TRANSVERTEBRAL RUPTURE OF INTERVERTEBRAL DISC*

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It is of historical interest to trace the development of information about rupture of intervertebral discs that was taking place concurrently on each side of the Atlantic Ocean in the first third of the twentieth century. Goldthwait, in this country, in 1911, presented a clinical report of displaced lumbar intervertebral cartilage producing sciatica and weakness of the leg. During the same year in Scotland, Middleton and Teacher reported neurological disorder caused by rupture of intervertebral disc. Elsberg in 1916, Stookey in 1928 and Bucy in 1930 reported cases of "chondroma" arising within the spine, producing neurological problems. Bucy's paper described a very satisfactory result following surgical removal (1929), by Dr. Percival Bailey, of the cartilaginous lesion "attached to the disk lying between the third and fourth lumbar vertebra." Dandy in 1929 described 2 cases in which he had removed loose cartilaginous fragments, considered by him to be "undoubtedly traumatic" in etiology. Schmorl and Junghanns in Germany (1932) graphically demonstrated pathological changes in structure of the disc although they were interested primarily in the prolapse of nucleus pulposus into the adjacent vertebral body. They recognized small posterior protrusions of the disc but felt that these rarely caused neurological symptoms. The stage was set for enlightenment and the first comprehensive clinical surveys of the problem of herniated disc were published at about the same time by Maurice in 1933 in Paris, and by Mixter and Barr in 1934 in Boston. Since then, thousands of papers have been published concerning the diagnosis and treatment of herniated intervertebral disc as well as the associated anatomical, pathological and biochemical aspects.

The purpose of this paper is to present an unusual form of rupture of discal material, wherein cartilage prolapses into the vertebral body and then breaks through the posterior wall of the vertebral body producing an intraspinal neurological problem (Fig. 1). This process obviously would be associated with defective bony structure even conceivably with infiltrative neoplasm, but here reported in the presence of osteoporosis in elderly people. We refer to the disorder as transvertebral rupture of intervertebral disc and, to the best of our knowledge, this has not been described hitherto.

The author has had clinical experiences with 3 cases of this unusual form of discal disorder which are described as follows:

Case 1. W.B.H., a 70-year-old man, was admitted to Strong Memorial Hospital on Aug. 29, 1959. He complained of right sciatic pain which had begun 1 week previously when he turned over in bed. Two weeks of orthopedic therapy in the hospital gave no relief of his constant severe pain.

Neurological examination revealed positive Laségue's sign at 45° on the right side, diminished right knee jerk, partial atrophy and weakness of the quadriceps muscle, and no definite sensory loss. Roentgenograms of the lumbosacral spine indicated moderate osteoporosis and narrowing of the L3–L4 intervertebral space. Pantopaque myelography revealed a flat filling defect of the right lateral and central aspect of the subarachnoid space just above the L4–L5 interspace. Oblique views of the myelogram confirmed extension of the defect along the L4 body. The possibility of a metastatic tumor was considered but survey studies were negative for neoplasm.

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Operation. At laminectomy the L3–L4 and L4–L5 discs were intact but intervertebral discal material was found presenting through a defect in the posterior wall of the L4 vertebral body on the right side. Forceps could be passed through the bony defect in an upward direction, communicating with the central portion of the discal space between L3 and L4. There was copious bleeding from the space within bone, controlled with Gel-foam.

Postoperatively, the patient followed an excellent course of recovery, with relief of pain as well as neurological improvement.

Case 2. J.A.B., a 74-year-old woman, was admitted to Strong Memorial Hospital on March 1, 1960. She had a 5-month history of left sciatic pain and weakness of the left leg, beginning without known significant injury. We were able to discern that the first flash of sciatic pain appeared while she was walking in her back yard in October 1959. There was a history of mild diabetes.

Examination showed positive straight-leg-raising test on the left side and there was marked neurological deficit in the left leg, consisting of atrophy and weakness of thigh and calf, almost complete foot drop, decreased left knee jerk, absent ankle jerk bilaterally and sensory defect over the lateral aspect of the left calf. Roentgenograms of the lumbosacral spine were interpreted as showing marked osteoporosis and partial narrowing of the L4–L5 interspace. Pantopaque myelography outlined a large left-sided filling defect in the region of L4–L5 discal space, extending up over the L4 vertebral body. The clinical picture and contrast studies were considered compatible with an intraspinous neoplasm. Survey studies were negative for metastatic neoplasm.

Operation. At laminectomy a granulomatous epidural mass was found arising cephalad to the L4–L5 disc on the left side. There was no defect at the intervertebral space. During the surgical extirpation, a sizable defect in vertebral bone was exposed and tissue was withdrawn from the central portion of the vertebral body. There was generous bleeding from the soft regional bone. This was considered, at the time of operation, to be a metastatic neoplasm. It was not until pathological examination of the tissue was made that it was identified as intervertebral disc and we realized that the organization and vascular reaction involving the discal material over a period of 5 months had produced the gross picture of neoplasm.

The patient followed a course of satisfactory recovery in terms of relief of disabling pain and satisfactory ambulation, using a spring brace for partial residual foot drop.
Case 3. M.R., a 70-year-old woman, was admitted to Strong Memorial Hospital on Oct. 18, 1960. She had a 3-week history of left sciatic pain 5 years previously, and noted the unexplained onset of pain in her right buttock and posterior thigh 6 weeks prior to admission. There was no history of injury. She followed a regime of 3 weeks of rest in bed without relief of pain.

