Audible cerebrospinal fluid flow through a ventriculoperitoneal shunt

Report of two cases

JOE I. ORDIA, M.D., RONALD W. MORTARA, M.D., AND EDWARD L. SPATZ, M.D.

Department of Neurosurgery, The University Hospital, Boston City Hospital, and Boston University School of Medicine, Boston, Massachusetts

An audible, noisy cerebrospinal fluid flow is an uncommon sequela of ventriculoperitoneal shunting. Two cases presenting this phenomenon are described.

KEY WORDS • hydrocephalus • cerebrospinal fluid • shunt

Ventriculoperitoneal (VP) shunting is the treatment of choice in most patients with hydrocephalus. Both early and late complications are well described. However, a functioning VP shunt usually does not claim the patient's attention by acting as a "noisy faucet." We report two unusual cases in which the patients presented with audible cerebrospinal fluid (CSF) flow following VP shunting. The first patient was bothered by the head noise which initially was unexplained. The second patient was concerned that the disappearance of the noise meant that the shunt had ceased to function.

Case Reports

Case 1

This 51-year-old unemployed male truck driver was admitted to the hospital on November 11, 1981, because of weakness of the left leg and a pounding bifrontal headache of sudden onset 10 days prior to admission. He had no history of hypertension or diabetes. In May, 1981, he had been assaulted and punched in the face; however, no fracture was seen on skull and facial x-ray films and he was not hospitalized at that time.

Examination. Neurological examination revealed an alert patient with a left hemiparesis particularly affecting the leg. Muscle tone was increased on the same side, and a left extensor plantar response was present. There was sensory extinction on the left side. The optic discs were flat. Weber's sign lateralized to the right, but gross hearing and Rinne's test were normal. Blood pressure was 120/80 mm Hg. Computerized tomography (CT) of the head was normal except for enlarged ventricles. Xanthochromic CSF was obtained on lumbar puncture. The opening pressure was 350 mm of CSF. The patient remained alert on bed rest, blood pressure control, and epsilon-aminocaproic acid. Cerebral angiography on December 2, 1981, demonstrated an aneurysm of the ventral wall of the left internal artery with severe vasospasm of the anterior and middle cerebral arteries. Clipping of the aneurysm was delayed to allow the vasospasm to resolve.

Operations. On December 12, the patient underwent right VP shunting because of lethargy, disorientation, and a marked increase in hydrocephalus on repeat CT scanning. The burr hole was made in the right parietal area, 8 cm above and 3 cm lateral to the inion. A right-angle metal connector was used to join the ventricular catheter to a Hakim reservoir and Hakim valve with a tested opening pressure of 85 mm saline. The valve was positioned in the subgaleal space in the retromastoid region about midway between the mastoid and the atlas, and was connected to a distal subcutaneous catheter passed into peritoneal cavity via a subxiphoid incision. After shunt placement the patient became alert and lucid. Repeat cerebral angiogra-
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phy 3 days later showed resolution of the vasospasm. On December 17, 1981, he underwent a left pterional craniotomy with clipping of the left internal carotid artery aneurysm. He made a slow but steady postoperative recovery and was discharged on February 5, 1982, on a course of diphenylhydantoin (Dilantin), 100 mg three times a day. His memory was impaired and his gait was slightly unsteady, but he had no other deficits.

Postoperative Course. The patient had no complaints at his initial outpatient visit 2 weeks after discharge. On November 20, 1982, he came to the emergency room complaining of an intense “hissing noise like air escaping from something” in his head. On further questioning, he stated that the noise had been present since placement of the VP shunt, but had become more intense. He had no associated vertigo, headache, nausea, or vomiting, and the blood Dilantin level was therapeutic (11 mg%). He came to the neurosurgery clinic 2 days later with the same complaint. He described a constant noise “like running water” predominantly in the right ear. He was alert and the shunt valve pumped well. Hearing was diminished in the left ear and Weber’s sign lateralized to the right. Rinne’s test was normal and there was no cranial bruit. He was referred to the otolaryngology clinic.

