Case Report

A Case of Large Carotid Body Tumor: Surgical Challenge

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Abstract

Carotid body tumors (CBTs) are rare benign tumors, but they do have a chance of turning into malignant tumors. Hence, the earliest mode of treatment is surgical resection. The high vascularity of the tumors poses a surgical and anesthetic challenge. Hereby, we present a successfully resected case of large CBT measuring 7 cm × 6 cm. In contrast-computed tomography angiogram of the neck, the hyperdense mass was noted in the left carotid space splaying the left internal carotid artery and external carotid artery. Conventional general anesthesia with controlled ventilation technique was used in the resection of this tumor. The final histopathology report was paraganglioma. She had an uneventful perioperative period and was doing well after 18 months of follow-up.

Key Words: Carotid body tumor, paraganglioma, surgery

Introduction

Carotid body tumors (CBTs) or chemodectomas are rare, nonchromaffin paraganglioma. Their reported incidence is 1–2 per 100,000. They take origin from chemoreceptor cells at the carotid artery bifurcation. The carotid body has autonomic control over the respiratory and cardiovascular systems. Paraganglionic cells constitute carotid body sense pH, pO₂, and pCO₂ changes in the blood. von Haller first described carotid body in the year 1743. CBTs are painless, slow-growing and can invade or exert pressure on adjacent neurovascular structures. These tumors can present at any age and are seen in both genders with equal frequency. These tumor are benign and have a tendency to turn into malignant tumors. Therefore, surgical excision is the earliest treatment of choice to avoid the local spread and metastasis. Surgical resection remains a challenge as these neoplasms are highly vascular.

Case Report

A 49-year-old woman presented with a swelling at the left side of neck of 1-year duration and pain for 1 week. There was no history of fever, loss of weight, or loss of appetite. She did not give any history of hypertension, tuberculosis, or diabetes. General physical examination showed no lymphadenopathy. On examination of the neck, a swelling of 7 cm × 6 cm was present on the left upper part. It was soft in consistency, nonpulsatile, mobile horizontally, but mobility was restricted in vertical direction (Fontaine sign) with a bruit on auscultation.

Ultrasonography of the neck showed a heterogeneous lesion with numerous vascular channels in the left paratracheal region with splaying of internal carotid artery (ICA) and external carotid artery (ECA); furthermore, the left internal jugular vein (IJV) was compressed. There were no enlarged cervical lymph nodes. Contrast-computed tomography angiogram of the neck showed intense hyperdense mass lesion measuring 8.3 cm × 5.6 cm in the left carotid space splaying the left ICA and ECA. A few enhancing areas suggestive of necrosis were noted within the mass. The lesion was supplied by ECA and its branches while the venous drainage of the lesion was into left IJV. Right carotid arteries were normal. Impression given was left CBT.

Conventional general anesthesia with controlled ventilation technique was administered. Intraoperative-induced hypotension was achieved with infusion of nitroglycerine 0.5 mcg/kg/min and clonidine 1 mcg/kg/h and adjusted to maintain the mean arterial blood pressure 80–90 mmHg and pulse rate 70–80 beats/min. Modified Schobinger incision...
Given on the left side of neck and subplatysmal skin flaps raised. Firm irregular mass of size 8 cm × 6 cm was seen extending from 2 cm below carotid bifurcation up to the angle of mandible. It was encasing common carotid artery and proximal parts of both ICA and ECA. IJV was displaced laterally and was adherent to the mass. Left sternomastoid muscle was divided in the middle to get a better access to the tumor. The mass was separated from IJV using sharp dissection. Furthermore, it was dissected off from carotid arteries using sharp and blunt dissection and was excised in toto [Figure 3a and b]. At the time of tumor dissection, there was an episode of bradycardia that was treated with intravenous administration of 0.6 mg atropine.

