

Traumatic Bilateral Carotid Artery Dissection and Stroke Following Dog Bite: A Rare Case of Bilateral Hemispheric Stroke

CASE REPORT

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ABSTRACT

A 36-year-old woman presented to the emergency department after sustaining significant neck trauma from a dog bite, leading to bilateral carotid artery dissection and bilateral intracerebral stroke. The case involved complex injuries, including fractures of the cricoid and thyroid cartilage, and required an interdisciplinary approach for successful management. This unique presentation highlights the critical need for awareness and management strategies for severe dog bite injuries, and it offers insights into the challenges of diagnosing and treating traumatic bilateral carotid artery dissection. This case contributes to the limited literature on dog bite-related traumatic bilateral carotid injury and subsequent stroke, illustrating the importance of timely multidisciplinary care and public safety awareness.

KEYWORDS

dog bite, bilateral carotid artery dissection, bilateral stroke, trauma

INTRODUCTION

Extracranial internal carotid artery (ICA) dissection is a rare but potentially life-threatening condition, typically resulting from trauma, such as blunt or penetrating injuries. Common symptoms include cervical pain, swelling, hematoma, and masses, and patients are at high risk for complications including rupture, hemorrhage, thromboembolic events, ischemic stroke, and cranial nerve dysfunction, all of which significantly increase morbidity and mortality.^{1,2} While most cases of ICA dissections stem from traumatic incidents, animal bites are an exceptionally uncommon cause. In fact, the literature contains only a few reports of carotid injuries caused by dog bites.³⁻⁶

This case report presents a 36-year-old woman who suffered bilateral carotid artery dissections following a severe dog bite to the neck, resulting in bilateral strokes. To the best of our knowledge, this is one of the few documented cases of bilateral carotid artery injury from an animal bite.

CASE PRESENTATION

A 36-year-old female presented to the emergency department with significant neck trauma after a dog attack. She was reportedly knocked to the ground and bitten on the neck by a large wolf-husky mix, resulting in multiple injuries. Her family recounted that the attack caused her to fall and hit her head on the concrete. Upon arrival, the patient had a Glasgow Coma Scale score of 15, but she was noted to be stridulous, with complaints of hemoptysis, hematemesis, and voice changes. Given the concern for airway compromise, she was promptly intubated.

As seen in [Figure 1](#), initial imaging via computed tomography angiography (CTA) of the head and neck revealed bilateral traumatic carotid artery dissections: a dissection of the right common carotid artery (CCA) ([Figure 1A and C](#)) and a dissection of the left cervical ICA ([Figure 1B and D](#)). Additional injuries included fractures of the cricoid and thyroid cartilage and a posterior hypopharyngeal wall injury. The presence of extensive subcutaneous emphysema was also noted in the neck, chest wall, and axilla, suggesting deep soft tissue trauma. Due to the complexity of her injuries, a multidisciplinary team was involved in her care.

In the trauma operating room, the primary trauma team performed an initial exploration of the neck. The carotid artery was carefully inspected, revealing no visible injury, bleeding, bruising, or hematoma. Anatomical observations included a high carotid bifurcation and aberrant anatomy in the high neck. With no penetrating injury identified, the trauma team concluded the procedure, allowing the ENT team to proceed with repairs on the cricoid and thyroid cartilage fractures through open reduction and fixation.

Following the initial neck exploration, the neurointerventional radiology (NIR) team conducted digital subtraction angiography (DSA) after an initial CTA showed bilateral carotid artery dissections. These injuries were suspected to be blunt carotid artery injuries due to the trauma mechanism and the findings from the initial

