

The importance of preoperative embolization for the treatment of the carotid body tumor: case report and review of the literature

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ABSTRACT

Carotid body tumors are rare neoplasms originating from the small chemo- and baroreceptors located in the adventitia of the common carotid artery bifurcation. They are a disease of great interest for vascular surgeons, given that they grow adhered to the adventitia of vessels comprising this bifurcation. For that, their surgery requires not only anatomical knowledge of the region, but also perfect familiarization with vascular repair techniques. Carotid body tumors are a particular problem as to their management, due to rich vascularization and intimacy with important structures of the cervical region, such as nerves and large vessels. We report on a male patient with carotid body tumor adhered to the right carotid artery, diagnosed by puncture biopsy and treated at two different time periods: first by endovascular treatment, with percutaneous embolization of the tumor; and later by surgical resection, which represents the combined treatment suggested in the current literature.

Keywords: Carotid body tumor, paraganglioma, chemodectoma.

RESUMO

Os tumores do corpo carotídeo são neoplasias raras, que se originam dos pequenos órgãos quimio e barorreceptores localizados na adventícia da bifurcação da artéria carótida comum. Constituem-se uma doença de grande interesse para o cirurgião vascular, na medida em que crescem aderidos à adventícia dos vasos que compõem essa bifurcação. Por isso, sua cirurgia requer não só o conhecimento anatômico da região, mas também perfeito reconhecimento das técnicas de reconstrução vascular. Representam um problema especial quanto a seu manejo, devido à sua rica vascularização e intimidade com estruturas nobres da região cervical, como nervos e grandes vasos. Neste caso, apresentamos um homem com um tumor de corpo carotídeo aderido à carótida

direita, diagnosticado por punção biópsia e tratado em dois tempos, sendo o primeiro por tratamento endovascular, realizando embolização percutânea do tumor, e, no segundo, a ressecção cirúrgica do mesmo, o que evidencia o tratamento combinado, segundo atual literatura.

Palavras-chave: Tumor do corpo carotídeo, paraganglioma, quimiodectoma.

Introduction

Carotid body tumor is also known as chemodectoma or paraganglioma. It is derived from neural crest cells, and has the same histological characteristics of a normal tissue. It is located in the posterolateral region of the carotid bifurcation.¹

The carotid body has both a baroreceptor and chemoreceptor function. A similar tissue is found in the jugular bulb, middle ear, ganglion nodosum of the vagal nerve, adventitia of the ascending aorta, abdominal aorta, and pulmonary surface.¹

The main complaint is usually presence of consistent, uncompressible and painless cervical mass below the mandible angle. Some classical signs can be observed on physical examination, such as the finding of a firm tumor on palpation, located between the internal and external carotid arteries (Kocher's sign I); unfixed tumor in the horizontal and fixed in the vertical (Fontaine's sign); and tumor located in the tonsillar region (Kocher's sign II).¹

The most common differential diagnosis is with increased lymphatic nodules, brachial cyst, mixed tumors, and carotid artery aneurysm.² Such range of differential diagnoses makes this a rich clinical case.

Case report

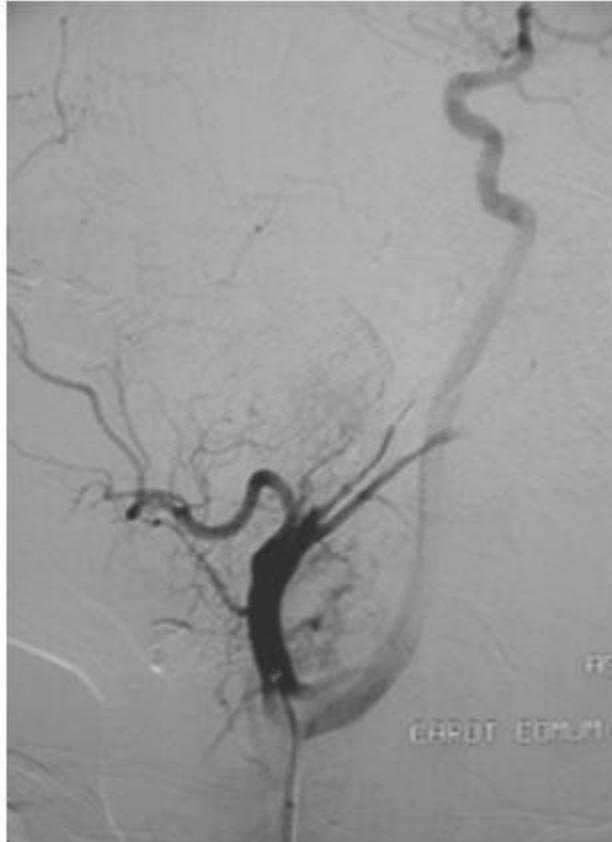
A 44-year-old male patient, Caucasian, born and resident in Vitória de Santo Antão, Brazil, driver had complaint of painless tumor in the right cervical regions for 2 years. He was referred to the vascular surgery outpatient clinic with a histopathologic result of puncture biopsy compatible with carotid body paraganglioma.

On physical examination, he was in good general and nutritional status, aware, ruddy, febrile, with no palpable adenomegalies and no alterations in cardiovascular, respiratory, digestive and nervous exams. On cervical palpation to the right, a rounded mass of approximately 3 x 3 cm, pulsatile, unfixed in the laterolateral direction and fixed in the longitudinal direction, painless, with no flogistic or fluctuation signs was detected.

