

SYMPTOMATIC NON-ATHEROSCLEROTIC BILATERAL EXTRACRANIAL VERTEBRAL ARTERY OCCLUSION TREATED WITH EXTRACRANIAL TO INTRACRANIAL BYPASS

Case report

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ABSTRACT - Posterior fossa ischemia is not a very frequent situation. It is responsible for about 25% of all ischemic strokes, and the vast majority of the cases are related to atherosclerotic stenosis of the vertebral and/or basilar arteries. Acute ischemia can also occur in the setting of vertebral artery dissection, traumatic or spontaneous. Recently, blunt trauma has been increasingly recognized as a cause for craniocervical artery injury. The management options for both traumatic and atherosclerotic lesions of the posterior fossa are still under debate. We present a case of a delayed onset of hemodynamic ischemic symptoms due to bilateral vertebral artery occlusion probably related to remote trauma to the head and neck in a 55-year-old man treated successfully with extracranial to intracranial bypass.

KEY WORDS: EC-IC bypass, ischemic stroke, surgical revascularization.

Oclusão sintomática não-aterosclerótica da artéria vertebral extracraniana tratada com bypass: relato de caso

RESUMO - Acidentes vasculares cerebrais (AVC) isquêmicos no sistema vertebro-basilar não são frequentes. Representam cerca de 25% dos AVCs isquêmicos, e a maioria é relacionada com aterosclerose das artérias vertebrais e/ou basilar. Isquemia aguda pode também ser resultado de dissecções da artéria vertebral, traumáticas ou espontâneas. Recentemente, traumatismos fechados têm sido cada vez mais reconhecidos como causa de lesão das artérias craniocervicais, podendo ou não resultar em sintomas isquêmicos. O tratamento para estas lesões, sejam traumáticas ou ateroscleróticas, ainda é motivo de debate. Relatamos o caso de um homem de 55 anos com sintomas isquêmicos, hemodinâmicos, tardios, devido a oclusão bilateral das artérias vertebrais, provavelmente relacionada a lesão traumática das artérias vertebrais, tratada com sucesso com bypass extra-intracraniano.

PALAVRAS-CHAVE: bypass, isquemia cerebral, revascularização intracraniana.

Posterior fossa ischemia is not a very frequent situation. It is responsible for about 25% of all ischemic strokes, the vast majority related to atherosclerotic stenosis of the vertebral and/or basilar arteries. Blunt trauma to the head and neck is being recognized as a cause of carotid and vertebral artery injury, most commonly, carotid dissections. Since its institution in the 50s, anticoagulation has been the main stem of medical management of vertebrobasilar insufficiency. The use of surgical means to treat intracranial ischemic symptoms has been disfavored since the EC-

IC bypass study, although the surgical treatment of vertebrobasilar insufficiency can be considered in cases where there is no response to maximal medical therapy and no endovascular options. We present a case where surgical treatment of posterior fossa ischemia resulted in complete resolution of symptoms.

CASE

A 55 years-old man was referred to evaluation of neurosurgical treatment options from a stroke neurologist. His past medical history was unremarkable, except for a head

