LOW CARDIAC OUTPUT MEASURED BY BIOREACTANCE AND ADVERSE OUTCOME IN PRETERM

INFANTS WITH BIRTH WEIGHT LESS THAN 1250G

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ABSTRACT

Background and Aims

The measurement of cardiac output by bioreactance was shown to correlate with cardiac output detected by echocardiography in healthy preterm neonates and extremely preterm neonates following patent ductus arteriosus ligation. Aim of our study was to correlate cardiac output measurements by bioreactance in the first 48 hours of life with adverse outcomes attributable to hypo-perfusion in infants with birth weight less than 1250g.

Design/Methods

A prospective, observational cohort study. Neonates with birth weight less than 1250g were eligible. The bioreactance cardiac output measurements were started at six hours of age and continued up to 48 hours of age. The recordings were divided into 20 minute periods and mean for each period was calculated. Our primary outcome was to compare the lowest cardiac output detected in infants with intraventricular haemorrhage ≥ grade II and/or necrotizing enterocolitis ≥ stage IIA with infants without these complications.

Results

Forty two neonates with birth weight less than 1250g were enrolled. Three infants were subsequently excluded, 39 infants was then included in the final analysis. The mean gestational age (±SD) was 27.5 (±1.8) weeks of gestation and mean birth weight (±SD) of the cohort was 0.95 (±0.15) kg. Six infants (15%) had predefined adverse outcome. The lowest cardiac output was statistically significantly different compared to infants without these complications (median of the means 30.1 ml/kg/min (range 12.1 to 72.1) vs. 67.2 ml/kg/min (range 28.9 to 90.7), p=0.009).

Conclusion

Cardiac output measurement by bioreactance correlates with adverse outcomes attributable to hypo-perfusion in infants with birth weight less than 1250g.

BACKGROUND AND AIMS

New method of non-invasive cardiac output (left ventricular output) monitoring based on trans-thoracic bioreactance (NICOM™) became available. Bioreactance measurement of cardiac output was shown to correlate with cardiac output detected by echocardiography in healthy term and preterm neonates, in unstable preterm neonates following ductal ligation and in term neonates with hypoxic ischaemic encephalopathy.[1-3]

The aim of our study was to correlate cardiac output measurements by bioreactance in the first 48 hours of life with adverse outcomes attributable to hypo-perfusion (low blood flow states) in the cohort of infants with birth weight less than 1250g.

METHODS

Prospective Observational Cohort study in Coombe Women and Infants University Hospital (level III neonatal centre, Dublin, Ireland)

Participants

Inclusion criteria: birth weight <1250g; less than six hours of age at the time of enrolment; baseline cranial ultrasound free of IVH >grade I (performed at six hours of age); parental consent.

Exclusion criteria: Major congenital and/or chromosomal anomaly; congenital heart disease other than patent ductus arteriosus or foramen ovale diagnosed on the echocardiography; IVH >grade I at the time of enrolment; decision to provide palliative care.

Measurements:

- NICOM™ monitor was applied at six hours of age and continued up to 48 hours of age.
- NICOM™ monitor consisted of four emitting and receiving electrodes placed bilaterally over mid-clavicles and in 6th-7th intercostal space.
- The recordings of cardiac output (left ventricular output) were divided into 20 minute periods and the mean for each period was calculated.
- Basic demographic data for each infant were recorded from the chart.

Outcome

- Comparison of the lowest cardiac output detected in infants with intraventricular haemorrhage (IVH) ≥grade II and/or necrotising enterocolitis (NEC) ≥IIA with infants without these complications.
- Description of the cardiac output measured by bioreactance in infants less than 1250g in first 48 hours of life.

Research Ethics Committee in Coombe Women and Infants University Hospital approved the study. Consent was obtained from the parents/guardians prior to the study.

RESULTS

	Infants with predefined adverse outcome (IVH/NEC) n=6	Infants without predefined adverse outcome (IVH/NEC) n=33	p
Gestational Age, mean (±SD), weeks of gestation	26.5 (1.6)	27.7 (1.8)	0.15
Birth weight, mean (±SD), kg	0.88 (0.12)	0.97 (0.16)	0.22
Mortality, n (%)	1 (17)	0 (0)	0.15
Lowest cardiac output, median of the means (range), ml/kg/min	30.1 (12.1-72.1)	67.2 (28.9-90.7)	0.009
Mean cardiac output, median of the means (range), ml/kg/min	114.8 (50.6-165.6)	104.9 (84.6-160.6)	0.23

Receiving operating characteristic (ROC) curve was constructed and the cut-off point of minimal cardiac output 31.7 ml/kg/min had 80% positive predictive value and 94% negative predictive value of subsequent IVH ≥grade II and/or NEC ≥grade IIA.

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2. Weisz DE, Jain A, McNamara PJ, A EL-K. Non-invasive cardiac output monitoring in neonates using bioreactance: a comparison with echocardiography. *Neonatology*. 2012;102:61-7.
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