SPINAL EPIDURAL HEMATOMAS
EXPERIENCES WITH THREE PATIENTS

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(Received for publication March 17, 1958)

In the past three years, I have explored 3 patients with spinal epidural hematomas unassociated with spinal fractures or a bleeding diathesis. A search of the literature indicates that this condition is rare. Sadka and Schultz et al. in 1953 in separate articles listed the same 12 cases. Sadka added 2 and Schultz et al. 4 more cases. Since then reports of 3 more cases have been found in the English literature. Aymes et al. reported 1 (2 reported patients did not fit the above criteria) in 1955, Nichols and Mangiello in 1956, and Maxwell and Puletti in 1957, making a total of 21. The last authors listed Jackson’s case in 1869. This is not included, as the reference was not available. The cases are summarized in Table 1 taken directly from Sadka’s article and adding the subsequent cases including the 3 reported here. The table is similar to Kaplan and Denker’s earlier table in 1949.

Age and sex do not appear to be factors. Patients from 1½ to 79 years of age are reported. There were 15 males and 8 females. The sex of the 18-month-old baby is not stated.

Any segment of the spine may be involved, and the hematoma in 1 patient (Reid and Kennedy) extended from the 3rd cervical to the 2nd sacral vertebra. In most patients the hematoma extended over 2 or 3 segments.

HISTORY AND PHYSICAL FINDINGS

As seen from Table 1, most patients associated some mild trauma or strain with the onset of symptoms. The initial symptom was almost invariably pain in the neck or back at the level of hemorrhage, followed within a matter of hours, days or even weeks by varying degrees of motor and sensory paralysis. Weakness was sometimes delayed in onset, then rapidly progressive, resulting in complete paraplegia. In other patients the weakness was slowly progressive or occasionally intermittent.

DIAGNOSIS

Roentgenograms of the spine were not helpful. Lumbar puncture showed anything from a complete block to normal dynamics. The spinal fluid showed levels of total protein from normal to several hundred milligrams per cent. Myelography is the most useful procedure, but even this may be normal, as reported by Sadka in both of his cases. Lumbar puncture may be followed by a temporary improvement in motor and sensory signs leading to an unfortunate delay in treatment.
SPINAL EPIDURAL HEMATOMAS

TREATMENT

Laminectomy is obviously the only method of treatment, and the earlier performed the better because many patients with slowly developing signs may suddenly get worse. The age and risk of the patient should not delay us from offering the only treatment that may lead to recovery in these patients. Surgery unfortunately was delayed 2 days in the first patient here reported because first, it was felt her lesion was caused by a thrombosis of the cord and second, because her age of 71 years and her fixed chest (rheumatoid arthritis) were felt to contraindicate surgery. The age and fused spine resulting from rheumatoid arthritis in this patient are surprisingly similar to those in Ver Bruggen's patient.

PROGNOSIS

As one would predict from Tarlov's work, the patients with slowly developing incomplete lesions do better. Some patients showed poor recovery even when the cord looked normal. The extensive clots in some patients probably interfered with the nutrient vessels to the spinal cord. Many patients had to be transferred to suitable hospitals for laminectomy and the changing neurological signs are difficult to follow. The suddenness of onset in some patients suggests arterial bleeding. The bleeding in Case 3 reported here was probably arterial.

ETIOLOGY

In some patients, bleeding apparently arises from a previously existing hemangioma. This was apparently the explanation in the case of Nichols and Manganiello. The intermittent attacks of pain in the chest for 7 months prior to the acute episode suggest a pre-existing lesion in this patient.

Most patients with this condition, however, have had no previously existing symptoms at the level of the lesion and have nothing to suggest a hemangioma at the time of surgery. In the case reported by Maxwell and Pulettì, the discrete clot arose from a single epidural vein. The source of bleeding usually is not discovered. The complete lack of prior symptoms at the site of the lesion argues against a pre-existing hemangioma.