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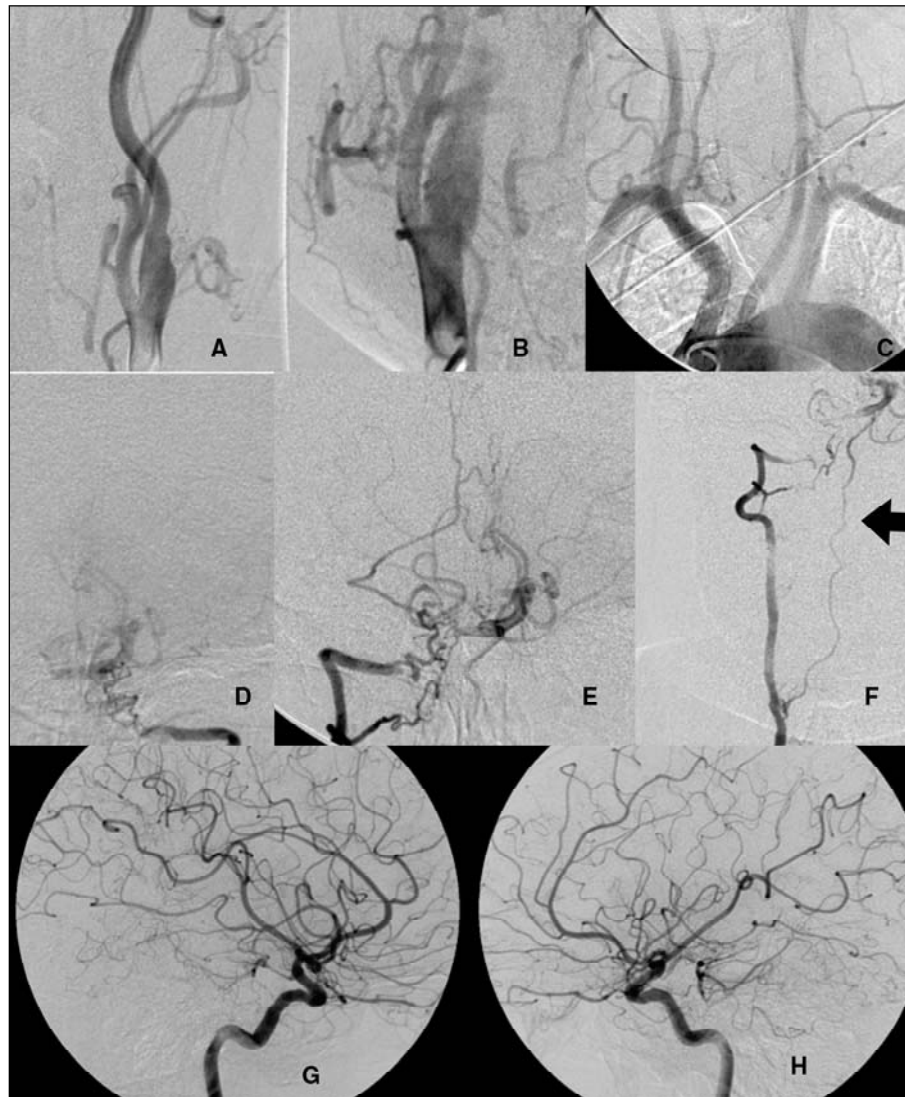


Fig 1. Preoperative angiogram: (A) normal right common carotid bifurcation. (B) normal left common carotid bifurcation. (C) aortic arch with both vertebral arteries origins. (D) and (E) left and right vertebral artery. Both vertebral arteries seem to be occluded at C1. Note the collateral flow to the posterior fossa. (F) right vertebral injection in the neck, showing the huge contribution from the anterior spinal artery to the posterior fossa circulation (arrow). (G) and (H) right and left internal carotid arteries. Note the contribution through the posterior communicating artery to the posterior circulation.

trauma with loss of consciousness 12 years ago. For the last one and a half years he had been presenting sudden episodes of double vision, unsteadiness and vertigo, and occasionally left-sided weakness and numbness. He had multiple episodes a day, and noticed that they improved faster with some physical exercise. He was mildly hypertensive, but could not tolerate antihypertensive medications, which appeared to aggravate his symptoms. He was also using antiplatelets, but still having symptoms frequently. Neurological examination was unremarkable. Physical examination was also normal, except for mild hypertension. A magnetic resonance imaging study (MRI) was done, and suggested bilateral extracranial vertebral occlusion, which was con-

firmed by an angiogram. The angiogram also showed that the posterior fossa circulation was supplied only by collateral circulation through very small posterior communicating arteries and some collateral flow from extracranial arteries. Of note, an enlarged anterior spinal artery was seen being responsible for most of the flow in the lower basilar artery segment (Fig 1). The patient was then submitted to a bilateral occipital to PICA bypasses, in order to increase the blood flow to the posterior fossa (Fig 2). Postoperative angiogram done two days after the procedure showed good blood flow through the bypasses (Fig 3). In his last visit, two months after the procedure, he had not had any episode of the previous ischemic symptoms.

