Utility of Image-Guided Atherectomy for Optimal Treatment of Ambiguous Lesions by Angiography

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ABSTRACT: Peripheral endovascular interventions have been limited by multiple shortcomings, including difficulty in assessment of the 3-dimensional nature of obstructive plaque within the vasculature with only contrast angiography and 2-dimensional fluoroscopy. Herein, we present a case of pseudodissection seen angiographically post CTO crossing, which was accurately assessed as eccentric plaque using OCT imaging and treated using an OCT-guided directional atherectomy device, preventing bail-out stenting.

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Key words: eccentric plaque, image-guided CTO crossing, optical coherence tomography imaging, OCT-guided atherectomy

A 67-year-old female with lifestyle-limiting claudication affecting the left lower extremity was brought to the endovascular lab for definitive peripheral angiography. Right common femoral artery access was obtained, and selective left common femoral artery angiogram was performed. This demonstrated moderate diffuse plaque of 40% severity in the proximal to mid superficial femoral artery (SFA) with 100% occlusion of the mid vessel and reconstitution at the distal SFA via collaterals (**Figure 1**). There was 2-vessel runoff to the foot via patent posterior tibial and peroneal arteries. The Ocelot device (Avinger Inc.), an optical coherence tomography (OCT)-guided chronic total occlusion crossing device, was used to traverse the occluded segment, maintaining intraluminal position by directing the catheter

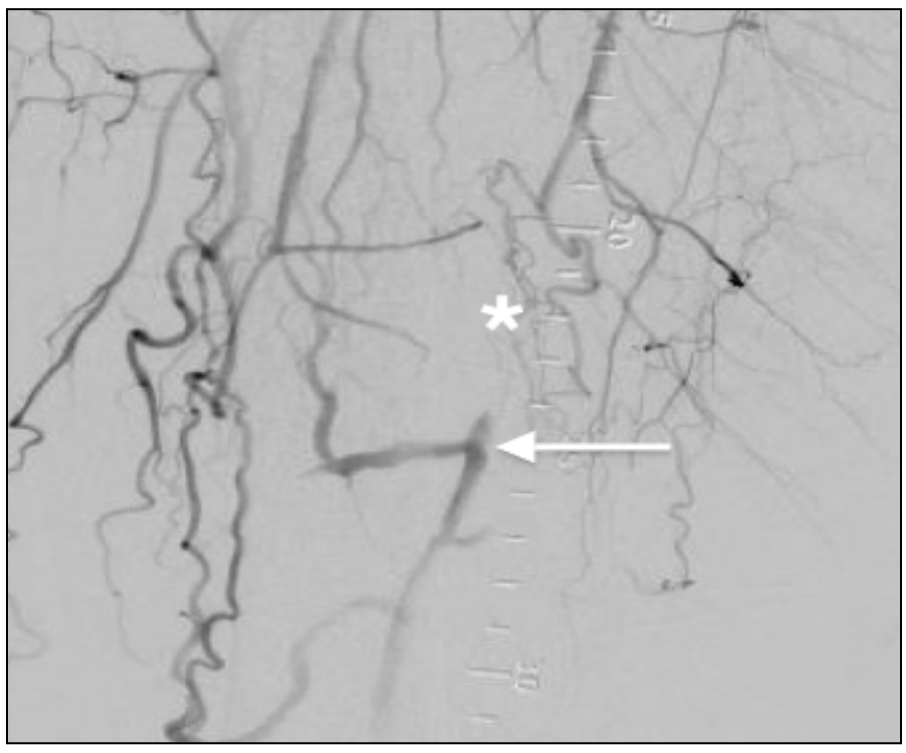

Figure 1. Baseline angiogram demonstrating mid SFA 100% occlusion (*) with reconstitution at distal SFA (arrow) via profunda collaterals.

away from the normal vessel layers toward the plaque (**Figure 2**). Post SFA CTO crossing angiogram dem-

