REVERSIBILITY OF CEREBRAL VENTRICULAR DILATATION

HENRY A. SHENKIN, M.D., AND CHARLES R. PERRYMAN, M.D.
Neurosurgical Service, and Department of Radiology, Hospital of the University of Pennsylvania, Philadelphia

(Received for publication January 12, 1946)

Ventriculography and encephalography, combined or separate, are established procedures in the preoperative diagnosis and localization of mass lesions of the brain, but seldom have they been utilized to study the evolution of anatomic changes following operation. In the course of a larger study being carried on at the Hospital of the University of Pennsylvania, we have had occasion to observe, by ventriculography and ventriculo-encephalography, three patients with mass lesions causing an internal hydrocephalus, before and after relief of the hydrocephalus. The significant feature that we wish to emphasize in this report is that dilatation of the lateral ventricles caused by obstructing lesions in the third or fourth ventricle may, in certain instances, be reversible.

REPORT OF CASES

Case 1. O.B., an 18-year-old man, complained of headache and blurring of vision for 3 months and staggering gait for 8 weeks before entering the hospital. On examination, generalized hypotonia and hyporeflexia were evident and there was marked trunkal ataxia. His optic discs were elevated to between 5 and 6 D. The preoperative ventriculographic study is shown in Fig. 1, A and B.

At operation on Aug. 15, 1943, most of a large medulloblastoma of the vermis of the cerebellum was removed. This immediately relieved the obstruction of the fourth ventricle. The postoperative convalescence was uneventful. In January 1944 a full course of roentgen therapy was administered.

Although the patient continued to do well, a second course of roentgen therapy was planned. A second ventriculo-encephalographic study was done on Sept. 19, 1944, 13 months after his original air study (Fig. 1, C and D). The lateral and third ventricles were approximately normal in size. One can compare the appearances before and after operation because the same roentgen technic was employed in both examinations. A filling defect was noted in the fourth ventricle which was thought to be residual neoplasm.

In May 1945 a recurrence of symptoms was noted and the patient died on Oct. 2, 1945.

Case 2. M.W., a 38-year-old woman, had headache and blurring of vision beginning in December 1943. Nausea, vomiting and increasing somnolence began in January 1944. On admission to the University Hospital April 11, 1944, she was disoriented and confused, unable to stand or walk and had a high degree of papilledema bilaterally.

A ventriculographic study (Fig. 2, A and B) was performed on April 15, 1944, and immediately followed by a suboccipital craniectomy. A fairly well demarcated medulloblastoma was removed from the vermis of the cerebellum. The obstruction of the iter was relieved and cerebrospinal fluid was seen to flow freely from it. Her convalescence was uneventful and on July 7, 1944, 3 months after the initial air study, a ventriculo-encephalogram was done preceding irradiation therapy. This showed considerable decrease in the size of the ventricles (Fig. 2, C and D).

In November 1944, she noted pain low in the back, radiating down both legs. Otherwise, save for poor vision and mild residual disturbance in walking, she was asymptomatic. An-
REVERSIBLE CEREBRAL VENTRICULAR DILATATION

Fig. 1. Case 1. (A and B) Ventriculogram of an 18-year-old man who had symptoms of a posterior fossa lesion for 3 months. In the postero-anterior and left lateral horizontal positions, the lateral and 3rd ventricles are dilated to approximately twice their normal volume. The foramina of Monro and the aqueduct of Sylvius also are dilated. The shadow of the 4th ventricle is not visible. (C and D) Ventriculocisternogram 13 months after operative removal of a cerebellar medulloblastoma, showing little dilatation of the lateral and 3rd ventricles.

other course of x-ray therapy was given in December 1944, which included irradiation over the vertebral column, without improvement of her low back pain. She was again readmitted in March 1945, because of back pain. Spinal fluid manometric studies were entirely normal as was the spinal fluid total protein. Pantopaque myelography was entirely negative. She was discharged, and a firm brace was recommended for her back. She was last seen on June 25, 1945 and her back pain was much relieved.

Case 3. H.R., an 8-year-old boy, was struck on the head 2 months before admission to the University Hospital. He was not unconscious but did complain of generalized headache immediately after the injury. He had occasional headaches for the following month, which subsequently increased in frequency to the point where he complained daily of headache in the morning on awakening. Nausea and vomiting accompanied each bout of morning headache. On admission he had 5 D. of papilledema bilaterally, accompanied by hemorrhages in the left eye. The visual fields were normal but his visual acuity was reduced in each eye to
Fig. 2. Case 2. (A and B) Preoperative ventriculogram of a 38-year-old woman with symptoms of increased intracranial pressure for \( \frac{41}{2} \) months. The postero-anterior and left lateral horizontal views reveal lateral ventricles enlarged approximately 3 times. The aqueduct of Sylvius and 4th ventricle are displaced forward by a mass in the region of the cerebellum (arrows). (C and D) Ventriculo-encephalogram made 3 months after operative removal of a cerebellar medulloblastoma. The lateral ventricles are approximately \( \frac{1}{2} \) their former size. The absence of the shadows of the subarachnoid pathways may be secondary to basal arachnoiditis, residual tumor, or failure of complete drainage of the cerebrospinal fluid.

