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# Migraine-like presentation of vertebral artery dissection after cervical manipulative therapy

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## KEYWORDS

Vertebral artery dissection;  
Cervical manipulative therapy;  
Headache;  
Migraine

**Summary** Headache is the common symptom in patients with cervical artery dissection. However, it rarely occurs in isolation, without focal neurological signs, and even more rarely mimics migraine. We present a clinical case of young woman with new severe throbbing unilateral headache which started one week after cervical manipulative therapy. No history of migraine was present. Vertebral artery dissection was diagnosed after duplex ultrasound and CT angiography. Local symptoms and signs were absent, and diffusion-weighted MRI did not show any acute brain ischemic lesions. Throbbing headache gradually resolved in 10 days. Follow-up 5 months later showed near-complete normalization of lumen and flow of dissected vertebral artery. The possibility of extracranial dissection should be considered in patients with first attack of migraine-like hemicrania, especially if cervical manipulations or trauma occurred recently.

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## Introduction

Headache is the common symptom in patients with cervical artery dissection (CAD). However, it rarely occurs in isolation, without focal neurological signs, and even more rarely mimics migraine. Spontaneous CAD can be associated with minor traumas of various origin, including stretches, sudden neck movements, and chiropractic manipulation [1,2]. We present a clinical case of patient with new severe migraine-like hemicrania after cervical manipulative therapy (CMT) in whom dissection of vertebral artery (VA) was diagnosed after ultrasound and neuroimaging assessment.

## Case report

A 26 years old woman arrived to our out-patient neurological department due to persistent severe throbbing unilateral left-side headache, predominantly in the temporal region, which started 1 week ago. Nausea, photophobia, intolerance of physical activity was also present. Her clinical history revealed that three weeks ago cervical manipulations were applied for recurrent right-side neck pain which exacerbated episodically during the last few years. No other minor trauma or severe coughing was reported by patient. Dull cervical pain alleviated after CMT and resolved 1 week before the onset of pulsating hemicrania. The patient did not have attacks of episodic hemicrania or symptoms compatible with migraine aura never before.

*General examination* was unremarkable. Height of the patient was 160 cm, weight 48 kg (patient had intense training in gymnastics during adolescence). *Neurological examination* revealed no focal signs and was normal. *Extracranial color duplex ultrasound* showed typical direct signs of right VA dissection (dilation of V1 before the

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entrance into C6 vertebra (Fig. 1a), double lumen of V2 segment and narrowing of true lumen (Fig. 1b) (video supplement)) and abnormal extracranial flow (decreased flow velocities and high resistance index) in right VA (Fig. 1c). It has never been performed before. *Transcranial color coded sonography* confirmed normal flow within Willis circle (the circle of Willis), however, flow within the intracranial segment of the right VA was not detected. The *CT angiography* confirmed a long dissection of the right VA, with a large intramural hematoma and a string-like true lumen (Fig. 2). *Diffusion-weighted MRI* did not show any acute brain ischemic lesions.

Antithrombotic treatment (aspirin) was given for prevention of cerebral embolism. The possibility of endovascular stenting of the right VA was considered, however, it was not performed because of own risks of stenting related to long dissected segment and needs for multiple stents.

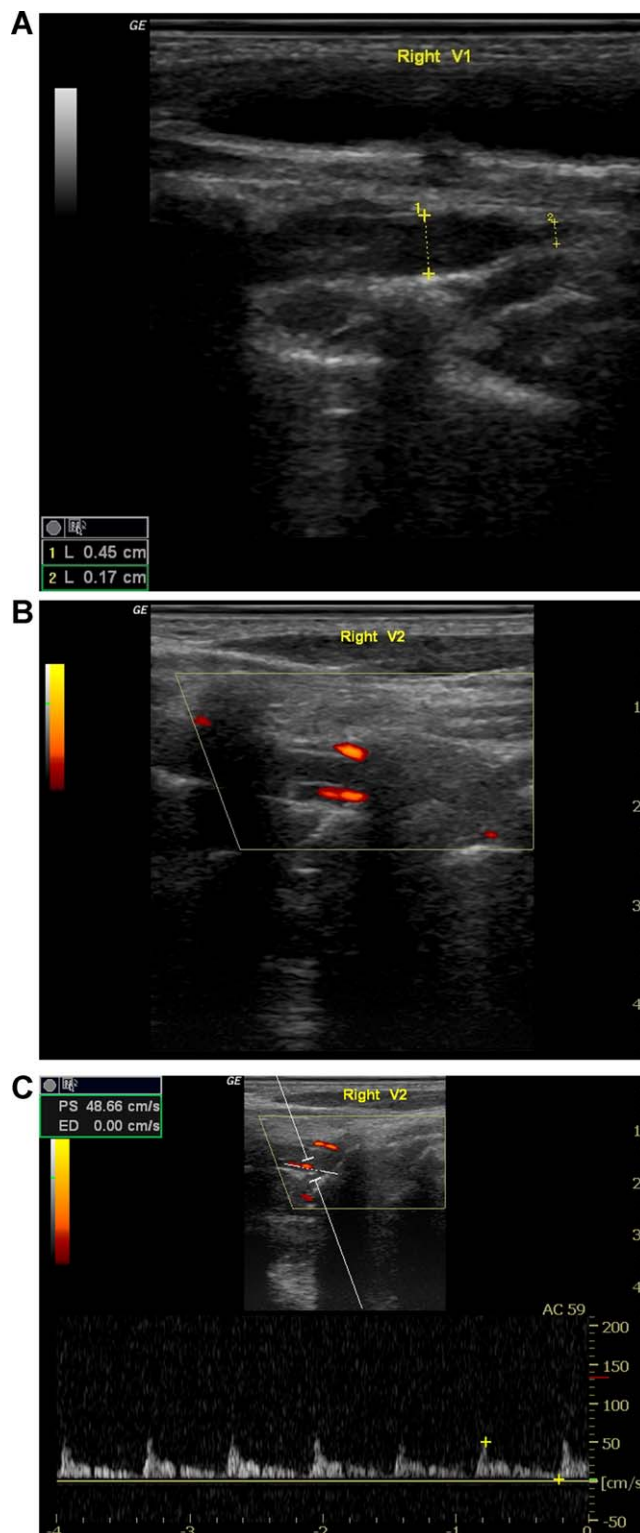
Hemicrania lasted for approximately 10 days and gradually resolved. Follow-up 1 and 5 months later showed near-complete normalization of lumen and flow of the right VA (Fig. S1 (A) and (B)). Migraine-like hemicrania did not appear again.

