

# Fracture of a Vertebral Body End Plate and Disk Protrusion Causing Subarachnoid Block in an Adolescent

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Disk protrusions in children and adolescents are rare. Webb, Svein, and Kennedy<sup>9</sup> reviewed 6500 cases of lumbar disk herniations operated on between the years 1942-1952 at the Mayo Clinic. Only 60 patients (0.92%) were under the age of 20. Twenty-five were under the age of 17, and 5 (0.077%) were under 16 years of age.

Epstein and Lavine<sup>3</sup> reviewed 1222 cases of herniated disks operated on at St. Bartholomews Hospital in England between 1938 and 1958. Sixteen were at the cervical level; the youngest person was 22 years old. Six were thoracic; the youngest patient was a 34-year-old, and 1200 were lumbar with 38 (3.2%) in patients under the age of 17.

Rugtveit<sup>8</sup> reported on 7 patients 11 to 17 years old out of 840 operated upon for lumbar disk herniation.

To the best of my knowledge this case report is unique in terms of its fracture component.

## CASE REPORT

A.H., a 16-year-old Hispanic boy, was admitted to the Hospital for Joint Diseases May 13, 1974 with a chief complaint of pain and "stiffness," posteriorly in both thighs and calves, more marked on the right.

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The patient was well until September 1973. At that time he joined a weight lifting club. During a workout, he placed a 200 lb weight behind his neck onto his shoulders while in a squat position, with his back hyperflexed and his trunk forward in an almost horizontal position. He then lifted the weight by bringing his trunk to a more posterior vertical position, his hips and knees remaining flexed. During this maneuver he heard something "pop" and began experiencing pain in his lumbar spine.

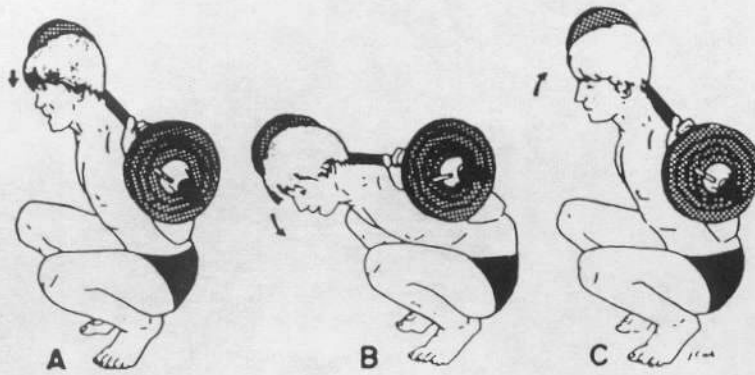
He saw a neighborhood physician who told him he had pulled some muscles and prescribed muscle relaxants. The back pain gradually subsided over a two month period.

Approximately two months post injury he began experiencing a tightening sensation and pain in both calves and posterior thighs more marked on the right. The symptoms were intermittent and did not limit his daily activities.

He sought further medical treatment through our Out Patient Department because of persistence of symptoms in March. According to our clinical records, there were no objective findings on two visits. X-rays of his hips and knees were normal. He was again given muscle relaxants with no relief. Due to persistent complaints, x-rays of his lumbar spine were ordered. These showed an apparent chip of bone lying in the L4-L5 interspace as well as narrowing of that interspace. He was then admitted.

Pertinent physical findings on admission were: percussion tenderness over L4 and L5 spinous processes and, mild paravertebral spasm on the right. Straight leg raising was limited to 40° on the right and 70° on the left, due to marked hamstring spasm.

FIG. 1. Schematic drawing of mechanism of injury.



There was no motor weakness or atrophy. There was no sensory deficit. Knee and ankle deep tendon reflexes were intact (2+) bilaterally. Plantar responses were flexor. There was no clonus.

A myelogram was done which showed a complete block at L4.

On May 31, 1974 a right hemilaminectomy at L4 and L5 was carried out. The L4-L5 disk was protruded. Above the disk space a bony fragment was noted extending across and compressing the cauda equina. It appeared to have come from the inferior border of the L4 vertebral body. It was thicker on the right and progressively narrowed as it crossed the spinal canal from right to left. It and the disk were removed. A fusion was not carried out.

Postoperatively the patient had complete resolution of signs and symptoms.

### DISCUSSION

Trauma appears to play an important role in the production of a lumbar herniation in a child or adolescent. In the adult pre-existing degenerative changes render the disk susceptible to herniation. Lavine and Stein<sup>3</sup> state that although degenerative changes occur with advancing age, none is known to be of significant magnitude to seriously compromise the structure of the annulus until the third decade of life.

Load and Rosenberg<sup>4</sup> points out that the intervertebral disk is subjected to a total load of approximately 1500 pounds when a weight of 100 pounds is lifted with the trunk in the flexed position.

