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CASE REPORT

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Carotid Free Floating Thrombus: Description of a New Technique of Stent Retriever Treatment

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Abstract

The carotid free floating thrombus (FFT) is an infrequent and therefore little studied cause of stroke. Different alternatives of medical and surgical treatment have been described, without demonstrating that one is better than the other. In recent years endovascular treatment techniques have been improved, showing promising results. In this work we present a case report of a FFT treated with a technique of stent retriever thrombectomy

Keywords: Stroke; Free Floating Thrombus; Carotid; Stent Retriever; Thrombectomy

Abbrevations: CCA: Common carotid artery; CT: Computed tomography; DWI: Diffusion weighted imaging; FFT: Free floating thrombus; ICA: Internal carotid artery; MCA: Middle cerebral artery; MR: Magnetic resonance; NIHSS: National Institute of Health Stroke Scale

Introduction

The carotid free floating thrombus (FFT) is an infrequent but probably underdiagnosed pathology whose importance lies in being a potential cause of stroke with significant prognostic and therapeutic implications [1]. It was first described in 1905 by Dr. Hans Chiari and is defined as the presence of a thrombus with an elongated or protrusive morphology, attached to the arterial wall, with circumferential blood flow and cyclical movements associated with heart rhythm in its most distal end [1]. Although there are multiple reports of this condition there are still discrepancies about which is the best diagnostic and therapeutic approach [1, 2, 3]. Here we present a novel technique of endovascular management with carotid stent and mechanical extraction of the thrombus

Clinical Case

A 51-year-old man, smoker and with a history of hypertension and ankylosing spondylitis was referred to our center due to left-sided sensory and motor deficit. The patient reported similar episodes during the last 10 days, but milder and self-limited. Physical examination on admission disclosed left arm weakness and left-sided numbness, with a NIHSS score of 2. Brain CT was normal and CT angiography showed a filling defect in the proximal segment of the right internal carotid artery (figure 1A). The study was completed by carotid Doppler ultrasonography (figure 1B) and MR angiography (figure 1C) that confirmed the presence of a thrombus attached to the wall of the right carotid artery, with a mobile distal end, suggestive of a free floating thrombus. All laboratory results were unremarkable.

The initial clinical course was unstable despite being treated with intravenous heparin and oral aspirin during the first 6 days, no Clopidogrel was used to not increase the risk of bleeding. On the sixth day there was an abrupt worsening of neurologic deficit (NIHSS=10). A new CT angiography performed within the first hour showed no change in thrombus size and an occlusion of an upper distal branch of the right MCA, whose flow was compensated by collateral branches in the CT perfusion. A concomitant brain MR showed a new ischemic lesion (figures 2C & 2D). Given the progressive worsening despite receiving intensive medical treatment, endovascular thrombectomy was indicated.

