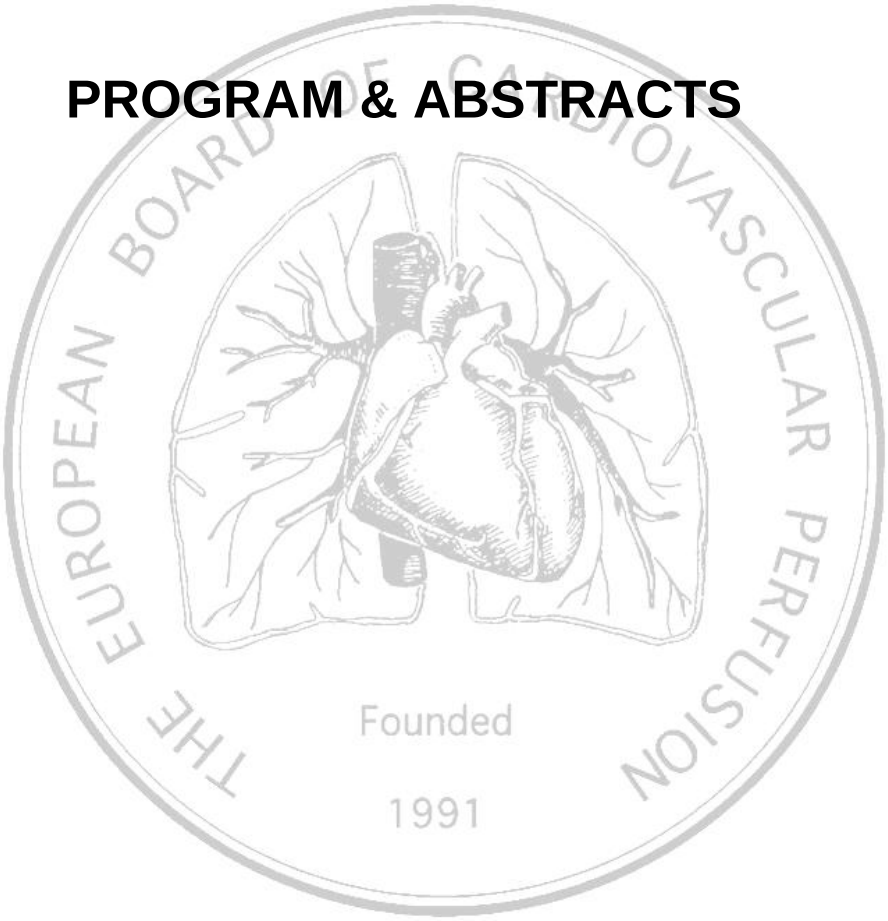
PROGRAM & ABSTRACTS



10th European Conference on Perfusion Education and Training

"Management in Perfusion"

Saturday, 11th September 2010
9:00 to 17:00
Geneva, Switzerland

Geneva Palexpo Conference Centre
Mont Blanc room
www.palexpo.ch

"Management in Perfusion"

Management is a form of handling that uses tools to plan, organize, motivate, lead, and coordinate individuals or teams to accomplish certain goals for a useful outcome.

This meeting represents the 10 year anniversary that brings together cardiac perfusionists and other health care professionals from many countries around the world in a forum to communicate and exchange information to realize these goals.

With this theme The European Board of Cardiovascular Perfusion would like to welcome you to the 10th European Conference on Perfusion Education and Training.

Carole Hamilton CCP, CPC, ECCP
Chief Perfusionist
Schön Clinic Vogtareuth, Germany
ECoPEaT Organizing Committee
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The European Board of Cardiovascular Perfusion

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Moderators: 1st Session

Judith Horisberger
Chief Perfusionist, Lausanne, Switzerland
Host Delegate and EBCP Secretary Academic Committee

Eric Laliberté CCP, CPC
Perfusionist, Quebec, Canada
Canadian Society Cardiovascular Perfusion: Annual General Meeting Coordinator

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9:00-9:10

Speaker: Judy Horisberger

Welcome to Geneva, Switzerland

9:10-9:25 EUROSETS MEDICAL DEVICES SPONSORED SESSION

Speaker: Federico Pappalardo M.D.
Director Cardiothoracic and Vascular Intensive Care
Member Coordinating Group for ECMO Management in Italy for H1N1 Influenza
San Raffaele Hospital, Milan, Italy

Preliminary Experience with the New Eurosets A.L.One Oxygenator for ECMO

F. Pappalardo, L.Ruggeri, G. Maj, L. Corno, D. Ferrari, M. Pieri, A. Zangrillo

Introduction: Polymethylpentene (PMP) oxygenators have gained wide application for ECMO. This new surface is attractive because of the diffusion properties of gases, the low resistance to blood flow and the high biocompatibility [1-2]. We describe here the first worldwide experience in V-V and V-A ECMO configuration with the new EUROSETS ALONE oxygenator with Phosphorylcoline coating with NO-DOP tube (phthalate free)[3].
Materials: Three patients were treated in our Institution with V-V ECMO (2 patients) and V-A ECMO (1 patients). The EUROSETS A.L.ONE oxygenator was inserted into a circuit with the Levitronix Centrimag blood pump. All patients received unfractionated heparin for a target aPTT 50-60" and aspirin 100mg/24h. Data on oxygenator performance (gas exchange, pressure drop, hemolysis) and activation of coagulation were prospectively collected.
Results: Two patients suffered from ARDS due to H1N1 influenza and one from cardiogenic shock secondary to acute MI. Veno-venous cannulation was performed via femoral vein and right internal jugular vein with 21Fr and 15Fr cannulas, respectively; the V-A setting consisted of femoro-femoral cannulation (venous 23Fr, arterial 19Fr) with distal reperfusion of the leg through a 6Fr sheath. All patients were transported on ECMO: the two veno-venous patients were implanted in a remote hospital, whereas the veno-arterial patient was transferred to our referring heart transplantation center. Transportation was performed by ground and by airplane. No adverse event was recorded and all patients survived. Duration of support ranged from 3 to 7 days. Clinical data on the EUROSETS ALONE oxygenator are reported in the tables.
Conclusions: The number of artificial lungs used for ECMO for heart or lung failure has shown significant growth in recent years. Therefore, it is expected that durability and antithrombogenicity will ensure the prolonged use of an artificial lung for several weeks or months. The new EUROSETS A.L.one oxygenator adds a new tool for the performance of prolonged cardiorespiratory support with ECMO; our preliminary experience encourages further evaluation of its performance.

1. Sidebotham D, McGeorge A, McGuinness S, Edwards M, Willcox T, Beca J. Extracorporeal membrane oxygenation for treating severe cardiac and respiratory disease in adults: Part 1--overview of extracorporeal membrane oxygenation. J Cardiothorac Vasc Anesth. 2009 23:886-92.
2. Khoshbin E, Roberts N, Harvey C, Machin D, Killer H, Peek GJ, Sosnowski AW, Firmin RK.Poly-methyl pentene oxygenators have improved gas exchange capability and reduced transfusion requirements in adult extracorporeal membrane oxygenation. ASAIO J. 2005 51:281-7.
3. Pappalardo F, Della Valle P, Crescenzi G, Corno C, Franco A, Torracca L, Alfieri O, Galli L, Zangrillo A, D'Angelo A. Phosphorylcholine coating may limit thrombin formation during high-risk cardiac surgery: a randomized controlled trial. Ann Thorac Surg. 2006 Mar;81(3):886-91.

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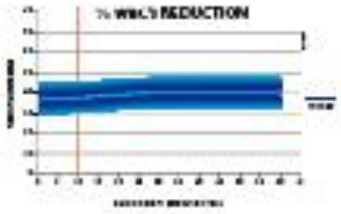

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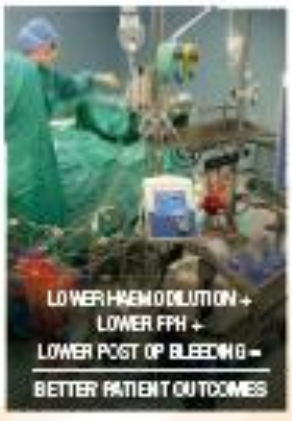

Eurosets s.r.l. Medolla (MO) Italy www.eurosets.it

9:25-9:55 **MEDOS SPONSORED SESSION**

Speaker; Sebastian Schmidt
Perfusionist
University Clinic of Regensburg, Germany

First Clinical Experience with the MEDOS DELTASTREAM® DP3 Diagonal Pump In ECMO Systems

Schmidt S., Philipp A., Foltan M., Thrum A., Gietl M., Schettler F., Ertl M., Schmid C.

