Unilateral subdural-peritoneal shunting for bilateral chronic subdural hematomas in infancy

Report of three cases

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The authors present the cases of three infants with bilateral chronic subdural hematomas (SDH's) (effusions). Communication between the hematoma cavities was confirmed by an injection of air or metrizamide into one of the cavities. In all three cases, both SDH's (effusions) were successfully treated by placement of a unilateral subdural-peritoneal shunt without any untoward consequences. It is stressed that the cavities of bilateral chronic SDH's (effusions) may communicate, and that in such cases unilateral subdural-peritoneal shunting is sufficient to eradicate the SDH's on both sides. In addition, subdural fluid, even with a high protein concentration, may be successfully eliminated by an internal shunt using a shunt tube with a large internal caliber and a low-pressure valve.

KEY WORDS • chronic subdural hematoma • subdural-peritoneal shunt • metrizamide computerized tomography subdurography • infant

Although most chronic subdural hematomas (effusions) in infants are bilateral, no study has yet been made to assess communications between the hematoma cavities. In general, on the assumption that the hematoma cavities do not communicate with each other, treatment has been directed separately to each subdural hematoma. We describe three infants with bilateral chronic subdural hematomas (effusions), the cavities of which communicated with each other. This communication was confirmed by injecting air or metrizamide into one of the hematoma cavities. The results of unilateral subdural-peritoneal shunt placement are reported.

Case Reports

Case 1

This 7-month-old baby boy was brought to our department of neurosurgery on June 12, 1978, because of a generalized tonic convulsion occurring immediately after he fell backward from a sitting position. On arrival, the patient was alert but irritable, with frequent vomiting, a tense fontanel, and retinal and preretinal hemorrhage. A subdural tap yielded fresh liquid blood, leading to a diagnosis of bilateral acute subdural hematomas. His condition allowed conservative observation. Three weeks later, because his anterior fontanel remained tense, he underwent computerized tomography (CT) scanning, which disclosed bilateral subdural hematomas (Fig. 1). Daily subdural taps over the next few days failed to reduce the size of the hematoma cavities. Air was injected into the right subdural hematoma cavity during subdural tapping, and the left side of the head was raised. The air passed to the opposite side, revealing communication between the right and left cavities (Fig. 2). On July 11, the patient underwent placement of a subdural-peritoneal shunt on the right side. The protein concentration of the subdural fluid withdrawn prior to operation was 984 mg/dl. While the outer membrane of the hematoma cavity was identified at surgery, the inner membrane was not demonstrated. The patient's postoperative course was uneventful. A CT scan 2 years after surgery revealed disappearance of both subdural hematomas. At that time, his neurological development was normal.

Case 2

This 5-month-old baby boy was referred for evaluation of an enlarged head on February 8, 1978. His
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FIG. 1. Computerized tomography scans in Case 1. Left: Preoperative scans demonstrating extensive subdural hematomas on both sides. Right: Postoperative scans showing disappearance of the hematomas.

FIG. 2. Pneumosubdurography in Case 1. Air was injected into the right subdural cavity (left), then the right side of the head was lowered and the air flowed into the left subdural cavity (right), revealing a communication between the hematomas cavities.

delivery was unremarkable, and there was no history of recent head trauma. At the time of admission, his head circumference was 48.5 cm, showing marked enlargement for his age. The anterior fontanel was mildly tense and 4 × 4 cm in size. The baby's physical development was assessed to be approximately 2 months delayed. A CT scan revealed extensive subdural hematomas in both hemispheres, and communication between both cavities was confirmed by injection of air into the right hematoma cavity during subdural tapping. On February 28, a unilateral subdural-peritoneal shunt was placed on the right side. The protein concentration of the subdural fluid obtained at surgery was 2800 mg/dl, and outer and inner membranes of the hematoma cavity were identified. Postoperatively, the patient's physical development remained delayed, but the head did not enlarge any further. Follow-up CT scanning on February 19, 1981, demonstrated complete resolution of both subdural hematomas.

