

INTRODUCTION

A femoral pseudoaneurysm (PSA) is one of the most common complications following cardiac catheterisation (Huseyin et al., 2013). A PSA occurs when all 3 layers of the arterial wall become disrupted. The PSA consists of a perfused sac with a connection to the femoral artery, and is contained by the perivascular structures (Kassem et al., 2013). Femoral PSAs most commonly occur due to inadequate compression at the entry site (Lisowska et al., 2011). Kassem et al. (2013) report the incidence of PSA post-catheterisation to range from 0.05-2%.

Ultrasound (US) is paramount to both diagnosis and treatment of a PSA. Doppler US is considered the modality of choice in the initial imaging of patients with groin complications post-catheterisation and in the subsequent monitoring of PSAs (Stone, Campbell and AduRahma., 2014). Mahmoud et al. (2015) report Doppler US to have a 94% sensitivity and 97% specificity in the diagnosis of a PSA. In addition, US guided thrombin injection is the first line treatment for PSAs, with a success rate of 97% (Lisowska et al., 2011). Figure 1 indicates the correct placement of the needle for thrombin

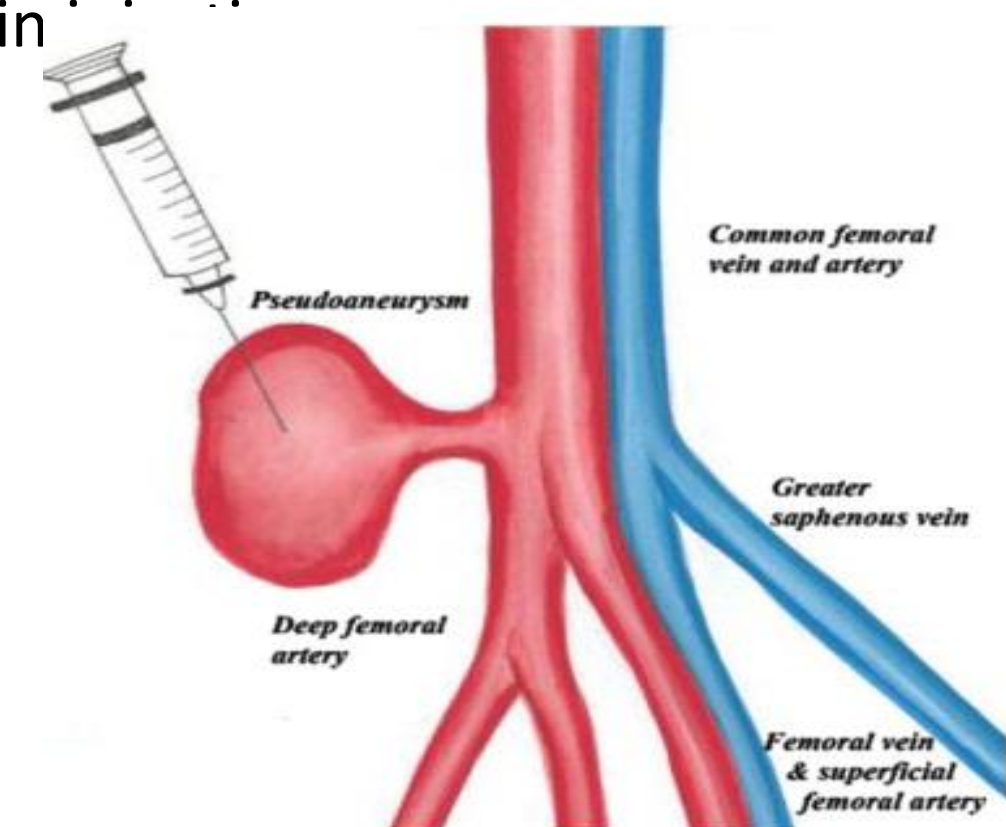


Figure 1. An illustration of a thrombin injection into a common femoral artery PSA (Kassem et al., 2013).

BACKGROUND

A 90 year old lady presented to the US department for a 4 week follow up of a left superficial femoral artery (SFA) PSA. This developed as a complication of a coronary angiogram she underwent, in the work up for a transcatheter aortic valve replacement. The PSA, measuring 3.3 x 2.1 cm, was injected with 500 IU of human derived thrombin under US guidance. Complete thrombosis occurred without any local or distal thromboembolic complications. A repeat US was carried out 2 days post-procedure. The PSA remained thrombosed and had started to reduce in size.

