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The Clinical Case of Total Effective Removal of a Craniovertebral Junction Tumor

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Introduction. treatment of meningiomas of the brain and spinal cord

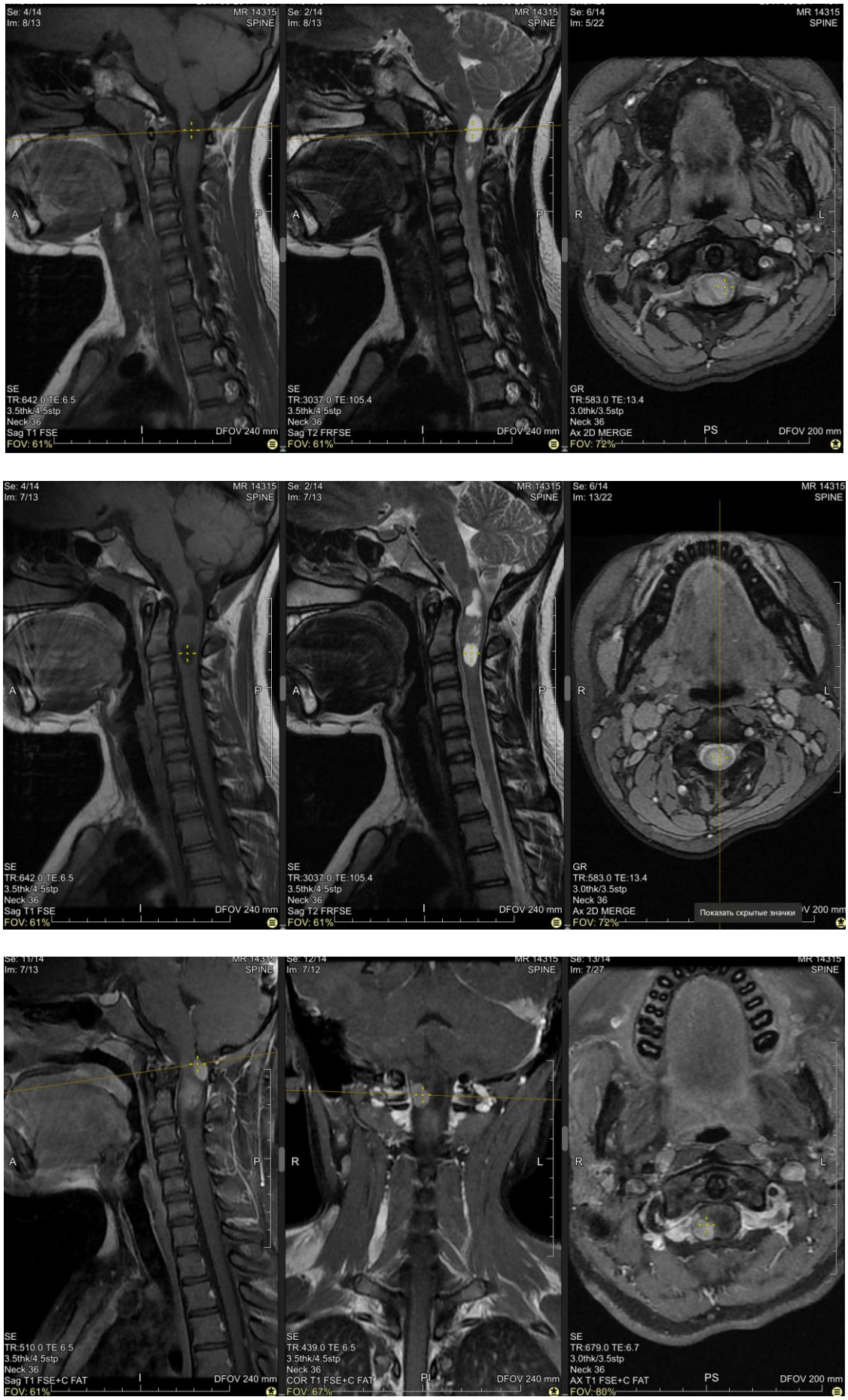
The prevalence of meningiomas is due to their high incidence. According to the US Central Brain Tumor Registry, meningiomas account for 35.5% of the overall incidence of primary CNS tumors, which is 20 per 100,000 population per year. In people 35 years and older, meningioma is the most common CNS tumor. In people 85 years and older, the incidence of meningiomas reaches 46 per 100,000 population per year or more. The incidence rate of spinal meningiomas is three times higher than that of gliomas [1,2,5]. Spinal meningiomas are often diagnosed in the elderly. Thus, patients over 60 years of age account for 60% of the total number of primary spinal tumors. Such tumors are mainly diagnosed in women. Most meningiomas are localized in the thoracic spine, and are extremely rare in the lumbar spine [3,4]. The most typical localization of the tumor relative to the spinal cord is ventrolateral. The problem of timely and correct diagnosis is relevant. Most patients are hospitalized in a neurosurgical hospital with severe neurological deficit. The main goal of the operation is to improve spinal cord function and radically remove the tumor. The widespread use of microsurgical techniques in neurosurgery has made it possible to radically remove spinal meningiomas in 92–97% of cases, while the mortality rate does not exceed 2–3%. Positive dynamics were noted in 80% of observations [6,7,8].

