Hazards of Stereotaxic Thalamectomy*
Added Safety Factor in Corroborating X-Ray Target Localization with Neurophysiological Methods

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Radiological and electrophysiological techniques make it possible for the surgeon to introduce electrodes through a small trephine to hitherto inaccessible regions of the brain in the awake patient with a high degree of accuracy and safety. Stereotaxic surgery requires that the following steps be taken: 1) establish the radiological coordinates of the target; 2) reach the target by precision apparatus over an appropriate route; 3) corroborate the target neurophysiologically; 4) destroy the target. We believe that to eliminate the step of neurophysiological target corroboration is to increase the hazards to the patient.

Target

In Parkinson’s disease, tremor and rigidity are totally eradicated without neurological deficit. The target is the ventral lateral nucleus of the thalamus (as suggested by Hassler and Riechert) which includes the ventral oral posterior (VOp), the ventral oral anterior (VOa), and the ventral intermedium (VIm) divisions. A parasagittal section (Fig. 1) illustrates that the target is delimited posteriorly by the ventral posterior (VP) nucleus of the thalamus, encroachment of which results in paresthesias; inferiorly by the corpus Luysi, the destruction of which results in ballismus; and anteriorly by the anterior one-quarter of the posterior limb of the internal capsule containing frontothalamic and frontopontine fibers, which if compromised can result in mental changes.

A horizontal section of the thalamus (Fig. 2) depicts the target area delimited posteriorly by the VP nucleus; laterally by the motor area of the internal capsule, destruction of which results in spasticity and dysarthria; and medially, the dorso-median and mammillo-thalamic bundle, destruction of which can produce mental changes.

A frontal section (Fig. 3) shows the proximity of the target area to the dorso-median nucleus and the internal capsule; a lesion too inferior, encroaching on the brachium conjunctivum, may result in excessive hypotonia and lateropulsion.

Radiological Localization of Target

The coordinates of length and height of the target area can be obtained from the lateral ventriculogram and that of laterality from the anteroposterior ventriculogram. The anterior commissure, the posterior commissure, and the foramen of Monro can be identified in the lateral ventriculogram (Fig. 4) and a bicommissural CA–CP line joining the midpoints of the two commissures constructed. Talairach et al., developed the method of outlining the thalamic nuclei by a method of proportional values based on the height of the individual thalamus and the division of the CA–CP line into thirds (Fig. 5).

An oblique line uniting the point of junction of the first vertical line with HT/2 and the midpoint of the posterior third of the CA–CP represents the anterior border of the VP nucleus.

The coordinate of laterality is the most difficult to ascertain precisely radiologically since the third ventricle is variable in width and irregular (the target area facing the narrowest part); the presence of a massa intermedia often interferes. Difficulties encountered in establishing this coordinate par-
FIG. 1. A parasagittal section of human brain 14.5 mm from the midline; crossing the target center in the average case. Below is a drawing of this section with the superimposed outline of the third ventricle (each division of the grid is 1 mm). The usual trajectory is indicated by the arrow. The bicommissural line (CA-CP) is 25 mm in this case.