Retropharyngeal haemorrhage from a vertebral artery branch treated with distal flow arrest and particle embolisation

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ABSTRACT

Retropharyngeal haematoma is a rare cause of rapid neck swelling that may result in fatal upper respiratory airway obstruction. Reported causes include trauma, surgery, retropharyngeal inflammation, carotid aneurysm, aberrant artery at the thoracic inlet and bleeding diathesis. We report a 90-year-old man who developed rapid and progressive neck swelling following a minor traumatic episode. Computed tomography showed a large low-density retropharyngeal haematoma extending from the skull base to the mediastinum, with suspected extravasation. The right vertebral artery angiogram confirmed contrast agent extravasation arising from a small branch artery. This was treated with temporary distal flow arrest and particle embolisation.

Keywords: endovascular treatment, particle embolisation, retropharyngeal haematoma, vertebral angiogram, vertebral artery haemorrhage

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INTRODUCTION

Retropharyngeal haemorrhage is a rare but potentially life-threatening condition. This entity is usually treated conservatively or via open surgery. This case report describes a novel approach in the management of retropharyngeal haemorrhage with angiography, and subsequent embolisation of a bleeding branch vessel with protective distal balloon occlusion.

CASE REPORT

A 90-year-old Chinese man presented with a history of trauma, having been found on the floor of his living room. He was known to have atrial fibrillation and was treated with aspirin (75 mg per day) and digoxin. He had no pre-existing disease in the region of his neck, nor a history of smoking or alcohol abuse. On physical examination, he was alert and normotensive. His neck swelling progressed quickly within five minutes of the initial Emergency Department consult. He was also developing increasing stridor. Haematological profile and coagulation tests were normal.

Laryngoscopy revealed compression of the trachea posteriorly, more on the left side. He was intubated. Computed tomography (CT) of the neck showed a large low-density retropharyngeal haematoma, without peripheral enhancement, that extended from the skull base to the mediastinum. The trachea was displaced anteriorly and compressed. An ill-defined high-density collection of contrast agent was noted within the haematoma. This was located approximately 1.5 cm below the right carotid bifurcation, at the level of the C4 vertebral body (Fig. 1). This was suspicious for active extravasation of contrast agent.

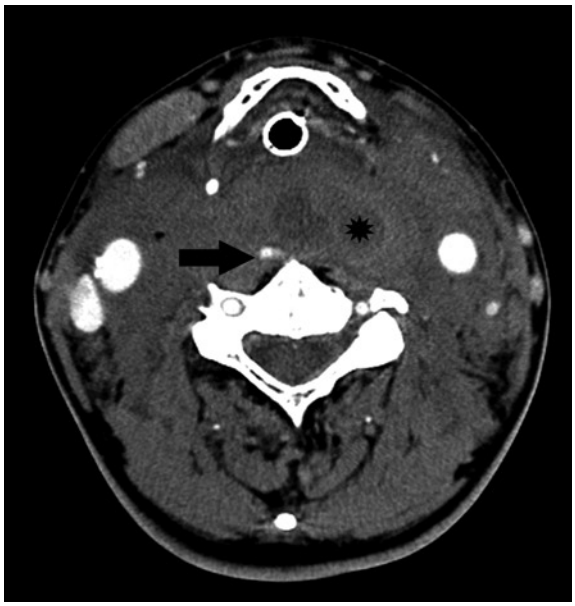
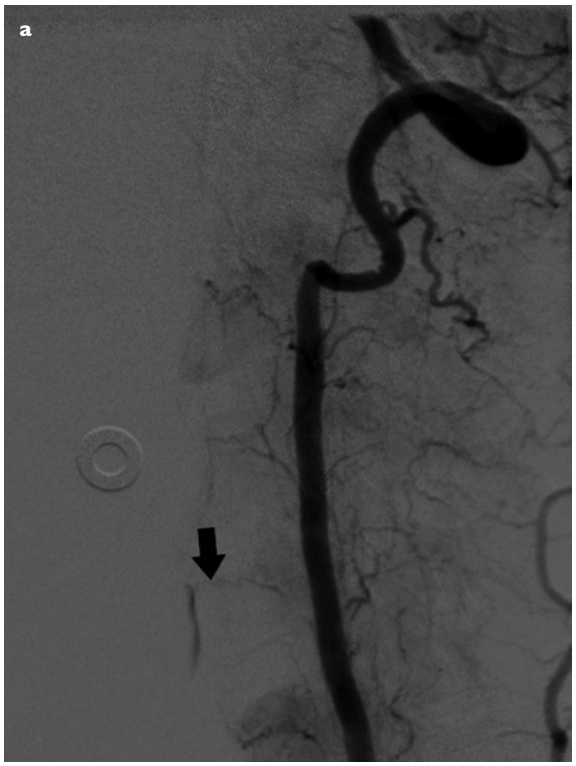


