




Transaneurysmal Access with Suture-Mediated Closure Device to Treat Iatrogenic Common Femoral Artery Pseudoaneurysm under Ultrasound Guidance: A Novel Technique

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Abstract

We describe three cases that were complicated by access site-related common femoral artery pseudoaneurysm following therapeutic endovascular procedures. In all the cases, presentation was with painful swelling in the right groin that was tender and pulsatile on palpation; further evaluation with color Doppler ultrasound revealed pseudoaneurysm at the access site in common femoral artery. Ultrasound-guided transaneurysmal access was obtained and ProStyle (Abbott Vascular, Redwood City, California, United States) suture-mediated device was used to treat the pseudoaneurysm safely and successfully.

Keywords

- ▶ pseudoaneurysm
- ▶ ultrasound
- ▶ closure device
- ▶ transaneurysmal

Introduction

Iatrogenic pseudoaneurysm is one of the common access site complications following angiographic procedure. This is a result of inadequate hemostasis at the arterial access site. The incidence of femoral arterial access site pseudoaneurysm has been reported to be 0.2 to 8%; the rates are higher for therapeutic endovascular procedures when compared with diagnostic angiographies that is due to larger vascular sheath size and more aggressive anticoagulation and antiplatelet regimens following therapeutic procedures. The conventional treatment methods for the management of femoral artery pseudoaneurysms are manual compression, ultrasound-guided thrombin injection, and rarely open surgical repair.¹

Case Presentation

The ethical committee approval was not required as per institutional guidelines. Three cases of iatrogenic common

femoral artery pseudoaneurysm were treated with ProStyle suture-mediated closure device.

Case 1: A 50-year-old male with acute subarachnoid hemorrhage underwent a cerebral angiogram, anterior communicating artery aneurysm was detected, and endovascular coiling was performed.

Case 2: A 65-year-old female with unruptured posterior inferior cerebellar artery aneurysm underwent cerebral angiography and elective coiling.

Case 3: A 84-year-old male with acute limb ischemia was treated with endovascular catheter directed thrombolysis successfully.

The patient demographics with access site, access size, closure method used, day of presentation, and pseudoaneurysm details are summarized in ▶ **Table 1**. The presentation was with painful swelling in the right groin that was tender on palpation; a color Doppler ultrasound confirmed pseudoaneurysm arising from common femoral artery.

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Table 1 Patient demographics

No.	Age	Gender	Access site	Sheath size	Timing of presentation	Size of PSA	Neck size	Depth from skin to rent/neck
1	50 years	Male	Right CFA	8 Fr	Day 6	32 × 12 × 16mm	3.2 mm	37 mm
2	65 years	Female	Right CFA	8 Fr	Day 4	37 × 16 × 20mm	3.1 mm	40 mm
3	84 years	Male	Right CFA	6 Fr	Day 1	23 × 11 × 14mm	2.7 mm	29 mm

Abbreviation: CFA, common femoral artery.

All three pseudoaneurysms had very short neck; also the third patient was receiving therapeutic anticoagulation following a successful thrombolysis. Two of the three pseudoaneurysms had partially thrombosed sac. There was no attempt to treat the pseudoaneurysms with manual compression.

► **Figs. 1 and 2** illustrate the procedural steps. After local anesthetic infiltration (1% lidocaine), ultrasound-guided access was taken into the pseudoaneurysm using an 18G needle till the needle tip was very close to the neck of pseudoaneurysm. This was followed by insertion of an 0.035" guidewire (Amplatz straight tip, Cook Medical, Boomington, USA) which was navigated through neck of pseudoaneurysm into the common femoral artery by manipulating the direction of the puncture needle to point toward the puncture site. The needle was removed, a small incision was made on the skin at the needle entry site, and blunt dissection was performed around the wire using a curved forceps. A ProStyle device was introduced over the guidewire and the guidewire removed once the guidewire exit port was at the skin puncture site. The device was inserted further under ultrasound guidance till the curvilinear echogenic plastic footplate housing was seen entering the common femoral artery on ultrasound. We cannot rely

entirely on trickle of blood from the marker lumen as this can happen while the device is in extravascular position within the perfused sac of the pseudoaneurysm, and ultrasound is essential to confirm that the footplate is approximating the anterior wall of the common femoral artery. Following this the routine steps of deployment of ProStyle suture-mediated device were followed to tie and tighten the suture knot approximating the defect at the neck of pseudoaneurysm and thus resulting in exclusion of pseudoaneurysm. The access can be retained with 0.035" guidewire prior to withdrawal of the device; however, this was not done in our cases. After successful use of ProStyle device, an ultrasound Doppler was done to confirm the lack of blood flow, that is, the exclusion of pseudoaneurysm from the circulation. Follow-up ultrasound Doppler was done after 48 to 72 hours to confirm thrombosis of the femoral artery pseudoaneurysm and absence of recurrence. There were no procedure-related complications.

