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ORAL ABSTRACT PRESENTATIONS

MAIN CHARACTERISTICS OF THREE PORTUGUESE PICU: COMPARATIVE EVALUATION

ACTIVIDADE ASSISTENCIAL DE 3 UCIP PORTUGUESAS: AVALIAÇÃO COMPARATIVA

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Objectives: Periodic and critical evaluation of the main characteristics of the population served by the PICU and of delivered care is part of good practice procedures and is fundamental to improve the quality of delivered care. Since May 2002, three Portuguese PICUs collected prospective data about patients' characteristics and about delivered care.

Methods: Prospective collection in all pediatric admissions between May 1, 2002, and April 30, 2004, of data regarding demographics, admission diagnosis (elective postoperative, respiratory, sepsis/septic shock, trauma, others), need of mechanical ventilation (MV), outcome, forgoing life-sustaining treatment (FLST), length of stay (LOS), and all data needed to calculate standardized mortality ratios (SMR) using PRISM, PRISM-III(12h), PIM, and PIM2 probability of death algorithms.

Results: Values are shown for each PICU, respectively, Coimbra/Lisbon/Oporto. From the total of 1,315 (450/445/420) cases included in the study, 48%/48%/44% ($p = .462$) were male patients and the median age was 35/43/40 months ($p = .252$). Admission diagnosis differs significantly between the three PICUs ($p < .001$). MV was needed in 76%/32%/66% of the cases ($p < .001$). Crude mortality rate was 8.9%/5.8%/13.1% ($p < .001$). FLST occurred in 40%/42%/44% of patients who died ($p = .939$). Median LOS was 2.2/3.0/3.1 days ($p < .001$). SMR were 0.78/0.90/0.81 (PRISM), 1.08/1.13/1.06 (PRISM-III), 1.24/1.26/1.54 (PIM), and 1.34/1.28/1.63 (PIM2).

Conclusions: Although these are preliminary results and data collection is still going on, we were able to determine statistically significant differences between demographics of PICU populations and in some indicators of delivered care. Explanations for these differences and their future implications in care delivered in our PICUs are still being discussed.

DEPENDENCE ON OXYGEN AT THE 28TH DAY OF AGE IN NEWBORNS WEIGHTING 1500 G: INCIDENCE AND PREDISPOSING FACTORS

DEPENDÊNCIA DE OXIGENIO AOS 28 DIAS DE VIDA EM RECEM NASCIDO COM MENOS DE 1.500 G: INCIDENCCIA E FATORES PREDISPONENTES

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Introduction: Dependence on oxygen among premature newborns is due to a multifactor process that is variable between different NICUs. Knowledge of predisposing factors allows a better organization of the services and also revision of the management practices for newborns at higher risk.

Objectives: To assess the incidence of dependence on oxygen and to evaluate some predisposing factors among newborns weighting 1500 g at birth.

Methods: Retrospective study including newborns weighting 1500 g at birth that were born between January 2001 and December 2002 and that were alive on the 28th day of life. Infants with major congenital malformations or that were dead or transferred to another service before the 28th day of life were excluded. The continuous use of oxygen until the 28th day of life was considered to be bronchopulmonary dysplasia. Continuous use of oxygen from birth to the 28th day of life was considered dependence on oxygen. Birth weight, gestational age, pre- and postnatal infection, pre- and postnatal steroid use, amniorrhexis time, Apgar score at first and fifth minute, clinical risk index for babies (CRIB), and mechanical ventilation time were evaluated as predisposing factors. t-Test statistics or Fisher's exact test were used for quantitative variables and the chi-square test for qualitative variables. Results are expressed as mean ± SD. A logistic regression model was used in the final analysis. The hospital ethics committee approved this study.

