

# Paranglioma of the cerebellopontine angle. Case presentation and pathological considerations

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## Abstract

Parangliomas (glomus tumors) arise from the extra-adrenal neuroendocrine system. They are benign but locally aggressive tumors, causing bone destruction and compression related symptoms. We present a case of paranglioma of the cerebellopontine angle. Emphasis on possible difficulties in clinical, imaging or pathological identification, and surgical removal is done. To the best of our knowledge, only one more case was reported arising in the cerebellopontine angle.

**Keywords:** paranglioma, cerebellopontine angle, diagnostic difficulties, surgical approach.

## ☞ Introduction

Parangliomas (glomus tumors) are tumors of the specialized extra-adrenal neuroendocrine system. The term was proposed for the first time in 1891 by Marchand, cited by Lack [1].

If located in the carotid body area, the tumor is also called chemodectoma [2].

The prevalence is low, paranglioma accounting for only 0.6% of neoplasms of the head and neck region [3]. There is slight gender predominance, with a female-male ratio of 4 : 6.1 for the jugulotympanic lesions [4]. The maximum of incidence is in the 5<sup>th</sup> and 6<sup>th</sup> decades [5].

Their overall location of parangliomas is in accord with the sites of normal paraganglia: the carotid body, the jugulotympanic body, the vagal body, etc. Usually, they are in close relation with vessels, nerves and the autonomic aorticosympathetic chain [6].

Only rare cases arise in peculiar zones, with possible diagnosis challenges. Such zones include: sella turcica [7], tongue [8], pineal gland, orbit, thyroid gland, soft palate, face, and cheek [1].

It is also the case for the cerebellopontine angle, where we found only one citation [9] as well as a mention in a review [10]. In this region, parangliomas may arise from small paraganglionic structures present in the region.

The classical jugulotympanic tumour arises from minute's paraganglia rests located along the jugular bulb, Jacobson or Arnold nerves [11].

The classical evolution of the tumor is local invasion, with destruction of the petrous bone, following the paths of low resistance, toward mastoid cell tracts [4, 12], vascular channels [13], eustachian tube [14].

We present a peculiar case, apparently strictly confined to the area of the cerebellopontine angle, with invasion into the nervous parenchyma of the brainstem, giving the aspect of an exophytic mass and

macroscopically suggestive for a schwannoma. The tumors did not raise any suspicion of a glomus tumor at either clinical or imaging examinations and proved to be so only after the pathological study of the case.

## ☞ Material and methods

We assessed the case of a patient, a 34-year-old man, with no remarkable medical history that had, a week prior the hospital admission, intense headache and vomiting. A progressive loss of hearing was remarked by the patient during the last year, accompanied by tinnitus.

Clinical examinations revealed unsystematic equilibrium troubles, right pyramidal syndrome, right neocerebellar syndrome and a horizontal nistagmus at right look.

The otolaryngologic examination showed a right transmission hypoacusia.

On the brain CT, a right pontocerebellar angle mass appeared, with intense contrast enhancing.

The surgical intervention was performed by a complex team of neurosurgeons and otolaryngologists. The procedure consisted of a right retromastoid craniectomy.

In the right cerebellopontine angle, the tumor mass appeared as a relatively hard, well vascularized tumor infiltrating the brain stem. The resection of the extra axial portion of the tumor was performed.

Postoperatively, the evolution was good, with progressive recovering of the patient.

Evaluation of the case was done on the material surgically removed.

Conventional hematoxylin & eosin, as well as Masson's trichrome and Bielschowsky silver reticulum staining were performed.

The antibodies listed in the Table 1 were used to determine the immunophenotype and proliferation potential.

To evaluate the Ki67 positivity, 1000 nuclei in the most positive areas were counted, the final result being a percentage.