Discussion

We describe three cases where successful closure of common femoral artery pseudoaneurysms was achieved with the use

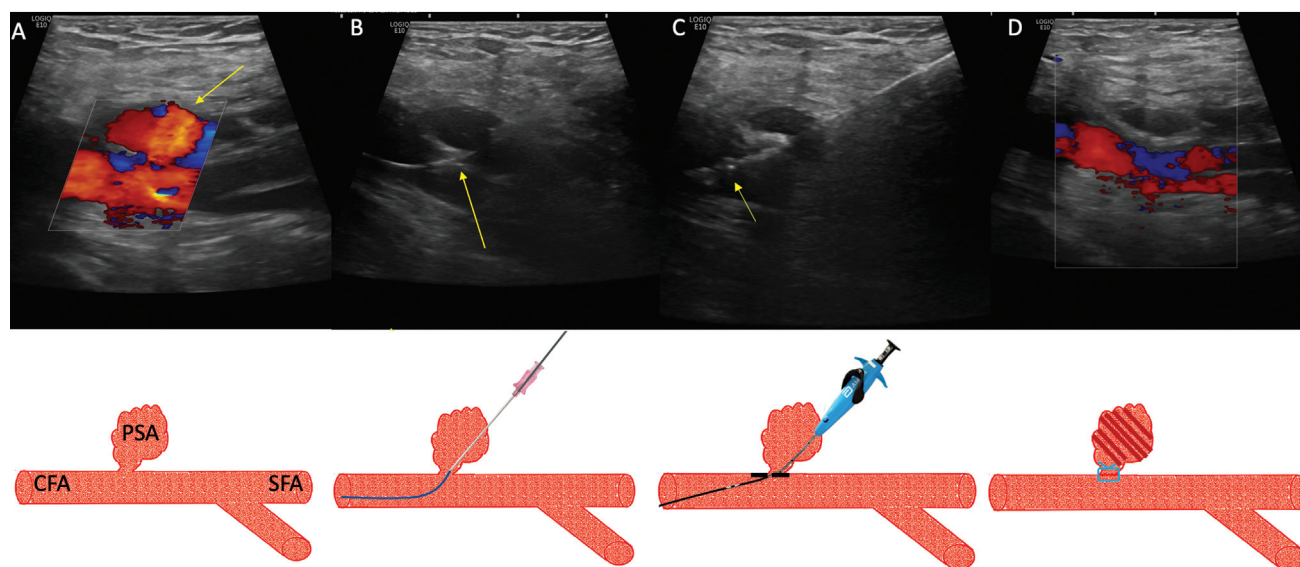


Fig. 1 Ultrasound color Doppler with illustration. (A) Short neck pseudoaneurysm (PSA, yellow arrow) arising from common femoral artery (CFA). (B) Percutaneous ultrasound-guided wire access into the CFA through neck of PSA (yellow arrow). (C) Visualization of footplate housing of the ProStyle device as echogenic structure (yellow arrow). (D) Thrombosed PSA after successful deployment of the suture. SFA, superficial femoral artery.

