the bypass and maintained above 480 seconds. All patients received a general anaesthetic and α–stat acid/base management was used. The arterial filter purge line was connected via the sampling manifold to the venous inlet port and was open throughout CPB.

The venous line to cannula connection was de-aired or not, according to surgeon preference, prior to commencing CPB. During CPB, the oxygenator sweep gas composition and rate were titrated according to clinical needs. The HSVR was operated within the manufacturer's recommended guidelines for minimum volume, with a low -volume alarm set at that threshold. Cardioplegia was delivered according to surgeon preferences using 4:1 blood cardioplegia. In accordance with standard practice, cardiotomy suction blood was sequestered for cell salvage at a later stage, delivered straight to the cell saver or added to the venous reservoir as required. Any blood vented from the left ventricle was returned to the venous reservoir or the cardiotomy reservoir, according to the perfusionist's preference. Additional volume was administered as required via the dedicated ports on the venous reservoir or to the venous line, also according to the perfusionist's preference. Drug additions were made via the sampling manifold to the HSVR in the perfusionist's usual manner.

An emboli detection and counting (EDAC) quantifier (Luna Innovations, Roanoke, VA) was used to count emboli in the circuits. These devices utilize sonar-like technology to count and measure emboli passing the detector probes in the CPB circuit. Their accuracy and limitations have been assessed and described.[6] Two sites on the CPB circuit were simultaneously monitored at fixed positions as follows: immediately upstream from the arterial filter and on the arterial line downstream from the arterial filter (Figure 1). The measurement of emboli immediately upstream and downstream of the filter facilitated precise evaluation of the removal of emboli by the arterial filter. Importantly, it largely mitigated the non-randomized design of the study because factors that could have differed between cases and which might have influenced the number and size of emboli reaching the filter (such as duration of CPB, the nature of the surgery and the management of cardiotomy blood) were controlled by counting those emboli upstream of the filter in all patients. Intraoperative emboli counting was started at the inception of CPB and ceased at the first termination of CPB. Data from both sensor sites were captured on the EDAC quantifier hard disk for each patient. Throughout the counting period, the EDAC quantifier recorded emboli counts within 10 µm size bands for both EDAC sites. Perfusion and procedural data were collected in the Stöckert Data Management System (DMS) patient file in keeping with normal practice.

Statistical Analysis

The microemboli count data were reported as means with standard deviations (SD) and were treated as follows. For each patient, the emboli recorded at each of the two EDAC sites were totalled, both for each size band and for all sizes combined, and these counts were divided by the duration of the CPB period to produce a count per minute. The proportion of emboli removed by the arterial filter for each procedure was calculated by subtracting the count per minute downstream from the count per minute upstream and dividing the result by the count per minute upstream. The primary outcome measure was a comparison of the mean (for all procedures) proportion of emboli removed by the arterial filter in the 20 and 40 µm filter groups. The significance of any difference was evaluated with a two-tailed t test.

Secondary outcome measures included the following. We compared the filter groups in respect of the mean emboli counts per minute by 10 µm emboli size intervals (from 0 to 100 µm), both upstream and downstream of the filter. A two-tailed t test was used to evaluate between group differences in each comparison. We also sought evidence for any obvious haemodynamic disadvantage during use of the 20 micron filter by comparing the two groups with respect to arterial line pressure (measured 10 cm proximal to the filter), flow rates and systemic vascular resistance during CPB. These parameters were measured every 30 seconds and the pooled measurements for each group were averaged for comparison. Once again, a two-tailed t test was used to evaluate between group differences in each comparison. To avoid measurements during drops in flow (associated with clamp placement or at the surgeon's request), only data from periods where flow was ≥1.2 L.min1.m–2 were analysed.

A p-value of 0.05 or less was taken to indicate statistical significance in all tests.

Results

Data were collected from 24 bypass procedures. Twelve procedures with a 40 µm arterial filter totaled 18.2 hours of bypass time and 12 procedures with a 20 µm arterial filter totaled 22.7 hours of bypass time.

A comparison of the mean emboli counts per minute upstream of both 20 µm and 40 µm arterial filters revealed no significant difference for any 10 µm emboli size interval between 10 and 100 µm (p-values between 0.23 and 0.54). Thus, both filters were exposed to virtually identical incoming emboli loads. There was a significantly greater proportional reduction in the mean

Figure 1.

Circuit design used in this experiment, showing EDAC sensor positioning.
EDAC: emboli detection and classification quantifier; HSVR: hard-shell venous reservoir.

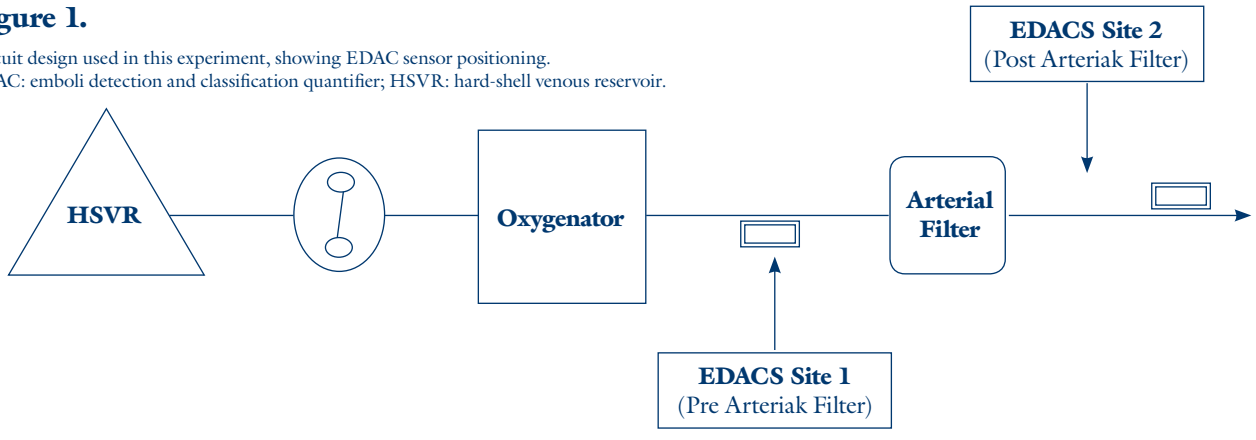

Table 2. Mean emboli count/minute downstream from the arterial filter (ALF).

Emboli size	0-10µm	10-20µm	20-30µm	30-40µm	40-50µm	50-60µm	60-70µm	70-80µm	80-90µm	90-100µm	Total emboli per minute (0-100µm)
40µm ALF Mean (SD)	356.6 (447.4)	336.6 (402.5)	182.1 (233.7)	108.1 (141.5)	41.6 (51.4)	17.7 (21.4)	7.7 (9.4)	4.1 (5.1)	2.1 (2.7)	1.4 (1.8)	1060.2 (1309.9)
20µm ALF Mean (SD)	183.0 (175.1)	154.2 (174.8)	52.2 (68.3)	13.5 (20)	4.0 (6.7)	1.7 (3.2)	0.8 (1.4)	0.4 (0.8)	0.2 (0.3)	0.1 (0.1)	410.4 (440)
P	0.224	0.164	0.078	0.032	0.020	0.018	0.019	0.023	0.029	0.025	0.118

(SD = Standard deviation).

Table 3. Comparison between groups of the haemodynamic parameters across the arterial filter.

	LP 20 mmHg	LP 40 mmHg	p	Flow 20 $L.min^{-1}$	Flow 40 $L.min^{-1}$	p	SVR 20 Dynes. cm^{-5}	SVR 40 $Dynes.cm^{-5}$	p
Mean. (SD)	170.97 (30.66)	176.34 (30.04)	0.67	5.24 (0.75)	5.11 (0.47)	0.62	898.46 (173.58)	845.28 (79.73)	0.31

LP20 and LP40: arterial line pressure for the 20 µm and 40 µm arterial filter groups, respectively. Flow 20 and Flow 40: arterial blood flow for the 20 µm and 40 µm arterial filter groups, respectively. SVR 20 and SVR 40: systemic vascular resistance for the 20 µm and 40 µm arterial filter groups, respectively.

emboli count per minute for all emboli size ranges across the 20 µm arterial filter (0.621 [0.22SD]) compared to the 40 µm arterial filter (0.334 [0.36SD]) (p = 0.029). In addition, counts downstream from the 40 µm arterial filter were significantly greater (by an order of magnitude) for all emboli size intervals from 30 µm to 100 µm when compared to the 20 µm arterial filter (Table 2). The total emboli count per minute across all emboli size ranges downstream of the 40 µm filter circuits was more than double that downstream of the 20 µm filter circuits. This was not statistically significant (Table 2).

There was no significant difference between the two filter groups with respect to arterial line pressure, flow or systemic vascular resistance (Table 3). It should also be noted that there was virtually no difference in the size of arterial cannulas used between the two groups (8 x 24Fr and 4 x 22Fr versus 7x 24Fr and 5 x 22Fr cannulas in the 20 µm and 40µm arterial filter groups, respectively).

Discussion

In 1988, Padayachee and colleagues demonstrated that the use of a 25 µm filter (compared to a 40 µm device) was associated with less middle cerebral artery emboli during CPB using a bubble oxygenator. To our knowledge, the present study is the first to subsequently demonstrate an advantage for a finer screen filter (in this case 20 µm).[7] As could be predicted, this advantage did not apply for emboli smaller than the pore size of the 20 µm filter and it was marginal for statistical significance in the 20 – 30 µm emboli size range. However, the advantage did remain through all the larger size intervals, even for removal of those emboli larger than the pore size of the 40 µm filter. This is an important finding because a strong argument can be made for greater pathogenicity from larger emboli.[8] Comparison of the total emboli counts across all size ranges downstream from the two filters reveals an approximate halving of the total emboli count in the 20 µm filter circuit compared to the 40 µm filter circuit. This was not statistically significant, largely due to the effect of variable counts of very small emboli (<20 µm). We reiterate the important finding that the numbers of larger emboli crossing the filter are significantly higher in the 40 µm circuit (Table 2).

