Catecholamine-producing vagal paraganglioma: a case report

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Abstract. Here we report the case of a 50-year-old male patient who presented at our ENT department with a mass on the left side of his neck. Clinical examination revealed a voluminous mass in neck region II. MRI showed that this mass was a hypervascular glomus vagal tumour on the left side at the naso-oropharyngeal level. Endocrinological evaluation revealed high normetanephrine levels. Total resection was performed after preoperative drug administration to reduce perioperative and postoperative morbidity.

Key-words. Extra-adrenal paraganglioma, catecholamine

Introduction

Paragangliomas are rare tumours that arise from paraganglion cells, most often in the carotid glomus (>50%), and less commonly in the jugular ganglion, vagal nerve (<5%), or other small chemoreceptor organs. Patients with vagal paraganglioma present with a slow-growing painless neck mass. Approximately 4% of paragangliomas secrete catecholamines with endocrine effects. It is extremely important to preoperatively determine the diagnosis, and whether the lesion is secreting catecholamines.

Case report

A 50-year-old male patient, who had recently been diagnosed with diabetes mellitus type 2 and arterial hypertension, presented at our ENT department with a mass on the left side of his neck, which had increased in volume over the past year. The patient was asymptomatic, with no dysphagia, pain, cephalalgia, anorexia, hoarseness, otalgia, weight loss, or dyspnoea. ENT examination showed a voluminous mass in neck region II, on the left side, without adenopathies. Laryngotracheoscopy revealed left-sided bulging of the oro and hypopharynx, the vocal cords exhibited normal mobility, without mucosal lesions.

An MRI scan was performed (fig 1), revealing a hypervascular glomus vagal tumour on the left side at the naso-oropharyngeal level, with an anteroposterior diameter of 30 mm and laterolateral diameter of 57 mm. The tumour reached the skull base, without erosion of the foramen jugularis or carotic channel. A mass effect was detected on the lateral oropharynx wall. CT scan was performed to evaluate the stylomandibular tunnel, and the findings excluded parotid pathology.

Endocrinological evaluation revealed high normetanephrine levels. This catecholamine excess could be associated with the patient's recent diagnoses of diabetes mellitus type 2 and arterial hypertension. The patient required preoperative drug preparation to reduce the perioperative and postoperative morbidity. The alpha-blocker prazosin hydrochloride (Minipress) was administered using a build-up schedule, in combination with ramipril and hydrochlorothiazide (Tritazide), to control arterial hypertension. In the event of tachycardia, beta blockers could be administered.

One day before surgery, the patient underwent embolization of the a. pharyngea ascendens and a branch of the a. lingualis. During surgery, the paraganglioma was fully

resected, sparing the n. hypoglossus (XII) and n. accessorius (XI). Elongation of the n. hypoglossus was observed, so paresis could be expected. Since the tumour derived from the n. vagus (X), the nerve had to be dissected. Excision of the tumour was followed by neck dissection of region II.

In the ICU, the patient was started on nicardipine (Rydene) and prazosin hydrochloride (Minipress) due to hypertension. Postoperatively, the patient experienced paralysis of N X, and a left-sided paresis of the n. glossopharyngeus (IX), n. hypoglossus (XII), and n. facialis (VII) due to compression. Logopedic revalidation was started postoperatively. The patient showed recovery from paresis of N VII, N IX, and N XII in 9 months, but experienced persistent paralysis of N X. The patient underwent genetic testing and counselling, and was negative for SHDB or SDHD mutations

Discussion

A paraganglioma is a rare tumour containing chief cells, derived from neural crest (chromaffin) cells that migrate outside the sympathetic chain. Head and neck paragangliomas constitute less than 0.5% of all head and neck tumours, showing an incidence of 0.2–1/100,000 in the general population.[1,2,3] The most common anatomical location of head and neck paragangliomas is the carotid body bifurcation (CBPGL) (60%), with less common occurrences in the jugular bulb of the temporal bone, tympanic branch of the ascending pharyngeal artery within the middle ear (30%), vagal nerve (5–10%), and larynx (very rare).[1,2,4–9]

Here we report the case of a paraganglioma deriving from the vagal nerve. Compared to carotid body tumours, vagal paraganglioma (VPGL) are located more cephalad in the neck, between the jugular vein and the internal carotid artery, sometimes extending to the skull base through the jugular foramen. Such tumours derive from the inferior ganglion of the vagal nerve.[10] All paragangliomas are capable of producing catecholamines (e.g., norepinephrine, epinephrine, or dopamine), but this only occurs in approximately 4% of head and neck paragangliomas. Our case involved a normetanephrine-secreting PGL.

