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CASE REPORT

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Endovascular snare retrieval of an Angio-Seal causing acute limb ischemia

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Abstract

Vascular complications (VCs) remain an important source of morbidity and mortality following percutaneous arterial catheterization. Vascular closure devices are popular and frequently used, but sometimes cause vessel occlusions that may require vascular surgery or complex endovascular procedures. In this case report, we describe the endovascular retrieval of an embolized Angio-Seal device causing acute limb ischemia in a severely diseased 75-year-old female patient. This case highlights the endovascular technique using a snare catheter and adds another example to the growing evidence of an endovascular approach to manage vascular access site complications in comorbid patients at risk.

KEYWORDS

acute limb ischemia, Angio-Seal, snare catheter, vascular access site complication, vascular closure device

1 | INTRODUCTION

Despite increasing use of radial access for percutaneous arterial catheterization procedures, many interventions are still performed via the transfemoral access, for various reasons. A major challenge of the femoral approach remains access site management. Vascular complications (VCs) remain an important source of morbidity and mortality following these procedures and are associated with longer hospital stays, greater nursing requirements, and increased in-hospital and long-term rehabilitation costs. Vascular closure devices (VCD) are popular and frequently applied, since they reduce time to achieve hemostasis. Angio-Seal (Terumo Medical Corporation, Somerset, NJ) is the most commonly used VCD following percutaneous coronary and peripheral catheterizations worldwide.

A rare complication of Angio-Seal deployment is an occlusion of the femoral artery leading to acute limb ischemia requiring revascularization. The reported incidence of clinical relevant femoral artery stenosis or occlusion with the Angio-Seal device is up to 0.6%.[1–3] Although rare, their consequences are often severe and may lead to extensive interventions, including surgery. This case illustrates the endovascular retrieval of an intravascular deployed Angio-Seal causing acute leg pain highlighting the potential of endovascular complication management.

2 | CASE REPORT

A 75-year-old severely diseased woman with comorbidities including ischemic heart disease with reduced ejection fraction, atrial fibrillation, chronic obstructive pulmonary disease, hypertension, obesity (BMI > 35), type 2 diabetes, and chronic kidney failure (Cystatin C 1.38 mg/L) attended for elective coronary angiography in a day care setting. The indication for coronary angiography was a stable angina combined with dyspnea NYHA

II. The transradial access is the standard approach in our center. In this case, a transfemoral approach was chosen because of known radial artery spasm in a previous procedure. Left common femoral artery (CFA) access was obtained without ultrasound guidance and a 5F sheath was inserted. Coronary angiography demonstrated a known severe coronary artery disease (CAD) without progress. In total, 5000 I.E. of Heparin were administered. Since the patient was severely affected by comorbidities, an optimal medical treatment was recommended. A contrast injection through the sheath at the end of the procedure confirmed regular femoral artery anatomy without significant atherosclerotic disease (Figure 1) and a puncture site significantly proximal of the femoral artery bifurcation. Since the calculated National Cardiovascular Data Registry (NCDR) bleeding risk score was way above 3%, a 6F Angio-Seal was implanted, which is our standard practice by default.

The patient was brought back to the ward and was planned for same-day discharge. After 1 h, she informed the nurse about left groin pain. Foot pulses and popliteal pulse were palpable on the right side, but not on the left side. Therefore, an ultrasound examination of the groin (Figure 2A) was performed right away, revealing a subtotal closure of the left CFA, most likely due to an occlusion through a malpositioned Angio-Seal.

We discussed this case within a multidisciplinary "vascular team" at our hospital, consisting of vascular surgeons, interventional angiologists, and cardiologists. Since the patient was affected by severe pain and therefore restless, surgery would have necessitated general anesthesia. Several Angio-Seal related occlusions of the CFA causing acute leg ischemia were treated successfully before with an endovascular approach.[4] Because of the aforementioned comorbidities the mutual decision was an endovascular approach using a crossover access from the right side. Access was gained quickly via the right CFA (6F Terumo Fortress sheath). Fluroscopy of the left CFA confirmed a subtotal closure, most likely through an Angio-Seal VCD (Figure 2B) at the site of puncture. Superficial femoral artery (SFA), profunda femoral artery (PFA), and below the knee arteries (BTK) had good runoff.

