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CASE REPORT

Carotid Body Tumor Diagnosed by On-Site FNA: a Case Report

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Abstract

Carotid body tumors (CBTs) are paragangliomas which arise from the chief cells of the carotid body, usually located at the bifurcation of the common carotid artery. A 45-year-old male presented with swelling over the right cervical region for 1 year. Based on location, FNA and radiologic investigations, the diagnosis of CBT was made; later, confirmed on histopathology. Although FNA is seldom suggested due to its location and possibility of severe bleeding complications for the diagnosis of CBT, it can however be detected incidentally. Our case, the diagnosis was incidental cytological diagnosis on rapid onsite staining.

Keywords Carotid body tumor · Paraganglioma · Toluidine blue · Rapid on-site evaluation · Cytology

Background

Carotid body tumors (CBTs) are rare benign slow-growing neoplasms also called as paragangliomas. These tumors arise from the carotid bodies located in the adventitia at the posteromedial aspect of carotid bifurcation. These carotid bodies are chemoreceptors which help in modulating cardiovascular and respiratory functions in response to fluctuations in arterial pH, CO_2, and O_2 tension. Tumors of the carotid body were historically treated by excision [1]. CBTs are the most common paragangliomas of the head and neck region.

Fine needle aspiration cytology (FNAC) is a valuable diagnostic procedure in the diagnosis of all head and neck lesions including CBTs [2]. FNA diagnosis of paragangliomas had been documented in the literature. Although FNAC of suspected paraganglioma is contraindicated in view of the possible hypertensive crisis after FNA, this tumor can be an unexpected finding in FNA of a neck mass [3].

Case Presentation

A 45-year-old male presented with swelling over the right cervical region for 1 year. On examination, the swelling was soft to firm, non-tender and gradually increasing in size, measuring 3 × 3 cm on right cervical level IIa. (Fig. 1a) He had no history of fever, dyspnea, hoarseness of voice, and difficulty in deglutition. Oral cavity was normal with four-finger entry. Ultrasonography of neck revealed a 2.8 × 3 cm heterogeneous mass of predominantly hypoechoic lesion noted at the junction of bifurcation of the right common carotid artery which is seen displacing the internal carotid and external carotid artery with increased vascularity. No calcification was noted. No evidence of cervical lymphadenoapthy was noted (Fig. 1b).

FNAC was done with 23 G needle. Rapid on-site evaluation was done using toluidine blue stain followed by routine PAP and Giemsa stain. Cytosmears revealed scattered clusters of round to oval cells showing moderate anisonucleosis in a hemorrhagic background. Occasional spindle cells with fibro-collageneous stromal fragments were also seen among the clusters of cells. A focal acinar pattern was also noted (Fig. 2a–c). Based on the findings, a diagnosis of CBT/paraganglioma was made. Histology followed by IHC with synaptophysin of the excised mass received confirmed the cytodiagnosis.

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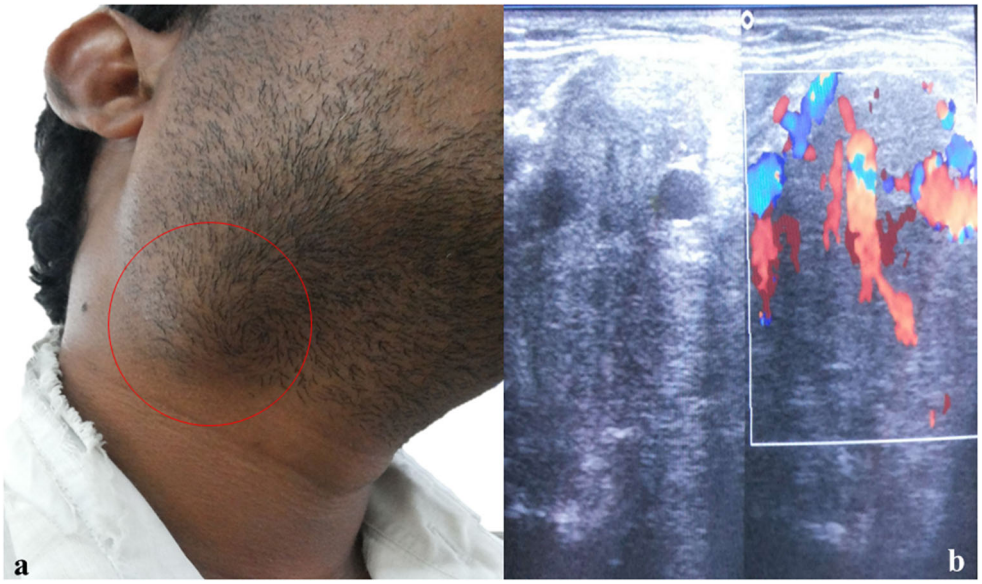

