CASE REPORTS

Posterior element pain in an adolescent schoolgirl

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Abstract

A case is presented of a transitional lumbosacral vertebra in an adolescent girl, presenting with low back pain. There was no evidence of a pars interarticularis defect. Careful assessment of children or adolescents presenting with low back pain is important since back pain in this age group is usually caused by organic disease.

(*Br J Sports Med* 1996;30:356-358)

Key terms: adolescence; low back pain; sports; lumbosacral defect

Low back pain is a common complaint of young athletes. Most frequently seen in athletes involved with sports requiring repetitive flexion, extension, and rotation, high incidences have been reported in dancers, divers, figure skaters, and gymnasts.¹⁻² Unlike adult athletes, in this age group low back pain typically results from posterior element pathology rather than disc or degenerative disease.² While many of these injuries stem from overuse, a proportion arises solely or in part from congenital spinal anomalies. These may include spina bifida, spondylolysis, spondylolsthesis, and transitional lumbar vertebrae. Pars interarticularis defects are a well documented cause of low back pain in adolescents, yet reports of low back pain due to other vertebral anomalies are scant.³ This report is of a 14 year old schoolgirl involved with gymnastics who presented with posterior element back pain.

Case report

A 14 year old schoolgirl presented with a six month history of low back pain. She was otherwise in good health and dates the onset of her discomfort from physical education classes during which she undertook a series of hyperextension manoeuvres and sustained a fall. Pain was exacerbated by prolonged standing and interfered with activities of daily living activity. She was a recreational athlete, would swim as pain permitted, but otherwise curtailed involvement in school sports. Pain was limited to her low back with no radiation, neurological symptoms, or bowel and bladder dysfunction. Past medical history was unremarkable and family history non-contributory. She had previously attended ballet classes between the ages of 8 and 10 years.

Physical examination revealed normal spinal curvatures with no scoliosis or other deformity. Active range of spinal motion was complete;

however, she experienced left lower lumbar discomfort with extension, rotation, quadrant testing, and left single leg hyperextension. Skin examination was normal with no spasm or tenderness. There was localised bone tenderness at the level of L5/S1, more pronounced on the left than on the right. Straight leg raise was 90° and symmetrical, with a negative Lasègue test. Neurological testing of sensation, power, and deep tendon reflexes were within normal limits. Provocative sacroiliac tests were normal. She was noted to be flexible with no specific hamstring, quadriceps, or hip flexor tightness.

Initial investigations included plain film radiographs which showed unilateral left hemisacralisation of L5 on S1 and left facet joint sclerosis at L4/5 (fig 1). There was no radiographic evidence of a pars interarticularis defect; however, a triple phase limited bone scan (with SPECT) revealed increased uptake in the superior portion of the left sacral wing suggestive of a stress fracture (fig 2). In order to further define the site of pathology a CT scan was performed which showed a transitional vertebral body at the L5 level with a pseudoarthrosis of the left L5 transverse process with a left S1 transverse process (figs 3 and 4). A minimal L4/5 central disc bulge was noted.

Her initial management had been relative rest, avoidance of extension manoeuvres, and a non-steroidal anti-inflammatory agent. Following the imaging studies she was prescribed a lumbosacral corset which she discontinued because of discomfort and instead purchased a soft corset. Her symptoms gradually resolved over three months, allowing progressive return to activity, starting with swimming.

Discussion

This case shows the importance of careful assessment of children or adolescents presenting with low back pain. Back pain in this age group is usually caused by organic disease and the spectrum and distribution of pathology is different from that in the adult population.¹⁻⁴ Despite problems associated with sports injury surveillance, the increased incidence of sports related injuries are mirroring increased participation.⁵⁻⁸ Specifically, the incidence of back injuries is increasing, particularly in those sports requiring repetitive extension and rotation of the lumbar spine.¹

This case involved hyperextension gymnastic manoeuvres during a physical education class. The relatively higher incidence of injuries during physical education classes and of nonorganised

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Accepted for publication
16 January 1996

Figure 1 Plain film radiograph (AP of lumbosacral spine) showing hemisacralisation of L5 on S1 and left facet joint sclerosis at this level.

