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The abstracts published in this issue have not been corrected for spelling or grammar.

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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Out of the box

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Welcome message

Dear All,

We’re delighted to welcome you to the 34th EACTA Annual Congress 2019, hosted in the historic city of Ghent!

Until the 13th century Ghent was the second-largest city in Europe next to Paris and still remains one of the best-preserved medieval cities in all of Europe. The Adoration of the Mystic Lamb, an altarpiece by the Flemish brothers van Eyck, is only one of the treasures of the city. Despite being historic, Ghent remains small enough to feel cozy but big enough to be a vibrant. National Geographic Traveler Magazine has therefore listed Ghent as the most authentic and historic city in the world and full of life.

This year we are collaborating with our North American colleagues from the SCA in order to bring you an exciting meeting with world-renowned speakers, a comprehensive program, multiple pro-con debates and several exciting workshops.

A wise man once said “The only people who see the whole picture are the ones who step outside the frame”. As cardiothoracic anaesthetists and intensivists we need to think further ‘out of the box’ as we are now at the forefront of becoming the new perioperative physician. Therefore it is important to share experiences and knowledge with colleagues, to interact with key opinion leaders and to discover new scientific developments in the field of cardiovascular and thoracic anaesthesiology during our annual congress.

Welcome in Ghent!

Stefaan Bouchez
President of the 34th EACTA Annual Congress 2019
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Session: TO MONITOR, SERVE AND PROTECT THE BRAIN – September 4, 2019

S02:03

Comparison of serum level S100B in patients inducted with desflurane and propofol

V. Aliev, A. Yavorovskiy, A. Popov, E. Bulanova, R. Komarov
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Introduction: The problem of postoperative cognitive dysfunction today remains extremely relevant. One way to protect the brain is to use drugs that increase tolerance to intraoperative ischemia.

The aim of this study is compare protective effects on brain during endarterectomy in terms of intravenous (propofol) and inhalation (desflurane) anesthesia.

Methods: The study included patients over 65 with carotid atherosclerosis(Stenosis >70%) All patient were divided in two groups.

Both groups underwent standard anesthesia induction with fentanyl (10 mcg/kg), propofol (2.0 mg/kg), and pancuronium bromide (0.1 mg/kg)

In group D anesthesia was maintained on O2/air/desflurane at concentrations up to 1.3 MAC and in group P by continuous infusion of propofol.

Serum level of baseline protein S100B (the possibility of using S100b, as a marker and prognostic index for brain tissue damage during ischemic stroke has been proven [1,2]) before surgery (T1), immediately after surgery (T2), and day after surgery(T3) was evaluated in all patients. All patients were continuously monitored for Heart rate, invasive blood pressure, SpO2, urine output, BIS index, capnography, brain dopplerography, nasopharyngeal temperature, and arterial blood gases. During the clamping of the carotid vessels, sympathomimetic support with norepinephrine was used to achieve MBP in the region of 100 mm Hg if required.

Results: The concentration of 100b in both groups did not differ at T1. The serum level of s100B at the T2 and T3 was significantly higher in group P (mediana 0.12 ng/l for group D vs 0.30 ng/l for group P in T2 (p = 0.002)); (mediana 0.15 ng/l for group D vs 0.44 ng/l for group P in T3 (p = 0.001))

Discussion: The serum level of the S100b marker in the postoperative period was significantly higher when TIVA was performed. Probably desflurane has pharmacological protective properties on the brain, but it requires additional analysis.


Session: ECHOCARDIOGRAPHY ANNO 2019 – September 4, 2019

S03:03

Coronary sinus blood flow estimated by transesophageal echocardiography correlates well with transit time flowmetry after coronary artery bypass grafting

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Introduction: The adequacy of revascularisation is an important quality control measure of coronary artery bypass grafting (CABG). Intra-operative transit-time flowmetry (TTF) remains
the most widely used technique for estimation of graft flow due to logistic issues of performing a completion angiography. Coronary sinus blood flow (CSBF) is often used for the assessment of the cardiac perfusion. Previous study have demonstrated the feasibility and reproducibility of transesophageal echocardiography (TEE) based non-invasive estimation of CSBF. [1] Due to paucity of literature, we planned to evaluate the predictive value of TEE based CSBF estimation for identifying favourable TTF graft measurements.

**Methods:** A Prospective observational study designed to include forty adult patients undergoing CABG after obtaining institute ethics committee approval. A TEE probe (Philips iE33, Bothell, WA, USA) was inserted after anaesthesia induction and the coronary sinus (CS) was imaged in the lower esophageal CS view at multi-planar angle of 0-10˚ and CS was centered in the imaging sector. A zoomed view was utilized for measuring the CS diameter 1 cm before its opening into the right atrium. A pulsed wave Doppler was aligned (within 20˚ of angle correction) and applied with the sample volume well within the CS (approx. 1 cm inside). and the spectral signature was traced to get the VTI of CSBF. The acquisition was done 5 min after sternotomy when the haemodynamics returned close to the baseline values. The echo imaging and Doppler interrogations were done by an experienced echocardiographer who was unaware of patients’ diagnosis. After CABG, the surgeon applied TTF probes (Medistim VeriQ® system, Oslo, Norway) to individual grafts for interrogation after ensuring the acoustic coupling index (ACI) >90% under sterile saline. Average graft pulsatility index (PI) and diastolic filling (DF) were noted with special attention to ACI>50%. Before administering protamine, CSBF was estimated once again using the above technique after completion of CABG.

**Results:** The percentage increase in CSBF (ΔCSBF) was estimated by subtracting pre from the post CABG average CSBF values. Subjects were grouped based on favourable (PI <3, DF>50%) and unfavourable (PI>3, DF<50%) parameters. Group with PI<3 (n = 32) had significantly higher ΔCSBF compared to group with PI>3 (n = 8) (38.22±12.05%, 13.75±3.37%, p<0.001). A strong negative and significantly positive correlation was observed between ΔCSBF with PI, DF (r = -0.903, 0.571 respectively, p<0.001). A ΔCSBF >19% was found to predict a mean PI<3 and DF>50% with sensitivity and specificity of 100% and 100%; 100% and 91.4% respectively.

**Discussion:** A TEE based demonstration of an augmented CSBF ensured favourable TTF graft parameters, guiding the adequacy of surgical revascularisation. It expands the horizon for application of TEE in the era of minimally invasive and endoscopic coronary artery bypass surgeries.

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**Pain control with ultrasound-guided ilioinguinal-iliohypogastric nerve block compared with local infiltration anesthesia in patients undergoing transfemoral transcatheter aortic valve implantation: a prospective randomized trial**

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**Introduction:** Ilioinguinal-ilioinguinal nerve block is frequently performed for analgesia in inguinal surgery. The authors hypothesized that preoperative ultrasound-guided ilioinguinal-iliohypogastric (II-IH) nerve block produce better intraoperative analgesia and less analgesic requirement in comparison to commonly used local infiltration anesthesia in patients undergoing transfemoral transcatheter aortic valve implantation (TF-TAVI).

**Methods:** 87 elderly patients scheduled for TF-TAVI were randomized to receive either II-IH nerve block (Group A) or local infiltration anesthesia (Group B) between July 2018 and April 2019 (ClinicalTrials.gov: ID: NCT03863899). In patients in group A ultrasound-guided II-IH nerve block was performed preoperatively by anesthesiologist. Patients in group B received local anesthetic infiltration of the operative area performed by surgeon. Pain intensity was assessed using numeric rating scale (NRS 0-10; 0 = no pain; 10 = the worst pain imaginable) in five time-points intraoperatively (femoral artery cannulation (1), aortic valve system introduction (2), aortic valve implantation: a prospective randomized trial (3), vessel closure devices insertion (4), the end of the operation (5)). When NRS was <4, paracetamol was given intravenously. If NRS was >4, fentanyl was given. The need for additional analgesics was also evaluated during the procedure.

**Results:** After exclusion of 10 patients the analysis was performed in 77 patients: 40 in group A and 37 patients in group B. In time points (1-4) pain intensity was lower in group A than in group B (p<0.0003 for all comparisons). Pain intensity at time point (5) did not differ between the groups (p = 0.52).
The need for supplementary fentanyl administration was lower in group A in comparison to group B (p = 0.02). Time from arrival in operation room to start surgery was longer in group A than in group B (median: 60 min. vs. 50 min., respectively; p = 0.01).

**Discussion:** Ultrasound-guided II-IH nerve block produce better intraoperative analgesia and less analgesic consumption than local infiltration anesthesia in patients undergoing TF-TAVI, at the cost of slightly longer patient’s preparation to surgery.

**REFERENCES:**

**Session:** WHAT’S NEW IN THORACIC ANAESTHESIA? – September 4, 2019

**S05:04**

The association between anaesthetic technique and cancer specific survival following surgical resection of non-small cell lung cancer

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**Introduction:** Due to the biological effects of anaesthetics on the immune system, it has been hypothesised that use of volatile anaesthetics during lung cancer surgery may negatively affect cancer outcomes compared to total intravenous anaesthetics. This study sought to investigate the relationship between anaesthetic choice and lung cancer outcome; the primary outcome was time to cancer specific mortality, with the secondary outcome of time to mortality of any cause. The effect of dose of volatile anaesthetic received was also explored in relation to cancer specific survival.

**Methods:** This is a retrospective cohort study of patients who underwent elective open lung resection for non-small cell lung cancer between January 2010 and December 2014. Surgical records were combined with both information from the Scottish Cancer Registry and continuously recorded, electronically measured anaesthetic data. Kaplan-Meier survival curves were drawn for cancer specific and overall survival and tested for significance using Log-rank testing. Factors influencing survival were analysed using univariate and multivariate Cox Proportional Hazards Ratios.
Exposure to volatile anaesthetic was quantified by determining the area under the end tidal expired anaesthetic agent vs time curve. This was adjusted for anaesthetic type using minimum alveolar concentration (MAC), to give MAC-hours which were plotted against vital status then assessed using logistic regression.

Results: Final analysis included 746 patients, 342 received total intravenous anaesthetic and 404 were exposed to volatile agents, with mean time to follow up of 3.65 (1.2-6.1) years. Log rank testing did not demonstrate significant differences in survival between volatile and total intravenous anaesthetics in terms of cancer specific (p = 0.80) or overall survival (p = 0.74). Anaesthetic type was not found to be a significant predictor for cancer specific or overall survival in univariate or multivariate Cox analysis (p = 0.81 for cancer specific survival and p = 0.94 for overall survival).

Logistic regression used to assess dose-response was not significant for cancer specific survival (p = 0.054). No significance was found in univariate or multivariate Cox analysis for cancer specific survival based on logistic regression results.

Discussion: This study found no significant relationship between anaesthetic technique and long term non-small cell lung cancer survival. This contradicts a large body of retrospective work suggesting a survival benefit in patients receiving total intravenous anaesthesia for cancer surgery, but is in keeping with the findings of Oh et al (1) who also demonstrated no effect in 362 patients undergoing surgery resection keeping with the findings of Oh et al (1) who also demonstrated no effect in 362 patients undergoing surgery resection.


Methods: We recruited 40 patients who underwent LTx in 2013-15 at Harefield Hospital. Clinical data were recorded. Vasoplegia was defined according to Tsiouris et al (1). PGD was diagnosed and scored according to ISHLT criteria 2005, Acute Kidney Injury (AKI) to KDIGO criteria. Blood samples were collected before surgery and at different time points after the arrival in ITU and analysed for MPO and HBP levels (Axis-Shield Heparin Binding Protein ELISA kit). Data were analysed and reported as appropriate.

Results: 13 patients developed post-operative vasoplegia (32%). Within this group, 6 patients also developed PGD (46%, p = 0.284) and 9 AKI (69%, p = 0.312), 7 requiring haemofiltration (54%, p = 0.032). Vasoplegic patients showed lower P/F ratios on day 1 (23.1 [17.3, 35.7] vs. 31.4 [24.4, 41.4], p = 0.151), day 2 936.0 [29.0, 44.6] vs. 46.7 [41.4, 50.5], p = 0.011), and day 3 939.6 [29.7, 46.9] vs. 48.3 [43.4, 53.2], p = 0.004). They also had longer ventilation duration (159 [59, 971] hours vs. 29 [15, 114] hours, p = 0.012) and longer ITU stay (22 [5, 43] days vs. 5 [3, 9] days, p = 0.029). Overall survival was not significantly affected by vasoplegia (log rank 1.005 p = 0.316). Vasoplegic patients exhibit a tendency for higher levels of MPO early after surgery (232 [140, 406] ng/ml vs. 170 [110, 336] ng/ml before surgery (p = 0.247), 566 [84, 1246] ng/ml vs. 312 [121, 658] ng/ml at the arrival in ITU (p = 0.504), 441 [231, 753] ng/ml vs. 300 [142, 518] ng/ml at 6 hours (p = 0.353), 160 [52, 447] ng/ml vs. 139 [112, 744] ng/ml at 12 hours (p = 0.200)), but similar levels of HBP.

Discussion: These results identify high incidence of vasoplegia in the LTx population. One third of our patients developed vasoplegia in the early post-operative period with significant impact on survival and clinical outcomes. We hypothesise that LTx is associated with a high incidence of vasoplegia and that this is associated with a profound inflammatory response and high mortality and organ dysfunction. To test our hypotheses, we have identified patients who developed vasoplegia in the first 48 hours after LTx, described the impact of the vasoplegia on the clinical impact and explored the role of neutrophil degranulation products, such as Myeloperoxidase (MPO) and Heparin Binding Protein (HBP).

Session: ICU UPDATES – September 4, 2019

S07:03

Liraglutide for perioperative management of hyperglycaemia in cardiac surgery patients - A multicentre, prospective, randomised superiority trial

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Introduction: Most cardiac surgery patients, with or without diabetes, develop perioperative hyperglycaemia, for which intravenous insulin is the only therapeutic option. This is labour-intensive and carries a risk of hypoglycaemia. We hypothesised that preoperative administration of the glucagon-like peptide-1 receptor agonist liraglutide reduces the number of patients requiring insulin for glycaemic control during cardiac surgery.

Methods: In this randomised, blinded, placebo-controlled, parallel-group, balanced (1:1), multicentre randomised, superiority trial, adult patients undergoing cardiac surgery in four Dutch tertiary hospitals were randomised to receive 0-6 mg subcutaneous liraglutide on the evening before surgery and 1-2 mg after induction of anaesthesia or matching placebo. Blood glucose was measured hourly and controlled using an insulin-bolus-algorithm. The primary outcome was insulin administration for blood glucose above 8-0 mmol/L in the operating theatre. Research pharmacists used centralised, stratified, variable-block, randomisation software. Patients, care providers, and study personnel were blinded to treatment allocation.

Results: Between June 2017 and August 2018, 278 patients were randomised to liraglutide (139) or placebo (139). All patients receiving at least one study drug injection were included in the intention-to-treat analyses (129 in the liraglutide group, 132 in the placebo group).

In the liraglutide group 55 (43%) patients required additional insulin compared to 80 (61%) patients in the placebo group, absolute difference: 18% (95% CI 5-9–30-0, p = 0-003). Dose and number of insulin injections and mean blood glucose were all significantly lower in the liraglutide group, see figure. We observed no difference in the incidence of hypoglycaemia, nausea and vomiting, mortality, or postoperative complications.

Discussion: Preoperative liraglutide, compared to placebo, reduces insulin requirements while improving peri-operative glycaemic control during cardiac surgery.

Session: PAEDIATRIC CARDIAC ANAESTHESIA – September 4, 2019

S08:03

Using of peripheral near infrared spectroscopy during vascular occlusion test to assess the microcirculatory response during cardiopulmonary bypass in pediatric cardiac surgery

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Introduction: The microvascular dysfunction after cardiac surgery with cardiopulmonary bypass (CPB) and impaired
tissue oxygen saturation (StO2) have been associated with adverse patient outcome.(1) Measuring StO2 using near-infrared spectroscopy (NIRS) with a reproducible vascular occlusion test (VOT) has shown to be a noninvasive method suitable for assessment of microcirculation(2).

The aim of this study was to assess microcirculatory function with NIRS using the VOT during cardiac surgery with cardiopulmonary bypass in pediatric patients.

Methods: 63 pediatric cardiac patients undergoing cardiac surgery with CPB were prospectively investigated. For cardiac surgical patients, NIRS parameters during the VOT were assessed before anesthesia (T1), after anesthesia (T2), full flow CPB (T3), after CPB (T4) and sternum closure (T5). VOT is including baseline, ischemia, reperfusion and return to baseline.

Results: There was significant difference in occlusion slope (rate of oxygen consumption) between T1 and T5 (p = 0.001), T2 and T5 (p = 0.001), T4 and T5 (p = 0.001). Reperfusion slope (representing microcirculatory vasoactive response to hypoxia) was significantly different T1 and T2 (p = 0.004), T1 and T3 (p = 0.001), T1 and T4 (p = 0.006), T2 and T3 (p = 0.01), T2 and T5 (p = 0.03), T3 and T5 (p = 0.002), T4 and T5 (p = 0.04). Reperfusion time was significant differences T1 and T3 (p = 0.03), T2 and T3 (p = 0.0019, T2 and T4 (p = 0.004), T3 and T5 (p = 0.001), T4 and T5 (p = 0.003).

Discussion: Intraoperative monitoring of peripheral microvascular reactivity enables detection of alterations in microcirculatory function thereby may contribute to preventing impaired tissue perfusion(3). The combination of VOT with NIRS monitoring showed CPB induced microvascular dysfunction in pediatric cardiac surgery.


Session: CARDIAC ELECTROPHYSIOLOGY – September 5, 2019

S15:02

Perioperative management of the heterotopic heart transplant recipient for catheter ablation of native heart ventricular tachycardia

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Introduction: Heterotopic heart transplant is a surgical procedure whereby the donor heart is grafted onto the native heart in
parallel and essentially behaving as a biventricular support system for the native heart.

This technique allowed for smaller donor hearts to be used and appeared to be advantageous in the pre-cyclosporine era as those who went on to suffer primary graft failure still had some residual cardiac output from the native heart. This is rarely performed these days and survivor numbers are diminishing, but it is still possible to encounter such patients as they present with coronary artery disease, valvular disease or dysrhythmias in either the native or donor heart, in addition to illnesses unrelated to their transplant.
Results: A 56-year-old male presented to our hospital with palpitations, chest discomfort and dyspnoea 21 years after heterotopic heart transplant for non-ischaemic dilated cardiomyopathy (DCM). ECG confirmed ventricular tachycardia (VT) in the native heart and although initial cardioversion was successful, the VT returned and proved to be refractory to cardioversion and medical anti-arrhythmic therapies. Coronary angiography and cardiac MRI excluded ischaemia as a cause for the dysrhythmia and he eventually underwent cardiac catheter electrophysiology mapping and subsequent radiofrequency ablation of both left and right ventricles including outflow tracts of the native heart.

Challenges of delivering anaesthesia in the cardiac catheter laboratory include its remote location, risk risks of radiation, the ergonomics of positioning (and access to) the patient in an environment that does not lend itself to complex cardiac anaesthesia.

Present in this case was the additional aspect of anaesthetising a heart transplant recipient. Issues relate to both the transplanted heart and the ever-present complications of immunosuppressant drug regimes. These include the pathophysiological consequences of a denervated heart (though in this case most likely to be partially re-innervated) and numerous complex medical co-morbidities including significant renal impairment.

The anaesthetic monitoring required is invariably intricate and must include multimodal ECG, transoesophageal echocardiography and invasive pressure measurement. Cardiovascular instability must be expected at any point during general anaesthesia and extreme vigilance is required from all involved in its delivery.

Discussion: The principles of the perioperative management of orthotropic cardiac transplant recipients apply those with heterotopic grafts. As clinical experience of heterotopic recipients declines, unfamiliarity of the heterotopic transplant circulation is not the only challenge in the management of such patients. Performing and interpreting many of the usual haemodynamic monitoring techniques available to the cardiac anaesthetist (such as electrocardiography, transthoracic and transoesophageal echocardiogram, invasive cardiac output monitors) may prove to be difficult.

Methods: Single center, prospective, observational study. Post-hoc analysis of n = 509 adult patients undergoing open heart surgery on CPB.

Patients were grouped according to one dose of dexamethasone administered before CPB: I - none (n = 326), II - low dose - 0.4 mg/kg (n = 96), and III - high dose - 1.0 mg/kg (n = 87).

Primary outcomes were: IL-6, ICAM1, soluble E-selectin levels three hours after operation, and CRP and WBC - 18 hours after operation.

Secondary outcomes were: new-onset atrial fibrillation, myocardial infarction, delirium, acute lung injury, acute kidney injury, length of stay in ICU and hospital, first-day drainage, and surgical reintervention.

Stratified analyses were performed in CPB duration quartiles: 1: 11 – 100 Min. (n = 130), 2: 101-127 Min (n = 126), 3: 128-160 Min. (n = 126), 4: 161-476 Min. (n = 127).

Results: Dexamethasone ceased the trigger effect of CPB on levels of IL-6, ICAM1, E-selectin at 3 hours after operation and CRP at 18 hours after operation.

The levels of IL-6, soluble E-selectin, CRP and WBC didn't differ between groups II and III (p>0.05) and were lower than in group I (p<0.05). WBC count increase at 18 hours after operation was not related to CPB duration, but to dexamethasone dose alone (p<0.05).

Primary outcome variables were in close association with the secondary outcomes:

IL-6 was a predictor for ICU-LOS (p = 0.049) and AKI (p = 0.0001); ICAM1 for ICU-LOS (p = 0.047), AKI (p <0.0000), and sepsis (p = 0.005); CRP for AKI (p = 0.01) and increased chest drainage (p<0.0000); and WBC for AKI (p = 0.04) and sepsis (p = 0.0004).

Significant effects of dexamethasone were found only in detailed stratified analyses: in the third CPB quartile MI prevalence was higher in group II, compared with group I or III. In patients within the third CPB quartile, group II had higher risk.
of postoperative MI (aRR = 2.15; p = 0.03) in comparison to group I. Higher delirium prevalence in group III when compared with group II was observed in the first CPB quartile (aRR = 7.19; p = 0.035). Incidence of surgical reintervention was significantly lower in groups II and III, regardless of the dose, in the 4th CPB quartile, when compared with group I.

Discussion: CPB duration is a surrogate for complexity of the surgical procedure. Therefore AKI, sepsis, and postoperative bleeding remained in correlation with CPB duration. Dexamethasone in a dose of 0.4 mg/kg was as effective as 1.0 mg/kg in attenuating post-operative SIRS parameters, but had no significant effect on early postoperative morbidity.

Session: LEFT AND RIGHT CARDIAC DYSFUNCTION – September 5, 2019

S17:03

Preconditioning and postconditioning with netrin-1 in acute myocardial infarction model of rat improves systolic and diastolic left ventricular dysfunction

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Introduction: To evaluate the improvement of systolic and diastolic left ventricular (LV) dysfunction by preconditioning and postconditioning with netrin-1 after acute myocardial infarction (MI) in rat model, we examined the changes of echocardiographic parameters and compared with them before and after MI.

Methods: Male, 8-to 9-week-old, Spraque-Dawley rats with a mean body weight of 277.40 ±9.48 g were anesthetized with intraperitoneal injection of pentobarbital at a dose of 65 mg / kg, followed by intubation and positive pressure ventilation for 15 minutes as a stabilizing period. The acute MI model had the ligation of left coronary artery under heart exposure through 4-5th intercostal space then closed. After 30 minutes under mechanical ventilation, the left anterior descending artery (LAD) of the rat was ligated for 30 minutes And reperfusion for 2 hours to produce an ischemic / perfusion animal model of myocardial ischemia.

After 30 minutes of ischemia, netrin-1(5mcg/kg) was slowly injected into MI group but vehicle(normal saline) into another MI group via tail vein. Netrin-1 preconditioning was administered intravenously 3 minutes before the induction of ischemia and 3 minutes after the induction of ischemia. Netrin-1 post-conditioning was administered intravenously 5 minutes before the end of ischemic induction for 3 minutes and pentobarbital 35 mg / kg after 2 hours of reperfusion. And the echocardiographic evaluation was performed.

Using Vevo2100, Echocardiographic studies were performed before surgery and After 120 minutes of reperfusion.

Results: Fractional shortening values were significantly increased in the pre-isch, pre-netrin, post-isch and post-netrin groups compared to the vehicle group. The EF (ejection fraction)
fraction), And in the post-netrin group, the left ventricular systolic function was improved.

$E'(\text{initial diastolic velocity})$ values were significantly higher in the post-iso, post-isch, and post-netrin groups than in the vehicle group. $E / E'$: Post-isch, post-isch, and post-netrin, respectively.

**Discussion:** Preconditioning and postconditioning with netrin-1 makes meaningful improvement of systolic dysfunction with significant increase with FS and EF after acute MI. Also it helps $E'$ recovery for LV diastolic function and $E/E'$ ratio for left atrial pressure.


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**Session:** HEMODYNAMIC MONITORING – September 5, 2019

**S18:03**

The effect of common interventions in the intensive care unit on right ventricular function after cardiac surgery – An intervention study

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**Introduction:** Critical care following cardiac surgery is a complex task including both cardiac and pulmonary management strategies because optimal postoperative care is essential for outcome [1]. The effect of such interventions on right ventricular (RV) function has not been sufficiently explored. The aim of this study was to investigate what effect ICU interventions have on RV function.

**Methods:** Thirty patients were studied in the ICU following coronary artery bypass graft surgery. Transoesophageal echocardiography (TEE) and a pulmonary artery catheter (PAC) were used to assess hemodynamic variables and echocardiographic measures of RV function. TEE evaluation included RV fractional area change, 3D RV ejection fraction, 3D RV stroke volume and RV global longitudinal strain (RV-GLS). Interventions were done separately and included: Trendelenburg position, PEEP 0, 5 and 10 cm
H2O, increased oxygen fraction (100%), and AAI, DDD and VVI pacing.

**Results:** Trendelenburg increased global echocardiographic measures of RV function as well as CO 0.44L*min-1 [95%CI: 0.21;0.67] due to an increased stroke volume (SV). Increasing PEEP from 0 to 10 reduced SV and consequently CO by 0.41L*min-1. Pulmonary vascular resistance (PVR) was not significantly changed by different PEEP levels. AAI or DDD pacing at a heart rate 15 beats above baseline increased CO 0.35L*min-1 [95%CI 0.07;0.63]. In contrast VVI pacing decreased CO by 24% (1.2L*min-1 [95%CI 0.9;1.6]). VVI reduced all RV echocardiographic variables. Applying 100% O2 did not affect PVR or haemodynamic state but RV-GLS was significantly improved -4.4% [95%CI: -6.9; -1.9].

**Discussion:** In patients with normal RV function undergoing CABG several routine interventions in the ICU affects RV function significantly, in particular PEEP and VVI pacing which induces clinically important reductions in SV.

Incidental finding of PFO during cardiac surgery and implications - A dilemma in decision making

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Introduction: Patent foramen ovale (PFO) is common finding during coronary artery bypass graft (CABG) surgery. There is lack of data to help guide treatment decisions regarding incidental findings of PFO during CABG surgery. Certainly, the benefit versus risk equation seems to be a reasonable approach on individualized basis.

