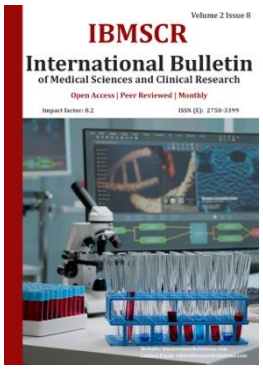

LUMBAR AND SACRAL SPINE INJURIES AND THEIR SURGICAL TREATMENT

Mamajonov Boxadir Solijanovich
Email:mamajonovb1972@mail.ru
Islamov Jaloliddin Muhammad Ugli
E-mail: jaloliddinislamov05@gmail.com
Andijan state medical institute of Uzbekistan, Andijan, Otabekov 1.
Tel: (0-374) 223+94-60. E-mail: info@adti
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Abstract: Purpose of the study. To determine the clinical efficacy of lavsanoplasty in the treatment of lumbar and sacral spine injuries. Material and methods. 87 patients with injuries of the lumbar and sacral spine were operated on. Fifty-six of them had spondylolisthesis accompanied by neurologic deficit. In all patients we applied LAVSANOPLSTIKA to stabilize the damaged spinal segment. Results. Differential application of different variants of dural sac compression elimination using Lovesanoplasty for treatment of patients with spondylolisthesis allowed to obtain good treatment results in 63 patients, satisfactory - in 22 patients, unsatisfactory - in 2 patients. Conclusion. In traumatic stenoses of the spinal canal in the lumbar spine, the choice of the method of dural sac decompression should be planned individually for each patient taking into account the time since the trauma, the severity and dynamics of neurological disorders, and the localization of spinal column damage.

Keywords: spine, trauma, stenosis, decompression, Lovesanoplastic fixation.

Spinal cord injuries and their surgical treatment is an urgent problem of modern vertebrology and neurosurgery. The most frequently damaged are the transitional sections of the spine. The lumbar and sacral transitional spine account for about 58.4% of injuries, and in 30-70% of cases there is compression or damage to the spinal cord [2, 3, 8, 9, 14]. Along with early decompression of the spinal cord, the main principles of surgical treatment of these injuries are full correction of traumatic deformity and durable stabilization of the injured spine with restoration of its bearing capacity for early activation of the injured. Among modern methods of spinal correction and stabilization, spinal lavsanoplasty offers the greatest opportunities for solving the main tasks of spinal injury treatment.

The aim of the study was to determine the clinical efficacy of dural sac decompression and spine stabilization when applying Lovesanoplasty for the treatment of spondylolisthesis of the lumbar and sacral spine.

Material and Methods

We studied 87 adult patients with injuries of the lumbar and sacral spine and spondylolisthesis of the spinal canal. Among them 66 men and 21 women from 17 to 68 years old. Traumatic stenosis of the spinal canal in all patients was measured by CT or MRI; the stenosis ranged from 25% to 100% of the sagittal dimension of the spinal canal.

The patients' PDS injuries were classified using the Universal Classification of Spinal Cord Injuries [20]. Eleven (12.4%) patients had A1, 6 (3.5%) had A2, and 21 (28.8%) had A3 fractures; 17 (15.9%) had B1, 15 (14.7%) had B2, and 5 (2.9%) had B3; 7 (10.6%) had C1, 4 (4.7%) had C2, and 1 (6.5%) had C3.

Injuries of one PDS were recorded in 63 (72.4%) cases, two - in 24 (20.6%).

Seventy-six (68.2%) patients had spinal spinal cord injury (SCI) accompanied by neurologic deficit of varying severity, while the remaining 11 (31.8%) had isolated spinal

injuries not accompanied by vertebrogenic neurologic disorders. In 74 (80.2 %) patients, PSMT was localized at the level of L4-L5, in 13 (19.8 %) - L5-S1.

44 (38,0 %) patients had lower paraplegia with complete anesthesia from the level of injury and absence of sensitivity in S4-S5 segments (group A according to ASIA/ISCSCI scale); 15 (16,4 %) had lower paraplegia with preservation of sensitivity elements in S4-S5 segments (group B); 11 (31,0 %) had neurological disorders in the form of lower paraparesis (group C). Seventeen (14.6%) patients had limited neurologic deficit in the form of mild inferior paraparesis, radicular syndromes at the level of injury (group D).

Neurologic disorders in 9 (7.8%) patients tended to regress in the first days after the injury (in the acute and early periods of PSMT); in 73 (87.9%) neurologic status remained without clinically significant dynamics until the moment of surgery; in 5 (4.3%) signs of worsening neurologic deficit were noted in the preoperative period.