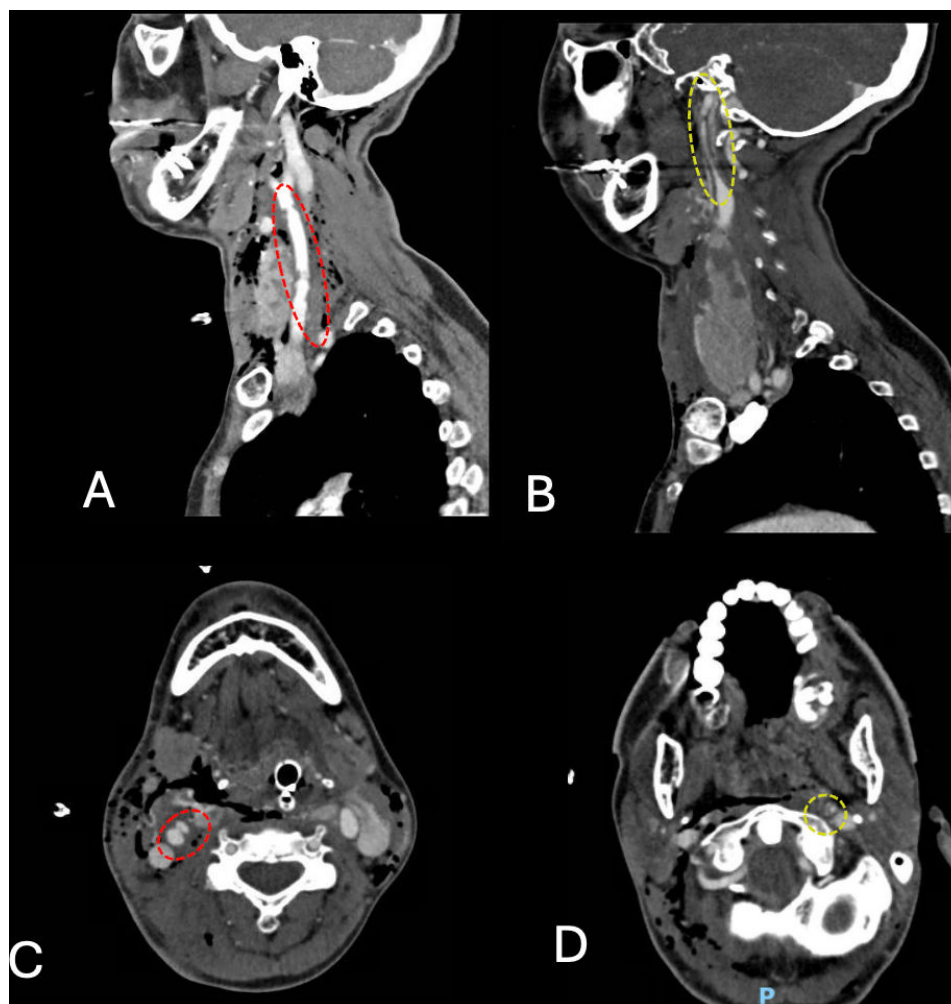


FIGURE 1. Sagittal (A) and axial (C) CT angiography (CTA) images show a right common carotid artery dissection (circled in red), evidenced by intimal irregularity. Additional sagittal (B) and axial (D) CTA images demonstrate a left internal carotid artery dissection (circled in yellow), featuring a long segmental dissection with potential occlusion of the distal cervical portion near the vertical petrous segment.

exploration. As seen in Figure 2, DSA confirmed a grade 2 dissection of the left ICA with a critical 91% flow-limiting stenosis, increasing the risk for ischemic complications. Figure 3 shows the right CCA having tandem grade 2 dissections with raised intimal flaps but no significant flow limitation. Given the high-grade stenosis on the left ICA, the neurointerventional team performed stenting, which improved cerebral perfusion. In contrast, the right CCA dissection, which did not exhibit significant flow limitation, was to manage conservatively at that moment with close monitoring and medical therapy.

After further review of the angiogram findings and considering the mechanism of the blunt-force trauma, the vascular surgery team decided to re-explore the right neck to address the injury. The right neck was explored again, and an interposition graft with a bypass was performed on the right CCA using the harvested right saphenous vein. This provided a stable bypass for the affected segment of the right carotid artery. Postoperatively, the patient was started on dual antiplatelet therapy with 325 mg aspirin and 75 mg Plavix daily, with initial loading doses given intraoperatively. A heparin infusion was initiated to prevent thrombus formation, and systolic blood pressure was maintained below 140 mmHg to protect the stented vessel.

OUTCOME

Forty-eight hours post-surgery, the patient demonstrated decreased motor function in her left upper and lower extremities and was unable to be weaned off mechanical ventilation. MRI imaging indicated embolic strokes with small infarcts throughout the right hemisphere and within the left frontal lobe.