Methods: 67 years old female with history of unstable angina, no other comorbidities and normal preoperative Echocardiogram underwent elective CABG. Intraoperative TOE showed good biventricular function, no significant valvular abnormality and moderate size PFO with left-right shunt. The PFO was not treated as the patient was asymptomatic preoperatively.

Immediately in postoperative period the patient was hypoxic. CTPA showed basal atelectasis, TOE demonstrated pericardial collection and reversal of the flow across the PFO. Percutaneous closure of PFO was considered but deemed inappropriate due to lack of evidence.

Following discharge patient was readmitted with shortness of breath. She underwent a complicated redo-sternotomy for surgical removal of pericardial collection and PFO closure. Injury to the RV due to adhesion required femoral cannulation and led to compartment syndrome. Peri-operative TOE demonstrated moderate PFO with significant right-left shunt.

Failure of mechanical ventilation wean mandated another review by cardiology and decision to percutaneously close the PFO was agreed. PFO closure was followed by immediate drop in oxygen requirement and facilitated immediate extubation and wean from ventilation.

Discussion: There is no evidence to suggest incidental PFO in patients undergoing cardiac surgery is linked to morbidity or mortality, and no evidence to support closure. One study showed that change from a planned procedure to include PFO closure increased risk of postoperative stroke with no long-term survival benefit. PFOs in patients with history of cryptogenic stroke are known to be larger (>4 mm) with longer tunnels (>1 cm) and that size and history of paradoxical embolism are major factor behind the surgeon’s decision to close PFO.

Conclusion: Lack of strong evidence has led to our patient’s unanticipated complication and longer hospital stay. Closure of PFO in asymptomatic patient should be decided on individual basis. Stronger evidence and recommendations are necessary to prevent complications.

Methods: Apneic oxygenation was used in both patients (patients A and B) intraoperatively, initially by oxygen insufflation via a thin catheter advanced to the level of the carina through a single lumen endotracheal tube. After the development of hypoxemia apneic oxygenation was continued via a Mapleson C circuit.

Results: For a significant period of time, oxygenation was preserved in both patients. Patients A and B showed time to oxygen desaturation of 30min and 25min respectively. Hypoxemia was recognized immediately by SpO2 decline below 90% and was confirmed via blood gas samples. Apneic oxygenation via a Mapleson C circuit was applied successfully for hypoxemia management in both patients. Oxygen levels improved immediately and remained stable until the end of apneic oxygenation. Total duration of apneic oxygenation was 90min and 50min in patients A and B, respectively. Increase of arterial carbon dioxide tension (PaCO2) and subsequent respiratory acidosis were predictable results of apneic oxygenation that were corrected quickly by mechanical ventilation (MV). After the end of surgery, both patients were admitted intubated to the ICU, where weaning from MV was successful after 2hrs. Patients A and B were discharged from the ICU on first postoperative day after an uncomplicated postoperative course.

Discussion: Apneic oxygenation is an acceptable oxygenation technique during thoracic surgery, especially in patients with previous pneumonectomy, which is able to keep sufficient oxygenation for a significant period of time, and does not deserve any special equipment. The expected hypercapnia and respiratory acidosis limit the duration of its application. PaCO2 values are related with the total time of apneic oxygenation and the only effective way for its decrease is mechanical ventilation. In the absence of pulmonary hypertension or pathology of the brain, mechanical ventilation normalises PaCO2 and pH quickly, without any complications.


Session: ECHOCARDCIOGRAPHY – September 5, 2019

S21:03

Echocardiography based algorithm for prevention and treatment of spinal hypotension: a prospective randomised controlled study

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Introduction: Left ventricular end diastolic area (LVEDA) less than 10 cm² in mid-papillary para short axis view of trans-thoracic echocardiogram indicates hypovolemia.1 We compared the efficaciousness of an algorithm based on LVEDA to the standard clinical practice during subarachnoid block (SAB) in the prevention and treatment of post spinal hypotension.

Methods: After obtaining approval from the institutional ethics committee and written informed consent 60 adults scheduled for elective surgery under SAB were enrolled in this prospective, randomized intention to treat trial. Patients were randomized into two groups. In Group-E (n = 30) echocardiography based algorithm (figure-1) was used to assess LV preload, its optimization before administration of SAB and to decide treatment of post spinal hypotension either with phenylephrine or intravenous fluids. Group-S (n = 30) patients that served as control, received standard management for SAB. The incidence of hypotension, number of episodes of hypotension, magnitude and duration of hypotension, vasopressor requirement, fluid requirement and hemodynamic parameters first 30 minutes after administration of SAB were compared.

Results: The incidence of hypotension (Gr-E = 26.7% vs Gr-S = 25%, p = 0.766), number of episodes of hypotension (Gr-E 14 vs 12 episodes in Gr-S, p = 0.721), mean duration of hypotension (Gr-E 6.87±3.6 vs 7.42±3.1 minutes in Gr-S, p = 0.757) and magnitude of maximum fall in blood pressure from baseline values (Gr-E 25.9±3.09% vs 27.7±5.68% in Gr-S, p = 0.451) were comparable between the two groups. Total amount of intravenous fluid administered was 2.5 times less in Gr-E (Gr-E = 147.6±119.2 ml vs Gr-S = 390±204 ml, p<0.001) as compared to control group while amount of vasopressors used (Gr-E = 20.8±59.4 mcg vs Gr-S = 20±43.7 mcg, p = 0.96) remain comparable between two groups. The heart rate was significantly higher in Gr-E than Gr-S at all time points till 25 min after administration of SAB. The mean arterial blood pressure was significantly lower at 10, 20, 25, and 30 minutes after administration of SAB in Gr-S as compared to Gr-E.

Discussion: Echocardiography based algorithm for the management of spinal hypotension may result in decreased requirement of intravenous fluid and help in optimizing the vasopressor use. However, the incidence of spinal hypotension may remain unchanged.

Pharmacologically versus endogenously induced changes in tissue oxygenation, measured by near infrared spectroscopy (NIRS)

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Introduction: Near-infrared spectroscopy (NIRS) enables continuous estimation of regional tissue oxygen saturation (rStO2). Ensuring adequate tissue oxygenation in patients undergoing general anaesthesia is of paramount importance to prevent post-procedural end-organ dysfunction. During endotracheal intubation, laryngoscopy elicits an endogenous stress response, resulting in an increased mean arterial pressure (MAP). Intraoperatively, vasopressors are routinely used to counter anaesthesia-related hypotension. Since rStO2 is MAP-dependent, we aimed to study whether changes in rStO2 differ depending on the origin of increased MAP.

Methods: After ethical approval and written informed consent, we randomly assigned 28 patients undergoing arterial dilation of the lower limb. Phenylephrine or ephedrine were administered according to a predefined scheme, when MAP dipped below 20% from baseline. Cerebral (rScO2) and paravertebral (rSpvO2, measured at T3, T9 and lumbar) rStO2 were measured. Differences in changes in rScO2 and rSpvO2 following MAP increase obtained by vasopressor administration or laryngoscopy, were compared. After rigorous selection of fixed effects to minimize risk of multicollinearity, a linear mixed model was used to determine predicted effects of each intervention on rStO2, with intervention, rStO2-location and their two way interaction as fixed effects.

Results: We observed a significant increase in rScO2 (+6.27% [CI 5.19, 7.36]) following laryngoscopy, compared to ephedrine (-0.15% [CI -0.86, +0.56]) and phenylephrine (-1.57% [CI -2.27, -0.87]). rSpvO2 showed a decrease following laryngoscopy of -2.91% [CI -3.78, -2.03], whereas no changes were noted after administration of ephedrine (-0.65% [CI -1.36, +0.06]) or phenylephrine +0.35% ([CI -0.36, +1.05]).
Discussion: MAP increase following tracheal intubation resulted in a significantly higher rise in rScO2 and a significant lower rSpvO2 compared to changes in rStO2 following pharmacologically induced MAP increases.


Introduction: Postoperative cognitive dysfunction (POCD) occurs in 30-80% patients. Cerebral blood flow changes during surgery, especially via cardiopulmonary bypass (CPB), when it becomes nonpulsate. This is one of the factors, which may lead to various neurological complications.

The aim of this study was to compare a. cerebri media (ACM) blood flow changes before, during and after heart surgery with CPB for patients with and without POCD based on Addenbrookes cognitive examination (ACE-III).

Methods: This prospective-case control study included patients undergoing elective coronary artery bypass grafting (CABG) or/and valve surgery with cardiopulmonary bypass (CPB). 110 patient completed ACE-III for cognitive evaluation. For determine mild cognitive dysfunction cut-off 88 was chosen. Mean flow velocity was monitored with transcranial dopplerography device and evaluated 1 day before surgery, after anaesthesia induction, before CPB, at the beginning, ending and after of CPB, and post-surgery in ICU unit.

Results: 97 patients without preoperative cognitive dysfunction were examined, 67 (69.1%) male and 29 (29.9%) female; age 70± 9.2. According to ACE-III results patients were enrolled in to 2 groups: healthy patients without cognitive dysfunction after surgery were included into the first (H)group, patients with postoperative cognitive dysfunction (POCD) were included into the second (POCD) group. Groups did not differ according to age, comorbidities, amount of narcotic analgesia, duration of bypass and cross-clamping, ejection fraction. POCD was established for 29 patients. ACM blood flow velocity (BFV) was significantly higher after anaesthesia induction (mean 39.9 SE 2.2) comparing to velocity during CPB (mean 36.5; SE 2.4); p = 0.029 and lower after bypass (mean 36.5 SE 2.3) comparing to velocity after surgery (mean 38.7; SE 2.1) in POCD group; p = 0.000 ACM BFV was significantly lower before surgery (median 44.7) comparing to velocity after surgery (median 45.9); p = 0.001 and BFV after bypass (median 44.5) was lower comparing to BFV after surgery, (median 45.9); p = 0.018 in H group.

ACM BFV during CPB was significantly lower in POCD group (median 36.12), comparing H group (median 54.9),
p = 0.03. ACM BFV after surgery (median 34.43) was lower in POCD group comparing to H group (median 55.21), p = 0.01.

Spearman correlation analysis revealed that ACM blood flow velocity during bypass was week positively correlated (Spearman Rho 0.339, p = 0.01) and moderate positively correlated (Spearman Rho 0.428, p = 0.00) with ACE-III test result after surgery.

Discussion: Comparing ACM blood changes during heart surgery revealed that patients with mild cognitive dysfunction ACM velocity was lower than in patients without POCD, and correlation was found between lower ACE-III test results and reduced blood flow.


Session: EDUCATION – September 6, 2019
S25:03
The ideal sequence of didactic lectures and simulation in teaching transoesophageal echocardiography (TOE) to anaesthesiologists
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Introduction: Performing Basic TOE needs psychomotor skills, 3D knowledge of cardiac anatomy and image interpretation. It requires expensive simulation facilities, skilled
manpower and time to teach. Hence, it is important to teach TOE in the most time and resource efficient manner. Conventionally, TOE is taught using Lecture followed by Simulation1. Differences occur among learners when this sequencing of instructional components is altered2. We investigated, the ideal sequence of lectures and simulation in teaching basic TOE.

**Methods:** Forty-three non-cardiac anaesthesiologists, at trainee or specialist levels with no prior knowledge of TOE, underwent a TOE training program conducted at a single university hospital. They were randomized into 2 groups. Both groups were exposed to a 1-hour didactic lecture and hands on simulation, in which they were taught about indication, contraindication, patient safety, basic probe handling and obtaining 11 basic views. The first group (LS) attended the lecture followed by a simulation session. The second group (SL) attended the simulation followed by the lecture. A HeartWorks® (MedaPhor Ltd, Cardiff, UK) simulator was used for training. All participants took pre- and post-course multiple -choice question (MCQ) and post-course practical skill tests, which were repeated 1 month after the course. Thirty MCQs assessed safety, probe manipulation, and basic views. The practical test assessed the skill of acquiring 11 basic views on the simulator.

**Results:** Table 1 shows the baseline characteristics of both groups. Group SL, which underwent simulation followed by lecture, consistently scored better in both post-course MCQ and skill test. This group also demonstrated significantly better retention of knowledge and skills than the other (Table 2).

**Discussion:** Similar results have been seen in surgical simulation studies. Recall of prior factual knowledge and psychomotor skills happens during simulation session. The lecture, which follows, helps to activate, synthesise and reinforce this learning. Better consolidation of knowledge and skills helps them perform better 1 month later compared to LS group. Our study suggests that, for long-term retention of both knowledge and skills, it is preferable to teach practical skills followed by theoretical knowledge to an intermediate level group of anesthesiologists who are complete novices to TOE.


<table>
<thead>
<tr>
<th>Table 1</th>
<th>Baseline Characteristics of Lecture followed by Simulation (LS) group and Simulation followed by Lecture (SL) group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td>LS group (n=22)</td>
</tr>
<tr>
<td>21-30</td>
<td>8</td>
</tr>
<tr>
<td>31-40</td>
<td>11</td>
</tr>
<tr>
<td>41-50</td>
<td>2</td>
</tr>
<tr>
<td>&gt;50</td>
<td>1</td>
</tr>
<tr>
<td>Gender female/male (n)</td>
<td>6/16 (22)</td>
</tr>
<tr>
<td>Anaesthesia experience (in years)</td>
<td>3-5</td>
</tr>
<tr>
<td>&lt;3</td>
<td>16</td>
</tr>
<tr>
<td>3-5</td>
<td>2</td>
</tr>
<tr>
<td>Pre-course Multiple choice scores out of 30</td>
<td>15.59 (9-20)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Comparison of the Basic TOE knowledge and Skill Assessment between the Lecture followed by Simulation (LS) group and Simulation followed by Lecture (SL) group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-course MCQ scores</td>
<td>LS group (22) Mean scores % (SD)</td>
</tr>
<tr>
<td>Post-course MCQ scores</td>
<td>51.36 (10.17)</td>
</tr>
<tr>
<td>Re-test MCQ scores</td>
<td>81.82 (11.94)</td>
</tr>
<tr>
<td>Re-test Practical test scores</td>
<td>72.73 (13.04)</td>
</tr>
<tr>
<td>Post-course Practical test scores</td>
<td>61.55 (17.76)</td>
</tr>
<tr>
<td>Re-test Practical scores (after 1 month)</td>
<td>71.90 (18.59)</td>
</tr>
</tbody>
</table>
Session: ERAS – September 6, 2019

S26:03

The influence of enhanced recovery after cardiac surgery on 30-day readmission rate, hospital and ICU length of stay

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Introduction: Enhanced Recovery After Surgery (ERAS) pathways have been proven to increase patient satisfaction scores, decrease the complication rate, decrease the length of stay (LOS), and decrease cost for many surgical specialties. Recently, ERAS for cardiac surgery guidelines have been published and are being implemented in many centers. However, few data are reported on clinically important outcomes. We examined the effect of ERAS for cardiac patients on the duration of mechanical ventilation, ICU and hospital LOS.

Methods: We retrospectively analyzed prospectively collected outcome data of patients undergoing cardiac surgery enrolled in the ERAS pathway (n = 115) compared to a historical standard care group (n = 188). The ERAS pathway included pre-operative patient education, multimodal pain management to minimize opioid usage, carbohydrate loading 2-4hrs before induction of anesthesia, minimizing crystalloid infusions, tight glucose control, early postoperative invasive access and chest tube removal, early extubation, and early mobilization. The standard care group was treated per preexisting institutional guidelines. Data were compared using univariate analysis: parametric and non-parametric data were analyzed with Student’s t-test and Wilcoxon rank-sum test, respectively. A p-value of less than 0.05 was considered statistically significant.

Results: The median (25th, 75th) intensive care unit (ICU) length of stay (LOS) was 1 day (1, 2) in the ERAS group and 2 days (1, 3) in the standard care group (p < 0.05). One patient in the standard care group was readmitted to the ICU for arrhythmia requiring a permanent pacemaker, none in the ERAS group. The median (25th, 75th) hospital LOS was 1 day shorter in the ERAS group compared to the standard care group: 5 days (4, 7) vs. 6 days (5, 8), p < 0.01. The 30-day readmission rate was not different between the ERAS (n = 10) and the standard care group (n = 15). There was a trend for a higher predicted mortality in the standard care group, calculated using the Society of Thoracic Surgery database (1.1% vs. 1.3%), ERAS vs. standard care, p = 0.053); no patient in the ERAS group died within 30 days vs. 2 patients in the control group.

Discussion: The Enhanced Recovery Pathway after Surgery pathway uses a standardized approach to perioperative patient care. Implementation of ERAS for cardiac surgery results in shorter ICU and hospital LOS, comparable ICU and 30-day readmission rates, without a noticeable increase in 30-day mortality. Further studies focusing on other relevant outcome parameters are warranted.

Session: JOINT SESSION ESA/EACTA – September 6, 2019

S27:03

Patient perspectives of ‘one stop shop’ preassessment

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Introduction: We decided to explore the patient perspective of our new ‘one stop shop’ cardiothoracic surgery pre-assessment service, in which the patient sees the surgeon, specialist nurse and anaesthetist in one hospital visit. The service aims to improve patient experience by reducing the number of preoperative hospital visits, and facilitate the move of all elective patients to day of surgery admission. Identification of anaesthetic concerns in advance of admission and discussion of Enhanced Recovery following surgery were anticipated clinical advantages. As part of the service, we give a written leaflet (1) and introduced online information videos for patients to access at home following their ‘one stop shop’ preassessment.

Methods: In April 2019, a year following service implementation, we surveyed 30 post-operative inpatients by use of a bedside questionnaire. All patients had attended our preassessment clinic before their surgery.

Results: We visited 16 Cardiac and 14 Thoracic patients. 100% of patients felt they received enough information to feel adequately prepared for surgery. 88% (14/16) cardiac patients received the leaflet ‘Anaesthesia for Heart Surgery’ (1), with 86% (12/14) finding it useful. 30% (9/30) accessed our online videos. Feedback was positive. 24% (5/21) of non-viewers, were unaware of them, but of these, only one accessed other online information. The average time spent in hospital for the ‘one stop shop’ was 5 hours 22 minutes (median 5 hours IQR 2.25 hours). 97% (29/30) felt this was acceptable and did not wish to have separate visits to the hospital. Patients found it helpful to have their partner with them, and found it ‘overall a good experience’. Staff were rated as friendly, supportive and reassuring. Suggested areas to improve upon included:
Discussion: Patients appear to rate our ‘one stop shop’ highly, and favour the reduction in number of hospital visits despite the long day. We need to highlight the availability of our online videos, signposting patients towards them during their visit to the “one stop shop” more clearly. Production of a written patient information leaflet on anaesthesia for thoracic surgery is needed.


Session: THROMBOSIS VERSUS BLEEDING – September 6, 2019

S28:03

The new P2Y12 inhibitor cangrelor unreliably inhibits heparin-induced platelet aggregation in the presence of hit antibodies, an in vitro study

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3Faculty of Biology and Medicine, University of Lausanne (UNIL), Lausanne, Switzerland

Introduction: Cardiac surgery in patients with HIT puts the patient at high risk of lethal thrombotic complications if heparin is used during surgery. Two strategies exist to prevent intraoperative platelet aggregation during cardio-pulmonary bypass if anti-PF4/heparin antibodies (HIT-Abs) are present. The first is to use an alternative anticoagulant, the second is to use heparin combined with an antiaggregant agent, iloprost or tirofiban. The new P2Y12 inhibitor cangrelor could be an attractive candidate in this setting and several authors report its successful use. In this in vitro study we evaluated the capacity of cangrelor to inhibit platelet aggregation induced by heparin in the presence of HIT-Abs.

Methods: Platelet poor plasma (PPP) from 30 patients with functional HIT-Abs was mixed with platelet rich plasma (PRP) from healthy donors. Heparin-induced platelet aggregation (HIPA) was measured by light transmission aggregometry (LTA) after adding heparin to achieve a final concentration of 0.5 IU ml-1 and compared to samples with normal saline only (negative control) or cangrelor (final concentration 500 ng ml-1) added prior to heparin (treatment).

Results: Heparin 0.5 IU ml-1 triggered platelet aggregation in 22 out of 44 PPP-PRP mixtures, with a median aggregation of 85.9 % (IQR 69.2 to 90.9). For these 22 HIPA positive samples, the median aggregation in the corresponding negative control was 22.1% (IQR 15.9 - 29.7) (p<0.001). Median aggregation in the treatment samples was 28.5% (IQR 19.5 to 51.9): significantly lower than in HIPA positive samples (P<0.001) but higher than in negative control samples (p<0.05) (Figure 1). The mean percentage of inhibition of HIPA by cangrelor was 73.4 ±34.0 %. In only 10 out of 22 positive samples (45%) cangrelor reduced HIPA by more than 95%. In 5 out of 22 (22 %) the inhibition by cangrelor was less than 50 %, and in 3 out of 22 (14 %) it was less than 10 %.

Discussion: In this in vitro study we found that cangrelor unreliably inhibits heparin-induced platelet aggregation in the presence of HIT-Abs. We conclude that cangrelor cannot be used as a standard antiaggregant agent in combination with...
heparin for cardiac surgery in HIT patients, unless its efficacy has been confirmed in a functional test prior to surgery.

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Session: LVAD & TRANSPLANT – September 6, 2019

S30:02

Initial United Kingdom experience with the syncardia total artificial heart

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Introduction: The SynCardia Total Artificial Heart (TAH) is a form of mechanical circulatory support where the patient’s native ventricles and valves are explanted and replaced by a pneumatically powered artificial heart (1). Implantation is indicated in patients with irreversible biventricular cardiac failure (2). We have recently initiated a TAH program at Harefield Hospital for the UK patient population. The aim of this study is to review our initial experience in terms of success rate of bridging patients to transplantation and post cardiac transplant outcomes.

Methods: We analysed data from all patients who received a TAH from July 2014 until April 2019 at our institution to quantify the rate of successful bridging to transplantation and the subsequent post cardiac transplant outcomes.

Results: 22 patients (males, n = 14; mean age 39 ± 17) received TAH implants due to severe, irrecoverable biventricular failure. Aetiologies were dilated (n = 11, 50%), ischaemic (n = 6, 27%) and valvular (n = 3, 13%) cardiomyopathies. 12 patients (55%) were on veno-arterial extracorporeal membrane oxygen support with mean duration of 8.3 ± 8.6 days prior to TAH implantation. Mean duration on TAH support was 95 ± 114 days. 7 patients (32%) suffered stroke, 8 (36%) required surgical exploration for bleeding and 7 (32%) developed sepsis. 9 patients (40%) were successfully bridged to and received a heart transplant, another 3 patients are on the waiting list. 6 patients (27%) are still living: 3 post heart transplantation and 3 remain on the waiting list for a heart transplant.

Discussion: We have successfully introduced The TAH program in the UK as an important and unique intervention for a high risk patient population with biventricular heart failure who are not candidates for left ventricular assist device. Despite high rate of perioperative and early mortality and postoperative complications TAH implantation provides a realistic alternative for these otherwise futile cases.

Extraction of implantable cardiac devices: the role of transesophageal echocardiography monitoring


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Introduction: Background: Data for the utility of continuous trans-esophageal echocardiography (TEE) monitoring during trans venous lead extraction remain scarce. Removal of the implanted transvenous lead system can be a significantly complex procedure, facing main complications. Our objective: the retrospective assessment of the TEE in the monitoring during trans venous lead extraction of implantable cardiac devices (pacemaker and implantable cardiac defibrillator).

Methods: From November 2013 to November 2018 the transvenous lead extraction of 93 leads in 50 patients was reviewed. Lead extraction techniques combined traction and mechanical approach by the same surgeon. Extraction procedures were performed under general anesthesia either total intravenous or inhalation anesthesia. Invasive arterial line blood pressure and continuous TEE monitoring were performed. TEE images of different projections were acquired and stored before and immediately after the extraction of each lead.

Results: From the 50 patients (mean age 58.9 years, 64% male, 1.86% lead per patient) which had the following indication: lead dysfunction (24%), upgrade (8%), infection (54%), or other (14%). The lead extraction was complete for 69 out of 93 leads (74.19%), partial extraction was for 24 leads out of 93 leads (25.80%). General anesthesia by total intravenous (30%) and inhalation anesthesia (70%). New TEE findings following TEE were observed in 7 of 50 cases (14%). Two cases which had new mild tricuspid regurgitation without the need of re-intervention, new appearance or worsening of tricuspid regurgitation in three cases which needed non-emergency re-intervention and pericardial effusion in two cases. No cases needed rescue

<table>
<thead>
<tr>
<th>Age/gender</th>
<th>Duration of implantation</th>
<th>Number of Leads</th>
<th>Indication for Trans venous lead extraction</th>
<th>TEE Findings</th>
<th>Clinical course</th>
</tr>
</thead>
<tbody>
<tr>
<td>84/M</td>
<td>164 months</td>
<td>2 (RA, RV)</td>
<td>Infection - Endocarditis</td>
<td>TR</td>
<td>Re-intervention</td>
</tr>
<tr>
<td>51/F</td>
<td>68 months</td>
<td>2 (RA, RV)</td>
<td>Infection - Endocarditis</td>
<td>TR</td>
<td>Re-intervention</td>
</tr>
<tr>
<td>51/M</td>
<td>73 months</td>
<td>2 (RV)</td>
<td>Infection</td>
<td>TR</td>
<td>Uneventful</td>
</tr>
<tr>
<td>35/M</td>
<td>28 months</td>
<td>1 (LV)</td>
<td>Extrusion and Infection</td>
<td>TR</td>
<td>Re-intervention</td>
</tr>
<tr>
<td>60/M</td>
<td>120 months</td>
<td>1 (LV)</td>
<td>Malfunction</td>
<td>TR</td>
<td>Uneventful</td>
</tr>
<tr>
<td>86/F</td>
<td>86 months</td>
<td>1 (RA)</td>
<td>Malfunction</td>
<td>PE</td>
<td>Uneventful</td>
</tr>
<tr>
<td>64/F</td>
<td>93 months</td>
<td>2(LV, RV)</td>
<td>Malfunction</td>
<td>PE</td>
<td>Uneventful</td>
</tr>
</tbody>
</table>

M: male; F: female; RA: right atrial lead; RV: right ventricle lead; LV: left ventricle lead; PE: pericardial effusion; TR: tricuspid regurgitation; TEE trans esophageal echo cardiograph.
surgery. In all other cases, TEE findings did not entail immediate diagnostic or therapeutic measures.

**Discussion:** New findings necessitating immediate therapeutic measures occurred zero cases, no mortality, yet all patients with new TEE findings had strict observational control. We suggest TEE monitoring during trans venous lead extraction, as it provides useful real-time information and should be standard of care monitoring during lead extraction, to guide trans operative and postoperative management. TEE presents some non-negligible risks associated with its use and is a costly procedure, such investment, however, may have a high return in terms of increased patient safety.


**PP.01.02**

The attenuated effect of remote ischemic conditioning on tissue oxygen saturation and heart rate variability in the patient undergoing cardiac surgery: a pilot study

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**Introduction:** Remote ischemic conditioning (RIC) has been proven to have organ-protective effects but clinical results for RIC have been inconsistent among cardiac surgery patients. Although there has been several hypothesis for these inconsistent result in cardiac surgery patient, it has not been proven, yet.

