CLINICAL CONFERENCE

Chronic Subdural Hematoma Treated by Subdural-Pleural Shunt

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Dr. Ransohoff: I want to draw your attention to a group of infants with chronic subdural hematoma. The distinctive feature of these patients is marked enlargement of the skull. This megaloecephaly was of such a degree in eight patients we treated that they were all admitted to the hospital with a tentative diagnosis of internal hydrocephalus. The presence of subdural hematoma was only discovered in these children at the time of tipping the subdural space through the enlarged anterior fontanelle prior to carrying out ventriculography. When air is injected into the subdural space in these patients, roentgenograms reveal fairly normal-sized cerebral hemispheres surrounded by hugely distended subdural spaces. We believe that it is this disproportion between the size of the boney vault and the size of the underlying brain which makes this group a special therapeutic problem (Fig. 1).

When a surgeon drains blood and fluid from the subdural space, he expects the underlying compressed brain to re-expand and obliterate the remaining cavity. If the lesion is of long standing, he may find it necessary to remove the inner membrane of the subdural hematoma, which is covering the surface of the brain, before the expected re-expansion can occur. However, when the cranium has been so enlarged by bilateral subdural collections that it is considerably larger than the normal-sized brain, the brain cannot be expected to re-expand sufficiently to fill the entire cavity.

We became aware of this therapeutic dilemma after applying the usual techniques of treatment to a 3-month-old infant admitted in 1952 with a definite history of trauma. After the removal of about 350 ml of subdural fluid by daily subdural taps, we made bone flaps, bilateral and frontoparietal, and removed the inner membranes of the subdural hematomas, 1 week apart. Following recovery from the second operative procedure, the patient again showed signs of increased intracranial pressure and repeat subdural taps showed persistence of the hematomas. An additional 850 ml were withdrawn from the left and right subdural spaces on alternate days, and the left craniotomy was reopened before we carried out a subdural-pleural shunt. This patient was completely studied for any bleeding tendency without abnormal findings (Case F.F. in Table I).

The operative technique is quite similar to that which we employ in carrying out a ventriculo-pleural shunt in the treatment of hydrocephalus. In spite of the fact that in the majority of large subdural collections in infants the subdural spaces communicate from one side to the other under the falx cerebri, it is my opinion that both spaces should be drained in order to assure the greatest chance of success. We have achieved bilateral subdural drainage by the use of the usual gum-rubber "T" tube employed for gall bladder drainage. The inside diameter of this tubing is 4 mm. The patients are anesthetized with nitrous oxide, intratracheally, supplemented by sodium pentothal, intravenously. Figure 2 is a diagrammatic representation of the operative procedure. The two short ends of the "T" tube are inserted into the subdural spaces through bilateral occipital-parietal burr holes, the junction point of these having already been buried lower in the subcutaneous tissue of the occipital region. The single end of the "T" tube is tunneled subcutaneously along the posterolateral thoracic wall to the region of the fourth or fifth intercostal space. At this point, through an intercostal approach, the tube is inserted for 4 or 5 cm into the pleural space. The procedure is thus carried out through four small incisions (two in the occipito-parietal region, one in the suboccipital and one in the thoracic area). The patients are maintained with the head elevated at all times in the postoperative period, thus achieving constant drainage of the subdural hematomas.

This presentation was part of a Clinical Conference conducted under the Chairmanship of Dr. Conrad M. Riley at the Babies Hospital, New York City, for the Annual Meeting, October 11, 1956.
TABLE I
RESULTS OF TREATING EIGHT PATIENTS WITH CHRONIC SUBDURAL HEMATOMA
BY SUBDURAL-PLEURAL SHUNT

<table>
<thead>
<tr>
<th>Patients</th>
<th>Age (mo)</th>
<th>History of Trauma</th>
<th>Head Size (cm)</th>
<th>Total Fluid Aspirated (ml)</th>
<th>Date of Shunt</th>
<th>Course</th>
<th>Follow-up (yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.F. 106528</td>
<td>3</td>
<td>yes</td>
<td>48</td>
<td>1200</td>
<td>12/18/52</td>
<td>Good until shunt became infected</td>
<td>Retarded (3)</td>
</tr>
<tr>
<td>R.P. 138763</td>
<td>6</td>
<td>no</td>
<td>48</td>
<td>300</td>
<td>6/12/53</td>
<td>Excellent, Superior intelligence, I.Q. 126</td>
<td>(3)</td>
</tr>
<tr>
<td>F.DeR. 142936</td>
<td>2</td>
<td>no</td>
<td>48</td>
<td>200</td>
<td>7/7/53</td>
<td>Good</td>
<td>Retarded but making slow progress (3)</td>
</tr>
<tr>
<td>C.M. 187763</td>
<td>11</td>
<td>no</td>
<td>56</td>
<td>200</td>
<td>7/2/54</td>
<td>Good for 6 mo, apparently retarded</td>
<td>Di d after short period of increasing pressure. Necropsy showed cephalic end of tube displaced (( ? ))</td>
</tr>
<tr>
<td>J.H. 254400</td>
<td>2½</td>
<td>no</td>
<td>47.5</td>
<td>560</td>
<td>11/23/55</td>
<td>Good for 1 yr, Mentally good, development good</td>
<td>Excellent physically and mentally (1)</td>
</tr>
<tr>
<td>D.C. 254288</td>
<td>6</td>
<td>postoperative hydrocephalus third ventricle cyst</td>
<td>47</td>
<td>1020</td>
<td>12/27/55</td>
<td>Subdural remained collapsed</td>
<td>Somewhat retarded</td>
</tr>
<tr>
<td>R.H. 254669</td>
<td>8</td>
<td>no</td>
<td>47.5</td>
<td>1500</td>
<td>1/3/56</td>
<td>Good</td>
<td>Mentally good making good progress (( ? ))</td>
</tr>
<tr>
<td>M.P. 288303</td>
<td>2</td>
<td>no</td>
<td>49</td>
<td>1150</td>
<td>2/10/56</td>
<td>Good</td>
<td>Mentally alert making good progress (( ? ))</td>
</tr>
</tbody>
</table>