The patient was hospitalized for a total of 36 days, during which she was stabilized and ultimately discharged with dual antiplatelet therapy and a walker to assist with residual weakness. At her follow-up appointment, approximately 2.5 weeks post-discharge, she demonstrated a full recovery, having returned to her baseline pre-injury strength.

DISCUSSION

This case of bilateral carotid artery dissections leading to bilateral ischemic strokes due to a dog bite is exceedingly rare, with few cases documented in the medical literature.³⁻⁶ Typically, dog bites result in superficial injuries, such as lacerations or puncture wounds, that do not threaten major vascular structures. However, when a bite involves large vessels like the carotid arteries, it can lead to severe complications, including vessel dissection and pseudoaneurysm formation, potentially causing ischemic events.

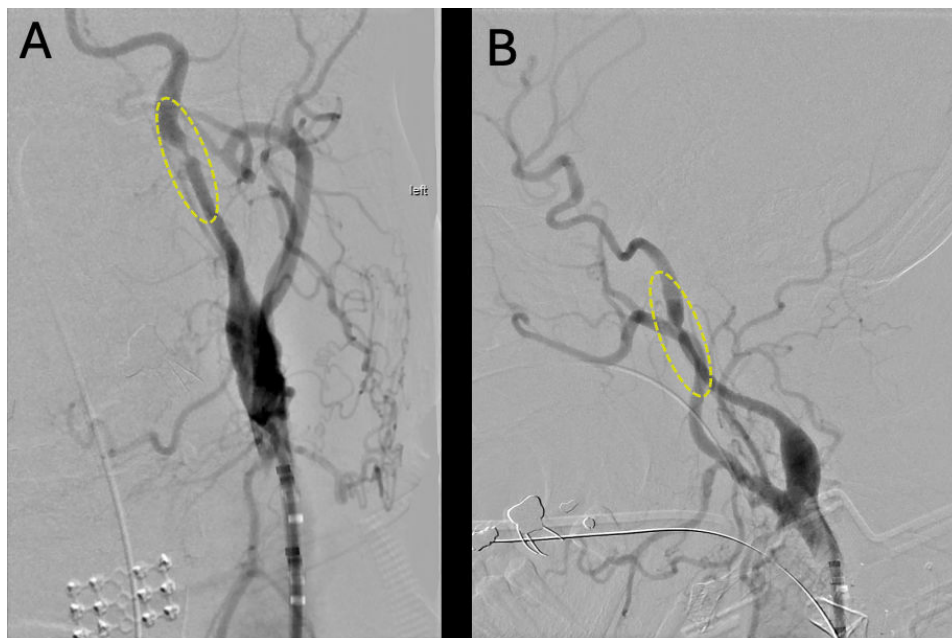


FIGURE 2. Oblique (A) and lateral (B) angiographic images of the left internal carotid artery show a patent origin but demonstrate a focal area of severe stenosis in the distal cervical segment, with approximately 91% narrowing as per the North American Symptomatic Carotid Endarterectomy Trial (NASCET) criteria, leading to distal flow delay. The left external carotid artery is patent at its origin, and the visualized portions of the external carotid artery and its branches appear normal without signs of ulceration or stenosis. No evidence of arteriovenous shunting is noted.

