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EQUIPMENT, MONITORING, AND ENGINEERING TECHNOLOGY

Paper No: 8.00

Nindex monitor performance vs. bispectral index (bis) in anesthesia for cardiac surgery in adult patients

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Purpose: Monitors of depth of anesthesia use mathematical algorithms to transform the spontaneous or evoked brain electrical activity in numerical indices. These indices are in a scale from 0 to 100, and are correlated with the anesthetic depth. The purpose of this study is to evaluate the performance of the NINDEX monitor (Controles S.A. y Dr. D. Cibils, Uruguay) compared with the BIS monitor (Aspect Medical Systems, MA, USA), in adult patients undergoing anesthesia for cardiac surgery.
Methods: Monitorize the course of anesthesia with both monitors simultaneously, in 30 adult patients undergoing cardiac surgery. Most of them with cardiopulmonary bypass (CPB). The monitors are placed on patients forehead using adhesive electrodes, following the manufacturers recommendations. Numerical indices from the monitors are recorded while the patients are awake, and then during the induction and maintenance of the anesthesia all along the surgery. ANOVA test and curvilinear estimation are used to quantify the statistical significance. $p < 0.05$ is considered significant, data are presented as mean $\pm$ sd.
Results: The mean values found during the monitorization are:

BIS	93	49	47	50	47	48	49	50	52
NINDEX	98	57	50	56	53	53	52	55	61

While the patients are awake, values are: BIS $= 93 \pm 4$, NINDEX $= 98 \pm 1.8$ After induction of anesthesia, the values of both monitors are compatible with "general anesthesia". Those values are: BIS 47–52, NINDEX 50–61. For superficial and deeper anesthesia both values tend to agree: BIS 54–59 and 40–43, NINDEX 61–72 and 40–48. NINDEX monitor delay to show the first numerical index is 84 ± 16 seconds larger than BIS monitor. The statistical correlation in both tests used shows a value of $p = 0.0001$.

Conclusions: The results found on the 30 patients using NINDEX monitor are very similar to the ones found using the BIS monitor. The data correlation is statistically significant. NINDEX monitor operating characteristics may offer additional benefits, such as disposable electrodes, wireless communication, and the ability to run it in a notebook or net book. This could reduce operating costs, wich is of particular relevance for developing countries like Uruguay.

Keywords: monitoring of anesthesia; BIS; NINDEX

Paper No: 10.00

The accuracy of continuous noninvasive measurement of hemoglobin via pulse co-oximetry in patients undergoing knee arthroplasty

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Introduction: Hemoglobin is one of the most frequently ordered laboratory measurements in patients, especially in surgery patients. A continuous and non invasive measurement of hemoglobin concentration would be a great advantage in clinical monitoring.
Objectives: The purpose of this study was to compare simultaneous measurements of hemoglobin using non-invasive pulse co-oximetry and invasive laboratory co-oximetry in subjects undergoing knee arthroplasty.
Methods: After approval of the local ethics committee and obtaining informed consent, a prospective clinical study in 31 patients undergoing knee arthroplasty was performed. Hemoglobin measured with non-invasive pulse co-oximetry (SpHb) (Masimo Radical-7®) and hemoglobin measured with invasive blood sample (Hb) were collected four times in each patient during and after surgery: 1) after initial monitoring, 2) one hour after tourniquet release (TR), 3) three hours after TR and 4) six hours after TR. Accuracy (mean difference) and precision (standard deviation) were used to determine the measurement discrepancy.
Results: One hundred and twenty four data pairs were collected from a total of 31 patients (23 female, 8 male) with a median age of 76 years. Bland-Altman plots

demonstrated good agreement between values obtained by the non invasive device compared with the gold standard. Hemoglobin measurements correlated well (r = 0.868)

Conclusions: Non-invasive co-oximetry provides clinically acceptable accuracy compared to laboratory co-oximetry in surgery patients. Our study shows its accuracy improves as time goes by.

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Paper No: 14.00

Case report of the early detection of potential aspiration through the nasogastric port of the igel supraglottic airway

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Introduction: Supraglottic airways are not definitive airways neither do they prevent of aspiration. The nasogastric port in the I-gel supraglottic airway not only aids in passing the nasogastric tube, but may also help in early detection of regurgitation & prevent aspiration

Case Report A 46 year old, otherwise fit & healthy, gentleman presented for an urgent lower limb orthopaedic procedure. He had been fasted for more than 24hours and the trauma had occurred 48hours prior to surgery. His only significant background was of moderate/severe alcohol consumption but no evidence of neuropathy.

GA was induced with Propofol200mgs and Fentanyl200umgs. An LMA-Classic size5 LMA was inserted with easy, and secured with tie. Adequate ventilation was confirmed with capnograph and bilateral chest movement. Anaesthesia was maintained with oxygen, air and sevoflurane. The patient was ventilated with pressure control ventilation at peak airway pressures of 14 at a RR of 12 achieving TV of 550mls.

On the theatre table, the LMA developed a leak around the airway, and machine bellows collapsed. Despite repositioning LMA, ventilation remained inadequate. Absence of bronchospasm was confirmed by auscultation. The airway was replaced with an I-gel airway size five, nothing untoward was noticed at replacement or on suction. This corrected the ventilation initially. But ventilation became difficult again and the patient's SpO2 dropped to 94% from 99%. At this stage, (clear/yellow)fluid was seen in nasogastric port. The airway was removed; an emergency RSI was performed with Suxamethonium100mgs and airway was secured with a size8.0 oral endotracheal tube. The saturations improved to 98% on 40% FiO2. The rest of the operative period was uneventful.

At the end of surgery, the patient was extubated when fully awake and following verbal commands. The chest X-ray performed post-operatively was normal. Clinically the patient did not have any respiratory embarrassment with adequate gas exchange noted throughout the recovery period. Prophylactic postoperative physiotherapy was organised.

Discussion: The Igel airway provides a port, which aids the insertion of a nasogastric tube. In our case where the first evidence of potential aspiration was the regurgitate seen in the nasogastric port. This alerted us and immediate action was taken to secure a definite airway. By aiding the early detection of regurgitation, it prevented aspiration and subsequent consequences like potential ARDS. This case demonstrates, and supports evidence3, that the IGel offers a portal that the classic laryngeal mask airway doesn't possess, which allowed the early detection of potential aspiration.

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Paper No: 43.00

Does near infrared spectroscopy provide an early warning of low haematocrit following the initiation of hypothermic cardiopulmonary bypass in cardiac surgery?

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Introduction: Near infrared spectroscopy (NIRS) may provide a transfusion trigger based on decreased regional cerebral oxygen saturation (rScO2), occurring in proportion to compensated or uncompensated blood loss, during cardiopulmonary bypass (CPB).
Objectives: This study investigated whether NIRS could warn a low haematocrit following the initiation of hypothermic CPB in cardiac surgery.
Methods: The study was prospectively conducted in patients undergoing cardiac surgery with hypothermic CPB using cardioplegic solutions. The rScO2, haemoglobin (Hb), haematocrit (Hct), and arterial partial pressures of carbon dioxide and oxygen recorded at 5 min after the initial administration of heparin for CPB were analyzed as before CPB values; and values recorded at 90 s after completion of the first cardioplegic solution injection, as after initiation of hypothermic CPB values. Mean systemic blood pressure and temperatures were also recorded.
Results: Immediately following initiation of hypothermic CPB, the rScO2, Hb, and Hct values were significantly decreased compared with those before CPB. Mean systemic blood pressure did not differ between before and after initiation of CPB. The temperature was significantly decreased after initiation of CPB. The change in the Hct (13.5 ¡¾ 2.9%) between before and after initiation of hypothermic CPB was not significantly correlated with the change in the left (11.8 ¡¾ 9.3%; $r = 0.14$), right (14.1 ¡¾ 9.1%; $r = 0.13$) or mean rScO2 (14.1 ¡¾ 9.9%; $r = 0.18$).
Conclusion: NIRS did not provide an early alert to a low Hct following the initiation of hypothermic CPB in cardiac surgery.

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Paper No: 59.00

Intraoperative electromyographic monitoring of cranial nerves V, VII, IX, X, XI and XII in posterior fossa surgery

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Introduction: Posterior fossa surgery is a high-risk intervention and complex surgical anaesthetic management. The main risks are intraoperative bleeding, air embolism and neurological sequelae. The resection of tumours near the brain stem can lead to injury of cranial nerves with significant neurological sequelae.
Objectives: The neurophysiological intraoperative monitoring techniques allow continuous monitoring of functional integrity of the nervous system during brain tumour resections. Intraoperative electrophysiological monitoring can prevent or minimize the injury of cranial nerves. From the standpoint of anaesthesia is necessary not to interfere with drugs on evoked potentials.
Material and methods: We report a 24-yr-old man, known to have a recurrent brain glioma. His previous neurological history included a glioma resection 20 years ago and facial palsy and residual left hemiparesis.

Anaesthesia was induced with propofol and remifentanyl intravenous. The tracheal intubation was facilitated by rocuronium. Monitoring consisted of pulse oximetry, ECG, invasive arterial pressure, BIS, central venous pressure by subclavian central line, and placement of oesophageal stethoscope for detecting air embolism. The prone position was chosen because of surgeon preference. Electrophysiological monitoring was performed with two electrodes type hook wise placed on right vocal cord to record the response of the X cranial nerve. It is also held the record EMG of muscles innervated by cranial nerves V, VII, IX, XI and XII.

Electrical stimulation is used to identify the neural structures at the beginning. Later, the objective is to verify the absence of nerve injury, through the registration of any change in amplitude, morphology and latency of motor responses.
Results: During the surgical procedure the tumour was partial removed. There were no postoperative complications.
Conclusions: EMG monitoring is a safe and effective tool for the identification and location of the cranial nerves. EMG monitoring is a helping to preserve neurological and anatomical function. Also, EMG monitoring helps to define the extent of tumour resection.

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Paper No: 95.00

Stroke Volume Variation and Cardiac Index measured by FloTrack system during hepatic surgery

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Introduction and Objectives: In our institution Vena Cava half occlusion (VCHO) and Pringle method are used to reduce surgical bleeding in liver surgery. We found that Stroke Volume Variation (SVV) is significantly correlated with CVP and both are significantly changed by VCHO and VCHO+the Pringle. We showed the optimal SVV for liver resection is 19–20% from the standpoint of blood loss. The aim of this study is to investigate the systemic circulation during liver surgery under these conditions.
Material and Methods: 35 patients who underwent liver resection were monitored by the FloTrac system. SVV, Cardiac Index (CI) and CVP were recorded during the Pringle, VCHO and VCHO+the Pringle. We measured the SVO2 saturation in 14 patients at the same time.
Results: CI and SVO2 were not changed by the Pringle. CI, however, was significantly changed by VCHO and VCHO+the Pringle as were SVV (11% to20%) and CVP (9mmHg to 6mmHG). The CI minimum value 2.45 L/m2 was recorded at the first VCHO+the Pringle. SVO2 was also changed with CI but not significantly. SVO2 were over 75% at the first to third VCHO+the Pringle and the minimum value was 72.9% at fourth VCHO +the Pringle.
Discussion: To reduce arterial bleeding, arterial and portal blood inflow to the liver is blocked by the Pringle, which does not affect CVP, SVV or CI. This indicates that systemic circulation is not interrupted by the Pringle. To reduce venous bleeding, blood outflow to a systemic circulation from the liver is increased by decreasing CVP. VCHO decreased CVP and affected SVV and CI. This indicates that systemic circulation is disturbed by VCHO. This effect was increased by adding the Pringle. In the goal of achieving systemic circulation of clinically ill patients, CI and SVO2 are aimed over 2.5 L/mm2 and 75%, respectively. Our data were less than the goal values. However SVO2 under 75% was recorded only at 4th VCHO+Pringle. The goal values were gained quickly by release of the Pringle and then the lowered duration dose not lasting over 15 minutes. We conclude that in the optimal condition for blood loss of liver surgery indicated by SVV the systemic circulation is maintained.
Conclusion: SVV and CI measured by FloTrack system are useful parameters for liver surgery.

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Paper No: 147.00

Association between preoperative thromboelastography and mortality after liver transplantation

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Introduction: The coagulation monitoring during liver transplantation (LT) is of fundamental importance because the hemostatic balance of the patient is complex and excessive bleeding may compromise the result of the transplantation. Several studies have pointed out a discrepancy between the usual coagulation tests and bleeding in patients undergoing LT. Some authors believe that the use of thromboelastography (TEG) during LT is linked to the rational use of blood components, lowering costs and exposure to risks associated with blood transfusions. Despite the benefits of the use of thromboelastogram in LT, no study evaluated its impact on survival at five years of patients transplanted. The main objective of this study is to evaluate the association between preoperative TEG profile and survival, up to 5 years after the LT.
Methods: Upon approval by the hospital ethics committee, a cohort study was held, having as its inclusion criteria the patients undergoing orthotopic LT in the institution. The exclusion criteria were patients younger than 18 years, donor related transplantation, retransplantation, surgery for fulminant hepatitis and death during surgery or those occurred within the first 24 hours after the end of the operation. Quantitative variables were analyzed according to Levene's tests and Spearman correlation, whereas the qualitative ones according to the chi-square test. It was adopted the 5% significance level.
Results: A total of 113 patients were analyzed and 20 were excluded because they did not fill the inclusion criteria. According to the thromboelastography profile, 45 patients (48.4%) showed hypocoagulable TEG, 14 (15.0%) a normal one and 34 (36.6%) hypercoagulable TEG. During the follow up, 22 patients (23.7%) died. Survival ranged from two to 1.495 days: 86% in 30 days, 82% in 1 year and 76% in 5 years. The hypocoagulable thromboelastography profile associated with a higher survival at 30 days (table 1). When the patients of hypercoagulable and normal profile are grouped, patients with hypocoagulable preoperative TEG show a higher survival, at 30 days and 5 years (table 2).
Discussion: Although it is known that changes in coagulation of liver diseases are highly complex, the hypocoagulable TEG

showed to be a protective factor for mortality after LT. It is probable that patients with hypocoagulable TEG present a lower activation of the inflammatory system and a lower incidence of vascular thrombosis. However prospective, controlled, randomized and multicentre studies are necessary to confirm this hypothesis.
Conclusion: The preoperative hypocoagulable thromboelastogram was a protective mortality factor after liver transplantation.

Paper No: 163.00

The use of mcgrath® mac for awake laryngoscopy and intubation in an obese patient with predicted difficult airway

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Introduction: Although awake fiberoptic intubation is the gold standard for difficult airway, there are recent reports of awake intubation facilitated by videolaryngoscopes. (1,2)
Objective: We present a case in which the McGrath® MAC (Aircraft Medical Limited, Edinburgh, UK) videolaryngoscope was used for awake intubation.
Methods/results: The patient was a 38-year old female planned for elective orthopaedic surgery. Her medical history included obesity (body mass index 36 kgm-2, body weight 89kg) and hypertension. Assessment of the airway indicated possible difficult intubation-she had a receding chin and short neck.

Awake intubation using the McGrath® MAC videolaryngoscope was planned. After the application of routine monitoring, oxygen was administered via a nasal cannula. Intravenous glycopyrrolate 0.2mg and midazolam 1.5mg were administered. Lignocaine gel 2%, 10 ml was gargled and lignocaine 10% was sprayed twice on the tongue and in the hypopharynx via an atomisation device (Long Flexi Nozzle, ENT Technologies, Victoria, Australia). Remifentanil target controlled infusion at 2 ng/ml was commenced.

Laryngoscopy performed with minimal force and without cervical manipulation showed a Cormack and Lehane grade 1 view of the larynx. After 2 sprays of lignocaine 10% on the vocal cords, a 7.0 mm tracheal tube was passed through the larynx over a malleable stylet. There were no complications such as coughing, gagging or bleeding. Capnographic confirmation of successful tracheal intubation was followed by induction of anaesthesia.

In the postoperative period, she reported that although she could recall the intubation process, it was not unpleasant.
Discussion: As visualization of the glottis during videolaryngoscopy is not dependent on aligning the oral-pharyngeal-laryngeal axes, there is less airway and cervical manipulation.(4) This allows better patient tolerance and less cervical spine movements. These are obvious advantages in difficult airways or unstable cervical spines requiring awake intubations.

McGrath® Mac improves the grade of laryngoscopic view whilst using a conventional laryngoscopy technique. It allows viewing of glottis directly, similar to the traditional Macintosh or via the indirect camera view, thus reducing blind spots and risks of trauma. In the difficult intubations, the anterior image can reduce the possibility of blind tube insertion and obtain otherwise difficult views with little force.
Conclusion: MacGrath® MAC seems to be able to faciliate awake intubation well. More studies are needed to compare MacGrath® MAC videolaryngoscopy and flexible fiberoptic endoscopy for awake intubation so as to allow meaningful conclusions to be drawn.

