

Adolescent apophyseal ring fracture simulating lumbar disc herniation: a case report

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Lumbar disc herniation in adolescents is a rare condition. It is commonly associated with fracture of the vertebral ring apophysis. The diagnosis is most clearly established by CT scan. The differential diagnosis is important and should include spine and spinal cord tumours, discitis and neuropathy. A case is presented to illustrate the pathophysiology, clinical and radiological diagnosis and to discuss the differential diagnosis. (JCCA 1992; 36(1):11-16)

KEY WORDS: adolescent, disc herniation, ring apophysis, fracture diagnosis, chiropractic, manipulation.

L'hernie discale lombaire est une condition rare chez l'adolescent et souvent associée à une fracture de apophyses de l'arc vertébral. L'utilisation du C.T. Scan permet le diagnostic le plus précis. Le diagnostic différentiel demeure important et devrait inclure les tumeurs vertébrales et de la moëlle épinière, l'inflammation discale et la neuropathie. Un cas est présenté pour démontrer la pathophysiologie, les signes diagnostiques cliniques et radiologiques et pour élaborer sur le diagnostic différentiel. (JCCA 1992; 36(1):11-16)

MOTS-CLÉS : adolescent, hernie discale, apophyse, diagnostic d'une fracture, chiropratique, manipulation.

Introduction

Lumbar disc prolapse in children and adolescents are rarely found. The incidence of surgery for disc herniation in patients below twenty years of age is 0.92% to 2.1% of all disc operations.^{1,2} The disc lesion is frequently associated with a posterior apophyseal ring fracture.^{1,3,4,5}

Trauma is an important etiologic factor in the onset of symptoms.^{1,3,4,6,7,8} However, it can appear insidiously.¹⁰ It is the purpose of this case report to illustrate the diagnosis and differential diagnosis of non-traumatic adolescent disc herniation associated with posterior ring fracture.

Case report

A 14 year old male presented with a five month history of left leg pain of insidious onset. His pain was described as a pulling

sensation and was located over the posterolateral thigh and extended to the posterior calf. He did not suffer from low back pain. Walking quickly and bending forward aggravated his complaint. He is a long-standing severe diabetic.

On physical examination, he stood with an antalgic list to the left. The range of motion of his lumbar spine was restricted and reproduced his leg pain in forward flexion and rotation to the left. Straight leg raising was 60 degrees on the left and 70 on the right, both causing left leg pain. Neurological examination revealed weakness of the left tibialis anterior graded at 4/5.

Plain film radiographs of his lumbar spine showed a moderate decrease in the disc space at L4-L5. (Figure 1) In order to rule out discitis, a bone scan (Figure 2) and sedimentation rate were ordered. They failed to show any abnormality. A CT scan of his lumbar spine showed a central disc herniation at L4-L5 with associated bony fragments protruding posteriorly from the superior aspect of L5. (Figure 3) A sagittal reconstruction showed the extent of the disc herniation at L4-L5. (Figure 4 and 5)

A diagnosis of disc herniation combined with posterior apophyseal ring fracture was made. Management consisted of electrotherapy and spinal manipulative therapy. Follow up 2 months later revealed significant improvement with full ranges of motion, straight leg raising at 85 degrees bilaterally, and absence of neurological deficit.