ULTRASOUND EXAMINATION

US imaging, with a high frequency 4-11 MHz linear array transducer, commenced with B-mode.

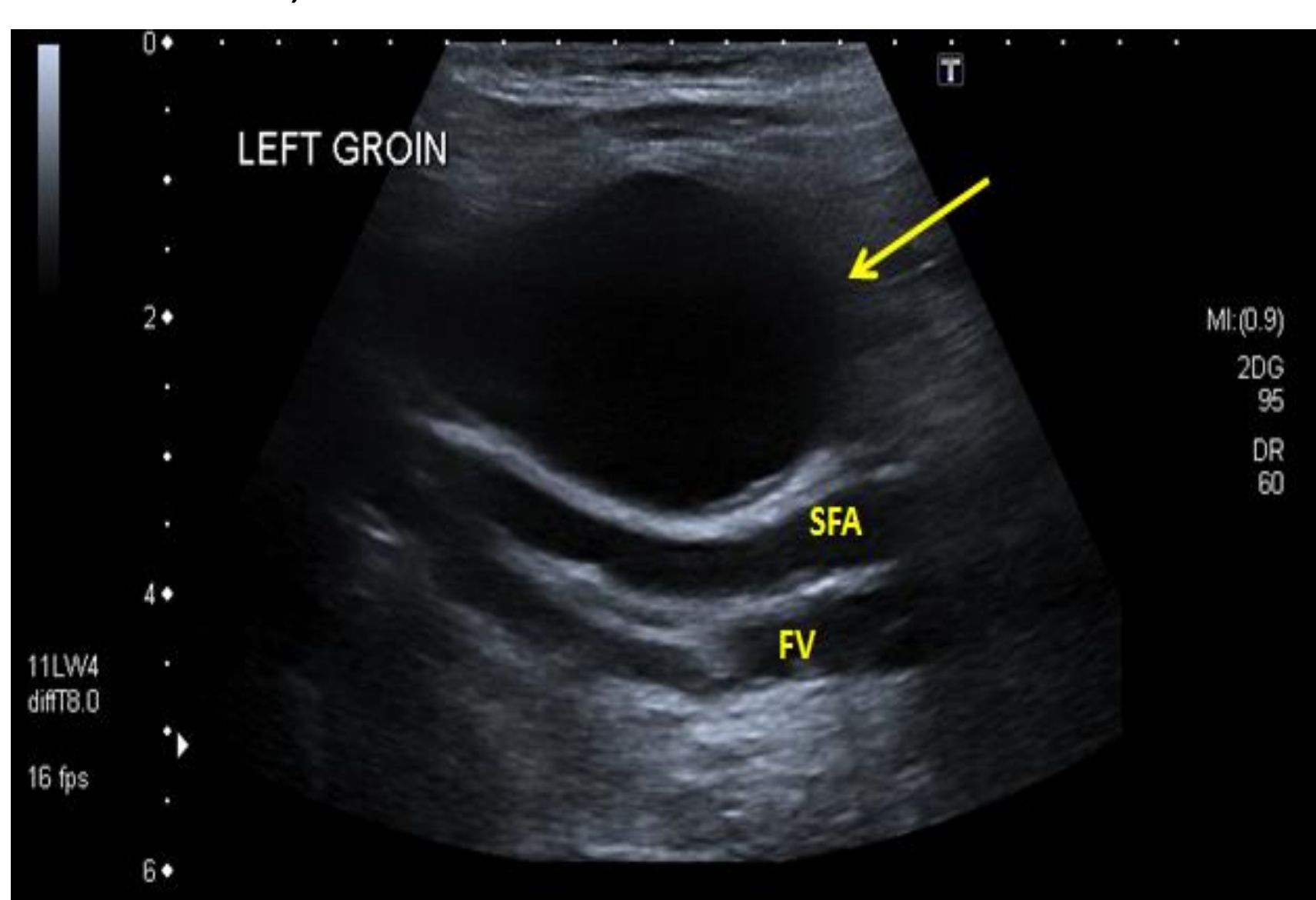


Figure 2. LS B-mode image demonstrating an echolucent sac (arrow) adjacent to the SFA in the left groin. FV: Femoral Vein

Although B-mode US may provide a range of information including the size and number of PSAs, it is inconclusive in diagnosis. Colour and spectral Doppler US provide essential additional information including PSA communication, blood flow patterns and velocities (Mahmoud et al., 2015).