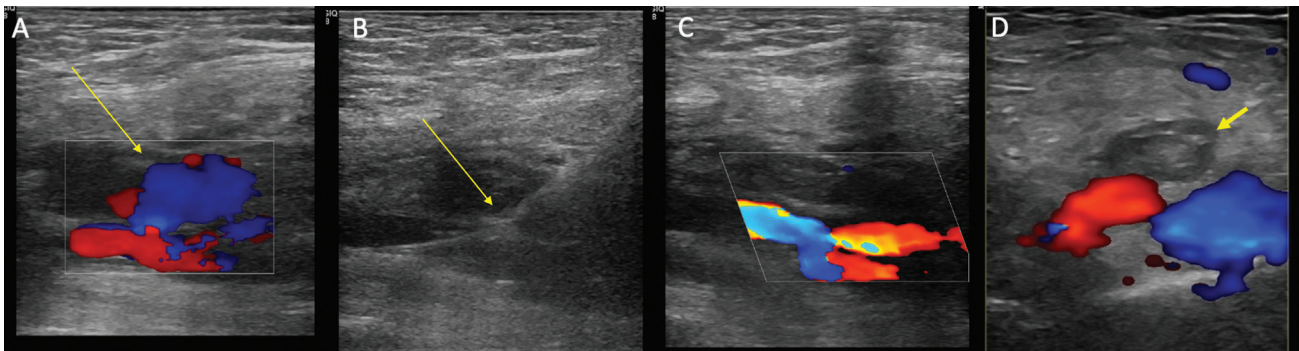


Fig. 2 (A) Short neck pseudoaneurysm arising from common femoral artery (CFA; yellow arrow). (B) Percutaneous ultrasound-guided wire access into the CFA through neck of pseudoaneurysm (yellow arrow). (C) Thrombosed pseudoaneurysm after successful deployment of the suture. (D) Follow-up ultrasound doppler after 3 days showing thrombosed pseudoaneurysm (yellow arrow).

of ProStyle suture-mediated closure device under ultrasound guidance. The established methods to treat iatrogenic arterial access site pseudoaneurysms are manual compression and ultrasound-guided thrombin injection.^{1,2} The other less commonly used method described for the treatment of these pseudoaneurysms includes placement of stent grafts to exclude the pseudoaneurysm. Manual compression has been reported to be successful but its disadvantages include patient intolerance due to pain, significant failure rates, and higher incidence of reperfusion of pseudoaneurysm especially in patients on anticoagulation. The failure and recurrence rates following manual compression for femoral pseudoaneurysms are high and reported to be up to 40%.³ Ultrasound-guided thrombin injection has been proven to be safe and effective with primary success rate of 93.8%, low complication rates which include—pseudoaneurysm reperfusion rate of 2.1% and thromboembolic complication rate of 0.8%.⁴ Rarely, potentially fatal complications like thrombotic occlusion of the femoral arteries can be encountered after ultrasound-guided thrombin injection for pseudoaneurysms as reported in literature.⁵ Angiographic placement of balloon at the femoral artery puncture site has been employed to prevent distal thromboembolic complications,⁶ and thrombotic complications have been reported despite this technique.⁷

Vascular closure devices have become increasingly popular to achieve access site hemostasis due to their advantages that include high operator convenience and patient satisfaction with effective management of departmental resources.⁸ Angioseal (Terumo International) closure device has been successfully used to treat femoral artery pseudoaneurysm.⁹ However, all our patients who had presented with pseudoaneurysms underwent femoral arterial access site closure with Angioseal. There is a case report in literature describing the use of Proglide (Abbott Vascular, Redwood City, California, United States) suture-mediated closure device to treat deep femoral artery pseudoaneurysm; this involved a more complex procedure utilizing an angiographic suite.¹⁰ Another case report described successful closure of brachial artery pseudoaneurysm with suture-mediated device, and the procedure described involved initial radial artery access and angiographic guidance.¹¹ We have described a much more simple technique

with ultrasound guidance while using ProStyle suture-mediated device to treat these pseudoaneurysms. The procedure is fairly simple with ultrasound guidance required to place the guidewire across the neck of pseudoaneurysm and to confirm the insertion of the device into the common femoral artery lumen and approximation of the device foot plate to the anterior wall of the artery, which is followed by the standard steps in the use of ProStyle suture-mediated device. It obviates the need of a contralateral or ipsilateral vascular access sheath and need for angiograms. This technique can be technically used to treat pseudoaneurysms following arterial access up to 8 French as per the instructions for use of the ProStyle suture-mediated closure device, that is, for pseudoaneurysm neck size up to 3.3 mm. There is another technique described to close pseudoaneurysms following large hole arterial access using double guidewire access to partially occupy the hole using small-sized sheath to reduce the area of perforation.¹² There were no post-procedural complications. The potential complications that can be encountered are the same as with use of suture-mediated closure device and include failure to achieve hemostasis and occlusion of the parent vessel. The major limitation of the study is relatively small size of pseudoaneurysms that were treated. Sometimes the patient can present with large pseudoaneurysm sac size with surrounding hematoma that may limit ultrasonographic visibility of the footplate; using a curvilinear ultrasound probe may be useful in such instances.

Conclusion

ProStyle suture-mediated closure device can be safely and successfully used to treat iatrogenic femoral artery pseudoaneurysms under ultrasound guidance. This technique can be particularly useful for patients presenting with pseudoaneurysms with short neck and in patients on anticoagulants.

Informed Consent

Informed consent was obtained from the participants included in the study.

Conflict of Interest

None declared.

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