VENTRICULO-AURICULOSTOMY. A TECHNIQUE FOR SHUNTING CEREBROSPINAL FLUID INTO THE RIGHT AURICLE*

PRELIMINARY REPORT

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The treatment of hydrocephalus by establishing a communication between the cerebrospinal fluid pathways and the vascular system has interested surgeons since it was first suggested by Gärtners at the National Science Convention in Lübeck in 1895. Despite the failures in the past, the idea remains alive and is being continually explored.

Eight years ago, with the help of engineers skilled in flow dynamics, we devised a ventriculo-venous shunt tube which included an encapsulated sleeve valve in its midportion. It was hoped that this valve would maintain a unidirectional flow of cerebrospinal fluid, prevent reflux of blood into the lateral ventricle and sustain the intraventricular pressure at or above the pressure at which the valve opened. In September 1953, we began a series of animal experiments designed to test this valve, and in April 1955 it was subjected to its first clinical trial. Because of the encouraging result in this first patient, we are presenting our data in the form of a preliminary report.

HISTORICAL BACKGROUND

In 1895 Gärtners suggested that the most physiological method for treating hydrocephalus would involve establishing a connection with either the venous or lymphatic systems of the head and neck. During the two decades that followed, procedures incorporating these surgical principles were carried out by surgeons on the European and American continents.

Payr,15 who published his experiences in 1908, was the first to attempt ventriculo-venous anastomosis. This author's first report concerns 3 patients in whom the lateral ventricle was connected to the longitudinal sinus using a segment of saphenous or temporal vein. All patients died within 4 months, but it was noted at autopsy that blood had not refluxed into the lateral ventricle and that the longitudinal sinus was not thrombosed.

In a later communication Payr16 described further attempts to connect the lateral ventricle to the internal jugular vein. He used a formalin-fixed,

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paraffin-treated anterior or posterior tibial artery obtained from dogs or calves. A fresh segment of saphenous vein was drawn over the artery in a manner permitting an intima-to-intima junction with the internal jugular vein. The method was used in 8 patients, with 3 excellent results. In the 5 remaining patients his results were variable. The shunt was demonstrated to be patent at autopsy in some of his cases.

In 1911 Enderlen\(^4\) connected a hydrocephalic ventricle with an enlarged superficial temporal vein by means of a freshly extirpated temporal artery. The anastomosis functioned "for a short period of time" and then blocked, following which the signs and symptoms of hydrocephalus returned.

Review of the American literature of the same period discloses that Kanavel\(^1\) had thrust a vein "running upon the side of the head of the child" through a hole in the dural flap. It is not mentioned whether the vein entered either the subarachnoid space or the lateral ventricle. The result was unsuccessful. Beck\(^2\) attempted a similar procedure in 2 patients without success.

In 1909 McClure\(^3\) reported his attempts to connect the cisterna magna with the external jugular vein of 6 dogs by interposing an autogenous segment of femoral vein or contralateral external jugular vein. The animals were killed at periods varying from 3 weeks to 3 months. On the basis of gross observation, all tubes were non-functioning. It was concluded that if the flow of cerebrospinal fluid had been more copious the outcome might have been successful. The technique was tried in a 10-month-old infant, using a cephalic vein removed from the child's father. Unfortunately the infant died several hours after surgery of a "central thermic disturbance."

In 1913 Haynes\(^7\) published the first of a series of papers characterized by a progressive loss of enthusiasm for establishing a cerebrospinal fluid shunt into the venous system. In his first paper, this author described 2 unsuccessful attempts to connect the cisterna magna of hydrocephalic infants with the venous system. In the first case the cisterna magna was connected to the occipital sinus in the region of the torcular with a rubber tube. In the second patient the cistern was anastomosed to a parietal emissary vein. Both attempts were unsuccessful. By 1915\(^8\) he had operated on 12 patients. In his final paper in 1916, Haynes\(^9\) remarked, "I claim that cisternasinus drainage is founded on logical and physiological conceptions. . . . " He reported that 5 of the 12 patients operated on had died in the immediate postoperative period. In the 7 survivors results were not encouraging and he stated, "I confess I am not very enthusiastic about curing these subjects."

In the Cameron Prize Lectures of 1925, Cushing\(^2\) mentioned that he had attempted to connect the dilated third ventricle with the longitudinal sinus by passing a specially devised tube through the corpus callosum. While the result was inconclusive, he commented that blood did not pass from the sinus into the ventricle which suggested that pressure in the ventricle was always higher.