DIFFERENT PEEP LEVELS ON GAS EXCHANGE USING LOW TIDAL VOLUME VENTILATION STRATEGY

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INTRODUCTION. Improvement in oxygenation due to PEEP is not always due to a better alveolar ventilation. Different PEEP levels were tested on gas exchange in ALI/ARDS patients

METHODS. 11 ALI/ARDS patients (PaO2/FiO2 197±59, age 63±16 years, measured weight 75.3±14.4 Kg) were ventilated with a low tidal volume (VT) strategy according to NIH protocol (1). The VT used was 6.9±3.6 ml/kg. 5, 8, 10, 12, 14, 16, 18 cmH2O of PEEP were applied in crescent order. Before starting a recruitment manoeuvre was performed. Gas exchange and invasive hemodynamics (arterial and venous mixed samples) were measured at each PEEP level after thirty minutes.

RESULTS. A significant correlation between the improvements in arterial oxygenation and PEEP levels (deltaPaO2 vs delta-PEEP) was found. 2) the best PEEP was defined as PEEP level at which was reached the highest decrease of PaCO2 (deltaPaCO2). In figure is the regression between the slope of the previous correlation with the deltaPaCO2 at the best PEEP (p<0.001).

CONCLUSION. The improvement in PaO2 is associated with a decrease in PaCO2 suggesting a possible increase in the alveolar ventilation with the PEEP.

REFERENCE(S). N Engl J Med 2000; 342:1301-8

PARTIAL LIQUID VENTILATION DOES NOT PROTECT LUNGS AGAINST INFLAMMATION DURING ENDOTOXEMIA

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INTRODUCTION. Partial liquid ventilation (PLV) with perfluorocarbon (PFC) is a new technique used in experimental and clinical studies to improve oxygenation in acute lung injury. Perfluorocarbon is biologically inert liquid with high affinities for O2 and CO2 and low surface tensions. It can improve the respiratory mechanics by filling the collapsed lung units. It may also possess some anti-inflammatory properties. To determine whether partial liquid ventilation modifies lung inflammatory response, we analysed blood cytokine levels and cytokine mRNA expression in the lung using a model of endotoxemia.

METHODS. Thirty six rats were randomized to receive either conventional gas ventilation (CV) or PLV with perfluorocarbon (PFC) infusion. After a 6-hr washout period, rats were cross-overed to receive the drug by the alternative mode of ventilation. Static and dynamic airway pressures, minimum (Rint) and maximum (Rrs) inspiratory resistance, the difference between Rrs and Rint (Ar), and respiratory system compliance (Crs,rs) were measured before and at 15, 30, 60, 120, 180 and 240 min after S. 

RESULTS. S caused a significant decrease in dynamic and static airway pressures, PEEPi, Rint and Rsr. These changes were not influenced by the ventilatory mode and were evident at 15, 30, 60 and 120 min after S. 

CONCLUSION. We conclude that S delivered by an MDI and a spacer device induces significant bronchodilation in mechanically ventilated patients with COPD, the magnitude of which is not affected by the ventilatory mode, but is quite similar between volume-controlled and pressure-support ventilation.

REFERENCE(S). N Engl J Med 2000; 342:1301-8

REFERENCE(S). N Engl J Med 2000; 342:1301-8

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VENTILATORY STRATEGY IN POTENTIAL ORGAN DONORS: RESULTS OF A REGIONAL SURVEY

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INTRODUCTION. In potential organ donors organ perfusion is ensured by aggressive fluid management and use of vasoactive drugs. Although only 20% of potentially available lungs are donated no data are available to identify optimal ventilatory strategy for potential organ donors. We hypothesised that ventilator settings used for severe brain injured patients is not modified after the diagnosis of brain death.

METHODS. We performed a prospective multicentric observational study: data were collected between May 1 and October 30, 2002 from all adult potential organ donors admitted to the ICUs of the Piedmont region (Italy). Ventilatory pattern and blood gas analysis before and after the diagnosis of brain death, apnea test modality, manoeuvre of tracheal suction and use of recruiting manoeuvres were recorded.

RESULTS. 34 potential donors were included (age 53±17 years). Apnea test was performed disconnecting the patient from the ventilator in 33 cases, in one during CPAP. Tracheal suction was performed through a closed circuit in 8 cases. Recruiting manoeuvre was performed in 3 cases. Mean±SD, paired t-test *=n.s. Vt=tidal volume, PBW=predicted body weight, RR=RESpiratory rate, Pst,rs=static pressure of respiratory system, PEEP=positive end expiratory pressure.

CONCLUSION. After diagnosis of brain death no variations in the ventilatory pattern or manoeuvres able to improve recruitment were performed. This setting represents the "standard of care" and is used as control group for an ongoing randomized controlled trial testing the hypothesis that the use of protective lung strategy may increase the number of lungs available for donation.
HALF LATER. We measured continuously PaO2, PaCO2, pH (Paratrend 7+), airway pressure and group 3 PLV was started within 3 minutes after acid instillation in group 4 PLV was started half an
received PLV (5 ml perfluorocarbon/kg body weight, PF5080, 3M, Neuss, Germany). While in
group 3 PLV was started within 3 minutes after acid instillation in group 4 PLV was started half an hour later. We measured continuously PaO2, PaCO2, pH (Paratrend 7+), airway pressure and arterial blood pressure. Mann-Whitney-Test was used to analyse differences between the groups (p < .05).

RESULTS. After hydrochloric acid instillation PaO2 decreased significantly from 481±37 mmHg to 128±71 mmHg and increased again in the time course of a few hours to 320±102 mmHg. Immediate initiation of PLV resulted in a significant longer survival when compared to a delayed initiation or no PLV (544±250 min versus 328±168 min or 204±169 min). There was a wide variation in individual effects on gas exchange, airway compliance and haemodynamic parameters
variation in individual effects on gas exchange, airway compliance and haemodynamic parameters

CONCLUSION. In the acute phase following acid injury beneficial effects of PLV on survival depends on the time of perfluorocarbon instillation. Our results suggest that rate of survival is higher when perfluorocarbons are instilled early after acid-induced lung injury.

REFERENCE(S). 1. Kawame K, et al. Crit Care Med 2000; 28:479-83, 2. Loer SA, et al. Anesthesiology 2001; 94:1045-49.

ESTIMATING OPTIMAL BLADDER VOLUME FOR INTRA-ABDOMINAL PRESSURE MEASUREMENT BY BLADDER PV-CURVES

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INTRODUCTION. Intra-abdominal pressure (IAP) is an important parameter. Correct measurement is crucial. Measurement of IAP via an indwelling bladder catheter has been forwarded as the gold standard. The highly compliant wall of the bladder acts as a passive diaphragm and intrinsic bladder (IBP) pressure does not rise when its volume is between 50 and 100 ml. However considerable variability in the measurement technique has been noted. Some authors recommend to inject 50ml of saline others up to 200ml. The aim of this study is to determine optimal bladder volume for correct IAP transmission without risk of “overinflation” of the bladder hence raising IBP.

METHODS. In 13 sedated and ventilated patients sterile saline was injected via a Foley catheter with 25ml increments up to 300ml. In total 29 “inflation” and “deflation” pressure volume (PV) curves were constructed. The M:F ratio was 8:5, BMI 24.5±3.9, age 69±13.5, MODScore 7.7±3.4, SOFA 9.8±3.5, APACHE-II 28.3±10, SAPS-II 60.8±13.7.

RESULTS. The values for IBP with regard to bladder volume are summarized in Table 1. The “inflation” and “deflation” PV curves show hysteresis as can be seen with respiratory PV curves. A lower inflection point was seen at a bladder volume of 50 to 100ml and an upper inflection point at a bladder volume of 250ml on the inflation limb. The difference in bladder pressure was 1.5±1.9mmHg between 0 or 50ml volume, 1.9±0.9mmHg between 50 and 100ml, 2.9±2.2mmHg between 50 and 150ml, 5.3±7.3mmHg between 50 and 200ml, 8.3±5.9 between 50 and 250ml and 15.9±6.9mmHg between 50 and 300ml (p<0.001 for all comparisons with 2-tailed paired student’s t-test).

| Volume (ml) | 0 | 50 | 100 | 150 | 200 | 250 | 300 |
|-------------|---|----|-----|-----|-----|-----|-----|
| IBP (mmHg) | 6.1±4.2 | 7.6±4.1 | 8.7±2.2 | 10.6±4.8 | 12.6±6.1 | 15.9±8.2 | 23.6±12.3 |

CONCLUSION. If IBP is used as an estimate for IAP the volume instilled in the bladder should be beyond 100ml, however in some patients with low bladder compliance IBP can be raised at low volumes. Ideally a bladder PV curve should be constructed in each patient before using IBP as estimate for IAP. This study makes it difficult to compare the literature data. It raises not only questions with regard to previously published definitions and cut-offs, it also puts the IBP in question as the so-called gold standard.

CARDIO-PULMONARY AND HEMODYNAMIC EFFECTS OF TOTAL LIQUID VENTILATION IN RABBITS

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INTRODUCTION. Perfluorocarbon total liquid ventilation (TLV) has been shown to improve pulmonary function, while hemodynamic effects remain understudied. This study was performed to compare cardiopulmonary and circulatory parameters caused by liquid or gas tidal volumes.

METHODS. In a prospective, controlled study, 12 anesthetized, paralyzed, adult New Zealand rabbits (3.1 ± 0.1 kg) were ventilated with a pressure-controlled ventilator (PCV). For a given slice total expiratory resistance (Rtot), consisting of that of respiratory system (Rrs), endotracheal tube (Rtube) and ventilator circuit (Rvent), was calculated as time constant/Crseff ratio. In the absence of flow limitation Rrs was adapted for isocapnia.

RESULTS. At zero PEEP the time constant of the respiratory system increased significantly toward the end of expiration due to a significant increase in Rs. Application of PEEP significantly decreased Rs at the end of expiration and resulted in a faster and relatively constant rate of lung emptying. We conclude that without PEEP the respiratory system in COPD patients deliques with a rate that progressively decreases, due to a considerable increase in expiratory resistance at low lung volume. Application of PEEP decreases the expiratory resistance, likely by preventing airway closure, and as a result modifies the pattern of lung emptying.

CONCLUSION. In patients with acute exacerbation of COPD effective expiratory resistance at the end of expiration was several fold higher than that at the end of inspiration and beginning of expiration. Application of PEEP in these patients caused a graded and considerable decrease in expiratory resistance, resulting in a more uniform rate of lung emptying.
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EFFECT OF INTRAPULMONAL PROSTACYCLINE APPLICATION ON LUNG MECHANICS AND HEMODYNAMICS IN PLV AND TLV
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INTRODUCTION. Influence of pulmonal prostacycline application on lung mechanics and hemodynamics during partial (PLV) and total liquid ventilation (TLV) after acute lung injury.

METHODS. 14 NZW rabbits (3.1kg±0.2 bodyweight) were randomized into 2 groups (control group (CG) and prostacycline (PROST) with 7 animals each. After tracheostomy and stabilizing acute lung injury criteria, animals were turned to PLV by pulmonal instillation of 25ml/kg PP4. An intrapulmonal bolus of 50mg/kg prostacycline (Biomedin,Schering GmbH, Berlin, Germany) was injected, followed by continuous application of 50ng/kg/h. Arterial oxygenation (paO2), mean arterial pressure (MAP), central venous pressure (CVP), static compliance (CS), static in-(PI) and endexpiratory pressure (PE) were measured every 10 minutes for 1h. Then TLV was established (tidal volume 40ml) and MAP, CVP, CS, PI and PE were determined at intervals of 10 minutes for 1h again. After that, animals were turned to TLV.

RESULTS. During PLV, MAP and HF significantly increased (p=<0,001) in PROST vs CG (HF: 182,9/min±28,2; MAP: 71,95 mmHg±15,09) compared to CG (HF: 170,0/min±26,2; MAP: 57,0 mmHg±14,76). No difference in HF, CVP and PE during TLV was observed.

CONCLUSION. The results show clear improvements of static and significant changes in HF during PROST in compared to CG. Increased MAP and HF during TLV are interpreted as effect of pulmonal resorption and therefore better catecholamine action.

REFERENCES. J Kubes, Per et al Am J Physiol 277 2 Pt 1 1999.

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APPLICATION OF APC AND PP4 IN A RABBIT MODEL OF ACUTE LUNG INJURY TREATED WITH PLV AND TLV
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INTRODUCTION. Partial liquid ventilation (PLV) and total liquid ventilation (TLV) are two possible methods of treating the acute lung injury (ALI) and the adult respiratory distress syndrome (ARDS). Activated Protein C (APC) has been successfully used to treat patients with sepsis. The aim of this study was to demonstrate if the additional application of APC to PP4 would have a positive effect on the pulmonary mechanics and blood gases in a saline lavage model of acute lung injury.

METHODS. N=6 anaesthetized and paralyzed female New Zealand White Rabbits (3.1±0.2 kg bodyweight) were submitted to a standardized volume–controlled mode at the Siemens Servo 300 ventilator (tidal volume: 8ml/kg, PEEP=5mmbar, FIO2=0,1, respiratory rate: 12-16/min for maintaining normocapnia). Acute lung injury was induced by repeated pulmonary lavage with isoton saline solution. After meeting injury criteria (paO2/FIO2 < 180) and acquisition of baseline data, a mixture of PP4 and APC was administered in the trachea with a dosage of 1.5 mg/kg bodyweight. For 60 minutes the rabbits were ventilated in the PLV – mode while blood gases were taken and basic haemodynamics (heart rate, arterial and central vein pressure) were measured each 10 minutes. Afterwards, the lung was completely filled with the mixture of PP4 and APC and taken on a self-constructed volume–limited, time-cycled, liquid ventilator support, double-cylinder piston pump with two separate limbs for active inspiration and expiration. In this mode – the rabbits were ventilated for one hour (p=70/min, V=4×3+8 ml) and blood gases as well as the basic haemodynamics were recorded each 10 minutes. After that, the rabbits were ventilated for 30 minutes in the former volume–controlled ventilation mode.

RESULTS. After 1 hour of ventilation in the PLV and TLV – mode, successively paO2 significantly changed (p=02: PLV:166±27 vs. 86±24, TLV: 118±50 vs. 55±5; p<0,5) while PaCO2, pH, hCO3, BE, pulmonary compliance and the haemodynamic parameters did not significantly differ between study and control groups.

CONCLUSION. In this small animal model there was a significant impact on gas exchange, but no changes in lung mechanics and haemodynamics when compared with the same ventilation modes without APC.
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PRESSURE-TIME CURVE PROFILE (STRESS INDEX) OPTIMIZES PROTECTIVE VENTILATORY STRATEGY IN ARDS
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INTRODUCTION. The shape of the airway pressure-time curve during constant flow ventilation, described by the exponential coefficient of a power equation (Stress Index), was recently proposed to assess the presence of stress during mechanical ventilation. An upward concavity and a downward concavity on the curve would indicate stress due to hyperinflation (stress index > 1) and opening-closing (stress index < 1), respectively. A linear curve (stress index = 1) should indicate absence of mechanical stress. This study tested the hypothesis that mechanical stress may be present despite the use of the NIH protocol and that adaptation of the ventilator parameters to get a stress index = 1 may result in further reduction of mechanical stress.

METHODS. 22 ARDS patients were ventilated in 3 subsequent steps of 12 hours each: (a) NIH protocol (b) SI strategy (recruiting manoeuvres and PEET to obtain a stress index = 1) (c) NIH protocol. At the end of each step, mini BAL and plasma samples were taken for cytokines level evaluation (ELISA, R & D System kit).

RESULTS. 5 and 17% of the patients had values of stress index > 1.1 during NIH I and NIH II respectively; 23 and 17% of the patients had values of stress index < 0.9 during NIH I and NIH II respectively. * p < 0.05 NIH vs. Stress Index.

CONCLUSION. Although the stress index > 1.1 is an indicator of stress, the use of a linear curve (stress index = 1) appears to be a better indicator of absence of stress. The reduction of stress index from > 1.1 to 1.0 is suitable to determine the optimal ventilatory strategy in ARDS.

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PERMISSIVE HYPERCAPNIA AND CEREBRAL FUNCTION IN PATIENTS WITH ACUTE LUNG INJURY
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INTRODUCTION. A 30% reduction of mortality and an increase of the number of ventilator-free days were described in patients with acute lung injury (ALI) treated with permissive hypercapnia. However, according to recent animal studies, hypercapnia leads to a temporary rise of the cerebral blood flow as well as cerebral blood volume and to an increase of the intracranial pressure. Other studies showed the disappearance of the cerebral autoregulation if the PaCO2 was acutely raised to 80 mmHg. All changes described may negatively influence cerebral function. The effect of permissive hypercapnia on cerebral function in men has to be investigated.

METHODS. 11 patients (8 males, mean age 58 ± 17 years) were enrolled in all patients with clinical pulmonary infiltrates were enrolled. All patients were ventilated in pressure control mode (tidal volume: normocapnic: 6-13 ml/kg body weight, hypercapnic: 4-6 ml/kg body weight). Cerebral function was assessed by short- (N13-N20 interpeak latency) and long-latency (N70 peak) sensory evoked potentials (SEP), an objective and sensitive method of cerebral integrity. Regional cerebral oxygen saturation (rsO2) was measured by near infrared spectroscopy. From randomisation SEP were assessed by a doctor blinded for ventilation mode in a cross-over design at baseline and 1, 3 and 6 hours after enrollment.

RESULTS. During normocapnia SEP peak latencies and rsO2 remained unchanged. Data during permissive hypercapnia are shown in the table.

| Patient | Baseline | 1 hour | 3 hours | 6 hours |
|---------|----------|--------|---------|---------|
| PaCO2 (mmHg) | 38±5 | 48±7 | 48±7 | 48±7 |
| N13-N20 (ms) | 65±2 | 66±2 | 66±2 | 66±2 |
| N70 (ms) | 142±1 | 142±1 | 142±1 | 142±1 |
| rsO2 (%) | 63±1 | 63±1 | 63±1 | 63±1 |
| alpha peak | 0.05 | 0.05 | 0.05 | 0.05 |

CONCLUSION. There was a significant impairment of the long latency SEP after 1 hour of treatment with permissive hypercapnia. After 6 hours of treatment, the N70 peak latencies returned to baseline values. These results indicate a cerebral adaptation to a PaCO2 which is increased for a longer time period.

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SUCTIONING THROUGH A DOUBLE LUMEN ET TUBE CAN PREVENT ALVEOLAR COLLAPSE AND WORSENING OF OXYGENATION
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INTRODUCTION. Tracheal suctioning through a single lumen endotracheal tube (SL-ETT) leads to a decrease in Pao2, loss of lung volume, and hypoxia. Extending the two limbs of ventilator tubing into the trachea via a double lumen ETT (DL-ETT) allows maintaining the set pressure in the trachea during suctioning. How beneficial is this for lungs prone to alveolar collapse?

METHODS. Seven anaesthetised pigs were subjected to lung lavage (PaO2/PF2 < 100mmHg at PEEP 5mbar) and 3 runs (random) of ventilation and suction: 1 and 2 via SL-ETT (8mm I/D.), 3 via DL-ETT (Mallinckrodt Bronchocath 4Fr I/D.), all tied to a pressure regulator. Oxygen (%) was measured separately for the lungs of the different limbs of ventilator tubing. The mean of all measurements was taken as Pao2. The difference between the mean Pao2 of SL-ETT and DL-ETT was calculated.

RESULTS. After recruitment, gas in lungs (CT, n=4) amounted to 1462(1356/1558)ml and Pat2 to 532/290/628mHg [mean/min/max]. The suction flow of 20l/min effective a dp of the DL-ETT of 8.07/5.85mbar and a relevant reduction of Pat2 and lung volume not seen with SL-ETT.

CONCLUSION. The DL-ETT technique is promising for ventilating patients with acutely injured lungs. Reduction of lung volume (= alveolar collapse) and subsequent re-recruitment, potentially damaging to lung tissue, can be reliably avoided even during suctioning.

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ENDOTRACHEAL TUBE INTRALUMINAL DIAMETER NARROWING AFTER MECHANICAL VENTILATION
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INTRODUCTION. Adherence of secretions on the endotracheal tube (ETT)inner surface during mechanical ventilation is a frequent event among intubated patients although data about it’s incidence and relevance is lacking. Implications on delay of weaning and development of pneumonia remain unknown. Our objective was determine the ETT inner diameter reduction after mechanical ventilation using acoustic reflectometry.

METHODS. We prospectively analyzed 115 ETT from 97 critically ill patients intubated for more than 12 hours in a medical-surgical ICU during a 6 month period. Six ETT were discarded (HME) were routinely used in all patients (Higroster, DAR Mallinckrodt Italy). Acoustic reflectometry technique was made within the first hour after the ETT was removed from the patient to measure its inner volume at 13 cm from Murphy hole. We analyzed intubation days and reflectometry technique was made within the first hour after the ETT was removed from the patient. We prospectively analyzed 115 ETT from 97 critically ill patients intubated for more than 12 hours in a medical-surgical ICU during a 6 month period. Six ETT were discarded (HME) were routinely used in all patients (Higroster, DAR Mallinckrodt Italy). Acoustic reflectometry technique was made within the first hour after the ETT was removed from the patient to measure its inner volume at 13 cm from Murphy hole. We analyzed intubation days and reflectometry technique was made within the first hour after the ETT was removed from the patient. We prospectively analyzed 115 ETT from 97 critically ill patients intubated for more than 12 hours in a medical-surgical ICU during a 6 month period. Six ETT were discarded (HME) were routinely used in all patients (Higroster, DAR Mallinckrodt Italy). Acoustic reflectometry technique was made within the first hour after the ETT was removed from the patient to measure its inner volume at 13 cm from Murphy hole. We analyzed intubation days and reflectometry technique was made within the first hour after the ETT was removed from the patient.

RESULTS. ETT analyzed had a median of 4 intubation days (range 12 hours - 25 days). Two patients were considered to have clinical ETT obstruction before extubation. We observed a significant reduction of the actual effective volume when compared with theoretical volume (5.46 ± 1.21cc vs 6.59 ± 0.74cc; p<0.05) of ETT of the same size. This implies a effective volume mean reduction of 18%. ETT inner narrowing was superior to 10% in 67/115 cases. The remaining inner diameter was < 6.5mm in 20% of the ETTanalyzed. No significant correlation was observed between intubation time and the degree of ETT narrowing (r = 0.0229, p=n.s.) Peak pressure measured just before extubation did not correlate with the degree of ETT narrowing (r = 0.127, p=n.s.).

CONCLUSION. Acoustic reflectometry identified an ETT occlusion no suspected clinically. Narrowing of the ETT happened within the first intubation hours/days. Such occlusion could worsen work of breathing and delay weaning in 1/6 patients.
THE SAFETY OF FANTON’S TRANSARYNGEAL TRACHEOSTOMY IN “DIFFICULT NECK” OR COAGULATION DISORDERS.

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INTRODUCTION. Percutaneous Dilatational Tracheostomy (PDT) has become an increasingly standard procedure in many ICU’s. Three PDT methods are in use, each with a relatively commercial kit: Griggs, Ciaglia and Fantoni (TLT) technique. An ongoing debate centres on which percutaneous technique should be used. Several papers have been published leading to different conclusions regarding procedural, early and late complications of these three techniques. Very often patients with neck problems or coagulation disorders were excluded from these studies in particular when the Griggs or Ciaglia technique was used in order to avoid potential risks such as tracheal laceration, false passage and vessels injury provoked by pushing rigid dilating probes against delicate anatomical structures of the neck. The aim of this study was to assess the difficulties and complications of TLT in 34 patients for whom other percutaneous techniques were problematic or contraindicated.

METHODS. Among 263 patients, aged 16-81, who underwent elective TLT from September 1996 to December 2002 in our ICU, 9 had coagulation disorders and 25 presented neck deformities (obesity, short neck, tracheal deviation, enlargement of thyroid gland). Exclusion criteria, in all cases, consisted of the inability to obtain transillumination of the trachea.

RESULTS. The mean operating time, defined as the interval from puncture of the trachea to the positioning of tracheostomy cannula, was 16 min. There were no procedural complications, in particular: no bleeding, no posterior tracheal wall injury, no loss of airway. In 10 patients who required prolonged ventilation, we observed superficial stoma infections which were successfully managed with local measures.

CONCLUSION. The important feature of TLT is the way in which tracheal dilation is carried out, from inside to outside of the trachea by means of an original device (cone-cannula set) which acts as well as a dilator and carrier of tracheostomial cannula. This reduces local trauma and results in a very neat stoma which adheres tightly to the cannula with a reduced risk of infection and a virtual lack of bleeding. None of the other PDT has these advantages because squashing of the trachea is inevitable with the outside-inside direction of the dilation manoeuvre and the possibility of complications especially when anatomical landmarks are not clear or when coagulation disorders exist. The absence of complications in our series of patients proved that, in expert hands, TLT is a safe, quick and simple procedure even for those patients for whom other PDT can prove to be dangerous.

ENDOSCOPICALLY GUIDED PERCUTANEOUS TRACHEOSTOMY IN THROMBOCYTOPENIC PATIENTS

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INTRODUCTION. Tracheostomy is considered the airway management method of choice for patients in the intensive care unit (ICU) who require prolonged mechanical ventilation or prolonged tracheal intubation. Thrombocytopenia, a frequent problem in ICU patients, is considered a relative contraindication for tracheostomy. Several studies have reported that percutaneous tracheotomy (PT) techniques are associated with lower risk of bleeding than open tracheotomy (1, 2). In this study, we evaluated PT-related hemorrhagic complications in thrombocytopenic ICU patients in order to assess whether thrombocytopenia is associated with an increased risk of bleeding.

METHODS. We reviewed the charts of 55 ICU patients who underwent PT in the period of May 2001 through January 2003, and investigated the cases with platelet count <75,000 mm-3. All PTs were performed at bedside by experienced staff anaesthesiologists, and each procedure was done under endoscopic guidance using the Griggs forceps dilatational technique. Demographic data, indications for tracheostomy, durations of endotracheal intubations, coagulation profiles, and Acute Physiology and Chronic Health Evaluation II (APACHE II) scores were recorded, and PT-related morbidity and mortality were determined.

RESULTS. Eleven of the 55 patients had platelet counts <75,000 mm-3. In this group, the means for patient age, body weight, and APACHE II score were 57±23 years, 67±12 kg, and 30±12, respectively. The indications for PT were prolonged mechanical ventilation due to acute respiratory failure (n=8) and airway protection (n=3). The mean duration of endotracheal intubation before PT was 9±3 days. The respective mean values for platelet count, international normalized ratio, and activated partial thromboplastin time were 53,000±12,000 mm-3, (range, 28,000 to 73,000 mm-3), 1.46±0.18, and 38±13 s. There were no deaths associated with PT in the 11 cases, but two patients suffered transient hypoxemia during the procedure. The only PT-related hemorrhagic complication was mild extratracheal bleeding (n=2). There was no other PT-related morbidity.

CONCLUSION. The results suggest that thrombocytopenia is not a contraindication for PT. We conclude that PT performed by skilled operators under endoscopic guidance should be the method of choice for prolonged airway management in thrombocytopenic ICU patients.

REFERENCE(s). 1. Mittendorf EA, et al. Am Surg 2002;68:342. 2. Beiderlinden M, et al. Intensive Care Med 2002;28:59

TRANSLARYNGEAL VERSUS DILATATIONAL PERCUTANEOUS TRACHEOSTOMY: FEASIBILITY OF THE ENDOSCOPIC CONTROL

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INTRODUCTION. The risk of posterior tracheal wall injury or paratracheal puncture during non surgical tracheostomies justifies the endoscopic control of the airway. The feasibility of this procedure is ideally continuous to improve safety, has not been fully assessed in the ICU setting to our knowledge.

METHODS. We prospectively assessed the feasibility of airway control using a fiberoptic bronchoscope during 56 consecutive tracheostomies, in two medico-surgical ICUs. Patients were tracheotomized using translaryngeal way according to Fantony (TLT, 26 patients) or Griggs, using guidewire forceps (PDT, 30 patients). Each procedure was performed by two operators, one was devoted to secure airways, endoscopic control, ventilator settings adjustment, under anaesthesia and controlled ventilation (FG0=1). Four steps were evaluated: positioning tracheal tube distal tip short the vocal cords (PDT), transilluminate trachea before puncture, rotating new cannula (TLT), tracheal dilatation (PDT), positioning new cannula upper the carina.

RESULTS. Patients (median values): Age 52 years, SAPS II 48, intubation time 12.7 days. Endoscopic control of initial positioning was possible in all cases (incidents: loss of airway requiring emergency intubation, two patients, impaired ventilation 4 patients). Transilluminate the trachea was always possible (ventilation problems, 4 patients) as well as the dilatation step (tracheal haemorrhages requiring bronchial clots aspiration, 4 patients, cartilage injury cranial to osomy 5 patients). Checking cannula rotating step was possible in 10 TLT patients (impaired ventilation and haemorrhages, 5 patients). In cases with critical hypoxia following inhalation of clots, bronchial access with the fibroscope required new intubation in 3 TLT patients. Final cannula positioning was always feasible.

CONCLUSION. Without to prejudge from the respective results of both techniques, the loss of airway control inherent to translaryngeal tracheostomy impairs the feasibility of its continuous endoscopic control, as opposed to dilatational tracheostomy. Reasonable experience in difficult airway control is required in both techniques to achieve safety.
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CLINICAL CHARACTERISTICS AND OUTCOMES FOR PATIENTS REQUIRING TRACHEOSTOMY IN A GENERAL ICU
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INTRODUCTION. Tracheostomy has been performed in general ICUs in a routine manner. However there is still concern about the best technique, moment or safety of this procedure. The aim of this study was to describe clinical characteristics and outcomes for patients requiring surgical tracheostomy in a general ICU

METHODS. Design: Prospective cohort study. Setting: Intensive care unit of Complexo Hospitalar Santa Casa, a teaching hospital. Patients: 90 consecutive patients requiring surgical tracheostomy in an ICU. Interventions: Prospective patient surveillance and data collection.