CASE REPORTS

Case 1. K.B., a 71-year-old housewife, was seen a few hours after she fell off a chair, striking the right side of her head slightly. She was not unconscious and immediately got up and walked but complained of pain in her neck. She noted weakness of the legs within an hour and paralysis within 4 hours.

Neurological Examination. There was tenderness at C7. There was good movement of the right arm and left upper arm. The left forearm and hand were paralyzed. There was paralysis of the left leg and weakness of the right leg. Sensation was intact. The patient had a completely fused spine from old healed rheumatoid arthritis. There was no expansion of the chest. Lumbar puncture showed normal dynamics. The fluid contained no cells and a total protein of 41 mg. per cent.
Course. Following the lumbar puncture, function in the right leg returned, but by the next morning paralysis recurred in the right leg and a sensory level developed at C7. The original diagnosis was a thrombosis involving the spinal cord. Roentgenograms showed a healed rheumatoid spondylitis with fusion. The patient did not improve in 48 hours and was therefore transferred to another hospital for exploration.

Operation, under local anesthesia, disclosed an extensive extradural hematoma from C5 to D5. The clot was 3 to 8 mm. thick. Several bleeding areas in the epidural fat were coagulated. The dura mater was opened only enough to rule out an intradural clot. Closure was carried out in layers and the incision was drained.

Postoperative course was uncomplicated. Improvement in sensation was noted the next day with gradual improvement for the next month until she was transferred to her home in Seattle. At this time she still had marked weakness of the left forearm and paralysis of the left leg. A subsequent report from Dr. John E. Stewart showed that she had a dislocation of C5 on C6. When this occurred is not known. Even in retrospect, preoperative roentgenograms showed no fracture. The patient continued to improve somewhat in spite of the dislocation.

Case 2. J.W., a 23-year-old, mentally retarded, 220-pound man, was seen 5 days after the onset of pain in the back which came on while lifting. An exact history could not be obtained. Four days after onset, numbness appeared in the legs and he had difficulty voiding.

Neurological Examination. The patient was a mentally retarded, obese male complaining of tenderness and pain in the back from L3 to the sacrum. His temperature was 100°F. Straight leg raising at 60 degrees bilaterally produced pain in the back. Reflexes in the legs were normal. There was diminished sensation over dermatomes L4 to S1, inclusive. Position sense was absent in the toes. He was unable to move his thighs or hips but could move his feet, toes and ankles.

Count of red blood cells was 5.58 million, with 17.9 gm. hemoglobin; count of white blood cells was 16,800 with 75 per cent polymorphonuclear cells. Urine was normal. Roentgenograms of the thoracolumbar spine were normal. A lumbar puncture showed an incomplete block and an attempted myelogram was unsuccessful. The spinal fluid contained 3 white blood cells and a total protein of 425 mg. per cent.

Course. The patient was relieved of pain by the lumbar puncture but by the next morning his paralysis had increased and his sensory level had risen to D11. A myelogram showed a complete block at D11.

Operation. Laminectomy at D11 disclosed a small epidural fluid clot with infarcted epidural fat for a distance of 2 cm. The dura mater did not pulsate. On opening the dura mater, the subarachnoidal fluid appeared yellow. When some was removed, clear fluid appeared from above. The cord appeared shrunken.

Postoperative Course. Four days later, the wound was re-opened because no improvement had occurred, and repeat fluoroscopy with the residual Pantopaque showed a persistent block. There was no hematoma of the wound. The cord appeared essentially normal. Clear cerebrospinal fluid came down from above. A lumbar puncture at L2–3 yielded yellow fluid. This needle was irrigated with saline until the fluid was clear and appeared readily at the site of the laminectomy. The incision was then closed.

