




# Limb Ischemia Secondary to Inadvertent Intravascular Angio-Seal Closure Device Deployment

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## Abstract

### Keywords

- ▶ closure devices
- ▶ Angio-Seal
- ▶ ischemia
- ▶ interventional radiology
- ▶ complication

Vascular closure devices (VCD) are frequently used after endovascular interventions to attain faster hemostasis, earlier mobilization, and patient comfort compared to manual compression. VCDs are safe. However, rare complications have been reported. We report a case of an inadvertent intravascular deployment of an Angio-Seal VCD causing limb ischemia and discussing management options from our experience and the previously published cases.

## Introduction

Vascular closure devices (VCD) are frequently used after endovascular interventions to achieve faster hemostasis and mobilization, in addition to patient comfort compared to manual compression. While VCDs are safe, rare complications have been reported.

We report a case of an inadvertent intravascular deployment of an Angio-Seal VCD (St Jude Medical, St Paul, Minnesota, United States) causing limb ischemia.

## Case Presentation

A 64-year-old male smoker with multiple comorbidities, including hypertension, dyslipidemia, chronic renal disease, ischemic heart disease, and peripheral arterial disease, presented with left first and second toes gangrene. He was immobile for the last few months due to ipsilateral distal tibial fracture managed by intramedullary nail, which was partially extruding from his foot. In addition, he was legally blind. Given his limb-threatening ischemia and tissue loss, the decision was made to intervene. His 20 cm superficial

femoral artery (SFA) occlusion was managed by two Viabahn stents (W. L. Gore and Associates, Inc, Flagstaff, Arizona, United States) via an antegrade left common femoral artery (CFA) approach (▶Fig. 1A, B). To achieve hemostasis, an Angio-Seal was deployed but the patient continued to bleed from the access site. Ultrasound demonstrated an intravascular deployment of the collagen plug of the Angio-Seal in the proximal SFA (▶Fig. 2). Therefore, a CFA access was re-established over the Angio-Seal remaining suture, in addition to a contralateral CFA access.

In an attempt to retrieve the plug, manual pulling, aspiration, and snaring were performed, which achieved partial plug retrieval. A subsequent arteriogram demonstrated complete left SFA thrombosis (▶Fig. 3) that was managed immediately by thrombectomy using a 6 Fr Rotarex device (Straub Medical AG, Wangs, Switzerland) (▶Fig. 4) and a Viabahn stent due to rethrombosis despite thrombectomy.

A final arteriogram demonstrated patent SFA and runoffs, with an eccentric nonflow-limiting stenosis of the left CFA attributed to manipulation, and the remains of the plug (▶Fig. 5). Further endovascular intervention was deemed unnecessary and the procedure was concluded.

