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Case Report

Potential risk of rupture of repeated angioplasty in patient with in-stent restenosis after subintimal angioplasty for heavily calcified SFA lesion

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ABSTRACT

Sub-intimal angioplasty is a relatively safe and effective strategy for the treatment of long and total occluded segment of superficial femoral artery. However, since wiring and stenting is usually guided by angiographic image, to confirm the exact layer of stent implantation is difficult. Computed tomography (CT) angiographic images could be informative to identify the stent position in arterial wall. We report our case to emphasize the importance of CT imaging in determining the appropriate strategy for the treatment of an in-stent restenosis lesion that was previously performed via subintimal approach.

<**Learning objective:** Computed tomography angiography could help in determining the appropriate strategy for the treatment of in-stent restenosis lesion that was previously performed via subintimal approach by visualizing the true and complete course of the previous implanted stent.>

Introduction

Subintimal angioplasty (SA) has been accepted as an effective and safe technique for revascularization of peripheral artery disease, especially in the superficial femoral artery (SFA) [1]. Although SA has high procedural success rate and limb salvage which were reported to be over 90%, in-stent restenosis (ISR) rate is over 50% and the rate of target lesion revascularization was also reported to be over 60% [2].

We present a case of SFA-ISR lesion that was initially performed via SA technique and showed interesting images in computed tomography (CT) angiography which was informative in setting the treatment strategy.

Case report

A 56-year-old male patient was admitted for repetitive left leg claudication (Rutherford classification III). He had undergone percutaneous transluminal angioplasty at left proximal SFA with self-expandable stent (6 × 150 mm, SMART; Cordis, Miami Lakes, FL, USA) via subintimal approach 5 years previously. His comorbidities included hypertension, diabetes mellitus, and end-stage renal disease with regular hemodialysis.

We performed CT-angiography of both legs before peripheral angiography (Fig. 1). A previously implanted stent at left SFA was shown outside the native vessel with 70–80% of multifocal ISR lesion (Fig. 1b). So, we planned the repeated angioplasty for ISR lesion with drug-eluting balloon, if the balloon angioplasty is feasible and possible.

Angiogram was performed via the right common femoral artery and contralateral antegrade approach. Peripheral angiography showed multi-focal ISR of left SFA compatible with CT angiographic finding (Fig. 2a). An angled 0.035-inch hydrophilic guidewire (Radifocus; Terumo, Tokyo, Japan) was inserted to the level of popliteal artery and then balloon dilatation was done with 6.0 × 80 mm balloon (Foxcross; Abbott Vascular, Santa Clara, CA, USA) at 8 atm (nominal pressure) for 2 min from distal to proximal SFA stent (Fig. 2b). Subsequent angiography showed extravasation of contrast which meant vascular rupture at the level of bifurcation of SFA and deep femoral artery (Fig. 2c). And then we performed fluoroscopy-guided manual compression at the site of rupture and waited for more than 10 min, however the amount of extravasation

