

MODERN METHODS FOR TREATING SPINAL CORD TUMORS

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Abstract

Spinal cord tumors are one of the pressing problems of neurosurgery. Spinal cord tumors account for 2% of all neoplasms and 3% of nervous system pathologies in adults[V.V. Stupak, S.V. Shabanov, I.V. Pendyurin, S.S. RabinovichResults of surgical treatment of patients with extramedullary hourglass tumors]. Most often, spinal cord tumors are observed in a socially active group of people aged 30–50 years, which determines the great relevance of this problem[V.V. Stupak, S.V. Shabanov, I.V. Pendyurin, S.S. RabinovichResults of surgical treatment of patients with extramedullary hourglass tumors]. According to the types of tumor incidence]. Spinal tumors account for 5–10% of all central nervous system tumors.

Keywords: Spinal cord tumors are one of the pressing problems of neurosurgery.

Introduction

Spinal cord tumors are one of the pressing problems of neurosurgery. Spinal cord tumors account for 2% of all neoplasms and 3% of nervous system pathologies in adults[V.V. Stupak, S.V. Shabanov, I.V. Pendyurin, S.S. RabinovichResults of surgical treatment of patients with extramedullary hourglass tumors]. Most often, spinal cord tumors are observed in a socially active group of people aged 30–50 years, which determines the great relevance of this problem[V.V. Stupak, S.V. Shabanov, I.V. Pendyurin, S.S. RabinovichResults of surgical treatment of patients with extramedullary hourglass tumors]. According to the types of tumor incidence]. Spinal tumors account for 5–10% of all central nervous system tumors. Of these, 70–80% are intradural and extramedullary. Intramedullary spinal cord tumors (IMSCT) constitute the least common types of spinal neoplasms. They account for about 2–4% of all central nervous system tumors and 20–30% of all spinal cord tumors. The most common type of IMSCT is ependymoma, followed by astrocytoma. [Leonardo Guilmon Ruschel^{1,2,3}, Afonso Aragao¹, Matheus Fernandez de Oliveira, Jeronimo Buseti Milano, Mauricio Coelho Neto, Ricardo Rami Department of Neurosurgery, Neurological Institute of Curitiba, Curitiba, Paraná, 2DFV Neuro, Alemão Osvaldo Cruz Hospital. Department of Neurosurgery, Hospital do Servidor Público Estadual de São Paulo, São Paulo, Brazil]. Intradural neoplasms account for approximately 45% of all spinal cord tumors and can be classified as intra- (5%) or extramedullary (40%).1 Ependymomas are the most common primary intramedullary tumor, accounting for approximately 60% of all intramedullary neoplasms. Intramedullary spinal cord tumors (IMSCT)

