

Surgical Treatment of Cervical Spine Injuries in Conditions of Emergency Medical Care

*Khudaiberdiev K. T, Isakov B. M, Tashlanov F. N, Kadirov A. A, Isakov K. B.
Andijan branch of the RSPCEM & Andijan State Medical Institute, Uzbekistan*

Abstract: Cervical spine injuries account for up to 30-35% of all spinal injuries. Due to mobility and being under constant loads, unstable and complicated injuries are most common in the cervical spine. Complicated injuries are characterized by high rates of disability - up to 85-90% of cases and deaths - up to 30%. Goal: to improve the results of surgical treatment of cervical spine injuries. Material and methods. 38 patients with various types of injuries to the cervical spine were examined and surgically treated. After establishing the diagnosis and nature of the spinal cord injury, surgical treatment was performed: decompression and stabilization of the damaged spinal segment with a carbon and nickel-titanium implant. According to the results of the treatment, good and satisfactory results were obtained in more than 70% of cases, unsatisfactory results in 5 (13.1%) patients, which was associated with severe damage to the spinal cord. Conclusions: performing surgical interventions at an earlier time after injury contributes to the restoration of lost functions of the spinal cord.

Keywords: trauma, spine, spinal cord, instability, myelopathy, decompression, stabilization.

Relevance. Treatment of patients with cervical spine and spinal cord injuries caused by severe neurological disorders, a large number of complications, high mortality and disability rates is one of the pressing problems of traumatology and neurosurgery [1-3]. Spinal injuries occur in 4-6% of cases among all skeletal injuries. The cervical spine accounts for 25-35% of cases of injury. Complicated cervical spine injuries caused by trauma are one of the most severe types of pathology. High mobility and relatively weak development of the ligaments of the cervical spine is the cause of frequent dislocations, subluxations and sprains of the ligamentous apparatus. Dislocations and subluxations lead to displacement of the vertebrae, deformation of the spinal canal, muscle spasm and local edema lead to disruption of the topographic and anatomical relationships of the spine, spinal cord and its roots. Lesions of the cervical spinal cord resulting from trauma lead to the development of a complex of structural and functional changes manifested in the form of gross neurological deficit, various neurotrophic, metabolic, circulatory disorders and infectious complications, which significantly aggravate the course of the pathological process.

Despite significant changes in the organization of emergency care, active surgical tactics, the introduction of new types of operations and technologies for complicated cervical spine injuries, a high percentage of fatal outcomes remains, reaching 90% depending on the level of damage [6, 7]. The main causes of mortality are pulmonary complications, cardiovascular disorders, neurotrophic disorders leading to sepsis [4, 7]. Improvement of functional treatment results, reduction of the number of complications and improvement of the quality of life in victims with complicated cervical spine injury are possible due to early surgical treatment and complex treatment [8, 9].

Objective: improving the results of surgical treatment of patients with cervical spine injuries.

Material and methods. Examination and surgical treatment of 38 patients with cervical spine injuries was performed in the neurosurgical department of the Arkhangelsk Branch of the Russian Scientific Center for Emergency Medical Care. The age of the patients ranged from 18 to 65 years. There were 27 men (71.0%) and 11 women (28.9%). By the mechanism of injury: domestic - 18 (47.3%), road - 14 (36.8%), industrial - 2 (5.2%), sports - 2 (5.2%) cases. The causes of domestic injuries were falls from a height and swimming in water bodies - "diver's injury". A neurological examination, X-ray and

MSCT study of the cervical spine were performed. Neurological changes according to the classification ... By the level of spinal injury: C2 vertebra fracture – 2 (5.2%), C4 – 9 (23.6%), C5 – 16 (42.1%) and C6 – 11 (28.9%). The most frequent localization of injuries was noted at the level of C5-C6 vertebrae – 27 (71.0%) cases. Of these, unstable injuries (fractures-dislocations) were detected in 23 (60.5%) patients.

Fig. 1. MSCT picture of fracture-dislocation of the C5-C6 vertebra.

Based on the examination results, the patients underwent the following types of surgical treatment:

1. Closed fixation of the fracture of the C2 vertebra - 2 patients.
2. Anterior decompression of the cervical spinal cord, installation of a carbon transplant - 27 patients.
3. Anterior decompression of the cervical spinal cord, installation of a cage and fixation with a plate - 9 patients.

