ENCEPHALOGRAPHY IN DIAGNOSIS OF POSTERIOR-FOSSA TUMOURS*

H. F. W. PRIBRAM, D.M.R.D.

Department of Radiology, University of Alberta Hospital, Edmonton, Alberta, Canada

(Received for publication August 15, 1961)

In recent years encephalography has become accepted as the procedure of choice in the investigation of cerebral tumours. With the use of fractional techniques it has become a safer and more informative procedure than ventriculography and it allows us to distinguish between intracerebral and extracerebral tumours.

One of the main difficulties in the diagnosis of posterior-fossa tumours is the frequent failure to obtain ventricular filling. The subarachnoid cisterns therefore assume an almost greater importance than the ventricular system itself. The present study of 15 confirmed posterior-fossa tumours was undertaken to explore the diagnostic possibilities of the so-called "failed encephalogram." In these cases the diagnosis was indicated by one or more of the following features which will be discussed on an anatomical basis.

1. Hydrocephalus
2. Herniation of the cerebellar tonsils
3. Flattening of the pontine cistern
4. Displacement of the quadrigeminal plate

Additional findings may consist of:

5. Outlining the tumour itself
6. Displacement or dilatation of the vallecula

The technique of fractional encephalography has been described fully by Robertson and Lindgren and it is necessary to mention only one or two points. A successful examination, without risk to the patient, demands the closest co-operation between the surgeon and the radiologist. The procedure is therefore undertaken only as a prelude to possible craniotomy. Papilloedema is not considered a contraindication to encephalography and it was fully established in 4 of the cases whilst 1 patient showed early papilloedema. There were no complications attributable to the procedure but facilities for an emergency twist-drill burr hole should be available; others feel reassured if parietal burr holes are made prior to the examination.

In order to maintain the intracranial pressure no cerebrospinal fluid is removed until the end of the examination and then only a small amount for laboratory studies. We use only small amounts of air, 7 cc. at a time, and these are instilled extremely slowly (viz. at the rate of 1 cc. per min.) to a maximum of about 35 cc. Each step is followed with lateral and postero-anterior films taken in the sitting position until it is judged that sufficient air is present in the ventricles and the subarachnoid spaces.

In the event of failure to obtain ventricular filling and evidence of tonsillar herniation, we do not always abandon the procedure but sometimes persist in trying to obtain ventricular filling. Even if these attempts fail, air will pass into the subarachnoid cisterns which often contribute sufficient information for a positive diagnosis. At the end of the examination it is our practice to take the normal brow-up and brow-down films as the presence of a supratentorial lesion may be disclosed. This was possible in 1 ease in which there were metastases in the right frontal region and the right cerebellar hemisphere. The diagnosis was made because the filling films showed the vallecula to be displaced to the left and the pontine cistern to be flat-

* Presented at 13th annual meeting of the Canadian Neurological Society, Montreal, Canada, June 15, 1961.
The「Failed encephalogram」in case of posterior fossa meningioma. The inferior margin of the herniated cerebellar tonsils is indicated (arrow). The pontine cistern is flattened. The callosal sulcus is stretched indicating hydrocephalus; it is also dilated.

The brow-up films confirmed the flattening of the pontine cistern and showed the pericallosal cistern to be displaced to the left.

The diagnostically important subarachnoid cisterns will now be considered in turn.

The pericallosal cistern encloses the corpus callosum from the rostrum to the splenium. In front it communicates with the cistern of the lamina terminalis and behind with the cisterna vena magna and the ambient cistern. Since the corpus callosum forms the roof of the lateral ventricles, filling of the pericallosal cistern will indicate ventricular dilatation or displacement in the same way as the pericallosal artery does at angiography (Fig. 1).

In 8 of the 15 cases and in 5 of a further 9 cases there was dilatation of the callosal sulcus (Figs. 2–4). We ascribe considerable significance to this finding, which was first described as a sign of pressure hydrocephalus by Schechter and his associates in 1958.3 Dilatation of the pericallosal cistern, however, may be seen in cortical atrophy. It was noted in 13 out of 100 cases but failure to obtain ventricular filling in this condition is most unusual. Studies at autopsy show that, whilst there may be considerable cortical atrophy, dilatation of the pericallosal cistern is not a striking feature. The real value of the observation lies in raising our index of suspicion to the presence of a tumour and in not dismissing the appearances as being caused by cerebral atrophy.

The ambient cistern is a two-fold cistern:4

Fig. 1. "Failed encephalogram" in case of posterior fossa meningioma. The inferior margin of the herniated cerebellar tonsils is indicated (arrow). The pontine cistern is flattened. The callosal sulcus is stretched indicating hydrocephalus; it is also dilated.

Fig. 2. Dilated pericallosal cistern in case of 4th ventricle tumour. Note also diastasis of suture.

Fig. 3. Stretched and dilated callosal sulcus indicating hydrocephalus.