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CARDIOLOGY

P1 Impact of perioperative administration of steroid over inflammatory response and pulmonary dysfunction following cardiac surgery

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Introduction Cardiac surgery with cardiopulmonary bypass (CPB) is a recognized trigger of systemic inflammatory response, usually related to postoperative acute lung injury (ALI). As an attempt to dampen inflammatory response, steroids have been perioperatively administered to patients. Macrophage migration inhibitory factor (MIF), a regulator of the endotoxin receptor, is implicated in the pathogenesis of ALI. We have previously detected peak circulating levels of MIF, 6 hours post CPB. Experimental data have shown that steroids may induce MIF secretion by mononuclear cells. This study aims to correlate levels of MIF assayed 6 hours post CPB to the intensity of postoperative pulmonary dysfunction, analysing the impact of perioperative steroid administration.

Methods We included patients submitted to cardiac surgery with CPB, electively started in the morning, performed by the same team under a standard technique except for the addition of methylprednisolone (15 mg/kg) to the CPB priming solution for patients from group MP ($n=37$), but not for the remaining patients – group

NS ($n=37$). MIF circulating levels were assayed at the anesthesia induction, 3, 6, and 24 hours after CPB. A standard weaning protocol with fast track strategy was adopted, and indicators of organ dysfunction and therapeutic intervention were registered during the first 72 hours postoperative.

Results Levels of MIF assayed 6 hours post CPB correlated directly to the postoperative duration of mechanical ventilation ($P=0.014$, $\rho=0.282$) and inversely to $\text{PaO}_2/\text{FiO}_2$ ratio ($P=0.0021$, $\rho=-0.265$). No difference in MIF levels was noted between the groups. The duration of mechanical ventilation was higher ($P=0.005$) in the group MP (7.92 ± 6.0 hours), compared with the group NS (4.92 ± 3.6 hours).

Conclusion Circulating levels of MIF assayed 6 hours post CPB are correlated to postoperative pulmonary performance. Immunosuppressive doses of methylprednisolone did not affect circulating levels of MIF and may be related to prolonged mechanical ventilation.

P2 Immediate and short-term safety of catheter-based autologous bone marrow-derived mononuclear cell transplantation into myocardium of patients with severe ischemic heart failure

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Critical Care 2003, **7**(Suppl 3):P2 (DOI 10.1186/cc2198)

Background Bone marrow-derived mononuclear cell (BM-MNC) transplantation into the myocardium has been proposed as a new therapy for ischemic heart failure (HF). Successful cellular therapy for HF using myoblast transplantation has been reported previously but malignant arrhythmias (MA) were an issue. We investigated the safety of BM-MNC transplantation into the myocardium for MA.

Methods A prospective study to evaluate the safety of autologous BM-MNC transplantation in patients with severe ischemic HF not amenable to myocardial revascularization was conducted. Bone marrow was harvested from the iliac crest and BM-MNCs were selected by Ficoll gradient. Hibernating myocardium areas were targeted using electromechanical mapping in catheter-based subendocardial injections (MyoStar, Cordis, Miami Lakes, FL, USA). All patients were evaluated for MA, number of premature

ventricular contractions (PVC) and QT dispersion using a 24-hour Holter test at baseline, immediately after the procedure and then after 8 weeks. Perfusion tests to quantify the left ventricular (LV) ischemic mass and echocardiograms to evaluate the ejection fraction (EF) were performed at baseline and then repeated at 8 weeks.

Results Fourteen patients (12 males, 56.9 ± 10 years) with severe HF (LV EF $30 \pm 6\%$) were enrolled. All patients had triple-vessel disease and 64% had previous myocardial revascularization. A total of 30×10^6 BM-MNC were injected at 15 sites. All patients were discharged from hospital 48 hours after the procedure. The estimated LV ischemic area on MIBI SPECT was measured by percentage of myocardial defect reverse, $14.8 \pm 15\%$ of LV mass at baseline that was reduced to $5 \pm 11\%$ ($P=0.009$) at 8 weeks after

procedure. EF increased 16% ($P=0.03$) at 8 weeks. The number of PVC was reduced at 24 hours (483 ± 4598 versus 236 ± 6243 , P =not significant) and at 8 weeks (483 ± 4598 versus 191 ± 1236 , P =not significant). No MA were documented at 24 hours or at 8 weeks. QT dispersion decreased from 63 ± 24 ms at baseline to 54 ± 16 ms ($P=0.3$) at 2 months of follow-up.

Conclusion BM-MNC transplantation into myocardium of patients with severe heart failure was safely performed and short term follow-up suggests electrical stability as observed by a decrease in the QT dispersion, maintenance in the number of PVC and an absence of MA. Possible mechanisms may be due to ischemic LV mass reduction and improvement in myocardium contractility.

P3 Clinical improvement after autologous bone marrow mononuclear cell transplantation

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Background Our group and others have reported symptoms, myocardial perfusion and mechanical improvements with bone marrow mononuclear cell (BM-MNC) transplantation into areas of hibernating myocardial in end stage ischemic heart disease (ESIHD) patients. However, there is no information about the course of these improvements during time. We evaluated, week by week, the improvements in New York Heart Association (NYHA) functional class, CCS angina class and ejection fraction (EF) by echocardiography in ESIHD patients to BM-MNC transcatheterial delivery.

Methods In 14 patients, bone marrow was harvested from iliac crest and BM-MNCs were selected by Ficoll gradient. Endocardial injections targeting hibernated myocardial areas were performed utilizing electromechanical mapping (MyoStar, Cordis, Miami Lakes, FL, USA). At baseline and during a follow-up of 10 weeks the patients were evaluated about their NYHA functional class, CCS angina class, and EF by echo (Simpson). Ischemic area was evaluated by SPECT-MIBI (Siemens ICON workstation) before and 8 weeks after BM-MNC transplantation. The statistical analysis used for comparisons between baseline and 8 weeks was analysis of variance, and that for evaluation of peak of improvements during time was a generalized linear model with time strata.

Results All 14 patients (two females, 57 ± 10 years old) had multi-vessel disease and previous myocardial infarction. The patients presented a significant 73% reduction in total reversibility defect ($P=0.022$, from $15.15 \pm 14.99\%$ to $4.53 \pm 10.61\%$) in an 8 week follow-up. The NYHA class were 2.21 ± 0.89 at baseline and improved to 1.14 ± 0.36 at 8 weeks ($P=0.0003$). The CCS angina class were 2.64 ± 0.84 at baseline and improved to 1.28 ± 0.61 ($P=0.0001$). The EF moved from $30 \pm 5\%$ at the baseline to $35 \pm 7\%$ at 8 weeks ($P=0.02$). We obtained a significant improvement of NYHA at the fourth week ($P=0.0002$) and for CCS at the seventh week ($P=0.00006$). Concomitantly we observed a significant improvement in EF by echo between the sixth and eighth weeks ($P=0.04$).

Conclusion These preliminary data suggest a time window for clinical, functional and myocardial perfusion improvements with BM-MNC transplantation during the second month of follow-up. This data, if confirmed in more powerful studies, may be useful for informing patients submitted to BM-MNC transplantation to hibernating myocardial areas, as well as to identify the major mechanism involved in this approach.

P4 Primary angioplasty in a public hospital: initial results

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Critical Care 2003, **7(Suppl 3)**:P4 (DOI 10.1186/cc2200)

Background Many studies in the literature show that primary angioplasty is the best method for myocardial reperfusion.

Objectives The aim of the study was to evaluate the angiographic and clinical results of primary angioplasty in patients with acute myocardial infarction (AMI).

Methods We prospectively studied 1055 patients with AMI, in a coronary unit care, from March 1994 to March 2003. The angiographic successful of revascularization was defined as a reduction of at least 20 percent points in the stenosis of at least one lesion, resulting in a residual stenosis of less than 50% of the luminal diameter and Thrombolysis in Myocardial Infarction 3 flow. Clinical successful was defined as angiographic successful without in-hospital complications of death, reinfarction, repeated percutaneous procedure, or referral for coronary artery bypass graft (CABG) surgery. For statistical analyse we used chi-square analyses or Fisher's exact test and Student's *t*-test.

Results Between March 1994 and March 2003, 1055 consecutive patients with AMI were hospitalized and 57 were referred to our catheterization laboratory for direct angioplasty within 12 hours

of symptom onset. Of these patients, the mean age was 61 years. Males comprised 56.1% (31).

Traditional risk factors prevalence were 17.5% for diabetes mellitus, 73.7% for hypertension, 43.9% for current smoker, 52.6% hypercholesterolemia and 56.1% for family history of CAD. Of the patients, 31.5% had a history of myocardial infarction. Anterior wall AMI occurred in 35 patients and inferior in 22. Of the patients, 54.4% were submitted to direct angioplasty within 12 hours from symptom onset, the ejection fraction mean was $56.8 \pm 11.9\%$, and infarct-related artery was descend anterior in 49.1% and right coronary in 38.6%. The extent of CAD was one vessel in 48.1% and three vessels in 15.8%. Angiographic successful was demonstrated in 45 patients (81.8%) with stent implantation in 61.4%, reinfarction in 3.51%, repeated percutaneous procedure in 7%, CABG in 1.8% and mortality was 12.3% (included five patients in cardiogenic shock). The clinical success was 75.5%.

Conclusion We demonstrated good results of direct angioplasty with the greatest mortality because of previous infarction, cardiogenic shock and the time from symptom onset to angioplasty.

P5 Should left ventricular failure be part of the risk score in acute ischemic syndrome without ST elevation?**M Araujo^{1,2}, ET Mesquita^{1,2}***¹Universidade Federal Fluminense, Niteroi, RJ, Brazil; ²Hospital Pró-Cardíaco, Rio de Janeiro, RJ, Brazil
Critical Care 2003, 7(Suppl 3):P5 (DOI 10.1186/cc2201)*

Background For the identification of cardiac prognostic risk markers in the emergency room, in patients with ischemic heart syndrome without ST elevation, it is important to choose the best and the most cost-effective therapeutic strategy.

Goal To evaluate the prognostic impact of left ventricular failure (LVF) in patients with acute ischemic syndrome without ST segment elevation.

Methods Included were 124 patients, most of them male (58%), with average age of 68.9 ± 12.3 years. A total of 8.9% had clinical LVF symptoms at admission, and 17.7% had events in the following 180 days.

Results LVF was present in 41.7% of the patients with combined events and only in 13.9% of patients without ischemic events.

Comparing the LVF group and the without LVF group in their admission we observed a greater prevalence of events ($P=0.02$)

Table 1

| Variable | Coefficient | Standard error | P value | C statistic |
|------------|-------------|----------------|---------|-------------|
| Clinic LVF | 166.3 | 0.713 | 0.012 | 0.66 |

in the first group, relative risk=3.16 (95% confidence interval=2.28–4.04). The positive Likelihood ratio was 4.28 and the negative Likelihood ratio was 0.8. In this multivariate analysis, LVF ($P=0.012$) was the only independent predictor of events.

Conclusion Evaluating the presence of clinical LVF is a main factor in the risk stratification of patients with acute ischemic syndrome without ST segment elevation.

P6 Identification of subgroups of greater mortality in patients undergoing surgical cardiac valve replacement based on preoperative, perioperative, and postoperative variables**RV Gomes, J Oscar F°, B Tura, RS Vegni, C Weksler, LAA Campos, MAO Fernandes, PMM Nogueira, R Farina, HJF Dohmann***Hospital Pró-Cardíaco, Rio de Janeiro, RJ, Brazil and Instituto Nacional de Cardiologia Laranjeiras, Rio de Janeiro, RJ, Brazil
Critical Care 2003, 7(Suppl 3):P6 (DOI 10.1186/cc2202)*

Background The identification of a subgroup with greater mortality among patients undergoing surgical cardiac valve replacement (SCVR) may prevent inadequate management and also identify subgroups requiring review of the therapeutic strategies in surgical intensive care units (SICU).

Objectives To define the inhospital mortality (HM) on the first post-operative day (FPOD) using preoperative (PREOP), perioperative (PEROP), and FPOD variables.

Case series and methods A classical cohort with data consecutively collected at a public SICU (A, 326 patients) from January 2001 to February 2003, and at a private SICU (B, 121 patients) from June 2000 to February 2003. All 46 variables were previously defined according to the major prognostic indices in the literature,

which were correlated with HM. A classification and regression tree (CART; using the Gini index with a FACT stop rule of 0.10 and equal priori) was created and followed by pruning based on misclassification and crossvalidation.

Results Based on CART, eight relevant variables were selected. The model had an accuracy of 81.33, sensitivity of 95%, and specificity of 80% for HM prediction.

Conclusions CART may provide interesting solutions regarding the management of patients in the postoperative period of SCVR. Variables: FPOD SOFA score, PEROP fluid balance, FPOD epinephrine >0.1 or norepinephrine >0.1, patient's sex, left atrial length on ECHO, alveoloarterial O₂ tension gradient >250, PREOP creatinine, body mass index <20.

P7 Endocardial delivery of bone marrow-derived mononuclear cells (BMMCs) in patients with severe ischemic heart failure**HF Dohmann, E Perin, A Sousa, SA Silva, R Borojevic, MI Rossi, LA Carvalho, R Verney, N Mattos, H Dohmann***Hospital Pró-Cardíaco/Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil
Critical Care 2003, 7(Suppl 3):P7 (DOI 10.1186/cc2203)*

Background Intra-myocardial injections of BMMCs have shown promising initial results regarding improvement in myocardial ischemia. Experimental models have depicted the potential of some cell phenotypes in differentiating into blood vessels. BMMCs are a heterogeneous cell subpopulation group and the individual contribution of each cell subpopulation to favorable clinical outcomes remains unclear.

Methods Fourteen patients with end-stage ischemic heart failure (mean ejection fraction [EF]=20%) were submitted to endocardial BMMC injections at targeted hibernated segments utilizing electro-mechanical mapping (MyoStar, Cordis, Miami Lakes, FL, USA). BMMCs phenotypes were determined utilizing flow cytometry (CD3, CD4, CD8, CD14, CD19, CD34, CD45, CD56 and HLA-DR). Clonogenic assays for fibroblast and granulocyte-

macrophage colony forming units (CFU-F and CFU-GM) was also performed. We correlated the density (cells/mm², area determined by the Noga system) of each injected cell phenotype with the total reversibility defect (objectively quantified by ICON workstation; Siemens) using exact Pearson moment correlation.

Results All 14 patients (2 females, 57 ± 10 years old) had multivessel disease and previous myocardial infarction. Cell viability analysis was greater than 90% (96.2 ± 4.9%). There was a significant reduction in total reversibility defect (from 15.15 ± 14.99% to 4.53 ± 10.61%, *P*=0.022). Within the phenotypes studied, the only one that had a significant correlation with the improvement in myocardial perfusion was the density of the CFU-F subpopulation (*P*=0.033, *R*=0.6).

Conclusion Within the limits of the studied group, these data highlight the relevance of quantitative cell phenotype analysis aimed to identify the subpopulations that could play a major role to obtain

Table 1

| Cell type | <i>P</i> | <i>R</i> | Cell type | <i>P</i> | <i>R</i> |
|---------------------------------------|----------|----------|-------------------|----------|----------|
| Total cells | 0.6 | 0.1 | CD19 ⁺ | 0.6 | 0.1 |
| CD34 ⁺ CD45 ^{lo} | 0.9 | 0.02 | CD14 ⁺ | 0.2 | 0.3 |
| CD34 ⁺ HLA-DR ⁻ | 0.6 | 0.1 | CD56 ⁺ | 0.5 | 0.1 |
| CD3 ⁺ CD4 ⁺ | 0.8 | 0.04 | CFU-F | 0.033 | 0.6 |
| CD3 ⁺ CD8 ⁺ | 0.9 | -0.01 | | | |

clinical improvement. The benefit of selection and/or expansion of BMSC subpopulations should be addressed by future studies.

P8 Clinical presentation of patients with chest pain and acute aortic dissection admitted in the chest pain unit

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Critical Care 2003, **7(Suppl 3):P8** (DOI 10.1186/cc2204)

Background Chest pain (CP) is one of the most common symptoms of presentation in emergency rooms around the world. Although uncommon, acute aortic dissection (AAD) is a life-threatening medical emergency that is difficult to diagnose and so requires a high clinical index of suspicion. The objective was to evaluate the characteristics of CP in patients with AAD admitted in a chest pain unit (CPU).

Patients and methods We evaluated in a cross-sectional and prospective study patients admitted in a CPU, between March 1997 and May 2001, with diagnosis of AAD. The authors carried out a descriptive analysis in the sample and they compared the proportions of the categorical variables between the types A and B (Fisher Test). Values of *P*<0.05 were considered significant.

Results Were evaluated 34 patients with diagnosis-confirmed AAD, 26 (76.5%) being of type A and eight (23.5%) of type B Stanford. Eighteen patients (52.9%) were male and 33 (97.1%) were blacks, presenting an average age of 63.5 ± 13.5 years. CP was the most

common symptom presented in 28 (82.4%) patients, and 75% of these were of type A dissection. The most common site of pain was the anterior chest, occurring in 82.2% of the patients with a prevalence of precordial CP in type A dissection (*P*=0.065). Back pain was observed only in 21.4% of the cases. The tearing and ripping pain was not described and the constrictive quality of pain was most described in type A dissection (90%). The radiated pain was shown in 82.3% of patients, with most frequency for the back (42.9%). Associated with CP, syncope was observed in two patients (11.1%), everybody of type A dissection, and disturbance of conscience and seizures in four patients (22.2%).

Conclusions The typical characteristics of CP as described in the past was less frequent. A meticulous medical history and clinical examination must be carried out to increase clinical suspicion. Although CP is the most common symptom, syncope and disturbance of conscience should be valued, mainly when associated with the CP.

P9 Prognostic impact of troponin >0.2 µg/ml and <0.5 µg/m in UA/NSTEMI

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Critical Care 2003, **7(Suppl 3):P9** (DOI 10.1186/cc2205)

Objective To evaluate the risk of coronary events in patients with troponin levels >0.2 µg/ml and <0.5 µg/ml.

Methods From June 2000 to October 2002 we selected patients with UA/NSTEMI and divided them in two groups as follows: group I, composed of 90 patients with troponin levels between 0.2 and 0.5 µg/ml, measured at the first 24 hours in the hospital; and group II, composed of 98 patients with a troponin level <0.2 µg/ml. We excluded all patients with a troponin level >0.5 µg/ml. We analyzed the clinical results while in hospital and after the first 6 months.

Results There were no differences between the groups with regard to sex, risk factors and anti-ischemic drugs used while in the hospital. However, there were important differences in some aspects as we will show: age, older patients belonged to group I (65.6 ± 12 years)

while in group II the patients were 58.9 ± 13 years old (*P*<0.0003); invasive treatment, group I was 88.7% × 21.4% in group II (*P*<0.002); vessel obstruction, left anterior descending artery in group I was 91% and in group II was 21% (*P*<0.001); and right coronary artery, group I was 52% and group II was 4.2% (*P*<0.001).

While in hospital there were no significant differences in mortality between the groups, there were much more refractory cardiac events in group I (12.2%) versus group II (1%) (*P*<0.001), and left ventricular dysfunction was 10% in group I versus 1% in group II (*P*<0.02).

At 6 months, the global mortality was greater in group I (12%) versus 5% in group II (*P*<0.02).

Conclusion Patients with AU/NSTEMI with troponin levels more than 0.2 µg/ml had more risk of death in 6 months.

P10 Clinical security with association of four antithrombotic drugs in the treatment of UA/NSTEMI: experience of our unit**S Gomes de Sá, G Nobre, C Vilela***Rio Mar Hospital, Av. Cândido Portinari 555, Barra da Tijuca, Rio de Janeiro, RJ, Brazil
Critical Care 2003, 7(Suppl 3):P10 (DOI 10.1186/cc2206)***Objective** To evaluate the clinical security of four antithrombotic drugs in association.**Methods** From April 2000 to December 2002 we followed 287 patients with acute coronary syndrome (UA/NSTEMI), and divided them in two groups: group I (90 patients), at least 20% older than 70 years, who used the association of enoxiparin + aspirin + clopidogrel + glycoprotein IIb/IIIa inhibitor; group II (remaining patients), who used enoxiparin + aspirin with or without clopidogrel.We monitored the frequency of bleeding while in hospital and after 30 days as shown in TIMI (*Ann Int Med* 1991).**Results** There were no significant difference between the groups with regard to sex, risk factors, anti-ischemic drugs and the number of obstructed vessels or bleeding events in the 30 days following the beginning of the protocol. However, there were important differences with regard to the following: level of age, 57.4 ± 11 years for group I and 64.1 ± 13 years for group II ($P < 0.001$); troponin elevation, 88.9% in group I and 56.8% in group II ($P < 0.001$); ST-T wave abnormality, 41.2% in group I and 17.8% in group II ($P < 0.001$); and treatment with angioplasty or surgery, 91.1% for group I and 61.7% for group II ($P < 0.0001$).**Conclusions** In our experience, the association of four antithrombotic drugs was shown to be safe, and the association of tirofiban and enoxiparin did not lead to more bleeding events.**P11 Admissional B-type natriuretic peptide is an independent predictor of outcome in patients with decompensated heart failure****H Villacorta, M Vinicius Martins, E Tinoco, HJF Dohmann***Hospital Pró-Cardíaco, Rio de Janeiro, RJ, Brazil
Critical Care 2003, 7(Suppl 3):P11 (DOI 10.1186/cc2207)***Background** B-type natriuretic peptide (BNP) is a neurohormone secreted mainly by the cardiac ventricles in response to volume and pressure overload and is increased in patients with congestive heart failure (CHF), especially in those with more severe disease. The aim of this study was to determine the prognostic value of the admissional BNP measurement in patients who present to the emergency department (ED) with decompensated CHF.**Methods** From April 2001 through January 2002, 70 patients were admitted to an ED with decompensated CHF. Mean age was 77 ± 12 years and 37 (53%) were male. BNP was measured in all patients during admission using a rapid bedside test (Triage, Biosite, San Diego, CA, USA). We sought to determine the utility of BNP in predicting the following combined endpoint: hospital mortality + 30-day mortality or readmission. The utility of BNP in predicting outcome was assessed using multivariate logistic regression. The independent variables analysed in the model were age, sex, mean blood pressure, heart rate, ejection

fraction, serum sodium, C reactive protein, cardiothorax ratio, and BNP. The receiver operating characteristic curve was used to determine the best cutoff value to predict worse outcome.

Results During the study 29 endpoints occurred (six hospital deaths, six deaths during the 30-day follow-up and 17 CHF re-admissions). BNP concentrations were higher in patients who had an adverse event than in those who did not (952 ± 440 vs 679 ± 456 pg/ml, $P = 0.012$). The independent predictors of adverse outcomes were BNP ($P = 0.012$; C statistic = 0.77), mean blood pressure ($P = 0.019$) and heart rate ($P = 0.034$). BNP concentrations ≥ 960 pg/ml had sensibility of 70.2% and specificity of 69% in predicting an adverse outcome.**Conclusion** Admissional BNP measurement in patients who present to the ED with decompensated CHF is useful in predicting short-term outcomes.**P12 Transendocardial, autologous bone-marrow cell transplant in severe, chronic ischemic heart failure****HF Dohman^{1,2}, E Perin¹, A Sousa¹, SA Silva¹, C Tinoco¹, R Esporcatte¹, F Rangel¹, LA Campos¹, MA Fernandes¹, H Dohmann¹***¹Hospital Pró-Cardíaco, Rio de Janeiro, RJ, Brazil; ²Texas Heart Institute, 6770 Bertner Avenue, Houston, TX 77030, USA
Critical Care 2003, 7(Suppl 3):P12 (DOI 10.1186/cc2208)***Background** This study evaluated the hypothesis that transendocardial injections of autologous mononuclear bone-marrow cells in patients with end-stage ischemic heart disease could promote neovascularization and improve perfusion and myocardial contractility.**Methods and results** Twenty-one patients were enrolled into this prospective, non-randomized, open-label, controlled study (first 14, treatment; last seven, control). Baseline evaluations included complete clinical and laboratory evaluations, exercise stress (ramp treadmill), two-dimensional Doppler echocardiogram, SPECT perfusion scan, and 24-hour Holter monitoring. Bone-marrow mononuclear cells were harvested, isolated, washed, and resuspended in salinefor injection by NOGA catheter (15 injections of 0.2 cm^3). Electromechanical mapping (EMM) was used to identify viable myocardium (unipolar voltage $\geq 6.9 \text{ mV}$) for treatment. Patients underwent 2-month noninvasive and 4-month invasive (treatment group only) follow-up using standard protocols and the same procedures as baseline. Patient population demographics and exercise test variables did not differ significantly between the treatment and control groups; only creatinine and BNP levels varied in laboratory evaluations. At 2 months, there was a significant reduction in total reversible defect within the treatment group and between the treatment and control groups ($P = 0.02$) on quantitative SPECT analysis. At 4 months, there was improvement in ejection fraction from a baseline of 20% to 29% ($P = 0.003$) and a reduction in ESV ($P = 0.03$) in the treated

patients. EMM revealed significant mechanical improvement of the injected segments ($P < 0.0005$).

Conclusions In patients with chronic, ischemic heart failure, EMM technology was used to target viable, hibernating myocardium for transendocardial delivery of autologous bone-marrow mononuclear cells. At follow-up, treated patients had significantly improved myocardial perfusion and contractility.

P13 Epidemiologic profile and clinical follow-up of a population with acute atrial fibrillation and age <60 years old in the emergency room

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Introduction Atrial fibrillation (AF) has a high prevalence in the elderly population. Nevertheless, it has been found in young patients.

Objectives To show the clinical and epidemiological aspects of a population of patients with AF and age <60 years old in the emergency room (ER), evaluating symptoms, triggering factors, related diseases and recurrence of AF.

Methods From March 2000 to October 2002, 236 patients with AF were seen in the ER. Fifty-seven patients (24.1%) were aged <60 years old. Forty-six patients (80%) were male, mean age 49.4 ± 8.3 years old. The patients were set on an algorithm for AF.

Results All the patients were hemodynamically stable. Forty-five patients (78.9%) presented palpitation and 10 patients (17.5%) precordial pain to admission. Twelve patients (21%) had the first reported incident of AF; 39 patients (68.3%) had recurrent AF, six patients (10.5%) had >10 admissions per AF in the past year. Twenty-five patients (43.8%) indicated stress as the main triggering factor of the event and 23 patients (40.3%) indicated alcohol intake. Thirty-nine patients (68.4%) started AF at a rest period, 13 (22.8%) at activity and five patients (8.7%) after food intake. Among the risk factors for embolic events, 20 patients (35.1%) were hypertensive; two patients (3.5%) had previous stroke; three

patients (5.2%) had mitral disease; four patients (7%) had hypertrophic cardiomyopathy; four patients (7%) had coronary artery disease; one patient (1.7%) had diabetes mellitus; and seven patients (12.3%) had thyroidal disease. Twenty-two patients (38.5%) had been using anti-arrhythmic medications regularly. Forty-one patients (71.9%) showed <48 hours of symptoms, and the others an unknown time or >48 hours. Thirty patients (52.6%) had arrhythmia reversed with oral medication, with mean reversion Δt of 5.7 hours. Thirteen patients (22.8%) had successful ECV with an average charge of 200J. Ten patients (17.5%) had spontaneous reversion; three (5.26%) had unsuccessful. In a follow-up of 5 months to 2 years, 32 patients were observed. Fifteen patients (46.8%) had recurrence of AF despite use of anti-arrhythmic medication. Eighteen patients (31.5%) did not use anticoagulant or anti-agglutinant. There was an embolic event in one patient (3.1%).

Conclusions Our patients develop with hemodynamic stability to admission and present an elevated reversion rate in the ER (75.4%) with mean $\Delta t < 6$ hours. Hypertension was the main risk factor without correlation to recurrence ($P = \text{not significant}$). Stress was the factor correlated to recurrence ($P = 0.038$). Patients with $\Delta t < 48$ hours showed a higher reversion rate of AF in the ER ($P = 0.009$). The recurrent rate of AF in this population was high even with anti-arrhythmic medication, but the number of thromboembolic events was low.

P14 Compensated mortality of cardiovascular disease in the States of Rio de Janeiro, São Paulo and Rio Grande do Sul from 1980 to 1999

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Critical Care 2003, 7(Suppl 3):P14 (DOI 10.1186/cc2210)

Objective To compare trends in mortality due to cardiovascular diseases (CVD) in the State and City of Rio de Janeiro (RJ), Brazil, with that observed in the States of Rio Grande do Sul and São Paulo (SP) and their capitals between 1980 and 1999.

Methods The annual death data were collected from DATASUS, and population data from IBGE. The crude and adjusted (for age and sex, by the direct method, with the standard population of RJ, age 20 or older, in 2000) mortality rates were obtained. Because a considerable increase in mortality rates due to ill-defined causes of death in RJ was observed from 1990 onwards, defined deaths were compensated by ill-defined causes preliminary to adjustments. The trends were analysed by linear regressions.

Results The annual rate declines of the compensated and adjusted mortality due to CVD varied from -11.3 to -7.4 deaths per 100,000 inhabitants in RJ and the city of SP, respectively. These declines due to ischemic heart diseases (IHD) were similar among RJ and Porto Alegre, and lower in the city of SP (-2.5 deaths per 100,000 inhabitants). The declines due to cerebrovascular diseases (CRVD) varied from -6.0 to -2.8 deaths per 100,000 inhabitants at the State of Rio and Porto Alegre, respectively.

Conclusions A steady decline in compensated and adjusted mortality rates due to CVD, IHD and CRVD was observed in all three states and capitals, between 1980 and 1999. In RJ the decline of IHD mortality rates was remarkable after 1990. The decline in mortality rates due to CRVD occurred since 1980.

P15 B-Type natriuretic peptide assessment in coronary arterial bypass graft surgery**W Homena, P Rezende, A Camarozano, J Fonseca, A Pyramides, D Oliveira, J Magalhaes, V Carreira***Cardiovascular Surgery Division, Barra D'Or Hospital, Rio de Janeiro, RJ, Brazil
Critical Care 2003, 7(Suppl 3):P15 (DOI 10.1186/cc2211)*

Background Although data have shown that B-type natriuretic peptide (BNP) levels correlate with the severity and prognosis of heart failure, there are few studies regarding its levels in cardiac surgery patients.

Objectives We sought to correlate the clinical and hemodynamic features in postoperative (PO) stay and the levels of BNP.

Methods A prospective and observational study. We assessed the level of BNP (immunofluorescence – Triage®) at 1 and 24 hours PO. A BNP level above a cutoff point of 100 pg/ml was found to be highly sensitive and specific for the diagnosis of cardiac heart failure. The population consisted of two groups: group A had levels below 100 pg/ml and group B was above this level. Evaluated at 1 hour of PO stay were: time of cardiopulmonary bypass (CPB), hidric balance (HB), mean arterial pressure (MAP), heart rate (HR), central venous pressure (CVP), pO₂ and FiO₂ ratio (P/F), mechanical ventilation time (MV) and O₂ central venous saturation (VO₂SAT). The left ventricular function was assessed by two-dimensional echocardiography

in the preoperative period (Simpson method) and values under 40% were considered ventricular dysfunction. The Student *t*-test was used for comparison between the found means.

Results We investigated 17 patients (three women, median age 58.4 years old; standard deviation=9.7). Group A was composed of 11 patients and group B of six patients. No statistical difference was found regarding CPB, HB, MAP, HR, CVP, P/F and VO₂SAT, whereas the MV time in group A was 211.3 ± 229 min, with regard to group B being 520.8 ± 332.9 min (*P*=0.038). At 24 hours PO, the BNP mean level (327.8 ± 206.9 pg/ml) was found in 13 patients (76.4%).

Left ventricular dysfunction was observed in two patients of group B.

Conclusions Although there was a reduced number of patients, these findings suggest that the BNP levels were related to the mechanical ventilatory time.

P16 The use of enoxaparin during coronary angioplasty: study of clinical security**S Gomes de Sá, G Nobre, F Afonso, GG de Freitas***Coronary Care, Rio Mar Hospital, Av. Cândido Portinari 555, Barra da Tijuca, Rio de Janeiro, RJ, Brazil
Critical Care 2003, 7(Suppl 3):P16 (DOI 10.1186/cc2212)*

Objective To evaluate hemorrhagic and ischemic complications with the use of enoxaparin as anticoagulant during angioplasty.

Methods From June 2001 to December 2002, we selected 273 patients who had undergone coronary angioplasty, and divided them into two groups. Group I consisted of 173 patients who used subcutaneous or intravenous enoxaparin, following a protocol. Group II consisted of 130 patients who used intravenous heparin during angioplasty. The protocol of enoxaparin consisted of administering intravenous enoxiparin (after insertion of a catheter) to patients who were not using subcutaneous enoxaparin and those patients who used enoxaparin more than 6 hours before the angioplasty. To the patients whose last dose of subcutaneous enoxaparin

had been administered in the 6 hour interval, no anticoagulant needed to be added.

Results There was no significant difference between the groups in relation to age, sex, risk factors, drugs in use and obstructive coronary arteries.

In 30 days the great bleeding was less in group I (1.7%) compared with group II (3.1%). The incidence of death and myocardial infarction was not different between the two groups within 30 days.

Conclusion The use of enoxaparin as an anticoagulant during PTCA did not increase ischemic or hemorrhagic complications after coronary angioplasty.

P17 Role of chronobiological rhythms in acute aortic dissection**CM Clare, ET Mesquita, FM Albanesi Fo, M Scofano, H Villacorta***Hospital Pró-Cardíaco – PROCEP/UERJ, Rio de Janeiro, RJ, Brazil
Critical Care 2003, 7(Suppl 3):P17 (DOI 10.1186/cc2213)*

Background The chronobiological rhythms have been shown to cause an impact in the occurrence of a variety of cardiovascular disorders like acute myocardial infarction, sudden death and stroke. However, the effects of the chronobiological rhythms in patients with acute aortic dissection (AAD) have not been well studied. The International Registry of Acute Aortic Dissection (IRAD) observed that the frequency of AAD was significantly higher between 6:00 am and 12:00 noon, during the winter with a peak in January, and no variation was found for the day of the week. The objective was to know the chronobiological rhythms of our population with AAD.

Patients and methods We evaluated in a cross-sectional and prospective study patients admitted to a chest pain unit, between March 1997 and May 2001, with a diagnosis of AAD. The authors carried out a descriptive analysis in the sample and they compared the proportions of the categorical variables between types A and B (Fisher test). Values of *P*<0.05 were considered significant.