RESULTS. 54 patients were male and the mean age was 60±18 years. The ICU mortality rate was 40% (36/90) with a mean APACHE II of 19.6±6.8. The main primary indications for tracheostomy were neurological dysfunction (n=49) and weaning failure (n=30). Among patients who fail to wean, 24 had moderate to severe neurological dysfunction (Glasgow coma scale <11). When tracheostomy was indicated the mean Glasgow coma was 4±3.0 and the mean number of days of intubation was 18±11 days. Most patients (n=58) had a tracheostomy before 21 days of intubation. The mean number of extubation attempts was 1.7±0.9 but in 32 patients the decision to perform tracheostomy was not based on extubation failure. The mean ICU stay after tracheostomy was 28±7.6. Only one patient had a major complication (pneumothorax) attributed to the procedure. The survivors had a greater Glasgow coma scale when compared to non-survivors (9.7±3.0 vs. 8.8±3.0).

CONCLUSION. These data show like others that the main indications for tracheostomy are neurological dysfunction and weaning failure. Despite having longer stay in the ICU, these patients had few complications. In our ICU, tracheostomy has been performed earlier when a risk factor has been identified. It seems obvious that patients with moderate to severe neurological dysfunction can benefit of tracheostomy earlier in their ICU stay.

REFERENCE(S). Kollef MH, Ahrens TS, Shannon W. Clinical predictors and outcomes for patients requiring tracheostomy in the intensive care unit. Crit Care Med 1999; 27:1714-20.

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PERCUTANEOUS TRACHEOSTOMY WITH DILATING FORCEPS (GRIGGS METHOD): A REPORT ON 742 CONSECUTIVE CASES
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INTRODUCTION. Percutaneous tracheostomy is gaining acceptance in Intensive Care Units (ICU). The Griggs percutaneous tracheostomy (PT) kit with dilating forceps has been subject to few investigations. The objective of the study is to assess the feasibility and safety of this method.

METHODS. We prospectively studied 742 consecutive PT on 729 critically ill patients, 509 males and 220 females, performed between September 1996 and March 2003. Mean age: 58.2 (range 15-86). Twenty-seven of them had a previous tracheostomy, 108 patients had coagulation disorders and 125 had PaO2/FIO2 <200. Seven PT were made as an emergency. The procedures were performed by ICU staff or residents.

RESULTS. Underlying conditions were neurological in 240 patients (33%), acute or chronic respiratory failure in 212 patients (29%), postoperative respiratory failure in 164 patients (22%), and other conditions in 113 patients (16%). The 742 PT were performed by 36 ICU staff or residents. The mean duration of the procedure was 6.5 minutes (range 55 seconds-34 min) and for those physicians with more experience, mean duration was 3.5 minutes. All the procedures were successfully completed. There were no complications in 625 PT (84%). Peroperative complications occurred in 94 PT (13%): minor bleeding 31 cases, transient hypoxemia (SpO2<90%) 25, accidental extubation of the transglaryngeal tube 19, cuff puncture of the endotracheal tube 19, anesthesiologist 6, subcutaneous embolus 4, cardiac arrest who recovered 3 (secondary to extubation and secondary to cannula malposition 1), tracheoesophageal fistula 3. Postoperative complications occurred in 26 patients (3%): minor bleeding 14, major bleeding (requiring surgical haemostasis or transfusion) 3, stomal infection 5, atelectasis 1, tracheoesophageal fistula 1, difficult cannula change 2 one of them with cardiac arrest and death of the patient.

CONCLUSION. Based on our results, PT with the Griggs technique is a simple and rapid bedside procedure with a low complication rate. There is a learning curve for the technique.

REFERENCE(S). Griggs WM. Surg Gynecol Obstet 1998; 170:543.

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PROLONGED MECHANICAL VENTILATION: EARLY OR DELAYED TRAQUEOTOMY?
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INTRODUCTION. There are controversies about when tracheostomy should be performed in patients requiring prolonged mechanical ventilation (MV). The aim of our study was to describe the clinical characteristics and outcome in this kind of patients, as well as the differences between those who underwent early or delayed tracheostomy.

METHODS. Prospective observational study involving all patients (n=75) admitted in a surgical-medical ICU requiring MV for more than 7 days from October 2001 to June 2002. Tracheostomy was performed in 59 patients (78.7%) and it was decided by physician in charge. Patients were divided into 3 groups. Group 1: with no tracheostomy. Group 2: tracheostomy performed before the 10th day. Group 3: tracheostomy performed from 10th day. Characteristics of the patients, duration of MV, length of stay (LOS), need of sedation and antibiotics, respiratory infections, complications related to endotracheal intubation (CREI), mortality, APACHE III and predicted mortality (PM) were studied. Statistical analysis: ANOVA, Kruskal Wallis, Chi-Square.

RESULTS. The mean age was 56±22.79. Twenty one patients (28%) had neurological disease, twenty nine (38.7%) had respiratory disease and twenty five (33.3%) formed an heterogeneous group (HG).

REFERENCE(S). Griggs WM. Surg Gynecol Obstet 1990; 170:543.
INTRODUCTION. ASV is a close-looped mode to maintain the preset minute volume with the patient’s breathing rate decreased sharply. We found that at P+20, Pressure Time Product (PTP) was lowest, and machine rate is then add on 20%MV (P+20) decrease 20%MV (P-20), turn back to 100% ASV as the end.

RESULTS. We found that at P=20, Pressure Time Product (PTP) was lowest, and machine rate is higher. The PTP is inversely correlated with %MV. Once the machine rate is larger than zero, the patient’s breathing rate decreased sharply.

CONCLUSION. The appropriate minute volume is reached once the machine rate is larger than zero, especially when the %MV addition with 20% more in amount.

REFERENCE(S). 1. Tschächer H, et al. AJRCMM 2001; 164(6):614-619.
2. Ranieri VM, et al. JAP1996; 81(1):426-436.
3. Tassaux Diet al.. CCM 2002; 30(4):801-7.
4. Sulzer CF, et al. Anaesthesiology 2001; 95(6):1339-1345.

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DOES THE INTRODUCTION OF PICCO CHANGE FLUID AND CATECHOLAMINE THERAPY IN SEVERE THORACIC TRAUMA?
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INTRODUCTION. Prospective evaluation of the influence on catecholamine and fluid therapy, introducing the PICCO® monitor (Pulsion Medical Systems, Germany) in patients with severe blunt chest trauma induced ARDS.

METHODS. With informed consent and approved by the ethics committee two groups, each including 15 patients, meeting the criteria (blunt thoracic trauma, Murray score >2, 3, APACHE II >30) before (grp1) and after (grp2) the introduction of PICCO into our clinical routine were enrolled. All patients were treated according to a standardized therapeutic regime for trauma patients at our ICU. Volume and catecholamine therapy were eligible. In grp1 fluid and catecholamine therapy was done by routine monitoring. Grp2 patients were treated according to the PICCO® system. Ventilatory status, catecholamines, fluid balance and haemodynamic data were monitored each hour, scoring once a day. Statistics was done by ANOVA and t-test.

RESULTS. Both groups were comparable to demographic data and trauma severity (Murray>2, 3) at the start of the study. In grp1 and after (grp2) the introduction of PICCO into our clinical routine 3 out of 15 patients were excluded. Administration of fluid was significantly reduced in grp2 (days+1-30: grp1: 23±4,3, grp2: 22±4,1). The most common causes of ARDS were: pneumonia (35%), intraabdominal sepsis (39%), multiple trauma (15%), severe brain injury 2%. Overall mortality rate of ARDS patients was 64% (36/55), and in patients without ARDS was 26% (52/199), (p<0.001), and 19±13 days (p<0.001), respectively. The most common causes of ARDS were: pneumonia (35%), intraabdominal sepsis (39%), multiple trauma (15%), severe brain injury 2%. Overall mortality rate of ARDS patients was 64% (36/55), and in patients without ARDS was 26% (52/199), (p<0.001). Multiple organ failure developed 47 of out 55 ARDS patients (84%).

CONCLUSION. The incidence and mortality of ARDS is high. The fact that ARDS was diagnosed throughout the ICU stay of the patient and not only at admission may partly explain the high incidence detected.

REFERENCE(S). 1. Murray, C., et al. JAMA 1993; 270: 1236-1240.
2. Dellinger RP, et al. JAMA 2001; 285: 1867-1874.
3. Ranieri VM, et al. JAP1996; 81(1):426-436.
4. Tassaux Diet al.. CCM 2002; 30(4):801-7.
5. Sulzer CF, et al. Anaesthesiology 2001; 95(6):1339-1345.
**Poster Session**

**Neuroendocrinological aspects of sepsis – 583-596**

**583**

**FEVER CONTROL IN SEPTIC SHOCK: BENEFICIAL OR HARMFUL?**

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**INTRODUCTION.** Fever is the primary host defense mechanisms of life and an energy-dependent process. Heat shock proteins (HSP) may have protective effects. Without knowing whether fever is blessing or curse, antipyretics are widely used. The aim of this study is to investigate whether utilization of acetylmethionine and external cooling to control fever in ewe septic shock model is beneficial and influence HSP70.

**METHODS.** Twenty-four fasted, anesthetized, invasively monitored, mechanically ventilated female sheep (27±4.6 Kg) received 0.5 g/kg body weight of feaces into the abdominal cavity to induce sepsis. Ringer's lactate (RL) was titrated to maintain pulmonary artery occlusion pressure (PAOP) at baseline level throughout the experimental period without any antibiotics and vasoactive drugs utilization. After surgical operation, randomization was performed as following: if temperature> 36.0°C, the animal was placed in the hypothermia group; the other animals were randomized to three groups: high fever (T>37.0°C), mild fever (37.0°C<T<37.8°C) and normothermia(36.0°C<T<37.0°C) group. Acetaminophen 25 mg/kg 4-6 hours combined with external cooling (ice pad) was used to control core temperature in the expected range. Hemodynamic, mechanical ventilation parameters, and gas exchange values were obtained every hr. Plasma samples were obtained every four hrs for HSP70 measurement (Hsp70 ELISA Kit, Stressgen, Canada).

**RESULTS.** Survival time was longer in the fever group (25±3 hrs) than in the mild fever group (17.7±3.5 hrs), normothermia group (16.0±1.9 hrs) and hypothermia group (18.5±2.5 hrs). Plasma samples were obtained every four hrs for HSP70 measurement (Hsp70 ELISA Kit, Stressgen, Canada). Without knowing whether fever is blessing or curse, antipyretics are widely used. The aim of this study is to investigate whether utilization of acetylmethionine and external cooling to control fever in ewe septic shock model is beneficial and influence HSP70.

**CONCLUSION.** In this septic shock model, febrile response had beneficial effects on the CONCLUSION.

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**SEASONAL VARIATION IN WHOLE BLOOD CYTOKINE PRODUCTION AFTER LPS STIMULATION IN NORMAL INDIVIDUALS**

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**INTRODUCTION.** Biologic rhythms are found in the immune system (circadian, circaseptan, circannual), which has important clinical applications in medical practice, including the establishment and interpretation of reference values (1). Sepsis is associated with a refractory state characterized by a reduced capacity of monocytes to produce pro-inflammatory cytokines after re-stimulation with LPS ex vivo (“LPS tolerance”) (2). Monocytic ex vivo capacity to produce pro-inflammatory cytokines in response to LPS (whole blood and ELISA) has been suggested as a measurement of immunocompetency in patients with sepsis (3).

**METHODS.** We examined seasonal differences in whole blood cytokine production after LPS stimulation in 17 healthy volunteers. We first established a dose and time response curve for TNF-α production after LPS stimulation of whole blood. We selected 500 pg/ml of LPS for incubation period of 4 hr to stimulate 100 microl of whole blood of the same subjects in June, September, February, and March.

**RESULTS.** We found no differences in the circulating total WBCs and differentials between different seasons. Cytokine levels are shown on the table.

| CYTOKINE | June | September | February | March |
|----------|------|-----------|----------|-------|
| TNF-α   | 681±47.1 | 344±35.9 | 813±34.1 | 751±36.5 |
| IL-6    | 1275±234.4 | 646±119.1 | 1362±253.1 | 1335±118.1 |
| IL-10   | 4.1±0.4 | 4.2±0.3 | 9.5±3.2 | 9.4±2.2 |
| TNF-R1  | 500.3±14.3 | 469±7±12.3 | 140±7±9.9 | 142±8±4.1 |
| S100B   | 758±31.2 | 143±35.4 | 143±35.4 | 143±35.4 |

**VALUES ARE EXPRESSED AS MEAN ± SEM (pg/ml). * STATISTICALLY DIFFERENT P<0.005**

**CONCLUSION.** In early summer there is a predominating pro-inflammatory response, which is counterbalanced in autumn. These results may have significant implications in the determination of reference values, in exploration of immune response between different seasons, in determining LPS tolerance and planning clinical trials and immunomodulatory therapies.

**REFERENCE(S):**
1. Haus E. (1999) Chronobiology International 16(5):581-622.
2. Docke WD. (1997) Nat Med 3:678-681.
3. Volk HD. (1999) Eur J Surg Suppl 584:708-725.

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**CLINICAL SIGNIFICANCE OF THYROTROPIN AND THYROID HORMONE PLASMA CONCENTRATIONS IN SEPTIC PATIENTS.**

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**INTRODUCTION.** Septic shock is the reason of human body organ dysfunctions including the hormonal system. There are abnormal thyroid hormones releasing as well. Unfortunately clinical value of these changes is unknown yet. It is also noticed that sepsis caused serious disturbances in pituitary-thyroid axis function. This is called euthyroid sick syndrome (ESS). The aim of this study was to qualify the prognostic value of thyroid hormones serum concentrations changes in patients with septic shock. We also hope that thyroid hormone mechanism of action recognition in the septic shock could help in treatment of these patients.

**METHODS.** 30 patients with septic shock were included into the study. Septic shock was diagnosed according to ACCP/SCCM criteria. The study group was divided into two subgroups: survivors (n=15) and non-survivors (n=15). 20 healthy volunteers served as controls. Blood for analysis was taken at the moment of septic shock recognition and on the 1st, 2nd, 5th and 10th day of the observation between 8.00 a.m. and 9.00 a.m. We studied thyrotropin (TSH), free triiodothyronine fraction (fT3) and free thyroxin fraction (fT4) serum concentrations, APACHE II and APACHE III scores, acute lung injury (ALI) or acute respiratory distress syndrome (ARDS) appearance.

**RESULTS.** We noticed significant decrease of fT3 and TSH serum concentrations (respectively 2.34±0.79 pg/ml and 0.76±1.12 mU/l) according to the control group (respectively 3.28±0.61 pg/ml and 0.95±0.46mU/l). Non-survivors had significantly lower TSH serum level (0.37±0.62 mU/l) in comparison to survivors (1.27±0.45 mU/l) in spite of very similar fT3 serum level (respectively 2.45±0.87 pg/ml and 2.22±0.66 pg/ml). It could mean that there were disturbances in the pituitary-thyroid axis function in patients who did not survive. Our study did not show any correlations between thyroid hormones serum concentrations and APACHE II and APACHE III scores, ALI or ARDS.

**CONCLUSION.** This study shows that low TSH serum level may be useful as a significant prognostic factor of death in patient with septic shock especially with low fT3 serum level. The results also suggest that there is a need to better development of pituitary TSH realising disturbances.
INTRODUCTION. A few studies have reported that low doses of hydrocortisone (HC) may rapidly improve hemodynamics and reduce the time to vasopressor cessation in septic shock, but none has focused on this effect in acute pancreatitis. We therefore performed this study to assess the effects of HC on catecholamine-dependent shock among patients with severe acute pancreatitis.

METHODS. Retrospective, case controlled study among 10 patients with severe acute pancreatitis. The control group comprised 11 patients with the same severity of circulatory shock according to the norepinephrine support required.

RESULTS. The patients in the HC group were weaned off norepinephrine in a significantly shorter time (61 h in HC group vs. 141 h, p<0.01). The HC group received significantly less norepinephrine (area under curve of norepinephrine dose, p=0.041). The reduction in norepinephrine dose was comparable at 24 h being -0.051 (-0.208 to 0.022) mg/kg/min in the HC group vs. -0.026 (-0.150 to 0.030) mg/kg/min in the controls (p=0.307), and at 48 h with respective figures of -0.206 (-0.317 to -0.102) mg/kg/min and -0.103 (-0.178 to 0.029) mg/kg/min (p=0.072), from the start of HC administration. The reference point for the control group was the time point at which the dose of norepinephrine exceeded 0.3 mg/kg/min.

CONCLUSION. Low doses of HC seem to shorten the time to vasopressor cessation and rapidly reduce the need for norepinephrine support in patients with hemodynamic shock associated with severe acute pancreatitis.

REFERENCE(S).

HYDROCORTISONE INDUCES HYPERNATREMIA

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INTRODUCTION. On the basis of recent trials corticosteroids have regained a place in sepsis treatment. Past trials found no benefit of very high doses of methylprednisolone, a steroid with pure glucocorticoid action. Recent research indicates that steroids with mixed glucocorticoid and mineralocorticoid action (i.e hydrocortisone;HCN) may be beneficial in patients with sepsis shock. We investigated if HCN induces hypernatremia.

METHODS. At our surgical ICU, HCN was mainly administered to patients with severe or prolonged dependency on noradrenalin. In our protocol HCN was started in a dose of 3x100 mg iv. Fludrocortisone was not used. The start and stop dates of HCN, as well as the HCN dose were recorded. Parameters of myocardial function and haemodynamic parameters did not change significantly except for heart rate (109 ± 6 vs. 89 ± 17 ; p<0.05(Table 1).

RESULTS. After administration of HCN, NE requirement fell significantly from 1.4 ± 0.7 to 0.2 ± 0.2 mg/kg/min (Wilcoxon test, p<0.01) after 45.5 ± 28.6 hours. Parameters of myoccardial function and hemodynamic parameters did not change significantly except for heart rate (Table 1).

CONCLUSION. Low dose HC does not affect myocardial function in patients with septic shock.

REFERENCE(S). Reference: 1. Annane D et al. JAMA 2002; 288: 862-71.
RESULTS. An MODS was defined by an APACHE score (AP2) of 20 or above. 9 patients were:

younger patients (G1 18 to 39 y), middle-age patients (G2 39-60 y) and older patients

variability (HRV), baroreflex sensitivity (BRS) and chemoreflex sensitivity (CRS) as markers of

We enrolled 105 consecutive MODS patients into the study and assessed heart rate

METHODS. 41 patients with hyperdynamic septic shock according to the consensus criteria were

included in the study and randomised to receive hydrocortisone (0.18 mg/kg body weight) or

placebo. After a short synchon test study medication was started. Time to cessation of

vasopressor support was documented. The SOFA (sequential organ failure assessment) score was

performed daily. Blood for cytokine measurements was drawn before medication was started and

consecutively on day 1, 3, 5, 7, 9, 14 and 28.

RESULTS. Of all pats 72% fulfilled criteria of adrenal insufficiency (i.e. a rise in cortisol plasma

level of < 200 nmol after 0.25 mg ACTH). Time to shokk reversal was significantly (sig.) shorter in

the HC group compared to placebo (53 hrs. vs. 120 hrs; p<0.02). After 48 hrs sig. less pats were in

septic shock in the HC group (9 pats) compared to placebo (19 pats) (p<0.05). This

hemodynamic effect was more marked in the pats with adrenal insufficiency compared to pats

with normal adrenal reserve, though not statistically sig.. Also, morbidity (as assessed by the

SOFA score) was improved in the HC treated pats (after 48 hrs: 8 vs. 12; p<0.05). Mortality was

not different between the two groups (p=0.2). The level of the proinflamitory cytokine IL-6 was sig.

lower during days 1 and 5 the pats treated with HC compared to placebo (p<0.05).

CONCLUSION. Although mortality was not different between the two groups, low dose HC did sig..

improve hemodynamics (time to shockk reversal) in pats with hyperdynamic septic shock. Also,

morbidity and cytokine response were positively influenced. This beneficial effect was more

evident in those pats with impaired adrenal reserve, however, not sig. Therefore, larger multi-

centre trials including cytokine measurements are needed.

INTRODUCTION. The development of a MODS is characterized by an overwhelming activation

of the innate immunity leading to neural, inflammatory, metabolic and neuroendorine

disturbances. The resulting autonomic dysfunction (AD) may well contribute to the aggravation of

these disturbances. We investigated the changes in septic patients with high catecholamines. After

stimulation, testosterone, 17-estradiol and DHEAS remained constant, whereas progesterone and 17-OH progesterone increased (p<0.01) in all groups without significant difference. In control or cardiogenic patients stimulation leads to significantly increasing values of cortisol (p<0.05). In patients with sepsis the increase of cortisol (p<0.01) was blunted, however. This diminished cortisol stimulation was independent of the use of sedatives. In cardiogenic patients the increase in cortisol levels after stimulation was similar to control (15±g/dl) not influenced by increasing dosage of catecholamines but in septic patients the increase was blunted especially in patients with high catecholamines. The increment of serum cortisol after stimulation in septic group was correlated inversely with baseline progesterone and 17-OH progesterone but not with baseline cortisol levels.

CONCLUSION. At baseline, patients with septic or cardiac shock had higher progesterone, higher 17-OH progesterone but only slightly elevated cortisol levels compared to control. Septic patients showed diminished response to cortyotropin stimulation regarding cortisol levels despite a normal increase of cortisol precursors progesterone and 17-OH progesterone. This impairment of cortisol synthesis at the level of the enzymes 21-hydroxylase or 11-hydroxylase should impair the aldosterone synthesis as well.
INTRODUCTION. Autonomic dysfunction appears frequently in patients at the ICU, especially in sepsis. Heart rate variability (HRV) is a window on central autonomic regulation which enables to investigate the activity of the autonomic nervous system. This phenomenon is caused by oscillation in the interval between consecutive heart beats. S日内gaussia results in a decrease of HRV and is proposed as method to estimate the depth of sedoanalgesia. The aim of our study was to estimate the extent of the autonomic dysfunction in patients with septic shock.

METHODS. We investigated 22 patients (mean age 46), 9 with severe sepsis and catecholamines administration and 13 without (control group) in an observational study who received a continuous sedoanalgesia (Midazolam, Fentanyl) to achieve tolerance for mechanical ventilation corresponding to a Ramsay-Score between R2 and R3 at a SIUC. Dosage of sedoanalgesics was unchanged during 24h-registration with a flash-memory recorder (Ela-medical, Munich). T-test was used for statistical analysis (SPSS®).

RESULTS. All patients showed decreased parameters of HRV as a result of sedoanalgesia. The patients with severe sepsis and catecholamines showed a significant reduction of all frequency domain parameters in comparison to the total (control power [TP] 93.7±11.7 vs. 269±32.7, low frequency [LF] 9.3±2.12 vs. 46.7±2.9, high frequency [HF] 19±2.2 vs. 85±19.8 (mean±SEM for all parameters, the dimension of all parameters is [ms2]). The control patients showed a lasting day-night rhythm with a significant increase of HRV during daytime (TP 154.6 vs. 357.8; LF 18.6 vs. 68.3; HF 18.5 vs. 141.3), while those with severe sepsis and catecholamines showed nearly equal parameters of spectral analysis during night- and daytime (TP 72.1 vs. 108.2; LF 10.1 vs. 8.4; HF 20.2 vs. 16.7).

CONCLUSION. S日内gaussia results in a well known decrease of the autonomic tone corresponding to a downregulated HRV. Patients with severe sepsis show a marked impairment of HRV in comparison to a control group with an equal level of sedation and moreover seems to lose their day-night-rhythm. The plain impairment of HRV and in particular the loss of circadian rhythm is not only explainable with the administration of catecholamines. Reduced HRV as a marker of autonomic dysfunction reflects the loss of biological oscillation in patients with severe sepsis.

INTRODUCTION. The multiple organ dysfunction syndrome (MODS) is the consequence of failure of several organ systems after a trigger; event like sepsis or cardiogenic shock with a high mortality of up to 70%. Autonomic dysfunction (AD) may substantially contribute to the development of MODS [1]. Our study aimed to characterize the AD by several techniques and to check the accuracy of AD in predicting 28 day mortality (28DM) and in hospital mortality (HM). METHODS. We enrolled 90 consecutive MODS patients into the study and assessed heart rate variability (HRV). One of the most common markers of autonomic dysfunction is heart rate variability (HRV), a baroreflex sensitivity (BRS) and chemoreflex sensitivity (CRS) as markers of AD according to the international standards (summary in [2]). The patients were followed up for 28DM and HM. A MODS was defined by an APACHE score of 24 to 96 years as a predictor of mortality in MODS.

RESULTS. Total mortality after 28 days was 34% (28/85, range 3-28 days) and IHM 47% (40/85). Mean hospital survival time was 31±23.8 days (range 3-127 days). HRV parameters were: LF (28DM: CHI=0.05, IMH: CHI=0.4, p=0.04), LF/SDNN (CHI=0.4, p=0.04), LF/TP (CHI=0.4, p=0.04) and lnHF (CHI=0.7, p=0.06/ CHI=0.06, p=0.04) were the best parameters with a significant difference to the control group. Measurement of thiobarbituric acid reactive substances (TBARs) in expired breath has been reported in numerous inflammatory lung disorders in adult patients, including acute respiratory distress syndrome, pneumonia and chronic obstructive pulmonary disease. TBARs are recognized as end products of polyunsaturated fatty acid peroxidation, however, they are also formed during oxidative injury of DNA, proteins and carbohydrates [3]. In this study we tried to investigate the outcome of very low birth weight (VLBW) neonates suffered from respiratory distress syndrome (RDS) using the concentrations of exhaled TBARs.

METHODS. 21 intubated VLBW neonates suffered from RDS were enrolled into the study. Mean gestation age was 28.3 weeks (26 - 30), mean birth weight 1076 grams (780 - 1430). All neonates were ventilated using IMV or PRVC mode of ventilation. EBC was collected by cooling the additional expiratory tube for 60 minutes. During the collection of EBC, humidification of inspiratory gas was switched off. TBARs were measured by a spectrophotometric assay; readings were expressed in micromoles using the regression equation.

RESULTS. 6 of total 21 patients developed bronchopulmonary dysplasia (BPD). TBARs concentrations in EBC obtained from these patients were higher then in 15 neonates who did not suffer from BPD, and the difference was statistically significant (p<0.01). Mean concentration of TBARs in EBC from patients who developed BPD was 0.825 micromole, in contrast, TBARs levels of 11 from 15 patients who did not developed BPD were below the method sensitivity.

CONCLUSION. The results show a correlation between elevated TBARs concentrations in EBC of VLBW neonates suffered from RDS, who developed BPD. We speculate that TBARs concentrations may be useful as a biomarker of lung injury in newborn infants suffered from RDS, but further studies are needed.

REFERENCE(S). 1. Janero D.R. Malondialdehyde and thiobarbituric acid-reactivities diagnostic indices of lipid peroxidation and peroxidative tissue injury. Free Radic Biol Med 9: 515-540.

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ENTERAL VANCOMYCIN TO CONTROL METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS IN A PAEDIATRIC I.C.U.

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patients is blunted according to the “uncoupling” hypothesis of MODS development and that this attenuation has prognostic implications.

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INTRODUCTION. Measurement of thiobarbituric acid reactive substances (TBARs) in expired breath condensate (EBC) is suggested to reflect peroxidative damage in the airways. Increased TBARs exhalation has been reported in numerous inflammatory lung disorders in adult patients, including acute respiratory distress syndrome, pneumonia and chronic obstructive pulmonary disease. TBARs are recognized as end products of polyunsaturated fatty acid peroxidation, however, they are also formed during oxidative injury of DNA, proteins and carbohydrates [1]. In this study we tried to investigate the outcome of very low birth weight (VLBW) neonates suffered from respiratory distress syndrome (RDS) using the concentrations of exhaled TBARs.

METHODS. 21 intubated VLBW neonates suffered from RDS were enrolled into the study. Mean gestation age was 28.3 weeks (26 - 30), mean birth weight 1076 grams (780 - 1430). All neonates were ventilated using IMV or PRVC mode of ventilation. EBC was collected by cooling the additional expiratory tube for 60 minutes. During the collection of EBC, humidification of inspiratory gas was switched off. TBARs were measured by a spectrophotometric assay; readings were expressed in micromoles using the regression equation.

RESULTS. 6 of total 21 patients developed bronchopulmonary dysplasia (BPD). TBARs concentrations in EBC obtained from these patients were higher then in 15 neonates who did not suffer from BPD, and the difference was statistically significant (p<0.01). Mean concentration of TBARs in EBC from patients who developed BPD was 0.825micromole, in contrast, TBARs levels of 11 from 15 patients who did not developed BPD were below the method sensitivity.

CONCLUSION. The results show a correlation between elevated TBARs concentrations in EBC of VLBW neonates suffered from RDS, who developed BPD. We speculate that TBARs concentrations may be useful as a biomarker of lung injury in newborn infants suffered from RDS, but further studies are needed.

REFERENCE(S). 1. Janero D.R. Malondialdehyde and thiobarbituric acid-reactivities diagnostic indices of lipid peroxidation and peroxidative tissue injury. Free Radic Biol Med 9: 515-540.
THE IMPACT OF A PAEDIATRIC EARLY WARNING SYSTEM (PEW) ON THE CARE OF THE CRITICALLY ILL CHILD

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INTRODUCTION. The recognition and management of the critically ill child outside the intensive care setting is of critical importance. Delay leads to potentially avoidable morbidity and mortality. This abstract describes the development of a paediatric early warning system (PEW) within our hospital.

METHODS. PEW comprises a group of key physiological observations. These are classified along the A,B,C, and D approach. In addition a number of clinical conditions activate the system irrespective of physiological state. Activation leads to senior paediatric/intensive care review and initiation of treatment. A prospective evaluation of PEW through case note review for all consecutive admissions occurred over a 4-month period. Children attaining one or more PEW criteria were selected to determine if critically ill children were being correctly identified with subsequent activation of the PEW system, and if this led to a change in clinical management.

RESULTS. All 808 admissions in the time period were reviewed. 50 (6.1%) attained 1 or more PEW criteria. PEW was activated in 35 (70%). The mean time from attaining PEW criteria to activation of the system was 0.8 hours (0-6 hours). Commonest site of activation was Children’s High Dependency Unit (65%). Median time from PEW activation to senior clinician review was 0.9 hours (0.1-7 hours). In 20 (57.1%) of the activated cases, management changed following senior review. The remaining 15 (42.8%) where merely highlighted as potential problems with no intervention.