This man has made gradual and steady improvement in the 2 years since injury.
**TABLE 1**

<table>
<thead>
<tr>
<th>Number</th>
<th>Author, Year</th>
<th>Sex</th>
<th>Age in Years</th>
<th>Site</th>
<th>Preceding Strain</th>
<th>Pain (P); Cord Loss Below Lesion (L)</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Binns</td>
<td>1907</td>
<td>F</td>
<td>18</td>
<td>C7 &amp; C8</td>
<td>At stool</td>
<td>P: Immediate L: Partial at once, complete 2 hrs.</td>
</tr>
<tr>
<td>2</td>
<td>Hopkins</td>
<td>1909</td>
<td>M</td>
<td>40</td>
<td>T1 &amp; T2</td>
<td>Shovelling coal</td>
<td>P: Immediate L: Partial at once, complete 3 hrs.</td>
</tr>
<tr>
<td>3</td>
<td>Jonas</td>
<td>1911</td>
<td>M</td>
<td>35</td>
<td>T5 &amp; T6</td>
<td>Fell 10 feet</td>
<td>P: Immediate L: Partial at once, complete 24 hrs.</td>
</tr>
<tr>
<td>4</td>
<td>Reid &amp; Kennedy</td>
<td>1925</td>
<td>F</td>
<td>*</td>
<td>C8-S3</td>
<td>Fell off bicycle</td>
<td>P: 14 hrs. L: Partial 5 hrs., complete 5 days</td>
</tr>
<tr>
<td>5</td>
<td>Hasin &amp; Stone</td>
<td>1945</td>
<td>F</td>
<td>24</td>
<td>T15</td>
<td>Trivial fall</td>
<td>L: Complete 4 days</td>
</tr>
<tr>
<td>6</td>
<td>Shenkin et al</td>
<td>1945</td>
<td>F</td>
<td>( \frac{1}{2} ) T</td>
<td>upper</td>
<td>—</td>
<td>L: Complete few days</td>
</tr>
<tr>
<td>7</td>
<td>Shenkin et al</td>
<td>1945</td>
<td>M</td>
<td>42</td>
<td>T5 &amp; T6</td>
<td>Twist in bed</td>
<td>L: Complete 2 hrs.</td>
</tr>
<tr>
<td>8</td>
<td>Ver Bruggen</td>
<td>1946</td>
<td>M</td>
<td>75</td>
<td>C3 &amp; C6</td>
<td>Fell 4 feet on buttocks</td>
<td>P: Some mins. after L: Almost complete few hrs.</td>
</tr>
<tr>
<td>9</td>
<td>Kaplan &amp; Denker</td>
<td>1949</td>
<td>M</td>
<td>43</td>
<td>T12 &amp; L1</td>
<td>—</td>
<td>P: At onset L: Partial few hrs., complete 3 days</td>
</tr>
<tr>
<td>10</td>
<td>Kaplan &amp; Denker</td>
<td>1950</td>
<td>F</td>
<td>39</td>
<td>T5 &amp; T6</td>
<td>Vomiting</td>
<td>P: Immediate L: Partial at once, complete 3 hrs.</td>
</tr>
<tr>
<td>11</td>
<td>Clavanny et al</td>
<td>1950</td>
<td>F</td>
<td>70</td>
<td>L1 &amp; L2</td>
<td>—</td>
<td>P: At onset L: Almost complete few hrs.</td>
</tr>
<tr>
<td>12</td>
<td>Scien et al</td>
<td>1953</td>
<td>M</td>
<td>67</td>
<td>L3 &amp; L4</td>
<td>Fell on ice upon buttocks</td>
<td>P: 2 wks. later, Partial cauda equina lesion, time uncertain</td>
</tr>
<tr>
<td>13</td>
<td>Sudka</td>
<td>1953</td>
<td>F</td>
<td>72</td>
<td>T8-10</td>
<td>—</td>
<td>P: At onset L: Complete 1 hr.</td>
</tr>
<tr>
<td>14</td>
<td>Sudka</td>
<td>1953</td>
<td>M</td>
<td>70</td>
<td>C7-T2</td>
<td>—</td>
<td>P: At onset L: Partial 2 days, complete 4 days</td>
</tr>
<tr>
<td>15</td>
<td>Schultz et al</td>
<td>1953</td>
<td>M</td>
<td>24</td>
<td>T2-4</td>
<td>Heavy lifting</td>
<td>L: 1 hr. L: Complete 18 hrs.</td>
</tr>
<tr>
<td>16</td>
<td>Schultz et al</td>
<td>1953</td>
<td>M</td>
<td>79</td>
<td>L2-4</td>
<td>Mild lifting</td>
<td>L: Immediate L: Complete mins.</td>
</tr>
<tr>
<td>18</td>
<td>Schultz et al</td>
<td>1953</td>
<td>M</td>
<td>34</td>
<td>T9 &amp; L1</td>
<td>None</td>
<td>P: Immediate L: Intermittent, then complete</td>
</tr>
<tr>
<td>20</td>
<td>Nicholas &amp; Manganello</td>
<td>1956</td>
<td>M</td>
<td>15</td>
<td>C6-T1</td>
<td>Blow on head</td>
<td>L: Days L: Gradual days</td>
</tr>
<tr>
<td>21</td>
<td>Maxwell &amp; Paielli</td>
<td>1957</td>
<td>M</td>
<td>4</td>
<td>T1-2</td>
<td>Fell 3 feet</td>
<td>P: 5 max. L: Gradual, then sudden paralysis</td>
</tr>
<tr>
<td>22</td>
<td>Lowrey</td>
<td>1959</td>
<td>F</td>
<td>71</td>
<td>C5-T5</td>
<td>Struck side of head</td>
<td>P: Immediate L: Partial hrs.</td>
</tr>
<tr>
<td>23</td>
<td>Lowrey</td>
<td>1959</td>
<td>M</td>
<td>23</td>
<td>T11</td>
<td>Straining</td>
<td>P: Immediate L: Partial days</td>
</tr>
<tr>
<td>24</td>
<td>Lowrey</td>
<td>1959</td>
<td>M</td>
<td>52</td>
<td>T12-L2</td>
<td>Straining</td>
<td>P: Immediate L: Sudden complete 16 hrs. after onset</td>
</tr>
</tbody>
</table>

