

HERNIATION OF THE BRAIN *

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The falx and tentorium constitute an important protection against any sudden impacts of pressure by keeping apart heavy portions of the brain, but they also provide an opportunity for trouble in case of swelling or need of displacement.

From the material that has gone through the Neurological Laboratory of the Henry Phipps Psychiatric Clinic, I have selected some cases illustrating various types of herniation under the falx and under the tentorium and into the foramen magnum. They give an interesting quasi-experimental picture of the topography and at least in two instances collateral consequences of possible importance among the so-called distant symptoms of brain tumor.

The line along which the tentorium can produce depressions passes over the uncus along the subiculum of the cornu ammonis.

The case A. M., with glioma of the left opercular region, shows, beside a moderate cerebellar wedging into the foramen magnum, a characteristic sagittal "tentorial line" on the left uncus, not to be taken for a sulcus semi-annularis Retzius (Figs. 1 and 2).

The case D. W., with a glioma of the anterior and middle hind-brain segment, shows similar tentorial lines due to slight hydrocephalus (Figs. 3 and 4).

A most extensive prolapsing glioma of the left temporal lobe (G. McL.) with death in coma, shows a frontal herniation under the falx and a marked subtentorial herniation of the uncus (Fig. 5).

In M. B. (Figs. 6 to 8) a cancer metastasis with a cyst in front of the paracentral lobule leads to herniation of the fornicate gyrus under the falx and subtentorial herniation of part of the uncus and of both subicula, with a striking impingement on the calcarine branch of the posterior cerebral artery and collapse of the corresponding part of the occipitotemporal cortex; hence providing a foundation for hemianopsia.

In R. H. (Figs. 9 and 10), an aneurysm of the circle of Willis just in front of the optic tract and chiasma impinged on the circulation of the right hemisphere, with swelling of the right hemisphere without actual softening or infarction, but marked herniation of the subiculum; left hemiplegia and hemianesthesia, three days later coma, and nine days later death.

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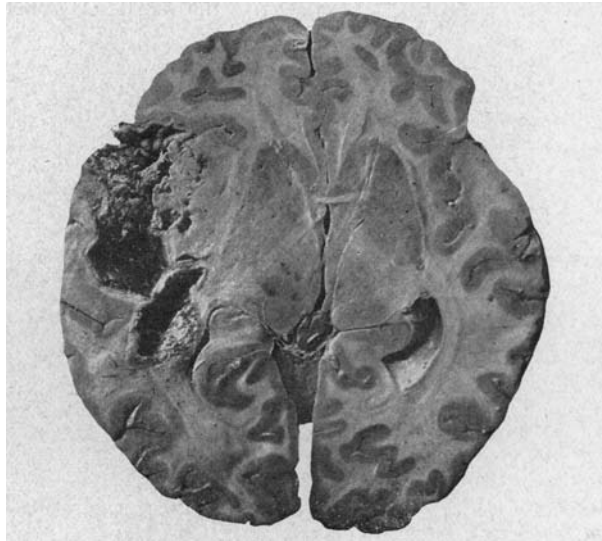


Fig. 1.—A. M., glioma with cystic degeneration in the left opercular region.

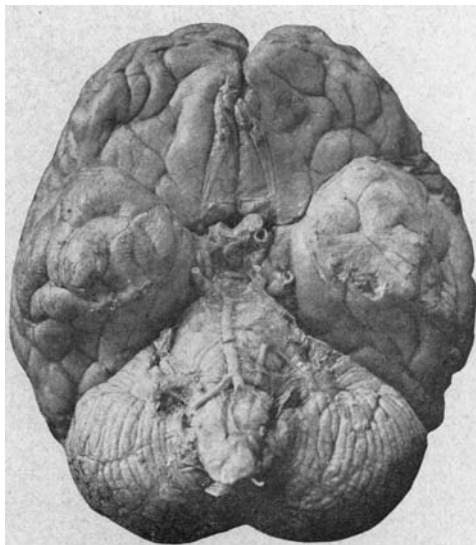


Fig. 2.—A sagittal depression of the uncus on either side marking the line of the tentorium; also moderate wedging of the cerebellum into the foramen magnum.