CONCLUSION. PEW is a model for the improved recognition and early management of the sick child. Although only a small proportion of paediatric admissions led to its activation, in more than half, early senior clinician involvement led to a change in clinical management and may have prevented morbidity or mortality.

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SERUM IL-1RA CONCENTRATION - IS IT USEFUL FOR DIAGNOSIS OF INTRAUTERINE INFECTIONS IN NEWBORNS?

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INTRODUCTION. To evaluate the diagnostic value and to delineate serum profiles of interleukin-6 (IL-6), interleukin-1 receptor antagonist (IL-1ra) and procalcitonin (PCT) we have analyzed their concentrations in newborns with confirmed congenital pneumonia (CP).

METHODS. IL-6, IL-1ra and PCT were measured in 10 newborns with CP at gestational age (median and interquartile range): 35(31-36) weeks and in 35 others [33(30-34) weeks] without symptomatic infection admitted to NICU. The studied markers were analyzed together with CRP, leukocyte(WBC) and neutrophils count at admission and after 24 and 72 hrs. The diagnosis of CP was based on radiological examination and clinical symptoms.

RESULTS. At admission the values of analyzed parameters did not differ between the groups with the exception of the higher neutrophils count in newborns with CP (p=0.02). The difference in the neutrophils count was also noted on the following days. The concentration of IL-6 has increased after 24 hrs only in the patients with CP while in the other patients has declined. The difference at this time was significant [135(103-315) vs 24(10-80) mg/ml respectively; p<0.02]. 72 hrs after admission IL-6 concentrations were low and of the same level in both the groups. Similar profile of changes was noticed for IL-1ra [15(7.6-36.0) vs 2.9(1.2-8.5) mg/ml after 24 hrs - p<0.01; 8(3.5-14.4) vs 2.3(1.4-4.4) mg/ml after 72 hrs – p<0.02]. PCT values did not differ between the two groups in all time points and showed transient increase 24 hrs after admission. There was no difference in respect to serum CRP levels was found after 24 and 72 hrs.

CONCLUSION. The predictive usefulness of serum IL-6, IL-1ra and PCT measurement seems to be limited shortly after delivery, but could be helpful - especially IL-6 and IL-1ra - on the following days for the diagnosis of CP.
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**SPONTANEOUS CORRECTION OF MALPOSITIONED PERIPHERALLY INSERTED CENTRAL VENOUS CATHETERS IN NEONATES**

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**INTRODUCTION.** Peripherally Inserted Central Venous Catheters (PICC) are increasingly used in the Neonatal Intensive Care Unit (NICU). Malpositioning of the PICC occurs in up to 20% of cases. Spontaneous correction of malpositioned PICC may be due to the volume of blood flowing through a large vein.

**METHODS.** We prospectively studied the malpositioning of PICC and its spontaneous correction from Feb, 2002 to Feb, 2003. Malpositioned PICC were treated as peripheral lines. Repeat X-ray were done within 24 hrs of the insertion to detect spontaneous correction.

**RESULTS.** Over our study period, we had 4 malpositioned PICC (8.7%). Case 1: (A 24 wks gestation infant). A Vygon catheter was inserted 13 cm in Rt. Basilic Vein with good blood return. The PICC was in the Internal Jugular Vein. IV rate was 6 ml/hr. X-ray, 24 hrs later showed that the catheter was in the SVC. Case 2: A baby girl born at 27 wks gestation. A Vygon catheter was inserted 10 cm in the Temporal vein with good blood return. X-ray showed the PICC coiled in Rt. Subclavian vein. IV rate was 6 ml/hr. 12 hrs later the catheter tip was in the Right Atrium. Case 3: A baby boy born at 29 wks gestation. A Vygon catheter was inserted 7 cm through the Rt. Axillary vein with good blood return. X-ray showed the catheter in Rt. Internal Jugular vein. IV rate was 5.3 ml/hr. A day later the catheter tip was in the Rt. Atrium. Case 4: A term infant, birth wt. 2450 gm, had Esophageal Atresia. A Vygon catheter was inserted 8 cm in the Rt. External Jugular vein, with good blood return. X-ray showed the tip in the Rt. Submandibular vein. IV rate was 16 ml/hr. A day later the catheter was in the SVC.

**CONCLUSION.** Our 4 cases of malpositioned PICC, spontaneously corrected. They include 3 cases where the catheters were malpositioned in large veins. The catheter tip of our 4th case was malpositioned in the Submandibular vein, yet it spontaneously corrected. We propose that: A) Spontaneous correction of malpositioned PICC is due to the combined effect of blood flow through the vein and flow of infused fluids through the catheter. B) Malpositioned PICC may be used as a peripheral line awaiting spontaneous correction which frequently occurs within 24 hrs.

**REFERENCES.** 1. Rastogi S et AL. Spontaneous correction of the malpositioned percutaneous central venous line in infants. Pediatr Radiol 1998;28:264-6.

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**INTRAOPERATIVE VOLUMEN USE IN PEDIATRIC NEUROSURGICAL PATIENTS**

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**INTRODUCTION.** The debate over colloid versus crystalloidd as the best solution for intraoperative fluid resuscitation in neurosurgical paediatric patients is not resolved. The quality of postoperative recovery between colloid and crystalloid in paediatrics with neurosurgical diseases has not been well investigated. In addition, experience of Voluven use during neurosurgical operations is absent.

**METHODS.** We investigated the effects of colloid hydroxyethyl starch Volumen 130/0.4 and crystalloidd (0.9% NaCl) resuscitation on nausea and vomiting and on the postoperative patient recovery profile. 40 paediatrics from 3 to 12 y.o. undergoing major neurosurgical operations without clinical signs of intracranial hypertension were randomized to receive 6% Volumen in saline (group 1) and 0.9% NaCl solution only (group 2) on the basis of a fluid administration algorithm. The anaesthetic was standardized.

**RESULTS.** Hemodynamic targets included maintenance of arterial blood pressure, heart rate, and urine output within a predefined range. A postoperative morbidity survey was performed at baseline and daily after surgery. The amounts of study fluid (mean SD)madministered were 750 ± 410 ml in group 1 and 1650 ± 480 ml in group 2, respectively (P=0.05, Volumen group versus 0.9%NaCl group). The colloid group had a significantly less frequent incident of nausea and vomiting, use of rescue antiemetics, severe pain, peripheral edema, and double vision.

**CONCLUSION.** We conclude that intraoperative fluid resuscitation with colloid solution 6% Volumen, when compared with crystalloid administration is associated with an improvement in the quality of postoperative recovery.

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**PROKALCITONIN AND C-REACTIVE PROTEIN FOR EARLY DIAGNOSIS OF SEPSIS IN CRITICALLY ILL NEONATES**

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**INTRODUCTION.** Sensitive, reliable and early parameters of bacterial infection are extremely valuable in diagnosis of nosocomial infections in neonatal intensive care unit. In this study prokalcitonin (PCT) and C-reactive protein (CRP) were evaluated for their diagnostic relevance in neonatal late onset sepsis. The acute-phase reactant CRP is the most common used biochemical inflammatory marker in neonatology, however its use has important disadvantage: it does not increase significantly until 24-48 hour after onset of inflammatory response. Prokalcitonin is a highly sensitive and specific early marker of bacterial infection used in neonatology from late nineties (1).

**METHODS.** In this study I have analysed inflammatory parameters in 48 newborn infants admitted to the Neonatal Intensive Care Unit in University Hospital in Lodz, who suffered from nosocomial sepsis. 17 of them had Gram negative infection and 31 had Gram positive sepsis. They were sampled for PCT and CRP levels at the time of onset of signs and 24 hours later. CRP was determined by a nephelometric method and PCT by an immunoluminometric assay.

**RESULTS.** At the onset of Gram negative sepsis 14 from 17 contaminated newborns had significantly increased CRP levels and 15 of them had increased levels of PCT. After 24 hours 100% of them had elevated CRP and PCT levels. At the onset of Gram positive sepsis only 18 from 31 neonates with positive blood culture had increased CRP levels and 28 of them had elevated concentrations of PCT. This difference was statistically significant. After 24 hours 26 of them had elevated CRP and 31 (100%) had increased PCT concentrations - this difference was not significant.

**CONCLUSION.** Measurement of prokalcitonin concentrations is useful for early diagnosis of late onset sepsis in neonates and its diagnostic relevance may be superior to that of C-reactive protein.

**REFERENCE(S).** 1. Chiesa C., Pacifico L., Rossi N. et al. Prokalcitonin as a marker of nosocomial infection in the neonatal intensive care unit. Intensive Care Med 26:S175-S177.
607 UROLOGIC ESTIMATION OF INTERNAL JUGULAR VENUS FOR PEDIATRIC CENTRAL VENOUS CATHETER INSERTION

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INTRODUCTION. It has been reported that ultrasonography-guided cannulation of the internal jugular vein (IJV) is useful in infants. However, ultrasonography transducers with high frequencies for pediatric superficial vessels are not yet widely available. When the three-dimensional position of the IJV from the carotid artery (CA) is estimated, the success rate may increase even without ultrasonography. In this study, we measured the distance between the IJV and the CA (Diss), the width of the IJV (W) and depth of it from the skin (Dep) with an ultrasound scanner and evaluated whether they could be estimated by age, height and body weight (BW).

RESULTS. Correlation of these variables with age, height and BW.

| Correlation coefficient | Diss (0°) | W (0°) | Dep (0°) | Diss (15°) | W (15°) | Dep (15°) |
|-------------------------|-----------|--------|----------|------------|---------|-----------|
| Age                     | 0.72      | 0.71   | 0.25     | 0.77       | 0.75    | 0.29      |
| Height                  | 0.77      | 0.73   | 0.39     | 0.80       | 0.77    | 0.41      |
| BW                      | 0.76      | 0.75   | 0.35     | 0.79       | 0.79    | 0.37      |

609 PRELOAD INDEXES ASSESSMENT IN PEDIATRIC PATIENTS AFTER INTRA-THORACIC PRESSURE AND VOLEMIC VARIATION

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INTRODUCTION. Intrathoracic blood volume (ITBV) reflects intravascular volumes. We studied ITBV in relation with acute intrathoracic pressure and blood volume variations.

METHODS. Patients between 6 months and 10 years old, coming to Department treated with mechanical ventilation. Exclusion criteria were: neuro-muscular chronic respiratory failure with rib cage malformations, chronic renal failure (creatinine >2mg/dl). Standard anaesthesia: Remifentanyl 0.25/μg/kg/min, Midazolam 0.2mg/kg/h. Haemodynamic monitoring using PACCO (Pulsion System, Munich, Germany) with CVC in left atrium and femoral arterial access (4F-16 cm). Parameters variations were obtained every 10 minutes. 16 patients were enrolled, with 35 haemodynamic profiles each made of the 3 times T0-T1-T2 (105 haemodynamic profiles), with record of beat-to-beat data every 10 minutes.

RESULTS. Correlation of these variables with age, height and BW.

| Correlation coefficient | sSVI-ITBV | dPMAX-ITBV | dC-ITBV | sSVV-ITBV |
|-------------------------|-----------|------------|---------|-----------|
| T0-T1                   | 0.4454    | 0.9370     | 0.7845  | 0.2095    |
| T1-T2                   | 0.7467    | 0.0945     | 0.8546  | 0.2701    |
| T2-T0                   | 0.7773    | 0.0372     | 0.8768  | 0.2335    |

608 HYPOPROTEINEMIA AND ITS RELATIONSHIP WITH RESPIRATORY PROBLEMS IN NEONATAL SEPSIS

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INTRODUCTION. Literature data show high incidence of Acute Respiratory Distress Syndrome (ARDS) in septic newborns due to hypoproteinemia and low oncotic pressure, increased microvascular permeability and edema formation. AIM: the goal of this study was to determine the correlation of hypoproteinemia with ARDS occurrence and to compare the outcome of the septic newborns depending on the serum total protein levels.

METHODS. In the study were included term newborns born on O&G Clinic in Skopje, with clinically and laboratory proven sepsis. Serum total protein levels were obtained second-daily for each baby with sepsis, beginning from the day two. The signs of ARDS were confirmed clinically, with blood gasses, and X-rays. As referral levels for all parameters were taken those from Neonatology, Roberton 1999.

RESULTS. 32 newborns with proven sepsis met the criteria for the study, 14 of which had low serum total protein levels. These formed the examined group, and the others (18) had normal protein levels. These formed the examined group, and the others (18) had normal protein levels.

CONCLUSION. The two-dimensional position of the IJV from the CA may be estimated by age, height and BW in paediatric cardiac patients.

REFERENCE(S). 1 Verghese, ST. Anesthesiology 1999;91:71-7.

610 SUCCESSFUL TREATMENT WITH TISSUE PLASMINOGEN ACTIVATOR OF SVCS IN AN INFANT WITH SEPSIS

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INTRODUCTION. We report a case of a 22-month-old female of SVC syndrome with good clinical response to recombinant tissue plasminogen activator (r-tPA).

METHODS. A 22-month-old girl was admitted with history of elevated body temperature, vomiting, lethargy, and multiple seizures localizing to the left of the body. Her Glasgow coma scale was 4. She had increased deep tendon reflexes with bilateral Babinski sign. Electroencephalographic (EEG) showed diffuse slowing with temporal epileptic activity on the right side. The presumptive diagnosis of herpes simplex encephalitis (HSE) was made and empiric therapy. Cerebrospinal fluid (CSF) obtained by lumbar puncture on day 7 revealed two lymphocytes, glucose of 72 mg/dl and protein of 60 mg/dl. The final diagnosis was made by the presence of herpes simplex virus (HSV)-specific IgM and IgG antibodies in CSF. A CVL was inserted via the left subclavian vein on day 3. Blood culture yielded positive for Candida albicans and Pseudomonas aeruginosa. She was started on antifungal therapy. Twenty four days after a CVL, and 12 days after sepsis, she developed swelling and discoloration of the head, neck, and upper body with venous distension. We considered superior vena cava syndrome (SVCS) owing to these symptoms and signs. Thrombosis of the bilateral jugular veins was diagnosed by ultrasound and computed tomography angiography. Doppler investigations showed no blood through the thrombus. Hematology and coagulation values included: platelets 263x109/L, INR 1.1, aPTT 29.2 s, PT 11.3 s, fibrinogen activity 390 mg/dl (200-400 mg/dl).

RESULTS. The CVL was removed and she received totally two doses of i.v. r-tPA at 0.5 mg/kg/day. With this regimen of two days, blood flow in the bilateral jugular veins returned to normal (recanalization), and three days after TPA treatment, the clinical features of SVCS completely disappeared.

CONCLUSION. So, we firstly preferred to conservative therapy, although SVS syndrome rarely responds to it. r-tPA by peripheral infusion was given at a dose of (0.5 mg/kg/day) for 2 days and the symptoms of our patient showed as a dramatic resolution.

REFERENCE(S). 1-Imberti R, Albertario F, Bellinzona G, Dionigi RV, Preseglio I, Mapelli A. Fibrinoletic (r-tPA) therapy for superior vena cava thrombosis in a multiple trauma patient. Acta Anaesthesiol Belg 1991;42:233-236.
INTRODUCTION. The efficacy and safety of prostacyclin (PGII) and citrate (ACD) anticoagulation were compared during continuous hemodiafiltration (CVV HDF) in patients with high risk of bleeding.

METHODS. 32 mechanically ventilated patients treated with CVV HDF were randomized to receive either PGII synthetic analogue epoprostenol (Group A, n=17) or 2.2% ACD (Group B, n=15). Patients with liver failure (serum bilirubin >100 umol/l) were given PGII. PGII was infused proximally to filter in dose 4.5-10 ng/kg/min in combination with heparin (6 IU/kg/h). Blood pump was slowed down to 120 ml/min to reach the blood flow equal to circuit filling volume per time equal to T1/2 of PGII. Patients with bleeding, decrease of thrombocytes or filter clotting within the first 10h were switched to ACD. 2.2% ACD was administered by predilution.

RESULTS. Apache II was comparable in both groups (24.3±6.0 vs 23.5±6.0, p>0.05). 39 filters were monitored in Group A. ICU mortality was 47.1% (8/17). Mean dose of PGII was 8.73±2.38 ng/kg/min. In 4 patients (23.5%) the dose had to be reduced due to hypotension. 4 patients (23.5%) were switched to ACD due to the decrease of thrombocyte count, in 1 of those bleeding ceased after changing for ACD. No death could be attributed to haemorrhage. 1 patient (5.5%) was given ACD due to frequent filter clotting. Median filter survival was 26h (16.37). 56 filters were monitored in Group B. ICU mortality was 40% (6/15). Median filter survival was 36.5 h (23.25-50), p<0.01. No bleeding episodes, decrease of thrombocyte count or haemodynamic effects were monitored.

CONCLUSION. ACD is associated with no bleeding side effects compared to PGII in thrombopenic patients in particular. It offers longer filter survival and is less expensive. Increasing the dose of PGII insignificantly prolonged filter life (1) but increased the haemodynamic side effects. These were not satisfactorily reduced by slowing the blood pump to reduce the amount of the drug entering systemic circulation.

REFERENCE/S. (1)Langeniece SA, Felfernig M, Werba A, et al: Anticoagulation with prostacyclin and heparin during continuous venovenous hemodiafiltration, Crit Care Med, 1994, Vol 22: 1774-1781

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REGIONAL CITRATE ANTI-COAGULATION DOES NOT PROLONG FILTER SURVIVAL DURING CVVH

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INTRODUCTION. Regional anticoagulation with sodium-citrate is used in patients who are at high risk of bleeding.

METHODS. All patients admitted to our 10-bed mixed ICU and requiring CVVH in the period between June 2001 and December 2002 were studied for filter survival and way of anticoagulation. For analysis, only treatments in patients where CVVH was continued until clotting of the filter were included. Postdilutional filtration was used, the filter blood flow was 200 ml/min, the ultrafiltrate volume was 2000 ml/hr.

RESULTS. During the study period 249 CVVH treatments in 47 patients were analyzed for filter survival. Mean APACHE-II score at admission was 23, mean age 65 years. Anticoagulation was

CONCLUSION. In a mixed ICU population, regional citrate anticoagulation did not prolong filter life when compared with systemic heparin anticoagulation.
615 REPEATED STRONG ION DIFFERENCE MEASUREMENT TO DETERMINE METABOLIC CORRECTION DURING CVVH
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INTRODUCTION. Restoring electrolyte and acid-base balance over time may improve hemodynamic stability. We hypothesised whether over time, during CVVH the electrolyte balance, measured as strong ion difference (SID), improves.

METHODS. In ten patients SID was measured before start of CVVH, after 12 and after 24 hours. SID was calculated from the sum of plasma concentrations of sodium, potassium, magnesium and twice ionised calcium, minus chloride and lactate. Two patients did not obtain a 24 hour period of CVVH because of clotting in the filter. Mean APACHE II was 27, mean age 75 years, 4 were male.

RESULTS. SID ranged from supranormal to subnormal values. Over time the SID range narrowed towards normal levels (figure). In the same way, bicarbonate and pH levels narrowed over time from a wide range towards slight metabolic alkalosis. The gap between SID and bicarbonate concentration decreased over time from mean 16.4 at 0 hours, to 10.5 at 12 hours and 7.98 at 24 hours.

CONCLUSION. Both electrolyte and acid base disorders, measured as strong ion difference and SID-bicarbonate gap, normalises over time during 24 hours of CVVH.

616 CARDIAC SURGERY IS ASSOCIATED WITH PREDOMINANTLY DISTAL RENAL TUBULAR INJURY.
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INTRODUCTION. Although acute renal failure due to acute tubular necrosis is common in ICU’s, its pathogenesis is unclear and the site of tubular injury (proximal/distal) is unknown. The absence of reliable markers of tubular cell injury has hampered intervention studies. Glutathion S transferases (GST) are cytosolic enzymes. The afa isoform is present only in proximal tubular cells, whereas the pi isoform is confined to distal tubular cells. Aim of the present study was to determine the extent and site of tubular injury as reflected by urinary GST enzyme excretion after cardiac surgery.

METHODS. Urinary enzyme excretion and endogenous creatinine clearance were determined 0-4 hours and 20-24 hours after cardiac surgery in 43 consecutive patients. Urinary GST-alfa and -pi were measured by an ELISA as previously described (1). Data are expressed as means±SEM.

RESULTS. We have previously shown that GST alpha- and pi/creatinine ratios in healthy volunteers range from 0.12 to 0.75 nmol/mmol and from 0.19 to 1.08 nmol/mmol, respectively (2). The patients in our study all had uneventful recovery after surgery, and none had evidence of acute renal failure (increase of serum creatinine > 25%). Urinary excretion of GST alpha was 1.1±0.3 and 0.6±0.1 nmol/mmol, whereas excretion of GST pi was 2.5±0.7 and 1.7±0.7 at the early and late time point.

CONCLUSION. There was no major increase in the urinary excretion of GST alpha in our patients after cardiac surgery compared to healthy controls. In contrast, urinary excretion of GST- pi was elevated. Our study indicates that after cardiac surgery there is evidence of tubular injury, predominantly at a distal site, even in patients without evidence of renal failure. We hypothesize that measurement of these specific enzymes might be useful for detecting subtle cell injury, and might allow to define high risk groups and enable future intervention studies.

REFERENCES. 1. Mulder TPJ et al: Clin Chem 1996; 42: 416-419. 2. Branten AJW et al: Nephron 2000; 85: 120-126.

617 CIPROFLOXACIN SERUM LEVELS MONITORING DURING CONTINUOUS VENO-VENOUS HIGH-FLUX DIALYSIS
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INTRODUCTION. Ciprofloxacin (CIP) is an antimicrobial agent that is widely used in the ICU setting, frequently as empirical therapy. The ratio of CIP binding to plasma protein ranges from 20% to 40%. To predict whether therapeutic levels for drugs with low propensity for binding to plasma protein are reached while of continuous veno-venous high-flux dialysis (CVVHF) may be a problem. The aim of our study was to determine CIP serum levels in anuric patients treated with CVVHF.

METHODS. CIP levels were monitored in four patients with anuria. Three patients had severe acute pancreatitis and one patient had anuria due to rhabdomyolysis after a trauma. CVVHF was performed on Diapact (B.Braun), with blood flow 200-300 mL/min, dialysate flow 2000 mL/hod without dialysate recirculation. The dialysis used capillary polysulphone dialyser - Ultrafax AX 600S with total surface area 1.4 m2 (Presensio). Total of 31 samples of arterial blood were analyzed. 8 samples while on CIP 400mg q12h dosage regimen, and 23 samples while on CIP 200mg q8h dosing regimen, all samples were drawn immediately prior to the administration of next CIP dose. Serum concentrations of CIP were determined using validated high-performance liquid chromatographic method (HPLC, Waters 2695), on a C8 reversed-phase cartridge column with photodiode-array detection (FDA 996, Waters).

RESULTS. Ciprofloxacin serum levels ranged while on 400mg q12h and 200mg q8h regimens from 0.41 to 0.86 mg/L (mean value 0.57) and 0.62 to 4.23 mg/L (mean value 1.85), respectively.

CONCLUSION. Administration of CIP 200mg q8h in patients treated by CVVHF under the above specified conditions reaches sufficient serum levels – ciprofloxacin breakpoint for bacteria of Enterobacteriacae family and non-fermenting gram-negative bacilli is 1 mg/L. (National Committee for Clinical Laboratory Standards) Administration of CIP 400mg q12h reached levels that might fail to maintain therapeutically sufficient MIC level in bacterial species with intermediate antibiotic susceptibility. The described analytical method is sufficiently sensitive, accurate, and fast to warrant routine monitoring of serum CIP levels.

618 ACUTE RENAL FAILURE REQUIRING HEMODIAFILTRATION IN ICU: EPIDEMIOLOGY AND PROGNOSTIC FACTORS
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INTRODUCTION. Acute renal failure (ARF) is a frequent complication of critically ill patients in the intensive care unit (ICU) often leading to renal replacement therapy through haemodiafiltration (HDF). The aim of this study was to evaluate the epidemiology, outcome and prognostic factors in critically ill patients with severe ARF requiring HDF.

METHODS. We retrospectively studied 197 consecutive patients treated with HDF over a 7-year period in a 16-bed adult multidisciplinary ICU. Demographic, biochemical, clinical, and outcome data were collected at ICU admission. ARF onset, initiation and duration of HDF were also recorded.

RESULTS. The incidence of severe ARF requiring HDF was 5.9% in the ICU. The mortality rate was 71.6%, clearly higher than overall ICU mortality during the study period (25.5%). Univariate analysis found numerous prognostic factors significantly associated with death such as Simplified Acute Physiology Score at admission, ARF onset, HDF initiation, number of Organ System Failure at ARF onset, delayed onset of ARF (ARF onset > 6 days after ICU admission), mechanical ventilation, sepsis, shock and poor haemodynamic tolerance of HDF. Chronic renal failure, urine output < 1000 mL/day at HDF initiation, high serum creatinine concentration and high variation of serum creatinine concentration during HDF predicted favourable outcome. Multivariate analysis found 3 independent factors associated with fatal outcome: mechanical ventilation, sepsis and shock requiring vasoactive medication. In contrast, 2 independent factors predicted favourable outcome: Urine output > 1000 mL/day at HDF initiation (nonoliguric ARF) and serum creatinine concentration over 34 mg/L (300microno mol/L) at ARF onset. An algorithm using the Chi-square Automatic Interaction Detector (CHAID) statistical method allowed the identification of patient groups with very different mortality rates ranging from 25 to 100%.

CONCLUSION. Severe ARF requiring HDF in our ICU was associated with a high overall mortality rate casting doubt over the effectiveness of HDF. However, our prognostic algorithm identified sub-groups of haemodiafiltrated patients with low mortality rates. In such patients, HDF appeared as an essential therapeutic contribution.
620 INSULIN-LIKE GROWTH FACTOR-I AS A MARKER OF MORTALITY IN ACUTE RENAL FAILURE PATIENTS

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INTRODUCTION. The nutritional status of acute renal failure (ARF) patients is proposed to be an important determinant of mortality. Although standard methods of nutritional assessment are used in ARF, these methods may be not applicable to this patient population. Serum insulin-like growth factor 1 (IGF-I) has proved to be a sensitive index of nutritional status. The aim of this study was to evaluate the impact of nutritional markers on mortality in ARF.

METHODS. From September 2001 to August 2002 we studied in a 24-bed ICU teaching hospital, prospectively, 55 patients admitted with ARF (serum creatinine level > 2.0mg/dl). At admission, Subjective Global Assessment (SGA), arm muscle area, triceps skinfold thickness, IGF-1 (radioimmunoassay), total cholesterol, serum albumin, transferrin and total lymphocyte count were measured. Organ function was evaluated daily according to the sequential organ failure assessment (SOFA) score. Univariate and multivariate logistic regression models were used to estimate the mortality associated with several variables.

RESULTS. The observed hospital mortality rate was 71%. Dyslipidemia was performed in 24% of the patients. Oliguria was present in 29%, sepsis in 66% and multiple organ failure in 67%. The mean APACHE II score was 21.2 ± 6.1. The mean IGF-I level among patients who died was 50.1 ± 25.5 ng/ml as compared with 71.2 ± 39.1 ng/ml in survivors (p = 0.0218). Serum cholesterol level was significantly lower in non-survivors than in survivors (83 ± 39 mg/dl vs 138 ± 44 mg/dl, respectively, p < 0.0001). Predictors associated with a high risk of death identified in this study include IGF-I < 50 ng/ml (RR, 1.6; CI, 1.12 to 2.29; p < 0.01), total cholesterol < 100 mg/dl (RR, 1.74; CI, 1.14 to 2.26; p < 0.01), sepsis (RR, 1.76; CI, 1.07 to 2.89; p < 0.01) and oliguria (RR, 1.53; CI, 1.15 to 2.02; p < 0.01).

CONCLUSION. These results strongly suggest that lower values of IGF-I and total cholesterol in ICU patients with ARF are associated with poor prognosis and may indicate need for more aggressive nutritional treatment.

REFERENCE(S). Nutrition in acute renal failure patients. Adv Ren Replace Ther. 1997;4(2 Suppl 1):S4-63. Recombinant human growth hormone in patients with acute renal failure. J Ren Nutr. 2001; 11(4):212-9

622 URINE AND BLOOD BIOCHEMICAL CHANGES IN EXPERIMENTAL GNEG SEPSIS

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INTRODUCTION. The incidence of contrast-induced nephropathy (CIN; definition: increase of serum creatinine of >0.5mg/dl within 48h after contrast-medium (CM) is highest among patients with chronic renal insufficiency. However, CIN occurs in patients with normal renal function. Therefore, we evaluated risk-factors (RF) of CIN in patients with serum creatinine levels in the upper normal range (0.8-1.2mg/dl).

METHODS. In 200 patients undergoing coronary angiography RF of CIN and baseline laboratory markers were prospectively evaluated. Follow-up serum creatinine values were determined 24h and 48h after CM. A fluid supply of at least 2L/d was advised. No medical prophylaxis was applied.

RESULTS. 1)Baseline characteristics: age 65.3±10 years; sex 73% male; creatinine 1.03±0.61mg/dl; creatinine clearance 80.6±24.9ml/min; BUN 39.1±11.6mg/dl; cystatin C 0.99±0.2mg/L; sodium 139.6±2.6mmol/L; magnesium 0.87±0.1mmol/L; amount of CM 298±162ml; EF 55.1±13%; TNT 0.005±0.003mg/ml; diabetes 23%, 10% oral antidiabetics 10%, hypertension 82%, diuretics 42%, acetylsalicylic acid 89%, clopidogrel 69%, ticlopind 100%, angina pectoris 9%, signs of ischemia in the ECG 100%, emergency 42%, intervention 46%, coronary stenting 39%. 2)Mean serum creatinine significantly increased 24h (1.16±0.2mg/dl; p<0.001) and 48h after CM (1.15±0.03mg/dl; p<0.001) compared to baseline. The incidence of CIN was 8/200 (4%). 3) The multiple regression analysis of the above-mentioned characteristics demonstrated that the use of diuretics was the only significant RF for renal impairment after CM (p<0.0092). Among the laboratory markers, cystatin C had the highest predictive value. However, statistical significance was failed (p=0.9625).

