

# Doppler Ultrasound in the Surveillance of a Femoro-Popliteal Bypass Graft Pseudoaneurysm

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## INTRODUCTION

Peripheral arterial disease is associated with serious morbidity and mortality and involves the progressive stenosis, occlusion or aneurysmal dilatation of the aorta and its non-coronary, non-intracranial branches (Sibley et al., 2016). Revascularisation of the limb plays a critical role in the management of the disease. In relation to the femoro-popliteal segment, femoro-popliteal bypass is an effective intervention for advanced occlusive disease, of which the preferred conduit is the saphenous vein (Vartanian and Conte, 2015). Doppler Ultrasound (US) is a well established imaging modality in the surveillance of peripheral arterial bypass grafting using autologous veins. US is non-invasive, convenient and widely available (Chappell et al., 2014).

However, revascularisation in the form of a bypass graft is not without its complications. These include graft stenosis, thrombosis, thromboembolism, limb loss and aneurysmal degeneration. Aneurysmal degeneration may be true or more commonly, false. False aneurysmal degeneration involves a pseudoaneurysm, usually occurring at anastomotic sites (Chavez et al., 2014).

## BACKGROUND

This case study follows a 69 year old man who underwent a left femoro-popliteal autologous great saphenous vein bypass graft as a result of complete occlusion of the left superficial femoral artery and proximal popliteal artery. He subsequently presented to the US department on multiple occasions for Doppler US surveillance of the bypass graft.

## ULTRASOUND FINDINGS

7 years after the initial bypass surgery, Doppler US surveillance demonstrated a patent graft, with a 3 cm x 3 cm pseudoaneurysm arising from the mid portion, as demonstrated in Figure 1a and 1b.

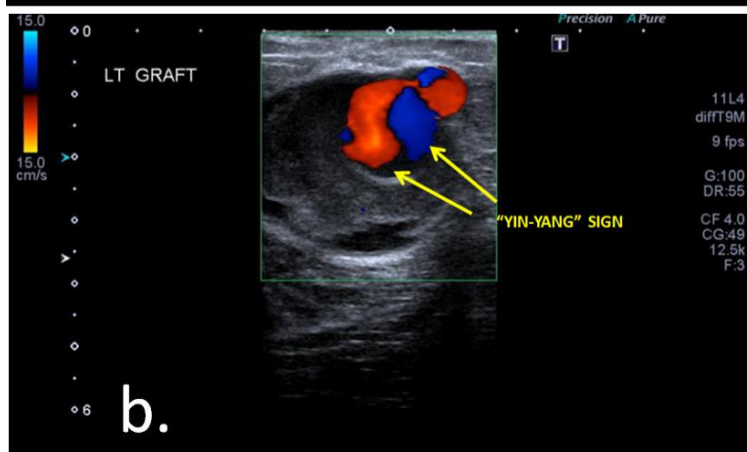
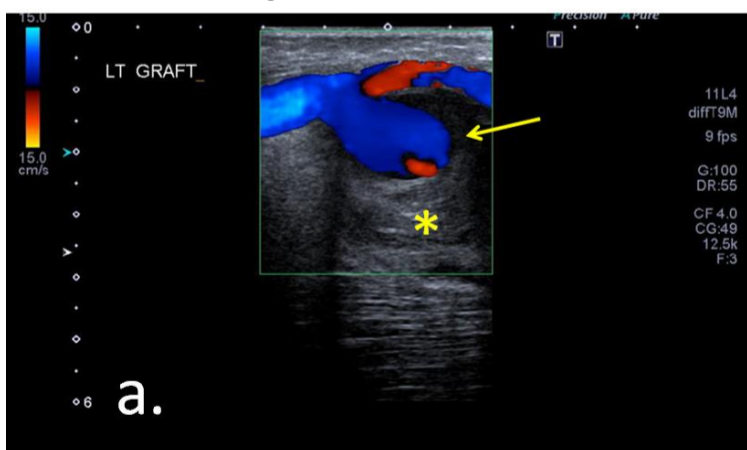


Figure 1a and 1b. Longitudinal and transverse colour Doppler images respectively of the graft and pseudoaneurysm, which demonstrates flow (arrow) and contains thrombus (asterisk). Swirling bidirectional colour flow pattern, referred to as the “Yin-Yang” sign can also be identified in Figure 1b (Thrush and Hartshorne, 2009).

