Vertebral artery dissection: Intelligently using CT Angiography with vascular reconstruction imaging for timely diagnosis and management

Ali Zohair Nomani¹, Haris Majid Rajput², Mansoor Iqbal³, Mazhar Badshah⁴, Rao Sohail Yasin Khan⁵, Zakir Jan⁶, Muhammad Irshad⁷

¹-⁷ Department of Neurology, Pakistan Institute of Medical Sciences, Islamabad, Pakistan.

ABSTRACT

Vertebral artery dissection (VAD) is an important cause of stroke in the young. It can present with nonspecific symptoms and may be misdiagnosed with adverse consequences. Since VAD is a potentially treatable disease and the greatest risk of stroke in cranio-cervical dissection appears to occur in the first few weeks after dissection, prompt diagnosis is essential. We present the case of a 32 years old lady, who after neck massage, developed PICA syndrome. We performed her emergency CT brain and CT angiography (CTA) and found signs suggestive of VAD within minutes of ER arrival. One should, therefore, suspect VAD under clinically relevant scenarios and intelligently order imaging modalities. In this context, CTA is a relatively easily accessible, convenient, fast and cheap yet reliable means of reaching the diagnosis of VAD. Future studies should compare imaging techniques in well-defined, undifferentiated populations of clinical VAD suspects and imaging protocols should be standardized.

KEYWORDS: Arteria l dissections; vertebral; basilar; cervical; antiplatelets; anticoagulation; steroids; angioplasty; endovascular surgery.

INTRODUCTION

Vertebral artery dissection (VAD) is often a clinically intangible diagnosis. It often has nonspecific clinical symptoms and mostly diagnosed at stage of complications due to lack of sophisticated imaging techniques at most of the non-tertiary care setups [1, 2]. Although conventional angiography is often considered the gold standard, other noninvasive modalities are used with increasing frequency and sensitivity of Computed Tomography Angiography (CTA) for symptomatic VAD appears to be high [3, 4, 5]. Here we present a case of VAD with the objective to delineate the use of CTA in emergency department for timely recognition of VAD.

CASE REPORT

A 35 years lady presented to emergency department of our neurology stroke unit with sudden onset vomiting, hoarseness of voice, difficulty swallowing and walking. She was on oral contraceptives for the last 2 months. She had neck pain for the last 7 days and was having neck massage at the time of onset of these symptoms. Her examination revealed normal motor examination, right sided Horner’s, crossed hemisensory loss with right side of face and left side of trunk involved, right 9th and 10th nerve palsies, right sided cerebellar signs and ataxic gait with tendency to fall towards right. A clinical diagnosis of right sided lateral medullary syndrome was made. An urgent CT scan brain and CT angiography was done. CTA revealed a double lumen right sided vertebral artery at the level of C3 (Fig 1).

Axial images from cervical vertebrae upwards from C3 to foramen magnum showed a segmental dilation of right vertebral artery and occluded flow secondary to thrombus formation in V3 and V4 (Fig 2). Vascular reconstruction images showed an absent right vertebral artery (V3 and V4). CT brain revealed right sided cerebellar infarct (Fig 3).

These findings were attributed to the right vertebral artery dissection and were confirmed by consultant radiologist. The diagnosis of right vertebral artery dissection with consequent right lateral medullary syndrome was made. Predisposing factors included: use of oral contraceptives, female gender and rotational injury during neck massage.
The patient was offered antiplatelets and oral steroids resulting in near complete resolution of all the symptoms and signs within 8 weeks but residual hemisensory impairment.

Figure 1: Serial CTA images at C3 and C4 (axial view; with soft tissue attenuation)

Top image: Intact lumen of both vertebral arteries at C4 level; Bottom image: double lumen of right vertebral artery at C3 level; short arrowhead (left vertebral artery), long arrowhead (right vertebral artery).

Figure 2: Serial CTA images at C1 and foramen magnum (axial view)

Top image: Dilated lumen of right vertebral artery at C1 level (double arrowhead) and loss of arterial flow; Bottom image: absent right vertebral artery at level of foramen magnum; long arrowhead (left vertebral artery), short arrowhead (right vertebral artery).
Spontaneous dissections of the carotid and vertebral artery account for only about 2 percent of all ischemic strokes but they are an important cause of ischemic stroke in young and middle-aged patients. It accounts for 10 to 25 percent of such cases [1, 2]. Spontaneous dissections of the vertebral arteries affect all age groups but there is a distinct peak in the fifth decade of life. The overall incidence of VAD is approximately 1–1.5 per 100,000 [1, 2]. Although there is no overall sex-based predilection, women are on average about five years younger than men at the time of the dissection [6, 7].