One-third to one-half of head and neck paragangliomas are familial, including up to 40–50% of VPGL.[4,11] Head and neck paragangliomas also show female predominance, and the mean age of onset is during the 5–6th decade of life. One-fourth of paragangliomas are bilateral of multifocal, and these cases are most often hereditary in nature and associated with succinate dehydrogenase (SDH) mutations.[2,6,8] Hereditary paragangliomas can be classified into four different types, all of which derive from the

SDH germline via autosomal dominant transmission. Types 1 (SDHD gene), 2 (SDHAF2 gene), and 3 (SDHC gene) involve paragangliomas in the head or neck region, while Type 4 (SDHB gene) involves paragangliomas in the abdomen and carries a higher risk of malignant metastasizing tumors.[4] The SDH enzyme is a critical component between the Krebs cycle and electron transport chain in the mitochondria, such that SDH loss results in ATP production through glycolysis. These pathway alterations also enable tumour cells to grow even in low-oxygen environments.[6] In addition to SDHx gene mutations, head and neck paragangliomas are associated with other genetic multisystemic disorders, such as van Hippel Lindau, neurofibromatosis type 1, transmembrane protein 127, and MYC-associated factor X.[6] Genetic testing in our present case revealed no mutations of the SDH germline.

The clinical presentation of vagal paraganglioma is a painless slow-growing neck mass. Fewer than 50% of cases present with other symptoms, such as tinnitus, hoarseness, or cranial nerve paralysis (IX, X, XI, or XII).[3,6,11] Differential diagnoses include CBPGL, thyroid nodules, carotid artery aneurysm, salivary gland tumour, schwannoma, meningioma, and jugulotympanic paraganglioma.[7,8,12] Pre-operative diagnosis of VPGL is made by examining both clinical findings and radiographic studies. CT and angiography can reveal vascular displacements and arterial supply. MRI is considered the most important imaging modality, especially when lesions involve the skull base.[9] Characteristics on CT and/or MR include a hypervascular mass relative to major cervical vessels, no infiltration, anterior displacement of the carotid bifurcation, and posterior displacement of the internal jugular vein.[12] Doppler ultrasound lacks sufficient sensitivity for a diagnostic work-up, but can be helpful for defining the tumour's vascularity and location.[2,7]

Catecholamine-secreting paragangliomas can be detected based on urinary fractionated metanephrines or catecholamines, or less commonly by high-performance liquid-phase chromatography measurements of plasma-free metanephrines. It is important to determine whether the tumour secretes catecholamines to ensure adequate preoperative and intraoperative hypertension management.[4,10]

Surgical resection is the sole curative treatment for paragangliomas. Surgery generally requires sacrificing the vagus nerve, and is associated with other nervous lesions. The use of preoperative embolization is controversial due to the risk of ICA thrombosis; however, it may facilitate resection by reducing clamping time and blood loss. Embolization is only recommended in selected cases with a tumour size of >5 cm, Shamblin's type III (CPGL), or significant cranial extension.[7,8] In our case, the VPGL had a size of 30 × 57 mm, and N X paresis was present. Although complete surgical excision is the only curative treatment, radiation therapy may be considered in patients for whom surgery is contraindicated.[2,8] Radiotherapy can effectively arrest tumour growth, but can lead to neurologic sequelae and rarely destroys the tumor.[10]

Advances in genetic screening, imaging, and surgery have significantly reduced perioperative mortality (<1%) and vascular morbidity (stroke, <1%). However, postoperative peripheral neurological morbidity (mainly involving the cranial nerves) is common, with an early deficit rate of up to 50% and persistent deficit rate of up to 25%. The most frequently involved nerves are N X, N IX, cervical sympathetic, N XII, and n. laryngeus superior. Only 17% of patients do not fully recover within 18 months.[2] Our presently reported case exhibited an early deficit comprising paralysis of N X, and paresis of N VII, N IX, and N XII. The paresis of N VII, N IX, and N XII recovered within 9 months. The paralysis persisted due to the sacrifice of N X during surgery.

