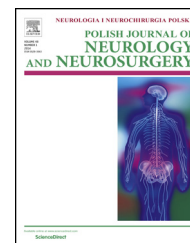


Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

ScienceDirect

journal homepage: <http://www.elsevier.com/locate/pjnns>

## Case report

# The antero-lateral approach with corpectomy in the management of the ventral meningioma of the spinal canal



Maciej Radek<sup>\*</sup>, Marek Grochal, Bartłomiej Tomasik, Andrzej Radek

Department of Neurosurgery and Peripheral Nerve Surgery, Medical University of Łódź,  
University Hospital WAM-CSW, Łódź, Poland

## ARTICLE INFO

## Article history:

Received 22 September 2015

Accepted 15 February 2016

Available online 24 February 2016

## Keywords:

Anterolateral approach

Oblique corpectomy

Spinal canal meningioma

Cervical spine meningioma

## ABSTRACT

The authors present the anterior approach to cervical spine, which enabled complete resection of tumor located in the anterior part of the spinal canal. Considering there are not many reports in the literature, the authors present a case of a meningioma at the level C5–C6 resected with good result through anterolateral approach.

© 2016 Polish Neurological Society. Published by Elsevier Sp. z o.o. All rights reserved.

## 1. Introduction

Meningiomas are neoplasms arising from meningotheelial cells. The majority, about 90%, are benign, clearly demarcated from the surrounding tissues. These neoplasms account for about 20% of intracranial tumors whereas the location within the spinal canal is less common and comprises only about 10% [13].

Typically, these tumors are intradural. Spinal intradural extramedullary tumors account for two thirds of all intraspinal neoplasms and include meningiomas and neuromas [1]. Meningiomas account for 25–46% of primary spinal tumors and are second after neuromas [9]. They are most commonly

located in the thoracic portion of the spine, cervical spine is the second most common location and account for about 15% [8,10,13].

The thoracic spinal meningiomas are generally anterolateral, lateral or posterolateral. In the cervical region they are often located on the anterior surface of the spinal canal [8,10].

Most tumors are diagnosed in the sixth and seventh decade of life, with a female predilection in a 2:1 ratio. In the case of the spinal canal meningiomas this ratio is higher being about 4:1 [9]. In addition to genetic factors, these differences result from the occurrence of hormone receptors on the surface of these tumors, particularly for estradiol or progesterone [13].

Considering the benign nature of these tumors, their complete resection provides an opportunity of successful

<sup>\*</sup> Corresponding author at: Department of Neurosurgery and Peripheral Nerve Surgery, University Hospital WAM-CSW, Żeromskiego 113, 91-647 Łódź, Poland. Tel.: +48 42 639 35 51.

E-mail address: [maciej.radek@umed.lodz.pl](mailto:maciej.radek@umed.lodz.pl) (M. Radek).

<http://dx.doi.org/10.1016/j.pjnns.2016.02.006>

0028-3843/© 2016 Polish Neurological Society. Published by Elsevier Sp. z o.o. All rights reserved.

treatment and prevents recurrence. In most cases of radical surgery, except for very rare malignant and anaplastic lesions, there is no need for adjuvant radiotherapy. The radical resection of the tumor requires good intraoperative visualization allowing its complete removal with minimal risk of damage to the spinal cord.

Ventral cervical meningiomas can be operated on by both, anterior and posterior approach [2]. Although anterior approach seems to be an ideal solution, it is rarely used due to technical difficulties associated mainly with the problem of obtaining watertight closure of the dura and usual necessity of spine stabilization [4,12].

In the presented case, we successfully used the anterolateral approach with extended oblique corpectomy [5–7] [Fig. 1].

## 2. Case report

A 33-year-old female patient presented to neurologist with numbness in fingers (III–V) of both hands, with the accompanying periodic arm and shoulder pain, weakness in her lower extremities and a feeling of general weakness. She had a history of Graves–Basedov disease.