Introduction: Since November 2009 the DP3 diagonal pump was used at the University Hospital Regensburg in 17 ECMO Systems [n=11 veno–venous, n=6 veno-arterial].
The DP3 is an advancement of the DP2 diagonal pump.
The DP2 was used in our clinic from December 2006 to October 2009 in 17 ECMO cases [n=12 veno–arterial, n=5 veno–venous]. It was determined that the DP2 had a limited lifetime caused by mechanical problems and operating noise and the pump had to be changed from 3 to 7 days. The limited lifetime of the DP2 was also caused by wear due to rubbing on a seal which coats the motor axle and separates the blood ducting parts from the drive mechanism. There was also a risk for thrombosis on the motor axle caused by the rubbing heat.
Methods: In a retrospective data analysis we compared the DP2 and the DP3.
Results: The mean duration for the ECMO Systems in the DP2 group was 8.5 days [range 1 to 33 days] and in the DP3 group 14.9 days [range 2 to 38 days]. In the DP2 group the ECMO systems had to be changed 6 times due to mechanical pump failures, in the DP3 group no pump failure occurred during operating time.
Conclusion: The MEDOS DELTASTREAM® DP3 diagonal pump is a safe and effective rotary pump for the use in ECMO systems.

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9:55-10:10

Maik Foltan Dipl. Ing, ECCP
Perfusionist
University Clinic of Regensburg, Germany

ECMO for patients suffering from Influenza-virus A (H1N1)

M. Foltan, A. Philipp, F. Schettler, A. Thrum, M. Gietl, S. Schmidt, C. Schmid, M. Lubnow[1], T. Müller[1] Department of Cardiothoracic Surgery, Department of Medicine II, [1] University Hospital Regensburg, Germany

Background: The Influenza-virus A (H1N1) caused a large number of patients to suffer severe and life-threatening respiratory failure. At the beginning of June 2009 the WHO declared the Influenza-virus A (H1N1) - disease as a pandemia.

Methods: Thirty Patients were provided with care at the intensive care units of the University Medical Centre of Regensburg during the period of May 2009 to May 2010. Eleven patients with a severe respiratory insufficiency required a veno-venous extracorporeal membrane oxygenation (vv-ECMO).
The miniaturized ECMO-system (BE-ELS 3050, Maquet-Cardiopulmonary-AG, Hirrlingen) consists of a centrifugal pump and a polymethylpentene diffusion membrane oxygenator. The deairing volume of the complete heparin coated device is about 500 ml.
Due to the coating and the low-dose heparinisation, the anticoagulation target with a partial thromboplastin time (aPTT) of 1.5 to 2 times to the normal value was aimed.
The cannulation was performed using the Seldinger technique with all patients. For the connection of the veno-venous ECMO a 21 Fr cannula (BE-VS 2138 Maquet-Cardiopulmonary-AG) was used for the femoral vein.
The reinfusion of the oxygenated blood from the ECMO takes place in the jugular vein using a 17 Fr cannula (BE-PAL 1723, Maquet-Cardiopulmonary-AG).
The transportable and miniturized “CARDIOHELP System” (Maquet-Cardiopulmonary-AG) was employed on the eleventh patient, for the very first time.

Results: Four (36%) of the eleven patients suffered from the Influenza-virus A (H1N1) and supported by the vv-ECMO were discharged from the hospital in good health. The cumulative support time was 210 days and the average support duration was 19 $\pm$ 7.0 days.
The average age of the ECMO-patients (7 female, 4 male) was 44 $\pm$ 11.0 years and the average Body Mass Index (BMI) was 37 $\pm$ 9.0. The SOFA-Score was calculated with 12.0 ± 2.1. The intubation time prior the ECMO- implantation was in median 1 [1-25]. Six patients required in addition to the ECMO a renal replacement therapy (Continuous veno-venous hemofiltration)

Total time vv-ECMO support	[days]	210
Average support duration	[days]	19 $\pm$ 7.0
Transfused packed red blood cells	[units]	131
Oxygenator exchange	[n]	7

Tab.1: Overview to the vv-ECMO-supports

Conclusions: Miniaturized ECMO-Systems are safe in the application and facilitate an effective and protective ventilation of patients suffering from severe lung failure.

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10:10-10:25

Speaker: Timothy Jones M.D.
Consultant Paediatric Cardiac Surgeon
ECLS Unit, Birmingham Children's Hospital, Steelhouse Lane, UK

Are Small Volume ECLS Centres Safe and Effective?

M Farley, L Edwards, F Reynolds, A Horsburgh, R Willetts, D Barron, W Brawn, T Jones

Introduction: The complexity, training and maintenance of skills required to provide permanent availability of Extra-Corporeal Lung Support (ECLS) precludes many units from developing an ongoing ECLS programme. This is particularly problematic for congenital cardiac surgical programmes which may require infrequent pre or post operative ECLS. The lack of an established programme potentially results in the delivery of suboptimal support. We describe our early experiences of developing and running a low volume cardiac support programme.

Method: Between 2006 and 2008 and in collaboration with an established ECMO programme we identified our need for an ECLS programme to deliver paediatric cardiac surgical support and began service development. Regardless of previous experiences 19 ECLS nurse specialists, 2 perfusionists and 6 physicians underwent formal training including 40 hours of supervised bedside care. A simplified ECLS circuit based on the Levitronics Centrimag pump was developed and trialled. After protocol development, in house wetlab simulation and team training, the programme commenced in September 2008.
There is an ongoing programme of waterlab training and additional shifts are undertaken at the larger established ECMO centre to maintain skills and a minimum of 70 hours practice per year. Regular team meetings, debriefings and an audit programme with benchmarking to an international database (ELSO) are used to ensure quality of care. The service undergoes invited external peer review every 3 years.

Results: Ten patients (7 neonates, 1 infant, 2 children) with an average weight of 5.75kgs (2.14-17.6) have been placed on VA support. Nine patients with complex congenital defects required post operative cardiac support. Seven patients (70%) were successfully weaned from ECLS with a 60% survival to discharge from hospital. The average length of support has been 86.6 hours (range 4-180). There have been no cannulation or equipment failures but 3 oxygenators were electively changed due to a reduction in performance. Two patients (20%) required haemofiltration. One patient (10%) suffered a transient neurological event and 2 (20%) required active management of surgical site bleeding.

Conclusion: By appropriate service development and clinical governance and using new generation equipment it is possible to maintain a permanent ECLS capability despite a low volume with outcomes comparable to larger programmes.

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10:25-10:40

Speaker: **Sabrina Meloni**
Perfusionist, Master in Health Management
Tor Vergata Hospital, Rome, Italy

A Different Anticoagulation Approach during Extracorporeal Membrane Oxygenation: A Case Report

Sabrina Meloni [a],Laura Radomile [a], Carlo Bassano[b], Jacob Zeitani[b], ,Pasquale De Vico[c],Alessandra Tartaglione[c] and Luigi Chiariello[b]. [a] Perfusionist, division of cardiac surgery, Policlinico Tor Vergata, Rome, Italy; [b]Division cardiac surgery, Tor Vergata University hospital, Rome, Italy; [c] Department of anesthesiology, Tor Vergata University hospital, Rome, Italy.

Objective: Extracorporeal membrane oxygenation (ECMO) is a 'rescue' therapy for the most severe cases of acute respiratory distress syndrome (ARDS). The aim of our study was to evaluate anticoagulation management in patients with severe pulmonary insufficiency assisted by ECMO following cardiac procedures.

Methods: A 56 year old white Eurasian man, weighing 120 kg, underwent aortic valve and ascending aorta replacement for acute type A dissection. Postoperatively the patient was mechanically ventilated with Bi-Level Positive Airway Pressure at high frequency. An extracorporeal respiratory assistance veno-venous ECMO (PLS Maquet) was instituted after 5 days for a rapidly progressive respiratory failure with refractory impairment of gas exchange unresponsive to rescue therapies (recruitment maneuvers, etc.).
The inflow cannula was positioned in the femoral vein while the outflow cannula was placed in the Jugular vein. The support time was 332 hours. The patient was heparinized with 5000 IU heparin before the cannulation procedure. Based on thromboelastography, the continuous heparin administration was given to maintain R values between 16-18 min. The patient received tranexamic acid 1000 mg/day, Antithrombin III 2000 IU/day and the following day we added dipyridamole 1200 mg/day.
During the ECMO procedure we found a mismatch between the values of ACT, aPTT and R TEG and we considered the R TEG priority for the anticoagulation therapy.

Results: The patient was discharged from the ICU after 29 days. No bleeding or thromboembolic adverse events were observed

Conclusion: Different perioperative anticoagulation management during ECMO procedure may improve results. The R TEG represents an excellent option during ECMO. The use of safe anticoagulation protocol and thromboelastography monitoring permits to reduce significantly the risk for bleeding and thromboembolic events.

