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Clinical Record

Common carotid artery pseudoaneurysm after neck dissection: colour Doppler ultrasound and multidetector computed tomography findings

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Abstract

Common carotid artery pseudoaneurysm is a rare disease, which has been previously unreported in association with neck dissection. We describe the Doppler ultrasound and multidetector computed tomography (CT) findings of a case of carotid pseudoaneurysm, one month after pharyngolaryngectomy with bilateral neck dissection. Multidetector CT confirmed the diagnosis made on the basis of Doppler ultrasound; the high image quality of axial and three-dimensional reconstructions avoided the need for pre-operative conventional angiography. In the presence of a pulsatile cervical mass after neck surgery, pseudoaneurysm of the carotid artery should be included in the differential diagnosis, and multidetector CT can be the sole pre-operative diagnostic imaging modality.

Key words: False Aneurysm; Internal Carotid Artery; Computed Tomography; Colour Doppler Ultrasonography

Introduction

Pseudoaneurysms of the common carotid artery are rare but should be considered in the differential diagnosis of carotid space lesions. They may occur due to blunt or penetrating trauma[1] or infection. Iatrogenic pseudoaneurysms have been reported after a variety of surgical procedures.[2]

We report a case of a pseudoaneurysm of the common carotid artery after pharyngolaryngectomy with bilateral neck dissection. Doppler ultrasound (US) and multidetector computed tomography (CT) findings are presented.

Case report

A 69-year-old man underwent surgical treatment for an infiltrating squamous cell carcinoma of the hypopharynx and larynx with metastatic involvement of cervical nodes on the right side ($pT_4\ N_2\ M_0$), in January 2002.

Before surgery, routine, four-row, multidetector CT (Lightspeed, General Electric Medical Systems, Milwaukee, Illinois, USA) of the neck and thorax was performed, after intravenous injection of 110 ml of non-ionic, iodinated contrast agent (Iopamiro 350, Bracco Imaging, Milan, Italy) at 2 ml/second with a 40 second delay. A soft tissue mass, 2 cm in diameter, was detected at the right piriform sinus, together with several enlarged nodes on the same side. The level three nodes were confluent with large masses up to 5 cm in diameter and were judged to infiltrate the internal jugular vein (Figure 1). This vascular involvement was confirmed at pathologic examination. Moreover, close contact between the metastatic mass and the carotid artery was noted. A total pharyngolaryngectomy with bilateral neck dissection (radical on the right side and functional on the left) was performed. During surgery, it was necessary to suture the superior thyroid artery due to neoplastic involvement.

On the fourth day after surgery, the patient suffered an acute myocardial infarction, which was treated with nitrates, acetylsalicylic acid and heparin. One week after surgery, the patient suffered an acute neck haemorrhage, with blood found in the tracheostoma. Surgical revision revealed necrosis of anterior neck muscles and deep haemorrhage. A small, partial tear of the common carotid bulb was found and sutured. Moreover, the right external carotid artery was ligated.

In April 2002, the patient presented again with a hard, pulsatile, right cervical mass with no overlying skin abnormality. A Doppler US examination was performed (Hitachi Medical Corporation, Tokyo, Japan) and revealed a strict relation of the mass with the common carotid artery. Colour Doppler examination revealed high blood flow in the track connecting the defect of the carotid wall and the cavity, an intracavitary systolic jet, as well as rotatory blood flow in the cavity (Figure 2a). A probable diagnosis of pseudoaneurysm was made.

A multidetector CT angiography examination was subsequently performed, using the same equipment described above, with an imaging protocol comprising injection of 80 ml of contrast agent (Iopamiro 350, Bracco Imaging, Milan, Italy) at 3 ml/second with a 20 second delay. Post-processing was performed to

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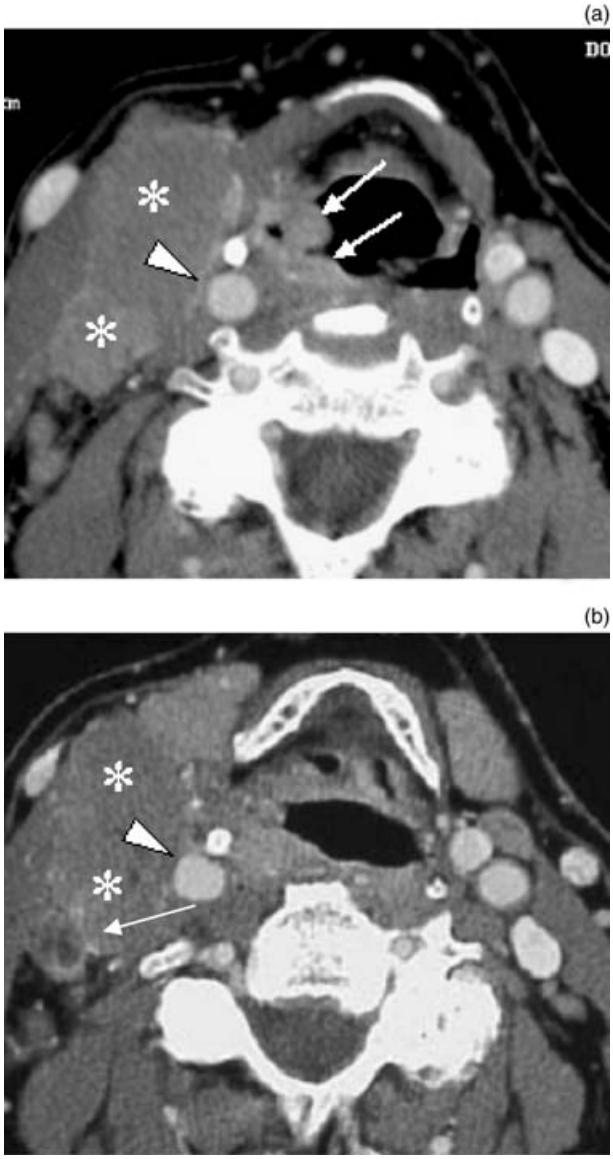