9 months later, the patient returned for surveillance of both the graft and pseudoaneurysm. The graft remained patent. However, the pseudoaneurysm had increased in size, as demonstrated in Figure 2a and 2b.

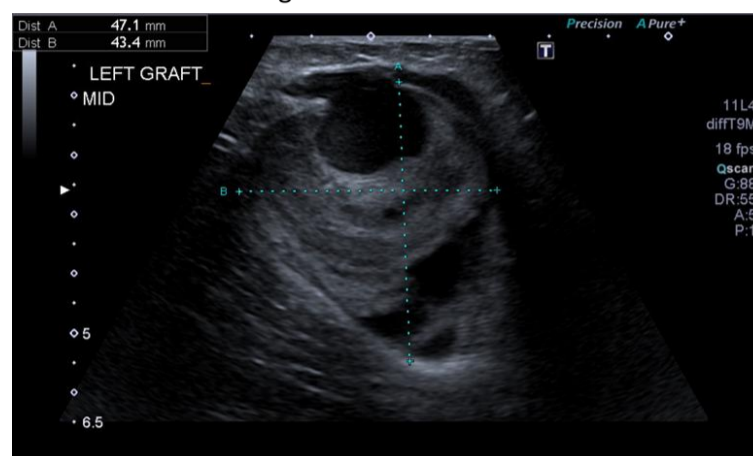


Figure 2a. Transverse B-Mode image of the pseudoaneurysm, demonstrating a maximum dimension of 4.7 cm.

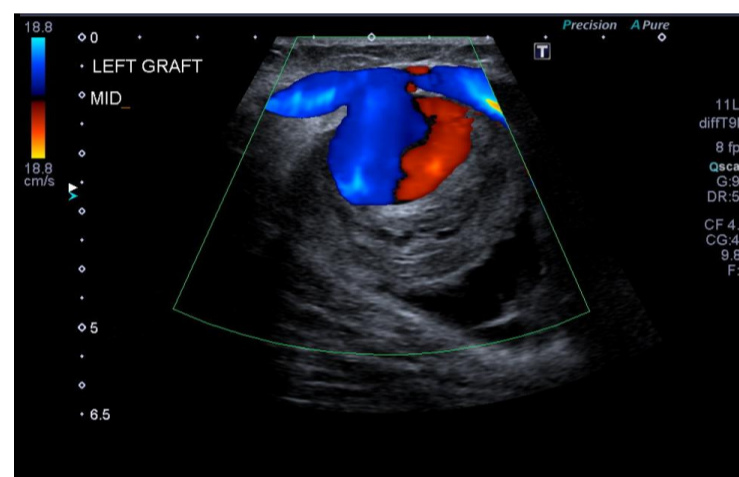


Figure 2b. Longitudinal colour Doppler image demonstrating a patent graft and flow within the pseudoaneurysm. Again, thrombus within the pseudoaneurysm and the “Yin-Yang” sign is identified.

As a result of the increasing size, the patient underwent surgery to resect the great saphenous vein pseudoaneurysm, using the small saphenous vein as a conduit. 10 days following this, the patient represented to the US department with a swelling in his left thigh. Doppler US demonstrated a 4.7 cm x 5.7 cm hypoechoic avascular abnormality in the mid thigh surrounding the bypass graft, consistent with a haematoma, as demonstrated in Figures 3a and 3b.