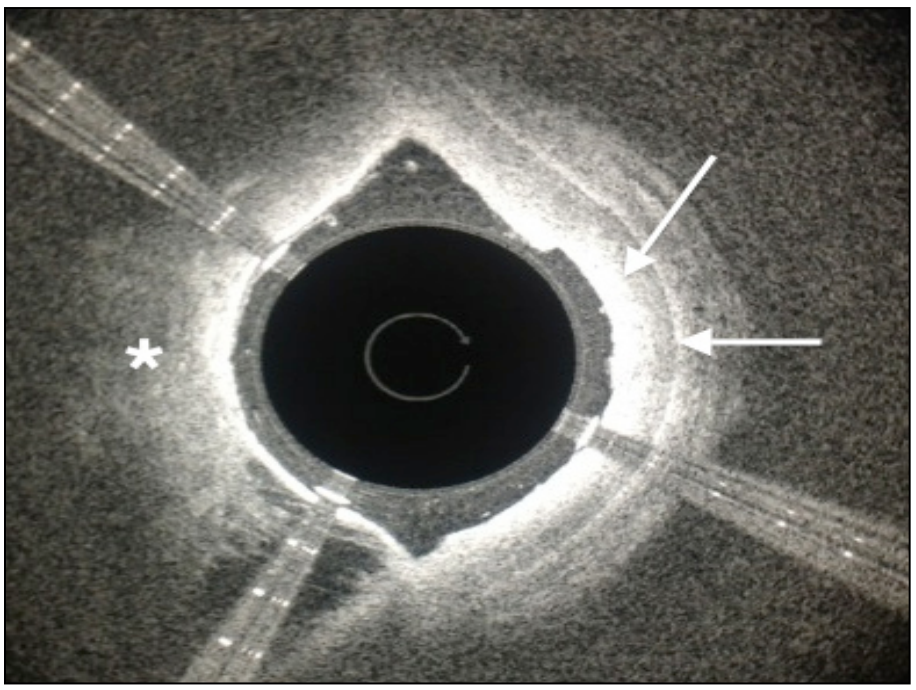

Figure 2. Optical coherency tomography imaging guided crossing of the occlusion using the Ocelot device (Avinger Inc.), allowing differentiation of the normal layered structures of the vessel architecture (arrows) and the occlusive plaque burden (*).

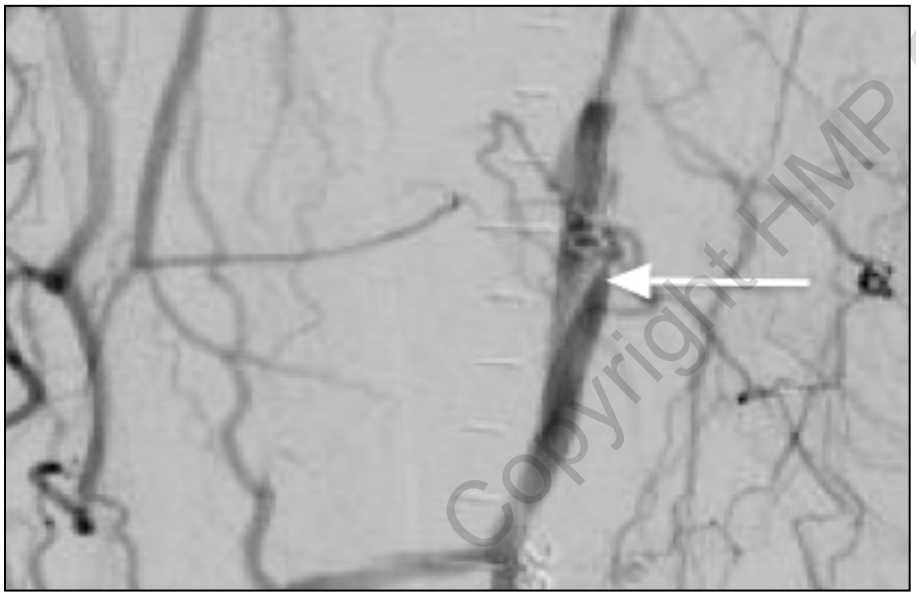

Figure 3. Subsequent angiography demonstrating a "dissection-like" flap (arrow) within the treated segment.

