

CLINICAL CIRCULATION

Paper No: 66.00

Intraoperative blood loss evaluation in major Orthopaedic Surgery

Ine Adadevoh and I. C. Udomesiet

National Orthopaedic Hospital, Igbobi, Lagos, Nigeria National Orthopaedic Hospital, Igbobi, Lagos, Nigeria

Introduction: Orthopaedic surgery affects significant blood loss. Blood conservative technique is limited, and the need for blood therapy in trauma victim couple with lack of willing donors makes blood a scarce commodity in our bank. Intraoperative blood loss is often perceived to be in excess of preoperative provision for replacement at surgery. This has been a problem as it causes delay in start and sometimes postponement because anaesthetist would not proceed with cases until sufficient blood is available for replacement of loss. It became necessary to have measured value in major procedure which could serve as guide for pre-operative order of blood.

Objective: To use available methods of blood loss evaluation and demonstrate flaws of the commonly used visual estimation, thereby encourage practitioners to engage more reliable method.

Method: Intraoperative blood loss was measured in 200 randomly taken major elective procedures with anticipated significant blood loss in the hip, limbs and spine, using – swab weighting technique, collection in suction bottle and estimate in drapes and gown. Surgeons and anaesthetist visual estimates in each procedure was enquired in all the 200 procedures and were compared with measured values.

Result: Wide range of blood loss was observed in all groups of procedures. The range was relatively wider with groups of procedures involving applications of tourniquet. Large blood loss 1500– 5000mls occurred in shoulders, hip, thigh and spine in increasing order in volume. Worse offenders in blood loss being chronic malunion, nonunion implant removal, repeat surgery of femoral fracture and spine procedures. Surgeons underestimated blood loss in 57% of cases by volume >500mls, anaesthetist by 35%. These were seen mostly in large blood loss as was encountered in spine, chronic femoral and hip procedures. Under transfusion with blood was 45% while over transfusion was 8.5%. Blood loss range minimum – maximum measured volume in each groups of procedures are as indicated below-Hemiathroplasty 400-1800mls Humerus 200-1500mls Hip-replacement

400– 2000mls Femoral fracture 700-3500mls Knee 300-1500mls Laminectomy 3000-5000ml

Conclusion: Surgeons and anaesthetist were reasonably accurate with visual estimation in small blood loss. However, as loss increases the visual estimate become unreliable.

Paper No: 109.00

Effect of Colloid Versus Crystalloid Administration in Cardiopulmonary Bypass Prime Solution on Tissue and Organ Perfusion

Shahrbano Shahbazi and Davood Zeighami

Shiraz University of Medical Sciences

Background. We evaluated the effects of tissue and organ perfusion during and after coronary artery bypass grafting surgery with either colloid (Voluven) or crystalloid (Lactated ringer's) as prime solution.

Materials and Methods: In this prospective randomized-controlled trial study, 70 patients undergoing on-pump coronary artery bypass grafting surgery were randomly assigned to receive either colloid (Voluven) or crystalloid (Lactated ringer's) as prime solution, during cardiopulmonary bypass. Tissue and organ perfusion markers including lactate, troponin I, liver and renal function tests and electrolytes were measured sequentially, before induction of anesthesia and the day after surgery.

Results: there was no significant differences between two groups regarding those parameters.

Conclusion: Both voluven and Lactate Ringer had same effects on organ perfusion as assessed by parameters of tissue perfusion.

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Paper No: 219.00

Prothrombin complex concentrate (Octaplex®) in an unusual Stauffer's syndrome

Ana Fernandez and Beatriz Perdomo

Department of Anesthesiology, Intensive Care and Pain Treatment. Nuestra Sra de Candelaria University Hospital. Tenerife, Canary Islands

Introduction: Renal cell carcinoma (RCC) is associated in up to a 20% to the emergence of paraneoplastic syndromes, being sometimes the first clinical outcome. Hepatic dysfunction in non metastatic RCC patients was first described by Stauffer in 1961, and can be categorized as a non-specific hepatitis with coagulation times extension, increased cholestasis enzymes and even hyperbilirubinemia (1). In most cases, analytical alterations are normalized after the surgery attributing the syndrome to cytokines sintetized by the own tumor(2).

Objetives: Because of its uniqueness and its impact on the hemostasis we describe the case of a patient subjected to laparoscopic nephrectomy due to a RCC and Stauffer syndrome, in which the use of protrombin complex concentrate (PCC) achieved an effective hemostasis.

Methods: 70 years and 80 Kg weight woman submitted for laparoscopic left nephrectomy due to a RCC. Her personal background includes hypertension, treated with Enalapril and NIDD in antidiabetic oral therapy. Preoperative laboratory tests reveal 10.3 total bilirubin (nv 0, 20-1, 20) at the expense of DBR 9.2 (nv 0, 00-0, 30), AST 672 (nv 5-31), ALT 397 (nv 5-31); GGT 507 (nv 7-32); ALP 222 (nv 35-104); PT 30% (nv 75-100 per cent); INR 2.04 (nv 0, 8-1, 2). Prior to the surgery 2 fresh frozen plasma (FFP) and iv vitamin K were administrated, and the patient didn't require blood transfusion. Once in the recovery room, within 3 hours from arrival, bleeding through the surgical drainage and trocar incisions was objected, without hemodynamic inestability.

