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The abstracts have not undergone review by the Editorial Board of the *Journal of Cardiothoracic and Vascular Anesthesia*. They have been reviewed by the EACTA 2017 Abstract Committee, and revised accordingly by the authors. The abstracts published in this issue have been corrected for spelling, grammar, and put into readable English without the original content being altered in meaning.

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 animal have institutional approval.

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OP01

The decisions we make - end of life on the ICU

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Introduction: Intensive care physicians are frequently required to make treatment decisions on behalf of patients who lack capacity. In the UK, these decisions are taken under the 'best interests' principle, unless the patient has appointed a power of medical attorney or has a valid and relevant advanced directive.

Although it is impossible to accurately predict the course of any one patient's critical illness, there exists a plethora of data and scoring systems that can be applied to aid prognostication. In addition physicians have their own inherent beliefs and biases, based on experiential data that have been shown to be highly accurate. Despite this potential for accurate outcome prediction, many incapacitated patients, with sequentially worsening prognoses, undergo prolonged periods of organ support without recovery. The absence of pre-morbid data of the patient's own wishes makes decisions on the escalation of treatment particularly difficult.

The aim of this study was to use a simulated scenario to explore differences in end-of-life decision-making between intensive care physicians and lay members of the public, as potential future patients.

Methods: Following REC (Research Ethics Committee) review and waiver, structured interviews were performed on convenience-sampled groups of intensive care consultants (n=15) and members of the public between 30 and 50 years old (n=15). Both groups were taken through a hypothetical patient journey on intensive care and asked to play the role of care provider or patient, respectively. The script described a step-wise deterioration in the patient’s condition with both groups receiving odds of death, disability or full recovery based on an evidenced-based model designed for this study. Interviewees were given the choice of further intervention or withdrawal of care at each of the five points of deterioration ending in cardio-pulmonary resuscitation (CPR). Responses and reasons were recorded.

Results: In the intensivist group, no interviewees limited treatment until a final CPR decision, with 80% continuing treatment even at this final stage. This is in stark contrast to the lay group where decisions to withdraw treatment were distributed throughout all, but the earliest, stages. Only 14% chose to continue treatment to CPR.

Discussion: This small qualitative study indicates a potentially large gap between the wishes of patients who lack capacity and the actions of the intensivists caring for them. Prolonged supportive therapies, instituted in the face of dwindling survival odds, may have a negative impact on patients, relatives, ICU staff and the wider health economy. Further ethnographic work is required to better understand decision making on the ICU.


OP02

Higher model for end-stage liver disease scores are associated with worse survival in patients with mechanical circulatory support

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Introduction: Liver dysfunction in heart failure patients is mainly due to congestive hepatopathy. Model for End-stage Liver Disease (MELD) score was originally developed for liver transplantation, but recently it is applied for risk stratification in end stage heart failure. We hypothesized that perioperative
liver dysfunction is associated with worse survival after mechanical circulatory support (MCS).

**Methods:** After Institutional Review Board Approval, we have retrospectively analyzed the data of 102 consecutive patients in need of MCS between January 2012 and December 2015. Survival was recorded until 15th of November, 2016. Subgroups were formed according to the first type of MCS used. Type of MCS, strategy after MCS, demographic parameters, perioperative hepatobiliary markers, MELD score, hemodynamic parameters and transfusion were investigated using multivariate Cox regression analysis.

**Results:** Eighteen patients (17.6%) had LVAD, twelve patients (11.5%) had RVAD, nine patients (8.7 %) had BIVAD and 63 patients (60.6%) had ECMO implantation. Sixty patients (58.8 %) died, the mean survival time was 657 days after initiation of MCS. Survival rate was 72.2%, 50 %, 33.3 %, 31.7 % after LVAD, RVAD, BIVAD and ECMO support, respectively. Multivariate Cox regression analysis showed that age (year; Hazard ratio 1.04; 95 % Confidence Interval 1.02-1.07; p = 0.001), type of bridging (p = 0.02), length of MCS (days; HR:0.99, 95 %CI 0.995-0.999; p = 0.004) and MELD score (point; HR: 1.04 95 % CI 1.01-1.08; p = 0.016) were independently associated with increased risk for mortality.

**Conclusion:** Our results indicate that severity of preoperative liver dysfunction negatively influence survival after MCS and liver function should be closely assessed in these patients.

**OP03**

Assessment of endothelial dysfunction in Lung Transplantation

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**Introduction:** Lung transplantation (LTx) remains one of the highest risk surgeries with high incidence of early graft failure termed Primary Graft Dysfunction (PGD). Endothelial dysfunction and permeability are believed to be core events in PGD. Endocan is a soluble endothelial proteoglycan, with multiple roles in inflammation emerging as a promising biomarker of endothelial dysfunction in sepsis and lung injury. We have evaluated the impact of i) surgical approaches including the use of cardiopulmonary bypass (CPB) and minimally invasive approach (MI) and ii) PGD on endothelial dysfunction by monitoring endocan release.

**Methods:** Plasma levels of endocan were measured by ELISA at baseline and at 0, 6, 12, 24, 48, and 72 hours after LTx in 40 patients without CPB (n = 24) or using elective (n = 6) or unplanned CPB (n = 10). 15 LTx were performed using MI while clamshell (CS) was used in the remaining patients. We applied the ISHLT 2005 criteria for the diagnosis of PGD.

**Results:** CPB caused higher release of endocan early after surgery (p = 0.008) and at 24 hours (p = 0.009) (Figure 1A). Unplanned CPB was associated with significant increases of endocan levels within 24 hours. MI patients exhibited a non-significant trend for lower levels of endocan on day 1 (p = 0.375) compared to the CS group (Figure 1B). 13 patients (33%) developed the most severe form of PGD (Grade 3) within 72 hours after LTx. There was no significant difference in endocan levels between PGD Grade 3 and control patients.

**Conclusion:** The use of CPB, especially unplanned conversion to CPB, impacts on endothelial function with increased degradation of endothelial glycocalyx. Less invasiveness surgery may reduce endothelial dysfunction. Severe Primary Graft Dysfunction was not characterised by specific changes in endocan levels. Further studies are needed to fully elucidate the nature and determinants of endothelial dysfunction and biomarkers of PGD.
Introduction: Cerebral injury is a common complication after cardiac surgery where postoperative cognitive dysfunction (POCD) can occur, and new cerebral infarcts can be detected using diffusion-weighted magnetic resonance imaging (DWI) in up to 50% of patients.

Near InfraRed Spectroscopy (NIRS) is used increasingly during cardiac surgery to monitor regional cerebral oxygen saturation (rSO₂) but so far, the use of NIRS has not been demonstrated to result in prevention of postoperative neurological injury. The Perfusion Pressure Cerebral Infarct (PPCI) trial(1) sought to assess whether the incidence of new cerebral infarcts and postoperative cognitive dysfunction were influenced by mean arterial pressure (MAP) level during cardiopulmonary bypass (CPB). Blinded NIRS monitoring was used throughout the PPCI trial.

The aim of the present substudy of the PPCI trial was to:
1. Compare rSO₂ levels between patients randomised to two distinct MAP levels during CPB.
2. Evaluate changes in rSO₂ in patients with and without new cerebral infarcts on DWI.
3. Evaluate changes in rSO₂ in patients with and without POCD.

Method: In the PPCI trial 197 patients were included from July 2014 until January 2016 and follow-up finished in April 2016. Patients were 18 years or older and underwent CABG and/or valve replacement surgery. Patients with a history of neurological disease and patients where DWI was contraindicated were excluded. Patients were randomised to either a MAP at 40-50 mmHg or 70-80 mmHg during CPB. A Covidien/Medtronic Invos Somatic/Cerebral 5100c NIRS monitor was used throughout the trial. Data collection was done with a frequency of approximately 0.2Hz and time points for initiation and weaning of CPB were clearly marked on each patient record. The NIRS monitor was blinded and all alarms were muted prior to recording, and management of patients was based on conventional haemodynamic and respiratory monitoring. DWI was conducted the day before surgery (baseline) and day 3 to 6. Cognitive dysfunction was evaluated at baseline, discharge and at 3 months.

Results: Patient inclusion in the PPCI trial has been completed and data analysis is currently undertaken. For this reason, the results of the present substudy are not available before deadline for abstract submission, but will be presented at the EACTA meeting.

Discussion: Discussion of the results will be carried out as part of the EACTA meeting presentation.


OP05

Cerebrovascular autoregulation impairment during cardiac surgery is related to postoperative cognitive dysfunction

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Introduction: Post-operative cognitive dysfunction (POCD) occurs in up to 40–60% of cases in early postoperative period after cardiac surgery with cardiopulmonary bypass (CPB). Its incidence still remains high after 6 weeks and 1 year (30–25%). Pilot clinical data suggest, that non-invasive monitoring of individual cerebrovascular autoregulation (CA) and correction of mean ABP (MAP) could prevent neurological complications. The goal of the study was to detect impaired CA during cardiac surgery with CPB and find its relation with the rate of POCD.

Method: The prospective observational study was conducted at Kaunas Klinikos, the Hospital of Lithuanian University of Health Sciences. The patients undergoing elective CABG surgery without preoperative neurological disorders were included. In addition to standard monitoring CA was monitored using “Vittamed” non-invasive monitor. The method is based on intracranial blood volume (IBV)
measurement. Neurological function was evaluated by cognitive performance tests before and after cardiac surgery.

**Results:** The data of 59 patients were analysed. 20% of the patients (12 pts) experienced POCD. There were no significant differences between the group with POCD and the group without POCD in demographic data, MAP during the surgery, mean duration of CPB and aortic cross-clamping time, time of stay in ICU and total hospital stay. All patients in both groups had periods of impaired CA. The mean longest period didn’t differ between groups (with POCD 7.62 (+ 3.56) min., without POCD 6.2 (+ 2.95), p > 0.05). But the total CA impairment time was significantly longer in patients with POCD (41.59 (+ 7.35) vs 25.35 (+ 13.75) min., p = 0.02).

**Discussion:** CA impairment episodes occur during cardiac surgery with CPB. Our results show that total duration of CA impairment correlate with POCD. However, further studies are needed to find the cause of CA impairment and possibilities to prevent it during cardiac surgery.

**Acknowledgment:** The study is funded by Lithuanian Science Council.

**OP06**

**A comparison of three videolaryngoscopes for double-lumen tubes intubation in humans by users with mixed experience. A randomized controlled study**

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**King Fahd Hospital of the University of Dammam, Department of Anaesthesiology, Al Khobar, Dammam, Saudi Arabia**

**Introduction:** A recent manikin study demonstrated that the Airtraq® and non-channelled King Vision™ videolaryngoscopes (VL) took longer times for double-lumen tube (DLT) intubation than the Macintosh by less experienced providers. [1] We hypothesized that the use of the King Vision™ and Airtraq® VLs by users with mixed experience might reduce the time to DLT intubation in patients undergoing thoracic surgery.

**Methods:** One hundred-thirty-three patients scheduled for elective thoracic surgery using the DLT for one-lung ventilation were assigned randomly to place the DLT using the Macintosh (n = 32), GlideScope® (n = 34), Airtraq® (n = 35) or King Vision™ (n = 32). Time to DLT intubation, first-pass success rate, percentage of glottic opening score, intubation difficulty using a Likert scale, optimisation manoeuvres, failure to intubation, defined as an attempt taking longer than 150 s. or if peripheral oxygen saturation decreased < 92%, and postoperative sore throat and hoarseness of voice, were recorded.

**Results:** Compared with the GlideScope®, the Macintosh, Airtraq®, and KVL took shorter times to DLT intubation (median times: GlideScope®, 111.5 s. [95% confidence interval (CI) 89.3 s. to 136.6 s.]; Macintosh 64 s. [95% CI 59.3 s. to 76.6 s.]; Airtraq® 67 s. [95% CI 49.5 s. to 86.2 s.]; KVL 91 s. [95% CI 39.2 to 80.4], P = 0.004) and had comparable first-pass success rate (100%, 100%, 94.4%, and 100%, respectively, P = 0.522), glottis view, and postoperative sore throat and hoarseness of voice. Compared with the GlideScope®, the Airtraq® and KVL required less frequent optimising manoeuvres (P < 0.001). The Airtraq® was easier to use than the GlideScope® [1.1 ± 1.53 vs. 2.4 ± 1.60; P = 0.023] and associated with two failures due to the inability to advance the DLT through the glottis opening because the blade was placed too deep in the airway and not midline. Duration of DLT intubation had a significant negative correlation with the prior experience of using the device tested (r = −0.392, P = 0.001).

**Discussion:** The channeled Airtraq® required less time for DLT intubation and was easier to use than the GlideScope® when used by users with mixed experience.

It was registered with www.clinicaltrials.gov [NCT NCT02305667]

OP07

Pulmonary artery wave intensity analysis following lung resection

Adam Glass¹ ², P McCall¹ ², A Arthur², J Kinsella², B Shelley¹ ²

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²University of Glasgow, Department of Anaesthesia, Pain and Critical Care Medicine, Glasgow, UK

Introduction: Our group has previously demonstrated that right ventricular ejection fraction (RVEF) decreases following lung resection. Whilst the most intuitive cause is increased afterload previous studies have failed to show persistent increases in pulmonary artery (PA) pressure or pulmonary vascular resistance postoperatively. These measures overlook the pulsatile nature of afterload however, and only assess resistance to static flow. Arterial wave reflections contribute to pulsatile afterload and can be assessed by wave intensity analysis (WIA).

WIA combines changes in pressure and flow throughout the cardiac cycle into wave intensity. This combined wave can be separated into forward (F) or backward (B) traveling components and characterised based on their effect on blood flow/pressure. Compression waves (CW) encourage flow in the direction they travel. At a decrease in vessel calibre/compliance a FCW will be partially reflected as a BCW causing increased afterload. WIA can be performed non-invasively from velocity encoded cardiovascular magnetic resonance (CMR) flow imaging of PAs using cross-sectional area as a surrogate for pressure.

Methods: With informed consent and ethical approval 27 patients undergoing lobectomy for suspected lung cancer completed velocity encoded CMR of the left and right PAs; pre-operatively (pre-op), day two (POD2) and two months (2month) post-operatively. Flow and area changes over the cardiac cycle were measured by tracing the anonymised PA endocardial border post-processing with Argus software (Siemens, Germany). Wave processing, separation, characterisation and measurement was performed in R Studio (Boston, USA). Paired comparisons were made using Wilcoxon signed rank and associations tested with Pearson’s correlation coefficient.

Results: FCW area was strongly associated with peak and total flow through the vessel (r = 0.720, p < 0.001). Post-operatively FCW area increased in non-operative vessels and decreased in operative vessels (p < 0.005 for all). BCW area, expressed as a percentage of the FCW area (BCW/FCW), increased on POD2 and 2 months in the operative (p < 0.001 and p = 0.008) but not the non-operative vessel (p = 0.088 and p = 0.754) (Figure 1). The distance to the point of wave reflection in the operative PA was decreased from pre-op (7.0cm IQR 5.2-8.3cm) versus POD2 (2.5cm IQR 2.1-4.6cm) and 2 month (2.9cm IQR 2.1-3.8cm) (p < 0.001). BCW/FCW in the operative and non-operative PAs combined was associated with RVEF at all time points (r = -0.412, p < 0.001).

Discussion: This is the first example of wave intensity analysis in this population and demonstrates increased afterload following lung resection. Increased BCW and decreased distance to reflection site can be explained by the ligation of an operative PA lobar branch causing earlier and greater FCW reflection. This may explain the decrease in FCW and blood flow through the operative vessel. The observed association between RVEF and combined BCW/FCW (reflective of main PA) demonstrates for the first time the hypothesised link between increased afterload and decreased RVEF following lung resection.
OP08
Effects of pulmonary resections on endothelial glycocalix (preliminary results)
Zerrin Sungur1, M Yornuk1, Ö Turhan1, U Aksu2, F Toraman1, M Sentürk1

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2Istanbul University, Faculty of Science, Department of Biology, Istanbul, Turkey
3Acibadem University, Department of Anaesthesiology, Istanbul, Turkey

Introduction: Pulmonary parenchyma and vasculature are primary sites of insult after lung surgery. However pathogenesis is not well understood. Endothelial glycocalyx (EGL) is a key factor in vascular permeability and oedema formation (1). Data with EGL integrity and lung surgery are scarce. The aim of this study is to investigate changes in EGL and contribution of oxidative stress in patients undergoing pulmonary resections.

Method: After ethical approval sixteen patients for elective anatomic pulmonary resections were included in this prospective observational study. Demographic, preoperative and operative data (one-lung ventilation time, fluid balance, use of vasopressor, etc) were noted.

Blood samples were obtained preoperatively (T0), at first (T1) and 24th hours (T24). EGL integrity was assessed with plasma sialic acid concentration whereas oxidative stress status was evaluated via advanced oxidation protein products (AOPP), total thiol (SH) and ischemia modified albumin (IMA) levels. Additionally free haemoglobin level was determined as osmotic stress biomarker.

Results: Mean age was 59.3 ± 14 among study patients. Thirteen of them were assessed as ASA status II and 3 as ASA III. Mean OLV time was 145 ± 87min. Total volume infusion was 3.65ml.kg.h-1 during surgery and 10 patients needed noradrenaline infusion. Results of EGL injury and oxidative stress were summarized in table 1.

Discussion: Lung surgery provokes the oxidative stress as reflected by decreased thiol content and oxidative stress leads to EGL injury in early postoperative period. However ischemic stress could be present in the view of IMA. Further studies are needed to investigate about late phase of lung surgery.


<table>
<thead>
<tr>
<th></th>
<th>T0</th>
<th>T1</th>
<th>T24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sialic acid (mg.ml⁻¹)</td>
<td>0.89 ± 0.12</td>
<td>1.33 ± 0.7*</td>
<td>0.94 ± 0.09</td>
</tr>
<tr>
<td>AOPP (mmol.ml⁻¹)</td>
<td>2825 ± 682</td>
<td>2740 ± 402</td>
<td>2572 ± 508</td>
</tr>
<tr>
<td>Free Hb (g.dl⁻¹)</td>
<td>0.031 ± 0.02</td>
<td>0.04 ± 0.03</td>
<td>0.07 ± 0.04*</td>
</tr>
<tr>
<td>Total SH (umol.L⁻¹)</td>
<td>89.6 ± 13</td>
<td>79.2 ± 9.9</td>
<td>87.5 ± 13</td>
</tr>
<tr>
<td>IMA (ABS Unit)</td>
<td>1.45 ± 0.16</td>
<td>1.4 ± 0.18</td>
<td>1.68 ± 0.27*</td>
</tr>
</tbody>
</table>

OP09
Multilevel dilatation of tracheal and bronchial stenosis using a non-occlusive tracheal dilatation balloon in a patient with sclerosing airway disease
Ross Hofmeyr1, J McGuire2, P Douglas-Jones2, M Proxenos3, K Park3, D Lubbe2

1University of Cape Town, Department of Anaesthesia & Perioperative Medicine, Cape Town, South Africa
2University of Cape Town, Division of Otolaryngology, Cape Town, South Africa
3DISA Vascular 2015 (Pty) Ltd, Cape Town, South Africa

Introduction: A 33-year-old female presented with acute upper airway obstruction secondary to laryngeal stenosis, for which she initially received a tracheotomy, then a laryngectomy. She suffers a progressive inflammatory process involving her entire respiratory tract, that has resulted in stenosis of the nasal passages, trachea distal to the tracheotomy site, and bilateral bronchi. At presentation, her condition was critical, requiring serial multilevel dilatations of the airway to maintain patency. Sequential dilatation with solid bougies was undesirable because of concerns for airway trauma, and the fact that her laryngectomy and anatomy precluded the use of a rigid bronoscope. The patient was considered for surgery under cardiopulmonary bypass or extra-corporeal membrane oxygenation, but was declined as a candidate for either therapy due to the very low likelihood of success of definitive reconstructive surgery.

Method: We elected to use a novel, non-occlusive tracheal dilatation balloon currently under investigation at our facility. Ethical approval and informed consent for compassionate use were prospectively obtained. Anaesthesia with spontaneous ventilation was provided with a balanced technique using nebulised lignocaine, intravenous dexmedetomidine infusion and sevoflurane in oxygen. Flexible fibroptic endoscopy using a paediatric bronchoscope via the tracheostomy demonstrated tracheal, left and right main bronchus stenosis (4.7, 3.0 and 6.0 mm respectively). Endoscopy was performed through a catheter mount with bronchoscopy adaptor to allow continuous ventilation. By passing the tracheal dilatation balloon parallel to the tracheostomy tube, the trachea was dilated with continuous spontaneous ventilation. To dilate the left main bronchus (LMB), a guide-wire was passed through the bronchoscope into the bronchus, the bronchoscope withdrawn and then placed parallel to the tracheostomy tube, and the balloon passed over the guide-wire into the LMB. Ventilation of both lungs during dilatation was confirmed clinically. It was elected to allow these two sites a chance to heal, and a second dilatation procedure was subsequently performed in the same fashion after 14 days.

Results: Dilatation at each site with the non-occlusive balloon was performed for 3 minutes without interruption of spontaneous breathing, oxygenation or ventilation, as confirmed by pulse oximetry and waveform capnography.
The patient's respiratory compromise improved rapidly with each procedure, and there were no complications other than minor transient mucosal bleeding at the dilation sites.

**Discussion:** This case documents the first use of a non-occlusive tracheal dilatation balloon for multilevel endoscopic dilation of the trachea and bronchi. Importantly, this technique allows dilatation of intrathoracic stenosis in patients with difficult airway anatomy and/or limited physiological reserve. Prospective evaluation of the device in a series of adult patients is currently underway.

**OP10**

**Chronic pain after VATS: effects of paravertebral block**

Mesut Yornuk, Z Sungur, O Turhan, B Başaran, B Ozkan, M Sentürk

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**Introduction:** Chronic postoperative pain after open thoracotomies is a well-documented important problem; studies examining the frequency and severity of chronic postoperative pain after videothoracoscopic surgery (VATS) are relative less, but frequencies up to 40% are reported (1,2). Our preliminary investigation in our clinics has shown that 22% of the patients had pain after 3 months after VATS. This study was designed to compare the effects of paravertebral block (PVB) and the systemic analgesia (SA). The hypothesis was that PVB was associated with a less frequency of chronic postoperative pain.

**Material & Method:** After approval of Ethical Committee and the appropriate sample size estimation, 140 ASA I-III patients undergoing VATS were included in this randomised clinical study. Induction and maintenance of the anaesthesia were similar in both groups and standardised; for lung isolation, left sided double-lumen tubes were used. In PVB group, in four periincisional space, 4 mL of 0.5% bupivacaine was applied for each level (total of 20 mL) before the operation. In SA group, 0.1 mg kg\(^{-1}\) was applied IV 10 minutes before the end of the operation. In both groups, 1 g Paracetamol was given immediately after the operation. In both groups, postoperative analgesia was achieved with IV-PCA of morphine (basal infusion: 0.03 mg kg\(^{-1}\) h\(^{-1}\); bolus: 1-1.5 mg; lock-out 30 minutes) to obtain a VAS of < 4; if necessary Tramadol was used as rescue analgetics.

After 2 and 6 months following the operation, the patients were asked concerning:

- Periincisional pain: Existence and intensity (via VAS)
- Any other complains around the incision (pruritus, etc)
- Need for additional analgetics
- Effects on daily activity.

This questionnaire was performed by an author who was blinded to the postoperative analgesia method. To compare the frequency chi-square test was used; to compare the numeric parameters MannWhitney u-test was used.

**Results:** Nine patients were excluded. Demographic data and acute postoperative pain findings were similar in both groups. The results of 2nd and 6th month are shown in the table. There was a significant difference between two groups in the incidence of pain after 6 months. No patient in both groups had a VAS > 3 after 2 and 6 months.

**Discussion:** PVB was associated with a decreased frequency of postoperative pain. This finding has some similarities with the one that in open thoracotomies, thoracic epidural analgesia was associated with a decrease in chronic pain.

**REFERENCES:**

<table>
<thead>
<tr>
<th>Use of analgetics</th>
<th>Other periincisional complaints</th>
</tr>
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<tbody>
<tr>
<td>PVB (n=62)</td>
<td>12 (%18,4)</td>
</tr>
<tr>
<td>SA (n=65)</td>
<td>23 (%37,1)</td>
</tr>
<tr>
<td>0</td>
<td>25 (%40,32)</td>
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</table>

*: p = 0.0021; between two groups

**Oral Presentations 108**

**Wednesday, 19 April 2017**

**14:30 - 16:00, Auditorium 3**

**OP11**

**Oxidative stress and early complications after cardiac surgery**

Valery Likhvantsev\(^1\), Z Fillipovskaya\(^1\), O Grebenchikov\(^1\), Y Skripkin\(^1\), O Gerasimenko\(^1\), O Ulitkina\(^1\), A Ovezov\(^1\), R Zinovkin\(^2\)

\(^1\)Moscow Regional Clinical & Research Institute (MONIKI), Intensive Care Unit, Moscow, Russian Federation

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**Introduction:** It is known that cardiac surgery increases the severity of oxidative stress (OS), but the relationship between this process and the frequency of post-operative complications and adverse outcomes remains unexplored and, consequently,
unproven. As such, this study investigates the relationship between the level of carboxylated proteins (CP) in plasma (as a marker for OS) and occurrence of acute heart failure (AHF) and acute kidney injury (AKI) after cardiac surgery.

**Methods:** The prospective observational cohort study was performed with a total of 67 adult patients including: CABG "off-pump" – 21 patients; CABG with CPB – 29 patients; heart valve replacement – 17 patients. Informed consent was obtained from all patients. CP plasma levels were measured by spectrophotometry at a wavelength of 370 nm with extinction coefficient 22000 M⁻¹ cm⁻¹. Measurements were taken at the following stages: before induction (1); 1h (2); 16h (3) and 72h (4) after surgery. The Statistica 10.0 (StatSoft, Inc.) and MedCalc 12.5.0.0 (MedCalc Software bvba) software were used for all statistical analyses.

**Results:** The baseline CP level was the same in all groups - 0.69 [0.52; 0.77] nmol/mg. In group "CABG-CPB" at stage 2 it increased to 0.87 [0.74; 0.96] nmol/mg (p < 0.01 to baseline) and returned to the baseline only at stage 4 – 0.77 [0.65; 0.87] nmol/mg. The level of CP in the "off pump CABG" group did not differ from that in the "CABG-CPB" group: at stages 2 and 4 it reached 0.76 [0.64; 0.94] nmol/mg (p=0.3 in relation to the "CABG-CPB" group) and 0.68 [0.61; 0.85] nmol/mg (p > 0.05) respectively.

Results showed a positive correlation between the level of CP at stage 2 and a composite outcome of surgical treatment (AHF&AKI). The Spearman rank correlation coefficient (r) was 0.5 (95% confidence interval 0.29 to 0.66; p < 0.0001) (Fig.1). It was established that the areas under the ROC curve for the risk of AKI and AHF were respectively 0.81 and 0.83 (in both cases p < 0.01), which permitted rating the studied model "very good quality.”
Results: Founded on parallelism of survival lines, coronary artery bypass grafting (CABG) without comorbidities reached background mortality 30 days after surgery. CABG with comorbidity and aortic valve replacement reached background mortality after 10-120 days, while single other, double procedures and aortic surgery after 180 days. Mitral valves and triple procedures appeared not to reach background mortality within the first year after the index procedure (Fig. 1).

The 30-day mortality decreased over time from 3.9% (2006) to 3.0% (2015) (P = 0.009). The fraction of patients dying outside the ICU the first 14 days after the procedure did not change from 2006 to 2015 being 23.1% and 20.9% (P = 0.82) respectively. However, the mortality on day 3-4 seems relatively high compared to 0-2 days and 5-6 days in ICU. Regarding outside hospital mortality, we found a non-significant increase from 18.2% to 26.2% (P = 0.30).

Conclusion: 30-days mortality is not an optimal quality measuring standard. It should be replaced with 4-month mortality or an individual marker, depending on the type of procedure to obtain a more exact depiction of the quality standard. Analysis of the place of death does not support that economic pressure has resulted in poorer quality when measuring mortality, although the fraction dying outside ICU on day 3-4 could call for further analysis.

OP13
Prevalence and impact of abnormal respiratory patterns in cardiac surgery: a prospective cohort study
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Novosibirsk Research Institute of Circulation Pathology, Department of Anaesthesia and Intensive Care Unit, Novosibirsk, Russian Federation

Introduction: Reduced pulmonary function is commonly underdiagnosed in the cardiac surgery setting, with implications for outcomes (1). The objective was to examine prevalence and impact of abnormal respiratory patterns among patients undergoing coronary artery bypass graft (CABG) surgery.

Methods: Between March 2015 and August 2016, 454 consecutive patients had pulmonary function tests (PFTs) before surgery. Chronic obstructive pulmonary disease (COPD) was ascertained based on medical documentation. Abnormal respiratory patterns were defined as follows: obstructive (forced expiratory volume in 1 second (FEV1)/forced vital capacity (FVC) < 0.70), restrictive (FEV1/FVC ≥ 0.70 and FVC < 80% of predicted), mixed (FEV1/FVC < 0.70 and both FEV1 and FVC < 80% of predicted). For all patients, 30 days follow-up was obtained. Linear and logistic regression and unpaired t-test were used for statistical analysis.

Results: Of 31 patients with history of COPD, no abnormal respiratory pattern were confirmed in 5. Of 423 patients without COPD, we newly identified 57 obstructive, 46 restrictive and 4 mixed patterns. Therefore, lung disease was reclassified in 24.7% cases. Independent predictors of obstructive pattern were age (1 year increment, odds ratio, OR: 1.05, 95% confidence interval, CI: 1.01 to 1.09, p = 0.01), male gender (OR: 2.27, 95% CI: 1.01 to 6.41, p = 0.04), history of smoking (OR: 2.21, 95% CI: 1.23 to 4.09, p < 0.01) and COPD (OR: 4.70, 95% CI: 2.12 to 10.36, p < 0.01). Airway obstruction was associated with 16 hours (95% CI: 2 to 31 hours, p = 0.02) longer ventilation. Predictors of restrictive pattern were history of asthma (OR: 4.76, 95% CI: 1.18 to 16.88, p = 0.01), body mass index (1 kg/m² increment, OR: 1.06, 95% CI: 1.01 to 1.13, p = 0.04) and peripheral vascular disease (OR: 2.13, 95% CI: 1.10 to 4.04, p = 0.02). FEV1 was associated with likelihood of atrial fibrillation post surgery (1 litre decrement, OR: 1.38, 95% CI: 1.01 to 1.90, p = 0.04) and hospitalisation time (regression coefficient: 1.23, 95% CI: 0.54 to 1.91, p < 0.001). Thirty days mortality was 6 (1.3%); two patients were lost to follow-up. Median length of hospital stay was 12 days.

Discussion: Abnormal respiratory patterns are common and often latent in the cardiac surgery setting. PFTs help reveal patients at risk of complications, such as prolonged ventilation or atrial fibrillation, and provide an opportunity for intervention.


OP14
Cell-free circulating DNA as a potential predictor of AKI in patients undergoing CABG
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²Department of Anaesthesiaology and Intensive Care, IRCCS San Raffaele Scientific Institute, Milan, Italy, and Vita-Salute San Raffaele University, Milan, Italy
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Introduction: Acute kidney injury (AKI) is a frequent complication of cardiac surgery and is associated with increased morbidity and mortality. The mechanism of its occurrence during
extensive, traumatic surgery may include massive tissue decay, including release of cell-free circulating DNA.

**Methods:** This prospective observational cohort study involved 50 adult patients undergoing off-pump (n = 21) or on-pump (n = 29) coronary artery bypass grafting surgery.

Acute kidney injury (AKI) was defined according to the RIFLE-criteria (2). Cell-free circulating DNA content was determined using real-time PCR analysis on the CFX96 Touch™ Real-Time PCR Detection System (BioRad, USA) in the operating room before the induction of anaesthesia, 1, 12 and 72 hours after surgery. The Statistica 10.0 (StatSoft, Inc.) and the MedCalc 12.5.0.0 (MedCalc Software bvba) software were used for all statistical analyses.

**Results:** Baseline median [interquartile] cell-free circulating DNA was 3.7 [2.5; 5.3] mcg/mL, with no differences between off-pump and on-pump techniques. Surgery was associated with a significant (p < 0.01) increase in cell-free circulating DNA to a maximum of 17.0 [9.6; 22.5] mcg/mL 12 hours after surgery and with no differences between off-pump and on pump techniques.

Cell-free circulating DNA at 16 hours after surgery had an area under the curve of 0.8 in predicting AKI with the RIFLE criteria (ref 2) and with the best cut-off point set at 17.9 mcg/mL (sensitivity of 78.6% and specificity of 96.4%) (fig. 1).

**Discussion:** We observed a sharp increase in the concentration of cell-free circulating DNA after off-pump and on-pump coronary artery bypass grafting surgery.

Cell-free circulating DNA predicted AKI after cardiac surgery and there are physiopathological pathways to speculate that its role could be causative.

**REFERENCES:**


**OP15**

**Do we need a different transfusion strategy in patients with chronic kidney disease undergoing CABG?**

Muharrem Kocyigit, S Senay, AU Gullu, EM Okten, C Arıturk, F Toraman, H Karabulut, TR Evrenkaya, C Alhan

Acıbadem University, Department of Anaesthesiology, İstanbul, Turkey

**Introduction:** Despite the increased risk for adverse outcomes, patients with chronic kidney disease (CKD) presenting with coronary artery disease are less likely to receive evidence-based therapies. Several studies demonstrated that anemia and blood transfusions are both risk factors for mortality, while others argue that it is preoperative anemia -rather than RBC transfusion itself- that is harmful. There is still a gap to adequately address this issue especially in patients with CKD.

**Patients and Methods:** In this study, patients (n = 4949) who underwent isolated coronary bypass grafting (CABG) in our centre between January 2001 and February 2016 were analysed. Data was obtained from the institutional cardiovascular surgery database, which contains preoperative demographics, comorbidities, operative details, blood transfusions and mortality. Patients were initially divided into two groups according to their preoperative renal functions. Group I (n = 4386) was consisted of patients without or minimal renal impairment (eGFR > 60 mL/min/1.73 m2) and Group II (563) was comprised of ≥ Stage 3 renal impaired patients. During this period, a restrictive red blood cell (RBC) transfusion strategy was applied based not only on hematocrit levels, but also hemodynamic parameters and/or any evidence of end-organ ischemia.

**Results:** Mortality was correlated with the degree of renal impairment (Stage I: 12/2315/ (0.5%); Stage 2: 22/2071 (1.06%); Stage 3A: 9/386 (2.33%); Stage 3B: 3/121 (2.47%); Stage 4: 7/40 (17.5%) and Stage 5: 3/16 (18.75%)). The mortality rate in transfused versus non-transfused patients was 0.2% vs. 2.4% in Group I, compared to 1.3% vs. 7.3, in Group II, respectively.

Multivariate analysis revealed that in group I, NYHA Class 3-4 functional capacity (OR: 2.7, p = 0.02), age > 70 years (OR: 2.1, p = 0.05), and RBC transfusion (OR: 10.9, p < 0.0001); and in Group II, NYHA Class 3-4 functional capacity (OR: 3.5, p = 0.03), congestive heart failure (OR: 5.6, p = 0.007), non elective surgery (OR: 5.4, p = 0.009), preoperative anemia (Hct < 35%) (OR: 4.3, p = 0.009), and longer CPB times ( > 100 min) (OR: 8.9, p = 0.01) was related with increased mortality.
In patients without or minimal renal impairment, preoperative anemia (Hct < 35%) was not related with increased mortality OR: 1.3, p = 0.58.

