Differential Diagnosis of Cervical Schwannomas and Carotid Body Tumors by Color Doppler Ultrasound

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Abstract

Objective: To explore and analyze the significance of color Doppler ultrasound in the differential diagnosis of cervical schwannomas and carotid body tumors.

Methods: From May 2010 to May 2012, 24 cases were treated in our hospital. 11 cases of cervical schwannomas and 13 cases of carotid body tumors were confirmed by surgery. We retrospectively analyzed the color Doppler ultrasound images of all cases.

Results: The schwannomas were single-shot, substantially hypoechoic cysts, which were round and had an envelope, clear borders, and internal wired blood flow signals. The arterial blood flow spectrum belonged to high-resistance type; Single or double masses appear in the bifurcation of the common carotid artery of carotid body tumor cases. The blood flow in the tumor is abundant. The external carotid artery was squeezed forward and internal shifted by the tumor while the internal carotid artery squeezed backward and external shifted. The arterial blood flow spectrum belonged to Low resistance spectrum.

Conclusion: Both carotid body tumors and cervical schwannomas have specific imaging characterization. Color Doppler ultrasound has very important clinical application practical value on the differential diagnosis of cervical schwannomas and carotid body tumors.

Keywords
Color Doppler Ultrasound; Cervical Schwannomas; Carotid Body Tumor

1. Introduction

Neurilemmomas are benign tumors, originating from the degeneration of the neurocytes. It's acknowledged by scholars that the neurilemmomas formed by the proliferation of neuroectodermal Schwann cells, thus also called as Schwannomas. Neurilemmomas tend to be solitary masses with complete capsule composing of the perilemma epineurium, which were round or oval. Liquefactive necrosis can be seen when the tumor was large [1]. They can occur in every part of the body, however mostly in the carotid triangle area. Neurilemmomas from the glossopharyngeal, vagus, sympathetic nerves shared the same occurrence position with the CBTs, thus it’s difficult to differentiate.

The objective of this paper is to explore and analyze the significance of color Doppler ultrasound in the differential diagnosis of cervical schwannomas and carotid body tumors.

2. Materials and Methods

2.1 Clinical data

From May 2010 to May 2012, 24 cases were treated in our hospital. 11 cases of cervical schwannomas were confirmed by surgery, including 6 males cases and 5 females cases. Among them, the age ranged from 17 to 55 years old. 3 cases were on the right while 8 cases on the left. The patient's neck usually has a painless mass, which was mostly located in the upper third of the neck and the boundary is relatively clear. The carotid pulsation can be felt when palpation. There were 13 cases of carotid body tumor confirmed by surgery, including 7 male cases and 6 female cases. Among them, the age ranged from 18 to 54 years.
old. 5 cases were on the right while 8 cases on the left (Table 1). In the early stage, there was a painless mass in the upper neck without obvious subjective symptoms and slow growth. Most of the tumors were round or oval, medium hardness, with clear boundary and no adhesion to surrounding tissues. When the tumor is large, it is prone to cystic degeneration, compress the mass, and patients may have a reflex cough.

Ethical clearance of this research has been obtained from our hospital ethical committee.

Table 1 Demographic data of the patients

<table>
<thead>
<tr>
<th>Type</th>
<th>Case</th>
<th>Male</th>
<th>Female</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical Schwannoma</td>
<td>11</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Carotid Body Tumor</td>
<td>13</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>

2.2 Inspection Methods

Select the Color Doppler ultrasound (model Acusson128XP/10), probe frequency 5-7 MHz, observe the size of the mass and the relationship between internal echo and surrounding tissue structure by two-dimensional ultrasound, observe blood supply situation of the mass and the blood flow situation of carotid artery by color Doppler ultrasound, detect the characterization of the blood flow spectrum inside and around the tumor by spectral Doppler. The DSA contrast machine (Model: SIEMENS Anziostar plus), during angiography, the patient was placed in a supine position.

3. Results

3.1 Two-Dimensional Image

In the group of the carotid body tumors (CBTs), the largest one was 5.3×4.6×3.8(cm) in size, while the smallest one was 3.2×2.8×2.0(cm) in size (Table 2), and they were well circumscribed but without the defined capsule. They were solid iso to hypoechoic masses, and inhomogeneous and stripped hypoecho could be seen inside.

