Pre- and post-enteral feeding measurement of splanchnic/cerebral oxygenation ratio (SCOR) by near infra-red spectroscopy (NIRS) in neonates with congenital heart disease (CHD) and comparison with healthy neonates

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Background: an increased risk of necrotizing enterocolitis has been documented in neonates affected by CHD. However, the beneficial effect of early enteral feeding on the perinatal and surgical prognosis is well known.

Aim: our study aims at evaluating the effect of enteral feeding on the splanchnic oxygenation in neonates with CHD, in comparison with healthy neonates.

Methods: the regional oxygen saturation index was measured by means of NIRS skin sensors positioned on the forehead and on the umbilical region of neonates with CHD and healthy neonates (Fig.1-2). The ratio between the splanchnic and cerebral oxygenation (SCOR) before and after enteral feeding was evaluated.

Fig.1: position of NIRS skin sensors

Fig.2: exemple of NIRS monitoring

Results: twenty seven neonates affected by complex CHD were enrolled in the study (9 with LVOT obstruction, 6 with RVOT obstruction, 8 with TGA and 4 with HLHS) and compared with 18 healthy neonates. All the CHD neonates were in stable hemodynamic condition, on PGE1 at a mean dose of 35 ng/kg/min. The NIRS monitoring lasted 63,7 hours ± 32,6 in CHD patients and 5,4 hours ± 1,2 in controls. A mean of 4,7 ±1,7 meals were recorded in CHD patient, 2 meals in 8 controls and 1 in 10.

CHD patients showed pre- and post-prandial SCOR significantly lower than controls: CHD SCOR pre 0.784 ± 0.221, controls 1.019 ± 0.134 (p 0.000), CHD SCOR post 0.793 ± 0.217, controls 1.021 ± 0.128 (p 0.000), without difference in pre- and post-prandial oxygenation.

SCOR	CHD	Controls	Sig.(p)
PRE	0.784 ± 0.221	1.019 ± 0.134	0,000
POST	0.793 ± 0.217	1.021 ± 0.128	0,000
Sig. (p)	0,592	0,638	

Tab. 1: pre and post-prandial SCOR in CHD and controls

Among CHD patients, those with LVOT obstruction and HLHS had lower SCOR in comparison with TGA and RVOT obstruction patients, always without difference between pre and post prandial SCOR: LVOTO SCOR pre 0,76 ± 0,19 post 0,75 ± 0,18, HLHS SCOR pre 0,70 ± 0,23 post 0,70 ± 0,23; TGA SCOR pre 0,90 ± 0,28 post 0,93 ± 0,32; RVOTO SCOR pre 0,82 ± 0,21 post 0,84 ± 0,19.

	SCOR-PRE	SCOR-POST	Sig. (p)
LVOTO	0,76 ± 0,19	0,75 ± 0,18	0,744
RVOTO	0,82 ± 0,21	0,84 ± 0,19	0,661
D-TGA	0,90 ± 0,28	0,93 ± 0,32	0,301
HLHS	0,71 ± 0,24	0,70 ± 0,23	0,783

Tab. 2: Comparison among CHD patient

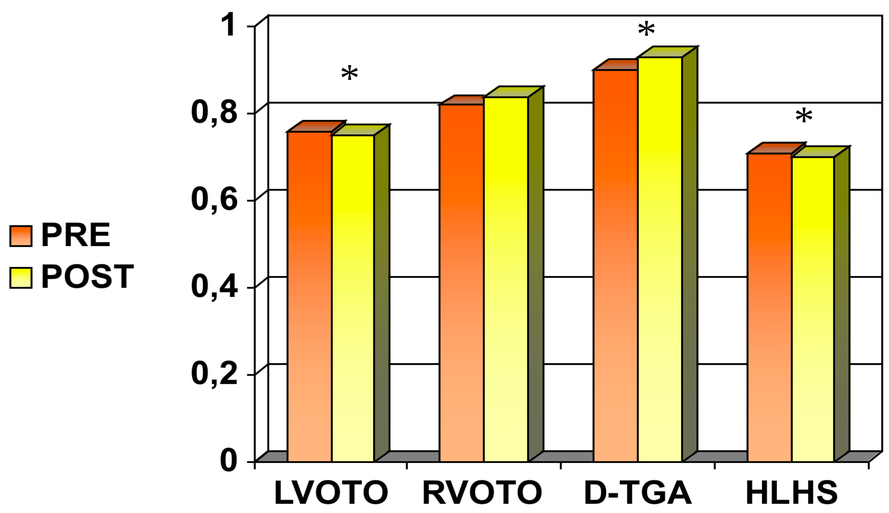

Fig. 3: Comparison among CHD patient

Conclusion: in CHD patients, in stable condition, enteral oxygenation is significantly lower than in controls, mainly in patients with LVOTO and HLHS. Enteral feeding does not seem to modify the splanchnic oxygenation. According to these results the advantage of enteral nutrition on the surgical prognosis should overcome the risk of necrotizing enterocolitis.

References: (1) McElhinney DB, Hedrick HL, Bush DM, et al. Necrotizing enterocolitis in neonates with congenital heart disease: risk factors and outcomes. Pediatrics. 2000; 106:1080–1087; (2) Fortune PM, Wagstaff M, Petros AJ. Cerebro-splanchnic oxygenation ratio (CSOR) using near infrared spectroscopy may be able to predict splanchnic ischaemia in neonates. Intensive Care Med. 2001; 27:1401-14.