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10:40-10:55

Speaker: Ruza Mrkonjic ECCP
Perfusionist
Clinical Hospital Dubrava, Zagreb, Croatia

Our New Role: Perfusionist as a VAD Coordinator

R. Mrkonjic, M. Grubisic, N. Marusic, M. Solaric, N. Lukacevic, M. Sentic, D. Baric

Heart failure has a substantial risk of death, and is one of the most common reasons for hospital admissions in the elderly. One of two citizens in Croatia dies of heart and blood vessel failure and this is considered as the main reason of the major percentage of hospital admission amounting to around 15 percent.
The gold standard for the treatment of a failing heart is heart transplantation, but the limiting factor in cardiac transplant surgery is the number of available donors.
Parallel to the progressive transplant techniques, the technique of the mechanical heart function support has been developing and today clinical medicine has therefore a whole range of systems aimed at the mechanical heart support.
The support to heart functioning is obtained by the insertion of cannulas into heart cavities thus carrying blood in the mechanical system (VAD) which pumps blood throughout cardiovascular system. The VAD system may be used in several varieties: for left ventricular support, for right ventricular support, for left and right ventricular support.
Indication for the application of the mechanical support may be acute or chronic heart failure; patients qualifying for heart transplant, patients who it is impossible to disconnect from cardiopulmonary bypass upon heart surgery, patients who cannot be assisted by any other kind of treatment.
A mechanical pump is surgically implanted to provide pulsatile or non-pulsatile flow of blood to supplement or replace the blood flow generated by the native heart.
The project of mechanical assistance to patients at the Clinical hospital Dubrava started officially on October 30, 2008 by implantation of a paracorporeal pulsatile support. Another three pumps of HeartMate type providing a continuous blood flow were implanted later on.
Given the complexities of considering patients for VAD implantation and managing them postoperatively, the decision of the implant and the follow-up of a patient with the implanted support requires a multidisciplinary approach. The goals are to assure that all the patient's needs are met throughout the continuum of care, includes successful home discharge and long term follow-up.
Considering that all procedures performed in cardiovascular surgery theater requiring the specific technique are usually made by perfusionists, we meet them very often also in the function of VAD coordinators.
Role of VAD coordinator is to provide case management of patients on mechanical circulatory support devices throughout the continuum of care, provide clinical and technical support to doctors, allied health staff in the operation of the mechanical support, including emergent evaluation of clinical and technical problems and development of solutions, provide patient education regarding VAD operation, equipment management, medications, diet, exercise and other areas as identified, provide education and support for the public, and clinical and technical support staff.

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10:55-11:25 **COFFEE BREAK**

Moderators: 2nd Session

Adrian Bauer ECCP; MCVT
Perfusionist, Coswig Cardiac Center, Germany
EBCP Delegate to Germany

Prof. Alexander Wahba MD
Cardiac Surgeon Tronstein, Norway
EBCP Chairman

11:25-11:40 **MEDTRONIC SPONSORED SESSION**

Michael Van Driel
Marketing Manager CVT
Medtronic International Sarl

Affinity Pixie™ Oxygenation System Overview

Van Driel, Michael

The Affinity Pixie™ Oxygenation System recently introduced by Medtronic delivers performance and versatility for neonates, infants and small children requiring CPB at flow rates up to 2.0 L/min. The comprehensive system design of the oxygenator, venous reservoir and holder provides ease of set, ease of use and minimized prime volumes.
An overview of system characteristics and performance will be presented as will an overview of a new non-heparin biocompatible surface treatment called BalanceBiosurface, designed to resist cell adhesion and protein deposition.

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11:40-11:55 **MEDTRONIC SPONSORED SESSION**

Speaker: Nigel Cross
Chief Perfusionist
Great Ormond St NHS Trust, London UK

Initial Clinical Experience with the Medtronic Affinity Pixie™ Infant/Pediatric Oxygenator

Cross, N and Crook, R

Objective: the purpose of this study was to clinically evaluate in vivo the performance of the Pixie™ pediatric oxygenation System across a range of patient sizes.
Methods: a total of 6 devices were placed in our standard extracorporeal circuit. Blood gases were performed per institutional protocol. A Gampt Microbubble detection system was also used to measure gaseous microembolic load at the outlet of the reservoir and the outlet of the oxygenator.
Results: Clinical parameters measured including pressure drop, gas transfer, temperatures, flow rate and patient demographics will be presented. The gaseous microembolic load will also be presented and discussed, as will the positioning of the system, set up, prime, and use in ECC per the standard institutional protocol for ECC.
Conclusion: The Affinity Pixie™ oxygenator performs very well across different patient sizes, represents a solid balance of prime vs. performance, and is a system that adequately meets the day to day clinical needs of this institution.

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11:55-12:10

Speaker: Dr. Ilya N. Yemets MD Ph.D
Director of Ukrainian Children's Cardiac Center
Ukrainian Children's Cardiac Center, Kyiv

Autologous Umbilical Cord Blood In Arterial Switch Operation

K.Chasovskyi, O.Fedevych, H.Vorobjova, V.Zhovnir, A.Maksimenko, O.Boychenko, J. Lysak, I.Yemets

Objective: We report the innovative approach in blood management using autologous umbilical cord blood (UCB) components in neonatal cardiac surgery. This method allows us to modify the perioperative management and to perform repair of congenital heart defects (CHD) in the first hours of life before pathological changes develop.

Methods: Between January 2006 and June 2010; 242 neonates underwent arterial switch operations at our institution. All procedures were performed under moderate hypothermic cardiopulmonary bypass (CPB) with cold-crystalloid cardioplegia. Since September 2009 ten neonates who were prenatally diagnosed with d-TGA were operated on using autologous UCB components (RBC's, FFP) for priming the extracorporeal circuit and post CPB transfusion. Priming volume was reduced to 130 ml. Salvaged RBC's from CPB circuit were re-infused at CICU.

Results: There were no hospital mortality or UCB transfusion related side effects in our study. Mean volume of harvested UCB was 87±29.4 ml. Mean preoperative hematocrit (HCT) was 45 % (range 39-59%). Mean intraoperative HCT was 24.04% (range 17-37.3%), at one hour after surgery mean HCT was 33.4% (range 26.1 to 43.7%). The HCT progressively increased to 35.7% (range 26.7-41.2%) on the first postoperative day.

Conclusions: The use of autologous UCB components is feasible for intraoperative blood management in neonatal open heart surgery. Our preliminary data requires a prospective clinical study to evaluate the limitations and benefits of autologous UCB in neonatal cardiac surgery.

Key words: congenital heart diseases, cardiopulmonary bypass, umbilical cord blood, blood management.

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12:10-12:25

Speaker: Manon Caouette, CCP, CPC
Perfusionist
University Clinic of Quebec, Canada

Bentall Procedure on a 204 Kg Patient using a Capiox SX 25 Oxygenator: A Case Report

M. Caouette, Y.Lamarre , Y.Poirier
Institut Universitaire de Cardiologie et de Pneumologie de Québec, Québec, Québec, Canada

A 34 year old male weighing 325 kg underwent Bariatric surgery in the year 2000. Years later he presented with an aortic arch aneurysm requiring a Bentall procedure. The patient's weight at this time was 204 kg, height 175 cm with a BSA of 2.94 m^2 (according to Dubois calculation).

To anticipate potential difficulties of oxygenation and rewarming, the decision was made to incorporate a second oxygenator in parallel into the circuit. Both membranes were primed and deaired after which the second membrane was isolated from the circuit. During the procedure, mild hypothermia at 32^0 Celcius and cold blood cardioplegia were used. Bypass time was 105 min., cross clamp time 85 min. and rewarming time 60 min. The highest oxygenation gas flow was 5.0 l/min. with a maximum FiO_2 of 0.90. After several blood gases, a maximum pump flow rate of 6.5 LPM and a highest O_2 consumption of 323 ml/min/m^2, the patient demonstrated no oxygen deficit.
There was no indication to use the second oxygenator. Another concern during the surgery was the management of the venous blood volume to ensure proper venous return. The patient blood volume was estimated to be at least 10 liters so the blood storage capacity of the open reservoir was in question. In total, four liters of heparinized blood was retrieved from the venous line and put into bags. In conclusion; the patient underwent a successful Bentall procedure and was separated from bypass very easily with no complications.

