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Mycotic aneurysm of the external carotid artery

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Abstract
Mycotic aneurysms of the extracranial carotid arteries are extremely rare. A case is reported of a false aneurysm of the left external carotid artery. This developed secondary to cervical lymphadenitis which did not settle with high dose antibiotic therapy. The diagnosis was made on investigation with carotid doppler ultrasound and confirmed with computerized tomography. Digital subtraction angiography was performed to highlight the vascular anatomy. In addition percutaneous balloon catheter control of blood flow in the external carotid artery was used as an adjunct to surgical management.

Key words: Aneurysm, infected; Carotid artery, external

Case report

A 21-year-old male Jehovah's Witness presented to his family practitioner with a two-week history of a left-sided sore throat and fever. He was initially treated with a 10-day course of erythromycin, but this led to little improvement in his symptoms. Two weeks later he developed a swelling in the left side of his neck. On examination there was a 4×4 cm smooth tender lump in the left anterior triangle of the neck. This was non-pulsatile in nature and was deep to the left sternomastoid muscle. Examination of the oropharynx revealed medialization of the left tonsil. Full blood count revealed a haemoglobin of 14.4 g dL and a white cell count of 14.2×10^9/l. Serology for toxoplasma and cytomegalovirus (CMV) were negative and chest radiograph was normal. Blood cultures were negative. Ultrasound scan (USS) of the neck revealed multiple deep cervical lymph nodes but no abscess was identified. Fine needle aspiration cytology of one of the lymph nodes was performed. The procedure was uneventful and the cytology revealed changes consistent with reactive lymphadenitis. A diagnosis of left parapharyngeal cervical lymphadenitis was made and the patient commenced on intravenous benzylpenicillin and metronidazole.

Several days later *Staphylococcus aureus* was isolated from the needle aspirate and the antibiotics changed to flucloxacillin and fucidic acid according to sensitivities. His condition failed to improve with the above antibiotic regime and thus seven days later a repeat ultrasound scan was obtained using carotid doppler ultrasound (CDUS). An aneurysm measuring 3.3 cm $\times$ 1.9 cm arising from the anterior aspect of the external carotid artery (ECA) was demonstrated. A surrounding haematoma was also seen. A contrast enhanced computed tomogram (CECT) of the area revealed a large low attentuation lesion with an enhancing centre consistent with the aneurysm and its surrounding haematoma. Considerable distortion and narrowing of the oropharyngeal airway were noted (Figure 1). Prior to planning definitive treatment, digital subtraction angiography (DSA) of the carotid territory was performed. This demonstrated a large pseudoaneurysm arising from the ECA just distal to the origin of the lingual artery. The marked compression and displacement of the internal carotid artery (ICA) and ECA by the pseudoaneurysm and associated haematoma was seen (Figure 2).

After lengthy discussion with the patient in view of his refusal to accept blood products, a ligation of the left

FIG. 1
A contrast enhanced computed tomogram (CECT) of the area revealing a large low attenuation lesion with an enhancing centre consistent with a large suppurative lymph node mass in which a false aneurysm has developed.

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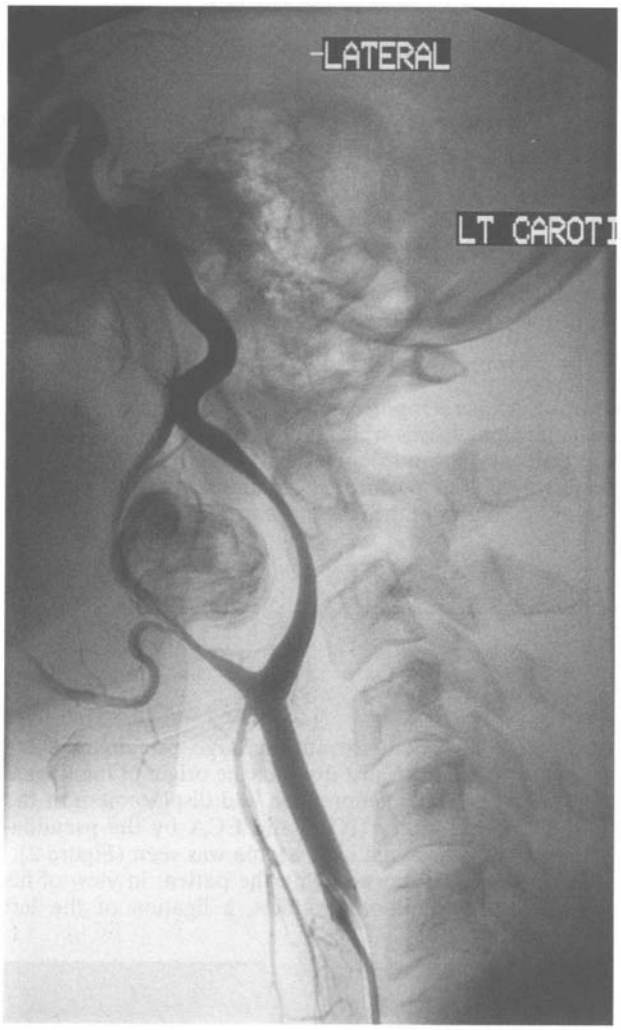