account for approximately 5-10% of spinal canal tumors. [M. Abd-El-Barr, Kevin T. Huang, Zieve B. Moses, J. Brian Iorgulescu, and John H. Chi Department of Neurosurgery (MMA-EB., KTH, ZBM, JHC) and Department of Pathology (JBI), Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts]. Standardization of a neurological examination and formulation of a neurological conclusion in cases of spinal injury is an urgent problem in neurotraumatology, neurosurgery and neuro-oncology. Improved diagnostic methods and visualization of spinal cord structures, development of microsurgical techniques and minimally invasive approaches have significantly expanded the indications for surgery and improved treatment results. But even at the same time a differentiated choice of surgical approaches is required, which should provide optimal visual control over the progress of tumor removal and the condition of the nerve structures with minimal displacement of the spinal cord. Thus, the search for new solutions and tactical and technical approaches in the treatment of spinal cord tumors, in particular intramedullary spinal cord tumors, have not lost their significance and are a subject for discussion in the neurosurgical community. A search of literary sources in the Pubmed, Medline and eLibrary databases showed the presence of single studies devoted to the study of long-term results of surgical treatment of intradural spinal cord tumors, this fact demonstrates that microsurgery of spinal tumors is one of the complex areas in neurosurgery [Abd-El-Barr MM, Huang KT, Moses ZB, et al. Recent advances in intradural spinal tumors. *Neuro Oncol.* 2017. Forthcoming.]. The growth of a tumor from the substance of the spinal cord causes "alertness" during their removal and limits its radicalness. Only radical removal of the tumor with maximum preservation of spinal cord functions currently makes it possible to achieve a virtual cure for the patient. Surgical treatment of spinal tumors is always accompanied by a high risk of damage to neural structures or disruption of the blood supply to the spinal cord, which, in turn, can lead to profound disability for the patient. Surgical interventions for spinal cord tumors differ depending on the location relative to the diameter of the spinal cord, the size of the tumor and the level of localization relative to the spine. There are many surgical approaches to remove tumors, including laminectomy methods. Difficult to reach localization, abundant vascularization, often malignant nature of vertebral tumors, large size of the tumor, and destabilization of the spine after surgery make their surgical treatment difficult. One of the unsolved problems of vertebral surgery is radical removal of tumors, especially those that have spread to more than 4 vertebrae, when tumor resection can only be achieved by laminectomy of each affected vertebra. The main tasks that need to be addressed are maintaining the stability of the spinal column and reducing the traumatic effect on the spinal cord during tumor removal. Namely, in the surgical treatment of long and super-long tumors, the new modified laminectomy method has not yet been used. The results of surgery are influenced by the size and density of the tumor, the degree of compression and direction of displacement of the brain, and the spread of the tumor relative to the spine.

Purpose of the study: To analyze and compare the results of surgical treatment of patients using scalene laminectomy and standard laminectomy methods for long and extra-long spinal cord tumors. Introduction into medical practice of a single modified new method of laminectomy, which will serve as the main method of total, simultaneous removal of long and extra-long tumors, preserving neural structures, support of the spinal column with minimal trauma to the roots and eliminating neurological deficits in the postoperative period.

Materials and Methods

Between 2010 and 2021, 162 patients were operated on in the neurosurgery department of the 1st clinic of the Samarkand State Medical Institute. patient with spinal cord tumors. Of these, 70 were men and 92 were women, most often ranging in age from 16 to 71 years.

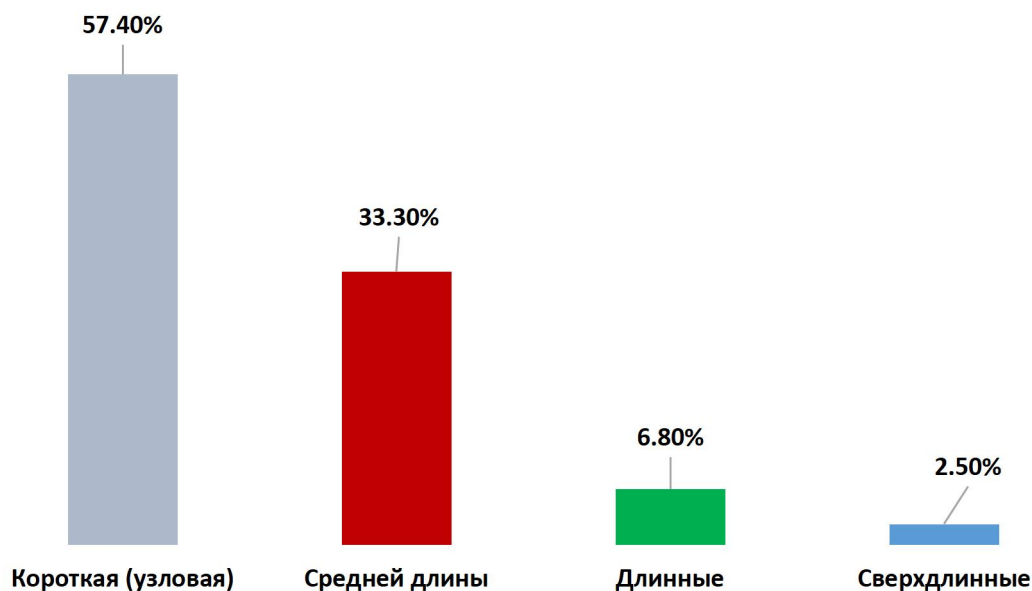


Fig.1. Distribution of patients according to the extent of tumor in the spinal canal. Research results:

Among the patients, to unify the approach to the assessment of neoplasms in relation to the length of the spinal column and spinal cord, we proposed a classification according to the following forms of tumors, according to this classification: in 93 patients a nodular or short tumor was identified (neoplasm at the level of one or two vertebrae); 54 patients had a tumor of medium length (at the level of 3-4 vertebrae); 11 patients had long tumors (at the level of 5-6 vertebrae); 4 patients had extra-long tumors (the tumor is distributed along the length of the spinal canal and spinal cord at the level of more than 6-7 vertebrae) (Fig. 1). In all cases with types 1, 2, and 3 tumor spread, a standard laminectomy with resection of the base of the spinous process of the vertebrae was performed. Also, 18 patients with type 3 and 1 patient with type 4 underwent standard laminectomy.

The remaining 12 patients with long and extra-long tumors underwent scalene laminectomy. Scalene laminectomy - resection of the spinous processes and arches starting from the level of the pole of long and extra-long spinal cord tumors that spread to more than four vertebrae, 1st to 3rd and so on through one vertebra, which represents a significant difference from standard laminectomy methods, where each affected vertebra is subjected to resection, which threatens destabilization of the spinal column and high morbidity.

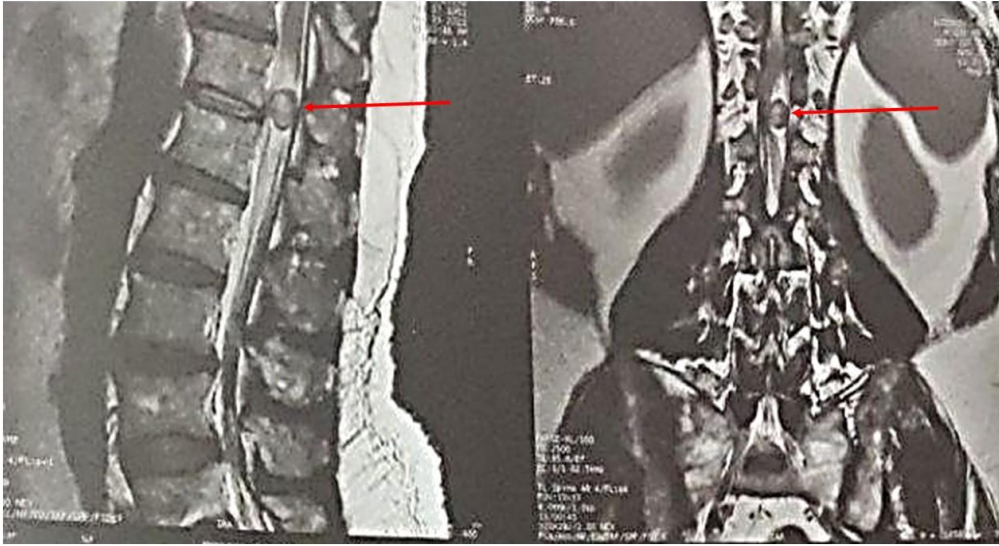
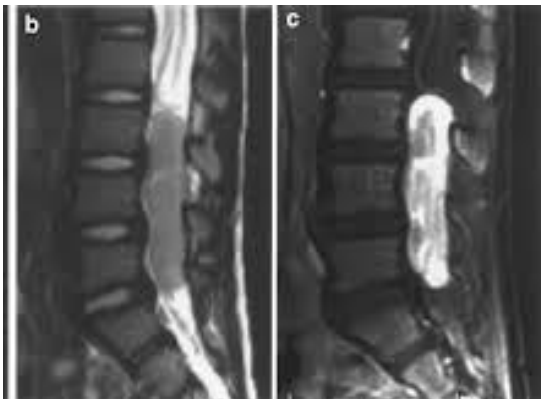