**Discussion:** This study shows that for isolated CABG, preoperative anemia is well tolerated and transfusion of RBC is associated with increased mortality in patients with normal renal function. However, in patients with impaired renal function preoperative anemia is an independent risk factor for mortality that may justify the aggressive treatment of anemia before surgery. A “patient specific transfusion strategy” may improve outcome.

**OP16**

**Reversal of coagulopathy with factor concentrates and autologous platelet rich plasma for aortic surgery with deep hypothermic circulatory arrest**

V Mehta, A Jackson, K Mills, M Shaw, M Field, Seema Agarwal

*Liverpool Heart and Chest Hospital, Department of Anaesthesia, Liverpool, UK*

**Introduction:** Aortic surgery with deep hypothermic circulatory arrest (DHCA) leads to coagulopathy which traditionally requires blood components to reverse it. We studied the use of factor concentrates and autologous platelet rich plasma as first line clotting products with point of care testing to reduce blood product transfusion and associated morbidity.

**Methods:** We analysed 166 consecutive patients who had aortic surgery with DHCA between July 2014 and June 2016, comparing 118 patients who had traditional transfusion (who were treated with Fresh Frozen Plasma, cryoprecipitate and platelets in a TEG guided algorithm) versus 48 patients who were treated with factor concentrates and autologous plasma and platelets, in a similar algorithm (figure). In the study group patients, whole blood was taken from the patient prior to the start of surgery and separated into autologous platelet rich plasma (PRP) and platelet poor plasma (PPP) and red cells. The red cells were transfused back once they were available, the PRP and PPP were given after the administration of protamine. During rewarming at 32°C, blood samples were taken for point of care testing and any clotting deficiency was corrected according to protocol in Figure.

**Results:** The use of factor concentrates and PRP led to a significant reduction in all transfusion (mean 19.3 to 8.1 units per patient, p = 0.005). As expected there was also a significant reduction in transfusion of Fresh Frozen Plasma (mean 5.4 units to 0.9 units, p < 0.001), platelets (mean 3.3 units to 1.9 units, p < 0.001) and cryoprecipitate (from a mean of 2.5 to 0.4 units, p < 0.001). There were no significant differences in mortality or morbidity including acute renal failure needing dialysis, return to theatre for bleeding, reintubation, length of ITU stay and in-hospital stay.

4.9 units per patient (p = 0.005). As expected there was also a significant reduction in transfusion of Fresh Frozen Plasma (mean 5.4 units to 0.9 units, p < 0.001), platelets (mean 3.3 units to 1.9 units, p < 0.001) and cryoprecipitate (from a mean of 2.5 to 0.4 units, p < 0.001). There were no significant differences in mortality or morbidity including acute renal failure needing dialysis, return to theatre for bleeding, reintubation, length of ITU stay and in-hospital stay.
Discussion: Using autologous plasma and factor concentrates as part of a point of care testing algorithm as first line clotting restoration significantly reduces blood product transfusion, with less fluid volume infusion and quicker restoration of clotting. This new protocol has the potential to reduce demand on blood transfusion services and reduce costs.

OP17

Effects of mean arterial pressure on haematocrit during cardiopulmonary bypass - a substudy of the PPCI-trial

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Introduction: Induction of general anaesthesia is known to cause an increase in plasma volume resulting in decrease in haematocrit. Recently, a randomised study showed preservation of haematocrit if mean arterial pressure (MAP) was maintained at baseline level by means of vasoconstrictors (1). Haemodilution is even more pronounced during cardiopulmonary bypass (CPB) and a low haematocrit is associated with ischaemic complications. The purpose of this substudy of the Perfusion Pressure Cerebral Infarct (PPCI) trial (2) was to investigate whether a higher MAP resulted in a higher level of haematocrit during CPB.

Method: The PPCI trial randomised 197 (97 versus 98) patients undergoing coronary artery bypass grafting and/or heart valve surgery, in a 1:1 allocation ratio, to either a high MAP (70-80 mmHg) or low MAP (departmental practice) (40-50 mmHg) during CPB.

The CPB pump flow was fixed at 2.4 l/min/m² plus 10–20 % in both groups. Bolus phenylephrine to a maximum of 2 mg and a titrated infusion of noradrenaline up to 0.4 μg/kg/min was given to obtain target MAP, if necessary.

The endpoint of this substudy was the relative change in haematocrit from initiation until the end of CPB defined as the first and last haematocrit measured during CPB at full flow, respectively. Secondary outcomes were intraoperative urine output and fluid balance.

Patients who required red blood cell (RBC) transfusions during their primary surgery were excluded from the analysis.

Results: Median MAP during CPB was 45 (IQR 42-47) mmHg and 68 (IQR 64-70) mmHg in the low and high MAP group, respectively.

Complete data were available for 171 patients. Baseline haematocrit levels were comparable in the two groups, but the high MAP group maintained a higher haematocrit level during CPB with a relative change of +8 % versus -3 % in the low MAP group (P < 0.001) (Figure 1A). The median urine output was significantly higher in the high MAP group (700 (IQR 400-1100) mL) compared to the low MAP group (500 (IQR 310-800) mL), (P = 0.01) (Figure 1B).

Amounts of fluid administered during the first 24 hours were comparable between groups, as were haematocrit levels and fluid balance on the morning after surgery.

Discussion: This PPCI trial substudy showed preservation of haematocrit and a higher urine output in the group randomised to a high MAP during surgery.

OP18
Deep hypothermic circulatory arrest or cerebral perfusion during aortic surgery: a randomised study
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Introduction: The present study aimed to investigate efficacy of deep hypothermic circulatory arrest (DHCA) versus antegrade cerebral perfusion (ACP) for cerebral protection during the surgical treatment of chronic dissection of the ascending aorta and aortic arch.

Methods: 58 patients with chronic type I aortic dissection undergoing ascending aorta and aortic arch replacement were included in this prospective single blind randomised study. Patients were allocated in two groups: 29 patients who underwent surgery under DHCA (18°C) with craniocerebral hypothermia and 29 patients underwent surgery under moderate hypothermia (24°C) combined with ACP. The endpoints were: cerebral regional oxygen saturation (rSO2) during surgery, neurological complications during the hospitalisation period, quality of life (QoL) at baseline and at 1-year post surgery. For the latter, the Short-Form 36 Health Survey Questionnaire (SF-36) was used. For between group comparisons, Mann-Whitney test and Fisher’s exact test were used. Wilcoxon test was employed for within group comparisons. Univariable logistic regression was used to assess risk of neurological events. Spearman correlation was utilized to examine association. A p value below 0.05 indicated statistical significance.

Results: During the early postoperative period, 37.9% of patients in the DHCA group exhibited neurological complications, compared with 13.8% of those in the ACP group (p < 0.05). In the ACP group, rSO2 decreased on average by ≤ 17% from baseline during circulatory arrest. In the DHCA group, a more profound decrease in rSO2 (> 30%) was recorded (p < 0.05). Patients with rSO2 below 33% during circulatory arrest were at increased risk of neurological events: odds ratio 5.4 (95% CI 1.1 to 12.9, p = 0.03). Hospital mortality was 3 (10.3%) and 4 (13.8%) in the ACP and DHCA groups (p > 0.99). At 1 year post surgery, QoL was improved as compared to baseline, but it was not dependent on the cerebral protection method used during surgery.

Discussion: ACP during aortic surgery is advantageous over DHCA in terms of cerebral protection, as evidenced by the lower neurological events rate. QoL after surgery was not dependent on the cerebral protection method used during surgery.

OP19
Post-cardiotomy vasoplegic syndrome: role of Copeptine
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Introduction: Post-cardiotomy vasoplegic syndrome (PCVS) is vasodilatory shock, which occurs in 3 to 10% of patients undergoing to cardiopulmonary bypass and it is characterised by a decrease of vascular tone with a normal or increased cardiac output (CO). A different concentration of arginine vasopressine hormone (AVP) has been observed in patients undergoing cardiopulmonary bypass. Copeptine is precursor of AVP and it is more stable and easy to measure. The hypothesis of the present study was to evaluate whether high pre-operative copeptine level might be associated with an increased risk of PCVS.

Methods: Between October 2015 and May 2016, all patients scheduled for cardiac surgery on cardiopulmonary by pass at “Città della Salute e della Scienza” Hospital were enrolled. Exclusion criteria were: age < 18 years old, corticosteroids therapy, heart transplantation, extra-circulatory life support, endocarditis, sepsis, pre-operative use of vasoactive drugs, off-pump surgery, chronic hepatic and renal failure, paraneoplastic syndrome, lack of informed consent. PCVS was defined as a mean arterial pressure (MAP) < 60 mmHg, a reduction of systemic vascular resistances (SVRI) < 1200 dyne/cms5/m2 and/or the need of nor-epinephrine (NE) ≥ 0.1mcg/kg/min for at least 12 hours and within the first 24 hours after surgery.

All patients underwent a preoperative evaluation of the corticotropin (ACTH) stimulation test, then immediately before surgery (T0), on day one post operative (T1) and after 7 days (T2) copeptine concentration, NTproBNP and hemodynamic monitoring (MAP, SVRI, CO) and NE infusion were recorded.
Results: Fifty-five patients were enrolled. Among them 9 (16.3%) patients developed PCVS. There was no significant difference in cortisol level between patients who developed PCVS and those who did not. Patients who developed PCVS had pre-operative levels of copeptine (22.23±14.64 vs 12.17±6.53pmol/L) and NTproBNP (1501.78±150.56 vs 666.45±722.06 pg/ml) significantly higher compared to the control group (p < 0.001). Moreover, we observed a significantly higher level of copeptine (59.43±58.53 vs 14.21±9.67 pmol/L, p=0.002) post-operative, at 7 days from the intervention. Patients who developed PCVS had a significantly longer CPB (179±53 vs 129±41 min, p=0.005) and clamping time (142±44 vs 94±30 min, p=0.0004). At the multivariate analysis the only variables associated with a risk of PCVS were clamping time (OR: 1.038, 95%CI 1.006-1.071, p=0.018) and pre-operative copeptine (OR: 1.165, 95%CI 0.99-1.36, p=0.05). Additionally pre-operative copeptine had a good correlation with NTproBNP, with an high negative predictive value, when the variables were plotted together (figure 1). The ROC curve for pre-operative copeptine showed a high sensitivity (88.9%) and specificity (81.4%), AUC=0.87.

Conclusions: Increased pre-operative levels of copeptine and NTproBNP might be associated with and increased risk to develop PCVS and those results might be mean that patients who presented with a decompensated cardiac dysfunction are more prone to develop PCVS.

OP20

The influence of mean arterial pressure during cardiopulmonary bypass on cerebral complications

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2University of Copenhagen, Section of Biostatistics, Copenhagen, Denmark

Introduction: Stroke and postoperative cognitive dysfunction are common complications after cardiac surgery. Furthermore, silent strokes detected by diffusion-weighted magnetic resonance imaging (DWI) have been reported in up to 50% of cardiac surgery patients. The majority of these lesions seems to be caused by emboli, but other mechanisms may induce hypoperfusion and consequently lead to tissue ischaemia. A few randomised controlled trials have previously investigated the influence of mean arterial pressure (MAP) during cardiopulmonary bypass (CPB) on cardiac and neurological endpoints with diverging results. The aim of the Perfusion Pressure Cerebral Infarct (PPCI) trial was to assess the effects of two distinct levels of MAP during CPB on the development of perioperative cerebral injury in cardiac surgery patients(1).

Methods: We randomised 197 (99 vs. 98) patients in a single-centre, patient- and investigator blinded trial. Before undergoing coronary artery bypass grafting and/or left heart valve surgery, patients were stratified by age and surgical procedure and randomised 1:1 to CPB with either increased MAP (70–80 mmHg) or ‘usual MAP’ (departmental practice) (40–50 mmHg). CPB pump flow was fixed at 2.4 l/min/m2 body surface area plus 10–20% in both groups and MAP was increased to the target level by phenylephrine and a titrated infusion of norepinephrine to a maximum of 0.4 μg/kg/min, if necessary. The primary endpoint was total volume of new cerebral infarcts (ml) (change from baseline DWI scan to one conducted day 3-6). Secondary endpoints included the total number of new ischaemic infarcts and postoperative cognitive dysfunction at discharge and after 3 months.

Results: The results reported below are blinded. Final, unblinded results will be presented at EACTA Annual Congress 2017.

Mean MAP was 66.8 mmHg (SD 4.9) in one group and 44.7 mmHg (SD 4.9) in the other. Mean age was 67 years (SD 11), 57% of the procedures were coronary artery bypass graftings and 43% were left heart valve procedures. We found no significant difference in volume of new cerebral infarcts between the two groups (median 0.03 mL (IQR 0-0.12) vs. 0.03 mL (IQR 0-0.14); P= 0.48). The total numbers of new cerebral infarcts were comparable between groups (median 1 (IQR 0-2); P=0.53), as was the incidences of cognitive dysfunction after 1 week and 3 months.

Discussion: In cardiac surgery patients, the volume of new cerebral infarcts was comparable in patients randomised to a low vs. high mean arterial pressure during CPB. Moreover, there was no statistically significant difference in the incidence of postoperative cognitive dysfunction between groups.


OP21

Urine partial oxygen pressure as early marker of acute kidney injury after paediatric cardiac surgery

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Introduction: Acute kidney injury (AKI) is the common and serious complication which occurs in open-heart surgery (HS) using cardiopulmonary bypass (CPB). The renal medulla is one of the first affected tissues from decreased perfusion during the procedure of cardiopulmonary bypass. Partial pressure of the urine taken from the renal pelvis is related to the perfusion of renal medulla was shown. Neutrophil gelatinase-associated lipocalin (NGAL) is accepted as an early biomarker and a predictor of AKI in a variety of clinical settings. We sought to evaluate the relationship between urine pO2 and kidney function-injury biomarkers and contribution of glycocalyx derangement after paediatric cardiac surgery.

Methods: Twenty paediatric patients with normal preoperative renal function as assessed by the creatinine level, undergoing HS with CPB were included in this prospective clinical observational study. Besides routine hemodynamics and cerebral tissue oxygen saturation monitoring, patients were assessed for the partial pressure of the bladder urine (PuO2) and renal tissue oxygen saturation monitoring by NIRS intraoperatively (after induction, before CPB, after CPB) and postoperative (admission of ICU, 3rd, 6th, 9th, 12th in ICU) periodically. Additionally, syndecan-1, hyaluronan, cystatin-c, and NGAL levels were measured in plasma and urine samples.

Results: PuO2 was found wavy throughout the operation (p > 0.05) and increased at the 6th (p < 0.05), 9th (p < 0.001) and 12th (p < 0.001) hours of ICU admission. Renal tissue oxygen saturation (rSO2) monitored by NIRS was found stable throughout the operation and postoperative 12 hours. Plasma NGAL and hyaluronan levels were measured in plasma and urine samples.}

Discussion: Coexistence of urine pO2 fluctuations and increment of plasma NGAL-hyaluronan levels suggest that urine pO2 could be early marker of kidney injury in paediatric patients undergoing HS. Further investigation in the role of urine pO2 plays in ischemic organ injury and its potential diagnostic implications is needed.


OP22

Impact of cardiopulmonary bypass flow on renal oxygenation (“ICAROX study”)

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Introduction: The use of cardiopulmonary bypass (CPB) is associated with acute kidney injury, and the pathogenesis might include inflammation, micro-embolization and hypoperfusion. A recent study (1) showed impaired renal oxygenation (i.e. increased renal oxygen extraction) during CPB at 2,5 L min-1 m-2 due to reduced renal oxygen delivery. In this prospective study, we evaluated the systemic and renal effects of increased pump flow during CPB.

Methods: The Regional Ethics Committee approved of the study protocol. Patients with a normal renal function scheduled for cardiac surgery with an expected CPB duration > 60 minutes were included after informed consent. All patients received renal vein and pulmonary artery catheters. Filtration fraction was measured using 51Cr-EDTA infusion clearance, and renal oxygen extraction (primary outcome) was measured [(arterial − renal vein O2 content)/arterial O2 content]. After start of CPB and aortic cross clamp, the pump flow was varied between 2.4, 2.7 and 3.0 L min-1 m-2 in a random order. Renal and systemic variables were measured at each pump flow level after 10-15 minutes of constant flow. A linear mixed model with post-hoc test was used for statistical analysis of the variables at the different pump flow rates.

Results: Ten patients (mean age 68 years, 2 women) were included. Systemic and renal variables are summarized in the table. Increasing pump flow index from 2.4 to 3.0 L min-1 m-2,
increased DO2I by 30%. This was accompanied by 20% decrease in RO2Ex. Filtration fraction was maintained, suggesting that GFR increased in proportion to the increase in renal perfusion.

**Discussion:** The impaired renal oxygenation seen during CPB is attenuated by an increased pump flow. Thus, one way to protect the kidneys, during CPB, could be to use a higher pump flow rate than the one traditionally used.

**REFERENCE:** 1. Lannemyr L et al. Effects of Cardiopulmonary Bypass on Renal Perfusion, Filtration, and Oxygenation in Patients Undergoing Cardiac Surgery. Anesthesiology 2016; Epub Dec 1 ahead of print.

**OP23**

**Ventricular arterial coupling to manage hemodynamic instability in the theatre: an elastance based approach at bedside**

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**Introduction:** Early recognition of hemodynamic impairment using echocardiography is paramount to the optimal management of patients undergoing cardiac surgery. Recognising hemodynamic derangement by measuring the relationship between ventricular contractility and arterial load has been described in the critical care setting. 2. We report a case of hemodynamic derangement and restoration using an elastance functional hemodynamics based approach in the operating theatre.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre CPB</th>
<th>2.4</th>
<th>2.7</th>
<th>3.0</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RO2Ex (%)</td>
<td>12.0 ± 4.4</td>
<td>16.7 ± 7.1</td>
<td>16.0 ± 5.7</td>
<td>13.5 ± 4.2</td>
<td>0.048</td>
</tr>
<tr>
<td>MAP (mmHg)</td>
<td>70 ± 8</td>
<td>67 ± 12</td>
<td>71 ± 10</td>
<td>73 ± 8</td>
<td>n.s.</td>
</tr>
<tr>
<td>Cardiac index (L min⁻¹ m⁻²)</td>
<td>2.0 ± 0.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Filtration Fraction</td>
<td>0.27 ± 0.08</td>
<td>0.25 ± 0.09</td>
<td>0.26 ± 0.09</td>
<td>0.24 ± 0.09</td>
<td>n.s.</td>
</tr>
<tr>
<td>SvO₂ (%)</td>
<td>73 ± 8</td>
<td>76 ± 2</td>
<td>79 ± 2 ***</td>
<td>81 ± 3 ***</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>DO2I (ml min⁻¹ m⁻²)</td>
<td>275 ± 46</td>
<td>306 ± 55</td>
<td>365 ± 34 ***</td>
<td>399 ± 41 ***</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>VO2I (ml min⁻¹ m⁻²)</td>
<td>72 ± 18</td>
<td>71 ± 15</td>
<td>72 ± 7</td>
<td>72 ± 9</td>
<td>n.s.</td>
</tr>
<tr>
<td>Body temperature (°C)</td>
<td>35.2 ± 0.5</td>
<td>35.7 ± 0.4</td>
<td>35.6 ± 0.3</td>
<td>35.6 ± 0.4</td>
<td>n.s.</td>
</tr>
<tr>
<td>Norepinephrine (μg kg⁻¹ min⁻¹)</td>
<td>0.07 ± 0.07</td>
<td>0.11 ± 0.09</td>
<td>0.10 ± 0.07</td>
<td>0.09 ± 0.08</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

Means ± SD. RO2Ex, Renal oxygen extraction; MAP, Mean arterial pressure; SvO₂, Mixed venous oxygen saturation; DO2I, systemic oxygen delivery index; VO2I, systemic oxygen consumption index. * p < 0.05, *** p < 0.001 3.0 vs. 2.4 l min⁻¹ m⁻².

**Objectives:** We investigated the accuracy and applicability of an hemodynamic approach of diagnosis and treatment based on the non-invasive measurements of left ventricular elastance (Ees), effective arterial elastance (Ea) and ventricular arterial coupling (VAC).

**Methods:** In a patient with severe LV dysfunction undergoing emergency CABG after AMI, we applied an elastance based method. Measurements of the elastances were accomplished using a single-beat noninvasive approach. Conventional invasive and non invasive hemodynamic measurements (HR, BP, CI, Scv02) were also recorded. All measurements were performed at baseline (after induction of anaesthesia), and after any cardio-vasoactive treatment in order to evaluate the response.

**Results:** Elastance measurement at baseline showed ventricular arterial uncoupling (2.42) mainly due to Ees depression (Ees 0.56 mmHg/ml, Ea 1.34 mmHg/ml). Inotropic support (Levosimendan 0.5 mcg/kg/min) was started which improved VAC (from 2.42 to 1.6) after 2 hours. Due to persistent hypotension, a vasoconstrictor was applied (Norepinephrine 0.1-0.3 mcg/kg/min) resulting in a sudden Ea rise and further decoupling (2.08). Norepinephrine was withdrawn and Esmolol 5-10 mcg/kg/min was introduced to reduce Ea, which led to HR reduction and restored VAC (from 2.08 to 1.31) (fig.1).

**Conclusion:** We reported the application of a functional elastance based hemodynamic approach in order to rapidly diagnose the determinants of hemodynamic alteration. In our opinion this pathophysiological method applied in the theatre, as well as already reported at bedside in the critical care setting, offers a better understanding of hemodynamic alteration and a more accurate representation of cardiac interaction with the vasculature leading to more accurate therapeutic approach. Further investigation is needed to test such approach in larger series.

OP24

Levosimendon after mitral valve replacement supports right ventricular function better in mitral stenosis patients with moderate to severe pulmonary hypertension

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Introduction: Development of pulmonary arterial hypertension (PAH) in patients having rheumatic mitral stenosis (MS) results in right ventricular hypertrophy and dysfunction that affects postoperative outcome. Conventional vasodilators though improve right ventricular function but also result in an increase in heart rate and contribute in development of AF. Levosimendan has been used in the care of heart-failure patients for the positive inotropic effect by binding to cardiac troponin C and sensitising cardiac myofilaments to calcium without increase in oxygen consumption[1]. Pleiotropic effects include activation of adenosine triphosphate-sensitive sarcolemmal K+ channels of smooth muscle cells (linked to vasodilation) and activation of adenosine triphosphate-sensitive K+ channels in cardiovascular mitochondria (involved in a cardioprotective effect). We postulated that Levosimendon can be a better vasodilator in supporting RV function in patients that develop moderate to severe PAH due to severe MS

Methods: 50 patients with normal LV size and contractility with moderate to severe PAH (MPA P > 25 and beyond at rest) but without AF were randomised to conventional management with dobutamine and noradrenaline combination (Gr.1) or addition of levosimendon as a bolus in pump followed by infusion (Gr.2) during and after coming off bypass after mitral valve replacement. The levosimendon infusion was continued for 48 hours. The RV function was evaluated by TAPSE, FAC, MPI of RV, PRVSP, S’ pulmonary flow Acceleration time (PAt) by TEE post induction pre-bypass, after closure of chest and 24 hours in ICU by TTE

Results: Complete data of 25 patients of in Gr.1 and 24 in Gr. 2 was analysed using SPSS ver 21 using appropriate test (significant p < 0.05). Demographically both the groups were similar. There was significant improvement in the echo RV parameters of TAPSE, FAC and S’ velocity and PAt in Gr. 2. 11 patients developed AF in postoperative period in Gr.1 as compared to 4 in Gr.2. The 24 hours urine output was
significantly more in Gr.2. Patients in Gr. 2, warmed up earlier and needed significantly more pacing as compared to Gr.1. There were no deaths and they were extubated within 10-12 hours and after the completion of study they were placed on oral sildenafil.

Discussion: Levosimendan exerts a vasodilatory effect on vascular smooth muscle cells, by inducing adenosine triphosphate-dependent potassium channel opening, primarily in the pulmonary arterial vasculature. It results in improved RV-PA coupling in experimental acute RV failure more than dobutamine. In this study these effects have been shown, clinically, with improvements in RV function and reduction in PAH after mitral valve replacement, including reduction in AF with better outcome.


POSTER ABSTRACT PRESENTATIONS

Poster Session PS01
Wednesday, 19 April 2017
11:00 - 13:00, Poster & Exhibition Lounges

PP01

Strain based novel indices as a viable alternative to E/Ea for the prediction of filling pressures in patients undergoing CABG

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Introduction: The accurate measurement of left ventricular (LV) filling pressures is important to evaluate, stratify and guide the management of the cardiac surgical patients. Doppler echocardiography is used for assessment of diastolic filling of the LV. Tissue Doppler mitral early diastolic velocity (Ea) combined with peak transmitral early diastolic velocity (E) to obtain E/Ea, provides an estimate of LV filling pressure. However, E/Ea has a significant gray zone and is less reliable in preserved LV ejection fraction. Global myocardial peak diastolic strain (Ds) & strain rate (DSr) at the time of E and isovolumic relaxation (IVR) combined with E (E/Ds & E/DSr)-have recently been proposed as novel indices to estimate the filling pressure (Dakainish et al). These novel indices have not been studied and validated in perioperative setting where it has the potential to decrease the need for pulmonary artery catheter (PAC) insertion. We hypothesised that Transoesophageal Echocardiography (TEE) derived diastolic strain indices correlate better with PAC measured LV filling pressures compared to Doppler indices in patients with coronary artery disease (CAD) with preserved EF planned for coronary artery bypass grafting (CABG).

Methods: After institutional ethics committee approval and obtaining written informed consent, 120 adult patients with CAD with preserved EF scheduled for elective CABG were studied. Patients with coexisting mitral valve abnormalities and patients not in sinus rhythm were excluded from the study. An investigator with 10 years’ experience conducted 2-D echocardiographic exam and acquired the loops using a IE-33 Philips machine before sternotomy. An experienced investigator performed the offline analysis. The attending anaesthesiologist measured the wedge pressures at the time of echocardiographic recording of the loops. Mitral inflow measurements included peak early (E) velocity. Ea velocity using tissue Doppler at the septal and lateral annular sites were measured and E/Ea ratio computed using the average of the septal and lateral Ea. The Left ventricle was imaged with a frame rate > 40. Strain was measured in all possible segments in 3 standard views (Mid oesophageal 4 chamber, Mid oesophageal 2 chamber & Midoesophageal long axis view). Time from peak R wave of the QRS complex to peak E was measured to identify LV longitudinal diastolic strain at peak E. Thus, early diastolic strain and strain rate at peak E was measured and averaged among the 3 views to generate early global Ds and DSr. Strain rate(SR) was analysed in the IVR (to make the index load independent) and E/Ds, E/DSr, E/SRIVR were formulated and calculated.

Results and Discussion: to be notified later (study underway).


PP02

Need of intraosseous access in advanced life support in the in-hospital setting

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**Introduction:** Intraosseous devices (IOD's) have been proven useful in an out-of-hospital-cardiac-arrest (OHCA) setting [1]. Recent ERC (European-Resuscitation-Council) guidelines states that the use of IOD’s in cardiac arrest is effective and should be considered in cases where obtaining an intravenous access was not successful[2]. Based on earlier findings, the use of intraosseous devices have been incorporated in the standard operational procedures of the Dutch EMS (Emergency-medical-services) protocols for OHCA. In IHCA, the evidence for the use of IOD’s is scarce but promising [3]. In our hospital the standard use of an IOD have not been generally accepted and incorporated. One of the reasons is professionals need regular use of the device should be warranted. The aim of this observational study is to determine the frequency of ‘failed intravenous access’ and which professional should use the IOD in an IHCA.

**Methods:** For every cardiac arrest (IHCA and OHCA), a resuscitation team is called. In all cases a standardised flowchart derived from ERC-protocols [3] is followed. After each resuscitation procedure data was collected.

**Results:** From 1 December 2015 to 31 may 2016, 152 resuscitation-calls took place and 118 forms were submitted (34 cases data loss). A total of 94 cardiac arrest could be studied, of which were 63 OHCA and 31 IHCA. Patient characteristics consisted of 75 men and 19 women. The first obtained cardiac rhythms were 19 Asystole, 30 Pulseless Electrical Activity, 41 Ventricular Fibrillation and 4 Ventricular Tachycardia. For results of available access, see table 1.

Only 5 cases of delay regarding administration of medication (due to lack of vascular access) were reported.

**Discussion:** Our data demonstrates that the prevalence of difficult vascular access in a cardiac arrest in a clinical setting is less common than expected. In only 6 of 64 cases administration of medication was delayed because access was not directly available on arrival of the resuscitation team. Patients in IHCA often already have a vascular access. For OHCA, the Dutch EMS provides highly trained medical personnel, who are experienced in placing a vascular access and are already equipped and trained with an IOD.

The ERC guidelines state that every patient in an Advanced Life Support (ALS) setting should be able to receive an intraosseous access if necessary. Our hospital has 422 members of trained personnel in ALS. Earlier research states that self-efficacy, experience and knowledge of the procedure highly depends on regular training with an IOD [4]. In combination, a now demonstrated low prevalence of difficult vascular access, has led to adaptation of local protocols. In future, only a small group of personnel with a constant factor will be regularly trained; in our case the residents of Intensive Care medicine (10 residents with 24 hour presence in the hospital).

**PP03**

One-centre experience in the Intensive care and anaesthetic management in pregnancy of a patient with pulmonary arterial hypertension

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**Introduction:** The presence of pulmonary arterial hypertension (PAH) in pregnancy increases mortality up to 12 - 30% (50% when PAH is associated with Eisenmenger syndrome) [1, 2]. Due to the low prevalence of PAH in pregnancy many questions of periooperative management are still unclear. The aim of this study is to summarise our approaches to the anaesthesia and intensive care in pregnant patients with PAH.

**Methods:** 22 pregnant with PAH (systolic pulmonary artery pressure (SPAP) more than 60 mm Hg) who were delivered in 2010 - 2016 were included in the one-centre retrospective study. Data are presented as median (25th, 75th percentile).

**Results:** The age median was 27 (23; 29) years. There were 4 (18%) cases of idiopathic PAH and in 18 (82%) PAH was associated with congenital heart disease (CHD), in 12 (55%) patients with Eisenmengers syndrome were found. At the time of admission the following parameters were observed: SPAP 90 (82; 103) mm Hg, SpO2 in whole group 90 (85, 95)% and in the Eisenmengers syndrome subgroup 87 (82; 93)%; platelets count 105 (62; 164) x 103 / μl. 20 patients received PAH specific
therapy (sildenafil) before delivery. There was 1 who laboured at 36 weeks and 21 who has Caesarean sections (CS) at 32 (28; 34) weeks. In 20 cases under epidural anaesthesia with a slow titrated technique was used. One CS was performed under general anesthesia due thrombocytopenia (16 × 103/µl). Inhaled nitric oxide (NO) in a dose of 40 - 60 ppm was administered intraoperatively for all pregnant. All the Labour and abdominal deliveries were hemodynamically stable, all patients were admitted to the ICU conscious without respiratory support. The postoperative period was uncomplicated in five females (22.7%). Decompensation with a PAP rise, acute right ventricular failure and hypoxemia developed in 17 (77.3%) cases at 30 (24; 40) h after delivery. These patients required combined PAH specific therapy:- NO, sildenafil, inhaled iloprost and inotropic agents, respiratory support was used in four. The ICU median stay was 13 (9; 22) days. 3 patients died (13.6%). The mortality in the Eisenmengers syndrome subgroup was 25% (3/12). 19 healthy babies (86.4%) were discharged from the hospital.

Discussion: Our one-centre observation data series of the pregnant woman with PAH is comparable with international studies [1]. Despite having severe PAH (in 82%) associated with CHD and in 55% associated with Eisenmenger syndrome the mortality rate was 13.6% and in 86.4% babies alive.


PP04

Effect of sevoflurane or propofol on shunt fraction in pediatric patients undergoing percutaneous transcatheter closure of atrial septal defect

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Introduction: Most of the anaesthetic agents have significant hemodynamic effects such as venodilation, decreased SVR and myocardial depression, which alter angiographic measurements and shunt fractions (1). The effect of anaesthetics on the magnitude of intracardiac shunt may have some impact on ASD occluder device placement. The aim of this study was to compare the effects of propofol and sevoflurane on shunt fraction, hemodynamics and recovery times in children scheduled for ASD closure.

Method: Following ethical committee approval and informed consent 44 children aged 3-17 years undergoing percutaneous transcatheter ASD closure were enrolled. Twenty minutes after premedication with 0.5 mg kg⁻¹ oral midazolam, 0.2 µg kg⁻¹ min⁻¹ remifentanil infusion was started and infused during the procedure without supplemental oxygen in all children. After reaching an adequate sedation level, the groin was infiltrated with local anaesthetic. After cardiac catheter insertion, shunt fraction (Qp:Qs) was calculated using catheterisation data. Then the children were randomised into two groups; Group S (n = 23) (inhalation induction with 6% and maintenance with 1 MAC sevoflurane) and Group T (n = 21) (propofol 2.5 mg kg⁻¹ bolus followed by 150-200 µg kg⁻¹ min⁻¹ infusion). Neurromuscular blockade was achieved with rocuronium and all children were ventilated with a tidal volume of 8 mL kg⁻¹, 33 % O₂ in air. Shunt fractions were calculated five minutes after induction. ASD was closed with Amplatzer Septal Occluder under TEE guidance. Hemodynamic data, complications and reaching an Aldrete score ≥ 9 after extubation were recorded. Data were evaluated by non-parametric tests.

Results: Demographic data were similar between groups (Table 1). Before induction, Shunt fraction was 1.6 ± 0.4 and 1.5 ± 0.3 in Group S and Group T, respectively. Shunt fraction increased in both groups (1.9 ± 0.6 in Group S, 1.9 ± 0.8 in Group T) after induction (p > 0.05). Mean heart rates decreased after induction in Group T (p < 0.05), but it was not clinically significant. ASD were closed successfully without any difficulty in all children. Recovery times and complications were similar.

Discussion: Sevoflurane or propofol in combination with remifentanil infusion may be used for transcatheter ASD closure in children. Although shunt fraction increased with both agents, the success of device deployment during ASD closure was not affected.


PP05

Celit based viscometer sonoclot analysis in infants with D-transposition of great arteries undergoing arterial switch operation

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Introduction: The present study was undertaken in infants with dextro- Transposition of the great arteries (d-TGA) undergoing an arterial switch operation (ASO). The primary objective of the study was to evaluate the baseline and post cardiopulmonary bypass (CPB) coagulation profiles employing Sonoclot technique. A secondary objective of the study was to evaluate the efficacy of epsilon- amino-caproic acid (EACA) in preventing peri-operative blood loss.
Methods: A prospective, randomised, study was carried out in a tertiary care set up on thirty five patients undergoing ASO for d-TGA. The study group patients received EACA, in a dosage of 100 mg/kg after induction of anaesthesia, upon initiation of CPB and after protamine, while the Control group patients received normal saline. Sonoclot analysis was done after induction of anaesthesia (T0) and 15 min after the administration of the third dose of EACA (T1). The quantitative measurements included the activated clotting time (SonACT), the clot rate (CR), the platelet function (PF) and DR15 (Diminishing rate of clot strength at 15 min postmaximal clot strength).

