LOW BACK PAIN WITH FRACTURE OF THE PEDICLE AND CONTRALATERAL SPONDYLOLYSIS

A TECHNIQUE OF SURGICAL MANAGEMENT

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We present a 26-year-old athlete with severe low back pain associated with a fracture of a lumbar pedicle and contralateral spondylolysis. The difficulties of diagnosis are discussed together with the subject of segmental pain referral. A technique of operative management is described involving instrumentation of the symptomatic level alone.

A fracture of the pedicle associated with a contralateral spondylolysis is an unusual cause of back pain, and difficult to diagnose with plain radiographs. These features combined with a lack of awareness of the condition may lead to more radical surgery than is required.

To improve the understanding and management of this condition a case history is analysed in detail together with a review of the literature.

CASE HISTORY

A 26-year-old physical education instructor and cricketer presented with a 16-month history of pain in his lower back and right thigh. The back pain began after intense training for cricket, eased with rest, but returned during training. Some months later he developed episodes of lower right abdominal pain which lasted for periods of up to a few hours. His left leg was not involved except for a three-week period of numbness involving the antero-medial aspect below the knee. When the cricket season finished his back and abdominal pain improved.

Symptoms on referral. Some months later, when he began training again, his back pain returned with its previous

intensity, situated centrally between the posterior iliac crests. With exercise there was a referral of pain to his right thigh and lower right abdomen.

Examination. No abnormality was found on clinical examination. He was six feet tall (1.83 m) and weighed 83 kg; he had a full and painless range of motion of his lumbar spine and there were no abnormal neurological findings.

Investigations. Conventional straight radiographs showed no abnormality apart from sclerosis of the right L4 pedicle (Fig. 1). It was thought that this might represent an osteoid osteoma or osteoblastoma. An isotope bone scan revealed increased uptake coincident with the sclerosis but also, to our surprise, increased uptake on the left at the same level (Fig. 2). Computerised tomography was then carried out and revealed a fracture of the base of the right pedicle with sclerosis and a unilateral pars interarticularis defect on the left at the same level (Fig. 3).

TREATMENT

Following the identification of these lesions, and in view of the failure of conservative management to allow this man to pursue his cricketing career, we decided to operate. Through a midline incision the L4 lamina was exposed on each side. The fracture of the right pedicle was treated as a hypertrophic nonunion and fixed with a pedicular screw to effect compression and stabilisation at the fracture site. The screw was placed laterally to prevent impingement at the L3/4 facet joint during lumbar extension. The contralateral pars defect was also treated in a direct manner using the screw fixation technique described by Buck (1970) for spondylolisthesis.

Immediately following the operation the patient

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Figure 1 – PA radiograph of the lumbar spine showing sclerosis of the right L4 pedicle. Figure 2 – Bone scan. Increased isotope uptake on both sides at the L4 level.

Fig. 1

Fig. 2

Fig. 3a

Fig. 3b

Figure 3a – CT at L4 showing fracture and sclerosis of the base of the right pedicle. Figure 3b – CT at L4 (a different section) showing a unilateral spondylolysis on the left side in addition to the changes noted on the right.

PA radiographs six months postoperatively showing placement of the screws.

Fig. 4a

Fig. 4b

reported complete loss of his pre-operative low back and right abdominal pain. He was given a moulded polythene lumbar support for six weeks. At six months the patient remained free of symptoms and had returned to his previous sporting activities. Straight radiographs revealed no displacement or breakage of the screws (Fig. 4) and a CT scan showed bony union of both defects.

It is now over one year since the operation and he remains asymptomatic. His last cricketing season was

his best ever and his bowling capabilities and prospects were reported in the national press (Fig. 5).

DISCUSSION

Sherman, Wilkinson and Hall (1977) reported 11 cases of unilateral spondylolysis associated with sclerosis of the contralateral pedicle. The sclerosis was considered to reflect a response to stress created by an unstable neural

arch. No fracture was ever identified. In the earlier cases it was considered that the diagnosis might be that of an osteoid osteoma or osteoblastoma. Excision of the pathological lesion, however, revealed no tumour. In later cases when conservative measures failed, surgical management was recommended with fusion to the level above and below. All 11 patients had significant backache on presentation and one had transient abdominal pain. The mean age at diagnosis was 15 years and the right pedicle was involved in nine of the 11 cases. In one patient the lesion was at L2, one was at L3 and the remaining nine were at L4 and L5.

