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Contents

Editorial remarks .......................................................... 11

Open Oral Sessions

Oral Session – Echocardiography
O-1 Feasibility and accuracy of intra-operative assessment of systolic pulmonary artery pressure by transoesophageal echocardiography ........................................ 13
O-2 Prognostic value of pre- and post-operative RV systolic function in patients referred for cardiac surgery .................................................. 14

Oral Session – Kidney
O-3 Erythropoietin and Protection of Renal function In Cardiac Surgery (the EPRICS trial) . 15
O-4 Acute kidney injury may be associated with specific ICAM-1 and TNFα genes variance ............................................................ 15

Oral Session – Thoracic Surgery
O-5 Thoracic surgery for infectious diseases: case series and peri-operative management from an academic centre in Ethiopia ......................................... 16
O-6 Lung deflation with Arndt® blocker during video-assisted thoracoscopy: a comparison of the disconnection technique with a continuous bronchial suction 17
O-7 Target-controlled infusion of remifentanil without muscle relaxant allows acceptable surgical conditions during thoracotomy ........................................ 17
O-8 Effect of benzydamine spraying on postoperative sore throat and hoarseness after tracheal intubation with a double-lumen endobronchial tube .................... 18
O-9 Comparison of the effects of sevoflurane and desflurane on microcirculation in non-cardiac surgery ........................................................ 19

Oral Session – Myocardial Ischemia
O-10 Intravenous glutamate reduces the need for inotropes in patients with heart failure after CABG for acute coronary syndrome ........................................ 20
O-11 Hyperoxia reduces regional myocardial oxygenation distal to acute coronary stenosis in swine ........................................................................ 20
O-12 Mechanical circulatory support with Impella 5.0 assist device in severe cardiogenic shock: 5 years experience ................................................ 21
O-13 Intra-aortic balloon pump use does not affect the renal function in patients undergoing off-pump coronary artery bypass surgery ....................... 22
O-14 Independent predictive factors of postoperative renal replacement therapy after adult cardiac surgery ......................................................... 22

Oral Session – Pediatric
O-15 High dose methylprednisolone reduces degradation of endothelial glycocalyx in paediatric open heart surgery ............................................. 23
O-16 Dosage feasibility of urine biomarkers [TIMP-2]/[IGFBP7] in paediatric acute kidney injury after cardiac surgery with cardiopulmonary bypass ............ 24
O-17 Analgesia for chest drain removal in children after cardiac surgery: sevoflurane vs. ketamine ........................................................................ 25
O-18 Inhalation agents for the treatment of pulmonary hypertension in patients undergoing cardiac surgery: a systematic review and meta-analysis .......... 26
O-19 Specifying indications for chest radiographs after cardiac surgery increase their efficacy and reduce their number ........................................ 26
Oral Session – Organ Dysfunction

O-20 Organ hierarchy during low blood flow on-pump: a randomized experimental positron emission tomography study in pigs ................................................................. 27
O-21 Prognosis value of tissue oxygen saturation recovery slope (RS) during a vascular occlusion test (VOT) in cardiogenic shock patients ....................................................... 28

Oral Session – Thoracic Anaesthesia

O-22 Continuous control of double-lumen endotracheal tube cuff pressure vs. standard management for the prevention of intra-operative pulmonary aspiration .................. 29
O-23 Effect of increasing age on the haemodynamic response to thoracic epidural anaesthesia ................................................................................................................. 30
O-24 Acute permissive hypercapnia during one lung ventilation: impact on right ventricular function during lung resection ......................................................... 31
O-25 Comparison between dopamine and phenylephrine in maintaining cerebral oxygen saturation in thoracic surgery ......................................................... 31
O-26 Double-lumen tube vs. video-assisted Cohen blocker for mini-invasive mitral valve surgery .............................................................................................................. 32

Oral Session – Electrophysiology

O-27 Implementation of a modified WHO checklist for the cardiac catheterization laboratory – a complete audit cycle ................................................................. 33
O-28 Clinical use of the ‘Baska mask’ for transcutaneous interventional cardiology aided with transoesophageal echocardiography: an preliminary study .................. 34

Oral Session – Vascular

O-29 Remote ischaemic preconditioning for elective abdominal aortic aneurysm (AAA) repair: a randomized controlled trial to assess feasibility ................. 35
O-30 Adherence to ACC/AHA guidelines does not decrease the incidence of MI in post-PCI patients undergoing non-cardiac surgery ........................................... 36
O-31 Identification of the guidewire in the brachiocephalic vein to confirm guidewire placement during internal jugular central venous catheter placement .......... 37
O-32 Treatment of gram-positive cardiovascular infections with daptomycin or vancomycin: a retrospective analysis of efficacy and nephrotoxicity ......................... 37
O-33 Randomized trial of fish oil infusion to prevent atrial fibrillation after cardiac surgery: data from implantable continuous cardiac monitor ......................... 38

Oral Session – Best Orals

O-34 Effect of anti-platelet drugs on platelet microparticles during on-pump cardiac surgery ............................................................................................................. 39
O-35 Systemic and pulmonary phenotypes in relation to postoperative hypoxaemia ...... 39
O-36 Goal-directed crystalloid fluid resuscitation does not increase extravascular lung water content in cardiac surgery patients: a randomized pilot study .......... 40
O-37 In vitro endothelial cell barrier disruption after exposure to plasma from patients subjected to cardiopulmonary bypass .................................................. 41
O-38 Acute myocardial and skeletal muscle injury after serial transthoracic shocks as detected by cardiovascular magnetic resonance in swine ......................... 42

Oral Session – Lung

O-39 Adverse pulmonary changes following cardiopulmonary bypass: separate assessment of bronchoconstriction and lung peripheral derecruitment ................. 43
O-40 Scavenging of volatile anaesthetics during long-term sedation of critical care patients .................................................................................................................. 44
<table>
<thead>
<tr>
<th>Oral Session – Renal</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-41 Risk factors of acute kidney injury in adult cardiac surgical patients operated with use of cardiopulmonary bypass.</td>
</tr>
<tr>
<td>O-42 Does dexmedetomidine affect renal outcome in patients with renal impairment undergoing CABG?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Session – Haemostasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-43 Heparin management during cardio-pulmonary bypass: a comparison between traditional method and new technologies</td>
</tr>
<tr>
<td>O-44 Thromboelastography (TEG) and post cardiopulmonary bypass bleeding</td>
</tr>
<tr>
<td>O-45 Von Willebrand Factor assay in patients with aortic valve stenosis: impedance aggregometry vs. laboratory tests</td>
</tr>
<tr>
<td>O-46 Dalteparin does not increase postoperative bleeding and has no effect on selected in-hospital morbidity parameters and 30-day mortality</td>
</tr>
<tr>
<td>O-47 The effects of red blood cell transfusion during cardiac surgery: a matched cohort study in Jehovah Witnesses</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Session – Fluids</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-48 Effects of acute plasma volume expansion on renal perfusion, filtration and oxygenation after cardiac surgery: crystalloid vs. colloid</td>
</tr>
<tr>
<td>O-49 A randomized controlled trial of the effect of concentrating residual cardiopulmonary bypass blood using Hemosep on patient haematocrit after cardiac surgery</td>
</tr>
<tr>
<td>O-50 Miniaturized versus conventional cardiopulmonary bypass and acute kidney injury after cardiac surgery in an Asian population</td>
</tr>
<tr>
<td>O-51 Central venous oxygen saturation as trigger for blood transfusion in cardiovascular surgery patients: an observational study</td>
</tr>
<tr>
<td>O-52 The impact of routine noradrenaline infusion on haemodilution and blood transfusion in cardiac surgery</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Session – Aorta</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-53 Multiorgan protection for arch surgery with Frozen Elephant Trunk: antegrade perfusion instead of long circulatory arrest</td>
</tr>
<tr>
<td>O-54 Prolonged ICU stay following cardiac surgery: is there any room for new scores?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Session – Cardiac Anaesthesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-55 Anaesthesiologic regimen for transcatheter aortic valve implantation (TAVI): sedation vs. general anaesthesia: a prospective randomised comparison</td>
</tr>
<tr>
<td>O-56 A comparison of three strategies for levosimendan administration in cardiac surgery patients with severe myocardial dysfunction</td>
</tr>
<tr>
<td>O-57 Re-sternotomy for bleeding following cardiac surgery: the financial and clinical impact of a quality defect</td>
</tr>
<tr>
<td>O-58 Effects of remote ischaemic preconditioning on cognitive function and neurologic injury in cardiac surgery</td>
</tr>
<tr>
<td>O-59 Intra-operative methadone for the prevention postoperative pain: a randomized, double-blinded clinical trial in cardiac surgical patients</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Session – Haemodynamics</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-60 TOE-guidance for transcatheter paravalvular aortic, mitral or tricuspid leakage repair</td>
</tr>
<tr>
<td>O-61 MPR and i-scan planimetry in real time 3D transoesophageal echocardiographic (3DTOE) measurement of tricuspid valve annulus area change and its correlation with right ventricle function parameters in patients with rheumatic mitral stenosis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oral Session – Transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>O-62 Association between peri-operative factors and in-hospital and long term mortality of patients undergoing orthotopic heart transplantation</td>
</tr>
</tbody>
</table>
O-63 AMiLiE-Survey: current practice of anesthesia in patients undergoing lung transplantation in Europe ................................. 63
O-64 Low cardiac output states in LVAD patients: an overview of cases in a cardiac centre in the United Kingdom .................................................. 64
O-65 Percutaneous trans-femoral trans-septal left atrium drainage for left heart decompression of heart transplant candidates with peripheral veno-arterial extracorporeal membrane oxygenation. ........................................... 65
O-66 Vasoplegia after implantation of a non-pulsatile left ventricular assist device: incidence, risk factors and outcome ........................................ 65

**Oral Session – Safety**

O-67 Is osteopontin, a new biomarker of systemic inflammatory response in high risk coronary artery bypass grafting patients? ........................................ 66
O-68 Association between rs5498 single nucleotide variation of ICAM-1 gene and EuroSCORE-II in adult cardiac surgical patients operated with use of cardiopulmonary bypass ......................................................... 67

**Oral Session – Cerebral Oximetry**

O-69 Optimization of intra-operative depth of anaesthesia and cerebral oxygenation significantly reduces postoperative delirium after coronary artery bypass graft surgery ...................................................... 68
O-70 Cerebral oximetry monitoring during transcatheter aortic valve implantation (TAVI) procedure ............................................................... 69

**Oral Session – Haemodynamics**

O-71 Comparison of single and recalibrated measurements of cardiac index obtained by ProAQT-Pulsioflex™ with those of FloTrac/Vigileo™ ........................................ 69
O-72 Tissue rSO2 during on-pump CABG can predict post-op renal dysfunction ......................... 70
O-73 Propofol anaesthesia for surgery with cardiopulmonary bypass is related to decreased tissue saturation during vascular occlusion test in comparison to sevoflurane ......................................................... 71
O-74 Troponin T and brain natriuretic peptide after on-pump cardiac surgery: impact on 1-year mortality and major cardiac events after adjustment for postoperative complications ............................................................... 72
O-75 In a FAST-TRACK protocol remifentanil is not superior to standard sufentanil regime ........ 73

**Free Poster Sessions**

**Poster Session – Best Posters**

P-1 Association of carotid arterial circumferential strain with left ventricular function and haemodynamic compromise during off-pump coronary artery bypass surgery .... 74
P-2 Ultrasound acquired cardiac power integral: minimally invasive instantaneous monitoring of cardiac energy delivery in the failing heart in pigs ......................... 74
P-3 Helium post-conditioning increases caveolin 1 and 3 protein levels in serum of rats ........................... 75
P-4 A comparison of the efficacy and adverse effects of double-lumen endobronchial tubes and bronchial blockers for lung isolation: a systematic review and meta-analysis ......................... 76
P-5 The relationship between hospital surgery volume and surgical outcomes following oesophageal cancer resection .................................................. 77

**Poster Session – Cardiac Anaesthesia: Risk Factors & Outcome**

P-6 Does volatile anaesthetic exposure lead to an improvement in patient outcome after cardiac surgery: a meta-analysis ........................................ 77
P-7 Pre-operative IABP to reduce mortality in CABG surgery: a meta-analysis of randomized controlled trials ........................................................................ 78
P-8 On-pump vs. off-pump coronary artery bypass graft surgery (CABG): outcomes after 10 years of experience ................................................................. 79
P-9 Propofol and survival: a meta-analysis of randomized clinical trials. ............. 79
P-10 Estimating plasma oncotic pressure and its relationship with early morbidity in postoperative cardiac surgery: preliminary study. .................................. 80
P-11 Association between red blood cell storage duration and clinical outcome in patients undergoing off-pump coronary artery bypass graft surgery ............... 81

Poster Session – Mitral Valve and Vascular
P-12 Anaesthesia management for MitraClip device implantation: a case series at National Heart Centre, Singapore ......................................................... 82
P-13 Minimally invasive mitral valve surgery: the largest Russian experience. ........ 82
P-14 Assessment of the mitral ring geometry after MitraClip procedure using Real Time 3D transoesophageal echocardiography ....................................... 83
P-15 Anaesthetic management for transapical off-pump implantation of artificial chordae to correct mitral regurgitation ......................................................... 84
P-16 Regional anaesthesia in patients undergoing carotid surgery: a 5-years single centre experience ................................................................. 84

Poster Session – Intensive Care
P-17 Cardiac surgery ICU vs general ICU in cardiac surgery patients: influence on early postoperative outcomes .................................................. 85
P-18 Repatriation of patients from a specialist cardiothoracic intensive care unit (CICU) to a general intensive care unit (GICU) ........................................... 86
P-19 Right ventricle contractility in the early postoperative period after coronary artery bypass grafting with cardiopulmonary bypass ............................... 87
P-20 Prediction of fluid responsiveness in patients with atrial fibrillation: PEEP-induced increase in central venous pressure vs. passive leg raising. ...................... 88
P-21 Impact of immediate versus delayed tracheal extubation on length of ICU stay of cardiac surgical patients ..................................................... 88
P-22 Glucose management during on-pump elective coronary artery bypass graft surgery (CABG) in non-diabetic patients ............................................... 89
P-23 Changing glucose control target and risk of surgical site infection in a South-East Asian population ................................................................. 90

Poster Session – Haemostasis
P-24 Antifibrinolytics are not indicated in the pre-bypass period for first time sternotomy in cardiac patients ................................................................. 91
P-25 Assessment of the impact of the administration of pre-operative low molecular weight heparin on postoperative bleeding in adult cardiac surgery ........................................... 92
P-26 An assessment of the clinical utility of the PlateletWorks platelet aggregation system in cardiac surgery involving cardiopulmonary bypass .............................. 92
P-27 Efficacy of fibrinogen concentrate compared with cryoprecipitate for reversal of the antiplatelet effect of clopidogrel in an in vitro model ...................... 93
P-28 High activated clotting time level after cardiopulmonary bypass in paediatric heart surgery does not indicate residual heparin .......................................... 94
P-29 Analysis of transfusion requirements in cardiac surgery patients using a method of recursive partitioning .................................................. 95
P-30 Cold agglutinins and cardiac surgery: a national survey of cardiac anaesthetic practice in the UK ................................................................. 96
**Posters Session – Cardiac Anaesthesia & Cerebral Monitoring**

P-31 Can pre-operative cognitive impairment predict delirium in patients undergoing cardiac surgery? ........................................ 96

P-32 Jugular bulb fibreoptic oxygenation: is it necessary in cardiac anaesthesia? .................. 97

P-33 Novel dynamic near-infrared spectroscopy parameter monitoring during on-pump cardiac surgery .................................................. 98

P-34 Effects of near-infrared spectroscopy on cognitive dysfunction for patients undergoing elective coronary surgery ................................................ 99

P-35 A goal-oriented therapy protocol based on cerebral regional oxygen saturation may improve neurologic outcome in high-risk cardiac surgery patients .................. 100

P-36 Cardiovascular instability following phenytoin administration in cardiac intensive care ....... 101

P-37 Adherence to the local guidelines for the management of delirium in a cardiothoracic intensive care unit: a clinical audit ................................................ 102

**Posters Session – Cardiac Anaesthesia & Aortic Valve**

P-38 Pre-operative screening for aortic atherosclerosis with modified transoesophageal echocardiography in transcatheter aortic valve implantation .................. 102

P-39 Procedural sedation with dexmedetomidine for transfemoral aortic valve implantation .......................................................... 103

P-40 Comparison of three anaesthetic techniques for endovascular aortic repair: retrospective analysis .................................................. 104

P-41 Effectiveness of intra-operative detection of persistent endoleak by spontaneous echocardiographic contrast after thoracic endovascular aortic repair ................. 105

P-42 Cerebral microembolism in transapical TAVI: comparison of Symetis Acurate Aortic Valve Prosthesis with the Edwards Sapien Valve .......................... 106

P-43 Freedom SOLO Stentless Aortic Valve Prosthesis: no freedom of late dysfunction and failure .................................................. 106

P-44 First-in-Man use of a novel pacing sheath for transapical transcatheter aortic valve implantation: case report .................................................. 107

P-45 Heart failure associated variables and one-year mortality after transcatheter aortic valve replacement in elderly patients .................................................. 108

**Posters Session – Monitoring**

P-46 Comparison of a non-invasive with two minimally invasive cardiac output monitors during off-pump coronary artery bypass surgery .......................... 109

P-47 Does LiDCO rapid® reliably track relative changes in cardiac output in cardiac surgery patients with a low ejection fraction? .................................................. 109

P-48 The effect of Trendelenburg, reverse Trendelenburg positions and Vasalva manoeuvre on internal jugular vein diameter and location in children .................. 110

P-49 Pre-operative fasting and postoperative metabolic response after coronary artery bypass grafting .................................................. 111

P-50 The effect of induced hypotension on motor neuron protection in experimental spinal cord ischaemic/reperfusion injury in rats .................. 112

**Posters Session – Myocardial Protection**

P-51 Comparison of the haemodynamic effects of nitric oxide and inhaled iloprost in patients with severe left ventricle systolic dysfunction .................. 112

P-52 The effects of conventional vs. high-dose rocuronium on the QTc interval during anaesthesia induction in patients for coronary artery surgery .................................................. 113

P-53 The role of ethnicity in post coronary artery bypass graft atrial fibrillation in an Asian population .................. 114
P-54 Extracorporeal cardiopulmonary resuscitation (E-CPR) in refractory cardiac arrest after an acute coronary syndrome: a case report

Poster Session – Thoracic Anaesthesia

P-55 Comparison of bupivacaine and levobupivacaine for thoracic paravertebral block for post-thoracotomy pain
P-56 Melatonin on acute pain
P-57 Effect of morphine on lung cancer in relation to opioid growth factor receptor (OGFR)
P-58 Retrospective study of peri-operative anaesthesia management of myasthenia gravis patients undergoing thymectomy
P-59 Lung transplantation in critically ill patients with cystic fibrosis

Poster Session – Quality Management

P-60 Quality of life of elderly patients in one year after cardiac surgery: relation to peri-operative course parameters
P-61 Patient satisfaction in cardiac anaesthesia: a single centre survey
P-62 Does minimally invasive direct coronary artery bypass (MIDCAB) reduce hospital length of stay? A retrospective analysis
P-63 Pre-hospital therapeutic hypothermia in cardiac arrest: a meta-analysis of randomized clinical trials
P-64 Levosimendan in non-cardiac surgery: a systematic review

Poster Session – Thoracic Anaesthesia: Ventilation

P-65 Window setting of chest computed tomography to appropriately determine the left mainstem bronchial diameter
P-66 Gel lubrication reduces fluid leakage past the endobronchial cuff of double lumen tubes
P-67 Protective lung ventilation with pressure control ventilation versus volume control ventilation during one lung ventilation
P-68 Protective one lung ventilation for pulmonary resections: a pilot study
P-69 Effect of ventilatory mode on arterial oxygenation during one-lung ventilation for thoracic surgery in patients with obstructive lung diseases
P-70 The one and a half ventilation technique with Human Silbroncho® double lumen tube for improving hypoxaemia during one-lung ventilation: a pilot study

Poster Session – Cardiac Anaesthesia

P-71 Pre-operative renal function stratification and early cardiac ICU adverse events in coronary artery disease
P-72 Parameters of renal function after myocardial revascularization with the use of cardiopulmonary bypass
P-73 Beneficial impact of levosimendan in critically ill patients with or at risk for acute renal failure: a meta-analysis of randomized clinical trials
P-74 Urinary catheter management in a Cardiac Intensive Care Unit: a follow up
P-75 Haemodialysis in ICU patients results in cerebral microembolism
P-76 Evaluation of outcomes for renal transplant recipients who undergo cardiac surgery
P-77 Reduction of the risk of gastro-duodenal bleeding in cardiac surgery: new tactics

Poster Session – Echocardiography

P-78 Impact of intra-operative transo-oesophageal echocardiography on cardiac surgery decision-making: a prospective analysis
P-79 Inter- and intra-observer variability of tricuspid annular plane excursion by 2 Dimensional-mode and M-mode in Transoesophageal Echocardiography
P-80  Tricuspid annular plane excursion and peak systolic velocity in grading of right ventricular function in TOE in operative setting: is it valuable? ................................. 136

P-81  Use of a novel stethoscope in a cardiac intensive care ............................................... 137

P-82  Simulation-based transthoracic echo teaching: a tertiary centre experience ............ 137

Author Index .................................................................................................................. 139
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The abstracts have not undergone review by the Editorial Board of the *Applied Cardiopulmonary Pathophysiology*. They have been reviewed by the EACTA 2014 Abstract Committee, and have been revised accordingly by the authors. The abstracts published in this issue are camera ready copies prepared by the authors.

The investigators of these abstracts have stated in their submission letter that prospective studies where patients are involved have Ethics Committee approval and informed patient consent, and that the studies using experimental animals have institutional approval.
FREE ORAL SESSIONS

Oral Session – Echocardiography

0-1
Feasibility and accuracy of intra-operative assessment of systolic pulmonary artery pressure by transoesophageal echocardiography

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Introduction. The non-invasive Doppler echocardiographic estimation of systolic pulmonary artery pressure (sPAP) based on assessing peak tricuspid regurgitation (TR) velocity and adding central venous pressure is a standard component of the transthoracic echocardiographic examination [1]. However, its feasibility and accuracy in surgical patients studied by transoesophageal echocardiography (TOE) is unknown.

Methods. In 109 consecutive patients undergoing cardiac surgery, we assessed the feasibility for obtaining an adequate Doppler signal with ≤ 20° angle between TR jet and Doppler interrogation beam. In 33 of them who were monitored by a pulmonary artery catheter (PAC), we analysed whether Doppler results were within ± 10% of the value indicated by PAC. TOE studies were performed by two experienced echocardiographers blinded for the sPAP values measured by PAC, on the midoesophageal level between 0-120° before sternotomy. TOE data were electronically stored for off-line analysis by two independent readers.

Results. Doppler signals were found to be adequate for estimation of the peak tricuspid regurgitation velocity in 64 patients (59%) using the modified bicaval view and/or the right ventricular inflow-outflow view. Bias ± 95% limits of agreement between sPAP values measured by PAC and estimated by TOE Doppler were 3.8 ± 15.3 mmHg. Only 16 (40%) of 40 TOE Doppler estimates were within ± 10% of the PAP value simultaneously measured by PAC. α for the rating “feasible Doppler signal” was 0.890, and interclass correlation coefficient for peak tricuspid regurgitation velocity was 0.987 (95% CI 0.975-0.993).

Discussion. The results of this study strongly suggest that estimation of sPAP by TOE using maximal TR velocity is an unreliable method in the peri-operative patient. Reasons are that the feasibility for obtaining adequate Doppler signals was low and, more importantly, that the majority of sPAP values estimated by TOE Doppler were inaccurate, i.e., not within a ± 10% range of the simultaneously measured sPAP value.

References
0-2
Prognostic value of pre- and post-operative RV systolic function in patients referred for cardiac surgery

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¹ Chang Gung Memorial Hospital, Linkou, Taoyuan County, Taiwan
² Institute of Emergency and Critical Care Medicine, National Yang Ming University, Taipei City, Taiwan

Introduction. Among patients undergoing cardiac surgery, right ventricular (RV) dysfunction had been proved to be an indicator of peri-operative morbidity and mortality [1]. Our study sought to compare the utility of RV systolic indices in predicting surgical outcomes, and further to clarify, if survey at the different timing of the operation mattered.

Methods. This prospective study enrolled consecutive patients referred for cardiac surgery from June 2012 to June 2013. Exclusion criteria included contraindications to transoesophageal echocardiography (TOE) and non-sinus rhythm. Two-dimensional (2D) and tissue Doppler TOE exam and simultaneous pulmonary catheter haemodynamics were recorded in two stages:
(1) after induction of anaesthesia and before sternotomy;
(2) after sternal closure.
RV systolic measurements performed off-line included RV fractional area change (FAC), RV-to-LV end-diastolic diameter ratio (R/L ratio), peak systolic tricuspid annular velocity (S'), tricuspid annular plane systolic excursion (TAPSE), myocardial performance index (MPI), and RV global longitudinal strain (GLS) by 2D speckle tracking. The outcome of the study was defined as postoperative intra-aortic balloon pump (IABP) placement, duration of mechanical ventilation in the intensive care unit (ICU), length of time of inotropic agents use, and occurrence of arrhythmias.

Results. Of 68 patients with complete data set, the EuroSCORE II averaged 3.27 ± 3.16%. After cardiac surgery, mean duration of ventilator use in the ICU was 22.9 ± 36.4 h and of inotropic agent use was 22.8 ± 32.3 h. IABP was placed in 8 (12%) patients, and arrhythmias were observed in 18 (26%) patients. RV GLS averaged –19.81 ± 5.44% in stage 1 and –17.62 ± 5.19% in stage 2 (p = 0.003), and some other RV variables also became significantly worse post-operatively. In separate-staged regression models toward the individual outcome, serial R² in stage 2 was better than stage 1. In the union-of-two stages model adjusted to EuroSCORE and cardiopulmonary bypass time, RV GLS in stage 2 had the highest partial correlation coefficient (Partial r = 0.486, p = 0.001) toward the duration of postoperative inotropic agent use.

Discussion. RV GLS is reliable for outcome prediction of patients undergoing cardiac surgery. RV systolic measurements with TOE after sternal closure depict better prediction than the pre-operative ones.

References
Introduction. To date, there are no known methods for preventing acute kidney injury after cardiac surgery. Increasing evidence suggests that erythropoietin (EPO) has renal anti-apoptotic and tissue-protective effects [1]. However, recent human studies have shown conflicting results. We aimed to study the effect of a single high-dose EPO pre-operatively on renal function after coronary artery bypass grafting (CABG) in patients with pre-operative impaired renal function.

Methods. This single centre, randomized, double blind, placebo-controlled study included 75 patients scheduled for CABG with pre-existing renal impairment (estimated glomerular filtration rate based on p-Cystatin C < 60 ml/min and > 15 ml/min). The patients either received a single high-dose EPO (400 IU/kg) or placebo pre-operatively. The primary endpoint was renal protection evaluated by p-Cystatin C at the third post-operative day compared to the pre-operative values. Incidence of acute kidney injury and other renal biomarker changes were among secondary endpoints.

Results. There was no statistically significant difference on the third postoperative day for relative p-Cystatin C level changes from baseline between the groups, 50% ± 60% (mean ± SD) for the study group and 40% ± 4 for the control group, $p = 0.27$, 95% CI: −0.10 to 0.37. There were no statistically significant differences in other renal biomarkers or measures between the groups (p-NGAL, p-Creatinine, p-Urea, and estimated glomerular filtration rate). There were no other differences in outcome variables between the groups.

Discussion. Intravenous administration of a single high-dose (400 IU/kg) EPO did not have a renal protective effect in patients with reduced kidney function undergoing coronary artery bypass surgery.

References

0-4
Acute kidney injury may be associated with specific ICAM-1 and TNFα genes variance

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Introduction. Associations between genome variance and clinical phenotypes of early postoperative morbidity after cardiac surgery with use of cardiopulmonary bypass (CPB) have been revealed in recent years [1].

Table 1

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<thead>
<tr>
<th>Analysed SNV alleles</th>
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<tr>
<td>ICAM-1 rs5498 AA &gt; GG</td>
<td>−7.4%</td>
<td>F-E; 0.0926</td>
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<tr>
<td>IL6-rs1800796 CG &gt; GG</td>
<td>−2.7%</td>
<td>F-E; 0.4</td>
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<tr>
<td>LBP1 rs2232582</td>
<td>25.7%</td>
<td>F-E; 0.0351; differ in stratum</td>
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<tr>
<td>CRP rs1800947 GC &gt; GG</td>
<td>−3.7%</td>
<td>F-E; 0.2699</td>
</tr>
<tr>
<td>NOD2 rs2066844 CC &gt; CT</td>
<td>8.8%</td>
<td>F-E; 0.1338</td>
</tr>
<tr>
<td>MASP2 rs2273346 CT &gt; TT</td>
<td>−7.4%</td>
<td>F-E; 0.4615</td>
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<tr>
<td>TNF rs1800629 GA &gt; GG</td>
<td>5.1%</td>
<td>F-E; 0.1275</td>
</tr>
<tr>
<td>SEL-E rs1805193 GG &gt; TT</td>
<td>16.5%</td>
<td>nd</td>
</tr>
<tr>
<td>NOS3 rs179983 GG &gt; TT</td>
<td>−5.0%</td>
<td>F-E; 0.2678</td>
</tr>
<tr>
<td>TLR4 rs4986790 AA &gt; GA</td>
<td>4.0%</td>
<td>F-E; 0.3306</td>
</tr>
</tbody>
</table>
Methods. 492 adult patients, referred for open heart surgery with use of CPB, who signed informed consent, were included in a prospective, observational study. It was aimed to assess associations between single nucleotide variants (SNV) of 10 selected genes and acute kidney injury (AKI) defined in the RIFLE classification, after adjusting for CPB-time. Patients with end-stage kidney disease (E; n = 2) and with complicated surgery (n = 43) were excluded. SNV were identified by PCR followed by a SNapShot reaction. Mantel-Haenszel, chi-squared or Fisher-exact tests were considered significant when the \( p \)-value was < 0.05.

Results. No analysed SNV proved to be significantly associated with the AKI-phenotype (RIFL) (Table 1).

However a combination of ICAM-1-rs5498-GG+TNF\( \alpha \)-rs1800629-GA SNV revealed a 20% increase of AKI risk when compared with the ICAM-1-rs5498-AA+TNF\( \alpha \)-rs1800629-GG allele combination (\( p = 0.0243 \)).

Discussion. It is evidenced that coexistence of two SNV in genes of inflammatory mediators may be associated with increased AKI risk after cardiac surgery with use of CPB.

References

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Oral Session – Thoracic Surgery

0-5
Thoracic surgery for infectious diseases: case series and peri-operative management from an academic centre in Ethiopia

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\(^1\) Department of Anesthesia and Pain Management, University Health Network, University of Toronto, Toronto, Ontario, Canada
\(^2\) Department of Anesthesia, Tikur Anbessa Hospital, Addis Ababa University, Addis Ababa, Ethiopia

Introduction. Thoracic surgery in the West focuses primarily on malignancies. In contrast, most cases in lower-income countries involve complications of infectious disease (ID). As such cases are rare in Western countries, their management is not well described in the anaesthesia and critical care literature.

Methods. We reviewed all non-emergency thoracic cases during the year ending 25 October 2012. The logs of the department of surgery were reviewed for diagnosis, procedure and in-hospital mortality. We further provide a description of the peri-operative course for thoracic surgical patients.

Results. Of 175 thoracotomies, 47% were for ID, 34% for cancer and 19% for other indications (e.g., trauma, PDA). There were 5 in-hospital deaths (2.9%), all amongst cancer patients. Of 83 ID cases, 63% were directly related to TB, 7% were resections of aspergillomas, likely in prior TB cavities and 25% were resections of hydatid cysts.

Pre-operative evaluation consisted of general assessment, blood work, CXR and CT. TTE was available when cardiac involvement was suspected. PFTs and blood gas analysis were unavailable.

NIBP, pulse oximeter, ECG, and ventilator monitors were standard. Capnography and end-tidal gas analysis were unavailable. Due
to shortage of disposable components, invasive monitors were reserved for the most critical cases (e.g., restrictive pericarditis). Tank oxygen was the sole carrier gas. Thiopental, halothane, fentanyl, meperidine, succinylcholine and pancuronium were usually available. Rocuronium, vecuronium, morphine and propofol were rarely available. Small supplies of sevoflurane were used when halothane was strongly contraindicated. DLTs were sterilized and re-used. Thoracic epidural use was limited by catheter supply. Cross-matched whole blood was available in exchange for blood donation from family. Blood storage was a significant challenge.

**Discussion.** Complex cases are routinely managed with very low resources and good outcomes in low-income nations. Strong efforts are needed to incorporate these regions into the global academic community. This project was part of a growing collaboration involving numerous medical and allied health departments.

**O-6**

**Lung deflation with Arndt® blocker during video-assisted thoracoscopy: a comparison of the disconnection technique with a continuous bronchial suction**

*Mohamed El Tahan*

*Dammam University, Al Khubar, Saudi Arabia*

**Introduction.** The use of a wire-guided Arndt® endobronchial blocker does not gain widespread acceptance during video-assisted thoracoscopy (VATS) because it takes a longer time to collapse the operative lung. The use of a disconnection technique could hasten the lung collapse, however with potential risks for contamination of the dependent lung. We hypothesized that the suctioning technique would have a comparable time to optimum lung collapse with the disconnection technique.

**Method.** After ethical approval, 58 patients with spontaneous pneumothorax scheduled for elective VATS using the Arndt® blocker for lung separation were randomly assigned to deflate the operative lung with either disconnecting the endotracheal tube from the ventilator for 60 sec prior to inflation of the bronchial blocker, or attaching $-30$ cmH$_2$O suction through a barrel part of a 1-ml insulin syringe attached to the suction port of the Arndt® blocker (n = 29 for each group). Time to total lung collapse, surgeons rating of lung collapse, overall surgeon satisfaction, need for further fibrescopic bronchial suction manoeuvres, and intra-operative hypoxaemia were recorded. ClinicalTrials.gov registration ID: NCT02030795.

**Results.** Compared with the disconnection group, the bronchial suction technique had a significantly shorter time to total lung collapse (92.5 [95% CI 81.32 to 103.70] vs. 197.2 [95% CI 157.37 to 237.04] s., respectively; $p < 0.001$). Both groups had comparable excellent surgical rating of lung collapse, overall surgeon satisfaction, and intra-operative hypoxaemia ($p > 0.21$). No patient in the bronchial suction group needed further manoeuvres to collapse the surgical lung.

**Discussion.** The use of continuous bronchial suction through the lumen of the Arndt® blocker offers an effective method to accelerate lung collapse.

**O-7**

**Target-controlled infusion of remifentanil without muscle relaxant allows acceptable surgical conditions during thoracotomy**

*Mohamed Mohamed*

*Dammam University, Al Khubar, Saudi Arabia*

**Introduction.** Muscle relaxation for thoracic procedures is a standard of care, although it could cause postoperative residual curarization (PORC) increasing the total costs. Sugammadex offers new perspectives to re-
duce the incidence of PORC. Unfortunately it is not available in many countries. We hypothesized that the use of target-controlled remifentanil infusion (TCI) with non-muscle relaxant (NMR) would be associated with comparable surgical conditions and reduced total costs compared with the use of neuromuscular blockers during thoracotomy.

**Method.** After ethical approval, 66 patients scheduled for elective thoracotomy under sevoflurane anaesthesia with TCI remifentanil were randomly assigned to receive cisatracurium or saline (n = 33 for each) throughout the procedure. Laryngoscopy and intubating conditions, intra-operative modified thoracic surgery rating scale, incidence of light anaesthesia defined as an episode with State Entropy values that exceeded 50 and/or mean arterial blood pressure, and heart rate values that exceeded the baseline by 20% and that lasted for more than 3 consecutive min, and use of vasopressors and anaesthetics, clinical recovery, incidence of PORC, and total costs were recorded.

**Results.** Compared with the cisatracurium group, the NMR group had comparable clinically acceptable laryngoscopy and intubating conditions (93.9% vs. 100%, respectively; \( p > 0.09 \)), good-to-excellent surgical rating scales (\( p > 0.32 \)), use of vasopressors, and hospital stay, and fewer episodes of light anaesthesia (\( p = 0.04 \)), shorter times to clinical recovery, to extubation (7.6 [95%CI 6.82 to 8.39] vs. 19.0 [95%CI 15.76 to 22.23] min respectively; \( p < 0.001 \)), and to PACU discharge (37.4 [95% CI 35.09 to 39.79] vs. 70.9 [95% CI 56.90 to 84.91] min respectively; \( p < 0.001 \)), and 47.2% lower total costs (\( p < 0.001 \)). There was no failed intubation. No patient received cisatracurium in the NMR group. Two patients in the cisatracurium group developed PORC.

**Discussion.** The use of TCI remifentanil with NMR offers acceptable intubating and surgical conditions and reduced total costs during open thoracotomy.

0-8 Effect of benzydamine spraying on postoperative sore throat and hoarseness after tracheal intubation with a double-lumen endobronchial tube

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1 SMG-SNU Boramae Medical Center, Seoul, Republic of Korea
2 Seoul National University Hospital, Seoul, Republic of Korea

**Introduction.** Postoperative sore throat and hoarseness are common complaints after tracheal intubation with a double-lumen endobronchial tube (DLT) for one-lung ventilation. The aim of this study was to evaluate the effect of benzydamine hydrochloride (a topical non-steroidal anti-inflammatory drug with analgesic effect) spray on postoperative sore throat and hoarseness following the DLT intubation.

**Method.** In total, 52 adult patients undergoing thoracic surgery with DLT intubation for one-lung ventilation were randomly allocated to one of two groups. In group S (n = 26), the DLT cuffs and oropharyngeal cavity were both sprayed with 3 puffs of normal saline, and in group BH (n = 26), the DLT cuffs and oropharyngeal cavity were both sprayed with 3 puffs of benzydamine hydrochloride. During tracheal intubation, Cormack-Lehane Grade, resistance to DLT insertion, the number of intubation attempts and the time to achieve intubation were recorded. Throughout the surgery, the number of repositioning, and the duration of one-lung ventilation and tracheal intubation were also recorded. Postoperative sore throat and hoarseness were evaluated at 1, 6, and 24 h after surgery. Sore throat was evaluated using a 0-100 mm visual analogue scale (VAS; 0, no pain, to 100, worst pain imaginable). Hoarseness was defined as a change in voice quality.

**Results.** In the postoperative period, the incidence and severity of sore throat were lower in group BH compared to group
S (VAS; at 1 h after surgery, 8.4 ± 13.6 vs. 22.4 ± 23.5; \( p = 0.008 \), at 6 h after surgery, 8.8 ± 14.3 vs. 24.6 ± 27.9; \( p = 0.013 \), at 24 h after surgery, 3.2 ± 4.7 vs. 9.2 ± 10.9; \( p = 0.034 \)). At 1 h after surgery, the incidence of hoarseness was lower in group BH than in group S (30.8% vs. 7.7%; \( p = 0.038 \)), but the incidence of hoarseness at 6 and 24 h after surgery was similar between the two groups.

**Discussion.** Prophylactic benzydamine hydrochloride spraying on the DLT cuffs and oropharyngeal cavity reduced the incidence and severity of postoperative sore throat and hoarseness.

**O-9**

**Comparison of the effects of sevoflurane and desflurane on microcirculation in non-cardiac surgery**

**Hemra Cil**, Banu Ayhan, Elif Ayse Cizmeci, Meral Kanbak, Can Ince

1 Hacettepe University, Ankara, Turkey

2 Department of Translational Physiology, Academic Medical Center, Amsterdam, The Netherlands

**Introduction.** Microcirculation is important for tissue oxygenation. Anaesthetic drugs can alter the microcirculation in cardiac surgery patients [1]. However, to our knowledge, no study has documented effects of sevoflurane and desflurane in non-cardiac surgery. Our aim was to compare the effects of these inhalation agents on the microcirculation in non-cardiac surgery by using side stream dark field (SDF) imaging.

**Methods.** After ethical committee approval and informed consent, ASA I-II patients who underwent ≥ 2 hour surgery were enrolled in this prospective and randomized study. Patients were divided into two groups: Group S (sevoflurane) \( n = 20 \); Group D (desflurane) \( n = 19 \). Demographic, haemodynamic variables (heart rate, mean arterial pressure) and laboratory parameters (haematocrit, haemoglobin, urea, and creatinine) were recorded. Microcirculation imaging was performed after anaesthesia induction and intra-operative 2nd hour by using SDF technique. SDF images were analysed using AVA 3.1 (Automated vascular analysis programme). The statistical analyses were performed with one-way ANOVA, Mann-Whitney U and Wilcoxon.

**Results.** Thirty-nine patients were enrolled. No statistical differences in demographic, laboratory and haemodynamic parameters were detected between groups. In the sevoflurane group, microvascular flow index (MFI) (5.13%) and proportion of perfused vessel (PPV) (1.87%) of small vessels were increased; total vascular density (TVD) (–4.35%) and perfused vascular density (PVD) (–2.81%) of small vessels were decreased compared to the post-induction period. These differences were not statistically significant except for PPV. In the desflurane group, MFI (2.12%) of small vessels was increased; PPV (–0.75%), TVD (–1.70%) and PVD (–2.37%) were decreased compared to the post-induction period. These differences were not statistically significant. No differences between groups and microcirculation values were seen (Table 1).

**Discussion.** Sevoflurane increased the proportion of perfusion (PPV) of small vessels in non-cardiac surgery in ASA I-II patients (1.87%, \( p \leq 0.05 \)).

<table>
<thead>
<tr>
<th></th>
<th>MFI sm (AU)</th>
<th>PPV (%)</th>
<th>PVD sm (mm/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After induction</td>
<td>2.63 ± 0.23</td>
<td>93.05 ± 4.19</td>
<td>14.90 ± 1.85</td>
</tr>
<tr>
<td>2nd hour</td>
<td>2.75 ± 0.31</td>
<td>94.73 ± 3.65</td>
<td>14.38 ± 2.07</td>
</tr>
<tr>
<td>p value</td>
<td>0.092</td>
<td>0.036</td>
<td>0.241</td>
</tr>
<tr>
<td>Group D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>After induction</td>
<td>2.68 ± 0.27</td>
<td>94.24 ± 3.77</td>
<td>15.59 ± 1.91</td>
</tr>
<tr>
<td>2nd hour</td>
<td>2.73 ± 0.26</td>
<td>93.50 ± 5.20</td>
<td>15.16 ± 2.24</td>
</tr>
<tr>
<td>p value</td>
<td>0.561</td>
<td>0.358</td>
<td>0.345</td>
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</table>
Intravenous glutamate reduces the need for inotropes in patients with heart failure after CABG for acute coronary syndrome

Bashir Tajik1, Erik Hakanson1, Mårten Vidlund2, Jonas Holm3, Farkas Vanky4, Örjan Friberg2, Rolf Svedjeholm1
1 Linköping University Hospital, Linköping, Sweden
2 Örebro University Hospital, Örebro, Sweden

Introduction. In a double-blind randomized clinical trial (GLUTAMICS-ClinicalTrials.gov Identifier: NCT00489827), intravenous glutamate was associated with a risk reduction exceeding 50% for developing severe circulatory failure after isolated CABG for acute coronary syndrome (ACS) [1]. Here our aim was to investigate whether glutamate also influenced the need or use of inotropes.

Method. Post hoc analysis of 824 patients in the GLUTAMICS-trial operated on isolated coronary artery bypass graft (CABG) for ACS. ICU-records were retrospectively scrutinized including hourly registration of inotropic drug infusion, dosage and total duration during the operation and postoperatively. Student’s t-test and Mann-Whitney U test were used for statistical comparisons.

Results. ICU-records were available for 171 out of 177 patients who received inotropes peri-operatively. Only 26% of the patients treated with inotropes fulfilled study criteria for postoperative heart failure at weaning from cardiopulmonary bypass (CPB) or later in the ICU. Inotropes were mainly given preemptively to facilitate weaning from CPB or to treat postoperative circulatory instability (bleeding, hypovolaemia). With the exception of significantly lower need of epinephrine there were only trends towards lower need of other inotropes overall in favour of glutamate. In patients treated with inotropes (glutamate n = 17; placebo n = 13) who fulfilled criteria for left ventricular failure at weaning from CPB, the average duration of inotropic treatment (34 ± 20 vs 80 ± 77 h; p = 0.014) and the number of inotropes used (1.35 ± 0.6 vs 1.85 ± 0.7; p = 0.039) were lower in the glutamate group.

Discussion. Intravenous glutamate had a limited effect on inotrope use overall in patients undergoing CABG for ACS, whereas a substantial and significant effect was observed in patients with left ventricular failure at weaning from CPB.

References

Hyperoxia reduces regional myocardial oxygenation distal to acute coronary stenosis in swine

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2 Montreal Heart Institute, Philippa & Marvin Carsley CMR Centre, Montreal, QC, Canada

Introduction. Although recent guidelines limit the use of high oxygen concentration after arrest and restoration of circulation, it has
not yet been demonstrated whether hyperoxia can induce relevant regional ischaemia. Oxygenation-sensitive (OS) cardiovascular magnetic resonance can measure changes in myocardial tissue oxygenation.

**Methods.** In 16 swine, a flow probe was placed on the left anterior descending (LAD) coronary artery. In 8, acute significant LAD stenosis was created by proximal hydraulic occlusion. Using OS cine (3T), left ventricular myocardium was imaged at normoxia (PaO₂ = 13.3 kPa) and hyperoxia (PaO₂ = 39.9 kPa). Myocardial oxygenation changes are presented as %-change in OS signal intensity (SI) between the two levels. Regional differences between LAD territory and remote myocardium were assessed.

**Results.** In both groups, hyperoxia significantly reduced coronary blood flow from normoxia. Global myocardial oxygenation did not differ between healthy or stenosed animals when hyperoxia was induced. However, in healthy animals SI remained consistent across the myocardium, whereas in stenosed animals hyperoxia reduced oxygenation-sensitive SI within the LAD territory significantly more than within remote myocardium.

**Discussion.** Hyperoxia significantly reduces coronary blood flow and may cause regional oxygenation imbalance in myocardium supplied by coronary arteries with significant stenosis.

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**0-12**

**Mechanical circulatory support with Impella 5.0 assist device in severe cardiogenic shock: 5 years experience**

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*Arnaud de Villeneuve hospital, Montpellier, France*

**Introduction.** Cardiogenic shock (CS) remains an important issue, with high in-hospital mortality rate. The use of mechanical circulatory support is increasing, while inotropes are associated with adverse events, lack of efficacy and increasing myocardial oxygen consumption [1]. We report our single centre experience about MCS with the Impella 5.0 device in CS.

**Methods.** We retrospectively reviewed all the Impella 5.0 implantations indicated for CS from 2008 (first case) to the end of 2013. All clinical parameters, treatments, complications and outcome are described as median [25 and 75 percentile]. Statistical analysis was performed with Wilcoxon test and p < 0.05 considered as significant.

**Results.** 40 patients (age: 57yr [49-63]) in severe CS (SOFA: 11 [9-14]) had an Impella 5.0 support device: 25 as a single support strategy (SSS) and 15 as a combined support strategy with VA-ECMO (CSS). CS aetiologies were: postcardiotomy (n = 7), acute myocardial infarction (n = 17), dilated cardiomyopathy (n = 12) and others (n = 2). The duration of support with Impella was 7 days [5-10], and ICU stay was 22 days [9-33]. The cardiothoracic ratio decreased from 0.58 [0.52-0.66] before Impella to 0.54 [0.49-0.59] at day 2 (p = 0.001). The inotrope score decreased rapidly from 9.0 [0.6-13.6] before Impella to 1.0 [0.0-8.9] 6 hours after implantation (p = 0.022) indicating a fast weaning of inotropes. During support, we observed major device malfunction (n = 4), malposition (n = 8) with successful bedside repositioning, no bleeding requiring surgery, but 32 patients needing transfusion, ischaemic events (n = 3).
and device related infection (n = 7). A cardiac recovery or a bridge to LVAD or heart transplantation was possible for 73% of patients. The survival rates at day 28 and month 6 were respectively 65% and 50% without difference between SSS and CSS.

