FINAL PROGRAM TIMES

12th European Conference on Perfusion Education and Training

Saturday, 27th October 2012
9:00 to 17:00
Barcelona, Spain

Barcelona Conference Center

"Solutions in Perfusion"
The European Board of Cardiovascular Perfusion

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EBCP Chairman
09:10-10:45                      Micro-air Forum

10:45-11:25                     Coffee Break

11:25-13:00                     Scientific Abstract Presentations

13:00-14:10                     Lunch

14:10-15:35                     Scientific Abstract Presentations

15:35-16:15                     Coffee Break

16:15-17:00                     Scientific Abstract Presentations

09:00-09:10                     “Welcome to Barcelona”

Speaker: Maite Mata,
Perfusionist, University of Barcelona, Spain
Spanish Delegate to the EBCP
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"Initial Clinical Experience with the Affinity FusionTM Oxygenation System"

Introduction:
Oxygenation system design is also continuing to evolve, with more and more attention on low prime, high performance, and an ability to manage gaseous microemboli in a safe and effective manner. Medtronic Inc. has brought to market a new, advanced and innovative oxygenation system: the Medtronic Affinity Fusion® Oxygenation System. The Fusion® is designed and indicated for clinical use as both an oxygenator and an arterial filter.

Material and Methods:
Per standard institutional clinical protocol, documentation of in vivo performance characteristics regarding primeability at set up of the system, in vivo measurement of pressure drop, gas transfer results, and a detailed overview of patient demographics including but not limited to pathologies, cross clamp time, on pump time, flow rates, temperature, and overall patient characteristics including BSA.

Results:
To be presented upon compilation of the study. In vivo data will support the indication for use using the device as an integrated filter and oxygenator. Gas transfer and pressure drop data will be presented for a wide range of patients being run at the institution.

Conclusions:
The Affinity Fusion Oxygenation System performs as clinically indicated and is adaptable to routine clinical use in our insitution.
Designed by perfusionists. Engineered by Medtronic.

Introducing the Affinity Fusion® oxygenation system. Built on the input of more than 500 perfusionists worldwide, Fusion is the result of a unique collaboration between perfusionists and Medtronic. A fundamentally different design approach yielding 79 new design enhancements, including a fully integrated oxygenator and arterial filter. An advancement in oxygenation system design. To find out more, visit www.fusionoxygenator.com
"Evaluation of Different Membrane Oxygenators with Integrated Filter Media referring to their Micro Bubble Elimination and Heat Exchange Efficiency"

Objective:
Over the past few years, oxygenators are being designed with integrated arterial filters. Heat exchangers have different construction principles and are made from different materials. Therefore the main differences in oxygenators today are the integrated filter mediums and the heat exchanger materials. Studies of micro bubble effects have shown neurophysiologic injury, cardiac arrhythmias, and tissue ischemia. Along with this, surgical procedures that require extreme cooling, require a very efficient heat exchanger. This study compares micro-bubble elimination and heat exchanger performance of the new “Fusion” Oxygenator from Medtronic with data sampled during a bachelor thesis from “FX 25” Terumo and “Quadrox I” Maquet.

Material and Methods:
From 10/2011 to 10/2012 a total of 60 patients were studied retrospectively. Three Groups of 20 Cases undergoing adult cardiac surgery with Cardiopulmonary bypass (CPB) with hardshell reservoir without DHCA.
Micro bubble activity was measured pre and post oxygenator using the GAMPT Bubble Counter BCC200. Heat exchanger efficiency was calculated by including inflow and outflow temperatures of water and blood in the oxygenator.

Results: There is no significant difference in micro bubble elimination between all oxygenators tested. But clear tendencies was seen between technical methods of filtering.
We saw a significant difference in heat exchanger performance between all three devices. But all were within safe limits for cooling and rewarming in medium hypothermia.

Conclusion:
The in vivo results in this clinical trial show clearly different results to provided in vitro results by the manufacturers. It’s not surprising we saw more microbubbles then zero. Integrated arterial filters are truly a good thing but no free ticket for air on preoxygenator side.
Differences in heat exchanger performance are given but without any aftermath for cooling to medium hypothermia and rewarming in time.
**Introduction:**

In the last 10 years we treated more than 5000 CABG-patients with the MECC-system. The MECC-system consists of a rotary pump, an oxygenator and a tubing system. The most part of published studies concerning minimized cardiopulmonary bypass are based on the MECC-system, as a golden standard. With the implementation of new oxygenators (Capiox FX, Terumo, Japan; Affinity Fusion, Medtronic, USA) and rotary pumps (Affinity CT, Medtronic, USA; DP III, Medos, Germany) different combinations between rotary pumps and oxygenators are used. We investigated different kinds of combinations focused on their air elimination characteristics. We hypothesize a better deairing behavior of new developed systems.

