Do fetuses need vasopressors just before their birth?

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Spinal anesthesia-induced hypotension (SAIH), caused by the use of spinal anesthesia for cesarean delivery, poses a major threat to both mother and child, and its prevention and cure are still the subject of intensive research [1]. Recent studies have focused on ondansetron administration immediately before spinal anesthesia as a simple method of preventing SAIH [2, 3]. Norepinephrine is also attracting attention as the third-choice vasopressor after ephedrine and phenylephrine [4, 5]. Karacaer et al. conducted a study using ondansetron to prevent SAIH and to reduce norepinephrine required to treat it, and published the results in the February edition of this journal [6]. They found that, although there was no significant difference in the incidence of SAIH, the primary outcome, between patients who received 8 mg ondansetron intravenously 5 min before the induction of spinal anesthesia and those who received a placebo, the dose of norepinephrine required to treat hypotension, one of the secondary outcomes, was significantly lower in the ondansetron group. The fact that prophylactic ondansetron administration enables a further reduction in the dose of norepinephrine, which is considered to have a lower risk of neonatal acidemia than ephedrine and phenylephrine, is a valuable finding for the management of spinal anesthesia for cesarean section. However, I also took another important message from this paper, in addition to the one the authors intended to convey.

The vital message I have gleaned from this paper is the importance of shortening the interval between the induction of spinal anesthesia and delivery of the fetus. In this prospective study of elective cesarean deliveries, the interval between the induction of anesthesia and the start of surgery

was approximately 7 min and that from the start of surgery to delivery was approximately 6 min, making a total of approximately 13 min from anesthesia induction to delivery. Compared with other reports, this duration is extremely short. For example, in Onwochei et al.'s study on the optimum dose of norepinephrine, the time from induction of anesthesia to delivery was 20.4 ± 3.4 min [7]. Although unclear whether it was due to the shorter duration, the neonatal umbilical cord blood pH reported by Karacaer et al. was higher than that reported by Onwochei et al. Needless to say, due to the differences in the study designs, we must be wary of inferring too much from these results. However, the possibility that time is being unnecessarily squandered for the purpose of collecting data, in the studies on the prevention and treatment of SAIH, is a matter of concern.

What initially sparked my concern on this issue was the study by Sprung et al. on modes of delivery and long-term infant prognosis [8]. According to that study, the long-term prognosis for the learning ability of infants born by cesarean delivery under local anesthesia was better than that for those born by vaginal delivery. Although the reason for this was not fully discussed, hypoxia experienced by the infant during vaginal delivery was regarded as one possible cause. Compared with the risk of hypoxia if a fetus were to be delivered vaginally, SAIH poses a far lower hypoxia risk to the fetus, as long as it is not left untreated. Since reading that paper, I have endeavored not only to perform appropriate SAIH prophylaxis (left uterine displacement and co-loading) and treatment (vasopressor administration) during the management of anesthesia for cesarean section, but also to shorten the time between the induction of anesthesia and delivery.

My belief was strongly reinforced by two papers published in 2016. These were studies on the effect of the choice of vasopressor on the mother and fetus during emergency cesarean section. Mohta et al. compared neonatal outcomes when phenylephrine or ephedrine was used to treat hypotension during emergency cesarean sections performed because

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of the poor condition of the fetus, and found no significant difference in the umbilical artery pH between the two groups [9]. Jain et al. compared the neonatal outcomes when phenylephrine or ephedrine was used to prevent hypotension in emergency cesarean sections, and found no significant differences in the rate of neonatal acidosis or umbilical artery pH between the two groups [10]. The results of these studies contradict recent reports that phenylephrine reduces the incidence of neonatal acidosis compared with ephedrine. The reason for this inconsistency in the results may be that the time from induction of anesthesia to delivery in these studies was shorter because they considered emergency surgeries. It is undoubtedly true that shortening the time from the induction of anesthesia to delivery reduces the effect of different vasopressors on umbilical artery pH.

Clinical trials have become more difficult to conduct in recent years, for reasons including ethical issues, funding problems, and the limited time available to researchers. Under these circumstances, as the section editor for obstetric anesthesia, I am happy to know of the existence of colleagues who are devoting themselves to the study for the prevention and treatment of SAIH. This journal will continue to actively publish reports of studies on the prevention and treatment of SAIH. However, we request that care be taken to ensure that the fetus is not disadvantaged for the sake of research.

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