**Discussion.** Impella 5.0 in CS offers a cardiac outflow supply with fast weaning of inotropes and may facilitate myocardial recovery and better outcome or bridge to LVAD and heart transplantation.

**References**


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**0-13**

**Intra-aortic balloon pump use does not affect the renal function in patients undergoing off-pump coronary artery bypass surgery**

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**Introduction.** Renal dysfunction is known to occur during cardiac surgery. A few factors such as peri-operative hypotension, use of potential nephrotoxic therapeutic agents, or radio opaque contrast media. In the recent past, intra-aortic balloon pump (IABP) and cardiopulmonary bypass have been blamed as contributing factors to the causation of postoperative renal dysfunction in cardiac surgical patients. At times in patients with renal failure and low cardiac output status, one may face the dilemma whether the use of IABP is safe.

**Methods.** We undertook this prospective observational study to determine the degree of possible renal injury when IABP is used by measuring serial values of serum creatinine and cystatin C. Elective patients scheduled for off pump coronary artery bypass surgery requiring pre-operative use of IABO were included in this study. Cystatin C and serum creatinine levels were checked at fixed intervals after institution of IABP. Twenty-two patients were eligible for enrolment to the study.

**Results.** There was no significant change in the values of serum creatinine from the basal value of 1.10 ± 0.233 to 0.98 ± 0.363 mg/dl (p > 0.05). Cystatin C levels significantly decreased from the basal level of 0.98 ± 0.29 (p < 0.05).

**Discussion.** Contrary to the present belief, cystatin C, the early indicator of renal dysfunction, decreased suggesting absence of renal injury after the use of IABP. Absence of elevation of cystatin C levels in our study suggests the lack of potential of the IABP to cause renal dysfunction in patients who received elective IABP therapy pre-operatively.

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**0-14**

**Independent predictive factors of postoperative renal replacement therapy after adult cardiac surgery**

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CHU Dinant Godinne UCL Namur, Yvoir, Namur, Belgium

**Introduction.** Postoperative need for renal replacement therapy (RRT) after cardiac surgery is a serious complication associated with increased morbidity and mortality. Early identification of patients (pts) at high risk of RRT allows applying strategies to reduce acute kidney injury and to improve outcomes. The aim of this study was to identify peri-operative independent risk factors of postoperative RRT after cardiac surgery.

**Methods.** From February 2010 to June 2013, 1,112 patients (pts) underwent on-pump cardiac surgery in our institution. Peri-operative data were prospectively recorded in our institutional database. Criteria for the initiation of RRT were at least 2 of the follow-
ing: oligo-anuria (urine output < 0.5 ml/kg per 12 h); blood urea > 200 mg/dl; K+ > 6.5 meq/dl; pulmonary oedema unresponsive to diuretics; uncompensated metabolic acido- 
sis. Univariate analysis was performed first to determine factors significantly associated with postoperative RRT. Significant factors (p < 0.05) were included in a multivariate logistic regression model.

**Results.** Two pts died in the operating room, 1,110 were analysed. Five hundred fifty-two pts underwent bypass surgery, 335 pts valve surgery, 172 pts bypass + valve surgery, 28 pts aortic surgery and 7 pts complex surgery. 29 pts (2.6%) required postoperative RRT during intensive care unit (ICU) stay. Median delay between surgery and RRT initiation was 3 days [1.3-4.0]. ICU mortality rate was 41.4% in the RRT group and 2.2% in the non-RRT group (p < 0.0001) (Table 1).

**Discussion.** In our experience, pre-op erative creatinine ≥ 1.5 mg/dL, EuroSCORE > 7, peri-operative use of intra-aortic balloon pump, postoperative low cardiac output, and infection complications during ICU stay are predictive factors of postoperative RRT after cardiac surgery.

### Table 1. Multivariate logistic regression analysis

<table>
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<th>Odds ratio</th>
<th>95% CI</th>
<th>P value</th>
</tr>
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</tr>
<tr>
<td>EuroSCORE &gt; 7</td>
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<td>1.39-9.32</td>
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</tr>
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<td>Intra-aortic balloon pump</td>
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<tr>
<td>Postoperative low cardiac output</td>
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<td>1.58-11.42</td>
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<td>Infection during ICU stay</td>
<td>17.05</td>
<td>5.73-50.77</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

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**Table – Pediatric**

**0-15**

**High dose methylprednisolone reduces degradation of endothelial glycocalyx in paediatric open heart surgery**

_Eero Pesonen, Juho Keski-Nisula, Pertti Suominen_

_Helsinki University Hospital, Helsinki, Finland_

**Introduction.** Degradation of glycocalyx occurs in open heart surgery. It regulates leukocyte and platelet adhesion and vascular permeability on the endothelium. Corticosteroids are widely used in paediatric heart surgery. In an ex vivo model of cardiac reperfusion, hydrocortisone has been reported to decrease degradation of endothelial glycocalyx.

**Methods.** Forty neonates undergoing heart surgery were randomized in a double-blind, placebo-controlled trial to receive 30 mg/kg of methylprednisolone (n = 20) or saline (n = 20). Plasma syndecan-1 as a marker of glycocalyx degradation was measured pre-operatively, 30 min on cardiopulmonary bypass (CPB), after aortic declamping and 6 h post-CPB.

**Results.** Plasma syndecan-1 concentration did not differ between the methylprednisolone (35.0 ± 22.4 pg/ml) and the control group (29.8 ± 13.5 pg/ml) at baseline. Due to a wide variation, rise of syndecan-1 is expressed as a fold-increase of the baseline level. After aortic declamping and at 6 h
post-CPB, rise of plasma syndecan-1 was significantly weaker in the methylprednisolone than the control group (Figure 1).

Discussion. As glycocalyx is important in regulation of inflammation and vascular permeability, the present data offer a novel mechanism for therapeutic effects of corticosteroids in neonatal heart surgery.

O-16
Dosage feasibility of urine biomarkers [TIMP-2]/[IGFBP7] in paediatric acute kidney injury after cardiac surgery with cardiopulmonary bypass

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Service d'Anesthésie-Réanimation 2, Hôpital cardiologique, CHU de Bordeaux, Pessac, France

Introduction. Urine biomarkers [TIMP-2]/[IGFBP7] (Nephrocheck), are early validated markers of acute kidney injury (AKI) in adults. Acute kidney injury is known to prolong intensive care unit stay, mechanical ventilation and causes higher mortality in children after cardiac surgery. Early AKI detection, and hence setting up peritoneal dialysis, improves these parameters. The objective of the study was to explore the feasibility and accuracy of Nephrocheck to predict AKI in neonates and children after cardiac surgery.

Methods. In this prospective, observational cohort study, we included 15 children less than 36 months of age with cardiopulmonary bypass (CPB) longer than 1 h during a 4 months period. We collected demographic, surgery-related and postoperative clinical data, peri-operative NIRS and pNGAL in the paediatric cardiac intensive care unit of a tertiary hospital. Urine samples were collected 1 h before surgery (T0), 1 h (T1), 4 h (T2) and 18 h (T3) after the end of bypass. pNGAL was measured at the same times. AKI stage was defined according to the pRIFLE and AKI Network. We did not use the urine output criteria because of high doses diuretics given. We used thenon-parametric Wilcoxon test.

Results. The study included 5 neonates, median age 7 months. The most frequent surgery was correcting VSD (7 cases). Median CPB length was 124 min. All samples were made. Among the 15 patients, 1 required peritoneal dialysis (7%), none died. No correlations were found between AKI and Nephrocheck at any time, Nephrocheck/T2/T1, Nephrocheck/Urinary creatinine,
postoperative creatinine day 1 and 2, pNGAL, clamping time and renal NIRS.

Discussion. As it was possible to sample urine for all the patients, even at T1 in the operating room, we know now it is possible to study Nephrocheck in this patient category. Despite no significant results, Nephrocheck seems interesting in paediatric AKI pathogenesis, as both molecules are involved in the phenomenon of G1 cell cycle arrest. Evolution of Nephrocheck between T1 and T2, so few hours after surgery, seems the most interesting to study.

References

O-17
Analgesia for chest drain removal in children after cardiac surgery: sevoflurane vs. ketamine

Isabelle Fonteyne, Ingrid Herck, Fabienne Van Lierde, Johan De Cruyenaere
Ghent University Hospital, Ghent, Belgium

Introduction. Standard postoperative analgesia in the paediatric cardiac intensive care unit comprises paracetamol, ibuprofen and morphine. During painful procedures this may be supplemented with sevoflurane or ketamine (not routinely). This prospective, randomized controlled trial aimed to determine whether standard analgesia is adequate for chest drain removal in awake, non-ventilated children, and whether the addition of sevoflurane or ketamine can enhance comfort and pain relief.

Methods. Following ethics committee approval and informed consent, 51 children under the age of 14 were randomized into 3 groups. Group 1 received the standard analgesia alone, group 2 received standard and sevoflurane (6% start) and group 3 standard and ketamine (1 mg/kg). The primary endpoints were pain and comfort measured by the Comfort B Score and VAS observation scale. Secondary endpoints were changes in blood pressure and heart rate, and potential side effects.

Results. There were no significant differences in the number of drains, consumption of standard analgesics or baseline comfort B score across all groups. In the standard group, there was a significant rise of the Comfort B to a mean of 22 indicating severe discomfort. In the sevoflurane group, it decreased to a mean of 8 indicating oversedation ($p < 0.05$). In the ketamine group, comfort B remained within the limits of comfort. The mean blood pressure rose significantly in the standard and ketamine group (30 and 11% resp; $p < 0.001$), and dropped significantly by 18.9% in the sevoflurane group. The heart rate increased significantly in the standard and ketamine groups (17.8 and 6.3% resp; $p < 0.05$); in the sevoflurane group, there was a non-significant drop (4%).

Discussion. This study suggests that standard postoperative pain relief using a combination of paracetamol, ibuprofen and morphine is inadequate during painful procedures. The use of sevoflurane appears to cause oversedation and haemodynamic instability, whereas the addition of ketamine to the standard pain medication provides sufficient comfort whilst maintaining cardiopulmonary stability.
0-18
Inhalation agents for the treatment of pulmonary hypertension in patients undergoing cardiac surgery: a systematic review and meta-analysis

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2 Hôpital du Sacré-Coeur de Montréal, Montreal, QC, Canada

Introduction. In the context of cardiac surgery, pulmonary hypertension (PH) is an important prognostic factor associated with increased morbidity and mortality, with an impact on survival mainly through its effects on right ventricular function. Optimal perioperative management is therefore essential to ensure the best postoperative results. Intravenous vasodilators play an important role in the management of PH, but their lack of specificity for the pulmonary circulation often limits their use because of their systemic hypertensive effects. The introduction of inhaled nitric oxide (iNO) as a selective pulmonary vasodilator has been a major advance in the treatment of PH, but treatment with iNO is expensive. Consequently, other inhaled pulmonary vasodilators, such as prostacyclin and milrinone, have been investigated as alternatives. In this study, we performed a meta-analysis to determine the effectiveness of inhaled agents compared to intravenously administered agents or a placebo in the treatment of PH during cardiac surgery. Additionally, using subgroup analysis, we explored the efficacy among inhaled agents, divided between iNO and non-iNO alternatives.

Methods. We performed a systematic review and meta-analysis of randomized controlled trials. Studies were identified in MEDLINE, CENTRAL, EMBASE, The Web of Knowledge and ClinicalTrials.gov. databases from inception to February 02, 2013. From 629 studies retrieved, 9 articles comprising a total of 323 patients were included in the meta-analysis. Primary outcome was haemodynamic stability and secondary outcomes were length of stay in-hospital, length of stay in the intensive care unit, and mean dose of inotropes and vasopressor agents.

Results. Overall, inhaled agents were associated with a significant decrease in pulmonary vascular resistance ($p = 0.02$), central venous pressure ($p = 0.04$) and transpulmonary gradient ($p = 0.002$) and a significant increase in cardiac index ($p = 0.03$) and mean arterial pressure ($p = 0.005$). No statistically significant difference was observed regarding other outcomes evaluated. The use of iNO was associated with a significant increase in mean arterial pressure compared with non-iNO inhaled agents ($p = 0.0003$). No other differences were observed between the groups.

Discussion. The administration of inhaled agents for the treatment of PH during cardiac surgery is associated with a greater decrease in pulmonary vascular resistance and fewer systemic haemodynamic side effects compared to intravenously administered agents. Additionally, although non-iNO inhaled vasodilators seem as promising cost effective alternatives, their efficacy compared to iNO requires further study based on randomized controlled clinical trials.

0-19
Specifying indications for chest radiographs after cardiac surgery increase their efficacy and reduce their number

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2 Amphia Hospital, Breda, The Netherlands

Introduction. In the intensive care unit (ICU), chest radiographs (CXRs) are frequently obtained routinely for postoperative
cardiosurgical patients despite the fact that the diagnostic and therapeutic efficacy of routine CXRs is known to be low. The discussion regarding the safety of abandoning routine CXRs is still ongoing. We investigated the efficacy of CXRs performed after cardiac surgery for specified indications only.

**Methods.** We prospectively included all patients who underwent major cardiac surgery in the year 2012. A routine postoperative CXR was performed at ICU arrival only for certain specified indications like minimally invasive cardiac surgery or difficult central venous catheterization. An on-demand CXR could be obtained during the postoperative period for other specified indications including certain haemodynamic or respiratory problems. A control CXR was performed on the morning of the first postoperative day for all patients who had not undergone a CXR prior to that time. The diagnostic and therapeutic efficacy (the number of abnormalities or interventions divided by the total number of CXRs) were calculated for all CXRs.

**Results.** A total of 1,351 patients were included in this study. The diagnostic efficacy of CXRs for major abnormalities was clearly higher for the direct postoperative and on-demand CXRs that were performed for specific indications than for the next morning routine control CXRs (6.7% and 6.9% vs. 2.9%) ($p = 0.004$). The therapeutic efficacy was also clearly higher for the direct postoperative and on-demand CXRs (2.9% and 4.1%). The need for intervention after the first postoperative morning control CXRs was minimal (0.6%) ($p = 0.000$).

**Discussion.** Specifying clear indications for CXRs following cardiac surgery increases the efficacy of these CXRs and can reduce the total number of CXRs performed.

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**Oral Session – Organ Dysfunction**

**O-20**

**Organ hierarchy during low blood flow on-pump: a randomized experimental positron emission tomography study in pigs**

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2. Aalborg University Hospital, Department of Thoracic Surgery, Aalborg, Denmark
3. Aarhus University, Department of Nuclear Medicine and PET-Center, Aarhus, Denmark

**Introduction.** Higher co-morbidity, age and weight of the patients scheduled for today’s cardiac surgery question the precalculation of blood flow during cardiopulmonary bypass (CPB) [1]. Approximately 10-20% of cardiac surgery patients suffer from hyperlactataemia indicating tissue hypoxia [2]. The purpose of this animal study is to investigate the organ hierarchy of brain, liver, kidney and muscle at normal and low blood flows by using dynamic positron tomography (PET-CT) during CPB.

**Methods.** CPB at different blood flows will be investigated in an experimental model of six 70 kg pigs, with normothermic CPB with a blood flow of 2.5 l/min/m² for one h followed by a randomization to a blood flow of either 2.0 l/min/m² (Group I) or 1.5 l/min/m² (Group II) for another h and finally one h with blood flow of 2.5 l/min/m². Regional tissue perfusion of brain, liver, kidney, and muscle will be measured with dynamic PET-CT before CPB and during the different blood flows. Systemic oxygen consumption will be estimated by measurement of mixed venous saturation and lactate, and regional muscle oxygen saturation ($tSO_2$) with near-infrared spectroscopy at the lower limb.
Results. Preliminary data of the first four pigs indicate existence of an organ hierarchy with preserved perfusion of the brain but affected muscle tissue perfusion in both groups of suboptimal blood flow. The last two pigs will be studied in May, and the results will be ready for presentation in September. Non-parametric statistical method will be used.

Discussion. To our knowledge this is the first study investigating organ hierarchy with dynamic PET-CT during profound systemic ischaemia due to suboptimal blood flows during normothermic CPB.

References


0-21

Prognosis value of tissue oxygen saturation recovery slope (RS) during a vascular occlusion test (VOT) in cardiogenic shock patients

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Introduction. Cardiogenic shock (CS) results in microcirculatory regulation disorder that may be involved in the development of multiorgan failure and death. Tissue oxygen saturation (StO₂) RS impairment after VOT in septic shock patients is associated with a poor outcome [1]. This study evaluates the prognosis value of dynamic thenar oxygen saturation response using a VOT during severe CS.

Methods. Adult patients treated for severe CS were included within the first 24 h after ICU admission for prospective StO₂ and VOT monitoring during 48 h and for retrospective observational analysis. StO₂, RS after VOT, serum lactate and haemodynamic parameters were compared between ICU survivors and non survivors at 0, 12, 24, and 48 h.

Figure 1

![Kaplan-Meier analysis of survival regarding RS at H12 (cut-off = 3.5% s⁻¹)](image)
**Results.** Thirty-eight patients suffering from CS (mean ± SD: age 55 ± 14 ys; APACHE score 20.5 ± 11) were treated with inotropes (n = 28) and/or mechanical circulatory support (12 IAPB, 10 ECLS) and vasopressors (n = 33) without significant difference between groups. Mortality in ICU was 47%. The SOFA was more important in non-survivors (12.4 ± 3.3 vs. 9.7 ± 2.1; \( p < 0.01 \)). The first measurement of RS (%·s\(^{-1}\)) was low but faster in survivors than non-survivors (2.7 ± 0.9 vs. 1.9 ± 1; \( p = 0.02 \)). Then, the RS increased early in survivors (to 4.5; \( p < 0.001 \)) and not in non-survivors (to 2.2; \( p = 0.59 \)) at H12. We found a cutoff value at 3.5%·s\(^{-1}\) at H12 with 80% sensibility and specificity to predict mortality (Figure 1).

**Discussion.** Our results suggest that in patients treated for CS, the post-VOT StO\(_2\) RS within the first 24 h after ICU admission indicates a poor outcome if very low and without an early improvement despite intensive management.

**References**


**Oral Session – Thoracic Anaesthesia**

**0-22**

**Continuous control of double-lumen endotracheal tube cuff pressure vs. standard management for the prevention of intra-operative pulmonary aspiration**

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\(^2\) Hospital Clinic, Pulmonary and Critical Care Medicine
\(^3\) Hospital Clinic, Nuclear Medicine
\(^4\) Hospital Clinic, Anesthesiology, Barcelona, Spain

**Introduction.** Leakage of colonized oropharyngeal secretions across the double-lumen endotracheal tube cuff frequently occurs, particularly when the cuff is under-inflated. This potentially leads to postoperative pneumonia. We evaluated whether continuous control of the tracheal cuff pressure (PT\(_{Cuff}\)), in comparison with standard cuff management could avoid pulmonary aspiration.

**Methods.** Twenty-seven patients (64.7 ± 10.8 yr) undergoing elective lobectomy for lung cancer were enrolled into the study. Tracheal diameter was computed through CT scan. Tracheal cuff diameter was measured with a calliper. A 20-G epidural catheter was attached to the double-lumen tube to allow installation into the subglottic region. Following intubation, patients were randomized to receive continuous control of PT\(_{Cuff}\) (treatment group, 12 patients) through an electronic controller (Mallinckrodt pressure control, Covidiem, Boulder, USA) or standard care of PT\(_{Cuff}\) (control group, 15 patients). In the treatment group, PT\(_{Cuff}\) was maintained at 28 cmH\(_2\)O. In the control group, following intubation, the PT\(_{Cuff}\) was set at 28 cmH\(_2\)O.
with a manometer, and adjusted in cases of consistent signs of air leakage. Throughout the surgical procedure, nitrous oxide was never administered. Following placement of the patient into the lateral position for thoracotomy, 4-ml of a solution of methylene blue and 3.7 megabecquerels of $^{99m}$Tc-DTPA were slowly installed into the subglottic region. The half-life of the isotope is 6 h and is not orally absorbable. 1, 2 and 3 h after installation, we collected oropharyngeal and tracheal secretions to assess macro-aspiration through presence of methylene blue. Radioisotopic counting was performed using a gamma counter to evaluate micro-aspiration. Scintigraphic results were corrected for background activity, decay, and expressed as log10, of the counts per minute (cpm) per gr. Data were analysed through student’s t-test, Wilcoxon-Mann Whitney test, Chi-squared test and Friedman test. A two-sided $p < 0.05$ was considered statistically significant.

**Results.** The median double-lumen tube diameter was 39 Fr (range 35-41). The ratio between cuff and tracheal diameter was 1.71 ± 0.2 without difference between groups ($p = 0.990$). Macro-aspiration was detected in 20.0 and 23.3% of the samples in the treatment and control groups, respectively ($p = 0.736$). Mean oropharyngeal radioactivity was $5.5 ± 1.5$ log10 cpm/gr. Tracheal secretion’s radioactivity was $2.4 ± 1.6$ log10 cpm/gr in the treatment group and $2.8 ± 1.8$ in the control group ($p = 0.213$). Additionally, tracheal secretion’s radioactivity was consistent at 1 h ($2.8 ± 1.8$), 2 h ($2.4 ± 1.6$) and 3 h ($2.8 ± 1.8$) after installation ($p = 0.437$).

**Discussion.** Our findings demonstrate that pulmonary aspiration across the double-lumen tracheal cuff is common during thoracic surgery, irrespective of continuous control of internal cuff pressure.

**0-23**

**Effect of increasing age on the haemodynamic response to thoracic epidural anaesthesia**

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2 University Hospitals Ghent, Ghent, Belgium

**Introduction.** Sympathetic blockade with thoracic epidural anaesthesia (TEA) results in circulatory changes and may directly alter cardiac function. Aging is associated with an impairment of autonomic nervous system control and a deterioration of diastolic performance. We postulated that haemodynamic changes induced by TEA could vary with age.

**Methods.** Thirty-five patients scheduled for lung surgery and TEA, were stratified into three age groups (G1: < 45 y; G2: 45-65 y; G3: > 65 y). Cardiac performance was evaluated in awake patients immediately before and 45 minutes after institution of TEA using transthoracic echocardiography (TTE). Tissue Doppler imaging (TDI) and other echo-derived indices were used to quantify biventricular systolic and diastolic function. Cardiac Index was calculated using the LV outflow velocity time integral. For statistical analysis, we used the paired student’s t-test and linear regression analysis.

**Results.** After exclusion of five patients, 10 patients per age group were analysed. Baseline systolic and diastolic LV function and RV diastolic function decreased with age. After TEA, mean arterial pressure decreased (91.2 versus 79.2 mmHg, $p < 0.001$) and Cardiac Index increased (2.7 versus 3.0 l/min/m$^2$, $p = 0.005$), while heart rate and Doppler-derived indices of LV contractility remained unchanged. RV ejection indices increased, and TDI-derived measures of diastolic performance increased for the LV as well as the RV. Except for TAPSE that increased with increasing age ($R = 0.53$, $p$
TEA effects on biventricular function were not influenced by age.

**Discussion.** When preload is preserved with volume loading, TEA predominantly causes systemic vasodilatation and increases global haemodynamic performance. Indices of LV systolic function do not change while LV and RV diastolic function appear to improve. TEA effects on RV systolic function are inconclusive. While increasing age causes a consistent decline of baseline diastolic function, the cardiovascular response to TEA is not impaired in the elderly.

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**O-24**  
**Acute permissive hypercapnia during one lung ventilation: impact on right ventricular function during lung resection**

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**Introduction.** Mechanical ventilation with low tidal volume has been shown to attenuate lung injuries in critically ill patients. This study assesses the impact of acute permissive hypercapnia on haemodynamics, gas exchange and right ventricular function during one-lung ventilation (OLV) for pulmonary resection.

**Methods.** We studied 15 patients scheduled for pulmonary resection through a thoracotomy. Patients with pulmonary hypertension (systolic > 50 mmHg), intracranial hypertension or previous intracranial haemorrhage, pre-existing hypercapnia, co-existing metabolic acidosis, ischaemic heart disease, predicted postoperative FEV₁ < 800 ml or < 40% of the expected in pneumonectomy were excluded. Patients had a standardized management for thoracotomies. Initial V₁ 10 ml/kg was reduced to 8 ml/kg after OLV and the rate adjusted to maintain PaCO₂ 4-4.7 kPa. Haemodynamic, respiratory variables and echocardiographic data were obtained at: T₁, 15 min after establishing OLV with normocapnia, T₂, 15 min after establishing OLV with hypercapnia (PaCO₂ 8 kPa (60 mmHg) and 9.3 kPa (70 mmHg) and pH > 7.1), and T₃, 15 min after resuming OLV with normocapnia. One-way repeated measures ANOVA with post hoc Dunnet’s test were used for analysis. p < 0.05 is considered statistically significant.

**Results.** Values as mean (SD).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>(T₁)</th>
<th>(T₂)</th>
<th>(T₃)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO (l·min)</td>
<td>5.6 (1.2)</td>
<td>6.5 (1.3)</td>
<td>6.32 (1.3)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>CI (l·min·m⁻²)</td>
<td>2.93 (0.4)</td>
<td>3.37 (0.5)</td>
<td>3.33 (0.5)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>RVSP (mmHg)</td>
<td>19.5 (3.4)</td>
<td>20 (4.0)</td>
<td>19.9 (3.7)</td>
<td>0.039</td>
</tr>
<tr>
<td>TAPSE (cm)</td>
<td>2.16 (0.2)</td>
<td>2.4 (0.2)</td>
<td>2.35 (0.1)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>RVMPI</td>
<td>0.32 (0.01)</td>
<td>0.33 (0.01)</td>
<td>0.33 (0.015)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

**Discussion.** OLV with permissive hypercapnia is likely to be tolerated in the short-term and beneficial in terms of attenuating lung injury.

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**O-25**  
**Comparison between dopamine and phenylephrine in maintaining cerebral oxygen saturation in thoracic surgery**

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**Introduction.** Fluid restriction is recommended to prevent acute lung injury in thoracic surgery. In case of intra-operative hypotension, we therefore often administer vasoactive agents or inotropes. One lung ventilation (OLV) decreases arterial oxygenation, so that oxygen delivery to the brain can also be decreased. In this study, we compared dopamine and phenylephrine in maintaining cerebral oxygen saturation during OLV in major thoracic surgery.

**Methods.** Fifty patients aged 65 and more undergoing lobectomy were randomly
assigned to a dopamine (group D) or phenylephrine (group P) group. Mean blood pressure (MBP) was maintained within 20% of baseline by dopamine or phenylephrine continuous infusion. Desflurane 1 minimum alveolar concentration (MAC) and remifentanil were administered under bispectral index guidance. Cerebral tissue oxygen saturation (SctO₂) by near infrared spectroscopy and haemodynamic parameters, including oesophageal cardiac Doppler measurement, were recorded at baseline, 15 min after induction, 30 and 60 min after OLV and 15 min after restart of two lung ventilation. T-test, Mann-Whitney test, Chi-squared test or Fisher’s exact test were conducted for the comparison between the two groups. Relationship between various factors and SctO₂ was analysed by Pearson’s correlation.

Results. Dopamine was better in maintaining SctO₂ during OLV than phenylephrine (72 vs. 66%, p = 0.011). The number of patients whose SctO₂ < 60% during operation was higher in the group P (4 vs. 12 p = 0.016). Group D showed a higher cardiac index (CI) and lower MBP than group P (2.9 vs. 2.4 l/min/m², 77 vs. 84 mmHg, p = 0.029, 0.017). Age and CI were correlated with SctO₂. There were no differences in the incidence of postoperative delirium, atrial fibrillation, mechanical ventilation or intensive care unit hours between the two groups.

Discussion. Dopamine was superior to phenylephrine in maintaining SctO₂ during OLV. Dopamine showed a higher CI than phenylephrine and CI was correlated with SctO₂.

0-26 Double-lumen tube vs. video-assisted Cohen blocker for mini-invasive mitral valve surgery

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Introduction. Mini-invasive mitral valve surgery is one of heart surgical procedures requiring single lung ventilation. The most commonly used devices are the double-lumen tube (DLT) and different models of endobronchial blockers. The aim of this randomized controlled study was to compare the efficacy and the safety of Cohen endobronchial Blocker (CB) placed with Et-view vs. DLT in mini-invasive mitral valve surgery.

Methods. After Ethics Committee approval and informed written consent, 30 patients undergoing elective mini-invasive mitral valve surgery via right mini-thoracotomy were included. Exclusion criteria were age < 18, ASA IV or patients with a suspected difficult airway. Patients were randomly allocated into two groups: DLT and CB. The DLT group was intubated with a left-side DLT using conventional laryngoscopy. The CB group was intubated with an Et-view tube, and then the Cohen endobronchial blocker was placed into the right bronchus under continuous bronchial vision. Efficacy parameters were: time to initial tube placement (TIP); the incidence of displacement; the time to correct replacement; the grade of satisfaction of surgeons on lung collapse and the grade of difficulty in using the devices.

Results. The placement of DLTs was faster than CBs (TIP: 85 sec ± 35 vs. 130 ± 95 sec). After posturing patients into the correct surgical position there were 2 cases of dis-
placement of the DLT with the necessity of fibreoptic broncoscopy (mean time 185 sec) vs. 1 in the CB group which was immediately resolved with the Et-view (mean time 40 sec). There was no difference in the grade of satisfaction of surgeons. The degree of difficulty (DLT vs. CB) for anaesthesiologists was very easy in 50% vs. 66%; easy 15% vs. 33%; medium 2% vs 10%; worse 13% vs 5%. All patients were then transferred to UTI, but in the DLT group, it was necessary to change to a single tracheal tube for the DLT to facilitate respiratory weaning.

Discussion. Although time for intubation was longer in the CB group, there was a minor incidence of displacement and more rapid replacement of CB thanks to Et-view. The efficacy of single lung ventilation was the same. There were also advantages of Et-view CB in cases of unsuspected difficult airway. Moreover after heart surgery with the necessity of progressive awakening and weaning in the UTI, the DLT has to be changed to a normal single lumen tube. So, Et-view CB can be considered a valid alternative device for mini-invasive mitral valve surgery.

Oral Session – Electrophysiology

0-27
Implementation of a modified WHO checklist for the cardiac catheterization laboratory – a complete audit cycle

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Introduction. In 2007, the World Health Organization (WHO) trialled a surgical checklist and demonstrated a significant reduction in both major complications and 30-day mortality [1]. In the UK, this checklist is mandatory for all surgical procedures. Uptake for medical procedures has been variable. Our quaternion referral cardiac catheterization laboratory (Cath Lab) frequently performs complex invasive procedures. Following a patient safety incident, we suspected that we were not utilising the WHO checklist to its fullest extent and proposed changes to the form aimed at providing specialty-specific safety checks and improving its use in this environment. We conducted audits before and after the introduction of this modified checklist.

Methods. We conducted a Trust-registered audit, during which we observed whether each of the three sections (sign-in, time-in, time-out) was carried out for 20 Cath Lab cases, and if these sections were documented as completed. Feedback was then sought from the Cath Lab team, and the WHO checklist was modified to make it more appropriate for use in this area. After staff training, our audit was repeated for 34 further cases.

Results.

<table>
<thead>
<tr>
<th>Section</th>
<th>Initial Audit n = 20 (%)</th>
<th>Re-audit n = 34 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Completed</td>
<td>Documented</td>
</tr>
<tr>
<td>Sign-in</td>
<td>6 (30)</td>
<td>8 (40)</td>
</tr>
<tr>
<td>Time-in</td>
<td>2 (10)</td>
<td>3 (15)</td>
</tr>
<tr>
<td>Time-out</td>
<td>2 (10)</td>
<td>3 (15)</td>
</tr>
</tbody>
</table>

Two patient safety incidents were reported during the initial audit; none were reported in the subsequent re-audit.

Discussion. Initial audit results were poor. Sections of the checklist were documented as completed, despite never being carried out, suggesting it was treated as a ‘tick-box’ exercise rather than a patient safety tool. Following staff engagement and the development of an area-specific checklist, we demonstrated improvement in both completion and documentation in all sections of the checklist.

References
Clinical use of the ‘Baska mask’ for transcutaneous interventional cardiology aided with transoesophageal echocardiography: a preliminary study

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Introduction. In our cardiac catheterization laboratory (CCL), several procedures are performed with the aid of transoesophageal echocardiography (TOE). In this setting, we use general anaesthesia (GA) [1]. Use of laryngeal mask airways is technically difficult due to space constraints. We designed an observational study about the feasibility to perform total intravenous anaesthesia (TIVA) and volume support mechanical ventilation (VMV) through the new laryngeal mask airway (LMA) Baska mask (BM) and the simultaneous use of TOE monitoring.

Methods. Ten patients ASA III-IV scheduled for percutaneous cardiac techniques in the CCL were included (Table 1). The anesthetic technique chosen was TIVA propofol (bolus 1.5-2.5 mg/kg plus continuous iv. infusion 5 mg/kg/h) and remifentanil (0.15 µg/kg/h). The BM was inserted, and the ease of success and technical features were recorded. VMV was set at VT of 8 ml/kg and RR of 10/min to obtain normocapnia and SaO₂ > 96%.

Results. Insertion rate success was 100%. Two BM were changed after insertion because the size first selected was deemed not correct. The management of the TOE probe was feasible in all patients. In one patient, severe laryngospasm occurred during TOE probe insertion, which was resolved successfully.

Discussion. Percutaneous interventional cardiology is an expanding area. TIVA is used because it provides safety and a rapid recovery. The BM supraglottic device is a new LMA with special characteristics: A bite block over the full length of the airway; a self-sealing membranous variable-pressure cuff; a large sump cavity with two aspiratable gastric drain tubes. The cuff is not an inflatable balloon but increases laryngeal pressure seal with every mechanical breath when VCV [2]. Our preliminary study highlighted the feasibility to technically insert and perform TOE monitoring during VMV with the BM.

References

Table 1
<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Technique</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD ostium secundum</td>
<td>Amplatzer closure</td>
<td>4 (40%)</td>
</tr>
<tr>
<td>Mitral prosthetic leak</td>
<td>Amplatzer closure</td>
<td>2 (20%)</td>
</tr>
<tr>
<td>Aortic stenosis</td>
<td>TAVI</td>
<td>4 (40%)</td>
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</table>
Introduction. Remote ischaemic preconditioning (RIC) is a brief episode of ischaemia-reperfusion with a limb tourniquet that protects against a subsequent longer ischaemic insult. Small clinical trials demonstrated it can protect organs during cardiovascular surgery. This study investigated the feasibility of RIC in elective AAA surgery, a specialty that is undergoing significant organizational change, to inform the design of a large RCT.

Methods. Consecutive patients presenting for elective AAA repair (using the open or EVAR approach) were assessed for eligibility. Consented patients were randomized to receive either RIC (three cycles of 5 min ischaemia and 5 min reperfusion in the upper arm immediately before surgery) or a sham procedure. Blood samples to measure serum creatinine and troponin levels were taken after surgery and on the first 2 post-operative days. Patients were followed-up for 6 months. We assessed the practicability and acceptability of the intervention, and success of blinding through interviews with patients and staff. A study in 60 participants (30 Open and 30 EVAR procedures), was considered sufficient to provide recruitment estimates with adequate precision to inform a larger definitive trial; e.g., 50% eligible patients recruited (worse-case scenario) would be estimated with a 95% confidence interval of ±13%. The study was not powered to compare outcomes between the RIC and sham groups.

Results. Ninety-eight patients underwent surgery during the study period, 93 were screened for the trial, and 84 were eligible to take part. Of these 70 were approached and 69 patients consented to participate. Thirty-four participants were randomized to RIC and 35 to a sham procedure. By chance, the complexity of EVAR surgery was higher in the RIC group. Overall, 28/69 participants (41%) had acute kidney injury (AKI) following surgery. In the majority of cases the injury was graded as AKIN 1 (16 participants, 23%). AKI occurred more frequently in the RIC group (47% vs. 34%). Cardiac events were also more common in the RIC group (MI 15% vs. 6%; new arrhythmias 21% vs. 14%; Troponin T >14 ng/l 47% vs 29%). There were 3 deaths, one in the RIC group and 2 in the sham group. Post procedure interviews indicated that patients and staff remained blinded to the allocation and that the procedure was acceptable. There were no adverse events secondary to the intervention.

Discussion. This study provides essential information for the planning and design of a multi-centre RCT to assess the effectiveness of RIC for improving clinical outcomes for patients having elective AAA surgery. Consent was high and the RIC intervention can be carried out with minimal disruption to clinical care and the time taken for anaesthetic or surgical procedures.
Adherence to ACC/AHA guidelines does not decrease the incidence of MI in post-PCI patients undergoing non-cardiac surgery

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Introduction. It is estimated that 5-16% of patients (pts) previously treated with Percutaneous Coronary Intervention with stents (PCI) will present for elective non-cardiac surgery (NCS) within the year. The ACC/AHA guidelines for management of these pts suggest a combination of delaying NCS and the continuation of anti-platelet therapy (APT) with aspirin (ASA) and/or clopidogrel for up to 1 year. Despite these recommendations, the incidence of peri-operative myocardial infarction (MI) in these patients (pts) remains very high. The objective of this multi-centre prospective, cohort study was to determine if the guidelines and specifically APT decreased the incidence of MI in this population. The secondary objective was to determine the mechanism of MI in post-PCI pts undergoing NCS.

Methods. After REB approval, pts after previous PCI scheduled for elective NCS were recruited for this prospective study. The primary outcome was MI. The incidence of MI was blindly adjudicated in duplicate using the 3rd Universal Definition of MI. Troponin levels were measured every 8 h for the first two days postoperatively, then once daily until discharge in addition to ECG measurements. All pts were followed up for any clinical symptoms of MI. The location of MI was judged according to its location (area of stent or not). The platelet inhibition by ASA and clopidogrel was measured using Platelet Mapping Assay (PMA). PMA was performed pre- and post-operatively and at 24 h after surgery. Pts’ demographics and pre-operative characteristics were summarized using descriptive statistics. We used restricted cubic spline plots to evaluate the nature of the association of platelet inhibition (continuous variable) and the risk of MACE (logit transformation). Univariate analyses applied chi-squared or Fisher’s exact test for categorical data, and t-test and Mann-Whitney U test for continuous data.

Results. A total of 190 pts were recruited. Thirty pts were excluded from analysis (day case surgery or lack of third PMA). The incidence of MI was 19%. Pts operated within 60 days of PCI had an increased risk of MI > 60%. Pts exposed to ASA within 5 days of surgery had better PMA than non-exposed pts. The area of the MI occurred most frequently in the location of the stent placement (71%). Percentage of inhibition was analysed as a continuous variable. There was no difference in the PMA between pts suffering from MI and those who did not. Factors that were associated with increased MI included higher Revised Cardiac Risk Index, specifically elevated creatinine, and a history of diabetes. Pre- and post-operative anaemias were independent predictors of MI.

Discussion. In this prospective study, PMA adequately indicated platelet inhibition when ASA was stopped prior to surgery. However, the use of ASA or its withdrawal were not associated with MI. This increased risk of MI was associated with chronic renal failure, diabetes and anaemia. Future interventional trials should incorporate these findings.
Identification of the guidewire in the brachiocephalic vein to confirm guidewire placement during internal jugular central venous catheter placement

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Introduction. Ultrasound (US) visualization of the guidewire in the internal jugular vein (IJV) during central venous catheterization (CVC) is often used to verify proper guidewire placement and to aid in prevention of inadvertent arterial cannulation. However, inadvertent arterial cannulation can occur despite visualization of the guidewire in the IJV. Visualizing the guidewire in the brachiocephalic vein (BCV) might be a more reliable method of confirming proper guidewire placement.

Methods. This prospective feasibility study included 76 adult patients undergoing cardiothoracic procedures. The aim of the study was to assess the likelihood of obtaining US imaging of the guidewire in the BCV during CVC placement. All of the images were acquired by anaesthesiology trainees under direct supervision of one of the investigators. The guidewire was imaged in the IJV in short axis view and the transducer was then angled caudally under the clavicle, following the guidewire until the BCV appeared in the view.

Results. The BCV was imaged in all patients. There were 4 out 76 (5%) failures to visualize the guidewire in the BCV. In 2 patients, the guidewire was not clearly visualized in the BCV due to presence of multiple pacemaker/defibrillator wires and a pre-existing CVC. In another 2 patients, the guidewire was not visualized in the BCV because it coiled in the IJV (confirmed by a long axis view of the IJV). The guidewire was then visualized in the BCV on the second attempt after it was repositioned. There was a single arterial puncture, but no arterial cannulations.

Discussion. Visualizing the guidewire in the BCV assures that the guidewire is not curled in the IJV, mispositioned in the subclavian vein, or inadvertently placed in an artery. Imaging the guidewire in the IJV alone does not rule out arterial placement because the wire may continue through the far wall of the IJV and into an adjacent artery. Our preliminary data suggests that the BCV can be imaged routinely, although interference from pre-existing wires or catheters may obscure the guidewire.

Treatment of gram-positive cardiovascular infections with daptomycin or vancomycin: a retrospective analysis of efficacy and nephrotoxicity

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Introduction. Gram-positive organisms are a leading cause of infection for patients undergoing cardiovascular surgery as a reason or a complication of surgery. Furthermore, these patients are at high risk for postoperative renal impairment. Some antibiotic drugs are known to further impair renal function [1], which can necessitate renal replacement therapy (RRT). The aim of our study was to evaluate whether the use of a less nephrotoxic drug such as daptomycin (DAP) for high-risk patients (rate of RRT about 5%) leads to improved efficacy, outcomes and reduced cost of medical care in comparison with vancomycin (VAN).

Methods. All patients who received either DAP or VAN in the ICU prior to or after cardiovascular surgery from January 2010 to June 2012 were included in this retrospective cohort study. We excluded patients with end stage renal disease and length of treatment less than 48 h. The main purpose was
to compare the incidence of a 20% decrease in creatinine clearance measured by MDRD formula for the two drugs. Secondary objectives were the incidence and duration of RRT in ICU, mortality and clinical success rates.

Results. Seventy-five patients were included. Infections were: endocarditis (n = 18), vascular graft infections (n = 14), ventricular assist device infections (n = 7), catheter-related infections (n = 8), operative site infections (n = 13) and miscellaneous (n = 15). A decrease in creatinine clearance > 20% or need for RRT during treatment occurred more frequently with VAN 74% vs. 48% with DAP, \( p = 0.024 \). The maximum decrease in MDRD was significantly higher with VAN (−32%) versus DAP (−14%), \( p = 0.032 \). RRT was required at the beginning or during antibiotherapy for 9 DAP patients (31%) and 19 VAN patients (41%), \( p = 0.465 \). The incidence of RRT for more than 5 days was 10% with DAP vs. 35% with VAN, \( p = 0.028 \). When RRT was started before antibiotherapy (n = 18), duration of RRT was significantly reduced with DAP (3 days) versus VAN (22 days), \( p = 0.019 \). Treatment discontinuation (n = 35/61) and clinical failure (n = 14/48) of initial antibiotherapy occurred more likely with VAN (71% and 42%) than with DAP (35%, \( p = 0.021 \) and 14%, \( p = 0.024 \)).

Discussion. Nephrotoxicity is a clinically relevant issue in ICU that leads to discontinuation of VAN therapy with a negative impact on treatment efficacy. DAP appears to be safer than VAN with regard to renal function in a high risk population and may reduce duration of RRT, with a potential economic impact.

References


O-33 Randomized trial of fish oil infusion to prevent atrial fibrillation after cardiac surgery: data from implantable continuous cardiac monitor

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Introduction. The effectiveness of \( \omega-3 \) polyunsaturated fatty acids (PUFA) for the prevention of postoperative atrial fibrillation (POAF) in cardiac patients is questionable. We hypothesized that peri-operative \( \omega-3 \) PUFA infusion would reduce the incidence of POAF as assessed by performing subcutaneous continuous cardiac monitoring (CCM).

Methods. In a single-centre, prospective, double-blind, placebo-controlled trial a sample size of 148 patients was calculated to provide 80% power to detect a reduction in the event rate from 30% to 15%. The study was suspended when the first interim analysis showed a higher incidence of event in the intervention group at 10 days of follow-up and terminated due to futility when this trend was supported at the 2-year follow-up. Thus, 39 patients undergoing coronary artery bypass graft surgery (CABG) under cardiopulmonary bypass (CPB) were randomly assigned to receive either \( \omega-3 \) PUFA infusion (200 mg/kg/day starting before anaesthesia induction for 24 h followed by 100 mg/kg/day from postoperative day [POD] 2 to POD 7) or placebo. A continuous cardiac monitor (Reveal XT®; Medtronic Inc., USA) was implanted intra-operatively after the CABG in the parasternal area of the chest of all patients. The primary outcome was freedom from atrial fibrillation (AF) at 2-year follow-up. AF was defined as AF burden > 0.5%. Data from CCM was collected on POD 10 and 3, 6, 12, and 24 months after surgery.

Results. POAF developed in 4 (19%) patients in the control group and in 5 (27.8%) patients in the intervention group.
patients in the ω-3PUFA group at 10-days follow-up ($p = 0.88$). At 2-years follow-up, 5 (27.8%) patients in the control group and 6 (35.3%) patients in the ω-3PUFA group had AF ($p = 0.9$). AF duration predicted risk of cardiovascular hospitalization at the 2-year follow-up (regression coefficient estimate = 0.24, standard error 0.02, $p < 0.0001$; $R^2 = 0.74$).

**Discussion.** Infusion of ω-3PUFA failed to prevent the occurrence of new-onset AF immediately after the operation or AF burden in 2 years after CABG surgery. The AF burden registered on performing CCM at the 2-year follow-up was a significant predictor of adverse outcome.

**Oral Session – Best Orals**

**O-34**

Effect of anti-platelet drugs on platelet microparticles during on-pump cardiac surgery

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**Introduction.** Platelet microparticles (PMP), sub-micron sized vesicles released from activated platelets, are involved in haemostasis, but little is known about the effect of anti-platelet drugs on PMP populations. Patients receiving aspirin and clopidogrel in the week before their cardiac surgery are at an increased risk of postoperative bleeding.

**Methods.** This prospective observational study gathered data from 137 patients undergoing on-pump cardiac surgery, of which 65 received aspirin and/or clopidogrel in the 7 days before their operation while 62 did not. Pre-anaesthetic, intra-operative (pre- and post-heparin, pre- and post-crossclamp, after crossclamp removal, and post-protamine) and both 1 and 5 days postoperative blood samples were analysed by flow cytometry for microparticle counts and expression of platelet-specific antigens (CD41, CD42, CD61 and CD62P). Blood-product transfusions and postoperative blood-loss were recorded. Platelet inhibition was analysed using Multiplate® to identify non-responders.

**Results.** PMP numbers decreased by 54% at the onset of CPB in both groups, even when accounting for haemodilution. There was no significant difference in PMP numbers or antigen expression between the two groups, even when platelet inhibition was accounted for. Despite this, patients who exhibited platelet inhibition from aspirin and/or clopidogrel had a relative risk of intra-operative blood-product transfusion of 6.0 ($p = 0.01$) and of blood-product transfusion in the 24 h following surgery of 2.6 ($p = 0.02$). There was no significant difference in mean blood loss in the 12 h following surgery between patients in the anti-platelet drug group and those in the control group (382 ml, 95% CI 326-444 ml, vs. 354 ml, 95% CI 295-422 ml, $p = 0.62$).

**Discussion.** Pre-operative aspirin and/or clopidogrel do not affect the numbers of PMP produced during cardiac surgery. The increased risk of transfusion in the anti-platelet group could be a result of proactive steps to infuse coagulation products more readily in patients receiving pre-operative anti-platelet drugs in order to minimise blood-loss in this group.