Purpose of the work— to improve the results of surgical treatment of extracerebral tumors of the craniovertebral junction.

Description of a clinical case. Patient inThe patient is conscious and oriented in time and place. There are no changes in the innervation of the cranial nerves, and there is no bulbar syndrome. Sensory disturbance is manifested by conductive hemihypesthesia from the C1 segment on the right. Extremity muscle strength assessment revealed moderate tetraparesis. The score is up to 4 points in the arms and up to 3 in the legs. There are no pelvic floor dysfunctions. The preoperative quality of life according to the Karnofsky scale was 80 points.

Upon admission, according to MRI data(Fig. 1), at the level of the craniovertebral junction (body of the C1 vertebra) on the ventral surface of the spinal cord, a contrasting extramedullary formation is determined, causing compression of the spinal cord at this level, most likely a meningioma.

Fig. 1.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FOV: 61%
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Neck 36
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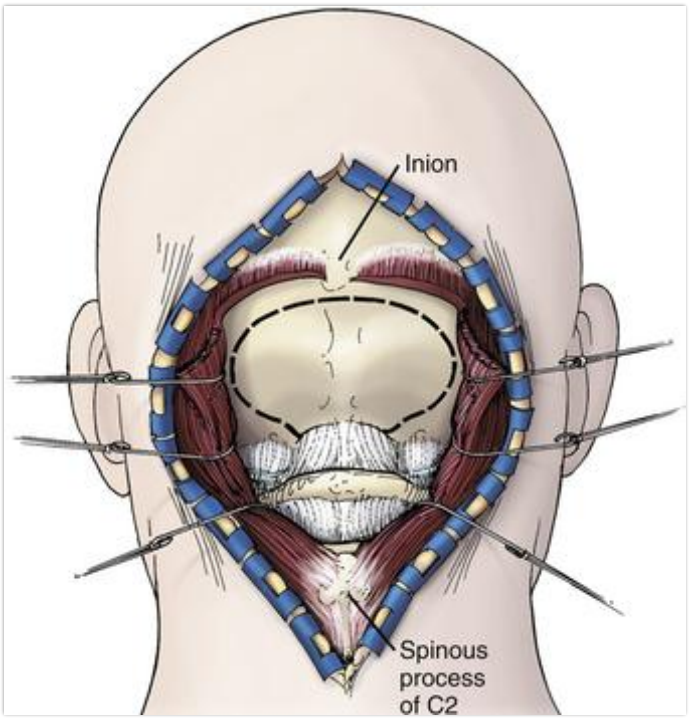
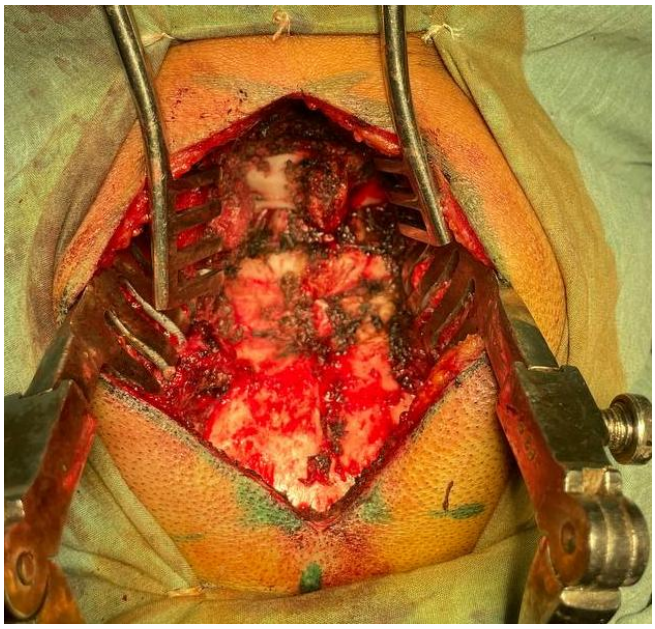
PS
DFOV 200 mm
FOV: 80%

