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Mistakes and complications after surgical treatment of lumbar spondylolisthesis. Clinical case

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Spondylolisthesis is a pathology of the musculoskeletal system that causes a vertebra to move forward, sideways or backward. Most often, it is treated surgically using transpedicular structures. Objective. To present a clinical case of re-treatment for degenerative lumbar spondylolysis of the L_V vertebral body using transpedicular and posterior autografting techniques. Methods. The clinical case of lumbar spine osteochondrosis, spondyloarthritis, posterior transpedicular fusion L_V–S_I, fracture of the screw in the body of the S_I vertebra on the right, and spinal canal stenosis at the level of L_V–S_I is described. Lower paraparesis. Results. The patient underwent metal removal, decompression of the spinal canal at the level of L_V–S_I, open reduction of the L_V vertebral body, posterior transpedicular fusion of L_{IV}–S_I and posterior autografting fusion. The surgical intervention was successful, despite the technical difficulties associated with removing the threaded part of the broken screw. According to the visual analogue scale, the patient had 8 points before the operation, which indicates acute pain syndrome, and after that the pain intensity decreased to 4 points. Muscle strength of the right and left lower extremities before surgery was 2 and 2.5 points, respectively, 5 days after surgery, improvement was recorded — 3 points for each limb. From the second day after repeated surgical treatment, the patient showed a significant improvement in muscle sensitivity and strength in both lower extremities. Conclusions. The clinical example of repeated surgery due to the failure of the metal structure and the deterioration of the patient's neurological status highlights the need for postoperative follow-up. Taking into account the percentage of complications after transpedicular spondylodesis, it is necessary to continue scientific research to improve the results of surgical treatment of patients with degenerative diseases of the spine.

Спондилолістез — це патологія опорно-рухової системи, за якої відбувається зміщення хребця наперед, убік чи назад. Частіше за все її лікують хірургічно з використанням транспедикулярних конструкцій. Мета. Навести клінічний випадок повторного лікування з приводу дегенеративного поперекового спондилолізного спондилолістезу тіла L_V хребця з використанням методик транспедикулярного та заднього автокістковопластичного спондилодезу. Методи. Описано клінічний випадок остеохондрозу поперекового відділу хребта, спондилоартрозу, заднього транспедикулярного спондилодезу L_V–S_I, перелому гвинта в тілі S_I хребця справа, стенозу хребтового каналу на рівні L_V–S_I. Нижній парапарез. Результати. Пацієнтові видалено металоконструкції, виконано декомпресію хребтового каналу на рівні L_V–S_I, відкрите вправлення тіла L_V хребця, задній транспедиулярний спондилодез L_{IV}–S_I та задній автокістковопластичний спондилодез. Хірургічне втручання пройшло успішно, не дивлячись на технічні труднощі, пов'язані з видаленням різьбової частини зламаного гвинта. За шкалою ВАШ до операції у пацієнта було 8 балів, це вказує на гострий больовий синдром, а після інтенсивність болю знизилась до 4 балів. Сила м'язів правої та лівої нижніх кінцівок до операції становила 2 і 2,5 бали відповідно, через 5 діб після операції було зафіксовано покращення — по 3 бали для кожної кінцівки. З другої доби після повторного хірургічного лікування пацієнт констатував значне покращення чутливості та сили м'язів в обох нижніх кінцівках. Висновок. Клінічний приклад повторної операції через неспроможність металоконструкції та погіршення неврологічного статусу пацієнта підкреслює необхідність післяопераційного спостереження. Ураховуючи відсоток ускладнень після транспедикулярного спондилодезу, необхідно продовжити науковий пошук для покращення результатів хірургічного лікування пацієнтів із дегенеративними захворюваннями хребта. Ключові слова. Дегенеративний остеохондроз, спондилолізний спондилолістез, спондилодез.

Key words. Degenerative osteochondrosis, spondylotic spondylolisthesis, spondylodesis

Introduction

Spondylolisthesis is a locomotor disorder, characterized by displacement (listhesis) of a vertebra: forward (antelisthesis), sideways (laterospondylolisthesis) or backward (retrolisthesis). Vertebral listhesis can lead to spine deformation, narrowing of the spinal canal [1]. As with many diseases of the spine, the main symptom of this abnormality is pain. Compression of nerve endings and blood vessels, overload of the joint complex, which triggers the development of deforming spondyloarthrosis and spondylosis, can also occur. According to etymology, spondylolisthesis is divided into types: degenerative, dysplastic or congenital, isthmic, pathological, traumatic [1, 2]. We pay special attention to acquired spondylolisthesis, which occurs due to excessive physical exertion secondary to impaired bone tissue nutrition or vertebral dysplasia.

