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Single Case – General Neurology

Sequential Bilateral Vertebral Artery Dissections with Prompt Resolution of Initial Insult

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Keywords
Ischemic stroke · Dissection · Vasculopathy · Vertebral artery

Abstract
Vertebral arterial dissection is a known cause of stroke in young adults. There has been a multitude of cases of bilateral vertebral dissections, including progression from one vertebral artery to another. This case reports the curious sequential nature of the healing of a previously dissected vertebral artery with subsequent dissection of the collateral vertebral artery. Follow-up neuroimaging evaluation performed several months later showed healed bilateral vertebral artery. The potential trigger was neck cracking.

Case Presentation

A 32-year-old right handed man presented to the emergency room with persistent dizziness and neck pain for the past 3 days. He was discharged home 1 month prior after being diagnosed with a cerebellar infarction secondary to a spontaneous right vertebral artery dissection (Fig. 1, 2, 3). The clinical presentation of the first event was headaches associated with

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dizziness and right beating nonpersistent horizontal nystagmus. He reported to occasionally cracking his neck during his initial admission but reported not cracking his neck during his second admission. His family history was pertinent for a spontaneous left cervical carotid dissection in his mother at the age of 41 years. He had no history of illicit drug use, alcohol abuse, or cigarette smoking. General examination was normal. No abnormal body habitus. No blue sclera. No skin abnormalities like cutaneous xanthomas or other abnormalities suggestive of connective tissue disease were observed. The neurologic examination during his second admission was normal and symptoms of neck pain and dizziness resolved within 24 h. Neuroimaging studies performed during his second admission included MRI of the brain and MRA of the head/neck initially and then followed by CTA of the head and neck. MRI brain during his second admission showed no evidence of recurrent cerebral or cerebellar infarction; however, MRA of the head showed an intracranial vertebral artery narrowing most consistent with arterial dissection on the left and recanalization of the previously seen right vertebral dissection during his prior admission (Fig. 4, 5). Additional investigations including lipid profile hemoglobin A1C, and other routine testing were within reference laboratory values. He had further testing, including alpha-1 antitrypsin levels, CTA of the renal arteries, genetic testing for COAL3A4 (vascular Ehlers-Danlos), and homocysteine levels that were all unremarkable. Antinuclear antibody screen test was negative (test performed using HEP 2 cells and screened at 1:40 dilution); however, anti-RNP (ribonucleoprotein) antibodies were 38 units (normal reference range: <20 units). Rheumatology revaluated the patient and their impression was that the slightly elevated anti-RNP antibodies were nondiagnostic and that the patient did not meet all criteria for the diagnosis of mixed connective tissue disease. The patient was initially started on aspirin and clopidogrel; however, he was unable to tolerate clopidogrel due to an allergic reaction, hence he was continued on aspirin monotherapy. In addition, the patient was also started on statin therapy. He was discharged home asymptomatic and with a normal neurologic examination. Follow-up neuroimaging evaluation performed several months later showed resolution of left vertebral dissection. Statin therapy was discontinued and he was maintained on low-dose aspirin therapy.

Discussion

Cervicocephalic arterial dissection is a known cause of stroke in young adults. The most commonly identifiable cause is trauma; however, the underlying etiology is frequently unclear. There are many cases diagnosed as spontaneous arterial dissections with underlying predisposing risk factors. Observational studies have recognized an association between several types of minor trauma and cervicocephalic arterial dissections [1]. Neck cracking has been associated with vertebral artery dissection; however, causality is difficult to establish [2]. Weather neck cracking played a role as the underlying cause in this patient's recurrent multivessel vertebral artery dissections is not completely clear. Anti-RNP antibodies were of questionable significance. Thus far, there are reported cases of cervicocephalic vertebral dissection associated with mixed connective tissue disease. Nonetheless, Ohki et al. [3] reported a case of an intracranial dissecting aneurysm involving the posterior cerebral artery. The decision to start him on statin therapy was based on indirect evidence of vessel remodeling [4].

Bilateral vertebral artery dissection has been reported in multiple scenarios including subarachnoid hemorrhage, acute disseminated encephalomyelitis (ADEM), sports related, in association with osteogenesis imperfecta, as the initial presentation of Cushing's syndrome, trampoline use, cervical spine manipulation, postpartum period, eclampsia and HELLP, labor and delivery, essential thrombocytopenia, dynamic arterial compression, blunt trauma, connective tissue aberrations, Hirschsprung's disease, syphilis, fibromuscular dysplasia, chiropractic manipulation, facial massage, neck cracking, roller coaster ride, and various gene mutations. Table 1 and Table 2 provide a summary of selected reported cases of bilateral vertebral dissections in association with particular diseases [5–41].

This case should encourage new research to better understand the process of healing of a dissected vertebral artery. Our case is unique since our patient exhibited successive spontaneous intracranial vertebral dissections with evidence of prompt (within 1 month) resolution of the initially dissected vessel. The intriguing mechanism of these events could be related to an underlying connective tissue disease (positive family history) in association with minor trauma (neck cracking).

Statement of Ethics

The authors confirm obtaining written consent from the patient for publication of the manuscript.

Disclosure Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Author Contributions

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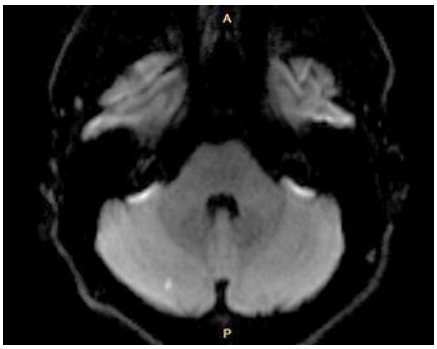

Fig. 1. Axial diffusion-weighted image showing a punctate region of an acute right inferior cerebellar infarction.

