



## Reporte de Caso

# Endovascular treatment of traumatic dissection of bilateral internal carotid artery: Case report and review of literature

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### ABSTRACT:

Internal carotid artery dissections are a common cause of subarachnoid hemorrhage and stroke in young patients. Traumatic etiology is more common than spontaneous. Conservative treatment with anticoagulant and antiplatelet therapy is indicated in most cases. When there is progression of the symptoms and of the dissection with intracranial extension refractory to medication, endovascular procedures should be considered.

A case of a young female with post-traumatic bilateral dissection of the internal carotid artery successfully treated by endovascular approach is presented based on retrospective analysis of the patient's medical records and compared with a literature review.

There are few reports in the literature describing endovascular therapy for bilateral internal carotid artery dissections. Most of them are related to traumatic etiologies and affect young patients. Simultaneous bilateral carotid angioplasty does not increase the complication rates in comparison to unilateral consecutive approach and it seems to be a better choice for the treatment of similar cases. Conservative treatment, even effective, can allow rapid neurological deterioration in bilateral internal carotid dissection. Immediate endovascular intervention must prevent brain damage and it is in full technical development to approach this situation. Randomized and controlled prospective studies with larger numbers of cases are needed to establish the best treatment.

**Keywords:** Internal Carotid Artery Dissection; Stents; Blood Vessel Prosthesis; *Cerebrovascular Trauma; Carotid Artery Injuries.*

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## RESUMEN:

**Introducción:** Disección de arteria carótida interna es una causa común de hemorragia subaracnoidea e ictus en pacientes jóvenes. Etiología traumática es más común de lo espontáneo. El tratamiento conservador con terapia anticoagulante y antiplaquetaria está indicado en la mayoría de los casos. Cuando hay una progresión de los síntomas y de la disección con extensión intracraneal refractaria a la medicación, procedimientos endovasculares se deben considerar. **Caso Clínico:** Un caso de una mujer joven con disección bilateral post-traumática de la arteria carótida interna tratada con éxito mediante abordaje endovascular se presenta con base en un análisis retrospectivo de las historias clínicas de los pacientes y se comparó con una revisión de la literatura. **Conclusiones:** Existen pocos informes en la literatura que describen la terapia endovascular para las disecciones de las arterias carótidas internas bilaterales. La mayoría de ellos está relacionada con etiologías traumáticas y afectan a pacientes jóvenes. Angioplastia carotídea bilateral simultánea no aumenta las tasas de complicaciones en comparación con el enfoque unilateral consecutivo y parece ser una mejor opción para el tratamiento de casos similares. El tratamiento conservador, aunque eficaz, puede permitir un rápido deterioro neurológico en la disección de la carótida interna bilateral. Intervención endovascular inmediata debe prevenir el daño cerebral y es en el desarrollo técnico completo para abordar esta situación. Se necesitan estudios prospectivos aleatorizados y controlados con mayor número de casos para establecer el mejor tratamiento.

Palabras clave: Disección de arteria carótida interna; stents; prótesis vascular; trauma cerebrovascular; traumatismos de la arteria carótida.



## INTRODUCTION:

Arterial dissection occurs when the intima and media layers are separated and the blood flow produces a hematoma in the vessel wall through the intimal flap.<sup>[14]</sup> In cervical vessels it can occur spontaneously or after trauma, usually contusion, and can promote ischemic strokes. Its mechanism can be thromboembolic and / or hemodynamic because the intimal flap can create a luminal stenosis.<sup>[3,14]</sup> Furthermore, a weakened adventitia and middle layer can result in the formation of a pseudo aneurysm.<sup>[1]</sup>

The internal carotid artery dissections (ICAD) have an incidence of 2.5-3 per 100,000 inhabitants in the United States, representing 2% of total ischemic stroke and 25% in young patients.<sup>[14]</sup> Traumatic etiology is more common than spontaneous, which generally is associated with underlying diseases such as Ehlers-Danlos syndrome, fibromuscular dysplasia and Marfan syndrome.<sup>[14]</sup> Intracranial extension of dissections of any cervical artery, especially of the internal carotid artery (ICA), predicts a worse neurological prognosis.<sup>[14]</sup> Among all ICAD, bilateral carotid involvement (BICAD) occurs in 5-21%,<sup>[11]</sup> usually presenting with unilateral symptoms.