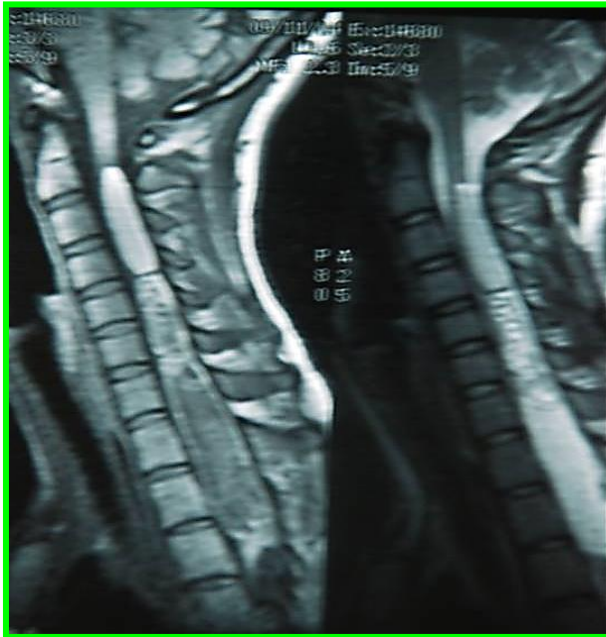
Fig.2. Intradural extramedullary “nodular” tumor at the Th12-L1 level
 After skeletonization of the spinous processes and vertebral arches, a pedicled flap is cut out from the supraspinous and interspinous ligaments for posterior autotenoplasty at the end of the operation. This method ensures total, one-step removal of long and extra-long tumors, preserving neural structures, support of the spinal column with minimal trauma to the roots and eliminating neurological deficits in the postoperative period. When removing tumors, microneurosurgical techniques and instruments are used.



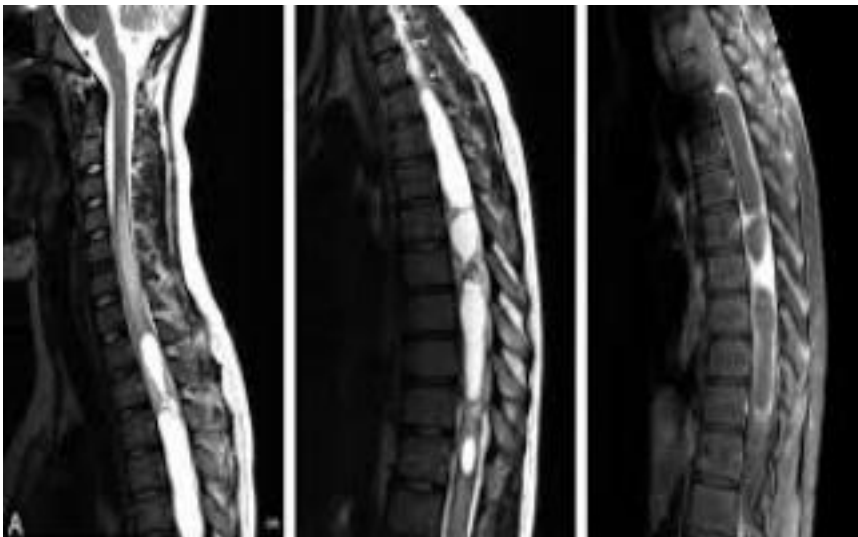
Rice.3. Nodular or short tumors - if the tumors are located at the level of one or two vertebrae.



Rice. 4. Tumors of medium length, when the tumors are located at the level of 3-4 vertebrae.



Rice.5. Long tumors, when the tumors are located at the level of 5-6 vertebrae.



Rice. 6. Extra-long tumors, if the tumors spread along the length of the spinal canal and spinal cord at the level of more than 6-7 vertebrae.



Schematic representation of the ladder laminectomy method.

