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The Detection of Successful Epidural Blockade by Subjective Assessment of Toe-temperature Elevation

To the Editor:—In patients who are handicapped because of verbal or hearing disorders, it is not always possible to determine the extent of epidural anesthesia by the usual sensory examination. Therefore, a predictor of the success or failure of epidural catheter placement that did not require patient cooperation would be useful. One possibility is cutaneous temperature. Cutaneous temperature is well known to increase after lumbar epidural anesthesia due to sympathetic blockade and vasodilation. We therefore investigated whether an anesthetist could feel the elevation of toe temperature and thereby determine the adequacy of epidural blockade.

We studied 40 gynecological patients who had no vascular or neurologic disorders in the lower extremities after obtaining institutional approval and the patient informed consent. In the operating room, a thermistor probe (Terumo Co., PD-11, Tokyo, Japan) was attached to each of the big toes. Toe temperatures were recorded before and at 10 min and 20 min after epidural injection. The epidural puncture was performed with a 17-gauge Tuohy needle at the L3–L4 interspace, and an epidural catheter was advanced 5 cm into the epidural space. The test injection of 3 ml of 2% mepivacaine was followed by an additional 12 ml of 2% mepivacaine. The patients ability to detect cold was tested using a swab of cotton soaked with absolute alcohol from the thoracic to sacral dermatomes bilaterally 15 min after the test injection. Other sensory modalities were not examined. A separate anesthetist (F.A) who was unaware of the sensory level and the measured cutaneous toe temperatures, then felt the patients feet and simply recorded whether they were "warm" or "cold." This was done before and again 10 and 20 min after the injection. The lower extremities were covered with sheets during the procedure and between measurements. The room temperature was controlled at 24°C.

Bilateral epidural blockade was obtained in 36 patients, and unilateral blockade was obtained in 4 patients (as determined by the patient's loss of sensation to cold testing). In 75 warm toes, the measured toe temperature increased significantly 10 min after the test injection (from 27.7 ± 1.5°C to 30.5 ± 3.5°C [mean ± SD]) and again 20 min after (from 27.7 ± 1.5°C to 34.3 ± 1.7°C; $P < 0.01$), although it did not elevate significantly in the 5 toes without warmth 20 min after the injection (from 27.8 ± 0.3°C to 28.1 ± 0.4 °C). In 80 lower extremities, the examiner recorded a subjective elevation in toe temperature in 59 extremities (74%) 10 minutes after, and in 75 (94%) 20 minutes after the test injection. In four patients with unilateral block of cold sensation in the lower extremity, no increase in toe temperature was detected on the unblocked side. In one of these patients, measured toe temperature also did not increase on the blocked side despite absence of cold sensation at the L2 dermatome.

Sympathetic blockade measured by laser Doppler flowmetry has been reported to be useful in predicting successful epidural catheter placement.[1] However, this monitor is not always available so another simple and practical predictor is needed in daily clinical practice. Our results showed that perception of warm toes by the anesthetist could correlate well with measured skin temperature changes and the presence of sensory blockade in the lower extremities. It also indicated that failure of lumbar epidural catheter placement, such as unilateral and no epidural blockade, could be predicted by no temperature elevation in the toes felt by the anesthetist's fingertips. The advantages of our method are detecting failed epidural block, thus allowing appropriate management such as catheter adjustment or replacement or changing to general anesthesia. Also, the number of noxious sensory examinations would decrease in patients who are unable to verbally communicate, and they would also be able to receive the benefits of epidural anesthesia. However, there are limitations with this method. First, it is not an adequate predictor of surgical anesthesia because insufficient cephalad spread of sensory blockade (below T10 dermatome) was obtained in five patients with bilateral warm toes. Secondly, no temperature increase has been reported in patients who had severe vascular disorders in the lower extremities despite successful epidural anesthesia.[2] In cases when actual elevation of toe temperature was not obtained, it is important to clarify whether failure of epidural anesthesia or severe vascular disorders in the lower extremities occurred despite successful epidural anesthesia. We concluded that perception of warm toes by the anesthetist's fingertips is a useful predictor of successful epidural catheter placement.

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