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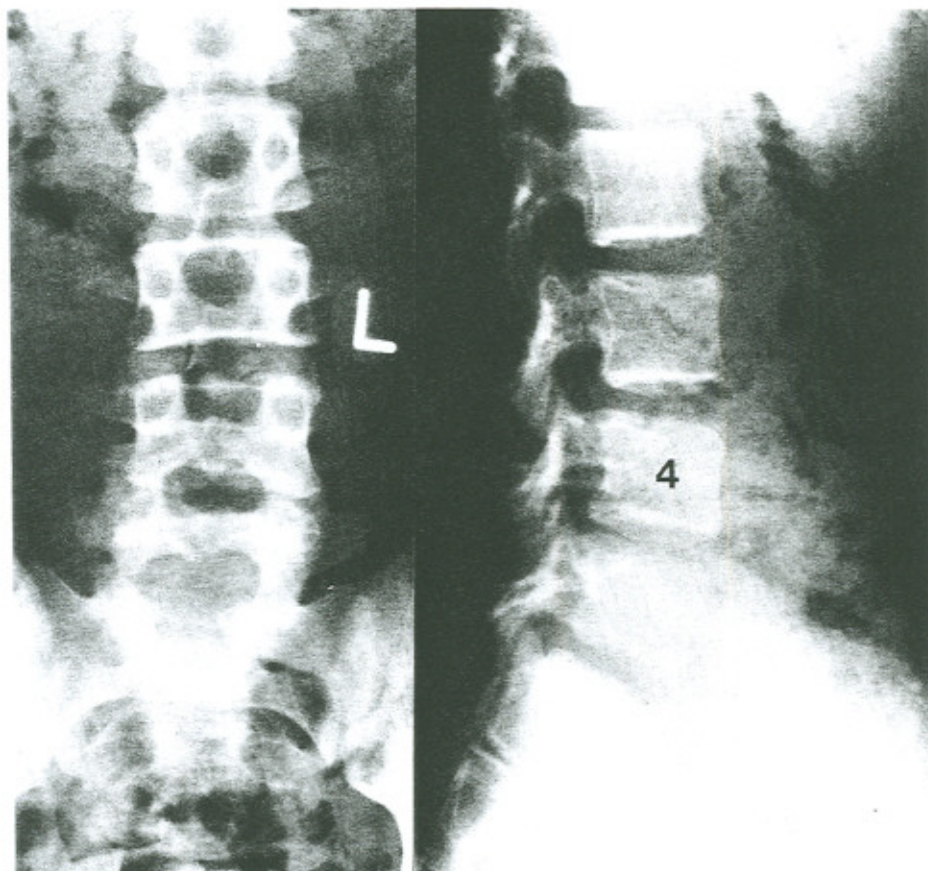


Figure 1 Anteroposterior and lateral radiographs of the lumbar spine. A decrease in disc height is present at L4-L5. There is no evidence of end plate irregularities at the L4-L5 level.

Discussion

The vertebral ring apophyses appear at about the age of five years.⁹ The intervertebral disc of the immature spine is fastened to this ring by fibrous extensions of the annulus fibrosis (Sharpey's fibers).⁴ As ossification progresses within the ring apophysis, these fibers become embedded in the bone. However, the ring does not undergo complete osseous union with the vertebral body until age eighteen.⁹ Until this fusion is complete, there is an area of relative weakness at the osteocartilaginous junction.^{4,9} Disc herniations which take place prior to complete maturation pull the ring apophysis away from the vertebral body.

The clinical features of adolescent disc protrusions are typically different than those of adults.^{1,7,8,10} Nerve root tension signs are more marked in the younger age group. Straight leg raising is often severely limited. Pain is usually not a prominent feature. Paraspinal muscle spasm with loss of lordosis is common. Along with this, forward flexion is greatly reduced. Root pain is rarely an early symptom, but when present, it tends to override the back pain. Few adolescents demonstrate significant neurological deficit.

Typical features of this case include the limitation of forward

flexion and restricted straight leg raising. Several features of this case, however, do not follow the usual pattern. First, leg pain was the primary complaint. Second, this patient had a significant neurological deficit.

This young man is also atypical because there was no significant trauma associated with the onset of the complaint. In a study by Dake, eighty-three percent of apophyseal ring fractures were associated with a history of trauma or strenuous physical activity.³

This case is complicated by the fact that this patient is also a diabetic. The combination of an atypical disc presentation and a history of diabetes, means that the differential diagnosis must be expanded to include diabetic neuropathy and disc space infection.

The incidence of diabetic neuropathy is 5-12% in those who are controlled by insulin.¹¹ The incidence increases with the age of the patient and the duration of the disease. However, neuropathy is often the earliest sign of diabetes mellitus.¹¹ There are two types of diabetic neuropathy; the more common polyneuropathy and mononeuropathy. The latter is often of abrupt onset in mild, undiagnosed diabetes. It often involves the femoral nerve with weakness of the quadriceps muscle and loss