Results We evaluated 34 patients with diagnosis-confirmed AAD, 26 patients (76.5%) of type A and eight patients (23.5%) of

type B Stanford. Eighteen patients (52.9%) were male and 33 patients (97.1%) were blacks, presenting an average age of 63.5 ± 13.5 years. It was observed that the schedule of the day for an incidence of AAD was between 6:00 pm and 12:00 midnight (41.2%), and only 11.7% occurred in the period between 6:00 am and 12:00 noon. The day of biggest occurrence was Monday, with 26.4% of the cases. The months of May and July (14.7%

each) were the most frequent, and the season of the year was winter (32.3%).

Conclusions Like other cardiovascular conditions, AAD could exhibit chronobiological rhythms. In our population we observed the incidence of AAD in the nocturnal period of 6:00 pm and 12:00 midnight, on Mondays, and in the period of winter.

P18 The utility of B-type natriuretic peptide in differentiating decompensated heart failure from lung disease in patients presenting to the emergency department with dyspnea

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 Critical Care 2003, 7(Suppl 3):P18 (DOI 10.1186/cc2214)

Background Differentiating congestive heart failure (CHF) from lung disease is extremely important in patients evaluated in the emergency department (ED). Therefore we sought to assess the utility of B-type natriuretic peptide (BNP), which is secreted by the left ventricle in response to volume or pressure overload, in differentiating CHF from lung diseases in elderly patients presenting to the ED with acute dyspnea.

Methods From April to July 2001, 70 patients presenting to the ED of a tertiary cardiology hospital with acute dyspnea were included. Mean age was 72 ± 16 years and 33 (47%) were male. BNP was measured in all patients at the moment of admission in the ED using a rapid bedside test. Emergency-care physicians were required to assign a probable diagnosis, blinded to BNP values. A cardiologist retrospectively reviewed patients' data (blinded to BNP measurements) and assigned a diagnosis that was considered the gold standard to assess the diagnostic performance of the BNP test.

Results The mean BNP concentration was higher in patients with CHF (n=36) than it was in patients with lung diseases (n=29). Such values were 990 ± 550 vs 112 ± 59 pg/ml, respectively (P<0.001). The pulmonary diseases and their respective BNP levels were: chronic obstructive pulmonary disease, 98 ± 69 pg/ml (n=5); asthma, 38 ± 30 pg/ml (n=3); acute pulmonary embolism, 158 ± 35 pg/ml (n=2); and pneumonia, 80 ± 52 pg/ml (n=19). In patients with a history of lung disease but whose current complaint of dyspnea was found to be CHF, BNP levels were 898 ± 456 pg/ml. Those patients with a history of CHF but a current diagnosis of pulmonary disease had a BNP of 98 ± 47 pg/ml. The area under the receiver operating curve for BNP levels in differentiating CHF from lung diseases was 0.98.

Conclusion A rapid bedside test for BNP is useful in differentiating lung diseases from decompensated CHF in elderly patients presenting to the ED with dyspnea.

P19 Levosimendan improves hemodynamic effects in patients with acutely decompensated heart failure: the Argentinean multicenter registry

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Background Levosimendan (Ls) is a novel inotropic agent, calcium sensitizer and vasodilator indicated for the treatment of patients (patients) with acutely decompensated heart failure (ADHF). Randomized trials show Ls to be an effective and safe option for the management of ADHF.

Objective To analyze the hemodynamic effects of intravenous Ls in patients with ADHF.

Method Data from 10 Argentinean hospitals in a multicenter registry were collected. Eligibility criteria were clinical ADHF, ejection

Table 1

| Measure | Baseline (mean ± standard deviation) | 48 hours (mean ± standard deviation) | P value |
|--|---|---|----------|
| Pulmonary capillary pressure (mmHg) | 24.1 ± 6.0 | 17.0 ± 5.3 | 0.0001 |
| Pulmonary vascular resistance (dyne s cm ⁻⁵) | 280 ± 182 | 188 ± 110 | 0.008 |
| Systemic vascular resistance (dyne s cm ⁻⁵) | 1690 ± 558 | 1066 ± 295 | < 0.0001 |
| Mean arterial pressure (mmHg) | 77.0 ± 11 | 71.0 ± 10.8 | 0.001 |
| Right atrial pressure (mmHg) | 9.3 ± 5.7 | 6.5 ± 3.8 | < 0.008 |
| Cardiac index (l/min/m ²) | 1.88 ± 0.44 | 2.77 ± 0.5 | < 0.0001 |
| Cardiac output (l/min) | 3.49 ± 0.9 | 5.01 ± 1.1 | 0.0001 |
| Heart rate (beats/min) | 84 ± 14 | 87 ± 15 | 0.2 |

fraction $\leq 40\%$, cardiac index ≤ 2.5 l/min/m², and pulmonary capillary pressure ≥ 15 mmHg if a Swan–Ganz (SG) catheter was used. We analyzed the data of the 41 patients monitored with a SG catheter. Complete clinical, radiographic, EKG, and laboratory examinations were performed before and after Ls. Ls was administered as a loading dose of 6–24 μ g/kg over 10 min, followed by a continuous infusion of 0.1–0.2 μ g/kg/min for 24 hours. Hemodynamic measures were recorded at baseline, 30 min, 2, 6, 24, and 48 hours. Data were compared using the *t* test or Wilcoxon rank-sum test.

Results Basal characteristics (mean \pm standard deviation [range]) included age 61.4 \pm 10.95 years (21–81 years), male

75.6%, and left ventricular ejection fraction 19.5 \pm 6.95% (10–39%; *n*=32). Etiologies were: ischemic, 48.8%; idiopathic, 22%; valvular, 9.3%; chagasic, 7.3%; myocarditis, 4.9%; restrictive, 2.4%; other, 4.9%. Hemodynamic measures at baseline and 48 hours after Ls are included in Table 1; similar results were obtained at 24 hours.

Conclusion Ls significantly improved pulmonary pressures, cardiac index and output, with no significant effects on heart rate in patients with ADHF. Ls is an effective and safe option that should be considered for the management of ADHF.

P20 Postoperative circulatory support in adult cardiac surgery: recent experience from one center

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Critical Care 2003, **7(Suppl 3)**:P20 (DOI 10.1186/cc2216)

Between December 1998 and December 2001, circulatory support (CS) was used in seven patients submitted to cardiac surgery in our institution.

The sample was composed of seven patients whose age varied from 32 to 78 years old (mean 51.85 years), and there were five male and two female patients. Coronary artery bypass grafting was performed in six patients and mitral valve replacement in one. Four patients presented failure of one ventricle and three had failure of both ventricles in the immediate postoperative period.

The system most commonly used was the Bio-pump® centrifugal pump, used in all cases; in one case biventricular support with the Bio-pump was changed after 48 hours to a biventricular DAV-InCor® system (temporary pulsatile ventricular assist device). Intra-aortic balloon pumping was used as secondary support in four cases with the aim of delivering a pulsatile flow.

The mean support time was 51 hours and 38 min/patient, the shortest time was 4 hours and 6 min, and the longest was 151 hours and 20 min.

Table 1

| Type of circulatory support | Number of patients |
|-------------------------------|--------------------|
| Left atrium–aorta | 3 |
| Right atrium–pulmonary artery | 2 |
| Biventricular | 2 |

There were five deaths during CS and the cause of them all was multiple organ failure. Two patients were discharged from CS (28% removal), one was bridged to emergency heart transplant and the other recovered ventricle function (bridge to recovery). The patient bridged to recovery is now in 12 months of followup, and in New York Heart Association class II.

Although the mortality index is still high (86%), we were able to bridge 28% of the patients to a more definitive treatment or status (transplant or recovery). The overall survival was 14%, but long-term survival of bridged patients is 50% and we expect to increase it in the near future.

P21 Dynamic subaortic stenosis with the use of vasoactive drugs in critical care: case report

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Critical Care 2003, **7(Suppl 3)**:P21 (DOI 10.1186/cc2217)

Introduction Although the use of vasoactive drugs is widespread in the critical care setting, its use is associated sometimes with an undesirable hemodynamic outcome. The dynamic subaortic stenosis is a phenomenon described in the echocardiogram stress testing in which patients are submitted to the use of dobutamine. Similarly it could happen in the critical setting where high doses of vasoactives drugs are frequently prescribed, but to our knowledge this has never been described previously.

Case report A male patient, 66 years old, with no mentioned cardiovascular disease was submitted to an elective surgical correction of an infrarenal abdominal aortic aneurysm. The surgery was complicated with hemorrhagic shock, with the necessity for large amounts of volume (crystalloids, colloids and blood products) and high doses

of vasoactive drugs. He was admitted to the intensive care unit (ICU) where a pulmonary artery catheter was placed. On the fourth day he was using 16.67 μ g/kg/min dobutamine and was submitted to the first cardiac echocardiogram, which revealed a normal aortic valve/ventricular gradient (Ao/LV) (< 25 mmHg) and an ejection fraction (EF) of 0.61. Despite the aggressive treatment, he had progressive hemodynamic worsening that prompted progressive elevation of the vasoactive drugs dosage. On the seventh day, with a dobutamine dose of 20.80 μ g/kg/min, a second echocardiogram was performed that revealed an Ao/LV of 100 mmHg, an EF of 0.59 and an image suggestive of subaortic stenosis. During the recovery period of his clinical status, on the eighth day, a new echocardiogram was performed and showed an Ao/LV lower than 25 mmHg and an EF of 0.61. The patient was discharged from the ICU 64 days later.

Table 1

| Day | HR | CVP | PW | CI | Dobutamine (µg/Kg/min) | Noradrenaline (µg/Kg/min) | Ejection fraction | LV/Ao | Septum | Post wall | MAP | Arterial lactate |
|-----------------|----|-----|----|-----|------------------------|---------------------------|-------------------|-------|--------|-----------|-----|------------------|
| 4 th | 72 | 15 | 20 | 4.0 | 16.67 | 1.78 | 0.61 | <25 | 9 | 10 | 60 | 50.7 |
| 8 th | 98 | 11 | 20 | 3.1 | 20.80 (37.5) | 2.66 | 0.59 | 100 | 12 | 12 | 70 | 14.3 |
| 9 th | 90 | 13 | 16 | 4.9 | 6.50 | 1.25 | 0.61 | 36 | 12 | 12 | 93 | 9.7 |

Discussion This phenomenon seems to mimic echocardiogram stress testing, and its misinterpretation may induce the use of deleterious doses of vasoactive drugs.

Conclusion This observation warns the intensivists about the potential dangers of misinterpretation in vasoactive drug dosages in the critical care setting.

P22 Catheter-based transendocardial delivery of autologous bone marrow-derived mononuclear cells in patients listed for heart transplantation

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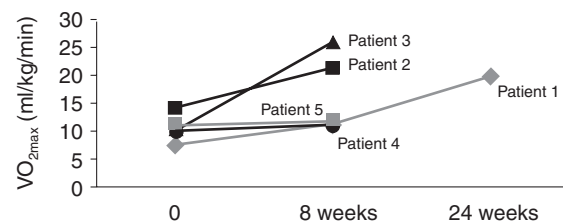
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Critical Care 2003, **7**(Suppl 3):P22 (DOI 10.1186/cc2218)

Background Patients (patients) with end-stage ischemic heart failure (ESI-HF) with $VO_{2max} < 14$ ml/kg/min carry a very high mortality. Heart transplantation (HTx) improves the outcome of selected patients but, since it has limited epidemiological impact, alternative therapies have been explored. Intramyocardial injections of autologous bone marrow-derived mononuclear cell (BM-MNCs) have shown promising initial results regarding functional improvement. Therefore, we evaluated the outcome of BM-MNC transendocardial delivery in patients listed for HTx.

Methods Five patients with ESI-HF (aged 54. 8 ± 8 years), presenting $VO_{2max} < 14$ ml/kg/min and already listed for HTx, were submitted to BM-MNC injections. Bone marrow was harvested from the iliac crest and BM-MNCs were selected by Ficoll gradient. Endocardial injections targeting hibernated myocardial areas were performed utilizing electromechanical mapping (MyoStar, Cordis, Miami Lakes, FL, USA). The Treadmill Test Ramp Protocol (TT) (five patients, baseline; four patients, 8 weeks; one patient, 24 weeks) as well as MIBI-SPECT and the two-dimensional echocardiogram Simpson's Method (baseline and 8 weeks) were also performed.

Results A total of 30×10^6 BM-MNC were injected at 15 sites in each patient. Left ventricular total reversibility (TR), percentual of

Figure 1



myocardial rest defect at 50% and ejection fraction at baseline and 8 weeks. The results of TT are shown in Figure 1.

Conclusion In this pilot study of BM-MNC endocardial injections, our data suggest that this procedure seems to be safe to be performed in this very sick population, and suggest an improvement in objective assays of myocardial perfusion and exercise capacity in some patients listed for HTx. Future studies must be conducted to evaluate the role of BM-MNC transplantation as an alternative therapy for these patients.

P23 Levosimendan treatment for acutely decompensated heart failure is as effective for Chagas disease patients as for patients with other etiologies

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Objectives The BELIEF study was designed to evaluate the safety and efficacy of a 24-hour levosimendan (Levo) infusion for the treatment of acutely decompensated heart failure (HF) patients. The primary endpoint was to check the proportion of patients who have been discharged from hospital without the need of using inotropes, other than Levo. In this subset, we investigated whether the Chagas disease (CD) subgroup has had the same hemody-

namic benefits and achieved the primary endpoint compared with non-CD patients.

Methods The BELIEF study was a multicentric trial, in which 156 acutely decompensated New York Heart Association class IV HF patients, mostly male (68%), mean age 56 years old, have received a 24-hour Levo infusion of 0.05–0.2 µg/kg/min. The patients have

been diagnosed with HF 6 years ago, with a mean of 2.99 hospitalizations within the past year. The initial systolic blood pressure (SBP) was 110.8 mmHg (70–180 mmHg). Twenty-eight patients (22.4%) had CD as the HF etiology, 42 were due to ischemic disease and 38 were idiopathic.

Results One hundred and twenty-five patients (78.6%) have achieved the primary endpoint. The same proportion was seen in the CD patient subset, when compared with the non-CD group (75% vs 79.3%, $P=0.813$). CD patients had the same mean age, sex distribution and clinical features as the non-CD patients. The CD group had more frequent hypotension when

compared with the non-CD group (28.5% vs 15.4%, $P=0.0195$). The dilated cardiomyopathy group also had the same incidence of hypotension as the CD group (28.5% vs 34.2%, $P=0.826$).

Conclusion CD patients with acutely decompensated HF had the same hemodynamic benefits as HF patients with other etiologies treated with Levo. Three-quarters of CD patients have been discharged from the hospital without the need for inotropes after Levo treatment. Although hypotension was slightly more frequent in the CD group, it did not reduce the Levo response in this group of patients.

SEPSIS AND SHOCK

P24 Case report: short time reversible myocardial dysfunction in sepsis treated with drotrecogin alpha

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Critical Care 2003, 7(Suppl 3):P24 (DOI 10.1186/cc2220)

Severe sepsis is a complex process that involves a number of host immune responses with an orchestration of various specific and nonspecific soluble factors and cellular elements that may result in a completely different outcome. Among organ dysfunction induced by sepsis, heart failure can occur in up to 40% of cases [1]. Myocardial depression in shock probably was first described in 1947 [2]. Its onset may be extremely early, but is most evident in the first 3 days of the disease. Normalization usually happens over the following 7–10 days in the survivor patients [3]. We have described an atypical sort time reversible myocardial dysfunction, in a patient with rapid evolution to a multiple organ dysfunction syndrome (heart, renal, pulmonary, and hematological). An 87-year-old man with hypertension and diabetes mellitus type 2 was admitted to our intensive care unit (ICU) with severe sepsis caused by community-acquired pneumonia. On the following day of his ICU entrance he developed septic shock which was associated with an increase in the cardiac enzymes, particularly troponin I and CK mass (fluorogen immunoassay). We started the infusion of Xigris[®], a recombinant version of human activated protein C, according to the PROWESS [4] protocol. His baseline examination characteristics before and 3 days after Xigris[®] infusion are summarized in Table 1.

The patient was discharged 10 days after the Xigris[®] end-of-infusion to a step-down unit. The physiology of the myocardial dysfunction that occurs in systemic inflammatory response syndrome is not well understood, although there are several theories to explain it [5–8]. We are reporting an unusual behavior of reversible nonischemic myocardial dysfunction possibly related to Xigris[®] treatment. Perhaps this communication could be tested in a well-designed study to address a new hypothesis for new applications of activated protein C outside the setting of severe sepsis.

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Table 1

| Characteristic | Admission | Pre-Xigris [®] infusion | 3 days after end-infusion |
|------------------------------------|-----------|----------------------------------|---------------------------|
| Troponin I (ng/ml) <0.4 | 1.1 | 1.6 | Normal |
| CPK MB mass (ng/ml) <5 | 6.2 | 9.5 | Normal |
| C-reactive protein (mg/dl) <1 | 36.3 | 38.7 | 3.6 |
| Antithrombin (%) | 64 | 54 | 89 |
| Protein C (%) | 62 | 48 | 100 |
| D-dimer (mg/ml) <0.5 | 2.15 | 2.34 | 3.28 |
| Thrombocytes | 98.000 | 81.000 | 233.000 |
| B-type natriuretic peptide (pg/ml) | >1300 | | 1170 |
| Vasopressor therapy | + /++++ | ++++ /++++ | None |
| Mechanical ventilation | None | ++++ /++++ | Weaning |
| Echo dysfunction | + /++++ | ++++ /++++ | + /++++ |

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P25 Comparative analysis of SVO₂ of samples drawn in the superior cava vein and pulmonary artery

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 Critical Care 2003, 7(Suppl 3):P25 (DOI 10.1186/cc2221)

Objective To assess the correlation between the SVO₂ drawn in the superior cava vein and pulmonary artery.

Introduction Bearing in mind the importance of the early detection and correction of tissue hypoxia to avoid the progressive organic dysfunction and death, SVO₂ has been used as a prognosis index and as a therapeutic answer. Therefore, this study aims at the assessment of the correlation between the SVO₂ drawn in the superior cava vein, which shows itself as an easier access route and also of lower cost, and the SVO₂ drawn in the pulmonary artery, aiming to facilitate and optimize the cost of one more index of assessment of the use of oxygen.

Materials and methods We are dealing with a transverse study with the record of pieces of information on the mixed venous blood samples drawn in the superior cava vein and pulmonary artery for comparative analysis of the mixed SVO₂ in the period of January

through May scheduled until November 2003. The samples were chosen randomly and through simple analysis according to a collecting protocol which consists of using 5 ml mixed venous blood, collected with a previously heparinized (0.1 ml heparin) syringe and with a total suction time of 20s. The analysis was made in a gasmeter brand Radiometer (model ABL5) immediately after collecting. The data are evaluated through the hypothesis test in which the void hypothesis equals the average and the alternative is the difference between them. The statistic is confirmed through the Student *t* method and the correlation through the Pearson index. The correlation between the SVO₂ value collected in the superior cava vein and the pulmonary artery as a comparative method is evaluated.

Conclusion The preliminary results indicate a Pearson coefficient of 0.6. The Student *t* test shows that the probability of results coming from a different distribution is 0.4, indicating that the void hypothesis is true.

P26 Is there a role for continuous esophageal Doppler in critically ill patients?

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 Critical Care 2003, 7(Suppl 3):P26 (DOI 10.1186/cc2222)

Introduction Esophageal Doppler is a noninvasive method used to guide fluid loading, resulting in clinical outcome benefits, especially during anesthesia. Its role in critically ill patients is still controversial.

Objective To compare cardiac output (CO) obtained from esophageal Doppler with thermodilution, using a Swan-Ganz catheter.

Methods Data was obtained from two medical intensive care units between February and March 2003. An esophageal probe for cardiac output monitoring was introduced in severe sepsis and septic shock patients when a pulmonary artery catheter was indicated by the attendant physician; four CO measurements were done for each patient with 6-hour intervals. CO determination by

esophageal Doppler was performed simultaneously with thermodilution.

Results Eight consecutive patients with a mean age of 61.1 years were included (five females and three males). Twenty-five measurements were done; as shown in Figure 1 there was no correlation ($R^2=0.02$) between thermodilution and esophageal Doppler CO measurements. Figure 2 shows that no correlation was seen when we analysed only the variations of CO measurements ($R^2=0.4$; $P=0.11$).

Conclusion In this study, in concordance with published data, there is no evidence to support esophageal Doppler as a technique for CO continuous monitoring in the intensive care unit.

Figure 1

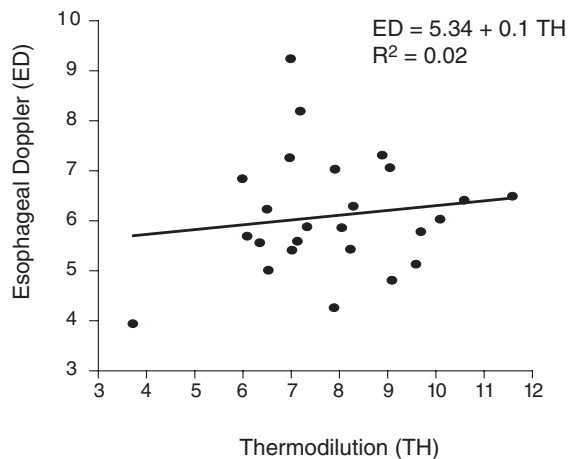
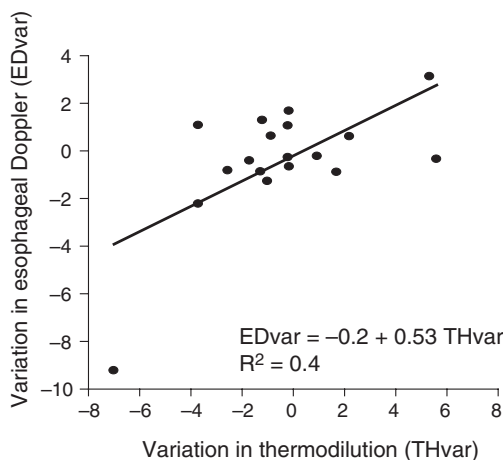


Figure 2



P27 Systemic and regional hemodynamic effects of fluid resuscitation in experimental septic shock**AG Garrido, LF Poli de Figueiredo, E Silva, R Cruz Jr, FAB Auler, MM Yada-Langui, M Rocha e Silva***Heart Institute, InCor, University of São Paulo Medical School, Av Dr Enéas de Carvalho Aguiar 44, CEP 05403-000 São Paulo, SP, Brazil
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Experimental models may help to understand the pathophysiology of septic shock. The aim of this study is to evaluate effects of different volumes of Lactate Ringer's solution (RL) on cardiovascular function and intestinal perfusion in experimental hypodynamic septic shock. Anesthetized, ventilated mongrel dogs ($n=21$, 16.3 ± 1.9 kg) received an intravenous injection of 1.2×10^{10} /kg cfu live *Escherichia coli* over 30 min (baseline–T30). Then, the animals were randomized to receive 16 ml/kg RL ($n=7$), 32 ml/kg RL infused over a 30-min period or a control group (no fluid resuscitation, $n=7$) (T60–T90). The animals were followed for 2 hours thereafter (T90–T210). Systemic hemodynamics were determined by arterial

and pulmonary artery catheters. Portal and renal vein blood flows were measured with ultrasonic flowprobes. The PCO_2 gap (gas tonometry), arterial and portal vein lactate levels were measured at each timepoint. The data are expressed as mean \pm SEM. The different variables were analyzed by analysis of variance.

Live *E. coli* injection in dogs promotes low cardiac output, systemic and regional lactic acidosis and severe splanchnic hypoperfusion. The RL solution promoted only modest and transient improvement in blood flows but not in systemic and regional acidosis. There were no differences between the resuscitated groups.

Table 1

| | Baseline | T30 | T90 | T210 |
|---|------------------|-------------------------------|-------------------------------|------------------|
| Mean arterial pressure (mmHg) | | | | |
| Control | 105.9 \pm 4.6 | 93.8 \pm 4.6 ^a | 62.8 \pm 7.6 | 79.5 \pm 5.9 |
| RL, 16 ml/kg | 108.7 \pm 4.0 | 98.0 \pm 5.2 ^a | 75.1 \pm 7.3 | 88.9 \pm 8.9 |
| RL, 32 ml/kg | 107.0 \pm 2.9 | 91.1 \pm 3.5 ^a | 89.8 \pm 6.1 | 92.1 \pm 3.3 |
| Cardiac index (l/min/m ²) | | | | |
| Control | 2.92 \pm 0.09 | 1.78 \pm 0.18 ^a | 1.39 \pm 0.13 | 1.32 \pm 0.06 |
| RL, 16 ml/kg | 3.23 \pm 0.35 | 2.30 \pm 0.34 ^a | 2.40 \pm 0.46 ^b | 1.35 \pm 0.19 |
| RL, 32 ml/kg | 3.10 \pm 0.08 | 1.73 \pm 0.18 ^a | 2.68 \pm 0.26 ^b | 1.52 \pm 0.09 |
| Portal vein flow index (ml/min/m ²) | | | | |
| Control | 697.8 \pm 62.2 | 390.9 \pm 70.6 ^a | 225.2 \pm 34.2 | 183.5 \pm 32.3 |
| RL, 16 ml/kg | 591.9 \pm 41.5 | 311.6 \pm 25.4 ^a | 320.7 \pm 47.1 ^b | 201.5 \pm 18.9 |
| RL, 32 ml/kg | 632.8 \pm 25.5 | 244.5 \pm 32.3 ^a | 441.0 \pm 59.2 ^b | 162.0 \pm 12.4 |
| PCO ₂ gap (mmHg) | | | | |
| Control | 5.0 \pm 2.7 | 12.6 \pm 4.1 ^a | 33.1 \pm 4.2 | 44.3 \pm 5.3 |
| RL, 16 ml/kg | 2.4 \pm 0.9 | 15.0 \pm 4.2 ^a | 22.7 \pm 2.3 | 48.6 \pm 3.4 |
| RL, 32 ml/kg | 0.6 \pm 2.3 | 6.4 \pm 2.8 ^a | 13.8 \pm 2.2 | 35.3 \pm 2.5 |
| Arterial lactate (mmol/l) | | | | |
| Control | 1.34 \pm 0.18 | 1.53 \pm 0.17 ^a | 2.91 \pm 0.29 | 3.33 \pm 0.32 |
| RL, 16 ml/kg | 1.58 \pm 0.17 | 1.72 \pm 0.29 | 4.23 \pm 0.30 | 5.63 \pm 0.37 |
| RL, 32 ml/kg | 0.97 \pm 0.20 | 1.77 \pm 0.21 ^a | 3.87 \pm 0.54 | 2.57 \pm 0.40 |

^a $P < 0.05$ vs BL, ^b $P < 0.05$ vs control group. RL, Lactate Ringer's solution.

P28 Bacterial translocation consequential to intestinal bacterial overgrowth provokes aggravation of mortality by sepsis**JL Menchaca-Diaz¹, RM Silva², LFP Figueiredo¹, GM Bugni¹, AY Watanabe¹, FJP Silva¹, IHJ Koh¹***¹Department of Surgery and ²Department of Microbiology, Federal University of São Paulo, SP, Brazil
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Increasing evidence from experimental and clinical studies has eluded to the 'intestinal hypothesis of sepsis', which is based on bacterial or endotoxin translocation from the intestinal lumen to the

extra-intestinal sites, thus generating an exacerbated inflammatory response leading to the aggravation of the pre-existing sepsis state or to the onset of sepsis. Nevertheless, growing acceptance of the

'intestinal hypothesis' was mainly triggered by indirect rather than concrete scientific evidence. In this study we examined the role of the association of bacterial translocation with varying severity of sepsis states, monitoring mortality and recovery of translocated bacteria in several host compartments using a rat model of bacterial translocation (BT) and sepsis (S).

Methods BT groups: midline laparotomy was performed on Wistar rats under ketamine + hydroxychloral anesthesia (4:1). Rats were inoculated with 10ml $10^7/10^{10}$ cfu/ml *Escherichia coli* R-6 ($n=20$ /group) by oroduodenal catheterization, which was confined to the small intestine by ligation of both the duodenum and ileum. S groups: inoculation of $10^7/10^9/10^{10}$ cfu/ml/100g body weight *Enterobacter cloacae* 89 into the portal vein ($n=20$ /group). BT + S groups: 10^{10} BT + $10^7/10^9$ S ($n=20$ /group). From 10 animals of each group, samples of mesenteric lymph node, liver, spleen and blood were collected 2 hours post inoculation and cultured in MacConkey agar medium. The remaining animals in each group were observed for mortality for 30 days ($n=10$ /group).

Results BT- $10^7/10^{10}$ did not cause death and only 10^{10} inoculum promoted BT (mean= 1.8×10^5 cfu/g tissue). S- 10^7 was not lethal, but promoted a transient bacteremia state, S- 10^9 was LD₈₅ within 25 hours, and S- 10^{10} showed LD₁₀₀ within 5 hours. Bacterial recovery from these groups/g tissue were, at

the most, 10^4 cfu at S- 10^7 , 10^7 cfu at S- 10^9 and 10^8 cfu at S- 10^{10} . BT- 10^{10} in combination with S- 10^7 showed significantly increased mortality (LD₅₀ within 32 hours) as compared with BT- 10^{10} (LD₀) and S- 10^7 (LD₀) alone ($P<0.05$), and the mortality rate was statistically similar to the severe sepsis group (S- 10^9). In addition, the association of BT- 10^{10} +S- 10^9 also provoked a significant increase in mortality (LD₁₀₀ within 13 hours) as compared with BT- 10^{10} (LD₀) and S- 10^9 (LD₈₅ within 25 hours) in terms of length of time to cause mortality ($P<0.05$). Besides, sepsis in combination with BT showed a decreased rate of translocation in all groups as compared with the BT group alone. Overall data demonstrated significant deleterious synergistic effects of BT in combination with all states of sepsis, suggesting that translocation of bacteria through the gut-associated lymphoid system (GALT) favors the activation of the host systemic inflammatory response, even though the total quantification of internalized bacteria in the host compartments did not change at all by the addition of the BT process. Therefore, BT appears to provoke an exacerbated inflammatory state due to the bacterial challenge to the GALT during their traffic through mesenteric lymphatic tissue rather than the quantitative physical presence of the bacteria in the systemic compartment, therefore suggesting a distinctive GALT-related host inflammatory response associated with the BT phenomena.

P29 The role of the mesenteric lymph on microcirculation injury during bacterial translocation

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Background Increasing evidence has implicated bacterial translocation (BT) as the main source of the so-called gut hypothesis of the pathogenesis of sepsis progressing to multiple organ failure. Others have shown that mesenteric lymph content in the course of BT promotes increased pulmonary permeability. In previous work we have shown significantly increased tumor necrosis factor alpha and lymphocytes in the mesenteric lymph during BT. In this study we examined the correlation between microcirculation injury and mesenteric lymph exclusion during the BT process.

Methods Female Wistar rats were distributed in the following groups: BT, inoculation of 10ml of 10^{10} cfu/ml *Escherichia coli* R-6 confined to the small intestine; BT-E, submitted to BT without the influence of the mesenteric efferent lymph (diverted away from systemic circulation by catheterization of the mesenteric lymph duct); BT-R, submitted to the same procedure as BT-E group followed by re-inoculation of the collected lymph into the systemic circulation; BT-N, inoculation of lymph collected during BT into naïve animals. All animal mesenteric microcirculations were examined for 2 hours ($n=6$ /group) using an intravital microscope. The same number of BT-R and BT-N animals was injected with either lymph cells or lymph supernatants into the systemic circulation (immediately after light centrifugation of lymph collected during BT). A midline laparotomy was performed on Wistar rats under ketamine + hydroxychloral anesthesia (4:1). Rats were inoculated with 10ml *E. coli* R-6 10^{10} cfu/ml by oroduodenal catheterization, which was confined to the small intestine by

ligation of both the duodenum and ileum. All lymph samples were submitted to culture in MacConkey agar medium.

Results All lymph cultures were negative. During BT, the onset of injuries in the mesenteric microcirculation was mainly focal hemorrhages in capillaries and small venules beginning around 30 min, which progressed quantitatively up to 2 hours. After 1 hour of translocation, focal thrombosis of capillaries and small and medium venules were observed. In contrast, in animals where the lymph was diverted away from systemic circulation by catheterization of the mesenteric lymph duct, no microcirculation injury occurred (BT-E group). The re-inoculation of the collected whole lymph (BT-R) promoted similar injuries to the microcirculation as seen in the BT group in the same time period. Interestingly, the injection of whole lymph collected (negative culture for bacteria) from animals submitted to BT in the naïve animals (BT-N group) provoked similar mesenteric microcirculation damage within the same period. In addition, only lymph supernatant was able to promote microcirculation injuries in both the BT-R and BT-N groups. These findings allow us to speculate that BT-induced alterations in the mesenteric microcirculation are possibly due to the gut-associated lymphoid system activation by the BT process with the release of proinflammatory factor(s) and not due to the existence of bacteria in the lymph. Therefore, this might be the BT mechanism for the aggravation of a pre-existing state of sepsis or for the installment of infectious disease. Ongoing experiments are in progress to better elucidate this hypothesis.

P30 Hemodynamics and metabolic effects of prolonged and isolated hepatic artery occlusion in dogs**RJ Cruz Jr, EA Ribeiro, LF Poli de Figueiredo, O Rojas, M Rocha e Silva***Heart Institute, InCor and LIM11, University of São Paulo Medical School, SP 05403-000 São Paulo, SP, Brazil
Critical Care 2003, 7(Suppl 3):P30 (DOI 10.1186/cc2226)*

Background To improve resectability of several hepatobiliarypancreatic tumors, the vascular structures with cancer invasion could be resected and reconstructed. The liver is submitted to a global hypoxia during the hepatic artery reconstruction, since almost 50% of oxygen delivery to this organ is maintained through this vessel. This study addresses the initial impact of prolonged hepatic artery occlusion on liver hemodynamics and oxygen metabolism.

Methods Seven pentobarbital anesthetized mongrel dogs (19.7 ± 1.2 kg) underwent laparotomy. The gastroduodenal artery was ligated and the common hepatic artery was occluded during 60 min, followed by 120 min of reperfusion. Systemic hemodynamics were evaluated through a Swan–Ganz catheter and arterial catheters. Splanchnic perfusion was assessed by portal vein blood

flow (ultrasonic flowprobe), hepatic artery blood flow and liver enzymes (ALT, AST, DHL). Systemic and hepatic oxygen delivery (DO₂s and DO₂h, respectively) were calculated using standard formulae.

