

Dissection of the V3-V4 due to whiplash injury: description of a non-fatal case

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Abstract

Whiplash injuries, a common sequel of road traffic accidents, may be defined as a musculo-ligamentous sprain resulting from forced acceleration/deceleration and flexion/ extension neck injury. We report a non-fatal case of vertebral right artery dissection after a minor rear-lateral collision. The injury was detected twenty-four days after trauma when a computerized tomography (CT) scan and cerebral angiography revealed multiple ischemic lesions of the right cerebellum. Digital subtraction angiography (DSA) has been the most sensitive imaging modality to describe the types and degree of vascular injury. The accuracy of such imaging allows linking several injuries with minor car crash avoiding patients seeking litigation for correct financial compensation. *Clin Ter 2020; 171(1):e7-10. doi:10.7417/CT.2020.2181*

Key words: dissection, vertebral artery, whiplash injury, CT, DSA

Introduction

Whiplash-associated disorder (WAD) of the cranio-cervical junction (CCJ) encompasses a wide and complex spectrum of signs and symptoms and risk factors seem to include personal, societal, and environmental factors (1).

Hence, in industrialized countries WAD results in significant economic burdens related to patients query for correct financial compensation (2).

The medico-legal purpose is to properly define the injuries consequence of whiplash mechanism that includes any traumatic action exerted on the structures of the neck causing sudden movements of flexion, hyperextension, or laterality, also in agreement with the type of accident reported. The clinical signs and symptoms are variable but generally included paravertebral muscles contracture with back pain and (subjective) restriction of neck movement; spine x-ray can show reduction or inversion of the physiological cervical lordosis. In rare cases the mechanism of WAD may cause vascular injuries of considerable severity, even in the absence of direct impact of the head against the rigid structures of the vehicle.

Vertebral artery injury (VAI) is frequently underdiagnosed or misdiagnosed, because victims of minor traffic accidents are not submitted to II° level imaging examinations and can remain asymptomatic for many days, especially when the VAI is damaged unilaterally.

In this report, we describe a rare vertebral artery dissection in its transition V3-V4 diagnosed 24 days after a minor rear-lateral collision. The importance of digital vascular imaging (DVI) are here highlight for diagnosing major vascular injury and guaranteeing a correct patients compensations for late neurological sequelae after minor traffic accident.

Case Report

A 23 year-old man, involved in a minor traffic collision was it on the right posterior side of his vehicle. He was admitted to Hospital Emergency Department where a minor head injury and trauma and distortion of the cervical spine was diagnosed in the absence of neurological signs. He had no medical history. The patient was discharged a few hours later with the prescription of a cervical collar for 15 days and analgesic therapy as needed.

About 24 days later the patient showed a clinical picture characterized by violent tension headache, tinnitus, and clogged left ear, as well as dissociated nystagmus, notwithstanding an apparent well-being. He was immediately transported to Hospital ED where Computed Tomography (CT) scan showed multiple ischemic lesions in the load of the vermis and of the right cerebellar hemisphere (Fig.1; Fig.2). The following angiography revealed a dissection of the transition V3-V4 of the right vertebral artery (Fig.3).

In the next months, the patient was submitted to further instrumental and neurological examinations that confirmed the diagnosis of cerebellar ischemia. He was treated with any medicines including calcium channel blocker, antithrombotics, antidepressants. As late neurological sequelae of cervical spine distortion he was affected by right cerebellar hemisyndrome with dysarthria and slight limitations in right arm and leg movements.

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Fig. 1. Cranial CT scan of posterior cranial fossa: infarctual area in the right cerebellum

Cranial CT scan of posterior cranial fossa demonstrated an infarctual area in the right cerebellum (Fig. 1).

Higher cranial CT scan (5mm) revealed the extension of the lesion in superior section of right cerebellum (Fig. 2).

DSA of the right vertebral artery (VA), in AP cranio-caudal view, showed a dissection in the pre-terminal tract of the artery, boarding the C1 lateral mass (yellow arrow).



Fig. 2. Higher cranial CT scan: infarctual area in high section of the right cerebellum

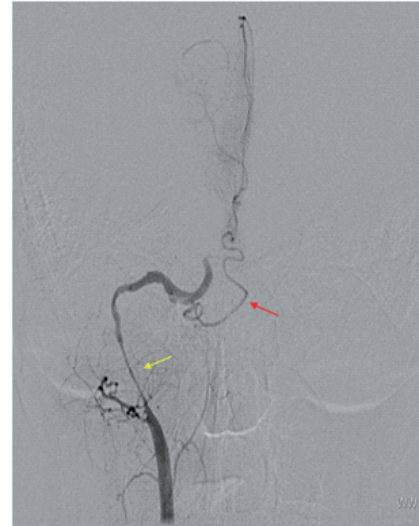


Fig.3. DSA of the right vertebral artery (VA): dissection in the pre-terminal tract of the artery, boarding the C1 lateral mass (yellow arrow); distal VA with a slightly normal diameter, and blood flow continuing in the vermian branch of right PICA (red arrow)

The distal VA presented a slightly normal diameter, but hemodynamically it continued in the vermian branch of the right PICA (red arrow). The basilar artery is injected by the contralateral VA (Fig. 3).