**O-35**

Systemic and pulmonary phenotypes in relation to postoperative hypoxaemia

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**Introduction.** The association between exposure to major surgery and impaired oxygenation is well known, but the mechanisms that drive this effect remain unclear. We have previously shown that exposure to coronary
artery bypass grafting (CABG) severely affects human metabolome. The purpose of this study is to further characterize the systemic (pulmonary artery, PA) and pulmonary (left atrium, LA) phenotypes first morning postoperatively and to identify events that contribute to the development of hypoxaemia.

**Methods.** Fifty patients undergoing CABG were included in this study. Blood gases, C-reactive protein (CRP), lactate dehydrogenase (LDH), and 70 metabolites measured by nuclear magnetic resonance spectroscopy were analysed by paired t-test, Pearson correlation, and regression analysis. A p-value below 0.05 was considered significant.

**Results.** Thirty-four patients showed decreased oxygenation on the third day postoperatively. In order to characterize systemic and pulmonary microvasculature responses to surgery, LA and PA samples were compared. Elevated levels of LDH, metabolites involved in mitochondrial respiration, energy supply, reactive oxygen species (ROS) formation, oxidative stress, inflammation, fatty acids, together with lower levels of CRP, lipoproteins, antioxidants, and ketone bodies were found in LA compared to PA samples of patients developing hypoxaemia. Interestingly, more similar phenotypes were observed in patients with normal oxygenation, indicating more protected mechanisms. In addition, metabolites involved in mitochondrial respiration, ROS formation, andflammation were found both correlating (r > 0.4-0.51, p < 0.009) and showing high predictive power (r = 0.9, p < 0.0001) to the indices of hypoxaemia measured on the third day postoperatively.

**Discussion.** We report different systemic and pulmonary phenotypes in patients developing hypoxaemia postoperatively. Further, metabolites involved in mitochondrial respiration, ROS production and inflammation were identified as cornerstones contributing to the triggering mechanisms involved in the progression of postoperative hypoxaemia.

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**0-36 Goal-directed crystalloid fluid resuscitation does not increase extravascular lung water content in cardiac surgery patients: a randomized pilot study**

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**Introduction.** The ‘right’ fluid for hypovolaemia treatment without evoking pulmonary oedema is still unclear, particularly in cardiac surgery patients. The aim of the study was to investigate the effect of crystalloid as compared to colloids on extravascular lung water index (EVLWI) in patients who underwent on-pump coronary artery bypass surgery (CABG).

**Methods.** Based on sample size estimation (α = 0.05, power = 0.8) each intervention arm required 15 patients. Patients were randomized to receive either balanced crystalloid (group I) or balanced 6% hydroxyethyl starch 130/0.42 (group II) or 4% gelatin (group III). Fluids were administered to maintain global end-diastolic volume index (GEDVI) determined by trans-pulmonary thermodilution (PiCCO plus) within 680-850 ml/m². Primary (EVLWI) and secondary (fluid balance, lactate, SvO₂, haemodynamics) outcome measures were assessed at baseline (T1), 5 min before CPB (T2), 5 min after CPB (T3), at the end of surgery (T4), 2 h (T5), 4 h (T6), 6 h (T7), 12 h (T8), and 24 h after surgery (T9). For statistical analysis, Kruskal-Wallis test and post-hoc analysis with Mann-Whitney U test with Bonferroni correction were used.

**Results.** There were no differences in EVLWI among the groups (Figure 1). Values of GEDVI were similar among the groups. It was provided by significantly higher fluid balance in group I [1,570 ml (750-1,920)] compared with group III [0 ml (–515-380)] and group II [–300 ml (–663-165); p
< 0.017] at 24 h after surgery, but fluid balance was comparable at the end of surgery. No significant differences were observed in SvO2, lactate, and haemodynamics values among the groups.

Discussion. The study showed that within the goal-directed haemodynamic algorithm to optimize preload in CABG patients, balanced crystalloid does not increase extravascular lung water content when compared with colloids. However, the algorithm was reached by about 200% more fluid balance in the crystalloid group, as compared to colloids, at 24 h after surgery.

Figure 1

0-37
In vitro endothelial cell barrier disruption after exposure to plasma from patients subjected to cardiopulmonary bypass

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Introduction. Cardiopulmonary bypass (CPB) for cardiac surgery is suggested to be associated with postoperative vascular leakage. We investigated the effects of non-pulsatile or pulsatile CPB-induced plasma changes on in vitro endothelial barrier function and evaluated whether these changes could be ascribed to haemodilution.

Methods. Plasma samples of patients undergoing elective coronary artery bypass graft surgery randomized for non-pulsatile (n = 20) or pulsatile (n = 20) CPB were obtained after anaesthesia induction (pre-CPB), after
protamine administration (post-CPB; ≈ 30% haemodilution) and upon intensive care unit (ICU) arrival. Using Electric Cell-substrate Impedance Sensing (ECIS) with human umbilical vein endothelial cells exposed to 10% plasma, the effects of CPB on in vitro endothelial barrier function were assessed. We further obtained a dose-response relation of different dilutions (3x, 5x and 10x) of plasma drawn before CPB with barrier function. Between group differences were analysed by repeated measures ANOVA. \( p < 0.05 \) was considered as statistically significant.

**Results.** In vitro endothelial barrier function after exposure to post-CPB and ICU plasma was 21% (Resistance 784 ± 91 \( \Omega \); \( p < 0.001 \)) and 20% (Resistance 792 ± 106 \( \Omega \); \( p < 0.001 \)) lower compared to pre-CPB samples (Resistance 993 ± 153 \( \Omega \)). No beneficial effect was found of pulsatile CPB-flow: post-CPB (Resistance 778 ± 130 \( \Omega \)) and ICU plasma samples (Resistance 802 ± 150 \( \Omega \)). During CPB, haematocrit decreased by 31% from 0.39 ± 0.04 to 0.27 ± 0.04 l/L (\( p < 0.001 \)). Steady-state barrier function with 3x diluted post-CPB plasma (Resistance 1,142 \( \Omega \)) was still lower when compared to 10x diluted pre-CPB plasma (Resistance 1,183 \( \Omega \)), suggesting that reduced post-CPB endothelial resistance could not overtly be explained by haemodilution.

**Discussion.** Cardiopulmonary bypass-related changes in the constitution of human plasma have a profound negative effect on in vitro endothelial barrier function. The human plasma-induced alterations in in vitro endothelial barrier function could not be prevented by pulsatile flow during CPB.

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**Acute myocardial and skeletal muscle injury after serial transthoracic shocks as detected by cardiovascular magnetic resonance in swine**

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**Introduction.** It is controversial to what extent cardioversion or defibrillation damage the myocardium. Features of acute myocardial injury are oedema and hyperaemia, which can be visualized by T2 mapping and early gadolinium enhancement (EGE), respectively.

**Methods.** Sixteen swines were anaesthetized; ten were treated with R-triggered synchronized 5x200J transthoracic shocks; six served as control. T2 maps in 3 short-axis (SAX) slices at 3T, and SAX function cines were obtained hourly during a 5 h observation period. Regions of interests (ROI) were visually defined in T2 maps. Early (EGE) and Late Gadolinium Enhancement (LGE) images were acquired at the end of the protocol. EGE was normalized to healthy skeletal muscle and expressed as an EGE-Ratio.

**Results.** T2 increased in the affected ROI at 1 h, 3 h and 5 h post defibrillation, which differed from remote myocardium of the same animals (\( p < 0.05 \)) and from control animals. T2 changes corresponded to the defibrillation pad locations and were most pronounced in the basal slices. In the basal images EGE-Ratios of the shocked pigs were significantly higher in the left ventricle (3.1 ± 0.4 vs. 2.1 ± 0.2; \( p = 0.02 \)) and the pectoral muscle (2.7-fold, \( p = 0.03 \)) than in controls. T2 of the left pectoral muscle was also increased at all time points compared to baseline and to contralateral muscle (\( p \))
< 0.001). There was a decrease in end-diastolic volume at 3-5 h post-shock (nadir, −13%; \( p < 0.05 \)), while cardiac output was depressed after 3 h (−10 ± 4%) and 5 h (−18 ± 7%; \( p < 0.05 \)). There was no change in systolic volume or ejection fraction.

**Discussion.** Serial cardioversion/defibrillation consistently results in myocardial injury. This can be visualized by T2 mapping (oedema) and early gadolinium enhancement (hyperaemia), and is associated with signs of diastolic dysfunction.

**Oral Session – Lung**

**O-39**

**Adverse pulmonary changes following cardiopulmonary bypass: separate assessment of bronchoconstriction and lung peripheral derecruitment**

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**Introduction.** Cardiopulmonary bypass (CPB) induces adverse alterations in the pulmonary system. However, the effects of CPB on the airway and lung tissue mechanical changes have not been related to those indices reflecting ventilation heterogeneities and anatomical and functional dead spaces.

**Methods.** We enrolled anaesthetized, mechanically ventilated patients (n = 46) undergoing elective cardiac surgery under open-chest condition. Forced oscillation technique was applied to measure the airway resistance (\( R_{aw} \)), inertance (\( I_{aw} \)), lung tissue damping (\( G \)) and elastance (\( H \)). Mainstream capnography was used to assess the third phase slope of the expired CO₂ concentration (\( S_{III} \)) and the respiratory dead space parameters. Fowler’s dead space (\( VD_f \)) reflecting the volume of the conductive airways, Bohr’s dead space (\( VD_B \)) including also the unperfused alveolar volume, and Enghoff’s dead space (\( VD_E \)) comprising additionally the volume of the perfused, but not ventilated alveoli were assessed. Accordingly, the intrapulmonary shunt was estimated by calculating the \( VD_E-VD_B \) difference. All mechanical and ventilation variables were assessed before CPB and 5 min after weaning from CPB. The measurements were preceded by a recruitment maneuver to minimize the extent of atelectasis and to standardize the volume history. Paired t-tests were used for the statistical analyses.

**Results.** Following CPB, significant increases in \( R_{aw} \) (143 ± 15 [SE]%), decreases in \( I_{aw} \) (−178 ± 25%) and \( VD_f \) (−10 ± 0.1%) were observed. \( S_{III} \) (38 ± 17%), \( G \) (130 ± 6%) and \( H \) (7 ± 0.5%, \( p = 0.024 \)) were elevated post CPB. The CPB-induced decreases in \( VD_B \) (−12 ± 0.1%) were associated with significant rises in \( VD_E-VD_B \) (38 ± 0.6%) \( p < 0.001 \) for all.

**Discussion.** The development of airway narrowing along with their shortening can be anticipated from the rise of \( R_{aw} \) with concomitant drops of law and \( VD_f \) after CPB. Enhancement of ventilation heterogeneities is suggested by the CPB-induced increases in \( S_{III} \), \( G \) and \( H \). These adverse lung peripheral changes led to increased \( VD_E-VD_B \) indicating augmented intrapulmonary shunting subsequent to CPB. In conclusion, combination of forced oscillatory and bedside capnography measurements revealed that constriction of the central conducting airways are associated with loss of alveoli and increased ventilation/perfusion mismatch following CPB.
Scavenging of volatile anaesthetics during long-term sedation of critical care patients

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Introduction. Volatile anaesthetics are theoretically ideal sedative agents for long-term ICU sedation. However, the administration of volatile-based sedation within ICUs has been partly limited by concerns regarding staff exposure and atmospheric pollution. Previously, our group developed a simple scavenging system to be used with the Anaesthesia Conserving Device (AnaConDa®, Sedana Medical, Sweden) and demonstrated atmospheric volatile concentration levels were below current Canadian limits for occupational exposure (< 2 ppm) during short-term sedation study [1, 2]. We are currently running the ‘Volatile Anesthetics for Long-term Sedation in Critically Ill Patients (VALTS)’ study. This sub-study reports our initial data on atmospheric isoflurane levels during this long-term ICU sedation study.

Methods. VALTS is a prospective, multi-centre RCT recruiting 60 ICU patients requiring mechanical ventilation > 48 h. With REB approval, 60 patients will be randomized to receive either isoflurane via AnaConDa® (40 patients) or intravenous propofol and/or midazolam (20 patients). Sedation is titrated to a sedation agitation scale (SAS) score of 3-4 (unless medically indicated otherwise) using an explicit sedation-analgesia protocol until extubation or tracheostomy. Isoflurane is infused at low rates of 0.5-5 ml/hour. Atmospheric pollution is minimized using a combination of ICU room air exchanges and our previously developed active scavenging system. This system comprises 2 Deltasorb® canisters (Bluezone, ON, Canada) arranged in-series from the expiratory port of the ICU ventilator to wall outlet suction. Isoflurane concentrations were measured daily using the InfraRan Specific Vapour Analyzer (Wilkins Enterprise Inc.) at 4 points along the system – (1) Expiratory port, (2) Post 1<sup>st</sup> Deltasorb, (3) Post 2<sup>nd</sup> Deltasorb, (4) Patient’s head.

Results. Twelve patients received isoflurane for a mean (standard deviation) 4.5 (3.2) days. There were no technical difficulties pertaining to the scavenging system or AnaConDa®. The mean (SD) isoflurane levels at the expiratory port, post 1<sup>st</sup> Deltasorb, post 2<sup>nd</sup> Deltasorb and around the patients head were 5.4 (3.3) ppm, 3.3 (1.6) ppm, 1.9 (1.4) ppm, and 0.5 (0.6) ppm respectively.

Discussion. This sub-study shows volatile anaesthetics can be safely administered, with atmospheric levels well below current Canadian occupational exposure guidelines for long-term sedation in critical care environments.

References
**Oral Session – Renal**

**O-41**
Risk factors of acute kidney injury in adult cardiac surgical patients operated with use of cardiopulmonary bypass

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**Introduction.** Accurate risk prediction of acute kidney injury (AKI) morbidity after open heart surgery with cardiopulmonary bypass (CPB) is vital for the appliance of preventive measures and avoidance of additional risk factors.

**Methods.** A prospective observational cohort of 492 adult patients referred to open heart surgery with use of CPB who signed a written consent were studied. Pre-operative EuroSCORE-II variables, intra-operative data, and levels of two cytokines measured in serum with flow cytometry bead array 3 h after the operation were adjusted in simple and logistic regression against capability to predict early postoperative AKI according to RIFLE classification. Three patients with low output/end stage renal disease were excluded. For normally distributed data, means and standard deviation (SD) were compared with ANOVA test. Non-homogeneous distributed data were compared by medians and interquartile ranges (IQR) with Kruskal-Wallis test. Bartlett’s test was used to analyse inequality of population variances. Univariate and multiple logistic regression was used to test significant associations between risk variables and AKI with p-value considered significant when ≤ 0.05.

**Results.** The characteristics of 100/489 (20.4%) AKI-cases (s. Table 1).

A logistic regression model consisting of EuroSCORE (aOR-2.1), intra-operative complications (aOR-4.1), intra-operative base excess (aOR-1.9), postoperative ICAM-1 (aOR-1.8) and IL-6 (aOR-1.9) proved significant risk factors with sensitivity-95.5%, specificity-100%, negative predictive value-93.1%, precision-100%.

**Discussion.** Previously identified risk factors of AKI were confirmed as reliable risk-predictors. However, intra-operative complications were related to the highest risk of AKI after cardiac surgery with CPB. Our study confirmed the value of an early increase of IL-6 and ICAM-1 concentrations as AKI predictors in cardiac surgical patients.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>no-AKI (%)</th>
<th>Risk (%)</th>
<th>Injury (%)</th>
<th>Failure (%)</th>
<th>p-value</th>
<th>OR for AKI</th>
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<tr>
<td>No. (%)</td>
<td>389 (79.4%)</td>
<td>74 (15.1%)</td>
<td>17 (3.5%)</td>
<td>9 (1.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EuroSCORE-II (median; IQR)</td>
<td>4.3; 2.3-7.0</td>
<td>5.9; 4.1-8.4</td>
<td>5.2; 4.4-9.2</td>
<td>10.8; 3.7-19.1</td>
<td>0.0001</td>
<td>2.2; 4x10-4</td>
</tr>
<tr>
<td>CBP-time [Min.] (median; IQR)</td>
<td>123; 98-152</td>
<td>144; 112-173</td>
<td>171; 156-195</td>
<td>198; 180-202</td>
<td>0.0000</td>
<td>2.6; 3x10-5</td>
</tr>
<tr>
<td>Intraop. compl. [%; 95% CI]</td>
<td>5.1; 3.2-7.9</td>
<td>17.6; 9.7-28.2</td>
<td>23.5; 6.8-49.9</td>
<td>66.7; 29.9-92.5</td>
<td>0.0000</td>
<td>5.4; 3x10-7</td>
</tr>
<tr>
<td>Lactates [mmol/l] (median; IQR)</td>
<td>1.7; 1.4-2.1</td>
<td>1.9; 1.5-2.6</td>
<td>2.1; 1.3-2.9</td>
<td>2.4; 2.0-2.8</td>
<td>0.0303</td>
<td>1.8; 0.004</td>
</tr>
<tr>
<td>Base deficit [mmol/l] (median; IQR)</td>
<td>3.8; 5.0-2.5</td>
<td>4.7; 5.8-3.1</td>
<td>4.4; 5.3-2.7</td>
<td>5.5; 10-1.5</td>
<td>0.0006</td>
<td>2.2; 3x10-4</td>
</tr>
<tr>
<td>ICAM-1 [ng/ml] (median; IQR)</td>
<td>34; 26-44</td>
<td>40; 31-54</td>
<td>44; 27-50</td>
<td>48; 42-55</td>
<td>0.0020</td>
<td>2.2; 3x10-4</td>
</tr>
<tr>
<td>IL-6 [ng/ml] (median; IQR)</td>
<td>0.2; 0.1-0.3</td>
<td>0.3; 0.1-0.5</td>
<td>0.2; 0.1-0.4</td>
<td>0.3; 0.8-1.6</td>
<td>0.0130</td>
<td>1.9; 0.003</td>
</tr>
</tbody>
</table>
Does dexmedetomidine affect renal outcome in patients with renal impairment undergoing CABG?

Maged Salah, Tarek Eltawil, Sherif Nasr, Tarek Nosser
Cairo University, Cairo, Egypt

Introduction. Dexmedetomidine has been used as adjunct to anaesthesia and sedation for its efficient sympatholytic, analgesic and anxiolytic properties. Coronary artery bypass grafting (CABG) with cardiopulmonary bypass (CPB) is associated with a high incidence of peri-operative renal dysfunction which is believed to be caused partly by the increased sympathetic nervous system activity leading to compromised haemodynamics and attenuated renal function. We aimed to test the hypothesis that dexmedetomidine would prevent the development of AKI in patients undergoing elective CABG with mild to moderate renal dysfunction during the early postoperative days.

Methods. A double-blind randomized placebo controlled study. Eighty adult patients with mild to moderate renal impairment (serum creatinine between 132-177 µmol/l) and scheduled for elective CABG with CPB were randomly allocated into either dexmedetomidine infusion or placebo infusion groups. Infusion was started after anaesthesia induction and continued until end of surgery. The primary outcome measured variables for assessing renal functions included serum creatinine, creatinine clearance and urinary output in the 72 h postoperatively.

Statistical Analysis: Forty patients per treatment group were needed to get a 80% power to detect a 36% difference between the treatment groups with a 5% type I error rate and assuming a standardized effect size (expected effect size divided by SD of the outcome variable) of 0.63. Results of urine output, serum creatinine, creatinine clearance and urinary output in the 72 h postoperatively were presented as mean ± SD and analysed using repeated measures ANOVA. Statistical power calculations were performed using computer programme G*Power 3 for Windows. (Franz Faul, Universität Kiel, Germany).

Results. No significant difference was detected for any indicators of renal function of both groups, except for an increase in urinary output in the dexmedetomidine infusion group. In between both groups, there was no statistically significant difference in the first 24 h after surgery (\( p = 0.007 \)) in creatinine clearance at any time of comparison (baseline, 24, 48, and 72 hours postoperatively). However a significant increase in creatinine clearance at 24 h postoperatively was noted in both groups as compared to their own baseline values.

Discussion. Use of dexmedetomidine infusion did not alter renal function in terms of serum creatinine or creatinine clearance, but was associated with an increase in urinary output in the first 24 h postoperatively.

Heparin management during cardiopulmonary bypass: a comparison between traditional method and new technologies

Andrea Farinaccio, Paolo Prati, Valentina Ajello, Nicola Iasevoli, Chiara Buonomo, Pasquale De Vico, Dionisio Colella
Policlinico tor Vergata, Rome, Italy

Introduction. Peri-operative blood loss and transfusions during cardiopulmonary bypass (CPB) could be due to total dose of heparin and protamine administered. Strategies to optimize administration of heparin and protamine are evolving. In a randomized prospective study, we compared the traditional weight-based method with two heparin and protamine-concentration level techniques.

Methods. We enrolled 54 patients undergoing elective normothermic cardiac surgery and randomized them to three different
groups: 18 in the Control group (heparin bolus UI 300/kg and protamine reversal 1:100), 18 in the Hepcon® H MST™ group and 18 in the Hemochron® group. The ACT target was 480 seconds for all the patients.

Two-way analysis of variance (ANOVA) and Chi squared tests were used to study demographic variables. Two-ways ANOVA test was used to compare the parameters. A p-value of < 0.05 was considered to be significant.

Results. Total heparin administered and its plasma level during cardiopulmonary bypass were higher in the control group than in the others (319 ± 27.5, 291 ± 31.6, 263 ± 43.1, p 1-2 < 0.05, p 1-3 < 0.05, p 2-3 NS). The ACT target was reached more precisely using the heparin concentration-level techniques (32.4 ± 8.5, 8.1 ± 2.4, 18.3 ± 6.2, p 1-2 < 0.05, p 1-3 < 0.05, p 2-3 NS). Patients treated with heparin concentration-level management protocols had less bleeding at 12 h in ICU (486 ± 89, 357 ± 116, 315 ± 57, p < 0.05) and fewer blood transfusions (3.28 ± 2.13, 1.79 ± 0.97, 1.94 ± 1.24, p < 0.05).

Discussion. Compared with the traditional weight-based method of anticoagulation during CPB, the use of new technologies based on the heparin concentration-level show a reduction of the total heparin and protamine administered, a higher precision in obtaining the ACT desired and a significant reduction in bleeding and in the use of blood and platelets transfusions.

O-44
Thromboelastography (TEG) and post cardiopulmonary bypass bleeding

Marc Mourad, Norddine Zeroual, Jacob Eliet, Géraldine Culas, Philippe Gaudard, Rémy Coves, Pascal Colson
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Introduction. Circulating Heparin (CH) due to incomplete heparin reversal or heparin rebound is common after cardiopulmonary bypass (CPB) [1] and can contribute to excessive bleeding. An extra protamine dose for all patients has been suggested [2], but excessive heparin/protamine reversal could alter coagulation. TEG analysis can detect CH [1] and help to assess its contribution to other coagulation disorders.

Methods. In a six month period, 40 mg of protamine was administrated to 36 consecutive patients presenting with post-CPB bleeding (chest tube loss > 2 ml kg/h). TEG (Haemoscope, TEG-5000) was measured before protamine injection (without and with heparinase: TEG k and TEG kh) and 30 minutes after (TEG k2). No haemostatic factors transfusions were given before TEG 2 analysis. CH was defined as a difference > 2 min in TEG Reaction time (R) without and with heparinase.

Results. CH was found in 27 (75%) of these 36 patients.

<table>
<thead>
<tr>
<th>TEG results of patients with CH</th>
<th>TEG k</th>
<th>TEG kh</th>
<th>TEG k2</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-time increased, n (%)</td>
<td>25 (93)</td>
<td>4 (15)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>K and/or angle abnormalities, n (%)</td>
<td>22 (82)</td>
<td>12 (44)</td>
<td>3 (11)</td>
</tr>
<tr>
<td>MA decreased, n (%)</td>
<td>15 (55)</td>
<td>8 (29)</td>
<td>4 (15)</td>
</tr>
</tbody>
</table>

Heparin neutralization improved R-time, but also coagulation time and clot amplitude in case of CH. The in-vivo effect of 40 mg protamine was stronger than in-vitro heparinase. 9 patients (25%) had no CH at the time of bleeding. All patients presenting coagulation
time and/or clot amplitude TEG abnormalities without CH or after full neutralization by protamine had fibrinogen level < 2 g/l and platelet count < 100 10^9/l–1 respectively.

**Discussion.** TEG can avoid inappropriate heparin reversal. Because of incomplete heparin reversal by heparinase, TEG-guided haemostatic factors transfusion should be given if there is no CH or after full reversal by protamine to avoid excessive transfusion.

**References**


**O-45**

**Von Willebrand Factor assay in patients with aortic valve stenosis: impedance aggregometry vs. laboratory tests**

*Chiara Buonomo, Valentina Ajello, Andrea Farinaccio, Pasquale De Vico, Dionisio Fernando Colella*

Department of Cardio-Vascular Anesthesia and Intensive Care, Tor Vergata University, Rome, Italy

**Introduction.** Acquired von Willebrand syndrome (AvWS) is a rare bleeding disorder (0.04-0.013%) that can lead to unforeseen bleeding in surgical patients. The diagnosis is made on expensive laboratory tests (vWF:Ag, vWF:RCO/vWF:Ag,VIIIIF), not feasible in all centres. Whether vWF can be quantified by impedance aggregometry is still unclear. The aim of this study was to evaluate whether AvWS can be diagnosed by aggregometric response.

**Methods.** This was a prospective observational study, enrolling 25 patients with severe aortic valve stenosis undergoing aortic valve replacement (AVR), vWF:Ag, vWF:RCO/vWF:Ag, VIIIIF and the aggregometric response by RistoTestHigh/RistoTestLow were quantified by collecting two blood samples at: T0 (before anaesthesia induction), T1 (after AVR) and T2 (24 h after surgery).

**Results.** No bleeding or deaths were observed. At T0, both laboratory tests and aggregometry results were normal in all 25 patients. Instead, at T1 and T2, the increase of vWF detected with the laboratory tests was not confirmed by the aggregometric response, whose result was lower than normal values.

**Discussion.** We can confirm that vWF levels increased after AVR and remained high. Aggregometry, on the contrary, has proved to be reliable at T0 agreeing with laboratory results, but at T1 and T2, had high sensitivity and low specificity proving to be unhelpful in patients’ follow-up. The altered aggregometric response at T1 and T2 should be attributed to cardiopulmonary bypass, which represents a massive stress for platelets. Finally, aggregometry is certainly reliable in diagnosis of vWD, but more studies are required to assess its value in follow-up.

**O-46**

**Dalteparin does not increase post-operative bleeding and has no effect on selected in-hospital morbidity parameters and 30-day mortality**

*Jacob Greisen, Mariann Tang, Michael Kremke, Carl-Johan Jakobsen*

Aarhus University Hospital, Aarhus, Denmark

**Introduction.** To discontinue antiplatelet therapy or in patients with acute coronary syndrome, patients may in the immediate pre-operative period be treated with Dalteparin for pre-operative thromboprophylaxis.
The aim of this study was to analyse the association between Dalteparin treatment and postoperative bleeding and selected outcomes. The hypothesis was that Dalteparin is associated with more transfusions and complications.

**Methods.** We made a cohort study of 7,583 patients undergoing CABG ± AVR at three university hospitals (2006-2012) based on data from the common heart registry. Groups were established based on pre-operative exposure to Dalteparin or control. To adjust for possible patient differences and continued antiplatelet therapy the groups were balanced using propensity scores on 24 parameters, resulting in 2x 735 patients for analysis. The primary outcome was re-exploration surgery and postoperative drainage together with 30-day mortality, postoperative new dialysis and thromboembolic event.

**Results.** We found no difference in bleeding, but Dalteparin patients were more often transfused. No difference was seen in the frequency of re-exploration. We found no statistically significant differences between Dalteparin and the control group in 30-day mortality (4.76% vs. 3.13%; \( p = 0.141 \)). Conditional regression analysis of in-hospital new dialysis, stroke, myocardial infarction and CAG, PCI or CABG within 6 month is given in Table 1.

**Conclusion.** Dalteparin has no impact on postoperative bleeding. The data raise question regarding protection against postoperative thromboembolic event but further studies and analysis are needed.

**Table 1**

<table>
<thead>
<tr>
<th>Endpoints</th>
<th>Dalteparin</th>
<th>Control</th>
<th>Odds-ratio (95% CI)</th>
<th>Adjusted* Odds-ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRT (new dialysis)</td>
<td>27</td>
<td>27</td>
<td>1.00 (0.58-1.72)</td>
<td>0.50 (0.18-1.33)</td>
</tr>
<tr>
<td>Stroke</td>
<td>13</td>
<td>15</td>
<td>0.85 (0.39-1.85)</td>
<td>1.48 (0.48-4.57)</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>56</td>
<td>46</td>
<td>1.23 (0.82-1.84)</td>
<td>1.17 (0.75-1.83)</td>
</tr>
<tr>
<td>In-hospital event</td>
<td>106</td>
<td>92</td>
<td>1.17 (0.87-1.58)</td>
<td>1.08 (0.78-1.51)</td>
</tr>
<tr>
<td>CAG and/or PCI</td>
<td>110</td>
<td>75</td>
<td>1.56 (1.13-2.13)</td>
<td>1.58 (1.12-2.21)</td>
</tr>
<tr>
<td>Event within 6 month</td>
<td>191</td>
<td>156</td>
<td>1.29 (1.01-1.64)</td>
<td>1.23 (0.96-1.59)</td>
</tr>
</tbody>
</table>

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**O-47**

The effects of red blood cell transfusion during cardiac surgery: a matched cohort study in Jehovah Witnesses

*Esther Hogervorst¹, Anske van der Bom², Nardo van der Meer³, Anneke Brand³, Leo van de Watering³, Mohamed Bentala³, Peter Rosseel³*

¹ Sanquin Research, Leiden, The Netherlands
² LUMC, Leiden, The Netherlands
³ Amphia Hospital, Breda & Oosterhout, The Netherlands

**Introduction.** Anaemia as well as red blood cell (RBC) transfusion is associated with (severe) side effects during cardiac surgery. The independent effect of each is hard to analyse because they often occur simultaneously. Jehovah’s Witnesses (JW) refuse blood products based upon their religious beliefs, making it possible to investigate the adverse effects of anaemia. The primary objective of this study is to analyse the effect of RBCs administered according to current transfusion guidelines proposing a transfusion trigger of 7-8 g/dl during cardiac surgery.

**Methods.** In this single centre cohort study, data were collected from consecutive patients undergoing cardiac surgery from 1997 until 2012. JWs with an intra-operative haemoglobin (Hb) < 8 g/dl and/or Hb decrease of 50% or more were compared with propensity matched patients who received 1 RBC unit. Propensity scores were calcu-
lated based on pre-operative patient characteristics and type of surgery.

**Results.** Data of 23,590 non-JWs and 270 JWs were collected. 60 JWs had an intra-operative Hb < 8 g/dl and/or a Hb decrease of 50% or more. Results are shown in Table 1. JWs had a similar postoperative outcome than matched non-JWs who received RBC’s.

**Discussion.** JWs who according to the guidelines should receive RBC’s were compared to non-JWs who did receive RBC’s. JWs had a similar postoperative outcome. These results could imply that the current guidelines propagate a too liberal transfusion strategy in cardiac surgery patients.

<table>
<thead>
<tr>
<th>Postoperative outcome, N (%)</th>
<th>Total</th>
<th>JWs</th>
<th>Non-JWs</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n = 122)</td>
<td>(n = 61)</td>
<td>(n = 61)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>25 (20.5)</td>
<td>12 (19.7)</td>
<td>13 (21.3)</td>
<td>0.823</td>
</tr>
<tr>
<td>Acute kidney injury</td>
<td>11 (9.0)</td>
<td>5 (8.2)</td>
<td>6 (9.8)</td>
<td>0.752</td>
</tr>
<tr>
<td>Stroke</td>
<td>4 (3.3)</td>
<td>2 (3.3)</td>
<td>2 (3.3)</td>
<td>1.000</td>
</tr>
<tr>
<td>ICU length of stay &gt; 48 h</td>
<td>52 (42.6%)</td>
<td>22 (36.1)</td>
<td>30 (49.2)</td>
<td>0.143</td>
</tr>
<tr>
<td>Mechanical ventilation &gt; 24 h</td>
<td>30 (24.6)</td>
<td>11 (18.0)</td>
<td>19 (31.1)</td>
<td>0.093</td>
</tr>
<tr>
<td>In hospital mortality</td>
<td>3 (2.5)</td>
<td>1 (1.6)</td>
<td>2 (3.3)</td>
<td>0.559</td>
</tr>
</tbody>
</table>

### Oral Session – Fluids

**0-48**

**Effects of acute plasma volume expansion on renal perfusion, filtration and oxygenation after cardiac surgery: crystalloid vs. colloid**

**Jenny Skytte Larsson, Gudrun Bragadottir, Bengt Redfors, Vitus Krumbholz, Sven-Erik Ricksten**

Anaesthesiology and Intensive Care Medicine, Sahlgrenska University Hospital, Gothenburg, Sweden

**Introduction.** Acute kidney injury may occur in patients undergoing cardiac surgery because of hypovolaemia and renal hypoperfusion. Hypovolaemia is commonly treated with artificial solutions. In a recent experimental study, haemodilution with crystalloids, in contrast to colloids, showed to induce intrarenal hypoxia [1].

**Methods.** The study was approved by the Institutional Ethics Committee. Twenty-eight patients where studied in the ICU early after surgery. Patients were randomized to receive a bolus of either a balanced crystalloid (Ringers-Acetate, 20 ml/kg, n = 14) or a colloid solution (HES 6%, 130/0.4, 10 ml/kg, n = 14). Systemic haemodynamics and renal variables were measured before and 20, 40 and 60 minutes after volume expansion. Renal blood flow (RBF) and glomerular filtration rate (GFR) were measured by the
renal vein retrograde thermodilution technique and by renal extraction of Cr-EDTA, respectively. Blood samples were taken for measurements of arterial (CaO₂) and renal vein (Crvo₂) oxygen contents. Renal oxygen consumption \[\text{RVO}_2 = \text{RBF} \times (\text{CaO}_2 - \text{Crvo}_2)\], delivery \[\text{RDO}_2 = \text{RBF} \times \text{CaO}_2\] and extraction \[\text{RO}_2\text{Ex} = (\text{CaO}_2 - \text{Crvo}_2)/\text{CaO}_2\] were calculated. RO₂Ex is a direct measure of renal O₂-demand/supply. ANOVA was used for intragroup statistical analysis, followed by Greenhouse-Geiser post-hoc test. Intergroup comparisons were made by t-tests on area under the curve.

**Results.** Plasma volume expansion was greater in the colloid group, indicated by significantly lower haematocrit and CaO₂ and higher filling pressures. Urine flow increased significantly only in the crystalloid group. Cardiac index, RBF and GFR increased to a similar extent in both groups. RDO₂ did not change in any of the groups. RVO₂ increased significantly only in the crystalloid group, with no significant between-groups difference. RO₂Ex increased by 19% in the crystalloid group, compared to 5% in the colloid group \((p = 0.034)\) (Figure 1).

**Discussion.** The crystalloid and colloid solutions both increase GFR, but none of the solutions improve renal oxygen delivery as the increase in RBF is offset by haemodilution. Crystalloids, in contrast to colloids, impair the renal oxygen demand/supply relationship.
raised patient haematocrit compared with standard re-transfusion of CPB blood.

**Methods.** After formal ethical approval and written consent, 47 adult patients undergoing primary coronary bypass graft, valve, or combined graft and valve surgery using CPB were randomized to have residual CPB blood treated with Hemosep or not, before it was re-transfused. Data are reported as mean (standard deviation), and analysed for significance using student’s t-test.

**Results.** The quantity of residual CPB blood collected was not different between groups (768 [189] ml and 797 [245] ml, \( p = 0.66 \)). Treatment with Hemosep for a fixed 20 minute period significantly reduced the volume of blood from 797 (245) ml to 624 (257) ml (\( p = 0.04 \)), and effectively raised the haematocrit of the residual CPB blood (26 [4]% to 31 [5]%, \( p = 0.002, n = 20 \)). Patient haematocrit after re-transfusion was however not significantly different between either standard (30 [3]%, \( n = 27 \)), or Hemosep (31 [4]%, \( n = 20 \)), treated groups.

**Discussion.** Hemosep reduced the volume of residual CPB blood, leading to a concentration effect of around 20%. However, this was not associated with increased patient haematocrit compared with current standard practice of simply re-transfusing the residual blood. The concentration effect is insufficient to result in raised patient haematocrit after cardiac surgery with CPB.

**References**


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**0-50**

**Miniaturized versus conventional cardiopulmonary bypass and acute kidney injury after cardiac surgery in an Asian population**

*Roderica Ng¹, Sophia TH Chew², Weiling Liu³, Lian Kah Ti³*

¹ Yong Loo Lin School of Medicine, Singapore
² Singapore General Hospital, Singapore
³ National University Health System, Singapore

**Introduction.** Acute kidney injury (AKI) is a serious and common complication after coronary artery bypass grafting (CABG). Miniaturized cardiopulmonary bypass (MCPB) systems have been developed to mitigate deleterious effects of on-pump surgery including the risk of AKI. We evaluated the risk factors for AKI in patients undergoing CCPB with cell salvage and biocompatible circuits compared to MCPB. In addition, we examined whether the improved inflammatory profile and haemodilution with the MCPB would reduce the incidence of AKI.

**Methods.** Sixty-five Asian patients presenting for first time elective CABG between February 2009 and December 2012 at a tertiary heart centre were randomly assigned to the MCPB (\( n = 32 \)) or CCPB group (\( n = 33 \)). Clinical covariate and inflammatory biomarkers were measured peri-operatively. The primary outcome was AKI, as defined by the Acute Kidney Injury Network stage 1 criteria.

**Results.** Overall, the AKI incidence was 21.5%. There was no difference in the incidence of AKI between the MCPB group (21.9%) as compared to the CCPB group (21.2%) (\( p = 0.948 \)). The first CPB haematocrit was independently associated with AKI in the MCPB group (\( RR = 0.484, 95\% C.I. = 0.268-0.876, p = 0.016 \)); while postoperative blood loss was independently associated with AKI in the CCPB group (\( RR = 1.002, 95\% C.I. = 1.001-1.003, p = 0.004 \)). There was no significant difference in inflammation
between the MCPB and CCPB groups. These were not associated with AKI in either group.

Discussion. Despite a better preserved haematocrit in the MCPB group, the initial haematocrit that occurs on initiation of bypass is significantly associated with AKI. We postulate that the absence of a venous reservoir in the MCPB circuit may expose patients to reduced cardiac index at this stage, which then may render the haematocrit that is acceptable on the CCPB flow rates to be insufficient for adequate oxygen delivery to the renal vasculature, thereby predisposing MCPB patients to AKI. There was significantly higher bleeding in the CCPB group which may have predisposed patients to AKI in that group.

O-51 Central venous oxygen saturation as trigger for blood transfusion in cardiovascular surgery patients: an observational study

Gianluca Samarani, Norddine Zeroual, Marine Saour, Granson Sandra, Remy Ruiz, Philippe Gaudard, Pascal Colson
CHRU Montpellier, Montpellier, France

Introduction. The blood transfusion rate in patients undergoing cardiovascular surgery is around 50% [1]. The decision to transfuse is taken according to haemoglobin levels (Hb), where Hb less than 7 g/dl is considered a reasonable trigger [2]. There is some suggestion that central venous oxygen saturation (Svo2) could be a complementary and accurate parameter to trigger blood transfusion [2]. We carried out a retrospective study in patients who received blood transfusion during or immediately after cardiovascular surgery.

Methods. Patients undergoing coronary artery bypass, valve replacement or combined operations, as well as major vascular surgery were included in the study. Exclusion criteria were active bleeding due to coagulation instability and emergency surgery. At the time the decision to transfuse blood was made, as a standard procedure, samples were collected through peripheral arterial and central venous catheters to measure respectively Hb and Svo2 (co-oximetry). A trend between the two has been shown. Moreover, the retrospective character of the study did not allow us to collect Svo2, because we do not use Swan Ganz probes systematically. Statistical analysis was performed with Mann-Whitney test, median (25 and 75 percentile), \( p < 0.05 \) was considered as statistically significant.

Results. Sixty-eight consecutive patients were included in the study. The Hb at the time of transfusion was 7.4 g/dl (6.9; 8.2), while Svo2 was 70% [60; 77]. There was no correlation between Hb and Svo2. Svo2 of patients transfused with Hb < 7 g/dl (n = 44) was not significantly different from Svo2 in patients transfused with Hb > 7 g/dl (n = 23) (69, 59-79 vs. 71, 61-77 respectively; \( p = 0.90 \)). Svo2 levels in patients transfused during controlled ventilation (n = 45) were significantly higher compared to patients in support/spontaneous ventilation (n = 22) (72; 64-81 vs. 63; 56-71 respectively; \( p = 0.01 \)), while Hb among the two groups were similar (7.5; 6.9-8.2 vs. 7.15; 6.8-8.1 respectively \( p = 0.73 \)).

Conclusions. In this study, Hb level at the time of transfusion does not correlate to Svo2. Patients undergoing respiratory weaning or during spontaneous ventilation have significantly reduced Svo2 compared to patients who still benefit from controlled ventilation, in the absence of a significant difference in Hb.

References

**0-52**

**The impact of routine noradrenaline infusion on haemodilution and blood transfusion in cardiac surgery**

*David Canty*, *Martin Kim*, *Colin Royse*, *David Andrews*, *Stephen Botrel*, *Alistair Royse*  
1 University of Melbourne, Melbourne, Australia  
2 Royal Melbourne Hospital, Melbourne, Australia  
3 Royal Children’s Hospital, Melbourne, Australia

**Introduction.** Haemodilution and blood transfusion are associated with poor outcome after cardiac surgery, and routine prevention of haemodilutional anaemia intra-operatively is recommended [1]. We hypothesised that routine noradrenaline infusion (NA) commenced prior to and during anaesthesia to treat vasodilation would reduce red blood cell (RBC) transfusion for on-pump cardiac surgery.

**Methods.** The Control group (n = 94) included consecutive patients from a single surgeon 12 month experience where patients received selective noradrenaline infusion post cardiopulmonary bypass for persistent hypotension and vasodilation, in 2005. The NA group (n = 72) included consecutive patients form the same surgeon, but all received low dose noradrenaline commenced at 3-5 μg/min prior to anaesthetic induction which continued into the postoperative period, in 2010. In the absence of blood loss, haemodynamic stability was achieved using vasopressors and inotropes rather than fluid administration, in an attempt to reduce haemodilutional anaemia and trigger for RBC transfusion. Retrospective data extraction of perioperative Hb, creatinine concentrations and units of RBCs transfused was performed. The surgeon, perfusion management and transfusion trigger (haemoglobin < 70 g/l) were the same in both groups. Aprotinin was not used in 2010.

**Results.** Intraoperatively, haemoglobin concentrations were higher in group NA compared with controls (p < 0.0001), despite lower baseline values (p = 0.03), more extensive surgery (p = 0.042), longer clamp-time (p = 0.009) and less aprotinin use. Three-fold fewer units of RBCs were transfused in the NA group compared with controls. Maximum postoperative rise in serum creatinine concentration was not different (NA 26 ± 32, controls 30 ± 57, p = 0.49 μmol/l) (Table 1).

**Table 1: Intraoperative RBC transfusion and surgical data; mean ± SD or n(%)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control Group n = 94</th>
<th>NA Group n = 72</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units RBC transfused</td>
<td>50</td>
<td>11</td>
<td>0.041</td>
</tr>
<tr>
<td>Units RBC per patient</td>
<td>0.53 ± 1.47</td>
<td>0.15 ± 0.60</td>
<td>0.041</td>
</tr>
<tr>
<td>Patients transfused</td>
<td>16 (17)</td>
<td>6 (8)</td>
<td>0.11</td>
</tr>
<tr>
<td>&gt; 4 RBC units</td>
<td>5 (5)</td>
<td>1 (1)</td>
<td>0.37</td>
</tr>
<tr>
<td>CPB time</td>
<td>99.6 ± 47.9</td>
<td>114.5 ± 46.6</td>
<td>0.046</td>
</tr>
<tr>
<td>Aortic clamp time</td>
<td>73.9 ± 42.1</td>
<td>90.9 ± 39.7</td>
<td>0.009</td>
</tr>
<tr>
<td>Isolated CABG</td>
<td>61%</td>
<td>44%</td>
<td>0.042</td>
</tr>
<tr>
<td>Valve ± CABG/complex</td>
<td>39% (aortic 2)</td>
<td>56% (aortic 4)</td>
<td>0.042</td>
</tr>
<tr>
<td>Aprotinin</td>
<td>74%</td>
<td>0</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>
Discussion. This study shows proof of concept that during on-bypass cardiac surgery, routine low dose noradrenaline infusion used to treat vasodilation is associated with reduced haemodilution and intra-operative red cell transfusion, without increasing postoperative serum creatinine.

References

Oral Session – Aorta

O-53
Multiorgan protection for arch surgery with Frozen Elephant Trunk: antegrade perfusion instead of long circulatory arrest

Claudio Roscitano, Samuele Bichi, Matteo Parrinello, Samantha Nadalin, Giuseppe Mariconda, Aurora Puglisi, Camillo Poloni, Giampiero Esposito, Giovanni Albano
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Introduction. Appropriate management of arch surgery with Frozen Elephant Trunk technique (FET) is a critical factor for achieving satisfactory organ protection. We report our experience with additive thoracoabdominal aorta perfusion in addition to epiaortic vessels to attenuate multiorgan ischaemia after mild hypothermic circulatory arrest.

Methods. Twelve patients underwent ascending aorta and arch replacement with Vascutek Lupiae™ prosthesis plus antegrade delivery of endograft E-vitaOpen Plus-Jotec. After FET deployment in mild hypothermic circulatory arrest, antegrade perfusion through a Pruitt Catheter (LeMaitre-Paris) was immediately provided to achieve MAP 30-40 mmHg in the femoral artery. We evaluated mortality, ICU Length Of Stay, neurological and visceral damage.

Results. We observed in-hospital mortality 0%. There was no stroke or spinal cord injury, no renal, bowel, hepatic, significant or permanent dysfunction. There was an uncommonly rapid decrease of serum lactate. Median ICU LOS was 4 ± 2 days.

Discussion. Our results suggest that this type of modified perfusion strategy attenuates the lower body and visceral ischaemia providing a better systemic multiorgan protection.

References

O-54
Prolonged ICU stay following cardiac surgery: is there any room for new scores?

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Introduction. Although several pre-operative scoring systems have been developed, ICU mortality after cardiac surgery (CS) may not be so easy to predict [1]. Peri-operative
events also play an important role in affecting patients’ (pts) early outcome. The aim of our study was to evaluate the role of early ICU support requirement in predicting postoperative mortality in adult pts undergoing CS.

**Methods.** We prospectively analysed 3,735 pts who were admitted to our ICU over a period of 49 months (January 2010-January 2014). 667 pts who stayed at least 72 h in ICU were selected. 525 of them underwent conventional CS (group 1) and 142 received left ventricular assist device (LVAD) implantation or heart transplant (group 2). We developed a home-made score, in which every pt was daily weighted by giving a value, ranging from 0 to 6, to 13 supports, when utilized. Ventilation, IABP, ECMO, cardiac rhythm control, coagulation control, inotropes, vasoconstrictors, pulmonary vasodilators, systemic vasodilators, targeted insulin infusion, renal function control, thermal control and sedation were considered. Their sum was used to create a daily overall support dependency score (SDS) assigned to each pt from the first postoperative day (Adm score), to pt’s discharge or death.