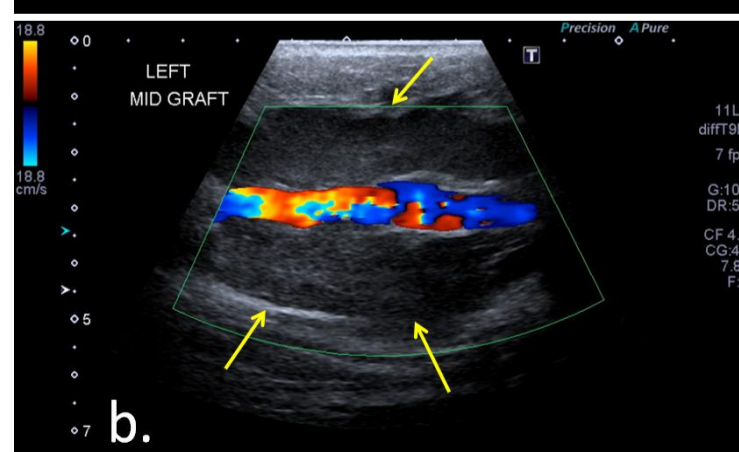
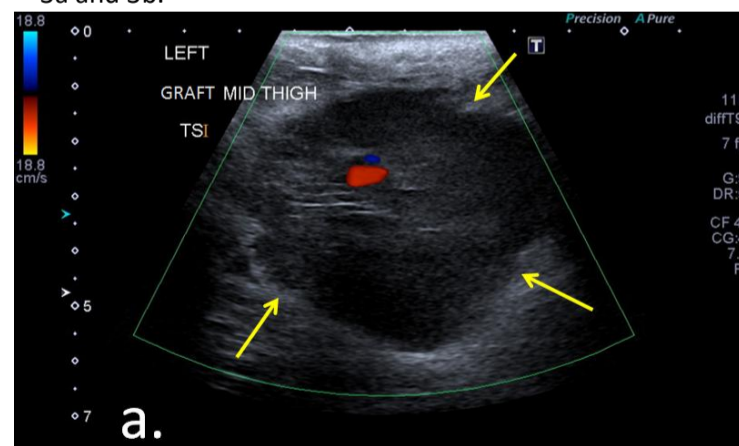


Figure 3a and 3b. Transverse and longitudinal colour Doppler images respectively, demonstrating a patent graft, with no evidence of communication between the graft and surrounding haematoma (arrows). The patient underwent further surgical intervention as a result.

## FOLLOW UP

2 months following surgical intervention, the patient returned to the Accident and Emergency department with pain and absent pulses in his left calf. Consequently, a CT lower limb angiogram was performed.



Figure 4. 3D volume rendered image of the CT angiogram reveals an occluded left femoro-popliteal bypass graft throughout its length. However, the left popliteal artery was patent just below the level of the knee joint at the graft anastomosis site, filling via collaterals from the profunda to vessels in the proximal leg. As a result, the femoro-popliteal bypass graft was revised with a synthetic interposition graft. Most recent Doppler US confirmed patency of the synthetic graft.

## DISCUSSION

Peripheral arterial disease is an increasing entity worldwide and is associated with claudication, rest pain in the leg or foot, tissue loss, non-healing wounds, infection and limb loss. In addition, patients with peripheral arterial disease experience a reduced quality of life and are at a higher risk for cardiovascular events (Sibley et al., 2016). The cornerstone of treatment for advanced symptomatic peripheral arterial disease remains surgical revascularisation. In the post-operative setting, a Doppler US at 1, 3, 6 and 12 months following discharge from hospital and 6 months thereafter is suggested as a surveillance program (Vartanian and Conte, 2015).

It is evident that a graft surveillance program requires considerable commitment from a vascular laboratory (Thrush and Hartshorne, 2009). However, Doppler US surveillance is a sensitive method for the detection of vein graft stenosis, of which early intervention can prolong the longevity of the graft (Vartanian and Conte, 2015). In addition, Doppler US surveillance will also help to detect graft related problems, such as aneurysmal degeneration (Chavez et al., 2014). As a result, a Doppler US surveillance program should be implemented for all patients undergoing femoro-popliteal bypass surgery.

## REFERENCES

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