Fig. 1 **a** Swelling in the right cervical region anterior to the sternocleidomastoid muscle, measuring 3 × 3 cm. b Ultrasonography showed a 2.8 × 3 cm heterogeneous hypoechoic lesion noted at the junction of bifurcation of the right common carotid artery, seen displacing the internal carotid and external carotid artery

Discussion

Paragangliomas are tumors arising from the paraganglion cells of the parasympathetic system first reported in 1935 [4]. Paragangliomas of the head and neck region commonly include carotid body tumor/paraganglioma followed by jugulotympanic paraganglioma, vagal paraganglioma, laryngeal paraganglioma, and aorticopulmonary paragangliomas [5]. Multiple paragangliomas may occur in 2–10% cases. These are rare tumors with slow evolution, posing diagnostic/therapeutic problems and are more frequent in familial forms. They may exhibit patterns of inheritance that predispose their occurrence in families, often with multicentricity [6].

CBTs constitute the most common extra-adrenal paragangliomas. They are located at the bifurcation of the common carotid artery and become closely adherent to it [3]. CBTs typically appear as a slowly growing, painless mass near the angle of the mandible. In some patients, there may be signs and symptoms of cranial nerve palsy, such as dysphasia

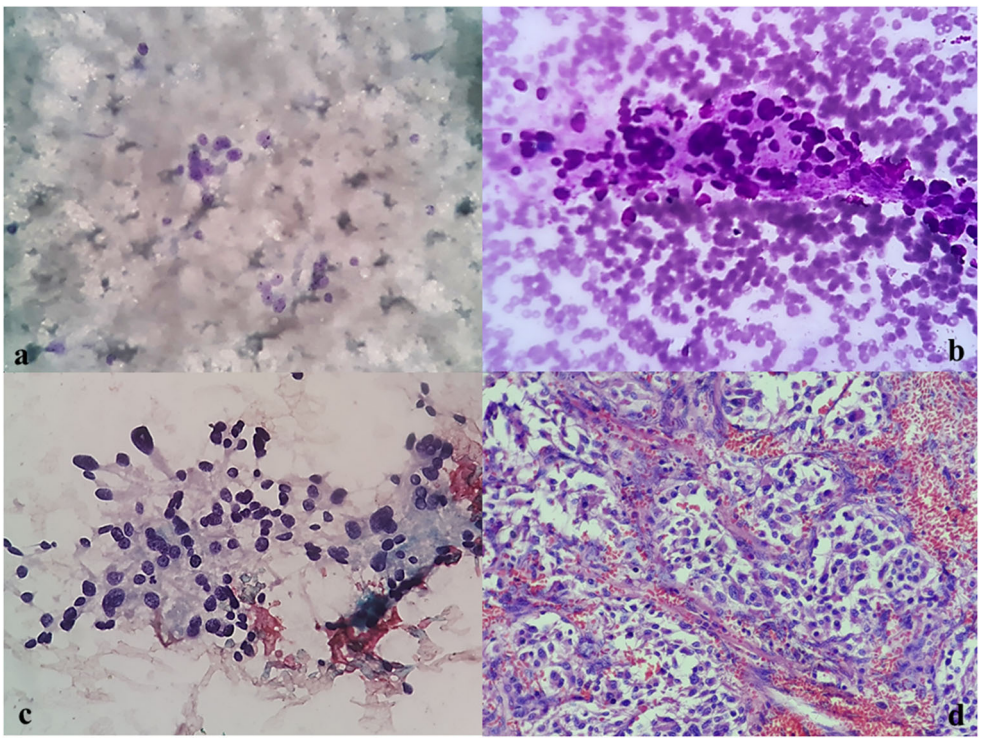

Fig. 2 **a**, **b**, **c** Cytosmears are hemorrhagic with scattered clusters of round to oval cells, moderate anisokaryosis seen. Occasional fibrous strands with spindle cells were seen among the clusters of cells. Focal small acinar pattern was also noted (Toluidine blue × 40, Giemsa × 40, PAP × 40). **d** Histology showed neoplastic cells in classic Zellballen pattern with few cell nests showing anisokaryosis. (H&E, × 40).