Results: Given the underlying liver dysfunction, 25 IU/Kg of PCC (Octaplex®, Octapharma S.A., Madrid) were administrated, ceding the bleeding. The patient left the anesthesia intensive care unit with PT 44%, INR 1.6 and platelet counting of 137,000.

Discussion: Octaplex is a new PCC that is indicated for treatment or perioperative prophylaxis of bleeding in patients with prothrombin complex coagulation factors deficiency, when rapid correction of bleeding is required. Although numerous studies emphasizes the value of PCC in reversing the effects of oral anticoagulant therapy in bleeding patients undergoing

cardiac surgery and other surgery's, as well as in the liver transplantation, not much has been published to date about its use in controlling postsurgical bleeding in patients with hepatic dysfunction undergoing non-cardiac surgery (3-4).

Conclusions: We can therefore say Octaplex® use increases, in this case, the efficacy and safety in post-operative bleeding management, and deserves a special attention for its rarity and implications in hemostasis.

** BRD: Direct bilirubin, AST: Aspartate transaminase, ALT: Alanine transaminase, GGT: Gamma glutamyl transpeptidase, ALP: Alkaline phosphatase, PT: prothrombin time, INR: international normalized ratio, APTT: Activated partial thromboplastin time.

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Paper No: 231.00

The correlation analysis of hemovisñoelastografy and traditional tests of blood coagulation

Oleg Tarabrin¹, Ivan Tyutrin², Ruslan Tkachenko³, Sergii Shcherbakov¹ and Dmytro Gavrychenko¹

¹ Odessa National Medical University, Odessa, Ukraine, ² Siberian State Medical University, Tomsk, Russian and ³ National Medical University, Kiev, Ukraine

Introduction: It's known that deep vein thrombosis of lower extremities and pulmonary embolism occupies an important place in the structure of postoperative morbidity and mortality.

Methods: After Ethics approval and informed consent, was studied the functional state of hemostasis in a group of 40 healthy volunteers, who were not receiving drugs affecting coagulation and 37 patients with postphlebothrombotic syndrome (PPTS). In patients PPTS conducted baseline studies coagulation state and daily monitoring of dynamic changes in the functional state of hemostasis, a comparative evaluation of performance low-frequency piezoelectric vibration hemoviscoelastography (LPVH) and platelet aggregation test (PAT), standard coagulation tests (SCT), thromboelastogram (TEG).

Results: It was found that the LPVH correlated with SCT, PAT and TEG (Table 1). However, our proposed method is more

Table 1. Correlation analysis of indexes of LPVH with platelet aggregation test, standard coagulation tests, thromboelastogram.

PAT ICC spontaneous aggregation	0,76
t1 spontaneous aggregation	0,59
ICC epinephrine 2,5 mcg/ml	0,66
SCT t3 (BCT) CT	0,86
ICD APTT	0,56
ÀÀ fibrinogen	0,67
IRCL fibrinolytic activity	0,83
TEG CTA È	0,93
BCT R	0,76
ICD R	0,64
ÀÀ ÀÀ	0,86
IRCL FA	0,74

voluminous: indexes ICC (the intensity of the contact phase of coagulation), t1 (the time the contact phase of coagulation), and AO (initial rate of aggregation of blood) consistent PAT indexes, indexes ICD (the intensity of coagulation drive), CTA (a constant thrombin activity) and CIP (the clot intensity of the polymerization) - SCT and TEG. In addition, the advantage of this method is to determine the intensity of fibrinolysis - with indicator IRLS (the intensity of the retraction and clot lysis).

Conclusion: LPVH allows make the total assessment of all parts hemostasis: from initial viscosity and platelet aggregation to coagulation and lysis of clot, as well as their interaction. His figures are objective and informative, as evidenced by close correlation with the performance of traditional coagulation methods.

Paper No: 232.00

Can the combination of low molecular weight heparin and epidural anesthesia reduce the level of postoperative thrombotic complications at the patients after total hysterectomy?

Oleg Tarabrin¹, Vladlena Dubinina¹, Alexandr Turenko², Sergii Tarasenko¹ and Sergii Shcherbakov¹

¹ Odessa National Medical University, Odessa, Ukraine and

² Odessa Regional Clinical Hospital, Odessa, Ukraine

Introduction: Each year in the world the cancer of reproductive system is diagnosed in more than 600,000 women. In 8-35% of patients with cancer of reproductive system pulmonary embolism was the cause of death, and at 43% - the background for other fatal complications.

Objectives and methods. The results of surgical treatment of 79 patients after hysterectomy under prolonged epidural anesthesia during the period from 2008 to 2010 entered

the study. Condition of hemostasis was monitored by 12 standard biochemical tests, as well as the new instrumental method haemoviscoelastography preoperatively, intraoperatively and every day during 10 days after surgery. Prevention of thrombotic in group 1 (37 patients), conducted by bemiparin 3500: the first injection 12 hours before surgery, then at 6 hours after the operation in the future once a day for 10 days, group 2 (42 patients) received heparin 5000 units: the first injection 6 hours before surgery, then 6 hours after the operation, then 4 times per day for 10 days.

