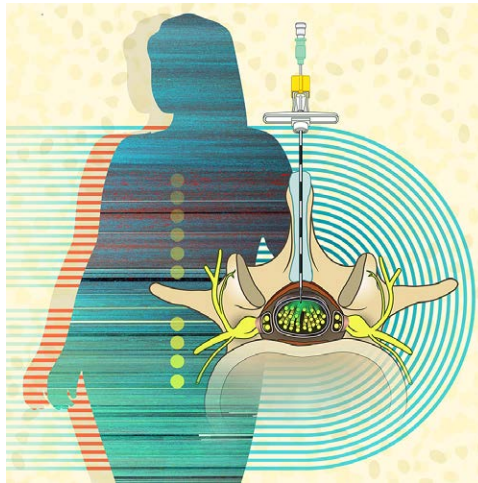


Dural Puncture Epidural for Labor Analgesia: Is It Really an Improvement over Conventional Labor Epidural Analgesia?

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Neuraxial analgesia is considered the definitive standard for labor pain relief, utilized by more than 73% of laboring women in the United States, with growing popularity over time.¹ This is perhaps unsurprising given its analgesic effectiveness, titratability, relative lack of serious side effects, and acceptance by most obstetric clinicians. During the last several decades, various refinements to neuraxial labor analgesia have included the use of continuous infusions of local anesthetic, addition of lipophilic opioids to epidural injectates, use of higher-volume and lower-concentration local anesthetic solutions, patient-controlled epidural analgesia, programmed intermittent epidural bolus, combined spinal-epidural analgesia, and dural puncture epidural analgesia. In combined spinal-epidural and dural puncture epidural, a spinal needle is passed through the epidural needle, and in combined spinal-epidural, small doses of opioid, usually combined with very small doses of local anesthetic, are injected intrathecally at the time of epidural initiation. In dural puncture epidural, no drug is injected. In this issue of *ANESTHESIOLOGY*, Tan *et al.*² report the results of a randomized clinical trial of dural puncture epidural compared to conventional epidural in obese parturients, hypothesizing that in this relatively high-risk group, dural puncture epidural would improve analgesia and lessen epidural failures.

Despite multiple features designed to demonstrate a clinically meaningful difference between dural puncture epidural and conventional epidural techniques, the authors found none (52% *vs.* 49% for the primary outcome, a composite of several measures of inadequate analgesia). Removing the very common outcome of clinician top-up



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did not change the conclusion (30% *vs.* 26%). No individual secondary outcomes appeared to differ, the time to effective analgesia was similar, and there were no differences in adverse events for the mothers or the babies.

The purported advantages of the combined spinal-epidural technique are faster onset of analgesia, especially in sacral dermatomes, less motor blockade and greater patient mobility, more positive identification of the epidural space by detection of cerebrospinal fluid (CSF), fewer epidural catheter failures and replacements, faster cervical dilation, greater patient satisfaction, and facilitation of use of more dilute epidural local anesthetic solutions. The possible disadvantages of the technique (although several have been largely disproven) include more pruritus, more frequent fetal heart rate changes including fetal bradycardia, increase in postdural puncture headache, and uncertainty regarding epidural functionality due to masking by the initial intrathecal medication. Importantly, continued innovation in conventional epidural analgesia has narrowed some of the advantages of the combined spinal-epidural technique observed in early studies.³

The dural puncture epidural technique attempts to have the best of both worlds, in principle, by providing the advantages of a modern low-dose labor epidural analgesic while avoiding the intrathecal opioid-induced pruritus and fetal bradycardia associated with combined spinal-epidural. Because there is affirmative observation of CSF before catheter insertion, dural puncture epidural (like combined spinal-epidural) may offer greater certainty of proper epidural needle placement. Finally, because the dural puncture might allow partial transdural passage of

Image: A. Johnson, Vivo Visuals Studio.

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local anesthetic and opioid, some of the benefits of combined spinal–epidural may be observed, particularly the more rapid onset of sacral and perhaps overall analgesia. Conversely, because a dural puncture is still intentionally made, a potential, but likely small, risk of postdural puncture headache would remain.

Unfortunately, these theoretical benefits have not been consistently documented. The initial report of dural puncture epidural showed faster onset of sacral analgesia, a higher incidence of visual analog scale pain scores of less than 10 of 100 at 20 min, and fewer asymmetric blocks.⁴ This study was criticized on statistical grounds;⁵ in a subsequent study, the same institution found similar beneficial effects over the conventional epidural technique and fewer side effects than combined spinal–epidural,⁶ but again, there were methodologic concerns.⁷ Other groups found no or minimal differences between dural puncture epidural and conventional epidural blocks, and two meta-analyses published in 2019 concluded the differences were minor at best.^{8,9} Subsequently, published studies from several international groups once again found slightly faster onset of adequate analgesia with dural puncture epidural,^{10–12} but other studies found trivial or no differences.¹³ While it is unclear why such disparate results have been observed, variations in spinal needle size, epidural drug administered, patient population studied, method of analgesia assessment, and other unknown confounders or random variation may be responsible. It is also certainly possible that some patients could benefit much more than others from the use of the dural puncture epidural technique but that in the parturient population as a whole, these benefits are obscured.

The study by Tan *et al.*² features a design well poised to help detect a difference between techniques. Obese women are often thought to present more difficult anatomy for identification of the epidural space and would thus potentially benefit more from the observation of CSF during dural puncture epidural, which would help the operator confirm midline placement of the epidural needle and reject a false loss of resistance. The investigators used a 25-gauge Whitacre spinal needle, which might increase transdural transfer of local anesthetic compared to finer needles. They utilized the programmed intermittent epidural bolus and patient-controlled epidural analgesia techniques for the subsequent epidural analgesia. The higher pressures achieved during such injections compared to continuous infusion might also increase transfer of drug to the intrathecal space. Finally, they measured a composite outcome of block inadequacy that included one or more of the following: the need for physician top-ups, asymmetric block, catheter adjustment or replacement, and failed conversion to surgical anesthesia for cesarean delivery. This primary outcome occurred in more than half the participants; use of such a commonly observed event class increases the power of the study to detect a difference, compared to rarer outcomes. The study was adequately powered to detect a fairly large difference in the primary

outcome (62% reduction, as has been observed in epidural *vs.* combined spinal–epidural studies). Careful attention to randomization and observer blinding was achieved, and randomly observed baseline differences between the groups were controlled for in the analyses.

Despite this study design, Tan *et al.*² found no advantage of the dural puncture epidural technique. They acknowledged that use of a very dilute epidural solution might have lessened the effect of transdural drug passage. Use of programmed intermittent epidural bolus and patient-controlled epidural analgesia may have made the epidural group function better than older techniques and lessened the possibility of showing an advantage of dural puncture epidural. In addition, several of their secondary outcomes had wide CI ranges that included clinically meaningful differences, even though the point estimate showed none. Furthermore, the study was powered to detect a greater than 60% difference in the composite outcome, which might have missed smaller differences in the composite or individual outcomes that could still be relevant.

Where does the current study leave the field? Dural puncture epidural appears to be a clever idea in search of an indication. In the general parturient population, the overall effect seems to be quite modest at best. In the higher-risk population studied by Tan *et al.*,² there were no significant advantages. It may still be possible to identify patients who could benefit (for example, those in whom equivocal loss of resistance is encountered). However, randomized clinical trials studying such narrow subgroups are unlikely to be performed, and individual clinician judgment will probably guide the development of a home, if any, for the dural puncture epidural technique.

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Competing Interests

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