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12:25-12:55 **TERUMO SPONSORED SESSION**

Speaker: Ingo Kutschka M.D.
Cardiac Surgeon
Department of Thoracic- and Cardiovascular Surgery,
Hannover Medical School, Germany

Modern Cardiac Surgery Requires New Perfusion Strategies – The Role of Minimized Perfusion Circuits
Priv.- Doz. Dr. med. Ingo Kutschka

Minimal invasive procedures in cardiac surgery made rapid progress over the recent years. Especially minimized approaches for aortic and mitral valve surgery have already made their way into clinical routine. Although there is a clear trend to innovative surgical techniques, most procedures relay on standard extracorporeal perfusion concepts.
It is now time to reconsider perfusion strategies and adjust these to the needs of modern cardiac surgery. Minimized perfusion systems (MPC) or extracorporeal membrane oxygenation (ECMO) circuits may play a major role in this context. The new generation of MPCs have very low priming volumes and markedly reduced foreign surface. Some circuits can be easily customized for the dedicated operation as well as patient needs. Due to special deairing features they provide the safety and performance requirements for a wide range of cardiac surgery. The risk of air aspiration into the circuit is low. Since completely coated circuits allow for adjusted heparin management, bleeding complications can be reduced. The combination of MPC and femoral cannulation is an ideal solution to support circulation in minimal invasive aortic valve replacement or mitral valve repair. Moreover, MPCs have been shown to be suitable to support minimal invasive lung transplantation and to provide sufficient lower body, intestinal, and renal perfusion during surgery of the thoracoabdominal aorta.

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12:55-13:40 LUNCH

Moderators: 3rd Session

Hans Seiler ECCP
Perfusionist, Germany

Heinz Weitkemper ECCP
Perfusionist Bad Oyenhausen, Germany
EBCP Accreditation Sub-Committee
www.ebcp.org Webmaster

13:40-13:55

Kurt Staessens
Chief Perfusionist
University Hospital Brussels/ASZ Aalst, Belgium

Lipid Micro Emboli and Leukocyte Filtration: A Critical Review
Staessens, K.

Introduction: Numerous researchers have shown that cardiopulmonary bypass (CPB) plays a large role in the initiation of the systemic inflammatory response during cardiac surgery. The activation of leukocytes during this process has been implicated as one of the major contributors to post-operative tissue injury. After promising results and improving techniques, leukocyte and lipid filters are still not widely used.

Objective: This research aims to provide further evidence on the clinical benefits of several filtration techniques. A literature review showed conflicting results especially for leukocyte filtration. Several organ function, like myocardial, lung, renal and cerebral function were objects of investigation, while other investigators focused on leukocyte depletion or timing of filtration. Lipids are less investigated.

Results: It has been proven that patients were more hemodynamic stable when leukocytes were filtered. Other authors could not show less vasopressor use. Improvement of pulmonary function was easier to prove. Control groups suffered a greater degree of injury to renal tubules and glomeruli. Haematological disturbance, bleeding and blood transfusion requirements were in a multitude of studies. There was no significant adverse impact on the degree of post-operative blood loss and the need for blood transfusion. Microemboli (gaseous, fat, debris,…) are recognised as the most important contributor to cerebral injury.

Conclusion: There is evidence that leucocytes, fat and particulate all contribute to postoperative tissue injury. From a clinical point of view, the best results can be achieved with filtration of shed mediastinal blood but there is still need for large scale clinical studies.

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13:55-14:10

Rob Bennett
Perfusionist
Hull Royal Infirmary, Hull, UK

Clinical Evaluation Of The Evado (E.C.C. Vacuum Assisted Drainage Optimised) Perfusion Strategy

R. Bennett[1], S. Bennett[3], M. Chaudhry[2], V. Francis[1], M. Loubani[2], J. Shepherd[4], A. Wallhead[1] [1] Perfusion Department, [2]Department of Cardiothoracic surgery, [3]Anaesthetic Department, Castle Hill Hospital, UK; [4]Department of Clinical Biochemistry, Hull Royal Infirmary, Hull, UK.

Objectives: The EVADO perfusion strategy utilises the unique design features of the Admiral oxygenator; prime volume and contact surface area is reduced by using VAVD and blood trauma is reduced by substituting roller pump suction with a vacuum. The aim of this study was to evaluate the EVADO strategy.
Methods: Institutional permission was obtained for two studies.
Study (1); 20 primary CABG patients were assigned alternately to CPB using conventional gravity drainage and roller pump suction or EVADO strategy. All suction blood was separated and processed with a cell saver. Regional cerebral saturation was measured using near infra red spectroscopy.
Study (2); 20 valve patients were assigned alternately to CPB using conventional CPB or EVADO strategy without separation of suction blood. Demographic, operative, perfusion, transfusion and blood loss data were collected. Plasma free Hb (PfHb), Hct and lactate were measured at four time points: Pre CPB, CPB + 10 min, on rewarming and Post CPB. PfHb was measured in the suction blood for study (1) before processing.
Results: No statistically significant differences were found between the parameters measured. There was a trend towards preserved haematocrit and reduced haemolysis in the EVADO CABG patients. Separated suction blood contained high concentrations of PfHb and circulating PfHb was higher in valve patients.
Conclusions: The EVADO strategy is safe and easy to implement with advantages over existing strategies and could offer significant clinical benefit for patients. Larger studies are warranted to fully determine the potential benefits of the EVADO strategy.

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14:10-14:25

Speaker: Giuseppe Nasso
Department of Cardiovascular Surgery
Anthea Hospital, Bari, Italy

EVADO: A New Extracorporeal Vacuum-Assisted Device to Optimize CPB: Comparison with Conventional CPB System

Claudio COSTANTINI[1], Giuseppe NASSO[1], Andrea CAVALLUCCI[2], Antonio PETRALIA[3], Giuseppe SPEZIALE[1]
[1]The Department of Cardiovascular Surgery. Anthea Hospital. Bari. Italy
[2]The Department of Cardiovascular Surgery. Villa Maria Cecilia Hospital. Cotignola (RA). Italy [3]Perfusion Service Villa Maria Group. Lugo (RA). Italy

Background: The miniature cardiopulmonary bypass (CPB) systems have been associated with less hemodilution and inflammatory activation than conventional circuits. However, they are limited in their applications in cardiac surgical operations. We evaluated a versatile CPB system (EVADO) based on the elimination of roller pumps, the separation of extra-cavitary suctioned blood and state-of-the-art technology for oxygenator systems and digital control.

Methods: We randomized 73 patients undergoing a variety of cardiac operations to either EVADO or conventional CPB. Intraoperative hemolysis was assessed (free hemoglobin, FHb, and Haptoglobin, HPT, levels). Postoperative blood loss, hemoglobin levels and need for blood transfusions was also assessed.

Results: In all patients randomized to EVADO, surgery could be easily completed without conversion to conventional CPB. The use of EVADO significantly reduced intraoperative hemolysis (less increase in FHb levels, $p< 0.0001$ vs. control, and less decrease in HPT levels, $p<0.02$ vs. control). Among patients undergoing surgery with EVADO, we observed a reduced postoperative total bleeding ($p=0.029$ vs. control), reduced need for transfusions of blood products ($p=0.02$ vs. control). Hemoglobin levels were higher in the EVADO group at all time points during both CPB and the ICU stay, although not statistically significant.

Conclusions: All cardiac procedures (coronary, valvular, thoracic aortic or combined) could be completed using EVADO. Compared with a conventional system, the application of EVADO was associated with a reduction in hemolysis, less hemodilution, less blood loss, and hence reduced transfusions requirements. However, we could not demonstrate a clinical advantage in terms of perioperative mortality/morbidity rates. Further studies with larger sample size are required to address this issue.

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14:25-14:55 **MAQUET SPONSORED SESSION**

Speaker: Inderaj Bilkhoo
Senior Perfusionist
Southampton University Hospital, UK.

Influence of the Reservoir Shape on Air Separation Capability

The development of oxygenator and reservoir design has seen parallel improvements in response to monitoring and safety devices. This long history of improvements has seen the introduction of anti-foaming agents for bubble oxygenators, cardiotomy filters, oxygenator membranes alongside venous reservoir level detection, arterial bubble detection and arterial line filters. These have become standards in the vast majority of centers.

In spite of these developments contributing to the reduction of mortality and morbidity of cardiac patients, neuro-cognitive dysfunction is still present in some post operative cases. One contributing factor to this is systemic embolisation.

The capacity of arterial filters to eliminate all sources of emboli has significant limitations. The impact of perfusion interventions have also shown that following injections (of drugs/other interventions) into the venous reservoir, gaseous emboli may be allowed rapid passage through to the arterial outflow. These external sources (including surgical air entrainment) and internal sources (splashing and turbulence) contribute to embolisation.