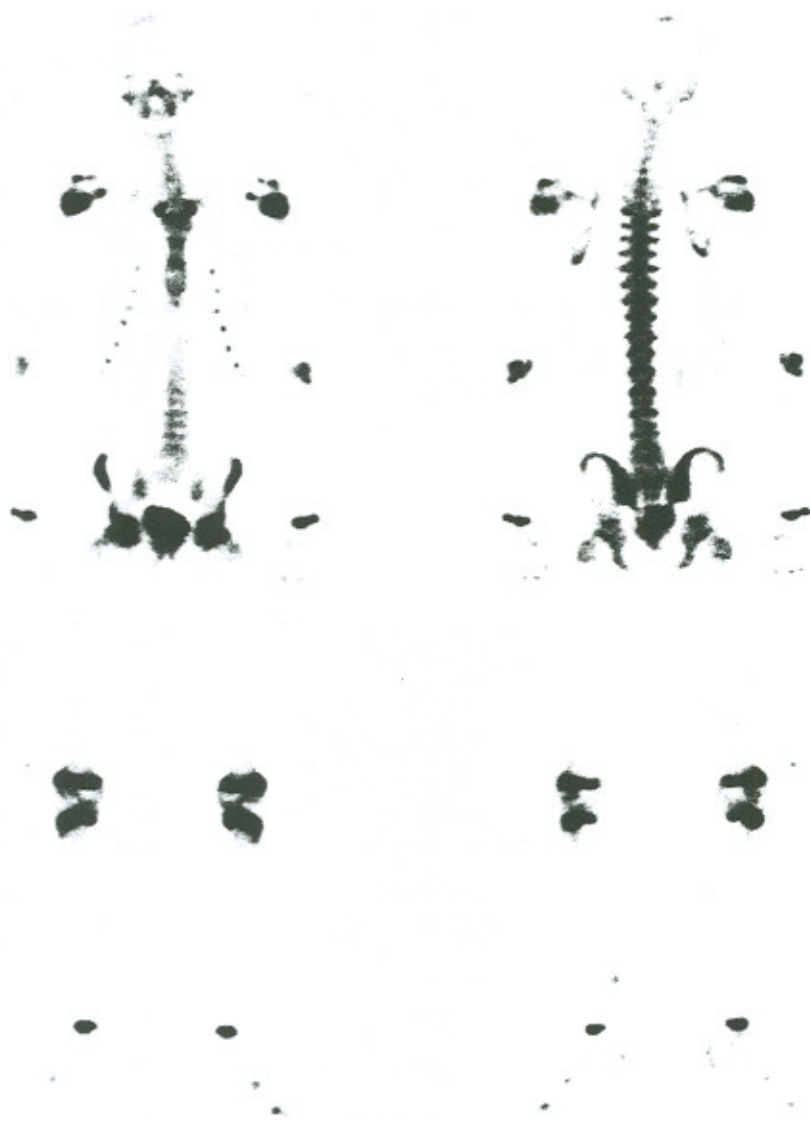


Figure 2 Anteroposterior and posteroanterior bone scan showing no evidence of increase uptake in the lumbar spine. The denser areas correspond to the growth plates.

of the knee jerk.¹¹ This appears typically in older individuals.¹² Although the individual in this case is an adolescent, the clinical picture is similar. Therefore, this condition must be excluded as the cause of the symptoms.

Disc space infection must be suspected in any young person with back pain. Although this patient had no back pain, his posture was antalgic and his lumbar range of motion was limited. Also, the fact that he was diabetic leaves him at higher risk

for infection. Fortunately, infection of the disc space was ruled out by the bloodwork and bone scan.

A further possibility which must be considered in children is tumour. There are several tissues which may give rise to tumours capable of causing a radiculopathy. Tumours may arise from either intradural or extradural spinal tissues. Intradural tumours are less common and are subdivided into those from within the spinal cord, known as intramedullary tumours, and