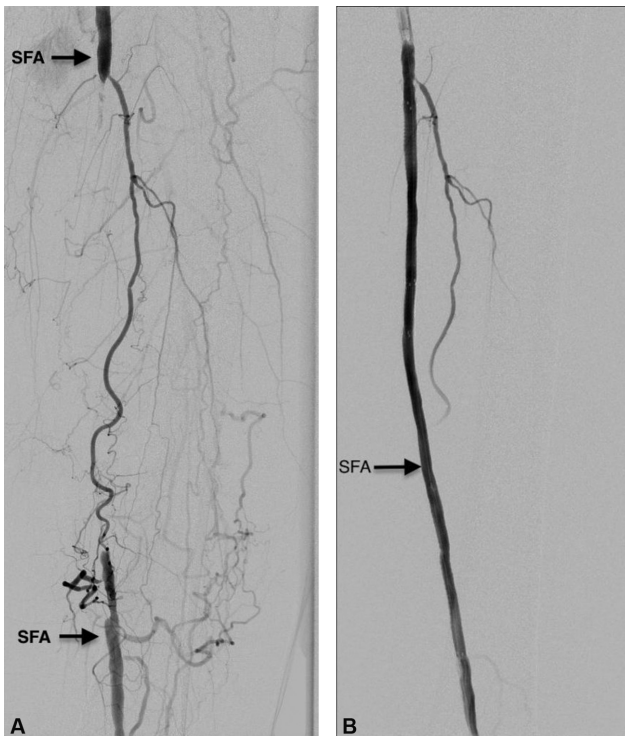
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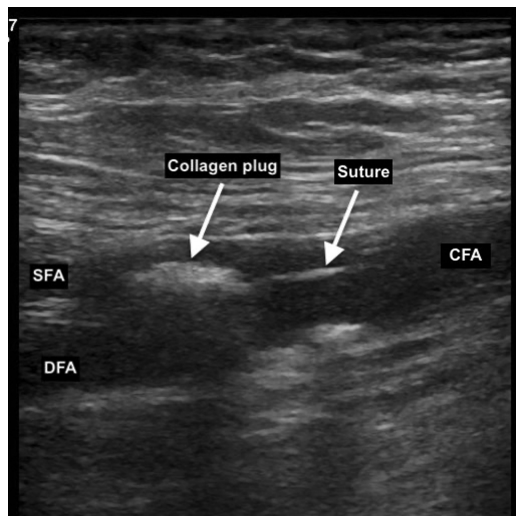
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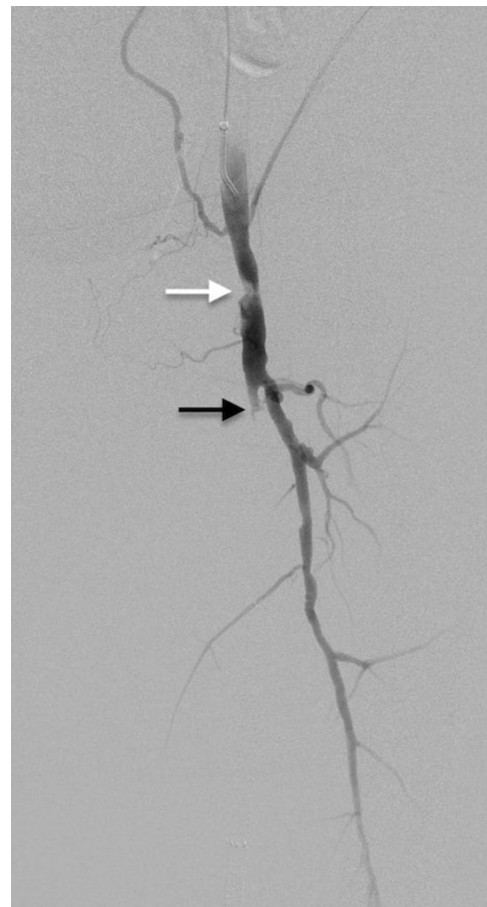


**Fig. 1** Digital subtraction arteriography of the left common femoral artery demonstrating (A) a long occlusion of the left superficial femoral artery (SFA) and (B) patent SFA after angioplasty and stent placement.

Vascular surgery was consulted and advised for conservative management and discharge. Clopidogrel (75 mg) was resumed in addition to 80 mg enoxaparin twice daily. On a phone call 2 days later, the patient complained of vague left leg pain at the orthopaedic surgical site. He was advised to come to the hospital but unfortunately, he lives far away from any hospital access. Ten days later, he presented to the emergency department with a cold, dark, and pulseless left



**Fig. 2** Ultrasound image of the left groin demonstrating echogenic structure at the CFA bifurcation more toward the left SFA representing the collagen plug. CFA, common femoral artery; DFA, deep femoral artery; SFA, superficial femoral artery.



**Fig. 3** Digital subtraction arteriography of the left common femoral artery (CFA) demonstrating complete occlusion of the left superficial femoral artery (black arrow) along with an eccentric filling defect in the left CFA (white arrow) representing fragments from the collagen plug.

leg and foot. Computed tomography angiography demonstrated complete occlusion of the left CFA, SFA, and popliteal artery.

