TRAUMATIC PSEUDOANEURYSM AND ARTERIOVENOUS FISTULA DETECTED BY BEDSIDE ULTRASOUND

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Abstract—Background: The case of late presentation of a pseudoaneurysm and an arteriovenous fistula (AVF) of the common femoral artery and vein secondary to penetrating trauma is reported. Traumatic AVF and pseudoaneurysm may be present within a variety of clinical conditions, which sometimes makes it difficult to detect them clinically. Undiagnosed AVF can lead to clinical manifestations mostly secondary to increased output generated by the fistula. Case Report: A 31-year-old man presented to the Emergency Department (ED) for wound care follow-up. A week before, he had suffered a stab wound to the medial thigh and the primary suture was performed in our ED. During his first visit to our ED, the vascular examination revealed palpable dorsalis pedis and tibialis posterior pulses. The formal Doppler ultrasound was negative. During his second presentation, however, the physical examination was remarkable for a palpable thrill and continuous bruit in the left mid-thigh region. Also, an ultrasound with a 7.5-MHz linear probe demonstrated a pseudoaneurysm and an AVF between the femoral artery and vein. Conclusion: The mechanism of the injury, wound location and tract, and physical findings after a penetrating thigh trauma can help to predict femoral artery injury. A pseudoaneurysm and AVF often present as a pulsatile mass and a palpable thrill, and they can cause a flexion deformity.

INTRODUCTION

Pseudoaneurysm and concomitant arteriovenous fistula (AVF) are associated with penetrating or high-injury blunt trauma, sport activities, and bone fractures (1,2). Patients may present with a variety of clinical conditions that sometimes make the diagnosis difficult to make clinically (3). In a study of 808 eligible patients, 50 (6.2%) had a femoral arterial injury on angiography, 20 (40%) of which were clinically occult injuries (4). The mechanism of injury, wound location and tract, and physical findings after penetrating thigh trauma may help to predict femoral artery injury. A pseudoaneurysm and AVF often present as a pulsatile mass and a palpable thrill, and they can cause a flexion deformity.

CASE REPORT

A 31-year-old man presented to the Emergency Department (ED) for wound care follow-up. A week prior to his presentation, he had received a stab wound to the...
medial thigh and the primary suture was performed in our ED. He had no previous medical or surgical history, nor did he have any known allergies. During his first presentation, he was hemodynamically stable. The laceration on the medial thigh was approximately 1 cm in length. The vascular examination revealed palpable dorsalis pedis and tibialis posterior pulses, although there was no bruit. Radiographs of the left thigh were negative for osseous abnormality and radiopaque foreign bodies. The formal Doppler ultrasound done by a radiologist did not demonstrate turbulent flow, vessel dilatation, or any other problem. The wound was repaired with five interrupted 3-0 polypropylene sutures without complications. Removal of the sutures was planned for 1–2 weeks later.

The patient returned 8 days later for wound care. At this second presentation in our ED, there was no hyperemia, fever, or any other sign of infection in the region of the injury. His physical examination was remarkable for a palpable thrill and continuous bruit in the left mid-thigh region. There was no distal neurovascular deficit in the left lower limb on examination performed by the emergency physician.

The bedside ultrasound (SonoSite Micromaxx, SonoSite Inc., Bothell, WA) examination, conducted with a 7.5-MHz linear probe, demonstrated a pseudoaneurysm and an AVF between the femoral artery and vein (Figures 1, 2). The video clip demonstrates a typical color bruit artifact and turbulence in the pseudoaneurysm (Video 1). The spectral Doppler analysis image of the femoral vein shows arterialized flow (Video 2).

DISCUSSION

The local complications of a penetrating arterial injury include hematoma, pseudoaneurysm, and formation of AVF. The true incidence of traumatic pseudoaneurysms and AVF has not been definitively demonstrated, likely because they are seldom reported and may go unrecognized. Rich et al. reported the largest series of peripheral vascular injuries, of about 7500 cases, after the Vietnam War. The incidence of pseudoaneurysm and AVF in their study was 3.5% and 3.9%, respectively (5).

Pseudoaneurysms that display progressive enlargement may take several months to develop and are the
result of a partial laceration of the arterial wall. Most patients with femoral artery pseudoaneurysm have a history of some trauma or surgical procedure. It usually presents as a painful, tender, pulsatile mass. Functional or neurological damage is not likely to occur (5,6). AVFs are abnormal connections between the arterial and venous system that bypass the normal anatomic capillary beds. AVF may also result from penetrating injury to the lower extremity, including stab wounds, gunshot, and shotgun injuries (7). In 1994, Roobs et al. reported on 202 civil traumatic AVFs, with penetrating trauma accounting for 98% of the injuries, mainly stab (63%) and missile (22%) wounds (8). The most common clinical features of traumatic AVF are thrill, hematoma, swelling, bruit (present in only 61%), pulse deficit in the affected limb, and neurological deficit (5,8). High-output heart failure may develop due to left-to-right shunt in large AVFs (9). However, these signs may be absent or remain unnoticed, and with either traumatic AVF or pseudoaneurysm, show no clinical signs.

Although angiography has been regarded as the gold standard imaging modality, color flow Doppler ultrasound is now preferred for evaluation of vascular injuries in trauma patients. Fry et al. reported formal duplex ultrasound to be 100% sensitive and 97.3% specific for peripheral vascular trauma (10). There are three classic signs of pseudoaneurysm in sonography, although the absence of these does not exclude the presence of pseudoaneurysm. The neck communicating with the pseudoaneurysm (Figure 1) and the “yin-yang” sign (which indicates bidirectional flow due to the swirling of blood within the pseudoaneurysm cavity on color Doppler, thus resembling the ancient Chinese yin-yang symbol) (Figure 2) and the “to-and-fro” spectral waveform within the neck (characterized by reversal of flow in the neck during diastole, due to changes in pressure gradients) are findings of pseudoaneurysm with Doppler ultrasound (11). Color Doppler sonographic characteristic findings for AVF are: 1) visualization of the fistulous communication seen as a disturbed high-velocity jet of blood in color Doppler imaging, 2) a high-velocity arterIALIZED waveform and dilatation in the draining vein, and 3) a junction of low- and high-resistance flow in the supplying artery (11–13). Furthermore, color Doppler ultrasound should demonstrate turbulent flow and venous dilatation (Video 2) in AVF.

CONCLUSION

Reported here is a case of a hemodynamically stable patient who had a pseudoaneurysm and arteriovenous fistula after trauma. Occult vascular injuries after penetrating trauma may easily be overlooked on the physical examination. Noninvasive bedside ultrasound may be used as an alternative choice for emergency physicians when diagnosing occult injuries.

REFERENCES


SUPPLEMENTARY DATA

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.jemermed.2013.08.136.