The results we have had with this technique are summarized in Table I. As can be seen, all eight infants had considerably enlarged heads, except one (Case F.DeR.) whose head was only slightly so. One patient died when the cephalic end of the tubing became displaced and the recurrence of increased pressure was not recognized. Four of the children are making what appears to be a complete recovery and are normal as far as we can determine, including mental development. Three of the patients are normal from a motor standpoint but are clearly retarded mentally, one also has seizures. Three of the eight patients were born prematurely but this fact is of uncertain significance.

The first patient presented (Case J.H.) was operated upon at 2½ months of age after we had aspirated 560 ml of fluid from the subdural spaces. Now at 1 year of age the head has not grown since operation so that it no longer seems out of proportion with the rest of the body. He is very alert and is beginning to walk.

The second patient presented was older and had been operated on in 1953 at the age of 6 months (Case R.P.). Although the shunt collapsed the subdural satisfactorily, he was discharged with a very gloomy prognosis and a diagnosis of severe mental retardation. He was not seen for a while but came back to see us late last year. It was obvious that our poor prognosis had not been borne out by the child's development. At present he is a bright and alert little boy of 3 years. The tube in his neck is broken and obviously is no longer
functioning. The electroencephalogram is normal and intelligence tests show an I.Q. of 126.

In summary, I think we have, through trial and error, established to some extent a variety of the syndrome of subdural hematoma in infants, in which the resulting chronic enlargement of the head is greatly out of proportion to the size of the underlying brain. These patients cannot be successfully handled by the usual techniques of treating subdural hematoma, but require constant drainage of the subdural space. In this hospital we have chosen to drain this space into the pleural cavity. I am sure that any of the shunting procedures usually used in management of hydrocephalus could be converted for this purpose.

CHAIRMAN RILEY: Now we have a few minutes for questions. May I ask anyone who asks a question to give his name and city.

Dr. ALONZO DE G. SMITH (Washington, D.C.): What criteria do you use for removing the tube? Does the brain ever expand sufficiently to fill up that “dead-space?” Do you have roentgenograms to show that the brain has filled up the space?

Dr. RANSOHOF: As far as removing the tube goes, I don’t remove it. I am sure that in the second case presented the tube is no longer useful, it is broken. The constant movement wears it out.

Fig. 1. Roentgenograms in various positions after injection of air into subdural space. Shows extent of lesion.

Fig. 2. Diagrammatic representation of subdural-pleural shunting operation.
Dr. Smith: You mean they go through life with the tubes left in place?

Dr. Ransohoff: Yes. I told the parents if he had to come in for an appendectomy or something else, we could slip the tube out, but I wouldn't do it intentionally.

As to Dr. Smith's second question, the subdural space does collapse entirely eventually. The underlying brain expands maximally. Many children have as a result some degree of internal hydrocephalus. I expect the ventricles are a little larger than normal. The head collapses. In the last patient presented I am convinced the brain is directly under the dura, this probably occurs in most of them.

Dr. Jean V. Brady (Urbana, Illinois): Can you tell me why you don't drain the subdural fluid externally into a bottle for a month or so?

Dr. Ransohoff: Yes, because the subdural fluid is an ideal culture medium. If you were to drain it constantly to the outside, a subdural empyema probably would develop.

Dr. Brady: You think that risk of drainage to the outside is a great deal more than opening the chest to put in a pleural shunt?

Dr. Ransohoff: Certainly. We haven't had any trouble with the pleural shunt. We put in a clamp and spread the ribs apart, make a nick in the pleura and drop the tube through. It is a simple procedure. We have not had any trouble with the mechanics in these children.

Dr. Hattie E. Alexander (New York, New York): I would like to ask whether your term "chronic" is a reflection of the time that the subdural fluid collection has been there, and whether you believe they all represent traumatic subdural hematomas, initially.

Dr. Ransohoff: I use the term chronic to represent the time that it has been there. Obviously, it has been there for quite a while. In acute subdural hematoma, if the baby is going to get into trouble, he will do so from the problem of pressure, very much as an adult will. This is a chronic thing and must have been there for a number of weeks, if not months, in order to enlarge the head.

Basically every subdural hematoma is traumatic, and develops as a result of some traumatic episode. Whether it occurs at birth or shortly after birth, I cannot decide. The history of trauma has not been available in all instances. I also don't know whether prematurity is a factor.
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