

# TRANSPEDICULAR FIXATION IN THE BURST FRACTURES OF THE THORACOLUMBAR JUNCTION: THE EFFICACY OF TIMING OF THE SURGERY

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**Study Design:** In this study, the efficacy of timing of the surgery in the burst fractures of the thoracolumbar junction which were surgically treated between May 1993 - May 1994 with short segment fixation using transpedicular screws were evaluated.

**Method:** The patients were divided into two groups according to time elapsed between injury and operation. Cases operated within the first 24 hours were taken as early surgery group (n = 5) and cases operated later than 24 hours after the injury were considered as the late surgery group (n = 6). The efficacy of treatment was assessed by evaluation of the sagittal index (SI) restoration and reduction of the canal compromise.

**Result:** The pre- and post-operative values for SI and canal narrowing for both groups are presented in the table:

	<u>EARLY</u>	<u>LATE</u>	
pre-operative			
SI (5)	27.10 ± 1.5	24.00 ± 1.10	p > 0.05
Canal			
Narrowing (10)	0.43 ± 0.04	0.65 ± 0.04	p > 0.05
post-operative			
SI	2.17 ± 0.83	11.40 ± 1.00	p ≤ 0.01
Canal			
Narrowing	0.06 ± 0.02	0.38 ± 0.04	p ≤ 0.01

**Conclusion:** There is still controversy concerning the relation between canal narrowing and neurologic deficit, and the effect, if any, of decompression on neural recovery. Nevertheless, if the main aim of the surgical procedure is to restore the sagittal index and decompress the neural canal, then anterior approach should be preferred to transpedicular fixation in cases to be operated later than 24 hours.

**Key words:** transpedicular fixation, Burst fractures, thoracolumbar junction, timing of surgery.

## INTRODUCTION

Vertebrae fractures have been considered as being distinct from other bone fractures, since they might cause neurological problems. In the successful treatment of these fractures, timing of the treatment appears to be as important as the treatment chosen.

At present, burst fractures which cause neural canal and/or foramen narrowing and result in neurological deficits, have been frequently treated with surgical methods. Transpedicular fixation (TPF) is commonly preferred method for burst fractures in the thoracolumbar and lumbar region TPF is based on indirect reduction of the bone fragment, and can only be used when posterior longitudinal ligament (PLL) or posterior annular complex is intact. For a TPF to be successful, fracture fragments should be mobile and the fracture haematoma should not be organized. Moreover, the fracture to which TPF will be applied should not in-

clude a rotational displaced bone fragment (4, 7, 9, 11, 13).

In this study, the relation between the time of the surgery and treatment success has been investigated in thoracolumbar junction burst fractures treated with TPF.

## MATERIALS AND METHODS

11 patients with burst fractures in the thoracolumbar junction treated with TPF at 19 Mayıs University, Faculty of Medicine, Department of Orthopaedics and Traumatology, between May 1993 - May 1994 were included in the study. 4 patients were female and 7 were male.

In 3 of the cases fracture was located at T12 and in 8 cases at L1. The mean follow-up period was found to be 7.6 months (2-14 mo). the etiology of the fractures was, fall from a height in 2 cases, and traffic accidents in 9 cases.

The patients were divided into two groups accord-

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ing to the time of the surgery performed. The cases who were operated within the first 24 h were considered as the early surgery group, and cases operated later than 24 h constituted the late surgery group. There were 5 patients in the early group and 6 in the late group.

The neurological symptoms of the patients were evaluated according to Frankel grading system. 2 of 3 patients classified as Class A preoperatively progressed to B postoperatively, with no change in one patient's neurological picture. 2 of 4 patients graded as D preoperatively, returned to normal postoperatively while the other two patients remained same. 4 patients did not have any neurological deficit preoperatively and no neurologically intact patient was made worse by surgical intervention.

The evaluation was performed by measuring sagittal index (described by Farcy et al.) and the narrowing of the canal diameter (described by Mumford et al.) on the preoperative and early postoperative X-rays. Mann-Whitney U test was used for the statistical comparisons.

## RESULTS

In the early surgery group; mean age was  $34.50 \pm 4.70$  years, the sagittal index was pre-op  $27.10^\circ \pm 1.50$  and post-op  $2.17^\circ \pm 0.83$  ( $p \leq 0.01$ ), canal narrowing was pre-op  $0.43 \pm 0.04$  and post-op  $0.06 \pm 0.02$  ( $p \leq 0.01$ ).