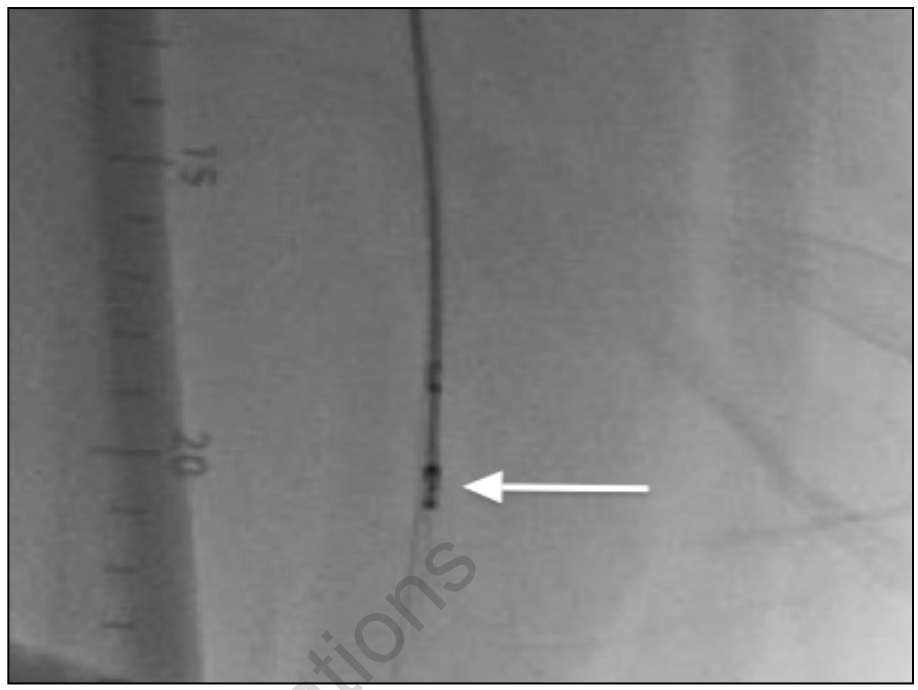

Figure 4. Optical coherency tomography imaging guided directional atherectomy using the Pantheris device (arrow).

