May 2010

Operative management of unstable thoracolumbar burst fractures

Mujahid Jamil Khattak  
*Russell's Hall Hospital NHS Foundation Trust, UK*

Shakir Syed  
*Russell's Hall Hospital NHS Foundation Trust, UK*

Riaz Hussain Lakdawala  
*Aga Khan University*, riaz.lakdawala@aku.edu

Follow this and additional works at: [http://ecommons.aku.edu/pakistan_fhs_mc_surg_surg](http://ecommons.aku.edu/pakistan_fhs_mc_surg_surg)

Part of the [Orthopedics Commons](http://ecommons.aku.edu/pakistan_fhs_mc_surg_surg)

**Recommended Citation**


Available at: [http://ecommons.aku.edu/pakistan_fhs_mc_surg_surg/250](http://ecommons.aku.edu/pakistan_fhs_mc_surg_surg/250)
INTRODUCTION

Despite advances in techniques and instrumentation, optimal approach for treatment of disrupted spinal segments remains debatable.1,2 Choosing the most appropriate technique, requires knowledge and ability to define the extent of injury as well as appreciation of rationale of treatment methods. The goals of surgical intervention are restoration of alignment, stabilization and improvement of neurological recovery without further damage. It is difficult to decide on a single surgical technique that can manage all injuries. The selection of surgical approach (anterior, posterior or combined), type of instrumentation and modes of reconstruction (bone grafts/cages) must be planned. Analysis of fracture, patient condition, limitations of working environment and shortcomings of instrumentation, a rationale decision making process should be used to maximize benefits and diminish risks.

This report describes the surgical management of burst thoracolumbar vertebral fractures.

METHODOLOGY

All surgically managed cases of burst thoracolumbar vertebral fractures were reviewed. Patients were identified through computerized medical record system. The criteria for instability was neurologic instability, a three column injury or a two column injury with major comminution (kyphosis > 30°).3 Stable fractures managed conservatively or pathologic fractures with operative intervention were excluded. Ten patients fulfilled the criteria. Outcome measures included, functional assessment by Hanover spine score.4 Frankle grades of neurology were used as part of the Hanover spine score. Data before fracture were obtained to establish a pre-trauma functional level. At each follow-up, AP and lateral radiographs were obtained for radiological assessment. Degree of kyphosis was measured as described by Knight et al.5

Data were summarized using mean and standard deviation. Since most of the variables were not normally distributed, comparison of means was done using non-parametric test, i.e. Wilcoxon sign ranks test for two related samples. P-value < 0.05 was considered significant.

RESULTS

Patients and injury details along with surgical procedure are mentioned in Table I. The mean operative time was 4.2 hours with average blood loss of 900 ml. No intra-operative or immediate postoperative complications were noted. Mean hospital stay was 19 days. The range of follow-up was from 5 months to 60 months. One patient lost to follow-up in the immediate postoperative period. There was statistically significant difference (p=0.008) between mean pre-operative and post-operative Hanover spine score. Likewise, there was significant difference (p=0.006) between mean immediate postoperative and final follow-up kyphosis.
DISCUSSION

The goals of operative intervention for thoracolumbar trauma are anatomic reduction rigid fixation and stabilization and neural decompression, whenever indicated. Different operative approaches were employed to obtain these goals in this series. Although mean postoperative drop in the Hanover spine score was significant, postoperative score was fairly high in most of the cases, except a few.

Case number 9 and 2 in Table I, had similar injuries, but the postoperative Hanover scores are different (86 versus 45). Although both patients had posterior instrumentation, the difference was short segment pedicle screws fixation, single level above and below the injured vertebra, in case 9, as compared to two levels above and below in case 2. Fixation levels need to be considered critically. Short segment fixation can attribute to loss of correction in the absence of anterior reconstruction (bone graft or cage) and high fatigue failure rates. Also, the case 9 had some residual pain in L2 dermatome, which was noted in the follow-up clinic. Pedicle screw fixation is technically demanding and has limitations and problems. One should have reasonable training and expertise before practicing this system.

Another case with low functional score was case 7 in Table I. This patient had L1 burst fracture with neurogenic bladder (Frankle grade C). He was managed by short segment pedicle screw instrumentation only (D12-L1: one level above and below the injured level). Per operative kyphosis correction achieved was from 39 to 3 degrees. He had kyphosis of 8 degrees in the final follow-up evaluation (loss of 5 degrees). This patient still has bladder problem and his postoperative score at final follow-up was 42 (base line: 98). On retrospective review, we believe that anterior surgical approach might have resulted in a better outcome. The amount of bony comminution with the primary injury was extensive and failure to support the anterior column after posterior correction is associated with higher risk of loss of kyphosis as well as instrumentation failure when compared to a combined approach or anterior approach.

