

MINI-FOCUS ISSUE: INTERVENTIONAL CARDIOLOGY

BEGINNER

CASE REPORT: CLINICAL CASE

Calcified Nodules in the Superficial Femoral Artery Confirmed by Intravascular Ultrasound, Angioscopy, and Histology



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ABSTRACT

An 84-year-old man was admitted to the authors' hospital for the treatment of intermittent claudication. Angiography revealed an exophytic calcified nodules in the distal superficial femoral artery. Angioscopy also revealed abundant exophytic atherosclerotic calcification. Histology confirmed the diagnosis. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2020;2:1862-6) © 2020 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Calcified nodules (CNs) have been previously described by optical coherence tomography (OCT) and intravascular ultrasound (IVUS). Histologically, CNs are defined as heavily involved by calcified plates and a surrounding area of fibrosis in the presence of a necrotic core. These plaques are vulnerable to rupture of calcified lesions and thrombi (1). Furthermore, calcified sheets or plates break and form nodules which can protrude into the lumen where they are associated with platelet-rich thrombi.

The IVUS images of CNs can have various characteristics, such as convex shape of the luminal surface and side of the calcium, irregular luminal surface, and leading edge of the calcium. On OCT, CNs are defined as low-intensity, heterogeneous regions that are clear outside of the borderline. OCT has demonstrated a high, backscattering, protruding mass with signal attenuation. Previous angioscopy reports of coronary artery atherosclerotic plaques have described dense polypoid lesions protruding into the vessel lumen (2), but there are no reports of superficial femoral artery (SFA) CN plaques.

This paper describes the case of CNs in the SFA confirmed by angioscopy and removed by biopsy forceps, with histologic confirmation.

LEARNING OBJECTIVES

- To evaluate calcified nodules shown by angioscopy as cauliflower-like reddish masses protruding into the vessel lumen.
- To be able to arrive at a differential diagnosis of calcified nodules plaque by using multi-modality imaging.

PRESENTATION

In June 2019, an 84-year-old man was admitted to our hospital with signs of intermittent claudication. The

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the *JACC: Case Reports* [author instructions page](#).

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symptoms began after approximately 3 to 5 min of walking or while seated for a prolonged period with his knee in a flexed position. Physical examination showed that his bilateral lower extremity pulses were weak. Initial blood pressure was 130/90 mm Hg; heart rate was 64 beats/min; oxygen saturation was 98%; his breathing respiratory rate was 18 breaths/min; and his temperature was 36.3°C. The ankle-brachial index was 0.69 on the right side and 0.79 on the left side. Echography revealed diffuse soft plaque in the right SFA and calcified lesions in the left distal SFA. The authors suspected significant stenosis in both SFAs.

MEDICAL HISTORY

The patient had diabetes mellitus, hypertension, and hyperlipidemia as risk factors of atherosclerosis. His

right SFA was treated with drug-coated balloon angioplasty (130 cm, 6.0- × 150-mm, Lutonix DCB, Lutonix, New Hope, Minnesota).

DIFFERENTIAL DIAGNOSIS

The differential diagnosis included neurogenic claudication and critical limb ischemia. The patient's orthopedic disease was ruled out by an orthopedic surgeon because the patient did not display any neurological signs.