Fig. 2. Reconstructed MRA showing evidence of decreased flow in the distal right vertebral artery.

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Fig. 3. Reconstructed CRA showing evidence of decreased flow in the distal right vertebral artery.

Fig. 4. Reconstructed MRA during the second admission showing evidence of decreased flow in the distal left vertebral artery with resolution of the previously seen right vertebral artery.

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Fig. 5. Intracranial view of reconstructed MRA during the second admission showing evidence of decreased flow in the distal left vertebral artery with resolution of the previously seen right vertebral artery.

Table 1. Cerebrovascular diseases with reported associated bilateral dissections of vertebral arteries

Cerebrovascular and Related Disorders	
SAH	Subarachnoid hemorrhage with bilateral intracranial vertebral artery dissecting aneurysms [5]
Cerebral sinus venous thrombosis	Intracranial bilateral vertebral artery dissection during anticoagulation after cerebral venous and sinus thrombosis (CSVT) [6]
Cystic medial necrosis	Fatal bilateral vertebral artery dissection in a patient with cystic medial necrosis [7]
Intracranial aneurysm	Bilateral spontaneous dissection of the posteroinferior cerebellar arteries [8]
Essential thrombocythemia	A rare case of bilateral vertebral artery dissection associated with essential thrombocythemia [9] Bilateral vertebral artery dissection and essential thrombocythemia with JAK2 mutation [10]
Reversible cerebral vasoconstriction	The link between migraine, reversible cerebral vasoconstriction syndrome and cervical artery dissection [11]
Connective Tissue Disease	
Connective tissue disease	Bilateral vertebral artery dissection and unilateral carotid artery dissection in case of Ehlers-Danlos syndrome type IV [12] Bilateral vertebral artery dissection, agenesis of both ICAs, and connective tissue aberrations [13]
Infectious	
Syphilis	Bilateral vertebral artery and internal carotid artery dissecting aneurysms due to syphilis [14]
Viral meningitis	Vertebral artery dissection associated with viral meningitis [15]
Autoimmune	
ADEM	Bilateral vertebral artery dissection in the setting of ADEM [16]
Metabolic/Endocrine/Toxic	
Cushing's syndrome	Bilateral vertebral artery dissection revealing Cushing's syndrome [17]
Pregnancy Related	
Cesarean section	Reversible cerebral vasoconstriction syndrome and bilateral vertebral artery dissection presenting in a patient after cesarean section [18]
Pregnancy	Bilateral vertebral artery dissection causing a cerebrovascular accident in pregnancy [19]
Postpartum period	Bilateral carotid and vertebral artery dissection: a life-threatening cause of postpartum headache [20]
Preeclampsia and HEELP	Bilateral thalamic infarct caused by spontaneous vertebral artery dissection in pre-eclampsia with HELLP syndrome [21]
Genetic and Congenital Disorders	
Single-nucleotide polymorphism of PHACTR1	Spontaneous bilateral cervical internal carotid and vertebral artery dissection in a Japanese patient without collagen vascular disease with special reference to single-nucleotide polymorphisms [22]
PAI-1, MTHFR C677T, and ACE	Spontaneous bilateral vertebral artery dissection secondary to PAI-1, MTHFR C677T, and ACE gene mutations in a young man [23]
Osteogenesis imperfecta	Progressive bilateral vertebral artery dissection in a case of osteogenesis imperfecta [24]
Afibrinogenemia	Bilateral vertebral artery dissection in a patient with afibrinogenemia [25]
Hirschsprung's disease	Bilateral vertebral artery dissection with familial Hirschsprung's disease [26]
Fibromuscular dysplasia	Follow-up of intracranial aneurysms in patients with fibromuscular dysplasia [22]

Table 2. Cerebrovascular diseases with reported associated bilateral dissections of vertebral arteries (continued)

Trauma/Minor Trauma	
Cervical spine manipulation	Locked-in syndrome due to bilateral vertebral artery dissection after cervical spine manipulation [27] Vertebral artery injury during cervical discectomy and fusion in a patient with bilateral anomalous arteries in the disc space [28] Postoperative bilateral vertebral artery dissection (cervical discectomy) [29]
Neck cracking	Patient with only associated trauma with recent self neck cracking [2]
Sports	Spontaneous bilateral vertebral artery dissection during a basketball game [30] Combined thrombolysis in posterior circulation stroke caused by bilateral vertebral artery dissection in a squash player [31] Bilateral spontaneous dissection of extracranial vertebral arteries (tennis) [32]
Inline skating	Inline skating as a possible cause of consecutive bilateral vertebral artery dissection [33]
Roller coaster ride	Bilateral internal carotid artery and vertebral artery dissections with retinal artery occlusion after a roller coaster ride [34]
Dynamic arterial compression	Dynamic arterial compression in pediatric vertebral arterial dissection [35]
Blunt trauma	Bilateral internal carotid and left vertebral artery dissection after blunt trauma [36]
Facial massage	Bilateral carotid and bilateral vertebral artery dissection following facial massage [37] Bilateral cerebellar infarction caused by intracranial dissection of the vertebral artery after long periods of Shiatsu [38]
Chiropractic manipulation	Bilateral vertebral artery dissection during chiropractic treatment [39]
Cervical traction	Vertebral artery dissection related to basilar impression: case report [40]
Temperature related	Seasonal variation in cervical artery dissection in the Hunter New England region, New South Wales, Australia: a retrospective cohort study [41]