**Methods:**

Following different combinations were analyzed: Rota Flow and Quadrox (Maquet, Germany); Rota Flow and Capiox FX; DP III and Capiox FX; DP III and Quadrox; Rota Flow and Affinity Fusion; Affinity CT and Fusion. Deairing characteristics were analyzed with the BC 100 (Bubble Counter BC 100, Gampt, Germany). In every combination, 20 ml of air were injected into the venous line. The probes were positioned in different manors: Inlet and outlet of the rotary pump or inlet of the rotary pump and outlet of the oxygenator. This setup allowed a selective visualization of the behavior from air bubbles in the oxygenator and in the rotary pump.

**Results:**

Our preliminary results showed different characteristic concerning air behavior for DP III and Rotaflow compared to Biomedicus. Quadrox showed different air elimination characteristic concerning micro- and macro bubbles, compared to Capiox and Fusion FX.

**Discussion:**

The fact that DP III is not able to move air for a certain time, can be a safety issue for ECMO use with the consequence of a arterial flow interruption. On the other hand, the combination of Affinity CT and Fusion allows a efficiency air elimination during CABG surgery without flow interruption. Furthermore we assume that the excellent air elimination behavior of the Capiox FX and Affinity Fusion is a result of the new development which includes an integrated filter and the physically optimal design. We conclude, that the behavior of air in rotary pumps and oxygenators can be a important aspect in the evaluation of components for modern cardio pulmonary bypasses technologies.
CAPIOX® FX
Oxygenators with Integrated Arterial Filter

Reduces blood transfusion requirements

JECT, 2009; 41:220

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“Air Concerns and Mini-Circuits: A Straightforward Path Towards Reduced Air Embolism“

In this review, I summarize the best available evidence to guide the conduct of adult cardiopulmonary bypass (CPB) to achieve minimal gaseous microemboli (GME) production. At the present time, there is considerable controversy related to the definition of gaseous micro-air emboli. A universally accepted definition of GME to date does not exist and mortality and morbidity for GME are commonly linked to “counts” and “accumulation” of GME rather than size. A new definition for GME should eliminate the “counts” and “accumulation” requirement and should only relate to size. Large bubbles are clearly not GME so a new adopted definition should be for a bubble size less than 20µm – 30µm. Air embolism has been extensively documented to be a major cause of morbidity and mortality in CPB. Gaseous microemboli are a very detrimental and a costly complication with an occurrence rate between 2-20 percent. The sources of GME are broken down into two major categories: surgical and manual manipulation of the heart and arteries and components of the extracorporeal circuit. Emboli classifications and origins include foreign, gaseous, and biological all of which can cause the multiple deleterious effects. The effects include damage to the cerebral vascular endothelium, disruption of the blood-brain barrier, complement activation, leukocyte aggregation, increased platelet adherence and fibrin deposition in the micro-vasculature. Mini-extracorporeal circuits (MECC’s) in the 2011 STS guidelines are now highly recommended and better at GME removal versus conventional extracorporeal circuits (CECC). Improvements in perfusion technologies and surgical and perfusion techniques and behaviors have drastically decreased the occurrence of GME during cardiac surgery. The clinical relevance of cerebral air embolization in causing neurological is un-clear, every single person involved in perfusion and surgical technology should be aware of the risk of embolization and strictly regulate clinical behavior.
“Could Venous Drainage Influence Morbidity or Mortality?“

The surgical teams would claim there is a notorious relationship between Perfusion and venous return. Our profession knows that Perfusion motives for ‘regular updates’ on the state of venous return are admirable. Not having enough volume in the venous reservoir can influence the optimisation of the patient’s arterial flow and haematocrit. Improving venous drainage is a simple and easy way for the Perfusionist to optimise these parameters, even though there are other methods available to the Cardiac Team.

There may however be a more sinister complication associated with poor venous drainage, an issue that may refocus the mind of the entire Cardiac team. The flow restriction does not occur in our venous line, it occurs further back along the ‘supply network’. This venous congestion can result in a sub-optimal hydrostatic pressure gradient or worse sub-optimal end organ perfusion.

If we are honest, as a profession we understand very little about venous drainage and over the years we have not given much thought to ‘controlling’, ‘monitoring’ or ‘optimising’ this area of artificial heart and lung support. Much of the literature in the past 10 years focuses on how to ‘suck harder’. We spend a lot of time monitoring and considering what we deliver to the patient and not enough at the other end of the system.

The presentation considers venous drainage from a variety of different aspects:
1. We present our findings with regard to ‘Patient Specific Venous Collapse Pressure’
2. We consider this in the context of the actual negative pressures generated by gravity, vacuum and kinetic venous drainage.
3. We review a case study that presents the potential post-operative complications related with sub-optimal venous drainage.
4. We present the results from our test rig (Figure 1), investigating the potential for selective venous drainage and whether venous congestion will always manifest itself in poor venous return.

