

# Surgical tactics in the treatment of trauma of the cervical spine

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## Abstract.

One of the most important stages of surgical treatment of complicated injuries of the cervical spine, along with adequate decompression of the spinal cord, is the optimum stabilization of the damaged vertebral-motor segment. Obtaining reliable primary stabilization of the operated segment, allowing as soon as possible strengthening the patient without external immobilization, it is the primary goal of stabilizing stage surgery.

*Key words: cervical spine, posttraumatic instability, surgical treatment, granular "CollapAn", primary stabile arthrodesis*

## Умуртқа поғонаси бўйин қисми жароҳатларини даволашда жаррохлик тактикаси

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## Аннотация.

Асоратланган бўйин умуртқалари жароҳатларини жаррохлик йўли билан даволашда, орқа мия адекват декомпрессияси билан бир қаторда, зарарланган умуртқа харакат сегментини оптимал стабилизацияси асосий тамойилларидан хисобланади. Ташқи иммобилизациясиз эришиландиган, эрта муддатларда беморни фаоллаштириш имконини берадиган ташрих ўтказилган сегмент оптимал стабилизацияси умуртқа поғонасида ўтказиладиган ташрихларни энг муҳим босқичи деб биламиз.

*Калит сўзлар: бўйин умуртқалари, посттравматик нотуруғлик, хирургик даволаш, гранулалар «КоллапАн», бирламчи тургун спондилодез.*

# Хирургическая тактика в лечении травмы шейного отдела позвоночника

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## Аннотация.

Одним из важнейших этапов хирургического лечения осложненной травмы шейного отдела позвоночника, наряду с адекватной декомпрессией спинного мозга, является надежная, оптимальная стабилизация поврежденного позвоночно-двигательного сегмента. Получение первично надежной, оптимальной стабилизации оперированного сегмента, позволяющей в максимально короткие сроки активизировать пациента без громоздкой внешней иммобилизации, является основной целью стабилизирующего этапа оперативного лечения на позвоночнике.

*Ключевые слова: шейный отдел позвоночника, посттравматическая нестабильность, хирургическое лечение, гранулированный «КоллапАн», первично-стабильный спондилодез.*

The increase in road traffic injuries is accompanied by an increase in the frequency of injuries of the cervical spine, possibly due to the negative role of the seat belt, which reduces the risk of damage to the chest and head, but contributes to the flexion or "whiplash" mechanism of injury to the cervical spine. If in the 60s of the last century injuries of the cervical spine were mainly the result of a diver's injury, then at present the leading position belongs to a road injury [7, 12]. The reason for the variety of neurological complications are the features of the anatomical relationship of the spine with the spinal cord, roots, vertebral arteries. On this basis, some authors consider the term "uncomplicated" injuries of the cervical spine doubtful [2, 10, 12]. Most traumatologists and neurosurgeons are convinced that full-fledged decompression of the spinal cord and roots with reliable stabilization of the spine is achieved only by the surgical method [11, 12]. Preference is given to operations from the front access. This position is not always recognized by clinicians. The widespread introduction into practice of the Cloward operation or its modifications has shown that this method is not without drawbacks.

Orthopedic complications (migration, resorption of bone grafts, etc.) are not uncommon, they reach 25% even on the material of the author of the operation. It is understandable that clinicians strive to modify the operation in accordance with the requirements for primary stable fusion, allowing for early rehabilitation of patients. To date, various methods have been developed to stabilize the spine using metal structures [1, 6], ceramic-based implants [5, 9], composite materials [2, 4], and titanium nickelide [3, 7, 8]. Without belittling the advantages of these methods of fusion, we note that the use of implants does not exclude the occurrence of late complications [7]. Our own experience in the treatment of injuries of the cervical vertebrae allows us to assert that primary stable fusion is achievable without the use of metal or ceramics and excludes the development of complications specific to them.

**Material and methods.** The present study was based on clinical observations of 135 patients treated between 2002 and 2015. The majority of patients were young men (mean age 28 years). In 80% of cases, trauma to the cervical spine was obtained in car accidents. In equal numbers of observations, a neck injury was stated both among patients using a seat belt and without it. Diver's injury occurred in 12% of cases, including 8% of patients hospitalized before 2005. In the acute period of the injury (up to 10 days), 63 patients were admitted, in the early period (up to 3 weeks) - 22 patients -nyh. Chronic injuries (more than 3 weeks) were stated in 50 observations. Over the past 10 years, the proportion of chronic injuries has significantly decreased (11 patients). This indicates an improvement in the diagnosis of this type of spinal injury. Dislocations and subluxations of the vertebrae were present in 90 patients, fracture-dislocations - in 32, fractures of the vertebral bodies - in 13 patients. Neurological vertebrogenic syndromes were noted in 127 patients. A total of 80 patients had no clinical manifestations of spinal cord and nerve roots injury. In the majority of observations (81) the neurological picture corresponded to the radicular syndrome, less often (46) to the syndrome of myeloradiculopathy. We have not established clear clinical manifestations of the vertebral artery syndrome. However, 3 patients noted a short-term loss of consciousness followed by headache and nausea for 3-4 days. The scanning of the vertebral arteries carried out in these observations ruled out a violation of blood flow in them and in the posterior cranial fossa.