Discussion

In the last decade Italy had the highest percentage of insurance claims for whiplash injury in Europe, as well as the highest economic cost per person.

The reason was that Medico-Legal diagnosis of whiplash associated disorder was mostly related to cervical pain and stiffness referred by the patient and due to this lack of objectivity it was extremely difficult to establish the degree of physical impairment and therefore the correct financial compensation (3). The law 27/2012 stated the importance of cervical x-ray findings (reduction or inversion of cervical lordosis) in diagnosing cervical spine injury so that there was an increasing reduction in insurance compensation of WAD.

However it is unquestionable that the traumatic movement of hyperflexion associated with extensor recoil can involve many anatomical structures so that it could be responsible of wide range of injuries included vascular damage.

Misdiagnosed VAI has often been reported to cause acute neurologic deterioration of previously conscious patients with cervical spine injury (4,5,6).

The types of vascular injury after blunt trauma include dissection with or without an intimal flap or mural thrombus, pseudoaneurysm, occlusion, transection, and arteriovenous fistula (AVF) (7). The intima is the most vulnerable anatomic structure in the vascular wall, and its disruption results in dissection. Progression of dissection to involve the media, coupled with formation and accumulation of thrombus,

results in stenosis or complete occlusion (8). The adventitia is relatively resistant to traumatic stress, but its partial disruption results in pseudoaneurysm formation and, if complete, transection. Biffi et al (7,9) proposed a VAI grading scale according to angiographic findings, which had been originally developed for blunt carotid artery injury (CAI): grade I, dissection with less than 25% luminal narrowing; grade II, dissection with more than 25% luminal narrowing; grade III, pseudoaneurysm; grade IV, occlusion; and grade V, transection.

On the other hand, non traumatic vertebral artery dissections in young people are not so rare even in absence of specific risk factors (10).

Digital subtraction angiography has been the most sensitive imaging modality to describe the types and degree of vascular injury. Subtle intimal irregularities can be detected only with DSA. Immediate therapeutic intervention is possible after a diagnostic angiography, particularly in cases with transection or AVF (11,12). It also images both the intracerebral vascular anatomy and collateral circulation.

Computed tomography angiography has recently emerged as another potentially useful screening imaging modality for VAI (13,14,15,16,17). Patients who are identified for screening of VAI usually have indications for a CT scan of the neck and/or head, which can be performed at the same setting. In computed tomography angiography (CTA), the VA (vertebral artery) within the transverse foramen may be difficult to be imaged accurately because of bony artifacts (7,18). DSA is invasive and resource intensive; there is approximately a 1% overall risk of complications involved with DSA procedures, and the transport and monitoring necessary for performing DSA in a critically injured trauma patient create a situation that require vigilance (13,19).

Presently, the VA in the transverse foramen can be imaged reliably with the use of a multi-detector row helical CT (15,16,20,21), and several authors advocated CTA as an effective screening imaging modality for VAI (13,22,16).

Vital Hauser et al. described 8 cases of victims of a car accident that led to a wish-crash. Each of them developed a cerebral stroke with motor sensory hemiparesis, tetraparesis, neck pain, headaches, dysphasia, speech disturbance, psychomotor retardation, affective incontinence (23).

As in the case here presented, it may be difficult to establish an association between whiplash injury and the dissection of the cervical arteries, excluding other causes of vascular damage, even not known by the patient. In such cases the evaluation of victim's damage might be challenging for insurance companies, especially after minor rear collision.

Indeed the appearance of the symptomatology depends on the extent of the thromboembolic phenomena that occur after the arterial dissection. An intraluminal blood clot generally forms distal to the dissection; if the thrombus were large, it would cause a rapid decrease in cerebral flow and the early appearance of brain symptoms. This does not occur in the case of small thrombus because the cerebral blood flow deficit is compensated by the collateral circulation of the contralateral arterial system. At this stage there are no symptoms until secondary emboli are detached from the primary thrombi by the increase of cerebral flow following the vascular recanalization.

Diagnostic imaging is important to establish the association between whiplash injury and the dissection of the cervical arteries, especially when the symptoms occur many days/months later.

The common tools used were magnetic resonance imaging (MRI), Doppler sonography, angiography. Thus DVI is a valuable aid for the clinician in determining whether a traumatic event involving the cervical region may represent a real risk factor for arterial dissection and consequent cerebrovascular events.

Digital subtraction angiography has been the most sensitive imaging modality to describe the types of VAI, compared with magnetic resonance angiography (MRA), CTA, or doppler ultrasonography (DUS) (7, 24, 25, 26).

It is expected that the rapid refinement in diagnostic imaging technology may improve the diagnostic sensitivity and specificity of MRA and CTA to be comparable with that of DSA in the near future.

At the same time, insurance companies would find much less critical issues in compensating road accident victims with late neurological sequelae as in the case here presented.

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