**Results.** Group 1: mortality (5.9%) was significantly related to the Adm score (9 ± 5 vs. 15 ± 5 p < 0.001), cardiopulmonary bypass (CPB) time (173 ± 79 min vs. 223 ± 111 min p = 0.022), ICU length of stay (LOS) (9 ± 10 days vs. 20 ± 15 days p = 0.001). Mean area under ROC curve (AUC) for Adm score was 0.77 (95%-CI 0.7-0.83), which increased in 2nd (AUC 0.807 95%-CI 0.75-0.86) and 3rd (AUC 0.84 95%-CI 0.79-0.88) postoperative day. Group 2: mortality (9.8%) was not significantly related to the Adm score (16.2 ± 5.8 vs. 20.7 ± 11.9), but significantly related to the 2nd postoperative day SDS (13.9 ± 5.9 vs. 24.4 ± 7.1 p < 0.001) and ICU LOS (10.4 ± 6.7 vs. 27.6 ± 27.2 p = 0.03). AUC for 2nd and 3rd postoperative day SDS was 0.86 (95%-CI 0.77-0.96) and 0.88 (95%-CI 0.79-0.96) respectively. In both groups, non-survivors showed difficulties in dismissing supports.

**Discussion.** Early and daily assessment of SDS were shown to be reliable in predicting death in pts requiring more than 72 h of ICU stay after conventional CS. Pts undergoing LVAD implantation or heart transplantation need higher early ICU support; but fast weaning from 2nd postoperative day predicts successful intensive care treatment. Pts who need prolonged high postoperative assistance are at high risk of death.

**References**


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**Oral Session – Cardiac Anaesthesia**

**0-55**

**Anaesthesiologic regimen for transcatheter aortic valve implantation (TAVI): sedation vs. general anaesthesia: a prospective randomised comparison**

*N. Patrick Mayr*, Alexander Hapfelmeier, Klaus Martin, Alexander Kurz, Barna Babik, Thomas Ried, Gunther Wiesner, Peter Tassani

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2 Institut für Medizinische Statistik und Epidemiologie, Klinikum Rechts der Isar
3 Klinik und Poliklinik für Psychiatrie und Psychotherapie, Klinikum Rechts der Isar, Technische Universität München, Munich, Germany
4 Department of Anesthesiology and Intensive Therapy, University of Szeged, Szeged, Hungary

**Introduction.** TAVI has become an established treatment strategy for patients having a high peri-operative risk. Different methods of anaesthesia care (general anaesthesia [TAVI-
GA] and sedation [TAVI-S]) have previously been described. The proposed benefits of sedation have not been investigated in a randomised trial.

**Methods.** Sixty-six patients were enrolled in a controlled parallel-group study with balanced block randomisation. The same haemodynamic monitoring and anaesthetic drugs (remifentanil, propofol) were used in both groups. We chose cerebral oximetry ($rSO_2$) as a robust noninvasive parameter for assessing peri-operative outcome. We assumed that TAVI-S would exhibit a higher peri-operative cumulative decline below the desaturation threshold (> 20% below room-air baseline or 50% absolute). Patients underwent pre- and postoperative neurocognitive testing examining age-adjusted cognitive dysfunction, perceptual speed and formal-lexical stream of speech. Peri-operative arterial blood gas (ABG) samples were also analysed.

**Results.** After secondary exclusion, 62 patients were analysed. Pre-operative clinical data, procedure-time and room-air $rSO_2$ were comparable. $rSO_2$ values decreased in all the patients during valvuloplasty. In six TAVI-GA and five TAVI-S patients, $rSO_2$ dropped below the desaturation threshold (TAVI-GA (median [IQR]) (108 [48-204] sec%) vs. TAVI-S (66 [48-138] sec%); $p = 0.792$). During valve implantation, six TAVI-GA and five TAVI-S presented an $rSO_2$ decrease below desaturation threshold (TAVI-GA (median [IQR]) (315 [138-798] sec%) vs. TAVI-S (1674 [1632-3468] sec%); $p = 0.052$). Overall, 24 (39%) patients showed a decrease in $rSO_2$ below the desaturation threshold (TAVI-GA: $n = 13$, TAVI-S: $n = 11$; $p = 0.602$). Cumulative peri-operative cerebral desaturation was comparable (TAVI-GA (0 [0-1308] sec%) vs. TAVI-S (0 [0-276] sec%); $p = 0.505$). Eight patients (TAVI-GA: $n = 5$, TAVI-S: $n = 3$; $p = 0.707$) presented a cumulative desaturation of more than 3000 sec%. Baseline ABG analysis was comparable. Peri-operative TAVI-S patients showed significantly higher values of PaCO$_2$ and lower pH. Pre-/postoperative differences in neurocognitive testing were comparable. Adverse events in TAVI-S patients were mainly restlessness/pain (61%), bradypnoea (52%), and respiratory disruption, with 6 patients (19%) requiring bag-valve mask ventilation.

**Discussion.** A decrease of $rSO_2$ below desaturation threshold was common (39% 24/62). There was no difference between the anaesthesia regimens. Secondary outcome parameters revealed significantly better arterial blood gas values in TAVI-GA while TAVI-S presented more frequent adverse events. Neurocognitive testing revealed no advantage of a specific regimen. Based on these findings, we do not see a favour for sedation and believe that general anaesthesia should be the favoured regimen for TAVI.

### 0-56 A comparison of three strategies for levosimendan administration in cardiac surgery patients with severe myocardial dysfunction

**Vadim Pasyuga$^1$, Sergey Beregnoy$^1$, Sergey Belov$^1$, Ruslan Adzhigaliev$^1$, Oleg Panov$^1$, Stanislav Ibragimov$^1$, Vasily Alexeev$^1$, Eleonora Yusupova$^1$, Alexander Mamedov$^1$, Andrew Ryzhkov$^1$, Dmitry Lugovoy$^1$, Dmitry Tarasov$^1$, Andrew Yavorovsky$^2$**

$^1$ Astrakhan Federal Centre for Cardiac Surgery, Astrakhan, Russia

$^2$ Petrovsky National Research Center of Surgery, Moscow, Russia

**Introduction.** Levosimendan was associated with reduced mortality and other adverse outcomes in patients undergoing cardiac surgery. We compared three different modalities of levosimendan administration.

**Methods.** After approval by Ethical Committee, sixty consecutive patients with a preoperative ejection fraction ≤ 35% scheduled for elective cardiac surgery with cardiopulmonary bypass (CPB), were randomly allocated to 3 different groups. In Group A ($n = 20$), infusion of levosimendan (0.1 µg/kg/min) was started 24 h before surgery. In
Group B (n = 20), infusion of levosimendan (0.1 µg/kg/min) started just after the induction of anaesthesia. In Groups A and B the loading dose of levosimendan (6 µg/kg, for 10 min) was used. In Group C (n = 20), patients received a bolus of levosimendan (24 µg/kg) 15 min before aortic cross-clamping. Haemodynamic data and blood samples for troponin T were obtained initially (24 h before surgery) (T in), 30 min after separation from CPB (post-CPB), on arrival in the ICU (T0), and 6 (T6), 12 (T12), 24 (T24), and 48 (T48) h later.

Results. Parameters of central haemodynamics were comparable in the three groups but PCWP was significantly higher in Group C at the stages of T0, T6 and T12. (p = 0.010, p = 0.001, p = 0.005 respectively). The number of patients who needed pharmacological and mechanical cardiac support was higher in Group B and C. There was a significant difference in troponin T levels between groups and reached a critical level of significance at several points: T0 (p = 0.037), T6 (p = 0.004), T12 (p = 0.001), T24 (p = 0.004), and T48 (p = 0.011). The ICU length of stay was much shorter in Group A than in Group C (p = 0.002).

Discussion. Thus, the “full dose” of levosimendan was much more effective than single bolus 24 µg/kg in reducing the extent of postoperative troponin T release and ICU LOS, whereas initiation of therapy for 24 h prior to surgery allowed further reduction of the frequency of administration and the total dose of sympathomimetics.

Table 1: Postoperative complications and costs

<table>
<thead>
<tr>
<th></th>
<th>No re-sternotomy (n = 1,034)</th>
<th>Re-sternotomy (n = 94)</th>
<th>Pvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Postoperative course</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inotrope support</td>
<td>50.2</td>
<td>72.3</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>IABP support</td>
<td>1.1</td>
<td>6.4</td>
<td>0.002</td>
</tr>
<tr>
<td>Ventilation &gt; 48 h</td>
<td>3.2</td>
<td>24.5</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>Complications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute renal failure</td>
<td>6.2</td>
<td>24.5</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Surgical wound infection</td>
<td>0.8</td>
<td>6.4</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Stroke</td>
<td>1.4</td>
<td>3.2</td>
<td>0.16</td>
</tr>
<tr>
<td>Myocardial Infarction</td>
<td>0.0</td>
<td>1.1</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICU LOS (days)</td>
<td>1 (1-3)</td>
<td>3 (2-8)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Postoperative LOS (days)</td>
<td>7 (6-12)</td>
<td>11.5 (7-23.5)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>In-hospital mortality</td>
<td>1.7</td>
<td>13.8</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Overall Costs (£)</td>
<td>14,358 (11,207-11,942)</td>
<td>20,725 (14,580-39,697)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>
comparison with those without this event. To account for differences in case-mix we developed a propensity score for pre-operative re-sternotomy group membership, based on twenty-one variables using multivariable logistic regression analysis. The financial and clinical outcomes between the propensity matched groups were compared. \( p < 0.05 \) was significant.

Results. Postoperative complications and costs (s. Table 1).

The re-sternotomy group had an increased incidence of renal failure, wound infections and mortality \( (p < 0.001) \). The additional cost of re-sternotomy was £ 6,367 \( (p < 0.001) \) per case. The increased costs were mainly due to longer critical care time and higher blood product requirement.

Conclusion. This financial and outcome data should be used to support the cost effectiveness of investment in near-patient coagulation testing, targeted pharmacological interventions such as tranexamic acid and Factor rVIIa which have been shown to reduce re-sternotomy rate.

**O-58**

Effects of remote ischaemic preconditioning on cognitive function and neurologic injury in cardiac surgery

**Vladimir Shmyrev, Dmitry Ponomarev, Vladimir Lomivorotov**

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Introduction. Remote ischaemic preconditioning (RIPC) is a strategy thought to confer organ protection against prolonged ischaemia achieved via brief preceding ischaemia of a remote organ or tissue. We hypothesized that RIPC could affect cognitive function and neurological injury in patients operated under cardiopulmonary bypass (CPB).

Methods. 83 patients scheduled for coronary artery bypass grafting (CABG) were randomly assigned to RIPC (42) or control (41). RIPC was induced by three 5-min cycles of upper limb ischaemia and reperfusion using a blood pressure cuff immediately after induction. The groups were well-matched by baseline characteristics. Neuron specific enolase (NSE), troponin I, haemodynamics, and complication rates were assessed peri-operatively. Neurological examination, neuropsychological and psychophysiological assessment were conducted the day before and 10-14 days after surgery. Repeated-measures ANOVA, Mann-Whitney, and chi-squared tests were used for the analysis.

Results. No neurologic events occurred in the study. No statistically significant between-group differences in neurocognitive parameters, levels of biochemical markers, haemodynamics, or clinical outcome were observed. There was a considerable improvement in cognitive function after surgery regardless of group allocation. Peri-operative NSE data are presented in Table 1.

Discussion. No evidence of an effect of RIPC on NSE release and cognitive function after CABG surgery was found. An observed improvement of the latter may be attributed to ameliorated haemodynamics after surgery. A study powered for neurological outcome is needed to conclude on clinical benefits of RIPC.

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>30 min post-bypass</th>
<th>6 h post-bypass</th>
<th>1 POD</th>
<th>2 POD</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIPC</td>
<td>2.03 (1.47-4.30)</td>
<td>9.11 (5.06-11.20)</td>
<td>9.15 (7.04-11.65)</td>
<td>7.69 (3.83-10.05)</td>
<td>3.95 (3.38-5.02)</td>
</tr>
<tr>
<td>Control</td>
<td>3.33 (1.50-5.00)</td>
<td>7.57 (5.53-12.80)</td>
<td>11.55 (6.46-17.25)</td>
<td>6.68 (4.32-9.94)</td>
<td>2.95 (2.04-4.60)</td>
</tr>
</tbody>
</table>

POD = postoperative day

Table 1: Perioperative NSE results, \( \mu \text{mol/l} \). Data are median (25-75).
Intra-operative methadone for the prevention of postoperative pain: a randomized, double-blinded clinical trial in cardiac surgical patients

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² Northwestern University, Chicago, IL, USA

Introduction. The intensity of pain after cardiac surgery is often underestimated, and inadequate pain control may be associated with poorer quality of recovery. An alternative strategy to short-acting opioids in the operating room is the administration of a single intra-operative dose of methadone, which has an elimination half-life of up to 35 h. The aim of this randomized, double-blinded study was to examine the effect of intra-operative methadone on postoperative analgesic requirements, pain scores, patient satisfaction, and clinical recovery.

Methods. Patients undergoing cardiac surgery with cardiopulmonary bypass (n = 164) were randomized to receive methadone (0.3 mg/kg) or fentanyl (12 µg/kg) at anaesthetic induction. All anaesthetic and surgical management was standardized. Postoperative analgesic requirements were recorded. At 15 minutes and 2, 4, 8, 12, 24, 48, and 72 h after tracheal extubation, patients were assessed for pain at rest and with coughing and movement. At these same assessment periods, patients were evaluated for level of sedation, nausea, vomiting, itching, hypoventilation, and hypoxia. Ordinal data and non-normally distributed continuous data were compared between groups using the Mann-Whitney U-test and within groups across time with the Friedman test. Normally distributed continuous data were compared using the unpaired t-test. The criterion for rejection of the null hypothesis was a two-tailed $p < 0.01$.

Results. The time to first morphine rescue was longer in the methadone group (6.5 [0.05-72] h) compared to the fentanyl group (3.75 [0.25-21.75] h, $p < 0.0001$). The requirements for morphine during the first 24 h were reduced in methadone group compared to the fentanyl group (6 [0-34] mg vs. 10 [2-106] mg, $p < 0.0001$). The number of patients requiring high-dose morphine ($\geq 20$ mg) during the first 24 h was lower in the methadone group (2.6%) compared to the fentanyl group (29.1%, $p < 0.0001$). Total morphine use over the first 72 h was less in the methadone group (8 [0-44] mg) compared to the fentanyl group (14 [2-146] mg, $p < 0.0001$). Verbal pain scores (scale of 0 to 10, with 0 = no pain, 10 = worst pain imaginable) at rest were significantly less in the methadone group (2-3) compared to the fentanyl group (3-5, all $p < 0.0001$) during the first 72 h. Similarly, pain scores with coughing (4-5 methadone group, 5 to 7 fentanyl group, all $p < 0.0001$) and with movement (3-5 methadone group, 5-7 fentanyl group, all $p < 0.0001$) were reduced in the methadone group throughout the first three postoperative days. Overall satisfaction with pain management, measured on a 100-point VAS scale, was higher in the methadone group (90-100) compared to the fentanyl group (70-90, $p < 0.0001$). The incidence of opioid-related adverse events was not increased in the methadone group. The durations to tracheal extubation (6.5 versus 6.0 h) and ICU admission (30.5 versus 47.1 h) were not different between the methadone group and the fentanyl group.

Discussion. The administration of intra-operative methadone resulted in reductions in analgesic requirements, improvements in pain scores, and enhanced patient-perceived quality of pain management.
Oral Session – Haemodynamics

O-60
TOE-guidance for transcatheter paravalvular aortic, mitral or tricuspid leakage repair

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Lavasani Heart Center, Tehran, Iran

Introduction. Paravalvular leakage (PVL) is a potential complication of valve replacement surgery. Incidence is reported to be 2-17%. Percutaneous transcatheter closure of PVLs, using various devices, has been reported with variable procedural success rates.

Methods. Between Nov 2006 and Dec 2013, 145 procedures were performed in 137 patients (mitral = 85, aortic = 50, tricuspid = 2), age (16-75 yr), all under general anaesthesia and visualization of defects by TOE and fluoroscopy without using contrast media. Type of valves was mechanical (bileaflet, single leaflet, single disc, ball and cage) in 135 patients and bioprosthesis in 2 patients. A variety of devices were used including ASD Amplatzer, perimembranous and muscular VSD Amplatzer, PDA occluder and vascular plug. Time from replacement surgery resulting in a paravalvular leakage was 1 week to 32 yr before the percutaneous procedure.

Results. Time of procedure was 25-180 (98 ± 33) minutes. The procedure was technically successful in 137 of 145 patients (94.4%). A successful second attempt was carried out in 3 patients as the result of ventricular fibrillation and resuscitation or difficulties during first attempt. Only in one patient was contrast induced nephropathy found. In two patients residual peridevice leak occurred. One of them had transient severe haemolysis, which resolved after 1 week. Two patients died In-hospital, one as a result of vascular access complications and one unknown. One later death occurred as a result of intracranial haemorrhage at 3 yr follow up. Three patients required surgery for tamponade or unsuccessful procedure. Clinical improvement in NYHA class occurred in 135/137 patients (98.5%). None of patients (0.0%) developed contrast induced nephropathy (CIN) because no contrast media was injected.

Discussion. Percutaneous closure of PVLs is feasible in selected referral centres with experienced operators. Intra-procedural TOE has an impact on confirming previous diagnosis and co-existing abnormalities, evaluation of endocarditis as well as determination of size, shape and location of leak, proper positioning of device, evaluation of complications of device before release and residual leak assessment. As we improved our experiences, we carried out this time-consuming procedure straightforwardly and faster. TOE reduces the need for contrast media injection and the incidence of contrast induced nephropathy.

O-61
MPR and i-scan planimetry in real time 3D transoesophageal echocardiographic (3DTOE) measurement of tricuspid valve annulus area change and its correlation with right ventricle function parameters in patients with rheumatic mitral stenosis

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Introduction. Tricuspid valve annulus (TVA) shows conformational change during the cardiac cycle [1]. In patients with mitral stenosis and tricuspid regurgitation (TR) the TVA dilates and becomes more circular. 3DTOE helps in delineating the complete TVA, thus making area measurement more reliable [1]. We evaluated the indexed TVA area change and correlated it with RV systolic pressure (RVSP), tricuspid annular plane systolic excursion (TAPSE), RV S’ (at lateral annulus tissue Doppler), RV myocardial performance index (MPI), and RV area change.

Methods. After institutional approval, prospectively, 25 patients having mitral ste-
nosis with no AF underwent TOE on ie33 system (Phillips) after induction of GA in the operation room. RV function parameters RVSP, TAPSE, RV MPI and RV S’ were measured in standard 2D views. 3DTOE data set was acquired in full volume mode in mid-oesophageal position with centred TV and then analysed on Q Lab software (Phillips Medical Systems, Andover, MA) for TVA area measurement in end systole and diastole by planimetry. Data was presented as mean with SD and analysed with correlations and scatterplots using SPSS software ver. 15.00.

Results. Complete echo dataset for the evaluation of the parameters was acquired in 14 female and 8 male patients. TVA area increased with TR (diastole male 15.41 ± 1.69 female 8.62 ± 1.32; systole male 9.38 ± 0.15 female 5.16 ± 0.28). The indexed change in TVA area (icTVAa) correlated strongly with MPI in a negative way (males: r –1.00, p < 0.01; females: r –.754, p < 0.01). icTVAa correlated well, only in males, with RVSP (r –1.00, p < 0.01), with s’ and s’ duration (r 1.00, p < 0.01; r -1.00, p < 0.01) and TAPSE (r 1.00, p < 0.01).

Discussion. icTVAa significantly diminishes as RV MPI increases in both male and female patients and seems to be a better index of RV function as compared to RV MPI because it is measured in a single cardiac cycle. 3DTOE based i-scan MPR planimetry seems to be an accurate method for its evaluation.

References
postoperative left ventricular ejection fraction < 40%, length of stay on ICU, hypotension, need for MCS, high NOREPI or EPI dose after transplantation, primary graft failure, respectively (p < 0.05). Multivariable analysis showed that cumulative FFP use (p = 0.015; adjusted odds ratio (AOR): 1.46; 95% confidence interval [95% CI]: 1.08-1.98 and perioperative terlipressin use (p = 0.009; AOR: 3.24; 95% CI: 1.34-7.79)) were independently associated with long term mortality.

Discussion. Cumulative amount of blood products given and indicators of unstable haemodynamics, i.e., need of high catecholamine, terlipressin and MCS, are significant risk factors of in-hospital mortality. The use of FFP and terlipressin seem to be independent risk factors of long term mortality.

O-63
AMiLiE-Survey: current practice of anesthesia in patients undergoing lung transplantation in Europe

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2 Department of Anesthesiology, Madgeburg, Germany
3 Department of Cardiothoracic Transplantation and Mechanical Support Royal Brompton and Harefield NHS Foundation Trust, EACTA subcommittee, London, UK
4 Department of Anesthesia, Toronto General Hospital, Toronto, Canada

Introduction. More than 1,750 lung transplantations were performed throughout Europe in 2012 [1]. Nevertheless, just a few single centre reports concerning the intra-operative management of patients undergoing lung transplantation have been published. With the objective of reducing a crucial lack of information, an online-survey was performed to collect data about the way intra-operative management is actually performed in European transplant centres.

Methods. The survey consisted of 31 questions covering six major subjects: structural data, haemodynamic management, fluid therapy, vasopressor/inotropic support, treatment of intra-operative pulmonary hypertension and general anaesthesiological considerations. The survey was sent to 72 transplant centres currently performing lung transplantations in 17 countries in Europe.

Results. 42 questionnaires were completed representing an overall response-rate of 58.3%. Standard haemodynamic monitoring such as ECG, etCO2, body temperature, CVP, SPO2 and invasive blood pressure was used in every transplant centre. The standard use of advanced haemodynamic monitoring included pulmonary arterial catheter (78.6%) and transoesophageal echocardiography (71.4%). VV-ECMO (92.9%), VA-ECMO (97.6%) and CBP (95.2%) were available in almost all transplant centres and were commonly used in case of pulmonary arterial hypertension with right heart failure (88.1%), severe hypoxaemia (85.7%), and therapy-refractory hypercapnia with respiratory acidosis (73.8%), haemodynamic instability (76.2%) and pulmonary oedema (64.3%). Crystalloids (95.2%) were used for fluid replacement. Volume replacement therapy consisted of crystalloids (38.1%) as well as colloids (38.1%) and blood products (i.e., FFP) (23.8%). 64.3% of the transplant centres established transfusion management protocols or algorithms to control procoagulatory therapy. Most commonly used first choice inotropic therapy was dobutamine (45.2%) and epinephrine (23.8%), first choice vasopressor therapy was norepinephrine (95.2%). When facing intra-operative pulmonary hypertension, most centres used either inhaled NO (73.8%) or inhaled prostanooids (11.9%) as first choice medication. Postoperative ventilation was usually managed by using pressure controlled ventilation (61.9%), a tidal volume of 6-8 ml/kg BW (97.6%) and a maximum PIP of 25-30 cmH2O (71.4%).
Conclusion. In some fields, we see overall consensus, i.e., regarding intra-operative basic and advanced technical equipment. However, there is a great variability of intra-operative management strategies, especially with respect to recent controversial issues (i.e., volume replacement therapy) and new technologies (i.e., POC-devices). Therefore establishing a consensus recommendation seems helpful to improve intra-operative standards in lung transplantation, to give guidance to low volume centres and thus possibly to improve patients’ outcome.

References

O-64
Low cardiac output states in LVAD patients: an overview of cases in a cardiac centre in the United Kingdom

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Introduction. Left ventricular assist devices (LVAD) are an increasingly common in emergency departments and non-cardiac intensive care units worldwide. While the devices are very safe, patients can still present in low cardiac output states needing urgent medical management. We examined the cases of low cardiac output diagnosed in the over 100 LVAD patients known to our institution. We excluded LVAD patients presenting in cardiac arrest.

Methods. We reviewed the patients whose LVADs had been implanted at our institution.

Results. Of the 130 HeartWare LVADs implanted, 43 patients died before transplantation. 6 had pump-related complications (5 pump thrombus and 1 bleed from driveline entry), 10 died of a cardiac cause (7 RV failure, 1 calcified LV and 2 arrhythmias), and 27 died of non-pump non-cardiac causes (13 sepsis, 13 intracerebral bleed and one withdrawal by the local hospital).

Discussion. Low cardiac output states in LVAD patients are a recognised entity. Low device preload due to right ventricular failure or inflow cannula obstruction are the most common, while LVAD failure is a vanishingly rare entity. The degree of flow decrease tolerated by the patient is dependent on the underlying left ventricular function and/or recovery, right ventricular function and the individual’s physiological reserve. Clinical management is similar to that of any acute heart failure patient – ventilatory support, inotropes, mechanical circulatory support including extracorporeal life support, urgent transplantation, and targeted end-organ support therapy. LVAD patients with primary or secondary device failure must be heparinised as they are at high risk of device thrombosis and subsequent high mortality. New generation non-occlusive LVADs also allow free regurgitation of blood back into the left atrium and pulmonary circulation, thus worsening the degree of heart failure.

References
O-65  
Percutaneous trans-femoral trans-septal left atrium drainage for left heart decompression of heart transplant candidates with peripheral veno-arterial extracorporeal membrane oxygenation

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Introduction. The purpose of this study was the evaluation of efficiency of the left heart by trans-femoral trans-septal decompression of the left atrium (LA) of heart transplant candidates with peripheral veno-arterial extracorporeal membrane oxygenation (VA ECMO).

Methods. This study included 46 heart transplant candidates (35/11M/F, age 16-66 [42.1 ± 4.1 yr]) with peripheral VA ECMO. Diagnoses were DCM (n = 31; 67.4%), CAD (n = 8; 17.4%), chronic cardiac allograft dysfunction (n = 4; 8.7%) and valvular diseases (n = 3; 6.5%). In all cases, we used a peripheral surgical cannulation technique via femoral arterial cannula 15-19 Fr, venous cannula 21-25 Fr and arterial cannula or vascular catheter 8-10 Fr for anterograde legs perfusion. For LV unloading, we used a supplement drainage cannula (venous cannula 17-19 F) percutaneously introduced to the LA through the femoral vein of the contralateral leg and connected to the venous line of the ECMO circuit. For installation of transcutaneous trans-septal LA cannula we used a long trans-septal needle, long introducer and long dilator, and standard venous ECMO cannula. All manipulations were controlled by transoesophageal echocardiography and radioscopy. We tried to make the trans-septal puncture of LA in the region of the fossa ovalis.

Results. VA ECMO support was a blood flow 4.8 ± 0.6 l/min or 2.65 ± 0.06 l/min/m², gas flow 4.8 ± 0.6 L/min, FiO₂ 0.81 ± 0.02. 28 (60.8%) of 46 patients receiving VA ECMO, despite right atrium unloading (CVP 3.2 ± 0.4 mmHg), still had a high (> 25 mmHg) pulmonary artery wedge pressure (PAWP) that demanded active left heart decompression. In 17 (61%) of 28 patients, trans-septal LA cannulation was made immediately after VA ECMO initiation, and 11 (39%) on 3.4 ± 0.5 day. Mean blood flow of the LA cannula was 1.84 ± 0.04 l/min. After beginning LV drainage, we noted a significant (p < 0.05) decrease of PAWP from 29 ± 2 to 18 ± 3 mmHg. Duration of pre-transplant VA ECMO in surviving patients receiving OHTx/reOHTx was 1-34 (8.6 ± 1.7) days. The mortality of heart transplant candidates with active LA/LV unloading (n = 2, 7.1%) was less (p < 0.05) than patients without left heart decompression (n = 6, 33.3%). Just before heart transplantation, the LA cannula was removed into the vena cava inferior.

Discussion. More than 50% heart transplant candidates with peripheral VA ECMO needed active left heart decompression. Active percutaneous trans-femoral trans-septal LA drainage following VA ECMO is an effective tool of left ventricle unloading and protection against pulmonary congestion.

O-66  
Vasoplegia after implantation of a non-pulsatile left ventricular assist device: incidence, risk factors and outcome

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Introduction. Vasoplegia occurs in 5-25% of regular cardiac surgery patients and is associated with increased morbidity and mortality. The exact incidence of vasoplegia after non-pulsatile left ventricular assist device (LVAD) implantation as a treatment of heart
failure is unknown. The aim of this study was to evaluate the incidence, potential risk factors and the outcome of vasoplegia after LVAD implantation.

**Methods.** All patients scheduled for LVAD implantation between 2006 and 2013 were included. Vasoplegia was considered present if a patient had at least three out of the following conditions in the first 48 h after ICU admittance: mean arterial pressure < 50 mmHg, systemic vascular resistance < 800 dyn/s/cm², cardiac index > 2.5 l/min/m², or use of norepinephrine > 100 ng/kg/min. The analysis included independent student’s t-test and logistic regression analysis.

**Results.** One hundred forty-seven patients underwent 176 procedures. Vasoplegia occurred in 76 procedures (43%). Pre-operatively, patients with vasoplegia were older (p = 0.006, OR 1.03, 95% CI 1.01-1.06), used more loop-diuretics (p = 0.020, OR 2.40, 95% CI 1.13-5.07) and less low-molecular-weight-heparins (p = 0.023, OR 0.41, 95% CI 0.19-0.90), had lower neutrophil volumes (p = 0.007, OR 0.96, 95% CI 0.93-0.99), higher bilirubin levels (p = 0.036, OR 1.02, 95% CI 1.00-1.04) and higher creatinine levels (p = 0.029, OR 1.01, 95%CI 1.00-1.01). Intra-operatively, they received more epinephrine (p = 0.003, OR 6.06, 95% CI 1.65-22.32). Immediately post-operative, haemoglobin (Hb) levels were lower (p = 0.007, OR 0.68, 95% CI 0.51-0.90). They underwent more often a re-thoracotomy (p = 0.014, OR 2.19, 95% CI 1.16-4.11), developed more often renal failure (p < 0.001, OR 3.90, 95% CI 1.91-7.98), and showed increased ICU mortality (p = 0.040, OR 2.49, 95% CI 1.02-6.04). Using multivariable regression analysis, neutrophil volumes, the use of loop-diuretics and epinephrine, and post-op Hb remained significantly associated with vasoplegia. However, the areas under the ROC-curves were < 0.64.

**Discussion.** Vasoplegia after LVAD-implantation affects almost half of the LVAD patients. Prediction of this condition remains difficult.
ized Estimating Equation. $p < 0.05$ was considered to be statistically significant.

**Results.** Post CPB, SIRS developed in 9 (18%) patients. At T1, the OPN and TNF-α levels were comparable in all patients ($p = 0.23$ and $0.65$ respectively). A positive correlation was observed between OPN and TNF-α at different time points (T1; $r = 0.33$, $p = 0.01$, T2; $r = 0.84$, $p = 0.00$, T3; $r = 0.88$, $p = 0.00$ and T4; $r = 0.92$, $p = 0.00$ respectively). Significantly high levels of OPN and TNF-α were found at T2 (50.1 ± 11.3 vs. 77.9 ± 16.6 pg/ml, $p = 0.01$ and 132.8 ± 13.9 vs. 191.9 ± 35.7 pg/ml, $p = 0.001$ respectively), T3 (38.9 ± 12.8 vs. 154.1 ± 35.5 pg/ml, $p = 0.001$ and 130.5 ± 8.2 vs. 290.5 ± 18.8 pg/ml, $p = 0.0001$, respectively) and T4 (28.7 ± 14 vs. 261.6 ± 40.2 pg/ml, $p = 0.000$ and 119.4 ± 22.5 vs. 335.5 ± 26.5 pg/ml, $p = 0.002$ respectively) in SIRS patients. The overall complication rate, inotropic support, duration of intensive care unit stay and hospital stay was significantly higher in patients with a high OPN level.

**Discussion.** High serum levels of OPN were associated with poor clinical outcome in patient suffering from post CPB SIRS. There exists a direct potential link between OPN and SIRS related to cardiopulmonary bypass. Advances in our understanding of the interaction of OPN with other inflammatory marker of cellular and humoral responses to CPB will enable more effective intervention to reduce the deleterious effects and improve outlook for patients undergoing cardiac operations in future.

**O-68**

**Association between rs5498 single nucleotide variation of ICAM-1 gene and EuroSCORE-II in adult cardiac surgical patients operated with use of cardiopulmonary bypass.**


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**Introduction.** Association between specific genome variants of inflammatory mediator genes and risk of complications after cardiac surgery was proposed [1]. The rs5498 single nucleotide variation (SNV) of the intracellular adhesion molecule 1 (ICAM-1) gene was previously reported to be associated with postoperative myocardial infarction and acute kidney injury after cardiac surgery [2].

**Methods.** 492 adult patients referred for open heart surgery with use of cardiopulmonary bypass were recruited and signed informed consent to participate in a prospective observational cohort study (NCT01020409). ICAM-1 SNV rs5498 was identified with polymerase chain reaction and SNaPshot tests. Relevant pre-operative data were collected at the pre-operative visit, and EuroSCORE-II was calculated. Score and variables were compared between GG and AA alleles.

**Results.** 152 (30.9%) patients were identified with the AA allele and 91 (18.5%) with the GG allele of rs5498. Patients with the AA-allele compared with patients having the GG-allele presented, respectively: EuroSCORE-II 6.57/4.80 (K-W $p = 0.029$), female/male ratio 0.92/0.49 (OR –1.87; 95% CI: 1.09-3.25; $p = 0.011$), arterial hypertension ratio 5.33/2.79 (OR –1.91; 95% CI: 1.00-3.63; $p = 0.025$) and NYHA I/II/III/IV class ratios 0.90/1.28/2.37/7.00 ($p = 0.036$), while other EuroSCORE variables proved insignificant.
Discussion. The wild ICAM-1-rs5498-AA allele seems to be related to higher risk of cardiac surgery, as estimated with EuroSCORE-II, due to its connection with pre-operative risk factors such as arterial hypertension and more advanced heart failure. The observed association with female gender could not be explained by this study and required further analysis. Pre-operative tests of specific genome variants might prove useful in calculating peri-operative risk in adult cardiac surgical patients.

References

Oral Session – Cerebral Oximetry

O-69 Optimization of intra-operative depth of anaesthesia and cerebral oxygenation significantly reduces postoperative delirium after coronary artery bypass graft surgery

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Introduction. Postoperative delirium after cardiac surgery is a common problem with significant implications for patient morbidity and mortality.

Methods. After ethical approval, patients older than 64 yr undergoing coronary artery bypass graft surgery were enrolled in a randomized controlled trial. The depth of anaesthesia in the intervention group was aimed at a BiSpectral Index (BIS) of 50 ± 10 and standardized interventions were delivered if cerebral oxygenation (rSO2) dropped below 15% of the baseline or below 50%. The control group was blinded to BIS and rSO2. We hypothesized that optimisation of intra-operative depth of anaesthesia and cerebral oxygenation significantly reduces postoperative delirium, which was the primary outcome. The trial was powered as a pilot study. We projected a 40% incidence of post-operative delirium and a 70% relative risk reduction with BIS and rSO2 monitoring. A total sample size of 76 gave an 80% power to detect a significant difference at the 95% confidence level. Postoperative delirium was assessed at 3 ± 1 days following surgery using the Confusion Assessment Method (CAM).

Results. Eighty-one patients (86% male) with a mean age of 71.9 yr were randomized. Baseline mini-mental state examination (MMSE) ranged from 24-30. At 3 days postoperatively 26% of the control group were CAM positive compared to 0% of the intervention group \( p = 0.001 \) (Fisher’s exact test). The percentage of time spent outside the target BIS range was significantly higher in the control group \( p = 0.009 \) (median 38% vs 21% IQR 18%-55% vs 9%-26%). The number of minutes spent with rSO2 less than 15% of baseline was significantly higher in the control group 9.5 vs 0, \( p = 0.008 \) (IQR 0-47 vs 0-3). Patients with postoperative delirium spent significantly longer with an rSO2 less than 15% of baseline than those without (IQR 36-49 vs 0-31 min, \( p = 0.048 \)).

Discussion. Intra-operative monitoring of depth of anaesthesia and cerebral oxygenation significantly reduced postoperative delirium in elderly patients undergoing cardiac surgery. BIS and rSO2 optimization may be associated with a reduction in postoperative delirium.
Cerebral oximetry monitoring during transcatheter aortic valve implantation (TAVI) procedure

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Introduction. For 12 years, TAVI has become an alternative solution for patients not eligible for surgical aortic valve replacement. However, TAVI procedures are not without risk, especially regarding the neurological events [1]. The aim of the study was to assess whether cerebral oximetry monitoring is predictible for neurologic outcome.

Methods. This is a prospective study including 100 consecutive patients eligible for TAVI (femoral access most of the time) in a single centre. The cerebral oxygen saturation (rScO2) was monitored (INVOS® device Covidien®). Desaturation was defined as a 20% decrease of the basal value and early neurologic event as a stroke within 2 days after the procedure.

Analysis of variance, parametric or non-parametric statistic tests were used to assess statistical significance (p < 0.05)

Results. Forty-six percent of the patients experienced at least one episode of rScO2 decrease, but early neurological events were observed in 3.75% patients only. Three pre-operative characteristics were associated with desaturation occurrence:
- Low pre-operative haemoglobin level: 11.53 vs 12.32 g/dl (p = 0.026).
- Sex: 61% women vs 39% men (p = 0.028).
- Right basal rScO2: 57.6 vs 61.1% (p = 0.042).
There was no significant correlation between desaturation occurrence and neurological events. There was no difference between the types of valve implanted (Corevalve®, Edwards Sapiens®)

Discussion. The TAVI technique is associated with impaired cerebral oxygenation in almost half of the cases. Cerebral desaturation is not predictive of early neurologic event, but its association with cognitive dysfunction remains unclear and deserves further studies.

References

Comparison of single and recalibrated measurements of cardiac index obtained by ProAQT-Pulsioflex™ with those of FloTrac/Vigileo™

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Introduction. The ProAQT-Pulsioflex™ is a minimally invasive method to obtain cardiac index (CI) using pulse contour analysis. According to the manufacturer, the device has to be calibrated at the start of every procedure and should be able to measure CI accurately without further calibration. However, recalibration of CI is possible, e.g., after major changes in vascular tone or volume. We compared these single calibrated measurements (CIPAsc) and recalibrated ones (CIIPAcal) with our clinical standard, i.e., CI measured by FloTrac/Vigileo (CIFTV).

Methods. This prospective, observational single centre study includes seventy patients undergoing off-pump coronary artery bypass surgery. The moments at which CI was documented were randomly chosen during surgery to resemble clinical practice. Values were compared by Bland-Altman analysis for repeated measures. Four-quadrant plots and
polar plot methodology were used to evaluate CI trending ability for each Method.

Results. CIPAsc overestimated CIFTV with an average of 23%. This overestimation increased over time, doubling in four hours from 15% to 30%. In contrast, CIPAcCal consistently overestimated CIFTV by 13%. Agreement analysis of CIPAsc and CIPAcCal versus CIFTV revealed a bias of −0.76 and −0.23 l/min/m² and 95% limits of agreement of ±1.37 and 0.95 l/min/m², respectively. The percentage error was 112% for CIPAsc and 79% for CIPAcCal. Polar plot analysis showed moderate concordance to track CI changes in both methods (69% and 84% within 30º limits of agreement).

Discussion. The ProAQT-Pulsioflex™ should be recalibrated at certain intervals to increase its accuracy and precision of measuring and tracking CI. Both CIPAsc and CIPAcCal are not interchangeable with CIFTV.

O-72
Tissue rSO₂ during on-pump CABG can predict post-op renal dysfunction

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Introduction. Near-infrared spectroscopy is a non-invasive continuous monitoring method for measuring the oxyhaemoglobin saturation. Cerebral rSO₂ is the parameter being most commonly monitored during CPB, especially in aortic surgery. But it was shown in several publications that rSO₂ of skeletal muscles can also reflect the hypovolaemic disorders in human traumatic and septic shock [1, 2]. It is also clear that during CPB, the cerebral blood flow is not the same as other regions. The aim of our work was to monitor skeletal muscle rSO₂ during on-pump CABG and to estimate its predictive value for post-op renal dysfunction.

Methods. Twenty-two men and women (mean age 56.8 ± 4.1 yr) underwent CABG with normothermic CPB. The INVOS method was used during the whole period of operation before and after CPB. The two NIRS sensors were positioned at the dorsum muscles at the Th 10-L2 levels. Also for cerebral rSO₂ measurement, two other NIRS sensors were used in the standard frontal cerebral position. rSO₂ values were recorded every 3 seconds. To assess renal dysfunction, the RIFLE score was used. For statistical analysis, the nonparametric methods were used in IBM SPSS Statistic 19.0. To assess the predictive value, ROC-analysis was used.

Results. In all patients rSO₂ levels decreased after sternotomy and were significantly lower during the whole period of CPB than before the operation levels (70.3% vs. 87%; p < 0.01). In patients with acute kidney injury, the rSO₂ levels during CPB were significantly lower than in the patient with normal renal function (65.1% vs. 78%; p < 0.01). The area under the ROC-curve for rSO₂ was calculated as 0.773 (p < 0.0001) and the mean rSO₂ value less than 69% during the CPB has a sensitivity 53.5 and specificity 97.1 for post-op acute kidney injury prediction. Cerebral and tissue rSO₂ trends of those patients were compared.

Discussion. Regional tissue rSO₂ can possibly be routinely monitored during on-pump CABG to assess the safety of the procedure.

References
Propofol anaesthesia for surgery with cardiopulmonary bypass is related to decreased tissue saturation during vascular occlusion test in comparison to sevoflurane

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Introduction. The purpose of this study was to compare the effects of propofol and sevoflurane on tissue saturation during a vascular occlusion test (VOT) in various phases of heart surgery with CPB.

Methods. Data from 60 patients, randomized to group P (Propofol) and S (Sevoflurane) were analysed. VOT was performed using the INVOS oximeter placed over the thenar muscle, by inflating a sphygmonometer cuff to exceed the systolic pressure value by 30 mmHg, and maintain this induced ischaemia for 3 minutes at the following stages:
1) 30 min after anaesthesia induction;
2) directly after sternotomy;
3) 20 min after aortic X-clamp;
4) 40 min after aortic X-clamp;
5) 20 min after release of aortic X-clamp;
6) 45 min after weaning of CBP. Group and time effects on oximetric parameters were analysed with RM-ANOVA and post hoc Tukey test.

Results. During the hypoxic phase, a trend towards a lower rate of desaturation was observed in group S compared to group P (p = 0.08). Patients given propofol showed lower measurements of the lowest tissue saturation (p = 0.018). No difference between propofol and sevoflurane was observed in the speed of tissue saturation recovery and the highest saturation on reperfusion. Post hoc analysis demonstrated that in both groups, the lowest
tissue saturation during CPB was lower than before (s. Figure 1).

**Discussion.** The rate of desaturation during VOT was proposed to reflect the local metabolic rate and the speed of tissue saturation recovery on reperfusion is thought to express microcirculatory flow [1]. Differences observed in the hypoxic phase might be caused by attenuation of mitochondrial respiration by sevoflurane. We conclude that sevoflurane anaesthesia may ameliorate hypoxia resulting from tissue ischaemia in comparison to propofol.

**References**

**0-74**

**Troponin T and brain natriuretic peptide after on-pump cardiac surgery: impact on 1-year mortality and major cardiac events after adjustment for postoperative complications**

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**Introduction.** The independent predictive value of troponin T (TNT) after on-pump cardiac surgery was established in several studies. However, adjustment was limited to pre-operative risk factors without considering peri-operative complications. Data on post-operative B-type natriuretic peptide (BNP) after on-pump cardiac surgery are scarce. Our aim was to assess the independent value of TNT and BNP to predict 1-year outcome after adjustment using the EuroSCORE and postoperative complications and to report risk stratification gains.

**Methods.** This prospective cohort study included consecutive patients undergoing on-pump cardiac surgery between 2007 and 2010 in a tertiary centre. We evaluated postoperative peak TNT and BNP, the EuroSCORE, and postoperative complications, i.e., sepsis, sternal infection (without sepsis), respiratory infections and acute kidney injury as predictors of adverse events using Cox regression. The primary endpoint was death or major adverse cardiac events (MACE) within 1 year after surgery. We calculated the net reclassification improvement of TNT and BNP in addition to the EuroSCORE.

**Results.** We enrolled 1559 patients. Follow-up was completed in 1545 patients (99.1%). Within the first year after surgery, 176 patients (11.3%) suffered an event. Eighty-three events (5.3%) occurred within 30 days of surgery, of which there were 58 deaths (3.7%). The adjusted hazard ratio (HR) of peak TNT > 0.8 μg/l was 2.13 (95% CI 1.47-3.15), of peak BNP > 790 ng/l 2.44 (95% CI 1.65-3.62). The net reclassification improvement of the addition of TNT and BNP to the EuroSCORE was 0.276 (95% CI 0.195-0.348). A model fitted to predict 30-day events showed similar results.

**Discussion.** Postoperative TNT and BNP are strong predictors of 1-year events after on-pump cardiac surgery independent of pre-operative risk factors and postoperative complications. Updating the pre-operative EuroSCORE risk with postoperative TNT and BNP after surgery allows improved prediction of 1-year death or MACE.
In a FAST-TRACK protocol remifentanil is not superior to standard sufentanil regime

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Introduction. Progressive cost containment care has resulted in a growing interest of fast-track cardiac surgery and length of stay (LOS) in the ICU. A recent, though not randomized, study showed that remifentanil anaesthesia resulted in shorter postoperative ventilation time and LOS. Additionally, a major issue is that LOS in ICU is not a fully objective measure, as patient discharge, besides medical factors, may also be guided by logistics and policies. We hypothesized that remifentanil compared to sufentanil would reduce ventilation time and LOS in ICU and that remifentanil would have beneficial effects on the overall quality of recovery.

Methods. Sixty patients, planned for elective coronary artery bypass grafting ± aortic valve replacement were randomized to remifentanil or sufentanil combined with propofol. Patients with ejection fraction < 0.3, myocardial infarction within the last 4 weeks, diabetes and severe pulmonary or arterial hypertension were excluded. The primary outcome was eligible LOS in the ICU. Secondary parameters were ventilation time, actual LOS in ICU, time in hospital, quality of recovery and peri-operative complications.

Results. The groups were fully comparable in selected demographic and peroperative parameters. There were no differences in ventilation time, eligible or actual ICU discharge time and in-hospital stay between remifentanil and sufentanil patients (table). Remifentanil patients received more morphine during recovery (20 mg vs. 10 mg; \( p = 0.040 \)). No difference was found in medical support or use of pacemaker (s. Table 1).

Discussion. In a fast-track protocol remifentanil does not seem superior to standard moderate to high dose sufentanil regime.

<table>
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<th>Parameter</th>
<th>Sufentanil</th>
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<td>Hospital time (days)</td>
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Statistics: Mann-Whitney test
**P-1**

*Association of carotid arterial circumferential strain with left ventricular function and haemodynamic compromise during off-pump coronary artery bypass surgery*

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**Introduction.** Large artery stiffness is closely coupled with ventricular function. A measure of common carotid arterial circumferential strain (CCA CirS) using ultrasound speckle tracking analysis is a novel indicator of vascular stiffness. We evaluated its predictive value for haemodynamic deterioration during mechanical heart displacement in off-pump coronary artery bypass graft (OPCAB) surgery.

**Methods.** Patients scheduled for multi-vessel OPCAB surgery with left ventricular ejection fraction ≥ 50% were prospectively enrolled. Intra-operative cardiac index and mixed venous oxygen saturation (SvO₂) were compared in relation to the tertile distribution of the CCA CirS.

**Results.** A total of 96 patients’ data were analysed. Cardiac index and SvO₂ during left circumflex artery grafting and after sternum closure were significantly lower in the first tertile than those in the third tertile. Univariate logistic regression analysis revealed female, ratio of early transmitral velocity to early diastolic mitral annular velocity, pulse pressure, and the CCA CirS as predictors of haemodynamic deterioration (decrease in SvO₂ ≥20%), while only the CCA CirS remained as an independent predictor after multivariate analysis (odds ratio 0.27, 95% confidence interval 0.11-0.68). The optimal cut-off value for the prediction of haemodynamic deterioration measured by receiver-operator characteristic curve was 2.016 (%) CCA CirS with a sensitivity and specificity of 71.4% and 73.7%, respectively (area under the curve: 0.730; 95% confidence interval: 0.608-0.852; \( p = 0.002 \)).

