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Nonsurgical Management of a Complicated Iatrogenic Pseudoaneurysm of the Superficial Femoral Artery

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Abstract: ***This case report describes the successful nonsurgical management of a large, complicated iatrogenic pseudoaneurysm of the right superficial femoral artery in an 89-year-old female following coronary arteriography. Despite initial rapid expansion of a groin hematoma and imaging confirmation of a 7.3 cm pseudoaneurysm, conservative management using repeated manual compression was pursued. Follow-up sonography revealed hematoma without Doppler flow by day 4, and the patient's symptoms resolved fully by day 46. This case challenges conventional interventionist approaches by highlighting the potential role of prolonged manual compression, even in complex presentations, and underscores the utility of Doppler imaging in monitoring treatment outcomes.***

Keywords: pseudoaneurysm, superficial femoral artery, manual compression, Doppler ultrasonography, iatrogenic complication

1. Introduction

A pseudoaneurysm (PSA) is caused by disruption of all three layers of the arterial wall resulting in arterial blood leakage to the surrounding soft tissue [1-2]. Postcatheterization PSA is a common vascular complication of cardiac and peripheral angiographic procedures. The incidence of PSA ranges from 0.05% to 2% after diagnostic catheterization, but increases to 2% to 6% after coronary or peripheral intervention [1]. One of the risk factors for PSA formation is catheterization of the superficial femoral artery or deep femoral artery [3-4]. Nonsurgical treatment such as ultrasound-guided compression is effective for treatment of PSA smaller than 2 cm [2]. PSA size greater than 6 cm failed in compression. Patients with complicated femoral PSA (e.g., expanding hematoma) generally require open surgical repair or endovascular repair [1, 5]. This case report aims to demonstrate the effectiveness of nonsurgical manual compression in resolving a large iatrogenic pseudoaneurysm of the superficial femoral artery.

2. Case Report

An 89-year-old female patient sustained chest pain, dyspnea and elevated blood hs Troponin I level during hospitalization for treatment of anemia and gastric ulcer bleeding. Echocardiography showed mildly impaired systolic function of left ventricle. Under the impression of myocardial infarction, the patient underwent coronary arteriography (CAG) from the right femoral arterial access, with the CAG result of insignificant coronary artery disease. The puncture site was compressed by using a manual compression device. However, a large, rapidly expanding area of skin ecchymosis and swelling was found in the right groin and right upper medial thigh, despite multiple 15-minute manual compression sessions performed daily over several days. [Figure 1]. Color Doppler ultrasonography of the right inguinal area showed an oval and anechoic mass with internal Doppler signal communicating with the right superficial femoral artery, suggesting extravasation within a hematoma [Figure 2a]. Contrast-enhanced computed tomography (CT) was immediately performed to confirm a PSA with a diameter of 7.3 cm arising from the right superficial femoral artery, with a neck diameter of 3.9 mm and a communication track length of 10.5 mm [Figure 2b and 2c]. The manual compression technique persisted to apply on the puncture site. The cardiac surgeon was consulted and he recommended operation. Repeated sonography of the right inguinal area on the 4th day after CT performance showed no more Doppler signal in the hematoma [Figure 3a], and the scheduled operation was cancelled. The ecchymosis of the right groin gradually improved and resolved on the 46th day post-CT performance [Figure 3b]. The patient was discharged home on the 50th hospitalization day after symptom relief and in stable condition.

3. Discussion

The common femoral artery has served as the most common site of percutaneous access for both diagnostic and interventional procedures including coronary artery and non-cardiac catheterization such as diagnostic angiography, angioplasty and stent deployment, with the incidence rising significantly over recent years [2, 4]. Postcatheterization femoral PSA (also known as false aneurysm) is one of the most common iatrogenic complications of cardiac and peripheral angiographic procedures [1, 2, 4]. The arterial puncture causes disruption of the arterial wall, with blood

flow through the injured wall into the surrounding tissues forming a hematoma, which finally recanalizes to develop into a false lumen communicating to the femoral artery by a neck. The PSA is contained by the pressure of the surrounding tissues, with rupture being a potential catastrophic complication to cause life-threatening bleeding [4]. The risk of spontaneous rupture of PSA relates to a size larger than 3 cm, presence of symptoms, a large hematoma, or continuous growth of the sac [1].

A number of risk factors can contribute to the development of a PSA, including female sex, obesity, old age (> 65 years), catheterization of both artery and vein, hypertension, severely calcified arteries, larger access sheath size (> 6 French), use of anticoagulant at the time of arterial cannulation or in the immediate post-procedure period, hemodialysis, low or high puncture sites (with the puncture site not in the common femoral artery but rather in the superficial or deep femoral artery, or external iliac artery), and inadequate post-procedure compression [1-6]. Interventional procedures have a higher risk than diagnostic procedures, as well as when the left femoral artery is used for access compared with the right femoral artery [5].