In situations where anticoagulant and antiplatelet therapies fail, the

interventional therapy should be considered. Furthermore, despite anticoagulation, a progressive number of patients have shown hemodynamically significant residual stenosis or developed pseudo aneurysm, leading to the risk of distal embolism. In these symptomatic patients, surgery or endovascular treatment is indicated.<sup>[3,13]</sup>

There are few case reports describing the successful endovascular management of ICAD with progressive intracranial extension. As there is not yet evidence defining which subset of patients will fail to drug treatment alone, and because of the rapid evolution of technology and intervention techniques, it has been indicated invasive treatment earlier.<sup>[14]</sup>

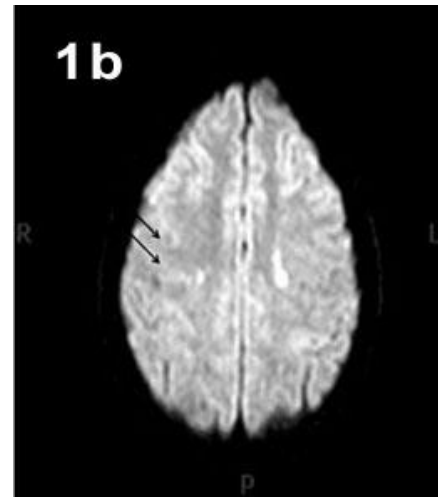
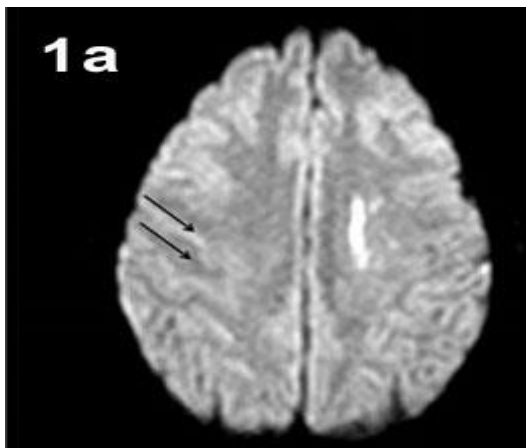
## CASE REPORT:

Female, 34 years old, was admitted to the emergency because of sudden lowering of consciousness. She has a history of a rollover car 30 days prior, and was 3 months postpartum. She presented no comorbidity, addiction, recent history of infections neither personal nor family history of cerebrovascular disease. Magnetic resonance imaging (MRI) showed bilateral ischemia in the watershed area and transcranial Doppler showed increased resistance to bilateral carotid. Investigation

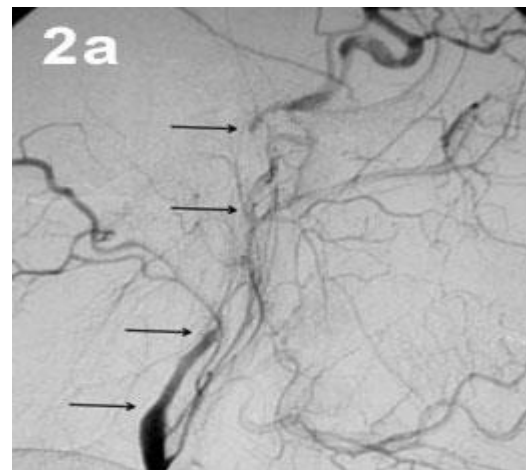
with digital subtraction angiography (DSA) revealed a progressive decrease in the diameter of the cervical ICA to total occlusion, with retrograde filling of the

petrous, cavernous and ophthalmic segments by anastomoses between branches of the external carotid artery (ECA) and ophthalmic arteries, characterizing an acute long carotid dissection (Figures 1 and 2). The vertebrobasilar system was normal, with late partial arterial reperfusion of the carotid territory. These findings were consistent with bilateral carotid dissection, determining cerebral ischemia by an arterial circle (circle of Willis) insufficient.

**Figures 1a and 1b** – MRI diffusion sequence showing bilateral frontal ischemia (arrows).



**Figures 2a and 2b** – Lateral digital subtraction angiography revealing dissection on the right (a) and left (b) internal carotid arteries.