Results: All included in the study patients before the surgery has detected hypercoagulation and inhibition of fibrinolysis: increasing of MA (maximum density of the clot, fibrin-platelet constant of the blood) to 20.7% ($p < 0.001$), ICD (the intensity of coagulation drive (the intensity of clot formation)) to 15,6%; reduction of IRCL - the intensity of the retraction and clot lysis to 13.6% ($p < 0.05$) in both groups compared to normal rates. At 1st day after surgery in patients treated by bemiparin (group 1) declines MA, ICD - the intensity of coagulation drive to 12.7 ($p < 0.05$) and 9.6% ($p < 0.001$) respectively, and IRCL increase by 4.6% ($p < 0.05$) compared with preoperative. In group 2, there was a similar picture: the reduction of MA and ICD to 10.3 ($p < 0.001$) and 6.6% ($p < 0.05$) respectively, and IRCL increase by 4.4% ($p < 0.001$). At 5th day condition of hemostasis in both groups came almost to the same value - a moderate hypocoagulation, normal activity of fibrinolysis. At 7th days of postoperative period, thrombotic complications developed in 1 patient of 1st group (2.70%). In the 2nd group, complications developed in 4 (9.52%) patients: in 3 cases - deep venous thrombosis and in 1 case - coagulopathic bleeding.

Conclusions: Using combination of bemiparin and epidural anaesthesia reduces the level of postoperative thrombotic complications, such as deep venous thrombosis, massive bleedings at the patients after total hysterectomy.

Paper No: 404.00

Tissue Doppler of the right ventricle: Prognostic value after a non cardiac surgery

Maria Carolina Cabrera Schultmeyer, Roberto Flores, Marcela Labbe and Irini Semertzakis

Universidad de Valparaíso, Fach Hospital

Introduction: It is well demonstrated that the right ventricular dysfunction has bad prognosis. Intraoperative assessment of the right ventricular (RV) function with echocardiography is difficult, because of its complex anatomy. Tissue Doppler imaging (TDI) is a new ultrasound tool that measures regional myocardial velocities in systole and diastole. TDI focuses on the high-intensity, low-velocity echoes of the myocardium and could be a valuable tool for the assessment of the systolic right ventricular function (RV).

Objectives: To evaluate the correlation of intraoperative systolic RV TDI velocities (s') with length of the intensive care unit, hospital stay and early postoperative cardiovascular complications after a non-cardiac surgery.

Methods: TEE examinations performed in patients with cardiac disease undergoing non-cardiac surgery were included. Patients with tricuspid valve disease and patients in non sinusual rhythm were excluded. Echocardiographic examination for evaluating systolic function (s') was obtained from the mid-esophageal four-chamber view with the pulsed-wave TDI sampling of 3 mm placed in the lateral tricuspid annular site. The clinical outcomes studied were length of stay in the intensive postoperative care units and the duration of the hospitalization. Postoperative cardiac events defined as hypotension, hypertension, myocardial ischemia, pulmonary edema, arrhythmias and death, were also studied. To calculate the necessary sample size, it was considered that a 20% decrease in hospital stay between patients having normal and abnormal tricuspid systolic velocity (s') would be important. For the results to be of statistically significant with an $\alpha=0.05$ and a potency of 80%, it was necessary to recruit 20 patients in each group. Statistical analysis was conducted using STATA 10.0. Continuous data were expressed as mean \pm SD or median with an interquartile range, depending on the distribution of the variable. Parametric data of the groups were analyzed using the unpaired t-test or the Mann-Whitney U test. Categorical variables among groups were compared using the Fisher's exact test. Independent predictors of cardiac events were calculated by logistic regression. Significance was set at $p < 0.05$.

Results: 67 patients (ASA II 36%, ASA III 52% and ASA IV 12%), 52% male, 65 ± 11 years were studied. RV s' velocity was measured easily in all patients. RV s' lower than 12.8 ± 2.5 cm/seg was considered abnormal and it correlated with a longer time of hospitalization ($p < 0.05$) and higher incidence of cardiovascular complications ($p < 0.05$).

Discussion: This prospective study shows that RV s' velocity was a good predictor of length in ICU stay, length of hospitalization and postoperative cardiovascular complications. Hypotension was the most frequent complication found. Having a clinical predictor of systolic RV function (s'), that is easily obtainable, non-invasive and readily available can be useful, and the non-invasive assessment of RV function can be an important clinical tool as it could be used to identify potential risky patients.

Conclusion: TDI is clinically relevant in the perioperative setting for evaluating the RV function and also for predicting early morbid events after a non-cardiac surgery.

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Paper No: 429.00

Systolic heart function remains depressed for at least one month after on-pump cardiac surgery

Peter Juhl-Olsen, Christian Alcaraz, Frederiksen Erik and Sloth Carl-Johan Jakobsen

Department of Anaesthesiology & Intensive Care, Århus University Hospital, Skejby, Denmark

Introduction: Cardiac surgery remains a source of considerable morbidity and mortality. Impaired postoperative heart function is thought to be a main cause of this. Ischemia and reperfusion injury facilitated by cardioplegia and extra-corporal circulation contributes to postoperative cardiac depression.

Objective: The objective of this study was to quantify the duration of systolic and diastolic cardiac dysfunction after on-pump cardiac surgery.

Methods: The study was prospective, descriptive and approved by the regional ethical committee. 59 patients scheduled for on-pump coronary bypass grafting, aortic valve replacement or combination procedures thereof were included. Echocardiography was performed at 1) the day before operation, 2) the 1st postoperative day, 3) the 4th postoperative day, 4) one month postoperatively and 5) 6 months postoperatively. All measurements were performed by a single experienced echocardiographic technician minimizing inter-individual variation. Radial systolic function was quantified by ejection fraction (EF) whereas longitudinal contraction was measured as global strain (GS) and by tissue tracking score (TT). Diastolic function was evaluated as E/E' and E'/A'. Data was analyzed with a univariate ANOVA for repeated measurements and a paired t-test was used for comparison between two time points. $P < 0.05$ was considered significant.

