

# Traumatic carotid artery dissection in polytrauma: is conservative treatment an adequate strategy? A case report

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## Abstract

We present the case of a 24-year-old man, involved in a car accident, with a traumatic right carotid artery dissection Grade II Blunt Cerebrovascular Injury (BCVI) according to the Eastern Association for the Surgery of Trauma (EAST). The patient arrived at our hospital without neurological symptoms and was then admit-

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ted to the Intensive Care Unit (ICU) for neurological monitoring; antithrombotic and antiplatelet therapy was initiated and in line with current literature, no routine endovascular treatment was performed. Twenty-four hours post-trauma, the patient required an urgent abdominal surgical intervention under general anesthesia. Upon awakening, he presented with left hemiplegia. The CT scan revealed hypodensity in the front-insular region prompting an urgent endovascular procedure. Fourteen days post trauma the patient was discharged from the Stroke Unit with an unchanged neurological performance, despite receiving appropriate treatment for Grade II BCVI, as recommended in current literature. Our patient developed a severe neurological disability. Further discussions are needed.

## Introduction

Traumatic Carotid Artery Dissection (TCAD) is a rare yet potentially devastating injury affecting blunt trauma patients, distinctly different from spontaneous carotid dissection.<sup>1</sup> Despite this distinction, existing guidelines, including the 2020 EAST guidelines on BCVI,<sup>2</sup> do not differentiate between spontaneous and traumatic dissection.<sup>2,3</sup> One of the most concerning complications of TCAD is stroke, which can occur in up to 20% of patients, with the highest incidence within the first 72 hours post-injury. Early initiation of Antithrombotic Therapy (ATT) and Antiplatelet Therapy (APT) (Class IIa, Level B recommendation, 2020 EAST Guidelines), has been shown to significantly reduce the risk of stroke, stroke-related morbidity, and overall mortality in BCVI patients.<sup>2,4</sup> However, administration of ATT and APT in trauma patients, who often present with elevated bleeding risk and multiple concomitant injuries, presents a clinical challenge.<sup>4,5</sup> Endovascular intervention for Grade II BCVI is suggested only if the patient's neurological status deteriorates despite conservative medical treatment (Class IIb, Level C recommendation, 2020 EAST Guidelines), primarily due to the iatrogenic stroke risk in patients without neurological deficits. Some authors suggest endovascular treatment in TCAD patients with radiological evidence of cerebral hypoperfusion.<sup>5,4</sup> In conclusion, the management of TCAD poses significant challenges, with potentially severe neurological consequences, with the absence of specific guidelines.

## Case Report

We present the case of a 24-year-old man involved in a car accident, resulting in traumatic right carotid artery dissection classified

as Grade II, with stenosis of the vessel lumen ranging between 25% and 50%, categorized as Blunt Cerebrovascular Injury (BCVI) according to the Eastern Association for the Surgery of Trauma (EAST).

After primary care outside the hospital setting, the patient was admitted to our facility's (IRCCS Policlinico San Matteo, Pavia) emergency room. His initial vital signs included a Glasgow Coma Scale 15, Arterial Blood Pressure 125/70 mmHg, Heart Rate 130 bpm, and SpO<sub>2</sub> 98% without supplemental oxygen. They have also placed a pelvic binder. Blood gas analysis revealed a Hb 13.7 g/dl, Lactate 4.4 mmol/L, and a Base Excess -3,6 mmol/l. On secondary evaluation, no neurological deficits were observed, Extended Focused Assessment with Sonography for Trauma (EFAST) and total body CT scan revealed multiple skeletal fractures (ribs, pelvic, femur, and tibia fractures), as well as a thin pneumothorax flap and a right Traumatic Carotid Artery Dissection (TCAD), from its origin till carotid siphon (Figure 1); TCAD was evaluated by both a vascular surgeon and an interventional radiologist, who determined that there was no indication for endovascular procedures due to the absence of neurological deficit in the patient.

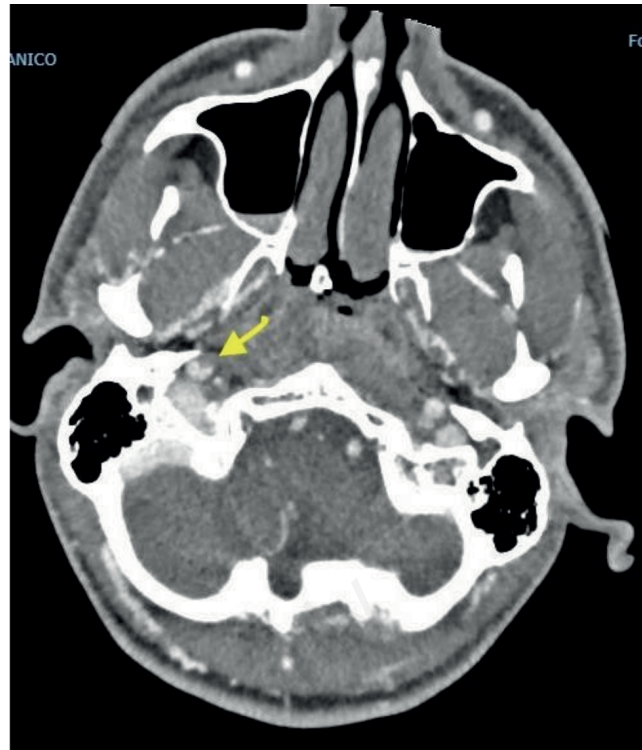
Following admission to the ICU for close monitoring; APT and ATT were started (aspirin 300 mg and enoxaparin 4000 UI) despite the increased risk of bleeding due to severe trauma, to avoid the risk of stroke. In the first hours and the whole night after the trauma, the patient's neurological status remained stable, except for a transient episode of visual impairment during the first hours and throughout the night post-injury. However, the following day, the patient experienced severe abdominal pain: abdominal CT scan showed free abdominal fluid. Subsequently, the patient underwent surgical intervention under general anesthesia. Initially, an exploratory video laparoscopy was performed, but the procedure was converted to an open laparotomy because of a blast intestinal injury at the Treitz ligament level. The injury was promptly treated during the intervention. Upon awakening in the ICU a few hours later, the patient exhibited left hemiplegia. An immediate perfusion CT scan revealed a hypodensity in the right front-insular and nucleus-capsular region. An urgent endovascular procedure was done: a clot was retrieved from the M1 tract of the right middle cerebral artery. Subsequent neurological assessments in the following days confirmed persistent left hemiplegia and right eyelid ptosis. Dysarthria became evident upon the removal of the orotracheal tube. Sequential CT scans showed a more defined ischemic area (Figure 2). After fourteen days of ICU admission, the patient was transferred to our Stroke Unit ward, with no neurological improvement. He was then transferred to a neurological rehabilitation center.

