

## Neuroradiology

## Peripatetic carotid artery simulating a carotid dissection on catheter angiography and CT angiography: a case report

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## ABSTRACT

Retropharyngeal carotid arteries are a common clinically relevant anatomic variant. “Peripatetic” carotid arteries refer to change in position to and from a retropharyngeal location, and are a newly described finding. Knowledge of this phenomenon is important to avoid potential procedural complications as well as misdiagnosis. We present a unique case of a peripatetic carotid artery simulating a carotid artery dissection during a catheter angiogram and subsequent CT angiogram. To our knowledge, this has never been described in the medical literature.

## 1. Introduction

Retropharyngeal carotid arteries are a commonly known anatomic variant, with clinical relevance predominantly due to their risk of iatrogenic injury [1–4]. “Peripatetic” or “moving” carotid arteries are an only recently described phenomenon, defined by change in position of the carotid artery to and from a retropharyngeal location [5,6]. Awareness of peripatetic carotid arteries is important to avoid these potential iatrogenic complications, as well as misdiagnosis.

The prevalence of retropharyngeal carotid arteries is estimated between 2.6 and 18.2% [3,6]. Peripatetic carotid arteries are rarely described in the medical literature, and were first documented in a 2013 case report [5]. However, a 2016 study reported that 6.3% of patients had a documented change to or from a retropharyngeal position between comparison studies, suggesting a higher prevalence than expected [6].

To our knowledge, a case of a peripatetic carotid artery that resulted in contrast stasis simulating a carotid artery dissection has never been described. Recognition of this case may have important management implications. Carotid dissections are commonly treated medically with anticoagulation and antiplatelet therapy, though endovascular stent placement and even surgical treatment are possible interventions in certain clinical settings [7–9]. Appropriate diagnosis of a peripatetic carotid artery with contrast stasis simulating a dissection would prevent these unnecessary and potentially invasive interventions.

## 2. Case report

A 60-year-old woman with a history of previously coiled intracranial aneurysms presented for diagnostic catheter angiography.

Initial AP and lateral 2D angiograms of the right ICA acquired with the catheter tip placed in the right distal common carotid artery were uneventful. However, slow washout of contrast was noted immediately after acquisition of a subsequent power injected 3D digital subtraction angiogram. The catheter was then withdrawn entirely, and a single shot AP image demonstrated a standing column of contrast spanning the length of the right common carotid artery (Fig. 1). The patient remained neurologically intact. The exam was halted, and the patient was admitted to the ICU for medical management, including serial neurologic assessments.

Two hours after the catheter angiogram, the patient underwent a CT angiogram (CTA) to confirm the angiographic findings (Fig. 2). This CTA appeared consistent with the presumed dissection. However, the standing column of hyperdense contrast along the vessel wall appeared to start at the origin of the common carotid artery from the brachiocephalic artery, whereas it had been clearly recorded that the catheter tip at the time of the 3D angiogram was in the distal common carotid artery just proximal to the bifurcation. This was considered unusual but there was no obvious explanation for this phenomenon.

The patient's ICU course was initially uncomplicated, but 2 days later the patient complained of brief facial numbness. A repeat CTA was performed (approximately 58 h after the initial catheter angiogram), revealing no acute abnormalities, no evidence of dissection, and disappearance of contrast within the previously identified presumed false

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Fig. 1. Catheter angiogram. Single shot image from catheter angiogram demonstrates a standing column of contrast spanning the right common carotid artery.

lumen (Fig. 3). Also, the course of the right common carotid artery was significantly different; while it was retropharyngeal on the first CTA, it was more lateral in the neck and not retropharyngeal on the repeat CTA. The patient continued to do well and was discharged 5 days after the initial presentation.

### 3. Discussion

We have described a case of a peripatetic carotid artery with contrast stasis simulating a carotid artery dissection during catheter angiography and subsequent CTA. This case demonstrates the characteristic finding of a change in position of the carotid artery at two separate time points, as well as a static contrast column that disappears without any evidence of a dissection flap, thrombus, stenosis, nor intimal irregularity within a very short duration. A true carotid dissection in this scenario was considered unlikely since there was complete resolution of the static contrast column within 2 days with no residual anatomic nor symptomatic sequelae, and the abnormality correlated with the course of the carotid artery. Rao et al. has previously shown the mean time to complete or near-complete anatomic resolution for a carotid dissection to be 11.2 months [7]. Vessel spasm was thought to be less likely due to a few reasons. The tip of the catheter was in the distal common carotid artery during the 3D acquisition that resulted in slow washout of