In the late surgery group; mean age was  $36.20 \pm 3.40$  years, the sagittal index was pre-op  $24.00^\circ \pm 1.10$  and post-op  $11.40^\circ \pm 1.00$  ( $p \leq 0.01$ ), canal narrowing was pre-op  $0.65 \pm 0.04$  and post-op  $0.38 \pm 0.04$  ( $p \leq 0.01$ ).

Although there was no significant difference between the two groups regarding the preoperative sagittal indexes ( $27.10^\circ$  and  $24.00^\circ$ ,  $p > 0.05$ ), postoperative improvement in the early surgery group was found to be significantly better than the late surgery group ( $2.17^\circ$  and  $11.40^\circ$ ,  $p \leq 0.01$ ).

Moreover, although preoperative measurements of the canal narrowing did not show statistically significant difference between early and late groups ( $0.43$  and  $0.65$ ,  $p > 0.05$ ), postoperatively the difference was found to be significant ( $0.06$  and  $0.38$ ,  $p \leq 0.01$ ).

## DISCUSSION

After 1983, with the detailed classification of the vertebral fractures and recent advances in spinal instrumentation, surgical treatment had been accepted as a

valuable approach in vertebral burst fractures, and surgical treatment had even been recommended in all burst fractures (3, 7, 12). However, in recent years, burst fractures without neurologic deterioration treated with non-operative methods have also been reported with high success rates (2).

Nonetheless, at the thoracolumbar junction the sagittal index is accepted to be 0 degree. For this reason, restoration of the sagittal anatomic contour has a special consideration. If the kyphotic angulation is not corrected, it may further result in the development of early degenerative changes, increase in deformity and/or occurrence of late neurologic deficits (5).

On the other hand, it is known that narrowing of the canal does not always correlate with the neurologic deficits. There are patients with minimal decrease in the canal diameter but advanced neurological deficits or, some others with canal narrowing almost completely but without any neurologic deficit (6). In some reports, it has been suggested that the removal of the pressure on the neural tissue facilitates the neurological improvement. However, it has been widely suggested and accepted that the patient's neurological outcome is mostly determined by the location and severity of trauma at the time of event. For this reason, in some patients in whom appropriate decompression have been performed at early stages, no improvement has been observed. However in cases with neural tissue compression, decompression constitutes one of the important goals of the treatment (1, 8).

TPF is a frequently used method for the correction of the sagittal contour and also for neural decompression. Nonetheless TPF requires intact PLL or posterior annular complex. When these structures reach to their original tension, the fracture fragments displaced into the canal, are pushed back to their place, and hence the canal restoration is provided. On the other hand, if the fracture fragments are not mobile enough or the fracture healing process has started and the hematoma organized, this reduction does not occur even if PLL is intact. reduction of retropulsed bone fragment. If there is rotational displacement, TPF is not successful (11). So, the treatment success has been affected by the ratio of the canal narrowing and the timing of the surgery. In the literature, instead of TPF, anterior approach has been recommended for cases who have canal narrowing of more than 35-50% and to whom delayed surgery is performed (1, 11).

Indirect reduction using short-segment TPF is currently under criticism, as it has been shown that the

initiated reduction obtained may be lost in an early post-operative period. Those discussions will probably lead to modification and perfecting in the hardware. This study aims to investigate the relation between the timing of the surgery and the effectivity of the indirect reduction (9).

Although the patient number in our study groups are small, we obtained successful results with early surgery regarding to both sagittal contour and canal narrowing in cases who have canal narrowing very close to 50 %. However, we could not be successful in decompression and also in contour restoration in cases who had been operated later than surgery 24 h, even though there was no statistical difference in pre-op canal narrowing and sagittal index measurements between the groups.

Under the light of this study results and the literature, the anterior approach should be preferred if the contour restoration and decompression is the primary goal in patients who will be operated later than 24 h. Early cases with canal narrowing of more than 50 %, TPF may be used, but decompression should be controlled with intraoperative myelography after the reduction (7): We believe it is not appropriate to decide whether PLL is intact or not, just by considering the narrowing degree of the canal, since we have cases who had canal narrowing more than 50 % but successfully treated with early TPF.

### CONCLUSION

TPF is a successful method in the treatment of burst type vertebral fractures. However, the duration between the injury and surgical intervention appears to be very important for the success of this method.

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