Fifty-four (31.8%) patients with isolated injuries of the thoracic and lumbar spine not accompanied by neurologic deficit had spinal canal stenosis.

Patients with PSMT were hospitalized within a few hours to 3 months from the time of injury. Sixty-eight (58.6%) patients were operated on in the acute period of PSMT, 27 (31.9%) in the early period, and 2 (9.5%) in the intermediate p The average value of traumatic spinal canal stenosis in 46 patients with PSMT was 55.6%; in 31 patients with isolated uncomplicated injuries, it was 42.7%. Local kyphosis in the traumatized PDS averaged 14.8° Cobb in patients with PSMT and 10.8° in patients with isolated spinal injuries. In patients with neurologic deficits, the vertical ventral dimension of the injured segments was reduced to an average of 63.6%. In patients with isolated vertebral injury, the reduction in the vertical dimension of the osteoligamentous column was as high as 67.2%.

Of the 67 patients with neurologic deficit, 23 (25.9%) had a single large vertebral body fragment with reversion (and 15° or more) as the cause of traumatic spinal canal stenosis, and 12 (10.4%) had a single large fragment without reversion. This type of spinal canal stenosis averaged 51.8% of its sagittal dimension. Traumatic stenosis with two free fragments of the vertebral body with reversion (and 15° or more) occurred in 14 (12.1%) patients, and without reversion - in 15 (12.8%) patients. This type of stenosis averaged 52.2% of its sagittal dimension. Stenosis of the spinal canal by several small fragments of the body or fragments of the root of the wishbone and the broken wishbone itself in the group of patients with neurological deficit occurred in 19 (16.4%) cases and averaged 55.9%. Vertebral dislocations (fractures) were the cause of traumatic stenosis in 26 (22.4%) cases; the dislocation of the traumatized vertebral body averaged 34.9%, and the traumatic stenosis was 66.3% of its sagittal size.

In the group of patients without neurologic deficit, the cause of traumatic stenosis of the spinal canal was a single large fragment with reversion (15° or more) in 15 (35.2%) cases, and a single large fragment without reversion in 17 (31.5%). Stenosis of this type in patients with isolated spinal injuries averaged 41.4% of its sagittal dimension. Stenosis of the spinal canal by two free fragments with reversion was recorded in 8 (14.8 %) cases, and without reversion - in 7 (12.9 %). Its average value was 45.3%. Traumatic stenosis by several small fragments, as well as fragments of the roots of the wishbones and broken wishbones themselves in the group of patients without neurologic deficit occurred in 2 (3.7 %) cases and averaged 66.5 %. Vertebral dislocation (fracture) was the cause of stenosis in 1 (1.9%) case and accounted for 29.3%. All patients underwent surgical treatment, including decompression

of neurovascular formations of the spinal canal at the level of the traumatized PDS, correction of anatomical relationships and reliable stabilization of the spine. In all cases, surgical correction and stabilization of the spine was performed using Lausanoplasty of the injured PDS. The CHM spinal system was used. Lapsanoplasty for one PDS was used in 4 (2.4%) cases, two - in 137 (80.6%), three - in 18 (10.5%), four - in 7 (4.1%), five - in 4 (2.4%). The choice of the method of dural sac decompression was determined individually for each patient. Where possible, preference was given to the least traumatic decompression options based on indirect repositioning reconstruction of the spinal canal. Preoperative planning took into account the depth and dynamics of neurologic deficit, the time since injury, spondylometric characteristics of traumatic deformity, the size and type of spinal canal stenosis, and the level of spinal injury. In each case, we predicted the possibility of performing indirect repositioning decompression due to the effect of ligamentotaxis. In the presence of traumatic spinal canal stenosis and signs of regression of neurologic disorders, spinal angiography (3 patients) and/or CT-myelography in two projections (5 patients) were performed at the preoperative planning stage to clarify the indications for various options of dural sac decompression.

Laminectomy during TPF was performed in 52 patients. Open decompression of the dural sac from the posterior access was performed in 20 patients. Meningomyeloradiculolysis was performed in 16 (9.4%) patients with gross neurologic deficit. After laminectomy, if gross anterior compression of the dural sac persisted, 13 (7.7%) patients underwent anterior open decompression through subtotal corpectomy during staged intervention on the ventral spine. 76 (44.7%) patients were operated on in the first three days after the injury; 11 (30.6%) patients were operated on 4-14 days later). In 45 (47.1%) patients, dural sac decompression was performed without opening the spinal canal and was achieved during lavsanoplasty due to the effect of ligamentotaxis. Among these patients, 29 (28.8%) were with isolated uncomplicated spinal injuries, and 16 (18.2%) with PSMT. Results

