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Secondary Post-Traumatic Stenosis of The Thoracic and Lumbar Spine and its Surgical Treatment

Hudoyberdiyev K.T., Isakov B.M., Isakov K.B.

Andijan State Medical Institute.

Abstract:
Spinal injuries occur in 20% of all skeletal injuries. Some injuries are accompanied by secondary stenosis of the spinal canal due to the displaced vertebral body in unstable fractures and bone fragments in comminuted fractures. The purpose of the study is to eliminate spinal canal stenosis through reconstruction and removal of bone fragments. 131 patients with signs of stenosis were examined and surgically treated. Kyphotic spinal deformity from 0 to 10° was detected in 51 (38.9%) patients, 11-20° in 62 (44.3%), over 20° in 18 (13.7%). Surgical treatment consisted of stabilization of the damaged segment with the establishment of TPF and ligamentotaxis in 87 (66.4%), GLE and stabilization in 36 (27.4%) and DLE, removal of the Urban wedge, embedded bone fragments and stabilization in 8 (6.1 %) of patients. Results. good results were observed in 79 (60.3%) patients; satisfactory result in 47 (35.8%) patients and unsatisfactory result in 5 (3.8%) patients. Conclusions. TPF systems allow for full correction of the spine and provide reliable stabilization of the damaged spinal segment.

Key words: *spine, trauma, thoracolumbar region, spinal cord, stenosis, decompression, stabilization, TPF.*

Introduction

Spinal injuries account for 6 to 20% of all musculoskeletal injuries; injuries to the thoracic and lumbar spine account for 45-55% of injuries. It should be noted that the main part of the damage occurs in the transitional and mobile thoracolumbar spine (1, 2, 3, 10). The relevance of spinal injuries is confirmed by the fact that thoracolumbar injuries most often occur in young, working ages - from 20 to 45 years. In this regard, the issues of diagnosis and treatment of victims are currently not only a medical, but also a social problem (4, 7). In connection with the development of medical science and improved technical support, it has been possible to reduce mortality rates from 85% to 25%. Currently, mortality is observed in victims with complicated injuries and the causes of this are various complications - pneumonia, bedsores, urological complications and sepsis. Also, such injuries are characterized by high rates of disability of patients - from 50 to 80% of cases. Modern views on the treatment of complicated injuries of the thoracolumbar region are aimed not only at decompression of the damaged spinal cord and its elements, but also at stabilizing the damaged segment of the spine and restoring the ability to support N.V. Kornilov, V.L. Usikov, 2000, Makhkamov K.E. , Israyilov D.U., Kuzibaev Zh.M., 2012). The use of modern stabilizing systems contributes to the early activation of patients, improving the quality of life of victims and reducing indicators of temporary disability and disability (Dulaev A.K., Usikov V.D., Dydykin V.V., Ptashnikov D.A., et al., 2010 ; Grin A.A., 2011; Hasler R.M.,

Exadaktylos A.K., Bouamra O., Benneker L.M., 2011). Uncorrected instability of the damaged segment of the spine, adequate decompression of the spinal cord, in many cases becomes the cause of disability for victims in the long term after the injury (Osipov Yu.V., 2012).

Purpose of the study. Improving the results of surgical treatment of patients with complicated injuries of the thoracolumbar spine.

Material and methods. The clinical study is based on an analysis of the results of surgical treatment of 131 patients with complicated injuries of the thoracolumbar spine in the neurosurgical department of the Andijan branch of the Russian Research Center for Emergency Medicine from 2015 to 2022. The age of patients ranged from 20 to 65 years, the average age was 35.4 years. The main contingent was aged from 20 to 45 years - 85 (64.8%) patients. The causes of injury were: catatrauma (fall from a height) - 107 (81.6%), road traffic accidents - 17 (12.9%), industrial accidents - 7 (5.3%). Isolated injuries were detected in 108 (82.4%) patients. Combined injuries were diagnosed in 23 (17.5%) cases (TBI, limb fractures, chest injuries - rib fractures, injuries to abdominal organs). By time of admission to the hospital: in the first 6 hours - 97 (74.0%), on the first day - 16 (12.2%), from 3 to 10 days - 18 (13.7%) patients. The reasons for the late admission of 18 patients were hospitalization in regional sub-branches and their transfer through the SAS line.

