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Correlation of near-infrared spectroscopy (NIRS) with cardiac index in infants following surgery for congenital heart disease

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Objectives: Determine the values of spectroscopic monitoring by INVOS system during the immediate postoperatory. Compare the values obtained in the regional oxygen saturation (rSO2) in the flank (rSO2f), abdominal (rSO2a) and cerebral (rSO2c) with the central venous oxygen saturation (ScvO2) and cardiac output measured by transpulmonary thermodilution (TPTD). Assess the ability of INVOSR to detect the situation of low output.
Material and methods: Prospective (February 2009 - June 2010) analytical study in children under 10 kilograms. Measurements were made at 1, 4, 8, 16 and 24 hours after surgery in PICU using INVOS 5100R, simultaneously ScvO2 , stroke volume index (SVI) and cardiac index (CI) obtained by TPTD (PiCCO) were registered. Patient data are expressed as median and range. We used the Pearson test to determine the association between the variables obtained and the Mann-Whitney test for comparison of means.
Results: We included 17 patients, age 8 (3-34) months and weight 7.8 (3.8-10) kilograms. There was a significant correlation between ScvO2 and right rSO2c (r = 0.54), left rSO2c (r =0.63) and rSO2f (r =0.54) and a stronger correlation with the previously proposed formula = 0,45x rSO2c + 0,45x rSO2f (r = 0.76). SVI correlated with right rSO2c (r =0.66) and left rSO2c (r =0.69). In addition, we obtained a formula = - 33 + 0.215x rSO2f + 0.626 x rSO2c that correlates the flank and cerebral saturation with SVI (r = 0.72). Comparing the measures that showed CI<3.3 vs CI> 3.3ml /min/m2 we obtained a significant difference p< 0.01 for the right rSO2c, (65 vs 73 %), left rSO2c (64 vs 73 %) , SVcO2 (68 vs 77 %), proposed formula (66 vs 72) and new IC formula (24 vs 31 ml/m2).
Conclusions: We found an association between NIRS, ScvO2 and TPTD. A cerebral and renal measurement together improves correlation slightly. Spectroscopy is useful to detect low output state. INVOS provides a useful monitoring the postoperative congenital heart disease in children under 10 kilograms.