Fig. 1 Contrast-enhanced axial CT image taken at C4 vertebral level shows a large retropharyngeal haematoma with mass effect on the trachea (asterisk). The patient is intubated. Note the pool of high-density contrast material suspicious for active extravasation (arrow). The haematoma extends inferiorly to the mediastinum (not shown).



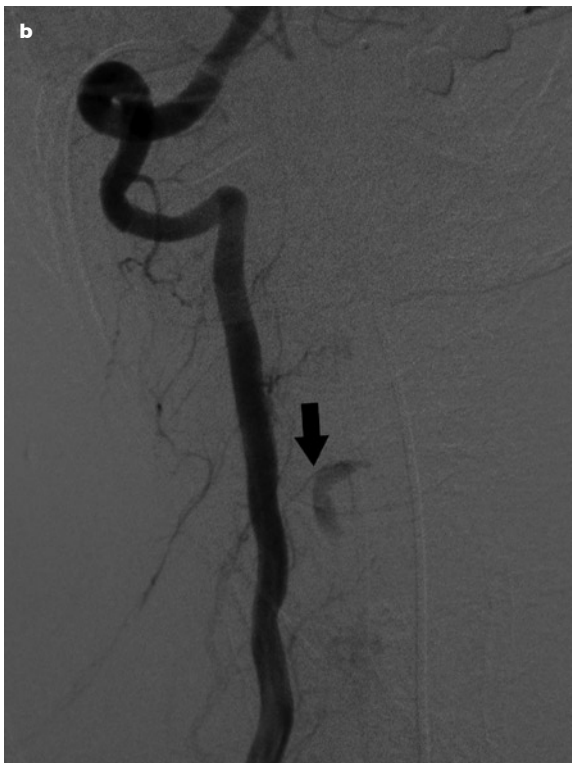


Fig. 2 Selective (a) left and (b) right vertebral artery angiograms taken in the lateral projection reveal extravasation of contrast medium. Fine branches arising from both vertebral arteries (arrows) contribute to the bleeding point.

