

# Bilateral Extracranial Internal Carotid Artery Dissection: Interventional Management – A Case Report

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**Abstract:** Traumatic internal carotid artery dissection (ICAD), particularly in bilateral cases, is a rare but life-threatening condition that poses diagnostic and therapeutic challenges. The cervical segment of the internal carotid artery (ICA) is especially vulnerable to injury following blunt trauma, often leading to significant neurological sequelae. Despite established guidelines advocating conservative management as the initial approach, the optimal timing and criteria for endovascular intervention remain areas of ongoing investigation. We report the case of a 38-year-old female who presented with bilateral extracranial ICAD following a motor vehicle accident. Initially, the patient exhibited right hemiparesis and aphasia, and imaging confirmed left extracranial ICAD without critical stenosis or pseudoaneurysm formation. Conservative management with dual antiplatelet therapy was guided by imaging findings and risk assessment and led to temporary symptomatic improvement. However, the patient returned on the eighth day with left hemiplegia and loss of consciousness, prompting further imaging that revealed bilateral dissection and right anterior cerebral artery infarction. Given the failure of medical therapy, endovascular stenting was performed, achieving successful revascularization and symptomatic improvement. The management of traumatic ICAD, particularly bilateral cases, necessitates careful risk assessment and timely intervention. Our case highlights the importance of imaging in guiding the decision-making process and balancing conservative versus invasive management strategies. Endovascular stenting, although effective, should be reserved for cases with progressive symptoms or when medical management fails. This report contributes to the limited literature on bilateral traumatic ICAD and underscores the need for further research to establish evidence-based guidelines for the management of such cases. Future studies should compare the outcomes of conservative, surgical, and endovascular interventions to optimize patient care and improve prognostic outcomes.

**Keywords:** Traumatic Internal Carotid Artery Dissection; Bilateral ICAD; Endovascular Stenting; Antiplatelet Therapy; Blunt Trauma; Stroke.

## 1. Introduction

Carotid artery dissection is an uncommon condition, with a prevalence ranging from 2.5 to 3 cases per 100,000 people annually based on population-based studies [1]. Internal carotid artery dissection (ICAD) is characterized by a tear in the intimal layer of the artery,

which allows blood to enter the vessel wall, creating a cleft. This can result in the formation of aneurysmal dilation or a mural hematoma [2, 3]. The portion of the internal carotid artery (ICA) located between the bifurcation of the common carotid artery and the base of the skull is known as the cervical ICA [4]. ICAD occurs when a tear in the intimal layer or rupture of the vasa vasorum leads to bleeding within the arterial media. This separation of the vessel wall layers results in the creation of a false lumen, which can lead to arterial stenosis, occlusion, or the formation of a dissecting pseudoaneurysm. While most ICAD occur spontaneously and are more commonly observed in older patients, approximately 4% of cases are associated with severe trauma and tend to occur predominantly in younger individuals. Traumatic carotid artery dissections are often underdiagnosed but can be life-threatening [5]. Overall, carotid artery dissection, encompassing both traumatic and spontaneous cases, accounts for 2% of all cerebrovascular accidents (CVAs) in individuals under 50 years of age. While it is a rare cause of stroke, most instances occur in young adults. Blunt trauma accounts for 3 to 10% of carotid artery injuries, with over 90% of these injuries involving the ICA [6].

Diagnosing traumatic internal carotid artery (ICA) dissection can be challenging and often delayed, as initial symptoms may be overlooked during the clinical assessment, especially when other injuries are present [7]. Both European and American clinical guidelines recommend anticoagulant and antiplatelet therapy as the initial treatment choice for managing patients with CAD [8, 9]. Current indications for endovascular treatment of CAD include recurrent cerebrovascular events, expansion of a dissecting aneurysm, contraindications to anticoagulation (such as intracranial hematomas or penetrating injuries), and severe carotid luminal stenosis [10, 11]. CADs can be managed using open surgical techniques such as microvascular suturing, extracranial-intracranial bypass, and thromboendarterectomy. Alternatively, endovascular approaches like stenting, stent-assisted intravascular thrombolysis, and thrombectomy can also be employed [7, 12]. In recent years, endovascular treatment (EVT) for patients with spontaneous carotid artery dissection (sCAD) has been demonstrated to be both safe and effective [13-15]. However, there is currently no clinical classification available to guide the interventional or surgical management of spontaneous carotid artery dissection (sCAD).

