

Sonographic Detection of Pseudoaneurysm in Vascular Injury in Emergency Department

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الكشف بالموجات فوق الصوتية عن أم دم كاذبة في إصابات الأوعية الدموية في قسم الطوارئ

لى جين شين، يو جانغ سو، وتشانغ تشيه تشن، ويدي تساي

الملخص: رجل (31 عاماً) من العمر يعاني من جرح بسبب طعنة في طرفه السفلى. كان المريض يعاني من علامة صعبة لإصابة الأوعية الدموية (تقلص النبض القاصي)، فكان لا بد من إخضاعه لعملية إستصلاحية، لكنه رفض. بعد أسبوع واحد، عاد إلى غرفة الطوارئ لدينا نتيجة لتورم مؤلم في الفخذ الأيمن. تم استخدام التصوير فوق الصوتي للكشف السريري عن أم دم كاذبة. الكشف بالموجات فوق الصوتية في حالات الطوارئ هو إجراء سريع وغير نافذ لسرعة اتخاذ القرار في نهج الممارسة في حالات الطوارئ.
مفتاح الكلمات: أم الدم؛ كاذبة؛ الشريان الفخذي؛ الجرح؛ الصرف؛ التصوير بالموجات فوق الصوتية؛ تقرير حالة؛ تايوان.

ABSTRACT: A 31-year-old man suffered from a stab wound to the lower extremity. The patient had a hard sign of a vascular injury (a diminished distal pulse) and therefore probably should have undergone operative repair, but refused. One week later, he returned to our emergency department with a painful right thigh swelling. Bedside sonography was used to detect a pseudoaneurysm. Emergency sonography is a fast, non-invasive, and rapid decision-making approach in emergency practice.

Keywords: Aneurysm, false; Femoral artery; Wound; Drainage; Ultrasonography; Case report; Taiwan.

PATIENTS WITH HARD SIGNS OF VASCULAR injury (diminished distal pulse) due to various types of wounds should undergo operative repair. Bedside sonography can be used to detect pseudoaneurysms (PA). Angiograms are often done in the emergency department (ED) when no hard signs of vascular injury are present following penetrating trauma and when PA is a possible diagnosis.

Case Report

A 31-year-old man presented to the ED with a knife-inflicted stab wound to his anterior right thigh. The knife had been removed immediately at the scene by the patient. The patient was in a cold sweat with low blood pressure (BP) (78/51 mmHg) and a pulse rate of 115 beats per minute (BPM). A physical examination found a right lower limb wound with continuous bleeding. With the exception of a diminished pulse in the *dorsal pedis*

artery, the capillary refill time (CRT), pulse in the posterior tibial artery, and muscle strength were all intact. The patient was experiencing no sensory deficit. We immediately compressed the stab wound and performed a primary wound closure, inserting a drainage tube. The patient also received 1,500 ml of normal saline, 1 unit of whole blood, and 500 ml of 6% polystarch. His vital signs gradually stabilised. Computed tomography (CT) angiography revealed a small breakdown of the superficial femoral artery with patent distal flow [Figure 1].

Despite this finding, and against the physician's advice, the patient left the hospital without receiving full medical care; this was due to his economic situation. He was, however, advised to return to the ED if he experienced shortness of breath, dizziness, or visible expansion or pulsing of the haematoma.

One week later, he returned to the ED with progressive right thigh swelling and pain. The drainage tube was found to be still in place. The patient presented with BP of 112/64 mmHg, a pulse

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Figure 1: Computed tomography angiography showing a small breakdown of the superficial femoral artery (arrow).

of 136 BPM, and a respiratory rate of 20 breaths per minute. The physical examination revealed a tense right thigh that was painful and grossly tender; however, the rest of the examination was unremarkable. A vascular ultrasound revealed an oval mass, which was suspected to be a PA of the femoral artery [Figure 2]. A follow-up CT angiography demonstrated a haematoma on the superficial femoral artery with extravasated contrast medium [Figure 3]. The patient again left the ED against the medical advice of physicians.