CONCLUSION. 1)Coronary angiography in patients with normal serum creatinine results in a significant increase in serum creatinine 24h and 48h after CM. The use of diuretics prior to CM increases the risk of renal impairment. Therefore, in addition to sufficient hydration, the use of diuretics should be avoided before coronary angiography. 2)Cystatin C might be useful in predicting an increased risk of CIN in patients with serum creatinine levels in the upper normal range.

REFERENCE(S). 1Palsson J, et al. Effects of dopamine, dopexamine and dobutamine on renal excretory function during experimental sepsis in conscious rats. Acta Anaesthesiol Scand 1997;41:392-8

2. Weber A, et al. Time course of systemic and renal plasma prostanoid concentrations and renal function in ivine hyperdynamic sepsis. Clin Sci (Lond) 1994;86:599-610

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ACUTE RENAL DYSFUNCTION / FAILURE IN THE CRITICALLY ILL PATIENT

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INTRODUCTION. Acute renal failure (ARF) is seldom a community-acquired disease but usually develops in hospitalized patients. Critically ill patients have the highest incidence (>20%), and is associated with a persistent high mortality in intensive care units (ICU)

Objective: to assess the incidence and the outcome of Acute Renal Dysfunction (Failure) in ICU.

METHODS. Prospective study. All patients admitted to our ICU, were included, during 3 years. Basic demographic data were collected. We used renal SOFA score to evaluate renal dysfunction/failure.

RESULTS. A total of 823 patients were admitted in our ICU during 3 years. 90 patients (11%) had ARF at admission, as diagnosed by a serum creatinine of 300 micromol/l (3.5 mg/dl) or more and/or a urine output of less than 500 ml/day. 121 patients had renal dysfunction (SOFA 1,2).

Severity of Renal Dysfunction / Failure(SRDF)

| SRDF | Number patients | SAPSII | SOFA | Mortality Rate |
|------|-----------------|--------|------|---------------|
| SOFA 0 | 612 | 25.8±12.9 | 4.2±3.0 | 15.2% |
| SOFA 1,2 | 121 | 37.4±14.4 | 6.5±2.9 | 29.7% |
| SOFA 3,4 | 90 | 48.9±17.0 | 7.0±4.0 | 45.6% |
| Statistical Analysis | ANOVA / | ANOVA / | p = 0.001 |
| | p = 0.001 | | |

CONCLUSION. In ICU patients, the severity of acute renal dysfunction/failure is associated with an increased mortality rate.

REFERENCE(S). De Mendonca A, Vincent JL, Suter PM, et al. Acute renal failure in the ICU: an increased of mortality rate.

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MORTALITY IN ACUTE TUBULAR NECROSIS.

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INTRODUCTION. Acute tubular necrosis (ATN) is common in the intensive care unit. Mortality rate from ATN has remained at 50% to 80%. The aim of the present study was to evaluate epidemiological aspects of ATN.

METHODS. Data from adult patients in medical and surgical ICUs presenting ATN (serum creatinine level > 1.8 mg/dl) were retrospectively reviewed. Diagnosis of ATN was considered by excluding prerenal and postrenal causes of acute renal failure and chronic renal failure. Data on the study sample, associated diseases, drugs, interventions performed and outcome was evaluated.

RESULTS. Out of 829, 524 patients with ATN were studied. Mean age was 58 years old. Most prevalent factors related to ATN were shock in 397 patients (76%), infection in 267 (51%), sepsis in 223 (42%), hypovolemic status in 182 (35%) and nephrotoxicity (11%). Cardiovascular diseases (27%) and diabetes (6.5%) were frequently associated with ATN. Oliguria was present in 51.5% and 11.6% required renal replacement therapy (RRT). Overall mortality was 66% and 70% for those patients requiring RRT.

CONCLUSION. Mortality rate from ATN remain high over the past decades. Information about diagnosis and supportive care for patients with ATN might help centers to improve quality of care.

REFERENCE(S). Eison ML, Schrier RW. Diagnosis and treatment of acute tubular necrosis. Ann Intern Med 2002;137(9):744-52

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PROSTAGLANDIN INHIBITION AND THE HEMODYNAMICS IN SHORT-TERM INSULIN DEFICIENCY

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INTRODUCTION. The hemodynamic derangements present in diabetic ketoacidosis are the results not only of profound volume depletion but also of the effects of increased production of vasodilating prostaglandins (PGs), principally P Gl. In animal and in vitro models, prostaglandin synthesis is increased during insulin deficiency [1].

METHODS. We assessed the effects of short-term ketois on the metabolism and hemodynamic variables of 10 IDDM patients free from long-term complications and of 9 normal control subjects after a 7-day randomized double-blind indomethacin (INDO) (50 mg q.d.) or placebo treatment period. Calf blood flow (CBF), postcaspicative reactive hyperemia (PORH), and recovery half-time (tan) index of overall perfusion after PORH were measured by plethysmography. Left ventricular and myocardial functions were also studied in each different condition during placebo and INDO treatment in IDDM patients.

RESULTS. During placebo treatment, the increase in CBF during ketosis was higher (1.7±0.9 ml/min/100 ml muscle) than during INDO (0.5±0.8 ml/min/100 ml muscle; P = 0.007). PORH was similar in baseline conditions, during ketosis, and in recovery in both the placebo and INDO arms. Recovery half-time increased during placebo (10±2%; 200%; P < 0.01) but not during INDO (1±1%; 100%; NS) treatment. In normal control subjects, insulin deficiency did not induce any effect on hemodynamic variables. In IDDM patients, during placebo treatment, ketosis increased both the cardiac index (from 3.4±0.7 to 4.1±0.81/min/70 ml; P < 0.01) and the stroke index (from 42±8 to 49±7 ml/m2; P < 0.01) without changes in left ventricular ejection fraction but with a significant increase in both left and right ventricular end-diastolic volumes. Metabolic recovery induced a normalization of these parameters. INDO treatment significantly blunted these alterations.

CONCLUSION. We showed that during acute insulin deficiency, INDO-sensitive mechanisms mediate vascular disturbances. Moreover, INDO treatment was capable of preventing the cardiac ventricular return and the left ventricular alterations. INDO does not interfere with the overall ketogenic process or with insulin-induced metabolic recovery.

REFERENCE(S). I. Carugo et al. Progression of functional and structural cardiac alterations in young normotensive uncomplicated patients with type 1 diabetes mellitus. J Hypertens. 2001 Sep;19(9):1675-80.

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REGULATION OF GLUCOSE LEVELS IN LONG-STAY ICU PATIENTS: CHARACTERISTICS AND DETERMINANTS OF MORTALITY

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INTRODUCTION. Maintaining a normal glucose level in ICU is beneficial [1]. The regulation of the glucose level and not the administration of insulin may be responsible for the beneficial results [2]. However, the long-term effects of high parental glucose intake are unknown. We studied the metabolic regulation of long-stay ICU patients and correlated metabolic regulation with outcome parameters. In addition we studied the effect of glucose regulation, insulin doses, and the amount of infused glucose on outcome parameters.

METHODS. We performed a retrospective analysis of all the patients admitted to our ICU in 45 months. Patients treated for 7 to 30 days in the ICU, and availability of a complete medical record were included. We collected baseline characteristics, the amount of parenteral glucose and insulin and biochemical results. Plasma glucose level (PGL) was measured 4 times daily in most patients. In patients with stable PGL the measurements were reduced to twice daily. The daily mean value was therefore a representative value of that day. T test was used to compare groups after logarithmic transformation to obtain a normal distribution.

RESULTS. 273 patients were eligible. The mean age was 66 years; the mean APACHE II was 24.6. The mean daily PGL of all patients was 9.0 mmol/l. Mean PGL and mean insulin dose were related (r=0.06, p=0.001). Hospital survivors showed a lower mean PGL compared to nonsurvivors (p=0.04). For ICU survivors, such a relationship was not found. PGL lower than 8 mmol/l was associated with a lower mortality rate (p=0.023). In a multivariate linear regression analysis, none of the parameters of mean daily PGL, mean daily insulin dose or mean daily glucose infusion were related to duration of mechanical ventilation, or duration of ICU treatment. Both ICU mortality and hospital mortality were correlated, in a logistic regression analysis, to mean daily glucose infusion (p=0.001) and APACHE II score (p=0.001) but not to mean daily PGL or mean daily insulin dose.

CONCLUSION. High dose glucose infusion and APACHE II showed a relation with hospital mortality in contrast to glucose regulation and insulin doses. Future studies to the effect of glucose regulation on outcome parameters should include analysis of the amount of parenteral glucose administered.

REFERENCE(S). [1] NEJM 2001;345:1559-63. [2] Crit Care Med 2003;31:359-66.
A STRONG ASSOCIATION BETWEEN MEAN HYPERGLYCEMIA AND MORTALITY IN THE MEDICAL ICU

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INTRODUCTION. Hyperglycemia at admission predicts mortality in various stress situations. It has been proven that strict regulation of hyperglycemia is beneficial, especially in patients who need intensive care for more than 5 days [1]. Thus glucose regulation over a prolonged period is important. We recently found that mean hyperglycemia (MHG), i.e. the mean glucose level above a cut-off point divided by time, predicts mortality more precisely than hyperglycemia at admission.

METHODS. We performed a retrospective analysis of all eligible patients admitted to a medical ICU of an University Hospital to determine if MHG predicts mortality.

RESULTS. Over a two year period 678 men (56%) and 531 women (44%) were included. Mean age was 56±18 years. Median (IQR) ICU stay was 3 (2-5) days with a maximum of 51 days. Reason for admission was respiratory insufficiency in 27%, sepsis or multi-organ failure in 13% and post surgery in 23%. Median (IQR) hospital stay was 15 (6-31) days. Mean glucose on admission was 7.9±4.5 mmol/l, mean glucose was 7.5±2.9 mmol/l, MHG was 7.7±2.6 mmol/l. 235 patients (19%) died in the medical ICU and 208 patients (25%) died during hospital stay. In patients who died the MHG was significantly higher than in patients surviving the medical ICU, 7.5±1.9 mmol/l versus 8.8±3.7 mmol/l (p<0.01). The mortality rate in the quartiles of MHG were 16%, 20%, 25%, and 40% (p for trend<0.01).

CONCLUSION. Mean hyperglycemia is related with mortality in patients admitted to a medical ICU. MHG in the highest quartile is associated with a 40% mortality rate. If strict regulation of glucose metabolism in this subgroup of patients is feasible, a large beneficial effect could be obtained.

REFERENCE(S). 1. van den Bergh G, Wouters P, Weevers F, et al. Intensive insulin therapy in the critically ill patients. N Engl J Med 2001;345:1359-67

DECREASED RENAL GlUCOSE-THRESHOLD IN ICU PATIENTS

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INTRODUCTION. Strict blood glucose regulation in ICU-patients decreases both morbidity and mortality (1). Since blood glucose (BG) can change quickly in ICU patients, frequent BG samples are necessary to achieve timely normalisation of BG. Measurements of urinary glucose (UG) may be useful for early detection of hyperglycemia if blood glucose is above the ‘renal threshold’. In healthy subjects this threshold is 10 mmol/l (2). However, the relationship between BG and UG in critically ill patients is not known. We investigated urinary glucose concentrations in surgical ICU patients. We also compared BG with UG to determine the renal glucose-threshold.

METHODS. Patients admitted to the surgical ICU in February and March 2003 were collected from the hospital database. Patients received enteral or parenteral nutrition or a combination of both. Hyperglycemia was corrected with continuous insulin-infusion aiming at a target BG of 5-6 mmol/l. Compliance of nurses with the protocol was 67% (71 out of 106 cases). In case hyperglycemia was measured a significant decrease in glycaemia has been found in the following 6 hour period (from 9.2 (8.0 - 10.7) to 6.0 (5.0 - 9.3); p<0.00001). The most significant drop was measured between the 2nd and 6th hours after an insulin dose change (from 8.0 (6.4 - 11.2) to 6.0 (5.0 - 9.0); p<0.01). In case normoglycemia (<6 mmol/l) was measured (n=34) this was present only in 44% (15 cases) at the following check after 6 hours. Severe hyperglycemia (>13 mmol/l) occurred in 5 cases during the study and only 1 of these values was measured with the analyser. The most frequent deviation from the protocol was caused by further correction of insulin dose after one and especially 2 hours after previous insulin dose change. Glycaemia during the study was 6.3 (6.0 - 8.7) and did not differ from glycaemia seen before and after the study (7.3 (6.1 - 9.1) and 6.0 (5.0 - 8.7) mmol/l, respectively; NS).

CONCLUSION. The implementation of normoglycaemia protocol in the critically ill increases interest in this topic among ICU personnel. Seminars explaining the protocol including its importance and longer test period are necessary to reach significant therapeutic results.

REFERENCE(S). Van den Bergh G, Wouters P, Weevers F, et al. (2001) Intensive insulin therapy in the critically ill patients. N Engl J Med 345, 1359-67

GLUCOSE MANAGEMENT IN INTENSIVE CARE PATIENTS REQUIRES A STRICT PROTOCOL.

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INTRODUCTION. Over the past decades hyperglycemia in critically ill patients has been regarded as normal and even beneficial to patients. The publication by van den Bergh et al. (+) changed this perception and has created an awareness within the critical care society that stricter regulation of the patients blood glucose is needed. After the publication our unit implemented stricter rules for glucose management.

METHODS. These, unwritten, rules where that patients glucose should be maintained between 4.5 and 7 mmol/L. The use of a strict protocol was not considered a necessity.

RESULTS. See table

| Glucose (mmol/L) | mean / median / mode | * of hypoglycaemic incidences (<2.5mmol) | Total amount of insulin admin. (IU) |
|-----------------|----------------------|-----------------------------------------|-----------------------------------|
| 10.2 / 9.5 / 8.2| 9.7 / 9.1 / 8.9       | 9.7 / 9.1 / 8.9                        | 9.8 / 8.9 / 8.1                   |

**CONCLUSION.** Although the amount of insulin used more than tripled, the average blood glucose levels did not change significantly. Even more, the number of adverse events (hypoglycaemic incidents) increased dramatically. This lead us to conclude that management of patients blood glucose, aimed at the levels as described by van den Bergh et al, is not possible without a strict protocol.

REFERENCE(S). 1.Bergh G van den G, et al. Intensive Insulin Therapy in Critically Ill Patients. N Engl J Med 2001 Nov 8 345:1359-67
RENAL CHLORIDE EXCRETION IN PATIENTS WITH METABOLIC ACIDOSIS

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INTRODUCTION. The physicochemical approach described by Stewart states that the excretion of chloride is the most important mechanism by which the kidney regulates acid-base balance. We studied renal chloride excretion in 50 patients with severe metabolic acidosis admitted to the intensive care unit.

METHODS. In 50 consecutive patients with a metabolic acidosis (SBE < -5) we measured Na+, K+, Ca2+, Mg2+, Cl-, lactate, creatinine, urea, phosphate, albumin, pH, PaCO2 and PaO2 and calculated HCO3-, BE, SIDa, SIDe and SIG. Furthermore we measured urinary pH, Cl- and Na+ and calculated the urinary Na+/Cl- ratio in relation to the serum creatinine level.

RESULTS. Mutiple mechanisms were present to explain the metabolic acidosis (increased Cl-: 80%, increased lactate 62% and increased SIG 98%). Hyperchloremic acidosis was the consequence of excessive NaCl 0.9% resuscitation. The urine Na+/Cl- ratio was highly variable and ranged between 0.03 and 1.97. The Na+/Cl- ratio increased with increasing serum creatinine levels (Y = 0.0019X + 0.4198, R2 = 0.329, P < 0.001).

CONCLUSION. In patients with a severe metabolic acidosis the magnitude of renal chloride excretion is related to renal function. Consequently patients with impaired renal function are more prone to develop hyperchloremic acidosis as a consequence of excessive NaCI administration. A balanced resuscitation fluid may be appropriate in these patients.

SERUM AND PLASMA POTASSIUM LEVELS IN ICU PATIENTS

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INTRODUCTION. There is a significant relation between the difference in serum and plasma potassium values and platelet counts (1/2). As a result factitious potassium serum levels can be measured. This is observed in ICU patients during everyday practice, since serum potassium is measured by routine biochemistry and plasma potassium is measured by the gas analysis machine. We related the difference in serum and plasma potassium levels of ICU patients to their platelet counts and compared them with normal volunteers.

METHODS. We compared serum potassium (SK-a), serum/plasma potassium difference (SPD-a) and platelet count (PLT-a) from 98 blood samples from 65 consecutive admissions in our ICU during November and December 2002 (Group A) to serum potassium (SK-b), plasma potassium (PK-b), serum/plasma potassium difference (SPD-b) and platelet count (PLT-b) from 20 healthy volunteers (Group B) Blood samples where obtained from the radial artery. Serum potassium was collected in a Vacutainer tube, plasma potassium was collected in a syringe treated with heparin and platelet counts were measured in EDTA-treated plasma samples.

RESULTS. Group A results = male: 43, female: 22, age: mean 66 (StDev 12), SK-a: 4.15 mmol/L (StDev 0.67), PK-a:3.70 mmol/L (StDev 0.63), SPD-a:0.45 mmol/L (StDev 0.24), PLT-a: 200245 (StDev 112208) Group B results = male: 10, female: 10, age: mean 49 (StDev 14), SK-b: 4.14 mmol/L (StDev 0.52), PK-b: 3.90 mmol/L (StDev 0.48), SPD-b: 0.24 mmol/L (StDev 0.12), PLT-b: 220100 (StDev 62005). There was no statistically significant difference between Group A's and B's platelet counts (t-test, N.S.) SPD-a was considerably higher than SPD-b (t-test, p<0.001).

CONCLUSION. Although ICU patients have similar platelet levels compared to normal volunteers, their serum/plasma potassium difference is much higher, making clinical problems as Pseudohyperkalemia more likely. The higher serum/plasma potassium difference implies that a number of platelets are not counted with conventional methods, probably because they are activated by drugs or by the acute phase reaction leading to their aggregation.

REFERENCE(S). 1) Pseudohyperkalemia and Thrombocytopenia, R.W.Wulkan te al, J.Clin.Biochem, Vol28, 1990, p489-491

CHANGES OF SERUM CHLORIDE DETERMINE METABOLIC ACID-BASE STATE IN CRITICAL ILLNESS

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INTRODUCTION. The recent concept of simultaneous co-existence of several metabolic acid-base disorders raises the question about a metabolic acid-base disorder with a predominant impact on the overall metabolic acid-base state in critical illness. The aim of this study was to determine the influence of various components of blood plasma on metabolic acid-base state in the course of critical illness.

METHODS. Arterial blood samples were drawn from 30 patients of a ICU over the course of one week. All together 556 blood samples were analyzed. Metabolic acid-base status was assessed by means of the model by Gilfix with base excess of free water (BECl-), base excess of chloride (BECl-), base excess of albumin (BEAlb) and base excess of unmeasured anions (BEUMA) accounting for metabolic acid-base disorders caused by changes of free water, serum chloride, serum albumin and unmeasured anions, respectively. Standard base excess (SBE) was used as an overall measure of metabolic acid-base state. Data were analysed using linear regression assuming autocorrelation of error terms. Partial R2 was computed for each variable, in order to compare the influence of BECl-, BEAlb and BEUMA on variations of SBE.

RESULTS. Mean daily increase of SBE, BECl-, BEAlb and BEUMA was 0.95, 0.58 and 0.16 mmol/L respectively. BECl- and BEUMA remained unchanged. Partial R2 of BECl-, BEAlb and BEUMA were 6%, 4% and 2% respectively.

CONCLUSION. Progressive hyperchloremic alkalosis is the main cause of a developing metabolic alkalosis in critical illness. 41% of the overall metabolic acid-base changes can be assigned to changes of serum chloride. Assessment of chloride-related acid-base disorders might be helpful in diagnosis, prevention and treatment of metabolic acid-base disorders in critically ill patients.

ADRENOCAPITAL EVALUATION IN A LARGE COHORT OF 100 CRITICALLY ILL PATIENTS

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INTRODUCTION. Adrenocortical function in critically ill patients has been mostly examined by measuring random cortisol levels or by performing dynamic stimulation with the short, high-dose (250 mcg) corticotropin (ACTH) test. During the last decade it has been shown that 1 mcg is the lowest ACTH dose that causes maximal adrenal stimulation. A few studies have assessed the adequacy of cortisol production by this so termed low-dose stimulation test (LDST) in critical illness.

METHODS. One hundred critically ill patients (75 men), having diverse admission diagnoses, with a median age of 50 years were enrolled in the present study. First, a morning blood sample was taken to determine baseline cortisol. Then, a LDST was performed: 1 mcg of synthetic ACTH was injected as a bolus through a central venous line and 30 min later a second blood specimen was obtained to measure stimulated cortisol. Patients having stimulated cortisol levels below 18 mcg/dL were defined as non-responders to the LDST.

RESULTS. Median values for baseline and stimulated plasma cortisol were 17.0 mcg/dL (range: 4.5-79.0 mcg/dL) and 23.5 mcg/dL (range: 6.2-80.0 mcg/dL) respectively. The median increment in cortisol was 4.9 mcg/dL (range: 0-21.3 mcg/dL). There was a significant correlation between baseline cortisol and stimulated cortisol (r=0.73, p<0.001). Overall, 20/100 patients (20%) were non-responders to the LDST. There were no differences between responders and non-responders in gender or age. Non-responders had lower baseline cortisol (12.1 vs. 18.2 mcg/dL, p<0.001), along with lower stimulated cortisol levels (15.3 vs. 25.4 mcg/dL, p<0.001).

CONCLUSION. Adrenal cortisol production following dynamic stimulation is inadequate in a substantial number of critically ill patients.
INTRODUCTION. The thyroid axis is often severely disturbed in critically ill patients. This prospective observational study was designed to investigate thyroid dysfunctions in medical intensive care unit (ICU) and to assess the prognostic significance of non thyroidal illness (NTI).

METHODS. 117 patients were enrolled in the study with mean age of 56.7±18.25 and mean APACHE II score of 21.06±6.29 between January 2003 and March 2003. Patients with present or past history of thyroid disorder and those on drugs that might interfere with thyroid function indices were excluded. In order to assess thyroid dysfunctions free triiodothyronine (fT3), free thyroxine (fT4) and thyrotropin (TSH) were measured.

RESULTS. 98 patients (83.8%) had abnormal thyroid function tests suggestive of NTI. 52 patients (44.4%) had only low fT3; 14 patients (12%) had low T3 and low fT4; 3 patients (2.6%) had low TSH, 1 patient (0.9%) had high TSH 26 patients (22.2%) had low fT3 and low TSH. 1 (0.9%) patient had only low fT4 and 1 patient (0.9%) had low fT3 high TSH. The overall mortality rate for patients with NTI was 31% less than euthyroid (43%) patients but the difference was not significant. APACHE II score were 18±6.41 in euthyroid patients and 21.65±6.12 in patients with NTI (p<0.05). Survivors had significantly higher TSH levels (1.616±1.451) than nonsurvivors (1.059±1.286) (p<0.05).

CONCLUSION. In this study we found that high TSH value is associated with mortality but because of overlapping values routine study of thyroid function indices in ICU for its prognostic value is not encouraged.
639 GLOBAL END-DIASTOLIC VOLUME INDEX FOR PRELOAD MONITORING IN PATIENTS WITH REDUCED CARDIAC FUNCTION
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INTRODUCTION. Transcardiopulmonary thermodilution allows the measurement of the global end-diastolic volume index (GEDVI) which comprises the volume of blood contained in the four chambers of the heart. GEDVI has shown to be an accurate parameter to monitor changes of cardiac preload in patients with normal cardiac function (1). Aim of this study was to investigate the ability of GEDVI to follow changes of preload as a result of volume loading in patients with severely reduced cardiac function.

METHODS. 10 mechanically ventilated patients with severely reduced left ventricular ejection fraction (EF < 35%) were studied immediately after coronary artery bypass grafting. After baseline measurements of GEDVI, central venous pressure (CVP), pulmonary artery occlusion pressure (PAOP) and left ventricular end diastolic area index (LVEDAI), stepwise volume loading was performed using 10 ml of hetastarch 6% / 30 ml times body mass index until stroke volume index (SVI) failed to increase by more than 5%.

RESULTS. In total, 25 volume loading steps (VLS) were performed (mean: 2.5 per patient, corresponding to 809 ml). Under volume loading, SVI increased significantly from 32 ± 6 ml/m² to 39 ± 5.2 ml/m². GEDVI increased significantly from 692 ± 118 ml/m² to 770±94 ml/m² as did EDAL (29±10 ml/m²) to 33 ± 8 ml/m²), CVP (7 ± 3 mmHg to 9 ± 3 mmHg) and PAOP (6 ± 3 mmHg to 9 ± 3 mmHg). Changes in GEDVI (DeltaGEDVI) as a result of volume loading correlated significantly to concomitant changes in SVI (DeltaSVI) (r=0.92, p<0.001) as did changes in LVEDAI (DeltaLVEDAI) (r=0.82; p<0.001). For DeltaPAOP and DeltaCVP, no significant correlation to DeltaSVI was found.

CONCLUSION. Discontinuous measurement of GEDVI allows reliable to monitor changes in preload condition due to volume loading in cardiac surgery patients with reduced left ventricular function.

REFERENCE(S). 1. Godje et al. Eur J Cardiothorac Surg 1998;13: 533-539

640 EXTRAVASCULAR LUNG WATER ASSESSED BY THERMAL-DYE DILUTION CORRELATES WITH GRAVIMETRIC TECHNIQUE
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INTRODUCTION. Endotoxemia and sepsis are often associated with increased pulmonary capillary pressure and permeability resulting in accumulation of extravascular lung water (EVLW) and development of lung oedema (1). In critically ill patients, the EVLW assessed by thermal-dye dilution (TDD) technique correlates well with survival and is an independent predictor of prognosis and course of illness (2). However, in sepsis TDD is still not conclusively validated by gravimetric measurements over a wide range of changes. Thus, the TDD correlates well with the gravimetric measurements over a wide range of changes. Thus, the TDD is a reliable method for assessment of sepsis-induced pulmonary oedema.

METHODS. Thirty-three ventilated ICU patients (age 58±15 yrs, 13 men, SAPS III 51±30, APACHE II 25±11) monitored with PICCO and for whom transesophageal echocardiography was performed, were prospectively studied.

RESULTS. Eighty-three measurements were obtained. A robust relation was observed between EVLW and CFI (r=0.81, F=7.86, p<0.0001). The sensitivity and specificity of estimating CFI by TDD were 94% and 84% for CFI≤4. FAC changes over time were correlated to CFI changes (r=0.80, p<0.0001).

CONCLUSION. In ICU mechanically ventilated patients, the PICCO-derived cardiac function index provides a reliable estimation of LV systolic function

REFERENCE(S). 1. Sakka SG et al. Circ Res 2002;122:2060-2066
**643**

**HYPERNATREMIA AND LACTIC ACIDOSIS STATES AFTER BRAIN DEATH.**

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**INTRODUCTION.** To know the influence that several electrolyte disturbances associated to brain death have over anaerobic metabolism.

**METHODS.** Fifty brain death (B.D) patients who were potential organ donors were studied. Mean age:49,5±17,08 years. Causes of brain damage: Head trauma 44%, subarachnoid haemorrhage 18%, ischemic strokes 6%, cerebral neoplasms 2% and others 2%. An homogeneous protocol for donor maintenance was applied. We studied the incidence of hypernatremia, hypokalemia, hypophosphataemia, hyperglycemia, hyperosmolality and lactic acidosis. We also analysed the relationship between electrolyte disorders and plasmatic levels of lactic acid. The statistic test used was Pearson’s Js square for quantitative dates.

**RESULTS.** The more frequent electrolyte disturbances detected were: hyperglycemia in 74% of patients, hypophosphataemia 72%, hypokalemia in 70%, hypernatremia 66%, hyperosmolality 48%. Supranormal lactic acid levels were detected in 61%. Values of Na higher than 152 mEq/l were significantly related to pathological lactate plasma levels (p<0,05). The bases excess was also significantly associated to high lactic acid. No relationship between other electrolyte disturbances and lactic acidosis levels were observed.

**CONCLUSION.** 1. Hypernatremia after brain death is significantly associated to anaerobic metabolism. Probably intravascular dehydration could be implicated in this phenomenon.

2. An specific treatment for normalization of natremia could help to preserve the quality of organs for donation.

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**EFFECT OF MARS ON CONSCIOUSNESS AND HAEMODYNAMICS AFTER TOTAL HEPATECTOMY.**

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**INTRODUCTION.** Acute liver failure (ALF) or hepatic necrosis following transplantation (OLT) may be associated with refractory shock for which total hepatectomy (TH) is proposed to reduce reperfusion syndrome and good evolution was described in case of acute liver failure. Despite the complications, M.A.R.S is a dialysis system based on albumin, supposed to clear albumin-bound toxins. The hypothesis being tested was whether M.A.R.S could improve consciousness and cardiovascular stability after TH.

**METHODS.** Case Report : 5 days after OLT, a 53 y-old patient developed ALF due to ischemia-reperfusion syndrome after portal vein thrombosis. She then presented encephalopathy, coma, shock (with NA up to 100 g/min), lactic acidosis (up to 14,2 mmol/l), need of mechanical ventilation and haemofiltration. Urgent TH was considered. After surgery, patient still required shock (with NA up to 100 g/min), lactic acidosis (up to 14,2 mmol/l), need of mechanical ventilation. During the 24h postoperative period, patient presented encephalopathy, coma, need of mechanical ventilation and haemofiltration. Urgent TH was considered. After surgery, patient still required shock (with NA up to 100 g/min), lactic acidosis (up to 14,2 mmol/l), need of mechanical ventilation and haemofiltration. Despite the use of M.A.R.S., the patient required mechanical ventilation and haemofiltration.

**RESULTS.** M.A.R.S is a dialysis system based on albumin, supposed to clear albumin-bound toxins. The hypothesis being tested was whether M.A.R.S could improve consciousness and cardiovascular stability after TH. The patient underwent a second OLT and made a full recovery.

