Ventriculoauriculostomy for Infantile Hydrocephalus Using a Direct Cardiac Approach

Technical Note

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VENTRICULOAURICULOSTOMY with a Spitz-Holter or a Pudenz valve is extensively used for the treatment of infantile hydrocephalus. Nulsen states that accurate placement of the cardiac tube within the center of the right auricle is an essential part of the operation. The classical method of introducing the tube via either the jugular or the common facial vein requires the use of special techniques to ensure that the tube is in the auricle.

MacNab recommended special calculations based on preoperative radiography of the chest. The allowances made for magnification and for the difference in the external measurements of the chest wall as compared to the true jugular-auricular distance, however, lead to errors that make accurate placement uncertain. Pudenz, et al., and Anderson recommended x-ray studies during operation using Hypaque injected into the lumen of the tube, after it had been placed at the estimated depth. Robertson, et al., have enumerated several objections to this method and have described an electrocardiographic method to ensure accurate placement of the cardiac tube.

A transthoracic direct intra-auricular introduction of the cardiac tube is the technique now used at this hospital for the accurate placement of the tube within the center of the right auricle. This is a combined procedure performed by a neurosurgeon and a thoracic surgeon. The results of 42 cases operated on since January, 1964, have justified the continued use of this method.

Operative Technique

A general intratracheal anesthetic with controlled respiration is used. The patient is in a semilateral position with the right side up and the neck slightly extending over a sandbag (Fig. 1). The skin over the cranium, neck, and front of the chest is prepared. The neurological surgeon makes an inverted "hockey stick" incision on the right, which extends upwards from the mastoid to the posterior parietal region. The scalp including the pericranium is retracted with the aid of two self-retaining retractors. A scalp incision is then made at the summit of the exposure, and a small stab incision made in the dura. The ventricular tube of the shunt apparatus is introduced into the right lateral ventricle and a primed Spitz-Holter or Pudenz valve connected to this ventricular tube. The cardiac tube is connected to the other end of the valve, and cerebrospinal fluid then drips

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Fig. 1. The patient is shown in position on the operating table. The cranial, cervical, and thoracic incisions have been marked on the skin.
through the end of the cardiac tube, ensuring a working mechanism.

Simultaneously, the thoracic surgeon makes a right submammary skin incision extending from the right sternal edge medially to a point between the anterior and mid-axillary lines laterally. The breast and the pectoral muscles are detached from the fifth rib and retracted to expose it. The periosteum on the anterior aspect of the fifth rib is incised longitudinally with diathermy and a curved periosteal elevator used to reflect it upwards. The fourth intercostal space is now opened via the bed of the fifth rib. A rib spreader is used to enlarge the exposure, with the fourth coastal cartilage incised near its junction with the rib, if necessary.

With the aid of a small “step-ladder” cervical incision, a subcutaneous tunnel is then constructed with a blunt dissector from the thoracotomy to the craniotomy wound, and the cardiac tube brought subcutaneously from the cranial to the thoracic wound.

The upper lobe of the right lung is retracted downward and laterally to expose the pericardium over the right atrium. The pericardium is incised longitudinally over the right atrium, anterior to the phrenic nerve. The tip of the auricle is grasped with a pair of Duval’s forceps and a non-crushing auricular clamp (mitral clamp) is applied across the base of the auricle, thus isolating it from the rest of the atrium. A purse-string suture 1 cm in diameter of 0000 braided silk is inserted on a semicircular round bodied needle (arterial suture) into the lateral wall of the auricle, near its tip. A small stab incision is made in the center of the purse string with a tenotomy knife.

The cardiac tube enters the thorax through the medial end of the thoracotomy incision. The length of cardiac tube is now estimated and a loop allowance made for growth. The length of the loop is such that it equals the diameter of the right auricle. When the tube is trimmed to the desired length, a ligature (black silk) is used to mark a distance from the end of the cardiac tube, which is half the anteroposterior diameter of the right atrium. This is the estimated intracardiac length of the tube, which ensures that it will lie in the center of the right auricle. The cardiac tube is now introduced into the auricle through the stab incision, up to the estimated depth; the purse string is tightened and ligated around the tube. The ends of the suture are wrapped around the cardiac tube and ligated again to prevent the tube from being pulled out of the auricle (Fig. 2).

The flow of cerebrospinal fluid is checked at this stage by pumping the valve. The pericardium is sutured with interrupted silk sutures, with large gaps left for the free escape of postoperative exudates from the pericardial cavity. The lung is expanded by the anesthetist, and the intercostal muscles are approximated with continuous catgut except for the medial corner where the cardiac tube will enter the thoracic cavity through the anterior intercostal membrane; this will avoid constricting the tube. The pectoral muscles and subcutaneous tissues are sutured separately with interrupted catgut.

The valve is anchored to the pericranium of the cranial wound; it is then checked...