

Traumatic brachial artery pseudoaneurysm diagnosed in the emergency department with point-of-care bedside ultrasound

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Abstract

Case A 55-year-old gentleman was referred to the emergency department for penetrating trauma of his left upper arm. X-rays identified a metallic foreign body. Clinical examination revealed a swollen left upper arm with a pulsatile mass. Point-of-care bedside ultrasound in the ED confirmed a traumatic brachial artery pseudoaneurysm.

Discussion The features of a peripheral pseudoaneurysm and its ultrasonographic appearance in both B-mode, and color Doppler imaging.

Keywords Emergency ultrasound · Vascular injury · Pseudoaneurysm

Case Report

Mr. X was a 55-years-old Chinese gentleman who works as a mechanic in an auto-repair shop. He gave a history of hammering on a metal object in the auto-repair shop when a sudden sharp pain was felt in his left upper arm. A small puncture wound with bleeding and subsequent progressive swelling was seen. Mr. X first presented to his general practitioner, who provided hemostasis, and ordered an X-ray of the left upper limb. He was referred to our emergency department (ED) with the provisional diagnosis

of “Foreign body of the left upper limb with hematoma”. He presented to the ED about 4 h post-injury.

At our ED, Mr. X had the following vital signs: temperature of 36.9° Celsius, heart rate of 87, respiratory rate of 18, and blood pressure of 197/115. He had no other injuries other than what was described above. He had no known underlying medical or surgical conditions. On examination of Mr. X’s left upper limb, there was swelling and extensive ecchymosis of the left upper arm, mostly on the ulnar aspect of the left elbow and proximal to the cubital fossa. There was no active hemorrhage from the puncture wound. The swelling was pulsatile and a faint palpable thrill was thought to be present. The brachial pulse as well as the distal, radial, and ulnar pulses was well felt and capillary refill of the fingers was within normal limits. There was no numbness or weakness present in the distribution of the median, ulnar or radial nerves. The systemic review of Mr. X was unremarkable and he had no other injuries or complaints.

The above clinical findings suggest a vascular injury to Mr. X’s left upper arm, and an emergency department bedside ultrasound was performed. Scanning was done with a 5–10 MHz linear array probe from the Sonosite M-Turbo ultrasound machine. An anechoic cyst-like structure was visualized within the area of swelling (Figs. 1, 2a).

The measured dimensions on ultrasound were about $3.3 \times 2.4 \times 2.2$ cm (Fig. 2b, c). There were no distinct “cyst” walls seen. This anechoic space appeared to communicate with the brachial artery via a narrow “neck”. Also, a linear hyper-echoic structure measuring about 0.5 cm was visualized near or within the wall of the brachial artery (Fig. 2a). This most likely represent one of the metallic foreign bodies identified on the X-ray. Next, color Doppler imaging was applied. Bidirectional flow could be

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Fig. 1 The outpatient X-ray of patient's left upper limb

seen within the anechoic space, represented by the red and blue colors. The color Doppler demonstrated flow emanating from within the brachial artery lumen (Figs. 3, 4—video clip).

The diagnosis of a traumatic left brachial artery pseudoaneurysm was made and urgent consultation with vascular surgery was obtained. Pain control with intravenous opioids as well as blood pressure control with intravenous Labetalol were initiated in the ED. Patient was sent for an urgent CT angiogram of the left upper limb, about 1.5 h from his arrival to the ED, and he was brought to the emergency operating room for operative repair and foreign body removal at about 2.5 h from arrival. Subsequently, Mr X made a full recovery and was discharged well on the fifth postoperative day.

Discussion

Pseudoaneurysms of the extremities are uncommon, and they may present acutely or sub-acutely. They are usually the result of trauma, both blunt and penetrating; though, penetrating trauma probably represents the more common mechanism. Iatrogenic causes due to diagnostic and interventional arterial catheterizations are the major contributors. [1] Physical examination cannot reliably distinguish between simple hematomas, pseudoaneurysms and arteriovenous fistulas [2, 4].

Ultrasound is the diagnostic imaging modality of choice for the confirmation of peripheral pseudoaneurysms [3].