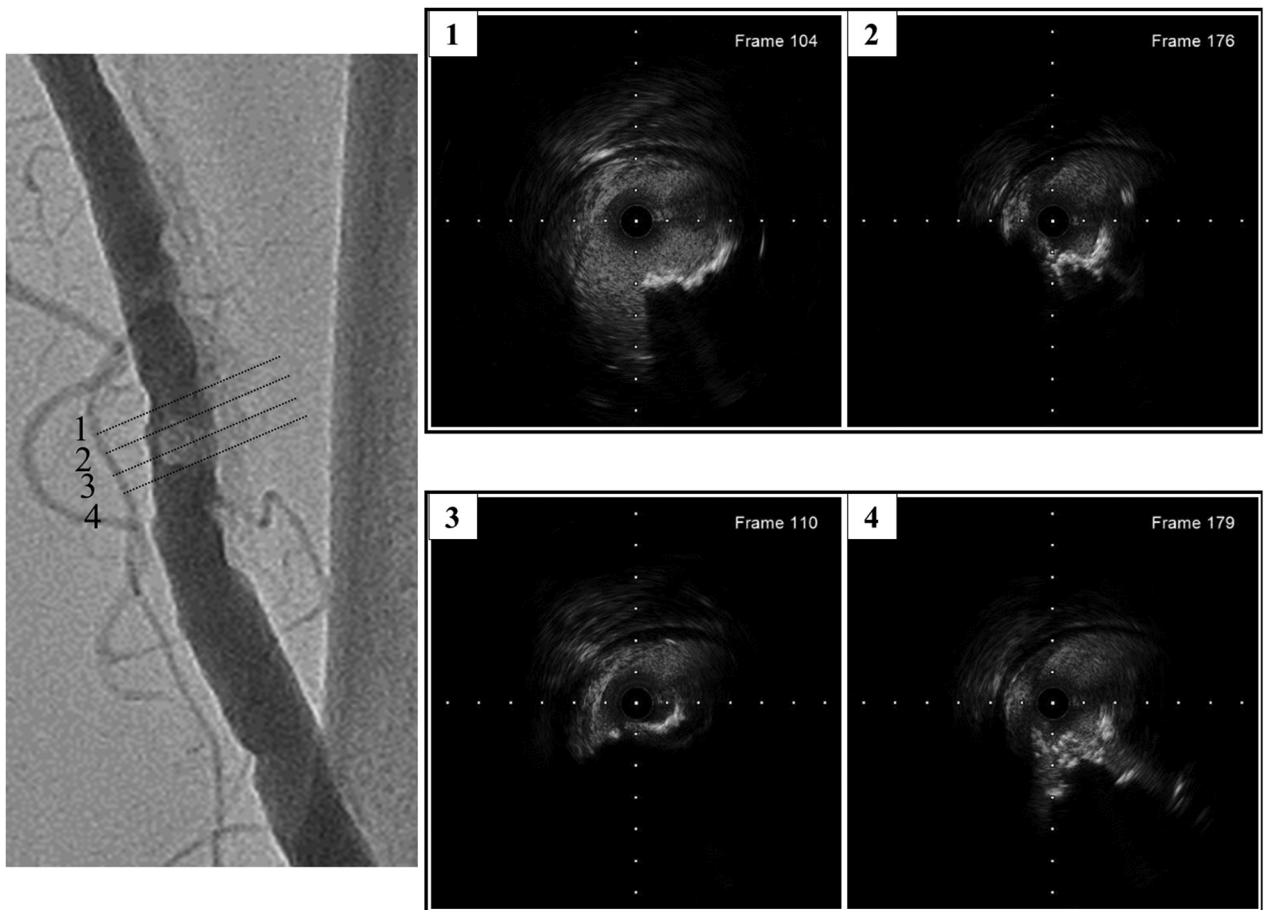
INVESTIGATIONS

When the right SFA was treated, an angiogram revealed an eccentric calcified plaque in the left distal SFA.

