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Poster and Oral
Presentation Abstracts

Oral Presentation Abstracts

Is a pre-operative guideline for the Optimisation of diabetic patients requiring cardiac surgery warranted? A retrospective review of outcomes over 3 years from a Cardiathoracic tertiary referral centre.

*Emma Houston, Nigel Scawn, Mark Pullen, Nicky Best, Damian Cullen, Omar Al-Rawi
Liverpool Heart and Chest Hospital, Liverpool, United Kingdom*

Introduction

It is well established that the prevalence of Diabetes mellitus is increasing. ¹Diabetes is estimated to affect 10-15% of the surgical population and is associated with higher complication rates and mortality.

¹The reasons for these adverse outcomes are multifactorial but have been suggested to include inadequate knowledge of diabetes and its management ²and a paucity of institutional guidelines for the management of these patients in the perioperative period. ³

The Association of Anaesthetists of Great Britain and Ireland (AAGBI) advocate thorough pre-operative assessment of these patients alongside optimisation, which they define as targeting a HbA1c < 69 mmol mol⁻¹. ¹If the HbA1c exceeds this value then the AAGBI suggest postponing the procedure until control is improved. Currently, guidelines do not exist at our centre for the management of diabetic patients presenting pre-operatively for cardiac surgery.

Method

In order to establish if the introduction of these guidelines would be of benefit, we retrospectively assessed 2707 (n=2707) admissions for cardiac surgery between 2015-2018. We compared outcomes to the presenting HbA1c. We aimed to elucidate if the presence of an elevated HbA1c beyond healthy levels (>42 mmol mol⁻¹) was affected complication rates, morbidity and mortality.

Results

Results demonstrated a statistically significant increase in postoperative length of stay for any patient presenting with HbA1c levels in the pre-diabetic range and above (>42 mmol mol⁻¹), (p=0.006). Higher odds of mortality were noted in patients with a HbA1c over healthy limits and were highest in the group presenting with a HbA1c over 69 mmol mol⁻¹. These results confirm that an elevated HbA1c is associated with an increasing prevalence of adverse outcomes.

Conclusion

We therefore advocate the introduction of a pre-operative clinical guideline for diabetic patients presenting for cardiac surgery that aims to identify those with poor control and offers a management plan for optimisation prior to hospital admission.

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**Nitric oxide-mediated kidney protection in cardiac surgery with cardiopulmonary bypass:
Prospective randomized study**

*Nikolay Kamenshchikov, Yuriy Podoksenov, Boris Kozlov, Yulia Svirko, Yana Anfinogenova, Vladimir Evtushenko, Vladimir Lugovsky, Vladimir Shipulin
Cardiology Research Institute, Tomsk National Research Medical Center, Russian Academy of Sciences,
Tomsk, Russian Federation.*

Objective: To study the effects of nitric oxide (NO) administration during cardiopulmonary bypass (CPB) on the onset of cardiac surgery-associated acute kidney injury (AKI).

Methods: A prospective randomized study was performed in surgical intensive care unit in Cardiology Research Institute, Tomsk NRMC. A total of 96 patients underwent elective cardiac surgery with CPB. For patient randomization, a computer-generated permuted block (up to a size of 20 and 1:1 133 allocation) randomization sequence was used. Patients received supplementation of NO to CPB circuit (group 1, n=48) or usual care (group 2, n=48). In group 1, patients received 40-ppm NO delivered to gas-air mixture supply circuit during the entire CPB period. Group 2 received sham treatment.

Results: The primary outcome was AKI rate. Nitric oxide-treatment was associated with a significant decrease in AKI rate during CPB: 10 (20.8%) vs. 20 (41.6%); $p = 0.023$. Nitric oxide administration was also associated with higher diuresis rate: 2.6 [2.1; 5.08] mL/kg/h vs. 1.7 [0.80; 2.50] mL/kg/h; $p = 0.0002$. Patients administered with NO had significantly lower urinary neutrophil gelatinase-associated lipocalin levels 4 h after surgery: 1.12 [0.75; 5.8] vs. 4.62 [2.02; 34.55] ng/mL; $p = 0.005$. In group 1, NO metabolite concentrations significantly increased at 5 min post-clamping, 5 min after declamping, and at the end of surgery: $p = 0.0073$; $p = 0.00014$; $p = 0.028$. Concentrations of proinflammatory and anti-inflammatory mediators, as well as free plasma hemoglobin concentration did not significantly differ between groups.

Conclusions: Administration of NO supplied to CPB circuit in patients undergoing elective cardiac surgery was associated with reduced AKI rate. Proposed approach of NO supplementation was safe and well tolerated.

A retrospective review of high risk lung resections with the view of establishing a high risk thoracic preoperative clinic.

Authors: Dr M. O'Connell (Clinical fellow in Thoracic Anaesthesia), Dr S. Kumar (Consultant Anaesthetist), Heartlands Hospital, University Hospital Birmingham Foundation Trust.

Introduction: Heartlands Hospital is a supra regional centre for thoracic surgery. Currently our institute does not offer a consultant led pre-operative service. With a growing body of evidence suggesting the needs of high-risk surgical patients are not being met, and development of the collaborative perioperative care programme, we hope to establish a Consultant led pre-operative clinic for these patients. The following review summarises the recent outcomes from lung resection surgery at our institute and proposes an evidence-based approach to identifying high-risk patients who would benefit from earlier senior review and potential optimisation.

Methods: A retrospective analysis from the thoracic surgical registry at Heartlands Hospital identified 621 patients who had lung resection surgery from 01/01/17- 30/06/18. We identified 47 patients (7.5%) as high risk with predicted post-operative (ppo) FEV1 or DLCO <40%. The British Thoracic Society identifies patients with ppo-FEV1 and/or ppo-DLCO <40% as being moderate to high risk of post treatment dyspnoea. Risk stratification and outcomes were reviewed using the thoracic registry and patient online records. Case notes were reviewed of the highest risk patients (FEV1 or DLCO <30%) and in-patient deaths.

Results: Our review highlighted a number of ways in which we could optimise our service. Key findings included: no pre-operative documentation of predicted post-operative pulmonary function tests, an underutilisation of cardiopulmonary exercise testing, an unacceptable number of patients without a pre-operative transfer factor calculated, a high prevalence of untreated pre-operative anaemia and outdated models of risk stratification. None of these patients saw a Consultant Anaesthetist prior to the day of their surgery. 23.4% of patients suffered cardio-pulmonary complications resulting in a significant increase in length of hospital stay (5.1 vs. 16.1) highlighting the potential cost saving of an improved service.

Discussion: We have made the following recommendations: All patients should have pulmonary function tests that include FEV1 and carbon monoxide transfer factor (DLCO); Predicted post-operative values should be calculated in pre-operative assessment based on the proposed surgery; Any patient with ppo-FEV1 or ppo-DLCO <40% should have formal cardiopulmonary exercise testing as per national guidance and be referred to the high-risk clinic; Additional referral criteria to the high-risk clinic have been proposed; Strategies need to be implemented to allow the identification and treatment of preoperative anaemia in a timely fashion; Further consideration needs to be made on the use of additional risk stratification tools e.g. NSQIP.

A high-risk preoperative clinic will allow early anaesthetic input to assist in optimisation, such as patient blood management, and is fundamental to a service that offers and supports joint decision making. The impact from implementing such a service should focus on patient led outcomes (quality of life and patient satisfaction) as well as traditional medically led outcomes (mortality rates).

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Antiphospholipid Syndrome and Cardiac Surgery

Harvey Parsons, Anuvidya Reddy, Danielle Blackie, Amman Sarang, Bonnie Kyle, Wael Awad, Philip Gamston

Barts Heart Centre, Barts Health NHS Trust, London, United Kingdom

Antiphospholipid syndrome (APLS) is a multisystem autoimmune disease associated with prothrombotic complications in both arterial and venous systems. Anticardiolipin antibodies are directed against protein-phospholipid complexes on plasma and vascular cells. Binding to platelet membranes cause aggregation and thrombosis. Traditional lab testing however demonstrates paradoxical prolongation of coagulation. As such, this cohort presents a challenge to both management of anticoagulation and perioperative bleeding. The syndrome occurs in 2% of the healthy population, however antibodies can be detected in 5%.

APLS patients presenting for cardiac surgery are at high risk of perioperative thrombosis. Major body cavity surgery, hypothermia, and use of cardiopulmonary bypass (CPB) profoundly alters coagulation. Balancing anticoagulation and excess bleeding is challenging. Circuit selection, anticoagulation and perfusion management need to be tailored accordingly. Usual techniques of monitoring ACT are unreliable due to interference with phospholipid surfaces resulting in prolongation. A number of strategies have been proposed and no gold standard has been universally established; Barts Heart Centre's Perfusion Departmental CPB strategy utilises the Hepcon, Heparin Management System (HMS). Bespoke Softline coated circuits are prescribed. This institution targets a Hepcon of 350iU/kg. This is repeated every thirty minutes and is based on patient demographics and pump prime volume. The HMS will recommend subsequent repeat dosing of heparin and protamine should reversal be desired. The perfusion strategy is focused upon mitigating risks of potential blood stasis during the CPB period.

We hereby present five cases.

Case 1: 60-year-old male who had coronary artery bypass graft for severe three vessel disease.

Case 2: 49-year-old female with SLE, who had mitral valve replacement due to severe mitral stenosis with moderate regurgitation.

Case 3: 38-year-old male who had urgent left ventricle aneurysm repair and circumflex graft. Chest closure was performed the following day.

Case 4: 29-year-old female who had mechanical mitral and aortic valve replacement due to rheumatic heart disease.

Case 5: 38-year-old male who had elective mechanical aortic root replacement.

Intraoperative anticoagulation was guided by HMS. Management of postoperative bleeding on the ITU has been guided by the use of TEG. Again, there is no universal consensus here and as such the approach is anaesthetist-dependent. In case 3, a double-dose of heparin was used. In cases 1 to 3 there was consensus in using a half-dose of protamine initially, to avoid potentially catastrophic thrombosis. Cases 4 and 5 received routine heparin and protamine dosing. All five patients made good recovery without significant complications.

We have collected data over 2 years and have 1 further case pending inclusion into our case series.

Going forward we intend to produce more robust guidelines as to managing this unique cohort of patients, now that we have at least 6 cases with good outcomes that have been reviewed. The CPB protocols are now well established, however perioperative management less so. Clearly an MDT approach is mandated and this continued approach peri-operatively has proved to be important in ensuring good patient outcomes.

	Case 1	Case 2	Case 3	Case 4	Case 5
Weight (kg)	104	64	74	52	103
Baseline ACT (s)	155	148	163	181	140
Heparin loading (IU)	40,000	25,000	50,000	15,000	35,000
ACT (s)	350	-	725	-	-
Further Heparin (IU)	10,000 in pump	10,000 in pump	10,000 + 10,000 in pump	10,000 in pump	10,000 in pump
Total Heparin (IU)	50,000	35,000	70,000	25,000	45,000
Protamine (mg)	220 + 100mg (ITU)	80 + 50(ITU)	125 + 100 + 100 + 100 (250 recommended by HMS)	150mg	350
Final ACT (s)x	196	307	-	-	159
Total CPB time (min)	105	82	185	181	160
Blood products (intraop)	Cell salvage Tranexamic Acid	Red cells x3 Cell salvage Tranexamic Acid	Red cells x6 Platelet x2 Cryoprecipitate x2 Octaplex 1000ml Cell salvage Tranexamic Acid	Red cells x2 FFP x2 Cell salvage 796ml Tranexamic Acid	Cell salvage 666ml

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Opioid-free Anaesthesia for Perioperative Management of Cardiac Surgery Patients: a feasibility study.

*Julia Neely, Guillermo Martinez, Chinmay Patvardhan
Royal Papworth Hospital, Cambridge, United Kingdom*

Introduction

Modern cardiac surgery post-operative management focuses on 'fast-tracking' patients, to reduce time to mobilisation. Opioid use is the mainstay of analgesia, but in patients with comorbidities this can delay recovery. A systematic review has shown opioids lead to similar post-operative pain outcomes compared with opioid-free anaesthetics, but contribute to higher side effect rates^[1]. Opioid-free cardiac anaesthesia has been described^[2], and increasingly, advantages of perioperative use of regional blocks are being acknowledged in cardiac surgery patients^[3]. Our institution has recently adopted opioid-free anaesthesia for selected patients; we report our initial experience.

Methods

Retrospective data for the first twelve patients undergoing opioid-free anaesthesia for a range of cardiac procedures between October 2018 and March 2019 were collected. All patients had general anaesthesia, incorporating multimodal analgesia and bilateral regional blocks using 0.25% Levobupivacaine. The anaesthetic technique was not standardised, and has evolved. All blocks were ultrasound-guided. The majority were muscular fascial plane blocks, without catheter placement.

