PERITONEAL SHUNT FOR HYDROCEPHALUS

UTILIZING THE FIMBRIA OF THE FALLOPIAN TUBE FOR ENTRANCE TO THE PERITONEAL CAVITY*

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Roughly recognized by the ancients, hydrocephalus, as noted by Dorothy Russell, who gave the first accurate description of an autopsied case. It remains a partial etiological enigma until the present time. However, a great deal of knowledge has accumulated concerning its origin through the efforts of numerous workers from Magendie through Dandy. The saga of the treatment of hydrocephalus has been well documented in numerous reviews. On the whole, treatment has been directed toward either reducing the quantity of cerebrospinal fluid or shunting cerebrospinal fluid into areas where absorption or excretion may occur. Many ingenious shunting procedures have been devised.

Ureterothecal Anastomosis. Shunting fluid from the subarachnoid space into the urinary bladder after nephrectomy was first proposed and attempted by Drachter and independently by Heile in 1925. Heile anastomosed the kidney pelvis directly to the subarachnoid space. This procedure was modified by Matson who utilized a polyethylene catheter inserted into the subarachnoid space and into the free end of a ureter detached from the renal pelvis. Matson's method has had rather wide acceptance and has been effective in many instances. There are, however, as pointed out by Matson, certain disadvantages which warrant further search for a means of diverting the cerebrospinal fluid of a communicating hydrocephalus. These include: (1) sacrifice of a kidney, (2) loss of fluid and electrolytes resulting from excretion of the cerebrospinal fluid with the urine and (3) possible retrograde infection.

Ventriculomastoid Shunts. In 1950 Nosik proposed ventriculomastoid shunts employing a cannula connecting the dilated temporal horn of the lateral ventricle with the antrum of the mastoid. Because of the high incidence of middle ear infection in childhood and the attendant danger of meningitis, this ingenious method carries a significant risk.

Peritoneal Shunts. Cerebrospinal fluid diversion to the peritoneum was first attempted by Ferguson in 1898. He accomplished this with a U-shaped silver wire passed from the subarachnoid space about the cauda equina.

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through a drill hole in the 5th lumbar vertebra into the peritoneum. In 2 cases reported, the first patient died shortly, and the second after 3 months' improvement. In 1905 Nicoll\textsuperscript{16} attempted a peritoneal shunt by attaching omentum, which was brought through a paravertebral opening, to a defect in the spinal dura mater. Ventriculoperitoneal shunt was attempted with a rubber tube by Kausch\textsuperscript{13} in 1905 and with a silver wire by Hartwell\textsuperscript{17} in 1910. The latter's patient is particularly interesting in that he survived for 2 years. After death from a brain stem tumor without evidence of increased pressure, a patent scarred tube was found connecting the ventricle and the peritoneum. Cushing\textsuperscript{2,3} accomplished peritoneal shunts in 1905 by means of a silver cannula passed through the 4th lumbar vertebra into the peritoneal cavity. Twelve patients were treated in this way, but the operation was abandoned because of the development of intussusception and death in 2 patients. Cushing attributed these complications to the presence of pituitary secretion in the cerebrospinal fluid causing increased peristalsis. Further attempts at a peritoneal shunt were made by Heile\textsuperscript{4} by means of silk threads, vein grafts, and a rubber tube from the dura mater to the peritoneum.

Following these early trials with peritoneal shunts the procedure fell into disrepute among modern surgeons. It has recently been revived by Cone, Lewis, and Jackson\textsuperscript{18} who advocate ventriculoperitoneal and in some instances lumbar subarachnoid-peritoneal shunts. Analysis of their results has not yet been published. The experience of others seems to indicate frequent failure of the peritoneal shunts because of obliteration of the peritoneal end of the shunting tube by exudate or adhesions.\textsuperscript{1}

Other Shunting Procedures. Among other methods that have been suggested are shunts from the ventricles to the pleural cavity and to major venous sinuses. Experimental pleural shunts were found unsatisfactory by Ingraham and co-workers.\textsuperscript{11} This has also been our experience in patients. Attempts to sidetrack the cerebrospinal fluid into large venous channels have been made unsuccessfully since proposed by Payr\textsuperscript{18} in 1908 and Haynes\textsuperscript{8} in 1913.

Ideally a shunt will provide for removal of excess cerebrospinal fluid from its usual habitat and for its reabsorption to prevent fluid and electrolyte imbalance. Persistent patentcy in the presence of normal cerebrospinal fluid pressure, minimal local reaction to the shunting mechanism and least opportunity for central nervous system infection are imperative. It is the purpose of this communication to propose a workable modification of the peritoneal shunt applicable to female hydrocephalics and to present the early results in 12 patients so treated.

METHOD

Preliminary Considerations. Demonstration of hydrocephalus and determination of its type is effected by combined ventricular and lumbar puncture. If PSP or indigo carmine dye placed in the ventricle appears in the lumbar cistern within 30 minutes, adequate communication is considered present. Air studies have been useful in excluding the presence of a tumor as