ABBREVIATIONS AND ACRONYMS

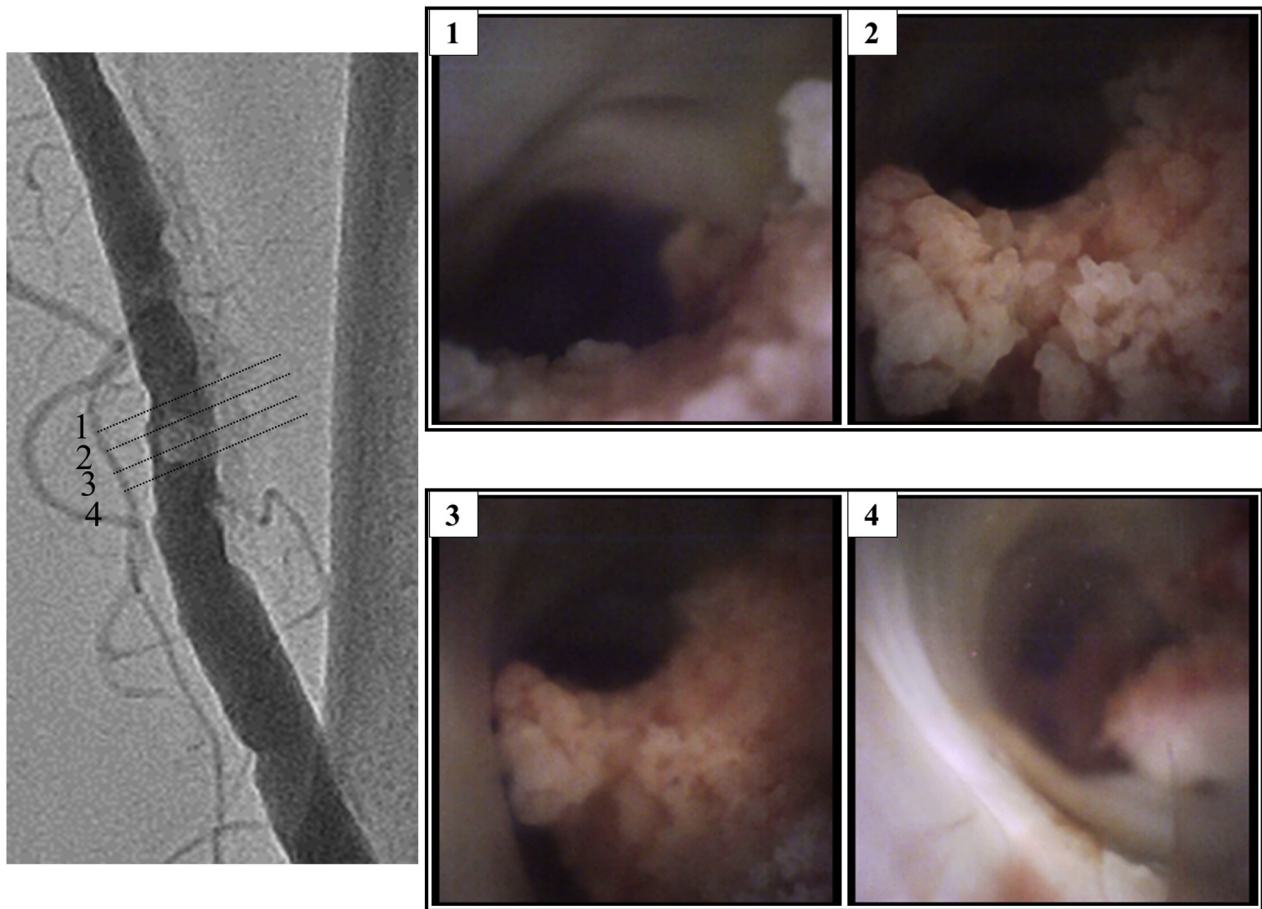
- CN** = calcified nodule
- IVUS** = intravascular ultrasound
- OCT** = optical coherence tomography
- SFA** = superficial femoral artery

FIGURE 1 Pre-Treatment Intravascular Ultrasound Images



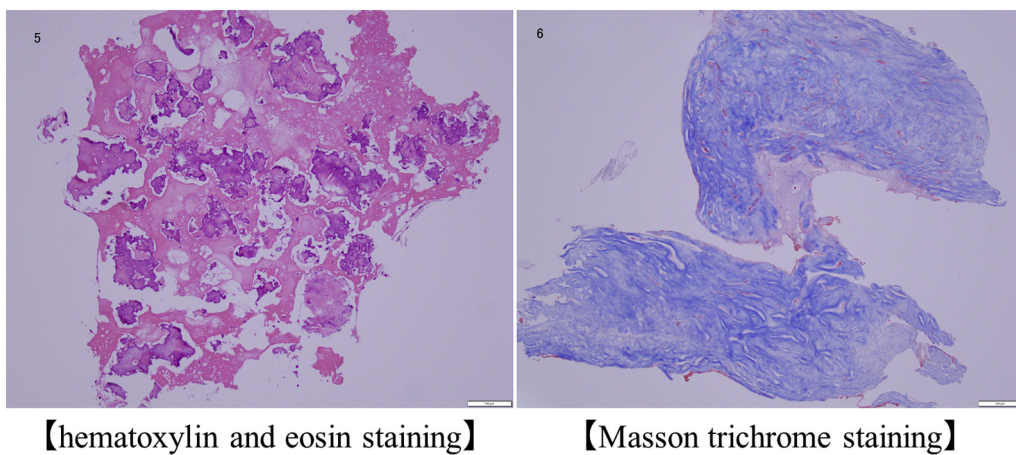
Intravascular Ultrasound is correct. (IVUS) cross-sectional images. IVUS revealed an irregular and convex shape of the luminal surface arising from a hypochoic mass of rounded calcified tissue protruding into the lumen. See [Video 1](#).