Results: All measures of systolic function changed over time (all P -values < 0.025). As compared with baseline data, values for EF, GS and TT were depressed the 1st postoperative day (P -values < 0.047) and remained depressed at the 4th postoperative day (P -values < 0.004). 1 month after surgery, EF and TT were still decreased (P -values < 0.038), and GS was insignificantly decreased ($P = 0.094$). 6 months after surgery, all measures of systolic function had returned to baseline values (P -values > 0.148). Both echocardiographic indices for diastolic function did not change significantly over time (P -values > 0.081).

Discussion: This study showed that patients undergoing on-pump cardiac surgery had impaired systolic function for at least one month postoperatively as evaluated by echocardiographic methods. This was found despite

revascularization and/or afterload reduction achieved by surgery. This finding may be explained by the ischemia and reperfusion injury induced by intraoperative cardioplegia and extracorporeal circulation. To our knowledge, this study is the first to quantify the duration of depressed systolic function after on-pump cardiac surgery.

Conclusion: Measures of systolic function remained depressed for at least 1 month after on-pump cardiac surgery, but had returned to preoperative values 6 months after surgery. Indices of diastolic function did not change significantly in the perioperative period.

Paper No: 551.00

Chart for Haemodynamic-Oxygen delivery diagnostic

Sergey Sokologorskiy and Efim Shiman

Introduction: B.Shramek's Haemodynamics' diagnostic chart is widely used in cardiovascular monitoring for diagnostic and therapy management purposes. But as the main function of circulation is to deliver oxygen to tissues and cells, in absence of oxygen delivery analyses this chart doesn't clearly answer the question whether the patient's haemodynamic changes are physiological or pathological ones. Our objectives were to combine B.Shramek's Haemodynamics diagnostic chart with system oxygen transport parameters.

Methods: Oxygen delivery index (DO₂I) is commonly used for evaluation of system oxygen transport and calculated as: $DO_2I = CaO_2 \times CI$. B.Shramek's Haemodynamics diagnostic chart already has horizontal axis which represents current $\dot{V}I$ values. It is very easy to add the second vertical axis to the right side of the chart for representing current CaO_2 values. In order to reduce lines on the chart we scaled the CaO_2 axis in such a way that graphical borders of its normal values match the lines of Mean blood pressure normal values. Now, each time a point on the chart with coordinates corresponding to CI and CaO_2 current values shows the oxygen delivery state. So this advanced Hemodynamics-Oxygen delivery chart carries two points: first one – the original Shramek's haemodynamics point and the second – newly introduced Oxygen Delivery (OD) point.

Results: Normal value range of DO₂I lies within 480-800 ml/min/m². So we have to draw two parabolas corresponding to these values on the chart. These lines divide the chart into three zones: left – hypoxia, central – normal oxygen delivery and right – hyperoxia. The location of the OD point on the chart will demonstrate the system oxygen delivery state.

Conclusions: This combined chart may be successfully used in a real time monitoring mode for diagnostic and therapeutic management of haemodynamics and system oxygen delivery disturbances.

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Paper No: 832.00

Opcab surgery in elderly patients: evidence of benefits?

Davy Cheng, Janet Martin and Daniel Bainbridge

Department of Anesthesia & Perioperative Medicine, EPICOR Program, LHSC-University Hospital, University of Western Ontario

Introduction: The majority of earlier trials comparing clinical outcomes after off-pump bypass surgery (OPCAB) and conventional bypass surgery (CCAB) were non-randomized comparisons of low-risk patients undergoing single- or double-vessel bypass, with the potential risk of unbalanced baseline patient characteristics leading to bias in favor of either OPCAB or CCAB. There remains considerable uncertainty as to the role of OPCAB for patients across the full spectrum of risk groups.

Objectives: This systematic review and meta-analysis sought to determine whether off-pump bypass surgery (OPCAB) provides significant clinical advantages compared to conventional coronary artery bypass surgery (CCAB) in elderly patients (>60y, >70y, >80y, >90y), and whether the benefits of OPCAB over CCAB are directly related to increasing age.

Methods: Comprehensive searches of MEDLINE, Cochrane CENTRAL, EMBASE, abstract databases up to January 2011. Criteria for Included Trials: Randomized or non-randomized controlled studies - Elderly patients (age>60) undergoing OPCAB compared directly with elderly patients (age >60) undergoing CCAB, reporting a least one relevant outcome in any language. Two reviewers independently identified relevant trials and extracted outcomes data.

Bias. Publication bias was explored through visual inspection of funnel plots. Meta-Analysis: Odds ratios [OR, 95% CI] were calculated for proportions, and weighted mean differences [WMD, 95% CI] were calculated for continuous data.

Results: Eligible studies: 27 studies (26 nRCT and 1 RCT - 10,271 patients) were included in the analysis. Regression did not show publication bias, but significant heterogeneity was found for neurocognitive dysfunction, low cardiac output syndrome, transfusions, ventilation time, and length of stay. Significant clinical benefit of OPCAB over CCAB in elderly patients was summarized in table 1.

