



Review Article

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STRUCTURE OF SPINAL CORD INJURY

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Annotation. Spinal cord injury (SCI) is a severe pathological condition resulting from damage to the vertebral column and spinal cord, accompanied by impairment of motor, sensory, and autonomic functions. This paper examines the structure of SCI, including the anatomical features of the spine and spinal cord, injury mechanisms, and morphological and functional changes associated with various types of injury. Particular attention is paid to the classification of injuries, their clinical manifestations, and the importance of timely diagnosis. Based on the data analysis, approaches to assessing the severity of injury and preventing complications have been developed. SCI is a pressing issue in practical medicine. The incidence of SCI is steadily increasing. According to literature reports, the proportion of spinal fractures in the overall structure of skeletal trauma has ranged from 2 to 18% of cases in recent years, with an upward trend. Damage to the spinal cord and its roots accounts for approximately 20% of all spinal injuries. Disability due to spinal cord injury hovers around 80%, two-thirds of whom are people of working age. Mortality from complicated spinal cord injury also remains high, reaching 35% according to summary statistics. The literature reviewed above clearly illustrates not only the prevalence and severity of spinal cord injury but also the importance of treating victims at all stages of surgical care. It is known that the key conditions for adequate surgical treatment of complicated spinal injury in the acute period include decompression of the spinal cord and its roots, correction of post-traumatic deformity, stabilization of vertebral segments, and prevention of degenerative changes in the spine and spinal cord. While the need for decompression in

cases of spinal cord and root compression is currently non-negotiable and should be performed without fail, the choice of method for stabilization and correction of post-traumatic deformity remains controversial.

In the current stage of neurosurgery, increasing attention is being paid not only to eliminating vertebral -medullary conflict but also to maintaining stability in the operated segment, preserving its proper anatomical, spatial, and biomechanical relationships to prevent the development and progression of neurological disorders and degenerative changes in the intervertebral motion segments, as well as those adjacent to the injury level. The presence of an unstable injury creates a risk of secondary displacement or worsening vertebral displacement, which requires reliable immobilization of the spine or surgical stabilization of the damaged segment. The term "decompression -stabilization" surgery encompasses two key concepts, including both "decompression" and "stabilization," which define the goals of surgical treatment. "Decompression" refers to the release of the neurovascular structures of the spinal canal from one or more compressive factors (a displaced vertebral body, bone fragments, localized hemorrhages, foreign bodies, etc.). "Stabilization" refers to the elimination of mobility and immobilization of all damaged supporting structures in the spine being operated on. The tactics for performing this type of surgical intervention, particularly in emergency neurosurgical settings, require special attention when choosing the method of stabilizing the damaged spinal motion segment (SMS).

Fusion plays a significant role in ensuring the stability of the operated spinal segment . Maintaining stability in the operated spine after restoration of proper relationships creates the conditions for the formation of a complete bone block. Therefore, many authors discuss the need for additional posterior fixation of the injured spine. In this regard, the use of Harrington-type metal structures, parallel vertebral plates such as those used at the Central Institute of Traumatology and Orthopedics (CITO), titanium nickeline devices with shape memory effect (SME) and superelasticity (SE), as well as various variants of combined fusion using grafts in the treatment of complicated spinal injuries in emergency neurosurgical care, are worthy of consideration.

Undoubtedly, in such cases, the time course of the traumatic disease remains important and must be taken into account when choosing the stage, tactics, and extent

of surgical intervention. These, in turn, depend on the timing of patient examination, the method of decompression, and the technique and reliability of metal implant placement. According to epidemiological studies and assessments of the organization of medical care for patients with spinal cord injury, many factors influencing the quality of treatment remain relevant. These include the training of neurosurgeons; late and poor diagnostics and their cost-effectiveness; the complexity and high cost of devices for metal osteosynthesis ; inappropriate surgical tactics; and the risk of potential complications. All of the above determines the feasibility of continuing research on improving the treatment of patients with spinal cord injury in the context of emergency neurosurgical care.

Key words. Spinal cord injury, spinal cord, spine, spinal trauma, neurological disorders, compression, spinal cord damage, diagnosis, classification.

The aim of the study was to examine the structure of spinal cord injury, including the anatomical and functional characteristics of spinal and spinal cord injuries, to inform approaches to diagnosis and prevention of complications.

