Single photon emission computed tomography (SPECT) scanning for adolescent back pain. A *sine qua non*?

Malcolm T. F. Read MA MRCP

60 Woodbridge Road, Guildford, Surrey, UK and London Bridge Clinic, London, UK

Nine cases of adolescent back pain show that a diagnosis of spondylolysis cannot be made on physical examination alone and that single photon emission computed tomography (SPECT) scanning revealed pars interarticularis stress lesions undiagnosable on planar technetium-99 bone scan. As management of spondylolysis differs from other lumbar dysfunctional problems SPECT scanning of children should be a *sine qua non* in extension related back pain with a normal radiograph and planar bone scintigraphy.

Keywords: SPECT, single photon emission computed tomography, bone scan, children, adolescent, spondylolysis, back pain

Recognition and correct management of early spondylolysis or stress fracture of the pars interarticularis may prevent future vertebral dysfunction and frank unstable spondylolisthesis. Physical examination shows an extension related lesion, however, diagnostic signs may be similar in facet joint dysfunction and some disc lesions. Oblique radiographs display the spondylotic defect or sclerosis, which may represent a later remoulding phase, of the pars interarticularis lesion¹. Planar technetium-99 bone scintigraphy (PBS) shows bony remodelling ahead of radiographic changes, but may still miss the earliest stress changes that are diagnosable with SPECT scanning²⁻⁴.

Relevant positive findings are shown in Table 1.

Examination of the lumbar spine was as described by Cyriax⁵ but included the Lasegue sign, slump test, one legged hyperextension test (spondylolysis swing test)^{6,7}, Fitch catch⁸ (leaning backwards with the right hand to grab the left Achilles and *vice versa*), facet rolling⁷ and rocking tests (patient lies prone, one hand is placed over the transverse process of L5 and the ipsilateral iliac crest is rocked posteriorly abutting the S1 facet on to the L5 facet – the process is repeated on L4, L3 etc.)⁹. Tests for lumbar sacral dysfunction were also performed^{6,7}.

Results

Apart from case 2, who was pain free until 'demon' fast bowling, all cases had extension related back pain. Case 5 had sclerosis of the right pedicle on radiography. 'Specific tests' such as the spondylolysis swing and Fitch catch were not pathognomic for spondylolysis – but did increase extension pain. All cases had negative PBS but five cases had a positive lesion on SPECT scanning that would fit with a pars interarticularis stress lesion.

Management

To reduce the amount of radiation the patients were not radiographed (unless previously investigated) and went straight to SPECT scanning. Those cases with a negative SPECT scan were treated actively with manipulation, mobilization and short wave/interferential diathermy and returned to activities within 2–4 weeks.

Because it was felt that active mobilization might make the stress lesion worse, the SPECT positive cases were rested from sport until pain free daily living was established and then returned to sport without extension elements: bat, slow bowl, field for cricket; ground strokes and volley for tennis; pommel horse, balancing and conditioning for gymnastics. Extension manoeuvres were gradually introduced, but the number of repetitions of these elements was limited, i.e. one fast ball per over, 40 overs per week.

Discussion

Fredrickson *et al.* reported a 4.4% incidence of spondylolysis in 5-year-old children¹⁰ and perhaps adolescents doing extension and rotation related sports should have pre-participation screening for pars interarticularis lesions and spina bifida with its increased incidence of pars lesions¹¹. Weber and Woodall¹² in their review of the literature suggested that gymnasts present with reliable signs, especially pain on the one legged hyperextension test (spondylolysis swing), but the cases presented here indicate that this test and other recommended tests are not specific for spondylolysis. One cannot, for clinical management's sake, assume that all extension pains are from spondylolysis as manipulative treatment of

Address for correspondence: Dr Malcolm T. F. Read, London Bridge Clinic, 1 St Thomas's St, London SE1 2PR, UK

