SPHENOIDAL ELECTRODES IN THE ELECTROGRAPHIC STUDY OF PATIENTS WITH TEMPORAL LOBE EPILEPSY

AN EVALUATION*

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The principal epileptogenic area in the majority of patients with temporal lobe epilepsy involves the mesialbasal regions of the temporal lobe (uncus, amygdaloid and hippocampal areas). Accordingly, it has been well recognized that some type of recording from the base of the skull is essential for detailed electroencephalographic study of this most common type of focal epilepsy. Standard scalp electrodes are, therefore, supplemented in most electroencephalographic laboratories by the use of either pharyngeal or sphenoidal electrodes. Other techniques such as electrodes placed against the tympanic membranes, etc., have been less popular.

At the Montreal Neurological Institute, nasopharyngeal electrodes have been used routinely in the investigation of all patients suspected of having temporal lobe epilepsy. A single pair of sphenoidal electrodes has been used on rare occasions, usually when the pharyngeal recording was unsuccessful. With multiple recordings and use of various activation techniques, satisfactory localization of the epileptiform abnormality has been possible in most, but not all, patients suspected clinically of suffering from temporal lobe epilepsy. In an effort to improve the accuracy of the electroencephalogram in complicated problems of temporal lobe seizures, a technique has been developed using two sphenoidal electrodes beneath the greater wing of the sphenoid bone on each side to complement the nasopharyngeal electrode and permit recording from six separate points, three on each side, beneath the mesial portions of the temporal lobe.

A detailed description of this technique and a preliminary assessment of its value has been reported elsewhere, so only a brief outline will be presented here.

TECHNIQUE

Under aseptic conditions insulated sphenoidal needle electrodes are inserted into the cheek just below the zygomatic arch and directed mesially to the base of the skull just anterior and lateral to the pterygopalatine fossa (“anterior sphenoidal electrode”), and to the posterior rim of the foramen ovale (“posterior sphenoidal electrode”) as shown in Fig. 1. The landmarks and technique of insertion of the needles are essentially those used for the injection of the 2nd and 3rd divisions of the trigeminal nerve by the lateral approach. Recording is then carried out using electrode linkages that permit comparison and localization of discharges at the anterior or posterior sphenoidal and/or pharyngeal electrodes in relation to the standard scalp and ear electrodes. If Metrazol activation is to be carried out, or if it is desired to repeat the recording on a second or third day, fine (.008" diameter) insulated piano-wire electrodes are inserted through the needles and the needles are then removed leaving the wire electrodes in situ. The wire electrodes are firmly fixed to the skin with Nylon plugs. The wire electrodes may then be left in place for several days and successive recordings can be made to confirm the existence and localization of an elec-

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FIG. 1. Position of sphenoidal electrodes below base of skull. “Anterior sphenoidal electrode” is placed against the lateral pterygopalatine fossa. “Posterior sphenoidal electrode” lies near the posterior rim of the foramen ovale.

trographic abnormality. Spontaneous or induced seizures have failed to dislodge the flexible wire electrodes.

This technique, utilizing multiple basal electrodes, has been performed in over 80 patients suspected of having temporal lobe epilepsy at the Montreal Neurological Institute. No complications have resulted. It is the purpose of the present report to outline the advantages inherent in the use of multiple sphenoidal electrodes in the electroencephalographic diagnosis of patients with temporal lobe epilepsy, and to compare the efficacy of these sphenoidal electrodes with nasopharyngeal electrodes in the same patients. Individual case reports will be cited to illustrate general patterns of results encountered in this study.

CASE MATERIAL

The present study is limited to the first 50 patients with temporal lobe epilepsy who were examined using this multiple basal electrode technique. Most of the patients were being evaluated for possible cortical excision of a presumed temporal lobe focus. Each patient in the present group had at least one other type of electroencephalography performed in addition to the sphenoidal electrode recording. Most of the patients had had numerous electroencephalographic studies performed over a period of years prior to the present examination. All previous electroencephalograms, if available, were studied, summarized, and compared with the results obtained using this multiple sphenoidal electrode technique. Special attention was paid to the comparative efficiency of nasopharyngeal electrodes and the separate sphenoidal electrodes in recording small abnormal electrographic potentials.

ILLUSTRATIVE CASE REPORTS

Case 1. I.C., a 23-year-old female, was becoming increasingly incapacitated by frequent seizures since their onset 6 years previously. The seizures were characterized chiefly by long, complex automatisms lasting for as long as 3 to 4 hours. During these attacks her consciousness appeared to wax and wane. Following a few of the attacks, a postictal speech deficit had been elicited. Several major seizures had been observed without any localizing or lateralizing features. Standard Electroencephalograms. Numerous recordings had been made previously at the Montreal Neurological Institute and other institutions. Very little abnormality had ever been seen; surely nothing characteristic of a localized lesion. Some bilateral, irregular, low-voltage 5 to 6 c./sec. waves had been recorded over both temporal regions. These were occasionally slightly sharp in form, but no predominance of one side could be made out, even using pharyngeal electrodes. Activation techniques including hyperventilation, photic stimulation, sleep and Metrazol failed to induce any evidence of a localized epileptogenic lesion.

Sphenoidal Electrode Studies. Two recordings were made using both sphenoidal and pharyngeal electrodes, as well as the standard scalp leads. Surface electrodes over the temporal regions showed only bilateral theta rhythms. Almost continuous spike and sharp-wave activity of low and medium voltage was present at both anterior and posterior sphenoidal electrodes beneath the mesial portion of the left temporal lobe during the first examination; at a time when surface and pharyngeal electrodes recorded normal activity. This examination was repeated and discrete epileptogenic spike activity was seen at both of the left sphenoidal electrodes, and to a lesser extent at the left pharyngeal lead. Again, no diagnostic abnormal potentials were seen from scalp electrodes over the lateral surface of either temporal lobe (Fig. 2).

Operative Findings. When left temporal lobectomy was carried out the left uncinate region was found to be extremely soft and atrophic. The