Results The results are presented in Table 1.

Conclusion We conclude that temporary hepatic artery occlusion induces a progressive decrease in portal vein blood flow during ischemia, which is maintained during reperfusion. The hepatic artery blood flow was promptly restored after arterial unclamping. This effect was associated with a significant and progressive reduction in hepatic oxygen delivery that could contribute to the development of postoperative hepatic failure in critically ill patients with a borderline of established preoperative hepatic dysfunction.

Table 1

| | Baseline | HAO-60 | R15 | R60 | R120 |
|---------------------------|------------|-------------|--------------|---------------|-------------|
| MAP (mmHg) | 129 ± 6.9 | 132 ± 5.9 | 127.7 ± 8.5 | 128.6 ± 7.7 | 129.6 ± 6.8 |
| CO (L/min) | 2.6 ± 0.3 | 2.5 ± 0.4 | 2.3 ± 0.2 | 2.2 ± 0.3 | 2.0 ± 0.3 |
| PVBF (ml/min) | 632 ± 107 | 522 ± 96 | 446 ± 61 | 375 ± 30* | 346 ± 42* |
| HABF (ml/min) | 205 ± 40 | 0* | 203 ± 48 | 183 ± 47 | 170 ± 53 |
| DO ₂ -L (mmHg) | 33.3 ± 5.9 | 19.1 ± 1.1* | 23 ± 2.9* | 18.5 ± 1.3* | 16.5 ± 1.6* |
| DHL (U/L) | 76.7 ± 7.6 | 86.3 ± 6.4 | 103.2 ± 15.5 | 125.8 ± 21.4* | 131 ± 21.2* |

MAP, mean arterial pressure; CO, cardiac output; PVBF, portal vein blood flow; HABF, hepatic artery blood flow; DO₂-L, liver oxygen delivery. Values presented as mean ± SED. * *P* < 0.05 vs baseline.

P31 Acute, normovolemic hemodilution: effects on systemic and splanchnic blood flows and oxygen metabolism**D Perin, LF Poli de Figueiredo, E Cruz Jr, RJ Silva, M Piccioni, M Rocha e Silva***Heart Institute, InCor, and LIM11, University of São Paulo Medical School, São Paulo, SP, Brazil
Critical Care 2003, 7(Suppl 3):P31 (DOI 10.1186/cc2227)*

The impact of acute normovolemic hemodilution (HD) on splanchnic perfusion was evaluated in 21 anesthetized (fentanyl and

vancuronium) mongrel dogs (16 ± 1 kg). They were randomized to controls (*n* = 7, no HD), moderate HD (hematocrit 25 ± 3%, *n* = 7)

Table 1

| | Baseline | HD0 | HD30 | HD60 | HD120 |
|------------------------|-----------|-----------|-----------|------------|------------|
| Cardiac output | | | | | |
| Control | 2.4 ± 0.2 | 2.4 ± 0.2 | 2.3 ± 0.2 | 2.3 ± 0.2 | 1.8 ± 0.2 |
| Moderate hemodilution | 2.6 ± 0.4 | 3.6 ± 0.4 | 3.4 ± 0.5 | 2.8 ± 0.3 | 2.8 ± 0.3 |
| Severe hemodilution | 2.3 ± 0.5 | 3.6 ± 0.5 | 3.2 ± 0.2 | 2.8 ± 0.2 | 2.4 ± 0.3 |
| Portal vein blood flow | | | | | |
| Control | 448 ± 31 | 450 ± 45 | 440 ± 47 | 419 ± 39 | 379 ± 23 |
| Moderate hemodilution | 311 ± 55 | 438 ± 83 | 485 ± 60 | 446 ± 55 | 436 ± 57 |
| Severe hemodilution | 382 ± 61 | 454 ± 68 | 459 ± 56 | 445 ± 47 | 388 ± 51* |
| PVCO ₂ gap | | | | | |
| Control | 3.9 ± 0.9 | 4.7 ± 0.8 | 6.3 ± 1.1 | 5.4 ± 1.2 | 6.4 ± 1.9 |
| Moderate hemodilution | 6.7 ± 1.5 | 6.0 ± 1.2 | 7.9 ± 1.6 | 7.7 ± 0.6 | 6.0 ± 0.7 |
| Severe hemodilution | 4.6 ± 0.5 | 7.1 ± 1.0 | 7.4 ± 0.6 | 8.0 ± 1.2 | 9.9 ± 1.6 |
| PCO ₂ gap | | | | | |
| Control | 3.3 ± 2.8 | 4.3 ± 2.7 | 2.7 ± 2.4 | 5.3 ± 2.6 | 11.6 ± 1.7 |
| Moderate hemodilution | 4.4 ± 3.4 | 5.6 ± 2.6 | 4.6 ± 2.5 | 6.9 ± 2.7 | 9.6 ± 2.3 |
| Severe hemodilution | 1.0 ± 2.2 | 7.9 ± 1.5 | 10.0 ± 1 | 12.0 ± 1.4 | 16.1 ± 2.9 |

or severe HD (hematocrit $15 \pm 3\%$ ml/kg), through an isovolemic exchange of whole blood and 6% hydroxyethylstarch at a 20 ml/min rate, to the target hematocrit. The animals were followed 120 min after HD. Cardiac output (ml/min), portal vein blood flow (ml/min), portal vein-arterial CO₂ gradient (mmHg) and PCO₂ gap (gas tonometry, mmHg), and splanchnic perfusion were evaluated through portal vein blood flow and gas tonometry.

Results Exchange blood volumes were 33.9 ± 3.3 and 61.5 ± 5.8 ml/kg for moderate HD and severe HD, respectively. Controls maintained a hematocrit of around 41% throughout the study. Arterial pressure remained stable for all animals.

Conclusion Global and regional hemodynamic stability were maintained after moderate and severe HD. However, a moderate gastric mucosal acidosis was induced with a hematocrit of 15%, which may become relevant after major surgery or trauma.

P32 Total homocysteine plasmatic levels as a marker of clinical severity in septic patients

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Introduction Homocysteine is a sulfur-containing amino acid formed during methionine metabolism that has been appointed as a marker of cardiovascular disease. The mechanisms involved are unclear, but include an increase in oxidative stress, excessive thrombogenesis, mitotic alterations in smooth muscular cells and endothelial dysfunction. Some of these mechanisms are present in septic patients, suggesting that total homocysteine (tHcy) levels might be implicated in the pathogenesis of organ dysfunction. The objective of this study is to correlate tHcy levels and the severity of septic process, evaluated by SOFA score.

Methods In this prospective clinical trial, patients admitted in a tertiary university intensive care unit with severe sepsis were included, before 48 hours of organ dysfunction diagnosis. Patients with acute renal failure were excluded. Blood samples were collected after 8 hours of starvation, and SOFA parameters, on days 1, 3, 7 and 14 after inclusion. Statistical analysis was done using the Kappa test.

Results We studied tHcy in 30 samples of 10 patients (three female and seven male) with a mean age of 46.9 ± 24.5 years and a mean APACHE score of 19.5 ± 8.4 (minimum 10, maximum 35). The mean tHcy values for each day studied were $6.299 \pm 3.183 \mu\text{mol/l}$ ($n=10$), $5.425 \pm 1.343 \mu\text{mol/l}$ ($n=9$), $7.216 \pm 3.091 \mu\text{mol/l}$ ($n=7$), and $7.024 \pm 4.265 \mu\text{mol/l}$ ($n=4$) for days 1, 3, 7 and 14, respectively. The mean SOFA scores were 2.00 ± 0.98 ($n=10$), 1.58 ± 0.72 ($n=9$), 1.32 ± 0.62 ($n=7$), and 0.68 ± 0.55 ($n=4$) for days 1, 3, 7 and 14, respectively. After analysis with the Kappa test, the concordance coefficient (K_w) was 0.02 with a z_{cal} of 0.20 (not significant), resulting in a poor level of agreement between these two parameters.

Conclusion Our results suggest that homocysteine levels could not be related to organ dysfunction in this septic patient population. These results must be confirmed in a larger population of septic patients.

P33 When is the 'golden time' to apply the SOFA score in critically ill patients?

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Introduction Multiple organ failure is the main cause of mortality in intensive care units (ICUs). Initial treatment is probably the most important step for critically ill patient outcome. Many scores have been proposed to assess organ dysfunction evolution and outcome. However, the ideal time to apply organ dysfunction scores has not been clearly established. We hypothesized that the SOFA score, when applied after initial treatment (24 hours later on), is more valuable than at the ICU admission to predict outcome in critically ill patients.

Objective To evaluate whether SOFA score calculation after treatment is more adequate to predict outcome than SOFA score calculation at ICU admission in critically ill patients.

Method This is a prospective analysis from the BASES study, which is an epidemiological, observational study performed in 1379 patients from private and public Brazilian ICUs. From this databank, we selected only patients with a length of stay longer than 24 hours

($n=884$). From those patients, we calculated the daily SOFA score at admission and 24 hours later, and we also collected patient-related outcome. The Youden test was calculated to choose the best cut-off value. Receiver-operating characteristic (ROC) curves were built for SOFA scores in those days. Finally, we compared the areas under ROC curves throughout a Hanley and McNeil test to estimate the most appropriate day to apply this organ dysfunction descriptor. $P=0.0002$ was considered significant.

Results The mean age was 62 ± 19 years, 59% were male, and the overall mortality rate was 22%. The best cut-off value for SOFA score at day of admission was 8 and for the next day was 5. Areas under the ROC curves were 0.716 and 0.775 for day of admission and the next day, respectively ($P<0.05$).

Conclusion The SOFA score applied after initial resuscitation is more accurate to predict outcome than the SOFA score applied at ICU admission.

P34 What is the prevalence and clinical relevance of hypocalcemia in sepsis?**GF Ferreira, LC Palma, ACKB Amaral, L Brauer, B Nery, M Park***Intensive Care Unit, Emergency Medicine Department, HC-University of São Paulo, SP, Brazil
Critical Care 2003, 7(Suppl 3):P34 (DOI 10.1186/cc2230)*

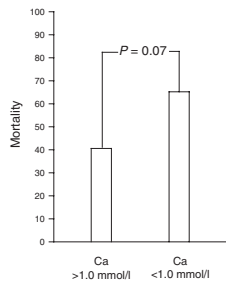
Introduction Hypocalcemia has a prevalence of 88% in general intensive care units (ICUs). Calcium (Ca) administration may be associated with hemodynamic improvement, but with increased mortality in animal studies.

Objective To describe the incidence of hypocalcemia in septic patients, and its associated morbidity and mortality in the first 14 days of ICU stay.

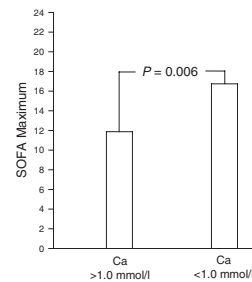
Methods A prospectively collected database was retrieved for Ca and SOFA score at days 1–14, APACHE II, lactate, creatinine, albumin, and mortality. All severe sepsis and septic shock patients were included from June 2000 to June 2001. Patients were classified as presenting severe hypocalcemia (SH) (<1.0 mmol/l) or moderate hypocalcemia/normocalcemia (>1.0 mmol/l).

Results Fifty-five patients had a mean (\pm standard deviation) age of 50.5 (\pm 18.0) years, and an APACHE II score of 21.4 (\pm 9.1). At entrance, 27.3% of patients were in septic shock, and subsequently 70.9% developed criteria for septic shock. The incidence of hypocalcemia was 80%, and that of SH was 41.9% (23 patients). APACHE II scores, lactate and creatinine at D1 were higher, and albumin was lower in SH ($P<0.05$). Vasoactive drug use was higher in SH (87% vs 59.4%; $P<0.05$). Mortality and morbidity (SOFA maximum) and are shown in Figures 1 and 2.

Conclusions Hypocalcemia is common in septic patients. SH is associated with increased organ dysfunction, and a trend towards increased mortality. It probably represents a sign of more severe disease. More studies are needed to establish the role of calcium supplementation in septic patients.

Figure 1

Mortality in severe hypocalcemic patients.

Figure 2

SOFA maximum in septic patients.

P35 Evaluation of blood transfusion effects on mixed venous oxygen saturation and lactate levels in patients with systemic inflammatory response syndrome (SIRS)/sepsis**BF Mazza^{1,2}, FR Machado¹, DDS Mazza^{1,2}, F Callera³, VA Hassmann²***¹Intensive Care Unit, Disciplina de Anestesiologia, Dor e Terapia Intensiva, UNIFESP/IEPM, São Paulo, SP, Brazil; ²Critmed, Hospital Uniclínicas/SJC, Santa Casa de Misericórdia/Cruzeiro, São Paulo, SP, Brazil; ³Serviço de Hematologia e Hemoterapia de São José dos Campos, R. Napoleão de Barros 715, 4ª andar, São Paulo 04024 002, SP, Brazil
Critical Care 2003, 7(Suppl 3):P35 (DOI 10.1186/cc2231)*

Introduction Blood transfusions continue to be a controversial therapy in intensive care units, mostly in patients with SIRS/sepsis, with conflicting thresholds for transfusion and different results in the literature. The present study is aimed at evaluating the effects of blood transfusion in two parameters of organ perfusion, mixed venous oxygen saturation (SvO₂) and serum lactate levels in patients with SIRS/sepsis who presented with hemoglobin levels <9.0 g/dl.

Methods All patients admitted to the intensive care unit with SIRS/sepsis, as defined by Consensus Conference 1992, and hemoglobin levels <9.0 g/dl were included. Hemoglobin levels, mixed venous oxygen saturation and lactate levels were collected before (BT) and up to 1 hour after blood transfusion (AT). These variables were analyzed through the paired Student *t* test and results were considered significant if $P\leq 0.005$.

Results Twenty-nine patients (17 male, 12 female) with mean age of 61.9 \pm 15.1 years (21–85 years) and a mean APACHE II score of 12.5 \pm 3.75 (7–21) were transfused with a mean of 1.41 packed red cell units. Although a significant increase in hemoglobin levels was achieved by blood transfusion (BT, 8.14 \pm 0.64 and AT, 9.4 \pm 0.33; $P>0.0001$), this was not accompanied by a significant change in lactate levels (BT, 1.87 \pm 1.22 and AT, 1.56 \pm 0.28; $P=0.28$) or in SvO₂ (BT, 64.3 \pm 8.52 and AT, 67.4 \pm 6.74; $P=0.13$). The results were similar when the analysis was performed only with those patients with hemoglobin levels <8.0 g/dl ($n=9$).

Conclusions These results suggests that blood transfusions, despite a significant increase in hemoglobin levels, are not associated with an improvement in tissue oxygenation in patients with SIRS/sepsis with hemoglobin levels <9 g/dl.

P36 Severe hemodynamic compromise, respiratory failure and disseminated skin lesions due to *Strongyloides stercoralis*

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Introduction *Strongyloides stercoralis* is an intestinal nematode, endemic in tropical and subtropical regions and of a great importance in Brazil, that induces a chronic infection in humans, usually asymptomatic. Mainly in immunocompromised individuals, such as patients with AIDS, malignancy, and receiving corticosteroids or immunosuppressors, this parasite can cause hyperinfection with systemic manifestations.

Case report We report a case of disseminated Strongyloidiasis in a 64-year-old patient with COPD and chronic use of corticosteroids, presenting with acute respiratory failure, bilateral interstitial infiltrate, needing mechanical ventilation, associated with septic shock, meningitis caused by *Enterococcus* and purpuric skin lesions. The diagnosis was

done by sputum analysis and responded to thiabendazole and ivermectin.

Discussion Thiabendazole has been used in *Strongyloides* infestation, and cure rates of 60% have been achieved in immunocompetent patients with hyperinfection who receive prompt therapy, but the mortality approaches 75% in immunocompromised patients. Recently, ivermectin has been used in severe and resistant cases of *S. stercoralis* dissemination.

Conclusion It is important to search for *Strongyloides* in the sputum of immunosuppressed patients presenting with acute respiratory failure and skin manifestation in tropical countries for earlier diagnostic and successful treatment.

P37 Is it possible to use levosimendan to treat cardiovascular dysfunction in septic patients?

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Introduction Cardiovascular dysfunction (CD) occurs frequently among patients with septic shock and it is more severe in the first 3 days, relapsing at the end of the first week among those who survive. Fifteen percent of the patients with septic shock, who evolve to death, die as a result of CD, whose physiopathologic mechanisms are not fully understood. Levosimendan (LEVO), a new inotropic drug which acts as calcium sensitizing agent and also has effects on potassium channels in vascular smooth muscle cells leading to vasodilatation action, has shown benefits in patients with cardiac failure. An experimental study on the endotoxic shock model has shown improvement on cardiac output, and systemic and regional oxygenation. The aim of this study is to prove the acute hemodynamic effects of LEVO administration on septic patients with severe CD.

Materials and methods SLS, 70 years old, male, with a history of ischemic cardiomyopathy was admitted with pulmonary infection

sepsis and multiple organ dysfunction. The patient received LEVO without bolus dose at an initial rate of 0.1 µg/kg/min in the first hour, followed by 0.2 µg/kg/min during the next 24 hours, monitored with a pulmonary arterial catheter during the observation.

Results The main hemodynamic and metabolic data are shown in Table 1.

Conclusion The administration of LEVO in patients with sepsis and septic shock and severe CD has proved to be safe, with immediate improvement of hemodynamic and metabolic parameters that was maintained after discontinuation of the drug. It is necessary that a randomized, controlled trial be done to compare the use of LEVO and other inotropic drugs in the treatment of CD associated with sepsis in order to validate this new indication for the drug.

Table 1

| | Baseline* | 18 h of treatment# | After 1 h LEVO** | After 3 h LEVO## | 12 h with LEVO | 24 h with LEVO## | Without LEVO 2 h | Without LEVO 12 h | Without LEVO 24 h | Without LEVO 48 h |
|------------------|-----------|--------------------|------------------|------------------|----------------|------------------|------------------|-------------------|-------------------|-------------------|
| CI | 1.4 | 2.8 | 2.8 | 3.3 | 3.2 | 4.2 | 3.6 | 3.6 | 3.7 | 4.4 |
| MAP | 73 | 92 | 78 | 70 | 70 | 66 | 73 | 88 | 79 | 93 |
| PAOP | 22 | 21 | 16 | 21 | 14 | 20 | 20 | 22 | 21 | 22 |
| SVO ₂ | 68 | 75 | 78 | 79 | 75 | 74 | 74 | 75 | 73 | 77 |
| VO ₂ | 85 | 90 | 94 | 102 | 111 | 123 | 122 | 119 | 143 | 121 |
| Lactate | 7.43 | 5.21 | 2.55 | 1.77 | 1.55 | 1.77 | 1.55 | 1.55 | 1.54 | 1.91 |

Hemodynamic support: * 0.6 µg/kg/min noradrenalin + 20 µg/kg/min dobutamine. # 30 µg/kg/min dobutamine + 5l Ringer's solution + 500 ml hydroxyethylstarch (HES) (200/0.5). ** 20 µg/kg/min dobutamine + 0.1 µg/kg/min levosimendan (LEVO). ## 0.2 µg/kg/min LEVO + 500 ml HES (200/0.5).

P38 The use of radionuclide-labeled white blood cell scintigraphy and ⁶⁷Ga scintigraphy in critically ill patients with sepsis

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The usual diagnostic approach to patients with sepsis in an intensive care unit (ICU) or coronary care unit is based on clinical, biochemical, microbiologic and pathologic data and on radiologic imaging (radiograph, ultrasound and computed tomography), which are used to determine the most common sites of infection. In many cases, however, the site of infection is difficult to determine. Nuclear medicine provides various noninvasive scintigraphic methods for the imaging of focal sepsis, based on the intravenous administration of a radiotracer that accumulates at the site of infection or inflammation. The combined use of total body scintigraphy with ultrasound and computed tomography is considered a useful tool for the diagnosis of occult sepsis in ICU patients, and allows the targeting of aggressive measures against infections. The aim of this study is to evaluate the diagnostic value of technetium 99m-white blood cell (^{99m}Tc-WBC)-labeled scintigraphy and gallium-67 citrate (⁶⁷Ga) scintigraphy in the detection of focal sepsis in the ICU. We reviewed seven patients affected by sepsis of unknown origin. After the usual diagnostic approach, five patients were submitted to a total body scan using

the ^{99m}Tc-WBC and two patients using ⁶⁷Ga. The patients had complete clinical and instrumental data, but none of the radiological image detected the site of infection. The ^{99m}Tc-WBC scan showed typical patterns of increased tracer accumulation in six different sites. Four of these sites were studied histopathologically, confirming the infection: one case of left kidney abscess was associated with concomitant infection of the psoas muscle in the same patient, one frontoparietal osteomyelitis, and one acute cholecystitis. The other two sites corresponded to pulmonary accumulation of the tracer, which was interpreted as pneumonia. Of the two patients who underwent ⁶⁷Ga scintigraphy, one had decubitus ulcerated infection associated with sacrum and left femoral osteomyelitis, and the other had clinical suspect of pulmonary vasculitis and diffuse pulmonary ⁶⁷Ga accumulation.

Conclusions Analysis of our results suggests that scintigraphy with ^{99m}Tc-WBC and ⁶⁷Ga can be considered a powerful tool in the detection of the source of infection in patients with sepsis in the ICU and the coronary care unit.

P39 Acidosis and mortality in severe sepsis and septic shock evaluated by base excess variation

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Critical Care 2003, 7(Suppl 3):P39 (DOI 10.1186/cc2235)

Introduction Hypoperfusion in sepsis may be identified by lactate levels, but there are many other unmeasured acids that may be better represented by negative base excess (BE). Successful resuscitation should be followed by increased BE.

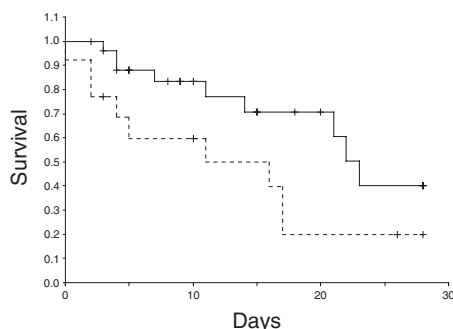
Objective To evaluate the utility of BE variation in mortality in severe sepsis (S) and septic shock (SS).

Methods A prospectively collected database was retrieved for BE at days 1 and 3 (D1 and D3), APACHE II, lactate, creatinine, albumin, and mortality at 28 days. Patients with S or SS were included, except if renal failure was diagnosed at D1 (creatinine

>3.5 mg/dl; diuresis <500 ml). Patients were classified as increased (less acidosis) BE vs decreased BE, based on the difference between D1 and D3.

Results Forty patients had a mean (\pm standard deviation) age of 48.4 (\pm 19.8) years, and an APACHE II score of 19.6 (\pm 9.1). At D1 and day 14, 20% and 65% of patients were in SS, respectively. Table 1 summarizes the main findings. Binary logistic regression analysis showed that only the APACHE II score (odds

Figure 1



Twenty-eight day survival.

Table 1

| | Increased base excess (n = 27) | Decreased base excess (n = 13) | P value |
|------------------------------|--------------------------------|--------------------------------|---------|
| Age (years) | 47.8 (21.0) | 49.7 (17.8) | 0.78 |
| APACHE II | 19.2 (9.6) | 20.6 (8.2) | 0.65 |
| Lactate, day 1 (mmol) | 2.1 (1.7) | 1.8 (1.1) | 0.60 |
| Base excess, day 1 | -9.3 (5.9) | -6.8 (4.7) | 0.18 |
| Albumin, day 1 (g/dl) | 2.2 (0.6) | 1.9 (0.5) | 0.07 |
| Creatinine, day 1 (mg/dl) | 1.1 (0.7) | 1.1 (0.5) | 0.96 |
| Septic shock at day 1 (%) | 25.9 | 7.7 | 0.24 |
| Septic shock at any time (%) | 59.3 | 76.9 | 0.32 |
| Mortality (n/total) | 9/27 | 9/13 | 0.046 |

All values are shown as mean (standard deviation) unless indicated otherwise.

ratio 1.114) and a decreasing BE from D1 to D3 (odds ratio 5.687) were independent predictors of mortality. Kaplan–Meier survival curves are shown in Figure 1.

Conclusions In patients with S and SS, increased BE from D1 to D3 seems to be a good predictor of morbidity and mortality, and may be considered a possible goal.

P40 Can we predict pulmonary wedge pressure from central venous pressure in hepatic transplantation?

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Critical Care 2003, 7(Suppl 3):P40 (DOI 10.1186/cc2236)

Introduction Volume infusion is the main therapeutic option to optimize preload and tissue oxygen supply in distributive shock. Pulmonary capillary wedge pressure (Pw) has been used as the most important variable to predict preload in unstable hemodynamic patients. However, most patients are not monitored with pulmonary artery catheters, making central venous pressure the preload variable of choice. The literature has shown a moderate correlation between Pw and central venous pressure (CVP) in septic patients. As far as we know there are no data about this correlation in the postoperative period of hepatic transplantation.

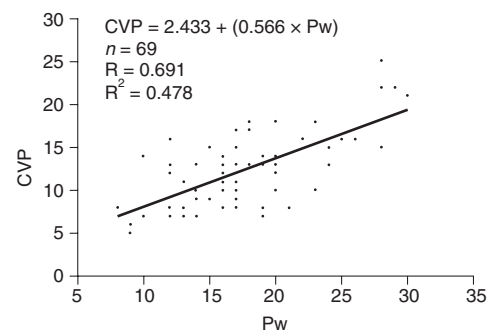
Objective To evaluate the correlation between CVP and Pw in hepatic transplantation.

Materials and methods Twelve postoperative hepatic transplantations were studied from January to November 2002. All analyses were performed 24 hours after surgery.

Results We analyzed 69 simultaneous measurements and found a good correlation between CVP and Pw (Fig. 1).

Conclusion The CVP can be used to estimate Pw in the postoperative period of hepatic transplantation. Probably, CVP can

Figure 1



Correlation between central venous pressure (CVP) and wedge pressure (Pw) in hepatic transplantation. R, Pearson correlation coefficient; R², Square Pearson correlation coefficient.

be used as a preload variable to guide volume infusion in this group of patients.

P41 Sepsis-based critical care teaching program: the SETUP Project

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Critical Care 2003, 7(Suppl 3):P41 (DOI 10.1186/cc2237)

Introduction Sepsis is a very frequent, severe multisystemic disease with a myriad of signs and symptoms that can mimic several critical illnesses. Only the optimal treatment of sepsis-associated conditions is able to reduce the high morbidity and mortality associated with such a complex disease. Evidence-based medicine concepts have been developed to manage those conditions, improving patient care. Particularly regarding sepsis, there is a gap between evidence-based literature and clinical application. Moreover, different intensive care units (ICUs) may have heterogeneous facilities with unequal health care providers. Therefore, we have been developing a tool able to diagnose current sepsis ICU management and to translate evidence-based concepts into bedside practice.

Objectives To use sepsis as a model to highlight the optimal clinical practice that may influence outcome based on known pathophysiological mechanisms and life-saving interventions in

critical care medicine. Also, to implement a tool capable to find major drawbacks in critical care management.

Methods Initially, evidence-based interventions were reviewed in order to choose six inexpensive interventions, which could be taught to most physicians and easily applied in ICUs, even those with minimal resources. First, the MEDLINE database was systematically reviewed, addressing established evidence-based interventions and preparing guidelines and protocols to conditions that reduce sepsis-induced organ dysfunctions, and thereby morbidity and mortality. Second, evaluative questionnaires before and after the proposed interventions are characterizing individualized ICU current standards of care and how they will be impacted by the SETUP Project. Third, adherence to the proposed protocols will be evaluated. Finally, patient outcome evaluation will demonstrate the overall impact of the SETUP Project.

P42 Is it possible to obtain Frank–Starling curves in the intensive care unit?

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Critical Care 2003, **7(Suppl 3):P42** (DOI 10.1186/cc2238)

Introduction Oxygen delivery depends on cardiac output and oxygen arterial content. Adequate preload is important to optimize cardiac output. Optimal preload can be obtained through Frank–Starling curves, which are difficult to determine at the bedside. Thus, optimal preload is difficult to determine in the intensive care unit.

Objective To evaluate the correlation between the wedge pressure and systolic volume in different subsets of shock.

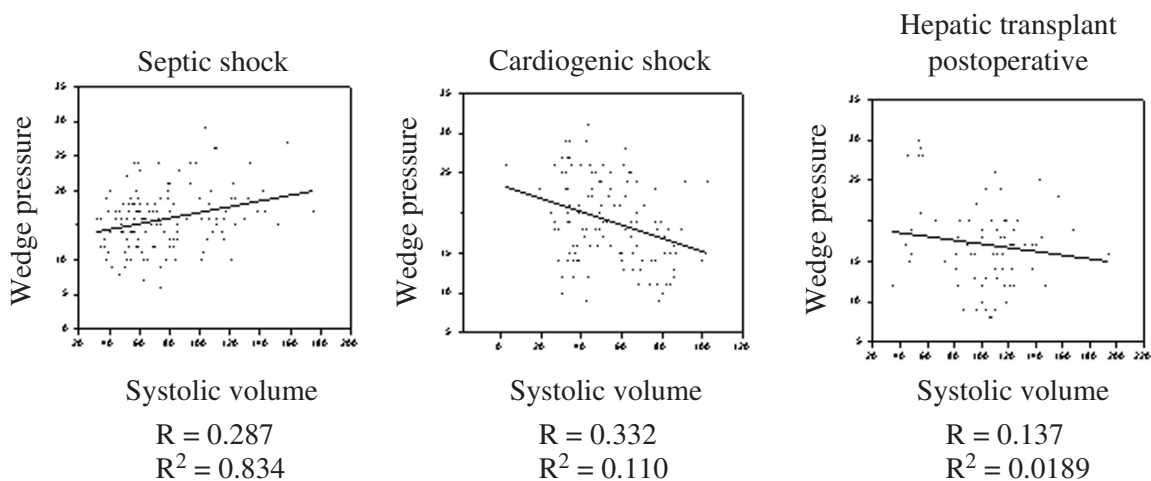
Materials and methods This study was undertaken in a general intensive care unit and enrolled 41 patients, with 334

hemodynamic measures in sepsis (139), in cardiogenic shock (119) and in hepatic transplantation (76) in the period from January to November 2002.

Results See Figure 1.

Conclusion A higher wedge pressure is not associated with a greater systolic volume. Thus, the absolute value of the wedge pressure cannot be associated with optimal preload.

Figure 1



R, Pearson correlation coefficient; R², square Pearson correlation coefficient.

NEPHROLOGY**P43 Effects of customized bicarbonate buffered solutions for continuous renal replacement therapies on polymorphonuclear function and viability**

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We have previously shown that the mixture of bicarbonate and calcium in the solutions for continuous renal replacement therapies (CRRT) leads to the formation of crystals and a decrease in the delivered dose of calcium. The aim of this study was to investigate the impact of bicarbonate/calcium and lactate/calcium solutions for CRRT on polymorphonuclear cell (PMN) viability and function. We tested four customized bicarbonate buffered solutions: the single bag (bicarbonate and calcium mixed 24 hours before testing), the double bag (mixed immediately before), and the filtered single bag and double bag solutions. We also tested one commercial lactate buffered solution. Blood from six volunteers was incubated with the test solution for 30 min followed by PMN isolation. Isolated PMNs

were resuspended in 50% RPMI+50% autologous serum and kept overnight. Viability, necrosis and apoptosis were analyzed by annexin V and PI staining. Phagocytosis was determined by the analysis of *Staphylococcus aureus*-PI stained PMN and ROS production by the mean fluorescence intensity of DCFH in these cells. There was no difference between the test solutions with respect to PMN viability and function. Lactate and bicarbonate had similar effects on PMN viability and function. More studies are mandatory to elucidate the impact of CRRT solutions on other inflammatory cells and pathways, particularly on the cytokines associated with systemic inflammatory response syndrome and sepsis.

P44 The use of renal scintigraphy with technetium-99m-L,L-ethylenedicysteine in critically ill patients with acute renal failure in the intensive care unit

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Critical Care 2003, 7(Suppl 3):P44 (DOI 10.1186/cc2240)

Background Patients with acute renal failure (ARF) often represent a diagnostic challenge to physicians in the intensive care unit. A noninvasive test would be valuable to assist the clinicians in making differential diagnoses for these patients. Technetium-99m-L,L-ethylenedicysteine (^{99m}Tc-EC), a new renal radio-pharmaceutical, provides high-quality images in patients with renal failure and its clearance resembles that of hippuran, which makes it a desirable agent to evaluate tubular function, such as in patients with acute tubular necrosis (ATN). Adequate renal uptake seemed to predict recovery of renal function.

Aim To evaluate the diagnostic value of ^{99m}Tc-EC renography in the diagnosis of acute renal failure in critically ill patients in an intensive care unit.

Methods After the usual diagnostic approach, two patients were submitted to renal scintigraphy with ^{99m}Tc-DTPA and ^{99m}Tc-EC, and one patient to ^{99m}Tc-EC renal scintigraphy.

Results The first patient was hospitalized with hypertension and left renal abscess. She was submitted to left nephrectomy and evolved to ARF, requiring hemodialysis. The ^{99m}Tc-EC renography showed normal flow to the right kidney, and delayed and

decreased activity compatible with ATN. The clearance values of ^{99m}Tc-EC and ^{99m}Tc-DTPA were 28.4 ml/min and 6.1 ml/min, respectively. The hemodialysis was suspended and the ^{99m}Tc-EC clearance increased to 35 ml/min. The second patient had diabetes and hypertension, and was hospitalized with acute pulmonary edema. The ^{99m}Tc-EC renography showed decreased flow and uptake to both kidneys without any evidence of significant excretion into collecting systems. The findings were consistent with the clinical suspect of renal cortical necrosis. The clearance values of ^{99m}Tc-EC and ^{99m}Tc-DTPA were 16.9 ml/min and 9.4 ml/min, respectively. The patient required hemodialysis treatment. The third patient had myocardial infarction and evolved to shock with ARF. The ^{99m}Tc-EC renography showed normal flow to both kidneys, and delayed and decreased activity compatible with ATN. The patient required hemodialysis. The clearance value of ^{99m}Tc-EC was 39 ml/min.

Conclusions For patients with acute renal failure, the ^{99m}Tc-EC renal scan may facilitate decisions regarding the management of therapy. The use of the ^{99m}Tc-EC renal scan in the differential diagnosis of acute renal failure appears promising in the setting of the intensive care unit.