Conclusion
Isolated organ ‘under perfusion’ is a problem in current clinical practice. Venous drainage is critical and is currently under monitored meaning venous congestion could still be present despite our current criteria for ‘good venous drainage’ being met. The venous system has a patient specific collapse threshold; even gravity drainage can exceed this threshold. Monitoring, controlling and optimising venous drainage could improve hydrostatic pressure gradients, end organ perfusion and subsequently influence post-operative morbidity and mortality.
10:45-11:25  
Coffee Break

11:25-13:00  
Scientific Abstract Presentations
"Evaluation of Blood Management Standards in Conducting Conventional Cardiopulmonary Bypass (CPB) and Minimized Extracorporeal Circulation (MECC)"

A. Bauer ECCP, MCT*; J. Schaarschmidt ECCP, MCT*; C. Ulrich ECCP*; F.O. Große ECCP, MCT*; J. Schubel MD**; Al Alam MD**; M. Mochalski MD**; Th. Eberle***; H. Hausmann MD**.

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Introduction:
Evaluation of blood management standards in conducting conventional cardiopulmonary bypass (CCPB) and minimized extracorporeal circulation (MECC).

Background: Avoiding unnecessary administration of blood transfusions is obligatory in clinical practice nowadays. Engoren et al. examined the 5-year mortality and morbidity rate in cardiac surgery patients. Thirty-four percent of all patients were transfused. The mortality rate was 15% compared to 7% in the non-transfused patients group. The role of perfusionists in minimizing the need of blood transfusions is widely accepted in the field of cardiac surgery.

Objective:
Evaluation of blood management standards implemented at the MediClin Heart Center Coswig in conducting conventional cardiopulmonary bypass (CCPB) and minimized extracorporeal circulation (MECC).

Material & Methods: This study was conducted using retrospective data analysis with transfusion rate (TR) as a primary endpoint. Subanalysis was done according to body surface area (BSA). In group 1 all patients with CCPB and improvements in blood management standards were included (n = 1536). Following measures of priming volume reduction were implemented: optimization of the ECC-system (1a), retrograde autologous priming (RAP) (1b) and patient-adapted systems (smaller tubing and filter sizes, vacuum assist venous drainage (1c). Additional implementations included: isovolemic blood cardioplegia (2), normothermia (3), coagulation management utilizing Hepcon HMS Plus™ (Medtronic GmbH, Germany) (4a) and thrombelastography (4b). In group 2 all patients with MECC were included (n = 973). The priming volume was kept <1000 ml and suction blood separation was used. The RAP procedure was particularly implemented in combination with utilization of minimized extracorporeal systems for its effectiveness in completely removing priming volume in hemodynamic stable patients. In addition, tip-to-tip coated (Softline®, MAQUET Cardiopulmonary) minimized extracorporeal systems were used and operated with centrifugal arterial pumps (Rotaflow, MAQUET Cardiopulmonary).
Results:
Overall transfusion rate TR was 0.42 units per patient; 0.44 units in CCPB patients vs. 0.28 units in MECC patients, p <0.001. Of all patients 21.3% were transfused (24.4% CCPB vs. 16.4% MECC). BSA sub analysis in patients <1.9 m² revealed transfusion rates for CCPB of 0.72 units vs. 0.51 units in MECC patients, p<0.0093. Overall, 42.1% of CCPB patients received blood transfusions vs. 30.3% in the MECC group, p <0.001. Significant differences in the amount of transfusions were seen in patients with BSA less than <1.6 m², 1.6 units in the CCPB group vs. 0.8 units in the MECC, p <0.0001.

Conclusions:
All strategies were implemented stepwise since 2003. Therefore the intraoperative transfusion rate decreased from 0.8 units (2003) to currently 0.42 units of packed red blood cells per patient at our institution. Despite all optimizations in the CCPB group a further decrease of blood transfusions was achieved in the MECC group only. This study demonstrates a strict indication for MECC systems for patients with a BSA less than 1.7 m². These findings match with the recommendations for blood management (A. Alevizou et al. "Update 2011"), who awarded a class Ia recommendation for the use of MECC systems in children and Jehovah's Witnesses.
"Predictive Hemodilution"

The concept clinicians must embrace during the infusion of intravenous solutions like colloids and crystalloids is that these asanguineous fluids are drugs. Like all pharmaceuticals, they have their indications, contraindications and side effects. If these fluids are used for the wrong indications or administered in excess, they can complicate perioperative fluid management and compromise hemodilution during bypass. Several authors (1,2) have concluded that most changes in the management of ECC over the past five decades have been driven by the personal biases, clinical impressions, experiences of individual cardiac surgical groups, and industry pressures.