FIGURE 2 Pre-Treatment Angioscopy Images



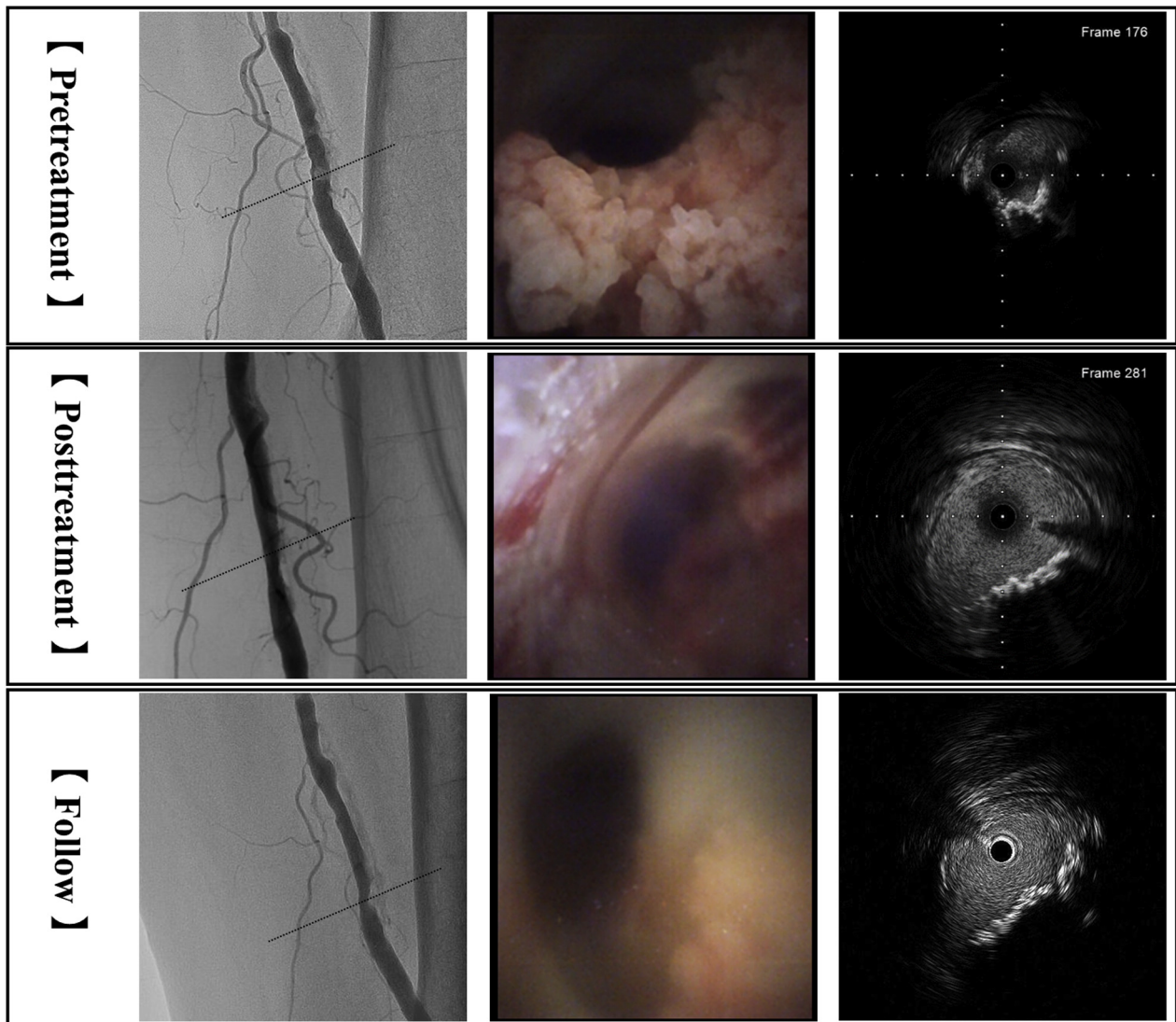
Angioscopy cross-sectional images show an exophytic lesion in the distal superficial femoral artery (SFA). See [Video 2](#).

