

## 296. Surgical treatment of the vertebrae fractures in the lower-thoracic and lumbar localization with the contemporary technologies

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**Abstract.** The absence of the unique approach to a problem of treatment of fragmented fracture of the lowest thoracic and lumbar part of a spinal column makes the given problem very actual. The purpose of the work is to mark the surgical methods applied to patients with fragmented fracture of the lowest thoracic and lumbar part of a spinal column. The material of research is based on the given supervision over the patients with the given pathology, operated on in clinic of the Traumatology and Orthopedics on the basis of UZ "GKO" "SMP" in Grodno. The decompressive-stabilizing operations with the use of transpeduncular fixators were applied in treatment. Offer new way of surgical treatment of traumas of a spinal column: combined spondilodezsis with the use of transpeduncular fixators and demineralizing bone matrix. While analyzing the results of treatment good results were revealed.

**Keywords:** spinal column, corpectomy, transpeduncular fixation, spondilodezsis, demineralizing bone matrix.

### Introduction

In recent years traumatic injuries of the breast and lumbar divisions of spine remain at the stable high level with the tendency toward a constant increase. One of the first places take up comminuted fractures of the bodies of vertebrae. The absence of united approach to a problem of the estimation of the state of the damaged segment, selection of the methods of conservative and surgical treatment makes the given problem very actual.

The purpose of the work is to estimate the surgical methods applied with patients who have comminuted unstable fractures of the breast and lumbar divisions of spine.

### Material and the methods of the study

During the period from 2004 to 2006 in the clinic of traumatology, orthopedics on the basis of hospital of the first help Grodno were operated 20 patients with unstable comminuted fractures of the lower-thoracic and lumbar divisions of spine. Sex distribution: female - 41.8%, male — 58.2%. The patients' average age was 21-40 years old. Patients' neurologic disturbances occurred in 9 cases and were averted: in 2 cases - according to the type of lower, one-sided pareses of extremities with the function of pelvic

organs disturbance, in 2 cases - occurred paresis of foot, in 5 cases - occurred reduction in sensitivity in the lower extremities. The periods of the patients' admission to hospital comprised from a few hours to two days. By the patients' admission to hospital in the hospital ward they were adapted the clinico-neurologic method of inspection, and also the roentgenography of spine in standard projections. During the establishment of diagnosis the international classification on F. Denis (1983), based on the three-column biomechanic concept of the damages of front, average, and rear of vertebral posts was used. After patients' admission to the hospital the additional studies were conducted: X-ray computer tomography, MRT (magnetic resonance tomography), myelography. Depending on patients' diagnostic data they were advanced to one or another form of surgical treatment. In all cases the decompressive-stabilizing operations from the rear access were performed. The patients' MRT data examination before the surgical treatment in 4 cases disturbance of the integrity of rear longitudinal bond was detected and confirmed. All the 20 patients were applied the surgical treatment. 2 patients were carried out the back decompression of spinal cord with the removal of the bone fragments of the body of the damaged vertebra, the intra-operating reposition with the simultaneous fixation of the damaged segment TPF (transpeduncular fixation). 13

patients were carried out the reposition decompression of spinal cord with the subsequent transpeduncular fixation. 5 patients were carried out the back decompression of spinal cord in the form of gemilaminektomii, intro-operating reposition with the simultaneous fixation TPF. In all surgical treatments the universal fixator TPF, developed by firm "Medbioteh" was used. Surgical technology provided for preoperation planning with the determination of the parameters of the utilized screws (transverse diameter and length) and the selection of the most optimum version of the installation of fixator depending on the existing damage. Screws were set to transpeduncular procedure taking into account the individual anatomical characteristics: diameter and the height of the roots of the arcs of vertebrae distance from the articulate branches to the ventral cortical plate of the body of vertebra, peduncular angle in the horizontal plane. Most frequently fixation was carried out bisegmentarno, with the introduction of intermediate screw into the body of the damaged vertebra.