To compare the results, patients aged from 19 to 71 years were taken, most of whom were women from 21 to 66 years old, men from 25 to 71 years old, of which 97 patients were diagnosed with intradural extramedullary tumor of the SM, 48 intradural intramedullary tumor, 17 patients paravertebral extramedullary tumor of the CM (Fig. 7.), with localization in the cervical region 34.9%, thoracic 55.2%, lumbar 9.8%. According to histological data: 58 patients had schwannomas, 56 meningiomas, 13 ependymomas, 8 astrocytomas, 7 dermoid cysts, 6 hemangioblastomas, 13 neurofibromas (Fig. 8.).

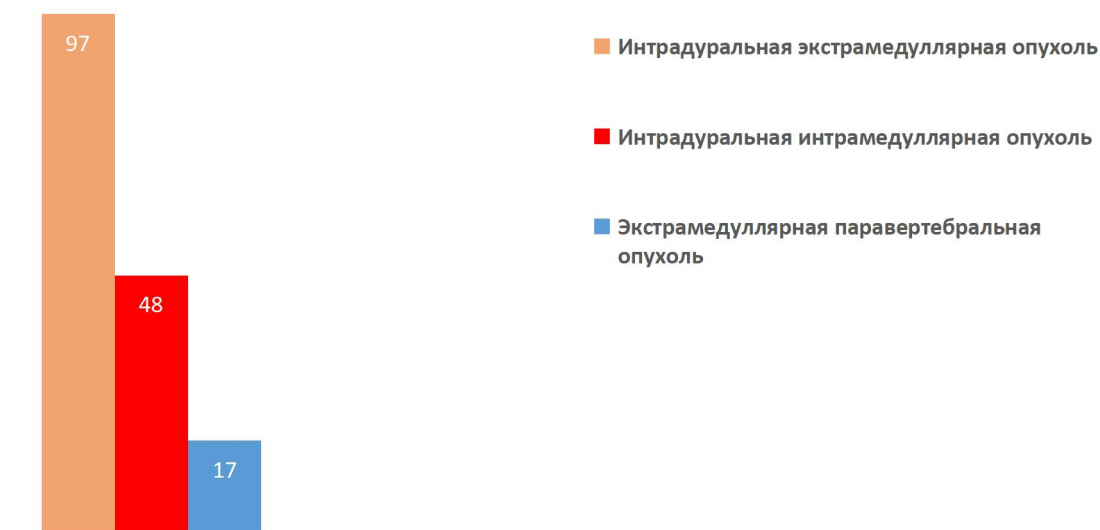


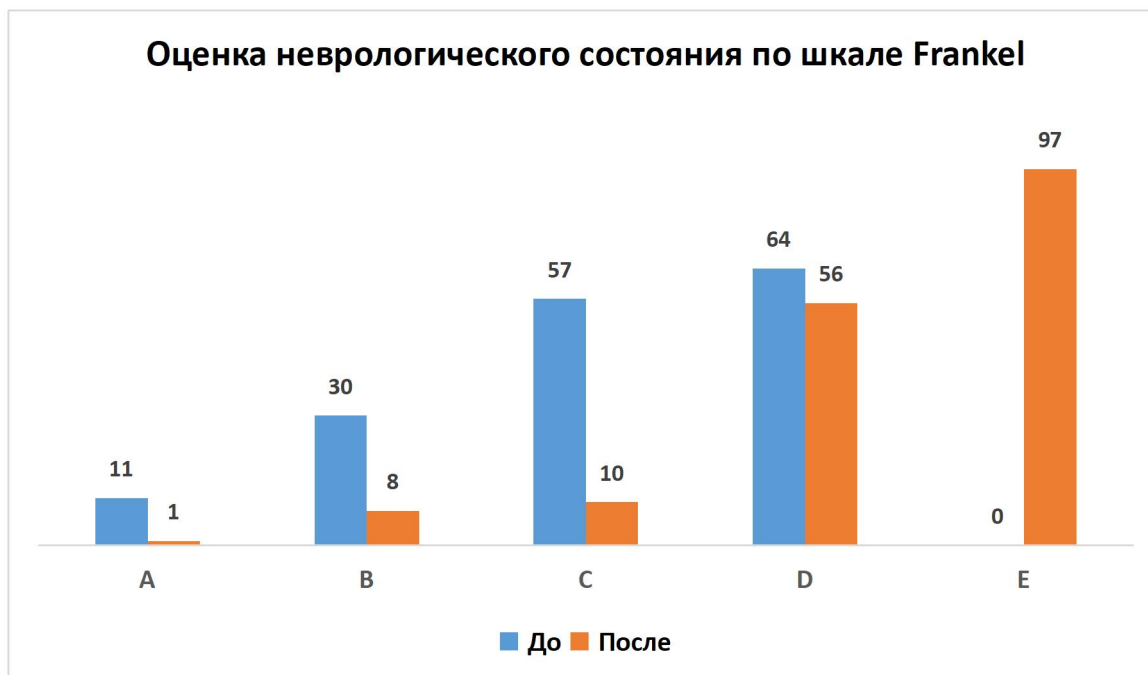
Fig 7.
Graph
spinal

of distribution of patients relative to the



Figure 8. Distribution of patients according to histological data

According to clinical observations, in the preoperative period, 2% of patients had complete damage, lack of motor and sensory function in the extremities, which corresponds to the Frankel A scale; According to the Karnovsky scale 30% - the patient is bedridden, hospitalization is indicated, although a terminal condition is not necessary. 11% of patients had a complete absence of motor function, but with preservation of sensitivity (Frankel B); According to Karnovsky, 50% of the patient often requires help and medical care. 30% of patients suffered from severe impairment of motor function with preservation of sensitivity (Frankel C); According to the Karnovsky scale, 60% of the patient sometimes needs help, but mostly takes care of himself. 57% mild movement disorders with normal sensation (Frankel D); According to Karnovsky 80% Normal activity is possible with additional efforts, with moderate symptoms of the disease. The introduction of international standard assessment criteria allows us to obtain a more accurate understanding of the results of surgical treatment. According to our observations: in patients aged 21 to 62 years, after the modified "staircase" method, installation of vinyl chloride drainage using tendoplasty for 10-12 days allowed us to achieve more favorable results, i.e. a decrease in neurological deficit according to Frankel with "A" " to "E" in 60% of cases, from "A" to "D" in 35% of cases and from "A" to "C" in 5% of cases.



