

## The To and Fro Sign: The Hallmark of Pseudoaneurysm

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A pseudoaneurysm, or communicating hematoma, usually results from penetrating trauma of a native vessel with subsequent formation of a cavity contained by the adventitia, perivascular tissue and fibrous tissue originating from organization of the hematoma. Less commonly, pseudoaneurysm can result from rupture of a native vessel or leakage at the site of a surgical anastomosis. Common femoral artery pseudoaneurysms complicating catheterization procedures are by far the most common. However, pseudoaneurysms can occur anywhere. Patients with pseudoaneurysms usually present with a mass in the area of trauma that may be pulsatile. The objective of imaging is to differentiate between hematomas associated with pseudoaneurysm and those that are not. Whereas hematomas resolve spontaneously, a pseudoaneurysm can po-

tentially rupture and therefore must be identified, closely monitored and in most instances, treated. Methods of treatment include ultrasound Doppler-guided compression and thrombin injection [1,2], transcatheter stent-graft placement, and surgical repair.

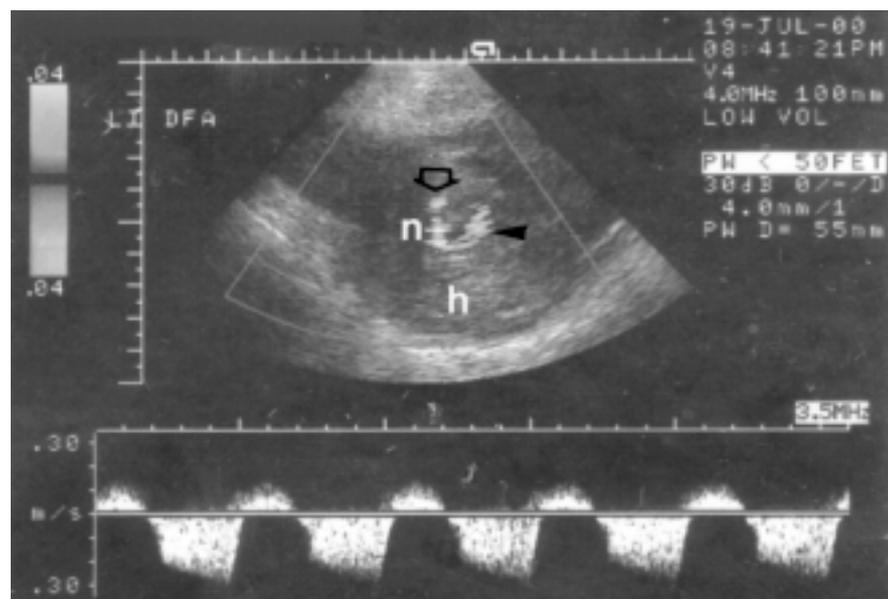
Ultrasound is the imaging modality of choice to differentiate between pseudoaneurysm and non-communicating hematoma. The characteristic appearance of pseudoaneurysm in triplex ultrasound (B-mode combined with color and pulsed Doppler spectral analysis) include the presence of a hematoma of variable echogenicity, which may represent separate episodes of bleeding and rebleeding, expansile pulsatility and detection of turbulent flow ("yin-yang" appearance) within the mass [3]. However, these findings are not always present, and may also be observed in

non-communicating hematomas due to transmission of pulsations from the underlying artery.

The definitive diagnosis of pseudoaneurysm requires detection of the neck connecting the pseudoaneurysm with the injured artery, and identification within this neck of the pathognomonic "to and fro" spectral waveform pattern [4]. This pattern results from the alternating flow direction – into the aneurysm in systole and away from it in diastole.

We recently applied this sign in locations other than the CFA to differentiate between a hematoma and a pseudoaneurysm. The diagnoses were confirmed by angiography in one case and surgery in the other. In the first instance an elderly female presented to the imaging department with thigh compartment syndrome [5] following nailing of a femoral neck fracture. The diagnosis of pseudoaneurysm of a branch of the deep femoral artery was made on the basis of the presence of the to-and-fro sign between the feeding artery and the pseudoaneurysm [Figure]. Angiography revealed a pseudoaneurysm and active extravasation from a branch of the deep femoral artery corresponding in location to the ultrasound finding. Symptoms resolved following transcatheter embolization of this branch. The second case involved a pulsatile mass in the left brachial region following transbrachial peripheral angiography. The diagnosis of pseudoaneurysm was made on the basis of the to-and-fro sign, and confirmed upon subsequent surgical repair.

In view of the increasing frequency of percutaneous catheterization procedures in arteries other than the CFA, as well as



Transverse ultrasound image of the proximal thigh. Within the 7 cm hematoma (h) the DFA is imaged in cross-section (open arrow). The neck of the pseudoaneurysm (n) connects the DFA with lumen of the pseudoaneurysm (arrow head). A Doppler cursor placed on the neck displays the typical to (above the zero line) and fro (below the zero line) flow.

CFA = common femoral artery

the application of ultrasound to the initial evaluation of penetrating trauma, the presence of the to-and-fro sign should be included in the sonographic examination of these cases whenever technically feasible. It is stressed that whereas detection of this sign is pathognomonic for the diagnosis of pseudoaneurysm, its absence does not entirely exclude this diagnosis.

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### References

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