Neurological examination revealed spastic paraparetic gait, weak tendon reflexes in the upper extremities, exaggerated knee jerk reflexes and bilateral Babinski sign.

Magnetic resonance imaging of the cervical spine revealed the presence of a lesion characteristic of meningioma at C5/C6, located on the ventral surface of the spinal canal, slightly more to the left side [Fig. 2a–c].

The patient was admitted to our Department for surgical treatment.

Because of the ventral location of the tumor, the anterior approach was selected.

## 3. Surgical procedure

The patient was positioned supine, with head turned to the right side. Approach from the left side. Skin incision was made

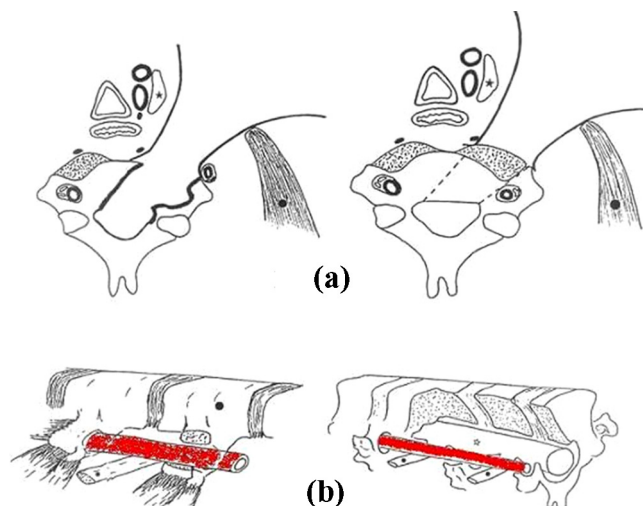


Fig. 1 – Exposure of the vertebral artery and the spinal cord.

along the medial border of the sternocleidomastoid muscle. The anterolateral surface of the spine was visualized by dissection of tissues externally to the neurovascular bundle. Then the sympathetic chain was identified and displaced laterally. The Longus colli muscle was removed along the transverse processes of C5 and C6.

When the vertebral artery was located and dissected from the transverse foramina of C5 and C6, an oblique drilling of C5 and C6 vertebral bodies, extended to the midline was performed with continuous control of the vertebral artery.

Following the removal of the posterior longitudinal ligament, the dura was exposed and on its surface the presence of tumor attachment as well as some pathological venous vessels were revealed. After the vessels have been coagulated, the dura was longitudinally incised to expose the arachnoid above and below the lesion, the tumor margins were identified.

After a circular resection of the infiltrated dura, the significant bulking of the lesion and intensive pulsation of the spinal cord were observed. The tumor was located extramedullary, slightly more to the left and longitudinally spreading to C5.

Microsurgical technique was applied. The tumor was separated from the arachnoid and totally removed. Histopathological examination revealed a meningothelial meningioma [Fig. 3].

The watertight dura closure was performed using Duragen and Tachosil preparations and right thigh fascia lata with tissue glue.

Taking into account the range of the vertebral body resection and age of the patient it was decided to perform spinal fusion C4–C7 with right iliac crest graft. Titanium plate and five screws were used for stabilization [Fig. 4b].