**Discussion.** A measure of the CCA CirS may provide comprehensive risk stratification in patients requiring surgical coronary revascularization in a highly feasible and reproducible manner.

**P-2**

*Ultrasound acquired cardiac power integral: minimally invasive instantaneous monitoring of cardiac energy delivery in the failing heart in pigs*

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**Introduction.** Cardiac power output (CPO) has shown a great ability to predict outcome in a broad spectrum of cardiac disease. The cardiac power integral (PWR-integral) is an instantaneous equivalent to CPO. In a previous study, we have demonstrated that an invasively measured PWR-integral closely followed stroke work (SW) over large variations of afterload, preload and contractility in healthy porcine hearts. In this study, we aimed to validate a minimally invasive meth-
od for acquiring the PWR-integral and to test this method in failing hearts.

**Methods.** Seven pigs were examined using Doppler ultrasound to measure aortic flow, which was combined with brachial blood pressure to calculate a low invasive PWR-integral (uPWR-integral) during mechanically manipulated preload and afterload, before and after induced global ischaemic left ventricular failure. The uPWR integral was compared to an invasive PWR-integral obtained by a transit time flow probe and an aortic micromanometer (ttPWR-integral), and SW, calculated as the area encompassed by a pressure-volume-loop (PV-loop) acquired by an intraventricular Leycom conductance catheter.

**Results.** Bland-Altman limits of agreement analysis illustrate a high degree of agreement between the uPWR-integral and the ttPWR-integral, although the uPWR-integral overestimates by a factor of approximately 1.2 compared to the ttPWR-integral. Regression analysis demonstrates that the uPWR-integral follows SW both before and after induced ventricular failure, although a mitral regurgitation that followed induced failure led to a reduction of uPWR compared to SW. Pearson correlation coefficients for each animal between SW and the uPWR-integral were in the range of 0.816 and 0.963.

**Discussion.** The uPWR-integral seems promising for minimally invasive measurement of cardiac energy delivery and could prove to be a valuable parameter to optimize circulatory unstable patients.

**P-3**

**Helium post-conditioning increases caveolin 1 and 3 protein levels in serum of rats**

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**Introduction.** The noble gas helium induces pre- and post-conditioning in different models of ischaemia reperfusion in animals and in humans [1]. The exact mechanisms are still unknown. Recent data suggest a role for caveolins, structural scaffolding proteins that allow for organization of signaling molecules in caveolae, membrane invaginations enriched in lipids. Caveolin-1 and -3 are essential players in ischaemic- and volatile anaesthetic induced cardioprotection [2]. Caveolins are secreted into the bloodstream after helium inhalation in mice [3]. Here, we hypothesize that helium post-conditioning induces caveolin-1 and -3 secretion into the blood of rats.

**Methods.** Rats were subjected to 25 min of cardiac ischaemia and 5, 15 or 30 min of reperfusion. He5 (n = 6), He15 (n = 8) and He30 (n = 8) groups inhaled 5, 15 and 30 min of 70% helium during reperfusion and were compared with controls not inhaling helium (IR5, IR15 and IR30). Serum of the rats was analysed by Infrared Western Blotting for expression of caveolin 1 and 3. Statistical analysis was performed by Student’s t-test. Data are mean ± SD of arbitrary units of light intensity.

**Results.** He15 post-conditioning increased caveolin-3 significantly in the serum compared with the IR15 group (7.6 ± 0.37 vs. 6.4 ± 0.37, p ≤ 0.05). He30 was associated with significant higher levels of caveolin-1 in
the serum compared with IR30 group (3.3 ± 0.23 vs. 2.2 ± 0.18; \( p \leq 0.01 \)). Caveolin-1 levels at 15 minutes and caveolin-3 levels at 30 minutes were not significantly different. In He5 and IR5 animals, no differences were found.

Discussion. These data suggest that post-conditioning with 70% helium for 15 and 30 minutes causes higher caveolin-1 and -3 levels in the serum of rats.

References

P-4
A comparison of the efficacy and adverse effects of double-lumen endobronchial tubes and bronchial blockers for lung isolation: a systematic review and meta-analysis

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Introduction. Bronchial blockers (BBs) and double-lumen endotracheal tubes (DLTs) may be used to obtain lung isolation. However, controversy exists as to which is easier to use and has fewer adverse outcomes. Randomized controlled trials (RCTs) have been undertaken, but they have small study population sizes so inflating their risk of Type II statistical error. The aim of this study was to compare the efficacy and adverse effects of BBs and DLTs by systematic review and meta-analysis of RCTs.

Methods. A comprehensive literature search was conducted for RCTs comparing BBs and DLTs using Google Scholar, Ovid Medline and Cochrane library databases up to October 2013. Inclusion criteria were RCTs comparing BBs and DLTs, intubation carried out by qualified anaesthetists or trainee specialists and outcome measures relating to either efficacy or adverse effects. Studies that were not published in English were excluded. The systematic review of papers used the PRISMA 27-step checklist. Mantel-Haenszel fixed-effect meta-analysis of recurring outcome measures was performed using RevMan 5 software.

Results. Seven hundred and ninety-one participants were included in the 13 RCTs that were published between 1996 and 2013. DLTs were quicker to place (mean difference: 51; 95% CI: 8.48-93.62 seconds; \( p = 0.02 \)) and less likely to be incorrectly positioned (odds ratio (OR) 2.70; 95% CI 1.18-6.18; \( p = 0.02 \)) than BBs. BBs resulted in less postoperative sore throat (OR): 0.39; 95% CI: 0.23-0.68; \( p = 0.0009 \), less hoarseness (OR: 0.43, 95% CI 0.24-0.75, \( p = 0.003 \)) and fewer airway injuries (OR: 0.40, 95% CI 0.21-0.75, \( p = 0.005 \)) than DLTs.

Discussion. Whilst BBs are associated with a lower incidence of airway injury and a lower severity of injury, DLTs take less time to place correctly and are easier to do so.
P-5
The relationship between hospital surgery volume and surgical outcomes following oesophageal cancer resection

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Introduction. The relationship between the number of operations conducted in a hospital (HSV: Hospital Surgery Volume) and the mortality of surgery in a hospital were investigated in many countries. Some studies suggested more HSV was related to less mortality, especially in complicated surgery. However, other studies did not show that HSV were significantly related with mortality. There have been numerous studies investigating the relationship between HSV and other surgical outcomes, but the results were controversial. We investigated the effects of HSV on in-hospital mortality and postoperative length of stay (LOS) following oesophageal cancer resection.

Methods. We identified 3,918 patients who underwent oesophageal cancer resection in Japan. The data were taken from national reimbursement database called Japanese Diagnoses Procedure Combination which had 5.85 million inpatient data. Patients were divided into four groups in order of HSV: high (H), medium-high (MH), medium-low (ML) and low (L). The size of each group was designed to be equal. Multivariate regression analyses were conducted to analyse the concurrent effects of patient demographic and medical factors and surgical types on postoperative outcomes.

Results. Overall in-hospital mortality was 4.1%, and was significantly lower in group H, MH and ML compared with group L (1.6%, 4.1%, 4.7%, and 5.9%, respectively; \( p < 0.001 \)). LOS was shorter in higher-volume groups than in group L (mean of H 26.0 days, MH 28.0 days, ML 28.0 days and L 32.0 days, respectively; \( p < 0.001 \)). The Hazard Ratio of group H, MH and ML of discharge from hospital compared with group L were 1.34, 1.31 and 1.21, respectively.

Discussion. Higher HSV was associated with significantly lower in-hospital mortality and shorter postoperative LOS following oesophageal cancer resection in Japan. The differences in LOS between group H and group L may be large enough to consider centralization of oesophagectomy surgery to utilize limited medical resources effectively although geographic factors may become obstacles of implementation.

Poster Session – Cardiac Anaesthesia: Risk Factors & Outcome

P-6
Does volatile anaesthetic exposure lead to an improvement in patient outcome after cardiac surgery: a meta-analysis

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Introduction. Cardiac surgery is associated with myocardial ischaemia and the release of cardiac enzymes. The use of volatile anaesthetics may reduce myocardial damage but randomized studies have shown conflicting Results. We have conducted an updated review to determine if volatile anaesthetic exposure leads to an alteration in troponin levels and optimization of cardiac outcomes compared with an intravenous anaesthetic control.

Methods. Institutional approval was obtained prior for the conduct of this analysis. The full protocol conformed to the PRISMA guidelines for meta-analysis design. PubMed, clinicaltrials.gov and the Cochrane Library databases were searched with limitation to prospective randomized trials. There were no restrictions in the language or date of publication. Trial quality was assessed
using Eggers methodology. The outcome variables were blood troponin, cardiac index and mortality at 30 days. Analyses were completed with REVMAN5 software on an intention to treat basis. Heterogeneity was assessed with the I2 statistic with a value of > 75% regarded as high. Publication bias was assessed through the use of the funnel plot.

Results. A literature search identified 59 studies enrolling 5687 patients. Overall volatile anaesthetic exposure was associated with a reduction in troponin values (Table 1). A sub-group analysis for troponin T did not meet criteria for statistical significance ($p = 0.23$). Cardiac indices in the volatile exposed group were elevated after the ischaemic insult until 12 h postoperatively compared to intravenous controls. There was no difference in 30 day mortality (Odds Ratio 0.75 [0.44-1.29]). The I² values were elevated indicating heterogeneity between studies. Funnel plot review revealed significant publication bias with a lack of negative studies.

Discussion. Our data revealed that volatile anaesthetic exposure corresponds to lower troponin values and an increase in postoperative cardiac indices. This was not associated with any significant change in postoperative mortality. There were significant differences between studies which cannot be explained by random chance alone. Publication bias also exists with a distinct lack of negative publications.

P-7
Pre-operative IABP to reduce mortality in CABG surgery: a meta-analysis of randomized controlled trials

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Introduction. Intra-aortic balloon pump (IABP) is routinely used in heart failure patients undergoing cardiac surgery. However its impact on clinical outcome is yet a matter of debate. We performed a meta-analysis of all the randomized controlled trials (RCTs) that investigated the use of pre-operative IABP in adult high-risk patients undergoing coronary artery bypass grafting (CABG).

Methods. Eligible trials were identified by searching Medline, Embase, Scopus, ISI Web of Knowledge and the Cochrane Library. Analysis was performed using STATA 11.0 Software (StataCorp LP, College Station, TX, USA). The primary endpoint was mortality at the longest follow-up available, and the secondary endpoint was 30-days mortality.

Results. Eight pertinent RCTs were identified and included in the meta-analysis for a total of 625 enrolled patients (312 assigned to receive IABP and 313 controls). Pre-operative IABP implantation was found to be associated with a significant reduction in mortality risk (11 of 312 [3.5%] in the IABP group versus 33 of 313 [11%] in the control group, RR 0.38 [95% CI 0.20-0.73], $p$ for effect = 0.004, $p$ for heterogeneity = 0.7, $I^2 = 0$). The benefit on mortality reduction was confirmed when restricting the analysis to trials with low risk of bias, to those reporting 30-days follow up, and to patients undergoing on-pump CABG surgery.
Discussion. Prophylactic intra-aortic balloon pump can reduce peri-operative and 30-days mortality in high-risk patients undergoing coronary artery bypass grafting.

P-8
On-pump vs. off-pump coronary artery bypass graft surgery (CABG): outcomes after 10 years of experience

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Introduction. We aim to describe our experience in CABG with cardiopulmonary bypass vs. without cardiopulmonary bypass (on pump vs. off pump technique) comparing intra-operative and postoperative outcomes.

Methods. From January 2003 to June 2013, 3,097 patients underwent consecutive emergency and scheduled CABG surgery. 1,770 underwent on-pump CABG and 1,327 off-pump CABG according to surgeon’s criteria. Patients undergoing on-pump without aortic clamping, receiving other concomitant procedures or re-operations were excluded. A propensity score matching was performed to identify appropriate matched pair patients between groups by building a binary logistic regression model with the main pre-operative risk variables and comorbidities. Univariate and multivariate logistic regression analysis was performed to assess significant predictors of 30 day morbidity composite endpoint (renal, pulmonary, cardiovascular and neurological) and mortality composite endpoint.

Results. We identified 1004 patients in each group. The average of grafts performed was higher in the on-pump group, 3.50 ± 0.96 vs. 2.87 ± 0.99 (p < 0.001). There were no significant differences in mortality between groups, 2.8% vs. 3.8%, respectively (p = 0.21). ICU and hospital length of stay (LOS) were higher in the on-pump group, 4.1 ± 2.6 vs. 3.4 ± 2.3 (p < 0.001) and 9.7 ± 5.8 vs. 7.8 ± 4.1 (p < 0.001). Cardiovascular, neurological, respiratory and renal complications were more frequent in the on-pump CABG group, 13.9% vs. 8.7% (p < 0.001), 3.9% vs. 2.2% (p 0.03), 13.5% vs. 7.5% (p < 0.001), 7.1% vs. 5.3% (p = 0.095). In both univariate analysis pre-operative renal failure, chronic obstructive pulmonary disease and on-pump CABG were independent predictors of morbidity and mortality composite endpoints.

Discussion. Both coronary revascularization techniques are safe options. However, off pump CABG is associated with less post-operative mortality and shorter hospital and ICU LOS. It would be important to assess the long term impact of a reduced number of grafts performed in the off-pump CABG.

P-9
Propofol and survival: a meta-analysis of randomized clinical trials

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Introduction. One of the most commonly used hypnotics is propofol, which is well known to non-anaesthesiologists because of its white colour and the broad public interest due to Michael Jackson’s death. Propofol is widely used in different settings because of its characteristics: fast induction, rapid elimination, short duration of action, smooth recovery from anaesthesia, few adverse effects, and no teratogenic effects, characteristics that undoubtedly contributed to its popularity. However, its effect on survival is unknown, with meta-analyses reporting an increased mortality in cardiac surgical patients receiving a propofol-based total in-
travenous anaesthesia. Furthermore, the possibility of infections and the “propofol syndrome” have suggested that this drug might be dangerous. We decided to carry out a meta-analysis of all randomized controlled studies ever performed on propofol versus any comparator in any clinical setting.

**Methods.** Pertinent studies were independently searched in BioMedCentral, PubMed, Embase, and the Cochrane Central Register of clinical trials by expert investigators. The following inclusion criteria were used: random allocation to treatment and comparison between propofol and any comparator in any clinical setting. Computations were performed with Stata (release 11, College Station, TX) and SAS 2002-08 program (release 9.2, SAS Institute, Inc, Cary, NC). Outcomes from individual studies were analysed to compute individual and pooled risk ratio (RR) with pertinent 95% confidence interval (CI), by means of inverse variance method and with a fixed-effect model.

**Results.** One hundred and thirty-three studies randomizing 16,026 patients were included. No difference in mortality between patients receiving propofol (335/7,758 [4.30%]) versus any comparator (324/8,268 [4.0%]) were observed in the overall population (RR 1.04, [95% CI 0.92 to 1.18], \( p = 0.5 \)) and in several subanalyses.

**Discussion.** In spite of theoretical concerns, propofol has no detrimental effect on survival according to the largest meta-analysis of randomized controlled trials ever performed on this hypnotic drug.

**P-10**

Estimating plasma oncotic pressure and its relationship with early morbidity in postoperative cardiac surgery: preliminary study

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**Introduction.** The stress caused by cardiac surgery provokes an increase of cytokines that alter the functioning of vascular endothelium and produces capillary leak into the interstitial space. It is associated with increased postoperative morbidity and mortality. The balance between plasma hydrostatic and colloid osmotic pressures is the key to maintaining water distribution in the interstitial and extravascular spaces. Different methods for calculating these pressures have been developed without a clear superiority of one over the others. However, the Landis-Pappenheimer equation shows a better correlation in critical patients. The objective of this study was to estimate the peri-operative colloid osmotic pressure (COP) through the use of Landis-Pappenheimer formula and to find out if it is related to the development of complications. We present the preliminary analysis of the first 20 enrolled patients.

**Methods.** This was a prospective cohort study in patients undergoing any kind of cardiac surgery not meeting any of the exclusion criteria such as renal, intestinal or hepatic disease, gammopathies, apart from malnutrition.

**Results.** The pre-operative COP was 30.50 mmHg, a typical deviation of 8.63 producing a significant statistical reduction \( (p < 0.0001) \) of the COP of 43% in the immediate postoperative period. There was no improvement of this value measured 48 h after surgery. We did not find significant differences between a decrease of COP and
the development of complications after 48 h. The most frequent observed complication was SIRS defined by the ACCP/SCCM [3] criteria with an incidence of 30% in our series, and we did not find significant statistical differences in the COP values of the SIRS patients in the first 48 h compared to the rest of the patients. However, in our sample, we observed that all patients with COP over 18.6 mmHg after 48 h did not have SIRS criteria. After the first 48 h, we observed an average weight gain of 2.5 kg (standard deviation of 2.2 kg). With the available data, we did not find any relationship between the weight gain and the PCO decrease after 48 h and the development of complications.

Discussion. The incidence of SIRS in our analysis is similar to that found by other authors. The Landis-Pappenheimer formula for pre-operative COP does not predict the development of complications, nor did we find a relationship between the COP decrease and the development of complications after 48 h, but it seems that COP values over 18.5 mmHg after 48 h can predict that the patient will not have inflammatory complications according to the ACCP/SCCM criteria. The fluid overload increased the weight by an average of 2.5 kg after 48 h, without any relationship with complications.

References

P-11
Association between red blood cell storage duration and clinical outcome in patients undergoing off-pump coronary artery bypass graft surgery

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Introduction. Prolonged storage of red blood cells (RBCs) leads to fundamental changes in both the RBCs and the storage medium. We retrospectively evaluated the relationship between the RBC age and in-hospital and long-term postoperative outcomes in patients undergoing off-pump coronary artery bypass surgery (OPCAB).

Methods. The electronic medical records of 1,072 OPCAB patients were retrospectively reviewed and information on the transfused RBCs and clinical data were collected. The effects of RBC’s age (mean age, oldest age of transfused RBCs, any RBCs older than 14 days) on various in-hospital postoperative complications and long-term major adverse cardiovascular and cerebral events (MACCEs) over a mean follow-up of 31 months were investigated using multivariate analysis. Correlations between RBCs age and duration of intubation, intensive care unit, or hospital stay, and base excess at the first postoperative morning were also analysed.

Results. After adjusting for confounders such as total number and oldest age of transfused RBCs, hypertension, intra-aortic balloon pump, diabetes mellitus, and body mass index, there was no relationship between the RBC’s age and in-hospital and long-term clinical outcomes except for postoperative wound complications. Thus, additional adjusted model for wound complications was constructed using the oldest age of transfused RBCs as quartile. There was a significant linear trend between the oldest age quartiles of transfused RBCs and postopera-
tive wound complications (quartile 1 vs. 2, 3 and 4: OR, 8.92, 12.01 and 13.79, respectively; \( p \) for trend = 0.009). The oldest transfused RBCs showed significant relationships with a first postoperative day negative base excess (\( p = 0.021 \), postoperative wound complications (\( p = 0.001 \)), and length of hospital stay (\( p = 0.008 \)).

**Discussion.** In patients undergoing OP-CAB, the oldest age of transfused RBCs was associated with a postoperative negative base excess, increased wound complications, and a longer hospital stay, but not with the other in-hospital outcomes or long-term MACCEs.

**References**


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**Poster Session – Mitral Valve and Vascular**

**P-12**

**Anaesthesia management for MitraClip device implantation: a case series at National Heart Centre, Singapore**

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**Introduction.** Percutaneous MitraClip implantation has been demonstrated as an alternative procedure in high-risk patients with symptomatic severe mitral regurgitation (MR) who are not suitable (or) denied mitral valve repair/replacement due to excessive comorbidity. The MitraClip implantation was performed under general anaesthesia and with 3-dimensional transoesophageal echocardiography (TOE) and fluoroscopic guidance.

**Methods.** Peri-operative patient data were extracted from the electronic and paper medical records of 32 patients who underwent MitraClip implantations.

**Results.** Thirteen MitraClip implantations were performed in the catheterization laboratory; the remaining 19 were performed in the hybrid operating theatre. In 2 patients, the procedure was aborted, in one due to migration of the Chiari network into the left atrium, and in the other, the leaflets and chords of the mitral valve tore during clipping resulting in consideration for open surgery. In the remaining 30 patients, MitraClip was implanted and the patients showed acute reduction of severe MR to mild-moderate MR. All patients had invasive blood pressure monitoring, and the initial 6 patients had central venous catheterization prior to the procedure. Intravenous heparin was administered after the guiding catheter was introduced through the inter-atrial septum, and activated clotting time was maintained beyond 250 sec throughout the procedure. Protamine was administered at the end of the procedure. All patients were monitored in the ICU after the procedure.

**Discussion.** Percutaneous MitraClip implantation is a feasible alternative in high-risk patients with symptomatic severe MR. Anaesthesia management requirements are similar to open surgical mitral valve repair or replacement. TOE plays a vital role during the MitraClip implantation.

**References**


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**P-13**

**Minimally invasive mitral valve surgery: the largest Russian experience**

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**Introduction.** It is believed that minimally invasive mitral valve surgery (MIMVS) has
multiple benefits as compared to median sternotomy. In Russia, little is known about clinical implications of MIMVS due to lack of experience.

**Methods.** We retrospectively analysed the clinical course of 146 patients operated with MIMVS (75) or median sternotomy (71). Peri-operative characteristics and complication rates were studied. ANOVA, logistic regression, chi-squared or Fisher’s exact tests were used for the analysis. Data are median (25; 75 percentile) or number (%). \( p < 0.05 \) was considered statistically significant.

**Results.** MIMVS patients were younger than those operated with sternotomy (\( p = 0.01 \)). No other differences in patients’ baseline characteristics were observed. Bypass times were 180 (139; 224) and 84 (69; 117) min in the MIMVS and sternotomy groups, respectively, \( p < 0.01 \). Aortic cross-clamping times were 111 (87; 145) and 62 (49; 81) min in the two groups. Heart failure (HF) occurred in 17 (22.7%) and 7 (9.9%) cases in MIMVS and sternotomy groups, respectively, \( p = 0.06 \). Odds ratio (95% CI) for HF associated with MIMVS was 2.7 (1.1-6.9), \( p = 0.03 \). Respiratory failure occurred in 6 (8%) cases in the MIMVS and was not observed in the sternotomy group, \( p = 0.03 \). Re-exploration for bleeding was required in 4 (5.3%) and 3 (4.2%) cases in the MIMVS and sternotomy groups. No infection complications occurred in either group. Two (2.7%) patients died in the MIMVS group and none in the sternotomy group, \( p = 0.50 \). Hospitalization times did not differ between the groups.

**Discussion.** Our experience with MIMVS started in 2011 and at the moment it is the largest in Russia. Our data suggest that MIMVS is inferior to sternotomy in terms of cardiovascular and respiratory complications. The former might be attributed to the longer ischaemic period as compared to sternotomy, while the latter may be due to one-lung ventilation used with MIMVS. Sparse bleeding data and absence of infection cases do not permit conclusions on these matters. As the cohort matures data on long-term outcomes will become available.

**P-14**

**Assessment of the mitral ring geometry after MitraClip procedure using Real Time 3D transoesophageal echocardiography**

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**Introduction.** MitraClip procedure is a new treatment option for high risk patients with severe mitral regurgitation. In contrast to surgical mitral valve repair, no annuloplasty ring is inserted during the procedure. The aim of our study was to examine the change in mitral annulus area after implantation of a MitraClip with the help of Real Time 3D.

**Methods.** After induction of general anaesthesia, a 3D TOE probe (iE 33, Philips Amsterdam, The Netherlands) was inserted and a comprehensive 2D examination was performed. In addition, a full volume dataset was recorded. With the help of a special software (Qlab®, Philips, Netherlands), the mitral annulus area and the latero-medial distance were measured pre- and post MitraClip insertion. Values are expressed as mean with standard deviation.

**Results.** Twenty-three patients with secondary mitral regurgitation were included. The mean mitral annulus area post-interventionally was only slightly reduced (12.9 cm² ± 2.8 cm² pre- vs. 12.1 cm² ± 2.7 cm² post). In addition, the latero-medial diameter changed only minimally (4.5 cm ± 0.5 cm and 4.4 cm ± 0.5 cm). In 9/23 patients, a minimal increase in latero-medial diameter (4.28 cm ± 0.18 cm to 4.69 cm ± 0.43 cm) was observed, which was associated with an increase in annulus area (11.75 cm² ± 0.54 cm² to 12.6 cm² ± 0.27 cm²) in 4 patients.

**Discussion.** Our data show that the mitral ring geometry is not subject to significant changes after MitraClip implantation in secondary mitral regurgitation, which is in contrast to the study of Schmidt et al., who found a significant change in mitral annulus area.
References

P-15
Anaesthetic management for transapical off-pump implantation of artificial chordae to correct mitral regurgitation

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**Introduction.** Transapical implantation of NeoChord is an emergent beating heart technique for correction of mitral regurgitation through minimal invasive left mini-thoracotomy. The purpose of this study was to evaluate the peri-operative management of patients undergoing this procedure.

**Methods.** This was an observational bio-ethics committee approved prospective study. From December 2011 to March 2014, 41 patients underwent mitral valve repair with the NeoChord system in our institution. Balanced anaesthesia with fentanyl-propofol-sevoflurane was used in all cases. We attempted to keep the patients’ core temperature above 36°C with warming blankets and warm infusion fluids. A 2D and 3D TOE was used in all patients to navigate the NeoChord deployment instrument to the posterior mitral valve leaflet. Following effective leaflet capture artificial chordae were deployed. Optimal placement of artificial chordae was evaluated by placing them under tension and observing significant contribution to MR reduction. A cell saver was used in all cases. Following surgery all patients were transferred to the ICU.

**Results.** Mean age of the patients was 59 ± 12 yr (range 33-84), male/female ratio 24/17. Most patients had severe mitral regurgitation (grade IV – 24%, grade III – 68%). The average pre-operative EuroSCORE II was 1.1 ± 0.6% (range 0.43-3.14). Mean duration of the procedure was 129 ± 30 min. Average reduction of mitral regurgitation was from pre-procedural grade 3.3 ± 0.4 to 0.3 ± 0.5 immediately following the procedure. One patient was converted to conventional mitral valve repair due to failure to effectively deploy NeoChords. All patients underwent an uneventful postoperative course. The average time to extubation was 4.4 ± 2.3 h and the average length of ICU stay 2 ± 4.6 days. Blood products were used in 4 patients (9.7%) (including one patient who was converted to conventional MV repair).

**Discussion.** Two dimensional and three dimensional TOE plays a vital role during the NeoChord implantation. Anaesthesia for transapical NeoChord implantation could be performed safely under beating-heart conditions, with short procedural time and minimal peri-operative patient morbidity.

P-16
Regional anaesthesia in patients undergoing carotid surgery: a 5-years single centre experience

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**Introduction.** Carotid endarterectomy is the most effective treatment for reducing the risk of stroke in patients with significant carotid stenosis. Despite several published studies, there is still no consensus about the influence of the anaesthetic technique on the
postoperative outcome after carotid endarterectomy. Moreover, results of randomized trials (GALA trial) and large observational studies are controversial. We therefore decided to report our experience as a major centre of vascular surgery.

Methods. Data of all patients undergoing carotid endarterectomy between January 2009 and December 2013 in our centre were retrospectively reviewed. Anaesthetic and surgical techniques, intra-operative neurological complications and mortality were analysed. Combined deep and superficial cervical plexus block or superficial cervical plexus block were performed according to anaesthesiologist’s choice and patients characteristics (e.g., anticoagulation or dual antiplatelet therapy). Intra-operative remifentanil (0.025-0.05 µg/kg/min) was administered as needed in order to maintain an adequate level of comfort, responsiveness, and cooperation.

Results. A total of 2,271 procedures on 2,085 patients were performed (eversion technique 75.2%, patch closure 24.8%). A Javid shunt was selectively used in 282 (12.4%) cases because of the presence of clinical signs of cerebral ischaemia at clamp test. Regional anaesthesia was practiced in 2,245 (98.9%) interventions, while 259 (1.1%) patients received general anaesthesia. In 7 (0.3%) cases regional anaesthesia was converted to general anaesthesia because of severe agitation (6 patients) and persistence of neurological deterioration after shunt insertion (one patient). No intra-operative deaths were observed.

Discussion. Carotid endarterectomy under regional anaesthesia is safe and associated with a very low rate of conversion to general anaesthesia and intra-operative complications.

Poster Session – Intensive Care

P-17
Cardiac surgery ICU vs general ICU in cardiac surgery patients: influence on early postoperative outcomes

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2 Cardiothoracic Surgery Department
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Introduction. The early postoperative period after cardiac surgery requires high quality critical care to minimize complications, morbidity, and mortality [1]. The aim of our study was to evaluate the early postoperative outcomes of cardiac surgery patients’ recovery in a new designed cardiac surgery ICU (CICU) compared to a general ICU.

Methods. Between May 2012 and December 2013, a total of 684 consecutive cardiac surgery patients were admitted to ICU. From May to December 2012 (period 1), 224 patients received postoperative care in a general ICU staffed by intensivists, and from January to December 2013 (period 2), 460 patients were admitted postoperatively in a newly opened specialized cardiac surgery ICU staffed by intensivists, cardiac anaesthesiists, and cardiac surgeons. The following parameters were compared between the 2 groups retrospectively: Fast track extubation (less than 8 h), re-intubation, respiratory complications necessitating non-invasive ventilation (NIV), pneumonia, septicemia, acute kidney injury (AKI) and re-exploration for bleeding. Statistical analysis was performed using the chi-squared test ($p < 0.05$).

Results. Although period 2 included double the number of patients, the postoperative care of cardiac surgery patients in a specialized cardiac surgery ICU resulted in
more fast track extubations, less respiratory complications necessitating NIV, and less septicaemia incidence, while there was no statistical difference in the incidence of AKI, pneumonia, re-exploration for bleeding, and re-intubation rate (s. Table 1).

Discussion. The number of complex cardiac surgery procedures is increasing. Highly trained medical and nursing staff, a multi-disciplinary approach and implementation of specialized intensive care unit protocols undoubtedly contribute to better early post-operative outcomes [2].

References


Table 1

<table>
<thead>
<tr>
<th></th>
<th>Period 1</th>
<th>Period 2</th>
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</tr>
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<tbody>
<tr>
<td>No pts</td>
<td>224</td>
<td>460</td>
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<tr>
<td>EuroScore II</td>
<td>2.07</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Mortality</td>
<td>3.3%</td>
<td>2.8%</td>
<td></td>
</tr>
<tr>
<td>Fast track</td>
<td>83 (36.7%)</td>
<td>291 (63.3%)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>NIV</td>
<td>55 (24.3%)</td>
<td>50 (10.9%)</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>6 (2.65%)</td>
<td>9 (2%)</td>
<td>0.557</td>
</tr>
<tr>
<td>Septicaemia</td>
<td>13 (5.8%)</td>
<td>11 (2.4%)</td>
<td>0.024</td>
</tr>
<tr>
<td>AKI</td>
<td>38 (16.8%)</td>
<td>71 (15.4)</td>
<td>0.642</td>
</tr>
<tr>
<td>Bleeding</td>
<td>18 (8%)</td>
<td>21 (4.6%)</td>
<td>0.07</td>
</tr>
<tr>
<td>Re-intubation</td>
<td>5 (2.2%)</td>
<td>13 (2.8%)</td>
<td>0.636</td>
</tr>
</tbody>
</table>

P-18 Repatriation of patients from a specialist cardiothoracic intensive care unit (CICU) to a general intensive care unit (GICU)

Kiran Salaunkey, John Friis, Stephen Webb
Papworth Hospital NHS Foundation Trust, Cambridge, UK

Introduction. CICU beds are a scarce resource. Their availability in specialist referral centres facilitates necessary care for patients in need. After initial recovery from cardiothoracic surgery patients sometimes need prolonged intensive care, but they do not necessarily need specialist input and their care can be managed in a GICU. We sought to audit morbidity and mortality of patients who were repatriated to a GICU.

Methods. This was a retrospective study over 18 months. CICU data was obtained from the electronic records of Computer Information system. GICU’s data regarding discharge destination, length of stay and survival was obtained from Intensive care National Audit and Research centre (ICNARC) database. Data was verified by two operators.
Results. The total number of patients repatriated to GICU was 136 over 18 months out of total admissions of 3,605. Mean age was 60.77 yr (SD 18.19). Average stay in CICU was 16.59 days (SD 16.36). Over 75% of patients were transferred to level 3 care. 69% survived to hospital discharge. 78% of survivors went home and 16% went into care. 4% of repatriated patients were readmitted to CICU. Mean duration of stay in GICU prior to discharge was 14.25 days.

Discussion. Repatriation of patients from CICU is potentially favourable for patients as it allows better integration with rehabilitation, domiciliary support and primary care. It causes less disruption to visiting family members. It also helps CICU capacity in specialist centres. With appropriate knowledge skills framework of receiving hospitals, these patients do receive excellent care with intermittent telephonic advice if needed as shown by mortality, bed occupancy and re-admission rates. It is difficult to compare the mortality figures of repatriated patients in a GICU to CICU long stay patients as the patient profiles are arguably different. GICU care is probably more cost effective but this will require further analysis. Finally, the true burden to the community will be ascertained by QALYs post discharge and we needs further study.

P-19
Right ventricle contractility in the early postoperative period after coronary artery bypass grafting with cardiopulmonary bypass

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Introduction. The aim of our research work was to study the contractility of the right ventricle (RV) with regard to its relationship with systemic haemodynamics in patients undergoing coronary artery bypass grafting (CABG) with cardiopulmonary bypass (CPB).

Methods. The study included 25 patients (14 male, 11 female, mean age 58 ± 7 yr) admitted to ICU after CABG with CPB. All patients required inotropic therapy. Patients with previous pathology of the right ventricle or right coronary artery were excluded from the study. Haemodynamic parameters and RV functions were estimated by PiCCO plus-VoLEF system. The obtained data were processed using the classical methods of variation statistics and correlation analysis, as well as non-parametric methods, Mann-Whitney and Fisher’s exact test.

Results. In 10 patients (40%), the need for inotropic agents was associated with the fall in RV contractility (RV ejection fraction (RVEF) < 40%, dP max > 1,200 mmHg/sec), in 8 patients (32%) with isolated left ventricle (LV) dysfunction (RVEF > 40%, dP max < 1,200 mmHg/sec), in 7 patients (28%) with biventricular dysfunction (RVEF < 40%, dP max < 1,200 mmHg/sec). Patients with isolated RV dysfunction required a longer period of inotropic therapy (22.5 [21-23] h) compared with patients with isolated LV failure (10.5 [10-11.5]) h, p < 0.001 and ICU stay (28 [27-29]) h vs. 15.5 [15-16.5] h), respectively, p < 0.001). It was found that the reduced contractility of RV may cause the reduction in stroke volume of LV with normal contractility (dP max > 1,200 mm Hg/sec). The increase of preload in patients with RVEF less than 30% does not improve its function, but leads to an increase in its end-diastolic volume. We found a negative correlation between RVEF and mean pulmonary artery pressure (r = -0.73, p < 0.05). Also we discovered a negative correlation between RVEF and pulmonary vascular resistance (r = -0.95, p < 0.05).

Discussion. RV dysfunction is common after CABG. The clinical course of isolated RV failure is longer than isolated LV dysfunction. After CABG, a fall in RVEF is associated with increase pulmonary vascular resistance.
P-20
Prediction of fluid responsiveness in patients with atrial fibrillation: PEEP-induced increase in central venous pressure vs. passive leg raising

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¹ Yonsei University Health System, Seoul, Republic of Korea
² Kyungpook National University Hospital, Daegu, Republic of Korea

Introduction. Dynamic indices of preload depending on the heart-lung interaction require sinus rhythm and cannot be applied to patients with atrial fibrillation. PEEP-induced increase in central venous pressure (CVP) was shown to be a valid predictor of fluid responsiveness after cardiac surgery in patients with sinus rhythm and was speculated to be of value in patients with rhythms other than sinus. The aim of this study was to assess the predictability of PEEP-induced increase in CVP and passive leg raising (PLR)-induced changes in stroke volume index (SVI) on fluid responsiveness in patients with atrial fibrillation following valvular heart surgery.

Methods. In 33 patients with atrial fibrillation after valvular heart surgery, baseline PEEP was increased to 10 cmH₂O for 5 min, and increase in CVP was assessed. After returning the PEEP to 0 cmH₂O, PLR was performed for 5 min, and changes in SVI obtained from the pulmonary artery catheter connected to continuous cardiac output monitor device were recorded. After that, 300 ml of hydroxyethyl starch 130/0.4 were infused in the supine position for 10-20 min, and haemodynamic variables including SVI were assessed 5 min after completion of fluid challenge. Fluid responders were defined as SVI increase ≥12% derived from the pulmonary artery catheter. To analyse the relationship between the increase in CVP and SVI, Pearson’s correlation analysis was used. To evaluate the predictability of the PEEP-induced increase in CVP and fluid challenge-induced increase in SVI on fluid responsiveness, the area under the receiver operating characteristic curve (AUROC) was used.

Results. Overall, 9 (27%) patients were fluid responders. PEEP-induced increase in CVP did not show any correlation with the changes in SVI after fluid challenge (beta coefficient; -0.05, p = 0.968), whereas changes in SVI after PLR showed significant correlation with the changes in SVI after fluid challenge (beta coefficient; 0.713, p < 0.001). The AUROC of PEEP-induced increase in CVP for fluid responsiveness was 0.649 (95% confidence interval; 0.385-0.913, p = 0.199). The AUROC of changes in SVI after PLR was 0.808 (95% confidence interval; 0.631-0.985, p = 0.008).

Discussion. In contrast to the previous report performed in patients with sinus rhythm, PEEP-induced increase in CVP was not able to predict fluid responsiveness after cardiac surgery in patients with atrial fibrillation. Increase in SVI after PLR seems to be a valid predictor of fluid responsiveness in patients with rhythm other than sinus following cardiac surgery.

P-21
Impact of immediate versus delayed tracheal extubation on length of ICU stay of cardiac surgical patients

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¹ Kasr Al-Ainy Faculty of Medicine, Cairo University, Cairo, Egypt
² Students Hospital, Cairo University, Cairo, Egypt
³ Students Hospital, Cairo University, Cairo, Egypt

Introduction. Ultra-fast track anaesthesia (UFTA) aims at immediate extubation of cardiac surgical patients at the end of the operation. This study compared the effect of UFTA versus continued postoperative mechanical ventilation on the ICU length of stay (LOS).

Methods. Fifty-two elective adult patients were randomly allocated into UFTA and conventional groups by computer-generated random numbers. Redo operations,
pre-operative intubation, uncontrolled diabetes, shock/LVEF < 45%, PASP > 55 mmHg, creatinine clearance < 50 ml/min, haemodynamic instability, or those with concerns of postoperative bleeding were excluded. Pre- and intra-operative management was similar and Logistic EuroSCORE II was calculated for all. Intra-operatively, haemodynamic parameters, urine output, SPO₂, arterial blood gas analysis (ABG), 5-lead ECG, operative-, bypass-, and cross clamp time, and opioid consumption were collected. Postoperatively, patients were compared during their ICU stay (Table 1). Data were analysed by χ²/Fischer exact, unpaired student’s t-test, univariate two-group repeated measures ANOVA with post hoc Dunnett’s test, and Mann-Whitney U tests as appropriate. p < 0.05 was considered significant.

**Results.** Patients were comparable regarding their peri-operative characteristics and EuroSCORE. The ICU LOS was shorter in the UFTA group (57.4 [18.6] vs. 95 [33.6] h, p < 0.001), without increasing postoperative renal, respiratory complications rate or reopening rate.

**Discussion.** UFTA seems to decrease ICU LOS without increasing the rate of postoperative complications.

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variables</strong></td>
</tr>
<tr>
<td>Extubation time (h)</td>
</tr>
<tr>
<td>ICU stay (h)</td>
</tr>
<tr>
<td>VAS (numeric scale)</td>
</tr>
<tr>
<td>ICU morphine (mg)</td>
</tr>
<tr>
<td>Vomiting</td>
</tr>
<tr>
<td>Ischaemia</td>
</tr>
</tbody>
</table>

Values as mean ± SD or n(%)
sulin was given according to dynamic CAPA (Space Glucose Control, BBraun, Germany). BG levels were measured in arterial blood with “ABL – 800 Flex” (“Radiometer”, Denmark) at the following points: surgery start (I); heparin introduction (II); start, middle and end of CPB (III, IV, V); protamine introduction (VI), surgery end (VII). Hyperglycaemia was considered as BG level over 8.3 mmol/l, hypo- less than 4.4 mmol/l. Statistical analysis was performed with SPSS 17.0 for Windows.

**Results.** The incidence of hyper- and hypoglycaemia (% of patients) is presented in Table 1.

**Discussion.** CADA provides better glucose control, than empiric control. Despite higher insulin doses, there were no hypoglycaemia episodes, which make this therapy safer for the patient.

### P-23
**Changing glucose control target and risk of surgical site infection in a South-East Asian population**

**Sophia TH Chew**, **Roderica Ng**, **Weiling Liu**, **Lian Kah T**

1 **Singapore General Hospital**, Singapore, Singapore
2 **Yong Loo Lin School of Medicine**, Singapore, Singapore
3 **National University Health System**, Singapore, Singapore

**Introduction.** Hyperglycaemia is associated with increased morbidity, such as surgical site infection (SSI) and mortality in cardiac surgical patients [1]. There is overriding evidence that glycaemic control improves morbidity and mortality [2]. However, the optimal glucose range in these patients remains controversial. Intensive glucose control can lead to mortality among critically ill adults, due to hypoglycaemia. Therefore, we examined the effect of different glucose target controls on the incidence of SSI in our population of diabetics and non-diabetics undergoing coronary artery bypass grafting (CABG).

**Methods.** Data from 1,442 patients who underwent elective CABG at a tertiary heart institution from 2009 to 2011 was obtained. The first glucose upon arrival in the cardiothoracic intensive care unit was set at 4-8 mmol/l in 2009 and 2010 and 4-10 mmol/l in 2011 as part of a quality improvement initiative. Glucose control was achieved with intravenous insulin infusion with a strict glucose monitoring protocol. Population demographics, medical history, pre-operative risk assessment, intra-operative variables and postoperative outcomes were analysed. SSI was the primary outcome.

**Results.** The majority of patients presenting for CABG were males, Chinese and diabetics. Diabetic patients had significantly higher levels of glucose upon arrival in the intensive care unit. The change in target glucose control did not result in a significant increase in the SSI incidence of non-diabetic patients \((p = 0.615)\). However, for diabetic patients, there was a significant increase in SSI incidence from 2.2% to 6.9% with a less stringent target glucose control \((p = 0.003)\).

**Discussion.** Target blood glucose of \(< 8 \text{ mmol/l} \) was associated with a lower incidence of SSI in diabetic patients present-

<p>| Table 1 |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|</p>
<table>
<thead>
<tr>
<th>STAGES</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>HYPO- (cases)</th>
<th>TOTAL Insulin dose (ED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>0</td>
<td>36</td>
<td>56</td>
<td>64</td>
<td>72</td>
<td>87</td>
<td>80</td>
<td>2</td>
<td>6 ± 1</td>
</tr>
<tr>
<td>Group 2</td>
<td>0</td>
<td>30</td>
<td>0*</td>
<td>10*</td>
<td>10*</td>
<td>0*</td>
<td>0*</td>
<td>0*</td>
<td>15 ± 3*</td>
</tr>
</tbody>
</table>

\*p < 0.05.
ing for elective CABG in the local South-East Asian population.

References

Poster Session - Haemostasis

P-24
Antifibrinolytics are not indicated in the pre-bypass period for first time sternotomy in cardiac patients

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¹ Stanford University School of Medicine, Stanford, CA, USA
² University of Pennsylvania, Philadelphia, PA, USA

Introduction. Antifibrinolytics have been shown to be effective in minimizing fibrinolysis during cardiopulmonary bypass (CPB). Antifibrinolytics are related to serious complications. The intra-operative timing and dosing differs among cardiac surgery centres with a majority starting before surgical incision. We aimed to clarify whether antifibrinolytics are indicated before CPB in first time sternotomy cardiac surgery patients.

Methods. In a prospective, randomized, double-blind study of two groups of 20 pts, group A received epsilon-amino caproic acid (EACA) 10 g iv bolus dose after anaesthesia induction, followed by 1 g/h continuous infusion before CPB, and group B received placebo. In group B, EACA was started after heparinization just before CPB. In both groups, EACA was continued until the end of surgery. Before anaesthesia induction (baseline) and just before heparinization, blood samples for D-dimers and thromboelastography (TEG) measurements were collected.

Results. The mean (± SD) incision to CPB time was 140 ± 63 min in group A, and 165 ± 63 min in group B. From induction to heparinization, pre-CPB D-dimers did not change in group A. D-dimers increased (median) from 266 to 291 ng/ml in group B. MA and EPL median values did not change in either group. There was no statistical difference between the groups in incision to CPB time. D-dimers increased significantly more in group B (p < 0.05)

Discussion. This prospective, randomized study showed that in first-time sternotomy cardiac surgery patients, D-dimers increased significantly in the group where EACA was administered only after heparinization. However, according to the TEG values, the D-dimer increase was not associated with increased fibrinolysis in either group. This implies that there is no clinical indication to start antifibrinolytics in the pre-CPB period in this patient population.

References
P-25
Assessment of the impact of the administration of pre-operative low molecular weight heparin on postoperative bleeding in adult cardiac surgery

Marios Vezyrgiannis, Andrea Kelleher, Simon Davidson, Eleanor Dunnett, Winston Banya
Royal Brompton Hospital, London, UK

Introduction. Following the publication of the NICE guidance CG92 (Jan 2010) on reducing the risk of venous thromboembolism, our institution included low molecular weight heparin given on the evening before cardiac surgery in all adult patients. We investigated the impact of this in elective adult cardiac surgery, on operative (postop) bleeding.

Methods. A total of 410 patients were included over a period of 7 months. 174 received pre-operative enoxaparin before March 2013, and 236 patients after March 2013 did not. Results were analysed by medians and interquartile range. p values were calculated on all parameters.

Results. See Table 1.

Discussion. Our results show that the group that received enoxaparin before surgery bled more postoperatively than the group that did not. They also had higher postoperative heparin concentrations. A higher percentage had to be re-operated to control post op bleeding. Our study is limited by its small size but our results indicate that pre-operative enoxaparin may be associated with increased postoperative bleeding in cardiac surgical patients and warrants further investigation.

References
[1] NICE guidance CG92 (Jan 2010) on reducing the risk of venous thromboembolism. (DVT & PE) for inpatients.

P-26
An assessment of the clinical utility of the PlateletWorks platelet aggregation system in cardiac surgery involving cardiopulmonary bypass

Bruce Cartwright
Royal Prince Alfred Hospital, Sydney, NSW, Australia

Introduction. Impairment of platelet function is a major factor in bleeding after cardiac surgery. This study explored the ability of the PlateletWorks® point of care test at a

<table>
<thead>
<tr>
<th>Variable</th>
<th>Preop enoxaparine administered n = 174</th>
<th>Preop enoxaparine not administered N = 236</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood loss ICU admission</td>
<td>825 (550, 1,375)</td>
<td>800 (500, 1,312.5)</td>
<td>0.41</td>
</tr>
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<td>Blood loss at 6 h</td>
<td>325 (200, 475)</td>
<td>275 (175, 475)</td>
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<tr>
<td>Blood loss at 12 h</td>
<td>500 (330, 800)</td>
<td>450 (275, 700)</td>
<td>0.032</td>
</tr>
<tr>
<td>Plasma, units</td>
<td>4 (3, 8)</td>
<td>4 (3, 7)</td>
<td>0.36</td>
</tr>
<tr>
<td>Red blood cells, units</td>
<td>6 (4, 8)</td>
<td>4 (4, 8)</td>
<td>0.43</td>
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<td>Platelets, units</td>
<td>2 (2, 3)</td>
<td>1 (1, 2)</td>
<td>0.06</td>
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<tr>
<td>PT</td>
<td>14.2 (13.1, 15.3)</td>
<td>14.7 (13.35, 16.05)</td>
<td>0.014</td>
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<td>APTT</td>
<td>32.9 (30.2, 37.1)</td>
<td>32.9 (30.1, 37.4)</td>
<td>0.78</td>
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<tr>
<td>Fibrinogen</td>
<td>1.8 (1.5, 2.25)</td>
<td>1.9 (1.6, 2.2)</td>
<td>0.16</td>
</tr>
<tr>
<td>Heparin</td>
<td>0.11 (0.08, 0.14)</td>
<td>0.10 (0.06, 0.14)</td>
<td>0.013</td>
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<td>PLT</td>
<td>111 (94, 138)</td>
<td>111.5 (92.5, 142)</td>
<td>0.66</td>
</tr>
<tr>
<td>By pass time (min)</td>
<td>102</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>Cross clamp (min)</td>
<td>64</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>Re-operation for bleeding (%)</td>
<td>7.5</td>
<td>5.9</td>
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</table>
single point after protamine administration to predict mediastinal chest tube drainage and platelet transfusion requirement in cardiac surgery involving cardiopulmonary bypass. This point represents the commonest time when clinical decisions about platelet transfusions are made.