We report a rare case of a 38-year-old female who developed traumatic bilateral internal carotid artery dissection because of blunt trauma. The condition was successfully managed with stenting and double antiplatelet therapy. Blunt bilateral traumatic dissections of the ICA are extremely rare, as shown by the limited case reports and series in medical literature. However, raising awareness about such injuries is crucial for clinicians and healthcare teams. Increased awareness can enhance diagnostic and treatment strategies by raising the index of suspicion, ultimately helping to reduce morbidity and mortality associated with trauma cases.

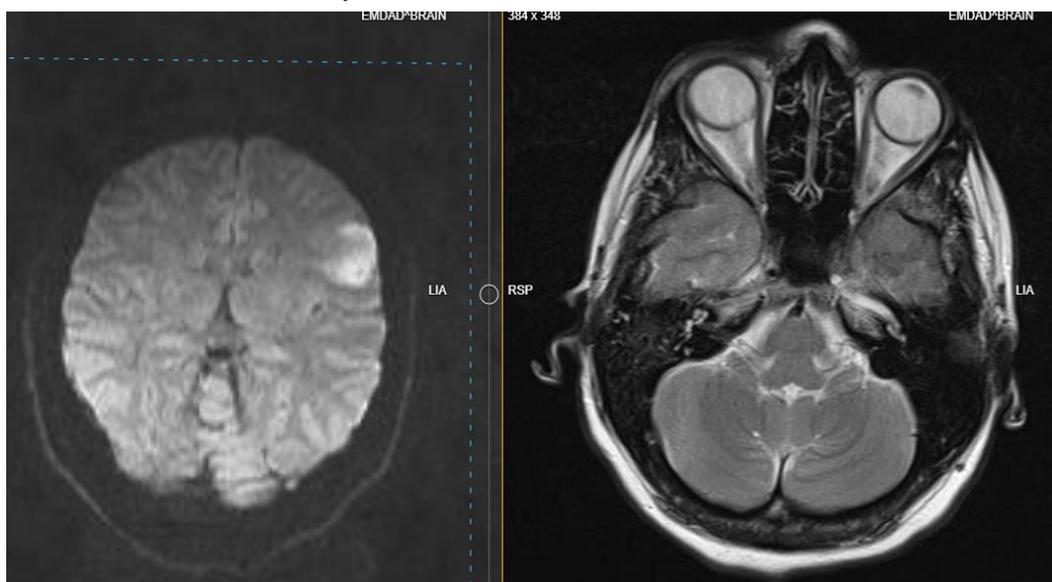
## 2. Case Report

A 38-year-old female patient presented with blunt trauma following a motor vehicle accident and was initially transferred to our level I trauma center. Ten hours after her initial assessment and management, she developed right hemiparesis and aphasia, marking her initial clinical presentation. Subsequent CT angiography (CTA) and magnetic resonance imaging (MRI) revealed a left extracranial internal carotid artery dissection accompanied by a left superior middle cerebral artery (MCA) infarct (Figure 1). Given the intact left M1 perfusion and improvement in her symptoms, patient was subsequently transferred to neurology unit, where conservative treatment and dual-antiplatelet therapy with Aspirin 80 mg once daily and clopidogrel (75 mg daily) were initiated on the day following the trauma.