Results: The SonACT was prolonged in both groups at T0 (163.41 ± 16.72 and 171.72 ± 12.22, p=0.1). The CR (15.47 ± 9.02 and 13.83 ± 9.27,p=0.601) and the PF (0.91 ± 0.57 and 0.85 ± 0.45,p=0.748) were at the lower limit of normal values in both groups. Preoperative PF(T0) was deranged in 74.2% and preoperative CR in 51.43% of the total patients which increased to 62.8% in the post CPB period (T1). There was no significant difference in ACT, CR and PF at T1 between the two groups (p > 0.05). DR 15 increased significantly after CPB in the control group while no significant change occurred in the study group.(53.06 ± 3.45 vs 29.76 ± 2.58, p < 0.01). Intra-group comparison between pre-CPB (T0) and post-CPB(T1) in both the groups showed statistically significant decrease in platelet function at T1 . PF also had significant positive correlation with preoperative oxygen saturation (r=0.346,p=0.042). Cumulative mean blood loss, total packed red blood cells, and fresh frozen plasma requirements were significantly less in study group (p < 0.01).

Discussion: There was a high incidence of preoperative abnormalities in the Sonoclot measured CR and PF in infants with d-TGA undergoing ASO. Preoperative ACT was prolonged in all subjects at baseline and the clot rate and platelet function was at the lower limit of reference values,1 suggesting the impairment of the entire coagulation process in patients with TGA. After CPB, there was a significant decline in the PF. EACA was found to be effective in reducing postoperative blood loss and transfusion requirements.


PP06
ECMO with cannulation of femoral vein and pulmonary artery in a patient after heart transplantation and unknown refractory hypoxemia

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Introduction: Venovenous ECMO is a well established treatment option for patients with severe ARDS. There is evidence that its use might improve mortality among these complex patients. Nevertheless, certain clinical shortcomings might limit its use in individual patients, especially after heart transplantation: patients at high risk for right ventricular failure might benefit from an alternative cannulation strategy with the venous outlet cannula placed in the right atrium and the inlet cannula directly in the pulmonary artery. This provides both reliable right heart assistance and adequate blood oxygenation.

Case report: We present a case of a 23 years- old man suffering from right ventricular arrhythmogenic dysplasia and listed for heart transplantation. Chronic cyanosis and severe hypoxemia (domestic O2 treatment) were interpreted as consequence of an atrial septal defect (ostium secundum type, atrial septal defect II) and right to left shunting. After decompensation due to refractory ventricular tachycardia he was admitted to the intensive care unit following implantation of a biventricular assist device (Centrimag, Levitronix) he was listed for high priority heart transplantation. Good hemodynamic stability was achieved but surprisingly severe hypoxemia occurred despite surgical closure of the ASD II. This finding emphasised the possibility for an unrecognised chronic pulmonary process. When paO2/FiO2 values dropped below critical values venovenous ECMO (femorojugular) was instituted to guarantee adequate oxygenation. Acceptable arterial oxygenation was achieved although severe recirculation problems was observed. Successful cardiac transplantation was performed four days after the venovenous ECMO implantation. Due to right sided necrotising pneumonia ECMO support was maintained for ten more days. Right ventricular function was never impaired and after improving paO2/FiO2 to > 200 the patient was successfully decanulated, and five days later, he was weaned from mechanical ventilation after tracheotomy.

Discussion: Veno-pulmonary-artery ECMO is a viable option in patients with severe respiratory failure and at risk for right ventricular failure. In our patient pulmonary computer tomography before the ECMO implantation showed nonhomogenous lung perfusion suggesting a ventilation/perfusion mismatch as an underlying cause for the continuing hypoxemia. This required respiratory maintained ECMO support – combined cardiopulmonary transplantation was refused by the lung transplant team.

On the hemodynamic side the pretransplantation studies on pulmonary vascular resistance were considered not fully reliable due to severe right to left shunting. Therefore, right heart failure after cardiac transplantation was a possible scenario and decision for veno-pulmonary-ECMO support was made. It provided excellent hemodynamic and respiratory stability after cardiac transplantation and was a safe and successful choice for our patient.

PP09

Bedside monitoring of cerebral energy state during cardiac surgery – a novel approach utilizing intravenous microdialysis

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Introduction: Brain damage remains an important complication of cardiac surgery.1 During neurocritical care cerebral energy state is routinely evaluated from the lactate to pyruvate (LP) ratio obtained by intracerebral microdialysis (MD). In an experimental study we have recently shown that a global decrease in cerebral oxygenation due to a pronounced decrease in MAP is reflected in an increased LP ratio of the draining venous blood.2 This study investigates whether the LP ratio obtained by MD of the cerebral venous outflow reflects a derangement of global cerebral energy state during cardio-pulmonary bypass (CPB).

Method: Ten patients undergoing primary, elective coronary artery bypass grafting, were blindly randomised to low MAP (40 to 60 mmHg, n = 5) or high MAP (60 to 80 mmHg, n = 5) during CPB. MD catheters were positioned in a retrograde direction into the jugular bulb and a reference catheter was inserted into the brachial artery. Association between biochemical MD variables, MAP, data obtained from simultaneous bi-frontal near infrared spectroscopy (NIRS), and postoperative neurological outcome measures (MMSE) were assessed.

Results: During CPB the mean LP ratio obtained from microdialysis of the internal jugular vein increased significantly by 160% (low MAP) and 130% (high MAP). The correlated difference between pooled LP ratio (low and high MAP) of the jugular venous and the arterial blood was significant (LPartery 17 [15-20] vs. LPbulb 26 [23-27]; p = 0.0001). No cerebral desaturations (decrease in rSO2 > 20% from baseline) were observed in either group utilising NIRS. In both groups 50% of the patients showed significant cognitive decline (MMSE 3 points) two days after surgery.

Discussion: It is technically simple and feasible to place a microdialysis catheter in the jugular bulb and monitor biochemical variables related to energy metabolism bedside. The LP ratio of cerebral venous blood increased significantly during CPB indicating compromised cerebral oxidative metabolism and was correlated to the decrease in MAP. The increase in the jugular bulb LP ratio was significantly higher than the increase in LP ratio of the arterial blood. There was no significant difference between low and high MAP groups regarding their venous outflow LP ratio during CPB but low MAP patients had tendency to higher LP ratios. Conventional monitoring of rSO2 by NIRS did not show a corresponding decrease in cerebral oxygenation. As the patients exhibited decreased cognitive functions after CPB increase in jugular venous LP ratio may be a sensitive indicator of impending cerebral damage.


PP10

Vasoplegia syndrome in cardiac surgery: combined use of hydrocortisone and N-acetylcysteine, description of two clinical cases

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Introduction: Vasoplegia syndrome is a known complication after heart surgery and is associated with high morbidity and mortality. It is characterised by marked vasodilation and loss of peripheral vascular resistance. The pathogenesis is multifactorial and involves activation from contact, intrinsic and extrinsic coagulation pathway, the complement system, activation of cytokines, endothelial cells and platelets resulting in widespread syndrome. Interleukin 6 (IL-6) and interleukin 8 (IL8) produced during this inflammatory process have a negative inotropic effect that could worsen the cardiac outcome also. IL6 and free oxygen radicals cause no reply to vasopressors. Treatment requires the administration of vasopressors, but hypotension may be refractory to such drugs. Corticosteroids significantly reduces the inflammatory response associated with cardiopulmonary bypass and N-acetylcysteine works as a powerful antioxidant.
Methods: We report our experience with the application of a combined use of hydrocortisone and N-acetylcysteine in treating vasoplegia syndrome. The first case is a 62-year-old patient admitted to ICU for serous pericarditis and cardiac tamponade treated with pericardiocentesis, the second case is a 52-year-old patient treated with extracorporeal membrane oxygenation for refractory cardiac arrest after Mitral Valve repair surgery. Either way it is an important that vasoplegia caused by a different pathogenesis initially treated with maximal doses of Noradrenaline. Starting combined administration of hydrocortisone and N-acetylcysteine has allowed us to significantly reduce the doses of vasopressors as the arterial pressure increases relatively quickly.

Results: In the two patients we obtained complete resolution of vasoplegia syndrome.

Conclusion: Administration of hydrocortisone and N-acetylcysteine may be a reasonable choice for the treatment of refractory vasodilatatory shock in cardiac surgery patients with different pathogenesis.

Poster Session PS02
Wednesday, 19 April 2017
14:30 - 16:00, Poster & Exhibition Lounges

PP11
Effect of cardiopulmonary bypass on carboxyhemoglobin levels in smokers and non-smokers undergoing various cardiac surgical procedures

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Background: Low dose exogenous and endogenous carbon monoxide (CO) have been shown to be cytoprotective in various pathophysiological conditions such as organ transplantation, ischemia/reperfusion, inflammation, sepsis or shock states.1,3 Endogenous CO is produced mainly from the inducible isoform of microsomal heme oxygenase-1 in the reticuloendothelial cells via heme degradation. Because cigarette smokers can have COHb levels that are 2 to 10 times higher than that of non-smokers, it has been suggested that smoking may have protective effect and leads to favorable outcome compared to non-smokers. Anesthesia, surgery, and cardiopulmonary bypass are known stressful conditions and inducers of HO-1 gene expression.2 The aim of this study was to investigate the behaviour of CO levels and the clinical impact of this behaviour in smokers versus non-smokers undergoing cardiopulmonary bypass.

Methods: In this retrospective cohort study, adult patients that were admitted to Augusta University Medical Center for coronary artery bypass graft (CABG) alone, CABG in combination with valve repair or replacement, or valve surgery alone, whether elective or emergent, from April 1, 2012, to January 1, 2016, were included in the study. Patients who died before an arterial blood gas sample could be obtained in the ICU were excluded.

Results: A total of 193 patients (42 smokers and 151 non-smokers) were identified. Two patients were excluded because of insufficient data. Smokers were significantly younger than non-smokers (p=0.004). Other demographics including sex and race as well as mean intraoperative variables such as CPB and aortic cross clamp times were comparable between the two groups. (Table 1) Smokers had significantly higher carboxyhemoglobin (COHb) levels at baseline (p<0.001), just prior to CPB (p<0.001), and immediately after weaning off CPB (p<0.001). COHb levels on arrival to the ICU were similar in the two groups. Subgroup analysis showed a significantly higher COHb levels in non-smoking valve patients on arrival to ICU as well as change in COHb levels from preinduction to ICU as compared to CABG only patients, suggesting a higher degree of systemic stress causes higher production of endogenous COHb.

Conclusion: The more pronounced reduction in COHb levels following CPB in smokers as compared to non-smokers suggests that smokers have less endogenous production of CO in response to systemic stress. It is possible that exogenous CO in smokers has a "preconditioning effect" by reducing the overall systemic stress response.

Table 1: Demographics, changes in carboxyhemoglobin levels and other perioperative variables.

<table>
<thead>
<tr>
<th></th>
<th>Smoker (N=42)</th>
<th>Non-smoker (N=151)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>56.2±9.2</td>
<td>62.4±13.0</td>
<td>0.004</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>23</td>
<td>76</td>
<td>NS</td>
</tr>
<tr>
<td>Female</td>
<td>19</td>
<td>75</td>
<td>NS</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>27</td>
<td>95</td>
<td>NS</td>
</tr>
<tr>
<td>African American</td>
<td>15</td>
<td>51</td>
<td>NS</td>
</tr>
<tr>
<td>Hispanic</td>
<td>0</td>
<td>2</td>
<td>NS</td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
<td>2</td>
<td>NS</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>1</td>
<td>NS</td>
</tr>
<tr>
<td>CPB time, min</td>
<td>121.7±81</td>
<td>129.8±70</td>
<td>NS</td>
</tr>
<tr>
<td>Aortic cross clamp time, min</td>
<td>81.1±59</td>
<td>88.4±48.9</td>
<td>NS</td>
</tr>
<tr>
<td>COHb levels, %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preinduction</td>
<td>2.2±1.4</td>
<td>1.3±0.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pre CPB</td>
<td>1.6±0.9</td>
<td>1.1±0.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Post CPB</td>
<td>1.6±0.6</td>
<td>1.2±0.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>1st ICU arrival</td>
<td>0.9±0.6</td>
<td>0.78±0.4</td>
<td>NS</td>
</tr>
<tr>
<td>Overall change in COHb</td>
<td>-1.3±1.0</td>
<td>-0.57±0.64</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mean ICU stay, day</td>
<td>7±6</td>
<td>10±16</td>
<td>NS</td>
</tr>
<tr>
<td>Mean hospital stay, day</td>
<td>12.5±8.8</td>
<td>16±17</td>
<td>NS</td>
</tr>
</tbody>
</table>

Table 2: Changes in COHb in smokers and non-smokers based on the type of surgery

<table>
<thead>
<tr>
<th>COHb levels</th>
<th>CABG (N=81)</th>
<th>Valve (N=87)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preinduction</td>
<td>Smokers</td>
<td>2.06</td>
<td>2.57</td>
</tr>
<tr>
<td></td>
<td>Non-Smokers</td>
<td>1.33</td>
<td>1.36</td>
</tr>
<tr>
<td>Pre CPB</td>
<td>Smokers</td>
<td>1.44</td>
<td>1.89</td>
</tr>
<tr>
<td></td>
<td>Non-Smokers</td>
<td>1.07</td>
<td>1.16</td>
</tr>
<tr>
<td>Post CPB</td>
<td>Smokers</td>
<td>1.55</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td>Non-Smokers</td>
<td>1.08</td>
<td>1.30</td>
</tr>
<tr>
<td>1st ICU arrival</td>
<td>Smokers</td>
<td>0.87</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>Non-Smokers</td>
<td>0.6</td>
<td>0.88</td>
</tr>
<tr>
<td>Overall change in COHb</td>
<td>Smokers</td>
<td>-1.1917</td>
<td>-1.57</td>
</tr>
<tr>
<td></td>
<td>Non-Smokers</td>
<td>-0.72</td>
<td>-0.49</td>
</tr>
</tbody>
</table>
**PP13**

The effect of n-acetylcysteine on respiratory function in the aortic surgery with antegrade cerebral perfusion

F Toptan, Omer Faruk Savluk, F Guzelmeric, R Yaltirik, A Erkilinc, E Gurcu, C Guler, T Kocak

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**Introduction:** Cardiopulmonary by-pass and antegrade cerebral perfusion have important advantages during aortic surgery. However, it has bronchopulmonary, cardiovascular and other multisystem side effects caused by peroperative hypothermia and non-physiological components like ischaemic process, laminar flow circulation, blood contact with foreign surfaces during antegrade cerebral perfusion. In this study, we aimed to study the use of NACs protective effect of respiratory functions prophylactic in elective ascending aortic surgery patients with antegrade cerebral perfusion.

**Method:** Between 40-80 years old ASA I-III patients 25 consecutively had elective aortic surgery with planned antegrade cerebral perfusion were included in this study. The patients were separated into two groups: study group (NAC +, n=13) and control group (NAC -, n=12). After induction, a loading dose of 50 mg/kg was given to Group NAC +, and the same dose of saline was given to Group NAC - for 30 minutes maximum. Preoperative and postoperative 72 hour respiratory function tests were performed to all patients in the sitting and upright position.

**Results:** 72 hours postoperatively, the PaO2 of the study group were significantly higher statistically than the control group (p=0.001) 72 hours postoperatively, the PaO2 measurements in the study group were lower than the control group although not statistically significant (p=0.067). Postoperative FEV1 and FVC measurements showed statistically difference between the groups. (p=0.005 and p=0.006 respectively.)

**Discussion:** The effect of NAC application to the neutrophil’s oxidative response during the cardiopulmonary by-pass was firstly evaluated by Anderson et al. in 1995. 24 patients included in that study and 12 patients got a bolus of 100 mg/kg followed by 20 mg/kg infused NAC during the by-pass. In NAC (+) patients neutrophil respond was statistically significantly lower. This finding predicted that NAC has a role of a free oxygen radical scavenger in open heart surgery (1). In this prospective, randomised, placebo controlled clinical original study we found that the use of NAC in antegrade cerebral perfusion applied to elective aortic surgery cases increases the oxygenation and prevents respiratory effects of aortic surgery and speeds up the healing process of the lungs.


<table>
<thead>
<tr>
<th>Postop 72 hrs</th>
<th>Group NAC (+)</th>
<th>Group NAC (-)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>PaO2</td>
<td>118.31 ± 32.5</td>
<td>78.08 ± 15.6</td>
<td>0.001</td>
</tr>
<tr>
<td>PaCO2</td>
<td>36.69 ± 4.84</td>
<td>39.33 ± 3.52</td>
<td>0.06</td>
</tr>
<tr>
<td>FEV1</td>
<td>62.92 ± 8.5</td>
<td>52.83 ± 7.76</td>
<td>0.005</td>
</tr>
<tr>
<td>FVC</td>
<td>64.54 ± 9.2</td>
<td>53.25 ± 9.2</td>
<td>0.006</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td>97.70 ± 6.69</td>
<td>100.51 ± 12.41</td>
<td>0.72</td>
</tr>
</tbody>
</table>

**PP16**

Elimination of hydroxyethyl starch (HES) when used as colloid priming in cardiovascular surgery

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2Acibadem University, School of Medicine, Department of Clinical Biochemistry, Istanbul, Turkey
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5Istanbul University, School of Medicine, Department of Anaesthesiology and Reanimation, Istanbul, Turkey

**Introduction:** Synthetic colloid fluids (Hydroxyl ethyl starch (HES)) are widely used especially in non-cardiac surgery due to their plasma expanding properties. In cardiac surgery, colloids (HES) may be preferred to reduce interstitial oedema caused by increased permeability during extracorporeal circulation (ECC). It is known that HES is primarily cleared by plasma amylase activity. However, there is insufficient information about the elimination of HES when organ dysfunction is present due to non-pulsatile flow. In this study, we aimed to evaluate the elimination process of HES used as priming solution.

**Method:** In this prospective randomized study approved by Acibadem University ethics committee, patients who underwent elective cardiovascular surgery without any systemic disease other than hypertension and who used HES as a priming solution in ECC were included. Patients who underwent emergency surgery and who used HES during and after surgery except priming were excluded from the study. All patients underwent standard anesthesia and CPB management protocol. Blood and urine samples were collected at 7 time
points: Before induction (T0), intensive care admission (T1), 2nd hour (T2), 4th hour (T4), 6th hour (T5), 24th hour (T6) post operatively. HES levels both in plasma and urine were determined as well as standard biochemical measurements.

**Results:** The maximum plasma HES concentration during ICU admission reached the baseline level at post-6th hour (0.039 ± 0.004 g/100 mL, p < 0.05) (Figure-1). There was no correlation between blood and urinary HES levels at any time (p > 0.05).

**Discussion:** As the non-HES polysaccharides in plasma might also interfere with the measurements, the baseline plasma HES level was not found to be zero (1,2). The plasma level of the HES used as a prime solution reached the baseline level at 6 hours of post operation. There is no significant relationship between urine concentration of HES in a small amount and the plasma concentration of HES. Further studies are needed to investigate the way in which the breakdown products of HES were eliminated.

**REFERENCES:** 1. Clin Investig 1992;70,707

**PP17**

**pSerum phosphorus, a simple biomarker of acute kidney injury severity and renal recovery after cardiac surgery**

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**Introduction:** Acute kidney injury (AKI) is common after cardiac surgery and is a strong predictor of morbidity and mortality.1 Serum Phosphorus (Ph) is measured daily after cardiac surgery since its variations may impact on cardiac performance. Its elevation following AKI is frequent but has never been studied in this context though it could be a simple marker of AKI. The objective was to determine Ph kinetic and predictability for both AKI diagnosis and renal recovery.

**Methods:** This prospective observational study was conducted between February 2015 and March 2016 in our cardiothoracic intensive care unit (ICU). All consecutive patients with no preoperative renal dysfunction nor major hemodynamic instability operated on elective on-pump cardiac surgery were included. Ph and Cr were measured at baseline before surgery, at admission, every 12 hours in ICU and daily until hospital discharge. AKI was defined according to KDIGO criteria.3 The diagnostic performance of maximal postoperative Ph elevation (% EPh = (maximal postoperative Ph-baseline Ph)/(baseline Ph) *100) was assessed by calculating the area under the Receiver Operating Characteristic Curve (AUC) with sensitivity (Se), specificity (Sp), positive and negative predictive values (PPV, NPV). In case of renal recovery, defined as a Cr discharge below baseline Cr + 26.5 μmol/L, Ph and Cr decreasing rate were assessed with ANOVA test.

**Results:** Among the 260 included patients, 33% developed AKI: AKI 1 22.3%; AKI 2 4.2%; AKI 3 6.5% with 3.5% of renal replacement therapy (RRT). Patients with AKI had higher Euroscore II, cardiopulmonary bypass length, transfusion need and mortality than those without AKI (p < 0.001). In AKI patients, postoperative Ph elevation peaked at 48 hours as well as Cr elevation. A %EPh value of 54% had a good predictibility to diagnose severe AKI (stage ≥ 2): AUC-ROC [CI 95%] at 0.928 [0.854-1], Se 92.3%, Sp 92.1%, PPV 57.1%, NPV 99.1%. A threshold of 59% predicted the initiation of RRT with an AUC-ROC value [CI 95%] at 0.936 [0.824-1], Se 88.9%, Sp 86.9%, PPV 20% and NPV 99.5%. In severe AKI patients with no-need for RRT, the Ph 24h-decreasing rate after the peak started between 48 h and 72 h and was significantly greater than Cr decline (9% vs 4%, p < 0.04).

**Discussion:** Serum Ph is not an earlier biomarker for AKI diagnosis. However, a %EPh less than 59% may predict the no-initiation of RRT in severe AKI. The Ph 24h-decreasing rate after the peak could also be an early biomarker of renal recovery.

PP18

Wellbeing and agency in parents of children with congenital heart disease

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Introduction: Parents of children suffering from congenital heart diseases develop symptoms of depression, distress, anxiety and hopelessness more frequently than parents of healthy children (1, 2). Associated with the described symptoms, parents may experience a lack of control and disempowerment, which decreases the parent’s agency, a construct from development studies, and which may have negative consequences on adherence to treatment (3). The primary aim of this study was to assess the effect of medical treatment on wellbeing and agency in parents of children suffering from congenital heart diseases in Chile and to compare it with Reference values.

Methods: 40 parents of children suffering from congenital heart diseases (before surgery and before hospital discharge) and 115 parents of healthy children were surveyed. To evaluate mental wellbeing the General Health Questionnaire was applied; to assess agency the Basic Psychological Needs Scale and the Self-Determination Scale were used; in addition the Beck Hopelessness Scale and a socioeconomic survey were included in this study.

Results: Parents of children suffering from congenital heart diseases scored significantly worse than parents of healthy children on the General Health Questionnaire (p = 0.001). This difference was not found using the others scales. Children’s surgery decreased parents’ hopelessness (p = 0.04), and no significant differences were found in the remaining scales.

Discussion: Children’s surgery has a positive effect on parent’s hopelessness, but it does not have any impact on their wellbeing nor agency. Parents of children suffering from congenital heart disease have a decreased wellbeing compared to parents of healthy children, but have a similar level of agency. Socioeconomic level and gender may influence this association.


PP19

Impact of combined anaesthesia on cognitive functions of patients after cardiac surgery

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2Vilnius University, Faculty of Medicine, Clinic of Anesthesiology and Intensive Care, Vilnius, Lithuania
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Background and Goal: The incidence of postoperative cognitive dysfunction (POCD) occurs in 30-65% of patients after cardiac surgery. The aim of our study was to investigate the impact of general anaesthesia with thoracic epidural anaesthesia on cognitive functions after cardiac anaesthesia with CPB.

Methods: 80 patients were enrolled into two groups: general anaesthesia (GA, n = 42) and general anaesthesia with thoracic epidural anaesthesia (TEA, n = 38). Neurocognitive tests were accomplished 1 day before surgery and 7 days postoperatively: MMSE, Six – item cognitive impairment test, WAIS Digit symbol substitution test.

Results: All preoperative (baseline) test results did not differ significantly among TEA and GA groups. 7th-day WAIS test results did not differ much comparing TEA (20.03; SD 5.97) and GA (17.14; SD 6.48) groups. Comparing preoperative and postoperative WAIS test results there was a relevant decline in GA (preoperatively: 19 (SD 7.11); postoperatively 17.14 (SD 5.97) group. WAIS score change was significantly higher in GA groups, compared to TEA. There was no significant difference in 7th-day MMSE test results comparing TEA (median 28, min 23,
max 30) and GA (median 28, min 18, max 30) groups. Patients in TEA group demonstrated better Six-item test results than in GA group at the 7th day after surgery ($p = 0.16$). Less points demonstrate better cognitive function, more points - cognitive dysfunction: GA median 2 (min 0, max 16) vs TEA median 2 (min 0, max 16) before surgery and GA median 4 (min 0, max 18) vs TEA median 2 (min 0, max 18) after surgery.

**Conclusions:** Combined anaesthesia is not associated with POCD, compared to general anaesthesia. Memory and processing speed capabilities decrease after general anaesthesia.

**PP20**

**Pericardial disease after cardiac surgery: postpericardiotomy syndrome, purulent and constrictive pericarditis**

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Postpericardiotomy syndrome (PPS) after cardiac surgery is a common inflammatory (20-40%) process due to opening of the pericardium, pleural or both (1), can occur a few days to several weeks after surgery. The diagnosis is clinical. Anti-inflammatory non-steroids and colchicine are the first line therapy and corticoids in severe cases.

Purulent pericarditis (PP) is a localised infection. It’s a rare and serious complication. Staphylococcus aureus is the most frequent agent and is usually contiguous contamination, although it can be present by blood dissemination from distant focus. 30-40% have negative microbiological studies. The overall prognosis of purulent pericarditis is dismal with mortality rates up to 40% (2).

**Case report:** We report on a 68 year old male who presented with a sub acute stroke. A cardiac myxoma with extension over both atria was diagnosed. Tumour resection was uneventful and the histopathology confirmed a myxoma. In the postoperative period a VVIR pacemaker was implanted due to slow atrial fibrillation. The patient was discharged on postoperative day 12. After one week he was readmitted with clinical criteria suggestive of PPS with a large pericardial and pleural effusion. A sterile, serohematic liquid was aspirated during pericardiocentesis. Ibuprofen and colchicine was started. Peripheral phlebitis by methicillin-sensitive Staphylococcus aureus occurred and we added cloxacillin (Flucloxacillin) therapy. He had a persistent pericardial effusion and clinical signs for pericarditis, so we added prednisolone, in spite this an emergency sternotomy was performed due to pericardial tamponade. At this time the effusion was clearly purulent. Pleuromediastinal drainage tubes were left and used for topic gentamicin washings accompanied by endovenous daptomycin/cloxacillin although so far all cultures stayed negative. The clinical progression led to severe constrictive pericarditis with refractory cardiogenic shock despite of antiphrenic pericardiectomy performed. The patient died on day 45.

**Discussion:** The clinical challenge of this case lies in the distinction between two differently defined pericardial pathologies PPS and PP.

While PPS is diagnosed (2) based on clinical criteria (fever without infection, pleuropericardial rubs, chest pain, pericardial effusion and pleural effusion with CPR elevated), for the diagnosis of PP microscopic purulence is needed with more than 20,000 leucocytes with or without growth.

We believe that the persistence of severe PPS despite treatment, favoured bacterial haematogenous dissemination after phlebitis (MSSA positive). Our treatment strategy was changed putting an infectious process into the focus although the cultured pericardial effusion stayed negative. Nevertheless we could not safely rule out pericardial infection by haematogenous spread.

**Conclusion:** PP is severe condition with high mortality rate (3). Patients under suspicion for a PPS must be intensively screened for possible infectious signs as the clinical manifestation of both entities are similar but treatment strategies are clearly different. Delayed drainage and antibiotic treatment of manifested purulent infectious pericarditis has a very poor outcome.
Clinical outcome of non-cardiac surgery among patients with history of coronary revascularization by percutaneous coronary intervention vs. coronary artery bypass

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**Objective:** The objective of this study was to compare clinical outcomes of non-cardiac surgery in patients with a history of coronary artery disease treated by percutaneous coronary intervention and coronary artery bypass grafting.

**Background:** Life after percutaneous coronary intervention and coronary artery bypass grafting is compared not only the survival rate but also in various aspects such as angina frequency, physical limitations, and quality-of-life sub-scales. Coronary artery bypass grafting provided slightly better intermediate-term health status and quality of life.

**Methods:** From July 2012 to June 2015, 296 patients with a history of treated coronary artery disease, scheduled for non-cardiac surgery were identified. Patients were divided into percutaneous coronary intervention group and coronary bypass grafting group and the postoperative clinical outcomes were compared between two groups. The primary outcome was all-cause death in 1-year follow-up. The secondary outcome was major cardiac adverse events and myocardial infarction in 1-year follow-up.

**Results:** Of the 296 patients, 168 (56.8%) patients had a history of percutaneous coronary intervention and 128 (43.2%) had a history of coronary artery bypass grafting. In multivariate analysis, 1-year mortality, major cardiac adverse events and myocardial infarction showed non-significant result. (hazard ratio [HR], 2.9; confidence interval [CI] 95%, 0.26-32.48; P=0.39, HR 1.82; CI 95%, 0.91-3.62; P= 0.89, HR 4.19; CI 95%, 0.43-40.73; P= 0.21, respectively).

**Discussion:** This study showed that in treated coronary artery disease, patients undergoing non-cardiac surgery, neither the percutaneous coronary intervention group or coronary artery bypass showed no difference in postoperative clinical outcome. A further study is necessary.

Clinical outcomes in 1-year follow up.

<table>
<thead>
<tr>
<th></th>
<th>PCI (N=168)</th>
<th>CABG (N=128)</th>
<th>Univariate analysis (HR, CI95%)</th>
<th>p-value</th>
<th>Multivariate analysis a (HR, CI95%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
<td>9 (5.4)</td>
<td>11 (8.6)</td>
<td>2.93 (0.27-21.37)</td>
<td>0.38</td>
<td>2.9 (0.26-32.48)</td>
<td>0.39</td>
</tr>
<tr>
<td>MACE</td>
<td>6 (3.6)</td>
<td>11 (8.6)</td>
<td>2.93 (0.27-32.37)</td>
<td>0.07</td>
<td>1.82 (0.91-3.62)</td>
<td>0.89</td>
</tr>
<tr>
<td>MI</td>
<td>4 (2.4)</td>
<td>3 (2.3)</td>
<td>3.92 (0.41-37.66)</td>
<td>0.24</td>
<td>4.19 (0.43-40.73)</td>
<td>0.21</td>
</tr>
</tbody>
</table>

Values are n(%)

aCovariates included male, age, diabetes and emergency operation

Autophagy mediates the protective role of heme oxygenase-1 against hepatic ischemia reperfusion injury in rats

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**Objective:** To identify the role of autophagy in the protective mechanism of HO-1 against hepatic ischemia reperfusion (I/R) injury.

**Methods:** Forty Sprague-Dawley (SD) rats were randomly (random number table) divided into five groups (n=8 in each group), namely sham group, model group, CoPP group, ZnPP group and 3-MA group. Partial hepatic I/R model was established by clamping the pedicles of left and median lobes for 1 h and reopening after 6 h in rats. In the CoPP group, CoPP (5mg/kg) was administered i.p 24 h before I/R. In the ZnPP or 3-MA group, besides pretreatment with CoPP, the rats were given ZnPP (an HO -1 inhibitor, 25mg/kg) or 3-MA (an autophagy inhibitor, 30 mg/kg) i.p 1 h before I/R. Serum alanine aminotransferase(ALT) was determined with automatic biochemistry analyser.

The hepatic pathological scores (PS) were determined under light microscope using hematoxylin-eosin (HE) staining. The hepatocyte apoptosis index (AI) was assessed with terminal dextranucleotidyl transferase-mediated dUTP nick end labelling (TUNEL) staining. Autophagosomes in liver tissue were counted under an electron microscope. The mRNAs of HO-1, caspase-3, Beclin-1 and Atg-5 in the liver were determined by reverse transcription-polymerase chain reaction (RT-PCR). The HO-1 activity was also measured by the generation of bilirubin with the method of double-wave spectrophotometry.

**Results:** Compared with the sham group, hepatic injury indicators including ALT, PS, AI in the model group were increased significantly (P<0.01 ). In the CoPP group, the hepatic injury was blunted compared with that in the model group [ALT(U/L) : 223.3 ± 34.4 vs. 560.3 ± 73.6 , PS:5.6 ± 2.3 vs. 12.0 ± 2.0 , AI(%):11.38 ± 2.39 vs. 19.38 ± 3.07, all
P < 0.01]. HO-1 was induced in the CoPP group and autophagy was also increased significantly after I/R when compared to those in the model group [HO-1 mRNA (2-ΔΔCT) : 3.01 ± 0.71 vs. 1.14 ± 0.20, HO activity (pmol. mg-1protein-1.h) : 259 ± 39 vs. 113 ± 26, the number of autophagosomes: 8.75 ± 0.87 vs. 1.25 ± 0.71, Beclin-1 mRNA (2-ΔΔCT) : 2.85 ± 0.28 vs. 1.15 ± 0.11, Atg-5 mRNA (2-ΔΔCT) : 2.44 ± 0.25 vs. 1.14 ± 0.12, all P < 0.01]. In the ZnPP group, the activity of HO was much lower than that in the CoPP group (P < 0.01), and as a result autophagy was decreased and liver injury was increased. In the 3-MA group, although there was no difference in the activity of HO-1 compared with that in the CoPP group, autophagy being inhibited eliminated the protective effects of HO-1.

Conclusion: HO-1 could regulate the level of autophagy during liver ischemia reperfusion, and in turn autophagy might mediate the protective effects of HO-1 against liver I/R injury.

PP25

Highly sensitive cardiac troponin T (hsTnT) as a marker of perioperative myocardial infarction after cardiac surgery

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²Charles University Medical School and Faculty Hospital, Institute of Clinical Biochemistry and Haematology, Pilsen, Czech Republic

Introduction: Using troponins for the diagnosis of perioperative myocardial infarction (PMI) after cardiac surgery brings difficulties with the interpretation of elevated values. These are influenced by recent myocardial infarction before surgery, reperfusion injury, direct surgical trauma and also inadequate cardiac protection [1]. Troponin level profiles after different cardiac surgery procedures differ in kinetics. Release of troponin after cardiac surgery uncomplicated by PMI is different (peak at 6-8 hours) from one with PMI (peak at 18-24 hours) [2].

The aim of the study was to determinate „normal values” of hsTnT after 3 different types of cardiac surgery procedures and determine the cut-off level which could be diagnostic for PMI.

Methods: 244 patients without preoperative myocardial infarction who underwent elective surgery from February to December 2015 were enrolled to our retrospective study: group AVR (aortic valve replacement) – 55 patients, group CABG (coronary artery bypass grafting) – 115 patients, group OTHERS (mitral valve repair/replacement with or without MAZE - 74 patients). HsTnT was measured immediately after surgery (time T1), 4 hours later (T2), next 4 hours later (T3) and in the morning of the first postoperative day.

Results: Mean values and 95% confidence interval of hsTnT in time T1-4 for all three groups are shown in Figure 1. The cut-off has not been determined for the extremely low number of patients with PMI – only 1 patient in group CABG (peak T3: 7 385ng/l) and 2 patients in group OTHERS (peak T4: 10 126ng/l and 15 843ng/l).