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Paper No: 182.00

Differences between cardio-q and uscom doppler cardiac output readings in high risk surgery patients

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Introduction: Doppler ultrasound measurement of cardiac output, and related parameters, is being promoted to guide goal directed fluid therapy in high risk surgery patients, as part of enhanced surgical recovery. Two commercial devices are available: CardioQ (Deltex Medical, Chichester, England) and USCOM (USCOM Ltd, Sydney, Australia). They differ slightly in application, the CardioQ uses an oesophageal probe which detects flow in the descending aorta and the USCOM uses a suprasternal probe which detects flow at the aortic valve. Thus, differences exist in their measurements. In clinical practice these two devices are interchangeable, and as the reliability of clinical ultrasound is very patient-operator dependent, when data from one devices is unreliable, the other may be used.
Objective: To compare the performance of these two devices in high risk surgery patients.

Methods: In high-risk surgery patients paired CardioQ and USCOM cardiac output readings were made at regular intervals throughout surgery.
Results: Overall 71 (range: 5 to 17) data pairs were collected from 6 patients. Data was spread evenly across the range of cardiac outputs. Data in all cases showed good correlation ($r = 0.88$ (range 0.64 to 0.98) ($p < 0.001$). The slope of the regression line (mean(range)) was 0.83 (0.49 to 1.14) [x-axis representing CardioQ cardiac outputs and y-axis representing USCOM cardiac outputs], indicating differences in calibration between the two devices and patients. Furthermore, the regression lines did not pass through the origin cutting the y-axis at 1.2 L/min (range: 0.4 to 1.9), suggesting that the CardioQ under-read compared to the USCOM at low cardiac outputs, but over-read compared to the USCOM at high cardiac outputs. Bland & Altman analysis of all the data showed a mean(range) cardiac output of 5.7(2.5 to 9.4) L/min, bias of 0.0 L/min and wide limits of agreements (95% confidence intervals of the bias) of -3.3 to $+3.4$ L/min; partly due to the bias varying with cardiac output from $+1.0$ L/min at low readings to -1.0 L/min at high readings.
Conclusions: Both the CardioQ and USCOM were capable of trending changes in cardiac output during surgery. However, variations in calibration between patients existed. Also, an offset in readings between devices exists with the CardioQ under-reading at low values against USCOM, and vice versa. This may be explained by the different origins of the Doppler flow signal, as descending aorta flow used by the CardioQ is 70% of cardiac output and requires a correction factor that may vary during surgery.

Paper No: 207.00

Relationship of resistin, interleukin 6 and lipid profile to the extent of vessel disease determined by angiography in diabetes and ischemic heart disease (ihd) patients

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Background: Studies in animals have shown that hyperresistinemia impairs glucose tolerance and induces hepatic insulin resistance in rodents, while mice deficient in resistin are protected from obesity-associated insulin resistance. Although assays for human resistin are in their infancy, but several small studies have reported that circulating resistin levels are increased in human obesity and diabetes.
Aims: To measure serum Resistin levels, Interleukin 6 (IL6) and lipid profile in, diabetic patients and non diabetic controls, with and without ischemic heart disease (IHD).
Methods: Patients between the ages of 50–70 years coming to angiography department for evaluation of their heart disease were divided into 2 groups i.e. patients with diabetes mellitus and those without diabetes. Each group was further divided into two groups of those having coronary heart disease and those without coronary heart disease, thus making 4 groups of patients i.e diabetes with IHD, diabetes without IHD, non diabetics with IHD and non diabetic without IHD who served as controls. The study was approved by ethical committee Ziauddin University and consent was taken from each patient. Fasting blood sample was taken and serum was stored at -70 oC for analysis. Diabetes mellitus was diagnosed if fasting blood sugar exceeds 110mg/dl and random blood sugar>140 mg/dl. The extent of vessel block was determined by angiography in cases having ischemic heart disease while serum Resistin and Interleukin 6 were done using ELISA and lipid profile by standard kit method. Single two vessel and three vessel occlusions were included in the study. More than 50% of artery lumen occlusion were termed as Ischemic Heart Disease (IHD).
Results: A total of 147 subjects were included in the study, while 13 subjects were dropped from the study due to other cardiac complications. They were divided into four groups of Non diabetic controls and diabetic patients and each group was further divided into those with coronary heart disease and those without heart disease (IHD). The relationship of circulating resistin and interleukin 6 was checked in IHD patients with and without diabetes. High circulating levels of resitin and IL6 were seen in IHD patients with and without diabetes as compared to the controls. Significant positive correlation was found between the resistin and interleukin-6 in patients having IHD without diabetes ($r = 0.66$, $p < 0.01$) and IHD with diabetes ($r = 0.41$, $p < 0.05$). Age and waist hip ratio of the four groups were comparable The study also looked into the variation of resistin and interleukin-6 with the extent of coronary vessel disease and showed significant raise in interleukin 6 and resistin levels with the increase in number of affected vessels.
Conclusions: There was a significant increase in the levels of resistin and interleukin 6 in three vessel disease as compared to single vessel disease.

Paper No: 235.00

Relationship of cerebral oxygenation and oxygen transport in complex valve surgery

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Introduction: Complex valve surgery represents a high-risk cardiac intervention frequently accompanied by hemodynamic disorders and deterioration of oxygen transport [1]. In these patients, the extraction of O2 by tissues may be severely disturbed, particularly following cardiopulmonary bypass (CPB) [2]. Thus, monitoring of oxygenation parameters may be of importance during operation and in early postoperative period. The continuous measurement of central venous (ScvO2) and cerebral (ScO2) oxygen

saturation in cardiac surgery may be a valuable adjunct to routine hemodynamics that can facilitate the achievement of a balance between oxygen delivery (DO2) and consumption (VO2) and attenuate cerebral hypoperfusion and organ dysfunction [3,4]. Combination of these parameters seems to be an attractive approach for the "global view" on systemic and cerebral oxygen delivery. However, the correlation of cerebral oxygenation and oxygen transport during complex valve surgery is still to be investigated.

Objective: The aim of our study was to assess the relationship between ScO2 and parameters of oxygen transport during complex valve surgery.

Methods: We enrolled 12 patients who underwent elective complex valve replacement/repair (2 or more valves) with total intravenous anaesthesia (propofol/fentanyl). The depth of anesthesia was maintained aiming at cerebral state index values within 30–40 (Danmeter, Radiometer, Denmark). All patients have received perioperative monitoring of ECG, SpO2, heart rate, arterial pressure (LifeScope, Nihon Kohden, Japan), cardiac index (CI), ScvO2, DO2, VO2 (PiCCO2, Pulsion Medical Systems, Germany), ScO2 (Fore-Sight, CAS Medical Systems, USA), blood gases, lactate, hemoglobin and glucose (ABL800Flex, Radiometer, Denmark). Cardiopulmonary bypass was performed in non-pulsatile mode with perfusion index of 2.5 l/min/m2 using a standard roller-pump CPB-machine (Jostra HL 20, Maquet, Sweden). The hemodynamic measurements were performed after induction of anesthesia, during CPB, at the end of surgery, and during 24 hrs postoperatively. The data were assessed by SPSS 15.0. The correlations were estimated using Spearman's r coefficient. A $p < 0.05$ was regarded as statistically significant.

Results: Cerebral oxygen saturation correlated with ScvO2 and DO2 after induction of anesthesia, at 2, 18 and 24÷hrs after operation ($p < 0.05$). During CPB, we found correlation of ScO2 with arterial lactate ($r = -0.6$; $p < 0.05$) that might be explained by tissue hypoperfusion. During surgery and postoperatively, ScO2 was not related significantly with CI, hemoglobin and PaO2.

Conclusion: In complex valve surgery and postoperatively, ScO2 correlates with ScvO2, DO2 and lactate, thus it can reflect decreased oxygen transport during perioperative period and hypoperfusion during CPB.

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Paper No: 271.00

Non-invasive continuous blood pressure monitoring vs invasive blood pressure monitoring during vascular surgery

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Introduction: Continuous non-ivasive arterial pressure (CNAP) monitoring is using over the last 25 years [1]. Different authors have contradictory opinions about accuracy of measurement and usability of this method for critically ill patients [2,3].

Objectives: Our study was designed to compare CNAP and invasive blood pressure during (IBP) vascular surgery.

Methods. Ten patients undergoing major vascular surgery were included. We compared systolic blood pressure only because this was a main characteristic that determines decision makes algorithm. All data collected by the Infinity Delta XL (Dräger Medical AG & Co. KG, Lübeck, Germany) simultaneously. Calibration time for CNAP was 15 minutes.

Results: One hundred and seventy eight pairs of simultaneous CNAP and IBP measurements were compared. The range of IBP measurements was 77–220 mmHg for CNAP 56–179 mmHg. Correlation between IBP and CNAP was $r = 0.83$ ($p < 0{,}001$). Bias and 1.96 SD limit of agreement between invasive BP and CNAP measurements were respectively -13,7 and -12.0 to 39.4 mmHg. The percentage of unidirectional changes IBP and CNAP measurements were depended on time after calibration. There was 90, 80 and 73 for calibration period, 5 min and 10 min after calibration respectively. Infinity CNAP module cannot make a measurements during systolic IBP low 65 mmHg and has a big dispersion after 140 mmHg.

Conclusions: CNAP have a good correlation with IBP in the normal systolic blood pressure interval (70–140 mmHg). In spite of continuous BP monitoring by CNAP it cannot replace IBP monitoring during major vascular surgery because of substantial changers BP during this type of operation.

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Paper No: 292.00

Continuous non-invasive perioperative monitoring of cardiac output by pulmonary capnotracking

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Introduction: A number of technologies are available for minimally-invasive cardiac output measurement in patients during surgery. A growing body of research suggests that improvements in patient outcomes can be achieved with their use. However, the penetration of these devices into the routine haemodynamic management of patients undergoing major surgery remains limited. This may be due their cost and complexity.
Objectives: A novel system was developed based on CO2 elimination (VCO2) by the lungs for use in ventilated patients, which can be fully integrated into a modern anesthesia/monitoring platform, and provides automated, hands-free continuous breath-by-breath cardiac output monitoring. After initial testing in an animal model [1], the system was validated in patients during or after major surgery.
Methods: A prototype measurement system was constructed to measure VCO2 and end-tidal CO2 with each breath. A baseline measurement of non-shunt cardiac output was made during a brief change in ventilator rate and I:E ratio, according to the differential CO2 approach [2–4]. Continuous breath-by-breath monitoring of cardiac output was then performed from measurement of VCO2, using a derivation of the Fick equation applied to pulmonary CO2 elimination. Automated recalibration was done periodically or on command by the anaesthesiologist. Data was processed and cardiac output displayed in real time. Measurements were compared with simultaneous measurements by bolus thermodilution in 77 patients undergoing cardiac surgery or liver transplantation.
Results: Overall mean bias [standard deviation] for agreement in cardiac output measurement (capnotracking – thermodilution) was – 0.1 [1.2] L/min, with a percentage error of 44.2%, r = 0.92. The slope of the regression relationship was y = (0.9x+0.41) L/min. Concordance in measurement of changes in cardiac output from baseline was 90.4%. The method followed sudden changes in cardiac output due to arrythmias and run onto cardiopulmonary bypass in real time.
Conclusions: The accuracy and precision were comparable to other more invasive clinical techniques [5]. The method is seamless and fully automated and has potential for continuous, cardiac output monitoring in ventilated patients during anaesthesia and critical care.

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Paper No: 325.00

Relationship between bispectral index and auditory evoked potential index for propofol and midazolam during induction of general anesthesia

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Introduction: Several monitors are used to prevent awareness during anesthesia. The bispectral index (BIS), derived from bispectral analysis of the electroencephalogram, has been used to monitor the depth of anesthesia. In particular, during propofol-induced hypnosis, it is highly predictive of depth of sedation. However it is reported that BIS is not an accurate measure of the depth of anesthesia when using midazolam and fentanyl (1). Whereas the auditory evoked potential index (aepEX) is derived from the middle latency auditory evoked potential. It is reported that the auditory evoked potentials is an effective tool for monitoring sedation induced by midazolam (2).
Objectives: We investigated the relationship between BIS and aepEX for propofol and midazolam during induction of general anesthesia.
Methods: After institutional approval and written informed consent was obtained, ten patients scheduled for lower abdominal surgery under general anesthesia@participated in this study. They were randomly divided into two groups, one group was received propofol infusion (Group P), and the other was received midazolam infusion (Group M). Before the drugs started, monitoring BIS and aepEX was started. Propofol and midazolam infusion were given until BIS or aepEX reached 35 at a rate of 10mg/kg/h and 0.3mg/kg/h, respectively. BIS and aepEX were simultaneously recorded and the relationship between two indices was evaluated.
Results: The relationship between BIS and aepEX indicies was BIS = 1.25 x aepEX+8.32 (R2 = 0.58) in group P, and BIS = 0.68 x aepEX +39.99 (R2 = 0.24) in group M. The relationship between BIS and aepEX was more associated in group P than group M. BIS tended to be higher than aepEX in group M.
Conclusion: The aepEX may be better than BIS at distinguishing the depth of anesthesia during induction of general anesthesia with midazolam.

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Paper No: 334.00

Cardiac output and spinal anesthesia: An echocardiographic study

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Introduction: Spinal anesthesia produces hemodynamic changes, like hypotension (described in up to 30% of patients) and bradycardia. The physiology of these changes has been studied years ago in experimental animal models and humans. At present transthoracic echocardiography (TTE) can be a useful modern non-invasive monitor to study what happens to the cardiac output (CO) after a subarachnoid block in patients during real clinical practice.
Objective: To evaluate the performance of the CO with the use of TTE after the installation of a spinal anesthesia.
Methods: ASA I patients proposed for surgery under spinal anesthesia were prospectively studied. The basal CO was studied using the left paraesternal window where the diameter of the outflow tract of the left ventricle was measured and its area was calculated. Then, from the apical five-chamber window with continuous Doppler the velocity time integral from the outflow tract (VTI) was measured. Multiplying VTI by the area, the stroke volume (SV) was obtained, which again multiplied by the heart rate (HR), determined CO. After this basal examination, a spinal anesthesia was started using a standardized mixture with Chirocaine 0.5% and fentanyl 20 micrograms in a volume between 2.5 and 3 ml. The same echocardiographic examination was performed to measure CO after verifying the installation of the spinal block.
Results: We studied 68 patients, in only 4 echocardiographic windows were not satisfactory. The average age was 42.6 ± 10 years. All patients underwent surgery with spinal block. The block level was T6 achieved a 34.26% of the cases and 31.11% in T4. Variations in systolic, diastolic and heart rate had a statistically significant decrease. There was no significant difference in the GC before (4.41 ± 0.34 l min-1) and after spinal anesthesia (4.22 ± 0.36 l min-1). Maximum height of sensory subarachnoid block was not correlated with the decrease in MAP and the echocardiographic parameters.
Conclusions: Spinal anesthesia decreased hemodynamic parameters, but not the CO. The intraoperative use of transthoracic echocardiography allowed direct and real study of cardiovascular physiology and demonstrates that despite low blood pressure, and heart rate, CO tended to remain normal, probably because of offset by other mechanisms such as increased myocardial contractility and improvement diastolic function. In the future, the TTE may be a study tool to evaluate what happens with different anesthetics and different types of patients like obstetric patients, patients having abnormal myocardium and hypertensive patients.

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Paper No: 358.00

The difficult airway trolley: an audit of DAS guidelines in 3 acute department across all hospitals in a UK school of anaesthesia

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Introduction: There is a huge range of equipment available to the anaesthetist to deal with both the anticipated and unanticipated difficult airway. However, without adequate and appropriate training, the use of such equipment might paradoxically put the patient at increased risk. The 4th National Audit Project (NAP4)[1] found that airway events on Intensive Care Unit (ICU) are likely to be more serious and result in permanent neurological damage or death. Following a critical incident in Scotland, the Fatal Accident Enquiry[2] recommended that equipment available on the difficult airway trolley should be rationalised and standardised.
Objective: We surveyed the theatres, Emergency Department (ED) and ICU of all hospitals in the Wessex Deanery with regarding the equipment stocked on their respective difficult airway trolleys against guidelines published by the Difficult Airway Society (DAS)[3].
Methods: A postal survey was sent to a named doctor in the three departments at all eight hospitals in the Wessex Deanery. A reminder letter was later sent to non-responders.
Results: The response rate was 100%. One of the ED surveyed did not have a difficult airway trolley but were in the process of setting it up. There was a high degree of variation across the departments and hospitals in the type of equipment stocked on the trolleys. Only two hospitals had identical equipment on their difficult airway trolley across the three departments.
Conclusion: Anaesthetic trainees and consultants are now expected to work in various departments providing acute care. Furthermore, UK trainees rotate through various hospitals within a region. NAP4 concluded that at least a quarter of major airway events occur in the ICU or ED and these are associated with particularly poor outcomes1. In particular, assessors judged airway management in ICU to be good less frequently compared to either anaesthesia or ED. They found that issues with the lack of equipment and appropriate training arose frequently and recommend that every difficult airway trolley should have the same content and layout in all departments within the hospital. Our survey highlights the considerable intra- and inter-hospital differences in a single school of anaesthesia in the UK.