Results

Patients underwent: aortic valve replacement (AVR, 4 patients), coronary artery bypass grafting (CABG, 5 patients - three were urgent procedures), combined AVR and CABG, minimally-invasive mitral valve repair and aortic arch replacement with AVR. Their median age was 71years [IQR 61-82years], and most were mildly or moderately frail. Median BMI was 28kgm⁻², and one patient was morbidly obese. Other comorbidities included: COPD, chronic pain, chronic kidney disease, and epilepsy. Nine patients had a clonidine or dexmedetomidine infusion intraoperatively. All received intravenous lignocaine, magnesium sulphate and paracetamol. One patient had intercostal nerve blocks, another had serratus anterior plane blocks, and the remainder had bilateral pectoralis nerve blocks – all without complication. Additionally, for mediastinal drain site pain, four had either surgical infiltration or rectus sheath blocks. Median time to extubation was 149minutes [IQR 23–260minutes]; with two patients extubated prior to admission to ICU, and two extubated within 30minutes of ICU arrival. Extubation was delayed in two patients for bleeding and agitation. Four patients required rescue intravenous opioids: three had morphine boluses and one had morphine patient controlled analgesia (PCA). Regular paracetamol and gabapentin were prescribed, and tramadol, codeine or oramorph were available as required. Median time to ICU discharge was 38.5hours [IQR 23-58hours]. Four patients did not require any opioids in ICU. Their median length of stay was 26.5hours.

Discussion

After an extensive literature search, it appears this is the first case series reported in adult cardiac surgery patients using single-shot regional techniques as part of multimodal, opioid-free anaesthesia. Our findings demonstrate this is a feasible anaesthetic approach. Unfortunately, pain scores and ward-based analgesia use were not captured. A third of our patients did not require opioids during their ICU admission. Introduction of a post-operative protocol for opioid-free management, coinciding with nurse education, could lead to an increase in this proportion; with anticipated benefits of higher early extubation rates, faster mobilisation, shorter length of ICU stay and lower costs. Intended next steps are development of an opioid-free perioperative pathway, in collaboration with our ICU nursing colleagues, and comparison of its outcomes with our standard practice.

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Malignant central airway obstruction (CAO) complicated by the ball-valve effect

Ahmad Kamal Azri Abi Musa Asa'ari¹, Muhammed Haris², Shilajit Ghosh¹, Bala Murali¹

¹Royal Stoke University Hospital, University Hospitals of North Midlands NHS Trust, Stoke-on-Trent, United Kingdom. ²Royal Stoke University Hospital, University of North Midlands NHS Trust, Stoke-on-Trent, United Kingdom

Introduction

We present a case of malignant central airway obstruction complicated by the ball-valve effect.

Case

A 50-year-old male presented to clinic with dyspnoea, hoarse voice, haemoptysis, myalgia and joint pains. His comorbidities include Wolf Parkinson White (WPW) syndrome, single unilateral kidney and chronic spontaneous urticaria. His Eastern Cooperative Oncology Group (ECOG) Performance status (PS) was 1. A computed tomography (CT) staging scan of his chest was performed showing confluent soft tissue mass at the right hilum staged at T4 N3 M1b (TNM-staging 8th edition). An urgent bronchoscopy was arranged on the next available general anaesthesia list. Anaesthetic induction was performed. An endotracheal tube (ET) was inserted with the plan for flexible bronchoscopy examination via a swivel connector. The patient became hypotensive, desaturated and was difficult to ventilate with reduced expansion of the right hemithorax. A therapeutic flexible bronchoscope was introduced through the ET tube to assess. Examination revealed the soft tissue prominence in the right hilum has developed into a fleshy tumour; involving the right tracheobronchial airway demonstrating a ball-valve effect. Manual external pressure to the right hemithorax was applied in combination with using the distal end of the flexible bronchoscope to 'lift' the tumour, to alleviate gas trapping. The ET tube was exchanged to a rigid bronchoscope and manual jet ventilation. We utilised a therapeutic flexible bronchoscope through the rigid bronchoscope for endoscopic intervention. Forced argon plasma coagulation was applied to debulk and to devitalize the tumour prior to mechanical coring (Fig 1). The patient felt an immediate symptomatic improvement. A diagnosis of poorly differentiated lung adenocarcinoma was confirmed.

Discussion

Central airway obstruction (CAO) occurs due to malignant or non-malignant lesions. The field of interventional bronchoscopy has expanded and is a recommended intervention for malignant CAO. Combined rigid and flexible bronchoscopy under general anaesthesia is the preferred method of our unit. These are commonly performed for palliative intent although it can also be implemented at all stages of cancer treatment at neo-adjuvant and adjuvant phases. The ball-valve effect (BVE) is as a result of partial obstruction of an airway that allows the inflow of gas during inspiration but prevents its outflow during expiration. This results in hyperinflation of airways and alveoli distal to the obstruction. The excessive positive intrathoracic pressure due to gas trapping can cause compromise to nearby structures including the consequences of barotrauma such as pneumothorax. We speculate that this complication may not have occurred if done under conscious sedation as the patient would have retained the ability to overcome through the dynamic obstruction due to intact spontaneous ventilation. A technique to resolve intrinsic positive end-expiratory pressure (i-PEEP) due to breath stacking in invasively ventilated asthmatics were employed here; by applying external pressure to the chest in an 'open disconnected system' through the rigid bronchoscope.

Conclusion

The ball-valve effect with dynamic hyperinflation causing physiological compromise can occur in the case of critical airway obstruction. Anaesthetic implications of intrathoracic malignancy and its potential effects are important to ensure safe anaesthetic management.

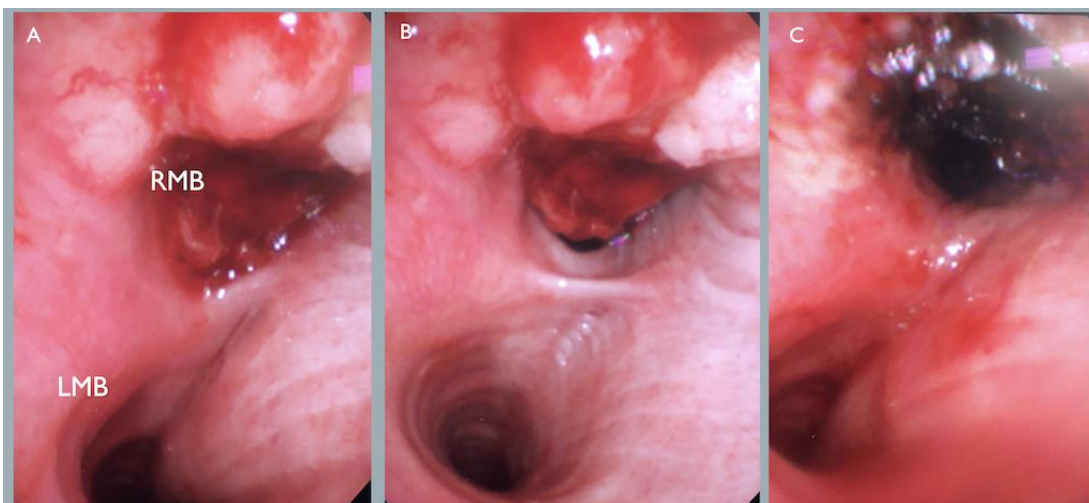


Fig 1. (A) Without ventilation (B) During positive pressure. (C) Post-debulking. Airway more patent.

Cardiopulmonary Exercise Testing (CPET) - How Do I Use It In clinical Practice – A surgeons View

Christopher M R Satur¹, Ian Cliff²

¹University Hospital of North Midlands, Stoke-on-Trent, United Kingdom. ²University Hospital of North Midlands, Stoke on Trent, United Kingdom

Introduction

Cardiopulmonary exercise testing (CPET) provides a wealth of information in regard to pulmonary, cardiovascular, metabolic and musculoskeletal status in regard to exercise. However, its perceived value has been reduced to role of provision of a cut-off prediction of operative mortality of thoracic surgery by providing a value of VO₂max alone. Nevertheless, CPET has an important role identifying abnormalities in exercise function in patients with musculoskeletal, cardiac or respiratory function. Better comprehension of the information provided will facilitate maximisation of its use in clinical practice. It is the intention of this presentation to provide a surgeon's eye view of CPET evaluation of a normal patient.

Body of Talk

CPET assessment is most commonly performed using bicycle ergometry. The test is used to assess 3 factors of exercise tolerance, pulmonary gas exchange, cardiovascular performance and skeletal muscle metabolism. Oxygen delivery may therefore be defined by the following formula:

$$VO_{2max} = (SV_{max} \times HR_{max}) \times (CaO_{2max} - CvO_{2max})$$

This formula represents the interaction of the of the elements of oxygen delivery and utilisation. It is the intention of this presentation to undertake stepwise discussion through results of CPET with a view to developing a basic understanding of how these tests and values may be used. It is intended to examine answers to questions: how do I know when a patient is exercising maximally? How do I know how much work or oxygen delivery has been undertaken? How do I know if they have cardiac or respiratory dysfunction?

Conclusion

It is intended that through this presentation a clinician will gain a foundation of knowledge in regard to CPET that allows effective use of this investigation for clinical and research purposes.

Exercise Dysfunction of Pectus Excavatum is Caused by Compromised Ventilation. A Two Centre Study

Christopher M R Satur¹, Vankata SKK Pulivarthi², R. Arsanjan², Ian Cliff¹, Watson Nick¹, Dawn Jaroszewski³

¹University Hospital of North Midlands, Stoke on Trent, United Kingdom. ²Mayo Clinic, Arizona, USA.

³Mayo Clinic, Arizona, USA

Introduction

Symptoms of exercise dysfunction reported by patients with Pectus excavatum (PE) are commonly either disregarded as unsubstantiated by pulmonary function tests or attributed to reduced patient fitness. The impact of the defect on cardio-respiratory function as a cause of symptoms requires further investigation. We have undertaken a two centre collaborative study to examine, with Cardio-Pulmonary Exercise Testing (CPET), the patterns of change during exercise in patient with PE.

Methods

Between 2006 and 2018, adult patients requiring surgical correction of PE underwent detailed pre-operative assessment of anatomical and physiological status. Investigations included CT Scan, spirometry and CPET. CPET used a standardised bicycle ergometer protocol. Measurements recorded at anaerobic threshold and at peak exercise were measures of work, oxygen utilisation, characteristics of ventilation. Data are presented as percentages of predicted values, means and standard deviation. Statistical analysis used students t-test, $p < 0.05$, univariate and multi-variate regression analysis to identify predictors of exercise function.

Results

345 patients, 76.0% male, aged 29.2 Years (± 11.0) had Haller's Indices on CT scan of 4.45 (± 1.73). Results of CPET demonstrated that at peak exercise the heart rate (HR) was 85.3% ($\pm 8.7\%$), Work achieved was 85.6% (± 22.0), 94.4% of patients achieved Respiratory Equivalents (RER) greater than 1.1, mean 1.22 (± 0.11).

Oxygen delivery as measured by VO_2Max and $\text{VO}_2\text{ AT}$ were reduced, 73.2% (± 15.6 , Normal $> 80\%$) and 41.1% (± 12.3 , Normal 40% - 60%) respectively. O_2Pulse , a surrogate of stroke volume was 86.0% (± 16.6 , Normal $> 80\%$). Measures of Ventilation Equivalents (VE BTPS) were reduced to 41.2% (± 11.7 , normal $> 85\%$) and Breathing Reserve (BR%) elevated at 46.9% ($\pm 14.8\%$, normal $< 15\%$).

$\text{VO}_2\text{ max}$ (0.87) and Anaerobic threshold (0.57) showed close correlation with O_2Pulse (Stroke volume), $p = 0.0001$. Multiple linear regression however identified Ventilation Equivalents (VE BTPS), Respiratory rate and O_2Pulse as composite predictors of $\text{VO}_2\text{ Max}$, $R^2 91\%$, $P = 0.001$. Predictors of O_2Pulse were VE BTPS and End-tidal CO_2 , $p = 0.001$.

Conclusion

The results demonstrate that patients with PE invest supra-normal degrees of effort during exercise but achieve reduced levels work. VO_2Max and O_2Pulse are secondary markers of exercise function, the primary determinants being ventilatory in-efficiency. We conclude symptoms of exercise dysfunction in patients with PE may be directly attributed primarily to compromised ventilatory function.

Lung Ultrasound for the Assessment of Extravascular Lung Water and Effect on Oxygenation in Cardiac Surgery: a prospective study.

