Poster Session
Strategies in lung injury – 555-568

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

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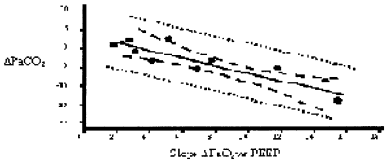
INTRODUCTION. Improvement in oxygenation due to PEEP is not always due to a better alveolar ventilation. Different PEEP levels were tested on gas exchange in ALI/ARDS patients

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±1.6 ml/Kg. 5, 8, 10, 12, 14, 16, 18 cmH_2O 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 thirdly minutes.

RESULTS. A significant correlation between the improvements in arterial oxygenation and PEEP levels (deltaPaO2 vs deltaPEEP) 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

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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, modality of tracheal suction and use of recruiting maneuvers 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 maneuver 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.

		Before brain death	After brain death
Ventilatory pattern	Vt/PBW (ml/kg)	9.7±1.8	9.7±1.6*
	RR (breath/min)	12±3	12±2*
	PEEP (cmH_2O)	3.6±3.6	3.8±3.5
	Pst,rs (cmH_2O)	22±5	22±4*
Gas exchange	$PaO2/FiO_2$	252±31.5	222±30*
	PaCO2 (mmHg)	38±7	38±6*

CONCLUSION. After diagnosis of brain death no variations in the ventilatory pattern or maneuvers 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.

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BRONCHODILATOR DELIVERY BY MDI IN MECHANICALLY VENTILATED COPD PATIENTS: CONTROLLED VS.ASSISTED MODE

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INTRODUCTION. The delivery of bronchodilators by metered-dose inhaler (MDI) and a spacer in mechanically ventilated patients has become a widespread practice. Previous studies have shown no difference in bronchodilatory effect of various ventilator settings, such as flow rate, tidal volume (VT) or ventilatory mode (pressure- versus volume-controlled mechanical ventilation). However, the effectiveness of bronchodilators delivered by MDI and a spacer during assisted ventilation has been studied only in experimental models, where bronchodilator delivery was found to be significantly lower during controlled mechanical ventilation (CMV) than during simulated spontaneous breaths of a similar VT. To verify these findings in a clinical setting, the effect of two different vetilatory modes on the bronchodilation induced by b2-agonists delivered by MDI and a spacer in a group of mechanically ventilated patients with acute exacerbation of chronic obstructive pulmonary disease (COPD) was examined.

METHODS. Nine mechanically ventilated patients were prospectively randomised to receive 4 puffs of salbutamol (S, 100 ìg/puff) either with volume-controlled (VC) or pressure-support (PS) ventilation. With both modes tidal volumes were identical. S was administered with an MDI adapted to the inspiratory limb of the ventilator circuit using an aerosol cloud enhance spacer. After a 6-hr washout period, patients were crossed-over 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 (ÄR), static end-inspiratory respiratory system compliance (Cst,rs), intrinsic positive end-expiratory pressure (PPEPi) and heart rate (HR) 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 Rrs. These changes were not influenced by the ventilatory mode and were evident at 15, 30, 60 and 120 min after S. HR, Cst,rs and ÄR did not change 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.

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PARTIAL LIQUID VENTILATION DOES NOT PROTECT LUNGS AGAINST INFLAMMATION DURING ENDOTOXEMIA

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INTRODUCTION. Partial liquid ventilation (PLV) with perfuorocarbon (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 O_2 and CO_2 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 perfluorobron (10ml/kg) with or without lipopolysaccharide (LPS) infusion (20mg/kg) (CV, PLV, CV/LPS and PLV/LPS groups respectively). Following 4 hours period of treatment, blood was sampled for cytokine assay and the lungs were excised for subsequent mRNA extraction.

RESULTS. Blood levels of TNFalpha, IL-1Beta, IL-10, INF-gamma and IL-1Beta receptor antagonist were significantly increased in CV/LPS and PLV/LPS groups. mRNA expression of proinflammatory cytokines in the lung tissue was also significantly increased in these groups. mRNA expression of IL-6 in PLV/LPS group was significantly increased in comparison with CV/LPS group. Other inflammatory cytokine mRNA expression was also potentiated in PLV/LPS group, however this was not significant.

CONCLUSION. Our results suggest that PLV does not effectively protect the lungs against inflammation in systemic endotoxemia in rats.

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PARTIAL LIQUID VENTILATION IN ACID-INDUCED LUNG INJURY - EFFECTS OF IMMEDIATE AND DELAYED INITIATION

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INTRODUCTION. Hydrochloric acid induced lung injury is a dynamic process following an initial physicochemical injury to the alveolocapillary membranes with subsequent local and systemic inflammatory reactions. Partial liquid ventilation (PLV) has been shown to improve gas exchange and to reduce filtration coefficients in acute hydrochloric acid-induced lung injury [1,2]. We tested the hypothesis that immediate initiation of PLV results in longer survival and improved gas exchange of rats when compared to a delayed initiation.

METHODS. Anaesthetised and ventilated rats (V_T 6 - 8 ml/kg, respiratory rate 60 - 90 breaths/min, FiO_2 1.0, I:E 1:1, PEEP 5 cmH_2O) were randomly assigned to one of four groups (n = 6 in each group). Group 1 served as control group without lung injury, in group 2, 3 and 4 lung injury was induced by intratracheal instillation of hydrochloric acid (0.1 N, 2.5 ml/kg body weight). Subsequently, lungs of group 1 and 2 were gas-ventilated and lungs of group 3 and 4 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 PaO_2, $PaCO_2$, 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 PaO_2 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 between the individual groups without statistical significant differences, however, with a clear tendency in the PLV groups towards higher PaO_2- and lower $PaCO_2$-values.

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.

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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 69.2±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±1.8mmHg between 0 or 50ml volume, 1±0.9 mmHg between 50 and 100ml, 2.9±2 mmHg between 50 and 150ml, 5±3.7 mmHg between 50 and 200ml, 8.3±5.9 between 50 and 250ml and 15.9±10.9 mmHg between 50 and 300ml ($p<0.0001$ 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	7.6±4.1	8.7±4.2	10.6±4.8	12.6±6.2	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 between 50 and 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.

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PATTERN OF LUNG EMPTYING IN MECHANICALLY VENTILATED COPD PATIENTS -EFFECTS OF PEEP

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INTRODUCTION. The purpose of the present study was to measure expiratoty resistance in patients with acute exacerbation of COPD during controlled mechanical ventilation.

METHODS. The pattern of lung emptying was studied in 10 mechanically ventilated patients with acute exacerbation of COPD. At 3 levels of PEEP (0, 5 and 10cmH_2O) tracheal (Ptr) and airway pressures (Paw), flow (V') and volume (V) were continuously recorded. and flow-volume(V'-V) curves during passive expiration were obtained. Expired volume was divided into five equal volume slices and the time-constant and effective deflation compliance (Crseff) of each slice was calculated by regression analysis of and post-occlusion V/Ptr curves relationships, respectively. In each slice the existence or not of flow limitation was examined by comparing V'-V curves with and without decreasing Paw. 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 obtained by subtracting Rtube and Rvent from Rtot, while in the presence of flow limitation Rrs equaled Rtot. The time-constant of pure respiratory system was calculated as the product of Rrs and Crseff

RESULTS. At zero PEEP the time constant of the respiratory system increased significantly toward the end of expiration due to a significant increase in Rrs Application of PEEP significantly decreased Rrs 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 deflates 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 faster and more uniform rate of lung emptying

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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 undetermined. This study was performed to compare cardiopulmonary and circulatory parameters caused by liquid or gas tidal volumes.

METHODS. In a prospective, controlled study, 12 anesthesized, paralyzed, adult New Zealand rabbits (3.1 ± 0.1 kg) were conventionally gas-ventilated (CGV) for 15 min, underwent left lateral thoracotomy, and were instrumented for continuous measurement and recording of arterial (AP), central venous (CVP), left atrial (LAP), and pulmonal arterial pressures (PAP), as well as cardiac output (CO). Additionally, pulmonary gas exchange (pGE) was measured by acquisition of arterial and pulmonary arterial blood gases at 15 minute intervals, and calculation of avDO2, oxygen delivery (DO2) and consumption (VO2), transpulmonary shunt, and systemic (SVR) as well as pulmonary vascular resistance (PVR) were prepared. After baseline, animals were divided into two groups: In TLV animals (n=6) first partial liquid ventilation (PLV) was established with 12 ml/kg perflubron. After 15 min, TLV was instituted applying a pressure-limited, time-cycled, double-piston configured TL-ventilator with tidal volume = 23 ml/kg, resp. rate = 7/min, I:E ratio 1:2, and maintained for 3 hours, then PLV was re-established. CGV animals (n=6) remained volume-controlled gas-ventilated throughout at 8 ml/kg, FiO2=1.0, PEEP=5mbar, resp. rate adapted for isocarbia.

RESULTS. Between TLV and CGV, differences in CO, circulatory pressures (AP, CVP, LAP), pGE measurements (PaO2, PaCO2, arterial pH, pulmonary PO2, PCO2, pH) and oxygen dynamics (avDO2,DO2, VO2, transpulmonary shunt,O2-extraction-rate) were not significant in analysis of covariance (ANCOVA; $p<0.005$). Also, there was no significant difference in systemic (SVR)($p=0.2646$)nor in pulmonary vascular resistance(PVR)($p=0.2577$) between CGV and TLV. Mean PAP showed significance between the two ventilation modes ($p=0.0396$), so does heart rate ($p=0.0185$). There is a significant time effect in PaO2(ANCOVA; $p=0.0006$) in the TLV group while establishing PLV, but no significant difference between CGV and TLV group (ANCOVA; time*group; $p=0.1119$) during TLV.

CONCLUSION. This study demonstrates that liquid tidal volumes suitable for long-term TLV do not have significant impact on cardiac output, main circulatory pressures, and oxygen dynamics when compared to gas ventilation.

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DISTANT EFFECTS OF NITRIC OXIDE INHALATION IN ENDOTOXEMIC PIGS.

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INTRODUCTION. There are indications that inhalation of nitric oxide (INO) has distant effects (1). By a blood borne factor INO downregulates the endogenous NO production in healthy pig lungs, resulting in vasoconstriction in lung regions not directly reached by INO (2). The aim of this study was to investigate if INO have distant effects in endotoxemic pig lungs.

METHODS. Cross circulation was established in twelve pairs of anesthetised pigs. Six pairs received endotoxin (Control group) and six pairs received endotoxin and INO (80 ppm) was given to one of the pigs (Treatment group).NO in exhaled air (NOE), NO synthase (NOS) activity in lung tissue, endothelin-1 (ET-1) in blood, vital parameters and blood gases were measured.

RESULTS. Endotoxin per se increased NOE by 100 % compared to baseline (Control group). In the pigs receiving blood from the NO-inhaled pigs (Treatment group) NOE increased by 300 % (p=0.01). The eNOS activity was also higher in these pigs (p= 0.06) indicating an increased endogenous NO production. However, this increased NO production did not significantly alter the pulmonary vascular resistance. ET-1 increased in both groups, but more markedly in the Treatment group.

CONCLUSION. INO to endotoxemic pigs causes an increase in NOE and NOS activity in lung regions not receiving INO. A possible explanation is that the observed increase in ET-1 causes an increased NO production via the ET-B receptor. If our results are translated into a single pig model the lungs not receiving INO are per definition shunt regions. An increased NO-production in these lung regions may cause vasodilation resulting in decreased or abolished effect of INO upon the arterial oxygenation.

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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 2groups (control group(CG) and prostacycline (PROST))with 7 animals each. After tracheostomy and stabilizing acute lung injury was initiated with saline washout(lung injury index: paO2<100mmHg at FiO201,0, PEEP=0).Afterfulfilling lung injury criteria, animals were turned to PLV by pulmonal instillation of 15ml/kg PP4. An intrapulmonal bolus of 50ng/kg prostacycline (Iliomedin,Schering GmbH, Berlin, Germany)was injected, followed by comtinous application of 50ng/kg/h. Heart rate (HF), mean arterial pressure (MAP), central venous pressure (CVD), static compliance (CS), static in-(PI) and endexspiratory pressure (PE) were measured every 10minutes for 1h. Then TLV was established (tidal volume 40ml) and HF, MAP, CVD, CS, PI and PE were determined at intervals of 10 minutes for 1h again. Thereafter, animals were turned to PLV.

RESULTS. During PLV, no difference in CS and PI was observed in PROST compared to CG. PE was significantly (P=<0,001) reduced during PLV PROST (6,68mmHg±3,1) vs CG (9,63mmHg±2,77) as well as MAP (p=0,009; PROST:57,0 mmHg±11; CG:66,0 mmHg±13) and HF (p=0,048; PROST:215,9/min±26,2; CG: 226,2/min±15,8). CVD is significantly increased (p=<0,001) during PLV PROST (8,0mmHg±1,1) compared to CG (6,0mmHg±1,2). No difference in CS, PI and PE during TLV was observed. HF and MAP were significantly reduced (p=<0,001) in PROST (HF:182,9/min±28,2; MAP: 57,0 mmHg±14,76) compared to CG (HF: 206,9/min±19,5; MAP: 71,95 mmHg±15,09) during TLV, meanwhile CVD was significantly increased (p=<0,001) in PROST (8,5 mmHg±0,6) vs CG (6,5 mmHg±1,1).

CONCLUSION. Prostacyclines have no positive influence on static compliance neither in PLV nor in TLV. Haemodynamic changes were due to systemic effect of prostacycline.

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EFFECT OF INTRAPULMONAL CORTISON ADMINISTRATION ON LUNG MECHANICS AND HEMODYNAMICS IN PLV AND TLV

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INTRODUCTION. Influence of pulmonal cortison application on lung mechanics and hemodynamics during partial (PLV) and total liquid ventilation (TLV) after acute lung injury.

METHODS. 14 NZW rabbits were randomized into 2 groups (control group(CG) and cortison group(CORT)) with 7 animals each. After tracheostomy and stabilizing acute lung injury was initiated with saline washout (lung injury index: paO2<100mmHg at FiO2=1,0 and PEEP=0). After fulfilling lung injury criteris, animals were turned to PLV by pulmonal instillation of 15ml/kg PP4. An intrapulmonal bolus of 30mg/kg methylprednisolon(Urbason forte®,Aventis Pharma, Frankfurt am Main,Germany)was injected, followed by continous application of 30mg/kg/h. Heart rate(HF), mean arterial pressure(MAP), central venous pressure(CVD), static compliance(CS), static in-(PI) and endexspiratory pressure(PE) were measured every 10minutes for 1h. Then TLV was established (tidal volume 40ml) and HF, MAP, CVD, CS, PI and PE were determined at intervals of 10minutes for 1h again. Thereafter, animals were turned to PLV.

RESULTS. During PLV, MAP and HF significantly increased (p=<0,001) in CORT vs CG (CORT:HF 248/min±22,5; MAP 90,1mmHg±12,8; CG:HF 226/min±15,8; MAP67,78 mmHg± 12,3). CVD,CS,PI and PE in CORt and CG show no difference during PLV.In TLV, MAP as well as CS significantly increased (p=<0,001) in CORT
(MAP 91,8mmHg±13,6; CS 3,45±0,6) vs CG(MAP 71,9mmHg±15,1; CS 2,7±0,4). PI in CORT (25,16mmHg±6,17) is significantly reduced (p=0,025) compared to CG (29,32mmHg±8,17) during TLV. No difference in HF,CVD and PE during TLV was obsorved.

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

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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 actue 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 (Perfluoro-1,3,5-trimethyl-cyclohexan) 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±0,2kg bodyweight) were submitted to a standardized volume–controlled mode at the Siemens Servo 300 ventilator (tidal volume: 8ml/kg, PEEP:5mbar, FiO2=1,0, respiratory rate: 12-16/min for maintaining normocapnia). Acute lung injury was induced by repeated pulmonary lavage with isotone saline solution. After meeting injury criteria (paO2/FiO2 < 100) and acquisition of baseline data, a mixture of PP4 and APC was installed in the trachea with a dosage of 1,5 mg/kg bodyweight/h. 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 ventilatory support, double-cylinder piston pump with two separate limbs for active inspiration and expiration. In this TLV – mode the rabbits were ventilated for one hour (f=7/min, Vt=43±8 ml) and blood gases as well as the basic haemodynamics were recorded each 10 minutes. After this, the liquid was taken out of the lung and 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 (paO2: PLV:166±27 vs. 86±24, TLV: 118±50 vs. 55±6; p<0,5) while paCO2, pH, sHCO3, 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 difference 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 asses 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 PEEP 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.

	VT (ml/kg)	PEEPtot (cmH_2O)	Est, rs (cmH_2O/ml)	sTNFR I (pg/ml) Plasma	sTNFR I (pg/ml) BAL	sTNFR II (pg/ml) Plasma	sTNFR II (pg/ml) BAL
NIH I	7.4±1.1	9±3.9	34.6±14	3118±1242	1811±1065	3494±729	1573±1375
Stress Index	7.1±0.8	16±3.4*	32.5±14	3639±1640	1221±1055*	3571±695	1096±1170*
NIH II	7.4±0.8	10±2.7	28±17.8*	3390±1847	895±261	3615±579	851±716

CONCLUSION. Some amount of mechanical stress may be present during the NIH protective strategy. Bedside monitoring of stress index may optimize the use of recruiting manoeuvres and PEEP to minimize consequences of mechanical ventilation on pulmonary and systemic concentration of inflammatory cytokines.

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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 pCO2 was acutely rised 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) with ALI on account of bilateral pulmonary infiltrates were enrolled. All patients were ventilated in pressure control mode (tidal volume: normocapnia: 9–13 ml/kg body weight, hypercapnia: 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. After 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.

	Baseline	1 hour	3 hours	6 hours
paCO2 (mmHg)	43±5,7	82±4,9alpha	86±7,9alpha	80±8,7alpha
N13-N20 (ms)	6,1±0,6	6,6±0,6alpha	6,6±0,6alpha	6,6±0,6alpha
N70 (ms)	132±14	157±25alpha	142±22alpha	139±22
rSO2 (%)	63±13	70±11	71±10	69±11

alpha p<0.05 vs baseline value

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 pCO2 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 Ptr, 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/FiO2 < 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 41Fr O.D., lumina cut to equal length and connected separately to the limbs of the tubing). For suctioning (16Fr catheter), in 1 the SL-ETT was disconnected, in 2 and 3 the systems stayed closed (CPAP mode). The ventilator (Siemens Servo 300) was modified to regulate pressure at Y-piece (SL-ETT) or trachea (DL-ETT) during CPAP. Sequence per run: 2min PC ventilation (RR 15/min, PEEP 30mbar, Pinsp 60mbar) for alveolar recruitment / 5min of baseline ventilation (VC mode, RR 30/min, Vt 10-12ml/kg, PEEP 16mbar) / suction (20s) / 5min of baseline ventilation.

RESULTS. After recruitment, gas in lungs (CT, n=4) amounted to 1462(1356/1558)ml and PaO2 to 532(290/628)mmHg [mean(min/max)]. The suction flow of 20l/min effected a dP along the SL-ETT of 8.0(7.5/8.5)mbar and a relevant reduction of Pa02 and lung volume not seen with DL-ETT.

	Time	SL-ETT, discon	SL-ETT, closed	DL-ETT, closed	Signif. Diff.
Gas in Lung [ml]	after suction	302 (198/371)	851 (704/1156)	1377 (1255/1486)	all
	end of run	1240 (1150/1336)	1220 (1153/1267)	1402 (1332/1448)	DL-ETT vs. other
PaO2 [mmHg]	after suction	62(54/71)	158(63/388)	521(427/577)	all
	end of run	435(232/532)	468(226/540)	532(447/585)	DL-ETT vs. other

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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ENDOTRAQUEAL 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 allthough data about it´s clinical 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 acustic reflectometry

METHODS. We prospectivelly 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 from the study due to problems with the measurement technique.Heat and moisture exchangers (HME) were routinetly 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 observed volume loss. Statistical analysis was performed with CIA program (level of significance p<0.05).

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 degee of ETT oclusion (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 oclussion no suspected clinically. Narrowing of the ETT happens within the first intubation hours/days. Such oclussion could worsen work of breathing and delay weanning in 1/6 patients.

