



Clinical and radiological outcomes of conservative treatment after stable post-traumatic thoracolumbar fractures in elderly: Is it really best option for all elderly patients?

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HIGHLIGHTS

- Brace isn't always best in spine fractures elderly.
- Conservative treatment has failure risk for female patients and junction fractures.
- Elderly patients with risk factors should be informed about the possible complications and poor results of conservative treatment.

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ABSTRACT

Objective: The purpose of this study was to research the effectiveness of conservative treatment of stable post-traumatic thoracolumbar vertebral fractures in elderly patients.

Methods: The study included 21 elderly patients (13 females, 8 males) with post-traumatic thoracolumbar compression fracture who were treated with a brace. Fractures without any trauma history, pathological fractures, patients younger than 60 years old and patients with no malignancy history were excluded from study. Neurological examination and posterior ligamentous complex (PLC) were intact in all patients. Radiological parameters and pain scores were recorded in regular follow-up.

Results: The mean age and follow-up were 71.3 years (range, 60–84 years) and 20.1 months (range, 12–26 months) respectively. During follow-up, 4 patients had significant height loss resulting in kyphotic deformity and intractable pain. There was a significant increase in the local kyphosis angle ($p = 0.001$) and height loss percentage ($p = 0.017$). At the final follow-up, the mean Denis Score of pain was 1.62 ± 0.74 .

Conclusion: Although there is wide acceptance of conservative treatment of post-traumatic stable thoracolumbar fracture with intact PCL according to the Thoracolumbar Injury Classification and Severity Score (TLICS), elderly female patients with a post-traumatic compression fracture in the junctional region are at great risk of conservative treatment failure. These patients should be well-informed about the possible complications and poor results of conservative treatment, and surgical treatment should be considered in selective cases with the informed consent of the patients.

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1. Introduction

There is still no consensus about the treatment of thoracolumbar vertebrae fractures, especially in elderly patients who

have a high risk of comorbidity [1–4]. Several classifications and treatment algorithms have been devised to guide proper treatment for these fractures. The devised systems of classification of vertebral fractures are mainly based on the mechanism of injury and depend on defining stability. Thoracolumbar fractures are classified separately by Denis although these fracture patterns have recently been classified in the Vaccaro systems as a subtype of fracture occurring as a result of the compression mechanism [5,6]. Vaccaro et al.

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described the Thoracolumbar Injury Classification and Severity Score (TLICS) to assist in clinical decision-making in terms of the need for operative versus non-operative care and surgical treatment approach in unstable injury patterns [6].

According to the currently popular TLICS, surgical treatment is considered for unstable thoracolumbar fractures especially if there is accompanying posterior ligamentous injury and there is wide acceptance of conservative treatment of stable thoracolumbar fractures. There have been studies investigating the outcomes of conservative treatment after stable thoracolumbar vertebral fractures [1–3,7–9], but these studies failed to specify age, stage and aetiology. To the best of our knowledge, there has been no prospective study evaluating conservative treatment of thoracolumbar fractures after acute onset trauma in elderly patients.

In the present study, the effectiveness of conservative treatment with a thoracolumbosacral orthosis (TLSO) was investigated after post-traumatic stable thoracolumbar vertebral fractures with no concurrent posterior ligamentous injuries in elderly patients. The reliability of the use of the TLICS scoring system depending on PLC integrity in elderly patients was questioned and whether there were acceptable clinical and functional outcomes after conservative treatment in these patients was evaluated by recording radiological parameters and pain scores of the patients in regular follow-up.

2. Material and method

The present study was designed as a prospective observational study with 21 elderly patients who underwent conservative treatment for post-traumatic stable thoracolumbar vertebral fractures. Inclusion criteria were acute onset trauma, compression type of thoracolumbar fracture and age older than 60 years. Exclusion criteria were any other additional fracture, previous spinal surgery history and pathological fractures. Written informed consent was obtained from all patients who met the inclusion and exclusion criteria described above. Regarding the aetiology, 10 patients had a history of a simple fall, 6 patients had been involved in vehicle accidents and 5 patients had been struck by a vehicle. Ten patients had L1, five had T12, three had L2, two had T11 and one had L3 vertebral fractures.