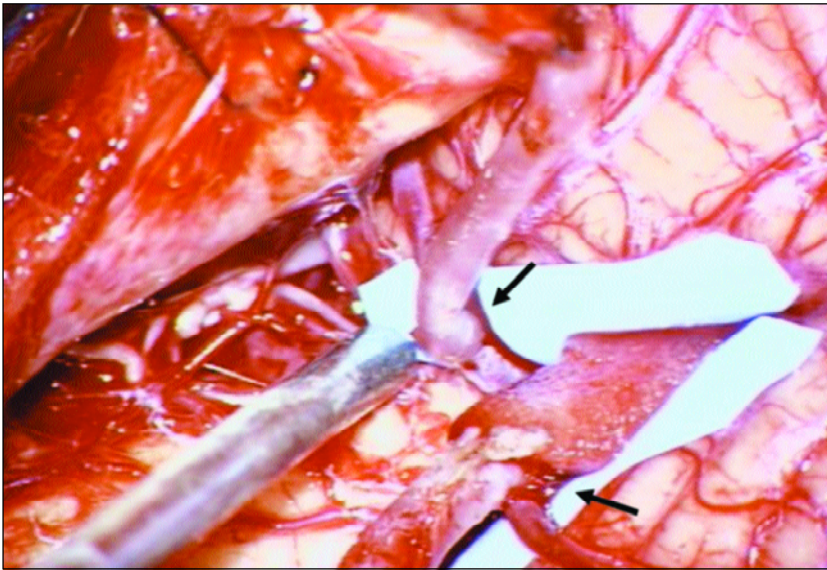
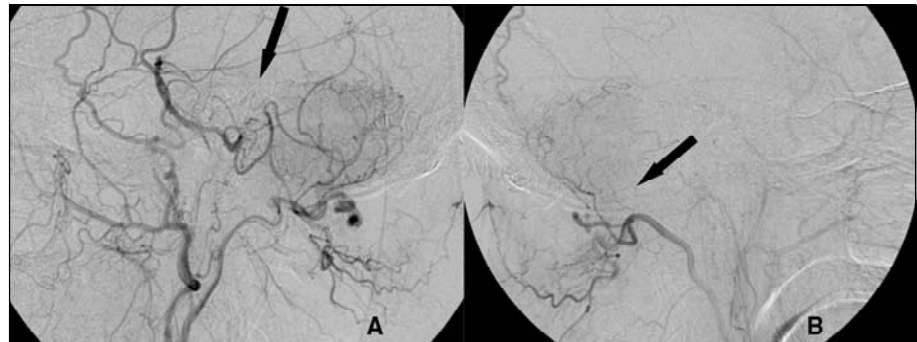


Fig 2. Intraoperative picture showing the bilateral occipital to PICA bypasses (arrows).

Fig 3. Postoperative external carotid angiogram showing the filling of the left vertebral and basilar artery through the left bypass (A), and of the PICA territory in the right side through the other (B).



DISCUSSION

Posterior fossa ischemia represents roughly 25% of all ischemic strokes. The most common cause is atherosclerotic stenosis of the vertebral and/or basilar arteries. The anatomy of the posterior fossa circulation is such that most of the times the occlusion of one of the vertebral arteries is well tolerated. In the absence of congenital anomalies, the collateral circulation is usually sufficient to keep an adequate blood flow. Trauma, soft tissue or osseous compressions are also cited as cause of compression and stenosis of the vertebral artery in the neck, although less frequently¹⁻⁴.