There were no obvious disadvantages of this increase in efficiency. Although we did not directly measure the pressure drop across the filter, the lack of any differences in arterial line pressures and flow rates, aortic cannula sizes or the patients' systemic vascular resistance between the groups suggest that there was no obvious haemodynamic disadvantage associated with use of the 20 µm filter. There is a theoretical concern that a smaller pore size arterial filter may be associated with increased trauma to blood components. Non-routine measures of blood damage were beyond the scope of this audit. However, we were unable to find any reports of increased damage to blood components in the 20 µm compared to the 40 µm arterial filters. In addition, the Pall AL20 filter has undergone the Food and Drug Administration (FDA) 510(K) Premarket Notification evaluation. The mandated in vitro testing found the Pall AL20 to be substantially equivalent to the Pall AL6 40 µm predicate filter in respect of pressure drop at various flow rates, effects on blood clotting and effects on cellular components.[9]

The crucial question, not answered by this study, is; "What is the clinical relevance of this finding?" The proliferation of emboli-counting technology in cardiac surgery units has presented surgeons and perfusionists with a mass of evidence that exposure of patients to arterial microemboli via the CPB machine remains a feature of contemporary cardiac surgery. Circumstantial evidence,

such as the relationship between arterial line emboli and events like the presence of venous air or perfusionist interventions like drug additions, suggests that most of these emboli are small bubbles.[10,11] Perhaps because of the ubiquitous nature of this exposure or because of a perception that bubbles are less harmful than solid emboli, it is common to encounter a degree of indifference in relation to the potential problem represented by small bubbles. The failure to consistently demonstrate better cognitive outcomes for off-pump surgery (which is likely to be associated with less emboli exposure) and the increasing awareness of post-operative cognitive dysfunction after non-cardiac surgery (also likely to be associated with less emboli exposure) have also contributed to a reduced focus on emboli and a growing interest in patient factors, such as pre-existing mild cognitive impairment, as an explanation for these events.[12] This is compounded by conflict in the literature describing emboli and their effects, which was recently reviewed by Kruis et al.13 They reported that only 5 of 15 studies that measured both cerebral emboli exposure during cardiac surgery and post-operative cognitive impairment found a correlation between the two. To some extent, this was not surprising, given that most of the studies were not designed to demonstrate such a correlation and several of those included were overtly unsuited to the purpose. It is also notable that their review omitted five studies, positively correlating emboli numbers to neurocognitive outcome, that are known to the present authors.[14–18]

Despite these concerns, we acknowledge Kruis and colleagues' fundamental conclusion that the literature is conflicted and that microemboli cannot be definitively ruled in or out as causative agents for cognitive dysfunction after cardiac surgery. We note that they end their paper with the statement: "Although convincing evidence for this is still lacking, it remains prudent to minimize the microembolic load in clinical practice." We concur with this position. Not only are there clinical studies that have correlated greater microemboli exposure with poorer cognitive outcomes (as discussed above), there are also in vivo studies of cerebral arterial gas embolism (CAGE) pathophysiology that demonstrate harm by bubbles of sizes that seem relevant to clinical CPB. For example, blood brain barrier disruption is caused by bubbles of a similar size to those seen during CPB in the present study[19] and functionally important inflammatory events occur in the cerebral circulation after exposure to very small aliquots of arterial gas.[20] There is also evidence from parallel medical fields that bubbles of a similar size to those passing into the CPB arterial line can cause cerebral dysfunction, even in relatively healthy normotensive subjects. For example, cerebral symptoms of decompression sickness are strongly correlated with the presence of a patent foramen ovale, which allows venous nitrogen bubbles to enter the arterial circulation.[21] The diameter of the vast majority of these bubbles lies in the range between 20 and 150 µm22 and they are, therefore, comparable in size to emboli detected in the present study. Their effect on the brain after diving is independent of supersaturation of cerebral tissue with inert gas because the brain washes out inert gas extremely quickly.[23] In another relevant example, cerebral symptoms occasionally occur during the use of venous bubble contrast for the detection of a patent foramen ovale when the test is positive and the bubbles enter the arterial circulation.[24] These contrast bubbles have a mean diameter of 25 – 30 µm, which is well within the range detected in the present study.[25]

On balance, while it seems clear that emboli may not be the only, or even the most important, cause of cognitive dysfunction after cardiac surgery, much has yet to be learned about how the potential causative factors (including emboli and mild pre-existing cognitive impairment) may act and interact. The preceding discussion should sound a cautionary note to those who feel ambivalent about the importance of emboli in our CPB circuits. It is highly unlikely that emboli (whether gaseous or solid) are benign when entering the cerebral circulation during a period of relative hypotension. It follows that any simple, safe and relatively cheap interventions to reduce such exposure deserve careful consideration.

This brings the discussion back to the findings of the present study. The 20 µm Pall AL20 arterial line filter was significantly more efficient at removing emboli larger than 20 – 30 µm than its 40 µm counterpart (Pall AL6). The numbers of larger arterial line emboli distal to the 40 µm and 20 µm filter measured here translate to a respective embolic load of 456 versus 42 emboli between 70 and 100 µm in diameter being delivered to the patient per hour of CPB. While the 20 µm filter was not significantly more efficient at removing emboli less than 20 µm in diameter (see Table 2), the clinical relevance of these emboli is less certain. Even if they reach the patient, tiny emboli are less likely to be injurious and more likely to spontaneously involute due to high surface tension pressures.

Study limitations

There are several limitations of this study that must be acknowledged. First, while the EDAC quantifier is a "state of the art" device, it is prone to inaccuracies in both sizing and counting of emboli, which are documented elsewhere.[6] In general, it tends to undercount and underestimate the true diameter of the emboli.[6] This may, in fact, lend more importance to our observation of an advantage for the 20 µm filter in removing the larger emboli. Second, although we believe the majority of emboli detected were bubbles, we cannot be certain of their nature (gaseous versus particulate) because the EDAC quantifier does not make this distinction. Third, we did not definitively explore all the potential disadvantages of a finer screen filter. In particular, we did not measure indices of inflammation or blood cell damage, though others have done so without finding any related problem.[9] In a related vein, although we did not find any obvious haemodynamic disadvantages during the use of the 20µm filter, we did not directly measure and compare pressure drop across the two filters and we cannot comment definitely on its effect on circuit resistance. Finally, as previously pointed out, we did not attempt to demonstrate an outcome advantage through more efficient filtration.

Conclusion

The improved filtration of the 20 µm arterial line filter over the 40 µm arterial line filter in emboli less than 40 µm in size is not unexpected and, in the absence of any detectable clinical disadvantage, supports consideration for the inclusion of a 20 µm arterial filter for CPB. However, the persistence of superior filtration by the 20 µm arterial line filter for emboli beyond 40 µm in size, by order of magnitude, is an important finding with more obvious clinical implications. Notwithstanding the limitations of this study, the superior performance of the 20 µm arterial line filter measured in this comparison argues in favour of its use during CPB in preference to the 40 µm filter.

Conflict of Interest

The authors declare that there is no conflict of interest

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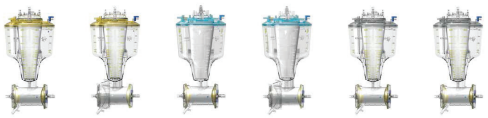

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Original Article

ECMO SIMULATION PROGRAM WITH ORPHEUS PERFUSION SIMULATOR: A ROYAL PERTH HOSPITAL EXPERIENCE

Viji Vincent *B.Sc., DPT (India), CCP (Aus),*
Clinical Perfusionist at Royal Perth Hospital, WA

Royal Perth Hospital (RPH) has supported 47 patients on Extracorporeal Membrane Oxygenation (ECMO) since 2005 (64% survival rate) with a total ECMO run of 397 days, the longest being 48 days.

ECMO is a low-volume and high-risk procedure. RPH averages around 5 ECMOs per year. We have 4 Clinical Perfusionists and around 40 trained ECMO specialist nurses. We conduct in-house training: 2-day ECMO Foundation course bi-annually based on Extracorporeal Life Support Organisation (ELSO) set guidelines which includes formal lectures, wet labs, and patient management workshops and it concludes with a written and a practical assessment. This is done twice a year with nearly 14-16 candidates – nurses, perfusionists and medical practitioners. Our training program commenced in 2007 and has developed immensely over this period.

As part of continuing education, an ECMO Refresher Course is conducted once a month with informal lectures and wet drills in a smaller group. Furthermore, the ECMO Simulation Program was developed in 2011 and is considered to be an integral component in delivering the curriculum, incorporating in-situ simulation modules to train multidisciplinary health care professionals involved in the management of ECMO patients.

Mechanical emergencies on ECMO have an associated mortality of 25%.[1] Clinical simulation facilitates the practice of emergency procedures, setting guidelines and algorithms into action in a real-time 'realistic' environment which is safe for both the 'patient' and the learner.[2]

The recent purchase of the Orpheus Simulator at RPH has proved invaluable in the application of these simulation programs. So far 6 simulation courses have been completed using the Orpheus since 2011. Orpheus is a computer controlled hydraulic model of human circulation, which is designed to function as a complete patient substitute for the training of perfusionists in the use of heart-lung machines.

We developed this simulator to be used for conducting high-fidelity ECMO simulation program. Orpheus works well with Veno-arterial ECMO scenarios, as it is designed for cardiopulmonary bypass situations. For Veno-venous ECMO simulation scenarios, we incorporated a few other devices including the Index BioTek SpO2 simulator and NETECH MiniSim patient simulator alongside the Orpheus to provide a near-perfect ECMO Simulation experience.

To be selected for the course, the candidates had to achieve an 80% pass mark in the pre-course examination that consisted of an open-book written exam. If the candidate failed to achieve 80% in this exam, they were expected to attend an ECMO refresher course and re-sit the exam. The successful candidates were then assigned very carefully to form teams in a similar pattern to that routinely used in ICU, including, medical practitioners, nurses and on-call perfusionists.

The ECMO simulation program is a one-day course involving 2 lectures and 4 simulation-scenarios. Each scenario lasts for 45 minutes which includes 5 minutes of briefing, 25 minutes of the scenario and 15 minutes of debriefing.