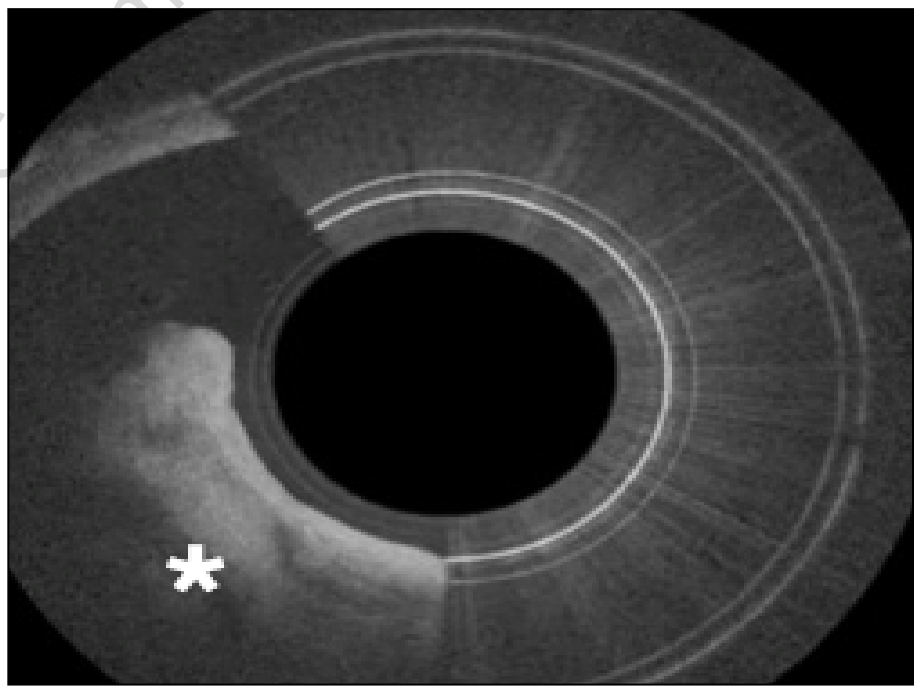

Figure 5. Optical coherency tomography imaging of the "dissection-like" flap confirming an eccentric plaque (*).

onstrated what appeared to be a dissection plane within the crossed segment (**Figure 3**).

At this point, the OCT images from the Ocelot crossing were reviewed, confirming a luminal plane between the proximal and distal caps, making a medial or adventitial dissection highly unlikely. The Pantheris catheter (Avinger Inc.), an investigational directional atherectomy device with OCT guidance allowing for intravascular imaging during atherectomy, was advanced through the occluded segment in question (**Figure 4**). The OCT imaging in the Pantheris device revealed no signs of vessel dissection, but it did reveal spiral planes of eccentric plaque extending into the arterial lumen (**Figure 5**). Seven passes with atherectomy were performed using OCT guidance to debulk the spiraling plaque, retrieving a large amount of atheroma (**Figure 6**). Postather-

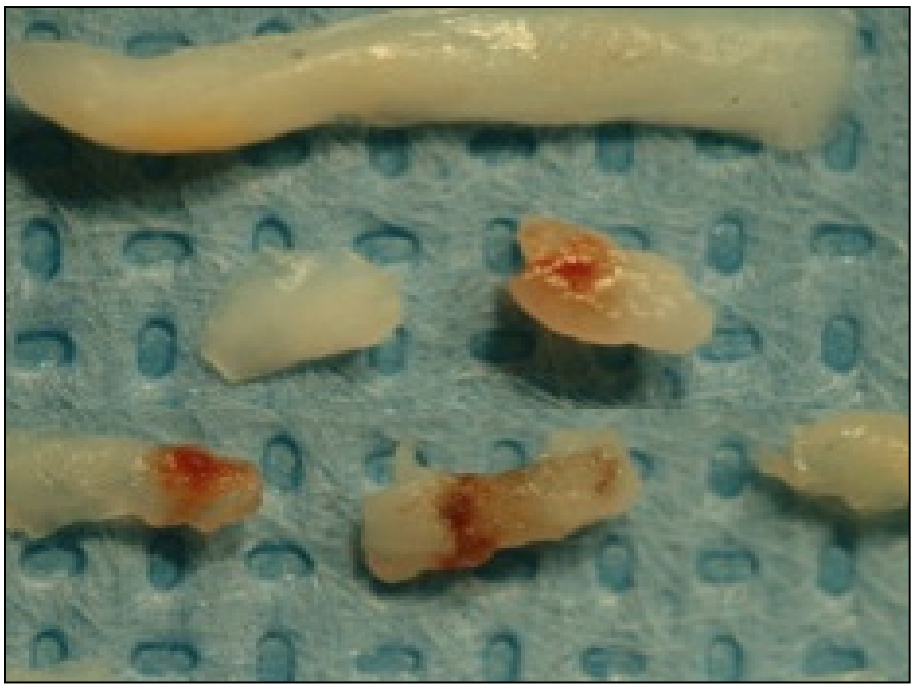

Figure 6. Gross image of retrieved atheroma post atherectomy.