We are at a point in the evolution of cardiopulmonary bypass where the devices we use, and the circuits we use them with, are the smallest and most efficient pieces of technology we have ever seen and there is an ever increasing awareness of hemodilution in adult cardiac surgery. From another perspective, even the annual case load of most major cardiac surgery programs has been slowly declining over the past decade, possibly due to the technology growth in interventional cardiology. However, global transfusion of allogeneic blood continues to rise year after year (3). Predictive Hemodilution is an understanding of how we hemodilate adult bypass patients during the perioperative period. With this understanding, it may allow us to use evidence based and mathematical approaches to reduce the risk of exposing bypass patients to unnecessary hemodilution and allogeneic transfusions during cardiac surgery.

This review will discuss fourteen preoperative and perioperative practices that can influence levels of hemodilution during bypass and the likelihood of avoiding allogeneic blood transfusion. Including the possibility of using or modifying only three of these practices to increase some intraoperative hemoglobins’ by 16-28% (2.15-3.23 g/dl).


Today, more than 30% of adults in Europe and in the United States are obese, and it is estimated that by the year 2025 that number will exceed 40%. It is also been noted an increase of cardiopulmonary bypass (CPB) patients with very high or morbid obesity (MO). Obesity affects every organ system and is the cause of many chronic medical problems and induce alterations to the normal human physiology. Therefore, very obese patients represent a big challenge to the CPB surgery team and are in need for special care.

In this paper, a review of the alterations to the normal physiology and to concepts normally used on adult perfusion will be performed. These comprehend metabolism of fat tissue, blood volume calculation, pharmacokinetics (especially the anesthetic agents), arterial pump flow, among other issues.

Total blood volume (TBV) calculation deserves special attention. Initial attempts to predict normal blood volume used a fixed ratio of blood volume to body weight, with different ratios for men and for women. However, fat is much less vascular than lean tissue, so two individuals of the same weight with different body compositions can have markedly different normal blood volumes. Some early attempts to address this problem included categorizing individuals by body type, but this method proved too subjective.

For patients undergoing major surgery, and especially MO individuals, pre-operative estimation of TBV is as important as determining hematocrit and hemoglobin levels. While hematocrit and hemoglobin levels define the percentage of red cells and quantity of oxygen-carrying protein in blood, they provide little insight with regard to the magnitude of TBV. Clinically, pre-operative over-estimation of TBV, which could easily occur in MO patients using 70 ml kg⁻¹ for indexed BV, might lead to under-administration of crystalloids, colloids, and red blood cells in the event of massive fluid translocation and/or hemorrhage.
"Advantages of an Ultra-low Volume Single-Shot Cardioplegic Solution"

**Introduction:** Traditional cardioplegic approaches typically require prolonged intra-coronary perfusion of a relatively large volume of an “induction” crystalloid solution, possibly mixed with blood and possibly followed by one or several period(s) of “reinfusion”. We aimed at developing a simplified cardioplegia that would achieve an immediate cardiac arrest (delay of less than 10 seconds) and prolonged myocardial protection (>45 minutes) with a single low-volume (100 ml) injection. More than 6 years of evaluations resulted in the development of Cardioplexol™ (Bichsel AG, Interlaken, Switzerland), which has now been used in more than 3'500 cardiac surgery patients at the university hospital in Berne during the last 4 years.

**Data:** Pre-, peri- and post-operative data of all consecutive patients operated in our clinic are collected prospectively in a patients’ registry. Data of consecutive adult patients operated between September 2008 and August 2011 were reviewed (n=2'873). Two sets of data are presented.

**Results:**

1. **CABG:** 1'181 patients were operated for an isolated CABG procedure during this period, 99% with a mini-extra-corporeal circuit (MECC). Demographics (M: 79.8%; age: 66.3±9.7) and preoperative data (log.Euroscoor: 6.1±9.2; EF: 55.6±13.4%, 2.8±0.4 vessels disease) were similar as typical groups reported in the literature. Patients received 103±21.7 ml Cardioplexol™. 3.1±0.8 bypasses were performed. X-clamp and MECC times were 45.1±15.8 min and 70.5±23.2 min respectively. Only 9.2% of the patients needed an electro-conversion after coronary reperfusion. ECC volume balance was low (487±529 ml) and hematocrit during MECC was kept high (28.4±4.8%). Maximal post-operative troponin-T (0.7±1.8 ng/ml, median 0.34 ng/ml) and CK-MB (28.1±51.8 mg/dl, median 13.2 mg/dl) as well as corresponding values assessed 6 hours post-surgery (0.4±1.0 ng/ml, median 0.24 ng/ml for TnT, and 18.7±41.0 mg/dl, median 11.3 mg/dl for CK-MB) were low. Complication rate was similar to data reported in the literature (hospital mortality: 0.7%; MI: 2.6%; stroke: 2.3%, new dialysis: 1.0%).