Tissue oxygen saturation (StO2) and heart rate variability (HRV) reflect peripheral micro-circulation and autonomic nervous system activity, respectively. However, changes in these metrics have not been well-documented during RIC.

(A) Changes in the lowest tissue oxygen saturation (StO2) value during remote ischemic conditioning (RIC). Data points are means and error bars are standard deviations.

(B) Box-and-whisker plots of low frequency (LF) domain heart rate variability. Horizontal line within the box indicates the median value; lower and upper boundaries of the box indicate the 25th and 75th percentiles, respectively; horizontal lines outside the box indicate the 10th and 90th percentiles, respectively; dots indicate outliers.

* adjusted p value for changes within a group (mixed model).
** p value for % change from the initial value: comparison between groups (mixed model). The interaction between time and group was not significant for changes in the lowest StO2 value from the initial value (p=0.121).

§ p value for comparison between pre- and post-RIC values within a group (Wilcoxon signed rank test).
We hypothesized that RIC effect may be attenuated in the patients undergoing cardiac surgery and that may be reflected on StO2 changes and HRV. We measured and analyzed the changes in StO2 and HRV during RIC in cardiac surgery patients and healthy volunteers.

Methods: Ten patients undergoing cardiac surgery and ten healthy male volunteers were included in this pilot study. Exclusion criteria were as follows: systolic or diastolic blood pressure >150 or >100 mmHg, body mass index <18 or >30 kg/m2, uncontrolled hypertension or diabetes mellitus, use of beta-blockers, any anomaly in the upper extremities, peripheral vascular disease or coagulopathy, and refusal to participate. Subjects received RIC treatment, consisting of four cycles of 5-min ischemia with cuff inflation to 200 mmHg followed by 5-min reperfusion by deflation of the cuff (which was applied to the upper arm). Changes in StO2, measured at the thenar eminence, and HRV, according to R-R intervals of the electrocardiogram, were recorded during RIC.

Results: During RIC, there was no difference between the two groups in baseline StO2, occlusion or recovery slope. The lowest StO2 during the ischemic period of RIC decreased in cardiac surgery patients (adjusted p = 0.042) but increased in healthy volunteers (adjusted p = 0.006). The mean difference between the groups in the percentage change of the lowest StO2 value was 20% (95% CI, 9–32%, p = 0.002). Among HRV parameters, the low-frequency domain, which corresponds to sympathetic system activity, increased after RIC in healthy volunteers, but not in the patient group (p = 0.028 and p = 0.169, respectively).

Discussion: Our results suggest that tissue oxygen content is depleted during RIC in cardiac surgery patients, but preserved in healthy volunteers. Sympathetic system activity seems to increase during RIC in healthy volunteers, while not being affected in cardiac surgery patients. These results show that RIC mechanisms may be attenuated in cardiac surgery patients.


Orotracheal intubation guided with a vivasight single lumen tube in unanticipated difficult airway

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Introduction: The management of an unanticipated difficult airway is a challenge for any anesthesiologist. Over the years, devices have been developed to improve intubation in cases of difficulty.

Methods: We present the case of a patient with an unanticipated difficult airway, who was intubated during the first attempt thanks to the use of a VivaSight tube. The consent for the publication of this case was obtained by the patient. He is a 57-year-old man, who underwent a programmed left upper lobectomy. Predictors of airway assessment performed in preanesthesia classified the patient as low risk. The initial plan included the use of a VivaSight SL tube and a bronchial blocker for left lung collapse under direct vision during surgery.

Results: The patient underwent general anesthesia. After 2 minutes of induction and verify that the ventilation could be carried out without problem, a direct laryngoscopy was performed. A spheroidal tumor adhered to the epiglottis was visualized (figure 1), turning the patient into a Cormack-Lehane III grade. Because we had prepared a VivaSight single lumen endotracheal tube for intubation, we chose to perform intubation guided by the video of the camera integrated in the VivaSight tube. The intubation sequence can be seen in the images of figure 1. The result was an intubation of less than a minute in duration and without incidents during the first attempt.

Discussion: VivaSight is a special tracheal tube, which has a built-in direct vision camera. It is used mostly in anesthesia for thoracic surgery. There are 2 models: double lumen and single lumen. The single lumen can usually be used together with bronchial blockers without requiring a fiber optic bronchoscope. The main advantages described with the use of these devices are the visualization of the correct position of the tube and the visualization of the correct position of the bronchial blocker2. Other authors have shown that the use of the VivaSight tube decreases intubation time and number of attempts with respect
to video laryngoscopy in emergencies. In the case that we have described, the camera of the tube allowed us to perform an intubation in a case of unanticipated difficult airway. Therefore, we think that the VivaSight tube should be an option to consider in the cases of patients with anticipated or known difficult airway in thoracic surgery. However, it is necessary to develop prospective studies that provide more evidence.

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PP.01.04
Incidence of acute and persistent postoperative pain in cardiac surgery after sternotomy and lateral thoracotomy using a fast track protocol

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Introduction: The aim of the study was to compare the incidence of acute and persistent postoperative pain following cardiac surgery performed through sternotomy (group S) or lateral thoracotomy (group T) at discharge from hospital, 3 and 6 months after surgery, using a fast track protocol.

Methods: Patients scheduled for elective cardiac surgery and postoperative fast track approach were prospectively included in the study. All patients were trained how to use Piritramid 0.1 mg/Kg and Metamizol 1mg. Postoperative pain management, where they received a bolus of Propofol and Remifentanil, where they received a bolus of Pain ((0 = no pain, 10 = worst pain)) to estimate the level of postoperative pain. Induction and maintenance of anaesthesia were performed according to our standard protocol. All patients were transferred to the post anaesthetic care unit with continuous perfusion of Painbreak as a rescue medication, which was higher in T group (5.6±14.9 T vs 1.2±6.9mg S (p = 0.010)). There was no statistically significant difference in the incidence of pain at hospital discharge, 3 and 6 postoperative months between the two groups (table 1).

Discussion: Our study showed no difference in the incidence of acute and persistent postoperative pain at 3 and 6 months in patients undergoing cardiac surgery with sternotomy or lateral thoracotomy using a fast track protocol.

REFERENCES:

PP.01.05
Comparison of silicone double-lumen tube and polyvinyl chloride single-lumen tube in fibreoptic tracheal intubation in patients with semi-rigid neck collar: a randomized controlled non-inferiority trial

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Introduction: Direct insertion of a double-lumen tube over a fibreoptic bronchoscope is considered more difficult and traumatic than that of a single-lumen tube, especially in patients with difficult airway. We hypothesized that time to intubation

<table>
<thead>
<tr>
<th>Pain intensity (NRS)</th>
<th>discharge</th>
<th>3 months</th>
<th>6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pain</td>
<td>S</td>
<td>T</td>
<td>S</td>
</tr>
<tr>
<td>50%</td>
<td>49.1%</td>
<td>76.3%</td>
<td>69.6%</td>
</tr>
<tr>
<td>Mild (NRS 1-3)</td>
<td>46.9%</td>
<td>49.1%</td>
<td>16.1%</td>
</tr>
<tr>
<td>Moderate(NRS 4-6)</td>
<td>2.1%</td>
<td>0%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Severe (NRS 7-10)</td>
<td>1%</td>
<td>1.9%</td>
<td>3.2%</td>
</tr>
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</table>
over fibreoptic bronchoscope using a silicone double-lumen tube would be non-inferior to that using a polyvinyl chloride single lumen tube in patients with semi-rigid neck collar.

Methods: Fifty patients were randomly allocated to fibreoptic tracheal intubation with either a silicone double-lumen tube or polyvinyl chloride single lumen tube with bronchial blocker (DLT and SLT groups, respectively). Time to tracheal intubation (time to insertion of fibreoptic bronchoscope plus railroading [advancement over the fibreoptic bronchoscope] time); total time for correct tube and bronchial blocker positioning; difficulty of railroading; and the incidence of sore throat, swallowing difficulty, and hoarseness were compared between groups.

Results: The median time to intubation over the fibreoptic bronchoscope was 24 s in the DLT group and 23 s in the SLT group. The upper limit of the confidence interval of this difference was below the non-inferiority margin of 10 s (median difference: −1 s; 95% confidence interval: −5 to 4 s).

Railroading over the fibreoptic bronchoscope (rated on a four-point scale) was regarded as less difficult in the DLT group than in the SLT group (p<0.01). Sore throat, swallowing difficulty, and hoarseness in the post-anaesthesia care unit were comparable between the two groups.

Discussion: Tracheal intubation using fibreoptic bronchoscope can be achieved at least as fast using the silicone double-lumen tube as using the polyvinyl chloride single lumen tube in patients with semi-rigid neck collar. Railroading the silicone double-lumen tube was easier than that of the polyvinyl chloride single lumen tube.


PP.01.06

The retrospective consideration of postoperative analgesia in the patients who undergo rats (robot-assisted thoracic surgery) – Thoracic epidural analgesia vs intercostal nerve block via surgical field with IV-PCA

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Introduction: Robot-Assisted Thoracic Surgery (RATS) is new technique compared with Video-assisted thoracic surgery (VATS) or Open thoracotomy. (1)

Though the advantage of RATS, which brings clearer surgical vision three dimensionally, has been reported gradually, There are not so many articles available about postoperative analgesia in RATS and adequate postoperative analgesia of RATS has not been considered.

The incision is smaller for each but the numbers of those are not less. For the robotic devices moving intercostal space flexibly, the pain could be severer in RATS than we imagined.

Methods: We conducted the retrospective comparison of analgesic effects between thoracic epidural analgesia (TEA) and intercostal nerve block (ICNB) combined with IV PCA of fentanyl in the patients who underwent RATS.

The pain with numerical rating scale on 0 to 10 on 0,1,2,5 of postoperative day (POD), requirement of supplemental analgesic in 24hrs after surgery, postoperative hypotension, nausea, duration of bed rest from surgery, and duration after surgery to discharge were investigated in the RATS patients between Jan. 1st,2017 and March 31st, 2018.

It was approved IRB of our institution.

In order to test differences between means, the Student’s T-test was applied in case of normal distribution. In case of abnormal distribution, the NRS score or incidence were analyzed the Pearson chi-squared test and Mann-Whitney U test were used.

Variation of NRS were performed repeated measure ANOVA as treated continuous parameter.

We considered P<0.05 to be statistically significant. Statistical analysis was performed with SPSS 25.0.

Results: One hundred and seven patients were enrolled into the study. (Group E = 31, group I = 76). NRS on POD1 was significantly higher in Group I than Group E (3 vs 2, P<0.001). The requirements of supplemental analgesics were significantly more in Group I than Group E (43%vs 15%, P = 0.006). The other parameters were not significantly different between two groups.

Discussion: TEA with opioid provided well analgesia on POD1 and which needed less supplemental analgesics postoperatively than ICNB combined with IV PCA. The combination of ICB and IVPCA may indicate not enough for postoperative
pain in the patients who undergo RATS. We need select carefully thoracic analgesic methods for RATS including other blocks in future.


PP.01.07

Efficacy of jaw elevation device (JED®) for maintenance of upper airway patency during transcatheter aortic valve replacement under deep sedation

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Introduction: There has been a growing popularity of performing transcatheter aortic valve replacement (TAVR) under sedation. However, insecurity of upper airway patency caused by deep sedation poses great challenges. To counteract the collapse of upper airway, we have adopted Jaw Elevation Device (JED®: Hypnoz Therapeutic Devices), an externally applicable device that holds up the mandible so that the upper airway can be kept patent non-invasively. The purpose of this study was to determine whether the intraoperative use of JED® is efficacious in improving the upper airway patency during deep sedation for TAVR.

Methods: We retrospectively reviewed medical and anesthetic records from patients who underwent transfemoral TAVR under sedation with or without JED® between May 2018 and November 2018. The primary outcome was the intraoperative upper airway obstruction (UAO) score: 0: no snoring/obstruction, 1: snoring, 2: spontaneously resolving UAO within a few breaths, 3: UAO resolved with manual jaw thrust, 4: UAO requiring mask ventilation. This study was approved by the institutional human research committee (Approved No. 20130023) and the written informed consents for data collection were obtained from the patients prior to the procedures.

Results: Data were collected from 46 patients, of which 31 were anesthetized with JED® [JED (+) group] and 15 were managed without any airway device [JED (-) group]. Baseline characteristics and preoperative variables were comparable between groups. None of the patients in either group required insertion of any alternative airway devices or conversion to general anesthesia during the procedure. JED (+) group showed significantly less upper airway obstruction scores at valve deployment with median (interquartile range) of 0 (0-1) compared with 3 (2.5-3) in JED (-) group (P < 0.0001). There were frequent needs for manual jaw thrusts in JED (-) groups, whereas none required in JED (+) group.

Discussion: Our data suggest that JED® is effective in securing upper airway patency in a non-invasive manner, and therefore can be a viable option for deep sedation during TAVR procedure. Considering complicated and demanding anesthetic managements during TAVR procedure, provision of hands-free environment by JED® may significantly contribute to the improvement in safety.


PP.01.08

Hyperchloremic acidosis post cardiac surgery and role of cardioplegia; an audit cycle

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**Introduction:** Metabolic acidosis is common post cardiac surgery. The incidence of hyperchloremic metabolic acidosis (HCMA) post cardiac surgery was 56% in our previous audit. There was a huge correlation with the use colloid 4% gelatin in these patients. The purpose of the present audit was to assess the current incidence of HCMA and contributing factors as part of quality improvement.

**Methods:** A prospective audit, data collected from all cardiac surgical patients over a period of two months. Incidence of HCMA on admission to ICU and its course over the first 24 hours was analysed. The duration of CPB, amount of cardioplegia used, perioperative chloride level and amount and type of perioperative fluids used were analysed.

**Results:** On Admission to ITU, 30 patients (56%) had metabolic acidosis, of whom 19 (63%) patients were hyperchloremic, giving an incidence of HCMA as 36%. Hyperchloremia without acidosis was seen in 43% patients, making the overall incidence of hyperchloremia on admission as 55%.

Hyperchloremia persisted in 61% patients on day 1 post surgery. No relation was found between perioperative fluids used and hyperchloremia. Maintenance fluid had changed to hartmann’s solution & use of colloid 4% gelatin had decreased by 75% following the previous audit.

Among the patients with persistent hyperchloremia, 57% had CPB time greater than 120 minutes and 61% had more than 2 litres of cardioplegia.

**Discussion:** HCMA post cardiac surgery has been related to the CPB prime and perioperative fluids. Our CPB prime is normochloremic and there was no relation between hyperchloremia and the intravenous fluids used. There was a direct relationship between hyperchloremia and the duration of CPB and the volume of cardioplegia used because cardioplegia contains 160 mmols/L of chloride. Thus, we conclude that increasing volumes of cardioplegia used with longer cardiopulmonary bypass times might be a significant contributor to increasing incidence of hyperchloremic metabolic acidosis. This is the first report implicating cardioplegia in the pathogenesis of HCMA.

**REFERENCES:**

**Unusual presentation of cardiac haemangioma**

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Effects of small tidal volume and positive end-expiratory pressure on oxygenation in pressure-controlled ventilation-volume guaranteed mode during one-lung ventilation

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Introduction: The purpose of this study was to investigate whether tidal volume (TV) of 8 mL/kg without positive end-expiratory pressure (PEEP) and TV of 6 mL/kg with or without PEEP in pressure-controlled, ventilation-volume guaranteed (PCV-VG) mode can maintain arterial oxygenation and decrease inspiratory airway pressure effectively during one-lung ventilation (OLV).

Methods: The study enrolled 27 patients undergoing thoracic surgery. All patients were ventilated with PCV-VG mode. During OLV, patients were initially ventilated with TV 8 mL/kg (group TV8) without PEEP. Ventilation was subsequently changed to TV 6 mL/kg with PEEP (5 cmH2O; group TV6+PEEP) or without (group TV6) in random sequence. Peak inspiratory pressure (Ppeak), mean airway pressure (Pmean), and arterial blood gas analysis were measured 30 min after changing ventilator settings. Ventilation was then changed once more to add or eliminate PEEP (5 cmH2O), while maintaining TV 6 mL/kg. Thirty min after changing ventilator settings, the same parameters were measured once more.

Results: The Ppeak was significantly lower in group TV6 (19.3±3.3 cmH2O) than in group TV8 (21.8±3.1 cmH2O) and group TV6+PEEP (20.1±3.4 cmH2O). PaO2 was significantly higher in group TV8 (226.8±111.4 mmHg) than in group TV6 (202.1±101.3 mmHg) (P = 0.044). There was no significant difference in PaO2 between group TV8 and group TV6+PEEP (226.8±121.1 mmHg). However, three patients in group TV6 were dropped from the study because PaO2 was lower than 80 mmHg after ventilation.

Discussion: It is postulated that TV 8 mL/kg without PEEP or TV 6 mL/kg with 5 cmH2O PEEP in PCV-VG mode during OLV can safely maintain adequate oxygenation.


PP.01.12

Usefulness of chest ultrasonography for prediction of pleural adhesion and postoperative severe pain in thoracoscopic surgery


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Introduction: Video-assisted thoracoscopic surgery (VATS) is the most widely used technique in thoracic surgery. However, preoperative pleural adhesion is a major obstacle in VATS and pleural adhesiotomy could aggravate a severe pain after surgery. In this study, we evaluated the usefulness of chest ultrasound to predict preoperative pleural adhesion and postoperative severe pain in VATS.

Methods: This study was a double blind observational study. Before induction of anaesthesia, 54 patients undergoing VATS were evaluated by using chest ultrasonography. During spontaneous and forced breathing, the sliding of visceral pleura was assessed by 7-MHz linear transducer at three points (upper and lower blue points and phrenic point of the operating side). Presence of pleural adhesion was confirmed by surgeon through thoracoscopy at same points. Based on the existence of pleural adhesion in chest ultrasound, all of patients were assigned to two groups. Postoperative pain was assessed by numeric rating scale (NRS) and consumption of opioid until postoperative 24 hours.

Results: Preoperative chest ultrasonography to find pleural adhesion demonstrated a sensitivity of 53.3% [95% confidence interval; 0.38-0.68], a specificity of 96.5% [0.91-0.99], an accuracy of 84.3% [0.78-0.90], a positive predictive value of 85.7% [0.67-0.96], and a negative predictive value of 84.0% [0.77-0.90]. Patients with severe pain (NRS > 6) was not different significantly (adhesion group vs. free group; 57.9% vs. 64.7%; p = 0.624). Consumption of opioid did not show difference statistically (fentanyl equivalent dose, mcg; median [interquartile range], 530 [390-580] vs. 435 [375-570]; p = 0.594).

Discussion: Chest ultrasonography showed usefulness to predict pleural adhesion. It could help to decide an approach plan (VATS or open thoracotomy) in thoracic surgery. However, it would not be helpful to predict a postoperative severe pain.


PP.01.13

Combined spirometry and diffusion capacity test does not enhance diagnostic prediction before TAVI

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Introduction: Chronic Pulmonary disease (CPD) has been considered a high risk factor in aortic valve replacement. Many studies have found an acceptable short time outcome, but CPD influences long term mortality [1], and thus are increasingly referred to transcatheter aortic valve implantation (TAVI). A limited activity level and shortness of breath can be due to both pulmonary and cardiac reasons and pulmonary function testing are routinely used in patients referred for TAVI. So far the impact of obstructive and restrictive lung disease on TAVI outcomes remains unclear [2,3]. The aim of this study was to assess whether diffusion capacity testing improves diagnostic prediction.

Methods: Fifty patients scheduled for TAVI were evaluated with spirometry, diffusion capacity-test (Diffusion capacity Lung Carbon monoOxide, (DLCO)) and 6 minutes walking-test the day before the procedure, and repeated 30-45 days after. Outcomes were changes in walking-test, inhospital complications and 30-days/6-month mortality.

Results: Average age was 79.0 ± 6.0, BMI 27.1 ± 6.1 and 36% females. Preoperative testing showed that 20 (40%) had CPD (FEV1 < 80% of predicted), of which 11 had obstructive disease (FEV1/FVC < 0.7) and 9 restrictive disease (FEV1/FVC > 0.7). Sixteen patients had marginally reduced DLCO (60-80 % of predicted), while 15 were moderately reduced (40-60%). More patients, although not significant, with obstructive CPD had a reduced DLCO (9/11), compared to other groups (Left). Significantly more patients without CPD, but reduced diffusion capacity, improved the postoperative walking-test (> 10%), compared to other groups (P = 0.031; Right). The complications were low with one new dialysis (restrictive CPD), one stroke (obstructive CPD) and one death within 30-days (No CPD). Nine patients did not complete the second examination due to death (1), still ICU day 30 (1), readmitted cancer (1), logistics (3), while the final three declined due to lack of energy.
Discussion: Overall the number of complications was low and chronic lung disease seems without serious impact on postoperative outcome. Patients with isolated lower diffusion capacity seemed to benefit most in postoperative activity, theoretically to improved circulation or less pulmonary oedema after TAVI. The combination of spirometry and diffusion testing did not increase the ability to select patients that will not benefit from TAVI. Interestingly, research in high age patients increase the risk of dropouts.


PP.01.14

Acute arterial embolism of lower extremity after mitral valve replacement in a chronic lymphocytic leukaemia patient: a case report


Introduction: Acute arterial embolism is a potential severe complication after cardiac surgery: it can be a clinical manifestation of early prosthetic valve (PV) thrombosis, whose incidence is higher in case of mechanical mitral valve or in presence of subtherapeutic anticoagulation, hemodynamic (atrial fibrillation) or haemostatic (obesity, anaemia, renal failure) predisposing factors (1).

EACTA guidelines recommend to start anticoagulation during the first 24 hours after surgery, balancing the haemorrhagic risk(2). Although, in presence of specific comorbidities and risk factors, life-threatening thrombotic events can complicate postoperative period even following the international recommendations.

Methods: We report a 73-year-old man, suffering from chronic lymphocytic leukaemia (without treatment) and paroxysmal AF who received mitral mechanical valve replacement with a On-X 27/29 mm valve placed on anti-anatomic position because of a severe mitral insufficiency (with chordal systolic anterior movement) and single coronary artery by-pass graft.

Unfractionated heparin (UFH) and acetylsalicylic acid were started 18 hours after surgery, in order to maintain an aPTT ratio...
of 1.5 to 2.5. On postoperative day (POD) 4 patient presented sudden pain and signs of acute hypoperfusion in left leg (distal femoral artery territory), requiring urgent surgery. Transthoracic echocardiography was performed but limited by artefacts and suboptimal acoustic windows. Considering the high risk surgery and the usefulness of early transoesophageal echocardiography (TOE), the patient received a general anaesthesia with tracheal intubation.

Results: Successful open embolectomy on the common femoral artery was performed; UFH perfusion was maintained during the whole duration of the procedure without haemorrhagic complication. Intraoperative TEO detected spontaneous echo contrast in left atrial appendage and reduced motion with impaired coaptation of the right leaflet (red arrows in figure); neither valvular-atrial-ventricular thrombus nor increased transvalvular gradient nor regurgitation were found.

Postoperative TEO (POD 3) showed a PV with normal leaflets movement, without significative stenosis/regurgitation. Warfarin was started on POD 4 and heparin bridging was discontinued when INR target range was reached.

Discussion: In patients with multiple thrombotic risk factor (id malignancy, AF) adequate anticoagulation level can be difficult to reach: in these cases, serious thrombotic complications must be highly suspected even when guidelines have been followed. Prompt diagnosis and aggressive treatment are crucial to guarantee a good prognosis. Early TOE and a “tailored” anticoagulation therapy play a fundamental role in the management of such complications.


PP.01.15

The fate of non-revisited transesophageal findings after cardiopulmonary bypass managed conservatively

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Introduction: Transoesophageal echocardiography (TOE) use has experienced an exponential growth in cardiac surgery (CS). The latest guidelines recommend TOE for all adult patients undergoing CS, but the management of unexpected TOE findings (ATOEF) after cardiopulmonary bypass (CPB) might be controversial. We reviewed the outcomes of those patients with ATOEF after CBP managed without immediate surgical revision.

Methods: A systematic TOE use policy is applied in our institution for patients undergoing CS. Intraoperative TOE is performed by a senior anaesthesiologist. Data from intraoperative TOE cases were collected prospectively between January 2014 and December 2017. The presence of post-CPB ATOEF and its impact on the immediate surgical treatment decision-making was analysed.
**Results:** A total of 2421 TOE examinations were registered, with 197 post-CPB ATOEF. Among those with post-CPB ATOEF, 108 (55%) led to immediate surgical treatment. The remaining 89 (45%) cases with post-CPB ATOEF did not receive surgical treatment. These non-treated ATOEF were characterised into: 25 (28%) periprosthetic leak, 1 (1%) intra-prosthetic regurgitation, 20 (22%) regurgitations after aortic valve repair, 11 (12%) regurgitations after aortic valve (AoV) repair, 7 (8%) and 2 (2%) regurgitations related to native MV and AoV respectively, 12 (13%) systolic anterior motion of the MV and 11 (12%) classified as other findings. The immediate postoperative follow-up showed the persistence of 36% of periprosthetic regurgitations, 100% of intraprosthetic regurgitations, 70% and 91% related to MV and AoV repair respectively, 86% and 100% related to native MV and AoV respectively. Two patients died in the immediate postoperative period and none required immediate re-do surgery due to the findings. The 6-12 month follow-up showed the persistence of 34% of periprosthetic leaks, 100% of intraprosthetic regurgitations, 70% and 91% of those related to MV and AoV repair, 71% and 100% of those related to native MV and AoV. Among all post-CPB ATOEF, 2 (2%) patients have required surgical treatment related to the finding in the long-term follow-up.

**Discussion:** Almost half of the post-CPB ATOEF did not lead to an immediate surgical treatment. Follow up echocardiography in the immediate postoperative period and at 6-12 months, showed reduction of periprosthetic leaks. However, we observed stability of left-sided valve repair regurgitations. The incidence of reinterventions due to post-CPB ATOEF was low, reinforcing our current decision making.

**Reference:**

**PP.01.17**

High flow nasal cannula oxygen therapy prevents hypoxia and hypercapnia even TOE insertion

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**Introduction:** The use of transoesophageal ultrasound (TOE) is often cited as a limitation in TAVI under local anaesthesia and sedation. The reason is that moderate or deeper sedation is used, its respiratory depression becomes stronger and airway and respiratory management become unstable. High flow nasal cannula oxygen therapy (HFNC) is a device that has recently been attracting attention as one that is expected to have oxygenation and ventilation assistance effects by using a high flow of humidified gas. We inserted TOE and managed by using HFNC in TAVI under local anaesthesia and sedation.

After entering the room and securing various monitors and arterial pressure lines, HFNC was started with FiO2 40%, flow 40L. For induction of anaesthesia, fentanyl 0.5-1 mcg / kg and Propofol 20-30 mg were administered. After the disappearance of the eyelash reflex was confirmed, TOE was inserted after local anaesthesia to the pharynx with 8% Lidocaine spray.

The state of anaesthesia was maintained at Propofol 2 mg / kg / hr and Remifentanil 0.01-0.03 mcg / kg / min.