N X lesions can produce palatal, pharyngeal, and laryngeal paralysis, as well as abnormalities of oesophageal motility, gastric acid secretion, gallbladder emptying, and heart rate, and other autonomic dysfunction. Palatal, pharyngeal, and laryngeal lesions can be diagnosed by inspection of the palatal arch. No elevation or constriction will be seen on the affected side, and the gag reflex will also be absent. Laryngoscopy will reveal unilateral vocal cord paralysis on the affected side. Such lesions will initially be treated by a speech therapist. Dysphagia is managed by careful feeding with assistance until normal adaptation occurs. Unilateral vocal cord paralysis is treated with intensive speech therapy and, if speech therapy is insufficient, vocal cord injection or thyroplasty can also be performed.[13,14]

Conclusion

Vagal paragangliomas are extremely rare. Although they present as a non-painful neck mass, they can lead to paralysis of some cranial nerves. Since they can potentially secrete catecholamines, preoperative testing and treatment is extremely important to reduce perioperative morbidity or mortality. An accurate diagnosis and good multidisciplinary preoperative and perioperative management are critical when approaching this pathology.

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Figures

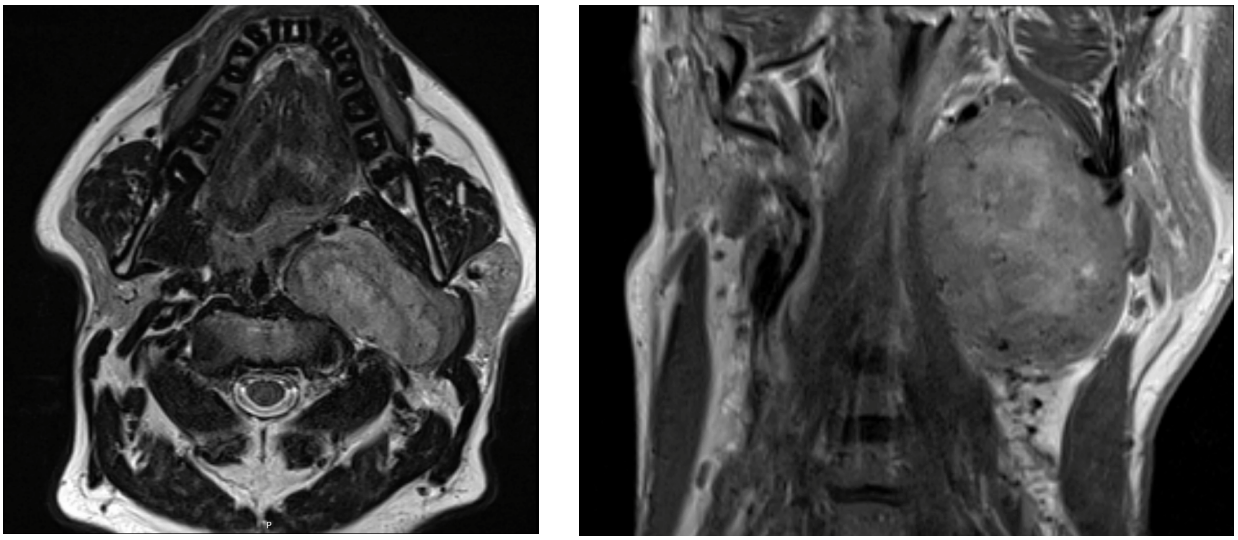

Fig 1: MRI images from the transversal (left) and sagittal (right) planes.