Novel Technique to Treat Common Femoral Artery Pseudoaneurysm using Angio-Seal Closure Device

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Abstract

Keywords

- pseudoaneurysm
- Angio-Seal
- retrograde access
- common femoral artery

Iatrogenic common femoral artery pseudoaneurysm is a well-described vascular access complication. Several methods have been proposed to treat these pseudoaneurysms. In this report, we present three cases of successful pseudoaneurysm closure using a novel method of retrograde pseudoaneurysm access and thrombosis with Angio-Seal (St Jude Medical, St Paul, MN) closure device. This technique appears safe, effective, and reduces patient discomfort.

Femoral artery pseudoaneurysms are infrequent complications of angiography and percutaneous interventions occurring in 0.2 to 7% of patients.¹ Several methods have been proposed to treat these pseudoaneurysms including ultrasound-guided compression,² direct percutaneous thrombin injection,³ selective embolization of the pseudoaneurysm neck with n-butyl cyanoacrylate⁴ or coil embolization,⁵ direct saline/lidocaine injection in the vicinity of the pseudoaneurysm neck followed by brief compression,⁶ stent graft placement,⁷ stethoscope-guided compression,⁸ and surgical correction.⁹

Direct thrombin injection is generally safe but may carry the possibility of severe complications that can be fatal.¹⁰ Also, surgical repair carries a higher rate of complications including bleeding, wound infection, arrhythmia, and longer hospital stay.¹¹ Furthermore, successful femoral pseudoaneurysm thrombosis following compression occurs in only 59 to 90%^{2,12,13} of cases. Predictors of failure for successful compression include larger diameter pseudoaneurysm (greater than 4 cm), and the use of anticoagulation before and during compression. Finally, compression may not be feasible in pseudoaneurysms complicated by retroperitoneal bleed given the typical presence of severe abdominal pain in these patients.

In this report, we present three cases of pseudoaneurysm repair with subsequent thrombosis using a retrograde approach through the neck of the pseudoaneurysm and subse-

quent closure with Angio-Seal (St Jude Medical, St Paul, MN) deployment.

Case Reports

Case 1

An 81-year-old male presented with dyspnea and an abnormal stress test. He has history of atrial fibrillation and has been on warfarin. Patient underwent angiography and revascularization to his left anterior descending artery using an 8F sheath to access the right common femoral artery. Unfractionated heparin was used during the procedure. Following the intervention, an attempt was made to close his arteriotomy site with the Perclose closure device (Abbott, Abbott Park, IL) which failed to achieve hemostasis. Manual compression was then performed with good hemostasis. Patient did well and was discharged the next morning. He was placed back on his warfarin for stroke prevention. Clopidogrel 75 mg and aspirin 81 mg po daily were added to his medical regimen.

On 1 week follow-up, he was noted to have a right common femoral artery bruit. Duplex arterial ultrasound revealed a 3.5 × 1.6 cm pseudoaneurysm (►Fig. 1A). He was brought to the cardiac catheterization laboratory. A 6-F contralateral sheath was positioned in the distal right external iliac from the left common femoral artery and angiography was performed (►Fig. 1B). Using a 0.014 inch Wisper wire (Abbott, Abbott Park, IL), the neck of the

Fig. 1 (A) Pseudoaneurysm seen on duplex ultrasound and (B) angiography (arrow); (C) 5F sheath advanced through the neck of the pseudoaneurysm (white arrow) over the 0.014 inch Whisper wire (black arrow); (D) 0.014 inch wire exchanged with 0.034 inch Wholey wire (white arrow) through the 5F sheath.

pseudoaneurysm was entered. Using this wire as a marker to the location of the neck of the pseudoaneurysm, a micropuncture needle entered the pseudoaneurysm at approximately 45-degree angle. A 0.014 inch Whisper wire was then advanced through the micropuncture needle retrogradely into the right external iliac. The 5-F micropuncture sheath (Merit Medical Systems, South Jordan, UT) was inserted over the wire into the right external iliac (►Fig. 1C). A 0.034 inch Wholey wire (Covidien, Minneapolis, MN) was then advanced through the sheath into the right external iliac (►Fig. 1D). The 5F microsheath was removed and an 8F Angio-Seal was deployed with the anchor pulled against the neck of the pseudoaneurysm (►Fig. 2). Closure was accomplished by deploying the collagen into the pseudoaneurysm. Angiography using the contralateral sheath confirmed complete closure of the pseudoaneurysm with no complications. Patient was discharged home the same day.

Case 2

A 63-year-old female with history of advanced vascular disease presented with unstable angina. She underwent angiography from the right common femoral artery. She

Fig. 2 An 8-F Angio-Seal catheter placed over the wire and deployed with anchor against neck of pseudoaneurysm (white arrow). A 0.014 inch wire placed from contralateral sheath is still seen in pseudoaneurysm before being pulled out.

