



## Long-term results of conservative treatment for thoracolumbar compression fractures

### *Torakolomber omurga kompresyon kırıklarında konservatif tedavinin uzun dönem sonuçları*

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**Amaç:** Kompresyon tipi torakolomber omurga kırıklarında konservatif tedavinin klinik ve radyografik sonuçları değerlendirildi.

**Çalışma planı:** Kırk üç hastadaki (28 erkek, 15 kadın; ort. yaş 39; dağılım 24-54) 47 torakolomber omurga kompresyon kırığı konservatif olarak tedavi edildi. Bütün hastalar düz röntgenografi ve bilgisayarlı tomografi ile değerlendirildi. Denis sınıflamasına göre, kırıkların sekizi tip A, 20'si tip B, 12'si tip C, yedisi tip D olarak değerlendirildi. Kırıkların 30'u L<sub>1</sub>, beşi L<sub>2</sub>, 12'si T<sub>12</sub> seviyesindeydi. Hiçbir hastada nörolojik defisit saptanmadı. Tedavide iki ay vücut alçısı, buna ek olarak dört ay boyunca torakolumbosakral ortez uygulandı. Tanı sırasında, alçı sonrasında ve son kontrol sırasında çekilen grafilerden lokal kifoz açısı ve sagittal indeks ölçüldü. Ağrı ve fonksiyonel durum Denis ve ark.nın skalası ile değerlendirildi. Ortalama takip süresi 7.5 yıl (dağılım 6-11 yıl) idi.

**Sonuçlar:** Lokal kifoz açısı ve sagittal indeks alçı tedavisinden önce sırasıyla ortalama 12.6 ve 13.7 derece, alçı yapıldıktan sonra 5.9 ve 7.0 derece ölçüldü (p<0.05). Son kontroldeki değerler (sırasıyla ort. 12.7 ve 13.9 derece) tedavi öncesine göre anlamlı bulunmadı (p>0.05). Ortalama ağrı skoru 1.4, fonksiyonel skor 1.6 bulundu. Orta veya ciddi derecede sırt ağrısından yakınan dört hastada tedaviden önce, alçı sonrasında ve son kontrolde ölçülen ortalama kifoz açıları sırasıyla 12, 13.5 ve 14.8 derece idi. İki hastada alçıya bağlı aşırı terleme yakınmaları nedeniyle alçı ortez ile değiştirildi. Üç hastada ortez uygulamasına bağlı cilt sorunları lokal tedavilerle giderildi.

**Çıkarımlar:** Kifoz açısı 30 dereceden az ise, kompresyon kırıkları stabil olarak kabul edilebilir ve konservatif tedaviden tatmin edici klinik sonuç elde edilebilir. Alçı tedavisi sonrası uzun dönemde radyografik parametrelerde iyileşme olmaması hasta fonksiyonlarını olumsuz etkilememektedir.

**Anahtar sözcükler:** Sırt ağrısı/etioloji; kırık iyileşmesi; lomber vertebra; ortotik gereç; omurga kırığı/televi; torasik vertebra.

**Objectives:** We evaluated the radiologic and clinical outcomes of conservative treatment for thoracolumbar compression fractures.

**Methods:** Forty-three patients (28 males, 15 females; mean age 39 years; range 24 to 54 years) were treated conservatively for 47 thoracolumbar compression fractures. All the patients were assessed by plain radiograms and computed tomography. According to the Denis classification, there were eight type A, 20 type B, 12 type C, and seven type D fractures. Involvement was at L<sub>1</sub> in 30, L<sub>2</sub> in five, and T<sub>12</sub> in 12 fractures. There were no neurological deficits. Treatment involved use of a body cast for two months, followed by a thoracolumbosacral orthosis for four months. Radiographically, local kyphosis angle and sagittal index were measured before treatment, after casting, and at the final follow-ups. Pain and functional scales proposed by Denis et al. were also utilized. The mean follow-up was 7.5 years (range 6 to 11 years).

