Paraganglioma of superior laryngeal nerve mimicking as carotid body tumor: A rare case report

Gyanendra S. Mittal[1*], Deepak Sundriyal[2], Mudit Agrawal[3]

[1-3]Consultant: [1]Santosh Deemed to be University, Ghaziabad, Uttar Pradesh, [2]All India Institute of Medical Sciences, Rishikesh, Uttarakhand, [3]Rajiv Gandhi Cancer Institute & Research Centre, Rohini, New Delhi, India

***Corresponding Author: Gyanendra S Mittal**
Email: g20mittal@gmail.com

Abstract

A paraganglioma is rare neuroendocrine neoplasms arise from chromaffin cells that may develop at various body sites (including the head, neck, thorax and abdomen). About 97% are benign and remaining 3% are malignant because they are able to produce distant metastases. Vagal paragangliomas represent <5% of all head and neck paragangliomas, and till date only 200 cases have been reported.[1]

We present a case of paraganglioma of superior laryngeal nerve, because of rarity of the disease and after careful search no case report as tumor arising from the superior laryngeal nerve is found in the literature. Patient underwent pre-opeative investigations like CT Angio, MRI, DOTA-NOC Scan and tumor markers, intra-operatively it had seen that tumor was arising from superior laryngeal branch of vagus nerve. Patient recovered well after surgery and developed post operative neurological complications like voice changes and aspiration to liquids. These complications were managed conservatively. Absence of neurological symptoms, local invasion, indolent histological features and absence of lymph node metastasis confirm the frequent benign behaviour of these neoplasms.

Keywords: Paraganglioma, Superior laryngeal nerve, Vagus paraganglioma, Carotid body tumor, Head and neck tumours.

Introduction

Paragangliomas are slow growing, usually benign and rare neoplasms arising from chromaffin cells of neural crest and paraganglionic tissue. They are distributed throughout the body along with autonomic nervous tissue. The paraganglia in the head and neck region are anatomically associated with the parasympathetic nervous system and are located in the vicinity of major arteries and nerves, whereas the adrenal medulla and other paraganglia below the head and neck are more closely associated with the sympathetic nervous system.[2]

Vagal paragangliomas are uncommon tumours of the parapharyngeal space. They are usually asymptomatic for many years and slow growing tumors. They can be present as cranial nerve palsy (in about 10% of cases) with paralysis of either hypoglossal, glossopharyngeal, recurrent laryngeal or spinal accessory nerve. They may therefore, be associated with pain, hoarseness, dysphagia, Horner syndrome, or dropping of shoulder.[3]

Surgery is the main treatment modality. Radiotherapy may be used in selective cases or in palliative setting. We present this case because of rarity of the case and we did all the investigations like CT Angio, MRI, DOTA-NOC scan and tumor markers, pre-operatively case was diagnosed as carotid body tumor but intra-operatively it was actually arising from superior laryngeal nerve a branch of vagus nerve. Patient recovered well after surgery. Post operative neurological complications require careful rehabilitation and long term follow-up.

Case Report

A 50 years old lady came with complaints of swelling in right side of neck for 3 years, with mild discomfort. She had no voice complaints. On examination she was hypertensive and had a ≈ 2 × 1.5 cm firm, non-tender, non-pulsatile mass lesion in the right carotid triangle with minimal mobility. MRI neck (Fig. 1) revealed heterogenous signal intensity space occupying lesion on T1 of size 2 x 1.6 cm showing intence enhancement with irregular margins near the right carotid triangle,

no neck nodes. CT carotid angiography (Fig. 2) showed a hypervascular mass between right internal and external carotid arteries causing splaying of carotid vessels, receiving its blood supply from internal carotid artery suggestive of carotid body tumor. 68Ga-DOTANOC scan suggested somatostatin receptor expressing tumor involving right parapharyngeal region. Her chromogranin-A was markedly elevated (490 ng/ml), her 24 hrs. urinary catecholamines (metanephrines and normetanephrines) were slightly elevated. Patient was admitted one week before surgery for adequate pre-operative prepration including α-sympathetic blockers (phenoxybenzamine) followed by β- blocker (propranolol) and hydration. With the preoperative diagnosis of carotid body tumor she was taken for surgery.

