Neurosurgical Techniques

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The Ventriculo-Atrial Shunt

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A ventriculo-atrial shunt is of value in relieving internal hydrocephalus resulting from a variety of lesions that cause obstruction of the intracranial cerebrospinal fluid pathways. Among these are congenital obstructive and communicating hydrocephalus of infancy, inoperable tumors of the brain stem or other structures of the posterior fossa, and hydrocephalus secondary to adhesive arachnoiditis resulting from subarachnoid hemorrhage or various types of meningitis.

Although the ventriculo-atrial shunt was introduced to treat infantile hydrocephalus, it is applicable to all age groups. Because of the progressive withdrawal of the cardiac tube resulting from growth, this method of shunting cannot be considered to remain permanently operational in infants and young children. Surgical revision or the substitution of another effective operation may be required at a later date. It is not recommended as a substitute for ventriculocisternostomy or similar techniques designed to relieve obstructive hydrocephalus in adults.

Inasmuch as this technique introduces a foreign body into the blood stream, it should not be used in the presence of known focal or systemic infection, particularly with suspected meningeal inflammation. Additional contraindications are congenital heart disease and advanced, arrested hydrocephalus.

Preoperative Evaluation

In the management of infantile hydrocephalus, only those patients whose hydrocephalus has not been undergoing spontaneous arrest have been selected for operation. Following the original examination, all infants are seen at weekly intervals and the usual signs of increasing intracranial pressure are noted. The maximum circumference of the head is plotted on a graph containing the curves of normal growth of the head of male and female infants as reported by Westropp and Barber.11

If serial plotting shows that the growth of the head is extending out of the normal range and is linear in time, surgery is recommended. In contrast, a growth curve of decreasing exponential pattern suggests that further observation is warranted and that surgery may not be necessary. This, however, is often a matter of clinical judgment and no hard and fast rules can be made.

It is interesting that the majority of the reports concerning the operative and nonoperative management of hydrocephalus have not presented these essential data. Unless it can be shown conclusively that the surgical procedure controlled the increasing intracranial pressure and arrested the growth of the head, its effectiveness cannot be evaluated.

The preoperative evaluation of the hydrocephalic infant should include a program similar to that outlined by Ingraham and Matson2 and Murtagh and Kirkpatrick.3 Associated anomalies should be searched for in conducting the physical and neurological examinations. Roentgenograms of the skull will often shed light on the mechanism of the hydrocephalus. Subdural taps are performed to exclude the presence of blood or fluid in this space. Bubble ventriculograms, using 10 to 30 cc. of filtered air, will disclose the pattern and degree of ventricular enlargement. Larger amounts of air may be required to exclude the presence of an intraventricular tumor. Tests with phenolsulfonphthalein dye are helpful in distinguishing between obstructive and communicating hydrocephalus. Ventriculography with 0.5 to 1.0 cc. of ethyl iodophenylundecylate (Pantopaque) will often provide excellent visualization of the site and nature of the obstructing lesion. Prior to operation a roentgenogram of the chest is made in the recumbent position. This film will outline the cardiac shadow and serve as a guide in the passage of the cardiac tube during the operation.

Materials

Description of the shunt system. The shunt