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CASE STUDY

SUCCESSFUL USE OF FIBRIN SEALANT IN POST-CATHERIZATION PSEUDO-ANEURYSM OF FEMORAL ARTERY AFTER FAILURE OF COMPRESSION ATTEMPT – A CASE STUDY

¹Kunwar, B.K., ²Pathak, V, ³Chandrasekhar Tulasigeri and ⁴Apsangikar, P.

¹Senior Interventional Cardiologist, Fortis Hospital, Navi-Mumbai

²Head Radiology, Fortis Hospital Navi-Mumbai

³Chief Intensivist Fortis Hospital Navi Mumbai

⁴Head Medical Affairs, Reliance Life Sciences

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ABSTRACT

A classic case study example of multidisciplinary approach where an expert radiologist superbly assisted cardiologist to do a rare difficult procedure is presented here. A 75 years old female referred for severe painful swelling in right groin showed a large soft tissue swelling filled with blood and communicating with femoral artery diagnosed as pseudo-aneurysm. Attempt was made to compress the neck which was not clearly defined, which failed. Hence, patient was taken for intra-lesion injection of fibrin sealant in Cath lab for guided usage of fibrin sealant. The procedure was approached from left femoral artery using 6F long sheath and 6F Judkins JR catheter. A large 8x40 mm balloon was kept across the neck of pseudo-aneurysm and inflated to occlude the communication and simultaneously the fibrin sealant was injected into the pseudo-aneurysm under both ultrasonic and fluoroscopic guidance. Within few seconds, the whole pseudo-aneurysm was seen getting thrombosed with no flow from femoral artery as confirmed from post-procedure Doppler. The balloon was retrieved and check angiogram showed nicely flowing femoral artery with no signs of pseudo-aneurysm. The patient immediately improved with decrease in pain and swelling.

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INTRODUCTION

A pseudo-aneurysm or pseudo-aneurysm of the vessels, occurs when a blood vessel wall is injured and the leaking blood collects in the surrounding tissue forming a space which is connected with the main vessel through a neck with to and fro swirling movement of blood. It is sometimes called a false aneurysm. In a true aneurysm, the artery or vessel weakens and bulges, sometimes forming a blood-filled sac. pseudo-aneurysm is usually caused by a penetrating injury to the vessel, which then bleeds, but forms a space outside the vessel wall communicating with the lumen. It may be pulsatile and can resemble a true aneurysm. Post-catheterization PSA is one of the most common vascular complications of cardiac and peripheral angiographic procedures. The incidence of PSA after diagnostic catheterization ranges from 0.05% to 2%⁴. Femoral pseudo-aneurysms may complicate up to 8% of vascular interventional procedures. Small pseudo-aneurysms can spontaneously clot, while others need definitive treatment (Kouvelos, 2011).

***Corresponding author: Kunwar, B.K.,**
Senior Interventional Cardiologist, Fortis Hospital, Navi-Mumbai

Factors which increase the propensity to develop pseudo-aneurysm during cardiac Cath lab procedure includes elderly ages, small heights, female sex, obesity, poor nutritional status and associated connective tissue disorder, improper compression following sheath removal, prolong procedure, multiple procedure from same sight, use of wide or high French sheath, use of anticoagulants and antiplatelet medications etc. The diagnosis should be suspected if the patient has a history of arterial trauma. This can include arterial access for catheterization i.e. the common femoral artery (CFA), blunt trauma (i.e. to an extremity), or penetrating trauma (i.e. gunshot or blast injury). A patient with such a history who presents with a painful, pulsatile, tender mass at the site of catheterization or trauma should be suspected to have a pseudo-aneurysm (Nael, 2005). Some complications associated with pseudo-aneurysms develop unpredictably and carry high morbidity and mortality rates. The advent of new radiologic techniques with a greater sensitivity for asymptomatic disease has allowed more frequent diagnosis of pseudo-aneurysms. Conventional angiography remains the standard of reference for diagnosis but is an invasive procedure, and non-invasive diagnostic modalities [e.g. ultrasonography (US), computed tomographic angiography,

