Fracture and complete dislocation of the spine with a normal motor neurology


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Introduction

Spinal injuries are becoming increasingly common as a result of the increasing number of high velocity road traffic accidents. Fracture dislocation of the spine with overriding of fragments are rarely described in the literature and they are usually associated with neurological deficit. We present our experience with managing such a case with intact motor neurology.

Case report

A 21-year-old male presented to us following a road traffic accident. At the scene he had a GCS of 15/15 and was able to move all limbs but complained of some paraesthesiae in his right leg. It took 3 h to extricate him at scene and was immobilised on a spinal board. He had a complete ATLS protocol in emergency room and during secondary survey bruising and a step in the spine was noted. The patient had MRC grade five power in both lower limbs and decreased sensations of pain, temperature and touch in L2 dermatome on the right side. His imaging studies included plain radiographs, CT scan with reconstruction and MRI scan. CT scan of his spine revealed a complete fracture dislocation L1–L2. According to the Maegerl Classification it was Type C3.2 (Figs. 1–3). Associated injuries were fractured right 9–12 ribs, dislocation of 11 and 12 ribs from the costo-vertebral junction, and bilateral haemopneumothoraces for which chest drains were inserted.

MRI scan showed a fracture through the L1/2 disc near the superior endplate of L2. The L2 vertebral body was dislocated laterally and to the left and had ridden up alongside the L1 vertebral body. There was a 90° kink in the thecal sac at the level of the fracture (Figs. 4 and 5).

Patient was admitted to the High dependency unit and nursed on an Edgerton spinal bed with full spinal precautions. A baseline electromyogram (EMG) study and somatosensory evoked potential (SSEP) was performed on HDU prior to planned surgery.

Surgery was performed at 48 h after the initial trauma on an elective spinal theatre list with all the necessary personnel available and spinal cord monitoring. The patient was carefully log rolled into a prone position. A posterior approach was used and there was extensive soft tissue stripping revealing the fracture dislocation with an associated dural tear. The intraoperative finding confirmed our
pre-operative impression that the patient had fractured the pedicles in a manner that allowed preservation of neurological function despite gross malalignment (Fig. 6).

Pedicle screw instrumentation was performed two levels above and below. The superior and inferior lamina was further decompressed and in particular bone fragments were removed to allow further decompression without damage to the thecal sac. Traction was employed by two personnel pulling on the feet and shoulders simultaneously and the surgical team were able to manipulate the pedicle screws of the spine to a normal anatomical position.

The L1–L2 disc was excised from a posterior approach and fused with a Moss Cage filled with an iliac crest graft to recreate normal sagittal balance.

Figure 1 X-ray of the spine showing the fracture dislocation.

Figure 2 A three-dimensional reconstruction of the fracture dislocation of the spine.

Figure 3 Three-dimensional posterior view of the spine.

Figure 4 MRI showing the tenting of the dural sac with a 90° kink in the dural sac.
The fracture dislocation was stabilised with rods and cross connectors Figs. 7 and 8. The SSEPs showed good stability in amplitude and latency throughout the procedure and showed no change when the spine was re-aligned. Nerve root monitoring during re-alignment did show some short-lived bursts of motor units but these did not persist once the correction had been completed. The operative time was 5 h and the blood loss was 800 ml. Postoperatively, the patient was in the HDU for 24 h. He had a stable neurology throughout the post-operative period. Check radiographs were performed and were satisfactory (Figs. 7 and 8).

The patient was mobilised with a Jewitt-Extension brace for 6 weeks. He was discharged from the hospital on day 5. He was weaned off the brace at 6 weeks. At 9 months follow up the patient has fully recovered with a normal neurology and there is no implant failure. We are not planning to remove the implants.

Discussion

Rotational injuries are the severest injuries of the thoracic and the lumbar spine and are associated with the highest rate of neurological deficit. 5,9 Denis 5 described such shear injuries of the spine. However, all the patients in his series had paraplegia. Surgery is usually required in such cases because of the high degree of instability and poor healing associated with disco-ligamentous injuries. 9 C3 type fractures had an incidence of 1.11% of abnormal neurology in Maegerl’s series of 1445 thoracolumbar fractures. Intact neurology is rare in C3 type injuries. Looking at previous case series, Garin et al. 6 described rotational injury in a 14-year-old girl with disruption of the cartilage and dislocation of a single facet without any neurological deficit. Chen 3 and Smith and Love 12 described a shear fracture dislocation of the L4–L5 level with an intact neurology however it was a shear injury with no rotational elements and there was no overriding of the fragments or shortening of the spine as in our case.

Spontaneous decompression of the posterior elements explains the preservation of neurology. In this case, there was a fracture of the right pedicle of L1.
and a left pedicle of L2 with separation of anterior and posterior elements (Fig. 9).

Other authors in their case reports described this pattern of injury (Korovessis et al., Abdel-Fattah and Rizk, de Lucas et al.). Simpson et al. described bilateral pedicular fractures causing posterior “floating arches” which accounted for cord sparing in their series of three patients. Admission to the ITU/HDU is necessary due to the unstable nature of these injuries and the need for a closer monitoring to prevent secondary cord injury. Pressure care and pain relief are extremely important.

Timing of the surgery is controversial. It is the authors’ opinion that it is important to understand the personality of the fracture and mechanism
of injury before attempting surgical stabilisation. Multidisciplinary approach is important in managing these difficult injuries, particularly radiologists input in planning the surgical strategy cannot be overemphasised. This is particularly important in patients with normal neurology. In our opinion, surgery is best carried out on the next available elective list with appropriately trained personnel.

Careful pre-operative planning to understand the nature of injury and plan of intraoperative reduction is very essential and we advise adequate CT scanning and MRI scanning in the pre-operative planning phase.

The goals of surgery were (1) *Primum non-nocere*—do no more harm. (2) Posterior decompression and prevention of secondary damage to the thecal sac. (3) Anatomic reduction and restoring mechanical stability.

For intraoperative spinal cord monitoring, we preferred to use somatosensory evoked potentials (SSEPs) instead of motor evoked potentials (MEPs). This was because SSEPs has a less latent time and has been shown to have the highest probability of detecting a surgically induced neurological deficit. We performed the surgery with continuous monitoring of the spinal cord using this electrophysiological study which we feel is mandatory during the reduction and stabilisation of these types of injuries.

References