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Patient with a lumbar vertebra fracture. Clinical discussion

This is a new feature for *Paraplegia* and is due entirely to Dr Barros who suggested it during the editorial board meeting of the journal at the IMSOP Scientific Meeting in Gent, Belgium on 25–28 May 1993.

The idea is that an author provides a succinct description of a SCI patient, including relevant x-rays that have so far been taken, and gives an outline of his/her management of the patient. The history, clinical findings and x-rays are sent to a number of other clinicians in different countries and departments, and each senior doctor in these departments is asked to consider the case and to provide an outline of their (possible further) investigations and treatment and the likely clinical (and radiological) outcome.

These reports are then sent to the doctor who has set up the clinical discussion and all of the material is sent on to the editorial secretary of *Paraplegia* in the office in Edinburgh.

What I now desire are comments from other readers of the journal, please, as soon as possible and I will then summarise the various answers.

You will observe that Dr Barros' first clinical discussion case certainly presents a very interesting therapeutic challenge.

I seek more such clinical discussion cases along the lines of the first one by Dr Barros. Please send them on to the office in Edinburgh.

Phillip Harris
Editor

Case presentation

A 17 year old man suffered a car accident and complained of back pain. Neurological examination of the lower limbs was normal. A radiograph taken at the emergency unit revealed an L4 fracture (Figs 1a and 1b). A CT scan showed an L4 fracture with important encroachment on the vertebral canal (Fig 2).

How should this patient be treated?

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First opinion

We are presented with a 17 year old boy with an L4 burst fracture due to a car accident. He has only back pain and the neurological examination is normal. The plain x-rays show a 40% vertebral wedging, but the posterior column is intact. There is no lumbar kyphosis and no widening of the distance between the spinous process of L3 and L4. It is a type B burst fracture following the Denis[1] classification. The CT scan shows a large protruding fragment of bone occupying 50% or more of the lumbar vertebral canal. Classically the thecal compression is at the pedicle level. The absence of neurological compromise in this patient is explained by the posterior localisation of the cauda equina roots in the dural sac. For this patient I would advise conservative treatment. I would advise bedrest for about 3 weeks, and then he may start walking wearing a TLSO for 3 months. I would expect a good result with conservative treatment as has been shown by us,[2] and by other authors.[3,4] There is a great likelihood of remodelling of the lumbar vertebral canal,[2] with the patient returning to his previous activities.