FIG. 2

Digital subtraction angiography (DSA) of the carotid territory demonstrating a large pseudoaneurysm arising from the ECA just distal to the origin of the lingual artery. The marked compression and displacement of the ICA and ECA by the pseudoaneurysm and associated haematoma are seen.

external carotid artery was performed. Proximal control of the ECA was achieved by balloon occlusion of this vessel at its origin at the carotid bifurcation. In the operating theatre an 8 French guiding catheter was placed into the common carotid artery (CCA) via the right common femoral artery in order to provide stable access to the external carotid. A wire was manoeuvered into the ECA and then a 6 mm angioplasty balloon was placed distal to the carotid bifurcation (Figure 3). This was then inflated and the ECA occluded. A loose suture was placed around the proximal ECA distal to the balloon and as the balloon was deflated and removed the suture was engaged, thereby achieving proximal ECA control. Distal control of the vessel was performed in the conventional manner. The false aneurysm was opened and infected haematoma evacuated. A completion angiogram showed preservation of internal carotid flow, but with narrowing of the vessel in the region of the carotid bifurcation secondary to vascular spasm and residual haematoma (Figure 4). Intravenous antibiotics were continued for a further three weeks. Two months after the procedure, the neck swelling has reduced in size and the patient has no neurological sequelae as a result of the procedure.

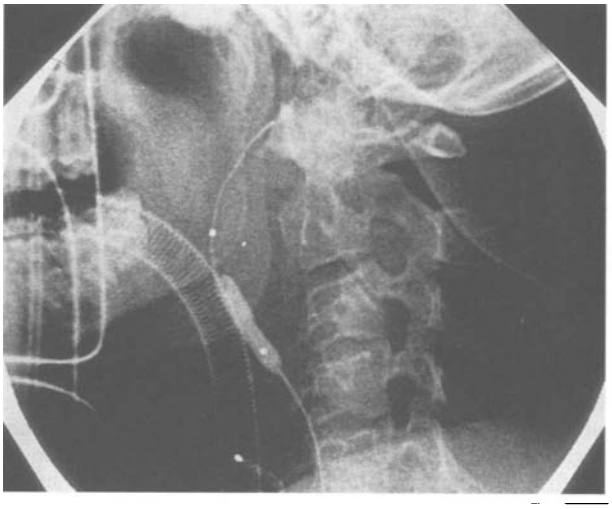

FIG. 3

An inflated 6 mm angioplasty balloon placed just distal to the carotid bifurcation with the ECA occluded.

Discussion

Mycotic aneurysms of the extracranial carotid artery are extremely rare. These aneurysms are caused by one of three separate pathological processes, namely a primary microbial arteritis, direct spread from an infected adjacent structure or metastatic spread of infection. The incidence of primary mycotic aneurysms due to microbial arteritis has decreased with the use of antibiotics as most of these aneurysms were caused by syphilis or tuberculosis (Lloret *et al.*, 1996). Direct spread of infection from adjacent structures most commonly occurs following lymphadenitis leading to breakdown of the vessel wall. This is usually due to infection with *Staphylococcus aureus* as in this case. Rarely, direct spread after extension from adjacent endocardial infection may occur. More recently *Staphylococcus aureus* has been the most common isolate in mycotic aneurysm associated with intravenous drug abuse and penetrating neck wounds. In addition iatrogenic introduction of bacteria following needle aspiration, arterial puncture, and internal jugular vein catheterization