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age</th>
<th>Gender</th>
<th>Injury</th>
<th>Surgical procedure</th>
<th>Pre-operative Hanover spine score</th>
<th>Postoperative score-final follow</th>
<th>Pre-op Kyphosis</th>
<th>Immediate post-op Kyphosis</th>
<th>Final follow-up Kyphosis</th>
<th>Loss of Kyphosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>F</td>
<td>L2 burst fracture, incomplete parapresis below L3</td>
<td>Anterior decompression and instrumented fusion with iliac crest bone graft</td>
<td>98</td>
<td>85</td>
<td>30</td>
<td>-1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>34</td>
<td>F</td>
<td>L1 burst fracture, normal neurology</td>
<td>Reduction and stabilization by posterior instrumentation</td>
<td>96</td>
<td>86</td>
<td>30</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>35</td>
<td>M</td>
<td>Double burst fracture at D12 and L1, with conus medullaris syndrome</td>
<td>Posterior stabilization, anterior decompression and fusion with bone graft</td>
<td>96</td>
<td>64</td>
<td>30</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>M</td>
<td>L1 burst fracture, normal neurology</td>
<td>Posterior stabilization and anterior reconstruction with bone graft</td>
<td>96</td>
<td>86</td>
<td>30</td>
<td>-2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>24</td>
<td>F</td>
<td>L1 burst fracture with incomplete conus medullaris lesion</td>
<td>Posterior stabilization and anterior decompression and fusion with bone graft</td>
<td>96</td>
<td>88</td>
<td>35</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>48</td>
<td>M</td>
<td>L1 fracture with paraplegia</td>
<td>Posterior reduction and instrumentation D11-L3</td>
<td>97</td>
<td>64</td>
<td>45</td>
<td>4</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>26</td>
<td>M</td>
<td>L1 burst fracture with neurogenic bladder</td>
<td>Posterior reduction and instrumentation D12-L2</td>
<td>98</td>
<td>42</td>
<td>39</td>
<td>3</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>31</td>
<td>M</td>
<td>L3 burst fracture, normal neurology</td>
<td>Posterior reduction and instrumentation L2-L4</td>
<td>95</td>
<td>60</td>
<td>35</td>
<td>2</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>26</td>
<td>M</td>
<td>L1 burst fracture, normal neurology</td>
<td>Posterior reduction and instrumentation D12-L2</td>
<td>95</td>
<td>45</td>
<td>38</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>16</td>
<td>M</td>
<td>L1 burst fracture, normal neurology</td>
<td>Posterior reduction and instrumentation D12-L2</td>
<td>95</td>
<td>Lost to follow-up</td>
<td>41</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Table I: Injury details, treatment and outcome of the patients.
only for instrumentation and bone grafting. To address the issue, load-sharing classification was developed, which quantify the amount of comminution of the injured vertebral segment. This classification has been validated also in the clinical practice. Another reason in this case is associated neurologic injury. Motor recovery and return of bowel and bladder function is more reliable after direct anterior decompression. The ligamentotaxis effect of indirect posterior decompression is based on integrity of Sharpey, fibers or annular ligament attachments to the displaced fracture fragments. This technique may also be ineffective in the setting of higher canal compromise. Considering the degree of comminution and the significant canal compromise (70%) in this patient, direct anterior decompression and reconstruction of the anterior column might have resulted in a better outcome. The outcome of this case can be compared with other cases in this series. Cases number 3 and 5, had better neurological outcome and therefore, higher postoperative functional scores after direct anterior decompression.

Another case to consider is case 4; this patient with normal neurology had anterior reconstruction by bone graft in addition to posterior instrumented stabilization. Anterior surgery was done for comminuted injured vertebral segment mentioned in load sharing classification. This patient had good functional score (86) postoperatively. Kyphosis is well-known criteria for the outcome assessment of spinal injuries. As it is balanced by lumbar hyperlordosis, this causes muscle strain and pain and loss of kyphosis with posterior instrumentation alone is well recognized.

**CONCLUSION**

The treatment of thoracolumbar fractures is still evolving. Evolution is based on the understanding of spinal mechanics and instrumentation. Although, techniques may change, but treatment should be guided by well founded principles and detailed structural and neurological assessments. Surgical intervention should be used to preserve or improve neurologic function, reduce bone deformity and stabilize the spine for early mobilization of patients.

---

**REFERENCES**