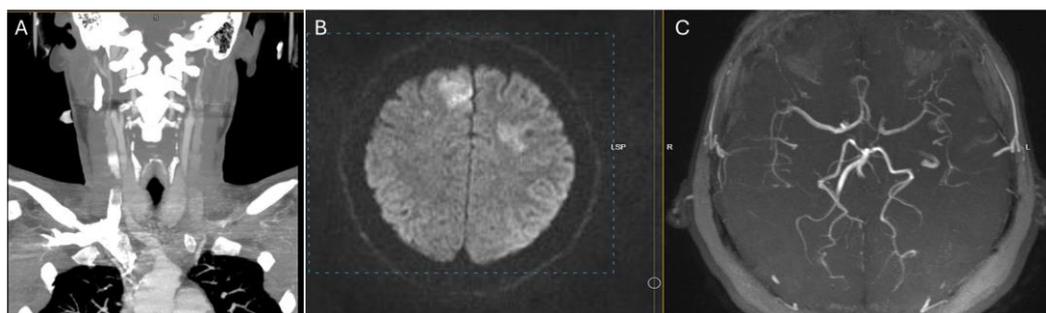
After 7 days, she showed excellent recovery and was discharged with mild right hemiparesis and dysarthria. On the 8th day, the patient experienced loss of consciousness and left hemiplegia, representing her second clinical presentation. An emergency MRI

and CT angiography (CTA) were conducted, revealing a right anterior cerebral artery (ACA) infarction, along with right extracranial internal carotid dissection and complete occlusion of the right internal carotid artery, resulting in limited blood supply from the left carotid artery (Figure 2). This led to the conclusion of bilateral extracranial internal carotid dissection due to blunt trauma.

**Figure 1.** Diffusion-weighted Magnetic Resonance Imaging (DWI) taken one day after the onset, showed new ischemic lesions in the left hemisphere, and T2 showed thrombosis in the left internal carotid artery.



**Figure 2.** Magnetic Resonance Imaging (A) and angiogram (B) showed new ischemic lesions in the right hemisphere and bilateral common carotid dissection. A thrombus or intimal flap is recognized in the right common carotid artery (CCA) (C).



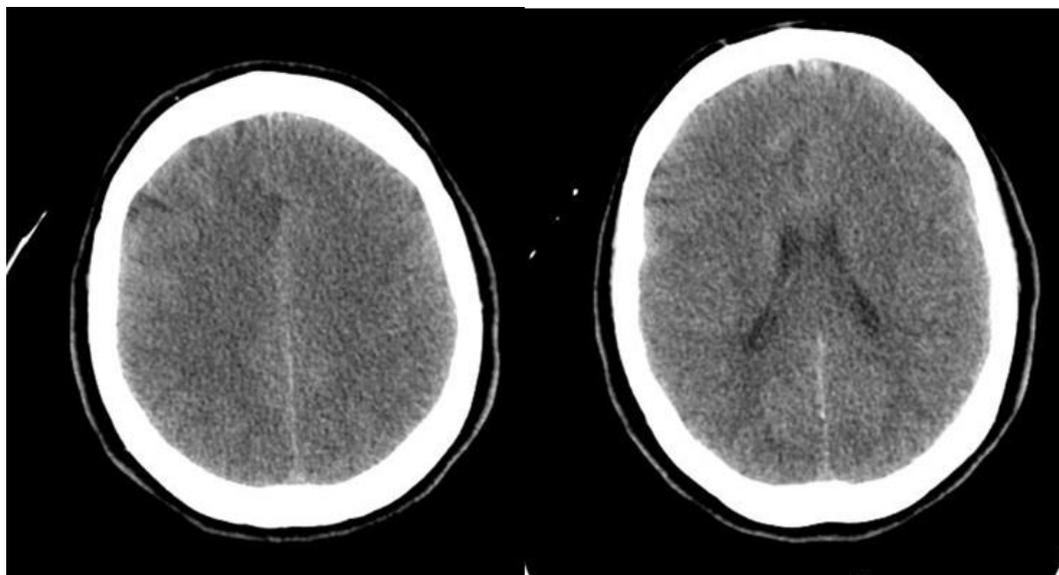
She was transferred to the catheterization lab for diagnostic angiography, which confirmed dissection of the bilateral common carotid arteries. After the failure of conservative management and the occurrence of bilateral carotid artery dissection, we decided to proceed with endovascular treatment by stenting both affected arteries. Under local anesthesia, a 9F guiding catheter was advanced into the right common carotid artery (CCA). Due to the length of the dissected lesion, two stents were required to adequately cover the entire area. A guide wire was navigated into the right internal carotid artery beyond the dissection, and primary stenting was performed using a 6x8x40 mm stent for the distal part of the dissection, completed without distal protection due to the operator's expertise. Subsequently, a 7x9x40 mm stent was deployed in the proximal segment, overlapping the first stent. Together, these two stents effectively covered the entire lesion, resulting in the immediate disappearance of the thrombus and intimal flap.

