

Pregnancy-associated hypocapnic alkalosis: role of cerebrospinal acid-base characteristics

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Argomento: Altro

Introduction. Hypocapnic alkalosis is a typical feature of late pregnancy [1]. The underlying physiologic mechanisms have not been fully elucidated.

Aim. To investigate, using Stewart's approach, the role of cerebrospinal fluid (CSF) acid-base characteristics in the development of pregnancy-associated hypocapnic alkalosis.

Methods. We enrolled pregnant women (PW) with gestational age >35 weeks undergoing spinal anesthesia for elective caesarean section and non-pregnant fertile women (Control group) undergoing spinal anesthesia for elective surgery. A CSF sample was taken anaerobically from the spinal needle almost simultaneously with an arterial blood sample. Electrolytes, albumin, phosphates, PCO_2 , pH and osmolality were measured for CSF and blood samples. Strong Ion Difference (SID) and total concentration of weak, non-volatile acids (A_{TOT}) were calculated. T-test, Rank-Sum test and linear regression were used for analysis.

Results. Seven pregnant (age 38.6 ± 4.6) and 5 non-pregnant women (age 38.8 ± 6.1) were enrolled. Arterial PCO_2 was lower in PW (29 ± 3 vs. 37 ± 2 mmHg, $p < 0.001$), resulting in higher arterial pH (7.453 ± 0.02 vs 7.400 ± 0.01 , $p < 0.001$). Acid-base characteristics of CSF are summarized in Table. SID_{CSF} and CSF PCO_2 were significantly lower in PW, while A_{TOT} did not differ. The resulting pH_{CSF} was slightly, though significantly higher in PW. The reduction in SID_{CSF} was mainly caused by a marked reduction in CSF sodium, while chloride did not differ significantly between groups. The reduced sodium concentration caused a significant reduction in CSF osmolality in PW. A fair linear regression was found between CSF SID and PCO_2 ($r^2 = 0.46$, $p = 0.015$).

Conclusion. CSF acid-base could play a significant role in pregnancy-associated hypocapnic alkalosis. The typical hemodilution of pregnant women could lead to a reduced SID_{CSF} , mandating an increase in alveolar ventilation in order to lower CSF PCO_2 and thus avoid a reduction in pH_{CSF} .

References.

1. Machida H et al. JAP 1981

Acknowledgments. The study was supported by the Onlus "Associazione Bambino Nefropatico".

Table 1. CSF acid-base characteristics

CSF Variables	Pregnant women (n=7)	Control Group (n=5)	p-value
pH	7.357±0.019	7.332±0.013	.027
pCO ₂ [mmHg]	40 [39 – 41]	44 [43 – 46]	.003
SID [mEq/L]	19.7±1.2	22.5±1.8	.009
A _{TOT} [mmol/L]	1.1±0.3	1.2±0.1	0.6
Na ⁺ [mEq/L]	136±1	140±1	<.001
Cl ⁻ [mEq/L]	119±1	120±1	.11
Osmolality [mOsm/kg]	269±3	274±3	.007