Blunt trauma to the head and neck is being recognized as a cause of carotid and vertebral artery injury, most commonly, carotid dissections. The real incidence of vertebral artery injury after blunt trauma is unknown as also is its clinical significance. Series report an incidence of 30 to 60% of carotid and/or vertebral artery injury associated with some patterns of blunt head and neck trauma. Some patterns of cer-

vical spine fracture are being related to high risk of vessel injury, with some authors suggesting that almost every patient with a cervical spine fracture should be screened for craniocervical vessel injury⁵⁻¹⁰.

The prognosis of posterior fossa stenosis is not well determined, although an increased incidence of stroke is suggested¹. In a series from the Cleveland Clinic¹¹, including also asymptomatic patients with atherosclerotic stenosis, an increased stroke rate of 5.25% per year, most in the anterior circulation was observed. The presence of intracranial vertebral artery stenosis, which is often associated with basilar artery stenosis, seems to increase the risk of posterior fossa stroke to 7% per annum, if compared to extracranial stenosis alone. The inclusion of patients with associated carotid disease and asymptomatic patients may have biased the results, however. Traumatic lesions are associated with early or delayed ischemic symptoms, and aggressive medical management with full anticoagulation is suggested. Better prognosis (lower stroke rates) for the patients with lesions diag-

nosed and treated before the onset of ischemic symptoms has been demonstrated in some case series^{5,6,8,9}.

Hemodynamic insufficiency seems to be the most common mechanism of symptoms associated with vertebro-basilar stenosis. In vertebral stenosis cases, the involvement of both arteries or some anomaly (eg: ending in a PICA artery, hypoplastic vertebral artery) that compromises the contralateral blood flow need to be present for symptoms to occur^{2,3,10-12}.

Since its institution in the 50s, anticoagulation has been the main stem of medical management of vertebro-basilar insufficiency. Antiplatelets may also be used if embolism is a consideration. Endovascular techniques are being more and more commonly used in the treatment of intracranial vascular insufficiency, and it has it is now the first choice in cases of symptomatic proximal vertebral artery occlusion¹¹⁻¹⁴.

Surgical treatment of vertebrobasilar insufficiency can be considered in cases where there is no response to maximal medical therapy and no endovascular options. In the past, both extracranial and intracranial vertebral endarterectomies were done¹⁵⁻¹⁸. The extracranial vertebral endarterectomy is being replaced by the more convenient and less invasive endovascular angioplasty and stenting. The long term duration of this treatment is still to be determined. The complexity and high risk of the intracranial vertebral artery endarterectomy prompt the search for new options for the treatment of intracranial vertebrobasilar insufficiency, and angioplasty with or without stenting is rising as an option. The use of EC-IC bypass for the treatment of intracranial vascular insufficiency was nearly abandoned after the publication of the results of the EC-IC bypass trial¹⁹. Extracranial to intracranial circulation bypasses are an intuitively very attractive technique to increase the blood flow to a given area of the brain, and in spite of the results of the EC-IC trial, it seems to have an indication in selected cases^{15,20-22}.

We believe that our patient had bilateral extracranial vertebral artery occlusion due to traumatic injury of the arteries. He is otherwise healthy, with no risk factors for atherosclerotic disease except for mild hypertension, and the angiographic appearance of the stenosis does not suggest atherosclerotic lesions. Its late presentation, for which we do not have an explanation, makes his case unique. The clear hemodynamic nature of his symptoms indicated to us that a procedure to improve the blood flow in the posterior fossa was indicated. The need for better blood supply could also be inferred from the extremely en-

larged anterior spinal artery. Endovascular treatment was not considered an option in his case, and bilateral occipital to PICA bypasses were performed, with complete resolution of the symptoms. In spite of not being commonly used nowadays, we believe that revascularization procedures still have an important role in the management of patients with cerebrovascular insufficiency, especially in carefully selected subgroups.

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