**CONCLUSION.** M.A.R.S might be ideally suited for patients with acute liver failure or anhepatic to maintain or improve hemodynamics and neurologic condition and serve as a bridge to liver transplant.

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**ROBUSTNESS OF TWO METHODS FOR ESTIMATING RESPIRATORY SYSTEM COMPLIANCE DURING MECHANICAL VENTILATION.**

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**INTRODUCTION.** In monitoring technology, robustness is as important as precision. Robustness measures the performance of estimation methods when they work under conditions representing a deviation from the assumed model for their design. Multilinear curve fitting methods (MLF) yield the parameters of multiple line equations that reproduce the behaviour of the fitted system. Artificial Neural Networks (ANN) can extract information from signals, once having been trained to perform this specific task. Aim of the present contribution is to compare the robustness of AN and MLF methods in estimating Respiratory System Compliance (CRS).

**METHODS.** We used a bi-compartmental lung model ventilated in volume-controlled constant flow modality. By varying the parameters of the model, 756 different tracings subdetermining different respiratory mechanics conditions, were generated. These were obtained by combining different levels of CRS (from 5 to 50 ml/cmH2O), Resistance (from 5 to 50 cmH2O/l/sec), Flow (from 0.15 to 0.75 l/s) and Positive End Expiratory Pressure (from 0 to 10 cmH2O). To test the robustness of MLF and ANN methods, we simulated a transient disconnection of the pressure sensor, during inspiration. Disconnection time (Tdis) ranged from 2% to 50% of the Inspiratory Time (TI). ANN and MLF had to extract CRS from signals modified by the application of disconnection. Performance of the two methods was assessed at each level of Tdis according to Bland & Altman. Moreover, we computed the “conclusion matrix”, where we counted, for each level of Tdis, the tracings whose compliance was correctly estimated (assuming arbitrarily that correct system was an error lower than 25%).

**RESULTS.** ANN and MLF, when no disconnection was applied, correctly classified 100% of the tracings. When Tdis was shorter than 6% of TI, both methods showed similar biases and scatter. At Tdis between 6% and 50% of TI, ANN showed lower bias and scatter than MLF.

**CONCLUSION.** In conditions of sensor disconnection, ANN has a better performance than MLF in estimating CRS when Tdis is longer than 6% of TI. This may be due to the ANN capability of extracting information when the pattern to be classified is corrupted or incomplete.

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**RETROSPECTIVE EVALUATION OF A SYSTEM FOR ADJUSTMENT OF VENTILATOR SETTINGS.**

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**INTRODUCTION.** For intensive care patients selecting the correct mechanical ventilation is a difficult balance between ensuring gas exchange whilst avoiding ventilator induced lung injury [1]. This study presents a computer system for supporting this process, suggesting values of ventilator settings for control-ventilated patients.

**METHODS.** A computer system has been developed providing patient specific suggestions of inspired oxygen fraction (FiO2), tidal volume (VT) and respiratory frequency (f). This system includes mathematical models of lung mechanics, O2 and CO2 transport, and clinical preference towards goals and side effects of ventilation, i.e. oxygenation, acidosis and alkalosis, baro/volutrauma, atelectasis, and oxygen toxicity. 19 stable post-operative CABG patients were studied at the ICU. Values of ventilation, arterial and mixed venous blood gases, and cardiac output were measured. Retrospectively, computer generated settings for FiO2, VT and f were compared to those used in the clinic by thoracic anaesthesiologists.

**RESULTS.** In 10 patients the system suggested values of FiO2 within 0.05 from the value used. For the remaining patients the system suggested a decrease in FiO2 (0.103±0.034) for 7, and an increase for 2 (0.08 and 0.13). Where a decrease was suggested the system predicted arterial oxygen saturation SaO2 := 94.5 % after the decrease. The 2 patients, for whom an increase was suggested, were the only patients with measured SaO2 below 80%. In 15 patients the system suggested values of VT within 50 ml from the value used. For the remaining 4 patients the system suggested an increase (52-158ml) for 3, and a decrease for 1 (76ml). The 3 patients where an increase was suggested were the only patients with measured SaO2 below 72% normal, and values of peak inspiratory pressure :=16 cm H2O. The patient where a reduction of Vt was suggested presented with the highest measured venous pH :=7.41. In all patients the system suggested values for respiratory frequency within 0.5 breath/min of the values used.

**CONCLUSION.** In the majority of patients the computer system suggested ventilator settings similar to those selected by the clinician. Where changes in FiO2 or VT were suggested these were consistent with maintaining a sufficient oxygenation without risking side effects.

**REFERENCE(S).** 1. Intensiv Care Med. 1999; 25:1444-52.
INTRODUCTION. During invasive mechanical ventilation, inspired gas must be humidified. We have previously shown that high ambient air temperature greatly impaired hygrometric performances of last generation heated humidifiers. The aim of the study was to assess performances of standard heat and moisture exchangers (HME) and of a new advanced active HME in different conditions of ambient air temperature.

METHODS. We tested on bench the new humidification device (Humid-Heat, Hudson) with passive and active humidification property, and two standard HMEs (Hygrobac and Hygrobac-S). We measured at steady state inspired gas hygrometry at Y-piece, with psychrometric method. In each condition, six measurements were performed.

RESULTS. None of the three devices were significantly influenced by ambient air temperature. As previously shown, HME evaluate in this study (Hygrobac and Hygrobac-S), both hygroscopic and hygrophobic HME, could generate absolute humidity around 30 mgH₂O/L. The new "active HME" could deliver 35 mgH₂O/L of absolute humidity (p<0.001 in comparison with standard HME).

CONCLUSION. Hygrometric performances were significantly improved with the new humidification device. Ambient hygrometry had little influence on the performances of each device. This contrasts with previous findings with heated humidifiers.

INTRODUCTION. Aim of this study was to assess the measurement of pressure time product (PTP) obtained by the rapid interrupter technique, performed by means of a commercial ventilator, compared to PTP-derived from esophageal pressure (Peso) measurement, during PSV.

METHODS. We studied 13 no-COPD patients undergoing PSV by an Evita4 ventilator (Drager - Lubeck). We recorded: Flow, airway opening pressure (Paw), and Pes. To perform inspiratory and expiratory occlusions, the ventilator was driven by a PC (Medibus serial protocol). Occlusions, lasting 2 seconds, were performed at different inspiratory volumes (25 ml steps) in random order, along tidal volume range. Immediately after the occlusion Pes equals the alveolar pressure (Paco). Further changes in Paco at the time of occlusion and plateau represent the pressure generated by the inspiratory muscles (Pmus). However, since the occlusion gives rise to a noise in the signal for a period of 50-100 ms, the value of Paco at the time of occlusion must be back extrapolated from the inspiratory muscle pressure (Pmus) obtained from the Paw by standard computations were used as controls. data were analysed according to Bland and Altman, and by linear regression.

RESULTS. Rapid interrupter technique provided a good estimate of both Paco (Pmus, Paco= Pmus, ps 1.05 - 2.5, r=0.84; 95% CI: ±0.2 - 5.9 cmH₂O) and Pmus (Pmax, max, Paco= Pmax, max 1.3 ±0.39, r=0.87; 95% CI: ±5.7 - 5.1). From the analysis of Pmus, the inspiratory occlusion time course, PTP (PTPinterr=PTP, *0.87 + 1.02, r=0.90; 95% CI: ±2.3 - 2.8 cmH₂O*s) and maximal Pmus value (Pmax, max, Paco= Pmax, max 1.3 ±0.23 + ; r=0.95; 95% CI: ±2.93 and 9.98) could be estimated.

CONCLUSION. Compared to standard method, requiring measurement of esophageal pressure, the rapid interrupter technique performed by a PC driven commercial ventilator, provided accurate estimate of PTP.

Grant acknowledgement: MIUR

REFERENCE(S). Frova G, Quintel M. A new simple method for percutaneous tracheostomy: controlled rotating dilation. Intensive Care Medicine 2002; 28: 299-303.
### 651

**OCS - ONLINE CORRECTION OF PRESSURE SIGNALS FROM LIQUID FILLED PRESSURE MEASUREMENT KITS**

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**INTRODUCTION.** For a valid data base of the in arterial waves contained informations about hemodynamic parameters an exact pressure signal is essential. A new tool which is able to correct system induced errors in resonance and phase shift (Online Correction System, "OCS") shall be evaluated in a lab investigation.

**METHODS.** Analysis of seven clinically used pressure measurement kits. All systems were diagnosed with the Gabarith1-technique, for absolute and phase error. We developed a special fourier analysis based correction data set. Now synthetic arterial wave forms (BIOTEC 601A) were applied to the measurement kit with different frequencies (40–150 bpm). The resulting measured wave forms were now modified online with the correction data set. Evaluation was done comparing original, measured and corrected wave form – especially for systolic, diastolic and dp/dt differences.

**RESULTS.** The kits showed typical reproducible specifications. All errors could be eliminated with the correction data set. It is interesting, that the absolute error and changes in wave form (dp/dt) is increasing with the heart rate.

| Example 5 Systems at 90 bpm - error in comparison to original wave form |
|---------------------------------------------------------------|
| **Error (% to reference)** | **systolic systolic diastolic diastolic dp/dt dp/dt corrected corrected** |
| **System 1** | 0.6 | 0.3 | 0.3 | 0.0 | 26.5 | 2.5 |
| **System 2** | 3.1 | 0.3 | 0.3 | 0.2 | 42.2 | 3.2 |
| **System 3** | 2.2 | 0.2 | 1.1 | 0.4 | 15.3 | 1.4 |

**CONCLUSION.** Even with big differences in signal conduction quality, OCS® is able to reduce error probability to levels below 3%. The frequency dependent errors result from configuration dependent phase shift in the systems and probably follow a certain algorithm. With OCS an unique system for online bedside correction of data sets from liquid filled pressure measurement kits is now available. This make further pulse wave analysis more reliable.

**REFERENCE(S).**
1.) Billiet E: IntensiveCareMed. 1998 Dec;24(12): 1323-6
2.) Wellhofer et al: JClinMonitComput. 1999 Jul;15(5):307-15

### 652

**DISCREPANCIES BETWEEN PRESSURE AND VOLUME DERIVED FILLING STATUS IN UNSTABLE SEPTIC PATIENTS**

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**INTRODUCTION.** To compare an alternative technique, the Pulse Contour Cardiac Output (PCCO), a combination of transpulmonary thermodilution and arterial pulse contour analysis, with the arterial pulmonary catheter (PAC) for measurement of circulating blood volume and cardiac preload.

**METHODS.** Prospective study on a Surgical Intensive Care Unit. All patients were mechanically ventilated and had a ventilator shock. In patients with a PAC, a PCCO catheter was inserted and hemodynamic variables consisting of CVP, CI, CO, wedge, Intrathoracic blood volume (ITBV) and systemic vascular resistance (SVR) were collected simultaneously every 4 hours. The correlation between variables was evaluated with a linear regression model.

**RESULTS.** The median APACHE II score of the included patients was 17 (range 10-24). All patients were mechanically ventilated with positive end expiratory pressure (PEEP), ranging from 5 to 15. A total of 139 paired data sets in 13 patients were collected. We found a reasonable correlation between the PAC and the PCCO, for the CO (0.84), the CI (0.73) and the SVR (0.76). When comparing the ITBV and the CI (0.1), no correlation was found, and only moderate between the wedge and the CI (0.41). There was no correlation between the wedge and the ITBV (0.12). There was a correlation between the wedge and the PEEP (0.6) while hardly any between the ITBV and the PEEP (-0.12) was found.

**CONCLUSION.** There is an acceptable correlation between the CO measured by the PAC and the PCCO. The same applies for the CI and the SVR. In contrast to the results in recent literature (1,2), there was hardly any correlation between the CI and the ITBV. There is, as expected, no correlation between the ITBV and the wedge. There is a discrepancy between pressure derived measures (wedge) and volume derived measures (ITBV) regarding the volume status of hemodynamically unstable patients. This is also influenced by positive end expiratory airway pressure. These observations are of major influence when performing goal directed volume therapy in patients with distributive shock.

**REFERENCE(S).**
1. Eur. J. Anaesth. 2002 Dec 19;12(8):686-75; Preload and haemodynamic assessment (...): Della Rocca G, et al.
2. J. Cardiothorac. Vasc. Anaesth. 2001 Oct;15(5):584-8; Assessment of intrathoracic (...): Wiesenack C, et al.

### 653

**NON-INVASIVE AUTOMATIC ESTIMATION OF DYNAMIC INTRINSIC PEEP (PEEPdyn) IS IT FEASIBLE?**

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**INTRODUCTION.** Detection of the beginning of inspiratory effort (IEstart) by the expiratory flow pattern analysis (AJRCCM 2002;166:21-30, online suppl.), combined with the evidence that airway (Piaostole) and esophageal (Piplaole) pressure slopes during the first 100 ms of an occluded inspiratory breath are equal to Pilaole at IEstart in patients with PEEP (AJRCCM 1996;154:907-12), allow to compute noninvasively PEEPi,dyn by multiplying Piaostole by the time interval between IEstart and the onset of inspiration (DPEEPi) (AJRCCM 2003, abstract in press). We wondered whether this noninvasive estimation could be automated.

**METHODS.** We developed algorithms to detect both IEstart and Piaostole. Then, we measured in 18 intubated / tracheostomized, mechanically ventilated patients with COPD PEEPi,dyn both conventionally (Ref) (AJRCCM 1994;149:1069-76). and noninvasively with manual (Manual) and automatic (Auto) detection of IEstart and Piaostole during a trial of spontaneous breathing.

**RESULTS.** Results are means±SD. 42 occluded breaths were analyzed. Linear regression and Bland and Altman analyses (figure) were used to evaluate the correlation and agreement between measurements. PEEPi,dyn (Ref), (Manual) and (Auto) were -4.5±2.9, 5.4±3.1 and 4.2±2.2 cm H2O respectively. Both PEEPi,dyn (Manual) and (Auto) showed a significant linear correlation with PEEPi,dyn (Ref) (r2 = 0.463 and r2 = 0.518, p < 0.0001, respectively). Bland and Altman analysis: PEEPi,dyn (Ref) vs (Manual) (left panel): mean bias = -0.8 ± 2.4 cm H2O; PEEPi,dyn (Ref) vs (Auto): mean bias = 0.27±2.0 cm H2O, p = NS.

**CONCLUSION.** We conclude that it is possible to obtain a clinically acceptable noninvasive automatic estimation of PEEPi,dyn in spontaneously breathing intubated-tracheostomized patients with COPD.

**Grant acknowledgement: Drager, Germany**

### 654

**ACCURACY OF TRANSPULMONARY THERMODILUTION METHOD TO DETECT SMALL INCREASES IN LUNG WATER**

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**INTRODUCTION.** The accuracy of the transpulmonary method to detect large increments in extravascular lung water (EVLW) is very high in normal lung and somewhat less so in oedematous lung (1). However, it may be more clinically relevant to measure small EVLW variations, for which other diagnostic measures such as chest X-ray are of little utility. Objective: to analyze the accuracy of the transpulmonary thermodilution method to detect small increases in EVLW.

**METHODS.** Eleven EVLW determinations were performed by transpulmonary thermodilution (PICCO®) in four pigs weighing 29-32 Kg before and after the intratracheal introduction of 50 ml of saline. Six determinations were performed in normal lung and five in oedematous lung.

**RESULTS.** In normal lung, the EVLW increased from 279±22 ml to 322±19 ml (p=0.001) after the introduction of 50 ml of saline, Therefore, 86% (43 ml; range, 29 – 58 ml) of the 50 ml introduced was detected. In oedematous lung, the EVLW increased from 517±126 ml to 562±144 ml (p=0.001) after the introduction of 50 ml of saline. Therefore, 88% (44 ml range, 19 – 67 ml) of the 50 ml introduced was detected.

**CONCLUSION.** The transpulmonary thermodilution method shows a remarkably high accuracy to detect small variations in EVLW, making it a very sensitive tool for the diagnosis and follow-up of lung oedema.

**REFERENCE(S).**
1. Fernández-Mondejar E, et al. Intensive Care Med 2001; 27:S250

**Grant acknowledgement: FIS 01/1287**
655 TRANSCUTANEOUS PACO2 MONITORING: EVALUATION OF A NEW PACO2-SPO2 SENSOR
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INTRODUCTION. The gold standard in evaluating oxygenation and ventilation in a patient is arterial blood gas determination. The present study was designed to investigate the usability, the precision and accuracy of a new miniaturized carbon dioxide tension (PaCO2)- SpO2 single sensor (Tosca Monitor, Linde Medical Sensors AG, Basel, Switzerland) to monitor continuously and non-invasively the PaCO2 (TePCO2) and the oxygen saturation by pulse oximetry (SpO2) in ICU patients.

METHODS. 12 postoperatively mechanically ventilated patients (mean age 59±11 years) were studied. A heated (42°) sensor was applied at the ear lobe with a special low pressure clip. The simultaneously obtained TePCO2 and arterial blood PaCO2 values, measured using a blood gas analyser, were compared by linear regression analysis and using the method of Bland and Altman [1].

RESULTS. 58 paired measurements were analysed. TePCO2 correlates remarkably well with PaCO2 (r=0.96; p<0.01). Mean bias [1] between the two methods of measurement was 0.12±0.6 kPa (SD) (Figure). A correlation coefficient for oxygen saturation was not found.

CONCLUSION. The present study demonstrates that PaCO2 may be accurately assessed by measuring transcutanous PaCO2 using the miniaturized Tosca ear probe sensor.

REFERENCE(S). [1]: Bland JM, Altman DG. Lancet 1986, I: 307-310

Grant acknowledgement: The study was funded by the Association of Anaesthetists

656 FOCAL ISCHAEMIA AFTER CEREBRAL VA SOPASM: BEDSIDE MICRODIALYSIS AS A TOOL TO OPTIMIZE CARDIAC INDEX.
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INTRODUCTION. Haemodilution and hypertension more or less hypervolemia are recommended to prevent and/or treat delayed ischemic neurological deficit after cerebral vasospasm. The purpose of this study is to determine the effect of increased cardiac index (CI) on ischemic status assessed by lactate/pyruvate ratio (L/P).

METHODS. 6 patients hospitalized following high grade aneurysmal subarachnoid haemorrhage (SAH) were monitored with bedside microdialysis (MD). The catheter was inserted into the brain parenchyma of the vascular territory most likely to be affected by vasospasm. MD levels of glucose, glyceral, lactate and pyruvate were analyzed (MD probe CMA 70, micro-injection pump CMA 106, CMA 600 analyzer; CMA/Microdialysis AB, Sweden). Continuous CI was measured using a PICCO system (Pulsion®). Vasospasm, suspected on daily transcranial Doppler, was diagnosed on angiography. The hypertension-haemodynamic-hyperdilution therapy was then initiated to maintain a CI >1.5 L.min-1.m-2. The occurrence of biochemical ischemia, defined by two consecutive measurements of L/P ratio > 30, was treated by increasing the CI to obtain normalization of this ratio.

RESULTS. 3 of the 6 patients developed cerebral vasospasm. Among 2 of them, 6 episodes of biochemical ischemia were successfully treated by increasing CI. Even if a CI superior to 4 L.min-1.m-2 was associated with a significant decreasing of L/P ratio (p=0.0005), the threshold of 6 L.min-1.m-2 was the only one associated with normalization of L/P ratio, with a mean of 28.35 (p=0.0031).

CONCLUSION. These preliminary results seem to show that the recommended CI threshold of 3.5 L.min-1.m-2 to prevent focal ischemia after vasospasm is too low (1). Even if additional studies are mandatory, threshold for CI adjustment appears to be above 4 L.min-1.m-2. In addition, future prospective prognostic studies will have to define the acceptable upper limit of L/P ratio. In conclusion, one way to manage cerebral vasospasm after SAH might be to optimize CI using bedside biochemical monitoring. This monitoring is feasible in an ICU, and might provide a valuable tool for clinicians in charge of patients suffering with vasospasm and focal ischemia.

REFERENCE(S). 1. Archer (1996) Augmentation de la performance cardiaque pour la prévention et le traitement de l’ischémie cérébrale retardée par vasospasme. Ann Fr Anesth Réanim 15: 359-365

Grant acknowledgement: DGA (French Ministry of Defense)
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SIMULTANEOUS MEASUREMENTS OF SUBCUTANEOUS AND INTRAMUSCULAR TISSUE PO2 IN CRITICALLY ILL PATIENTS.
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INTRODUCTION. The primary goal in the treatment of patients with shock is to restore the tissue perfusion and oxygenation. Clinical endpoints of resuscitation i.e. bloodpressure, heart rate, urine output and oxygen saturation give an incomplete or even misleading picture. Tissue oxygen tension (pO2) reflecting tissue oxygenation may be a useful endpoint of resuscitation, however in clinical setting pO2im measurements in subcutaneous tissue (pO2sc) and muscle (pO2im) are both used although a comparative study has never been performed.

METHODS. In five critically ill patients pO2sc and pO2im were simultaneously and continuously measured using polarographic Clark-type electrodes (LICOX Catheter Measurement System, GMS) placed subcutaneous and in the m. biceps brachii of the upper arm. Collected data were stored in a bedside computer.

RESULTS. Three men and two women with septic shock n=3, trauma n=1 and non septic ARDS n=1 were included. The median age was 56(range 37-72), median APACHE-II-score on admission was 21 (range 18-31). Median duration of tissue oxygen measurements was 5 days (range 3-7). In three patients mean pO2im was higher than mean pO2sc (34 vs 28, 51 vs 40 and 42 vs 38 mmHg) while in two patients the opposite was the case (38 vs 28 and 42 vs 30 mmHg). pO2sc as well as pO2im values showed variation around the mean, but the variation was greater in pO2im values ( Variance pO2im:199 vs Variance pO2sc:164). Curves reflecting changes in pO2im and pO2sc during the course of the illness showed an identical pattern and run in a parallel fashion.

CONCLUSION. Although differences between mean pO2im and pO2sc were found in individual patients a clear pattern could not be established. Based on the findings in our patients we conclude that because of the lesser variation around the mean, absolute values of tissue oxygenation are more reliably measured in subcutaneous tissue, while the measurement of trends in tissue oxygenation may be performed in subcutaneous as well as muscle tissue.

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COMPLICATIONS OF ARTERIAL LINES IN AN INTENSIVE CARE UNIT
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INTRODUCTION. Arterial cannulation is a very useful tool in the management of patients in mechanical ventilation or haemodynamic instability. However local complications are always a concern. Objective: To describe complications of different arterial cannulation sites correlating them with line obstruction, local and distal ischemia, infection and thrombosis.

METHODS. A prospective, observational study of the arterial cannulations performed in a clinical and surgical intensive care unit from October 2001 to August 2002. Daily evaluations for catheter obstruction (dumpling of waves, difficulty in draining blood) or local and distal ischemia (livedo reticularis, pale or cyanotic extremity) were done. Arterial Doppler scans were obtained 24h after catheter removal searching for partial or total obstructive thrombosis.

RESULTS. 603 arterial cannulations were analyzed:

| Radial | Axillary | D. Pedis | Femoral | Total |
|--------|----------|----------|----------|-------|
| 300(49.8%) | 169(28.0%) | 91(15.1%) | 43(7.1%) | 603(100%) |
| obstruction | 18 | 4 | 6 | 1 | 29 |
| ischemia | 46 | 0 | 7 | 0 | 53 |
| dumping of waves | 21 | 13 | 14 | 2 | 50 |
| normal | 215 | 152 | 64 | 40 | 471 |
| trombosis | 83 | 0 | 25 | 0 | 108 |

CONCLUSION. Despite the lower utilization of the axillary artery the number of complications favoured this site for monitoring over the mostly used radial artery.

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ALVEOLAR EJECTION VOLUME PREDICTS DEATH IN PATIENTS WITH ACUTE LUNG INJURY
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INTRODUCTION. In early Acute Respiratory Distress Syndrome, elevated values of dead-space fraction are associated with an increased risk of death (1). The fraction of tidal volume corresponding to the exhalation of alveolar gas \(V_{A}/V_{T} \) is a computerized, physiologically based new index, easy to measure at the bedside and not influenced by different values of tidal volumes or positive end-expiratory pressure (2). The objective is to evaluate the prognostic value (association with mortality) of different outcome and respiratory variables in patients with acute lung injury (ALI) receiving mechanical ventilation.

METHODS. Twenty-five patients were prospectively studied. Simplified Acute Physiologic Score II (SAPS II), \(P_{a}O_{2}/FiO_{2} \), respiratory system compliance (Crs), and capnographic indices (Bohr’s dead space, expired CO2 slope and \(V_{A}/V_{T} \)) were measured at the admission and after 48 hours. Data were expressed as mean ± SD. Risk of death was assessed with receiver operating characteristic (ROC) curves.

RESULTS. The change in VAE/VT between admission and 48 hours (DeltaVAE/VT) was greater in patients who died (0.07 ± 0.09), compared to patients who survived (-0.03 ± 0.06); p<0.01. The area under the ROC curve was significant only for DeltaVAE/VT (area: 0.825; p<0.05). Threshold DeltaVAE/VT of 0.13 allowed discrimination between survivors and nonsurvivors with a specificity of 100% and a sensitivity of 33%.

CONCLUSION. DeltaVAE/VT can predict mortality in patients with ALI better than other common variables. The measurement of DeltaVAE/VT does not need variations in the patient’s breathing pattern.

REFERENCE(S). 1. Nuckton T. J., Alonso J. A., Kallet R. H., et al. Pulmonary Dead-Space Fraction as a Risk Factor for Death in the Acute Respiratory Distress Syndrome. N Engl J Med 2002; 346:1281-1286. 2. Li Blanch L, U Lucangelo, J Lopez-Aguilar et al. Volumetric capnography in patients with acute lung injury: effects of positive end-expiratory pressure. Eur Respir J 1999; 13: 1048-1054. Grant acknowledgement: Funded By: FIS 99/0391, FIS 01/015 and Fundacion Parc Tauli.

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RELIABILITY OF PICCO MONITOR IN ESTIMATING INTRATHORACIC BLOOD VOLUME AND EXTRAVASCULAR LUNG WATER
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INTRODUCTION. The PiCCO monitor (PULSION Medical Systems) allows the assessment of the maximum quantity of blood contained in the heart, called the global end-diastolic volume index (GEDI). The PiCCO monitor also estimates the intrathoracic blood volume index (ITBI = GEDI + pulmonary blood volume) and the extravascular lung water index (ELWI), assuming that ITBI is 25% greater than GEDI. Several anatomical, mechanical and physiological factors may affect the relationship between the volume of blood contained in the heart and in the pulmonary circulation.

METHODS. The first 4 transpulmonary thermodilution measurements (COLDeSystem) done in 48 surgical ICU patients were analyzed to compare the reference ITBI and ELWI to the estimated ITBIPico (t = 25 s GEDI) and ELWIPico (intrathoracic thermal volume – ITBPico) and to investigate factors that may influence the relationships between reference and estimated parameters.

RESULTS. A total of 192 measurements were available for analysis. Overall, ITBI and ELWI were closely correlated with ITBIPico (r = 0.94) and ELWIPico (r = 0.96), respectively. The bias were not influenced by the weight, the body surface area, the body mass index, the ITBI, the cardiac output and the P-FO2, but significantly correlated with the ELWI, the level of PEEP, the intrapulmonary shunt and the Pao2/PFO2 ratio.

CONCLUSION. Our findings demonstrate that the estimation of ITBI and ELWI by the PiCCO monitor is slightly influenced by the amount of ELWI, the level of PEEP, the intrapulmonary shunt and the degree of hypoxemia, however that it remains reliable even in patients with severe lung disease.

Grant acknowledgement: PULSION Medical Systems
EFFECTS OF PEEP ON ITBV AND EVLW MEASUREMENT BY SINGLE VS DOUBLE DILUTION TECHNIQUE IN ARDS

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INTRODUCTION. Estimate of extra-vacular lung water (EVLW) and intrathoracic blood volume (ITBV) by the single dilution technique (SDT), as implemented in the PICCO-system, rely on the assumption of a linear relationship between ITBV and global end diastolic volume (GEDV) (ITBV = 1.25*GEDV), which has been derived from a large population of mixed critically ill patients. This relationship implies a constant ratio between pulmonary blood volume (PBV=ITBV-GEDV) and GEDV (PBV/GEDV=0.25). We hypothesized that PEEP could differently affect PBV and GEDV, thus changing PBV/GEDV and the accuracy of SDT. Aims of the study were to assess in ARDS patients: 1) the effects of PEEP on PBV, GEDV, and PBV/GEDV; 2) the effects of PEEP on SDT accuracy compared to double dilution technique (DDT).

METHODS. 9 ARDS patients, ventilated in CPPV, had a pulmonary artery catheter and a 4F thermistor-tipped, fiberoptic catheter, inserted through the femoral artery, both connected to the COLD monitoring system. All patients randomly received 3 levels of PEEP (5, 10 and 15 cmH2O). SDT and DDT measurement were obtained by standard formulas. Data were analysed by one way ANOVA, and linear regression; accuracy was assessed according to Bland and Altman.

RESULTS. Increased PEEP levels resulted in a significant reduction of PBVSDT and PBVDDT/GEDVDDT. PBVDDT was not affected. In all except two patients, PBV_SDTS/DGTSDT was higher than the expected 0.25. The difference between DDT and the ITBV (ITBV), and EVLW (EVLW) significantly decrease with increased PEEP levels. Mean absolute percentage difference were 8.6%, 7.9, 5.9 % for ITBV and 22.3, 21.5, 12.7 % for EVLW respectively at 5, 10, 15 cmH2O. Bias and 95% CI for ITBV and EVLW decreased with increased PEEP levels. PEEP induced changes in ITBV and EVLW correlated significantly correlated with PBV, and PBV/GEDV changes.

CONCLUSION. Since PBV, but not GEDV, was significantly affected by PEEP, the PBV/GEDV relation changed at different PEEP levels. This resulted in different accuracy of SDT vs DDT at different PEEP levels. Our study suggests that attention should be paid in the assessment of PEEP effects on EVLW and ITBV in ARDS patients by means of SDT.