Intraoperatively (Fig. 3,4) there was a mass of ≈ 3 x 2 cm arising from right superior laryngeal nerve in parapharyngeal space between the internal and external carotid artery, which was successfully resected along with the part of the nerve as it was arising directly from the nerve. End to end anaestamosis of upper and lower end of superior laryngeal nerve was done.

HPE and immunohistochemistry markers report revealed paraganglioma of superior laryngeal nerve. Post operatively she developed some aspiration to liquids and voice changes. These complications were managed conservatively by multi-disciplinary team approach as careful teaching of supra-glottis swallowing maneuver to the patient and comprehensive speech therapy. In post-operative follow up, she had normal chromogranin A levels and recovered her voice upto a satisfactory level. Some degree of aspiration of liquids was still present but patient had learned to manage it.

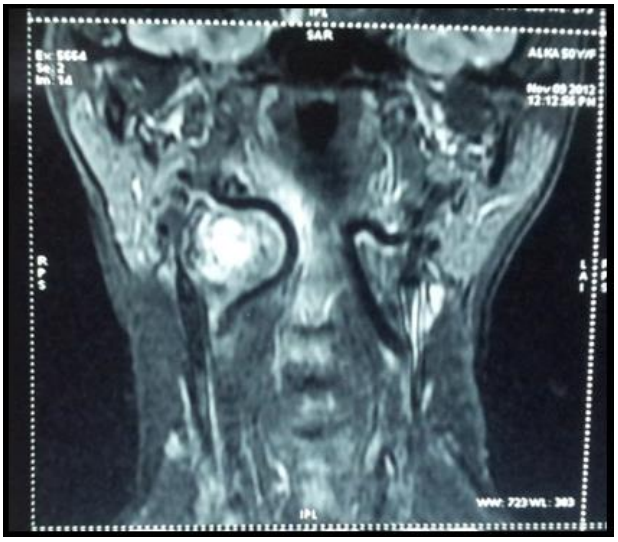

Fig.1: (MRI neck showed a hypervascular mass)

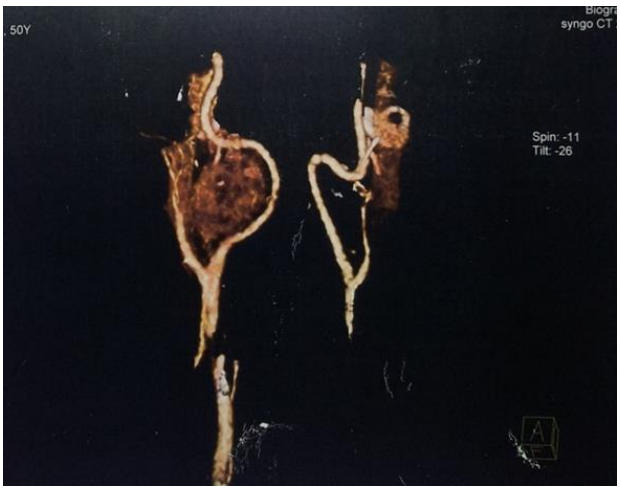

Fig. 2: (CT carotid angiography)

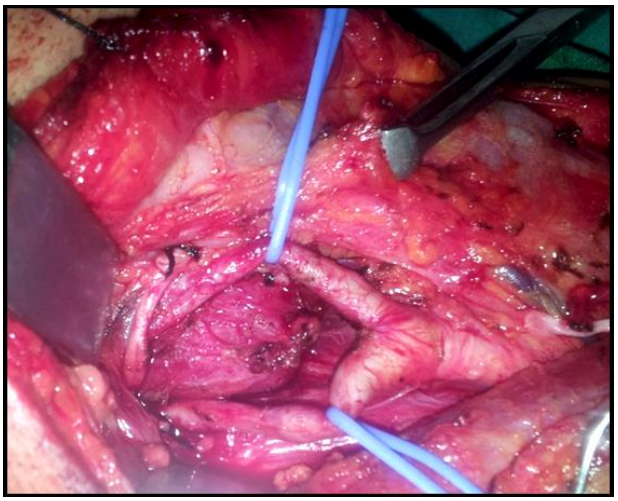

Fig. 3: (Mass between the internal and external carotids)

