General Articles

1. Application of Thalamic Recording with Microelectrode Technique to Stereotaxic Surgery

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From our recent experiences of thalamic recording with microelectrode during stereotaxic surgery in 84 cases, the following results were obtained and discussed from the practical point of view.

1) Upper limit of the thalamus, detected by sudden increase of cellular discharges, is between 14 mm and 20 mm from the intercommissural (IC) line in our antero-posterior approach.

2) Inferior margin of the thalamus which is important for coagulation of sub-VL and/or sub-Vim area is indentified by the reduction and/or disappearance of cellular discharges. In most of the cases it is within ±1 mm in relation to the IC line.

3) The thalamic sensory nucleus (VP) is detected by the increased spontaneous background activity and the responses to peripheral natural stimulations of various modalities, if any. As the anterior portion of VP receives impulses from passive joint movement or muscle compression, the responses to these stimuli must be examined carefully when the tracking is directed posteriorly.

4) Along a tracking, this method gives us a continuous information in the depth of brain and is very reliable for identification of the recording point.

5) Thus, with the aid of this technique, the effects of operations for parkinson's disease were excellent; 98% to rigidity and 86.7% to tremor (estimated by EMG examined one or two weeks after operation in 48 cases operated from JAN 1970 to MAY 1971).

2. An Automated Determination of a Trajectory for Two Targets in Stereoecephalotomy

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An automated determination of a trajectory for two targets has been programmed for the application in the stereoecephalotomy. Two targets \( t (X_t, Y_t, Z_t) \) and \( T (X_T, Y_T, Z_T) \) have been measured in a three dimensional space \( (X, Y, Z) \) from both antero-posterior and lateral view of the X-ray picture.

When the \( Z \) axis is rotated by \( \theta \) degree and 0 point is moved to \( T \), \( t (x_t, y_t, z_t) \) is written as follows;

\[
x_t = (X_t - X_T) \cos \theta + (Y_t - Y_T) \sin \theta \\
y_t = -(X_t - X_T) \sin \theta + (Y_t - Y_T) \cos \theta \\
z_t = Z_t - Z_T
\]

A trajectory passing through the two targets \( t \) and \( T \) is determined by \( \alpha \) and \( \beta \);

\[
x_t = -\bar{t}T \cos \alpha \cos \beta \\
y_t = \bar{t}T \cos \beta \\
z_t = \bar{t}T \sin \alpha \sin \beta
\]

The real distance of \( \bar{t}T \), \( \alpha \) and \( \beta \) is calculated as follows;

\[
\alpha = \tan^{-1}\left( \frac{z_t}{x_t} \right)
\]

\[
\beta = \tan^{-1}\left( \frac{x_t}{y_t \cos \alpha} \right)
\]

\[
\bar{t}T = \frac{y_t}{\cos \beta}
\]

The computer-aided determination of a trajectory for two targets has made it possible to drive a stereotaxic equipment automatically.

3. Experimental Study of Stereotaxic Implantation of Silastic Chemode

—The Introduction for Diffusion of Drugs into Cerebral Basal Ganglia—

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Since the work of Folkman and Long (1964), it has been known that silicone rubber is permeable to some kinds of drug and chemicals. Its permeability has no relation with molecular weight of substances. Substances which are soluble in lipid solvent or gaseous substances is able to pass silicone rubber. The diffusion rate depends upon surface area, membrane thickness and the chemical agents, moreover the rate of passing is constant over a long time.