Outcomes	OR	[95%CI]	p
Death, 30d	0.62	[0.46-0.85]	0.0024
Death, 1-3yr	0.59	[0.34-1.03]	0.062
Stroke	0.43	[0.29-0.63]	0.00001
Myocardial Infarction	0.83	[0.51-1.33]	0.42
Atrial Fibrillation	0.79	[0.69-0.90]	0.0005
Renal insufficiency	0.64	[0.44-0.91]	0.013
Neuro complication	0.62	[0.40-0.96]	0.005
Reintervention	0.40	[0.09-2.76]	0.42

Conclusions: In elderly patients, OPCAB is superior to CCAB for reducing risk of death, stroke, AF, neurologic complications, low cardiac output syndrome, renal insufficiency, transfusions, ventilation time, and hospital length of stay, without increased risk for reoperation for bleeding, myocardial infarction, angina recurrence, or need for reintervention. However, the magnitude of benefit of OPCAB over CCAB did not rise further with increasing age >70.

Paper No: 878.00

Point-of-care ultrasound reveals important heart pathology

Chirstian Alcaraz Frederiksen, Peter Juhl-Olsen, Niels Holmark and Andersen Erik Sloth

Introduction: Very few recommendations exist for preoperative assessment of cardiac function. A typical preoperative assessment consists of a medical history, stethoscopy, ECG and a limited blood screening. With this set of examinations it is unlikely to identify impaired systolic / diastolic function or significant cardiac pathology. A full cardiological examination including echocardiography will provide the information needed for proper safety during surgery and anesthesia, but this is unrealistic due to financial limitations and limited resources. Similar issues in the emergency units and the critical care setting has given rise to different point-of-care ultrasound protocols with focus assessed transthoracic echocardiography (FATE) being one of the first in the field [1]. The FATE protocol consists of four predefined scanning positions in which the examiner will be able to exclude obvious pathology, asses wall thickness, cardiac dimensions and myocardial function. However, little is known about the diagnostic accuracy of FATE examinations in the hands of relatively inexperienced examiners.

Objectives: The purpose of this study was to examine whether FATE can correctly diagnose common serious heart pathology.

Methods: 25 patients with or without significant cardiac pathology were included. FATE was performed by an inexperienced examiner at the bedside and images were interpreted with dichotomous outcomes in regard to seven entities: 1) pericardial effusion (≥ 10 mm), 2) left ventricular dilatation (≥ 62 mm), 3) right ventricular dilatation (≥ 35 mm), 4) left ventricular hypertrophy (≥ 13 mm), 5) left ventricular failure ($\geq 40\%$), 7) aortic stenosis (Maximum flow velocity ≥ 3 m/s), 7) tumors or masses. The examiner was blinded to the patients; medical history and results from previous echocardiographic examinations. Results from the interpretation were compared with ultrasonic diagnosis made by a specialist in cardiology.

Results: 175 assessments were made with a total of 5 discrepancies between the FATE examiner and the specialist; two with regard to right ventricular dilatation, two with regard to tumors and masses and one with regard to left ventricular hypertrophy. Overall sensitivity was 97.4% and specificity 97.1%. Positive predictive value was 90.5% and

negative predictive value was 99.2%. Kappa statistics showed good agreement between observers ($k=0.92$).

Conclusions: These preliminary results show good diagnostic performance of bedside ultrasound performed by an inexperienced examiner and shows potential for screening in the perioperative period. The results call for broad implementation of point-of-care ultrasound among all physicians dealing with any kind of potential cardiovascular disease. A more substantial sample size is needed in order to assess diagnostic performance in the seven different entities.

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Paper No: 967.00

When to transfuse in cardiac surgery?

Junia Rahman, Michael Husband, Kim Ng and Kate Wark

The London Chest Hospital, London, UK

Introduction: A low preoperative haemoglobin(Hb) or substantial blood loss in patients with cardiac disease is associated with high mortality and morbidity [1]; The threshold for transfusion in the perioperative patient with known coronary artery disease is still unknown. Previous studies have suggested that the risk of transmitting blood related disease or inducing adverse reaction outweighs the benefit of improved tissue oxygenation. Although international data and guidelines [2] support more restrictive transfusion, practice within specialist centers remains variable[3].

Objective: To assess transfusion triggers and practices against the standard guidelines in patients undergoing cardiac surgery in a tertiary specialist center.

Methods: We carried out a prospective survey of transfusion rates, indications and red packed cell volume given to patients undergoing cardiac surgery over a period of 6 months. The haemoglobin level at time of transfusion and at time of discharge from intensive care unit (ITU) was measured.

Results: A total of 100 cardiac surgery patients were transfused corresponding to a transfusion rate of 37%. High risk factors Mean % (range) Age (yr)-66 (40 $\hat{=}$ 85) High Risk surgery-40 Previous anti coagulation/platelet therapy -77 Pre-op Hb (g/dL) 12.7 (8.2 $\hat{=}$ 16.2) Mean transfusion volume (ml) 1217 (95 $\hat{=}$ 5830) Reason for transfusion -Mean (%) Low Hb -41 Not documented 36 Bleeding 18 To raise Hb to 10g/dL 2 Surgeons request 1 Pump dilution 1 Hypotension 1 Twentynine patients received blood at Hb > 7g/dL. Seventy at < 7g/dL; Three received blood at Hb > 10 d/dL due to ongoing bleeding. One was unrecorded. Average Hb on Discharge from ITU was 9.67.

Conclusion: Our transfusion rates are significantly lower than the 50% suggested by the database of The Society of Thoracic Surgeons. Not all patients undergoing cardiac procedures have

equal risk of bleeding or blood transfusion. The clinical need for transfusion must be made on an individual basis and further local and national guideline reinforcement is needed.