Brown, Hansen and Yorra<sup>2</sup> have tested the mechanical properties of the interverte-

bral disk and related articular structures using fresh specimens obtained from routine autopsies and testing techniques used in civil or mechanical engineering. In one of their specimens submitted to rapid flexion combined with mild axial compression, the inferior posterior margin of the superior vertebra was avulsed but the annulus remained intact. This appears to be an experimental reproduction of the precise injury incurred by the patient presented.

### SIGNS AND SYMPTOMS

One of the most remarkable aspects of this case report is that despite a complete



FIG. 2. Lateral view lumbar spine. Note bony fragment in foramen.

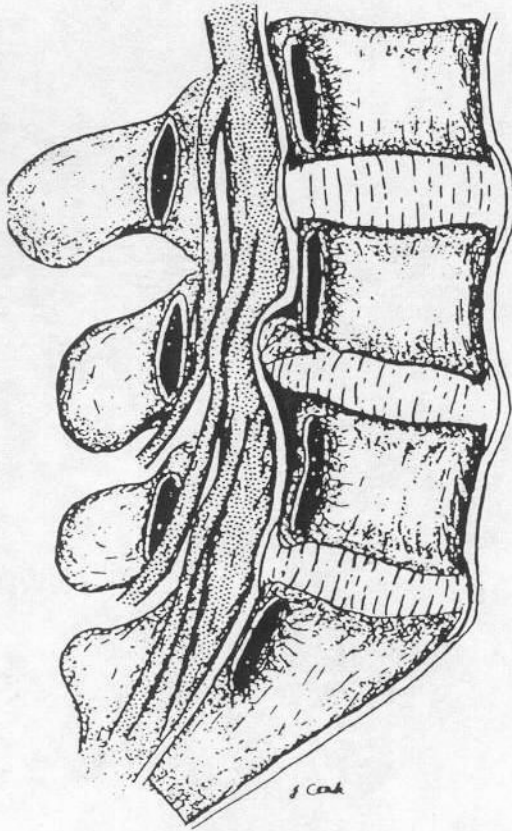


FIG. 3. Schematic drawing of pathologic findings showing protruded L4-L5 disk, and fracture from L4 body.

block on myelogram, there were minimal signs and symptoms. Macgee<sup>5</sup> points out it is uncommon for children with lumbar disk protrusions to have the usual signs and symptoms seen in adults. Low back pain, limitation of motion in forward flexion, a peculiar gait, and the limitation of straight leg raising are the outstanding signs. Pain is not a prominent complaint. Neurological findings are rare.

Bradford and Garcia<sup>1</sup> point out that symptoms are of an intermittent nature. The patient is often seen and treated by various physicians without the true significance of the lesion being recognized.

O'Connell<sup>6,7</sup> puts forth an interesting hypothesis to explain the clinical pictures in

the adolescent and adult. Spinal signs (deformity and reduced mobility) and tension signs (limited straight leg raising) are designed to protect the effected extradural nerve from the forces which stretch or compress it. Abnormal neurological signs are the results of injury to the nerve and represent a failure of the protective mechanism. When the nerve is compressed by large soft protrusions so frequently found in the adolescent it becomes hyperirritable. When the nerve becomes hyperirritable, protective spinal and tension signs are exaggerated. When the irritability of the extradural nerve is lost, protective mechanisms diminish and neurologic signs ensue.

### TREATMENT

Any adolescent or child with persistent low back pain or radicular complaints with a history of trauma unresponsive to conservative treatment should have myelography even if neurological findings are minimal or

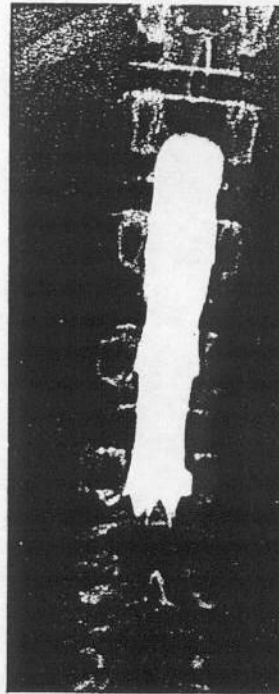


FIG. 4. Antero-posterior view: myelogram shows complete block at L4.

absent. A routine myelogram may disclose a need for surgical intervention.

#### SUMMARY

An apparently unique case of retroprotrusion of a portion of the vertebral end plate plus L4 disk in a 16-year-old boy demonstrated a complete myelographic block. The block was produced by a large fragment of bone which had broken off the inferior end plate of the body of L4 and was protruding into the spinal canal. Removal of the bony block and protruding disk resulted in complete resolution of symptoms.

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