Acquired Arteriovenous Fistula at an Unusual Site

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Arteriovenous fistula (AVF) is a known complication of femoral catheterization. These fistulas are almost always located at the common or superficial femoral vessels, and diagnosis can be made using Doppler sonography. In this article, we report an AVF involving the inferior epigastric vessels.

Case Report

A 72-year-old woman presented with right inguinal swelling 2 days after coronary angiography via a femoral artery. A thrill and bruit were felt and heard at the inguinal area. Sonography, performed with a multifrequency 5–12 MHz linear array transducer (HDI 5000, Philips Medical Systems), revealed normal common and superficial femoral vessels on gray-scale, color Doppler, and duplex examinations. However, when the transducer was placed above the site of maximum bruit, an artery with a high-resistance waveform was seen (Fig. 1A) that was followed by a low-resistance waveform, leading to a turbulent high-velocity flow on spectral display and a mosaic pattern on color Doppler imaging (Fig. 1B). By tracing the vessel to its origin at the common iliac artery, it was proven to be the inferior epigastric artery. Moving forward from the origin of the inferior epigastric artery, a classical arterialized flow was seen in the draining vein (Fig. 1C).

These findings suggested an AVF. In addition, perivascular soft-tissue speckling color artifact was seen surrounding the fistula. This artifact is caused by perivascular tissue vibration due to turbulent continuous blood flow between the feeding artery and the draining vein (Fig. 1D). These findings were consistent with an AVF of the inferior epigastric vessels. The patient was discharged, and the fistula closed spontaneously.

Discussion

AVF is a direct connection between an artery and a vein. Like hematomas and pseudoaneurysms, AVFs can be spontaneous, but they are often the result of penetrating trauma [1, 2]. Almost 1% of patients undergoing cardiac catheterization develop a femoral AVF [3]. AVFs have become more common since large catheters started being used for and anticoagulation treatment started being used after vascular interventional procedures [1]. Other risk factors for AVF have been identified, including arterial hypertension, female sex, and complex interventions [3].

AVFs are rarely located above the femoral bifurcation because at that level the femoral artery and vein are side by side and therefore are difficult to puncture simultaneously. Below the bifurcation, the vein travels behind the artery so there is a higher risk of simultaneous puncturing [1]. An AVF is usually asymptomatic, although large AVFs can cause high cardiac output stress or ischemic changes in the involved extremity [1, 4]. Physical examination can reveal slight swelling or ecchymosis and a palpable thrill is often present. A bruit can be heard on local auscultation.

Gray-scale sonography is not diagnostic unless the AVF is chronic and the high-flow state has caused dilatation of the vein and the artery [1, 3]. The diagnosis is based on findings from color Doppler and duplex examinations [2]. In the extremities, normal arterial waveforms have a typical triphasic high-resistance pattern with an anterograde systolic peak, a brief early diastolic retrograde peak, and an end anterograde diastolic peak [2]. In the presence of an AVF, the arterial flow pattern turns to a very low-resistance one.

Major and minor criteria have been postulated for the diagnosis of AVF by color Doppler and duplex sonography [2]. Major diagnostic criteria include a junction of low- and high-resistance flow in the supplying artery, high velocity arterialized waveform in the draining vein, and turbulent high-velocity flow spectrum at the junction of the artery and vein. The described minor diagnostic criteria included a direct communication seen between the artery