The contralateral lesion was treated in the same manner as the first, with carotid artery stenting performed accordingly. A 6x8x40 mm stent and a 7x9x40 mm stent were deployed to completely cover the lesion of the common carotid artery (CCA) dissection, replicating the approach used on the right side (Figure 3). After stenting, the patient continued dual-antiplatelet therapy with aspirin (80 mg once daily) and clopidogrel (75 mg daily). Her symptoms improved significantly, and the following day, she regained consciousness, exhibiting complete responsiveness and eye contact, along with dysarthric speech and mild paresis. Follow-up computed tomography (CT) imaging performed 2 days post-stenting revealed a minor infarction in the right hemisphere (Figure 4).

**Figure 3.** Right carotid angiograms after stent placement revealed good patency of the right CCA.



**Figure 4.** Follow-up Computed tomography imaging 2 days after stenting showed a minor infarction in the right hemisphere.



In the case described, the initial decision to delay endovascular intervention was guided by imaging findings and risk assessment. When the patient first presented with right hemiparesis and aphasia, imaging (CT angiography and MRI) confirmed a left extracranial internal carotid artery dissection without critical luminal stenosis or pseudoaneurysm formation. The patient showed symptomatic improvement with conservative management, which aligned with established guidelines recommending anticoagulant or antiplatelet therapy as the first-line approach when symptoms are stable and there are no high-risk imaging features. However, after the patient's subsequent presentation with loss

of consciousness and left hemiplegia, further imaging revealed bilateral extracranial internal carotid dissections with significant progression. At this point, the decision was made to proceed with stenting, as the recurrent ischemic events despite conservative management indicated a failure of medical therapy.

### 3. Discussion

Most internal carotid artery (ICA) dissections occur spontaneously; however, there is a lack of clinical data regarding ICA dissections resulting from trauma. Additionally, the bilateral occurrence of traumatic ICA dissections is particularly rare [7], making this case a valuable addition to the existing literature our paper provides a comprehensive overview of clinical presentation, diagnostic methods, management strategies, and patient outcomes. Bilateral ICA dissection can occur spontaneously or as a result of multiple traumas, particularly blunt neck trauma from motor vehicle accidents, with a prevalence of 4% [16]. Early diagnosis is crucial for optimal prognosis in emergency settings. Any patient with a neck injury, including those from car accidents, strangulation, or choking, should undergo arterial imaging. Initial ultrasound with Doppler imaging is a rapid and effective assessment, while CT scans and CT angiography remain the primary diagnostic tools for cerebrovascular pathologies [17]. Patients may present with headaches, transient ischemic attacks (TIAs), face or neck pain, or stroke, though many remain asymptomatic [18]. Neurologic deficits can manifest later in blunt trauma cases, necessitating prompt imaging, as strokes often result from distal embolization of thrombi formed at the dissection site [19].

