Thoracolumbar fracture-dislocations can be devastating injuries. These injuries tend to disrupt the bony and ligamentous structures that provide stability to the spine and are often associated with neurological injury. Surgical stabilization is often undertaken through a posterior approach with segmental pedicle screw instrumentation. Many techniques are available for the reduction of cervical spine fracture-dislocations.1–6,8 Little has been written on how thoracolumbar dislocations should be reduced. Usually these dislocations are reduced during surgery by removing a portion of the superior articular facets of the caudal vertebrae. We present a reliable method of reducing the spine without significantly disrupting the facet complex.

**Methods**

This project was exempt from institutional review board review. It is a retrospective review of 8 cases of thoracolumbar fracture-dislocations in patients presenting to a Level 1 trauma center. In all 8 cases, the described reduction technique was used. The patients presented to MetroHealth Medical Center immediately after sustaining a significant injury to the thoracolumbar spine between April 2007 and September 2009. All patients underwent a CT scan and evaluation by the spine service. The patients’ neurological examination findings were documented on presentation and again 3 days after injury. On the basis of the neurological examination and the ASIA Impairment Scale, the patients’ condition was classified as ASIA A in 6 cases, ASIA C in 1, and ASIA E in 1. The patients’ demographic characteristics and Thoracolumbar Injury Classification and Severity Scores are presented in Table 1. Figure 1 left and right shows the sagittal and axial CT scans obtained in Case 6. We propose the “tree sign,” which can often be seen on an axial CT cut through the level of the dislocation, as characteristic of these injuries.

All patients were offered posterior surgical stabilization to aid in their rehabilitation. All patients underwent surgery within 12 hours of their presentation to the hospital. One patient returned to the operating room 10 days after the initial procedure for incision and drainage of a superficial iliac crest wound infection. Follow-up intervals were 24 months in 5 patients, 18 months in 2 patients, and 12 months in 1. Postoperative lateral radiographs were obtained to ensure maintenance of the thoracolumbar reduction (Fig. 2).

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**Abbreviation used in this paper: ASIA = American Spinal Injury Association.**
Operative Technique

All patients were positioned prone on a Jackson table. Somatosensory evoked potential monitoring was used in 2 cases. Recordings were made at baseline and during surgery in these 2 patients (whose condition was classified as ASIA C and E); no monitoring was used in the remaining 6 (whose condition was classified as ASIA A). A standard posterior longitudinal incision was made over the involved levels. There was significant disruption of the thoracolumbar fascia in all 8 patients. Dissection was carried out in the usual manner to expose the facet joints and pars interarticularis of the affected levels.

None of the patients had reduction of the dislocation by prone positioning. The reduction of the dislocation was performed in the following manner: Pedicle screw instrumentation was inserted at the vertebral levels of the dislocation in all but 1 case. In Case 8, the left T-12 pedicle was fractured and not acceptable for instrumentation. More cranial and caudal points of fixation were accomplished with pedicle screws usually 1 level above and below the dislocated level. Once the pedicle screws were

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age (yrs), Sex</th>
<th>Mechanism of Injury†</th>
<th>Fracture Level</th>
<th>TLICS</th>
<th>Sx Levels</th>
<th>ASIA‡</th>
<th>SSEP</th>
<th>FU (mos)</th>
<th>Complications</th>
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<tbody>
<tr>
<td>1</td>
<td>30, M fall (40)</td>
<td>T10–11</td>
<td>6</td>
<td>T7–12</td>
<td>E/E</td>
<td>yes</td>
<td>24</td>
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<td>18, M fall (30)</td>
<td>T11–12</td>
<td>8</td>
<td>T10–L2</td>
<td>A/A</td>
<td>no</td>
<td>24</td>
<td>none</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>18, F MVC</td>
<td>T12–L1</td>
<td>10</td>
<td>T12–L2</td>
<td>C/E</td>
<td>yes</td>
<td>24</td>
<td>graft site infection</td>
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<td>T12–L1</td>
<td>8</td>
<td>T11–L2</td>
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<td>no</td>
<td>24</td>
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<tr>
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<td>8</td>
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<td>A/A</td>
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<td>24</td>
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<tr>
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<td>T11–L2</td>
<td>A/A</td>
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<td>18</td>
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<tr>
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<td>8</td>
<td>T11–L2</td>
<td>A/A</td>
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<td>T10–L2</td>
<td>A/A</td>
<td>no</td>
<td>12</td>
<td>none</td>
<td></td>
</tr>
</tbody>
</table>

* FU = follow-up; MVC = motor vehicle collision; SSEP = somatosensory evoked potential recording; TLICS = Thoracolumbar Injury Classification and Severity Score.
† Values in parentheses are distance in feet.
‡ ASIA Impairment Scale scores obtained in the initial examination and 3 days later.
Thoracolumbar dislocations

inserted, attention was directed to the reduction of the dislocation.

A temporary rod was inserted transversely between the pedicle screws of the same level at the level above and below the dislocation. The screw caps were tightened provisionally without being torqued. Vice grips were secured to the rods between the cranial and caudal screws for control of the segments. The reduction maneuver was slight distraction to unlock the facets and ventral force on the distal segment to “cover” the superior facets of the distal segment (Video 1). The rods were removed and the fusion was carried out routinely.

Video 1. Intraoperative video clip showing actual reduction maneuver in Case 6. The cranial direction is to the left, caudal to the right. Reduction is accomplished by distraction and ventral force on the caudal segment to cover the superior articular facets. Click here to view with Quicktime. Click here to view with Windows Media Player.

All 8 dislocations were reduced using this technique. During the reduction maneuver, CSF was apparent in 4 of the cases. Once the segments were reduced, there was no CSF leakage, and therefore dural repair was not performed. Decompression in the form of a laminectomy was not performed in any case. There was no change in the spinal cord monitoring during or after the reduction maneuver in the 2 cases in which monitoring was used.

Discussion

Thoracolumbar fracture-dislocations are considered to be unstable injuries. These injuries often involve surgical intervention to stabilize the dislocated segment. The goal of the surgery is most often stability, with reduction of the dislocation and segmental instrumentation.

To our knowledge this is the only description of a reduction maneuver for thoracolumbar dislocations. Often these injuries are reduced by removal of a portion of the superior articular facets of the caudal vertebra and pulling the cranial vertebral dorsally, allowing the instrumentation to be locked with the injured vertebrae in the reduced position. The advantage our technique affords is maintaining the integrity of the normal anatomy without the need to disrupt the facet joints. Maintaining the superior articular facets may impart greater stability following surgery. Moreover, there is less risk to the neurological elements in that they are not exposed by removal of the facet complex.

In our small series of patients, spinal cord monitoring was used in 2 cases. There was no change in the monitoring from baseline to positioning to after reduction of the dislocation. This technique might be safely used in patients who are neurologically intact or have incomplete spinal cord injuries without incurring further or new neurological damage.

Disclosure

Dr. Steinmetz reports a relationship as a consultant with Biomet Spine. Dr. Anderson reports that he is a patent holder of devices marketed by Stryker and Pioneer as well as having an ownership interest in Pioneer and consulting for Medtronic.

Author contributions to the study and manuscript preparation include the following. Conception and design: Moore. Acquisition of data: Moore. Analysis and interpretation of data: Moore. Drafting the article: Moore. Critically revising the article: all authors. Reviewed submitted version of manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Moore. Administrative/technical/material support: Moore. Study supervision: Moore.

References


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