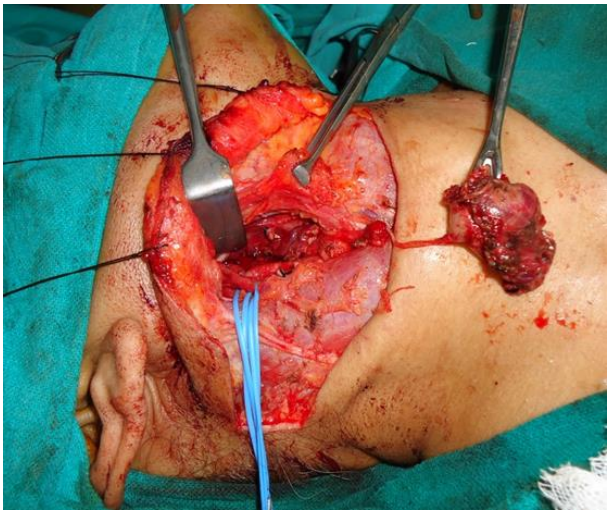

Fig. 4: (Mass lesion attached to superior laryngeal nerve)

Discussion

A paraganglioma is rare neuroendocrine neoplasm that may develop at various body sites (including the head, neck, thorax and abdomen). About 97% are benign and remaining 3% are malignant because they are able to produce distant metastases.[4,5]

"Paraganglioma" is now the most-widely accepted term for these lesions, as previously they have also been described as: glomus tumor, chemodectoma, perithelioma, fibroangioma, and sympathetic nevi.

In 2004 WHO divided these tumors into adrenal (pheochromocytomas- chromaffin positive) or extra-adrenal (paragangliomas- chromaffin negative).[6] Paragangliomas originate from paraganglia in chromaffin-negative glomus cells derived from the embryonic neural crest, functioning as part of the autonomic nervous system. These cells normally act as special chemoreceptors located along blood vessels, particularly in the carotid bodies (at the bifurcation of the common carotid artery in the neck) and in aortic bodies (near the aortic arch).

About 75% of paragangliomas are sporadic; the remaining 25% are hereditary (and have an increased likelihood of being multiple and of developing at an earlier age). Mutations of the genes for the succinate dehydrogenase, SDHD (previously known as PGL1), SDHA, SDHC (previously PGL3) and SDHB have been identified as causing familial head and neck paragangliomas.[7] Mutations of SDHB play an important role in familial adrenal pheochromocytoma and extra-adrenal paraganglioma (of abdomen and thorax), although there is considerable overlap in the types of tumors associated with SDHB and SDHD gene mutations. Paragangliomas may also occur in MEN type 2A and 2B.[8] They are seen in at a higher incidence in people living at high altitude. Other genes related to familiar paraganglioma are SDHAF2, VHL, NF1, TMEM127 and MAX.

The paragangliomas appear grossly as sharply circumscribed polypoid masses and they have a firm to rubbery consistency. They are highly vascular tumors and may have a deep red color. On microscopic inspection, the tumor cells are readily recognized. Individual tumor cells are polygonal to oval and are arranged in distinctive cell balls, called Zellballen.[9] These cell balls are separated by fibrovascular stroma and surrounded by sustentacular cells. With immunohistochemistry, the chief cells located in the cell balls are positive for chromogranin, synaptophysin, neuron specific enolase, serotonin, neurofilament and neural cell adhesion molecule; they are S-100 protein negative. The sustentacular cells are S-100 positive and focally positive for glial fibrillary acidic protein.[10,11]

