Neurosurgical Techniques

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Control of Hydrocephalus by Valve-Regulated Shunt

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The operative procedure for control of hydrocephalus by use of the Holter valve appears on first glance to be one of the simplest in neurosurgery. Experience has shown, however, that strict adherence to minute technical details and careful aseptic precautions are imperative; otherwise the procedure may be doomed to ultimate failure even though this may not become apparent for several years. The technical points we have emphasized are based on our experience with complications which will be described in another publication.

Good preoperative pneumoencephalography is essential to define the etiology of the hydrocephalus and eliminate the possibility of a lesion which could be treated by more specific surgery.

Risk from air embolism is unlikely, even in a small infant when the venous shunt has to be established while ventricular air is still present. If excessive amounts of air are required to delineate the etiology of the hydrocephalus, carbon dioxide may be used.

Bacterial contamination of the cerebrospinal fluid, either through an open myelomeningocele or from repeated ventricular taps, is another hazard. When such a possibility is recognized, an initial temporizing shunt into the peritoneal or pleural cavity may be advisable since it carries less risk.

Operative Procedure

Anesthesia and Positioning. We prefer general anesthesia with intubation. This permits the use of positive pressure during venous catheterization as a safeguard against air embolism, and x-ray procedures are facilitated by the ability to control anesthesia from a distance. In situations of poor risk, however, the operation can be accomplished under local anesthesia. There is usually no need for a separate intravenous infusion since the surgeon’s first maneuver will be catheterization of the jugular vein through which fluids can be easily introduced. Monitoring of temperature is important in the small infant where an unexpected degree of hypothermia can endanger cardiopulmonary function.

The best position of the patient for both surgical exposure and x-ray study is as follows: The head is placed with the right side upward in a true lateral plane. Folded sheets raise the shoulders to extend the neck for surgical accessibility. The chest lies in a neutral supine position unless avoidance of pressure on a myelomeningocele requires oblique rotation. A cassette holder is placed under both the head and the chest. In small infants, a non-opaque warming unit is interposed.

The Holter Apparatus. Fig. 1 illustrates the components of the Holter apparatus. The barium-impregnated silicone-rubber venous catheter (A) usually employed has an external diameter of 2.5 mm. The rigid connector (C) fits within the tubing to permit solid anchoring. A modified catheter (B) is preferred by some surgeons on the theory that this stepped-down filamentous end could rest low in the heart without danger of endocarditis, but we prefer the proven safety of higher placement of the (A) catheter described later. The paired-valve assembly (D) incorporates check valves available at three different grades of resistance. They are designated as normal pressure (70 mm of re-