Internal Hydrocephalus Secondary to Cysticercosis Cerebri: Treatment with a Ventriculoatrial Shunt

Case Report

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Central nervous system cysticercosis requiring surgical intervention is infrequently encountered in the United States; it exists primarily in those areas of the world that may not have adequate sanitation. The majority of reported cases emanate from Chile, Poland, Mexico, and Spain.

Man ordinarily serves as the definitive host of the adult tapeworm, Taenia solium. Egg-bearing segments of the parasite are eliminated from the intestinal tract of man, eaten by swine (intermediate host), and the eggs mature into actively motile larvae which traverse the intestinal wall to reach the blood stream. From here they eventually invade and encyst in the striated muscles of the porcine host. The cycle completes itself when man eats insufficiently cooked pork containing the encysted larvae (cysticerci). Occasionally, however, humans may serve as the intermediate host; such a situation exists when man ingests the ova rather than the larvae. Following ingestion of ova, larvae develop, gain access to the blood, and thereby invade the skeletal muscles, the chambers of the eye, and the central nervous system. In man the most common site of encystment is the brain. From a summary of the literature and their experience, Arana and Asenjo reported the occurrence of intracranial cysts in 40 to 82% of human cases.

This report concerns a 37-year-old man infested with cysticerci in whom the lesions produced mental deterioration, seizures, and intractable headaches. Hydrocephalus resulted from obliteration of the aqueduct of Sylvius. The method of treatment was the insertion of a ventriculoatrial shunt. To our knowledge, this is the first case reported in this country which received palliation by this therapeutic means. A review of other surgical cases from the United States is also given.

Case Report

The patient was first admitted in January, 1957, at the age of 27 years, because of three major motor seizures. Past history revealed that he had been a prisoner of war in North Korea in 1953. While there he ate poorly cooked pork, drank contaminated water, and lost 71 lbs.

First examination. When seen in 1957, there were multiple subcutaneous nodules on the arms, chest, and neck, and the patient showed slurred speech, minimal right hearing loss, a positive Romberg sign with abnormal heel-to-knee testing, and an equivocal right Babinski sign. There was no papilledema. Cerebrospinal fluid dynamics were within the range of normal, and the fluid contained 3 red cells, 12 mononuclear cells, 37 mg% glucose, and 61 mg% protein. The colloidal gold curve was 4443211000; the Wasserman reaction was negative. There was a 10% peripheral eosinophilia; stools were negative for ova and parasites on repeated examinations. Skull x-ray films were normal, but calcific densities were demonstrated in the soft tissues of the neck, chest, and the abdomen (Fig. 1). Films of the extremities revealed multiple linear calcifications compatible with cysticercosis. Pneumoencephalography was normal except for a number of papillary projections into the lateral ventricles, an x-ray finding consistent with the diagnosis of cysticercosis cerebri. Confirmation of the diagnosis was obtained on January 23, 1957; a deltoid muscle biopsy revealed smooth-walled cysts containing parasites with the histologic appearance of Taenia solium. The patient was given anticon-
were performed. The postoperative course was complicated by a pulmonary embolism on the third day which was treated with heparin and warfarin. During the convalescent period, the patient complained of frequent, severe headaches and difficulty with the volitional control of micturition. Bilateral carotid angiography suggested enlarged lateral ventricles. A pneumoencephalogram indicated that air entered the cisterna magna and the fourth ventricle; no air was seen in the rostral aqueduct of Sylvius, third or lateral ventricles (Fig. 2 left). A ventriculogram (Fig. 2 right) revealed the lateral ventricles to be symmetrically dilated; the posterior third ventricle and rostral aqueduct were not visualized. For 3 to 4 days following the ventriculogram, the patient's confusion increased and he was markedly disoriented. It took 10 days for the air to be absorbed from the ventricular spaces.

Ventriculoatrial Shunt. Because of the aqueductal block and secondary hydrocephalus, a Pudenz ventriculoatrial shunt was performed under general anesthesia on March 7, 1968. Following placement of the shunt, there was dramatic relief of headaches and no further seizures. One week after the procedure it was believed the ventricular end of the shunt was not functioning properly. On March 28, 1968, under local anesthesia, the ventricular end of the shunt was examined. There was no particulate matter in the ventricular catheter or in the reservoir. The pressure in the right lateral ventricle was considerably less than at the original operative procedure.

After this revision the patient improved, and there were no seizures or headaches. Because of drug-related drowsiness, mepobarbital (Mebaral) was deleted from his anticonvulsant regimen, which at the time of transfer from general surgery included mepobarbital 60 mg each morning and 120 mg at bedtime, diphenylhydantoin (Dilantin) 100 mg four times daily, and primidone (Mysoline) 250 mg three times daily. Deletion of the mepobarbital was well tolerated, and the patient became more alert. The other anticonvulsant medications were reduced gradually. On April 10, 1968, he had a seizure; resumption of the previous diphenylhydantoin and primidone dosage controlled the convulsive episodes and he had

Fig. 1. Plain x-ray film of the abdomen demonstrating numerous calcified cysticerci in striated muscle.

vulsant medications and discharged from the hospital.

Other Examinations. Over the ensuing 10 years, there was poor seizure control, progressive mental deterioration, and increasing frequency and severity of headaches. These symptoms led to 12 additional hospital admissions. By the spring of 1959, memory loss and poor concentration were prominent, but the neurological examination remained unchanged. A second pneumoencephalogram in 1962 (eighth admission) disclosed moderate dilatation of the lateral ventricles without a shift of midline structures; there were no intracranial calcifications. The study was interpreted as indicative of mild cerebral atrophy. Intelligence testing in January, 1964 (ninth admission), revealed that his I.Q. had dropped from 114 in 1955 to 103. During the tenth through twelfth admissions, headache was the predominant subjective complaint.

In November, 1967 (thirteenth admission), he was readmitted to the medical neurology service because of poor seizure control. A history of food intolerance was obtained and oral cholecystography showed cholelithiasis. On January 11, 1968, a cholecystectomy and cystic duct cholangiography