

Spinal Anesthesia for Cesarean Delivery in Severely Preeclamptic Women: Don't Throw Out the Baby with the Bathwater!

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The optimal anesthetic technique for cesarean delivery in severely preeclamptic women remains controversial. Recent clinical practice, however, indicates that spinal anesthesia can be, and is, safely used. In the past, there has been concern that intravascular volume contraction related to preeclampsia could result in catastrophic hypotension that would be difficult to treat (1). As a result, epidural anesthesia became the preferred neuraxial technique for cesarean delivery in women with severe preeclampsia because of a more gradual onset of sympathectomy. In fact, we now know that hypotension may occur less frequently when spinal anesthesia is administered to preeclamptic as compared with normotensive women having a cesarean delivery in modern day practice (2). Small-dose spinal as part of a combined spinal-epidural technique with subsequent top-off of the epidural component has also been advocated, but there are many anesthesiologists and obstetricians who are still concerned about the use of spinal anesthesia in preeclampsia (3).

There are now several studies that support the use of spinal anesthesia in the severely preeclamptic (2–6). In the first, a prospective and randomized trial, there was no significant difference in the incidence of hypotension in severely preeclamptic women having spinal as compared with epidural anesthesia for cesarean delivery (4). The findings of this paper resonated among anesthesiologists and obstetricians because it was performed at Parkland Hospital in Dallas, Texas, an institution that for many years taught that spinal

anesthesia was absolutely contraindicated in severely preeclamptic women. The second study, a retrospective review, reported that there was no significant difference in the lowest mean arterial blood pressure (MABP) between severely preeclamptic women having spinal as compared with epidural anesthesia for cesarean delivery (5). Most recently, Aya et al. (2) in a prospective cohort study reported that the incidence and severity of hypotension were in fact less in severely preeclamptic women as compared with normotensive women having a cesarean delivery with spinal anesthesia. In this issue of *Anesthesia & Analgesia*, two more studies weigh in on the subject, one by Visalyaputra et al. (6) and the other, a follow-up study, by Aya et al. (11).

There is good news and bad news. First, the potentially bad news for advocates of spinal anesthesia is that Visalyaputra et al. (6) report that the use of spinal anesthesia for cesarean delivery in severely preeclamptic women was more likely to result in mild hypotension and to require more ephedrine to correct than epidural anesthesia. However—before we throw the baby out with the bathwater—there is also good news if we look at this finding in perspective. The hypotension was mild and the difference in the median lowest MABP measured in the spinal as compared with epidural anesthesia group was small and transient (generally <1 min).

The current study by Visalyaputra et al. (6) selected a group of preeclamptic women who were categorized as “severe” and thus would be at greatest risk to develop hypotension related to sympathectomy. They also excluded women who were in labor because labor can decrease the incidence of hypotension under regional anesthesia (7). Women were prepared for surgery with hydration and hydralazine administration (to decrease the diastolic blood pressure to at least 90 mm Hg), and most received magnesium sulfate. The authors attempted to standardize obstetric and

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anesthesia practice. However, there may be some limitations related to the study design used by the authors. The study was conducted at 5 separate hospitals and, therefore, it is possible that variances in patient selection and clinical practice occurred. In addition, the spinal group included one woman with triplets. This, if near term, could have contributed to greater aortocaval compression and hypotension. There also appeared to be differences in clinical practices among the 5 study centers. For instance, the difference in the median lowest MABP between the epidural and spinal groups was -12 , -8 , and -2 mm Hg at Centers 1, 4, and 5, respectively, whereas at Centers 2 and 3 the difference was much larger, -23 and -28 mm Hg, respectively. Also, the administration of ephedrine used to treat hypotension was not blinded. According to the protocol, a woman with a systolic blood pressure of 101 mm Hg would receive 3 mg of ephedrine whereas if the systolic blood pressure was 99 mm Hg, 6 mg of the drug would be administered. The latter sets criteria for the administration of ephedrine which may have been somewhat arbitrary.

There has also been a concern that the hemodynamic consequences of spinal anesthesia in preeclamptic women may potentially cause fetal risks. More good news is that Visalyaputra et al. (6) found no significant difference in neonatal outcome between infants whose mothers were given spinal as compared with epidural anesthesia. This is not surprising for two reasons. First, the difference in the lowest MABP between the two groups was small, transient, and easily corrected. Moreover, there is a normal diurnal variation in MABP of at least a similar magnitude as the difference in MABP between the two techniques measured (8). Second, although the authors did not measure uteroplacental perfusion, it is possible that the sympathectomy attributable to spinal anesthesia could have actually improved uteroplacental perfusion despite a somewhat lower MABP as compared with the epidural group. This is particularly important in preeclamptic women because the relationship between uterine blood flow and pressure may be adversely affected by abnormally high resistance to flow related to the disease. Unfortunately, we have no way of knowing whether the slightly larger decrease in MABP with spinal as compared with epidural anesthesia resulted in differences in placental perfusion. Regional analgesia for labor pain relief has been shown to actually increase placental blood flow in severely preeclamptic women, presumably because of a decrease in uterine vascular resistance as a result of sympathectomy (9). Nonetheless, the fact that there was no significant difference in Apgar score and umbilical artery pH and gas tensions, both surrogate markers of the adequacy of uteroplacental perfusion, suggests that any difference in MABP between the two anesthetic techniques was of no clinical consequence.

It is generally accepted that preeclampsia is a disease of the vasculature, particularly the endothelium. The first study by Aya et al. (2) reported that preeclamptic women were at lower risk of developing hypotension during spinal anesthesia for cesarean delivery than normotensive women. In our editorial accompanying that study (10), we suggested that although the less-frequent incidence of hypotension in preeclamptic women could have been the result of preeclampsia-related "vasoactivation," it could have also been the result of the smaller gestational weight and smaller uterine mass (less aortocaval compression) in the preeclamptic women. The new study by Aya et al. (11) published in this issue of the journal, indicates that preeclampsia itself may play a role in decreasing the incidence of hypotension. Elucidating these preeclampsia-related factors mitigating hypotension would be of obvious clinical importance. Furthermore, although studies evaluating the use of ephedrine and phenylephrine to treat hypotension after spinal anesthesia in healthy parturients have been reported (12), there is a need for further evaluation of how to best treat spinal-induced hypotension in severely preeclamptic women. In addition, the technique of using smaller doses of local anesthetic for the spinal component of a combined spinal-epidural with epidural supplementation as needed also requires further study.

So, what is the bottom line? We maintain that the use of spinal anesthesia in stable and noncoagulopathic severely preeclamptic women is a reasonable alternative to epidural block, especially in emergency situations and particularly if it avoids the use of general anesthesia. The slightly lower MABP that may occur with spinal anesthesia pales in comparison with the specter of failed intubation/ventilation and the potential for hypertensive crisis during laryngoscopy and intubation when general anesthesia is used in severely preeclamptic women.

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