Fig. 3 (A) Micropuncture needle seen through the neck of the pseudoaneurysm; (B) a 5F sheath advanced through the neck of the pseudoaneurysm over the 0.014 inch Whisper wire; (C) an 8-F Angio-Seal catheter advanced through the neck of the pseudoaneurysm; (D) angiogram post closure of the pseudoaneurysm.

had prior interventions from the left common femoral artery and had a small pulsatile mass in her left groin with a bruit. Angiography to her left common femoral artery revealed a pseudoaneurysm. With a contralateral sheath placed in the left external iliac, the pseudoaneurysm was entered through the neck using a Whisper wire. A microintroducer needle was then used to enter the pseudoaneurysm. A 0.014 inch Whisper wire was then advanced through the neck of the pseudoaneurysm retrogradely into the external iliac (►Fig. 3A). The microintroducer sheath was then advanced into the pseudoaneurysm over the wire and retrogradely into the external iliac (►Fig. 3B). The 0.014 inch wire was exchanged with a 0.034 inch Wholey wire. The Angio-Seal was then deployed (►Fig. 3C) with the anchor against the pseudoaneurysm neck with subsequent thrombosis of the pseudoaneurysm. Angiography through the contralateral sheath showed complete occlusion of the neck with no compromise to the common femoral artery (►Fig. 3D).

Case 3

A 47-year-old female who underwent angiography with no obstructive disease found. She was discharged home on the same day but returned to the hospital for severe abdominal pain shortly after discharge. Patient was found to have a large hematoma by computed tomography (CT) of the abdomen. She continued to lose blood and was transferred to our institution for emergent treatment. She had severe abdominal pain from her large retroperitoneal bleed and required large amount of narcotics for pain control. Patient was brought to the cardiac catheterization laboratory. A 6F sheath was placed in the left common femoral artery and abdominal aortogram was performed revealing a pseudoaneurysm emerging from the proximal segment of the right common femoral artery (►Fig. 4A). Closure was then carried on with the pseudoaneurysm crossed initially with a Whisper wire via the contralateral sheath. A microintroducer needle was then used to enter the pseudoaneurysm (►Fig. 4B). A 0.014

Fig. 4 (A) Pseudoaneurysm seen on angiogram of the right common femoral artery (white arrow); (B) Micropuncture needle seen through the neck of the pseudoaneurysm (white arrow); (C) An 8-F Angio-Seal catheter (small white arrows) postdeployment of the Angio-Seal; (D) Angiogram postclosure of the pseudoaneurysm.

inch Whisper wire was then advanced through the neck of the pseudoaneurysm retrogradely into the external iliac. The 5-F microintroducer sheath was then advanced into the pseudoaneurysm over the wire retrogradely into the external iliac. The 0.014 inch Whisper wire was then exchanged with a 0.034 inch Wholey wire. The Angio-Seal was then deployed (► Fig. 4C) with the anchor against the pseudoaneurysm neck with subsequent thrombosis of the pseudoaneurysm. Angiography through the contralateral sheath showed complete occlusion of the pseudoaneurysm with no compromise to the common femoral artery (► Fig. 4D). Patient did well with no complications and was discharged home 48 hours after the procedure.

Discussion

In these three cases, we illustrate the technique used to close pseudoaneurysms of the femoral artery using the Angio-Seal

closure device. There are several methods currently used to close pseudoaneurysms the most common of which are ultrasound-guided compression and thrombin injection.^{2,3} Ultrasound-guided compression is likely to fail in 10 to 40% of cases^{2,12,13} particularly in larger size pseudoaneurysms and patients on double or triple anticoagulation. Also, compression is generally not possible in most patients who have severe abdominal pain from associated retroperitoneal bleeding. Thrombin injection is an effective way of closing pseudoaneurysms with experienced operators but it carries significant risk of distal lower extremity thrombosis and may lead to serious consequences. However, the familiarity with the Angio-Seal as a closure device by most endovascular specialists may lead to the adoption of this technique over thrombin injection. All three cases performed in our laboratory were successful with no complications.

Angio-Seal closure of the pseudoaneurysm is a practical, easy to perform procedure, and carries minimal discomfort to

the patient. The skills required to do so are part of the skills that most endovascular specialists have or can easily acquire. The closure is immediate and complete and can be verified with angiography that also reassures the operator that no lower extremity distal complications have occurred during the closure. The drawbacks of the procedure are the insertion of a sheath from the contralateral femoral artery and a few hours admission to the hospital adding some risks and expenses to the procedure. Therefore, we see this technique reserved primarily to patients who have large pseudoaneurysms, likely more than 3 cm in size and those on multiple anticoagulants, where compression success is reduced (see case 1). Also, this is more likely to be adopted in patients who are not able to undergo compression because of retroperitoneal bleed (see case 3) and those with pseudoaneurysms incidentally discovered while patients are undergoing a required invasive procedure (see case 2).

This procedure is likely to be successful in a patient with access site-related pseudoaneurysm and a sheath size 8F or less. Duplex ultrasound can be helpful in determining the size of the neck of the pseudoaneurysm. A large pseudoaneurysm orifice exceeding 5 mm is less likely to be successfully closed with the Angio-Seal because of inability to anchor an orifice of that size. If the orifice of the pseudoaneurysm cannot be measured by ultrasound, CT angiography is a viable alternative to evaluate the location, size, and orifice diameter of the pseudoaneurysm.

Conclusion

In this report, a novel approach to close an iatrogenic pseudoaneurysm using the Angio-Seal closure device is described. This alternative method is likely to be useful in the setting of a large pseudoaneurysm (> 3 mm) with a neck diameter less than 5 mm, an incidentally found pseudoaneurysm during a subsequent invasive procedure, or a pseudoaneurysm in the setting of severe abdominal pain from a retroperitoneal pain where compression is not a feasible option. A larger series is required to fully assess the safety and effectiveness of this technique in closure of pseudoaneurysm.

Disclosure

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