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THE SAFETY OF FANTONI'S TRANSLARYNGEAL 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 relative 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 coagulations disorders were excluded from these studies in particular when the Griggs or Ciaglia technique were used in order to avoid potential risks such as tracheal laceration, false passage and vessel 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 1966 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 tracheostomic canula, 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 mesures.

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-canula set) which acts as well as a dilator and carrier of tracheostomic canula. This reduces local trauma and results in a very neat stoma which adheres tightly to the canula 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.

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ENDOSCOPICALLY GUIDED PERCUTANEOUS TRACHEOTOMY IN THROMBOCYTOPENIC PATIENTS

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INTRODUCTION. Tracheotomy is considered the airway management method of choice for patients in the intensive care unit (ICU) who require prolonged mechanical ventilation or prolonged airway protection. Thrombocytopenia, a frequent problem in ICU patients, is considered a relative contraindication for tracheotomy. 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 tracheotomy, 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.

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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 control, 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 fiberbronchoscope during 56 consecutives tracheostomies,in two medicosurgical 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 (FiO2=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 craniad to ostomy,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 fiberbronchoscope 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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AWAKE PERCUTANEOUS DILATATIONAL TRACHEOSTOMY WITHIN THE CRITICAL CARE ENVIRONMENT

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INTRODUCTION. Percutaneous dilatational tracheostomy (PDT) done in awake (conscious, non-anaesthetised, non-intubated) patients was found to be safe and effective 1. We have extended this study to 56 patients (40 male, 16 female) to examine ICU admission rate and mortality in a critical care setting (8 bed ICU, 12 bed geographically distinct High Dependency Unit (HDU).

METHODS. Data was collected prospectively from 56 patients who had awake PDT performed in the Critical Care Unit at North Manchester General Hospital. An ICU Consultant using a Ciaglia Blue Rhino ™ PDT Introducer Set (COOK ®) carried out the procedure with Anaesthetist support. The indications for awake PDT were the need for ventilatory support, neurological dysfunction, high risk of aspiration and retention of secretions, high risk of haemodynamic instability related to sedation and endotracheal intubation and those patients with acute respiratory failure deemed inappropriate for admission to ICU.

RESULTS. Mean age was 60.75 years (34-84). Location of procedures performed: HDU-32, ICU-19, Theatre-3, ward-1, A&E-1. Complications: 2 patients had mild, self-limiting bleeding, 1 had a small posterior wall tracheal tear. None required surgical intervention. 16 (50%) patients who had awake PDT on HDU were considered appropriate for multi-level support in ICU. 9 (56%) required transfer to ICU. All 7 (44%) who did not require transfer to ICU survived. These patients all had 1 or 2 organ failure. There were 7 (44%) survivors from the 16 HDU patients not considered candidates for ICU. Out of the 5 non ICU/HDU PDT patients 3 were transferred to HDU (survived) and 2 were transferred to ICU (died).

CONCLUSION. Our data supports the view that awake PDT is a safe and effective method for early supportive ventilation and bronchial toilet without the need for sedation, paralysis, and endotracheal intubation in selected patients with predominant single organ failure. It can prevent ICU admission in these patients and enable another therapeutic option in those patients deemed inappropriate for ICU care.

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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 scale was 9.4±3.0 and the mean number of days of intubation was 18±11 days. Most patients (n=58) had a tracheotomy before 21 days of intubation. The mean number of extubations attempts was 1.7±0.9 but in 32 patients the decision to perform tracheostomy was nor based on extubation failure. The mean ICU stay after tracheostomy was 28±78. 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.

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PROLONGED MECHANICAL VENTILATION: EARLY OR DELAYED TRAQUEOTOMY?

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INTRODUCTION. There are controversies about when tracheotomy 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 tracheotomy.

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. Tracheotomy 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 tracheotomy. Group 2: tracheotomy performed before the 10th day. Group 3: tracheotomy 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(N), twenty nine (38,7%) had respiratory disease(R) and twenty five(33,3%) formed an heterogeneous group(HG).

	Group 1 (n= 16)	Group 2 (n=16)	Group 3 (n=43)
N / R / HG (%)	12,5/ 31,2/ 56,25	12,5/ 37,5/ 50	39,5/ 41,8/ 18,6
Mortality (%)	4 (25)	3 (18,75)	14 (32,56)
APACHE III - PM (%)	81 - 42	69 - 30	63 - 41
Resp. Infections (%)	6 (37,5)	11 (68,75)	31 (72)
LOS / VM (days) p<0.001	21,4/ 15,75	34,6/ 25,4	44,9/ 38,3
Sed/Antib (days) p<0.05	11,7/ 24,3	12,56/ 22,7	20,7/ 34,7
CREI n (%)	2 (12,5)	4 (25)	6 (13,95)

CONCLUSION. Most of the patients requiring prolonged MV underwent tracheotomy. Neurological disease was the most frequent into the group of patients with delayed tracheotomy. Comparing patients with similar gravity, in those with early tracheotomy, LOS in ICU, duration of MV, need of sedation and antibiotics were shorter.

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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 had a previous tracheostomy, 108 patients had coagulation disorders and 125 had PaO_2/FIO_2 <200. Seven PT were made as an emergency procedure. All PT were done in our medical-surgical ICU as a bedside procedure using the Griggs percutaneous tracheostomy method with guide wire dilating forceps and 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 translaryngeal tube 19, cuff puncture of the endotracheal tube 19, atelectasis 6, subcutaneous emphysema 4, cardiac arrest who recovered 3 (secondary to extubation 2 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.

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HYGROMETRIC MEASUREMENTS DURING CPAP WITH BOUSSIGNAC® CPAP AND DIFFERENT HUMIDIFICATION STRATEGY

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INTRODUCTION. CPAP can be performed with BoussignacÂ® CPAP, using high oxygen and air flows. Inspired gases may be underhumidified leading to discomfort and increased nasal resistances. The aim of the study is to assess the level of humidification obtained with different humidification strategies.

METHODS. in 10 healthy subjects breathing with CPAP (BoussignacÂ® CPAP, Vygon), several humidification strategies were tested: Heated humidifiers (HH), Heat and moisture exchanger (HME) (dead space 28 ml) (placed between mask and CPAP or after the CPAP), or no humidification (NH). Hygrometry of inspired gas was measured with psychrometric method during steady state.

RESULTS. When no humidification was used very low levels of absolute humidity were reached (3.9 +/- 0.7 mg H_2O/L). With HH or with HME, significantly higher levels of absolute humidity could be reached (around 25 mgH_2O/L). With HME however, performances were very dependant on the location of the HME. Indeed, placed after the CPAP device, performances were much reduced (4.9 +/- 0.6 mgH_2O/L)

CONCLUSION. Hygrometric performances are greatly influenced by humidification strategy and were adequate only when an HME or HH were used. The location of the HME strongly influences its performance.

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HOW TO SET THE APPROPRIATE MINUTE VOLUME IN ADAPATIVE SUPPORT VENTILATIORN (ASV) MODE

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INTRODUCTION. ASV is a close-looped mode to maintain the preset minute volume with the optimal breathing rate in the least work of breathing. However, how to set up an appropriate minute volume to meet the patient's need is still obscure. Since ASV is the mixture of SIMV and PSV, we proposed that once the given minute volume meet or over the patient's need, patient will take a rest by decreasing his own breathing rate. In the meantime, machine control rate will become larger than zero to take over the decreased rate from the patient to insure the given minute volume. Therefore, the appropriate minute volume is reached by increasing %minute volume (%MV) until the machine rate is larger than zero.

METHODS. We studied 22 patients (14M, 8F) with mean age of 72.05 with 3 COPD, 14 pneumonia and 5 other disease entities, measured by putting on oesophageal balloon and pneumotachograph and connected to BICORE CP-100 monitor with Maclab soft ware for replay and analysis. We started the study by setting minute volume at ASV 100%, and then adjust the %Minute volume until the machine rate is larger than zero. This point is called the target point (P), 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 highest. The PTP is inversely correlated with %MV. Once the machine rate is larger than zero, the patient's breathing rate decreased sharply.

Item	ASV 100%	Target Point	P+20%	P+20%	ASV 100% 2
MV%	100	158±19.24	176±20.77	138±19.24	100
Actual Vt	411.57±	507.3±882	516.73±761	487,73±89.14	431.59±66.04
Actual total RR	14.6±0.55	18.8±1.48	20±1.41	17.4±2.07	14.02±0.45
Control RR	0	3±122	15.04±5.93	0	0
Actual MV	9.42±32	8.51±1.66	10.22±1.52	9.62±2.25	9.69±2.63
PTP	1.97±2.97	0.5±107	0.38±0.85	0.93±1.51	1.69±2.56

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.

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DOES THE INTRODUCTION OF PICCO CHANGE FLUID AND CATECHOLAMINE THERAPY IN SEVERE THORACIC TRAUMA ?

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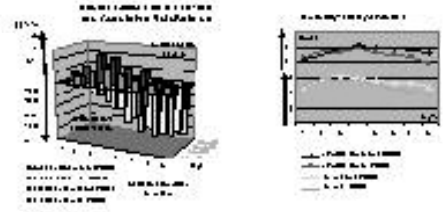
INTRODUCTION. Prospective evaluation of the influence on catecholamine and fluid therapy, introducing the PiCCO® monitor (Pulsion Medical Systems, Germany) in patients with severe blunt chest trauma induced ARDS.

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 enroled. 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 EVLW and ITBV, provided by 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±2SD: grp1: 2,48±0,36, grp2: 2,58±0,49; APACHE II±2SD: grp1: 32,2±4,3, grp2: 34,9±5,2). In grp2 treatment with catecholamines was begun earlier and levels were higher due to more restrictive fluid therapy (fig1). Murray and APACHE II scores decreased significantly (p<0,05)earlier grp2. Aggressive ventilatory assist using the Open Lung Concept was easier to establish and maintain. Ventilatory assist was significantly shortened in grp2 (days+/-2SD: grp1: 12,3+/-5,8, grp2: 10,7+/-4,4), wereas the outcome was similar. In both groups two patients died from their severe chest trauma, another died in grp1 due to malignant ICP.



CONCLUSION. The monitor made decision making in catecholamine and fluid therapy more easily. Therapy surveillance was improved, gaining more patient safety. Ventilator time was reduced, morbidity in this small group decreased.

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INCIDENCE AND MORTALITY OF ARDS IN POSTOPERATIVE OR/AND MULTIPLE TRAUMA PATIENTS

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INTRODUCTION. The incidence of acute respiratory distress syndome (ARDS) is considered to be 3.5 to 13.5 per 100.000/year. The purpose of this study is to determine the incidence and mortality of ARDS in our ICU.

METHODS. We prospectively studied 255 ICU-patients during a 3-year period (Sep 97-Sep 2000). ARDS was recorded when the patient met the criteria of American-European consensus conference at any time during their ICU stay. Patients were excluded from this study when they died in the first 24 hours after onset of mechanical ventilation.

RESULTS. During this period, 255 patients were treated with mechanical ventilation for at least 24 hours. Of these 255 patients, 56 (22%) developed ARDS. In ARDS patients the age was 51±20; 37/56 (66%) were male, APACHE II score was 24±8, and duration of mechanical ventilation was 32±24 days; in patients without ARDS was 49±20 (p>0.05); 147/52 (74%), 18±7 (p<0.05), 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 oragn failure developed 47 out of 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.

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EFFICACY OF SEVOFLURANE SEDATION IN INTENSVE CARE PATIENTS

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INTRODUCTION. sevoflurane(sevo) is an inhaled anesthesic of short acting period brief elimination time and minimal hepatic biodegradation.Thus it´s an attractive agent for intensive care (IC) patients (P) sedation(S) who are under mechanical ventilation(MV)the scope of this work was to determinate its uselfullness in medium term sedation

METHODS. Prospective and longitudinal study approved by the hospital ethical committee were performed. P under mechanical ventilation for longer than 24 hrs in the ICU were included The two exlusion criteria were intracraneal pathology and malignant hyperthermia Demographic data simplified acute physiological score (SAPS),s time length Ramsay score (RS)percent of inhaled anesthesic qualiti and time to wakeup were recorded All of the patients were respiratory and haemodynanamically monitored Fluids inotropics and vasoactive amines were used for haemodynamic stability Respiratory supportwas achieved improving MV parameters ALL patients received 2 mcg/kg/hr fentanyl analgesia.Ventilator in its inspiratory flow branch with 1litter of O2 flow was used

RESULTS. eigth male (67%)and 4 female(33%)with a mean age of 61±18yearsand initial SAPS of 16±3 were included.Sevo concentration varied betwen 0.9±0.8 and 1.5±1.3%.Initial an final RS mode were 4and 5.Total S time was 70±34 hrs. The wakeup time defined as the time elapsed for open eyes once sevo was stopped was 17±18 min. One p die after the first 24 hr due mesentheric trhombosis.Another P presented agitation after suspension of sevo. Sevo administration dose not modified hepatic or renal functions. Intrapulmonary shunt started in 28.6% and finished in 19.4%

CONCLUSION. Sevo pharmacokinetics and pharmacodinamics allows its administration in IC P without detrment in haemodynamic,respiratory,hepatic and renal functions.P present an adecuate grade of S and rapid wakeup time.We conclude that sevo is usefull in short term and medium term S in P under MV.

Poster Session Neuroendocrinological aspects of sepsis – 583-596

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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 acetaminophen and external cooling to control fever in ewe septic shock model is beneficial and influence HSP70.

METHODS. Twenty-four fasted, anaesthetized, invasively monitored, mechanically ventilated female sheep (27.0±4.6 Kg) received 0.5 g/kg body weight of feces 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>39.0°C); mild fever(37.8°C<T<38.2°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 (25.2 ± 3.0 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) ($p < 0.05$). There was no significant difference in homodynamic parameters except that DO2 (oxygen delivery) was higher in the two fever groups then the other two groups ($p < 0.05$). PaO2/FiO2 ratio was highest and blood lactate level was lowest in the high fever group than the other three groups ($p < 0.01$ and 0.05 respectively). Plasma HSP70 level was higher in the two fever groups than in the other groups ($p<0.05$).

CONCLUSION. In this septic shock model, febrile response had beneficial effects on the respiratory function, blood lactate level and survival time. Antipyretic interventions including acetaminophen and external cooling were associated with lower circulating HSP70 levels.
Grant acknowledgement: Apply

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BRAIN DAMAGE AND MULTIPLE ORGAN FAILURE IN PATIENTS WITH SEPTIC SHOCK.

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INTRODUCTION. Encephalopathy (SE) is a common complication of sepsis and associates with a higher mortality. The aim of this study is to investigate the two brain specific proteins markers in serum: Neuron-Specific Enolase (NSE) and S100B protein (S100) as indicators of brain damage in septic shock patients.

METHODS. Serum measurement of NSE and S100 was performed in 91 patients with septic shock, in the first 24 hours after haemodynamics (HD) stabilization and for 4 consecutive days. NSE and S100 were considered elevated if their values were above 12.5 ƒ_g/L and 0.5 ƒ_g/L respectively. Patients were not included in the study if they had a primary cerebral infection, or a secondary sepsis after brain injury, cardiac arrest, coronary by-pass surgery, as well as those that had primary renal and liver failure at their admission. Chi square test was used for statistics.

RESULTS. The mean age of these 91 patients was 64.4¡Ó13.6 years old. 67 patients had elevated NSE (73%), but only 32 had elevated S100 (35%). Compared with no difference in mortality and multi-organ failure (MOF) between NSE positive and negative group, S100 positive was correlated with higher mortality and morbidity of MOF ($p<0.005$). In the subgroup of patients with an elevated S100 in the first 24 hours and normalized value in the following 24 hours, mortality and morbidity of MOF was significantly lower ($p<0.005$).

CONCLUSION. Elevation of NSE and S100 in more than one third patients with septic shock showed that brain damage was an on-going process and occurred early during the evolution of sepsis. The elevation of S100, but not NSE, was associated with a higher incidence of MOF and had a predictive value for adverse outcome in these patients.

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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-a production after LPS stimulation of whole blood. We selected 500 pg/ml of LPS for incubation period of 4 h 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-a	681.4±77.1	344.3±39.1*	813.9±116.2	751.4±86.5
IL-6	1275±234.4	646.1±119.1*	1362±153.1	1335±118.1
IL-10	4.1±0.4*	4.2±0.3*	9.5±3.2	9.4±2.2
TNF-RI	500.3±14.3*	469.7±13.2*	1405±79.9	1428±84.1
TNF-RII	758.8±12.2*	769.4±10.5*	1592±21.2	1438±25.4

*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 immunomodulary therapies.

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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 AACP/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 (fT_3) and free thyroxin fraction (fT_4) 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 fT_3 and TSH serum concentrations (respectively 2.36±0.79 pg/ml and 0.76±1.12mU/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±1.45 mU/l) in spite of very similar fT_3 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 fT_3 serum level. The results also suggest that ESS could be a consequence of pituitary TSH realising disturbances.

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SHOCK ASSOCIATED WITH SEVERE ACUTE PANCREATITIS, IS THERE A PLACE FOR HYDROCORTISONE TREATMENT?

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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=0.016). 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.

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HYDROCORTISONE INDUCES HYPERNATRIEMIA

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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 hypernatriemia.

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. All serum sodium (normal range 132-144 mmol/l) and 24-hour urinary sodium values were collected. No special protocol for preemptive correction of serum sodium was used. In the case of hypernatriemia the patients infusion was adjusted to glucose 5% or glucose 2.5%/NaCl 0.45%. Means were compared with Students t-test.

RESULTS. Over a 2-year period 39 patients with a mean age of 63 +/- 16 years were studied. 15 patients (38%) died at the ICU. Hydrocortisone was administered over a median period of 5 days (IQR 3-8). In the 5 days following HCN administration, 33 (85%) patients displayed a serum sodium above 144 mmol/l. At the end of HCN administration serum sodium had risen to a mean of 144.8 mmol/l. It gradually decreased to 136.5 mmol/l over 12 days (P<0.01) after discontinuation of HCN. Urinary excretion of sodium displayed the opposite pattern with an initial decrease of excretion after the initiation of HCN and later restoration of excretion to levels > 150 mmol/day.

CONCLUSION. In accordance with its mixed mineralocorticoid and glucocorticoid action, HCN administration indeed induces mild hypernatremia. The mechanism appears to be sodium retention, because sodium excretion decreases at the same time. In order to avoid hypernatriemia as a result of HCN, sodium levels must be monitored and timely restriction of sodium administration should be considered(2).

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LOW DOSE HYDROCORTISONE DOES NOT INFLUENCE MYOCARDIAL FUNCTION IN PATIENTS WITH SEPTIC SHOCK

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INTRODUCTION. In patients with septic shock low doses of hydrocortisone(HC)have been shown to reduce vasopressor requirements and improve survival (1). However, there are only limited data whether myocardial function is affected by administration of low dose HC.

METHODS. After approval by the local ethical comittee 10 patients with septic shock (mean age: 46,9 ± 19,7 (18 - 74) years, APACHE II score: 21,5 ± 2,4 (18-25) and a mean norepinephrine (NE) dose of 1,4 ± 0,7 (0,6 - 2,5) ug/kg/min were prospectively studied before and after administration of HC(100 mg bolus followed by continuous infusion of 200 mg/24 h) and reduction of NE requirement of at least 50 % (control). Following parameters were assessed by transesophageal echocardiography: Fractional area change (FAC), preload adjusted maximal power (PAMP), tei-index, transmitrale flow profile (E/A), and isovolumetric relaxation time (IVRT). Furthermore, cardiac index (CI), intrathoracic blood volume index (ITBVI), mean arterial pressure (MAP) and heart rate were measured.

RESULTS. After administration of HC, NE requirement fell significantly from 1,4 ± 0,7 to 0,2 ± 0,2 mug/kg/min (Wilcoxon test, p<0.01) after 45,5 ± 28,6 hours. 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).

Parameter	Before HC	Control
ITBVI [ml/m_]	928 ± 168	918 ± 216
CI [L/min/m_]	4,9 ± 0,8	4,5 ± 0,9
FAC [%]	54 ± 17	57 ± 10
PAMP [$Wcm^{-2}10^{-2}$]	3,61± 1,18	3,30± 1,45
Tei-Index	0,3 ± 0,15	0,36 ± 0,14
IVRT [msec]	66 ± 26	72 ± 22
E/A	1,34 ± 0,34	1,45 ± 0,52

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

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HYPERGLYCAEMIA AND MORTALITY IN CRITICALLY ILL PATIENTS. A PROSPECTIVE STUDY.