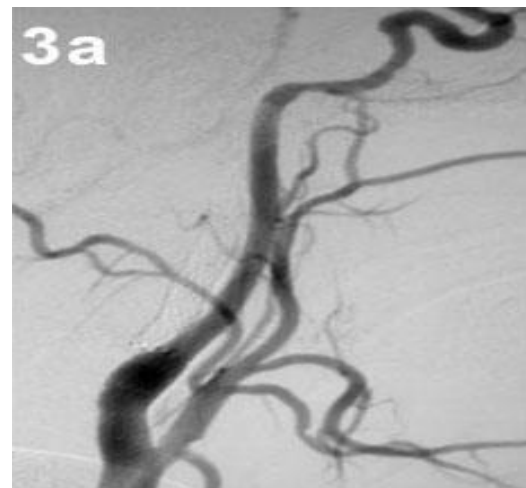


Treatment was then performed through the same right femoral artery access. The Berenstein 5F (diagnose catheter) positioned in the left common carotid artery (CCA) was replaced by a Epsylar 6F (long introducer) with the aid of guide hydrophilic exchange 260cm. 5,000 units of heparin were injected intravenously for anticoagulation. With a Courier 0.17 microcatheter and a 0.14 microguide Watusi 300 cm, it was located the true lumen of left ICA, and the dissection was overtook. With the microcatheter in supraclinoid portion was performed a control arteriography, confirming proper placement within the artery. The microcatheter was removed, maintained the microguide in position, through which was placed a stent Astron Pulsar 5mm diameter and 60mm long.

The device was opened under fluoroscopy, covering the whole extent of the dissection. The ASD control showed normalization of arterial diameter, and then the sheath was positioned in the right ACC. Similarly, a stent Astron Pulsar 4mm diameter by 60mm in length was used in the cervical right ICA. The ASD control revealed that the initial dissection in the carotid bulb was not covered by the stent, being corrected with telescoped application of other tapered stent Sinus 7-10mm diameter by 40 mm long. It was not been used cerebral protection device

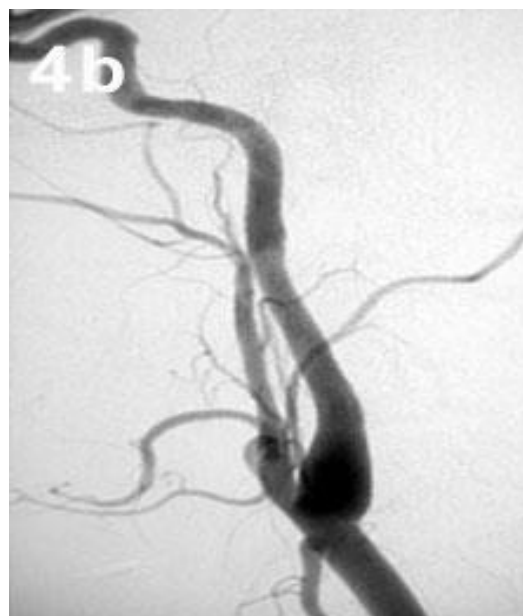
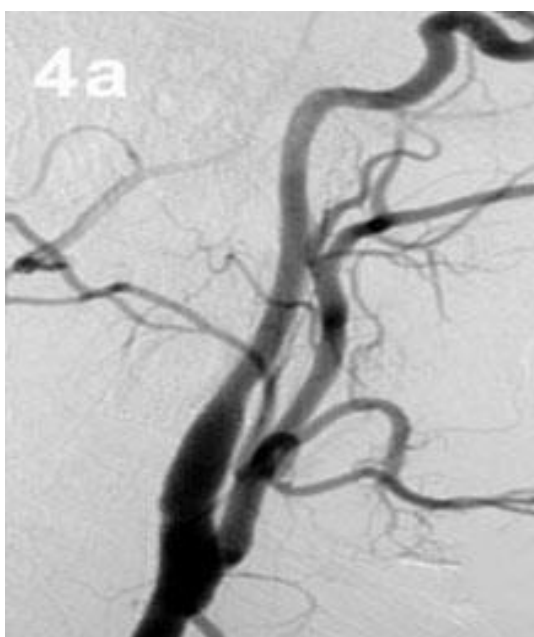
because of the degree of stenosis. Balloon angioplasty was not required by the appropriate opening stents without significant stenosis. Immediate ASD showed full coverage of the dissections with bilateral normalization of blood flow (Figs. 3a and 3b). Epsylar was replaced by a 7F introducer, removed after spontaneous reversal of heparin.