Given the difficult accessibility of the tumor and the high risk of additional injury to the bulbar nerves and vertebral artery, a decision was made to use a distant lateral approach to remove the tumor. The procedure included a distant lateral approach, a C1 hemilaminectomy with partial resection of the left occipital bone, and microsurgical total removal of the intradural extramedullary tumor at the craniovertebral junction with neurophysiological monitoring.

Progress of the operation. With the patient in the right lateral position, a semi-arbalestic incision of the soft tissues was made in the cervical-occipital region on the left, to the level of the spinous process of the C3 vertebra.

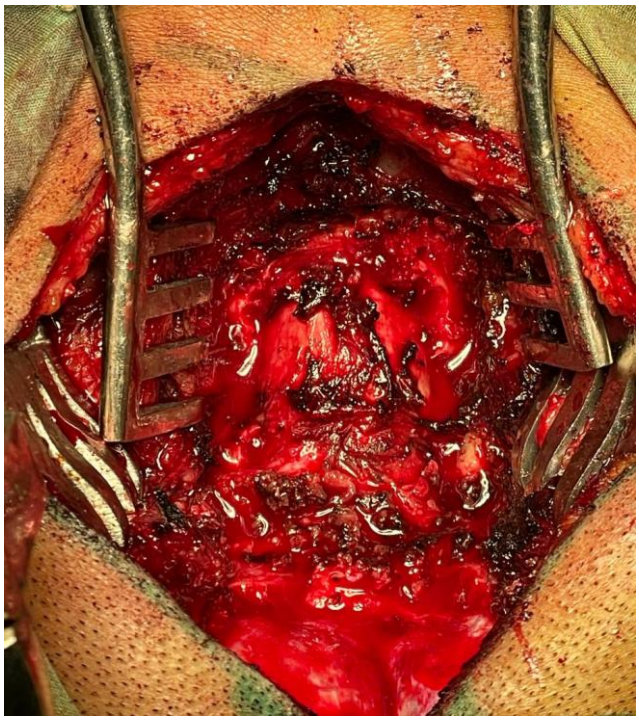


The skin and subcutaneous tissue were dissected layer by layer. The occipital bone and the semi-arch of the C1 and C2 vertebrae on the left were skeletonized. The vertebral artery was displaced laterally subperiosteally at the level of the C1 vertebral arch. The wound edges were spread apart using two retractors.

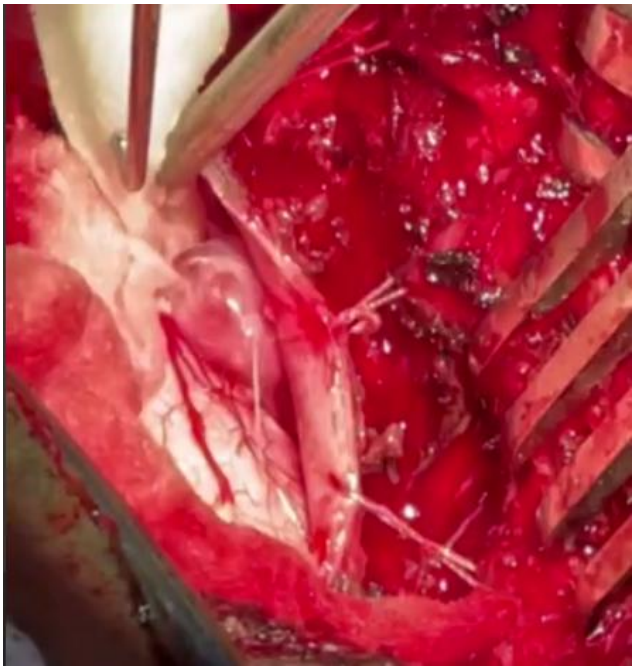


A left C1 hemilaminectomy was performed, and the left edge of the foramen magnum was resected. The dura mater is tense and does not transmit pulsation to the