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INTRODUCTION. Hyperglycaemia is associated with increased mortality in hospitalized patients [1]. Intensive insulin treatment reduced mortality in critically ill patients admitted to a surgical intensive care unit [2].
The aim of the present study is to describe a possible association between hyperglycaemia and mortality in critically ill patients without known diabetes.

METHODS. All adult patients admitted to the multidisciplinary ICU in a 6-month period were consecutively included. Patients with < 2 days in the ICU or with known diabetes were excluded. Altogether, the study included 135 patients, 97 surgical and 38 medical. Insulin was administrated when blood glucose level >12 mmol/l. A registration form was fulfilled for each patient, including demographic data, reason for admission, first day APACHE II score, daily maximum blood glucose level and death. Patients were classified into three groups according to maximum blood glucose level during the stay. The possible association between blood glucose level and mortality were described with an odds ratio from a multivariate logistic regression model.

RESULTS. Table 1 shows maximum blood glucose level groups vs. mortality and first day APACHE II scores (median and interquartile range). High maximum blood glucose level was associated with high mortality in our ICU, crude odds ratio 3.49 (CI95% 1.64-7.45, p=0.001). First day APACHE II score and reason for admission was included in the final multivariate logistic regression model, adjusted odds ratio 2.94 (CI95% 1.29-6.66, p=0.010).

	<10.2 mmol/l (n=44)	10.2 - 13.7 mmol/l (n=46)	> 13.7 mmol/l (n=45)
Mortality	2 %	13 %	29 %
APACHE II score	12.5 (10 - 17)	16 (11 - 23)	20 (16 - 25)

CONCLUSION. In our ICU high maximum blood glucose level was associated with increased mortality. Severity of illness on the first day in ICU and reason for admission only partly explains this association.

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IMPROVEMENT OF SEPTIC SHOCK WITH LOW DOSE HYDROCORTISONE IS ASSOCIATED WITH IMPROVED CYTOKINE LEVELS

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INTRODUCTION. There is increasing evidence that low dose hydrocortisone (HC) is beneficial in patients with septic shock, especially in those with adrenal insufficiency. On the other hand HC may be harmful in patients (pats) with normal adrenal reserve. The exact mechanisms on how HC may improve the outcome of pats with hyperdynamic septic shock is not known. Recently HC was shown to attenuate the immune response. We conducted a single centre randomised controlled trial to study the effect of low dose HC on hemodynamics and cytokine response.

METHODS. 41 pats 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/hr) or placebo. After a short synachten 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/l after 0.25 mg ACTH). Time to shock 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 proinflammatory cytokine IL-6 was sig. lower during days 1 and 5in 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 shock 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.

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AUTONOMIC DYSFUNCTION IN MODS PATIENTS OF DIFFERENT AGE GROUPS

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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 MODS by an “uncoupling” of neurally mediated organ interactions (1). We aimed to characterize the AD by several autonomic techniques in three age groups.

METHODS. We enrolled 105 consecutive MODS patients into the study and assessed heart rate variability (HRV), baroreflex sensitivity (BRS) and chemoreflex sensitivity (CRS) as markers of AD according to the international standards. The cohort of patients was divided into 3 subcohorts (2): younger patients ([G1] 18 to 39 y), middle-age patients ([G2] 39-60 y) and older patients ([G3] > 60 y). An MODS was defined by an APACHE score (AP2) of 20 or above. 9 patients were excluded on account of technically inappropriate Holter-ECG´s and intermittent loss of sinus rhythm.

RESULTS. Patients characteristics: 47 female and 58 male, age (mean±sd)60.1±13.8 y, AP2 29.7±7.9, SOFA Score 11.4±3.7, 82% on mechanical ventilation, 63% with catecholamine application, 62% sedated). The AD in these groups was as follows: SDNN (ms) 54.4±24.0 [G1], 61.8±31.3 [G2], 55.9±0.5 [G3], 0.5 [p-value]; pNN50 (%)1.9±3.3, 5.7±10.8, 5.3±7.5, 0.2; TP (ms2)293.9±18.9, 691±1343.8, 716.8±1776.4, 0.5; HF (ms2) 46.4±49.7, 106.6±76.0, 76.8±449.4, 0.1; LF/HF 1.9±1.3, 1.5±2.2, 1.0±0.8, 0.1; BRS 1.7±1.5, 2.4±1.7, 1.0±0.9, 0.003 (2 vs.3); CRS 0.6±0.7, 0.5±0.4, 0.5±0.4, 0.6. The severity of illness of the age groups was comparable (AP2 27.9±9.9, 25.5±7.6, 27.4±8.0, p=0.1; SOFA 11.2±5.5, 10.9±4.2, 10.6±3.9, p=0.4).

CONCLUSION. According to our results we conclude that the AD in MODS is mainly attributed to the disease serverity that superimposes upon the potential effects of age. These results are in keeping with those from lost of age effects after myocardial infarction. The elderly patients seem not to have an additional risk by an especially pronounced AD.

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IMPAIRED ADRENAL HORMONE SYNTHESIS IS LEADS TO HYPOCORTISOLISM AND POSSIBLY TO HYPOALDOSTERONISM

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INTRODUCTION. In patients with severe illness adrenal insufficiency is often suspected and treatment with hydrocortisone and fludrocortisone has been shown to decrease mortality. However the pathophysiology of an adrenal failure is not understood.

METHODS. Using commercially available essays, the steroid hormones progesterone, 17-OH progesterone, cortisole, testosterone, dehydroepiandrostenedione and 17-estradiol were determined before, 30 and 60 minutes after stimulation with 250g cosyntropin. The underlying admission diagnosis grouped patients in septic (n=43, 5 women), cardiogenic (n=22, 9 women) shock or control (n=34).

RESULTS. At baseline septic and cardiogenic patients showed similar cortisol levels (21 and 21g/dl) higher than control (15g/dl, p<0.05). Progesterone was increased 4-fold (p<0.001) in septic (1.2ng/ml) and cardiogenic shock (1.1ng/ml) compared with control (0.3ng/ml). In addition 17-OH progesterone was increased in both groups of patients compared to control (p<0.05). There were no correlations between steroid hormones and scoring systems or laboratory signs of infections. After stimulation, testosterone, 17-estradiol and DHEAS remained constant, whereas progesterone and 17-OH progesterone increased (p<0.001) in all groups without significant difference. In control or cardiogenic patients stimulation leads to significantly increasing values of cortisol (p=2,15E-12 and p=0.04), in patients with sepsis the increase of cortisol (p>0.1) 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 (7g/dl) not influenced by increasing dosage of catecholamines but in septic patients the increase was blunted espcially in patients with high catecholamines. The increment of serum cortison 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 cardiogenic shock had higher progesterone, higher 17-OH progesterone but only slightly elevated cortisol levels compared to control. Septic patients showed diminished response to cosyntropin stimulation regarding cortisol levels despite a normal increase of cortisol precorsors 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.

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LPS-INDUCED HYPOTHERMIA: ROLE OF DOPAMINERGIC NEUROTRANSMISSION IN THE HYPOTHALAMIC PRE-OPTIC AREA

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INTRODUCTION. Serotonergic, cholinergic and dopaminergic neurotransmission are involved in the regulation of body temperature at the level of the pre-optic area. Lipopolysaccharides (LPS) can induce hypothermia in certain conditions, although the mechanism is poorly understood. We investigated the changes in extracellular concentrations of serotonin (5HT) and dopamine (DA) at the level of the pre-optic region of the hypothalamus in freely moving rats during endotoxemia-induced hypothermia.

METHODS. Pyrogen-free Wistar rats weighing 250 to 300 g were anesthetized for the stereotactic placement of a microdialysis probe in the left pre-optic area and of a thermistor probe in the right frontal lobe. A subcutaneous thermistor was implanted in the interscapular region to measure skin temperature. The following day the freely moving animals were randomized into two groups: the LPS group and the control group. Dialysates were collected every 15 minutes for a period of 6 hours. Temperatures were noted every 15 min. After baseline collections during 90 min the LPS group received 4 mg/kg LPS of E. coli type 055.B5 in 0.5 ml saline i.p. The control group received 0.5 ml of saline i.p. Levels of 5HT and DA were analyzed using reversed phase liquid microbore LC with electrochemical detection. In a second experiment haloperidol was administered in the 3rd ventricle 1 hour before LPS injection

RESULTS. All animals receiving LPS developed mild hypothermia (average –1.4 °C) and a more pronounced drop in skin temperature. Serotonin levels were not influenced by the LPS administration. A significant increase of extracellular DA was seen starting 30 min after LPS injection and lasting for 210 min. The average maximal increase was 1295 percent of the basal level. The LPS induced hypothermia was partially antagonised by the DA D2 antagonist.

CONCLUSION. We found an increase in the extracellular concentration of dopamine but not of serotonin in the pre-optic region of the anterior hypothalamus during LPS induced hypothermia. The dopaminergic neurotransmission is probably not the sole player in this process since a DA D2 receptor antagonist only partially reversed the observed effect on brain temperature.

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HEART RATE VARIABILITY FOR ASSESSMENT OF SEVERE AUTONOMIC DYSFUNCTION IN PATIENTS WITH SEPTIC SHOCK

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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. Sedoanalgesia 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 catecholamine 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 SICU. 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 control (total power [TP] 93,7±11,7 vs. 269,0±32,7; low freqency [LF] 9,8±1,2 vs. 46,7±7,2;high freqency [HF]19,0±2,2 vs. 85,8±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. Sedoanalgesia 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 loose their day-night-rhythm. The plain impairment of HRV and in particular the loss of circardian 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.

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AUTONOMIC DYSFUNCTION IN MODS PATIENTS AGED 24 TO 96 YEARS AS A PREDICTOR OF MORTALITY IN MODS

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INTRODUCTION. The multiple organ dysfunction syndrome (MODS) is the consecutive 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 (IHM).

METHODS. We enrolled 90 consecutive MODS patients into the study and assessed heart rate variability (HRV), 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 IHM. A MODS was definied by an APACHE score of 20 or above. 5 patients were excluded on account of technically inappropriate Holter-ECG´s.

RESULTS. Total mortality after 28 days was 34% (29/85, range 3-28 days) and IHM 47% (40/85). Mean hospital survival time was 31.1±23.8 days (range 3 - 127 days). HRV parameters lnTP (28DM: CHI squared [CHI]=5.1, p=0.03/ IHM: CHI=4.6, p=0.04), lnSDNN (CHI=4.0, p=0.04/ CHI=3.4, p=0.04) and lnVLF (CHI=7.6, p=0.006/ CHI=6.4, p=0.01) were the best predictive parameters in univariate analysis. Sensitivity (SE) and specifity (SP) for VLF to predict 28DM and IHM were assessed across a range of cutoff values using ROC curves and the best prognostic cutoff for survival status was defined as that whith the highest product of SE and SP. Using the optimal cutpoint of VLF (3.85 lnms2) for illustrating the cumulative survival (CM, Kaplan-Meier-survival analysis) there was a CM of 0.8 vs. 0.56 (28DM, p=0.006, first group: values above and second below the cutpoint). Kaplan-Meier-analysis for IHM also revealed a significant difference in CM (0.57 vs. 0.31, p=0.01).

CONCLUSION. This is the first study providing evidence that the autonomic function of MODS patients is blunted according to the “uncoupling” hypothesis of MODS development and that this attenuation has prognostic implications.

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EXHALED THIOBARBITURIC ACID REACTIVE SUBSTANCES AS BIOMARKERS OF PULMONARY DAMAGE

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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 adult 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 exipiratory 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 suffered 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 sudies are needed.

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

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INTRODUCTION. The control of infections caused by methicillin-resistant Staphylococcus aureus (MRSA) has become a global and difficult task. The MRSA carrier state has been identified as an independent risk factor for endogenous infection. Screening for and treating gut carriage of MRSA may control secondary endogenous MRSA infections.
The aim of this prospective observational single centre study is to control secondary endogenous infections due to MRSA, by detecting and eradicating MRSA carriage using enteral vancomycin in critically ill children.

METHODS. On our 20 bed paediatric intensive care unit(PICU), all microbiological data on patients staying >4 days is collected prospectively. All children in the PICU have surveillance (oral and rectal) swabs on admission and then twice weekly. The children who are identified to carry MRSA are treated with enteral vancomycin for 5 days along with conventional infection control measures.

RESULTS. Over a 3 year period (Mar 99 – Feb 02) data was recorded on 948 children staying >4 days in the PICU. 26 children were MRSA positive (2.7%); 9 cardiac, 8 medical, 5 burns, 4 surgical. Median age and stay for MRSA children was 5 months and 11 days respectively. 23 children were carriers and 10 received enteral vancomycin. 16 patients imported MRSA into the unit, whilst 7 patients acquired it, with a median time to acquisition of 7 days. MRSA carriage was abolished in 80% receiving enteral vancomycin after a median of 5.5 days. 8 children (0.8%) had 19 infections - the majority were wound infections. Of the 19 infections 4 were primary endogenous, 14 exogenous, 1 unable to evaluate. There were no secondary endogenous infections. There was no difference in the median Paediatric Index of Mortality [PIM] score between the children with MRSA and those without. 2 children who had MRSA died. Mortality was similar between MRSA children and those without. Neither vancomycin resistant enterococci nor vancomycin intermediate resistant Staphylococcus aureus were isolated.

CONCLUSION. Eradication of MRSA carriage, in a minute 1% of the population, controlled transmission and resulted in the absence of secondary endogenous infections. There were no side effects in terms of resistance to enteral vancomycin.

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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 occured 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 23/35 (65.7%). Median time from PEW activation to senior clinician revue 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 inproved 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 analyzed their concentrations in newborns with confirmed congenital pneumonia (CP).

METHODS. IL-6, IL-1ra and PCT were measured in 10 newborns with CP[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) ng/ml respectively; p<0.02)]. 72 hrs after admission IL-6 concentrations were low and of the same level in the both groups. Similar profile of changes was noticed for IL-1ra [15.7(6.1-36.0) vs 2.9(1.2-8.5) ng/ml after 24 hrs - p<0.01; 8.0(3.5-14.4) vs 2.3(1.1-4.4) ng/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. No difference in respect to serum CRP levels was found after 24 and 72 hrs.

At admission	IL-6 [ng/ml]	IL-1ra [ng/ml]	PCT [ng/ml]	WBC [G/l]	Neutrophils [G/l]	CRP [mg/dl]
pneumonia	90(35-131)	9.6(6.4-33)	1.4(.7-3.6)	13.7(10-17)	9.1(5.1-12)	0.7(.6-.8)
others	87(52-131)	7.4(3.1-22)	1.2(.4-3.7)	9.9(7-13)	5.0(3.3-8)	0.6(.4-1.2)

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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PEDIATRIC INTENSIVE CARE OUTCOME:BEYONT MORTALITY.

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INTRODUCTION. Pediatric Cerebral Performance Category (PCPC) and Pediatric Overall Performance Category (POPC) scales are known, valid and reliable measures of PICU outcome.(1,2) .We examined the alterations in the scales after PICU stay and their relationship with other parameters of pediatric critical care illness.

METHODS. We examined prospectively 120 consecutive PICU patients, 70M/50F, aged 1mo to 17y. Data collected: Demographics, PCPC and POPC scores at admission and discharge, Pediatric Risk of Mortality Score (PRISM III 24h), Mechanical Ventilation days (MV), Length Of Stay (LOS), Hospital Stay (HS). DPCPC and DPOPC scores (the decline in scales scores between discharge and admission, group 0 = no alteration, group 1 = 1 scale decline, group 2 = 2 to 5 scales decline) were calculated and related to the above parameters. Statistical analysis: Kruskal Wallis test, p<0,05. Values are mean ± SD.

RESULTS. 15 patients died in the PICU.72 pts were in DPCPC group 0, 25 pts in DPCPC group 1 and 23 pts in DPCPC group 2. Groups 0,1 had lower PRISM scores (6,4 ± 4,09 and 8,08 ± 6,5 vs 19,1 ± 12,2 p <0,001), and shorter PICU stay(LOS 5,7 ± 5,5 and 9,6 ± 11,9 vs 22 ± 40,4 p <0,01) compared to group 2. Group 0 spend less days in MV compared to group 2 (4,1 ± 4,3 vs 16,4 ± 31,65). 36 pts were in DPOPC group 0, 57 pts in DPOPC group 1 and 27 pts in DPOPC group 2. Groups 0,1 had lower PRISM scores (7,02 ± 4,5 and 6,1 ± 3,4 vs 18,5 ± 12,5 p<0,001)), and shorter PICU stay (LOS 7,7 ± 8,1 and 6,1 ± 7,8 vs 20,4 ± 38,26 p<0,01). Group 1 spend less days in the hospital compared to group 2 (15,7 ± 16,38 vs 31,46 ± 39,9, p<0.01).

CONCLUSION. DPCPC and DPOPC groups 0 and 1 had lower illness severity and stayed in the PICU shorter compared to DPCPC and DPOPC group 2. Cognitive impairement (DPCPC) seemed to have more impact on MV whether functional morbidity (DPOPC) seemed to had more impact on HS.

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ASSESSMENT OF SEDATON AND ANALGESIA IN NEONATES ON ECMO USING THE COMFORT-SCALE AND BIS-MONITOR

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INTRODUCTION. Adequate analgesia and sedation are cornerstones of Extracorporeal Membrane Oxygenation (ECMO)treatment protocols. However the pharmacodynamics of the applied drugs may be altered due to an expanded circulating volume and drug absorption by circuit materials together with altered drug elimination. Assessment of the effect of sedation and analgesia in ECMO patients remains limited and standards are lacking. We assessed efficacy of standardised protocols for sedation and analgesia in neonates on ECMO using the COMFORT-scale and Bispectral Index Monitoring (BIS).

METHODS. During the canulation procedure for VA-ECMO, patients receive morphine (50mcg/kg/hr) and midazolam(0.2mg/kg/hr). Directly after canulation morphine and midazolam infusion is stopped, to asses the neurological status of the neonate. Morphine and/or midazolam are restarted after standardised behavioural re-assessment. Neonates were monitored using a validated postoperative pain and sedation score, the COMFORT-scale, together with a BIS-monitor. BIS measures the effect of sedative agents on the brain and computes the patients EEG to a single number from 0 to 98. Paired COMFORT and BIS values were assessed at regular intervals during 48hrs post-canulation for ECMO in 18 newborns.

RESULTS. The median postnatal age was 1 day(range 0-6). The median time at restart of midazolam (dosage 0-0,2mg/kg/hr) and/or morphine(dosage 0-20mcg/kg/hr) was 22hrs(range 3-72). 15min.before restart, 86% of the BIS values were>60. There was no difference (Wilcoxon rank test) between the BIS 15min. before and 15min. after restart, resp. a median of 75(range 20-98) and 65(range 32-98). 130 paired observations showed a median BIS of 56(IQR 44-73) and a COMFORT of 9(IQR 8-10). Looking specifically at body movements, in only 7% of all observations frequent small movements were observed. BIS values were>60. The correlation of BIS v.s. COMFORT(pearson), regardless of medication was 0.3(p=0.001,n=130). The within-subject correlation between BIS and COMFORT varied from -0.42 to 0.99.

CONCLUSION. There is a significant but moderate correlation between the COMFORT and BIS in neonates on ECMO. Despite adequate analgesia and sedation, BIS values were highly variable. The intra-individual correlation between COMFORT and BIS shows a great variability. These preliminary data do not support the hypothesis that BIS can be used as a primary parameter to assess the effect of sedation and analgesics in neonates on ECMO.

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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(1).

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 Submanedibular 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.

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INTRAOPERATIVE VOLUVEN USE IN PAEDIATRIC NEUROSURGICAL PATIENTS

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INTRODUCTION. The debate over colloid versus crystalloid 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 in paediatrics is absent.

METHODS. We investigated the effects of colloid hydroxyethyl starch Voluven 130/0.4 and crystalloid (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% Voluven 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 mobidity survey was performed at baseline and daily after surgery. The amounts of study fluid (mean SD)administered were 750 410 mL in group 1 and 1650 840 mL in group 2, respectively ($P<0.05$, Voluven 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,periorbital edema, and double vision.

CONCLUSION. We conclude that intraoperative fluid resuscitation with colloid solution 6% Voluven, 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 proteine.

