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SHORT REPORT

Flap Protrusion after Carotid Artery Stenting (CAS) Detected by Intravascular Ultrasound: A Potentially Valuable Technique following CAS

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KEYWORDS
Carotid artery stenting;
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Abstract *Introduction:* Intravascular ultrasound (IVUS) can be used as a quality control technique following carotid artery stenting (CAS).
Report: An asymptomatic 79-year-old female, with 70% right internal carotid artery (ICA) stenosis, underwent CAS. ICA IVUS evaluation was performed before and after CAS. Angiogram post-CAS showed good results while IVUS detected a flap protrusion across the stent. We treated the flap protrusion with another stent placement. A second IVUS evaluation did not show any further procedural defects.
Discussion: IVUS can be a useful tool to perform quality control following CAS.

Introduction

Carotid artery stenting (CAS) is an alternative to carotid endarterectomy (CEA) for treating internal carotid artery (ICA) stenosis.[1] The quality control methods generally used after CEA/CAS are intra-operative duplex scan (DS) and angiography scan (AS). A 79-year-old patient was referred to our hospital due to asymptomatic right ICA stenosis revealed by DS (70%), MRA (80%) and intra-operatively by AS (Fig. 1A). The patient underwent CAS after administration of 300 mg clopidogrel and aspirin. Virtual histology intravascular ultrasound (VH-IVUS) imaging technology (EagleEye®Gold IVUS imaging catheter, 2.9-F, 20-MHz Volcano Therapeutics, Rancho Cordova, CA, USA) was used to provide detailed information on the composition of the patient's atherosclerotic plaques[2] and to perform a quality control following CAS. After positioning the embolic protection device (EPD, Emboshield NAV6, Abbott Park, Illinois, USA), the VH-IVUS catheter was advanced over a 0.014-inch guidewire and placed in a distal ICA

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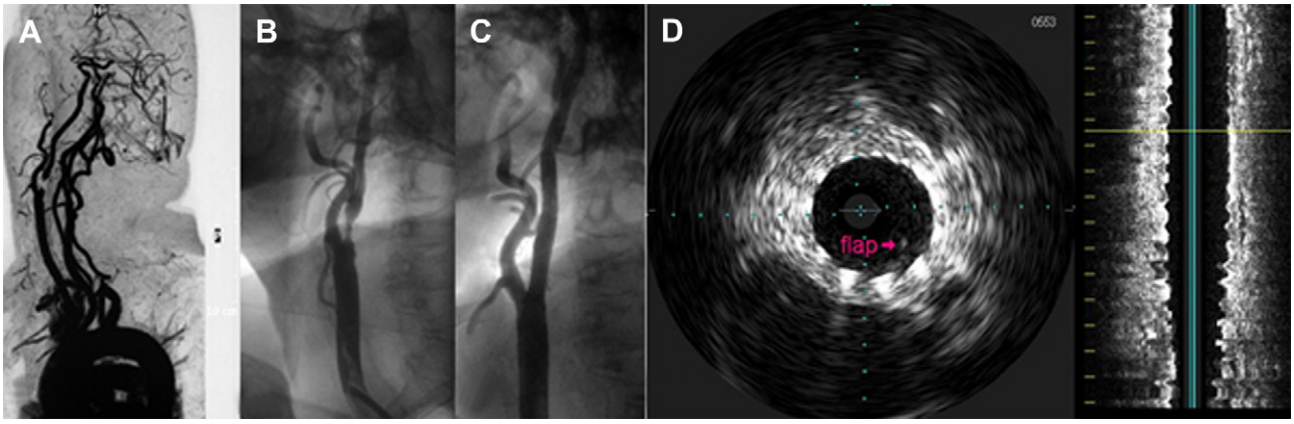

Figure 1 A) Proximal ICA stenosis of 80% detected angio-magnetic resonance. B) Angiography scan of proximal ICA stenosis. C) Post-procedural angiography scan control of ICA stenting. D) ICA intimal flap protrusion across the stent detected by VH-IVUS exam.