Pain, swelling and a palpable mass in the inguinal region after femoral artery catheterization may be a presentation of a PSA [1, 4]. The mass effect causes compression of the underlying neurovascular structures resulting in severe pain, venous thrombosis, neuropathy, ischemia, infection, or compartment syndrome [1, 2, 4]. The diagnosis is made by color Doppler imaging showing turbulent and bidirectional blood flow (ying-yang sign) [2, 5]. Contrast-enhanced CT shows active contrast extravasation from the offending artery and identifies the presence of retroperitoneal hematoma [2, 5].

Management of a PSA depends on the size and the degree of severity of the PSA [1-5]. A small PSA (less than 2-3 cm) arising from the arterial puncture may take a “wait and observe” strategy because this PSA can thrombose spontaneously within 4 weeks [2, 3, 5]. A PSA with a long neck (0.9 cm or longer) shows earlier spontaneous thrombosis than that with a short neck [2].

Ultrasound-guided compression (UGC) was introduced in the early 1990s to reduce significantly the need for surgical repair of PSA [2]. The ultrasound probe is applied to the neck of PSA, maintaining flow in the native artery while preventing flow through the PSA [2, 5]. The average compression duration lasts for 10-15 minutes with an interval of 5-10 minutes up to 3 times per treatment session, until the PSA is thrombosed, the ultrasound operator becomes fatigued, or patient discomfort and pain prevent the treatment to continue. The success rate ranges from 54% to 100% [2]. The compression failure increases with a wider PSA neck diameter (> 4 mm), shorter tract length (< 8 mm), high patient’s body mass index (≧ 28 kg/m2), and when compression begins 48 hours after formation of the PSA [6-7]. PSA size larger than 3 or 4 cm in diameter affects the success rate of UGC. The present case showed a PSA with a narrow neck (showing a diameter of 3.9 mm) and a long track length (10.5 mm), therefore, it is no surprise that the compression was successful despite its large size.

Ultrasound-guided thrombin injection (UGTI) is currently the treatment of choice for post-catheterization PSA [1, 4, 5]. As compared with the UGC, UGTI shows a greater technical success, shorter procedural time, and less painful sensation of the patient [4]. Thrombin in bovine or human form is commercially available [1, 4]. Under ultrasound guidance, a 22 G needle is inserted with tip placed centrally inside the PSA. Thrombin (50-1000 iu) is injected into the sac until blood flow ceases on color Doppler ultrasound [4]. A high success rate of 86 to 100% is obtained, with the majority of cases being successful at the first attempt. It should be emphasized that UGTI and UGC should not be combined (that is, thrombin injection and compression) as their combined effect may increase the risk of peripheral embolization [5].

The indications for open surgery are complicated femoral iatrogenic PSA, such as hemodynamic instability, expanding hematoma, soft tissue infection, compression effect leading to peripheral ischemia or neuropathy, extensive skin damage, and failure of other treatment options [2, 4, 5]. Primary repair of a small arterial defect, or repair of a larger defect with a vein patch should be performed.

In conclusion, although an expanding hematoma is considered as a complicated PSA requiring surgical intervention, nonsurgical management such as manual compression may be useful for the treatment of this complication, but at the expense of pain of the patient during the procedure and prolonged time of treatment. Color Doppler sonography plays a key role in assessing the status of the PSA. This case is significant because it challenges conventional management guidelines by documenting the successful resolution of a large pseudoaneurysm through conservative methods, potentially broadening clinical perspectives on treatment options.

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Figure legends

Figure 1. Skin ecchymosis is seen in right groin and right medial thigh on day 7 post CAG.

Figure 2. On day 8 post CAG. (a) B-mode ultrasonography (left image) and color Doppler imaging (right image) shows an anechoic sac-like lesion (S) with Doppler signal within the sac (open arrow). (b) Pre-contrast-enhanced, axial CT, and (c) post-contrast-enhanced, reformatted sagittal CT demonstrate a hypodense mass (arrow) with a diameter of 7.3 cm in right groin, showing 32 Hounsfield units (HU) on the pre-contrast-enhanced image (b) and 60 HU on the post-contrast-enhanced image (c), indicating contrast pooling after contrast enhancement. A tract communicating the mass is shown (arrowhead). Ladder arrow: superficial femoral artery; curved arrow: deep femoral artery.

Figure 3. (a) Follow-up color Doppler ultrasonography on day 24 post CAG shows mild shrinkage of the sac-like lesion (S) with no more Doppler signal within the sac. (b) Resolution of skin ecchymosis is noted in the right groin and medial thigh on day 54 post CAG.