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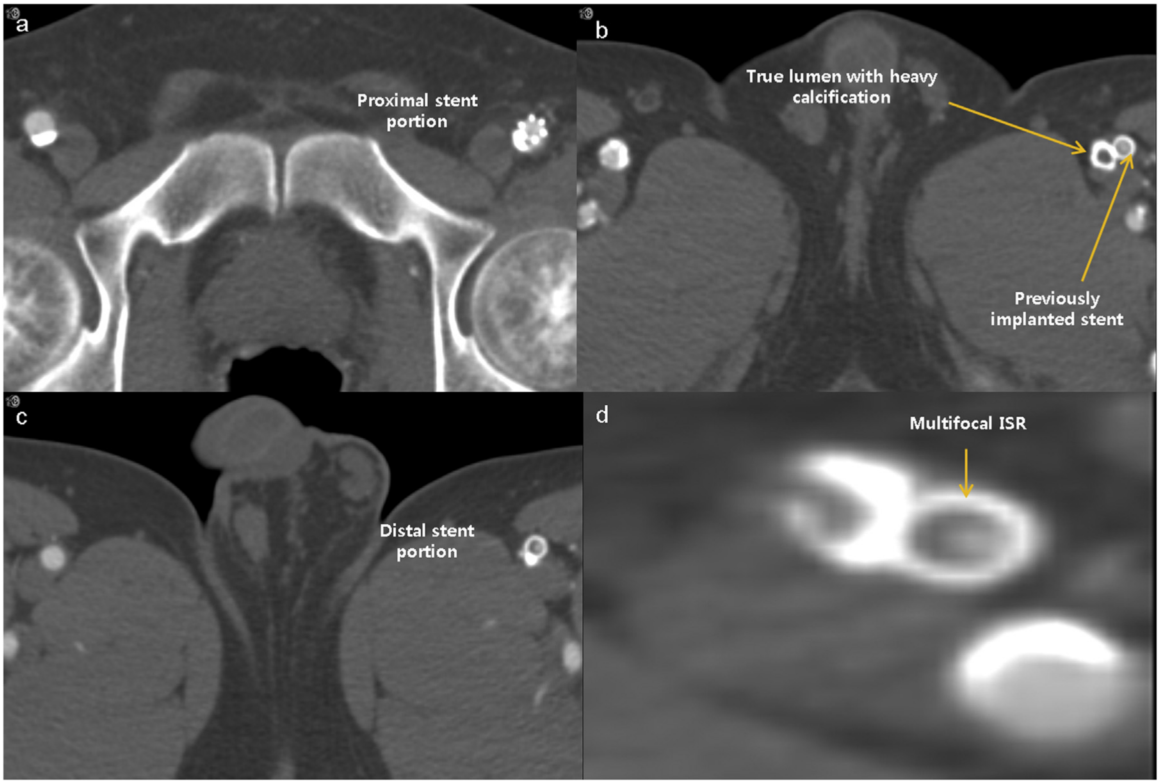

Fig. 1. (a, c) Both stent edges in the vascular lumen. (b) Double circumferential calcified structure and (d) in-stent restenosis (ISR) lesion.