Discussion: We established a ”safe” range of values for postoperative hsTnT at our department (upper limit 95% confidence interval for each group). Previously published cut-off value (3 466 ng/l with sensitivity and specificity 90%) [1] may be appropriate, but more data is needed and a single cut-off value for different surgery procedures does not seem optimal. For the diagnosis of PMI it is important not only the absolute value, but also the kinetics. Peak within 8 hours after surgery, followed by stagnation or decline does not indicate a PMI. According to our data, hsTnT rise by more than 30% between times T2 and T3 is strongly suspected of ischemia. Sharp rise with a peak until the first postoperative day or later confirms PMI.


PP27

Blood and blood product transfusion management experiences of Turkish anaesthesiologists: a multicentre survey study

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Introduction: Anesthesia providers are responsible for the appropriate use of blood and blood products (BBP) that are
mainly used in operating rooms and intensive care units(1). The aim of this study was to investigate the attitudes towards and levels of knowledge about BBP transfusion (BBPT) among Turkish Anesthesiologists, raising awareness of this topic and as a result; prevention of transfusion related complications.

Method: After ethics approval was obtained, a survey consisting of 30 questions was administered to 501 Anesthesiology and Reanimation specialists and trainers from various hospitals in Turkey. Survey questions were prepared according to the clinicians' use of current guidelines as well as their traditional approaches. The questionnaire forms were delivered to participants by hand or e-mail between November 2014 and January 2015. Statistical analysis of data was done with SPSS 11.5 package program. In the analysis of data; Ki-Kare and Fisher exact test were used. P was done with SPSS 11.5 package program. In the analysis of data: Ki-Kare and Fisher exact test were used. P < 0.05 was considered statistically significant.

Results: The results of the present study showed that most of the participants are insufficient in their knowledge about transfusion instructions, such as preoperative evaluation of patients in terms of hemostasis, perioperative transfusion requirements, application of transfusion consent and follow-up forms and awareness about hospital transfusion protocols. Nearly 40% of the participants never use transfusion guidelines and 30% use plasma as volume replacement.

Discussion: BBPT is a highly effective and potentially life-saving treatment for many patients and an essential component of modern anesthesia and perioperative periods. Updated knowledge is essential for safe procedures(2). In our study, we investigated Turkish anesthesiologists' knowledge about and practices of BBPT. Most of the participants (97%) were employed in hospitals where BBPTs were frequently used. It was observed that their transfusion practices were not well-planned or guideline-based. Anesthesia providers' lack of knowledge regarding various aspects of BBPT may be a real threat to patient safety. It is obviously seen that it is rare for anesthesia doctors to quit traditional approaches and to obtain updated knowledge. The findings of the present study indicate the necessity of regular and deliberate educational and training programs for anesthesia providers in Turkey.


Oxygen delivery and acute kidney injury after cardiac surgery
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Introduction: Acute kidney injury (AKI) is a frequent and serious complication following cardiac surgery using cardiopulmonary bypass (CPB). The aetiologia of AKI is complex and multifactorial. Several pre- and intraoperative risk factors have been identified including nadir haematocrit (HCT), transfusion of red blood cells (RBC), age, gender, and diabetes. Haemodilution and the associated limited oxygen delivery (DO2) have gained increased attention due to superiority as predictors (1). The aim of this study was to identify modifiable risk factors for kidney injury after CPB.

Method: Retrospectively collected data from 2308 patients who underwent coronary artery bypass graft (CABG) ± aortic valve repair (AVR) from 2012 to 2014 at Rigshospitalet, Denmark were used for risk assessment. The following data were recorded for each patient: mean arterial pressure (MAP, mmHg), reoperation (within 48 hours), time on CPB (minutes), nadir haematocrit, and pump flow (mL/min/m²). DO2 was calculated as the lowest 30 minutes rolling mean (mL/min/m²). All variables were explored using univariate analysis and variables with a significant association were included in linear and multivariate logistic regression analyses with respect to dialysis dependent renal failure (DDRF) and postoperative peak serum creatinine (PPSC) measured within 48 hrs.

Results: Among the 2308 patients, 31(1.6%) required dialysis. The nadir 30 minutes mean DO2 was 347.4 (± 70.2) mL/min/m² and PPSC was 108.9 (± 46.4) μmol/L. We found MAP, CPB duration, nadir haematocrit and nadir 30 minutes mean DO2 to be risk factors in DDRF. Regarding PPSC as outcome, reoperation, MAP, CPB duration, and nadir haematocrit were all significant risk factors (Table 1).
**Discussion:** We found that oxygen delivery, partly related to a low haematocrit, was a predictor for DDRF. In contrast, oxygen delivery was not associated with PPSC, which may be related to a higher mean DO₂ overall.


<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>DDRF Regression Coefficient</th>
<th>DDRF p-value</th>
<th>PPSC Regression Coefficient</th>
<th>PPSC p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Re-operation</td>
<td>NS</td>
<td>NS</td>
<td>0.105</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>MAP</td>
<td>0.062</td>
<td>0.002</td>
<td>0.108</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>CPB duration</td>
<td>0.007</td>
<td>0.001</td>
<td>0.146</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Nadir haematocrit</td>
<td>-0.278</td>
<td>0.001</td>
<td>-0.118</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Nadir 50 minutes</td>
<td>0.010</td>
<td>0.027</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>mean DO₂</td>
<td></td>
<td></td>
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</tbody>
</table>

**PP29**

Cardiac arrest due to anaphylactic shock after cardiac surgery with massive bleeding and cardiac tamponade following cardiopulmonary resuscitation: case report

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**Introduction:** Anaphylaxis is a severe and life-threatening systemic hypersensitivity reaction. Perioperative anaphylaxis is reported in up to 1/13,000 anaesthetic procedures. Hypotension related to anaesthetic agents, inability of the anaesthetised patient to communicate early symptoms and that the patient is covered can contribute to delayed diagnosis with terrible consequences.

**Case report:** We report a case of a 76-year old man admitted to ICU after elective valvular heart surgery. Immediate postoperative follow-up was complicated by hemodynamic instability due to a major bleeding requiring surgical revision. After re-admission to ICU, the patient stayed hemodynamically stable with low doses of vasoactive and inotropic drugs with no evidence of bleeding or myocardial dysfunction. Unexpectedly, the patient developed refractory hypotension and subsequent cardiac arrest (asystole). Cardiopulmonary resuscitation (CPR) was started. When we uncovered the chest of the patient to perform urgent transthoracic echocardiography generalised flushing and hives were noticed. At that point fresh frozen plasma (FFP) was being transfused to optimise coagulation, as well as metamizol. Immediate management of anaphylaxis (epinephrine, aggressive fluid therapy, corticosteroids and antihistamines) was started stopping all the suspected triggers (FFP, metamizol).

During external cardiac massage, massive bleeding appeared through the thoracic drainage tubes and plasma-free management according to our institutional protocol was started. Emergency resternotomy was performed in the ICU due to cardiac tamponade and ineffective CPR. A bleeding point in the aorta was repaired successfully. A total of 10 red packed blood cells, 4g of fibrinogen concentrate, 1200 IU of prothrombin complex concentrate and 2 pools of platelets were transfused, achieving patient stabilisation after 40 min of CPR. Once again, the patient was transferred to the operating room for surgical revision.

The levels of plasma total tryptase after the reaction were not elevated, neither histamine, latex or complement factors. Patient was discharged from hospital two months later, after overcoming multiple postoperative complications. At the moment, the delayed immunological study is still outstanding.

**Discussion:** Serious allergic events occurring during anaesthesia and the peri-operative period are rare, but can rapidly evolve into life-threatening situations if not recognised and managed promptly. In the postoperative period after cardiac surgery the immediate diagnosis of anaphylaxis can be difficult, particularly as sudden cardiovascular collapse is also observed in situations of cardiogenic shock, major bleeding, cardiac tamponade, vasoplegia or severe arrhythmias. Nevertheless anaesthesiologists should not forget about the rare diagnosis of anaphylaxis. While transthoracic echocardiography is performed, the patient’s body should be uncovered to check for cutaneous manifestations. With a high level of clinical suspicion early and specific management of anaphylaxis should be started. In this case it is possible that high levels of triptase were not detected because of total replacement of circulating blood volume due to massive transfusion.

**PP30**

Neuromuscular ultrasound as a promising tool in the diagnose of diaphragmatic paralysis after cardiac surgery

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²Hospital Sant Pau, Department of Intensive Care, Barcelona, Spain

**Introduction:** Diaphragm dysfunction is a potential factor for postoperative pulmonary complications leading to prolonged mechanical ventilation and failed extubation after cardiac surgery.
surgery (1). A prompt diagnosis is crucial for starting with therapeutic strategies as soon as possible.

Different structural and functional techniques such as chest radiographs, fluoroscopy, computed tomography, dynamic magnetic resonance and electromyography are available; each one has its strengths and weaknesses (1,2).

Neuromuscular ultrasound has emerged as a non-invasive technique useful in the structural and functional assessment of the diaphragm. It is considered as a fast, reliable, cheap and safe method using no ionising radiation to study the structure and function of the diaphragm (1).

After cardiac surgery, imaging protocols should be developed and validated to standardise the ultrasonography assessment of the diaphragm (3).

Method: We report a case of a 74-year-old woman admitted to Intensive Care Unit (ICU) after myocardial revascularization with combined aortic and mitral valve replacements who developed after extubation a progressive and unexplained tachypnea and orthopnea, more marked in the supine position and accompanied by respiratory secretions.

Chest X-rays were not conclusive. Initial lung ultrasonography revealed a pattern of consolidation. Antibiotic therapy was started as pneumonia was suspected but there was no improvement in the amount of dyspnoea. We decided to perform a neuromuscular ultrasound to evaluate the diaphragm.

Result: Neuromuscular ultrasound revealed a right diaphragmatic paralysis. This finding with no need for any other invasive or expensive method, gave us her diagnosis. We contacted our pneumologist and we started noninvasive ventilation (NIV) which resulted in a clear improvement. The patient was finally discharged to ward on NIV.

Discussion: Postoperative diaphragmatic dysfunction due hypothermia, traction or cautering of the phrenic nerve during the surgery is under-diagnosed because of its varied and often non-specific presentation, such as unexplained respiratory distress, asymmetric breathing pattern or an elevated diaphragm on chest radiographs (1,2,3). In the presence of any of these symptoms, checking diaphragm function should be mandatory.

Ultrasonography is a promising technique for the evaluation of the structure and dynamic function of the diaphragm, perhaps the future chosen technique. It is accurate, reproducible, relatively easy to learn, portable, which is very important for critically ill patients on mechanical ventilation (1)

Ventilator weaning protocols involving diaphragmatic parameters to predict success of extubation should be developed and tested (1,3).


Control of nosocomial outbreak due to multiresistant bacteria based on audit and education in a cardiothoracic intensive care unit

Philippe Gaudard, M Saour, S Parer, C Jeandel, P Colson

Introduction: Large nosocomial outbreaks caused by Extended-Spectrum-Beta-Lactamase (ESBL) producing gram-negative, associated to selective antibiotic pressure, have been reported in hospitals. These outbreaks have a serious impact on the organisation of care in ICU and sometimes impose a stop to all admissions to control the dissemination. We report the description, investigation and control of an ESBL producing Escherichia coli outbreak in an adult cardiothoracic ICU from January to June 2016.

Results and Discussion: Overall, during this period, 17 patients were contaminated with ESBL producing Escherichia coli, 11 of which came from the same clone (epidemic course, Figure 1). Of these 11 patients, 8 had a bacteriologically proven clinical infection (5 ventilator associated pneumonias, 2 urinary tract infections and 1 isolated bloodstream infection) due to this strain and 3 patients died. Among the 6 patients identified with other clones of these bacteria, 4 were only colonised, 1 had a urinary tract infection and 1 had a fatal pneumonia. A careful hygiene survey was conducted, followed by training activities for caregivers, adjustments to care protocols and regular dissemination of information on the situation to the nursing team and medical staff. The investigation revealed the presence of a patient reservoir in almost all cases but did not identify an environmental reservoir despite 103 samples from ICU and operative rooms environment. The audit of practices indicated areas for improvement, in particular concerning hand hygiene with a decrease of hydro-alcoholic solution consumption. Specific training programme was followed by 46 non-medical caregivers (66% of the team). After a rapid decrease in the number of new cases at the start of the various actions, the outbreak could be controlled without further death and without interrupting cardiovascular and thoracic surgery and declared finished 13 weeks after the index case. The feature of this epidemic clone was its high virulence characterised by rapid spread, very early contamination of some patients and the high rate of severe infections. By comparison, for the whole of 2015 in our ICU, 18 cases of ESBL producing Escherichia coli were found with a peak of 4 cases in 1 month. The search for the virulence factors of this clone is carried out in our laboratories.

Conclusion: The increase in the number of ESBL producing Gram-negative in recent years, both at the origin of community and hospital infections, poses a serious public health problem and represents a high risk of epidemic in ICU if strict routine hygiene measures are not strictly observed under standard precautions. Audit and real-time adjustment of practices are useful methods in case of cross-transmissions for rapid control of an outbreak without closing an ICU. Nevertheless, a continuous educational programme should be necessary to maintain a high level of hygiene in hospitals.

Acute Risk Change (ARC) can be used for continuous quality monitoring and detection of adverse clinical events

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2Monash University’s School of Public Health and Preventive Medicine, Alfred Hospital, Department of Epidemiology and Preventive Medicine, Melbourne, VIC, Australia
**Introduction:** Quality of care in cardiac surgery is commonly measured using outcomes such as morbidity and mortality. Statistically significant changes in quality are not detected unless variation is considerable. We have previously shown that Acute Risk Change (ARC), a quality measure based on change in mortality risk from preoperative to postoperative phase, is associated with adverse events, morbidity, long-term mortality and can identify outlier hospitals in an Australian population. In this study, we assess the validity of ARC in a UK population, the utility of ARC as a continuous quality monitor, and we characterise adverse events that lead to outlier ARC status.

**Method:** 2.5 years of pre and postoperative data was gathered from a single large centre using local and Intensive Care National Audit and Research Centre (ICNARC) data. 3 time periods were generated. Period 1 was used to calculate local predicted risk of death pre and postoperatively using Euroscore and ICNARC score, respectively. ARC was calculated as postoperative minus preoperative risk of death. Period 2 was used to test accuracy of predicted risk of deaths and assess ARC validity. Period 3 was used to test ARC control charts looking for surgeon outliers, and characterise adverse events leading to extreme ARC.

**Results:** A database of 4651 patients was generated. Both Euroscore (recalibrated to the local population) and ICNARC score were good predictors of mortality. ARC was associated with mortality (OR 1.1, p < 0.001) and morbidity, including readmission (OR 1.04, P < 0.001), return to theatre (OR 1.04, p < 0.001), second bypass run (OR 1.02, p < 0.005) and length or stay (coeff. =2, p < 0.001). There were 2 patterns of ARC within surgeons: those with a constant ARC around zero (i.e. patient as expected in ICU) and those with occasional high ARC (patient much sicker than expected in ICU) (Figure 1). Case review showed avoidable adverse events leading to high ARC, including major vessel injury, failed valve repair or grafts requiring repetition, failed myocardial protection and suboptimal patient management or work-up.

**Discussion:** ARC is a measure of perioperative quality of care that is both measurable and valid in a UK population. It is associated with morbidity and mortality and can contemporaneously identify outlier providers using control charts. Avoidable intraoperative adverse events led to high ARC and outlier classification. ARC may be used as a continuous monitoring tool to highlight errors in clinical care that lead to poor outcome.


**OP27**

Effects of non-technical skills training in immediate life support courses

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2Graz University of Technology, Department Biomedical Engineering, Graz, Austria
3AUVA Trauma Centre Salzburg, Department of Anaesthesiology, Salzburg, Austria
4The Austrian Order Province of Hospital Order of St. John of God, Overall Medical Director, Vienna, Austria
Introduction: There is a great potential to come closer to the requirements of well – performed non-technical skills (NTS) in passing an ERC Immediate Life Support (ILS) course, with the purpose to improve patient care and safety. [1][2] The aim of our study was to approve this potential by exploring the self expected behaviour related to this field, in medical emergency situations, from ILS course providers in traditional course structure compared with ILS course providers with supplementary training in NTS.

Method: A multi-centre trial was performed within 30 ILS provider courses in several hospitals and training centres in Austria from June 2013 till September 2014. 18 courses had been allocated as control group (CG) with a standard ILS course and 12 courses as intervention group (IG) with an interactive, video supported and directed targeted – training in NTS, according to the ILS course regulation. Self assessment was conducted by an after-course-questionnaire for all participants with statements around the elements of the Anaesthetists Non-Technical Skills (ANTS) as behavioural marker [3].

Results: 330 surveys had been validated positively (IG n = 139 and CG n = 191). The distribution of the overall result with reference to ANTS behavioural in IG and CG shows a statistically significant difference (p = 0.001) between responder trends (IG median 1.0, IQR 1.0-2.0.; CG median 1.50, IQR 1.0-2.0). In detail we determined differences in the skill category “Decision making” (p = 0.024) and “Situational awareness” (p < 0.001). The skill category “Teamwork” (p = 0.566) and “Task management” (p = 0.143) are statistically similar in both groups.

Discussion: Out of our results we recommend the use of NTS specific targeted – training in ILS provider courses, especially to improve “Decision making” and “Situational awareness” performances.


Oral Presentations 206
Thursday, 20 April 2017
10:00 - 10:36, Auditorium 2

OP28

Cardiac arrest in cardiac surgery patients. Incidence and outcome. A single center report

Aurore Ughetto, B Nucci, P Burtn, R Berthezene, P Courant

CABG AVR MVR Tot COMBINED OTHER AO DISSEC

<table>
<thead>
<tr>
<th>Variable</th>
<th>All patients</th>
<th>Multivariable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unadjusted OR (95% CI)</td>
<td>Adjusted OR (95% CI)</td>
</tr>
<tr>
<td>Age, per year*</td>
<td>1.034 (0.013 – 1.057)</td>
<td>1.076 (1.038 – 1.117)</td>
</tr>
<tr>
<td>Sex, male*</td>
<td>1.481 (0.959 – 2.251)</td>
<td>1.481 (0.959 – 2.251)</td>
</tr>
<tr>
<td>Preoperative creatinine clearance, ml/min(*)</td>
<td>0.991 (0.984 – 0.997)</td>
<td>0.991 (0.984 – 0.997)</td>
</tr>
<tr>
<td>Previous cardiac surgery*</td>
<td>2.855 (1.209 – 5.978)</td>
<td>2.855 (1.209 – 5.978)</td>
</tr>
<tr>
<td>LVEF &lt; 30%(*)</td>
<td>1.684 (1.298 – 2.156)</td>
<td>1.684 (1.298 – 2.156)</td>
</tr>
<tr>
<td>Preoperative AF-AFl</td>
<td>2.532 (1.483 – 4.161)</td>
<td>2.532 (1.483 – 4.161)</td>
</tr>
<tr>
<td>Peripheral arterial occlusive disease*</td>
<td>1.872 (1.047 – 3.171)</td>
<td>1.872 (1.047 – 3.171)</td>
</tr>
<tr>
<td>EuroSCORE II, per %</td>
<td>1.085 (1.047 – 1.125)</td>
<td>1.085 (1.047 – 1.125)</td>
</tr>
<tr>
<td>Revision</td>
<td>3.154 (1.792 – 5.321)</td>
<td>3.154 (1.792 – 5.321)</td>
</tr>
<tr>
<td>Cross clamp time</td>
<td>1.008 (1.001 – 1.014)</td>
<td>1.008 (1.001 – 1.014)</td>
</tr>
<tr>
<td>CPB Time</td>
<td>1.007 (1.002 – 1.011)</td>
<td>1.007 (1.002 – 1.011)</td>
</tr>
<tr>
<td>Peak TnT, per 100 ng/L</td>
<td>1.019 (1.008 – 1.029)</td>
<td>1.019 (1.008 – 1.029)</td>
</tr>
<tr>
<td>New AF-AFl on 7d ECG</td>
<td>1.775 (0.839 – 3.394)</td>
<td>1.775 (0.839 – 3.394)</td>
</tr>
<tr>
<td>New pathological Q wave, any</td>
<td>1.110 (0.636 – 1.841)</td>
<td>1.110 (0.636 – 1.841)</td>
</tr>
<tr>
<td>New pathological Q wave, by location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inferior location†</td>
<td>0.690 (0.286 – 1.417)</td>
<td>0.690 (0.286 – 1.417)</td>
</tr>
<tr>
<td>Lateral location†</td>
<td>1.001 (0.345 – 3.212)</td>
<td>1.001 (0.345 – 3.212)</td>
</tr>
<tr>
<td>Anterior location†</td>
<td>3.737 (1.643 – 7.708)</td>
<td>3.737 (1.643 – 7.708)</td>
</tr>
<tr>
<td>Number of new pathological Q waves‡</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 new Q wave</td>
<td>0.979 (0.534 – 1.680)</td>
<td>0.979 (0.534 – 1.680)</td>
</tr>
<tr>
<td>2 new Q waves</td>
<td>3.362 (0.755 – 10.826)</td>
<td>3.362 (0.755 – 10.826)</td>
</tr>
</tbody>
</table>

Table 3: Main Model: Logistic Regression of New Pathological Q Waves for the Occurrence of 12-Month, All-Cause Mortality and/or MACE

OP29
The significance of new Q waves in postoperative ECGs after elective on-pump cardiac surgery

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2University Hospital Gent, Gent, Belgium
3University of Basel Medical School, Basel, Switzerland
4University Hospital Düsseldorf, Düsseldorf, Germany

Background: The diagnosis of infarction post CABG surgery is characterised by cardiac biomarkers (preferably troponin) elevated above 10 x the upper limit of the norm plus clinical signs of ischemia such as new pathological Q waves [1]. While the prognostic relevance of troponins on cardiac morbidity and mortality has been extensively studied [2], the application of this definition to high-sensitivity troponins leads to some 90% of
patients fulfilling the biomarker criterion of the third universal definition. However, the clinical significance of new pathological Q waves after on-pump cardiac surgery is uncertain.

We hypothesise that 1) the occurrence of new pathological Q waves 7 days after on-pump cardiac surgery as well as 2) their location (anterior, inferior, or lateral) is independently associated with 12-month, all-cause mortality and/or MACE when adjusting for the EuroSCORE II, cardiopulmonary bypass time, and peak postoperative troponin T concentrations.

Method: In this observational cohort study from a single university centre, we examined consecutive patients undergoing elective on-pump cardiac surgery from 01/2007 to 10/2010. Patients suffering death or major adverse cardiac events (MACE), defined as acute coronary syndrome, cardiac arrest, congestive heart failure, or revascularization prior to the 7th postoperative day or those with missing ECGs were excluded. Our primary endpoint was 12-month, all-cause mortality and/or MACE at 12 months.

Using logistic regression, we examined the prognostic value of new pathological Q waves according to the Minnesota ECG Code [3], adjusting for the EuroSCORE II, cardiopulmonary bypass time, and peak postoperative troponin T concentrations. We conducted a subgroup analysis in patients undergoing isolated CABG only.

Results: We included 1,464 patients (74% male; mean age 66 ± 10 years) and observed 103 (7.0%) all-cause deaths and/or MACEs at 12 months. A total of 236 patients (16.1%) had definite or probable new pathological Q waves according to the Minnesota ECG Code. The occurrence of new pathological Q waves per se was not associated with our primary endpoint (adjusted OR 0.970 [95%CI 0.540-1.648]). However, the occurrence of a new pathological Q wave in V1-V5 (anterior) was a strong independent predictor for poor outcomes (aOR 3.461 [95%CI 1.501-7.242]). The subanalysis in 740 isolated CABG patients yielded similar results.

Discussion: The prognostic significance of new Q waves after cardiac surgery has not been examined in large studies in the troponin era. However, the increasing precision of high-sensitivity troponin assays has led to the dilemma that some 90% of patients will fulfill the biomarker criteria of the third universal definition of myocardial infarction, complicating diagnosis of MI and prognostication.

This analysis suggests that for patients undergoing elective on-pump cardiac surgery, only new pathological Q waves in V1-V5 (anterior) in the 7th postoperative day ECG are associated with 12-month, all-cause mortality and/or MACE, while other locations are not.

OP30

Comparison of local and regional anaesthesia in arteriovenous fistula surgery

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2Uludag University Medical School, Department of Cardiovascular Surgery, Bursa, Turkey

Introduction: Arteriovenous fistula (AVF) is preferred because of its long lasting, low cost and low complication rates in chronic renal failure patients. We compared local and regional anesthesia for AVF surgery by investigating the effect on the blood flow and the diameter of arteries and veins creating fistula, time taken to perform the block, contentment of surgeon and patients.

Method: After ethics committee approval patients (18-85 yr) were randomised: Group LA (n=20) and Group RA (n=20) according to administration of local or regional anesthesia. SpO₂, peripheral perfusion index (PPI) were recorded. The diameter of brachial artery, cephalic vein, axillary vein and artery and Pulsatile Index (PI) were measured with ultrasonography before the block, 20 minutes after block and 1 day after the operation. Contentment of surgeon satisfaction and patient’s pain (VAS) were evaluated after the operation.

Results: There was no significant difference in demographic data, surgical time and monitoring. Surgeon satisfaction was higher in group RA (p = 0.005). VAS levels at the end of the operation and 8 hour after the operation were higher in group LA (p = 0.0001). PI levels were lower and PPI levels were higher 20 minutes after the block in group RA (p = 0.0001). Diameters of axillary artery - vein, cephalic vein and brachial artery were in table1.

Discussion: In conclusion, we believe that brachial plexus block, causing veno-arterial dilatation and increasing arterial blood flow provides favorable conditions for creation of AVF.


Table1. Diameters of axillary artery - vein, cephalic vein and brachial artery

<table>
<thead>
<tr>
<th></th>
<th>GROUP LA</th>
<th>GROUP RA</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axillary artery diameter (mm) before block</td>
<td>5.9 ± 0.8</td>
<td>5.9 ± 1.5</td>
<td>0.714</td>
</tr>
<tr>
<td>Axillary artery diameter (mm) 20 min after block</td>
<td>5.9 ± 0.9</td>
<td>6.8 ± 1.6</td>
<td>0.0001</td>
</tr>
<tr>
<td>Axillary artery diameter (mm) 1 day after block</td>
<td>5.9 ± 0.7</td>
<td>5.9 ± 1.4</td>
<td>0.723</td>
</tr>
<tr>
<td>Axillary vein diameter (mm) before block</td>
<td>6.1 ± 1.0</td>
<td>6.2 ± 1.1</td>
<td>0.968</td>
</tr>
<tr>
<td>Axillary vein diameter (mm) 20 min after block</td>
<td>6.1 ± 1.0</td>
<td>6.9 ± 1.2</td>
<td>0.0001</td>
</tr>
<tr>
<td>Axillary vein diameter (mm) 1 day after block</td>
<td>6.1 ± 0.8</td>
<td>6.1 ± 1.1</td>
<td>0.381</td>
</tr>
<tr>
<td>Cephalic vein diameter (mm) before block</td>
<td>3.9 ± 0.6</td>
<td>4.2 ± 1.0</td>
<td>0.054</td>
</tr>
<tr>
<td>Cephalic vein diameter (mm) 20 min after block</td>
<td>3.9 ± 0.7</td>
<td>5.1 ± 1.0</td>
<td>0.0001</td>
</tr>
<tr>
<td>Cephalic vein diameter (mm) 1 day after block</td>
<td>3.9 ± 0.6</td>
<td>4.2 ± 0.9</td>
<td>0.051</td>
</tr>
<tr>
<td>Brachial artery diameter (mm) before block</td>
<td>4.7 ± 0.5</td>
<td>4.5 ± 0.8</td>
<td>0.171</td>
</tr>
<tr>
<td>Brachial artery diameter (mm) 20 min after block</td>
<td>4.7 ± 0.4</td>
<td>5.2 ± 0.9</td>
<td>0.0001</td>
</tr>
<tr>
<td>Brachial artery diameter (mm) 1 day after block</td>
<td>4.5 ± 0.9</td>
<td>4.5 ± 0.9</td>
<td>0.459</td>
</tr>
</tbody>
</table>
OP31
Serum copeptin levels as predictor of cognitive dysfunction after carotid endarterectomy

Dragana Unic-Stojanovic, V Maravic-Stojkovic, D Radak, N Aleksic, P Gajin, B Milicic, S Tanaskovic, M Jovic
1Cardiovascular Institute Dedinje, Department of Anaesthesia and Intensive Care, Belgrade, Serbia
2University of Belgrade, School of Medicine, Belgrade, Serbia

Introduction: The incidence of cognitive dysfunction (CD) after carotid surgery is about 10-28%. Copeptin is the C-terminal fragment of provasopressin and is presumably co-secreted with arginine vasopressin from the hypothalamus. Copeptin levels have also been found to be elevated in ischemic stroke. The aim of this study was to evaluate the predictive value of postoperative serum copeptin level in the occurrence of CD in patients undergoing carotid endarterectomy (CEA).

Methods: This prospective study was conducted on patients operated for carotid stenosis during a 6-month period at a referral, high-volume vascular centre. The Local Ethical Board approved the study. All patients underwent CEA under general anaesthesia. Blood samples were drawn to determine the levels of copeptin 3 hours after the surgery. A complete neurocognitive evaluation was performed 1 day before surgery as well as 6 months after surgery. In total, a battery of 10 neuropsychological tests was used that assessed a range of cognitive functions. Statistical analysis was performed with SPSS 20.0.

Results: A total of 98 patients (60% male) with a mean age of 66.0 ± 6.8 years undergoing CEA surgery were enrolled in the study. 10.5% patients had CD after carotid surgery. Patients with CD were significantly older than patients without CD (65.3 ± 6.6, vs. 69.7 ± 2.5; respectively; P=0.001). In the multivariate linear analysis postoperative serum copeptin concentration was significantly associated with late CD (B 14.139 (95% CI 0.989-27.288); P=0.036). A ROC curve analysis showed that a serum copeptin level > 103.1 pmol/L predicted POCD after carotid surgery with 85.7% sensitivity and 64.2% specificity (AUC 0.740; 95% IP, 0.530 - 0.950).

Discussion: The close and reproducible relationship of copeptin levels to the degree of activation of the stress axis is the basis of its unique usefulness as a prognostic and diagnostic biomarker. In ROC curve of this study, serum copeptin levels had high AUC for postoperative CD after CEA surgery. In this study, it was found that postoperative serum copeptin is independently associated to late postoperative CD.


OP32
Dexmedetomidine versus propofol/opioid for sedation in TAVI: a propensity matched analysis of effects on perioperative gas exchange and haemodynamic support

Patrick Mayr, G Wiesner, P van der Starre, J Michel, G Goppel, M Erlebach, M Kasel, C Hengstenberg, O Husser, H Schunkert, P Tassani
1German Heart Centre Munich, Technical University of Munich, Institute of Anaesthesiology, Munich, Germany
2Stanford University Medical Center, Stanford, CA, USA

Background: Transfemoral Transcatheter Aortic Valve Implantation (tf-TAVI) has become an established therapy for elderly patients with aortic stenosis and can be performed under procedural sedation. Propofol (often combined with opioids) is usually the first choice for procedural sedation. Nevertheless, adverse events like hypotension, hypoxemia and hypercapnia have been described. In this context, the pharmacologic properties of dexmedetomidine (DEX) as a central Alpha-2 receptor agonist may be favourable.

Methods: Data was obtained from our prospectively maintained AVIATOR TAVI registry. Moderate sedation – as defined by the ASA – was the targeted depth of sedation. Premedication consisted of 3.75mg midazolam p.o. Patients were either sedated with a combination of propofol and opioid (P/O) or DEX. To minimise a potential selection bias in the choice of the sedation technique, a 1-to-1 nearest neighbour matching was used. Sex, body mass index, left-ventricular ejection fraction, EUROScore II and a combination of propofol and opioid (P/O) or DEX. To minimise a potential selection bias in the choice of the sedation technique, a 1-to-1 nearest neighbour matching was used. Sex, body mass index, left-ventricular ejection fraction, EUROScore II and a combined endpoint for pulmonary condition (COPD, pulmonary function, smoking) were included in the matching algorithm. Periprocedural gas-exchange and need for haemodynamic support were the endpoints. Furthermore, the need for additional sedatives/opioids in the DEX group was investigated.

Results: Out of 1088 tf-TAVI patients (09/2013 – 02/2016) 312 eligible (n= 152 P/O / n= 160 DEX) were identified in our database. After matching 272 patients (n= 136 P/O, n= 136 DEX) were analysed. Baseline characteristics were
comparable. Periprocedural data are shown in Table 1. In terms of efficacy, additional analgo-sedative therapy was required in 20 DEX patients (15%). Twelve patients received only propofol, five a combination of propofol and opioids and further three only opioids.

**OP33**

**Haemodynamics are age dependent and have little impact on the use of inotropes and constrictors**

Pia K Ryhammer, NE Hjørnet, J Greisen, C-J Jakobsen

Aarhus University Hospital, Department of Anaesthesiology and Intensive Care, Aarhus N, Denmark

Low cardiac output syndrome (LCOS) is common in patients undergoing cardiac surgery contributing to morbidity and mortality. LCOS increases length hospital stay and costs, making it desirable to diminish its occurrence and attenuate its severity. What is an inadequate cardiac output during and after cardiac surgery is a key question. It has been suggested that LCOS was present if cardiac index (CI) \(< 2.4\) L/min/m² with simultaneous evidence of organ dysfunction. However, we know from today’s population of cardiac surgery patients that many patients have an uncomplicated course, even with a CI less than 2.0 L/min/m². CI in otherwise healthy subjects decreases with age, but considerable inter-patient differences and intra-patient variation has been shown. The aim of this study is to describe CI, mixed venous saturation (SvO₂) and mean arterial blood pressure (MAP) related to age, thus contributing to establish a definition of LCOS.

**Methods:** Observational cohort study of 8,963 patients from our heart registry merged with data from our electronic patient management system. Data were divided primarily on age and
gender and associated to perioperative vasoconstrictor and inotropic treatment. Data was retrieved as average pre-bypass and post-bypass data for each patient.

Results: Median values of CI correlated with age, ranging from 2.28 (2.03-2.65) in patients younger than 50 to 1.92 (1.68-2.21) in patients older than 80 years. Mixed venous saturations showed the same correlation while mean arterial blood pressure did not correlate the same way. Females have significantly lower MAP values. Otherwise no differences were found in gender.

Patients treated with inotropes or constrictors were correlated to age, the fraction increasing from 37.9% (< 50 yrs) to 69.4% (80+ yrs). Overall the fraction of patients receiving perioperative vasoactive medication was only 2.2% in pre-bypass values above or below median values and 4.0% in post-bypass values. Regarding SvO₂ the difference between above and below values was somewhat higher being 10.7% in pre-bypass values and 14.0% in post bypass values. Low SvO₂ seems to have a higher treatment fraction in younger patients while no difference is seen in 80 plus patients.

Conclusion: Cardiac index and mixed venous saturations are highly associated with age in cardiac surgery patients. CI is a relatively poor indicator of vasoactive treatment in all age groups while mixed venous saturation seems to influence more, especially in younger patients.

OP34

Outcomes following minimally invasive cardiac surgery

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²St. Thomas’ Hospital, London, UK

Introduction: Survival outcomes are improving following elective cardiac surgery. Quality of recovery and the cost of treatment are increasingly important in the delivery of this complex intervention.