The choice of tactics and method of treatment of spondylolisthesis of the spine depends on the specific clinical situation and can vary from the use of conservative treatment methods to the implementation of various surgical interventions. The use of short 4- or 6-screw fixation provides adequate correction of spinal deformity and a good functional result already in the early postoperative period [3, 4]. A generally accepted method of surgical treatment of patients with degenerative spondylolytic spondylolisthesis at the lumbar level of the spine is posterior transpedicular spondylodesis in combination with bone allo- or autoplasty. The main advantage of transpedicular spondylodesis is precisely that its use makes it possible to achieve stable fixation of spinal segments [5]. Numerous scientific publications confirm that it is this volume of surgical intervention for lumbar spondylolytic spondylolisthesis that enables satisfactory treatment results in most clinical observations [5–7]. However, complications occur after transpedicular spondylodesis in 5–10 % of cases [8]. In our opinion, this is primarily due to errors at the stages of preoperative planning and execution of the operation. Among them, insufficient length of instrumentation, inadequately selected size and length of implants, incorrect insertion of screws and placement of rods, incorrect reduction of listhesis should be highlighted [9].

Purpose: to present a clinical case of repeated treatment for degenerative lumbar spondylolytic spondylolisthesis of the body of the L_V vertebra using the techniques of transpedicular and autoosseous spondylodesis.

Material and methods

The research material was reviewed and approved by the local Bioethics Committee at the State Institution Professor M. I. Sytenko Institute of Spine and Joint Pathology of the National Academy of Medical Sciences of Ukraine (Protocol No. 232 dated 19.05.2023).

Patient Ch., born in 1975, a professional serviceman of the Armed Forces of Ukraine (AFU), was referred to the State Institution Professor M. I. Sytenko Institute of Spine and Joint Pathology of the National Academy of Medical Sciences of Ukraine with pronounced pain in the lumbar region of the spine, which intensified during physical activity and radiated to the lower limbs, numbness and weakness in lower legs and feet, especially right lower limb.

From the history of the disease, it is known that in 2007 an operation was performed for degenerative lumbar spondylolysis spondylolisthesis of the L_V vertebral body in the neurosurgical department of another medical institution in the scope of open reduction of the L^V vertebral body and transpedicular fixation of the L_{IV}–L_V segment. At that time, the patient complained of pain in the lumbar spine and left lower limb, numbness and weakness of the left foot. After surgery, the condition improved, but the strength of the muscles of the left foot did not fully recover, and the feeling of numbness of the left lower limb remained. At the same time, the patient returned to service in the Armed Forces without any physical limitations.

The patient could not remember the exact episode of the injury due to the significant psycho-emotional stress he experienced during the combat encounter, in which he felt a significant deterioration of the condition of the lumbar spine and lower limbs. The patient noted a large number of falls, jumps from combat equipment and jumps to shelter.

We can make an assumption that it was permanent static and dynamic weight overloads on an inferior structure that caused the failure of the installed structure in 2007 and the fracture of its elements.

With repeated complaints, the patient was hospitalized in the department of vertebrology, where he underwent a comprehensive examination, X-ray examination and electroneuromyography of the muscles of the lower extremities, computed tomography (CT), densitometry of the spine. He was diagnosed with osteochondrosis of the lumbar spine; spondyloarthrosis; state after surgical treatment — open reduction of the body of the L_V vertebra, posterior transpedicular spondylodesis of the L_V–S_I; failure of the metal

structure, fracture of the screw in the body of the S_I vertebra on the right; stenosis of the spinal canal at the $L_V–S_I$ level; lower paraparesis (Fig. 1).

The patient underwent a repeat operation under general anesthesia on 13 January 2023: removal of the metal structure, decompression of the spinal canal in the form of a facet flavectomy and hemylaminectomy at the $L_V–S_I$ level, open reduction of the L_V vertebral body, posterior spondylodesis of the $L_{IV}–L_V–S_I$ transpedicular construction and posterior autoosseous plastic repair (Fig. 2). The surgical intervention was successful, despite the technical difficulties associated with the removal of the threaded part of the broken screw.

Results and their discussion

Postoperative period was uneventful. The patient received standard therapy — antibacterial prophylaxis, pain relief, postoperative wound care. On the second day after the surgical intervention, physiotherapeutic treatment aimed at electrostimulation of the muscles of the lower limbs and magnet therapy in the area of the postoperative wound was started.

From the second day after repeated surgical treatment, the patient noted a significant improvement in sensitivity and muscle strength in both lower limbs.

The VAS index before the operation was 8 points, which reflected an acute pain syndrome, and after the surgical intervention, the pain intensity decreased to 4 points. The strength of the muscles of the right and left lower limbs before the operation was equal to 2 and 2.5 points, respectively, and 3 points on both limbs 5 days after the operation. The patient was discharged from the vertebrological hospital in satisfactory condition for certification by the military medical commission and further rehabilitation treatment.

During the follow-up examination on 22 February 2023, patient Ch. walked on his own without gait disturbance, but complained of moderate numbness in his feet, more so in the left.

The patient was scheduled for further consultative examinations 3, 6, and 12 months after the operative treatment to control the position of the installed structure and observe the degree of formation of the autoosteoplastic spondylodesis. Meanwhile, the patient has already been referred by the unit's medical service to a specialized center for restorative and sanatorium treatment.

