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Case Report

Traumatic lumbar vertebral ring apophysis fracture with disk herniation in an adolescent

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ABSTRACT

We present a case of a 15-year-old male with history of back pain and bilateral lower limb radiculopathy due to fall. The magnetic resonance imaging scan showed disc bulge at L2-L3 level causing compression on contained nerve roots. In this case, computed tomography scan was indispensable for diagnosis and classification of the vertebral apophyseal fracture and to guide appropriate further management. Apophyseal ring fracture is an uncommon cause of back pain with radiculopathy in adolescents and athletes. High degree of suspicion is necessary to differentiate these injuries from disc herniation so as to further guide appropriate conservative or surgical management. The common cause of back pain in this population is related to musculoskeletal injuries. Lumbar disc herniation contributes to negligible number of cases in this age group, as against that seen in the adult population. An important and rare etiology to be considered for these patients includes vertebral ring apophyseal fracture.

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Introduction

The purpose of this article is to draw attention to an unusual and extremely rare cause of back pain in adolescents and young adults, especially in athletes [1–4]. The common cause of back pain in this population is related to musculoskeletal injuries. Lumbar disc herniation contributes to negligible number of cases in this age group, as against that seen in the adult population. An important and rare etiology to be considered for these patients includes vertebral ring apophyseal fracture.

Case report

We are presenting a case of 15-year-old male who came with history of minor accident in the form of fall from an autorickshaw followed by back pain and bilateral lower limb radiculopathy. The power in both lower limbs was Medical Research Council grade III of V at presentation. There was no bowel or bladder incontinence.

For the evaluation of back pain with radiculopathy, magnetic resonance imaging (MRI) of the lumbar spine was performed as the primary investigation. It showed a diffuse disc

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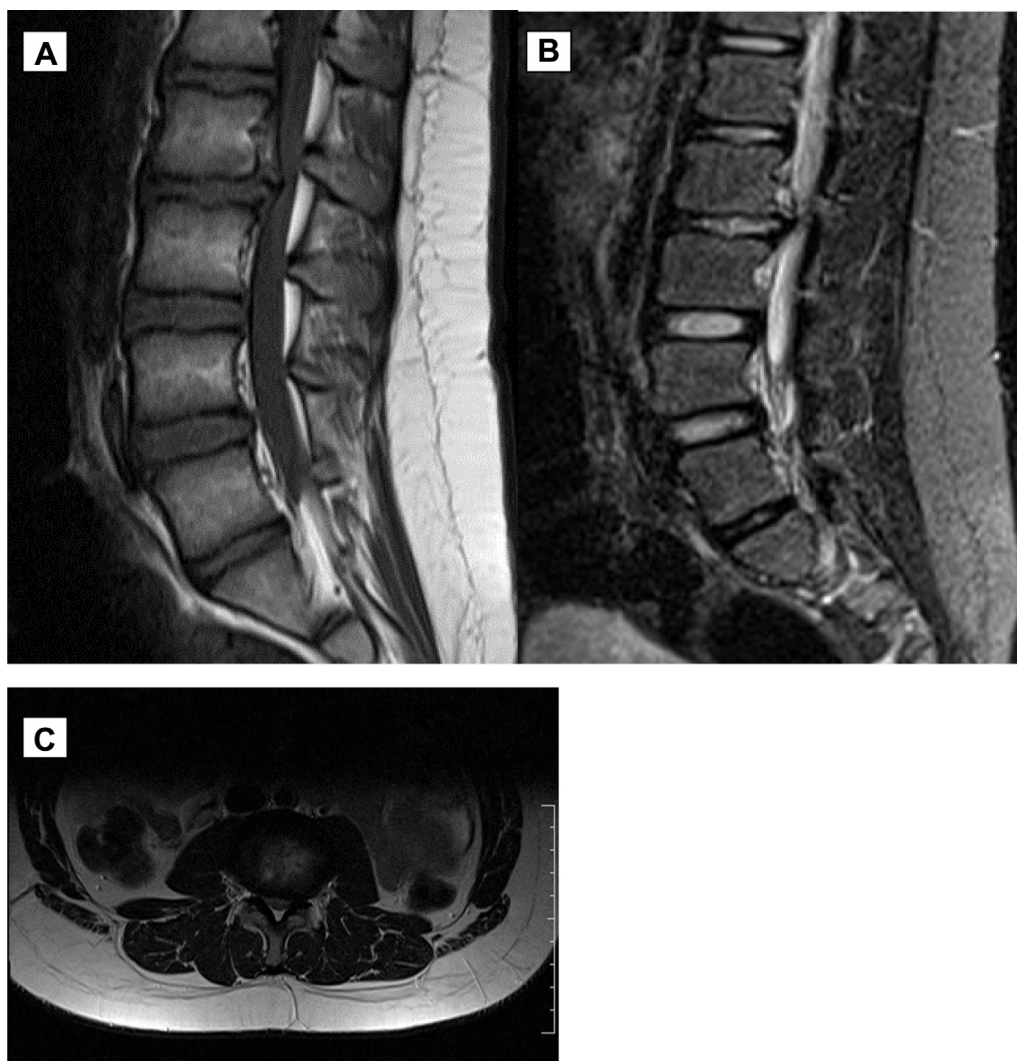