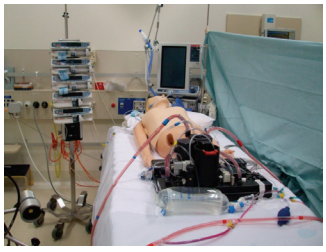

Fig.1: Orpheus simulator

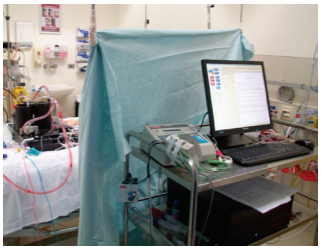

Fig.2: Orpheus controller

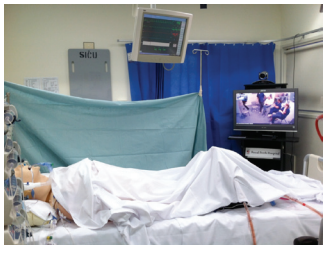

Fig.3: ICU Simulation Room set-up

Fig.4: Team in an emergency scenario

Scenarios were recorded and reviewed whenever required during debriefing by all the participants. Debriefing is considered to be the most challenging aspect of the simulation training as it leads to reflective learning. The theory underlying reflective practice draws on cognitive science, social psychology, and anthropology[3] allowing all aspects of technical and behavioural skills to be discussed reviewing the actual scenario and also discuss the necessary strategies that could be implemented if similar situation occurs in real-life scenarios.

Traditional medical education and training focuses primarily on cognitive and technical skills; very little attention is paid to the development of effective behavioural skills[4].Behavioral skills are a vital component of the ECMO Simulation program that focuses upon effective communication, team dynamics and psychomotor objectives. Pre and post course personal evaluation surveys have shown that the course greatly benefits the candidate and improves confidence within their abilities and as such provides an excellent training program.

The RPH ECMO Simulation Team
From left to right: Viji Vincent, Melissa Bedford, Brian Wright, Chris Allen

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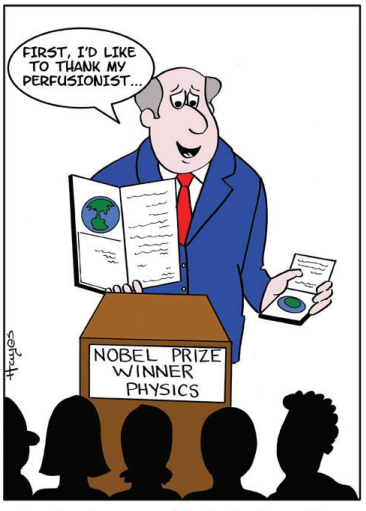

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Open HEART INTERNATIONAL

by Molly Oldeen, *CCP*

Upon arrival in Siem Reap, Cambodia after nearly 24 hours of travel, we were feeling only slightly uncomfortable from both the exhaustion and 35 degrees of heat and humidity. We managed to transport over 25 boxes of equipment and supplies from all over Australia that would enable us to perform 14 open heart surgeries over the next six days at the Angkor Hospital for Children.

More than 40 patients were screened as potential candidates, and a lucky 14 children were selected for surgery. The difficulty of turning away those who were unfit was felt by the entire team.

Our team consisted of extremely talented individuals including a surgeon, intensivist, cardiologist, anaesthetist, perfusionist, physiotherapist, and numerous theatre, ICU, and ward nurses, in addition to wonderful volunteers. Together, we assisted and guided our local counterparts to successfully perform these complex cardiac surgeries.

Being my first cardiac mission trip, I was in absolute awe of the desire and motivation to learn displayed by the local team members. Not only did it make our jobs easier, but we felt that we were instilling the education in order to provide them with the resources, techniques, and confidence to become an independent surgical team in the near future. I was impressed not only by the local team, but ours as well. I have never worked with such an exceptional group of individuals that had the same drive to give and make a difference. This was especially evident after the multiple twelve (or even 17) hour days in theatre.

Our caseload consisted of relatively more complex procedures than previous trips. We were challenged with a 17 year old TOF, a 20 year old mitral valve repair, numerous AVSDs, VSDs, an ASD and PA Band. Despite the tough ones, our team persisted.

Due to the close proximities of the ward, ICU, and theatre, it was convenient to follow patients from pre-op to discharge. It resulted in an experience in which I was able to become quite familiar with each individual patient and their families. I was amazed at the kindness and appreciation they demonstrated, despite the existence of a language barrier. No words needed to be exchanged in order to understand the positive effect we had on this select group of people. With the help of a translator, we were able to learn the unique stories of each of the patients as well. I was touched by the distance some families had to travel and the sacrifices they made to be there for our team's presence that week.

Above all, I was impressed by the little patients themselves. Their recovery from surgery was motivational. Knowing that just 24 hours ago, their chest was open and heart was operated on, to see them walk around and smile was moving. The children fought through the pain and fatigue to recover as quickly as possible.

I sincerely look forward to future trips to Cambodia and other countries visited by Open Heart International in order to relive this life changing experience as many times as possible.

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We are currently registering students for course commencement dates:

May 26th and
September 1st, 2014

For additional information and enrolment details, please contact the course co-ordinator, Chris Morley at
Chrismo@barwonhealth.org.au

CONFERENCE CORNER

UPDATE

2014 Annual Scientific Meeting Hilton, Auckland, New Zealand 6th – 8th November 2014

Planning for the 2014 Annual Scientific Meeting is well underway. The meeting will be held at the Hilton Auckland which is located 300 metres out to sea and overlooks the harbour. The Hilton is a five minute walk to the CDB as well as many other local attractions. The meeting room is spacious and bathed in natural light and the Hilton is known for great food and its cocktail bar.

We have negotiated a great room rate which includes 24 hour venue wide Wi-Fi and full buffet breakfast. Due to high demand we have limited rooms available and therefore encourage early booking if you wish to stay at the Hilton. We will notify all members when the bookings open up.

Auckland has many great attractions including Rangitoto Island, which is a short ferry ride from the Hilton, Waiheke Island for wineries, or adrenaline junkies could try a bridge bungee or sky jump from the Sky Tower. For something more sedate you could check out the Auckland Art Gallery or Museum which are all within easy distance of the Hilton.

We will be adhering to the previous meeting format of a casual Thursday afternoon session and then full days on Friday and Saturday. Friday night we will offer an informal social event at one of the local venues and Saturday will be the formal Gala dinner which will be held at the Floating Pavilion in the vibrant viaduct area.

Killian has kindly been working away on the meeting website and this will be live within the next few weeks. We will be continually updating this and encourage all members to keep checking back for the latest information. We will also be sending out regular emails with updates and information.

We are putting in the hours to make this a meeting to remember, but as with all meetings the ultimate success relies on attendance and participation. We encourage everyone to consider not only attending but also presenting. We welcome first time presenters and will be offering short presentation slots for those who wish to give it a go.

Please do not hesitate to contact myself or Shuja if you have any queries regarding the meeting. We also welcome comments and suggestions of what you would like to have in the meeting.

We look forward to hearing from you and of course seeing you in November!

Taryn Evans

Contacts
taryne@adhb.govt.nz
shujaz@adhb.govt.nz

REVIEW

Tongariro Cardiac Surgery Meeting New Zealand Hamilton 28-30 March 2014

ANZCP credit – 10 CME points for attendance

Invited Guests:

- Cardiovascular: Professor David Taggart, Oxford, UK
- Dr. Martyn Thomas, London, UK
- Anaesthesia: Professor Bruce Spiess,Virginia,USA
- Perfusion: Mr. Darryl McMillan, Sydney,Australia

Convenors:

Waikato Hospital,Hamiltion

With the very generous support of the sponsors this meeting is an annual reality for the cardiac- surgical group (Surgeons, Anaesthetists, Cardiologists, Nurses and Perfusionists) to come together, learn and network.

Friday morning started off with Registrar training and presentations.

Friday afternoon was open to all delegates with the session Topic – 'The Heart Team' With a strong focus and a gentle reminder on teamwork.

The evening concluded with a BBQ Dinner at a fantastic location - Narrows landing. This was thoroughly enjoyed by those that attended.

Saturday morning session was on Revascularisation, again great talks and stimulation of conversation. Followed by three Finalists Registrar Talks.

Mid-morning: breakout sessions into Surgical, Perfusion, Anaesthetic and Nursing Groups.

The afternoon was set aside for two trips followed by conference dinner.

Sunday morning session focused on Blood Conservation, which generated excellent discussion.

Mid-morning was open to free papers and again these were very interesting.

Meeting closed at midday.

This was an excellent meeting and is one of the few meetings that encompass the entire surgical team and it most certainly exceeded all expectations for both educational information and networking.

I highly recommend this meeting to the Perfusion community.

Congratulations and thank you to the entire organizing team.

Val Haripershad

The following pages contain the abstracts from the ANZCP 30th Annual scientific Meeting, Melbourne.

ANTICOAGULATION STRATEGIES AND DIFFICULTIES IN PAEDIATRIC EXTRACORPOREAL LIFE SUPPORT

Christian Stocker *MD FCICM*
Paediatric Intensive Care Unit, Mater Children's Hospital
Raymond Tce, South Brisbane Qld 4101, Australia

Background

Paediatric extracorporeal life support (ECLS) providers around the world are increasingly concerned that current recommendations for anticoagulation management are of limited value in understanding their patient's level of anticoagulation and protecting them from complications.

Objective

To audit international experience with bleeding and clotting complications on paediatric ECLS, evaluate traditional concepts of haemostasis and contemporary practice of anticoagulation management, and discuss modern concepts and potential future strategies.

Methods

Extracorporeal Life Support Organisation (ELSO) database search, and literature review.

Findings

Bleeding and clotting complications rates in paediatric ECLS are increasing internationally. It would appear that traditional concepts of haemostasis and recommended anticoagulation practice do not translate into satisfactory patient outcomes in the current ECLS era. The problems identified are sicker ECLS patients, a bad nonagenarian anticoagulant, abundance of device technologies, maturation issues of the haemostatic system in infants, and inadequate anticoagulation monitoring tools.

Conclusion

Anticoagulation strategies for ECLS need to be designed around modern concepts of haemostasis, resulting in development of anticoagulants that are trialled by validating laboratory measures of drug concentrations and effect in terms of clinical safety and efficacy. Furthermore, drug-specific point-of-care (POC) anticoagulation monitoring tests along with POC global haemostatic function tests are required. And finally, ECLS providers should expect ready-made and validated, technological fully integrated and streamlined systems incorporating pumps, circuits, anticoagulant, and POC monitoring tools. The Steve-Jobs-philosophy for ECLS !

ECMO SUPPORTED CPR

Alois Philipp *ECCP*, Thomas Mueller *MD*, Matthias Arlt *MD*, Dirk Lunz *MD* and Christof Schmid *MD*.
University Hospital Regensburg, Germany, Franz Josef Strauss Alle 11, D-93053 Regensburg, Germany

We report on our experience since 2008 with extracorporeal life support (ECLS) in adult patients suffering from cardiogenic shock or cardiac arrest by providing an analysis of the prospectively collected data of the Regensburg ECMO registry.