Discussion

The aetiology of peripheral vascular injuries is primarily divided into blunt and penetrating mechanisms, and the severity of vascular injuries ranges from non-occlusive to occlusive injury, in which all effective perfusion distal to the occlusion is lost. While transections, thrombosis, and reversible spasms typically result in occlusive types of vascular injuries, intimal flaps, dissections, arteriovenous fistulas (AVF), and PAs result in non-occlusive types of vascular injuries.

A true aneurysm contains all three layers of the vessel wall (*intima*, *media*, and *adventitia*). A

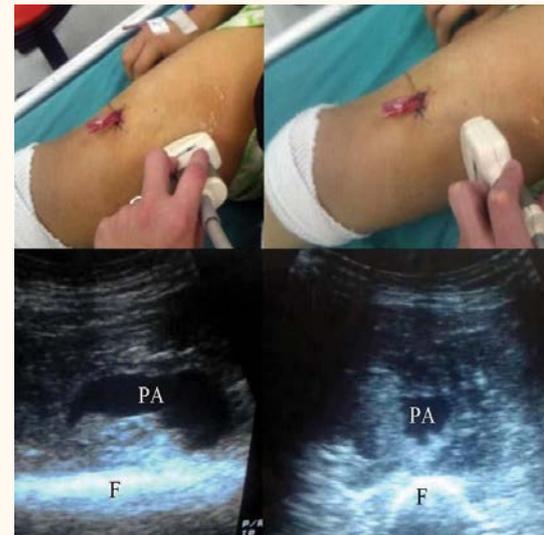


Figure 2: The drainage after primary closure is in situ. The sonographic probe is kept in the axial view (left hand image) and in the coronal view (right hand image) of the right thigh. The vascular ultrasound showed an oval mass, highly suspected to be a pseudoaneurysm (PA) of the right femoral artery.

F = femoral bone.

PA, or false aneurysm, is a haematoma that forms as a result of a leaking hole within an artery. The haematoma is contained by the surrounding *fascia*, and is gradually encased by a capsule of fibrous tissue. Since haematomas lack a normal fibrous aneurysmal wall, they sometimes are described as pulsatile haematomas.

The classic hard signs of an active haemorrhage are an expanding or pulsatile haematoma, a *bruit* or thrill heard when placing a stethoscope over the wound, the absence of a palpable distal pulse, and distal ischaemic manifestations (i.e. pain, pallor, paralysis, paresthesias, poikilothermy, or coolness). When hard signs are present, the incidence of arterial injury is greater than 90%.¹ The diagnostic tools used to assess arterial injury include ultrasound, CT, and angiography. Further investigation on the applicability of emergency angiography or immediate surgical intervention is warranted, especially in regards to the duration of the warm ischaemia and the overall status of the patient. The combination of a B-mode and Doppler ultrasound is typically referred to as a duplex ultrasound. The sensitivity of a duplex ultrasound ranges from 90–100%, and the specificity ranges from 99–100%.^{2–4} However, a duplex ultrasound is technically limited in examining certain anatomic areas such as the *profunda femoris* and *brachii*



Figure 3: Computed tomography angiogram (axial view) of the right thigh. With an extravasated contrast medium, the white arrow indicates haematoma formation on the superficial femoral artery.

arteries, and the iliac and subclavian vessels. Its accuracy is highly operator-dependent.

While angiography is still the gold standard for the evaluation of vascular injury, multidetector CT (MDCT) angiography provides non-invasive, high-resolution images with 98.7–100% specificity and 90–95% sensitivity.^{5,6} Additionally, an increasing number of emergency physicians prefer MDCT over catheter-based angiography.

Conclusion

Our case highlights the importance of using sonographic approaches for vascular injuries in the ED. As detected with sonography, the vascular injury of our patient at the second visit had progressed into a PA. Thus, emergency sonography is a fast, non-invasive, and rapid decision-making aid in emergency practice.

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