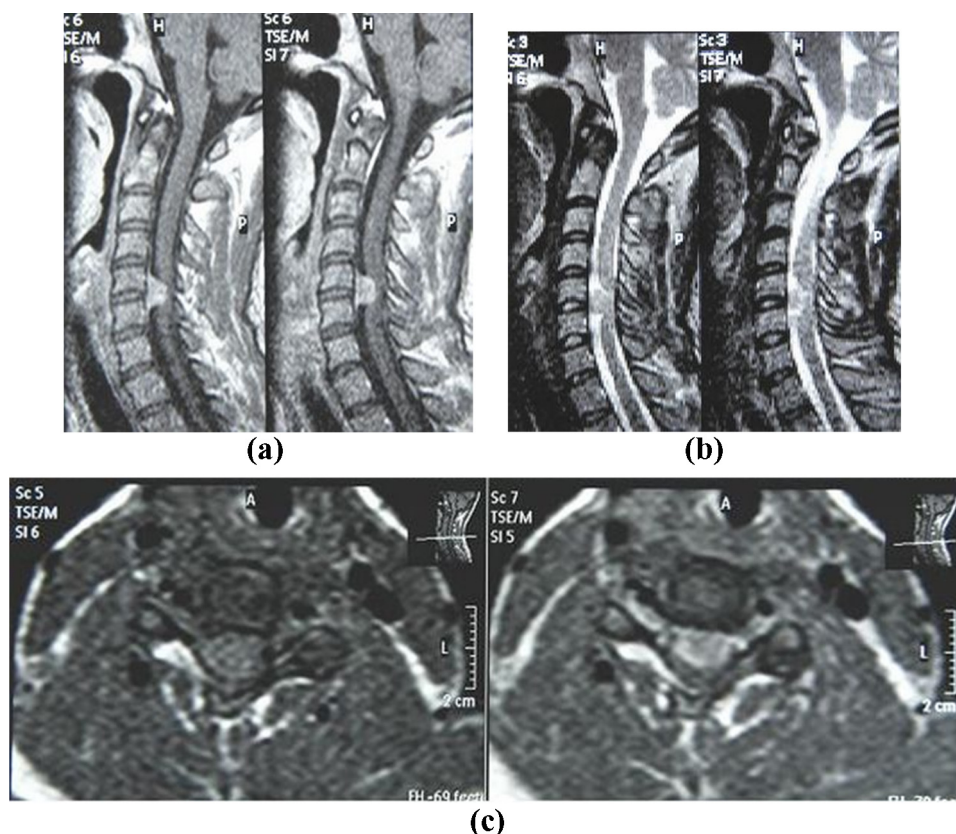
The patient responded well to the surgery. Horner's sign on the left side was observed after the procedure. On 1, 3 and 6-months follow-up the patient presented regression of preoperative symptoms and normalization of neurological status including the Horner's sign. Follow-up imaging examinations showed total meningioma resection [Fig. 4a].

## 4. Discussion

Meningiomas are mostly benign tumors of the central nervous system (WHO I). They represent 25–46% of all tumors of the spinal canal and most frequently occur in the thoracic region. Cervical meningiomas account for about 15% and they are mostly located on the ventral surface of the spinal canal and are technically usually difficult to remove [1,8–10,12,13].

Due to relatively slow grow, both patients and physicians can underestimate the symptoms for a long time. Careful neurological examination, early MR imaging and surgery are crucial for avoiding the spinal myelopathy [4]. In meningiomas, the extent of surgical excision is the main factor of risk of recurrence and all effort should be made to remove the tumor along with its dural origin.

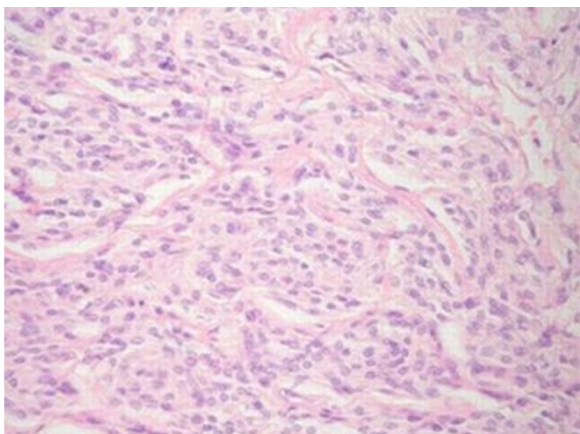
The majority of the literature is devoted to the technique allowing the lesion resection from the posterior approach [2,12,13]. By the laterally extended laminectomy or hemilaminectomy, meningioma located in the anterior part of the spinal canal can be approached from one or both sides of the



**Fig. 2 – (a) T1 enhanced MRI scan, sagittal cross-section. Tumor at C5–C6 level. (b) T2 MRI scan, sagittal cross-section. Tumor at C5–C6 level. (c) MRI scan, axial. Medially located tumor with slight displacement to the left.**

spinal cord. However in most cases effective, this method can be burdened with extensive damage to the paraspinal muscles and the risk of kyphosis resulting from damage to the posterior spinal column [3,11,12].