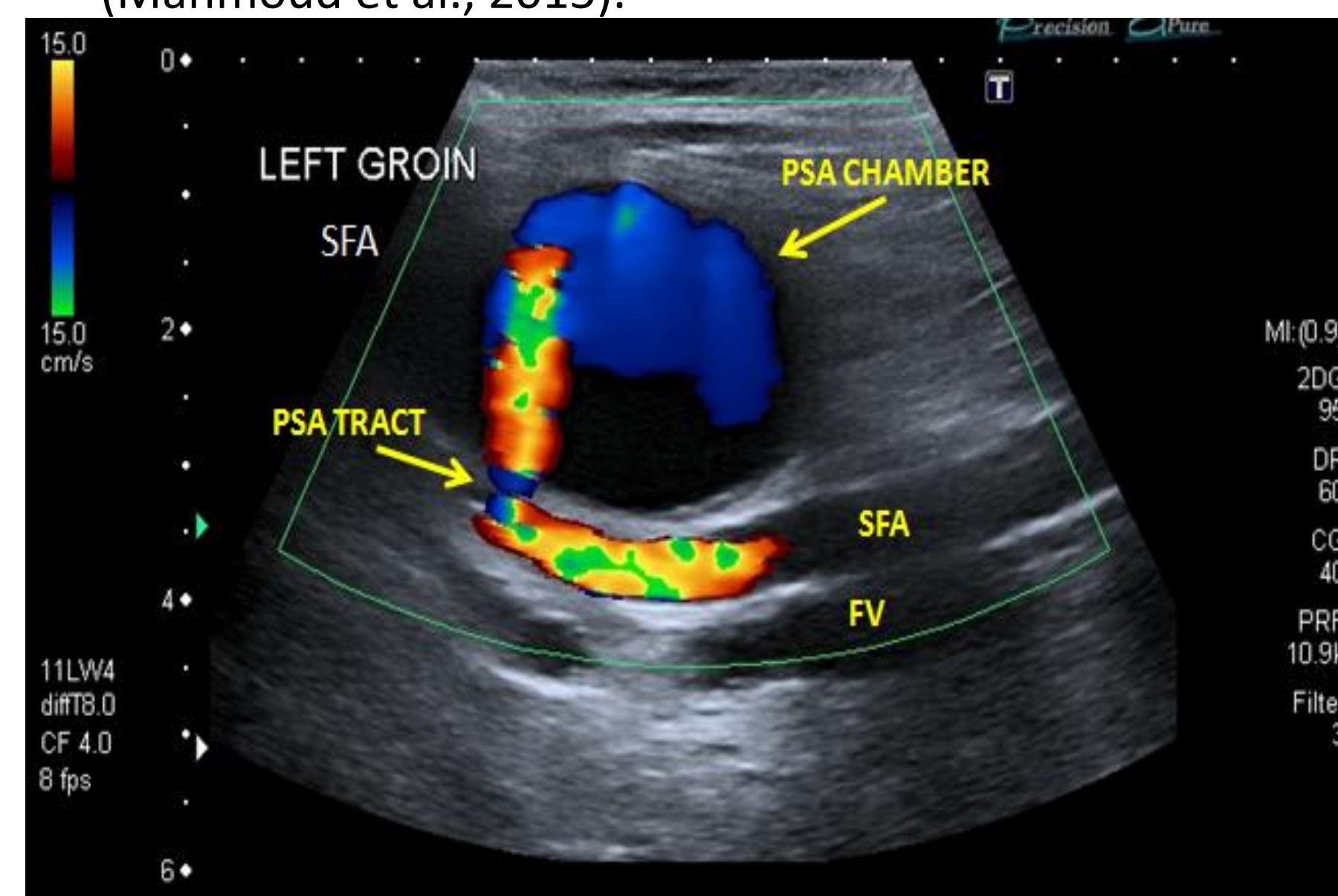


Figure 3. LS colour Doppler image reveals a tract (or neck) connecting the PSA chamber to the SFA. Blood flow is also visualised within the chamber.



