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SURGICAL TREATMENT OF SPONDYLOLISTHESIS WITH THE USE OF TRANSPEDICULAR FIXATORS

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The purpose of this work is to analyze the 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 structures and methods of their installation in combination with various methods of anterior fusion.

Material and methods

The results of surgical treatment of 30 patients with isthmic spondylolisthesis of the L5 vertebra were analyzed. Grade I–II dislocations were present in 10 patients, grade III–IV in 17 and spondyloptosis in 3. All patients underwent transpedicular fixation (TPF) of the cervical-sacral spine with various designs. Depending on the level of fixation, 4 groups were identified: two segments were fixed in group I patients, 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 C3, L4, L5 and S1 vertebrae, in III – into C3, L5 and S1 vertebrae and in group IV – into C3, L4 and S1 vertebrae. Posterior fixation was combined with interbody fusion L5–S1, performed by various methods.

Clinical results of treatment

they were regarded as good in 93.3% of cases. Satisfactory results in 6.7% of cases occurred due to the development of a slight paresis of the extensor muscles of the foot and fingers in two patients after surgery. Long-term results were followed in 16 patients, the average follow-up period was 29 months. Radiologically, with the exception of patients with structural fractures, fixation of the cervical-sacral region was stable. Fracture of metal structures occurred in 7 patients (23.3%), in 6 of whom anterior fusion was not performed. At the same time, there was a partial loss of reduction. Clinically, fractures of the metal structure did not lead to deterioration. After performing L5–S1 interbody fusion with cortical grafts, the cervical-sacral region also stabilized. The calculation of radiological parameters characterizing the change in anatomical and biomechanical relationships of the cervical-sacral region before and after surgical treatment was carried out. The analysis of the

treatment results indicates the effectiveness of the use of TPF in combination with interbody fusion in the treatment of spondylolisthesis. The use of primary-stable L5–S1 spinal fusion with a cortical graft in severe degrees of spondylolisthesis is justified. The purpose of surgical treatment for spondylolisthesis is the elimination of pain syndrome, restoration of anatomical relationships and stabilization of the cervical spine[10]. The technique of transpedicular fixation, widely used in the surgical treatment of spinal pathology, including spondylolisthesis, has shown its high effectiveness [6]. The importance of L5–S1 interbody fusion is emphasized by most authors, while various methods and methods of its implementation are also reported [2-4, 11]. There is no data in the literature for a comparative analysis of the results for various methods of installing transpedicular fixators.

Material and methods

In the neurosurgery departments of the AndGosMI and AF RNCEMP clinics, 57 patients with spondylolisthesis underwent surgical treatment using transpedicular fixation. 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 11 to 20 years – 20 patients, from 21 to 40 years – 7 and from 41 to 55 years – 3. Male – 18 patients, female - 12. In the complex of preoperative instrumental examination, patients underwent standard and functional radiography of the cervical spine and myelography, CT in combination with myelography and MRI. Spondylolysis defect of the L5 vertebral arch was detected in 22 patients. In 8 cases, dysplastic changes such as a flattened elongated arch of the L5 vertebra, a rounded deformed upper closure plate of the first sacral vertebra were observed, and in 6 cases, non–involvement of the posterior elements of the cervical and sacral vertebrae. Depending on the degree of Meyerding bias, the distribution of patients was as follows: grade I spondylolisthesis in two, grade II in eight, grade III in twelve, grade IV in five; spondyloptosis was detected in three patients. Thus, grade I–II dislocations in 33.3% of patients, severe and extremely severe – in 66.7%. Patients in all cases complained of pain syndrome, leading to restriction of physical activity. Complaints of pain only in the cervical-sacral region were presented by 5 patients, pain both in the cervical-sacral region and in the lower extremities bothered 25 patients, and in 6 of them the irradiation of pain was bilateral. In one case, an 11-year-old girl had cervical-femoral rigidity syndrome (Furmeier syndrome). In one 34-year-old patient, lumbalgia was combined with intermittent myelogenous lameness syndrome. In one case, when treating a 39-year-old patient with spondyloptosis, a secondary unilateral L5 paretic syndrome was found (a decrease in the strength of the extensors of the foot and fingers to 2 points) and pronounced hypotrophy of the lower leg muscles on the affected side. Sensitive disorders in the form of transient paresthesia and hypoalgesia in the innervation zone of the L5 and S1 roots were noted in 7 patients. Two patients had previously been operated on in other clinics for spondylolisthesis with unsatisfactory results. Long-term results were followed in 16 patients, the average follow-up period was 29 months (from 9 months to 6 years). To determine and characterize changes in the cervical-sacral region during spondylolisthesis before and after surgical

treatment, we performed a number of measurements using lateral radiographs [1, 18]. The following parameters were evaluated:

1) the degree of bias in percentage terms;

2) the magnitude of cervical lordosis in degrees along the upper end plates of the C1 and L5 vertebrae;

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

4) the offset angle of the Mitbreit;

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

6) the slope of the cervical spine is the angle between the line connecting the centers of the C1 and L5 vertebrae and the horizontal;

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

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

9) the inter–link angle S1 is between the lines connecting the centers of the bodies L5–S1 and S1–S2. Results

Clinically, in the postoperative period and with further observation, a complete regression of pain symptoms was noted in all patients. All patients returned to full-fledged physical activity within a year after the operation, continued their educational and work 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 urgent problem of vertebrology and are widely discussed in modern literature. As noted by almost all authors, there is no unity in the choice of tactics and methods of surgical treatment of spondylolisthesis at the moment. The method of transpedicular fixation, widely used in modern spinal surgery, including in 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 significantly reduces the time of functional recovery after surgery. The improvement of transpedicular fixators and the use of multiaxial screws

facilitates the installation of the structure during deformations and makes it possible to correct the displaced vertebra from the posterior access [10]. Particular importance is attached to the issue of reduction of the displaced vertebra and elimination of anatomical and biomechanical disorders occurring during spondylolisthesis. To assess these changes and their correction after surgery, both our scientists and foreign ones have proposed a number of radiometric characteristics [1, 9]. If pronounced reduction is possible with small degrees of displacement, then in cases of large displacements, reduction is much more complex and to a certain extent limited. When using reduction of fixation by transpedicular structures with severe displacements, in general, our results are comparable with literature data in a number of parameters [11], except in cases when reduction was performed due to anterior resection of the displaced vertebra and fixation of L4 to S1. Reduction rates are higher in such cases, but it is necessary to note the great technical difficulties and risk in such operations [3].

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