Discussion

Today, the etiology of spondylolisthesis remains poorly understood. One of the factors of its development is considered to be a violation of the spinal-pelvic balance and *pars interarticularis* disorder [8]. In recent years, a steady increase in the number of degenerative diseases of the spine has been recorded.

Due to the war in Ukraine, the number of orthopedic and traumatological patients is increasing, in particular, those with vertebral non-combat disorders, both among the civilian population and military personnel. Among the latter, such diseases are considered a «hidden epidemic».

It is military personnel who are now most prone to spine disorders (for example, spondylolisthesis) due to round-the-clock superhuman physical and nervous stress. For example, a standard armored vest of the Armed Forces weighs 11–13.3 kg, and even for a person in good physical condition, such constant additional weight will worsen the condition of the musculoskeletal system, lead to a violation of the spine-pelvic balance, the development of spondyloarthrosis and spondylosis, and other disorders of the spine. It has been proven that repetitive loads on the lumbosacral region in athletes (i. e. greater than in people with a normal lifestyle) trigger the development of spondylolisthesis or a significant neurological deficit [10]. In addition, a significant rela-

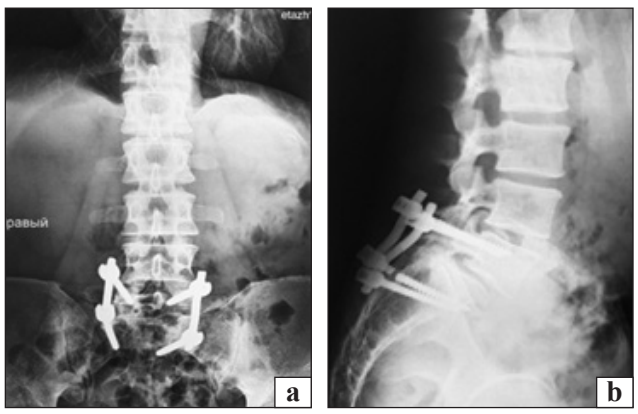

Fig. 1. X-ray images of the patient Ch. at the time of application: frontal (a) and sagittal (b) projections

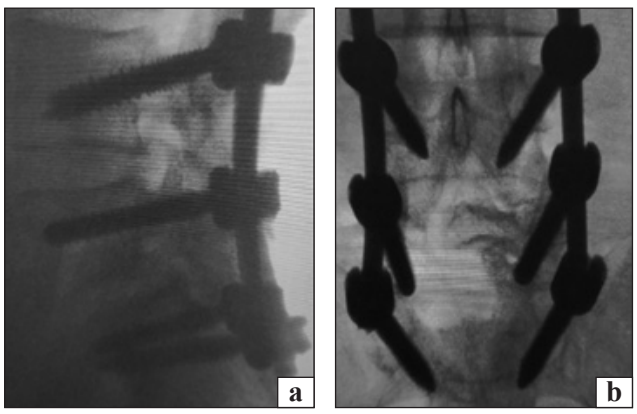

Fig. 2. X-ray images of the patient Ch. after replacing the structure: lateral (a) and frontal (b) projections

tionship between the exacerbation of chronic pain in the lower back and the level of depression and anxiety in military personnel has been proven [11]. The majority of Ukrainians who, under modern conditions, are subjected to excessive work and are under constant stress (military servicemen, rescuers, medical personnel, etc.), regardless of the treatment method used, should return to their functional duties as soon as possible, preferably in full. Thus, the issue of treatment and rehabilitation of patients with degenerative diseases of the spine has become even more urgent.

In the given clinical example, one of the routine surgical methods for the treatment of degenerative spondylolisthesis — posterior transpedicular spondylodesis of the L_V–S_I [12, 13] was applied. However, in the postoperative period, he developed a complication related to the failure of the metal structure, which may be related to the progression of the degenerative disease and excessive loads [10]. In addition, today the optimal method of surgical treatment of patients with degenerative spondylolisthesis has not been determined, experts still argue about the best method of spondylodesis, the need to use interbody support, etc. [1]. In our opinion, careful preoperative planning, preparation of the patient and the surgeon for operation, postoperative monitoring of the patient (periodic X-rays) and compliance with the orthopedic regimen help to prevent complications and reduce the risks of vertebral displacement.

The given clinical case shows that surgical methods of treating degenerative diseases of the spine must be improved in accordance with today's challenges, giving our patients the opportunity not only to get rid of existing complaints and preserve the function of an organ or system, but also to return to everyday and professional life without losing their own professional efficiency.

After repeated surgical intervention, the patient announced at the follow-up examination that he intends to return to the ranks of the Armed Forces and continue to defend the Motherland, despite the recommendations of specialists to observe a gentle orthopedic regimen and limit all types of physical exertion.

Conclusions

The given clinical case demonstrates the need for careful examination and research of each patient with a degenerative spine disease and emphasizes the need for regular postoperative monitoring in individuals who are exposed to excessive loads.

Conflict of interest. The authors declare no conflict of interest.

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MISTAKES AND COMPLICATIONS AFTER SURGICAL TREATMENT OF LUMBAR SPONDYLOLISTHESIS. CLINICAL CASE

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