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Paper No: 368.00

Temporal Comparison of Ultrasound versus Auscultation and Capnography in Verification of Endotracheal Tube Placement in Obese Patients

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Introduction: Ultrasound can be as fast as auscultation in verifying endotracheal intubation in a normal weight population.1 Obesity has been reported to compromise the use of ultrasound.2 We set out to evaluate the use of ultrasound to verify endotracheal intubation in obese patients.
Objectives: This study was designed to compare the time consumption of bilateral lung ultrasound with auscultation for verifying endotracheal intubation in the obese patient. We hypothesized that, in obese patients, verification of endotracheal intubation would be as fast with ultrasound as with auscultation.
Methods: A prospective, paired and investigator blinded study carried out in the operating theater. Twenty-four adult obese patients scheduled for gastric bypass surgery were enrolled. During intubation transtracheal ultrasound was performed to visualize passage of the endotracheal tube. During bag ventilation bilateral lung ultrasound was performed for detection of lungsliding as sign of ventilation simultaneous with capnography and auscultation of the epigastrium and the chest. Primary outcome measure was time difference to confirmed endotracheal intubation between ultrasound and auscultation alone. Secondary outcome measure was time difference between ultrasound and auscultation combined with capnography.
Results: Twenty-two patients were included and two were excluded. Median body mass index was 41.5 [IQR 39–45]. Both methods verified endotracheal tube placement in all patients. No significant difference was found between ultrasound compared with auscultation alone. Median time for ultrasound was 43 sec [IQR 40–51 sec] and for auscultation alone it was 47.5 sec [IQR 40–51 sec], with a mean difference of -0.3 sec in favor of ultrasound (95% CI -3.5–2.9 sec), $p = 0.87$. Comparing ultrasound with the combination of auscultation and capnography, there was a significant difference between the two methods. Median time for the combination of auscultation and capnography was 55 sec [IQR 46–65 sec], with a mean difference of -8.0 sec in favor of ultrasound (95% CI -9.4 -4.8 sec), $p < 0.0001$.
Conclusion: In obese patients verification of endotracheal tube placement with ultrasound can be as fast as auscultation alone, and faster than the standard method of auscultation and capnography.

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Paper No: 381.00

Platelet function analysis after cardiopulmonary bypass in patients taking antiplatelet agents: a pilot study

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Introduction: Transfusion of blood products is associated with significant morbidity and mortality (1,2). Cardiopulmonary bypass (CPB) however, detrimentally affects platelet structure and function, leading to increased blood loss and transfusion requirements(3,4).

ACC/AHA guidelines recommend stopping Aspirin and Clopidogrel prior to coronary artery bypass grafting (CABG) in order to reduce blood loss(5). However, many patients with left main stem disease and unstable angina are unable to safely discontinue antiplatelet therapy prior to surgery.

Platelets are transfused according to low platelet counts and clinical suspicion of poor function. Although thromboelastography parameters such as maximum amplitude are useful indicators of clot strength, they are not as sensitive with regard to platelet function as aggregometry (6).
Objectives: This prospective, blinded, pilot study was designed to assess the ability of a new platelet function analyzer (Multiplate, Verum Diagnostica GmbH) to predict transfusion requirements in on-pump CABG in patients continuing antiplatelet agents in the perioperative period.
Methods: 17 patients undergoing on-pump CABG while taking aspirin were included in the study. Anaesthesia was standardised to include equivalent doses of tranexamic acid and heparin. Multiplate analyses of arachidonic acid (ASPItest), thrombin receptor agonist (TRAPtest) and adenosine diphosphate (ADPtest) were performed at

baseline and during chest closure. All clinicians involved in the patient's care were blinded to the results. Blood loss and transfusion requirements were recorded for 24 hours post-operatively.

Results and discussion: All patients were taking aspirin at least two days prior to surgery and this effect is confirmed by mean baseline ASPItest value of 39 (normal range 75–136) and explains the high proportion (59%) of patients receiving packed red blood cell (PRBC) transfusion. This inference is strengthened by the differing baseline ASPItest (31 vs 50, $p = 0.08$) in the transfused and non-transfused groups.

Examining platelet transfusion requirement in isolation reveals an interesting trend. Patients requiring platelet transfusion (24%) have significantly lower TRAPtest (82 vs 137, $p = 0.02$) and ADPtest (35 vs 60, $p = 0.05$) values during chest closure compared to the non-platelet transfused group.

Conclusion: This study demonstrates the efficacy of Multiplate in detecting reduced platelet function secondary to aspirin use as well as the quantitative trend between greater inhibition and PRBC requirement. We also demonstrate a significant association between two Multiplate modalities measured after CPB and peri-operative platelet transfusion requirement. We suggest further large scale study into the use of Multiplate analysis to predict the need for perioperative blood products, in patients undergoing CPB who are unable to stop antiplatelet agents.

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Paper No: 382.00

Comparison of the macintosh, mccoy, airtraq® laryngoscopes and intubating lma in a simulated difficult airway with manual in-line stabilisation - a randomised crossover simulation study

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Introduction: Patients with multi-system trauma undergoing intubation with manual in-line stabilisation (MILS) have a higher incidence of difficult or failed intubations. The purpose of this study was to compare the effectiveness of the Macintosh laryngoscope with three other intubating devices in a high fidelity simulation model.

Methods: The study had local approval from the audit department and further formal ethical approval was not deemed necessary. Thirty-five anaesthetists performed orotracheal intubations on a Laerdal SimMan manikin in both a normal airway and a difficult airway scenario with MILS. The four devices utilised, in a randomised order, were the Macintosh, McCoy, Airtraq® laryngoscopes and the intubating Laryngeal Mask Airway (iLMA). The success rate of tracheal intubation, time to intubation, grade of laryngoscopy and force of intubation were measured. In a previous similar study, clinicians utilised a Macintosh laryngoscope in an easy airway scenario, with time taken for tracheal intubation found to be approximately 16 s, with a standard deviation of 5 s. We considered an absolute change of 25% in time taken to intubate to be important [1]. On this basis, an ? value of 0.05 and ? value of 0.2, we calculated that 35 participants would be needed. Data analysis and comparison was made of the different intubating devices for each simulated scenario and not between the scenarios themselves.

Results: In the normal airway scenario, there was no difference in success rates and time to intubation between all four devices. In the difficult airway scenario there was no difference in success rates, but use of the Airtraq® was associated with a significant prolongation in the time to intubation, while the iLMA returned the fastest time ($P < 0.0001$). The Airtraq® delivered the best glottic visualisation and lowest force of intubation in both scenarios ($P < 0.0001$). Use of the McCoy was associated with a significant improvement in the glottic visualisation and force of intubation over the Macintosh ($P < 0.0001$).

Conclusions: In this manikin study, the McCoy demonstrated some advantage over the Macintosh and may have a role as a primary intubating device in trauma patients with manual in-line stabilisation. The Airtraq® was associated with improved glottic visualisation and a lower force of laryngoscopy, which may make it useful as a secondary intubating device.

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Paper No: 386.00

Proseal© LMA for laparoscopic cholecystectomy: the experience in a tertiary hospital in the Philippines

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Introduction: Laparoscopic cholecystectomy has, in recent years, been rapidly growing in popularity here in the Philippines. Seafarers who are found to have gallbladder stones, symptomatic or otherwise, are prohibited to embark on their respective vessels for fear of the symptoms manifesting while on board. The Proseal© laryngeal mask airway was introduced to the hospital in the year 2007. It is an oropharyngeal airway that may be an alternative to the endotracheal tube, and has a separate tube that allows for the insertion of a gastric tube to empty gastric contents. There has been no local recommendation or consensus with the use of the Proseal LMA for laparoscopic cholecystectomy, and thus the reluctance of anesthesiologists to use it.
Objective: To describe the effects of the laryngeal mask airway among patients who underwent laparoscopic cholecystectomy.
Methods: The anesthesia records of all cases done at the operating room were reviewed from January 2007 to December 2010. Of these, cases of laparoscopic cholecystectomy were identified. Laparoscopic cholecystectomies done using the Proseal© LMA were then selected for this study. Outcome measures include patient weight, gender, ASA risk, length of procedure and length of hospital stay. When postoperative days were more than four, the charts were retrieved from the records department and scrutinized for the reason for the delay in discharge. Reasons for delays in discharge were noted.
Results: A total of 1,112 patients underwent laparoscopic cholecystectomy using Proseal LMA. The average age was 41.5 years, with a standard deviation of 9.6 years. The majority of patients were male (79.8% vs 20.2%). The average weight of patients was 70.81 ± 12.2kg. The average length of hospital stay was 2.9 ± 1.2 days while duration of surgery was 116.1 ± 41.1 minutes. Results show that the use of the Proseal LMA as the airway management of choice for laparoscopic cholecystectomy at the Seamen's Hospital has increased since its introduction in 2007. From 45% in 2007, the percentage has gone up to almost 90% in 2010. This may indicate the increasing confidence of anesthesiologists on the Proseal LMA on such procedures. No complications were seen with the use of the Proseal LMA.
Conclusion: The use of the Proseal LMA for laparoscopic cholecystectomy has gained popularity among anesthesiologists. This study also shows that it is safe. It may be recommended that the Proseal LMA may be used as an alternative to the endotracheal tube as the airway management of choice for laparoscopic cholecystectomy.

Paper No: 414.00

Propofol consumption and narcotrend index during TCI anaesthesia for laparoscopic cholecystectomy

Mirjana Kendrisic and Nikac Tomanovic

Introduction and Objectives: The following study examines the efficacy of the use of Narcotrend monitoring for defining the depth of anaesthesia and reduction of propofol consumption during TCI anesthesia (target controlled infusions) in patients undergoing laparoscopic cholecystectomy.
Methods: After approval of the local ethics committee, 80 patients, aged 52 ± 7.8 (ASA II-III) were included in this prospective, randomised, double blind study. Patients were divided into four groups of 20 patients (A1,A2,B1,B2). Blood-targeted Marsh model for propofol was used in groups A1 and A2. Effect-site Schider model for propofol was used in groups B1 and B2. Anaesthetic induction was started with infusion of propofol (Marsh Vs. Schnider) and remifentanil (Minto model) at target concentrations of 6 μg/ml and 6 ng/ml respectively. After the loss of consciousness muscle relaxant rocuronium was administered 0,6mg/kg. Following intubation, remifentanil was reduced to 3ng/ml. Propofol infusion was adjusted according to target values (Narcotrend index between 40–60) in groups A1 and B1 and according to clinical parameters in groups A2 and B2. Heart rate (HR), arterial pressure (MAP), respiratory rate, oxygen saturation, end tidal carbon dioxide and Narcotrend index were recorded. Statistics were analysed with the Chi-Squared test and Student's t test.
Results: A1 A2 B1 B2 p value Narcotrend index(induction) 45 ± 7 42 ± 5 45 ± 2 48 ± 2 NS Narcotrend index(maintenance) 42 ± 12 36 ± 10 50 ± 8 48 ± 8 $p < 0,05$ Propofol consumption-ind.(mg)152 ± 22 166 ± 24 98 ± 12 88 ± 14 $p < 0,01$ Prop. consumption-maint. (mg)515 ± 32 592 ± 46 370 ± 24 452 ± 34 $p < 0,05$ HR (bpm) 62 ± 14 70 ± 12 78 ± 12 76 ± 16 $p < 0,05$ MAP (mmHg) 74 ± 15 68 ± 14 90 ± 9 84 ± 2 $p < 0,01$.
Conclusions: Narcotrend index was significantly lower and anaesthesia was deeper than expected in A2 group during maintenance. Propofol consumption was significantly lower in the Narcotrend guided groups when compared to standard practice. Cardiovascular stability was better in B1 and B2 group (Schnider model) during the induction and maintenance. Narcotrend guided Schnider model for propofol is the most effective in providing stabile depth of anaesthesia and reduces propofol consumption comparing to Marsh model for laparoscopic cholecystectomy.

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Paper No: 445.00

Preliminary experiences of heart beat detector as a first mass monitoring equipment outside hospital

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Introduction: We cannot monitor heart rate outside hospital in mass casualities or in military context, which would be essential in detecting deteriorating patients needing instat treatment.
Objectives: Using single dispensable heart rate indicator to detect worsening condition of patients in field at military practice
Methods: Volunteers participating in main Military Field Operation tested SPEKTICOR. LED unit flashes green light,when heart rate is between 40–150 beats/min, and 2 red lights, when heart rate is below 40 /min or over 150 /min. Time to identify patients, whose condition demanded instant medical care, was observed in four different multiple patient situation in spot, in FAP(First Aid Post) and in ACP (Advanced Care Post) and during transportation in military field ambulance.
Results: detecting time for worsening condition was in Spektikor group only 2–6 seconds compared to 5–10 minutes in control group, even in forest surrounding.
Conclusions: Using Spektikor deteriorating condition of patients were observed markedly quicker than using conventional patient examination and follow up.This quick response time makes possible to start urgent medical care and treatment in time, and patient survival rate increases. Also control of many patients at the same time is possible, because Field Medic can actually see all patients with Spekticor at once, so all medical capacity can concentrate for patient in urgent need on therapy. There are no other single disponsable monitors available to help in triage, treatment and follow up of many patient situations. Tests confirmed, that this tecnology and Spekticor can be successfully used in field, where multiple patients must be taken care by minimal medical personnel, bringing monitoring onto field.

Paper No: 446.00

The universal anaesthesia machine - experience in 2 large UK centres

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Introduction: The Universal Anaesthesia Machine (UAM) is a recently introduced low cost anaesthetic machine designed to enable safe reliable anaesthesia in poorly resourced countries. The machine function is based on time tested principles and engineered using modern technology. It is straightforward to use and teach, using high flow oxygen from a concentrator, cylinder or piped supply in either continuous flow or drawover modes. We describe an early evaluation in adults and children in a district and university teaching hospital in the UK.
Objectives: As the first CE marked anaesthetic machine for use in developing countries, it was important to establish its ease of use and dependability in a conventional, highly monitored setting for both adults and children across a broad spectrum of clinical practice.
Methods: A variety of adult and paediatric patients (age range 1 month to 92 years; weight 4 to 134kgs) were anaesthetised using the UAM. Basic information was logged; the study was observational and non interventional. The majority of patients were anaesthetised using a combination of oxygen, air or nitrous oxide and isoflurane. Evaluation forms were subsequently analysed by an independent observer.
Results: The UAM was used in a total of 261 cases, including 52 paediatric cases (age ? 10 years), 6 of whom were infants or neonates. There were no cases of machine malfunction or untoward incidents. Cases ranged from short simple procedures to long complex cases lasting over 4 hours, with spontaneous breathing or hand ventilation, prone cases, complex patients (eg cardiac) and in infants using the Ayres T piece. The UAM was successfully used in 3 adult critical airway incidents. The bellows functioned well, with good movement and ease of use including in small children. The UAM was rated very positively, scoring above average for most criteria. Innate end expiratory pressure of approximately 5cm H2O during spontaneous ventilation is a feature, deemed beneficial by one evaluator, excessive by another. The draw-over vaporiser had some minor inconsequential inaccuracies in set versus measured inspired isoflurane.
Conclusion: The UAM is safe, reliable and versatile. Together with a comprehensive but simple educational training program, the UAM offers solutions for the delivery of safe anaesthesia in a variety of settings. Its options to function in both continuous and drawover modes, its ease of use and versatility for adult and paediatric use make it an attractive option for resource scarce settings.

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Paper No: 463.00

Assessing the newly developed grapid griph device compared with conventional methods

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Introduction: Anesthesia practitioners often encounter situations, such as intraoperative bleeding and anaphylactic shock in which they need to administer a large amount of fluid rapidly. Lately, a new transfusion line with a reservoir called grapid griph became available in Japan, however, there have never been any research done regarding the efficiency of the new device.
Objectives: The purpose of this study is to evaluate the efficiency of this newly developed line, in comparison with other conventional devices.
Methods: Fifteen residents, all of who had less than 1 year of anesthetic experience, participated in this study. All participants were asked to administer 250ml of normal saline into an empty bag by the following four different methods. Method A: participants were asked to administer fluid, using a 20 ml syringe and a conventional transfusion line Terufusion transfusion setÛ (Terumo, Tokyo, Japan). Method B: participants were asked to administer fluid, using a 20 ml syringe and a newly developed transfusion line SQ40s-RBYZ with grapid griphÛ (Pall, Tokyo, Japan). Method C: participants were asked to administer fluid by squeezing grapid griph of SQ40s-RBYZ. Method D: participants were asked to administer fluid by squeezing the fluid bag connected to terufusion transfusion setÛ. The primary outcome was the time taken to deliver 250 ml of normal saline and the seconday outcomes included time to fatigue and the fatigue score on a scale of 1 to 5.
Results: Average times taken to administer 250 ml of normal saline by Method A, B, C and D were 173s, 137s, 235s and 315s, respectively. It was significantly shorter with Method B, compared with the other three methods ($p < 0.05$). On the other hand, Method D needed more time than the other three and this is statistically significant ($p < 0.05$). Time to fatigue was the longest with Method B and the shortest with Method C at 101s and 70s, respectively. Method D showed the highest fatigue score.
Conclusions: The present study suggests the conventional way of rapid fluid administration with 20 ml syringe and SQ40s-RBYZ transfusion set was the most efficient. Although grapid griph of SQ40s-RBYZ functioned as a reservoir and facilitated drawing of fluid by syringe, fluid administration by squeezing grapid griph turned out to be less efficient. This is due to the fact that the reservoir of grapid griph takes longer to fill up and needs more@-physical strength than the other three methods. Bag squeezing, on the other hand, proved to be the least efficient, which is contrary to what many anesthesiologists have believed. In summary, fluid administration with 20ml syringe and SQ40s-RBYZ is the method of choice and bag squeezing is not recommended when administering fluid rapidly.

