



# The Journal of Bone & Joint Surgery

**Journal Club:** 14 June 2012

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**Theme:** Spinal trauma – Conservative management of thoracolumbar burst fracture

## Presented Papers:

- 1. Shen WJ, Liu TJ, Shen YS.** Nonoperative treatment versus posterior fixation for thoracolumbar junction burst fractures without neurologic deficit. *Spine (Phila Pa 1976)* 2001;26:1038-45.
- 2. Chow GH, Nelson BJ, Gebhard JS, Brugman JL, Brown CW, Donaldson DH.** Functional outcome of thoracolumbar burst fractures managed with hyperextension casting or bracing and early mobilization. *Spine (Phila Pa 1976)* 1996;21:2170-5.
- 3. Wood K, Buttermann G, Mehbod A, Garvey T, Jhanjee R, Sechriest V.** Operative compared with nonoperative treatment of a thoracolumbar burst fracture without neurological deficit. A prospective, randomized study. *J Bone Joint Surg [Am]* 2003;85-A:773-81.

## Foreword

It is essential for all orthopaedic surgeons to have a fundamental knowledge of the treatment principles of burst fractures, which includes understanding the role and scope of non-operative management.

### Paper 1:

#### **Non operative treatment versus posterior fixation for thoracolumbar junction burst fractures without neurologic deficit**

## Summary

### 1. Purpose

To compare the outcome of operative versus non-operative treatment of thoracolumbar burst fractures in neurologically intact patients.

### 2. Methods

Prospective trial.

Patients included aged 18-65 years had a single level closed fracture of T11 - L2, with no facet joint dislocations, with normal neurology. The fracture was not due to osteopenia or other pathological process. Multiply injured patients were excluded.

Initially patients were to be randomised to operative or non-operative treatment, however high level of cross over into the non-operative group, therefore pragmatic randomisation was undertaken.

In the non-operative group analgesia and normal mobilisation was allowed, then an anterior hyperextension type brace was fitted and worn continuously for 3 months.

In the operative group short segment fixation was undertaken as a priority, with a similar post operative regimen (brace for 3 months).

Outcome measures included a visual analogue pain score, work status (Denis 5 point scale), and Greenough low back outcome score. Hospital stay and costs were also recorded.

### 3. Results

83 patients met the initial inclusion criteria, 43 assigned to non-operative group and 40 to the operative group, however 3 patients in the non-operative group were unavailable for the 2 year follow up. After cross over there were 47 patients treated non-operatively and 33 treated operatively.

For both groups there was no development of neurological deficit. No patient suffered VTE or pressure ulceration.

In the operative group there was no deep infection and only one episode of superficial infection treated with oral antibiotics.

Mean hospital stay was 10.4 in the surgical group versus 9.2 days in the nonsurgical group.

Hospital costs were significantly higher in the operative group (approximately 4 times).

Low back pain scores were initially significantly better in the early follow up period for the operative group but became non-significant at the latter stages.

No significant difference in functional outcome at 2 years.

### 4. Conclusions

Despite an early pain relief with operative management there is no significant difference in outcome at 2 years, however the cost of surgical treatment remains significantly high. No neurological deterioration occurred. Therefore the authors conclude that non-operative treatment is a viable option.

### Critique

#### Strengths

- Comparable groups
- Good inclusion / exclusion criteria
- Fair outcome measures
- Standardised treatment plan
- Good follow up period - 2 years (should capture complications)

#### Methodological Concerns

- Randomisation / selection bias for non-operative patients may report better outcomes
- Fixation with lordotic rods may have contributed to the rate of instrumentation failure / removal of metalwork.

### Paper 2:

#### Functional outcome of thoracolumbar burst fractures managed with hyperextension casting or bracing and early mobilization

### Summary

#### 1. Purpose

To determine the outcome of patients with unstable burst fractures of the thoracolumbar spine treated non-operatively, and identify any variables which may adversely influence final outcome.

#### 2. Methods

Retrospective review of 26 patient's medical records and radiographs. Included patients had a single level unstable burst fracture (T11-L2). Multiply injured patients were included. Lamina and facet fractures were excluded.

Clinical examination findings and questionnaires to assess pain, ability to work / perform ADLs, and overall satisfaction were the main outcome measures. Degree of kyphosis was also calculated. Unstable fracture was defined according to Denis classification as involving 2 or more columns. A standard treatment protocol was followed of initial bed rest with log rolling every 2 hours, then hyperextension body casting. Some patients, at the treating physicians' discretion, had a Jewett hyperextension brace instead. Mobilisation to an erect position and ambulation are allowed immediately with the help of a physiotherapist when the cast or brace has been applied. Radiographs are usually taken immediately after cast application with the patient recumbent and then with the patient standing when he or she is able to stand erect independently. Patients were discharged when safe and pain controlled. Casting was maintained for 6-12 weeks, then further Jewett hyperextension bracing for 6-8 weeks at the treating physicians discretion.