**Results:** The mean local kyphosis angle and sagittal index were measured as 12.6 and 13.7 degrees before treatment, and 5.9 and 7.0 degrees after casting, respectively (p<0.05). However, both did not differ significantly from the baseline at the final measurements (12.7 and 13.9, respectively; p>0.05). The mean pain and functional scores were 1.4 and 1.6, respectively. Four patients had moderate to severe back pain despite mean kyphosis angles of 12 (baseline), 13.5 (after casting), and 14.8 (final). Two patients required substitution of the body cast for orthosis due to excessive sweating, and three patients received local treatment for skin problems secondary to the use of orthosis.

**Conclusion:** If the kyphosis angle is less than 30 degrees, compression fractures are supposed to be stable to be treated conservatively with satisfactory clinical results. Functional results seem to be unaffected from the fact that casting does not improve radiographic parameters in the long-term.

**Key words:** Back pain/etioloji; fracture healing; lumbar vertebrae; orthotic devices; spinal fractures/therapy; thoracic vertebrae.

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It is controversial whether surgical or conservative treatment is more effective in the treatment of spinal fractures. It is generally accepted that conservative treatment should be considered for stable fractures and surgical treatment for unstable fractures.<sup>[1,2,3,4]</sup> In this study, we aimed to evaluate the efficacy of nonoperative treatment in compression type thoracolumbar spinal fractures.

## Patients and methods

Between 1996 and 2001, 43 patients with 47 thoracolumbar spinal fractures were treated conservatively for a 2-months period in a body cast and an additional 4 months by a TLSO and early ambulation as soon as the pain permitted. There were 15 women and 28 men. The mean age was 39 (24-54) years and the average of the follow-up was 7.5 (range, 6-11) years. The cause of the fractures were a fall from a height in 40 patients and motor vehicle accidents in three patients.

These compression-type fractures were classified according to Denis.<sup>[5,6]</sup> There were type A fractures in 8 patients, type B in 20, type C in 12, and type D in seven. More than half (30 of 47) of the spinal fractures were located in L1 level. Five fractures were located in L<sub>2</sub> level and 12 fractures were located in T<sub>12</sub> level. None of the patients had any neurological deficit at the time of diagnosis and during the treatment course.

In all patients, plain radiographs and computed tomography (CT) scans were taken for the initial diagnosis. From radiographs taken at the initial diagnosis, immediately after body cast immobilization and at the latest follow-up, kyphosis angle and sagittal index were measured and compared with each other. Pain and functional status at the latest follow-up were evaluated using the scale (0-5) described by Denis.<sup>[7]</sup>

The Wilcoxon test was used for statistical analysis.

## Results

Age, fracture level, fracture subtype, trauma mechanism, follow-up period, kyphosis angle and sagittal index on admission and at latest follow-up with results of pain and functional evaluation are all shown in Table 1. CT scans revealed only anterior column injury in all of the patients, approving that the fracture was a compression-type spinal fracture.

Changes in the kyphosis angle and the sagittal index before treatment (mean, 12.58° and 13.74) and immediately after cast immobilization (mean, 5.86° and 7.02) were statistically significant ( $p < 0.05$ ), whereas, there were no significant changes in kyphosis angle and sagittal index obtained before treatment and at the latest follow-up (mean, 12.74° and 13.90) and after cast immobilization and latest follow-up ( $p > 0.05$ ).

The mean pain score was 1,44 and the mean functional score was 1,55.

Two patients complained of sweating immediately after cast immobilization and three patients had skin problems after TLSO application. These complications were managed with changing body casts to TLSOs and local medications, such as topical steroids, for skin problems. No other complications were noted.