6/15. The procedure of ventriculo-encephalography, done on June 19, 1945, showed the lateral ventricles to be symmetrically dilated, due apparently to a mass in the anterior portion of the third ventricle obstructing the foramina of Monro. The posterior portion of the third ventricle and fourth ventricle appeared normal (Fig. 3, A and B). A right frontotemporal craniotomy with craniectomy was done for decompression and to allow the right lateral ventricle to dilate sufficiently to permit an operative attack on the presumed third ventricle tumor at a later time. The child did well postoperatively and was discharged asymptomatic on June 29, 1945.

He was readmitted to the hospital on Sept. 15, 1945. In the interim he had been entirely free of all symptoms of increased intracranial pressure. He had, however, gained an excessive amount of weight. The papilledema had receded, leaving an unusual amount of consecutive atrophy of the optic papillae. His acuity was maintained at 6/15 bilaterally, but the visual fields showed a left homonymous superior quadrantic defect. Another ventriculographic study was done on Oct. 3, 1945 (Fig. 3, C and D). The lateral ventricles were almost normal.
**Fig. 3. Case 3.** (A and B) Preoperative ventriculo-encephalogram of an 8-year-old boy with symptoms of increased intracranial pressure for 2 months. There is moderate dilatation of the lateral ventricles and a filling defect is in the third ventricle. (C and D) Ventriculogram 3½ months after operation shows that the lateral ventricles are much smaller and the 3rd ventricle deformity is not so apparent.

in size. The third ventricle was much more completely filled with air. Since the child was relatively asymptomatic, it was felt that operation could be deferred. The child was discharged to return for further observation in 3 months. However, he had an acute recurrence of the symptoms of increased intracranial pressure, and on Dec. 8, 1945 reoperation disclosed a cystic tumor of the third ventricle.

**COMMENT**

In the first patient (Fig. 1) there was an internal hydrocephalus, secondary to a tumor in the region of the fourth ventricle, which almost disappeared
after operation. The patient had had symptoms of increased intracranial pressure for 3 months and at the time of the ventriculogram the lateral ventricles, the foramina of Monro and the third ventricle were at least twice their normal size. Approximately 14 months after operation, ventriculoeencephalograms showed essentially normal ventricles. In the second patient (Fig. 2) there was greater dilatation of the lateral ventricles than was observed in the first patient. Three months after operation there was some reduction in the size of the ventricles, but they were still larger than normal. In this instance, the greater initial dilatation of the ventricles, the shorter interim between studies, the longer duration of symptoms and the difference in the ages of the patients may be the explanation for the incomplete restoration to normalcy of the ventricular system. In the third patient (Fig. 3) the enlargement of the lateral ventricles was due to an obstructing lesion of the third ventricle. Following decompression the obstruction was relieved temporarily and in 3½ months the lateral ventricles were considerably smaller.

Penfield\(^2\) states that a temporary internal hydrocephalus may leave the ventricles dilated for the remainder of the patient’s life. He suggests that it is the result of “an atrophy which, to a large extent, remains permanent.” Northfield,\(^1\) in a recent discussion of this point, concludes it is not known whether ventricles remain permanently dilated after transient increased intracranial pressure. The cases we are reporting effectively demonstrate that ventricular dilatation can be a reversible phenomenon.

The extent of the reversible changes are different in all of the three patients. Our experience is too limited to permit drawing any conclusions, but increased use of ventriculoeencephalograms before and after operation, as well as before and after roentgen therapy, should provide data from which one may learn more about dilatation of the ventricles due to obstructing lesions, and how reversible those changes are after the relief of the obstruction at varying intervals.

**SUMMARY**

Three cases are reported of internal hydrocephalus caused by an obstructing lesion in either the third or fourth ventricle which were studied by ventriculography before and ventriculoeencephalography after relief of the obstruction. In every patient, the lateral ventricles were smaller after operation, illustrating, we believe, that ventricular size is reversible in many instances, if the dilatation of the ventricles is due to an obstructive lesion, and the obstruction has not been present too long.

**REFERENCES**