**Table 1 - Antibodies used in the characterization of this case**

Antibody	Producer	Dilution	Result
Chromogranin	Dako, Glostrup	1:100	-
Synaptophysin	Dako, Glostrup	1:50	++
Neurofilament protein	Dako, Glostrup	1:100	-
Neuron specific enolase	Dako, Glostrup	1:50	+, zonal
S-100 protein	Dako, Glostrup	1:500	+
GFAP	Dako, Glostrup	1:50	++
HNK1 (Leu 7)	Dako, Glostrup	1:50	-
CD 56	NeoMarkers	1:50	-
Bcl-2	Dako, Glostrup	1:100	-
PGP 9.5	Novocastra	1:40	-
Somatostatin	NeoMarkers	1:50	+
VIP ( <i>vasoactive intestinal polypeptide</i> )	Novocastra	1:100	-
Ki 67	Dako, Glostrup	1:100	10%

## ☞ Results and discussions

The tumor presented the typical histological features of a paraganglioma, with round cells, arranged in lobules, cell balls (“zellballen”) and diffuse patterns (Figures 1 and 2).

Masson’s trichrome and Bielschowsky silver method showed a fine connective stroma surrounding cell cords and lobules (not shown).

The immunoreactivity was in some way atypical for a paraganglioma, since practically all neuroendocrine markers (neurofilaments, synaptophysin, PGP 9.5, chromogranin) were negative. On the other hand, S100 protein had a diffuse staining of all chief cells, with only scattered, rare positive sustentacular cells (Figure 3).

The proliferating potential was medium in some areas, roughly 10% (Figure 4). Bcl-2 protein was positive mainly in the lymphocytes infiltrating the stroma and only in rare tumor cells.

GFAP expression was rather diffuse, and disposed in a dot-like manner in some tumor cells (Figure 5).

Of the two neuropeptide antibodies, only somatostatin showed positivity in a subset of cells (Figure 6).

The cerebellopontine angle region shows a variety of possible tumors arising within. Schwannoma and meningioma are by far the most frequent.

Excluding these two categories, many other lesions are rarely occurring here, with origin within the cerebellopontine cistern (arachnoid cyst, aneurysms), embryologic remnants (epidermoid and dermoid cysts), tumor extensions from the skull base (chordoma, pituitary adenoma, cholesterol granuloma) or conversely, exophytic growths from brain stem and ventricular system (glioma, medulloblastoma, ependymoma) [10].

Paragangliomas are considered among skull base tumors with invasive potential in the region. On the other hand, they are reported to arise in unusual locations [11]. Even the tongue can be involved [8].

Our case seems to represent such a peculiar located

paraganglioma with typical appearance on histological examination but a peculiar immunohistochemical profile. In our case, the GFAP expression was rather diffuse, disposed in a dot-like manner in many of the tumor cells, different from the findings of Kontogeorgos *et al.* [15], which found GFAP to be expressed only in sustentacular cells.

Somatostatin was expressed by the tumor, even though we investigated for no more than two neuropeptides expression, the vasoactive intestinal peptide (VIP) and somatostatin.

According to Linnoila *et al.* [16] a decreased expression of neuropeptides appears in more aggressive variants of paraganglioma.

The scarceness of sustentacular cells and their lack of expression for GFAP are in accord with an overall aggressive behavior in paragangliomas [17].

The tumor infiltration into the brainstem was a curious behavior, since the majority of cases infiltrate the osseous structures, sparing the parenchyma. The proliferating potential, relatively high, is in accord with all these features.

Regarding the Bcl-2 expression, we assessed it since the opinions are conflicting. Some recent papers affirm a direct relation between Bcl-2 expression and survival in gliomas [18], other articles found no relation with prognosis. As a rule, there are no reliable histological criteria to predict malignant behavior in paragangliomas.

Of a clinical point of view, the apparition of paragangliomas in the cerebellopontine angle should be kept in mind by neurosurgeons, and differential diagnostic problems are to be retained, mainly with the acoustic schwannoma or meningioma. The prognosis is different for the three groups.

Schwannomas, even the for the melanotic variant, are considered uniformly benign and have very good prognosis.

