Idiopathic floating thrombus of the common carotid artery: Diagnosis and treatment options

G. Pagliariccio ^{a,*}, R. Catalini ^b, O. Zingaretti ^b, L. Mancinelli ^c

^a Department of Vascular Surgery, Azienda Ospedali Riuniti Ancona, Italy

^b Department of Vascular Medicine, Azienda Ospedali Riuniti Ancona, Italy

^c Department of Internal Medicine, Azienda Ospedali Riuniti Ancona, Italy

KEYWORDS

Floating carotid thrombus;
Color Doppler sonography;
Surgical treatment.

Abstract The authors report a case of ischemic stroke caused by a floating thrombus in the common carotid artery and review the diagnostic techniques used to identify the cause of ischemic strokes. They also examine the possible origins of idiopathic carotid thrombi and the current options for their management, with emphasis on the difficulties and risks associated with medical and surgical approaches.

Sommario Gli autori, prendendo spunto da un caso clinico di ictus ischemico da trombo flottante della carotide comune, analizzano le tecniche diagnostiche da utilizzare per una diagnosi etiopatogenetica in caso di ictus ischemico. Prendono inoltre in esame le possibili origini di un trombo idiopatico della carotide e le attuali possibilità terapeutiche, distinguendo le difficoltà e i rischi sia del trattamento medico che di quello chirurgico.

© 2010 Elsevier Srl. All rights reserved.

Introduction

The presence of a free-floating thrombus in the carotid artery is a rare finding, but a number of cases have been reported with analyses of the etiopathogenesis of this condition and possible approaches to its treatment [1]. Most cases can be attributed to atherosclerotic plaques or intracardiac thrombi in the heart. Cases in which these causes have been ruled out are extremely rare and are generally described as idiopathic [2]. Nonetheless, the possibility of free-floating thrombi should always be considered in the differential diagnosis of ischemic stroke

in a patient with no evidence of atherosclerosis or cardiac disease. They can be readily detected with color Doppler studies and confirmed, if necessary, with a contrast-enhanced examination (computed tomography [CT] or magnetic resonance imaging [MRI]) [3]. There are basically two treatment options: surgical removal of the thrombus or medical therapy based on anticoagulation. In this report we describe our experience with a patient who had a floating carotid thrombus and review the diagnostic and therapeutic options available for the management of cases of this type.

Case report

The patient was a 76-year-old woman with a family history of stroke and hypertension. She herself was being treated

* Corresponding author. via Rosselli 3, 60019 Senigallia, Ancona, Italy.

E-mail address: gpagliariccio@yahoo.it (G. Pagliariccio).

for hypertension with olmesartan. She also suffered from bronchial asthma. Her surgical history included an appendectomy, left knee replacement, and repair of a prolapsed uterus.

After taking levofloxacin and lansoprazol, she had reportedly developed generalized erythema followed by vomiting and chest pain. She was taken to a local emergency room, where she developed progressive left-sided weakness followed by a generalized convulsive episode. After the seizure the patient was confused, and brief episodes of clonic contractions were noted in the left arm. She was treated with luminal, aspirin, and steroids. CT of the brain was negative for ischemic events.

The physical examination revealed an alert cooperative elderly woman with disorientation to time, left hemiasomatognosia (deviation of the head and eyes to the right, left hemiplegia and hemianesthesia), and no impairment of deglutition or micturition. Doppler sonography of the supra-aortic trunks revealed moderate eccentric atheromasia in the middle third of the right common carotid artery, which was not associated with stenosis, and a finger-shaped extension that had no contact with the vessel wall and that moved back and forth in rhythm with the sphygmoc wave. The patient was immediately transferred to the Critical Care department of the regional hospital. Here a second color Doppler study confirmed the presence of a mobile thrombotic formation arising in the proximal portion of the right common carotid artery (Fig. 1, Fig. 2) with a circumscribed area of adherence to the vessel wall. The thrombus extended for 20 mm, and its tip lay approximately 18 mm from the bifurcation. On CT angiography, the thrombus appeared as an elongated, rod-shaped, nonenhanced, endoluminal formation. The lower end was attached to the intimal surface of the artery, and the remainder of the thrombus was mobile. The length of the thrombus (craniocaudal axis) was 2.2 cm, and the cranial tip was located

Fig. 1 Doppler sonography reveals a floating thrombus in the common carotid artery (longitudinal scan).