Grant acknowledgement: MIUR

MEASURING SEDATION WITH EVENT RELATED POTENTIALS DURING CONTROLLED SEDATION IN VOLUNTEERS

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INTRODUCTION. The degree of sedation in critically ill patients is usually determined using clinically derived, subjective score devices [e.g. Ramsay Score (RS)]. We hypothesized that event-related potentials (ERPs) to auditory stimuli could reflect the electrophysiological analogue of patient awareness. The objective of this study was to determine if a clinical level of sedation in septic patients could be identified by the analysis of evoked potentials at multiple cortical sites.

METHODS. Eight healthy volunteers ERPs were measured during stepwise increasing, clinical relevant levels of sedation (RS 2-4). Three EEG recordings were obtained by random order using scalp electrodes. Amplitude of N100 was measured at the superior temporal gyrus. For analysis, the latency of N100 was calculated as the difference between the peak of N100 and the baseline (the mean amplitude of the recording for 100 ms before stimulus onset). Amplitude of N100 was significantly higher when sedation was achieved by propofol alone (Pro vs. Pro/Remi, RS 3: 2.12 ± 0.51 vs 1.32 ± 0.43, p<0.01; RS 4: 3.37 ± 0.47 vs 1.86 ± 0.34, p<0.001).

RESULTS. These findings suggest that clinically relevant sedation levels can be identified by decreasing ERP amplitudes, while in too deep levels of sedation the N100 component disappears.

CONCLUSION. The use of a long radial catheter to measure aortic pressure was described as early as [191], prompting the development of a 4Fr 50 cm radial artery catheter for use with the PICCO system (Pulsion Medical Systems). We have compared this catheter with a pulmonary artery catheter (AorTech Critical Care) and investigated whether the use of a shorter catheter might be possible.

METHODS. We studied 18 patients undergoing coronary artery surgery. Measurements were made post-operatively. TCPO was determined using 20ml of iced injectate. TCPO was then recorded. Simultaneously, PACO2 was determined using 10ml of room temperature injectate. After 3 measurements the catheter was withdrawn by 5cm and the above measurements repeated. Further withdrawals were made until no measurement of TCPO was possible. Statistical analysis was by the method of Bland and Altman.

RESULTS. Bias and precision for TCPO and PACO2 recorded during catheter withdrawal are shown in table 1. TCPO and thus PACO2 could be measured in all patients after a single 5cm pullback, but only in 17 patients at 10cm pullback, 12 patients at 15cm pullback and 9 patients at 20cm pullback.

CONCLUSION. Our results show bias and precision comparable to the femoral catheter [1]. The use of a shorter catheter does not seem possible due to the inability to reliably calibrate the PICCO system with a determination of TCPO.

REFERENCE(S). 1. Nagger JE et al. Bioheuristics 2001: 38 : 439-448

PULSATE CONTOUR CARDIAC OUTPUT WITH THE PICCO SYSTEM USING A LONG RADIAL ARTERY CATHETER

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INTRODUCTION. The use of a long radial catheter to measure aortic pressure was described as early as [191], prompting the development of a 4Fr 50 cm radial artery catheter for use with the PICCO system (Pulsion Medical Systems). We have compared this catheter with a pulmonary artery catheter (AorTech Critical Care) and investigated whether the use of a shorter catheter might be possible.

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CONCLUSION. Our results show bias and precision comparable to the femoral catheter [1]. The use of a shorter catheter does not seem possible due to the inability to reliably calibrate the PICCO system with a determination of TCPO.

REFERENCE(S). 1. N Engl J Med 1974; 290: 1227-31. 2. J Cardiothoracic Vase Anesth 2000; 14: 125-129.
MULTIDIMENSIONAL QUESTIONNAIRE COVERING STRUCTURE, ORGANISATION AND ACTIVITIES OF ICUS

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INTRODUCTION. ICU needs to define a minimal data set covering structure, organisation and activities.

METHODS. A questionnaire which collected questions originating from different sources [1-3] was submitted to a panel of intensivists, ICU nurses and hospital directors. Using a modified Delphi method, we selected pertinent items for each subgroup of experts. The final version of the questionnaire was made up of 250 questions classified into 12 categories. The questionnaire was filled out by 26 ICU directors and head nurses from 26 ICUs located in the Paris area. The responses were validated with a one day on-site visit with 2 auditors (intensivist and methodology expert).

RESULTS. a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z

CONCLUSION. The questionnaire provides information pertinent for intensivists, nurses and administrators.

REFERENCE(s). 1- Shortell SM. Med Care 1991, 29: 709-727. 2- Reis Miranda D. Update in intensive care medicine. 2001,10:173-177. 3- Grant acknowledgement: PHRC AOM 98-124

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THE USE OF A MODIFIED EARLY WARNING SYSTEM (MEWS) AND OUTREACH TO INCREASE RECORDING OF VITAL SIGNS

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INTRODUCTION. The introduction of MEWS resulted in an increase in the recording of RR by 86% on the surgical wards. Of the 1980 Outreach referrals, 82% are surgical.

METHODS. A survey of all acute in-patients was carried out in July 2001. In March 2002 it was repeated after the introduction of Outreach and MEWS in surgery and in March 2003 after the introduction of MEWS in the rest of the hospital.

RESULTS. The introduction of MEWS scoring has resulted in an increase in the recording of RR across all patients. The increase was greatest on the site that has an Outreach service.

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SECOND AMSTERDAM TEST EXAMINATION FOR THE EDIC 2002 IN BARCELONA

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INTRODUCTION. In the Netherlands, participation in the written part of the EDIC organised by the European Society of Intensive Care Medicine is compulsory in the national training programme of Intensive Care Medicine. In 2001, we organised the first Amsterdam Test Examination (ATE) for the preparation of the EDIC 2001 in Geneva. We now report the results of the second ATE for the preparation of the EDIC 2002 in Barcelona.

METHODS. The second ATE was held on September 3, 2002 for all Dutch fellows of the 8 Dutch training Departments of Intensive Care Medicine. This informal test examination reflected the EDIC and consisted of 100 questions with 5 true/false alternatives in the English language to be answered in 2.5 hours. We compared the results of the ATE with the results of the EDIC, and we compared the results of the EDIC between ATE participants and Dutch non-ATE participants.

RESULTS. Fifteen fellows participated in the ATE and in the EDIC. Another 5 fellows only performed the EDIC. We received the results of the EDIC of 18 fellows. One fellow who participated in both examinations was lost to follow-up due to fatal illness. The mean ± standard deviation score of the ATE of 15 fellows was 64.2% ± 4.7% (range 56.4%-76.0%). The mean ± standard deviation score of the EDIC of 14 fellows participating in the ATE was 70.5% ± 5.6% (range 52.0%-77.2%). Assuming that the level of difficulty of both exams was comparable, the increase of the mean ± standard error score was 6.3% ± 2.1% (95% confidence interval for difference 2.0-10.5%; t-test p=0.005). The mean ± standard deviation score of the EDIC of 5 fellows not participating in the ATE was 73.0% ± 4.5% (range 70.0%-80.8%), which was not significantly different from the results of the 14 fellows who participated both in the ATE and in the EDIC (t-test p=0.43). The EDIC had 93 participants of whom 17 did not pass. Of the ATE participants, 3 did not pass the EDIC (Fisher exact test: p=1.0).

CONCLUSION. ATE participants did not achieve better results of the EDIC than non-ATE participants. The fellows did consider the ATE as a useful tool in their preparation of the EDIC.
671 GEOGRAPHICAL ORIGIN OF THE COMMUNICATIONS PRESENTED AT THE ANNUAL CONGRESS OF THE ESICM

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INTRODUCTION. The ESICM annual congress is devoted to the presentation of medical studies by intensivists from all over Europe, as well as from other continents. The aim of this descriptive study was to determine the geographical origin of the communications presented at the ESICM congress.

METHODS. 3939 abstracts presented at the six previous ESICM congresses were studied (Paris 1997, Stockholm 1998, Berlin 1999, Rome 2000, Geneva 2001 and Barcelona 2002). The nationality of each abstract was recorded by taking into account the nationality of the first author. An international abstract was defined as being written by several authors from different countries.

RESULTS. 77% of the abstracts came from the European Union, 12% from other European countries and 11% from other continents. This proportion remains consistent for each studied congress. The top eight classifications for the number of abstracts is shown in Table 1. When the number of abstract is compared with each country’s population, Belgium, Greece, Austria and The Netherlands are ranked in the first four nations in terms of communication productivity. France, Sweden, Germany and Switzerland, have presented significantly more abstracts when they organized the ESICM congress. International communications have increased since 2000.

| European Union | Other European Countries | Other continents |
|----------------|-------------------------|-----------------|
| Germany 600    | Switzerland 112         | Brazil 90       |
| France 441     | Czech Republic 60       | The United States 81 |
| Spain 433      | Turkey 78               | Japan 57        |
| United Kingdom 410 | Russia 35              | Israel 37       |
| Italy 297      | Croatia 29              | Australia 32    |
| Netherlands 217 | Poland 25               | Canada 28       |
| Belgium 187    | Yugoslavia 22           | Argentina 17    |
| Greece 157     | Norway 21               | Hong Kong 13    |

CONCLUSION. Collecting data on the ESICM congress communications could be a way of assessing the comprehensive audience of ESICM and comparing the scientific activities of different countries. It would be interesting to obtain such data on a regular and official basis.

672 MANAGING PERFORMANCE IN ICU – A NEW SYSTEM IN BRAZIL

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INTRODUCTION. The study of the performance of one ICU is still setting up. The usual criteria, nowadays, is not enough to assure quality and safety. To analyse the performance of the ICU and to benchmark it with other ICUs could be an experience of great value

METHODS. We register, in a daily basis, variation of the data studied, the mean value, the minimal and the maximal value, the minimal and the maximal value, the mean value of the variation (the same subject in 7 other ICUs) control graphs (with upper limit and lower limit of control covering a confidence interval of 99.7%); these information is in an ICU computer covering a period of 16 weeks; each three months we receive a report with more complete analyses and after 12 months there is a special report with consolidated information.

The data are divided in management, clinical and risk indicators. Each group of indicators are composed of some data; for example risk indicators are composed of rate of patients with some infection, rate of accidental extubation, rate of pneumonia by barotraumas, rate of pneumothorax by venous puncture, rate of pressure ulcers. The system has confidentiality, you only know your data and the benchmarking, but no the data from one specific ICU. The databank is domain of AMIB (the Brazilian Society of Intensive Medicine). We start using the QuaTI at the University-affiliated teaching hospital, data on all procedures performed by fellows in training are collected.

In this period, 19 fellows were trained in our ICU: 8 anesthesiologists, 9 internists, 1 neurologist, and 1 cardiologist. The group consisted of 11 males and 8 females. The number of procedures per month of each fellow. Statistical analysis by means of the Student t-test.

RESULTS. We compare the performance of our ICU with ourselves along the time, each three months, each year and with data from benchmarking ICUs. With this information we have to know our comparative performance and we can decide if it’s necessary to change some process in real and comparative basis

CONCLUSION. The study of the performance of one ICU is difficult, complex and expensive. The better way to know one specific performance is to compare it with similar ICUs that have similar resources and case-mix. To compare a Brazilian with European or American ICU is not ideal and could give equivocal information that generates erroneous decisions. With QuaTI, we start a very interesting project that will create a Brazilian databank on ICU performance.

673 COMPARING QUALITY: COMPUTER VERSUS HAND WRITTEN PRESCRIBING IN THE ICU

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INTRODUCTION. In critical care computerised prescribing is an alternative to handwritten (HR) drug charts. Medication errors (ME) are usually assessed by their effect on patient outcome (1). This scoring system does not reflect issues of quality (Q). For example, an antibiotic could be prescribed and given to the wrong patient without incident. This scores a low patient outcome score but reflects poor Q prescribing. Q examines the extent to which the right drug has been chosen for the correct patient, at the appropriate dose, with adequate information for administration and monitoring. No study could be found in the literature that addresses the issues of quality of prescribing (QOP). Our study compares QOP by assessing ME from the QSS-5.6 Computer Information System (CIS) without decision support and HR drug charts, in a 22 bed general ICU/HDU at a teaching hospital.

METHODS. Details of ME were collected over 9 days for HW charts and 17 days of CIS. Total prescriptions numbers were recorded. A novel QOP Scale was developed: A-C Excellent to adequate, D-Quite poor e.g. an abbreviation used for drug name, signature omitted, E Moderately poor e.g. lack of information on prescription to adequately give drug appropriately, F Extremely poor e.g. wrong patient, wrong dose, wrong drug etc. ME were coded D, E or F Prescriptions without errors were coded A-C.

RESULTS. CIS was associated with a significant improvement in the incidence of A-C prescribing (p<0.01 Chi squ) (table 1). CIS was associated with a reduction in D and E prescribing (p<0.01 Chi squ). The difference in F prescribing was not significant.

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|---|---|
| A-C | D |
| CIS | 23/22 (95.5%) | 4 (18.2%) |
| D | 5 (22.7%) | 22 (12%) |
| E | 72 (3%) | 2429 |
| Total | 2429 |

CONCLUSION. Prescribing is a key function of patient management in the ICU. A novel way to assess prescribing was used - focusing on Q rather than patient outcome from ME. QIS CIS improved the QOP, with less ‘quite poor’ and ‘moderately poor’ prescribing.

REFERENCE(S). 1. ASHP ASHP guidelines on preventing medication errors in hospitals. AJHP 1993:50:305-14.

674 PROCEDURES DURING THE TRAINING OF FELLOWS IN INTENSIVE CARE MEDICINE

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INTRODUCTION. In the Netherlands, fellow-intensivists are trained to obtain the European Diploma in Intensive Care Medicine (EDIC) according to the theoretical and practical guidelines of the European Society of Intensive Care Medicine (ESICM). There are no guidelines for the minimal number of procedures to be performed during the training. The aim of this study was to describe and analyze the number of procedures performed by fellow-intensivists during their training in our Intensive Care Unit (ICU).

METHODS. In the setting of an 18-bed level I closed format medical-surgical ICU in an university-affiliated teaching hospital, data on all procedures performed by fellows in training are prospectively collected in the Intensive Care Database (ICDB) since January 1, 1997 until March 1, 2002. We performed a descriptive analysis of 7 categories of procedures: insertion of arterial catheters, central venous catheters, thoracic drains, endotracheal tubes, and tracheal cannulas, and the performance of cardiopulmonary resuscitations/electric cardioversions and anesthesia. Unit of analysis was the number of procedures per month of each fellow. Statistical analysis by means of the Student t-test.

RESULTS. In this period, 19 fellows were trained in our ICU: 8 anesthesiologists, 9 internists, 1 neurlogist, and 1 cardiologist. The group consisted of 11 males and 8 females. The number of procedures per fellow per month (expressed as mean ± standard deviation, and range) was as follows: arterial catheters 5.9 ± 1.5 (3.4-8.9); central venous catheters 7.2 ± 2.2 (2.8-13.4); thoracic drains 0.8 ± 0.4 (0.2-1.6); endotracheal tubes 3.2 ± 2.1 (1.1-9.6-3); tracheal cannulas 1.0 ± 0.5 (0.1-2.4); cardiopulmonary resuscitations/electric cardioversions 1.2 ± 0.7 (0-3.1); and anesthesia 3.7 ± 1.5 (1.1-6.7). Anesthesiologists performed less procedures than non-anesthesiologists with a statistically significant difference in the categories arterial catheters, central venous catheters, thoracic drains, and endotracheal tubes. Female fellows performed less procedures than male fellows with a statistically significant difference in the categories arterial catheters, central venous catheters, and thoracic drains.

CONCLUSION. The number of procedures per unit of time was determined for 19 fellows trained as intensivists in our ICU. Non-anesthesiologist fellows performed more procedures than anesthesiologist fellows. Male fellows performed more procedures than female fellows.
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SF-36 AND EQ-5D IN ADULT ICU PATIENTS  
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INTRODUCTION. The high cost of intensive care therapy makes it particularly important to be able to measure patient outcomes in terms of improved survival and quality of life. This study evaluated the use of two generic measures of health related quality of life (SF-36 and EQ5D) for assessing outcomes for adults in intensive care.

METHODS. All patients admitted over a 3-month period to 7 hospital general intensive care units (2 Teaching Hospitals and 5 General Hospitals) were included in the study (601 patients). General demographic data and APACHE II3 scores were collected together with reason for admission and survival status. At 3, 6 and 12 months post ICU admission SF36 and EQ5D were sent to those patients who had survived and were capable of completing the questionnaires. With the 3-month questionnaire a separate EQ5D was sent and the patient was asked to complete this on their quality of life prior to admission.

RESULTS. 601 patients were admitted 54.2% Male 45.8% Female. Mean age 60 years. Mean length of stay 5.7 days. 85% were emergency admissions. Mean APACHE II score 17.5. 145 patients died in ICU (24.1%) and 52 died in Hospital (8.6%). 22 patients were incapable of completing a questionnaire and 10 patients died between hospital discharge and 3 months, therefore a total of 394 questionnaires were sent out with a response rate of 65.5% (258) at 3 months. EQ5D and SF-36 indicated that there were significant problems across a range of dimensions. There was also evidence of continued improvements between assessments. However they did not reach the levels of an age and sex matched sample. 

CONCLUSION. The EQ5D and SF-36 have been found to be useable in an adult ICU population.

REFERENCES. 1. Ware JR. The MOS 36-item short-form health survey (SF-36). Conceptual framework and item selection. Med Care. 1992: 30, 473.  2. Williams A. EuroQol Group EuroQol. – a new facility for the measurement of health-related quality of life. Health Policy 1990; Vol. 16, 199-208.  3. Knass WA. APACHE II: A severity of disease classification system. Critical Care Med. 1985 Vol. 13, No 10. 818-829

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HEALTH RELATED QUALITY OF LIFE IN SEVERE BURN PATIENTS: ASSESSMENT USING EURO-QOL QUESTIONNAIRE  
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INTRODUCTION. Early diagnosis of any alterations of quality of life (QOL) post-injury and specification of the type of alteration facilitating treatment of problems through rehabilitation, psychological support, occupational therapy is mandatory in all critically ill patients and particularly in burn patients. In recent years, the studies regarding QOL have proliferated and a number of questionnaires have been developing; one such instrument is the EuroQol-5D(EQ-5D).

METHODS. This study was carried out on severe burn patients who were discharged from a polyvalent intensive care unit (ICU) of a University Teaching Hospital from 1999 to 2001. All patients at admission were intubated a cause of inhalation or head burn involvement. The following data were collected: age, sex, percentage of total body surface area burned (% TBSA), degree of burn, location of burns, length of ICU stay (LOS). The QOL was evaluated using EuroQol-5D questionnaire that was administered to survivor patients by telephone by the same clinician six months after injury.

RESULTS. Sixteen adult burn patients were evaluated (9 male and 7 female); their mean age was 50.1±19.4; they had a mean of percentage of TBSA burned of 39.6±19.2, of III degree. Most patients were burned to the upper and lower extremities 12 (75%); burns to the head, face, neck were present in 9 (56.2%) patients. The mean of LOS was 15.6±14.9 days. Three patients died in the ward after ICU discharge, two died within six months follow-up period and two were lost to follow-up. Nine patients were interviewed. At time of interview the level of health of all patients was worse than previously to injury. EQ visual scale (VAS) score median was 50. Moderate and extreme problems in the five dimensions studied were present as follow: mobility (moderate 44.4%; extreme 9%), self-care (moderate 22.2%; extreme 33.3%), usual activities (moderate 66.6%; extreme 22.2%), pain/discomfort (moderate 66.6%; extreme 11.1%), anxiety/depression (moderate 44.4%; extreme 33.3%).

CONCLUSION. In our severe burn patients population, QOL is influenced by consequences of injury both in psychological and physical health. In this preliminary report, EQ-5D seems to be reasonably valid, reliable and responsive in burn patients.

REFERENCES. 1. Salvador-Sanz JF, et al.Burn 1999:25:593-598.  2. The EuroQol Group. Health Policy 1990;16:198-208

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QUALITY OF CARE IN THE INTENSIVE CARE UNIT: THE SIGHT OF THE FAMILY MEMBERS  
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INTRODUCTION. In spite of new technologies and sophisticated monitoring, the intensive care has been distant from humanization. To know anxieties and the perception of the family members of patients at the ICU can optimize the improvement of the intensive care quality.

METHODS. Medical students interviewed 45 family members of patients at the ICU of a university hospital, using a 12 query questionnaire the quality of care (physicians and nursing).

RESULTS. 45 families answered the questionnaire; mean length of stay by the time of the interview was varying from 3 to 120 days; the most frequent complaint was the noise and reduced visit period (only 30 minutes per day) in 26%(12of the answers). 12(26%) of the families reported that the patients have not complained of pain and 9(20%) did report pain, most of all of minimum intensity (66.6%) with quick relief after medication. There were 2(4,4%) complaints of pain during blood exam sampling. Variations of temperature troubled 7(15,5%) of the patients. Visit period (30 minutes) was considered to be unsatisfactory by 18 (40%) of the families; 20(44,4%) suggested to amplify visit period and number of visitants. The medical attendance was qualified as „very good” by 24(53%) and „good” by 21(47%); the nursing attendance of qualified as „very good” by 12(26,6%) and „good” by 27(60%); unsatisfactory information provided by nursing was the complaint of 14(31,1%) families. 38(84,4%) families reported great hope in the treatment instituted at the ICU.

CONCLUSION. To know the anxieties of the families in the regard of treatment instituted in the ICU allows correction of mistakes and improvement the quality and humanization.

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BEYOND CLASSICAL FRONTIERS IN INTENSIVE CARE MEDICINE  
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INTRODUCTION. Traditionally, physicians are divided in headworkers and handworkers. Generally, the medical staff in a department of Intensive Care Medicine consists of physicians of different origins. We describe and analyse the contribution of headwork and handwork by intensivists, fellow-intensivists and residents in our Intensive Care Unit (ICU).

METHODS. In the setting of an 18-bed level I closed format medical-surgical ICU in an university-affiliated teaching hospital, data on all procedures and notes performed by our medical team are prospectively collected in the Intensive Care Database (ICDB) and through an Intensive Care Information System (MetaVision®). We studied the contribution of headwork and handwork of 29 physicians from March 1, 2001 until March 21, 2003. From March 1, 2001 until March 21, 2003, 29 physicians worked in our ICU: 5 intensivists, fellow-intensivists and residents.

RESULTS. From March 1, 2001 until March 21, 2003, 29 physicians worked in our ICU: 5 intensivists, fellow-intensivists and residents in our Intensive Care Unit (ICU). The number of procedures and notes per day of employment per physician and the mean number of notes per day of employment per physician.

CONCLUSION. The number of procedures and the number of notes per unit of time per physician was equally distributed between the two stereotypes of headworkers and handworkers. Physicians in Intensive Care Medicine have gone beyond the classical frontiers.
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RESPIRATORY PULSE PRESSURE VARIATIONS AS A GUIDE TO FLUID RESPONSIVENESS IN MAJOR HEPATIC SURGERY?
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INTRODUCTION. Major hepatic surgery leads to variations in volume status and venous return. The aim of the study was to assess the use of six hemodynamic parameters in predicting fluid responsiveness in major hepatic surgery. Two static parameters measuring cardiac preload were studied through pulmonary artery catheterisation: right atrial pressure (RAP) and pulmonary capillary wedge pressure (PCWP). Four dynamic parameters studied ventricular preload dependency : respiratory pulse pressure variations (△PP) (1) of radial arterial pressure (△PArt), pulmonary arterial pressure (△PAPap), infrared photo-plethysmographic capillary pressure (Finapress®) (△PPina) and respiratory variations of the pulse oximetry curve (△PPrat). Fluid responsiveness was assessed through increase in stroke volume index (SVI) measured by thermodilution.

METHODS. With institutional ethics review board approval, 8 patients undergoing major hepatic surgery were prospectively enrolled. A 250 ml colloid fluid challenge (FC) was systematically performed for heart rate rising and/or systolic blood pressure falling up to 20% from baseline. Each hemodynamic parameter was measured before and after FC. The FC was repeated if SVI increased over 10% (responder: R). An increase in SVI >10% was classified as non responder (NR). To assess the ability of indexes to predict increase in SVI to FC, Receiver Operating Characteristic (ROC) curves were generated and the areas under the ROC curve (AUC) were calculated and compared for each parameter.

RESULTS. 54 FCs (27 R and 27 NR) were performed. The AUC were 0.77 (95% confidence interval [CI] 0.65 to 0.90), 0.78 (95% CI 0.66 to 0.90), 0.72 (95% CI 0.58 to 0.86), 0.71 (95% CI 0.57 to 0.85), 0.38 (95% CI 0.24 to 0.53) and 0.44 (95% CI 0.28 to 0.59) for △PPart, △PPina, △PPrap, △PAPap, POD and PCWP, respectively. The areas for dynamic parameters were significantly greater than those for RAP and PCWP.

CONCLUSION. Respiratory pulse pressure variations (△PPart, △PPina, △PPrap) and oximetry curve variations (△PPrat) may be considered as predictive indexes of the cardiac output response to fluid challenge in patients undergoing major hepatic surgery.

REFERENCE(S). 1. Michard F et al. Am J Respir Crit Care Med 2000;162:134-8.
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COMPARISON OF STROKE VOLUME MEASURED BY WEP TECHNIQUE VERSUS THERMODILUTION.

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INTRODUCTION. The Wideband External Pulse (WEP) calculates arterial compliance by analysis of the ratio of the incident (SS1) to reflected waves (SS2). The waves are recorded from a piezoelectric sensor positioned beneath the distal edge of a blood pressure cuff placed over the brachial artery. Stroke volume is calculated by multiplying compliance by pulse pressure.

METHODS. Stroke volumes with WEP were measured in 24 patients in Intensive Care in whom continuous cardiac output was assessed using the Wep®® thermodilution pulmonary artery catheter and the values compared. 40 measurements in total were made. Patients were either admitted to Intensive Care post surgery (n=8), suffered from sepsis (n=13) or cardiac failure (n=3). Age ranged from 52 to 83.

RESULTS. The analysis described by Bland and Altman, which is used to assess agreement between two devices measuring the same parameter, is shown in fig.1. The simple correlation between stroke volume (ml) by pulmonary artery catheter versus stroke volume (ml) by WEP is shown in fig.2 (R²=0.6768).

CONCLUSION. The WEP system has reasonable agreement with thermodilution (pulmonary artery catheter) particularly for stroke volumes less than 80 ml and could be a useful monitor in Intensive Care subjects. Differences between the two techniques could be due to continuous averaging/Vigilance® versus single measurement (WEP). Additional studies are required to further validate these results.

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BNP AND NT-PROBNP AS NEW MARKERS OF CARDIAC DYSFUNCTION IN SHOCK PATIENTS.

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INTRODUCTION. We sought to assess the diagnostic value of BNP and NT-pro-BNP levels to identify cardiogenic origin in patients admitted in shock.

METHODS. Twenty-one patients with shock were prospectively enrolled in this multicentric study. All of them underwent clinical examination, EKG, chest X ray, cardiac echo and blood gases analysis. They were evaluated by 2 independent clinicians blinded to BNP and NT-pro-BNP results. Practitioner divided patients in 3 groups : no cardiac dysfunction (group 1), patient with cardiac dysfunction (group 2) and cardiac death (group 3).

RESULTS. For all conditions the correlation between BNP and N-T pro-BNP was strong (r=0.83; p<0.0001). These two markers were significantly elevated in patients with abnormal cardiac echo findings (BNP: 449 ± 428 pg/ml vs 199 ± 428 pg/ml, p=0.005; NT-proBNP: 2953 ± 54349 pg/ml vs 1106 ± 1055 pg/ml, p<0.01) and strongly correlated to increased capillary pulmonary wedge pressure (BNP: r=0.69, p<0.01; NT-proBNP: r=0.62, p<0.05). We noticed a proportional increase in both markers associated to the severity of cardiac dysfunction (BNP: 338 ± 345 pg/ml in group 1, 775 ± 375 pg/ml in group 2, 1063 ± 425 pg/ml in group 3, p=0.01; NT-proBNP: 1729 ± 1503 pg/ml in group 1, 7186 ± 503 pg/ml in group 2, 5892 ± 7411 pg/ml in group 3, p<0.01). To detect cardiac abnormalities in patients with shock, sensitivity (Se) and specificity (Sp) of BNP levels higher than 163 pg/ml was of 93% and specificity (Sp) of 57%, with a positive predicting value (PPV) of 81% and negative predictive value (NPV) of 80% (AUC of 0.85). For a NT-proBNP level >869 pg/ml we found Se=92%, Sp=100%, PPV=100% and NPV=88% (AUC of 0.97). Finally, in a patient admitted for shock a BNP level = 889 pg/ml allows to diagnose cardiac dysfunction with a Se of 86%, Sp of 86%, PPV of 75% and NPV of 92% (AUC of 0.82), a NT-proBNP level =16541 pg/ml had a Se=86%, Sp=100%, PPV=100% and NPV=93% (AUC of 0.96).

CONCLUSION. This study shows that BNP and NT-proBNP levels assessment is a powerful, fast and non invasive tool to diagnose cardiac participation in patients admitted for shock. Moreover NT-proBNP appears to be a stronger predictive marker than BNP in assessing the reality of cardiac shock.

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RELIABILITY OF VENOUS BLOOD GAS MEASUREMENTS IN THE RECOGNITION OF THE ACUTELY ILL PATIENT.

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INTRODUCTION. This study aims to determine the extent of correlation between arterial and venous pH, Base Excess and Lactate with a view to identifying whether venous samples could be used as an alternative to arterial values in the clinical management of acutely ill patients.

METHODS. We prospectively compared 210 pairs of simultaneously obtained central venous and arterial blood gas values for pH, Base Excess and Lactate in a group of 31 surgical intensive care patients. Data were analysed using Pearson correlation and Bland-Altman plots.