### 3. Results

24 patients (10 men / 14 women) aged 17-75. Follow-up time ranged from 12 months to 100 months, with a mean of 34.3 months. Six patients were treated in Jewett hyperextension orthoses, 17 had hyperextension casts, and one had a custom-moulded thoracolumbosacral orthosis. Mean hospitalisation 8.2 days (3-21).

Despite correction with casting/brace the deformity generally recurred when the patient stood upright and by final follow up kyphosis was an average of 2.3° more, angulation 1.9° more, and the anterior body compression was an average of 10.7% more than at the time of the initial injury.

1 patient rated his pain as "severe;" 1 as "significant;" 3 as "moderate;" 8 as "minimal;" and 11 stated that they had no pain at all.

Overall satisfaction was high.

### 4. Conclusions

No correlation could be found between radiological findings and the clinical outcomes as measured by pain and return to work status. On this basis the authors recommend non-operative treatment with bracing/casting for this type of unstable fracture.

### Critique

#### Strengths

- Reinforces message of non-operative treatment

#### Methodological Concerns

- Heterogeneous group of patients and fractures
- Inclusion criteria variable
- Brace / cast technique is variable
- Retrospective

### Paper 3:

#### Operative compared with non-operative treatment of a thoracolumbar burst fracture without neurological deficit.

### Summary

#### 1. Purpose

Hypothesis that operative treatment would lead to superior long-term clinical outcomes in patients with a thoracolumbar burst fracture without neurological compromise, when compared to non-operative treatment.

#### 2. Methods

Randomised to operative or non-operative management.

Inclusion criteria - Isolated thoracolumbar burst fracture, CT showing a burst-type fracture with retropulsion of vertebral body bone posteriorly into the spinal canal, no new neurological abnormality of the lower extremities or abnormality of bowel/bladder function, presentation less than 3 weeks after injury, aged 18-66 years, with no significant medical co-morbidities.

Exclusion criteria - Head injury (GCS <14 points on admission), Open fracture, Loss of structural integrity within the posterior osteoligamentous complex.

No absolute degree of kyphosis, canal encroachment by bone, or anterior loss of height was a criterion for inclusion/exclusion.

Those participating in the study were initially managed with bed rest for two to five days until either the operation was performed or the cast or thoracolumbosacral orthosis was applied.

Operatively managed patients had either a short-segment (two to five-level) posterolateral spinal arthrodesis with pedicle screw-hook instrumentation and autologous iliac crest bone-grafting or an anterior two-level fibular and rib-strut construct arthrodesis with local autogenous bone-grafting and instrumentation.

Non-operatively managed patients had hyperextension casting/bracing to reduce the kyphosis, worn continuously for 8-12 weeks, with potential further thoracolumbosacral orthosis for 4-8 weeks.

Outcome measures included radiological findings and functional outcome as recorded by questionnaire - SF 36, Visual analogue score, Oswestry back pain questionnaire, modified Roland & Morris disability.

### 3. Results

After exclusions 47 patients (89%) were followed clinically and radiographically for a minimum of two years (average, 44 months). There were 32 men and 15 women, and they were first seen between 1994 and 1998.

The mean duration of hospitalization was 7.9 days (range, two to seventeen days) in the group treated nonoperatively and 10.7 days (range, six to twenty-seven days) in the group treated operatively.

No correlation was found in either treatment group between the final amount of kyphosis and the degree of pain reported, or disability according to the Roland and Morris questionnaire, or the Oswestry questionnaire. At the final follow-up examination, no significant difference was found between the two treatment groups with respect to the sagittal plane measurements ( $p = 0.6$ ).

No significant difference in pain reduction between the two treatment groups was found, with the numbers available ( $p = 0.18$ ). The rates at which the patients returned to work were not found to be significantly different between the groups.

The difference in hospital cost was significant higher for surgical treatment ( $p < 0.01$ ).

19 complications occurred in 16 patients treated operatively compared with 2 complications in 3 of those treated nonoperatively.

### 4. Conclusions

Operative treatment of patients who have a stable thoracolumbar burst fracture and are neurologically intact provides no substantial benefit compared with nonoperative treatment with a cast and/or brace.

### Critique

#### Strengths

- Intention of paper was good - RCT operative vs. non operative
- Clear inclusion
- Detailed analysis of results

#### Methodological Concerns

- Significant heterogeneity between treatment groups

- Small sample size - greater impact of heterogeneity
- Strict exclusion criteria should be adhered to.

#### **Final Discussion Points**

- Clear definition between the multiply injured patient and the patient with the isolated thoracolumbar fracture needs to be made as this affects treatment decision.
- Non operative treatment is effective, and there is no clear evidence to recommend surgical intervention in this group of isolated fractures.
- No advantage to casting in extension as opposed to a well fitted extension brace
- Bracing is symptomatic and has no influence on the final resting position of the fracture or on long term functional outcome.
- Retropulsed fragment is of no significance to the decision making process as most neurological injury from fragment has already occurred.
- Complications from surgical treatment are still significant when compared to very few observed for non-operative, therefore careful patient selection is recommended.