
CASE REPORT

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SYMPATHETIC PARAGANGLIOMA AS AN UNUSUAL CAUSE OF HORNER'S SYNDROME

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Accepted 11 July 2000

Abstract: *Background.* Paragangliomas are rare tumors arising from paraganglionic tissue of neural crest origin. They are present in any location where autonomic ganglia are found. The most common location in the head and neck is the carotid body, followed by the jugular bulb and vagus nerve.

Methods. A 30-year-old woman with a slowly growing left neck mass, anisocoria, and left eyelid ptosis was found to have a vascular tumor consistent with a paraganglioma arising near the left carotid bifurcation. After preoperative embolization, the patient underwent resection of the tumor.

Results. The tumor was found to be arising from the left sympathetic trunk and did not involve any other surrounding structures. Histopathologic analysis revealed the typical findings of a paraganglioma.

Conclusions. Sympathetic paragangliomas are exceedingly rare tumors in the head and neck and should be considered in the differential diagnosis when clinical and radiographic evidence suggest a paraganglioma. The presentation is typically a slow-growing neck mass with the presence of an ipsilateral Horner's syndrome. © 2001 John Wiley & Sons, Inc. *Head Neck* 23: 338–342, 2001.

Keywords: paraganglioma; sympathetic nerve; Horner's syndrome; neck mass; Zellballen

A 30-year-old woman was seen with a 1-year history of a slowly enlarging left neck mass and a several month history of anisocoria and left eyelid ptosis. The patient denied problems with hoarseness, dysphagia, hypertension, palpitations, tinnitus, or hearing loss. The medical history was remarkable for hypothyroidism, and 2 years before presentation the patient underwent an open neck biopsy for a benign enlarged left cervical lymph node.

On physical examination, there was a diffuse, ill-defined mass in the left level II neck that was nontender and nonpulsatile. There was no detectable bruit. There was obvious anisocoria and ptosis of the left eyelid with a constricted left pupil. The remainder of the physical examination was unremarkable, including intact cranial nerves II–XII and a normal laryngeal and otoscopic examination.

A contrast CT scan revealed a hypervascular mass posteromedial to the carotid vessels measuring 6 × 4 cm, 1 to 2 cm superior to the carotid bifurcation displacing the internal and external carotid arteries anterolaterally (Fig. 1). A four-vessel angiogram was performed to further characterize the lesion and for preoperative embolization (Fig. 2). Angiography demonstrated a hypervas-

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FIGURE 1. CT scan of an enhancing mass measuring 6 × 4 cm near the left carotid bifurcation.

cular mass at the C2–C4 level fed by a left ascending cervical branch of the inferior thyroid artery; left vertebral artery branches; and branches off the left external carotid, occipital, and ascending pharyngeal arteries. Embolization of approximately 90% of the feeders was achieved by a combination of particles, coils, and Gelfoam. Postembolization angiography revealed only residual filling of the tumor directly from the left external carotid artery.

One day after embolization, the patient was taken to the operating room for surgical resection of the left neck mass. Wide exposure of the left side of the neck was performed and proximal and distal control of the common carotid artery was obtained. Several enlarged lymph nodes were identified and removed for pathologic evaluation. The mass was identified deep to the carotid artery and was not in continuity with the vagus nerve. The sympathetic trunk, however, was noted to run directly into the inferior portion of the mass at the level of the midthyroid cartilage, and the mass was noted to extend superiorly to the level of the midstyloid process. To remove the mass,



FIGURE 2. Four-vessel angiogram revealing a hypervascular mass at the C2–C4 level in the left neck. The mass is noted to be superior to the carotid bifurcation.

the sympathetic trunk was divided inferiorly and the mass was dissected off the deep cervical fascia and surrounding structures in an inferior to superior direction. All cranial nerves and major vessels were spared.

Histologic examination of the mass revealed the characteristic clusters of epithelioid cells (Zellballen configuration) and extensively branching vascular sinusoids that are typical of paragangliomas (Fig. 3). All lymph nodes were negative for metastatic paraganglioma. Of incidental note, embolic material was found in the large blood vessels of the specimen.

Postoperatively, the patient did well with no neurologic sequelae other than the left Horner's syndrome that was present preoperatively. Two months after surgery, the patient continues to complain of slowly improving left jaw discomfort with eating.

