

Direction of the Needle Bevel and Epidural Anesthetic Spread

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Many factors can influence the spread of local anesthetic solution in the epidural space. The direction of the bevel of the epidural needle and its influence on epidural anesthetic spread has not been determined. Therefore, this study was designed to evaluate what influence, if any, the direction of the epidural needle bevel during anesthetic injection had on the spread of epidural anesthetic.

METHOD

One hundred and fifty men who required epidural anesthesia for elective surgery were investigated. Seventy-five patients received an epidural injection of 15 ml of 1.5% lidocaine with epinephrine (1:200,000) with the bevel of the epidural needle pointing cephalad (cephalad group), and another 75 patients were given the same local anesthetic solution with the bevel of the needle pointing caudad (caudad group). The mean age of the patients was 49 ± 15.3 years (range, 20-79 years) and the mean height was 177 ± 7.5 cm (range, 158-208 cm). This study was approved by the human research committee of our institution and informed consent was obtained from each patient prior to the procedure.

After an intravenous catheter was inserted and a blood pressure cuff and EKG electrodes were applied, the patient was placed in the lateral decubitus position on a horizontal operating table. A 17-gauge Tuohy needle was introduced through the third lumbar intervertebral space, and the epidural space was identified using the "loss of resistance" technique. With the bevel of the needle pointing either cephalad or caudad, 2 ml of 1.5% lidocaine with epinephrine (1:200,000) was injected.

After one minute, if there was no evidence of inadvertent subarachnoid or intravenous injection of the drug, the remaining anesthetic solution was injected at the rate of 0.7 ml/s. An epidural catheter was inserted if indicated, and the patient was then turned to a supine position.

The spread of sensory anesthesia then was checked every 10 min by pinprick, and the arithmetic mean of the anesthesia level on each side was determined using a segmental dermatome chart. Student's *t* test was used for the statistical analysis of the paired data.

RESULTS

Data from this study are summarized in table 1. Mean heights of the patients in both cephalad and caudad groups were similar in comparable age groups. All patients investigated had caudad spread of anesthesia to the end of the sacrum. In young patients (20 to 39 years old) there were no significant differences in cephalad spread of epidural anesthesia between cephalad and caudad groups. However, in patients older than 40 years, the cephalad spread of epidural anesthesia was significantly higher in the cephalad group than in the caudad group.

DISCUSSION

Our results indicate that the direction of the bevel of the epidural needle during epidural injection of local anesthetic produces a significant effect on the epidural spread of local anesthetic only in patients older than 40 years of age. The mechanisms involved in this preferential spread of anesthetic in a direction of epidural needle bevel in older patients are not clear. Areolar tissue in epidural space and the dura are very soft and loose in young patients.¹ Also, the pressure in epidural and subarachnoid spaces can be increased significantly during epidural injection of local anesthetic.^{2,3} Perhaps, during injection, the local anesthetic pushes away the dura and areolar tissue from the tip of the epidural needle and thus spreads fairly evenly in both cephalad and caudad directions in younger patients. However, in older patients, the dura, areolar tissue, and ligamentum flavum become firm and thickened as a result of their fibrotic change and calcification.^{1,4} These firm tissues around the needle tip could interfere with even spread of anesthetic solution from the tip of the needle, producing a prefer-

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TABLE 1. Relationship between Direction of the Bevel of the Epidural Needle and Anesthetic Spread in the Epidural Space

Age Groups (yr)	Upper Level of Anesthesia (Thoracic Dermatome)		Probability
	Cephalad Direction	Caudal Direction	
20-39	8.6 ± 0.4 (25)	9.2 ± 0.5 (25)	0.19
40-59	5.2 ± 0.4 (25)	6.2 ± 0.4 (25)	<0.05
60-79	4.4 ± 0.5 (25)	5.9 ± 0.4 (25)	<0.02

Values are means ± SEM. The number of patients in parentheses.

ential spread of the solution in a direction of the bevel of the epidural needle.

The small but significant influence of the direction of the epidural needle bevel on epidural anesthetic spread in older patients has, we believe, little clinical importance compared to some of the variables mentioned, *i.e.*, technical factors, physical characteristics of the patient, and intrinsic anatomic factors.⁴⁻⁶ Because of the involvement of these many variables in epidural anesthetic spread, the epidural anesthesia becomes very unpredictable and

the epidural catheter is, therefore, often inserted in patients of our institution to insure not only the duration of the anesthesia, but also an adequate level of the anesthesia.

In conclusion, local anesthetic injected into the epidural space had a preferential spread to the direction of the epidural needle bevel only in patients older than 40 years of age. However, because the difference is less than two segments, the direction of the bevel is of little significance clinically.

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An Unusual Occurrence of Total Anesthesia Machine Failure during Administration of an Anesthetic

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Separate needle valves and flow columns for nitrous oxide and oxygen are standard equipment on conventional anesthesia machines. Recently, a new type of gas flow control with separate adjustments for concentration and for total flow has been introduced. The intended purpose of this innovation is to prevent delivery of hypoxic mixtures by making a 70-30% mix of nitrous oxide-oxygen, the lowest oxygen concentration that can be

dial. We describe a case in which the use of such a system, (Monitored Dial Mixer)‡ (fig. 1) was involved with failure of the anesthesia machine to deliver fresh gas when a critical component of the device malfunctioned during administration of an anesthetic.

REPORT OF A CASE

An 86-kg, 61-year-old man was scheduled for supraglottic laryngectomy and radical neck dissection because of cancer of the larynx. His past history included two prior myocardial infarctions and a cardiac arrest. He previously had removal of a left ventricular aneurysm and had also had coronary artery bypass grafts. He was taking propranolol, persantin, and cimetidine, but had been progressing well since bypass

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Key words: Equipment: circuits, circle; monitored dial mixer; ventilators; valves; flowmeter.

‡ Manufactured by Fraser-Sweetman, Inc.