Figure 2 AP delayed image of triple phase bone scan showing increased uptake in the superior portion of the left sacral wing (arrowed).

sports over organised team sport has previously been noted and reflects the larger number of participants.⁹ The site of pathology was the posterior spinal elements and this is typical for this mechanism and age group. Of interest was the finding of a transitional lumbosacral vertebra (TLSV) and the absence of evidence of a pars interarticularis defect. Of the congenital lumbar spine anomalies, spondylolysis and spondylolisthesis are recognised causes of low back pain, but not spina bifida or TLSV.³ Whether or not TLSV are associated with increased risk of low back pain is in dispute and

Figure 3 Coronal reformation computerised tomography of the lumbosacral spine showing enlarged transverse processes of L5 bilaterally (arrows) with a left pseudoarthrosis with the S1 transverse process. Sclerotic margins of this articulation are present (arrowhead) but there is no evidence of sacral trabecular disruption.

Figure 4 Axial CT of the L5/S1 junction showing the left pseudoarthrosis with no bony union. A joint line is visible with sclerotic margins (arrowhead).

this probably reflects the variable anatomy of these lesions.¹⁰ Although their occurrence is relatively common (4-7% of the population), relatively little is known about their biomechanics and pathophysiology.¹⁰⁻¹¹

In 1917 Bertolotti described the association of back pain and a TLSV, the pain being attributed to degenerative changes at that level.¹² While arthritic changes at the TLSV may exist, other degenerative processes occur and are typically found above the affected segment. In patients with back pain and a TLSV the occurrence of a disc bulge or herniation, or spinal or root canal stenosis is more common in the segment immediately above the TLSV than at other levels. Typically, radiologically evident degenerative changes in pseudoarthroses do not provide a predictable localisation of symptoms.¹¹

In this case there was a left dysplastic L5 transverse processes with a fibrous pseudoarthrosis producing a hemisacralisation of the L5 vertebra. A minimal disc bulge was noted above the hemisacralisation which was asymptomatic. The patient's low back pain was bilateral, with clinical tenderness ipsilateral to the

asymmetrical pseudoarthrosis. The asymmetrical morphology of this lesion and lack of solid fusion may have contributed to the production of symptoms at this level. This would be consistent with the findings of Barzo *et al*, who showed that asymmetrical anomalies have greater clinical significance,¹³ and of Jonsson *et al*,³ who did not encounter patients with bilateral anomalous articulations seeking help for low back pain.³

The bone scan (fig 2) and SPECT studies showed a focal area of increased uptake in the sacral wing ipsilateral to the left hemisacralisation. This finding of a sacral bone stress reaction in association with a TLSV has not previously been reported. Typically sacral wing fractures occur in one of two patterns. The first and more frequent is an insufficiency fracture in patients with osteopenia due to involutional osteoporosis, radiotherapy, or prolonged steroid use.¹⁴⁻¹⁶ The second less frequently reported group occurs as a fatigue fracture in healthy athletes or recruits following strenuous activity.¹⁷ The exact nature of the stress injury to the sacral wing in this case is conjectural. These findings may have been indicative of accelerated bone remodelling in the sacrum of an adolescent performing exercises which, through the asymmetric TLSV, placed abnormal stress on the sacral wing. The sparsely increased uptake on the bone scan was not accompanied by trabecular changes on a CT scan of the sacrum, which was performed seven months after the onset of symptoms, suggesting that the lesion had not progressed to a true stress fracture. Specific provocative tests of the sacroiliac joints were negative, lending credence to the suggestion that the pseudoarthrosis was not the sole cause of her symptoms. The final working diagnoses were back pain in association with a TLSV (Bertolotti's syndrome) and an ipsilateral sacral wing bone stress injury.

She was treated in a corset to limit motion at the TLSV; however, this was not tolerated and she instead elected to use an elastic support brace. Her symptoms slowly improved allowing a return to swimming. The prognosis is unclear, but as many individuals with a TLSV

remain asymptomatic an optimistic outlook is warranted for conservative management. Surgery in cases of TLSV is recommended in very selected cases and has a variable success rate.³⁻¹⁸ The bone stress injury involving the ipsilateral sacral wing was not accompanied by trabecular changes on CT scan and with rest this lesion should resolve. Future studies are required to compare the specific symptoms and signs referable from the different morphological types of TLSV and investigate their relations to abnormal stress patterns in the sacrum.