magnetic resonance angiography] should be included in the initial work-up if possible (Nael, 2005). While surgery was the gold-standard treatment in the past, several less invasive treatment options are popular today. Since the pseudo-aneurysm communicates with an artery through a hole in the arterial wall, a covered stent may be placed endovascularly across this hole to "exclude it," or to prevent it from receiving blood flow from the artery. The covered stent is composed of metal and is covered with polytetrafluoroethylene (PTFE) or another sterile fabric-like material. The covered stent remains in place permanently, and the pseudo-aneurysm, without a continuous flow of arterial blood, then thromboses. Complications include covered stent migration, persistent leakage of blood into the pseudo-aneurysm, fracturing (breaking) of the stent, and infection of the stent or of the arterial insertion site. Another option for treatment is ultrasound probe compression of the neck of the pseudo-aneurysm. The ultrasound probe can be pushed firmly against the patient's skin to compress the neck of the pseudo-aneurysm for usually about 20 minutes. During this time, the blood within the pseudo-aneurysm clots; after the probe is then removed, the pseudo-aneurysm will hopefully remain clotted and will not continue to expand. The procedure may be stopped early due to patient discomfort. It is less successful if the patient is obese. It also is less successful if the neck of the pseudo-aneurysm is wider, since it is less likely to clot off during the period of compression. Finally, it is also much less successful if the patient is taking aspirin, warfarin (Coumadin), or another anticoagulant, since these would prevent clotting of blood within the pseudo-aneurysm. In addition to covered stent placement, another popular, minimally invasive technique used today is ultrasound-guided thrombin injection. Under ultrasound guidance, thrombin can be injected directly into a pseudo-aneurysm, causing it to clot. Advantages are that the technique is relatively easy to perform, is successful, and is minimally invasive. One contraindication to this procedure is if there is an arteriovenous fistula (communication between an artery and vein), in addition to the pseudo-aneurysm. This occurs with about 10% of pseudo-aneurysms. Open surgery may also be performed to remove pseudo-aneurysms or prevent them from expanding. If the artery is small and "expendable" - the tissues it supplies have adequate collateral blood flow - then the artery supplying the pseudo-aneurysm may be ligated both proximally and distally to the pseudo-aneurysm. The pseudo-aneurysm may or may not be removed. If the tissues supplied by the artery do not have sufficient collateral flow (the artery is not expendable), then a vein or synthetic graft would have to be anastomosed proximally and distally to allow for continued blood flow around the pseudo-aneurysm. However, it is more invasive (a large skin incision is necessary), and there is more post-operative pain and a risk for wound infection. One of the less invasive options may be preferred in a patient with many co morbidities, who is at high risk for surgery.

Fibrin sealant is a two-component material consisting of fibrinogen and thrombin. In the presence of small amounts of calcium and factor XIII, the thrombin converts fibrinogen into insoluble fibrin, the final stable form of the agent. Fibrin sealant now has over a century of development and use. Although straightforward, a few clear definitions are important in this area. A haemostat causes blood to clot and usually is not effective unless blood is present in the operative field. A sealant creates a sealing barrier that prevents the leakage of gas or liquid from a structure. It polymerizes on its own and is

often most effective in a dry field. An adhesive is capable of gluing structures together. It is also self-polymerizing and usually most effective in a dry field. Both sealants and adhesives when applied to potentially leaking blood vessels, may have a haemostatic effect by blocking holes in the vessel and preventing bleeding, but they do not necessarily cause blood to clot. Fibrin sealant is the only commercially available approved material for clinical use in all the three of these groupings: haemostats, sealants, and adhesives (William, 2014).

MATERIALS AND METHODS

75 years old female was referred for severe painful swelling in right groin. There was a history of right femoral artery catheterization few days back. The swelling was tense and pulsating. Doppler done by chief radiologist showed a large soft tissue swelling filled with blood and communicating with femoral artery (Figure 1). Hence, the diagnosis of pseudo-aneurysm was made.

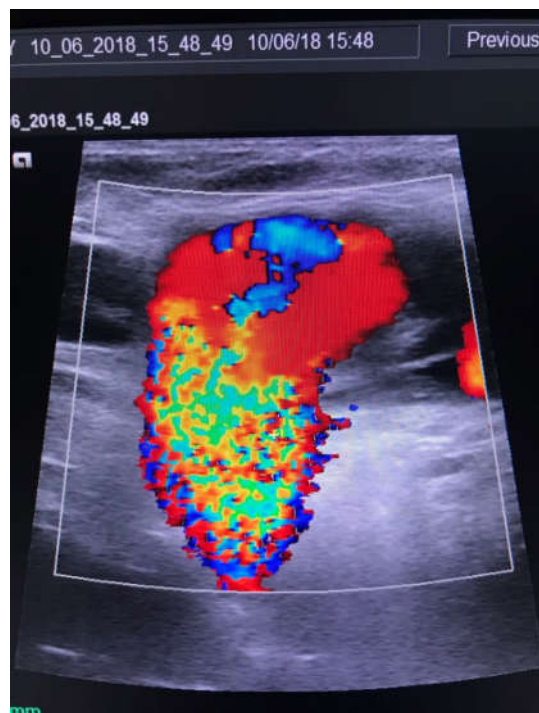


Figure 1. Pre-procedure Doppler showing colour flow due to pseudo-aneurysm

The neck was not very clearly defined. Attempt was made to compress the neck and occlude the pseudo-aneurysm, which failed. Hence, after discussing with relatives, patient was taken for intra-lesion injection of fibrin sealant in Cath lab for guided usage of fibrin sealant. In the sealant product, the contents of the fibrinogen and factor XIII vial are reconstituted using aprotinin, which is a solution of bovine origin that prevents natural fibrinolysis. The thrombin is reconstituted in a solution of calcium chloride. Fibrin sealant is formed when the contents of the vial containing fibrinogen + factor XIII and the contents of the thrombin vial are injected simultaneously using a Y-shaped connector that comes with the kit. The procedure was approached from left femoral artery using 6F long sheath and 6F Judkins JR catheter. The angiogram of right femoral artery showed larger pseudo-aneurysm with undefined neck with free communication with femoral artery. A large 8x40 mm balloon was kept across the neck of pseudo-aneurysm and inflated to

occlude the communication and simultaneously mixed solution of aprotinin, fibrinogen and thrombin was injected into the pseudo-aneurysm under both ultrasonic and fluoroscopic guidance (Figure 2).