Francis Emperador Marquez¹, Sean R Bennett¹, Julia Gonzalez ¹, Bassim Alsaywid², Ahmed Saati³, Andres Fernandez¹

¹King Faisal Cardiac Center, NGHA, Jeddah, Saudi Arabia. ²Research unit, King Saud Bin Abdulaziz University for Health Sciences, Jeddah, Saudi Arabia. ³College of Medicine King Saud Bin Abdullaziz KASAU, Jeddah, Saudi Arabia

Background

Extravascular lung water (EVLW) is the fluid that accumulates in the interstitial and alveolar space. It is represented by vertical artifacts known as B-lines using lung ultrasound¹ (LUS). Pulmonary complications relating to excess lung water include poor oxygenation and prolonged ventilation. There are currently no guidelines for LUS post cardiac surgery.

Aim

To score B-lines using LUS to assess EVLW before and after cardiac surgery and record the effect on oxygenation and time of extubation (Extub T) as primary outcomes. Secondary outcomes were pleural effusion (PE) and consolidation.

Method

This is a prospective cohort study in elective cardiac surgery using cardiopulmonary bypass (CPB) which was approved by Institutional review board. LUS was performed: pre-surgery T0, one-hour post-surgery T1 and 24-hour post-surgery T2. The arterial oxygen partial pressure to inspired oxygen ($\text{PaO}_2/\text{FiO}_2$) ratio was recorded at each time. LUS was performed using a Philips CX50 and phased array probe, with lung ultrasound 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. Other data included; CPB time, Aortic cross clamp (ACC) time, fluid balance at T1 and T2. 79 patients were recruited using consecutive sampling (March 2018 to March 2019). SPSS version 23 was used with simple descriptive and Pearson correlation analysis reported with a level of significance of $p < 0.05$, two tailed.

Results

73 patients completed the study age 56 range 18 to 87 years.

We found a negative correlation between LUS score and $\text{PaO}_2/\text{FiO}_2$ 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 $p < 0.013$.

Amongst the secondary outcomes PE increased from 7.7% at T0 to 34.6% at T2.

In addition, a positive correlation between PE and total fluids at T2 was found $p < 0.03$.

The incidence of consolidation increased from 12% at T0 to 52 % at T2.

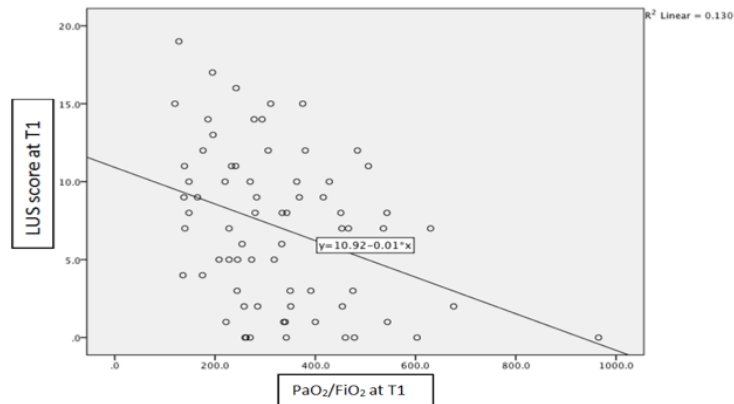


Fig.1 LUS score and oxygenation at T1

Discussion

Our results showed a negative correlation between ultrasound detected signs of EVLW and oxygenation. The fewer B-lines the better the oxygenation. Accordingly, the more B-lines the longer the period of ventilation.

This finding is in agreement with other studies using LUS to identify patients with increased EVLW demonstrated by B-lines and a decreased of PaO₂/FiO₂ which was correctable by dialysis². As shown in other studies the incidence of PE (27-95%) and consolidation is high (up to 80%) after cardiac surgery which we demonstrated with LUS³.

LUS is a simple and feasible method to assess peri-operative EVLW which predicts oxygenation and duration of ventilation.

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Type A Aortic Dissection and Successful Use of Novoseven- two case reports at University Hospital North Midlands

*Prabhjoyt Kler, Matthew Ilchyshyn, Roofa Mushtaq, Ravish Jeeji, Lognathen Balacumaraswami
University Hospital North Midlands, Stoke-on-Trent, United Kingdom*

Introduction: Recombinant factor VIIa (rFVIIa) has been used in haemostatic management of patients with major haemorrhage where blood products and clotting products have not been sufficient¹. The high-risk profiles of using rFVIIa and the associated costs have meant clinicians reserve the use to those at extremity. In cardiac surgery this has been reserved in patients who have continuous intra-operative bleeding and significant post-operative bleeding¹. Type A aortic dissections are associated with large volumes of blood loss despite improvements in peri-operative management and surgical techniques¹. This leads to large volumes of blood products being administered and resultant issues with coagulopathy¹.

We discuss two case reports of patients administered rFVIIa and the successful outcome following type A aortic dissection requiring deep hypothermic circulatory arrest (DHCA) on cardiopulmonary bypass.

Case 1: 61 year old male admitted with severe chest pain and absent left radial pulse. CT scan showed an extensive type A aortic dissection. Patient's background history of severe hypertension requiring four anti-hypertensives meant pre-operative labetalol infusion commenced alongside a history of nephrectomy for renal cancer. Patient had an 18 degrees DHCA enabling a 28mm Vascutek Gelweave Graft to be successfully inserted. Patient administered ten packed red cells (PRC), eight fresh frozen plasma (FFP), three adult doses cryoprecipitate, three platelets and two novoseven 5mg. Patient successfully extubated day one post-op and discharged after three days on CCU.

Case 2: 79 year old female admitted following severe chest pain and right-sided weakness leg/arm/face and slurred speech. Pre-operative stroke diagnosed and further imaging identified type A aortic dissection. Patient was an ex-smoker with history of depression and arthritis. Patient had an 18 degrees DHCA enabling a 28mm Gelweave Graft to be successfully inserted. Patient initially administered cell salvage blood 1113mls, two FFP, two platelets and one adult dose cryoprecipitate. Patient transferred to CCU however had one litre drainage of blood from chest drain. Return to theatre for repair and further blood products administered: five PRC, four FFP, two platelets, one adult dose cryoprecipitate and three novoseven 2mg. Patient extubated two days post op and discharged from CCU after one month and six days.

Discussion: Type A aortic dissection is known for high amounts of blood loss and the combination of prolonged DHCA, use of heparin and inflammatory reactions lead to issues with coagulation and increased bleeding in this patient cohort¹. Novoseven is an analogue of rFVIIa, which acts directly on factor X and at tissue injury to increase thrombin formation². Its high cost and side effect profile of venous thromboembolic events has led to its cautious use. It has been hypothesized that the use of rFVIIa routinely in cardiac surgery may enable a better coagulation profile and reduction in number of blood products, however larger studies are needed to establish this although single case reports have proved successful².

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An audit of enteral protein delivery in the Cardiothoracic Intensive Care Unit in patients undergoing prolonged ventilation

Matthew Ilchysyn, Prabhjoyt Kler, Phillip Johnston, Roofa Mushtaq
University Hospital North Midlands, Stoke-on-Trent, United Kingdom

Introduction

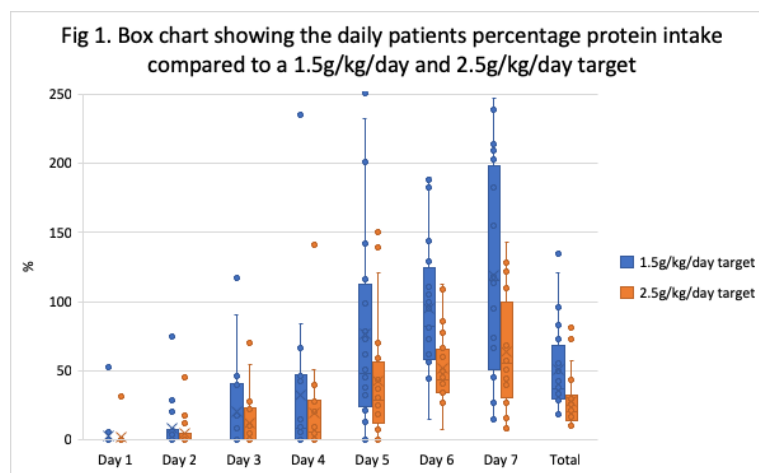
Providing adequate intake of protein is a vital aspect of cardiothoracic intensive care nutritional support. Patients undergoing cardiac surgery experience a systemic inflammatory response. This response driven by sympathetic neuronal output and the pituitary hormones acts to increase metabolic substrates to cope with the burden of increased energy requirement. Data from observational studies suggests adequate protein intake may be associated with increased critical care survival [1]. Guidelines suggest a target of protein intake between 1.5-2.5 g/kg/day and recommend initiation of feeding within 24 h after surgery [2]. It is suggested that targeting a higher protein intake of up to 2.5g/kg/day is optimal, although strong evidence in favour of this assertion is lacking. Overfeeding has also been shown to be detrimental to the critically ill patient, possibly due to suppressed autophagy. It is therefore important that nutritional provision is carefully assessed and monitored on the cardiothoracic intensive care unit. The aims of this audit are to evaluate protein delivery in patients undergoing prolonged mechanical ventilation. Audit standards were that all patients should receive a dietician review and have feed commenced within the first 48 hours of their surgery. All patients should receive $\geq 80\%$ of their estimated protein requirement over the first week. This is compared at a lower 1.5g/kg/day and higher 2.5g/kg/day protein requirement target.

Methods

A retrospective cohort was identified and daily protein intake data was collected for patients who received mechanical ventilation for greater or equal to seven days. Data was collected from the cardiothoracic ITU electronic patient data management system. Patients were excluded if nutritional support was discontinued before seven days or there was risk of re-feeding syndrome requiring a restrictive nutritional plan.

Results

Data from 20 patients was collected, covering 140 patient days. 80% (16/20) of patients received a dietician review within the first 48 hours and in 40% (8/20) of patients feed was commenced within the 48 hour target. In our audit overall 4/20 (20%) of the patient's met a target of 80% of the lower 1.5g/kg/day and 0/30 (0%) met the higher target of 2.5g/kg/day. Fig 1 shows the increased delivery of protein during the week and from day 5-7 the mean delivery was above the 1.5g/kg/day 80% target. The total mean percentage of protein delivery was 51% for the 1.5g/kg/day target and 28% for the 2.5g/kg/day target.



Discussion

Performance was high in patients receiving dietetic review but was low in commencement of feeding within the 48 hour post admission window. The audit has shown that delivery of protein remains suboptimal in many patients. Likely reasons for the target being missed include hesitance to initiate feeding due to concerns of intestinal ischaemia, use of lower protein enteral feed preparations, and intolerance of enteral feed. Protein delivery could be enhanced by use of higher protein concentration feeds on commencement of nutrition support, and the use of protein supplements in addition to tube feeds.

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Poster Presentation Abstracts

Introducing somatosensory evoked potential testing for prognostication after cardiac arrest: the experience of our cardiothoracic intensive care unit.

Joe Hawkins¹, Sarah Finlayson², Andrew Sinclair²

¹West of Scotland School of Anaesthesia, Glasgow, United Kingdom. ²Golden Jubilee National Hospital, Glasgow, United Kingdom

Introduction

In the comatose intensive care patient following cardiac arrest, clinical judgement incorporating a series of investigations and physical signs aims to reduce the chances of early treatment withdrawal in patients who would recover to a good neurological outcome; and prevent futile life-sustaining therapy in those who will not survive. We present our experience of introducing somatosensory evoked potential (SSEP) testing (an investigation with a reported 40-60% sensitivity and a very low false positive rate (FPR) for identifying non-survivors)¹ in our intensive care unit over the past 16 months, and how that has influenced our decision making.

Methods

This is an ongoing prospective audit project with periodic checkpointing. A database has been maintained since the introduction of testing to our cardiothoracic intensive care unit (20 funded level 3 beds) in August 2017. Our patients are admitted via a regional coronary reperfusion service covering the West of Scotland. Targeted temperature management is routine. A unit protocol is in place for prognostication which aligns with the 2015 European Resuscitation Council guidelines. Outcomes are subsequently assessed using the Cerebral Performance Category scale.

Results

Approximately 40 patients per year are admitted to our intensive care unit subsequent to out of hospital cardiac arrest. In the 14 months after test introduction, 19 patients underwent SSEP testing. 16 patients had a GCS motor score of 1 or 2 at the time of testing, 84% compliance with our protocol criteria. 14/19 patients underwent SSEP testing within our target timeframe. Overall 17/19 tested patients died of hypoxic brain injury. Only one patient had bilaterally absent N20 potentials, they subsequently died. Four tests were unusable for prognostication secondary to technical factors. Of the 14 patients with present N20 potentials, 1 patient survived with a CPC of 3 and 1 patient survived with a CPC of 1. In our patients, we observed a sensitivity in detecting poor outcome of 6%, a negative predictive value of 11%, a positive predictive value of 100%, and an FPR of 0%.