**Methods.** Seventy-three elective adult cardiac surgical patients were enrolled. Patients with a documented haemostatic abnormality, heparin allergy or heparin induced thrombocytopenia, and/or patients on clopidogrel within 10 days of surgery were excluded. Surgery, anaesthesia and cardiopulmonary bypass perfusion management were as per current practice at the institution. Anticoagulation management consisted of heparin and protamine for its reversal. In addition to our usual haemostatic tests, 5 minutes following the administration of protamine, assessment of platelet function was performed using the PlateletWorks system, i.e., a baseline platelet count, adenosine diphosphate (ADP) agonist count and collagen agonist count. The functional count was derived by subtraction from baseline. Comparison was also made with the PlateletWorks assessment performed immediately after induction of anaesthesia. Physicians were blinded to the results from the PlateletWorks assessments.

**Results.** There was no relationship with the duration of cardiopulmonary bypass and the level of platelet dysfunction measured by the PlateletWorks agonists (ADP or Collagen) using Pearson’s correlation coefficient. ROC curve analysis of parameters at the primary study point post protamine revealed the functional platelet count by ADP agonism was the best discriminator of the requirement for platelet transfusion (AUC 0.801; sensitivity 71.4% and specificity 93.3%). All post protamine variables consistently had greater specificity than sensitivity. No univariate correlation was found between the PlateletWorks or thromboelastography variables and mediastinal blood loss at 6 or 24 h.

**Discussion.** Bleeding in cardiac surgery relates to many factors such as surgical technique, the patients’ premorbid haemostatic profile and coagulation management. The results support the hypothesis that platelet function assessment by ADP agonism, but not collagen agonism during cardiac surgery predicts platelet transfusion; however, there was no relationship found between univariable haemostatic parameters and postoperative mediastinal blood loss.

**P-27**

**Efficacy of fibrinogen concentrate compared with cryoprecipitate for reversal of the antiplatelet effect of clopidogrel in an in vitro model**

**Bruce Cartwright, Peter Kam, Kenny Yang**

Royal Prince Alfred Hospital, Sydney, NSW, Australia

**Introduction.** The management of dual antiplatelet therapy when patients present for surgical revascularization is a clinical challenge. Approaches include allowing the drug to wear off, platelet transfusion, cryoprecipitate transfusion or desmopressin infusion. Fibrinogen concentrate may have a role to restore altered adenosine diphosphate (ADP) dependent platelet activation, increase glycoprotein fibrinogen binding or increase formation of soluble fibrin as a component of whole blood clot. Our hypothesis was that fibrinogen concentrate would normalize in vitro haemostatic parameters after clopidogrel loading. The effect was compared to two doses of cryoprecipitate.

**Methods.** Platelet aggregation was assessed using Multiplate impedance aggregometry. Rotational thromboelastometry ExTEM and FibTEM assays; and modified thromboelastography ADP-Platelet Mapping assessed viscoelastic properties. Twenty patients presenting for cardiac catheterization, loaded with dual antiplatelet therapy, with a documented ADPtest < 40 U were studied. Whole blood was titrated with the equivalent of five and ten units of cryoprecipitate and the equivalent of 50 mg/kg and 100 mg/
kg of fibrinogen concentrate. Samples were then diluted 40% with normal saline and titrated with the equivalent of ten units of cryoprecipitate and 100 mg/kg of fibrinogen concentrate. The Mann-Whitney U test was used to test the significance of difference between samples.

Results. The principal finding of the study was that fibrinogen supplementation primarily improved assays of fibrin formation. Platelet aggregation response to ADP and TRAP was not improved. Fibrinogen supplementation resulted in supranormal fibrin polymerisation in whole blood and restoration of fibrin polymerisation between 50mg/kg and 100 mg/kg in diluted blood as demonstrated by the ExTEM and FibTEM assays. It also significantly improved the rate of clot formation, represented by the angle in the modified TEG, ADP assay. In contrast, neither cryoprecipitate nor fibrinogen concentrate, at the concentrations used improved the amplitude at 30 minutes in the TEG-ADP assay, the threshold value used in the Target-CABG trial [1] to delineate bleeding risk with clopidogrel. They also produced comparable amplitudes at 30 minutes on the modified TEG assay, despite a two fold difference in fibrinogen supplementation.

Discussion. Further research is required to delineate the role of fibrinogen in the management of patients presenting for surgery on clopidogrel.

References

P-28
High activated clotting time level after cardiopulmonary bypass in paediatric heart surgery does not indicate residual heparin

Tomohiro Yamamoto, Hans-Gerd Wolf, Ehrenfried Schindler
Asklepios Klinik Sankt Augustin, German Paediatric Heart Centre Sankt Augustin, Sankt Augustin, Germany

Introduction. 300-400 IU/kg heparin is given before cardiopulmonary bypass (CPB) and its effect is measured with the active clotting time (ACT). However, the ACT during CPB poorly reflects the anticoagulant status in paediatric patients [1]. 1:1-1.5 protamine is given after CPB and heparin neutralization is also evaluated with the ACT. However, the precise dose of protamine required to neutralize heparin after CPB in paediatric heart surgery is still controversial.

Methods. Twenty-seven children (< 10 kg) were included in this study. 400 IU/kg heparin was administered before CPB. No further heparin apart from 2000 IU in the pump priming volume was administered until neutralization by 1:1 protamine. Neither blood products nor other coagulation factors were administered. The ACT levels and the levels of coagulation factors, thrombin-antithrombin complex (TAT) and prothrombin fragment 1+2 (F1+2) in the blood were compared with one another prior to, during, after CPB and after 1:1 protamine following modified ultrafiltration (MUF). Heparin concentration in the blood was measured by anti-Xa assay. Statistical significance was determined as $p < 0.01$ using the student’s paired t-test.

Results. The ACT levels seemed to alter parallel with the heparin concentration in the blood after heparin administration. However, correlation coefficients showed little correlation between them. The mean duration of CPB was 68.3 ± 6.8 min. The ACT levels after 1:1 protamine still remained significantly higher (177.14 ± 5.43 sec) compared to those before heparin administration (128.89
± 3.09 sec), although there was no residual heparin in the blood after 1:1 protamine. The levels of coagulation factors in the blood were significantly lower. On the other hand, those of TAT and F1+2 were significantly higher after 1:1 protamine.

**Discussion.** Many anaesthesiologists and surgeons believe the cause of the higher ACT after protamine administration following CPB to be due to residual heparin and requires additional protamine, although its negative effects on the coagulation system have been well-known for a long time. However, a high ACT level after CPB is due to the low levels of the coagulation factors in the blood, which are caused by their consumption as well as haemodilution during CPB.

**References**


**P-29**

**Analysis of transfusion requirements in cardiac surgery patients using a method of recursive partitioning**

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**Introduction.** The recursive partitioning analysis (RPA) is a statistical methodology that allows definition of risk factors related to a dependent variable. The aim of this study was to analyse the variables that allow us to forecast transfusion requirements in patient candidates for heart surgery using this new statistical method.

**Methods.** We made a prospective study of 2,122 adult patients treated with cardiac surgery consecutively at a tertiary hospital during the period 2009-2013. Age and sex of patients were evaluated, as well as body mass index, haemoglobin (Hb) and pre-operative creatinine clearance, NYHA grade, EuroSCORE, type of surgery performed, priority of surgery and history of previous surgery. Transfusion frequency (FT), defined as the administration of at least one blood product during the peri-operative period (from 2 days prior to 10 days after surgery) was evaluated.

**Results.** The percentage of patients receiving transfusions was: red blood cells 69.5%, plasma 11.1%, and platelets 11.6%. All measured variables were significantly associated with performing transfusions during the peri-operative period in both univariate and multivariate analysis. The results obtained using the RPA method allowed us to define four categories of patients according to frequency of transfusions depending on Hb levels, creatinine clearance and the age of patients: group I patients Hb > 135 g/l and age ≤ 66 yr, 39.5% FT; group II, patients with Hb > 135 g/l, and age > 66 yr or patients with Hb 120-135 g/l and creatinine clearance > 76.13 ml/min/m², 58.4% FT; group III, patients with Hb 120-135 g/l and creatinine clearance ≤ 76.13 l/min/m², 83.4% FT; group IV, patients with Hb ≤ 120 g/l, 93.1% FT. The predictive ability of the classification was 73.9%.

**Discussion.** Regarding other more complex classification methods, the determination of Hb, pre-operative creatinine clearance and age of patients enabled a categorization of patients who underwent cardiac surgery with relation to their transfusion needs [1, 2].

**References**


P-30
Cold agglutinins and cardiac surgery: a national survey of cardiac anaesthetic practice in the UK

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Introduction. The risk of cold agglutinins (CAs) for cardiac surgical patients is of haemolysis. Due to variation in advice and absence of any guidelines, we conducted a UK-wide survey regarding anaesthesia practice in patients with cold autoantibodies presenting for cardiac surgery [1].

Methods. Our electronic survey was approved by the Committee of the Association of Cardiothoracic Anaesthetists (ACTA) and sent to all ACTA members. The questions related to CA were: Awareness of cold agglutination syndrome; Existence of any protocol in the institute; Incidence of the problem in the practice; General action taken; Investigations ordered; Pre-operative management with high titre CAs; Alteration of cardiopulmonary bypass (CPB); Surgery requiring deep hypothermic cardiac arrest (DHCA).

Results. We received 40 responses out of approximately 200 (response rate of 20%). 35 were aware of the cold agglutination syndrome. 37 did not have any hospital policy. 60% have less than 5 cases/year. 85% would refer to haematologists. 35% and 27% preferred antibody titre and thermal amplitude testing. Referring to haematologist’s for pre-operative management, 70% advised using warm cardioplegia. On the last question with DHCA, 42% would proceed with caution.

Discussion. Our national survey shows there is confusion over appropriate management of these patients. Most cardiac anaesthetists seeing between 1 and 5 cases per year, have no hospital policy, and the most popular option is to contact a haematologist. Some anaesthetists are willing to cancel surgery and others happy to go ahead with deep hypothermia even in the face of high antibody titres. A literature review does not show any consensus on the best plan of action. Our results prompted the development of local guidance (Royal Victoria Hospital, Belfast, UK).

References

Posters Session – Cardiac Anaesthesia & Cerebral Monitoring

P-31
Can pre-operative cognitive impairment predict delirium in patients undergoing cardiac surgery?

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Introduction. Delirium is a common and serious complication of cardiac surgery and numerous studies have confirmed this with incidences of delirium varying from 3% to 47% [1]. It results in higher levels of patient morbidity and mortality, functional and cognitive decline as well as increased health care expenditure [2]. The aim of this study was to determine the incidence and prospective risk factors (e.g., age and pre-operative cognitive function) for postoperative delirium.

Methods. A single-centre cohort of 40 patients undergoing elective cardiac surgery, were prospectively studied. Participants’ pre-operative cognitive function was assessed using the Mini Mental State Examination. Other demographic and clinical variables were obtained from medical notes. Patients were followed up for 5 consecutive days post-operatively and delirium incidence and duration was documented using the Confusion Assessment Method.
Results. The incidence of postoperative delirium was 45%. Delirium lasted on average 2.05 days (measuring only those patients who developed delirium, S.D = 1.468) and 1.05 days for all patients (median: 1, first quartile 0.5, third interquartile: 3) and was most common on post-operative day 1. Average age of delirious patients was significantly higher than non-delirious patients (71.3 vs. 63.7 yr). Average MMSE score was significantly lower in the delirious patients vs. non-delirious (27.3/30 vs. 28.6/30). Pearson's chi squared test revealed a significant association between MMSE scores and incidence of delirium (Pearson-chi score = 4.639, df = 1, p < 0.05), suggesting cognitive functioning correlates not only with incidence but duration or severity of delirium. A Receiver Operator Characteristics curve demonstrated use of MMSE in delirium as moderately effective as a diagnostic utility (area under the curve 0.693).

Discussion. Our current analysis suggests advancing age and MMSE score are predictive factors for delirium after cardiac surgery. Our study and other examples in the literature suggest a link between pre-operative cognitive functioning and delirium [3]. Because of the limitations of this study, some ground must be covered before we will fully understand the role of pre-operative cognitive impairment in the development of delirium. However, cognitive function can be assessed easily in the hospital setting and it may be advisable to implement cognitive function screening in future practice. Regular screening will allow clinicians to identify, observe and target at risk patients more closely and in some cases permit the prophylactic use of anti-delirium medication to reduce the potentially hazardous complications of delirium.

References

P-32
Jugular bulb fibreoptic oxygenation: is it necessary in cardiac anaesthesia?

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Introduction. Measurement of oxygen saturation in jugular bulb (SjbO2) allows estimation of brain oxygen delivery/consumption ratio. The fibreoptic monitoring of SjbO2 provides continuous measurement “in vivo”. The aim of the study was to estimate efficiency and safety of fibreoptic monitoring of SjbO2 in pts undergoing cardiac and aortic arch surgery with cardiopulmonary bypass (CPB).

Methods. After the local Ethic Committee approval and informed consent, 48 pts underwent cardiac and aortic arch surgery with CPB. We studied safety and efficiency of fibreoptic SjbO2 measurement during anaesthesia and surgery. The fibreoptic catheter was placed by retrograde manner into the jugular bulb through a 5F introducer. We used “Explorer” or “Vigilance” oximeters and fibreoptic catheter 4F (Edslab Dual-Lumen Oximetry Catheter, 94-015H-4F) 25 cm (Baxter). We used simple linear regression analysis to compare data of the applied methods of brain oxygenation measurement.

Results. There were no complications of this method. We have found high accuracy of the method; correlation coefficient was 0.82 in comparison with standard “in vitro” method of oximetry performed on ABL 800 Flex (Radiometer). We have found most significant changes of SjbO2 during the start of
CPB, cooling, rewarming and CPB weaning. During CPB start and cooling, SjbO2 increased and stayed high through this period. In case of deep hypothermia (T nasoph 13.5 ± 0.5 °C), SjbO2 increased and was similar to arterial SO2, indicating decrease in brain metabolism. Rewarming was always accompanied by a decreasing SjbO2 and in some cases critically low. We did not find a correlation between jugular bulb fibreoptic oxygenation and transcranial oximetry (r = 0.249).

Discussion. Fibreoptic monitoring of SjbO2 is a safe and accurate method, continuously showing changes of oxygen delivery/consumption ratio in the brain. It allows early recognition of mismatch between brain O2 delivery and consumption, which may prompt some changes in anaesthesia management. Also blood samples from the jugular bulb allow detailed estimation of brain metabolism in cardiac pts during anaesthesia and surgery. Use of fibreoptic brain oxygenation continuous monitoring allowed us to avoid critical events and prevent brain injury during cardiac surgery and CPB.

P-33
Novel dynamic near-infrared spectroscopy parameter monitoring during on-pump cardiac surgery

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Introduction. The commercially available cerebral oximeters might have some limitations in accurate judgement of sufficient cerebral oxygen supply. Continuous monitoring of oxyhaemoglobin (HbO2) and deoxyhaemoglobin (HbR) concentrations and their cross-correlation can better indicate perturbations in regional oxygen saturation (rSAT) of the cerebral cortex. A prospective observational study was designed to investigate its dynamics during on-pump cardiac surgery and to reveal its association with rSAT and S100B protein levels.

Methods. Subjects aged ≥ 45 yr undergoing elective surgery with cardio-pulmonary bypass (CPB) were eligible for inclusion. Twenty adult patients with a mean age of 67 ± 9 yr were enrolled in the trial. Based on quality control of data, 14 patients (7 female and 7 male, 66 ± 9 yr) were included into this study. Anaesthesia was performed with a standardized technique and monitoring. We used cwNIRS-LEDi imager, a 3 wavelength, 16 channel device. Near-infrared spectroscopy (NIRS) signals were registered at a sampling rate of 3 Hz during the operation. The raw NIRS data were resampled and screened with continuous wavelet transform algorithm for excluding channels with poor optical coupling. The HbO2/HbR compartmental cross correlation coefficient (rHb) was calculated by Pearson’s correlation within a running window of 6 sec. rHb values were averaged in 15 minutes blocks of ‘steady-state’ in pre-CPB, CPB and post-CPB periods, respectively. The percent change in the SD of rHb on CPB relative to its pre-CPB value (ΔSDrHb) was also determined. Plasma level of S100B protein, indicative of glial damage, was measured prior to induction of anaesthesia and 6 h, 24 h and 48 h postoperatively.

Results. The mean value of rHb changed significantly during CPB when pre- and post-CPB periods were compared (rHb: 0.19 ± 0.38, −0.44 ± 0.30, −0.36 ± 0.22, p < 0.001, respectively) with a positive linear correlation between mean arterial blood pressure and rHb during CPB (r² = 0.30, p = 0.044). rHb did not correlate with changes in haemoglobin levels, core temperature, metabolic factors (pH, PO2, PCO2) and rSAT during the operation. There was no correlation between on-CPB value of rSAT, rHb and S100B, however, ΔSDrHb correlated with S100B levels at 24 h, 48 h (r² = 0.53, p = 0.017, and
Discussion. We confirmed that rHb can dynamically follow the alterations in regional cerebrocortical tissue oxygenation and its derivative, ΔSDrHb, appeared to be linked to postoperative elevated S100B levels.

P-34
Effects of near-infrared spectroscopy on cognitive dysfunction for patients undergoing elective coronary surgery

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Introduction. Postoperative cognitive dysfunction (POCD) is a common phenomenon after cardiac surgery. Near-InfraRed Spectroscopy is often used in cardiac surgery to monitor adequacy of cerebral perfusion. There are conflicting results for incidence of POCD and decrements in cerebral saturation [1, 2]. The aim of the study was to compare the incidence of POCD for patients under conventional monitoring or under NIRS during elective coronary artery bypass graft (CABG) surgery.

Methods. After Ethical Committee approval patients older than 60 yr undergoing CABG surgery were included in this randomized study. They were randomly assigned into two groups, the first (GI) was treated under conventional monitoring modalities (blood pressures, SpO2, etc.), whereas the second (GII) was handled according to NIRS values [3]. Neurocognitive function was assessed pre-operatively, at first week and third month postoperatively with a psychometric test battery. POCD is defined as a decline for more than 1 SD in more than two tests. Statistical analysis was performed with chi-squared test or Fisher’s exact test for categoric variables and unpaired t-test or Mann-Whitney U test for continuous variables.

Results. Thirty-eight patients were assessed for the study (GI n = 21, GII n = 17). Demographic and operative data were similar between groups. Psychometric tests results showed no significance at any time of the study. Nine patients (43%) in GI and 7 (41%) in GII developed early POCD (p > 0.05). At the third month 10 patients (47%) in GI and 4 patients in GII (24%) showed late POCD (p > 0.05). The 4 patients in the latter group had a significant decrement in the peri-operative course despite adequate treatment.

Discussion. Early POCD is common after coronary surgery. Although the incidence of early POCD was similar between conventional and NIRS guided therapy, persistent cerebral desaturation seems to be accompanied with late POCD. NIRS may be a promising modality of monitoring for this topic.

References
A goal-oriented therapy protocol based on cerebral regional oxygen saturation may improve neurologic outcome in high-risk cardiac surgery patients

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Introduction. NIRS (Near InfraRed Spectroscopy) is a neuro-monitoring tool that provides cerebral regional oxygen saturation (rSO2) [1]. We hypothesized that a goal-directed therapy (GDT) protocol based on cerebral rSO2 changes would be associated with reduced incidence of postoperative neurologic complications (PNC) in high-risk cardiac surgery (CS) patients.

Methods. Eighty-five high-risk CS patients (mean age 71 ± 9) were prospectively monitored with NIRS (cNIRS group) during CS. The primary endpoint (i.e., PNC) was defined as the occurrence of at least one of the following: stroke, stupor, coma, cognitive function deterioration, memory deficit, and seizures. The GDT protocol was based on specific interventions aimed at improving peri-operative cerebral blood flow and rSO2, such as 1) increasing the arterial oxygen content either with red blood cell transfusions (when appropriate) or high inspired oxygen fraction; 2) raising arterial blood pressure and cardiac output by administering fluids, inotropic drugs and vasoconstrictors; 3) optimizing roller or centrifugal pump flow rates during cardiopulmonary bypass. cNIRS group was compared with 100 patients (mean age 73 ± 6 yr) who were not monitored with cerebral NIRS (N-cNIRS group) and who were selected from our electronic patient data management system using a propensity score-matched analysis. In the cNIRS group, neuron-specific enolase (NSE) and S-100B protein were collected at different times before, during and after CS.

Results. PNC were 21% and 35% for cNIRS and N-cNIRS group, respectively (p < 0.05). Compared to cNIRS group, N-cNIRS group had longer times of mechanical ventilation (MV) (150.3 ± 274.9 vs. 29.9 ± 65 h, p = 0.02) and length of stay in the intensive care unit (ICU) (13.3 ± 14.7 vs. 3.4 ± 3.9 days, p = 0.01). Pre-operative cerebral rSO2 values were lower in patients who had PNC than in those with good neurologic outcome (59.6 ± 7.6 vs. 63.4 ± 7.8%, p = 0.04). Inverse correlations were found between the nadir cerebral rSO2 and the duration of MV (r = –0.31, p = 0.04) and length of stay in the ICU (r = –0.43, p = 0.003). NSE peaked significantly later in time (i.e., only at 6 h after CS) in patients with PNC (p = 0.02). S-100B protein did not show significant changes after CS in both the groups.

Discussion. Serum levels of NSE and S-100B protein were not predictors of PNC. Conversely, the higher the pre-operative cerebral rSO2 the better the neurologic outcome. In our cohort of CS patients, interventions aimed at improving peri-operative cerebral rSO2 had a positive impact on the incidence of PNC. A GDT protocol guided by cerebral rSO2 changes may decrease PNC in high-risk CS patients.

References
P-36
Cardiovascular instability following phenytoin administration in cardiac intensive care

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Introduction. Seizures following cardiac surgery and cardiac arrest are linked to significant morbidity and mortality. Phenytoin is regularly used in management, however its side effect profile means there are concerns regarding safe use in the cardiac intensive care unit (CICU) [1].

Methods. We retrospectively reviewed minute by minute haemodynamic and inotrope data of patients loaded with phenytoin in a mixed CICU from Jan 2012 to Mar 2014. Unit protocol for infusion rate was < 50 mg/min. Comparison was made using paired t-test or Wilcoxon rank sum test.

Results. Thirty-seven patients, age 62 yr (57.4-66.7) were loaded with phenytoin 17.47 mg/kg (16.44-18.49) (mean, 95% CI). Following commencement of phenytoin there was a 12.6 mmHg (8.3-16.8) drop in MAP by 50 mins. In this time, one (2.7%) patient had a cardiac arrest. In the 6 h following phenytoin, mean infusion rates of adrenaline ($p = 0.042$), noradrenaline ($p = 0.009$), and dobutamine ($p = 0.038$) all increased. Eleven (29.7%) patients required new inotropes to be started (Table 1).

Discussion. This data suggests that instability following phenytoin administration is common with patients requiring more cardiovascular support. Phenytoin should be administered cautiously in CICU with alternative agents considered and a slower infusion rate used.

References

Table 1: Mean arterial pressure (MAP) during phenytoin administration (mmHg), $n = 37$

* = Start of Infusion, # = max pressure drop ($p < 0.001$)
P-37
Adherence to the local guidelines for the management of delirium in a cardiothoracic intensive care unit: a clinical audit

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Introduction. Postoperative delirium is still poorly recognized in clinical practice. Prevention and proper recognition of this condition could improve patients’ outcome and reduce the hospital stay [1].

Methods. We performed a prospective observational clinical audit over a 12 weeks period. The audit was aimed at evaluating the adherence to the local guidelines on delirium management. The incidence of delirium was also assessed. 207 eligible patients were admitted to the ICU following cardiac surgery. 150 of these who stayed in the ICU at least 24 h were included in the analysis. Compliance by the nursing staff with undertaking the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) was audited. The same assessment was also undertaken daily by the auditors.

Results. Delirium developed in 17% (25/150) of these patients admitted to the ICU after cardiac surgery. 15 patients (60%) had signs of hyperactive delirium, 4 (16%) of hypoactive delirium and 6 (24%) had signs of both hypo- and hyperactivity. According to the local guidelines, the CAM-ICU screening should be performed and documented daily by the nursing staff. However, this was observed in only 15% of patients (22/150). Only hyperactive delirium and the hyperactive phase of mixed delirium were treated pharmacologically. Haloperidol was used as the first-line drug in 80% of patients. Patients who developed delirium were significantly more likely to be older (> 65 yr) and rather more were female. Delirious patients had a significantly longer length of stay in the ICU. The mean duration of delirium was 2.5 days. The most frequently performed surgical procedure in patients who developed delirium was CABG plus valve surgery (48%).

Discussion. High adherence to the local guidelines was noticed regarding the pharmacological treatment of delirium. However, compliance by nursing staff for undertaking the CAM-ICU assessment was low. Periodic re-training of the nursing and medical staff may be of benefit to raise awareness of the condition and to develop novel strategies for its prevention and management.

References

Poster Session – Cardiac Anaesthesia & Aortic Valve

P-38
Pre-operative screening for aortic atherosclerosis with modified transoesophageal echocardiography in transcatheter aortic valve implantation

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Introduction. Transcatheter aortic valve replacement (TAVR) has emerged as a treatment for severe aortic stenosis in selected patients. In the PARTNER trial, however, TAVR was associated with an increased risk of peri-operative cerebral embolic events, believed to be caused by the dislodgement of aortic atherosclerosis. The distal ascending aorta, aortic arch and its branches can be accurately visualized with modified tran-
soesophageal echocardiography (A-view) through the placement of a fluid-filled balloon in the trachea (area under curve: 0.89; 95% CI: 0.86-0.92). We aimed to study the prevalence of aortic atherosclerosis visualized with A-view in patients who underwent TAVR.

Methods. A single-centre prospective cohort study was made, which included consecutive TAVR patients operated between 02-2011 and 09-2012. A-view was included in a pre-operative diagnostic protocol. Presence of atherosclerosis was recorded for seven segments of the thoracic aorta. Severity of atherosclerosis was defined according to the Katz-criteria. We also differentiated soft from calcified plaques.

Results. Included were 58 patients with a mean age of 80.7 ± 5.9 yr and a mean EuroSCORE of 17.9. The approach was transfemoral (TF) in 65.5%, direct aortic (DA) in 22.4% and transapical (TA) in 12.1%. Prevalence of severe (grade 3) atherosclerosis was the lowest in TF with 83.3%, 63.9%, 86.1%, 69.4, 51.4%, 94.4% and 75% in the proximal ascending aorta (PAA), distal ascending aorta (DAA), aortic arch, innominate artery, the left carotid, the descending aorta and the left subclavian artery, respectively. In DA, the prevalence was 91.7% in the DAA, PAA and the left subclavian artery, 90.9% in the innominate artery, 63.6% in the left carotid and 100% in all other segments. The prevalence of severe atherosclerosis in TA was 60.0% in the left carotid, 71.4% in the DAA, 85.7% in the left subclavian artery and 100% in all other segments.

Discussion. Severe atherosclerosis of one or more segments of the thoracic aorta was diagnosed in 100% of the patients. Visualization and awareness about the exact segment location of severe atherosclerosis of the thoracic aorta may help us to choose the optimal access route for TAVR patients in order to reduce cerebral complications.

P-39
Procedural sedation with dexmedetomidine for transfemoral aortic valve implantation

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Introduction. Transfemoral Aortic Valve Implantation (TF-AVI) can be performed under local anaesthesia (LA) and sedation using different sedatives and opioids [1]. Dexmedetomidine (DEX) is a centrally acting alpha-2 adrenergic agonist used for intensive care and procedural sedation. We report our initial experience with DEX sedation in TF-AVI.

Methods. With IRB approval, patients undergoing TF-AVI received local anaesthesia and sedation as per clinical routine. Starting from July 2011, patients were sedated with DEX (loading dose, 0.5 µg/kg in 20 min., followed by infusion of 0.3-0.7 µg/kg/h) to achieve a sedation level of Ramsay Scale 3 or 4. DEX group was compared to the LA group from our registry without DEX treatment. Data are mean ± SD. Alpha was 5%.

Results. The first consecutive 120 patients undergoing procedural sedation with DEX for TF-AVI were compared to 226 LA cases of the registry without DEX treatment. No patient was excluded. No differences in baseline characteristics were found. Mean DEX induction and cumulative dose was 53 ± 42 and 122 ± 66 µg, respectively. Anaesthetic management and outcomes are summarised in Table 1.

Discussion. Procedural sedation with DEX for TF-AVI is feasible and safe. Procedural outcomes do not differ between DEX sedation regimes and alternatives. After TF-AVI with DEX-sedation, 95% of patients are
fit for a step-down unit immediately at the end of the procedure.

References

P-40
Comparison of three anaesthetic techniques for endovascular aortic repair: retrospective analysis

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Introduction. Endovascular aortic repair is widely used for high risk patients for whom open surgery constitutes serious morbidity, even mortality. Peri-operative management is still a challenge for anaesthesiologists for this population according to procedural risk factors [1]. General anaesthesia (GA) or neuraxial blocks (NAB) are safely used as well as local techniques. We herein present the results of endovascular repair from 2000 to 2014 in one centre.

Methods. After Ethical Committee approval, the records of all patients enrolled for elective endovascular aortic repair from 2000 to 2014 were examined. Demographic data, ASA scores, comorbidities, anaesthetic techniques and complications are all recorded. Duration of operation, ICU stay and length of stay are similarly noted. Statistical analyses were performed with chi squared test or Fisher’s exact test for categoric variables, and unpaired t-test or Mann-Whitney U test for continuous variables.

Results. Eighty-six patients were registered with 25 under GA, 37 NAB and 24 with local anaesthesia (LA). The mean age of LA group was significantly different from GA and NAB groups (74 ± 8, 67 ± 9, 68 ± 11 yr old, respectively, with \( p < 0.05 \)). Comorbidities such as ischaemic heart disease, diabetes or renal failure were similar between groups. Duration of operation was significantly longer for the GA group compared to NAB or LA (160 ± 35, 120 ± 47 , 120 ± 32 min, respectively, with \( p < 0.001 \)). Systemic complications were comparable between groups. Length of stay was similar between the three groups. However, ICU stay was found to be longer in GA patients than NAB and LA groups (3 ± 0.8, 1 ± 0.4, 1 ± 0.4 day, \( p < 0.01 \)).

Discussion. Endovascular aortic repair increased over last decade due to technological opportunities for high risk patients. GA was mostly associated with complex long procedures or with a learning period. LA is the preferred alternative for high risk elderly

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<th>Vasopressor</th>
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<th>Mortality intraop.</th>
<th>Spontan. breathing postop.</th>
<th>ICU postop.</th>
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<tr>
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<td>35%</td>
<td>63%</td>
<td>5% (6)</td>
<td>1% (1)</td>
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<td>8% (10)</td>
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<td>65%</td>
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Table 1
patients. None of the anaesthetic approaches showed superiority in hospital length of stay.

References

P-41 Effectiveness of intra-operative detection of persistent endoleak by spontaneous echocardiographic contrast after thoracic endovascular aortic repair

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Introduction. Transoesophageal echocardiography (TOE) with colour flow Doppler, unlike angiography, can frequently detect endoleaks after thoracic endovascular aortic repair (TEVAR). Some of these endoleaks are so minor that they may not affect short- or long-term outcomes. It has been reported that a change in the character of spontaneous echocardiographic contrast (SEC) within the aneurysmal sac can indicate endoleak closure. The aim of our study was to determine if this effectiveness held true for persistent endoleaks after TEVAR.

Methods. Consecutive adult patients (July 2010 to January 2013) undergoing TEVAR of descending thoracic aortic aneurysms (caused by atherosclerosis, type B dissection, trauma) were included in this study. After completing the endovascular procedure, we explored the aneurysmal sac with TOE to look for residual SEC or thrombus. Thrombus was defined as no SEC within the sac regardless of high echodensity. In type B dissection patients, we also looked for a false lumen around the intimal tear. The primary outcome was detection of persistent endoleak by contrast-enhanced spiral computed tomography 6 months later. Need for additional intervention within 6 months also was considered because of persistent endoleak. We examined the association between intra-operative residual SEC and persistent endoleak. Comparisons were made with the Mann-Whitney U test or Fisher’s exact test when appropriate, and \( p < 0.05 \) was considered significant.

Results. A total of 57 patients underwent TEVAR for descending thoracic aortic aneurysms during the 31-month study. Patients with peri-operative death, incomplete follow-up, or inadequate TOE records were excluded, leaving 53 participants (41 men, 12 women; mean age 71.3 ± 12.5 yr). SEC and thrombus were observed in 14 and 33 patients, respectively. In 6 patients, the aneurysmal sac was unobservable because of acoustic shadowing from the endograft. Persistent endoleak was detected in 10 patients (18.9%). Intra-operative angiography detected persistent endoleak in only two patients. Later, persistent endoleak was observed in 8 patients (57.1%) with SEC and 1 patient (3.0%) with thrombus. The presence of SEC had high sensitivity (80.0%) and specificity (86.0%) for detection of persistent endoleak, indicating that SEC was significantly associated with persistent endoleak (\( p = 0.0001 \)).

Discussion. Intra-operative TOE assessment of SEC and thrombus within the aneurysmal sac is highly effective for detecting persistent endoleak after TEVAR. Persistent endoleak was rare in patients with thrombus. Although we are sometimes unable to see inside the aneurysmal sac with TOE after endovascular graft insertion, the intra-operative goal following TEVAR may be to achieve the disappearance of SEC.
P-42

Cerebral microembolism in transapical TAVI: comparison of Symetis Acurate Aortic Valve Prosthesis with the Edwards Sapien Valve

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Introduction. The Symetis Acurate TA™ (SA) is a new self-expanding transcatheter aortic valve (TAVI) prosthesis, characterized by a specific two-step transapical (TA) implantation technique. TA-TAVI is associated with cerebral microembolism, which is detectable as high intensity transient signals (HITS) on transcranial Doppler (TCD) ultrasound [1]. The aim of this study was to quantify differences in HITS count, frequency and pattern during TA-TAVI, when comparing the SA with the balloon-expandable Edwards Sapien™ (ES) valve.

Methods. TCD recordings of 31 consecutive patients undergoing TA-TAVI using SA or ES were analysed for HITS during instrumentation (IN) prior to valvuloplasty, balloon aortic valvuloplasty, prosthesis deployment (PD), and post-implantation (PI). HITS were compared between different procedural steps using Friedman Repeated Measures ANOVA on ranks; for comparison between the two prosthesis types, Mann-Whitney rank sum test was used. Data are presented as number or median with interquartile ranges.

Results. Twenty-two patients (n = 11 in each arm) displayed TCD signals of good quality throughout the entire procedure (in the remaining cases, TCD was not performed due to logistic reasons (4) or to absence of the temporal bone window (3), or data acquisition was stopped because of premature loss of the MCA signal (2). No differences were detected in total procedural or interval-related HITS load (SA: 303 [200;594], ES: 499 [285; 941]; p = 0.16). With both devices, HITS peaked during PD, whereas fewer HITS occurred during IN (p < 0.005) or PI (p < 0.01). PD generated almost half of the total HITS load. One patient (ES) suffered a new stroke. Thirty-day mortality was 3/22.

Discussion. Despite its unique deployment technique, which results in more interaction with the calcified native aortic annulus, the SA device did not generate more HITS than the balloon-expandable ES valve. The similarity in HITS count, frequency and pattern of the two systems points to a common mechanism for the release of cerebral microemboli.

References

P-43

Freedom SOLO Stentless Aortic Valve Prosthesis: no freedom of late dysfunction and failure

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Introduction. The 3rd generation Freedom SOLO (FS) stentless aortic valve prosthesis consists of bovine pericardial tissue and uses homocysteic acid in a unique anticalcification treatment. FS is implanted in the
supra-annular subcoronary position without rinsing, using a single continuous suture line. This study reports a case series of failures and explantations of the FS.

**Methods.** N = 149 patients (mean age 73 ± 8 yr, 68 females) underwent isolated or combined aortic valve replacement using FS. Clinical and echocardiographic follow-up findings were recorded at discharge, 6 months and yearly thereafter. Following intra-operative documentation, all explanted valve prostheses underwent histological examination. Follow-up was 100% complete with an average observation time of 5.5 ± 2.3 yr and a total of 821 patient years.

**Results.** Freedom from structural valve deterioration (SVD) at 5, 6, 7, 8 and 9 yr were 92%, 89%, 82%, 72% and 63%. Thirteen prostheses required explantation due to valve-independent dysfunction (thrombus formation, oversizing, aortic dilatation, endocarditis, suture dehiscence) or valve-dependent failure (acute leaflet tears or severe stenosis). Thus, freedom from explantation at 5, 6, 7, 8 and 9 yr were 95%, 95%, 92%, 82% and 73%. Vertical tear along the non-coronary/right-coronary commissure to the base became manifest at a mean of 6 yr post-implantation (range, 4.6-7.3 yr), and affected size 27 prostheses exclusively. Four FS required explantation after a mean of 7.6 yr (range, 7.0-8.3 yr) due to severe functional stenosis and gross calcification, that included the entire aortic root.

**Discussion.** The FS is safe to implant and shows satisfactory haemodynamic performance, early- and mid-term results. However, freedom from SVD and explantation decreased markedly after only 6-7 years. Patients with FS require close clinical and echocardiographic observation and follow-up.

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**P-44**  
First-in-Man use of a novel pacing sheath for transapical transcatheter aortic valve implantation: case report

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**Introduction.** We describe first-in-man feasibility of in-situ transapical (TA) access site pacing for TA balloon aortic valvuloplasty (BAV) in TAVI, using a novel pacing device (PacingSheath™). After initial animal experiments, this PacingSheath has been used successfully in a TAVI patient unsuited for other, less invasive pacing options.

The device consists of a 24F introducer with two integrated electrodes alongside the delivery sheath to stimulate the myocardium at the transapical access site. With Federal Veterinary Office approval in a prior animal experimentation (6 pigs, 61 ± 1 kg), three electrode widths (2, 4, and 6 mm) had been compared for LV stimulation and sensing thresholds at 5 sets of pacing rates ranging from 120 to 200 stimulations per minute. The surgical setup included full percutaneous TA access. Thereafter, a similar device was used in a patient without other pacing means for TA-TAVI with a Sapien XT balloon-expandable valve.

Animal experimentation had demonstrated successful capture for all three electrode sizes, with arterial pressure nadir at a stimulation rate of 200 bpm (baseline, 95 ± 16 systolic/56 ± 15 mmHg diastolic; nadir, 58 ± 15/35 ± 13 mmHg; p < 0.05). Pacing thresholds varied significantly with electrode width (2.7 ± 0.2 mV for 2 mm, 4.2 ± 0.4 mV for 4 mm, 5.4 ± 0.4 mV for 6 mm; p < 0.01).
**Case report.** First-in-man TA access site pacing with the PacingSheath provided reliable capture and systolic blood pressure reduction below 50 mmHg during BAV and valve deployment. Backup pacing was also reliably possible at stimulation thresholds below 2 mV throughout.

**Discussion.** First-in-man use of the novel PacingSheath for BAV and TAVI is feasible. A dedicated introducer with integrated pacing electrodes combines access with LV pacing for TA-TAVI. Obviating a separate pacer access, fluoroscopy guidance and lead placement (e.g., transvenous, surgical), PacingSheath allows reliable procedural rapid and backup LV pacing with potentially better synchronization and supports a full percutaneous TA-TAVI approach.

**P-45**
**Heart failure associated variables and one-year mortality after transcatheter aortic valve replacement in elderly patients**

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**Introduction.** Transcatheter aortic valve replacement (TAVR) is an accepted procedure in elderly patients with aortic valve stenosis. However, postoperative cardiac failure is still an issue that may impact on long-term mortality. The aim of this study was to establish the relationship between postoperative heart failure (PHF) and patient pre- and post-TAVR conditions, and whether PHF affects one-year mortality.

**Methods.** A retrospective study was performed in 112 consecutive patients with aortic stenosis treated with TAVR from March 2009 to April 2014. Mean age was 79.8 ± 7.3 yr, and 54% were men. General anaesthesia was performed in 106 patients and sedation/analgesia in 6 patients. Arterial pressure, vasopressors and preload were optimized to obtain mean arterial pressure > 75 mmHg before and during the implant. Angiography/fluoroscopy was used for valve implantation guidance, and transesophageal echocardiography. Corevalve (Medtronic) implantation was done by a retrograde approach (110 transfemoral and 2 subclavian), 100 of which were primary TAVR (without predilation). Chi-squared test was used to compare categorical variables.

**Results.** Pre-operative logistic EuroSCORE was 19.5 ± 14.8, ejection fraction (EF) was 54.8 ± 11.3 (16% with EF ≤ 40), and 94 patients (84%) were in functional class III-IV. Overall mortality during the observation period (5 yr) was 13.4% (15 patients). Kaplan-Meier survival probability curve showed 6-month survival of 91% and 1-year survival of 86.6%. Postoperative heart failure was associated with echocardiographic postoperative transvalvular regurgitation ≥ 2 (p < 0.05) considering 108 patients, as 4 patients died during the day of the procedure (2 perforations, 1 valve dislocation and 1 electro-mechanical dissociation). However, only 6 patients (5.6%) presented with grade 3 regurgitation. A definitive pacemaker was significantly associated with PHF (p < 0.05); 62.5% of these patients had a pacemaker prior to TAVR. Postoperative heart failure had a significant effect on one-year mortality, taking into account 79 patients (p < 0.001) due to exclusion of patients with less than one year survival.

**Discussion.** Pre-operative variables were not related to PHF. Post-intervention factors showed that, although prevalence of severe regurgitation was low, further reduction of postoperative paravalvular regurgitation would decrease PHF, and hence lower mortality in this critically ill elderly population.
Poster Session – Monitoring

P-46
Comparison of a non-invasive with two minimally invasive cardiac output monitors during off-pump coronary artery bypass surgery.

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Introduction. Cardiac index (CI) can be measured using arterial pressure curve analysis, which can be derived either minimally invasively from the radial artery (e.g., FloTrac/Vigileo™ [CIFTV] or ProAQT-Pulsioflex™ [CIPA]) or completely non-invasively with a finger cuff (e.g., ccNexfin™ [CINF]). Assuming that CIFTV and CIPA are clinically interchangeable, we compared CIFTV and CIPA with each other and the average of the minimally invasive CIFTV and CIPA (CIAVR) with non-invasive CINF.

Methods. In 70 patients undergoing off-pump coronary artery bypass surgery, CI was compared at predefined events during anaesthesia (before and after induction of anaesthesia, before and after sternotomy). Values were compared by Bland-Altman analysis for repeated measures. Four-quadrant plots and polar plot methodology were used to evaluate CI trending ability.

Results. Agreement analysis of CIFTV versus CIPA showed a bias of −0.2 l/min/m², limits of agreement (LOA) of ±1.5 l/min/m² and percentage error (PE) of 103%. CINF slightly underestimated CI compared to CIAVR with a bias of 0.6 l/min/m², LOA of ±1.6 l/min/m² (p < 0.001), PE of 102%. Polar plot analysis revealed moderate concordance to track CI changes comparing CIFTV to CIPA and CIAVR to CINF (83% and 90% within 30° limits of agreement).

Discussion. The arterial pressure curve derived CIFTV and CIPA reveal a similar agreement and trending ability with each other as with non-invasive CINF. Therefore, non-invasive CINF can be considered as interchangeable with the minimally invasive arterial pressure curve based CI monitors.

P-47
Does LiDCO rapid® reliably track relative changes in cardiac output in cardiac surgery patients with a low ejection fraction?

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Introduction. Bolus thermodilution CO measurement with a Swan-Ganz catheter has been the clinical standard for decades. Nowadays, devices that determine CO using the pulse contour technique are employed more and more frequently. One of them, the LiDCOTM plus system, has already been validated for patients with low cardiac ejection fraction [1]. This device, however, necessitates occasionally cumbersome calibration with lithium chloride prior to its use. A novel uncalibrated system, the LiDCO rapid®, has recently been introduced. Uncalibrated it gives relative CO changes only. We hypothesized that the LiDCO rapid® system will adequately track relative changes of thermodilution CO in patients with low left ventricular ejection fraction after cardiac surgery.

Methods. After having obtained informed consent, 7 cardiac surgery patients have been included until now. All patients were managed with a pulmonary artery catheter. After admission to the ICU, parallel measurements with both devices, were carried out to evaluate the haemodynamic impact of interventions, which became necessary during ICU treatment. Thermodilution CO was averaged from 5 consecutive measurements. Relative changes from pre-intervention CO for both techniques were subsequently used for analysis. Regression analysis was calculated employing SPSS 19.0. Furthermore, agreement
between the two monitoring techniques was also evaluated. \( p < 0.05 \) was considered statistically significant.

**Results.** We report data from 54 simultaneous CO measurements. Thermodilution CO ranged from 3.3 to 8.6 l/min. Median left ventricular ejection fraction was 35% (range: 21 to 38%). Relative changes determined by both techniques (–22 to +35% for the LiDCO rapid\(^\text{®} \) system vs. –23 to +34% for thermodilution CO) correlated modestly (\( r^2 = 0.761, Y = 0.867 \times X -0.25, p < 0.05 \)). There was no statistically significant difference in the direction of relative changes of CO.

**Discussion.** These preliminary data indicate that the uncalibrated LiDCO rapid\(^\text{®} \) system appears to adequately track relative CO changes in patients with low left ventricular ejection fraction after cardiac surgery.

**References**


**P-48**

**The effect of Trendelenburg, reverse Trendelenburg positions and Vasalva manoeuvre on internal jugular vein diameter and location in children**

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**Introduction.** The aim of this ultrasound (US) study was to compare the effects of supine (S), supine+Valsalva (SV), Trendelenburg (T), Trendelenburg+Valsalva (TV), the reverse Trendelenburg (RT) and the reverse Trendelenburg + Valsalva (RTV) manoeuvres on the diameter and location of the right internal jugular vein (RIJV) in patients between 2 and 12 yr.

