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Neuroimaging Highlight

Acute Vertebral Artery Dissection in the Context of Bilateral Duplicated Vertebral Arteries

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Unilateral vertebral artery duplication, defined as dual origin of vertebral artery with variable proximal course and distal fusion in the neck, is an uncommon normal developmental anatomic variant. It has been hypothesized that this is related to failure of controlled regression of intersegmental arteries during days 32–40 of embryogenesis.[1] On review of literature, these can occur on either side (prevalence 0.3% on Computed Tomography Angiography (CTA)),[2] with a small predilection to the left (1.6:1.0).[3] Bilateral duplication of the proximal vertebral arteries is rare, with only three cases documented.[4–6] Two of the cases had an asymmetric branching pattern, as in the presented case, and one had symmetric branching. Whether unilateral or bilateral, these are often detected incidentally on noninvasive imaging performed for other reasons. Although some authors have suggested these could cause dizziness/vertigo and increase risk for aneurysm, dissection, thrombosis, kinking, and vascular malformations related to altered flow dynamics, no strong correlation has been shown.[7,8]

We present to our best knowledge, the fourth case of bilateral vertebral artery origin duplication, and the first case where this normal variant anatomy had clinical importance. A 33-year-old male sustained a gunshot wound with an entry point at the anterior right neck, resulting in complex fractures involving C5 to T2 vertebrae, including burst fractures at C6 and C7. There was scattered bullet shrapnel, with the largest metallic fragment (0.5 cm) seen in the posterior spinal canal at the level of C6–C7. On the left, the duplicated vertebral artery had the anterior branch originating from the aortic arch (between the left common carotid and subclavian arteries) and the other mildly larger posterior branch originated as the first branch from the left subclavian artery (Figure 1). The anterior branch traversed the carotid space and fused with the posterior branch (which entered the left transverse foramen at C6–C7) at the level of C4–C5 transverse foramen. On the right, both vertebral arteries arose from the right subclavian artery with the anterior branch traversing the right carotid space and joining the posterior branch (which enters the right transverse foramen at C6–C7) at the level C4–C5 transverse foramen. Secondary to the penetrating neck trauma and cervical spine fractures, the patient sustained acute right posterior branch vertebral artery dissection with non-opacification of the vertebral artery from its origin up to the level C5, just proximal to its merging point on CT neck angiogram. The anterior branch remained patent. Follow-up CTA in 3 months demonstrated complete occlusion of that branch. There was no evidence of ischemic infarct on unenhanced CT head. Prior imaging of the neck demonstrating duplicated vertebral arteries was unavailable at the time of dictation, and Figure 2 was misinterpreted as a pseudoaneurysm arising from an aberrant single right vertebral artery that subsequently resolved.

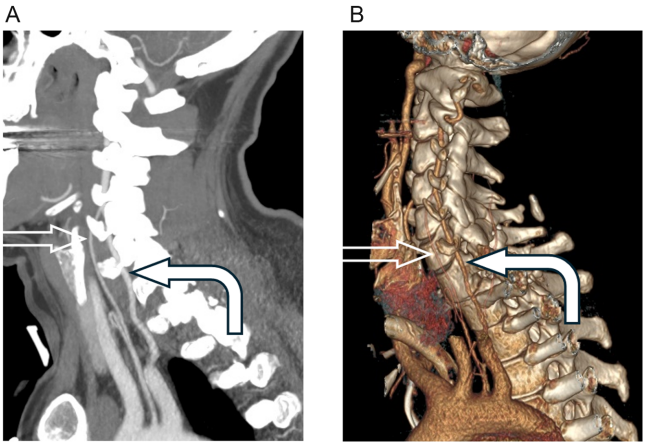

Figure 1. (a) Sagittal oblique CT angiogram showing the left anterior branch (empty white arrow) and left posterior branch of the vertebral arteries (curved white arrow); (b) 3D reconstruction of the left vertebral artery after gunshot injury.

Those who interpret neuroimaging should be aware of bilateral vertebral duplication as a rare anatomical variant to avoid misinterpretation. Duplicated vertebral arteries may result in added redundancy and robustness to the posterior arterial circulation and could be beneficial and protective to the brain's vascular supply.