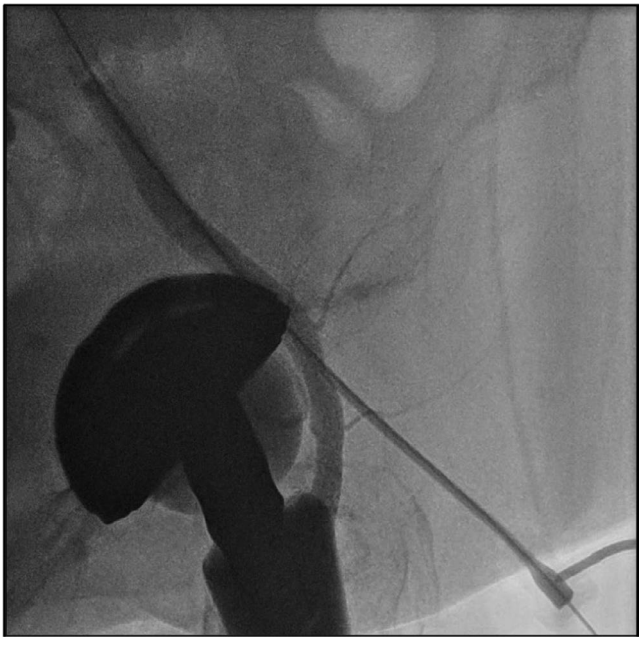

FIGURE 1 Left common femoral arteriogram after coronary angiography before Angio-Seal deployment

No anticoagulation was administered to avoid severe bleeding of the left CFA after endovascular treatment of the malpositioned Angio-Seal. Recanalization of the CFA was achieved with a Terumo Glidewire 35 and a Biotronik Passeo 35 7 × 40 mm balloon serving as a support catheter. Angioplasty of the closure site was performed with a Biotronik Passeo 35 7 × 40 mm uncoated balloon (Figure 2C). Angiographic visualization of the angioplasty site showed a good result in the CFA, but an occluded bifurcation, most probably by an embolized Angio-Seal collagen plug (Figure 2D,E). Thrombotic material seemed less probable; aspiration of did not show any change. We discussed different endovascular options including aspiration through a large sheath or atherectomy using JetStream (Boston Scientific) or Rotarex (Straub Medical) with an Emboshield (Abbott Laboratories, Abbott Park) as a distal protection device. To avoid potential peripheral embolization through atherectomy and since the collagen plaque seemed easy to catch, we decided for a snare catheter retrieval.

A 10 mm double-looped snare (pfm medical mepro gmbh) was inserted via the glidewire 35 and positioned in the proximal SFA. Visualization of the retrieval is difficult, since the collagen plaque is not visible under fluoroscopy. Therefore, the procedure is dependent on tactile feeling of the operator: Basically, the snare catheter is retracted along the wire from distal to proximal, with the goal to withdraw the snare and the Angio-Seal into the sheath. In this case, withdrawal of the snare into the sheath was not possible because the collagen plaque was too large for the sheath. We therefore assumed successful capture of the Angio-Seal and removed the sheath and snare leaving the main wire in the left SFA. Removal of the sheath was uncomplicated, but we could not retrieve the snare out of the right CFA. Notably, no bleeding was seen although the sheath was already retracted, most likely due to the Angio-Seal sealing the right puncture site. With a steady and strong pull, the snare catheter was retracted revealing a partially captured collagen plaque (Figure 3). A new 6F sheath was inserted in the right CFA closing the arteriotomy. No bleeding was noted. Fluoroscopy of the right CFA showed no injury. Angiography of descending arteries