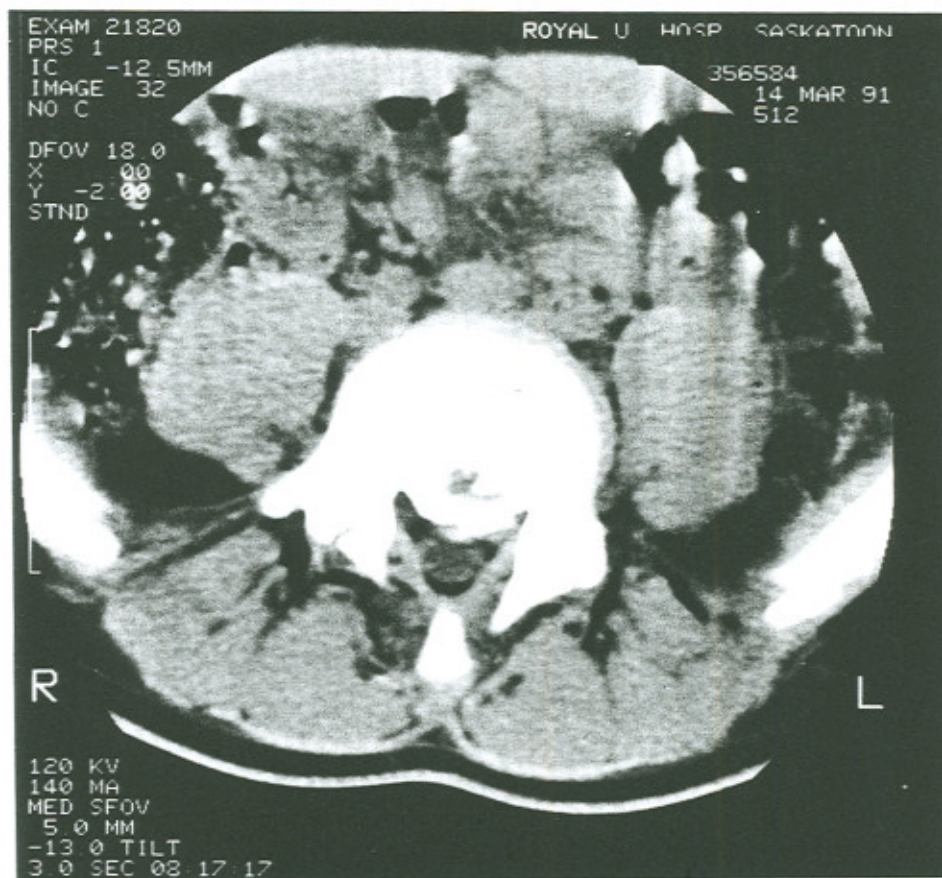


Figure 3 Axial CT scan at the level of the L5 superior end plate. This shows a central disc herniation associated with a rupture of the apophyseal ring.

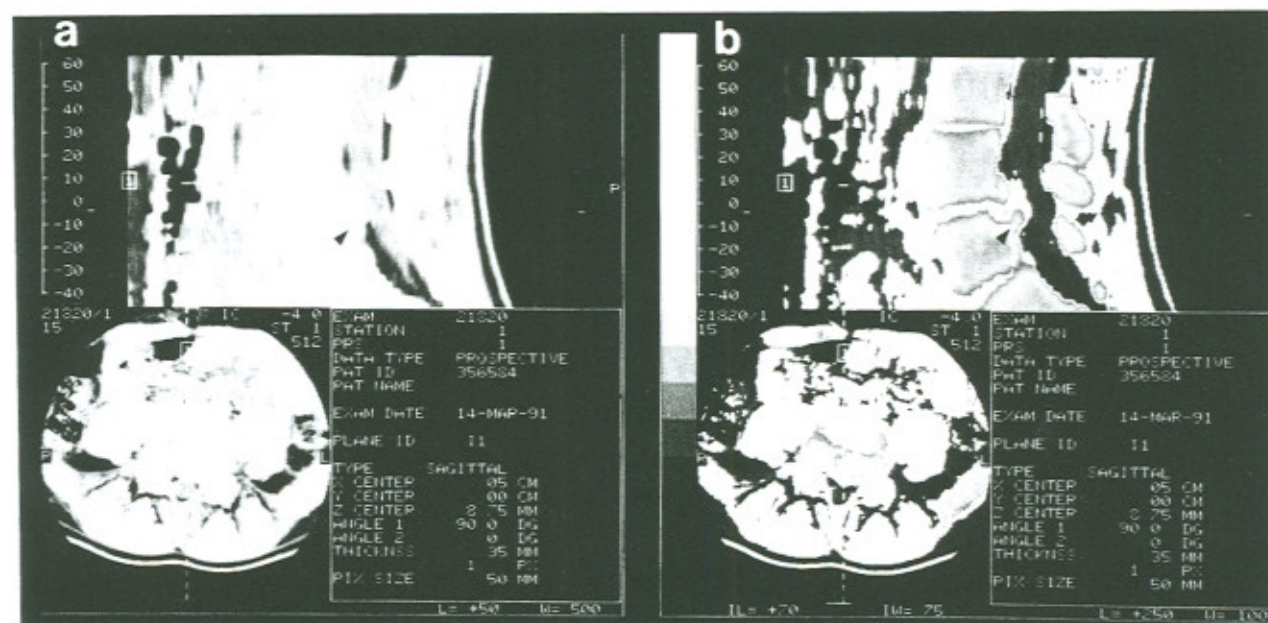


Figure 4 Central sagittal reconstruction of a CT scan of the lumbar spine showing a fracture of the posterosuperior end plate of L5 (A and B). Figure 4A which is the soft tissue window shows evidence of disc herniation at L4-L5 protruding into the spinal canal and compressing the cauda equina. The bone window (Figure 4B) shows avulsion of the posterosuperior ring apophysis of L5. (ARROWS)