Most traumatic ICA dissections respond well to antiplatelet or anticoagulant therapy, which can prevent primary or recurrent ischemia. However, in cases of persistent ischemia despite optimal medical management, endovascular or surgical intervention may be necessary [18]. Recent guidelines recommend a minimum of three months of antithrombotic therapy for ICAD management, with stenting reserved for patients with recurrent ischemic events despite medical therapy [20]. The 2011 guidelines from the Society of Vascular Surgery for managing extracranial carotid and vertebral artery diseases recommend considering surgical or endovascular treatment if conservative management fails, with endovascular therapy (EVT) generally preferred over open surgery [21].

EVT aims to improve distal blood flow and reduce stroke and mortality risk by achieving immediate revascularization. Studies have shown EVT's high success rate and acceptable postoperative complication levels. However, EVT is not recommended during the acute phase unless symptoms worsen rapidly due to thromboembolism or hypoperfusion [15, 22-24]. A systematic review by Bontinis et al. [13] included 24 trials with 1,224 CAD patients undergoing carotid artery stenting. It categorized patients into immediate CAS and CAS after failed medical therapy. The results showed that CAS following failed medical therapy was associated with lower mortality and complication rates compared to immediate CAS, suggesting EVT should be reserved as a secondary option when medical therapy fails.

Another systematic review of 21 studies with 191 patients (179 undergoing 190 CAS procedures) demonstrated a 100% technical success rate for CAS [25]. No major cardiovascular events occurred within 30 days in either traditional CAS or flow-diverting Pipeline Embolization Device (PED) groups. Long-term follow-up showed excellent recanalization and pseudoaneurysm occlusion rates, with very low retreatment rates, supporting the safety and efficacy of these treatments. While CAS is effective in preventing recurrent stroke and TIA in traumatic ICAD cases, there are challenges, including the technical difficulty of microcatheterizing the true lumen. Misnavigation may worsen the condition or lead to thrombus dislodgement, necessitating a microcatheter angiogram to confirm accurate lumen access. Endovascular treatment for traumatic CAD has been reported in small case series but is not routinely recommended due to the low recurrence rate of dissections and risks such as embolization during stent placement and reperfusion injuries [12, 26, 27].

A recent study comparing surgical versus conservative management in carotid artery dissection showed no significant difference in stroke recurrence. However, surgical intervention demonstrated better symptom resolution and stroke prevention in patients unresponsive to conservative management, indicating a potential role for surgery in select cases and the need for further trials to evaluate its efficacy [28]. Currently, studies directly comparing surgical and endovascular approaches for traumatic ICAD are lacking, highlighting the need for future research to determine if the endovascular approach offers superior short- and long-term outcomes. The effectiveness of endovascular stent treatment in emergency settings still requires further investigation.

#### 4. Conclusion

Traumatic internal carotid artery dissection (ICAD), particularly bilateral cases, remains a rare but critical condition requiring timely diagnosis and intervention. This case adds valuable insights to the limited literature on traumatic ICAD, highlighting the importance of early imaging and the role of targeted endovascular therapy in cases with recurrent ischemic events despite optimal medical management. As recommended by current guidelines, initial treatment should start with anticoagulant and antiplatelet therapy. Endovascular intervention should be reserved for patients who experience recurrent ischemic events despite optimal medical therapy. While endovascular treatment shows promising outcomes in both technical success and long-term patency, it is best reserved for cases unresponsive to conservative therapy. Our case underscores the effectiveness of stenting in such scenarios, contributing valuable insights to the existing literature. Future studies should focus on directly comparing surgical and endovascular approaches to optimize treatment strategies for traumatic ICAD.

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**Research Ethics Committee Approval:** Ethics approval for this case report was not required in accordance with the institution's policies on case reports. However, written informed consent was obtained from the patient for the participation in this case report. The patient was informed about the purpose of the report, the nature of the information to be published, and the potential risks and benefits associated with their participation. The patient understood that participation was voluntary and could be withdrawn at any time without affecting their medical care. Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

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**Conflicts of Interest:** The authors declare no conflicts of interest.