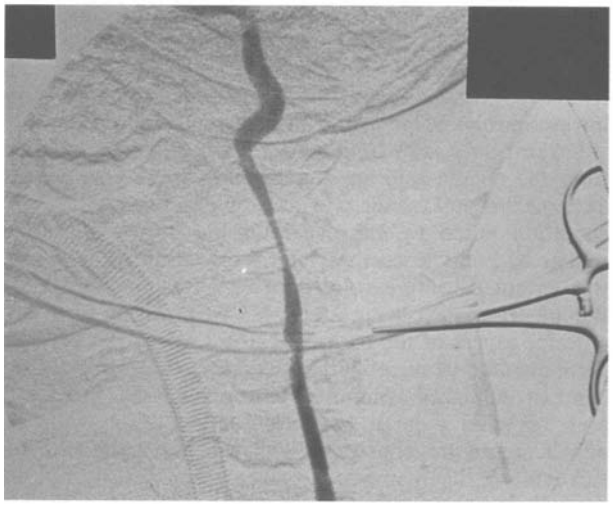

FIG. 4

A completion angiogram showing preservation of internal carotid flow, but with narrowing of the vessel in the region of the carotid bifurcation secondary to vascular spasm and residual haematoma.

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has been reported. Metastatic infection can occur in any part of the body causing multiple mycotic aneurysms and organ abscesses (Cohen *et al.*, 1987) and is most commonly seen in severe salmonella infections. The sources of infection include septic emboli lodging in the arterial lumen and septicaemia with invasion of the vasa vasorum. In addition to *Staphylococcus aureus* and *Salmonella* species, other organisms implicated in mycotic aneurysms include *Esherichia coli*, *Corynebacterium* species, *Yersinia enterocolitica*, *Proteus mirabilis* and *Klebsiella* sp. In the case described the mode of infection was thought to be secondary to direct spread from cervical lymphadenitis. A fine needle aspiration of the lymph node mass was undertaken. As this procedure was uneventful and the specimen did not contain excessive blood, it is most unlikely that this was an aetiological factor.

The following clinical features may indicate a mycotic aneurysm of one of the great vessels in the neck, particularly in the presence of incomplete resolution of an appropriately treated neck space infection. The neck mass may become pulsatile with an associated bruit or thrill. There may be oropharyngeal bleeding and purplish discolouration of the skin and mucose membranes of the pharynx together with dysphagia. In addition neurological signs may occur including Horner's syndrome, 10th and 12th cranial nerve palsies and transient ischaemic attacks. The differential diagnoses includes carotid body tumour, cervical lymphadenitis including peritonsillar abscess or carotid artery kinking (Naik *et al.*, 1995).

The initial diagnosis is usually made with ultrasonography, computed tomography or magnetic resonance imaging, but high quality digital subtraction angiography (DSA) is essential for the detailed vascular anatomy required for surgical planning. If the aneurysm is infected then embolization using endovascular means is contraindicated unless the patient is too ill to tolerate general anaesthesia (O'Sullivan *et al.*, 1997). Therefore, the management of this condition requires close cooperation between otolaryngologist, vascular surgeon and vascular radiologist. If the patient's condition permits it is advisable to give high dose intravenous antibiotics for a minimum of 48 hours pre-operatively. If the external carotid artery is the sole vessel involved, management should consist of ligation of the vessel with removal of infected material. However, some reports are published of reconstruction of the artery. If the aneurysm occurs adjacent to the carotid bifurcation, as in the case described, proximal control of this vessel is difficult. In this case this difficulty was overcome by gaining proximal control by neovascular balloon occlusion of the external carotid artery via the groin. This has previously been described for vascular control of an infected axillary artery pseudoaneurysm (Stedman *et al.*, 1994), but to our knowledge has not been performed previously for the purposes described. If a mycotic aneurysm affects the common or internal carotid artery, then removal of the aneurysm and subsequent revascularization is recommended as ligation of the carotid artery has a mortality of up to 60 per cent (Howell *et al.*, 1977). Reconstruction should be performed with autologous materials and the long saphenous vein appears to be the graft of choice.

Conclusion

In a patient with an incomplete resolution of a neck space infection, the possibility of an underlying mycotic aneurysm of one of the great vessels of the neck should be remembered. The diagnosis can be achieved with ultrasonography, computed tomography or magnetic resonance imaging. However digital subtraction angiography remains the most useful investigation in terms of diagnosis and also in planning the most appropriate management.

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