Recent innovations have included minimising the size of surgical incision to potentially improve pain and recovery times. Only one study in the literature has studied the health economics of minimal access aortic valve replacement (AVR) revealing potential cost savings(1).

Methods: In the POMICS study (Pain Outcomes following Minimally Invasive Cardiac Surgery), with institutional review board approval we are prospectively collecting data on recovery profiles following isolated AVR through the following incisions:

- Standard midline sternotomy (STERN)
- Mini sternotomy (MINI)
- Right anterior thoracotomy (RAT)

We report an interim analysis of the first 100 patients from the POMICS study. Logistic and regression analysis, as appropriate for the data, was performed using SPSS 24 (IBM Corporation).

Results: The likelihood of developing clinically meaningful postoperative pain – a score of at least four on a numerical rating scale of zero to ten - at 24 hours following surgery, both at rest (Odds ratio OR = 1.11 for MINI and 1.56 for RAT) and at maximum cough (OR = 1.14 and 1.89), are non-significant, when compared with the STERN incision.

Morphine equivalent consumption of opioids is also similar across the three groups (133mg, 142, 158mg respectively) with non-significant differences in doses when comparing STERN with MINI (95% Confidence Interval (CI) = -19 to 38) and STERN with RAT (95%CI= -11 to 62mg).

Extubation times are similar (490, 460 and 464 minutes for STERN, MINI and RAT respectively, all non-significant at the p=0.05 level.)

Length of stay on the Cardiac Intensive Care Unit (CICU) varied between groups with MINI incision reducing time by 19 hours (95%CI =4-34 hours, p=0.013) and RAT incision by 18.5 hours (95%CI = 2-37 hours, p=0.05) from a mean time of 51 hours for STERN.
Overall median length of stay in hospital in hospital was similar at 7, 7 and 7.5 days respectively.

**Discussion:** Our study confirms the previous work around the potential for cost saving with the use of minimally invasive surgical incisions for isolated AVR. The potential to discharge patients earlier from the cardiac CICU may improve flow of patients throughout the institution and improve patient experience.

While not randomised, this observational study suggests that recovery profiles and pain outcomes following MICS are similar to standard incision. There are however potential resource utilisation implications from this study and the health economics of minimally invasive surgery need to be explored further.


**OP35**

Cerebrovascular CO$_2$ reactivity after cardiac surgery in patients with depressed left ventricular function

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*Medical University of Vienna, Department of Anaesthesia, Critical Care and Pain Medicine, Vienna, Austria*

**Introduction:** Cerebral blood flow in patients with low left ventricular ejection fraction (LVEF) is frequently compromised [1]. Cerebrovascular CO$_2$ reactivity as one of the major determinants of cerebral blood flow was found to be diminished in heart failure patients as well [2]. Perioperative maintenance of intact regulatory mechanisms, however, is crucial to prevent cerebral malperfusion. We therefore investigated CO$_2$ reactivity in anaesthetized, ventilated patients immediately after heart surgery.

**Method:** Fifteen patients were studied after cardiac surgery with cardiopulmonary bypass. Previous cerebrovascular accident and carotid artery disease were exclusion criteria. Patients were sedated with propofol (BIS: 40-50) and received 0.05 μg kg$^{-1}$ min$^{-1}$ remifentanil for analgesia. Blood flow velocity in the middle cerebral artery (CBFv) was determined by transcranial Doppler during step changes of PaCO$_2$ (at 40, 30, and 50 mmHg) by altering respiratory rate. Differences between patients with LVEF $\leq 40\%$ (n=5) and patients with normal LVEF (n=10) were assessed by $\chi^2$ and multivariate analysis. Values are depicted as means ± SD.

**Results:** Dosage of inotropes and vasopressors, as well as cardiac output and mean arterial pressure was not different between groups. CBFv was similar between groups during hypo-, normo- and hypercapnia. Patients with LVEF $< 40\%$ nominally showed a more pronounced CO$_2$ reactivity during hypo- and hypercapnia (-1.2 ± 0.3 vs. -1.0 ± 0.4 and +1.4 ± 0.7 vs. +1.1 ± 0.7 cm s$^{-1}$ mmHg$^{-1}$, respectively; P $< 0.05$ vs. normocapnia for both groups). Differences in CO$_2$ reactivity, however, did not reach statistical significance.

**Discussion:** These preliminary results show that CO$_2$ reactivity immediately after cardiac surgery seems to be impaired in general. Measured values are comparable to those determined in patients with peripheral vascular disease [3]. CO$_2$ reactivity, however, is equally affected in patients independent of their ventricular systolic function.


**OP36**

Tracheal milrinone bolus administration as an alternative therapy in right ventricular dysfunction during cardiovascular surgery

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**Introduction:** Acute right ventricular (RV) failure can occur in up to 20-30% of all cardiovascular surgeries and remains a major cause of postoperative morbidity and mortality (1, 2). Current treatment strategies of RV dysfunction include intravenous (IV) administration of milrinone. However, several shortcomings of this treatment option have been reported, including a systemic vasodilating effect, which can be prevented by using the inhalation route. (2, 3) Thus, we are reporting our experience with the use of direct endotracheal tube bolus administration of milrinone (tMil) in patients undergoing cardiac surgery with acute RV dysfunction after cardiopulmonary bypass (CPB).
**Methods:** In this single centre study, we retrospectively assessed patients undergoing cardiac surgery (n=3821) and selected those who developed acute RV dysfunction after separation from CPB and received tMil 5mg (Primacor, Sanofi-Synthelabo Canada Inc., Markham, ON, Canada) between December 2004 and January 2015. Successful weaning was defined as the absence of additional IV inotropes, mechanical support or return on CPB.

**Results:** A total of 176 patients (4.6%) received tMil. Procedures included coronary revascularisation (31%), simple valve (23%) and complex procedures (46%). Successful weaning from CPB was observed in 109 patients (61.9%) while treatment failure occurred in 67 patients (38.1%). Patients with treatment failure had pre-CPB left ventricular (LV) (41.8% versus 25.9%, p=0.03) and RV (18.2% versus 4.7%, p=0.004) systolic dysfunction, longer CPB duration (140.3±65.6min versus 110.0±53.2min, p=0.001), higher postoperative fluid balance (2905±1788ml versus 2255±1165ml, p=0.01) and higher cardiac operative risk (EuroSCORE II) (5.4 (1.7; 13.4) versus 2.0 (1.2; 3.9), p<0.0001). Using a multiple logistic regression model, severe LV dysfunction (OR 3.72; 95% CI 12.2-11.33; p=0.012), CPB duration (OR 1.014; CI 1.01-1.02; p=0.001) and higher postoperative fluid balance (OR 1.39; CI 1.05-1.82 per 1 liter of fluid; p=0.02) were found to be significant predictors of treatment failure with tMil.

**Discussion:** tMil facilitates separation from CPB in almost 2/3 of patients with acute RV dysfunction. It is a simple, rapid and easily applicable treatment modality when acute RV dysfunction occurs after CPB. However, factors limiting its therapeutic efficacy such as LV dysfunction, higher fluid balance or long CPB-time need to be taken into consideration before therapy is initiated. Future studies will have to compare the intravenous versus the intratracheal administration therapy as well as different dosing schemes, combinations and administration routes.

**REFERENCES:**

**OP37**

Changes in microcirculatory perfusion using acute normovolemic hemodilution (ANH) with HES (130/0.4) during cardiac surgery

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**Introduction:** Cardiac surgery remains a major consumer of blood components. ANH provides fresh autologous blood units for later retransfusion after control of surgical bleeding. The real efficacy of ANH in reducing allogeneic blood transfusions is discussed controversially in the literature. Thus, the present investigation was performed to effects of ANH with HES (130/0.4) on microcirculation in cardiac surgery.

**Method:** Patients scheduled to undergo CABG entered the study protocol and were randomly allocated to one of two groups: ANH (n:11) or standard care management (n:11). In the ANH group, 500 ml whole-blood was withdrawn from the patients and 500 ml colloid was given to the patients. SDF measurement technique was used to evaluate the sublingual microcirculation. Haemodynamic variables (HR, MAP, CVP, CO, PCWP) laboratory parameters (Htc, lactate and K+) and microcirculatory variables (Total vascular density-TVD (mm. mm-2), microvascular flow index-MFI (AU), perfused vessel density-PVD (mm-mm-2), proportion of perfused vessels-PPV (%) of vessels were obtained after induction (before ANH), before CPB (after ANH), during CPB, at the end of the operation and at 24 hours postoperatively. These images have been analysed by using AVA (Automated Vascular Analysis) software.

**Results:** In the two groups; CVP, CO, PCWP, and CI values did not differ significantly between the groups. The greatest alterations at the microcirculatory level occurred on the small vessels during CPB. In the ANH group, small vessels of TVD (from 12.9±2.6 to 11.0±2.6, 14.7%), PVD (from 13.6±2.5 to 10.6±3.0, 22%), PPV (from 90.5±5.6% to 85.1±12.7%, 5.97%) (P<0.05) and MFI (from 2.25±0.29 to 2.0±1.0, 7.69%) (P<0.05) were decreased. In the Control group, small vessels of TVD (from 12.9±1.83 to 11.0±2.3, 14.7%), PVD (from 13.3±1.8 to 10.6±2.2, 20.3%) were decreased but PPV (from 94.5±4.7% to 96±6.2%, 1.69%) and MFI (from 2.39±0.33 to 3.0±0.0, 17.99%) were increased (P<0.05). These changes were returned to initial values 24 hours postoperatively.

**Conclusion:** We observed that ANH with HES had no negative effects on hemodynamics and microcirculatory parameters. Therefore this technique can find a place in cardiac surgery.

**REFERENCES:**

OP38

The effects of Alprazolam and melatonin used in premedication on oxidative stress, glycocalyx integrity and postoperative neuro-cognitivty disorders

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Introduction: Oxidative stress in open heart surgery can disrupt microvascular control and impairs tissue perfusion and leads to organ damage. We aimed to investigate the effects of melatonin as an anxiolytic drug, which has high antioxidant activity and radical scavenging properties, on oxidative stress status and postoperative neuro-cognitive dysfunction.

Methods: In this prospective randomized controlled study approved by the Acibadem University ethics committee, 42 patients who underwent elective cardiovascular surgery were included and were divided into two groups: Patients given alprazolam (0.5 mg) 22 hours prior to surgery, Group-A (n: 21) and patients given melatonin (3 mg p.o.) At 22 and 4 hours prior to surgery (total 6 mg), Group M (n: 21). Midazolam (0.06mg / kg i.m.) was administered to both groups 30 minutes before the surgery. To assess the oxidative stress status of patients undergoing standard anesthesia protocol blood samples were collected at (T0) pre-induction, (T1) intensive care admission and (T2) postoperative 24 hours and measured ischemia modified albumin (IMA), advanced oxide protein products (AOPP), total thiol (T-SH), free haemoglobin (fHb) and sialic acid (SA). In addition, a Mini-Mental State Examination (MMSE) test was performed to evaluate the preop and postoperative neuro-cognitive status of the patients.

Results: The total T-SH level reflecting the potentiation of the endogenous defense response to the oxidative stress was found to be significantly higher in the melatonin group at the T1 time point than at the baseline level and the alprazolam group (p < 0.05). Looking at oxidative stress, the free hemoglobin level was lower in the melatonin group than the alprazolam group in T1 (p < 0.05) and higher sialic acid in melatonin group (p < 0.05). In other variables, no significant difference was found between the groups at the measurement time points.

Discussion: In terms of T-SH, endogenous defense response against oxidative stress was found to be superior with melatonin administration, but in terms of sialic acid, endothelial damage was still present. We believe that melatonin should be used in higher doses to be able to detect the injury preventive effect.


OP39

Point-of-care diagnosis of perioperative lung pathology with lung ultrasound in cardiothoracic surgery - comparison with clinical examination and chest x-ray

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2 Monash University, Clayton, Melbourne, VIC, Australia
**Introduction:** Lung ultrasound (LU) is superior to clinical examination and chest X-ray (CXR) in diagnosis of acute respiratory pathology in critical care but has not been reported before and after cardiothoracic surgery on the ward. The aim of this study was to determine the proportion of clinically significant respiratory pathology detectable with CXR, clinical examination, and lung ultrasound in patients on the ward before and after cardiothoracic surgery.

**Method:** Prospective observational study in consenting patients who received a CXR on the ward before or after cardiac or thoracic surgery. Two clinicians performed standardised clinical assessment followed by LU. Incidence of atelectasis, consolidation, alveolar-interstitial syndrome, pleural effusion and pneumothorax were compared between clinical examination, CXR and LU (Reference method) using pre-defined diagnostic criteria in three lung zones by two blinded observers.

**Results:** In 78 participants included, presence of any pathology was detected in 56% of the cohort by lung ultrasound; 24% preoperatively and 94% postoperatively. Intraobserver agreement of was better with LU (0.84-0.97) than clinical examination (0.28-0.70). Pathology was found with LU in 32 % of lung zones, and included atelectasis (11% of zones), effusion (9%), alveolar interstitial syndrome (5%), consolidation (4%) and pneumothorax (2.5%). Compared with LU, agreement in diagnosis of the 5 lung pathologies was poor (CXR 42%, clinical examination 34% and combined 56%), sensitivity was poor to modest (CXR 7-69%, clinical examination 7-76% and from combined 82%-97%), and specificity was good (CXR 84-98%, clinical examination 90%-99% and from combined 82%-97%). Correlation between clinical examination and CXR was poor (0-0.58).

**Discussion:** Clinically important respiratory pathology is detectable by lung ultrasound in a substantial number of noncritically ill, pre or postoperative cardiothoracic surgery participants with high estimate of interobserver agreement beyond that expected by chance, and we showed clinically significant diagnoses may be missed by the contemporary practice of clinical examination and CXR.

Table. Sensitivity and specificity of chest X-ray and clinical examination in patients with pathology detected by lung ultrasound

<table>
<thead>
<tr>
<th>Pathology</th>
<th>Modality</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collapse/atelectasis (n = 35)</td>
<td>Chest X-ray</td>
<td>43</td>
<td>91</td>
</tr>
<tr>
<td>Collapse/atelectasis (n = 35)</td>
<td>Clinical examination</td>
<td>63</td>
<td>92</td>
</tr>
<tr>
<td>Consolidation (n = 12)</td>
<td>Combined</td>
<td>71</td>
<td>89</td>
</tr>
<tr>
<td>Consolidation (n = 12)</td>
<td>Chest X-ray</td>
<td>37</td>
<td>84</td>
</tr>
<tr>
<td>Alveolar-interstitial syndrome (n = 13)</td>
<td>Clinical examination</td>
<td>15</td>
<td>96</td>
</tr>
<tr>
<td>Alveolar-interstitial syndrome (n = 13)</td>
<td>Combined</td>
<td>50</td>
<td>82</td>
</tr>
<tr>
<td>Pleural effusion (n = 32)</td>
<td>Combined</td>
<td>14</td>
<td>97</td>
</tr>
<tr>
<td>Pleural effusion (n = 32)</td>
<td>Chest X-ray</td>
<td>69</td>
<td>91</td>
</tr>
<tr>
<td>Pneumothorax (n = 8)</td>
<td>Clinical examination</td>
<td>76</td>
<td>90</td>
</tr>
<tr>
<td>Pneumothorax (n = 8)</td>
<td>Chest X-ray</td>
<td>29</td>
<td>94</td>
</tr>
<tr>
<td>Pneumothorax (n = 8)</td>
<td>Clinical examination</td>
<td>6</td>
<td>99</td>
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</tbody>
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**Oral Presentations 212**
**Thursday, 20 April 2017**
**11:00 - 12:15, Auditorium 3**

**OP40**

**Pain locations in the postoperative period after cardiac surgery: chronology of pain and response to treatment**

Purificación Matute-Jiménez, J Roca-Obrador, R Valero-Castell, C Gomar-Sancho

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**Introduction:** Pain is one of the primary sources of concern among patients who have undergone a cardiac surgery (CS). Postoperative pain after CS can be generated at several foci besides the sternotomy. 75% of patients report pain after CS that often is severe and undertreated and may impact recovery, rehabilitation, overall satisfaction and become chronic pain (1-3).

**Method:** Prospective descriptive longitudinal study of pain in 11 sites after CS including consecutive patients submitted to elective CS through sternotomy. The primary endpoints were the main origins of pain and its chronological evolution during first postoperative week. Secondary endpoints were pain characteristics in the sternotomy and to correlate pain intensity with other variables. Numerical Pain Rating Scale (NPRS) at rest and movement was recorded on postoperative days (POD) 1st, 2nd, 4th and 6th. NPRS > 3 was considered
Results: 47 patients were enrolled. In 4 out of 11 local pain was reported as NPRS > 3 (sternotomy, oropharynx, saphenectomy and musculoskeletal pain in the back and shoulders). Maximum intensity of pain on POD1 and on POD2 was reported in the sternotomy area, while on POD4 and on POD6 it was reported at the saphenectomy. Pain at rest and at movement differed considerably in the sternotomy, saphenectomy and oropharynx. Pain in the back and shoulders and at central venous catheter entry were not influenced by movement. Pain in the sternotomy was mainly described as oppressive. Patients with arthrosis and younger patients presented higher intensity of pain (p = 0.004; p = 0.049, respectively).

Discussion: Four locations were identified as the main sources of pain after CS: sternotomy, oropharynx, back and shoulders and saphenectomy. Pain in different focuses presented differences in chronologic evolution and was differently influenced by movement. To provide satisfactory pain control, the evaluation of acute postoperative pain after CS should involve possible sources of pain at different locations and the assessment of both, rest pain and dynamic pain, throughout the first postoperative week.


OP41

The Crossed Leaflets Sign: stressing the importance of the posterior mitral leaflet in hypertrophic cardiomyopathy

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2Medical College of Georgia at Augusta University, Department of Cardiology, Augusta, GA, USA

Introduction: In patients with hypertrophic cardiomyopathy (HCM), systolic anterior motion (SAM) of the posterior mitral leaflet (PML) is under recognised and relatively uncommon (identifiable in about 10-12% of a consecutively studied series of patients), 1 mechanism for dynamic sub-aortic obstruction, and is due to a malformation of the posterior mitral leaflet.2 A 56-year-old man with HCM underwent an alcohol septal ablation. Intra-operative TEE showed that along with systolic anterior motion (SAM) of the anterior mitral valve leaflet (AML), we noticed SAM of the redundant posterior mitral leaflet (PML) as well, generating a rare "crossed swords sign".

It has been postulated that in HCM, SAM is a result of the Venturi phenomenon, in which the high velocity in the narrowed LVOT draws the AML forward against the IVS. LVOT obstruction then occurs by virtue of mitral valve SAM and mitral-septal contact. MR is common in HCM patients with LVOT obstruction and may play a primary role in producing the symptoms of dyspnea. The temporal sequence of events of eject-obstruct-leak supports the concept that the MR in most patients with HCM is a secondary phenomenon. The jet of MR is directed laterally and posteriorly and predominates during mid and late systole. An anteriorly directed jet should suggest an intrinsic abnormality of the mitral valve. The severity of the MR may be proportional to the degree of LVOT obstruction in some patients.

A subset of patients with HCM have a unique pattern of abnormal mitral valve coaptation and SAM of the PML.2 At end-diastole, the AML and PML do not co-apt at their distal free margins. Rather, the distal portion of the PML passes caudal to the AML while the AML co-aps at or near the base of the PML. Subsequently, during systole the "residual" or "redundant" distal portion of PML approaches or contacts the IVS through the spaces between the chordae creating a "crossed swords" appearance. Morphologic observations suggest that SAM of the PML is mostly due to elongation of the middle scallop of the posterior leaflet, which probably comes into apposition with the IVS during systole.

It is extremely important to correctly identify which leaflet is responsible for the SAM prior to any surgical repair because any AML shortening procedure can worsen SAM of PML, therefore worsening LVOT obstruction.

OP42

Tracing and animating to help define the dynamics of the tricuspid - and mitral valve annulus

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Introduction: The developments in echocardiography together with the software to analyse the echo data and images have been tremendous. Recent studies have been conducted to assess tricuspid annular shape with these developments in echocardiography. We would like to present another approach to annular quantification. Our aim is to demonstrate how to contribute to the evaluation of the dynamics of the tricuspid valve annulus utilising animation techniques.

Materials and Methods: This study is a part of an ongoing Institutional Review Board-approved protocol for intraoperative 3D echo data collection with a waiver of informed consent. We have examined 10 patients undergoing cardiovascular surgery. All patients presenting more than mild valve abnormalities were excluded from this study. Our study is based on 3D TEE data which were then reformatted and converted using a variety of available software to finally obtain an animation of the structure of interest.

Results: We have been successful in visualizing the shape of the tricuspid annulus by tracing the annulus, processing the data, and visualising it with animation software utilizing 3D image ultrasound data. This approach helped us to shape the following calculations that lead to new ideas and broaden the understanding of the tricuspid annular dynamics:

- Examination of the three-dimensional travel distance activity of the defined landmarks per timeframe and overall
- Comparing four diameters in between the landmarks of the annulus
- Comparing the landmarks and their location at set timeframes to a planar three-dimensional mathematical equation of least square regression (assuming that the tricuspid annulus is a planar structure)
- Analysis of the planar three-dimensional functions assessing the angle between them in end-diastole vs end-systole and defining the rotation-point of the annulus

Additionally, we have been successful in visualizing the shape and mutual relation of the tricuspid- and mitral valve annuli by animation techniques.

Discussion: We are convinced that this approach could seriously contribute to a better understanding of the tricuspid
valve annular shape, its deformations and motion throughout the cardiac cycle. Both annuli have been animated whereby the visualization of the motion and mutual relation of the annuli help us to better interpret and deepen our insight into their dynamics. This approach allows us the opportunity to focus on particular details of their shape, visualization from every desired angle and adding various markers to create certain effects. These new possibilities could be meaningful in the choice or manufacture of an appropriate ring for annular valve repair procedures and to help broaden the understanding and definition of annular shape and motion.

At this stage the process is time consuming; however we see a lot of space for improvement in this promising approach.

**OP43**

**Clinical and echocardiographic predictors for postoperative recovery in children undergoing tetralogy of fallot surgery**

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**Introduction:** The patients with Tetralogy of Fallot (TOF) are subjected to the effects of chronic hypoxia and pressure overload on the right ventricle (RV). This may result in RV systolic and diastolic dysfunction. The objective of this study was to identify clinical and echocardiographic predictors of poor postoperative recovery in this subset of patients.

**Methods:** A prospective observational study was carried out in a single tertiary care centre. A total of 112 patients in the age group of 2-12 years were enrolled in the study. Preoperative clinical and transthoracic echocardiographic indices of RV systolic and diastolic functions were analysed in 77 patients who fulfilled the study criteria. A poor postoperative outcome was defined as vasoactive inotropic protocol of interventions [1] for correcting rSO2 desaturation (60%) during high-risk cardiac surgery under cardiopulmonary bypass would reduce the overall incidence of postoperative complications.

**Results:** Preoperative RV systolic and diastolic dysfunction was observed in 18.2% and 71.4% in the study population respectively. Poor postoperative outcome was observed in 28.5% (22/77) of patients. In a multivariate logistic regression model, preoperative oxygen saturation (odds ratio [OR]:0.79, 95% confidence interval [CI] :0.607-1.037) and tricuspid valve annular systolic velocity (TAPSV) (OR: 0.29, 95% CI :0.116-0.763, p =0.012) were found to be predictors of poor postoperative outcome. The cut off threshold for TAPSV and E/e' were defined using receiver-operating characteristic curves and were 11.7 cm/s and 5.7 respectively. TAPSV showed the highest diagnostic performance (AUC: 0.945 (0.875-1.00), Sensitivity 86.4%, Specificity 90.9%).

**Conclusion:** Preoperative assessment of RV systolic and diastolic function along with select clinical variables would help in predicting the postoperative outcomes of patients undergoing TOF surgery. RV echocardiographic indices of TAPSV and E/e' has been found to be predictor of postoperative outcome.

Receiver operating characteristic curve analysis of RV function echocardiographic parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>AUC ( 95% C.I.)</th>
<th>Cut-off</th>
<th>Sensitivity%</th>
<th>Specificity%</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAPSE(mm)</td>
<td>0.837 (0.745-0.929)</td>
<td>18.5</td>
<td>68.2</td>
<td>74.5</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>TAPSV(cm/s)</td>
<td>0.945 (0.875-1.00)</td>
<td>11.7</td>
<td>86.4</td>
<td>90.9</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>E/e'</td>
<td>0.709 (0.561-0.857)</td>
<td>5.7</td>
<td>72.7</td>
<td>69.1</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Tei Index</td>
<td>0.775 (0.67-0.88)</td>
<td>0.55</td>
<td>59.1</td>
<td>80</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Abbreviations: AUC = area under the curve; CI = confidence interval; TAPSE = tricuspid annular plane systolic excursion.TAPSV = tricuspid annular peak systolic velocity.

**OP44**

**Cerebral oximetry in reducing postoperative morbidity in high-risk cardiac surgery**

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**Introduction:** Numerous studies have shown that the magnitude and duration of cerebral oxygen (rSO2) desaturation is associated with early postoperative neuropsychological dysfunction and prolonged stay after cardiac surgery. We hypothesized that the use of predefined protocol of interventions [1] for correcting rSO2 desaturation (< 60%) during high-risk cardiac surgery under cardiopulmonary bypass would reduce the overall incidence of postoperative complications.

**Methods:** 120 patients were randomized before surgery to one of two groups, control (CG) or intervention (IG) with cerebral oximetry monitoring using FORE-SIGHT oximeter (CAS
Medical Systems Inc., USA). High-risk surgery was defined as a presence of at least one of the following: the age greater than or equal to 75 years on the day of screening; left ventricle ejection fraction less than 35%; use of a preoperative intra-aortic balloon pump; combined valve and coronary artery surgery or multiple valve surgery in patients who have congestive heart failure, or renal insufficiency (creatinine clearance < 60 ml/min). In the IG, predefined protocol of interventions for correcting rSO2 desaturation during cardiac surgery was used. In the CG the screen of cerebral oximeter was closed with the paper and the alarms of low rSO2 were turned off. The primary outcome was the incidence of postoperative complications (composite outcome). Patients were followed-up for 30 days after surgery by the phone. Comparative analysis of qualitative data was performed with Fisher exact test. For all statistical criteria, the type-I error was considered equal to 0.05. All of the statistical analyses were executed using the R software Rx64 2.15.0 statistical programming language (R Development Core Team, 2012).

Results: Groups were comparable in preoperative demographic characteristics. The average baseline rSO2 was not different between the groups. Cerebral desaturations occurred in 52 (86.7%) of the 60 patients in IG and 41 (68.3%) of the 60 patients in CG patients (P = 0.02). Although cerebral desaturation was successfully corrected in 47 of 52 patients (90.4%), mean cerebral desaturation load did not differ between the groups. There was no difference in composite outcome (68 events in IG vs 70 events in CG, p = 0.82) and duration of hospitalization between the groups.

Discussion: In our study, application of a predefined algorithm to correct a decrease in cerebral oxygenation failed to reduce cerebral desaturation load and the overall incidence of postoperative complications in high-risk cardiac surgery. Future studies are needed to determine the effects of desaturation reversal on clinical outcome in different populations of cardiac surgery patients.


OP45

Blunting effect of dexamethasone on postoperative IL-6 level is associated with IL6 genotypes

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Introduction: Dexamethasone given prior to cardiopulmonary bypass (CPB) blunts post-operative inflammatory response, which is evidenced by reduced serum levels of pro-inflammatory cytokines.[1] We hypothesized, that genetic variants may modify the effect of dexamethasone upon inflammatory response.

Method: In a post-hoc analysis of 511 adult patients from the INFLACOR-trial, post-operative serum levels of interleukin-6 (IL-6), tumor necrosis factor α (TNF), intracellular adhesion molecule-1 (ICAM-1), serum E-selectin (ESEL), and C-reactive protein (CRP) were tested for association with single nucleotide variants (SNV) of relevant genes and with one dose of dexamethasone (median - 0.6 mg/kg) given before CPB. Genotypic and allelic associations were evaluated in by dexamethasone use stratified analysis by Kruskal-Wallis (KW) test. Bonferroni correction was applied and is reported (BC).

Results: Of the 511 analyzed patients, 184 (36%) received dexamethasone resulting in decreased postoperative serum levels of ICAM-1 by 8.6% (p = 0.029), serum E-selectin by 31% (p < 10-4), TNFα by 41% (p = 0.002), CRP by 44% (p < 10-4), and IL-6 by 83% (p < 10-4). All analyzed SNVs were in Hardy-Weinberg equilibrium. Postoperative IL-6 levels did not differ between the IL6 rs1800796 genotypes in placebo-treated patients (p = 0.221). In patients receiving dexamethasone IL-6 serum levels were associated with rs1800796 genotypes (p = 0.017), (Fig. 1A) independent of dexamethasone dose and CPB duration. The C allele of rs1800796 was associated with a reduced effect of dexamethasone upon IL-6 levels (BC p = 0.0038) compared to the G allele.

Postoperative CRP levels were lower in the heterozygous genotype of CRP rs1800947 (p = 0.0001) in patients not receiving dexamethasone.(Fig.1B) Dexamethasone decreased postoperative CRP levels (p = 0.0000), but the CRP level difference between the two genotypes was similar in patients receiving (ca. 19%, BC p = 0.039) and not receiving dexamethasone (ca. 22%, BC p = 0.0004), so the effect of dexamethasone was not genotype dependant.

The analyzed variants of E-Sel rs1805193 (G > T), ICAM1 rs5498 (A > G) and TNFα rs1800629 (G > A) genes tested negative for associations with postoperative levels of E-selectin, ICAM-1 and TNFα respectively, regardless of dexamethasone use.
Discussion: Dexamethasone given in one dose before CPB reduces postoperative cytokine and CRP levels, and seems to have genotype-dependant effect on IL-6 gene expression. If these results could be replicated, and the associations would be related to outcome - i.e.: postoperative acute kidney injury or atrial fibrillation - they could pose rationale for a ‘patient-suited’, genotype-adjusted dexamethasone prophylaxis in patients undergoing cardiac surgery on CPB.

Introduction: Pain and its control is a phenomenon of significant interest after cardiac surgery. 71% of patients recalled having pain after cardiac surgery. It has been hypothesised that an environment where the speedy haemodynamic stabilisation occurs, pain control can become a secondary consideration.

Studies describe the intensity of cardiac surgical pain as fluctuating mainly between moderate and severe. Effective pain management is fundamental to the quality of care received by patients. Inadequate pain management predisposes postoperative cardiac surgical patients to complications such as, atelectasis, pneumonia, and deep vein thrombosis because of their inability to cough and mobilise effectively.

We evaluated the Pain Relief Protocol after minimally invasive Aortic Valve Replacement at Glenfield Hospital.

Method: Observational retrospective audit from January 2014 to December 2015. 27 patients undergoing minimally invasive Aortic Valve Replacement. Data collected: duration of the surgery, numerical pain scores at rest and deep breathing after extubation, 4,12 and 24h postextubation, mg morphine in theatre and total amount in 24h, requirements of antiemetics and hospital length of stay.

Limitations: Data for all procedures was not collected. Retrospective collection of the data.

Results: 85.1% of patients had a pain score of <4 after extubation at rest.
66.7% of patients had a pain score of <4 after extubation deep breathing.
88.9% of patients had a pain score of <4 4h after extubation at rest.
66.7% of patients had a pain score of <4 4h after extubation deep breathing.
100% of patients had a pain score of <4 12h after extubation at rest.
66.7% of patients had a pain score of <4 12h after extubation deep breathing.
92.6% of patients had a pain score of <4 24h after extubation at rest.
81.5% of patients had a pain score of <4 2 4h after extubation deep breathing.
75% of patients received morphine intraoperatively. The average amount of morphine in 24h required by these group was the same than those patients who did not receive morphine intraoperatively.

The average amount of morphine weight adjusted requirements in 24h was 0.1mg/kg.

In 85% of the patients no more than 8 mg of ondansetron was enough to treat PONV.

Discussion: The current pain protocol for patients after minimally invasive aortic replacement surgery has shown that 85% of patients have mild pain after extubation. The average amount of morphine weight adjusted requirements in 24h was 0.1mg/kg. In 40.3% of the patients 8mg of ondansetron was enough to treat PONV. The mean length of stay in hospital for these patients was 5 days.


PP33

Lung abscess isolation using double lumen tubes combined with bronchial blockers: a case series

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Introduction: Thoracic surgery in patients with lung infections is an absolute indication to isolate healthy lung or lobes. Different methods have been described, including the double-lumen endotracheal tube (DLT) or a variety of bronchial blockers (BBs) (1). However, when an abscess is
present in only one lobe and lobectomy is planned, the insertion of a DLT alone or a single tube plus a BB may not be sufficient to prevent the spread of infection to an ipsilateral lobe. We present three cases with lung infection in which the isolation was made by combining DLT with a BB.

Case Report: Case 1: 22-years-old man diagnosed with lung aspergilloma within the residual tuberculous cavity in the upper left lobe. The surgeon requested selective resection of this lobe.

Case 2: 50-year-old man diagnosed with lung abscess in the left lower lobe with suspected neoplasia, proposed to lobectomy.

Case 3: 45-year-old woman diagnosed with lung abscess in the left upper lobe with suspected neoplasia/infection, proposed for lobectomy.

In all three cases, airway management was a combination of left DLT (two Robertshaw type DL and one VivaSight DL®) with a BB, using the flexible fiberoptic scope as a guide to place the BB to the lobe that was being isolated. In case 1 a Cohen BB was used; in case 2 and 3, an Arndt BB was chosen. After BB placement, the corresponding lobes were isolated, ventilation in the rest of the ipsilateral lung was initiated. The lobes remained isolated until the bronchus resection.

Discussion: In thoracic anaesthesia providing satisfactory surgical exposure and maintaining adequate oxygenation is a challenge. But in these cases, isolation was even more important. Several devices are used to perform lung/lobe isolation: some experts recommend DLT for its shorter insertion time and less need for repositioning; others suggest that the BB have lower complication rates with the same efficiency (2). However, in thoracic surgery involving lung abscess the combination of both devices (DLT and BB) provides excellent isolation and results. This method prevented the spread of infection to the healthy lung with the DLT and to non-affected areas of the ipsilateral lung with the BB during airway and surgical manipulation with a favourable clinical-surgical outcome.


Morbidity & mortality at 5 years following endovascular aortic aneurysm repair in the West of Scotland

Peter Moffitt, N O'Reilly, I Raju

Introduction: Endovascular aortic aneurysm repair (EVAR) is offered to patients who have an aortic aneurysm > 5.5cm with suitable aneurysm anatomy, often in older patients or those with co-morbidities that preclude an open repair. The EVAR 1 study showed a 3-fold reduction in operative mortality compared to open repair [1] but this early benefit is not translated into long-term survival [2].

Methods: The aim of this data review was to assess the 5-year mortality post-EVAR, cause of death, survival time and the prevalence of procedural related complications and re-intervention. We retrospectively reviewed the electronic records of 93 patients who underwent an EVAR between 2/2010 - 26/7/2011 in the Greater Glasgow & Clyde Healthboard area using the Orion Health Clinical Portal system.