Results: The medical records of 216 patients with 1500-g birth weight were evaluated, of which only 150 fulfilled the inclusion criteria. At 28 days of age, 44.7% (67) had a dependence on oxygen. The birth weight ranged from 560 to 1500 g. The mean birth weight was lower among infants with dependence on oxygen: 1077.8 ± 204.8 vs. 1298.3 ± 151 ($p < .001$). The gestational age ranged from 25 to 37 wks. The mean gestational age was lower among infants with a dependence on oxygen: 30.8 ± 2.1 vs. 32.6 ± 1.9 ($p < .001$). Of the analyzed predisposing factors, birth weight, gestational age, mechanical ventilation for >7 days, and CRIB >5 reached statistical significance. After logistic regression, birth weight <1250 g (OR = 5.25), CRIB >5 (OR = 4.96), and mechanical ventilation for >7 days remained as independent factors.

Conclusion: The incidence of dependence on oxygen at 28 days of age was 44.7%; the odd of dependence on oxygen was five times greater for newly born infants weighting <1250 g at birth or with a CRIB >5 and was four times greater for those infants that needed mechanical ventilation for >7 days.

DEAD SPACE/TIDAL VOLUME RATIO (VD/VT) AND PULMONARY FUNCTION (PF) IN OBSTRUCTIVE ACUTE RESPIRATORY FAILURE

RELAÇÃO ESPAÇO MORTO / VOLUME CORRENTE (VD/VC) E FUNÇÃO PULMONAR EM INSUFICIÊNCIA RESPIRATÓRIA POR DOENÇA OBSTRUTIVA

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Objectives: To evaluate the association between VD/VT and alveolar ventilation (VA), minute ventilation (VE), dynamic compliance (Cdyn), dynamic resistance (Rdyn), Pa_{O_2}, Pa_{CO_2}, pH, F_{IO_2}, Pa_{O_2}/F_{IO_2}, Pa_{O_2}/PA_{O_2}, V_{CO_2}, V_{CO_2} for breath (V_{CO_2}/br), Pet_{CO_2}, mean airway pressure (MAP), ventilation index [VI = (Pa_{CO_2} × PIP × RRmec)/1000], oxygenation index [OI = (MAP × F_{IO_2} × 100)/Pa_{O_2}].

Methods: 29 children, 0–2 yrs, with obstructive acute respiratory failure, were studied. Measurements were made between 24 and 72 hrs of MV, using volumetric capnography and blood gas analysis.

Results: Significant correlations (Spearman's rs) were found between VD/VT and VA (rs = -0.78; $p < .001$), VE (rs = -0.58; $p = .001$), Pa_{O_2} (rs = -0.63; $p < .001$), Pa_{O_2}/PA_{O_2} (rs = -0.46; $p = .012$), Pa_{CO_2} (rs = 0.51; $p = .005$), V_{CO_2} (rs = -0.62; $p < .001$), V_{CO_2}/br (rs = -0.69; $p < .001$), OI (rs = -0.48; $p = .009$), VI (rs = -0.53; $p = .003$), Cdyn (rs = -0.55; $p = .002$), and Rdyn (rs = 0.54; $p = .002$). A statistically significant association was found between increased VD/VT and severe lung injury, defined as $Pa_{O_2}/F_{IO_2} < 200$ ($p = .03$, Mann-Whitney).

Conclusions: VD/VT is related to variables representative of pulmonary mechanics and gas exchange. The results above suggest that VD/VT may be a useful marker for the severity of lung injury.

FORGOING LIFE-SUSTAINING TREATMENT IN THREE PEDIATRIC INTENSIVE CARE UNITS IN SOUTHERN BRAZIL

LIMITAÇÃO DE SUPORTE DE VIDA EM TRÊS UNIDADES DE TERAPIA INTENSIVA DO SUL DO BRAZIL

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Objectives: To describe modes of death and factors involved in decision-making together with life support limitation (LSL) procedures in three university-affiliated pediatric intensive care units (PICU) in southern Brazil.