Fig. 1 – T1 weighted (A) magnetic resonance imaging (MRI) image of the lumbar spine in sagittal plane shows a disc bulge at L2-L3 level. A defect with a small suspicious hypointense structure is seen along the posterior aspect of the inferior end plate of the L2 vertebral body. The disc material is seen herniating superiorly through this defect. Short tau inversion recovery (STIR) (B) image shows mild marrow hyperintensity in adjacent bone due to acute fracture. T2 weighted axial image (C) shows disc bulge producing mass effect on contained nerve roots at this level.

bulge with central disc component causing compression on contained nerve roots at L2-L3 level (Fig. 1). A linear T1 and T2 hypointense line was seen along the posterior aspect of the inferior end plate of the L2 vertebral body, which was suspicious for a fracture.

To confirm the same, a limited computed tomography (CT) scan of that region was performed (Figs. 2 and 3). It confirmed a mildly displaced apophyseal fracture of the L2 vertebral body involving its inferior end plate.

In view of neurodeficit in both lower limbs, the patient was subjected to an operative intervention in the form of discectomy and nerve root decompression at L2-L3 level. The fractured fragment was completely resected. On follow-up, patient had grade V by V power in both lower limbs with significant relief of symptoms and complete neurological recovery.

Discussion

Fracture of the vertebral ring apophysis is an uncommon but important cause of back pain in adolescents [1]. It usually follows a strenuous physical activity or trauma.

The ring apophyses of vertebral bodies appear at age 5 years and fuse with rest of the body at 18-20 years, and in some cases up to 25 years. The annulus fibrosus is adhered to the superior and inferior vertebral plateau via the Sharpey's fibers and also to some fibers of the posterior longitudinal ligament. For these reasons, the fractures are commonly seen along the posterior aspect and in the midline [1,2].

During strenuous activity, there is avulsion of the vertebral end plate fragment along with herniation of the disc. The fracture usually occurs on posterior aspect of the end plate in



Fig. 2 – Limited computed tomography (CT) scan correlation at L2-L3 level confirms an apophyseal fracture in the midline of the inferior end plate of the L2 vertebral body.

the midline. Rarely, it maybe seen on the posterolateral aspect of the superior end plate.

Herniation of the disc occurs through the fractured fragments, and this may prevent healing and reunion of this fragment.

Review of the literature reveals common affection of the end plates of L4, L5, and S1 vertebral bodies [2,4] as the most common site for these fractures. However, in our case, the inferior end plate of L2 vertebral body was affected.