This investigation sets out to compare the different shapes of reservoir available and their air separation capabilities. The appreciation of these factors in the design and flow path characteristics shall also be discussed.

indie_bilkhoo@hotmail.com

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14:55-15:25 COFFEE BREAK

Moderators: 4th Session

Frank Merkle Dipl.-Med. Päd. ECCP
Akademie für Kardiotechnik
Steinbeis Transfer-Institut Kardiotechnik
Deutsches Herzzentrum Berlin
Secretary EBCP

Mr. Dalibor Zovko ECCP
Perfusionist
Specialized Hospital Magdalena
Krapinske Toplice, Croatia
EBCP Delegate to Croatia

15:25-15:45 **SORIN SPONSORED SESSION**

Speaker: Gerard J Myers RRT, CCP
Perfusionist
Halifax, Nova Scotia, Canada

Optimizing Microemboli Protection during Cardiopulmonary Bypass

There are many sources of gaseous microemboli generated during the course of cardiopulmonary bypass. Perfusion contributions to these embolic events are usually technique and device related. Technique can be modified to achieve optimal results, but devices are a matter of choice.
Gaseous emboli, regardless of gas composition, has been shown to result in stupor, coma, reduced intellect, memory loss, confusion, agitation, seizures, stroke and cognitive dysfunction

Some of the sources of gaseous microemboli addressed in this presentation are;

- Start of CPB
- Blood gas sampling
- Drug Injection
- Vacuum Assist Drainage
- Reservoir vent return
- Cardiotomy suction
- Low levels in reservoir

With the use of ultrasound technology, the past decade has seen a dramatic increase in the literature devoted to finding these gaseous embolic sources.
To optimize handling of microemboli, the perfusionist must first recognize what microemboli are, how they affect their patient population and utilize evidence based literature to provide them with information that helps make choices in their use of cardiopulmonary techniques and equipment. This presentation will address both the sources mentioned in this abstract, and address the literature dedicated to preventing these iatrogenic embolic events.

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THE NEW RELEASES
FROM SORIN GROUP

SORIN GROUP
AT THE HEART OF MEDICAL TECHNOLOGY

15:45-16:05 **SORIN SPONSORED SESSION**

Eddy Overdevest ECCP
Perfusionist
Catharina Hospital Eindhoven

Clinical Evaluation of the new Sorin XTRA® Autotransfusion System

E.P. Overdevest, EKP, ECCP

The last introduction of a new autotransfusion system occurred in the year 2001, when Sorin Group introduced the Electa. Now, nine years later, Sorin Group introduces the Sorin XTRA®, a new generation autotransfusion device, equipped with a graphic colored touch screen user interface and an improved vacuum system, using a different disposable bowl set, for easier and faster setup and improved performances.
Catharina Hospital participated, among several other hospitals, in a Pre-Market Evaluation Study to validate the functionality and acceptance of the system in operative conditions. In 20 procedures the set-up, processing speed and ease of use of the system were tested among the features already mentioned above.

A consecutive study evaluated the performance of the Sorin XTRA® by measuring the hematocrit, calculating the elimination rates for several contaminants, the recovery rate of red blood cells and comparing the results of its hematocrit sensor with laboratory measurements.
The performance of the XTRA® was studied in 60 patients undergoing coronary artery bypass grafting, where an autotransfusion system is used routinely in our setting. Each bowl size was studied, using the Optimized Protocol (Popt) when processing blood collected from the surgery field, suction blood collected in a separate chamber of the cardiotomy reservoir and a part of the residual volume of the Heart Lung Machine.
Blood samples were taken during the first cycle from both the collection reservoir, after gentle mixing of its content, and the reinfusion bag to determine hematocrit, concentrations of heparin (in IU/ml), free plasma hemoglobin (FPH)(in mmol/L), total plasma proteins (g/L), number of platelets, white and red blood cells.

The data of both the Pre-Market Evaluation and the Clinical Performance Evaluation Studies are presented.

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16:05-16:20

Speaker: Bruno Claro, Pedro Pires
Perfusionist
Serviço de Cirurgia Cardiotorácica
Hospitais da Universidade de Coimbra, Portugal

How to Build a low-cost Perfusion Simulator
Bruno Claro, Pedro Pires

Objective: Simulators in perfusion allows the recreation of clinical situations associated to the heart-lung bypass machine, so that perfusionists can respond efficiently and faster to problems and crisis situations that may occur during a real procedure.
Every perfusion team would be pleased to have a simulator that generally requires high costs. We managed to build a system almost for free with high applicability and want to share it with the scientific community.

Methods: We started by gathering a lot of unutilized material and equipment. A silicon and PVC circuit were made to simulate the circulatory system, bags were used to simulate some organs and clamps to allow changes in the vascular resistance. The Circuit was connected to an old heart-lung machine. A beating-heart was created using an old roller-pump in a pulsatile flow mode.

Results: The simulator displays arterial and CVP waveforms recreating different situations that the instructor can manage.
The model allows the use of centrifugal pump, intra-aortic balloon and other perfusion equipment.
Students can prepare everything for the extracorporeal circulation, initiate cardiopulmonary bypass, manage different cases, emergencies, weaning of bypass with a “beating-heart” that recreates the patient pressures during and after the weaning of bypass.
The instructor can set the clinical agenda and the educational outcomes for each session.

Conclusions: The simulator allows the gaining clinical experience without impacting patient safety and the outcome of real life procedures.
It allows a better education, maintenance of core skills, practice of emergency situation responses, team resource management and a multi-disciplinary team education.

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16:20-16:30

Andreas Dietz
Dipl. Eng. of Medical engineering
Hochschule Furtwangen University, Villingen-Schwenningen, Germany

10 Years Experience with the First European Perfusion Simulator Education, Training and Research at the Centre for Applied Simulation

A. Dietz; C. Benk, F. Born, S. Lützow, G. Haimerl

Since the nineties, the Hochschule Furtwangen University has performed research in the field of hard- and software based medical simulation. After the year 2000, the hardware based simulation was introduced to students' education and training of medical experts. At this time the first software based simulation of Extra-Corporeal Circulation was developed.

Starting with simple circulation simulation units called "Green Box"; the first experiences in practical simulation using real Heart-Lung Machines took place and laid the foundations of the development of full scale simulators for Extra-Corporeal Circulation.
An important step for further development was the symposium "Safety at the Heart Lung Machine" performed in Schwenningen at the Hochschule Furtwangen University in 2002.
The introduction of simulation in an almost real operation theatre environment is a great improvement in students' education. It shortens significantly the time for the students when they come to a heart centre to perform perfusions on their own under supervision. The continuous further development led to the world wide most complex perfusion simulator including the possibility of coordination training with perfusionists, cardiac surgeons and anaesthesiologists. Even the industry can use the simulator for research and development.

Our Cardiovascular Engineering, Education and Research Network consisting of the Hochschule Furtwangen University, the University Freiburg and the Bodensee Heart Centre is now an ideal platform for education, training and research.

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16:30-17:00

Summary of Posters:
Alphabetical order

Presenter: Francesco Conti
Perfusionist, Gemelli Polyclinic, Rome, Italy

Continuous Blood Gas Monitoring as a Valid Alternative to Intermittent Blood Gas Sampling Managed by Laboratory Analysers during Cardiopulmonary Bypass

Francesco Conti, CCP, Fabrizio Rosica, CCP, Valentina Orlandi,CP, Lorenzo Martinelli MD, Stefano De Paulis MD, G. Federico Possati,MD.
Division of Cardiac Surgery, Catholic University, Rome, Italy.

Background: Continuous blood gas monitoring is an interesting tool for perfusionists. The values on the screen monitor are quickly updated to ensure a safe control of Cardiopulmonary Bypass (CPB). But are these values sufficiently compatible with the correspondents from the laboratory analyzers? An investigation on this matter has been performed using a software data collecting and installed on a personal computer.
Methods: Our Institute, during the period September 2009-March 2010, has enrolled 160 randomized patients undergoing to open heart surgery and supported by CPB. All the patients have received the continuous blood gas monitoring and the intermittent blood gas sampling obtained from the laboratory analyzers. During every CPB, the data from the monitoring system and from the laboratory assistance were collected on line using a dedicated SW on the PC to create a file for each patient for an appropriate and fast comparison.
We have separated 160 patients into two groups:
60 patients for group A and 100 for group B.
Group A was dedicated to the Golden method to verify the possibility of a recalibration of the monitor if the values were too different comparing the parameters we got reading the first report from laboratory analyzers. The suggested range we have considered was ±10%. We have performed all the CPB's of group A as first step of our research.
Group B included the patients for a whole investigation during the CPB: we have verified the data from the continuous monitoring and the data from the laboratory analysers to confirm their accordance along all the time of the CPB's. We have performed the CPB's of group B as second step of study.
Results: The files we have collected using the SW and belonging to the group A were considered as Golden method. The compared data have confirmed that the recalibration of the continuous monitoring isn't necessary following the instructions for a correct management of the system. The positive conclusion of this first step has permitted the second part of the study involving the group B. The application of the continuous blood gas monitoring has shown a good precision and accuracy with the data we have received using the intermittent blood gas sampling and the laboratory analyzers reports. The SW files we have verified are in conformity with the fixed range.
Conclusions: The continuous blood gas monitoring may be applied as an alternative to intermittent blood sampling managed by laboratory analyzers during the CPB. The system has success as routine application or for long time CPB because our experience confirms the adequacy when the use is prolonged. During our study and from the clinical point of view, we have observed that a continuous monitoring is suitable for a regular control of the CPB: the perfusionist can maintain a physiologic level of the blood parameters changing the blood flow rate, the gases fraction and the O2 percent in real time without waiting for the next laboratory report. This kind of continuous blood gas management has allowed a superior quality of CPB due to on-line monitoring of the oxygenator performance in relation to the blood flow and metabolic requirements of the patient.