Methods: Observational and retrospective study. The medical records of all deaths that occurred in 2002 in these selected PICUS of Porto Alegre were reviewed by three pediatric fellows with each service. The researchers were previously trained ($\kappa = 90\%$) and reviewed the records independently looking for general characteristics, modes of death (failed cardiopulmonary resuscitation [CPR], brain death, do-not-resuscitate status, withholding or withdrawing life-sustaining treatment), length of stay in the hospital and PICU, justification of plans, participation of the family, and ethics committee. These data were compared with a previous study, which involved the same institutions and used the same methodology (1988 and 1998 period). The Student's *t*-test, Mann Whitney, chi-square, relative risk, and multivariate analysis were used for comparing the data.

Results: The incidence of LSL was 36%, higher ($p < .01$) than observed in 1988 (5%) and 1998 (16%), whereas 53% of patients underwent CPR before their death. The most frequent practice for LSL was do-not-resuscitate orders (70%). The LSL was associated with the presence of chronic disease (odds ratio [OR], 4.4; confidence interval [CI], 1.6–11.8), and with the length of PICU stay (OR, 8.2; CI, 3.2–21.3). Poor long-term prognosis was the most frequently reported justification for LSL. The involvement of the family and the ethics committee in the decision-making process was <10%.

Conclusions: Similar to the northern hemisphere countries, the incidence of LSL was increasing in our units during the last years. However, the incidence of CPR remains higher than that described in North American and North European countries. The preference of do-not-resuscitate orders for LSL and the low participation of the families in the decision-making process reflect the difficulties and dilemmas encountered by the professionals responsible for handling critically ill children in our country.

TIDAL VOLUME DURING MECHANICAL VENTILATION IN THE NEWBORN: IS IT POSSIBLE TO ESTIMATE ACCORDING TO CLINICAL PARAMETERS?

VOLUME CORRENTE DURANTE A VENTILAÇÃO MECANICA EM RECÉM NASCIDOS: É POSSIVEL ESTIMAR DE ACORDO COM OS PARÂMETROS CLINICOS?

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Background: Volutrauma is the most important factor leading to pulmonary lesions associated with mechanical ventilation. Clinical observation of thoracic expansibility is the most usual parameter to estimate tidal volume during mechanical ventilation in the newborn. The aim of this study is to analyze if clinical observation of thoracic expansibility can predict tidal volume during mechanical ventilation in the newborn and if the experience of the examiner can influence this result.

Design: A prospective cohort study included physicians who work in neonatal intensive care and were classified into three categories according to their experience: low—resident physicians coursing the first grade of pediatrics; moderate—resident physicians coursing the second grade of pediatrics or specialist physicians coursing the first year of neonatology or pediatric intensive care; expert—second grade specialist physicians or physicians with >4 yrs experience working in neonatology. Clinical evaluation of thoracic expansibility was done during the weaning process from mechanical ventilation. Expansibility was considered adequate when the third median sternum lifted 0.5 cm and insufficient or excessive if this measure was under or over this value. After 2 mins of observation, each professional answered the following question. "After observation of the clinical parameters, do you believe that tidal volume is adequate?" Tidal volume was measured with a fixed orifice pneumotachography connected between the endotracheal tube and the ventilator circuit. Flow and pressure signals were captured by a graphic monitor (tracer 5—Intermed), stored in a personal computer, and subsequently analyzed using the software, Win Tracer (Intermed). Exhaled tidal volume was considered to be the mean of ten controlled cycles and was indexed by study day weight. The value was considerate adequate if the tidal volume was between 4 and 6 mL/kg (insufficient if the value was <4 mL/kg and excessive if the value was >6 mL/kg.

Results: 21 newborns were included in the study with 102 evaluations. According to the professionals with low experience, moderate experience, and the experts, 73%, 66%, and 51%, respectively, of the infants were ventilated. When clinical observations and tidal volume measurements were compared, 54% of the experts, 34% of those with moderate experience, and 18% of those with low experience were corrected. Statistical analysis was realized using κ. There was no concordance between observers and the monitor.

Conclusion: Physicians, including neonatologists, are unable to estimate adequate tidal volume using clinical parameters during mechanical ventilation.