Fig. 2 Doppler sonography reveals a floating thrombus in the common carotid artery (transverse scan).

about 2 cm from the bifurcation (Fig. 3). The study also revealed an area of parenchymal hypodensity at the cortical-subcortical level in the right temporoparietal region. Surgery was performed immediately. Longitudinal arteriotomy of the right common carotid revealed a floating thrombus attached to the posterior wall of the vessel (Fig. 4). The clot was removed, and the underlying vessel wall appeared intact and plaque-free. Histologic examination of the thrombus revealed hematic and fibrinoleukocytic elements. Cultures yielded no microbial growth. After surgery, the neurologic findings were unchanged. An episode of pneumonia was successfully managed with antibiotic therapy. The transesophageal echocardiogram was within normal limits, and screening for thrombophilia was negative. Color Doppler sonography performed after surgery revealed normal patency in the right common carotid with no evidence of residual thrombosis.

Discussion

The presence of a floating thrombus in the carotid axis is a rare finding that is widely described in the literature. Its presentation is often dramatically associated with an ischemic stroke caused by distal embolism [2]. An interesting review by Bhatti et al. [5] found that a total of 145 cases have been reported since 2004. Men are affected more frequently than women, and the condition is more common in younger patients than in those with atherosclerosis. This review also included floating thrombi arising from atherosclerotic plaques, which in our opinion should be excluded from discussions of idiopathic carotid thrombosis.

In the vast majority of cases (92%) [4], the diagnosis is made after the patient develops clinical signs of cerebral ischemia. The main risk attached to these lesions is the possibility of cerebral embolism caused by detachment of clot fragments.

Fig. 3 CT angiography of the floating thrombus.

In 75% of all cases, the thrombus develops in the internal carotid [4]. In the other 25%, the common carotid is involved, as it was in our patient.

As far as the etiopathogenesis is concerned, floating thrombi cannot be classified as idiopathic until cardiac thrombosis and underlying atherosclerotic plaques have been ruled out. The possibility that the clot is secondary to carotid disease (e.g., dissection, thrombosis of an aneurysm) must also be excluded. In clinical practice, most of these conditions can be excluded by transesophageal echocardiography and Doppler studies of the carotids. Identification of the exact cause is essential for selecting the right approach to treatment.

Ultrasonography allows rapid accurate diagnosis and is almost always performed when patients develop symptoms of cerebral ischemia; rare cases of floating carotid thrombi have also been diagnosed incidentally during color Doppler studies for other reasons, but these are clearly exceptions to the rule.

Carotid sonography is noninvasive, simple to perform, and easily repeated. It can be performed rapidly as

Fig. 4 Intraoperative appearance of the floating thrombus in the common carotid.

a bedside procedure during the acute phase of ischemic stroke [3]. In addition, its sensitivity and specificity in the diagnosis of carotid disease is quite high, and it can furnish very precise information on the cause of the patient's symptoms. In some cases, color Doppler studies of the epiaortic vessels are supplemented with transcranial Doppler sonography, which also allows exploration of the circle of Willis [2].

Except in rare cases, when the patient's condition requires urgent intervention [3], a confirmatory study is required (among other things for treatment planning purposes). The second-level examination is usually a noninvasive contrast-enhanced procedure like CT angiography or MR angiography [5]. As in the case described here, these studies can confirm the ultrasound findings and provide more precise information on the extension of the thrombus. This is especially important when the thrombus is located in intracranial segments of the carotid, where anatomical factors limit the value of color Doppler. Angiography, once routine in these cases, is no longer used in this phase of diagnosis because the procedure itself is associated with the risk of ischemic stroke (1.5%), as demonstrated by the Asymptomatic Carotid Atherosclerosis Study on carotid endarterectomy. It appears to be indicated only when the thrombus is going to be treated with an endovascular technique [6].

