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EFFECT OF BLOOD TRANSFUSION ON APNOEA, BRADYCARDIA, TACHYCARDIA AND OXYGEN SATURATION

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If oxygen delivery to the central nervous system is reduced because of anaemia of prematurity recurrent apnoea, bradycardia and tachycardia may become more prominent clinically. The purpose of this prospective study was to evaluate the effect of blood transfusions on apnoea, bradycardia and tachycardia frequencies in 25 anaemic premature infants (gestational age 29±3, birth weight 1170g ± 550, age at transfusion 32 ± 16 days). **Methods:** The premature infants received 10 ml red blood cells per kilogram of body weight over a 3 hour period. The frequency of apnoeas >10s, bradycardias <100 min⁻¹ and tachycardias >200 min⁻¹ were documented on an event recorder (EdenTec 2000W, Minneapolis, USA) over a period of 72 hours. The event recorder allowed the recording of pneumocardiograms and reevaluation of each event. The events were distinguished in apnoeas of 10 to 15s and more than 15s duration, bradycardias <80 and <100 min⁻¹. Oxygen saturation was documented during each event. No event recording was done at the day of transfusion. **Results:** We found significant decreases in frequencies of apnoeas >15s (2.7 to 0.9 per day), tachycardias >200 min⁻¹ (34 to 25 per day) bradycardias <100 min⁻¹ (65 to 12 per day) and <80 min⁻¹ (8.4 to 3.3 per day) using Wilcoxon-rank-test. Both types of bradycardia, caused by central apnoea or even by mixed or obstructive apnoea, will be effected by blood transfusion. There is no effect on periodic breathing and apnoeas of 10 to 15s, probably caused to methodology faults. Prevention of marked oxygen desaturation was ameliorated in some infants, the difference is statistical significant. The effects of transfusion remained for three days. This suggests that the beneficial effects of transfusion were not solely due to volume expansion. Day-to-day variability is not significant three days before and three days after transfusion.

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MULTIPLE TRAUMA IN CHILDHOOD: REVIEW OF 130 CASES

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Trauma remains the leading cause of death in the pediatric age group, despite recent advances in prevention and treatment. In this study we retrospectively analyzed 130 multiple trauma pediatric patients out of 726 pediatric patients with simple injuries treated at Rambam Medical Center during the years 1988-1989. Road accidents and falls from height were the most common causes of injury. Mean age was 7 years (range 0.5 to 15 years) with male to female ratio of 2.7:1. Overall mortality in this series was 9.2%. Fifty seven patients (44%) did not get any prehospital medical care and 5 of them with Injury Severity Score (ISS)>25 - all died. In contrast 11/18 (61%) patients with ISS>25 who were treated by medical teams survived. On arrival to the Emergency Room 15% of patients were hypothermic (<34°C). Six were in hypovolemic shock - all of them died. Most common injuries included: Head trauma (n=91), limb injuries (n=69), abdominal trauma (n=34) and thoracic trauma (n=34). Severe injury with Pediatric Trauma Score (PTS) <6 was found in 39 patients and 12 of them died. All deaths were associated with ISS>25 and severe head injury. There was no mortality in patients with PTS=7 or ISS<25.

In conclusion: 1. the prehospital care of pediatric patients has a great impact on survival. 2. Multiple trauma in pediatric patients with head injury is associated with a high mortality rate. 3. No mortality of patients with PTS > 7 emphasizes the importance of designated trauma centers for these patients.

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Modulation of NAP-2-induced Neutrophil (PMN) Activation by Different Surfactant Preparations

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Background: Lung surfactant, a complex composition of phospholipids, neutral lipids and various apoproteins is essential for lung function. In surfactant deficient neonates treatment was done successfully by endotracheal administration of either natural or artificial surfactant preparations. Alteration of the alveolo-capillary membrane may allow blood compounds, such as proteins and cells to interact with surfactant constituents and vice versa. **The aim** of our study was to investigate surfactant-related effects on PMN since these cells are major effector cells of the primary immune and inflammatory response, involved in pulmonary failure. **Methods:** PMN, isolated from citrated blood of 3 healthy volunteers were allowed to interact with different surfactant preparations for a time of 30 minutes. Cell activation, reflected by PMN degranulation was detected by measurements of elastase-activity in the supernatant. **Results:** While NAP-2-induced elastase release was suppressed about by 70% at concentrations of more than 1.0 mg/ml of natural preparations Survanta[®] and Curosurf[®], the only artificial preparation Exosurf[®] showed slightly stimulating effects. Alveofact[®], in contrast seems to combine both, activating and inhibiting properties, interfering with each other. If unstimulated, PMN were not affected by the surfactant preparations.