Objectives of the study : To study the existing tactics for providing emergency neurosurgical care to victims with spinal cord injury in a city hospital. To clarify the indications for various surgical approaches for victims with complicated thoracic and lumbar spine injury in emergency neurosurgical care. To study the effectiveness of primary intraoperative stabilization and the effectiveness of various types of metal osteosynthesis of damaged segments of the thoracic and lumbar spine performed in emergency neurosurgical care. To evaluate the short-term results of surgical treatment of victims with complicated thoracic and lumbar spine injury. To develop a scheme for preliminary planning of the volume of emergency decompression and stabilization interventions for complicated thoracic and lumbar spine injury.

Research methods. Analysis and synthesis of current scientific literature on spinal cord injury. Topographic and anatomical analysis of the spine and spinal cord structure. Comparative clinical analysis of various types of injuries and their consequences. Study of spinal cord injury classifications (by level, mechanism, and severity). Analysis of instrumental diagnostic data (X-ray, CT, MRI).

Study results. The study established that the structure of spinal cord injury includes damage to the bony elements of the spine (vertebrae, ligaments) and/or the spinal cord, with the development of primary and secondary changes. Primary damage was found to be caused by mechanical impact (impact, compression, flexion, extension), while secondary damage is associated with ischemia, edema, inflammation, and impaired blood circulation in the spinal cord. Clinical manifestations were found to be directly dependent on the level and extent of injury: with high-grade injuries, severe motor and respiratory impairment is observed, while with low-grade injuries, dysfunction primarily affects the lower extremities and pelvic organs. Analysis showed that timely diagnosis using CT and MRI allows for accurate determination of the nature of the injury and selection of the optimal treatment strategy.

For the first time, a preliminary planning scheme for the scope of emergency decompressive and stabilizing surgical interventions has been proposed. This scheme was developed based on examination data for patients with spinal cord injury using a modern neurosurgical diagnostic system in a city hospital setting. This system enables early recognition of spinal cord injuries and allows for the determination of the extent of surgical intervention and the method of fixation of the damaged spinal segment. It has been found that in life-threatening, severe conditions, the surgical intervention must be reduced and divided into two or more stages. The optimal scope of surgical treatment for patients with spinal cord injury at each stage in an emergency neurosurgical service depends on the type of damage to the bone-ligament structures, the form of vertebromedullary conflict, and the nature and extent of damage to the spinal cord and its structures. The advantages and disadvantages of surgical methods for decompressing neurovascular structures in the spinal canal and methods for intraoperative stabilization of the injured spinal motion segment using various fixation devices in emergency neurosurgical settings are determined. It has been established that in patients with unstable functioning of vital body systems, decompression of neurovascular structures in the spinal canal and primary stabilization of the injured spinal segment from the posterior and posterolateral approaches leads to good treatment outcomes. The effectiveness of fixation devices made of titanium nickelide with a shape memory effect and superelasticity in emergency neurosurgical care for patients with complicated thoracic and lumbar spine injuries is substantiated and indications for their use are defined.

Based on an analysis of the treatment outcomes for patients with complicated thoracic and lumbar spine injuries in emergency neurosurgical care, a relationship was established between the extent of the intervention and the severity of the patient's general condition. Among the indications for various approaches to decompressive and stabilizing interventions, attention was paid to the extended posterior and posterolateral approaches. The effectiveness of primary intraoperative stabilization and the effectiveness of various types of metal osteosynthesis for damaged segments of the thoracic and lumbar spine were studied. Furthermore, the indications for the use of laminar rod systems such as Harrington and titanium nickelide fixators with shape memory and superelasticity in emergency neurosurgical care were clarified. The developed scheme for preliminary planning of the extent of emergency decompressive and stabilizing interventions for complicated thoracic and lumbar spine injuries allows for determining the extent of surgical intervention and the method of spinal fixation.

The staged implementation of decompressive and stabilizing operations in the early stages after injury, regardless of the severity of the general condition of victims with complicated injuries of the thoracic and lumbar spine, improves the results of surgical treatment and promotes a more rapid restoration of the functions of the preserved neurovascular formations of the spinal canal.

Conclusions. Spinal cord injury is a complex injury involving both the bony structures of the spine and the spinal cord. Primary and secondary mechanisms of injury development determine the severity of the patient's condition. The clinical presentation depends on the level and extent of spinal cord damage. Early and accurate diagnosis is key to successful treatment and the prevention of complications. A comprehensive anatomical and clinical approach improves the effectiveness of medical care for patients with this condition.

List of references.

1. Axmedova PB. Adenotomy in children with allergic rhinitis and bronchial asthma. *Web Med J Med Pract Nurs.* 2025;3(3):459-466.
2. Durдона QSR0T. The current state of the problem of severe acute pancreatitis. 2024.
3. Imamova A. Features and prospects of the development of children's nutrition in the preschool institution. 2023.

