

Paraganglioma of the lumbar spinal canal – case report

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Abstract

We present the case of a 46-year-old female with a lumbar spine paraganglioma. The patient complained of a right-sided lumboischialgia. Preoperative MRI revealed an intradural tumour at the vertebra L3 level, located in the midline, 7 mm in diameter. The tumour was totally removed by laminectomy. Histopathological examination showed nests of chief cells (zellballen), surrounded by reticulin fibres. Immunohistochemistry showed a positive reaction for chromogranin A, neuronal specific protein, synaptophysin and cytokeratin in the chief cells. The sustentacular cells displayed immunopositivity for S-100 protein, single cells were also positive for GFAP. We found no proliferative activity in the tumour cells (Ki-67 index = 0%). In the two years follow-up the patient remains without clinical or radiological signs of recurrence. Spinal paraganglioma is a rare, surgically curable tumour with low proliferative potential. This entity should be taken into consideration in the differential diagnosis of extramedullary spinal lesions.

Key words: diagnosis, immunohistochemistry, MRI, paraganglioma, spine

Introduction

Extraadrenal paragangliomas are benign lesions of neuroendocrine origin. They are derived from chemoreceptors' cells, and observed usually in the carotic body and glomus jugulare [3,9]. Their location in the spinal canal is rare, and usually confined to the cauda equina and filum terminale. Spinal paragangliomas are encountered in adolescents and adults, with the peak incidence in the fifth decade [7,13]. We present a case of spinal root paraganglioma which developed in the lumbar segment of the spine.

Case report

A 46-year-old woman was admitted to the Department of Neurosurgery in Bytom, Poland with a history of right-sided lumboischialgia. The patient had L4-L5 fenestration on the right side four years earlier because of intervertebral disc hernia, diagnosed in computerized tomography scan. Preoperative magnetic resonance imaging (MRI) study showed recurrent L4-L5 hernia and intradural tumour located medially at the L3 level. The tumour, 7x6x6 mm in diameter, adhered to the dorsal aspect of the dura and spinal root and enhanced homogeneously after

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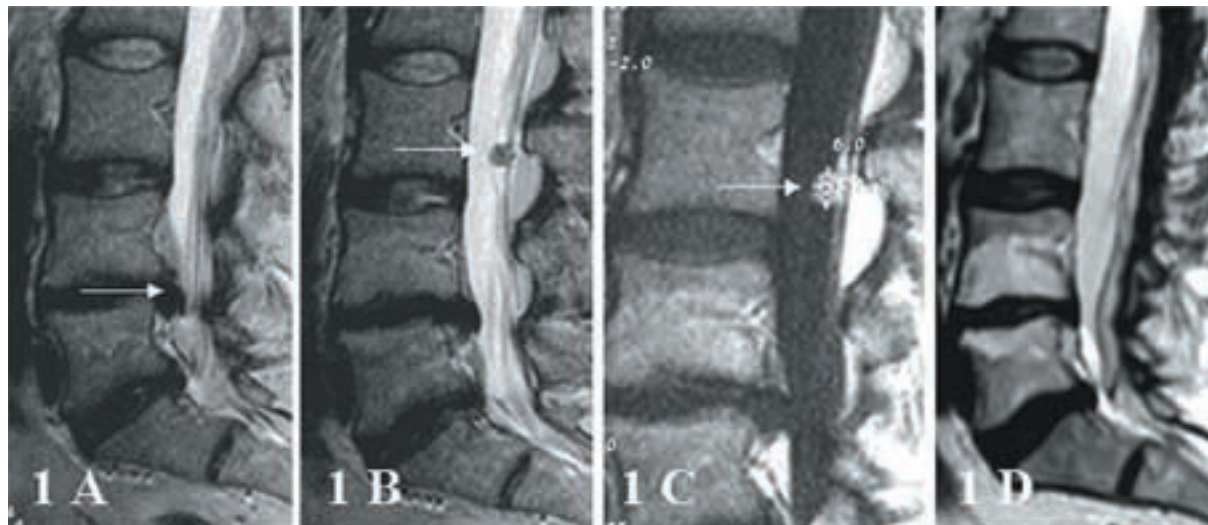