Neurological examination revealed moderate limitation of motion of the back and restriction of straight-leg raising on the right side at 30°. The right knee jerk was absent and both ankle jerks were sluggish. There was no significant motor or sensory defect. Films of the lumbar spine indicated rather marked osteoporosis, with narrowing of the L3–L4 intervertebral discal space. Pantopaque myelogram (Fig. 2) was characterized by a concave filling defect on the right side, just below the L3–L4 interspace.

Operation. Laminectomy was performed on Oct. 26, 1960 and no defect was found in the surface of the intervertebral disc at either L3–L4 or L4–L5. However, there was a definite rupture of cartilage through the posterior Wall of the L4 vertebral body, just below the L3–L4 discal space. This was causing compression of the dural edge and L4 root. Cartilage was withdrawn from the defect in the bone and the forceps could be projected upward through a Schmorl’s defect into the central portion of the L3–L4 discal space. There was copious bleeding from the bony defect. Three silver clips, attached to Gelfoam, were left in the region of the Schmorl’s defect as roentgen-ray markers.

Postoperative films (Fig. 3) outline the position of the silver clips within the 4th lumbar vertebral body.

This patient has gotten along well since operation, with satisfactory relief of pain and no significant neurological defect.

DISCUSSION

The primary clinical factors related to the 3 cases above are summarized in Table 1. It is noted that all 3 patients were in the seventh decade and, by pre-operative roentgenograms, were found to have potential weakness in structure of the bone (osteoporosis). In their pathological examinations, Schmorl and Junghanns10 found some degree of prolapse of cartilage into the vertebral body in approximately 38 per cent of the spines examined. Inman and Saunders6 reported that diseases producing demineralization of the vertebral bodies may result in widening of the discal space with production of "fish vertebrae." Brown et al.1 have demonstrated the reaction of intervertebral disc to forces of compression, with contrast studies showing prolapse of discal cartilage into the vertebral body as a result of vertical stress. These investigators studied specimens from cadavers of various age groups and noted that the tendency toward prolapse of disc into the vertebral body was much more common in older individuals with osteoporosis than in the specimens from younger people. It is entirely understandable that cartilage that has prolapsed into the centrum could break through the posterior vertebral wall at a point weakened by demineralization.

In the 3 cases described, continued sciatic pain has been a characteristic feature, much the same as occurs with frank extrusion of cartilage in a typical case of ruptured disc. The histories have included only mild if any trauma and there has not been a long-term pre-existing history of backache or sciatica. Roentgenograms have shown osteoporosis of the lumbar spine. Myelograms have outlined variable filling defects raising the question of intraspinous neoplasm. In all 3 cases the
osseous defect has been in the 4th lumbar vertebral body, presenting as a prolapse from the L3 interspace in 2 cases and from the L4 interspace in 1. At the time of operation, the regional intervertebral spaces have not shown rupture or defect in the annulus fibrosus. In the ordinary routine of discal cases, it is not particularly rare to find that the annulus fibrosus has become detached at the vertebral edge, allowing a fragment of cartilage to move under the posterior spinous ligament in one direction or the other. Such was not the process in these 3 cases. The discal material protruded through a defect in the bone itself and, in cleaning out this material, the surgeon encountered copious bleeding from the cancellous interior of the vertebral body. Packing with Gelfoam controlled the situation nicely in all 3 cases. Postoperatively, the patients obtained satisfactory relief of their pain.

In reminiscence, the appearance of acute sciatic pain in elderly patients with osteoporosis has presented a perplexing problem, especially when a typical myelographic defect has not been present, or when surgical exploration of discal spaces has not demonstrated a rupture. It is hoped that reference

TABLE 1

<table>
<thead>
<tr>
<th>Case</th>
<th>Sex</th>
<th>Age</th>
<th>Chief Complaint</th>
<th>Trauma</th>
<th>Osteoporosis</th>
<th>Myelogram</th>
<th>Vert. Body</th>
<th>Disc</th>
<th>Surgical Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>W.A.H.</td>
<td>♂</td>
<td>70</td>
<td>Right sciatic pain</td>
<td>Turned over in bed</td>
<td>Moderate</td>
<td>Filling defect</td>
<td>L4</td>
<td>L3</td>
<td>Excellent</td>
</tr>
<tr>
<td>J.A.B.</td>
<td>♂</td>
<td>74</td>
<td>Left sciatic pain</td>
<td>Walking in yard</td>
<td>Marked</td>
<td>Filling defect</td>
<td>L4</td>
<td>L4</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>M.R.</td>
<td>♂</td>
<td>70</td>
<td>Right sciatic pain</td>
<td>None known</td>
<td>Marked</td>
<td>Filling defect</td>
<td>L4</td>
<td>L3</td>
<td>Satisfactory</td>
</tr>
</tbody>
</table>

Fig. 3. Case 3. Postoperative anteroposterior and lateral roentgenograms indicate intravertebral position of silver clips, left in place at time of operation.
to flat interdiscal defects and possibly more radical exploration of the posterior vertebral surfaces may provide identification and removal of the ruptured cartilage.

SUMMARY

Transvertebral rupture of intervertebral disc is described and the salient characteristics of 3 cases are outlined, with special reference to clinical features and surgical aspects of the problem. These factors would apply in cases of defective bony structure and therefore most commonly in elderly patients in whom the incidence of osteoporosis is increased.

REFERENCES