In 1982 Porter and Park considered the subject of unilateral spondylolysis and examined five isolated vertebral specimens. They noted that it was extremely difficult to demonstrate a unilateral spondylolysis radiologically by any single technique and postulated that it might in some instances be a cause for back pain.

Aland et al (1986) reported a fracture of the right pedicle of L4 associated with a contralateral spondylolysis in a 26-year-old male. Computerised tomography demonstrated sclerosis of the pedicle associated with a fracture not seen on the plain radiographs. The patient had back pain and symptoms referable to the right L4 root. He was treated by excision of the pedicle and a lateral fusion from L3 to L5.

In 1986 Garber and Wright reported the same condition in a 25-year-old man with the right L4 pedicle involved. Computerised tomography was again the investigation which revealed the fracture. Treatment in this case involved grafting the spondylolytic defect and drilling and grafting the right pedicle. One-level internal fixation was then carried out using a wire as reported by Nicol and Scott (1986) for spondylolysis.

Our patient was athletic, as were the previously reported cases, and of a similar age. Fast bowling in cricket is an activity which imposes strenuous extension, rotation, and flexion upon the lumbar spine. Furthermore, many of the world's elite in this field have had their careers affected by spondylolysis and spondylolisthesis.

As with the majority of previously reported cases one of the lower two lumbar levels was affected. The involvement of the right pedicle in the majority of cases may reflect right-sided dominance when turning and throwing. Several factors would seem to suggest that the symptomatic lesion in these cases is a stress fracture. It is likely, as proposed by Sherman et al (1977) that this occurs in response to abnormal stress created by a deficiency in the posterior contralateral neural arch. It is possible that the nature of the physical activity and the skeletal age at the time of these stresses may be factors which determine whether a unilateral pars defect is followed by a contralateral pars defect (as in two of the nonoperated cases in their series) or whether it is followed by a stress fracture of the contralateral pedicle.

The initial diagnosis in these cases was an osteoid osteoma or osteoblastoma. The basis for this diagnosis

was severe back pain requiring regular analgesia in an otherwise fit young person, with dense sclerosis of a pedicle on plain films and no other radiological abnormality.

In our case a bone scan highlighted an undetected abnormality on the contralateral side and both lesions were confirmed by computerised tomography. Clearly this investigation should be considered in any case in which there is sclerosis of a pedicle on plain radiographs. The failure of Sherman et al in 1977 to identify a fracture indicates the limitations of simple radiography, computerised tomography being not then available. The failure of plain radiographs to identify a unilateral spondylolysis was well shown by Porter and Park (1982).

Fig. 5

The patient fast bowling nine months postoperatively (reproduced by courtesy of the *Sunday Independent*).

Our patient's principal complaints were low back pain and proximal right thigh pain. In addition he reported occasional episodes of lower right abdominal pain. These symptoms were associated with a lesion involving the right pedicle, on the medial and inferior side of which passes the right L4 nerve root. Compression of the L4 nerve root may produce altered sensation over the anteromedial aspect of the lower leg, an absent knee jerk, altered motor function and pain on stretching the femoral nerve. None of these were present in this case. In our experience, however, lesions involving the L4 level frequently give rise to lower abdominal pain on the ipsilateral side. Whether the pattern of pain referral in our case represents a lesser degree of L4 root compression or involvement than that producing the well-established symptoms and signs reported above, or whether it represents non-radicular pain referral, is difficult to know. If it represents the latter then it is of interest to note that the side of the pain may still indicate the side of the lesion at least when this involves the pedicle. By

contrast, the short episode of numbness affecting the anteromedial aspect of the left lower leg would indicate involvement of the L4 root on that side. Presumably this occurred in relation to the ipsilateral pars defect. The fact that the pattern of symptom referral in this man was so different on the two sides of the body, from different lesions at the same level indicates the need for further study in this field and perhaps a review of established teaching.

In the paper by Sherman et al (1977), the surgical management employed, when conservative measures were not effective, was resection of the pedicle combined with fusion to the level above and below. However, when histological studies showed no evidence of tumour but simply homogenous dense bone, surgical treatment in the later cases consisted of a three-level fusion without resection of the pedicle. Garber and Wright (1986) did not resect the pedicle but grafted both lesions and then used the wiring technique of Nicol and Scott (1986) to provide internal fixation at the same level.

We report an even simpler and more direct approach

to the problem. Each lesion was regarded as a hypertrophic nonunion and treated by compression fixation. This form of surgical management proved highly effective and has been most rigorously tested in our patient. We would recommend its use for similar cases.

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