**Methods.** After Ethics Committee approval, 100 ASA I patients aged between 2-12 who have normal cardiac function and scheduled for elective surgery (repair of hypospadias, inguinal hernia, cystoscopy) were enrolled. Demographic data were recorded. Routine monitoring was applied. Following induction with propofol and fentanyl, 2% sevoflurane was used for maintenance. The RIJV diameter of the subjects was measured with guidance of US by applying the manoeuvres of S, SV, T, TV, RT and RTV. 15° angle was given to the table for T and the RT positions. Airway pressure of 20 cmH\(_2\)O

<table>
<thead>
<tr>
<th>Position and manoeuvres</th>
<th>Diameter (cm)</th>
<th>Variation (%)</th>
<th>( p ) value</th>
<th>min-max</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>1.66 ± 0.21</td>
<td></td>
<td></td>
<td>1.26-2.34</td>
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<tr>
<td>SV</td>
<td>1.86 ± 0.26</td>
<td>10.33</td>
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<tr>
<td>T</td>
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<td>6.19</td>
<td>&lt;0.001</td>
<td>1.28-2.66</td>
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<tr>
<td>TV</td>
<td>1.95 ± 0.26</td>
<td>20.19</td>
<td>&lt;0.001</td>
<td>1.43-2.77</td>
</tr>
<tr>
<td>RT</td>
<td>1.68 ± 0.21</td>
<td>1.33</td>
<td>0.111</td>
<td>1.24-2.41</td>
</tr>
<tr>
<td>RTV</td>
<td>1.91 ± 0.22</td>
<td>16.94</td>
<td>&lt;0.001</td>
<td>1.38-2.80</td>
</tr>
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</table>
was applied to the patient for the Valsalva manoeuvre. During measurements, the patient’s head was turned 20º to the contralateral side. The location of RIJV relating to the carotid artery (CA) was recorded. Statistical analyses were carried using SPSS ver. 20.0®. Data were analysed using Wilcoxon’s signed rank test.

**Results.** The mean age of 78 male and 22 female patients was 5.95 ± 2.81 yr. RIJV diameters regarding position and manoeuvres (s. Table 1). In 15%, RIJV was in front of the CA. In 5%, it was lateral to CA, in 80% anterolateral to CA.

**Discussion.** While the T position and V manoeuvre increase RIJV diameter significantly, the RT position does not have a significant effect on the change of RIJV diameter. The most significant increase in the RIJV diameter was the T position together with the V manoeuvre.

**P-49**

**Pre-operative fasting and postoperative metabolic response after coronary artery bypass grafting**

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**Introduction.** A prolonged period of preoperative fasting may worsen the postoperative metabolic response [1]. A meta-analysis showed that it is safe to shorten pre-operative fasting before elective surgery [2]. We studied the impact of pre-operative fasting on postoperative levels of arterial lactate (AL), pH and base excess (BE) since ICU admission in patients undergoing coronary artery bypass grafting (CABG).

**Methods.** This was a single centre retrospective study with one year data collection (Aug 2012 to Jul 2013) from electronic medical records. Two groups were analysed: M = morning (1st case); A = afternoon (2nd case). Patients were nil-by-mouth from the midnight before surgery, regardless the list order. Demographics, comorbidities, logistic EuroSCORE, n° of grafts performed and pre-operative AL, pH and BE were screened. Data on AL, pH and BE at ICU admission and at 1, 3, 6, 12, 18, 24 h after ICU admission were collected. Patients with pre-operative haemodynamic support and/or dialysis were excluded. Normal distribution of data was assessed. Continuous variables are presented as mean ± standard deviation and compared with student’s t test for independent samples. Categorical variables are presented as percentage (%) and analysed with chi-squared test with Yates’s correction.

**Results.** We found 339 patients (M = 173, 52%; A = 163, 48%). There were no differences in rate of on- vs off-pump CABG (M = 64.8%, A = 62.0%, p = 0.67). Demographics, comorbidities and logistic EuroSCORE were not different. Number of grafts performed was higher in the M group (2.9 ± 0.7 vs 2.7 ± 0.8; p = 0.03). There were no differences in the values of pH and BE between the groups at any time. We found a trend towards higher AL in the CABG patients scheduled 1st on the list. These results still await confirmation by multi-regression analysis.

**Discussion.** The length of pre-operative fasting before cardiac surgery did not affect the level of pH and BE. Lactate level seemed worse in the CABG patients scheduled 1st on the list. These results still await confirmation by multi-regression analysis.

**References**

P-50
The effect of induced hypotension on motor neuron protection in experimental spinal cord ischaemic/reperfusion injury in rats

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Introduction. Spinal cord ischaemia remains a devastating neurologic complication of thoraco-abdominal aortic surgery. The incidence of paraplegia after thoraco-abdominal aortic aneurysm repair has been reported to be 16%. The aim of this study was to evaluate the effect of induced hypotension before aorta cross clamping on motor neuron protection in experimental spinal cord ischaemia-reperfusion injury.

Methods. Male Sprague-Dawley rats (300-350 g; n = 6) were assigned randomly to two groups: (1) the control group (n = 3) was maintained at normal blood pressure for 30 minutes before ischaemia; and (2) the hypotension group (n = 3) had induced hypotension for 30 minutes before ischaemia. Spinal cord ischaemia was induced for 10 minutes using a balloon-tipped catheter placed in the proximal descending aorta in both group. Neurologic function was assessed daily until 2 days after reperfusion. To assess the degree of ischaemic neuronal injury, the number of normal motor neurons in the anterior horn of the spinal cord (anterior to a line drawn through the central canal perpendicular to the vertebral axis) was counted in 3 sections for each animal and then averaged. Data were expressed as mean ± SD. The number of motor neurons was compared using a one-way analysis of variance followed by the Dunnett post hoc test.

Results. At day 1 after reperfusion, the hypotension group showed a significantly higher motor deficit index compared with the control group (7.14 vs 0; p < 0.001). This trend was sustained at day 2 (9.71 vs 0.33; p < 0.001). The control group displayed a significantly larger number of normal motor neurons compared with the hypotension group.

Discussion. The induced hypotension before aorta cross clamping significantly damaged the neuronal cell after a spinal cord ischaemia-reperfusion injury in a rat model. The effect of the induced hypotension must be taken into consideration for ischaemia-reperfusion injury in patients undergoing thoracoabdominal aortic surgery.

P-51
Comparison of the haemodynamic effects of nitric oxide and inhaled iloprost in patients with severe left ventricle systolic dysfunction

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Introduction. The aim was to evaluate the haemodynamic effects of nitric oxide (NO) and inhaled iloprost in patients with pulmonary hypertension (PH) associated with left ventricular (LV) systolic dysfunction.

Methods. Seventy-two right heart catheterizations and vasoreactivity tests (VRT) were performed in 58 candidates for heart transplantation. All patients had heart failure.
III-IV NYHA and PH associated with LV systolic dysfunction. NO, 80 ppm for 20 min (43 cases, NO group [gr]), or inhaled iloprost, 20 micrograms (29 cases, iloprost gr) were consistently used for vasoreactivity test. Haemodynamic effects were estimated at baseline, after 15 minutes of NO inhalation, or 15 minutes later, at the end of iloprost inhalation. Statistical analysis was performed using the t-test for dependent samples and Fisher’s exact test; results are presented as mean ± SD.

Results. Both vasodilators decreased pulmonary vascular resistance (PVR): in the NO gr, PVR dropped from 4.8 ± 2 WU to 3.6 ± 1.3 WU (p < 0.0001), in the iloprost gr, PVR decreased from 4.5 ± 1.6 WU to 2.9 ± 1 WU (p < 0.0001). More than 30% decrease in PVR was observed in 14 cases (32.6%) in the NO gr and in 20 cases (69%) in the iloprost gr (p < 0.001). PCWP increased in 20 cases (46.5%) in the NO gr and in 7 cases (24.1%) in the iloprost gr (p < 0.05). There were no changes in systemic vascular resistance (SVR) in the NO gr. In contrast, inhaled iloprost significantly decreased SVR from 1,905 ± 477 dyn/s/cm⁵ to 1,505 ± 460 dyn/s/cm⁵ (p < 0.0001). The observed fall of the afterload only after iloprost inhalation resulted in considerable enhancement in LV performance: at baseline, the stroke volume index (SVI) was 24.9 ± 7.9 ml/m²; after iloprost inhalation, SVI increased to 30.1 ± 10.2 ml/m² (p < 0.001).

Discussion. Inhaled iloprost decreased PVR more effectively compared with NO. Inhaled iloprost causes favourable changes in preload and afterload of the impaired left ventricle and increases its performance. We found that inhaled iloprost was preferable for VRT in patients with PH associated with LV systolic dysfunction than NO.

P-52
The effects of conventional vs. high-dose rocuronium on the QTc interval during anaesthesia induction in patients for coronary artery surgery

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Introduction. Myocardial ischaemia may lower the cardiac depolarization threshold and cause QT prolongation [1]. The mild vagolytic effect of rocuronium is an advantage in cardiac surgery [2]. We studied the effects of high-dose initial bolus rocuronium on the duration of QTc and incidence of arrhythmias following anaesthesia induction.

Methods. In this prospective randomized trial, patients received either conventional dose (0.6 mg/kg, Group C, n = 25) or high-dose (1.2 mg/kg, Group H) rocuronium for muscle relaxation after induction with etomidate and fentanyl. Heart rate, MAP, and QTc were recorded before induction (T0), after induction (T1), after muscle relaxation (T2), and 2 minutes (T3) and 5 minutes (T4) after intubation. Data were analysed with Friedman ANOVA, Wilcoxon and Bonferroni tests.

Results. In Group C and Group H, QTc was significantly longer after intubation (T3) than at baseline (475 vs. 429 msec in Group C [p < 0.001], and 459 vs. 434 msec in Group H [p < 0.01]). On inter-group comparisons, mean QTc values in both groups were similar at all time points (p > 0.05) throughout the study. The incidence of arrhythmias in Group C (28%, n = 7) and in Group H (24%, n = 6) was similar (p = 0.5). Arrhythmias (non-sustained ventricular tachycardia), ventricular extrasystoles, and ST depression)
in both groups occurred at similar rates 2 minutes after intubation (T3).

Discussion. QTc interval prolongation after high-dose rocuronium was not significantly longer than after conventional-dose rocuronium in patients induced with etomidate and fentanyl about to undergo coronary artery surgery. The incidence of cardiac arrhythmias was similar in both groups and none needed treatment.

References

P-53
The role of ethnicity in post coronary artery bypass graft atrial fibrillation in an Asian population

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Introduction. Post-operative atrial fibrillation (AF) is associated with increased morbidity, mortality and resource use [1]. African Americans have a lower risk of post coronary artery bypass graft (CABG) AF than Caucasians, but the role of ethnicity in Asian populations has not been studied [2]. We tested the hypothesis that ethnicity is an independent risk factor for AF after CABG in an Asian population.

Methods. 3,010 patients undergoing cardiac surgery between August 2008 and July 2012 at two tertiary heart centres were prospectively recruited. Exclusion criteria were non-AF post CABG cardiac arrhythmia, missing post CABG arrhythmia data, and ethnicity other than the three major local groups. 2,199 patients, which consisted of Chinese (n = 1,552), Malays (n = 357) and Indians (n = 290), were eligible for analysis. Univariate analysis was carried out using the 2-tailed unpaired T test for continuous variables and chi-squared test for categorical variables. Factors from the univariate analysis with p < 0.1 were included into the multivariate Poisson regression model with robust estimator to estimate the relative risk of developing post CABG AF.

Results. Post CABG AF rate was 15.7% in our cohort. It was more common in Chinese (16.5%) and Malays (18.5%) than Indians (7.9%) (p < 0.001). Patients who developed post CABG AF were likely to be older, had previous AF, pulmonary hypertension, and a more complicated peri-operative course. Ethnicity was an independent risk factor for post CABG AF, with Chinese and Malays having a higher risk than Indians (RR: Chinese vs Indian 1.95 [95% C.I. = 1.31-2.88, p < 0.001]); Malay vs Indian 2.22 (95% C.I. = 1.44-3.42, p < 0.001).

Discussion. Chinese and Malays have a higher risk of developing post CABG AF than Indians in an Asian population. This is the first study conducted in an Asian population validating ethnicity as an independent risk factor for post CABG AF.

References
Extracorporeal cardiopulmonary resuscitation (E-CPR) in refractory cardiac arrest after an acute coronary syndrome: a case report

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Introduction. Current guidelines state that extracorporeal membrane oxygenation (ECMO) may improve outcomes in refractory cardiac arrest (CA) when the cause lends itself to an immediate curative intervention. Examples are hypothermia, drowning and drug overdose. Though expensive and invasive, the outcome can be gratifying. We report a successful E-CPR in a patient with refractory CA following an acute coronary syndrome, who subsequently underwent a coronary artery bypass grafting (CABG), but succumbed to sepsis.

Case Report. A 58 year old diabetic and hypertensive man who had suffered an inferior wall myocardial infarction 3 days prior to admission presented with left ventricular failure. He had not been thrombolysed due to late presentation. A day after admission, he developed hypotension with desaturation requiring non-invasive ventilation and inotropes. Twelve hours later, he had an episode of pulseless electrical activity (PEA), which initially responded to CPR with return of spontaneous circulation (ROSC) in 15 minutes. Within 30 minutes, he again developed refractory PEA not responding to conventional CPR which was continued for nearly 2 hours with brief periods of ROSC. Hence, peripheral veno-arterial ECMO was established through the right femoral vessels. Supportive treatment with ventilation, inotropes, continuous renal replacement therapy (CRRT) and blood transfusions was continued. The following day, he was awake, with improved haemodynamic and metabolic parameters. The need for an intervention for definitive treatment was discussed. While on ECMO, he underwent a coronary angiogram which revealed total occlusion of the left anterior descending artery (LAD) and mid right coronary artery with distal filling by collaterals. Angioplasty had to be abandoned after multiple, futile attempts. CABG using saphenous vein grafts to LAD and posterior descending artery was done the same day. CRRT, ECMO, inotropes and ventilation were continued. With improving haemodynamic parameters, ECMO was successfully weaned and discontinued on the 4th postoperative day after placement of an intra-aortic balloon pump (IABP). The IABP was removed after 3 days with minimal inotropic support. An endotracheal tube aspirate culture revealed Acinetobacter and appropriate antibiotics were started. Four days later he deteriorated and blood cultures showed growths of Klebsiella and Enterococcus. He eventually succumbed to multi-organ failure as a consequence of the sepsis syndrome on the 14th postoperative day.

Discussion. In witnessed, refractory CA not responding to conventional CPR, when infrastructure and skilled personnel are available, ECMO is not only viable but may be the only option for a subset of patients.

Comparison of bupivacaine and levobupivacaine for thoracic paravertebral block for post-thoracotomy pain

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Introduction. Post-thoracotomy pain is very severe and is exacerbated by ventilation [1]. This study compared post-operative pain...
and respiratory function in two groups of thoracotomy patients, who were given bupivacaine or levobupivacaine with fentanyl through a paravertebral catheter.

**Methods.** After ethics committee’s approval, 40 patients (ASA I-III) (18–65 years old), scheduled for thoracotomy, were randomized into two groups as Group B or Group L according to the local anaesthetics they received. An epidural catheter was placed by the surgeon into the paravertebral space. All patients received 20 ml bolus local anaesthetic according to their groups (Group B received bupivacaine, Group L received levobupivacaine) after the closure of the pleura. The solution for patient-controlled analgesia contained 170 ml 25% bupivacaine or levobupivacaine and 7 ml (350 µg) fentanyl. In Group B, 0.25% bupivacaine and in Group L, 0.25% levobupivacaine combined with fentanyl were infused at a rate of 0.1 ml/kg via paravertebral catheter by patient-controlled analgesia system for 48 h after the operation. The pain scores measured by VAS were assessed at rest, coughing and movement. Arterial blood gases were evaluated and respiratory function tests were made one day before the operation and 1, 6, 24 and 48 h after the operation. Side effects were recorded. The patients with VAS above 4 received 1 mg/kg pethidine. Time and doses of administration were recorded.

**Results.** Demographics and duration of surgery were not different \((p > 0.05)\). VAS scores recorded at 1st h were higher in both groups compared to the next h \((p < 0.001)\) at rest, coughing and movement, but there was no difference between groups \((p > 0.05)\). Dosage and number of administration of rescue analgesia contained 170 ml 25% bupivacaine or levobupivacaine and 7 ml (350 µg) fentanyl. In Group B, 0.25% bupivacaine and in Group L, 0.25% levobupivacaine combined with fentanyl were infused at a rate of 0.1 ml/kg via paravertebral catheter by patient-controlled analgesia system for 48 h after the operation. The pain scores measured by VAS were assessed at rest, coughing and movement. Arterial blood gases were evaluated and respiratory function tests were made one day before the operation and 1, 6, 24 and 48 h after the operation. Side effects were recorded. The patients with VAS above 4 received 1 mg/kg pethidine. Time and doses of administration were recorded.

**Discussion.** In the treatment of post-thoracotomy pain with paravertebral block, bupivacaine and levobupivacaine had equivalent efficacy and could be safely used.

**Reference**

P-56

**Melatonin on acute pain**

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**Introduction.** Melatonin has anxiolytic and potential analgesic effects. The aim of this study was to investigate whether melatonin had any impact on postoperative pain after video assisted thoracoscopic surgery (VATS).

**Methods.** Forty patients undergoing VATS were randomly allocated into either \((n = 20\) each) M group or P group. Patients were premedicated with melatonin 6mg (M group) or placebo (P group). All patients were anaesthetized with sevoflurane and remifentanil. Thirty minutes before the end of surgery, patients received morphine sulphate through a patient-controlled analgesic infusion device. Pain scores and analgesic requirements were recorded 1, 12, and 24 h postoperatively. The demographic data were analysed with the t-test and the chi-squared test and the postoperative morphine consumption was analysed with the t-test. The Mann-Whitney test was
used for analysis of the categorical variables like NRS. P value of less than 0.05 was considered statistically significant.

**Results.** After 24 h, the NRS scores of the P group were significantly higher than those of the M group (M group 1.0 ± 1.1 vs P group 2.2 ± 1.3, p < 0.05). The morphine consumption of P group was also greater than that of the M group (M group 45.9 ± 19.2 ml vs P group 62.5 ± 29.7 ml, p < 0.05). There were no differences in postoperative complications.

**Discussion.** We concluded that oral melatonin premedication for patients undergoing VATS provided better postoperative analgesic condition.

**References**


**P-57**

**Effect of morphine on lung cancer in relation to opioid growth factor receptor (OGFR)**

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**Introduction.** We evaluated the expression of opioids receptors on human lung cancer tissues and cancer cell lines and how administration of opioids influences cancer cell growth.

**Method.** Cancer and adjacent normal lung tissues of 16 patients were compared (3 samples of cancer and normal tissues in each patient). Human lung cancer cell lines; H1703, A549 and H1975, were used to examine OGFR and MOR expression and the effect of opioids on their growth. T test was used to compare normal and cancer tissues or control and treatment group.

**Results.** OGFR mRNA levels were higher in normal lung tissues than lung cancer tissue (29.7 vs. 10.4, p < 0.01) and higher in the adenocarcinoma than squamous carcinoma (15.5 vs. 4.5, p < 0.05). MOR mRNA expression was much lower than OGFR expression and there were no differences between lung cancers and adjacent normal tissues. H1975 (adenocarcinoma), which has the highest OGFR level showed increased cell growth when treated with opioids.

**Discussion.** Lung cancer mainly showed OGFR but not MOR. OGFR has inverse correlation with cancer cell growth and opioid treatment promoted cancer cell proliferation only in high OGFR cancer. Exogenous opioids may inhibit OGFR which is known to be a cancer suppressor.

**P-58**

**Retrospective study of peri-operative anaesthesia management of myasthenia gravis patients undergoing thymectomy**

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**Introduction.** Myasthenia Gravis (MG) is an autoimmune disease that attacks postsynaptic nicotinic acetylcholine receptors at the neuromuscular junction. The aim of the retrospective study was to analyse the peri-operative anaesthetic management of MG patients who underwent thymectomy.

**Methods.** After ethics committee approval, the demographic data, disease-specific features and peri-operative anaesthesia management of 33 patients of ASA I-III class were recorded.
**Results.** 87.9% of patients were I/II type according to the Osserman classification. Leventhal score was calculated as ≥10 in 3 patients. Combined balanced anaesthesia and thoracic epidural analgesia (TEA) were used in 26 patients (78.8%). Total intravenous anaesthesia with TEA was used in 4 patients (12.1%). The balanced anaesthesia was performed in 3 patients (9.1%). Neuromuscular blocker (NMB) was given in only 2 patients. Intra-operatively, hypotension occurred in 5 patients and bradycardia in only one patient. All patients were extubated in the operating room. Generalized tonic-clonic seizure, hypertension and respiratory distress were observed in 3 patients, respectively. Re-intubation or ventilation support was not required. Additional analgesic was needed in 4 cases.

**Discussion.** Optimal peri-operative management of MG patients undergoing thymectomy requires careful pre-operative assessment and preparation [1]. Furthermore, the use of balanced anaesthesia with TEA reduces or eliminates the need for NMB and provides adequate analgesia, therefore providing early recovery in this patient population.

**References**


**P-59**

**Lung transplantation in critically ill patients with cystic fibrosis**

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**Introduction.** Lung transplantation is the ultimate therapeutic option for patients with end-stage cystic fibrosis (CF), and accounts for 16-35% of all lung transplantations performed in different centres. In these patients, pre-operative clinical status and operative conditions may influence primary graft dysfunction (PGD) and survival [1]. The aim of this single centre study was to analyse patient’s transplant factors determining the incidence of PGD and survival.

**Methods.** Forty-one CF patients (34 with complete haemodynamic data) undergoing lung transplantation at the Hospital Universitario Fundación Favaloro between 1996 and 2014 were retrospectively analysed. Mean age was 25.3 ± 6.2 yr (12-37) and 41% were women. Sixty-five percent of the patients (22/34) had secondary pulmonary hypertension (SPH), > 25 mmHg); 63.4% hospitalized for emergency transplantation were receiving mechanical or non-invasive ventilation (HOSP) and 36.6% were ambulatory patients for elective transplantation with non-invasive ventilation (AMB). Primary graft dysfunction dependence on cardiopulmonary bypass (CPB), total ischaemic time (TIT), patient clinical status (HOSP or AMB), and SPH were assessed. Overall, PGD and clinical status survival Kaplan-Meier curves were analysed. The chi-squared test was used to establish significant differences.

**Results.** The overall incidence of PGD was 41%. Use of CPB affected PGD (55.6% with CPB vs. 12% without CPB, p < 0.01), while TIT < 380 min vs. TIT > 380 min, presence of SPH, or not and HOSP vs. AMB patients did not influence PGD. Kaplan-Meier overall survival probability was 70.3 ± 10.7% at 5 yr and 63.3% at 10 yr; PGD reduced 5-yr survival to ± 48.9% compared to 82.1% in non-PGD patients (p < 0.05). Conversely, pre-operative clinical status did not affect survival with a 10-yr survival rate of 67% (HOSP) vs. 58.3% (AMB).

**Discussion.** PGD was shown to be an undesired effect of CPB and affected survival. The good 10-yr survival for this type of intervention independent of pre-operative clinical status indicates that in experienced centres, all CF patients undergoing lung...
transplantation have a similarly favourable chance of long-term survival.

References

Poster Session – Quality Management

P-60
Quality of life of elderly patients in the first year after cardiac surgery: relation to peri-operative course parameters

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Introduction. The early results of cardiac operations in elderly patients (pts) are evaluated [1]. The quality of life (QOL) in the first year (yr) after surgery is the focus of our interest.

Methods. Sixty-four pts (45 males, 19 females) aged 75 (80 ± 4) or more were included. Cardiac procedures with cardiopulmonary bypass (CPB) were performed: coronary artery bypass grafting (CABG) – n = 46, aortic or mitral valve replacement/repair (VR) – n = 13, VR and CABG – n = 5. The telephone survey was carried out one yr after surgery. The criteria assessed were (yes or no): 1) survival, 2) absence of unplanned repeated hospitalizations, 3) ability to self-service at home, 4) walking outside the home more than once a week. The satisfactory QOL was registered if all questions are answered “yes”. Student’s t-test was used, p < 0.05 was considered significant. Data are given as mean ± standard deviation.

Results. Forty-two pts reported a satisfactory QOL (group 1). One pt died. In 21 pts, the QOL was not satisfactory (group 2). There were 6 repeated hospitalizations. The pts in the 1st and 2nd group were of similar age: 79 ± 2 and 80 ± 3 yr (p = 0.778). Group 1 had a lower CPB time: 62 ± 21 and 91 ± 28 min (p = 0.0014), post-CPB blood lactate level: 1.7 ± 0.7 and 2.5 ± 1.1 mmol/l (p = 0.016), amount of blood loss: 7.3 ± 2.2 and 11 ± 4.4 ml/kg (p = 0.014), blood transfusion rate: 2.4 ± 1.4 and 7.7 ± 3.1 ml/kg (p = 0.021), and a higher pre-operative haemoglobin level: 137 ± 10 and 125 ± 14 g/l (p = 0.0061) and post-operative platelets (PLT) count: 185 ± 53/10⁹ and 135 ± 46/10⁹/l (p = 0.004).

Discussion. The QOL of elderly pts one yr after cardiac surgery is determined by the features of the peri-operative course.

Reference

P-61
Patient satisfaction in cardiac anaesthesia: a single centre survey

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Introduction. Assessing patient satisfaction with a validated assessment tool is becoming more and more important. The inclusion of patients’ peri-operative experiences within a decision-making process is one of the priorities of the NHS in the UK. The results of validated patient satisfaction questionnaires allow comparison with other departments and they have the potential to facilitate improvement in the delivery of patient care. We used a validated patient satisfaction
questionnaire in cardiac surgery in combination with the modified Brice questionnaire to assess awareness with recall [1, 2].

Methods. Patients between 18 and 80 yr scheduled for elective or urgent cardiac surgery were included in this registered survey (AP3022). Exclusion criteria were diagnosis of psychiatric disorder or severe cognitive disorders and the inability to read, write and speak English. Patients received the satisfaction questionnaire on the third or fourth postoperative day.

Results. Eighty-one patients participated in the survey; 41 underwent coronary artery bypass graft (CABG) surgery, 22 single valve surgery and 11 received a valve procedure plus CABG surgery. The mean age was 66.7 ± 10.6 (SD), and 17 patients were female. Most patients (73/81) felt reassured by meeting the anaesthetist pre-operatively. None of the patients had an episode of awareness during surgery. The main postoperative complaints were pain and nausea by 59% and 50% of patients, respectively. The overall patient satisfaction levels demonstrated that 91% and 93% of patients were very satisfied or satisfied with the service offered by the anaesthetists and by the surgeons, respectively.

Discussion. Overall patient satisfaction levels in this survey were very high with none of the patients having intra-operative awareness. The results reveal however, that many patients complain about postoperative pain and postoperative nausea and vomiting after cardiac surgery.

References

P-62
Does minimally invasive direct coronary artery bypass (MIDCAB) reduce hospital length of stay? A retrospective analysis

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Introduction. During the last 20 years Minimally Invasive Direct Coronary Artery Bypass (MIDCAB) has been suggested as a means of reducing costs. A shorter hospital length of stay (LOS), less postoperative pain, accelerated rehabilitation, reduction of wound infections and superior cosmetic results have been postulated as the underlying benefits of MIDCAB. However, much of the early literature on this topic is based on technical reports or small case series and a lack of agreement between studies (statistical heterogeneity between randomized controlled trials, conflicting results) produced only low grade recommendations from experts.

Methods. From January 2005 to December 2011, overall 818 elective surgical coronary revascularization cases have been performed at our institution. We retrospectively matched a mixed cohort of 59 MIDCABs with a cohort of 59 off-pump (full sternotomy) coronary artery bypass cases (OPCAB) extracted from our electronic dataset, using the propensity score based nearest neighbour matching as described by Rosebaum et al. Multilevel stepwise regression modelling was used to indentify predictors of ICU and hospital LOS. Differences in ICU and hospital LOS were primary endpoints.

Results. The mini-invasive approach was not a predictor of ICU-LOS, hospital LOS, duration of mechanical ventilation, perioperative blood losses or peri-operative red packed cells transfusions. The mini-invasive approach was an independent predictor of duration of surgery. Independent of the number of grafts performed, MIDCAB pa-
tients underwent a longer procedure (66 min longer, \( p < 0.01 \), 95% CI: 47-85 min). Higgins’s Cardiac Risk Score (CRS) was the only independent predictor of hospital LOS on multilevel analysis. Post hoc power analysis showed 87% power to detect a difference in hospital LOS of 2 days but only 32% for a difference of 1 day (Figure 1).

**Discussion.** This retrospective analysis failed to show any significant difference (> 2 days) in ICU LOS and hospital LOS. MIDCAB was not a predictor of ICU and hospital LOS. This might be the result of the lack of superiority of MIDCAB against OPCAB or might be due to a lack of an ultra-fast track protocol at our institution. However, ultra-fast track hospital discharge in cardiac surgery is still debated and a fully integrated ultra-fast track protocol after MIDCAB as a standard of care requires further evaluation. Albeit some cost related benefits of MIDCAB have been suggested (cosmetic results, reduction of sternal infections, a reduced risk in redo cardiac surgery), a reduction in LOS and thus peri-operative costs attributable to MIDCAB is still debated, and further research is imperative.

**References**


P-63
Pre-hospital therapeutic hypothermia in cardiac arrest: a meta-analysis of randomized clinical trials

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Introduction. Current guidelines suggest therapeutic hypothermia to 32-34 °C in comatose patients after out of hospital resuscitation for cardiac arrest to improve neurological outcome. However, recent large randomized clinical trials (RCTs) did not confirm these beneficial effects. We therefore performed a meta-analysis of RCTs to evaluate the effects of hypothermia on mortality, neurologically intact survival, and re-arrest.

Methods. Four trained investigators searched pertinent studies on BioMedCentral, PubMed, Embase and the Cochrane Central Register. Inclusion criteria were adult patients and random allocation to treatment (pre-hospital therapeutic hypothermia versus normothermia or in-hospital therapeutic hypothermia). Computations were performed with Review Manager version 5.2. Outcomes were analysed to compute individual and pooled risk ratio (RR) with pertinent 95% confidence interval (CI), by means of Mantel-Haenszel method with a fixed- or random-effect model.

Results. Among 447 retrieved studies, five eligible studies randomizing 1,993 patients (1,003 to pre-hospital therapeutic hypothermia and 990 to normothermia or in-hospital therapeutic hypothermia) were identified. No difference in mortality was found at the longest follow-up available (555/1,003 [55%] in the pre-hospital therapeutic hypothermia group versus 552/990 [56%] in the control group, RR = 1.00 [95% CI 0.93 to 1.08], p for effect = 0.97, p for heterogeneity = 0.74, I² = 0% with 5 studies included). Moreover, no difference in neurologically intact survival was recorded (180/803 [22%] in the pre-hospital therapeutic hypothermia group versus 196/793 [25%] in the control arm, p for effect = 0.24 with 3 studies included). In contrast, pre-hospital therapeutic hypothermia was associated with an increased rate of re-arrest (181/921 [20%] in the pre-hospital therapeutic hypothermia group versus 143/909 [16%] in the control group, RR = 1.24 [95% CI 1.02 to 1.50], p for effect = 0.03, p for heterogeneity = 0.70, I² = 0% with 4 studies included).

Discussion. Pre-hospital therapeutic hypothermia does not improve outcome of patients after cardiac arrest and could be detrimental since it increases the rate of re-arrest.

P-64
Levosimendan in non-cardiac surgery: a systematic review

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Introduction. Levosimendan reduces mortality in the critically ill [1] and increases cardiac output with no increase in myocardial oxygen consumption. It is mostly used in cardiac surgery and heart failure patients. Even if more than 200 million major non-cardiac surgical interventions are performed per year worldwide, the use of this drug has been seldom reported in this context. We performed a systematic review to identify all the manu-
scripts ever published reporting levosimendan administration in patients undergoing non-cardiac surgery.

**Methods.** An extensive research of the literature (PubMed, BioMedCentral and Scopus) was performed by trained investigators. Data on surgical setting, dose of levosimendan, postoperative course, and outcome were extracted.

**Results.** Nine studies (published in 2008-2013) reported the use of levosimendan in non-cardiac surgery, 4 of them in vascular surgery. A total of only 46 patients received levosimendan and 10 patients placebo (only one small randomized trial has been published so far). Four manuscripts described emergency procedures. Bolus dose was reported by five authors and continuous infusion (0.1-0.2 µg/kg/min) was continued for 12-48 hr. A significant improvement in the main cardiac function parameters (e.g., cardiac index) and no 30-day mortality were achieved in the 5 manuscripts reporting these data. No haemodynamic complications (e.g., hypotension) nor major arrhythmias were described, with the exception of a single case of atrial fibrillation with spontaneous reversal.

**Discussion.** Levosimendan may be a feasible option for the peri-operative management of high-risk patients undergoing non-cardiac surgery. The topic merits further attention since only few and small studies previously investigated the role of levosimendan in this setting.

**References**


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**Poster Session – Thoracic Anaesthesia: Ventilation**

**P-65**

**Window setting of chest computed tomography to appropriately determine the left mainstem bronchial diameter**

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**Introduction.** Measuring the left mainstem bronchial (LMB) diameter on the chest computed tomography (CT) is widely used to determine the left-sided double-lumen tube (DLT) size. However, the LMB diameter is differently measured according to the window setting of the CT, which may result in inappropriate size of DLTs. This study was performed to investigate the optimal window setting for measuring the LMB to predict the proper DLT size for patients.

**Methods.** Patients scheduled for thoracic surgery were randomly allocated into two groups, the soft-tissue window group (n = 110) and the bronchial window group (n = 111). We decided the DLT size according to the chest CT, in which the window settings were to width 400 Hounsfield unit (HU), level 25 HU in the soft-tissue window group and width 1000 HU, level 450 HU in the bronchial window group. The appropriateness of the tube size was determined by the presence of air-tight seal during one-lung ventilation with 25 cmH₂O of peak airway pressure. We considered the selected DLT to be oversized if there was no air-leak with the bronchial cuff totally deflated, and undersized if there was air-leak even with the bronchial cuff volume over the resting volume. The selected DLT size, the probability of selecting oversize/undersize tube and the intra-cuff volume and pressure of the bronchial cuff during air-tight seal were examined in the both groups.
Results. There was a significant difference in the selected DLT size in both groups. The incidence of oversized DLT was higher in the soft-tissue window group ($p = 0.003$). The intra-cuff volume of the bronchial cuff during air-tight seal was higher in the soft-tissue window group ($0.8 \pm 0.5$ vs. $0.6 \pm 0.4$, $p = 0.024$), but the intra-cuff pressure was comparable between both groups.

Discussion. The window setting of width $1000$ HU, level $-450$ HU in chest CT is preferable for selection of a proper size DLT.

References

P-66
Gel lubrication reduces fluid leakage past the endobronchial cuff of double lumen tubes

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Introduction. To protect the healthy lung from soiling, the bronchial cuff of double-lumen tubes (DLT) must achieve a water-tight seal. Although a polyvinylchloride (PVC) endotracheal cuff cannot achieve a water-tight seal, application of lubricating gel on the PVC cuff has been reported to improve sealing characteristics [1]. Thus, we hypothesized that lubricating gel on endobronchial cuffs can reduce the fluid leakage past the cuff. An artificial tracheobronchial tree was made and the fluid leakage past the cuff was measured.

Methods. Seven 35 Fr left sided DLTs were tested. The endobronchial cuff of DLTs were randomly lubricated either with water (group C) or lubricating gel (group Gel), the was intubated the artificial tracheobronchial tree. 5 ml of coloured water put into the non-dependent side of the artificial tracheobronchial tree and fluid leaking past the endobronchial cuff was monitored for 6 h.

Results. Fluid leakage was first detected within one minute [0.5 min (0.4-0.7); median (interquartile)] in group C. In contrast, fluid leakage was not detected until 240 min in group Gel. At the end of the study period, all the fluid had passed over the cuff in group C, but 0 (0-0.6) ml of fluid leakage was detected in group Gel.

Discussion. Lubricant gel can increase the sealing characteristics of the DLT by filling the folds in the cuff, thereby obstructing the flow of material along the folds. Lubrication of bronchial cuff can effectively reduce the fluid leakage past the bronchial cuff.

References

P-67
Protective lung ventilation with pressure control ventilation versus volume control ventilation during one lung ventilation

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Introduction. A constant threat during one lung ventilation (OLV) in patients undergoing thoracic surgery is hypoxaemia. For many years, it was thought that large tidal volumes produced the highest arterial oxy-
gen tension (PaO2) during OLV, leading to the recommendation that tidal volume (TV) during OLV should be as high as in two-lung ventilation (8-12 ml/kg). Recent data have demonstrated that protective lung ventilation (TV ≤ 5ml/kg, positive end-expiratory pressure-PEEP 5-10 mmHg and limit of the plateau airway pressures up to 20 cmH2O) prevents acute lung injury (ALI). Use of pressure control ventilation (PCV) versus volume control ventilation (VCV) during OLV is considered to improve pulmonary oxygenation, to reduce intrapulmonary shunt and to lower airway peak pressure [1]. However, benefits of PCV implementation remain controversial not only in patients with pulmonary pathology but also in otherwise healthy patients [2]. In this study we investigated whether PCV or VCV can achieve the target of PLV during OLV in non-functionally impaired patients during thoracic surgery.

Methods. Twenty patients with good pre-operative pulmonary function (FEV1 > 75%, FEV1/FVC > 75%) scheduled for thoracic surgery were prospectively enrolled in this study. Ten patients underwent OLV with VCV and ten patients with PCV for a similar period of time with the same settings (TV: 5ml/Kg, PEEP: 5 cmH2O). Peak, plateau airway pressure and arterial blood gases were obtained during OLV.

Results. Arterial PO2 did not differ between the two groups before OLV establishment. There were significant differences during OLV in arterial oxygenation between VCV and PCV (PO2: 12.9 ± 0.72 kPa vs 18.4 ± 4.78 kPa respectively, p = 0.031). Peak airway pressure was lower with VCV than with PCV (Ppeak: 20 ± 0 vs 36 ± 3.28 respectively p = 0). Plateau pressure up to 20 cmH2O was achieved only with PCV, even though the low Pinspiration PCO2 was maintained less than 50 mmHg.

Discussion. The use of PCV during OLV leads to improved oxygenation compared with VCV also in patients with good pre-operative pulmonary function. Moreover PCV reduced peak airway pressures resulted in better distribution of ventilation to the lung, better ventilation/ perfusion matching and protection from barotraumas.

References

P-68
Protective one lung ventilation for pulmonary resections: a pilot study

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Introduction. Postoperative pulmonary complications are still major causes of morbidity and mortality after pulmonary resection. The use of low tidal volume (VT) during one lung ventilation (OLV) has been recently evaluated to decrease the incidence of Acute Lung Injury (ALI) as part of the ventilation strategy [1]. No study has been designed so far to evaluate the best VT during OLV. The primary endpoint of this study was to evaluate the feasibility of 6 vs. 4 ml/kg of VT during OLV for pulmonary resection and the impact of intra- and postoperative PaO2/FiO2. The secondary endpoints were the postoperative length of stay (LOS), cardiac and pulmonary complications and mortality.
Methods. Twenty-four patients (pts) undergoing elective thoracotomy or thoracoscopic lobectomy were enrolled and randomly assigned to two different OLV groups. During two lung ventilation (TLV), both groups were ventilated with a VT of 8 ml/kg. The comparison, as an observational intermediate step for designing a pilot study, was directed to a VT of 6 ml/kg (group 6) vs. a “more” protective VT of 4 ml/kg (group 4) during OLV. Exclusion criteria were: history of heart and/or renal disease, pulmonary hypertension, severe COPD and pts with preoperative PaO₂ < 8 kPa and/or PaCO₂ > 6 kPa. During TLV, both groups were ventilated with a peak pressure (P_{peak}) ≤ 25 cmH₂O and I:E = 1:2. During OLV, both group 6 and group 4 were ventilated with P_{peak} ≤ 35 cmH₂O, I:E = 1:2, while ZEEP was set in group 6, and a PEEP of 5 cmH₂O was set in group 4. Only in group 4, lung recruitment manoeuvres (LRM) were performed every hour of OLV, and in case of desaturation (SpO₂ < 92%), FiO₂ was increased to maintain SpO₂ > 93%. LRM were implemented as described by Tusman et al. [2]. After LRM, ventilation parameters were switched to baseline settings. After lung re-expansion, but before chest closure, PEEP of 5 cmH₂O was set in TLV. Intra-operatively, arterial blood gas analysis, haemodynamic and ventilatory data were recorded. In the postoperative period, vital signs every 12 h for 2 days, arterial blood gas analysis on the first and third postoperative day (POD), pulmonary and cardiac complications, postoperative LOS, need for re-operation and mortality were recorded.

Results. Are reported in Table 1.

Discussion. There were no statistical differences between the two groups in terms of PaO₂/FiO₂ and LOS. Among the postoperative complications, there was a higher
incidence of pneumonia in group 6. During OLV, hypercapnia was a side-effect of the “more” protective ventilation in group 6 with minimal pH changes. In thoracic surgery, Yang et al. [1] reported that OLV of the 6 ml/kg strategy, despite the smaller VT, was comparable to 8 ml/kg in terms of oxygenation, alveolar ventilation and postoperative outcomes. In conclusion, the present “pilot” study comparing a VT during OLV with 6 vs. 4 ml/kg showed that both protective ventilation strategies were safe caused no differences in postoperative results.

References

P-69
Effect of ventilatory mode on arterial oxygenation during one-lung ventilation for thoracic surgery in patients with obstructive lung diseases

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Introduction. The effect of ventilation mode during one-lung ventilation (OLV) on arterial oxygenation in patients with obstructive lung diseases has not been clearly determined yet. The purpose of this study was to evaluate the effects of ventilation mode on arterial oxygenation, airway pressures and haemodynamic variables during one-lung ventilation.

Methods. Forty patients, who had obstructive lung diseases on pulmonary function tests, undergoing elective thoracic surgery in the lateral position, were included. They were randomly assigned to one of two groups. In group A, OLV was started by volume-controlled ventilation (VCV) and the ventilation mode was switched to pressure-controlled ventilation (PCV) after 30 min. In group B, ventilation modes were performed in the opposite order. OLV was performed with a tidal volume of 6 ml/kg based on predicted body weight, with a positive end-expiratory pressure (PEEP) of 5 cmH₂O. Arterial blood gas analysis data, peak inspiratory pressures (Ppeak), mean airway pressure (Pmean), plateau inspiratory pressure (Pplateau), and haemodynamic variables were obtained at the end of each ventilatory mode during OLV. Statistical analysis was performed using paired t-test for numerical data and chi-squared test for non-numerical data between groups. Statistical significance was accepted for p-values of < 0.05.

Results. No significant difference was observed in arterial oxygenation during OLV with VCV (PaO₂ = 194.3 ± 43.7 cmH₂O) or PCV (PaO₂ = 200.8 ± 58.3 cmH₂O; p = 0.722). Compared to two-lung ventilation (18.8 ± 2.4 cmH₂O), peak airway pressure increased after the initiation of OLV with VCV (21.9 ± 2.5 cmH₂O; p = 0.002) or PCV (21.3 ± 4.1 cmH₂O; p = 0.039), but the airway pressures and haemodynamic variables were similar during OLV with each ventilation mode.

Discussion. In patients with obstructive lung disease, PCV provides no advantage over VCV in terms of respiratory and haemodynamic variables during protective OLV.
P-70
The one and a half ventilation technique with Human Silbroncho® double lumen tube for improving hypoxaemia during one-lung ventilation: a pilot study

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Introduction. Double lumen endobronchial tubes (DLT) are the most common method of achieving lung isolation and one-lung ventilation (OLV) during thoracic anaesthesia. The selective application of continuous positive-pressure ventilation (CPAP) to recruit the non-dependent lung (NL) during OLV improves arterial oxygenation, but may limit the surgical access during video-assisted thoracoscopic surgery (VATS). We hypothesized that the one and a half lung ventilation (OHLV) using Human Silbroncho® DLT during VATS may improve arterial oxygenation and providing a similar surgical access compared to the CPAP.

Methods. Sixteen patients scheduled for elective VATS were included. They were intubated with Human Silbroncho® (manufactured by INSUNG Medical.co, South Korea). After the first 15 min of OLV (TOLV), the NL was ventilated with tidal volume 5 ml/kg and CPAP of 5 cmH₂O (TCPAP). After 15 min of CPAP, patients were ventilated with the OHLV (TOHLV) (Figure 1). The OHLV means conventional OLV plus 50% ventilation of NL. PaO₂ of TOLV, TCPAP, and TOHLV were compared to each other. The degree of field disturbance (DFD) was evaluated by the surgeon and described as follows: DFD score 0 = no disturbance, 1 = mild, 2 = moderate, 3 = severe disturbance. Statistical analysis was performed with Wilcoxon signed-rank test using SPSS 12.0 (SPSS Inc., Chicago, IL, USA). Data are mean ± SD.

Results. There was no significant difference between PaO₂ of TOHLV (17.6 ± 6.8 kPa) and TCPAP (19.2 ± 9.2 kPa). Both PaO₂ of TOHLV and TCPAP were significantly higher than PaO₂ of TOLV (14.0 ± 44.8 kPa). DFD showed no significant difference between OHLV (1.0) and CPAP (0.9).

Discussion. OHLV with Human Silbroncho® was as effective as CPAP in improving the oxygenation during OLV, and provided satisfiable surgical fields for operation during VATS.

Figure 1: Human Silbroncho® DLT and OHLV
**Introduction.** Patients with chronic kidney disease (CKD) presenting for cardiac surgery often display comorbid diseases and a varying degree of adverse events in the perioperative setting [1]. In this group of patients, association of CKD and complications during cardiac ICU (CICU) stay are not well-defined. The objective of this investigation was to evaluate early postoperative complications in CICU among patients with normal or mild deterioration of renal function versus those with CKD (moderate to severe kidney dysfunction).

**Methods.** We retrospectively analysed data from 598 consecutive patients admitted to CICU after elective isolated coronary artery bypass grafting procedures from June 2012 to March 2014. Patients on renal dialysis, those having undergone urgent or emergent surgery, or those who suffered from pre-existing arrhythmia were excluded prior to the study. Estimated GFR (eGFR) was calculated by the MDRD equation for each patient. An eGFR of less than 60 ml/min/1.73 m² was considered the threshold for CKD. Early postoperative outcomes included re-intubation, pneumonia, acute kidney injury (AKI), renal failure requiring dialysis (RD), multiple organ dysfunction syndrome (MODS), new onset atrial fibrillation (AF) and in-hospital mortality. Chi-squared test and student’s t-test were used for statistical analysis.

**Results.** The threshold of CKD occurred in 165 patients (27.6%; Group 2), while 433 patients presented normal or mild deterioration of renal function (72.4%; Group 1). The mean age of Group 1 and Group 2 was 63.2 ± 10.6 and 69 ± 8.4 yr, respectively. Patients with CKD had higher re-intubation rates and incidence of pneumonia, AKI and RD (Table). A relative statistical significance was observed regarding MODS (4 vs. 5; \( p = 0.06 \)). Concerning AF, there was no statistical significance between the groups. Incidence of in-hospital mortality was less in Group 1 (Table 1).

**Discussion.** According to our results, patients with moderate to severe renal dysfunction undergoing open-heart surgery for coronary disease show increased postoperative morbidity and mortality. Therefore, preoperative stratification according to renal function is required to adopt renal protection.
strategies in an effort to avoid postoperative-
ly potential deleterious adverse events.

References
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P-72
Parameters of renal function after myocardial revascularization with the use of cardiopulmonary bypass

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Introduction. During cardiac surgical procedures with the use of CPB, kidney function is often affected, which manifests itself in changes in glomerular and tubular function. In patients with normal pre-operative renal function, there is a transitory renal dysfunction with the use of CPB. The aim of research was to establish renal function parameter values in patients before and after myocardial revascularization with and without the use of CPB.

Methods. Eighty patients with coronary heart disease who were subjected to elective surgical myocardial revascularization were studied prospectively. 40 patients were subjected to myocardial revascularization with the use of CPB and 40 patients subjected to myocardial revascularization without the use of CPB. Renal function parameters were measured in all subjects before and after myocardial revascularization and postoperatively up to 48 h. Creatinine clearance (CrCl), fractioned sodium excretion in urine and free water clearance were measured.

Results. Values of CrCl after myocardial revascularization in the CPB group were significantly lower compared to the off-pump group, as well as ClH₂O values (p < 0.01). Values of FENa in urine after myocardial revascularization were significantly higher in the CPB group compared to the off-pump group (p < 0.01).