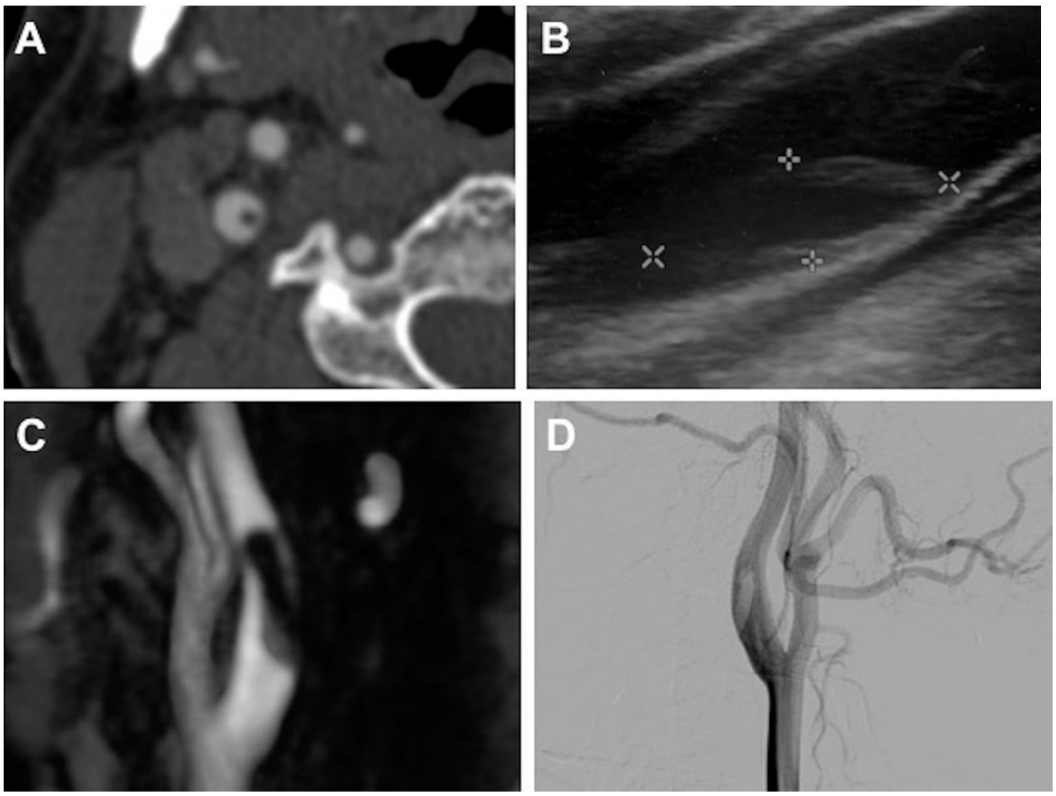

Figure 1: Different images of the carotid FFT. Angio-CT with the donut sign (A), carotid Doppler (B), angio-MR with the finger sign (C) and angiography with the finger sign (D)

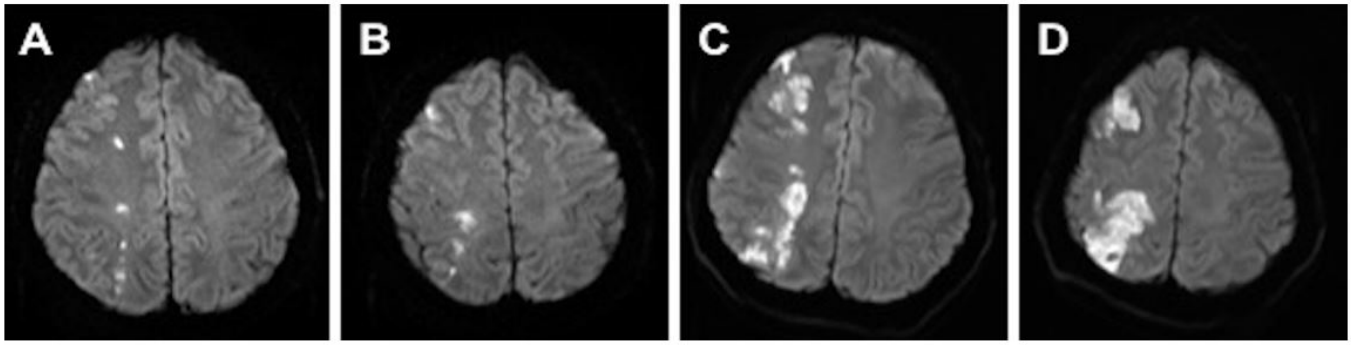

Figure 2: Progression of watershed infarct in the DWI sequences of MRI from admission (slices A & B) to the 6th day (slices C & D)

Interventional Technique

An arteriography was performed 8 hours after the fluctuation revealing an 7 mm diameter right ICA with a floating thrombus inside that occupied approximately 50% of the lumen and an occlusion of a superior branch of the right MCA. Then, a FlowGate2 8F balloon guide catheter (Stryker Neurovascular-Concentric Medical Inc.) was placed in the right CCA, simple aspiration of the FFT through the 8F introducer was attempted but was not effective, no push was made to avoid distal thrombus migration. With a 0.014-inch 300 cm BareWire microguide (Abbott Vascular), the stenosis in the right ICA was crossed without touching the thrombus and the C2 segment of the right ICA according to the Bouthillier classification was catheterized. An Emboshield 4.0-7.0 mm distal protection filter (Abbott Vascular) was raised and deployed in a straight portion of the artery for its proper functioning. A 10x40 mm Carotid Wall Stent (Boston Scientific) was raised and the first 2/3 of the stent were unsheathed without deploying it, at the thrombus vicinity, catching it. With the guide catheter balloon inflated and under continuous aspiration with the Penumbra aspiration pump (Penumbra), the stent was removed slowly and carefully, achieving full repermeabilization of the right ICA. Finally, the distal protection filter was removed and angiographic studies were carried out demonstrating complete repermeabilization of the right ICA, without residual stenosis, the occlusion of the upper branch of the right MCA persisted and was not repermeabilized due to the time of evolution, because it was a distal branch and because it had good compensation for collateral branches in the previous images. The puncture site was closed with a Perclose-ProGlide mechanical suture (Abbott) and there were no complications. After clot removal, the patient had a NIHSS of 13 and remained stable with neither fluctuation nor stroke recurrence, at 3 months he had an modified Rankin scale of 2.