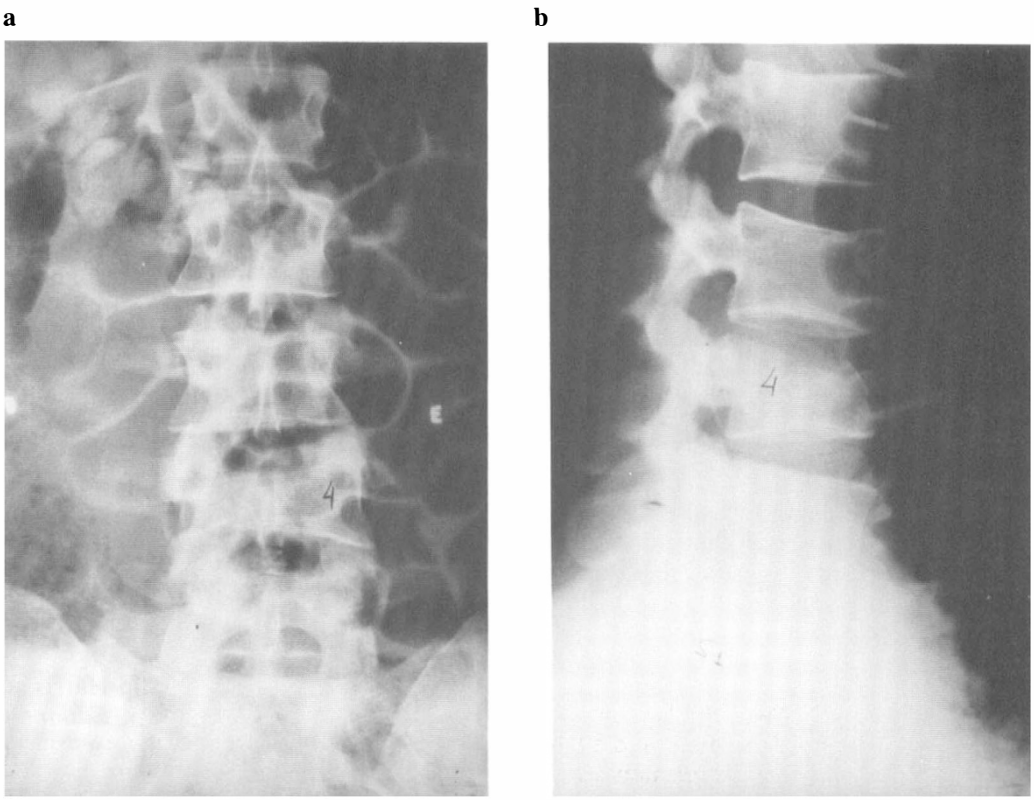

Figure 1 Radiographs showing L4 fracture. (a) Anteroposterior film. (b) Lateral film.

Figure 2 CT scan showing L4 fracture with encroachment on vertebral canal.

1 Denis, F (1983) The three column spine and its significance in the classification of acute thoracolumbar spine injuries. *Spine* **8**: 817–31.
2 Barros Filho TEP, Basile Jr R, Oliveira RP, Greve JM, Taricco MA (1993) Remodelling of the spinal canal after lumbar burst fractures. *J Am Paraplegia Soc* **16**: 104.
3 El Masry WS (1993) Neurological significance of bony canal encroachment following traumatic injury of the spine in patients with Frankel C, D, and E presentation. *J Am Paraplegia Soc* **16**: 105.

4 Mumford J, Weinstein JN, Spratt KF, Goel VK (1993) Thoracolumbar burst fractures. The clinical efficacy and outcome of nonoperative management. *Spine* **18**: 955–70.

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Second opinion

In the case of the 17 year old man with an L4 severe fracture, my opinion is as follows.

A compression fracture of L4 with instability, compression of the spinal canal, and no neurological lesion: absolute indication for spinal surgery; a posterior approach, decompression–reduction–stabilisation by transpedicle screws and Steffee plates, transpedicle bone grafting.

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Third opinion

Regarding my approach to this patient with a burst fracture of L4 (Denis, type B), I will attempt to clarify the assessment and evaluation strategies that I would employ to form an appropriate decision analysis for management of this 17 year old male.

The history is succinct. I would want to know if the boy was wearing a lap type seat belt. Although I do not see a distraction component on the AP, lateral x-ray, and the CT scan, this information is important in order to avoid overlooking an even more unstable injury. Neurological examination findings concerning lower limb function were normal. I would also carefully check anal sphincter tone, and ensure that the patient had normal genitourinary function. This is often difficult to assess in the injured patient who is provided with a urinary catheter immediately upon arriving in the emergency room. With the amount of retropulsion demonstrated in this patient a careful and complete neurological evaluation is essential. Finally, I would want to ensure that no other associated injuries were present, including spinal injury at another level. Forces sufficient to cause the injury seen in this patient can certainly result in injury to other organ systems as well as to other areas of the spine.

Once I have become satisfied that the patient is physiologically stable and the only injury is the burst fracture at L4, I would discuss the options of treatment with the patient and family and formulate my recommendations. I do not believe that nonoperative management is the most appropriate treatment in this patient although if he truly is completely neurologically intact, recumbency followed by casting or bracing may be a consideration. I would personally recommend surgical decompression and stabilization through a posterior approach, with decompression via the pedicles so that an 'anterior' decompression is complete. Intraoperative ultrasonography can help to ensure that an adequate decompression has been achieved. I prefer the posterior approach at this cauda equina level since the dural tear which will most likely be encountered can be repaired. Our experience with transpedicular decompression has been excellent at Vanderbilt. The split laminar fracture, seen in the CT scan, allows me to speculate regarding dural laceration, approximately a 35% chance. I would use prophylactic antibiotics prior to and during surgery for a total of 24 hours. During the surgery, evoked potentials would be monitored.

Once an adequate decompression has been obtained, initial stabilization would be achieved with pedicle screws at the L3 and the L5 levels. I would most likely use a rod system with compression posteriorly to 'shorten' the posterior column in order to decrease the chance of kyphosis. Offset laminar hooks could be considered distally to decrease the likelihood of kyphosis. Cross linking the construct would add also to the stability. A posterior–lateral fusion with autograft from the iliac crest would be performed.

