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Advanced Surgical Approaches to Degenerative Cervical Spine Disorders

Yuldashev Ravshan Muslimovich
Republican Scientific Center of Neurosurgery under the Ministry of Health of the Republic of Uzbekistan

Djumanov Kamaliddin Nuriddinovich
Republican Scientific Center of Neurosurgery under the Ministry of Health of the Republic of Uzbekistan

Shukurov Xumoyuddin Asliddin o'g'li
Republican Scientific Center of Neurosurgery under the Ministry of Health of the Republic of Uzbekistan

Ibragimov Akobir Ismailovich
Republican Scientific Center of Neurosurgery under the Ministry of Health of the Republic of Uzbekistan

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Abstract: Degenerative diseases of the cervical spine are increasingly prevalent and present complex challenges for treatment. This study analyzes clinical outcomes of 76 patients who underwent various surgical interventions, including anterior discectomy, spondylodesis, laminoplasty, and decompressive laminectomy. The findings suggest that timely surgical treatment significantly reduces pain, improves neurological function, and enhances quality of life. Two-stage surgeries proved most effective for cases involving severe myelopathy and spinal stenosis.

Keywords: Cervical spine, disc herniation, laminoplasty, cervical spondylosis, radiculopathy, myelopathy, spinal stenosis, discectomy, spondylodesis, neurological recovery.

Introduction: Degenerative diseases of the spine are on the rise worldwide, including in Uzbekistan. Cervical spondylosis and intervertebral disc degeneration can lead to radiculopathy or myelopathy due to progressive stenosis of the spinal canal and deformation of the interarticular surfaces. An epidemiologic study conducted over 14 years in Rochester (Minnesota, USA) showed that cervical radiculopathy is 83.2 cases per 100,000 population. Although conservative therapy is effective in the majority of patients with degenerative manifestations or disc herniation, many patients require surgical treatment due to the progression of symptoms or the ineffectiveness of conservative treatment [1,2,9].

As is known, the spine is the basis of the musculoskeletal system and, due to upright posture, is regularly subjected to significant statodynamic loads. Due to the above reason, dystrophic pathologies are diagnosed relatively early in the spine. Vascular obliteration of intervertebral discs noted in childhood significantly aggravates degenerative processes. The literature presents data that the genetic determinism of intervertebral disc lesions often manifests in the form of inherited collagen structure disorder. To a large extent, the development of degenerative processes in the spine is caused by injuries, as well as traumatic disorders of statics, manifested in the form of limitation of mobility in joints, diseases, and pathology of knee and hip joints. A recent study shows that 79% of the population aged 18-44 years have smartphones, and practically all the time, the cervical spine is in an involuntary physiologic position. Prolonged use of smartphones and sitting at a computer directly affects

the cervical spine. Forward bending of the head is reflected in varying degrees on the load on the spine - when the head is bent forward at 15 degrees, the force of the load on the neck is equal to 12kg, at 30 degrees, 18kg, at 45 degrees 22kg and at 60 degrees up to 27 kg, at 90 degrees the model prediction was not reliable. Prolonged use of smartphones, prolonged time spent in front of the computer, and a sedentary lifestyle usually cause neck pain and soreness - further, it all leads to degenerative changes in the intervertebral discs. Degenerative changes most often occur in the cartilage structures of intervertebral discs and arch joints, as evidenced by clinical signs of cervical osteochondrosis and deforming spondylosis and spondyloarthritis, often combined [4,6].

The objective of this study is to evaluate and enhance the surgical management of degenerative diseases affecting the cervical spine.

METHODS

This study included 76 patients who underwent surgical treatment at the Republican Scientific Center of Neurosurgery during the years 2022–2023 for degenerative cervical spine diseases. The cohort consisted of 29 females and 47 males, aged between 28 and 83 years (mean age: 53.8). All patients presented with symptoms including neck pain, upper limb numbness, muscle weakness, and limited mobility. Neurological manifestations such as radiculopathy, myelopathy, and in some cases, pelvic dysfunctions were frequently observed.

Each patient underwent a comprehensive examination, including neurological evaluation, functional spinal radiography, magnetic resonance imaging (MRI), computed tomography (CT), and electroneuromyography (ENMG). Multilevel spinal compression was identified in 54% of cases, while single-level disc herniations were noted in the remainder, most commonly at C5-C6, C6-C7, and less frequently C3-C4 levels.