Rest of the perioperative period was uneventful. The patient was kept under observation in the intensive care unit, and low molecular weight heparin was continued for 3 days. She was discharged on the sixth postoperative day. Her histopathology report was paraganglioma. It showed the characteristic organoid or Zellballen pattern with increased vascularity [Figure 4]. She was closely observed and is currently asymptomatic without local recurrence after a follow-up period of 18 months.

Discussion

CBTs are rare, slow-growing, painless, and benign tumors. However, complete surgical resection is recommended because of the tendency to turn into malignant tumors. The different modality of investigation for diagnosis of CBT is ultrasound, computed tomography (CT), or magnetic resonance imaging. However, the gold standard for diagnosis is digital subtraction angiography.

In our patient, initially, ultrasonogram was done as a routine investigation which gave the important clue about CBT. CT of the neck done in our case with contrast and angiogram clearly demonstrated the vascular nature of the tumor and feeding vessels which was from the ECA. Venous drainage of the lesion was into left IJV.

Some of the tumors such as medullary thyroid carcinoma and neuroendocrine carcinoma, middle ear adenoma, meningioma, and schwannoma are considered in the differential diagnosis of CBT.

In 1971, Shamblin et al. introduced a classification system to determine the resectability of CBT based on the proportion of carotid encirclement. Type I tumor had no

![Figure 1: (a) Preoperative photograph of carotid body tumor. (b) Postoperative photograph of neck after tumor removal](image1)

![Figure 2: (a) Axial computed tomography image showing mass lesion in the left carotid space pushing the left internal carotid artery and external carotid artery medially, with enhancing areas within, suggestive of necrosis. (b) Contrast-computed tomography carotid angiogram showing intensely hyperdense mass lesion noted in the left carotid space splaying the left internal carotid artery and external carotid artery. The lesion is supplied by external carotid artery and its branches. Venous drainage of the lesion is into left internal jugular vein](image2)

![Figure 3: (a) Intraoperative photograph of neck showing the tumor. (b) Intraoperative photograph of the neck showing the external and internal carotid arteries after total excision of tumor](image3)

![Figure 4: Histopathology revealing characteristic Zellballen pattern of paraganglioma (H and E, ×100)](image4)
encirclement; Type II had partial encirclement and were therefore more difficult to resect; Type III were associated with total encirclement and were the most dangerous type to attempt resection.[10] As these tumors grow, even benign CBT require resection to prevent compression of the carotid and surrounding structure.[7]

There has been controversy concerning the usefulness of preoperative embolization. According to some authors, a routine preoperative embolization can reduce blood flow and decrease tumor size, thereby facilitating and simplifying tumor excision with less blood loss, particularly in larger tumors (Shamblin Type II and III) but does not decrease rates of cranial nerve injury. Most of the cranial nerve injuries are transient.[8-10] Sen et al. observed higher rate of neurological complications with tumors of higher Shamblin groups. They also opined that preoperative embolization was not effective in reducing neurological complications.[11] We have operated this patient without embolization. Due to intraoperative hypotension (mean arterial blood pressure 80–90 mmHg) and pulse rate 70–80 beats/min and mild hypothermia (body temperature 34–35°C), tumor dissection was facilitated.

Careful neurological examination may reveal deficits of cranial nerves VII, IX, X, XI, or XII as cranial nerve involvement has been estimated as 20%.[8] This may cause symptoms such as dysphagia, odynophagia, and hoarseness because of the anatomical neighborhood mainly the vagus (X) and hypoglossal (XII) nerves and the carotid vessels.[12] Hypoglossal nerve and vagus nerve appeared to be most vulnerable due to handling during surgery. In our case, we had to dissect the tumor off carotid vessels, preserving the cranial nerves.

Biopsy is contraindicated in such patients for diagnostic method because of its vascular nature.[12] Surgery remains the primary treatment modality. Radiotherapy is indicated for very large size and recurrent tumors. It is also indicated for malignant transformation with metastasis to the regional lymph nodes.[13]

This case is reported because of its large size, highlighting difficulty in surgical and anesthetic management. However, despite the difficulties faced, the patient had a good outcome and was currently doing well.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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