Paper No: 480.00

Use of PVI for Guidance of Fluid Management during Major Abdominal Surgery

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Introduction: The validity of 'dynamic' preload parameters such as stroke volume variation or pulse pressure variation to predict volume responsiveness in patients under controlled positive pressure ventilation has been previously reported. [1]. These parameters can add to the guidance of intraoperative fluid management and improve clinical decision-making. Recently, Pleth Variability Index (PVI) – obtained noninvasively from a pulse oximeter's plethysmographic waveform – was commercially introduced [2]. According to the manufacturer, PVI is derived automatically from the changes in the perfusion index over the respiratory cycle.
Objectives: We studied the ability of PVI to predict fluid responsiveness in the setting of major abdominal surgery.
Methods: Twenty consecutive patients were connected to a Radical-7 Pulse CO-Oximeter with PVI through an adhesive finger sensor (Masimo Corp., USA). Hemodynamic parameters such as stroke volume and corrected flow time were measured by an esophageal doppler device (CardioQ^{TM}, Deltex Medical, USA). In case of suspected hypovolemia (corrected flow time < 350 ms) a 250 ml colloid bolus (6% Hydroxyethyl Starch, 130/0.4) was administered. Study parameters (PVI and hemodynamic variables) were recorded before and 10 minutes after completion of fluid bolus administration. A positive fluid response was defined as an increase in stroke volume of 15% [1] to the first fluid bolus.
Results: The response to the first fluid bolus was studied in 10 female and 10 male patients with median age of 48 years (range: 41 – 67 years), and mean ($\pm$ SD) BMI of 26.2 kg/m^2 ($\pm$ 5.6 kg/m^2) . The mean ($\pm$ SD) duration of surgery was 247 min ($\pm$ 102 min). A positive fluid response was noted in 11 of 20 patients. PVI achieved an area under

the receiver operating characteristic (ROC) curve of 0.67. A cut-off point for PVI (maximising sensitivity and specificity) for the prediction of fluid responsiveness was found to be ?8.0 % (sensitivity: 100 %; specificity: 44 %; positive predictive value: 69 %; and negative predictive value: 100 %).
Conclusion: In the setting of major abdominal surgery, PVI may serve as useful tool for guiding intraoperative fluid management.

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Paper No: 544.00

Assessment of the hemodynamic and cerebral oximetry response to phenylephrine using the lidcorapid and invos cerebral oximeter in high risk surgical patients

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Introduction: Phenylephrine (P) is a commonly used vasoactive drug for treatment of hypotensive episodes during general anaesthesia (GA). Since mean blood pressure (MBP) is the product of cardiac output (CO) and systemic vascular resistance (SVR) it is essential to assess the contribution of each of these parameters to MBP increase as studies suggested the increase in MBP was associated with a decrease in CO1 and reduction in cerebral oxygenation2, which in itself may predict poor outcome 3.
Objectives: To quantify the relative contribution of CO and SVR to MBP increase using the LiDCOrapid (LR) and associated changes in cerebral oxygenation (rSO2) using the Invos cerebral oximeter, (ICO) Covidien USA).
Methods: The LR (which measures CO) and the ICO, which measures changes in rSO2 allow assessment of the contribution of SVR and CO to MBP change and the effects of P on cerebral oxygenation. 22 high risk patients undergoing major vascular surgery were studied where P was required to treat hypotension. P was given in a starting dose of 0.1 mg iv followed by an infusion. Percentage change in MBP, stroke volume (SV) and stroke volume variation (SVV), SVR and CO were calculated and change in rSO2 value, pre and post treatment of hypotension was recorded.
Results: Demography 22 pts, age 69 (46–87), wt. 80 (48–106), ASA 3 (2–4), Duration 4.4 (2.8–6.9). Haemodynamic response (mean and range) initial MBP 59mmHg (43 to 86), increase MBP % 52 (8 to 109) $p = 0.0001$, increase in SVR % 26 (0 to 79), increase in SV % 35 (3 to 86) $p = 0.0002$, correlation increase in MBP and increase in SV ($r = .62$ $p = 0.002$). Correlation between start SVV and inc. in SV ($r = .52$ $p = 0.01$). There were minimal changes in heart rate. Effect of P on rSO2 Mean starting rSO2% 59 (72 to 49), mean post P rSO2% 59 (77 to 37), mean % change -1 (8 to -18)
Discussion: P caused a significant increase in SV/CO. We did not see the reduction in CO nor the consistent reduction in rSO2 seen with P in a previous study2. The effect of P on rSO2 was variable but overall the effect was minimal. P had a greater effect on SV increase if SVV was high suggesting effects on venous and arteriolar tone.
Conclusion: P produced consistent increases in MBP and CO but may be associated with reduced rSO2 in some patients.

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Paper No: 545.00

Assessment of the hemodynamic effects of phenylephrine versus metaraminol for correction of anaesthesia induced hypotension using the lidcorapid

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Introduction: Drugs used to treat anesthesia induced hypotension include metaraminol (M) and phenylephrine (P). P increases mean blood pressure (MBP) but its effect on stroke volume (SV), cardiac output (CO) and systemic vascular resistance (SVR) is controversial1–3. The effect on SV/CO with M during general anaesthesia (GA) has not been studied.
Objectives: To assess the relative contribution of SV/CO and SVR to the increase in MBP with P and M using the LiDCOrapid (LR, LiDCO Ltd, Cambridge, UK).
Methods: We retrospectively analysed data from 22 patients (P) and 9 patients (M) where either drug was used to restore MBP. P and M were given i.v. (100 – 200ug) followed by an infusion as required. Percentage change in MBP, stroke volume variation (SVV), SVR and SV were calculated.
Results: Demography (mean and range) P group 22 pts, age 69 (46–87), wt. 80 (48–106), ASA 3 (2–4), Duration 4.4 (2.8–6.9). M group 9 pts, age 59 (32–78), wt. 90 (54–136), ASA 3 (1–4), Duration 4 (1–7.3) Haemodynamic response PM starting MBP 59 (43 to 86) 51 (41 to 57) increase MBP % 52 (8 to 109) $p = 0.0001$ 47 (20 to 92) $p = 0.0001$ increase in SVR %

26 (0 to 79) 55 (20 to 102) p = 0.02 vs P increase in SV % 35 (3 to 86) p = 0.0002 3 (-23 to 47) ns. p = 0.5 corrn inc in MBP and inc in SV r = .62 p = 0.002 ns p = 0.15 corrn between start SVV and inc. in SVr = .52 p = 0.01 r = .3 p = 0.05 All p values are versus control reading except where indicated. The effect on HR in the doses used was negligible.

Discussion: P, but not M, caused a significant increase in SV/CO. The increase in MBP with M was mainly due to SVR increase which was significantly greater than with P. We did not see the reduction in CO seen with P in previous studies 1,2. Both P and M increased MBP and SV more if SVV was high (P better than M) suggesting effects on venous and arteriolar tone. The increase in SVR seen with M suggests a more marked effect on arteriolar tone.

Conclusion: The less beneficial effect on SV/CO of M versus P suggests that M should be re-considered as a front line agent in the treatment of hypotensive episodes under anaesthesia until a formal RCT using the LR has been conducted.

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Paper No: 581.00

Clinical evaluation of closed-loop controlled propofol infusion in children

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Introduction: Although target controlled infusion (TCI) for general anesthesia in adults is widely accepted, its use in children is limited, due to the debated validity of pediatric pharmacokinetic (PK) and pharmacodynamic (PD) models and the large interpatient variability of PK/PD behaviour in children [1]. In closed-loop controlled systems, a measure of the clinical effect is used for feedback to adjust drug infusion. This is expected to improve stability of the depth of anesthesia, reduce the effect of interpatient variability and reduce drug overdosing.

Objectives: To clinically evaluate, in a pilot study, closed-loop controlled propofol anesthesia in children and to demonstrate that the closed-loop system can 1) automate induction of anesthesia while maintaining spontaneous breathing, 2) provide adequate maintenance of anesthesia for moderately painful procedures, 3) accommodate the interpatient variability in the sensitivity to the effect of propofol observed in children.

Methods: Following REB approval, and informed consent/assent, twenty children aged 6-15 (12y ± 3, 45kg ± 13, 154cm ± 16), ASA I-II, requiring anesthesia for elective upper or lower gastrointestinal endoscopic investigations were enrolled. A robust proportional-integral-derivative (PID) controller [2] was designed for the pediatric population. The WAVcns measure of the depth of hypnosis [3] was used for feedback. Propofol infusion was continuously adjusted using the Alaris TIVA infusion device. Induction and maintenance of anesthesia were closed-loop controlled, infusion was stopped for emergence. Remifentanil was administered as a bolus (0.5 mcg/kg) followed by continuous infusion (0.03 mcg/kg/min).

Results: The WAVcns index first passed below 60 on average (SD) 4min20s (± 79s) after the start of induction of anesthesia, and decreased to mean (SD) 38 (± 5). Spontaneous breathing was maintained for all subjects. During maintenance of anesthesia, the WAVcns was within 10 units of the setpoint for median (range) 89% (22–100%) of the time. The predicted plasma concentration, using the Paedfusor model [4], when the WAVcns first crossed 60 varied between 1.75 and 5.93 mcg/ml. The peak concentration during maintenance of anesthesia (WAVcns setpoint of 50) varied between 3.10 and 6.75 mcg/ml. The predicted concentrations continued to decline during the cases despite a stable setpoint.

Conclusions: Adequate depth of hypnosis can be provided by closed-loop control of propofol anesthesia in children. This study confirms the large interpatient variability previously found in PK/PD studies in children. This variability makes the development of TCI for children a challenging undertaking. The evaluated closed-loop system reduces the effect of interpatient variability. In future work, the controller performance will be optimized.

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Paper No: 616.00

Cerebral oxygen saturation monitoring during laparoscopic surgery under sevoflurane anesthesia: jugular bulb oxygen saturation versus near-infrared spectroscopy

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Introduction: The introduction of Trendelenburg position and pneumoperitoneum during laparoscopic surgery has the potential to cause significant cerebral hemodynamic changes. Jugular bulb oxygen saturation (SjvO2) is a useful indicator of cerebral blood flow, since it reflects the relationship between global cerebral oxygen supply and demand. However, jugular bulb catheterization is an invasive procedure and has inherent potential complications. Near-infrared spectroscopy is a monitoring device for non-invasive assessment of regional cerebral oxygen saturation (rSO2). To our knowledge, the relationship between SjvO2 and rSO2 in the Trendelenburg-pneumoperitoneum condition has not been investigated.
Objectives: In this study, we hypothesized that rSO2 could reflect SjvO2 in the Trendelenburg position under pneumoperitoneum. Therefore, we evaluated the relationship between SjvO2 and rSO2 during laparoscopic surgery.
Methods: Thirty-five consecutive male patients undergoing laparoscopic radical prostatectomy were enrolled prospectively. Anesthesia was maintained with sevoflurane 1.5–2.0 vol.% and remifentanil 0.1–0.2 §¶/kg/min. The depth of anesthesia was monitored continuously with a bispectral index score monitor. After induction of anesthesia, mechanical ventilation was adjusted to increase PaCO2 from 35 to 45 mmHg in the supine position, and the changes in SjvO2 and rSO2 were measured. Then, after establishment of pneumoperitoneum and Trendelenburg position, the CO2 step and measurements were repeated. The changes in SjvO2 (rSO2) -CO2 reactivity were compared in the supine position and Trendelenburg-pneumoperitoneum condition, respectively.
Results: We detected a little correlation between SjvO2 and rSO2 in the supine position (concordance correlation coefficient = 0.2819). Bland-Altman plots showed a mean bias of 8.4% with a limit of agreement of 21.6% and -4.7%. Also, SjvO2 and rSO2 were not correlated during Trendelenburg-pneumoperitoneum condition (concordance correlation coefficient = 0.3657). Bland-Altman plots showed a mean bias of 10.6% with a limit of agreement of 23.6% and -2.4%. The SjvO2-CO2 reactivity was higher than rSO2-CO2 reactivity in the supine position and Trendelenburg-pneumoperitoneum condition, respectively (0.9 ¡¾ 1.1 vs. 0.4 ¡¾ 1.2%/mmHg, P = 0.04; 16.5 ¡¾ 12.7 vs. 5.2 ¡¾ 10.5%/mmHg, P < 0.001, respectively).
Conclusions: There is a little correlation between SjvO2 and rSO2 in the supine position and Trendelenburg-pneumoperitoneum condition during sevoflurane anesthesia. We conclude that rSO2 could not replace SjvO2 during laparoscopic surgery under sevoflurane anesthesia.

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Paper No: 617.00

The universal anesthesia machine towards achieving MDG5 in Nepal

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Introduction: About half of the people in the world do not have access to anesthesia services. This ultimately results in disability or death of individual due to the lack of emergency surgical facilities with an affordable, functioning anesthesia machine. The root causes the high technology and cost of currently available anesthesia machines. Nepal is doing well within its territory on MDG 5 towards its goal. Nepal is rapidly producing doctors capable of providing obstetric care including c-section as well as anesthesia assistants (non-physician anesthetists) to provide anesthesia under supervision. Nepal is also attempting to imp access to surgical services by evaluating an anesthesia machine the Universal Anesthesia Machine (UAM) which is affordable, simple to use, and requiring little maintenance.
Objectives:

- To assess the functions of the UAM in terms of reliable oxygen supply, anesthetic agent flow, breathing system and scavenging system.
- To assess the user friendliness

Methods: Four UAM machines provided free by the NICK SIMONS Foundation, New York were distributed to four hospitals (two central and two peripheral hospitals). Three to five days orientation to all anesthetists and anesthesia assistants of each of individual sites were given with didactic and live demonstration. All the users were also oriented with an evaluation system by filling the prepared form. A team of anesthetist, biomedical technician and administrator carried out follow-up visits to each site every two months. Continuous communication was maintained between follow-up visits through email and phone calls to help for any problem and their management. Adequate forms to record

various parameters of patient and the machine were also made available. Records were collected periodically.
Results: Six hundred and forty-one patient records were collected within a period of 6 months and one week. Patients ranged from neonate to geriatric. Emergency surgery 31% and elective 69%. Among the cases 35% were from general surgery, 17% were obstetric and rest from other departments. The original bellow was used in majority of the cases though Ayre's T-piece and Bain's circuit were also used.
Conclusion: This initial impression to the UAM is very positive in Nepal's context. It is reliable in terms of oxygen supply system, vaporizer and use of a variety of breathing systems. It is possible to orient the UAM within a week period time. It is cheaper and can be easily used in Nepal's vague geographic locations.

Keywords: anesthesia; UAM; Bellow MDG

Paper No: 645.00

Continuous blood glucose monitoring revealed that blood glucose levels change markedly in a short time during surgery for pheochromocytoma

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Introduction: Inadequate anesthetic management of pheochromocytoma is known to be life-threatening, causing hypertensive crisis, wide fluctuations in blood pressure, and serious arrhythmia. In addition to these hemodynamic changes, it is important to manage blood glucose levels. The presence of hyperglycemia preoperatively reflects the metabolic effects of catecholamines, but resolves with tumor resection, potentially leading to hypoglycemia. However, few reports have described in detail the changes in blood glucose levels during surgery for pheochromocytoma.
Objectives: We previously reported that a continuous blood glucose monitoring system (STG-22; Nikkiso, Tokyo, Japan) is useful for detecting sudden changes in blood glucose levels during hepatectomy and large vessel surgery [1,2]. The purpose of the present study was to measure blood glucose levels continuously during pheochromocytoma surgery using the STG-22 system, and to reveal how the surgical procedure affects blood glucose levels.
Methods: We enrolled consecutive patients who underwent urologic surgery for pheochromocytoma in our hospital between October 2007 and July 2011. After general anesthetic induction, a 20-G intravenous catheter was inserted into a peripheral vein and connected to an STG-22 continuous blood glucose monitor. Continuous blood sampling was performed through the tube by drawing blood at a rate of 2 ml/h. Collected blood samples were passed through a glucose sensor, which displayed the glucose levels in real time by measuring them using the glucose oxidase method.
Results: (essential): Four patients participated in this study: 3 with an adrenaline-predominant pheochromocytoma and 1 with a dopamine-predominant pheochromocytoma. All patients received glucose at a dose of 0.08–0.1 g/kg/h using acetate-Ringer's solution containing 1% glucose. In the 3 adrenaline-predominant patients, blood glucose concentration was 108 ± 11 mg/dl at the start of the operation. During surgical manipulation around the tumor, there were marked increases in blood glucose to 200 ± 34 mg/dl, which represented a $185\% \pm 14\%$ increase compared with the baseline. However, blood glucose decreased to 101 ± 17 mg/dl within 1 h after tumor resection. In the dopamine-dominant patient, blood glucose increased from 86 mg/dl to 125 mg/dl, representing a 145% increase compared with the baseline.
Conclusions: Continuous blood glucose monitoring revealed that the blood glucose level was markedly changed in a short time as a result of surgical manipulation around the pheochromocytoma. This knowledge might contribute to optimal blood glucose management during surgery for pheochromocytoma.