Main results

245 patients were treated with ECLS. 152 (62%) did not undergo cardiac surgery prior to ECLS. In this group cannulation was performed in all cases percutaneously by Seldinger technique. Location of ECLS implantation was: Emergency room n=29, dept. of internal medicine n=29, cath.-lab. n=30, out of center n=34 (with consecutive air or ground transport) and various locations in the hospital n=30. The survival rate of patients without previous cardiac surgery was 38%.

93 patients were connected to an ECLS post cardiac surgery, in this group 60% could be weaned from ECLS. 10 patients subsequently received a left ventricular assist device (LVAD). 32% survived to discharge.

Conclusions

Modern miniaturized ECLS devices provide vital gas transfer and circulation in patients suffering cardiogenic shock or cardiac arrest. Increasing importance of such devices in intensive care medicine and emergency room is to be expected.

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2. Haneya A, Philipp A., Diez C., et. al., "A 5-year experience with cardiopulmonary resuscitation using extracorporeal life support in non-postcardiotomy patients with cardiac arrest" Resuscitaion 2012 Nov;83(11):1331-7

PATIENT TRANSPORT ON ECLS

Matthias Arlt[1] *MD*, Alois Philipp[2] *ECCP*, Bernhard M. Graf[3] *MD, PhD*, Christof Schmid[2] *MD, PhD* and Michael Hilker[2] *MD, PhD*
[1]*Kerckhoff Heart and Lung Centre, Dept. of Anesthesiology and Intensive Care*
[2]*University Hospital Regensburg, Dept. of Cardiothoracic Surgery*
[3]*University Hospital Regensburg, Dept. of Anesthesiology*
Research was carried out at University Hospital Regensburg, Germany
Dept. of Anesthesiology and Intensive Care
Kerckhoff Heart and Lung Centre, Benekestr. 2-8, D-61231 Bad Nauheim, Germany

Background

Severe pulmonary and cardiopulmonary failure resistant to critical care treatment leads to hypoxia-dependent organ failure. Extracorporeal life support (ECLS) can be an option but is often not available in outlying facilities. We report on mobile ECLS support and patient transport on ECLS which has been facilitated by the development of miniaturised, hand-held ECLS systems.

Method:

In 2006 we started our ECLS transport program at the University Hospital Regensburg. An ECLS phone hotline was established and requests for ECLS in patients located in outlying medical facilities were handled using a standardised questionnaire providing inclusion and exclusion criterions.

Patients with severe lung failure but preserved cardiocirculatory function were provided with percutaneous veno-venous Extracorporeal Membrane Oxygenation (VV-ECMO). Patients with refractory cardiac-, or cardiocirculatory failure were supported by percutaneous femoro-femoral veno-arterial ECLS (VA-ECLS).

Additional patient transfer was carried out by rescue helicopter or ground ambulance.

Findings:

199 Patients were provided with percutaneous ECLS. VV-ECMO was necessary in 73% of the patients, VA-ECLS was used in 27%. Hospital discharge in VV-ECMO patients was 72% and 55%in VA-ECLS patients.

Conclusion: Patient transport on ECLS is safe and effective. Proper patient selection is crucial and specialised interdisciplinary transport teams are necessary.

1. Arlt M., Philipp A., Zimmermann M.et.al. First experiences with a new miniaturised life support system for mobile percutaneous cardiopulmonary bypass. Resuscitation 2008;77:345-50
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REPORT OF THE PERFUSION DOWNUNDER COLLABORATION

Robert A Baker, *PhD, CCP (Aust).* Richard F Newland, *BSc, CCP (Aust),*
on Behalf of the Perfusion Downunder Collaboration.

Cardiac and Thoracic Surgical Unit, Department of Medicine, Flinders Medical Centre and Flinders University of South Australia, Adelaide, South Australia, Australia.

The perfusion Downunder collaboration is now in its 8th year, and has worked towards meeting the Mission and Vision established following the first Perfusion Downunder Meeting in 2005.

Mission

To foster and grow high quality research in the perfusion sciences by the establishment and maintenance of a prospective data set on cardiac surgical procedures performed in centres throughout Australia and New Zealand.

This will be achieved through the creation of a collaborative network of perfusion and interested researchers, who share the commitment to cooperation and collaboration in the pursuit of excellence in perfusion.

Core Tasks

1. To establish a de-identified data source to be known as the Perfusion Downunder Collaborative Research Database (PDUCRD).
2. To develop relationships with individuals, groups and organisations to enhance their collective knowledge, capabilities and capacity to foster research.
3. To encourage the development of new researchers as well as facilitating the development of research by all members of the Collaboration.

The strength of the collaborative data set will be in its availability to all members that will allow them to utilise the data for appropriate research initiatives.

Vision

PDUC aims to improve patient outcomes through its ability to provide research infrastructure and support to the Australian and New Zealand perfusion community, and by its ability to produce relevant and timely research publications.

The primary outcomes of this quality improvement initiative will be the incidence of RBC transfusion, minimum haemoglobin during CPB, and rate of adherence to institutional transfusion protocols. Secondary outcome measures will include length of postoperative stay, and mortality.

The PDUC continues to strive to find ways to work towards meeting its Mission and Vision.

CANNULATION FOR ECLS PROCEDURES

Alois Philipp *ECCP*, Thomas Mueller *MD*, Matthias Arlt *MD*, Dirk Lunz, *MD* and Christof Schmid *MD.*
University Hospital Regensburg, Germany, Franz Josef Strauss Alle 11, D-93053 Regensburg, Germany

We report on our experience with cannulation for extracorporeal support in patients who are treated with VA-ECMO due to cardiogenic shock or VV-ECMO due to acute pulmonary failure since 2008, analysing prospectively collected data of the Regensburg ECMO Registry. The gold standard for emergency extracorporeal life support in adults, regardless of whether VV-ECMO or VA-ECMO, is percutaneous cannulation with Seldinger technique. There are mainly five different locations for percutaneous cannulation in VV-ECMO. For patients with VA-ECMO, percutaneous access is limited to the femoral artery.

Main Results

Since 2008, 312 patients were treated with VV-ECMO, of which five suffered serious vascular complications. VA-ECMO with percutaneous cannulation was implemented in 192 patients. In this group there were 12 serious complications.

Conclusions

Percutanous cannulation is safe and quick, however: Severe complications happen and the procedure thus requires an experienced team.

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2. Dierk H. Endemann, Alois Philipp, Christian Hengstenberg et. al., "A simple method of vascular access to perform emergency coronary angiography in patients with veno-arterial extracorporeal membrane" Intensiv Care Med. 2011 Dez;37(12):2046-9.

ECHO – WHAT THE PERFUSIONIST NEEDS TO KNOW

Professor Colin Royse
Department of Surgery, The University of Melbourne,
and Cardiac Anaesthetist, the Royal Melbourne Hospital, Melbourne, Victoria, 3050.

Transoesophageal echocardiography (TOE) is now routinely performed as part of the intraoperative management of patients undergoing cardiac surgery. Surface ultrasound such as transthoracic echocardiography is frequently performed as part of the preoperative investigations, and intraoperative hand-held ultrasound used to detect aortic atheroma, or to assist visualisation of complex congenital cardiac lesions. The following information can be very helpful to the Perfusionists:

1. Preoperative: understand left and right ventricular function, presence of aortic regurgitation or left ventricular hypertrophy.
2. Intraoperative-pre-bypass: Understand the functional status of the ventricles, presence of aortic regurgitation and likely success of anterograde cardioplegia, or need for left ventricular venting. Prediction of requirement for mechanical support (e.g. IABP). 3. During bypass: Coronary sinus catheter insertion, and troubleshooting (e.g. Persistent left SVC, PDA or other systemic to PA shunts). Monitoring for distension. Presence or absence of rhythm.
3. Post-bypass: monitor for distension after cross clamp removal, identify abnormal rhythms. During the weaning process, echocardiography is the main monitor for assessing volume and function of the left and right ventricles. In rare cases, a new wall motion abnormalities will be detected which will point to a failed graft. Echocardiography is also used to check valve repair or replacement prior to cessation of CPB. Echocardiography is helpful in de-airing procedures to locate pockets of air (such as anteroapex or interatrial septum). If mechanical devices are required, echocardiography is used to help guide the placement of cannulae or the balloon pump.

NEAR-INFRARED SPECTROSCOPY DURING CARDIOPULMONARY BYPASS

Paul Soeding, *PhD FANZCA*

Cardiopulmonary bypass primarily aims to supply warm oxygenated blood to the circulation with adequate perfusion of each organ bed. Adjustment of flow rate, fluid infusion, or the use vasopressor drugs are common strategies, used to obtain a targeted mean arterial pressure (MAP). Current practice is based on the assumption that by attaining an adequate MAP, usually above 50 mm Hg, perfusion to all regions is ensured. However the adequacy of bypass flow and distribution to specific vascular beds remains unmonitored and clinically, the risk of organ ischaemia exists. In recent years near-infrared spectroscopy (NIRS) has emerged as a valuable tool in assessing cerebral blood flow. This non-invasive technology is based on the specific absorbance patterns of oxygenated and non-oxygenated haemoglobin, to near-infrared light[1]. As cerebral blood flow (CBF) decreases, tissue oxygen extraction will increase to maintain cerebral metabolism with an eventual decrease in haemoglobin saturation (ScO2). In the presence of a stable metabolic rate, ScO2 indirectly measures CBF and provides an "index" of organ ischemia[2]. Further development of real-time cerebral oximetry has been used to monitor cerebral autoregulation, and direct individual MAP management during CPB[3]. In many centres monitoring ScO2 is routine during cardiac surgery, with intervention algorithms formulated[4], and episodes of desaturation associated with adverse outcome[5,6]. Currently the question remains to whether tissue oximetry can monitor other vascular beds, such as the splanchnic circulation, which may be adversely affected during CPB, by both venous cannulation and potentially with administration of vasopressors[7].