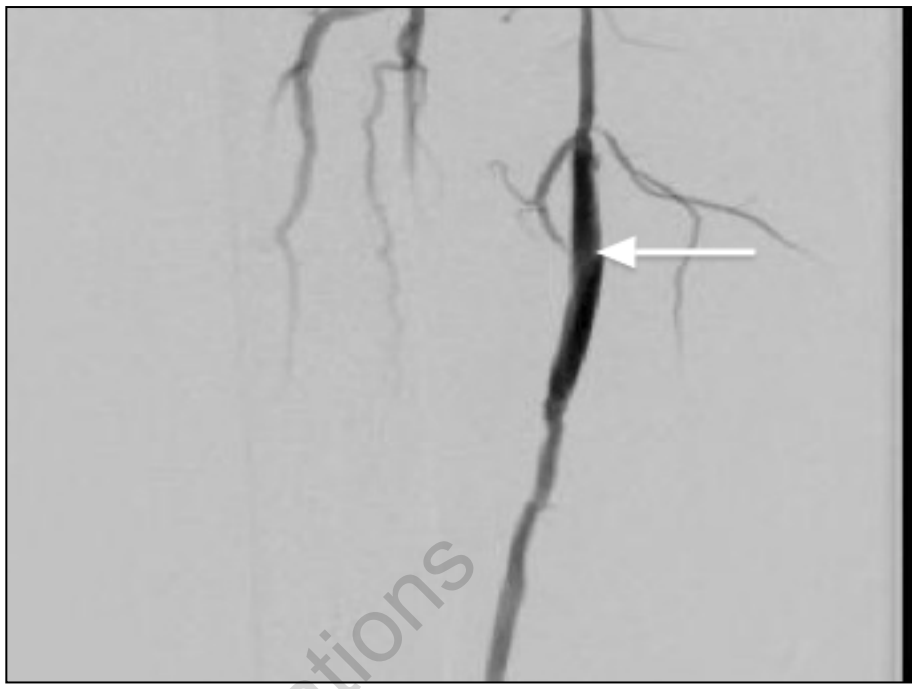

Figure 7. Final angiogram demonstrating an excellent result in the treated segment (arrow) of the superficial femoral artery.