DISCUSSION

Paragangliomas are rare causes of tumors in the head and neck arising from paraganglionic tissue

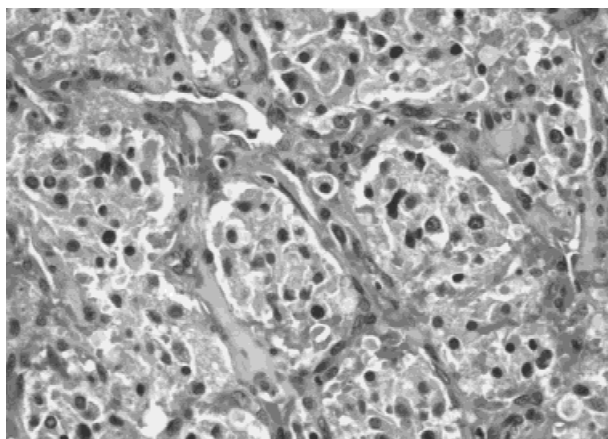


FIGURE 3. H & E stain of the left neck sympathetic paraganglioma. Note the characteristic clusters of epithelioid cells (Zellballen configuration) and branching vascular sinusoids.

of neural crest origin that surrounds blood vessels and nerves. The incidence of head and neck paragangliomas in a review of more than 600,000 tumors at Memorial Sloan-Kettering Cancer Center was 0.012%, and there was only one incidental paraganglioma identified in more than 13,400 autopsies.¹ The most common anatomic location for paragangliomas in the head and neck is the carotid body (61.7%), followed by the jugular bulb/tympanic plexus (26.7%), and the vagus nerve (9.3%).² Paragangliomas have also been described in the larynx, orbit, nasal cavity, thyroid, and involving the hypoglossal nerve.^{1,3}

The tumors are generally slow growing and affect surrounding structures by mass effect. Symptoms rarely occur until the tumor is large enough to affect surrounding cranial nerves or other vital structures. On average, the time span from the presence of symptoms to diagnosis is 3.3 to 6 years.⁴ The most common presenting symptoms are a painless neck mass in patients with carotid and vagal tumors and hearing loss and tinnitus in patients with jugular bulb/tympanic plexus paragangliomas. As the tumors increase in size, associated local cranial nerve deficits develop.

Both regional and distant metastases are uncommon in paragangliomas of the head and neck, occurring in approximately 4% to 10% of cases. Carotid body and vagal paragangliomas seem to have a greater risk of metastasis than paragangliomas of the temporal bone.⁵ Metastases most commonly involve the lymph nodes, followed by the lung, bone, and brain.

Synchronous paragangliomas may also occur in the head and neck. Multicentricity has been

reported in as many as 10% of nonfamilial cases of head and neck paragangliomas.^{6,7} In addition, approximately 10% of patients with a paraganglioma have an inherited form of this tumor, and of these, 25% to 33% have multiple paragangliomas.⁸⁻¹⁰

In addition to a complete history and physical examination, diagnostic evaluation includes a CT scan to identify the anatomic location and vascularity of the tumor and osseous changes of the skull base and middle temporal bone. MR imaging has advantages over CT in that is better able to characterize the tumor's relationship to surrounding structures (soft tissue resolution) and its overall vascularity. In addition, tumor invasion into the posterior fossa is better demonstrated on MR imaging. The finding of flow voids in the poststyloid compartment on T1-weighted images is thought by some surgeons to be virtually diagnostic of a paraganglioma. However, other hypervascular tumors of the parapharyngeal space (such as metastatic hypernephroma and metastatic thyroid carcinoma) may have similar appearances but can be usually differentiated on the basis of location, shape, and contour smoothness.¹¹ The differential diagnosis of the paraganglioma is aided by the direction of displacement of the internal and external carotid artery and internal jugular vein relative to the vascular mass. Splaying of the common carotid bifurcation is suggestive of a carotid body tumor, whereas vagal paragangliomas push the external and internal carotid artery anteromedially, separating the internal jugular vein from these vessels. Sympathetic paragangliomas, because of the location of the sympathetic trunk posteromedial to the carotid system, would be expected to displace the internal and external carotid artery anterolaterally.