Figure 1

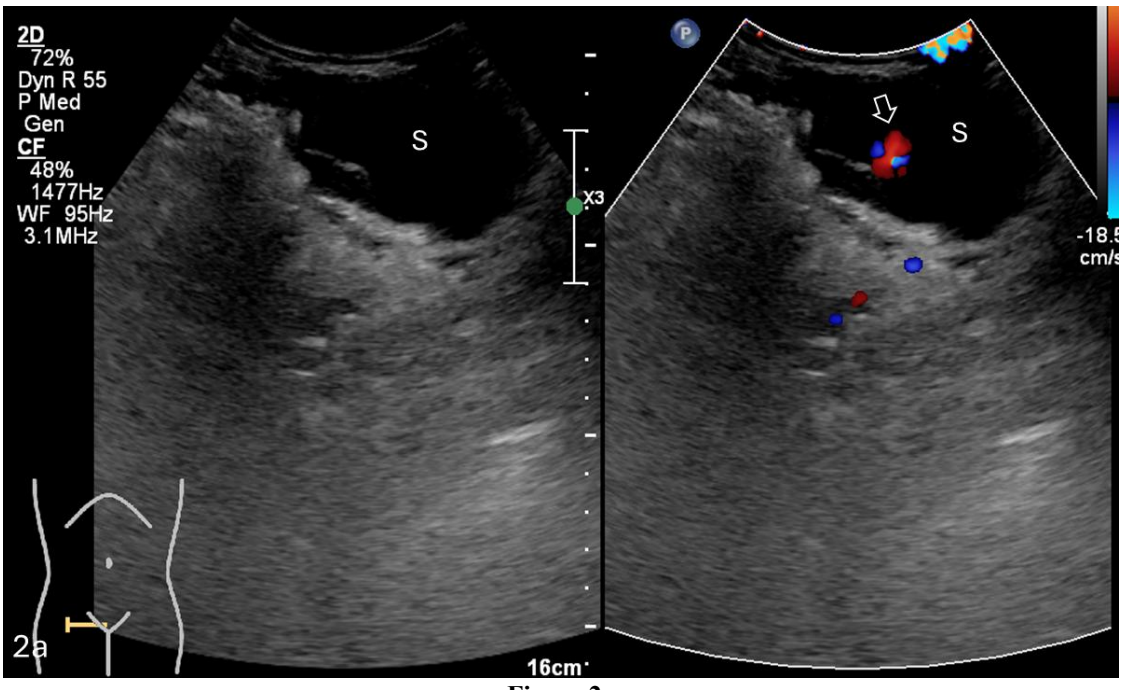

Figure 2a

Figure 2b

Figure 2c

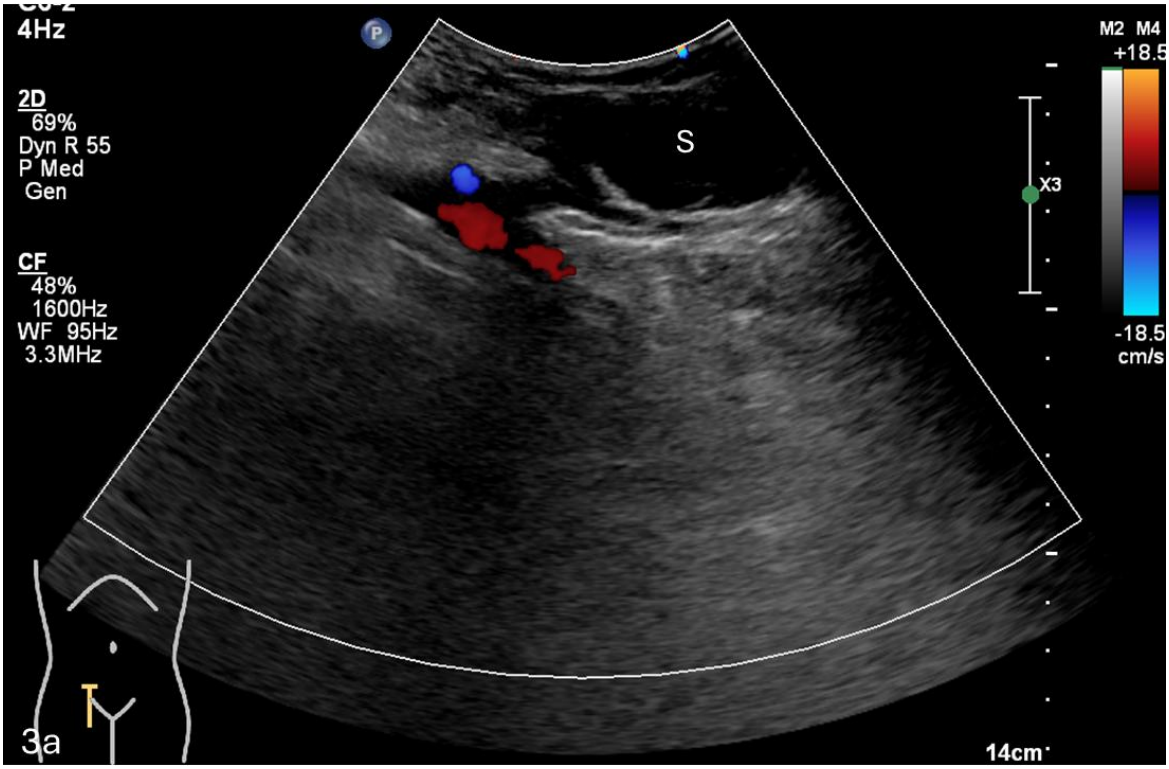

Figure 3a

Figure 3b