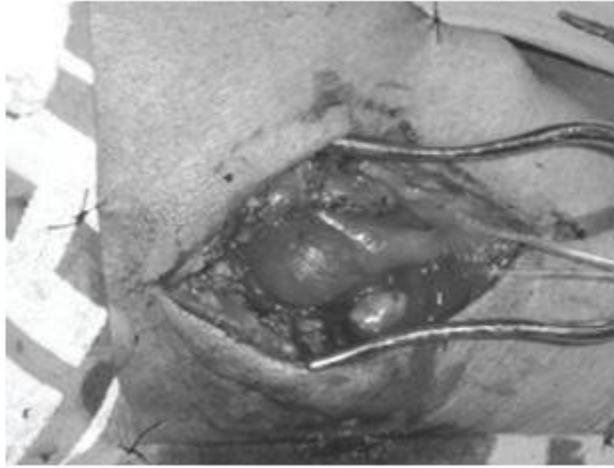
The patient already had an arteriography compatible with the diagnosis of carotid body tumor. After a clinical meeting at the Vascular Surgery Service of Hospital da Restauração, choice was to perform preoperative percutaneous embolization of the tumor to reduce its size and revascularization, facilitating its resection and reducing intraoperative bleeding.

During the embolization procedure, microcatheterization of the ascending pharyngeal artery was performed, which is responsible for feeding the middle and upper portion of the tumor; it was

embolized using polyvinyl alcohol particles (PVA). Such particles favor embolization in the blood supply to hypervascular tumors and arteriovenous malformations. The PVA measured 150 μ and were compatible with vessel caliber. Middle and lower thirds were fed by multiple thin branches originating from the occipital artery and from the external carotid artery. Because it is impossible to perform a microcatheterization of each branch, temporary occlusion of the occipital artery and external carotid artery was performed using Gelfoam,[®] which is a hemostatic gelatin sponge, followed by embolization of the external carotid artery origin with particles. Final angiographic control showed complete devascularization of the middle and upper third, with discrete capture of contrast in the lower third ([Figure 1](#)).



Thirty-six hours after embolization, the patient was submitted to tumor excision in a procedure that lasted approximately 2 hours, in which the incision is performed along the medial sheath of the sternocleidomastoid muscle for access to the common carotid artery and bifurcation. The hypoglossal and vagal nerves were also isolated after isolation of the common carotid artery and its external and internal branches, a procedure that occurred uneventfully ([Figure 2](#)).



The surgical specimen was sent to the pathologic anatomy of the hospital, whose report was given as paraganglioma ([Figure 3](#)).



The patient had no motor or sensory deficit in the postoperative period. He was discharged on the sixth day with no complaints.

Thirty days later, the patient returned to the vascular surgery outpatient clinic with complaint of mild numbness around the surgical wound. He is currently under outpatient follow-up by the Vascular Surgery Service of the hospital.

Discussion

The first description of the carotid body was performed by Von Haller in 1743. In 1880, Reigner performed the first surgery for tumors in this region, resecting the tumor along with internal and external carotid arteries (the patient died). Maydl successfully removed a glomus tumor from the carotid body, but the patient was aphasic and hemiplegic. Schudder was the first to remove one of these tumors and preserve the external and internal carotid arteries.²

Carotid glomus tumors are the most frequent among paragangliomas; according to Prache et al.,

its incidence is 1:1,170,000. They are benign tumors, which are developed in the vessel adventitia, in the common carotid artery bifurcation, in posteromedial location. They are richly vascularized and receive innervation of the ninth cranial nerve. The lesion is bilateral in about 5% of cases, and may reach 32% if it has family origin (dominant autosomal).²

Attention should be given to differential diagnoses of masses in the neck region. Singh et al. described a case of pulsatile mass in the neck in which clinical examination and tomography suggested diagnosis of carotid body tumor. During the surgical procedure, the carotid artery was resected and reconstructed. Histopathologic analysis recognized it as a vagal paraganglioma.³

Ultrasonography is a useful diagnostic modality in differential diagnosis of cervical tumors, and can be associated with the color mode to determine its association with the carotid bifurcation. Computed tomography and nuclear magnetic resonance confirmed its extension and relations with adjacent structures, and arteriography allows for a record of arterial anatomy and also to perform preoperative embolization of the tumor.⁴

Previous arterial embolization of large carotid body tumors (> 2 cm) is a useful measure. Such fact has been proposed by many authors as a facilitator of tumor surgical removal due to reduced blood loss, resulting in reduced inadvertent lesions of neighboring structures, such as carotid artery and regional nerves.⁵

This procedure should be performed up to 2 weeks before the surgery, because there is a possibility of tumor revascularization.⁵

Other authors question previous embolization, claiming that it causes a locoregional inflammatory response, which leads to difficulty during periadventitial surgical resection of tumors.^{6,7}

In a study of 19 cases of carotid tumor on surgical techniques, in which 11 patients were submitted to embolization, recommendation was that such procedure should be used by experienced professionals and in tumors up to 3 cm long.⁸

Use of radiotherapy in the treatment of carotid body tumor still needs to be investigated. Hu & Perky published a series of cases in 967 patients from 1962 and 2001 and described that the radiation therapy provides equal healing opportunity than the surgery, considering, however, diseases in advanced stages, with neural and brain lesion.⁹

Surgery is the treatment of choice for all lesions, regardless of lesion size, since it will continue to grow if not resected, increasing the difficulty level of the surgery. Tumor removal can be currently performed with stroke and mortality rate lower than 1% and is usually the definitive therapy for most cases.⁴

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