HYPERGLYCEMIA IN CHILDREN WITH SEPTIC SHOCK

HIPERGLICEMIA EM CRIANÇAS COM CHOQUE SÉPTICO

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Objective: To study the relationship between serum glucose and mortality in children with septic shock.

Design: Prospective cohort study.

Setting: A 12-bed pediatric intensive care unit at the Hospital Sao Lucas da PUCRS, Porto Alegre, Brazil.

Patients: All children admitted with fluid-refractory septic shock during a period of 22 months.

Interventions: None.

Measurements and Main Results: Serum glucose was measured in all children during the study period, and the highest value was assessed in relation to outcome. Fifty-seven of 1,053 intensive care unit admissions were enrolled in the study. The peak glucose level in those with septic shock was 214 ± 98 mg/dL (mean ± SD), and the mortality was 49.1% (28/57). In nonsurvivors, peak glucose level was 262 ± 110 mg/dL, which was higher ($p < .01$) than that found in survivors (167.8 ± 55 mg/dL). The area under the receiver operator curve for peak glucose level and mortality was 0.754. The best peak glucose level for predicting death in children with sepsis was 178 mg/dL (sensitivity, 0.714; specificity, 0.724), and the relative risk of death in patients with peak glucose levels higher than 178 mg/dL was 2.59 (1.37–4.88).

Conclusion: In children with septic shock, peak glucose levels >178 mg/dl is associated with an increased risk of death.

SERUM LEVEL OF CARDIAC TROPONIN I IN PEDIATRIC PATIENTS WITH SEPSIS/SEPTIC SHOCK

NIVEIS SÉRICOS DE TROPONINA CARDIACA EM PACIENTES COM SEPSE / CHOQUE SEPTICO.

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Introduction: Cardiac function alters markedly in sepsis. Troponin I, a cardiac-specific contractile protein, has been shown to be useful for diagnosing myocardial injury.

Objective: To evaluate the serum level of cTnI in the 24-hrs of sepsis diagnosis and outcome (hospital discharge or death).

Methods: In a 14-month period, 218 children were consecutively admitted using our inclusion criteria. The study was approved by the Research Ethic Committee. The Pediatric Index of Mortality (PIM/PIM2), electrocardiograms, CK-MB were collected. The cTnI was processed using the IMMULITE assay. At autopsy, myocarditis was diagnosed using to the Dallas criteria. Unpaired Students *t*-test, the chi-square test, Fisher's exact test or Mantel-Haenszel's test was used when appropriate. A two-tailed p .05 was considered statistically significant. The area under the ROC curve was calculated to evaluate PIM/PIM2 (SPSS 11.0).

Results: Among 218 patients, the most frequent primary disease was pneumonia (41.7%), followed by meningitis (18.4%). Overall mortality was 27 (12.4%), four (2.7%) in the sepsis group and 23 (33.3%) in the septic shock group. The PIM more closely predicted the deaths (51/23.4%) than did PIM2 (70/32.1%). The area under the ROC curve was 0.93 (95% confidence interval [CI], 0.89–0.97) for PIM and 0.86 (95% CI, 0.79–0.92) for PIM2. The electrocardiographic abnormalities were seen in 77 patients (35.5%), mainly repolarization ventricular disturbances (75.5%). Serum cTnI was elevated in ten patients, one (0.7%) in the sepsis group and nine (13%) in the septic shock group. There was a statistical significance between serum cTnI and outcome (survivors, 5/191 [2.6%]; nonsurvivors, 5/27 [18.5%]; $p = .003$). There was no correlation between cTnI and CK MB ($p = .07$) or ECG abnormalities ($p = .33$). The effect of all variables (age, gender, length of hospital stay, sepsis definition, presence of meningitis, CK-MB, cTnI) was studied in the outcome (hospital discharge/death) by logistic regression, and statistically significant differences were found in the severity of septic disease ($p = .0005$). Five patients died with elevated serum cTnI; three of them underwent autopsy (two patients showed myocarditis).

