Reports have amply demonstrated that third ventriculostomy can relieve acquired obstructive hydrocephalus, with a low operative morbidity and mortality. The operation might be more widely used except for the fact that unpredictable failures occur from time to time.

Although a number of authors have mentioned in passing that the perforations in the third ventricle sometimes seal, they have not analyzed the cause of failure or the criteria for the selection of patients. Consequently we performed postoperative encephalography with air, Pantopaque, or radioiodinated albumin in six cases in which third ventriculostomy was unsuccessful. These studies, and postmortem examinations in two more patients, demonstrated an obstruction of the subarachnoid cerebrospinal fluid pathways that accounted for the failure.

Materials and Results

Third ventriculostomy was performed 33 times in 29 patients between 1939 and 1967 at The New York Hospital-Cornell University Medical Center. A single hole was made in the lamina terminalis or in the lateral wall of the third ventricle in nine patients, and in both the lamina terminalis and the floor of the third ventricle in 20 more. Data from the two groups are combined because Dandy, Guillaume and Mazars, Krayenbuhl, et al., Pennybacker, Scarff, and others have reported good results after only a single perforation of the third ventricle.

Two critically ill patients died within 30 days after the operation, resulting in an operative mortality of 6%.

Of the 27 surviving patients, long-lasting relief from elevated increased intracranial pressure was achieved in 10 but not in 17.

Two of 13 infants with hydrocephalus were helped by third ventriculostomy; one was the only patient with a cervical myelomeningocele, and the other was one of 8 patients with a lumbar myelomeningocele.

Ventriculograms were performed with air and Pantopaque following failure of third ventriculostomy in five patients with aqueductal stenosis associated with myelomeningocele; the perforations in the third ventricle remained open in three but closed in two. In the latter two infants, the perforations were reopened and a tube placed between the third ventricle and prepontine cistern with the long limb of the tube passing through the lamina terminalis and anchored to the crista galli (Fig. 1). Subsequent studies showed that the perforations now remained opened though the hydrocephalus still progressed.

Among the 14 adults with acquired hydrocephalus, eight continued to be relieved for intervals of 31 months to 26 years. Postmortem examination or postoperative contrast studies revealed the likely cause of failure in three of the six patients who did not benefit from operation. In two, metastases of a primary cerebral neoplasm had filled the third ventricle or invaded the pontine cistern. In a third patient with aqueductal stenosis, a brain scan after radioiodinated albumin was introduced into the lumbar subarachnoid space showed that the material had passed into the ventricles but not over the cerebral hemispheres. Apparently the process that had constricted the aqueduct had also sealed the subarachnoid pathways. In a fourth patient in whom hydrocephalus followed a subarachnoid hemorrhage, although direct evidence was lacking, the subarachnoid space was probably incompetent.

Discussion

Our experience with third ventriculostomy is similar to that of other authors, namely, that the result of operation is generally not
Selection of Patients for Third Ventriculostomy

253

beneficial in cases of congenital hydrocephalus but often satisfactory in cases of acquired hydrocephalus. When postmortem examination or postoperative contrast studies were obtained on patients in this series, failure in both groups was found to be due to blockage of the cerebrospinal fluid pathways by metastatic tumor, blood, infection, or congenital failure to develop. Sealing of the perforations in the third ventricle was found in only two patients, both infants whose subarachnoid space was also incompetent.

We have learned from this study that the subarachnoid space in cases of acquired obstructive hydrocephalus should be assessed prior to third ventriculostomy by such tests as encephalography with air or radiiodinated albumin. Even aqueductal stenosis in adults may be associated with a defective subarachnoid space, as experienced in one of our patients.

Third ventriculostomy in suitable cases does give long-lasting relief from hydrocephalus without the complications associated with prosthetic tubes and valves. Consequently, it deserves serious consideration in patients with acquired aqueductal stenosis or a neoplasm not likely to infiltrate the cavity of the third ventricle or subarachnoid pathways.

Conclusions

1. Third ventriculostomy relieves obstructive hydrocephalus in properly selected patients for long periods of time and with a low operative morbidity and mortality.

2. When third ventriculostomy fails to relieve obstructive hydrocephalus, the usual cause is a block in the cerebrospinal fluid pathways of the subarachnoid space.

3. An incompetent subarachnoid space is usually present in patients with congenital hydrocephalus, meningitis, or subarachnoid hemorrhage, and less often in those with brain tumor or acquired aqueductal stenosis.

4. The competence of the subarachnoid