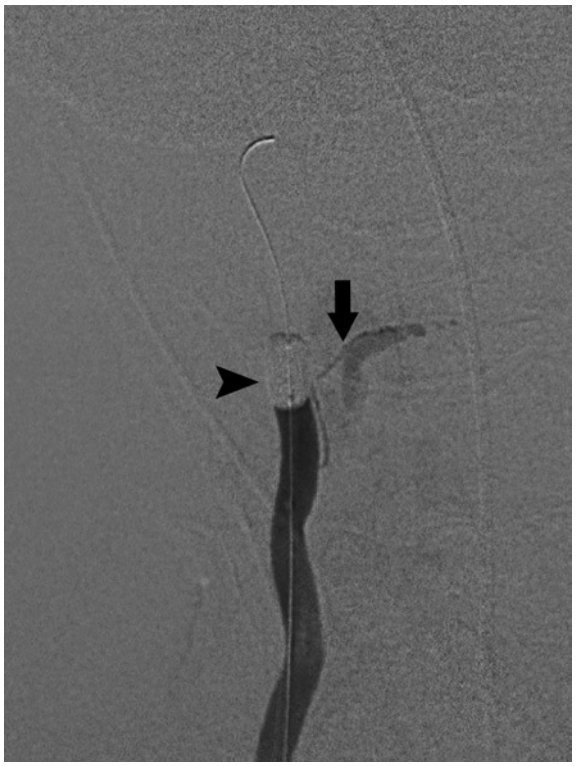


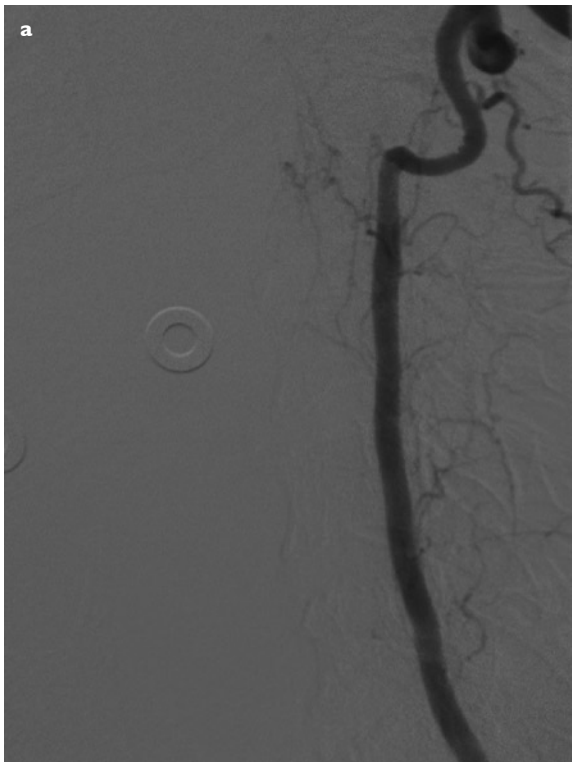
Fig. 3 Selective right vertebral angiogram shows a temporary occlusion balloon (arrowhead) placed distally and flow into the small branch vessel (arrow). PVA particles were injected at this point.

Bilateral external carotid, subclavian and common carotid arteriograms were negative. The right vertebral artery angiogram showed extravasation of contrast agent arising from a small branch artery, at the C4 vertebral level. The left vertebral artery angiogram also showed faint opacification of the contrast agent extravasation (Fig. 2). As the otolaryngologist and neurosurgeons felt that these vessels would be difficult to approach and localise operatively, endovascular treatment was recommended. At this point, either placing a covered stent within the right vertebral artery to exclude the bleeding vessel or flooding with polyvinyl alcohol particles was considered. As the right brachiocephalic artery was tortuous, it was not possible to advance a large-bore guiding catheter for stent placement. Hence, a decision to occlude the bleeding branch with polyvinyl alcohol (PVA) was made.

As the branch vessel was too small for superselective cannulation with a microcatheter, flooding of the vertebral artery using PVA suspended in contrast agent with distal flow protection was performed with the intent of reflux occlusion of the small branch vessel. After ensuring adequate retrograde filling of the contralateral vertebral arteries bilaterally, temporary distal flow arrest of the right vertebral artery with a temporary 7 × 7 mm microcatheter-based occlusion balloon (Hyperform, Micro Therapeutics, Irvine, CA, USA), mounted on a 0.01-inch hydrophilic guidewire through

a 0.037-inch outer diameter, 0.027-inch inner diameter microcatheter (MASSTRANSIT®, Cordis Neurovascular, FL, USA) was performed (Fig. 3). This was followed by gentle infusion of 150-250 μm of PVA (Contour, Boston Scientific Target Meditech, Watertown, MA, USA). Thorough gentle suction of contrast through the microcatheter at the level of the small branch vessel was then performed, prior to re-establishment of flow in the parent artery.

The post-embolisation angiogram showed good flow in the right vertebral artery and its branches, with the exclusion of the branch that previously had contrast agent extravasation (Fig. 4a). Repeat left vertebral artery showed no contrast agent extravasation, hence embolisation of the left vertebral branch was not performed (Fig 4b). The patient subsequently underwent surgical evacuation of haematoma and was successfully extubated three days later. He was transferred out of intensive care three days later, and discharged after another week's stay in the general ward. He had no further recurrence of haematoma and did not have any neurological deficit.