2. **Cardioplexol versus Buckberg:** 473 patients (259 Cardioplexol versus 214 Buckberg) were operated for an isolated valve procedure (89 vs. 115) or a combination procedure (170 vs. 99) during this period. A propensity score-adjusted logistic regression model was used to compare both groups. No difference regarding the choice of cardioplegia was seen regarding post-operative mortality, MACE, post-operative maximal TnT, TnT at 6 hours, maximal Ck-MB or CK-MB at 6 hours, and ICU stay.

**Conclusion:** Cardioplexol™ is a practically and clinically attractive cardioplegic solution. Early data out of our register highly suggest this new cardioplegia is efficient and safe. Randomized studies are necessary to confirm these initial encouraging results.

**Perspectives:** Cardioplexol™ is currently in a European registration process and a clinical phase-3 study has recently been initiated.
Background:
In cardiac surgery, acute kidney injury (AKI) is a severe postoperative complication and associated with increased rates of mortality, morbidity, and length of stay in intensive care units (ICU). It occurs in 5% to 30% of patients depending on the definition used [1] [2] [3]. The aim of this study is to present an overview of AKI following cardiac surgery associated or not with cardiopulmonary bypass, in our center.

Methods:
This retrospective study includes patients treated by cardiac surgery from April 1st, 2008 to March 31th, 2009 in a single center. We selected patients who underwent on-pump coronary artery bypass surgery (CABG), off-pump CABG (OPCAB), aortic valve replacement, mitral valve repair or replacement and aortic valve replacement combined with CABG. Patients undergoing renal replacement therapy preoperatively were excluded. The RIFLE classification (Risk, Injury, Failure, Loss and End stage kidney disease) allowed stratifying the patients into the 3 grades of AKI severity. The stratification was based on the most pejorative element observed within 7 days after surgery: increased serum creatinine level or decreased urine output, or decreased glomerular filtration rate according to criteria of Bellomo [4]. Occurrence of AKI was studied by type of cardiac surgery as its impact on the length of stay in ICU and in the hospital. Proportions were compared by the Chi-square test and median values by the Mann-Whitney U test. Results were considered significant at p < 0.05.

Results:
Four hundred and thirty-four patients were included: median (IQR) age 69.0(60.0-76.0) year, 30.2% females, 2.76% urgent/emergent cases. Fifty-eight patients (13.4%) underwent OPCAB, 182(41.9%) on-pump CABG, 104(24.0%) aortic valve replacement, 44(10.1%) mitral valve repair or replacement and 46(10.6%) aortic valve replacement combined with CABG. AKI occurred in 213(49.1%) patients: 79(37.1%) “Risk”, 108(50.7%) “Injury” and 26(12.2%) “Failure”. Distribution of AKI by type of surgery was equal to 36.2% among OPCAB, 44.0% on-pump CABG, 49.0% aortic valve replacement, 52.3% mitral valve surgery and 82.6% aortic valve replacement combined with CABG, respectively. AKI occurrences differed significantly according to the type of surgery (p<0.0001). Lengths of stay in ICU were
significantly longer (p<0.0001) in AKI group compared with non AKI group: 3(2-4) days versus 2(2-3) days. However, no difference (p = 0.65) was observed between the two (AKI and NON-AKI) groups in hospital length of stay: 13(10-18) days versus 12(10-16) days.

**Conclusions:**
The incidence of AKI is very high in this population as compared to the literature. This may be due to the fact that the three elements of the RIFLE classification for all the population studied have been used. This study emphasizes the need for clear definition of AKI in order to compare different studies adequately. AKI after cardiac surgery with cardiopulmonary bypass would be further studied in order to develop more appropriate preventive measures.

**Keywords:** cardiac surgery, cardiopulmonary bypass, acute kidney injury.

13:00-14:10
LUNCH

14:10-15:35
Scientific Abstract Presentations
**Introduction:**
Pericardial suction blood is contaminated by a substantial fraction of potential embolic substances as well as activated platelets and vaso-active mediators. To avoid allogenic transfusion requirement during cardiopulmonary bypass, cardiotomy suction is used. Several studies has proven the deleterious effects of this cardiotomy suction, affecting almost all organs of the body. However recirculation of this ‘shed blood’ to the systemic circulation is necessary in case of major blood loss. According to published guidelines, separate suction is a class one level B recommendation to avoid direct reinfusion of unprocessed blood exposed to pericardial and mediastinal surfaces.

**Objective:**
A new ‘shed blood’ filtering device has been developed, based on gravity separation and a polyester leukocyte depletion filter. The efficacy of such a filter with regard to clinical outcome is unknown. In our study setup, coronary artery bypass graft patients undergoing CPB are clinically evaluated for organ dysfunction after filtration of the mediastinal-suctioned blood. A comparison is made between a lipid filtered and a non-filtered group versus a control group of discarded mediastinal suctioned blood.