Reposition was carried out due to ligamentotaxsis. Initially, during piling the patient on the operating table hyperextension with the traction along the axis was carried out. The second stage of reposition was carried out due to the transpeduncular fixation. The stages of the introduction of screws TPF and reposition were intra-operating monitored X-ray.

Clinical example: the patient C, 34 years old in an accident obtained compression comminuted fracture of body L1 with the front compression of dural bag. Reduction in sensitivity in the lower extremities neurologically occurred. Upon During the patient's MRT study it was noted the front compression of dural bag by the splinter of body L1 vertebrae to 0.6 cm., in 10 days taking into account the unstable nature of the break of patient executed surgical treatment - the reposition decompression of spinal cord, transpeduncular fixation at the level T h12- L 2 with the introduction of intermediate screw into body L 1. The postoperative period without the special features, patient was put in vertical position in 10 days, sutures were taken off in 14 days, and the wound was healed primarily. Reduction in sensitivity in the lower extremities had disappeared. In the postoperative period the immobilization was achieved by a detachable rigid thoracolumbar orthopedic corset. The results of the effectiveness of surgical treatment are confirmed by MRT study: the compressions of dural bag during level L1 and deformation of spine was not observed, screws TPF cost correctly (fig. 1-2), and also X-ray: the sizes of vertebrae on the front outline comprised to the operation: Th of 12-30 mm., L of 1-10 mm., L of 2-28 mm., L of 3-35 mm., after the operation: T h of 12-30 mm., L of 1-30 mm., L of 2-29 mm., L of 3-35 mm. (fig. 3-5).

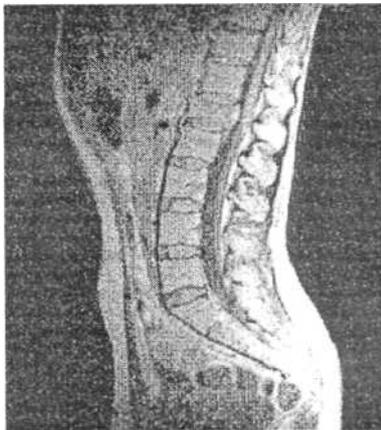


Fig.1. Patient C's MTR before operation



Fig.2. Patient C's MTR after operation

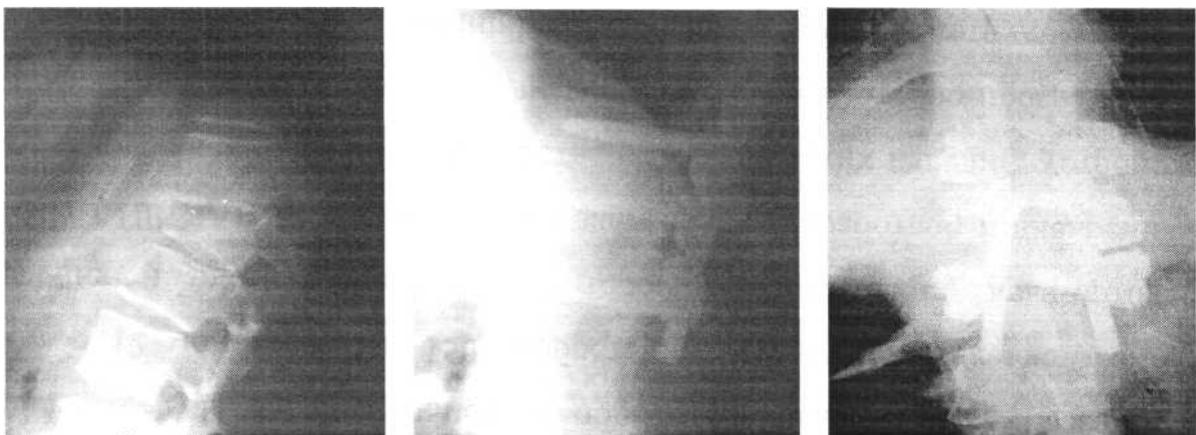
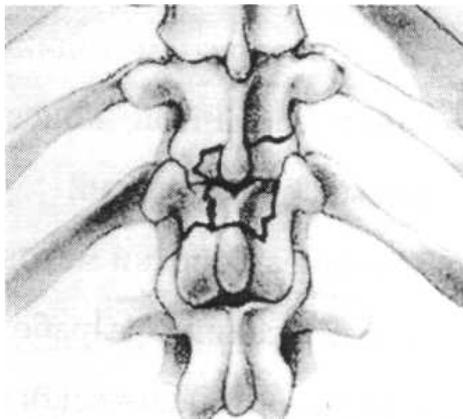