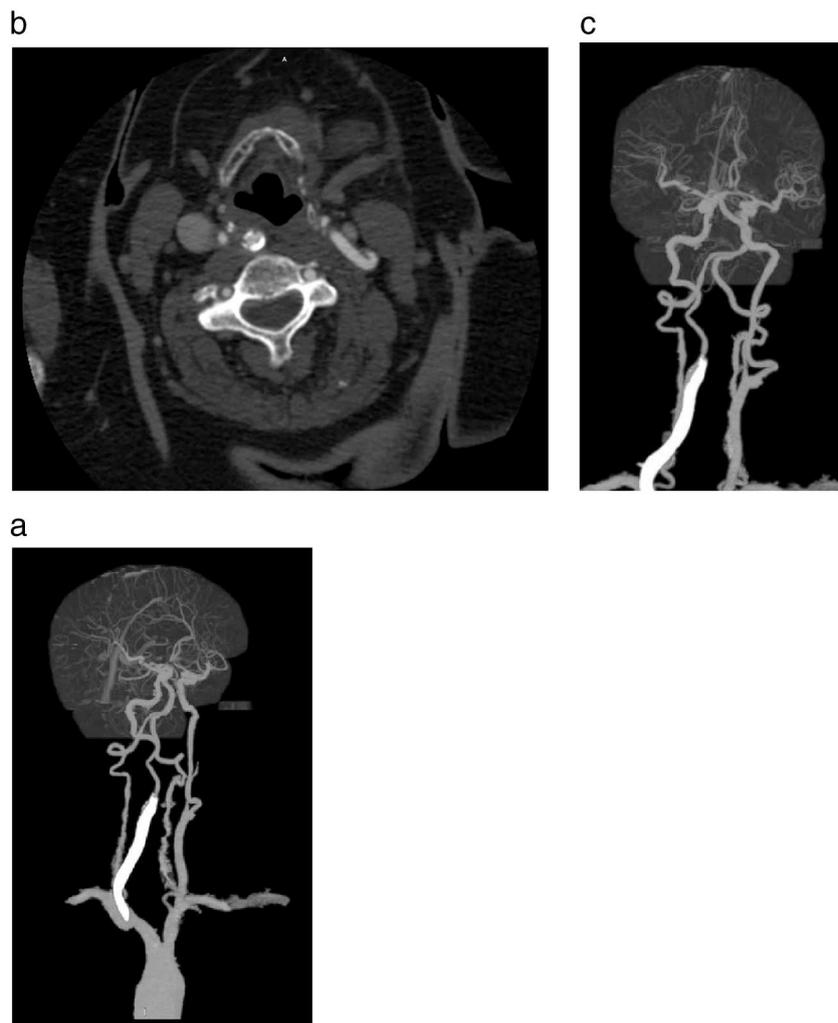
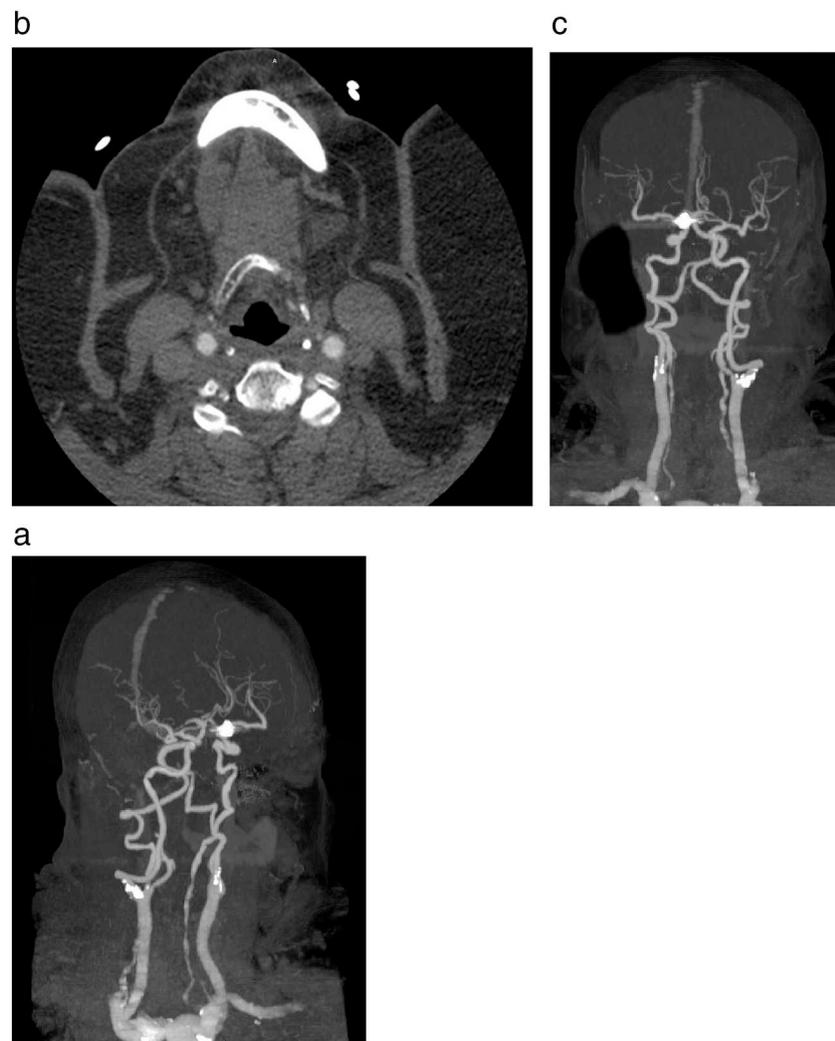


