

It was noted in the discussion that rotation of the Tuohy needle may be a practice of some. If you hold a Tuohy needle steadily and rotate the needle, you will note that the sharp edge of the needle describes a very nice arc, which could cut a circular pattern through the dura. For this reason, I advocate that when an epidural needle is placed by whatever technique and the epidural space is identified, the needle should not be rotated.

I would suggest that once the dura has been violated in an attempted epidural, the procedure at that level should be abandoned and another interspace sought. Invariably, if the needle is withdrawn to what theoretically may be the epidural space, the Touhy needle will direct the catheter to the hole in the dura that has just been

made. The case presented documents the problem that many of us have seen but not followed up so elegantly.

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In reply:—I find the mechanism of subdural injection proposed by Drs. West and Redick to be very interesting. However, the epidural catheter used in our report,¹ like all epidural catheters used at the University of Colorado, had only one hole at the tip of the catheter. Although it is perhaps possible that the catheter tip was located in the subarachnoid space and that local anesthetic (and later contrast material) retrogradely entered the subdural space, I believe it is much more likely that the catheter tip was located in the subdural space; otherwise, this complication would be much more common in continuous spinal anesthesia, for example. Thus far there have been no such reports to my knowledge.

By whatever mechanism it occurs, subdural injection of local anesthetic is a complication of epidural anesthesia.^{2,3} Once the subdural space is distended by either cerebrospinal fluid or local anesthetic, it is possible to insert a catheter into this space, as other authors have also demonstrated radiographically.⁴⁻⁶ Finally, in response to Drs. West and Redick, we clearly stated in our article that subdural injection of local anesthetic is more likely after perforation of the dura.

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Monitoring Maternal Heart Rate during Epidural Injection of a Test Dose Containing Epinephrine

To the Editor:—The potential for local anesthetic toxicity following epidural injection has prompted Moore and Batra¹ to suggest that an increase in heart rate after the injection of a test dose containing 0.015 mg epineph-

rine is both sensitive and specific for the identification of intravascular injection.

Recently, Abraham *et al.*² reported the administration of an epidural test dose containing 0.015 mg epinephrine

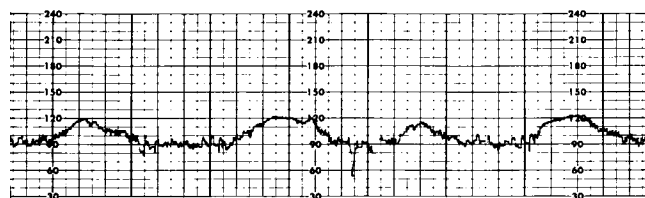


FIG. 1. Heart rate of laboring patient, as recorded with the use of direct ECG mode of fetal monitor. One min of time is represented between each pair of heavy vertical lines.

to 250 obstetric patients. They did not report how many of their patients were in active labor. They did state that "if the patient was in labor, the anesthesiologist waited until just after a contraction to inject the test dose . . . [to minimize] the likelihood of a painful stimulation causing an increase in heart rate coincident with injection of the test dose."² In eight patients with presumed intravenous placement of the epidural catheter, "mean maternal heart rate rose from 76 ± 2 to 109 ± 6 . . . beats/min."²

Both Moore and Batra¹ and Abraham *et al.*² monitored heart rate by radial artery palpation or by use of an electrocardioscope. We find neither method to be consistently satisfactory when giving a test dose to laboring patients. We report an alternate technique for the monitoring of maternal heart rate during injection of an epinephrine-containing test dose with the use of the direct ECG mode of a fetal monitor (Model 8040A, Hewlett-Packard, Palo Alto, CA). We have consistently obtained an excellent recording of maternal heart rate by placing one standard ECG lead at the upper left sternal border and a second lead just beneath the left breast in the anterior axillary line. The lead wires are inserted into the cable block, which is strapped to the patient's arm. The monitor electronically calculates each R-R interval and provides a graphic recording of maternal heart rate.

Figure 1 includes a representative segment of a tracing recorded during placement of an epidural catheter in a 21-yr-old nulliparous woman in active labor. Each heart rate acceleration corresponds temporally with the occurrence of a uterine contraction. These accelerations are similar in magnitude and duration to those reported by Moore and Batra¹ and Abraham *et al.*² after intravenous

injection of 0.015 mg epinephrine. The tracing illustrates that an increase in maternal heart rate may not be specific for intravascular injection of an epinephrine-containing test dose.

We³ and others⁴ have previously expressed concern for the potential adverse effect of intravenously administered epinephrine on uteroplacental blood flow. With this correspondence, we neither endorse nor condemn administration of an epinephrine-containing test dose to laboring patients. Rather, for those practitioners who include epinephrine in the test dose, we suggest that there are two advantages of this method of maternal heart rate monitoring. First, the equipment is readily available on an obstetric suite. Second, it provides a visual image of the actual heart rate. Should a parturient have heart rate accelerations with uterine contractions, one may avoid injection of the test dose immediately before and during a uterine contraction. However, an electrocardioscope should be available in the unlikely event that the parturient experiences a persistent cardiac arrhythmia.¹

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Minimal Requirements for Monitoring—1986

To the Editor:—The equipment available for monitoring patients during the conduct of an anesthetic was extremely crude a few decades ago. The watchful eye of the anesthesiologist looking for chest movement and noting the

patient's color, as well as an occasional finger on the pulse, were thought to be adequate. Today, equipment is vastly improved, yet resistance to its routine use is still evident. Many recommend the routine use of a blood pressure