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A COMPARISON OF RENAL FUNCTION AFTER CARDIOPULMONARY BYPASS WITH OR WITHOUT PULSATILE FLOW

Bruno Marino, Antoine Schneider, Harvey Sutcliffe, Rinaldo Bellomo,
Austin Hospital, Melbourne, Australia

Background

Acute kidney injury (AKI) is common after cardiopulmonary bypass (CPB). Due to the lack of guidelines it is unknown whether the use of pulsatile flow during CPB is associated with better post-operative kidney function than non-pulsatile flow

Aim

To compare changes in renal function in the first 4 days following cardiac surgery with CPB in patients treated with pulsatile vs. non pulsatile flow

Methods

We conducted a retrospective observational study of patients treated with pulsatile or non-pulsatile flow according to perfusionist preference. We obtained demographic data and post-operative renal functional data. We classified patients as having AKI using the RIFLE creatinine criteria

Results

Of 974 patients, 420 received non-pulsatile and 554 received pulsatile flow. Patients were similar for gender (73% vs. 70.6% males), age (65.5 vs 65.2 years), and baseline creatinine (95 vs.104 mcmol/L) but non-pulsatile flow patients had longer CPB duration by 6 minutes (119 vs. 113; p=0.03).Using consensus criteria, however, non-pulsatile flow patients were significantly more likely to develop AKI on day 3 (p=0.01) and on day 4 (p=0.03).

Conclusions

The use of pulsatile flow was associated with a significant decreased in the incidence of AKI in the first 3 and 4 days after cardiac surgery. These observations justify the conduct of randomized controlled trials of pulsatile CPB.

REDUCED EMBOLIC LOAD DURING CLINICAL CARDIOPULMONARY BYPASS USING A 20 MICRON ARTERIAL FILTER

Ghazwan N S Jabur, *MSc, CCP (Aust)* [§], Timothy W Willcox, *CCP (Aust)* [§¥], Shuja H Zahidani *MSc, CCP (Aust)* [§], Karishma Sidhu, *MSc*[§], Simon J Mitchell, *PhD, FANZCA*[¥§]

§Green Lane Clinical Perfusion, Auckland City Hospital, Auckland New Zealand
¥Department of Anesthesiology, Faculty of Medical and Health Sciences, University of Auckland, Auckland, New Zealand.

Objective

To compare the efficiency of 20 and 40 µm arterial line filters during cardiopulmonary bypass for removal of emboli from the extracorporeal circuit.

Methods

Twenty four adult patients undergoing surgery were perfused using a cardiopulmonary bypass circuit containing either a 20 µm or 40 µm arterial filter (n = 12 in both groups). The Emboli Detection and Classification system was used to count emboli upstream and downstream of the filter throughout cardiopulmonary bypass. The mean proportion emboli removed by the filter was compared between groups.

Results

The 20 µm filter removed a significantly greater proportion of these incoming emboli (0.621) than the 40 µm filter (0.334) (p = 0.029). The superiority of the 20 µm filter persisted across all size groups of emboli larger than the pore size of the 40 µm filter.

Conclusion

The 20 µm filter removed substantially more emboli than the 40 µm filter during cardiopulmonary bypass in this comparison.

AIR TRANSMISSION COMPARISON OF THE AFFINITY FUSION OXYGENATOR WITH INTEGRATED ARTERIAL FILTER TO THE AFFINITY NT OXYGENATOR WITH SEPARATED ARTERIAL FILTER–AN IN-VITRO STUDY

Kieron C. Potger, Darryl McMillan, Melissa Donnellan
Perfusion and Autotransfusion Unit, Dept. of Anaesthesia & Pain Management, Royal North Shore Hospital, Sydney, Australia

Background

A significant source of microemboli during cardiac surgery is the extracorporeal circuit (ECC). Arterial filters inserted in the ECC may minimise cerebral injury by capturing particulate matter and microbubbles. We clinically use the Affinity NT oxygenator with an Affinity arterial filter attached ('Affinity system'). The new Affinity Fusion oxygenator ('Fusion') incorporates an integrated arterial filter. We wanted to determine if the Fusion was as safe as the Affinity system in terms of relative microbubble transmission of introduced air.

Methods

A recirculating in-vitro circuit was used to compare the two oxygenator-arterial filter systems (Fusion; Affinity system). Microbubbles were detected in the outflow line of the oxygenator-arterial filter. Measurements were taken during the first and third minutes after the commencement of bolusing 50 mls air or infusing 20 ml/min air while altering pump flow rates (3L/min; 5 L/min).

Results

Microbubble volume transmitted by the Fusion was less than the Affinity system at both pump flow rates whether during air bolus or air infusion. The Fusion cleared its air challenge at a greater rate than the Affinity system. Median bubble size transmitted by the Fusion oxygenator was consistently smaller than that of the Affinity system.

Conclusions

Under the parameters of this in-vitro study, the Affinity Fusion oxygenator with integrated arterial filter is as safe as the Affinity NT oxygenator with separated arterial filter in terms of microbubble handling. However, more research is needed to confirm this study's findings and generalisability to the clinical environment.

CHALLENGES IN THE MANAGEMENT OF VA ECMO IN PATIENTS WITH COMPROMISED LUNG FUNCTION: WHAT IS THE IMPACT OF THE EJECTED BLOOD?

Alexander Guecheff

Summary

Extracorporeal membrane oxygenation can provide effective mechanical circulatory and respiratory support for failing circulation and / or respiratory function. The blood flow from the native pathway (the ejected blood) could present additional challenges for the extracorporeal membrane oxygenation cannulation, support and management, and the impact on the coronary and cerebral perfusion. How well we assess, manage and estimate the effect of this impact.

ECLS DURING PCI AND TAVI PROCEDURES

Matthias Arlt[1] *MD*, Alois Philipp[2] *ECCP*, Bernhard M. Graf[3] *MD, PhD*, Christof Schmid[2] *MD, PhD*, Christian Hengstenberg[4] *MD, PhD* and Michael Hilker[2] *MD, PhD*

[1]Kerckhoff Heart and Lung Centre, Dept. of Anesthesiology and Intensive Care
[2]University Hospital Regensburg, Dept. of Cardiothoracic Surgery
[3]University Hospital Regensburg, Dept. of Anesthesiology
[4]German Heart Centre Munich, Dept. of Cardiology, Germany
Research was carried out at University Hospital Regensburg, Germany
Dept. of Anesthesiology and Intensive Care
Kerckhoff Heart and Lung Centre, 1Benekestr. 2-8, D-61231 Bad Nauheim, Germany

Background

Cardiocirculatory arrest during percutaneous coronary interventions (PCI) or transcatheter aortic valve implantation (TAVI) requires mechanical cardio-pulmonary resuscitation (CPR) to restore spontaneous circulation. Mechanical CPR leads to interruption of the procedure and can compromise the success of the intervention. Extracorporeal life support (ECLS) can replace mechanical chest compression during CPR and therefore be highly effective.

Method

Patients with refractory cardiocirculatory arrest during PCI and TAVI procedures where treated with percutaneous femoro-femoral ECLS using two different types of miniaturized ECLS systems. Both systems can be hand-held and act independently from wall connection points for oxygen and power supply.

Findings

Between 2006 and 2011 we treated 14 patients with percutaneous ECLS during PCI (n=10) and TAVI (n=4) procedures. On ECLS, beating heart circulation could be restored in all patients, mechanical chest compression was not necessary. The interventional procedures could be successfully completed in all PCI and two TAVI patients. Two TAVI patients were bridged on ECLS to surgical aortic valve replacement. In total, hospital survival rate was 50%.

Conclusion

The use of miniaturized, hand-held ECLS systems enables extra-corporeal resuscitation support (E-CPR) easily and rapidly in PCI and TAVI patients. Blood flow and gas exchange can be restored effectively without disturbance by mechanical chest compression. However, severe vessel damage limits the use of miniaturized closed-loop ECLS systems.

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ASIA PACIFIC ELSO AND THE RED BOOK

A/Prof Graeme MacLaren
National University Heart Centre, Singapore

APELSO

Following the formation of a European Chapter of ELSO in 2012, a group of individuals in the Asia-Pacific region decided to create a comparable chapter in the Far East and Oceania. With the support of the then Chair of ELSO, the Chapter was formed and had its inaugural meeting in Beijing in October, 2013. A summary of the Chapter's achievements, structure, vision, and goals will be highlighted.

Red Book

In 2012, the fourth edition of the 'Red Book' was published. This text is generally regarded as the standard text of ECMO and is published periodically by ELSO. The speaker had the privilege of being invited as a senior editor for the fourth edition. The structure, content and contributors to the book will be discussed, alongside ELSOs larger vision for the global dissemination of ECMO.

THE CATHETER LAB AND THE CHANGING FACE OF CARDIAC SURGERY

Dr. Lucas J. Eastaugh
The Royal Children's Hospital Melbourne, Department of Cardiology, Flemington Road, Parkville VICTORIA 3052

Background

The role of cardiac catheterisation in the management of patients with congenital heart disease has significantly changed since the first cardiac catheterisation procedure was performed in 1929. The modern paediatric interventional laboratory is required to manage patients with complex forms of structural heart disease from small newborn infants to large adults. Increasingly, more complicated and higher risk transcatheter procedures are being performed. With more complex procedures comes an increased reliance upon our surgical and perfusion colleagues to be aware of the types of invasive procedures being performed, the risks and possible complications, as well as an understanding of the issues related to working in a cardiac catheterisation laboratory. MRI and radiation safety, the ergonomics and setup of the catheterisation laboratory are but a few of the challenges facing modern-day cardiac surgeons and perfusionist's.

Aims/Objectives

The aim of this review is to examine the evolving role of the interventional cardiologist, cardiothoracic surgeon and cardiac perfusionist in the so-called "hybrid" approach to managing congenital heart disease.

Methods

A review current literature and of our departmental database was performed to identify the types of procedures and scenarios, which may require cardiothoracic surgical and bypass support.

Findings/Conclusions

Collaboration between cardiologist, surgeon and perfusionist requires careful co-ordination and understanding of the issues related to the types of procedures performed in the modern cardiac catheterisation laboratory. With the increasing complexity of procedures performed, this relationship will continue to evolve and require a greater understanding of the unique roles performed by each member of the team.

THE LOOMING PLAGUE OF ADULT CONGENITAL HEART SURGERY PATIENTS

A/Pr Yves d'Udekem
Royal Children's Hospital, Melbourne

Today there are more adults with congenital heart disease (most of them operated) than children with an estimate of 30 000 in Australia. But we should not be deluded in believing that they are cured. Heart failure and sudden death are frequently encountered in this patient population.

