



Emergency Management of Free-Floating Thrombus in the Internal Carotid Artery Coupled with Thrombotic Enlarged Carotid Bulbous *via* Overlapped MicroNet™-covered stents

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Abstract

Purpose: Free-floating thrombus in the carotid artery represents an uncommon but challenging pathological condition associated with a high short-term risk of recurrent embolic ischemic events.

The aim of this report is to present a unique case of symptomatic free-floating thrombus in the internal carotid artery, developed in the presence of an extensive thrombosis of an enlarged carotid bulbous successfully treated in emergency *via* two overlapped MicroNet™ covered-stents.

Case Report: A 65-year-old male presented with a transient ischemic attack characterized by left hemiparesis. Color-duplex sonography and CT-angiography evidenced a free-floating thrombus extending into the lumen of the proximal right internal carotid artery associated with moderate arterial stenosis and an extensive parietal thrombosis in an enlarged carotid bulbous. No acute cerebral ischemic lesions were detected. Two MicroNet(TM)-covered stents (CGuard™ CGuard™, InspireMD, 9x40mm and 10x40mm) were overlapped at the level of the enlarged carotid bulbous from the distal common to the internal carotid artery. Neurological symptoms completely recovered in 24 h. At six-month follow-up, Eco-color-Doppler ultrasound control confirmed the correct positioning of the stents.

Conclusion: Carotid artery stenting *via* MicroNet™-covered stents might represent the more suitable endovascular option in symptomatic free-floating thrombus in the carotid artery.

Keywords: Free-floating thrombus; Internal carotid artery; Carotid artery stenting; MicroNet™, Mesh stent, Enlarged carotid bulbous; Transient ischemic attack

Introduction

The recognition of a Free-Floating Thrombus (FFT) in the Carotid Artery (CA) is relatively uncommon [1,2], with an estimated frequency among stroke patients around 0.4% [3,4].

Complicated carotid plaques represent the most common causes of FFT development; other more rarely reported causes are vascular trauma, fibromuscular dysplasia, carotid dissection and vasculitis [4].

Endovascular treatment *via* self-expanding MicroNet™, Mesh stent, has been shown to be effective in the management of this challenging pathological condition [4,5].

Here, we report and discuss a unique case of symptomatic Transient Ischemic Attack (TIA) with left hemiparesis, developed in the presence of an FFT in the internal CA associated with an extensive parietal thrombosis developed in an enlarged carotid bulbous successfully treated in emergency *via* two overlapped MicroNet™-covered stents (CGuard™, InspireMD).

Case Presentation

A 65-year-old male patient with a background history of diabetes mellitus, arterial hypertension, ischemic cardiomyopathy, and previous PTCA presented with a TIA characterized by left hemiparesis. No coagulation abnormality was demonstrated.

Color-duplex sonography showed a FFT extending into the lumen of the proximal right internal CA associated with moderate arterial stenosis and an extensive parietal thrombosis in

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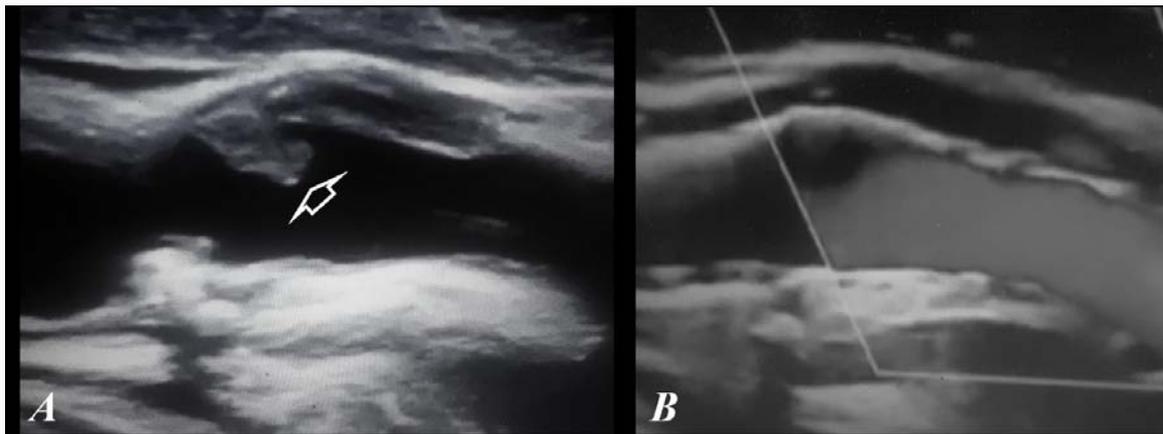


