Radiologic Evaluation of Carotid Body Tumor

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A.G.’s Story

A.G. was a 71-year-old Ethiopian woman who periodically traveled to Boston to visit her daughter.

She would frequent the BIDMC for diverse GI issues.

One day, a mass was felt on the left side of her neck.
By radiology and biopsy, the mass in A.G.’s neck was found to be a carotid body tumor (paraganglioma).

She was advised to have it removed, but opted not to.

Over the years, on subsequent visits from Ethiopia to Boston, A.G.’s tumor was followed as it slowly grew.

We will discuss its appearance on MRI, MRA, CT, CTA.
Four Ways of Looking at a Tumor

(1) MRI, August 2000.

(2) MRA, August 2000.

Images courtesy of Dr. Lai
Four Ways of Looking at a Tumor

(3) CT, August 2004.

(4) CTA, February 2006.

Images courtesy of Dr. Lai
DDx for a Solid Mass in the Carotid Sheath

1. Lymphadenopathy – inflammatory, infectious
2. Traumatic neuroma
3. Benign tumor
   a. Granular cell tumor (rhabdomyoblastoma)
   b. Hemangiolymphangioma
   c. Lipoma
   d. Nerve sheath tumor (schwannoma, neurofibroma, ganglioneuroma, ganglioblastoma, ganglioneuroblastoma)
   e. Paraganglioma (glomus jugulare tumor, glomus vagale tumor, carotid body tumor)
   f. Thyroid and parathyroid tumors (e.g. adenoma)
4. Malignant tumor – lymphoma, metastatic lymphadenopathy

Reeder MM. *Gamuts in Radiology*, p. 169.
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The diagnosis of paraganglioma was made in A.G.’s case through fine-needle aspiration and cytology.

However, when paraganglioma is being considered, biopsy is generally not advised because of the hypervascular nature of these tumors.

Imaging is the preferred way to make the diagnosis.
Menu of Imaging Choices for Diagnosis and Evaluation of a Lateral Neck Mass

- B-mode sonography + color-coded Doppler sonography
- Magnetic resonance imaging
- Computed tomography
- Digital subtraction angiography
Merits of Ultrasound

Useful as the first step in assessment but not the last.

Inexpensive.

Non-invasive.

Readily available.

Carotid Body Tumor on Ultrasound

Carotid Body Tumor on Ultrasound

External carotid artery (anterior)

Internal carotid artery (posterior)

Intratumoral vessels

Internal jugular vein

Abnormalities on Ultrasound

Splaying at the bifurcation: external carotid displaced anteriorly,

...internal carotid and internal jugular displaced posteriorly

Tumor-vessel flow direction predominantly upward (red)

Solid, well-defined, hypoechoic, hypervascular mass

Differential Diagnosis on Ultrasound

Non-paraganglioma masses, e.g. enlarged lymph node: would look similar on B-mode sonography, would not be hypervascular on Doppler.

Vagal paraganglioma: can also splay the bifurcation and look hypervascular, but the intratumoral flow signal is directed downward (blue).
Contribution of MRI

MRI helps diagnose paragangliomas by representing their hypervascularity as multiple low-signal areas due to flow void.

It is superior to CT scanning in delineating these tumors and in distinguishing them from inflammation and hemorrhage.

MRI is also better able to demonstrate the relationship of carotid body tumors to adjacent vascular structures.

Carotid Body Tumor on MRI

Courtesy of Dr. Lai
Carotid Body Tumor on MRI

Courtesy of Dr. Lai
Carotid Body Tumor on MRA

Courtesy of Dr. Lai
Carotid Body Tumor on MRA

R external carotid
R internal carotid
R vertebral artery

L external carotid
L internal carotid
L vertebral artery

Courtesy of Dr. Lai
Abnormalities on MRI

Mass splaying the internal and external carotid arteries

No definite flow voids
High signal on STIR
Enhances with gadolinium
Most Likely DDx on MRI

Schwannoma vs. paraganglioma

Courtesy of Dr. Lai
Role of CT

CT is excellent for defining the exact location of a mass and visualizing its effect on adjacent structures.

Combined with a knowledge of anatomy and epidemiology, it can help distinguish among congenital, inflammatory, and neoplastic processes that all result in neck masses.

It is quicker and more available than MRI.

Carotid Body Tumor on CT

![Carotid Body Tumor on CT](image)

23.13 mm

Courtesy of Dr. Lai
Carotid Body Tumor on CT

ECA
ICA
IJV

23.13 mm

Courtesy of Dr. Lai
Soft-tissue relations

Anterior scalene muscles

Sternocleidomastoid m.

Middle scalene m.

Abnormalities On CTA

Coarse hypervascularity

Incorporation of feeding vessels

Differential Diagnosis on CT

<table>
<thead>
<tr>
<th>Schwannoma</th>
<th>Lucent Isodense</th>
<th>Displaces adjacent vessels</th>
<th>Incorporates adjacent vessels</th>
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Definitive Confirmation by DSA

Digital subtraction angiography provides definitive preoperative characterization.

It provides endovascular access for possible embolization; best maps the arterial supply; and, in later phases, visualizes the venous drainage, which allows the surgeon to avoid cutting it until the end, decreasing intraoperative blood loss.

Angiograms of paragangliomas

Carotid body tumor, regular angiogram.

Vagal paraganglioma, digital subtraction angiogram.

References


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