

## The Position of Plastic Tubing in Continuous-block Techniques: An X-ray Study of 552 Patients

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To administer *continuous epidural or spinal blocks*, many physicians thread plastic tubing through a directional-point needle (Tuohy). The directional point has been thought to permit the tip of the tubing to be threaded to a predetermined level cephalad or caudad in the subarachnoid or epidural space. Other physicians use a needle with a conventional bevel and rely on the *angle of insertion* of the needle to facilitate advance of the tubing cephalad. In *continuous caudal block*, a conventional bevel needle is employed most often, and it has been postulated that plastic tubing will go cephalad when it is passed through this type of needle.<sup>1-5</sup>

Whether the tubing actually can be threaded cephalad or caudad in epidural and spinal block, or cephalad in caudal block, is open to question.<sup>6-10</sup> A study using radiopaque tubing in at least 150 patients for each block technique was started in March, 1964, in an attempt to resolve the controversy.

### METHOD

Adult patients only were used for the study. No consideration was given to weight, height, or abnormalities of the spine. At the completion of the surgical procedure, roentgenograms were taken to ascertain the position of the tubing. When the tip of the tubing could not be identified positively, the anesthetic injected sufficient radiopaque solution (pantopaque) to fill the tubing, i.e., 0.3 mg. The volume of the local anesthetic solution and the dermatome level of the anesthesia were correlated with the position of the tip of the tubing as determined by the postoperative X-rays. The distance the plastic tubing was inserted and

the type of needle used varied with the technique.

**Continuous caudal block:** The radiopaque plastic tubing was marked  $7\frac{3}{4}$  inches from the end to be inserted. A  $3\frac{3}{4}$ -inch, 18-gauge, thin-walled spinal needle with a conventional beveled point was placed in the caudal canal via the sacral hiatus, and the plastic tubing with a stylet was inserted through it to the mark on the tubing, to four inches beyond the tip of the needle in the caudal canal.

**Continuous lumbar epidural block:** A  $3\frac{3}{4}$ -inch, 18-gauge, thin-walled spinal needle with a directional point was inserted into the epidural space at the second, third, or fourth lumbar interspace, using the loss-of-resistance technique, with the opening in the point directed cephalad. The radiopaque plastic tubing with a stylet in place was inserted through the needle. In the first 25 patients (group A), the tubing was marked  $7\frac{3}{4}$  inches from the end to be inserted into the epidural space, i.e., it was inserted into the epidural space four inches.

In the next 167 patients (group B), the tubing was marked at  $5\frac{3}{4}$  inches, i.e., it was threaded into the epidural space two inches beyond the tip of the needle. In 155 of these patients, the  $3\frac{3}{4}$ -inch, 18-gauge, thin-walled needle with directional point was used, and in 11 patients (group C), the paraspinous approach was employed, using a  $3\frac{3}{4}$ -inch, 18-gauge, thin-walled needle with a conventional bevel.

**Continuous spinal blocks:** In 25 patients (group I), the tubing was marked  $7\frac{3}{4}$  inches from the tip to be inserted into the subarachnoid space, and in 186 patients (group II),  $5\frac{3}{4}$  inches from the tip. Thus, it was inserted four inches and two inches, respectively, into the subarachnoid space. An 18-gauge,  $3\frac{3}{4}$ -inch, thin-walled spinal needle with a directional point was used in all patients.

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TABLE 1.  
Positions of Plastic Tubing Determined by X-ray Examination

	No. of Patients	Straight	Single Loop	Coiled at Insertion Site	No Anesthesia (tubing out a foramen or inadequately positioned caudad)
Caudal block	150	134 (98%)	7 (5%)	9 (6%)	
Lumbar epidural block					
Group A	25	0	0	24	1
Group B	162	22 (14%)	37 (24%)	96 (62%)	7
Group C	11	6	4	0	1
Spinal block					
Group I	25	14 (56%)	8 (31%)	3 (13%)	1
Group II	184	128 (69%)	35 (19%)	21 (12%)	2

### RESULTS

Results are listed in table 1. The patients were tabulated according to whether the tubing threaded straight cephalad to the predicted level (fig. 1); threaded cephalad to approximately the anticipated level, but with a terminal loop in the tubing and caudad direc-

tion (fig. 2); coiled at the site of insertion (fig. 3); or threaded out through an intervertebral foramen or caudad resulting in inadequate anesthesia (fig. 4).