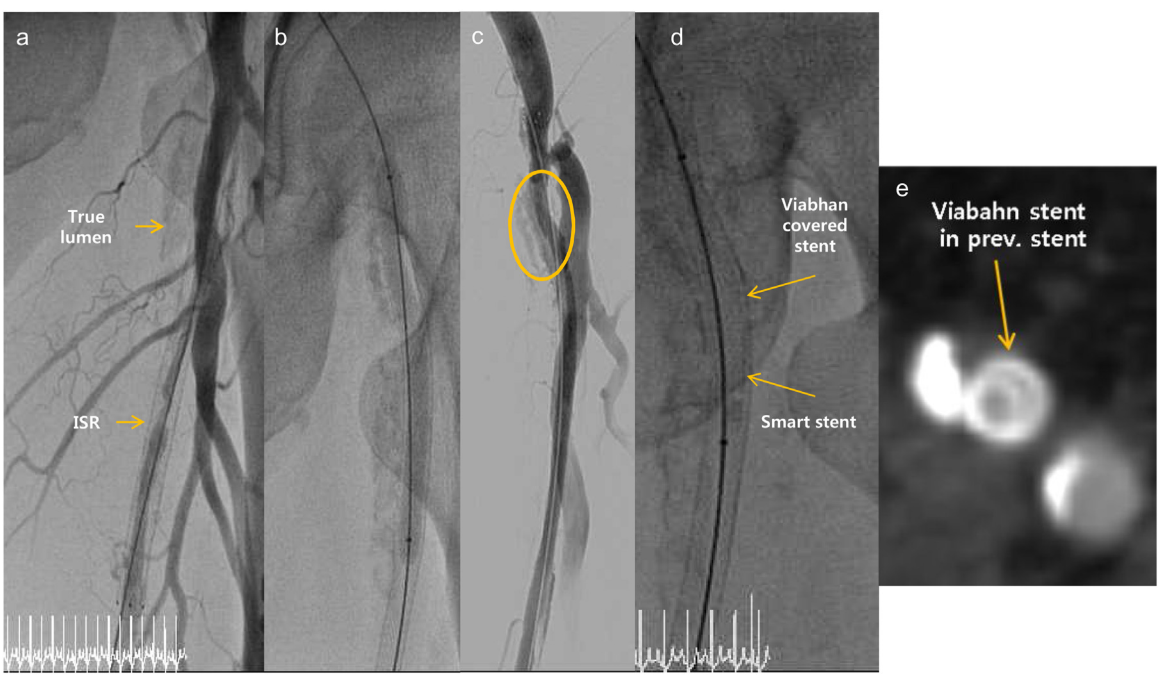

Fig. 2. (a) Multifocal in-stent restenosis (ISR) with clear delineation of native vessel with heavy calcification. (b) Balloon dilatation with 6.0 × 80 mm balloon and (c) extravasation of contrast at superficial femoral artery and deep femoral artery bifurcation lesion. (d) Double stent layer with Viabahn stent at inner and previously implanted Smart stent at outer layer. (e) Donut-like image with inner Viabahn stent and outer Smart stent.

did not decrease. Thus, we implanted a covered stent (Gore Viabahn 6.0 × 50 mm; Gore Medical, Newark, DE, USA) and performed post-stenting balloon dilatation with 6.0 × 80 mm balloon (Foxcross) at 8 atm (nominal pressure) for 2 min (Fig. 2d). Total procedure time was 58 min (total fluoroscope time 16 min), dose-area product was 70 Gy × cm^2, and the used total contrast volume was 60 ml. One day later, we performed CT angiogram to check whether extravasation was stopped or not.

Viabahn stent in the previous implanted Smart stent was well positioned at the rupture site without active bleeding, or massive hematoma (Fig. 2e).

Discussion

In our case, CT-angiography before the procedure showed two circumferential high HU signaled structures (Fig. 1b), one was the native circumferentially calcified vessel and the other was the previously implanted stent. When performing subintimal approach, we could not confirm the exact layer of vessel where the wire was located, but just presumed the location by the morphology of wire tip and fluoroscopic image. On follow-up CT, the previous stent looked to be located outside the vessel since the native vessel was clearly delineated with heavy calcification. We thought that the actual stent implantation site could be subadventitial space or outside the vessel with only both stent tips in the lumen. Considering the implantation site of the stent and the heavy calcification of the vessel, bypass surgery could be a proper treatment option. However, we performed balloon angioplasty after discussing with the patient and rupture occurred as we feared. Therefore, we paradoxically learned from this case that it is meaningful to predict the risk of balloon angioplasty after identifying the anatomical location of the previous stent through CT-angiography since angiography could not provide cross-sectional images of vessel or stent. Although we performed balloon dilatation with a same size balloon as the previous stent, it would be more feasible and safe to perform intervention with a smaller balloon and gradually expand with a larger one after checking the follow-up image.

Color duplex ultrasound (CDU) could be a non-invasive and effective tool in this case. CDU could be used to evaluate the patency of the stent and also be helpful in guiding the procedure by measuring the vessel diameter and hemodynamic parameters such as peak systolic velocity. Although not performed in this case, we think intravascular ultrasound (IVUS) is also a useful option in this situation. In particular, IVUS can observe the vessel intima, media, adventitia, and the status of the previously implanted stent in real-time. Therefore, in this case, IVUS would be also advantageous to identify the exact location of the previous stent and to predict the complications such as rupture.

We implanted a covered stent after vascular rupture and could finish the procedure without significant complications. Since Viabahn stent showed favorable results of 63% primary patency at up to 3 years of follow-up in SFA ISR lesions [3], it could be a good option to implant after the vessel rupture.

Conclusion

As like this case, CT angiography could help to visualize the true and complete course of the native vessel and the previous implanted stent. This additional information could assist in choosing the right revascularization strategy and thus help increasing the success rate.

Disclosure

Nothing to report.

Conflict of interest

None.

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