NAP-2-induced elastase [100%] from PMN exposed to surfactant [%]	Survanta [®]	Curosurf [®]	Alveofact [®]	Exosurf [®]
	27 ± 4	32 ± 5	91 ± 11	123 ± 7

Conclusion: NAP-2-induced activation of isolated PMN is modulated by surfactant. Clinical implications of preparation related effects have to be elucidated.

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ANAEMIA/HYPOVOLEMIA: AN UNSUSPECTED CAUSE OF IMPAIRED OXYGEN (O₂) TRANSPORT AFTER CARDIAC SURGERY

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Adequate blood volume (BV) is important for organ perfusion; haemodynamic monitoring and clinical assessment may be misleading. In a study of children, <48hrs after cardiac surgery, we compared measured BV and red cell volume (RCV) with [Hb] and Hct with a scoring system (SS) for hypovolaemia, in children who were clinically stable. RCV was measured using biotin-labelled autologous red cells. Twelve measurements were made in 10 children at from 2-11 days after surgery; median (range): age 28 days (2-3,549); weight 3.3kg(1-25.6). All received respiratory support (Sa O₂ 65-98%). RCV ranged from 14-33 ml/kg, BV 42-94 ml/kg. Significant depletion of BV and RCV was found in all, compared with normal, physiological predicted requirements. Neither Hct nor SS predicted RCV (r²=36%, 25%, 1%) or BV (r²=2%, 0.1%, 2%).

Suboptimal BV is common and may cause impaired O₂ transport after cardiac surgery. Standard assessment techniques are unreliable but biotin labelled red cells can be used to quantitate RCV and BV. Normalization of BV and RCV after bypass surgery may lead to reduction in post operative morbidity.

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EVALUATION OF THE PULSE ARRIVAL TIME AS A MARKER FOR BLOOD PRESSURE CHANGES IN INFANTS AND CHILDREN AFTER CARDIAC SURGERY

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The arterial blood pressure (BP) is an important parameter in patients (pts) after cardiac surgery. It would be desirable to monitor BP non-invasively and continuously. Pulse arrival time (PAT), which is the interval between the R wave of the ECG and the arrival of the pulse wave peripherally, has been reported to be suitable for use as an indirect measure of blood pressure changes. **Objective:** The purpose of this research was to evaluate, in critically ill infants and children after open heart surgery, the degree to which 1/PAT covaries with systolic, diastolic and mean blood pressure as well as heart rate. **Methods:** A laboratory device (Vectron GmbH) was used to calculate PAT in real time from the ECG and the plethysmographic curve of pulse oximetry used for routine monitoring. Calculated PAT and corresponding blood pressures and heart rate were stored on harddisk. **Patients:** Fifteen critically ill pts aged 6 days to 16 years with a weight of 3 to 80 kg were studied. **Results:** In all patients one period of 11- to 36-thousand beats could be evaluated. Mean correlation coefficients were best for systolic (r=0.73), followed by mean (r=0.68) and diastolic (r=0.61) blood pressure and finally heart rate (r=0.52). In 7 patients the correlation coefficient for systolic blood pressure was r > 0.9, but in 4 patients it was r < 0.4. **Conclusion:** Although there is a significant correlation between 1/PAT and systolic blood pressure, it is not strong enough to use it as a marker for blood pressure changes in critically ill pts. This is most likely due to changes of the pre-ejection period, which is part of the PAT.

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CONTINUOUS MEASUREMENT OF CARDIAC OUTPUT BY THE FICK PRINCIPLE - COMPARISON WITH THE THERMODILUTION METHOD

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Purpose of this study was to compare a system which continuously monitors cardiac output by the Fick principle with measurements by the thermodilution technique in pediatric patients. **Methods:** This system (Dataperformance) uses measurements of oxygen consumption by a metabolic monitor (Datex), arterio-venous oxygen difference by pulse- (Nellcor) and fiberoptic oximetry (Abbott) and arterial and pulmonary artery pressures (Hewlett Packard) to calculate cardiac output and systemic and pulmonary resistance every 15s. Statistical analysis was performed using linear regression and the Bland-Altman plot. **Patients:** 12 patients (aged 1 month to 16 years) after open heart surgery were studied. The catheters were placed intraoperatively. Only patients without tube leak and without residual shunts were included. **Results:** 46 pairs of measurements were obtained ranging from 0.21 to 3.9 l/min. A good correlation coefficient was found: r = 0.98; y = 0.016 + 0.95x; SEE: 0.21 l/min. However there were considerable differences between the two methods. The SD of the difference between the two methods was 0.22 l/min. The SD of the difference between the two methods in percent of the mean cardiac output was 18%. The difference was most marked in neonates with low cardiac output. **Conclusion:** Continuous measurement of cardiac output by the Fick principle offers a convenient method for hemodynamic monitoring of unstable infants and children. In neonates this system might be improved, when a neonatal metabolic monitor becomes available.