RESULTS. For the entire group (n=210), the correlation between venous and arterial pH, Base Excess and Lactate were r=0.878, 0.866, and 0.856 respectively (p<0.05). Median values for this group were pH, venous 7.32 (7.059-7.48) arterial 7.36 (7.1- 7.52), Base Excess, venous -1.3 (-16.5-5.1), arterial -2.0 (-16.8-4.6) and Lactate, venous 1.0 (4.8) arterial 0.9 (3.8). Bias and limits of agreement are shown in Table 1.

| Bias and Limits of Agreement | | | |
|----------------------------|------------------|------------------|------------------|
| pH                         | -0.04            | 0.022            | -0.08-0.02       |
| Base excess (mmols/L)      | 0.63             | 1.08             | -1.49-2.75       |
| Lactate (mmols/L)         | 0.13            | 0.29             | -0.437-0.703     |

CONCLUSION. Venous blood gas measurements provide a reliable reflection of acid base variables as compared to arterial samples. This suggests that they could be used to estimate the severity of acid base derangement in patients’ without arterial access and also as a simple method of quantifying severity of illness.

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GASTRIC TONOMETRY, CARDIAC INDEX AND INTRAABDOMINAL PRESSURE IN PATIENTS WITH INTESTINAL OBSTRUCTION.

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INTRODUCTION. Reduction of cardiac index (CI) and gastrointestinal ischaemia occurs particularly because of intraabdominal hypertension (IAH) (1). Analysis of CI and intraabdominal pressure (IAP) may determine their participation in gastrointestinal ischaemia.

METHODS. As intestinal failure can be accompanied by IAH (2) we studied 24 patients with diagnosis of intestinal obstruction. IAP and PyCO2-PaCO2 (kPa) were measured by TRIP NGS catheter and Tonocap monitor. CI was fixed by rheographic device. All measurements were carried out preoperatively and on the second day after operation. Cluster analysis was performed on the base of differences between IAP, CI and PyCO2-PaCO2.

RESULTS. Before operation in 16 patients the higher level of IAP was combined with relatively low CI and significant PyCO2. On the second day after operation (table 2) IAH was accompanied higher PyCO2 in 7 patients of the first cluster. There was no significant difference between CI in the clusters on the second day after operation. Differences between IAP, CI and PyCO2-PaCO2 before operation (n=24)

| 1st cluster (n1=16)       | 2nd cluster (n2=8) | p     |
|---------------------------|-------------------|-------|
| IAP, kPa                  | 18.7±2.31         | 9.3±3.14 | <0.05     |
| PyCO2-PaCO2, kPa          | 2.31±0.42         | 1.55±0.40 | <0.05     |
| CI, l/m²                  | 2.93±0.32         | 3.6±0.29 | <0.05     |

Differences between IAP, CI and PyCO2-PaCO2 on the 2nd day after operation (n=24)

| 1st cluster (n1=7)       | 2nd cluster (n2=17) | p     |
|--------------------------|---------------------|-------|
| IAP, kPa                 | 14.6±2.95          | 7.8±3.73 | <0.05     |
| PyCO2-PaCO2, kPa         | 2.58±0.39          | 1.03±0.28 | <0.05     |
| CI, l/m²                 | 3.11±0.34          | 3.6±0.38 | <0.05     |

CONCLUSION. Dynamic cluster analysis revealed dominant position IAH in gastrointestinal ischaemia in patients with intestinal obstruction.

REFERENCE(S).
1) Diebel L., Saxe J., Dulchavsky S (1992) Am Surg 58: 573-576
2) Malbrain MLNG (2000) Curr Opin Crit Care 6: 17-29

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COMPARISON OF SUBLINGUAL AND INTESTINAL MICROVASCULAR FLOW IN CRITICALLY ILL PATIENTS

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INTRODUCTION. In apparently adequately resuscitated shock patients microvascular failure may be severely underestimated. If not recognized timely, intestinal microvascular blood flow becomes jeopardized inducing organ dysfunction and increasing the risk of death. If intestinal hypoperfusion is reflected in abnormal sublingual microvascular flow, the latter parameter could possibly be used as a guideline for treatment.

METHODS. Sublingual and mucosal microcirculatory flow was determined in patients with a stoma admitted to our mixed bed ICU by orthogonal polarization spectral (OPS) imaging. For analysis, digital screen images were evaluated as described before[1] and microvascular flow index (MFI) was calculated in small, medium, and large-sized microvessels (0=no flow; 1=sludging, 2=moderate flow, 3=high flow).

RESULTS. During the study period of 6 months, 23 paired measurements (sublingual and stoma) in 17 patients (12 ileostoma, 5 colostoma) were evaluated. The mean age was 59 years with a mean APACHE score at admission of 18.6; mean predicted mortality 41%. Fourteen patients left the hospital alive. Two patients died due to persisting multiple organ failure. Mean sublingual MFI varied in small (2.2; range 0.3-3.0), medium-sized (2.5; range 0.3-3.6), and large-sized microvessels (2.9; range 0.8-3.0). Mean intestinal MFI was 2.4 (range 0.3). Intestinal microvascular flow was related to sublingual microvascular flow in small microvessels (P<0.001), medium sized microvessels (P<0.001), but not to the flow in large microvessels (P=0.199).

CONCLUSION. This observational data suggests that sublingual flow patterns in smaller microvessels might reflect intestinal mucosal blood flow. Sublingual OPS imaging may be a valuable and easy bed-side tool for optimizing intestinal blood flow. Further studies should corroborate this finding.

REFERENCE(S). [1] Spronk PE, Ince C, Gardien MJ, Mathura KR, Oudemans-van Straaten HM, Zandstra DF. Nitroglycerin promotes microvascular recruitment in septic shock after volume resuscitation. Lancet 2002, 360: 1395-1396

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INFLAMMATORY MARKERS IN PATIENTS WITH ATRIAL FIBRILLATION: EVOLUTION IN TIME AND RHYTHM INFLUENCE.

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INTRODUCTION. Inflammation plays a role in the development and maintenance of atrial fibrillation (AF). High-sensitivity C-Reactive Protein (hs-CRP) is increased in these patients. Some pro-inflammatory cytokines, such as TNF-alpha, IL-6 and IL-1beta are elevated in patients with heart failure. We aimed: 1) To evaluate inflammation in patients with AF by measuring these markers 2) To analyse them, after elective electrical cardioversion (ECV), at one-month follow-up, and the relationship with cardiac rhythm.

METHODS. We included 34 consecutive patients with AF planned to undergo electrical cardioversion (ECV). Levels of hs-CRP, TNF-alpha, IL-6 and IL-1beta were measured in all the patients previously to ECV and compared with a control group of 16 healthy volunteers. Patients with malignancy or active infectious process were excluded. At 1-month follow-up, rhythm and inflammatory markers were reassessed in 24 patients.

RESULTS. 34 patients (mean age, 63±11 years; 8 (23 %) women) with AF (mean duration 30 (10-40) years) were included. All the patients underwent programmed ECV, which was successful in 30 (88.2 %) cases. hs-CRP was significantly higher in patients compared to controls (mean 5.29 ± 7.63 vs. 1.56 ± 2.45 mg/l, P<0.015). TNF-alpha levels were elevated in 10 (29 %) patients (mean 2.07 ± 3.39 pg/ml) as compared with controls, whose levels were undetectable in all of them (p=0.017). Neither IL-6 nor IL-1beta were significantly different in both groups. Sinus rhythm (SR) was maintained in 10 (41 %) patients at 1 month. hs-CRP in these patients was significantly decreased compared with their baseline hs-CRP levels (baseline 4.59 ± 4.58 vs 2.97 ± 2.20 mg/l at 1 month, P< 0.03). We found no difference for TNF-alpha. Patients with recurrence of AF did not show this change.

CONCLUSION. 1. hs-CRP and TNF-alpha are increased in patients with AF compared with a control group of healthy volunteers. Other pro-inflammatory cytokines, such as IL-6 and IL-1beta, are not different in both groups. 2. Patients maintaining in sinus rhythm 1 month after elective ECV show a significant decrease in hs-CRP compared with their baseline levels, in contrast with patients with recurrence of AF. These are preliminary results and further data are needed to confirm these results in the long-term follow-up.

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COMPUTER CAPILLAROSCOPY: A NEW TOOL FOR ASSESSMENT OF MICRO-CIRCULATION IN CARDIOLOGICAL PATIENTS.

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INTRODUCTION. The appearance of new television and computer facilities has made possible processing of large video information content and obtaining of the quantitative characteristics of such dynamically varying processes as capillary blood flow.

METHODS. We used computer capillaroscope “Capillar” (Russia) for measurement capillary blood velocity (CBV), peripheral zone (PZ) size and some other parameters during treatment by diuretics and captopril in 17 patients with coronary artery disease (CAD) complicated with congestive heart failure (CHF).

RESULTS. At the beginning of the patient’s treatment PZ size was 143.5 ± 16.5 m, CBV was 265.3 ± 123 m s. After first week PZ size reduced to 126.5 ± 12.1 m, CBV increased to 320.6 ± 20 ms. PZ size declined to 115 ± 12.6 m, CBV increased to 342.7 ± 16.8 ms after 3 weeks from a beginning of treatment.

CONCLUSION. Computerized capillaroscopy could be used for noninvasive quantitative assessment of microcirculation parameters in cardiology, intensive care management, clinical and pharmacological trials.

REFERENCE(S). [1] Kennergren C et al. Am J Physiol 2002
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BPN PLASMA LEVELS ARE NOT AFFECTED BY AUTONOMIC DISFUNCTION IN MODS PATIENTS

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INTRODUCTION. Brain naturalipeptide is an established marker of left ventricular dysfunction in different disease entities. Its release characters are potentially influenced by the sympathetic activity. Our present study aimed to investigate whether the BPN plasma level (BPN) correlates with myocardial damage and whether BPN is influenced by autonomic dysfunction (AD) seen in MODS.

METHODS. We enrolled 45 consecutive MODS patients who were admitted to a university Medical/Cardiological ICU. MODS was defined by an APACHE score (AP2)>20 and sepsis as a sepsis score according to Eblebe and Stoner (SeSc) =12. BPN was measured by RIA. Tropomin 1 (T1) reflected the myocardial damage and was measured by routine hospital analysis (ELISA). Heart rate variability (HRV, time-domain and frequency domain analysis), baroreflex sensitivity (BRS, phenylephrine method) and chemoerreflex sensitivity (CRS, hyperox method) were used as markers of AD and assessed according to the international standards (summary in [1]). HRV parameters pNN50 and HF as well as BRS were used for assessment of parasympathetic activity. LF/HF ratio as a measurement of sympathetic modulations and mean heart rate (24 h) as an indicator of sympathetic-parasympathetic balance.

RESULTS. 16 female and 29 male MODS patients (mean±sd, age 59±15 y, AP2 29.0±9.8 [for comparison SOFA Score 11.4±3.9], SeSc 12.5±5.3, 84% on mechanical ventilation, 56% with catecholamine application, 62% sedated) into the study. The mean BPN was (in-transformed) 0.8±0.1 2 ng/ml and that of T1 (in-transformed) 2.2±0.8 ng/ml. We found a significant correlation of T1 with the BPN (r=0.54, p=0.017). The parameters of AD were characterized as follows (mean±sd): pNN50 5.1±8.4; HF 141.4±370.5; LF/HF 1.1±1.1; BRS 1.5±2.1 mln/mmHg, CRS 0.5±0.4 mln/mmHg, mean heart rate 93.0±18.5 be/min. We found no significant correlation of AD markers with BPN (pNN50 r=0.1, p=0.5; HF r=0.2, p=0.3; LF/HF r=0.01, p=0.9; BRS r=0.1, p=0.4; CRS r=0.2, p=0.4, mean heart rate r=-0.3, p=0.1). There was no difference between nonseptic and septic patients (lnBPN 0.76±0.77 vs. 0.77±0.4 ng/ml, p=0.5).

CONCLUSION. According to our results we conclude that BPN is correlated to the myocardial damage in MODS patients. The AD was blunted in the observed cohort of patients. Otherwise than in healthy subjects BPN seems not to be linearly correlated to sympathetic activity in MODS.

REFERENCE(s). [1] Schmidt et al. (2001) Curr Opin Crit Care 7:314-322
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Poster Session

Monitoring neurological emergencies - 692-705

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CEREBRAL OXYGEN METABOLISM AND SECONDARY HYPOPHYDOSIS IN NEUROSURGICAL PATIENTS WITH POOR OUTCOME.

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INTRODUCTION. Intensive care patients with severe brain injury (SBI) suffer from cerebral ischemia and dysoxia. Both low and high SjvO2 values are associated with poor outcome. SBI affects thyroid function and secondary hypothyroidism correlate with neurological impairment. The purpose of this study was to compare cerebral oxygen metabolism (COM) in patients who survived or died of SBI and to correlate this changes with thyroid function.

METHODS. COM and thyroid hormones were monitored in 56 patients with SBI in the NICU. Patients were managed by a standard protocol that emphasized prompt evacuation of intracranial hematomas and prevention of secondary brain insults. They all were ventilated and treated aggressively to keep ICP 70 mm Hg. Patients were divided in two groups according to GOS at discharge from the hospital: group I - severe disability and vegetative states (GOS 3-2, 16M/5F, 38 yo) and group II - dead (24M/11F, 39 yo). SjvO2 was measured intermittently in blood obtained from jugular bulb catheters. Plasma thyroid hormones and prolactin level were evaluated in 28 patients using RIA.

RESULTS. Multiple jugular venous desaturations were found in 67% and 36% and elevated SjvO2 were found in 44% and 59% of patients of group I and II respectively. Parameters of COM during first week after insult were different between groups, with higher SjvO2, lower CEO2 and AVDO2 in dead patients. Low TSH, T3 and T4 levels were very common, correlated with severity of diencephalic syndrome and were more pronounced in Group II. We found a very close correlation (r=0.9267, p<0.0001) between two methods of CEO2 calculation: 1. SjvO2, 2. 

AVDO2/CAO2 x 100%

CONCLUSION. These results demonstrate that both low and high SjvO2 are very common events in neurological coma patients with poor outcome. Decreased COM and symptoms of secondary hypothyroidism due to severe diencephalic dysfunction are very poor prognostic factors. We postulate that high level of SjvO2 is associated with impaired cerebral mitochondrial function due to severe hypothyroidism. Secondary diencephalic dysfunctions are independent factor of unfavorable outcome. We recommend to use SjvO2 as more practical method of calculating CEO2.
INTRODUCTION. The diagnosis of brain death must be made by clinical findings. Transcranial Doppler (TCD) can be used to confirm cerebral circulatory arrest. Five patterns of TCD profile changes that occur, as intracranial hypertension progresses to brain death, have been identified: Low diastolic flow velocity (SDV), High systolic peaks, Oscillating blood flow, Short systolic spikes, and Absence of TCD signal.

METHODS. 38 patients who met clinical criteria of brain death were examined by TCD. Bilateral TCD studies of intracranial arteries were performed: at least the middle cerebral (MCA) and posterior cerebral (PCA) arteries were insonated throughout the transcranial window, using an IntraView TM pulse Doppler instrument (Rimed, Israel) with 2 MHz probe. The examination was made within 3 - 12 hours after clinical diagnosis of brain death. Stable arterial blood pressure was maintained throughout the TCD examination.

RESULTS. 38 patients were examined, aged 0-75 years (mean 49.33 years), 27 males. Causes of brain death were: ischemic stroke (3), hemispheric haematoma (16), head trauma (6), primary infratentorial lesion (7), others (6). TCD examination showed the following FV patterns: 4 (10.5%) systolic peaks, 5 (13.2%) oscillating blood flow, 8 (25%) systolic spikes. In 3 (7.8%) patients it was not feasible to obtain an adequate signal. An asymmetric FV pattern of cerebral circulatory arrest (combining systolic peaks and oscillating flow) was observed in 12 (31.5%) patients. Three patients who fulfilled clinical criteria of brain death had near-normal preserved forward flow in the MCA: they had primary brain stem injury, cerebellar haemorrhage, and one was a neonate. Three patients (7.8%) had systolic peaks or oscillating blood flow pattern in some arteries and presence of normal waveforms in others.

CONCLUSION. 1.- In our series, 76.6% of patients who fulfilled clinical criteria of brain death, showed a TCD pattern of cerebral circulatory arrest. 2.- The most frequent pattern was an asymmetric FV pattern (31.5%), perhaps because most of the patients had massive unilateral lesions. 3.- TCD adds very useful information on patients with a primary infratentorial lesion, distinguishing brain death from brain stem death. 4.- In some patients (7.8%), no intracranial TCD signal was detectable and a further confirmatory test was required.

BISPECTRAL INDEX MONITORING TO TITRATE THIOPENTAL INFUSION IN BRAIN DEATH

CONCLUSION. The main aim of this survey has been to evaluate the influence of posttraumatic diffuse axonal injuries in the outcome of patients after head trauma.

METHODS. Prospective, and observational study. We included forty-seven consecutive patients admitted in our intensive Care Unit after a head trauma (< 47% severe head injury, 21% moderate, and 30% minor). An specific protocol of study of CT scan investigating images associated to DAI was developed, including lesions in corpus callosum, mesencephalon, brain stem, basal ganglia, intraventricular haemorrhage (IVH) and subarachnoid haemorrhage (SAH). For analysis of outcome the Disability Rating Scale of Rappaport (at 3, 6, and 12 months after trauma) was used. A specific registry of DAI was considered: (Group 1) Severe disability when the DRS values were higher than 6, (Group 2) Mild disability, DRS 2-6, (Group 3) Low or absence: 1-0. We compared the patients' disability ranking according to they showed or not DAI dates. We analysed all dates using Mann-Whitney non parametric test for independent samples.

RESULTS. The mean age was 27 +/- 10 years. 24% female. The outcome of patients according DRS was: (table1). 50 % of patients showed data of DAI in the CT scan. The lesions were situated: 19% mesencephalon, 43% SAH, 17% IVH. The mesencephalon and corpus callosum body lesions were related to a significant higher grade of disability measured with DRS (p < 0.05). The existence of any type of DAI was also related to higher disability to the discharge of ICU (p < 0.04).

LONG TERM PROGNOSIS OF SEVERE HEAD TRAUMA PATIENTS

BRAIN DEATH TRANSCRANIAL DOPPLER ULTRASONOGRAPHIC PATTERNS ASSOCIATED WITH BRAIN DEATH

CONCLUSION. 1. The neurological disability at discharged of the ICU, is high in patients who suffer DAI.

METHODS. Among 2641 trauma patients admitted from 1992 to 2000, a severe head trauma, defined as GCS ≤ 8 and indication of ICP monitoring, was diagnosed in 381 patients. 269 (70%) were alive after the ICU stay. All these patients or next of kin were contacted in order to determine their real independence, motor defects, and behavioral troubles. The visits were scheduled for the follow-up examinations at least one year after the trauma.

RESULTS. Among the 269 patients, 199 (74%) were got in touch. Their mean age was 32 +/- 15 yrs, with 77% of men. Among these 199 patients, GOS was as shown in Table 1. GOS ≥ 4 was found in 114 patients. Among them, 72 (63%) came back to their occupation, similar to those they had before the occurrence of trauma in 42% of cases. 66 (58%) were able to drive a car, 103 (90%) had not motor sequel. On the other hand, 46 (40%) had disabling memory problems and 22 (19%) did not experience behavioral disorders only, like aggressiveness, irritability, depression and anxiety.

Glasgow Outcome Scale

| GOS | 1 | 2 | 3 | 4 | 5 |
|-----|---|---|---|---|---|
| %  | 19 | 38 | 39 | 41 | 21 |
|     | 37 |

CONCLUSION. The prognosis of severe head trauma patients is gloomy, since 50% of them died between admission and follow-up examinations (> one year). Only few patients (< 20%) can have a quality of life similar to that they had before the occurrence of trauma. The determination of the long-term prognosis of severe head trauma patients with GOS overrates the patient quality of life. Most of them have severe cognitive disorders, harmful to their professional reintegration.
CRANIOCEREBRAL INJURY AND DAILY INTERRUPTION OF SEDATION IN MECHANICALLY VENTILATED PATIENTS

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INTRODUCTION. The aim of this clinical trial is to study the influence of daily interruption of sedative infusions in ICU patients (pts) with head injury on: duration of mechanical ventilation (DMV), duration of weaning (DW), length of stay (LS), number of brain CT scans required, number of extubations due to agitations when pts were awake and prognosis.

METHODS. We studied retrospectively 69 ICU pts with head injury, 45 men (65.2%) and 24 women (34.8%). All of them received sedation and mechanical ventilation. Mean age: 34.2±18.3 years. The pts were divided in 2 groups: in group A (30pts, 43.5%), sedation was regularly interrupted every 24h until the pts were awake and examined neurologically or until the absolutely needed sedation again because of agitations and hemodynamic instability. In group B (39 pts, 56.5%) sedation was not interrupted until the onset of weaning. Sedatives used were propofol or midazolam in combination with opiates in 56 pts (81.2%) and paralytic drugs in 45 (65.2%).

RESULTS. In groups A and B were respectively observed: Mean initial Glasgow Coma Scale: 6.7±1.7 and 6.6±1.3. Mean DMV: 11.2±3.7 and 16.8±3.4 days. Mean DW 1.8±0.9 and 4.7±1.3 days. Mean number of brain CT scans required 2.5±2.0 and 2.7±0.5. Mortality rates: 6/30 (20%) and 9/39 (23%). Overall mortality rates: 15.6%±21.7%. From pts of groups A, 1 needed brain MRI and 3 lumbar punction, while in group B 3 and 6 pts respectively. In group A the mean duration of infusion was 22.5±6h per day for propofol and 19.4±2h for midazolam.

CONCLUSION. Statistical analysis showed that: 1) Pts of group A had shorter DMV (p=0.05), DW (p=0.01) and LS (p=0.05). 2) Paradoxically the number of mean brain CT scans required had no significant difference between the two groups (p=0.1); however, this slight decrease may reduce the rate of complications related to the transport of pts and the risks due to irradiation. We mention that additional information was provided, especially during the last year, by the frequent use of transcranial Doppler in all pts with head injury. 3) No increased episodes of extubation by the pts were noticed in group A. 4) Prognosis was not influenced; mortality rates were similar in both groups (p=0.1).

GONADAL DYSFUNCTION IN ACUTE BRAIN INJURY

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INTRODUCTION. Disagreement between studies is evident regarding the incidence of gonadal dysfunction following traumatic brain injury (TBI). Moreover, factors posing a risk to gonadal deficiency in head injury victims are incompletely understood.

METHODS. To clarify these, 27 male patients with moderate-to-severe TBI (median GCS 7), having a mean age of 37 years, were studied after weaning from mechanical ventilation (10-60 days following physical injury). Head injury was due to motor vehicle collisions (n=20) or accidental falls (n=7). Initial brain CT-scans were graded according to Marshall Computerized Tomographic Classification (MCTCscores: I-VI). Intracranial pressure was determined by collecting hourly measurements. Endocrine assessment included measurement of testosterone (T), prolactin (PRL), folicile-stimulating hormone (FSH) and luteinizing hormone (LH). Hypogonadism was considered when serum levels of T were low along with low or normal concentrations of gonadotropins, in the presence of normal PRL concentrations.

RESULTS. T levels ranged from 66-535 ng/ml and PRL concentrations ranged from 3.3-42.0 ng/ml. Six of the 27 patients (22%) had hypogonadism. There were no differences in age, GCS score on admission in the ICU, presence or magnitude of intracranial hypertension between patients with hypogonadism and those with normal gonadal function. In contrast, patients with hypogonadism had a higher MCTC score on initial brain CT-scan compared to subjects with normal gonadal function (V vs. III, p=0.006).

CONCLUSION. In male patients treated in the ICU for TBI gonadal abnormalities are relatively frequent and depend upon radiological measures of head injury severity.

DIGITAL RECORDING AND ANALYSIS OF ICP IN TBI

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INTRODUCTION. Search for a correlation between plasmatic level Neural Specific Enolase (NSE) and short term prognosis in head trauma.

METHODS. Prospective study performed through 15 months and including 35 Head trauma requiring neurosurgery. La prise en charge was standardized for all patients in order to avoid systemic insults.1 Clinic and tomodensitometry (Fishier and Marshall class) survey was performed. Cerebral tomodensitometry is systematically practiced at 48h or emergency. Samples of NSE (1h, 12 and 15 after admission) is performed by ELISA: sandwich’s immunoenzymatic assay (Kit CanAg Diagnostics) by diaSorin automation (Eis-max 3000). Statistic analysis is performed by Chi2 tests and variance analysis for qualitative and quantitative variables. Values are expressed in mean (SD).

RESULTS. Mean age: 39 (17) ; sex ratio =4 : 80% of patients are serious head trauma and mortality is 47.5%.

702 PROGNOSIS VALUE OF NEURAL SPECIFIC ENOLASE (NSE) IN POST TRAUMATIC SUBARACHNOID HAEMORRAGE

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INTRODUCTION. Search for a correlation between plasmatic level Neural Specific Enolase NSE and short term prognosis in head trauma.

METHODS. Prospective study performed through 15 months and including 35 Head trauma with sub arachnoids haemorrhage (SAH). Non inclusion criteria: age <15 years and 3 months, head trauma requiring neurosurgery. La prise en charge was standardized for all patients in order to avoid systemic insults.1 Clinic and tomodensitometry (Fishier and Marshall class) survey was performed. Cerebral tomodensitometry is systematically practiced at 4h or emergency. Samples of NSE (1h, 12 and 15 after admission) is performed by ELISA: sandwich’s immunoenzymatic assay (Kit CanAg Diagnostics) by diaSorin automation (Eis-max 3000). Statistic analysis is performed by Chi2 tests and variance analysis for qualitative and quantitative variables. Values are expressed in mean (SD).

RESULTS. Mean age: 39 (17) ; sex ratio =4 : 80% of patients are serious head trauma and mortality is 47.5%.

N = 24
| L1* | 11 | 50 |
| L2* | 52 | 41 |
| L3* | 57 | 9 |
| D1** | 43 | 45 |
| D2** | 43 | 54 |
| D3** | 14 | 1 |

* Chi-square: p<0.0001 ** Chi-square: p=0.009

CONCLUSION. Intracranial hypertension often occurs in TBI, requires a stronger therapy and affects the outcome at discharge from ICU.
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**PROGNOSTIC VALUE OF NEURAL SPECIFIC ENOLOASE IN POST TRAUMATIC SUBARACHNOID HEMORRHAGE.**

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**INTRODUCTION.** Search for correlation between plasmatic level neural specific enolase NSE and short term prognosis in head trauma.

**METHODS.** Prospective study performed through 15 months and including 35 head trauma with sub arachnoids haemorrhage (SAH). Non inclusion criteria: age <15 years and 3 months, head trauma requiring neurosurgery. La prise en charge was standardized for all patients in order to avoid systemic insults. Clinic and tomodensitometry (Fisher and Marshall class) survey was performed. Cerebral tomodensitometry is systematically practiced at 48H or emergency. Samples of NSE (d1, d2 and d5 after admission) is performed by sandwichs immunoenzymatic assay (Kit CanAg Diagnostics) by diaSorin automaton (Eti-max 3000). Statistic analysis is performed by Chi2 tests and variance analysis for qualitative and quantitative variables. Values are expressed in mean (SD).

**RESULTS.** Mean age : 39 (17) ; sex ratio = 4 : 80% of patients are serious head trauma and mortality is 47.5%. NSE mean value in control and study group is 7.02 (3.86) and 18.21(17.05) mug/ml respectively (p = 0.001). (pathologic value above 12.5 mug/ml) 48.6% of patients have high NSE level at d1. All patients (9) who haven't normalised NSE at d3 or at d5 die. Levels are lower in survivors 11.51 ± 4.56 vs 25.74 ± 22.39 mug/ml (p=0.032). All dying patients had high NSE level at d5, among them 6 had normal level at d1. NSE starting levels were high in patients with GCS <8 24.89 ± 5.27 vs 15.2 ± 11.6 mug/ml (ns). There is no correlation between SAH Fisher class and NSE level.

**CONCLUSION.** High level persistence or secondary rising of NSE are short term prognostic factors. Patients with the most serious conditions, without necessary having statistical significant difference, had the highest seric rate.

Grant acknowledgement: We thank the biochemistry laboratory of SA Institute for their help to perform this study.

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**HYPOTENSION IS RELATED TO CEREBRAL VASOSPASM IN PATIENTS WITH ANEURYSMAL SUBARACHNOID HEMORRHAGE.**

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**INTRODUCTION.** Cerebral vasospasm remains a significant source of morbidity and mortality in patients with subarachnoid hemorrhage (SAH) after an aneurysmal rupture [1]. Interventions have to be quick and aggressive. We aimed to define the clinical outcome and factors related to cerebral vasospasm after SAH.

**METHODS.** From August 2000 to December 2002, we retrospectively studied 101 patients consecutively admitted to our twenty-four-bed ICU (700-bed primary hospital) who had a computed tomography (CT) scan revealing SAH. Ruptured aneurysm was verified using angiography.

**RESULTS.** Out of 101 patients (66 male, 35 female, mean age 51±11 years, Hunt and Hess grade 2.1±0.8, Fisher 2.4±1.0), 32 patients (32%) developed symptomatic vasospasm within 14 days after SAH. Presence of hypotension (mean arterial pressure < 70 mm Hg at any moment) was associated with vasospasm (RR 3.94 CI 95% 1.22-9.72). Patients who developed vasospasm had significantly higher values for Hunt and Hess (1.96 ± 0.76 vs 0.81 ± 0.14, p<0.05) and Fisher grades (2.0 ± 1.0 vs 2.8 ± 0.9, p<0.05) as well longer hospital stay (16±11 vs 11±7 days, p<0.05) compared to patients who did not. The observed hospital mortality rate was 34% (n=34) and was significantly higher in patients with vasospasm (63% vs 20%, RR 3.08, CI 95% 1.79-5.28).

**CONCLUSION.** The results of this study suggest that after SAH very close attention should be directed to hemodynamic stability that may be essential to optimize cerebral hemodynamics and thus to minimize secondary injuries.

**REFERENCE(S).** Mayberg MR. Cerebral vasospasm. Neurosurg Clin N Am 1999;10(3):615-27

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**PREDICTION OF EVOLUTION TO BRAIN DEATH IN SPONTANEOUS INTRACEREBRAL HAEMORRHAGE AT ICU ADMISSION.**

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**INTRODUCTION.** Spontaneous intracerebral haemorrhage (ICH) has become one of the most important causes of mortality because of encephalic death. Our purpose is to assess that there is correlation between volume of the haemorrhage measured by CT scan and Glasgow coma scale at admission to the ICU with evolution to encephalic death.