#### References

1. Jenkins JM, Norton J, Hampton T, Weeks R. Rare case of bilateral traumatic internal carotid artery dissection. *BMJ Case Reports*. 2016;2016:bcr2016217262.
2. Hassan AE, Zacharatos H, Souslian F, Suri MFK, Qureshi AI. Long-Term Clinical and Angiographic Outcomes in Patients with Cervico-Cranial Dissections Treated with Stent Placement: A Meta-Analysis of Case Series. *Journal of Neurotrauma*. 2012;29(7):1342-53.
3. Schievink WI, Mokri B, O'Fallon WM. Recurrent spontaneous cervical-artery dissection. *The New England journal of medicine*. 1994;330(6):393-7.
4. Wang G, Li C, Piao J, Xu B, Yu J. Endovascular treatment of blunt injury of the extracranial internal carotid artery: the prospect and dilemma. *International journal of medical sciences*. 2021;18(4):944-52.
5. Lenz M, Bula-Sternberg J, Koch T, Bula P, Bonnaire F. Traumatic dissection of the internal carotid artery following whiplash injury: Diagnostic workup and therapy of an often overlooked but potentially dangerous additional vascular lesion. *Der Unfallchirurg*. 2012;115:369-76.
6. Echefu G, Mahat R, Vatsavai R, Zuckerman S. Spontaneous dissections of bilateral internal carotid and vertebral arteries due to intractable vomiting. *Case Reports in Vascular Medicine*. 2022;2022.
7. Foreman Paul M, Harrigan Mark R. Blunt Traumatic Extracranial Cerebrovascular Injury and Ischemic Stroke. *Cerebrovascular Diseases Extra*. 2017;7(1):72-83.