Results: The 5-year mortality was 22.6% [n=21]. All patients who died were above 70 years old. Causes of death were 5 patients from malignancy, 3 from pneumonia, 2 from intracerebral events, 2 from aeurysm related mortality, 2 from myocardial infarctions, 1 from urosepsis, 1 from ischaemic limb, and 5 unknown. Overall 5 of these patients died within 1 year of an EVAR. These included one death 12 days after EVAR from pneumonia, 2 deaths from metastatic malignancy found after EVAR, 1 death after presentation with acute abdominal pain and 1 death from myocardial infarction. 41 EVAR related complications in 36 (38.7%) patients were identified. There were 9 Type I endoleaks, 18 Type II endoleaks, 2 Type III endoleaks, 11 occlusions and 1 stenosis. 27 separate therapeutic re-interventions were undertaken in 22 patients. Of these, 7 femoral crossover grafts, 6 embolisations, 5 angioplasties, 3 cuff insertions, 2 aorto-bifemoral grafts, 1 axillo-bifemoral graft, 1 femoral endarterectomy, 1 cuff repair and 1 open repair.

Discussion: The results demonstrate that EVAR is associated with a considerable 5-year all cause mortality with only 10% of these being aneurysm related. There were a number of procedural related complications with 41 identified in our cohort. This required an additional 27 therapeutic re-interventions in 21 (22.6%) of the patients with the majority being undertaken within the first year. EVAR may offer early outcome benefit however it is not without it's long-term impact. Further research is required to better understand the long-term outcomes of EVAR.
complications hence demonstrating that EVAR is not the complete solution. EVAR will still remain the treatment of choice for aortic aneurysms where appropriate but we have to be honest when informing our patients of the long-term sequelae of an EVAR.


PP35

Right lobar isolation by different methods in two patients with previous left lung resection

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Background: A collapsed lung may require lung manipulation during the course of thoracic surgery. In some cases selective lobar isolation may be required such as in patients who have had a previous pulmonary resection and therefore they present with reduced pulmonary functional reserve.

Selective lobar blockade (SLB) can be achieved by using the bronchial blocker (BB) through a conventional tube1 or a double-lumen tube (DLT). We present two cases in which SLB was performed with different techniques on patients with previous pulmonary resections.

Case 1: A 75-year-old-woman (ASA III) underwent a lobectomy of the right middle lobe. She had a history of a previous pulmonary resection and therefore they present with reduced pulmonary functional reserve.

After a standard anaesthetic induction a 37Fr DLT was inserted. This patient suffered a serious hypoxemia. After checking DLT was in the correct place, a 7Fr Arndt BB was inserted into the right intermediate bronchus through the bronchial blockers insertion. As an alternative to the

Discussion: The one lung ventilation of patients undergoing thoracic surgery who have undergone previous surgery in this lung can be very difficult due to the rapid onset of hypoxemia due to low pulmonary reserve. In this context, SLB by BB becomes important, allowing the collapse of the lobe undergoing surgery by blocking the entrance of a specific bronchial branch while the remaining lobes of the lung being operated could be normally ventilated.

This is only possible by using BB and a fiberoptic bronchoscope to guide and verify the BB’s correct placement. Choosing between a DLT or a conventional tube is based on each particular patient’s condition, with both options generally being acceptable. Knowing the bronchial anatomy is essential to ensure the success of the technique.


PP36

Totaltrack videolaryngoscope and VivaSight SL with bronchial blockers insertion without using fiberscope. A new way to isolate the lung

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Introduction: Lung isolation is a frequent requirement when performing thoracic surgery. This can be achieved with a double-lumen endotracheal tube (DLT) or a variety of bronchial blockers (BBs). Traditionally DLT has been considered the gold standard; however there is an increasing number of patients where its use is not feasible: difficult airway, patients with a tracheostomy, the need for selective lobe isolation and if postoperative intubation is required. In these situations, the BBs have their main role. These devices are placed in the main or lobar bronchi through single orotracheal tubes (OT), using the fiberoptic bronchoscope as a guide or through OT with a built-in optical camera.

Case report: 62-y-old male patient, ASA II, proposed for a right inferior lobectomy due to a malignant tumour. Airway evaluation was significant with an enlarge neck diameter, limited neck movement and Mallampati III. Due to the presence of these difficult airway predictors, the use of BB for lung isolation was preferred and TotalTrack VLM® was used for ventilation and intubation. As an alternative to the
fiberscope we decided to use a VivaSight™ SL for BB placement through direct vision in the right main bronchi.

In this case a combination of TotalTrack VLM®, VivaSight SL™ 7.5 mm and a BB Uniblocker™ was used. Right lung collapse was achieved with success and the surgery was uneventful.

Discussion: Airway management is a paramount area in anesthesia. In a difficult airway situation, the presence of a device that allows ventilation and intubation with continuous vision through all the process is the key in the management of patients with low pulmonary reserve, as are many of the candidates for pulmonary resection surgery. This can be achieved through a novel video laryngeal mask called TotalTrack VLM®.

Moreover, lung collapse is essential in thoracic anesthesia. The use of the fiberoptic bronchoscope is the gold standard to verify the correct position of the DLT or the BB, and is of vital importance in the last one.

When the fiberscope is not available or when we need an alternative, the tube VivaSight SL™ can be used. This is a single lumen OT with a built-in camera that allows the confirmation of the correct position of the BB and a continuous vision of the airway with the possibility for immediate correction if a displacement of the BB occurs.

The combine use of the TotalTrack VLM® with the VivaSight SL™ allows excellent management of the airway when the fiberscope is not available.


PP37

Nonintubated video-assisted thoracoscopic surgery: a report of five cases

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Introduction: In recent years, the performance of nonintubated video-assisted thoracoscopic surgery (NIVATS) has been expanding. It consists of video-assisted thoracoscopic surgery (VATS) under regional anaesthesia, with the patient awake or under sedation and with spontaneous ventilation. Its use is accepted to carry out simple interventions (drainage of pleural effusion, pneumothorax surgery or atypical lung resections), and aims to avoid the adverse effects of general anaesthesia and to accelerate postoperative recovery.

We report the first 5 cases of patients undergoing NIVATS in our hospital.

Method: Five patients were selected for NIVATS, four men and one woman, aged between 31 and 72 years old. The selection of the patients excluded patient who were obese, predictors of a difficult airway, sleep apnoea syndrome and altered coagulation.

Pulse oximetry, non-invasive blood pressure and electrocardiogram were monitored. In all patients, a thoracic epidural catheter was placed at T5-T6 level and 0.25% levobupivacaine was administered in bolus at doses of 8-10 ml h-1. Intravenous sedation was administered to achieve a 3–4 sedation level on the Ramsay scale. Remifentanil 0.05–0.1 μg kg-1 min-1 was used in all patients. In addition, propofol 2.3 mg kg-1 h-1 was used in three patients and the other two patients received dexmedetomidine 0.4–0.6 μg kg-1 h-1. Oxygen was administered through a face mask.

The interventions were performed by uniportal thoracoscopy. In three patients, lung biopsy was performed for the diagnosis of diffuse interstitial lung disease, and the other two patients underwent solitary pulmonary nodule resection.

Results: All patients adequately tolerated thoracoscopy in spontaneous ventilation, without refer pain or discomfort. Pulmonary collapse and vision were adequate in all cases. The intervention could be performed without any incident in all but one patient, in which conversion to general anaesthesia was necessary due to the difficulty in locating the nodule.

Discussion: Epidural anesthesia in NIVATS provides satisfactory analgesia of the chest wall and the parietal pleura. However, manipulation of the visceral pleura and hilar structures can trigger the cough reflex. In this case, some authors recommend the anaesthetic blockade of the vagus nerve at the intrathoracic level. In our patients there was no cough that interfered with the surgical procedure, and no blockage of the vagus nerve was required.

The need to convert NIVATS to general anaesthesia ranges from 2.3% to 10% depending on the type of procedure and the experience, and may occur due to bleeding, presence of pleural adhesions, severe hypercapnia, insufficient pulmonary collapse and difficulties to perform the surgical technique. We had to perform general anaesthesia in one of the patients due to an inadequate visualisation of the pulmonary nodule.

NIVATS is safe and feasible in simple interventions such as lung biopsies or atypical resections. Adequate patient selection is necessary.

PP39

Survival after prolonged ICU stay in patients who have had surgical resection of oesophageal squamous cell carcinoma
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2Rigshospitalet, Department of Cardiothoracic Surgery, Copenhagen, Denmark

Introduction: Oesophageal squamous-cell carcinoma (SCC) is associated with lifestyle-related behaviours (i.e. malnutrition, alcohol and tobacco), which also increase the risk of perioperative complications (1,2). Previously the impact of complications on survival has been explored in mixed SCC and adenocarcinoma populations with conflicting results. In the present study, the influence of perioperative complications on survival following open oesophageal resection was investigated exclusively in patients with SCC.

Methods: In a retrospective observational study at the department of cardiothoracic surgery and intensive care unit (ICU) at Rigshospitalet, Copenhagen, Denmark, 133 patients were included. Patients undergoing open surgical resection from February 2010 to December 2015 were consecutively included. Pre- and perioperative clinical information, mortality and complications defined as a Clavien-Dindo classification >1 were registered. The overall survival was calculated from time of index surgery to the censoring date November 16 2016. Primary outcome was overall survival. Secondary outcomes were short-term survival (30 and 90 days respectively), long-term survival (excluding 30 days mortality) and postoperative complications.

Results: Eighty-nine patients experienced one or more postoperative complications. The most frequent was suspicion of infection requiring antibiotic treatment (56%) and among these 19% had sepsis. In addition atrial fibrillation (14%), delirium (12%), anastomotic leakage (11%) and chylothorax (6%) were among the most common complications. The incidence of postoperative complications was associated with a low haemoglobin level (P < 0.001) and a low mean arterial pressure in the ICU (P = 0.015) and during the operation (P = 0.030). Short-term survival was not significantly different in patients with or without complications. However, long-term survival was significantly lower in patients with complications (log rank P = 0.038). Patients with a length of stay in the ICU ≥ 20 days had a significantly lower overall survival (log rank P < 0.001) (Figure 1). After one year 71% were dead, compared with 14% in the group requiring less than 20 days in the ICU. A univariate Cox regression analysis revealed that long-term survival was significantly worse in patients experiencing complications (HR: 2.07, 95% CI: 1.02-4.21, P = 0.044), and overall survival was lower in patients admitted for ≥ 20 days in the ICU (HR: 6.97, 95% CI: 2.61-18.59, P < 0.001).

Discussion: We found that survival was negatively affected by complications during the index hospitalisation for SCC resection and in patients requiring an ICU stay for 20 days or more. Additional follow-up studies are necessary to clearly identify markers for compassionate treatment in this high risk patient group.


PP40

Oral levothyroxine in the management of sick euthyroid syndrome after child open heart surgery

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Introduction: Thyroid hormone has long been known to exert profound effects on the cardiovascular system. Cardiopulmonary bypass (CPB) in children is associated with a marked decline in thyroid hormone levels consistent with the phenomenon referred to as sick euthyroid syndrome.
Iv and Po Triiodothyronine is not available in many countries. The purpose of the present study was to determine if oral levothyroxine could reduce the length of stay in ICU in infants and children undergoing open heart surgery using CPB.

Method: In a randomised, placebo-controlled, double blind clinical trial 40 children less than 5 year of age candidate of open heart surgery, were divided to two groups of 20 each; oral levothyroxine (T) and placebo (P). I group T oral levothyroxine given by nasogastric tube (3 microg/kg) starting on induction of anaesthesia and then every 24 hours for 5 days. We evaluated the length of stay in the intensive care unit (ICU), time to extubation, length of hospital stay and the mean inotrope use in the first 24h in the ICU, total T3 (TT3), free T3(FT3), total T4(TT4), free T4(FT4) and TSH levels during 5 days after surgery.

Results: Demography of surgery and anaesthetic data were comparable between the two groups. All the data were numerically and clinically different between the two groups, but statistically most were not significant (possibly due to sample size).

TSH at fifth day, TT3, TT4, FT3, FT4 during the whole study period were all significantly different between the two groups. The need for dopamine was less (p < 0.05) in the control group. The time to extubation, ICU stay and hospital stay were clinically less in the control group, but was not significantly different.

Discussion: Oral Levothyroxin could have a clinically significant impact in the postoperative course of children undergoing open heart surgery as paediatric intensivist and nurses imply. We need larger sample size to show how significant is this therapy.

Comparing time to extubation and length in ICU and Hospital Stay between two groups Case and Control, All Data are presented in Hours

Poster Session PS05
Thursday, 20 April 2017
11:00 - 13:00, Poster & Exhibition Lounges

PP41

Does the end-tidal concentration of inhalational anaesthetics accurately estimate blood concentration during one-lung ventilation?

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Introduction: End-tidal concentrations of inhalational anaesthetics estimate their arterial blood partial pressure with acceptable accuracy and are the standard of care for non-invasive monitoring of depth of anaesthesia (1). However, whether this relationship holds true during the sizeable physiological disturbance that occurs during one-lung ventilation is unknown. The aim of this study was to investigate the relationship between end-tidal and arterial concentrations of isoflurane and sevoflurane during one- and two-lung ventilation.

Methods: Patients over the age of 18 undergoing elective thoracic surgery with planned arterial access and anaesthesia with isoflurane or sevoflurane were included. Recordings of end-tidal isoflurane or sevoflurane were made at least 10 minutes after tracheal intubation and two-lung ventilation and then 10 minutes after one-lung ventilation was confirmed. Two samples of 10 mL arterial blood, simultaneous to end-tidal readings, were also taken from the radial arterial line. All arterial samples were analysed independently by high-performance gas chromatography/mass spectrometry using a headspace technique.

Results: Nineteen patients aged 44-83 years were included in the study. Twelve patients were maintained on sevoflurane and seven on isoflurane. Table 1 shows the mean concentrations of anaesthetics at the two time points. Scatter plots of the relationship between end-tidal and arterial concentrations were non-linear. Therefore, Spearman’s rank correlation coefficients were explored but did not yield any significant correlations (p < 0.05) between arterial and end-tidal concentrations at either time point both for isoflurane and sevoflurane.

Discussion: The absence of a relationship between end-tidal and arterial concentrations on two-lungs found in this study does not agree with accepted pharmacology. Type II statistical error as a result of the small population sample size, may account for these findings. In addition, patient temperature was not measured and its effect on the blood-gas solubility of inhalational anaesthetics could have introduced variance. Usually, there is a discrepancy between arterial and end-tidal concentrations. However, this gradient has been found to be consistent and predictable depending on age and phase of uptake/elimination (2, 3). The failure to find a relationship between end-tidal and arterial blood concentrations during two-lung ventilation in this study means the results during one-lung ventilation cannot be reliably interpreted. In conclusion, no statistically significant association was found between end-tidal and arterial blood concentrations of isoflurane or sevoflurane during two- or one-lung mechanical ventilation.


Table 1: Mean Concentrations on One and Two Lungs (mean ± SD)

<table>
<thead>
<tr>
<th></th>
<th>Isoflurane</th>
<th>Sevoflurane</th>
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<tbody>
<tr>
<td><strong>Two Lungs</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspired (%)</td>
<td>1.07 ± 0.22</td>
<td>1.95 ± 0.49</td>
</tr>
<tr>
<td>End-tidal (%)</td>
<td>0.68 ± 0.12</td>
<td>1.61 ± 0.46</td>
</tr>
<tr>
<td>Arterial (µg ml⁻¹)</td>
<td>44.0 ± 22.9</td>
<td>38.4 ± 18.0</td>
</tr>
<tr>
<td><strong>One Lung</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspired (%)</td>
<td>2.05 ± 0.39</td>
<td>2.36 ± 0.64</td>
</tr>
<tr>
<td>End-tidal (%)</td>
<td>1.27 ± 0.22</td>
<td>1.90 ± 0.51</td>
</tr>
<tr>
<td>Arterial (µg ml⁻¹)</td>
<td>72.5 ± 43.4</td>
<td>39.3 ± 24.7</td>
</tr>
</tbody>
</table>

PP42

Microbiological culture and 16-S polymerase chain reaction analyses of bronchoalveolar lavage samples to identify airway colonisation before lung resection surgery

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Introduction: A recent meta-analysis showed that pre-operative respiratory tract colonisation is associated with increased risk of respiratory complications after lung resection.[1] This study compares incidences of pre-operative airway colonisation detected using culture and sensitivity analyses and 16-S polymerase chain reaction (PCR) analyses of pre-operative bronchoalveolar lavage (BAL) samples. We compare outcomes for those identified as being colonised preoperatively by the different techniques.

Methods: This is a sub-analysis of an ongoing prospective study. For 25 patients, one BAL sample was taken from each lung during routine bronchoscopy performed between induction of anaesthesia and onset of surgery. All samples underwent culture and sensitivity and 16-S PCR analyses. Case notes were examined to identify demographics, pre-operative co-morbidities, length of hospital stay (LOS) and treatment of suspected chest infection. LOS for those with and without airway colonisation identified by the different techniques were compared using the Mann-Whitney U test. Fisher’s exact test was used to compare the incidence of treatment for suspected chest infection during the postoperative period within the same groups.

Results: The mean age of patients was 70.8 years, 40% were male, 16% had never smoked and 68% were admitted to the critical care unit postoperatively. BAL culture was positive in six patients and 16-S PCR analyses identified bacterial DNA in samples from 15 patients. The majority of organisms identified on PCR were those recognised as normal upper respiratory tract flora. There were five cases in which potentially pathogenic organisms were detected on both 16-S PCR and culture. In one case, DNA of haemophilus influenza was identified on 16-S PCR analysis but not on culture. In another case aspergillus fumigatus was detected on culture but not on 16-S PCR. All cultured organisms except for the aspergillus fumigatus were sensitive to amoxicillin, co-amoxiclav or flucloxacillin.

Outcomes are described in Table 1. The difference between LOS for patients with positive culture results and those with negative cultures was statistically significant (p= 0.027).

Discussion: These early results support existing evidence that pre-operative airway colonisation may be associated with a higher risk of adverse outcomes following lung resection surgery. This is the first study to examine 16-S PCR results in such patients. Further work is required to test whether 16-S PCR or conventional culture and sensitivity analysis is the most appropriate test to perform in this scenario.


<table>
<thead>
<tr>
<th>Outcome</th>
<th>BAL culture result</th>
<th>PCR result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive (n = 6)</td>
<td>Negative (n = 19)</td>
</tr>
<tr>
<td>Median length of hospital stay, days</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>Treated for suspected chest infection, n (%)</td>
<td>4 (67)</td>
<td>4(21)</td>
</tr>
</tbody>
</table>

PP43

Comparison of intraoperative fluid and vasopressor use between open and minimally-invasive esophagectomy and its impact on incidence of anastomotic leak

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Background: Minimally-invasive esophagectomy (MIE) has gained increasing popularity in the management of esophageal cancer. Intraoperative fluid management and vasopressor use differs considerably between MIE and open esophagectomy. The objective of this study was to assess the impact of intraoperative vasopressor requirements and intravenous fluid
administration on the incidence of anastomotic leak between open and minimally-invasive esophagectomy (MIE) patients.

**Methods:** With IRB approval, we performed a retrospective review of 494 patients from an administrative database, who underwent open and MIE between 2010 and 2015. Comparisons between open and MIE were conducted with Wilcoxon rank sum test for continuous variables and Fisher's exact test for categorical variables along with logistic regression.

**Results:** The MIE group had a prolonged duration of surgery, greater fluid administration, as well as vasopressor requirements compared to open (Table). Of the 494 patients, 70 patients (14%) developed an anastomotic leak. The incidence of anastomotic leak for open esophagectomy did not differ significantly than for MIE (16% vs. 9.7%, \( p = 0.2 \)). Within operative type subgroup analysis, there was no association with the amount of crystalloid administered and the risk of anastomotic leak in either group, but there was marginal evidence of association between the use of phenylephrine and a lower incidence of anastomotic leak in the MIE group (OR 0.31, 95% CI 0.09, 1.08, \( p = 0.066 \)).

**Discussion:** In this study, the use of crystalloid and colloid was greater in MIE compared to the open group. Despite higher fluid and pressor requirements in MIE, the rate of anastomotic leak did not differ. Our preliminary data show no evidence that the use of intraoperative pressors or the choice of fluid adversely affects the leak incidence. These findings are of particular importance in esophagectomy patients because it challenges the theory that excessive vasopressor administration compromises the integrity of the anastomosis.

**REFERENCES:**


### Table 1. Fluid and vasopressor administration in open vs. MIE

<table>
<thead>
<tr>
<th>Variables</th>
<th>Open (N=350)</th>
<th>MIE (N=144)</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalloid (ml), median[IQR]</td>
<td>3400 (2500, 4200)</td>
<td>6600 (4000, 8800)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Colloid (ml), median[IQR]</td>
<td>250 (0.0, 500)</td>
<td>500 (0.0, 1000)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Phenylephrine, no. (%)</td>
<td>166 (47)</td>
<td>68 (47)</td>
<td>1</td>
</tr>
<tr>
<td>Phenylephrine (mcg)</td>
<td>189 (0.0, 440)</td>
<td>806 (180, 5697)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Surgical duration (mins)</td>
<td>345 (286, 442)</td>
<td>431 (385, 506)</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Anastomotic leak, no. (%)</td>
<td>56 (16)</td>
<td>14 (9.7)</td>
<td>0.2</td>
</tr>
</tbody>
</table>

†Data are median [IQR range] or no. (%) * IQR: interquartile range.

**PP44**

Does preoperative oral carbohydrate intake improve postoperative outcomes in patients undergoing coronary artery bypass grafts?

Omer Faruk Savluk, F Guzelmeric, MA Kuscu, E Gurcu, H Ogus, D Cevirme, T Kocak

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**Introduction:** Cardiac surgery using cardiopulmonary bypass commonly results in a systemic inflammatory response resulting in a marked metabolic disorder and is a major cause of peripheral insulin resistance. Preoperative glucose treatment has been shown to benefit cardiac surgery patients; it has been associated with reduction in postoperative complications such as serious arrhythmias, the need for vasopressor and inotropic agents, and shorter duration of ventilatory support as well as reduced stay in the intensive care unit (ICU)(1).

The aim of the study is to see if preoperative oral intake of carbohydrate rich drinks in patients undergoing coronary artery bypass grafts will attenuate postoperative insulin requirements and improve postoperative patient discomfort, the level of inotropic support, length of ICU stay, and duration of postoperative mechanical ventilation.

**Method:** This study included 152 patients with coronary artery disease who were divided in to four groups. The first group (Group 1) (\( N=38 \)) received 800ml of carbohydrate 8 hours before the procedure and 400 ml of carbohydrate 2hrs before the procedure. The second group (Group 2) (\( N=37 \)) received 400ml of carbohydrate only 8hrs before procedure. The third group (Group 3) (\( N=38 \)) received 400ml of carbohydrate only 2hrs before procedure. The fourth group (Group 4) (control group) (\( N=39 \)) had an 8hrs preoperative fasting period. Insulin requirements were deliberately chosen as a surrogate marker to estimate the peripheral insulin resistance. In all groups the inotropic and vasopressor requirements, ventilation time and ICU stay time were recorded. Patients well-being, mouth dryness, hunger, anxiety, nausea were also assessed using visual analogue scale scores 1-10. All data was recorded at T0: preoperative, T1: preoperative (after inductions), T2: postoperative (transferred to ICU), T3: 6 hrs in ICU, T4: postoperative first day.

**Results:** Postoperative bleeding, cardiac arrhythmia, inotropic and vasopressor requirements, ventilation time and ICU stay time were evaluated. Inotropic requirements were significantly higher in the control group than in the other groups (\( p < 0.04 \)). Vasopressor requirements were not significantly different among the groups. Ventilation time was not significantly
different among the groups but the ICU stay time was significantly longer in control group than other groups. The results of VAS score comparisons for the four parameters (mouth dryness, hunger, nausea and anxiety). Mouth dryness and hunger were significantly higher in control group than other groups (p=0.03, p=0.02). The increase in blood glucose levels were significantly higher in the control group compared to the other groups (p=0.04). Exogenous insulin requirements was significantly higher in the control group than other groups (p=0.04).

Discussion: Low-grade inflammation associated with insulin resistance may be accentuated during surgery. In particular patients undergoing cardiac surgery experience aggravated inflammation and insulin resistance, which results in deteriorating endothelial dysfunction and glycaemic control and increases the risk of postoperative adverse outcomes. The effect of preoperative oral carbohydrate may not be strong enough to counteract the effect of surgical trauma-related stress hormone release in cardiac surgery (2). In conclusion, we provide evidence of the safety of an oral carbohydrate drink ingested before induction of anaesthesia for coronary artery bypass grafting surgery.


Table: Postoperative characteristics

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postoperative</td>
<td>837 ± 501</td>
<td>920 ± 625</td>
<td>900 ± 524</td>
<td>785 ± 435</td>
<td>0.5</td>
</tr>
<tr>
<td>Bleeding (ml)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiac Arrhythmia %</td>
<td>31.6</td>
<td>24.3</td>
<td>47.4</td>
<td>38.5</td>
<td>0.7</td>
</tr>
<tr>
<td>Inotropic</td>
<td>63.2</td>
<td>73</td>
<td>68.4</td>
<td>84.6</td>
<td>0.04</td>
</tr>
<tr>
<td>Requirements%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vasopressor</td>
<td>68.4</td>
<td>75.7</td>
<td>86.8</td>
<td>69.2</td>
<td>0.06</td>
</tr>
<tr>
<td>Requirements%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilation Time (hr)</td>
<td>11.9 ± 4.5</td>
<td>13.2 ± 4.3</td>
<td>11.8 ± 4.1</td>
<td>14.5 ± 18.5</td>
<td>0.07</td>
</tr>
<tr>
<td>ICU Stay Time (day)</td>
<td>2.3 ± 0.6</td>
<td>3 ± 1.6</td>
<td>2.6 ± 3.35</td>
<td>4.6 ± 4.5</td>
<td>0.03</td>
</tr>
</tbody>
</table>

PP45

Octogenarians – A growing population in cardiac surgery

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Introduction: Octogenarians are a growing population of patients who are candidates for cardiac surgery. The author analyses a single centre experience with patients over 80 years of age who underwent cardiac surgery.

Methods: A retrospective observational study was performed at the University Hospital in the period from 2011 to 2015. During that period 2139 heart operations were performed; authors compared preoperative, intraoperative and postoperative data of 1890 patients younger than 80 with group of octogenarian (123 patients over 80 years underwent cardiac procedures).

Results: There where 123 (6%) patients 80 years old or older. Sixty-five percent (65%) of the procedures were elective, 29% emergency and 6% urgent. Coronary artery bypass grafting was performed in 37% of patients, aortic valve replacement surgery in 31%, interventions involving the mitral valve in 3%, two procedures (CABG+AVR, CABG+MVR or AVR+MVR) in 22% and other procedures in 6%.

The mean age of the patients was 81 (80-88 range). Octogenarian had a statistically higher Euroscore (p < 0,001), more COPD (p < 0,05), diabetes mellitus type 2 (p < 0,05) and malignancies (p < 0,01). There was no statistical difference in the operation time, CPB time and clamp time. Postoperative (cumulative) time in ICU was higher in octogenarian group (p < 0,01); ventilator time was longer (p < 0,01) there were more respiratory complications (p < 0,01) and tracheotomies (p < 0,05). Octogenarian received more transfusions. (p < 0,01).

Although their physical status was heavily burdened with preoperative comorbidities (8 patients had a cerebrovascular insult (7%), 16 (13%) some kind of vascular surgery, 10 (8%) COPD, 34 (28%) atrial fibrillation, 28 (23%) myocardial infarction, 96 (78%) hypertension, 29 (24%) diabetes, 24 (20%), various degrees of renal insufficiency, 2 patients (1.63%) were on haemodialysis, mortality was low- one patient died (0,8%).

Discussion: Octogenarians are a growing population of patients undergoing cardiac surgery. These patients often present multiple comorbidities that put them in a higher risk category. However, improvements in surgical technique, CPB technology and perioperative management enable us to perform cardiac surgery procedures in a safe manner.

PP46

One lung ventilation in atrial fibrillation ablation surgery

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**Introduction:** In video-assisted thoracoscopy (VATS) atrial fibrillation (AF) surgical ablation, one lung ventilation (OLV) with dual lumen tube is utilised to keep the lung deflated to facilitate the exposure of the surgical field. In contrast with most of thoracic procedures, the patient lies supine, the protective effect of gravity is lost resulting in hypoxemia.

To increase oxygenation many strategies are utilised: high FiO2, PEEP on the ventilated lung, CPAP on the deflated lung (1), but these algorithms can be poorly tolerated during VATS.

We performed a prospective, monocentric, observational study to evaluate hemodynamic and respiratory changes in this kind of surgery.

**Method:** Patients were ventilated in pressure controlled ventilation (PCV) adjusting the inspiratory pressure to obtain a tidal volume (Vt) of 7 mL/kg keeping FiO2 constant 1.0, a respiratory rate (RR) to maintain PaCO2 between 35 and 40 mmHg, and PEEP 5 cmH2O. During OLV, inspiratory pressure was reduced to obtain a Vt of 5 mL/kg, maintaining FiO2 of 1.0, a RR to maintain PaCO2 between 35 and 40 mmHg with capnothorax of 10 cmH2O or capnothorax 10 cmH2O plus CPAP 10 cmH2O on deflated lung.

Inotropic agents (dopamine or dobutamine) were used when CI (measured by Monitor Vigilance II, Edwards) decreased below 1.5 L/min/m2.

**Results:** in 6 months 8 patients were enrolled, median age was 66 years (IQR 54-71), the patients were obese, median BMI was 29 (24-27).

Mean pulmonary artery pressure (PAPm) increased significantly during OLV and remained high at the end of the procedures, Multiple Comparisons One-Way ANOVA (MC-ANOVA), p= 0.002 (Table 1).

Cardiac index (CI) progressively increased during OLV until the end of the procedure, MC-ANOVA, p=0.02. Arterial oxygen content (CaO2) remained stable during the entire procedure. Accordingly, DO2 index increased significantly during CAPNO+CPAP step, MC-ANOVA, p= 0.03.

Intrapulmonary shunt (Qs/Qt) increased during OLV and remained high until total lung ventilation was reintroduced at the end of the procedure, MC-ANOVA, p= 0.0001 (Table 1).

**Discussion:** During one lung ventilation for surgical ablation of atrial fibrillation, CPAP on deflated lung seems to be ineffective in reducing the intrapulmonary shunt. To maintain adequate oxygen delivery during the entire procedure low dose of inotrope agents were required.


<table>
<thead>
<tr>
<th></th>
<th>TLV</th>
<th>OLV</th>
<th>CAPNO</th>
<th>CAPNO+CPAP</th>
<th>END</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAPm (mmHg)</td>
<td>18 ± 2</td>
<td>24 ± 4</td>
<td>29 ± 4</td>
<td>28 ± 4</td>
<td>28 ± 6</td>
</tr>
<tr>
<td>CI (L/min/m²)</td>
<td>1.8 ± 0.4</td>
<td>2.1 ± 0.8</td>
<td>2.4 ± 0.7</td>
<td>26 ± 1</td>
<td>2.7 ± 1.2</td>
</tr>
<tr>
<td>CaO2 (ml)</td>
<td>19 ± 2</td>
<td>17 ± 2</td>
<td>17 ± 2</td>
<td>17 ± 1</td>
<td>18 ± 3</td>
</tr>
<tr>
<td>DO2I (ml/min/m²)</td>
<td>364 ± 94</td>
<td>385 ± 160</td>
<td>421 ± 125</td>
<td>459 ± 179</td>
<td>511 ± 255</td>
</tr>
<tr>
<td>Qs/Qt (%)</td>
<td>23 ± 5</td>
<td>35 ± 7</td>
<td>40 ± 3</td>
<td>41 ± 9</td>
<td>27 ± 5</td>
</tr>
</tbody>
</table>

**PP47**

**Outcomes of TAVI in a Portuguese center**

Ana Martins, ML Castro

Centro Hospitalar de Lisboa Central, Department of Anaesthesiology, Lisbon, Portugal

**Introduction:** TAVI is an alternative to surgical treatment for aortic valve disease. It is considered an option for patients with inoperable severe symptomatic aortic stenosis and for patients with high risk of mortality in valve replacement surgery. Favourable clinical outcomes are leading to an increase in the number of TAVIs carried out in recent years.

This study aimed at describing the characteristics of the population of patients undergoing TAVI at our hospital, the analysis of the anaesthetic technique and the outcomes at 30 days and 1 year.

**Method:** Retrospective study in patients undergoing TAVI from January 2010 to December 2015. Data collected from clinical records. We assessed clinical, demographic and echocardiographic characteristics of patients, EuroSCORE, periprocedural complications (PC) and mortality at 30 days (M-30D) and 1 year(M-1Y) after intervention. PC evaluation was done according to VARC criteria.

**Results:** From 94 patients, 46 (48.9%) were male, mean age of 80.95 ± 6.27 years. 51 (54.3%) patients were classified as ASA IV. 89 (84.7%) patients had high (> 6) EuroSCORE.

91 were treated via transfemoral and 3 via subclavian access, 64 under GA and 30 under LA+S. The number of TAVI under LA+S increased across the years.
Mean length of procedure and hospital length of stay were 164.13 ± 48.158 minutes and 15.50 ± 13.62 days, respectively.

The success rate of the procedure was 98.9%. There were PC in 75 patients (79.8%). Main complications were major bleeding (n=38), cardiac arrhythmias (n=33), need for permanent pacemaker (n=25) and vascular complications (n=21). There were 6 readmissions and no reintervention was needed. M-30D was 4.3% (n=4) and M-1Y was 6.4% (n=6).

Twenty (21.3%) patients developed infectious complications (respiratory or urinary), and 14 (14.9%) renal complications. This latter group include patients with AKI - according to the classification AKIN (Acute Kidney Injury Network) – possibly associated with contrast nephropathy. According to this classification, 7 patients developed AKI stage 1, 4 stage 2, and 3 stage 3.

Among the less frequent complications was the development of respiratory insufficiency defined by gasometry (n = 3; 3.2%), cerebrovascular events - stroke / TIA (n = 2; 2.1%), and acute coronary syndromes (ACS) (n = 2; 2.1%).

Discussion: TAVI’s have been carried out with high success rate in our centre, with morbidity and mortality at 30 days and 1 year in line with the incidences described in literature. Based on these results TAVI seems to be a valid option for patients at high surgical risk.

Further prospective studies are needed to identify risk factors for complications, in order to develop strategies to reduce its incidence.

PP48

Acute kidney injury (AKI) as predictor of mortality in patients after percutaneous transcatheter aortic valve implantation (TAVI)

Ana Martins, ML Castro

Centro Hospitalar de Lisboa Central, Department of Anaesthesiology, Lisbon, Portugal

Introduction: AKI is a known complication of TAVI increasing procedural morbidity and mortality. According to previous studies, the incidence is between 12 and 21%. The aim of this study was to evaluate the incidence, predictors and outcomes of AKI after TAVI.

Method: Retrospective analysis in patients submitted to TAVI from 2010 to 2015. Patients demographic, echocardiographic and perioperative data were collected. Post-procedural renal function was assessed. All patients classified as stage 1, 2 or 3 in the AKIN classification were considered as having AKI. Frequencies (Chi-square), univariate (Mann-Whitney test) and regression analysis were performed to identify correlates and risk factors for AKI.

Results: From 94 patients, 48.9% were males with median age of 81 ± 6 years. 51 (54.3%) were classified as ASA IV. Incidence of AKI was 14.9% (n=14).