Figure 1: A) DUI of the right internal CA artery showing a FFT in the vascular lumen (arrow); FFT presented characteristically cyclical motion relating to the cardiac cycle. Note the extensive echogenic thrombosis attached to the surface of the carotid bulbous. B) Post-procedural DUI controls showing the effective thrombus trapping between the CGuard™stent and the arterial wall. Doppler Ultrasound Images (DUI). FFT: Free-Floating Thrombus; CA: Carotid Artery

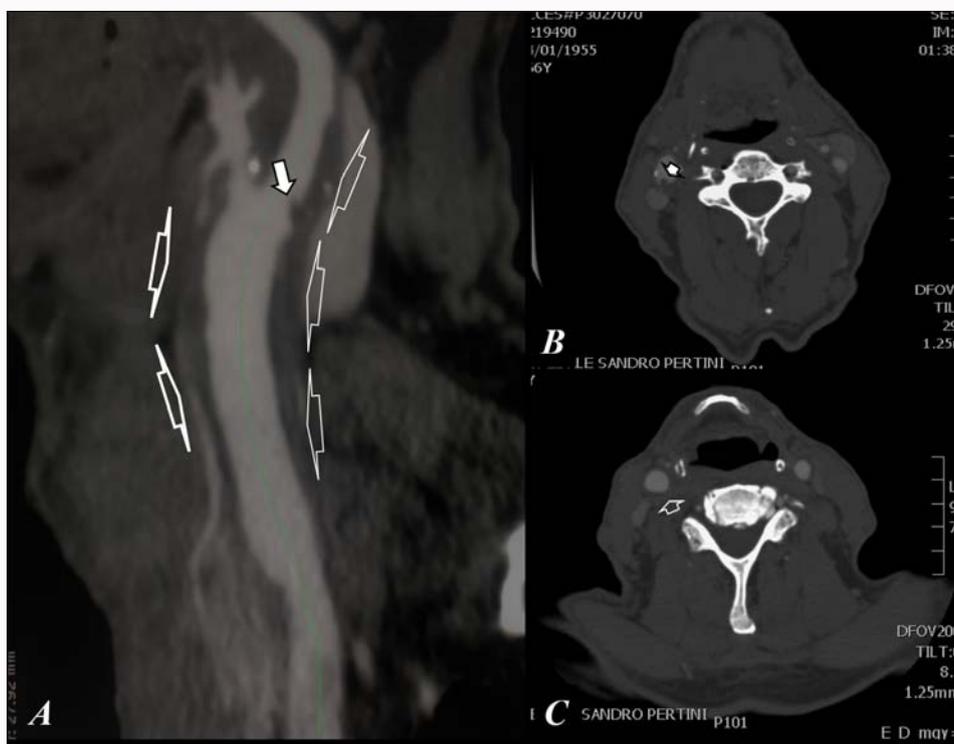


Figure 2: A) Note in the sagittal CTA reconstruction the extensive parietal thrombosis of the enlarged carotid bulbous (empty arrows). B,C) transversal CTA of the neck showing a moderate internal CA stenosis coupled with aFFT into the lumen of the proximal internal CA (small white arrows). FFT: Free-Floating Thrombus; CTA: CT Angiogram; CA: Carotid Artery

an enlarged carotid bulbous (Figure 1A). Computer Tomography Angiography (CTA) confirmed this instrumental finding (Figure 2A-2C). No acute cerebral ischemic lesions were detected.

Considering the substantial rate of recurrent cerebrovascular ischemic events, we decided to perform an emergency carotid stenting *via* MicroNet™-covered stent.

After general anesthesia, using a US-guided right common femoral artery access and a standard 8Fr introducer, a catheter guide was positioned in the aortic arc (Type II) to engage common carotid artery.

After careful positioning of a distal protection device, two MicronNet™-covered stents (CGuard™ 9x40mm and 10x40mm) were implanted from the distal common to the internal CA. CGuard™ stents were overlapped at the level of the enlarged thrombotic carotid bulbous (Figure 3A). No pre-dilation and only a slight stent post-dilation were performed. No intra procedural complications were detected.

Neurological symptoms completely recovered in 24 h. Post-procedural MRI, performed 2 weeks after the procedure, showed restricted diffusion thought to be secondary to microemboli.