The manifestations of heart failure are different in congenital patients. They tend to be asymptomatic, to be at higher risk of death once symptomatic, and to often suffer from arrhythmias.

Heart failure in congenital patients is mainly a disease of the right ventricle. Patients with right ventricle assuming the systemic circulation may fail and repaired tetralogy of Fallot may come at any stage with dilated right ventricular cavities.

There are today in Australia more than 1000 patients with a single ventricle who have survived the Fontan procedure, the last of a series of procedure. After the Fontan the systemic veins are connected directly to the pulmonary arteries, bypassing the heart. It has become clear that this population is undergoing a steady growth and will double within 15 years. The Australia and New Zealand Fontan Registry has now demonstrated that the majority of these patients may hope to survive 3 decades after Fontan surgery. But they are functioning close to their maximal reserve capacity and may fail abruptly. We know today that we will not have enough donor organs to transplant those who fail. What will we do to provide them with a fulfilling adult life?

IMPROVING OUTCOMES FROM ADULT VENOARTERIAL ECMO

A/Prof Graeme MacLaren
National University Heart Centre, Singapore

Venoarterial ECMO is regarded as a standard of care in adult cardiogenic shock refractory to conventional therapy. However, at least 50% of patients treated with ECMO for this indication do not survive. A number of recent advances may change this. The talk will focus on a number of key areas which may improve outcomes: patient selection, team training, medical management, anticipating complications, and bridging strategies.

RISK FACTORS FOR ANTICOAGULATION RELATED COMPLICATIONS ON PAEDIATRIC EXTRACORPOREAL LIFE SUPPORT: A SINGLE INSTITUTION EXPERIENCE

Christian Stocker *MD FCICM*, Emma Haisz, Paul Holmes, Molly Olden, Sylvio Provenzano, Andreas Schibler
Queensland Paediatric ECLS Service, Mater Children's Hospital, Raymond Tce, South Brisbane Qld 4101, Australia

Background

ECLS providers have learnt to circulate, oxygenate, and ventilate blood outside the body, but its biological domestication remains a problem.

Objectives

To describe institutional rates of bleeding/clotting complications during paediatric Extracorporeal Life Support (ECLS), benchmark against international experience, and identify potential risk factors.

Methods

Case-control study from 2008 through 2012. Data on potential predictors within 6 hours prior to a complication event, and event times from initiation of ECLS were recorded. Matching in event time, virtual events were created from patients with complication-free runs. Potential risk factors were examined for any association with bleeding/clotting complications.

Findings

44 clotting events were observed in 17, 20 bleeding events in 14 runs. The Extracorporeal Life Support Organisation (ELSO) database reveals increasing bleeding/clotting complication rates. Our complication rate is declining, but runs and deaths with reported complications match ELSO's. In 'bleeders', compared to controls, there were significantly more post-cardiac-surgical patients, longer activated partial thromboplastin times (aPTT), lower maximal amplitudes (heparinised thromboelastography, TEG), more fluid and blood products infused, higher flows and more frequent use of dialysis on pump. In 'clotters', the aPTTs and anti-FactorXa-activity were shorter/lower, more platelets and antifibrinolytics administered, ultrafiltrate volumes higher with dialysis also more frequently used.

Conclusion

Problems with anticoagulation and its complications on paediatric ECLS are global. In our institution, recommended ACT based anticoagulation management does not work, while aPTT, anti-FactorXa-activity, and selected TEG features may do. Care should be taken with administration of fluid and blood products, while ultradiafiltration makes anticoagulation harder to manage.

NEURO MONITORING – BEYOND THE EEG

Philip M. Lewis
Dept of Neurosurgery, Alfred Hospital, Melbourne.

Techniques for monitoring the brain have moved well beyond the classical electroencephalogram, to include the monitoring of brain pressures, blood flow and metabolism. Invasive techniques permit the direct monitoring of tissue oxygenation, focal blood flow, pressure and cerebral metabolites, which have important applications in the Neuro- intensive care setting. Noninvasive tools for neuromonitoring are performing an increasingly essential role in cardiothoracic surgery, driven by the need to ensure adequate cerebral oxygenation during procedures requiring selective cerebral perfusion.

This talk will give an overview of techniques for haemodynamic and metabolic neuromonitoring, with a focus on noninvasive techniques and their application in cardiovascular perfusion.

ROTEM 2013 – WHERE ARE WE AT?

Dr Ian Smith *MBBS FANZCA PGdip Periop Echo*
Department of Anaesthesia and Pain Management, Royal Children's Hospital Melbourne, 50 Flemmington Rd, Parkville 3052, Melbourne, VIC, Australia

Measurement of the in-vitro thromboelastographic properties of whole blood by ROTEM can provide qualitative and quantitative assessment of the intrinsic, extrinsic and common pathways. In addition, it provides information on heparin activity and the degree of activation of the fibrinolytic pathway. Its ability to provide rapid point-of-care data makes it a useful tool in the assessment of the in-vitro integrity of the coagulation system. It has the potential to guide clinicians in the choice of factor replacement for the specific coagulopathic conditions identified thereby reducing unnecessary patient exposure to blood products.

The objectives of this presentation are to provide:

1. An overview of the TEG and the ROTEM to look at the parameters measured, their similarities and differences.
2. Analysis of the correlation of ROTEM parameters with respect to the TEG and standard laboratory coagulation data.
3. A review of outcome data where ROTEM data has been used to guide therapy.
4. An opinion of where we are in 2013 in Australasia with regards to the use of the ROTEM and offer an alternate strategy.
5. A glimpse into the future of the 'third generation' machine being developed here in Melbourne.

The role of ROTEM within Australasia has yet to be defined. Reference ranges will need to be completed for the local populations. Within the context of paediatric cardiac surgery these will need to have appropriate age cohorts. Clear strategic guidelines need to be developed in conjunction with sound clinical trials to validate the utility of ROTEM guided factor replacement in the Australian population before its widespread adoption should occur.

A COMPARISON STUDY OF HAEMOLYSIS PRODUCTION IN THREE CONTEMPORARY CENTRIFUGAL PUMPS

Stephen Bottrell[1], Martin Bennett[1], Simon Augustin[1], Clarke Thuys[1], Brad Schultz[1], Alison Horton[1], Stephen Horton[1,2].
[1.] *Perfusion Department, Royal Children's Hospital, Victoria, Australia*
[2.] *Department of Paediatrics, Melbourne University, Australia*

One challenge in providing extracorporeal circulation is to supply optimal flow while minimising adverse affects, such as haemolysis. To determine if recent generation centrifugal pumps with their inherent design improvements would lead to reduced cell trauma we undertook a study comparing three devices. Utilizing a simulated short term ventricular assist circuit primed with whole human blood, we examined changes in plasma free haemoglobin values over a six day period. The three pumps investigated were the Maquet Rotaflow, Levitronix PediVAS and the Medos Deltastream DP3. This study demonstrated that all three pumps produced low levels of haemolysis and are suitable to be used in a clinical environment. The Levitronix PediVAS was significantly less haemolytic than either the Rotaflow ($p < 0.05$) or the DP3 ($p < 0.05$). There was no significant difference in plasma free haemoglobin between the Rotaflow and DP3 ($p = 0.71$).

THE ANZCP REGULATIONS AND STANDARDS CONCERNING CLINICAL PRACTICE – A SURVEY

Kuljeet Farrar *B.Sc CCP*
Flinders Medical Centre, Flinders Drive, Bedford Park, South Australia, 5042, Australia.

The science of Perfusion has come a long way since the first successful use of a heart-lung bypass machine in 1953 by Gibbon. In that time there has been meteoric advances in both equipment and the practice of Perfusion.

Our current ANZCP Regulations and Standards concerning Clinical Practice were last reviewed in 2009. In the four year interim gap, are all these guidelines still relevant to our current practices or have some become obsolete?

To evaluate the currency of our standards a survey of several Cardiac-Thoracic Units in Australia and New Zealand is being undertaken. A questionnaire has been sent to each of these units to be completed by a senior Perfusion staff member.

Questions were designed to evaluate each regulation and give opportunity for feedback, for example:

Regulation 9.2.6. "Safety glasses and protective gloves should be worn by all personnel involved in cardiopulmonary bypass who might be at risk of contact with blood or blood products."

Do the Perfusionist in your unit routinely wear safety glasses whilst the patient is on cardiopulmonary bypass (CPB)?

Yes, all; Yes, some; No

Comments

Do the Perfusionist in your unit routinely wear gloves whilst the patient is on cardiopulmonary bypass (CPB)?

Yes, all; Yes, some; No

The final results of the survey will be discussed.

ECMO SIMULATION: RPH EXPERIENCE

Viji Vincent, Brian Wright, Chris Allen and Luke Dix,
Royal Perth Hospital, Western Australia.

Royal Perth Hospital (RPH) has supported 43 patients on Extracorporeal Membrane Oxygenation (ECMO) since 2005 (63% survival rate) with a total ECMO run of 367 days, the longest being 48 days.

ECMO is a classic low-volume, high-risk procedure. RPH averages 5 ECMOs per year. We have 4 Clinical Perfusionists and around 40 ECMO trained specialist nurses. We conduct in-house training: 2-day ECMO Foundation course bi-annually and an ECMO Refresher Course once a month. The ECMO simulation training was considered to be an integral component in delivering the curriculum, incorporating in-situ simulation modules to train multidisciplinary health care professionals involved in the management of ECMO patients. The recent purchase of our Orpheus Simulator has proved invaluable in the application of these simulation programs.

Mechanical emergencies on ECMO have an associated mortality of 25%.1 Clinical simulation facilitates the practice of emergency procedures, putting guidelines and algorithms into action in a real-time 'realistic' environment which is safe for both the 'patient' and the learner.2 On the day of simulation, teams were grouped in a similar pattern to that used routinely in ICU. A one-day course was conducted involving pre-course self-directed evaluations, 2 lectures and 4 simulation-scenarios.

So far 4 simulation courses have been completed and 2 more are scheduled in September. Pre and post course personal evaluation surveys have showed that the course greatly benefits the candidate and improves confidence within their abilities and as such provides an excellent training program.