Paragangliomas are described by their site of origin and are often given special names:

Carotid paraganglioma (also known as a chemodectoma or carotid body tumor is a highly vascular glomus tumour that arises from the paraganglion cells of the carotid body, located at the carotid bifurcation with characteristic splaying of the ICA and ECA), Glomus tympanicum, Glomus jugulare, Vagal paraganglioma (they account for only 3% of all head and neck paragangliomas and are the third in prevalence after carotid and jugular localization, as opposed to carotid body tumours, vagal paragangliomas are located more cephalad in the neck, between the jugular vein and the internal carotid artery, sometimes extending to the base of the skull through the jugular foramen or posteriorly to the mastoid tip) and Pulmonary paraganglioma. Other rare sites of involvement are the larynx, nasal cavity, paranasal sinuses, thyroid gland, and the thoracic inlet, as well as the bladder in extremely rare cases.

Radiologically carotid body tumours are located at the carotid bifurcation with characteristic splaying of the ICA and ECA, described as the "Lyre sign". In all modalities the dense vascularity of these tumours is manifested as prominent contrast enhancement. Contrast enhanced CT is excellent at depicting these lesions. Typical appearance is soft tissue density on non-contrast CT (similar to muscle) and bright and rapid (faster than schwannoma) enhancement after giving contrast and splaying of the ICA and ECA. On MRI, T1 iso to hypointense compared to muscle, salt and pepper appearance when large tumor is there, representing a combination of punctate regions of haemorrhage or slow flow (salt) and flow voids (pepper) and intense enhancement following gadolinium. On T2 lesion is hyper intense compared to muscle. On DSA / angiography the splaying of the carotid vessels "Lyre sign" is again identified with an intense blush in tumour with and 'early vein' seen due to arteriovenous shunting. The ascending pharyngeal artery is the main contributing supply. Scintigraphy, although not specific, shows uptake with metaiodobenzylguanidine (MIBG) and octreotide scintigraphy[12] and can be useful for assessing multiple lesions.

The elevation of plasma metanephrines of more than 4-fold above the upper reference limit is associated with close to 100% probability of the tumor.[13] Therefore, current recommendations are that initial testing for paraganglioma must include measurements of fractionated metanephrines in plasma, urine, or both, as available.[14]

Surgical excision is the treatment of choice for these tumors. The larger the tumour the higher the risk of operative complications. Surgery usually requires sacrificing the vagus nerve or its branches, as tumors arises from the nerve itself and is associated with sequelae of the nervous lesions. Therefore vagal, hypoglossal and glossopharyngeal paralysis are common postoperative complications about 10 to 40%.[15,16]

Therapeutic embolization reduces the size of the tumour and limits intra-operative blood loss but may rarely be considered as definitive treatment. Radiation therapy is an alternative to surgery and may be effective in arresting the growth, but it can also lead to neurologic complications and rarely can destroy the tumour comlpetely.[17] Irradiation is generally used in elderly patients as well as in large and unresectable tumours. Radiotherapy can also be indicated after controlateral surgery in order to avoid bilateral vagus nerve damage.

We present this case because of the rarity of the disease and after best available investigations like CT Angio, MRI, DOTA-NOC Scan and tumor markers, pre-operatively case was diagnosed as carotid body tumor but intra-operatively it was actually arising from superior laryngeal nerve a branch of vagus nerve. After proper pre-operative optimization patient was taken up for surgery and was recovered well. Post operative neurological complications were managed conservatively.

In conclusion, paraganglioma of neck are rare tumors. Careful history, clinical suspicion and proper investigations required to diagnose it. Contrast MRI or CT scan and CT angiography are reliable investigations to diagnose these lesions. Radiological findings of a more cranial and lateral lesion, with respect to the carotid bifurcation, and the non-enlargement of the bifurcation angle, can differentiate vagal tumour from more frequent carotid paraganglioma. DOTA-NOC scan and tumor markers should be done preoperatively and used to follow-up the patients for recurrence. Complete tumour removal without sparing of the nerve is rarely possible, long term post-operative rehabilitation of cranial nerve deficits by multi-disciplinary taem approach (as learning of different swallowing maneuver, speech therapy, shoulder physiotherapy etc.) should be considered as an integral part of the management.