My postoperative management would include a moulded plastic orthosis for approximately 4 months. The patient could begin walking as soon as the brace was fitted following surgery, hopefully on the second postoperative day. Cyclic compression stockings would diminish the likelihood of deep venous thrombosis. I would follow the patient up for at least 2 years. I would anticipate a good clinical outcome, with a slight loss of lumbar lordosis.

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Fourth opinion

The patient has suffered an unstable three column burst fracture of L4 with approximately 80% compromise of the spinal canal without a neurological injury. The optimal treatment of burst fractures remains a controversial topic with proponents of both nonoperative and operative methods. Nonoperative treatment of burst fractures consists of bedrest followed by gradual mobilization in a brace. Surgical options include posterior fusion using distraction instrumentation with ligamentotaxis to reduce the retropulsed fragments, posterolateral decompression and fusion, and anterior decompression and fusion.

Advocates of surgical intervention argue that stabilization with direct or indirect decompression restores the spinal canal anatomical dimensions, improves neurological recovery, allows earlier mobilization of patients, and prevents late deformity. In addition, early stabilization and mobilization decrease the length of hospitalization thereby reducing the incidence of medical complications and overall medical costs. Therefore, surgical intervention has gained popularity. Unfortunately, operative treatment is not without risks including neurological injury.

Proponents of nonsurgical treatment claim that many of the reasons cited for operative treatment have not been borne out by studies. In fact, operatively treated and conservatively treated patients had no detectable differences in neurological recovery in several series. Kinoshita *et al*[1] reported that in 22 of 23 nonoperatively treated patients there was no significant increase in kyphosis. This study also confirmed prior findings that the dimension of the spinal canal gradually normalizes in time, with remodelling without late neurological sequelae. In this particular patient, we recommend nonoperative management with bedrest and gradual mobilization with bracing.

Prolonged bedrest would not be medically detrimental to a healthy 17 year old, and the risks associated with surgery are significant in this patient without neurological deficits. The patient's neurological status should be carefully monitored, with any deterioration (though unlikely) necessitating surgical intervention. If such a change occurs within the first 48 hours after injury, we would attempt distraction with instrumentation, as ligamentotaxis is only effective in this short time period. For late neurological symptoms, an anterior decompression would be necessary with a good chance of recovery as was described by Reid *et al*.[2] At the Rancho Los Amigos Medical Center we treat all neurologically intact patients with this fracture pattern nonsurgically.

1 Kinoshita H, Nagata Y, Ueda H, Kishi K (1993) Conservative treatment of burst fractures of the thoracolumbar and lumbar spine. *Paraplegia* **31**: 58–67.

2 Reid DC, Ch M, Hu R, Davis LA, Saboe LA (1988) The nonoperative treatment of burst fractures of the thoracolumbar junction. *J Trauma* **28**: 1188–1194.

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Fifth opinion

Regarding the case of the 17 year old youth who sustained an L4 burst fracture and had a normal neurology, obviously it is difficult to comment without having all of the information and some of the x-ray films. Looking at the information you sent to me, however, the AP x-rays show a widening of the pedicles with about a 30–40% compression of the body of L4 anteriorly, and the CT scan shows at least two column involvement with the anterior and middle column being involved with the significant retrodisplacement of the middle column. As you know, in our article on thoracolumbar burst fractures, looking at the efficacy and outcome with nonoperative management[1] we looked at 41 patients who presented with burst fractures of the thoracolumbar spine without neurological deficit. At injury, canal compromise averaged 37% but ranged up to as high as 66%. Only one patient had neurological deterioration that prompted surgical intervention. All of the other patients remained neurologically intact. At 2 year follow up, 49% of the patients had an excellent outcome relative to pain and function; 63% had an overall excellent to good outcome; 17% had a good outcome; and 34% had a fair to good outcome. Ninety percent of the patients had a satisfactory work status and serial roentgenograms documented significant progression of body collapse with an average of 8% from injury to follow up. On the other hand and more importantly, serial CT scans demonstrated significant improvement in canal compromise and midsagittal diameter from the time of injury to follow up. Average improvements were 22%, which was highly significant. On an average, nearly two thirds of the fragments in the canal were resorbed with most remodelling being complete at the end of 1 year.

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1 Mumford J, Weinstein JN, Spratt KF, Goel VK (1993) Thoracolumbar burst fractures. The clinical efficacy and outcome of nonoperative management. *Spine* **18**: 955–970.