segment. Then, using a motorised pull-back system (speed of 0.5 mm s^{-1}), the device was gradually withdrawn. A live VH-IVUS interrogation confirmed the degree and the fibro-calcific plaque composition of the stenosis. A closed-cell carotid artery stent (Wallstent 9 × 30 mm-Boston-Scientific, Natick, MA, USA) was deployed and a percutaneous transluminal angioplasty of stent was performed with a 5 × 20 mm balloon. Post-procedural AS showed good results without any further defects (Fig. 1C), while VH-IVUS detected intimal flap (>2 mm in length in the ICA) trembling in the flow. The flap protruded across the middle of the stent (Fig. 1D). This protrusion was probably caused by the stent deployment itself which has also promoted a lesion in the endothelium determining the fibrous cap rupture. We decided to place a second stent (Wallstent 9 30 mm), overlapping the first, to cover the intimal lesion (Fig. 2A). AS and IVUS control showed the good results of CAS without any further procedural flaws (Fig. 2B and C). The patient did not present any neurological symptoms; therefore, she was discharged 1 day after CAS in good shape with a life-long Aspirin (100 mg day^{-1}) therapy combined with Clopidogrel (75 mg day^{-1}) for 1 month. At follow-up, performed at 3, 6 and 12 months, DS showed patency of carotid vessels without residual flaps or restenosis.

Discussion

Literature describes some cases of plaque protrusion after CAS.[3] In most of these cases, AS has not been able to detect this defect; in few cases plaque protrusion across the stent caused immediate or late cerebral embolism.[4] In our case, VH-IVUS proved to be a good diagnostic tool to perform the evaluation of the plaque pre-treatment and to identify defects after CAS. There is no suitable and suggested strategy for the treatment of in-stent protrusion. We decided to treat the flap to prevent possible local thrombosis or distal embolism by stent mesh cutting. Considering the remarkable length of the flap and the risk that it could be cut by the stent mesh and it could promote a thrombus formation, we used the same indication reported in literature for residual flap after CEA detected at DS: mobile flap >2 mm in length in the ICA and ≥3 mm in the CCA.[5] IVUS was originally developed for coronary

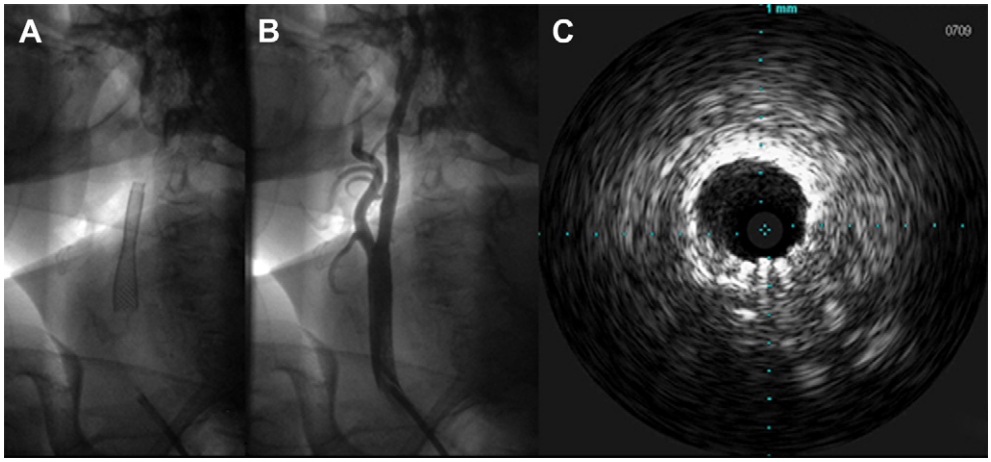

Figure 2 A—B) Angiographic scan control after second stent placement, overlapping the first, to cover the intimal flap. C) VH-IVUS scan control after second stent placement into ICA.

work. This catheter is ideal in ICA because the probe is low profile and tracks over the 0.014-inch wires of most cerebral protection devices; it also provides virtual histological mapping and composition of the carotid plaque. Moreover, IVUS seems to provide important information on carotid stenosis and its embolic potential, tailoring the procedure and guiding the choice of stent. In our case, VH-IVUS showed us the carotid plaque morphology (fibroclacific plaque) also in the district where at duplex there was a cone of shadow and confirmed us the possibility of CAS treatment. On the other hand, VH-IVUS presents some disadvantages: it is expensive, it increases the duration of the procedure and using it requires some training (it is generally used by interventional cardiologists) to avoid and/or reduce further complications. VH-IVUS is potentially useful diagnostic tool not only to detect the characteristics of atherosclerotic plaques, but also to perform quality control following CAS. It can reveal intra-procedural and post-procedural defects that can be corrected immediately to avoid or decrease complications during CAS.

Supplementary video related to this article can be found at doi:10.1016/j.ejvsextra.2011.10.001.

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Conflict of Interest

None.

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