Depending on the severity and level of the pathology, patients underwent various procedures: anterior discectomy with cage and plate fixation (Peek Cage, Double Medical), posterior laminoplasty (Double Medical), or decompressive laminectomy. In severe cases with myelopathy and spinal stenosis, two-stage surgeries were performed—posterior decompression via laminoplasty followed by anterior discectomy with cage-based spondylodesis.

RESULTS AND DISCUSSION

The analysis revealed that the majority of patients (88%) experienced significant improvement in the postoperative period. Pain intensity, measured using the Visual Analog Scale (VAS), decreased from 7.0 to 2.0 in the cervical region and from 8.5 to 2.0 in the upper limbs within 12 months of follow-up. Figure 1.

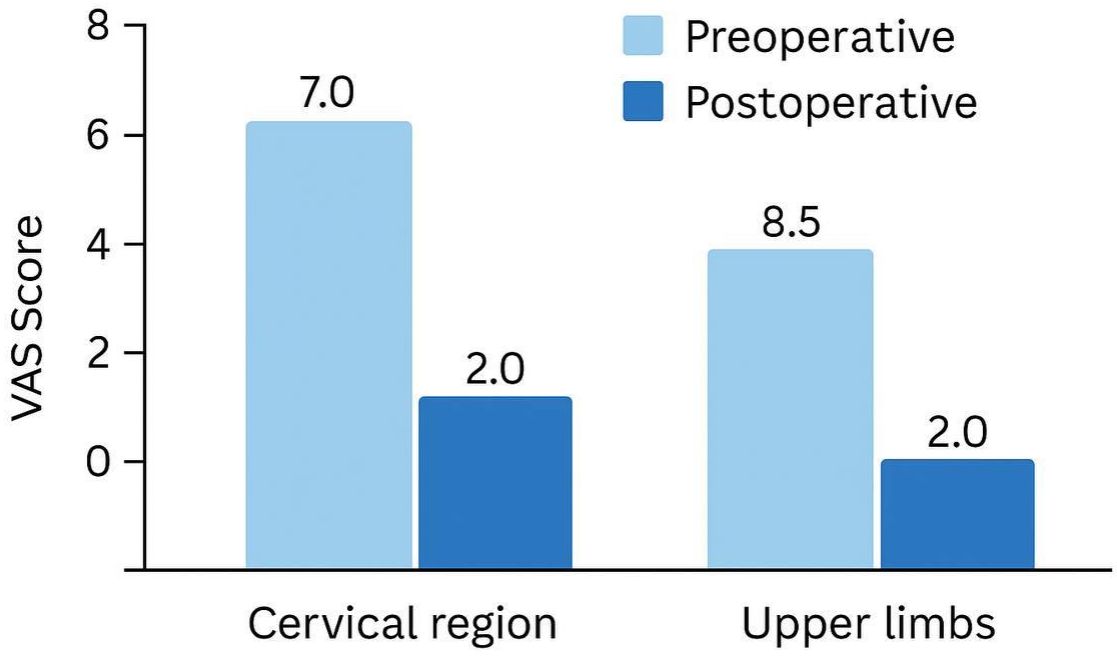

Figure 1. VAS score

In cases involving multilevel compression and pronounced myelopathy, the best outcomes were achieved through two-stage surgical interventions. This approach confirms the necessity of comprehensive treatment for complex degenerative pathologies. Patients undergoing laminoplasty or laminectomy showed notable recovery in sensory function, strength, and range of motion in the limbs, as well as improvement in pelvic organ function.

Complications were rare, with one case (1.3%) of spinal cord edema and one fatal outcome in a patient admitted in critical condition with severe tetraparesis and respiratory dysfunction. Overall, surgical management demonstrated strong clinical efficacy, especially when timely and individually tailored.

CONCLUSION

In conclusion, surgical intervention is an effective treatment strategy for degenerative cervical spine diseases when conservative methods fail. The best results are achieved through timely diagnosis and appropriate surgical planning.

Anterior cervical discectomy and fusion (ACDF) remains the gold standard for single-level disc herniations, while multilevel stenosis and cases with myelopathy benefit from posterior or combined approaches. Two-stage surgeries offer the most comprehensive neurological recovery and improved quality of life. A multidisciplinary diagnostic and therapeutic approach minimizes complications and substantially reduces disability rates among patients

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