Source of Funding
None.

Conflict of Interest
None.

References

1. Netterville JL, Jackson CG, Miller FR, Wanamaker JR, Glasscock ME. Vagal paraganglioma: a review of 46 patients treated during a 20-year period. *Arch Otolaryngol Head Neck Surg* 1998;124:1133-40.

2. Baysel BE. Hereditary paraganglioma targets diverse paraganglia. *J Med Genet* 2002;39:617–622.
3. Urquhart AC, Johnson JT, Myers EN, Schecther GL. Glomus vagale: paraganglioma of the vagus nerve. *Laryngoscope* 1994;104:440-5.
4. Urquhart AC, Johnson JT, Myers EN, Schecther GL. Glomus vagale: paraganglioma of the vagus nerve. *Laryngoscope* 1994;104:440-5.
5. Myers EN, Johnson JT, Curtin HD. Tumours of the parapharyngeal space. In: Myers EN, Suen JY, editors. Cancer of the head and neck. 3rd edn. Philadelphia, PA: Saunders; 1966:562-85.
6. Lenders JW, Eisenhofer G, Mannelli M, Pacak K. Phaeochromocytoma. *Lancet* 2005;366(9486):665-75.
7. Offergeld C, Brase C, Yaremchuk S, Mader I, Rischke HC, Gläsker S, et al. Head and neck paragangliomas: clinical and molecular genetic classification. *Clin* (*Sao Paulo*) 2012;67(1):19-28.
8. Kennedy DW, Nager GT. Glomus tumor and multiple endocrine neoplasia. *Otolaryngol Head Neck Surg* 1986;94:644-8.
9. Kairi-Vassilatou E, Argeitis J, Nika H, Grapsa D, Smyrniotis V, Kondi-Pafiti A (). "Malignant paraganglioma of the urinary bladder in a 44-year-old female: clinicopathological and immunohistochemical study of a rare entity and literature review". *Eur J Gynaecological Oncol* 2007;28(2):149-51. PMID 17479683.
10. Othman N.H, Ezzat S, Kovacs K, Horvath E, Poulin E, Smyth H.S et al, Growth hormone-releasing hormone (GHRH) and GHRH receptor (GHRH-R) isoform expression in ectopic acromegaly. *Clin Endocrinol* 2001;55:135-40.
11. Gosney J.R., Denley H., Resl M. Sustentacular cells in pulmonary neuroendocrine tumours. *Histopathology* 1999;34:211–5.
12. Bustillo A, Telischi FF. Octreotide scintigraphy in the detection of recurrent paragangliomas. *Otolaryngol Head Neck Surg* 2004;130:479-82.
13. Eisenhofer G, Goldstein DS, Walther MM. Biochemical diagnosis of pheochromocytoma: how to distinguish true- from false-positive test results. *J Clin Endocrinol Metab* 2003;88(6):2656–66.
14. Grossman A, Pacak K, Sawka A. Biochemical diagnosis and localization of pheochromocytoma: can we reach a consensus? *Ann N Y Acad Sci* 2006;1073:332–47.
15. Thabet M H, Kotob H. Cervical paragangliomas: diagnosis, management and complications. *J Laryngol Otol* 2001;115:467-74.
16. Köhler H F, Carvalho A L, Mattos Granja N V, Nishinari K, Kowalski L P. Surgical treatment of paragangliomas of the carotid bifurcation: results of 36 patients. *Head Neck* 2004;26:1058-1063.
17. Hawthorne MR, Makek MS, Harris JP, Fisch U. The histopathologic and clinical features of irradiated and nonirradiated temporal paragangliomas. *Laryngoscaope* 1988;98:325-31.

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