Can sequential coagulation monitoring predict major hemorrhage in extremely low birth weight infants?

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Background

Bleeds such as intraventricular (IVH) and pulmonary haemorrhage (PH) are life-threatening events in extremely low birth weight (ELBW) infants. Serial coagulation monitoring by measuring the international normalized ratio (INR) with small volume samples might facilitate early diagnosis and possibly prevent major bleeds.

Patients & Methods

This was a prospective longitudinal study performed in ELBW-infants, who received serial INR monitoring by point of care testing during their first 30 days of life. The primary objective was to explore whether INR monitoring could predict major bleeding events (IVH, PH). Secondary objectives were mortality and feasibility in this patient population.

Results

127 ELBW-infants were stratified into a bleeding and a non-bleeding group. Any bleeding (IVH 24%, PH 9%) occurred in 31% (39/127). Infants in the bleeding group were 4 days younger at birth ($p = 0.05$) and had a substantially higher mortality rate of 26% versus 5% in controls ($p = 0.005$). Median INR during the first three days before a bleeding event was 1.55 (95% CI: 1.39-1.74) compared to the control group with 1.45 (95% CI: 1.44-1.58; $p = 0.81$). Platelet counts were significantly lower in the bleeding group on the 3rd day and during the 2nd-4th week of life.

Obstetric history of the mother	No Bleeding (n = 88)	Bleeding (n = 39)	p
	n (%)	n (%)	
Caesarean section	80 (91%)	31 (79%)	0.07
Preeclampsia	3 (3%)	4 (10%)	0.12
Gestosis	1 (1%)	1 (4%)	0.55
HELLP-Syndrome	3 (3%)	4 (10%)	0.12
Preterm rupture of membranes	30 (34%)	14 (36%)	0.84
Chorioamnionitis	50 (57%)	14 (36%)	0.03
Antibiotic therapy (mother)	58 (66%)	17 (44%)	0.02
Antihypertensive therapy (mother)	8 (9%)	5 (13%)	0.52
Antenatal steroids (complete course)	46 (52%)	21 (54%)	0.16
Antenatal steroids (incomplete course)	40 (45%)	12 (31%)	0.12

Demographic & outcome data	No Bleeding (n = 88)	Bleeding (n = 39)	p
	median (range)	median (range)	
Birth weight, g	751 (430-995)	680 (420-985)	0.13
Gestational age	25+6 (23+1-33+4)	25+2 (23+2-29+0)	0.05
Days in the NICU	87 (10-212)	84 (3-181)	0.42
	n (%)	n (%)	
Male	49 (56%)	25 (64%)	0.37
Deceased	4 (5%)	10 (26%)	0.005
SGA	22 (25%)	10 (26%)	0.93
NEC	8 (9%)	4 (10%)	0.84
NEC surgery	1 (1%)	2 (5%)	0.17
PDA	63 (72%)	35 (90%)	0.025
BPD	21 (24%)	8 (21%)	0.68
ROP > grade 3	8 (9%)	2 (5%)	0.44

(NEC = necrotizing enterocolitis, IVH = intraventricular haemorrhage, PDA = persisting ductus arteriosus, BPD = bronchopulmonary dysplasia, oxygen demand >36+0, ROP = retinopathy of prematurity)

INR Screening	No Bleeding (n = 88)	Bleeding (n = 39)	p
Day of life	median (range)	median (range)	
1-3	1.45 (1.1-2.1)	1.55 (1.0-2.0)	0.81
4-7	1.38 (1.9-3.0)	1.33 (1.0-2.0)	0.77
8-14	1.2 (0.9-2.9)	1.2 (0.95-2.05)	0.82
15-21	1.13 (1.0-3.0)	1.1 (0.9-1.5)	0.91
22-30	1.1 (0.9-1.95)	1.18 (0.9-1.8)	0.49

Conclusion

Serial coagulation monitoring by INR point of care testing is feasible in ELBW-infants but could not predict bleeding events. Further studies with daily monitoring of INR and platelet counts during the first days of life might more precisely detect a risk of major haemorrhage in ELBW-infants.

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