Surgical Treatment of Spondylolisthesis Using Transpedicular Fixators

B.M.Isakov Andijan State Medical Institute.
N.Yu.Mirzayuldashev Andijan State Medical Institute.

ABSTRACT

The purpose of this work: is to analyze our own results of surgical treatment of 30 patients with isthmic spondylolisthesis of the L5 vertebra, who used the method of transpedicular fixation (TPF) using various types of transpedicular constructs and methods of their installation in combination with various methods of anterior fusion.

Keywords:

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The results of surgical treatment of 30 patients with isthmic spondylolisthesis of the L5 vertebra were analyzed. Displacements of I–II degree were present in 10 patients, III–IV degree – in 17 patients, and spondyloptosis – in 3 patients. Depending on the level of fixation, 4 groups were distinguished: patients of group I received fixation of two segments, screws were inserted into L4, L5, and S1 vertebrae; in the remaining groups, three segments were fixed, while in group II, screws were inserted into L3, L4, L5, and S1 vertebrae, in group III, into L3, L5, and S1 vertebrae, and in group IV, into L3, L4, and S1 vertebrae. Posterior fixation was combined with L5–S1 interbody fusion performed using various techniques.

Clinical results of treatment:

were regarded in 93.3% of cases as good. Satisfactory results in 6.7% of cases occurred due to the development of mild paresis of the extensor muscles of the foot and fingers in two patients after surgery. Long-term results were followed up in 16 patients, the average follow-up period was 29 months. Radiologically, with the exception of patients with structural fractures, fixation of the lumbosacral region was stable. Fracture of metal structures occurred in 7 patients (23.3%), 6 of whom did not undergo anterior spinal fusion. In this case, there was a partial loss of reduction. Clinically, metal structure fractures did not lead to deterioration. After L5–S1 interbody fusion with cortical grafts, stabilization of the lumbosacral region also occurred. The calculation of radiological parameters characterizing the change in the anatomical and biomechanical relationships of the lumbosacral region before and after surgical treatment was carried out. Analysis of the results of treatment indicates the effectiveness of TPF in combination with interbody fusion in the treatment of spondylolisthesis. The use of L5–S1 cortical graft in severe degrees of spondylolisthesis has been substantiated. The goal of surgical treatment for spondylolisthesis is to eliminate pain, restore anatomical relationships and stabilize the lumbosacral spine [16]. The technique of transpedicular

fixation, which is widely used in the surgical treatment of spinal pathology, including spondylolisthesis, has shown its high efficiency [6]. The importance of L5–S1 interbody fusion is emphasized by most authors, and various methods and techniques for its implementation are also reported [2–4, 11, 12, 16]. There are no data in the literature on a comparative analysis of the results for various methods of installing pedicle fixators.

Material and methods :

57 patients with spondylolisthesis underwent surgical treatment using transpedicular fixation in the Department of Neurosurgery of the AF RRCEMMP. In most cases (30 patients) there was isthmic spondylolisthesis of the L5 vertebra. We analyzed the treatment of this group of patients. The age distribution was as follows: from 18 to 40 years - 17 and from 41 to 55 years - 13. Male - 18 patients, female - 12. In the complex of preoperative instrumental examination, patients underwent standard and functional radiography of the lumbosacral spine and myelography , CT combined with myelography and MRI. In 22 patients, a spondylolysis defect of the L5 vertebral arch was detected. In 8 cases, such dysplastic changes were observed as a flattened elongated arch of the L5 vertebra, a rounded deformed upper endplate of the first sacral vertebra, and in 6 cases, non-fusion of the posterior elements of the lumbar and sacral vertebrae. Depending on the degree of displacement according to Meyerding, the distribution of patients was as follows: spondylolisthesis of I degree - in two, II degree - in eight, III degree - in twelve, IV degree - in five; three patients had spondyloptosis. Thus, displacements of I-II degree in 33.3% of patients, severe and extremely severe - in 66.7%. Patients in all cases complained of pain, leading to limitation of physical activity. Complaints of pain only in the lumbosacral region were presented by 5 patients, pain both in the lumbosacral region and in the lower extremities was disturbed by 25 patients, and in 6 of them the irradiation of pain was bilateral. In one 34-year-old patient, lumbodynia was combined with the syndrome of intermittent myelogenous claudication. In one case, a 39-year-old patient with spondyloptosis presented with a secondary unilateral L5 paretic syndrome (a decrease in the strength of the foot and toe extensor to 2 points) and severe hypotrophy of the leg muscles on the affected side. Sensitive disturbances in the form of transient paresthesia and hypoalgesia in the area of innervation of L5 and S1 roots were noted in 7 patients. Two patients were previously operated in other clinics for spondylolisthesis with an unsatisfactory result. Long-term results were followed up in 16 patients, the average follow-up period was 29 months. (from 9 months to 6 years). To determine and characterize changes in the lumbosacral region in spondylolisthesis before and after surgical treatment, we performed a number of measurements on lateral radiographs [1, 18].

The following parameters were evaluated:

1) the degree of bias in percentage terms;

2) the magnitude of the lumbar lordosis in degrees along the upper endplates of the L1 and L5 vertebrae;

3) the angle of sagittal rotation, measured between the perpendicular drawn to the tangent to the sacrum and the line drawn along the anterior edge of the L5 vertebral body;

4) offset angle according to Mitbrate;

5) angle of inclination of the L5 vertebra - the angle between the line passing through the centers of the anterior and posterior edges of the L5 body and the horizontal line;

6) inclination of the lumbar spine - the angle between the line connecting the centers of the bodies L1 and L5 of the vertebrae, and the horizontal;

7) inclination of the sacrum L5 the angle between the tangent to the sacrum and the vertical;

8) interlink angle L5 - the angle between the lines connecting the centers of the bodies L4–L5 and L5–S1 of the vertebrae;

9) interlink angle S1 - between the lines connecting the centers of bodies L5–S1 and S1–S2. results

Clinically, in the postoperative period and during further follow-up, all patients showed complete regression of pain symptoms. All

patients returned within a year after the operation to full physical activity, continued their educational and labor activities. All patients, with the exception of two who developed neurological complications after surgery, were completely satisfied with the treatment.

Discussion

The issues of surgical treatment of spondylolisthesis are an actual problem of vertebrology and are widely discussed in modern literature. As noted by almost all authors, there is currently no unity in the choice of tactics and methods of surgical treatment of spondylolisthesis. The method of transpedicular fixation, which is widely used in modern spinal surgery, including the treatment of spondylolisthesis, has a number of advantages over others. This is the possibility of segmental fixation, rigidity and primary stability of fixation, which can significantly reduce the time of functional recovery after surgery. The improvement of transpedicular fixators and the use of multiaxial screws facilitates the installation of the structure in case of deformities and makes it possible to reduce the displaced vertebra from the posterior approach [17]. Particular importance is attached to the issue of reduction of the displaced vertebra and elimination of anatomical and biomechanical disorders occurring in spondylolisthesis. To assess these changes and their correction after surgery, both our scientists and foreign scientists proposed a number of radiometric characteristics [1, 9, 18]. If, with small degrees of displacement, a pronounced reduction is possible, then in cases of large displacements, the reduction is much more complicated and to a certain extent limited. When using reduction and fixation with transpedicular constructs for severe displacements, in general, our results in a number of parameters are comparable with the literature data [11, 16], except for the cases when the reduction was performed by anterior resection of the displaced vertebra and fixation of L4 to S1. The reduction rates in such cases are higher, but it is necessary to note the great technical difficulties and risks associated with such operations [3, 16].

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