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IMPROVED SURVIVAL IN IMMUNOCOMPROMISED CHILDREN WITH ACUTE HYPOXEMIC RESPIRATORY FAILURE

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INTRODUCTION. The survival in paediatric patients with acute hypoxemic respiratory failure (AHRF) has substantially improved with optimized management of ventilator strategies and standartized sepsis therapy. We tested the hypothesis, that also in immunocompromised patients, the subpopulation with the highest mortality risk outcome improved.

METHODS. Retrospective data on etiology, clinical course and therapeutic interventions in immunocompromised patients with AHRF treated at our PICU since 1991 were systematically reviewed and stored to an ACCESS data base. Two groups were compared according to the treatment period 1991 – 1996 (Group A, N=19) and 1997 – 2002 (Group B, N=12) using the Chi-Square-test modified by Pearson and T-test as appropriate.

RESULTS. Since 1997 survival signoficantly improved (Group A: 26% vs. Group B: 67% p=0,027). The PRISM III-Score 0-12 h post intubation (MW+/-SD): 13 +/- 8 (Gr. A) vs. 18 +/- 7 (Gr. B), lowest pO2/FiO2-Ratio within 4 hrs after admission: 69 +/- 31 mmHg (Gr. A) vs. 85 +/- 42 mmHg (Gr. B) and the number of failing orgaqn systems at onset of AHRF: 2,6 +/- 0,6 (Gr. A) vs. 2,6 +/- 1,0 (Gr. B) did not differ significantly. Sepsis- induced AHRF was equally distributed to both groups. Mean tidal volumes declined from 11 +/- 3 ml/kg in gr. A to 7 +/- 4 ml/kg in gr. B (p=0,005). Maximum PIP-Level was reduced from 38 +/-8 cm H_2O(Gr. A) to 32 +/- 8 cmH_2O (Gr. B) (p=0,044. Maximum PEEP-level (Gr. A: 11 +/- 4 cmH_2O, Gr. B: 13 +/ 6 cmH2O) slightly increased after 1997. HFOV was usede in Gr. A in 16%, in Gr. B in 25% of patients. Since 1997 low dose steroids were systematically used during recovery of the bone marrow. Enteral nutrition was started early, using transpyloric feeding if necessary.

CONCLUSION. Beside a strict ventilatory managment with limited tidal volumes and high PEEP or HFOV a protocol driven sepsis management was applied after 1996. A more active approach to enteral nutrition and the systemic use of corticosteroids during recovery from neutropenia may be further reasons for the significantly improved outcome in immunocompromised patients with AHRF.

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ULTRASONOGRAPHIC ESTIMATION OF INTERNAL JUGULAR VEIN FOR PEDIATRIC CENTRAL VENOUS CATHETER INSERTION

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INTRODUCTION. It has been reported that ultrasound-guided cannulation of the internal jugular vein (IJV) is useful in infants[1)]. However, ultrasound transducers with high frequencies for paediatric 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 (Dis), 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).

METHODS. After obtaining institutional approval and parental informed consent, 50 paediatric patients (0-34 months, 47-94 cm, 2.5-12 kg,) undergoing congenital heart surgery were prospectively studied. After the trachea was intubated, the lungs were ventilated with pressure control (15 _} 1mmHg). Dis, W and Dep were measured using a 12MHz transducer with a SONOS 5500 ultrasound system (Philips Medical Systems, Andover, MA, USA). The measurement was performed at the end-inspiratory period at the level of the cricoid ring (0º). The same measurement was undertaken in the 15º Trendelenburg position (15º). We evaluated the correlation of these variables with age, height and BW.

RESULTS. Dis and W were strongly correlated with age, height and BW in each position while Dep was not.

Correlation coefficient	Dis (0º)	W (0º)	Dep (0º)	Dis (15º)	W (15º)	Dep (15º)
Age	0.72	0.71	0.25	0.77	0.75	0.25
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

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

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HYPOPROTEINEMIA AND ITS RELATIONSHIP WITH RESPIRATORY PROBLEMS IN NEONATAL SEPSIS

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INTRODUCTION. Literature data show high incidence of Acute Respiratiry Distress Syndrome (ARDS) in septic newborns due to hipoproteinemia and low oncotic pressure, increased microvascular permeability and oedema formation.
AIM: the goal of this study was to determine the correlation of hypoproteinemia with ARDS occurence 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 parametrs 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 serum total protein levels. In the examined group, in 10/14 ARDS occured with worse weight gain, longer oxygen needs, even mechanical ventilation, (mean 11±2 days), and higher mortality rate (2/14). In the control group, septic newborns without hypoproteinemia, there was lower ARDS incidence (2/18), better weight gain, shorter period of oxygen needs (mean 7±2 days), and none of the newborns died.

CONCLUSION. Although these results show high predictive and prognostic value of hypoproteinemia in septic patients, prospective randomized trials of serum total protein levels are needed to establish whether this difference is statistically significant, and whether there is a cause-effect relationship between these two entities.

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

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INTRODUCTION. Intrathoracic blood volume (ITBVI) reflects telediastolic volumes. We studied ITBVI, IC, SVI, dPmax variation in relation with acute intrathoracic pressure and blood volemic variations.

METHODS. Patients between 6 months and 10 years old, coming to Emergency Department treated with mechanical ventilation. Exclusion criteria were: neuro-muscular chronic respiratory failure with rib cage malformations, chronic renal failure (creatinine>2mg/dl). Standard analgesia: Remifentanyl 0.25gamma/kg/min-Midazolam 0.2mg/kg/h. Haemodynamic monitoring using PiCCO (Pulsion System, Munchen, Germany) with CVC in left atrium and femoral arterial access (4F-16 cm); thermodilution bolus NaCl0.9% 1.5±0.15 ml/kg, T<10°C, DeltaT blood/bolus<0.20°C. 3 times survey of haemodynamic data: T0: PIP<20cmH_2O, PAW<10cmH_2O; T1: PEEP increase=5cmH_2O, up to PIP>20cmH_2O; T2: fluid challenge with 20ml/kg bolus PPS5%. Statistic analysis was performed with Pearson's correlation coefficient for coupled parameters.

RESULTS. 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. Pearson's correlation coefficient showed:

	s SVI-ITBVI	dPMAX-ITBVI	IC-ITBVI	SVV-ITBVI
T0	0.7794	0.1372	0.6567	-0.2923
T1	0.7965	0.0457	0.6209	-0.4547
T2	0.8868	0.1161	0.7644	-0.1958

Correlation coefficients analysis for coupled parameters variations:

	s dSVI-dITBVI	ddPMAX-dITBVI	dIC-dITBVI	dSVV-dITBVI
T0-T1	0.4454	0.4930	0.7848	-0.2959
T1-T2	0.7467	0.0945	0.8546	-0.2701
T0-T2	0.7773 -	0.0372	0.8768	-0.2335

CONCLUSION. ITBVI showed a constant relationship to the variations of the principal factors influencing preload with high correlation values for single as well as examined coupled parameters variations. So, even in paediatric, ITBVI shows to be a useful indicator of cardiac preload.

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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 (rt-PA).

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. His 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 ve 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 aeroginosa. She was started the 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. rt-PA 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 SVC syndrome rarely responds to it. rt-PA 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(1).

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PROSTACYCLIN VERSUS CITRATE FOR ANTICOAGULATION IN CONTINUOUS HEMODIAFILTRATION

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INTRODUCTION. The efficacy and safety of prostacyclin (PGI2) and citrate (ACD) anticoagulation were compared during continuous hemodiafiltration (CVVHDF) in patients with high risk of bleeding.

METHODS. 32 mechanically ventilated patients treated with CVVHDF were randomized to receive either PGI2 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 PGI2. PGI2 was infused proximally to filter in dose 4.5-10.0 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 PGI2. Patients with bleeding, decrease of thrombocytes or filter clotting within the first 10h were switched to ACD. 2.2% ACD was administered by predilution mode. The authors recorded filter clotting, haemodynamics, thrombocyte count, bleeding episodes and survival of patients in both groups.

RESULTS. Apache II was comparable in both groups (24.3+/-6.0 vs 23.5+/-8.0, p>0.05). 39 filters were monitored in Group A. ICU mortality was 47.1% (8/17). Mean dose of PGI2 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 haemorhage. 1 patient (5.9%) was given ACD due to frequent filter clotting. Median filter survival was 26 h (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 PGI2 in thrombopenic patients in particular. It offers longer filter survival and is less expensive. Increasing the dose of PGI2 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.

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REGIONAL CITRATE ANTICOAGULATION DOES NOT PROLONG FILTER SURVIVAL DURING CVVH

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INTRODUCTION. Regional anticoagulation with sodium-citrate is used in patients who are at increased risk for bleeding and systemic heparinization is deemed contraindicated. This modality may prolong filter survival during CVVH in the ICU.

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 continuated 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 done with 10.000 U/24 hrs of unfractionated heparin (N=99; 1810 cumulative treatment hours) or sodium-citrate (N=150; 3132 cumulative treatment hours). Mean filter survival was 18.3 hours in the heparin group (range 1-58 hr) and mean 20.9 hours (range 1-97 hr) in the citrate group. Kaplan-Meyer analysis showed no significant difference (logrank P=0.26) in filter survival time between both groups.

CONCLUSION. In a mixed ICU population, regional citrate anticoagulation did not prolong filter life when compared with systemic heparin anticoagulation.

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MODELLING CHANGES IN INTRA-RENAL BLOOD FLOW AND PO2 BY THE USE OF DRUGS

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INTRODUCTION. Concurrent changes in intrarenal blood flow and tissue O2 tensions are poorly described. We therefore assessed the effect of a loop diuretic and an ACE inhibitor on these local responses.

METHODS. Spontaneously breathing, tracheotomised, isoflurane-anaesthetised male Wistar rats (320–350g) were instrumented for continuous measurement of blood pressure and urine output. Three 450 micron diameter fibreoptic probes, each consisting of a ruthenium fluorescence probe to measure tissue PO2 and laser Doppler probes to measure flux (OxyLite & OxyFlo, Oxford Optronix, Oxford, UK) were inserted into the left kidney to depths of 0.5mm [cortex],1.5mm [cortico-medullary junction, CMJ] and 3.5mm [medulla]. 1.5ml Hartmann's solution was given. To each separate group of animals (n=4), three cumulative doses of frusemide totalling (0.1mg, 0.5mg and 1mg) and 3 doses of enalapril (0.1mg, 0.5mg and 1mg) were administered as boluses. Measurements were made 30 minutes after each bolus.

RESULTS. Enalapril caused a rise in cortical blood flow over baseline values (15±8% with 0.1mg, 32±10% with 0.5mg and 28±10% with 1mg) that was not seen in the deeper regions (P=0.041, ANOVA). There were no changes in pO2 in cortical and CMJ regions but a paradoxical rise in medullary pO2 was recorded (1.7±0.2 to 2.6±0.6 kPa, mean±SEM). No changes were seen in microvascular flux with the loop diuretic frusemide, despite a large diuresis. Tissue pO2 rose in the region of the CMJ from 0.9±0.2 to 1.67±0.4 (kPa, Mean ± SEM). This reflects an area rich in energy-dependent Na+/K+ATPase co-transporters

CONCLUSION. We believe that this is the first stable, validated model to study contemporaneous changes in rat renal tissue flux and oxygenation in vivo. Our in vivo results confirm in vitro findings that enalapril (1) and frusemide (2) reduce renal oxygen consumption. Results presented here provide a model in which other pathological processes may be studied.

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EARLY AND LATE RENAL FAILURE (RF) IN ICU: INCIDENCE AND PREDICTORS OF MORTALITY AND MORBIDITY

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INTRODUCTION. In the SOAP study (observational cohort of patients admitted in 198 ICU centres from 24 countries between May 1 and May 15 2002), we looked at the incidence of RF and the predictive factors of mortality and morbidity. We hypothesized that early RF had different incidence and relation with outcome than late RF.

METHODS. Renal failure was defined as a renal SOFA score > 2. Early and late RF were defined as an onset within the first 2 days or later.

RESULTS. Of 3147 patients, 1120 (35.6%) had RF at any time. RF population had a higher LOS in ICU (3.9 [1.8-9.8] vs. 2.9 [1.7-30] p<0.05), and mortality rate (30.2 vs. 12.1 p<0.05) than the other patients. Compared to others, RF population was older (63 ±16 vs. 59±18; p<0.05) with a higher incidence of COPD (12.9% vs. 9.7%; p<0.05) and heart failure (11.9% vs. 8.6%; p<0.05), a higher FiO2 (0.6±0.23 vs. 0.5±0.2; p<0.05) and a lower mean blood pressure (69±18 vs. 72±18; p<0.05), a higher incidence of MOF (SOFA 9.1±4.4 vs. 5.2±3.8; p<0.05) and severe sepsis (42.5% vs. 22.4; p<0.05) or septic shock (22.8% vs. 10.2%; p<0.05). The cumulative fluid balance was more positive in RF group than in others (2.3±13.5 vs. -1.0±10.4, litres, p<0.05). The Kaplan Meier curve showed a higher mortality rate in late RF (p<0.05) than other patients, a difference that did not exist for early RF. In multivariate logistic regression analysis for RF population, ICU outcome was best related to mean fluid balance (odds ratio 1.77 [1.5-2.08]; p<0.001); cardiovascular failure (3.2 [2.1-4.9]; p<0.001); respiratory failure (3.5 [1.0-7.9]; p<0.002) and coagulation (2.0 [1.29-3.23]; p<0.002). Additional late RF determinants was coagulation failure (odds ratio 8.12 [3.06-21.6] p<0.001); and additional early RF determinants were liver cirrhosis (4.16 [1.56-11.1] and COPD (2.23 [1.16-4.28] p<0.016).

CONCLUSION. Early and late RF differed in term of outcome and determinant factors, with an important factor of coagulation failure in late RF. Sepsis did not play a major role in outcome.
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REPEATED STRONG ION DIFFERENCE MEASUREMENT TO DETERMINE METABOLIC CORRECTION DURING CVVH

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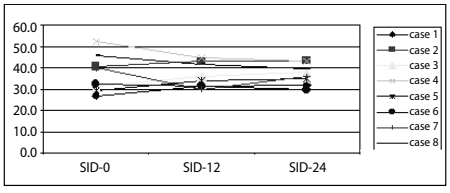
INTRODUCTION. Restoring electrolyte and acid-base balance over time may improve hemodynamic stability. We hypothesised whether over time, during CVVH the electrolyte balance, measured as strong ion difference (SID), improves.

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.

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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 alfa 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 mean±sem.

RESULTS. We have previously shown that GST alpha- and pi/creatinine ratios in healthy volunteers range from 0.12 to 0.75 ng/mmol and from 0.19 to 1.08 ng/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 ng/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.

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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 (CVVHFD) may be a problem. The aim of our study was to determine CIP serum levels in anuric patients treated with CVVHFD.

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. CVVHFD was performed on Diapact (B.Braun), with blood flow l20±30 mL/min, dialysate flow 2000 mL/hod without dialysate recirculation. The dialysis used capillary polysulphonate dialyser - Ultraflux AV 6OOS with total surface area 1.4m2 (Fresenius). 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 2690), on a C8 reversed-phase cartridge column with photodiode-array detection (PDA 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 CVVHFD under the above specified conditions reaches sufficient serum levels – ciprofloxacin breakpoint for bacteria of Enterobacteriacae family and non-fermenting gram-negative bacilli is 1mg/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.

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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 and 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 34mg/L (300micro 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.

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EFFECTS OF FENOLDOPAM ON RENAL FUNCTION DURING LIVER TRANSPLANTATION

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INTRODUCTION. Significant impairment of renal function is often recorded during OLT:Fenoldopam (F) is a selective D1 receptors agonist able to increase renal blood flow, glomerular filtration rate, natriures and diuresis. We tested the hypothesis that continuous infusion of F could provide renal protection from ischemic injury during OLT.

METHODS. Twenty cirrhotic adult patients undergoing their first OLT were enrolled in the study. Piggyback was used in all the cases. The pts were randomly assigned to the Control group (C, ten pts) and to the Treatment group (T, ten pts). In the T group, fenoldopam 0.1-0.2 mgr.kg-1 min was given as continuous infusion during OLT and for the first 24 hours. Haemodynamic profile was recorded at fixed times during the various phases of surgery and three times daily for the first 48 hours thereafter. Renal function was assessed at the same times during surgery till postoperative day(POD) 4 using fractional excretions of Na and Li,creatinine clearance and urine output. Data are reported as mean +/- SD. A p value < 0.05 was considered significant.

RESULTS. The two groups were well matched for age, sex, liver failure and preop serum creatinine.Very similar trends of intraoperative renal function were recorded in both groups. If compared to the preanhepatic phase, significant impairment of renal function became evident in both groups during the anhepatic phase and peaked after reperfusion, major changes being a significant increase of the fractional excretion of sodium and lithium (p< 0.05 anhepatic phase and end of surgery vs preanhepatic phase) and a significant decrease of creatinine clearance (p< 0.05 preanhepatic phase vs anhepatic phase; p< 0.05 preanhepatic phase vs end of surgery).While mean arterial pressure (MAP) was significantly lower in the T group during the preanhepatic phase (p<0.05 vs baseline) only, heart rate, cardiac index, wedge pressure and urine output showed similar trends in the two groups of patients during the various phase of surgery and in the early postoperative period. No patient needed hemofiltration

CONCLUSION. Intraoperative use of fenoldopam during OLT does not appear to prevent renal functional impairment during OLTand our study does not support the prophylactic use of fenoldopam during OLT to provide renal protection from ischemic damage

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INSULIN-LIKE GROWTH FACTOR-1 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-1) 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 evaluated. 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%. Dialysis 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-1 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 < 0.001). Predictors associated with a high risk of death identified in this study include IGF-1 € 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-1 and total cholesterol in ICU patients with ARF are associated with poor prognosis and may indicate need for more aggressive nutritional treatment.

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CONTRAST-INDUCED RENAL IMPAIRMENT AFTER CORONARY ANGIOGRAPHY: RISK-FACTORS AND PREDICTORS

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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+/-0.1mg/dl; creatinine clearance 80.6+/-24ml/min, BUN 39.1+/-11mg/dl; cystatin C 0.99+/-0.2mg/L; sodium 139.6+/-2.6mmol/L; magnesium 0.87+/-0.1mmol/L; amount of CM 298.2+/-162ml; EF 55.1+/-13%; TNT 0.005+/-0.03ng/ml; diabetes 23%, IDDM 10%, oral antidiabetics 10%, hypertension 82%, diuretics 42%, acetylsalicylic acid 89%, clopidogrel 69%, ticlopidin 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+/-0.18mg/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=0.0625).

CONCLUSION. 1.)Coronary angiography in patients with normal serum creatinine results in a significant increase in serum creatinine 24 and 48h after CM. 2.)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. 3.)Cystatin C might be useful in predicting an increased risk of CIN in patients with serum creatinine levels in the upper normal range.

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URINE AND BLOOD BIOCHEMICAL CHANGES IN EXPERIMENTAL GNEG SEPSIS

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INTRODUCTION. Renal function was studied in experimental septic shock with different results (1,2). We were interested if urine biochemical changes reflect changes in blood.

METHODS. Six pilot pigs were studied for 12 hrs after induction of experimental Gneg volume resuscitated sepsis (continuous live Pseudomonas aeruginosa intravenous infusion). Urine output, pH, osmolarity and Na/K extretion were studied on top of original experimental protocol (splanchnic perfusion/metabolism). Hourly diuresis was measured and urine sampled at T0, T2,T6 and T12. Data are median(range). Statistics: Friedman ANOVA and Wilcoxon matched pair test; p < 0.05 considered significant.

RESULTS. Main results are summarized in Table.

Time Points Parameters	**T0**	**T2**	**T6**	**T12**
Cardiac output l/kg/min	0.12 (0.01-0.16)	0.15 (0.11-0.19)	0.14 (0.08-0.15)	0.19 (0.15-0.23)**
Diuresis ml/kg/hr	5.5 (2.0-11.9)	3.7 (1.8-8.8)	5.3 (0.8-8.3)	1.9 (0.2-3.8) *
pH urine	6.43 (5.05-8.05)	6.18 (5.1-7.11)	5.83 (5.15-8.27)	5.31 (5.03-7.11)
pH blood	7.47 (7.42-7.57)	7.43 (7.38-7.48)	7.41 (7.35-7.45)	7.35 (7.18-7,42)**
Na urine mmol/hr	17.0 (8.6-27.5)	8.0 (3.9-26.7)	5.6 (0.5-20.0)	2.0 (0.15-5.7) **
K urine mmol/hr	11.0 (5.6-17.4)	3.5 (0.8-4.7)	2.4 (0.7-7.0)	1.1 (0.03-3.74) *

** - significant time effect during the study*

CONCLUSION. In experimetal Gneg sepsis urinary pH decreases early and the decrease is more pronounced compared to blood.