References

1. Simulating Extracorporeal Membrane Oxygenation Emergencies to improve human performance. Part I: Methodologic and Technologic Innovations, Anderson JM, Murphy AA, et al. Simulation in Healthcare 2006; 1: 220-227.
2. Critical events simulation for neonatal and paediatric extracorporeal membrane oxygenation, GR Nimmo, G Wylie, J Scarth, J Simpson, E Gracie, I Torrance, M Liddell, C Davies, Volume 9, Number 1, April 2008 JICS

REPORT OF THE INTERNATIONAL CONSORTIUM FOR EVIDENCE-BASED PERFUSION

Robert A. Baker, *PhD, CCP (Aus), Cardiac Surgery Research and Perfusion,*
Flinders University and Flinders Medical Centre, Adelaide, Australia, for the International Consortium for Evidence-Based Perfusion

The International Consortium for Evidence-Based Perfusion (ICEBP) has been working towards supporting its Mission and Vision.

Mission

The ICEBP is a partnership and collaboration between perfusion societies, medical societies, clinicians and industry to improve continuously the delivery of care and outcomes for our patients.

Vision of the ICEBP

To achieve this mission, we will:

1. Develop and support perfusion registries to evaluate clinical practices.
2. Develop and publish evidence based guidelines, and support their integration into clinical practice.
3. Identify gaps in the medical literature and empower investigation into areas where evidence is lacking.
4. Identify gaps between current and evidence-based clinical practice to promote the improvement in patient care.

We are now in a situation where we can report the following progress:

1. Development of a Perfusion Registry (PerFORM) which currently has over 23 sites contributing perfusion data.
2. Revision of the Essentials and Guidelines of the American Society of Extracorporeal Technology.
3. Participation in the Perfusion Task Force established by the Society of Thoracic Surgeons (STS) and Society of Cardiovascular Anesthesia (SCVA) which is developing Clinical Practice Guidelines in Cardiopulmonary Bypass.

We are now in a situation where we can report the following progress on two of these topics: Temperature Management and Attenuating the Systemic Inflammatory Response.

SUCCESSFUL USE OF PRE- AND POST-OPERATIVE ECMO FOR PULMONARY THROMBOENDARTERECTOMY, MITRAL VALVE REPLACEMENT AND MYOMECTOMY IN A PATIENT WITH CHRONIC THROMBOEMBOLIC PULMONARY HYPERTENSION AND HYPERTROPHIC CARDIOMYOPATHY

Williams, L., Thomson, B., Kermeen, F., Ziegenfuss, M., Bull, T., Fraser, J., McDonald, C. and Mullany, D.
Critical Care Research Group, The Prince Charles Hospital, Chermside, Queensland

Background

Pulmonary thromboendarterectomy (PTE) is a complex surgical procedure used to treat chronic thromboembolic pulmonary hypertension. The endarterectomy is aimed at producing an immediate reduction in pulmonary artery pressure, improved cardiac output and gas exchange. Occasionally patients are unable to be weaned from CPB due to a residual high PVR despite a successful endarterectomy. There are a few published reports of ECMO being successfully used in isolated PTE to allow lung recovery post surgery. We report a case that has not previously been described in the literature where ECMO was used pre and post surgery in a patient with chronic thromboemolic pulmonary hypertension, hypertrophic cardiomyopathy and mitral regurgitation.

Case report

A 35 year old man with multifactorial NYHA class IV dyspnoea was referred for consideration of PTE. Relevant medical history included significant HOCM, moderate to severe mitral regurgitation, grade II diastolic dysfunction, chronic renal failure and obstructive sleep apnoea. The pre-operative pulmonary angiogram showed multiple segmental pulmonary defects consistent with chronic thrombo-embolic disease out of proportion to measured pulmonary vascular resistance.

The patient deteriorated pre-operatively with worsening gas exchange and diffuse infiltrates on chest X-ray. Medical options were limited and supportive central VA ECMO commenced as a bridge to surgery at which time the patient underwent thromboendarterectomy, mechanical mitral valve replacement and septal myomectomy. Cardiopulmonary bypass time was 514 mins, 61 mins of deep hypothermic circulatory arrest and total aortic clamp time 265 mins. In theatre severe pulmonary reperfusion injury and biventricular myocardial dysfunction occurred and central VA ECMO was re-established. Patient was transitioned to femoral VV ECMO at post-op day 5. Post-operative ECMO duration was 25 days, mechanical ventilation was 53 days and a total of 56 days in ICU. Other notable complications included line sepsis, ARDS, HITTS, bilateral lower limb ischemia and acute on chronic renal failure requiring renal replacement therapy. The patient was discharged to rehabilitation on day 63 with renal function returned to baseline levels.

Conclusion

The indications for the successful use of ECMO have broadened considerably since its first use in 1976. Technological advances together with improved patient care, better nutrition and understanding of the effects of prolonged extracorporeal circulation have allowed high risk patients, previously contraindicated for ECMO, to have successful outcomes. This case highlights the importance of a multi-disciplinary approach and the possibility of bridging patients with reversible life threatening pulmonary hypertension to surgery using ECMO.

CUSTODIAL IS A SAFE ALTERNATIVE TO BLOOD CARDIOPLEGIA IN MAJOR AORTIC SURGERY

Nisal K. Perera, *MBBS*[1], Sean D. Galvin, *FRACS*[1], Bruno Marino, *CCP*[2], Frank Liskaser, *FANZCA*[2], Peter McCall, *FANZCA*[2], Rinaldo Bellomo, *FCICM*[3], Siven Seevenayagam, *FRACS*[1] and George Matalanis, *FRACS*[1].
Departments of Cardiac Surgery[1], Perfusion[2] and Intensive Care[3], Austin Hospital, Heidelberg, Victoria, Australia

Introduction

Single dose cardioplegia has many potential advantages in complex aortic procedures. Since 2008 we have selectively used Bretschneider histidine–tryptophan–ketoglutarate (HTK) crystalloid solution (Custodiol) and it is now our preferred method of myocardial protection in complex aortic surgery.

Methods

Patients undergoing major open aortic surgery at a single center, during a 13-year period (June 2001 – March 2013) were identified from a prospectively collected database. Pre-, intra- and postoperative characteristics were examined. Patients receiving standard blood cardioplegia (BC) were compared to those receiving custodial cardioplegia (CC).

Results

Three hundred and twenty one patients had major open aortic procedures performed at a single institution. Status was urgent in 44 (14%); Emergency in 76 (24%) and Salvage in 8 (3%) patients. Eighty-nine (28%) patients had acute aortic dissections. BC was used in 221 (68%) and CC in 100 (32%) patients. Pre-operative characteristics were similar in the two groups. Post-operative outcomes (Table 1) were similar but there was reduced RBC transfusion (BC:2.77 +/- 1.72 vs CC 1.77 +/- 1.87 units; p<0.001); reduced return to theatre for bleeding (BC: 27% vs CC: 12%; p=0.004) and a trend to a reduced in-hospital mortality (BC:13% vs CC:6%; p=0.08) with the use of custodial cardioplegia.

Discussion

The custodial group is a contemporary surgical cohort (2008 - 2013) and improved outcomes may be due to changes in surgical technique over time. Single dose Custodial Cardioplegia is a convenient and simple method of myocardial protection in major elective and emergent aortic surgery. It is comparable in safety to standard blood cardioplegia.

Tabel 1

Variable	BC (n=221)	CC (n=100)	P-value
Surgery Aortic Aortic + CABG Aortic + Valve Aortic + Valve + CABG	 48 (22%) 6 (3%) 125 (56%) 42 (19%)	 25 (25%) 3 (3%) 62 (62%) 10 (10%)	
AV Procedure None Repair Resuspension Replacement David Bentall Ross	 54 (24%) 2 (1%) 12 (5%) 74 (34%) 43 (20%) 36 (16%) 0 (0%)	 28 (28%) 6 (6%) 8 (8%) 9 (9%) 26 (26%) 21 (21%) 2 (2%)	
Cross Clamp (minutes)	170.5 (123.5-223.5)*	174.5(133-206)*	0.899
Bypass (minutes)	245 (198-309)*	254 (200.5-325.5)*	0.957
IABP	12 (5%)	3 (3%)	0.407
Ventricular Assist Device	8 (4%)	4 (4%)	4 (4%) 0.868
Length of stay (days)	9 (7-15)*	8.5(7-16)*	0.555
ICU Stay (hours)	44(22-111)*	42(21-93)*	0.636
Ventilation Time (hours)	15(10-41.5)*	11(8-23)*	0.956
Tracheostomy	24 (11%)	9 (9%)	0.460
Return to theatre	60 (27%)	12 (12%)	0.004
Periop MI	11 (5%)	1 (1%)	0.113
New Arrythmia	81 (37%)	30 (30%)	0.240
Permanent CVA	21 (10%)	4 (4%)	0.103
Transient CVA	2 (1%)	3 (3%)	0.174
CVVH	32 (14%)	10 (10%)	0.301
Inotropes >4hours	111 (50%)	62 (62%)	0.104
Limb ischemia	7 (3%)	2 (2%)	0.631
GIT Complication	17 (8%)	6 (6%)	0.604
RBC Units	2.77±1.72^	1.77±1.87^	<0.001
Non RBC Units	0 (0-15)*	7 (1-15)*	0.988
Hospital Mortality	28 (13%)	6 (6%)	0.080
Redo Aortic Surgery	9 (4%)	4 (4%)	

*Median (Interquartile range), ^Mean±Standard Deviation

PERFUSION IN THE 21ST CENTURY – A GERMAN PERFUSIONIST PERSPECTIVE

Alois Philipp *ECCP* and Christoph Benk* *ECCP, Dipl.Ing.*
University Hospital Regensburg, University Hospital Freiburg, Germany, Franz Josef Strauss Allee 11, D-93053 Regensburg, Germany

Germany has a population of 82.2 million people. The first successful extracorporeal circulation was conducted on 18 February 1958 by Zenker in Marburg, Germany. In its earliest days, implementation of the heart-lung machine was performed by surgeons. In the last decade, 95.000-100.000 cardiac surgeries with support from extracorporeal circulation are performed yearly. In addition, we have around 2000 ECMO treatments per year.

Today there are 82 cardiac centers working in Germany. There are 500 active Perfusionists, of which 30% have a close within medical engineering. Basically, there is no statutory provision for the activity of Perfusionists. However, in most institutions, ECCP as a minimum level of education is requested for Perfusionists in Germany. 85% of Perfusionists are organized in the German Society of Perfusionists.