In the postoperative period, the functional status was assessed according to McCormick, which showed:

57% of patients had minor neurological deficits in the form of mild spasticity, brisk reflexes, etc., which does not particularly affect his daily functionality.

30% had a moderate sensorimotor deficit, which affects daily life and quality of life; pain, dysesthesia, and mild gait disturbances were also observed. However, the patient is “independent” in his daily activities.

11% of patients diagnosed with long intradural intramedullary tumor showed more severe deficits, the patient may be ambulatory or have significant bilateral hand function deficits, in fact, not completely independent.

Severe deficiency (paraplegia/tetraplegia) was observed in 2% of patients. The patient is completely dependent on outside help.

According to the analysis of studies in patients who underwent modified scalene laminectomy, predominantly positive results were revealed, due to the fact that this method allows the total removal of the tumor while preserving the bone structures of the spinal cord. In addition, more than 90% of patients experienced accelerated regression of the degree of neurological deficit, total simultaneous removal of spinal cord tumors and release of the spinal cord from compression, thus achieving restoration of the working capacity of patients with this pathology

Conclusion

This study showed that differentiated surgical approaches for different lengths of spinal cord tumors are acceptable in order to minimize surgical trauma and maintain spinal stability, in particular the “staircase” laminectomy method allows to reduce the number of resected spinous processes and preserve the middle and posterior supports of the spinal column. The proposed method provided the following advantages:

- achieving total simultaneous tumor removal;
- abstaining from resection of the spinous processes at each affected vertebral level;
- improvement of liquor circulation in the subarachnoid space, by eliminating compression by the neoplasm;

- elimination of neurological deficits before and postoperative period;
- minimal side effects.

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