All patients underwent a complete physical examination on presentation at the Emergency Department. After obtaining bidirectional vertebral X-rays (Fig. 1) and computed tomography (CT), all patients were hospitalized. None of the patients had neurological deficits or any other pathological finding resulting from trauma. MRI evaluation of the posterior ligamentous complex was performed in all patients and any rupture in any of the components of PLC (supraspinous ligament, interspinous ligament, ligamentum flavum, facet joint capsule) was considered as PLC damage. None of

the patients had any PCL damage (Fig. 2).

A customized TLSO brace was prepared after measurement on the same day of hospitalization and produced by the same expert. Patients had bed-rest under the same analgesic treatment to reduce pain in the first two days after trauma. All patients were mobilized assistance from a family member at the end of the second day after trauma followed by brace application. The patients were discharged after independent ambulation on the third day after trauma. All patients were asked to use their brace regularly. The brace was to be used for the whole day for three months and then for half a day for an additional three months.

Patients were evaluated radiologically and clinically in 3rd, 6th and 12th months for the first year. During the regular follow-ups, the patients were evaluated with the Denis Score for pain. They were also asked to report any additional problems. Two orthopaedic surgeons who were not involved in the present study, took the measurements on the magnified radiographs in order to minimize interobserver and intraobserver errors. Local kyphosis angle and the percentage of height loss were measured from standing lateral radiographs at the 6-month follow-up. Local kyphosis angle was defined as the angle between the line drawn tangential to the superior endplate of the superior vertebra and the line drawn tangential to the inferior endplate of the inferior vertebra. The height loss percentage was calculated by dividing the mean value of the heights of the anterior parts of the inferior and superior vertebral corpuses by the height of the affected vertebra.

The study was approved by the Local Ethics Committee of the tertiary referral hospital with the ID number of E-13-021. Chi-square test and Student's t-test were used during statistical evaluation according to bidirectional p values. A value of $p < 0.05$ was considered statistically significant. Mean values were presented with ranges or standard deviations.

3. Results

The 21 patients included in the present study were 8 males and 13 females with a mean age of 71.3 years (range, 60–84 years). The mean follow-up period was 20.1 months (range, 12–26 months). During follow-up, 4 patients had significant height loss resulting in kyphotic deformity and intractable pain (Figs. 3 and 4). None of the patients had any progressive neurological deficit. The patient demographics and general properties of the thoracolumbar fractures are shown in Table 1.

At the 6-month follow-up, the mean local kyphosis angle values increased from 16° to 23° and the mean percentage of height loss values increased from 19% to 32%. The changes obtained from trauma to 6-month follow-up were statistically significant ($p < 0.05$). Both local kyphosis angles and height loss percentage



Fig. 1. AP and lateral thoracolumbar radiographs of a 73-year old female patient in the Emergency Service.