Discussion. Myocardial revascularization without the use of CPB maintains better renal function and enables better renal protection.

P-73
Beneficial impact of levosimendan in critically ill patients with or at risk of acute renal failure: a meta-analysis of randomized clinical trials

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Introduction. Critically ill patients show a high incidence of Acute Kidney Injury (AKI), with few interventions that can alter its clinical course and improve outcome. Levosimendan is an inodilator agent that seems to increase renal blood flow due to its vasodilating effects. The aim of the study was to comprehensively assess all randomized controlled trials (RCTs) ever performed comparing levosimendan with any pharmacological comparator in order to evaluate the role of this drug in critically ill patients with or at risk of AKI.

Methods. A systematic review (Cochrane Central Register, Embase, Scopus and Medline) and a meta-analysis of pertinent RCTs were performed in accordance with the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) guidelines. To identify ongoing or unpublished trials, we searched the Clinical Trial Registry. We extracted data on setting, dose of levo-
simendan, type of comparator, outcome and
length of follow up. The primary endpoint was the number of patients receiving Renal Replacement Therapy (RRT) after randomization. The secondary endpoint was the number of patients developing AKI.

**Results.** The final analysis included 33 RCTs and 3,879 patients (2,024 receiving levosimendan and 1,855 receiving control). The overall analysis showed that the use of levosimendan was associated with a significant reduction in the risk of RRT (17 of 492 [3.5%] in the levosimendan group versus 37 of 427 [8.7%] in the control group, RR = 0.52, 95% CI 0.32 to 0.86, \( p \) for effect = 0.01) and in the risk or worsening of AKI (114 of 1,598 [7.1%] in the levosimendan group versus 143 of 1,529 [9.4%] in the control arm, RR = 0.79, 95% CI 0.63 to 0.99, \( p \) for effect = 0.048).

**Discussion.** This meta-analysis suggests that the use of levosimendan is associated with a significant reduction in the incidence of RRT in critically ill patients, and that this promising drug should be further studied in large randomized controlled trials.

**P-74**

**Urinary catheter management in a Cardiac Intensive Care Unit: a follow up**

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**Introduction.** During their stay in the intensive care unit, patients are subjected to various sources of infection. Urinary tract infection is one of the most frequent. Epic2 Guidelines suggest bladder washout is not useful in preventing catheter related infections and could potentially increase infection rates due to opening of the sterile closed system.

**Methods.** An audit on urinary catheter management was done between March and June 2011 on 207 patients admitted consecutively in our cardiothoracic intensive care unit. The aim of the investigation was to assess compliance with Epic2 guidelines on management of urinary catheters, frequency of bladder washout and compliance with Trust Policy during the procedure. After two years, a re-audit was conducted on 267 patients of the same Unit, between October and December 2013. The aim of the re-audit was to ensure no bladder washouts were performed unnecessarily, to verify utilization of bladder scan to detect presence of urine in the bladder and to ensure total adherence with Trust Policy regarding urinary catheter management.

**Results.** The first audit showed a low rate of bladder washout (13 on 207 pts) but only 2 of the bladder washouts performed were useful in resolving an obstruction. Compliance with ANTT (aseptic non touch technique) in performing the manoeuvre was also considered not satisfactory. The use of bladder scan to detect presence of urine in the bladder and staff retraining was recommended. The re-audit results showed 6 bladder scans performed in 267 patients, 4 of them followed by bladder washouts. Two patients had bladder washout with no bladder scan performed and without appropriate indications which resulted in being not useful. Complete accordance with policy and 100% compliance with ANTT were recorded in performing the manoeuvre.

**Discussion.** Re-audit showed an excellent compliance with hygiene policy and very effective staff training. Bladder scan is now an established device in our Unit. Rate of bladder washouts has decreased further. Final suggestion has been to always perform a bladder scan before bladder washout and to limit washouts to situations in which the procedure is strictly required (severe haematuria).

**References**

Haemodialysis in ICU patients results in cerebral microembolism

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Introduction. Generation of microemboli (ME) in the dialysis circuit is a recognised event during continuous veno-venous haemodialysis (CVVH). Evidence is accumulating that ME do not trap in the pulmonary vasculature and reach the cerebral circulation. The aim of this pilot study was to quantify (as microemboli load per 30 minutes) and qualify (particulate versus gaseous) ME, detected by transcranial Doppler (TCD) as high-intensity transient signals (HITS), in the middle cerebral arteries (MCA) during haemodialysis.

Methods. With local Ethics Committee approval and informed patient consent, ICU patients undergoing CVVH were included. Patients with severe head injury, carotid artery stenosis > 80%, other extracorporeal support or agitation were excluded. In a randomized fashion, HITS were recorded for 30 minutes during and without haemodialysis in both MCAs. Statistical analysis used Wilcoxon Signed Rank Test (significance at p < 0.05). Data are presented as number (n), mean ± standard deviation and median with interquartile ranges.

Results. Twenty patients (6 female, age 56 ± 11 yr.) were examined. The double-lumen dialysis catheter was positioned in the left/right internal jugular vein (n = 5/10) or left subclavian vein (n = 5). Overall HITS count increased from 77 (14; 600) without haemodialysis to 358 (62; 1,142) during haemodialysis (p < 0.001). Compared to the right MCA, the left MCA exhibited more overall HITS (150 [18; 902] vs. 39 [7; 356]; p = 0.007) and more gaseous HITS (140 [17; 821] vs. 35 [7; 351]; p = 0.007) during haemodialysis.

Discussion. This study confirmes that CVVH generates a considerable number of both particulate and gaseous ME, which pass the lungs and reach the MCA. Further research is needed to investigate the association of HITS to stroke and cognitive dysfunction in patients undergoing CVVH.
using the Acute Dialysis Quality Initiative’s RIFLE acute renal failure guide, but clinically returned to baseline by discharge in 92.3% of patients. All patients were immunosuppressed, with 89.6% of patients on 2 or more agents. Infection rates observed were: leg wound infection (10%), sternal wound infection (10%) and pneumonia (9.1%).

**Discussion.** Cardiac surgery can be performed safely with low mortality and morbidity rates in patients with a renal transplant. Long term survival rate and allograft function were found to be in an acceptable range.

**Figure 1: Survival curve for renal transplant patients following cardiac surgery**

**P-77**

**Reduction of the risk of gastroduodenal bleeding in cardiac surgery: new tactics**

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**Introduction.** Acute erosion and ulceration of upper gastrointestinal tract mucosa occur in 0.8-35% of cardiac surgery patients and have high mortality rates (up to 70%) [1,2]. A method of forecasting gastroduodenal bleeding (GDB) was examined on the basis
of the pathological mechanisms of erosions and ulcer.

Methods. In a prospective trial, 180 patients scheduled for coronary artery bypass grafting surgery were examined. The study group included 84 patients 56 ± 6 yr old. A week before the surgery these patients underwent a hypoxic test (HT) (breathing gas mixture with 10% oxygen for 40 min). During the HT, measurement of intragastric pH by acidogastrometer “AGM-03” was performed. All cases where gastric antrum pH was below 4.0 were considered to be at high risk of GDB and were administered 40 mg omeprazole per os. A low risk of GDB was assumed with a stable pH (Utility patent RU No 2404712 C2, 2010). A comparison group of 96 patients (56 ± 5 yr) received traditional prophylactic antisecretory therapy. ROC-analysis was performed to assess the prognostic power of the Method. Odds ratio was used to estimate the risk of GDB in both groups.

Results. High risk of GDB was revealed in 21 (25%) patients of the study group. Analysis of pH monitoring during cardiopulmonary bypass (CPB), revealed that in 6 patients of the study group, pH decreased down to 3.8 (p = 0.05). They received intravenous omeprazole 40-80 mg intra-operatively. Using the HT in conjunction with intragastric pH-metering has sensitivity-76.2%, specificity-90.5%, and the critical pH is ≤ 3.8 (p = 0.001), AUC = 0.88 (95% CI 0.80-0.95). The likelihood of developing GDB in patients of the study group at pH > 3.8 is lower than in the comparison group, Odds Ratio = 5.3.

Discussion. Performance of HT in conjunction with intragastric pH-metering allows selection of patients that do not require antisecretory drugs before operation. Intragastric pH monitoring during the peri-operative period allows an estimation of risk of GDB for administration of individual pathogenetically substantiated antisecretory therapy.

References

Poster Session – Echocardiography
P-78
Impact of intra-operative transoesophageal echocardiography on cardiac surgery decision-making: a prospective analysis

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Introduction. Previous studies demonstrated the importance of intra-operative monitoring with transoesophageal echocardiography (TOE) in cardiac surgery [1]. We assessed the impact on surgical decisions in patients undergoing cardiac surgery in our environment.

Methods. We designed a prospective observational study of patients undergoing cardiac surgery from June 2012 to October 2013. TOE was performed by the consultant anaesthesiologist in charge. The data collected was: 1) Type of surgery; 2) Pre-operative echocardiographic findings (“basal ECHO”); 3) Echocardiographic findings before entering cardiopulmonary bypass (CPB) (“pre-CPB TOE”); 4) Differences between baseline ECHO and pre-CPB TOE (“new pre-CPB finding”) and whether these differences modified planned surgery; 5) Echocardiographic diagnosis after disconnection of CPB (“new post-CPB finding”) and whether these post-CPB echocardiographic findings were sufficiently significant to re-establish CPB.

Results. 449 patients were studied. Intra-operative TOE showed “new pre-CPB find-
ings” in 49 patients (10.9%) and 32% (16 patients) of these caused a change in scheduled surgery. The most frequent findings were valvular abnormalities in patients undergoing coronary revascularization surgery which led to a replacement or repair that had not been scheduled. The incidence of “new post-CPB findings” was 8.7% (39 patients) and 64.1% (25 patients), of those required re-instating CPB and modifying the surgery performed. The main cause that led to re-entry into CPB was worsening of mitral valve dysfunction. In the remaining 14 patients who had “new post-CPB findings”, there was no change in the surgical procedure.

**Discussion.** Differences between pre-operative and intra-operative echocardiographic diagnosis may be due to better quality TOE images compared with pre-operative transthoracic explorations or expertise of the baseline echocardiographer. This may differ from small centres to echocardiography laboratories. Also and very importantly, the differences may be related to disease worsening secondary to a large time period between the pre-operative echocardiographic exploration and the surgery. Echocardiographic study after CBP provides direct and immediate assessment of the surgical outcome which can be useful for modifying the procedure if required. As previously described, TOE examination affected decision making and should be a standard procedure for all patients undergoing cardiac surgery. Despite the limitations of our study, we consider that TOE proved to be very useful in our working area.

**References**


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**P-79**

**Inter- and intra-observer variability of tricuspid annular plane excursion by 2 Dimensional-mode and M-mode in Transoesophageal Echocardiography**

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**Introduction.** The aim of this study was to assess the inter- and intra-observer variability of different modes of TAPSE measurements in TOE.

**Methods.** Patients scheduled for elective cardiac surgery underwent TOE including modified right ventricular deep transgastric view (dTGRV) at 0° and 120°. TAPSE was measured in midoesophageal 4 chamber view (4CH) by RV free wall shortening in 2D and in dTGRV by M-mode of lateral tricuspid annulus (TA). Data were digitally stored for subsequent offline analysis. The degree of M-mode cursor alignment to lateral TA in dTGRV was characterized as good < 20°, regular 20°-45° or poor > 45°. Image quality of 4CH was described regarding endocardial definition as good, regular or poor. For intra-observer variability, one examiner performed the measurements twice in a time interval of 6 weeks. For inter-observer variability, a second examiner performed all the measurements blinded to the results of the first examiner. For reliability analysis we used the intraclass correlation coefficient (ICC) with the results shown as ICC and its 95% confidence interval.

**Results.** Thirty-five patients (19 men/16 women) were included. Quality of images was good in 68.5% of dTGRV 0°, 40% of dTGRV 120° and 57% of 4CH, regular in 28.5% of dTGRV 0°, 54% of dTGRV 120°and 34% of 4CH and poor in 3% of dTGRV 0°, 6% of dTGRV 120° and 9% of 4CH views (s. Table 1).

The intra-observer reliability analysis showed a very good ( > 0.91) correlation in dTGRV views and a good (0.7-0.9) one in 4CH view. The correlation for inter-observer
values was good or very good for dTGRV views but poor (0.31-0.5) in 4CH view.

**Discussion.** TAPSE measurement using M-mode in modified dTGRV 0° and 120° views in TOE demonstrates a good reproducibility in comparison to TAPSE measured by 2D-mode in 4CH view.

### P-80

**Tricuspid annular plane excursion and peak systolic velocity in grading of right ventricular function in TOE in operative setting: is it valuable?**

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**Introduction.** Right ventricular (RV) longitudinal shortening for assessment of RV function after cardiac surgery has been considered critical compared to fractional area change (FAC) [1]. The aim of our study was to assess the probable value of tricuspid annular plane excursion (TAPSE) and peak systolic velocity of tricuspid annulus (S’) evaluation in grading of global RV function pre- and post-cardiopulmonary bypass (CPB) by tranesoophageal echocardiography (TOE) in the operative setting.

**Methods.** Patients scheduled for elective cardiac surgery with sternotomy and CPB including aortic valve replacement (AVR), repair of ascending aorta (AA) and coronary artery bypass graft (CABG) underwent standard TOE. TAPSE by M-mode and S’ by tissue Doppler in RV modified deep transgastric view (dTGRV) as well as RVFAC in midoesophageal four chamber (4CH) view were measured pre- and post-CPB. FAC was categorized as normal (>35%), mildly (30-35%) or severely (<30%) reduced.

One way ANOVA was performed for pre- and post-CPB TAPSE and S’ values. Results are expressed as mean and SD and as percentage (p < 0.05).

**Results.** Thirty-seven patients (23 men/14 women) were included and scheduled for AVR ± AA (n = 30), CABG (n = 3) and AVR+CABG (n = 4).

A significant difference in TAPSE and S’ values was observed not only pre-, but also post-CPB between the various categories of RV function (s. Table 2).

**Discussion.** Despite the changes in RV contractile pattern in the operative setting, TAPSE and S’ measurements may be used to categorise RV function. Larger studies are

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necessary to define the value ranges within each category.

References

P-81
Use of a novel stethoscope in a cardiac intensive care

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Introduction. Pocket sized hand-held echocardiography devices have been claimed to be stethoscopes of the future. A novel device, V scan, provides good quality images comparable to standard echocardiography [1]. We present data from our on-going local service evaluations on the use of the V scan in a cardiac intensive care unit (ICU) setting.

Methods. Following the introduction of two portable V scan devices, we examined their use in 22 patients on our cardiac ICU. 16 out of the 22 focused studies were performed on patients following cardiac surgery and 6 studies on medical patients. A single operator (PRM) performed all the focused studies, as per the FATE protocol [2]. In each study, the indication, quality of images (on a scale of 0 = poor, 1 = acceptable, 2 = good), windows obtained and any change in clinical management resulting from the study, were documented.

Results. In all the focused studies, conclusions were based on at least three views. The quality of the images obtained were recorded as good in 68% (15/22) and acceptable in 32% (7/22) of the cases. In the subgroup of patients who were mechanically ventilated (13/22), the quality of the images were good in 9 (70%) and acceptable in 4 (30%) patients. In 64% (14/22) of the cases, the use of the V scan prompted a change in management. (Need for a comprehensive transthoracic echo study in 5 cases, optimization of fluid status in 3 cases, need for inotropic support in 2 cases, exclusion of cardiac tamponade in 2 cases and thoracocentesis in 2 cases).

Discussion. Despite having limited applications (2D and colour Doppler), pocket sized hand-held devices can provide valuable information on the haemodynamic status of critically ill patients. In our case series, interpretable images were obtained in all the focused studies, including in patients who were mechanically ventilated. Our results suggest that the V scan pocket device may be a useful tool for focused echocardiography in a cardiac ICU setting.

References

P-82
Simulation-based transthoracic echo teaching: a tertiary centre experience

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Introduction. Simulation-based teaching has recently been shown to be an effective approach to train echo naïve non-cardiologists in transthoracic echocardiography (TTE) [1].
We present data on our experience in simulation-based TTE teaching.

**Methods.** Following approval from the Intensive Care Society (UK), we developed a one-day course to teach basic transthoracic echo, for echo naïve intensive care physicians. The Heartworks® transthoracic echo simulator (HS) is a novel teaching tool that allows 3D visualization of the cardiac anatomy. The course incorporated simulation-based training using the HS, in addition to standard teaching. On our first course (August 2013), one of the four core lectures was delivered using the HS. Our second course (January 2014) included more simulation-based elements with three simulation-facilitated lectures. We evaluated candidates’ feedback from both courses.

**Results.** The core lectures were categorized as either simulator-based or didactic. Feedback data from both courses revealed that, although scores between the simulator-facilitated lecture teaching and didactic lectures were similar, the candidates’ overall impressions on the second course were significantly better than the first. This may be due to the fact that our second course had more simulation-based elements incorporated in the contents of the course (Figure 1).

**Discussion.** In our experience we found that the HS is an excellent teaching tool, which improves the candidates’ understanding of the cardiac sonoanatomy. Our results reveal that inclusion of a simulation-based teaching approach in a basic TTE course, improves candidates’ satisfaction and feedback.

**References**
### AUTHOR INDEX

<table>
<thead>
<tr>
<th>Author Name</th>
<th>Page</th>
<th>Author Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aadahl, Petter</td>
<td>P-2</td>
<td>Baiardo Redaelli, Martina</td>
<td>P-9</td>
</tr>
<tr>
<td>Aarts, Leon</td>
<td>O-23</td>
<td>Bai, Jiseok</td>
<td>P-50</td>
</tr>
<tr>
<td>Abate, Ananya</td>
<td>O-5</td>
<td>Baik, Seong-Wan</td>
<td>P-66</td>
</tr>
<tr>
<td>Adams, George</td>
<td>P-4</td>
<td>Bal, Serina</td>
<td>P-73</td>
</tr>
<tr>
<td>Adlam, Michael</td>
<td>P-61</td>
<td>Baliner, Eugeni</td>
<td>P-60</td>
</tr>
<tr>
<td>Adzhigaliev, Ruslan</td>
<td>O-56</td>
<td>Ballard, Clive</td>
<td>O-69</td>
</tr>
<tr>
<td>Agapov, Valery</td>
<td>O-72</td>
<td>Balogh, Adam</td>
<td>O-39</td>
</tr>
<tr>
<td>Agarwal, Surendra Kumar</td>
<td>O-61</td>
<td>Banya, Winston</td>
<td>P-25</td>
</tr>
<tr>
<td>Agdanlı, Dogus</td>
<td>P-52</td>
<td>Barbieri, Stefania</td>
<td>P-63</td>
</tr>
<tr>
<td>Aguilara, Elisabet</td>
<td>O-22</td>
<td>Barile, Luigi</td>
<td>P-37</td>
</tr>
<tr>
<td>Ahn, Hyun Joo</td>
<td>O-25</td>
<td>Barletta, Antonio</td>
<td>P-7</td>
</tr>
<tr>
<td>Ahumada, Rosalía</td>
<td>P-59</td>
<td>Baronecelli, Francesca</td>
<td>P-37</td>
</tr>
<tr>
<td>Aidietis, Audrius</td>
<td>P-15</td>
<td>Baroselli, Antonio</td>
<td>P-68</td>
</tr>
<tr>
<td>Ajello, Valentina</td>
<td>O-43</td>
<td>Basagan Mogol, Elif</td>
<td>P-55</td>
</tr>
<tr>
<td>Albano, Giovanni</td>
<td>O-53</td>
<td>Bascian, Reto</td>
<td>P-42</td>
</tr>
<tr>
<td>Alekseev, Alexey</td>
<td>P-19</td>
<td>Battezzi, Alessandra</td>
<td>P-68</td>
</tr>
<tr>
<td>Alexeev, Vasilii</td>
<td>O-56</td>
<td>Bautin, Andrei</td>
<td>P-51</td>
</tr>
<tr>
<td>Allerid, Fethia</td>
<td>O-5</td>
<td>Bayram, Sami</td>
<td>P-58</td>
</tr>
<tr>
<td>Algottsson, Lars</td>
<td>O-3</td>
<td>Bauturian, Oezgur</td>
<td>P-52</td>
</tr>
<tr>
<td>Allocca, Silvio</td>
<td>O-26</td>
<td>Beattie, Scott</td>
<td>O-30</td>
</tr>
<tr>
<td>Alston, Peter</td>
<td>P-4</td>
<td>Behrem, Adnan</td>
<td>P-72</td>
</tr>
<tr>
<td>Altun, Demet</td>
<td>P-40</td>
<td>Bellandi, Mattia</td>
<td>P-9</td>
</tr>
<tr>
<td>Amoako, Derek</td>
<td>O-69</td>
<td>Belletti, Alessandro</td>
<td>P-64</td>
</tr>
<tr>
<td>Ampatzidou, Fotini</td>
<td>P-17</td>
<td>Belov, Sergey</td>
<td>O-56</td>
</tr>
<tr>
<td>Andreas, Bayer</td>
<td>O-63</td>
<td>Bennett, Kyle</td>
<td>P-4</td>
</tr>
<tr>
<td>Andrews, David</td>
<td>O-52</td>
<td>Benson, Gary</td>
<td>P-30</td>
</tr>
<tr>
<td>Angelo, Morelli</td>
<td>P-68</td>
<td>Bentala, Mohamed</td>
<td>O-47</td>
</tr>
<tr>
<td>Araujo, Hugo</td>
<td>O-69</td>
<td>Beregnoy, Sergey</td>
<td>O-56</td>
</tr>
<tr>
<td>Arguis, María José</td>
<td>O-22</td>
<td>Bertolotti, Alejandro</td>
<td>P-59</td>
</tr>
<tr>
<td>Aron, Jon</td>
<td>O-69</td>
<td>Besser, Martin</td>
<td>O-49</td>
</tr>
<tr>
<td>Ascari, Roberto</td>
<td>P-64</td>
<td>Betz, David</td>
<td>O-63</td>
</tr>
<tr>
<td>Ased, Hosham</td>
<td>O-18</td>
<td>Bhatti, Aruna</td>
<td>O-13</td>
</tr>
<tr>
<td>Asouhidou, Irene</td>
<td>P-67</td>
<td>Bhaskaran, K</td>
<td>P-54</td>
</tr>
<tr>
<td>Asteri, Theodora</td>
<td>P-17</td>
<td>Bhavsar, Rajesh</td>
<td>O-75</td>
</tr>
<tr>
<td>Astuto, Marinella</td>
<td>P-49</td>
<td>Biagioli, Bonizella</td>
<td>P-35</td>
</tr>
<tr>
<td>Avram, Michael</td>
<td>O-59</td>
<td>Bici, Samuele</td>
<td>O-53</td>
</tr>
<tr>
<td>Ayhan, Banu</td>
<td>O-9</td>
<td>Biedrzycka, Aleksandra</td>
<td>O-73</td>
</tr>
<tr>
<td>Bełtejewski, Piotr</td>
<td>O-4</td>
<td>Bjuhrsten, Henrik</td>
<td>O-3</td>
</tr>
<tr>
<td>Baba, Hiroshi</td>
<td>P-41</td>
<td>Bleuvel, Irina</td>
<td>P-43</td>
</tr>
<tr>
<td>Babik, Barna</td>
<td>O-39</td>
<td>Boer, Christa</td>
<td>O-37</td>
</tr>
<tr>
<td>Baek, Seung-Wan</td>
<td>P-56</td>
<td>Bolliger, Daniel</td>
<td>O-74</td>
</tr>
<tr>
<td>Bahk, Jae-Hyon</td>
<td>P-11</td>
<td>Bosch, Alba</td>
<td>P-29</td>
</tr>
<tr>
<td></td>
<td>P-65</td>
<td>Botrell, Stephen</td>
<td>O-52</td>
</tr>
</tbody>
</table>
Bottiroli, Maurizio O-54
Bottrell, Fiona O-49
Bowdle, Andrew O-31
Boyer, Philippe O-16
Bragadottir, Gudrun O-48
Braham, Deborah O-27
Brand, Anneke O-47
Brandon B Bruinsma, GJ P-38
Brommundt, Jan P-46
Brondén, Björn O-3
Brown, Greg P-4
Buisman, Pieter O-71, P-46
Bunatyan, Armen P-22
Buonomo, Chiara O-43, O-45

Cıkrıkçı, Cengizhan P-52
Caciorgna, Marcella P-35
Camci, Emre P-34, P-40
Campos, Francisco O-22
Campos, Juan Manuel P-10
Cáneva, Jorge P-59
Canty, David O-52
Caponi, Gaspar P-45
Carlucci, Giacomo P-35
Carmona, Paula P-8
Carola, Matellon P-68
Carrel, Thierry P-42, P-43, P-44
Carrillo, Alejandro P-78
Cartwright, Bruce P-26, P-27
Cassisi, Cesare P-49
Cataruzza, Alex P-68
Chang, Jee-Eun O-8
Chang, Shi-Chuan P-2
Cherniavskiy, Alexander O-33
Chew, Sophia TH O-50, P-23, P-53
Chiara, Pravisani P-68
Chiarenza, Federica P-49
Chmara, Magdalena O-4, O-68
Cho, Ah-Reum P-50, P-56, P-66
Choi, Ji Won O-25
Chou, An-Sun O-2
Choudhury, Minati O-67
Christoph, Huber P-42
Cil, Hemra O-9
Cipriani, Nicolò P-16, P-73
Cizmeci, Elif Ayse O-9
Clayton-Smith, Ana P-4
Colella, Dionisio O-43, O-45
Cole, Oana Maria O-64
Colson, Pascal O-12, O-21, O-32,

D’Agrosa, Liliana P-37
D’Alessio, Simone P-73
Dardashti, Alain O-3
Datsenko, Sergey P-51
Davidson, Simon P-25
De Bonis, Clemaria O-26
De Caria, Daniele O-54
De Cruyenaere, Johan O-17
Dehghani, Majid O-60
Delisle, Stéphane O-18
Denuault, André Y O-18
Deschamps, Alain O-18
Dessouky, Ayman O-24
De Vico, Pasquale O-43, O-45
De Waal, Eric O-66
Díaz-Ravetllat, Vanessa O-22
Dijkstra, Homme O-19
Di Lorenzo, Alfonso O-26
De Maio, Salvatore O-26
Dincq, Anne-Sophie O-14
Dincyurek, Gamze P-48
Diplaris, Konstantinos P-17, P-71
Di Tommaso, Claudia O-54
Doherty, Maragret O-40
Dolores, Rufolo P-68
Dossi, Roberto P-7
Drossos, George P-17, P-71
Dunnett, Eleanor P-25
Durmus, Bengu P-58
Dworschak, Martin P-47
Eberle, Balthasar P-39, P-42, P-43,
P-44, P-75
Ederoth, Per O-3
Efremov, Sergey O-33
Eibel, Sarah P-14, P-79, P-80
Eichenbaum, Kenneth P-24
<table>
<thead>
<tr>
<th>Author Name</th>
<th>Page Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eke, Andras</td>
<td>P-33</td>
</tr>
<tr>
<td>Elhaj, Mona</td>
<td>O-32</td>
</tr>
<tr>
<td>Eliet, Jacob</td>
<td>O-12, O-21, O-44</td>
</tr>
<tr>
<td>Elmi-Sarabi, Mahsa</td>
<td>O-18</td>
</tr>
<tr>
<td>El Tahan, Mohamed</td>
<td>O-6</td>
</tr>
<tr>
<td>Eltawil, Tarek</td>
<td>O-42</td>
</tr>
<tr>
<td>Ender, Joerg</td>
<td>P-14</td>
</tr>
<tr>
<td>Ender, Jörg</td>
<td>P-79, P-80</td>
</tr>
<tr>
<td>Englberger, Lars</td>
<td>P-43</td>
</tr>
<tr>
<td>Englyst, Nicola</td>
<td>O-34</td>
</tr>
<tr>
<td>Erdös, Gábor</td>
<td>P-39, P-42, P-43, P-44, P-75</td>
</tr>
<tr>
<td>Eremeeva, Olga</td>
<td>O-65</td>
</tr>
<tr>
<td>Esposito, Giampiero</td>
<td>O-53</td>
</tr>
<tr>
<td>Etin, Vladimir</td>
<td>P-51</td>
</tr>
<tr>
<td>Evstifeev, Ivan</td>
<td>O-72</td>
</tr>
<tr>
<td>Fabregas, Neus</td>
<td>O-22</td>
</tr>
<tr>
<td>Facchini, Alberto</td>
<td>O-54</td>
</tr>
<tr>
<td>Farinaccio, Andrea</td>
<td>O-43, O-45</td>
</tr>
<tr>
<td>Fava, Carlos</td>
<td>P-45</td>
</tr>
<tr>
<td>Fawaii, Roberto</td>
<td>P-45, P-59</td>
</tr>
<tr>
<td>Federico, Barbariol</td>
<td>P-68</td>
</tr>
<tr>
<td>Fedotov, Petr</td>
<td>P-51</td>
</tr>
<tr>
<td>Felli, Alessia</td>
<td>P-47</td>
</tr>
<tr>
<td>Ferguson, Niall</td>
<td>O-40</td>
</tr>
<tr>
<td>Fernandez, José Antonio</td>
<td>P-10</td>
</tr>
<tr>
<td>Ferreira, Nicola</td>
<td>O-69</td>
</tr>
<tr>
<td>Ferreira, Renata</td>
<td>O-31</td>
</tr>
<tr>
<td>Ferrero, André</td>
<td>P-10</td>
</tr>
<tr>
<td>Ferrone, Ottavia</td>
<td>O-26</td>
</tr>
<tr>
<td>Filipovic, Miodrag</td>
<td>O-74</td>
</tr>
<tr>
<td>Fischer, Kady</td>
<td>O-11, O-38</td>
</tr>
<tr>
<td>Fita, Guillermina</td>
<td>P-78</td>
</tr>
<tr>
<td>Fleming, Ian</td>
<td>P-61</td>
</tr>
<tr>
<td>Flo, Anna</td>
<td>P-79, P-80</td>
</tr>
<tr>
<td>Flo-Forner, Anna</td>
<td>P-14</td>
</tr>
<tr>
<td>Fominskii, Evgeny</td>
<td>O-36</td>
</tr>
<tr>
<td>Fonteyne, Isabelle</td>
<td>O-17</td>
</tr>
<tr>
<td>Forero, Carolina</td>
<td>P-78</td>
</tr>
<tr>
<td>Forfoni, Francesco</td>
<td>P-37</td>
</tr>
<tr>
<td>Fraguas, Hugo</td>
<td>P-45</td>
</tr>
<tr>
<td>Franchi, Federico</td>
<td>P-35</td>
</tr>
<tr>
<td>Friberg, Örjan</td>
<td>O-10</td>
</tr>
<tr>
<td>Friedrich, Matthias G</td>
<td>O-11, O-38</td>
</tr>
<tr>
<td>Friis, John</td>
<td>P-18</td>
</tr>
<tr>
<td>Frokær, Jørgen</td>
<td>O-20</td>
</tr>
<tr>
<td>Galán, Josefina</td>
<td>P-10, P-29</td>
</tr>
<tr>
<td>Gal, Janos</td>
<td>O-62, P-33</td>
</tr>
<tr>
<td>Garcia-Aguado, Roberto</td>
<td>O-28</td>
</tr>
<tr>
<td>Garosi, Marco</td>
<td>P-35</td>
</tr>
<tr>
<td>Gaudard, Philippe</td>
<td>O-12, O-21, O-32, O-44</td>
</tr>
<tr>
<td>Giardino, Salvatore</td>
<td>O-26</td>
</tr>
<tr>
<td>Giorgio, Della Rocca</td>
<td>P-68</td>
</tr>
<tr>
<td>Giuseppe, Aresu</td>
<td>P-68</td>
</tr>
<tr>
<td>Göber, Volkhard</td>
<td>P-43</td>
</tr>
<tr>
<td>Gomar, Carmen</td>
<td>O-22</td>
</tr>
<tr>
<td>Gómez, Carmen</td>
<td>P-45, P-59</td>
</tr>
<tr>
<td>Goody, Philip</td>
<td>P-61</td>
</tr>
<tr>
<td>Goren, Suna</td>
<td>P-58</td>
</tr>
<tr>
<td>Granzotti, Saskia</td>
<td>P-68</td>
</tr>
<tr>
<td>Grapow, Martin</td>
<td>O-74</td>
</tr>
<tr>
<td>Greco, Teresa</td>
<td>P-7, P-9</td>
</tr>
<tr>
<td>Green, David</td>
<td>O-69</td>
</tr>
<tr>
<td>Greisen, Jacob</td>
<td>O-46, O-75</td>
</tr>
<tr>
<td>Greval, Deep</td>
<td>O-30, O-40</td>
</tr>
<tr>
<td>Grins, Edgars</td>
<td>O-3</td>
</tr>
<tr>
<td>Guarnieri, Marcello</td>
<td>P-63</td>
</tr>
<tr>
<td>Gudehus, Sven</td>
<td>P-14</td>
</tr>
<tr>
<td>Guensch, Dominik P</td>
<td>O-11, O-38</td>
</tr>
<tr>
<td>Gurbet, Alp</td>
<td>P-48</td>
</tr>
<tr>
<td>Gürvit, Hakan</td>
<td>P-34</td>
</tr>
<tr>
<td>Guseva, Olesya</td>
<td>P-60</td>
</tr>
<tr>
<td>Hakanson, Erik</td>
<td>O-10</td>
</tr>
<tr>
<td>Han, Sunghee</td>
<td>P-50</td>
</tr>
<tr>
<td>Han, Sunhee</td>
<td>P-66</td>
</tr>
<tr>
<td>Hapfelmeier, Alexander</td>
<td>O-55</td>
</tr>
<tr>
<td>Hasheminejad, Elham</td>
<td>P-14, P-79, P-80</td>
</tr>
<tr>
<td>Hasselaar, Wiebren</td>
<td>O-19</td>
</tr>
<tr>
<td>Hastings, Stuart L</td>
<td>P-6</td>
</tr>
<tr>
<td>Hawthorne, Tim</td>
<td>P-4</td>
</tr>
<tr>
<td>Hedzic, Haris</td>
<td>P-72</td>
</tr>
<tr>
<td>Herck, Ingrid</td>
<td>O-17</td>
</tr>
<tr>
<td>Hoetink, A</td>
<td>P-38</td>
</tr>
<tr>
<td>Hogan, Maurice</td>
<td>O-49</td>
</tr>
<tr>
<td>Hogervorst, Esther</td>
<td>O-47</td>
</tr>
<tr>
<td>Holm, Jonas</td>
<td>O-10</td>
</tr>
<tr>
<td>Holloway, Judith</td>
<td>O-34</td>
</tr>
<tr>
<td>Hollmann, Markus</td>
<td>P-3</td>
</tr>
<tr>
<td>Name</td>
<td>Affiliation</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Horlait, Geoffrey</td>
<td>O-14</td>
</tr>
<tr>
<td>Hosny, Hisham</td>
<td>O-24, P-21</td>
</tr>
<tr>
<td>Hote, Milind Padmakar</td>
<td>O-67</td>
</tr>
<tr>
<td>Huber, Christoph</td>
<td>P-44</td>
</tr>
<tr>
<td>Huisman, Albert</td>
<td>O-66</td>
</tr>
<tr>
<td>Hurt, Alfred</td>
<td>P-24</td>
</tr>
<tr>
<td>Hwang, Jin-Young</td>
<td>O-8, P-69</td>
</tr>
<tr>
<td>Hwang, Nian Chih</td>
<td>P-12</td>
</tr>
<tr>
<td>Iakovlev, Andrei</td>
<td>P-51</td>
</tr>
<tr>
<td>Ialongo, Vincenzo</td>
<td>O-35</td>
</tr>
<tr>
<td>Iasevoli, Nicola</td>
<td>O-43</td>
</tr>
<tr>
<td>Ibragimov, Stanislav</td>
<td>O-56</td>
</tr>
<tr>
<td>Imai, Hidekazu</td>
<td>P-41</td>
</tr>
<tr>
<td>Ince, Can</td>
<td>O-9</td>
</tr>
<tr>
<td>Irina, Mandel</td>
<td>P-77</td>
</tr>
<tr>
<td>Irina, Suhodolo</td>
<td>P-77</td>
</tr>
<tr>
<td>Isella, Francesca</td>
<td>P-16, P-63, P-64, P-7</td>
</tr>
<tr>
<td>Jackson, Mark</td>
<td>O-57</td>
</tr>
<tr>
<td>Jagielał, Dariusz</td>
<td>O-41, O-73</td>
</tr>
<tr>
<td>Jain, Anand</td>
<td>P-37</td>
</tr>
<tr>
<td>Jainandunsing, Jayant</td>
<td>O-71</td>
</tr>
<tr>
<td>Jain, S</td>
<td>P-82</td>
</tr>
<tr>
<td>Jakobsen, Carl-Johan</td>
<td>O-46, O-75</td>
</tr>
<tr>
<td>Janavicute, Gabija</td>
<td>P-15</td>
</tr>
<tr>
<td>Jansen Klomp, WW</td>
<td>P-38</td>
</tr>
<tr>
<td>Janusauskas, Vilis</td>
<td>P-15</td>
</tr>
<tr>
<td>Jarmoszewicz, Krzysztof</td>
<td>O-68</td>
</tr>
<tr>
<td>Jelacic, Srdjan</td>
<td>O-31</td>
</tr>
<tr>
<td>Jeon, Yunseok</td>
<td>P-11, P-65</td>
</tr>
<tr>
<td>Jerath, Angela</td>
<td>O-40, P-6</td>
</tr>
<tr>
<td>Jimenez, María José</td>
<td>O-22</td>
</tr>
<tr>
<td>Jung, Yoo Sun</td>
<td>P-11, P-65</td>
</tr>
<tr>
<td>Kabil, Edin</td>
<td>P-72</td>
</tr>
<tr>
<td>Kalaivani, MV</td>
<td>O-67</td>
</tr>
<tr>
<td>Kalmar, Alain</td>
<td>O-71, P-46</td>
</tr>
<tr>
<td>Kam, Peter</td>
<td>P-27</td>
</tr>
<tr>
<td>Kanbak, Meral</td>
<td>O-9</td>
</tr>
<tr>
<td>Karadeniz, Meltem</td>
<td>P-40</td>
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<tr>
<td>Karaïskos, Theodoros</td>
<td>P-17</td>
</tr>
<tr>
<td>Kasper, Jorge</td>
<td>O-74</td>
</tr>
<tr>
<td>Kaya, Fatma Nur</td>
<td>P-55, P-58</td>
</tr>
<tr>
<td>Kaya, Sener</td>
<td>P-55</td>
</tr>
<tr>
<td>Kaya, Sünkar</td>
<td>P-40</td>
</tr>
<tr>
<td>Keiralla, Amar</td>
<td>P-49</td>
</tr>
<tr>
<td>Kelleher, Andrea</td>
<td>P-25</td>
</tr>
<tr>
<td>Keranovic, Suad</td>
<td>P-72</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lee, Sangmin M O-25, P-57 Matteazzi, Andrea P-73
Lembo, Rosalba P-63, P-64 Mauriat, Philippe O-16
Lev, Gustavo P-45 Mayr, N Patrick O-22
Lewandowski, Krzysztof O-41 Mendiz, Oscar O-55
Lex, Daniel O-62 McCaill, Philip P-36
Li Bassi, Gianluigi O-22 Michaël, Isabelle P-45
Lichtenbelt, Bart Jan O-71 Meraglia, Antonella P-37
Lightfoot, Nicholas J P-6 Min, Jeong Jin P-11, P-65
Limon, Janusz O-4, O-68 Min, Seong-Won O-8
Liu, Weiling O-50, P-23, P-53 Mininni, Maria O-54
Livia, Pompei P-68 Molins, Laureano P-29
Llagunes, José P-8 Moloz, Gleb P-10
Lo, Joyce P-24 Moral, María O-36
Lombrano, Maria Rita P-37 Moretto, Rebecca P-7
Lomeña, Francisco O-22 Mohamed, Mohamed O-7
Lomivorotov, Vladimir O-33, O-36, O-58, P-13 Moideen, Ijas P-76
Lyamin, Andrey P-60 Molos, Laureano P-29
Lyng, Oddveig P-2 Murad, Marc O-12, O-44
Lyriti, Konstantia P-17, P-71 Mukherjee, Chirojit P-79, P-80

Madesis, Athanasios P-71 Mukhi, Peter P-33
Madhvathanan, P R P-81, P-82 Muñoz, Christian P-29
Maestre, Maria Luz P-10, P-29 Murphy, Glenn O-59
Maffini, Alice P-9, P-73 Mutagirov, Vladimir P-32
Maglioni, Enivarco P-35
Maltesen, Raluca G O-35
Mamedov, Alexander P-56 Nagy, Zoltan P-33
Marcella, Brazzoni P-68 Nandor, Marczin O-63
Marchetti, Luca P-35
Mariconda, Giuseppe O-53 Nardelli, Pasquale P-16, P-63
Marini, Elena P-37, P-74 Nasr, Sherif O-42
Markstaller, Klaus P-75 Naumenko, Vitaliy P-19
Marques, Jose O-28 Navales, Ignacio O-22
Marquez, Michael P-24 Navarro, Ricardo O-22, P-78
Martí, Joan-Daniel O-22 Nebot, Alexia P-10
Martinelli, Giampaolo P-37, P-74 Needham, Amy O-49
Martínez León, Juan P-8 Negroni, Jorge P-45, P-59
Martin, Klaus O-55 Nemeth, Endre O-62, P-33
Martino, Enrico Antonio P-7, P-64 Névély, Kittki O-39
Mashari, Azad O-5 Ng, Roderica O-50, P-23, P-53
Masutin, Sergej O-65 Nicola, Langiano P-68
Mateo, Eva P-8 Nierich, AP P-38
Matsuno, Jun P-9, P-73 Nonini, Sandra O-54
<table>
<thead>
<tr>
<th>Name</th>
<th>Page</th>
<th>Name</th>
<th>Page</th>
<th>Name</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nordhaug, Dag Ole</td>
<td>P-2</td>
<td>Ponomarev, Dmitry</td>
<td>O-58</td>
<td>P-13</td>
<td></td>
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<td>Norkiene, Ieva</td>
<td>P-15</td>
<td>Ponschab, Martin</td>
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<td>P-76</td>
<td>Putzu, Alessandro</td>
<td>P-9,</td>
<td>P-63, P-73</td>
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<td>P-36</td>
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<td>P-46</td>
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<td>P-17,</td>
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<td>O-53</td>
<td>Rogers, Chris</td>
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<td>Pasin, Laura</td>
<td>P-9,</td>
<td>Rogowski, Jan</td>
<td>O-4,</td>
<td>O-41, O-68</td>
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<td>Passannanti, Tito</td>
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<td>O-33</td>
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<td>Roscoe, Andy</td>
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<td>P-3</td>
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<td>Roux-Morlon, Béatrice</td>
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<td>Perdomo, Juan</td>
<td>P-78</td>
<td>Rubinchik, Vadim</td>
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<td>Perrault, Louis P</td>
<td>O-18</td>
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<td>O-39</td>
<td>Russell, Glenn</td>
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<td>Russell, Nicki-Jayne</td>
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<td>Rybakov, Vladislav</td>
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<td>O-29</td>
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<td>Poloni, Camillo</td>
<td>O-53</td>
<td>Ryu, Sun</td>
<td>P-57</td>
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</tbody>
</table>
Ryzhkov, Andrew  O-56  Sinclair, Angus  P-4
Saad, Hoda  P-21  Sitaram, AK  P-54
Sahan, Cenk  P-34  Sivrikoz, Nükhet  P-34, P-40
Saini, Sabita  O-67  Skarvan, Karl  O-1
Saiz, Cristina  O-28  Shkirtladze-Dworschak, K  P-47
Salah, Maged  O-42, P-12  Skytte Larsson, Jenny  O-48
Salah, Moataz  P-21  Slinger, Peter  O-63
Salunkey, Kiran  O-69, P-18  Slobodajanik, Vladimir  O-65
Saleh, Omar  P-16, P-63, P-64  Smith, A  P-81, P-82
Samalavicius, Robertas  P-15  Smith, David  O-34
Samarani, Gianluca  O-51  Smith, Robyn  P-36
Sandra, Granson  O-51  Soar, Jasmeet  O-29
Sanfilippo, Filippo  P-49  Soh, Sarah  P-20
Santonocito, Cristina  P-49  Soliman, Dina  O-1
Saour, Anne Charlotte  O-21  Song, Young  P-1, P-20
Saour, Marine  O-51  Spanjersberg, AJ  P-38
Savi, Claudio Federico  P-62  Spirina, Ekaterina  O-65
Sayin, Omer  P-40  Stanger, Olaf  P-43
Scheeren, Thomas  O-71, P-46  Starzyk, Lukasz  O-30
Schiaivone, Sara  O-26  Steel, Andrew  O-40
Schiaivone, Vincenzo  O-26  Steenstra, Renske  P-3
Schindler, Ehrenfried  P-28  Stortecky, Stefan  P-42
Schueler, Stephan  O-64  Stucki, Monika  P-39
Schutzer-Weissmann, John  O-27  Sungur, Zerrin  P-34, P-40
Scohy, Thierry  O-19  Suominen, Pertti  O-15
Scolaro, Simone  P-16  Svedjeholm, Rolf  O-10
Scolletta, Sabino  P-35  Syed, Summer  O-30
Seeberger, Esther  O-74  Szekely, Andrea  O-62
Seeberger, Manfred  O-1, O-74  Szokol, Joseph  O-59
Segantin, Alice  P-73
Semenova, Anna  O-72  Tabucchi, Antonella  P-35
Senese, Ludovica  P-35  Taddeo, Daiana  P-7, P-16, P-63, P-64
Sentürk, Mert  P-34  Tadesse, Mahlet  O-5
Seo, Hye Jeong  P-70  Tafer, Nadir  O-16
Seo, Jeong-Hwa  P-65  Taggart, David  P-49
Sergey, Mikheev  P-77  Tajik, Bashir  O-10
Sferragatta, Vincenzo  O-26  Taneoka, Miki  P-41
Sgro, Charlotte  O-16  Tang, Mariann  O-46
Shah, Shtal Kumar Sharad  P-30  Tan, Jay  P-4
Shah, Shital Kumar Sharad  P-12  Tarasov, Dmitry  O-56
Shaw, Mathew  O-57  Tartamella, Fabiana  P-62
Shie, Nancy  O-11  Tashkhanov, Dmitrii  P-51
Shigaev, Michael  O-72  Tassani, Peter  O-55
Shilova, Anna  O-33  Tavaearai, Hendrik  P-43
Shmyrev, Vladimir  O-58, P-13  Tempo, Jake  O-34
Sileli, Maria  P-17, P-71  Tewari, Prabhat  O-61
Simeone, Felicetta  P-35  Tezcan Keles, Gonul  P-52
Sim, Ji Hoon  P-70  Thalmann, Markus  P-43
Sim, Ji Yeon  P-70  Thomas, Hachenberg  O-63
<table>
<thead>
<tr>
<th>Name</th>
<th>O-20</th>
<th>Name</th>
<th>O-43</th>
</tr>
</thead>
<tbody>
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<td>O-2</td>
<td>Walker, D</td>
<td>P-82</td>
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<td>O-31</td>
<td>Wappler, Edina A</td>
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<td>O-39</td>
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<td>O-4,  O-68</td>
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<td>Tolsma, Martijn</td>
<td>O-19</td>
<td>Wasowicz, Marcin</td>
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<td>P-9</td>
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<td>P-18</td>
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<td>O-70</td>
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<td>P-39,  P-42,  P-44</td>
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<td>P-71</td>
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<td>O-55</td>
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<td>P-77</td>
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<td>O-71</td>
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<td>O-37</td>
<td>Yavorovsky, Andrew</td>
<td>O-56,  P-22</td>
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<td>P-38</td>
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<td>P-48</td>
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