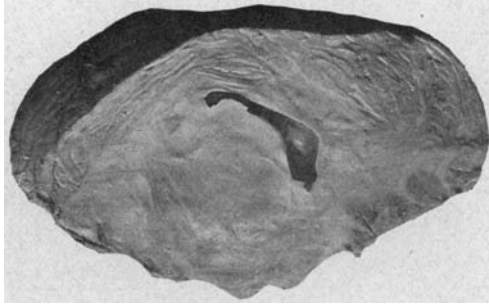


Fig. 3.—D. W., general extent of the glioma bulging into the hind-brain ventricle.

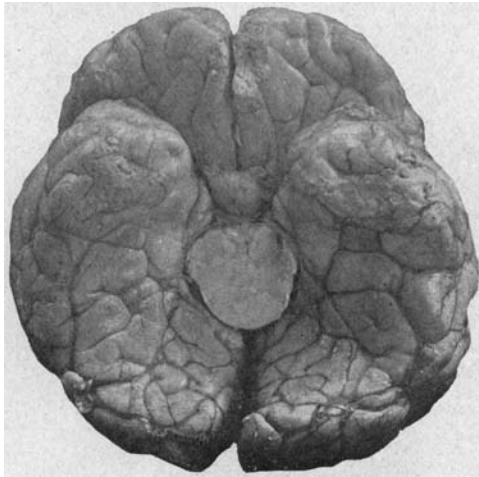


Fig. 4.—D. W., hydrocephalus visible in the distention of the tuber cinereum. Change of contour of the isthmus through the glioma; marked sagittal depressions of each uncus.

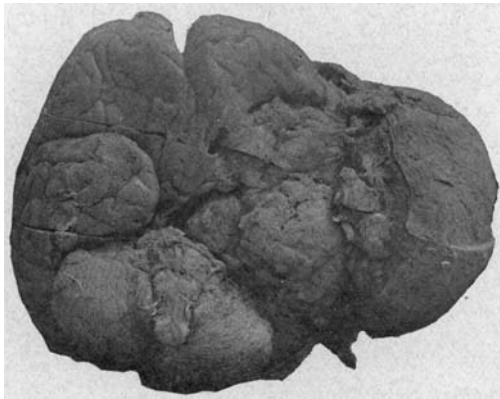


Fig. 5.—Prolapsing glioma (G. McL.); herniation of the left frontal lobe under the falx. Almost the entire left uncus is displaced on the inner side of the tentorium.



Fig. 6.—M. B., metastatic cancer and cyst taking up the mesial edge of the hemisphere. The lateral ventricles are somewhat compressed. The fornicate gyrus is pushed under the falx beyond the median line.



Fig. 7.—A ridge of herniation of the subiculum of the cornu ammonis to either side of the pineal region; compression, on the right side, of the posterior cerebral artery to the calcarine region; complete reduction of the calcarine and fusiform gyrus cortex on the right side, in contrast to the normally wide cortex on the left.