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Paper No: 710.00

Measurements of oxygen saturation of brain, liver and heart areas in the supine and sitting position by the INVOS 4100 near-infrared spectrophotometer

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Introduction: Cerebral oximetry by near-infrared spectroscopy (NIRS) measures regional intracerebral oxygen saturation (rSO2) continuously and non-invasively [1]. The method has been validated and used extensively during carotid endarterectomy [2]. It has also been used in stroke and cardiac arrest [3] and it has been found useful in coronary artery bypass surgery [4].
Objective: The present study investigates the rSO2 values of the brain, heart and liver tissue as assessed by NIRS in the supine and the sitting position.
Methods: After obtaining approval from the IRB and written informed consent from forty-nine healthy volunteers, rSO2 values were recorded in the heart and liver areas in the

supine and the sitting position, recording simultaneously the rSO2 values of the brain.

Results: The rSO2 brain values in the supine and the sitting position were 69 ± 6.0 and 66 ± 5.7 respectively ($p = 0.0001$). The rSO2 values in the supine and the sitting position were 76 ± 10.5 and 79 ± 6.7 for the heart ($p = 0.212$) and 85 ± 6.8 and 82 ± 7.2 for the liver ($p = 0.007$) respectively. Heart rSO2 values were higher than the brain rSO2 values in both the supine (76 ± 10.4 and 69 ± 6.6, respectively, $p = 0.0001$) and the sitting position (79 ± 6.7 and 66 ± 6.1 respectively, $p = 0.0001$). The liver rSO2 values were also higher than the brain rSO2 values in the supine (85 ± 6.8 versus 69 ± 6.0, $p = 0.0001$) and in the sitting position (82 ± 7.2 versus 66 ± 5.7, $p = 0.0001$). Arterial blood pressure and SpO2 did not differ between the two positions but the heart rate was higher in the sitting position ($p = 0.030$).

Conclusions: We conclude that in the supine position rSO2 values are higher in liver and brain. Also NIRS may be useful to assess heart and liver oxygenation.

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Paper No: 716.00

A comparison of continuous hemodynamic monitoring by lidcorapid via simultaneous intra-arterial vs non-invasive bp waveforms using nexfin

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Introduction: Continuous non-invasive blood pressure (NIBP) monitoring that generates a reliable blood pressure waveform has been recently introduced. The NexFin (NF, BMEye, Amsterdam, NL) provides a continuous NIBP waveform that can be integrated into the LiDCOrapid (LiDCO Ltd, London, UK) to estimate hemodynamic parameters.

Objectives: This study aims to determine if the NIBP waveform, when compared with an intra-arterial waveform, is reliable for analysis by the LiDCOrapid's PulseCO algorithm and provide clinically useful measures of advanced hemodynamic parameters.

Methods: Vascular surgery patients having routine invasive arterial BP (IABP) monitoring were recruited. Each BP waveform was inputted to a separate LiDCOrapid monitor synchronised at the start. Continuous Stroke Volume (SV), Mean Arterial Pressure (MAP), Stroke Volume Variation (SVV) and Pulse Pressure Variation (PPV) were measured until extubation, for IABP (I) and NIBP (N) waveforms. Measurements were taken every 15 min from the sync event and averaged over 60 sec. Comparisons were made for changes in MAP and SV pairs across the surgical interval. SVV and PPV pairs were compared to determine if they gave consistent indication of fluid responsiveness (eg SVV $< 10\%$; PPV $< 13\%$). Individual fluid challenges were collated from each patient to determine concordance of fluid response.

Results: 8 vascular surgery patients (7male) age 71+/-5yrs, weight 86+/-13Kg, ASA3(3–4) were recruited. A total of 97 measures were obtained. Bland-Altman Analysis of MAPN to MAPI yielded 8+/-22mmHg difference. In 46 instances SVI changed by $>5\%$ and SVN agreed 43 times (93%). MAPI changed by $>5\%$ 51 times and MAPN agreed 50 times (98%). SVVN and PPVN gave the same indication of fluid responsiveness in 92% and 88% of comparisons to SVVI and PPVI, respectively. 25 fluid challenges were given, 68% were fluid responsive. Concordance was seen in 24 instances (96%).

Discussion: MAPN has a large bias and limits of agreement compared with MAPI in this population. However, MAPN and SVN both trended consistently with MAPI and SVI. SVVN and PPVN were consistent with SVVI and PPVI values, with SVV slightly more consistent than PPV. Most importantly, the SVN usually gave the same indication of fluid response.

Conclusion: The NF NIBP MAP value is not comparable to MAP from an invasive arterial catheter . The LiDCOrapid/PulseCO algorithm is able to reliably provide clinically useful hemodynamic monitoring based on this waveform.

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Paper No: 737.00

Hemodynamic Changes During Pneumoperitoneum and Steep Trendelenburg Position in Patients Undergoing Robot Assisted Laparoscopic Radical Prostatectomy: A Study Using Semi-Invasive Pulse Contour Analysis Device (Flotrac/VigileoTM)

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Introduction: Technical advances have led an evolution in radical prostatectomy from open to minimally invasive methods. Robotic assisted laparoscopy prostatectomy (RALRP) requires a steep Trendelenburg position (40–450) and high pressure (16–18 mmHg) CO2 pneumoperitoneum. This lead to significant hemodynamic and respiratory consequences. Since the published data is very limited related to this subject.
Objectives: To find out the effect of steep trendelenburg position with high pressure CO2 pneumoperitoneum on hemodynamic parameters in a patient undergoing RALRP using FloTrac/Vigileo^{TM}1.10
Methods: Fifteen ASA I-ll patients scheduled for RALRP were included in the study. Patient's radial artery and internal jugular vein were cannulated. Cardiac output(CO), cardiac index(CI), stroke volume(SV) and stroke volume variation (SVV)were recorded from Flotrac. Pre-sep CVP was connected to Vigileo monitor to measure CVP. Readings were taken at following intervals: Pre-induction (Baseline value), after 5 minutes of induction of anesthesia, after 5 minutes of creating CO2 pneumoperitoneum, after 5 minutes of 450 Trendelenburg position with CO2 pneumoperitoneum, after 20 minutes of 450 Trendelenburg position with CO2 pneumoperitoneum, then hourly till the end of surgery.
Results: After induction HR SV, CO and CI were decreased (p value < 0.05). SV, CO and CI further decreased after creating pneumoperitoneum (p value < 0.05). At 450 Trendelenburg position HR, SV, CO and CI were decreased compared to baseline. CO and CI were persistently low throughout 450 Trendelenburg position (p value: 0.001). CVP increased after pneumoperitoneum and at 450 Trendelenburg position (after 5 minutes and 20 minutes) compared to baseline (p value < 0.05). There were no significant changes in SVV throughout the study period.
Discussion: Hemodynamic changes occur during RALP might be harmful for elderly patients. We found significant decrease in HR, MAP, SV, CO and CI, and increased CVP. However, no change in SVV. In view of this we are of the opinion that SVV may be of useful in guiding the intravascular volume status in RALRP surgery where CVP may not be reliable. Previous studies with Flotrac (version) 1.10 have shown SVV to be a reliable data in determining fluid responsiveness,
Conclusion: Steep trendelenburg position and CO2 pneumoperitoneum, during RALRP, leads to significant decrease in SV and CO. So we suggest continuous CO monitoring is useful in selected group of patients with significant cardio respiratory co-morbidities undergoing RALRP. SVV may be a better and reliable predictor for assessment of fluid status in RALRP.

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Paper No: 786.00

To study the success rate of radial artery catheterization at various degrees of wrist angulations –A randomized, prospective study

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Introduction: Optimal wrist position is essential for successful catheterization of radial artery Ultrasonographic evidence of wrist position on radial artery diameter has demonstrated that antero posterior diameter of radial artery is decreased when wrist is extended to an angle of 600 in healthy subjects and 750 in patients having atherosclerosis (CABG) patients.
Objectives: To study the success rate of radial artery catheterization at various degrees of wrist extension angulations.
Methods: This prospective, randomized study was conducted in 60 consenting patients of age group 18–65 years undergoing various surgeries requiring arterial catheterization. All patients were randomized into three groups: Group 300 ($n = 20$)-radial artery was cannulated at 300 of wrist extension, Group 450 ($n = 20$) radial artery was cannulated at 450 of wrist extension and Group 600 ($n = 20$) - radial artery was cannulated at 600 .Three metallic angulated wrist boards with angles of 300, 450, 600 (angle measured with calipers) were prepared, on which patient's wrist was kept at the above mentioned angles of extension . During the radial artery catheterization success rate, catheterization time, numbers of attempts were recorded by the person not involved in the study.
Results: 60 patients were enrolled and no patients were excluded from the study. The base line demographic parameters were comparable ($p > 0.05$).The catheterization time was 36.00 ± 14.19 sec, 30.50 ± 16.82 sec and 43.50 ± 13.80 sec, in group 300, 450 and 600 respectively ($p = 0.046$). Radial artery was cannulated in first attempt in 60% of patients in group 450 and group 600, 50% in group 300 (p value 0.559). The arterial catheterization was

maximum successful in group 450 and least in group 300 though the difference was statistically insignificant (p 0.121).

Discussion: Extension of the wrist joint reduces the mobility of the vessels, aiding its cannulation but over extension reduces the anterior posterior diameter of the radial artery rendering the cannulation difficult. So the wrist joint must be kept at an optimum degree of extension to make radial artery cannulation easier. Mizukoshi et al, observed that the radial artery height (anteroposterior diameter) decreases when the wrist joint is extended to an angle of 600 in healthy subjects.

Conclusion: We conclude that the wrist extension at 450 angulation appears to be optimal wrist joint extension for successful radial artery cannulation.

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Paper No: 794.00

Effect of an intubation dose of atracurium on spectral entropy responses to laryngoscopy

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Introduction. Entropy is an anaesthetic EEG monitoring method, calculating two numerical parameters: State Entropy (SE, range 0–91) and Response Entropy (RE, range 0–100). Low Entropy numbers indicate unconsciousness. SE uses the frequency range 0.8–32 Hz, representing predominantly the EEG activity. RE is calculated at 0.8–47 Hz, consisting of both EEG and facial EMG. RE–SE difference (RE-SE) can indicate EMG, reflecting nociception.

Objectives: To evaluate the effect of atracurium on entropy responses(RE- and SE-entropy) to laryngoscopy.

Methods: A total of 25 patients, undergoing urologic surgery were anaesthetized with propofol 2.5–3mg/kg until loss of consciousness . At steady state, they randomly received 0.6 mg/ kg atracurium(A) or saline (S). After 3 min, a 20 s laryngoscopy was applied. RE- and SE-entropy were recorded continuously and averaged over 1 min during baseline, at steady state, 2 min after A or S administration (A/S+2) and 0, 1, 2 and 3 min after laryngoscopy (L0, L1, L2, L3).

Results: At A/S+2, the RE–SE gradient was higher in Group S than in Group A. Laryngoscopy provoked an increase in RE- and SE-entropy. Comparing A/S+2 and L0 values in Groups A and S, SE increased from 43 (7) to 50 (8) and 41 (10)to 55 (12), and RE increased from 46 (8) to 54 (9) and 47 (12) to 66 (15), respectively. SE did not differ between groups. At L0, RE and RE–SE were higher in Group S [66 (15) and 11 (4), respectively] than in Group A [54 (9) and 4 (2), respectively].

Conclusions: Atracurium alters the RE–SE gradient and the RE and RE–SE responses to laryngoscopy. Muscle relaxation may confound interpretation of entropy monitoring.

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Paper No: 805.00

Evaluation and comparison of BIS, espectral entropy and quantified EEG in measuring anesthetic depth

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Introduction: The monitoring of anesthetic depth is difficult but of vital importance in order to avoid inadvertent intraoperative awareness during general anesthesia. Several parameters derived from electroencephalogram (EEG) have been developed to measure the depth of hypnotic state.

Methods: 40 patients undergoing ambulatory gynaecologic surgery were included in the study. BIS, SE, RE, spectral edge frequency (SEF), relative power in delta, beta, theta and alpha and beta/ delta ratio were recorded for posterior analysis during general anesthesia maintained with 1–2% sevoflurane. Correlations among variables were studied using logistic and linear regression models. The ability to properly discriminate awake from anesthetized states were analyzed with ROC curves. We also determined the cutoff points for SEF,SE, RE, delta ratio and beta/ delta ratio with higher sensitivity and specificity to distinguish awake versus unconsciousness according to BIS values categorized as BIS $<$ 60 (anesthetized) and BIS $>$60 (awake).

Results: Relative power in delta, beta / delta ratio and RE showed relationship with BIS values in the linear and logistic regression models. Moreover, BIS, SE and RE presented a strong concordance during different stages of anesthesia

(ICC>0.7). RE and SE were able to correctly discriminate awake from anesthetized patient, and were significantly superior to quantitative EEG derived parameters ($p < 0.05$). ROC curves were SE(0.974) and RE (0.979). Using as reference BIS = 60, the sensitivity and specificity for RE (87.5/98) and SE (84.6/97) parameters were high, with cutoff values of 60 for RE and 56.5 for SE. In contrast, the sensitivity and specificity of quantified EEG parameters were much lower: Delta (50.96/80), SEF (39.42/45.27), Beta/delta ratio(22/75.31).The optimal cutoff values to discriminate conscious versus unconscious state were: Delta 85.5, SEF 11.5, Beta/Delta ratio 0.052.

Conclusions: BIS, SE and RE have similar ability to discriminate the states of hypnosis and also present a similar behaviour during the different anesthetic stages. Quantified EEG derived parameters are not good predictors of depth of anesthesia. We demonstrate a relationship among quantified EEG derived parameters, RE and BIS.

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Paper No: 807.00

Comparative evaluation of hemodynamic variables and time-frequency balanced spectral entropy during different states of sevoflurane anesthesia

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Introduction. Hemodynamic variables have been traditionally used to assess if the patients were correctly anesthetized, as they reflect the autonomic nervous system function. However, heart rate and blood pressure changes are frequently attenuated or distorted by the administration of adjuvant drugs, which can lead to inadvertent intraoperative awareness periods. The electroencephalogram (EEG) would provide a more accurate measure of anesthetic depth. During the last 2 decades, processed electroencephalogram derived parameters have been developed in order to improve depth of anesthesia monitoring, and therefore, to diminish intraoperative awareness and potential morbidity due to overdose of anesthetic drugs. One of the latest published parameters is the time-frequency balanced spectral entropy. This entropy generates two indices, the state entropy (SE) which analyzes frequency range from 0.8 to 32 Hz (EEG frequencies) and the response entropy(RE), that includes facial electromyography information.

Objectives: This study was performed to compare the effectiveness of hemodynamic variables and time-frequency balanced entropy to adequately assess anesthetic depth. Moreover, we evaluated the influence of nociceptive stimulus such as laringoscopy on the accuracy of those parameters.

Material and Methods: 21 patients scheduled for minor abdominal surgery were enrolled in the study. Heart rate (HR), mean arterial pressure (MAP), SE and RE were recorded during different stages of sevoflurane induced anesthesia: awake, before laringoscopy, 10 minutes after surgical incision (surgical anesthesia) and at emergence. The ability of each variable to distinguish between the different anesthetic stages was analyzed using the area under receiver operating curve (ROC curves).

Results: During induction stage, SE and RE were considerably superior to HR and MAP to discriminate anesthesia depth (ROC curves 0.99, 0.99; 0.51 and 0.75; respectively). At laringoscopy and 10 minutes after surgical incision, SE and RE maintained the accuracy for monitoring anesthetic depth (ROC 0.95; 0.99), whereas hemodynamic variables were not better than chance to distinguish awake from anesthetized patients (ROC < 0.5). During emergence, SE and RE were worse to measure the depth of anesthesia (ROC 0.86) compared to previously studied stages. However, entropy was still superior to HR and MAP (ROC 0.603 and 0.635 respectively).

Conclusion: SE and RE are more reliable indicators of depth of anesthesia than hemodynamic variables in all studied anesthetic stages. -Noxius stimulus produces an increase of SE and RE values without altering their capacity to distinguish between awake and anesthesia state. -During noxious stimuli, HR and MAP fail in measuring the depth of anesthesia.