Fig. 1. Magnetic resonance imaging (MRI) of the lumbar spine. Preoperative sagittal scans (A-C): T2-weighted image shows large intervertebral L4-L5 disc hernia (arrow) (A), dorsally at the level L3 the intradural tumour measuring 7 x 6 mm (arrow) (B), T1-weighted image shows homogenous contrast enhancement of the tumour adhering to the root (arrow) (C), postoperative T2-weighted image reveals complete removal of the tumour and the L4-L5 disc hernia (D)

gadolinium (Fig. 1 A-C). The L3 laminectomy was performed and the total removal of intradurally located tumour was achieved. The tumour was soft, round, bluish in colour, and contiguous with the spinal root. The L4-L5 intervertebral disc hernia was removed by refenestration at the same time. The lumboischialgia disappeared soon after the operation. In the two years follow-up the patient has no neurological or radiological signs of tumour or hernia recurrence (Fig. 1 D). Histological examination showed a typical picture of paraganglioma, composed of cells balls (zellballen)

formed by nests of chief cells, separated from each other by fibrovascular septa (Fig. 2 A, B). Closely packed chief cells had regular, round to oval nuclei and abundant, eosinophilic cytoplasm. Some tumour regions showed extensive areas of hyalinization and fibrosis with secondary trabecular arrangement of tumour cells. There were no mitotic figures.

For immunohistochemistry, paraffin 3? m-thick tissue sections were used. The primary antisera (all from DAKO, Denmark) against the following antigens were used: neurofilament proteins (cat. no N1591), chromogranin A (N1535), neuronal specific enolase (N1557), S-100 protein (N1519), synaptophysin (N1566), cytokeratin (M0821), glial fibrillary acidic protein (GFAP) (N1506) and Ki-67 (N1633). The anti-cytokeratin antibody was diluted 1:50, remaining antisera were obtained pre-diluted from the manufacturer. Antibody binding was visualized by the labelled streptavidin-biotin complex technique with LSAB+ kit (DAKO, K0690) for detection of cytokeratin and LSAB (DAKO, K0675) for detection of other antigens, using diaminobenzidine as a chromogen. The sections were counterstained with Mayer's hematoxylin solution.

The chief cells were immunopositive for chromogranin A (CHR), neuronal specific enolase (NSE), synaptophysin (SF), and cytokeratin (CK) (Fig.

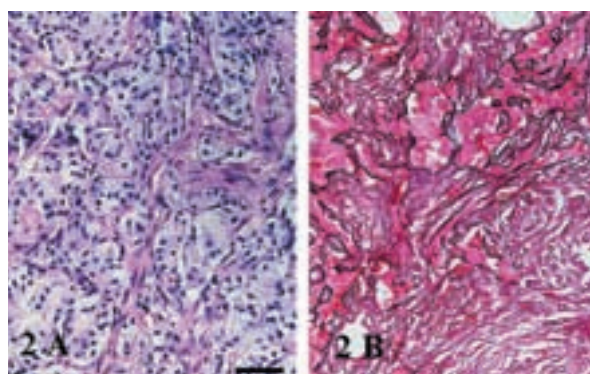


Fig. 2. Chief tumour cells form nests (zellballen), surrounded by fibrovascular septae. HE (A). Gordon-Sweet (B). Bar=100 µm

3A) and negative for neurofilament proteins (NF). Sustentacular cells, with their elongated processes encompassing nests of chief cells, were positive for S-100 protein, some of them were also GFAP-positive (Fig. 3 B). The tumour cells showed no proliferative activity (Ki-67 labelling index = 0%).

Discussion

Paragangliomas are neuroectodermal tumours of the autonomic paraganglia, derived from the chromaffin cells of neural crest origin [10]. Their location within the central nervous system is unusual. Intracranially, paragangliomas were encountered in the sellar, pineal and petrous ridge regions [3]. Spinal paragangliomas are rare, most of the single reported cases occurred in the cauda equina and filum terminale region [1,5,10,11-13]. Interestingly, a series of 30 spinal paragangliomas reported by Moran et al. [7] consisted of nineteen tumours located in the lumbar segment of the spine, six in the cauda equina, two in filum terminale, two in the thoracic and the remaining two in the cervical region of the spinal canal.