According to Frankel's classification, the severity of neurological complications in group B corresponded in 10 patients, C - in 30, D - in 90, E - in 5 patients. All patients were operated on from the anterior approach. In the

acute and early period of injury, the reduction of dislocations and subluxations was carried out using a reponator. For fractures, resection of the vertebral body was considered indicated, up to complete replacement and transcorporeal decompression of the spinal cord in spinal canal stenosis. To eliminate displacements of the vertebrae in fracture-dislocations in the acute and early periods, we proposed a reponator that provides dosed distraction of the vertebrae and their movement relative to each other. In case of failure of reposition, decompression of the spinal cord and roots was carried out by resection of the vertebral bodies with the corresponding uncovertebral joints. This operation is considered the method of choice in the late period of injury, since due to fibrous stabilization of the spine, repositions are dangerous due to possible iatrogenic complications. Stabilization of the operated segments of the spine was carried out with the biocomposite material "CollapAn". Bone cement was used to fix them in the vertebral bodies. Our experiments in 2002 on biomannequins showed that this method of fusion meets the requirements of primary stable fusion. Spinal fusion proved to be consistent with static and dynamic loads within the physiological parameters of loads on the cervical spine. This made it possible to apply early rehabilitation of patients in the postoperative period without a plaster cast or orthoses. However, when using transport, we recommended that patients use a removable orthosis.

Results and discussion. Decompression of the spinal cord and roots with primary stable fusion contributed to the high analgesic effect of the operation with intensive regression of neurological syndromes. A typical feature of the regression of neurological syndromes is noted - a lower intensity and a longer duration of this process in patients with chronic injuries.

The average duration of the recovery period for neurological complications of an old injury was 60 days, for other complications - 25 days. 3 months after the operation, the assessment of the neurological status according to Frankel was as follows: B - no, C - 6, D - 5, E - 124 patients. Thus, with the help of surgical treatment, it was possible to interrupt the pathogenesis of neurological complications in most cases. Bone or bone-carbon block due to "KollapAn" was achieved in all patients.

At the same time, there was no difference in the timing of the formation of a bone block when using granulated "Kollapan". The average duration of the formation of a bone block in one segment is 7 weeks, in two segments - 11 weeks. Postoperative complications occurred in the initial period of work. Failure of spinal fusion with migration was noted in 9 cases. The reason for

this complication is technical. The formation of a groove in the vertebrae was performed with an electromill, and the graft had the shape of a "chizhik". Subsequently, the grooves were formed manually with a chisel, giving them the appearance of a dovetail. The graft was made with supporting arms at the end protrusions inserted into the grooves of the vertebral bodies. When using this technology, there were no graft migrations. In the case of graft migration, the patients were operated on again with a positive result. Deterioration of the neurological status in the immediate postoperative period was noted in 2 patients. The cause of this complication, in our opinion, is a traumatic reposition, as well as vibration when using an electric cutter for resection of the vertebral bodies and the formation of grooves. This was the basis for the abandonment of the electric cutter. Subsequently, the resection of the vertebrae and the formation of grooves were performed manually with wire cutters and incisors, and the reposition was carried out without rough technical methods and once. If repositioning fails, we consider it safer to perform decompression of the spinal cord and roots by resection of the vertebral body. Suppuration of the wound was noted in 6 patients also in the initial period of work. When mastering the technique of anterior access, the operations were performed traumatically and, possibly, with imperfect hemostasis. With the development of the technique of the operation, suppuration of the wound became a rarity. Early results of treatment were evaluated taking into account the following criteria:

- analgesic effect of the operation;
- regression of neurological syndromes;
- achievement of the bone block of damaged vertebral segments;
- restoration of working capacity.

Good results were observed in 114, satisfactory - in 19, poor - in 2 patients. Long-term results with a follow-up of more than 5 years were followed up in 12 patients. There was no reassessment of treatment outcomes. In all observations, a consistent bone block of damaged segments was stated. However, 9 patients showed signs of degeneration of discs located adjacent to the level of fusion. We associate the degeneration of previously healthy discs with trauma and surgery, since spinal fusion is accompanied by an overload of segments adjacent to immobile ones. Despite the absence of clinical manifestations of osteochondrosis in patients, we regard the degeneration of healthy discs as a negative result of treatment.

Obviously, this complication does not depend on the method of fusion,

and the real measure of its prevention is the development of methods for dynamic stabilization of damaged vertebral segments.

Thus, the proposed tactics of surgical treatment of injuries of the cervical spine, including decompression of the spinal cord and roots with primary stable fusion, provides a stable positive result in most cases. Refusal to use metal structures for spinal fusion allows avoiding the complications of the late postoperative period, which are typical for them, and eliminating the possibility of repeated operations. A specific late complication of spinal fusion is degeneration of the segments adjacent to the level of stabilization due to compensatory overload. Probable prevention of this complication is the development of methods for dynamic stabilization of damaged vertebral segments.

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