Conclusion: The level of serum cardiac troponin I was elevated in septic pediatric patients in the first 24 hrs after diagnosis and correlated with the severity of disease (septic shock) and a higher mortality.

TH1, BUT NOT TH2, LYMPHOCYTES ARE DEPLETED DURING ACUTE RESPIRATORY SYNCYTIAL VIRUS INFECTION

LINFÓCITOS TH1, MAS NÃO TH2, SÃO DEPLETADOS DURANTE A INFECÇÃO RESPIRATÓRIA AGUDA PELO VIRUS SINCICIAL RESPIRATÓRIO.

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Rationale: There is a continuing debate about the nature of the T-helper lymphocyte response to acute respiratory syncytial virus (RSV) infection and whether RSV can alter T-cell function. Cytokine production *in vitro* has been used to characterize T-helper activity during and following acute RSV infection, but this methodology is indirect. Specific chemokine receptors are expressed on T-helper lymphocytes and can be used to identify phenotype. In particular, CXCR3 is found exclusively on Th1 lymphocytes, while CCR4 is a marker of Th2 cells. Suppressor activity may also be important in the overall T-lymphocyte function, and these cells will express CD25+.

Methods: Blood was taken from 20 infants with acute RSV infection and after recovery. Cell surface expression of CXCR3, CCR4, and CD25 on CD3+/CD4+ was determined by flow cytometry. Absolute lymphocyte counts were determined by hematological blood count.

Results: We found that absolute numbers of CXCR3+ T-helper cells (Th1) were significantly depleted in acute RSV infection compared with convalescent samples ($p < .01$). In contrast, the numbers of CCR4 T-helper cells (Th2) were unchanged in acute RSV infection. The Th1:Th2 ratio was significantly different between acute and convalescent samples. There was no difference in the numbers of CD25+ cells between acute and convalescent samples.

Conclusions: These results suggest that acute RSV infection is associated with a decrease in the number of circulating Th1 lymphocytes, while numbers of Th2 cells were unchanged. This led to a pronounced alteration in the ratio of Th1:Th2 lymphocytes. CD25+ T-suppressor cells, which tend to be of the Th2 phenotype, are also unchanged. These findings may have implications for the long-term memory response to acute RSV infection.

EVALUATION OF THE DEAD SPACE TO TIDAL VOLUME RATIO (VD/VT) AS A PREDICTOR OF SUCCESSFUL REMOVAL OF MECHANICAL VENTILATION IN CRITICALLY ILL CHILDREN

AVALIAÇÃO DA RELAÇÃO ESPAÇO MORTO/VOLUME CORRENTE (VD/VT) COMO ÍNDICE PREDITIVO DE SUCESSO NA EXTUBAÇÃO DE CRIANÇAS GRAVES

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Objectives: The dead space to tidal volume ratio (Vd/Vt) has been shown to be useful for evaluating the degree of lung injury in patients undergoing mechanical ventilation. The aim of this study was to evaluate the Vd/Vt index as a predictor of successful extubation in children undergoing mechanical ventilation and to compare it with other clinical or laboratory parameters as predictors of successful extubation.

Methods: From September 2001 to January 2003 a prospective cohort of all patients undergoing mechanical ventilation in the ICU was undertaken. Once the patient was considered ready for extubation, a preset of ventilatory parameters was applied for 20 mins. The Vd/Vt ratio was then calculated, followed by extubation. After extubation, patients were treated according to individual needs, and data concerning respiratory distress, arterial blood gases, and the Downes and Raphae ly score, for upper airway obstruction, were obtained. The need for reinstitution of invasive or noninvasive ventilation in a period of 48 hrs was considered extubation failure. A successful extubation was defined as a 48-hr period without the above. Statistical analysis included the chi-square test, determination of sensitivity and specificity, and the likelihood ratios for a Vd/Vt index with a cut-off of 0.65. An unpaired Students *t*-test comparison followed by logistic regression was applied to analyze the association between different clinical and biochemical variables with the Vd/Vt ratio and the extubation failure.