**Methods:** A retrospective chart review was conducted from April 2017 to March 2018, and arterial blood gas analysis data at induction of anaesthesia (PaO2, PaCO2, BE), intubation event incidence rate and its breakdown were examined. Defects in the description were excluded.

**Results:** There were 88 cases in the period. Six cases were intubation cases, but 2 cases were intubated condition from before operation, 3 cases were extracorporeal circulation introduction due to hemodynamic instability, 1 case was due to coronary artery occlusion and There was no intubation and general anaesthesia due to anaesthesia related and patient movement control difficulty. Arterial blood gas analysis data were PaO2 2 138.3 mmHg 95%CI[125.9, 150.7], PaCO2 2 37.5 mmHg, 95%CI[35.7, 39.3], BE 0.09mEq/l, 95%CI[-0.60, 0.79].

**Discussion:** Hypoxemia or hypercapnia did not occur even under moderate to deep sedation where TOE insertion did not cause movement.

HFNC can suppress the occurrence of hypoxemia and hypercapnia even in moderate to deep sedation where TOE insertion is possible.


**PP.01.18**

Marked reduction in right ventricular longitudinal contraction after cardiopulmonary bypass in patients with preserved right ventricular output

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**Introduction:** Assessment of right ventricular (RV) function is crucial since RV failure with a reduced cardiac output is
associated with compromised outcome in cardiac surgery. Echocardiographic evaluation of RV function is commonly used, and a reduction in tricuspid annular plane systolic excursion (TAPSE) and tricuspid annulus tissue Doppler imaging (S’) have been observed independently of clinical signs of RV failure. This has led to uncertainty of these variables’ ability to reflect RV function in cardiac surgery [1].

The objective of this study was to describe changes in transoesophageal echocardiographic (TEE) measurements of TAPSE and S’ during coronary artery bypass graft (CABG) surgery with detailed haemodynamic monitoring using pulmonary artery catheter (PAC) assessment of RV output in patients undergoing uncomplicated CABG without RV impairment.

Methods: We prospectively studied 30 patients with concomitant PAC and TEE measurements at four time-points, namely after: anaesthesia induction, sternotomy, cardiopulmonary bypass (CPB) and upon arrival in the intensive care unit (ICU).

Results: TAPSE and S’ were significantly reduced by 43% (p < .0001) and 22% (p = .006), respectively after CPB without any change in stroke volume (SV). RV ejection fraction (RVEF), RV fractional area change (RVFAC) and global longitudinal strain (RV-GLS) remained unchanged. SV measured with 3D echocardiography correlated with PAC measured SV (r = .66[95% CI .50; .78], p < .0001), but 3D showed a minor, but statistically significant underestimation of SV (8.5 ml (95% CI: 2.7 ml; 14 ml, p = .004).

Discussion: TAPSE and S’ were both reduced after CPB despite maintained cardiac output. RVFAC, RVEF and RV-GLS remained stable, however, these measures were unable to detect minor changes in SV. 3D-echocardiography showed a strong correlation with SV measured by thermodilution, but with a consistent underestimation of approximately 10%.

Our results suggest that 3D echocardiography is better at tracking RV output than other echocardiographic modalities, however, the clinician should be aware that 3D echocardiography underestimates SV compared to thermodilution.

PP.01.19

Retrospective evaluation of the use of left sided double-lumen endobronchial tubes with an embedded camera VivaSight-DL® during lung separation in 30 thoracic surgery patients

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Introduction: Lung isolation is essential in thoracic surgery, specially to achieve a lung resection. Left sided double-lumen endobronchial tubes with an embedded camera (VTDL) VivaSight-DL® allow the airway’s management and its continuous visualization on a portable external monitor as well as one-lung isolation during anesthetics procedures1. It might be useful in thoracic surgery because some studies concludes that this device is useful to check the double lumen insertion and its displacements during the changes of position of the thoracic patients or during the thoracic surgical procedure 2. Perhaps the FBS is now no so necessary as in the past but we needed more studies to analyze this situation.


PP.01.20

Diagnostic pitfalls: unexpectedly severe pulmonary hypertension with pulmonary hemorrhage after atrial septal defect closure - a case report

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Introduction: Certain elderly patients may suffer from an uncorrected congenital heart disease (CHD) and severe pulmonary hypertension (PHT).

Methods: A 69-year-old male patient presented for elective surgical closure of an atrial septal defect (ASD) and for a radiofrequency (RF) ablation of the pulmonary veins due to frequent episodes of atrial fibrillation. A transthoracic echocardiography revealed a small defect in the middle part of the atrial septum with a pulmonary to systemic blood flow ratio of 3:1 and a right ventricle (RV) systolic pressure of 45 mmHg.

Results: Following the cardiopulmonary bypass institution, surgical inspection detected a sinus venosus defect with anomalous drainage of the right upper pulmonary vein into the left atrium, apart from the ASD type secundum. A pericardial patch reconstruction and Cox-Maze IV procedure was performed. Several hours after the intervention, blood was
noted, refluxing from the endotracheal tube. Simultaneously, a severe hemodynamic instability appeared with nodal cardiac rhythm, due to a malposition of the atrial pace-maker wire. Pulmonary artery pressure measured 45/35 mmHg, pulmonary capillary wedge pressure (PCWP): 16 mmHg, right heart chambers were enlarged and RV contractility was severely reduced. A chest X-ray and a CT scan revealed massive hemorrhage in the right upper pulmonary lobe. A bronchial blocker was placed immediately and a resection of the affected lobe was performed.

**Discussion:** This case illustrates underestimated severity of pulmonary hypertension under conditions of the reduced RV function. An assessment of PCWP indicates precapillary PHT. The permanent left to right shunt with increased pulmonary blood flow resulted in progressive endothelial and medial disturbances of the pulmonary vessels, and in creation of the complex vascular lesions with consequential intrapulmonary hemorrhage.

Adult patients with CHD remain a high-risk perioperative population, requiring all available resources and a multidisciplinary approach.

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**PP.01.21**

**An approach to multidisciplinary team development in cardiothoracic theatres utilising video reflexive ethnography**

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**Introduction:** Safety in healthcare is predicated on excellent teamwork, this is particularly the case in cardiothoracic theatres where the complex interplay of multiple healthcare professionals is required to deliver successful patient outcomes. Improvements in healthcare habitually focus on the scientific basis of our interventions, evidence-based medicine and randomised control trials (RCTs), however these fail to consider the impact of a high functioning team on delivery of intended outcomes.1

Team development in healthcare is often neglected, despite its connection to patient safety.2 At best, organisations offer sporadic simulation training, however this falls short of the depth of training offered in other industries.

**Methods:** We present here a novel approach to the development of clinical expertise. Video reflexive ethnography (VRE) is a powerful tool utilising video to present a fresh perspective of in situ practice to participants.3 The potential for VRE lies in the rich descriptive power of video, and its ability to challenge participants to view their practice with fresh eyes. This results in exposure of tacit behaviour, development of shared understanding across a team and challenge to damaging hierarchy and inequalities.4

We recorded a multidisciplinary team engaged in cardiac surgery requiring cardio-pulmonary bypass. Short clips were selected and edited with a focus on interdisciplinary communication. The edited clips were used in a facilitated reflexivity session where the whole multidisciplinary team engaged in reflexive discussion.

**Results:** The reflexivity session explored:

i) Communication: Differences between surgeon/anaesthetist communication, versus surgeon/perfusionist. There are shared visual guides for the anaesthetic/surgical relationship, but our perfusionists cannot visualise the surgical field and surgeons have no visual cue for blood volume available to return to the circuit, both instead rely on verbal communication. This risks break down under unusual circumstances e.g. unanticipated complications or unfamiliar teams.

ii) Hierarchy: Examples surfaced during the reflexivity session, such issues have frequently been shown to have negative consequences.2 The VRE process offered a safe space to explore, challenge and flatten these hierarchies.

**Discussion:** Having demonstrated the power of the technique within our department our ongoing work will focus on the integration of this process into the normal working of the team.

**REFERENCES:**

**PP.01.22**

**Heart transplant complicated by metformin induced lactic acidosis**

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**Introduction:** Mild lactic acidosis following heart transplant is a known laboratory finding that generally does not require
treatment. However, we encountered a case in which a diabetic patient on metformin underwent a heart transplant and developed a profound rise in lactate which caused a severe anion gap metabolic acidosis and refractory vasoplegia.

Methods: Case Report.

Results: A 52 year old man with a past medical history of type 2 diabetes mellitus managed with metformin, chronic kidney disease, and coronary artery disease underwent an LVAD explant and a heart transplant utilizing bicaval anastomosis technique.

Twenty minutes after separating from bypass, an arterial blood gas was notable for a lactate of 7.8 mmol/L. Over the next two hours, the patient developed vasoplegia and a severe anion gap metabolic acidosis with a lactate that peaked at 18.0 mmol/L. TEE and surgical visualization agreed that cardiac function was excellent and without evidence of tamponade. The patient’s hyperdynamic cardiac function was confirmed by the cardiac output values nearing 14 L/m via Swan-Ganz thermodilution.

The patient’s preoperative medication history was once more analyzed and metformin induced lactic acidosis was added to our working differential diagnosis. A dialysis line was placed, and continuous veno-venous hemofiltration (CVVH) was initiated in the OR, followed by a downtrend of lactate and improvement in hemodynamics. CVVH was continued in the ICU resulting in resolution of lactemia.

Discussion: Metformin induced lactic acidosis is rare and a diagnosis of exclusion. We ruled out hypovolemia due to a CVP of 14-15 mmHg and ischemic bowel by benign abdominal exam and normal AST, ALT, amylase, and lipase. Sepsis was considered less likely due to lack of infectious source/fever and maintenance of scheduled antibiotic prophylaxis.

We had established that the donor cardiac function was excellent. Due to the unpredictable nature of heart transplant, our patient received metformin within 48 hours of surgery. The patient’s known chronic kidney disease, potentially exacerbated by cardiopulmonary bypass, likely contributed to metformin induced lactic acidosis.

REFERENCES:

PP.01.23

Use of endotracheal isoproterenol for severe bronchospasm while weaning from cardiopulmonary bypass

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Introduction: Weaning from cardiopulmonary bypass (CPB) is a complex process that focuses on cardiac function and rhythm, but adequate pulmonary function is also essential. We will present a case in which severe bronchospasm posed a substantial threat to the weaning process, but it was responsive to a novel treatment, endotracheal isoproterenol, in addition to intravenous ketamine and inhaled albuterol.

Methods: Case Report.
**Results:** 36-year old male with a history of Tetralogy of Fallot and asthma who presented with right-sided heart failure secondary to pulmonary stenosis and subsequent severe tricuspid regurgitation was initially managed with transcatheter pulmonic valve placement and then scheduled for a surgical tricuspid valve replacement. CPB weaning was complicated by inability to ventilate due to severe bronchospasm, which was managed with isoproterenol (120mcg in divided dosing via endotracheal tube), ketamine, and albuterol. This treatment resulted in adequate ventilation and consequently, a successful wean without tachyarrhythmias or hypotension.

**Discussion:** This case demonstrated treating bronchospasm while weaning from CPB with a novel administration route of a largely abandoned medication in the United States. Isoproterenol causes relaxation of bronchial smooth muscle amongst other effects including increasing heart rate/contractility and peripheral vasodilation, which could potentiate arrhythmias and hypotension1. These adverse effects could be detrimental following CPB but the risk may be drastically reduced by endotracheal tube administration. Notably, treatment of the pediatric population with asthma exacerbations in the 1970s with intravenous isoproterenol found associations with arrhythmias2. However, recent data with inhalation isoproterenol has demonstrated safety in addition to increased efficacy compared to inhalation salbutamol3. Thus, more research is needed to evaluate if endotracheal isoproterenol should be utilized for management of obstructive lung disease in the OR.

**REFERENCES:**

**PP.01.24**

A low flow rate for selective antegrade cerebral perfusion is sufficient to reach baseline tissue oxygenation of the brain during hypothermic circulatory arrest

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**Introduction:** Hypothermic circulatory arrest (HCA) in conjunction with selective antegrade cerebral perfusion (sACP) is frequently used for neuroprotection.(1) Nonetheless optimal sACP has only been investigated in animal studies.(2) The objective of this study was to determine sACP during HCA necessary to reach baseline tissue oxygenation as measured by near infrared spectroscopy (NIRS).

**Methods:** With local ethics committee approval, consecutive patients scheduled for elective aortic arch surgery in HCA were included in this prospective observational single center study. Bilateral sACP was instituted by introducing perfusion catheters in the innominate and left carotid artery. The quality of sACP was monitored by bifrontal NIRS. Baseline NIRS were measured before anesthesia induction in the awake patient. NIRS values were recorded after initiation of HCA at sACP of 6, 8 and 10 milliliters (ml) per ideal body weight (kg) per minute (min). For comparison the mean of bifrontal NIRS in each patient was calculated for this interim analysis. Differences in NIRS between sACP flow rates were assessed by one-way ANOVA and Bonferroni t-test. A p < 0.05 was considered significant. Results are presented as median and interquartile range (IQR) or mean +/- SD where appropriate.

**Results:** Fifteen patients had complete datasets (4 female). NIRS was 62 (8) at baseline; 56 (11) at 6; 62 (11) at 8 and 63 (9) at 10 ml/kg/min sACP, respectively. ANOVA showed no significant differences between baseline and the three distinct sACP (p = 0.223). Bonferroni t-test indicated no differences.
between the different sACP and the baseline (all p>0.05). Duration of HCA was 12 (15) minutes. All patients were discharged after a length of hospital stay of 10 +/- 4 days. Three patients had new onset focal neurological deficits before discharge and three patients had postoperative delirium.

Discussion: SACP of 6-10ml is the range often used in centers of aortic arch surgery. (1) In an animal-model, the lower threshold of 6ml/kg/min was confirmed recently, since venous saturation decreased markedly when sACP was lowered below this sACP. (2) Our data support this finding in humans as sACP of 6 ml/kg/min is sufficient to reach baseline NIRS values. A further increase, e.g., to 8 or 10 ml/kg/min, is not associated with an even better NIRS. The data suggest that sufficient frontal brain oxygenation can be achieved with a relatively low sACP flow rate in HCA.


PP.01.25

Intraventricular 4D blood flow: adding a fourth dimension to cardiovascular functional analysis by magnetic resonance imaging

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Introduction: Echocardiography is a standard tool for evaluating the cardiac chambers, valves and great vessels. Recent data shows techniques such as strain analysis display subtle contractile deficits long before ejection fraction (EF) drops, and this has already been linked to poor outcome. 4D colour doppler is a recent technical advancement, however its temporal resolution remains limited so far. Cardiovascular magnetic resonance (CMR) offers similar assessment of myocardial
function, vessels and valves, but beyond that also offers unmatched tissue characterization (fibrosis, scar, edema, oxygenation, metabolics). A novel development in this field is 4D flow CMR, which allows for visualization and quantification of multiple parameters like blood flow velocity, direction, pattern, wall shear stress and kinetic energy deposition. Cardiac diseases in early stages may not yet feature a reduced EF but may already display abnormal 4D flow patterns, which may reduce cardiac index and increase ventricular wall stress. In this study we applied CMR-based 4D intraventricular blood flow assessment in participants with normal left ventricular (LV) systolic function.

**Methods:** Using a 3T clinical MRI, seven participants underwent a non-contrast exam (one healthy control under 35 years, five controls older than 50 years, one patient with heart failure and preserved EF (HFpEF)). A 4D block of the thoracic cavity was acquired and blood flow patterns in the left ventricle were assessed for direct flow (blood that enters and leaves the ventricle during one heartbeat), residual volume (blood that remains in the LV cavity for at least 2 heartbeats), along with delayed ejection and retained flow (figure). Furthermore, ventricular function and strain by feature tracking were measured.

**Results:** While participants had an LVEF of 65±3% and a cardiac index of greater than 3.1±0.4 L/min/m², there was marked variation in intraventricular 4D blood flow patterns (figure). The patient with heart failure had the largest residual volume and lowest direct flow, whereas the young healthy control had the highest direct flow and lowest residual volume. Residual volume in the older controls ranged in between these two points. Furthermore, a larger direct flow was correlated with greater longitudinal strain (r = -0.886, p = 0.033), while there was a trend of larger residual volume to be associated with poorer global longitudinal strain (r = 0.829, p = 0.058).

**Discussion:** In a small cohort, CMR-derived patterns of intraventricular 4D blood flow and ventricular wall strain are associated despite quantitatively normal LVEF. Although acquisition, processing and quantification in 4D flow CMR are still time-consuming, the quantification of 4D blood flow in cardiac chambers and great vessels has the potential to offer a comprehensive evaluation of cardiovascular haemodynamics under normal and pathological conditions. Larger studies are required.

**PP.01.26**

Anesthesia in robotic thoracic surgery: case series

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**Introduction:** The first thoracic lobectomies and robotic transsegmental resections date from 2003, since then robotic-assisted thoracic surgeries have been increasing (1). Extensive benefits of robotic-assisted thoracic surgery (RATS) versus video-assisted thoracic surgery (VATS) have been demonstrated, among which we find improvement in surgical field vision, reduction in bleeding and decreased postoperative morphine consumption (2). Therefore, and due to its boom, it’s necessary to know the surgical technique and the anesthetic implications involved in the implementation of robotic surgery in our daily clinical practice (3).
Methods: This is a retrospective descriptive study that includes patients undergoing thoracic surgery using a robotic technique from January 2018 to May 2018 in our hospital. It includes a total of 10 patients, 70% undergoing transsegmental lobar resections and 30% with exeresis of mediastinal cysts. Subsequently, we describe both the anesthetic technique used, as well as the stay in the ICU, the hospital stay and the incidence of postoperative complications.

Results: Surgical positioning was lateral decubitus in all patients. The anesthetic induction was performed with intravenous midazolam, propofol, fentanyl and rocuronium. Pulmonary separation was performed by double lumen tube with embedded camera (VivaSight DL) for continuous airway monitoring and to facilitate repositioning of the device, invasive blood pressure monitoring, and central venous catheterization. The anesthetic maintenance included inhaled sevoflurane and continuous infusion of remifentanil and rocuronium; after surgery muscle relaxation was reverted with sugammadex. The average length of stay in the ICU and hospital stay was 1.6 days and 6.3 days, respectively. Only 2 patients presented postoperative complications as nosocomial pneumonia, bilateral pleural effusion and presence of atelectasis. One of these was death after 18 days of hospital admission. The 6-month survival was 90%.

Discussion: Robotic surgery allows performing thoracic interventions in a less invasive way. We must take into account the difficulty in accessing both the airway and peripheral intravenous catheters and we need using of advanced monitoring devices. More studies comparing postsurgical events of interventions performed by robotic surgery versus thoracoscopic surgery are necessary.


PP.01.27

Safe management of minimally invasive valve surgery using a intra aortic occlusion device: case series of 52 patients

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Introduction: Minimally invasive approach through a right mini-thoracotomy is a worldwide used procedure for mitral valve surgery. Aortic occlusion is one the most important open discussion in minimal incision valve surgery. Different techniques have been described during the last years and all have shown benefits and drawbacks. In this retrospective study we define a standard protocol to improve the safety of aortic clamping using a intra-aortic occlusion device in order to reduce related complications.

Methods: Fiftytwo patients (26 male and 26 female, mean age 62 ± 5 years) underwent cardiac surgery through a right antero-lateral minithoracotomy in our cardiac surgery department. The following surgical procedures have been performed: 32 mitral valve repairs, 4 atrial mixoma excisions, 16 mitral valve replacements. In 7 cases a combined tricuspid valve repair has been performed. In all cases a intra-aortic occlusion device was used for aortic clamping and cardioplegia. Continuous transesophageal three-dimensional echocardiography was performed to confirm the correct position of the venous cannulas and of the intra-aortic occlusion device. In particular, simultaneous multi-plane three-dimensional echocardiography imaging (dual screen simultaneously displaying two real-time images) was acquired to detect the intra-aortic device location in the ascending aorta, the inflation of the balloon, the complete occlusion of the aorta, the delivery of the cardioplegia and to visualize the origin and the blood flow in the right coronary artery. A bilateral upper extremity invasive arterial pressure monitoring has been detected in all cases. Aortic root pressure was measured by the tip of the intra-aortic occlusion device. Neuroronitoring was performed through bilateral cerebral oximetry and transcranial color Doppler.

Results: The analysis performed among 52 patients has shown no incidence of aortic dissection, no neurological damage type 1 and no myocardial ischemia. In 3 cases a distal displacement of the intra-aortic occlusion device was promptly detected by the combined use of echocardiographic imaging and by a drop of the right cerebral oximetry saturation and of the right radial artery pressure.
Discussion: In our opinion, the combined use of transesophageal simultaneous multi-plane three-dimensional echocardiography imaging, bilateral upper extremity invasive arterial pressure monitoring, aortic root pressure and cerebral oximetry may be accepted as a standard protocol in order to reduce adverse events and complications related to the use of the intra-aortic occlusion device.

PP.01.28

Lung ultrasound (LUS) for the assessment of extravascular lung water (EVLW) and effect on oxygenation in cardiac surgery: a prospective study

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Introduction: EVLW accumulates in the interstitial and alveolar space and represented by vertical artifacts known as B-lines using LUS1. Excess lung water causes poor oxygenation and prolonged ventilation.

Aim: To score B-lines using LUS to assess EVLW pre- and post-cardiac surgery and record the effect on oxygenation and time of extubation (Extub T).

Methods: A prospective cohort study in cardiac surgery using cardiopulmonary bypass (CPB). King Abdullah International Medical Research Center approved this study reference: RYD-18-417780-17652. LUS was performed: pre- T0, one-hour T1 and 24 hrs T2 post-surgery. The arterial oxygen partial pressure to inspired oxygen (PaO2/FiO2) ratio was recorded at each time. LUS was performed using a Philips CX50 and phased array probe, with LUS preset. Ten anatomical sites-thoracic left and right- anterior, lateral and posterior were assessed by LUS and scored according to the number of B-lines. Fluid balance at T1 and T2 was recorded. 79 patients were recruited using consecutive sampling (March 2018 to March 2019). SPSS v23, with simple descriptive and Pearson correlation analysis reported. Significance of p <0.05, two tailed.

Results: 73 patients completed the study age 56 (18-87 years).

We found a negative correlation between LUS score and PaO2/FiO2 at T1 p <0.001. Fig 1

There was a positive correlation with changes in LUS score at T1 and Extub T p <0.02.

Also a positive correlation between LUS score at T2 and a positive fluid balance p <0.013.

Discussion: We showed a negative correlation between ultrasound signs of EVLW and oxygenation. The fewer B-lines the better the oxygenation. The more B-lines the longer the period of ventilation.

This is in agreement with other LUS studies identifying patients with increased EVLW by B-lines and a decreased of PaO2/FiO2 correctable by dialysis2.


PP.01.29

Spontaneous ventilation in thoracoscopic surgeries(VATS), early experience

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Introduction: Thoracoscopic surgery (VATS) has been an important minimally invasive tool in the hands of experienced surgeons. On a natural progress, anaesthetic support has evolved and become equally less invasive1.

Thoracoscopic surgery without tracheal intubation is an emerging treatment modality for a wide variety of thoracic procedures.2 The Key advantage is to avoid the use of muscle relaxants and its related complications in a wide range of patients as well as it can reduce the need for endotracheal intubation and hence airway instrumentation.
**Methods:** This audit was a retrospective review of 26 patients underwent VATS with spontaneous breathing general anaesthesia (between March and November 2018).

Inclusion criteria: BMI <30 kg/m2, No significant cardiovascular pathology, No anticipated difficult airway intubation, No Major lung resections.

Anaesthetic perspective: All patients received General anaesthesia with induction with Propofol 10 patients, Propofol&Midazolam 11 patients & Midazolam and Morphine 5 patients. Maintenance of anaesthetics using sevoflurane aiming BIS around 40. NO MUSCLE RELAXANT WAS USED.

I-GEL in 24 patients, Only 2 patients had ETT from the start.

There was a close collaboration between the whole team regarding the fact that airway should be assessible at all times, in case of emergency.

**SURGICAL CONSIDERATIONS:** All patients had standard VATS technique (depending on individual preference: 24 double-port; 2 single-port techniques).

Pain management modalities:

- 23/26 received pre-incision paravertebral block, using anatomical landmark with 2 level single shot of total of 40 ml 0.25% Levobubivacaine provided by anaesthetic team. Additionally, pre-incision wound block and surgical ports with 20 ml Lidocaine 1% Provided by Surgeon. Adjuvant analgesics were used in the form of Morphine i.v, Paracetamol & if not contraindicated Ketorolac i.v. Patients received Morphine IV PCA in the recovery.

**Results:** 18 males and 8 females were studied with a mean age of 41 years. Average operative time was 101.3 minutes. Average values of oxygen saturation peak end-tidal carbon dioxide & respiratory rate were 97% and 6.1 KPa and 15 cycles/min respectively.

Average recovery Period was 79.9 minutes. Average pain score in the recovery was 3.9, with an average use of 5.2 mg of morphine PCA. Average recovery PaCo2 of 6.4 KPa. Mean postoperative stay was 4.8 days.

**Discussion:** Our initial experience in Glenfield Hospital showed that Spontaneously Breathing Thoracic Surgical procedure is feasible and safe with Careful patient selection and Multi-disciplinary collaboration between anaesthetists, surgeons and theatre team.


**PP.01.30**

**Uncoupling of cerebral blood flow and brain oxygen saturation under non-pulsatile flow conditions**

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**Introduction:** Non-pulsatile blood flow has been associated with altered microcirculatory perfusion. Soon after loss of pulsatility a marked heterogeneous flow profile in the very small vessels ensues that is coupled with impaired oxygen extraction [1]. We investigated if changes in cerebral blood flow during non-pulsatile perfusion would affect brain tissue oxygenation assessed by near-infrared spectroscopy.

**Methods:** After approval by the local ethics committee thirty-two patients were included in this trial. They were studied during general anaesthesia, and stable hemodynamic conditions. Cerebral blood flow velocity in the middle cerebral artery was measured during non-pulsatile flow in the course of cardiac surgery on total extracorporeal bypass and again postoperatively on the intensive care unit during pulsatile flow. We modified cerebral blood flow by changing arterial partial pressures of carbon dioxide between 30, 40 and 50 mmHg. This was conducted either by a change of sweep gas flow at the heart lung machine or by changing respiratory rate at the respirator. In addition to flow measurements patients’ regional brain oxygenation was determined. Relative changes in blood flow velocity were plotted against relative changes in regional brain saturation for both flow conditions and compared using Pearson’s correlation. A p-value < 0.5 was considered significant.

**Results:** Absolute cerebral blood flow velocity was slightly higher during non-pulsatile flow when serum hemoglobin was diluted. Relative changes in cerebral blood flow velocity and regional brain oxygenation were tightly coupled independent of the flow condition. R-values for non-pulsatile and pulsatile blood flow were 0.724 and 0.796, respectively. However, during non-pulsatile flow the slope of the regression line was less steep as compared with pulsatile flow (P < 0.05). In other words, the same increases or decreases in cerebral blood flow were accompanied by smaller changes in brain tissue saturation.