Figure 3: A-C) 3 Two CGuard(TM) MicroNet(TM)-covered stents (9x40mm and 10x40mm) were implanted from the common to the internal CA. They were overlapped at the level of the enlarged carotid bulbous. A) post-procedural angiographic control; B) neck radiography showing the overlapped Two CGuard(TM) MicroNet(TM)-covered stents that adapt perfectly to the vessel lumen; C) postoperative CTA reconstruction of the right carotid axis; normal internal CA lumen. DUI: Doppler Ultrasound Images; FFT: Free-Floating Thrombus; CTA: CT Angiogram; CA: Carotid Artery

Postoperative medical therapy consisted of dual antiplatelet therapy (clopidogrel 75 mg and aspirin 100 mg). Postoperative neck radiography (Figure 3B) and CTA reconstruction (Figure 3C) confirmed the exact placement of the overlapped MicroNet™-covered stents. At six-month follow-up, Eco-color-Doppler ultrasound control confirmed the correct positioning of the stents and a restored normal internal CA lumen without evidence of residual stenosis (Figure 1B).

Discussion

Bhatti et al. [5] had traditionally defined a FFT in the CA as an elongated thrombus attached to the arterial wall, usually presenting a cyclical motion related to the cardiac cycle. The internal CA represents the most affected vessel [4-6]. Atheromatous plaque complications, such as intra-plaque hemorrhage or plaque ulceration, and hypercoagulable states seem to be the most frequent causes of FFT development [4-6].

Our patient had any coagulation abnormality and only a moderate internal CA stenosis. However, CA presented in this case a thrombotic enlarged carotid bulbous (Figure 2A-2C); we cannot exclude that this specific anatomic-pathological condition may have favored the FFT development in the proximal internal CA. The ideal management of FFT is not well defined, and, similarly, comparative studies between medical and surgical or endovascular management are lacking [4].

Specifically, different kinds of treatment have been described, including medical management alone, medical management with emergency or delayed surgery or endovascular repair of the lesion *via* carotid endarterectomy, Carotid Artery Stenting (CAS), suction thrombectomy followed by CAS or, in particular anatomical conditions, endovascular thrombus stabilization *via* fibered coils [4-8].

Anticoagulation *via* low molecular weight heparin, unfractionated heparin, Vitamin K Antagonist, and/or singular or dual antiplatelet therapy represent the most reported medical therapy. There is no

consensus on how long anticoagulation treatment should be continued in these cases; furthermore, one cannot exclude the possibility of FFT reappearance after therapy discontinuation [9]. Also, thrombolytic agents might play a role in FFTs management but present a risk of clot fragmentation and distal intra-cerebral thrombus dislodgement [10,11]. The most frequent surgical management of FFT in the CA is based on traditional carotid endarterectomy or carotid stenting with first generation stent [4,12-14].

The main advantages of the CAS are in those cases of the absence of a “potentially embolic” vascular manipulation in addition to an effective and complete FFT covering.

Both WallStent and CGuard™ MicroNet™-covered stent appear suitable [4,5,14,15]. It is most likely that stents with micromesh (as MicroNet™) might offer a better safety profile and a better capacity to prevent clot fragmentation and distal migration [4]. Still, the advantages of MicroNet™-covered stent seem to not have been evaluated in the mentioned situations have sometimes not been profited in the mentioned situations.

Bhogan et al. [4] in a retrospective review published in 2021 including ca. 2200 CAS performed from January 2008 to September 2019, found only 7 patients with FFT in the CA.

In this recent review series, WallStent was used in 5 patients and CGuard™ in the remaining two; in one patient, two overlapping WallStents were necessary while two overlapping CGuard™ MicroNet™-covered stents were employed in no case.

Our case represents, therefore, to our knowledge, the first case of the use of two overlapped MicroNet™ covered-stents in the presence of symptomatic FFT in the internal CA associated with an extensive parietal thrombosis developed in an enlarged carotid bulbous.

Another key point in the endovascular treatment *via* MicroNet™ covered-stents of the FFT is represented by the necessity of complete and definitive coverage of the overall CA parietal thrombosis. Considering the elastic nature of the thrombosis and the possible

change in its length after stent deployment, the use of longer stents has been advised to ensure the complete coverage of the parietal thrombosis both proximally and distally [4,5].

Also, in this case, to obtain effective trapping of the thrombus between the stents and the arterial wall, we decided to cover a long tract of carotid axis intentionally from the distal common to the internal CA; the two MicroNet™-covered stents, CGuard™ were deliberately overlapped at the level of the enlarged carotid bulbous.

At six-months follow-up, Eco-color-Doppler ultrasound control confirmed the correct positioning of the CGuard™ stents.

Conclusion

Carotid artery stenting *via* MicroNet™ covered-stent might represent the more suitable endovascular option in symptomatic FFT in the CA.

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