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Paper No: 889.00

Use of supraglottic airway devices by the non-anaesthetists

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Introduction: Supraglottic airway devices (SADs) are an alternative to bag-valve-mask ventilation (BVMV) in the control of the airway of a patient and their safe use by paramedics in the pre-hospital setting during cardio-pulmonary resuscitation has already been documented1. In a more recent study, the ease and speed of use of the I Gel, LMA Unique and laryngeal tube airway (LTA) as SADs was demonstrated2 but the LMA Supreme was not tested.
Objectives: Our aim was to determine which SAD out of the three tested is the most efficient and preferred in the hands of non-anaesthetists.
Methods: 120 non-anaesthetic volunteers were recruited and tasked with the insertion of a SAD into a manikin with a deflated balloon attached to the trachea. An AMBU bag was used for ventilation. Our primary end-points were the time to first inflation of the balloon and the number of breaths required to full inflation of the balloon. All volunteers tested the I Gel, LMA Supreme and LMA Unique. Feedback was then obtained from the volunteers.
Results:

- 81.7% (98) of candidates found the I Gel or LMA Supreme easiest to insert while 18.3% (49) preferred the LMA Unique for ease of insertion.
- 33.3% (40) of candidates found the LMA Supreme easiest to ventilate with compared to 30% (36) for the I Gel and 12.5% (21) for the LMA Unique. 13.3% (16) found no difference between the three SADs.

Average time until first breath (s) Number of breaths to fill bag Ease of insertion (%) Ease of ventilation (%) I Gel 16.3 5.3 40.8 30.8 LMA Supreme 14.6 5.1 40.8 33.3 LMA Unique 18.9 5.5 18.3 12.5
Conclusions: Both the I Gel and the LMA Supreme were equivalent in terms of ease of use but markedly superior in this respect compared to the LMA Unique. Candidates perceived the LMA Supreme to be slightly easier to ventilate with when compared to the I Gel. The LMA Unique was the least preferred SAD to ventilate with.
Results: of the average time taken to first inflation of the balloon are consistent with this. All three SADs were similar with regard to the number of breaths required to fully inflate the balloon. Our results indicate that the LMA Supreme may be the most efficient and preferred SAD for the non-anaesthetist. Interestingly, most of the candidates had not used the LMA Supreme before and were more familiar with the I Gel.

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Paper No: 910.00

SensaScope® Semirigid Intuboscope: a new and safe device in a super morbidly obese with previously failed fibreoptic intubation attempts

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Introduction: SensaScope® is a recent advance in difficult airway and we describe a case of successful difficult tracheal intubation in a morbidly obese patient. Case: A 47 year obese male (BMI 54.6,147 kg) was scheduled for a laparoscopic gastric bypass procedure. He had two failed fibreoptic intubation at a district general hospital. Patient was known to have hypertension and obstructive sleep apnoea (OSA) needing CPAP. He smoked 20 cigarettes every day. His exercise tolerance was limited to 200 yards. His airway assessment was as follows: good mouth opening (4cm) with a receding mandible, Mallampatti grade 3, very limited neck extension with a large fat pad behind with neck circumference of 61cm. The local anesthesia and sedation for intubation was explained and consented. In theatre, patient was attached to standard monitors and a peripheral venous access was secured with a 16G Cannula. Oxygen was administered through a nasal cannula (3L/min) and sedation was initiated with a bolus intravenous injection of midazolam (2mg) and an infusion of Remifentanil (20 mcg/ml) at a rate of 20ml/hour. Airway anaesthesia was accomplished with Lignocaine (4%) spray into nostrils and mouth. Sensascope® was railroaded with a size 8 reinforced endotracheal tube. Sensascope® was passed into the mouth and further sprays of Lignocaine (4%) were done deep into the oropharynx with an atomiser (MAD device). A Cormack Lehane (CL) grade 1 view of the glottis was obtained. The pharyngeal mucosa was hypertrophied with very limited air space. A large and thick epiglottis was falling on the view with a reduced glottic opening. Successful tracheal intubation was confirmed with EtCO2 trace on the monitor. The general anaesthesia was induced with Propofol (2mg/kg BW) and

Rocuronium (0.5mg/kg BW).The patient was extubated awake in the end.
Discussion: SensaScope® was successfully evaluated and used in cases of anticipated difficult airway to perform intubation awake. This device has shown to improve view and the CL grade1. Our experience confirms the above finding from a previous study. Incidence of failed fibreoptic intubation is about 1.2% (Ovassapian-1983). Traumatic airway with secretions and blood can affect the view. Another important consideration is the lack of airspace with in the oral and nasopharynx. In this case, the patient is a known super obese individual with OSA and mucosal hypertrophy. As Sensascope is rigid equipment with a flexible tip, this could potentially help to create an air space as it is advanced deeper into the nasopharynx.

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Paper No: 948.00

A portable anaesthetic machine for all situations

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Introduction: The ability to provide safe and reliable anaesthesia in the developing world is fraught with difficulties, draw over anaesthesia remains popular in these difficult situations – it is inexpensive, simple, safe and can work without oxygen and electricity.
Objectives: The requirement for drawover anaesthesia in areas of limited resource led to the production of the DPA01 Diamedica Portable Anaesthetic Machine. This system has already been used with great success1. As with other drawover systems agents were limited to halothane and isoflurane. Previously sevoflurane for gaseous induction in a drawover system was not practical, due to the inability of drawover vaporisers to deliver a suitably high output concentration of sevoflurane. The advantages of using sevoflurane in drawover include, a smoother and quicker gas induction than with isoflurane and halothane respectively, less cardiovascular effects than with halothane, quicker wake up and less irritation to airways especially in patients with a history of reactive airways disease.
Methods: The new DPA03 has been designed to allow maintenance of anaesthesia through the drawover method using isoflurane or halothane but it also enables gaseous induction with sevoflurane. The sevoflurane vaporiser has been developed to have a low resistance to ensure minimal work of breathing and provide an output of up to 8%. Due to the low resistance supplementary oxygen, where available, can be supplied by an oxygen concentrator or cylinder, although the system is designed to work on entrainment of air only. The component parts of the DPA03 are a reservoir bag (to allow visual confirmation of respiratory effort and allow an increase in inspiratory oxygen concentration when external oxygen is used), two vaporisers in series, a self inflating bag (for assisting ventilation), a non re-breathing valve2 and light weight double lumen tubing.
Results: The new vaporiser for sevoflurane is placed in series with an isoflurane/halothane vapouriser. Once induced the maintenance agent can be switched to isoflurane or halothane allowing significant cost saving. The system provides safe, reliable and self controlled anaesthesia for use in remote areas and emergency or disaster situations.
Discussion: The use of drawover anaesthesia should be used more widely and modern and safe equipment to provide anaesthesia in this way should be available at reasonable cost.
Conclusion: We have demonstrated that drawover anaesthesia can provide safe anaesthesia in resource poor environments and that by use of the DPA03 sevoflurane, isoflurane and halothane usage is available to the anaesthetic practioner.

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Paper No: 954.00

It's possible to develop a tool for real time skills evaluation in life surgery? initial security study

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Background: Probably the ideal of simulation is evaluation of competence in real life. However, few papers have been dedicated to assess the competence in real time and life surgery.
Aim: Develop and test the security and interest of a new evaluation concept of clinical skills based in augmented reality by multiparametric source integration in order to offer real?time assessment for anesthesiology in life surgery.
Method: We use own systems developed by SSPA and US for augmentation of reality. This patented system (SAGIQ) allow us recording, visualization and distribution of virtually all images and source data from OR. For initial testing we decide add elements that could evaluate better the skills needed to survey very complex surgeries: Inputs: Real time cameras over surgery room oriented to operating table, anesthesia machine and overall OR. In addition: Video image from surgical fiel d (microscope, endoscope or helmet

microscope), Neurophysiologic control, and machine anesthesia monitors was introduced in the system. Outputs: 1. Main surgical field, as decided by the surgeon, 2 Main monitor from anesthesia machine. 3 Combined imaged with all sources selected 4 Audio bi?directional lines. For initial evaluation two complex neurosurgery operations were selected: After induction anesthesia and indwelling catheters were in place, the surgery was conducted all time by a last year resident. No inside OR staff control was offered, but the outputs were redirected to a specially designed area for external control.

Results: The surgical procedures were uneventful. No complications or interferences with surgical devices were detected during the 14 h surgery time. The staff could assess in real time the decision-making process of the trainee and suggest changes or ask about decisions taken. No interferences with the surgeries were recorded by independent questioning to surgical team and nurses.

Conclusion: This preliminary report permits us to consider the possibility to understand the real life surgeries as simulations situations if technical conditions are provided.

Paper No: 1020.0

Comparison of the LMA SupremeTM and the LMA ProSealTM concerning insertion success rate, insertion time and the success rate of gastric tube insertion into a manikin

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Introduction: The LMA Supreme(SLMA), introduced into Japan in 2010, is a single-use supraglottic airway device with gastric access developed as an alternative to the reusable LMA ProSeal (PLMA).

Objectives: We examined the usefulness of SLMA compared with PLMA which also has gastric access, using a manikin model. Items of evaluation were (1) success rate of the LMA insertion, (2) insertion time for the LMA, and (3) success rate of gastric tube insertion.

Methods: This research was performed by forty-two medical doctors consisting of 3 groups (15 residents, 13 registered anesthetists and 14 anesthetic specialists). We used LMA size #4 (both of the SLMA and PLMA). Only one experienced anesthetic specialist inflated cuff and evaluated the LMA insertion. Criteria of evaluation included: (1) success or failure of the LMA insertion was judged by effective bag ventilation(full thoracic expansion), (2) time for the insertion was measured as interval time from the LMA holding to the first effective ventilation. (3) success or failure of gastric tube (14 Fr.) insertion was judged by visual observation of the manikin's esophagus. Statistical analyses were performed using either two-sampled Student t test or Fisher exact test.

Results:

(1) There was no significant difference statistically in the success rate of SLMA insertion into the manikin between that of PLMA in the 3 groups (overall first attempt; 98% vs 88%).
(2) Insertion times for SLMA by residents and registered anesthetists were almost within the same range (15 sec) compared to anesthetic specialists, and were also shorter than those for PLMA.
(3) There was no significant difference statistically in the success rate of gastric tube insertion via SLMA and PLMA (overall first attempt; 100% vs 90%).

Discussion: The SLMA has no risk of cross infection because of it's single use disposable device, and SLMA is anatomically shaped airway tube enclosing a drain tube to insert a gastric tube

Conclusion: The SLMA might be more useful for the less experienced doctors than the PLMA.

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Paper No: 1022.0

Comparisons of three different warming devices on body temperature changes during open gastrectomy

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Introduction: All patients undergoing surgery are at risk of developing hypothermia, and prevention of hypothermia not only reduces the incidence of complications, but patients also experience a greater level of comfort. Several methods or devices to prevent hypothermia during surgery are applicable in a clinical setting these days.

Objectives: We performed this study to determine which devices are the most effective in preventing hypothermia among three devices.

Methods: Under the controlled operating room temperature, ninety patients who received open gastrectomy were randomly applied three different warming devices during anesthesia (fluid warming, forced surface air warming and heated breathing circuit devices, 30 patients each). We measured body temperature(axillary and rectal) and serum bicarbonate serially (30 minutes interval) till the patients were discharged from recovery room.

Results: All groups showed significant body temperature changes during anesthesia, even no difference in parenteral fluids and patients demographics. There was no statistical difference among groups in serum bicarbonate and rectal temperature changes but the dropping of axillary temperature was more prominent in heated breathing circuit device group(Group HBC) in 180 min. and end of operation. Axillary temperature recovery also significantly delayed in Group HBC.
Conclusions: Body temperatures are decreased continuously during open laparotomy even single warming device is applied. Heated breathing circuit device is inferior to other two modalities in this study. We better applied multiple warming devices to keep patient in normothermia during open laparotomy.

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Paper No: 1030.0

Clinical performance of electrical control for aisys^{TM} carestation, to automatically adjust fresh gas, end-tidal agent and oxygen

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Introduction: Traditionally, anesthesiologists administer oxygen and anesthesia agent (AA) by manually adjusting vaporizer (VAP) and FGF settings, observing airway gas concentrations, and according to clinical judgment. However, it is technically possible to design a feed-back system for the anesthesia workstation (AWS) to automate manual adjustment.
Objectives: After extensive lab testing, end-tidal control (EtC) prototype designed for Aisys^{TM} (GE Healthcare), was ready for evaluation on human subjects. Our aim was to access clinical performance vs. expectations of anesthesiologist, plus to compare behavior of the control system vs. technical specs by analyzing real time response data.
Methods: After approvals of ethical committee and authorities, written informed consent was obtained from 20 ASA 1-3 patients undergoing gynecological procedures according to hospital standards. Anesthesiologist responsible of patient care stayed in the O.R., continuously observing the control system. In addition, there was a technical observer to record time marked notes and comments. At induction, anesthesiologist deciding about target concentrations for EtAA and EtO2 dialed them to the controller, thus enabling software algorithm to start adjusting FGF and VAP settings automatically. Non-invasive monitoring (AS/3, independent of the controller), collected ECG, SpO2, NIBP, Entropy, NMT, spirometry, and airway gas concentrations of O2, N2O, CO2 and AA. Clinical data were automatically stored. Control system's high resolution data flow was also stored in real time. Clinical quality indications (e.g. hemodynamic variability) had been defined a priori. After each competed case, anesthesiologist estimated whether variability in monitored variables was due to technical or clinical reasons.
Results: Enrolled 20 patients met all inclusions criteria; none had to exit during study. Five anesthesiologist administered sevoflurane general anesthesia with the system: three were senior staff and two were anesthesia residents. There were no adverse effects. HR and BP remained stable ($\pm$25% from control) in 16/20 patients, in 4/16 patients the reason was clinical. In 18/20 cases SpO2 was above 90% all the time, in 2/20 the reason for deviation was clinical. None of the clinicians stopped using controller during the cases. Neither did AWS exit from the EtC unexpectedly. Technical assessment of control performance parameters included response and setting times, command overshoot and steady state deviations of both EtO2 and EtAA.
Conclusions: This open observational study was the first systematic comparison on human subjects, with the prototype end-tidal control designed for the Aisys^{TM} Carestation by GE. Both clinical findings and technical data were according to preset specifications.

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Paper No: 1074.0

Bispectral index monitoring in open heart surgery

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Introduction / Background: In cardiovascular anesthesia, 1)reduced cardiac contractility related many factors such as manipulation of the heart, hemodilution after cardiopulmonary bypass, hypotension, and hypothermia, and 2) bleeding which causes hemodynamic instability are treated with superficial anesthesia This situation increases the risk of wakefulness. Hemodynamic data may not correlate exactly with the patient's conscious state. Only these measurements are inadequate for the evaluation of depth of the anesthesia and sedation. In this study, we used to Bispectral Index (BIS) monitor in patients with open heart surgery for determination of depth of anesthesia. The effects of BIS monitor using on the anesthetic, analgesic

and inotropic drug consumption and intraoperative awareness were investigated.

Materials And Methods: 70 patients undergoing open-heart surgery were randomize divided into two groups. Group 1 (35): anesthesia was performed with BIS monitor were open and BIS values were known from anaesthesist team. GROUP 2 (35): BIS monitor was connected to the patients. BIS value of the monitor screen was closed to the anesthetist. Anesthesia was performed according to patient's clinical conditions. Data's on the monitor were recorded. At the beginning, the patients underwent monitoring of the systolic blood pressure, diastolic blood pressure, mean blood pressure, ECG and pulse oximetry. Additionally, the probe of BIS monitor was adhered to the forehead and the values were recorded, Anesthesia induction and endotracheal intubation were performed with with fentanyl, and etomidate and vecuronium. Maintenance of anesthesia was performed with propofol and remifentanil. In group 1, propofol and remifentanil infusion doses were titrated throughout the operation according to BÝS level kept at 35–45%. In group 2 propofol and remifentanil infusion doses were titrated according to clinical data. Hemodynamic data and BIS values were recorded at preoperatively after induction of anesthesia, skin incision, and sternotomy, before and after by-pass, and postoperative period. Respiratory parameters including arterial blood gases were also recorded.

Results: Patient's characteristics, hemodynamic data, ventilator parameters, blood gas values, BIS monitoring, and anesthetic drug dosages were compared in group 1 and 2. There were no statistical difference between group 1 and 2 ($p > 0.05$). Intraoperative awareness and awakeness were not observed at any patient.

Discussion.

Conclusion: In our study, we concluded that use of BIS monitoring in cardiovascular surgery has not effects on the total intra-operative anesthetic drug consumption.

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Paper No: 1084.0

Correlation between deviations of target parameters during a perioperative crystalloid fluid loading in a 3-step minimal volume loading test for total knee arthroplasty patients

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Introduction: Goal directed fluid management implies maximization of cardiac stroke volume (SV). However, measurement of SV has numerous limitations. Thus, indirect assessment of SV by measurement of more available parameters such as perfusion index (PI), venous and capillary hemoglobin concentration (Hb) or mean arterial blood pressure (MAP) seems attractive. Theoretically, it is possible since acute change in capillary PI is associated with change in systemic vascular resistance, haemodilution induced change in venous Hb is associated with change of blood volume that tends to change preload, and change in MAP may be associated with changing sympathetic stimulation and volume status. Correlation of SV deviations and capillary haemodilution can also exist since SV and arteriolar/venular tone are affected by the same neuro-humoral stimulus.

