

Nonoperative Treatment of Thoracolumbar Junction Fractures by Hyperextension Bracing

Burst fractures, as defined by Denis (1), involve compression failure of the anterior and middle columns of the spine. They occur frequently in the thoracolumbar spine between T10 and L2 and represent injuries that are unstable mechanically and put neural elements at risk of injury. The management of these unstable burst fractures in the thoracolumbar junction has been controversial for many years (2, 3). The original treatment recommended by Bedbrook (4) for unstable injuries was a period of recumbency during which the patient was confined to bed with great attention paid to lordotic posture for as long as 6-8 weeks followed by gradual mobilisation. There have been several reports in the literature documenting the efficacy of this treatment (4-9). The advantages of surgery include a shorter period of bed rest and hospitalisation, better correction of kyphotic deformity, avoidance of later deterioration caused by instability, and an opportunity to perform direct or indirect decompression of the neural elements (10-12). In recent years, with increasing emphasis on procedure justification and cost control, there has been a resurgence of interest in nonsurgical treatment, especially in

neurologically intact patients. Conservative management of thoracolumbar burst fractures in neurologically intact patients, with bracing and early mobilization, may prevent deformity, and postural reduction can produce indirect decompression of the spinal canal. This type of management also eliminates prolonged periods of recumbency and hospitalisation (7, 13).

Functional treatment is successful

A retrospective review of 24 patients who were treated conservatively for unstable burst fractures in the thoracolumbar region (T11-L2) obtained an evaluation after a mean follow-up time of 34.3 months (3). Mean duration of hospitalisation was 8.2 days, those patients who did not have injuries other than spine fracture had a mean hospitalisation time of 5.9 days. Kyphotic deformity could be corrected with hyperextension bracing but tended to recur during the course of mobilisation and healing. No correlation was found between kyphosis and clinical outcome. At final follow-up evaluation 79% of patients had little or no pain, 75% had returned to work, 75% stated that they had little or no restrictions in their ability to work,

and 67% stated that they had little or no restrictions in their ability to participate in recreational activities. Only one patient (4%) reported being dissatisfied with the initial nonoperative treatment. The authors concluded that nonoperative management of thoracolumbar burst fractures with hyperextension bracing had been proven to be a safe and effective method of treatment in selected patients. Clinical results were favourable, no neurologic deterioration was observed. Hospitalisation times were minimised, and patient satisfaction was high. The authors did not believe that ligamentous injury of the posterior column was a contraindication to nonoperative management of thoracolumbar burst fractures (3). Other studies that investigated the results of nonoperative treatment of thoracolumbar burst fractures with hyperextension bracing or casting and early ambulation revealed excellent or good functional outcome in 80 to 90% of cases regarding pain, range of motion, and return to work (2, 8, 9, 14).



Fig. 1: 28R14 3-Point Hyperextension Orthosis designed by A. Bähler

A prospective clinical trial assessed the functional outcome of conservative treatment with hyperextension bracing and early ambulation in 60 consecutive patients with single-level thoracolumbar spinal injury and no neurological impairment (2). Hyperextension brace was worn by all patients for 6 months, and early ambulation was

recommended. Several radiological parameters were evaluated. Denis Pain and Work Scale was used to assess clinical outcome. The average follow-up period was 42 months (range 24 to 55 months).

During this period the spinal canal occupation was significantly reduced. Other radiological parameters, such as Cobb's angle and anterior vertebral body impression, showed loss of fracture reduction which was not statistically significant. However, functional outcome was satisfactory in 55 of 60 patients with no complications recorded.