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Presenter: Gaspare DiLorenzo
Perfusionist
Perfusion Service, Mediterranean Institute for Transplantation and Highly Specialized Therapy (ISMETT)

H1n1 Flu Related Fluminant Respiratory Failure: ISMETT Experience

Gaspare DiLorenzo; Maurizio Favatella; Rosy Longo; Roberto Paternostro; Szymanski Jaroslaw; Majelli Giuseppe,

ISMETT ECMO Team:
Anesthesiologist
Cardiothaoracic surgeon
Perfusionist

Materials and Methods:

- Portable control unit Centrifugal pump
- Polymethylpentene low resistence oxygenator
- Heparin coated tip to tip miniaturized circuit
- High flow on ECMO
- The use of ECMO as rescue therapy for Flu related ARDS is effective in saving lives in young healthy people
- The experience made with the national ECMO net will allow in the future to use these type of organization also for other causes of cardio-respiratory failure
- Thanks to the progress made with the devices, in the next future ECMO will be not be used exclusively in the few highly specialized ICU's.

Case Report:

- 38 year old woman in the 25th pregnancy week
- Severe ARDS with pneumothorax
- Upper GI bleeding on day 6 of ECMO support
- Intracranial bleeding detected in the fetus on day 7 ECMO support
- Cesarean section performed during the 3rd weeks of ECMO support
- No bleeding complications during surgery
- The newborn was intubated and mechanically ventilated
- ECMO support removed 7 days post delivery
- 8 weeks post admission she was discharged home without O_2 support
- The baby is doing well also but the neurological status is being followed

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Drastic Coagulation Improvements After Cardiac Surgery Without the Use of Blood Products

J. Rocs, M.D., T. Winkler, M.D., W. Shely, M.D., B. Miller, M.D., R. Biesinger, M.D., J. Opton, M.D., A. Ianus, M.D., A. Anderson, M.D., L. Priollaud, M.D., D. Carlile, C.C.P., M. Hayoook, C.P., S. Beckmann, C.C.P., K. Engstad, M.D., Salem, OR

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Introduction

Optimal coagulation continues to be a challenge in the immediate postoperative period for the cardiac surgical patient. Exposure to red blood cell transfusions, fresh frozen plasma, platelet transfusions and cryoprecipitate has been associated with postoperative sequelae and increased morbidity and mortality. The impact of highly concentrated autologous whole blood on coagulation is less well understood.

There are increasing international stresses within healthcare regarding the allogeneic blood supply, its use and associated costs and morbidity (1,31,32). The concern is arguably one of greatest in the cardiac surgery arena today (2, 29). Improved blood administration practices have been encouraged by multiple professional societies whose members provide cardiac surgical care. (3,4,6).

There are vast differences in transfusion practices between cardiac surgical facilities throughout the world (5,16). As well, there are numerous blood conservation maneuvers that are employed during cardiac surgery that have not been widely adopted as standard of care (6,7,8).

Patient data from an ultrafiltration technique (the Hemobag®) to process residual extracorporeal circuit blood is presented as an example of a means to reduce allogeneic blood related use, risks and costs (9,20,21). This technology allows for the re-infusion of shed / residual blood without creating disturbances in hemodynamic or biochemical parameters, and avoidance of clinical complications or any increase in morbidity (9-10, 16-17). Further studies indicate that in over 50% of patients, FFP transfusion does not reliably reduce the PT or INR and exposes patients to unnecessary risk (18-19, 32-33).

Method

Twelve (12) patients undergoing coronary artery bypass graft, or redo coronary artery bypass graft surgery were evaluated for the effective change in the coagulation parameters of prothrombin time (PT), activated partial thromboplastin time (PTT), International normalized ratio (INR), fibrinogen concentration (FIB) as well as hematocrit, (HCT) and platelet (PLT) count.

After cardiopulmonary bypass (CPB) termination and neutralization of sodium heparin with protamine sulfate, these coagulation tests were collected before and after the infusion of "multipass" hemoconcentrated autologous whole blood via the Hemobag® (Global Blood Resources LLC, Somers, CT) technology using ultrafiltration/hemoconcentration (HBV).

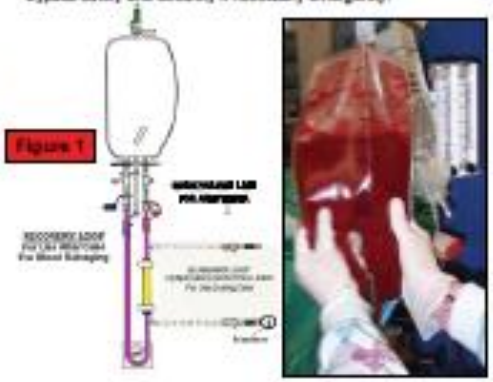
Cell washer (Cell Saver® 5 Haemonetics Corporation, Braintree MA) was also employed for all 12 patients to conserve blood. Residual heparin in the HB contents was neutralized with an additional 50mg of protamine sulfate after HBV infusion.

Process indicators and central hospital laboratory results were statistically compared by independent group t-test before and after the protamine administration and the reinfusion of ATS, ANH and HBV blood. Statistical analysis was performed using JMP software (SPSS 14.0, Chicago, IL).

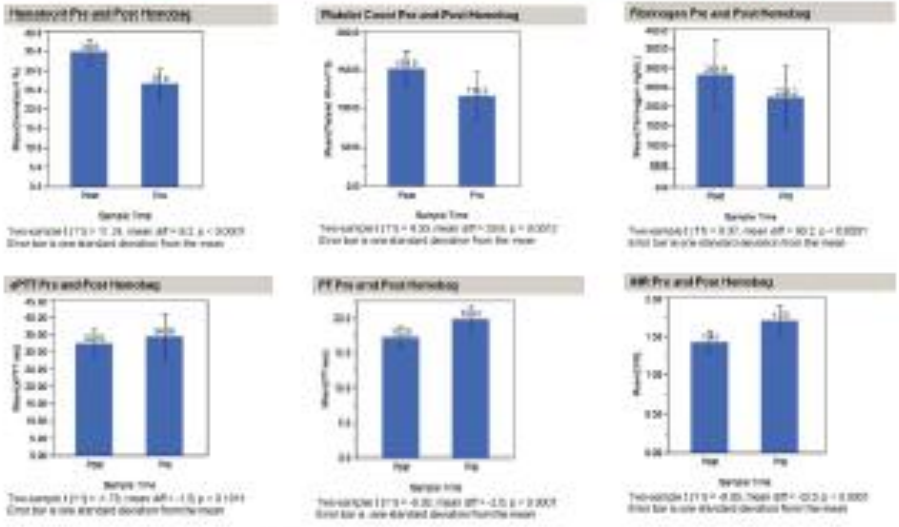
Hemobag®

The Hemobag® Blood Salvage Device (Figure 1) is a special reservoir system that allows the patient's own whole blood to be quickly salvaged, hemoconcentrated and safely reinfused. It efficiently uses the same convenient reservoir system while leaving CPB circuit integrity is safely primed for reinstituting bypass safely and securely if necessary emergently.

Figure 1



Preserving Blood



Results

The average HBV infused was 1,046mL. Zero percent of patients (n=12) were exposed to allogeneic blood or blood product transfusions immediately post CPB to achieve these impressive changes.

Table 1 presents the results of the statistical analysis of the differences pre and post HBV infusion. Except for aPTT, all parameters changed significantly after the post-protamine HBV infusion.

Significant reductions in PT and INR were also observed after HBV content infusion however, there was only a strong trend in decreased average aPTT.