Currently, there is no increasing need for Perfusionists in their classic field of cardiac surgery. However, increasing demands in fields outside cardiac surgery open up new opportunities for Perfusionists, such as specializations within ECMO support, medical engineering or technological electrophysiology.

Future Perfusionists will increasingly be assigned to new tasks beyond the implementation of extracorporeal circulation, which originally was their field of work.

'TO PREWARM, OR NOT TO PREWARM?' THAT IS THE QUESTION!

Rona Steel and Adam Hastings
Westmead Public Hospital, Hawkesbury Rd, Westmead, NSW, 2145.

Complications of intraoperative hypothermia have been well documented to increase mortality and morbidity (1) (2). After an audit on ICU arrival temperatures for 88 consecutive cardiac bypass patients at our institution, we were concerned to discover that 80% of our patients arrived in ICU with a nasopharyngeal (NP) temperature <36°C. After analysing the data, testing for many possible causes, the only factor with even slight significance was the patient's NP temperature at the commencement of bypass. 67% of our patients commenced bypass with a NP temperature <35°C.

In a subsequent audit we documented the ICU arrival temperature of 35 patients that had been prewarmed with a forced-air warmer prior to bypass and had a fluid warmer post bypass. These patients arrived in ICU much warmer, with 55% arriving ≥36°C for all comers including DHCA. A possible mechanism to explain this observation might be that their thermoregulatory vasoconstriction is reduced, especially in patients between 34-35°C(3). Thus, we can better manage their temperatures on bypass and rewarm them more uniformly.

In conclusion, there appears to be an association between prebypass patient temperature with the use of fluid warmers post bypass and ICU arrival temperatures. The more normothermic the prebypass temperature, the more normothermic ICU arrival temperature and thus improved patient outcomes.

References

1. Sessler,D.I(2001). Complications and Treatment of Mild Hypothermia. Anaesthesiology 95:531-43
2. Kirkbride,D.A. Buggy,D.J(2003). Thermoregulation and Mild Perioperative Hypothermia. British Journal of Anaesthesia 3(1)24-28.
3. Sessler,D.I(2000). Perioperative Heat Balance. Anaesthesiology 92:578-96

CAN DONATION AFTER CARDIAC DEATH ADDRESS THE INCREASING DEMAND FOR DONOR HEARTS?

Mr Joshua Byrne *MSc (Cardiovascular Perfusion) CCP, F.L. Rosenfeldt*, R.F.Salamonsen, *R. Ou, D.S. Esmore*
The Alfred, Commercial Rd, Melbourne, Victoria, 3004

Heart/Lung transplant recipients are traditionally transplanted with organs from a brain dead donor, where native circulation continues in the absence of any brain stem function. Globally, the demand for transplant organs has out grown supply, particularly in Australia which has some of the lowest donation rates in the world of 15.6 donors per million population. Increase in demand for organs, has led the medical profession to find a new avenue for organ donation. In the past decade, transplant centres have turned to donation after cardiac death (cessation of the native circulation) to address the organ supply/demand shortfall. Transplantation using DCD donor organs has been very successful in both renal and lung transplantation patients. Recently there has been a renewed interest in the possibility of cardiac transplantation from DCD donors. The question is can the DCD heart be re animated and successfully used in cardiac transplantation.

A canine model was used to examine the viability of DCD hearts in cardiac transplantation. Using a DCD protocol 12 dogs were euthanized, 4 were assigned to traditional cold storage preservation (4°C), 8 to continuous reinfusion of cold crystalloid myocardial preservation solution for a period of 4 hours. A further 12 dogs were euthanized and received the preserved DCD hearts. Myocardial function and metabolites were measured for a period of 4 hours post-transplant.

It was shown that DCD hearts that underwent continuous cold crystalloid preservation had superior right and left ventricular function post heart transplant when compared to traditional preservation methods.

CEREBRAL OXIMETRY: EVALUATION OF PERFUSION INTERVENTIONS DURING BYPASS

Jessica Ozdirik & Andrew Lahanas
Department of Clinical Perfusion, Prince of Wales Hospital, Level 3, Campus Building, Barker Street, Randwick, NSW 2031, Australia

Near-Infrared Spectroscopy (NIRS) is a non-invasive method frequently used for evaluating and optimising cerebral oxygenation during cardiac surgery. The regional oxygen saturation (rSO2%) within the microvasculature of the frontal cortex is an indication of the adequacy of perfusion to the brain and permits the Perfusionist to respond to desaturations with rapid interventions. Our objective was to evaluate the need for NIRS during routine coronary artery bypass graft (CABG) surgery by applying NIRS to 44 patients by collecting data during cardiopulmonary bypass (CPB), assessing the efficacy of specific interventions previously reported to augment rSO2%. There were 20 (45.5%) patients that required an intervention to be made in an attempt to raise their rSO2 above the minimum recommended threshold of 60%, 17 (85%) of which were successfully treated with at least one intervention. All interventions were found to have a positive effect on cerebral oxygenation; however, there was no single intervention found to be superior to another, with an average increase in rSO2of 2%. Of the 17 patients successfully treated, an average of 2.5 interventions were required, demonstrating that multiple actions on perfusion parameters were necessary to return rSO2 levels within normal limits. When compared to the intervention-responders, the non-responders had a higher mean age (81 vs. 66 years, $p = 0.019$) and lower baseline rSO2 values (64% vs. 81%, $p = 0.002$), although the minimum rSO2 values on CPB were not significantly different. The non-responders displayed lower average baselines with a higher average age and lower preoperative haematocrit (HCT). In conclusion, the use of NIRS in routine CABGs has demonstrated to be beneficial in diagnosing perioperative cerebral desaturations, often requiring multiple interventions to treat successfully.

QUALITY INDICATORS TO MONITOR AND IMPROVE PERFUSION PRACTICE OUTCOMES

Vijaykumar N Valiyapurayil, Annette Mazzone, Kuljeet Farrar, Richard Newland, Robert Baker
Flinders Medical Centre, Adelaide, SA

The electronic perfusion record is an important part of the clinical documentation, and as such is a legal record; in addition it's a source of data for quality assurance and scientific investigation.

At Flinders we have developed a process by which data from the electronic perfusion record is analysed and processed in a Microsoft Access database following a CPB procedure. Data from the blood gas analyzer, anesthetic machine and other peripheral devices can be integrated into the perfusion record. The processing is designed to transfer the collected data to a research database, to facilitate the creation of CPB quality indicators (QI).

QI for blood gas management, arterial outlet temperature, arterial pressure, hematocrit, blood glucose levels are strictly monitored. A Perfusion Quality Report is generated after every case and emailed automatically by the system to the concerned Perfusionist, the Chief Perfusionist & the Operating Surgeon; if any of the parameters are not within the range of predetermined values.

The QI reports are periodically analyzed and plotted for both the individual Perfusionist as well as for the whole perfusion team, for institutional standardization & improvement of perfusion practice. We conduct regular QI meetings among Perfusionists and the issues of practice are discussed. Automated generation of QI has resulted in improved adherence to process of care guidelines, highlighting the potential of electronic data collection for improving quality of perfusion.

At our recent QI meetings variation in practice in relation to the first ACT at commencement of bypass, pCO2 < 35mm of Hg, mean pressure < 40 mm of Hg for more than 5 minutes, arterial outlet temperatures etc. were noted in addition to variation in practice. Practice variations after extended leave were also noted.

Improvement plans including change in practice and protocols were initiated.

CALENDAR *of* EVENTS

MAY 2014

22-24
International Course on ECMO and EuroELSO
Hotel Pullman Montparnasse
Paris, France
http://www.paris-euroelso2014.com

28-31
10th International Conference Pediatric Mechanical Circulatory Support System and Pediatric Cardiopulmonary Perfusion
Hall of Flags, University of Pennsylvania
Philadelphia, Pennsylvania,
http://www.pennstatehershey.org/web/pedscpb/home

JUNE 2014

18-21
ASAIO 60th Annual Conference
Washington Hilton
Washington, DC
https://www.asaio.com/annual-conference/60th-conference-2014/

AUGUST 2014

6-9
10th Perfusion Down Under Winter Meeting
The Heritage
Queenstown, New Zealand
http://www.perfusiondownunder.com

SEPTEMBER 2014

15-18
25th Annual ELSO Meeting in Conjunction with AmSECT Pediatric Perfusion
Rackham Auditorium
Ann Arbor, Michigan,
http://elsonet.org/downloads/resources/meetings/elso%202014%20flyer.pdf

OCTOBER 2014

1-4
AmSECT's Quality and Outcomes: Incorporating Best Practices in Perfusion and New Advances in Blood Management
Sheraton Inner Harbor
Baltimore, Maryland
http://amsect.societyhq.com/meetings/upcoming.iphtml

11-12
40th Anniversary Conference of Japanese Society of Extracorporeal Technology in Medicine (40th JaSECT)
Hiroshima International Conference Center, Hiroshima, Japan
http://www.convention-w.jp/40thjasect-sp/e_outl.html

11-15
28th Annual Meeting for European Association for Cardio-Thoracic Surgery in conjunction with 14th European Board of Cardiovascular Perfusion Conference on Perfusion Education and Training
MiCO - Milano Congressi
Milan, Italy
http://www.eacts.org/annual-meeting/

17-18
40th Anniversary Congress on Perfusion – The Society of Clinical Perfusion Scientists of Great Britain and Ireland
Bristol Marriot Royal Hotel
Bristol, United Kingdom
http://www.scps.org.uk/index.php?option=com_content&task=view&id=85&Itemid=45

NOVEMBER 2014

6-8
ANZCP Annual Scientific Meeting
Hilton
Auckland, New Zealand
www.aucklandasm.com

Quiz Answers:

1. C. 1.0%
2. C. Prostaglandin
3. D. Norwood procedure
4. B. ASD
5. D. Sinus Venosus ASD
6. B. Pulmonary Artery Banding
7. B . Rastelli
8. A. Blalock-Taussig shunt
9. C. Ostium secundum
10. E. Double outlet right ventricle

WINTER MEETING PERFUSION DOWNUNDER

August 6th - 9th 2014
Heritage Hotel
Queenstown
New Zealand

www.perfusiondownunder.com

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Anaethesia & CVICV
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Auckland City Hospital
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REGISTRATION

To find out more details regarding the Conference including attendance fees, accommodation options, booking, contacts and registration, please visit **www.perfusiondownunder.com** or contact Bernardette Tackney on +61 3 400 111 014.