MR imaging is also useful in detecting lesions that are smaller than 5 mm¹² and is used by some physicians to screen for synchronous paragangliomas.¹³ The addition of MR angiography does not increase the diagnostic value of MR imaging but does add information on the vascularity of the tumor.¹⁴ However, the sensitivity of MRA in detecting important vascularization is lower than digital subtraction angiography.¹⁵ In addition, for tumors larger than 2.5 cm, four vessel angiography and preoperative embolization is useful in minimizing bleeding and injury to surrounding neurovascular structures.¹⁶ Digital subtraction angiography also allows the determination of carotid artery invasion and the performance of bal-

loon occlusion studies to assess collateral cerebral circulation.

Head and neck paragangliomas secrete catecholamines in approximately 2% of cases, in contrast to pheochromocytomas (a histologically similar tumor), which are frequently vasoactive. Headaches, flushing, hypertension, palpitations, or other symptoms of catecholamine overproduction are suggestive of a vasoactive paraganglioma and should illicit examination of the urine for metanephrines or catecholamines. If present, appropriate adrenergic blockade during surgery could prevent a hypertensive crisis. Because of the rarity of secreting tumors in the head and neck, however, lack of symptoms likely obviates the need for these tests.

The current treatment for paragangliomas of the head and neck includes surgical excision for those lesions where resection would not result in significant morbidity or mortality. The risk of significant postoperative cranial nerve deficits after excision of tumors greater than 5 cm has been reported to be between 20% and 50%.^{17,18} However, rehabilitation and compensation for acute cranial nerve loss in young patients is more complete than that found in elderly patients.¹⁹ Thus, surgery may not be appropriate for some lesions in the elderly. Alternatively, radiation therapy has been reported to have local control rates as high as 100% in some series.²⁰ However, the absence of cure and the lack of long-term follow-up of late onset complications (osteoradionecrosis, radiation-induced malignancies, CNS injury) in most radiation series makes its use in younger patients less favorable than surgery.

Although the overall incidence of head and neck paragangliomas is low, the incidence of sympathetic paraganglioma is exceedingly rare. In seven studies of more than 500 cervical paragangliomas,² there were no reported cases of a cervical sympathetic paraganglioma. Studies have found paragangliomas associated with the sympathetic trunk in the thorax and retroperitoneum but not in the cervical region.

There are only two case reports that we are aware of describing cervical sympathetic paragangliomas. One case was a solitary tumor² and the other was in a patient with the inherited form of the disease with multiple cervical paragangliomas.²¹ The solitary sympathetic paraganglioma was found in a 24-year-old man with a long-standing history of Horner's syndrome and a slowly growing left neck mass. The tumor measured 5 × 4.5 × 3 cm on CT scan. The other sym-

pathetic paraganglioma was described in a 28-year-old woman found to have a paraganglioma of the right sympathetic chain and the left carotid body. This sympathetic paraganglioma did not manifest with a Horner's syndrome. This patient had three siblings who also had multiple cervical paragangliomas, but none of them were sympathetic in origin.

Our patient had an approximately 6-month history of a Horner's syndrome preceded by 6 months of a slowly enlarging left neck mass. On CT scan, the tumor measured 6 × 4 cm and displaced the internal and external carotid arteries anterolaterally. The patient was otherwise asymptomatic and had no cranial nerve findings on physical examination. This is in contrast to vagal paragangliomas where on CT scan the internal and external carotid arteries are displaced anteromedially, and nearly 50% of cases are seen with ipsilateral vocal cord paralysis.²² Postoperatively, the patient had no neurologic deficits other than the left Horner's syndrome that was present preoperatively. The patient, however, does complain of left jaw discomfort while eating, which is thought to be either temporal mandibular joint in origin or secondary to "first bite syndrome." The cause of "first bite" is thought to be sympathetic denervation of the parotid gland leading to myoepithelial cell spasm.

CONCLUSION

Sympathetic paragangliomas are a rare cause of Horner's syndrome in patients with a slowly growing neck mass. Their presence should be considered in the overall differential when the diagnosis of paraganglioma is considered. The treatment is complete surgical resection with the meticulous dissection of surrounding tissues and preservation of neurovascular structures.

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