*Age not stated, but patient recorded as menstruating.
† Sex not stated.
‡ Present article.
He can ambulate with crutches for short distances, but still shows considerable spasticity.

_Case 3._ T.B., a husky 52-year-old mill supervisor, was pulling on a conveyor chain when he suddenly felt severe pain low in his back. He sat down and perspired profusely. He was hospitalized for observation and showed only tenderness of the lumbar spine. The next morning, after roentgenograms were taken, the patient walked about twenty-five steps to his bed. Within a few minutes, he had increased pain in his back and complete motor and sensory paralysis of his legs developed rapidly. The patient was flown to Honolulu for treatment.

**Neurological Examination.** When seen about 36 hours after onset, he had complete paralysis of the legs with absent reflexes and a sensory level to all modalities at L1.

Count of red blood cells was 5.7 million, with 15.8 gm. of hemoglobin; count of white blood cells was 15,150 with a normal differential. Urinalysis: albumin faint trace, white blood cells 40–50 per high power field and red blood cells 0–1 per high power field. Prothrombin level was normal.

Roentgenograms of the spine were normal, but films of the chest suggested a possible aneurysm of the descending aorta. Lumbar puncture showed a complete block on the Queckenstedt test. The block by myelography was over D12. The spinal fluid contained 20 white blood cells and a total protein of 122 mg. per cent.

**Operation.** Immediate laminectomy revealed a recent clot, extending from D12 to L2. One artery began to bleed as the clot was removed. This was clipped.

**Postoperative Course.** The patient made an uneventful recovery. Lumbar puncture showed no block and the spinal fluid protein was normal. Subsequent aortography shows the aorta is normal. There has been no return of function in the 6 months since injury, and the patient is on a paraplegic rehabilitation program.

**SUMMARY**

The 21 previously reported patients with spinal epidural hematomas unassociated with spinal fractures or a bleeding diathesis are listed. Three new patients with this condition are reported.

Like most reported cases, mild trauma or strain preceded the hemorrhage in these. Laminectomy and removal of clot was done in all 3 cases. Partial paralysis in 2 patients was followed by partial recovery of function, and complete paralysis in the third has persisted 6 months.

**REFERENCES**