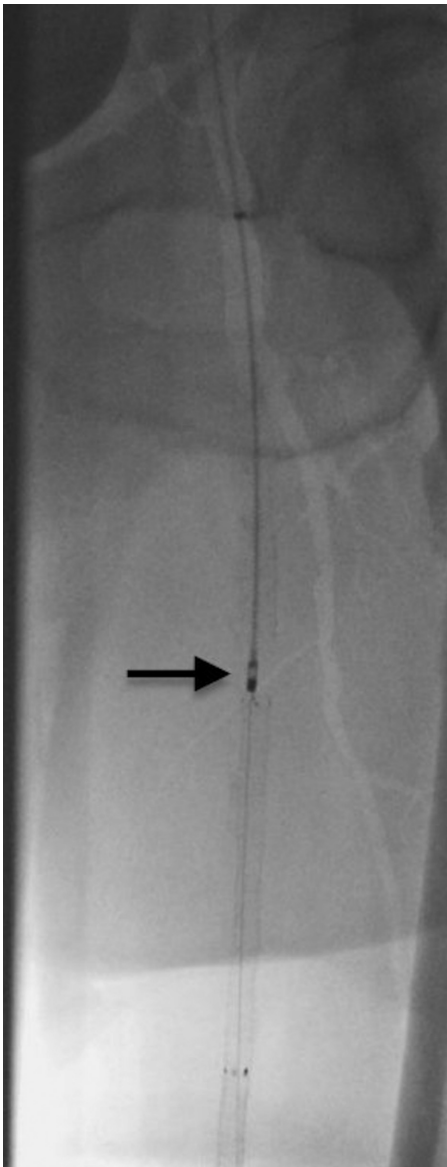
Therefore, he underwent left CFA endarterectomy with venous patch repair, thrombectomy, and above knee amputation. He had an uneventful hospital course and was discharged on day 14.

## Discussion

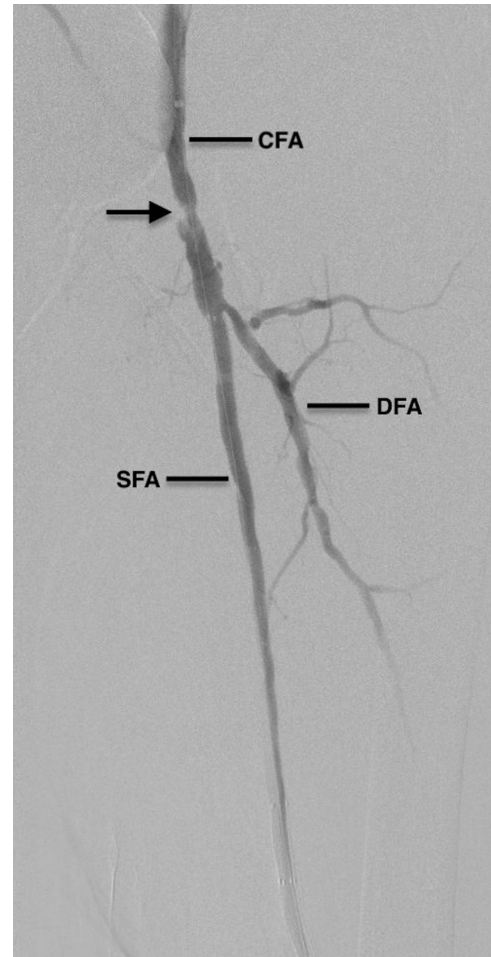
Percutaneous interventions for peripheral arterial disease are common and minimally invasive. In our practice, we utilize the CFA for arterial access and achieve hemostasis by manual compression or VCD with no major complications. Nevertheless, rare VCD complications have been reported such as infection, pseudoaneurysm, or limb ischemia due to CFA occlusion.