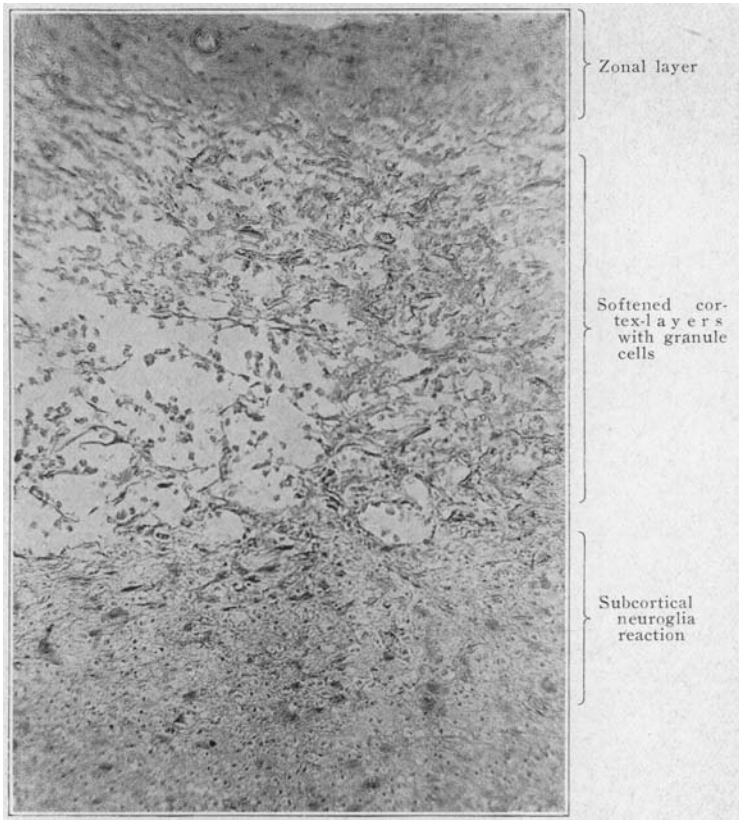


Fig. 8.—Calcarine cortex of Figure 7 with complete collapse of the cortex layers but preservation of the subcortex.

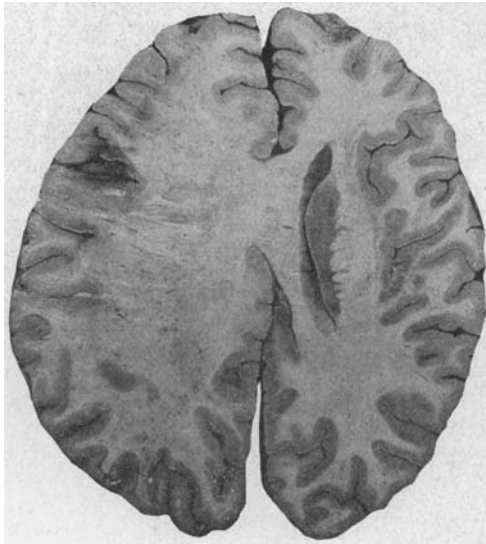


Fig. 9.—Swelling of the right hemisphere (to the left in the illustration).

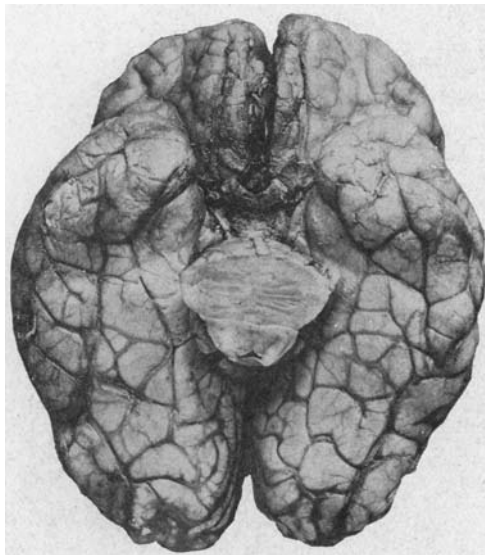


Fig. 10.—Hemorrhage from aneurysm in front of the optic chiasma; interference with the circulation in the right Sylvian artery; tentorial lines of the uncus and marked herniation of the subiculum (to the left of the midbrain).

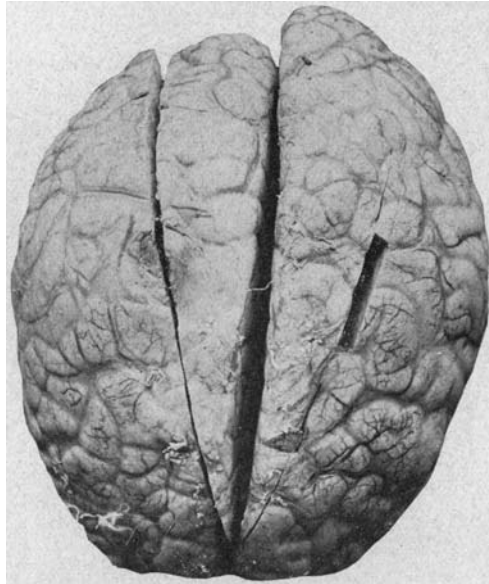


Fig. 11.—M. W., cancer metastasis in the right postcentral gyrus (to the left in the illustration).

