Isolated Unilateral Hydrocephalus Following Ventriculoatrial Shunt

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A shift of the brain stem may cause sudden death following decompression of one lateral ventricle by a ventriculoatrial shunt if there is a lack of communication between the two lateral ventricles. Isolated loculations of a ventricle following ventriculitis may have a similar effect. This is essentially an acute form of unilateral hydrocephalus.

Post-surgical instances of this type of isolated hydrocephalus are apparently quite unusual. In DeLange's monograph on hydrocephalus, no mention is made of this syndrome. However, in his list of autopsy cases, there were two patients who had an occlusion of the foramen of Monro. One patient had died 8 months after the insertion of the shunt and the second, 17 days after the insertion of the shunt. The clinical course is not given. Emery performed autopsies on 44 patients with shunts all of whom had myelomeningocele and hydrocephalus. Unilateral hydrocephalus was not demonstrated in any of these patients. Numerous articles have been written on complications associated with ventriculoatrial shunting of the cerebrospinal fluid, but none refer to post-shunt isolated hydrocephalus.

The fact that we have seen five such patients recently suggests that this condition may be unrecognized rather than rare.

Case Reports

Case 1. This premature infant was transferred to the Children's Hospital on August 11, 1966, 9 hours after birth. The birth weight was 1750 gm, and the head circumference, 30 cm. A 4 × 4 cm intact myelomeningocele in the sacral area was repaired on the day of birth.

When 13 days old, the patient became lethargic. The fontanel was full, and the head circumference had increased to 32.5 cm. Pseudomas aeruginosa and a hemolytic Streptococcus were cultured from the ventricular fluid. Intravenous antibiotics were administered and a Rickham reservoir placed in the left lateral ventricle to instill the antibiotic. Four weeks later a ventriculogram done by injecting air into both lateral ventricles demonstrated massive, symmetrical dilatation of the ventricular system; the septum pellucidum was in the mid-line. At this time, the baby weighed 5 lbs 4 oz, and the head circumference had increased to 38 cm. A ventriculopleural shunt was placed and the reservoir removed on August 30. The head continued to enlarge and a left hemiparesis developed. A second ventriculogram on September 10 (Fig. 1) demonstrated unilateral ventricular dilatation with a marked left-to-right shift. The obstruction at the foramen of Monro was relieved by fenestration of the septum pellucidum. The patient's hemiparesis improved. A repeat ventriculogram on December 21 demonstrated communication between the ventricles. Marked hydrocephalus was present despite a functioning normal-pressure Holter valve. This was replaced with a medium-pressure valve with further improvement in the hemiparesis; the head circumference became stable.

Comment. Many of the features of isolated or univentricular hydrocephalus following a ventriculoatrial shunt are present in this case. A premature infant developed ventriculitis in the neonatal period, survived after treatment with antibiotics, but subsequently developed hydrocephalus. This was initially symmetrical. Following a shunting procedure, the midline structures were displaced toward the ventricle containing the shunt because of lack of communication be-

219
between the two ventricles. Although the shunt appeared to be functioning upon palpation, the head continued to enlarge and the patient developed a left hemiparesis due to pressure of the tentorium on the right cerebral peduncle. The failure of communication between the two ventricles could have been recognized at the time of the initial ventriculogram if air had been injected only into the left lateral ventricle.

**Case 2.** This patient was seen initially at the Children's Hospital at 13 weeks of age because of increasing head size. Her weight was 800 gm. Pseudomonas aeruginosa was cultured from the ventricular fluid, and the patient was treated with systemic and intraventricular antibiotics. She responded to treatment. When she was 6 months old, a ventriculogram with injection of air into both ventricles demonstrated hydrocephalus and a large porencephalic cyst on the left side (Fig. 2). A right ventriculoatrial shunt was performed at that time. She was readmitted at 20 months of age because of increasing head size and lethargy. The ventricular catheter was repositioned, and a longer atrial tubing was put into place. On the day of operation, the patient developed a low-grade fever which persisted over the next 5 days. During this time, she was alert, ate well, and moved all extremities. She was afebrile on the fifth postoperative day, but was lethargic and quite irritable when aroused. She refused her feedings. She had stertorous respiration; however, the chest x-ray was clear. The patient was found dead in bed on the seventh post-operative day.

At autopsy, it was demonstrated that the large porencephalic cyst and the third ventricle did not communicate with the collapsed right lateral ventricle which contained the ventricular catheter (Fig. 3). The left lateral ventricle was displaced into the midline. No