**Discussion:** Despite greater cerebral perfusion during hypercapnia and non-pulsatile flow there was no equivalent rise in cerebral oxygenation. Assuming similar cerebral oxygen delivery this finding could be explained by impaired brain oxygen extraction in the high flow range while partial pressure of
carbon dioxide was elevated. In contrast, during hypocapnia, when cerebral blood flow was decreased to a greater extent as during pulsatile flow, the concomitant desaturation was less pronounced. Both findings are in line with shunting on the microcirculatory level, whereby hyperperfused vessels coexist with vessels lacking adequate flow. These findings substantiate that loss of pulsatility seems to negatively affect nutritive tissue perfusion. Raised neurological morbidity in patients supported with non-pulsatile extracorporeal cardiac assist devices could potentially be attributable to the observed perfusion deficit [2].


PP.01.31

Heart transplantation outcomes in patients with continuous-flow left ventricular assist devices

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Introduction: Durable continuous-flow left ventricular assist devices (CF-LVAD) are used increasingly as both destination and bridge to heat transplant (HTx), in end stage heart failure. Data on long-term survival post-HTx in patients supported with CF-LVAD compared to those undergoing de novo heart transplantation are inconsistent. Some studies show comparable 30-d mortality in both subpopulations, however, indicate increased risk of death in 1-year follow-up.

Methods: We retrospectively reviewed all 153 patients who had OHT in the last 5 years in a tertiary cardiac hospital. Patients were divided into two groups (1) those without mechanical circulatory support pre-transplant (n = 90), (2) and those who were bridged with implantable long-term CF-LVAD (n = 34), all other patients were excluded. Pre-transplant and peri-operative factors, as well as early and late outcomes were then compared between groups.

Results: Baseline pre-transplant factors were the same between groups, though patients bridged with MCS were more likely to have had a previous stroke (8.9% vs 29.4%, p = 0.008). The time spent on cardiopulmonary bypass was longer (168 vs 202 minutes, p = 0.004) in MCS group. Intraoperative haemoglobin was significantly lower in the MCS group (85g/l vs 79g/l, p = 0.01), and intraoperative lactate was significantly higher (7.9 vs 10.6, p = 0.002). The initial post-operative LVEF was lower (p = 0.004), and there was a trend towards developing severe PGD (18.9 % vs 32.3%, p = 0.054) in the MCS group. Early outcomes were similar with an equal need for renal replacement therapy (p = 0.19) and similar length of stay in ITU (p = 0.17). Despite similar 30-day mortality (p = 0.213), 60-day (p = 0.058) and 1-year mortality (Non-MCS 11.1% versus MCS 32.4%, p = 0.008)(Log-rank (Mantel-Cox) p = 0.11) were significantly higher in the MCS group. Kaplan Mayer curves show significant difference in estimated survival between the groups (Fig 1).

Discussion: Our results in agreement with present literature show comparable 30-d mortality in both subpopulations, however, indicate increased risk of death in 1-year follow-up.


PP.01.32

The wythenshawe hybrid circuit: a novel technique for lung transplantation

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Introduction: Wythenshawe Hospital is one of only six heart transplant units in the UK and one of five to perform lung transplant. Every year, around 60 transplant operations are performed, and in 2018, 32 lung transplants were carried out, with a 90 day survival rate of 91.7% as per the UK Organ Donation and Transplantation Activity Report 2017/18.

Methods: When the transplant program was initiated, lungs were initially done using Cardiopulmonary Bypass Support. In the past few years, ECMO has taken over and it is now the preferred method of support. Because lung transplants are surgically challenging operations, occasionally, conversion from ECMO to Cardiopulmonary Bypass during the procedure is needed. Taking this into account, we have designed an Extracorporeal Circulation system that allows quick and easy
switching from ECMO to Cardiopulmonary Bypass shall a complication arises (Figure 1).

Results: Since 2018, we have done 29 lung transplants using our Hybrid Circuit, with no difference in patient outcome compared to lungs done using standard ECMO circuitry. However, the utilization of this circuit offers many user-related advantages versus the usage of standard ECMO. Some of this include easier volume and drug additions, inclusion of volatile agents in the gas mixture, possibility of recording the case using a data management system and a straightforward switch to Cardiopulmonary Bypass if required.

Discussion: Even if the Hybrid Circuit set up is slightly more complex than setting up an ECMO or a Cardiopulmonary Bypass circuit, we believe that this technique is superior to the previous methods used for lung transplantation. If offers all the benefits of ECMO versus Cardiopulmonary Bypass, such as less Heparin usage and lower priming volumes, plus, it is a more interactive and user-friendly system designed to deal with emergencies in an efficient manner.


PP.01.33

Cardiogenic shock secondary to phaeochromocytoma: adrenalectomy on multiple mechanical circulatory support devices

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Introduction: Phaeochromocytoma is a neuroendocrine tumour of the chromaffin cells of the adrenal medulla. Tumours secrete catecholamines and typically present with hypertensive crisis or, in rare circumstances, cardiogenic shock.

Case Presentation: A 33 year old male presented with hypertensive crisis and fulminant cardiogenic shock. He required mechanical ventilation for hypoxaemia secondary to acute pulmonary oedema. A CT aortogram was performed for presumed aortic dissection which revealed a necrotic, enhancing adrenal mass. Due to severe left ventricular dysfunction, he was referred to our hospital for mechanical circulatory support (MCS). Peripheral veno-arterial extracorporeal membrane oxygenation (VA-ECMO) was established in the referral hospital and he was
transferred to our intensive care unit. An Impella-CP was then inserted to offload an increasingly dilated left ventricle. Hypertensive crises continued to occur despite maximum medical therapy, and it was determined the only viable option to control these paroxysms of hypertension was to perform adrenalectomy. Surgery was successfully performed whilst on dual MCS devices (VA-ECMO and Impella).

Preoperatively the patient had intravenous alpha and beta adrenoceptor blockade and fluid status was optimised to address the chronic circulating volume depletion. Glucose and electrolyte imbalances were corrected. Intra-operative management focused on blood pressure control, heart rate and arrhythmia control. Agents that induce catecholamine release were avoided and tumour manipulation was minimised. Hypotension after tumour removal was anticipated and developed relatively quickly requiring infusions of noradrenaline, adrenaline and vasopressin to support an adequate arterial pressure.

His post-operative recovery was initially favourable and myocardial function had improved to the point of planning ECMO explanation. Despite cardiovascular stability the patient suffered a catastrophic intracranial haemorrhage and treatment was withdrawn.

**Discussion:** Cardiogenic shock secondary to phaeochromocytoma can be difficult to manage and has high mortality. The evolution of short to medium term MCS devices has provided clinicians with additional therapeutic options to manage refractory cases of this uncommon cause of cardiogenic shock. The authors hope this case will add to an expanding library of practice of using MCS in phaeochromocytoma.

**PP.01.34**

**Left ventricular strain variations in cardiac surgery; The role of the type of surgery**

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**Introduction:** Perioperative alteration of 2D LV strain (AvgGLS) is associated with increased LOS and LCOS and poor outcome (1-3). To assess the intraoperative factors associated with AvgGLS deterioration after cardiac surgery we compared 2 cohorts of CABG vs AVR patients.

**Methods:** AvgGLS was measured by TEE under general anesthesia before and post-CPB (GE Vivid S7). We recorded demographic (Age, gender, preop conditions) and procedural (CPB, Clamp time, POD 1 troponine) data, early postoperative complications, ICU and hospital LOS, MACE (myocardial infarction, atrial fibrillation, ventricular arrhythmias, congestive heart failure, cardiac rehospitalization) occurrence and survival. Two groups were compared according to type of surgery: AVR vs CABG. A threshold of +10% was defined as a decrease of AvgGLS. We used Student t and KHI2 tests.

**Results:** 145 patients (AVR: 71(49%), CABG 74(51%)) with complete TEE were included. AvgGLS was decreased in 73.2% of AVR group and 62.1% of CABG group (NS). AVR and CABG groups were significantly different (p<0.05) for LV weight (277+/-108 vs 221+/-72 g), CPB time (86+/-32 vs 65+/-20), Clamp time (9+/27 vs 51+/-18), ICU LOS (4 +/-2.2 vs 3.6+/1.2). There was no difference between groups for age, pre and postop LVEF, pre and postop CPB AvgGLS, nadir hematocrit, POD1 Troponine, hospital LOS and complication rate. Perioperative variations of AvgGLS in both groups are summarized in Fig 1.

**Discussion:** Despite significant anatomical and procedural differences, AVR and CABG patients have similar rate and depth of AvgGLS alteration after CPB. This result suggest that non procedural factors may ba responsible for AvgGLS alteration in cardiac surgery patients. The association of inflammatory response and AvgGLS alteration should be investigated.

Perioperative LV strain (AVGGLS) alteration and predictive value for long term occurrence of MACE

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Introduction: Preoperative alteration of 2D LV strain (AvgGLS) are associated with LCOS and poor outcome (1-3). There is no report to date investigating the association of low AvgGLS and long term MACE occurrence.

Methods: AvgGLS was measured by TEE before and post-CPB (GE Vivid S7). We recorded comorbidities, early postoperative complications and survival. MACE were defined as myocardial infarction, atrial fibrillation, ventricular arrhythmias, congestive heart failure, cardiac rehospitalization. Groups were compared whether the AvgGLS was decreased (DEC) or unaltered (UNCH) with a threshold of +10%. Student t and KHI2 tests were used (p < 0.05). ROC curves were built and sensitivity and specificity were calculated respectively for pre CPB AvgGLS, post CPB AvgGLS and POD 1 troponine for the occurrence of MACE.

Results: 158 patients were included. Follow-up was 286 +/-115 days (max: 20-520). 45.5% patients had CABG, 35.2% valvular surgery and 19.3% combined surgery. The AvgGLS (%) was -14.38 +/-4.19(IC95: -12.96, -14.34) before CPB, vs -10.56 +/-4.9(IC95: -9.75, -11.37) after CPB (p<0.001). 108 (68.35%) patients were in the DEC group and had more in-hospital complications: 21.8% vs 5.81% (p: 0.015). DEC group had longer ICU LOS (days)(3.94 +/-1,9 vs 3.38 +/-1.22; p = 0.03) and hospital LOS (11.84 +/-3.89 vs 101.2 +/-2.41;p = 0.05). There was no difference for postoperative Troponine (ng/ml)(468.6 +/-535.6 vs 359.3 +/-648.6; IC95 -111.05 to 318.9). The mortality of DEC and UNCH groups was 1.81%
and 4.16% respectively (NS). No difference was found for MACE occurrence rate during follow-up: DEC: 38.2% vs UNCH: 20.8%, p: 0.33 Time to first MACE was shorter in group DEC (224.9+/−164.2 vs 272.3+/−120.9; p: 0.02). Post CPB AvgGLS had the best sensitivity and pre CPB AvgGLS had the best specificity to predict MACE occurrence (Se: 0.87 and Sp: 0.896 respectively). ROC curves are shown in Fig 1.

Discussion: Our main findings are: Almost 70% of patients decrease the AvgGLS after CPB irrespective of type of surgery. These patients experienced significantly more in-hospital complications and earlier incidence of MACE during long term follow-up. Perioperative AvgGLS show very high predictive Se and Sp for MACE occurrence. This opens the possibility of building a predictive score to detect the patients at risk of MACE.


PP.01.36

Airway management in the critically ill patient - How can we improve?

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Introduction: The NAP4 demonstrated adverse airway outcomes are associated with poor airway assessment and poor planning. 25% of major airway events occur in the Intensive Care Unit (ICU) or emergency department (ED), and the outcome of these events are more likely to lead to permanent harm or death compared with the operating theatre.

This study set out to review documentation of intubations in ICU patients, including the pre-procedure planning taking place to identify areas for improvement.

Methods: Single institution retrospective review of documentation of endotracheal intubations performed by ICU staff (on either ICU or a ward/ED) over a six week period in an English district general teaching hospital. Criteria assessed were: use of a pre-intubation checklist, documentation of name and grade of intubator, airway assessment, time of intubation, drugs and doses given, number of attempts at intubation, use of cricoid pressure, laryngoscopy grade, ETT size + length at teeth, type of laryngoscope used, monitoring used (including etCO2), ventilator settings and any complications.

Results: In the 6 week study period, there were 15 intubation episodes identified and reviewed (12 on ICU, 3 in ED). See attached table for full results.

Discussion: The lowest performing domain was airway assessment (0%). The explanation for this is likely in part due to the acutely unwell nature of ICU patients making airway assessment more challenging than in an elective setting. Another particularly low scoring domain was the use of a pre-procedure checklist (33%). Considering the NAP findings associating adverse airway events with poor airway assessment and planning, these are concerning findings, and unlikely to be isolated to this hospital. We suggested education to promote the routine use of a pre-intubation checklist that incorporates an airway assessment and procedural plan.


PP.01.37

The value of three-dimensional echocardiography in the evaluation of cor triatrium sinister

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Introduction: Cor triatrium sinister is a very rare congenital heart disease in which the pulmonary veins enter a proximal accessory left atrial chamber that is separated from a distal true left atrial chamber by a fibromuscular membrane presenting one or more ostia. Its incidence in the adulthood is extremely rare. Adult patients are symptomatic in case the orifice across the membrane becomes obstructive mimicking a mitral stenosis. It has been reported that severe obstruction is present if maximum doppler velocity across the orifice is more than 2 m/s. However, in a review of case series no correlation could be found between the pressure gradient across the fenestration and the clinical symptoms. We report the case of a symptomatic adult female with obstructive cor triatrium in whom the intraoperative three-dimensional transesophageal echocardiography (3D TEE) revealed the severity of obstruction in contrast to the mild intraoperative pressure gradients.

Methods: A 34-year-old female was scheduled for surgical repair of a cor triatrium sinister. The symptoms of dyspnea had increased during the last months (NYHA III) which resulted in the echocardiographic diagnosis. The mean pressure gradient across the orifice was estimated 6 mmHg at rest and 18 mmHg at effort using modified Bernoulli equation. There were no associated cardiac abnormalities and no signs of pulmonary hypertension. The patient gave written consent to present her case.

Results: The induction of anesthesia was performed with the aim to keep hemodynamic stability. The intraoperative TEE confirmed the diagnosis. Color flow across the orifice showed an aspect of rather laminar flow. The mean pressure gradient across the sole orifice was 2 mmHg. Three-dimensional en face view of the membrane permitted offline analysis of the lesion in several orthogonal planes and measurement of the effective opening area of the orifice which was 1.45 cm² (Fig 1).

Discussion: This case illustrates that pressure gradient across an obstructive cor triatrium may underestimate the true severity of the lesion as the blood flow may be low through the channel. Therefore, 3D echocardiography should be routinely performed in patients with cor triatrium in order to measure the exact maximal fenestration orifice area.

Multimodal prehabilitation: a promising strategy in patients listed for heart transplantation

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Introduction: Prehabilitation programs designed to improve functional status showed efficacy to increase functional capacity and to prevent postoperative complications in selected high-risk surgical populations. Patients awaiting heart transplantation (HT) usually exhibit poor quality of life and this situation usually progresses while waiting for HT.

Objective: to evaluate the effect of a multimodal prehabilitation program on quality of life and functional capacity in patients waiting HT.

Methods: Adult patients listed for HT were included. Exclusion criteria were hospitalized patients, clinical instability, refusal to participate and living far away or not availability for transportation to the hospital twice weekly.

The prehabilitation program was initiated after baseline assessment and all participants were reassessed after having completed 8 weeks of program. The intervention consisted in exercise training and promotion of physical activity, nutritional counselling and whey protein supplementation when necessary and coping of the psychological stress using mindfulness therapy. The exercise training consisted in 2 sessions of 1 hour per week of personalized monitored supervised moderate to high-intensity interval training and endurance strength training at the hospital’s outpatient gym during 8 weeks. All patients were instructed on breathing exercises with an incentive inspirometer.

After 8 weeks, and until HT, patients followed a maintenance program consisted in 1 session per week of supervised training and were empowered to maintain their level of physical activity.

Results: 24 patients were included in the study from July 2017 to April 2019 (21 males, Age 56±10). Two patients were transplanted before starting the program and 8 patients before the 8-weeks assessment. None of the patients withdrew from the study. Over the duration of the study, 9 enrolled patients were successfully transplanted. One patient asked to opt out from the HT waiting list after having completed the program.

No complications occurred during the program.

Discussion: This study suggests that a multimodal prehabilitation program in patients awaiting HT is feasible, safe and may increase functional capacity and quality of life.

Coagulation management in patient with heparin induced thrombocytopenia undergoing heart transplantation: is ROTEM helpful?


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Introduction: Heparin induced thrombocytopenia (HIT) is frequent in patients under extracorporeal membrane oxygenation (ECMO) or ventricular assist device support (VAD). Therapeutic plasma exchange (TPE) and use of direct thrombin inhibitors (DTI) as argatroban have proven to be useful. However, monitoring its effect can be difficult as activated clotting time (ACT) or standard coagulation tests (prothrombin time (PT) and activated partial thromboplastin time (aPTT)) lack enough reliability. Coagulation assessment during surgery may be challenging, especially during heart transplantation (HT) where there is narrow margin to metabolize DTI.

Methods: A 51-year-old male presented a myocardial infarction with cardiac arrest and arrhythmic storm requiring support with ECMO and VAD. The patient needed HT and was anticoagulated with intravenous argatroban for 3 weeks before surgery because of HIT (31000 thrombocytes/μL). Four TPE were performed and four intravenous doses of specific gammaglobulin (1g/kg) were given achieving negative values of anti-PF-4 antibodies. Argatroban infusion was stopped 6 hours before surgery.

Results: The coagulation test pre-surgery showed 98000 thrombocytes/μL, PT 39%, aPTT 55.1s fibrinogen 3.5g/L, haemoglobin 93g/L. Intraoperative anticoagulation was established with full dose unfractionated heparin and tranexamic acid was given (20mg/kg bolus+6mg/kg/h infusion). After coming off by-pass, anticoagulation was reverted with protamine and 2 units of PRBC, 1000mL fresh frozen plasma (FFP), two platelet pools and 1200IU 4-factor-prothrombin-complex-concentrate (PCC; Prothromplex®: 1200IU factor II, 1000IU factor VII, 1200IU factor IX and 1200IU factor X) were administered empirically. Despite being ACT back to baseline, significant diffuse bleeding was clinically noticed. ROTEM was performed showing prolonged EXTEM, INTEM and HEPTEM clotting time (CT). A second dose of PCC was administered and one unit of PRBC was transfused. Because no improvement was noticed, a second ROTEM was performed showing increased CT in all tests, with no heparin contribution (table 1). A litre of FFP was then administered with significant reduction of bleeding, allowing for chest closure. No further significant blood loss was observed in intensive care. The patient was weaned from mechanical ventilation on day 4 and discharged from the ward after 21 days. No thrombotic/bleeding events were noticed during the hospital stay.

Discussion: ROTEM was useful detecting coagulation factors deficiency in an appropriate time. Unexpected prolongation of CT after PCC administration may suggest residual thrombin inhibition by argatroban, that was neutralized with FFP administration.


Risk factors associated with the onset of delirium in a post-operative cardiac surgical ICU

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Introduction: Postoperative delirium is a disabling mental disorder in patients undergoing cardiac surgery. Post-cardiac surgery delirium is both a common and costly complication in the cardiac surgical ICU. Depending on the methodology, estimates of incidence have ranged from 3 to 70%. The potential consequences of delirium after cardiac surgery include increased morbidity, decreased functional status, cognitive decline and increased long-term mortality. Despite the impact of this condition, few studies exist in literature that help to identify risk factors associated with this condition in the specific setting of cardiac surgery. In this pilot, non-pharmacological, observational study we assessed the risk associated with the development of delirium in a cohort of patients who underwent cardiac surgery.

Methods: We prospectively included 145 patients: women 42 (28.9%) and 103 men (71%) who underwent cardiac surgery between April and June 2018 at the cardiothoracic surgery department of the Tor Vergata University Hospital in Rome, Italy. Data about pre-intra and post-operative period were
The presence of delirium was diagnosed if the CAM—ICU scale was positive when evaluated within the third post-operative day. Univariate logistic regression was used to evaluate perioperative risk factors associated with delirium. Odds Ratio was used to estimate the importance of each factor in the genesis of delirium. Multivariate logistic regression was applied to the positive variables to assess the independent risk factors. A value \( p < 0.05 \) was considered as positive.

**Results:** Among the 145 patients evaluated, 13 developed symptoms of delirium (5.09%). We found that the risk of Delirium was associated with pre-operative EuroSCORE II \( (p = 0.028) \) and history of previous cardiac surgery \( (p = 0.042) \). Moreover, in the intra-operative period the risk of Delirium was associated with red blood cell transfusion, intervention for Aortic Dissection \( (p = 0.013) \), HCA with ACP \( (p = 0.036) \). In the post-operative period risk of Delirium was associated with levels of creatinine clearance \( (p = 0.035) \) and CRP \( (p = 0.029) \).

**Discussion:** Delirium is relatively frequent in the cardiac surgical ICU. High EuroScore correlates with the onset of delirium, suggesting that delirium is a multifactorial pathology linked with pre-operative comorbidities. The complexity of surgery has a big influence on the development of delirium, especially in the cases of aortic dissection. Interestingly, the development of delirium was associated with intra-operative blood transfusions in agreement with similar studies in literature. Finally, our data point to a bridge between post-operative electrolytic disturbances, as well as inflammatory response to infections as factors potentially triggering delirium onset.


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**PP.01.41**

**Transesophageal guidance for trans-catheter trans-septal mitral valve in valve implantation**

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**Introduction:** In patients with high surgical risks, transcatheter mitral valve-in-valve replacement (VIV-TMVR) offers a less invasive alternative to open surgical approach for failing mitral bioprosthetic valves (1). Valve-in-valve transcatheter aortic valve replacement (VIV-TAVR) in failing aortic valve bioprosthesis is already an established technique worldwide (2). Transesophageal echocardiography (TEE) plays a vital role in the intraoperative management of these cases. Here we describe the approach to TEE evaluation and guidance of VIV-TMVR.

**Methods:** TEE is used for full assessment of the heart pre-procedurally as well as throughout the procedure to guide the placement of the new mitral valve and at the end to assess the integrity of the placement and to detect any complications. Both 2D B and color doppler modes as well as real-time, zoom and full volume 3D TEE modalities can be used to serve different purposes.

**Results:** Successful placement of an Edward Sapien S3 Valve (29 mm) under TEE guidance

**Discussion:** Pre-procedurally, severity and etiology of the bioprosthetic mitral valve disease should be confirmed using TEE (Fig 1A) as well as identification of factors that would contraindicate a VIV-TMVR such as infective endocarditis, severe paravalvular leak, bioprosthetic valve dehiscence or
significant prosthesis-patient mismatch. It is also imperative to complete a baseline assessment of the right and left ventricular size and function, left atrial size and look for any pericardial effusion.

During the procedure, TEE may rarely be used for guidewire placement into the IVC by the interventional cardiologists. Next, a combination of bicaval (90-110˚) and aortic short axis (30-45˚) views are used to guide the cardiologist to puncture the interatrial septum. The ideal site for puncture in these cases is determined in mid systole to be posterior and superior on the septum about 3-4 cm above the mitral annular plane. (Fig 1B) The puncture and passing of guidewire into the left atrium is followed by the passing of the valve deployment system, all of which are easily visible on TEE toggling between 2D and live 3D modes. (Fig 1C,D&E)

Post-deployment TEE assessment include confirmation of the stability of the new valve as well as ensuring leaflets are moving freely with no or minimal mitral regurgitation, no paravalvular leaks and no flow restriction across the valve. (Fig 1F) The size, severity and directionality of the interatrial shunt created by the iatrogenic atrial septal puncture site should be assessed using color and spectral doppler, (Figure 1G) which may require placement of an Amplatzer ASD percutaneous closure device (Figure 1H).


PP.01.42

Comparison of transcutaneous with arterial and end tidal carbon dioxide during thoracic surgery - A prospective observational study

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Introduction: Transcutaneous carbon dioxide (PtCO2) monitoring is a noninvasive alternative to measuring carbon dioxide in the blood (PaCO2) and End-Tidal Carbon Dioxide (EtCO2) during thoracic surgery [1,2]. Continuous non-invasive monitoring of CO2 is done using capnometry. PaCO2 derived from arterial blood gas sampling is the gold standard for accurate monitoring. Recently V-Sign Sensor 2, SenTec Digital Monitoring System: SenTec AG, Therwil, Switzerland has been introduced for assessment of PtCO2 and SpO2.

This study was conducted to validate the V-Sign digital sensor 2 in patients undergoing thoracic surgery by comparing PtCO2 with EtCO2 and PaCO2.

Methods: In 34 adult patients aged 18-81 years, simultaneous measurements of PaCO2, EtCO2 and PtCO2 gold standard at the following time points: Immediately after placement of the arterial line, just prior to initiation of one lung ventilation, 30 minutes after the initiation of one lung ventilation and at 30 minutes intervals thereafter till the end of the procedure and finally 10 minutes after resuming two lung ventilation.
Statistical analyses were performed using SAS 9.4 or R. For method comparison, End-Tidal agreement between PaCO2 and PtCO2 or EtCO2 was assessed using the Bland-Altman approach. Limits of agreement were defined as mean bias ± 1.96 standard deviation (SD). Passing and Bablok plot was used as a complementary plot to estimate agreement between PaCO2 and PtCO2 or EtCO2. A mean difference of more than arterial blood mmHg was taken as clinically unacceptable.

Results: PtCO2 data from 5 patients were excluded from the study because of calibration/sensor failure. General information of the patients is summarized in Table 1.

A Bland-Altman comparison of PtCO2 and PaCO2 revealed that the limits of agreement ranged from -14.40 to 13.36 (mean difference -0.52). The limits of agreement between EtCO2 and PaCO2 were between -32.52 to 1.19 (mean difference -15.66). (Figure 1)
Discussion: $\text{PtCO}_2$, as measured by the SenTec Digital Monitor, is equally accurate and as reliable as $\text{PaCO}_2$, whereas $\text{EtCO}_2$ is not.

PP.02.01

Meta-analysis of associations of sleep disordered breathing with outcomes after cardiac surgery

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Introduction: Sleep disordered breathing (SDB) is a chronic disorder characterized by repeated upper airway collapse during sleep with a high prevalence in patients undergoing cardiac surgery. Although patients with SDB are considered to be at increased risk for postoperative complications after noncardiac surgery, the impact of SDB on postoperative outcomes after cardiac surgery remains obscure.

Results: Nineteen eligible studies including 3992 patients were identified. SDB was significantly associated with postoperative all-cause mortality (OR 2.44, 95% CI 1.08–5.49), atrial fibrillation (OR 2.15, 95% CI 1.67–2.77), pulmonary complications (OR 2.02, 95% CI 1.20–3.39), acute kidney injury (OR 2.82, 95% CI 1.19–6.66), delirium (OR 6.4, 95% CI 2.6–15.4), and long-term major adverse cardiovascular events (MACE) (OR 3.44, 95% CI 1.43–8.25), but not short-term MACE (OR 1.64, 95% CI 0.57–4.74) or infection (OR 1.50, 95% CI 0.75–3.01). Increasing severity of SDB might be associated with worsened outcomes.