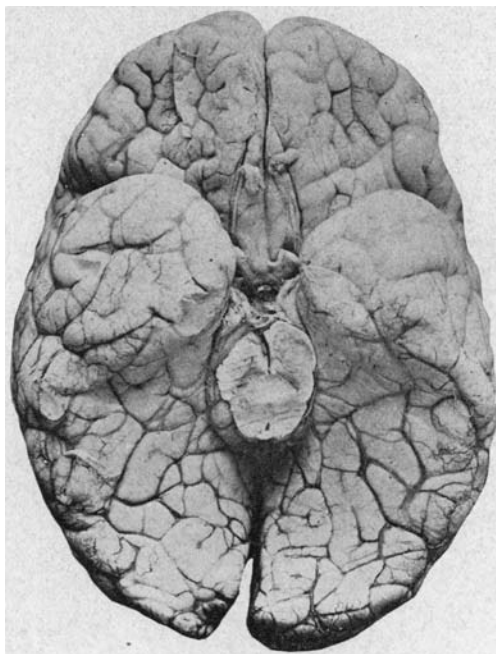


Fig. 12.—M. W., tentorial lines of the uncus and plain herniation of the subiculum along crus and midbrain.

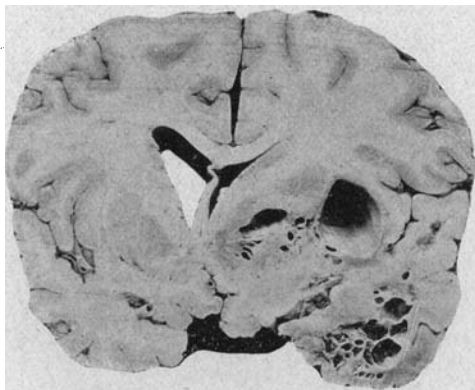


Fig. 13.—W. H. J., character of the cystic glioma extending from the striatum and frontal region through the temporal lobe to the ventral lip of the calcarine cortex (Fig. 16).

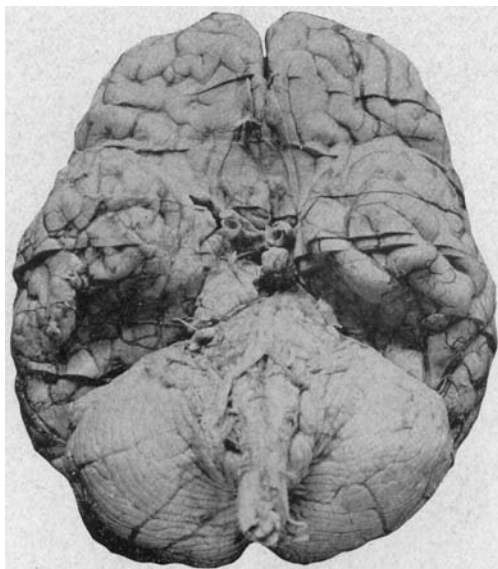


Fig. 14.—W. H. J., subtentorial herniation of the right uncus (to the left in the illustration) similar to that seen in Figure 5.

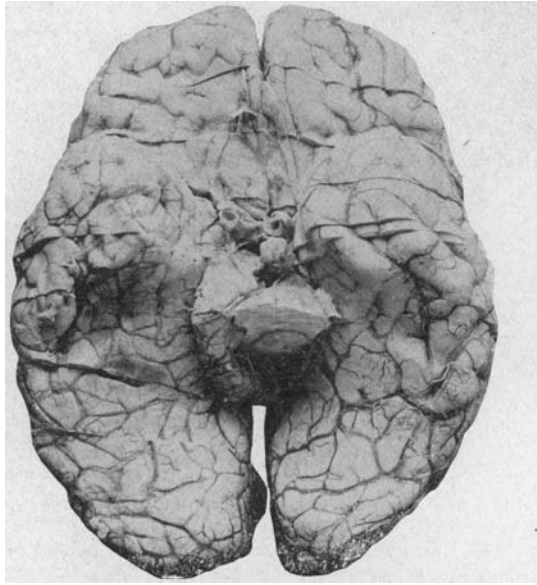


Fig. 15.—Continuation of the uncus hernia into a thick protrusion the entire length of the subiculum without occluding the posterior cerebral artery.