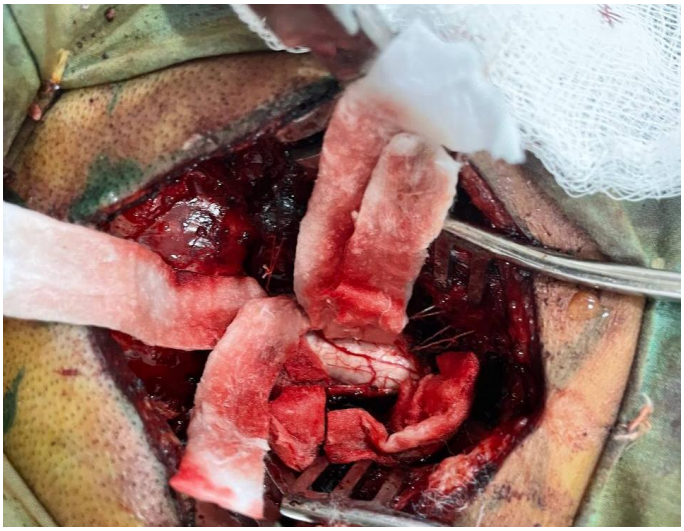
underlying brain.



Using a 20x magnification operating microscope and microsurgical instruments, the dura mater was opened with a linear incision extending into the cerebellar hemisphere and held apart with traction devices. At this level, the spinal cord was sharply retracted posteriorly and to the right.



At the C1 vertebral level on the left, the odontoid ligaments were dissected, and the spinal cord was retracted to the right with a spatula. To the left of the spinal cord, a serosal extramedullary tumor with a well-defined, soft, elastic capsule, resembling a meningioma, was detected in the subdural space. The bulk of the tumor is located anterior to the spinal cord. The vertebral artery is visualized laterally overlying the tumor, intimately fused with the tumor capsule.



Using microsurgical instruments and electrocoagulation, after separating the vertebral artery from the tumor, its capsule was opened and internal tumor decompression was performed (fragments were sent for histological examination). Then, in stages, mobilizing the tumor edges, it was separated from the spinal cord and completely removed. Following tumor removal, the spinal cord straightened, and its pulsation is clearly visible. The tumor matrix, measuring 1.0 x 1.0 cm, is located on the inner layer of the dura mater anterior to the spinal cord at the level of the C1 vertebra.

In the early postoperative period, the patient noted regression of tetraparesis, manifested by increased strength in her arms and legs. No bulbar dysfunction occurred.On postoperative MRI of the brain and spinal cord(Fig. 4)no signs of tumor tissue were detected.

The postoperative period was uneventful, healing

Primary wound. Gradual regression of neurological symptoms by the time of discharge, on the 10th day, to slight weakness in the right leg when walking. At discharge, the quality of life according to the Karnofsky scale was 90 points. Histological conclusion: meningioma, meningotheliomatosis

Grade I structural variant. The clinical presentation depends directly on the tumor's location relative to the spinal cord, its size, and the degree of compression at the craniovertebral junction. The most common symptoms include the development of tetraparesis and bulbar dysfunction, headache, and dizziness. The location of space-occupying lesions in the craniovertebral junction, in close proximity to the neurovascular structures of the brainstem, and sometimes the involvement of these anatomical structures in the pathological process, has a fatal impact on both the early results of surgical interventions and their long-term functional consequences. Therefore, when removing tumors in this location, the surgeon often faces the dilemma of determining the boundary surgical permission, which delimits the volume of removal education and subsequent quality of life of the patient [4, 6]. In the postoperative period, the patient's tetraparesis quickly regressed, and on the 10th day she was discharged for outpatient treatment. Of all neoplasms of the central nervous system, spinal cord tumors account for 1.4 up to 10.0% [1]. Extramedullary neoplasms are the most common, accounting for 75–90% of all spinal cord tumors. Tumors of the craniovertebral junction are space-occupying lesions extending rostrally to the border of the lower third of the clivus and caudally to the upper edge of the axis body [2]. Despite their relatively rare occurrence, from a surgical standpoint, these neoplasms represent one of the pressing and far from resolved problems in neuro-oncology [1, 3–5]. This is due to the difficulty of accessing tumors in this location, the presence of nearby stem structures and main vessels, and the complex role of this area Biomechanical function. The goal of this surgical intervention was to achieve maximum tumor removal with minimal impact on the brainstem, spinal cord and its roots, and major vessels, without causing new neurological deficits, and to preserve the bone structures that ensure spinal stability. Further observation of the patient is required to assess the complete recovery of neurological deficits and social and occupational rehabilitation. This case demonstrates the complexity of the approach and the clinical effectiveness of the chosen surgical approach.

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