Patients who developed AKI were in majority older, ASA IV and showed a trend to have higher EuroSCORE (≥ 6). Female sex (p=0.007) and previous coronary artery disease (p=0.002) were independent predictors of AKI in a univariate analysis. From the peri- and post-operative risk factors, 24h and 48h postoperative creatinine value > 1.2mg/dl, GFR (glomerular filtration rate) < 60, red blood cell transfusion, total volume of contrast administered, development of respiratory failure and infectious complications after procedure were also significantly associated with AKI in univariate analysis (p < 0.05).

When considering all the individually associated predictors of AKI in a multivariate analysis, only previous coronary artery disease remained significantly associated with increased risk of AKI (p=0.013, OR 0.027, IC 95%: 0.02-0.471). This was probably due to colinearity between the different predictors and the reduced number of cases.

There were no differences (p > 0.05) regarding other comorbidities, echocardiographic data or morbidity in AKI development.

Of all the considered variables, AKI was also the only factor significantly associated with 1 year mortality (p=0.041) in univariate analysis. This highlights the relevance of AKI in patients’ outcome and the importance of its control, since development of AKI increased 7 times the risk of 1 year mortality (p=0.041; OR 7.00; IC 95%: 1.253-39.111).

Discussion: The incidence of AKI was consistent with previous studies. A more careful monitoring of patients risk factors and a more restrictive strategy regarding blood transfusion and total volume of contrast administered is suggested during TAVI.

AKI was an independent predictor of 1 year mortality. This highlights the importance of AKI in the patients’ outcome and the importance of both preventing and identifying such a complication after TAVI.

Further investigation of the standardisation of the many identified risk factors for AKI will be important for the development of prediction tools for use in routine clinical practice.

PP49

Central and peripheral measurements of venous oxygen saturation and lactate in cardiac surgical patients

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Introduction: Central venous oxygen saturation (ScvO₂) is often used to monitor and guide interventions to improve patient care. Measurement of venous oxygen saturation (SpvO₂) from a peripheral venous cannula (PVC) is a less invasive alternative, which could help manage patients without a central venous catheter (CVC). We conducted a prospective observational study to compare measurements of venous oxygen saturation and lactate in blood obtained from PVC and CVC.

Method: A hundred and fifteen patients scheduled for elective cardiac surgery from April 29, 2015 to May 16, 2015 at Rigshospitalet, Copenhagen, Denmark, were included in the study. Central and peripheral venous gases were obtained simultaneously after induction of anaesthesia, on arrival in the ICU and 3-4 hours postoperatively. Bland-Altman analysis was performed at each time-point to identify bias and limits of agreement (lia). Trending ability was assessed by means of a four-quadrant plot.

Results: At baseline 50% of the blood samples SpvO₂ was > 93%, indicating arterialisation of blood. For this reason, the Bland-Altman plot was performed in two separate groups: (SpvO₂ > / < 93%). A bias of 17.2 (lia: 15.8, 18.6) group and 4.9 (lia: 1.1, 8.8) was seen in the high and low group, respectively. Postoperatively, bias was 11.3 (lia: 8.1, 13.8) and 16.5 (lia: 14.2, 18.2) on arrival in ICU and after 3-4 hours, respectively. A four-quadrant plot demonstrated an 89% concordance. Central and peripheral lactate measurements showed excellent agreement with a mean bias of -0.16 to -0.23 at all time-points.

Discussion: Preoxygenation resulted in arterialisation of peripheral venous blood in some patients, and SpvO₂ is not reliable in this situation. Otherwise, the bias between ScvO₂ and SpvO₂ were moderate at all time-points, and the concordance rate showed an acceptable trending ability. The present study is limited by the fact that only a few patients were demonstrating low cardiac output postoperatively and therefore additional studies are required to clarify if these observations are reproducible in patients during this condition.


PP50

Management of unusual complications of atrial septal defect device - a case series

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Introduction: Atrial septal defect (ASD) is a common congenital cardiac anomaly. Although surgical closure has been the traditional and gold standard treatment of choice, percutaneous device closure is gaining popularity in recent times because of the short duration of stay, cosmetic advantage and relative avoidance of morbidity associated with surgery. Nevertheless they are associated with some unavoidable complications making surgical intervention mandatory.

Material and Methods: Between May 2014 to June 2016, 3 patients have been referred to our centre after percutaneous transcatheter closure of atrial septal defects with unusual complications. The first patient, a 30yr old female referred for ASD device migration and left atrial appendage perforation causing a pericardial collection and cardiac tamponade within 3 hrs of intervention. The second patient, a 10yr old female with cardiac failure referred for endocarditis of an ASD device, tricuspid valve & mitral valve. The third patient, an 11 yr old female with the ASD device done 1 year back, now eroding the aorta through the right atrial wall producing Aorta-RA fistula.

Results: All patients underwent emergency surgery with midline sternotomy and cardiopulmonary bypass after adequate preliminary evaluation. In the first patient with device migration and left atrial appendage perforation the device was retrieved, LAA tear closed and atrial septal defect was closed with PTFE patch. In the second patient with endocarditis of the device, tricuspid valve & mitral valve, the device retrieval was done along with mitral valve replacement, pericardial patch closure of the defect and repair of tricuspid valve. The third patient with Aorta-RA fistula underwent device removal, closure of fistula with Dacron patch and closure of the defect. All the patients were discharged with normal convalescence.
Discussion: There is a rising trend for interventional closure of ASD in recent years with various devices due to multiple reasons [1-2]. Nevertheless, they are associated with some if not many complications such as device malposition, device migration, cardiac rupture, and of course less commonly device endocarditis [3].

Conclusion: Although the complications for ASD devices are minor, sometimes they can be very disastrous leading to high mortality in a rapid transit of time, making surgical intervention mandatory for emergency surgery with device retrieval and for the correction of original defect and other device-related defects.

REFERENCES:

Poster Session PS06
Thursday, 20 April 2017
14:30 - 16:00, Poster & Exhibition Lounges

PP51
Activated recombinant factor VII in massive bleeding after cardiac surgery: case series

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Introduction: Uncontrolled massive haemorrhage is an important cause of morbidity and mortality in patients after cardiac surgery [1]. Recombinant factor VIIa (rFVIIa) is a haemostatic agent licensed for patients with haemophilia [2]. Its “off-label” use in the treatment of severe bleeding in other patients is controversial nowadays: there are no studies supporting efficacy and security of this drug.

Methods: We present a case series of eight non-haemophilic patients after cardiac surgery who suffered uncontrolled massive haemorrhage, refractory to the administration of usual haemostatic drugs.

The cases presented include the following surgical procedures: three cardiac transplants, one combined valve replacement and four ascending aorta replacement (one aortic aneurysm and three aortic dissections).

Massive bleeding and the resulting coagulation disorders were treated in accordance to our specific institutional protocol. Moreover, in order to comply with this, rFVIIa was administered only if the following conditions were met: normal thromboelastogram, optimised global coagulation tests, patient temperature, ionic calcium level and pH correction, and absence of any indication of surgical revision. Family members of the patients gave their informed consent before rFVIIa was administered.

Results: In five out of these eight patients, massive bleeding was controlled immediately after a single dose of 90 mcg/kg of rFVIIa. However, three of them required additional doses due to continued bleeding. Out of this group of three patients, two of them suffered heparin-induced thrombocytopenia, requiring anticoagulation with bivalirudin during the cardio-pulmonary bypass. In addition, one of the latter group required a third dose of rFVIIa.

Out of the eight patients, one died 72 hours after the administration of a single rFVIIa dose due to a diffuse intestinal ischaemia. One patient died 24 hours after a single dose of rFVIIa, due to an ischaemic brain insult. The remaining patients showed no signs of any thromboembolic complications. Two died from septic shock, while four could be discharged from the hospital.

No patient died due to bleeding. Repeated doses of rFVIIa were not associated with an increased death risk.

Discussion: In our series, rFVIIa was effective in restoring haemostasis. In spite of this, the death of two patients could be related to the potential side effects of the drug.

The use of this agent could play a role in the treatment of otherwise untreatable, life-threatening bleeding after cardiac surgery. We consider rFVIIa to be a powerful and promising haemostatic drug which could be contemplated as an option in bleeding patients when the rest of haemostatic agents have been used unsuccessfully. Nevertheless, the possibility of thromboembolic complications makes the “off label” use of rFVIIa controversial.


PP52
Tissue rSO2 management during cardiopulmonary bypass and ECMO

Anna Semenova, D Bombin, V Agapov, M Kostrykin, M Shigaev
Introduction: Regional oximetry is a technique that became routine in the last decade. It has been shown to be good enough to predict brain injury in cardiac and non-cardiac surgery. It is being used in most cardiovascular procedures in adults and children, but still there is no commonly approved protocol of rSO2 management during the procedures. Target values of cerebral rSO2 and limits of its changes are still being discussed.

Methods: To assess the association between tissue rSO2 and pump flow, mean arterial pressure, PsO2, inotrope and vasopressors, use 58 cases of CPB and/or ECMO were prospectively analysed using “in-line” monitoring devices. INVOS method was used for regional (cerebral and somatic) monitoring. As the end-points post-op organ disorders incidence, length of inotrope use, lung ventilation, ICU (cerebral and somatic) monitoring. As the end-points post-op organ disorders incidence, length of inotrope use, lung ventilation, ICU

Results: It was found that cerebral rSO2 depends strongly on pump flow either on CPB or on ECMO. Cerebral rSO2 values are also affected by Ht and Hb levels that can be improved using hemotransfusion and hemoconcentration. Interactions between somatic rSO2 values are not so clear and easy to manage. According to study results the local clinical protocol was created in the draft.

Conclusion: The study of associations between tissue rSO2 and CPB and/or ECMO parameters can help to harmonise clinical practice and improve its safety and quality.

Heparin allergy management, no right or wrong decision in cardiac surgery yet

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Introduction: Although heparin allergy (HA) is a rare but well-documented entity, specific anticoagulation management for cardiac surgery in patients with heparin allergy has not been well established due to its rarity and short experience with the newer anticoagulant agents (AA) such as argatroban, lepirudin or bivalirudin.

Heparin may cause all types of allergic reactions. The most common involves a cell-mediated delayed type IV reaction with clinical manifestations of erythematous plaques or maculopapular exanthemas. The most dangerous, involving an antibody-mediated delayed type II reaction is heparin-induced thrombocytopenia (HIT). Immediate type reactions (IgE-mediated) seem to be very rare.

Currently, there are no standardised protocols to follow in the presence of any type of HA. We report a case showing our anticoagulation strategy in a patient with well documented HA scheduled for cardiac surgery.

Method: We present a case of an 82-year-old woman with recent myocardial infarction and low preoperative ejection fraction accepted for off-pump coronary bypass surgery.

Her background showed history of maculopapular exanthema while on treatment with low molecular weight heparin (LMWH) after total knee arthroplasty suggesting a cell-mediated type IV reaction. Intradermal tests were performed with positive early readings (20 minutes) for unfractioned-heparin and LMWH suggesting however an immediate (IgE-mediated) hypersensitivity reaction.

Desensitisation for heparin (based on the administration of increasing doses of antigen leading to a temporary state of non-response to optimal doses of antigen, in this case heparin) plus pretreatment regimen with corticosteroids and antihistamines prior surgery was the alternative accepted for our patient (1). Maximum doses of heparin for desensitisation were calculated based on the uncertain probability of requiring cardiopulmonary bypass (CPB). A continuous prophylactic heparin infusion was maintained after desensitisation and until surgery 48h later.

Results: Off-pump coronary bypass surgery was successfully performed by increasing gradually the speed of heparin infusion to achieve an activated clotting time (ACT) over 200s during the procedure. Once surgery was completed the infusion was stopped and protamine was administered according to ACT. Postoperative prophylactic anticoagulation was achieved with fondaparinux without any incidence.

Discussion: Hypersensitivity to heparin is a rare condition but represents a therapeutic challenge for patients requiring cardiac surgery. Based on our previous experience with bivalirudin(1), the therapeutic index of the AA is narrow. Overdosing can lead to catastrophic bleeding, whereas underdosing can result in clotting in the CPB tubing.
Desensitisation is an alternative in immediate allergy to drugs when no alternative of treatment is available, safe or effective. After evaluating the risks of using an AA and considering that our patient did not show HIT, we decided to go ahead with an intraoperative use of heparin after desensitisation with a successful result.


PP54

Role of local hyperfibrinolysis in the postoperative blood loss after open-heart surgery with cardiopulmonary bypass

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Introduction: Cardiopulmonary bypass can activate hyperfibrinolysis. In spite of pharmacological intervention and detailed surgical hemostasis, post-bypass bleeding remains the problem. Local hyperfibrinolysis can be one of the reasons of non-surgical bleeding after open-heart surgery with CPB.

Methods: This blind randomised clinical trial recruited two groups of patients (TXA 1 - 32 patients, TXA 2 - 28 patients) undergoing coronary artery bypass graft surgery or valve replacement surgery with CPB. In 1 group TXA has been administered at a dose of 15 mg/kg tranexamic acid after induction of anesthesia and 1mg/kg during all operation. As well there was local application of 1g TXA in the cavity of the pericardium in group 2. Criteria for evaluation: interoperative blood loss(ml), postoperative blood loss(ml), tempo of chest tube drainage on 2, 4, 6, 16 hours, thromboelastometry (ROTEM®) after protamine.

Results: Intraoperative blood loss consisted in TXA 1 – 870 ml, TXA 2 – 910 ml. There is no difference between the groups. Tempo of chest tube drainage on 2 hour was 40 ml/h in TXA 1, 25 ml/h in TXA 2, on 4 hour – 20 ml/h and 15 ml/h, on 6 hour – 17,5 ml/h and 10 ml/h, on 16 hour – 8 ml/h and 8 ml/h. There is not a difference between the groups. Patients in the TXA 2 group had a significantly lower postoperative blood loss (180 ml) than the TXA 1 group (265 ml) (P < 0,05). There is no difference between results of thromboelastometry in group TXA 1 and TXA 2. LY 30 was 100% in two groups.

Conclusions: Postoperative blood loss was significantly lower in the TXA group 2 then the TXA group1, however there is no difference between results of thromboelastometry in both groups. Consequently, there is a possibility of local hyperfibrinolysis in group TXA 1.

PP55

Suspected retrograde aortic dissection during minimally invasive mitral valve repair: a case report

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Introduction: Aortic dissection during cardiac surgery is a rare but potentially catastrophic complication with significant morbidity and mortality. The reported incidence during minimally invasive mitral valve repair (MINVR) is 0.2 - 0.3% (1). At our institution, this is the first case of an evolving aortic dissection that we have encountered during MINVR.

Background: A 69 year old gentleman with two previous episodes of infective endocarditis, presented for elective repair of a severely regurgitant mitral valve. Other relevant history included hypercholesterolaemia and atrial fibrillation. He was a non-smoker and had New York Heart Association Class II functional status. Pre-operative echocardiography examination revealed a preserved left ventricular ejection fraction of 65%, severe mitral regurgitation, posterior mitral valve leaflet vegetation and normal coronaries on angiography.

Procedure: Following peripheral venous and left radial arterial cannulation, the patient was induced uneventfully. The airway was secured with a double lumen tube and a right internal jugular vein central venous catheter was placed. Cerebral oximetry and transoesophageal echocardiography (TOE) were used throughout the case. The patient was haemodynamically stable prior to initiation of cardiopulmonary bypass (CPB).

Femoral-femoral cannulation was performed under full heparinisation and the patient was commenced on CPB and cooled to 32°C.

The aortic cross clamp was applied through a right anterior mini-thoracotomy and the heart arrested with antegrade cardioplegia, after which mitral valve repair proceeded.

Approximately 90 minutes after aortic cross clamping, there was an abrupt disappearance of the left radial arterial pressure waveform. Continuous TOE identified an evolving aortic dissection with a distal dissection and intimal flap in close proximity to the left subclavian artery. Aortic root pressure was reported to feel normal by the surgeons, and cerebral oximetry remained normal throughout the period of mitral valve repair.

A midline sternotomy was then performed and a dissection extending into the ascending aorta, with no clear intimal tear, was repaired. Total CPB time was 394 minutes.
Post-operative Course: Computed tomography (CT) angiogram confirmed an extensive aortic dissection (Stanford A) including the ascending aorta, and involving the carotid, superior mesenteric and renal arteries, terminating bilaterally at the external iliac arteries. The cardiac surgeons suspected retrograde dissection from a guidewire injury as the most likely cause. The patient’s course was complicated by moderate neurological sequelae (confusion, dysphagia), acute kidney injury not requiring dialysis, and haemodynamically unstable fast atrial fibrillation.

Discussion: Intraoperative aortic dissection is a rare complication, in which TOE is indispensable in correlating clinical assessment, changes in monitoring, likely surgical aetiology and assisting surgical decision making.


PP56

Psychosocial risk factors in cardiac surgery influencing adverse outcome

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Background: The clinical experience shows, that not only physiological, but psychological factors also, can strongly influence the postoperative outcome. Frailty, as a recently introduced concept, refines the former risk stratification, based on different clinically measurable data.

The present study aims to create an expanded risk-scoring system, identifying the most important psychological and social factors influencing the perioperative period and postoperative outcome prior to cardiac surgery.

Methods: Our prospectively managed study, approved by IRB, actually contains the data of 47 adult patients undergoing elective or urgent cardiac surgery between July 2014 and February 2016. Beck Depression Inventory (BDI), Mini, Mental State (MMS), Geriatric Depression Scale (GDS), Spielberger State-Trait Anxiety Inventory (STAI), Type D tests were fulfilled preoperatively. The database incorporates nearly all of the preoperative and intraoperative data regarding each patient. For risk stratification EuroScore II and ASA were applied. Primary end points were early postoperative complications.

Results: Twenty seven patients (57.4%) had complications, most frequently were arrhythmias (n=18; 38.3%), and infection (n=8; 17%) registered. Three patients (6.4%) died: one of them intraoperatively and two during the early postoperative period. After adjusting for age, EuroScore and length of surgery, worse self-rated health was independent predictor of adverse early postoperative outcome (OR =0.10; 95% CI: 0.01-0.70; p =0.021).

Conclusion: The identification and daily use of new frailty risk factors may help to improve the quality of hospital care and the sensitivity of the different prognostic scoring systems.

PP57

Non severe post operative bleeding in cardiac surgery: towards an optimized definition

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Introduction: Post operative bleeding (POB) is an independent risk factor for mortality in cardiac surgery. (1) According to the Universal Definition of Perioperative Bleeding (UDPB), 90% of patients suffer from non severe POB i.e insignificant to moderate. (2) However, UDPB still mostly classified non severe POB by volume of packed red blood cells transfused in the first 12 hours, a well-known centre and physician dependant parameter. This study aimed to define non severe POB with the only variable of chest tube output and to describe its kinetic.

Method: From January to June 2016, 303 patients were consecutively included in our cardiothoracic intensive care unit, for post operative care of on-pump cardiac surgery. Bleeding volume was recorded hourly during the first 12 postoperative hours. We then classified patients in the 5 UDPB stages. Secondly, we defined 3 severity stages of POB based on chest tube output in the first 12 hours: minor (600mL/12h), intermediate (601-1000 mL/12h) and serious (≥ 1001mL/12h or surgical reexploration in the first 24h). The hourly POB kinetic was analysed for minor and intermediate grades and expressed in ml.kg-1.h-1. The area under the Receiver Operating Characteristic Curve (AUC-ROC) determined the most predictive POB threshold of an intermediate POB with the best sensitivity (Se), specificity (Sp), positive and negative predictive values (PPV, NPV).

Results: According to UDPB, 83,1%, 7,6%, 4%, 3,6% and 1,7% presented insignificant, mild, moderate, severe and massive POB respectively whereas 83,1%, 11,6% and 5,3% of patients had minor, intermediate and serious POB as per our classification. Intermediate POB output was twice as important as minor POB but without significant difference in morbidity and mortality between both groups. We observed that half of the bleeding volume occurred within the first 3 postoperative hours. During this 3-hours period a POB threshold of 1,97ml.kg-1.h-1 had an excellent predictability for the occurrence of an intermediate POB (AUC 0,931, Se 80%, Sp 94,9%, PPV 68,3%, NPV 97,2%).

Discussion: After cardiac surgery, POB could be precisely defined by hourly chest tube output in the first 12 hours. Intermediate POB occurred early in the first 3 postoperative hours. A POB threshold lower than 1,97ml.kg-1.h-1 during this period predicted the absence of an intermediate bleeding. It thus could be included in a cardiac surgery fast-tracking protocol.


PP58

Prothrombin complex concentrate (PCC) does not restore clotting time after extrinsic activation by ROTEM reactants in a extreme hemodilution model

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Background and Goal of Study: Massive bleeding in cardiac surgery can lead to dilutional coagulopathy by replacing volume losses with crystalloid/colloid solutions. Monitoring of this pathology by thrombelastometry shows deterioration of blood clot stability in the early stage of bleeding, frequently based on hypofibrinogenemia. In later stages of severe bleeding thrombin generation can be additionally affected as expressed by significant prolongation of clotting time (CT). Many modern protocols for management of massive bleeding in cardiac surgery propose the administration of PCC to correct this bleeding associated coagulopathy. In vitro dilutional studies on whole blood showed good responsiveness of prolonged CT to PCC administration even in severe dilution as high as 70%. We hypothesised that PCC cannot fully restore prolonged clotting time in an initially coagulation factor free model for extreme dilutional coagulopathy.

Material and Methods: Human albumin 5% (Grifols, Spain) in Viaflo Plasmaplyte® 148 (Baxter, Spain), enriched with Ca++ gluconate (0,9 mmol/l) was titrated with TRIS buffer
2M to pH 7.3 -7.4 and heated to 37°C, defining our stem solution (SS). Fibrinogen concentrate (FC) was added to reach final concentrations of 4 g/l. FC enriched SS was then treated with stepwise ascending PCC factor activities. The calculated final PCC activities were 0.1, 0.25, 0.5, 1, 2 and 4 UI/ml. The study samples were analysed for viscoelastic properties with the FIBTEM S subtest on a ROTEM® delta machine. Obtained CT values were compared to the normal range defined in human plasma from 10 healthy, volunteer donors.

**Results:** A negative hyperbolic correlation between rising CCP-concentrations and CT was found when tested over FC at 4 g/l(Figure 2 A). Converting the variable "CCP concentration" to its reciprocal value "1/CCP concentration" this parabolic curve form converted to a very high positive linear correlation between CT and "1/dose" (p < 0.0001). In the range of 0,1 – 1 IU/ml the higher the CT concentration the shorter the observed clotting time. This observation is limited to the concentration range of 0,1 to 1 UI/ml. The shortest CT was detected at a concentration of 1 UI/ml with a medium CT of 116 sec - significantly prolonged when compared to the upper normal limit for CT in plasma of our control group (56 sec). Higher CCP doses (> 1UI/ml) did not shorten CT values. Even in very high concentrations of 4 IU/ml CT did not further shorten and could not reach levels measured in plasma of our control group.

**Discussion:** PCC does not contain factor V and factor VIII which might negatively affect thrombin generation in our model due to reduced prothrombinase and tenase complex activities. In continued massive bleeding these factors might drop below critical levels and determine a theoretical limit for a plasma free coagulation management.

**PP59**

**Early recovery of endogenous fibrinogen after cardiac surgery**

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**Introduction:** There is a lack of data describing kinetics of endogenous fibrinogen after weaning from cardiopulmonary bypass (CPB).

**Method:** In a prospective, controlled, observational design, we studied 26 patients with preoperatively normal Clauss fibrinogen concentration (C-FIB) who underwent open heart surgery with CPB with different degrees of haemodilution (minimal invasive extracorporeal circulation (MiECC) for coronary artery bypass grafting (CABG, n=10) or conventional CPB (cCPB) for replacement of the aortic valve (AVR, n=10) or the ascending aorta (AAR, n=6)). Patients with intraoperative fibrinogen replacement were excluded. C-FIB was determined at high temporal resolution postoperatively. Primary end-point was time to recovery of post-CPB C-FIB to ≥ 1.5 g l-1.

**Results:** C-FIB reached its nadir after protamine administration at 68 ± 7% (mean ± SD) of the pre-CPB baseline level after MiECC, and 62 ± 5% after cCPB (p=0.027 vs. MiECC). Corresponding haemoglobin concentration decreased to 76 ± 7% (p < 0.001 vs. C-FIB). C-FIB after protamine correlated with C-FIB prior to CPB (r=0.89; p < 0.001), estimated plasma volume (r=0.43; p=0.015) and fluid load during CPB (r= -0.46; p=0.037). Post-CPB, C-FIB recovery followed a linear model fit in each group (CABG, 78 ± 8 mg l-1 h-1; AVR, 81 ± 6 mg l-1 h-1; AAR, 95 ± 8 mg l-1 h-1). In all patients, C-FIB was ≥ 1.5 g l-1 at four hours and ≥ 2.0 g l-1 at 13 hours after protamine administration (Fig.1.).

**Discussion:** Endogeneous fibrinogen level decreases towards a nadir after weaning from CPB, mainly due to haemodilution.
but also due to consumption. After heparin reversal and with adequate surgical haemostasis, it recovers spontaneously within a few hours. We conclude that a subnormal plasma fibrinogen level after CPB weaning should not be used as the sole trigger for exogenous fibrinogen replacement.

**PP60**

The use of desmopressin (DDAVP) as haemostatic agent in patients undergoing coronary artery bypass grafting (CABG) surgery

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**Introduction:** Desmopressin has been used as an inexpensive blood saving agent in CABG surgery without the risk of transmitting blood-borne infections. However, the current literature includes conflicting results regarding its ability to limit blood loss. (1) The objective of the specific study is to investigate the efficacy and safety of the use of DDAVP by the cardio-anaesthesiologists.

**Method:** A prospective single centre observational clinical trial was performed including 10 ASA III patients undergoing CABG. 0.3 μg/kg body weight of desmopressin were administrated at the introduction of anaesthesia and after weaning of extracorporeal circulation, in 20 minute intravenous infusion. The patients haemorrhagic status and medication predisposing to bleeding were noted. Pre and post-operative conventional coagulation tests (PT, aPTT, INR, fibrinogen, d-dimers) and thromboelastogram (TEG) were examined. Also, DDAVP haemostatic efficacy, the presence of acute coronary syndromes, haemodynamic instability perioperatively, body temperature, pH, electrolyte balance and renal function were monitored. All patients had signed consent forms preoperatively.

**Results:** 50% of our patients showed increased haemorrhagic outflow intra or post-operatively, while 20% were re-operated due to major bleeding complications. TEG failed to predict the incidents above. 20% of patients underwent acute coronary syndromes with ST-segment depression intraoperatively. 40% of patients showed intraoperative hypotension associated with DDAVP administration. There were no significant variations on electrolytes or pH status. Also, no renal impairment was noted. Due to significant bleeding episodes and ethical consideration, the number of patients enrolled in this study was limited.

**Discussion:** In this present trial, it was proved that DDAVP failed to eliminate intra and post-operative blood loss as a single haemostatic agent in patients undergoing CABG surgery. Also, TEG did not manage to predict the incidents of increased postoperative drainage loss. Despite the fact that desmopressin is likely to lead to fluid retention and impaired renal function (2), this was not proved in our measurements. However, current data is limited and further investigation is needed in this field in order to reach firm results concerning the use of DDAVP in bleeding management in patients undergoing cardiac surgery.

**REFERENCES:**
OP46, PP08

Can foreign trainees be distractive in terms of communication during cardiac surgery?

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Introduction: We sometimes experience misunderstandings/miscommunication due to a different background or a language barrier in our life. Our hypothesis was that there were more communication errors in actual surgical settings where there were foreign doctors who had a different cultural and linguistic background. The aim of this study was to explore and quantify the effect dissimilar languages and cultures could have in the operating theatre, especially in cardiac surgery which requires effective communication to achieve excellent surgical performance.

Methods: Fifty elective conventional coronary artery bypass grafting (CABG) cases were randomly selected, and observed following obtaining written consent forms from the patient. All communication-related events from administration of heparin to chest closure, where all team members were present in the operating theatre, were documented. These events were then examined by the researchers whether it matched our definition of “communication error”. With those which had been addressed as a communication error, the number of total communication error in theatres with foreign doctor(s) and those without was not a significant difference in the number of communication errors between theatres with foreign doctor(s) and those without (p > 0.05) by Mann-Whitney test. Surgery time was also not statistically different between these two groups (p > 0.05, mean: 211.1 vs. 181.3 mins).

Discussion: Our study found that foreign trainees who had different cultural backgrounds did not have a negative impact on communication during CABG against our hypothesis. In the institute where the study was conducted there were no required English language qualifications, and we often do experience language barriers. It implies that understanding surgical procedure and flow may cover language barriers in terms of communication during cardiac surgery.

OP47, PP07

Cardiac anaesthesia risk evaluation score (Care Score) versus EuroSCORE II. Mortality and morbidity analysis in Spanish cardiac surgery population

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Introduction: EuroSCORE II and CARE score are risk indices for predicting mortality after cardiac surgery. This study evaluates its ability to predict mortality in a contemporary cardiac surgical population.

Methods: The probability of mortality was estimated with the EuroSCORE II, and the CARE score, for 405 patients undergoing cardiac surgery (Aortic Valve, Aortic+CABG, CABG,Aorta disease) in one institution between 1 January 2009 and 31 December 2010. The discrimination capacity of the models was obtained by calculating the Area Under the Curve (AUC) ROC curves and calibration using the goodness of fit test appropriate to each model.

Results: The AUC-ROC was 0.84 (95% CI: 0.83-0.85) for the EuroSCORE II, and CI 0.79 (95%; 0.78-0.81) with the CARE
score. The EuroSCORE II have poor calibration with x2 of 23.4 and p < 0.0001. As a consequence, the risk-adjusted mortality obtained with these models is significantly underestimated. The CARE score presents a good X2 calibration 15.62Y p = 0.054. Analyzing the Risk-adjusted Mortality Rate(RAMR) for the EuroSCORE II and CARE score we find that the first underestimate in the cohort of patients while the CARE score fits better except in the Aortic Valve Replacement and Aorta Surgery of Aorta where it underestimates and overestimates, respectively.

**Conclusions:** The EuroSCORE II significantly overestimates the mortality risk after cardiac surgery in our population. Despite its minor discrimination compared to EuroSCORE, the CARE score is simple and still calibrated more than a decade after its development. It is as robust as the EuroSCORE II to carry out risk-adjusted mortality analysis.

**OP48, PP12**

**Low cardiac output syndrome after adult cardiac surgery: predictive value of peak systolic global longitudinal strain**

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**Introduction:** Low cardiac output syndrome (LCOS) requiring inotropic support complicates 10 to 20 per cent of cardiac surgery procedures performed under cardiopulmonary bypass (CPB). Early identification of patients at risk of post-operative LCOS is important for timely introduction of therapeutic measures. We hypothesized that the global longitudinal strain (GLS) measured using the pre-CPB transoesophageal echo (TOE) images predicts postoperative LCOS and has an incremental value over established predictors of LCOS after cardiac surgery.

**Methods:** Our ethics committee approved the study. GLS of patients who had on-pump cardiac surgery between January 2015 and June 2016 was calculated retrospectively using 2D-speckle tracking echocardiography and the TOE images obtained before establishment of CPB. The primary endpoint of the study, LCOS, was defined as the need for an inotropic or mechanical circulatory support during more than 24 hours postoperatively. Patient and procedure characteristics associated with LCOS at the univariate level (P ≤ 0.05) were entered into a forward stepwise logistic regression to create a first predictive model. A second model was created by adding the GLS dichotomized at the optimal cut-point and the two models were compared using the likelihood-ratio test, the area under the receiver operating characteristic curve (ROC) and the integrated discrimination index (IDI). Secondary endpoints included times to complete weaning from inotropic support, discharge from the ICU, and discharge from the hospital and were analysed using cox proportional-hazards regressions. Finally, 30-day mortality was compared between patients with normal and low GLS.

**Results:** The GLS was successfully calculated in 275 patients and significantly associated with LCOS (P < 0.001) at the univariate level. A GLS > -17 was found to best predict LCOS. Other predictors of LCOS retained in the first model were CPB duration, low preoperative left ventricular ejection fraction, and NYHA functional class III or IV. Adding the GLS to the model improved the prediction of LCOS (P = 0.02). However, areas under the ROC were similar for the two models (0.83 vs 0.84, P = 0.37). The IDI associated with addition of GLS was 0.022 (P = 0.03). Times to complete weaning from inotropes, ICU discharge, and hospital discharge did not differ between patients with normal and low GLS. Eventually, after adjustment for EuroSCORE II, no association was found between GLS and 30-day mortality (P = 0.53).

**Discussion:** Pre-CPB GLS is an independent predictor of LCOS after on-pump cardiac surgery. Its incremental value over other established risk factors of post-operative LCOS is however limited.

**OP49, PP26**

**Time to central venous catheter imaging on the Cardiothoracic Intensive Care Unit (CICU)**

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**Introduction:** There is great disparity amongst policies relating to the routine imaging of Central Venous Catheters (CVCs) post-insertion on Cardiac Surgical Units. Literature review uncovered conflicting evidence with some proponents of routine chest radiographs (CXR) , while others felt the difficulty of insertion was a good indicator of whether a CXR post-insertion was warranted , and still others who felt that this was entirely unnecessary.

CVC Policy within our hospital stated that all CVCs should have a CXR but it did not place a time restriction on this. Our initial audit looking at time to imaging and complications of line insertion changed this policy. Now all CVCs must be imaged within 6 hours from admission to the CICU. We conducted a re-audit after implementation of this policy, and the results are discussed below.
Method: Data was collected retrospectively on the CICU of a West London Hospital. The time from CICU admission to first CXR and any complications were recorded for all cardiac surgery admissions (thoracic cases were excluded). All CXRs (100), were reviewed externally by a Radiologist for line related complications including malposition. Our first audit period ran in February 2014 and the second in May 2015 after implementation of a new CVC policy. 50 patients were collected in each group.

Results: The mean number of hours to CXR in February, 2014 was 26.4hrs (30.3 ± 2SD). Following the change in CVC policy the average time to CXR was 2.81hrs (4.03 ± 2SD), with the majority of CXRs being done at 1 hour. Interestingly, the incidence of complications in both periods was 6%. Complications from Feb 2014 included 2 pneumothoraces and 1 malposition that resulted in arrhythmia. Complications in May 2015 included 1 pneumothorax and 2 malpositions. There was an incidental finding of 2 pneumothoraces on the contralateral side to line insertion from the cases in Feb 2014.

Discussion: Our results show that the new policy has been well implemented on the CICU, even though 4 cases (8%) fell outside the 6 hour window. A complication rate of 6% in the first audit prompted the change in CVC policy. These included 1 case of non-sustained Ventricular Tachycardia associated with a malpositioned line, as well as pneumothoraces (including one case which tensioned). With the same incidence of complications in both periods we believe that early imaging and detection of complications is essential to improving patient safety following CVC insertion. All images were reviewed by a Radiologist, who diagnosed some CVC malpositions that were not detected by the clinical team. This highlights the further benefit of early CXR reporting.

OP50, PP22

Changes of serum creatinine in the early postoperative period and prognosis prediction of patients after cardiac surgery

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Introduction: Preoperative renal insufficiency is an important predictor of mortality after cardiac surgery and the association between small serum creatinine (SCr) changes (ΔCrea) within 48 hours after cardiac surgery and 30-day mortality has been demonstrated. (1) Further it has been shown recently that a preoperative elevated baseline SCr (IniCrea) is a predictor for worse outcome after cardiac surgery too. (2) The aim of the present investigation was the association between ΔCrea early after surgery on longterm mortality in patients below and above the IniCrea cut-off value of > 1.3 mg.dL-1 where mortality increases.