Discussion

Since introduction we have been utilising SSEP testing with a frequency comparable to reports from other centres, however it has so far demonstrated very limited use in our decision making largely secondary to low sensitivity. We theorise possible reasons for this: an unanticipated number of unusable patient results, and heavy patient selection before admission (younger, and with more limited comorbidity) in our particular centre.

We are working to improve, and will continue to monitor, utility. Neurophysiology have been able to provide additional resources with which to perform repeat testing in uncertain results; and this monitoring audit will continue to assess ongoing sensitivity.

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Implementation of a Checklist to Improve Anaesthetic Trainee Competence and Confidence in Initiating and Weaning from Cardiopulmonary Bypass

Claire Pollington, Timothy Strang, Natalie Thompson, Yonghan Li
Manchester University NHS Foundation Trust, Manchester, United Kingdom

Introduction:

Manchester University NHS Foundation Trust has one of the largest cardiothoracic departments in the UK. Cardiothoracic surgical procedures involving cardiopulmonary bypass (CPB) follow a predictable sequence of events, requiring close liaison between the anaesthetist, perfusionist and surgeon, in order to minimise complications. Checklists in healthcare have been adopted from the aviation industry, with a view to simplify complex multi-step tasks and reduce omission errors¹. This study aimed to assess the impact of implementing a checklist on anaesthetic trainee competence and confidence in initiating and weaning patients from CPB.

Methods:

Anaesthetic trainees, including registrars and clinical fellows, at Wythenshawe Hospital were identified to partake in the study between May 2018 and March 2019. A checklist was developed under the supervision of consultant anaesthetists, cardiac surgeons, and perfusionists. This outlined the vital steps required by trainee anaesthetists for initiating CPB and weaning patients from CPB, with each process containing 15 items. Trainee recall of these 15 items was tested, before and after reviewing the checklist, for going on and coming off CPB. A questionnaire created to determine self-perceived confidence levels of trainees (range 0-10) was also completed before and after examining the checklist, for going on and coming off CPB. Trainees were finally asked whether the presence of a checklist in theatre would be useful.

Results:

19 questionnaires were completed by 8 ST3 trainees, 6 ST5 trainees and 5 clinical fellows.

The mean score for recall of steps needed to initiate CPB was 6.5 before and 11.1 after reviewing the checklist. The mean confidence level reported was initially 5.2, increasing to 7.0 after examining the checklist.

Trainees' mean score for recall of steps involved in weaning from CPB was 8.4, increasing to 12.0 after reviewing the checklist. The mean confidence level was 4.9 to begin, increasing to 6.8 after the checklist was examined.

All trainees agreed that the presence of a checklist in theatre would serve as a useful prompt for remembering key steps involved.

Conclusion:

Use of the checklist was associated with an increase in recall abilities and self-reported confidence levels for trainees in both initiating CPB and weaning off CPB. Trainees scored higher at recall of steps coming off bypass, possibly due to association with the acronym 'TRAVEL' which is commonly encountered in anaesthetic textbooks. All trainees responded positively to the use of a CPB checklist, agreeing that the presence of the checklist in theatre would act as a helpful aide memoir. Further qualitative data regarding the effectiveness of the checklist as a prompt could be collected to guide ongoing improvement of the resource. Next steps would involve implementation of the checklist within all cardiothoracic operating theatres at Wythenshawe Hospital. A further study to determine the incidence of complications before and after implementation of the checklist would be necessary to assess the wider impact on patient outcomes.

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A tip for successful jet ventilation during rigid bronchoscopy

Bala Murali, Helen Daley

Royal Stoke University Hospital, Stoke on Trent, United Kingdom

Introduction:

The use of external laryngeal manipulation (ELM) is a well recognised technique for optimising the view on direct laryngoscopy, and thereby improving success at tracheal intubation (1). There are, however, no documented reports of ELM improving ventilation of the lungs once a rigid bronchoscope has been passed. We report a case of a patient undergoing rigid bronchoscopy where difficulty in jet ventilation was surmounted by the application of ELM.

Case report:

A 63 year old, morbidly obese patient, presented for a diagnostic rigid bronchoscopy. Total intravenous anaesthesia was used with Propofol and remifentanyl with rocuronium as the muscle relaxant. Following induction of anaesthesia, a rigid bronchoscope was passed by the surgeon and manual jet ventilation with a Sanders' injector was initiated by the anaesthetist via the bronchoscope proximal side port. However, at this stage, the lungs could not be ventilated because of a large audible leak with no visible chest expansion. Gentle external laryngeal pressure was applied by the operating department practitioner which reduced the air leak and allowed for ventilation of the lungs. The external laryngeal pressure was removed after inspiration to permit passive expiration.

Discussion:

Rigid bronchoscopy is a procedure that requires general anaesthesia. There are multiple ports on the proximal end of the bronchoscope that can be used for various forms of ventilation such as Jet (Venturi) ventilation, intermittent volume ventilation, continuous insufflation, and spontaneous ventilation. Jet ventilation, the most commonly used mode, uses the Venturi model based on air entrainment. It is accomplished by connecting a high-pressure oxygen jet through the side port at the proximal end of the scope. The modified Sanders' Jet ventilator delivers oxygen at a pressure of 25 to 30 lb/in² (2). The entrainment of air allows oxygenation and ventilation to occur. One of the documented risks of jet ventilation is barotrauma, due to the high airway pressures that can be generated. In our case, care was taken to ensure that the external laryngeal compression did not result in a closed system with the resultant risk of barotrauma.

The patient did not experience any desaturation or hypercarbia intraoperatively. Following the procedure, the patient made a full, uneventful recovery and was discharged home as per local protocol.

Conclusion:

This case highlights the challenges of ventilation via a rigid bronchoscope in obese patients with reduced lung and chest wall compliance and air leak around the bronchoscope that prevents sufficient ventilation to take place. The rigid bronchoscope is uncuffed, and any leak between the bronchoscope and the tracheal wall is meant to protect against barotrauma. Packing the oropharynx with gauze has been tried to reduce leaks (3). ELM helps to seal the leak and allows for better ventilation in selected patients. However, an important note of caution with this technique is that constant vigilance is required to reduce the risk of barotrauma and pneumothorax by monitoring the degree of chest wall excursion with every breath and to allow for chest deflation by releasing the laryngeal pressure.

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Intraoperative Cell Salvage: Preventing wrong patient transfusion in Critical Care

John McLenachan, Royal Infirmary of Edinburgh, Edinburgh, United Kingdom

Introduction

Intraoperative cell salvage (ICS) has been recommended for all cardiac surgical cases and shown to reduce allogenic red cell transfusion.¹ ICS is utilised in the majority of cardiac surgical cases at our centre. The UK Cell Salvage Action Group (UKCSAG) provides a framework for service provision including minimum standards for quality assurance and control.² Salvaged blood reinfusion bags (SBRBs) must have a hand written label attached containing the patient's name, date of birth, unique identification number and expiry date and time.² The anaesthetist must prescribe the salvaged blood (SB) on the transfusion record.²

Methods

Data was collected prospectively for all cardiac surgery cases involving ICS admitted to cardiothoracic intensive care (CTIC) over a 5 day period (Monday to Friday) in April 2018. Anaesthetic, surgical and theatre teams were not notified of the audit.

Results

A total of 13 cases (12 elective and 1 emergency) utilised ICS during the study period. Two (15%) cases received the SB in theatre and the SBRB was discarded, 4 (31%) cases had an attached SBRB which had been completely re-infused and 7 (54%) cases had an attached SBRB containing SB. No SBRBs were supplied unattached to the patient. Of the 11 cases where a SBRB was present, only 6 (55%) had a label attached. All 6 labels were completed correctly. Only 6 of the 13 cases (46%) had the appropriate documentation on their transfusion record. The average volume of SB re-infused was 723ml.

Discussion

Transfusion of ABO-incompatible blood is an NHS 'Never Event'.³ Data from the UK Serious Hazards of Transfusion (SHOT) initiative demonstrate that 'wrong blood into patient' incidents may be fatal, are preventable and are usually a result of human error.³ Failure to appropriately label SB risks inadvertent administration to the wrong patient. The UKCSAG state that labelling of SB is as important as the labelling of allogenic (donor) units and have developed a generic label for SB to help facilitate correct labelling.

The target for the process measure of correct SB labelling and documentation is 100%. This small audit was sufficient to demonstrate a significant and serious problem existed which needed addressing immediately. Having the SBRB attached to the patient is not a robust system for preventing wrong patient transfusion as this may be temporarily detached on admission to CTIC or in an emergency.

The findings of this audit were reported at a monthly departmental meeting and a formal report was emailed to all cardiothoracic anaesthetic and surgical consultants to raise awareness. SB labelling and documentation practices are now included in anaesthetic trainee inductions and included on a new CTIC admission checklist. Intensive care nurses are encouraged to incident report cases of inadequate labelling in addition to prompting the anaesthetist to amend this. This audit will be repeated regularly as a component of a broader quality assurance process for ICS.

Conclusion

As for transfusion of allogenic blood, meticulous attention to the labelling and documentation of SB is essential to avoid the preventable morbidity and mortality of wrong patient transfusion.

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Acute kidney injury post cardiac surgery: are prediction tools helpful?

*Martina Buerge, Danilo Rosario, David Nagore, Carlos Corredor
St Bartholomew's Hospital & Barts Heart Centre, London, United Kingdom*

Introduction

Acute kidney injury (AKI) after cardiac surgery remains a common risk and increases postoperative morbidity and mortality. Several prediction models have been developed to better guide possible prophylactic interventions. The Cleveland or Thakar Score has been proposed specifically for cardiac surgery [1] and has been validated to predict new need of renal replacement therapy (RRT). A different prediction model for postoperative AKI – not specific to cardiac surgery – is the recently published online AKIpredictor [2] which aims to predict risk of developing AKI during the first week of ICU stay. We aimed to compare the performance of both predictors in a cardiac surgical patient cohort at elevated AKI risk.

Methods

On 33 days all patients undergoing open non-congenital cardiac surgery with a Cleveland score [1] of ≥ 4 were retrospectively analysed. Patients with $\text{eGFR} < 15$ and/or preoperative haemodialysis were excluded. Pre- and postoperative variables (up to 48 hours after ICU admission, up to 1 week for AKI and RRT data) were sampled and presence of AKI as defined by KDIGO determined. Data were inserted into both the baseline and the ICU admission model of the AKIpredictor [2]. We compared predicted risks, Cleveland scores as well as pre- and intraoperative variables using two-sample t-test for normally distributed, Mann-Whitney test for non-normally distributed and Fisher's exact test for categorical data.

Results

Mean Cleveland score of patients with postoperative AKI was not significantly different compared to patients without AKI (table 1). Using both AKIpredictor models patients who developed AKI scored significantly higher than those without AKI. The AKIpredictor baseline model also discriminated between patients requiring postoperative RRT and those with AKI not needing haemofiltration. Most patient variables such as age, gender, preoperative creatinine, eGFR , ejection fraction, diabetes status, as well as intraoperative variables such as cardiopulmonary bypass time, aortic cross clamp time and dose of tranexamic acid were not statistically significantly different in this small patient cohort. However, preoperative total serum protein as well as albumin levels were significantly lower in patients who developed postoperative AKI.

Discussion

In our patient cohort, the Cleveland score was not able to distinguish between patients who developed AKI and those who did not. Our inclusion criteria being Cleveland score ≥ 4 might have contributed to this finding. In contrast, the AKIpredictor performed well in this patient cohort, particularly when using the preoperative model. Off note, the patients with the highest Cleveland score and those with the highest AKI probability on AKIpredictor did not develop AKI, possibly indicating an increased awareness of the clinicians, prompting a different clinical approach. Our data also confirm large studies indicating that preoperative serum protein and albumin levels correlate with AKI incidence [3].

Conclusions

In a cohort of patients undergoing open heart surgery at elevated postoperative AKI risk the AKIpredictor outperformed the Cleveland score in predicting postoperative AKI and RRT. Awareness of very high risk patients might lead to more effective clinical management preventing AKI; this hypothesis needs further investigation and could help developing widely applicable strategies to prevent AKI in moderate risk patients.