FIGURE 3 Histological Examination



Masson trichrome staining showing a fibrous cap over the nodule and intranodular fibrin.

FIGURE 4 Follow-Up Angiography, Intravascular Ultrasound, and Angioscopy



Follow-up angiogram, intravascular ultrasound and angioscopy of left superficial femoral artery showed mild restenosis.

MANAGEMENT

One month later, after his right SFA was treated, the authors performed endovascular treatment on the left side through a right femoral artery approach using a 6-F Sheathless PV (Asahi Intecc, Nagoya, Japan). A Vassallo Floppy 300-cm guidewire (Cordis, Cardinal Health, Tokyo, Japan) could be advanced into the lesion without any resistance. IVUS (Atlantis, Boston Scientific, Natick, Massachusetts) was performed, and high-resolution angioscopy (Zemporshe, Taisho Biomed Instruments, Osaka,

Japan), because characteristics were recognized, including vessel diameter and length of treated lesion. IVUS showed a convex and irregular intimal lesion with acoustic shadowing (Figure 1). Angioscopy revealed a nonmobile, irregular surface, and white cauliflower-like shape accompanied by red thrombus (Figure 2). Because this type of atherosclerotic plaque can be difficult to treat, it was decided to remove the exophytic calcified plaque with biopsy forceps. The protruded calcified plaque was debulked several times using biopsy forceps, which allowed significant restoration of the left SFA

lumen. Then the lesion was checked using IVUS and angioscopy, which showed removal of a considerable amount of calcified plaque and an increase in luminal area of the stenosis lesion. Balloon angioplasty was then performed using a Vascu Trak 140-cm, 6.0- × 40-mm (Bard Peripheral Vascular, Tempe, Arizona), followed by drug-coated balloon angioplasty (130-cm, 6.0- × 100-mm, Lutonix DCB, Lutonix). Post-treatment angiography of the left SFA showed sufficient dilation. IVUS and angioscopy also revealed no major dissection and good dilation of the treatment site (Video 3).

Plaque histology also was investigated. Exophytic intimal calcification was observed with hematoxylin and eosin staining. Masson trichrome staining indicated a fibrous cap over the nodule as well as fibrin deposition within the nodule (Figure 3).

DISCUSSION

CNs were defined as calcified plates surrounded by fibrosis. The luminal surface of the plaque contained fissures in the fibrous cap and calcifications with osteogenesis with overlying thrombus (1). IVUS showed a convex lesion with superficial hyperechoic signal with shadowing. Coronary angioscopy revealed a protruding polypoid lesion.

Little is known about the precise mechanisms underlying calcified plaque. Although postmortem cases of coronary artery disease have been reported (3), the appearance of CN plaques in patients undergoing angioscopy has not been described. In clinical practice, CNs are often difficult to treat.

In this case, angiography revealed an eccentric calcified plaque in the distal SFA. IVUS images showed a convex and irregular intimal lesion with superficial hyperechoic signal accompanied by acoustic shadowing. Angioscopy revealed a cauliflower-like, reddish mass protruding into the

vessel lumen. After observation with intravascular imaging, the calcified plaque was debulked using biopsy forceps and confirmed plaque in the tissues.

As previously reported, IVUS and OCT may be used to diagnose CN plaques in clinical practice (2). However, it is sometimes difficult to distinguish them from thrombotic lesions. As shown in Figure 2, high-resolution angioscopy can easily distinguish plaque from thrombotic lesions. In combination with angioscopy and IVUS or OCT, diagnostic accuracy can be further improved.

FOLLOW-UP

Eight months after the patient was treated, the SFA was checked using echography, because of intermittent claudication. Echography showed severe stenosis of the proximal left SFA.

When the proximal SFA lesion was checked, angiography, IVUS, and angioscopy were performed in the previously treated distal SFA lesion. This lesion showed mild stenosis in the angiogram and kept sufficient lumen area in the IVUS images and small CNs without thrombi in the angioscopy images (Figure 4).

CONCLUSIONS

CNs confirmed by angioscopy and histological examination in this case may help to elucidate the histophysiology of this condition.

AUTHOR RELATIONSHIP WITH INDUSTRY

All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS angioscopy, calcified nodules, histological examination, IVUS

APPENDIX For supplemental videos, please see the online version of this paper.