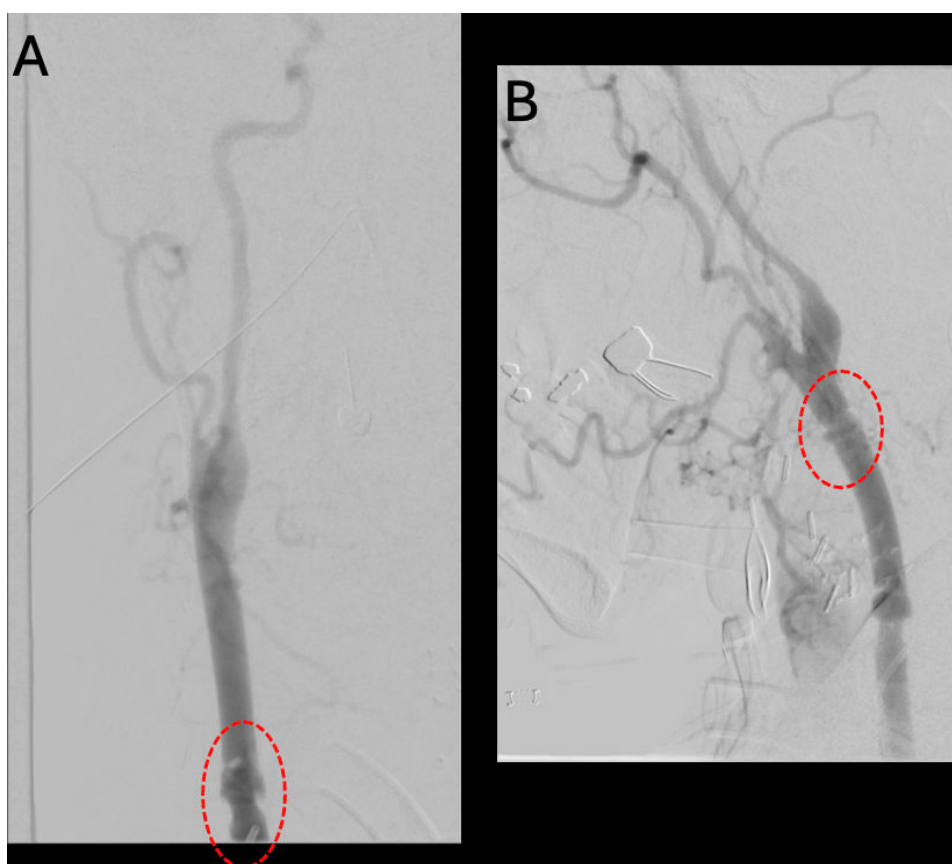


FIGURE 3. Anterior/posterior (A) and lateral (B) angiographic images of the right common carotid artery reveal two focal areas of dissection (circled in red) with raised intimal flaps, with the distal dissection located just proximal to the carotid bifurcation. The right external carotid artery is patent at its origin, and the right internal carotid artery (ICA) shows no evidence of injury (B). Visualized segments of the external carotid artery and branches appear normal without signs of ulceration or stenosis. The distal cervical and intracranial segments of the right ICA demonstrate normal filling without occlusion or stenosis.