**Preliminary results:**
The capacity of this lipid filter is 63% for lipid particles and 52% for the activated leukocytes, measured before and after filtration\(^5\). The mean lipid particle diameter was 15 micron. As most filters of 40 micron are ineffective, this filter has proven to be effective in the elimination of lipid particles and activated leukocytes, due to sedimentation over time and by filtration. In this present study we are investigating the clinical outcome after filtration.

**Conclusion:**
The deleterious effects of ‘shed blood’; especially lipid micro-emboli are still underestimated. Mediastinal suctioned blood is pointed out as major source of organ dysfunction. No feasible devices yet were appropriate for integration in the extracorporeal circuit. As this new integrated device is first of its kind, it could be of clinical advantage for the patients. Our preliminary results will be presented and discussed.
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As awarded by The Chicago Athenaeum: Museum of Architecture and Design.
“The Role and Scope of the Simulator in Perfusion Education Programs: Pathways from a Novelty to Essential Tool”

Since the 2007 publication in JECT of an article describing the Orpheus perfusion simulator, perfusion simulation has evolved from ‘pumping a bucket’ to a highly sophisticated educational training modality comparable with medical education of other medical specialties. Little work has been conducted on the comparative effectiveness of using simulation in perfusion training, although anecdotally the evidence is compelling. Understanding how to effectively implement an expensive simulator to produce quantifiable results can be a challenge in a busy perfusion school or department.

This talk will present three methodologies that have been employed by colleagues in anesthesia and surgery to evaluate higher order non-technical skills that serve as a framework for developing training tools in perfusion. The ANTS system (Anaesthetist's Non-Technical Skills); the NOTTS system (Non-Technical Skills for Surgeons) and OTAS system (Observational Teamwork Assessment for Surgery) have laid the framework for the development of a perfusion specific non-technical skills evaluation and feedback tool. The OTAS system is a tool that generates quantifiable data on the participant pre, intra and post-operatively on five defined behavioral markers that have been identified as key non-technical skills through a process of parameter validation.

The presentation will also briefly describe the development of a non-technical skills assessment tool for the cardiac surgical team, combined with a new, next generation mechanical-digital perfusion simulator.
Since the beginning of our ECMO-Program at the University Hospital Bern, the number of cases are still increasing. The majority of the applications are Venous/Arterial (V/A) ECMO’s. The age of the patients range from 4 days to 70 years. We started our ECMO program in early 2000 with a perfusion system based on a roller pump. In 2005 we first implemented an ECMO system with a diagonal pump, the DeltaStream® DP II (Medos AG; Stolberg; Germany). The main issue to use the Deltastream®-system was the integrated negative pressure limitation which allowed a certain “self-running” modus of the system. On the other hand, due to the low priming volume and the ideal flow characteristics, the Deltastream®- system can be used from neonates to adults and permits the application of one system for the whole clinic. Therefore, the clinical staff needs to be trained only on one system. In 2010 we switched to the new Deltastream®MDC system which includes the new diagonal pump, the DP III. The DP III is certificated for seven days and allows the same wide treatment spectrum as the DP II.

Furthermore, we developed a rapid prime tubing set with quick connectors. The implementation of the quick connectors allows a safe and fast exchange of the main components. Due to the possibility of rapid priming, the system is qualified for emergency applications.

The cerebral-, pump- and hemostasis monitoring during ECMO treatment is one of our main topics. We are convinced that just the measurement of the negative pressure with involvement of the pump flow and the patient blood pressure is efficient to assess the perfusion status. Furthermore, we recommend the use of the NIRS technology during ECMO as an noninvasive cerebral monitoring. The NIRS technology gives important information in the interaction between artificial ventilation and cardiac output during ECMO. For postcardiotomy - ECMO we recommend a complex hemostasis surveillance including thrombelastometry.

Main safety aspects are the extensive education of all involved staff, the air detection on the venous line and the use of the DP III.

Summarized, our ECMO concept consists of a simple perfusion circuit, a complex monitoring and an extensive educated staff.
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15:35-16:15  
Coffee Break

16:15-17:00  
Scientific Abstract Presentations
“Solid Past, Strong Future”
An Update on our Earthquake Recovery

“Best Practices in Perfusion: the future of Electronic Charting”

Current trends in hospitals worldwide are quickly increasing the need for use of electronic medical records (EMR’s) in cardiovascular surgical procedures. Movements toward improved patient outcome, practice improvement, quality management, traceability, and international patient registry efforts require use of an efficient and all encompassing method for data collection and analysis. EMR’s today provide the technology platform giving possibility and visibility to the data necessary in defining best practices and reaching these healthcare and practice improvement goals.

