SELECTIVE CORTICAL UNDERCUTTING AS A MEANS OF MODIFYING AND STUDYING FRONTAL LOBE FUNCTION IN MAN

PRELIMINARY REPORT OF FORTY-THREE OPERATIVE CASES*

WILLIAM BEECHER SCOVILLE, M.D.†

Hartford, Connecticut

(Received for publication September 1, 1948)

The physiological function of the frontal lobe in man still remains an uncharted field. A technique of cortical undercutting has been devised to enable one to detach certain areas of the frontal cortex by making a line of cleavage at the relatively avascular junction of gray and white matter by means of a suction tip and spatula, thus interrupting the long association fibers of the overlying cortex. The short U association fibers to adjacent gyri are interrupted by angling the undercutting superficially into the gray matter at the peripheral borders of the area to be isolated. Cortical undercutting thus constitutes a method of producing discrete cortical lesions without interference of the blood supply to adjacent areas of the brain. Forty-three operative cases have established the technical feasibility of this method. In addition to preservation of the blood supply, undercutting has other surgical advantages over cortical ablations. It can be accomplished under direct vision through short straight cortical incisions without leaving a raw exposed surface. Interruption of bridging veins and large arterial branches is unnecessary. Ligatures and electrocoagulation are used only in the initial straight incision. Undercutting can be carried out in areas where ablation is impossible. Reasonably exact delineation of the undercut area can be made with steel or tantalum wire loops.

SELECTION

Three areas have been selected for cortical undercutting: partial Brodmann’s areas 9 and 10, the orbital surface and the cingulate gyrus. Areas 9 and 10 have been selected because of a favorable alteration of human behavior demonstrated by Penfield, Pool and Freeman. The orbital and cingulate gyrus areas have been chosen because of their obvious importance in animal experimental work. Undercutting of areas 9 and 10 is roughly equal in extent to the areas ablated by Penfield and Pool in their gyrectomy and topectomy operations respectively. Undercutting of the orbital surface includes the entire orbital surface, especially the prechiasmal area 47. Undercutting of the cingulate gyrus includes the entire anterior limbic area together with Brodmann’s area 23 and small medial portions of areas 9 and 10.

* In conjunction with the Connecticut Cooperative Lobotomy Study.
† 56 Garden Street, Hartford 3, Connecticut.
Forty patients have undergone cortical undercutting for the treatment of mental disease at the Connecticut State Hospital, Institute of Living, and Norwich State Hospital, including 19 areas 9 and 10, 11 orbital, and 10 cingulate gyrus undercuttings. Three patients have undergone undercutting of areas 9 and 10 for intractable pain at the Hartford Hospital. These patients have been followed for from 1 to 8 months.

TECHNIQUE

Certain instruments are necessary for the cortical undercutting operation (Fig. 1). 1) A dental headrest for application to a standard table or stretcher.* 2) A headlight is essential. 3) Self-retaining scalp retractors. 4) 1½" and 2" trephines can be modified from machinists' standard "hole saws" which can be purchased for $1.00 from machine tool or auto supply stores. They are fitted with a centering point and shank for use with a standard Hudson drill handle. † A separate ½" twist drill is used for making the centering hole for the trephine points. 5) A fine No. 1 suction tip, to which is attached the electrocautery wire. ‡ It is necessary that this be the

* Approximate cost $17.50 by General Electric Company.
† Complete assembly by local machinist c/o the author can be purchased for $10.00 for the trephine and $15.00 for spatula-forceps.
‡ Manufactured by Codman & Shurtleff, Surgical Supply House, Boston, Massachusetts.