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Paper No: 1006.0

Peripheral venous pressure measurements to estimate central venous pressure

Andre Luis Momm Paganelli¹, Mariana Emi Makita¹, Priscila Marcon Cardoso¹, Clovis Tadeu Bevilacqua Filho¹ and Getulio Rodrigues de Oliveira Filho²

¹ Hospital Governador Celso Ramos, Florianopolis, SC Brazil - Anesthesia Department - Resident and ² Hospital Governador Celso Ramos, Florianopolis, SC

Introduction: Central venous pressure (CVP) reflects the relationship between blood volume and vascular compliance. CVP variability indicates changes in blood volume. CVP measurement requires catheterization of a central vein. Such procedures are not devoid of risks to patients and increase costs and perioperative time. Significant correlation and agreement between venous pressures measured at vena cava and peripheral veins have been demonstrated 1,2. Estimation of CVP from peripheral venous pressure (PVP) measures would be clinically useful to prevent central venous catheterization.

Objectives: The aim of this study was to determine the agreement between CVP and PVP measures and to derive a predictive equation for estimating CVP from PVP.

Methods: This prospective observational study was approved by the Institutional Review Board. The study included 13 adult patients undergoing elective surgery requiring CVP monitoring through a catheter inserted centrally via subclavian or internal jugular veins using Seldinger's technique. Additionally, teflon peripheral venous catheters (18 though 14G) were inserted into an upper limb vein. Concurrent measures of CVP and PVP were obtained through electronic pressure transducers. Agreement and biases between measurements were estimated by the Bland and Altman's method. Simple linear regression was applied to data having CVP and PVP as dependent and predictor variables, respectively. The robustness of the model was confirmed by 1000 bootstrap samples, from which 95% confidence interval of coefficients were calculated. Student's paired t tests were used to assess

the difference between observed and predicted CVP values. P values less than 0.05 was considered statistically significant. **Results:** Eighty one paired samples were obtained. CVP and PVP measures differed by -1.74 ± 1.85 mmHg. The percentage of differences contained into the limits of agreement of 2 standard deviation of the mean inter-measure difference was 92.5%. The correlation coefficient (r) between CVP and PVP measures was 0.90 ($r^2=0.81$). The resulting linear equation was $PVC=0.052 + 0.839 \times PVP$. No significant differences between the observed values of PVC (9.41 ± 3.99 mmHg) and those predicted by the model (9.40 ± 3.60 mmHg) were found. **Discussion and Conclusions.** Peripheral venous pressure can be used clinically as a surrogate for CVP in adult patients. In addition, CVP can be reliably estimate by the linear equation derived in this study.

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Paper No: 1095.0

Hemodynamic effects of phenylephrine on hypotension during combined general and epidural anesthesia

Yuriko Murata, Yasunori Tanaka, Satoshi Nishiike, Masao Ogawa and Hideaki Tsuchida

Department of Anesthesiology and Perioperative Medicine, Kanazawa Medical University, Ishikawa, Japan

Introduction: Hypotension is frequently observed after epidural injection of local anesthetics during combined general and epidural anesthesia. Intravenous volume expansion with a crystalloid solution or injection of a vasopressor such as ephedrine or phenylephrine (PE) is commonly used to treat this hypotension. However, because of its short plasma half-life and pure alpha adrenergic agonist property, PE is considered to be of limited therapeutic value.

Objectives: We examined the hemodynamic effects of PE infusion administered during combined epidural and general anesthesia.

Methods: The subjects were five patients undergoing elective upper abdominal surgery. A thoracic epidural catheter was inserted before induction of general anesthesia with propofol. Endotracheal intubation was facilitated with rocuronium and anesthesia was maintained with sevoflurane (0.6~0.8 MAC) in oxygen and intermittent fentanyl when required. PE infusion at $0.2 \mu\text{g/kg/min}$ was started when systolic arterial pressure (SAP) decreased below 90 mmHg after epidural injection of lidocaine. SAP, heart rate (HR), stroke volume index (SVI), and cardiac index (CI) were monitored for 30 min using a FloTrac monitor (Edwards Lifescience). SAP/CI was used to evaluate peripheral vascular resistance.

Results: (mean \pm SD) were subjected to analysis of variance, and post hoc analysis was done using the Dunnett test. **RESULTS:** Patients' characteristics were as follows: age was 62 ± 22 years, height was 155 ± 5 cm, and weight was 45 ± 7 kg. SAP decreased from 110 ± 15 mmHg to 84 ± 3 mmHg after epidural injection of lidocaine. SAP significantly increased by 20 min after PE infusion, without a significant change in HR. SVI, CI, and SAP/CI significantly increased by 30 min after PE infusion. **CONCLUSION:** PE infusion at $0.2 \mu\text{g/kg/min}$ may increase SAP by elevating both peripheral vascular resistance via arterial vasoconstriction, and cardiac index via venoconstriction during combined general and epidural anesthesia.

Paper No: 1110.0

Lateral E' is preload dependent during triggered positive pressure ventilation: a controlled cross-over study

Johan Fridolf Hermansen, Peter Juhl-Olsen, Christian Alcaraz and Fredriksen Erik Sloth

Introduction: Point of care ultrasound like the FATE (1) protocol is becoming an increasingly popular tool for hemodynamic evaluation of the critically ill. Doppler modalities can differentiate between systolic and diastolic dysfunction. The most accurate diagnostic method includes measurement of early transmitral flow, E, and early velocity of the mitral annuli, E' (2). However, E has been shown sensitive to preload variation, whereas studies have yielded conflicting results regarding E'. In addition, little evidence exists as to the effect of positive pressure ventilation (PPV) on diastolic indices.