Meningiomas have various clinical courses, according to their histology, but mostly are benign too.

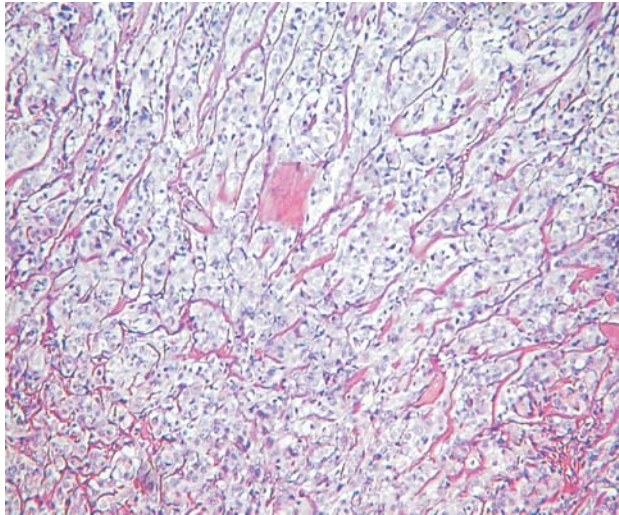
Paragangliomas, as we showed, are frequently aggressive tumors, despite their inoffensive histological features.

## ☞ Conclusions

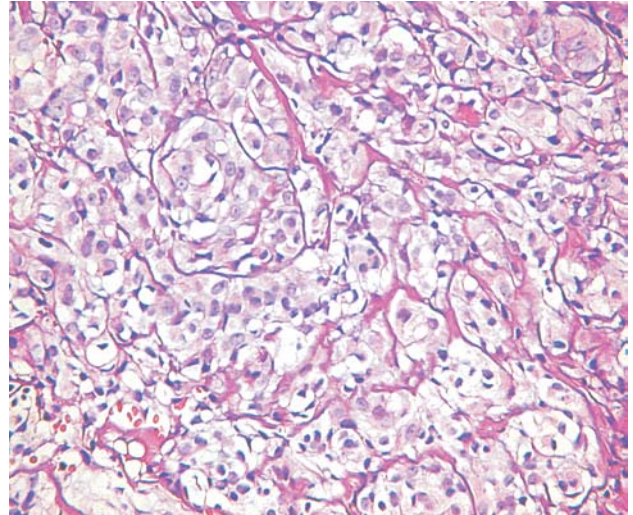
Paragangliomas are tumors with conflicting prognosis. Not clear histological parameters are decisive in establishing the overall prognosis. On the other way, a tumor arising in the cerebellopontine angle should be kept in mind as a possible paraganglioma and carefully examined in the pathology laboratory.

## References

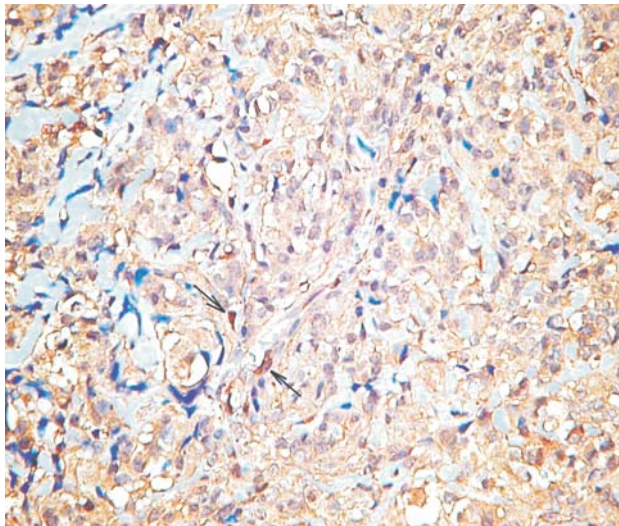
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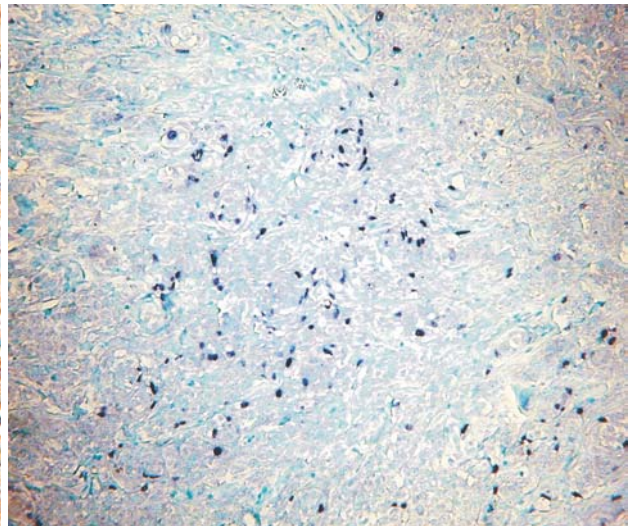
**Figure 1** – General aspect of the tumor. The cells are rather clear, arranged in cords and nests (HE staining)