	AKI No (n=30)	AKI Yes (n=15)	RRT No (n=8)	RRT Yes (n=7)	p value
Cleveland score	5.13	5.8			0.185
			6	5.57	0.634
AKI predictor baseline [risk %]	42.07	57.07			0.021
			51.3	63.66	0.029
AKI predictor ICU admission [risk %]	34.98	53.23			0.009
			49.34	57.67	0.281
Baseline serum proteine [g/dL]	68.33	61.83			0.011
Baseline serum albumin [g/dL]	43.1	37.08			0.006

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Improving cardiac arrest team leadership and role delegation: a single centre quality improvement project

Bonnie Kyle¹, Clare Morkane², Petra Carroll³, Mark Mason³, Christopher Walker³

¹Barts and the London NHS Trust, London, United Kingdom. ²Royal Free Hospital NHS Trust, London, United Kingdom. ³Royal Brompton and Harefield NHS Foundation Trust, London, United Kingdom

Introduction

Human factors within the healthcare environment and in particular resuscitation scenarios are of growing interest and represent important targets for improvement of patient safety¹. Eighty percent of adverse incidents or near miss reports are due to communication problems². In the context of shift working and continually changing on-call teams, clear leadership and role allocation are paramount to ensure transparent communication and optimise patient care and outcomes.

Pre-intervention survey

A survey focussing on cardiac arrest team leadership of 63 members of the multi-disciplinary team (including all grades of medical and nursing staff on both the wards and Intensive Care Unit (ICU)) at Harefield Hospital was conducted. This was designed to assimilate opinions about team leader identification and the overall efficacy of team working. Results of this pre-intervention survey are shown below. An obvious need for an intervention to improve leadership and cardiac arrest team effectiveness was identified.

Intervention

Key stakeholders in departments of Cardiology, Anaesthesia/ICU/Outreach and Cardiothoracic Surgery were identified and a collaborative intervention agreed. A twice daily 'cardiac arrest team brief' of all arrest team members at 8am and 8pm (shift change-over) in the same central location (cardiac catheterisation laboratory) was instigated. This 5-minute meeting was designed to enable individual arrest team bleep holders to introduce themselves, allocate roles for the emergency situation and crucially identify the team leader. The meetings were led and overseen by the ICU Outreach nurse for each shift. A 2-month pilot of daily arrest team meetings took place, which was then followed by a repeat survey of 52 participants.

Results

Survey respondents were asked to score the overall leadership of cardiac arrest scenarios on a scale 1-5 (1 poor to 5 excellent). The pre-intervention score was 2.9/5 compared with 3.7/5 following the introduction of the team brief. Likewise, overall team effectiveness was rated as 3.7/5 pre-intervention and 4/5 in the repeat survey.

Table 1 shows pre- and post- intervention survey results; of note in response to the question 'how often were roles for each member of the team clearly identified', 27% of pre-intervention respondents selected 'often' or 'always' compared to 70% of post-intervention respondents.

Question		Always (%)	Often (%)	Occasionally (%)	Never (%)
How often was a Team Leader clearly identified?	Pre-intervention	10	37	43	10
	Post-intervention	22	42	26	10
How often were roles for each member of the team clearly identified?	Pre-intervention	3	22	49	26
	Post-intervention	20	50	22	8

Table 1: survey responses pre-intervention (n= 63) and post-intervention (n= 52)

Conclusion

Predetermined identification of an arrest team leader along with arrest team role allocation in a twice-daily brief of the resuscitation team resulted in improved overall team working and effectiveness. This cardiac arrest team brief is now routine at Harefield Hospital.

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Management of Pacing Systems Following Cardiac Surgery: Local and National Practice

Melissa Baldwin, Sherif Ghabina, Amit Chawla, GSTT, London, United Kingdom

Introduction

Temporary pacing systems are commonly used following cardiac surgery and postoperative arrhythmias are common. We analysed practice in cardiac intensive care and found significant variability in the management of pacing (1). We raised awareness of pacing settings and reassessed practice. We conducted a UK-wide survey of cardiac intensive care units, aiming to establish national practice. From this we hope to identify how to improve patient safety.

Methods

A pro forma was developed, and completed by the ICU nurse for each patient on admission over a one-month period. Information collected pertained to pacing mode, box and monitoring settings, handover and documentation. This was gathered for 57 and 82 patients respectively, with a campaign of awareness in-between.

With the assistance of Association for Cardiothoracic Anaesthesia and Critical Care (ACTACC) we conducted an electronic national survey to obtain data regarding management of pacing in the perioperative period across the UK. 19 of 39 centres responded.

Results

Local analysis revealed that despite a campaign to raise awareness there was no statistically significant change to practice. Handover and documentation remained poor, with cases reported with settings on 'asynchronous' and 'rapid pacing on'.

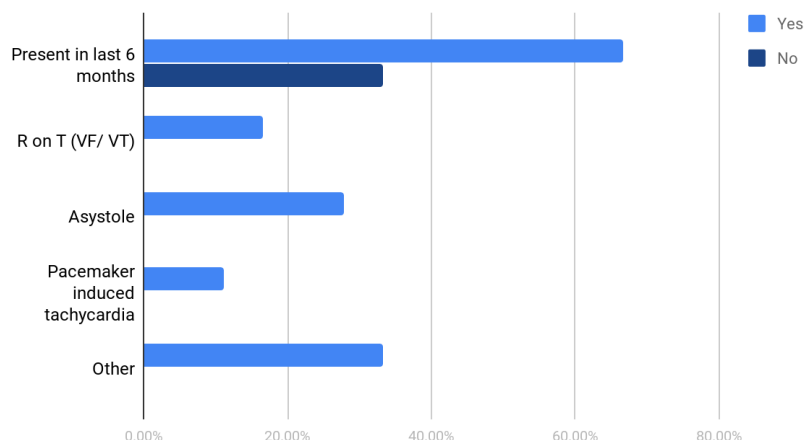
National practice also showed considerable variability. 21.1% of respondents use different boxes for atrial and ventricular pacing wires. 31.6% of respondents do not routinely test and establish pacing threshold, and 68.4% also do not document pacing thresholds.

73.7% do not have any protocol for the ongoing assessment of a patient's underlying rhythm, and 68.4% do not have a protocol for management for pacing-dependent patients

66.7% of respondents reported they had experienced a pacemaker associated adverse event in the last 6 months.

44.4% of respondents felt that a documentation chart attached to the pacing box would be a useful intervention.

Pacemaker Associated Adverse Events: a breakdown



Discussion

Despite attempts to raise awareness locally of pacemaker associated adverse events, the repeat audit did not show a statistically significant improvement. With rotation of staff and management of patients by junior members, the campaign of awareness has been lost and minimally efficacious. As a result, we propose standardised documentation transferable between stakeholders.

The national survey establishes that UK practice is variable, with minimal documentation of pacing settings. Adverse events are known to be an issue. Different pacing boxes in use within the same centre could cause confusion. The lack of protocolised management may contribute to these issues and just under half of respondents felt documentation would be useful, however there was doubt as to whether this would be supported and maintained.

We propose:

1. Documentation chart directly connected to the pacing box or charted on the patient's electronic record
2. Handover checklist
3. A protocol for assessment of underlying rhythm
4. Use of single type pacing box system for ventricular and dual chamber pacing

We hope to improve practice at a local level and prompt an awareness of this issue on a UK-wide basis. Further investigation will be conducted following the establishment of our proposals.

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Case report: Shearing of paravertebral catheter upon siting and its subsequent removal.

Martin O'Connell, Sajith Kumar, Heartlands Hospital, Birmingham, United Kingdom

Introduction

Paravertebral catheters are widely adopted for post-operative analgesia after thoracic surgery. They are commonly inserted by surgeons under direct vision. Here we describe a case of a retained portion of paravertebral catheter. Whilst the rare complication of retained epidural catheter is appreciated by anaesthetists this possibly may not be the case for surgical colleagues with less background and training in regional techniques.

Case report

A 64-year-old gentleman presented for a VATS lobectomy. He had a past medical history of previous MI with coronary stents, hypertension, TIA and mild COPD. He had recently been admitted with bowel perforation from which he recovered well with conservative management. However, a CT scan during the admission made the incidental finding of a lesion in the right upper lobe.

He underwent uncomplicated induction, a double-lumen endotracheal tube was inserted, and the patient positioned in the lateral position. After a 'stop before you block' a paravertebral block was performed, following aseptic precautions, at levels T4, T6 and T8.

After successful lung resection, as standard at our institution, a paravertebral catheter was to be placed under direct vision by the surgical team and an infusion of 0.1% bupivacaine commenced as part of our multi-modal post-operative analgesic regime. For this procedure we use a standard epidural set consisting of a 16G Touhy needle and 20G PVC epidural catheter. On the surgeons initial attempt, the catheter became stuck and would not advance a sufficient distance so they withdrew the catheter for a second attempt. On withdrawing the catheter through the Touhy needle the tip of the catheter was sheared off leaving it within the intra-pleural space. This was recognised immediately and a small incision in the parietal pleura was made to retrieve the distal portion (Figures 1). A second attempt at insertion was unremarkable with adequate catheter placement and our infusion was commenced as standard. No harm came to the patient.

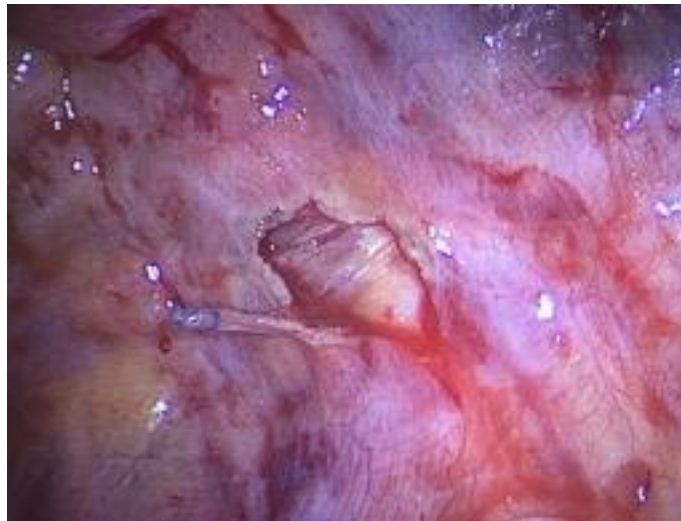


Figure 1. Catheter tip is removed through a small incision in the parietal pleura

Discussion

Shearing of an epidural catheter upon its removal is a rare but recognised complication. The exact incidence is unknown however a number of case reports have been published. At the time of writing we are aware of only one case report of a paravertebral catheter breaking on removal¹.

Retention of an inert catheter fragment located in the intrapleural space away from central neurological structures is unlikely to cause long term sequelae. However, we retrieved the fragment in this case as it could be located endoscopically and accessed easily.

It is becoming more common for surgical teams to perform regional techniques to aid post-operative pain control. As these techniques evolve, we should endeavour to support our surgical colleagues in refining techniques to reduce complication rates. Vigilance and the use of appropriate checklists will reduce the risk of these complications going unrecognised. Epidural catheters should never be withdrawn through Touhy needles due to the risk of shearing off a distal portion.

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Terlipressin: A rescue for chlorhexidine induced severe anaphylactic shock in cardiac surgery, case report

Amy Dunkoff-Gordon, Shrijit Nair, Paul Mendel, Gudrun Kunst, King's College Hospital, London, United Kingdom

Introduction

Chlorhexidine has been in use for over fifty years, and in the last five years it has become standard policy to use a mixture of 70% isopropyl alcohol and 2% chlorhexidine gluconate for skin cleansing prior to intravenous cannulation. Chlorhexidine is found in many commonly used products such as toothpastes, plasters, ointments, and cleansing fluids¹. In the recent NAP 6 audit the incidence of chlorhexidine anaphylaxis was reported to be 18/2,298,567 which is equivalent to 1 in 127,698 (95% CI 1 in 80,800 – 1 in >150,000²). Diagnosing perioperative anaphylaxis is complicated by possible exposure to multiple agents, and in the case of cardiac surgery hypotension can arise from the patient's cardiac pathology. In case of a hypotension refractory to adrenaline or volume replacement therapy – vasopressors can be considered. Up until the present there have been 8 cases where vasopressin has been used in refractory hypotension³.

Case report

An 85-year-old man was scheduled for mitral and tricuspid valve repair. The patient had no known drug allergy but did mention a rash after intravenous cannulation on previous occasions.

Induction of anaesthesia was uneventful with midazolam, propofol, fentanyl and atracurium. During central line insertion, which was 17 minutes after induction of anaesthesia the blood pressure dropped progressively to 20 mmHg. There was no response to metaraminol, multiple boluses of adrenaline 10 micrograms, and boluses of noradrenaline up to 1mg. It was noted that during central venous cannulation the patient was also catheterised and received cefuroxime 1.5g intravenously.

The patient was urgently prepped for sternotomy and cardiopulmonary bypass.

On cardiopulmonary bypass the blood pressure was initially under 30mmHg and did not respond to a 1mg bolus of noradrenaline. An infusion of Terlipressin was commenced and this restored normal blood pressure within minutes, and bypass was able to be discontinued with the patient in a stable condition, following the planned valve surgery.