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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 admited 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)

SDRF	Number patients	SAPSII	SOFA	Mortality Rate
SOFA 0	612	25,7±12,9	4,2±3,0	15,2%
SOFA 1,2	121	37,4±14,4	6,2±2,9	29,7%
SOFA 3,4	90	48,9±17,0	7,0±4,0	45,6%
Statistical Analysis		ANOVA / p<0,001	ANOVA / p<0,001	p < 0,001

CONCLUSION. In ICU patients, the severity of acute renal dysfunction/failure is associated with 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 crhonic 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 (27.4%) 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 remaim high over the past decades. Informations about diagnosis and supportive care for patients with ATN might help centers to improve quality of care.

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Poster Session
Metabolism: Glucose regulation – 625-638

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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 PGI2. In animal and in vitro models, prostaglandin synthesis is increased during insulin deficiency [1].

METHODS. We assessed the effects of short-term ketosis on the metabolic 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.i.d.) or placebo treatment period. Calf blood flow (CBF), postocclusive reactive hyperemia (PORH), and recovery half-time (an 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 (1.75±0.29 ml / min / 100 ml muscle) than during INDO (0.85±0.17 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; 106%; 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 / m; 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 venous return and the left ventricular alterations. INDO does not interfere with the overall ketogenetic process or with insulin-induced metabolic recovery.

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REGULATION OF GLUCOSE LEVELS IN LONG-STAY ICUPATIENTS: 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 parenteral 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=0.66, p<0.001). Hospital survivors showed a lower mean PGL compared to non-survivors (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.

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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 precise 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 298 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.

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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) might be useful for early detection of hyperglycaemia 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. Hyperglycaemia was corrected with continuous insulin-infusion aiming at a target BG of 5-6 mmol/l. We collected all BG, 24-hour urinary glucose concentration as well as 24 hour glucose excretion. For each patient-day multiple BG values were averaged to one BG value before further analysis. The renal threshold was estimated by subtracting individual UG from individual BG.

RESULTS. 4 patients (58 male; 36 female; age 59 ± 15 yrs) with 441 paired BG and UG values were studied. Since UG concentration behaved very similar to UG excretion, only UG concentration values are reported. Mean (±SD) BG was 6.6 ± 2.0 mmol/l, while mean UG was 2.6 ± 7.2 mmol/l. In 413 cases (93%) UG was lower than BG. Glucosuria was detected at relatively low BG levels, with a mean threshold of 4.6 and a relatively large standard deviation of 3.1 mmol/l.

CONCLUSION. Compared to healthy subjects, critically ill patients have a remarkably decreased renal glucose threshold. Presumably the lower threshold reflects impaired tubular glucose reabsorption during critical illness.

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EVALUATION OF THERAPEUTIC PROTOCOL AIMED AT CLOSE BLOOD GLUCOSE CONTROL IN THE CRITICALLY ILL

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INTRODUCTION. Normoglycaemia seems to be a very important factor influencing ICU patients outcome (1). We evaluated the impact of implementation of therapeutic protocol for glycaemia control in the critically ill.

METHODS. Evaluation of glycaemia and insulin therapy during five day test in 8-bed general ICU. Evaluation of compliance with the therapeutic protocol and glycaemic values obtained by two methods (biochemical analyser and glucometer).

RESULTS. Close correlation between analyser and glucometer glycaemic values were found (n = 109, r2 = 0.86; p < 0.01). Glycaemia measured with an analyser was higher by 0.46 + 1.12 mmol/l. Compliance of nurses with the protocol was 67% (71 out of 106 cases). In case hyperglycaemia 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 normoglycaemia (4-6 mmol/l) was measured (n=34) this was present only in 44% (15 cases) at the following check after 6 hours. Severe hypoglycaemia (< 3 mmol/l) occured 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 expecially 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.

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GLUCOSE MANAGEMENT IN INTENSIVE CARE PATIENTS REQUIRES A STRICT PROTOCOL.

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INTRODUCTION. Over the past decades hyperglycaemia in critically ill patients has been regarded as normal and even beneficial to patients. The publication by van den Berghe et all (1)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

	Sept/Oct 2001	Nov/Dec 2001	Jan/Feb 2002	Sept/Oct 2002
Total * of patients admitted to the ICU	322	319	322	347
Total / mean * of glucose measurements	2770 / 9	2881 / 9	3163 / 10	3832 / 11
Glucose (mmol/L) mean / median/ mode	10.2 / 9.5 / 8.2	9.7 / 9.1 / 8	9.7 / 9.1 / 8	9.8 / 8.9 / 8.1
*** of hypoglycaemic incedents (<2.5mmol)**	0	2	7	18
Total amount of insulin admin. (IU)	10198	16416	20974	35346

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 the conclusion that management of patients blood glucose, aimed at the levels as described by van den Berghe et al, is not possible without a strict protocol.

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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 NaCl administration. A balanced resuscitation fluid may be appropriate in these patients.

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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), plasma potassium (PK-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 blood samples 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: 209245/il (StDev 112028) Group B results = male: 10, female: 10, age: mean 49 (StDev14), 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: 220200/il (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

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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 MICU over the course of one week. All together 556 blood samples were analysed. Metabolic acid-base status was assessed by means of the model by Gilfix with base excess of free water (BE_{Na+}), base excess of chloride (BE_{Cl-}), base excess of albumin (BE_{Alb}) and base excess of unmeasured anions (BE_{UMA}) 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 R^2 was computed for each variable, in order to compare the influence of BE_{Na+}, BE_{Cl-}, BE_{Alb} and BE_{UMA} on variations of SBE.

RESULTS. Mean daily increase of SBE, BE_{Cl-} and BE_{Alb} was 0.95, 0.58 and 0.16 mmol/L, respectively. BE_{Na+} and BE_{UMA} remained unchanged. Partial R^2 of BE_{Na+}, BE_{Cl-}, BE_{Alb} and BE_{UMA} were 6%, 41%, 4% and 22%, respectively.

CONCLUSION. Progressive hypochloremic 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.

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ADRENOCORTICAL 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.

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THE PREVELANCE AND PROGNOSTIC IMPORTANCE OF NONTHYROIDAL ILNESS IN CRITICALLY ILL PATIENTS

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INTRODUCTION. The thyroid axis is often severly disturbed in criticaly 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 ilness(NTI).

METHODS. 117 patients were enrolled in the study with mean age of 56,75+18,25 and mean APACHE II score of 21,o6+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 thyrotrophin(TSH) were measured.

RESULTS. 98 patients (83,8%) had abnormal thyroid funtion tests suggestive of NTI. 52 patients (44,4%) had only low (fT3) , 14 patients(12%) had low fT3 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 were(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<005).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 overlaping values routine study of thyroid function indices in ICU for its prognostic value is not encouraged.

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RELATIONSHIP BETWEEN CYTOKINES AND THYROID FUNCTION INDICES IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Although the role of cytokines is still poorly understood in thyroid functions, it is reasonable to suppose that cytokines cause some changes in hypotalamic-pituitary-thyroid functions. This prospective observational study was designed to investigate relationship between cytokines and thyroid function indices in medical intensive care unit

METHODS. 42 patients were enrolled in the study with mean age of 53,38+19,31 and mean APACHE II score of 22,88+7,99. Hypothyroid and hyperthyroid patients were excluded. IL-1, IL-2, IL-4, IL-6, IL-8, IL-12 and TNFalpha were measured simultaneously with free triiodothyronine (fT3), free thyroxine(fT4) and TSH.

RESULTS. We found significantly strong positive correlation between fT4 and IL12 (r=0,739 p<0,0001). There was also weak positive correlation between fT4 and IL-1 (r=0,399 p<0,05) and weak negative correlation between TSH and IL-10 (r=-0,477 p<0,05).

CONCLUSION. Acording to our findings, cytokines might have a role in the hypothalamic-pituitary-thyroid dysfunction in critically ill patients.

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OUTCOME OF 61 PATIENTS WITH ACCIDENTAL HYPOTHERMIA (<32 ºC) ADMITTED TO THE ICU

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INTRODUCTION. Patients with accidental hypothermia admitted to the ICU may suffer substantial mortality and morbidity. The aim of this study is to evaluate the outcome of patients admitted to the ICU with moderate to severe hypothermia (<32 ºC).

METHODS. A prospective cohort analysis of patients admitted to the ICU with hypothermia <32 ºC. APACHE II (A II) and SAPS II scores were measured. Predicted mortality (PM) and standardised mortality ratio (SMR) according to A II and SAPS II were calculated. All patients were treated with active external rewarming using: 1) radiant heater (Aragona) above the patient; 2) circulating warm mattress at 40 ºC; 3) heated (40 ºC) humidified respiratory gases and other ICU supportive therapies.

RESULTS. 61 patients with a core temperature (Ct) < 32 ºC were evaluated. Mean ICU admission Ct 29.3+/- 2.6, range 20.9-32 ºC. Mean age 55.4 +/-19.8. A II score 28+/-11, PM 0.60, SAPS II score 58.1+/- 21.6, SAPS II PM 0.60. CPR prior to hospital admission: 23/61. Hospital mortality with CPR: 14/23. Total hospital mortality 21/61 (35%). Hospital mortality without prior CPR: 18.4%. Duration of ICU treatment: mean 73 hours, range 5-320 hours. Standardised mortality ratio (SMR) for A II and SAPS II; 0.56.

CONCLUSION. Outcome of patients with moderate to severe hypothermia treated with active external rewarming is better than predicted by A II and SAPS II resulting in an SMR of 0.56

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THE CLASSIFICATION OF HEPARIN-INDUCED THROMBOCYTOPENIA AND THROMBOSIS IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Thrombocytopenia is frequently observed in critically ill patients with the multiple organ dysfunction syndrome (MODS). The incidence of heparin-induced thrombocytopenia (HIT) in patients with MODS is around 5%. HIT reflects a procoagulant state and may be complicated by arterial and venous thrombosis (HITT). Therapy consists of discontinuation of heparin derivates and start of anticoagulation without cross-reactivity to heparin. Early identification of patients with HIT (T) is essential but difficult due to the lack of an absolute clinical diagnosis or laboratory test. In 2001, Chong has proposed a general classification for international consensus based upon the combination of clinical features and laboratory testing. We evaluated this classification in critically ill patients.

METHODS. From August 2001 to December 2002, 13 patients with MODS and (suspected) HIT (T) have been treated with lepirudin, a direct thrombin inhibitor. The diagnosis of HIT (T) was classified by the Proposed Point Scoring System (PPSS) according to Chong. Laboratory tests for HIT were performed with the HIT-antibody test (ELISA) in all patients. The diagnostic performance of the clinical part of the PPSS in relation to laboratory testing was assessed with receiver operating characteristic (ROC) curves expressed by means of the average area under the curve (AUC) ± the standard error (SE). The diagnostic value is regarded as good when the AUC is 0.8 or more, as moderate between 0.7 and 0.8, and as poor when less than 0.7.

RESULTS. The patients (6 males and 7 females) had a mean age of 71.8 ± (SD) 8.7 years, and a mean APACHE II score of 26.3 ± 7.4 points (as measured 24 hours after ICU admission). Four patients tested ELISA positive (30.8%). Thrombo-embolic complications occurred in 8 patients (61.5%). The diagnostic value of the clinical part of the PPSS in regard to the ELISA was poor (AUC=0.51 ± 0.18).

CONCLUSION. In critically patients with MODS and (suspicion of) HIT (T), the diagnostic value of the clinical part of the PPSS according to Chong is poor in relation to laboratory testing. This classification needs to be improved for critically ill patients. In case of suspicion of HIT (T), laboratory testing is advocated.

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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% 130 kD 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 ± 6.3 ml/m^2 to 39 ± 5.2 ml/m^2. GEDVI increased significantly from 692 ± 118 ml/m^2 to 770±94 ml/m^2 as did EDAI (29 ± 10 ml/m^2 to 33 ± 8 ml/m^2), 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<0.01). For DeltaPAOP and DeltaCVP, no significant correlation to DeltaSVI was found.

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

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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 comparison with a gravimetric technique, which is supposed to be the golden standard in the assessment of EVLW. Thus, the aim of our study was to evaluate whether a correlation exists between EVLW measured by TDD ($EVLW_{TDD}$) and postmortem gravimetry ($EVLW_G$) in endotoxemic sheep.

METHODS. In order to provoke varying degrees of lung injury, awake sheep were exposed to bolus injections of *Escherichia coli* lipopolysacharide (LPS) 1 mcg/kg and observed for 6 h (n = 7), or to continuous intravenous infusions of LPS ranging from 0.2 to 10 ng/kg/min for 8 to 36 h (n = 19). The EVLW content was measured *in vivo* by means of a TDD monitor (Cold Z-021; Pulsion Medical Systems, Germany) and compared with postmortem EVLW in blood-free lungs determined by a gravimetric technique (3). Linear regression analysis was used to evaluate the correlation between $EVLW_{TDD}$ and $EVLW_G$. A p value of < 0.05 was regarded as statistically significant.

RESULTS. The regression analysis between *in vivo* $EVLW_{TDD}$ and postmortem $EVLW_G$ resulted in $EVLW_{TDD} = 1.14 \times EVLW_G + 2.45$ in endotoxemic sheep (n = 26, r = 0.89, p < 0.001).

CONCLUSION. In endotoxemic sheep, the determination of EVLW by the TDD technique 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.

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ESTIMATION OF LEFT VENTRICULAR SYSTOLIC FUNCTION BY THE CARDIAC FUNCTION INDEX

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INTRODUCTION. Transpulmonary thermodilution with the PiCCO monitor permits assessment of cardiac index and intrathoracic blood volumes. The cardiac function index (CFI = Cardiac index / Indexed global end-diastolic volume) has been proposed as a new indicator of cardiac performance. Our study objective was to compare the CFI with LV fractional area change (FAC) obtained by transesophageal echocardiography.

METHODS. Thirty-three ventilated ICU patients (age 58±15 yrs, 13 men, SAPSII 53±20, 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 CFI and FAC (FAC=7.8(IFC)+7.6, r=0.80, p<0.0001). The sensitivity and specificity of estimating FAC<40% were 84% for CFI<4, (area under ROC curve =0.92). 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 permits a reliable estimation of LV systolic function

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ALTERATIONS OF THE PULSE WAVEFORM VARIABLY AFFECT THE RELIABILITY OF PULSE OXIMETERS

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INTRODUCTION. Former clinical trials suggest not only the pulse rate (PR) indication being affected but also the determination of the pulse oximeter saturation (SpO2), when cardiac arrhythmia (CA) or intraaortic balloon pumps (IABP) are present (1). This study was designed to objectively determine the reliability of the SpO2 and PR readings of three third and fourth generation pulse oximeters during CA and IABP treatment.

METHODS. 66 SICU patients (ASA II-IV, 26 to 84 yr) were enrolled into the study. 50 suffered from CA presenting variably deformed arterial pulse waveforms, 16 received cardiac support by means of IABP. The finger probes of three pulse oximeters (CMS Viridia, Masimo IVY, and Nellcor-595) were placed randomly, PR, SpO2, and heart rate (HR) were recorded simultaneously. Prior to each measuring period an arterial blood gas analysis (SaO2) was performed, SpO2 alarm limits were then set at ±3% of the SaO2 value. PR limits were set at 60 to 120 bpm with CA, in case of IABP the alarm limits were adjusted to the expected PR (= HR + IABP rate) ±20%. Alarms were categorized into true positive (TP), false negative (FN), false positive (FP), and true negative (TN) to calculate sensitivity and specificity.

RESULTS. Specificity in the IABP group is low with all three devices, but is compromised for CMS only during CA. Sensitivity is even lower in the IABP group, but is consistently high with CA. In the IABP group, 94.2% of all acoustical alarms were classified as FP, whereas arrhythmic patients accounted for only 21.7% of FPs. Erroneous SpO2 readings caused 21.1% FP alarms with CA and 15.1% with IABP. Standard deviations (SD) of the differences between SaO2 and SpO2 respectively were consistently low except for Masimo and Nellcor exceeding their specified accuracy of ±2% in the IABP group. Dropouts were rare with all devices in both groups except for N-595 in presence of IABP.

CONCLUSION. Regarding the correct detection of SpO2, no difference can be assessed between monomorphic (IABP) and polymorphic (CA) alterations of the pulse waveform providing for an acceptable overall performance. More importantly, limitations of the clinical utility of pulse oximeters during IABP (and CA) are mainly caused by erroneous PR readings as indicated by a reduction in specificity.

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HYPERNATREMIA AND LACTIC ACIDOSIS STATES AFTER BRAIN DEATH.

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INTRODUCTION. To know the influence that several electrolytic 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 haemorrhages 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, hypophosphoremia, hyperglycemia, hyperosmolality and lactic acidosis. We also analysed the relationship between electrolytes disorders and plasmatic levels of lactic acid. The statistic test used was Pearson's Ji-square for quantitative dates.

RESULTS. The more frequent electrolytes disturbances detected were: hyperglycaemia in 74% of patients , hypophosphoremia 72%, hypokaliemia in 70%, hypernatremia 68%, 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 others electrolytes disturbances and lactic acidosis. levels were observed.

CONCLUSION. 1- Hypernatremia after brain death is significantly associated to anaerobic metabolism. Probably intravascular dehydratation 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 CONSCIOUSSNESS 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 the "toxins" release from necrotic liver. During anhepatia, extracorporeal liver assist devices (LAD) might be used to serve as a bridge to transplantation.

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 100g/min NA), lactic acidosis (up to 14,2mmol/l), need of mechanical ventilation and haemofiltration. Urgent TH was considered. After surgery, patient still required high doses NA (125,5g/min) and lactate value was 20mmol/l. We started M.A.R.S.During the 24h period of treatment, we could observe a dramatic decrease of vasopressor need, of lactate (table 1) and a significant awakening assessed by improved GCS, evoked potentials, VO2 and agitation requiring propofol. The patient underwent a second OLT and made a full recovery.

RESULTS. Discussion : TH has been proposed for the management of severe hepatic necrosis, complications during OLT and severe hepatic trauma. The patient is left with a direct porto-caval shunt.During the anhepatic state, the use of LAD could decrease the risk of cerebral complications. M.A.R.S is a dialysis system based on albumin,supposed to clear albumin-bound toxin and small water-soluble molecule.Good results were demonstrated in case of hepato-renal syndrome and good evolution was described in case of acute liver failure. Despite the hepatectomy, improvement in lactic acidosis, hemodynamics and neurological condition was observed only after MARS was started. This was purely influenced by the LAD (and not to a liver recovery).

Haemodynamic evolution during MARS therapy

	Pre-hepatectomy	Post-Hepatectomy	MARS : H9	MARS: H24
Levophed (g/min)	92	112,2	49	33
Lactate (mmol/l)	14,2	18	14,7	12,2

CONCLUSION. Based on this experience, M.A.R.S. might be proposed as an adjunctive therapy in acute liver failure or anhepatia to maintain or improve hemodynamics and neurolocical 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 ANN 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 subtending different respiratory mechanics conditions, were generated. These were obtained by combining different levels of CRS (from 5 to 50 ml/cmH_2O), Resistance (from 5 to 50 cmH_2O/(l/s)), Flow (from 0.15 to 0.75 l/s) and Positive End Expiratory Pressure (from 0 to 10 cmH_2O). To test the robustness of MLF and ANN methods, we simulated a transient disconnection of the pressure sensor, during inspiration. Disconnection time (Tdisc) 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 Tdisc according to Bland & Altman. Moreover, we computed the "confusion matrix", where we counted, for each level of Tdisc, the tracings whose compliance was correctly estimated (assuming arbitrarily that correct esteem was an error lower than 25%).

RESULTS. ANN and MLF, when no disconnection was applied, correctly classified 100% of the tracings. When Tdisc was shorter than 6% of TI, both methods showed similar biases and scatter. At Tdisc 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 Tdisc 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 SvO2 below 60%. 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 presented with measured values of mixed venous pH (7.32) below normal, and values of peak inspiratory pressure <=16 cm H_2O. 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.