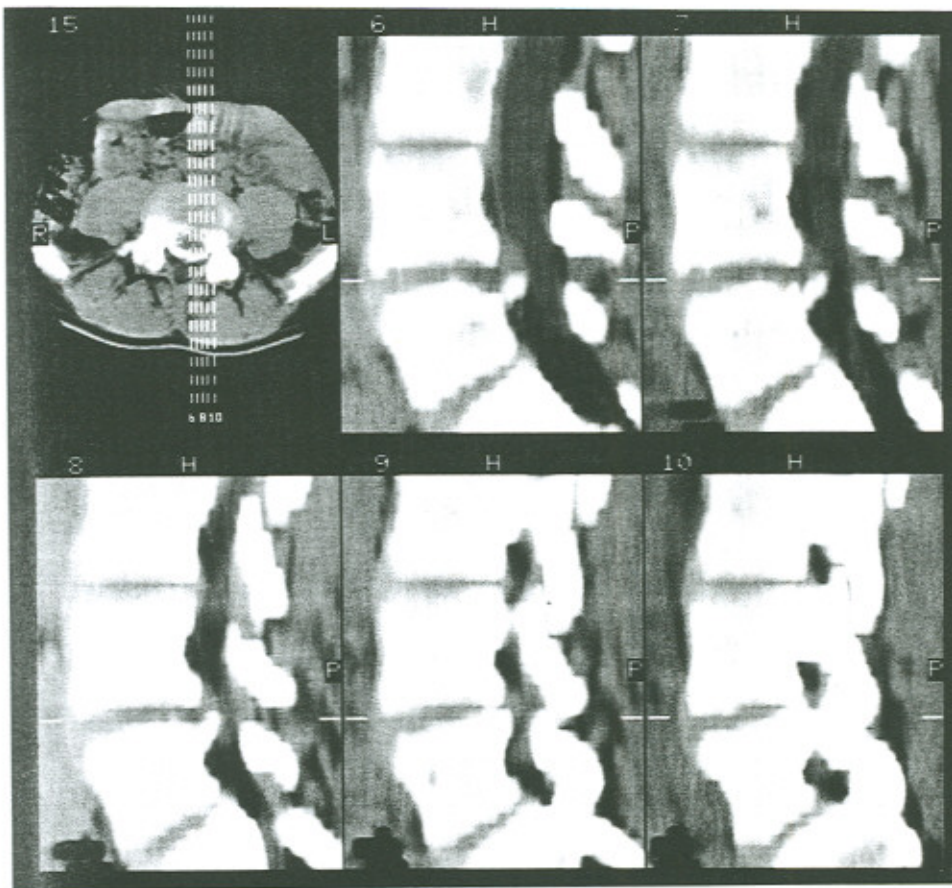


Figure 5 Parasagittal reconstruction of a CT scan showing section of the left half of the L4-L5 segments. An avulsion of the posterosuperior aspect of L5 body is visualized in different planes.

those that are extramedullary, but intradural.¹³ Intradural tumours include gliomas, such as astrocytomas and ependymomas.¹³ Tumours which are intradural and extramedullary include neurofibroma and meningiomas. Extradural tumours in this age group are usually benign. Adolescent types include osteoid osteoma and osteoblastoma. Back pain is the most common symptom, but radicular features may be present.¹⁴ Again the existence of a bone tumour was ruled out by blood work and a bone scan.

Imaging a posterior apophyseal ring fracture properly is essential for diagnosis. Plain films of the lumbar spine will not usually show the displaced fragment. As seen in Figure 1, the loss of disc height may suggest a simple disc herniation or discitis because the displaced fragment is not apparent. The best modalities for this purpose are computed tomography (CT), and magnetic resonance imaging (MRI). These techniques are superior to plain films because they make the diagnosis possible in cases in which the degree of calcification of the fragment is too little to make it possible with conventional radiographs. They also give information as to how much the apophysis has been avulsed and the extent of canal encroachment.¹²

In this case, the patient responded well to a course of spinal

manipulation. The treatment consisted initially of gentle mobilisation and was gradually upgraded to manipulation. The patient was seen daily for the first three weeks and then three times/week for the following six weeks. The exact therapeutic effects of spinal manipulation on disc herniation are not well understood. However, there is clinical evidence to support that it is an effective form of therapy in disc syndrome.^{15,16} In order to proceed with care, the clinician using manipulation must regularly monitor the neurological status of the patient.

Conclusion

Adolescent lumbar disc herniation is an uncommon occurrence. However, a finding which is often found associated with these lesions is an apophyseal ring fracture of the vertebral body. These fractures are often missed on plain film radiography. Computed tomography or magnetic resonance imaging (MRI) reveal the fragments much more readily. When an adolescent disc herniation is suspected, the differential diagnosis should also include tumour and discitis. This case is complicated by the fact that the patient is also a diabetic. Therefore diabetic neuropathy must also be suspected.

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