He was extubated the following morning with no vasopressor support and he had not sustained any neurological damage. Subsequent testing at an allergy clinic demonstrated that chlorhexidine was the sole causative agent.

Conclusion

Our case suggests that:

- a) Since vasopressin acts on the V1 receptors, while norepinephrine acts primarily on the alpha-adrenergic receptors, terlipressin should be considered in cases where hypotension is refractory to noradrenaline. .
- b) Hypotension can be attributed to other causes in cardiac anaesthesia, including the decompensation of the underlying cardiac condition.
- c) The quad lumen central venous catheters in use in our institution are impregnated with chlorhexidine (ARROW BR-22854). Our triple lumen lines are free of chlorhexidine and could be used as an alternative in a case where the allergic status was known.

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Perioperative Transfusion Practice In Coronary Revascularization Surgery: A 10-Year Single-Centre Retrospective Analysis

Slawomir Jaszczuk, Alessandra Verzelloni, Helena Day, Christopher Walker, Lakshmi Kuppurao
Royal Brompton & Harefield NHS Foundation Trust, London, United Kingdom

Introduction Cardiac surgical patients are among the highest recipients of blood components¹. Large transfusion rates in cardiac surgery lead to high costs and increased risk to patient safety. Due to population aging, the number of cardiac procedures and the total amount of blood products is estimated to be increased. In this clinical setting, no clear consensus regarding transfusion strategies has been established². It is important to be aware of transfusion practices to decrease the amount of blood products utilization. We aimed to describe blood products transfusion practices in a group of patients with ischaemic heart disease requiring surgical treatment admitted to our institution in the last 10 years.

Methods In this single-centre retrospective observational study, blood components utilization was investigated in a tertiary cardiothoracic centre (Harefield Hospital) over 10-year period. A total of 500 adult patients admitted for isolated coronary artery bypass grafting (CABG) surgery were analysed. Exclusion criteria were redo coronary artery bypass grafting and combined procedure. Data were obtained from automated data collection systems and National Cardiac Surgical Database (demographics, laboratory values, co-morbidities, perioperative details, postoperative outcomes).

Results In first-time isolated CABG, transfusion rates of red blood cells ranged between 22% and 64%, platelet concentrates 14% and 52%, fresh frozen plasma 8% and 42%, and cryoprecipitate 0 and 6%. Comparing the blood transfusion strategies between 2009 and 2018, there has been a decreased usage of red blood cells (56% vs 40%), platelet concentrates (30% vs 26%) and fresh frozen plasma (26% vs 16%). In particular, we observed a reduction in the perioperative transfusion in the last 2 years.

Conclusions Blood transfusion management is an important determinant of outcome in cardiac surgery. We performed a descriptive analysis of perioperative blood transfusion practices in our institution. There has been a diminished usage of blood components particularly in the last 2 years. Over the last decade, many independent factors could have impacted on the transfusion requirements and strategies. This may be due to advanced surgical equipment and skills, improved preoperative patients' assessment, availability of different blood products, increase use of point-of-care testing (thromboelastography, multiple platelet function analyzer) and cell salvage system, recent randomized controlled trials³ and updated local transfusion policies. It is necessary to continue monitoring transfusion appropriateness and dose-response relationship between multicomponent transfusion and postoperative adverse outcomes.

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A modification for the definition of flail chest based on anatomical location and its impact in the clinical setting

Rachel Chubsey, Manikander Cheruvu, Christopher Satur, Royal Stoke University Hospital, Stoke-on-Trent, United Kingdom

Background

Current definition for flail chest fails to recognise the complexity of chest injuries. Comprehensive planning of the management of chest trauma is therefore impeded with a potential of increased injury related mortality. We report a classification of chest wall injuries that encompasses the complexity of thoracic wall injuries and facilitates planning of therapeutic strategies.

Methods

This institute introduced chest wall reconstruction in August 2014 as part of a strategy for management of poly-trauma patients. 100 patients underwent chest wall reconstruction following major trauma. Evaluation of the patterns of injury allowed formulation of this classification. Retrospective review has been performed to define the distribution of injuries witnessed in patients.

Definitions of Flail Chest: The thoracic cavity is considered to be a cylinder constituted of the rib cage, sternum, thoracic vertebral column and clavicles. Disruption at paired sites, not necessarily parallel, and at multiple levels will cause a flail segment. Classification; Types A – bilateral anterior rib, sternal and clavicular fracture; Type B – lateral fractures; Type C – Postero-lateral situated lateral to the vertebral column and related to the scapular; Type D – posterior bilateral fractures of multiple ribs and vertebra.

Results

The average age of patients was 56.8, 70% were male and road traffic collisions responsible for 54% of injuries. The incidence of these injuries was; Type A (n=20), B (n=26), C (n=18), D (n=3), combination (n=11) and no-flail (n=22). 5 (25%) patients with a Type A flail also sustained a clavicular fracture, whilst 17 (85%) suffered a sternal fracture contributing to the flail segment. In this group (A) 4 (20%) patients required sternal fixation to stabilise the flail segment. Within the Type D group 2 (66%) of patients sustained both thoracic vertebral fractures and scapula fractures. The New Injury Score was 36.7 (34.5 – 39.01) indicating severe poly-trauma.

Conclusions

A new classification for flail chest facilitates appropriate assessment and management of patients with major chest wall injury. These patients have life threatening injuries as demonstrated by high New Injury Severity scores (NISS), thus enhanced assessment and definitive management such injuries will optimise patient outcome.

Table 1:	Definition
A	Sequential fracture of ribs, often bilateral and asymmetrical, including the sternum and clavicles.
B	Sequential pairs of fractures situated on the lateral border of the rib cage.
C	Sequential postero-lateral fractures, often seated under the scapular.
D	Fracture of sequential ribs situated either side of the vertebra and including anatomically associated vertebral bodies.

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Iron Deficiency Anaemia in Women Undergoing Cardiac Surgery

Abubakr Adlan, Caroline Evans, Department of Anaesthetics, University Hospital of Wales, Cardiff, United Kingdom

Anaemia is common in patients presenting for cardiac surgery and is associated with adverse outcomes.¹ Death has been shown to be linked with gender and severity of anaemia.²

The WHO classifies anaemia as a haemoglobin(Hb) of less than 120g/L in non-pregnant female patients. However, in female patients, borderline anaemia (120-129g/L) has been shown to be associated with increased transfusion rates, total red cell requirements and increased length of stay.³

Methods

Data was collected retrospectively from consecutive female cardiac surgical patients during the period of February 2018 – 2019.

Data collected included preoperative Hb, preoperative Ferritin, lowest Hb during cardiopulmonary bypass, red cell transfusion requirements during cardiopulmonary bypass and total length of stay.

Results

191 female patients underwent cardiac surgery. During this period 58%(112) were identified with a screening Hb of less than 130g/L. 54%(61) were classified with a Hb between 120-129 and 46%(51) with a Hb less than 120g/L. Ferritin level less than 100 ng/L was associated with 63.9% of patients classified as borderline anaemic and 56.8% of patients classified as anaemic. Anaemia and borderline anaemia were both associated with a lower nadir Hb during CPB, increase red cell usage during CPB and increased length of stay.

Discussion

Together female gender, anaemia and cardiac surgery are associated with poorer outcomes and increased mortality. In our audit data anaemia was a common occurrence within our female cohort of patients.

This data shows iron deficiency was frequently identified in these patients, which is a treatable cause of preoperative anaemia.

Anaemia and borderline anaemia were both associated with a lower nadir Hb on bypass, increased red cell usage on bypass and an increased length of stay. Ongoing research should focus on this at risk patient group.

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Audit of Antiplatelet drug administration and platelet transfusion during the perioperative period in patient undergoing first time CABG

Arshad Ghori, Richard Di Palma, Arshad Ghori, Royal Brompton Hospital, London, United Kingdom

Introduction

Antiplatelet drugs are the mainstay of treatment of ischaemic heart disease. Patients are usually started on anti-platelet therapy once a diagnosis of ischaemic heart disease has been made. The management of anti-platelet therapy on patients who are scheduled to undergo elective CABG surgery is variable. Some patient's anti-platelet therapy is suspended 7 days before surgery while some surgeons continue till surgery and some stop the therapy three days before. Patients are restarted on anti-platelet therapy 6 hours after surgery with a loading dose of Aspirin being given and then continued regularly.

In this Audit we looked at the post-operative administration of loading dose of anti-platelet therapy and platelet transfusion in the peri-operative period.

Summary of results

- The study group included patients undergone non-emergency 1st time CABG in the period between 1/8/2017 and 30/5/2018
- 164 patients had drain output >50ml/h in 1st 3h postoperative, 42 patients had ongoing drain output >50ml/h after 6h postoperatively
- 8 patients were re-opened in 1st 24h for exploration of bleeding and/or Haemodynamic instability

Aspirin 300mg administration:

- 137 patients received postoperative Aspirin
- Aspirin dose was delayed to beyond 8h in only 15 patients out of 137 patients.
- 27 patients did not receive Aspirin 300mg
- 23 patients received both Aspirin and Platelets, but only 5 of them received the Aspirin within 3h of giving Platelets while in the other 18 patients Aspirin dose was delayed to after 3h of giving Platelets

Platelets transfusion

- 27 patients received postoperative PLT transfusion
- 18 of them had minimum PLT count<150 and 7 had PLT count<100
- Looking at minimum PLT count of the study patients, 15 patients had a minimum PLT count of <100, only 8 of them received PLT transfusion either intra or post operatively
- 3 patients had TEG MA<50, but only 11 patients had TEG done intraoperatively

Pre-operative Anti-platelets:

- 47 patients had the Aspirin stopped 1 day before surgery, the other 117 patients had it stopped >3 days before surgery
- All patients receiving Clopidogrel or Ticagrelol pre-operatively, had it stopped at appropriate time: 5 days or more for Clopidogrel and 3 days for Ticagrelol. Only 4 patients had stopped Clopidogrel 4 days before surgery.
- Regarding patients who required postoperative PLT transfusion, the majority of the patients requiring PLT transfusion had the Aspirin stopped 1 day before surgery.

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Not so fast – An audit of preoperative fasting prior to cardiac surgery

Samuel Denham, Tessa Oelofse, Queen Elizabeth Hospital, Birmingham, United Kingdom

Introduction

Preoperative fasting prior to general anaesthesia is a long-established practice. However, as well as its protective benefits against pulmonary aspiration, it also has negative effects including dehydration, glycogen depletion with subsequent insulin resistance, and patient discomfort.¹ In many trusts there is a culture of 'nil by mouth from midnight', which does not reflect modern anaesthesia. The minimum period of preoperative fasting is set out in international guidelines.² It would seem desirable to limit fasting to the shortest time possible based on this guidance to reduce the development of detrimental effects.

The aim of this audit was to assess adherence to fasting guidelines in cardiac surgical patients within Queen Elizabeth Hospital Birmingham (QEH), and to look how potential improvements might be made.

Methods

Data was collected for a total of fifty-one patients who underwent cardiac surgery at QEH from 04/02/19 to 04/03/19. All data was collected retrospectively from the patient's medical notes and electronic patient record following their admission to critical care post operatively, typically on the day of surgery or the following morning. Starvation times were calculated using the induction of anaesthesia time on the anaesthetic chart and the times for last food and fluid intake on the preoperative checklist. The audit was fully registered with the trust's audit department.

Results

The audit results are shown in figure one.

Figure One – Preoperative fasting times for patients undergoing cardiac surgery

Time from Last Food Intake to Induction (Hours)	Total Time	Unnecessary Extra Time
Mean	9.6	3.6
Median	8.5	2.5
Minimum	5	0
Maximum	20	14
Time from Last Fluid Intake to Induction (Hours)	Total Time	Unnecessary Extra Time
Mean	8.4	6.4
Median	8.5	6.5
Minimum	2.5	0.5
Maximum	16	14

The patient cohort contained a mixture of CABG, valvular, aortic and GUCH surgery. No patients were admitted to hospital on the day of surgery. Patients are being fasted for an average of 3 hours for food and 6.5 hours for clear fluids longer than is required. One patient fasted for 20 hours preoperatively, another received no oral or IV fluids for 16 hours prior to anaesthesia.

Discussion

This audit has revealed that whilst minimum fasting guidelines are almost universally adhered to, there are areas of current practice that could be improved. Almost all patients are being fasted for longer than required, especially with regard to clear fluid intake. In addition there is significant variation in fasting times.

In some cases, patients are fasted for substantially longer than has been captured in the data, e.g. a patient who has a meal at 7pm may be recorded as being NBM from midnight, even though they have actually

been fasted 5 hours longer than this. Another area identified was patients were often fasted from the same time regardless of the order of the operating list, hence patients who were the second case on a list were often fasted longer than was necessary.

