PAIN "RELIEF" BY FRONTAL CINGULUMOTOMY*

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(Received for publication May 19, 1961)

Relief of pain as a clinical problem has faced physicians since man first began to attempt treatment of his own ailments. Drug therapy was found to be only partly successful in such treatment, and destructive operations on the primary pain-conducting pathways of the peripheral and central nervous system evolved, such as peripheral neurectomy, dorsal rhizotomy, and spinthalamic tractotomy. These precise neurosurgical procedures achieved adequate differential sensory (pain) deprivation of the areas involved, but in many instances the "psychogenic" component of the patient's reaction to his disease was not altered and the complaints of disabling pain continued. In some instances prefrontal lobotomy was effective in stopping the complaints of pain.27,30,31 However, these procedures were done in a variety of ways to produce a relatively massive nonspecific destruction of frontal-lobe white matter16–18 and shortly became rather unpopular because of the significant and at times devastating deterioration of personality.

Certain beneficial effects of prefrontal lobotomy were recognized early such as the immediate modification of the morphine-withdrawal syndrome.27,30 Further experimental study of this phenomenon indicated that the frontal cingulum fasciculus (Fig. 1), a white-fiber tract of the medial hemisphere destroyed anteriorly by most lobotomies,17,18 might be important as a mediating bundle carrying frontal-lobe modifying influences to autonomic effector areas, and that its specific destruction could greatly reduce and modify the autonomic phenomena that follow withdrawal of morphine.5,6 Since emotion and autonomic phenomena were so closely related,8,14,35 it was attractive to extrapolate that these influences from the frontal lobes via the cingulum might be in the "emotional sphere." Furthermore, Papez20 previously had implicated the cingulum in his anatomical theory of emotion. Other investigators already had drawn inferences relating the cingulate area with a number of autonomic-psychogenic factors.1,8,17,19,21,26,29,31,32 This concept of the functional significance of the cingulum has been supported by recent anatomic and physiologic studies of the limbic system and its many interconnecting fasciculi.1–3,7,9,19,25,34,35 These studies show that the cingulum consists of multisynaptic pathways connecting the medial frontal cortex, the anterior thalamic nuclei35 and the rostral mid-line and intralaminar nuclei7,8,19,24 with the hippocampal formation24,35 (Fig. 2). Therefore, it was attractive to postulate that transection of the cingulum might be of benefit in those clinical cases of intractable pain in which marked emotional factors appeared to contribute to the intolerable situation.5,6

In this project our intent was to modify the patient's emotional response to the life-threatening situation which he faced so that his expressions of fear and anxiety no longer augmented critically whatever pattern of organic pain was present to produce intolerable suffering.

METHODS

Selection of Patients. Over a 7-year period, patients who were presented for consideration of treatment of their intractable pain were reviewed and interviewed on multiple occasions in an effort to estimate the degree to which their emotional status was augmenting their complaint of pain. The type of

* Presented at meeting of the Harvey Cushing Society, Mexico City, Mexico, April 19, 1961.
pain was not considered critical in the decision, nor was the lesion causing this pain considered critical. In all cases, the chief complaint was intractable pain producing the patient’s disability and hospitalization. Our intent was to determine whether the patient showed prominent emotional factors in his complaint that could affect adversely the results of adequate destruction of specific pathways of pain. Sixteen patients met the criteria set up, based primarily on: 1) outward evidence of anxiety; 2) preoccupation with their illness to the point of depression or near depression; 3) demonstrable emotional lability in the situation of interview with inappropriate crying, etc. In 14 cases, psychiatric help on a consultant basis was sought through the cooperation of a member of the Psychiatry Department. In 2 instances, the neurosurgical decision that cingulumotomy was warranted was in opposition to the psychiatric opinion.

In most instances, the patients selected for cingulumotomy were chronic “pain problems” who had been hospitalized for long periods of time. Frequently, they had had multiple operations directed toward their primary disease, and several had been operated on specifically to relieve pain.

The operation and its expected results in all instances were reviewed carefully with the patient and members of the immediate family. The expressed intent of the procedure was to “relieve suffering” by modifying the patient’s reaction to his painful situation. No patient was accepted for cingulumotomy without realization on the part of the patient and the family that the patient probably would be a somewhat different person following the operation, but nevertheless improved in regard to his complaints of pain and evidence of suffering.

Technique of Cingulumotomy. Fig. 1 demonstrates diagrammatically the anatomical location of the cingulum fasciculus in enough detail only to demonstrate a logical surgical approach to the frontal cingulum to achieve severance of this tract by electrocoagulation. Using a limited air study, coagulating electrodes are placed in the cingulum under roentgen-ray control with the patient awake.

Preoperative medication is minimal, using only a small dose of atropine prior to coming to the operating suite. The last narcotic dose preoperatively is given on the usual schedule in each case.

Fractional pneumoencephalography or ventriculography is necessary for roentgen-ray controlled positioning of the electrodes. With the patient sitting upright on the operating table with his head in the optimum position for ventricular filling, lumbar or cisternal puncture is performed and 13–20 cc. of filtered air are injected slowly. After withdrawal of the needle, the patient is helped slowly into the supine “brow-up” position on the table, with cervical spine slightly anteflexed.

The shaved anterior half of the head is prepared and draped for bifrontal burr holes or preferably twist-drill holes (3/16 inch). A mid-line measurement is made from the nasion 9 cm. posteriorly to a point just anterior to the coronal suture. The exact mid-line position of the point may be checked by an anteroposterior roentgenogram, securing a #12-gauge wire over the presumed sagittal suture line from nasion to lambda.