С целью уточнения характера и уровня повреждения всем больным были Clinical neurological examination, X-ray, MSCT and MRI examination were carried out.

Neurological disorders identified during clinical and neurological examination of patients were assessed using the ASIA/IMSOP scale. Grade A was determined in 77 patients, B in 29, C in 13, D in 9, E in 3 patients. The distribution of patients by level of damage is given in Table. 1.

Table 1.

Distribution of patients by level of damage.

Gender of patients	Spinal Damage Level						Total
	Th9	Th10	Th11	Th12	Th12-L1	L1	
Men	4	1	2	11	6	58	82 (62,5%)
Women	2	1	2	19	3	22	49 (37,4%)
Total:	6	2	4	30	9	80	131

As can be seen from the data in Table 1, patients with damage to the Th12 vertebra were 30 (22.9%), L1 vertebra - 80 (61.0%), transitional Th12-L1 vertebrae - 9 (6.8%) victims .

Kyphotic deformity of the spine was determined by lateral radiographs using the Cobb method: deformation from 0 to 10° was detected in 51 (38.9%) patients, 11-20° - in 62 (44.3%), over 20° - in 18 (13, 7%).



A B

Figure 1. Kyphotic deformity with spinal stenosis
(A – frontal projection, B – lateral projection).

Indicators of the reserve spaces of the spinal canal were determined by MSCT and calculated using the formula: (A+C/2-B)/ (A+C/2)

Where A – channel indicators above the fracture zone;

B – indicators of the canal at the level of the fracture;

C – indicators below the level of the spinal fracture.

The obtained results of changes in the reserve spaces of the spinal canal are shown in Table. 2.

Table 2.

Changes in the reserve spaces of the spinal canal.

Narrowing of the spinal canal (%)	Number of patients	In a relationship
0 – 25	74	56,4%
26 – 50	43	32,8%
51 – 75	12	9,1%
76 - 100	2	1,5%

As can be seen from the data given in Table 2, in 57 (43.5%) patients a decrease in the reserve spaces of the spinal canal was detected by more than 26% of the calculated normal value.

Patients were distributed according to the types of surgical interventions performed as follows:

1 Stabilization of the damaged spinal segment with ligamentotaxis using the TPF endocorretor – 87 (66.4%) patients;

2 Hemilaminectomy at the level of 1 vertebra + stabilization of the damaged spinal segment – 36 (27.4%) patients;

3 DLE at the level of 2 vertebrae + revision of the spinal canal + meningomyeloradiculolysis + stabilization of the damaged spinal segment – 8 (6.1%) patients.



Fig. 2 Condition after reconstruction and stabilization of the spine by TPF.

Results. When analyzing the results of surgical treatment of patients, 4 main criteria were taken into account (according to the F. Denis scale) – regression of neurological disorders; the degree of restoration of the ability to support the damaged segment of the spine; the presence of pain and restoration of performance.

In our observations, a good result was observed in 79 (60.3%) patients. The criteria for a good result were considered to be positive dynamics and regression of neurological symptoms; restoration of the spinal axis and the lumen of the spinal canal; absence of pain when loading the spine;

A satisfactory result was observed in 47 (35.8%) patients and was characterized by positive neurological dynamics with partial restoration of lost functions or preservation of primary neurological disorders at the same level; restoration of the spinal axis and the lumen of the spinal canal; the presence of pain with moderate load on the spine.

The result was unsatisfactory in 5 (3.8%) patients and was characterized by deterioration of the neurological status; gross deformation of the operated segment of the spine; development of instability and the presence of constant pain with insignificant load on the spine.

Conclusions.

1. In case of complicated spinal injury, regardless of the level of damage, surgical interventions should include neurosurgical and orthopedic tasks simultaneously.

2 Planned interventions on the spinal cord are determined by the form, duration of compression and the depth of neurological disorders.

3 The posterior approach allows for rapid decompression and revision of the spinal cord and its roots through laminectomy or elimination of spinal cord compression using the ligamentotaxis method.

4 The TPF systems used allow full correction of the spine and provide reliable stabilization of the damaged spinal segment.

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