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Association between ionized calcium and severity of postpartum hemorrhage : a prospective multicenter cohort study

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Background

Maternal mortality remains a global health challenge, with postpartum hemorrhage (PPH) accounting for the first cause of maternal death worldwide. Calcium plays a pivotal role in various physiological processes including muscular contractility and coagulation. In obstetrical context, calcium regulates myometrial contractility, serving as a crucial factor in both the initiation and sustainment of uterine contraction during labor and after delivery.

Objective and Methods

To explore, in this prospective multicenter cohort study, **the association between ionized calcium, measured at PPH diagnosis, and severity of postpartum hemorrhage**.

Inclusion criteria: women ≥ 18 years old; ≥ 22 weeks of gestation and experiencing PPH (blood loss > 500ml from vaginal and caesarean deliveries).

Exclusion criteria: patients with known coagulopathy or those receiving intrapartum intravenous calcium supplementation or nitroglycerin.

Sample collection **at diagnosis**: CBC, platelets, PT, aPTT, fibrinogen, **veinous blood gas** including **ionized calcium**

Outcome and Results

Primary outcome : Occurrence of severe PPH

Severe PPH

Blood loss > 1000mL
or ↘ **Hb ≥ 4 g/dL**
or **transfusion of RBC or FBC units**
or **bakri/embolization/ligation/hysterectomy**
or **ICU**
or **death**

Multivariate logistic regression analysis
(n=132 patients)

	OR (95% Confidence Interval)	*p* Value
BMI, kg/m²	1.04 [0.97 - 1.2]	0.28
Parity, n	1.50 [1.05 – 2.35]	**0.045**
Gestational age, weeks	1.00 [0.79 - 1.26]	0.98
Multiple pregnancy, n	3.0 [0.65 – 18.8]	0.19
Caesarean-section before labor, n	2.05 [0.65 - 7.0]	0.23
Caesarean-section during labor, n	5.80 [1.59 - 28.2]	**0.014**
Ionized calcium at PPH diagnosis #, mmol/l	2.16 [1.11 – 4.81]	**0.047**

→ **Each drop in Ca^{2+} of 0.1mmol/l doubles the risk of severe PPH**

Discussion and perspectives

Take home message :

Ca^{2+} level at the time of PPH diagnosis is **independently associated** with risk of severe PPH.

Pathophysiological hypothesis:

- Uterine contraction depends on the increase in intracellular calcium concentration. Hypocalcemia might favor or exacerbate the occurrence of **uterine atony**.
- Hypocalcemia could worsen **acute obstetric coagulopathy**

Perspectives :

Early supplementation of calcium to prevent severe PPH should be assessed in future trials.