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IMPACT OF AMBIENT AIR TEMPERATURE ON A NEW ACTIVE HME AND ON STANDARD HMES: BENCH EVALUATION

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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 Â« active HME Â» 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 mgH_2O/L. The new „active HME“ could deliver 35 mgH_2O/L of absolute humidity ($p<0.001$ in comparison with standard HME).

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

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ASSESMENT OF PRESSURE TIME PRODUCT BY RAPID INTERRUPTER TECHNIQUE DURING PSV

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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 (P_{es}) measurement, during PSV.

METHODS. We studied 13 no-COPD patients undergoing PSV by an Evita4 ventilator (Drager - Lubeck). We recorded: Flow, airway opening pressure (P_{aw}), and P_{es}. 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 P_{aw} equals the alveolar pressure (P_{alv}). Further changes in P_{aw} are due to patient's respiratory effort; finally the patient relaxes his muscles and a plateau is seen on the P_{aw} trace, representing elastic recoil of respiratory system. The difference between P_{alv} at the time of occlusion and plateau represent the pressure generated by the inspiratory muscles (P_{mus}). However, since the occlusion gives raise to a noise in the signal for a period of 50-100 ms, the value of P_{alv} at the time of occlusion must be back extrapolated from the most linear portion of P_{aw} after the noise ceases. A mean of 31.6 occlusions for subject were performed, for a total of 411 occlusions. In each patient PTP_{occl} was computed as the area under the time course of $P_{mus,occl}$. The measures of P_{alv}, P_{mus}, PTP, and maximal inspiratory pressure (P_{max}) obtained from the P_{es} 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 P_{alv} ($P_{alv,\ occl}$= $P_{alv,\ pes}$*1.05-2.5, r=0.84; 95% CI: +10.2 -5.9 cmH_2O) and P_{musc} ($P_{musc,\ occl}$= $P_{musc,pes}$*1+0.39, r=0.87; 95% CI:+5.7 -5.1). From the analysis of P_{musc} time course, PTP (PTP_{occl}=PTP_{pes}*0.87+1.02, r=0.90; 95% CI: +2.3 -2.8 cmH_2O*s) and maximal P_{musc} value ($P_{max,occl}$= $P_{max,pes}$*1.3+0.23 + ; r=0.95; 95% CI +2.93 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.

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EVALUATION OF THE MARS® LIVER SUPPORT SYSTEM IN PATIENTS WITH SEVERE LIVER DYSFUNCTION

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INTRODUCTION. Until recently the treatment of liver failure consisted mainly of supportive care, or in selected cases, of liver transplantation. The elimination of accumulating hepatotoxic substances by albumin dialysis (MARS®) can theoretically lead to improvement of liver function. We report the treatment of 4 patients with liver dysfunction as evidenced by severe hyperbilirubinemia.

METHODS. One patient had severe itching and cholestasis as a result of toxic hepatitis of unknown origin; 2 patients had hyperbilirubinemia due to small-for-size syndrome after adult living donor liver transplantation (ALDLT), and 1 patient had cholestasis secondary to a steatotic cadaveric liver transplantation. The patient with toxic hepatitis was initially treated unsuccessfully with steroids; in the transplant patients rejection and mechanical bile duct obstruction were excluded. Treatment was considered when bilirubin exceeded 15 mg/dL. Biochemical parameters of liver function were evaluated before and after each session.

RESULTS. A total of 17 MARS® sessions was performed. Apart from membrane leakage during 1 session no adverse events were noted. MARS® treatments resulted in a decrease of bilirubin with a median of 28 % per session (interquartile range 17-33%). The patient with toxic hepatitis had 6 sessions during which bilirubin decreased from 42.6 to 17.0 mg/dL, with improvement of complaints. After the last session, bilirubin again gradually increased to 28.3 mg/dL. In contrast to the situation before MARS® treatment, this was successfully treated with steroids. Two days after the last session 1 ALDLT patient had a rise of bilirubin, attributed to acute cellular rejection. The other ALDLT patient had a progressive recovery of liver function after MARS® treatment, and the patient with the cadaveric transplant was retransplanted because of persistent liver failure.

CONCLUSION. MARS® albumin dialysis was easy to perform and safe. It was effective in lowering bilirubin levels, and may therefore have lead to decreased hepatotoxicity and pruritus associated with cholestasis. These data suggest that therapy with MARS® may contribute to the management of patients exhibiting small-for-size-syndrome after ALDLT. The highly effective albumin dialysis possibly resulted in decreased levels of immunosuppressives and acute cellular rejection in 1 patient.

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EVALUATION OF A NEW PERCUTANEOUS TRACHEOSTOMY SET USING CONTROLLED ROTATING DILATATION

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INTRODUCTION. We report our experience of a total of 60 consecutive procedures performed with the PercuTwist™ Tracheostomy Dilator Set using controlled rotating dilatation.

METHODS. The procedure was standard until dilation. Using the guidewire, the trachea was dilated with controlled rotation and a cannula placed with bronchoscopic guidance.

RESULTS. Mean age 63yrs. Mean duration of tracheal intubation before tracheostomy was 11 days Mean time from guidewire insertion to bronchoscopically confirmed tracheostomy tube insertion was 4 minutes. All procedures performed were graded as uneventful by the operators. All had absent or minimal bleeding. There was no difficulty in inserting the PercuQuick tracheostomy cannula. None of the following were identified: posterior tracheal wall injury, tracheal ring fracture, laceration of the mucosa and oxygen desaturation(<90%).

CONCLUSION. This novel technique of rotational dilation is simple to use and is associated with few complications in our series.

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„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 applicated 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 3 Systems at 90 bpm - error in comparison to original wave form

Error (% to reference)	systolic	systolic corrected	diastolic	diastolic corrected	dp/dt	dp/dt 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® was 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 s 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.

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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 (PiCCO), a combination of transpulmonary thermodilution and arterial pulse contour analysis, with the artery 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 distributive shock. In patients with a PAC, a PiCCO 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 PiCCO, for the CO (0.84), the CI (0.73) and the SVR (0.76). When comparing the ITBVI 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 PiCCO. 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 ITBVI. 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.

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NON-INVASIVE AUTOMATIC ESTIMATION OF DYNAMIC INTRINSIC PEEP (PEEPI,dyn): IS IT FEASIBLE?

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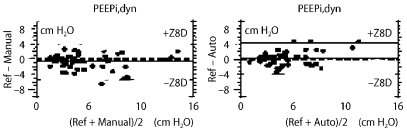
INTRODUCTION. Detection of the beginning of inspiratory effort (IEstart) by the expiratory flow pattern analysis (AJRCCM 2002;166:21-30, online suppl.), combined with the evidence that airway (Paoslope) and esophageal (Pplslope) pressure slopes during the first 100 ms of an occluded inspiratory breath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

METHODS. We developed algorithms to detect both IEstart and Paoslope. 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 Paoslope during a trial of spontaneous breathing.

RESULTS. Results are mean±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 H_2O, respectively. Both PEEPi,dyn (Manual) and (Auto) showed a significant linear correlation with PEEPi,dyn (Ref) (r^2 = 0.463 and r^2 = 0.518, p < 0.0001, respectively). Bland and Altman analysis: PEEPi,dyn (Ref) vs (Manual) (left panel): mean bias = -0.8 ± 2.4 cm H_2O; PEEPi,dyn (Ref) vs (Auto): mean bias = 0.27±2.0 cm H_2O, 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

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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 serum. 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 serum, 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 serum. 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.

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Grant acknowledgement: FIS 01/1287

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TRANSCUTANEOUS $PACO_2$ MONITORING: EVALUATION OF A NEW $PACO_2$-SPO_2 SENSOR

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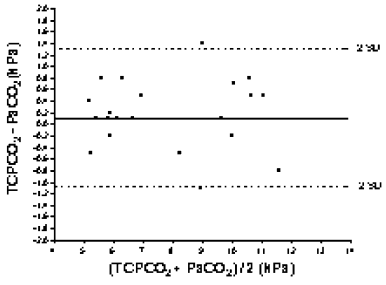
INTRODUCTION. The gold standard in evaluating oxygenation and ventilation in a patient is arterial blood gas determination. The present study was designed to investigate the usability, the precision and accuracy of a new miniaturized carbon dioxide tension ($PaCO_2$)– SpO_2 single sensor (Tosca Monitor, Linde Medical Sensors AG, Basel, Switzerland) to monitor continuously and non invasively the $PaCO_2$ (TcPCO2) and the oxygen saturation by pulse oximetry (SpO_2) in ICU patients.

METHODS. 12 postoperative 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 $TcPCO_2$ and arterial blood $PaCO_2$ 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. $TcPCO_2$ correlates remarkably well with $PaCO_2$ (r=0,96; p<0,01). Mean bias [1] between the two methods of measurement was 0.12±0.6 kPa (SD) (Figure).



CONCLUSION. The present study demonstrates that $PaCO_2$ may be accurately assessed by measuring transcutaneous $PaCO_2$ using the miniaturized Tosca ear probe sensor.

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FOCAL ISCHEMIA AFTER CEREBRAL VASOSPASM: BEDSIDE MICRODIALYSIS AS A TOOL TO OPTIMIZE CARDIAC INDEX.

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INTRODUCTION. Haemodilution and hypertension more or less hypervolaemia 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 ratio).

METHODS. 6 patients hospitalized following high grade aneurysmal subarachnoïd 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, glycerol, 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-hyperdynamic-haemodilution therapy was then initiated to maintain a CI > 3.5 L.min-1.m-2. The occurrence of biochemical ischemia, defined by two consecutives measurements of L/P ratio > 30, was treated by increasing the CI with dobutamine 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 presenting SAH with vasospasm and focal ischemia.

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Grant acknowledgement: DGA (French Ministry of Defense)

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DETERMINANTS OF EXHALED METHANE IN CRITICALLY ILL PATIENTS

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INTRODUCTION. Human colonic bacteria produce gaseous methane, which is absorbed into the blood through the colonic mucosa and exhaled. This might form the basis of a test for colonic blood flow, as reduced pulmonary methane excretion could indicate colonic underperfusion. However pulmonary methane excretion also depends on a range of other factors. We undertook a small observational study to determine what influences pulmonary methane excretion in critically ill patients before proceeding to more detailed studies.

METHODS. Daily measurements of pulmonary methane excretion were made on unselected Caucasian patients while they were artificially ventilated in our ICU. Mixed exhaled gas was analysed using a gas chromatograph with flame ionisation detection. The methane concentration was converted to excretion rate using the minute volume with appropriate corrections for temperature and water vapour content. Factors likely to affect the methane excretion (number of days ventilated, sex, age, weight, enteral feeding, surgical status, antibiotic use, vasoactive drug use and mean blood pressure) were recorded. Multiple logistic regression was used to determine the model which best explained pulmonary methane excretion.

RESULTS. The within-subject coefficient of variation was 10.3%. Twenty-six patients were studied for 53 patient-days. Pulmonary methane excretion ranged between 0.63 and 20.8 $umol.min^{-1}$ (mean 2.72, SD 2.93). The best fit model to predict pulmonary methane excretion is given in the table

Table

Variable	Coefficient	p value
Constant	-5.39	0.06
Enteral feed (yes=1, no=0)	1.50	0.096
Mean blood pressure (mmHg)	0.054	0.035
Age (years)	0.041	0.077

CONCLUSION. Pulmonary methane excretion can be measured in critically ill patients. The rate of excretion may be altered by blood pressure and hence by inference colonic blood flow. However, the major determinant of methane excretion appears to be the presence or absence of enteral feed. This will have to be addressed if a practical test of colonic perfusion is developed.
Grant acknowledgement: The study was funded by the Association of Anaesthetists

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EFFECTS OF CATECHOLAMINE THERAPY ON CELLULAR METABOLISM AFTER ACUTE HEMORRHAGE SHOCK

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INTRODUCTION. Acute hypovolemia with subsequent tissue hypoperfusion has been suggested to be of major importance in the development of multi organ dysfunction. In critical staes of shock disorders on the macro- and microcirculatory level are responsible for subsequent cellular malnutrition. In intensive care treatment hemodynamic parameters still are the „targets" of treatment while it remains unclear, if complete restoration of the hemodaynamic situation represents an adequate treatment to the tissue. Aim of the present investigation was to correlate biochemical tissue monitoring with hemodynamic observation after acute hemorrhage shock and catecholamine therapy.

METHODS. After approval of the local ethics committee 14 German landrace pigs (31,4+5,6 kg b.w.) under general anaesthesia and normoventilation were observed for hemodynamic parameters, global oxygenation and blood gas values (MAP, HR, CO, SvO2) for an observation period of 180 min. A CMA 60 microdialysis catheter was inserted into the adductor muscle for continuous measurement of interstitial lactate concentration. 7 animals were exposed to an acute blood loss (25 ml/kg b.w.) to a MAP of 30 mmHg without any therapy (C), while 7 animals after 60 min of shock were treated with continuous adrenaline infusion to a MAP of 60 mmHg (A).

RESULTS. MAP in both groups during the shock period decreased from 64+11 to 32+6 mmHg, accompanied by a decrease of CO (3,6+1,2 l/min to 1,6+0,5 l/min) and the SvO2 from 75+10 % to 56+14%. Under therapy with adrenaline significant higher values for MAP (60+6 vs. 30+15 mmHg), CO (4,2+2,1 vs. 1,5+0,5 l/min) and SvO2 (75+11% vs. 57+21%) were observed compared to control (p<0,05). Interstitial lactate concentrations of the muscle did not show significant differences between both groups during the whole observation period increasing to 6,1+2,2 mmol/l without therapy, while 6,4+2,1 mmol/l were measured under adrenaline therapy (n.s.).

CONCLUSION. Clinically „successful" treatment of hemodynamic deficites with adrenaline did not show any advantage in lower tissue lactate accumulation compared to animals without treatment. Biochemical tissue monitoring as possible with microdialysis should be introduced into the observation of critical ill patients to additionally adjust therapeutical interventions to the effects on tissue metabolism.

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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 (ptO_2) reflecting tissue oxygenation may be a usefull endpoint of resuscitation, however in clinical setting ptO_2 measurements in subcutaneous tissue (ptO_2sc) and muscle (ptO_2im) are both used although a comparative study has never been performed.

METHODS. In five critically ill patients ptO_2sc and ptO_2im 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-score on admission was 21 (range 18-31). Median duration of tissue oxygen measurements was 5 days (range 3-7). In three patients mean ptO_2sc was higher than mean ptO_2im (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). PtO_2sc as well as ptO_2im values showed variation around the mean, but the variation was greater in ptO_2im values (Variance ptO_2im:199 vs Variance ptO_2sc:164). Curves reflecting changes in ptO_2sc and ptO_2im during the course of the illness showed an identical pattern and run in a parallel fashion.

CONCLUSION. Although differences between mean ptO_2sc and ptO_2im 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 (dumping 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
number	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_{AE}/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), PaO_2/FiO_2, respiratory system compliance (Crs), and capnographic indices (Bohr's dead space, expired CO_2 slope and V_{AE}/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 ($DeltaV_{AE}/V_T$) 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 $DeltaV_{AE}/V_T$ (area: 0.825; $p<0.05$). Threshold DeltaVAE/VT value of 0.13 allowed discrimination between survivors and nonsurvivors with a specificity of 100% and a sensitivity of 33%.

CONCLUSION. $DeltaV_{AE}/V_T$ can predict mortality in patients with ALI better than other common variables. The measurement of $DeltaV_{AE}/V_T$ does not need variations in the patient's breathing pattern.

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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 thermo-dye dilution measurements (COLDsystem) done in 48 surgical ICU patients were analyzed to compare the reference ITBI and ELWI to the estimated ITBIpicco (1.25 x GEDI) and ELWIpicco (intrathoracic thermal volume – ITBIpicco) 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 ITBIpicco (r = 0.94) and ELWIpicco (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 PvO2, but significantly correlated with the ELWI, the level of PEEP, the intrapulmonary shunt, and the PaO2/FiO2 ratio.

Patients	n	ITBIpicco - ITBI (mL/m2)	ELWIpicco - ELWI (mL/kg)
All	192	21 ± 76	- 0.5 ± 1.9
ELWI > 7 mL/kg	110	52 ± 77	- 1.3 ± 1.9
P/F < 200 mmHg	113	38 ± 81	- 0.9 ± 2.0
Shunt > 25%	110	33 ± 77	- 0.9 ± 1.9
PEEP > 5 cmH20	59	46 ± 87	- 1.1 ± 2.1

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.
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EFFECTS OF PEEP ON ITBV AND EVLW MEASUREMENT BY SINGLE VS DOUBLE DILUTION TECHNIQUE IN ARDS

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INTRODUCTION. Estimate of extra-vascular 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 thermistore-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 cmH_2O). 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 PBV_{DDT} and $PBV_{DDT}/GEDV_{DDT}$. $GEDV_{DDT}$ was not affected. In all except two patients, $PBV_{DDT}/GEDV_{DDT}$ was higher than the expected 0.25. The difference between DDT and the SDT in ITBV (ITBVerr), and EVLW (EVLWerr) significantly decrease with increased PEEP levels. Mean absolute percentage difference were 8.0, 7.9, 5.9 % for ITBV and 22.3, 21.5, 12.7 % for EVLW respectively at 5, 10, 15 cmH_2O. Bias and 95% CI for ITBVerr and EVLWerr decreased with increased PEEP levels. PEEP induced changes in ITBVerr and EVLWerr 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.
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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 sedation scores [e.g. Ramsay Score (RS)]. We hypothesized that event-related potentials (ERPs) to auditory stimuli could reflect the electrophysiological analogue to clinical assessment of sedation.

METHODS. In ten healthy volunteers ERPs were measured during stepwise increasing, clinical relevant levels of sedation (RS 2-4), induced by randomly either propofol (Pro) or a combination of propofol and remifentanil (Pro/Remi). Effects of remifentanil infusion alone (Remi) were tested during target controlled infusion (1, 2 and 3 ng/ml). Auditory evoked potentials at about 100 ms after the stimulus (N100) were measured by using a paradigm consisting of 40 trains of 4 stimuli separated by 12 s intervals.

RESULTS. Remifentanil did not affect ERP amplitudes and latencies. During both Pro and Pro/Remi-induced sedation, amplitudes of N100 decreased significantly and similarly as the level of sedation increased from Ramsay score 2 to 4 (Table, $p<0.01$). At the same clinical level of sedation, propofol plasma concentrations were significantly higher when sedation was achieved by propofol alone (Pro vs. Pro/Remi, RS 3: 2.12 ìg/ml ± 0.51 vs 1.32 ± 0.43, $p<0.01$; RS 4: 3.37 ± 0.47 vs 1.86 ± 0.34, $p<0.01$).

Amplitudes (muV)	Prop	Pro/Remi	Remi
Baseline	-10.4 ± 3.5	-9.0 ± 4.1	-9.1 ± 2.6
RS 2	-7.1 ± 3.0	-7.1 ± 2.9	-8.0 ± 3.2
RS 3	-4.8 ± 2.0	-2.9 ± 2.3	-7.9 ± 3.3
RS 4	0 (not identifiable)	0 (not identifiable)	-10.8 ± 3.9

CONCLUSION. 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.
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MEASUREMENT TEMPERATURE DOES NOT INFLUENCE THE RED BLOOD CELL SHAPE IN SEPTIC PATIENTS

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INTRODUCTION. Several in-vitro studies have noted that alterations of red blood cells (RBCs) depend of measurement temperature (1,2). This possibility may limit in-vivo extrapolation. Recently, we have developed a technique by flow cytometry to estimate the RBC shape in critically ill patients (3).To investigate the effects of measurement temperature on RBCs shape estimated by flow cytometry in septic patients.

METHODS. Blood from healthy volunteers (n = 9, age: 33.9 ± 11.2 years) and from ICU patients with sepsis (n = 8, age 66.5 ± 18.7 years) were collected once the day of ICU admission. 0.5 mL of the blood were placed at 4 ºC, room temperature (20 ºC) or at 37 ºC. RBCs were analysed at time 30 minutes (T30) by flow cytometry and compared to baseline measures. With the flow cytometry technique, RBC shape of healthy volunteers shows a bimodal distribution related to the biconcave form (3). On this histogram, we calculated the moment (=3x(mean-median)/SD) representing the asymmetry of this histogram. With a value of zero, the moment represents a perfect spherical shape. Moment were expressed in mean values ± SD and compared by the t-test.