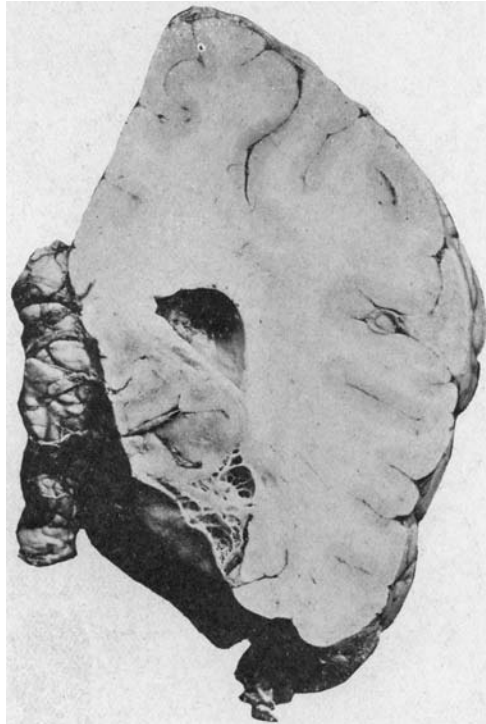


Fig. 16.—W. H. J., occipital horn and calcar avis. Cystic glioma of the basal lip of the calcarine. Prominent ridge of subiculum region forming a subtentorial herniation.

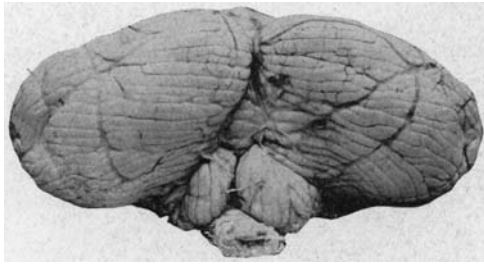


Fig. 17.—W. H. J., herniation into the foramen magnum.

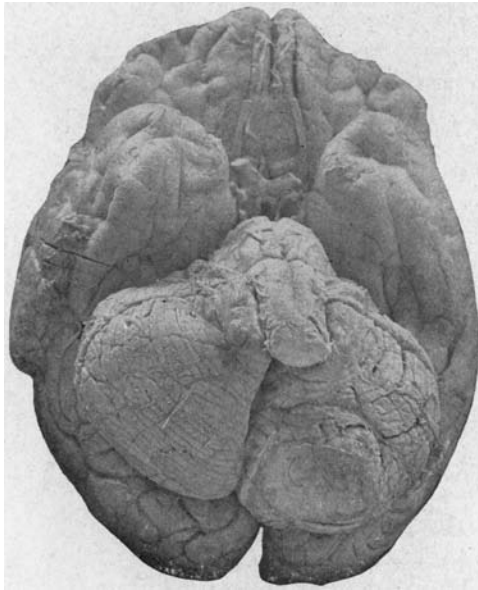


Fig. 18.—B. H., cancer metastasis of the left cerebellar hemisphere.

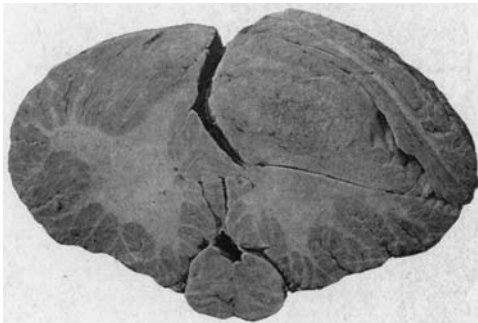


Fig. 19.—B. H., extent of the cancer.

