

17. Prevention of hypotension during elective cesarean section with a combination of colloid co-load and a continuous infusion of a vasoconstrictive agent: A comparative randomized study

Zoi Masourou¹, Kassiani Theodoraki^{1,*}

¹1st Department of Anesthesiology, Aretaieion University Hospital, National and Kapodistrian University of Athens, Athens, Greece. * ktheodoraki@hotmail.com

Background: Spinal anesthesia is considered the anesthetic technique of choice in cesarean section but it can be frequently complicated by hypotension, with occasionally serious consequences for both the mother and fetus. One of the standard techniques used in the prevention of maternal hypotension is the administration of a continuous phenylephrine infusion. However, phenylephrine can lead to baroreceptor-mediated reflex bradycardia with untoward consequences for the maternal cardiac output. Nowadays, noradrenaline has been proposed as an alternative agent in this context, since due to its additional weak dose-dependent β -action, it can be associated with an inferior incidence of maternal bradycardia and thus of propensity to decrease the cardiac output. Colloid co-hydration has also been proven to be an effective technique in the prevention of maternal hypotension. This double-blinded, prospective randomized study aimed to investigate whether the addition of a fixed rate phenylephrine infusion or noradrenaline infusion to a colloid co-hydration regimen results in better maternal hemodynamic status or in a more favorable metabolic profile in the newborn as compared to the administration of colloids alone without any vasoconstrictor during elective cesarean section under combined spinal-epidural anesthesia.

Materials and methods: One hundred-twenty parturients were randomized to either phenylephrine 50 $\mu\text{g}/\text{min}$ (group P) or noradrenaline 4 $\mu\text{g}/\text{min}$ (group N) or placebo (group C). All infusions had been prepared in identical syringes and the infusion rate was 30 mL/h in order to ensure the “blindness” of the study. As soon as the spinal injection started, all groups were administered 10 mL/kg of hydroxyethyl starch (HES) solution simultaneously with the onset of vasoconstrictor infusion. The primary end-point of the study was the incidence of maternal hypotension (SAP <80% of baseline). Additionally, maternal hemodynamics at specific time-points were recorded using non-invasive technology (Edwards Lifesciences ClearSight System) as well as the incidence of reactive hypertension, bradycardia, the requirement for bolus vasoconstrictor administration and the fetal acid-base status, the umbilical venous and arterial blood gases and the newborn Apgar score.

Results: The incidence of maternal hypotension was higher in group C than in group P and also higher in group C than in group N ($p = 0.024$ and 0.073 , respectively). The need of bolus administration of vasoconstrictor was higher in group C than in group P and also higher in group C than in group N ($p = 0.001$ and 0.003 , respectively). The incidence of bradycardia was higher in group P than in group N ($p = 0.018$). The incidence of reactive hypertension was higher in group P than in group N and also higher in group P than in group C ($p = 0.029$ and 0.005 , respectively). The need of modification of the infusion rate was higher in group P than in group N and also higher in group P than in group C ($p < 0.001$ και $p = 0.002$, respectively). The fetal pH of the umbilical vein was higher in groups N and P than in group C ($p < 0.001$), the fetal pO_2 of the umbilical vein was higher in group N than in group C ($p = 0.023$) and fetal blood glucose concentration was higher in group N than in group C ($p = 0.025$) as well as in group N than group P with no statistical significance. Higher systematic vascular resistance index (SVRI) and higher SAP were observed at specific time-points in group P versus the other two groups. Finally, post-delivery Apgar scores were similar in all groups.

Conclusions: The combination of a fixed-rate infusion of noradrenaline with the co-administration of colloid seems to be the most effective in the obstetric management of the parturient during cesarean section under regional anesthesia since it ensures maternal hemodynamic stability and a favorable metabolic profile in the newborn. This regimen seems to be superior to either a combination of colloid co-administration with a fixed rate of phenylephrine or to the administration of colloid alone without any vasoconstrictor agent. The higher concentration of fetal blood glucose in group N might be due to a catecholamine-induced glucose metabolism activation and due to a β -receptor-mediated decrease of insulin release.