RESULTS. At baseline, RBCs moment was decrease in volunteers (a more biconcave RBC shape)compared to septic patients(respectively –0.93 ± 0.05 for volunteers versus –0.73 ± 0.18 for septic patients; $p = 0.007$). For both groups, RBC shapes estimated by the flow cytometry technique were not modified by any temperature measurement (for septic patients : at 4C : –0.73 ± 0.18 vs –0.71 ± 0.17; at 20 C : –0.73 ± 0.18 vs –0.77 ± 0.18 and at 37 C : –0.73 ± 0.18 vs –0.70 ± 0.18; p = NS)

CONCLUSION. In flow cytometry, RBCs shape was not modified by measurement temperature. This observation supports the validity of the cytometry technique to study the RBC shape in critically ill patients.

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PULSE 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 1974 [1], 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. TPCO was determined using 20ml of iced injectate. PCCO was then recorded. Simultaneously, PACO 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 TPCO was possible. Statistical analysis was by the method of Bland and Altman.

RESULTS. Bias and precision for TPCO and PCCO versus PACO recorded during catheter withdrawal are shown in table 1. TPCO and thus PCCO 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.

Catheter Length	Number of Readings	TPCO vs PACO Bias (precision) l/min	PCCO vs. PACO Bias (precision) l/min
50cm	54	0.38 (0.77)	0.39 (0.76)
45cm (5cm pullback)	54	0.45 (1.18)	0.41 (1.10)
40cm (10cm pullback)	51	0.64 (1.37)	0.55 (1.34)
35cm (15cm pullback)	36	1.03 (1.30)	0.92 (1.17)
30cm (20cm pullback)	27	1.29 (1.56)	1.23 (1.22)

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 TPCO.

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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 is 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 methodologist).

RESULTS. n beds :14.7 [8-24], n admissions/year/bed :43.1 [20.2-60.3]; Occupancy rate : 84.4% [61.5-104.7]. FTE nurses and nurses'aides/bed: 2.9 [2.1-3.7].n admissions/total FTE: 14.3 [8-23].Integration period for new nurses: 4.5 weeks [0-10]. Absenteeism: 9.1 days/year [1.2-22.2]. Two shifts working 12 h: 69%. Night and days rotation for at least one month per year: 58%. FTE intensivists + residents / bed: 0.59 [0.23-0.69]. Morning meeting update: 75% staff, 25 % patients visit. Nurses participating in the morning updates: 33%. All participating ICUs have morning and evening rounds, on site intensivist 24h/day, defined minimum staff, a discharge sheet, daily prescription with identification of physician, recording of all blood products.
The improvement between year 1999 and 2000 concerned Echocardiography (81% vs 85%), Person in charge of the equipment (61% vs 65%), Recording of all patients refused for admission (23% vs 38%).

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

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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 wards1. Of the 1190 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.

	July 2001 Surgical n=64	All n=487	March 2002 Surgical n=68	All n=512	March 2003 Surgical n=75	All n=592
HR	93%	92%	96%	87%	94%	88%
BP	97%	85%	94%	87%	95%	87%
RR	2%	6%	88%	19%	92%	57%

Two day point prevalence study of observations made on all acute in-patients

	March 2003 Site with Outreach n= 332	March 2003 Site without Outreach n=270
HR	93%	78%
BP	93%	77%
RR	67%	41%

Observations made on patients at site with Outreach and site without Outreach

CONCLUSION. An important predictor of sickness is RR2. RR is seldom recorded1. Using MEWS has made improvements on the observations recorded in all patient groups. It is only in areas where the Outreach service is regularly accessed that virtually all patients will have vital signs recorded.

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DELIVERY OF CRITICAL CARE IN THE UNITED STATES: ATTRACTING PHYSICIAN ASSISTANTS TO CRITICAL CARE

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INTRODUCTION. There is currently a shortage of trained intensivists in the US. In the US, Physician Assistants (PA) are a key group of trained clinicians who practice medicine supervised by a licensed physician. Only a tiny fraction of PAs in clinical practice are engaged in the delivery of critical care (CC)(1). PAs with CC training are invaluable physician adjuncts in providing cost-effective and safe care in the ICUs. We present a feasibile training program for PAs in surgical CC.

METHODS. Setting: A 12-bed, community-based, university affiliated closed surgical ICU. A formal 6-week long CC training program was established for newly hired PAs. The methods used included 1)PA Manual containing state-of-the art current journal articles related to surgical CC, 2)1-1 teaching at the bedside by the intensivist and the senior PA, 3)Completion of Fundamental Critical Care Support Course of SCCM, and 4) Protocols in the disease management.The evaluation process inluded 1) Competency Assessment forms completed by the attending intensivist and senior PA, 2) Live Performance Competency Assessment completed by the hired PA during last week of training, and 3)Successful completion of FCCS course. Only after successful completion of all of the above 3 evaluations that the PA was credentialled for designated procedures and case management, and allowed to work under gerneral supervision of the intensivist and take night call in the ICU. All PAs were recredentialled on an annual basis.

RESULTS. The training program in CC greatly improved hired PA's cognitive and procedural skills. The PAs rated the overall experience highly valuable in preparing them for the clinical practice of CC.

CONCLUSION. Utilizing PAs in CC delivery provides for innovative ways to provide cost-effective and safe delivery of CC in the US. It represents a feasible solution to the current shortage of intesivists and likely to attract PAs to CC.

REFERENCE(S). 1. http://www.aapa.org

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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 19 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% ± 6.3% (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.

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GEOGRAPHICAL ORIGIN OF THE COMMUNICATIONS PRESENTED AT THE ANNUAL CONGRESS OF THE ESICM

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INTRODUCTION. The EICM 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 origine of the communications presented at the ESICM congress.

METHODS. 3939 abstracts presented at the six previous EISCM congresses were studied (Paris 1997, Stokholm 1998, Berlin 1999, Rome 2000, Geneva 2001 and Barcelona 2002). The nationality of each abstract was accorded 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 37	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 evolutive audience of ESICM and comparing the scientific activities of different countries. It would be interresting to obtain such data on a regular and official basis.

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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 mean value of benchmarking (the same subject in 7 other ICUs),control graphics (with upper limit and lower limit of control covering a confidence interval of 99,7%);these information is in a ICU computer covering a period of 16 weeks; each three months we receive a report with more complete analyses and after 12 months there are 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 pneumothorax 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 final of year 2001.There are 30 ICUs in the system at end of year 2002

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

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COMPARING QUALITY: COMPUTER VERSUS HAND WRITTEN PRESCRIBING IN THE ICU

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INTRODUCTION. In critical care computerised prescribing is an alternative to hand written (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 QS5.6 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.

	A-C	D	E	F	Total
CIS	2312 (95.2%)	40 (1.6%)	5 (0.2%)	72 (3%)	2429
HW	680 (65.6%)	211 (20.4%)	124 (12%)	21 (2%)	1036

$p<0.01$ Chi squ.

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. QS CIS improved the QOP, with less 'quite poor' and 'moderately poor' prescribing.

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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 analyse 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 neurologist, 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 (1.9-6.3); 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-361 and EQ5D2) 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 74% (233 from 315) at six months and 71% (211from 297) at 12 months. Both the 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.

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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(1).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)(2).

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 EQ-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 0%), 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.

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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%(12)of 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%) complains 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(44,44%) 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(31,11%) 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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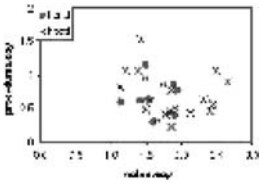
INTRODUCTION. Traditionally, physicians are divided in headworkers and handworkers. Generally, the medical staff in a department of Intensive Care Medicine consists of physicians of different origins. We describe and analyse the contribution of headwork and handwork by intensivists, fellow-intensivists 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®, iMDsoft, Tel Aviv, Israel) since March 1, 2001. We performed a descriptive analysis of the total number of procedures and notes. Unit of analysis was the mean number of procedures per day of employment per physician and the mean number of notes per day of employment per physician. Physicians were classified as headworkers or as handworkers.

RESULTS. From March 1, 2001 until March 21, 2003, 29 physicians worked in our ICU: 5 intensivists (permanent staff-members), 12 fellow-intensivists, and 12 residents. Twenty-one physicians were classified as headworkers (14 internists, 1 pulmonologist, 1 cardiologist, 5 emergency physicians), and 8 were classified as handworkers (7 anesthesiologists, 1 surgeon). The group consisted of 15 males and 14 females. The number of procedures per physician per day varied from 1.13-2.64. The number of notes per physician per day varied from 0.24-1.56. The scatterplot showed no real difference between the main activities of the two classical stereotypes of physicians.



CONCLUSION. The number of procedures and the number of notes per unit of time per physician were 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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TRAUMATIC ADULT RESPIRATORY DISTRESS. QUALITY OF LIFE AS OUTCOME. ANALYSIS AND FOLLOW-UP AT 2 YEARS

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INTRODUCTION. The objective is to identify mortality and quality of life (QL) outcomes obtained in a population with severe trauma presenting adult respiratory distress syndrome (ARDS)

METHODS. Prospective observational study. Setting: 24 ICUs in Andalusia. Period: 1/7 to 31/12/00. Inclusion criteria: severe trauma, defined by Injury Severity Score (ISS) > 15 and/or Revised Trauma Score (RTS) < 12; and ARDS, defined by American European Consensus Conference (AECC) criteria. Measurement instruments. Severity measured by Apache II, ISS and RTS. QL was evaluated by the PAECC Project questionnaire for critical patients (range: 0-29 pts) with 3 subscales: subscale 1, basic activities (range 0-9 pts); subscale 2, normal daily activities (range 0-15 pts); and subscale 3, emotional state (range 0-5 pts)

RESULTS. Out of the 612 patients with severe trauma in the GITAN registry, 44 (7%) developed ARDS. Age 37 ± 19 y., Scores: APACHE II, 16.4±7.3; ISS, 31±13.3; and RTS, 9.6±3. The intrahospital mortality was 52.3 %, remaining stable at 2 years. Characteristics of survivors(n =20): age, 34.5±13.4 y; scores: APACHE II, 13.4±6.1; ISS, 29.9±14.1; and RTS, 9.1±3.1.

Quality of Lfe (PAEEC questionnaire) at 2 years.

	GLOBAL SCORE	SUBSCALE 1	SUBSCALE 2	SUBSCALE 3
X±SD	4.9±4.6	0	3.9±3.7	1±1.1
% PN	21.4%	100%	28.6 %	50%

%PN: % with absolute normality in this item

CONCLUSION. Patients with ARDS of traumatic origin present a worsening in their QL at 2 years, mainly due to inability to perform normal daily activities and residual emotional disorders. Recovery to pre-accident levels is only produced in a minority of these patients.
Grant acknowledgement: Authors are representing GITAN group.

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REASONS FOR ADMISSION OF RENAL TRANSPLANT RECIPIENTS TO THE INTENSIVE CARE UNIT

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INTRODUCTION. To identify the major reasons why renal transplant recipients (RTRs) at our centre are admitted to the intensive care unit (ICU); to isolate prognostic factors and determine the ICU mortality rate in this group; and to assess graft function in ICU survivors.

METHODS. The medical charts of all RTRs who were admitted to our ICU from January 2000 through December 2002 were retrospectively studied. Demographic data, interval from transplantation to ICU admission, indications for ICU admission, Acute Physiology and Chronic Health Evaluation (APACHE) II score, length of ICU stay, need for and duration of mechanical ventilation, renal graft function at discharge from ICU, and ICU mortality were recorded.

RESULTS. Twenty-six patients had a total of 31 ICU admissions. The mean patient age and mean time since transplantation were 37±12 years and 38±43 months, respectively. Twelve (38.7%) admissions were due to infection (7 sepsis and 5 pneumonia cases), and 8 (25.8%) were due to neurological disorders. The other ICU admissions were due to cardiopulmonary arrest (4 cases, 12.9%), postoperative care (3 cases, 9.7%), metabolic disorders (2 cases, 6.5%), pulmonary oedema subsequent to hypervolaemia (1 case, 3.2%), and dissecting aortic aneurysm (1 case, 3.2%). The mean APACHE II score and mean ICU stay were 25±10 and 6±11 days, respectively. The overall ICU mortality rate for the group was 42%. Compared to the ICU survivor admissions, the non-survivor admissions required mechanical ventilation more frequently (p=0.001) and for longer periods (p=0.004). The non-survivor group also had a lower mean white blood cell count at the time of ICU admission (p=0.16), a higher mean number of organs that became dysfunctional during the ICU stay (p=0.03), and a higher mean APACHE II score (p=0.001). In the 18 survivor admissions, 44% of the patients showed adequate renal graft function at the time of hospital discharge.

CONCLUSION. Infections and neurological disorders are the main reasons for ICU admission in our RTRs. Need for and duration of mechanical ventilation, white blood cell count on admission to ICU, number of organs that dysfunction during the ICU stay, and APACHE II score were identified as important prognostic factors in this patient group. In more than half of the ICU survivors, the patient required haemodialysis at the time of hospital discharge.

Poster Session
Cardiovascular dynamics: Monitoring – 681-691

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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 catheterization: right atrial pressure (RAP) and pulmonary capillary wedge pressure (PCWP). Four dynamic parameters studied ventricular preload dependency : respiratory pulse pressure variations (ΔPP) (1) of radial arterial pressure (ΔPPart), pulmonary arterial pressure (ΔPPpap), infrared photo-plethysmographic capillary pressure (Finapress®) (ΔPPfina) and respiratory variations of the pulse oximetry curve (ΔPPsat). 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 ΔPPart, ΔPPfina, ΔPPpap, ΔPPsat, POD and PCWP, respectively. The areas for dynamic parameters were significantly greater than those for RAP and PCWP.

CONCLUSION. Respiratory pulse pressure variations (ΔPPart, ΔPPfina, ΔPPPAP) and oximetry curve variations (ΔPPsat) may be considered as predictive indexes of the cardiac output response to fluid challenge in patients undergoing major hepatic surgery.

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PREDICTION OF THE RESPONSE TO FLUID CHALLENGE: IMPACT OF SPONTANEOUS RESPIRATORY MOVEMENTS

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INTRODUCTION. The measurement of pulse pressure variation can reliably predict the response to fluid challenge. In these studies, spontaneous respiratory movements were carefully avoided. Whether this index can also be used in patients with spontaneous respiratory movements remains to be determined

METHODS. We performed a fluid challenge in 17 critically ill patients (7 mechanically ventilated, 10 on spontaneous ventilation) equipped with a pulmonary artery catheter and suspected to benefit from it. We obtained complete hemodynamic measurements before and after infusion of 1000 ml Hartmann solution or 500 ml HES solution. Pulse pressure variation (delta PP) was calculated. A positive response to fluid challenge was defined as a greater than 10% increase in cardiac index. Data are presented as median [range] and non parametric tests were used. Relationship between the changes in cardiac index and pulse pressure, PAOP and CVP, as well as the respiratory decrement in CVP were assessed by linear regression

RESULTS. Ten patients were considered as responders. Overall cardiac index increased from 3.2[2.3-3.7] to 3.5[3.1-4.1] L/min.M^2.

Relationship between predicting factors and changes in cardiac index

	Delta PP	PAOP	CVP	Delta CVP
R_	0.039	0.50	0.46	0.04
P value	0.88	0.047	0.06	0.7

CONCLUSION. The value of pulse pressure variation to predict fluid responsiveness is limited in patients with spontaneous respiratory movements

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COMPARISON OF STROKE VOLUME MEASURED BY WEP TECHNIQUE VERSUS THERMODILUTION.

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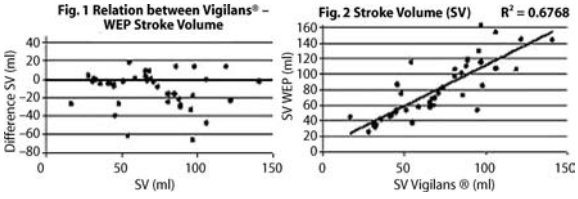
INTRODUCTION. The Wideband External Pulse (WEP) calculates arterial compliance by analysis of the ratio of the incident (SS1) to reflected waves (SS2). The waves are recorded from a piezoelectric sensor positioned beneath the distal edge of a blood pressure cuff placed over the brachial artery. Stroke 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 Vigilance® 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 (R^2=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-proBNP levels to identify cardiogenic origin in patients admitted in shock.

METHODS. Twenty-one patients with shock were prospectively enroled in this multicentric study. All of them underwent clinical examination, EKG, chest X ray, cardiac echo and conventional blood tests, BNP and NT-proBNP dosage and Swan Ganz if necessarly. Patients were evaluated by 2 independant clinicians blinded to BNP and NT-proBNP results. Practitioner divided patients in 3 groups : no cardiac dysfunction (group 1), patient with cardiac dysfunction with a shock not related to their cardiac condiction (group 2) and cardiogenic shock (group 3).

RESULTS. For all conditions the correlation between BNP and N-T pro-BNP was strong (r=0,83; p<0,00001). These two markers were significantly elevated in patients with abnormal cardiac echo findings (BNP: 849 +/- 428 pg/ml vs 199 +/- 428 pg/ml, p<0,005; NT-proBNP: 28953 +/- 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 +/- 3503 pg/ml in group 2, 58922 +/- 74184 pg/ml in group 3, p<0,001). To detect cardiac abnormalities in patients with shock, sensibility (Se) 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 > 3669 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 cardiogenic shock 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 0,90).

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 cardiogenic 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 (0.4-8), arterial 0.9 (0.3-8). Bias and limits of agreement are shown in Table 1.

Bias and Limits of Agreement

	Bias	SD	Limits of Agreement
pH	-0.04	0.022	-0.08-0
Base excess (mmols/L)	0.63	1.08	-1.49-2.75
Lactate (mmols/L)	0.133	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 PgCO2-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 PgCO2-PaCO2.

RESULTS. Before operation in 16 patients the higher level of IAP was combined with relatively low CI and significant Pg-aCO2. On the second day after operation (table 2) IAH was accompanied higher Pg-aCO2 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 PgCO2-PaCO2 before operation (n=24)

	1st cluster (n1=16)	2nd cluster (n2=8)	p
IAP, hPa	18,7±2,31	9,3±3,14	<0,05
Pg-aCO2, kPa	2,31±0,42	1,55±0,40	<0,05
CI, l/m2	2,93±0,32	3,62±0,29	<0,05

Differences between IAP, CI and PgCO2-PaCO2 on the 2nd day after operation (n=24)

	1st cluster (n1=7)	2nd cluster (n2=17)	p
IAP, hPa	14,6±2,95	7,8±3,73	<0,05
Pg-aCO2, 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.

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COMPARISON OF SUBLINGUAL AND INTESTINAL MICROVASCULAR FLOW IN CRITICALLY ILL PATIENTS

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INTRODUCTION. In apparantly 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 10 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 0-3.0), medium-sized (2.5; range 0.3-3.0), 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.

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INFLAMMATORY MARKERS IN PATIENTS WITH ATRIAL FIBRILLATION: EVOLUTION IN TIME AND RYTHM 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-PCR, 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 2 +/- 4 years) were included.All the patients underwent programmed ECV, which was successful in 30 (88.2 %) cases. hs-PCR 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 (41.7 %) patients at 1 month. hs-PCR in these patients was significantly decreased compared with their baseline hs-PCR 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-CPR 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-CPR 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), perivascular 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 126,9±12,1 m, CBV increased to 320,6±120 ms. PZ size declined to 115 ±12,6 m, CBV increased to 342,7±116,8 ms after 3 weeks from a beginning of treatment .

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

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MYOCARDIAL METABOLISM – DETERMINED BY MICRODIALYSIS – AND HEMODYNAMICS DURING CABG-SURGERY.

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INTRODUCTION. To determine the relationship between interstitial lactate - determined by myocardial microdialysis (1) -, hemodynamic variables, and (right ventricular) myocardial performance during coronary artery bypass grafting (CABG) - surgery .