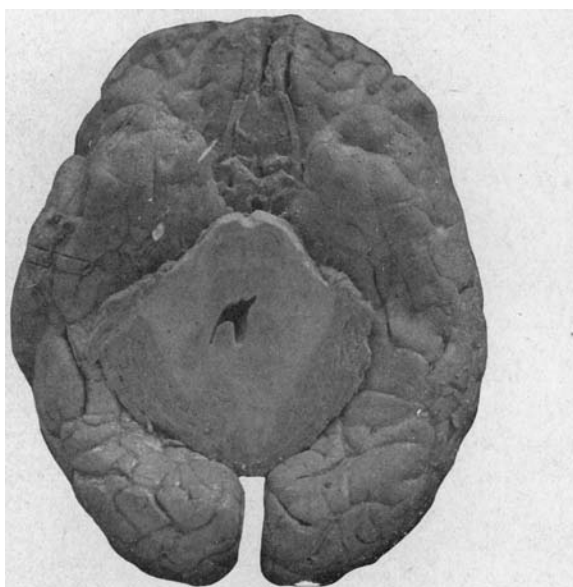


Fig. 20.—B. H., distortion of hindbrain ventricle by the cerebellar cancer.

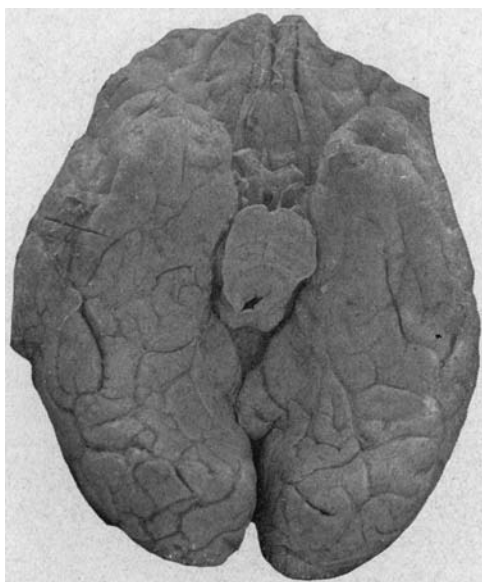


Fig. 21.—B. H., infratentorial distortion of the midbrain; remarkable supratentorial distention of the splenium and dislocation of the limbic lobe.

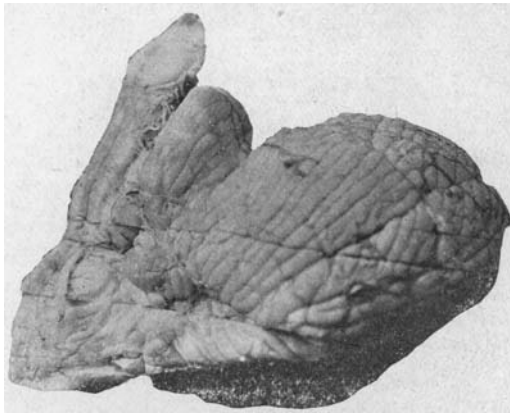


Fig. 22.—Foraminal wedging in case B. H.

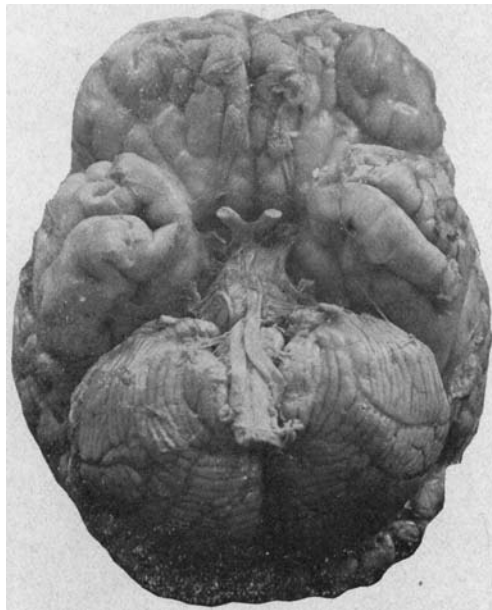


Fig. 23.—Child of 10 months; convulsions. Moderate cerebellar wedging in brain swelling.

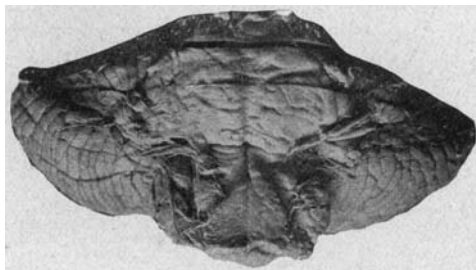


Fig. 24.—Marked wedging of the foramen, connected with lumbar puncture.