© 1994 Butterworth-Heinemann Ltd
0306-3674/94/010056-02

Table 1. Relevant positive findings

Case	1	2	3	4	5	6	7	8	9
Age (years)	17	12	14	17	16	13	15	14	13
Sex	M	M	M	M	F	F	M	M	F
Acute		+	+			+		+	
Sport	T	C	G	R	G	L/N	C	C	G
Time	3 months	2 months	3 months	1 month	6 months	2 weeks	2 months	2 months	1 month
Previous	Yes	-	Yes	Yes	-	-	Yes	-	-
External pain	+	-	+	+	+	+	+	+	+
Side flex									
Left	-	-	-	+	+	-	+	-	+
Right	+	-	+	-	+	-	+	-	+
Flex	-	-	-	-	Full+	Full+	-	-	+
SLR	90	90	120	90	110+	90	90	90	120
	90	90	120	90	110+	90	90	90	90+
Slump	-	-	+r	-	-	+	-	-	-
Spondylolysis swing	+	-	+	-	+	+	+	+	+
Fitch catch		-	+	+	+	+	+	+	+
Rock		+	+	-	-	-	-	-	+
Roll		-	+	-	+	-	-	+	+
Radiograph	nad		nad	nad	scl	nad			
MRI	nad								
PBS	nad	nad	nad	nad	nad	nad	nad	nad	nad
SPECT	+r	+l	+b	+l	+r	nad	nad	nad	nad

H, hockey; T, tennis; C, cricket; R, rugby; G, gymnastics; L/N, lacrosse and netball; +, lesion is present; -, lesion not detected; SLR, straight leg test; MRI, magnetic resonance imaging; PBS, planar technetium-99 bone scintigraphy; SPECT, single photon emission computed tomography; r, right; l, left; b, both; nad, no abnormality detected; scl, sclerosis

the facet joint may be rapidly curative and the child returned early to sport. Equally, manipulation may convert the stress related pars defect into a frank fracture, and too early a return to sport may create an unstable spondylolisthesis, which can affect the child for life. This paper and others⁴ show that in extension related vertebral pain the SPECT scan is the most sensitive indicator of bony stress lesions. Bellah *et al.*⁴ recommend SPECT scanning in adolescent back pain but this paper suggests that SPECT scanning should be a *sine qua non* in extension vertebral back pain with negative radiograph obliques and PBS, and if used as a first line investigation would reduce radiation.

References

- Camins MB, Patrick F, O'Leary PF. *The Lumbar Spine*, New York, USA: Raven Press, 1985: 262-3.
- Colier BD, Johnson RP, Carreva GF *et al.* Painful spondylolisthesis studied by radiography and single photon emission computed tomography. *Radiology* 1985; **154**: 207.
- Bodner RJ, Heyman S, Drummond DS, Gregg JR. The use of single photon emission computed tomography (SPECT) in the diagnosis of low back pain in young patients. *Spine* 1988; **13**: 1155-9.
- Bellah RD, Summerville DA, Trevas ST, Micheli LJ. Low back pain in adolescent athletes: detection of stress injury to the pars interarticularis with SPECT. *Radiology* 1991; **180**: 509-12.
- Cyriax P. *Illustrated Manual of Orthopaedic Medicine*. Oxford, UK: Butterworth Heinemann, 1992.
- Reid DC. *Sports Injury (Assessment and Rehabilitation)*. Edinburgh, Scotland: Churchill Livingstone, 1992: 789-835.
- Hutson MA. *Sports Injuries, Recognition and Management*. Oxford, UK: Oxford Medical Publications 1990: 86-93.
- Fitch K. Controversial issues in sports medicine. *Proceedings of Australian Sports Medicine Federation National Scientific Conference Adelaide* 1987; **1**: 282-5.
- Mennel J. Instructional course, Southampton General Hospital, Southampton, UK, 1986.
- Fredrickson BF, Baker D, McHollick WJ, Yuan HA, Lubicky JP. The natural history of spondylolysis and spondylolisthesis. *J Bone Joint Surg [Am]* 1984; **66-A**: 699.
- Hoshini H. Spondylolysis in athletes; *Phys Sportsmed* 1980; **8**: 75.
- Weber MD, Woodall WR. Spondylogenic disorders in gymnasts. *Journal of Orthopaedic and Sports Physical Therapy* 1991; **14**: 6-13.