Objectives: The aim of the study was to evaluate the preload dependency of E' and E by changing test subject position. Furthermore, also to assess how different ventilation pressures affect E and E'.

Methods: Ten healthy subjects (age 23-32) were studied. All were tilted in the neutral position (0°), reversed-Trendelenburg position (30°) and Trendelenburg position (-30°) to alter preload. Prior to the Trendelenburg position 1000ml of isotonic saline was rapidly infused through a cubital vein. In each position subjects were exposed to PPV with varying pressures (pressure support/positive end-expiratory pressure (cmH₂O): 0/0 (baseline), 0/10, 0/20, 10/4, 20/4, 10/10, 20/10). For each individual position and ventilator setting echocardiographic recordings comprising E and E' were recorded. An ANOVA for repeated measurements was used to analyze the influence of positioning and ventilator settings during triggered PPV. At baseline, a similar analysis was performed in evaluation of influence of positioning.

Results: During spontaneous respiration, E' was not dependent on position ($P=0.282$). With PPV applied, E' was dependent on position ($P < 0.001$). E was dependent on position during spontaneous respiration ($P < 0.001$) and during

triggered PPV ($P=0.001$). At the individual positions, E' was influenced by ventilator settings in horizontal ($P=0.005$) and reverse-Trendelenburg position ($P < 0.001$), but not by Trendelenburg ($P=0.515$). E was not influenced by ventilator settings in the individual positions (all P -values > 0.156). Overall inter-observer variability was -2.0 ($\pm 5.9\%$).

Discussion: E' was insensitive to preload with spontaneous ventilation, but surprisingly E' was preload dependent with PPV. E was preload dependent with spontaneous ventilation and with PPV, which is in accordance with previous results. Interestingly, E' was more sensitive to ventilator settings than E, despite being proposed to be less preload dependent.

Conclusions: E' should not be considered a reliable tool for diagnosing diastolic function in settings where preload is susceptible to change. E' at the lateral portion proved to be preload dependent during PPV, which also applies to E.

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Paper No: 1126.0

A Pilot Study: Randomized prospective clinical study on combined volatile-induced pre- and post-conditioning in patients undergoing coronary surgery

Adriaan Van Rensburg, Jacek Karski, Angela Gerath and Marcin Wasowicz

Department of Anesthesia, Toronto General Hospital, University Health Network, University of Toronto, Toronto, ON, Canada

Introduction: It is over 25 years since publication of the first reports describing the concept of ischemic preconditioning. These reports showed that short period(s) of ischemia applied to the myocardium before permanent occlusion of the coronary artery leads to a significant decrease in myocardial injury. These studies were followed by discoveries showing that different inhalation anaesthetic agents confer similar conditioning properties. Over the last 10-15 years, anaesthesiologists witnessed publication of multiple experimental studies suggesting that the use of these agents before an ischemic insult can reduce myocardial damage, termed volatile anaesthetic induced pre-conditioning (APC). Additionally, other studies proposed that the use of volatile agents after ischemia can provide further beneficial effect (post-conditioning).

Hypothesis: Volatile-induced pre- and post-conditioning result in better outcomes when compared to intravenous based anaesthesia and post-operative sedation.

Objective: To determine if cardiac outcomes in patients undergoing CABG surgery are improved when combined volatile-based anaesthetic pre- and post-conditioning are applied during the perioperative period.

Methods: After Ethics Board approval, 139 patients scheduled for elective on-pump CABG surgery were recruited. Patients were randomized to receive either: (1) combined volatile anaesthesia (0.6-2 MAC) and volatile postoperative sedation (0.1-0.3 MAC) or (2) propofol-based anaesthesia (2-6 mg/kg/hr) and postoperative sedation. Volatile sedation was provided with the use of Anaesthetic Conserving Device (AnaConDa, Sedana Medical, Sweden). Depth of anaesthesia was monitored with BIS value targeted between 40-60 from induction until extubation. Anaesthesia and ICU care were done according to study protocol. The following outcomes were analyzed: troponin levels, incidence of arrhythmias (Holter monitoring), hemodynamic parameters, and perioperative inotropic requirements. Statistical analysis of continuous and categorical variables was conducted with Mann-Whitney and Fisher's exact test, respectively.

Results: 70 patients were randomized to the volatile group and 69 to the propofol group. Demographic characteristics were similar between the two groups. The mean troponin levels in the volatile and propofol group were similar at 2, 4 and 12h after CABG surgery (3.2 vs 4.1 mcg/ml, $p = 0.27$; 5.0 vs 5.8 mcg/ml, $p = 0.53$; and 5.1 vs 5.5 mcg/ml, $p = 0.81$, respectively). There was no difference between groups in the hemodynamic variables, need for inotropic support, or incidence of post-operative atrial fibrillation.

Conclusions: Our data showed that combined volatile anaesthesia and post-operative sedation compared to the intravenous regimen does not offer additional cardioprotective properties in patients undergoing elective cardiac surgery. It may suggest that volatile induced pre- and post-conditioning extensively studied in laboratories may not translate into clinical practice.

