Neonatal HIE – Metabolic Alkalosis in Umbilical Cord Gas

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Introduction

HIE (Hypoxic Ischemic Encephalopathy) remains a significant cause of infant morbidity and neurodevelopmental deficit[1][2].

Cord gases are routinely done in our center. Neonates who are born with low PHs are routinely requested for review as low cord gases are found to be one of the indicators of HIE [3]. Neonates who are identified will be assessed clinically and cooling criteria will be filled if it is indicated.

Therapeutic cooling is one of the treatment is for HIE[4]. This is typically started within 6 hours of birth for it to be effective. As timely clinical assessment is critical[2]. Metabolic acidosis with PH <7 and base excess >-12 on the umbilical cord gases considered in treatment of HIE for babies more than 36wks Gestation[2].

In our case report, we notify a neonate who was born with umbilical metabolic alkalosis which neonate had collapsed and required therapeutic cooling after resuscitation.

Data

	Venous Cord Gas	1st Cap Gas during resuscitation	Repeat Cap Gas
Time	10.09	11.32	11.37
PH	7.59	6.93	7.31
PO2	4.83	5.62	5.30
PCO2	3.95	10.44	9.29
HCO3	31.0	12.1	15.5
BE	7.5	-16.8	-14.3
Lactate	2.62	8.76	9.23
Na	106.2	132.4	132.7
K	3.87	5.80	5.09
Ca	0.94	1.33	1.32
Cl	131	102	101

Case History

A female neonate born by SVD 3.3kg, vigorous. APGAR was 9 @1 minutes and 10 @ 5 minutes. She was born in good condition, was well and routine care was continued in the delivery suite.

At 51 minutes of life she was found unresponsive and limp while having skin to skin with mum. Mum had noticed neonate had stop breathing. She was pale, apneic and had poor tone when it was initially alerted. Heart rate was undetectable and she was commenced on IPPV and chest compression simultaneously. She was intubated and ventilated at 5 minutes of resuscitation. Chest compressions were stopped at 25 minutes as there was a detectable heart rate of more than 100 and there was respiratory effort. She was stabilized and transferred to NICU.

Mum is a 26 year old, Caucasian, normal risk pregnancy. She has a past medical history of Asthma and had COVID during the first trimester. She is not on any medication and was working in a bakery. She presented in spontaneous labour and ROM was 2 hours and 23 mins. Her total duration of labour was 7 hour and 37 minutes. Liquor was clear and there is no risk factor for sepsis.

Initial umbilical cord gas showed metabolic alkalosis. Capillary gas post resuscitation at 9omin of age revealed mixed acidosis as shown on table.

On arrival to NICU, her examination was normal and tone had slightly improved. She had a septic work up and was started on antibiotic to cover for sepsis. However after stabilization in our NICU, she developed seizure like activity. She was started on phenobarbitone and IV morphine. She also had met the cooling criteria and was started passive therapeutic cooling in our unit and was transferred then to tertiary center via NNTP for hypothermic therapy.

Patient had a final diagnosis of Mild HIE as MRI and EEG post treatment were normal. Her new born screening was normal as well. She is for routine follow up for neurodevelopmental assessment up to 2 year of life.

Discussion

Upon reviewing causes of neonatal collapse, from our case report we have concluded that it was a compensatory process for metabolic alkalosis by neonate which was through respiratory mechanism. This causes respiratory hypoventilation to increase PCO2[5] which result in reduced breathing and collapse. The capillary gas that was obtain showed mixed acidosis which showed signs of compensation from respiratory acidosis initially and subsequent compensation after.

Maternal causes of possible metabolic alkalosis of this event has been investigated to prevent occurrence in future pregnancies. Mum had dietician review and awaiting other specialty input such as Renal or Endocrine.

As HIE has significant morbidity and mortality, will this change our practice in the future? Should cord gases be routinely done in all deliveries in the future to prevent rare causes as well? Should all mum have routine bloods prior to delivery to detect any electrolyte imbalance?

Our case suggests that not only umbilical cord gas metabolic acidosis, but also metabolic alkalosis should not be ignored as this can prevent significant morbidity in newborn with early intervention.

References

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