8. Ricotta JJ, AbuRahma A, Ascher E, Eskandari M, Faries P, Lal BK. Updated Society for Vascular Surgery guidelines for management of extracranial carotid disease: Executive summary. *Journal of Vascular Surgery*. 2011;54(3):832-6.
9. Berge E, Whiteley W, Audebert H, De Marchis G, Fonseca AC, Padiglioni C, et al. European Stroke Organisation (ESO) guidelines on intravenous thrombolysis for acute ischaemic stroke. *European Stroke Journal*. 2021;6(1):I-LXII.
10. Kleindorfer DO, Towfighi A, Chaturvedi S, Cockroft KM, Gutierrez J, Lombardi-Hill D, et al. 2021 guideline for the prevention of stroke in patients with stroke and transient ischemic attack: a guideline from the American Heart Association/American Stroke Association. *Stroke*. 2021.
11. Martinelli O, Venosi S, BenHamida J, Malaj A, Belli C, Giosue'Irace F, et al. Therapeutical options in the management of carotid dissection. *Annals of vascular surgery*. 2017;41:69-76.
12. Mohan IV. Current optimal assessment and management of carotid and vertebral spontaneous and traumatic dissection. *Angiology*. 2014;65(4):274-83.
13. Bontinis V, Antonopoulos CN, Bontinis A, Koutsoumpelis A, Zymvragoudakis V, Rafailidis V, et al. A Systematic Review and Meta-Analysis of Carotid Artery Stenting for the Treatment of Cervical Carotid Artery Dissection. *European Journal of Vascular and Endovascular Surgery*. 2022;64(4):299-308.
14. Chen Z, Chen L, Zhang J, Chen Y, Liu C, Diao Y, et al. Management of extracranial carotid artery aneurysms: a 6-year case series. *Medical science monitor: international medical journal of experimental and clinical research*. 2019;25:4933.
15. Martinelli O, Venosi S, BenHamida J, Malaj A, Belli C, Irace FG, et al. Therapeutical Options in the Management of Carotid Dissection. *Annals of Vascular Surgery*. 2017;41:69-76.
16. Marschner-Preuth N, Warnecke T, Niederstadt T-U, Dittrich R, Schäbitz W-R. Juvenile Stroke: Cervical Artery Dissection in a Patient after a Polytrauma. *Case Reports in Neurology*. 2013;5(1):21-5.
17. Crönlein M, Sandmann GH, Beirer M, Wunderlich S, Biberthaler P, Huber-Wagner S. Traumatic bilateral carotid artery dissection following severe blunt trauma: a case report on the difficulties in diagnosis and therapy of an often overlooked life-threatening injury. *European journal of medical research*. 2015;20(1):62.
18. Khormi YH, Darraj AI, Arishy A, Abuzahirah SO, Atteya M, Darraj A, et al. Bilateral Blunt Traumatic Dissections of the Extracranial Internal Carotid Artery: A Case Report and Literature Review. *Cureus*. 2024;16(2).
19. Texakalidis P, Karasavvidis T, Giannopoulos S, Tzoumas A, Charisis N, Jabbour P, et al. Endovascular reconstruction of extracranial traumatic internal carotid artery dissections: a systematic review. *Neurosurgical Review*. 2020;43:931-40.
20. Kleindorfer DO, Towfighi A, Chaturvedi S, Cockroft KM, Gutierrez J, Lombardi-Hill D, et al. 2021 Guideline for the Prevention of Stroke in Patients With Stroke and Transient Ischemic Attack: A Guideline From the American Heart Association/American Stroke Association. *Stroke*. 2021;52(7):e364-e467.
21. Brott TG, Halperin JL, Abbara S, Bacharach JM, Barr JD, Bush RL, et al. 2011 ASA/ACCF/AHA/AANN/AANS/ACR/ASNR/CNS/SAIP/SCAI/SIR/SNIS/SVM/SVS Guideline on the Management of Patients With Extracranial Carotid and Vertebral Artery Disease: Executive Summary: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines, and the American Stroke Association, American Association of Neuroscience Nurses, American Association of Neurological Surgeons, American College of Radiology, American Society of Neuroradiology, Congress of Neurological Surgeons, Society of Atherosclerosis Imaging and Prevention, Society for Cardiovascular Angiography and Interventions, Society of Interventional Radiology, Society of NeuroInterventional Surgery, Society for Vascular Medicine, and Society for Vascular Surgery Developed in Collaboration With the American Academy of Neurology and Society of Cardiovascular Computed Tomography. *Journal of the American College of Cardiology*. 2011;57(8):1002-44.
22. Wang G, Li C, Piao J, Xu B, Yu J. Endovascular treatment of blunt injury of the extracranial internal carotid artery: the prospect and dilemma. *International journal of medical sciences*. 2021;18(4):944-52.
23. Moon K, Albuquerque FC, Cole T, Gross BA, McDougall CG. Stroke prevention by endovascular treatment of carotid and vertebral artery dissections. *Journal of NeuroInterventional Surgery*. 2017;9(10):952-7.
24. Brown SC, Falcone GJ, Hebert RM, Yaghi S, Mac Grory B, Stretz C. Stenting for acute carotid artery dissection. *Stroke*. 2020;51(1):e3-e6.
25. Texakalidis P, Karasavvidis T, Giannopoulos S, Tzoumas A, Charisis N, Jabbour P, et al. Endovascular reconstruction of extracranial traumatic internal carotid artery dissections: a systematic review. *Neurosurgical review*. 2020;43(3):931-40.
26. Taoussi N, Alghamdi AJ, Bielewicz J, Luchowski P, Rejdak K. Traumatic bilateral dissection of cervical internal carotid artery in the wake of a car accident: A case report. *Neurologia i neurochirurgia polska*. 2017;51(5):432-8.
27. Koleilat I, Gandhi R, Boulos A, Bonville D. Traumatic bilateral carotid and vertebral artery dissection. *Journal of emergencies, trauma, and shock*. 2014;7(1):47-8.
28. Feng Y, Zhu Z, Shao J, Li K, Xie Y, Xie L, et al. Comparative outcomes of surgical and conservative management in carotid artery dissection. *Vascular*. 0(0):17085381241289815.