Fig.3-5. Patient C's X-ray photographs before and after the surgical treatment

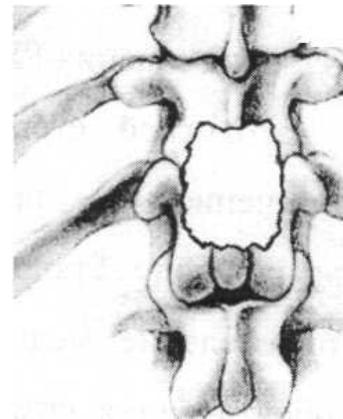
In the department of traumatology, orthopedics of Grodno state medical university during the last 25 years experimental and clinical research of the study of reparative regeneration in the treatment of the fractures of the bones of extremities with the use of biologically valuable material in the form auto-, allotransplants and especially DBM (demineralized bone matrix) has been carrying out. Is experimentally substantiated and proved the high effectiveness of the application DBM is experimentally proved. The active osteogenesis, noted within the early periods of experiments, means the high osteoinduction and osteoplastic properties of this form of plastic material. These studies became the basis of the new method of the surgical treatment of the injuries of the spine proposed by us, combined spondilodeza with the use TPF and DBM. 4 patients were carried out the combined spondilodeza procedure. Basic indications for combined spondilodeza were the unstable breaks of vertebrae. The essence of the offered method of surgical treatment is the following: surgical access standard - rear, after the specific form of the decompression of spinal cord (intra-operating segmental reposition decompression or decompression via laminectomy) and installation of transpeduncular fixation carried out the setting of thin DBM strips to the preliminarily prepared skeletonized arcs of vertebrae.

Auto-, allomaterial is arranged in such a way that the plastic material would overlap the zone of damage. Stabilization and its fixation are carried out either by rods of metallic fixators or by suture material to the arcs of vertebrae (fig. 9).

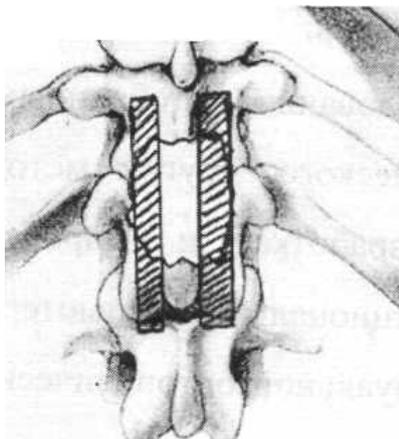
During the operations the alloplastic material (demineralizing bone matrix), preserved in the dilute solutions of aldehydes was used. Purveyance and preservation of alloplastic material was carried out in the laboratory on the conservation of tissues, organized with the department of traumatology, orthopedics Grodno state medical university. The postoperative conducting of patients did not differ from conventional: early mobilization in bed, then fixation by body cast after the removal of sutures during 2-4 months, outpatient observation. The studied group was composed of 4 patients at the age from 25 to 60 years old. Localization of the damage of vertebrae is the following: break at the level Th 12 - 1 case, L of 1 - 2 cases, at level L 5 - 1 case. All patients were carried out an alloplastic by the thin plates of cortical transplants. Period of observation takes up to 2 years. For the results estimation the moderately-priced methods of the study were applied: clinical, X-ray methods, computer and magnetic-resonance tomography.