METHODS. 20 patients undergoing CABG – surgery with cardiopulmonary bypass (CPB) were studied. Measurements of myocardial lactate levels were performed with a microdialysis probe inserted into the apical region of the beating heart. Right ventricular function was determined with a fast-response pulmonary artery catheter. Measurements were performed before (t1) and after CPB (t2) during periods of 15 min. Patients were grouped according to the median interstitial lactate at t1 (high lactate group: HL-group; low lactate group: LL-group; n = 10, respectively). Statistical analysis were performed nonparametrically.*: $p < 0.05$ for between group differences – Mann-Whitney-test.

RESULTS. Due to grouping, myocardial lactate at t1 was significantly higher in the HL-group. Lactate levels after CPB were not different between both groups. Heart rate, mean arterial pressure, and cardiac index were not different between both groups. Right ventricular ejection fraction before CPB was lower and central venous and pulmonary artery pressures after CPB were higher in the HL- in comparison with the LL-group ($p < 0.05$, respectively)

CONCLUSION. Increased myocardial lactate levels - before CPB - are associated with decreased right ventricular contractility before and increased filling pressures after CPB in pts. during CABG – surgery. It is suggested that myocardial microdialysis may be useful to identify pts. at risk for developing postbypass myocardial dysfunction and, hence, for optimizing pharmacological treatment during CABG-surgery.

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BNP PLASMA LEVELS ARE NOT AFFECTED BY AUTONOMIC DYSFUNCTION IN MODS PATIENTS

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INTRODUCTION. Brain natiuretic peptide is an established marker of left ventricular dysfunction in different disease entities. Its release characteristics are potently influenced by the sympathetic activity. Our present study aimed to investigate whether the BNP plasma level (BNP) correlates with myocardial damage and whether BNP is influence 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 definied by an APACHE score (AP2)>=20 and sepsis as a sepsis score according to Elebute and Stoner (SeSc) >=12. BNP was measured by RIA. Troponin I (TI) 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 chemoreflex sensitivity (CRS, hyperoxic 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 assessement 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±8.9 [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 BNP was (ln-transformed) 0.8±0.2 pg/ml and that of TI (ln-transformed) 2.2±2.8 ng/ml. We found a significant correlation of TI with the BNP (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 ms2, LF/HF 1.1±1.1, BRS 1.5±1.2 ms/mmHg, CRS 0.5±0.4 ms/mmHg, mean heart rate 93.0±18.5 beats/min. We found no significant correlation of AD markers with BNP (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 (lnBNP 0.76±0.77 vs. 0.77±1.2 ng/ml, p=0.5)

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

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Poster Session
Monitoring neurological emergencies – 692-705

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CEREBRAL OXYGEN METABOLISM AND SECONDARY HYPOTHYROIDISM 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 $SjvO_2$ 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). $SjvO_2$ 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 $SjvO_2$ 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 $SjvO_2$, lower CEO_2 and $AVDO_2$ in dead patients. Low TSH, T_3, T_4 and prolactin level 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 CEO_2 calculation: 1.$S(a\text{-}jv)O_2$ and 2. $AVDO_2/CaO_2$ x 100%.

CONCLUSION. These results demonstrate that both low and high $SjvO_2$ are very common events in neurosurgical comatose 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 $SjvO_2$ is associated with impaired cerebral mitochondrial function due to severe secondary hypothyroidism. Severe diencephalic dysfunctions are independent factor of unfavorable outcome. We recommend to use $S(a\text{-}jv)O_2$ as more practical method of calculating CEO_2.

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CEREBRAL MICRODIALYSIS IN SEVERE HEAD TRAUMA

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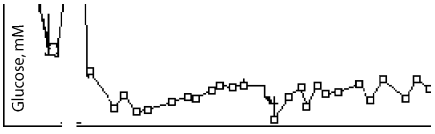
INTRODUCTION. The technique of cerebral microdialysis has been used on patients with cranial trauma, subarachnoidal haemorrhage and epilepsy.Cerebral energetic metabolism was monitored by analysing glucose, lactate, pyruvate and glutamate molecules collected by microcuvettes.

METHODS. The aim of our study was to observe the sensitivity of cerebral metabolites as glucose, lactate, pyruvate and glycerol in severe head trauma using microdialysis in predicting outcome.In literature four different types of lactate build-up mechanisms are described: 1.temporary build-up (< 1 hour), immediately after the probe is positioned. It is a localised phenomenon, probably due to the fitting of the catheter and does not reflect a true change in brain tissue metabolism. 2. a prolonged initial lactate increase, which gradually decrease over 24 to 48 hours, as illustrated in figure 2. Such conditions are typical of patients with significant primary brain injury, further complicated by massive cerebral oedema and pharmacologically resistant intracranial hypertension, which is later resolved by surgical decompression. 3. the third type of lactate increase is directly related to lack of cerebral oxygenation and extracellular glucose decrease.An increase in the lactate/pyruvate ratio is, therefore, one of the main markers for brain hypoxia/ischemia.

RESULTS. During the initial stages which follow cerebral trauma, high levels of extracellular glutamate and other excitatory aminoacids (EAA) have been observed. Using microdialysis, we have demonstrated EAA increases, especially glutamate, from 500 to 700% for basal values. We found two types of trends. Prolonged increases in concentration. Temporary increases in concentration.



CONCLUSION. The sampled molecules (especially glucose, lactate, pyruvate, glutamate and glycerol) are relevant indicators referring to patients outcome.

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COMPLICATIONS OF MONITORING OF JUGULAR BULB VENOUS SATURATION

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INTRODUCTION. Neurological monitoring is very important to change the prognosis of critical neurological patient. The jugular venous bulb saturation is extremely important to evaluate the consumption and delivery of oxygen.
To describe complications during insertion and permanence period of jugular venous bulb catheter.

METHODS. Prospective, observational study of 21 patients from June 2000 to September 2002 in an intensive care unit. All patients were monitored with intracranial pressure device (ICP-CAMINO). Jugular venous line was cannulated independent of which side. The catheter flow was sustained by continuous saline infusion (rate-3ml/h). The monitor used was VIGILANCE (Baxter). Complications were observed during insertion such as arterial puncture, bleeding, and misplacement; during catheter permanence obstruction and infection (daily examination); after decannulation: thrombosis detected through Doppler, which was performed after 24 hours. All the catheter tips were sent to bacteriological examination.

RESULTS. The meaning time of cannulation was 5 days. The thrombosis rate detected by Doppler was 31,6% (without clinical compromise). The catheter obstruction rate was 15,8% and infection rate 10,5%.

CONCLUSION. Strict control with Doppler examination is very important to warrant optimal flow. The catheter must be changed every five days in order to avoid infection.

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TRANSCRANIAL DOPPLER ULTRASONOGRAPHIC PATTERNS ASSOCIATED WITH BRAIN DEATH

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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 (FV), 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 though the transtemporal window, using an Intra-View TM pulse Doppler instrument (Rimed, Israel) with 2 MhHz 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: ischaemic 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 (15.62%) 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.

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BISPECTRAL INDEX MONITORING TO TITRATE THIOPENTAL INFUSION IN SEVERE HEAD INJURY PATIENTS

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INTRODUCTION. During high-dose barbiturate therapy, it is very important to monitor cerebral electrical activity. This is usually done with electroencephalogram (EEG) monitoring and burst-suppression (BS) is the endpoint of barbiturate titration. Frequent checks of EEG activity are, therefore, necessary. The aim of our study was to evaluate the utility of the Bispectral index (BIS), as an alternative to conventional EEG, to manage patients under barbiturate coma.

METHODS. We included traumatic brain injury patients with refractory intracranial hypertension (ICH) despite treatment with sedation, analgesia, neuromuscular blockade, optimized cerebral perfusion pressure, hyperventilation, osmotherapy with mannitol and/or hypertonic saline, and ventricular drainage, if available. Intracranial pressure and Bispectral Index (BIS XP, Aspect Medical Systems) were monitored in all patients. Absolute values of BIS and Suppression Rate (SR) were continuously recorded. Conventional EEG recordings were periodically performed to confirm BS pattern. Barbiturate treatment was initiated with a loading dose of thiopental (TP) and followed by an intravenous infusion of 3 mg/Kg/h. The therapeutic goal was ICH control or the attainment of BS on EEG. When ICH was not yet controlled, longer BS was permitted by increasing the TP dosage. (Data as mean±SD).

RESULTS. Five male patients were included. Their mean age was 35±12 years. The Glasgow Coma Score, on admission, was 7±4. The initial CT scan revealed, in all patients, a diffuse injury Grade IV on Marshall's classification. TP infusion was started after 52±39 hours from admission. The mean dose of TP was 2.6±0.2 mg/Kg/h, being the maximal dose employed of 5.4±1.6 mg/Kg/h. Length of barbiturate treatment was 187±36 hours.
Twelve EEG recordings were performed during the study period. We observed that 5-10 seconds EEG BS were in accordance with BIS values of 23±6 and SR of 49±12%. EEG BS of up to 20 seconds were observed with BIS values of 14±2 and SR > 60%. TP perfusion was titrated, according to SR, 13±6 times. Mortality rate was 20% (1/5 patients).

CONCLUSION. BIS absolute values and SR showed a good correlation with conventional EEG recordings. With BIS absolute values < 25 and SR > 45% the burst-suppression pattern was achieved. The BIS monitoring could be an easy and useful alternative to conventional EEG, for the management of patients under barbiturate coma.

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DIFFUSE AXONAL INJURY AFTER HEAD TRAUMA, RELATIONSHIP WITH POSTTRAUMATIC DISABILITIES.

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INTRODUCTION. 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 consecutives 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 ($p < 0,04$).

	ICU discharge	3 months	6 months
Group 1	17,5%	2,2%	2,5%
Group 2	77,5%	46,5%	35%
Group 3	5%	50%	62,5%

CONCLUSION. 1.-The neurological disability at discharged of the ICU, is high in patients who suffer DAI.
2.- The DAI who is localized in the in mesencephalon and corpus callosum involve higher disability than hemispherical lesions.

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LONG TERM PROGNOSIS OF SEVERE HEAD TRAUMA PATIENTS

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INTRODUCTION. Glasgow Outcome Scale (GOS) is the more often assessment used as prognosis index for head trauma patients. That prognosis scale does not seem specific enough to have a good assessment of the quality of life of these patients and overrates probably the real recovery. The aim of the present study was to investigate the long-term outcome in survivors among patients with severe head trauma admitted in intensive care unit (ICU).

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 sequels. 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
n	38	8	39	41	73
%	19	4	19	21	37

1: death; 2: vegetative; 3: sev. disability; 4: mod. disability; 5: good recovery

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.

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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 LS: 14.9±5.1 and 21.1±3.8 days. Mean number of brain CT scans required 2.2±0.2 and 2.7±0.5. Mortality rates: 6/30=20% and 9/39=23.1%. Overall mortality rates: 15/69=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±0.6h per day for propofol and 19.4±2.3h 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) Paradoxally the mean number of 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 ($p<0.1$).

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DIGITAL RECORDING AND ANALYSIS OF ICP IN TBI

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INTRODUCTION. our objective is to describe intracranial pressure (ICP) in traumatic brain injured patients (TBI) admitted to our ICU between 1997 and 2001 and its association with therapeutic level and outcome.

METHODS. 176 TBI (mean age 39 years, 71% males, 67% pure TBI, median post resuscitation motor GCS 4) with ICP digitally recorded. Therapeutic level was defined as: 1. standard (L1): sedation, mannitol, CSF (cerebral spinal fluid) drainage, PaCO2 35-30 mmHg 2. strengthened (L2): induced arterial hypertension, PaCO2 29-25 mmHg, myorelaxants 3. extreme (L3): barbiturate, PaCO2 < 25 mmHg. Outcome was assessed at ICU discharge with a simplified score (D1: performing simple orders; D2: not performing simple orders; D3: dead). For each patient the percentage of monitoring time with ICP > 20 mmHg has been calculated. Intracranial hypertension (HICP) was defined as ICP> 20 mmHg for more than 20% of recording time.

RESULTS. 20112 hours of ICP monitoring (median 96 hours; min 12-max 240), mean ICP 15 mmHg (SD 5). 79% of patients with at least one episode of ICP > 20 mmHg, 43% with HICP. Therapeutic level and outcome at discharge are shown in the next table:

	HICP (%)	Not HICP (%)
L1*	11	50
L2*	32	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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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 collissions (n=20) or accidental falls (n=7). Initial brain CT-scans were graded according to Marshall Computerized Tomographic Classification (MCTC)(scores I-VI). Intracranial pressure was determined by collecting hourly measurements. Endocrine assessment included measurement of testosterone (T), prolactin (PRL), follicle-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/dl 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.

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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 (Fisher and Marshall class) survey was performed. Cerebral tomodensitometry is systematically practiced at 48H or emergency. Samples of NSE (J1, J2 and J5 after admission) is performed by ELISA: sandwitch¡¯s 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¡¯s mean value in control and study group is 7.02 (3.86) and 18.21(17.05) _Ìg/ml respectively ($p = 0.001$). (pathologic value above 12.5 _Ìg/ml) 48.6% of patients have high NSE level at J1. All patients (9) who haven¡¯t normalised NSE at J3 or at J5 die. Levels are lower in survivors 11.51 ¡À 4.56 vs 25.74 ¡À 22.39 _Ìg/ml ($p=0.032$). -Tous les patients d¨_c¨_d¨_s avaient un taux s¨_rique ¨_lev¨_ ¨¤ j5, dont 6 avaient un taux s¨_rique normal ¨¤ J1 qui s¡¯est ¨_lev¨_ par la suite, NSE starting levels were high in patients with GCS <=8 24.89 ¡À25.27 vs 15.25 ¡À 11.6 _Ìg/ml (ns). There is no correlation between SAH¡¯s fisher class and NSE level.

CONCLUSION. The persistency of high SERIC rates of the specific ENOLASE NEURALE or their secondary elevation represents a short term prognostic element. Patients with the most serious conditions, without necessary having statistical significant difference, had the highest SERIC rate.

Grant acknowledgement: We thanks the laboratory of Salah Azaiez Institute for their help to establish this study

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PROGNOSTIC VALUE OF NEURAL SPECIFIC ENOLASE 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 sandwitchs 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 havent 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.

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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 neurorradiologist 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´38). 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´3%. In basal ganglia haemorrhages with a volume greater than 50 cc sensibility is 90´9% 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.

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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 significant 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.

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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 bathes 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 (1muM) or naloxone (0.5muM) 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 notedly 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.

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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 shortening 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 PC™ and the Sony Clié™ NX70V). 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 *.mqv files or *.wma files and viewed using Microsoft Windows Media™ or Sony Movie Player 1.0™. Procedures included central line and PA catheter 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 available to highlight 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 (tp), and after surgery (t0,t6,t24,t48,t72). To assess the patients clinical progress, Multiple Organ Dysfunction Scores (MODS) were calculated on ICU admission than 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 ($p<0.01$) 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).

Correlation coefficients for M:Cr with PaO2/FiO2 ratio

	r	p
t0	-0.218	0.012
t24	-0.193	0.032
t48	-0.238	0.025
t72	-0.057	0.644

CONCLUSION. Microalbuminuria measured on admission to ICU separated survivors from non-survivors, 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).

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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 glycerol and the ratio between lactate and pyruvate is calculated as a factor of peritoneal ischemia in the CMA 600 microdialysis analysator.

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, transversostomy 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 transversostomy caused laparatomy, also findings of a caecal ischemia and peritonitis, a resection of the remaining colon, and the transversostomy 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 intraabdominal 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.

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ABDOMINAL COMPARTMENTAL SYNDROME, SEVERE ACUTE PANCREATITIS AND PERCUTANEOS DECOMPRESSIVE PERITONEAL

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INTRODUCTION. Study of Intraabdominal Hipertension (IAH) and "percutaneos decompressive peritoneal drainage (DPD)" as an alternative to open surgery in Abdominal Compartmental 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 260.2 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 40%. 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 8.6 days which is the average duration of DPD. In all the cases neither the ecograph 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" percutaneos peritoneal drainage was shown to be effective in abdominal decompression

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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 anaesthetist 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 anaesthetist 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).

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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 review 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/m2. Previously known comorbidities were: hypertension in 6 patients (46.2%), diabetes in 1 (7.7%) 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 6 (46.1%), who were managed with Swan-Ganz catheter and vasopressors. Peritonitis occurred in 4 patients (30%), treated with antibiotics, peritoneostomy 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.

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MODIFIED PERCUTANEOUS DILATATIONAL TRACHEOTOMY: FAST AND SAFE IN THE SURGICAL INTENSIVE CARE

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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 (mPDT) 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 mPDT 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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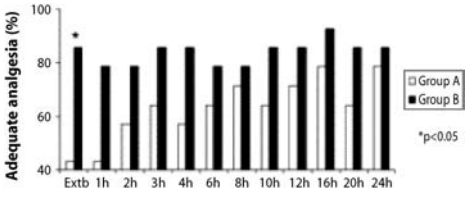
INTRODUCTION. The safety and efficacy of a long-term constant-dose iv infusion of Remifentanil (R) is not well established, based on patient satisfaction and lack of adverse effects. The aim of our randomized, double-blind study was to compare two constant dose continuous infusion of R in ICU patients 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: 0.05mug/Kg/min (Group A) or 0.1mug/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 0.25mg/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 percentages 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 0.05mug/Kg/min or 0.1mug/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 regiment in ICU patients.

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COMPARISON OF INTRA-ICU EVOLUTION OF RECIPIENTS OF LIVER TRANSPLANT FROM LIVING OR CADAVERIC 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%). Surgical procedure was similar although the operation time was longer for LDLT (7.7±1.4 vs 6±1.3h; p=0.002) and packing was only required by 14% of CLT recipients (p=0.058). As expected, the ischemic period was shorter for LDLT (85±38 min) than for CLT (343±125 min; p=0.001). In the intra-ICU period there were no differences in the presence of renal, metabolic, infectious, neurological and respiratory complications in the 2 groups. The AST peak was significantly lower in the LDLT (313±181 vs 865±881 UI/l; p=0.001). Other parameters of liver function were similar as were the presence of technical surgical problems (reintervention and vascular problems). Plasma requirements were significantly lower in LDLT (55±235 vs 708±1131 ml; p=0.001). The median ICU stay and the readmission rate were also similar in the 2 groups. Five patients died in the intra-ICU period (LDLT: 2; CLT: 3). The causes of death were infectious in 4 cases and pulmonary embolism in the remaining patient.

CONCLUSION. LDLT has a similar ICU evolution than CLT although the liver graft is smaller and the surgical procedure is larger and more difficult than in CLT. The low transaminase peak and plasma requirements probably reflect a lower ischemia-reperfusion injury due to a shorter ischemic time in LDLT.

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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 and renal failure at 48hrs (table 2)

Risk Factors	Age	Hardman Score	Respiratory Failure	Vasopressor at 48hrs	Renal Failure	Sepsis	ICU stay
P value	0.000117	0.002635	0.000613	0.000560	0.000001	0.000513	0.004483

Number of Organs failed	0	1	2	3	4	5
Patients	13	9	11	14	17	5
Survivors	12	5	7	5	1	0
% survival	92%	55%	64%	36%	6%	0%

CONCLUSION. Late mortality seems unrelated measures of hypovolaemic shock and reperfusion injury at the time of operation. It also seems unrelated to most common premorbid conditions with the exception of age. Late mortality does seem associated with the development of organ failure and sepsis; no patients over 76yr old survived failure of all 3 organs and sepsis.

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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 CXR for clinical course. In this study, we examined the effects of CXR for perioperative course in radical esophagectomy.

METHODS. PartA:We retrospectively collected data on 21 patients undergoing radical esophagectomy which were performed CXR before surgery over31 months.We analyzed patients profile, postoperative complications, prognosis, perioperative managements, intraoperative hemodynamics. PartB: 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 monitored contiuously. From 1postoperative day(OPD)to4opd CO, CVP, EVLW, PaO2/FiO2, renal function,liver function,body weight balance were wxamined. And also,C-reactive protein, interlukine-1(IL-1),IL-8,IL-10 and IL-6level 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 peri-operative body weight balance and EVLW, postoperative refilling of water is occurred earlier than control group.
Grant acknowledgement: This study was supported by Bristol-Mayers Unristricted Grant in 2002.

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INTRAVENOUS 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 nitropruside 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 nitropruside 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 vasopasm detected by transcranial Doppler sonography (TCD) after surgical treatment of ruptured intracranial aneurysms and subarachnoid hemorrhage. Isosorbid 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 administartion 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 parametres 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 efect of ISDN should be further evaluated by a prospective randomized study.