Case 3

This baby girl was born on April 19, 1984, at 36 weeks gestation after a breech delivery requiring a vacuum extraction. She was one of twins. Her birth weight was 3500 gm, and her head circumference was 35.0 cm. Immediately after birth, she was anoxic, with an Apgar score of 7 at 1 minute. A lumbar puncture performed the following day yielded bloody cerebrospinal fluid. She had persistent vomiting and poor appetite. Because of enlargement of the head and a tense fontanel, the patient was referred to us for evaluation at the age of 20 days. On admission, physical and neurological examination disclosed hematomas in both parietal regions, a head circumference of 39.5 cm, and an anterior fontanel measuring 5 × 5 cm with increased tension. She was irritable and vomited frequently. Computerized tomography scans (Fig. 3 left and center) demonstrated extensive subdural hematomas and mild enlargement of the ventricles with periventricular hypodensity on both sides. After injection of metrizamide (2 ml at a concentration of 83 mg/ml) into the right subdural hematoma cavity, CT scanning (Fig. 3 right) showed an opacification in both cavities, revealing communication between the right and left subdural hematomas. It also disclosed the widened subarachnoid spaces.

On June 18, 1 month after birth, the patient underwent placement of a subdural-peritoneal shunt on the
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FIG. 3. Preoperative computerized tomography (CT) scans in Case 3. Left and Center: Scans showing bilateral subdural hematomas and mild enlargement of the ventricles with periventricular hypodensity. Right: Metrizamide CT subdurography scan (metrizamide injected into the right subdural hematoma cavity) demonstrating opacification on both sides, indicative of communication between the right and left subdural hematomas. It also shows widening of the subarachnoid space.

right. At surgery, the protein concentration of the subdural fluid was 2610 mg/dl. The outer membrane was identified, but an inner membrane was not visualized. The patient's postoperative course was uneventful; the anterior fontanel became flat, and her vomiting and irritability resolved. A CT scan obtained 8 days later disclosed a remarkable reduction of the subdural hematomas on both sides.

Discussion

Chronic subdural hematoma (effusion) in infancy is bilateral in most cases; however, only a few reports have described a communication between the subdural hematoma cavities, and these were unsupported by subdurographic evidence. Moyes is the only author who has suggested the possibility of treating bilateral subdural hematomas by unilateral drainage. Most authors have treated bilateral chronic subdural hematomas (effusions) in infants by subdural tapping on each side, followed by craniotomy, or by internal or external drainage on both sides. In fact, McLaurin has stated that membranes may form which limit the lesion to one hemisphere.

The question of communication between bilateral hematoma cavities has received little attention in the literature. Thus, when treating infants with bilateral chronic subdural hematomas (effusions), we decided to study the communication between cavities. Initially we used pneumosubdurography (that is, injection of air into the subdural cavity on one side and tilting of the head to check for passage of air to the other side). Recently, after metrizamide became available, we used metrizamide CT subdurography. As a result, communication between both cavities was demonstrated in three of six patients. These three patients underwent placement of unilateral subdural-peritoneal shunts, which resulted in the disappearance of both subdural hematomas on CT scans. There were no complications caused by a shift of midline structures.

It is uncertain how high a concentration of protein in subdural fluid can be successfully drained through an internal shunt. The protein concentrations of subdural fluid taken pre- or intraoperatively in the present cases were 984 mg/dl, 2800 mg/dl, and 2610 mg/dl, respectively. Nonetheless, they did not obstruct the shunt, or cause ileus, malabsorption of the fluid, or other abdominal problems. One of the reasons why shunt patency was maintained, even for fluids of such high protein content, may be attributed to the tube devised by one of us (N.A.) (Fig. 4).* Based on the tube devised by one of us (N.A.) (Fig. 4).* Based on the

FIG. 4. Upper: Subdural-peritoneal shunt with a large-caliber tube and very low-pressure valve at the distal end. Lower: Ventriculoperitoneal shunt tube which is normally used in a subdural-peritoneal shunt.

* Aoki subdural-peritoneal shunt tube manufactured by Fuji System Co., Ltd., Tokyo, Japan.
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concept that placement of a subdural-peritoneal shunt is an entirely extracerebral procedure, and that there is not too low a pressure in the subdural cavity, we used a tube with a much larger caliber (2.5 mm in inner diameter and 4.0 mm in outer diameter) than is conventionally used in a ventriculoperitoneal shunt. It also has an excessively low-pressure valve (0 to 20 mm H2O) at the distal end. We would like to emphasize that a subdural-peritoneal shunt with a large-caliber low-pressure valve may be preferable to external drainage, which can be complicated by infection, electrolyte imbalance, or hypoproteinemia. Subdural-peritoneal shunting is less invasive than removal of the subdural membranes or lowering of the superior sagittal sinus by craniotomy. Thus, when treating infantile chronic subdural hematomas (effusions), it is valuable to note that bilateral lesions may be successfully treated with a unilateral subdural-peritoneal shunt, and that shunt patency for fluids with a relatively high protein concentration may be maintained by using the tube illustrated in Fig. 4.

References


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