The relation between cerebral oxygenation and lactate in infants with hypoxic-ischemic encephalopathy treated with hypothermia

Leanne Erkelens-de Vetten, Willemien S. Kalteren, Hendrik J. ter Horst, Arend F. Bos, Elisabeth M.W. Kooi

Division of Neonatology, Beatrix Children’s Hospital, University Medical Center Groningen, the Netherlands
Authors have nothing to disclose

Background

In infants with moderate to severe hypoxic-ischemic encephalopathy (HIE), blood circulation is often compromised. Besides serum lactate, regional cerebral oxygen saturation (rcSO₂) may be a marker for hemodynamic status. A (negative) relation between these two markers, may support the effect of hemodynamic status on both.

Aim

We aimed to examine during the first 4 days of life, the cross-sectional relation between rcSO₂ and serum lactate, in cooled infants with HIE with and without inotrope support.

Methods

- Retrospective cohort study.
- Inclusion: all cooled infants with cerebral NIRS measurements from 2010-2016 in a single centre tertiary NICU.
- Correlation of lactate levels and averaged rcSO₂ values measured during periods between 6, 12, 24, 48, 72, and 96 hours after birth.
- For the entire group, and in the subgroups of infants treated with inotropes.

Results

Seventy-three infants were included in this study. Patient characteristics are shown in table 1.

N=73	
Birth weight (gram)	3350 (1760-4990)
Gestational age (weeks)	40 (36-42)
5' Apgar Score	3 (0-7)
1st lactate	17.5 (1.9-71)

Table 1. patient characteristics (median, range)

- Twenty-one infants received inotropes.
- Before 72hrs, we found no significant correlation coefficients between rcSO₂ and lactate (shown in table 2). Only at 72hrs, they correlated ($\rho=+0.33$, $p=0.011$).
- Within the subgroup of infants that received inotropes no significant correlations were found at any time point.
- Of note, lactate, but not rcSO₂, was persistently higher in the inotrope treated subgroup, compared to the infants without inotropes.

	0-6hr	6-12hr	12-24hr	24-48hr	48-72hr*	72-96hr
Median (IQR)Lactate (mmol/L)	13.5 (7.3-17.5)	7.6 (4.3-12.3)	4.4 (3.2-9.4)	2.9 (2.1-5.1)	1.8 (1.5-2.5)	1.3 (1.0-2.0)
Median (IQR)RcSO ₂ (%)	71 (61-78)	72 (66-77)	79 (74-84)	87 (81-91)	88 (83-90)	86 (80-89)

Table 2. Course of lactate and rcSO₂ values total group (IQR-interquartile range). * Statistical significant correlation between lactate and rcSO₂.

Conclusions

Although a higher lactate and the use of inotropes does not necessarily reflect poorer hemodynamics, these results may suggest that rcSO₂ is a poor marker for hemodynamic status in HIE infants, possibly due to the decreased cerebral oxygen demand due to HIE, hypothermia and sedation.