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NT-proBNP in Newborns: Congenital Heart Disease or Respiratory Failure Due to Neonatal Lung Disease?

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Background

B- type natriuretic peptides have been demonstrated to enable differentiation between heart and lung disease in adults and children with respiratory distress. The purpose of this study was to investigate NT- pro BNP concentrations and their time courses during the first five days in neonates with arterial duct dependent congenital heart defect (CHD) compared to neonates with respiratory distress (RD) for other reasons.

Methods

From Feb 2009 to Oct 2011 ninety-five neonates were recruited for this single-center prospective study. Inclusion criteria were duct-dependent CHD or RD with need of respiratory support. At administration all neonates underwent physical examination, chest x-ray. Echocardiography was performed within 24 hours after admission. Plasma NT-pro-BNP levels were evaluated on day of life (DOL) 1, 2, 3, and 5 using an automated enzyme immuno assay. Exclusion criteria were <37 weeks of gestation (n=1), syndrome or other major extracardiac malformations (n=2), coincidence of CHD and asphyxia (n=2), missing parental consent (n=4), missing NT-pro-BNP levels on DOL 3 (n=6). Finally, 80 patients could be included in the statistical analysis, 40 were diagnosed with CHD (fetally diagnosed: 31, postnatally diagnosed: 9), 25 with lung disease and 15 with perinatal asphyxia.

Results

Demographic data of the two groups are shown in table 1. Diagnoses of the CHD group are shown in table 2. Mean NT- pro BNP concentrations in the CHD group were significantly higher on the second, third, and fifth day, but not on the first day. Repeated measurements ANOVA revealed a significantly different time course of NT- pro BNP concentrations between the two groups.(Fig 1)

Variable	Group 1 (n=40)	Group 2 (n=40)	Method	p-value
Male sex; N (%)	24 (60)	26 (65)	Fisher	0,82
Gestational week; mean (SD)	39.25 (1.0)	39.68 (1.4)	t-test	0,12
Birth weight, kg; mean (SD)	3.24 (0.52)	3.49 (0.61)	t-test	0.049
Birth length, cm; mean (SD)	49.65 (2.41)	51.46 (2.85)	t-test	0.003
Head circumference, cm; mean (SD)	33.80 (1.60)	34.68 (1.33)	t-test	0.009
Apgar score 1 minute; median (Q1-Q3)	9 (8-9)	7 (3-9)	MW-U-test	< 0.001
Apgar score 5 minutes; median (Q1-Q3)	9 (9-10)	8 (4-9)	MW-U-test	< 0.001
Apgar score 10 minutes; median ((Q1-Q3)	9 (9-10)	8 (7-9)	MW-U-test	< 0.001
Arterial umbilical pH; mean (SD)	7.27 (0.07)	7.19 (0.16)	t-test	0.005
Venous umbilical pH; mean (SD)	7.33 (0.06)	7.26 (0.13)	t-test	0.017
Mode of birth; CS / op. vag / spont. vag); N	13 / 0 / 27	12.06.22	Chi square	0.088
Mechanical ventilation at admission; N (%)	6 (15)	16 (40)	Fisher	0.023
Nasal CPAP at admission; N (%)	4 (10)	25 (63)	Fisher	< 0.001

Table 1: Comparison of demographic data (Group 1 = CHD, Group 2 = non CHD)
CS, caesarian section; op. vag, operative vaginal delivery; spont. vag, spontaneous vaginal delivery; Q1 – Q3, first quartile - third quartile; CPAP, continuous positive airway pressure

Types of cardiac defect	Number of patients
Hypoplastic left heart syndrome	11
Transposition of the great arteries	11
Shone-Complex	5
Transposition of the great arteries with VSD	3
Tricuspid atresia	3
Pulmonary atresia with intact ventricular septum	2
Critical aortic stenosis	1
Hypertrophic cardiomyopathy with subaortic stenosis	1
Critical coarctation of the aortic arch	1
Critical pulmonary stenosis	1
Pulmonary atresia with VSD	1

Table 2

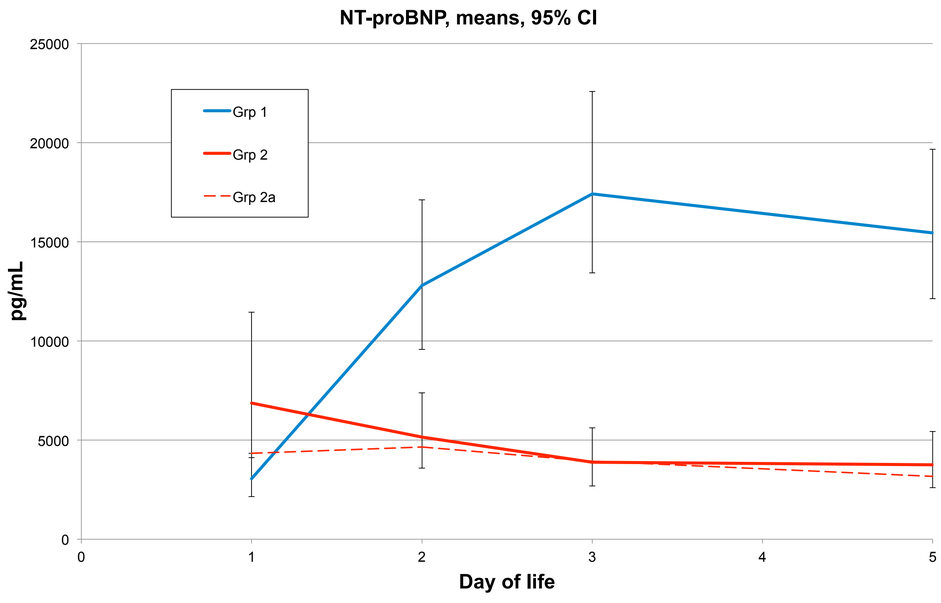

Figure 1, ANOVA of time course of NT- proBNP, group 1=CHD group, group 2 = RD group, Group 2a = lung disease group

Conclusions

NT- proBNP concentrations in neonates with CHD show a different time course compared to neonates with RD due to other than cardiac reasons. On the first day of life NT- proBNP cannot differentiate between CHD and RD without CHD. From the second day of life onwards, NT- proBNP enables differentiation between CHD and RD due to other than cardiac reasons. Perinatal asphyxia causes highly elevated NT- proBNP concentrations on the first day of life; therefore perinatal asphyxia in the patient´s history must be taken into account in interpretation of natriuretic peptide levels in the neonate.

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