Results: During the study period, 250 children underwent mechanical ventilation in the pediatric ICU. Eighty-six patients were included after applying the inclusion and exclusion criteria. Of these, 44 (51.1%) were male. Twenty-one patients failed extubation, with 11 (12.8%) needing noninvasive support and ten (11.6%) requiring reintubation. Mean age was 16.8 (±30.1) months, with a median age of 5.5 months. The mean Vd/Vt ratio for all samples was 0.63 (±0.18). The mean Vd/Vt index for successful patients and for those who failed extubation was, respectively, 0.62 (±0.17) and 0.65 (±0.21) ($p = .472$). Mean Vd/Vt ratios for patients who were successful compared with ones reintubated were, respectively, 0.62 (±0.18) and 0.64 (±0.21) ($p = .765$). Results of the likelihood ratio pointed out relative risks of success of 1.89 and 0.45 for a Vd/Vt .0.65 and >0.65, respectively. For reintubation, positive and negative likelihood ratios were 1.31 and 0.68, respectively. With the unpaired Student *t*-test for failed extubation, there was a statistical difference in pre-extubation oxygen saturation and in Pao_2/Fio_2 at admission with $p = .041$ and $p = .022$, respectively. The logistic regression analysis showed that the Vd/Vt index had no statistical association with success or failure of extubation or reintubation ($p = .8458$ and .5576, respectively). Regarding the risk of extubation failure, the only parameter associated with failure of extubation was Pao_2/Fio_2 at admission ($p < .0001$).

Conclusion: The Vd/Vt index was unable to discriminate between the successful and failed extubation groups. The Vd/Vt index with a cut-off of 0.65 had a limited performance regarding the sensitivity and specificity and a moderate performance regarding the likelihood ratio. The Pao_2/Fio_2 at admission showed a higher association with extubation success for patients with a failure of extubation.

MORTALITY DIFFERENCES FOR USE OF HYPERTONIC SALINE 3% AND INVASIVE MONITORING IN SEVERE HEAD TRAUMA IN A PEDIATRIC INTENSIVE CARE UNIT IN GUATEMALA

IMPACTO SOBRE LA MORTALIDAD POR UTILIZACIÓN DE SÓDIO HIPERTÓNICO SAL 3% Y MONITOREO INVASIVO EN TRAUMA DE CRANIO EN UTIP DE GUATEMALA.

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Objective: To determine the differences in mortality of patients admitted to the PICU with severe head trauma, who received treatment with hypertonic saline 3% and continuous invasive arterial blood pressure monitoring, with a group that did not receive this treatment.

Methods: All the patients were included for diagnostic testing of severe head trauma (Glasgow Coma Scale, <8 points; hemodynamic instability [shock]; multiple trauma; focalization or neurosurgical lesions) and required PICU admittance for monitoring and treatment. The frequent use of an arterial catheter for monitoring and hypertonic saline 3% was introduced during March–June 2003; since then, it has become an established protocol for treating these patients. Two groups were compared by number and period of time, but were not paired. In group 1, 59 patients were admitted to the PICU between October 2002 and May 2003. This group with severe head trauma received treatment with a Mannitol-like osmotic agent for cerebral edema and intracranial hypertension. In group 2, 63 patients were admitted between June 2003 and June 2004. An arterial catheter was placed for invasive blood pressure monitoring/samples, and hypertonic saline 3% was used as an osmotic agent. *t*-test independent samples, 95% confidence interval, were used.

Results: In group 1, 27 of 59 patients died (54.2%), while in group 2, 10 of 63 patients died (15.8%; $p < .01$). Differences exist in the total PRISM III score among the patients that survived (7.04 ± 5.85 points) and those that died (14.86 ± 11.21 points; $p < .01$). There is no difference between the patients who require surgical treatment and those who do not need it.

Conclusion: The use of hypertonic saline 3% and invasive arterial blood pressure monitoring has been a useful tool for the children with severe head trauma seen at the public university hospital. The application of treatment protocols used to avoid hypotension events and important serum osmolarity changes have had an important impact on mortality.