The choice of treatment is often difficult: the patient almost always presents signs of an acute ischemic stroke, and there are no standard guidelines on the way these cases should be managed [4].

The patient can be managed medically or the thrombus can be removed surgically or with an endovascular procedure. The decision depends on the location of the clot, its morphology, and its cause. If the thrombosis is idiopathic, treatment will depend on the location and extension of the thrombus. When possible (i.e., when the thrombus is located at the cervical level with no intracranial extension), a direct surgical approach (with direct extraction of the thrombus) seems to carry a low risk, and it can completely resolve the problem.

In the case described here, the thrombus was located in the middle third of the common carotid artery. The thrombus was easily removed and the surgery was quite effective.

Thrombi with intracranial extension can also be removed with a Fogarty catheter, but this approach seems to be associated with higher risks for both neurological and cerebrovascular lesions.

In recent years, some groups have proposed the use of protected endovascular stenting [6] with flow reversal (which eliminates the need to pass the protective device through the clot prior to stenting), but it is rarely used because it, too, carries a high risk of embolism due to the inherent instability of these thrombi.

The best alternative is anticoagulation therapy [4] with heparin and later warfarin. It should be continued for 3–6 months, depending on the clinical course of the case and the morphology of the thrombus. This approach is the treatment of choice when the thrombosis is secondary to cardiac disease (e.g., atrial fibrillation, dilatation of the heart chambers) or dissection of the carotid artery. If the floating thrombus is caused by the presence of an atherosclerotic

plaque, carotid endarterectomy is indicated. The timing of surgery will depend on the patient's neurological condition.

There are clearly several treatment options, and the choice must be based on a number of factors, clinical, etiological, and in many cases, the experience of the physician who is caring for the patient. The data available in the literature indicates that medical therapy is associated with lower risk but also more limited benefits than surgery, which produces better immediate and long-term results [4]. Patients with ischemic strokes caused by floating carotid thrombi will undoubtedly require admission to a stroke unit, where they can be managed by a multidisciplinary team (including a neurologist, an internist, a vascular surgeon, and an interventional radiologist) that can offer the most effective solution for each individual case.

Conclusions

In cases of ischemic stroke, floating carotid thrombus must be considered as a possible cause of the embolism. This condition can usually be identified by means of Color Doppler sonography, and more in-depth information can then be obtained with CT or MR angiography. Medical and/or surgical management should be provided by a multidisciplinary team and should be based on the characteris-

tics of the individual case (morphology and location of the thrombus and the condition of the patient).

Conflict of interest statement

The authors have no conflict of interest.

References

- [1] Hill SL, Brozyna W. Extensive mobile thrombus of the internal carotid artery: a case report, treatment options, and a review of the literature. *Am Surg* 2005 Oct;71(10):853–5.
- [2] Silver B, Gulka I, Nicolle M, Sahjapaul R, Hachinski V. Idiopathic free-floating thrombus of the common carotid artery. *Can J Neurol Sci* 2002 Feb;29(1):97–9.
- [3] Rossetti AO, Urbano LA, Lobrinus JA, Devuyst G. Stroke vignette. Ultrasonographical, radiological and pathological correlation of a floating thrombus in the common carotid artery. *Cerebrovasc Dis* 2002;14(1):64.
- [4] Bhatti AF, Leon Jr LR, Labropoulos N, Rubinas TL, Rodriguez H, Kalman PG. Free-floating thrombus of the carotid artery: literature review and case reports. *J Vasc Surg* 2007 Jan;45(1):199–205.
- [5] Linee guida della società Italiana di chirurgia vascolare ed endovascolare. *It J Vasc Endovasc Surg* 2009;vol. 16 [suppl. Sett].
- [6] Parodi JC, Rubin BG, Azizzadeh A, Bartoli M, Sicard GA. Endovascular treatment of an internal carotid artery thrombus using reversal of flow: a case report. *J Vasc Surg* 2005 Jan;41(1):146–50.