Methods: Elective adult cardiac surgical patients between 1997 and 2008 at the Medical University of Vienna were included. First the cohort was split into the two IniCrea-groups (low IniCrea: ≤ 1.3 mg.dL-1; high IniCrea: > 1.3 mg.dL-1). Second, the ΔCrea between the highest measured SCr within
120 minutes after end of surgery and the IniCrea value was calculated for each patient. Finally, the ΔCrea was divided in 4 groups depending on their change in SCr: A:(∞,-0.3]; B: (-0.3,0]; C:(0,0.5]; D:(0.5,∞].

**Results:** A total of 8030 patients (2834 women) with a mean age of 65.5 years (range, 18 to 94) were investigated, 1517 patients had an elevated IniCrea. Overall 2764 died within the observational period of 14 years.

Mortality was lowest in patients within cohort B and highest in cohort D in the low IniCrea-group. For the high IniCrea-group mortality was nearly equal in patients within cohort A&B and highest in cohort D. Detailed results are shown in figure 1.

**Discussion:** A slight decrease in SCr is the reaction to fluid supply and blood loss.

In patients with a low IniCrea both, a profound decline and a rise in ΔCrea increases the risk of mortality. In patients with a high IniCrea a decline in ΔCrea does not seem to increase the risk of mortality, but even a slight increase of ΔCrea worsens the outcome. Our findings suggest that an increase of ΔCrea early after CPB is worse and may be a marker of diffuse organ injury. A renoprotective postoperative course in those is recommended.

**REFERENCES:**

**OP51, PP38**

**Non-invasive indices of right ventricular afterload following lung resection**

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**Introduction:** Surgical resection of lung cancer offers the best chance of cure but is associated with post-operative dyspnoea and decrease in functional capacity. This decrease in functional capacity is poorly related to the change in lung function and may be influenced by post-operative cardiac dysfunction. Our group has shown that right ventricular (RV) ejection fraction falls following lung resection and we hypothesise that this change results, at least in part, from an increase in RV afterload. Previous studies have not demonstrated a consistent increase in pulmonary vascular resistance following resection although this measure overlooks changes in the pulsatile components of afterload. Pulmonary artery (PA) distensibility and PA acceleration time (PAAT) are non-invasive indices of afterload which assess the pulsatile components of afterload and may offer insight into RV loading conditions following lung resection. Distensibility is a measure of pulmonary artery stiffness and is related to compliance whereas PAAT is
associated wave reflections; both decrease in conditions of increased afterload.

Methods: With ethics approval, velocity encoded cardiac MRI of the main, right and left PA’s was performed; pre-op, on post-op day two (POD2) and two months on 27 patients undergoing lung resection by thoracotomy. Randomised and anonymised images were dual reported for PAAT and distensibility. PAAT is the time to peak flow (ms) and distensibility was calculated as (max−min PA area)/min PA area. Comparisons were made using independent samples or paired t-tests.

Results: The distribution of cardiac output was higher through the PA on the operative side than the non-operative side pre-op (p = 0.03) but higher in non-operative vessel on POD2 (p < 0.01) and at two months (p < 0.01). Operative vessel distensibility fell from pre-op on POD2 (p = 0.02) and at two months (p = 0.04); non-operative and main PA distensibility were unchanged throughout (p > 0.14). Distensibility was lower in the operative than non-operative vessels only at two months (p = 0.01). PAAT decreased in all vessels from pre-op to POD2 (p < 0.01 for all). Main and operative PAAT remained decreased from pre-op to two months (p = 0.02 and p < 0.01) whilst non-operative PAAT returned to baseline (p = 0.22) (Figure 1). PAAT was shorter in the operative than non-operative vessels on POD2 (p < 0.01) and at two months (p = 0.02).

Discussion: The changes in distensibility and PAAT imply the RV is subject to increased afterload following lung resection. By two months the non-operative vessel appears to have adapted to the increased cardiac output showing no change in distensibility or PAAT whilst the operative vessel has decreased distensibility and PAAT despite receiving a lower cardiac output. This operative vessel afterload is reflected in the main PA as decreased PAAT. Further work is needed to investigate if the described changes in afterload worsen on exercise and contributes to the post-operative decrease in functional capacity.

Discussion: The changes in distensibility and PAAT imply the RV is subject to increased afterload following lung resection. By two months the non-operative vessel appears to have adapted to the increased cardiac output showing no change in distensibility or PAAT whilst the operative vessel has decreased distensibility and PAAT despite receiving a lower cardiac output. This operative vessel afterload is reflected in the main PA as decreased PAAT. Further work is needed to investigate if the described changes in afterload worsen on exercise and contributes to the post-operative decrease in functional capacity.

OP52, PP32

Respiratory complications after lung resection: risk prediction model

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Introduction: Clinically significant postoperative pulmonary complications (PPCs) occur in 10% to 20% of patients after thoracic surgery. (1) Perioperative morbidity and mortality in thoracic surgery is a public health issue, due to its impact on short-and long-term survival and consumption of resources in health services. (2) Risk prediction scores help physicians to optimize individual perioperative management and provide them with an accurate method of stratifying patients by risk. Several scores have been developed and tested to improve stratification of mortality risk in thoracic surgery but few studies have dealt with pulmonary complication risks. The aim of our study was to derive a new predictive index for PPCs in pulmonary resection surgery in our population to identify high risk patients.

Methods: It was a retrospective, observational multicentre study (13 Spanish hospitals) during a period of 6 months. All the adult consecutive patients who underwent pulmonary resection were included. A record of the PPCs defined, as the presence of any of the following: atelectasis; pneumonia; pulmonary embolism; respiratory failure; and need for supplemental oxygen at hospital discharge. We used the potential PPC predictor variables according to earlier studies. A logistic regression model was constructed based on the presence of a PPC as the dependent variable. Bivariate analysis was performed to identify the preoperative variables that were associated (P < 0.05) with PPCs. Multivariate linear regression modelling, by backward stepwise selection (p < 0.05), was performed to assess the adjusted associations of the variables with the occurrence of PPCs. AUROC was computed as a descriptive tool for measuring discrimination by the model. To perform an internal validation of the proposed score, we conducted bootstrapping with 1000 replications using bias-corrected confidence intervals.

Results: The study included 559 patients, of whom 65 (11.6%) suffered PPCs. 359 patients had primary lung cancer, 25% had lung metastatic disease and 10% had non-oncological disease. We identified three statistically significant factors for predicting PPCs: age; smoking status; and predicted postoperative forced expiratory volume in 1 s (ppo FEV1%). Combining them into a simple risk score (Age (years) − ppoFEV1 (%) + (50 if current smoker or 35 if ex-smoker)), we were able to obtain an AUROC of 0.74 (95% confidence interval 0.68 to 0.79). (Fig 1.) We selected a score of 30 as the optimal cut-off value (sensitivity 80% and specificity 61%). According to that, 63% of our cohort was successfully classified as high risk with a likelihood ratio of 2.02.

Discussion: We used a more accurate score to predict the occurrence of PPCs in our cohort than the described previously in the literature. (3) It is based on age, smoking status and ppo FEV1s. We propose that our formula should be externally validated.
OP53, PP14

Evaluation of simulator training on transoesophageal echocardiography performance in anaesthesia residents

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Introduction: Training in transoesophageal echocardiography (TEE) is based on hands-on training in the operation room which is time consuming and therefore its experience is limited among anaesthesiologists.

Medical simulation has been used successfully for training of invasive procedures in many areas. (1)

We assessed if there was a difference in the study effect of teaching the 11 basic TEE views (2) in 3 groups of residents with no prior knowledge of echocardiography: the online study group (ON), the simulation group (CAE Vimedix Simulator) (SIM) and the hands-on group in the operation room (OR).

Methods: All 3 study groups received a lecture about theoretical knowledge followed by 2 practical study sessions either in the operating room, with the simulation model or online (www.pie.med.utoronto.ca/TEE). They had to complete a theoretical multiple choice test before and after the teaching sessions and a practical test after each training. In the practical test demonstration of the 11 basic TEE views was required. This examination was scored on a scale from 0 to 110 points (up to 10 points for each view).

Results: Fifty-one residents were randomized to three groups. Scores in the theoretical test for all groups were 28.63 ± 4.78 before the training and 37.61 ± 5.63 after the training (p=0.007, n=41). Scores in the theoretical test after the training sessions were 35.9 ± 4.65 (ON, n=14), 41.8 ± 4.36 (SIM, n=15) and 34.3 ± 5.14 (OR, n=12). Scores in the practical test were 106.36 ± 4.85 (ON), 108.4 ± 2.22 (SIM) and 106.58 ± 2.23 (OR). There was no significant difference between the 3 groups.

Discussion: The study effect of teaching the 11 basic TEE views was similar in all study groups with the best but not significant effect in the simulation group. Therefore, medical simulation is a useful alternative to training in the operation room and is not limited by time factors and the OR schedule.


OP54, PP15

A case of left atrial dissection after mitral valve replacement

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A 54 year old female case of rheumatic heart disease with severe mitral stenosis (mitral valve area 0.8cm²), moderate mitral regurgitation and moderate pulmonary arterial hypertension, underwent mitral valve replacement with a bioprosthetic valve 25mm. Her intraoperative period and postoperative day (POD) one was uneventful. On POD two she had hypotension with increasing requirement of inotropes. Her central venous pressure (CVP) was 20 mmHg and pulmonary artery pressure (PAP) was 60/38 mmHg. Arterial blood gases also revealed metabolic acidosis. Due to her haemodynamic status she could not be extubated.

Transoesophageal echocardiography (TOE) was done to rule out cardiac tamponade and to evaluate the prosthetic mitral valve. TOE revealed a large cavitating mass occupying the whole of the left atrium (LA) which was obliterating the movement of the mitral valve (MV) leaflets (figure1). There was gradient (peak/mean) of 13/8 mmHg across MV.

She was planned for re-exploration and cardiopulmonary bypass was established. Opening of LA revealed dissection of the LA wall. Deroofing of the LA was done and the bioprosthetic valve was checked. The patient was weaned off the CPB with mild inotropes. She was mechanically ventilated for 24 hours and inotropes gradually weaned. Her postoperative period was uneventful.

LA dissection is a rare and fatal complication of cardiac surgery with reported incidence of < 0.2%. It is primarily seen after mitral valve surgery and due to formation of a cavity between endocardium and epicardium of LA. LA dissection
with haemodynamic instability like in this case should be treated promptly with surgical intervention following TOE. However, haemodynamically stable dissections can be managed medically. Recently it has been reported after transcatheter aortic valve replacement.

REFERENCES:

OP55, PP21

Intraoperative red blood cell transfusion trigger in double lung transplantation: the higher the better?

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Introduction: Transfusion of packed red blood cells (PRBC) during double lung transplantation seems to have no effect on all-cause mortality of recipients [1]. This stands in contrast to general cardiothoracic surgery where low transfusion triggers are seen as a viable way to reduce the risks associated with the transfusion of PRBC [2]. We therefore investigated the effect of postoperative hemoglobin levels on mortality after lung transplantation.

Method: We conducted a retrospective cohort study investigating data from our institutional lung transplant database that comprised the time frame from January 2009 through July 2015. Hemoglobin levels immediately after surgery at arrival on the ICU were used to calculate mean and median values and patients were stratified into two groups: the low hemoglobin group (hemoglobin ≤ median) and the high hemoglobin group (hemoglobin > median). Our end point was all-cause mortality, assessed by the Kaplan-Meier method during the first year after transplantation. Log-rank test was used to test for group differences. A P-value < 0.05 was considered significant

Results: A total of 719 patients have been transplanted during the study period. Mean hemoglobin level at arrival on the ICU was 11.9 ± 1.5 g/dL and median was 11.9 g/dL. Kaplan Meier analysis is shown in Figure 1. The log-rank test for the difference between the two groups gave a p-value of 0.00018.

Discussion: This may indicate that patients arriving on the ICU with a higher level of hemoglobin have a significantly better chance to survive the first year after transplantation. A different transfusion policy might therefore be required for patients undergoing double lung transplantation in comparison to patients undergoing general cardiothoracic surgery.

REFERENCES:
Assessment of image quality of repeated focused transthoracic echocardiography after cardiac surgery

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Introduction: Focused transthoracic echocardiography (TTE) has emerged as a vital skill for the cardiothoracic anaesthetist to evaluate haemodynamic state and cardiac pathology in real-time. However, its use is restricted in patients after cardiac surgery due to reported poor image quality. The aim of this study was to determine the proportion of patients in whom haemodynamic state assessment is possible using a focused TTE protocol at repeated intervals after cardiac surgery.

Method: Retrospective sub-study of a published prospective observational study of 91 adults undergoing coronary artery, valve and aortic surgery (1). Patients received TTE before, and at three time points after cardiac surgery. Images were assessed offline using a validated image quality score by two expert observers. Haemodynamic state was assessed using the iHeartScan protocol, which integrates left and right ventricular volumes, contractility, and left atrial filling pressure. Significant valvular pathology was discriminated using colour flow Doppler and two-dimensional assessment without requirement of spectral Doppler. The primary endpoint was the proportion of patients with at least one window in which the haemodynamic state was interpretable at each of the four time points.

Results: In total, 51 patients were included in which haemodynamic state interpretability varied over time being highest before surgery (90%) and lowest on the first postoperative day (49%) (p < 0.01). Variation in interpretability over time occurred in all three transthoracic windows ranging from 43% to 80% before surgery and from 2% to 35 on the first day after surgery (p < 0.01). Similar variations over time were seen in terms of interpretability of function of aortic valve: 96% to 100% before surgery depending on the window and 59% to 82% on first postoperative day, mitral valve: 65% to 100% before surgery and 4% to 90% on first postoperative day, pulmonary valve: 80% before surgery and 41% on first postoperative day, and tricuspid valve: 63% to 98% before surgery and 2% to 59% on first postoperative day. Image quality scores were highest with the apical window ranging from 53% to 77% across time points and lowest for the subcostal window ranging from 4% to 70% across time points (p < 0.01).

Discussion: Interpretability of haemodynamic state and valve function with focused TTE is possible using a focused protocol after cardiac surgery at repeated time points in a high proportion of patients.

OP57

3D right ventricular global longitudinal strain correlates with mortality after cardiac surgery

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Introduction: Correct functional assessment of the right ventricle (RV) is of critical importance and impacts patient outcome (1). Because of its complicated geometry the right ventricular function using 2D echocardiography can only be

Figure 1 Interpretability and image scoring of focused TTE at four time-points after cardiac surgery

Figure Legend
Transthoracic echocardiography performed:
T1 – before surgery
T2 – 1st day after surgery
T3 – after extubation and removal of drains
T4 – patient ready for discharge
estimated by using surrogate parameters. In contrast, 3D echocardiography allows measurement of the RV ejection fraction (RVEF). Contractile dysfunction can be assessed and quantified using RV global longitudinal strain (RVGLS) (2).

We hypothesized that the preoperative 3D TEE derived RVEF and the 3D derived RVGLS correlates with mortality after cardiac surgery procedures.

**Methods:** A retrospective analysis of the institutional echo database was performed. Approval was given by the institutional review board. A total of 158 patients undergoing cardiac surgery procedures between November 2013 and June 2016 at the University Hospital Tübingen, Germany were identified to have complete right ventricular full volume datasets. 30 patients had to be excluded because of low frame rates or right sided cardiac surgery. 128 patients had complete preoperative 3D TEE full volume exams. All recorded TEE exams had been performed as per clinical standard after induction of anesthesia prior to sternotomy and after separation from cardiopulmonary bypass or in off pump surgery prior to sternal closure. All 3D datasets consisted of a preoperative 4-chamber view 3D full-volume loop of the right ventricle (multi-beat acquisition with 4 beats). A 4-dimensional model of the right ventricle was established using the Tomtec 4D RV Function® Software (Ver. 2.0, TomTec Imaging System GmbH, Unterschleissheim, Germany). The 3D TEE RV ejection fraction (RVEF) was calculated and the Tricuspid annular plane systolic excursion (TAPSE) and global longitudinal strain (GLS) was obtained derived from the full volume 3D data set.

**Results:** 128 patients (male = 94, female = 34; age 64 ± 15 years (17-87), BSA 1.94 ± 0.23 m²) with 3D TEE full volume datasets were included in the analysis. Surgical procedures included CABG (on pump) n = 31 (24.2%), OPCAB n = 19 (14.8%), AVR or MVR n = 39 (30.5%), combination CABG and valve n = 17 (13.3%), LVAD n = 17 (13.3%).

A preoperatively reduced freewall Right Ventricular Global Longitudinal Strain (RVGLS) was associated with a significantly increased in-hospital mortality (p < 0.007, mean RVGLS-freewall -9.24 7.74 SD) whereas neither a preoperatively reduced 3D RVEF (mean 34.4 11.0 SD) or TAPSE (mean 11.3 4.2 SD) correlated with increased in-hospital mortality (p = 0.70 and p = 0.78 respectively).

**Discussion:** 2D RV global longitudinal strain (RVGLS) has been previously shown to have predictive value in patient outcome. We now show that the 3D derived RVGLS of the RV freewall as a parameter for global functional impairment correlates with increased mortality in cardiac surgery patients and can be used to identify these high-risk patients.

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**OP58**

**Incidence of ARDS following cardiac surgery: comparison between American-European Consensus Conference Definition and Berlin Definition**

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**Introduction:** Acute respiratory distress syndrome (ARDS) is a leading cause of hypoxic respiratory failure after cardiac surgery. Development of this syndrome after cardiac surgery is associated with high mortality. ARDS after cardiac surgery was first described in 1973. However, over the last thirty years, patients’ profiles for surgery and the definition of ARDS have changed. In 2012, a new definition of ARDS (called the Berlin definition), was published. The aim of this study was to compare the incidence, risk factors, and mortality of patients...
Methods: We performed a retrospective, observational study that included prospectively-collected data from consecutive patients who had undergone cardiac surgery at a large tertiary university hospital over a 3.5-year period between 01.09.2012 and 30.03.2016. The study population comprised 2995 patients. Using non-identifiable patient data, we evaluated the following variables: sex, age, presence of congestive heart failure (NYHA class III-IV), peripheral vascular disease, chronic obstructive pulmonary disease, diabetes mellitus, presence of preoperative renal failure and left ventricular function. Peri- and postoperative variables included priority of surgery (elective, urgent or emergent), type of surgery, duration of cross-clamping and bypass, number of transfusions with PRC, need for revision, postoperative acute kidney injury, pneumonia, sepsis and presence of low cardiac output syndrome. All patients with a diagnosis of ARDS during the ICU stay were monitored by pulmonary artery catheter, and underwent serial echocardiographic evaluation according to our departmental policy. Complex surgery was defined as concomitant CABG and valve surgery or multiple valve surgery.

Results: From the 2995 patients who underwent cardiac surgery during the study period, 35 patients (1.17%) developed ARDS/ALI according to the AECC definition, and 37 patients (1.24%) according to the Berlin definition. The mortality rate was 34.3% and 32.4%, respectively (a total of 12 patients). Multivariate regression analysis identified prior cardiac surgery, complex cardiac surgery and > 3 transfusions with packed red blood cells as independent predictors for developing ARDS according to both definitions.

Discussion: ARDS remains a serious but very rare complication after cardiac surgery and is associated with significant mortality. Incidence and mortality rates of ARDS were found to be similar according to both the AECC and Berlin definitions.


OP59

Pre-operative frailty scores as markers for assessing disability-free survival in cardiac surgery?

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Background: Cardiac surgical populations are increasingly ageing. It is becoming more important to accurately stratify perioperative risk in these patients. It remains uncertain whether frailty scores provide added benefit in predicting morbidity and disability in cardiac patients. New patient centred outcome variables, such as disability-free survival,¹ are of interest to both patients and clinicians.

Objective: To investigate whether frailty scores have the potential to predict postoperative disability-free survival in cardiac surgical patients.

Method: A prospective, observational cohort study in 146 patients undergoing elective cardiac surgery at a large teaching hospital. Comprehensive Assessment of Frailty (CAF)² was used preoperatively to assess for frailty, and the World Health Organisation Disability Assessment Schedule 2.0 (WHODAS) was used to assess disability before, and 1 month after surgery. Length of hospital stay and mortality at 1 month were also recorded.

Results: Of 146 patients, 47 (32%) were identified preoperatively as frail, mean CAF frailty score of 9 (range 2-31). Age, gender and cardiovascular risk factors were not significantly different in frail patients. Preoperative CAF was found to correlate significantly with postoperative disability (WHODAS) score ($r=0.36, p<0.01$).

Frail patients had significantly reduced disability-free survival compared to non-frail patients, OR 2.2 (95% CI 1.1-4.7, $p<0.05$).

Length of hospital stay was significantly greater in the frail group, median 7.5 days (range 4-51), than in the non-frail group, median 6 days (range 4-31, $p<0.05$). In-hospital mortality was significantly higher in the frail group (8.6%) than in the non-frail group (0%, $p<0.05$).

Discussion: Frailty is associated with reduced postoperative disability-free survival at 1 month in cardiac surgical patients, hospital stay and mortality; and it provides potential as an added variable in surgical risk stratification for patient centred outcome variables.


OP60

Optimisation of pre-operative haemoglobin in patients undergoing elective cardiac surgery

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Introduction: An audit conducted over 22 months at St Thomas' Hospital identified that 25% of elective cardiac surgery patients (338/1360) are anaemic. Lower preoperative haemoglobin (Hb) was significantly associated with increased transfusion rates and increased intensive care unit and hospital length of stay1.

In line with British Society of Haematology guidelines2, a pilot pathway was established in January 2015, the aim of which was to optimise patients with low pre-operative haemoglobin levels and/or low iron stores. The pathway was revised in October 2015 and one year of results are presented here.

Methods: Patients referred for cardiac surgery with Hb < 110g/L or ferritin < 100μg/L were included and given 500mg intravenous iron (Ferinject). Patients were given a further treatment dose if they continued to meet referral criteria. Haemoglobin levels were re-evaluated upon admission for surgery.

The Sign test was used to compare changes in haemoglobin at referral and day of surgery. Pearson’s correlation coefficient and lines of best fit on attached figures were calculated and plotted using IBM SPSS 23. Continuous variables are described using median and interquartile ranges (IQR).

Results: 114 patients were included in the revised pathway and received intravenous iron. Amongst them, 38% were anaemic, and 12% had an Hb < 110g/L. Post treatment prevalence was 16% and 4% respectively.

The median change in Hb was 4g/L, (p=0.003). Those who were anaemic at referral showed a rise in Hb of 9g/L (IQR 4-19) P < 0.0001, whilst non anaemics showed a change of 0g/L (IQR -3 to +4) p=1.0. Those with Hb < 110g/L showed a change of 14g/L (IQR 4-33) p=0.013.

Discussion: The introduction of a patient blood management programme involving the administration of intravenous iron leads to increases in the pre-operative haemoglobin levels of patients undergoing elective cardiac surgery. The magnitude of this increase is most pronounced in those with lower Hb, particularly those < 110g/L.

Conversely, non-anaemic patients with low ferritin do not show a significant increase in Hb pre-operatively. Whether these patients benefit from intravenous iron in terms of transfusion requirements or incidence of adverse outcomes remains to be elucidated.


OP61

Metabolic acidosis after heart surgery and intraoperative red cell salvage

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Introduction: Metabolic acidosis is common in the early postoperative period after cardiac surgery and in part, related to the composition and volume of intravenous fluids administered during surgery. In particular, rapid infusion of large volumes of sodium chloride 0.9% has been associated with hyperchloraemic metabolic acidosis[1]. Sodium chloride 0.9% is used as the wash and suspension solution for intraoperative mechanical red blood cell salvage (ICS). Therefore, we hypothesised that ICS may contribute to metabolic acidosis following heart surgery. Our aim was to determine whether the volume of ICS blood reinfused into cardiac surgery patients was associated with severity of metabolic acidosis as estimated by standard base deficit (SBD), in the immediate postoperative period.

Methods: A single centre, prospective observational study was designed. All patients undergoing cardiac surgery at the Edinburgh Royal Infirmary between 11-30th July 2016 were approached for consent. The volume of reinfused ICS blood,
and ABG readings from immediately before anaesthesia induction and on arrival in the intensive care unit postoperatively were recorded. Change in SBD from before to immediately after surgery was used as the outcome measure.

**Results:** Thirty-seven patients (24 male, 13 female) with a mean age of 65 ± 11 years and mean BSA of 1.9 ± 0.3 m² were recruited. Procedures included coronary artery bypass graft (13), valve replacement/repair (18) and combined procedures (6). The mean volume of ICS blood reinfused was 638 ± 327 ml. ABG results are summarised in Figure 1. ICS reinfusion volume correlated weakly and negatively with change in SBD (r = -0.383, r² = 0.146, p = 0.019). Change in SBD also correlated significantly with the increase in chloride concentration (r = -0.655, p < 0.001).

An opportunistic stepwise multiple regression was run using postoperative plasma hydrogen as the dependent variable. Preoperative plasma hydrogen (β = 0.70, p < 0.001), change in PaCO₂ (β = 1.03, p < 0.001), total volume of fluid infused (β = 0.30, p < 0.001) and change in strong ion difference (β = -0.17, p = 0.05) together explained a significant proportion of the variance in postoperative plasma hydrogen (r² = 0.80, F (4, 32) = 32.194, p < 0.001).

**Discussion:** The significant but weak correlation between ICS reinfusion volume and base deficit found in this study indicates that red cell reinfusion contributes slightly to postoperative metabolic acidosis. The modest correlation with chloride levels suggests that the acidosis is of hyperchloremic origin.

Multivariate analysis highlights that besides strong ions like chloride, haemodilution secondary to intravascular volume replacement might influence acidosis development. Measuring serum lactate and serum albumin would help assess the contribution of hyperperfusion and haemodilution to the base deficit. Nevertheless, ICS-induced hyperchloremia is an iatrogenic cause of acidosis that might be avoided by using an alternative balanced crystalloid solution.

**Conclusion:** Cell salvage reinfusion is associated in a small way with severity of metabolic acidosis in patients following cardiac surgery.


**OP62**

The preconditioning properties of Sevoflurane seems not to be superior to TIVA – a cohort study of 17,771 patients

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Although several meta-analyses suggest beneficial effects of volatile inhalation agents (VIA) compared to total intravenous anaesthesia (TIVA) results are conflicting. Theoretically, experimentally and clinically propofol reduces oxidative stress and may thus protect against ischemia-reperfusion injury. The aim of this study was to evaluate whether the cardio protective effects of VIA is superior to TIVA, taking the patient preoperative cardiac state into consideration.

**Methods:** A study of 17,771 eligible procedures prospectively registered in the detailed West Denmark Heart Registry (WDHR) from 2007-15. All patients received TIVA or VIA. Patients in TIVA group received propofol 40-80 μg/kg/min. Induction in VIA patients were Midazolam or propofol and maintenance Sevoflurane 1.5-2.5%, continued during cardiopulmonary bypass. All patients received sufentanil 3-5 μg/kg or less often fentanyl 10-25 μg/kg for pain control and rocuronium/cisatracurium before endotracheal intubation. Perioperative treatment was at the discretion of the attending anaesthesiologist and surgeon. Patients received routine monitoring including ECG, radial and for the majority pulmonary artery catheters, pulse oximetry, capnography and temperature monitoring. Most patients were additionally monitored with perioperative transesophageal echocardiography. Patient characteristics and procedures were described primarily by EuroSCORE.

The short-term outcomes were 30-days mortality and postoperative incidence of in-hospital myocardial infarction (MI), CK-MB level, stroke and new dialysis. Long-term outcomes were long time in ICU, new ischaemic event (coronary angiography, percutaneous coronary intervention or re-do coronary artery bypass grafting) together with mortality within 6-months after the procedure. All outcome measures were in accordance with the pre-specified classifications used in the WDHR.

Propensity score matching was used to reduce the risk of confounding bias and non-random factors. Each TIVA patient was matched with a VIA patient with the nearest propensity score within a caliper range ± 0.025. We matched 6,800 (87.2%) of 7,796 TIVA patients.

**Results:** In crude analysis, TIVA was superior to VIA regarding 30-days mortality, in hospital MI and more than 72 hours in ICU. The effect on 6-month mortality was
All outcomes, also in subgroups were non-significant after adjustments.

Discussion: In this large cohort study of cardiac surgery patients from three university hospitals, we could not demonstrate differences between volatile anaesthesia and TIVA in postoperative outcomes.

OP63

Post-cardiotomy extra corporeal life support (ECLS) for refractory cardiogenic shock: a 4-year retrospective case-note audit in South Manchester, UK

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Introduction: ECLS for refractory cardiogenic shock post-cardiotomy can preclude the development of a multi-organ failure syndrome, with the ensuing aim for weaning, decannulation and recovery. We undertook a retrospective case-note audit for patients where ECLS was employed in such circumstances at a UK cardiothoracic centre.

Methods: We included cases where ECLS was initiated post-cardiotomy for refractory cardiogenic shock from August 2012-2016. Transplant cases were excluded. Data collected included age, gender, operation, urgency, logistic euroSCORE, ECLS mode, ECLS duration, ECLS complications and the cause of death. 30-day and 2-year mortality were derived from hospital records.

Results: 28 patients were included in the analysis. The age range was 23-77 (mean 57.7) and most were male (79%). The logistic euroSCORE range was 1.51-75.05% (mean 16.97%). Elective cases accounted for 46%, as did re-do surgery. The mean ECLS duration was 9.4 days. 19 (68%) were successfully weaned from support. 30-day and 2-year survival was 50%. The associations between recorded variables and mortality are provided in Table 1. 23 (82%) cases had documented evidence of multidisciplinary discussions, as per best practice local agreements, prior to initiation of ECLS. The complication rates were low, with one documented episode of limb ischaemia and one intra-cerebral haemorrhage. Causes of death were multi-organ failure (6), bowel ischaemia (5), biventricular failure (3), right ventricular failure (2), and unrelated causes (2).

Conclusion: We report encouraging survival data for this cohort of patients at our centre when compared to other published data. [1,2]. The included patients appear largely homogenous as evidenced by the lack of association between recorded variables and survival. A possible explanation for this could be appropriate patient selection. In order to initiate post-cardiotomy ECLS, consensus must be reached between four appropriately experienced consultants. There is a complex balance between permitting more/less restrictive use of post-cardiotomy ECLS and such changes could worsen overall mortality and increase costs. Thus, we believe that we are currently getting these difficult judgments right. We therefore propose several areas for further enquiry. The decision-making processes around the initiation of post-cardiotomy ECLS require further study. A comparison of those granted or denied the intervention through prospective observation could be used. Post ECLS mortality and dyspnoea may not tell the whole story and studies that reach beyond this to investigate quality of life and functional capacity for such patients are much needed.


OP64

Continuous ventilation during tracheal dilatation using a novel, non-occlusive tracheal balloon dilator in an ovine model

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Introduction: Subglottic and tracheal stenosis pose a challenge to surgeons and anaesthesiologists. Although common aetiologies differ in adults and children, post-intubation injury is universally the leading cause. Tracheal stenosis often presents as an airway emergency, and is difficult and costly to treat. Definitive surgical correction requires tracheal resection and reconstruction, but may be avoided with dilatation. This requires bougies of increasing diameter, or balloon dilatation. Balloon dilatation is effective and low risk compared to reconstruction, but may require multiple procedures. Traditional balloon dilators cause complete occlusion of the trachea, which prevents ongoing oxygenation and ventilation, limits the safe duration of dilatation, and increases the risk of barotrauma. We investigated the performance of a novel, non-occlusive tracheal dilatation balloon in anaesthetised sheep, to assess whether continuous ventilation is possible with this device.

Method: With institutional animal research ethics approval, eight adult anaesthetised sheep were included in the study. After induction of anaesthesia, each subject was intubated with a 9.0 mm internal diameter endotracheal tube (ETT), and ventilated using volume control. Pulse oximetry, electrocardiograph, airway pressures and volumes, and continuous waveform capnography were continuously measured. Using a bronchial blocker adaptor, a 3.7 mm flexible fiberoptic bronchoscope and the study device were introduced through the ETT, advanced to a mid-tracheal position, and the balloon inflated. Without altering ventilator settings, tidal volume (Vt), peak and plateau airway pressures (Ppeak/Pplat) were recorded with the ETT alone, with the deflated balloon and bronchoscope in the trachea, and with the balloon inflated.

Results: All subjects could be ventilated continuously. At no time during balloon deployment and inflation was there a loss of capnograph waveform or arterial desaturation. There were no clinically relevant changes in ventilatory parameters, (see figure). The median(range) at each time point were Vt of 565 (370-780), 560 (330-830) and 550(320-830) ml, Ppeak of 11 (9-22), 14(11-17) and 14(13-17), and Pplat of 9(7-17), 11(9-14) and 11(9-14) cmH₂O.

Discussion: Although undertaken in healthy tracheas in an animal model, this study demonstrates that continued oxygenation and ventilation through the study device is possible, effective and practical. Further study is required to apply this non-occlusive balloon dilatation technique in tracheal stenosis and human patients.

OP65

Continued preoperative antiplatelet treatment increases the risk of bleeding but has no impact on postoperative thromboembolic complications

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Patients with ischaemic heart disease referred to cardiac surgery are often treated with antiplatelet (AP) medications, most frequently aspirin (ASA) and adenosine diphosphate (ADP) receptor antagonists (primarily clopidogrel). The drugs seem effective in reducing thromboembolic events awaiting surgery, but carry a risk of increased bleeding and complications. Although unimpressive data, the latest recommendation is continuing ASA but discontinue ADP 5-days before surgery. The aim of this study was to verify associations between continued AP treatments and post-operative thromboembolic complications.

Methods: A cohort analysis of data from our mandatory Western Denmark Heart Registry. Eligible procedures were both on- and off-pump CABG with/without aortic valve replacement (N=10,608), regardless of urgency status. Until 2013 the standard handling of care was discontinuing AP drugs 5-days prior to surgery. A few patients with increased risk continued ASA until the day of surgery. From 2013 all patients continued ASA until the day before surgery. On pump patients received...
standardized cardiopulmonary bypass, where residual blood from the circuit routinely was re-transfused at the end of surgery. Transfusions of blood products were at the discretion of attending anaesthesiologist and surgeon based on local guidelines and national recommendations. The majority of patients received antifibrinolytic treatment.

The endpoints were 30-days and 6-months mortality, transfusions, in-hospital incidence of stroke, MI, new dialysis and a new ischaemic event (CAG/PCI/CABG within 6 months). Propensity score matching was used to reduce the risk of bias due to confounding and non-random discontinuation of AP medication.

Results: Besides a lower risk of postoperative CAG in ASA patients in crude analysis we could not demonstrate differences in outcomes between ASA and control patients. Postoperative drainage and platelet transfusions were marginally higher after ASA, but without difference in re-exploration due to bleeding. Comparing Clopidogrel and ASA the only difference in outcomes was a lower postoperative risk of stroke in clopidogrel-treated patients after adjustment. The Clopidogrel patients received more of all blood-products, bled more and were more often re-explored due to bleeding.

Conclusion: Patients continuing aspirin therapy carry a minor risk of increased postoperative bleeding. The risk is increased if clopidogrel is not discontinued 5 days before surgery. The continued therapy had no effect on the frequency of postoperative thromboembolic complications. The optimal timing of AP therapy still needs solid evidence.
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