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Paper No: 1127.0

The dependence of hemodynamics on the type of the anesthesia and on concomitant cardiovascular diseases

Yuriy Malyshev and Christina Dolmova

Introduction: The anesthesia in patients having concomitant cardiovascular diseases (CVD) is safe if hemodynamics, blood gas and water electrolytic balance maintain acceptable level [1,2].

Objectives: The lowering risk of hemodynamic imbalance in patients having concomitant CVD during surgery on the basis of selection optimal type of anesthesia.

Methods: 93 patients of age from 30 to 80 years have been operated for gastrointestinal diseases. 53 patients had concomitant ischemic heart disease (IHD), 27 patients had arterial hypertension (AH), 13 patients had the combination of IHD and AH. All patients had ASA class II-III. Dependent on the type of the anesthesia the patients were divided into groups: I group ($n = 29$) is total intravenous anesthesia (TIVA - diazepam, ketamine, fentanyl); II group ($n = 21$) is TIVA in combination with epidural anesthesia (EA-0,5ropivakain); III group ($n = 26$) is anesthesia sevoflurane in combination with fentanyl; IY group ($n = 17$) is anesthesia sevoflurane in combination with EA. Artificial lung ventilation was performed under condition of normoventilation. Duration of the surgery is 5-14 hours. Harvard's standart of monitoring including definition SI, CI, SVR was used.

Results: During anesthesia in I group occurred the increase of SI from 31 (27,5-50,0) to 35 (19,7-52,0) ml/m2 ($p < 0,05$), the tendency to decrease of CI 4-8% more and SVR from 2106 (1079-3318) to 1971 (1416-2557) dynesxcm-5 ($p > 0,05$). In II group has been increase of SI 22% more from 33 (24,2-55,0) to 40 (20,6-54,7) ml/m2 ($p < 0,05$), the tendency to decrease of SVR 11-28% more, CI remained within normal value. In III group occurred the lowering of SVR 36% more from 2171 (782-3153) to 1377 (797-2357) dynesxcm-5 ($p < 0,05$) and during completion of the anesthesia occurred the increase of SI 46% more from 27 (19,2-47,7) to 39 (24,6-59,1) ml/m2 ($p < 0,05$), CI 33% more from 2,1 (1,7-4,2) to 2,8 (1,9-5,8) l/minxm2 ($p < 0,05$). In IY group during anesthesia CI lowered 21% more from 3,4 (2,2-5,6) to 2,8 (1,7-4,8) l/minxm2 ($p > 0,05$). SI 2% more. SVR either decreased 10% more or increased 16% more but during completion of the anesthesia these were higher than normal value is. Two patients from III and IY groups had heart rhythm disorder and acute cerebrovascular accident.

Conclusions: Optimal type of the anesthesia in patients with concomitant CVD is the combination of TIVA and EA as well the anesthesia with sevoflurane and fentanyl that assisted the normalization of compensatory adaptation. TIVA or the combination of the anesthesia with sevoflurane and EA caused the compensatory adaptation tension of cardiovascular system.

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Paper No: 1151.0**Excision of arteriovenous malformation cerebral Jehovah's Witness patient**

Alejandro Cavagna

Universidad Abierta Interamericana Hospital, Buenos Aires,
Argentina Gabriela Orellana Octavio Fernandez

Introduction: The anesthetic handling of Jehovah's Witness patients undergoing surgery excision of bleeding as a cerebral arteriovenous malformation, is a real challenge for the physician.

Objective: Description of anesthetic management to ensure the transport of oxygen during high blood loss surgery without blood transfusion possible.

Material and methods: 23 year old patient, 45 kg, ASA1. Diagnosis: Temporal arteriovenous malformation. Jehovah's Witness refusal to consent to the transfusion. Erythropoietin was administered pre-operatively managed to increase cell mass. During the surgery, they looked for: Reducing the quantity and quality losses using: tramexámico acid (loading and maintenance), and extreme acute normovolemic hemodilution (21 ml/kg), controlled hypotension, blood recovery (cell-saver), patient positioning, exhaustive control of hemostasis field; Maintain normovolemia using: crystalloids, colloids, inotropic support and blood saved;

Increase the availability of oxygen using high FiO₂; Maintain adequate anesthetic plane (TIVA-TCI propofol / remifentanyl); Monitoring with ECG 5-lead, CVP, invasive blood, urine output, temperature, pulse oximeter, capnography; Serial laboratory blood count, coagulation, blood gases, blood glucose and lactic acid. Towards the end of the resection the vascular nest presents rupture with massive bleeding, hemodynamic instability and acute reduction of the globular mass; recovering immediately the recovered sanguineous volume plus the blood of the normovolemic hemodilution. In the post-operative treatment received analgesic, anticonvulsant, and erythropoietin. Discharged on the ninth day with Ht 25%, Hg: 7.8mg%, platelets: 130000. Without sequela.

Result: During massive bleeding with hemodynamic decompensation had fallen to 9% in Hct, Hb 2.9 and inotropic requirements. Remained normal ST segment, blood glucose, acid-base status and lactic acid throughout the surgery. Therapy with Ht passes. 26% and Hb 8.3. She was extubated at 12 hours.

Discussion: Beneficial effects of conservation techniques and blood conservation, versus negative effects of severe anemia, respecting the patient's will.

Conclusion: Respecting the will not get blood to Jehovah's Witness patients who underwent surgery at high risk of massive bleeding perioperative strategies currently exist that aim to ensure oxygen transport and tissue utilization, reducing mortality significantly.