Discussion

We present a patient with a carotid FFT in whom thrombectomy with a carotid stent used as stent retriever, plus a concomitant distal protection filter, prevented intraprocedural embolisms and led to clinical stabilization.

FFT is an infrequent condition, with between 150 and 200 cases reported to date, and an estimated incidence of 0.4-1.5% in angiographic studies [3]. It predominantly affects men, with a 2:1 ratio and usually occurs at a younger age than atherosclerotic disease [1]. The most frequent causes are complicated atheromatous plaques and hypercoagulable states, such as antiphospholipid syndrome or paraneoplastic syndromes, however it has also been associated with autoimmune disorders, carotid aneurysms, cardiogenic embolism and arterial dissections [3], these potential etiologies have been reasonably ruled out in our patient. FFT usually presents with acute neurological symptoms secondary to microembolisms [1,4], the clinical and radiological course of our patient prior to thrombectomy highly suggest this mechanism.

The diagnosis of FFT was supported by the neuroimaging findings. Characteristics signs in CT or MR angiography are the "donut sign" (figure 1A), a filling defect surrounded by contrast (5) and the "finger sign" (figures 1C & 1D), a finger-like projection of the thrombus attached to the underlying atherosclerotic plaque or dissection (6), both present in our patient.

Anticoagulants have shown a thrombus resolution rate of 58% [7], however, may increase the risk of cerebral bleeding and make a friable clot more prone to embolization [3]. Surgical treatment is the most frequent alternative [1], clinical improvement is reported in 37% of patients and stabilization in 54%, although retaining a rate of 9% of clinical worsening [1].

In recent years, endovascular thrombectomy has proven to be a safe and effective treatment in acute stroke with large vessel occlusion. The first descriptions of endovascular management of FFT date from 2003 in which Chakhtoura et al published two cases treated with carotid stent [8]. From 2014, there have been reported two patients treated with Penumbra aspiration [9, 10] and four patients treated with stent retrievers (Solitaire, Medtronic; CATCH, Balt Extrusion; Embotrap II, Neuravi) with distal filter protection [3, 11]. Compared to the surgical techniques, endovascular approach allows using devices to prevent distal emboli, does not require general anesthesia and anticoagulation may be continued in the periprocedural period if necessary [11]. According to our review we describe for the first time a thrombectomy of a carotid FFT by retrieving a carotid stent. To date, there is no stentretriever with a diameter that adapts to the diameter of the extracranial ICA, for this reason, the authors used the CarotidWallstent (instead of a stentretriever), since if it has the sufficient diameter and radial force to engage to the extracranial carotid wall and trap the thrombus. This technique resembles the use of intracranial stentretrievers, which originally also used a stent designed for another function, Solitaire AB, designed for the treatment of aneurysms [12]. Special care should be taken in only partially unsheathing the carotid stent to avoid an unwanted deployment, for this it is necessary that the team have experience in the use of this type of stent. The use of a distal protection filter, flow arrest and proximal aspiration through a balloon guide catheter, prevents intraprocedural embolisms. The subsequent patient clinical stability favors the idea that this technique can be used safely and effectively in early treatment of FFT, in order to prevent further ischemic events.

Conflict of Interest Disclosure

None of the authors has competing interests to declare

Ethics Statement

Informed consent of the patient was obtained. Institutional Review Board (IRB) approval was not required

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