Table 1: Results of coagulation parameter changes after administration of concentrated ECC residual whole blood using the Hemobag®

Parameter	Post	Change	Std Err	t value	p value
Hematocrit	34.5 %	+6.2	0.7	11.24	<0.0001
Platelet count	150 K/µl	+34	7.8	4.33	0.0012
Fibrinogen	264 mg/dl	+60	9.5	6.37	<0.0001
aPTT	32.8 sec	-1.8	0.98	-1.79	0.1011
PT	17.3 sec	-2.6	0.32	-8.03	<0.0001
INR	1.4	-0.2	0.03	-8.00	<0.0001

Legend: Coagulation parameter values for 12 patients (df=11) receiving an average of 1046 ml of concentrated ECC residual whole blood and 169 ml of processed washed cells are listed with the results of t-test analysis between pre and post-administration.

Discussion

Most allogeneic blood products are transfused in the first few perioperative hours and often based upon arbitrary clinical observations without adequate documentation of the need for blood bank components (5).

Overall improvements were seen in all measured parameters. Statistically significant improvements in coagulation studies, platelet count and hematocrit levels were observed. aPTT although reduced, was not statistically significant.

The administration of concentrated autologous whole blood using this technique following CPB, significantly improved the coagulation state in these patients. Optimizing coagulation can be achieved with this technology minimizing the risks and the hazards of exposure to precarious donated blood products after coronary bypass surgery (20-26).

These results strongly suggest that cardiac surgery patients may be spared donor exposures when this efficient, "Off-Line MUF" technique is implemented and the residual bypass circuit blood is highly concentrated and quickly reinfused as compared to cell washing technologies (9-10).

Use of the Hemobag® for salvaging blood is associated with significant increases in the patient's protein and cellular concentrations. These proteins would have normally been discarded by cell washing at an average cost of about $4,000 USD. (15) thus lowering coagulation times in the important, first few hours following CPB. (11-14,22,25)

Use of "multi-pass" ultrafiltration to process the residual perfusion circuit blood far exceeds the results of "single-pass" ultrafiltration and "direct infusion" methods (28, 34). This technology has improved our blood administration practices and greatly reduced unnecessary donor transfusions.

The Hemobag® provides patients with improved quality of care through the reduction of excess IV fluid and allogeneic blood products. Frequently, transfusions are directly related to costly, negative, patient outcomes and in many cases can be avoided (2,26,28,30).

Conclusion, the Hemobag® technology offers both the Anesthesiologist and Perfusionist an easy and improved method for optimizing both Coagulation and Fluid Shifts (Homeostasis) immediately after decannulation, which lasts for hours after the termination of cardiopulmonary bypass well into the ICU recovery phase. The Hemobag® infusion helps to reduce exposures to donor (allogeneic) blood products in cardiac surgery which improves outcomes.

*** References available on handout copy of poster**

Presenter: Eric Laliberté, CCP, CPC
Perfusionist
Clinical Perfusion Department, Département de perfusion clinique.
The Montreal Heart Institute, Institut de Cardiologie de Montréal.

Three Small Quality Projects to Improve Cardiopulmonary Bypass Conduct

First project: Many small adjustments have to be made to conduct cardiopulmonary bypass (CPB) safely. $PaCO_2$ is an important biochemical marker to continuously monitor. Unfortunately, a continuous in line blood chemistry monitoring is not always readily available for each case. An in-vivo evaluation was undertaken during all stages of CPB on non-consecutive patients to estimate and predict $PaCO_2$ through continuous monitoring and recording of oxygenator exhaust capnography ($PECO_2$). A total of 243 pairs of measurements were made over a period of 6 months. Overall measurements revealed a mean $PaCO_2$ of 40.3 mmHg, a mean $PECO_2$ of 44.2 mmHg. Continuous oxygenator exhaust capnometry ($PECO_2$) is a reliable method of monitoring, costless and easy to use in this particular clinical setting of CPB.
Second project: To evaluate the use of a Transonic flow probe to effectively control hemodialysis during CPB with the use of a standard hemofilter. Occasionally faced with elevated potassium levels on CPB, hemodialysis may be used to reduce potassium. A simple hemodialysis method was established to control dialysis inflow and effluent outflow. Counter current blood flows were established for the procedure. Dialysate solution flow of ≈300 ml/min was controlled by gravity and a scroll clamp device. The effluent was controlled via a side clamp adjusted to match the dialysate inflow, keeping a positive flow of ±25 ml/min to avoid transfusing volume to the patient. The blood flow through the device was achieved by passive flows diverted from the manufacturer purge line attached to the top of the oxygenator (≈500 ml/min). All flows were measured using a Transonic flow meter with appropriate flow probes. Adequate flow control was achieved and maintained in every patient in whom the flow meter was used throughout the dialysis period. Excessive, under or disproportionate hemofiltration was avoided in all patients as well as solution transfusion through the dialyser, directly related to the use of this monitoring device.
Third project: Incorporated,the use of a small adult Oxygenator to reduce transfusion. This device was used on 43 small adult patients with the unique goal of reducing per CPB homologous blood transfusion. From Sept 2008 to May 2009, 1057 patients were admitted to the operating room for cardiac surgery. CPB was used for 967 patients. The small adult units were used on 43 patients. Mean BSA was 1.69 m^2. The mean priming volume for the small unit was 1130 ml, compared to 1455 ml for the standard circuit. Blood transfusions in the reduced priming volume group during CPB was 20%. An historical cohort of patient perfused with a standard circuit had a transfusion rate of 38%. Since this evaluation, small adult oxygenators are now routinely available to our centre and in my experience, automatically selected for all octogenarians and patients with a BSA below 1.85m^2.

In Conclusion: By evaluating and identifying areas of improvement where a perfusionist can act, one can control many small details and offer best practice bypass to all patients, at low cost and high efficacy. Many other small projects are underway to achieve better results, better outcomes.

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Presenter: Helmut Mair
Cardiac Surgeon
Department Of Cardiac Surgery, SK Vogtareuth, Germany

Near-Infrared Spectroscopy in Routine Cardiac Surgery – 2 Case Reports
H. Mair, A. Schütz

Objective: Near-infrared spectroscopy (NIRS) monitors regional brain blood oxygen saturation noninvasively. Reduction of NIRS signals during cardiac surgery may result in adverse neurological events. We report two cardiac procedures in which rapid intervening returned critical levels of NIRS signals to normal values.
Methods: Since 2008 we performed NIRS in all cardiac procedures using the INVOS cerebral oximeter (Somanetics, Troy, MI) and NONIN .
Results: In case 1 the ascending aorta and the aortic arch were replaced in deep hypothermic cardiocirculatory arrest. During the procedure NIRS signals dropped critically. Therefore antegrade cerebral perfusion was started after cannulation of the left common carotid artery. Brain perfusion was achieved with an average flow rate of 1000 ml/min, at a perfusion pressure of approximately 55 mmHg. In this setting NIRS signal returned to normal baseline.
In case 2 off-pump coronary artery bypass was performed. During elevation of the heart for revascularization of the circumflex artery using the blood pressure dropped to approximately 90 mmHg systolic and mean 50 mmHg. Subsequent NIRS dropped below 50% of normal baseline. Immediate elevation of blood pressure above 65 mmHg (mean) by adjusting heart position and fluid administration, OPCAB surgery was finished with NIRS data in normal levels. Both patients had an uneventful postoperative course.
Conclusion: Clinical benefit and the lack of use-associated risk due to non-invasive monitoring support routine NIRS in cardiac surgery.