P45 Incidence, risk factors and prognostic factors of acute renal failure in patients admitted in an intensive care unit

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Critical Care 2003, 7(Suppl 3):P45 (DOI 10.1186/cc2241)

Purpose To assess the incidence, risk factors, impact in clinical outcome and prognostic factors of acute renal failure (ARF) in patients admitted to an intensive care unit (ICU).

Methods All patients admitted to the ICU with a length of stay greater than 48 hours were prospectively followed. ARF was defined by a serum creatinine higher than 1.5 mg/dl. The Acute Physiology and Chronic Health Evaluation (APACHE) II score, LODS score, pre-admission and admission characteristics, and clinical evolution were registered. The results were analyzed by *t* test, Wilcoxon test and, in multivariate analysis, logistic regression and discriminant analysis. They were considered significant if *P*<0.05 or if the confidence interval differs from one.

Results The incidence of ARF was 19.0%, with a mortality of 76.19%. Risk factors to the development of ARF were gender (male, *P*=0.053), surgical complications (*P*=0.035), higher volume replacement, bleeding and hypotension during surgery (*P*=0.017, *P*=0.008 and *P*=0.044, respectively), risk of death

(APACHE II, *P*=0.049), LODS (*P*=0.006), systemic inflammatory response syndrome (SIRS)/sepsis and shock (*P*=0.0001 and *P*=0.0001), respiratory failure (*P*=0.001), use of norepinephrine (*P*=0.003), and serum creatinine and urea at admission (*P*=0.0007 and *P*=0.0478). In the multivariate analysis, only male gender (odds ratio [OR]=4.275), heart rate at admission (OR=1.023), shock owing to SIRS/sepsis (OR=8.590), higher volume replacement during surgery (OR=1.002) and serum urea levels at admission (OR=1.012) remained significant. The prognostic factors of mortality were shock owing to SIRS/sepsis (*P*=0.0001), respiratory failure (*P*=0.021), highest level of serum potassium (*P*=0.013) and lowest level of serum bicarbonate (*P*=0.037). In the multivariate analysis, only the highest level of serum potassium remained significant (*P*=0.037).

Conclusions The incidence, morbidity and mortality of ARF in the ICU are high. The main factors associated with its development and prognosis are those associated with hemodynamic instability, suggesting that ARF is a part of multiple organ dysfunction syndrome.

PNEUMOLOGY

P46 Ventilator beyond ventilation: impact of the increase of elastic recoil pressure of a respiratory system through positive end expiratory pressure—zero positive end expiratory pressure vs manually assisted cough vs manually assisted cough adding positive end expiratory pressure 12 cmH₂O on the peak expiratory flow in mechanically ventilated patientsACM Duarte¹, KM Avena¹, AB Sampaio¹, EB Melo¹, EM Sena¹, JM Teles², MR Leite², DC Espirito-Santo², O Messeder², CM Silva³, CMN David⁴¹Department of Physiotherapy and ²Intensive Care Unit, Hospital Português, Av Princesa Isabel 02, Salvador, Bahia, Brazil; ³Department of Physiotherapy, University Hospital, UNB, Brasília, DF, Brazil; ⁴University Hospital, Intensive Care Unit, UFRJ, Rio de Janeiro, RJ, Brazil
Critical Care 2003, **7**(Suppl 3):P46 (DOI 10.1186/cc2242)

Introduction Physiotherapy has many techniques that are able to promote secretion clearance, decreasing airway obstruction in the attempt to improve ventilation homogeneity and exchanged blood gases [1–3]. These techniques aim to promote the increase of peak expiratory flow (PEF) and expiratory volume, probably through augmentation of the elastic recoil pressure produced by exsufflation forces. Our purpose was to assess the impact of the three usual modalities of bronchial hygiene on peak expiratory flow.

Design A prospective, experimental and blinded study.

Methods Twenty-six patients (mean age, 60 ± 13.5 years) admitted to the Hospital Português Clinical–Surgery Intensive Care Unit, requiring total support ventilation and with positive end expiratory pressure (PEEP) of 5.5 ± 1.44 cmH₂O, were assessed. Patients with a history of pulmonary disease, hemodynamic instability, rib cage and/or abdominal abnormalities, scoliosis, pregnancy, obesity, cardiac pacemaker, pneumothorax, unstable thorax and PEEP higher than 10 cmH₂O were excluded. PEF was measured by Navigator Graphics Monitor (Newport Medical Instruments Inc., Newport Beach, CA, USA) during PEEP–zero positive end expiratory pressure (ZEEP), manually assisted cough with baseline PEEP (MAC), mean PEEP of 5.5 ± 1.44 cmH₂O, and MAC with adding PEEP of 12 cmH₂O. Techniques were performed five times for each patient, with intervals of 5 min between each technique application. The Kruskal–Wallis test was used to compare the groups. The Mann–Whitney rank-sum test was used to compare the techniques two by two. Differences with *P* < 0.05 were considered significant.

Results Means of the PEF variations are presented in Table 1. The comparison of MAC vs PEEP–ZEEP and MAC vs MAC with PEEP of 12 cmH₂O showed statistical significance (*P* < 0.0002 and

Table 1

| Intervention | Peak expiratory flow | <i>P</i> |
|--------------------------------|----------------------|-----------|
| MAC | 0.750 ± 0.262 | < 0.00001 |
| MAC PEEP 12 cmH ₂ O | 1.070 ± 0.282 | < 0.0001 |
| PEEP–ZEEP | 1.088 ± 0.286 | < 0.00001 |

MAC, manually assisted cough; PEEP, positive end expiratory pressure; ZEEP, zero positive end expiratory pressure.

P < 0.01, respectively). When PEEP–ZEEP and MAC with PEEP of 12 cmH₂O were compared, no statistical significant differences were noted.

Conclusion PEEP–ZEEP and MAC with PEEP of 12 cmH₂O were more efficient on the increase of peak expiratory flow than MAC with baseline PEEP. Considering that there were no statistical differences between the more efficient techniques, the relationship of risk/benefit and the institutional aspects, the choice of the technique should be powerful to consider.

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3. Hess DR: **The evidence for secretion clearance techniques.** *Respir Care* 2001, **46**:1276-1292.

P47 Pulmonary thromboembolism among elderly intensive care unit patients

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Critical Care 2003, **7**(Suppl 3):P47 (DOI 10.1186/cc2243)

Introduction The increasing life expectation has increased the number of elderly patients in the intensive care unit (ICU).

Objective To evaluate pulmonary thromboembolism (PE) among patients older than 65 years old admitted to an ICU.

Methods We studied a prospective cohort enrolling 1993 patients admitted to a clinical ICU (from March 2000 to February 2003). Fifty-two patients with high clinical probability of PE were submitted to several complementary examinations such as D-dimer concentration, electrocardiogram, chest radiography, arterial blood gas, echo Dopplercardiogram and venous colored echo Doppler.

The PE was confirmed in 37 of those patients (of which 32 were older than 65 years old) with one of these confirmatory methods: ventilation-perfusion lung scan with a high probability result (56%), the identification of a clot by spiral computer tomography (41%), or a positive gadolinium-enhanced magnetic resonance angiography (3%).

Results The mean age of our patients was 78 ± 5 years old (maximum 98 years) and the mean Acute Physiology and Chronic Health Evaluation II score was 11 ± 6 (maximum 20). Eighty-four percent of our patients were female, and the most prevalent risk factors were age, immobilization (31%), ejection fraction < 40%

(28%), history of deep venous thrombosis (25%), and chronic pulmonary hypertension (16%). The most usual signs and symptoms were dyspnea (88%), tachypnea (78%), chest pain (34%), sinus tachycardia (31%), cough and cyanosis (19%). The complementary examinations showed the positivity of 94% for D-dimer, 72% for venous colored echo Doppler, 67% for echo Doppler cardiogram, 66% for chest radiography and 40% for electrocardiogram. Thirty-eight percent of the patients showed hypoxemia at the arterial blood gas analysis. Unfractionated heparin was used as the first choice treatment in 72% of the patients, and thrombolytic therapy in 19%. No major bleeding

episodes requiring blood transfusions were seen. The overall inhospital mortality rate was 28% (PE+septic shock), and 18% related to PE by itself. The average ICU inmate time was 6 ± 4 days (minimum 3 days and maximum 19 days) and the average time of hospitalization was 12 ± 25 days (minimum 4 days and maximum 143 days).

Conclusion The authors warn of the necessity of a clinical suspicion of pulmonary thromboembolism as the first step of a differential diagnosis with other prevalent pathologies among the elderly, and highlight the good results with therapy, including the thrombolytics.

P48 Mechanical ventilation with controlled pressure and controlled volume in septic patients with acute respiratory distress syndrome

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 Critical Care 2003, 7(Suppl 3):P48 (DOI 10.1186/cc2244)

Introduction It is known that mechanical ventilation with the adoption of high tidal volumes ($V_T=10-15$ ml/kg) has a relationship with the increase of the death rate in patients with acute respiratory distress syndrome (ARDS) [1]. Since then, different ventilatory strategies have been investigated adopting small tidal volumes; however, there is no agreement about which of them would cause a minimal pulmonary aggression to the pre-existing injury.

Objective To compare two methods of mechanical ventilation employed in septic patients with ARDS (controlled volume and controlled pressure), both adopting permissive hypercapnia, evaluating the hemodynamic and respiratory effects of those patients.

Methods Research previously approved by the Hospital's Medical Ethics Committee, prospective and randomized, performed in the intensive care unit of the Hospital of UNICAMP. Seven patients

Table 1

Patient characteristics at entry

| | Controlled volume (n=7) | Controlled pressure (n=9) | P value |
|---|-------------------------|---------------------------|---------|
| Age (years) | 52 ± 15 | 48 ± 20 | 0.81 |
| Murray's score | 2.86 ± 0.48 | 3.14 ± 0.52 | 0.31 |
| Sepsis-related Organ Failure Assessment | 8.6 ± 4 | 10.9 ± 3.3 | 0.09 |
| APACHE II score | 17 ± 2.9 | 22.2 ± 5.4 | 0.24 |
| APACHE II risk of death (%) | 33.6 ± 6.8 | 40.9 ± 18.2 | 0.26 |

APACHE II, Acute Physiology and Chronic Health Evaluation II.

Table 2

Results of the variable analyzed for both groups (controlled volume and controlled pressure) over three subsequent days

| | Controlled volume 1 | Controlled volume 2 | Controlled volume 3 | Controlled pressure 1 | Controlled pressure 2 | Controlled pressure 3 | P value* |
|---|---------------------|---------------------|---------------------|-----------------------|-----------------------|-----------------------|-----------|
| Static compliance (ml/cmH ₂ O) | 39 | 42 | 48 | 42 | 50 | 52 | 0.78/0.14 |
| PaO ₂ /FiO ₂ (mmHg) | 146 | 177 | 149 | 124 | 162 | 176 | 0.91/0.32 |
| Positive end expiratory pressure (cmH ₂ O) | 12 | 11 | 11 | 13 | 13 | 12 | 0.43/0.25 |
| pH | 7.35 | 7.40 | 7.41 | 7.27 | 7.32 | 7.33 | 0.19/0.02 |
| PaCO ₂ (mmHg) | 50 | 45 | 45 | 47 | 42 | 40 | 0.35/0.04 |
| Shunt (%) | 32 | 24 | 33 | 39 | 28 | 28 | 0.72/0.21 |
| IC (l/min/m ²) | 4.8 | 4.4 | 4.3 | 4.2 | 4.2 | 4.5 | 0.73/0.72 |
| RVS (mmHg/l/min) | 860 | 915 | 920 | 1018 | 957 | 821 | 0.85/0.56 |
| RVP (mmHg/l/min) | 185 | 154 | 156 | 214 | 172 | 142 | 0.8/0.01 |
| DO ₂ (ml/min) | 1160 | 1101 | 1111 | 872 | 982 | 998 | 0.3/0.8 |
| VO ₂ (ml/min) | 304 | 280 | 282 | 268 | 274 | 285 | 0.8/0.94 |

*P value between both groups/between the three days.

were ventilated with controlled volume and nine patients with controlled pressure (*Bird 8400[®] Sti* ventilator for both groups), the tidal volume variation being between 6 and 8 ml/kg, accepting PaCO₂ until 80 mmHg with pH >7.2. The ideal positive end expiratory pressure was calculated based on the higher compliance level through the method of progressive positive end expiratory pressure. The selected patients were submitted to the Murray scale [2] with LIS ≥2.5, and the Sepsis-related Organ Failure Assessment [3] and Acute Physiology and Chronic Health Evaluation II scale were applied to evaluate their gravity on the moment of the protocol inclusion. Hemodynamic and respiratory monitoring was carried out by Swan–Ganz catheter, gasometry (arterial and venous) and capnometry sampling, twice a day during three subsequent days.

Results There were no parameter differences between both mechanical ventilation groups. There was a significant difference for both groups, from the first to the second day of collection, only on the following parameters: pH rise and reductions of PaCO₂ and RVP.

Conclusion All septic patients with ARDS studied, when ventilated with low V_T (6–8 ml/kg), both in controlled volume and controlled pressure, did not present differences in the lung function nor in the hemodynamic state.

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P49 Peak expiratory flow in mechanically ventilated patients under three modalities of manually assisted coughing

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Introduction Bronchopulmonary hygiene physical therapy refers to techniques that promote clearance of airway secretion. One of these techniques is manually assisted coughing (MAC), which could be applied unilaterally, bilaterally or thoracic–abdominally. The first research about MAC was published in 1966; nevertheless, until now, no study has tried to compare the three different forms of applying this technique. Studies about MAC have just analysed the effects of secretion clearance on oxygenation. The aim of this study was therefore to compare the peak expiratory flow (PEF) produced by MAC when accomplished in different application forms, in mechanically ventilated patients.

Design A prospective, experimental and blinded study.

Methods Twenty-six patients (mean age 60 ± 13.5 years) admitted to the Hospital Português Clinical–Surgery Intensive Care Unit requiring controlled mechanical ventilation and with positive end expiratory pressure of 5.5 ± 1.44 cmH₂O were assessed. Patients with a history of pulmonary disease, hemodynamic instability, rib cage and/or abdominal abnormalities, scoliosis, pregnancy, obesity,

a cardiac pacemaker, pneumothorax, unstable thorax and positive end expiratory pressure higher than 10 cmH₂O were excluded. The PEF was measured by the Navigator Graphics Monitor (Newport Medical Instruments Inc., Newport Beach, CA, USA). MAC was performed five times in each hand position (unilateral, bilateral and abdominal–thoracic) in an alleatory way, with intervals of three breathings between each application of the technique. The Mann–Whitney rank-sum test was used to compare the groups. Differences with *P* < 0.05 were considered significant.

Results Means of PEF variations are presented in Table 1. When comparing the different modalities of MAC, no statistical significant differences were noted.

Conclusion MAC was efficient to increase the PEF in all tested modalities. Nevertheless, these results confirm that the efficacy was no different between the modalities, suggesting that it is a personal choice involving the patient and the therapist on the moment of technique performance.

Table 1

| | Manually assisted coughing | | |
|----------------------------|----------------------------|--------------|--------------------|
| | Unilateral | Bilateral | Abdominal–thoracic |
| Peak expiratory flow (l/s) | 0.773 ± 0.30 | 0.756 ± 0.26 | 0.711 ± 0.29 |
| <i>P</i> | < 0.0001 | < 0.0001 | < 0.0001 |

P50 Ventilator beyond ventilation: impact of positive end expiratory pressure on peak expiratory flow in mechanically ventilated patients under three modalities of manually assisted coughing

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Introduction Bronchopulmonary hygiene physical therapy refers to techniques that promote clearance of airway secretion. One of these techniques is manually assisted coughing (MAC), which could have early smaller airways narrowing or collapsing as an undesirable effect. Positive end expiratory pressure (PEEP) promotes small airway stability, and increases functional residual capacity and pulmonary volume at the end of expiration. The purpose of this study was to analyze whether the PEEP effects described are able to optimize peak expiratory flow (PEF) during MAC.

Design A prospective, experimental and blinded study.

Methods Twenty-six patients (mean age 60 ± 13.5 years) admitted to the Hospital Português Clinical–Surgery Intensive Care Unit and requiring controlled mechanical ventilation were assessed. Patients with previous pulmonary disease, hemodynamic instability, rib cage and/or abdominal abnormalities, scoliosis, pregnancy, obesity, a cardiac pacemaker, pneumothorax and unstable thorax were excluded. The PEF variation during MAC with a baseline PEEP (mean 5.5 ± 1.44 cmH₂O; n=26) was compared with the same modality with a PEEP of 12 cmH₂O (n=16). PEF was measured by the Navigator Graphics Monitor (Newport Medical Instruments Inc., Newport Beach, CA, USA). MAC was performed five times in each hand position (unilateral, bilateral and thoracic–abdominal) in an alleatory way. The Mann–Whitney rank-sum test was used to

Table 1

| | Baseline PEEP | PEEP 12 cmH ₂ O |
|------------------------|---------------|----------------------------|
| Unilateral MAC | 0.711 ± 0.29* | 0.963 ± 0.267* |
| Bilateral MAC | 0.773 ± 0.30* | 1.035 ± 0.274* |
| Thoracic–abdominal MAC | 0.756 ± 0.26* | 1.073 ± 0.288* |

PEEP, positive end expiratory pressure; MAC, manually assisted coughing. *P<0.0001.

assess differences between the groups. Differences with P<0.05 were considered significant.

Results Means of PEF variations are presented in Table 1. When all variations of PEF in each modality of MAC were compared with the variations after addition of PEEP, statistical significant differences were noted. When comparing the different modalities of MAC with adding PEEP, no statistical significant differences were noted.

Conclusion PEEP was efficient in MAC optimization and in increasing the PEF. The association of PEEP during MAC in mechanically ventilated patients is recommended.

P51 Influence of the increase of positive end expiratory pressure on the intra-abdominal pressure

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Introduction The intra-abdominal pressure (IAP) usually elevates in critically ill patients and must be monitored to avoid compartmental syndrome. The mechanical ventilation may increase the IAP even more by the transmission of the thoracic pressure from the diaphragm.

Objective To assess the effect of the optimization of the positive end expiratory pressure (PEEP) on the increase of the IAP in patients with a diagnosis of intra-abdominal hypertension.

Patients and methods Fifteen patients needing PEEP optimization and with intra-abdominal hypertension. The measurement of the IAP was obtained by intravesical pressure at five different moments: before and after neuromuscular blockade, right after PEEP optimization, and 6 and 12 hours after this procedure.

Results Fifteen patients, five female (33.3%) and 10 male (66.7%), aged between 20 and 89 years (mean 61 years) were

studied. Seven patients (46.7%) underwent gastroenterological surgeries, five patients (33.3%) were trauma victims and three patients (20%) underwent aorta surgeries. Considering the Burch classification [1], 10 patients had intra-abdominal hypertension grade I (10.4–15 mmHg), four patients had grade II (16–25 mmHg) and one patient had grade III (27.5 mmHg). The initial IAP measurement and the four measurements after PEEP optimization were between 2 and 10 mmHg; the differences among them were not significant (tests realized by Friedman analysis, P=0.196; therefore >0.005).

Conclusion The increment of the PEEP does not alter the levels of intra-abdominal pressure in the first 12 hours after PEEP optimization.

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P52 Staphylococcal and severe acute respiratory distress syndrome

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A 17-year-old boy with type I diabetes mellitus, was admitted to the intensive care unit with a 7-day history of right ankle contusion that progressed to erysipela, fasciitis and acute respiratory failure (septic embolic pneumonia – blood cultures positive to *Staphylococcus aureus*). Chest X-ray revealed bilateral infiltrates, the PaO₂/FiO₂ ratio was 150 and there was no evidence of pulmonary congestion. Vancomycin and surgical intervention were initiated and a thoracic computed tomography (CT) scan was performed right after the patient was intubated. The CT revealed gravity-dependent opacities and peribronchiolar patchy infiltrates. A stepwise recruitment maneuver (SRM) with high positive end expiratory pressure (PEEP) levels (25, 30, 35, 40 and 45 cmH₂O) and a fixed pressure control level of 15 cmH₂O was carried out at the Radiology suite, and the PEEP was titrated in order to keep the lung open and to minimize VILI. The CT scan showed that the lung opened with 45 cmH₂O PEEP + 15 cmH₂O PCV (60 cmH₂O total), and was kept open with 25 cmH₂O PEEP; the PaO₂/FiO₂ ratio was >350. After 24 hours the PaO₂/FiO₂ ratio worsened and another SRM was performed; the PEEP increased to 29 cmH₂O and the PaO₂/FiO₂ ratio increased to

>350. The FiO₂ was decreased to 30%, and after 96 hours the PEEP levels were progressively decreased and pressure support ventilation was initiated. After 10 days of intubation, the patient was weaned from mechanical ventilation and started on hyperbaric oxygen. After 3 days of extubation, the patient was breathing room air with SpO₂ >95%.

The CT scan showed that the SRM is important before increasing PEEP levels. PEEP levels must be set in order to prevent alveolar collapse according to the CT scan or PaO₂/FiO₂ ratio >350, and it is important to initiate pressure support ventilation as soon as possible in order to prevent critical illness polyneuropathy. In this case we did not observe barotrauma, circulatory failure, ventilator-associated pneumonia, and the intensive care unit length of stay was 12 days. In this severe case of acute respiratory distress syndrome, the SRM with high PEEP levels and PEEP titration according to the CT scan and according to PaO₂/FiO₂ ratio >350 was effective, and related to a better prognosis.

P53 Frequency of acute lung injury and acute respiratory distress syndrome in the intensive care unit of a teaching hospital: a prospective study

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Background Ashbaugh *et al.* first described acute respiratory distress syndrome (ARDS) in 1967 in 12 patients with acute respiratory failure. In 1994, the American–European Consensus Conference on ARDS established the diagnosis criteria for acute lung injury (ALI) and ARDS, and also defined the associated risk factors.

Objective To establish the frequency and the main risk factors for ALI and ARDS using American–European Consensus Conference diagnosis criteria, to describe the intensive care unit (ICU) and hospital mortality of these patients, and also to compare the outcome of ALI/ARDS patients (group I) with similar patients without ALI/ARDS (group II).

Design A prospective observational study.

Setting The Emergency Department (16 beds) ICU of a university hospital (Ribeirão Preto Medical School Hospital, University of São Paulo, Brazil).

Methods All patients admitted from 1 May 2001 to 30 April 2002 with one or more of 14 predefined risk factors for ALI/ARDS were

followed. Clinical data, Acute Physiology and Chronic Health Evaluation (APACHE) II score, complications, and ICU and hospital length of stay were recorded.

Results From 524 admissions during the study period, 175 patients (33.4%) had one or more risk factors for ALI/ARDS and 37 patients (7.0%) developed this condition (group I). The main risk factors were pneumonia (37.7%), shock (32.0%), multiple trauma (21.7%) and sepsis (21.1%). The frequency of sepsis was higher in group I than in group II (46% vs 14.5%, *P*<0.001). The comparison between groups showed that group I had a higher APACHE II score (20 vs 17, *P*<0.001), more hospital complications (68% vs 40%, *P*<0.05) and higher ICU mortality (73% vs 37%, *P*<0.001) and hospital mortality (76% vs 50%, *P*<0.05). The main causes of death were multiple organ dysfunction syndrome (38.5%) and shock (33.3%).

Conclusions The prevalence of ALI/ARDS was 7% in this ICU population. The main risk factors were pneumonia, shock, multiple trauma and sepsis. Patients with ALI/ARDS had high ICU mortality and hospital mortality.

P54 The measurement of proximal inspiratory pressure at intensive care unit admission can predict patient hospital mortality

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Background Maximal inspiratory pressure is one of the respiratory parameters that can be used to evaluate the

respiratory function in the intensive care unit (ICU). However, the meaning of these values for the diagnosis of muscle

disorders or for the prognosis of these patients is not completely understood.

Method We prospectively evaluated 213 patients admitted to a general ICU from April 2002 to August 2002. We measured the maximal inspiratory pressure and maximal expiratory pressure (the best of three measurements), tidal volume (ml), respiratory frequency, body mass index, age, gender, hospital admission time and mortality.

Results The measurements at ICU admission were: mean inspiratory pressure, 42.32 ± 19.92 mmHg (-12 to 120 mmHg); mean expiratory pressure, 43.66 ± 20.72 mmHg (0–120 mmHg); mean tidal volume, 460 ± 146 ml (100–1000 ml); respiratory frequency, 20 ± 6 (10–49); body mass index, 22.19 ± 4.94 (12.7–43.83); mean age, 61.78 ± 18.52 years (19–94 years); females, 81; males, 130.

Lower maximal inspiratory pressure, lower tidal volume and higher age are values were correlated with higher patient in-hospital mortality.

Conclusion The measurement of maximal inspiratory pressure at ICU admission can be a useful parameter to predict in-hospital mortality. Possible interventions such as better muscle evaluation, respiratory physiotherapy and muscle training programmes should be studied in the future.

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P55 Assessment of cardiorespiratory changes in critically ill patients in two methods employed for mechanical ventilation weaning

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Objectives To analyze gas exchange, respiratory mechanics and cardiovascular monitoring parameters during mechanical ventilation weaning, using pressure support ventilation (PSV) and T-piece techniques, and to compare these variables in subgroups of patients with heart disease (HD) or nonheart disease (NHD).

Materials and methods A randomized crossover clinical trial comparing PSV and T-piece techniques was performed. Twenty patients, aged 57 ± 15 years, 13 (65%) male and seven (35%) female, who were on mechanical ventilation for a period ranging from 2 to 54 days were studied. The following were analyzed: peripheral oxygen saturation (SaO_2), partial carbon dioxide pressure in the exhaled air (PetCO_2), respiratory rate, tidal volume (V_T), minute ventilation (V_E), heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP), changes in ST segment and presence of arrhythmia at the electrocardiographic evaluation. Data were recorded at times 0, 15 and 30 min after the start of the randomized weaning technique, with a 30 min resting interval before starting the second technique. Patients were also grouped as having HD ($n=11$) and NHD ($n=9$), and compared relative to cardiovascular parameters.

Results The comparison between PSV and T-piece techniques demonstrated that total SaO_2 and PetCO_2 were significantly higher during PSV, at all times ($P<0.001$ and $P<0.05$). As for respiratory

rate, it was reduced when subjected to PSV at times 0 and 15 min ($P<0.05$). V_E and V_T were significantly increased while at PSV, at all three times ($P<0.001$). There were no differences between the PSV and T-piece techniques for the values of MBP, SBP, DBP and HR. The comparison between PSV and T-piece techniques in patients with HD and NHD has shown that total HR values in patients with HD were significantly lower at time 30 min in PSV ($P<0.05$), with no significant difference in the other measurements. The HR was greater in NHD patients, both during PSV and T-piece ($P<0.05$). When comparing patients with HD ($n=11$) versus NHD patients ($n=9$), ST segment changes were observed more often in those with HD (64%) than in NHD patients (11%) ($P<0.05$). Arrhythmia occurred in 27% of the patients with HD and in 11% of those with NHD; sinus tachycardia was observed only in NHD patients, in five (56%) of them ($P<0.01$).

Conclusions When comparing PSV and T-piece techniques, the measurements of respiratory parameters and oxygenation displayed better results with the use of PSV. There were no significant differences in the measurements of cardiovascular and EKG parameters. When patients with HD and NHD were compared, a reduction in HR at 30 min on PSV was observed only in those with HD. Also, a greater number of ST segment changes, a smaller occurrence of sinus tachycardia and a trend toward a greater occurrence of arrhythmia in patients with heart disease were observed in both weaning modes.

P56 Heart rate variability in chronic obstructive pulmonary disease patients during bilevel positive airway pressure

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Objectives Ventilation by bilevel positive airway pressure (BIPAP) was applied in chronic obstructive pulmonary disease

(COPD) with the aim of increasing oxygenation, and reducing dyspnea and respiratory work. However, the positive pressure

may produce harmful effects on the cardiovascular system. The aim of this study was to evaluate the autonomic modulation of the heart by the heart rate response and heart rate variability analysis (HRV) during BIPAP ventilation in COPD patients.

Methods Seven patients aged 65.2 ± 6 years with $FEV_1 < 50\%$ predicted were selected for the study. The COPD diagnosis was based on the clinical history and spirometry test. The study protocol was approved by the Universidade Federal de São Carlos Human Ethics Committee. All patients were informed of the nature of the study and signed a consent document for participation (CNS no. 03/2000). The patients were submitted to clinical and resting electrocardiograph evaluation before the study. The experimental protocol consists of the collection of the heart rate beat to beat and RR intervals (RRi) (in milliseconds) using a cardiac rate meter (Polar-Vantage). Heart rate data and RRi were collected over a period of 10 min during rest in the supine and sitting positions. After this, the BIPAP (Respironics) was applied with inspiratory pressure (IPAP) of $14 \text{ cmH}_2\text{O}$ and expiratory

pressure (EPAP) of $6 \text{ cmH}_2\text{O}$, during 20 min with a nasal mask, and then HR and RRi values were collected. The data analysis evaluated the RRi values and HRV using the calculation of the RMSSD index of the RRi (in milliseconds), the square root of the mean sum of squares of the differences between the adjacent normal RRi in the record divided by the number of RRi within a given time minus one RRi. Data were analyzed statistically by the Friedman and Dunn test, with the level of significance set at $P < 0.05$.

Results There were no significant differences in the absolute results of RRi and HRV by the RMSSD index in different situations ($P > 0.05$).

Conclusion The results suggest that the BIPAP with pressures levels applied did not promote changes in the vagal-sympathetic control of the heart and in HVR. These procedures thus do not involve additional cardiovascular risks for the patients with COPD.

P57 Hemodynamic profile and vasoactive drugs in acute respiratory distress syndrome

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Introduction Acute respiratory distress syndrome (ARDS) is characterized by diffuse inflammatory response in the lungs with refractory hypoxemia. The maintenance of hemodynamic stability is a key point for tissue perfusion in this syndrome.

Objective To determine the hemodynamic profile and the response to vasopressor therapy in ARDS patients, and its relationship with mortality.

Materials and methods All patients who met American-European Consensus criteria for ARDS between January 1999 and

December 2002 were included in the analysis, dividing into survivors (SV) and nonsurvivors (NSV). The following data were collected prospectively: age, Acute Physiology and Chronic Health Evaluation (APACHE) II score at admission and at diagnosis, heart rate, mean arterial pressure, central venous pressure, mean pulmonary artery pressure, pulmonary artery occlusion pressure, systemic vascular resistance index and pulmonary vascular resistance index, left and right ventricular stroke work index, cardiac index, and doses of dopamine, dobutamine and norepinephrine, between the first and seventh days. The differences between groups were analyzed with a *t* test and considered significant with $P < 0.05$.

Table 1

| Variable | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | Day 7 |
|---|------------|------------|------------|------------|-----------|-----------|-----------|
| Heart rate | 100/119* | 106/115 | 104/112 | 94/112* | 96/110** | 91/114* | 98/102 |
| Mean arterial pressure | 91/88 | 93/92 | 92/94 | 98/92 | 97/94 | 91/92 | 103/93 |
| Central venous pressure | 10/12 | 12/15** | 14/14 | 13/14 | 14/15 | 13/15 | 15/15 |
| Mean pulmonary artery pressure | 29/30 | 28/32** | 31/32 | 29/32 | 30/30 | 27/31 | 30/27 |
| Pulmonary artery occlusion pressure | 10/10 | 10/11 | 10/11 | 10/11 | 12/11 | 12/12 | 11/10 |
| Pulmonary vascular resistance index | 434/441 | 343/437 | 326/413 | 321/404 | 288/373 | 295/391 | 296/336 |
| Systemic vascular resistance index | 1857/1616 | 1628/1549 | 1443 /1726 | 1529/1523 | 1415/1537 | 1330/1640 | 1573/1641 |
| Right ventricular stroke work index | 19/17 | 18/19 | 22/18 | 21/19 | 22/19 | 20/21 | 22/17 |
| Left ventricular stroke work index | 58/52 | 61/56 | 68/53** | 74/59** | 74/61 | 67/57 | 74/62 |
| Cardiac index | 4.4/4.5 | 4.6/4.6 | 5.2/4.5 | 4.7/4.6 | 5.1/4.8 | 4.6/4.8 | 5/4.5 |
| Dopamine ($\mu\text{g}/\text{kg}/\text{min}$) | 0.4/1.1** | 0.3/1** | 0.3/1** | 0.5/1.1 | 0.7/1.1 | 0.8/1.2 | 0.9/1.1 |
| Dobutamine ($\mu\text{g}/\text{kg}/\text{min}$) | 0.6/0.8 | 1.4/1.6 | 1.1/2.4 | 1/2.6 | 1/2.6 | 0.5/2.1 | 0.6/2.1 |
| Norepinephrine ($\mu\text{g}/\text{min}$) | 5.8/19.1** | 5.1/18.9** | 4.7/11.9** | 2.5/16.8** | 4.9/11.4 | 3.6/14.3 | 2/8.9 |

Data presented as survivors/nonsurvivors. * $P = 0.001$; ** $P = 0.05$

Results One hundred and ten patients met the ARDS criteria, of which 96 were managed with a pulmonary artery catheter and included in the analysis. In SV and NSV, the mean age was 36 ± 16 and 51 ± 19 years ($P=0.0001$), and the APACHE II score at admission was 16.6 ± 6.3 and 20.1 ± 8.3 ($P=0.031$) and that at ARDS diagnosis was 17.1 ± 5.5 and 22.3 ± 6.7 ($P=0.001$), respectively. The hemodynamic profile and doses of the vasoactive drugs are presented in Table 1.

Conclusions NSV were older and sicker according to the APACHE II score than SV, and they presented significant vasopressor dependency in the first 4 days. The absence of statistical difference in hemodynamics is probably due to purposeful interventions aimed to optimize the cardiovascular status of patients based on invasive hemodynamic data, and not related to the pulmonary artery catheter's inability to change patient outcome. The need for higher doses in the vasopressor reflects a vasodilatory state that could contribute to mortality.

P58 Mortality associated with invasive mechanical ventilation

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Introduction Few studies exist analysing the handling of acute respiratory insufficiency with invasive mechanical ventilation (IMV) and its correlation with mortality among the elderly intensive care unit (IUC) patient population.

Objectives To analyse the IMV association with mortality rate in patients in their seventh decade of life in a clinical ICU.