Discussion: SDB is associated with increased risk of mortality and morbidity after cardiac surgery. Future studies need to explore the optimal screening methods and interventions for SDB in the perioperative period.

REFERENCE: Danzi-Soares ND, Genta PR, Nerbass FB, et al. Obstructive sleep apnea is common among patients referred for coronary artery bypass grafting and can be diagnosed by portable monitoring. Coron Artery Dis. 2012; 23:31-38

PP.02.02

Does the selection of sedative in transcatheter aortic valve implantation influence the extent of hypercapnia leading to elevated pulmonary artery pressure?

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Introduction: Local anesthesia with sedation has recently become a common technique in transfemoral transcatheter aortic valve implantation (TF-TAVI) in patients with aortic stenosis. This retrospective study was performed to compare the influence of different sedating drugs on arterial carbon dioxide pressure and pulmonary artery pressure (PAP).

Methods: Thirty patients who underwent TF-TAVI under monitored anesthesia care from April 2018 to April 2019 were enrolled in this study. The subjects were divided into one of two groups; dexmedetomidine (D) group and propofol (P) group. A pulmonary artery catheter was inserted in all patients. The blood gas data, systemic blood pressure, pulmonary artery pressure, the value of BIS and spectral edge frequency 95 (SEF 95) before sedation and just after administering heparin were collected for analysis. The % change of PaCO2, mean PAP and mean pulmonary arterial pressure to mean systemic arterial pressure ratio (Pp/Ps) were calculated. The statistical analysis were performed using Mann-Whitney U-test.

Results: The median values of BIS and SEF 95 were not significantly different between groups. The % change of PaCO2 was significantly higher in group P (36.7 [28.6-45.1] % vs 14.0 [9.2-22.6] % median (inter-quartile range)); p < 0.01). Although the % change of mean PAP showed no significant difference, the % change of Pp/Ps were significantly higher in group P (+32.7 [13.9-59.7] % vs +13.5 [-9.2-24.4] %; p < 0.05).

Discussion: Our results showed a significant elevation of PaCO2 and Pp/Ps in group P. These findings indicate that propofol may be disadvantageous for performing TAVI under sedation from the aspect of hypercapnia and consequent elevation of pulmonary vascular resistance.
**PP.02.03**

**Peri-operative temperature measurement. Guideline or fantasy?**

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**Introduction:** Perioperative hypothermia is common but associated with adverse outcomes and is defined as patient core temperature below 36.0˚C. During the first 30 to 40 minutes of anaesthesia, a patient’s temperature can drop to below 35.0˚C. National guidelines advise:

- Temperature to be measured and documented in the hour before patient leaves ward
- If <36.0˚C, start active warming preoperatively on the ward
- Maintain active warming throughout intraoperative phase
- Temperature should be 36.0˚C before transfer from/to the ward

Additionally it is suggested that:

- Induction of anaesthesia should not begin unless temperature is 36.0˚C
- Intravenous fluids (500 ml or more)/blood products should be warmed to 37˚C using a fluid warming device
- Warm patients intraoperatively from induction of anaesthesia, using a forced-air warming device if they are undergoing anaesthesia for more than 30 minutes, or anaesthesia for less than 30 minutes but are at higher risk of inadvertent perioperative hypothermia.
- The patient’s temperature should be measured and documented before induction and every 30 minutes until the end of surgery
- Temperature should be measured and documented on admission to the recovery room and then every 15 minutes. If the patient’s temperature is <36.0˚C to actively warm using forced-air warming until they are discharged from the recovery room. Temperature is measured and documented as part of routine observations.

**Methods:** The electronic charts of 31 patients undergoing routine thoracic surgery of duration over 30 minutes in a dedicated cardiothoracic unit over a two-week period were reviewed. The use of peri-operative temperature measurement was examined.

**Results:** 41% of patients had a temperature measured on arrival in the operating department. At 30 minutes into the procedure only 29% had temperature recorded. In the PACU 11 (32%) of patients had temperature measured, and of these only 6 (19%) had an arrival temperature over 36.00C. Subsequently 1/31 patient had temperature measured every 15 minutes and just 4/31 patients had temperature recorded every 30 minutes. However 42% of patients had temperature recorded at discharge from the PACU.

**Discussion:** These data show a small improvement when compared to a previous audit of a similar cohort of patients (38 patients undergoing elective thoracic surgery over 30 minute duration) as shown below:

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2017</th>
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<tbody>
<tr>
<td>Arrival O R</td>
<td>41%</td>
<td>24%</td>
</tr>
<tr>
<td>30 min O R</td>
<td>29%</td>
<td>24%</td>
</tr>
<tr>
<td>Arrival PACU</td>
<td>32%</td>
<td>24%</td>
</tr>
<tr>
<td>Leave PACU</td>
<td>42%</td>
<td>5%</td>
</tr>
</tbody>
</table>

However no single data point exceeded 50% despite efforts to educate operating department staff on the requirement to record temperature and the benefits of actively warming patients.


**PP.02.04**

**Enhanced recovery after cardiac surgery: fluid balance and incidence of acute kidney injury**

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**Introduction:** Enhanced Recovery after Cardiac Surgery (ERACS) pathways can increase patient satisfaction, reduce the length of hospital stay and stay in the intensive care unit. The reported incidence of acute kidney injury (AKI) after cardiac surgery varies from 2.5% to 40% and is associated with an increased 30-day mortality. We examined the effect of ERACS on the total amount of fluid administered and the incidence of AKI.

**Methods:** We retrospectively analyzed prospectively collected outcome data of patients undergoing cardiac surgery enrolled in the ERAS pathway (n=1107) compared to a historical standard care group (n=173). The ERAS pathway included pre-operative patient education, multimodal pain management to minimize opioid usage, carbohydrate loading 2-4hrs before induction of anaesthesia, tight glucose control, early postoperative invasive access and chest tube removal, early extubation, and early mobilization. Intraoperatively, 500mL of the cardiopulmonary bypass (CBP)
priming fluid was replaced with albumin 5% and the patients received 250mL albumin 5% before initiation and 250mL after separation from CBP. Crystalloid bolus were administered in the intensive care unit (ICU) for clinical signs of hypovolemia, increasing pressor requirements or worsening metabolic acidosis. The standard care group was treated per preexisting institutional guidelines. AKI was defined using modified KDIGO (Kidney Disease Improving Global Outcomes) criteria, patients with pre-existing renal injury were excluded. Data were compared using univariate analysis: parametric and non-parametric data were analyzed with Student’s t-test and Wilcoxon rank-sum test, respectively. A p-value of less than 0.05 was considered statistically significant.

Results: The mean (SD) creatinine pre-operatively, at discharge, and the peak creatinine were not different between the ERACS and the standard care group (table). Less fluid was administered in the ERACS group, but the total fluid balance was not different. No significant difference exists between the occurrence of AKI between those groups; no patient developed AKI worse than KDIGO stage 1 (modified).

Discussion: Although the ERACS patients received less fluid than the standard care group during the hospital stay, the incidence of AKI did not differ, nor did the serum creatinine at discharge between both groups. A restrictive fluid management with intraoperative albumin administration does not increase the incidence of acute kidney injury for patients in the ERACS pathway.


PP.02.06

Unilateral pulmonary edema after minimally invasive mitral valve surgery

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Introduction: Unilateral right-sided pulmonary edema (UPE) is a rare but potentially life-threatening complication after minimally invasive mitral valve surgery (MICS).

Methods: We will present a case of severe unilateral pulmonary edema with cardiopulmonary instability after mitral valve repair with right minithoracotomy.

Results: A 45-year-old man (182 cm, 82 kg) was referred to the authors’ hospital for surgical treatment of mitral regurgitation. His medical history included hypertension and chronic obstructive
pulmonary disease. Mitral valve repair was performed with plication of prolapsed part of the posterior leaflet and annuloplasty, under general anesthesia. The right lung was decompressed with differential lung ventilation by a double-lumen tracheal tube. Cross-clamp time was 128 min, and CPB time was long (193 min). Three hours after the surgery, oxygen saturation suddenly dropped to approximately 90 %, and frothy pink sputum was blast out from the tracheal tube. Chest radiograph showed unilateral right-sided massive infiltrate. No evidence of residual mitral insufficiency was detected by trans-thoracic echocardiography. Arterial pressure was maintained with high dose norepinephrine. Cardiac output was maintained with epinephrine and dobutamine, which were gradually attenuated within the first postoperative day. Mechanical ventilation was performed with high PEEP and high FiO2 (12 mmHg, 100 %, respiratory rate 16/min, tidal volume 5 ml/kg) by assist/control mode to maintain oxygenation. Pulse steroid therapy was applied for 3 days. Urine output was maintained at least 50 ml/h through the perioperative period. Patient was extubated 21 h after surgery. On the postoperative day 2, chest radiography showed reduced right-sided infiltration. Patient was discharged home on the 8th postoperative day.

Discussion: The reasons of unilateral right-sided pulmonary edema are multifactorial, including complete lung collapse and ischemic reperfusion injury, systemic inflammatory reaction and extracorporeal circulation, level of mean pulmonary arterial pressure, chronic obstructive pulmonary disease, and increasing CPB time. Perioperative medical team should be aware of the heightened perioperative risk of UPE during MICS.


### Table 1

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>Rest</th>
<th>Cough</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.69±1.49</td>
<td>5.69±1.43</td>
</tr>
<tr>
<td>4</td>
<td>3.72±2.0</td>
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<td>12</td>
<td>2.6±1.34</td>
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<td>24</td>
<td>1.76±1.36</td>
<td>3.3±1.7</td>
</tr>
<tr>
<td>36</td>
<td>0.92±1.11</td>
<td>2.09±1.49</td>
</tr>
<tr>
<td>48</td>
<td>1.3±1.7</td>
<td>3.23±2.04</td>
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</tbody>
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#### PP.02.07

**Analgesic efficacy of erector spinae plane block in thoracoscopic lung surgery: case series**

O. Turhan, Z. Sungur, N. Sivrikoz, N.M. Senturk

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**Introduction:** Video assisted thoracoscopic surgeries (VATS) as well as thoracotomies require multimodal analgesia. Erector spinae plane block (ESPB) is newly introduced and showed adequate analgesia after VATS (1). In this report, we aimed to investigate the analgesic efficacy of the ESPB in thoracoscopic surgeries.

**Methods:** Written informed consent was obtained from all patients (for use of images and information) in this report. Patients (ASA I to III) above 18 years undergoing VATS were enrolled. Prior to anesthesia induction, we performed unilateral, single-injection ESPB at the level of T5 with USG guidance (figure 1). We used 20mL of 0.5% bupivakain. Multimodal analgesia comprised morphine via patient controlled analgesia, NSAID and paracetamol. Postoperative pain was questioned at 1st, 4th, 12th, 24th, 36th, and 48th hours (at rest and cough) using visual analog scale (VAS). Morphine consumption, additional analgesic (tramadol 0.5 mg/kg) requirement were enrolled as well as complications, mobilization and feeding times.

**Results:** This case series consisted of 3 female and 10 male patients with a mean age of 57±7. Four of them underwent lobectomy and resting 9 segmentectomy. VAS values (at rest and cough) are summarized in table 1. Mean morphine consumption for 12th and 24th hours were respectively 27.7±5.5mg and 48.2±13.6mg. Eleven of study patients needed once additional analgesic at 5±2.4 hours. Mobilization time was postoperatively at 4.7±0.98 hours and feeding at 5.11±0.92 hours. There was no complication among patients.

**Discussion:** ESPB is a simple and safe block with USG and systemic complications are rare. We think that ESPB is a suitable and reliable option at rest; meanwhile multimodal analgesia is still essential to ensure adequate analgesia for dynamic pain control after VATS.


### PP.02.08

**Association between acute kidney injury and atrial fibrillation in patients undergoing cardiac surgery**


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**Introduction:** Atrial fibrillation (AF) is the most common arrhythmia following cardiac surgery, affecting up to 50% of patients in the immediate postoperative period. Postoperative AF is associated with increased morbidity, mortality and prolonged ITU stay. Recent guidelines (1) have identified age >75, history of AF, renal failure, mitral valve surgery/pathology, heart failure and chronic obstructive pulmonary disease as preoperative risk factors.
Factors for developing new postoperative AF, with the intention of providing these patients with pre-emptive treatment to reduce the risk of AF in the postoperative period. We hypothesised that acute kidney injury (AKI) in the postoperative period could be an additional risk factor for the development of AF.

Methods: We performed an analysis on routinely collected data from patients who underwent elective cardiac surgery at our institution between 1st July 2013 and 31st December 2018. Patients who had pre-existing cardiac arrhythmias and patients who had undergone previous cardiac surgery were excluded. Multivariable logistic regression was used to explore the associations that post-operative AKI (defined as an increase in baseline creatinine by a minimum of 26.4 μmol/L or by 50% of the baseline measurement, during the first 48 hours after surgery) and preoperative risk factors had with postoperative AF.

Results: A total of 5588 patients were included in the study. The incidence of postoperative AF was 1384 (24.8%), postoperative AKI occurred in 686 patients (12.3%). Postoperative AKI was significantly associated with postoperative AF after adjustment for preoperative variables (adjusted odds ratio = 1.572; confidence interval = 1.295 to 1.908; p < 0.001). The preoperative factors also associated with postoperative AF were: increasing Age, increasing BMI, NYHA III, previous congestive heart failure, recent MI, routine use of hypertension medication, CABG + valve surgery and aortic surgery (see Table 1).

Discussion: This analysis of a large, contemporary cohort of patients identifies postoperative AKI as an associated risk factor for postoperative AF, along with other preoperative variables. Early identification of this patient cohort would allow targeted preventative treatment to reduce the incidence of postoperative AF. This analysis provides impetus for clinical trials that further explore the association between AF and AKI.


PP.02.09

Central venous to arterial carbon dioxide difference monitoring in chronic dialysis patients after cardiac surgery

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Introduction: At present, the use of mixed venous oxygen saturation (SvO2) is widely used as an index of tissue oxygen demand-supply balance in patients after cardiac surgery. However, it still remains challenging to identify patients with assumed adequate circulatory status quantified by SvO2 in chronic dialysis patients because of arteriovenous shunts for hemodialysis. Venous to arterial carbon dioxide difference (AVCO2) has been reported as a global marker of adequacy of tissue perfusion in sepsis patients. We sought to correlate AVCO2 with other variables for assessment of oxygen delivery (serum lactate, SvO2, serum hemoglobin, cardiac index); as well as investigate its capacity to predict poor outcome associated with low cardiac output syndrome (LCOS) in chronic dialysis patients after cardiac surgery.

Methods: A retrospective observational study was carried out in our intensive care unit from March 2013 to March 2017. Chronic dialysis patients who underwent cardiac surgery with cardiopulmonary bypass were enrolled in this study. On ICU admission, blood sample was obtained simultaneously from an arterial line and a central venous line. Poor outcome was defined as any: inotropic score >15, death, cardiac arrest, use of intra-aortic balloon pumping, unplanned surgical re-intervention.

Results: In total, 55 patients were included in this study. There was no strong correlation between AVCO2 and other commonly used variables including serum lactate (R = −0.04), SvO2 (R = −0.13), serum hemoglobin (R = −0.03) and cardiac index (R = −0.17). 11/55 patients (20%) had poor outcome. There was no difference in median AVCO2 (8.9(5.9-10.5) vs 7.2(5.4-9.0) mmHg, p = 0.35), serum lactate (17(11-23) vs 15(10-17) mg/dl, p = 0.34) and SvO2 (71(65-77) vs 75(70-80) %, p = 0.19) between patients with poor outcome and those without poor outcome on ICU admission. Mean arterial blood pressure on ICU admission was significantly lower in patients with poor outcome than those without poor outcome (63(60-69) vs 74(68-80) mmHg, p = 0.004). Operation time was significantly longer in patients with poor outcome than those without poor outcome (517(413-570) vs 391(317-447) minutes, p = 0.009).

Discussion: AVCO2 was not correlated with important variables for assessment of oxygen delivery and, does not appear to be associated with poor outcome related LCOS in chronic dialysis patients after cardiac surgery. Serum Lactate and SvO2 are also not associated with poor outcome in this population. Mean arterial blood pressure on ICU admission and operation time are associated with poor outcome. Further study is needed to identify other predictive value of outcome in chronic dialysis patients after cardiac surgery.


PP.02.10

The role of preoperative endocrine parameters in prediction of postoperative complication in adult patients undergoing elective heart surgery – Preliminary study

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Introduction: At present, the use of mixed venous oxygen saturation (SvO2) is widely used as an index of tissue oxygen demand-supply balance in patients after cardiac surgery. However, it still remains challenging to identify patients with assumed adequate circulatory status quantified by SvO2 in chronic dialysis patients because of arteriovenous shunts for hemodialysis. Venous to arterial carbon dioxide difference (AVCO2) has been reported as a global marker of adequacy of tissue perfusion in sepsis patients. We sought to correlate AVCO2 with other variables for assessment of oxygen delivery (serum lactate, SvO2, serum hemoglobin, cardiac index); as well as investigate its capacity to predict poor outcome associated with low cardiac output syndrome (LCOS) in chronic dialysis patients after cardiac surgery.

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Discussion: AVCO2 was not correlated with important variables for assessment of oxygen delivery and, does not appear to be associated with poor outcome related LCOS in chronic dialysis patients after cardiac surgery. Serum Lactate and SvO2 are also not associated with poor outcome in this population. Mean arterial blood pressure on ICU admission and operation time are associated with poor outcome. Further study is needed to identify other predictive value of outcome in chronic dialysis patients after cardiac surgery.

Introduction: The correct cost-benefit estimation and the more accurately perioperative risk evaluation is one of the more difficult tasks in the perioperative medicine. We wanted to study more than the obvious parameters, so we looked for less studied predictors, such as different peripheral hormone levels. Every hormone molecule acts a complex pathway, so we truly believe that the insufficient function or decreased serum level of these mediators could be heavy influence for the perioperative adverse events.

Methods: Our single center prospective, observational study approved by the IRB and registered at clinicaltrials.gov (NCT03736499). We enrolled 89 patients between 25.01.2019 and 30.04.2019 who underwent elective cardiac surgical procedure. In the preoperative period we measured different hormone levels in serum (TSH, free T3 and T4, prolactine and testosterone) and collected the demographic parameters. We corrigated the normal hormone levels for age and gender. We recorded the length of postoperative intensive care unit stay, length of mechanical ventilation, dose of different vasopressor and inotropic agents, fluid balance, blood transfusion and bleeding. The adverse outcomes were also collected. The primary outcome was the all-cause mortality. Secondary outcome were the length of ICU stay, length of mechanical ventilation and the frequency of different adverse events. We performed descriptive statistics, chi square test and Mann-Whitney U test using the IBM-SPSS 22.0 statistic software.

Results: Median age was 66.0 years (IQR: 59.0-73.0), 64.04% of the patients were male, median of BMI was 28.22 (IQR: 25.44-31.44). The median of EuroSCORE II was 1.94 (IQR: 1.17-3.05). The mean follow up time was 52.8±20.68 days. 8 patients (8.98%) died during the follow up time, the median length of ICU stay was 45 hours (IQR: 22.0-92.0), the median length of mechanical ventilation was 9 hours (IQR: 5.0-19.0). In unvariable Cox regression serum free T3 was correlated with all cause mortality (OR: 0.266, CI 95%: 0.096-0.735, p = 0.011) and the abnormal level of free T3 was associated with higher infection rate (OR: 6.052, CI 95%: 1.271-28.832, p = 0.024). Using nonparametric tests we found association between abnormal serum prolactine level and prolonged length of ICU stay (p = 0.002).

Discussion: The evaluation of serum hormone levels could help to make more precise estimation of perioperative risk in adult patients waiting heart surgery. Further examination should be performed, to establish stronger correlation between fine hormonal dysregulation and postoperation complications.

Discussion: A new unanimous definition for HR is needed to develop a standardized management. ACT is useful to monitor bedside anticoagulation, but second-line tests should always be available and adopted to characterize doubtful cases and verify HR.

Protamine/heparin 0.6 ratio in cardiac surgery

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Introduction: In cardiac surgery, haemostasis is key. Adequate heparinization is necessary to attain perioperative prevention of thrombus formation during cardio-pulmonary bypass (CPB). To counteract the heparin effect, protamine hydrochloride is administered. The main objective of this retrospective study was to analyse the effect of a protamine/heparin 0.5-0.7/1 ratio, which was implemented in our hospital as of May 2017, versus a ratio > 0.7-1.0/1 on postoperative blood loss and transfusion rate after cardiac surgery.

Methods: This retrospective study was conducted at a non-academic teaching hospital and based on a prospectively collected database. All patients that underwent cardiac surgery requiring CPB between May 2016 and May 2018 were included. The main outcome variables 12h postoperative total chest tube production and the total amount of blood and blood component transfusions were compared between groups by the use of the Chi-square and Mann-Whitney U test.

Results: A total of 1939 patients were included. We compared 1150 patients with a 0.5-0.7/1-protamine/heparin ratio versus 789 patients with > 0.7/1-protamine/heparin ratio (Table 1). Pre-operative coagulation values were within the normal range. The median 12h postoperative blood loss was 230 mL in the 0.5-0.7-ratio group versus 260 mL in the >0.7 ratio group (p <0.001).

The amount of patients that received blood component transfusion (composite endpoint of fresh frozen plasma (FFP), packed red blood cells (PRBC), fibrinogen concentrate (FC), platelet concentrate (PC) and prothrombin complex (PCC)) was significantly different. In the 0.5-0.7-protamine/heparin-ratio group 71.3% of the patients were transfusion free, compared to 62.5% of transfusion free patients in the high ratio group (p <0.001).

Discussion: A average 0.6-protamine/heparin-ratio after CPB in cardiac surgery is associated with a reduced 12h postoperative blood loss and a reduced amount of patients that received blood or blood components transfusion, compared to > 0.7-protamine/heparin ratio.

thresholds (ROC analysis) were integrated in a step-by-step algorithm (Figure 1).

**Results:** Correlation between Fi and FIBTEM A5 was very strong \((r = 0.94)\) but was lower in the CCR \((0.2-5 \text{ g/l}) (r = 0.65)\). The correlation between Fi and EXTEM A5 was weakly moderate \((r = 0.42)\). PLTEM A5 showed very strong correlation \((r = 0.96)\) with Pltc in the CCR \((< 150 \text{ G/L})\). INTEMCT showed very strong correlation with aPTT \((r = 0.84)\). EXTEMCT correlated moderately with PR \((r = -0.58)\). Cut-off based on ROC curve analysis for different parameters are showed in Table 1. A FIBTEM A5 \(< or = 12 \text{ mm combined to a EXTEM A5} < or = 44 \text{ mm could detect a Fi} < 1.5 \text{ g/L with a 100 % sensitivity and a 77.5 % specificity. EXTEM A5} < or = 34 \text{ mm could detect Pltc} < 50 \text{ G/L with a 90.9 % sensitivity and a 87.3% specificity. PLTEM A5} < or = 16 \text{ mm could detect Pltc} < 50 \text{ G/L with a 100% sensitivity and a 96.4% specificity.}

**Discussion:** In-house cut-off values of key ROTEM®sigma parameters differ from the published ones for ROTEM®delta. We report the first preliminary ROTEM®sigma-based algorithm for hemorrhage. Diagnostic and therapeutic performances shall be prospectively validated.

**PP.02.14**

**Review of safety in previous history of malignant hypertermia. Case report in cardiac surgery**

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**Introduction:** Malignant Hypertermia (MH) is a rare disease which low incidence (estimated as to 1:3000 general anesthesia) with potentially lethal inherited disorder characterized by disturbance of calcium homeostasis in skeletal muscle 1.

**Methods:** Case report: It is presented 71 years old patient, with history of two previous adverse events under general anesthesia, to aortic replacement due to symptomatic severe aortic regurgitation. The first one (1962, appendicectomy) it was reported high fever intra and postoperative period. The second one (1971, herniated disk surgery) was used halothane, fentanyl, midazolam and succinylcholine according to reports. It is presented tachycardia, muscular stiffness, high fever again 40°C Celsius) and finally cardiac arrest with successful resuscitation. Patient was suspected diagnosis of MH, but not confirmed diagnosis by in-vitro contracture testing or genetic test (mutations at ryanodine receptor gene) in following years.

**Results:** It is decided to apply actions to prevent a new MH event. According to studies, it should avoid trigger drugs, volatile anesthetics and depolarizing muscle relaxant, succinylcholine. Specific preparation of anesthetic machines to be ‘decontaminated’: vaporizers should be removed and all parts of the machine in contact with volatile anesthetics. The circuit of gas flow (GF) ought to be washed with a fresh GF of 10 l/min for at least 10 min. New anesthetic machines require a significantly longer time to washout residual inhalational anesthetics (concentration below 5 parts per million) 2. It is checked availability of dantrolene (unless 10 mg/kg) to treat if symptoms appear. Propofol, remifentanil, cisatracurium and midazolam. Neither problem appeared in perioperative period.

**Discussion:** It suggests to check preventive preoperative measurements about MH in known patients for safety. New anesthetic machines need more time to wash volatile anesthetics. In elective surgery confirms diagnosis in suspected patients before surgery.


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**PP.02.15**

**Adult congenital heart diseases: experience from a reference center**

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**Introduction:** Adult congenital heart disease (ACHD) represents a growing population in many cardiac centers and it’s a challenge for all physicians involved. Multidisciplinary teams integrated by cardiologists, echocardiographers, cardiac surgeons, cardiac anesthesiologists, radiologists and others, have been created in many hospitals to manage such patients (1). The objective was to describe the adult congenital cardiac population scheduled for cardiac surgery in our reference center.

**Methods:** We included all patients scheduled for cardiac surgery with a diagnosis of ACHD from January 2017 to May 2018. A retrospective review of medical records was performed for demographies, type of heart defect, intraoperative management, postoperative evolution, ICU length of stay and outcome at 30 days.

**Results:** A total of 1060 patients underwent elective cardiac surgery between the study period. Sixty-six patients (6.22%) had the diagnosis of ACHD. Mean age was 53.5±17 years [range 19 to 85 years], 63.6% were male and mean EuroSCORE II was 1.51 [range 0.5 to 5.41]. Type and number of diagnoses were: bicuspid aortic valve 45 patients, atrial septal defect 12 patients, congenital pulmonary stenosis 2 patients, congenital aortic stenosis 1 patient, sub-aortic membrane 1 patient, right coronary artery anomaly 1 patient, single ventricle 1 patient, tetralogy of Fallot 1 patient, Ebstein’s anomaly 1 patient and partial ativoventricular canal defect 1 patient. Eight of the 45 patient with aortic bicuspid valve had associated aortic root aneurysm. All patients were monitored with transesophageal echocardiography (TEE). Twenty-five patients (37.8%) were extubated in the operating room. Nine patients (13.6%) required blood products. Percentage of postoperative complications were: arrhythmias (28.7%), renal dysfunction (15.1%), hemorrhage >500ml at 24h (10.6%), respiratory alterations (7.5 %), neurologic events (4.5%), intubation >24h (4.5%), re-operation (3.03 %) and gastrointestinal problems (1.51%). Mean ICU length of stay was 3.27 days [range 1 to 9 days]. There was no mortality at 30 days.

