

## Carotid Body Tumor

Waleed M. Hussien \* FIBMS (ThCVS), MS

### Summary

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**Background:**-Carotid body tumors is an uncommon disease entity in Iraq , presented with painless swelling below the angle of the mandible , and is usually benign .The author reviews his personal surgical challenge with eight cases having had this tumor during twelve years period .

**Patients and Methods:**-Eight patients with carotid body tumors were managed during twelve years period (1994- 2005) in the Thoracic and Vascular Department of the Medical City Teaching Hospital in Baghdad, Iraq.

**Results:**-These patients were retrospectively studied as regard their age, gender, clinical features, diagnostic methods, operative findings, surgical techniques and postoperative outcome.

**Conclusion:**-Early presentation and surgical intervention limit the number of inoperable patients thus avoiding local invasion and malignant changes and leading to fruitful surgical results.

**Key Words:** Carotid Body Tumor (CBT) , Common carotid Artery (CCA)

### Introduction

Carotid body is round, reddish –brown structure, 3-5 mm in diameter, found in the adventitia of the common carotid artery .located on the vessel's postero medial wall at its bifurcation .It was first described by Von Haller in 1743 (R<sup>1</sup>) ; It is derived from both mesodermal elements of the third branchial arch and elements originating from neural crest ectoderm ( R<sup>2</sup>) .It consists of two types of two types of cells: the first being (APUD cells) which contain dense core granules that store and release catecholamine while the second type is the (Sustentacular cells ) which still have unclear function .The carotid body is responsible for detecting changes in the composition of the arterial blood. Hypercapnea ,hypoxia and changes in PH stimulate type 1 cells leading to increase in the rate and depth of the respiration , heart rate ,blood pressure and cerebral cortical activity .

Carotid body tumors are rare, Shamblin et al classified these tumors according to the degree of invasiveness of the arterial wall:

Grade (1) small tumor, easily dissected.

Grade (2) larger tumor adherent to the carotid adventitia . Grade (3) Large tumor adherent intimately to the carotid adventitia.(R-<sup>3</sup>) .Two forms of carotid body tumor may be seen ,the common being the sporadic form while the rare being the familial form with autosomal dominant inheritance (R-<sup>4</sup>) . Surgery of carotid body tumor is a big challenge to the surgeon

due to High vascularity of the tumor and its close contact with the cranial nerves.

This manuscript describes a personal surgical challenge in treating these eight patients having had these tumors during twelve years period in the Thoracic and Vascular Department of the Medical City Teaching Hospital in Baghdad - Iraq.

### Patients and Methods:

This is a retrospective study of eight patients with carotid body tumor who were admitted to the Thoracic and vascular Department of the Medical City Teaching Hospital, Baghdad -Iraq during a twelve years Period (1994-2005) under the author's care.

Detailed history taking with full physical examination, Colored Dopple and conventional carotid angiography were done for all the patients.

In three patients who presented after the year 2000, magnetic Resonance Imaging (MRI) and Magnetic Resonance arteriography (MRA) were also performed. Special formula was used to collect patients' information with regard age, gender, clinical features and the result of both non invasive and invasive investigations.Preoperative preparation included a through medical check up, fitness For general anesthesia, blood preparation and a written high risk consent was signed by each patient after explaining the possible morbidity and mortality. Due to the non availability of indwelling carotid shunt in our country then, an alternative shunt was prepared for patients as a stand by shunt.

Surgery consisted of exploration of the common carotid artery and its bifurcation through a cervical incision just anterior to the sternocleidomastoid muscle, and a proximal and distal control by nylon tape to both the common carotid artery and its bifurcation, while a careful sub adventitial dissection was carried out to resects the tumor .Careful

\*Dep. Of Surgery, College of Medicine, University of Baghdad

Consultant Thoracic and Vascular Surgeon,

haemostasis was done with proper monitoring of the patient's blood pressure and heart rate. Postoperatively, the patient was evaluated with