Methods A prospective cohort, enrolling 615 patients admitted to a clinical ICU in the period from July 2001 to August 2001, of which 70% were older than 65 years, were studied. Thirty consecutive patients older than 65 years needed IMV for more than 24 hours and were eligible for this study. The analysis was performed considering the following variables: clinical (age, gender, Acute Physiology and Chronic Health Evaluation [APACHE] II score, systolic blood pressure and cardiac frequency at the time of admission), laboratory (hematocrit, hemoglobin, leucocyte count, albumin and seric lactate) and mechanical ventilation parameters (length of IMV needed, FiO_2 , positive end expiratory pressure, static and dynamic compliance). The

significance level was 5%, using the Student *t* test, Pearson's correlation, the Kruskal-Wallis test, the Exact Fisher test, the Mantel-Haenszel test and analysis of variance.

Results The results showed a mean age of 79 ± 9.7 years and a preponderance of the male gender (58%). The mean APACHE II score was 16.7 ± 7.1 and the average time of requiring the IMV was 12.6 ± 8 days. Although the cohort mortality was 13%, this rate in patients submitted to IMV was 52%. Among all the variables studied, the following had a correlation with death: pulmonary septic shock ($P=0.01$), cardiogenic shock ($P=0.01$), inotropic drugs use ($P=0.01$), acute coronary syndrome ($P=0.01$) and cardiac failure during ICU hospitalization ($P=0.01$).

Conclusions In patients older than 65 years IMV was associated with significant mortality, and the inotropic drugs used, pulmonary septic shock, cardiogenic shock, acute coronary syndrome and the cardiac failure during ICU hospitalization were the only variables studied that were related with death.

P59 Automatic pressure support reduction is effective in weaning postoperative patients in the intensive care unit

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Automatic pressure support reduction based on a targeted respiratory frequency or MRV is disposable in the TAENA ventilator for an automatic reduction of pressure support during weaning of patients in the intensive care unit (ICU). We studied 23 patients (63.52 years) in the postoperative period (14 cardiac, two thoracic and seven abdominal surgeries) in a prospective, randomized protocol comparing automatic pressure support weaning with the traditional manual reduction of pressure support to 5–7 cmH_2O in our ICU. After arriving in the ICU after cardiac, thoracic or abdominal surgery, the patients were randomly assigned to traditional weaning consisting of manual reduction of pressure support (the pressure support was decreased every 30 min, keeping the RR/TV(L) <80 until 5–7 cmH_2O pressure support ventilation) or to the automatic pressure support reduction (MRV)

with a respiratory frequency target of 20/min (the TAENA ventilator automatically decreased the pressure support ventilation level by 1 cmH_2O every four respiratory cycles if the patient's RR was less than 16/min). Twelve patients were assigned to manual weaning whereas 11 patients were assigned to the automatic pressure support reduction weaning. The weaning mean time for the manual group was 3.18 hours while the weaning mean time for the automatic pressure support reduction group was 2.24 hours. There was no reintubation in both groups.

Conclusion The automatic reduction of pressure support is effective and without complications, and it can be useful for weaning patients in the postoperative period in the ICU.

INFECTION

P60 Prevalence of cytomegalovirus infection among patients in an intensive care unit

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Introduction Cytomegalovirus (CMV) is a frequent cause of illness in immunosuppressed patients. Patients in intensive care units (ICUs) are exposed to immunosuppressive-related factors and are prone to develop CMV infection and disease.

Objective To study the prevalence of active cytomegalovirus infection among patients in a general ICU.

Patients and methods ICU patients with at least 10 days of admission without an expected death in the following 48 hours and with positive anti-CMV IgG (enzyme-linked immunosorbent assay) antibody were included. Patients with known immunosuppression (AIDS, transplantation, cancer in chemotherapy) were excluded. Blood samples for detection of pp65 antigen in a 7-day mean interval were collected. The mean Sepsis-related Organ Failure Assessment (SOFA) score was assessed weekly during the patient permanency on the study.

Results Thirty patients with mean age of 67.9 ± 13.9 years were included, of whom 73% (22 patients) were male. The primary

diagnosis in the ICU was pulmonary infection in 10 patients (33%), cardiovascular disease in six patients (20%), neurological disease in six patients (20%) and other diagnosis in eight patients (27%). The mean general SOFA score was 7. Eighty-one samples for detection of pp65 were collected, a mean of 2.7 per patient. Five patients (16.6%) showed positive antigenemia in six samples (7.4%) (one patient presented two positive samples). The six positive samples mean were 5.5 ± 6.3 cells in 300,000 cells. The mean time of the ICU stay until the first sample became positive was 30.2 days. The mean SOFA score for patients with positive antigenemia was 8.5 versus 7 in patients without CMV active infection ($P=0.28$). CMV disease was recorded for one patient (pulmonary), treated with ganciclovir, although histopathologic confirmation was lacking.

Discussion Although patients in a general ICU setting are exposed to several immunosuppressive factors, the prevalence of CMV infection based in positive antigenemia in nonimmunosuppressed patients is low when compared with other immunosuppressed patient groups.

P61 Clinical usefulness of technetium (Tc)-99m-mononuclear leukocytes in the imaging of infectious lesions

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Nuclear medicine imaging of infection has two major indications: localization of a focus of infection in patients with fever of unknown origin; and the diagnosis of an infection in patients with localized symptoms, for example after surgery, when normal anatomy is absent or when metal implants prevent computed tomography or magnetic resonance imaging. Here we present the use of Tc-99m-mononuclear leukocytes in the imaging of 29 patients with infectious lesions (27 in hip prosthesis and two in lumbar spine). Autologous cells were labeled using a simple technique with

stannous chloride and Tc-99m-mononuclear leukocytes, previously described by us. The labeled cells were administered (444 MBq) and scans were carried out 1, 3 and 24 hours after injection. There were two cases where scintigraphies were negative and the biopsies were positive for infectious hip. All remaining cases were positive, indicating infections were present. These results may determine the future of this challenging and fascinating field and the role of nuclear medicine in the management of patients with infection/inflammation.

P62 Prediction of pneumonia in the postoperative period of cardiac surgery using the classification tree

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Background The classification and regression tree (CART) is an easier alternative to logistic regression as a predictor of the chance of bedside event occurrence, not requiring complex calculations.

Objective To assess the chance of predicting pneumonia using the CART model.

Patients A total of 1158 patients undergoing cardiac surgery in the Instituto Nacional de Cardiologia Laranjeiras and at the Hospital Pró-Cardíaco, in the city of Rio de Janeiro, from January 2000 to September 2002.

Study design A classical cohort.

Methods Data collected in the databank of the surgical intensive care unit, using the Gini index for selection of the variables with a stop rule based on misclassification and equal priors. The tree was constructed using Statistica 6.0.

Results The following variables were selected with cutoffs discriminated by the program with sensitivity and specificity of 90.63% and 63.23%, respectively.

Conclusions The model provides promising results, and should be validated and reassessed in subsamples or in a new sample.

P63 Preliminary results of a prospective randomized study comparing the effect of double-lumen central venous catheters impregnated with chlorhexidine and silver sulfadiazine with the standard on colonization

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Introduction Central venous catheters (CVC) are frequently used in the intensive care (ICU) setting. A wide number of strategies have been studied to prevent colonization and infection related to CVC. One of them is the use of antimicrobial-impregnated catheters, but no positive effect has been shown primarily for triple-lumen catheters.

Objective To compare the incidence of CVC colonization in two groups of patients using a double-lumen CVC impregnated with chlorhexidine and silver sulfadiazine, or the standard one.

Patients and methods Patients undergoing insertion of a double-lumen CVC in the ICU were randomized to receive either a VCV impregnated with chlorhexidine and silver sulfadiazine, or the standard one. The catheter tips were cultured by the roll-plate method after removal.

Results Sixty patients enrolled with successful insertion of 60 catheters, 24 of them impregnated (group 1) and 36 standards (group 2). There were no statistically significant differences between the groups in age, seven infection-related

risk factors, ICU diagnosis, mean Sepsis-related Organ Failure Assessment score, insertion sites, duration of catheterization, wrong location at X-ray, signs of allergy, and catheter colonization rates. The mean times of duration of catheterization in group 1 and group 2 were 14.5 ± 8.3 days and 13.8 ± 6.2 days respectively ($P=0.8$). The mean Sepsis-related Organ Failure Assessment scores in groups 1 and 2 were 5.4 ± 3.4 and 5.2 ± 3.3 , respectively ($P=0.8$). The colonization rates were 23.1% (six catheters) in group 1 and 29.4% (10 catheters) in group 2 ($P=0.5$). The impregnated catheters presented a trend of being removed more frequently due to systemic infection suspicion ($P=0.05$). Fifteen catheters presented Gram-positive cocci, four of them associated with Gram-negative bacilli and two with fungi. One catheter presented two Gram-negative bacilli in the roll plate.

Conclusion This preliminary analysis of the comparative study between a double-lumen CVC impregnated with chlorhexidine and silver sulfadiazine and the standard one did not show any statistically significant difference in colonization rates between the two groups.

P64 Resolution of *Staphylococcus aureus* (methicillin-resistant *Staphylococcus aureus*) osteomyelitis by oral linezolid

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The linezolid [1] spectrum of activity has provided a new venue to treat moderate to severe Gram-positive infections orally as well as using the intravenous methods. It has been recommended to avoid prolonged linezolid therapy because of reports of hematological toxicity, especially in thrombocytopenia. We present a case of osteomyelitis that has developed in the presence of vancomycin therapy, but improved when we changed to linezolid. On 8 August 2002, a 71-year-old woman with diabetes mellitus and hypothyroidism was submitted to a second coronary artery bypass graft surgery with a mammary-graft artery to the descending anterior coronary artery and two saphenous-veins grafts to marginal arteries, and also mitral valvuloplasty. Many weeks after this procedure her condition progressed to severe sepsis because of a large bowel ischemia associated with cytomegalovirus infection shown by colonoscopy visualization and biopsy. On this occasion, she further developed a right leg-wound cellulitis caused by *Staphylococcus aureus* (methicillin-resistant *Staphylococcus aureus* [MRSA]) that was treated promptly with vancomycin. Recurrence of staphylococcal signs of infection such as endocarditis was detected by transesophageal echocardiography with a vegetation of 0.96 cm shown on left coronary cusp, combined with reactive monoarthritis. After this new occurrence, vancomycin was reinstated again for 6 weeks longer. Improvement of the endocarditis was achieved but the patient deteriorated due to osteomyelitis in the left femur and sacral region. All of these were detected by gallium-67 citrate scintigraphy in spite of standard vancomycin therapy. Therefore,

we changed the therapeutic strategy to oral linezolid (600 mg twice daily) because of some difficulties to maintain safe vascular access [2]. An achievement of good outcome was shown by the second gallium-67 scintigraphy 5 weeks later. Furthermore, long treatment with linezolid was very well tolerated.

In conclusion, control of the bone infection with staphylococcus MRSA after a 5-week course of oral therapy with linezolid was attained. Treatment of osteomyelitis associated with a susceptible bacterial strain (MRSA) with this class of antibiotics taken orally appears to be safe, effective, and yielding a good outcome. Our case report supports the arguments of those who advocate the utilization of this kind of therapy, although there has not yet been consensus in the literature [3].

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P65 Microbiological predominance in an intensive care unit**MC Souza, GL Oliveira, V Michels Jr, A Marra, LF Aranha, SB Wey, E Knobel***Centro de Terapia Intensiva, Hospital Israelita Albert Einstein, Av Albert Einstein 627, CEP 05651-901 São Paulo, SP, Brazil
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Introduction It is of essential importance to be acquainted with the microbiological predominance profile (bacteria and fungi) in an intensive care unit (ICU), and with this to better lead the therapy offered to the patient, to guide the treatment, to establish the procedures, preventive actions and prolonged education, to influence clinical decision making, to understand problems connected to hospital contamination and to take administrative-directed decisions.

Objective Being acquainted with the predominance tendency and the fungal and bacterial profiles in the Albert Einstein Jewish Hospital Intensive Care Unit.

Table 1

| Place of collection | n | % |
|------------------------|-----|-------|
| Urine | 160 | 39.50 |
| Bloodstream | 88 | 21.72 |
| Airway secretion | 71 | 17.53 |
| Central venous line | 19 | 4.69 |
| Bronchoalveolar lavage | 13 | 3.20 |
| Peritoneal liquid | 9 | 2.22 |
| Skin | 6 | 1.48 |
| Pleural liquid | 5 | 1.23 |
| Incision infection | 4 | 9.87 |
| Other places | 30 | 7.40 |
| Total | 405 | 100.0 |

Materials and methods Data statistics analysis of bacterial and fungal cultures in the Albert Einstein Jewish Hospital Intensive Care Unit in the period of 1 January 2001–10 March 2003, totaling 405 samples.

Results See Tables 1 and 2.

Conclusion *Pseudomonas aeruginosa* predominance is very high. *Acinetobacter baumannii* and *Candida albicans* are similar to the worldwide literature. *Staphylococcus aureus* has a low value, in our point of view, due to the impact of medical actions, educative procedures and administrative rules inserted in the service.

Table 2

| Agent | n | % |
|-------------------------------------|-----|-------|
| <i>Pseudomonas aeruginosa</i> | 99 | 24.44 |
| <i>Enterobacteriaceae</i> spp | 61 | 15.06 |
| <i>Candida</i> spp. | 44 | 10.86 |
| <i>Enterococcus faecalis</i> | 34 | 8.39 |
| <i>Acinetobacter baumannii</i> | 33 | 8.14 |
| <i>Staphylococcus aureus</i> | 26 | 6.41 |
| <i>Staphylococcus epidermidis</i> | 25 | 6.17 |
| <i>Enterobacter cloacae</i> | 20 | 4.93 |
| <i>Serratia marcescens</i> | 7 | 1.72 |
| <i>Stenotrophomonas maltophilia</i> | 6 | 1.48 |
| <i>Enterobacter aerogenes</i> | 5 | 1.23 |
| Others | 45 | 11.11 |
| Total | 405 | 100.0 |

P66 Risk factors for catheter-related bloodstream infection in the intensive care unit**PF Branquinho, M Park, SF Costa, LM Cruz-Neto***Medical Intensive Care Unit, Hospital das Clínicas, Medical School, University of São Paulo, São Paulo, SP, Brazil
Critical Care 2003, 7(Suppl 3):P66 (DOI 10.1186/cc2262)*

Objective Catheter-related bloodstream infection is a major cause of morbidity and mortality in intensive care units (ICUs). The purpose of this study is to assess the risk factors associated with these infections.

Methods Thirty-one patients admitted to an ICU of our hospital were enrolled for a retrospective study. In these patients, a total of 64 central venous catheters were inserted. Data was collected and submitted to a univariate analysis.

Results The mean Acute Physiology and Chronic Health Evaluation score and age were 19 and 49 years, respectively. Sixteen patients were immunosuppressed, 24 patients were under mechanical ventilation and 10 patients died during the ICU stay.

The mean duration of catheter permanence was 9 ± 4 days. Among the catheters, eight were dual-lumen hemodialysis catheters, 12 were Swan–Ganz catheters and 44 were dual-lumen catheters. The sites of insertion were 37 in the internal jugular vein, 22 in the subclavian vein and five in the femoral vein. Fourteen dual-lumen catheters were the source of bloodstream infection. The majority of these infections involved Gram-positive aerobic organisms.

Conclusion In this study, some classical risk factors for catheter-related bloodstream infection were not found, but some new risk factors were identified. The technique of insertion and the care at the site of catheter insertion must be further assessed, seeking for the main risk factors for catheter-related bloodstream infection.

P67 Mobile septic intra-atrial masses in premature infants

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Introduction Mobile septic atrial masses are uncommon but severe complications in premature infants admitted to the neonatal intensive care unit. We describe eight premature infants with this diagnosis during an intensive care stay in our units.

Patients and methods We identified all premature infants with this diagnosis admitted to the Neonatal Intensive Care Units of Hospital Anchieta, HRAS and Hospital Santa Lúcia between 2000 and 2002.

Results Eight infants with gestational age of 27–35 weeks and birth weights of 1000–3040 g were identified. All of them had a diagnosis of a mobile intra-atrial mass attached to the septum (six cases), tricuspid valve (one case) or right atrial wall and catheter (one case) made by echocardiography. All of them used central venous catheters. Six of the infants had positive hemocultures for fungus and two were positive for coagulase-negative

Staphylococcus. All of them but one were treated with amphotericin B (22–72 days) and two were treated with vancomycin. Three premature infants received continuous heparin infusion, and one a full course of tissue-type plasminogen activator. One patient went to cardiomyotomy due to clinical deterioration and failure of clinical treatment. He died after surgery. The other death was due to septic complications after resolution of the mass with clinical treatment.

Conclusions Right atrial masses in premature infants constitute a diagnostic challenge (catheter-related thrombosis vs septic vegetations or 'atrial balls', or both). Due to a lack of adequate randomized trials, the choice of clinical or surgical treatment remains based on the description of a clinical series of cases. Despite the dramatic appearance, most patients do well with current treatment options.

P68 Polimixin B use in treatment of multidrug-resistant *Pseudomonas aeruginosa* infection

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Objective To describe the use of polimixin B as treatment of multidrug-resistant (MDR) *Pseudomonas aeruginosa* infection.

Method In this retrospective study we describe the features and demographic data of 27 patients with MDR *P. aeruginosa* treated with polimixin B, admitted to a private hospital medical and surgical intensive care unit (ICU).

Results Twenty-three patients (85.2%) were infected with MDR *P. aeruginosa*, confirmed with cultures and resistance tests, during the ICU stay. In greater part, they were isolated from respiratory and urinary tract infections (33.3% and 25.9%, respectively). Four patients were treated empirically, with 50% of therapy response. The study group presented a mean age of 63 years, 51.9% males, with a mean Acute Physiology and Chronic Health Evaluation II score of 24.63. Sixty-three percent of our patients were first admitted to the hospital with community-acquired infection, none caused by *P. aeruginosa*. The most frequent cause for ICU admission was communitarian or nosocomial respiratory tract infection (29.9%). The mean time of polimixin B use was

15.59 days. Twelve patients (44%) used imipinem, 12 patients (44%) used teicoplanin and three patients (11%) used vancomycin, for more than 3 days, during the ICU stay before polimixin B use. After treatment with polimixin B, we had 40.7% response and improvement and 59.3% death.

Conclusion After this series, we suggest that polimixin B can be a useful alternative for treatment of MDR *P. aeruginosa* infection.

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P69 Evaluation of mortality rate among patients submitted to a guideline for treatment of nosocomial pneumonia in the Intensive Care Unit of the Regional University Hospital, Londrina, Paraná, Brazil

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Background Nosocomial pneumonia is an important health problem that still generates great controversy and is the most common intensive care unit (ICU)-acquired infection with high mortality rate.

Methods To determine the incidence and mortality rates among in-hospital-developed pneumonia patients in an ICU with 10 beds of a university hospital, a 614 patient prospective sequential

analysis was performed from the period of June 2002 to January 2003. All patients had been treated in accordance with a guideline developed by the hospital's Infection Control Commission. For pneumonia diagnosis, the clinical criteria used by the Center for Diseases Control were adopted. For technical reasons, only 14 (8.4%) patients were submitted to bronchoalveolar lavage.

Results Among the 614 patients admitted to the ICU during that period of time, 60 (11%) developed nosocomial pneumonia and 55 (95%) had been submitted to mechanical ventilation support. The antimicrobial drugs utilized for treatment of these patients (defined in means of DDD by 1000 beds by day), were: cefepime, 4933.33; piperacillin/tazobactam, 3750.00; ciprofloxacin, 466.67; vancomycin, 8283.33; teicoplanin,

366.67; meropenem, 9066.67; imipenem, 950.00; and levofloxacin, 1666.67. Twenty-eight (46%) patients evolved to death.

Discussion In this present study, incidence and mortality rates did not differ from literature data, despite appropriate and early treatment of these infections.

P70 Hantavirus Cardiopulmonary Syndrome: report of four cases

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Hantavirus Cardiopulmonary Syndrome was first described in southwestern USA as a condition that involves mainly the lungs, leading to a high mortality rate (over 50%), caused by a new Hantavirus species. The pathology of this disease involves the direct viral damage of lung endothelial vessel cells, leading to leaking and alveolar inundation. Huge fluid expansion may lead to deterioration of pulmonary function and increased mortality. Therefore, one has to be cautious about fluid reposition, and treatment must take into account the use of vasoactive drugs.

We report four cases of such a syndrome admitted to our intensive care unit from December 2000 to March 2002. All patients came from the same county. They were rural inhabitants, living near rice and soybean storehouses that allow rodents entrance. The patients' age ranged from 31 to 57 years (median 36.5 years), and two of them were female. The initial symptoms (coughing, muscular pain, fever and dyspnea) set in from 48 to 96 hours before admission. Two patients required mechanical ventilation (and one of them also required the use of a pulmonary artery catheter).

Three patients survived (intensive care unit discharge before 1 week after admission). One patient died due to pulmonary atelectasis on the seventh day after admission.

Chest X-rays demonstrated in all cases mainly alveolar compromise, both bilateral and symmetrical, reminiscent of acute respiratory distress syndrome patterns in the latter stages. Blood sample serology confirmed the suspected diagnosis. Treatment consisted of general support, cautious fluid replacement and vasoactive drugs for the treatment of shock. We did not use ribavirin (although its use is well described in the literature).

In conclusion, diagnosis is based on high clinical suspicion, taking into account the epidemiological aspects that are highly important in such cases. Clinical manifestation is mainly noncardiogenic pulmonary edema, due to the direct endothelial vessel cell damage, leading to leaking and alveolar inundation. Huge fluid expansion may increase mortality. Use of a pulmonary artery catheter plays an important role in selected cases, in which fluid replacement can be targeted according to the pulmonary capillary wedge pressure.

P71 Mortality predictor parameters in infective endocarditis

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While the death rate associated with infective endocarditis (IE) remains high, the parameters for predicting mortality are poorly defined.

Through a retrospective study of 100 patients with IE based on Duke criteria, our group evaluated the clinical and echocardiographic factors that most strongly correlate with intrahospital mortality.

The study included patients with native valves and prosthetic valves as well as patients with congenital cardiac disease.

The results were obtained using the chi-square and Fisher exact tests.

We observed a positive relation between mortality and age ($P=0.005$), anemia ($P=0.047$), neurological events ($P=0.0006$), Janeway lesions ($P=0.0032$), number of abnormalities on echocardiography ($P=0.047$) and a tendency for a higher mortality related to cardiac heart failure ($P=0.105$), renal insufficiency ($P=0.093$), arthritis ($P=0.063$), mitral valve involvement ($P=0.062$), surgical indication ($P=0.076$), and cardiac abscess ($P=0.081$).

In conclusion, age, anemia, neurological events, number of echocardiographic abnormalities and Janeway lesions are strongly correlated with an increased mortality risk. The presence of cardiac heart failure, renal insufficiency, arthritis, mitral valve involvement, abscess and surgical indication show a tendency for the same correlation.

NEUROLOGY

P72 Traumatic brain injury: analysis of 64 cases managed in a general intensive care unit

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Background The modern management of traumatic brain injury (TBI) resulted in a significant reduction in mortality and functional deficit. These advances are imputed to the introduction of neurosurgical intensive care units (ICUs) and the implementation of guidelines to prevent secondary insult. However, in Brazil, most patients with TBI are managed in general ICUs. The results of the treatment of patients admitted to nonspecialized ICUs must be compared with those obtained in neurosurgical ICUs.

Objective We evaluated retrospectively a group of patients with TBI managed at a general ICU. Epidemiological aspects, severity evaluation, monitoring and the impact of therapeutic interventions were analyzed. The extended Glasgow Outcome Scale [1] was used to evaluate the long-term prognosis of patients discharged from the unit.

Patients All adult patients with TBI admitted to a general ICU from February 2000 to December 2002 were included. Patients who were discharged and those that died in the first 24 hours after admission to the ICU were excluded.

Measurements and results Thirty patients (46.9%) had a Glasgow Coma Scale of 3–8 on admission. The 10 patients that died in the ICU belonged to this group. Thirty-three patients were victims of motor vehicle accidents and 26 (40.6%) had major extracranial injuries. In 50 patients, tomographic results could be classified according to the Traumatic Coma Data Bank. Diffuse injury I (14 cases), diffuse injury II (14 cases) and nonevacuated

mass lesion (10 cases) were the most frequent findings. It was not possible to identify any impact of admission glycemia >110 mg/dl, PaO₂/FiO₂ and mean PaCO₂ in the first 72 hours on mortality. The intracranial pressure was monitored in six patients and the jugular bulb oxygen saturation in seven patients. The Glasgow Outcome Scale was evaluated in 40 (62%) patients. Assessment was carried out ≥6 months after the date of injury (median 29 months). Thirteen patients died, 10 while at the ICU. Sixteen patients made a good recovery; eight (20%) had moderate disability and three (7.5%) had severe disability. No patient remained in a vegetative state.

Conclusions Our results, compared with studies that analyzed patients managed at neurosurgical ICUs [2], demonstrated that patients with TBI admitted to a general ICU with resources to prevent and treat secondary injury have mortality and functional results after discharge comparable with patients managed at specialized ICUs.

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P73 Risk factors and impact of an acute confusional state in the postoperative period of cardiac surgery

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Background An acute confusional state (ACS) has been a frequent finding in patients undergoing cardiac surgery (CS), which, according to the literature, has resulted in a greater number of complications and in an increase in hospitalization and length of stay in the intensive care unit (ICU).

Objectives To assess the predisposing factors, the incidence and the influence of ACS in patients undergoing CS, and to assess the impact of ACS on the length of stay, morbidity, and mortality.

Case series and methods A classical cohort with data of 592 patients consecutively collected, 102 of whom had ACS undergoing CS from June 2000 to March 2003. Forty-six variables previously defined in the major prognostic indices in the literature were compared, and their correlation with ACS was analyzed. The statistical analysis comprised univariate analysis with the chi-

square test, Student *t* test, Mann–Whitney test, and Pearson test followed by logistic regression.

Results The univariate analysis showed significance of the following variables: chronic obstructive pulmonary disease ($P=0.03$), advanced age, and multiple organ dysfunction syndrome (MODS) score. After logistic regression, only the MODS score ($P=0.01$) and age ($P=0.005$) showed significance. In regard to length of stay in the ICU, the results were as follows: up to 3 days, 41.17% of the patients with ACS and 65.91% of those without ACS; from 4 to 7 days, 38.23% of the patients with ACS and 21.42% of those without ACS; and longer than 8 days, 20.58% of the patients with ACS and 12.65% of those without ACS, with significance ($P=0.00002$).

Conclusions ACS relates to age, MODS score, and longer length of stay in the ICU.

P74 Dissociative anesthesia with ketamine plus benzodiazepine in a prehospital setting: a retrospective analysis**BF Belezia, CT de Almeida, FL Ferreira, FB Carvalho, LFM Neves, MV Hermeto, RMJ Tassini, AD Moura***Emergency Medical Service, Belo Horizonte City, MG, Brazil
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Objective To analyse efficacy, safety and complications of dissociative anesthesia with ketamine plus benzodiazepine in a prehospital setting.

Materials and methods A retrospective series of 33 cases from January 1998 to December 1999, in which dissociative anesthesia with ketamine plus midazolam was used to provide anesthesia to prehospital trauma patients, most of them trapped in vehicles. A protocol was developed in 1997, and its use was the decision of the attending physician in patients with a revised trauma score 11 or 12. The data were collected from the patient form.

Results Ketamine was administered by intravenous route in 96.9% of cases. In 66.6% of the cases, patients received ketamine parallel to the extrication procedure. All patients became unconscious. The most frequent complications were agitation (9.09%), clonic eye movements (3.03%) and transient ventilatory depression (3.03%). None of the patients necessitated a definitive airway.

Conclusion Dissociative anesthesia with ketamine plus benzodiazepine is efficacious and safe in a prehospital setting, in patients with a revised trauma score of 11 or 12.

P75 Variability of care among neurological intensive care unit patients: the role of insurance coverage**HC Martins-Fadiga, GC Oehling, JP Ladeira, JA Karan, SA El-Dash, IM Lontakis***Hospital de Beneficência Portuguesa de São Paulo, São Paulo, SP, Brazil
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Background The Brazilian constitution of 1988 established universal access to the health services through the creation of the Unified System of Health (SUS). To our best knowledge there is not yet an evaluation of the quality of the services offered, in spite of the progress brought by this democratic proposal.

Objective To compare the mortality rate, predicted survival (Acute Physiology and Chronic Health Evaluation [APACHE] II), readmission rate, neurological intensive care unit (NICU) length of stay (LOS) and hospital LOS, and Glasgow Coma Scale (GCS) among SUS patients and those with private insurance.

Design, setting, and patients A prospective observational study of 200 neurological and neurosurgical patients admitted between April and October 2002 at a NICU located in São Paulo city's central area hospital. Subsets of this population were also studied: tumoral excision, aneurysm surgery, laminectomy, stroke, neurological intravascular procedures, GCS \leq 8, GCS $>$ 8 and GCS $>$ 14, and APACHE II mortality \leq 10 and APACHE II mortality $>$ 10. A bicausal analysis was made, and $P < 0.05$ was considered significant.

Results The LOS in NICU and in hospital was significantly higher for SUS patients. We found a significantly larger proportion of patients with a GCS \leq 8 in the SUS group. This trend was maintained in the majority of subgroups of patients studied. The predicted mortality (APACHE II), mortality rate, readmission rate, age, APACHE II score, proportion of clinical patients and emergency surgery rate was similar among the two main groups and in the majority of subgroups studied.

Conclusion Our data indicate a relationship between the insurance coverage and LOS (NICU and hospital). We also found a larger proportion of patients with reduced consciousness level, higher in the SUS group. These trends are maintained in the majority of subgroups studied, strongly suggesting a true variability in the process of care among the main groups studied. We believe that, at least in countries with similar health system structures, insurance coverage could play a substantial role in explaining care variability, and should be better studied.

P76 Use of dexmedetomidine beyond 24 hours in the intensive care unit**MG Rodrigues, DR Salgado, RNA Paiva, G Chindamo, LC Martins, JCR Verdeal***Critical Care 2003, 7(Suppl 3):P76 (DOI 10.1186/cc2272)*

Introduction Adequate sedation of critically ill patients is essential to ensure maximal quality of care in the high-stress environment of the intensive care unit (ICU). The main goals of sedation include augmentation of pain control, management of agitation and psychological distress, and improvement of patient tolerance and acceptance of the endotracheal tube and ventilatory support.

Dexmedetomidine (DEX) is a potent α_2 -adrenoceptor agonist with an $\alpha_2: \alpha_1$ ratio of 1300:1 that produces stable tranquility with rousability. DEX permits haemodynamic stability by effectively blunting both catecholamine and haemodynamic responses to endotracheal intubations, surgical stress, and arousal from anaesthesia.

Materials and methods A retrospective analysis of the data of 107 patients (54 surgical, 50 clinical and three trauma) admitted to a 27-bed general ICU from October 2000 to October 2002 was performed.

We evaluated DEX indication, time of usage and dosage, necessity of other sedating drugs, and reasons for DEX interruption.

Results The patient age average was 62.6 years and the Acute Physiology and Chronic Health Evaluation II score was 12.73. Indications for DEX were sedation for collaboration for weaning from mechanical ventilation, sedation of agitation in the ICU, adjuvant treatment of delirium and adjuvant to analgesia. The average dose used was 0.31 μ g/kg per hour (0.17–1.0), and the

loading dose was used in only four patients (3.73%). The reasons for interruption of DEX were: arterial hypotension, eight cases (7.47%); sinus bradycardia, three cases (2.80%); bradycardia + hypotension, two cases (1.86%); and weaning failure, 22 cases (20.5%). All cardiovascular events disappeared immediately after DEX interruption. The mean time of usage was 3.25 days (range 1–13 days). Concomitantly sedating drugs had to be used in 25 patients (23.3%): fentanyl in seven (6.54%), haloperidol in seven (6.54%), haloperidol + promethazine in four (3.73%),

midazolam in five (4.67%), and midazolam + fentanyl in one (0.93%).

Conclusions The use of DEX beyond 24 hours appears to be safe and effective for the sedation of ICU patients. The need for other sedating/analgesic drugs occurred in less than one-quarter of the patients and was well tolerated, with no extrapyramidal signs seen with antipsychotic drugs or no respiratory depression with opiates.

P77 Two-dimensional transcranial color Doppler: its role in subarachnoid hemorrhage

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Critical Care 2003, **7(Suppl 3)**:P77 (DOI 10.1186/cc2273)

Objectives The M-mode transcranial color Doppler technique became an important tool for neurointensivists in the followup of patients with subarachnoid hemorrhage and after its corrective surgery. Through the two-dimensional color Doppler (TDCD) technique we could obtain the same sort of information obtained with M-mode, but additionally it would be possible to visualize anatomically intracranial vessels. Therefore our purpose was to acquire color images from the intracranial vessels, the identification of arterial segments under vasospasm, and the recognition of aneurysms using the color Doppler technique.

Methods We used a two-dimensional color Doppler ultrasound with a 2MHz transducer. We obtained two-dimensional color images from the Circle of Willis, recording vessel velocities and analyzing the flow, resistance index and pulsatility index of patients admitted to the intensive care unit with subarachnoid hemorrhage. We used transtemporal, occipital and ocular windows in order to register the arterial flow. We defined vasospasm when mean velocities were higher than 120 cm/s. Images of vasospasm and probable aneurysms were recorded, and afterwards compared with cerebral angiography.

Results From May 2000 to August 2001, 16 patients were admitted to our surgical intensive care unit, where 13 were considered Fisher stage IV on head computed tomography scan. We diagnosed three aneurysms that were later confirmed by cerebral angiography. One was on the top of the basilar artery and the two others were in the middle cerebral artery. Arteries under vasospasm were also identified. Sixty-one percent of patients in Fisher stage IV had vasospasm initially diagnosed by TDCD and confirmed in the angiogram afterwards. Flow and velocities were recorded; these data helped us to understand and to use appropriate therapeutic intervention.

Conclusions There was technical feasibility on obtaining two-dimensional color Doppler images of intracranial vessels. There was no need to use contrast in the identification of the vessels. Immediate better management of cerebral vasospasm, including percutaneous angioplasty in selected cases, were possible thanks to color Doppler. Finally, good anatomical correlation between images from TDCD and angiography were also noted.