## Discussion

Stability is the major factor when selecting treatment for thoracolumbar spinal fracture. Until recent years, the “three column theory” described by Denis in 1983 was the most accepted concept.<sup>[5]</sup> Denis described instability as mechanical instability (first degree), and neurological instability (second degree), and combined mechanical and neurological instability (third degree). He stated that the involvement of the middle column was a sufficient criterion for instability without any relation to type or direction forces acting on the spinal column.<sup>[5,6]</sup> MRI has brought out a new dimension in the stability concept and leads us to consider the importance or the posterior ligamentous complex. It is advocated that evaluation of the posterior ligamentous complex on MRI is essential before a decision of instability is made. Compression fractures or burst fractures with middle-column involvement can be described as unstable if there is associated posterior ligamentous complex injury proven by MRI.<sup>[8,9,10]</sup>

Compression fractures are stable fractures produced by hyperflexion forces. The injury is only localised in the anterior portion of the vertebral body.<sup>[5,6]</sup> It was reported that posterior ligamentous complex injury was seen in fractures with kyphosis angle more than 30 degrees and anterior height loss more than 40%. Surgical treatment was advocated for these types of fractures.<sup>[11]</sup> In our study, the kyphosis angle was less than 30 degrees in all patients. During the follow-up

period, none of them reached that 30 degrees. In the multicenter study of 1019 cases by Gertzbein, it was reported that patients with kyphosis angle more than 30 degrees presented with significant back and low-back pain in their 2-year follow-up periods.<sup>[12]</sup> Four patients in our series reported dissatisfaction from the procedure because of moderate to severe back pain ve functional disability. Their mean of kyphotic angle before treatment, immediately after cast immobilization and at the latest follow-up were, 12, 12, 13.5 and 14.75 degrees, respectively. We could not explain the cause of their complaints, although a series of diagnostic imaging have been performed.

Willen et al. reported that satisfactory results were obtained with conservative treatment in types A and B compression fractures.<sup>[13]</sup> In our series, 59% of the patients had type A and B compression-type fractures and similar to Willen's series they were all satisfied.

There was no significant difference regarding kyphosis angle and sagittal index. These results showed that deformity increased radiologically during the conservative treatment period. In contrast, pain and functional scores were not related to the radiological increase in deformity. Most patients could return to their daily activities and previous jobs with minimal pain and functional loss. It is generally accepted that radiological and functional results of conservative treatment do not correlate with each other.<sup>[14,15,16]</sup> Hazel et al. could not find any relation between severity of the initial injury and radiological development of degenerative changes with clinical complaints.<sup>[11]</sup> Also, Young did not report any relation between symptoms and severity of fracture, deformity produced, or any other radiological changes found in 116 patients with compression fractures treated conservatively.<sup>[16]</sup> Mumford et al. reported 2-year followup results of 41 patients with burst fractures treated initially by 30-day bed rest and later mobilization with TLSO.<sup>[14]</sup> They detected 66% good-very good clinical results and 90% of the patients could return to their previous jobs. They could not find any relation between initial injury severity and post-treatment deformity.

Several complications, such as thromboembolic events, decubitus, cast syndrome and urinary infection, has been reported to occur during the course of conservative treatment of spinal fractures.<sup>[5,14,17]</sup> In our series, three patients complained of skin problems and two of sweating which responded to conservative

treatment. It must be noticed that regular and careful follow-up is essential to reduce such complications.

### Conclusions

In conclusion, compression-type vertebral fractures with kyphosis of less than 30° are stable and good candidates for conservative treatment. It is crucial to decide the treatment method based on each patient whether he/she will be treated with a long term casting and orthosis or a simple cast and hyperextension exercises. It must be taken into consideration that casting has no effect on sagittal plane in long term and the conservative treatment method must be individualized. Patient adaptation and quality of life must be taken into account in treatment process.

In means of radiologic parameters, there is no cure for compression fractures less than 30 degrees when treated with casting, but this condition does not have any adverse effect on the patient functions. On the other hand, it's necessary to obtain the untreated patients data to make an objective comment about the efficacy of conservative treatment.

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