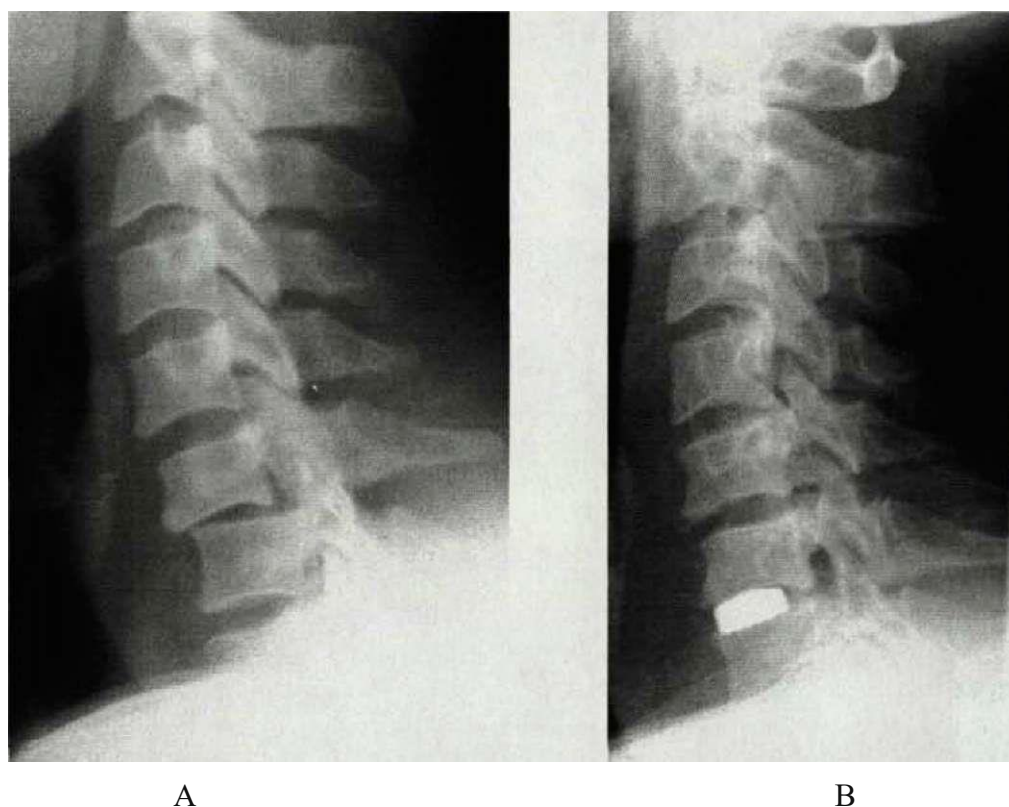


Fig. 1. A- Radiograph of fracture-dislocation of the C6 vertebra. B - open reduction of fracture-dislocation of C6, discectomy, stabilization of the damaged segment with a porous nickel-titanium implant.

Results. A good result in 21 (55.2%) patients was characterized by positive neurological dynamics (transition of patients from group A to group B, from group B to group C), restoration of the spinal axis and lumen of the spinal canal; absence of pain syndrome with full or moderate load on the spine.

Satisfactory results were achieved in 12 (31.5%) patients and consisted of positive neurological dynamics with partial restoration of lost functions or preservation of primary neurological disorders at the previous level; restoration of the spinal axis and lumen of the spinal canal, the presence of pain with moderate load on the spine. Unsatisfactory results in 5 (13.1%) patients included deterioration of the neurological status, gross deformation of the operated spine, development of instability and the presence of constant pain syndrome with minor load on the spine.

Example: Patient D., 54 years old, was delivered to the emergency room by ambulance workers 1 hour after the injury with complaints of pain in the cervical spine, limited active movements in the arms, numbness in the fingers of both hands, and urinary retention.

From the anamnesis: The injury was sustained at home, as a result of a fall on September 3, 2023, at about 18:30. After which she noted the appearance of pain and limited movement in the cervical spine, weakness in the arms, and urinary retention. She did not lose consciousness. The ambulance workers delivered the victim to the emergency room of the Andijan branch of the RNCM. Upon admission, the victim was examined by a neurosurgeon, a CT scan of the cervical spine was performed, and the patient was hospitalized in the neurointensive care unit.

Objective: The general condition at the time of examination is severe, stable. The severity of the condition is due to the injury, pain syndrome, and neurological symptoms. Body temperature is 36.5°C. Breathing is independent, adequate, RR = 16 per minute. In the lungs, breathing is conducted through all pulmonary fields, there are no wheezing. Heart sounds are rhythmic, pulse is 82 beats per minute, blood pressure = 140/70 mm Hg. The abdomen is soft, painless in all sections. Intestinal peristalsis is preserved, sluggish. Urination through a catheter, urine is light.