P78 Cerebral oxygen extraction during cardiopulmonary resuscitation (CPR) for ventricular fibrillation (VF) with and without assisted ventilation (AV)

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Critical Care 2003, **7(Suppl 3)**:P78 (DOI 10.1186/cc2274)

Introduction Recent studies have challenged the recommendation of assisted ventilation during the first 10 min of CPR for VF. They have shown that AV during initial CPR does not improve outcome and increases the procedural difficulty. The present study evaluated respiratory, cerebral and systemic oxygenation parameters in an animal model of 'bystander CPR' with and without AV.

Methods Fourteen dogs were randomized to two groups: group 1, VF without AV ($n=7$); group 2, VF with bag ventilation (15:2) ($n=7$). A 10-min CPR followed 1-min unassisted cardiac arrest. After CPR, animals underwent defibrillation and advanced cardiac life support. Blood samples from the cerebral transverse venous sinus and the pulmonary artery were collected for gas analysis and lactate. Ventilatory parameters were measured by a flow transducer.

Results There was no significant difference between groups in baseline measurements and successful CPR (three in each group). Systemic and cerebral oxygen extractions were significantly higher in group 2, although there was no difference in lactate between the groups. During CPR, PaO₂ and PaCO₂ were, respectively, higher and lower in group 2. There was no difference in the minute respiratory volume during the first 5 min of CPR. Thereafter, the minute respiratory volume decreased significantly in the group without AV.

Conclusions In this experimental model of CPR for VF, assisted ventilation (15:2) maintained higher arterial oxygen saturation and higher systemic and cerebral oxygen extraction but did not result in higher return of spontaneous circulation. After the first 5 min of CPR, AV maintained significantly higher ventilation and oxygenation parameters.

P79 Complications of monitoring of jugular bulb venous saturation

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Critical Care 2003, **7(Suppl 3)**:P79 (DOI 10.1186/cc2275)

Introduction Neurological monitoring is very important to change the prognosis of a critical neurological patient. The jugular venous bulb saturation is extremely important to evaluate the consumption and delivery of oxygen.

Objective To describe complications during insertion and the permanence period of a jugular venous bulb catheter.

Materials and methods A prospective, observational study of 21 patients from June 2000 to September 2002 in an intensive care unit. All patients were monitored with an intracranial pressure device. The jugular venous line was cannulated independent of which side. The catheter flow was sustained by continuous saline infusion (rate, 3 ml/hour). The monitor used was a VIGILANCE (Baxter). Complications observed were:

during insertion, arterial puncture, bleeding, and misplacement; during catheter permanence, obstruction and infection (daily examination); and after decannulation, thrombosis detected through Doppler examination, which was performed after 24 hours. All the catheter tips were sent for bacteriological examination.

Results The mean time of cannulation was 5 days. The thrombosis rate detected by Doppler examination was 31.6% (without clinical compromise). The catheter obstruction rate was 15.8% and the infection rate was 10.5%.

Conclusion Strict control with Doppler examination is very important to warrant optimal flow. The catheter must be changed every 5 days in order to avoid infection.

P80 Survey of severe head injury treatment in Brazil

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Critical Care 2003, **7(Suppl 3)**:P80 (DOI 10.1186/cc2276)

Introduction Head injury has been one of the most important public health problems, with high morbidity and mortality rates. In Brazil, the DATASUS (official government databank) reported 63,919 deaths caused by head injury during the year 2001. Increasing knowledge on traumatic brain injury physiopathology made possible the establishment of better guidelines for its treatment. However, there are no consistent data regarding the implementation of these guidelines in the management of head injury in Brazil.

Objectives To evaluate the treatment protocols of severe head injury in Brazilian intensive care units (ICUs).

Methods Between August 2002 and January 2003 a questionnaire was sent to 628 ICUs in Brazil. The data obtained were tabulated as categorical variables.

Results A total of 107 ICUs (17.3%) answered the questionnaire. From that total, 14 ICUs were excluded because they do not treat head injury patients on a regular basis. The results are presented in Tables 1–4, as the number and percentage of ICUs.

Conclusion A considerable number of Brazilian ICUs are still using treatment strategies that are no longer recommended by the actual medical literature (corticosteroids, routine hyperventilation, etc.). This fact claims for new campaigns and continued education for dissemination and implementation of the current guidelines on severe head injury management.

Table 1

| Use of corticosteroids | <i>n</i> | % |
|-----------------------------------|----------|----|
| Always | 5 | 5 |
| Never | 47 | 51 |
| Traumatic subarachnoid hemorrhage | 27 | 29 |
| HIV | 17 | 18 |
| Depressed skull fractures | 3 | 3 |
| Diffuse axonal lesion | 8 | 9 |
| Brain swelling | 8 | 9 |
| Intracranial pressure > 20 mmHg | 2 | 2 |
| Other reasons | 6 | 6 |
| Intracranial hypertension control | 13 | 14 |
| Use of corticosteroids (total) | 46 | 49 |

Table 2

| Intracranial pressure monitoring indications | <i>n</i> | % |
|--|----------|----|
| GCS < 9 with abnormal computed tomography | 60 | 86 |
| GCS < 9 with normal computed tomography + risk factors | 36 | 51 |
| Intracranial hematomas | 14 | 20 |
| Intraventricular hemorrhage | 17 | 24 |
| All listed indications | 5 | 7 |
| It was not informed | 3 | 4 |
| Other indications | 7 | 10 |

GCS, Glasgow Coma Scale.

Table 3

| Intracranial hypertension management | <i>n</i> | % |
|--|----------|----|
| Hyperventilation PaCO ₂ ≤ 25 mmHg | 45 | 48 |
| Mannitol | 86 | 92 |
| Thiopental | 59 | 63 |
| Furosemide | 20 | 22 |
| Volume restriction | 17 | 18 |
| Corticosteroids | 13 | 14 |
| Liquor drainage | 56 | 60 |
| Hyperventilation without intracranial pressure | 13 | 14 |
| Liquor drainage without PIC | 7 | 8 |

Table 4

| Management of severe head injury | <i>n</i> | % |
|---|----------|----|
| ICP monitoring | 62 | 67 |
| Capnography | 46 | 49 |
| Jugular bulb oximetry (SjO ₂) | 32 | 34 |
| Initial hyperventilation in all cases | 38 | 41 |
| Hyperventilation without SjO ₂ | 31 | 33 |
| Hyperventilation without capnography | 22 | 24 |
| Hyperventilation without ICP monitoring | 12 | 13 |
| Hyperventilation without capnography/SjO ₂ | 11 | 12 |
| Hyperventilation without capnography/ICP/SjO ₂ | 9 | 10 |
| SjO ₂ without ICP | 4 | 4 |
| It was not informed | 8 | 9 |

ICP, intracranial pressure.

QUALITY/HUMANIZATION

P81 Cutaneous integrity protocol for critical patients in the intensive care unit

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Critical Care 2003, 7(Suppl 3):P81 (DOI 10.1186/cc2277)

Background The occurrence of decubitus ulcers in the intensive care unit (ICU) is a significant comorbidity and reflects quality of care. In addition, it has great impact on the patient's quality of life. The skin is the first line of defense in protecting the body from constant changes in the environment. Far too often, the attention needed for keeping skin integrity is only realized after it has been disrupted.

Objective To evaluate the new cutaneous integrity protocol (CIP) implemented in our critical patients.

Methodology A total of 542 patients were studied (253 before and 289 after the initiation of the protocol) between May and October 2002 in a 24-bed medical/surgical ICU. Patients who received the new CIP care were submitted to pressure-reducing devices such as a pyramidal mattress, topic fatty acids after corporal hygiene, the Braden scale and changes in bed position as indicated by the Lowthien revolving clock.

Results Both groups were comparable regarding sex, age and origin of admission (*P*>0.05). In the group before implementation of the CIP 45.7% of patients were male and 48.6% were between 60 and 80 years old, whereas in the CIP group 63.1% were male and 73.7% were between 60 and 80 years old. The main sites of ulceration were, in order of importance: the sacrum region, the head, the auricular pavilion and the intergluteous fissure. The number of ulcers developed in the ICU decreased from 13.8% to 6.57% (*P*<0.05). The mean number of ulcers developed by patients was 2.49 versus 1.63 before and after the implementation of the protocol, respectively (*P*<0.05).

Conclusion These data suggest that simple and low-cost measures can significantly improve the quality of patient care in the ICU by reducing the occurrence of decubitus ulcers. All patients should benefit from a well-designed program to keep skin integrity and prevent the development of pressure sores.

P82 Transfusional practices: what have we learnt with Transfusion Requirements In Critical Care (TRICC)

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Introduction After the publication of the TRICC trial [1] almost 3 years ago, we expected transfusional practices to change, becoming more restrictive. However, since then no survey has been made in order to observe these practices in our intensive care units (ICUs).

Materials and methods We carried out a prospective and observational study on four general ICUs in João Pessoa-PB

during 4 months (9 January 2002 to 1 January 2003) in order to collect data concerning transfusional practices in critically ill patients. The data collected were: age, Acute Physiology and Chronic Health Evaluation (APACHE) II, vasoactive drug use, transfusion indication (hemoglobin [Hb] < 7 g/dl, acute bleeding with hemodynamic compromise [ABHC] or no specific motive), and number of transfused red blood units (RBU) per indication.

Results During this period, 614 patients were admitted to the ICUs. There were 121 transfusion indications (238 RBU) in 91 patients. The average age was 58.2 ± 21.8 years, and the mean APACHE II score was 20.3 ± 7.3 . Sixty percent were in vasoactive drug use, the mean Hb was 6.9 ± 1.9 g/dl, and 2.03 ± 1.01 RBU were transfused on average (total of 238 RBU). There was a specific motive in 91.7% of indications (57% because Hb < 7 g/dl, and 34.7% had ABHC). Ten (8.3%) of the indications did not have any specific motive and 14 RBU were used according to these indications. Patients who were less sick (APACHE II < 10) were transfused mostly with a specific motive (94.8%) ($P < 0.03$). In seriously ill patients (APACHE II > 20), low Hb (< 7 g/dl) was the most predominant indication (71.7%) ($P = 0.038$). More than three RBU were transfused mainly when there was ABHC (60%)

($P = 0.005$). When there was no specific motive, only 1 RBU was likely to be indicated (70%) ($P = 0.001$).

Conclusion The majority of transfusion indications were in agreement with the guidelines proposed by the TRICC trial. Transfusion indications without specific motives were most likely to be made in sicker patients (APACHE II > 20). These patients received only 1 RBU, in most cases.

Reference

1. Hebert PC, et al.: A multicenter, randomized, controlled clinical trial of transfusion requirements in critical care. *N Engl J Med* 1999, **340**:409-417.

P83 Quality of Life (QOL) improvement following catheter-based autologous bone marrow mononuclear cell transplantation (ABM-MCT)

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Background We have reported a pilot study of ABM-MCT to areas of ischemic myocardium [1], and in humans at 8 weeks follow-up after ABM-MCT ACC'03. The purpose of this study was to assess whether the changes in the QOL in patients with end-stage ischemic heart failure (ESIHF) submitted to catheter-based ABM-MCT persists in the 6 month followup.

Methods A prospective assessment of the QOL before and 8 and 24 weeks after ABM-MCT guided by the NOGA system, targeting hibernating myocardium in ESIHF, using the Minnesota Living with Heart Failure Questionnaire and the Medical Outcomes Study Short Form-36. The cardiac evaluation included Canadian Cardiovascular Society class, VO_2 max on the treadmill test, ejection fraction and end systolic volume on two-dimensional echocardiogram and total reversibility defect on MIBI-SPECT.

Results There were 14 patients (two females). The changes in parameters 8 and 24 weeks after the procedure are presented in Table 1. According to these objective data we observed a QOL improvement, based on the scores of Minnesota varying from 46 ± 19 to 30 ± 17 ($P = 0.002$) at 8 weeks and to 18 ± 14 ($P = 0.003$) at 24 weeks, and an increase of all eight dimensions of the Medical Outcomes Study Short Form-36 as presented in Table 2.

Conclusion The data suggest that ABM-MCT can improve the QOL of patients with ESIHF. Prospective studies with a greater number of patients will be necessary to confirm these initial data.

References

1. *Eur J Nucl Med* 2002, **29**:226A.

Table 1

| | Baseline | 8 weeks | P | 24 weeks | P |
|---------------------------------------|------------------|-----------------|--------|----------------|-------|
| Canadian Cardiovascular Society class | 2.64 ± 0.84 | 1.28 ± 0.61 | 0.0001 | 1.44 ± 0.5 | 0.003 |
| Ejection fraction | 30 ± 5 | 35 ± 8 | 0.029 | 32.4 ± 6 | 0.04 |
| End systolic volume | 147 ± 53 | 123 ± 48 | 0.02 | 139 ± 49 | 0.01 |
| VO_2 max | 17.96 ± 8.78 | 23.4 ± 8 | 0.01 | 24.4 ± 8 | 0.05 |
| Total reversibility defect | 15 ± 14 | 4.5 ± 10 | 0.02 | | |

Table 2

| Medical Outcomes Study Short Form-36 | Baseline | 8 weeks | P | 24 weeks | P |
|--------------------------------------|-------------|-------------|--------|-------------|------|
| BP | 39 ± 22 | 79 ± 27 | 0.0014 | 68 ± 30 | 0.03 |
| MH | 58 ± 21 | 74 ± 19 | 0.02 | 77 ± 20 | 0.02 |
| GH | 61 ± 19 | 77 ± 16 | 0.03 | 81 ± 21 | 0.05 |
| PF | 43 ± 26 | 68 ± 24 | 0.009 | 71 ± 26 | 0.03 |
| RE | 39 ± 49 | 58 ± 43 | 0.27 | 92 ± 15 | 0.06 |
| RP | 35 ± 42 | 65 ± 42 | 0.03 | 84 ± 27 | 0.06 |
| SF | 68 ± 26 | 74 ± 21 | 0.34 | 86 ± 14 | 0.04 |
| VI | 57 ± 22 | 74 ± 18 | 0.02 | 76 ± 19 | 0.08 |

P84 Quality of care in the intensive care unit: the sight of the family members

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Critical Care 2003, **7(Suppl 3):P84** (DOI 10.1186/cc2280)

Introduction In spite of new technologies and sophisticated monitoring, intensive care has been distant from humanization. To know anxieties and the perception of the family members of patients in the intensive care unit (ICU) can optimize the improvement of intensive care quality.

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

Results Forty-five families answered the questionnaire. The 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 min/day), in 26% (12) of the answers. Twelve (26%) of the families reported that the patients had not complained of pain and nine (20%) did report pain, most of

minimum intensity (66.6%) with quick relief after medication. There were two complaints (4.4%) of pain during blood examination sampling. Variations of temperature troubled seven (15.5%) of the patients. The visit period (30 min) was considered to be unsatisfactory by 18 (40%) of the families; 20 (44.44%) families suggested amplifying the visit period and the number of visitors. The medical attendance was qualified as 'very good' by 24 (53%) and 'good' by 21 (47%), and the nursing attendance was qualified as 'very good' by 12 (26.6%) and 'good' by 27 (60%). Unsatisfactory information provided by the nursing staff was the complaint of 14 (31.11%) families. Thirty-eight (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 of the quality and humanization.

P85 Haemoglobin behaviour in critical patients

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Purpose A haemoglobin decrease is common in critical patients. We investigated the haemoglobin behaviour in nonbleeding patients during the first week of stay in the intensive care unit (ICU).

Methods The study was retrospective and included 23 patients (16 men and seven women) in a seven-bed ICU from January to March 2001. Data were collected on days 1, 2, 4 and 7. We analysed the haemoglobin range and the possible causes related to it. We used the median and interquartile range to show the data.

Results Patients ages were 63 years (41.76 years), the Acute Physiology and Chronic Health Evaluation (APACHE) II score was 22 (16.32), and the body mass index was 24 kg/m² (23.28 kg/m²). Haemoglobin medians were: day 1, 12 g/dl (10, 13 g/dl); day 2, 11 g/dl (9, 13 g/dl); day 4, 11 g/dl (9, 13 g/dl); day 7, 10 g/dl (8,

13 g/dl) (Friedman $P < 0.001$, post-hoc $P < 0.05$, day 1 > day 2, day 4, day 7). Fluid balance between day 1 and day 2 was 586 ml (-263, 2129 ml). The most important haemoglobin reduction occurred between day 1 and day 2. Factors analysed were: age ($P = 0.369$; $R = 0.2$), APACHE score ($P = 0.05$; $R = -0.406$), body mass index ($P = 0.900$; $R = -0.005$), gender ($P = 0.007$; $R = -0.543$; women were the majority), and fluid balance ($P = 0.653$; $R = 0.105$). The mortality rate was 30.4% and was not related to haemoglobin fall ($P = 0.721$; relative risk = 1.012, 95% confidence interval = 0.946-1.084). There was a nonsignificant fall in white blood cells and platelets between day 1 and day 2.

Conclusions In our sample, we verified a major fall in haemoglobin between the first and second day of stay in the ICU. Female gender and, with least importance, the APACHE score were linked to a major fall in haemoglobin during the time of study.

P86 Chest roentgenogram (CR) performed as routine after thoracic tube withdrawal in heart surgery postoperatively (HS-PO): a useless examination?

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Background The CR has been used as routine in our hospital, after thoracic tube withdrawal in HS-PO. This study evaluates the utility of the CR after thoracic tube withdrawal.

Methods A retrospective study, in which 407 patients admitted to HS-PO with one or more thoracic tubes were evaluated. A total of 310 patients were submitted to coronary artery bypass graft and the other 97 patients were submitted to other cardiac surgeries. The incidences of pneumothorax and pneumomediastinum were evaluated, including clinical re-percussion, the treatment used, and the relationship with thoracic tube withdrawal.

Results Thirteen patients (3.17%) had a diagnosis of pneumothorax in HS-PO. Five patients had a pneumothorax diagnosis at a later time (6 days), related to central venous catheterization (subclavian vein). Eight patients (1.9%) had the diagnosis related to surgery and thoracic tube withdrawal. In two of these patients, an air escape through one or more tubes were previously detected. In two other patients, subcutaneous emphysema was detected before the tube withdrawal. Three other patients had dyspnea, chest pain and low oxygen saturation after tube withdrawal and before the roentgenogram. One of these last three patients also presented subcutaneous emphysema. These seven patients were submitted to pneumothorax treatment using a

'pig-tail' catheter. The eighth patient, despite having no signs and symptoms that could suggest any complication, had a pneumothorax diagnosed by roentgenogram, performed after thoracic tube withdrawal. This patient was kept in observation and was dismissed from hospital 6 days after surgery. Among the eight patients, two did not have the complication diagnosed by roentgenogram, but through thorax computed tomography.

Conclusion Among the 407 patients included in this study, CR was not essential for an early detection of complications after thoracic tube withdrawal in CS-PO. From the eight patients who had a pneumothorax diagnosis (1.9%) related to surgery and tube withdrawal, seven presented some kind of symptom suggesting the necessity of doing the examination. In only one patient did the examination detect the complication without any previous sign or symptom. We suggest a similar evaluation in other surgical intensive care units.

P87 Intrahospital transport of critical ill patients: is it a safe procedure?

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Introduction Intrahospital transportation of mechanically ventilated patients is a recognized high-risk situation. Our objective was to determine whether transportation could be safely performed using a defined transport routine.

Methods Between February and March 2003, all mechanically ventilated patients who needed transportation out of the intensive care unit (ICU) were included. All transports were done using a microprocessed ventilator (Microtak 920 plus-Takaoka®, São Paulo, Brazil) and an oxymeter, noninvasive arterial blood pressure and an electrocardiography monitor (M.3000-Morrrya®), together with a transport team composed of a physician, a nurse and a physiotherapist. Hemodynamics and respiratory parameters were measured immediately before disconnection from the patient's basal ventilator (BT) and, after returning to the ICU, immediately before disconnection from the transport ventilator (AT). All the complications during transport were registered. Statistical analysis was carried out using variance analysis and the paired Student *t* test. Results were considered significant if $P \leq 0.005$.

Results We studied 33 transports of 22 patients (eight female and 14 male) with a mean age of 46.6 ± 15.7 years. The main

causes of ICU admission were trauma (42.4%) and elective neurosurgery (24.2%). Patients with pulmonary disease comprised 42.4% of all the transports. Patients were ventilated with positive end expiratory pressure higher than 5, with $FiO_2 > 0.5$ or were using vasoactive drugs before transportation in 24.2%, 24.2% and 33.0% of the cases. The mean duration of the transport was 43.4 ± 18.9 min and performing a tomography was the reason in 96.9% of the cases. Complications occurred in only 27.3%, mainly (72.7%) agitation easily treated with an increase in sedation. A significant decrease in CO_2 was found (BT, 46.6 ± 15.7 and AT, 38.75 ± 16.14 ; $P=0.005$) together with a trend towards a better PO_2/FiO_2 ratio (BT, 303.6 ± 137.4 and AT, 346.4 ± 126.7 ; $P=0.06$). There was a trend towards an increase in cardiac rate (BT, 80.96 ± 18.7 and AT, 85.45 ± 17.6 ; $P=0.08$) with no significant changes in mean arterial blood pressure ($P=0.93$).

Conclusion These results suggest that intrahospital transport can be safely performed. Our low incidence of complications is possible related to the presence of a multidisciplinary transport team together with proper equipment to monitor vital functions and close control of the patient's ventilation.

P88 Evaluation of patients with acute leukemia admitted to an intensive care unit

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Introduction Patients with acute leukemia often confront themselves with critical illness during the course of their disease. Intensive care unit (ICU) admission of such patients carries a significant mortality. The mortality rate of critically ill patients with acute leukemia may be higher than 80%.

Objective To evaluate prospectively the characteristics of acute leukemia patients admitted to an ICU.

Materials and methods During the period from January 1998 to December 2002 we evaluated patients with the diagnosis of acute leukemia admitted to a medical-surgical ICU of a 560-bed tertiary hospital in southern Brazil. The variables evaluated were: age, Acute Physiology and Chronic Health Evaluation II score classification, time of mechanical ventilation, time from ICU admission to shock, admission time before admission to the ICU,

length of stay in the ICU and total hospital length of stay, incidence of septic shock, use of invasive hemodynamic monitoring through a Swan-Ganz catheter, and ICU and hospital survival. Statistical analysis was performed with the SPSS 11.0 software package using a *t* test and Kruskal-Wallis statistics where appropriate, with a significance level set at 5%.

Results In the period from January 1998 to December 2002 there were 44 patients admitted with a diagnosis of acute leukemia. The findings obtained from these patients were compared with those of 1753 patients without the diagnosis of acute leukemia admitted to the ICU in the same period. In the acute leukemia group, the mean age was 48 ± 18 years, the mean Acute Physiology and Chronic Health Evaluation II score at admission was 22.7 ± 6.4 , and the incidence of septic shock was 34.1%, with an overall ICU survival of 18%. Summarized data are presented in Table 1.

Table 1

| Characteristics | Leukemia | Control | P |
|---|-------------|-------------|--------|
| Age (years) | 48 ± 18 | 56 ± 19 | < 0.05 |
| Acute Physiology and Chronic Health Evaluation II score | 22.7 ± 6.4 | 16.2 ± 8.6 | < 0.01 |
| Septic shock (%) | 34.1 | 31.4 | NS |
| Time until shock (days) | 1.4 ± 3.2 | 0.8 ± 4.4 | NS |
| Swan–Ganz (%) | 45.5 | 20.1 | < 0.05 |
| Time of mechanical ventilation (days) | 6.1 ± 8.3 | 6.9 ± 16.7 | NS |
| Admission time before the ICU | 11 ± 11.4 | 10 ± 18.9 | NS |
| ICU length of stay | 7.7 ± 9.7 | 10.4 ± 17.4 | NS |
| Hospital length of stay | 23.9 ± 20.1 | 30.7 ± 37.3 | < 0.05 |
| Survival in the ICU (%) | 18 | 56 | < 0.01 |
| Survival in the hospital (%) | 18 | 47 | < 0.01 |

Values expressed as mean ± standard deviation. ICU, intensive care unit; NS, not significant.

Conclusions Patients with acute leukemia admitted to an ICU present an elevated risk of death, despite the progress in the care of critically ill patients achieved in recent years. The ICU admission of acute leukemia patients remains a controversial issue, based on conflicting data in the literature [1,2]. Because there is no survival prediction tool accurate enough to evaluate these patients, their admission to an ICU must be dependent on an individualized assessment of the current critical illness.

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P89 Toward a new frontier on economic and technologic assessment in intensive care: the role of ethics

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Intensive care historical development is always related to increasing high technological patterns and, as consequence, increasing financial costs. Economic and technological assessment of intensive care units has therefore become a very important analytical tools for efficient management of this kind of therapy.

The mainstream of the literature about economic and technological evaluation analysis focuses on technological innovation and, on the other hand, on cost containment. Our aim in the present article is to discuss the way in which ethical dimension should be incorporated to economic and technological evaluation analysis. In such a perspective the question is: How can ethical dimension be

an endogeneous part of those evaluations, and a ground for decision making in intensive care procedure?

Our critical view over the mainstream of this specialized literature refuses both the analytical reduction from a wide view of technology to a simple absorption of technical innovations, and also the reduction from a extensive view of economy to a simple matter of cost containment. We think that the ethical dimension can integrate those evaluations analysis and render possible a solid management of the process of the intensive care unit. We are sure this process could not be reached by a nonintegrated evaluation analysis. So, in that perspective, ethics can be the link between investments, costs and technological innovation in intensive care therapies.

P90 Evaluation of the patients refused admission into the intensive care unit: the lack of public beds

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Introduction In the past 5 years we have observed a progressive increase in nonmet demands of intensive care unit (ICU) beds. Most referrals to the ICU are emergencies or prebooked surgical cases. Some patients are refused admission because the units are full. The objective of this work is to identify the frequency of refused admission due to the lack of beds, the waiting time for admission, and the evolution of those patients.

Materials and methods Data of all referrals consecutively made to the HURNP's ICU collected daily for a year (February 2002–February 2003) were collated. The referrals were

categorized into clinical and surgical. The referrals criteria adopted was the hierarchy through a request order. The statistics was carried out through the Epilinfo program.

Results Throughout the observation period 1210 referrals to the ICU were made, 43.7% of patients being immediately admitted. Out of 681 referrals initially refused, 49.8% of the surgical cases were admitted and 312 clinical referrals were refused because of the lack of beds. The surgical referrals made were major elective surgeries that were prebooked ranging from 1 to 7 days. Of all clinical patients initially refused, 11.9% were cancelled due to

patients' clinical recovery; of the remaining 275 patients, 62.9% were admitted, 37.1% were never admitted into the ICU, and 8.4% died before an available bed. Of clinical patients later admitted into the ICU, 25% had a waiting time longer than 1 day. Their age median was 63.5 years (45–72 years), 60.1% being from the Emergency Room and the rest from the wards. Most clinical patients (24%) were diagnosed as having severe sepsis, and 31.8% were in mechanical ventilation when the referral was made. The mortality of patients admitted into the Emergency Room waiting for a bed in the ICU was no higher than those of the ward ($P=0.37$).

Conclusion In this population, 56.3% of the demand for ICU beds was not admitted immediately. The waiting time for admission ranged from 1 to 10 days. Fifty-five patients stayed longer than 1 day on mechanical ventilation outside the ICU. The mortality among the referrals expected to be about 60% was smaller than the ICU overall mortality (31.85%). This suggests that probably some patients reported as a ward evolution actually died. We suggest a study to analyse the need of adult ICU beds for this population, and the development of triage criteria.

PROGNOSIS

P91 Choose the prognostic index for patients with dialytic acute renal failure in the intensive care unit

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Objective To study APACHE II and Acute Tubular Necrosis Individual Severity Score (ATN-ISS) discrimination and calibration with the aim of choosing the prognostic rate for patients in dialytic acute renal failure (ARF), for routine use in our intensive care unit (ICU).

Method A retrospective study was carried out, based on data collected from patient's records (those treated in the ICU of Israel Hospital Albert Einstein). The study comprised 81 patients with dialytic ARF, treated from 1 January 1996 to 31 December 1998. Age, sex, origin, length and type of internment, associated chronic pathologies, intervals for dialysis indication, APACHE II and ATN-ISS scores and the hospital mortality were all analyzed.

Outcome The prognostic scores APACHE II and ATN-ISS were carried out on the day of the realization of the first dialysis. The

average age was 69, 14.72% were men and the mortality rate was 69%. In the survivors group there were 25 patients and 56 patients evolved for death internment. Both groups presented very similar characteristics, regarding the average prognostic scores and demographic data, differing only in time of hospital stay which was significantly longer in the survivors. Out of the evaluated prognostic scores, only the risk of death (APACHE II) presented a statistically significant difference among the survivors and non-survivors. The risk of death (APACHE II) and the ATN-ISS presented good discrimination. For the calibration, the risk of death underestimated the mortality in the lower tierces of seriousness significantly, while the ATN-ISS underestimated the mortality in all tierces of seriousness, although without significant difference.

Conclusion It is possible to use both scores in our ICU, however by its easy obtainment we have opted to use the ATN-ISS score.

P92 Prognostic risk markers at 180 days in patients with ischemic heart syndrome without ST elevation

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Background For identification of cardiac prognostic risk markers in the emergency room, in patients with ischemic heart syndrome without ST elevation, it is important to choose the best and most cost-effective therapeutic strategy.

Aim Evaluation of clinic, laboratorial and eletrocardiographic prognostic markers in nonselected patients with acute ischemic syndrome without ST elevation admitted to the emergency room.

Methods A prospective study took place from June 1998 to March 2000, with 124 patients with acute ischemic syndrome without ST elevation admitted to the emergency room of a tertiary hospital. Most

patients were male (58%), with an age average of 68.9 ± 12.3 years; 62.9% have had previous coronary heart disease.

Results Left ventricular heart failure was the most important prognostic risk factor for events, with a relative risk of 3.16 (95% confidence interval, 2.28–4.04). Troponin did not indicate risk, with a relative risk of 2.14 (95% confidence interval, 0.95–3.32).

Conclusion Left ventricular heart failure was the best risk marker of events in this population, which was older and had a higher incidence of previous coronary disease than the average.

Table 1

| Risk factors | Relative risk (95% confidence interval) | Positive likelihood ratio | Negative likelihood ratio |
|--------------------|---|---------------------------|---------------------------|
| Left heart failure | 3.16 (2.28–4.04) | 4.28 | 0.8 |
| Troponin I | 2.14 (0.95–3.32) | 2 | 0.75 |

P93 Association of cardiovascular disease with critically elderly patients' mortality

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Background The mortality of elderly patients who are admitted to intensive care units (ICU) has been the aim of some recent studies. However, there are few works that present the association of cardiovascular disease with the mortality of these patients.

Objective To show the association of previous cardiovascular diseases and/or cardiac failure with the mortality of elderly patients who are considered critically ill during the ICU stay.

Methods Study of a prospective cohort enrolling 1120 patients admitted to a clinical ICU in the period from April 2000 to December 2002, in which 62 patients who had septic shock and hemodynamic monitoring with a pulmonary artery catheter were included. The mortality was analysed by correlating it with age and with the patients who had previous cardiovascular disease or acquired cardiac failure during the septic shock ($n=40$), lack of previous cardiovascular disease and/or acquired cardiac failure ($n=22$), and previous cardiovascular disease ($n=34$). The significance level was 5% using analysis of variance, and a descriptive analysis was performed.

Results The Acute Physiology and Chronic Health Evaluation mean score was 20 ± 5.28 (range 8–29). The mean age was 80 ± 7.43 (range, 65–96) and its influence on these patients' mortality was not significant ($P=0.31$). The presence of the previous cardiovascular disease and/or cardiac failure ($P=0.001$) and of the previous cardiovascular disease ($P=0.001$) showed a relevant correlation with mortality, while the lack of the previous cardiovascular disease and/or acquired cardiac failure presented a correlation with ICU discharge ($P=0.013$).

Conclusion The age itself did not affect the mortality of the critically ill elderly population. The presence of cardiovascular disease seems to play an important role in the elderly patients' mortality.

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P94 Incidence of hypomagnesemia in the emergency room

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Introduction The importance of magnesium as an essential nutrient in health and disease has been recognized for many years [1]. Our previous studies showed the presence of a high incidence of hypomagnesemia in critically ill patients [2]. The aim of the present study is to assess the incidence of hypomagnesemia in the patients admitted to the Emergency Department.

Methods One hundred patients admitted to the Emergency Department of Clínica São Vicente were studied. All patients had serum electrolyte concentrations measured at admission. Correlation between electrolyte levels was obtained by linear regression.

Results The finding of hypomagnesemia was found to correlate significantly with hypocalcemia ($r = 0.2098$, $P = 0.038$), with hypophosphatemia ($r = 0.3244$, $P = 0.001$), and with hypokalemia ($r = 0.253$, $P = 0.012$)

Conclusions Low magnesium concentrations are common in patients admitted to the Emergency Department. The presence of hypomagnesemia is associated with hypocalcemia, with hypophosphatemia, and with hypokalemia.

Table 1

| Electrolyte | Incidence (%) |
|------------------------|---------------|
| Hypomagnesemia | 33 |
| Hypocalcemia (ionized) | 14 |
| Hypophosphatemia | 13 |
| Hipokalemia | 8 |
| Hiponatremia | 2 |

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P95 Identification of subgroups with long length of stay in surgical intensive care units among patients undergoing surgical cardiac valve replacement based on preoperative, peroperative, and postoperative variables

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Background The identification of subgroups of patients with long length of stay in surgical intensive care units (SICUs) may

avoid inadequate management, as well as an increase in morbidity and costs. Fast track flowcharts are available in the

literature, but they do not refer to surgical cardiac valve replacement (SCVR).

Objectives To identify first postoperative day (FPOD) markers for length of stay in the SICU using preoperative, perioperative, and FPOD variables.

Case series and methods A classical cohort with data consecutively collected in a private SICU from June 2000 to February 2003 (group B, 121 patients), and in a public SICU from January 2001 to February 2003 (group A, 326 patients). All 46 variables were previously defined according to the major prognostic indices in the literature and were correlated with the length of stay in the SICU as follows: group A, <3 days; group B, 4–7 days; and group C, >7 days. A classification and regression tree (CART) (using the Gini index with a FACT stop rule of 0.10 and equal priori) was created and followed by pruning based on misclassification and crossvalidation.

Results Based on the CART, 16 relevant variables were selected. The model had an accuracy of 69% for group A and 80% for groups B and C. Analyzing patients with length of stay in the SICU up to 7 days, the accuracy increased to 87%.