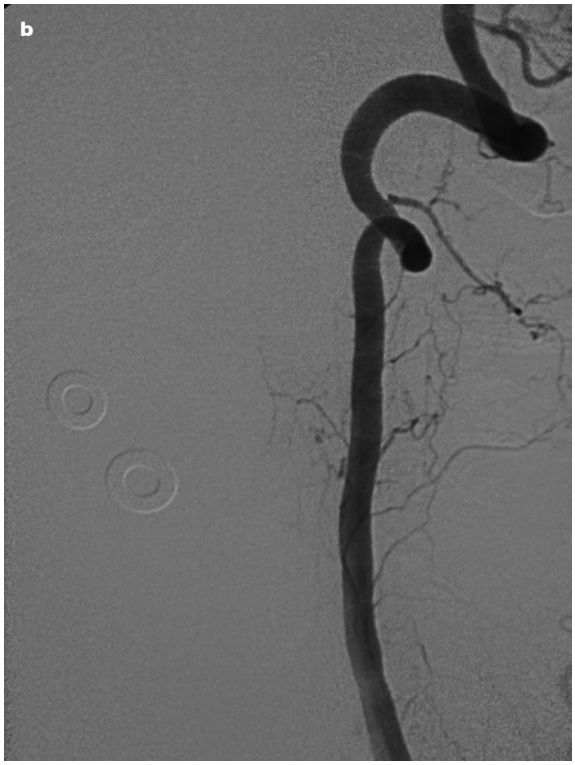


Fig. 4 Selective (a) left and (b) right vertebral artery angiograms taken in the lateral projection show no more contrast medium extravasation.

DISCUSSION

Retropharyngeal haematoma is a rare non-inflammatory cause of progressive blood loss and rapid airway obstruction. Most reported cases implicate bleeding diathesis, trauma, carotid artery rupture, paraesophageal veins, infection, parathyroid adenoma rupture, metastasis, foreign body ingestion or iatrogenic causes[1]. Our patient was taking 75 mg of aspirin daily, which may or may not have predisposed to bleeding after minor trauma. Classically, signs of cervicomediastinal haematoma constitute Capps triad[2]. This comprises tracheal and oesophageal compression, anterior displacement of the trachea, and subcutaneous bruising over the neck and anterior chest. Capps triad may not always be present. The patient may present with sore throat without stridor, which may lead to an initial diagnosis of pharyngitis or abscess.

Depending on the rate of haemorrhage, rapid increase in neck swelling may not be apparent. Anatomical communication of the retropharyngeal space with the mediastinum allows a large amount of bleeding, potentially without significant neck swelling. Furthermore, the insertions of the pharyngeal muscles which displace toward their origins with continued expansion of haematoma, provide no resistance to gradual accumulation of blood[1]. Laryngoscopy usually shows pharyngolaryngeal swelling with no sign of the bleeding source, leading to an initial tentative diagnosis of retropharyngeal tumour or haemorrhage.

Radiological investigation of these patients usually begins with CT of the neck. This may reveal a well-defined, midline collection separating the posterior pharyngeal wall from the prevertebral muscles[1]. No peripheral enhancement is expected, and the collection should be low attenuation overall[1]. However, if there is active bleeding, a "swirl" of hyperdensity can be seen internally, giving rise to a heterogeneous appearance overall. The major differential diagnosis on CT is tumour or inflammation.

Tumours of the retropharyngeal space comprise nasopharyngeal carcinomas, lymphoma, haemangioma and metastasis. These tend to exhibit strong, fairly homogeneous contrast enhancement. Occasionally, enlarged lymph nodes may be seen, which increases the diagnostic confidence for a tumour. In this case, the "swirling" appearance and rapid neck enlargement clinically argue against a diagnosis of tumour. Inflammation, on the other hand, may present with rapid onset neck swelling, as in this case. The patient is usually pyrexial and CT may show inflammatory stranding of the surrounding tissues. Occasionally, a rim-enhancing abscess may be seen in conjunction with suppurative cervical lymph nodes. Our patient was apyrexial, and CT did not show any significant inflammatory fat stranding.

