Tension pneumocephalus after insertion of ventriculoperitoneal shunt for aqueductal stenosis

Case report

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A case of tension pneumocephalus after the insertion of a ventriculoperitoneal shunt for aqueductal stenosis is reported. The possible mechanisms producing this complication are discussed.

KEY WORDS □9 aqueductal stenosis □9 cerebrospinal fluid rhinorrhea □9 pneumocephalus □9 ventriculoperitoneal shunt

PEUMOCEPHALUS occurs most commonly as the result of head trauma. However, it has been described with cranial and intracranial neoplasms and infections and after intracranial and paranasal sinus surgery.1,2,6 This report describes a case of chronic symptomatic pneumocephalus that appeared to be induced by a ventriculoperitoneal shunt.

Case Report

This 22-year-old college graduate presented with a 1-year history of "watery" drainage from his left nostril. The onset was not related to head trauma or any other event. The drainage was constant and was augmented when he bent forward. His only other complaint was headaches over a 10-year period.

Examination. The general and neurological examinations gave normal results. A small amount of clear fluid from the patient's left nostril was positive for glucose (Tes-Tape). The head circumference was 61 cm. The results of routine laboratory studies were within normal limits. Skull films demonstrated widening of the coronal sutures and prominent convolutional markings. The anterior wall of the sella appeared elongated and the dorsum sellae was eroded, shortened, and displaced forward. The electroencephalogram was normal. Computerized axial tomography (EMI scan) revealed symmetrical dilatation of the lateral ventricles; however, evaluation of the posterior fossa structures was not possible because the patient's head was too large to be inserted fully into the machine. A right retrograde brachial angiogram confirmed the presence of marked dilatation of the lateral ventricles. The posterior cerebral and superior cerebellar arteries were flattened and depressed. The internal cerebral vein also appeared to be flattened and pushed down. Air ventriculography demonstrated marked dilatation of the
lateral and third ventricles and a porencephalic cyst in the left frontal lobe communicating with the anterior horn of the left lateral ventricle. The aqueduct tapered to an area of stenosis approximately 4 mm from its origin. Air injected into the lumbar subarachnoid space filled the fourth ventricle and the lower end of the aqueduct. Examination of the cerebrospinal fluid (CSF) from the right lateral ventricle and the lumbar subarachnoid space failed to demonstrate any abnormality.

Operation. A right ventriculoperitoneal shunt, which included a medium-pressure Hakim valve, was inserted. The postoperative course was uneventful and there was no return of the CSF rhinorrhea. Computerized axial tomography and skull films demonstrated some residual air in the ventricular system (Fig. 1 left). The lateral ventricles appeared to be about the same size as they had been preoperatively. The patient was dismissed from the hospital 10 days postoperatively.

Two months later, the patient began to experience difficulty in walking. His legs felt "weak and unsteady" and he had frequent falls. His mental function also had deteriorated. There were no symptoms to suggest an infection, and he had not noticed any recurrence of the CSF rhinorrhea.

Second Admission. The neurological examination revealed slight weakness of the right leg and bilateral Babinski responses. His gait was broad-based and mildly ataxic. Func-
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doscopic examination was negative, and his neck was supple. The shunt appeared to pump well. The results of routine laboratory studies were within normal limits. Skull films revealed a large amount of air in the lateral ventricles and marked dilatation of the third and lateral ventricles (Fig. 2).

Second Operation. The Hakim valve was exposed. It appeared to be functioning normally and there was no evidence of shunt obstruction. A left frontal craniotomy was then performed. The left frontal lobe was found to be herniated into the frontal sinus, and the fistulous tract between the porcerephalic cyst and sinus was identified. The brain tissue in the sinus was resected and the fistula was repaired.

The patient's recovery was uncomplicated, and the right leg weakness and gait ataxia disappeared. Computerized axial tomography performed 1 week postoperatively demonstrated normal-sized lateral ventricles (Fig. 1 right). The patient has been asymptomatic since dismissal from the hospital 12 months ago.

Discussion

Spontaneous CSF rhinorrhea is an uncommon phenomenon. However, it occasionally is the presenting complaint of adult patients with chronic hydrocephalus secondary to aqueductal stenosis. This case was included in a previously reported series of adult patients with aqueductal stenosis.

To our knowledge, there has been one previous report describing a similar induction of pneumocephalus by a CSF shunt. Greenblatt and Wilson discussed the possibility of air being drawn into the intracranial cavity after the insertion of a CSF shunt for persistent CSF rhinorrhea, but no such cases were described. Kessler and Stern described a case of pneumocephalus in a 28-year-old man after the insertion of a ventriculopleural shunt for postmeningitic hydrocephalus. The development of a fistula between a bronchiole and the distal catheter resulted in the replacement of CSF with air.

In the present case, air appeared to enter the ventricular system through the fistula that connected the frontal sinus and the anterior horn of the left lateral ventricle. This air replaced the CSF being drained into the peritoneal cavity by the shunt, after which the shunt did not appear capable of decompressing the ventricular system adequately. The return of the lateral and third ventricles to normal size after the repair of the fistula indicated that the intraventricular air was under increased pressure. The prompt reexpansion of the brain was surprising in view of the fact that obstructive hydrocephalus probably had been present for many years.

References


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