A history of a minor precipitating event is frequently given by patients with a spontaneous dissection of the vertebral artery. Some precipitating events associated with hyperextension or rotation of the neck include practicing yoga, painting a ceiling, backing up a car, extending neck to wash hair, swinging golf club, forceful coughing, vomiting, sneezing, anesthesia and the act of resuscitation. Such neck movements, particularly when sudden, may injure the artery as a result of mechanical compression and stretching [3, 8]. Chiropractic manipulation of the neck has been associated with VAD. It has been estimated that as many as 1 in 20,000 spinal manipulations cause a stroke. While some speculate it to be a precipitating factor for VAD, others argue that it is a coincidental event often proceeding rather than preceding the dissection [9, 10].

Vertebral artery starts from the ipsilateral subclavian artery and immediately ascends upwards into the lower cervical vertebral foramina (V1 segment). It transcends the entire length of cervical column while passing from foramina of successive vertebrae right from the 6th to the 2nd (V2 segment). Here the artery passes from C2 to C1 foramina (V3 segment). Eventually it takes a sharp 180 degrees turn just above the C1 to take its course in to the skull via foramen magnum (V4 segment) [3, 6]. The V3 segment of the artery is potentially amenable to shear stretch and compression forces with likelihood of intimal tears and subsequent dissection. Such shear forces might be delivered through simple neck trauma or be part of a more complex entity including predisposition to tear.

This can be due to underlying weak connective tissue support to the artery in diseases like pseudoxanthoma elasticum, Ehler-Danlos, Marfans, osteogenesis imperfect, fibromuscular dysplasia, homocystenemia or predisposition due to cocaine abuse, alpha-1 antitrypsin deficiency, adult polycystic kidney disease, migraine or oral contraceptives. In any case, it is the extension from this segment either extra or intra cranially that leads to subtypes of VAD and its subsequent complications [7, 9].

Many of the imaging findings are nonspecific, but still may be consistent with VAD. It was the work of Fisher et al. in the late 1970s that led to the recognition of the clinical and radiological features of dissection syndromes facilitating their antemortem diagnosis. The sensitivity of CTA for symptomatic VAD appears to be high. However, classical double lumen specific to arterial dissections is not always visualized and more often only attenuation of arterial signal on CTA or identification of arterial thrombus is plausible [4, 5].

CTA supersedes Magnetic resonance Angiography (MRA) both in sensitivity of detecting anatomical abnormalities of vessels and being less costly, significantly less time consuming and more readily available at the same time [3, 4, 5]. The overall specificity of any imaging technique for symptomatic VAD, including conventional angiography, remains virtually unstudied. False positive MRIs, MRAs, CTAs, and duplex scans have all been reported. Whether findings of luminal imaging techniques alone should be considered confirmatory of VAD, remains controversial [3, 6].

Some authors contend that only techniques which image the vessel wall and demonstrate intramural hematoma are
definitive for dissection, since most forms of luminal stenosis are nonspecific with regard to underlying pathology. However, if used intelligently, CTA is a relatively easily accessible, convenient, fast and cheap yet reliable means of reaching the diagnosis of VAD [6, 10]. Findings to be looked for in CT brain should be: 1) SAH and 2) Cerebellar infarcts; those in CTA should be: 1) Double lumen, 2) Thrombus formation with occluded blood flow, 3) Segmental dilation of artery and 4) Absence of arterial continuation on reconstruction images [3, 6]. The treatment of VAD is nonetheless all the more controversial with different schools of thought including the use of steroids, antiplatelets, anticoagulants, emergency angioplasty with or without stenting or endovascular repair [6, 7].

CONCLUSION

While keeping the above in mind, it is pertinent to mention that a thorough clinical examination and targeted history is the key in making the decision of performing CTA in the first place rather than a simple CT brain. Whenever does a patient present with posterior circulation stroke, PICA in particular, VAD can only be diagnosed when one is intended to look for it. It is therefore essential for the ER doctor to be familiar with CTA findings and be able to acknowledge what and when to order appropriately, especially CTA, and what to look for. Future studies should compare imaging techniques in well-defined, undifferentiated populations of clinical VAD suspects and imaging protocols should be standardized for timely recognition and treatment of VAD.

CONFLICT OF INTEREST

The authors declare that they do not have any conflict of interest regarding this work.

REFERENCES


*Corresponding author: Dr Ali Zohair Nomani
E-Mail: alin9432@gmail.com