**Discussion:** The incidence of ACHD in this review was low and bicuspid aortic valve was the most common anomaly. Operative cardiac risk and age showed a wide range. In this small sample post-operative complications were lower than reported in the literature (2). As reference center for ACHD
now the number of complex cases is increasing mainly by those diagnosed and treated in the childhood and coming for a second or third operation.


PP.02.16

The implementation of patient blood management – A survey of European practice


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Introduction: Approximately 40% of patients undergoing cardiac surgery will require a blood transfusion. Whilst this may be life-saving, there is also a morbidity and mortality associated with it. In recent years Patient Blood Management (PBM) has evolved to integrate peri-operative haemostasis care in an attempt to drive down transfusion. However, it has evolved in different ways across the different health care systems across Europe (1). This has led to discrepancies between guidelines (2,3) and actual clinical practice across countries. The objective of this study is to understand how PBM strategies differ throughout Europe.

Methods: A 10-minute long online survey was developed with a group of European anesthesiologists. Between January and July 2019 the survey was disseminated by the National and European scientific societies of Austria, Finland, France, Germany, Ireland, Switzerland, the Netherlands and United Kingdom. Its first seven questions provide epidemiological data about transfusion need and local patient blood management practice depending of guidelines. Following this, we present two clinical cases and ask questions about how these patients would be managed by the respondent.

Results: Results are expected for Summer 2019. These pictures of the local practices will serve as a basis of discussion for the European working group of experts involved in PBM.

Discussion: This description and analysis of the differences among countries and against current guidelines will help to improve the existing guidelines for PBM (2,3).


PP.02.17

Impact of surgical technique on the development of postoperative vasoplegia

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Introduction: Vasoplegia after cardiothoracic surgery is associated with severe post-operative complications and worse outcomes. Despite recent innovations, lung transplantation (LTx) remains one of the highest risk surgeries. We hypothesise that the avoidance of cardiopulmonary bypass (CPB) and the use of lesser invasive surgical approaches, namely the “minimally invasive” thoracotomy approach (MI) compared to the traditional Clam shell technique (CS), may reduce the incidence of vasoplegia post-operatively. Furthermore, we explore the association of vasoplegia and endothelial dysfunction by analysing the plasma release of endocan.

Methods: 90 patients received a LTx between October 2013 and June 2015 at Harefield Hospital. 40 were recruited in our prospective study. Clinical data, including surgical approach, use of CPB and OCS were recorded. Vasoplegia in the first 48 hours was
defined according to Tsiouris et al (1). Plasma levels of endocan were then measured by ELISA at baseline and at 0, 6, 12, 24, 48 after Ltx. Data were analysed and reported as appropriate.

Results: 7 patients (44%) in the CPB group developed vasoplegia vs. 6 (46%) in the off-group (p 0.305), 3 after unexpected conversion to CPB (30% of the unexpected CPB group, p 0.302).

Discussion: Here, we demonstrate a high incidence of vasoplegia after LTx. The development of vasoplegia was not affected by either the surgical approach or the use of CPB. In addition, we found no evidence for association between vasoplegia and endothelial dysfunction. However, vasoplegia may be related to longer duration of CPB and surgery. Further studies are needed to identify mechanisms of vasoplegia following LTx.


PP.02.18

Impact on intra-aortic balloon pump placement technique on cardiac surgical patient outcomes

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Introduction: Although the use of intra-aortic counterpulsation in cardiogenic shock was recently debated¹, it remains widely used device for the treatment of cardiac failure. The aim of our study was to evaluate intra-aortic balloon pump (IABP) placement technique related morbidity in cardiac surgical patient population.

Methods: Single center retrospective review of 424 cardiac surgical patients treated with intra-aortic counter-pulsation between January 1, 2013 and April 30, 2019 in a tertiary care center. Patient outcomes, procedure related morbidity and IABP insertion technical characteristics were evaluated (elective vs urgent, sheathed vs sheathless, ideal balloon tip position vs malposition). According to tip position patients were divided into three groups: good (at T2-T4 vertebrae), malposition (T5-T6), severe malposition (at T7 or below).

Results: Median patient age was 67 [Interquartile range (IQR), 59 to 75 years], 307 (72.4%) were male. Median EuroSCORE II was 4.4 [IQR, 2.4 to 10.5], median LVEF was 35 [IQR, 28 to 50]. Indications for IABP treatment were: cardiac failure or angina treatment before surgery in 45 (10.6%) patients, prophylactic use in high risk 178 (42.0%) patients, hemodynamically unstable before CPB in 5 (1.2%), hemodynamically unstable during off-pump CABG in 11 (2.6%), facilitate weaning from CPB in 47 patients (11.1%) low cardiac output following surgery in 137 (32.3%), weaning from ECMO in 1 (0.2%). Three hundred forty nine patients (82.3 %) survived to hospital discharge. In-hospital mortality was 5.1% in elective IABP placement group vs 26.8% in urgent IABP implementation group (p<0.001). In 23 (5.4%) patients due to severe peripheral vascular disease IABP was placed intra-operatively through ascending aorta. In remaining 401 cases percutaneous IABP placement was performed, balloon position was presumed as good in 138 (34.41%), malpositioned in 187 (46.63%), severely malpositioned in 65 (16.21%) and unavailable for 11 (2.75%) cases. In 361 (90%) patients sheathless technique was used. The overall IABP related complication rate was 7.1%. Vascular complications rate was 15 (3.5%) and a tendency of lower morbidity (2.5% vs 10%, p<0.05) was noted when sheathless technique was used for IABP placement.

Discussion: Elective balloon placement was associated with lower morbidity in cardiac surgical patients. Sheathed insertion showed a tendency of higher rate of vascular complications. Suboptimal IABP tip position was not associated with adverse outcome.

PP.02.19

**Hyperalgesia and fentanyl dosing in on-pump coronary artery bypass grafting**

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**Introduction:** Opioids have many known side-effects. However, opioid-induced hyperalgesia (OIH), as a result of central sensitization, remains more obscure. The increase in hyperalgesia is dose-related and postoperatively an increased secondary wound hyperalgesia may be a factor in the development of chronic or persistent pain. This prospective, randomized and double-blind clinical trial aims to investigate the effects of fentanyl on secondary wound hyperalgesia in patients undergoing on-pump coronary artery bypass grafting.

**Methods:** Secondary wound hyperalgesia was investigated between two study-groups, respectively a low dose bolus group (n = 14, 3 mcg/kg) and a continuous infusion group (n = 17, Shibutani). The primary endpoint of this study was the area of secondary wound hyperalgesia after 24 hours. The area was measured using a Von Frey filament (256 mN). Additionally, we looked at hyperalgesia after 48 hours and we investigated following secondary endpoints: time to extubation, ICU/hospital length of stay, PONV, pain scores, the need for additional analgesia and the total dose of opioids administered 24 and 48 hours after surgery.

This study is a subgroup analysis of a larger study, in which the possible association between the area of secondary wound hyperalgesia and persistent pain at 3, 6 and 12 months after surgery will be investigated.

**Results:** The examination of preliminary results showed no statistically significant difference for the area of secondary wound hyperalgesia after 24 hours (p = 0.3268). However, the results became significant after 48 hours, where the area of secondary wound hyperalgesia was smaller in the low dose bolus group (p = 0.0389). No significant differences were found for the other secondary endpoints.

**Discussion:** There was less secondary wound hyperalgesia in the low dose bolus group after 48 hours, although at 24 hours this was not statistically significant. These findings are the result of preliminary data. We need to wait for the definitive results of hyperalgesia and for the results regarding chronic pain to draw any conclusions about the clinical significance of OIH.


PP.02.20

**Predictors of end-stage renal disease after cardiac surgery**


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**Introduction:** Cardiac surgery associated acute kidney injury (CSI AKI) is a severe complication. Incidence in literature varies up to 30%. In 2-5% of AKI patients introducing renal replacement therapy (RRT) is necessary and they are prone to development of a terminal renal failure. Aim of this study was to analyse incidence of AKI in our institution, compare to literature and benchmark institutions and define probably perioperative variables that are manageable and could be altered in order to reduce incidence of AKI. In order to analyse perioperative factors that can cause development of end-stage renal disease (ESRD) we collected data from Croatian Institute of Public Health (CIPH) registry of chronic renal disease and connected with our data.

**Methods:** Study design: a single centre retrospective observational study. Institutional board of Clinic Magdalena as well as Ethical Board of CIPH approved the study. There were 2181 heart operation in our institution during period 2013-2017. Eligible for study (all data collected) were 1817 patients. Categorical variables were analysed using Pearson Chi-square test, continuous variables were analysed using an unpaired T-test. The p value below 0.05 was considered statistically significant. AKIN classification was used for diagnosis of AKI.

**Results:** Data was collected from 1817 patients; 303 (16.6%) patients developed some kind of AKI; stage I 258
(85%), stage II 38 (12.5%) and stage III 9 patients (2.97%). Overall mortality was 1.98% (36) and in AKI group 5.28% (16). Thirteen patients developed ESRD (0.71%), 5 of them had AKI during hospitalisation (stage I 4, and stage III 1 patient). We found age, body mass index (BMI), Euroscore II score, cerebrovascular disease, pre-existing renal disease, peripheral vascular disease, hypertension, haemoglobin (Hb), haematocrit (Htc) and C reactive protein level to be preoperative variables related to development of AKI. Intraoperative variables with statistically significant difference among groups are operating time and clamp time.

As for variables related to development of ESRD we found preoperative Hb and Htc level as well as preoperative creatinine clearance (CrCl), pre-existing renal disease, diabetes mellitus, and atrial fibrillation to be statistically significant.

Discussion: Our data are comparable with literature data. Interestingly both level of Hb and Htc are variables related to development of AKI as well as ESRD after cardiac surgery. It seems that preoperative correction of anaemia and intraoperative meticulous blood management, among others perioperative tactics, could lead to reduction of incidence of AKI and ESRD after cardiac surgery.


PP.02.21

Left atrial dissection: taken from darkness by transoesophageal echocardiography

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Introduction: Left atrial dissection (LATD) is an infrequent (incidence 0.16%) however serious condition (mortality 13.8%).

Methods: The authors present three-LATD between 2016 and 2018 (from 2475 cardiac-surgery cases).

Results: Case 1 - A 57-year-old female with severe mitral regurgitation (P2 prolapse) was admitted for elective mitral valve repair (MVR). After two unsuccessful MVR attempts due to systolic anterior motion, a mitral valve replacement (MVR) was performed. LATD was diagnosed on the transoesophageal echocardiography (TOE). Conservative approach was decided based on the patient stability. However, LATD increased on the TOE and surgical treatment was required. She was successfully weaned form cardiopulmonary bypass (CPB) and transferred to the intensive care unit (ICU) stable on inotropes. Unfortunately, the patient died thirteen days after surgery due to airway and respiratory complications. A post-mortem study confirmed the patency of cardiac sutures.

Case 2 - A 74-year-old male with severe mitral regurgitation (P2-P3 prolapse) was admitted for elective mitral valve repair and pulmonary vein ablation. A LATD associated to intra and peri-annular leaks was diagnosed on the post-repair TOE. Surgical treatment on CPB was required. The LATD was repaired and MVR was performed. The patient was weaned form CPB and transferred to the ICU on Right-Ventricular Assistance Device (RVAD) and inotropes due to RV failure. He was successfully weaned from RVAD and then discharged from hospital two months after the initial surgery.

Case 3 - A 85-year-old female with severe aortic and moderate mitral regurgitation was admitted for elective aortic valve replacement and MVR. A LATD was diagnosed on the post-CPB TOE without affecting pulmonary-vein drainage or left atrial filling. Conservative approach was decided based on patient’s stability. Consecutive TOE controls showed no changes. Therefore, he was transferred to the ICU and discharged from hospital one month after surgery.

Discussion: As in the authors’ three-case series, this infrequent cardiac-surgery complication has been mainly related to mitral valve surgery (56.3%). Treatment depends on patients’ clinical status, left-atrial filing impairment and LATD progression on TOE. Both surgical and conservative treatments have been reported successfully. Therefore, TOE is paramount in order to diagnosed and deal with this condition.

Left Atrial Dissection Graphic and TOE-case images

Perdomo, JM.
Impact of mitral valve repair case volume on postoperative mortality: a population-based observational study

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Introduction: Although mitral valve repair is recommended over replacement when feasible due to its better outcomes, repair rates vary remarkably between cardiac surgery centers. The aim of this study is to examine the effect of institutional case volume on mortality after mitral valve repair.

Methods: We analyzed all cases of adult mitral valve repair performed in Korea between 2007 and 2016 using administrative data. The association between case volume and 1-year mortality after mitral valve repair was analyzed after categorizing centers depending on the number of mitral valve repairs performed: low- (<20 cases/year), medium- (>20 and <40 cases/year), and high- (>40 cases/year, reference) volume.
centers. The effect of case volume on cumulative all-cause mortality was also assessed.

**Results:** A total of 6041 cases were performed in 86 centers. One-year mortality was 10.1% (175/1728), 8.7% (93/1067), and 4.7% (153/3246) in low-, medium-, and high-volume centers, respectively. Low- and medium-volume centers showed increased risk of 1-year mortality compared to high-volume centers (OR [95% CI]; 2.80 [2.15–3.64] and 2.66 [1.94–3.64], respectively.). The risk of cumulative all-cause mortality of up to 10 years was also worse in low- and medium-volume centers (HR [95% CI]; 1.96 [1.68–2.29] and 1.77 [1.47–2.12], respectively.).

**Discussion:** Lower case-volume was associated with higher risk of mortality after mitral valve repair. A minimum case volume may be required for hospitals performing mitral valve repair to guarantee adequate patient outcome.

**REFERENCES:**


**PP.02.23**

Measurement of cardiac biomarkers in open lobectomies: comparison of combined thoracic epidural anesthesia with general anesthesia to general anesthesia alone

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**Introduction:** Troponin is a sensitive biomarker for cardiovascular injury. In lobectomies, perioperative analgesia can be performed with either a combination of thoracic epidural anesthesia and general anesthesia or general anesthesia alone. We wish to demonstrate that patients who receive the former tend to have lower levels of troponin.

**Methods:** In this prospective observational study, we included patients who underwent open lobectomy. Cardiovascular markers were recorded postoperatively, in order to correlate the fluctuation of these markers with the application or not of thoracic epidural anesthesia.

**Results:** Forty-eight (48) patients were enrolled, 15 (31.3%) received a combination of thoracic epidural anesthesia with general anesthesia, while 33 (68.7%) received general anesthesia alone. Patients with epidural anesthesia were found to have significantly lower levels of troponin 12-24 hours after surgery (8.9 ± 4.1 versus 16.8 ± 10.5, p < 0.05), while 48 to 72 hours postoperatively, the troponin values of the two groups did not appear to differ (10.7 ± 6.9 vs. 14.8 ± 8.3, p 0.103). Age, sex and body mass index were not found to be significantly associated with the fluctuation of troponin values in this setting.

**Discussion:** Patients who undergo open lobectomy receiving a combination of general and thoracic epidural anesthesia appear to maintain lower troponin levels in the immediate postoperative period than patients receiving general anesthesia alone.

**REFERENCES:**


**PP.02.24**

Encephalography guidance of anesthesia to alleviate geriatric syndromes (Engages-Canada) study in cardiac surgery patients: a pragmatic, randomized clinical trial


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Introduction: Postoperative delirium (POD) is a syndrome characterized by an acute onset of fluctuating confusion, disorganization and inattention. POD is frequent in the cardiac surgery population (incidence between 11-50%), and associated to complications such as increased risk of falls, prolonged hospital stay, functional decline and increased morbidity and mortality. Risk factors for POD are often non-modifiable, such as age, male sex, underlying cognitive or psychiatric conditions, while risk factors more specific to the cardiac surgery population include the type of surgery, cardiopulmonary bypass time, transfusions, and mechanical ventilation time15-18. Recent studies suggest that the use of a processed EEG for titration of anesthesia may reduce the incidence of POD. Burst suppression, or the pathological patterns of high-voltage electrical activity alternating with periods of quiescence may be associated with POD. Our primary objective is to demonstrate whether guiding anesthesia depth using an EEG monitor to avoid episodes burst suppression can result in a decreased incidence and severity of delirium in the cardiac surgery population. Secondly, we want to examine contributing risk factors and sequelae of delirium.

Methods: ENGAGES-Canada is an ongoing multi-center, double-blinded, randomized controlled trial across 4 Canadian sites. Patients included are those over the age of 60 scheduled for elective cardiac surgery with cardiopulmonary bypass. Exclusion criteria are pre-operative delirium, illiteracy, history of awareness, and planned surgery within five days of index surgery. Using an anesthesia protocol for EEG-guided anesthesia to avoid burst suppression, patients are randomized to the intervention or the control group (non-utilization of the monitor). The primary outcome is defined as the incidence of postoperative delirium, assessed using the Confusion Assessment Method (CAM) or CAM-ICU, coupled with chart review from day 1 to 5. Secondary outcomes include the effect of known risk factors on the incidence of delirium and 30-day and 1-year patient-reported outcomes of health-related quality of life and prevention of falls.

Results: Current enrollment includes 600 patients, out of a target population of 1200. An interim analysis was performed at 570 patients. The incidence of delirium across all subjects was 17.5% when considering CAM alone. Patients in the EEG-blinded group spent more cumulative time in burst suppression than those guided by EEG: median 317 seconds versus 136 seconds in the blind and guided groups respectively.

Discussion: ENGAGES-CANADA is the first RCT to examine whether avoidance of burst suppression using EEG guidance can decrease the incidence and severity of delirium in a cardiac surgery population.

PP.02.25
A novel oropharyngeal double lumen cannula for transesophageal echocardiography sedation: a case series
Impact of elevated glycosylated hemoglobin (HbA1c) on the outcome following coronary artery bypass graft surgery

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Objective: Glycosylated hemoglobin (HbA1c) is the commonly measured variable to predict or study the outcome following cardiac surgery in diabetic patients. It is a reliable measure of long term glucose control (2 to 3 months). HbA1c level >7% indicates poor blood glucose control. Our objective was to evaluate the association between the elevated HbA1c and adverse outcome after coronary artery bypass surgery both in diabetic as well as in non-diabetic patients.

Methods: 1080 patients were included in the prospective observational study. All patients underwent elective coronary artery bypass grafting surgery (CABG) using cardiopulmonary bypass. 581 patients were diabetic and 499 patients were non-diabetic. They were further divided into two groups based on HbA1c >7% and <7%. Patients were analyzed for in-hospital mortality and Post-operative morbidity (Atrial fibrillation, duration of mechanical ventilation, length of ICU stay, Post-operative renal dysfunction and length of hospital stay.

Results: The mean age of patients was in group of patients having HbA1c more than 7% was 58.3±9.6 and in patients with less than 7% was 56±11.6. There was no difference in Ejection fraction between patients having HbA1c more than 7% when compared with patients having less than 7% (46.5±11.3 Vs 47.6±11.2, p 0.11). 71.4% (415/581) of patients with DM were having HbA1c >7%. The overall in-hospital mortality was 6.3% (68/1080). Out of 68 patients died, 46 patients were in diabetic group. 32 patients (70%) who died in diabetic group were having HbA1c levels >7%. The length of stay (LOS) in ICU was significantly higher in patients with HbA1c >7% (5.44 ± 4.13 Vs 3.19 ± 2.63, p <0.001) as well as the hospital stay (10.5 ± 3.77 Vs 8.57 ± 5.33, p <0.001). Within the Diabetic group, the patients with HbA1c >7% were having longer ICU stay (4.19±2.91 Vs 1.25±3.37, p<0.001), longer hospital stay (10.62±3.74 Vs 9.71±4.78) and increased duration of mechanical ventilation (0.11±0.31 Vs 1.15±1.67 p <0.001). HbA1c adjusted odds ratio for adverse outcome, measuring the additional risk for every unit increase in HbA1c percentage:

<table>
<thead>
<tr>
<th>Adverse Outcomes</th>
<th>Continuous HbA1c adjusted OR (95% CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>1.057 (0.95–1.17)</td>
<td>0.62</td>
</tr>
<tr>
<td>Renal Failure</td>
<td>0.99 (0.90–1.01)</td>
<td>0.47</td>
</tr>
</tbody>
</table>

Conclusion: Increased HbA1c was associated with increased morbidity and mortality in patients undergoing cardiac surgery using cardiopulmonary bypass. HbA1c may predict the adverse outcomes after cardiac surgery. Optimal preoperative HbA1c may improve the outcome following cardiac surgery.

abnormal left ventricular longitudinal strain. Kaplan-Meier survival analysis and Cox proportional hazard regression were used to evaluate the association between preoperative left ventricular longitudinal strain and primary outcome.

**Results:** Of the 823 patients (40.3% women; median age, 64 years), 30 patients (3.6%) died within one year. Cumulative 1-year mortality rate was 3.4% (95% confidence interval; 1.5–5.2%) in the normal strain group and 3.9% (95% confidence interval; 2.1–5.6%) in the abnormal strain group. After propensity score matching (a total of 606 patients in matched cohort), there was no statistically significant difference in 1-year mortality between strain groups; 3.3% (95% confidence interval; 1.3–5.3%) in the normal strain group, 3.6% (95% confidence interval; 1.5–5.7%) in the abnormal group, hazard ratio of 1.11 (95% confidence interval; 0.47–2.61, P-value = 0.81).

**Discussion:** Preoperative left ventricular longitudinal strain does not have statistically significant association with postoperative 1-year mortality in patients undergoing cardiovascular surgery with preserved ejection fraction in this preliminary analysis.


**PP.02.28**

Perioperative thyroid dysfunction and outcome after heart transplantation

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**Introduction:** Thyroid dysfunction after serious systematic stress is a widely known phenomenon., called non-thyroidal illness syndrome or euthyroid sick syndrome. Triiodothyronine (T3) and tetra iodothyronine (T4) decrease without previous thyroid disorders could be an early sign. Current phenomenon in our special, critically ill patient population is not well-studied yet.

**Methods:** Our single centre retrospective study was approved by the IRB (65/2017). The data of patients undergoing orthotopic heart transplantation between January 2015 and January 2019 were analysed. Data on survival was refreshed on the 2nd of May 2019. Demographic variables, thyroid diseases and hormone replacement therapy in medical history, the United Network for Organ Sharing (UNOS) score, baseline T3 and T4 levels (pmol/L) and postoperative complications were collected into our dataset. Our primary outcome was 30-day mortality, secondary outcomes were overall and in-hospital mortality. For further analysis, multivariable Cox regression were applied.

**Results:** Final analysis included 75 patients, 26.7% (n = 20) were female. Median time of follow-up was 592 day (IQR25-75: 395-839). Thirty-day, overall and in-hospital mortality were 6.7% (n = 5), 12% (n = 9) and 9.3%(n = 7), respectively. Median T3 level was 2.94 pmol/L (IQR25-75: 2.40-3.85) and T4 level was 14.34 pmol/L (IQR25-75: 11.87-16.36). Twelve (16%) patients had hypothyroidism in their medical history and 8 (10.7%) patients had hyperthyroidism, 9 (12%) patient were on thyroid hormone replacement therapy before the procedure. Median age was 52 years (IQR25-75: 45-58), median UNOS score was 3 (IQR25-75: 2-5). After adjustment of the UNOS score, T4 level were independently associated with 30-day (OR: 1.10; 95% CI: 1.01-1.21; p = 0.038) and in-hospital mortality (OR: 1.10; 95% CI: 1.01-1.20; p = 0.031). Nevertheless, T3 level showed no associations with our outcomes.

**Discussion:** Thyroid function should be monitored in the perioperative period of heart transplantation, dynamics of T4 may represent a clinically important marker. Thyroid hormone replacement in the early phase might need further investigations.

**REFERENCE:** G. Van den Bergh; Non-thyroidal illness in the ICU: A syndrome with different faces; Thyroid. 2014 Oct;24(10):1456-65. doi: 10.1089/thy.2014.0201.

**PP.02.29**

Igm-enriched-immunoglobulins associated with EMiC2 filter in the treatment of early septic shock after cardiac surgery

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**Introduction:** The occurrence of septic shock after cardiac surgery is a rare event with a reported prevalence between 0.39% and 2.5% (1). However patients who develop severe sepsis after cardiac procedures have a high mortality, varying from 65% to 79%. They also require a prolonged mechanical ventilation in intensive care unit and hospital length of stay. Reducing the time to diagnosis and early extracorporeal treatment is believed to be crucial.
factor for reducing mortality from multiple organ dysfunction is sepsis (1). We assessed the effectiveness of IgM enriched immunoglobulins (Pentaglobin Biotech Germany) 5mg/kg/3 days associated with 72 hours of chronic renal replacement therapy with Emic2 using citrate anticoagulation in septic shock after cardiac surgery.

Methods: Our retrospective study was performed in the Department of Cardiovascular Anaesthesia and Intensive Care San Carlo Hospital between 01/01/2018 and 01/01/2019. Patients developed septic shock after elective cardiac surgery with the use extracorporeal circulation were included. Septic shock were diagnosed according to Sepsis Surviving Campaign criteria. We tested the serum concentration of IL-6, procalcitonin (PCT), white blood cell count (WBC) and Endotoxin Activity Assay (EAA) before treatment (T0) and at 24 (T1), 48 (T2) and 72 hours (T3) after treatment. We evaluated the dynamic changes in the serum concentrations and activity of these molecules and techniques.

Results: Finally, 11 patients (4 males) were included. The average age was 64.5±7.1 with EUROSCORE value of 13.5±2.3. Nine patients (90.0%) had concomitant renal insufficiency and 5 (45.5%) had chronic obstructive pulmonary disease. The serum concentration of IL-6 ranged from 313.4±111.1 μg/dl before the treatment to 446.1±117.5 μg/dl after 24 hours, 121.3±97.6 μg/dl after 48 hours and 67.6±36.7 μg/dl at 72 hours. At the same time the serum concentration of PCT decreased respectively from 7.3±2.3 mg/dl to 6.1±1.2 mg/dl; 4.5±2.1 mg/dl; and 2.1±1.9 mg/dl. Similarly the EAA decreased from 1.21±0.60 before the treatment to 0.35±0.14 at the end of the treatment.

Discussion: Our small study confirm that Pentaglobin associated with Emic2 treatment in early septic shock after cardiac surgery is safe and can reduce concentration of major cytokines of endotoxin activity. Further studies needed to assess the clinical efficacy of this promising treatment technique.


PP.02.30

Adding objectivity to submaximal exercise testing by non-linear modelling of heart rate recovery profile (search-modelling)

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Introduction: Pre-operative exercise testing is widely used to assess perioperative risk. ‘Maximal’ tests, such as Cardiopulmonary Exercise Testing, are not always well tolerated. To overcome this sub-maximal exercise tests (SET) are increasingly being utilised. Though potentially better tolerated, results may be dependent on patient motivation and effort. Assessment of heart rate recovery (HRR), as a marker of underlying cardiac vagal activity, following SETs could potentially add objectivity. Several authors have unsuccessfully attempted to model HRR using a variety of non-linear functions(1). We hypothesised that a) an individual’s HRR profile could be modelled using non-linear mixed effects modelling (NLME) and b) that the kinetics of an individual’s HRR profile were the same, regardless of effort level.