Objectives: Our prospective clinical trial aimed to investigate correlation between deviations of SV and MAP, capillary PI, venous and capillary Hb during crystalloid loading performed according to 3-step minimal volume loading test (mVLT) [1].

Methods: After approval by Ethics and signed consent, fifteen ASA II patients scheduled for primary total knee arthroplasty were enrolled. The 3-step mVLT was performed before anesthesia induction and after 24 postoperative hours. Every step consisted of 5 ml/kg bolus of acetated Ringer's followed by 5 minutes without fluid. Parameters were recorded before and after each mVLT step. Radial artery was cannulated for MAP (DASH 3000®, GE Medical Systems Information Technologies, Milwaukee, USA) and SV (LiDCOTMPlus, London, UK) measurements. Venous Hb was analyzed in laboratory. Capillary Hb (SpHb) and PI were measured noninvasively (Radical 7, Masimo, USA). Mathematical model of bolus induced response of deviations (BIRD-math) was used to calculate continuous and shifting residual-to-baseline deviations [1]. Continuous deviations reflect dynamics of parameter's fractional change during one mVLT step, and shifting reflect the tendency of continuous deviations by comparing two steps.

Results: Twelve subjects completed the study. Good correlation was found between the continuous ($rxy = 0.843$, $p = 0.035$) and shifting ($rxy = 0.893$, $p = 0.035$) deviations of MAP and SV, also between shifting deviations of SpHb and SV ($rxy = 0.959$, $p = 0.016$).

Conclusions: Monitoring of MAP and SpHb provides indirect evaluation of SV response to fluid challenges. Project was supported by ESA Research Grant 2009.

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Paper No: 1094.0

Low tidal volume does not affect the dynamic indicators of fluid responsiveness

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Introduction. The magnitude of dynamic preload indicators is affected by the tidal volume (VT). Pulse pressure variation (PPV) might less accurately predict fluid responsiveness in patients mechanically ventilated with protective strategy (VT as low as 6 ml/kg). We analyze the effects of VT on different invasive and non-invasive dynamic preload responsiveness indicators in a hemorrhage animal model. Ten rabbits were anesthetized and mechanically ventilated using a VT of 6 ml/kg and 12 ml/kg. Peep was set at 5 cmH2O. Central venous pressure, infra-diaphragmatic aortic blood flow (Transonic) and pressure (Statham) were measured and pulse oximetry (LNOP newborn, Masimo Corp) was recorded. PPV and stroke volume variation (SVV) were obtained by the variation of beat-to-beat PP and SV respectively. Non-invasive plethysmographic waveform variations (ΔPOP) and pleth variability index (PVI) were also obtained. SV was estimated by the integral of aortic flow. Animals were studied during normovolemia (BL), after blood progressive withdrawal (20% of volemia, BW) and after fluid loading with 6% hydroxyl-ethyl-starch (FL). Data are expressed as mean ± SD and presented in the table. Pearson product moment correlation, unpaired t test and ANOVA were used ($P < 0.05$). All dynamic preload indicators were significantly correlated with PPV during the different experimental conditions (R2 between 0.5 and 0.75).

	VT = 6 ml/kg		VT = 12 ml/kg	
	BL	BWFL	BL	BWFL
PPV, %	12 ± 4	32 ± 12*	10 ± 5†	14 ± 2
	30 ± 12	6 ± 2†		
SVV, %	10 ± 2	41 ± 36	10 ± 1	14 ± 3
	31 ± 12	10 ± 5†		
PVI, %	15 ± 2	22 ± 7	13 ± 2	14 ± 1
	34 ± 7*	11 ± 1†		
ΔPOP, %	9 ± 4	26 ± 8*	18 ± 10	7 ± 5
	31 ± 10*	11 ± 7†		
MAP,mmHg	67 ± 6	64 ± 13	76 ± 11	80 ± 17
	77 ± 4	77 ± 2		
SV, ml	0,3 ± 0,2	0,3 ± 0,2	0,3 ± 0,1	0,4 ± 0,1
	0,3 ± 0,1	0,5 ± 0,2		
HR, bpm	244 ± 19	267 ± 21	231 ± 12	247 ± 18
	261 ± 33	248 ± 24		

*p < 0.05 BL vs BW; † p < 0.05 BW vs FL. MAP: mean aortic pressure.

Dynamic indicators of fluid responsiveness increase with hypovolemia during both, high and low VT in this hemorrhage animal model. The lower transmission of respiratory pressure to the cardiovascular system and not the low VT in patients with acute lung injury would explain the absence to predict fluid responsiveness of dynamic indicators during protective ventilation.

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Paper No: 1098.0

The increase of vasomotor tone avoids the ability to predict fluid responsiveness of the dynamic preload indicators

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Respiratory variations in pulse pressure (PPV), stroke volume (SVV), pulse oximetry photoplethysmographic waveform amplitude (ΔPOP) and perfusion index (PVI: pleth variability index) has been proposed as a fluid responsiveness indicators. As vasopressors directly alter arterial tone, venous capacitance and the amplitude of the pulse oximetry waveform, we analyse the effects of phenylephrine (PHE) on the dynamic preload indicators in a model of hemorrhage. Ten anesthetized and mechanically ventilated (VT: 9 ± 2 ml/kg, peep: 5 cmH2O) rabbits were studied during normovolemia (BL) and after blood progressive withdrawal (20% of volemia, BW). Then, PHE infusion was titrated to achieve a MAP of ± 10% of BL and a third data set of data was obtained (BW+PHE). Central venous (CVP) and left ventricular (LV) pressures, and infra-diaphragmatic aortic blood flow (Transonic) and pressure (Statham) were measured. Pulse oximetry (LNOP newborn, Masimo Corp) was recorded. PPV and SVV were obtained by the variation of beat-to-beat PP and SV, respectively. Non-invasive ΔPOP and PVI were also obtained. SV was estimated by the integral of aortic flow. The vasomotor tone and LV preload were assessed by total arterial peripheral resistance (TPR = mean aortic pressure/mean aortic flow) and LV end-diastolic pressure (LVEDP), respectively. Data are expressed as mean ± DS and presented in the table. Pearson product moment correlation and ANOVA were used ($P < 0.05$). All dynamic preload indicators were significantly correlated with PPV during the different experimental conditions (R2 between 0.6 and 0.8). Mean doses of PHE infusion was 15 ± 2 μg/kg/min.

All dynamic preload indicators were influenced by PHE during hemorrhage. True intravascular volume deficit have been masked by the vasomotor tone increase during PHE. We cannot rule out the increase of pulmonary arterial pressure produced by PHE concomitantly. The LVEDP maintenance can discard a significant shifting blood from unstressed to stressed volume.

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Paper No: 1155.0

Simulator-based study of the Dräger apollo low flow wizard: preliminary results

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Introduction: The Low Flow Wizard (LFW; Dräger, Lübeck, Germany) provides real time guidance for cost effective user optimization of fresh gas flow (FGF) range during general inhalational anesthesia. The LFW continuously informs users whether FGF is too high, appropriate or too low and its color-coded display (red: too low; green: appropriate; yellow: too high) responds in real-time to changes in FGF performed by users.
Objectives: The study objective is to determine if the Low Flow Wizard feature, as implemented in the Dräger Apollo workstation, reduces volatile anesthetic consumption.
Methods: Because a study during actual clinical use with patients involves many potentially confounding variables, we used a mannequin patient simulator (Human Patient Simulator, HPS, version B, CAE Healthcare/Medical Education Technologies, Inc., Sarasota, Florida, USA) that consumes and exhales volatile liquid anesthetic. The patient was a 64-years old, 70 kg male with a pancreatic head mass scheduled for a laparoscopic procedure. A multi-parameter physiological monitor (Merlin 6M1046, Philips Healthcare, Andover, MA, USA) placed on top of the Apollo displayed the ECG, heart rate, SpO2 and first, noninvasive blood pressure and then invasive. In this within group study, each participant acted as his or her own control. Each participant was asked to anesthetize the same "patient", as simulated by the HPS as they normally would, twice: first with the LFW disabled and subsequently with the LFW enabled. The volatile anesthetic was isoflurane. Both simulation runs were set up to have similar time durations for the different phases of anesthesia: induction and maintenance. We started a 10 minute timer whenever the clinician said that they were ready for surgical prep and ended the scenario after 10 minutes has elapsed. We announced first incision 4 minutes after prep accompanied by elevation of BP and HR which declined over the next 5 minutes. Emergence was not simulated. The isoflurane vaporizer was weighed before and after each simulation run on a digital scale (Model EK-12Ki, 12000gx1g, A&D Engineering, San Jose, CA, USA) to determine volatile liquid anesthetic consumption.
Results: The ratio of liquid isoflurane consumption in grams with, and without, the LFW for the first three participants were 7:11 (63%), 5:7 (71%) and 5:14 (36%).
Conclusions: While we still have more participants to run through this ongoing study, our preliminary data suggest that use of the LFW results in large reductions (average of 47% reduction) in volatile liquid anesthetic consumption.

Paper No: 1223.0

The MIRUS* inhalation anaesthesia system: preliminary results

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Introduction: Inhalation anaesthesia depends on a linear or circular breathing system including admission of fresh gas partially loaded with an inhalation anaesthetic agent (IA), using a dedicated vaporizer. With these systems, a fast wash-in depends on the delivery of high IA concentrations in the fresh gas flow, with significant waste of costly agents and environmental concerns. A new system (MIRUS *PALL, D) was designed in order to combine fast induction and IA saving by introducing the IA directly into the systems' Y-piece rather than in the fresh gas flow. The IA delivery is sequential and targets only the alveolar part of the inspiration flow. A reflector allows for saving up to 70% of patient's expired IA for reuse within the next inspiration. The system has an inbuilt gas analyzer providing end tidal (ET) IA measurement and a servo control system to reach the targeted inspiratory and ET concentrations. The MIRUS* is a stand alone system that operates with any type of existing anaesthesia system.
Objectives: We report the preliminary descriptive comparison of the MIRUS* with a standard anaesthesia work station (Aisys* GE, USA) in terms of a) speed of reaching a target ET IA, and b) IA consumption.
Methods: a) With IRB approval, 4 large white pigs (24 ± 1 Kg) were studied under standard general anaesthesia (ketamine, azaperone, propofol, pancuronium) and mechanical ventilation (minute volume 5.5 ± 0.5 l/min). The Aisys* was used with a fresh gas flow of 1.5 l/min. The MIRUS* was used with a critical care ventilator (Centiva/5 Plus* GE, USA). Each subject, acting as its own control, was successively connected to both the systems and time to reach 90% of the target ET Isoflurane (t90; 2.0 Vol%) was measured in duplicate. b) During laparascopic OR training sessions in Large White pigs (28 ± 1 kg) the MIRUS* was used ($n = 4$) for induction and maintenance (7h) of isoflurane anesthesia (2.0 Vol%). The total IA consumption was compared with the one usually observed with an Aisys* system.
Results: a) The MIRUS* provided a 3 times faster wash-in (Aisys* $t90 = 1450 \pm 50$s, MIRUS* $t90 = 490 \pm 50$s) and b) used approx.

	BL	BW	BW+PHE
PPV, %	13 ± 3	31 ± 12*	13 ± 4†
SVV, %	12 ± 3	34 ± 19*	14 ± 3
ΔPOP, %	8 ± 4	29 ± 9*	12 ± 3†
PVI, %	15 ± 2	28 ± 9*	13 ± 4†
PI, %	1.1 ± 1.4	1.1 ± 1.1	0.5 ± 0.4
HR, bpm	246 ± 17	262 ± 27	240 ± 30
MAP, mmHg	73 ± 13	70 ± 11	83 ± 5
SV, ml	0.36 ± 0.12	0.33 ± 0.11	0.27 ± 0.13
TPR	0.71 ± 0.25	0.79 ± 0.23	1.4 ± 0.5†‡
mmHg/ml/min LVEDP, mmHg	9 ± 6	6 ± 5	5 ± 3
CVP, mmHg	4 ± 2	3 ± 1	5 ± 4

*p < 0.05 BW vs BL; †p < 0.05 BW+PHE vs BW; ‡p < 0.05 BW+PHE vs BL. HR: heart rate; MAP: mean aortic pressure; PI: perfusion index.

1/2 of the Isoflurane (Aisys* IA = 12.8 ± 0.5 ml/h, MIRUS* IA = 6,9 ± 2 ml/h); when compared to the Aisys* system.

Conclusions: In these preliminary observations, the MIRUS* has shown significant speed and IA consumption benefits in comparison with a standard anaesthesia work station.

Paper No: 1228.0

Bispectral index improving anaesthetic delivery in TCI propofol-remifentanil-based anaesthesia in schedule surgery

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Introduction: To achieve adequate depth of anaesthesia evaluating clinical signs, such as blood pressure and heart rate, can result in either an overdosage or underdosage of anaesthetic agents. The anaesthesia guided by BIS in TIVA with propofol and remifentanil target controlled infusion (TCI) decrease the consumption of anaesthetic drugs in surgery patients.

Methods: Forty adult patients ASA (physical status) I or II were enrolled for laparoscopic cholecystectomy and TIVA using TCI of propofol and remifentanil was evaluated. The muscle paralysis was facilitated with vecuronium (0.1 mg/kg). In the control group (I) the anaesthesia was guided by clinical signs (n = 20). In group II (n = 20), the depth of anaesthesia was guided by BIS to keep it within the recommended range (40 to 60). None of the patients received premedication. Standard clinical monitoring was performed with ECG-NIBP-SaO2 and ETCO2 and four electrodes of BIS in group II. Blood samples were obtained at T1: orotraqueal intubation; T2: 15 minutes after the beginning of surgery; and T3: extubation. Propofol plasma concentration was measured by HPLC and related to theorical Cp obtained by computer-controlled infusion of propofol (Base Primea, Fresenius). Duration of surgery, anaesthesia and intraoperative propofol dosage were recorded.

Results: Intraoperative theoretical propofol Cp in BIS group was significantly lower than in the control group guided by clinical signs with less consumption of propofol (P = 0.036). Plasma propofol values measured in II were lower at T2 and T3 compared to the control group (T2: 2.48 vs 4.13 ug/ml, $p < 0.05$; T3: 0.94 vs 1.30 ug/ml, $p < 0.05$). No significant differences were observed between measured and predicted propofol concentrations in group II, compared to the control group where propofol concentrations were underpredicted at T2 and T3 (T2: 3.00 vs 4.13 ug/ml, $p < 0.05$; T3: 0.59 vs 1.45, $p < 0.05$)

Discussion: The causes of intraoperative awareness are yet unknown. In the same way, the reasons why some patients requiere a higher dose of anaesthetic than others remain unknown and may be of multifactorial causes.

Using BIS in propofol–based anaesthesia can help to decrease the risk of intraoperative awareness and delayed recovery. In the present study, we kept the BIS values of the patients in the subgroup BIS in the range 40–60 which was considered to be an ideal depth of hypnosis. These results suggested that BIS improves anaesthetic delivery with less consumption of propofol with lower propofol plasma levels in schedule surgery.

Keywords: BIS (Bispectral Index)

Paper No: 1247.0

Universal anaesthesia machine (UAM) â€“ evaluation of a new anaesthesia workstation for use in the developing world

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Introduction: The provision of safe anaesthesia in many developing countries is compromised by a lack of appropriately designed anaesthesia equipment. Modern complex anaesthesia workstations are unsuitable for areas with challenging environmental conditions and where supplies of compressed oxygen and electricity are unreliable.The Universal Anaesthesia Machine (UAM) is a new CE marked anaesthesia workstation that uses a high-output oxygen concentrator to deliver continuous flow inhalational

anaesthesia with alternative draw-over mode if the electricity supply fails. The workstation also functions using compressed oxygen when available [1].

Objectives: This study formally evaluates the UAM against manufacturerâ€™s specifications and draft ISO 8835–7: anaesthetic systems for use in areas with limited logistical supplies of electricity and anaesthetic gases.