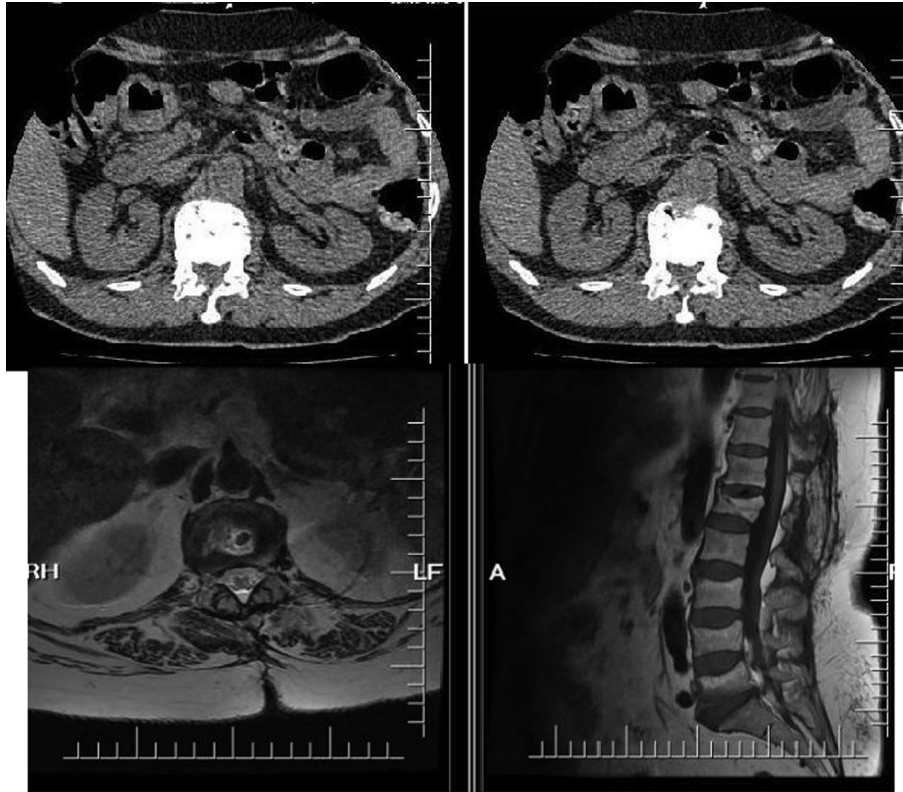


Fig. 2. CT scans showing anterior compression of L1 vertebra and MRI scans with intact posterior ligamentous complex.



Fig. 3. AP and lateral thoracolumbar radiographs revealed height loss and local kyphosis at 3-month follow-up.



Fig. 4. AP and lateral thoracolumbar radiographs revealed significant height loss (76%) and local kyphosis (31°) at 6-month follow-up.

Table 1
Demographic and clinical data of the patients.

Number	21
Age (years)	71.3 (60–84)
Gender (Female: Male)	13:8
Follow-up (months)	20.1 (12–26)
Level (T11/T12/L1/L2/L3)	2/6/8/3/2
Aetiology (Simple fall/vehicle/Pedestrian)	10/6/5

The values are given as the the number of patients and means with ranges in parentheses.

values increased significantly. At the final follow-up, mean pain score was 1.62 ± 0.74 . Mean spinal angles and pain scores during the follow-up are shown in Table 2. Two patients experienced difficulties wearing the brace but managed to sustain the treatment modality. There were no other complications related to brace usage.

Of the 4 patients with significant height loss resulting in kyphotic deformity, 3 were female and 1 was male. Height loss of these 4 patients was detected at 3-month follow-up and their height losses were 81%, 71%, 76% and 78% respectively. The mean age of these 4 patients was 75.7 years, while the mean age of the treatment group was 71.3 years. Regarding the localization of fracture, 3 were L1 fracture and 1 was T12 fracture. All of these 4 patients had intractable pain.

4. Discussion

The ideal treatment choice for thoracolumbar fractures is challenging due to the variety in fracture patterns and the unpredictable prognosis of these fractures especially in elderly patients. Although there is wide acceptance of conservative treatment of stable thoracolumbar fractures, conflicting results have been reported which indicates a need for further studies [1,2,7–10]. As elderly patients have low bone quality and quantity, treatment of thoracolumbar fractures becomes more complex due to the higher incidence of progressive kyphosis resulting in neurological symptoms in this patient group [11]. In this study, we aimed to evaluate the effectiveness of conservative treatment of stable acute onset post-traumatic thoracolumbar vertebral fractures in elderly patients according to the TLICS scoring system.

Table 2
Spinal angles and pain scores of the patients. F Female, M male, LKA Local Kyphosis Angle (°), BT Before Treatment, FU Follow-up (months), HL Height Loss (%).