The results of this audit will be used to inform further departmental quality improvement projects within this area.

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The role of non- medical practitioners in supporting both cardiothoracic anaesthetic provision and the National Organ Retrieval Service.

Lorraine Fingleton, Antonio Rubino, Pedro Catarino, Marius Berman, Thomas Howlett, Oliver Bermudez, Barbora Parizkova, Royal Papworth Hospital, Cambridge, United Kingdom

Introduction

Faced with an ever-increasing demand on resources, Royal Papworth Hospital sought to develop a new, cost efficient way of working that would allow them to continue supporting existing services and allow for future growth to occur. With the role of Physicians' Assistant in Anaesthesia (PAA) already well established in general surgery, Royal Papworth Hospital designed a pilot initiative to assess if the role of PAA could be expanded and integrated with that of the Donor Care Physiologist (DCP) to complement the specialist areas of cardiothoracic anaesthesia and cardiothoracic organ retrieval.

Method

Three successful candidates each enrolled into the full-time, 27-month Physicians' Assistant in Anaesthesia Postgraduate Diploma course offered by Birmingham University. Theoretical knowledge was delivered through 24 months of e-learning modules covering topics such as applied physics, anatomy and physiology, general anaesthesia and advanced practice. Weekly tutorials delivered by Consultant and Fellow Anaesthetists and Surgeons supported these University modules whilst also providing additional education on the specialist areas of cardiothoracic anaesthesia, surgery and transplantation. Clinical experience was gained through 24 months of hospital-based placement, 18 months of which was completed at Royal Papworth Hospital whilst 6 months was completed through a secondment to a local general hospital. The trainees also completed weekly on calls with the Royal Papworth Organ Retrieval team. They began by shadowing experienced DCPs on ITU based scouts and organ retrievals and progressed to confidently managing donor care independently. Advanced skills such as focused transoesophageal echocardiography (TOE), bronchoscopy and the insertion of invasive vascular access lines such as arterial cannulas, central venous catheters and Swan Ganz catheters were also achieved. A 3-month supernumerary period served in clinical practice concluded the PAA training.

Results

All three candidates successfully completed the assessments required by the University alongside additional local competencies. In practice, they play an active role in delivering anaesthetic care for patients in either a 1:1 or 2:1 capacity depending on patient acuity. In a 1:1 model, a PAA works directly alongside a Consultant Anaesthetist to provide perioperative care for the patient. In a 2:1 model, 2 PAAs provide anaesthetic care for patients in adjacent rooms supervised by a Consultant Anaesthetist. This model creates increased availability for anaesthetic cover, therefore providing a valuable service improvement. The specialist training surrounding organ retrieval has also allowed the PAAs to successfully integrate into the Transplant team as independent and competent Donor Care Physiologists.

Conclusion

The introduction of non- medical practitioners has shown to support the areas of cardiothoracic anaesthesia and organ retrieval in Royal Papworth Hospital in the form of specifically trained PAA- DCPs. A further period of service evaluation is required to fully assess the impact of the PAA- DCP team on anaesthetic workflow.

Pulmonary Artery Catheter Damage and Dislodgement during Pulmonary Endarterectomy

Cormac O'Connor, Antonio Rubino, Royal Papworth Hospital, Cambridge, United Kingdom

CASE REPORT

We present the case of a 34 year old gentleman presenting for an elective pulmonary endarterectomy. The patient's background included recurrent unprovoked venous thromboembolic events culminating in a diagnosis of Chronic Thromboembolic Pulmonary Hypertension. Despite optimal treatment with Sildenafil and Dalteparin he remained dyspnoeic on exertion. Subsequent MDT discussions concluded operative intervention was the appropriate management.

The patient was induced uneventfully and as per standard protocol a pulmonary artery catheter (PAC) was inserted via the right internal jugular vein. This was positioned in the main pulmonary artery with the balloon deflated. Cardiopulmonary bypass was commenced and during short periods of deep hypothermic circulatory arrest the right and main pulmonary arteries were dissected respectively. Surgically a good clearance was obtained bilaterally.

During dissection of the main pulmonary artery it was noted that the PAC had been damaged. The decision was made between anaesthesia and surgical teams to withdraw the PAC into the right atrium and to proceed with the operation. On completion of the final period of DHCA the right atrium was accessed and the 8cm distal plastic covering of the PAC was found within it. It was safely removed and the right atrium closed.

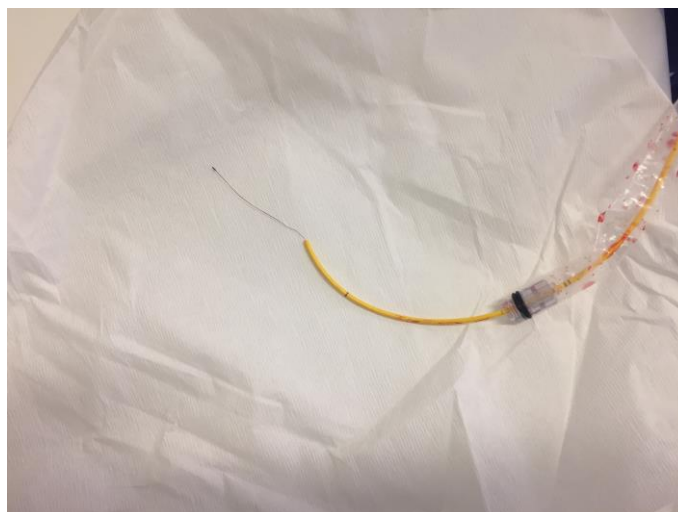
The damaged PAC was withdrawn out through the sheath and it was noted that the distal 8cm plastic covering of the catheter had indeed been dislodged (leaving the metal monitoring wiring intact underneath). A new PAC was introduced through the same PA sheath. The patient was transferred to the Critical Care Unit and was later repatriated to his regional hospital prior to discharge home.

DISCUSSION

Royal Papworth Hospital is the only centre in the UK offering the pulmonary endarterectomy (PEA, also known as PTE) procedure and has performed more than 1,900 operations since 1996. We are one of the most active centres in the world, carrying out up to 200 PEA operations per year, with some of the best long-term outcomes internationally.

We have a protocol in place encompassing the patient pathway from preoperative assessment through to critical care management and discharge. This includes the insertion of a right internal jugular PA sheath followed by floating of a PAC. Standard practice is to position the PAC tip in the main pulmonary artery with the balloon deflated. Relevant measurements are documented prior to chest opening and again when the chest is closed.

The use of the PAC has attracted much controversy in recent years regarding the benefits and potential harms of its use. In Royal Papworth PAC's are used frequently secondary to the case load (PEA, Heart



and Lung Transplants). Therefore, the staff are regularly inserting PAC's and making clinical decisions based on the data produced.

There have been previous case reports documenting dislodgement and transection of PAC's intraoperatively. In one case a PAC was inadvertently clamped during a pneumonectomy. A second documented case involved accidental clamping of pulmonary artery instead of the aorta while on CPB. Early recognition of these complications is paramount followed by appropriate management.

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Laparotomy on Extracorporeal Membrane Oxygenation: A Cross-Sectional Study

Samuel Heward, Elliot Heward, Stella Smith, Lee Feddy, Wythenshawe Hospital, Manchester, United Kingdom

Background: Extracorporeal membrane oxygenation (ECMO) provides respiratory and/or cardiac support in critically unwell patients' with respiratory and/or cardiac failure refractory to conventional management⁽¹⁾. These patients are at high risk of morbidity, mortality and haemorrhage; bleeding is the most common complication of ECMO⁽²⁾. Emergency laparotomy is necessitated in a minority of ECMO patients where it is expected that bleeding risk is high and outcomes poor. However, the literature on this topic is limited and it is unclear whether emergency laparotomy is feasible or futile in these patients.

Objectives: To ascertain the indications, bleeding risk and outcomes following emergency laparotomy on ECMO. To assess the applicability of mortality prediction tools in adult ECMO patients undergoing emergency laparotomy.

Method: Cross-sectional study. A systematic search of medical records of all 274 veno-venous and veno-arterial ECMO patients at our referral centre between 1st March 2012 and 1st March 2018 was performed. NELA, POSSUM and P-POSSUM scores were retrospectively applied to patients who underwent emergency laparotomy.

Results: Nine of 274 ECMO patients (3.3%) underwent laparotomy. Two patients underwent a second laparotomy. Median age was 55 years (range 40-71). Bowel ischaemia was the most common indication for primary laparotomy (n=7/9). Intra and post-operative blood product use was significant but no patients died of haemorrhage and there was no activation of the major haemorrhage protocol (Table 1). Two of nine patients survived to 90 days post-laparotomy and were discharged from hospital. Median predicted survival in our cohort was: POSSUM 0.8%, P-POSSUM 22.1% and NELA 82.1%.

Conclusions: The most common indication for laparotomy in our adult ECMO cohort was bowel ischaemia; secondary to radiological embolisation for bleeding or non-occlusive ischaemia due to high vasopressor requirements. Bleeding risk is high in these patients but may not be an absolute contraindication to surgery; however, survival rates were low and in-keeping with clinical context. Of the mortality prediction tools applied to our population, P-POSSUM was the most accurate but must be validated in a larger ECMO population.

	Patient	1	2	3		4	5	6	7	8	9	Median
		Primary and Secondary Laparotomy		Primary Laparotomy	Secondary Laparotomy							
Intra-operative and early post-operative (mL)	RBC	300	600	650	950	0	2800	0	300	0	0	300
	Platelets	300	650	400	700	180	350	0	0	0	0	180
	FFP	0	0	0	0	0	1000	300	1100	0	0	0
	Cryoprecipitate	0	0	0	0	0	0	800	0	0	0	0
Late post-operative (mL)	RBC	7500	1400	300	800	1200	1200	1800	250	0	900	900
	Platelets	4800	300	150	3000	750	650	2400	0	0	0	300
	FFP	1750	0	200	0	500	0	0	0	0	700	0
	Cryoprecipitate	0	0	400	0	0	0	200	0	0	0	0

Table 1 – Blood product use is shown in the following periods: intra-operative/early post-operative (on the day of laparotomy) and late post-operative (days 1-8 following laparotomy). Patient 1 underwent both laparotomies on the same day. Patient 3 underwent a second laparotomy two days following primary laparotomy. Patient 8 received minimal products as laparotomy findings were of unsurvivable bowel necrosis. Patient 6 and 9 both survived 90 days post-laparotomy.

RBC-red blood cells, FFP-fresh frozen plasma, mL-millilitre

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Pituitary Apoplexy Following Cardiopulmonary Bypass: A Systematic Review of a Rare Complication

Elizabeth Brown, Shruti Jayakumar, St George's Hospital, London, United Kingdom

Introduction

Pituitary apoplexy is a rare but potentially neurologically devastating complication of cardiac surgery. It occurs due to haemorrhage, oedema or infarction of the pituitary gland, usually in the presence of a pre-existing pituitary adenoma. Cardiopulmonary bypass (CPB) appears to carry a significantly increased risk of provoking this complication compared to other types of major surgery.

Our aims were: to characterise the pathophysiology and presentation of pituitary apoplexy following cardiac surgery; review strategies for treatment; and discuss the implications for preoperative assessment.

Methods

A literature search was conducted on PubMed, Ovid and Google Scholar using the keywords pituitary dysfunction, hypopituitarism, pituitary apoplexy, cardiac surgery and cardiopulmonary bypass to identify all cases of pituitary apoplexy following cardiac surgery in adult patients. Reference lists of included studies were reviewed to identify additional cases. Papers not in English or Spanish, or published before 1980, were excluded.

Results

30 studies met the inclusion/exclusion criteria, and included a total of 37 cases. The mean age was 64 years (range 45-79) and 34 (92%) were male. The presence of a pituitary adenoma was radiologically confirmed prior to surgery in 3 cases, and clinical signs consistent with a pituitary lesion were present in 5 additional cases. All but one case occurred following CPB. The vast majority of cases (n=33/37) involved haemorrhage into or infarction of a pre-existing pituitary adenoma while 4 cases reported infarction in the absence of a tumour.

26 patients presented with neurological symptoms, 3 with systemic symptoms, and 8 with both. The most common presentation was ophthalmoplegia (n=25/37) followed by ptosis (n=24/37) and abnormal pupillary light reflexes (n=23/37). 17 patients experienced visual changes ranging from mild visual field defects to complete bilateral blindness. Hyponatraemia was the most common non-neurological feature, and in 5 cases hormone deficiencies (panhypopituitarism or adrenal insufficiency) resulted in acute life-threatening instability.

16 patients were managed medically with hormone therapy alone, 20 with trans-sphenoidal resection and 1 with emergency craniotomy and decompression.