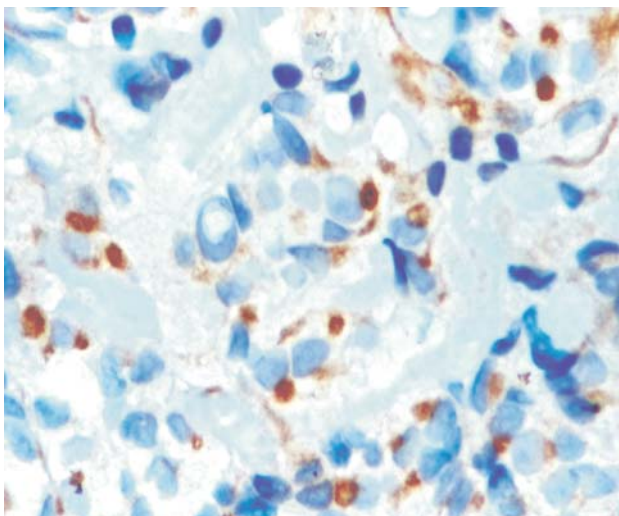
**Figure 2** – Details from the previous figure. Cell lobules (“zellbalen”) are surrounded by a delicate fibrous stroma (HE staining)



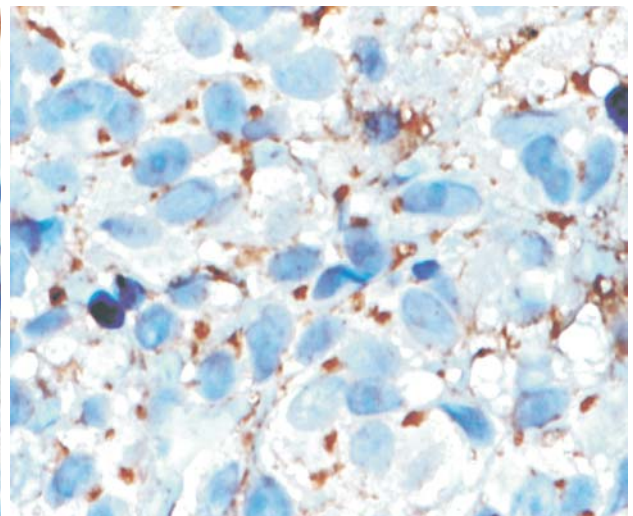
**Figure 3** – S-100 reactivity is diffuse, with two sharply apparent sustentacular cells with an enhanced staining (arrows) (S-100 immunostaining)



**Figure 4** – The proliferative potential is focally high, as shown by Ki 67 labeling (Ki 67 immunostaining)



**Figure 5** – Peculiar GFAP reactivity, in a dot-like manner adjacent to the nuclei (GFAP immunostaining)



**Figure 6** – Somatostatin is expressed in some tumor cells (somatostatin immunostaining)

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*Received: 10 September, 2005*

*Accepted: 20 November, 2005*