**Figures 3a and 3b** – Immediate postoperative lateral digital subtraction angiography after reconstruction of the internal carotid arteries with two stents in the right (a) and one in the left (b), with normalization of flow.



The patient had no adverse events post-procedure or late complications. There was complete recovery of aphasia, keeping a slight paresis of the right hand with progressive remission. She used for 6 months double anti-platelet therapy and later simple aggregation (AAS). She remains on the outpatient clinic for 2 years, without motor or speech deficit. An angiotomography 6months and an ASD 1 year following the procedure, showed patency of the stents with good flow through them without signs of myointimal hyperplasia. (Figures 4a and 4b).

**Figures 4a and 4b** – One year postoperative lateral digital subtraction angiography showing normal diameter of the internal carotid arteries on the right (a) and left (b).



#### DISCUSSION:

BICAD is rare, with few reports in the literature describing endovascular therapy. In one of them, therapy was indicated due to the concomitant presence of a ruptured aneurysm of the posterior inferior cerebellar artery (PICA) and more one asymptomatic aneurysm in the bifurcation of the middle cerebral artery, associated with the presence of vasospasm, impossibility of proper neurological monitoring in a patient in respiratory care, and above all because the radiological evidence of a worsening of carotid stenosis despite heparin therapy.<sup>[13]</sup> This patient underwent embolization of aneurysm of the PICA, and ASD later revealed fibromuscular dysplasia. In another report, a young patient with severe polytrauma presented BICAD getting good evolution after stenting.<sup>[6]</sup> His clinical condition was critical and a surgical



repair of both ICA could be dangerous. Especially because of the great extent of the dissection, one percutaneous treatment was considered the best choice. It was also proved that the presence of BICAD concomitant to inadequate collaterals of the circle of Willis may predispose to refractory hypoperfusion to the usual conservative treatment.

In another report, a young patient with severe polytrauma presented BICAD getting good evolution after stenting.<sup>[6]</sup> His clinical condition was critical and a surgical repair of both ICA could be dangerous. Especially because of the great extent of the dissection, one percutaneous treatment was considered the best choice.

It was also proved that the presence of BICAD concomitant to inadequate collaterals of the circle of Willis may predispose to refractory hypoperfusion to the usual conservative treatment. In another case, after five days of rigorous cough (pertussis-like), a patient presented with neck pain and hemiparesis. ASD showed BICAD, besides a hypoplasia of the anterior communicating artery and absence of posterior communicating arteries.<sup>[11]</sup> Even with immediate heparinization full and strict control of blood pressure, he developed neurological damage, and endovascular treatment was indicated without neurological worsening.

There are few series involving bilateral carotid angioplasty. Most refers to angioplasty due atherosclerotic stenosis of the ICA and not dissection.<sup>[1,2,4,5,9,15]</sup>

This is the second case report<sup>[6]</sup> of post-trauma BICAD treated with stenting of the ICA simultaneously. The advantages of simultaneous bilateral

angioplasty of ICA over into steps have been described in the literature: the complication rates of bilateral carotid angioplasty in two stages are similar to one single session, but the patient is submitted to an invasive procedure in only one occasion and may reduce their time hospitalization.<sup>[7,8,10,12]</sup>

The theoretical risks of simultaneous angioplasty include the occurrence of excessive hemodynamic depression because of bilateral stimulation of the carotid sinus reflex.<sup>[6]</sup> Such events have not occurred in our patient, mainly due to the meticulous hemodynamic monitoring and excellent neurointensive care post-procedure with strict control of blood pressure.

The main limitation of this study is that it is a retrospective analysis of a case report, and the literature review did not find a significant number of similar cases. BICAD is about a rare condition, and Interventional Neuroradiology is in full



technical development to approach also this type of situation.

Randomized and controlled prospective studies with larger numbers of cases are needed to define the best treatment.

## CONCLUSIONS:

Bilateral internal carotid artery dissections affect young patients with high mortality.<sup>[13]</sup> High index of suspicion is required to

diagnose BICAD even with unilateral symptoms.<sup>[11]</sup> Conservative treatment, even effective in the medium and long term, can allow rapid neurological deterioration.<sup>[6]</sup> In this case, we recommend digital subtraction angiography and immediate endovascular intervention in order to restore the blood flow early and prevent brain damage.

**Patient Consent:** The patient has consented to the submission of the case report for submission to the journal.

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#### Conflictos de intereses:

El autor declara no presentar conflictos de intereses