Spinal paragangliomas are presumably derived from ganglionic cells, normal paraganglions associated with blood vessels or from residual peripheral neuroblasts, which can give rise to either chemoreceptor or ganglion cells [5,10].

Spinal paragangliomas are benign, slowly growing tumours with low proliferative activity [1,8,9]. They may be associated with syringomyelia [10] or intramedullary cyst [3]. Clinically relevant secretory activity of spinal paraganglioma cells (e. g. release of catecholamines) is a rare phenomenon and can be induced by surgical manipulations of the tumour [12].

Histologically, spinal paragangliomas are generally identical to paragangliomas in other locations. Some variants of classic paraganglioma, including oncocytic metaplasia, the presence of spindle cell component, melanin pigment and ganglion cells have been observed in spinal paragangliomas [7].

The histological picture of the presented case, with alveolar „zellballen” pattern is typical of paraganglioma located elsewhere in the body.

Immunopositivity for neuroendocrine markers – chromogranin A, synaptophysin and neuronal specific enolase in chief cells and positive reaction

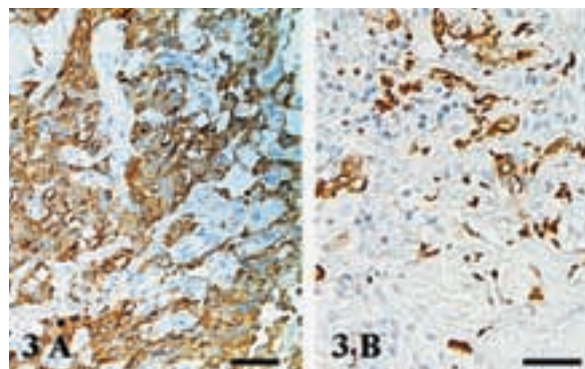


Fig. 3. Chief paraganglioma cells are immunopositive for neuroendocrine marker – chromogranin A (A). The elongated processes of sustentacular cells are positive for GFAP (B). Bar=100 μ m

for S-100 protein in sustentacular cells supported the histological diagnosis in the presented case. These markers are useful in the differential diagnosis of paragangliomas [7,8,9,13]. Positive reaction for NSE, CHR and SF was found by Moran et al. [7] in 100%, 91% and 91% of thirty spinal paragangliomas, and thus are the most consistent immunohistochemical findings in these tumours. Differential diagnosis of spinal paragangliomas should first of all include myxopapillary ependymomas and neurinomas. These last two entities are negative for neuroendocrine markers, furthermore, ependymomas are usually strongly GFAP and S-100 protein reactive [7,13]. Other antigens, less frequently detected in spinal paragangliomas, include leu-enkephalin, somatostatin, cytokeratin, neurofilament proteins and ACTH [7].

Another valuable tool in the diagnosis of paragangliomas is the electron microscopy. The presence of membrane-bound, electron dense neurosecretory granules in the cytoplasm, supports the diagnosis of neuroendocrine tumour [1,5,13].

Neuroradiological picture of the spinal paragangliomas usually consists of the intradural mass, isointense with spinal cord [3] and enhancing with gadolinium-DTPA [6,10].

In most cases of spinal paragangliomas surgical cure can be achieved, provided that total resection was accomplished [9,11], however, recurrences with progression of the disease [11] and even metastasizing outside the spinal canal [2,7] have been reported. On the other hand, vertebral metastases with spinal cord

compression from carotid body [6] and retroperitoneal [4] paragangliomas were reported.

In the presented case a small paraganglioma, located intradurally at the L3 level was probably asymptomatic and diagnosed incidentally only thanks to the follow-up MRI examination, performed in the patient with a history of previous lumbar disc surgery. This explains that, to our knowledge, it is the smallest spinal paraganglioma reported in the literature. Yoshida et al. [13] reviewed 69 spinal paraganglioma cases and found that they measured from 15 to 100 mm in the greatest diameter, tumours in a series of Moran et al. [7], encompassing 30 cases, measured from 10 to 50 mm.

The radicular pain in our patient was most likely caused by recurrent L4-L5 disc hernia. Nevertheless, the presented case supports the value of MRI study in the early diagnosis of spinal tumours and prompts to include paraganglioma in the differential diagnosis of extramedullary lesions.

Acknowledgements

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