In some cases of meningiomas located centrally in the anterior part of the spinal canal, the complete resection of the tumor and infiltrated dura from the posterior may appear difficult or impossible and the attempts of radical removal can compromise the spinal cord or roots. The lateral extension of



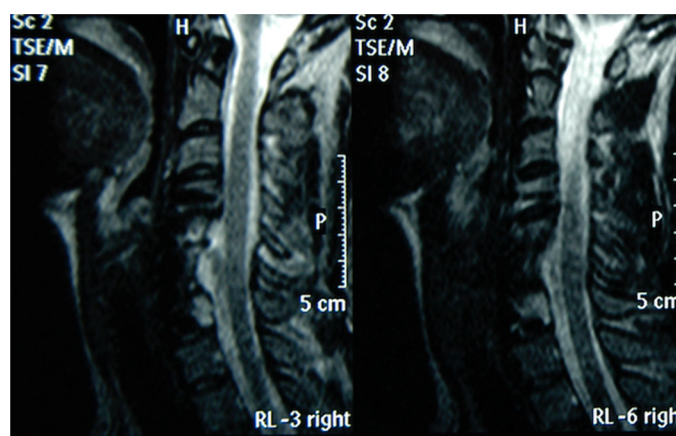
**Fig. 3 – Microscopic image: meningothelial meningioma.**

the laminectomy or hemilaminectomy allows in such cases for better visualization of the tumor and increases the chance of its total resection, but it involves the removal of the intervertebral joints at one or both sides [12].

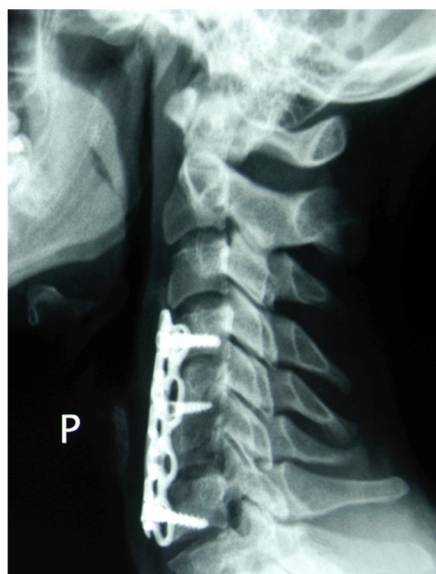
Presenting the above advantages and disadvantages of the extended lateral laminectomy, we wish to draw attention to a different technique – the anterolateral approach to the tumors of the ventral surface of the cervical spinal canal, which we used successfully in the described case of meningioma. Surprisingly, the literature on this subject is not rich. Among disadvantages of the anterior approach, the problem of dura closure and necessity of spinal stabilization are raised, but with anterolateral, extended approach the first is quite easily achievable and the latter, in cases when necessary, seems to be easier than posterior stabilization.

During the procedure, we paid special attention to watertight closure of the dura. It was achieved with the use of Duragen and Tachosil preparations and right thigh fascia lata with tissue glue. We did not use the lumbar drainage in our case, but this is a good alternative when CSF leak occurs in postoperative period, despite the materials used for dura closure [4].