Patient	Gender	Age	Follow-up	Pain score	LKA (BT)	LKA (FU)	HL (BT)	HL (FU)
1	F	68	26	1	18	20	15	21
2	M	84	26	2	17	24	13	21
3	F	71	25	1	22	28	14	10
4	M	77	23	1	15	21	23	27
5	F	85	24	2	16	24	23	25
6	F	83	23	3	19	35	22	81
7	F	77	22	1	15	17	17	24
8	M	81	22	3	13	34	18	71
9	M	73	17	1	13	21	21	16
10	F	69	22	1	14	10	20	16
11	M	69	24	1	10	8	25	17
12	M	74	23	1	14	11	18	22
13	F	72	21	2	15	22	24	31
14	F	74	19	1	21	27	15	21
15	M	78	15	2	17	25	24	31
16	F	79	18	2	23	25	22	22
17	F	73	17	2	12	31	14	76
18	F	84	16	1	22	25	19	24
19	F	81	15	1	14	18	21	22
20	F	75	12	3	12	32	17	78
21	M	75	12	2	18	22	15	21

With regard to conservative treatment, the role of the brace in treatment has been investigated in several studies. These studies have shown that neurologically intact patients with stable thoracolumbar burst fractures, treated with or without bracing had similar radiographic and clinical outcomes during regular follow-up [1,7,12]. However, there is a wide range of ages in these studies and a minority of the patients was elderly. Therefore, the lack of results from these studies led us to consider the role of the brace in elderly patients. In the present study, a customized brace was used by all patients who were in the elderly age group of over 60 years. The effectiveness of closed reduction and casting has also been investigated individually [8,9]. Closed reduction and casting of thoracolumbar fractures has been reported as a safe treatment method that yields acceptable functional and radiographic results. However, these studies were also conducted on a wide range of patient ages (range 14–75 years).

Several clinical studies and systemic reviews have compared the results of conservative and surgical treatments in thoracolumbar fractures [13,14]. It has been reported that short-segment posterior fixation provides partial kyphosis correction and earlier pain relief [13,14]. However, these studies also noted that the functional outcome in long-term follow-up was similar. Early activity and pain tolerance have been emphasized as the main advantages of surgical treatment. Systemic reviews have shown that the contradictory evidence provided by previous randomized controlled trials is insufficient to conclude whether surgical or non-surgical treatment yields superior pain and functional outcomes for people with thoracolumbar burst fractures without neurological deficit [15,16]. These studies warned that beside its potential benefit in early mobilization and pain relief, surgery is associated with more early complications and the need for subsequent surgery, as well as greater initial healthcare costs.

Strategies to increase life quality and reduce the possible complications of thoracolumbar fractures have also been investigated [17,18]. The medical treatment aimed to provide pain control and early mobilization and the importance of preventing kyphotic deformity resulting in focal or global sagittal imbalance was emphasized in follow-up [17]. Vertebral height loss associated with chronic back pain remains a problem after thoracolumbar fractures in elderly patients and recent studies have focused on preventing this complication [11,18]. Teriparatide treatment has been claimed to decrease the progression of vertebral body collapse in osteoporotic patients [18].

There are some limitations to this study. First, social descriptors of the elderly patients, such as the quality of their care, whether they live alone and whether they live in a house or in a nursing home were not reported in this study. These social descriptors may influence the patient's adherence to the treatment and clinical results. Second, this prospective study consisted of the data of 21 patients and a study conducted with more patients may give a more accurate picture of post-traumatic stable thoracolumbar fractures during the treatment period in elderly patients.

5. Conclusion

Although there is wide acceptance of conservative treatment of post-traumatic stable thoracolumbar fracture with intact PLC according to the TLICS scoring system, elderly female patients with a post-traumatic compression fracture in the junctional region are at great risk of conservative treatment failure. These risk factors should be considered while using the TLICS scoring system after post-traumatic compression fracture in elderly patients. The clinical relevance of this study is that these patients should be well-informed about the possible complications and poor results of conservative treatment, and surgical treatment should be

considered in selective cases with the informed consent of the patients.

Conflict of interest

The authors declare that they have no conflict of interest.

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None.

Ethical approval

The study was approved by the Local Ethics Committee of the tertiary referral hospital with the ID number of E-13-021.

Author contribution

Deniz Cankaya: writing, study design.
Serdar Yilmaz: follow-up.
Alper Deveci: evaluation of X-rays.
Abdurrahim Dundar: data collection.
Burak Yoldas: data analysis.
Ali Toprak: writing.
Yalcin Tabak: study design.

Guarantor

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