High clinical suspicion and investigations are important for planning treatment and proper surgical approach.



Fig. 3 – Limited CT scan correlation at L2-L3 level confirms an apophyseal fracture in the midline of the inferior end plate of the L2 vertebral body.

CT scan is the modality of choice to diagnose apophyseal fractures [5]. Nearly, all cases mentioned in literature were diagnosed with CT scanning. It has the best performance for the demonstration of the size, shape, and location of the fracture [2,5]. Excellent demonstration of the relationship between fracture fragment and herniated disc is also possible with CT scan.

CT scan further helps to differentiate calcified or non-calcified fractures from lumbar disc herniations.

Compared with the higher sensitivity of CT scanning, MRI identifies only 22% of the fractures. However, MRI helps to show the herniation or extrusion of the disc and its mass effect on the contained nerve roots.

The correct preoperative assessment of the location and type of fracture are essential to decide the line of further management. Various classifications are available to categorize these fractures. Out of these, the Epstein classification (Modified Takata classification) based on the morphology of the fracture is widely followed [5].

These fractures were initially classified using CT scan by Takata et al into 3 types [6]:

Type I—Posterior margin of the vertebra shows small separation. No abnormality is seen in the underlying vertebral body because only minimal bone loss occurs in the fractured fragment. An arcuate fragment is seen to lie within the spinal canal. This type occurs frequently in individuals younger than 13 years.

Type II—Avulsion fracture involving the posterior margin of the vertebral body, along with the overlying cartilage and annulus fibrosus. The fragment has an irregular shape. It is seen in older children and adolescents.

Type III—Fracture fragment is larger than the vertebral rim and leaves a round defect in the adjacent bone. It is seen more frequently in adults.

An additional category of type IV was proposed by Epstein et al, where a larger fracture was seen involving the superior and inferior end plates. This is a rare type.

Teaching point

Vertebral apophyseal fracture should be considered as a rare cause of adolescent disc prolapse and CT scanning is an indispensable investigation to correctly diagnose and properly delineate the relationship between the fractured fragment and herniated disc.

Conclusion

Apophyseal ring fracture is an uncommon cause of back pain with radiculopathy in adolescents and athletes. High degree of suspicion is necessary to properly differentiate these injuries from disc herniation so as to further guide appropriate conservative or surgical management.

CT scan is indispensable for diagnosis and classification of the fractures and to guide their appropriate management.

REFERENCES

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- [1] Alvarenga JALS, Ueta FTS, Del Curto D, Ueta RHS, Martins DE, Wajchenberg M, et al. Apophyseal ring fracture associated with two levels extruded disc herniation: case report and review of the literature. *Einstein (São Paulo)* 2014;12(2):230–1.
- [2] Puertas EB, Wajchenberg M, Cohen M, Isoldi MN, Rodrigues LMR, Souza PS. Avulsion fractures of apophysial ring (“limbus”) posterior superior of the L5 vertebra, associated to pre-marginal hernia in athletes. *Acta Ortop Bras* 2002;10(1):25–30 [serial on the Internet].
- [3] Farrokhi MR, Masoudi MS. Slipped vertebral epiphysis (report of 2 cases). *J Res Med Sci* 2009;14(1):63–6.
- [4] Bae JS, Rhee WT, Kim WJ, Ha SI, Lim JH, Jang IT. Clinical and radiologic analysis of posterior apophyseal ring separation associated with lumbar disc herniation. *J Korean Neurosurg Soc* 2013;53:145–9.
- [5] Wu X, Ma W, Du H, Gurung K. A review of current treatment of lumbar posterior ring apophysis fracture with lumbar disc herniation. *Eur Spine J* 2013;22:475–88.
- [6] Krishnan A, Patel JG, Patel DA, Patel PR. Fracture of posterior margin of lumbar vertebral body. *Indian J Orthop* 2005;39:33–8.