Analyzing the clinical efficacy of technical variants of lavsanoplasty for injuries accompanied by traumatic stenosis of the spinal canal, we evaluated the possibilities of repositioning the injured PDS and decompression of the dural sac at the different displacement variants, taking into account the time elapsed since the injury, regression of posttraumatic neurological deficit, and stability of fixation of the traumatized PDS during the period of vertebral consolidation or formation of the interbody bone block after corporodesis. The repositioning capabilities of lavsanoplasty in these types of injuries were characterized by the correction of the main components of traumatic deformity - spinal canal stenosis, local kyphosis at the level of spinal injury, transverse dislocations in the traumatized MCP in the case of subluxations and dislocations, and deficit in the vertical dimension of the ventral osteoligamentary column. In patients with PSMT, regression of neurological deficit, systematized according to the ASIA/ISCSCI scale, was characterized by the degree of recovery of basic spinal cord functions in the intermediate and late periods of PSMT, stability of Lausanoplasty - by the incidence and magnitude of partial loss of correction in the postoperative period.

In the group of patients with posttraumatic neurologic deficit, 9 patients tended to have positive dynamics of neurologic status before surgical treatment. After surgery, positive dynamics up to I stage according to ASIA/ISCSCI scale was achieved in 5 patients, regression up to II stage was noted in 3 patients, and complete regression of neurologic symptoms was observed in 1 patient.

In the group of 5 patients with a tendency to negative dynamics of the neurological status before the treatment, no regression was noted in 2 patients after the operation, positive dynamics up to I stage was achieved in 2 patients, improvement up to II stage in 1 patient. - y 1.

In the group of patients in whom no changes in neurologic symptoms were observed before the operation, after the operation positive dynamics to the I stage was achieved in 30 cases, regression to the II stage - in 26 cases, to the III stage - in 4 cases. 35 patients had no changes in the neurologic status, mostly these were patients with gross neurologic disorders (30 patients - group A according to the ASIA/ISCSCI scale, 2 - group B, 3 - group C).

Postoperatively, the local kyphosis in the injured PDS averaged 7.6° according to Cobb in patients with PSMT; the correction value averaged 7.2°. In patients with isolated spinal injuries, the postoperative local kyphosis was 6.5°; the correction value averaged 4.3°. After corporodesis, the loss of local kyphosis correction in patients with neurologic deficit was 6.5°, and without neurologic deficit - 2.9°.

The immediate results of treatment of unstable injuries of the thoracic and lumbar spine were evaluated 2 months after the final surgical stage. The long-term results of treatment were studied one year after its completion. The immediate treatment results were traced in all operated patients: good results were obtained in 65 (78.8%), satisfactory - in 9 (19.4%), unsatisfactory - in 3 (1.8%). Unsatisfactory treatment results were associated in two cases with destabilization of the metalwork, which required reassembly of the metalwork in one case and extension of fixation one level higher in the other. In one case there was a persistent (worsening from level C to A on the ASIA/ISCSCI scale) increase in neurologic symptoms after surgery.

The long-term treatment results one year after the surgical interventions were traced in 92 (54.1 %) patients: good - in 73 (79.3 %), satisfactory - in 16 (17.4 %), unsatisfactory - in 3 (3.3 %).

Discussion

The results obtained showed that Lovesanoplasty can restore anatomical relationships in traumatized PDS, including reconstruction of the spinal canal, and stabilize all supporting osteoligamentous columns.

In dislocations or fractures provoking gross deformity and stenosis of the spinal canal, but not accompanied by destruction of the posterior part of the vertebral bodies and temples, reformation is usually not difficult.

The analysis of the results showed that not every case of critical traumatic stenosis of the spinal canal in thoracic or lumbar spine injuries requires open decompression of the dural sac by corpectomy or laminectomy. In such cases, indirect decompression of the dural sac due to the effect of ligamentotaxis and reformation of the spinal canal with spinal repositioning instrumentation may be sufficient in the absence of neurologic deficit or in the presence of clear positive dynamics of the vertebral neurologic status when applying Lovesanoplasty.

Conclusions

1. In traumatic stenosis of the spinal canal in the lumbar spine, the choice of the method of dural sac decompression should be based on the spondylometric characteristics of the lesions in the traumatized PDS, the time since the injury, the severity and dynamics of neurological disorders, and the localization of the spinal column injury.

2. The decompression option based on repositioning reconstruction of the spinal canal is more preferable, as it provides minimal traumatic surgery and does not provoke the development of gross scarring and adhesions in the spinal canal.

3. In the absence of neurological manifestations or their complete regression, open reconstruction of the spinal canal should be performed in the presence of unresolved spinal canal stenosis under conditions of reliable stabilization of the traumatized PDS.

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