### DISCUSSION

The position of the tip of the plastic tubing with any continuous anesthetic technique



FIG. 1. Continuous spinal tubing going straight cephalad four inches.



FIG. 2. X-ray showing the plastic tubing with a single loop so the tip points caudad in the caudal canal.

in any given patient cannot be predicted definitely. In this series approximately 94 per cent of the continuous caudal tubes and 70 per cent of the continuous spinal tubes threaded to the anticipated levels. Consequently, the local anesthetic dose could be decreased with relative certainty when using these techniques.

In the patients who received continuous lumbar epidural anesthesia, only about 12 per cent of the tubes threaded to the hoped-for levels. The high incidence of coiled tubes demonstrated the necessity for administering approximately the same dose of local anesthetic drug as that used for single-dose lumbar epidural block. It also showed the futility of attempting to thread a plastic tube more than two inches within the epidural space. Even though radiopaque plastic tubing was used, in most patients a solution with a density greater than the vertebral column had to be injected into the tubing so that the tip could be located accurately, because the densities of the radiopaque tubing and the vertebral column are approximately the same. If the position of the tubing must be known definitely, roentgenograms are mandatory.

#### REFERENCES

1. Bonica, J. J.: *The Management of Pain*. Second edition. Philadelphia, Lea and Febiger, 1953.
2. Burn, J. M. B.: A method of continuous epidural analgesia, *Anaesthesia* 18: 78, 1963.
3. Lee, J. A.: A new catheter for continuous extradural analgesia, *Anaesthesia* 17: 248, 1962.
4. Hingson, R. A.: Continuous Peridural Analgesia and Anesthesia for Obstetric Delivery and Cesarean Section. *International Anesthesiology Clinic*, 2: 3 (May). Boston, Little, Brown and Co., 1964.
5. Lund, P. C.: *Peridural Analgesia and Anesthesia*. Springfield, Illinois, Charles C Thomas, 1966.
6. Bromage, P. R.: *Spinal Epidural Analgesia*. Edinburgh, Livingstone, 1954.
7. Collins, V. J.: *Fundamentals of Nerve Blocking*. First edition. Philadelphia, Lea and Febiger, 1960.
8. Duncan Alexander, F. A.: In Hale, D.: *Anesthesiology*. Second edition. Philadelphia, F. A. Davis, 1963.
9. Moore, D. C.: *Regional Block*. Fourth edition. Springfield, Illinois, Charles C Thomas, 1965.
10. Sanchez, R., Acuna, L., and Rocha, F.: An analysis of the radiological visualization of the catheters placed in the epidural space, *Brit. J. Anaesth.* 39: 485, 1967.

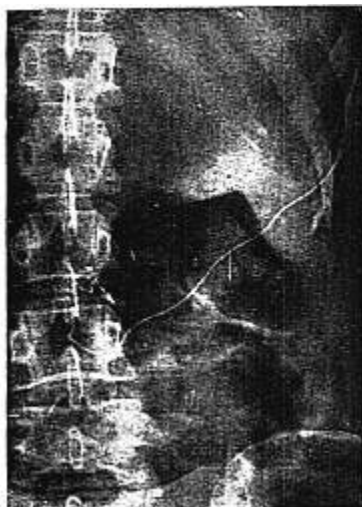


FIG. 3. Continuous epidural tubing coiled within one intervertebral space of insertion point.



FIG. 4. Continuous spinal tubing inadvertently threaded caudad.