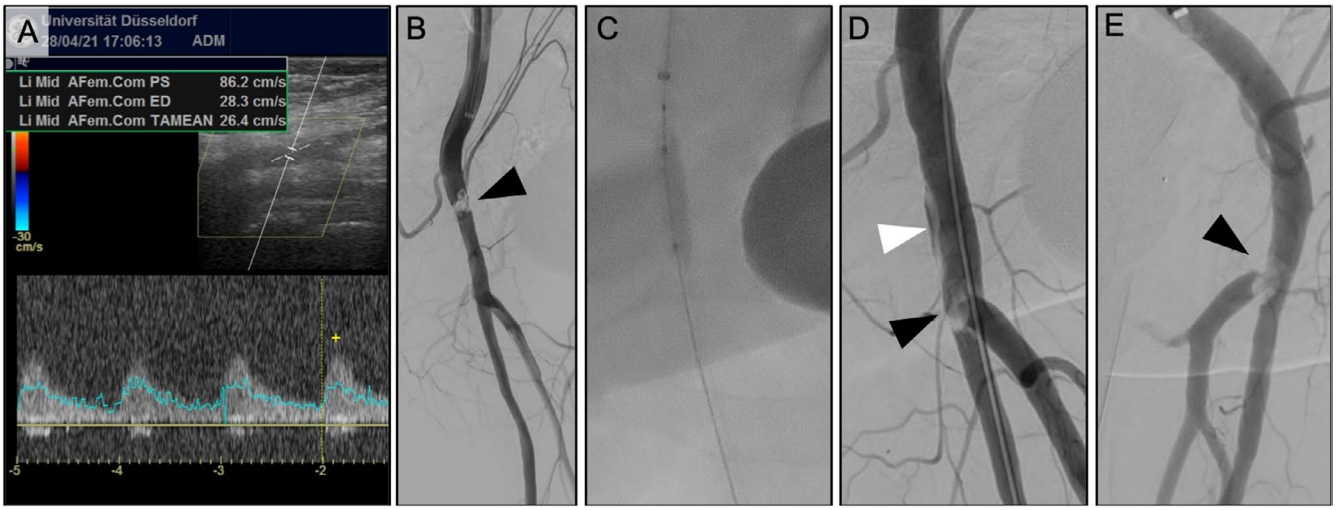

FIGURE 2 Occlusion of the left common femoral artery. (A) Left common femoral artery ultrasound examination revealing a severe impairment of blood flow. (B) Subtotal occlusion of the left common femoral artery due to an intravascular collagen plaque (black arrow). (C) Angioplasty of the closure site with an uncoated balloon. (D, E) Left common femoral artery angiogram showing an occluded bifurcation (black arrow) with an obstructed superficial and profunda femoral artery, most probably by an embolized Angio-Seal. A small dissection (white arrow, D) of the common femoral artery is visible, possibly due to angioplasty

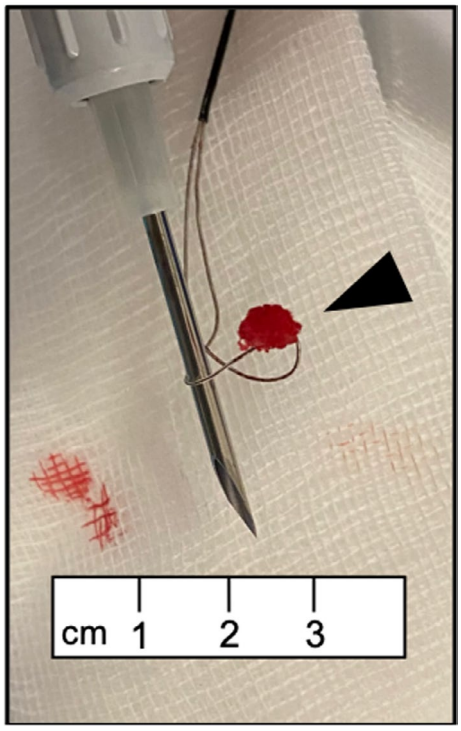

FIGURE 3 Snare catheter with a partially captured collagen plaque of an Angio-Seal vascular closure device

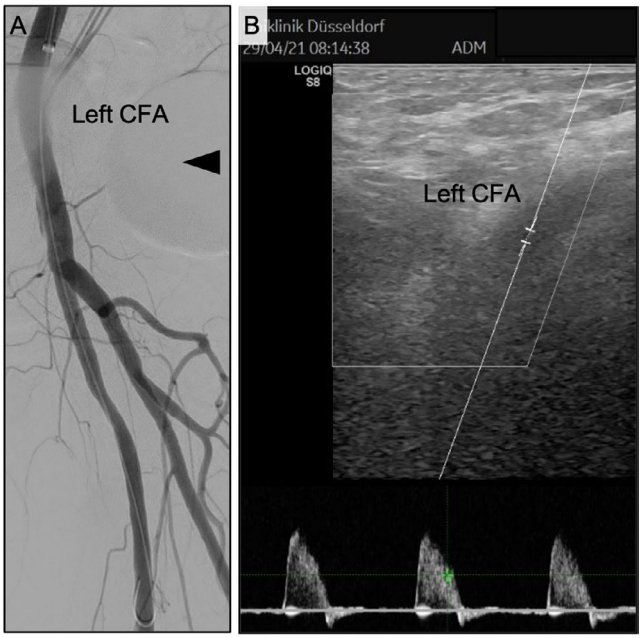

FIGURE 4 Control Angiogram and ultrasound examination after Angio-Seal retrieval. (A) Patent left common femoral artery after Angio-Seal retrieval. The black arrow indicates the middle of the left femoral head. (B) Ultrasound follow up of the left common femoral artery one day after endovascular treatment showing a normal flow pattern