Fig. 2. Initial computed tomography angiogram. Axial CTA image (a) and coronal and RAO maximum intensity projection images (b,c) show contrast within an apparent “false lumen” in the right common carotid artery, along with severe stenosis of the apparent right common carotid artery true lumen. Note that the contrast within the apparent “false lumen” is increased in attenuation compared to the contrast from the CTA. The right internal carotid artery takes a retropharyngeal course.



**Fig. 3.** Subsequent computed tomography angiogram, 2 days later. Axial CTA image at the same level as Fig. 2a (a) and coronal and RAO maximum intensity projection images (b,c) demonstrate no dissection flap, and no dense contrast in the right common carotid artery. The proximal cervical internal carotid artery is far more lateral than on the prior study, and no longer takes a retropharyngeal course.

contrast, but the standing contrast column was seen to commence much more proximally from the origin of the common carotid artery. If this was catheter induced spasm, one would expect the standing column to commence close to the catheter tip. Also, the contrast column persisted for several hours after the catheter had been pulled down after injection, making spasm less likely. The lack of a flap, thrombus, stenosis, or any intimal irregularity, in combination with the drastically different positions of the carotid artery on the initial and subsequent CTA examinations, make a peripatetic carotid artery with ‘trapped’ contrast along part of the lumen simulating a dissection the most likely diagnosis. The contrast was ‘trapped’ for at least 2 h, and resolved at an unknown time point prior to the second CTA, which was performed 58 h after the contrast column was initially identified.

The etiology behind such a phenomenon is unclear. Previous theories for peripatetic carotid arteries include variation in pharyngeal wall diameter and position of the hyoid bone during the respiratory cycle, as well as the internal carotid artery being temporarily held in a retropharyngeal position by the tip of the greater cornu of the hyoid bone after pharyngeal contraction during swallowing [5,6]. Our hypothesis, similar to what was proposed at the 48th Annual Meeting of the American Society of Head and Neck Radiology by Lu et al., is that the peripatetic carotid artery may be secondary to dehiscence of the carotid sheath fascia, with subsequent extrusion of part of the carotid artery through the fascia medially [10,11]. Prior histologic studies have

demonstrated the presence of thin or interrupted carotid sheaths on examinations of cadaveric specimens [12]. Given the medial course, we theorize that the ‘medial herniation’ may be secondary to dehiscence through the middle layer of the deep cervical fascia as it attaches ventrally to the superficial layer of the deep cervical fascia, and dorsally at the deep layer of the deep cervical fascia. The contrast column seen in the medial common carotid artery and proximal internal carotid artery on the initial CTA images in our case would therefore be explained by the intact portions of the carotid sheath pinching against the extruding part of the carotid artery, trapping contrast within the carotid artery external to the sheath, thereby creating a physiological false lumen but without a dissection. The herniation through the carotid sheath likely spans a long segment of the carotid artery, leading to an overall medialized course of the artery rather than a focal kinking. On the subsequent CTA image, the carotid artery returned to a lateral position, back entirely within the carotid sheath, thereby removing any trace of the trapped portion of the vessel and therefore contrast material; moreover, there was no evidence of vascular injury.

The clinical significance of peripatetic carotid arteries is currently unknown, and may be a future area of study. Potential complications include dislodgement of small emboli, or transient narrowing of the carotid artery caused by the carotid artery displacement [10]. Recognizing and understanding the CTA appearance of peripatetic carotid arteries may guide future studies on this phenomenon. Furthermore,

awareness that a peripatetic carotid artery with trapped contrast can mimic a carotid dissection after angiography could affect diagnosis and ultimately management. This entity should be considered when there is a retropharyngeal course of the carotid artery, a persistent contrast column in the medial carotid artery, and no visible dissection flap or intimal irregularity. In an asymptomatic patient with these findings, a short-term follow-up CTA can be considered prior to treatment, especially in cases of significant treatment risk. If the subsequent CTA performed hours or days later demonstrates no contrast column or evidence of prior dissection, as well as movement of the carotid artery from a retropharyngeal to lateral position, then a peripatetic carotid with contrast trapping should be considered the diagnosis.

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