### Results

Of these eight patients with carotid body tumor, five were females and three were males, the youngest patient being a twenty-year-old female while the oldest patient was a fifty-six-year-old male. The age distribution of these patients is illustrated in Figure (1). Seven patients presented with painless cervical swelling at the angle of the jaw anterior to the sternocleidomastoid, which was mobile horizontally and was slowly increasing in size, while another twenty-four-year-old female patient presented with huge cervical swelling in the same location but which was growing up deep and behind the mandible and associated with hoarseness of the voice. A male patient with a bilateral swelling had a one-sided exploration by a non-vascular surgeon believing that it was a cervical lymph node. As the swelling turned out to be pulsatile, he terminated his procedure. The vascular surgeon. All patients underwent colored Doppler, the reports of which suggested a pulsating carotid artery mass, more in favor of aneurysm; but the definite diagnosis was achieved by the conventional carotid angiography which clearly demonstrated the presence of a left carotid carotid tumor in five patients, right-sided in two patients and in one patient a bilateral carotid body tumors. Magnetic resonance imaging and magnetic resonance arteriography was performed in three patients which demonstrated the presence of a highly vascular mass on the common carotid artery bifurcation compressing both the external and internal carotid arteries. During surgery (Figure 2, 3, 4) six of these patients underwent successful resection of the carotid body tumor through the technique of sub-adventitial resection with minimal blood loss, while the seventh whose tumor was invading and blocking the external and engulfing the commencement of the internal carotid artery which necessitated ligation of the external carotid artery associated with a small Dacron patch (patch angioplasty) to the internal carotid artery. The eighth patient's tumor was huge and irregular compressing both arteries extending up and deep to the mandible making it technically irresectable but allowing to have multiple biopsies to be taken, the histopathology of which proved the malignant nature of the tumor. The postoperative course was smooth with no neurological sequel in six patients while a twenty-four-year-old female patient developed postoperative tongue deviation towards the operated side which needed six months to recover. The non-resectable tumor continued to have the symptoms postoperatively, and was referred to the oncologist. The patient with bilateral carotid body tumor underwent successful resection of the right carotid body tumor,

regard to any evidences of cranial nerve injury. If the post-operative period was uneventful, the patient was discharged home on the 7<sup>th</sup> - 10<sup>th</sup>. Post-operative day.

was discharged in a very good condition and was asked to be readmitted in three months for the left-sided resection, but failed to appear.

### Discussion

Carotid body tumor is a rare disease entity in Iraq. It should always be kept in the differential diagnosis of any painless cervical mass located anterior to the sternocleidomastoid muscle near the angle of the mandible. The rarity of CBT is also documented in other studies. Luna Ortiz K from Mexico<sup>5</sup> reported sixty-six cases during twenty years study; while Lazar B Dacicovic from Serbia reported only eight cases during a twenty-one years (R<sup>6</sup>); and Van der Bogt reported ninety-four patients during forty-two years study (R<sup>7</sup>); in contradistinction to the study by Mohamed Taghi Salihian who reported from Tehran ninety-seven cases during only sixteen years only. This relatively higher incidence in the latter, may be attributed to that the average altitude of Tehran is which is 1200 meter above the sea level and this high altitude may be a predisposing factor for increased number of cases of CBT (R<sup>8</sup>).

Females were affected more in this study and this is comparable to other studies (R<sup>5, 6, 7 & 8</sup>). The major presenting symptom in seven of our patients was a painless cervical mass anterior to sternocleidomastoid muscle near the angle of the mandible and this coincide with other studies (R<sup>5, 6 & 8</sup>), while hoarseness of the voice was seen in only one of our patients at the time of presentation. Proved bilateral carotid body tumor was only seen in one of our patients which was also reported by Luna from Mexico (R<sup>5</sup>), Erasmo from San Paulo (R<sup>9</sup>) and Mohammad T.S from Tehran (R<sup>8</sup>). Carotid body tumor seen more on the left side in this study while both sides were equally affected in Luna-Ortiz K study (R<sup>5</sup>). The gold standard investigation for the diagnosis was the conventional carotid angiography. In agreement with other studies (R<sup>2, 6, 8, 9</sup>), which clearly demonstrated the hypervascular oval mass widening the angle of carotid bifurcation (Lyre Sign) which is the classical pathognomonic angiographic findings (R<sup>10</sup>). The use of MRI & MRA as non-invasive procedure was used only in the last three cases as the conventional angiography gave a clearer picture of the lesion in contrast to the study by Julie (R<sup>11</sup>) who stated that MRI has greatly simplified the pre-operative diagnosis of CBT. Due to the unavailability of indwelling carotid shunt in Iraq as Javid shunt so an alternative shunt was used which is - the Scribner's Shunt, which is usually used for haemodialysis in chronic renal failure patients.