## Discussion

For neurological asymptomatic patients with post-Traumatic Arterial Carotid Dissection Grade II, conservative treatment with ATT and APT as heparin and aspirin, associated with close clinical and imaging observation represent adequate management to prevent further thromboembolic events (Table 1); most asymptomatic patients with low-grade dissections, achieve both anatomic and symptomatic resolution, with low rates of recurrence over long-term follow-up (1% secondary stroke risk).<sup>6,7</sup>

In the case of traumatic patients, as in our case, an interdisciplinary approach and specific considerations on ATT and APT therapies are necessary, because of high bleeding risk.<sup>8</sup>

Endovascular techniques are of limited utility in treating Grade I and II Blunt Cerebrovascular Injury (BCVI),<sup>1</sup> with their use generally limited for low-grade injuries progressing to higher grades. A study on 100 patients with Grade I and II BCVIs shows that a great



**Figure 1.** Head CT scan with contrast enhancement: Traumatic right carotid artery dissection (yellow arrow).



**Figure 2.** Head CT scan: Ischemic cortical-subcortical right frontotemporal-insular lesions and lesions of the region of the nucleus lenticularis-knees - posterior arm of the internal capsule- ipsilateral caudate nucleus (yellow arrow).

**Table 1.** Blunt CerebroVascular Injury Grade I-II description and management.<sup>1</sup>

Grade	Description	Management	Outcomes
I-II	I: minimal regularity, <25% vessel stenosis; II: dissection, >25% vessel stenosis.	Antithrombotic agents (e.g. Aspirin). Stenting is no longer recommended as an adjunct.	High rate of resolution. 50% of untreated healed at follow-up. About 1% secondary stroke risk.

part of patients remained stable or improved at final follow-up, and 14% had radiographic worsening without adverse clinical outcomes associated with radiographic changes; the stroke rate was 1%.<sup>1,9,10</sup> The practice management guideline from the Eastern Association for the Surgery of Trauma<sup>2</sup> states, for Grade I and II BCVIs, that early ATT and APT, in the absence of neurological alterations, improve outcomes and reduce BCVI-related stroke rates to less than 10%.

Our patient, with a Grade II BCVI and no neurological deficit, was managed with aspirin 300 mg, heparin, and neurological monitoring, according to current literature. In our case, as in all polytrauma patients, we had to consider the benefits of ATT and APT therapy alongside the risk of bleeding complications. Literature suggests that the risks of initiating APT and ATT therapy in terms of bleeding are low, while their use is associated with a significant reduction in both stroke and mortality. Our team excluded an endovascular treatment for TCAD in the absence of neurological problems; for Grade II or III BCVIs, the potential benefits of routine endovascular stenting do not outweigh the potential harms (iatrogenic stroke) associated with this intervention, therefore the use of routine endovascular stenting is not recommended.<sup>1,2</sup>

Despite adequate early management, our patient had an adverse neurological outcome. We wondered how we could have managed this patient differently. First, a perfusion head CT scan in the first 6 hours of ICU clinical monitoring, even in the absence of significant clinical changes (the patients had only a fleeting visual impairment), could have evidenced earlier a dissection progression or a reduction in brain perfusion; for example, when the abdominal CT was performed, a head and neck scan could have been done to highlight a cerebral lesion; second a NIRS (Near Infrared Spectroscopy) cerebral oximetry monitoring under general anesthesia (performed because of intestinal injury) might have detected hypoperfusion during surgical intervention; third an endovascular carotid stenting before surgical intervention, even in absence of neurological deficit could have avoided intra-operative hypoperfusion.

## Conclusions

Traumatic Carotid Artery Dissection presents a challenging clinical scenario. By the updated 2020 EAST BCVI guidelines for adult patients with Grade II BCVI (1), ATT and APT therapy represents the mainstay of adequate management, while routine endovascular treatment is not recommended in the absence of neurological symptoms because of iatrogenic stroke risk. However, it is crucial to recognize that ATT and APT therapies carry inherent risks, particularly in polytrauma patients. A multidisciplinary evaluation is essential to assess the risks and benefits.<sup>1,3,11</sup> Despite receiving appropriate management, our patient experienced an adverse neurological outcome,

as reported in the literature. Further investigations and discussions are needed to achieve better results. Continued research and collaboration are essential to refine treatment strategies and improve clinical outcomes in Traumatic Carotid Aortic Dissection.

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