or dysphonia. They may be functional, with signs and symptoms of excess catecholamine secretion [7].

For any neck swelling, FNAC is often considered the preliminary diagnostic modality before any other diagnostic workup is carried out [8]. The swellings in the anterior neck/cervical region are most commonly thought to be due to lymphadenopathy, which can either be reactive change/granulomatous lymphadenitis/metastasis from carcinomas in head and neck. The other possibility can be due to salivary gland lesions, schwannomas, or thyroid lesions in addition to CBT [5].

In clinically suspected cases of CBT, doing a FNA is controversial, owing to the risk of hemorrhage during the procedure, because of its location at the bifurcation of the common carotid artery and close adherence to it along with highly vascular nature of the tumor. Also, the aspiration of CBT may be dangerous, who may react with syncope caused by a sudden increase in blood pressure, resulting from secretion of norepinephrine [5, 9].

Cytologic features of CBT and extra-adrenal paraganglioma have been well documented. The smears usually contain blood and tumor cells, which are either isolated or loosely arranged in groups forming rosettes. The cells are often large, polygonal, ovoid or elongated. There is abundant cytoplasm granular/dense, which appears eosinophilic on H&E and pale on PAP stain. Red cytoplasmic granules are seen in Giemsa stain [5]. The nuclei are centrally or eccentrically located and show considerable variation in size and shape. Rare intra-nuclear cytoplasmic inclusions are seen [10]. Pleomorphic nuclei, prominent nucleoli, clumped chromatin, intra-nuclear inclusions, and granular cytoplasm may cause misdiagnosis of malignancy. There are no reliable morphologic criteria by which to separate the benign from the malignant forms [2].

The main differential diagnosis is a thyroid neoplasm. The follicular arrangement of the tumor cells may suggest a follicular carcinoma, but in follicular carcinoma, the cells are more closely packed and the nuclei are of more uniform size. Fine red cytoplasmic granulation, anisokaryosis, and presence of spindle cells are reminiscent of medullary carcinoma, while intra-nuclear vacuoles, which are common in papillary carcinoma of thyroid, may be found in paraganglioma. Other differentials may include schwannomas. However, cells in schwannoma are more spindled, with sharply pointed ends, show nuclear palisading, and have a collagenous background. Even the distinction from melanoma and metastatic carcinoma is difficult on purely cytomorphologic grounds [2, 11, 12].

The diagnosis of CBT is based on cytology, clinical, and radiologic findings. The location of the mass in the lateral neck with prolonged history, hemorrhagic fine needle aspirate, and cytologic features resembling an endocrine neoplasm help in arriving at a suggestive diagnosis of paraganglioma [5, 12].

Most paragangliomas follow a benign clinical course. The reported risk of malignancy is 10% [6]. Early detection on FNA, clinical and radiologic investigations will help in the prevention of any complication that might arise during or after surgical procedure, thus reducing the risk of mortality and morbidity [3].

Conclusion

Our case presentation of CBT is unique in the sense that it was initially diagnosed by on-site evaluation of FNA followed by radiologic and histopathologic confirmation. The patient did not have any side effect after FNA thus adding to existing literature on cytologic diagnosis and its accuracy and safety.

Authors' Contributions NP carried out concepts and design, literature search, and participated in clinical study. TS carried out data acquisition, data analysis and manuscript preparation and will also stand as guarantor. MP carried out concepts and design, and literature search. All the authors have read and approved the final manuscript.

Availability of Data and Materials All the data regarding the findings are available within the manuscript.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Consent for Publication Consent for publication for this case study and any additional related information was taken from the patient involved in the study.

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