4. Khakimova D, Sh K, Salomova F. Results of hygiene assessment of food of school students. In: International Scientific-Practical Conference “Only English: Advances in Medical Research and Practice Conference”; 2023 May.
5. Kobiljonova SR, Jalolov NN, Sharipova SA, Mirsagatova MR. Spectrum of cause-significant allergens causing pollinosis in children. 2022.
6. Light RW. Pleural diseases. Philadelphia: Lippincott Williams & Wilkins; 2017.
7. Malikov QSRMM. Diseases of the population from the level of air pollution in regional conditions. 2024.
8. Mirrahimova MX, Kobiljonova SR, Sadullayevna XA. Prevalence and risk factors of allergic disease in children. 2022.
9. Moore KL, Dalley AF, Agur AMR. Clinically oriented anatomy. Philadelphia: Wolters Kluwer; 2018.
10. Netter FH. Atlas of human anatomy. Philadelphia: Elsevier; 2022.
11. Prives MG, Lysenkov NK, Bushkovich VI. Human anatomy. St. Petersburg: SpetsLit; 2019.
12. Rustamovna QS. A modern view of the problem of cardiovascular diseases in women. 2025.
13. Salomova FI, QSR. Stimulation of the immune response by cytokine preparations and their standardization. In: European Youth Innovation Society Conference; 2024 Feb.
14. Salomova FI, Mirrahimova MX, Sadullayeva XA, Kobiljonova SR. Prediction and prevention of food allergies in children. In: Uzbekistan-Japan International Conference “Energy-Earth-Environment-Engineering”; 2022 Nov 17-18; Tashkent, Uzbekistan. p. 81.
15. Sapin MR, Bilich GL. Human anatomy. Moscow: GEOTAR-Media; 2020.
16. Shields TW. General thoracic surgery. Philadelphia: Wolters Kluwer; 2019.
17. Snell RS. Clinical anatomy by regions. Philadelphia: Wolters Kluwer; 2019.
18. Standring S. Gray's anatomy: the anatomical basis of clinical practice. Elsevier; 2021.
19. Yuldasheva FU, Imamova AO. The role of sports in the formation of a healthy lifestyle among young people. Eur Int J Multidiscip Res Manag Stud. 2022;2(11):85-89.

20. Zakirova MR. Intranasal immunotherapy of allergic rhinitis. 2024.
21. Zakirova MR. Soluble forms of membrane proteins of immune system cells in bronchial asthma in children. 2024.
22. Kobiljonova SR. Clinical and morphological features of gastroduodenitis in children with salt diathesis. 2024.
23. Kobiljonova SR, Sadullaeva HA. Impacts of the environment on human health. 2021.
24. Kobiljonova SR, Khamidullaeva SS, Azizova OD. Establishment of seasonal dynamics and correlation of air pollution levels in different zones. 2023.
25. Kobiljonova S, Ziyaeva I, Azizova O. Treatment of patients with gastrointestinal food allergy and rehabilitation in outpatient settings. 2023.
26. Malikov QSRMM. Ischemic heart disease and cancer. 2024.
27. Mirrahimova MX, Sadullaeva HA, Kobiljonova SR. The significance of environmental factors in bronchial asthma in children [dissertation]. Russia; 2022.
28. Salomova FI, SG. Influence of environmental factors on the prevalence of allergic diseases. 2024.
29. Salomova FI, KSh. Risk factors for allergic diseases in preschool children. 2024.
30. Salomova FI, Kobiljonova SR. Evaluation of the effectiveness of diet therapy in food allergies in children at different ages. Vestn TMA. 2023.
31. Salomova FI, Kobiljonova SR. Development of systemic algorithms to reduce allergic diseases. In: ANaMed Forum–New Generation; 2025; Almaty: KazNMU.
32. Salomova FI, Kobiljonova SR. Risk factors for allergic diseases in children. In: ANaMed Forum–New Generation; 2025; Almaty: KazNMU. p.1154-1155.
33. Salomova FI, Kobiljonova SR. Actual nutrition of children with evaluation of biological and nutritional value of diets in preschool allergic children. Med J Young Sci. 2026;17(3):384-389.
34. Salomova FI, Kobiljonova SR, Yuldasheva SP. Journal of Healthcare and Life-Science Research. 2026.
35. Salomova FI, Sadullaeva HA, Kobiljonova SR, Gaibnazarov SS. Gene modifications in allergic diseases and their effects in children. 2022.