Surgery in the seven resected tumor was conducted through the classical Sub adventitial resection of the CBT which is the standard approach in all studies in contrast to the report by Van der Bogt, illustrating a modified technique (the Cranio caudal dissection technique) favoring it due to its little blood loss so reducing the risk of postoperative morbidity (R<sup>7</sup>). In only one female patient the operative findings of a huge CBT which invade both carotid arteries and extending up high behind the mandible preventing any access to the distal internal carotid artery making distal control impossible, to avoid any tragic complications (Vascular and neurological) only biopsies were taken cautiously and the case was labeled as technically unresectable tumor. The patient was referred to the oncologist after obtaining the histological proof of the malignant nature of the tumor. Postoperatively the only one single complication of the seven resected tumor was the postoperative tongue deviation due to per operative hypoglossal nerve injury which recovered slowly but completely after six months. A similar complication was also reported in other studies (R<sup>6,7, & 8</sup>). There was no mortality seen in this study.

**Conclusion**

The future use of non invasive methods of diagnosis as MRI & MRA will definitely reduces the use of invasive procedure as conventional carotid angiography. Early diagnosis & surgical intervention will facilitate the resection, avoiding local invasion, malignant changes, decreasing postoperative morbidity leading to fruitful surgical results.

Figure(1) Age distribution of patients

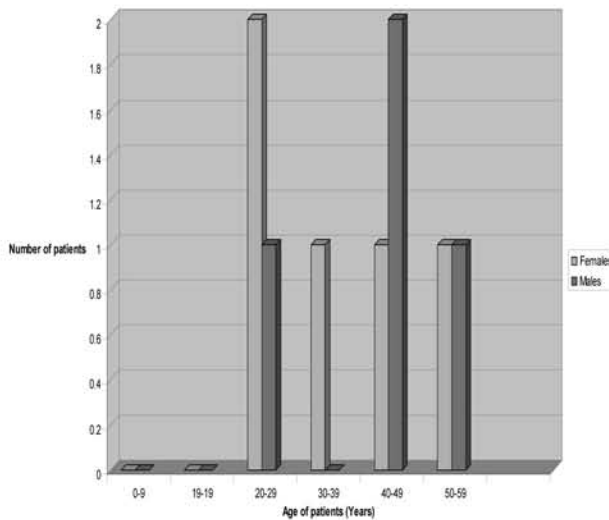
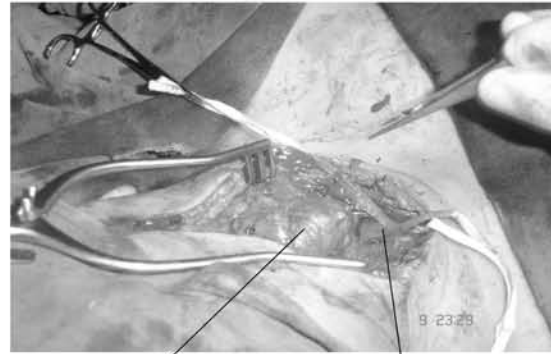


Figure (1) :-\_Age distribution of the patients



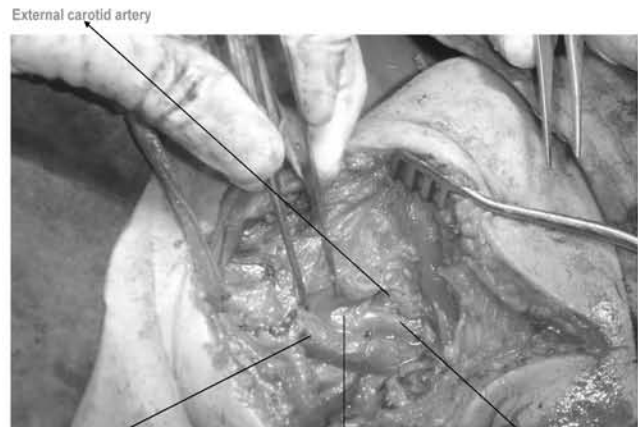
Carotid Body Tumor Proximal control on the CCA

Figure (2) :- The operative field



Carotid body tumor

Figure (3) :- Subadventitial dissection and resection



Internal Jugular vein Common carotid artery Internal carotid artery

Blood less field post resection of the CBT

Figure (4):- Operative field post resection of the CBT



The resected Carotid Body Tumor



Figure (5) :- The resected Carotid Body Tumor

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