## Discussion

The characteristics of pain associated with CAD are not specific and can sometimes resemble migraine or even cluster headache [3]. CAD with isolated pain might be more common than expected and is more often caused by extracranial VA dissection [4]. Recently a clinical case of VA dissection presenting with isolated occipital headache was published [5]. In a large series of CAD patients in whom pain was the only symptom, the pain was continuous in most cases, and headaches were mostly of a severe intensity and throbbing quality, whereas neck pain was more commonly constrictive and of moderate intensity [4]. The onset type ranged from thunderclap headache to progressive pain. In our case pain was intensive, throbbing, started gradually and mimicked migraine, however, it lasted much more than typical migraine attack. Interestingly, hemicranial left-sided pain started on the contralateral side to the dissection of right VA. No local symptoms and signs or ischemic manifestations occurred.

The cause of cervical artery dissection remains disputed. The most likely pathological mechanism is the trauma (torsional or stretching) of the arterial wall causing a tear in the intima that separates the intima from the tunica media. The mechanism and the severity of external trauma sufficient to cause dissection varies from blunt and penetrating external to trivial trauma such as coughing, or torsion of the neck as in forced head rotation on chiropractic manipulation or sporting injuries [6].

Though recognized as therapy for spinal pain for thousands of years, manipulation of the spine has been performed since the 18th century to treat, or even prevent, symptoms of neck pain, muscle tension and migraine without any medical or scientific background. There has been significant discussion and debate about the possible association between VA dissection and CMT. The first recorded case of fatal brain stem infarction due to vertebrobasilar vessel injury after neck manipulation was in 1947 [7].



**Figure 1** (a) Extracranial color duplex ultrasound: dilation of V1 before the entrance into C6 vertebra. (b) Extracranial color duplex ultrasound: double lumen of V2 segment and narrowing of true lumen. (c) Extracranial color duplex ultrasound: abnormal extracranial flow (decreased flow velocities and high resistance index).



**Figure 2** CT angiography: dissection of right vertebral artery.

More than one-quarter of cases of stroke from VA dissection were attributed to neck manipulation in one published case series [8]. However, a clear causal relationship has not yet been established, therefore, the role of CMT in VA dissection remains a controversy that sparks debate and disagreement between neurologists and chiropractors. For example, a recent paper in *Chiropractic & Osteopathy* came to conclusions that the relationship is not causal—patients with VA dissection already present prior to the manipulation often have initial symptoms which cause them to seek care from a chiropractic physician and have a stroke some time after, independent of the chiropractic visit [9]. A cause-and-effect relationship is even less convincing when the delay between manipulation and symptoms is hours or even days [6]. The question “Does CMT cause VA dissection and subsequent ischemic stroke?” was addressed with a structured evidence-based clinical neurologic practice review [10]. Authors found burden of evidence to support a cause-and-effect relationship between CMT with VA dissection. Young vertebrobasilar artery territory stroke patients were 5 times more likely than controls to have had CMT within 1 week of the event date. The best available estimate of incidence was approximately 1.3 cases of VA dissection or occlusion attributable to CMT for every 100,000 persons <45 years of age receiving CMT within 1 week of manipulative therapy [10].

In our case we are also not able to prove a causal relationship between CMT and VA dissection, as ultrasound examination of extracranial arteries has not been performed before CMT. However, the onset of new type of headache (different from common neck pain) weeks after CMT and confirmed new VA dissection make this relationship plausible.

## Conclusions

Causative relationship between CMT and VA dissection remains unproven. However, the possibility of extracranial dissection should be considered in patients with first attack of migraine-like hemicrania, especially if cervical manipulations or trauma were present recently. CMT should not be started without ultrasound screening of extracranial arteries in cases of atypical neck pain.

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## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.permed.2012.03.010>.

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