Described technique allowed direct visualization of the lesion and its total resection eliminating completely any spinal cord or spinal nerves manipulation. It also allowed for total removal of the dural attachment of the tumor, thereby maximally preventing its regrowth and leading to complete



(a)



(b)

Fig. 4 – (a) 3 months follow-up MRI, T1. (b) Follow-up X-ray.

recovery. The advantage over the classical central corpectomy lays in the possibility of controlling the vertebral artery from the beginning of the procedure. In cases when classical oblique drilling is sufficient to remove the pathology and the opening of the spinal canal is less extended to the midline, it is possible to avoid stabilization [5]. In presented case it was necessary to remove the medial part of the spinal bodies and the stabilization was performed. In our case we harvested bone from right iliac crest. The graft was inserted in the drilled space and stabilized with the titanium plate. The use of titanium mesh has been described [4]. In our case we used bone which filled very well the space and reduced the risk of artifacts in further MR control studies.

## 5. Conclusions

The surgical procedure with anterolateral approach with extended oblique corpectomy provides a relatively easy and bloodless access to the spinal canal.

Good intraoperative visualization reduces the risk of spinal cord, spinal nerves and vascular injury associated with manipulations. The technique makes radical resection of the tumor and watertight dura closure possible.

## Conflict of interest

None declared.

## Acknowledgement and financial support

None declared.

## Ethics

The work described in this article has been carried out in accordance with The Code of Ethics of the World Medical

Association (Declaration of Helsinki) for experiments involving humans; Uniform Requirements for manuscripts submitted to Biomedical journals.

#### REFERENCES

- [1] Albanese V, Platania N. Spinal intradural extramedullary tumors. Personal experience. *J Neurosurg Sci* 2002;46:18–24.
- [2] Angevine PD, Kellner C, Haque RM, McCormick PC. Surgical treatment of ventral intradural lesions. *J Neurosurg Spine* 2011;15(1):28–37.
- [3] Dugoni DE, Mancarella C, Landi A, Tarantino R, Ruggeri AG, Delfini R. Post laminoplasty cervical kyphosis – case report. *Int J Surg Case Rep* 2014;5(October (11)):853–7. <http://dx.doi.org/10.1016/j.ijscr.2014.09.020>
- [4] Fraioli MF, Marciani MG, Umana GE, Fraioli B. Anterior microsurgical approach to ventral lower cervical spine meningiomas: indications. Surgical technique and long term outcome. *Technol Cancer Res Treat* 2014;(March).
- [5] George B, Gauthier N, Lot G. Multisegmental cervical spondylotic myelopathy and radiculopathy treated by multilevel oblique corpectomies without fusion. *Neurosurgery* 1999;44:81–90.
- [6] George B. Extracranial vertebral artery anatomy and surgery. In: Krayenbühl H, editor. *Advances and technical standards in neurosurgery*, vol. 27. New York: Springer-Verlag; 2002. p. 179–216.
- [7] George B, Lot G. Surgical treatment of dumbbell neurinomas of the cervical spine. *Crit Rev Neurosurg* 1999;9:156–60.
- [8] Gezen F, Kahraman S, Canakci Z, Beduk A. Review of 36 cases of spinal meningioma. *Spine* 2000;25:727–31.
- [9] Gottfried ON, Gluf W, Quinones-Hnojosa A, Kan P, Schmidt MH. Spinal meningiomas: surgical management and outcome. *Neurosurg Focus* 2003;14(6):2.
- [10] Levy W, Bay J, Dohn D. Spinal cord meningioma. *J Neurosurg* 1982;57(6):804–12.
- [11] Nakashima H, Imagama S, Ito Z, Ando K, Matsui H, Hirano K, Tauchi R, Muramoto A, Matsumoto T, Wakao N, Ishiguro N. Intraoperative neurological deterioration secondary to spinal kyphotic change after cervicothoracic junction laminectomy. *Spine (Phila Pa 1976)* 2014;39(December (25)). <http://dx.doi.org/10.1097/BRS.0000000000000631>. E1549–E1551
- [12] Payer M. The anterior approach to anterior cervical meningiomas: review illustrated by a case. *Acta Neurochir (Wien)* 2005;147:555–6.
- [13] Solero CL, Fornari M, Giombini S, Lasio G, Oliveri G, Cimino C, Pluchino F. Spinal meningiomas: review of 174 operated cases. *Neurosurgery* 1989;25(2):153–60.