Neurological status: The patient at the time of examination is conscious, adequate, oriented in time and space, available for contact. There are no peculiarities from the side of 12 pairs of cranial nerves. Muscle tone in the upper limbs is moderately reduced, without difference between sides. Active movements in the joints of the hand and fingers of both upper limbs are limited. Tendon reflexes BR, TR D=S, are reduced. The strength of the extensor muscles of the forearm, flexors and extensors of the hand and fingers is reduced to 2-3 points, D=S. Hypoesthesia of the fingers of both hands. Motor and sensory disorders in the lower limbs were not revealed. Coordination tests: in the Romberg position and finger-nose tests were not studied. At the time of examination, pathological and meningeal symptoms were not revealed. Locally: The cervical spine is fixed with a rigid Philadelphia collar. Visually, an increase in cervical lordosis is noted. On palpation, the neck muscles are tense, sharply painful. Percussion of the spinous processes at the level of C4-C7 is painful. Examination performed:

- MSCT of the cervical spine: a linked dislocation of the C5 vertebra was revealed. A fracture of the superior articular process of the C6 vertebra on the left (Fig. 2).



Figure 2. Patient R., 46 years old: CT scan of the cervical spine on admission: Clutched dislocation of the C5 vertebra.

Based on the examination results, the diagnosis was: “Closed spinal cord injury. Bilateral sliding, clutched dislocation of the C5 vertebra, fracture of the superior articular process of the C6 vertebra on the left. Impaired spinal cord conduction of the segmental type from the level of the C5 vertebra, ASIA - C. Upper paraparesis. Impaired pelvic organ function of the delay type.”

The patient underwent surgery: removal of the C5-C6 intervertebral disc, open reduction of the C5 dislocation, elimination of anterior compression of the spinal cord and roots. Anterior interbody spondylosis of the C5-C6 interbody cage with fixation with a cervical plate and screws. From the operation protocol: "During revision along the surgical approach, pronounced imbibition of soft tissues and paravertebral muscles with blood, damage to the intervertebral disc with the formation of a step-like deformation at the level of the C5-C6 spinal motion segment were determined. Removal of the C5-C6 intervertebral disc, open manual reduction of the C5 vertebra dislocation were performed, anterior decompression of the spinal cord and roots was achieved. In the position of traction along the axis and extension of the cervical spine, an interbody metal cage measuring 6.0 × 12.0 mm was installed in the intervertebral space, the implant position is firm. Additionally, fixation of the C5-C6 spinal motion segment was performed with a cervical plate and screws." On control radiographs, the position of the implants is satisfactory (Fig. 3).



Figure 3. Patient D., 54 years old: X-ray of the cervical spine after surgery: Reduced dislocation of the C5 vertebra. Anterior interbody spondylodesis of the C5-C6 interbody cage, with fixation with a cervical plate and screws in the bodies of the C5-C6 vertebrae.

After the surgery, the patient was treated in the intensive care unit. Intensive care was continued in a specialized neurosurgical hospital. On the second day after surgery, rehabilitation treatment was started according to an individual program aimed at restoring overall activity, muscle tone in the limbs and active movements, preparing the patient for mobilization. The postoperative period was uneventful. The sutures were removed on the 8-10th day after the surgery, healing by primary intention. Fixation of the cervical spine with a rigid Philadelphia corset was continued. The patient was activated on the 7th day after the surgery, moves independently, without the help of foreign objects.

Positive dynamics were noted in the neurological status against the background of the treatment. The function of the pelvic organs was restored on the fourth day after the surgery. A gradual regression of neurological symptoms was noted in the form of an increase in the range of active movements and muscle strength in the upper limbs. At the time of discharge for outpatient treatment, the full range of active movements in the joints of the upper limbs was achieved, muscle tone in the upper limbs was moderately reduced, with no difference in sides. Restoration of the strength of the flexor and extensor muscles of the hand and fingers to 4-5 points, D = S. Mild hypesthesia of the fingers of both hands persists. Comprehensive rehabilitation treatment was continued at the outpatient stage.

Conclusion. Thus, even in case of complicated injuries of the cervical spine, early surgical interventions with adequate decompression and stabilization of the damaged segment contribute to the restoration of lost functions of the spinal cord.

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