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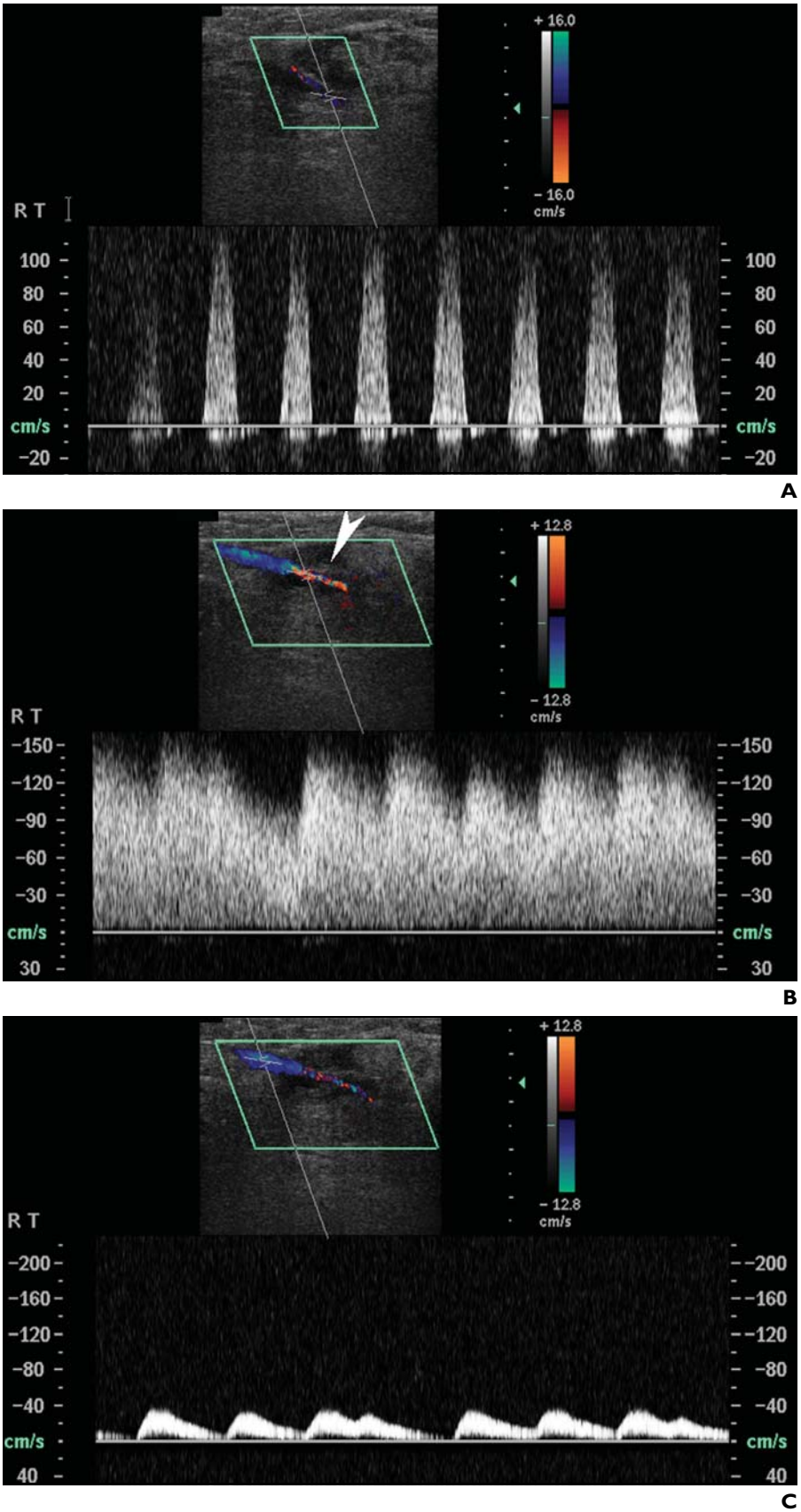
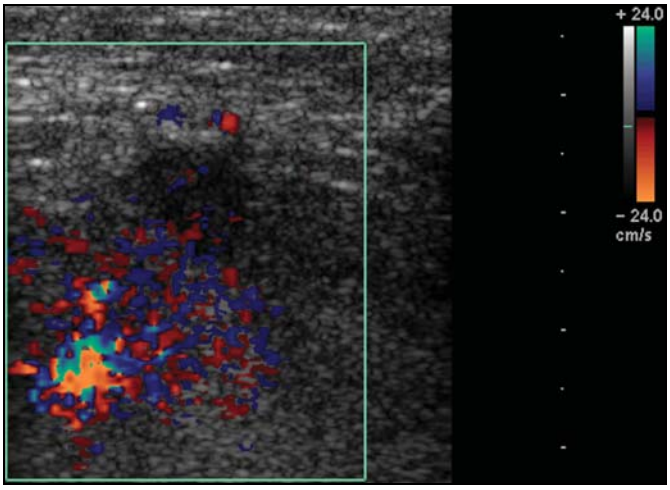


