



ANATOMICAL RATIONALE FOR PRACTICAL RECOMMENDATIONS FOR
PREVENTING INTERCOSSAL NERVES INJURIES

Abdukhamidova Robiyakhan Afzalkhujaevna

EMU, University Faculty of Medicine, Group 130a, student.

Supervisor: **Abdukodirova Nodira Khabibullaevna**

EMU, Assistant Professor in the Department of Medical and Biological
Sciences of the University

Abstract. The intercostal nerves are important anatomical structures of the chest wall, providing its sensory and motor innervation. Damage to them can lead to severe pain, respiratory impairment, and a decrease in the patient's quality of life. This paper examines the anatomical features of the intercostal nerves, their topographic relationships with surrounding structures, and clinical situations that pose a risk of injury. Based on anatomical data, practical recommendations for preventing intercostal nerve injury during surgical interventions, diagnostic procedures, and chest trauma are substantiated. In modern surgical treatment of patients with diseases and injuries of the spine and spinal cord, the primary focus is on eliminating vertebral - medullary conflict, maintaining stability in the operated spinal motion segment, and restoring proper anatomical and biomechanical relationships.

The relevance of surgical treatment of patients with traumatic deformities of the spinal canal (SCD) at the thoracic and lumbar levels is due to their frequency, reaching 5% of all skeletal trauma and 80% of all spinal injuries, 70% of which are accompanied by vertebromedullary conflict. Traumatic changes at the level of the transition from the thoracic to the lumbar spine remain the most common in the structure of all spinal injuries. In traumatic SCD complicated by neurological disorders, a chain of sequential compression-ischemic reactions is considered the leading factor in the occurrence and development of post-compression changes in the spinal cord. These reactions primarily arise as a result of acute traumatic impact directly on the neurovascular structures of the spinal canal, and secondly, as a result of compression of the spinal artery . anterior bone fragments, fragments of the intervertebral disc and Urban's pseudowedge or overstretching of the spinal a. Anterior at the apex of pathological kyphosis. This suggests that vertebromedullary conflict most often develops due to an anterior duodenal ulcer, which ultimately requires the greatest attention when determining surgical treatment tactics.

The use of new surgical technologies has improved the effectiveness of surgical treatment, reduced patient disability, and improved quality of life. However, preventing perioperative complications remains an unresolved issue in spinal surgery. These complications are related not only to the underlying disease but also to the surgical approach to the spine, the degree of decompression of the neural structures of the spinal canal, and the creation of fusion with fixation of the affected spinal segment. According to the literature, intraoperative complications occur in 5% of patients undergoing dorsal surgery for lumbar spinal decompression caused by degenerative changes in the lumbar spine. They reach 7% for scoliosis correction, and up to 12% for spinal cord injury (SCI). Postoperative blood loss continues to be a topic of discussion in the literature.

Key words: Intercostal nerves, chest wall, anatomy, topography, innervation, nerve injury, thoracic surgery, prevention of complications, pain syndrome

The aim of the study was to study the anatomical features of the intercostal nerves and to substantiate practical recommendations for preventing their injury during medical interventions and chest injuries.



Research objectives: To study the anatomical structure and topography of the intercostal nerves. To determine their relationship with the bony, muscular, and vascular structures of the thoracic cavity. To analyze the main causes and mechanisms of intercostal nerve injury. To evaluate the clinical consequences of intercostal nerve injury. To develop anatomically sound recommendations for preventing intercostal nerve injury during medical interventions.

Research methods. Analysis of scientific literature and modern medical sources on anatomy and clinical practice. Comparative anatomical method for studying variations in the course of intercostal nerves. Topographic and anatomical analysis of the chest wall. Clinical analysis of data on intercostal nerve injuries during surgery and trauma. Generalization and systematization of the obtained data.

Study results . The study found that the intercostal nerves run as part of the neurovascular bundle along the lower edge of the ribs, making them vulnerable during invasive procedures (thoracentesis , pleural drainage, surgical approaches). The most common cause of injury was found to be failure to observe anatomical landmarks during procedures. It was also found that the variability of the nerves' course increases the risk of injury.

Based on the analysis, the following practical recommendations were developed: performing punctures along the upper edge of the rib; taking into account anatomical landmarks during surgical approaches; minimizing soft tissue trauma; using visual control during invasive procedures.

The obtained data confirm the importance of an anatomical approach to reduce the risk of injury to intercostal nerves and prevent postoperative complications. Anterior decompressive and stabilizing procedures in patients with thoracic and lumbar spinal cord injuries allow for the complete surgical treatment to be performed in a single stage. Decompressive and stabilizing procedures, using anterior approaches to thoracic and lumbar spinal cord injuries, improved based on applied clinical, anatomical, and experimental research, help avoid damage to the intercostal nerves of the abdominal wall, ensuring an effective and safe surgical approach to the affected vertebrae. The use of a developed device for stopping vertebral bleeding and new surgical techniques for removing bone fragments from the spinal canal allows for effective and atraumatically decompressed angio-neural structures of the spinal canal . The developed method of anterolateral osteosynthesis in the thoracic and lumbar spine in patients with spinal cord injury enables stable fixation of the operated spinal segment using a single surgical approach. An improved method for assessing the support capacity of the operated spine during the postoperative period and rehabilitation of patients with thoracic and lumbar spinal cord injury enables optimized dynamic monitoring of neurological disorders and the functional state of the spine.

Conclusions. The intercostal nerves are important anatomical structures providing sensory and motor innervation to the chest wall. Their topographic location within the neurovascular bundle along the lower edge of the ribs poses a high risk of injury during invasive procedures. The main causes of intercostal nerve injury include poor procedural technique and insufficient knowledge of anatomical landmarks. Intercostal nerve injury can lead to severe pain, respiratory distress, and a decrease in the patient's quality of life. Adherence to anatomically sound recommendations (performing manipulations along the upper edge of the rib, using visual control, and minimizing tissue trauma) significantly reduces the risk of complications. Thus, a thorough understanding of the anatomy of the intercostal nerves is an important factor in improving the safety of medical interventions.



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