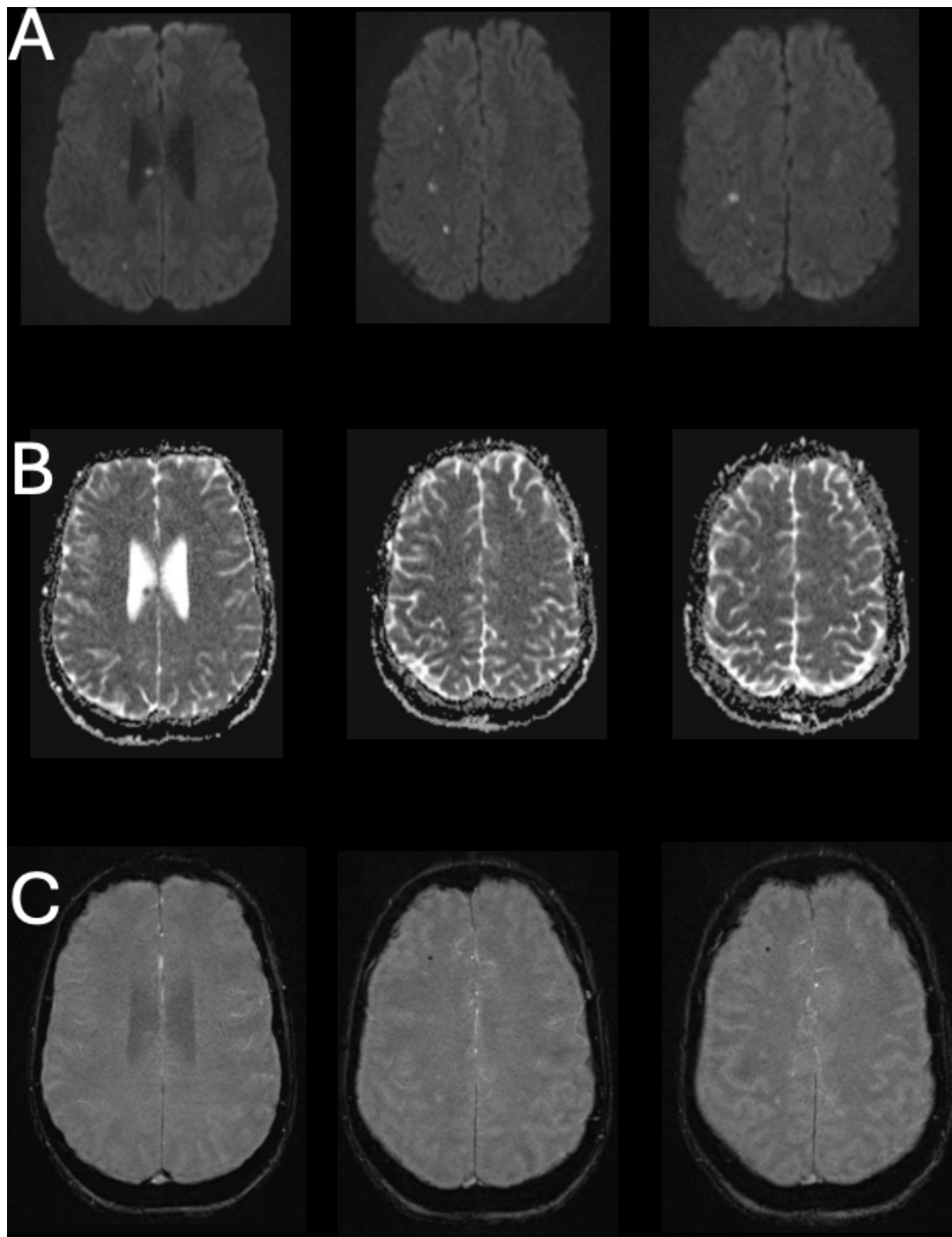


FIGURE 4. (A) Diffusion-weighted imaging (DWI) reveals multiple small infarcts scattered throughout the white matter in both the right and left cerebral hemispheres, which are confined to the anterior circulation. (B) The apparent diffusion coefficient (ADC) matches some of these infarcts, suggesting their acute nature. (C) Susceptibility-weighted imaging (SWI) indicates a single right frontal lesion. All of the acute infarcts seen on DWI/ADC are non-hemorrhagic, confirming an embolic rather than hemorrhagic origin.

Figure 4 demonstrates multiple small infarcts in the white matter of both cerebral hemispheres, as seen on diffusion-weighted imaging and apparent diffusion coefficient. These infarcts are scattered and within the carotid artery territories. Susceptibility-weighted imaging shows that most of these lesions are non-hemorrhagic, supporting an embolic rather than hemorrhagic origin.

Figure 5 adds further context, as fluid-attenuated inversion recovery (FLAIR) MRI imaging reveals abnormal hyperintensity

in the bilateral white matter, suggesting tissue injury or edema. T2-weighted imaging reinforces these findings, highlighting the same hyperintense regions in the bilateral white matter.

Strokes caused by traumatic vascular injuries are generally unilateral and confined to specific vascular territories; the presence of bilateral strokes indicates trauma to both carotid arteries, increasing the risk of severe outcomes. This case highlights the unusual but critical vascular risks associated with high-impact dog bites to the neck, emphasizing the importance