**METHODS.** We retrospectively analyze 78 patients who present a spontaneous ICH measuring location and volume of the haemorrhage and GCS at admission to ICU. Two neuroradiologist measure the volume of the ICH in the CT scan by the method AxBxC/2 described by Kothari et al. Patients are classified in two groups: group I for patients that present a GCS less or equal than 8, one volume of the haemorrhage greater than 65, 50, 20 and 5 cc if the location of the ICH is lobar, basal ganglia, cerebellum or brain stem*. Group II for the rest of the patients. Statistical analysis is done by the ANOVA test (analysis of variance). Location is analyzed by Fisher’s exact test and GCS by Chi-square method.

**RESULTS.** 25 patients progress to encephalic death. 22 present lobar haemorrhage, 36 of basal ganglia, 12 of the cerebellum and 8 of brain stem. In the group I, 22 of the 31 patients progress to encephalic death. Only three patients of the group II present encephalic death. Patients with a GCS less or equal than 8 have a greater risk of evolution to encephalic death (P<0.00001) with a relative risk of 46.6 (95% confidence limits 5.83-373.58). Probability of progress to brain death with this method owns a sensibility of 88% and a specificity of 83%. Among lobar haemorrhages with a volume greater than 65 cc the probability of brain death is 75% and the specificity 64%. In basal ganglia haemorrhages with a volume greater than 50 cc sensibility is 90% and specificity 92%. In haemorrhages of the cerebellum (volume >20 cc) and of the brain stem (volume > 5 cc) sensibility is 100%. Brain death is in the first five days of stay.

**CONCLUSION.** Volume of the cerebral haemorrhage (depending on the location) measured by CT scan at admission, together with the Glasgow Coma Scale score are very good, feasible and easy prognostic indicators of the evolution of ICH to brain death.

**REFERENCE(S).** *Broderick JP et al. Stroke 1993;24:987-993

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**Poster Session Peri-operative intensive care -- 706-719**

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**THE MODIFIED AGITATION AND SEDATION SCORE AS PREDICTOR FOR CLINICAL OUTCOME.**

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**INTRODUCTION.** Withdrawal symptoms are observed in more than 60% of all patients requiring long term sedation [1,2]. Prolonged agitated states are associated with a longer ICU stay and poor outcome [2]. We investigated if a new score, the Modified Agitation and Sedation Score (MASS), can predict length of ICU stay.

**METHODS.** After ethical approval and written informed consent, 1073 patients in the ICU were assessed using the MASS together with the Ramsay Sedation Scale (RSS) 3 times per day. The MASS is composed of eight criteria (orientation, hallucination, agitation, anxiety, seizures, tremor, paroxysmal sweating, altered sleeping waking rhythm) and for each criterion 0 to 7 points can be allocated. Earlier studies showed that a MASS > 7 is sensitive and specific for withdrawal symptoms [3]. A clinical diagnosis of withdrawal symptoms was documented as well as total ventilation time, over-all length of ICU stay and TISS-28. Statistical analysis: non-parametric variance analysis, rater operating characteristics (ROC).

**RESULTS.** Patients with a MASS > 7 (n=93) had a significantly longer ventilation time (p<0.001), a significant longer ICU stay (p=0.001) and a significant higher TISS-28 (p<0.001) than patients with a MASS ≤7. The ROC for a MASS > 7 versus length of ICU stay showed an AUC of 0.718 (CI: 0.666-0.770; p<0.001).

**CONCLUSION.** With the MASS a screening of patients at risk for withdrawal symptoms and prolonged ICU stay is possible and enables the clinician to start an intervention therapy immediately. A consequent screening of withdrawal symptoms, i.e. applying the MASS, is very reasonable in order to treat withdrawal symptoms early and avoid subsequent cost.

**REFERENCE(S).** 1. Jacobs J et al. Crit Care Med 2002; 30:119-41 2. Ely EW et al. Crit Care Med 2001; 29:1370-79 3. Otter H et al. Intensive Care Med 2002; 28: S159 [Abstract]

Grant acknowledgement: Institutional Grants
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THE OPIOID ANTAGONIST MNTX REDUCES THE INHIBITORY EFFECT OF OPIOIDS ON PERISTALSIS IN VITRO
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INTRODUCTION. Activation of opioid receptors is common after surgery because the stress of surgery provokes the release of endogenous opioids, but also because opioids remain the most common treatment for pain in patients undergoing surgery. Delays in gastric emptying and prolongation of bowel transit time are well documented side effects in these patients. Opioid antagonists like MNTX or naloxone can be used to antagonize these undesirable gastrointestinal side effects (1). The aim of this study was to evaluate the effect of MNTX or naloxone in combination with sufentanil on peristalsis.
METHODS. Guinea pig small bowel segments of 8 cm length were set up in parallel organ baths containing oxygenated Tyrode's solution. Peristalsis was elicited by luminal perfusion (0.5 ml/min) against an aboral resistance of 400 Pascal. Peristaltic pressures were recorded at the aboral end of the segments. Perfusion of the segments resulted in an increase of the intraluminal pressure until a pressure threshold (PT), at which peristaltic contractions were triggered, was reached. An increase of the PT is interpreted as inhibition of peristalsis, while a decrease of the PT is interpreted as stimulation of peristalsis. Increasing concentrations of sufentanil were added to the organ bath, after MNTX (1µM) or naloxone (0.5µM) had been added to the organ bath. Each drug or drug combination was tested on 8 different segments. One way and two way ANOVA for repeated measures were used for statistics, p < 0.05 was considered statistically significant.
RESULTS. Sufentanil showed dose-dependent inhibitory effects on peristalsis, with a complete block of peristalsis at a concentration of 1 nM. Naloxone was able to abolish the inhibitory effect of sufentanil almost completely. MNTX on the other hand, only shifted the dose-response curve of sufentanil to the right, but was not able to prevent a complete block of peristalsis at 10 nM.
CONCLUSION. Naloxone is a potent antagonist of opioid induced inhibition of intestinal motility, while MNTX notably attenuates the inhibitory effect on peristalsis. In contrast to naloxone, MNTX does not cross the blood-brain barrier. Therefore, in addition to a sufficiently maintained intestinal function, the analgesic effect of opioids is completely preserved.
REFERENCE(s). (1) Taguchi A et al. NEJM 2001; 345: 935-940

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POCKET PROCEDURES: USING A PDA AS A TRAINING AID FOR TEACHING ICU RELATED PRACTICAL PROCEDURES
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INTRODUCTION. The adage ‘See one, Do one, Teach one’ is often quoted as the method of acquiring practical skills training. If trainees are to acquire the high number of necessary skills in a short timescale the opportunity to ‘See one’ must be maximized. We have developed a method of transferring video clips of practical procedures onto two versions of PDA (Pocket PCM and the Sony Clie TX50V). Trainees can see procedures, learn key points and ask questions prior to undertaking them, without patients becoming unduly concerned by the inexperience of the operator.
METHODS. Following consent we have videoed key elements of several practical procedures. Images were converted into either Sony specific *.mpg files or *.wmv files and viewed using Microsoft Windows Media or Sony Movie Player. Procedures included central line insertion, percutaneous tracheostomy and thoracic epidural. We conducted an audit with the staff on the ICU. They stated whether they were naive, novice or experienced in the procedure, viewed the teaching package and assessed it using the following questionnaire: The quality was good, it has increased my knowledge of the procedure, and I learned more than I would have anticipated from a verbal presentation or a practical demonstration. Each question was assessed: I strongly agree, I agree, neither agree nor disagree, I disagree, and I strongly disagree.
RESULTS. We audited 10 junior staff. Most claimed to be amateurs for the procedures covered, with only one graded as a novice. All of them stated that the quality of the presentation was good, with the majority strongly agreeing (70%). Only one trainee thought that the presentation had not increased his knowledge of the procedure shown. All stated that they had learnt more from the presentation than they would have anticipated from a verbal presentation: 3 (30%) felt that a practical demonstration would have had the same teaching impact and 3 (30%) thought they would have learned more from a practical demonstration.
CONCLUSION. We have successfully used modern digital technology to add a new approach to the teaching of invasive procedures on our ICU. Our early audit confirms that the quality of the images is good and that it can be used with significant advantage, particularly if a practical demonstration is not an option. It highlights important teaching points.

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IS INCREASED GLOMERULAR PERMEABILITY AN INDICATOR OF PULMONARY DYSFUNCTION FOLLOWING MAJOR SURGERY?
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INTRODUCTION. The aim of our trial was to evaluate the ability of microalbuminuria as an indicator of outcome and to investigate its’ relationship with the postoperative respiratory dysfunction in the initial postoperative period in a high-risk patient group (1).
METHODS. In a prospective observational study, 153 patients were consecutively recruited following elective oesophagectomy, total gastrectomy, pancreas and liver resection due to tumor removal. Microalbuminuria (expressed as urine albumin/creatinine ratio) was measured before (t0), and after surgery (t0.5, t24, t48, t72). To assess the patients clinical progress, Multiple Organ Dysfunction Scores (MODS) were calculated on ICU admission then daily (t1, t2, t3). For statistical analysis Wilcoxon rank sum test, Mann-Whitney U test and Spearman’s rho test were used as appropriate.
RESULTS. 130 survivors, 23 nonsurvivors were investigated. Significantly higher MODS were observed in non-survivors throughout the study period (p<0.001). Microalbuminuria increased significantly (p<0.001) on admission to ICU (t0) compared to the preoperative levels, but levels returned to normal within 6 hours and remained so for the rest of the study. There was a significant difference between survivors and non-survivors at t0 (p<0.01). Comparison of M-Cr values with the PaO2/FiO2 ratio showed an inverse relationship on admission, which remained so for t24 and t48 (Table 1).

| T0 | -0.218 | 0.012 |
| T24 | -0.193 | 0.025 |
| T48 | -0.238 | 0.025 |
| T72 | -0.057 | 0.644 |

CONCLUSION. Microalbuminuria measured on admission to ICU separated survivors from nonsurvivors, and also showed an inverse relationship with the PaO2/FiO2 ratio following extended abdominal surgery. Further studies are required to evaluate the prognostic value of this test for postoperative patients with risk of respiratory failure (2).
REFERENCE(s). 1. Molnar Z, Szakmány T, Koszegi T et al. Eur J Anaesth 2000; 17:464-65 2. De Gaudio AR, Adembri C, Grechi S et al. Intensive Care Med 2000; 26: 1364-1368
NKFP 1A/0260, Ministry of Education, Hungary

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INCREASING LACTATE/PYRUVATE RATIO MEASURED BY INTRAPERITONEAL MICRODIALYSIS(IPM) PRECEDES POSTOPERATIVE COMPLICATIONS
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INTRODUCTION. Visceral ischemia is an early step in the development of shock and multiorgan failure. IPM has recently been described as a sensitive and safe method for detection of early visceral ischemia(1).
METHODS. A CMA 62 catheter is placed intraperitoneally before closure of the abdomen. Analysis of glucose, pyruvate, lactate and pyruvate ratio and the ratio between lactate/pyruvate is calculated as a factor of peritoneal ischemia in the CMA 600 microdialysis analyzer.
RESULTS. In a non-complicated postoperative course the lactate/pyruvate ratio starts around 20 and decreases during the first two postoperative days (p<0.007). A male patient, 58 years of age, was operated on as an emergency due to bowel obstruction. He was circulatory unstable preoperatively. During surgery an inflammatory process in the distal sigmoid colon was found. An anterior resection combined with a primary anastomosis and a loopileostomy were performed. Initially postoperative IPM indicated a high lactate/pyruvate ratio and the patient was in a septic phase. After a rapid normalisation of the lactate/pyruvate ratio, it was again increasing and during this time the patient was clinically improved. On the fourth postoperative day he developed rapidly severe illness with abdominal pain and tachycardia. After stabilisation of the patient a barium enema was performed, which discovered an anastomotic leakage. Later in his recovery a fistula between the urinary bladder and the neorectum was noticed after increasing intraperitoneal lactate/pyruvate ratio and creatinine. The second patient, 74 years old female, was operated due to a perforated diverticulitis. A left sided hemicolectomy, transversoectomy and gastrostomy were performed. She developed acute renal failure. IPM was started and showed increasing lactate/pyruvate ratio. The third day after starting the IPM a necrosis of the transversoectomy caused laparatomy, also findings of a caecal ischemia and peritonitis, a resection of the remaining colon, and the transversoectomy as well as an ileostomy were performed. A rapid normalisation of the lactate/pyruvate ratio was postoperatively recorded. Six days later after two days of increasing lactate/pyruvate ratio an intrabdominal abscess was discovered and drained.
CONCLUSION. A normal postoperative course results in decreasing lactate/pyruvate ratio. Complications as peritonitis, bowel ischemia, anastomosis leakage and urinary fistula are presented and all these complications were preceded by two to four days of increasing lactate pyruvate ratio. Intraperitoneal lactate pyruvate ratio measured by microdialysis is an early marker of intraperitoneal ischemia that precedes surgical complications.
711 ABDOMINAL COMPARTMENT SYNDROME, SEVERE ACUTE PANCREATITIS AND PERCUTANEOUS DECOMPRESSION PERITONEAL

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INTRODUCTION. Study of Intraabdominal Hypertension (IAH) and “percutaneous decompressive peritoneal drainage” as an alternative to open surgery in Abdominal Compartment Syndrome (ACS) in SAP

METHODS. Measuring intraabdominal pressure (IAP) is performed via indirect intrabladder or direct by means of a catheter in the peritoneum (1). DPD is performed in accordance with the peritoneal lavage technique protocol (2). A preliminary study of 26 patients with SAP during a period of three years (2000-2002) in accordance with the protocol used at the Virgen del Camino Hospital ICU. We analyzed variables such as age, gender, severity SAP indexes, IAP monitoring (Grade I-Normal: 10-15 mmHg, Grade II-IAH minimum 16-25, Grade III-IAH moderate: 26-35, Grade IV-IAH Severe = ACS: >35 mmHg), development of ACS, abdominal decompression with DPD, surgical decompression and mortality

RESULTS. Average age of 62.9 years (27-84), men 87.5%, average APACHEII of 16.1, IMRIE 4.2, PCR 307.7 mg/l, (120-500), Elastase-PMN 262.2 ng/l, (120-410), average severity index in dynamic TAC 6.1 (3-10). Fluid collections verified by means of dynamic CT were present in all the cases. IAP figures were the following: Grade I: 11 cases, Grade II: 8 cases, Grade III: 2 cases and Grade IV: 5 cases. IAH was present in 57.7% of the cases (11 cases). 23% developed ACS (All, except for one of the patients with Grade IV, developed ACS, as well as one of the patients with Grade II). Overall mortality was 18%: two were related to Pancreatic Sepsis (PS) and the other was related directly to the acute phase of pancreatitis. Mortality in the ACS group was 49%. As soon as Grade IV (severe IAH) was identified, DPD was performed on all ACS patients, with a rapid and progressive drop in IAP to physiological figures, except in one case where an average of 2.915 litres was drained in the course of 4.6 days which is the average duration of DPD. In all the cases neither the ekg nor the Tc detected the amount of drained fluid. Only one case, which had a maximum IAP of 61 mmHg, underwent surgical abdominal decompression and subsequently died due to secondary pancreatic infection

CONCLUSION. Intraabdominal Hypertension in SAP is present in 57.7% of our patients; 23% of them developed ACS. “Preventive” percutaneous peritoneal drainage was shown to be effective in abdominal decompression

REFERENCE(S). 1. Cheatham MLL(1999), 2. Maravi-Poma(1986)

712 INTRAOPERATIVE FACTORS ASSOCIATED WITH ICU COMPLICATIONS AFTER INFRARENAL AORTIC RECONSTRUCTION

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INTRODUCTION. Six-year experience of perioperative management of infrarenal aortic reconstruction (IAR) was evaluated. The purpose was to identify the intraoperative factors that could be associated with the postoperative complications (PC) in the ICU patients after elective IAR.

METHODS. Intraoperative and intensive care records of 250 consecutive patients that underwent IAR under standardised anaesthetic procedure were reviewed. The following variables were studied: body-mass index (BMI), duration of surgery (OP) and clamping (CT), blood loss volume (BL), fluid replacement volume (FR), minimal body temperature (Tmin) during surgery, experience of anaesthesitst and Sequential Organ Failure Assessment (SOFA) score (1) taken on the first postoperative day. The PC in the ICU were defined as one or more of the following: vital organ ischemia or failure, coagulation disorder, bleeding, requiring additional surgery, or death. Cases of severe intraoperative bleeding with subsequent hemodynamic instability and intraoperative ischemia of vital organs were excluded. The association of studied variables with PC in the ICU was evaluated by the logistic regression.

RESULTS. The overall in-hospital mortality was 5.2% (13 cases). The PC rate in the ICU was 15.6% (39 cases), including 15 cases of bleeding, 12 vital organs ischemia, 8 cases of multiple organ failure and 4 coagulation disorders. BMI, BL, OP time and Tmin during the IAR were found to be strongly associated with the outcome (P<0.05). Patients’ age, CT, FR and anaesthesitst experience were not associated with increased PC rate. OP time and BL showed significant association with the SOFA score.

CONCLUSION. BMI, OP time, BL and Tmin might serve as predictive factors of ICU morbidity and mortality after elective infrarenal aortic reconstruction. Our findings are in agreement with the previously published data (2).

REFERENCE(S). 1. Vincent et al. Intensive Care Med 1996;22:707.
2. Dardik et al J Vasc Surg 1999;30:985.

713 COMPLICATIONS AND OUTCOMES OF BARIATRIC SURGERY IN ICU

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INTRODUCTION. Bariatric Surgery (BS) is a relatively safe therapeutic approach for severe obesity. Complications are not completely known because there are scarce patient follow-up reviews in the literature. Our purpose is to describe the complications that took place and the final outcome of the patient admitted into our surgical ICU.

METHODS. We revised the data on BS in the last 31 months. Complications were divided in surgical and medical ones. Surgical complications were arbitrarily divided in early (<7 days) and late (>7 days) and these were subdivided in general (related to any surgery) and specific (related to BS). Medical complications refer to the need for mechanical ventilation, hemodynamic support, infectious, nutritional and metabolic features.

RESULTS. In that period, one hundred and sixty-nine patients were admitted with the diagnosis of BS in our ICU. Thirteen patients (7%), 3 women (23.1%) and 10 men (76.9%), had one or more type of complications. The mean age of the complicated group was 42±13.7 years-old and the mean BMI was 44.8±4.2 Kg/sm2. Previously known comorbidities were: hypertension in 6 patients (46.2%), diabetes in 1 (7.1%) and coronary artery disease in one. The surgical technique used was Scopinaro: 10 patients (76%), Higa: 2 (15%) and Capella: 1 (7%). Fistulae in the anastomosis between stomach and jejunum (3 patients, 23%), mechanical obstructions due to internal hernia, volvulus or adherences (4, 30%), gastrointestinal bleeding or hemoperitoneum in anastomotic sites (2, 15%) and malnutrition due to excessive weight loss one year after BS (2, 15%) were the main specific surgical complications. Important medical complications were ARDS in 4 patients (30%), shock in 2 (15%), who were managed with Swan-Ganz catheter and vasopressors. Peritonitis occurred in 4 patients (30%), treated with antibiotics, peritoneoscopy and periodic surgical re-interventions. Seven patients (53.8%) had parenteral nutrition support. None of our patients developed pressure ulcers although one had decubitus rhabdomiolysis. One patient (9.1%) died from massive venous mesenteric thrombosis. Twelve patients were discharged home and resumed well. Mortality in the whole group of BS was 0.6%.

CONCLUSION. In our sample, severe complications occurred in a small subset of patients. Most of them succeeded well despite difficulties in handling heavy patients, intrinsic high mortality rates and a heterogeneous group of surgeons.

REFERENCE(S). 1. Weinstein N, Van Meer O, Schoonberbek J, Bonier J, Van der Hoven B
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INTRODUCTION. Percutaneous Dilatational Tracheotomy was already described by Ciaglia in 1985 but is not the standard method for performing a tracheostomy in the Netherlands. This method, however, has many advantages compared to the Surgical Conventional Tracheotomy (SCT), which takes usually more than 30 minutes. Percutaneous Dilatational Tracheotomy is an easy procedure, which can also be performed by other clinicians than surgeons. It is easily performed at the bed-side and causes less bleeding. In 1999 this technique was modified in order to simplify the procedure with concurrent decrease in operating time and complications. The objective of this study is to document the time required to perform a modified Percutaneous Dilatational Tracheotomy (mPTD) and complications associated with the procedure.

METHODS. Since 2000 eighty-four patients in a surgical intensive care unit of a tertiary referral center underwent modified Percutaneous Dilatational Tracheotomy. All had prolonged mechanical ventilation with expected long duration of weaning. All tracheostomies were performed under supervision of a surgeon or staff intensivist. Airway management was performed by an anaesthesiologist.

RESULTS. The group consisted of 65 men and 19 woman, age 59 +/- 15 years. The time needed to perform the procedure was only 6 minutes (median) and varied between 6 and 30 minutes. Mean ventilatory time before tracheostomy was 9 days (1-43); after mPTD 20 days (2-94). Complications were seen in 7 patients (8%). In 5 patients superficial bleeding occurred, which could be managed by temporary compression, and in one patient mediastinal emphysema was seen. In only one patient the procedure needed to be converted into an open tracheotomy due to a bleeding venous plexus. No late complications were encountered. Procedure-related mortality was 0%. Mean post-procedure follow-up was 3.7 months (0-25).

CONCLUSION. The modified Percutaneous Dilatational Tracheotomy is a safe and quick procedure. It is easily performed at the bed-side, also by non-surgically trained clinicians. It is a safe procedure with low morbidity.
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LONG TERM CONTINUOUS INFUSION OF REMIFENTANIL IN ICU FOR SEVERE POSTOPERATIVE PAIN
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INTRODUCTION. The safety and efficacy of a long-term constant-dose iv infusion of Remifentanil (R) is not well established, based on patient satisfaction and lack of adverse effects. The aim of our randomized, double-blind study was to compare two constant dose continuous infusion of R in ICU patients following major abdominal surgery.

METHODS. Twenty-eight patients, 62±6 y.o., ASA II-IV were studied. All patients received TIVA with propofol and R, admitted in ICU and randomly assigned in two equal groups: 0.05µg/Kg/min (Group A) or 0.1µg/Kg/min (Group B). After extubation BP, HR, SpO2, RR, Pain score (0-3), and PONV score (0-2) were evaluated for 24 hours. Meperidine 0.25µg/Kg in bolus IV was given for pain score 2 or 3 as rescue analgesia.

RESULTS. The two groups were similar in respect of demographic data, surgical procedures, duration of anesthesia, and time of extubation in ICU. The percentage of patients with adequate analgesia (Pain score 0-1) at measured intervals are shown in figure: Rescue analgesia was significantly less in group B (18%) than in group A (43%) (p<0.05). There were no hypoxemia and respiratory depression.

CONCLUSION. The use of long term infusion of remifentanil at 0.05µg/Kg/min or 0.1µg/Kg/min, provided adequate analgesia in patients following major abdominal surgery, although patients in the former group required more rescue meperidine. This approach of remifentanil analgesia represents an effective and safe regimen in ICU patients.

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COMPARISON OF INTRA-ICU EVOLUTION OF RECIPIENTS OF LIVER TRANSPLANT FROM LIVING OR CADAVER DONOR
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INTRODUCTION. We designed a study aimed at assessing the early postoperative period (intra-ICU) of living-donor liver-related transplantation (LDLT) in comparison with contemporaneous cadaver liver transplantation (CLT).

METHODS. Analysis of 60 pre, intra and postoperative variables in our first 23 consecutive LDLT patients and in 46 CLT recipients (the immediate pre and post of each LDLT).

RESULTS. Preoperative characteristics were similar in the 2 groups regarding demographics, etiology of cirrhosis, presence of hepatocarcinoma and degree of liver impairment (LDLT: Child A 33.3%, B 38.1%, C 28.6%; CLT: A 37%, B 32.6%, C 30.4%).

Other parameters of liver function were similar as were the presence of complications in the 2 groups. The AST peak was significantly lower in the LDLT (313±181 vs 85±38 min) than for CLT (343±125 min; p=0.001). In the intra-ICU period there were significantly less in group B (18%) than in group A (43%) (p<0.05). There were no hypoxemia and respiratory depression.

CONCLUSION. The safety and efficacy of a long-term constant-dose iv infusion of Remifentanil (R) is not well established, based on patient satisfaction and lack of adverse effects. The aim of our randomized, double-blind study was to compare two constant dose continuous infusion of R in ICU patients following major abdominal surgery.

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PREDICTORS OF SURVIVAL FOLLOWING EMERGENCY ABDOMINAL AORTIC ANEURYSM REPAIR
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INTRODUCTION. Emergency ruptured aortic aneurysm (AAA) has a high mortality. Many of those who do die do so after a protracted admission to critical care. The aim of this study is to ask if there is any way of identifying this patient group at an early stage.

METHODS. All patients admitted to a regional vascular unit over a 3 year period (1999-2002) with a ruptured AAA were identified using theatre records, critical care database and surgeons' personal logbooks. Patients' notes were examined for pre-operative, intra-operative and post-operative events, demographics and physiological data.

RESULTS. Theatre records, databases and logbooks identified 138 patients. There were 77 deaths (55.8% 90 day mortality), with 37 occurring in the first 48hr and 40 occurring after 48hr. A total of 69 patients were still in an ICU at 48hr and this data was analysed. Significant predictors of subsequent mortality are seen on table 1.

Many factors had no significant association. Outcome is most significantly related to age >76yr, sepsis and respiratory, cardiovascular, renal and renal failure at 48hrs (table 2)

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PERIOPERATIVE MANAGEMENTS OF RADICAL ESOPHAGECTOMY WITH INDUCTION CHEMOTHERAPY AND IRRADIATION
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INTRODUCTION. In recent years, radical cancer surgery is performed after induction chemotherapy or irradiation therapy (CXR). But there is no evidence about the effects of CXR for clinical course. In this study, we examined the effects of CXR for perioperative course in radical esophagectomy.

METHODS. Part A: We retrospectively collected data on 21 patients undergoing radical esophagectomy which were performed CXR before surgery over 31 months. We analyzed patients profile, postoperative complications, prognosis, perioperative management, intraoperative hemodynamics. Part B: Prospectively, we examined the effects of CXR in radical esophagectomy. Eleven patients (CXR group) undergoing induction chemotherapy and irradiation therapy prior to radical esophagectomy from 2001 April to October. Patients in the control group (N=10) did not receive CXR before surgery. Anesthesia was maintained with isoflurane in oxygen and nitrous oxide and differential lung ventilation was done. An intravenous infusion of acetate ringer was maintained 8ml/kg/hr. A postoperative pain was controlled with epidural morphine. During operation, we used the routine monitoring (heart rate, blood pressure, body temperature, urine volume, blood loss volume, blood sugar, saturation of oxygen, end-tidal CO2. Besides these, cardiac output (CO), extra volume of lung water (EVLW) and central venous pressure (CVP) were measured continuously. From 1postoperative day/OPD/day4 post OPD CO, CVP, EVLW, Pat/Fio2, renal function, liver function, body weight were balance were examined. And also,C-reactive protein, interleukin-(1-1L), IL-8, IL-10 and IL-4 were measured.

RESULTS. In the CXR group, mortality rate was higher than control group. A preoperative white blood cell count was much lower than control group. EVLW was increasing earlier than control group after operation. Both the serum level of IL-6 and IL-8 were maintained high level until 3opd.

CONCLUSION. Compared to control group, the mortality rate of radical esophagectomy with CXR is very high. This is probably due to that systemic inflammation response syndrome (SIRS) is frequent in patients undergoing CXR therapy prior to radical esophagectomy. This hypothesis is shown that serum cytokine level of CXR group is higher than that of control group. And according to perioperative body weight balance and EVLW, postoperative refilling of water is occurred earlier than control group.

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INTRA VENOUS ADMINISTRATION OF ISOSORBIDE DINITRATE IN THE THERAPY OF CEREBRAL VASOSPASM

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INTRODUCTION. Cerebral vasospasm is a serious complication of subarachnoid hemorrhage (SAH) whose therapeutic options are still limited. Intraventricular administration of nitroprusside as a donor of nitric oxide (NO) molecules for the treatment of cerebral vasospasm after SAH has been described in the literature. Although intravenous administration of nitroprusside bears the advantage of direct action on the vessel wall, there is the risk of systemic hypotension.

METHODS. We retrospectively evaluated data from 12 patients with cerebral vasospasm detected by transcranial Doppler sonography (TCD) after surgical treatment of ruptured intracranial aneurysms and subarachnoid hemorrhage. Isosorbide dinitrate (ISDN) was administrated intravenously in all patients, hemodilution was evoked by use of hydroxy-ethyl-starch and all patients received nimodipine.

There were seven patients with rupture of ACoA aneurysms, five with MCA, two with ACA and one with PCoA aneurysm, the mean age 46.8 years (range 25-61), Hunt-Hess Grade at admission was 1 to 4 (median 2). Vasospasm was diagnosed on the 1st to the 16th day after SAH (median on the 6th day). Effect of administration of ISDN was evaluated by regular TCD monitoring on a daily basis.

RESULTS. Administration of ISDN was initiated between the 1st and 4th day (median on the 1st day) following the onset of significant vasospasm unresponsive to other medical treatment. Dose varied between 2 to 15mg per hour. Total time of administration was 5 to 21 days (median 9.5 days). Statistically significant change in end-diastolic-velocity (EDV) on TCD was observed on the 3rd day of administration. Mean values of these parameters with confidence intervals are shown in Table 1. In seven patients, the decrease of blood pressure was simultaneously treated by norepinephrine.

CONCLUSION. Intravenous administration of ISDN seems to be a clinically advantageous alternative of NO donor in the treatment of cerebral vasospasm after subarachnoid hemorrhage. Although we found statistically significant change in end-diastolic-velocity (EDV) on TCD on the 3rd day of administration of ISDN, this finding could not be distinguished from the natural course of cerebral vasospasm. Therefore, the effect of ISDN should be further evaluated by a prospective randomized study.