The Use of Rheomacrodex in the Surgery of Intracranial Aneurysms

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Cerebral edema and infarction are common causes of morbidity and death after rupture or surgical treatment of an intracranial aneurysm. Crompton\(^2\) found infarction in 75% of his autopsied cases of ruptured aneurysms and felt it should be considered significant from the standpoint of morbidity, if not mortality. Schneck and Kricheff\(^7\) suggested that vasospasm might be responsible for infarction of unknown etiology in their autopsied series.

In an effort to improve or prevent circulatory impairment caused by spasm or other factors, we have resorted to Rheomacrodex,† a low-molecular-weight dextran that supposedly improves the microcirculation by decreasing cellular aggregation, which can lead to stasis, thrombosis, and finally to cerebral edema or infarction. The beneficial use of Rheomacrodex in other fields\(^4,8,9\) and its anti-thrombotic effect in small vessel surgery\(^1,10\) prompted our clinical investigation. In addition, Cyrus, et al.,\(^2\) have demonstrated its protective action after experimental occlusion of the middle cerebral artery, while Hammargren, et al.,\(^5\) have shown that it protects the brain from damaging doses of Hypaque.

Our report is based on a series of 101 cases of proven intracranial aneurysm. Ninety-five patients were operated on by the attending and resident staffs of the Neurological Institute of New York since April, 1964. Six patients, too sick for surgery, were not operated upon. For most of the 95 intracranial operations, moderate hypothermia (28 to 30°C), temporary clips, and intravenous urea or Mannitol were used. Thirty-eight control patients were not treated with Rheomacrodex or steroid therapy (Decadron). Nineteen patients were treated only with Decadron. Another 38 patients were treated with Decadron plus Rheomacrodex.

Method of Treatment

Decadron therapy was usually started in the operating room and tapered off by the seventh to tenth postoperative day. Rheomacrodex was administered intravenously as a 10% solution in dextrose, and was usually started immediately after the clipping of an aneurysm; 250 cc were given in 2 hours, and then 500 to 1000 cc by continuous intravenous infusion for 1 to 14 days, the average being 3 days. In a few cases, Rheomacrodex was not given until a postoperative complication developed.

Laboratory studies pre- and postoperatively included a complete blood count, hematocrit and sedimentation rate, and coagulation studies; blood urea nitrogen and serum proteins were determined and fluid intake and output recorded. None of these was significantly altered by the administration of Rheomacrodex. Daily examination of the serum electrolytes revealed in 12 patients a slight rise in the sodium and chloride values on the first postoperative day, with a return to normal levels by the second day.

Results

The effect of Rheomacrodex in good-risk patients is summarized in Table 1, and for poor-risk patients in Table 2. No abnormal bleeding or other complications were noted with the use of Rheomacrodex. None of these figures suggests a universally beneficial effect of Rheomacrodex on morbidity or mortality. However, 12 individual cases clearly showed a dramatic response to Rheomacrodex during a critical phase of the clinical course. These included 6 favorable-risk and 6 poor-risk patients, all of whom could be finally classified as good results.

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† Supplied by the Pharmacia Laboratories, Inc., Piscataway, New Market, New Jersey.
The course of the 12 patients who clearly seemed to benefit from Rheomacrodex was characterized in one of four ways: 1) a marked and progressive clearing of severe, preoperative, neurological deficits in 4 poor-risk patients that made surgery and ultimate good results possible; 2) a remarkably stable course without neurological complications in 2 other patients, despite a prolonged period of arterial occlusion and secondary response due to rupture of the aneurysm at operation; 3) an immediate, unexpected, postoperative disappearance of preoperative paresis, aphasia, and lethargy in 2 patients; and 4) most impressive, the complete disappearance of postoperative paresis or aphasia in 4 patients within 1 hour after Rheomacrodex was started. We will discuss 3 characteristic patients to illustrate these points.

Case Reports

Case 1. B.W., a 49-year-old woman, was healthy until 5 days before admission when she developed severe left frontal headaches. The following day she noted some difficulty expressing herself. Her headaches increased in severity and she was admitted to the Neurological Institute of New York on December 27, 1965. Examination revealed her to be alert, oriented, and cooperative. Blood pressure was 140/80, pulse was 70 and regular. The general physical examination was unremarkable. The normal swing of the right arm was diminished. Sensory examination revealed diminished two-point discrimination in the right hand.

General laboratory studies were normal. A left temporal focus was present on electroencephalography (EEG). A lumbar puncture showed bloody spinal fluid. Bilateral common carotid arteriograms demonstrated a large aneurysm of the left internal-carotid artery arising near the posterior communicating artery; marked carotid artery spasm was seen.

Operation. On December 30, a left fronto-temporal craniotomy was performed. Marked spasm of the internal carotid was seen on exposing the aneurysm and a clot in the temporal lobe was evacuated. The aneurysm, which ruptured at operation, was clipped. Rheomacrodex and Decadron were started when the clip was applied. Two hours after extubation she awakened and conversed well.

Postoperative Course. On the morning after operation she was “alert, oriented, and verbalizing.” A very mild right hemiparesis was present. On January 2, 1966, 3 days after operation, the Rheomacrodex was stopped. Within 2 hours, marked weakness of the right arm and an expressive aphasia were noted. She remained awake, though less alert. The Rheomacrodex was started again and the steroids continued at their former level. The paresis and speech problem cleared slowly over a 3-day period and on January 5, the Rheomacrodex was again stopped.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>No. of Cases</th>
<th>Good Results</th>
<th>Poor Results</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURGICAL Control Group</td>
<td>6</td>
<td>17%</td>
<td>38%</td>
<td>50%</td>
</tr>
<tr>
<td>Decadron Only</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>100%</td>
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<tr>
<td>Decadron &amp; Rheomacrodex</td>
<td>12</td>
<td>50%</td>
<td>8%</td>
<td>42%</td>
</tr>
<tr>
<td>NON-SURGICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decadron &amp; Rheomacrodex</td>
<td>6</td>
<td>0</td>
<td>17%</td>
<td>83%</td>
</tr>
</tbody>
</table>

TABLE 2

Effect of Rheomacrodex on poor-risk patients