Conclusions The CART may provide interesting solutions regarding patient allocation and also quality assessment. Variables (ranking): age (100), FPOD multiple organ dysfunction syndrome (MODS) score (55), FPOD blood drainage (95), patient's sex (44), Rio score (89), FPOD Sepsis-related Organ Failure Assessment score (43), FPOD creatinine (86), alveoloarterial O₂ tension gradient >250 (42), left atrial length on ECHO (84), perioperative fluid balance (41), extracorporeal circulation duration (83), body mass index <20 (39), perioperative arterial bicarbonate (81), reoperation (37), FPOD epinephrine >0.1 or norepinephrine >0.1 (68), and age 0–64, 65–74 (35).

P96 Metabolic acidosis and organ dysfunctions in critically ill patients

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Objective Metabolic acidosis (MA) is common in critically ill patients. We characterize MA, analyse two methods of evaluation and correlate it with multiple organ dysfunction using the highest value of the Sepsis-related Organ Failure Assessment score of 5 days (SOFAm).

Methods We evaluated 29 patients at admission and 24 hours later. Vital signs and laboratorial values were recorded and analysed through the classic methods and Stewart's method. The anion gap (AG), strong ion gap (SIG) and base excess (BE) were correlated with the SOFAm using univariate and multivariate methods. Medians, interquartile ranges and a Bland–Altman diagram were used.

Results The Acute Physiology and Chronic Health Evaluation II score was 16 (13,19). Lactate represented 8–21% of anions. The

AG correlated with the SIG ($r=0.98$, $P<0.001$), but the Bland–Altman bias was 7.9. The SIG and AG at entrance did not correlate with the SOFAm ($r=0.364$ and $r=0.352$, $P<0.05$). BE at entrance and 24 hours later demonstrated inverse correlation with the SOFAm ($r=-0.670$ and $r=-0.620$, $P<0.001$). Multivariate analyses demonstrated that BE at entrance was the best predictor of multiple organ dysfunction (coefficient $\beta=-0.416$, $P=0.017$).

Conclusions Lactic acidosis is not the major factor responsible for MA in critically ill patients. BE is the best predictor of multiple organ dysfunction when compared with the other methods used, and is less demanding.

P97 Use of Acute Physiology and Chronic Health Evaluation II in nontraumatic neurological intensive care patients: calibration and discrimination analysis

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Context The Acute Physiology, Age and Chronic Health Evaluation (APACHE) II model has been extensively used since its publication in 1985, and there is a recommendation from the Ministry of Health for its use in Brazilian intensive care units. The severity scoring systems were developed to describe populations of intensive care patients from the perspective of gravity of disease. To meet this objective it is necessary to analyze the capacity of the scoring systems to describe the population in which they are to be used.

Objective To analyze the calibration and discrimination properties of the APACHE II severity score system in nontraumatic neurological intensive care unit (NICU) patients.

Design, settings and population A prospective study of all nontraumatic neurological patients admitted to two NICUs at two tertiary care level hospitals located in São Paulo city metropolitan area, between March 2002 and February 2003. The patients were followed until death or hospital discharge.

Statistical analysis The area under the receiver operator characteristic curve was used to analyze discrimination and calibration through a Hosmer–Lemeshow goodness-of-fit test.

Results There were 499 nontraumatic neurological patients admitted in the study period, with a mortality rate of 7.6% and a total standardized mortality ratio of 1.20. The neurosurgical patients were responsible for 76.9% of admissions (8% of emergency surgery); 52.3% of the neurological patients and 39.5% of neurosurgical patients were classified (using the APACHE II classification system) as other neurological/neurosurgical disease as the main diagnosis cause of admission. The discrimination was found to be excellent and the inclusion of the admission cause diagnosis did not appear to increase the discrimination further (area under the curve of 0.932 for APACHE II score and of 0.925 for APACHE II mortality). However, the goodness of fit was not adequate (18.73; $P=0.02$; 8 degrees of freedom).

Conclusion The APACHE II method showed an excellent discrimination and an inadequate calibration in this nontraumatic NICU population. A total 42.6% of patients were classified as

'other neurological/neurosurgical disease' as the main cause of admission, which could give room for improvement of the method.

P98 Mortality and length of stay (LOS) in the postoperative unit of cardiac surgery (POU) in patients with myocardial infarction (MI) undergoing myocardial revascularization (MR) surgery

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Background The impact of mortality and LOS in the POU of patients with MI undergoing MR surgery remains controversial.

in the major prognostic indices of the literature were compared. The statistical analysis comprised univariate analysis, chi-square, Fisher exact, Mann-Whitney, and Pearson tests.

Objectives To assess the mortality and LOS in the POU of patients undergoing MR, who had MI on admission or more than 28 days before admission.

Results Groups A and B showed no difference with regard to inhospital mortality (14.6% group A vs 9% group B, P =not significant). Group A patients had a greater incidence of emergency MR (46.8%) than did group B patients (6.6%) (P =0.001).

Case series and methods A classical cohort of patients undergoing MR admitted to the POU from July 2000 to March 2003. The mean age was 66 years (38–88 years). The median LOS in the POU was 3 (0–87). Ninety-five patients were divided into two groups: MI on admission (group A, 47 patients), and MI more than 28 days before admission (group B, 48 patients). The MR was classified as emergency and nonemergency. Forty-six variables previously defined

Conclusion In this small case series no correlation between MI on admission and mortality or length of stay in the POU was observed, although a greater incidence of emergency MR was found in group A.

P99 The impact of nutritional support on morbimortality of critically ill patients

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Introduction Although the benefits of nutritional support have been demonstrated in cellular and animal studies, the effects on patient morbidity and mortality have been less evident.

incidence of nosocomial pneumonia and other infectious complications.

Objective This study analyzes the influence of nutritional support on morbidity and mortality of critically ill patients.

Results In the study period, 612 patients were admitted to the ICU. Ninety were included in the study, 37 patients in group A and 53 in group B. There was no difference between the two groups with respect to mortality (relative risk [RR]=1.21; 95% confidence interval [CI], 0.70–2.07; P =0.40), nosocomial pneumonia (RR=1.22, 95% CI, 0.74–2.01; P =0.44) and other infectious complications (RR=0.99; 95% CI, 0.60–1.62). On the other hand, analysis of group C and group D showed a tendency for reduced mortality (RR=1.74; 95% CI, 0.69–4.39) and other infectious complications (RR=0.58; 95% CI, 0.25–1.34) in group C.

Methods Included in the study were all patients admitted to a 13-bed general intensive care unit (ICU) in the period from 1 June 2000 to 31 July 2001 who remained in the ICU for at least 7 days and who received at least 4 days of nutritional support (parenteral or enteral). Patients were classified into two groups according to calories received in the study period (7–10 days after admission): group A, patients who received at least 70% of their resting energy expenditure; and group B, patients who received less than 70%. Patients were also classified according to calories received on the third ICU day: group C, those patients who on the third day received 70% or more of the resting energy expenditure; and group D, those patients receiving less than 70%. We analyzed the length of stay in the ICU, mortality,

Conclusion In this study, as in many other published studies, it was not possible to demonstrate that nutritional support has a positive influence on morbidity and mortality of critically ill patients. However, the observed tendency to a lower morbimortality in those patients that received adequate nutrition on the third ICU day is consistent with findings in other studies.

P100 High impact of Sepsis-related Organ Failure Assessment score on mortality prediction of patients undergoing valve replacement on the first postoperative day

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Background International prognostic models for surgical cardiac valve replacement (SCVR) are rare, elaborated by Edwards and colleagues as the most recent and important score [1]. However,

that score was based on patients with North American demographic and epidemiological characteristics. Most scores for SCVR consider only preoperative variables.

Table 1

| Characteristic | Odds ratio | Score |
|--|------------|-------|
| Combined valvular surgery | 1.98 | +1 |
| Left atrium > 60 mm | 2.63 | +1 |
| Body mass index < 20 | 3.07 | +1 |
| 5 < Sepsis-related Organ Failure Assessment < 10 | 4.54 | +2 |
| Age > 50 years | 5.7 | +2 |
| Epinephrine > 0.1 or norepinephrine > 0.1 | 8.17 | +3 |
| Sepsis-related Organ Failure Assessment ≥ 10 | 10.38 | +3 |

Objectives To create a predictive score for inhospital mortality in patients undergoing SCVR and admitted to a public (A) and a private (B) surgical intensive care unit, considering preoperative, perioperative, and first postoperative day variables.

Case series and methods A classical cohort with data consecutively collected from June 2000 (group B, 121 patients) and January 2001 (group A, 326 patients) to February 2003. All 46 variables were previously defined according to the major

prognostic indices in the literature. The statistical analysis comprised univariate analysis with the chi-square test, the Student *t* test, the Mann–Whitney test and the Pearson test, followed by logistic regression and stepwise (likelihood ratio) analysis, with the linear trend test and receiver operating characteristic curve.

Results The score created, shown in Table 1, provides the following risk prediction: 0–4, low risk; 5–8, medium risk; and 9–13, high risk. The results had significance ($P < 0.0001$) and a linear trend ($P < 0.0001$). The area under the receiver operating characteristic curve was 0.78.

Conclusions This prognostic score shows the strength of first postoperative day variables, as does the Sepsis-related Organ Failure Assessment score [2], and the need for high doses of amines. The combined valvular surgery was the only perioperative marker. The 50-year cutoff point for age shows the precocity of valve disease in our country.

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P101 Risk of factors for readmission in the intensive care unit

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Background Readmission rates have been used as a measure of the results of the quality of care. It is proposed that a significant number of readmissions are potentially avoidable. The only legitimate basis for using precocious readmission as a quality indicator is that it demonstrates one relationship between readmission and the care process during the previous hospital stay. The interest in readmission is driven by the hypothesis that an improvement of care can result in a reduction of the readmissions to and in the costs of the intensive care unit (ICU).

Objective To identify risk factors for patient readmission for urinary tract infection.

Materials and methods A cohort study, based on data of patients from the ICU. The internments of 1 January 1999–31 December 2000 for UTI were analyzed. We established two groups: the first group was composed of patients that just presented one admission, and the second group was composed of patients that presented two admissions to the ICU (they were analyzed for the first internment).

Results In the study period 3034 patients were interned for UTI. In this population, the readmission rate for UTI was 10.7% and the

rate of medium occupation was $86.76 \pm 4.16\%$. The readmitted patients presented a medium age of 67.5 years (15.5 years), and for those patients with just a first admission the medium age was 63.2 years (17.2 years) ($P < 0.0001$); although age was divided into classes it also presented a significant difference. With relationship to sex there were 172 (60.6%) in the group with more than one admission and 1646 (61.9%) in the group with just one admission, without a significant difference. The indexes Acute Physiology and Chronic Health Evaluation II prognostics and Severe Acute Physiology Score II were, on average, for patients with one admission 12.0 (6.3) and 27.7 (11.9), respectively, and for readmitted patients 18.7 (6.4) and 33.1 (12.9), respectively; both with a significant difference. The hospital lengths of stay were 12.8 days (14.9 days) and 39.2 days (41.1 days), in the group with one admission and in the group that presented readmission, respectively; a fact also repeated in the ICU lengths of stay, both with a significant difference. In the multivariate analysis, the presence of creatinine A > 2.0 and systolic pressure < 90 mmHg, in the moment of internment, presented a significant difference.

Conclusion The patients' precocious identification with risk factors and the care at the moment of discharge for UTI can be decisive to reduce the readmission rates.

P102 Comparison between prognostic scores of patients undergoing cardiac surgery: which is the best score to predict mortality and length of stay in a surgical intensive care unit?

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Background Several studies on prognostic scores (PS) in cardiac surgery (CS) and their comparisons have been published in the literature. However, these studies have been carried out with populations whose demographic characteristics and prevalence of pathologies differ from those found among ours. We know no study aiming at predicting length of stay (LOS) in surgical intensive care units (SICU).

Objectives To compare the three following PS of in-hospital mortality in patients undergoing CS and admitted to a public (A) and a private (B) SICU, analyzing preoperative, perioperative, and first postoperative day variables: EuroSCORE [1], pre-Cleveland [2], and post-Cleveland [3].

Case series and methods A classical cohort with data of 1458 patients consecutively collected, and the three automatically calculated PS, from June 2000 (group B, 594 patients) and January 2001 (group A, 865 patients) to February 2003. The statistical analysis comprised univariate analysis with the Student *t* test, analysis of variance, and Mann-Whitney and Pearson tests, followed by logistic and multinomial regression, and the receiver operating characteristic curve.

Results The three PS had significantly different prediction of mortality and of LOS in the SICU ($P < 0.0001$). In predicting mortality and LOS in the SICU longer than 7 days, the three PS analyzed did not provide a good correlation (Nagelkerke's R^2 of 0.134=13.4% and of 0.226=22.6%, respectively). The less significant PS for prediction of mortality is the pre-Cleveland ($P=0.054$) as compared with the EuroSCORE and the post-Cleveland ($P < 0.0001$). Comparing the receiver operating characteristic curves of the three PS for LOS in the SICU longer than 7 days and prediction of mortality, the following was observed, respectively: EuroSCORE, 0.575–0.745; pre-Cleveland, 0.550–0.769; and post-Cleveland, 0.769–0.769.

Conclusions Prognostic scores are not intended to predict LOS in the SICU. With regard to prediction of mortality, the three receiver operating characteristic curves are similar, and the logistic regression is worse for pre-Cleveland. Although none of the PS analyzed seemed adequate to be used in this group of patients undergoing CS, post-Cleveland was the best among the three.

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P103 Evaluation of the organic dysfunction in elderly patients in the intensive care unit

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Introduction The multiple organ dysfunction syndrome (MODS) is the main cause of mortality in intensive care units. The number of patients older than 65 years in such units has progressively been increasing. The aim of this study is to evaluate the frequency and evolution of the MODS in that population and its impact on mortality.

Materials and methods A prospective, descriptive, longitudinal study. Data has been collected for the calculation of the Sepsis-related Organ Failure Assessment (SOFA) score of the patients in the intensive care unit of a public hospital school between September 2001 and December 2002. The MODS has been defined as a SOFA score ≥ 3 in two or more organs. The other data collected included age, sex, Acute Physiology and Chronic Health Evaluation II score, length of stay and mortality. The statistic analysis has been made by Student *t* test and the Wilcoxon test as indicated.

Results A total of 466 patients stayed in the intensive care unit for the period of the study, 176 being older than 65 years. The elderly patients age ranged from 65 to 98 years (75 ± 6 years). The Acute Physiology and Chronic Health Evaluation II and the mortality average rate values were higher if compared with younger patients. The MODS was present in 37% of the patients and its presence increased the risk of death 2.3 times for elderly patients. The dysfunction of the six main organic systems evaluated during the first 5 days presented a relation to mortality.

Conclusion The presence of MODS occurs in 37% of the elderly population and increases the risk of death 2.3 times. The dysfunction of the main organic systems described by the SOFA score during the first days presented a relation to mortality.

P104 The nurse's role in nuclear medicine service in the emergency room

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Background Recently our institution introduced a nuclear medicine laboratory inside the Emergency Department. Today's critically ill and emergency patients require heightened vigilance and extraordinarily intricate care. The role of the nurse in the assessment and management of critically ill patients is significant

and can greatly improve the safety of nuclear medicine procedures in this group of patients.

Aim and methods Our purpose is to describe the nurse's role in the Nuclear Medicine Service in the Emergency Room. The

Advanced Cardiac Life Support (ACLS)-trained nurse staff explains the details of nuclear imaging and provides continuous nurse care, especially in acutely ill patients. Calibration and injection of radiopharmaceuticals is another nurse's role.

Results In the period from November 2002 to February 2003 we performed 316 examinations, 70 (22%) of them in an emergency setting without any significant complication. Acute rest injection of technetium 99m-tetrofosmin was performed in seven patients suspected of acute coronary syndrome. Brain SPECT was carried out in two patients with neurologic symptoms. A lung scan was carried out in four patients. Technetium 99m-white blood cell

scintigraphy was performed in four septic patients, three of them during mechanical ventilation. Stress myocardial perfusion imaging was carried out in 53 patients admitted to the chest pain unit with normal or nondiagnostic electrocardiogram. The nurse ensured patient and staff radiation safety, provided continued nurse care and assisted in efficacious injection of radionuclide agents.

Conclusion The nurse's role is changing, and this has occurred as a result of historical evolution and the use of increasing technology in hospitals. An ACLS-trained nurse in a nuclear medicine laboratory inside the Emergency Department is essential because of the increasing complexity of critically ill and emergency patients.

P105 Epidemiologic analysis of patients admitted to the intensive care unit in a general hospital

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Background To understand the profile of patient flow to and from an intensive care unit (ICU) during 2 months in 2002. The study setting is a 24-bed ICU in a 301-bed general hospital with an Emergency Department.

Methods A prospective analysis of the data of all patients admitted to the ICU during the study period in order to classify all the first admission origins into four subgroups (ward, operating room, Emergency Department and specialized coronary and gastrohepatology ICU), and to evaluate the different patient needs of ICU resources in these different patient populations (see Table 1).

Results One hundred and forty-seven patients were admitted to our ICU during the study period. The mean duration of ICU stay was 6.46 days. Of the ICU admissions 70.7% originated from hospital wards, surgery and special units, while the remaining 29.3% came from the Emergency Department. Of our patients, 8.2% were readmitted to the ICU. The overall infection rate and observed mortality rate were 20.4% and 23.1%, respectively (lower than the expected mortality).

Conclusions Compared with previously reported data, these data suggest that a large part of the available resources for intensive care in our hospital are devoted to the in-hospital patient care. One suggested hypothesis is that this could result mainly from the lack of a subcritical care area.

Table 1

Comparative data between patients according to the admission origin

| | Ward (n = 41) | Surgical room (n = 52) | Emergency Department (n = 43) | Other ICU ^a (n = 11) |
|---------------------------------------|------------------|---------------------------|----------------------------------|------------------------------------|
| Gender (male/female) | 23/18 | 32/20 | 20/23 | 7/4 |
| Mean age (years) | 63.95 | 59.81 | 67.95 | 72.27 |
| Mean duration in the ICU (days) | 8.85 | 3.71 | 6.91 | 8.73 |
| Vasoactive drugs (%) ^b | 22.50 | 19.23 | 24.39 | 36.36 |
| Invasive ventilation (%) ^b | 51.51 | 15.38 | 32.55 | 45.45 |
| Readmission rate (%) | 9.75 | 4.00 | 4.87 | 57.14 |
| Infection rate (%) ^c | 34.14 | 9.61 | 13.95 | 45.45 |
| Mortality rate (%) | 31.70 | 10.63 | 34.37 | 45.45 |

^aOther intensive care unit (ICU), specialized coronary and gastrohepatology ICU. ^bIn the first 24 hours. ^cAt admission.

P106 Prognostics index: evaluation of Sequential Organ Failure Assessment and Multiple Organ Dysfunction Score in patients after cardiac arrest in intensive care

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Critical Care 2003, **7(Suppl 3)**:P106 (DOI 10.1186/cc2302)

Introduction Cardiac arrest is a frequent event that generates considerable exacerbation of the morbidity index of patients in the intensive care unit.

Objective To assess the variation of the Sequential Organ Failure Assessment (SOFA) index and the Multiple Organ Dysfunction Score (MODS) index as morbidity predictors after cardiac arrest.

Patients and methods The indexes SOFA and MODS were calculated for 40 patients that suffered cardiac arrest in the intensive care unit; the indexes were calculated based on laboratory values and clinical data obtained 24 hours before and after cardiac arrest.

Results Forty patients, 17 (42.5%) female and 23 (57.5%) male, whose age varied from 17 to 84 years (mode 76 years). The causes of cardiac arrest were shock and metabolic disorders in 18 patients (45%), hypoxemia in 16 (40%), and myocardial ischaemia and poisoning by drugs in six patients (15%). The modality of arrest was asystolia in 17 patients (42.5%), pulseless electrical activity in 14 (35%) and ventricular fibrillation in nine patients (22.5%). The Acute Physiology and Chronic Health Evaluation II score varied from 2 to 47 (mean 21, mode 11), and the mean risk of mortality was 32.54%. The previous SOFA score varied from 6 to 16 (mode 8) and that after arrest from 8 to 18 (mode 14). The MODS score varied from 3 to 16 (mode 7) and that after arrest from 5 to 21 (mode 12). In statistical analysis using

the Wilcoxon test, the increase of the SOFA and MODS indexes after cardiac arrest was significant ($z_{\text{calc}}=5.33$ or $P<0.001$), but in a nonparametric comparison between the two indexes we noticed that the proportional increase of each one in the same patient occurred only in 21% of the patients.

Conclusion The SOFA and MODS indexes were separately demonstrated to be good predictors of major morbidity of patients after cardiac arrest, but they did not as correlate variables for the same situation.

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SURGERY/TRAUMA

P107 Prehospital rapid sequence intubation in severe traumatic brain injury: a retrospective analysis

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Objectives To evaluate the efficacy, safety and complications of rapid sequence intubation (RSI) in patients with severe traumatic brain injury (STBI) in a prehospital setting.

Materials and methods Retrospective analysis of 144 patients with STBI (Glasgow coma scale ≤ 8) from January 1998 to January 2000, assisted by an Advanced Life Support Unit with a physician. RSI was considered to be when at least a sedative and a neuromuscular blocking agent were administered together. The data were collected from the patient form.

Results Ethomidate and succinilcholine were the most frequent drugs used, in 69.5% of sedatives and 80.5% of neuromuscular blocking agents, respectively. The intubation success rate was 99.31%, and in 93.6% of the cases was performed by nonanesthesiologists. No arrhythmias, cardiac arrest or death related to RSI occurred.

Conclusion RSI is an efficient and safe procedure for endotracheal intubation in patients with STBI in a prehospital environment.

P108 'Damage control' in the intensive care unit

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Introduction 'Damage control' therapy has been efficient in the control of haemorrhagic situations, particularly in serious trauma; assisting in the temporary control of severe bleeding in situations in which hypothermia, acidosis and coagulation disturbances aggravate the immediate prognosis.

Case report A male, 55 years old, admitted to the emergency room wounded by a gunshot. Subdued exploratory laparotomy found hepatic injury, gastric injury and splenic blast. The surgical procedure was interrupted because of hypothermia (33.3°C) and acidosis (pH 7.20), temporary haemostasis carried out with compresses and haemostatic surgical instruments. The patient was admitted to the intensive care unit hypothermic, in metabolic acidemia, haemodynamically unstable, and needing vasoactive drugs and mechanical ventilation. After 8 hours, when the

acid–basic balance, temperature and coagulation were normal, the patient underwent surgery for correction of the hepatic wound with epiploonplasty and peritoneostomy. When back at the intensive care unit, the patient was monitored with a pulmonary artery catheter, received large spectrum antibiotic therapy and reversal of the multiple organ dysfunction. After 14 days of internment, the patient was discharged in adequate clinical condition.

Conclusion 'Damage control' therapy has been demonstrated to be a promising therapy for temporary bleeding control under disturbance of coagulation in the presence of hypothermia, acidosis and prolonged hypotension in major surgical procedures. The intensive care unit must be ready for quick treatment of these disturbances, allowing the patient to undergo definitive surgery as soon as possible.

P109 Thoracic blood drainage debt: what amount should be expected as normal in the first postoperative hours of cardiac surgery?

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Background Data on the normal pattern of thoracic blood drainage in the first postoperative hours may be found in the literature, and values below 1 ml/kg per hour have been considered markers of good outcome.

Objectives To assess, in our population, the normality threshold of the blood drainage index (BDI) in the first postoperative hours of cardiac surgery (CS), and to correlate this index with the clinical variables that may predict a worse outcome and a longer intensive care unit (ICU) stay.

Case series and methods A classic cohort study was carried out with data of 1458 patients consecutively collected from June 2000 to January 2001 (593 patients, group B) and from January 2001 to February 2003 (865 patients, group A). All variables were previously defined according to the literature. The results underwent statistical analysis with the following tests: univariate analysis with the chi-square test, the Student *t* test, Pearson correlation, the Mann-Whitney test, Yates correction, and the McNemar test.

Results With data obtained in the sample, a histogram of postoperative thoracic blood drainage was made. Adjusting through the likelihood ratio and distributing in the exponential form,

its 95th percentile was determined, and the value of 0.97 ml/kg per hour was obtained in the postoperative period. When the BDI was correlated with the variables studied, greater drainage values were found in the following conditions: valve replacement associated with myocardial revascularization and surgery of the aorta ($P=0.0000$ and $P=0.00002$, respectively); patients with left atrium >4.5 ($P=0.003$); longer extracorporeal circulation ($P=0.0001$); platelet count lower than 100,000 ($P=0.001$); multiple organ dysfunction syndrome score greater than 4 ($P=0.00000$); Sepsis-related Organ Failure Assessment score >4 ($P=0.00000$); longer length of stay in the ICU ($P=0.001$); and a greater death index ($P=0.00000$). No statistical difference between the results of the two hospitals was found.

Conclusions A normal BDI of 0.97 ml/kg per hour was established in our population in the postoperative period of CS, and a poorer outcome and longer length of stay in the ICU were observed in patients with drainage greater than the BDI found. The following clinical variables can predict greater BDI in the postoperative period of CS: the type of CS; left atrium >4.5 ; prolonged extracorporeal circulation; platelet count $<100,000$; and greater multiple organ dysfunction syndrome and Sepsis-related Organ Failure Assessment scores.

P110 Use of noradrenaline (NA) in the early postoperative (PO) period of myocardial revascularization (MR) surgery in a group of patients with a short stay in the intensive care unit

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Background NA has been used in surgical intensive care units (ICUs) in the PO period of MR, aiming at decreasing the need for excessive blood volume restoration and its possible complications.

Objective To assess the impact on hospital costs of the use of NA initiated in the first 12 hours in patients with a short length of stay in the ICU in the PO period of MR, and to compare other variables between the groups using or not using that drug.

Patients and methods The use of NA initiated in the first 12 hours and the costs of hospitalization were studied in 268 adult patients undergoing MR and discharged from the ICU within the first 48 PO hours (94 patients received NA and 174 patients did not receive the drug). Other variables, such as fluid balance in the operation room and fluid balance in the first 24 hours (FBD1) of the PO period, extracorporeal circulation time (ECCt), mortality prediction score of the American Heart Association (mAHA), serum level of lactate in the postoperative period (first day), and postoperative multiple organ dysfunction syndrome and Sepsis-related Organ Failure Assessment (SOFA) scores, were also analyzed. The following statistical tests were used: Student *t* test, Wilcoxon test, rank sum test, and linear regression test.

Results The use of NA was not an independent predictor of hospital costs in this group of patients. The ECCt and the preoperative mAHA score were cost predictors, but influenced only 9.2% of the variation. The comparisons between the groups of the mAHA score, the ECCt, the fluid balance in the operation room, and the serum level of lactate in the early PO period did not show any statistically significant difference. The group receiving NA had a significantly greater FBD1 (0.9×0.2 ml/kg per hour) with $P < 0.00001$. The MODS and SOFA scores were also significantly greater with $P=0.01$ and $P < 0.00001$, respectively.

Conclusion The early use of NA in the PO period of MR was not an independent predictor of cost in this group of patients who stayed in the ICU less than 48 hours. The preoperative variables were similar in the groups. The postoperative MODS and SOFA scores were greater in the group receiving the drug, but their values were impaired because the use of the drug was one of their components. The FBD1 was significantly greater in the group receiving the drug, which may be a marker of a different outcome, justifying further studies.

P111 Percutaneous tracheostomy: Ciaglia Blue Rhino vs basic Ciaglia

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Introduction The percutaneous tracheotomy first described by Ciaglia in 1985 has been widely used since, showing it to be fast, safe and easy to perform.

In 1999 a new method arose, the Ciaglia Blue Rhino, which was done only by one person (hydrophilic dilatator). We compare the two procedures in our services.

Objective Registration of our experience with percutaneous tracheotomy, and a comparison between two procedures.

Methods From January 1997 to December 2001 we used the basic Ciaglia and the Ciaglia Blue Rhino as the chosen methods of tracheotomy. We had 184 patients; in 108 patients the basic Ciaglia was used, and in 76 the Ciaglia Rhino Blue.

There were no statistical differences with regards to sex, age, Acute Physiology and Chronic Health Evaluation II, but we had different results in the duration of procedure, the length of cannula that we can apply, and complications:

- Cannula >8.0 mm: Rhino Blue, 70 patients; basic Ciaglia, four patients ($P < 0.0001$).
- Procedure that takes >6 min: Rhino Blue, two patients; basic Ciaglia, 94 patients ($P < 0.0001$).
- Complications: Rhino Blue, 14 patients; basic Ciaglia, 38 patients ($P < 0.02$).

Conclusion When a skilled physician performs a percutaneous tracheotomy guided by bronchoscopy it is a safe method with a low risk of complication. Ciaglia Blue Rhino is a faster procedure, with a lower number of complications. In addition to this we can introduce a wider cannula; therefore it is safer. In our service it is the method of choice for tracheotomy.

P112 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 hemodynamic 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.

Materials and methods A prospective, observational study of the arterial cannulations performed in a clinical and surgical intensive care unit from October 2001 to November 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 carried out. Arterial Doppler scans were obtained 24 hours after catheter removal, searching for partial or total obstructive thromboses.

Results A total of 565 arterial cannulations were analyzed (see Table 1).

Conclusion Despite the lower utilization of the axillary artery, the number of complications favored this site for monitoring over the mostly used radial artery.

Table 1

| | Radial | Axillary | D. pedis | Femoral |
|-----------------|--------------|------------|-------------|-----------|
| n (%) | 272 | 162 | 89 | 42 |
| Obstruction | 15 (5.51%) | 4 (2.46%) | 6 (6.74%) | 1 (2.38%) |
| Ischemia | 45 (16.54%) | 0 | 7 (7.86%) | 0 |
| Pseudoaneurisma | | 0 | | 1 |
| Thrombosis | 74 (27.2%) | 0 | 16 (17.97%) | 0 |
| Dumping wave | 19 (6.98%) | 10 (6.17%) | 14 (15.73%) | 2 (4.76%) |
| Total | 153 (56.25%) | 14 (8.64%) | 43 (48.31%) | 4 (9.52%) |

Chi square = 20.26, degrees of freedom = 5, $P = 0.00111922$.

P113 Treatment of pseudoaneurism of the femoral artery with local injection of thrombin

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Background Vascular complications following arterial punctures for diagnostic or therapeutic procedures, or both, have been reported in several series with an incidence ranging from 0.7 to

9%. The most frequent complications are local hematomas, arteriovenous fistulas, and pseudoaneurisms (PA).

Objective To compare the efficacy of the surgical treatment and use of solutions with lower thrombin concentrations (150–200 U/ml), assessing the hospitalization time.

Case report A 54-year-old white Brazilian male, admitted to the Hospital Pró-Cardiaco, RJ, on 22 February 2003 for closure of a PA in the right inguinal region (after percutaneous angioplasty).

Materials and methods The Vivid 3 vascular echocardiographic and ultrasound device (General Electric) equipped with a 10MHz linear probe and pulsed color Doppler was used. Bovine thrombin (component of BERIPLAST® P; Aventis) in a 100 U/ml solution was used. A color duplex scan of the lower limbs was performed for diagnostic confirmation of the PA, identification of the vessel related to the PA, measurements required by the procedure, and assessment of the arterial anatomy of both lower limbs. Ultrasound-

guided puncture of the PA was performed, and contrast medium (agitated 0.9% saline solution) was injected to show the exact position of the needle tip inside the PA, which should be as far as possible from the PA neck, avoiding thrombin embolism. Then, the thrombin solution was slowly injected until closure of the PA (i.e. cessation of the systodiastolic flow through the PA neck), assessed on ultrasound. The amount of solution required for this was 0.5 ml, corresponding to 50 U thrombin. The duplex scan was repeated with the patient resting for 1 hour, and again on hospital discharge, 24 hours after the procedure, which confirmed the good result of the technique used.

Conclusion The injection of a low dose of thrombin guided by ultrasound and aided by contrast medium use was effective in closing the PA. The hospitalization time was reduced even in patients undergoing anticoagulation.

P114 Prehospital emergency thoracotomy: is there any indication? Report of five cases and an algorithm

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Critical Care 2003, 7(Suppl 3):P114 (DOI 10.1186/cc2310)*

Objectives To report five cases of emergency thoracotomy in a prehospital setting and its indication with an algorithm.

Materials and methods A case report of five emergency thoracotomies for penetrating thoracic trauma, in a prehospital environment, in an advanced life support unit with a physician.

Results All patients were male with a median age of 24 years and presented by a left penetrating thoracic trauma: two were gunshots, two were vehicle debris and one was stabbed. All of them had a hemothorax, two of them with cardiac injury (only one

tamponated). Internal cardiac massage was performed in all patients, with return of a spontaneous circulation (ROSC) in two of them. One patient died at the scene, one in the emergency room, two in the operation room and the other 6 hours after surgery. Three patients had signs of life before the procedure and two of them had ROSC.

Conclusion Emergency thoracotomy has a dismal result in a prehospital environment. Patients with signs of life before the procedure have the greatest chance of ROSC. An algorithm for rational use of emergency thoracotomy is proposed.

P115 Pulmonary thromboendarterectomy with embolectomy: a report of two cases

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Introduction Pulmonary Embolism (PE) continues to have a high mortality despite advances in diagnosis and therapy. We hereby present two patients with massive PE that underwent successful pulmonary thromboendarterectomy with embolectomy (PTE).

Case 1 A 56-year-old white male presented with a 10-day history of progressive dyspnea. Massive PE was diagnosed and the patient was started on anticoagulation. An inferior vena cava filter was placed because of extensive internal iliac thrombosis. Finally, PTE was undertaken because of recurrent hemodynamic instability in spite of thrombolytic therapy. In the postoperative period, the patient developed hemoptysis followed by *status epilepticus* and the appearance of petechiae on the legs. Serologies confirmed antiphospholipid antibody syndrome, which was managed with corticosteroids and immunoglobulin because of the aggressive presentation. After a long in-hospital stay with several infectious, renal and hematological (bleeding) complications, the patient was discharged with no ventilatory assistance.

Case 2 A 46-year-old white, heavy smoker and obese male was admitted after a 3-day history of dyspnea. Initial examinations showed hypoxemia, a S_1Q_3 pattern on ECG, chronic pulmonary hypertension and right ventricular dysfunction on echocardiogram. A chest computed tomography confirmed massive PE in both pulmonary arteries with calcification over the thrombi, leading to the diagnosis of an acute episode complicating chronic PE. An inferior vena cava filter was placed because the patient was considered to have a high risk of death after recurrent PE. Because of a worsening clinical condition despite adequate anticoagulation, the patient was submitted to PTE. He was also discharged after complete resolution of a nosocomial pneumonia.