Magnetic resonance (MR) imaging is sensitive to blood products and can demonstrate the evolution of a haematoma, based on the paramagnetic signal properties of blood. While the evolution of intracranial haematoma is predictable, the MR appearance of extracranial haematoma is variable[1]. Within a few hours of haematoma, blood products demonstrate increased T1- and T2-weighted signal intensity, with corresponding loss of signal due to susceptibility artifact on gradient-echo sequences[1].

Angiography is not usually performed in cases of retropharyngeal haematoma, but was indicated in our case as CT was suspicious for active extravasation. Reconstructions of the CT images revealed a suspicious vessel in the region of extravasation. Recognised blood supply to the retropharyngeal tissues arises from branches of the external carotid artery, the pharyngeal trunk of the ascending pharyngeal artery, as well as the vertebral artery[3]. The small branch identified angiographically in our patient may have arisen from muscular arterial branches of the vertebral artery.

Embolisation of the bleeding vessel in our patient was undertaken because of the significant rate of active extravasation. The endovascular approaches considered in this case included deployment of a covered stent to exclude the origin of haemorrhage or particle embolisation. Vertebral artery sacrifice was ruled out as there was contribution from both vertebral arteries. Placement of covered stents within the vertebral arteries has been performed in cases of pseudoaneurysm[4]. While long-term outcomes are lacking, the immediate and short-term evidence shows good exclusion of aneurysms. In our situation, we felt that the small calibre of the branch vessel would allow thrombosis and immediate cessation of bleeding after stent placement. However, the tortuous right brachiocephalic artery in this patient excluded passage of a large-bore guiding catheter for stent placement.

Temporary distal flow arrest with particle embolisation was carried out in this case. Temporary proximal flow arrest and microcoil embolisation of the vertebral arteries have been described[5,7]. The aim of proximal flow arrest, when used, is to prevent passage of distal microemboli into the intracranial circulation. This is different from placement of a balloon distal to the embolisation site as in this case, but the objective is the same, i.e. to prevent emboli from reaching the intracranial circulation. Care must also be taken not to inject too much particles at one time in order to avoid inadvertent reflux of particles down the vertebral artery and into its branches proximally.

To date, we are not aware of any other report on the use of distal flow arrest with particle embolisation in the vertebral artery[6]. There exists one other case report describing endovascular management of retropharyngeal haematoma. Van Velde et al described active bleeding in the region of the left thyrocervical trunk in their patient, which was then treated with Ivalon polyvinyl alcohol particles[6]. Theoretically, after protective temporary balloon occlusion of the vertebral artery, injection of contrast agent should show flow into the bleeding branch vessel. It is important to first demonstrate adequate retrograde filling of the distal vertebral artery, and ensure that the microcatheter tip is placed as close to the origin of the branch vessel as possible. Particle embolisation can then be performed slowly.

After completion of embolisation, thorough suctioning to remove excess particles within the parent artery is done. It is impossible to ascertain if all excess particles are removed as we are only guided by elimination of the contrast agent. Hence, the potential risk of stroke should be explained. To

minimise potential ischaemia, inflation time of the balloon should be as short as possible. Barr and Lemley, in describing temporary flow arrest for microcoil embolisation in the carotid and vertebral circulations, reported no neurological deficit after 15 minutes of arterial occlusion[7]. In our patient, it was kept to 12 minutes, which was within the safety limit.

Following successful occlusion of the right vertebral artery bleeder, selective angiogram of the left vertebral artery no longer demonstrated the small branch vessel, nor active extravasation of contrast. We postulate that PVA embolisation had occluded the main bleeder, thus obliterating the contributing branches from both vertebral arteries. Choice of occlusion material in this case was dictated by the small calibre of the vessel. PVA is available in a number of sizes which are compatible with injection through a microcatheter, ranging from 150-250 μm to 1,000 μm[8]. It causes an immediate inflammatory reaction within the endothelium with resultant long-term occlusion.

In summary, we describe a new approach to the management of retropharyngeal haematoma, using angiographical identification of an unusual bleeding vessel with contributions from both vertebral arteries. In this case, endovascular particle embolisation and distal flow arrest allowed stabilisation of the patient, while avoiding potentially hazardous surgery in an actively haemorrhagic operative field.

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