FIG. 1

(a) Transverse, contrast-enhanced, multidetector computed tomography (CT) scan, showing tumour of the right piriform sinus (thin arrow) and massive nodal involvement (asterisks). There is no clear detection of the internal jugular vein (arrowhead). (b) Transverse, contrast-enhanced, multidetector CT scan, showing the large, direct relationship between the metastatic node and the right common carotid artery (arrowhead), with the node adhering to the carotid artery on about 40 per cent of its surface. The right internal jugular vein is strongly compressed and just visible as an enhanced, curved line (thin arrow) between two nodal masses.

acquire multiplanar reformats and volume rendered representations. A pseudoaneurysm of the internal carotid artery was confirmed, with an origin 6 mm below the carotid bifurcation. A large aneurysm with a transverse diameter of 17 mm, a longitudinal diameter of 19 mm and a neck of 10 mm was noted (Figure 2b–d).

A surgical aneurysmectomy with vessel reconstruction was performed, using a bovine pericardium patch. The post-operative course was uneventful, apart from an immediate post-operative episode of acute respiratory failure. Two years after the intervention, the patient was healthy.

Discussion

Pseudoaneurysm is a disease of arterial vessels and is defined as 'a pulsatile haematoma that occurs following injury of all layers of the arterial wall' in which 'the centre of the haematoma liquefies and contains flowing blood that communicates with the arterial lumen, while the periphery of the haematoma clots, forming the wall of the aneurysm'.[2,3] Pseudoaneurysms are caused by various events: blunt or penetrating trauma, infection, and medical procedures (e.g. surgical interventions, and needle puncture for catheter placement or biopsy).[2]

In our experience, the spatial relationships between tumoral masses and vascular structures, in particular that between an enlarged node and the common carotid artery, can be precisely assessed with a pre-operative, contrast-enhanced multidetector CT examination (Figure 1). The high image quality of multidetector CT allows complete pre-operative information on the neck vessels to be obtained, thereby avoiding the need for digital subtraction angiography in most cases (with the exception of patients with excessively calcified vessel walls).[4]

In our case, it was clinically difficult to distinguish between a haematoma and a pseudoaneurysm. The Doppler US suggested a carotid pseudoaneurysm, because flow was detected in the track connecting the defect of the carotid wall and the pseudoaneurysm cavity. We also detected characteristic rotatory blood flow in the cavity.[5] However, we did not find the so-called 'to and fro' motion during systole and diastole, using pulsed Doppler placed at the cavity neck, which is typical of pseudoaneurysms.[6]

The multidetector CT examination performed after Doppler US allowed the diagnosis of pseudoaneurysm to be confirmed and showed the site of disease more precisely. Native axial images (Figure 2b), three-dimensional maximum intensity projections (Figure 2c) and volume rendered reconstructions (Figure 2d) gave the surgeon precise information about the pseudoaneurysm, including its dimensions, location and the site of its neck, all of which were crucial for surgical planning. Because surgery was the chosen therapy, digital subtraction angiography was not performed. The combined findings of Doppler US and multidetector CT were judged sufficient to proceed with surgery.

- **Pseudoaneurysms of the common carotid artery are rare, but should be considered in the differential diagnosis of carotid space lesions**
- **This paper describes a case of a pseudoaneurysm of the common carotid artery after pharyngolaryngectomy with bilateral neck dissection**
- **The authors discuss the roles of multidetector computed tomography and colour Doppler ultrasonography in imaging an iatrogenic pseudoaneurysm located at the common carotid artery**

Depending on the site, size and cause of the pseudoaneurysm, the management of patients with this lesion may entail surgery or endovascular intervention. The standard treatment of extracranial carotid artery pseudoaneurysms is open surgery with resection and graft reconstruction, as in our case.[7] When the aneurysm is in an intracranial or high extracranial position, surgery may be very difficult to perform, and the endovascular approach can be of value.[8] If the endovascular treatment is chosen,