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“Development and Implementation of the WEB Declaration of adverse events in Perfusion”

C.L. DIAZ ALVAREZ, M.S. GARCÍA ASENJO; Spanish Association of Perfusionists: Commission on Perfusion Quality Assessment

Objective:
Implementation of a fast and agile support system using the internet, the Spanish Association of Perfusionists have set up a voluntary declaration of adverse events that have occurred during cardiopulmonary bypass (CPB) at the national level in order to identify those situations that makes the event occurred and circulate alerts and strategies if necessary.

Methods:
Was designed based on the Spanish model of Patient Safety in perfusion, which adapts the "Contributing Factors" proposed by the Joint Commission International (JCI) to form part of a registration system. Each factor includes the standards that must be included in a safe perfusion. The tool is placed in a restricted area of our website, the sender identification (ID) and the proposal of advice is voluntary.

Results:
In the first year of operation, there were 103 registered declarations of events of which 13 (12.6 %) were rejected because of errors in compliance. Of the remaining 90 cases that were evaluated, 15 cases (16.7%) remained anonymous due to the wish of the respondents, 28 cases (30.7%) have not asked for support from the Quality Committee and 47 cases (69.3%) have requested a quality assessment report.

Conclusions:
The implementation of the Declaration of Adverse Events in Perfusion on the internet has proven to be an essential support tool. The tool is low in cost, easy to use and fast, but requires a strong organizational structure.
Lara Godoy L M, García Pérez S., Gonzales Rodríguez J.R.  
Department of Cardiac Surgery Service. Hospital Infanta Cristina (Badajoz, Spain).

“Mini-circuits vs. Conventional Extracorporeal Circulation in Myocardial Revascularization Surgery”

Objectives:  
The goal is to prove whether the usage of minicircuit bring real benefits in comparison to conventional extracorporeal circuits used for cardiopulmonary bypass.

Materials and Methods:  
Prospective randomized study for a year. Included were 108 patients, in 3 groups of 36 patients each. Group I, conventional cardiopulmonary bypass (CPB), with Quadrox oxygenator (Maquet®); group II, conventional CPB with Avant D-903 oxygenator (Dideco®), Group I and II both with open circuit and cold blood cardioplegia 4:1; group III, extracorporeal minicirculation with ROCsafe closed circuit and Capiox RX-15 oxygenator (Terumo®) and cold blood Calafiore cardioplegia. Group I and II were compared versus group III. Patients with a ventricular ejection fraction below 30% were excluded. Analytical and clinical laboratory variables were monitored preoperatively, intraoperatively and postoperatively.

Results:  
Homogeneous groups in age, sex, body surface area (p>0,05). No significant differences in preoperative variables (medical history, ventricular ejection fraction, contrapulse balloon). There were differences between the groups regarding intraoperative variables: haemoglobin on-pump, number of blood transfusions between groups of the minicircuit and conventional circuit. (p<0,05). In postoperative variables, no difference in mortality, duration of mechanical ventilation, reoperation and renal dysfunction (P>0,05). There were differences in haemoglobin, transfusions, hospital stay, troponin and CKmb (p<0,05).

Conclusions:  
The Mini-circuit is a safe and reliable technique to perform any myocardial revascularization surgery, providing benefits, as it significantly reduces blood product transfusions and hospital stay.
Judita Andrejaitiene, Edmundas Sirvinskas, Laima Raliene
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“Postoperative Delirium after Cardiac Surgery: Risk Factors and Clinical Outcome”

Introduction: Patients who undergo cardiac surgery have an increased risk of delirium, which is associated with many negative consequences [1]. Delirium has been reported to occur in 10 to 60% of surgical patients however, the incidence of delirium in older surgical patients may be as high as 73% depending on the diagnostic method used [2]. Therefore, the purpose of this study was to identify the post-cardiac surgery delirium risk factors and to evaluate clinical outcome.

Methods:
In this retrospective study, the Intensive Care Delirium Screening Checklist (ICDSC), the Richmond Agitation-Sedation Scale (RASS) and The Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) criteria were used after surgery to assess whether delirium had developed. The patients who underwent coronary artery bypass surgery (CABG) on cardiopulmonary bypass (CPB) were divided in two groups by evaluating the severity of the delirium: light and moderate delirium group (n=74) and severe delirium group (n=16). The data are presented as the mean and the standard deviation (M(SD). Statistical significance was accepted at a level of $p < 0.05$.

