A MODIFIED TECHNIQUE FOR SPINOthalamic CORDOTOMY

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SURGICAL section of the spinothalamic tracts of the spinal cord, conceived by Spiller and developed by Frazier, has been useful in the control of lower-body pain. Many carefully conducted studies have been reported relative to the precise position in the anterolateral cord quadrant of pain and temperature fibers from specific body areas. These studies have shown a degree of spatial predilection for area representation, but in clinical cases of severe pain, the most satisfactory results have followed as near as possible complete transection of the anterolateral quadrant of the cord.

The technique of cordotomy has evolved since its origin, chiefly in perfection of a rather fixed surgical pattern. In general, this has consisted of resecting 2 or 3 spinal laminae, opening the dura mater and arachnoid in the midline, and severing at least 2, and often 3, pairs of attachments of the dentate ligament from the dura mater. By traction upon a dentation of the ligament, the cord is rolled as completely upon its side as possible. The degree of rotation is limited by the resistance of the nearby anterior and posterior nerve roots. A knife or a hook of some type then is introduced into the cord and a cut is made through the anterolateral quadrant as nearby as possible to a predetermined depth and extent. Several surgeons have emphasized that after the section, the patient should be awakened, if he is anesthetized, and the level of analgesia be tested to insure its adequacy.

The application of this technique has been followed by results and complications so variable from surgeon to surgeon, and from patient to patient, that the value of the procedure is by no means commonly accepted. Particularly dubious are physicians in other fields, who must care for the patients after operation.

Several years ago the writer began to doubt the validity of several of the standard assumptions basic for the existing operation. Progressive modifications in technique have gradually resulted in an operation considerably different from the usual one. Conversation with colleagues stimulated the report of this modified technique of cordotomy.

PHYSIOLOGIC BASIS FOR MODIFICATION

Anesthesia. In general, it appears to me desirable to operate upon anesthetized patients. Modern anesthetic agents and techniques make this safe.
Certainly in the case of patients whose need for surgery stems from long-continued pain, it is more merciful than is operation with local analgesia alone. The combination of mild pre-induction medication, anesthesia with intravenous pentothal sodium, with or without nitrous oxide and oxygen, and generous procaine infiltration of the surgical area has proved entirely satisfactory.

In more cases than not, I have been dissatisfied with the results obtained by testing patients immediately after tract section to determine the level of analgesia. The patient operated upon with local analgesia is often too exhausted and apprehensive, by the time that stage of the operation is reached, to give reliable responses. If he is awakened for this purpose from light anesthesia maintained through the earlier phases of the operation, his responses again may mislead the surgeon in the result to be anticipated. It seems preferable to depend instead upon a more nearly complete section of the anterolateral tracts.

**Level of Section.** For patients having pain in various parts of the body, individualization of the level of cord section requires variability of depth of section according to the diameter of the cord at the level of the attack. Practically all pain for which cordotomy is indicated requires the level of analgesia at or only slightly below the umbilicus. To the patient, it makes little practical difference whether his level of analgesia is at the umbilicus or at the clavicles. To make the operation as uniform as possible in performance, we have fixed upon the cervical level. In the average case, sections at C4–5 on one side and C5–6 on the other, have proved entirely satisfactory. This insures quite uniform, adequate levels of analgesia between the clavicles and the nipple level. In cases in which arm analgesia also is desired, cordotomy has proved safe at even C1 and C2 levels.

By adopting the C4–6 levels for section, it is possible to anticipate quite uniform results with a 6 mm. depth of incision in patients of average build. The incision is made 5 mm. deep in smaller patients.

**Position.** The sitting position has decided advantages in cervical spinal cord surgery. Bleeding is minimized, so the operating time and trauma are considerably lessened. The surgical field is more easily available to the surgeon and his assistants than in operations upon prone patients.

The patient is securely fastened in a chair with the trunk erect and the head supported in a moderately flexed position. This permits loss of cerebrospinal fluid without entirely draining the ventricular system. Acute flexion of the neck is avoided, thereby minimizing possible cord trauma against unrecognized midline disc protrusion.

Fear of surgical shock has kept several surgeons from using this position. Although it is a hazard in the case of conscious patients, anesthesia largely minimizes it. The blood pressure regularly falls a moderate amount initially, but quite regularly it regains its original level by the time draping is completed. The blood pressure usually falls temporarily to 80 mm. or even lower after the second cord section is made. In sluggish cases the administration of