Conclusion Nowadays surgical embolectomy is rarely performed. These two cases underwent this unusual form of therapy with a good outcome; however, it is certainly an alternative form of treatment for PE. Although whether considered a last resource to be reserved for desperate situations, some authors suggest it as one of several available treatments that could be also used for anatomically extensive PE without hemodynamic compromise.

P116 Clinical value of *in vitro* labeling of red blood cells with technetium 99m-scintigraphy in the detection of acute gastrointestinal bleeding

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We evaluate the clinical value of *in vitro* labeling of red blood cells with technetium 99m (99mTc-RBC) scintigraphy for the detection of gastrointestinal (GI) bleeding sites. Ten patients referred with clinical evidence of GI bleeding and negative colonoscopy underwent 99mTc-RBC scintigraphy after endovenous administration of 925MBq (25mCi) 99mTc-RBC labeled by a simple technique, previously described by ourselves. Dynamic images of the abdomen were taken at 10s intervals for 40 min. Then, 5 min images were obtained 1, 3 and 5 hours after cell administration. Delayed images up to 24 hours were obtained when early results were negative. All the patients with suspected GI bleeding were confirmed to have

active hemorrhage up to 24 hours. The identification of bleeding sites was 40% (40 min), 20% (60 min) and 30% up to 24 hours. Of the nine patients with definite active hemorrhage, the bleeding sites were identified by surgery in all of them; and in the remaining patient, without active hemorrhage, the bleeding site was not identified by surgery. In conclusion, the simplicity, reproducibility and reliability of this technique of *in vitro* labeling of red blood cells, particularly when bleeding rates are low and intermittent, make it, in our point of view, the first line of investigation in any patient with suspected bleeding from the colon or upper GI tract if endoscopic evaluation is not possible in the latter.

BASIC SCIENCE

P117 Platelet-derived exosomes: a new vascular redox signaling pathway

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Cells release microparticles following apoptosis (apoptotic bodies) or for signaling purposes (exosomes). In contrast to the bigger apoptotic bodies (>400 nm), exosomes (diameter ~ 100 nm) do not present phosphatidylserine on their surface and expose major histocompatibility complex components, CD9 and CD63. Prognosis of some thrombotic-inflammatory diseases has been related to microparticle release. Sepsis is an abnormal immuno-inflammatory response to an infection, including dysregulation of apoptotic mechanisms in vascular cells. The major redox signaling pathway in vessels involves the enzymatic complex superoxide generating NADPH oxidase. In previous work we showed that, in sepsis, there is augmented platelet release of microparticles when compared with healthy controls. Those septic microparticles also possess greater NADPH oxidase activity, which can be responsible for vascular cell apoptosis. Our objective was to better characterize those microparticles obtained from septic patients and determine possible pathways related to their release. Through sequential filtration and centrifugation we separated microparticles from septic plasma ($n=16$, 24 hours of diagnosis accordingly to ACCP/SCCM 1992 criteria) or from healthy controls ($n=6$). Apoptotic bodies were obtained from the medium of cultured endothelial cells exposed to ultraviolet light for 30 min. Laser light scattering revealed particles with diameter

between 82 and 112 nm. In contrast to the microparticles, apoptotic bodies do not have NADPH oxidase activity as assayed by lucigenin 5 μ M luminescence. Western blot analysis revealed greater NADPH oxidase subunit expression in septic particles when compared with healthy controls, and none on apoptotic bodies. Flow cytometry disclosed positive phosphatidylserine exposure on apoptotic bodies, while microparticles were positive to CD9 and CD63. Washed, fresh platelets from single donors were stimulated with thrombin (0.1 U/ml), tumor necrosis factor alpha (10 μ g/ml), lipopolysaccharide (LPS) (0.1 μ g/ml) and with the nitric oxide (NO) donor sodium nitroprusside (2 mM) for 30 min. Particles obtained from the tumor necrosis factor-stimulated and thrombin-stimulated platelets were similar to the apoptotic bodies, while those obtained from NO-stimulated or LPS-stimulated platelets shared characteristics with the septic microparticles, with low phosphatidylserine exposure, high CD9 and CD63 expression, and oxidase activity. In conclusion, in sepsis there is a platelet release of exosomes, which possess a vascular pro-apoptotic NADPH oxidase activity. Furthermore, we showed that LPS and NO, agents related to the pathophysiology of severe sepsis, induce similar superoxide producing exosome release from healthy platelets, suggesting the existence of a new redox signaling pathway.

P118 Evidence for the interaction between protein disulfide isomerase and NADPH oxidase as a regulatory mechanism for superoxide generation in phagocytic and vascular smooth muscle cells

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Reactive oxygen species generation has been implicated with diverse vascular and inflammatory diseases. NADPH oxidase is the major source of reactive oxygen species within phagocytes. It is activated by

the phosphorylation and recruitment of cytosolic subunits p47phox, p67phox and rac2 to the membrane-bound cytochrome b558 formed by the p22phox and gp91phox subunits. In vascular cells, an

analogous enzymatic complex is found within the membrane or cytosol but it has primarily signaling purposes. Both oxidases are inhibitable by thiol oxidants, not affected by the global redox cell state. Thiol oxidoreductases are effective modulators of the thiol redox state on cell membranes, in the ER and cytosol. Considering that spontaneous thiol–disulfide exchange reactions occur at rates too slow to be involved with regulatory pathways, we postulate that thiol oxidoreductases may control the redox state of important thiol sites on the NADPH oxidase, affecting its superoxide generating activity. Protein disulfide isomerase (PDI) is a ubiquitous multifunctional enzyme of the thiol oxidoreductase family, involved in regulation of diverse cellular mechanisms. Our objective is to investigate a possible interaction between PDI and the oxidases in vascular smooth muscle cells and neutrophils. Western blot analysis disclosed PDI in neutrophils within granules and the membrane, the same place where

cytochrome b558 is found. In smooth muscle cells PDI was also found on the membrane fraction, and immunofluorescence disclosed a spatial colocalization between PDI and the oxidase. Superoxide generation was evaluated by superoxide dismutase-inhibitable cytochrome c reduction spectrophotometric assay using the cell free system (isolated membrane and cytosol from human neutrophils). Inhibition of PDI activity caused a 60% reduction of NADPH oxidase activity. With vascular smooth muscle cell homogenates, PDI inhibition caused similar oxidase activity. Angiotensin II, a known vascular NADPH oxidase agonist, induced in vascular cells a parallel increase in PDI activity.

PDI modulation of thiol redox state on the vascular and phagocytic oxidases may thus represent a new regulatory mechanism of reactive oxygen species generation.

P119 Positive and negative regulators of transforming growth factor beta 1/bone morphogenetic protein pathways are constitutively expressed in mesangial cells

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Background Phenotypic alterations of mesangial cells (MC) may compromise intraglomerular hemodynamics, particularly during hypoperfused states. Transforming growth factor beta 1 (TGF- β 1) is a key player in glomerular normal and pathological functioning. It has been recently demonstrated that Gremlin is a downstream target in the TGF- β 1 pathway in MC, and facilitates cell proliferation by directly antagonizing bone morphogenetic proteins (BMPs). Conversely, BMPs, which also belong to the TGF- β 1 superfamily, present an inhibitory effect on MC multiplication. During early development, the antiproliferative activity of BMPs depends on the upregulation of the inhibitor of DNA binding genes (ID), which works as the endogenous dominant negative of basic HLH, transcription factors involved in cell differentiation, growth and death. Thus, BMP antagonists and ID appear to have opposite effects in pathways activated by members of the TGF- β 1 superfamily.

Aim This study begins to characterize the expression patterns of the aforementioned genes in cultured MC.

Methods Primary MC were obtained from adult male Wistar rats. Cells were grown in 20% fetal bovine serum until confluence and then kept in serum-free medium for 24 hours. Total RNA was

extracted from quiescent cells and cDNA synthesized using oligo-(dT) primers. Analysis of mRNA gene expression was performed through quantitative real-time polymerase chain reaction.

Results Initially we confirmed the constitutive expression of Gremlin in rat MC. In addition, two other BMP antagonists, the head-inducing factor Cerberus and the tumor suppressor Dan, were also found at very similar expression levels. Quantitative real-time polymerase chain reaction analysis also demonstrated for the first time the presence of ID in quiescent rat MC. In fact, all four members of this family of genes (ID1–ID4) were expressed at relatively high levels in quiescent MC.

Conclusions Our study demonstrates the expression of proproliferative and antiproliferative genes that play a significant role in TGF- β 1/BMP-activated pathways in MC. The simultaneous, constitutive expression of these genes in adult, nontransformed rat MC suggests the presence of a novel autocrine loop, which may modulate MC proliferation. Additional studies are underway to characterize the functional role of BMP antagonists and ID-cultured rat MC. The elucidation of functional interaction between BMP antagonists and ID may enhance our knowledge about the molecular circuitry required for MC proliferation.

P120 Cyclooxygenase inhibition corrects the impaired microvascular reactivity in diabetic female rats

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Several studies have shown that endothelium-dependent vascular relaxation is altered in experimental diabetes and in diabetic patients, with peripheral vascular disease being almost twice as frequent in diabetic women as compared with diabetic men. Moreover, the mesenteric microvessels exhibit impaired responses to acetylcholine, bradykinin, histamine, and platelet activator factor in diabetic female rats. The aim of the present study was to investigate the effects of inhibition of cyclooxygenase upon the reduced response to endothelium-dependent vasodilator agents in diabetic female rats, to verify the possible involvement of prostaglandins in that alteration. The

changes of arteriolar and venular diameter after topical application of acetylcholine (17 nmol), bradykinin (30 pmol), and histamine (2.7 nmol) were measured *in vivo* by means of a closed video circuit coupled to a microscope before and after acute treatment with diclofenac, a cyclooxygenase inhibitor (2.5 mg/kg, intramuscularly). The cyclooxygenase inhibition corrected the decreased response of arterioles and venules to bradykinin, but only corrected the decreased venular response to acetylcholine. Diabetes impaired the response to histamine in arterioles but not in venules, and that response reduction was also corrected by diclofenac (see Table 1). These data suggest that increased

release of vasoconstrictor prostanoids may be involved in the impaired response to endothelium-dependent vasodilator agents in diabetic female rats.

Acknowledgements Financial support from FAPESP and PRONEX.

Table 1

| | Arterioles | | | Venules | | |
|-----------------------|---------------|------------|-----------|---------------|------------|-----------|
| | Acetylcholine | Bradykinin | Histamine | Acetylcholine | Bradykinin | Histamine |
| Control | 6.9±0.7 | 7.5±0.6 | 7.8±0.2 | 6.5±0.6 | 6.7±0.7 | 6.8±0.5 |
| Diabetes | 4.1±0.5* | 4.2±0.5** | 4.1±0.6** | 3.6±0.3** | 4.2±0.6** | 4.7±1.0 |
| Diabetes + diclofenac | 5.8±0.4 | 7.8±1.0 | 6.6±0.5 | 5.8±0.5 | 6.7±0.5 | 5.1±0.9 |

P* < 0.05 in comparison with controls, *P* < 0.05 in comparison with the diabetic + diclofenac group.

P121 Selective cyclooxygenase-2 inhibition with etoricoxib elevates blood pressure and alters vascular reactivity

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Selective inhibitors of cyclooxygenase-2 (COX-2) have been shown to be effective anti-inflammatory drugs with reduced gastrointestinal toxicity relative to conventional nonsteroidal anti-inflammatory drugs. However, given the ability of selective COX-2 inhibitors to suppress vascular prostacyclin synthesis, apart from their deleterious action on renal function, we decided to test the effects of the novel COX-2 inhibitor etoricoxib (ETO) on blood pressure (BP) and vascular reactivity.

Normotensive male Wistar rats and spontaneously hypertensive rats (SHRs) received ETO (10 mg/kg, p.o.) once daily for 5 weeks. BP measurements were performed weekly by the tail-cuff method, and at the end of the treatment period the animals had their aortae removed in order to test the *in vitro* responses to both acetylcholine and sodium nitroprusside.

ETO had no effect on the BP levels of normotensive Wistar rats. However, significant elevation of BP was observed in ETO-treated

SHRs in comparison with the untreated SHRs (third week, 204.2±5.8 vs 175.8±5.5 mmHg, *P*<0.001; fourth week, 206.4±8.9 vs 185.0±3.8 mmHg, *P*<0.05; fifth week, 237.4±4.9 vs 209.8±4.0 mmHg, *P*<0.001). Norepinephrine-precontracted aorta rings obtained from ETO-treated SHRs also showed a decreased relaxation response to both acetylcholine and sodium nitroprusside *in vitro* in comparison with the untreated SHR group. No ETO-related effects were observed in the *in vitro* reactivity of aorta rings obtained from the normotensive animals.

These preliminary results suggest that the selective COX-2 inhibitor ETO significantly impairs vascular relaxation in SHRs, thus contributing, at least in part, to the significant potentiation of the hypertensive status of these animals.

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P122 Rapamycin modifies the vascular tone of rat isolated aortas

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Background Post-PTCA restenosis has been almost completely prevented by rapamycin (RP)-eluting stents. High costs, however, preclude a broader utilization of these devices. In a pilot study, we have obtained promising data with the administration of oral RP to patients presenting high risk for restenosis, reducing costs considerably.

Aim As inhibitory effects on endothelial cell proliferation potentially deleterious to the cardiovascular system have been reported during oral administration of RP in animal models, the present study addresses the *in vitro* effects of this drug on endothelial function.

Methods Rat aortic rings with or without endothelium were prepared for isometric recordings. Contractile responses (to norepinephrine, 0.3 µM) and relaxant responses (to acetylcholine [1 µM] or to sodium nitroprusside [0.001–1000 µM]) were obtained in the absence or presence of increasing concentrations of RP, incubated to the preparations for different periods of time.

Results RP (1 hour, 100 ng/ml) produced slight but significant increments in contractions of aortas without endothelium to norepinephrine (74±4% to 101±7%, *n*=16, *P*<0.001). This difference was no longer present at higher RP concentrations (1000 ng/ml, *n*=8). Under the same conditions, RP did not modify endothelium-dependent relaxations induced by acetylcholine at any concentration tested (*n*=6). Contractile responses elicited by norepinephrine in aortas without endothelium were not significantly affected by RP (1000 ng/ml, *n*=6). However, concentration-response relaxant curves to sodium nitroprusside (endothelium independent) were significantly shifted to the right (*n*=6, *P*<0.05).

Conclusions Our preliminary results indicate that acute administration of RP promotes significant modifications in rat isolated aorta vascular tone, mainly by reducing endothelium-independent relaxation. *Ex vivo* experiments with chronic RP oral administration to rats are underway in order to define possible implications of these findings in the vasculature.

P123 Expression and regulation of bone morphogenetic protein antagonists in vascular smooth muscle cells**TT Maciel, N Schor, AH Campos***Nephrology Division, EPM, UNIFESP, São Paulo, SP, Brazil
Critical Care 2003, 7(Suppl 3):P123 (DOI 10.1186/cc2319)*

Background Vascular smooth muscle cell (VSMC) proliferation is crucial to the development of vascular diseases such as atherosclerosis and post-PTCA restenosis. Angiotensin II and platelet-derived growth factor play an important role in this phenomenon through direct action on VSMC or by modulating other growth factors. Bone morphogenetic proteins (BMPs) are members of the transforming growth factor beta superfamily and participate in signaling pathways linked to VSMC proliferation, hypertrophy and extracellular matrix production. BMPs exhibit an antiproliferative effect on VSMC and are inhibited by a family of antagonists (BMP-antag) that includes the proteins Gremlin, Dan and Cerberus. BMP-antag would thus facilitate cell proliferation by blocking an antimitotic pathway.

Aim The purpose of the present study is to characterize the expression patterns of BMP-antag in VSMC, and their regulation by well-known growth factors.

Methods Rat primary VSMC were cultured, RNA isolated and cDNA prepared by means of commercially available kits.

BMP-antag mRNA levels were determined through quantitative real-time polymerase chain reaction. Angiotensin II (300 nM) or platelet-derived growth factor (2 ng/ml) were added, and their effects evaluated following 3, 6 and 12 hours as described elsewhere.

Results We detected for the first time the constitutive expression of three members (Gremlin, Dan and Cerberus) of the BMP-antag family in cultured rat VSMC. In addition, our preliminary data demonstrate that Gremlin expression was significantly upregulated by angiotensin II (3 hours, 3.1 ×; 6 hours, 1.4 ×; 12 hours, 2.4 ×; $n=4$) and platelet-derived growth factor (3 hours, 2.2 ×; $n=4$).

Conclusions Taken together, our results suggest that the BMP-antag family of genes may have a relevant role in the development of phenotypic alterations involved in the pathophysiology of vascular diseases. Additional studies are underway to better define the regulation of these genes *in vitro* as well as their expression profile *in vivo*.

P124 Lipopolysaccharide-induced renin-angiotensin system (RAS) inhibition in human mesangial cells (HMC) is blocked by high ambient glucose**WS Almeida, GS DiMarco, DE Casarini, AH Campos, N Schor***Nephrology Division, EPM, UNIFESP, São Paulo, SP, Brazil
Critical Care 2003, 7(Suppl 3):P124 (DOI 10.1186/cc2320)*

Background Hyperactivation of the systemic RAS during sepsis and the intrarenal RAS in diabetes is well documented. We have previously identified the mRNA expression of all members of the RAS in immortalized HMC.

Aim The present study evaluates the direct effect of lipopolysaccharide (LPS) on HMC RAS in the presence of high ambient glucose, a model mimicking diabetes.

Methods Quiescent immortalized HMC kept for 24 hours in 0.5% serum-containing medium were incubated with vehicle, *Escherichia coli* LPS (100 µg/ml), glucose (30 mM), LPS+glucose, mannitol (30 mM), or LPS+mannitol. After 72 hours, angiotensin I and angiotensin II intracellular and extracellular concentrations (pg/mg protein) were determined by mass spectrometry analysis.

Results LPS significantly reduced angiotensin II concentrations (mean ± SEM, vehicle vs LPS: intracellular, 910 ± 33 vs 272 ± 12;

extracellular, 668 ± 62 vs 251 ± 17; $P<0.05$, $n=3-6$). This effect was markedly blocked by high ambient glucose, but not by mannitol, while glucose alone did not modify basal concentrations of angiotensin II. Similar results were obtained for angiotensin I. In a separate series of experiments, we measured the enzymatic activity of angiotensin I-converting enzyme and renin in protein extracts from HMC treated with LPS or glucose. LPS, but not glucose, significantly decreased ACE activity in HMC (-36%; $P<0.01$, $n=4$), while renin activity remained unaffected.

Conclusions These preliminary data suggest that the intrarenal RAS is regulated in opposite directions by LPS and glucose. The LPS inhibitory effect on the RAS can be partially explained by modifications in HMC angiotensin I-converting enzyme activity. These findings are potentially related to development of and/or recovery from acute renal failure in the context of sepsis, alone or superimposed to hyperglycemia. Additional studies are underway to better characterize the mechanisms involved in this phenomenon.

P125 Influence of losartan and enalapril on the diclofenac effect on leukocyte-endothelium interaction in spontaneously hypertensive rats (SHR)**LL Martinez, MA Oliveira, AS Miguel, JWM Cruz, VM Rastelli, RCA Tostes, MHC Carvalho, D Nigro, ZB Fortes***Department of Pharmacology, ICB I, University of São Paulo, São Paulo, SP, Brazil
Critical Care 2003, 7(Suppl 3):P125 (DOI 10.1186/cc2321)*

Objectives To investigate the influence of antihypertensives on the nonsteroidal anti-inflammatory drug effect on leukocyte-endothelium interaction in SHR, we tested losartan (L) or enalapril (E) and diclofenac (D) alone or in association (D+L or D+E).

Methods The number of rollers, adherent and migrated leukocytes after stimulus with tumor necrosis factor alpha were determined in venules of the spermatic fascia of anesthetized SHR using intravital microscopy. We determined the venular diameter and the venular

wall shear rate using an optical Doppler velocimeter, the number of circulating leukocytes, L-selectin or CD11/CD18 integrin expression on granulocytes by flow cytometry, and the intracellular adhesion molecule-1 (ICAM-1) or P-selectin expression in endothelial cells by immunohistochemistry. The left carotid artery of each anesthetized SHR was catheterized and the mean arterial blood pressure (MAP) was measured. The tail-cuff blood pressure (TBP) was measured in unanesthetized SHR.

Results E and L reduced TBP and MAP, whereas D increased the TBP and MAP levels. The association of D did not interfere with the TBP and MAP lowering effect of E and L. The number of rollers was reduced by D, by L and by D+L. E and D+E did not modify the number of rollers. The number of adherent and migrated leukocytes was reduced by all treatments. Neither

treatment increased the venular wall shear rate or modified the venular diameter, circulating leukocytes and L-selectin or CD11/CD18 integrin expression. All treatments decreased ICAM-1 expression. P-selectin expression was reduced by D, by L and by D+L, but E and D+E did not modify the P-selectin expression (Table 1).

Conclusion Our data allow us to suggest that the association of D did not interfere with the antihypertensive effect of E and L, but E interfered with the anti-inflammatory effect of D on leukocyte rolling and P-selectin expression. The reduction in ICAM-1 expression is involved and might explain the reduction of the number of adherent and migrated leukocytes observed.

Acknowledgement Supported by a grant from FAPESP.

Table 1

| | Saline | Diclofenac | Enalapril | Losartan | D+E | D+L |
|------------------------------|----------------------|----------------------|-----------------------|----------------------|----------------------|----------------------|
| Tail-cuff blood pressure | 167 ± 3.5 (n = 30) | 187 ± 2.9* (n = 27) | 149 ± 4.2* (n = 17) | 157 ± 3.3* (n = 18) | 148 ± 3.5* (n = 19) | 159 ± 4.4* (n = 21) |
| Mean arterial blood pressure | 100% (n = 8) | +3.8% (n = 8) | -13.9% (n = 11) | -21.8% (n = 6) | -20.3% (n = 6) | -33.8% (n = 6) |
| Rollers | 116.5 ± 9.3 (n = 8) | 25.4 ± 3.8* (n = 8) | 89.5 ± 7.8 (n = 9) | 65.2 ± 7.8* (n = 9) | 90.2 ± 9.4 (n = 9) | 58.6 ± 8.2* (n = 9) |
| Adherent | 9.2 ± 0.5 (n = 9) | 3.8 ± 0.4* (n = 9) | 5.7 ± 0.3* (n = 9) | 6.2 ± 0.4* (n = 9) | 5.4 ± 0.4* (n = 9) | 6.5 ± 0.4* (n = 9) |
| Migrated | 9.2 ± 0.6 (n = 9) | 4.7 ± 0.3* (n = 9) | 6.1 ± 0.4* (n = 9) | 6.6 ± 0.4* (n = 9) | 5.5 ± 0.4* (n = 9) | 6.4 ± 0.5* (n = 9) |
| Circulating leukocytes | 7500 ± 594.1 (n = 5) | 7970 ± 717.3 (n = 5) | 8250 ± 1233 (n = 5) | 6660 ± 299 (n = 5) | 8280 ± 626 (n = 5) | 10262 ± 916 (n = 4) |
| Venular diameter | 15.9 ± 0.3 (n = 28) | 15.9 ± 0.3 (n = 25) | 16.4 ± 0.4 (n = 23) | 16.1 ± 0.2 (n = 24) | 16.4 ± 0.3 (n = 25) | 15.9 ± 0.4 (n = 26) |
| Venular wall shear rate | 281.6 ± 16.7 (n = 5) | 217.1 ± 35.9 (n = 8) | 209.3 ± 23.8 (n = 12) | 121.0 ± 9.0* (n = 5) | 200.3 ± 28.0 (n = 6) | 205.4 ± 17.1 (n = 6) |
| LECAM | 7.8 ± 0.1 (n = 3) | 9.9 ± 1.1 (n = 6) | 9.1 ± 0.1 (n = 3) | 6.9 ± 0.1 (n = 3) | 6.7 ± 0.3 (n = 3) | 7.0 ± 0.1 (n = 3) |
| CD11-CD18 | 12.0 ± 4.2 (n = 5) | 14.9 ± 0.6 (n = 4) | 23.7 ± 4.2 (n = 3) | 17.4 ± 5.1 (n = 4) | 17.9 ± 6.0 (n = 5) | 15.5 ± 1.8 (n = 6) |
| ICAM-1 | 57.6 ± 3.4 (n = 8) | 38.6 ± 0.8* (n = 7) | 41.3 ± 4.4* (n = 7) | 35.4 ± 1.9* (n = 7) | 41.3 ± 1.6* (n = 7) | 45.2 ± 1.8* (n = 7) |
| P-selectin | 51.6 ± 2.2 (n = 11) | 37.1 ± 1.4* (n = 9) | 43.0 ± 1.3 (n = 6) | 34.1 ± 1.2* (n = 10) | 44.3 ± 4.1 (n = 6) | 37.2 ± 1.5* (n = 8) |

Data presented as mean ± SEM. ICAM-1, intracellular adhesion molecule-1. *P < 0.05 vs saline.

P126 Role of NADPH oxidase in the vascular reactivity and superoxide generation in the intrauterine undernourished rats: involvement of the renin-angiotensin system

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We previously reported that intrauterine undernutrition increased the oxidative stress by decreasing superoxide dismutase activity. In the present study, we tested whether NADPH oxidase, xanthine oxidase, cyclooxygenase or nitric oxide synthase are responsible for the increased O₂⁻ generation observed in rats submitted to intrauterine undernutrition. In addition, we investigated the effect of angiotensin II (Ang II) on O₂⁻ production via activation of NADPH oxidase. Treatment of mesenteric arterioles with the xanthine oxidase inhibitor oxypurinol, the nitric oxide synthase inhibitor L-NAME or the cyclooxygenase inhibitor diclofenac did not significantly change superoxide production. These vascular sources of superoxide were thus not responsible for the increased superoxide concentration. In contrast, treatment with the NADPH oxidase

inhibitor apocynin significantly decreased superoxide generation (10.3 ± 3.9 vs 22.35 ± 5.69, P < 0.05) and improved vascular function. On the other hand, intrauterine undernutrition did not alter the gene expression for p22^{phox} and gp91^{phox}. The fact that the local Ang II concentration was increased and the attenuation of oxidative stress by blocking the AT₁ receptor with losatan (9.9 ± 1.9 vs 22.35 ± 5.69, P < 0.05) led us to suggest that Ang II induces O₂⁻ generation in intrauterine undernourished rats. Our study shows that NADPH oxidase inhibition attenuated superoxide anion generation and ameliorated vascular function in rats submitted to intrauterine undernutrition. Although it is not clear which mechanisms are responsible for the increase in NADPH oxidase activity, a role for Ang II-mediated superoxide production via activation of NADPH oxidase is suggested.

P127 Metformin treatment improves vascular function in rats with neonatal streptozotocin-induced type 2 diabetes

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Critical Care 2003, 7(Suppl 3):P127 (DOI 10.1186/cc2323)**Objective** To verify the influence of the antihyperglycaemic agent metformin on the microvascular reactivity to inflammatory and noninflammatory mediators in type 2 diabetes.**Methods** Type 2 diabetes was induced by streptozotocin injection (160 mg/kg, intraperitoneally) in neonate (2-day-old) Wistar rats. The animals were treated with metformin (300 mg/kg) *per os* during 15 days. Using intravital microscopy, the changes in arteriolar diameters were determined in chloral hydrate (450 mg/kg, subcutaneously) control rats, diabetic (D) rats and diabetic treated with metformin (D + M) anesthetized rats, before and after topical application of the endothelium-dependent vasodilator noninflammatory mediator agent acetylcholine (24 nmol), the endothelium-independent vasodilator agent sodium nitroprusside (58 nmol), the endothelium-dependent vasodilator and inflammatory mediator agents bradykinin (42 pmol), histamine (4.1 nmol) and

platelet activating factor (60 pmol), and the vasoconstrictor agent norepinephrine (4.7 pmol, 14.1 pmol and 47 pmol).

Results The effects of acetylcholine, and 4.7 pmol and 47 pmol norepinephrine in D + M rats were not different from those in D rats (Table 1). On the other hand, metformin improved sodium nitroprusside, bradykinin, histamine and platelet activating factor-induced relaxation diminished in D rats. It also improved norepinephrine-induced vasoconstriction, enhanced in D rats to control levels (Table 1).**Conclusion** Type 2 diabetes seemed to affect the vascular responses to inflammatory and noninflammatory mediators. Metformin corrects such alterations in the diabetic rats.**Acknowledgement** Financial support from FAPESP.**Table 1****Arteriolar diameters (% alteration)**

| Rats | Norepinephrine (4.7 pmol) | Norepinephrine (14.1 pmol) | Acetylcholine (24 nmol) | Sodium nitroprusside (58 nmol) | Bradykinin (42 pmol) | Histamine (4.1 nmol) | Platelet activating factor (60 pmol) |
|----------------------|--------------------------------------|-------------------------------|--------------------------------------|--------------------------------------|--------------------------|--------------------------------------|--|
| Control | 1.41 ± 0.46 (n = 12) | 7.25 ± 0.98 (n = 12) | 5.70 ± 0.60 (n = 13) | 6.16 ± 0.51 (n = 7) | 6.82 ± 0.29 (n = 12) | 6.14 ± 0.4 (n = 14) | 6.88 ± 0.7 (n = 8) |
| Diabetic | 4.07 ± 0.53 [†] (n = 11) | 69.29 ± 11.34* (n = 13) | 1.17 ± 0.50 [†] (n = 8) | 2.57 ± 0.68* (n = 7) | 1.51 ± 0.23* (n = 14) | 2.1 ± 0.37 [†] (n = 8) | 2.25 ± 0.66* (n = 8) |
| Diabetic + metformin | 6.05 ± 0.91 [†] (n = 9) | 14.89 ± 3.33 (n = 11) | 1.91 ± 0.82 [†] (n = 10) | 5.39 ± 0.56 (n = 7) | 6.88 ± 0.56 (n = 14) | 7.9 ± 0.71 ^{††} (n = 10) | 5.7 ± 0.9 (n = 8) |

P* < 0.05 in comparison with control rats and diabetic + metformin rats. [†]*P* < 0.05 in comparison with control rats. ^{††}*P* < 0.05 in comparison with diabetic rats.P128 The effect of insulin and enalapril on the potentiation of bradykinin-induced vasodilation by angiotensin-(1-7) in diabetes mellitus**

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Critical Care 2003, 7(Suppl 3):P128 (DOI 10.1186/cc2324)**Objective** In control normoglycemic rats, angiotensin-(1-7) [Ang-(1-7)] potentiates the bradykinin (BK)-induced vasodilation. We studied the effects of insulin and enalapril in the Ang-(1-7) and BK interaction in diabetes mellitus.**Design and methods** After 30 days of alloxan (40 mg/kg, intravenously), arteriolar reactivity was determined *in vivo* by intravital microscopy in anesthetized diabetic rats. The increase in arteriolar diameter (%) was measured before and after topical application of BK (1 pmol) and of Ang-(1-7) (100 pmol) + BK. Animals were treated acutely (4IU, 4 hours before) or chronically (2IU, 12 days) with insulin. The effect of enalapril (10 mg/kg per 21 days) and tetraethylammonium (90 pmol, topically), a potassium channel blocker, was also tested.**Results** In diabetic rats, topical application of BK induced a small vasodilation (2.5 ± 0.8%), which was augmented by acute insulin(5.6 ± 0.8%, *P* < 0.05), chronic insulin (4.3 ± 0.2%, *P* < 0.05) and enalapril (5.3 ± 0.3%, *P* < 0.05) treatments. The Ang-(1-7) + BK association did not modify the BK-induced vasodilation in diabetic rats (2.5 ± 0.8 vs 3.4 ± 1.0%), in rats acutely treated with insulin (5.6 ± 0.8% vs 6.0 ± 0.8%) and in enalapril-treated animals (5.3 ± 0.3% vs 6.2 ± 0.2%). However, in animals with chronic insulin treatment, BK responses were potentiated by Ang-(1-7) (8.3 ± 0.5%, *P* < 0.05), and this potentiating effect was reversed in the presence of tetraethylammonium (5.5 ± 0.7%, *P* < 0.05).**Conclusion** These data may indicate that membrane hyperpolarization may contribute to the restoring effect of insulin on the potentiation of BK-induced vasodilation by Ang-(1-7) on diabetic microvessels.**Acknowledgements** Support by PRONEX and FAPESP.

P129 Tormentic acid inhibits proliferation and induces apoptosis in vascular smooth muscle cells

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Background Disturbance in the balance between vascular smooth muscle cell (VSMC) proliferation and death is directly involved in diseases such as atherosclerosis and post-PTCA restenosis. Drugs that modulate such phenotypic alterations may be useful in the control of these and other clinical situations.

Aim The present study analyzes the effect of the triterpenoid tormentic acid (TA, from the plant *Rubus sieboldii*), a DNA polymerase inhibitor with anti-inflammatory properties, on cultured VSMC.

Methods Subconfluent cultures of embryonic rat aortic VSMC (A7r5) were exposed to increasing concentrations of TA or vehicle (DMSO) for 24 h, in the absence or presence of 10% fetal bovine serum (FBS), and apoptosis rates were evaluated through chromatin morphology analysis following DNA staining with the fluorescent dye HOE33342. In a separate series of experiment, A7r5 cells were cultured in 10% FBS continuously incubated with TA or vehicle. Cells were electronically counted (Coulter counter) at 2-day intervals.

Results TA (30 μ M) significantly increased apoptosis of A7r5 cells under serum deprivation conditions (DMSO: $9.6 \pm 1.5\%$ vs TA: $17.9 \pm 1.5\%$, $n = 9$, $P < 0.001$), while cells cultured in FBS were not affected by the drug (DMSO: $2.0 \pm 0.4\%$ vs TA: $2.8 \pm 0.4\%$, $n = 9$, $P = 0.187$). A7r5 cell proliferation was significantly inhibited by TA from the 6th day of culture on (a 30% cell count reduction, $n = 12$, $P < 0.001$), with the relative difference in cell number remaining stable through the 8th day (33% reduction, $n = 6$, $P < 0.001$).

Conclusions Our data indicate that TA is a VSMC apoptosis inducer and proliferation inhibitor. The absence of a pro-apoptotic effect associated with an anti-mitotic action in the presence of serum suggests that TA may be useful in preventing proliferative vascular diseases without negatively affecting normal vasculature. *In vivo* models of vascular lesion are currently being employed in order to investigate this hypothesis.