Long-term results comparable with those of surgery

Shen et al. (15) conducted a prospective clinical trial comparing the results of nonoperative treatment versus short-segment posterior fixation using pedicle screws. The study involved 80 patients. Inclusion criteria required neurologically intact patients, single-level closed burst fracture involving T11-L2, no fracture dislocation or pedicle fractures, and no other major organ system or musculoskeletal injuries. Patients in the nonoperative group (n=47) were allowed activity to the point of pain tolerance beginning on the day of injury using a hyperextension brace. Patients in the operative group (n=33) underwent three-level (one above, one at fracture level, one below) fixation using instrumentation. The follow-up period was 2 years. The surgical group had less pain up to 3 months and a better Grenough Low Back Outcome Score up to 6 months, but the outcome was similar afterwards. No neurologic deficit occurred in any patient. In the nonoperative group, the kyphosis angle worsened by 4°, and the retropulsion decreased from 34% to 15%. In the operative group, there was one case of superficial infection and two cases of broken screws. The kyphosis angle was improved initially by 17°, but this was gradually lost. The authors conclude that short-segment posterior fixation

provides partial kyphosis correction and earlier pain relief, but the functional outcome at 2 years is similar (15). All of the other few reports that directly compare the results of surgical and non-surgical management concluded that the results of both treatment modalities were similar (16-18), but hospital charges were four times higher in the operative group (15).

Surgical treatment definitely is better with regard to correction of kyphosis. The amount of correction initially obtained usually is impressive, but much of the correction is lost soon (6, 19-24). The kyphosis increases while hardware remains intact, probably through combined fatigue-bending of the plate or rod, motion at the screw plate junction (connector loosening) and motion of the screw within the bone (15). Extension of the fusion is effective in preserving the correction, but at the cost of losing motion segments (25).

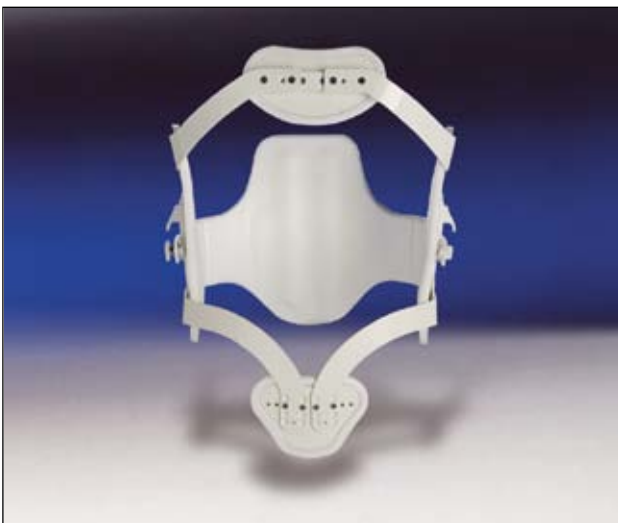


Fig. 2: 28R15 Hyperextension Orthosis in frame design

Poor correlation between kyphosis and clinical results

Kyphosis does not correlate well with clinical results, irrespective of surgical or nonsurgical treatment. In most studies the correlation was found to be poor, even when the kyphosis angle was greater than 30° (9, 15, 26-28). Whether kyphosis leads to early degeneration is speculative. In areas where tuberculosis is prevalent, thoraco-

lumbar kyphosis in the 90° range is not unusual. Provided that spontaneous fusion has taken place, the kyphosis per se is not painful, and many patients are able to do heavy work. Early degeneration is not common. The evaluation of spinal pseudarthrosis is difficult, particularly in the presence of stainless steel implants (15).

In studies investigating the results of nonoperative treatment of thoracolumbar burst fractures, no complications related to early mobilisation were found. Most authors believe that early mobilisation reduces the complications related to prolonged bed rest (2, 3, 8, 9, 14, 15). Hyperextension braces function by restricting gross motions of the trunk rather than intervertebral mobility (29). Although kyphosis deformity recurs after casting or bracing (3), most authors believe that bracing is useful for pain control (2, 3, 8, 9, 14, 15).

In conclusion, the few and short-term advantages of surgical management of thoracolumbar burst fractures without neurologic deficits need to be balanced against the risks of infection, iatrogenic injury, and hardware-related complications. Neurologic deterioration under nonoperative treatment was not seen in any clinical trial. There is no significant difference in the functional outcome of either surgical or nonsurgical treatment at 2 years. Hyperextension bracing and early activity to the point of pain tolerance is safe and cost-effective and should be allowed when conservative treatment of thoracolumbar burst fractures is chosen.

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