2 patients died, and 4 were left with severe neurological deficits. Less than half of patients with neurological symptoms made a full neurological recovery (n=15/34, 44%). Most patients who required resection of an adenoma were left on long-term hormone therapy.

Discussion

The current evidence suggests that CPB increases the risk of pituitary apoplexy in patients with pre-existing pituitary adenomas. Most patients presented with ophthalmic symptoms typically <12 hours post surgery, and a high index of clinical suspicion is necessary in these cases to allow prompt identification and treatment.

There are several mechanisms by which CPB may trigger pituitary apoplexy, including fluctuations in blood flow, systemic anticoagulation, and cerebral microemboli. Patients with known pituitary adenomas could be operated on 'off-pump' to minimise this risk. Pre-operative neuroimaging should be considered in patients who have signs or symptoms consistent with pituitary lesions.

Monitoring cerebral function using BIS in complex cardiac surgery with total circulatory arrest: A case report

Ahmed Salama, Ravish Jeeji, University Hospitals of North Midlands, Stoke on trent, United Kingdom

Introduction

Aortic arch surgery is a complex procedure that usually requires a circulatory arrest (CA) to achieve a surgical field that is free of cannulas and clamps. During this period there is an important risk of ischemia of all organs, especially of the central nervous system. The International Aortic Arch Surgery Study Group has published a system of organic dysfunction grading to avoid duplication of overlapping results and to limit fluctuating classifications of negative outcomes among institutions by providing standardised definitions (1).

The case

53 years old gentleman scheduled for repair of a 65 mm Aortic arch aneurysm via a third sternotomy following Double valve replacement in 1989 and Redo Mitral valve replacement in 2018. Patient is known AF on warfarin which was stopped 3 days before surgery. Surgery involved 5 hours cardiopulmonary bypass CPB time and 54 minutes of CA with cooling to 20 C. Cerebral ischemia monitor achieved by bilateral bispectral index monitor (BIS) and cerebral oximeter. Cerebral oximeter data were collected by the perfusionist. BIS data was recorded using 2 BIS electrodes over the right and left hemispheres due to unavailability of the single bilateral BIS electrode. BIS electrodes were connected to 2 BIS monitors displaying the BIS number and burst suppression on each side of the brain. Average BIS numbers before bypass was 24-43 on Both sides, that dropped to 7-10 on bypass which dropped further to 0 bilaterally during the CA. Readings stayed 0 after reinstitution of circulation on CPB. Readings started to rise from 0 to 25 and 28 on both sides after patient came off bypass. Head cooling and Solumedrol were used for cerebral protection. Patient was transferred to ITU and extubated the following day with no neurological deficit.

Discussion

Neuromonitoring tools such as EEG, have some clinical utility in the operating room and intensive care unit but they require complex and expensive equipment, as well as training and expertise in their use. The bispectral index incorporates the power spectrum—frequency and time and domains—and bicoherence of the raw EEG signal. Given that the BIS correlates well with anesthetic drug concentration, sedative levels, and memory processing, many clinicians have accepted that BIS can also monitor the adequacy of brain perfusion and as a predictor of neurologic outcome. This secondary purpose of BIS monitoring has particular application for patients undergoing cardiothoracic surgery and CPB, many of whom are at risk of hypoperfusion and cardiopulmonary arrest. BIS monitoring has become widely used in such settings, and its predictive clinical utility is being studied (2,3).

Conclusion

Although the outcomes of aortic arch surgery have improved, stroke remains one of the most devastating complications with an incidence of 7.3 %. Therefore, identification of true risk factors, understanding the pathogenesis of intra-operative stroke and the combination of bilateral BIS monitor with burst suppression monitor, cerebral oximeter and cerebral protection techniques may improve outcome after prolonged periods of ischemia like CA.



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Black swans - an audit of routine insertion of introducer sheaths for elective coronary artery bypass graft surgery

*Samuel Denham, Claire Scanlon, William Tosh, Alan Clethro, Heather Jones, Anwar Shah
Queen Elizabeth Hospital, Birmingham, United Kingdom*

Introduction

The insertion of central venous introducer sheaths during cardiac surgery for pulmonary artery catheter (PAC) monitoring is universal in our institution, and historical. Many of these sheaths will be inserted but not ever go on to be utilised for insertion of a PAC.

Routine sheath introducer insertion is an invasive procedure that requires additional time to perform and carries with it additional risks and a financial cost. With this in mind we decided to perform an audit of our unit's current practice in this area.

Methods

This audit was a retrospective case note review of adult patients undergoing isolated first-time coronary artery bypass graft surgery. All patients had an 8.5F sheath introducer inserted along with a central venous line as part of their anaesthetic. Audit data collected included patient demographics, preoperative LV and RV function, and baseline renal function. The primary audit outcome measure was the percentage of patients who had a set of cardiac output measurements performed using a PAC post operatively on the Intensive Care Unit (ICU). The number of post-operative days that the sheath introducer remained in situ was also recorded.

Results

Seventy-one patients were included in the audit. Of these, 66 (93%) were classed as low risk (normal or mild preoperative ventricular impairment). Within this low risk group, 14 (21%) were monitored post-operatively using a PAC. Indications for PAC in this group included diastolic dysfunction, surgical request, and one patient who had a post-operative cardiac arrest. In the majority of this low risk group the indication for using a PAC is not documented clearly. Reasons could include oliguria or suspicion of a low cardiac output state. Five patients in the audit sample were classed as high risk (moderate or severe preoperative ventricular impairment), of which only 3 (60%) received PAC monitoring. This may have been due to the use of additional monitoring by bedside echocardiography.

Most sheaths were removed on the first post-operative day. The mean duration of the sheath introducer remaining in situ was 2 days, however 6 remained in situ for over 2 days post operatively without ever being used to insert a PAC. One sheath had to be removed after it partially displaced prior to being used.

Discussion

This audit has demonstrated that the majority of introducer sheaths inserted in our institution are removed without ever being used. We would recommend that in future they should only be inserted on a necessity basis. This would reduce the cost and risk of complications associated with their use. When a PAC is being used, the indication for its insertion should be clearly documented. Perioperative echocardiography both transthoracic and transoesophageal is increasingly being used at the bedside in ITU and has potential to further reduce the use of PA catheters in our centre.

Does start time influence the time-to-extubation in elective cardiac surgery?

Matthew Ilchyshyn, Ramakrishna Pasupuleti, University Hospital North Midlands, Stoke-on-Trent, United Kingdom

Introduction

The organization of elective cardiac surgery results in the majority of patients being transferred to the cardiothoracic critical care unit in the early afternoon or in the evening. Our cardiothoracic critical care unit like many in the UK have a reduced number of nursing personnel out-of-hours and no dedicated airway trained anaesthetist. This poses a challenge to the cardiothoracic critical care unit to ensure both sets of patients receive similar care. A number of studies have found that late start time in cardiac surgery are associated with adverse clinical outcomes [1]. We hypothesize that patients on afternoon lists arriving to the cardiothoracic critical care unit out-of-hours have a prolonged duration of intubation. Prolonged mechanical ventilation following cardiac surgery is associated with increased pulmonary complications, increased length of stay and increased mortality [2][3].

Methods

A retrospective cohort of patients were identified using the cardiothoracic critical care electronic patient data management system. The inclusion criteria included all patients undergoing elective cardiac surgery requiring cardiopulmonary bypass from August 2018 to April 2019. The patients were divided into two groups; those with a start time between 07:00 and 11:59 and those with a start time 12:00 and 18:00.

Results

Data from 135 patients was collected during the study period. Table 1. summarises the demographic, comorbidities, perioperative and postoperative data collected. There was no significant difference in the demographic or comorbidities in the two groups. The total anaesthesia time was significantly shorter in the afternoon start time group, but other perioperative data did not show significant difference. The median time to extubate in the morning and afternoon group was seven hours and the length of critical care stay was 52 hours in the morning group and 51 hours in the afternoon group. None of these differences in outcome measurements reached statistical significance.

Table 1.	Morning Start Time (n = 76)	Afternoon Start Time (n = 59)	p Value
Age (years)	69.7 ±10.1	66.7 ±10.3	0.100
Gender Male %	68.4%	78.0%	0.217
ASA classification			
I + II	7.8%	3.3%	0.691
III	78.9%	79.7%	
IV	14.5%	13.6%	
V	0%	0%	
Chronic Lung Disease	47.4%	59.3%	0.168
Anginal classification			
No symptoms	15.8%	25.4%	0.102
CCS I	6.6%	16.9%	
CCS II	39.5%	35.6%	
CCS III	34.2%	20.3%	
CCS IV	3.9%	1.7%	
Total anaesthesia time (min)	360 (180-780)	260 (120-520)	0.017
Cardiopulmonary bypass time (min)	105 (26-356)	106 (20-263)	0.303
Cross-clamp time (min)	78 (18-199)	72 (10-220)	0.222
Time-to-extubation (hours)	7 (1-162)	7 (1-56)	0.888

Reintubation post initial extubation	2.6%	3.4%	
Length of ITU Stay (hours)	52 (5-1972)	51 (12-384)	0.363

Discussion

This retrospective study has shown starting anaesthesia time has no influence upon time-to-extubation in patients undergoing routine elective cardiac surgery. This is a reassuring study that demonstrates that in our unit extubation is not delayed regardless of the time of day. Fast-track extubation protocols have reduced the time of mechanical ventilation in cardiac patients reducing pulmonary complication and length of critical care stay.

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Anaesthetic management of patients with hypertrophic cardiomyopathy for non cardiac surgery: A case report

Juneenath Karattuparambil, Anand Gore, Glenfield Hospital, Leicester, United Kingdom

Introduction

Hypertrophic cardiomyopathy (HCM) is characterized by asymmetric hypertrophy of interventricular septum (LVOT) causing intermittent obstruction of LVOT. Sudden unexpected death due to acute LVOT obstruction or fatal cardiac arrhythmia, is possible in asymptomatic patients. Patients with HCM pose considerable anaesthetic challenge.

Case Report

A 71 year old male with history of hypertrophic cardiomyopathy, hypertension, AF, permanent pacemaker with ICD device was posted for elective laparoscopic cholecystectomy. His exercise tolerance was limited to 100 yards and NYHA class III. There was family history of sudden death at young age. The patient was given a predicted POSSUM score of 20% mortality and 65% morbidity at another hospital. The patient was reviewed and transthoracic echocardiogram showed asymmetrical septal hypertrophy with mild left ventricular systolic dysfunction and no significant outflow tract gradient. Based on this, a risk calculation of 10% mortality and 30% morbidity was quoted.

Preoperative assessment was performed in terms of pacemaker check, perioperative anticoagulation and post operative ITU care planned. In addition to the standard AAGBI recommended monitoring, invasive blood pressure, central venous catheter and TOE was established

General anaesthesia was induced with alfentanil, etomidate and rocuronium. Anaesthesia was maintained with mixture of oxygen, air and sevoflurane. Hypotensive episodes were managed with fluid bolus and phenylephrine. Close monitoring during pneumoperitoneum and haemodynamic instability avoided. Patient was extubated at end of procedure and transferred to ITU postoperatively. Intraoperative TOE showed moderately thickened septum with no flow acceleration across the LVOT, and mild LV systolic dysfunction. Patient remained stable overnight in the intensive care unit and was discharged to the ward the next day. Patient sent home the following day with post operative instructions.

Discussion

Hypertrophic cardiomyopathy (HCM) is an autosomal dominant cardiomyopathy with a prevalence of 1 in 200 in the general population [1,2]. The clinical presentation is variable. Patients may be completely asymptomatic or may have severe symptoms, such as dyspnea, chest pain, syncope or sudden cardiac death due to sustained ventricular arrhythmias or due to systolic anterior motion (SAM) of the mitral valve.[3,4]

Patients with HCM undergoing non-cardiac surgery at an experienced HCM centre have a very low rate of perioperative events such as death, MI or stroke. Patients with HCM warrants additional attention when undergo non-cardiac surgery, with regard to risk stratification and perioperative management. [6]

Perioperative goals includes maintaining intravascular volume, stable blood pressure, adequate systemic vascular resistance, and slow to normal heart rate. Care should be taken when introducing pneumoperitoneum for laparoscopic procedure. If haemodynamic instability with LVOT obstruction occurs, immediate treatment includes fluid administration, vasoconstrictors, and decreasing heart rate and contractility with anaesthetic or beta blocking agents. Postoperative management includes effective pain management to avoid pain-induced sympathetic stimulation and volume status.

Conclusion

Anaesthesia for patients with HCM is high risk even for non cardiac surgery. Preoperative assessment, risk stratification and planning is paramount in the management of these patients. Avoiding precipitation factors for worsening LVOT obstruction during intraoperative period and good post operative care are essential for safe management of these patient.

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