Methods: Thirty-four healthy volunteers underwent three, six-minute SETs on a cycle ergometer. Individuals on beta-blockers or with contraindications to exercise testing were excluded. The first test was used to familiarise the volunteer with the test protocol and was undertaken at 20% of predicted maximum wattage (Wmax). The following two tests were delivered in a randomised order at 40% or 60% Wmax. Data on HRR was collected for 5-minutes on test cessation. HRR was modelled using the asymptotic regression function; Asymptote + (Maximum HR - Asymptote)*e-RateConstant*Time.

Results: The median age of the study population was 39 (range; 22-72) with 15% of the population possessing chronic co-morbidities. Figure 1 demonstrates the NLME model using a fit by maximum likelihood. Residual inspection revealed a homoscedastic distribution. The root mean square error (RMSE) for the model fitted values for both 40% and 60% Wmax was estimated at ±7bpm, demonstrating a good fit independent of work load. Modelling assumed that the asymptote and rate constant were fixed regardless of effort, however the maximum heart rate achieved on exercise cessation could vary between 40% and 60% Wmax.

Discussion: We suggest the rate constant (obtained from NLME modelling) could provide an index for an individual’s fitness independent of patient work load. Further work is required to assess the minimum increase in HR required during SETs in order to establish a valid HRR profile and the influence of different types of exercise on HRR. SETs are easier to conduct, better tolerated and a cheaper more widely available alternative to maximal exercise testing. After further validation, we plan to begin clinical testing of this novel concept which has the potential to provide widespread access to objective exercise testing which can be applied easily in any pre-operative clinic scenario.

Pre-operative exercise testing is widely used to assess perioperative risk. ‘Maximal’ tests, such as Cardiopulmonary Exercise Testing, are not always well tolerated. To overcome this sub-maximal exercise tests (SET) are increasingly being utilised. Though potentially better tolerated, results may be dependent on patient motivation and effort. Measuring heart rate recovery (HRR) after SETs could potentially add objectivity. Quantifying HRR by calculating the difference between HR on exercise cessation and at one/two minutes into the recovery period (HRR1/HRR2) has been widely described(1). This study sought to assess the influence of SET effort level on the reproducibility of HRR and evaluate the reproducibility of novel methods for quantifying HRR.

Methods: Thirty-four healthy volunteers underwent three, six-minute SETs on a cycle ergometer. Individuals on beta-blockers or with contraindications to exercise testing were excluded. The first test was used to familiarise the volunteer with the test protocol and was undertaken at 20% of predicted maximum wattage (Wmax). The following two tests were delivered in a randomised order at 40% or 60% Wmax. Data on HRR was collected for 5-minutes on test cessation. Area under the (HR vs time) curve (AUC) and an effort corrected version of AUC (EC-AUC) were derived as novel indices of HRR. To ascertain the reproducibility of HRR indices, the intra-class correlation coefficient (ICC) and paired t-tests were estimated. Eight volunteers returned for a second day of exercise testing to determine the test-retest reliability.

Results: The median age of the study population was 39 (range; 22-72) with 15% of the population possessing chronic co-morbidities. The ICC for HRR1 was 0.15 (95%CI; 0-0.43). For HRR2 the ICC was 0.35 (0-0.68). The novel AUC method achieved an ICC of 0.61 (0.27-0.8). EC-AUC achieved an ICC of 0.46 (0.14-0.69). The test-retest reliability of HRR1 at 40% or 60% Wmax was 0.16 (0-0.79) and 0 (0-0.74) respectively. For HRR2 the test-retest reliability at 40% and 60% Wmax was 0 (0-0.7) and 0.2 (0-0.83). For AUC the test-retest reliability at 40% and 60% was 0.79 (0.26-0.95) and 0.55 (0-0.9). The test-retest reliability of EC-AUC at 40% and 60% was 0.65 (0.02-0.92) and 0.44 (0-0.87).

Discussion: HRR1/HRR2 demonstrated poor reproducibility across differing effort levels, suggesting they are influenced by level of exertion. The AUC methods displayed moderate reproducibility across and between the differing effort levels and may therefore be a superior way to quantify HRR post SET.


Sustained high-dose thiamine supplementation in high-risk cardiac patients undergoing surgery under cardiopulmonary bypass (apply trial): a pilot study

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Introduction: Numerous studies showed that relative thiamine depletion in critically ill patients and in patients undergoing cardiac surgery may contribute to cardiac dysfunction and hyperlactatemia leading to adverse outcomes. Thus, in preparation for a larger trial, we performed a pilot, randomized, placebo-controlled feasibility trial of sustained thiamine supplementation in high-risk patients undergoing cardiac surgery under CPB.

Methods: Forty patients who underwent high-risk cardiac surgery under CPB were randomly assigned to receive either 200 mg of Thiamine or placebo intravenously after anesthesia induction; after CPB; on the evening of the day of surgery; on three postoperative days (twice a day). Primary endpoints were successful compliance with protocol and successful recruitment of patients. Secondary endpoints included: vaso-inotropic score and norepinephrine equivalent dose, postoperative peak lactate and creatinine levels, incidence of acute kidney injury, daily SOFA score, rate of postoperative complications, incidence of adverse events, 7-day and 30-day mortality.

Results: The mean recruitment rate was 6.6 patients per month (1.6 patients per week). Compliance with protocol was excellent as all patients enrolled into the study received all assigned intervention. No patients develop allergic reactions to the study drug. All patients completed the 30-day follow-up. There were no differences in secondary endpoints. Statistical analysis performed with the Stata Statistical Software using Mann-Whitney U test, T test of Student and ANOVA.

Discussion: The rationale for thiamine administration in patients undergoing cardiac surgery comes from results of several studies that showed a high incidence of thiamine deficiency postoperatively.
Our study implies that it is feasible to achieve an acceptable recruitment rate in a typical tertiary institution with full compliance with the protocol and it’s not associated with major safety concerns in patients receiving complex cardiac surgery.

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PP.02.33
Cardiogenic shock treated with multiple mechanical circulatory support devices

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Introduction: A 62-year-old man was admitted to a local hospital for heart failure. An echo showed severe biventricular dysfunction, severe LV dilatation and a large and mobile finger-like aspect thrombus extending from septum, across apex and posterior wall. He presented severe instability and therefore was transferred to our centre for further management. On arrival, he suffered electrolyte storm and a VA-ECMO was inserted. At this point, heart catheterization and angiography were considered unsafe.

After multidisciplinary discussion, a Levitronix LVAD with filters was inserted as bridge to decision. Due to rapid RV function deterioration an intraoperative decision was made to add an RVAD with an oxygenator.

He was inserted on the transplant list, but unclear capacity to cope with treatment and significant psychiatric issues emerged after family discussion. Refractory VF developed which lead to an unwanted incomplete assessment of the patient to the transplant list.

Discussion: Over recent years, mechanical circulatory support devices have revolutionized cardiovascular therapeutics. In the present case, the initial issue was the severe haemodynamic instability condition in which the patient presented, which lead to an unwanted incomplete assessment of the underlying disease. A multidisciplinary discussion was made about further management after VA-ECMO insertion: in order to discuss with the patient and assess candidacy to transplant, no other ways appeared to be reasonable than implanting a Levitronix, which could have allowed to awake the patient.

As soon as the medical team was able to discuss with the patient and the family about further management, neuropsychiatric issues arose, delaying the decision to a definitive insertion of the patient to the transplant list.

During this assessment period, massive LV thrombus developed raising the issue of Levitronix occlusion, leading to two main life-treating options: heart transplant or total artificial heart.

This case shows how complex the management of a severe heart failure with cardiogenic shock may be and how different types of mechanical circulatory support devices may be required for similar severity of the original disease depending on the phase of the treatment and the comorbidities.

PP.02.34
Safety and efficacy of levosimendan in a cardiothoracic ICU – 5 year data

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Introduction: Levosimendan is an intravenous inodilator drug for the treatment of acute heart failure. There is a paucity of real-life physiological data with respect to the efficacy and safety of Levosimendan. We report the 5-year experience of a Tertiary UK Cardio-thoracic Intensive Care Unit (CT ICU).

Methods: Data was retrospectively analysed from a single centre CT ICU patient information system (Philips ICCA). Data from all patients receiving Levosimendan who survived > 48 hours after Levosimendan infusion were analysed.

Results: 165 consecutive patients treated with Levosimendan were analysed between Jan 2013 and Jan 2018. Mean age 59.8 ± 16 years, 69.7% male. Indications and associated percentages are as follows: pre cardiac surgery optimisation for patients with left ventricular dysfunction 17.6%, failure to wean off inotropic support post-cardiac surgery 23%, VA-ECMO weaning 19.4%, right ventricular (RV) support post LVAD implantation 2.4%, RV support post cardiac transplant 6% and for acutely decompensated severe chronic heart failure 31.5%.
Pre and post inotropic changes with Levosimendan findings are reported in Table 1. At 72 hours (a priori specified time point), Levosimendan was associated with a significant reduction in pre- and post-dosage VIS (vasopressor inotropic score) \([7(0-571)\) vs \(2(0-428), p<0.001\)] predominantly due to a decrease in Epinephrine (0-0.4mcg/kg/min to 0-0.25mcg/kg/min, \(p = 0.0013\)) and Norepinephrine (0-0.35mcg/min/kg to 0-0.3mcg/kg/min, \(p = 0.018\)) administration. Despite a slight decrease in haemoglobin concentration [93.5 (87 - 105) to 88 (85-96)g/L, \(p<0.001\)], there was no significant difference in total cumulative fluid balance \([314(696, 4724, 4537)\)ml vs \(61 (2406, 9807)\)ml, \(p = 0.10\)]. No adverse events were reported.

**Discussion:** To our knowledge this is the first report and largest review of Levosimendan experience at a tertiary UK CT ICU over a 5-year period. Levosimendan was associated with a significant reduction in Vasopressor/inotropic score at 72 hours and a relative modest increase in inotropy as measured by LVEF and CI. These data suggest measurements specific to the ventriculoarterial coupling response should help phenotype which patients could benefit from this drug.


### Table 1

<table>
<thead>
<tr>
<th></th>
<th>Pre-Levosimandan</th>
<th>Post-Levosimandan</th>
<th>(p)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVEF (%), n=157</td>
<td>32(19)</td>
<td>36(34)</td>
<td>0.001</td>
</tr>
<tr>
<td>CI/min/m², n=68</td>
<td>2.6±0.91</td>
<td>3.1±1.06</td>
<td>0.012</td>
</tr>
<tr>
<td>SwO₂ %, n=89</td>
<td>55(15)</td>
<td>62±15</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Legend: LVEF = Left Ventricular Ejection Fraction; CI = Cardiac Index; SwO₂ = Mixed venous oxygen saturation.

**PP.02.35**

**Cerebral blood flow velocity monitoring in patients during cardiac surgery with hypothermic VS. normothermic CPB**

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**Introduction:** It is clear that neurological complications occur due to imbalance of oxygen delivery and brain needs. Neurological outcomes in patients (pts) after cardiac surgery may be associated with impaired cerebral blood flow (CBF) during cardiopulmonary bypass (CPB)\(^1\).

Aim of study was to compare the pattern of CBF and neurological outcomes in patients underwent cardiac surgery with normothermic and hypothermic CPB modes.

**Methods:** After the local Ethic Committee approval, we studied 97 patients underwent cardiac surgery with CPB.

In 75 pts (group 1) we used moderate hypothermic 28.2±0.3°C and in 22 pts (group 2) — normothermic 36.5±0.2°C perfusion.

Cerebral blood flow velocity (CBFV) was measured in the middle cerebral artery using transcranial Doppler sonography continuously during anaesthesia and surgery. Statistics was performed at 8 selected stages (1-stable anaesthesia, 2-before CPB, 3-start CPB, 4-stable CPB, 5-aorta unclamp, 6-stop CPB, 7-aorta decanulation, 8-end of surgery). Cognitive function estimated by 5 computerized psychometric tests (21 parameters) 2 days before operation and 2 weeks after surgery.

**Results:** We observed significantly higher CBFV in pts operated with normothermic mode of CPB starting with stable CPB to the end of surgery (stages 4-8) in comparison to pts operated with hypothermic perfusion (figure).

Impairment of psychometric tests performing in pts with normothermic CPB was significantly higher than in pts operated with moderate hypothermia: 31.64±12.2% (18.1-54.5%) vs 27.95±10.18% (7.01-52.6%).

**Discussion:** Excessive cerebral perfusion in pts operated with normothermic mode of CPB may cause increasing quantity of microemboli to CBF and contribute higher rate of cognitive impairments\(^2\,3\).

Hypothermic mode of CPB is more preferable for cerebral protection in patients underwent cardiac surgery with CPB.

PP.02.36

One-year survival impact of early right ventricular diastolic dysfunction after lung transplantation

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Introduction: Right ventricular (RV) diastolic dysfunction is known to be associated with increased mortality in heart failure or cardiac surgical patients (pts). However, after lung transplantation (LTx), the impact of early RV diastolic dysfunction on 1-year survival, in a population without pulmonary hypertension, is not well documented.

Methods: We routinely perform a comprehensive transoesophageal echocardiography (TOE) after ICU admission of LTx patients (pts) to check the pulmonary veins’ patency. After exclusion of pts transplanted for pulmonary hypertension and of pts under ECMO, we retrospectively reviewed the diastolic RV parameters acquired during this TOE. At that time, all pts were mechanically ventilated. RV diastolic function was explored by tricuspid peak early and late velocities (E and A waves) (pulsed-wave Doppler (PW) through the tricuspid valve), early diastolic peak velocity (Ea) of the lateral tricuspid annulus (PW-TDI), hepatic venous flow (HVF) pattern (PW Doppler), and characterized as normal or abnormal according to the algorithm validated by Shi et al. One-year survival status was recorded. Continuous variables are presented as median [interquartile range] and analysed with Mann-Whitney U test. Dichotomous variables are presented as numbers (%) and analysed with Chi-Squared test.

Results: From May 2008 to March 2018, RV diastolic data were available in 69 pts. Indications for LTx were COPD in 51 pts (73.9%), fibrosis in 12 (17.4%), bronchiectasis in 1 pt (1.5%) and other indications in 5 (7.2%). RV diastolic function was categorized as abnormal in 47 pts. One-year survival rate was 72.3% (34/47) in the group with early RV diastolic dysfunction and 95.4% (1/22) in the group with normal RV diastolic function (P = 0.027).

Discussion: Based on these retrospective TOE data in this single-center experience, occurrence of early RV diastolic dysfunction after LTx seems to be associated with impaired 1-year survival. Further prospective data are needed to confirm these preliminary observations.


PP.02.37

Right ventricular systolic dysfunction early after lung transplantation: prevalence and impact on 1-year survival

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Introduction: Prevalence and 1-year impact of right ventricular dysfunction (RVSD) early after lung transplantation (LTx), in a population without pulmonary hypertension (PHT), is not well documented. In this retrospective study, we hypothesized that, as after heart Tx, occurrence of early RVSD after LTx in those patients (pts) would be associated with impaired 1-year survival.

Methods: After ICU admission of LTx pts, we routinely perform a comprehensive transoesophageal echocardiographic (TOE) after ICU admission of LTx patients (pts) to check pulmonary veins’ patency. After exclusion of pts transplanted for PHT and of pts under ECMO, we retrospectively reviewed RV systolic data acquired during this TOE. At the time of TOE, all pts were mechanically ventilated. RVSD was defined based on visual assessment (RV dilation and/or RV hypokinesia) and RV fractional area change (FAC) <35%. Peak systolic velocity (Sa) of the lateral tricuspid annulus (PW-TDI), TAPSE and myocardial performance index (MPI) were also recorded but not used to categorize RVSD. One-year survival status was recorded. Continuous variables are presented as median [interquartile range] and analysed with Mann-Whitney U test. Dichotomous variables are presented as numbers (%) and analysed with Chi-Squared test.

Results: From January 2004 to March 2018, 166 LTx pts underwent comprehensive TOE in ICU. Indications for LTx were COPD in 117 pts (70.5%), fibrosis in 25 (15.1%), cystic fibrosis in 7 (4.2%), bronchiectasis in 7 pts (4.2%) and other indications in 10 (6.0%). RV visual assessment was reported as abnormal in 56/166 pts (33.7%). RV FAC was reported in 112 pts and was <35% in 44/112 pts (39.3%). At 1-year, survival rate was 75.0% (42/56) in the group with early RVSD and 77.3% (85/110) in the group with normal RV systolic function (p = 0.745).
Discussion: Based on this retrospective TOE and single-center experience, prevalence of early RVSD after LTx, in a population without PHT, ranges from 34 to 39%, depending on the used criteria (visual assessment or RV FAC). However, occurrence of early RVSD after LTx was not associated with impaired 1-year survival.


PP.02.38

Single center retrospective study of risk factors and outcomes of patients with preoperative normal ejection fraction requiring venoarterial extracorporeal membrane oxygenation in the post cardiac surgery due to coronary artery dysfunction

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Introduction: Aim of our study was to identify mortality rate and associated risk factors of patients with preoperative normal ejection fraction (LVEF) who received VA-ECMO support in the postoperative period as a rescue strategy for cardiogenic shock after an acute coronary graft insufficiency or iatrogenic coronary issues in the postcardiac surgery

Methods: Single center, retrospective, observational study conducted between May 1998 and May 2018. All adult patients with a normal preoperative LVEF who received VA-ECMO support in the postoperative period were analyzed. Pre-, intra and postoperative data, indication of ECMO implantation and causes of mortality were collected. Patients who developed a cardiogenic shock due to acute coronary artery dysfunction or iatrogenic coronary lesions were selected. The association between all collected variables and mortality were analyzed using bivariate and multivariate analysis.

Results: Data from 92 patients were included. Mean age was 66 years (50% females) and a logistic Euroscore was 12.5%. 62% of patients were elective.

Procedures were isolated coronary artery bypass grafting (CABG) 29.4%, isolated valve (33.7%), CABG plus valve surgery (10.9%) and surgery involving root (27.2%).

ECMO was instituted in 58.7% of patients on the day of surgery (42.4% in the operating room and 16.3% after admission to ICU). ECMO on first postop day (13%), and 8.7% on second day, 19.6% received ECMO later due to delayed coronary artery dysfunction (median 5 days (4-6)).

All patients were subjected to cardiac catheterization. 16 of these (17.4%) patients were managed by percutaneous coronary intervention while the rest of the patients were managed surgically.

The major complications of ECMO were acute kidney injury (17.4%), bleeding (34.8%), thrombosis (1.1%), ischemia (2.2%), sepsis (5.4%), cerebral complications (7.6%), multiorgan failure (9.8%) and acute respiratory distress syndrome (1.1%). No complications were observed in 20.7% patients. The overall in-hospital mortality was 58.7%.

Those who died in hospital were on ECMO for a median duration of 2 days (0-8) and showed a survival time of 6.5 days (1.75 - 11.5). The median duration of ECMO for survivors was 4.5 days (2-7.25) and they were discharged after a median of 25 days (19.75-33.25).

The independent risk factors for mortality in this subset of patients are CABG with or without valve surgery (OR 0.28 (95%CI 0.12-0.67)), preoperative peripheral vascular disease (OR 3.25 (95%CI 1.21-8.72) and delayed coronary artery complication (OR 7.58 (95%CI 1.63-35.32).

Discussion: In our study one third of the patients survived to discharge with VA ECMO as salvage therapy for cardiogenic shock after cardiac surgery due to acute coronary artery insufficiency but a delayed coronary artery dysfunction which needs ECMO implantation has an extremely high mortality


PP.02.39

Outcomes following veno-arterial extracorporeal membrane oxygenation for post-cardiomyotomy cardiogenic shock in adult cardiac surgical patients with a normal preoperative left ventricular ejection fraction

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Introduction: Post-cardiomyotomy cardiogenic shock (PCCS) is a syndrome that occurs following separation from cardiopulmonary bypass or anytime in the immediate postoperative Course1.)
The aim of our study was to identify risk factors for mortality and outcomes in patients with normal preoperative left ventricular ejection fraction (LVEF) who received veno-arterial extracorporeal membrane oxygenation (VA ECMO) for PCCS in first 48 h post-cardiac surgery.

**Methods:** Retrospective cohort analysis of adult patients, who received VA ECMO for PCCS from 1998-2018. Association between all collected variables and mortality were analyzed, with bivariate and multivariate analysis.

**Results:** Of the 62,125 patients who underwent cardiac surgery procedures at our institution during the study period, a total of 173 patients (0.3%) with normal preoperative LVEF required PCCS. The mean age was 65 years (46.8% females) and a logistic Euroscore was 14.7%. 53% of patients were elective. Procedures were isolated coronary artery bypass grafting (CABG) in 24.2%, valve surgery 32.3%, CABG plus valve surgery 15.1%, aortic valve+ascending aorta 22.0%, aortic arch surgery 6.4%. Amongst these, 28.0% of patients were redo procedures, 11.6% had endocarditis, and 2.3% Type A dissection. VA ECMO was instituted in 74.6% patients on the day of surgery (49.6% in operating room, 25.0% after admission to the ICU), 16.8% on first postop day, and 8.7% on the second day. The median duration of ECMO support was 5 days. The reasons for ECMO implantation was: acute coronary insufficiency in 43.4% of patients, arrhythmias (8.7 %), pulmonary embolism (1.2%), valvular insufficiency (1.7%), and cardiogenic shock in 46.2%. ECMO complications were bleeding in 40.0%, acute kidney injury (18.0%), stroke (6.4%), gastrointestinal complications (5.2%), sepsis (5.8%), limb thrombosis (3.0%). No complications were noted in 21.4% of patients. The overall in-hospital mortality was 57.8 %. Causes of mortality were therapy refractory shock in 40.0%, LCOS (Low cardiac output syndrome)after ECMO weaning (17.0%) multiorgan dysfunction (33.0%), and cerebral insult (10.0%).

Independent risk factors for mortality were female gender (OR 2 (95%CI 1.1-3.7), Diabetes mellitus (DM) (OR 2 (95%CI 1.1-3.9), preoperative peripheral vascular disease (PVD) (OR 2.2 (95%CI 1.1-4.5), prior cardiac surgery (OR 3 (95%CI 1.4-6.3) and postoperative MI (Myocardial infarction) (OR 2.4 (95%CI 1.1-5.4). Non survivors had a median hospital stay of 7 (2-11) days and survivors had a median of hospital stay after ECMO of 19 (11-28) days.

**Discussion:** VA-ECMO is associated with high mortality for PCCS in adult cardiac patients with normal preoperative LVEF. In our cohort of patients, female gender, DM, preoperative PVD, prior cardiac surgery and postoperative MI were independent predictors of in-hospital mortality.


**PP.02.40**

**Use of intravenous lidocaine infusion during thoracic surgery: a prospective observational cohort**


**Hospital Universitario de Girona Dr J Trueta, Girona, SPAIN**

**Introduction:** Thoracic surgery by thoracotomy is associated with severe pain. Currently “thoracic epidural” is the gold standard but it isn’t free of complications. Use of paravertebral catheter, opioids, antinflammatory agents and lidocaine infusion may contribute to decrease postoperative pain. The goal of the our study was to observe whether the use of intravenous lidocaine infusion was associated with a decrease in morphine requirement and rescue therapy with lidocaine by paravertebral catheter for the first 24h.

**Methods:** This is an observational prospective cohort study. Data from consecutive 34 patients older than 18 years old undergoing lung resection were prospectively collected from January 1st to April 30th 2019. The primary outcome was intravenous morphine requirement and rescue therapy with lidocaine by paravertebral catheter for the first 24h after thoracotomy. Non-parametric test (Wilcoxon rank-sum and Fischer’s exact test) were used to compare the continuous and dichotomic variables between the groups that used intravenous lidocaine and those that did not. Stata 13.1 was used for data analysis.

**Results:** Data from 34 consecutive patients were prospectively collected. In 20 of them intravenous lidocaine infusion was used and 14 of them did not. In the lidocaine group the median dose of morphine IV in first 24h was 2mg and the rescue therapy of lidocaine para-vertebrally was 0mg. No significant differences were found between groups in terms of intravenous morphine requirement (median, [IQR] 6 [0-7] vs 2 [0-5], p = 0.16) and rescue therapy of lidocaine paravertebrally within 24h postoperatively (median, [IQR] 0 [0-4] vs 0 [0-0], p = 0.16).

**Discussion:** Cui et al. in their study found a significant decrease of morphine consumption during the first 2h after surgery. However, a longer follow-up up to 24h was not performed. The use of intravenous lidocaine infusion during thoracic surgery was associated with a trend towards a decrease in intravenous morphine requirement within the first 24h postoperatively. However, this difference was not statistically significant. Data from studies with larger sample size and power are warranted.

Individualized peep after recruitment maneuver during one lung ventilation and pulmonary complications for thoracic surgery: a prospective observational cohort


Hospital Universitari de Girona Dr J Trueta, Girona, SPAIN

Introduction: Thoracic surgery by thoracotomy is associated with postoperative pulmonary complications. The goal of our study was to observe whether the use of Individualized PEEP after lung recruitment during one lung ventilation was associated with a decrease in the rate of postoperative pulmonary complications.

Methods: This is an observational prospective cohort study. Data from consecutive patients older than 18 years old undergoing lung resection were prospectively collected from January 1st to April 30th 2019. The primary outcome was pulmonary complications after surgery, as defined by guidelines.

Non-parametric test (Wilcoxon rank-sum and Fischer's exact test) were used to compare the continuous and dichotomic variables between the groups using individualized PEEP and the non-individualized group. Individualized-PEEP was determined by best compliance. In non-individualized PEEP group, a PEEP of 5 mmHg was used. Stata 13.1 was used for data analysis.

Results: Data from 34 consecutive patients were prospectively collected. In 6 of them individualized-PEEP was used. In the individualized-PEEP group the median PEEP was 7 (median [IQR], 7 [6-8]). Pulmonary complications were observed in 6 patients (5 pleural effusion and 1 pneumothorax). No significant differences in pulmonary complications after lung resection were observed (%: 17.8% vs 16.6%, p 0.71). No significant differences in oxygenation at ICU admission were observed (PaO2/FiO2 ratio median [IQR], 380 [326-446] vs 408 [354-420], p 0.75).

The results of this study should be seen with caution due to a relative small sample size and possible lack of power to detect differences between groups.

Discussion: The use of an intraoperative individualized PEEP after lung recruitment strategy during one-lung ventilation was not associated with a decrease in pulmonary complications after thoracic surgery. Its use was associated with a trend towards an increase in oxygenation at ICU admission. However, this difference was not statistically significant. Data from studies with larger sample size and power are warranted.

greater incidence of shearing than 37mm and 39mm. Laterality did not appear to influence the degree of shearing.

**Conclusions:** Case reports of bougie fragments found in the airways likely represent a small proportion of the true incidence. Fragments can cause short-term morbidity and their long-term effects are unknown. We conclude that the extent to which a bougie shears is not only a function of that bougie’s physical properties, but that it varies according to the DLT with which it is used. Certain bougie-DLT combinations produced a particularly high degree of shearing; precautions should be taken to ensure that these combinations are not used together.

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