CEREBRAL SWELLING AND VENTRICULAR ALTERATIONS FOLLOWING EVACUATION OF INTRACRANIAL EXTRACEREBRAL HEMATOMA

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In 1951 regional swelling of the brain underlying subdural hemorrhagic collections was reported as the probable pathophysiological basis for the abnormal clinical features manifested by patients with these lesions. Briefly stated, contact trauma to the head was sustained, and subdural hemorrhage ensued, either as a single lesion or in conjunction with other traumatic alterations of the intracranial structures. After recovery from a period of drowsiness or stupor, in many the subdural collection remained asymptomatic, but this eventually was followed by recurrence of drowsiness, often hemiparesis, coma, and, if untreated, frequently by death. Focal cerebral edema directly beneath the compressed surface of the brain was observed pathologically in patients who died without operation and in others who succumbed after surgical removal of the extracerebral collection of blood. The evidence indicated that the intracerebral edema superimposed on the subdural mass accounted more readily for the abnormal clinical phenomena than did compression by the extracerebral lesion alone. Furthermore, the focal intracerebral edema appearing under circumstances as indicated seems to be a far more likely cause for the latent manifestations of subdural collections than does the time-honored theoretical concept that regional fluid is drawn into the collection thereby producing an increment in the mass on the surface.

The question arose regarding the rate of disappearance of a swollen cerebral hemisphere following surgical removal of a subdural hemorrhagic collection. In years gone by, pneumoencephalography and/or ventriculography were used as definitive diagnostic procedures in the course of the treatment of some patients with subdural collections. Such examinations were made at times both before and after evacuation of the hematoma. It seemed logical to assume that some indication of the extent and duration of the intracerebral edema could be estimated by a study of the roentgenograms made after introduction of air into the ventricular system, particularly those derived from pneumoencephalography carried out after operation. These observations and deductions comprise the subject matter of this presentation.

MATERIALS AND METHODS

Twenty-four patients were selected. Of these, 22 had subdural hematoma, and in 3 of these this lesion was bilateral. There was 1 patient with a subdural hygroma and 1 with an epidural hematoma. The survey was divided into three categories: (1) 7 patients had more than 1 pneumoencephalographic study postoperatively; (2) 13 patients had 1 postoperative examination each; (3) 4 patients had preoperative and postoperative pneumoencephalograms. The time intervals of the postoperative examinations varied, the earliest being 5 days and the latest single examination was 33 days after operation. The greatest number of postoperative examinations of any one patient was 3, and

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TABLE 1
Twenty-four intracranial extracerebral hematomas

<table>
<thead>
<tr>
<th>Type of Clot</th>
<th>No.</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidural</td>
<td>1</td>
<td>Craniotomy</td>
</tr>
<tr>
<td>Subdural</td>
<td>23</td>
<td>Craniotomy</td>
</tr>
<tr>
<td>Clotted</td>
<td>6</td>
<td>Craniotomy</td>
</tr>
<tr>
<td>Liquid</td>
<td>17</td>
<td>Burr holes</td>
</tr>
<tr>
<td>Unilateral</td>
<td>14</td>
<td>Craniotomy</td>
</tr>
<tr>
<td>Bilateral</td>
<td>3</td>
<td>Burr holes</td>
</tr>
</tbody>
</table>

Males 20  Average age 56.6 years
Females 4  Alcoholic history 12

more nearly normal position could not be ascertained. Yet, in all instances each pa-

the longest period elapsing between operation and pneumoencephalography was 6 months. Measurements of the position of the ventricular system were made with a ruler, the points of reference being the inner table of the skull and the septum pellucidum. The clinical condition of the patient was estimated for the most part by changes in the state of consciousness, pupillary alterations, and motor performance.

PRESENTATION OF DATA

In Table 1 the age, sex, alcoholic history, type of clot and operative procedure employed are recorded. The results of the air encephalographic examination demonstrated that, in spite of evacuation of a unilateral extracerebral hematoma, ventricular displacement persisted for varying periods (Fig. 1). In some of those who had preoperative examinations, the shift was demonstrated to be approximately the same by the postoperative examinations. A relationship of these changes to age, sex, alcoholic history, and state of consciousness was sought in individual instances, but constant features were not disclosed. Moreover, correlation could not be established between the degree of re-expansion of the brain observed at the time of operation and pneumoencephalograhic findings disclosed postoperatively. Since there did not exist any planned time for the serial air encephalographic examinations, a temporal relationship between the rapidity of recovery in neurological function and return of the ventricular system to a

Fig. 1. Serial air encephalograms taken at 5, 12 and 18 days respectively following evacuation of epidural hematoma.