EPIDURAL BLOCK ANESTHESIA FOR CORDOTOMY

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The success of cordotomy for relief of intractable pain depends upon complete division of nerve tracts conducting pain from the involved part of the body. It is impossible to determine empirically the precise depth of cut necessary into the anterolateral column of the spinal cord in order to abolish pain arising from any certain area of the body. Since cordotomy is indicated as a desperate measure in patients who may be debilitated from long illness, it is of great importance to accomplish relief of pain on the first attempt.

General anesthesia for cordotomy provides satisfactory working conditions for the patient and surgeon but does not allow testing of the adequacy of the procedure until the postoperative period. Discontinuing anesthesia and testing for pain relief after the patient has responded has certain disadvantages and the responses are likely to be misleading. Local anesthesia for laminectomy plus supplementary sedation has been used, but testing of pain response under such conditons is poor. Thoracic laminectomy is a formidable operation to perform under local infiltration anesthesia and large amounts of supplementary thiopental or narcotic may be necessary to keep the patient reasonably comfortable. Under such circumstances it is difficult to arouse the patient to a full level of consciousness for reliable sensory testing. In a state of partial dulling of the sensorium the difference between complete analgesia and a high grade hypalgesia may not be appreciated. Important "islands" of sparing may occur distal to the cord section. In addition, manipulation of the sensory roots is painful under local anesthesia and distracting to both the patient and the surgeon. It may be so distracting to the patient that it impairs the subjective response to sensory testing. The surgeon, in his natural desire not to cause undue pain to the patient, is restricted in his ability to manipulate the cord for proper cutting and he may technically defeat himself.

By the use of epidural anesthesia it is possible to provide total anesthesia at the operative site by a segmental block. The patient may be comfortably awake for sensory testing at the time of surgery. If the initial cord section fails to produce adequate analgesia and relief of pain, further cuts can be carried out at once until the desired level is obtained.

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Procedure

Preoperative medication is given in accordance with the patient's requirements and general condition. The site of the proposed laminectomy incision determines the interspace for introduction of the epidural catheter which is immediately above or below the area to be draped off for surgery. A 16 gauge Tuohy-Huber needle is advanced to the epidural space which is identified by the "drop-sign" of Gutierrez (1). A polyvinyl catheter size no. 3 French is introduced through the needle and directed toward the area of incision advancing 3–4 cm. either cephalad or caudad as the situation requires. The needle is withdrawn over the catheter and the catheter secured in place to be out of the operative field. A test dose of 2–3 cc. of anesthetic solution locates the tip of the catheter in the epidural space by the resulting band of hypesthesia and also gives warning of intrathecal or intravascular injection.

The volume of anesthetic solution used for the initial injection is determined by the number of spinal segments to be blocked and the location of the tip of the catheter. As little as 5 or 6 cc. has been adequate for the initial surgery with the same dose repeated prior to laminectomy or before opening the dura. We have used 1½–2 per cent lidocaine with epinephrine 1 : 200,000 or 1½–2 per cent hexylcaine hydrochloride without vasopressor with the same success. The lesser concentration is used in the debilitated, elderly patient to minimize motor paralysis of respiratory muscles. With these drugs the anesthesia is established in 6–12 minutes and the duration is usually 45–60 minutes. In most cases the operative procedure requires from one and one-half to two and one-half hours. Anesthesia can be prolonged by injecting a second dose prior to laminectomy or before opening the dura and, if necessary, a slightly smaller dose may be given following closure of the dura.

A variable fall in blood pressure can be anticipated but the administration of a vasopressor intramuscularly prior to the injection of the anesthestic solution into the epidural space minimizes this effect. Should the chosen dose of vasopressor prove to be inadequate an intravenous drip of dilute vasopressor such as phenylephrine 0.002 per cent will be most effective. In most instances the level of anesthesia will extend from C_7 or C_8 to T_{10}.

Results

Epidural segmental block has been employed as the method of surgical anesthesia for 9 thoracic cordotomies (table 1).* Five of these were bilateral procedures, 2 were unilateral and in one case bilateral section of the spinothalamic tracts was carried out in two stages. All

* Since this paper was submitted, an additional 3 cases have been successfully carried out with this technique.

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TABLE 1

DATA ON 9 CORDOTOMIES USING EPIDURAL BLOCK ANESTHESIA

Patient Number	Age	Diagnosis	Site of Injection	Course	Result
1	70	Carcinoma—bladder	T_5–T_6	Labile blood pressure	Died 6 days, post-operative
2	71	Carcinoma—bladder	T_5–T_6	Smooth	Pain relieved
3	72	Spinal injury	T_{10}–T_{11}	Decrease blood pressure	Pain relieved
4	46	Carcinoma—uterus	T_7–T_8	Smooth	Pain relieved
5	43	Carcinoma—rectum	T_4–T_5	Slight respiratory decrease	Pain relieved
6	62	Carcinoma—rectum	T_7–T_8	Smooth	Pain relieved
7	62	Spinal injury	T_3–T_4	Smooth	Pain poorly relieved
	62	Spinal injury	C_7–T_1	Smooth	Patient's response poor
8	42	Carcinoma—uterus	T_6–T_7	Smooth	Pain relieved

have been for the relief of pelvic or lower extremity pain. In addition dorsal, sensory root rhizotomy has been performed in two cases using the same method and with the same facility. Figure 1 illustrates clearly the division possible between the spinal segments anesthetized by epidural block and those concerned with transmission of pain from the more caudad portion of the body. All of the operative procedures were accomplished with a minimum of technical difficulty and without discomfort to the patient. Sensory testing was possible.