showed a patent 3 vessel BTK runoff. Angiographic visualization of the left bifurcation and lower leg arteries showed successful removal of the Angio-Seal VCD and good runoff with no signs of stenosis, occlusion or distal embolization (Figure 4A). At the angioplasty site of the left CFA, a small dissection was visible, probably due to the angioplasty, which we did not treat, since it did not impair blood flow. Moreover, there were no signs of bleeding after Angio-Seal removal on the left CFA, most probably due to the 2-h lasting occlusion of the left CFA and arteriotomy side with enough time for hemostasis. The sheath

was removed and manual compression was performed for 15 min on the right CFA without any abnormalities. The patient had no symptoms of leg ischemia with palpable foot pulses on both sides. In total, the procedure lasted 1 h. Ultrasound follow up 1 day after retrieval showed a normal CFA flow pattern (Figure 4B) and an ABI of 1 on both legs. Treadmill walking distance was not limited. Two months follow up showed no impairment of walking distance.

3 | DISCUSSION AND CONCLUSION

VCD implantation failure can cause acute limb ischemia that may require operative management.[3] Advantages of immediate endovascular repair are a quick return to ambulatory activity and avoiding, in most cases, vascular surgery, with its associated morbidity and mortality risk.

There are previous reports of endovascular Angio-Seal removal, but these attempts have been complicated by difficult direct visualization, with partial retrieval or distal embolization following manipulation.[5,6] Rafeh et al. describe a fluoroscopic guided attempt to capture a dislodged Angio-Seal in the right SFA with a Spider RX 7 mm filter device (Covidien) via a 7F sheath in the left CFA.[5] Jud et al. described a similar technique, using a Spider RX 7 mm filter to capture an embolized Angio-Seal anchor embolized to the posterior tibial artery at the ankle's level.[7]

A similar approach to our technique was performed by Palmer et al.[8] Retrieval of a malpositioned Angio-Seal was achieved using a 2- to 4-mm retrieval snare (Atrieve; Argon Medical Devices, Inc) and an 8F sheath via a contralateral access. Again, although using an 8F sheath, retrieval of a 6F Angio-Seal through the sheath was not possible. Contrary to our case, a complete Angio-Seal VCD was retracted. Palmer et al. used an 8F sheath and therefore had a larger arteriotomy side and were therefore, we speculate, able to retract the whole VCD. In our case, retraction was complicated; therefore, the sheath was retracted first. Interestingly, no bleeding was observed on the access side. After a steady and strong retraction of the snare catheter, the snare was removed showing a fragment of the collagen plaque. After extraction, the arteriotomy side started to bleed slowly again. We therefore speculate, that parts of the Angio-Seal VCD either stuck in the arteriotomy side or embolized into descending arteries. The latter could not be confirmed by control angiogram and by ultrasound at follow up.

In this case, a partial retrieval of an Angio-Seal with a 6F sheath was feasible and, in the end, successful without further vascular complications. The approach by Palmer et al. using a large sheath enabling a full capture of the device is an elegant way to avoid further vascular complications such as a distal embolization of Angio-Seal fragments. In this case, we did not choose a large sheath, since the CFA diameter was narrow, which is a known risk factor for access site complications.[9]

In summary, this case report underscores the potential of endovascular management of access site complications in high-risk patients affected by severe comorbidities undergoing percutaneous arterial catheterization. The spectrum ranges from re-angiography from the contralateral site, angioplasty and finally snare retrieval of the embolized Angio-Seal. This may be even expanded by stenting, atherectomy, local fragmentation, aspiration, and lysis in case of an embolization complicated by formation of intraluminal, flow-limiting thrombus.

In this case of complete occlusion of the left CFA due to an Angio-Seal implantation failure, an endovascular approach using a snare allowed immediate and straightforward retrieval without the need for surgical intervention in a high-risk patient affected by severe comorbidities.

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DISCLOSURES

All authors declare: no support from any industry or third-party organization for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous 3 years; no other relationships or activities that could appear to have influenced the submitted work.

CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Lucas Busch and Malte Kelm involved in conception and design. Lucas Busch, Manuel Stern, Georg Wolff, and Malte Kelm involved in drafting of the manuscript or revising it critically for important intellectual content. All authors involved in final approval of the manuscript submitted.

CONSENT

Yes. Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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