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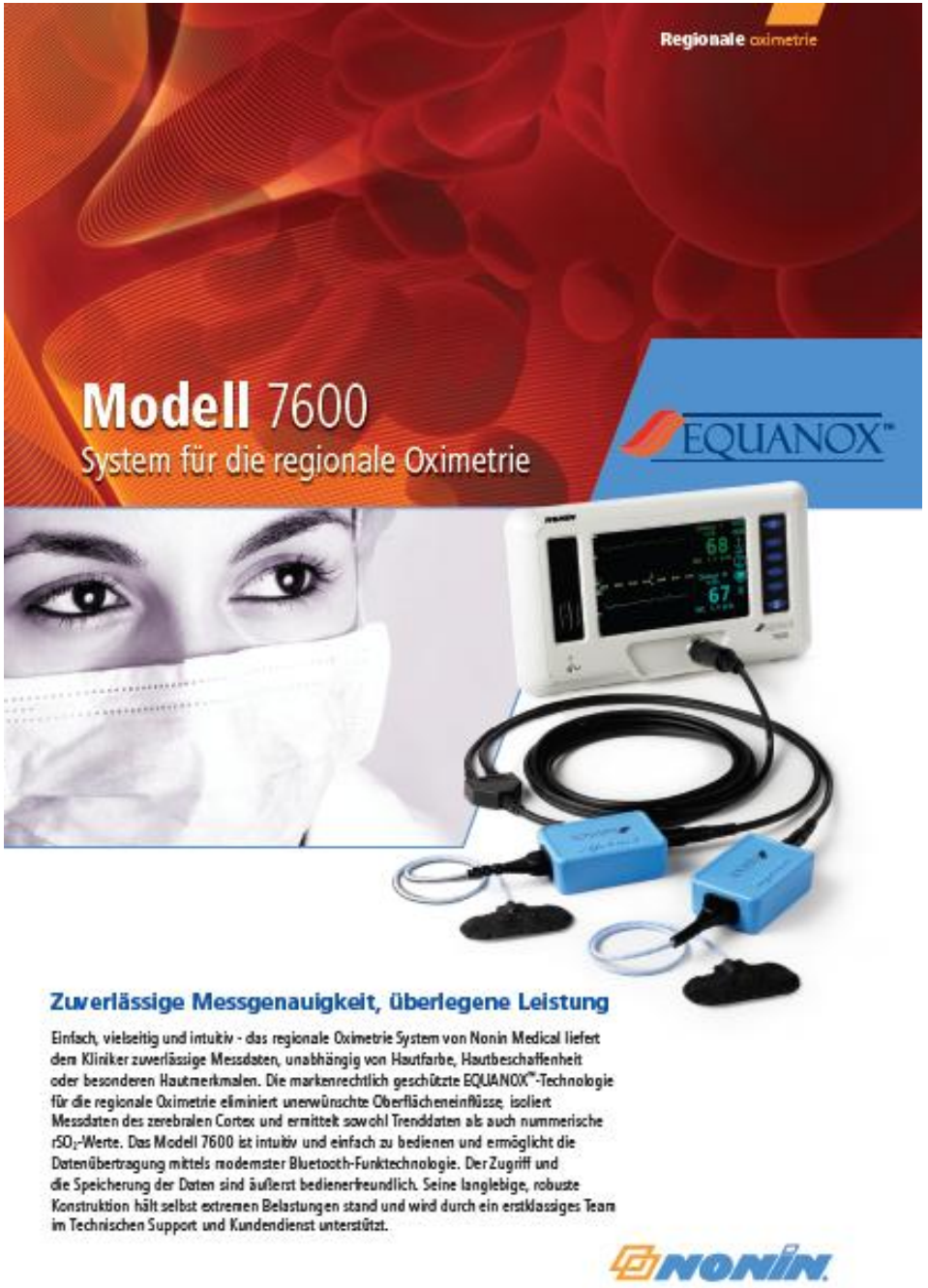
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NONIN

Presenter: Birute Mockuviene ECCP
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Critical Aortic Stenosis in a One Day Old Newborn: A Case Report

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This report describes how a neonate was supported with extracorporeal membrane oxygenation (ECMO) after cardiac surgical intervention: aortic valvular commissurotomy, atrial septal defect (ASD) increased, and closure of patent ductus arteriosus (PDA). ECMO was indicated and used to treat postoperative cardiac failure.
The above operation was performed in a one day old newborn weighing 2.6 kg using cardiopulmonary bypass (CPB). The aortic cross-clamp time was 32 min, CPB time 121 min and reperfusion time was extended to 58 min after initial failure to wean from CPB. After a second attempt, with inotropic support Epinephrine 0.5 µ/kg/min, Dopomine 5 µ/kg/min, Corotrope 0.5 µ/kg/min; it was decided to place the baby on ECMO for postoperative cardiopulmonary support. Veno-arterial (VA) ECMO was applied with the same cannulae used for CPB.
The patient was successfully weaned off ECMO after 34 hours with a systolic arterial pressure of 68 mmHg maintaining Epinephrine 0.3 µ/kg/min, and dopamine 10 µ/kg/min. After 10 minutes the arterial pressure increased to 80 mmHg, allowing dopamine and epineprhine to be reduced. The following day the hemodynamics remained stable and the baby was transferred to the normal ward after 36 days,.
Conclusion: Our experience shows that patients with severe cardiac failure may be saved with the treatment modality of VA-ECMO.

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Influence of Sevoflurane on Mitochondrial Function in Human Atrial Fibers during Coronary Artery Bypass Surgery

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Background. Potential cardioprotective properties of volatile anesthetics in patients who undergo coronary artery bypass grafting procedure (CABG) are not fully elucidated. The aim of this study is to compare the influence of sevoflurane and propofol on mitochondrial function in human atrial fibers during CABG with cardiopulmonary bypass (CPB) and to evaluate the myocardial damage related to ischemic-reperfusion injury.
Methods. Thirty-four patients, who underwent CABG with CPB using cold crystalloid cardioplegic solution, were divided into two groups: group I (n=19) volative anesthetic sevoflurane was used for anesthesia, and group II (n=15) intravenous anesthetic propofol was used for anesthesia. Mitochondrial respiration *in situ* was evaluated in human atrial fibers. Biopsy specimens (approximately 10-15 mg) were obtained before the aorta cross-clamping and at 15 min. after the end of CPB. The rate of mitochondrial respiration in atrial muscle fibers was measured oxygraphically at 37°C using glutamate+malate and succinate as substrates. We also studed alterations of troponin T (by imunoenzymetic method of ELISA) and lactate concentration in blood serum before and after surgery. Statistical analysis was performed by SPSS for Windows®, a value of $p < 0.05$ was taken as the level of significance.
Results. After cardioplegic arrest using sevoflurane for anesthesia the mitochondrial respiration rate in State 3 decreased by 25% ($p<0.05$). The external, ADP-dependent respiration rate of mitochondria was also significantly diminished by 24%. Succinate oxidation remained unchanged. Using propofol for anesthesia after ischemic period mitochondrial respiration rate in State 3 increased by 29% using glutamate+malate and by 25% ($p<0.05$) using succinate. The mitochondrial respiration rates after aorta cross-clamp release were also lower in sevoflurane group than those in the propofol group. In both groups we observed the loss of cytochrome c, which was most pronounced in the sevoflurane group. Troponin T concentration in blood serum was significantly lower (2.5 ± 0.7 µg/l) in patients of sevoflurane group as compared to the propofol group patients (5.6 ± 0.7 µg/l). There were no differences in lactate concentration among the groups.
Conclusions. We suppose that diminishing of mitochondrial respiration by sevoflurane could be involved in the sevoflurane induced cardioprotection. Sevoflurane showed lower concentration of troponine T in blood plasma as compared to propofol indicating less myocardial damage.

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Anticoagulation Management During Extracorporeal Circulation Of Patients Who Have Been Pre-Treated With Heparin

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Background: The figure of 480 seconds as measured by the activated clotting time (ACT) has been, and still is the golden standard of safety before starting extracorporeal circulation (ECC). After an increasing number of patients pre-treated with fractionated heparin had failed to reach this target, the heparin loading dose of 3 mg/kg (300 units/kg) was altered to 5 mg/kg (500 units/kg), just as in patients pre-treated with unfractionated heparin.

Methods: To evaluate if the initial heparin loading dose and the additional heparin dose is sufficient to reach the target ACT before and during ECC; Three patient groups were studied with respect to ACT; 42 patients pre-treated with unfractionated heparin (UFH), 39 patients pre-treated with fractionated heparin (FH) and 41 patients without pre-treatment of heparin (Control). The ACT (cellite ACT on the Hemachron 8000) was measured; after induction of anaesthesia, 3 minutes after the initial heparin loading dose was given and subsequently, if extra heparin was required, at 3 minutes after each extra heparin dose was given until the target ACT was achieved.

Results:

	UHF group	FH group	Control group
ACT after induction of anesthesia (sec.)	142 ±3.6	136 ±3.5	136 ±3.0
The initial loading dose of heparin (mg/kg)	4.95 ±009	4,96 ±0.09	3,09 ±0.05
After The initial dose of heparin missed target (%)	45	26	24
The rise in ACT per units heparin per ml blood (sec./ IU /ml blood)	65 ±5	75 ±5	113 ±5
The total initial dose to get to the target (mg/kg)	5.59 ±0.19	5.41 ±0.23	3.18 ±0.19
The ACT after this total initial dose (sec.)	590 ±28	640 ±30	594 ±18

The results demonstrate that the UFH group and the FH group needed a significantly higher initial and total loading dose of heparin compared to the Control group ($p<0.001$).

The ACT after induction of anesthesia and the ACT after the total loading dose were not significantly different between the three groups.

The rise of ACT was significantly lower in the UFH group and the FH group compared with the control group ($p<0,001$).

Conclusion: The patients pre-treated with heparin were less sensitive to heparin and needed a substantial larger amount of initial heparin.

NOTES

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