This material was presented at The 42nd Annual Meeting of The American College of Sports Medicine, Minneapolis, Minnesota, June 1995.

- 1 Micheli LJ, Wood R. Back pain in young athletes. *Arch Pediatr Adolesc Med* 1995;149:15-18.
- 2 Harvey J, Tanner S. Low back pain in young athletes. *Sports Med* 1991;12:394-406.
- 3 Jonsson B, Stromqvist B, Egund N. Anomalous lumbosacral articulations and low back pain. *Spine* 1989;14:831-4.
- 4 Papanicolaou N, Wilkinson RH, Emans JB, Treves S, Micheli LJ. Bone scintigraphy and radiography in young athletes with low back pain. *Am J Radiol* 1985;145:1039-44.
- 5 Garrick JG, Requa RK. Girls' sports injuries in high school athletics. *JAMA* 1978;239:2245-8.
- 6 Garrick JG, Requa RK. Injuries in high school sports. *Pediatrics* 1978;61:465-9.
- 7 Landry GL. Sports injuries in childhood. *Pediatr Ann* 1992; 21:165-8.
- 8 Maffulli N, Baxter-Jones ADG. Common skeletal injuries in young athletes. *Sports Med* 1995;19:137-49.
- 9 Zaricznyj B, Shattuck LJM, Mast TA, Robertson RV, D'Elia G. Sports related injuries in school-aged children. *Am J Sports Med* 1980;8:318-24.
- 10 Tini PG, Wieser C, Zinn WN. The transitional vertebra of the lumbosacral spine: its radiological classification, incidence, prevalence and clinical significance. *Rheumatol Rehabil* 1977;16:180-5.
- 11 Elster AD. Bertolotti's syndrome revisited - transitional vertebrae of the lumbar spine. *Spine* 1989;14:1373-7.
- 12 Bertolotti M. Contributo alla conoscenza dei vizi di differenziazione regionale del rachide con speciale riguardo all'assimilazione del V lombare. *Radiol Med* 1917;4:113-44.
- 13 Barzo P, Voros E, Bodosi M. Clinical significance of lumbosacral transitional vertebrae (Bertolotti syndrome). *Orvosi Hetilap* 1993;134:2537-40.
- 14 Jones DN, Wycherley AG. Bone scan demonstration of progression of sacral insufficiency stress fracture. *Aust Radiol* 1994;38:148-50.
- 15 Schneider R, Yacovone J, Ghelman B. Unsuspected sacral fractures: Detection by radionuclide bone scanning. *Am J Radiol* 1985;144:337-41.
- 16 Stroebel RJ, Ginsburg WW, McLeod RA. Sacral insufficiency fractures: an often unsuspected cause of low back pain. *J Rheumatol* 1991;18:117-9.
- 17 Volpin G, Milgrom C, Goldsher D, Stein H. Stress fractures of the sacrum following strenuous activity. *Clin Orthop* 1989;243:184-8.
- 18 Santavirta S, Tallroth K, Ylinen P, Suoranta H. Surgical treatment of Bertolotti's syndrome. *Arch Orthop Trauma Surg* 1993;112:82-7.

Commentary

I find this an extremely interesting case. I would, however, like to propose an alternative explanation for the imaging findings. Hemi-sacralisation of the lumbosacral junction is common and symptomatic pseudoarthroses/impingement are also not rare. The ones I have personally seen in the past do not look like the current CT images. Also, on the initial radiograph, sclerosis would have been expected at that time at the site of impingement. The CT images performed seven months after initial onset of symptoms show quite profound sclerosis and a barely perceptible line across the centre of the sclerotic band in the region of the lateral bar. Indeed, the appearances of the sclerosis and this barely perceptible line are much more akin to the appearances found elsewhere in the CT images of healing or healed pars defect. The current CT looks much more like the latter than the former and therefore a partially healed stress injury across a lateral bar from hemi-sacralisation would seem to be more likely. Such a stress injury could presumably occur secondary to the asymmetrical mobility of the lumbosacral junction. Whereas symptomatic pseudoarthroses are not particularly uncommon, such a stress injury across the lateral bar of the hemi-sacralised vertebra would, I suspect, be exceptionally rare, which heightens the interest in this case. I think, however, that considering the lack of sclerosis on initial radiograph and the barely perceptible lucent line on delayed CT, that this latter diagnosis is more likely.

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