Fig. 1—72-year-old woman presented with right inguinal swelling 2 days after coronary angiography via femoral artery. Thrill and bruit were felt and heard at inguinal area.
A, Spectral display of inferior epigastric artery proximal to fistula shows high-resistant waveform that is typical of artery supplying muscles.
B, Color Doppler and duplex sonography show turbulent high-velocity flow on spectral display and mosaic pattern (*arrowhead*) at fistula site.
C, Image reveals that flow in inferior epigastric vein is showing arterialized waveform.
(Fig. 1 continues on next page)



D

Fig. 1 (continued)—72-year-old woman presented with right inguinal swelling 2 days after coronary angiography via femoral artery. Thrill and bruit were felt and heard at inguinal area.
D, Color Doppler image shows artifact in soft tissues surrounding fistula due to perivascular tissue vibration.

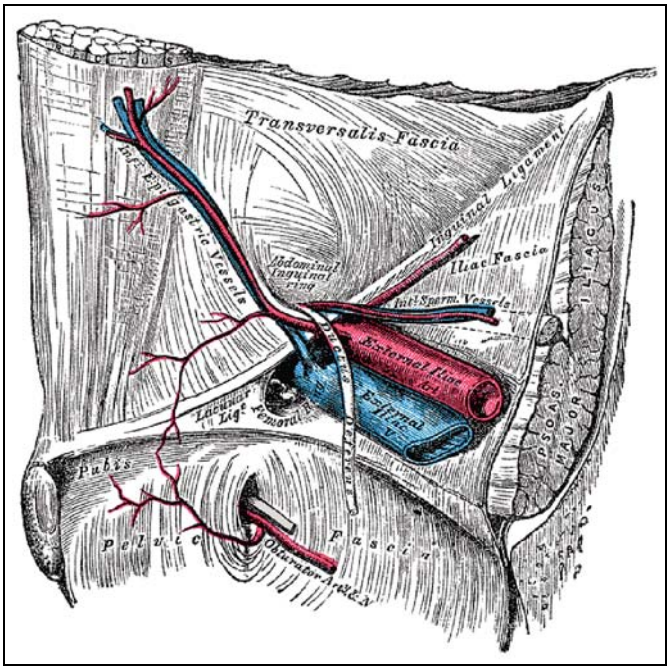


Fig. 2—Sagittal drawing of abdominal wall shows anatomic location of epigastric vessels. (Printed from [9])

and vein, significant change in the diameter of the supplying artery, a focal point of venous dilatation, and focal perivascular color artifact. One third of iatrogenic femoral AVFs close spontaneously within 1 year [3]. Compression repair is usually not successful in closing these AVFs. Percutaneous placement of a covered stent or surgical repair may be indicated [3].

To the best of out knowledge, an acquired inferior epigastric AVF has been reported only once in the literature [4]. In that case, the fistula was secondary to placement of a drain during surgery and coexisted with a pseudoaneurysm [4]. The inferior epigastric artery arises from the anteromedial aspect of the external iliac artery just above the inguinal ligament; it pierces the transverse fascia passing anterior to the arcuate line and courses with the inferior epigastric vein inside the rectus sheath behind the rectus muscle (Fig. 2). The artery continues in the retrosternal space with the internal mammary artery. The epigastric vessels run side by side, so simultaneous damage can occur during a very high and medial groin puncture. A fistula in the inferior epigastric vessels may cause discomfort and the development of abdominal varices due to reflux of flow into the contributory vessels of the epigastric vein [4].

A more frequently known but still quite rare traumatic injury to the inferior epigastric artery is a pseudoaneurysm. It has been described as a complication of surgery and retention sutures, paracentesis, and catheter placement for peritoneal dialysis and in spontaneous instances [5, 6]. Hemorrhage of the inferior epigastric artery due to laceration during catheterization has been reported rarely [7]. Diagnosis of any kind of arterial injury may be performed by color Doppler and Doppler sonography [8].

By presenting this case report, we emphasize that when evaluating the postcatheterization groin the possibility of an inferior epigastric AVF should not be overlooked. Although treatment is conservative, achieving the correct diagnosis will obviate further diagnostic workup and reduce patient anxiety.

We conclude that color Doppler and duplex examinations of the postcatheterization groin should include the femoral vessels and the peripheral and superficial areas to exclude vascular injuries in uncommon arterial sites for AVFs.

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