Figure 2 shows the anesthetic course of a 62-year-old patient. In this case unilateral cordotomy was performed at T_7. The epidural space was entered between T_3 and T_4 using a 16 gauge Tuohy-Huber

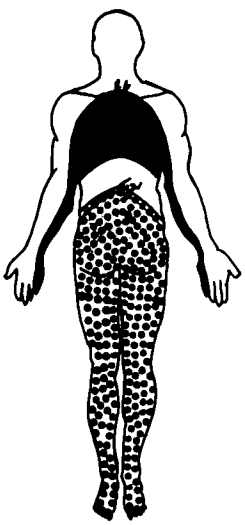

FIG. 1. Solid area shows dermatomere spread of epidural anesthesia. Dotted area shows dermatomere extent of pain to be relieved by cordotomy.

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needle. A polyvinyl catheter was threaded caudad 3–4 cm. An initial dose of 6 cc. of 2 per cent hexylcaine established an anesthetic level from T_2 to T_{10}. A second dose of 5 cc. of 2 per cent hexylcaine was injected just prior to opening the dura and a third dose of 4 cc. was administered after the dura had been tightly closed. One 10-mg. dose of desoxyephedrine was given intramuscularly 15 minutes prior to the initial block. This was not quite adequate to maintain arterial blood pressure at the preoperative level, but 50 cc. of 0.002 per cent phenylephrine given intravenously over a 50-minute period maintained a stable record. A small dose of thiopental was given for sedation during the preliminary preparation for surgery, but the patient was awake and alert during the remainder of the operation.

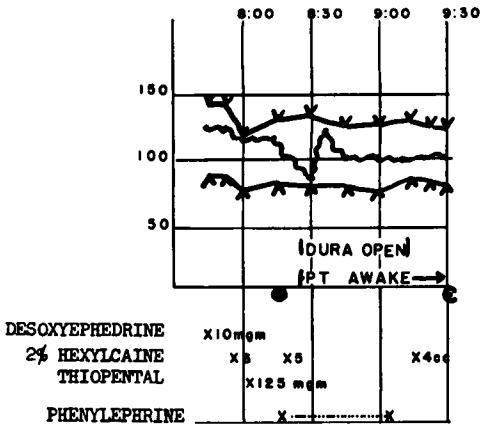

FIG. 2. Anesthesia record of a 62-year-old patient. Unilateral cordotomy was performed at T_7, epidural tap at T_{3-4}, catheter caudad 4 cm., and analgesic level established from T_2–T_{10}.

DISCUSSION

There have been no serious complications of epidural block per se in this small series. In most cases the level of surgical anesthesia extended from C_8 to T_{10-12}. In two cases the level of anesthetic effect ascended to C_4 or C_5 and in one of these there was slight respiratory embarrassment relieved by intranasal oxygen insufflation. One 70-year-old patient with advanced carcinoma of the bladder died on the sixth postoperative day in congestive failure and probable uremia. This patient had been admitted to the hospital two weeks prior to surgery in frank congestive failure and at the time of surgery his condition was improved but admittedly poor. His course on the operating table was reasonably smooth although more than the usual number of doses of vasopressor were required to maintain blood pressure within the normal range. Postoperatively hypotension became marked and continuous intravenous vasopressors were required. Pulmonary congestion gradually increased until death.

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Contraindications to the use of epidural anesthesia for thoracic cordotomy are generally the same as for all types of surgery under epidural or spinal anesthesia. Epidural anesthesia is specifically contraindicated when a second cordotomy is to be attempted at the same site after scar tissue has been allowed to form. A recent laminectomy does not contraindicate the use of this technique though the dosage of anesthesia agent may need to be modified.

Two observations are worthy of comment. During dorsal root rhizotomy duplication of the patients' pain by stimulation of the central end of the dorsal root was not possible at the time of operation apparently because of an anesthetic block. This would suggest a site of anesthetic action central to the dorsal root ganglion. On the other hand we have noted that a patient may complain of sharp pain at the moment of section of the lateral spinothalamic tract. The significance of these interesting clinical observations remains to be proven. It may be that the site of action of epidural anesthetics is within the subarachnoid space by diffusion through the dura as has been previously suggested by Frumin *et al.* (2). We have insufficient evidence to support or deny this statement.

Conclusion and Summary

We have found epidural block anesthesia to be superior to either general anesthesia or to local infiltration for thoracic laminectomy and cordotomy. Since cordotomy is most often performed for pelvic and lower extremity pain this technique provides the advantage of complete freedom from pain of surgery without disturbance of test areas. The adequacy of cord section may be judged accurately at the time of operation.

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