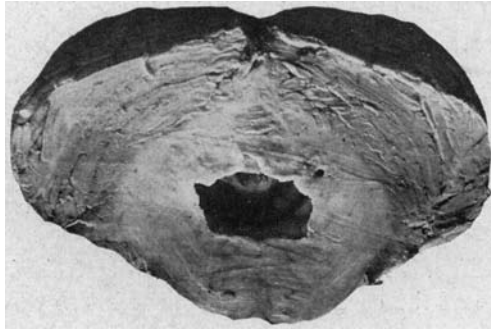


Fig. 25.—Distention of hindbrain ventricle in foraminal wedging.

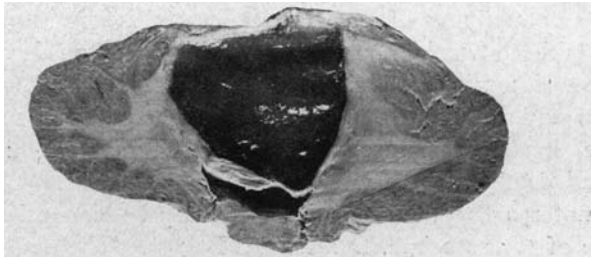


Fig. 26.—Cerebellar cyst causing foraminal herniation and partial compression of vertebral artery with bruit.

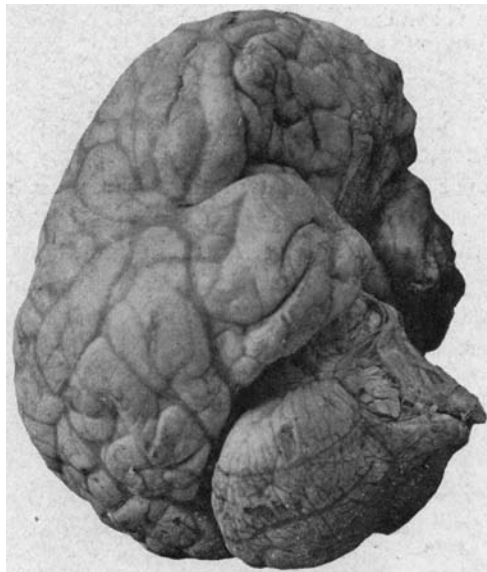


Fig. 27.—Herniation of cerebellum leading to compression of the vertebral arteries.

In M. W. (Figs. 11 and 12), an hemorrhagic cancer metastasis in the right postcentral gyrus led to subtentorial herniation and to wedging of the cerebellum.

An unusually great subtentorial herniation occurred in W. H. J. (Figs. 13 to 17), with a cystic glioma extending from the right frontal lobe to the right occipital lobe, without, however, occluding the calcarine artery. Wedging of the cerebellum was added as a secondary consequence.

In B. H. (Figs. 18 to 22), a cancer metastasis in the inferior semilunar lobule of the cerebellar hemisphere led to cerebellar herniation into the foramen magnum (Fig. 22), and to an interesting supratentorial distention of the region of the splenium, with death eight days after a subtemporal decompression.

Moderate wedging of the cerebellum (Fig. 23) in a child of 10 months, with convulsions and brain-swelling, but no focal lesion, led to a case of marked wedging of the cerebellum, distention of the hindbrain and forebrain ventricle (Figs. 24 and 25); severe frontal headache, lumbar puncture, followed by aggravation and disturbed vision and death in three weeks.

A counterpart to the case with secondary hemianopsia is produced by a case of my associate, Dr. Charles Bagley. The patient presented frontal headaches, convulsions, occasional staggering, but a vascular bruit over the entire cranium. A cerebellar cyst (Fig. 26) had produced a foraminal wedge which carried the vertebral arteries about 5 cm. below the foramen (Fig. 27).

CONCLUSION

Herniation in brain tumor and brain swelling occurs under the falx, under the tentorium and into the foramen magnum.

In the presence of pressure symptoms, we must remember that hemianopsia or vascular bruit may be a symptom of herniation.

A suspicion that herniations of the subiculum might be responsible for the sclerosis of the cornu ammonis in epilepsy through the effects of transitory subtentorial herniation is not, so far, corroborated by the present series.