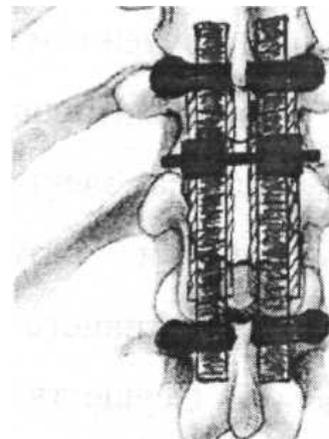
**Fig.6.** Break of the arcs of the vertebrae



**Fig.7.** Laminectomy



**Fig.8.** DBM piling



**Fig.9.** TPF installation

## Results

The results of treatment were estimated according to three categories: good, satisfactory and unsatisfactory. During the period from 2 months to 2 years the analysis of the results of treatment are reliably discovered the predominance of good results in 18 cases. Satisfactory results are obtained in two cases, and there were no unsatisfactory results.

Good results of treatment were characterized by the complete regress of neural disorders, by the absence of pain syndrome, by the restoration of the axis of spine. Satisfactory results were characterized by the positive dynamics of neural disorders with the partial restoration of those lost of function, by the residual kyphotic deformation of spine up to 15°, by the moderate pain syndrome.

Unsatisfactory - were characterized by the absence of the regress of neurologic symptomatology or by its deepening, kyphotic deformation of more than 15°, by instability in the operated division of spine and by a constant painful syndrome.

It is X-ray methods determined, that with combined spondilodezis with the use DBM the reparative regeneration occurs according to the type of synchronous "resolution- substitution". It is noted, that in period from 3 to 6 months occur the gradual transformation of plastic material with the formation of bone block. The active osteogenesis, noted within the given periods, means the high osteoinductive and osteoplastic features of the demineralized bone matrix, which in combination with the reliable fixation of the damaged segment of spine TPF makes spondilodez more valuable.

## Discussion

In the determination of the method of the surgical treatment of comminuted fractures of the bodies of the vertebrae of lower-breast and lumbar division must be included the necessary, maximally complete patient's examination procedure. In its turn surgical treatment must be directed toward the elimination of stenosis of vertebral channel, the correction of the deformation of spine during the sufficiently durable fixation.

## Conclusion

The carried out analysis of the surgical treatment of patients with comminuted fractures of the lower-breast and lumbar divisions of spine made it possible to formulate the following conclusions:

During the formulation of diagnosis the nature of the damages and the degrees of neural disorders must clearly be evaluated according to classification of Denis F. and Frankel.

The methods of study must include: clinico-neurologic, X-ray methods, including KT, magnetic-resonance tomography, to elektroneyromiografic, contrasting methods.

The integrity of rear longitudinal bond must be

considered during the selection of the method of the surgical treatment of comminuted fractures of the bodies of vertebrae.

With the integrity of rear longitudinal bond is possible a sufficient reposition decompression of spinal cord by force of the detailed intraoperative segmental extension – distrakcii.

The execution of the rear-lateral decompression of spinal cord with the removal of the bone fragments of body wasn't justified, since it is technically complex and has the high risk of secondary damage of spinal cord.

The volume of the rear decompression of spinal cord must correspond to the nature of damage and compression of the contained vertebral channel.

Preferably the fulfillment of hemilaminectomy before the wide laminectomy, which prevents the postoperative formation of spine in the distant period.

For the durable fixation and unloading the stabilized segments is expedient the application of transpeduncular fixation. This fixator makes it possible to carry out intraoperating multi-planar reposition with the elimination of traumatic stenosis of vertebral channel and the restoration of spine support ability.

The combined use of metal construction and bone tissue with operational interference must be the basic factor in an improvement in the results of treatment and fast activation, rehabilitation of patients. The use of alloplastic material (especially DBM) against the background of the stable fixation of breaks with metal constructions leads to the most valuable transformation and the fastest restoration of the anatomical structure of the damaged vertebral post.

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