Methods: The following aspects of the UAM will be tested. â€¢Electricity supply â€" machine functions and delivers anaesthetic gases in the event of mains electricity supply failure or sudden change in voltage. â€¢Means of gas delivery â€" oxygen concentrator is compliant with ISO 8359/ ISO10083/ Test fittings for alternative oxygen sources including hierarchy of use and automatic use of room air entrainment inlet when alternative oxygen sources fail. â€¢Means to prevent hypoxic gas mixtures of oxygen and nitrous oxide â€" hypoxic guard and accuracy of rotameter calibration including condensation check. Test integral fuel cell oxygen monitor and apnoea alarm. â€¢Draw-over vaporiser (isoflurane) â€" test structural components (including calibration and internal resistance ISO/TS 18835) and function against ideal characteristics [2] and other commercially available draw-over vaporisers [3,4]. Test that the vapour concentration output accurately reflects dial settings, remains constant over time and does not differ across clinically relevant ranges of flow rates (especially low flow rates) and ambient temperature. â€¢Means for delivering gas to the patient either by continuous flow breathing system (compliant with ISO 80601–2-13) or draw-over breathing system (compliant with ISO/TS 18835). Evaluation of the effects of Continuous Positive Airways Pressure (CPAP) on the system to determine whether flow reversal occurs and to quantify the reduction in gas flow occurring when using the Ayreâ€™s T-piece (static CPAP test). â€¢Means for manual ventilation of the patient â€" test efficiency of inflating bellows. â€¢Test the negative and positive pressure relief valve unit, balloon inflating valve, pressure relief valve and gas scavenging.

Results: Testing is in progress and full results will be available for discussion at WCA 2012.

Conclusions: Formal independent testing of this novel anaesthesia workstation will provide important information for those working in challenging environments.

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Paper No: 1278.0

Evaluation of the laryngeal mask supreme, easytube, and the king laryngeal tube suction by inexperienced personnel using a human patient simulator

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Introduction: The Laryngeal Mask Airway (LMA) Supreme, the EasyTube (EzT), and Laryngeal Tube Suction (LTS) are all supraglottic airway devices (SADs) with the ability to ventilate the lungs and drain the stomach. The effectiveness of each of these devices has been studied in controlled operating room and emergency situations. These studies suggest that each of the devices show promise as effective emergency airway devices in the pre-hospital setting for inexperienced personnel and for situations not conducive to endotracheal intubation.

Objective: The study objective was to compare insertion times of the EzT, the LTS and the LMA Supreme on a simulated patient mannequin by inexperienced personnel.

Methods: Forty-four medical students were recruited for the study. After a brief instructional session on the three SADs, medical students used each of the devices on a mannequin. The following data were recorded: insertion time, achievement of effective airway, the number of attempts taken to insert the SAD, and maneuvers required. The students were reassessed after an interval of at least 3 months to test retention of skills.

Results: A total of 34 students completed this study. Average insertion times for the EzT were 84 seconds the first session, 150 seconds in the follow-up, with a 66 second average difference. Times for the LTS were 44, 31 and -13 seconds respectively. Times for the Supreme were 23, 22 and -2 seconds respectively. Utilizing Tukey's HSD test to compare means we determined that the mean difference in insertion times (before and after) is statistically different between devices, with the EzT being statistically different from both Supreme and LTS groups, and no difference between Supreme and LTS groups ($P < 0.004$). Likewise, also using Tukey's HSD test, the mean insertion time for each device during the first phase of the study showed that it took significantly longer to insert the EzT compared to both Supreme and LTS ($p < 0.001$), but no significant differences between LTS and Supreme. The same results were observed in the second phase as well ($p < 0.0001$).

Conclusion: The study suggests that in the hands of inexperienced personnel the LMA Supreme and LTS offer an advantage in insertion time over the EzT, even with minimal instruction.

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Paper No: 1283.0

Tracheal intubation by anesthesiology medical residents comparing Airtraq® with the Macintosh laryngoscope - a prospective study on mannequins

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Introduction: The difficult or failed intubation (IT) results in high morbidity by direct injury to the airway or hypoxia, and even mortality. The new IT devices can minimize failures and complications. The Airtraq® is an optical device designed for airway management without oral, pharyngeal and tracheal alignment.
Objectives: The aim of this study is to compare the easiness of glottis visualization in a regular airway (RAS) and in a difficult airway scenarios (DAS) with the Macintosh laryngoscope and with the Airtraq®.
Methods: Eleven anesthesiology medical residents (MR) agreed to participate. After a brief explanation of the new device, each MR had time to train IT on a mannequin (SimMan, Laerdal, Kent, UK). Thereafter, they performed the simulation. The MR should intubate the mannequin with both devices in a RAS and in a DAS (tongue swelling and decreased cervical extension). The variables analyzed were: success of IT, time spent, number of attempts, need of additional measures, occurrence of tooth injury, glottis visualization (POGO) and difficulty of IT by a visual analog scale (VAS). We performed two rounds of simulation. The first round was for familiarization, so their data were not considered for analysis.
Results: In both scenarios, the success of IT was 100% for the two devices and there was no difference regarding the time spent. There was no need for additional measures when using the Airtaq®. Using the Macintosh, 3 MR needed repositioning of the mannequin in both scenarios, 2 MR needed to use the guide wire in the DAS and 1 MR requested external laryngeal pressure and positioning guide wire to the RAS. In both scenarios there were a higher incidence of tooth injury with Macintosh ($p < 0.005$) and glottic view was better with Airtraq ($p < 0.05$). There was no significant difference in the IT difficulty classification by VAS between two devices in both scenarios.
Discussion: The use of Airtraq® appears to be better than the conventional Macintosh laryngoscope concerning dental injury and glottic visualization. It was observed that despite instructor's orientation to perform the laryngoscopy as it was a real patient, most participants did not follow the correct IT technique, especially in the DAS, which resulted in a high incidence of tooth injury. This fact may be a possible bias in the mannequin study, however, the optical device facilitated the glottic visualization without the risk of tooth injury.

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Lingual and inferior alveolar nerve injury following the use of an i-gel™ laryngeal mask

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Introduction: The i-gel™ laryngeal mask (i-gel™ LM) has a supraglottic airway non-inflatable cuff, which is designed to anatomically fit the pharyngeal, laryngeal and perilaryngeal structures(2). This characteristic prevents injuries by

compression that can occur with supraglottic inflatable devices, such as the lingual, hypoglossal and recurrent laryngeal nerves(1). However, there are two published cases of lingual nerve injury with the i-gel™ LM (1) (2).

Objectives: We report a case of a patient who developed lingual and inferior alveolar nerve injury followed by the use of an i-gel™ laryngeal mask that was correctly and atraumatically inserted.

Methods: A female patient, 52 year old, 61 kg, physical state ASA 2, underwent elective knee arthroscopy under general anaesthesia. Monitorization was performed by the ASA standard recommendations. After induction of anaesthesia, we easily inserted a size 4 i-gel, following the manufacturer's recommendations. Volume controlled ventilation was not associated with an air leak. There were no adverse events during the maintenance and emergence of anaesthesia. The total operative time was approximately 52 minutes.

Results: In the recovery room, the patient noticed bilateral numbness in the anterior two-thirds of the tongue, lower lip, lower teeth, and loss of taste. On the examination the tongue appeared and moved normally and there were no visible stigmata of intra-oral trauma. The diagnosis of the Neurologist was a probable injury of the inferior alveolar and lingual nerves caused by the use of the i-gel™ LM. Conservative treatment was advised. After 12 weeks all symptoms resolved.

Conclusions: The lingual and inferior alveolar nerves go together between the medial and lateral pterygoid muscles along the internal face of the mandible branch until to the mandibular canal. At this level the nerves go by separate ways(1)(2). At any point of this route nerve damage can occur by the compression of the laryngeal mask, although it is a rare situation(2). We believe that the injury to the nerves in this case was caused by direct compression of the buccal cavity stabiliser (rigid and wide structure that prevent the i-gel™ LM to move) at any point of the route described above. Theoretically, the i-gel™LM decreases the risk of nerve damage by compression because it hasn't an inflatable cuff, however this complication can still occur.

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Prediction performance of a model of patient's lung and chest wall mechanics during mechanical ventilation

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Introduction: Simulating biological systems may improve the understanding of their behavior. Anesthesiologists and intensive care team deal constantly with patients on mechanical ventilation (MV). This work presents a model which can be simulated and used to help in training physicians and respiratory therapists to analyze the respiratory mechanics of patients.

Objectives: To create a simulation model of the patient system that distinguish patients lung, chest wall and airway components that allows the interaction of the user with the ventilation settings and patient characteristics. The latter includes diagnosis categories such as normal lungs, Acute Respiratory Distress Syndrome (ARDS) increased intra-abdominal pressure as it is observed during abdominal laparoscopic surgery.

Method: The patient respiratory system behavior is defined by the airway resistance, the lung compliance and the chest wall compliance. The simulation can use either lineal or non-lineal lung compliance. Chest wall compliance and resistance have a more lineal behavior in patients during mechanical ventilation. Adjusting the equation proposed by Venegas et al. to the lung and assuming that chest wall and airway resistance are constant ARDS patients mechanics can be simulated. By making variations chest wall compliance the behavior of an intra-abdominal hypertension model can be mimicked. The behavior of the mathematical model was compared with an animal model ventilated with volume control ventilation (VCV), where flow, airway pressure, esophageal pressure where recorded. A normal lung ventilated pig model of intra-abdominal hypertension was performed by increasing abdominal pressure in steps. Inspiratory and expiratory pause were generated to assess respiratory mechanics. The simulator was loaded with equivalent airway resistance and lung and chest wall compliance (Ccw). To emulate the animal model, Ccw was decreased in the simulator until similar airway plateau was achieved. We compare the resulting peak pressures and respiratory system dynamic and static compliance.

Results: The simulation and the animal model had similar performance. As expected with a chest wall compliance reduction, airway plateau and esophageal pressures were increased, while transpulmonary pressure remained unchanged. All measurements showed good correlation between the animal and the simulator model: Peak inspiratory ($R2 = 0.97$); respiratory system dynamic ($R2 = 0.82$) and static compliances ($R2 = 0.96$).

Conclusion: The simulation accurately reflected the animal model respiratory system mechanics behavior during intra-abdominal hypertension.

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Paper No: 1299.0

Comparison of invasive and noninvasive methods of measuring blood pressure in patients undergoing bariatric surgery

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Introduction: Intraoperative anesthetic approach depends mostly on the correct measurement of blood pressure (BP). The obese are a special group of patients where the measurement of BP requires specific care. Size and shape of the arm are possible causes of errors of noninvasive measurement of BP (NIBP), despite the use of appropriate equipment. Catheterization of the radial artery – an invasive method for measuring BP (IBP), is considered the gold standard for situations where the non-invasive technique is inaccurate or insufficient. There are no studies comparing the two techniques in bariatric surgery to determine the sufficiency of non-invasive technique in this circumstance.
Objectives: The aim of this study is to compare the values of BP with non-invasive methods by oscillometry (NIBP) and invasive techniques (IBP) in obese patients undergoing bariatric surgery, and correlate these measures with anthropometric data.
Methods: We evaluated 36 obese patients undergoing bariatric surgery with total intravenous anesthetic technique. Information was collected regarding gender, age, height, weight, BMI and proximal/distal arm circumference. BP was assessed by two methods - invasive (IBP) and non-invasive (NIBP) - from beginning to end of surgery, at constant intervals of 10 minutes, being recorded in a specific protocol designed for this purpose. Paired t test was used to analyze the difference between the means of the NIBPxIBP methods among all patients in each time of surgery. SPSS software was used for all statistical analysis.
Results: Kolmogorov-Smirnov normality test for quantitative variables (age, weight, height, BMI and P/D arm circumference) was normal for all variables studied ($p > 0.05$). Data analysis by paired t test showed that the mean differences between NIBP and IBP methods were statistically significant at 10–160 min and 180–200 min of surgery ($p < 0.05$). Although, in the remaining surgical times (0 min, 170 min and 210–250 min) mean differences between the two methods was not significant ($p > 0.05$). There was no correlation between the variables weight, height, BMI and P/D circumference.
Conclusions: The measurement of BP by invasive technique (IBP) demonstrates to be more reliable than non-invasive method in the majority of surgical time. NIBP measurement can show significant difference in this particular group of patients, possibly because of variations/anatomical deformation resulting from obesity, factors which could interfere on intraoperative anesthetic approach. Antropometric data showed no significant correlation with intraoperative BP. Our study suggests that BP measurement by invasive technique (IBP) is more reliable in obese patients undergoing bariatric surgery, providing more accurate information and allowing a better management of intraoperative anesthesia.

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Paper No: 1302.0

High precision of data in an anesthesia information management system does not imply high accuracy

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Introduction: When storing data in an Anesthesia Information Management System (AIMS), the precision of the data is determined by the data type definition in the database

software. In the case of times entered for the delivery of drugs or the times entered to document anesthetic events, the precision is often in the milliseconds. When an event is recorded by a computer to that level of precision, the inference drawn may incorrectly be that the event must have happened very close to that finely defined time.

Objective: Our hypothesis was that the difference between the time an event occurred and the time it was documented to have occurred (a measure of the accuracy of documentation) was far greater than the precision of the documented time. We also wished to see how the accuracy varied with the delay between the event occurrence and event documentation.

Methods: Following IRB approval, we queried our AIMS database for cases in 2006 in which nitrous oxide was delivered. For each case, we determined: (1) the initial time at which inhaled nitrous oxide was detected to be above 5% by an agent analyzer (Time1), (2) the time at which nitrous oxide was documented by the clinician as having been initiated (Time2), and (3) the time of the physical documentation (Time3). Subtracting Time1 from Time3 yielded a measure of the delay between the initiation of nitrous oxide and the documentation thereof. Subtracting Time1 from Time2 yielded a measure of the error between the actual time of nitrous administration and the reported time.

Results: The Figure displays the error in the clinician-documented time as a function of the delay in documentation (we have omitted four points with negligible errors but delays off the scale). Although the etiology of the errors is educated guesswork, we suspect that the errors of around 720 minutes represent a slip in documenting PM for AM, errors along the line of unity result from a lapse in documentation of the initial flow (whether accidental or deliberate), and the residual variability represents the intrinsic error related to the documentation method in this AIMS.

Conclusion: Despite the precision of timestamps in our AIMS to the millisecond, the magnitude of the error in the documented time of the administration of nitrous oxide is as great as twelve hours. Readers of electronic anesthesia records should not confuse a high level of precision with a high degree of accuracy.

Paper No: 1303.0

Audit to assess regional differences in difficult airway equipment & training

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Introduction: The Difficult Airway Society(UK) and The South African Society of Anaesthesiologists Hodgson's(SA)recommend "Required airway management equipment be immediately available wherever anaesthesia is administered" Local guidelines for stocking difficult airway trolley" Training should be provided in use of this equipment

Objectives:

(1) Assess adherence to the national recommendations (DAS/SASAHodgson) for providing difficult airway equipment in two teaching hospitals in separate countries - Guy's and St Thomas' Hospital (GSTT, London) and Groote Schuur Hospital (GSH, Cape Town)
(2) Evaluate the equipment available on airway trolley in -Theatres -Casualty
(3) Identify presence of any local guidelines for difficult airway trolley equipment
(4) Assess experience & training of the A&E clinicians in airway management

Methods: Snapshot assessment of

(1) Equipment availability on difficult airway trolleys(GSTT- 2sites; GSH-1) using a difficult airway checklist1 proforma.
(2) Casualty doctors in the 2 hospitals using a questionnaire- exposure to equipment and interventions

Results: LOCAL GUIDELINES

(1) Both hospitals had local theatre and casualty guidelines for stocking airway trolley's, BUT none adhered to the national recommendations
(2) Missing equipment Theatres GSTT- Facemask, Surgical Cricothyroidotomy, Bullard's Laryngoscope, Trachlight, Combitube GSH-Nasopharyngeal airway(only 2sizes), Bullard's Laryngoscope, Trachlight, Combitube Casualty GSTT- In addition to the ones in theatres, malleable stylet, ProsealLMA &Aintree catheter GSH- Same as theatre, but only had one size of supraglottic airway
(3) None had difficult airway algorithm present on the trolley

CASUALTY QUESTIONNAIRE SURVEY

(1) 1. Response rate was 100% at GSTT & 55% at GSH
(2) Grade of clinicians completing survey GSTT GSH Consultant-13% 20% Registrar-40% 60% Other-46% 20%
(3) Previous Anaesthetic experience- GSTT53% & GSH50%
(4) Awareness of guidelines National- 60%GSTT; 50%GSH Local- 33%GSTT; 30%GSH
(5) Correct answers to equipment was present on the trolley 85%GSTT; 68%GSH
(6) Experience with use of airway equipment FM-GSTT100%; GSH100% LMA- GSTT87%; GSH90% ILMA-GSTT47%; GSH50% ETT- GSTT80%; GSH100% Fiberscope- GSTT20%; GSH10% Cricothyroidotomy-GSTT40%; GSH10%
(7) Equipment confidence Facemask- GSTT80%; GSH90% LMA- GSTT67%; GSH70% ETT- GSTT53%; GSH100%

(8) Intubations(last year) 0-5- GSTT73%; GSH50% 6-10- GSTT6%; GSH20% >10- GSTT20%; GSH30% Failed Intubations- GSTT20%; GSH30%
(9) LMA Insertions 0-5- GSTT/GSH 60%/50% 6-10- GSTT/GSH 40%/50%

Conclusions: & Recommendations None of the institutions showed adherence to National recommendations, but had local guidelines Across the 2 countries it shows the value of experience with increasing intubations, increases confidence Developing exchange programs to improving training & experience Ready availability of specialized equipment, value of systems(guidelines &checklist), ensures preparedness for difficult airway

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