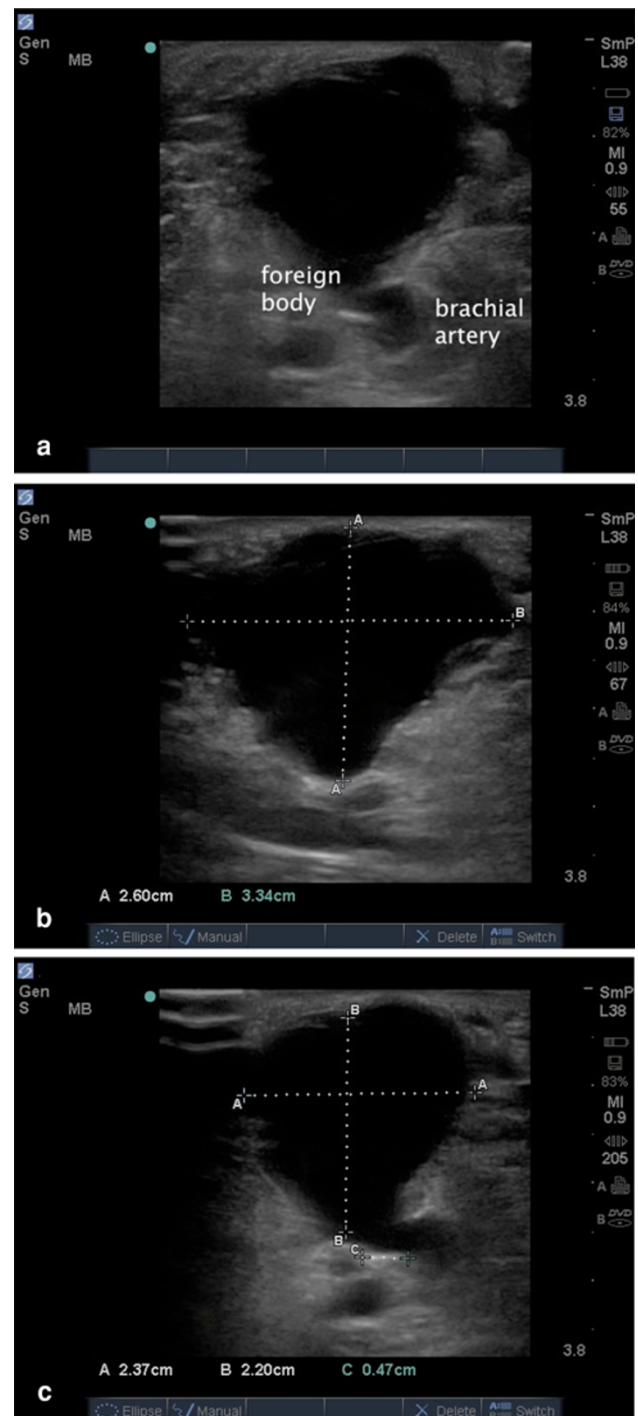


Fig. 2 a–c Ultrasound images of the anechoic structure and measurements

B-mode imaging usually reveals a hypoechoic “hematoma” with varying degrees of echogenicity depending on the chronicity at presentation. A hematoma neck connecting the pseudoaneurysms to the underlying artery may or may not be demonstrable by ultrasound. The characteristic ultrasound features of a pseudoaneurysm are seen on color

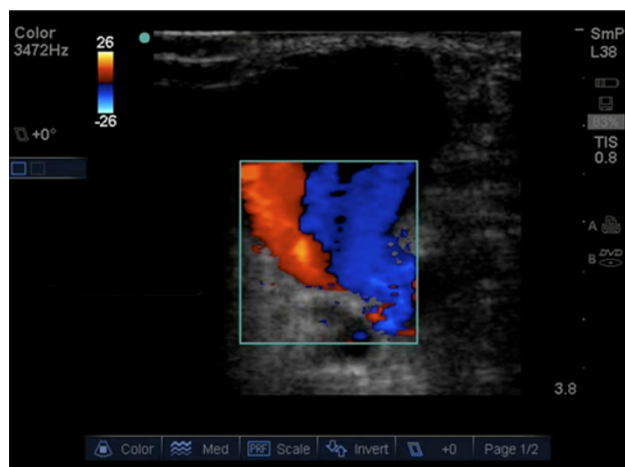


Fig. 3 Ultrasound image of the “swirl” or “yin-yang” sign

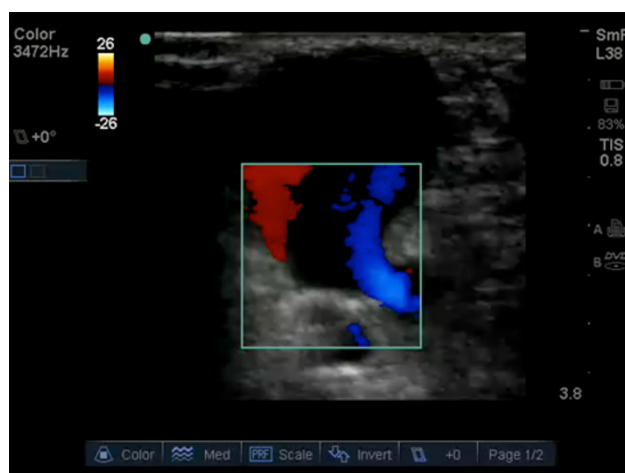


Fig. 4 Video clip of color doppler imaging

Doppler imaging (“swirl” sign or “yin-yang” sign) [4, 5] and spectral Doppler imaging (the “to and fro” sign) [5]. The “swirl” or “yin-yang” sign demonstrates high-

velocity, swirling turbulent flow within the pseudoaneurysm. The “to and fro” sign demonstrates bidirectional blood flow within the pseudoaneurysm neck; forward flow occurs during cardiac systole when the higher pressures within the artery forces blood into the pseudoaneurysm, and reversal of flow occurs during diastole when the pressure gradient is now reversed with the pseudoaneurysm having higher pressures than the artery. These ultrasonographic signs are considered pathognomonic for the diagnosis of pseudoaneurysm.

Color Doppler imaging is essential in picking up these vascular lesions. While improper ultrasound settings can fail to detect flow in a “low-flow” state, these high-velocity lesions are difficult to miss regardless of the color setting used. In this case, the application of bedside sonography by the emergency physician allowed for a quick and definitive diagnosis, appropriate referral as well as a rapid disposition of the patient.

Conflict of interest None.

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