This tumor was adjacent to the bifurcation of the common carotid artery (CCA), elongating upward and bilaterally. The Characteristic symptoms were the increase of the CCA bifurcation and the displacement of internal carotid arteries (ICA) Fand external carotid arteries (ECA), with the ICA displaced posteriorly and the ECA mid-anteriorly. CCA and jugular veins were also compressed to deformation when the tumor was larger. The tumor was closely related to the carotid system, which limited to the carotid bifurcation or grew around the arteries. In the group of the neurilemmomas, the largest one was 8.2×4.3×4.0(cm) in size, while the smallest one was 3.0×2.6×2.2(cm) in size. The tumors were well-circumscribed hypoechoic with characteristics of capsule reflections zone. The tumors were abutting the carotid artery, and the CCA bifurcation was normal [2].

Table 2 differential diagnosis by Doppler Ultrasound Image

<table>
<thead>
<tr>
<th>Type</th>
<th>Tumor Size(cm)</th>
<th>Capsular</th>
<th>Branch Angle</th>
<th>Blood Flow Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical Schwannoma</td>
<td>3.0×2.6×2.2-8.2×4.3×4.0</td>
<td>obvious</td>
<td>not change</td>
<td>No</td>
</tr>
<tr>
<td>Carotid Body Tumor</td>
<td>3.2×2.8×2.0-5.3×4.6×3.8</td>
<td>not obvious</td>
<td>enlargement</td>
<td>a lot</td>
</tr>
</tbody>
</table>

3.2 CDFI

CBTs were highly vascularized, and they can be detected with abundant blood flow signals within the tumors, which were strip-like or rod-shaped. The color flow of the ICA and ECA flowed by or through the tumor. Besides, small branches of arteries could be seen inside the tumor. While no blood signal was detected in the neurilemmomas

3.3 DSA imaging features

DSA revealed that CBT located at the posteromedial carotid bifurcation, and compressed the ICA and ECA to displace with CCA anterolaterally.

The bifurcation of the ICA and ECA enlarged like gold-cup. Oval mass full of vascularity can be seen at the bifurcation, while blood supply mainly came from the ECA. Compared with the normal carotid artery by DSA, the bifurcation was normal in the
neurilemmomas, and the mass splayed ICA, ECA and CCA, shifting anterolaterally. Compared with CBTs by DSA, the tumor cannot be detected, suggested of low vascularity in tumors [3].

4. Discussion

Neurilemmomas are benign tumors, originating from the degeneration of the neurocytes. It's acknowledged by scholars that the neurilemmomas formed by the proliferation of neuroectodermal Schwann cells, thus also called as Schwannomas. Neurilemmomas tend to be solitary masses with complete capsule composing of the perilemma epineurium, which were round or oval. Liquefactive necrosis can be seen when the tumor was large. They can occur in every part of the body, however mostly in the carotid triangle area. Neurilemmomas from the glosopharyngeal, vagus, sympathetic nerves shared the same occurrence position with the CBTs, thus it’s difficult to differentiate.

Carotid body tumors (CBTs) are rare chemoreceptor tumors occurring at the carotid body. The carotid body is located at the behind of the CCA bifurcation in the carotid triangle area, measuring at 6mm×4mm×2mm in size, and they are not easy to be revealed by ultrasound. The cause of the CBTs is that the chronic oxygen deprivation leads to the alterations of the components of blood, thus stimulating the carotid body triggering the compensatory hyperplasia, and finally develop into the tumors.

CBTs usually have no obvious capsules, but they are characteristic of abundant blood supply, mainly from the ECA. They are generally unilateral, with bilateral tumors detectable in only 5% of patients. Previous studies have reported that familial forms with bilateral tumors seen in 32% of cases. There were two cases of bilateral CBTs in this group, among which were siblings. Both the CBTs and the neurilemmomas present as painless neck masses with the characteristics of slow growing, besides, they lack specificity, therefore it’s rather difficult to make a diagnosis. Surgery is the priority treatment. They are different in terms of surgery and preoperative preparations; thus the differential diagnosis is of vital importance. Although CBTs and neurilemmomas have some similarities in clinical manifestations, they have their own clinical features and defined imaging characteristics in CDFI and DSA. Thus, these above features are of great clinical and practical value in diagnosis and differential diagnosis between the CBT and the neurilemmomas [2-4].

Reference


