CONTINUOUS SEGMENTAL EPIDURAL ANESTHESIA
WITH CATHETER VIA THE CAUDAL CANAL:
A PRELIMINARY NOTE

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Received for publication March 9, 1949

Segmental epidural anesthesia has been produced previously by means of a catheter threaded through a needle which had been inserted into the epidural space at the appropriate level (1-3). The technic has been improved by advancing the catheter within the epidural space from the lumbar level until the tip is at the appropriate level (4). The purpose of this preliminary note is to describe a new technic for placing the catheter at the appropriate level by way of the caudal canal. This technic depends on the fact that anatomically the caudal canal is the downward extension of the epidural space. A needle is inserted through the superficial posterior sacrococcygeal ligament into the caudal canal as in the usual caudal technic. Then a catheter is advanced through the needle up the epidural space to the appropriate level. Segmental epidural anesthesia can thereby be induced and maintained.

The advantages of this technic are significant. (1) The segmental block extends to portions of the body only slightly beyond the surgical field. Hence, the physiologic changes due to anesthesia will be almost minimal. This technic resembles thereby the segmental spinal technic described by Saklad (5). (2) The insertion of the needle into the caudal canal is relatively easy and is a familiar technic widely employed by anesthesiologists. (3) The long axis of the needle and the catheter are both directed cephalad. (4) The patient remains conscious. (5) Dural puncture is avoided. It is extremely unlikely that a catheter could enter the subarachnoid space when the needle has not punctured the dura. (6) The naked spinal cord with its roots is not exposed to anesthetic agents or foreign bodies. Consequently, the incidence of important neurologic complications such as transverse myelitis, cauda equina syndrome, radiculitis, arachnoiditis, cord bladder, persistent leakage of cerebrospinal fluid and headache may be expected to diminish significantly or completely. (7) The extent of anesthesia is controlled more readily than with the usual spinal techniques since diffusion and convection do not influence the spread of an-

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esthetic agents in the epidural space. (8) The doses of anesthetic agent and the volume of anesthetic solution are not excessive when compared with other extradural block technics. (9) Anesthesia can be maintained as long as necessary.

The complications and disadvantages of this technic should be emphasized. (1) The insertion of a needle into the caudal canal may at times be difficult, if not impossible. (2) The needle may enter the subarachnoid space before the insertion of the catheter if sacral anomalies exist or if the needle is advanced too far in the caudal canal. (3) The needle may shear off the catheter within the caudal canal if careless technic is employed. (4) The progress of the catheter cephalad to the appropriate level may be impeded if the catheter kinks or becomes caught on a nerve root. (5) The danger of epidural infection with abscess formation is always present, although remote. Antibiotics added to the anesthetic agent may reduce the incidence of this hazard. (6) The needle or catheter may rupture epidural vessels. The latter possibility appears unlikely because the epidural vessels course ventral to the dural sac which is attached by numerous fibrous slips to the posterior longitudinal ligament, especially in the lower part of the vertebral canal (6). Hence the catheter will normally advance dorsal to the dural sac. (7) Unilateral anesthesia or hypesthesia may result for reasons not yet clear. (8) Segmental differences between the somatic innervation of the initial incisional area and the visceral innervation which is involved in further surgical procedures may require extensive block. (9) The onset of anesthesia is relatively slow. After the spinal nerves emerge from the intervertebral foramina, they lose their thick dural sleeves and are covered merely by epineurium. Hence the anesthetic agent must leave the epidural space, that is, the vertebral canal, and penetrate a relatively large spinal nerve with its epineural covering before anesthesia results (1, 4). (10) The production of precise segmental block demands of the anesthesiologist a familiarity with the exact somatic and visceral segmental distribution involved in surgery and precision in placing the catheter at the appropriate level. Radiographic assistance may help to determine the position of the radiopaque catheter. (11) Certain viscera such as the bladder and the uterus are doubly innervated and require extensive epidural block to anesthetize these widely divergent segments.

A small series has already been carried out successfully for surgical procedures, including cesarean section, nephrectomy, cystolithotomy, inguinal herniorrhaphy and vaginal delivery requiring forceps application and episiotomy. In an attempt to solve the problem of anesthetizing the doubly innervated uterus during labor, we have inserted two catheters simultaneously through two needles into the caudal canal. The first catheter was advanced to the eleventh thoracic segment and the pathway of ('Ieland from the eleventh and twelfth
thoracic segments was blocked first, thereby providing complete relief from the pain of uterine contractions. The second catheter was advanced to the third sacral level and relief was provided later for the pain of the distention of the lower birth canal, the application of forceps, episiotomy and repair. We have encountered a number of complications. The needle could not be inserted into the caudal canal in some patients. Once the catheter was sheared off within the caudal canal. The position of the radiopaque fragment was verified by roentgenogram and the fragment was removed easily through a small trephination opening in the sacrum. At times partial or complete resistance has been encountered to the passage of the catheter cephalad in the epidural space.

The use of this technic is being extended to operations on the upper portion of the abdomen and the superficial chest. Continuous segmental sympathetic block is under consideration. In the experimental animal a functional sympathectomy has been produced by this technic (7).

**Summary**

A new technic is described for the production of continuous segmental epidural anesthesia. A catheter is inserted through a needle into the caudal canal and is advanced up the epidural space to the appropriate level.

The advantages, disadvantages and complications of this technic are discussed.

The authors wish to express their appreciation to the members of the Department of Radiology, Presbyterian Hospital, for their cooperation during this study.

**REFERENCES**

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