Results:
The incidence of early post-cardiac surgery delirium was 4.17 %; it has developed during the 2.5 (1.9) postoperative day. We’ve determined that post-cardiac surgery delirium prolonged the length of stay in the ICU (8.4 (8.6)) and hospital stay (23.6 (13.0)) days. The patients had higher preoperative risk score, their age was 71.5 (8.9) years, the body mass index was 28.8 (4.4) kg/min2, the majority were male (72.2 %), ejection fraction was 46.1(11.9) %. The statistical analysis by multivariable logistic regression has indicated that increasing the dose of fentanyl administered during surgery over 1.4 mg was also increasing the possibility of developing a severe delirium (OR = 9.9, CI 1.5–65.1) and longer aortic clamping time could be independently associated with severe postoperative delirium (OR = 1.02, CI 1.0–1.05).

Discussion:
Our data suggest that early post-cardiac surgery delirium was not a common complication, but it significantly prolonged the length in stay at the ICU and hospital stay. The delirium risk factors such as longer aortic clamping time and the dose of fentanyl could be modified and could rapidly indicate a postoperative delirium. Therefore, prevention and early recognition of delirium is essential and further prospective studies are necessary.

References:
Introduction:
Although significant changes and improvements were achieved on cardiopulmonary bypass (CPB) systems in recent decades, there remain complications related to tissue damage, which affect postoperative morbidity and mortality. The better understanding of these complications, and strategies against them, have been the focus of several experimental and clinical studies. The aim of this literature review is, thus, to understand how animal models have been used to study changes in microcirculation and inflammatory response after CPB, present their main results about non-pharmacological interventions and discuss their possible contribution to the improvement of CPB systems in the clinical use.

Material and Methods:
We used the set of terms ("Cardiopulmonary Bypass" [Mesh]) AND ("Microcirculation" [Mesh] OR "Inflammation" [Mesh] OR "Inflammation Mediators" [Mesh]) to search on PubMed. Repeated results, human studies, articles in non-English languages, studies where pharmacological therapies were tested or just consequences of CPB were studied, review articles and studies without control were excluded. We analyzed which modifications were made to the standard patterns of CPB and their consequences.

Results:
The use of filters, the miniaturization, the types of primers, the application of regional perfusion techniques and the determination of adequate flow and temperature levels are related to a reduction on microcirculation and inflammatory markers.

Conclusion:
Furthermore, they found that these changes in certain variables of CPB can reduce the inflammatory response induced by the use of CPB, what, if translated to clinical practice, could ameliorate the cardiac surgery prognosis.
Background:
Complications related to tissue damage after cardiopulmonary bypass (CPB) affect postoperative morbidity and mortality, but the use of pharmacological therapies can ameliorate postsurgical outcomes. The aim of this literature review is, thus, to list the pharmacological therapies studied on animal models and understand their effects on the microcirculation and inflammatory response after CPB.

Methods:
We used the set of terms ("Cardiopulmonary Bypass" [Mesh]) AND ("Microcirculation" [Mesh] OR "Inflammation" [Mesh] OR "Inflammation Mediators" [Mesh]) to search on PubMed. Repeated results, human studies, articles in non-English languages, review articles and studies without control were excluded. We analyzed which drugs were used and their consequences on inflammatory response and microcirculation after CPB.

Results:
Bivalirudin and dextran sulfate (DXS) reduced the formation of thrombin-antithrombin complex, and also reduced inflammatory cytokines. Sildenafil, prostacyclin, tetrahydrobiopterin, magnesium and milrinone increased endothelium-dependent relaxation. Inhaled nitric oxide (NO) reduced the levels of IL-8, as well as the use of aprotinin; when associated, NO, aprotinin and prostaglandin 1 showed reduction in the number of leukocytes, plasma elastase, CD11b, myeloperoxidase, IL-8 and thrombin-antithrombin complex, and also decrease the histological tissue injury. Bradykinin showed decreased levels of IL-6, IL-8, TNF-α, NF-κβ, myeloperoxidase and caspase-3, also diminishing the histological tissue injury. Peroxynitrite and glutamine reduced the levels of IL-6 and IL-8; rolipram and activated protein C decreased the expression plasma elastase, TNF-α and CD11b; sivelestat showed reduced levels of IL-8, myeloperoxidase and plasma elastase. Carbon monoxide (CO) inhalation before or after the CPB reduced the expression of IL-1β, IL-6, TNF-α and caspase-3 and increased the expression of IL-10. Curcumin and PPAR alpha-agonist led to reduced levels of IL-8, TNF-α, NF-κβ; PPAR alpha-agonist also decreased the expression of myeloperoxidase, caspase-3 and histological tissue injury. Simvastatin and mofloxacine decreased the levels of TNF-α and NF-κ; simvastatin also reduced IL-6 and myeloperoxidase. Only perfluorocarbon led to an increased expression of IL-1β, IL-6, IL-10 and TNF-α, in addition to increased histological tissue injury.

Conclusion:
The use of anticoagulant, vasoactive and anti-inflammatory drugs can reduce this inflammatory response and microcirculation injury caused by CPB, being effective options for improving prognosis in cardiac surgeries.
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