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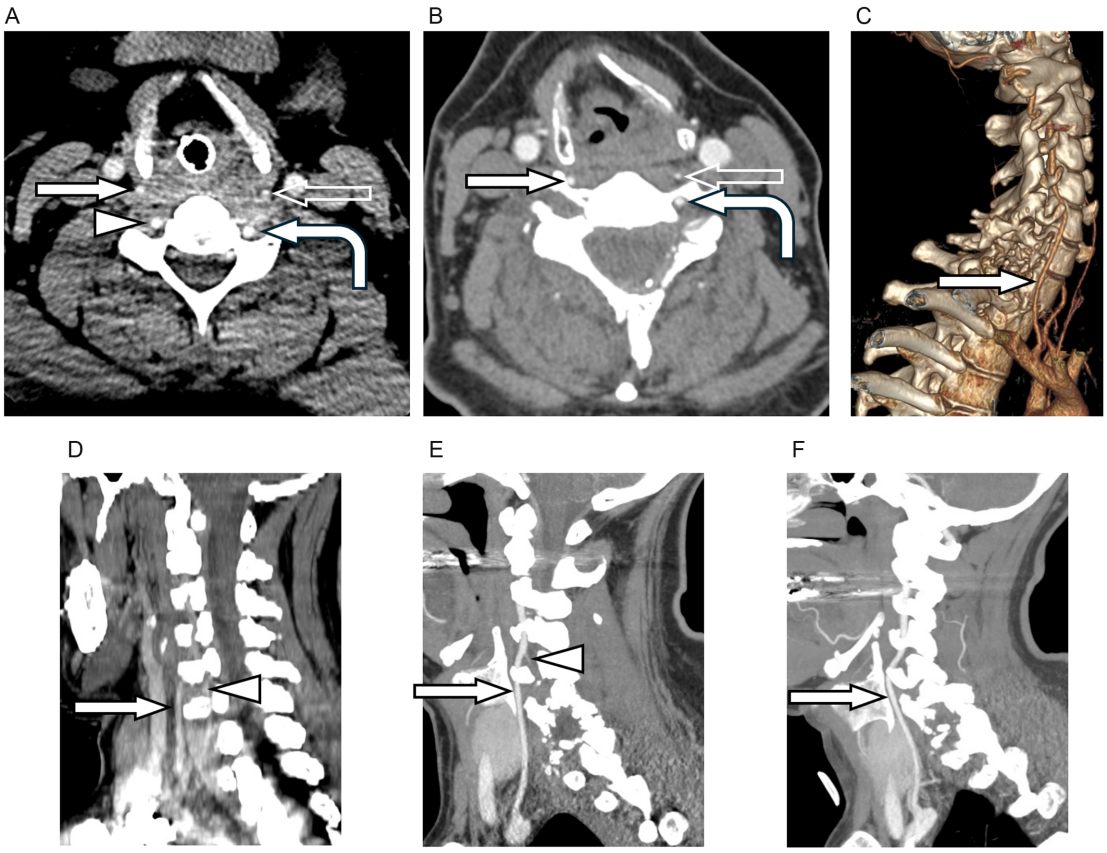

Figure 2. (a) Contrast enhanced axial CT before gunshot injury showing the right anterior branch (solid white arrow), right posterior branch (white arrowhead), left anterior branch (empty white arrow), and left posterior branch of the vertebral arteries (curved white arrow); (b) CT angiogram after gunshot injury showing non-opacification of the right posterior branch; (c) 3D reconstruction of the right vertebral artery after gunshot injury; (d) contrast enhanced sagittal oblique CT before gunshot injury showing the anterior and posterior branches of the right vertebral artery; (e) sagittal oblique CT angiogram after gunshot injury showing acute dissection of the right posterior vertebral artery with trace contrast opacification at C4-C5 (white arrowhead) and patent anterior branch of the right vertebral artery; (f) sagittal oblique CT angiogram 3 months after gunshot injury showing complete non-opacification of the posterior branch of the right vertebral artery.

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Competing interests. None.

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