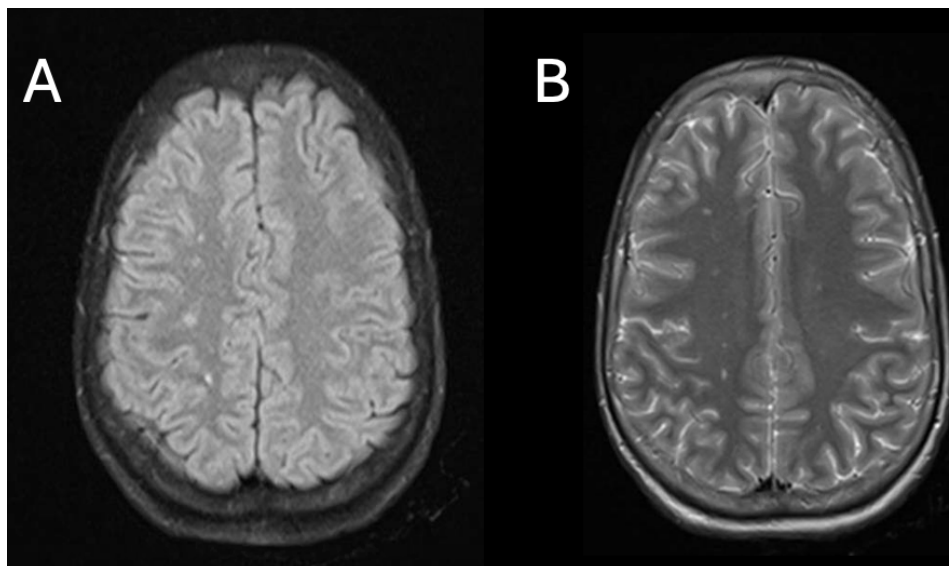


FIGURE 5. (A) FLAIR imaging reveals abnormal hyperintensity in the bilateral white matter, indicating areas of potential tissue injury or edema. (B) T2-weighted imaging further emphasizes these regions, highlighting the same areas of hyperintensity in the bilateral white matter.

of early neurovascular imaging and intervention to identify and manage such life-threatening complications.

Additionally, the involvement of the left and right carotid arteries necessitated a multifaceted treatment approach, including stenting for the left ICA and a right saphenous vein bypass on the right CCA. This approach aimed to address both immediate flow limitations and the risk of further embolic events, the essential role of rapid, comprehensive management in rare and complex traumatic stroke presentations.

LEARNING POINTS

1. **Rare cause of bilateral stroke:** Traumatic bilateral carotid artery dissections caused by a dog bite resulting in bilateral ischemic strokes is an exceedingly rare event.
2. **Importance of early imaging and diagnosis:** In cases of trauma involving the neck, especially when involving large vessels like the carotid arteries, early imaging is essential. CTA and angiography can provide crucial insights into vessel integrity, guiding timely interventions that may prevent or limit ischemic damage.
3. **Tailored interventional approach:** The management of carotid artery dissections must be individualized based on injury grading. In this case, a grade 2 flow-limiting left ICA dissection was treated with stenting, while the non-flow-limiting grade 2 injuries on the right side were managed surgically.
4. **Multidisciplinary care is essential:** The complexity of injuries involving both vascular and structural components of the neck requires a coordinated approach. In this case, NIR, vascular surgery, trauma surgery, and ENT specialists all played pivotal roles in managing different aspects of the patient's injuries.
5. **Recognition of the psychological and emotional impact:** Traumatic events involving familiar animals, like family pets, add a unique emotional burden for patients and their families. This highlights the importance of incorporating psychological support into the care plan for such cases, as recovery extends beyond physical healing.⁷

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Patient consent

The Institutional Review Board (IRB) and Ethics Committee at the University of Tennessee Health Science Center designated this case study as exempt, as it does not include any Protected Health Information (PHI) and involves fewer than five cases. Informed consent for publication was initially sought but could not be obtained despite multiple attempts using all available contact numbers in the EMR system. Patient privacy has been rigorously safeguarded by ensuring that no PHI is included in this case report.

Contributors

Molly Rodgers (MR), Dr. Vamsi Gorijala (VG), Alise Hanisian (AH), Amelia Brewer (AB), Dr. Diti Vinuthna Lavu (VL), Dr. Jenson Ma (JA), and Dr. Andrew Wilner (AW) were involved in the care of this patient. Jason Sims (JS) and JA analyzed the diagnostic imaging, with JS specifically analyzing the angiographic images. JS and AW performed critical revisions and editing of the manuscript. All authors reviewed and approved the final manuscript for submission. During the preparation of this work the author(s) do not declare use of generative AI and AI-assisted technologies in the writing process.

Conflicts of interest

We declare that we have no conflicting interests that could affect or be perceived to affect the integrity of our work, decisions, or recommendations related to this paper. Each member of our group confirms that they have no financial, personal, or professional relationships that could be seen as a conflict of interest in this context.

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