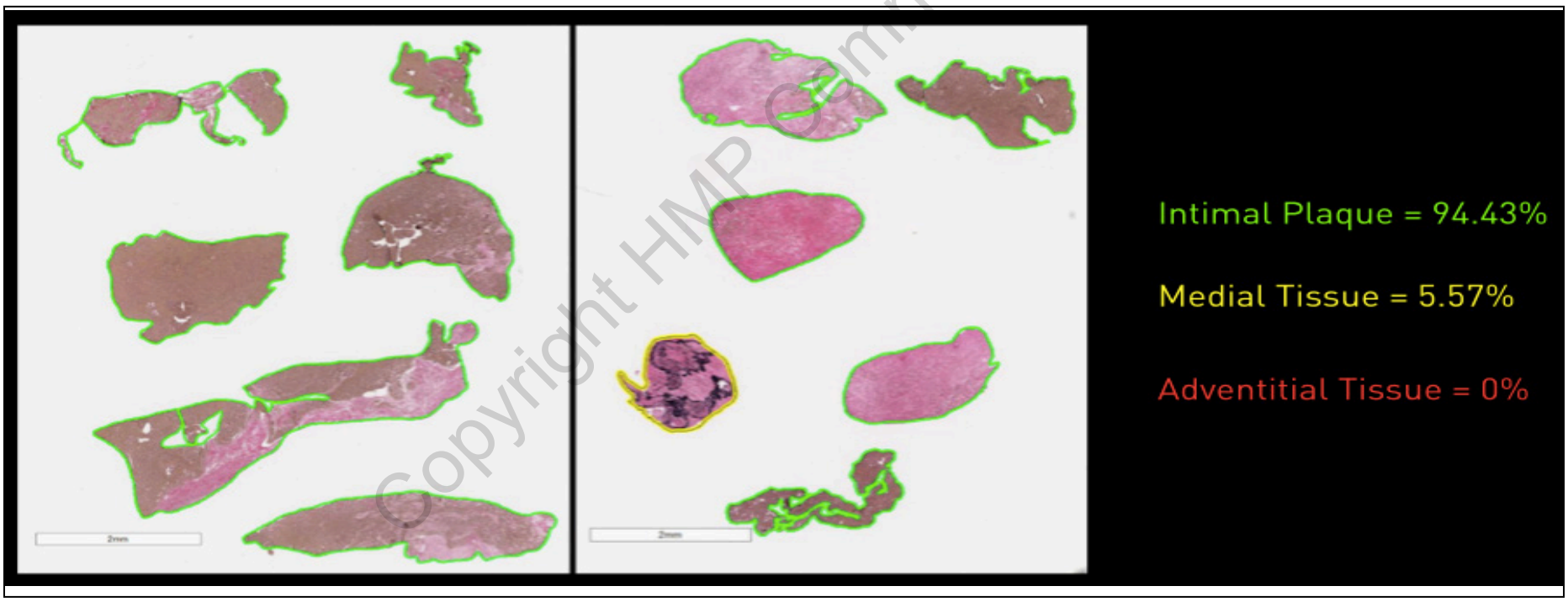

Figure 8. Histologic analysis of the excised atheroma confirming presence of fibrous intimal plaque and lipid with trace media and no adventitia.

ectomy OCT review demonstrated reduced plaque burden, laminar arterial surface, and excellent luminal gain. Likewise, angiography confirmed <10% residual stenosis. Accordingly, no adjuvant percutaneous transluminal angiography or stenting was required (**Figure 7**). Histological evaluation of the atherectomized tissue confirmed the presence of fibrous plaque and lipid with trace media and no adventitia (**Figure 8**).

DISCUSSION

Defining the optimal treatment strategy for SFA disease remains a formidable task. Conventional therapies such as angioplasty and stenting have yielded good, but not outstanding, results, with 1-year patency rates

ranging from 60% to 85%.[1-4] Both the development of improved stent designs as well as the introduction of drug-eluting stents have improved overall patency rates.[5,6] Furthermore, drug-coated balloons now offer the benefit of antirestenotic therapy without leaving any hardware behind.[7]

The use of stents in the SFA has several potential shortcomings, including stent fracture.[8] Although it is now a rare occurrence, stent fracture significantly increases the risk of in-stent restenosis. Additionally, the presence of occluded SFA stents may make percutaneous revascularization more challenging by necessitating intraluminal crossing with a wire or chronic total occlusion (CTO) device. Bailout stenting is a frequent occurrence when a flow-limiting dissection is encountered. In general, a movement to get a "stent-like" result with only atherectomy and balloon angioplasty for SFA lesions has been a growing trend for practitioners.

However, vessel dissection following atherectomy or balloon angioplasty is the most common reason for bailout stenting in the SFA. In most instances, dissection grade and severity are only judged angiographically, not by intravascular imaging, which may lead to unwarranted bailout stenting due to unclear understanding of the architectural abnormality.

The Pantheris device is an investigational directional atherectomy device with OCT guidance, which incorporates intravascular imaging while performing atherectomy, currently being evaluated in the VISION trial.9 This allows for targeted removal of eccentric plaque while sparing healthy portions of the vessel wall. The disruption of nondiseased portions of the intima, media, and adventitia is a known inflammation accelerant, potentially increasing the risk of restenosis.

Angiographic interpretation of peripheral arterial disease and specifically arterial dissection is often inadequate. Intravascular imaging is frequently required for a definitive diagnosis, yet, in clinical practice it is rarely performed, as it adds both time and cost to the procedure. More often than not, interventionalists find it easier to deploy a stent in such scenarios, which may not necessarily benefit the patient in the long term.

Herein, we present a case of pseudodissection seen angiographically post-CTO crossing, which was accurately assessed as eccentric plaque and successfully treated using an OCT-guided directional atherectomy device, preventing bail-out stenting. ■

Editor's note: *Disclosure: The authors have completed and returned the ICMJE Form for Disclosure of Potential Conflicts of Interest. The authors report Dr. Varghese reports no related disclosures. Dr. George reports consultancy to Avinger, Inc.*

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