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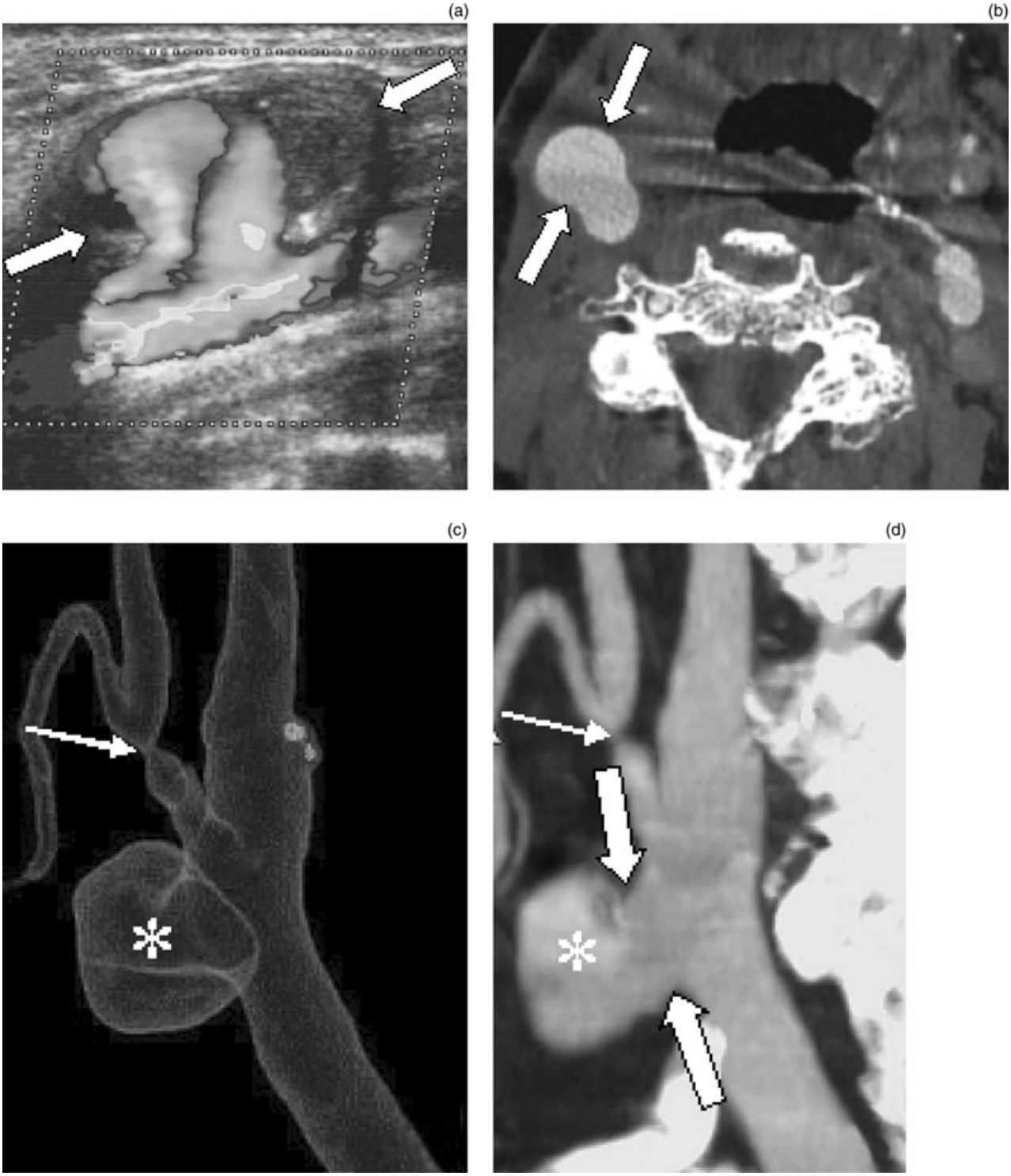

FIG. 2

(a) Colour Doppler sonogram showing the blood flow of the right common carotid artery, and the haematoma with rotatory flow within its cavity (arrows). Note the large neck connecting the carotid to the pseudoaneurysm. Pulsed Doppler showed a high speed systolic jet (not shown). (b) Transverse, contrast-enhanced multidetector computed tomography scan, showing the lumen of the right common carotid artery dilating to a cavity (arrows) with a large connecting neck. (c) Maximum intensity projection along the vessel axis, showing the pseudoaneurysm cavity (asterisk) and clearly demonstrating the site of origin from the common carotid artery, and the large connecting neck (arrows). Note the effect of the external carotid artery ligation (see text), resulting in a high grade stenosis of the vessel (thin arrow). (d) Volume rendering, showing the same findings as Figure 2(c) in a three-dimensional view.

diagnostic catheter angiography is obviously performed immediately before treating the pseudoaneurysm.

In conclusion, the case presented here shows the role of multidetector CT for imaging an iatrogenic pseudoaneurysm located at the common carotid artery. This diagnostic possibility should be taken into consideration when dealing with pulsatile neck masses, especially after neck surgery.

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