Collagen plug-based VCD has the least deployment failure rate among VCDs. However, its failure is associated with increased risk of vascular complications compared to other VCDs.<sup>1</sup>

Bito et al reported three cases of Angio-Seal-related complications by different mechanisms: (1) improper fitting of the anchor to the vessel wall due to calcified plaques; (2) intra-arterial deployment due to vigorous tamping



**Fig. 4** Left thigh radiograph demonstrating the Rotarex thrombectomy catheter in the left superficial femoral artery.

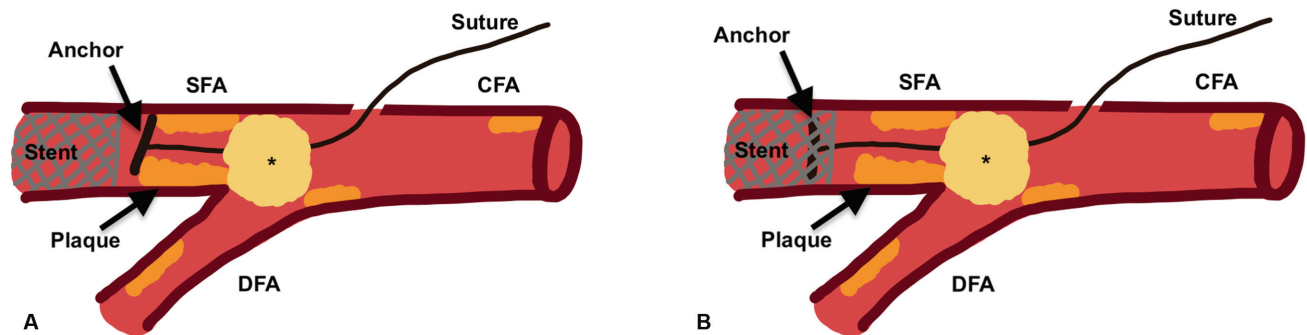


**Fig. 5** Digital subtraction arteriography (DSA) of the left common femoral artery (CFA) demonstrating brisk flow through the left superficial femoral artery (SFA) stents with residual nonflow limiting eccentric filling defect in the left CFA (black arrow).

of the collagen plug; (3) intra-arterial deployment due to anchor catching on a deep intravascular atherosclerotic calcification.<sup>2</sup>

In our case, we believe that the anchor got caught on a proximal SFA atherosclerotic plaque or the stent, causing intraluminal collagen plug deployment (► Fig. 6A, B).

Once the plug is deployed intraluminally, immediate retrieval is essential. Several techniques have been reported



**Fig. 6** Illustration drawing of the left common femoral artery (CFA) and Angio-Seal components demonstrating the hypothesized mechanisms that led to inadvertent intraluminal deployment of the Angio-Seal. (A) The anchor is caught on deep atherosclerotic plaque; (B) The anchor is caught on the superficial femoral artery (SFA) stent. Suture, collagen plug (asterisk), and anchor are Angio-Seal components. DFA, deep femoral artery.

to retrieve the collagen plug. Palmer et al retrieved the plug using a 2 to 4 mm snare.<sup>3</sup> A directional atherectomy device was also used by Sharma et al after failure of balloon angioplasty.<sup>4</sup>

We used similar techniques with subsequent successful restoration of flow, nonetheless, with residual CFA stenosis. Despite the brisk flow at the end of the procedure, and the use of anticoagulation, the CFA got occluded. The delayed presentation after the CFA occlusion aggravated the complication and worsened the outcome.

## Conclusion

In general, VCDs should be avoided near stents or extensive calcifications and coarse plaques. Early detection and intervention are key to prevent complications. If endovascular retrieval is unsuccessful, surgical intervention should not be delayed to avoid devastating outcomes.

### Note

The case was presented in The Pan Arab Interventional Radiology Society conference Dubai, UAE, February 2023.

### Ethical Approval

Institutional Review Board (IRB) approval was obtained from our institution research center.

### Conflict of Interest

None declared.

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