An audiogram on November 29, 1982, showed moderate high-frequency sensorineural hearing loss in both ears. The following month, he was seen twice at the neurosurgery clinic. The noise interfered with his sleep, and he described it “like that of air leaking out of a tire, or steam escaping from a valve,” and as “a hissing sound.” A repeat audiogram done at another hospital in December, 1982, confirmed the moderate sensorineural hearing loss. In 1983, he solved the mystery of the head noise by concluding that it was from the shunt. The examining neurosurgeon depressed the valve and the noise immediately stopped. It returned when the valve was allowed to refill. The same result was obtained on repeating the test on different occasions. Once he had a satisfactory explanation and he was reassured, the symptom was no longer bothersome. His clinic visits are now less frequent. In August, 1985, he described the noise as still present but just a little nuisance.

Case 2

This 26-year-old woman with a long history of borderline intelligence was referred by her family doctor to a neurologist in October, 1985, because of progressive frontal headaches of insidious onset. She had no nausea, vomiting, or visual disturbance. Her medical history was significant for prematurity by 3 weeks, necessitating forceps delivery. There was no apparent hypoxia, and intubation was not required. The neurologist found her to be overweight but alert, with no focal neurological deficits. Funduscopic examination revealed flat optic discs. Blood pressure was normal. Tylenol (acetaminophen) did not alleviate the headaches but Fiorinal (butalbital and aspirin), 5 tablets/day, relieved the pain a little. A CT scan in December, 1985, showed marked symmetrical dilatation of the lateral and third ventricles with a relatively normal fourth ventricle. There were no mass lesions.

Examination. The patient was admitted to the hospital in February, 1986. She remained alert and had no signs of increased intracranial pressure. Her head circumference was 3 cm above the 97th percentile.

Operations. A right frontal Ommaya ventricular reservoir was placed. The CSF was clear and had a normal cell count and chemical composition. A metrizamide ventriculogram with CT was consistent with a communicating hydrocephalus with no aqueductal stenosis. She was discharged and readmitted 10 days later for VP shunting. The opening pressure was 300 mm of CSF. The conversion of the reservoir into a right VP shunt was accomplished by replacing the Ommaya with a Rickham reservoir connected to a high-pressure Holter valve. The valve was positioned 3 cm from the midline and parallel to it. The peritoneal catheter was passed via a subxiphoid incision.

Postoperative Course. The patient did well and was discharged home on the 4th postoperative day. After shunt placement she was free of headaches, and became more animated. About 2 weeks after she was discharged from the hospital she telephoned because she was concerned that her shunt might not be working. She stated that since the shunt was placed she had heard a sound “like running water” in the right ear and assumed that this was CSF flowing through the shunt. For a few hours on the day before she telephoned, the noise had ceased but had later returned. She had no headaches or other symptoms. She was reassured that the shunt was probably functioning well. On a subsequent office visit the shunt pumped well, and the “noise of running water” in her right ear could be interrupted by depressing the valve. The noise remains but does not bother her, and it actually reassures her of shunt patency.

Discussion

An audible CSF flow is an infrequent sequela of ventricular CSF shunting. We have not found any similar reports in the literature. Neither of these patients gave a previous history of head noises, and in both the symptom followed VP shunting. The noises were localized to the ear on the side of the shunt, and they were described as sounding like running water, air leaking out of a tire, steam escaping from a valve, and hissing.

The noise is considered to be mechanical in origin, arising from CSF flowing through the shunt mechanism and transmitted largely by bone conduction. The first patient had a history of noise exposure from driving a truck for 5 years. His audiograms were consistent with bilateral moderate high-frequency sensorineural hearing loss. If this were the cause of his head noise it is likely that the noise would have occurred long before he underwent shunt implantation. Temporarily occlud-
ing the shunt would also be unlikely to stop the noise in that instance. The first patient discovered the cause of his annoying head noise. Once he did so, the only treatment required was reassurance. The noise remains, but it has ceased to bother him, and it no longer interferes with his sleep. The second patient also required no treatment.

Head noises are frequently masked by environmental noises.1,2 If the sound of a radio is less objectionable, the patient may be advised to leave the radio on at night. Patients with an intense psychosomatic response to the noise may benefit from biofeedback and relaxation therapy.3 In all probability, most patients are likely to require only an explanation for the noise, and a reassurance that it does not herald a more egregious problem.

References

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Address reprint requests to: Joe I. Ordia, M.D., Boston University School of Medicine, 720 Harrison Avenue, Suite 710, Boston, Massachusetts 02118.