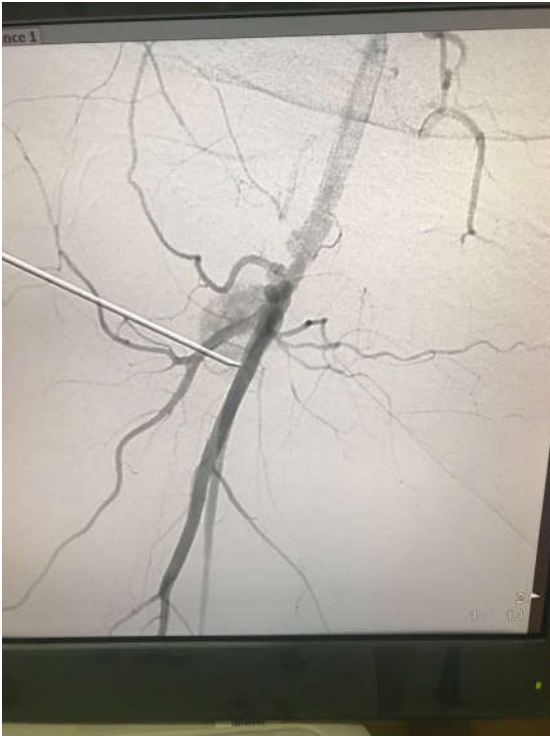


Figure 2. Needle pointing into pseudo-aneurysm under fluoroscopic and USG guidance

The inflated balloon in right superficial femoral artery (SFA) occluded the free connection between pseudo-aneurysm and SFA preventing the sealant to enter the lumen of the vessel (Figure 3), which can lead to dangerous complication of thrombotic occlusion of right Lower limb circulation.



Figure 3. Balloon inflation occluding the free connection between pseudo-aneurysm and SFA

With very cleared defined narrow neck where USG or manual compression has failed, procedure can be done only under USG guided without fluoroscopic support. However, the patient had a wide neck pseudo-aneurysm with ill-defined origin requiring fluoroscopic support.

RESULTS

Within few seconds, the whole pseudo-aneurysm was seen getting thrombosed with no flow from femoral artery as confirmed from post-procedure Doppler (Figure 4).

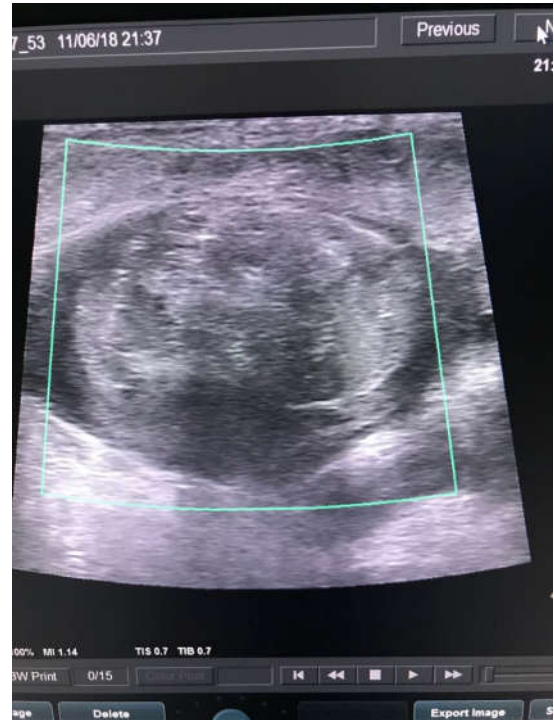


Figure 4. Post-procedure Doppler showing thrombosed pseudo-aneurysm with no colour flow

The balloon was retrieved and check angiogram showed nicely flowing femoral artery with no signs of pseudo-aneurysm (Figure 5). The patient immediately improved with decrease in pain and swelling.



Figure 5. Post-procedure right lower limb arterial angiogram showing normal flowing CFA and SFA with no pseudo-aneurysm

This case was a classic example of multidisciplinary approach where an expert radiologist superbly assisted cardiologist to do a rare difficult procedure.

Conclusion

Femoral artery pseudo-aneurysm is not an uncommon vascular complication following diagnostic or interventional cardiac catheterization and probably will increase. Multiple therapeutic options are available with various success rates depending upon the duration of pseudo-aneurysm and its complexity, which includes the size and neck configuration. Use of Fibrin sealant is an efficient alternative, which caused pseudo-aneurysm thrombosis with no flow from femoral with nicely flowing femoral artery and immediate symptomatic relief for the patient. Performing the procedure in Cath lab under fluoroscopic support in the hands of expert interventional cardiologist further makes the procedure safe with almost sure success.

Conflict of interest: This case report is a classic multidisciplinary management of pseudo-aneurysm and there is no conflict of interest.

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