INTRAMEDULLARY SPINOPTHALAMIC TRACTOTOMY*

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In spite of a definite knowledge of the location of the pain tracts in the upper levels of the nervous system, the relief of intractable pain in the upper extremities, shoulders and neck has not been uniformly satisfactory, and many procedures are still done offering incomplete relief and resulting in needless neurological deficit.

The lesions most commonly encountered are carcinoma with extension into the brachial plexus from the neck or from the breast, and superior sulcus tumors with involvement of the sympathetic chain as well as the segments of the arm. Where the pain is confined to the neck or upper chest, rhizotomy gives satisfactory relief, but a lesion involving either the segments of the neck or those of the upper chest will usually at some time involve the segments of the upper extremity. The disability of the upper extremity resulting from a rhizotomy is so great that a more selective operation, even at greater risk, would be desirable for the patient, and a section of the spinothalamic tract sufficiently high to include the distribution of the pain is obviously necessary. High cervical chordotomy has been employed, but with many unsatisfactory results. The level resulting is often not sufficiently high to include the area of pain and in addition so many of these patients have pulmonary involvement that damage to the phrenic segments may be particularly dangerous. This necessitates a still higher section of the spinothalamic tract.

The procedure of Schwartz and O'Leary1 sectioning the spinothalamic tract in the medulla at the level of the lower border of the olive appears ideal, but the paucity of reports on this procedure indicates that it has not had wide acceptance. This lack of acceptance has apparently been for three reasons, (1) the incomplete sensory loss of the shoulder and neck, (2) the technical difficulties of the procedure itself, and (3) the reported postoperative ataxia in ambulatory patients.

Twelve cases of intramedullary spinothalamic tractotomy for intractable pain of the neck, shoulder and upper extremities are reported here, and our experience with these cases has proven these difficulties to be largely invalid, so that the procedure is now considered a most satisfactory one. In the early cases, incomplete sensory loss in the shoulder and neck was the rule, but with further mapping of the tract it has been possible to obtain higher and more satisfactory levels of analgesia. According to Schwartz and O'Leary, and also Walker,2 there is a topographical arrangement of the pain

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and temperature fibers which lie between the dorsal border of the inferior olive and the 10th nerve filaments, the sacral segments lying most superficially and the cervical deepest (Fig. 1). On our first test case, a narrow cut skirting the olive was carried in stages to a depth of 6.5 mm. A level of analgesia up to the nipple line was produced at 5 mm., but this did not rise with the additional cut of 1.5 mm. A Horner's syndrome was produced as the cut was carried to its deepest extent. The incision was then carried to the level of the 10th nerve filaments, and a small rise of analgesia to include the shoulder was obtained together with an hypalgesia of the neck. The incision was then carried 1 mm. more dorsally still, and immediate analgesia was obtained to a level slightly above the border of the mandible. As the incision was carried posterior to the level of the vagus filaments, the patient complained of sharp pain on the ipsilateral side of the face. In succeeding cases, it was found necessary to extend the cut posteriorly to a level where pain on the ipsilateral side of the face was felt in order to obtain the highest analgesia possible. The curve of the knife blade does not permit a selective deep dorsal cut without carrying the superficial portion of the incision into the trigeminal tract. It is possible, therefore, that the elusive pain fibers to the neck lie deep and dorsal. The incisional depth which proved the most satisfactory was 5 mm. In practically every instance, analgesia was obtained to a level above the mandible and to the vertex posteriorly at the time of operation, but in some cases this level receded slightly in several weeks with a moderate hypesthesia remaining in the upper portion of the neck (Figs. 2 and 3).

These findings appeared to be borne out in the reports of White, Schwartz and O’Leary. The fact that White obtained about as high a level with a 4 mm. cut as Schwartz did with a 6 mm. cut appears significant. In the case of White, analgesia was obtained up to the shoulder, but only an hypalgesia resulted over the shoulder and neck. This was obtained with a cut between the levels of the vagus nerve and the olive at a depth of 4 mm. In the first case of Schwartz and O’Leary an incision 6 mm. deep between the levels of the vagus filaments and the olive produced an analgesia up to the clavicle. In their second case, an incisional depth of 5 mm. produced analgesia up to the 1st dorsal segment. There was one finding in White’s operative report which appears significant, fitting in with our findings, and this was the fact that he produced pain on the ipsilateral side of the face with