Figure 4. TS colour Doppler image demonstrates a swirling bidirectional colour flow pattern within the chamber. Blood flows in and out of the chamber, resulting in the classical "yin-yang" sign (Stone, Campbell and AduRahma., 2014).

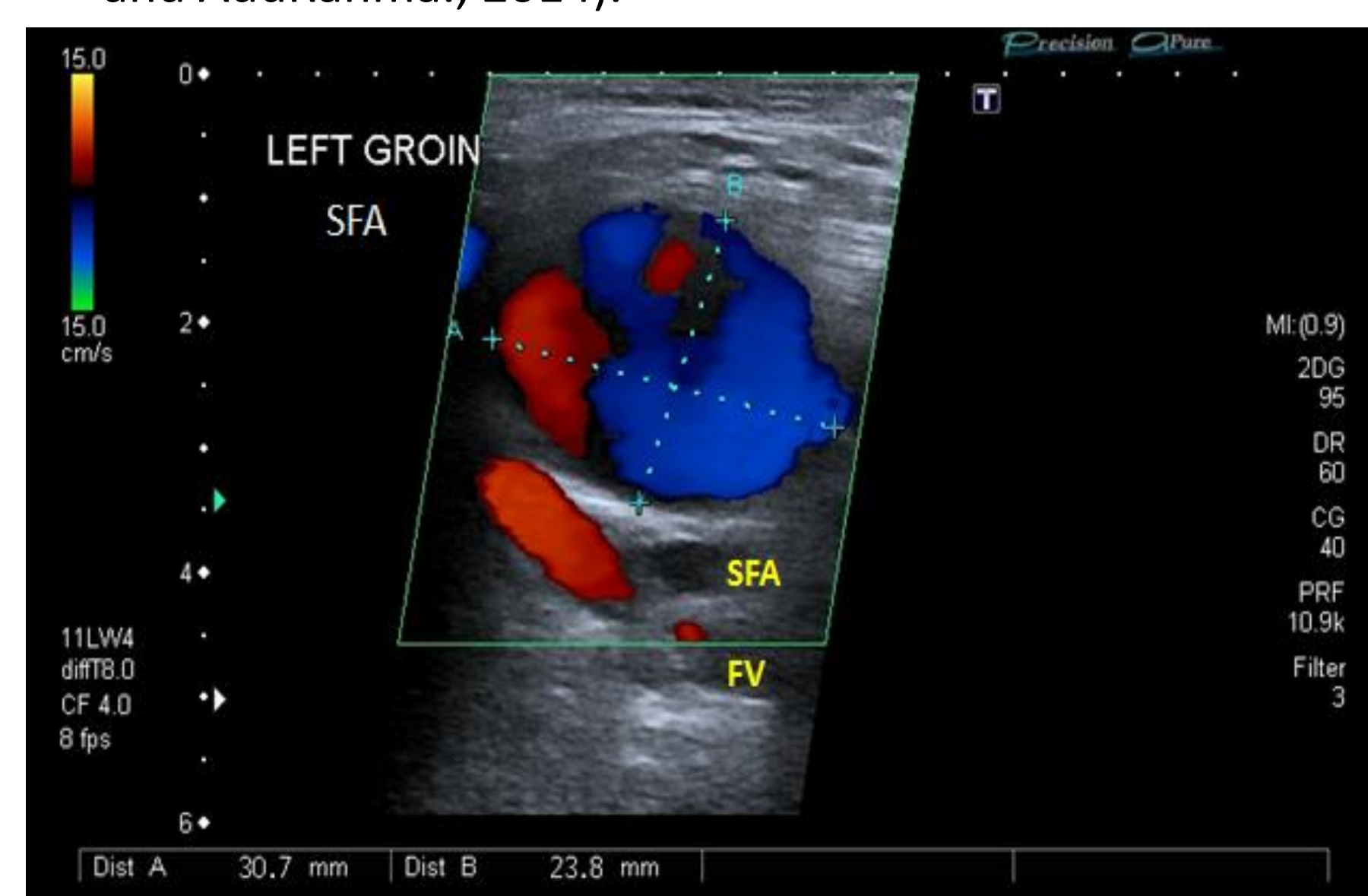


Figure 5. LS colour Doppler image of the PSA, measuring 3.07 x 2.38 cm at the widest point.

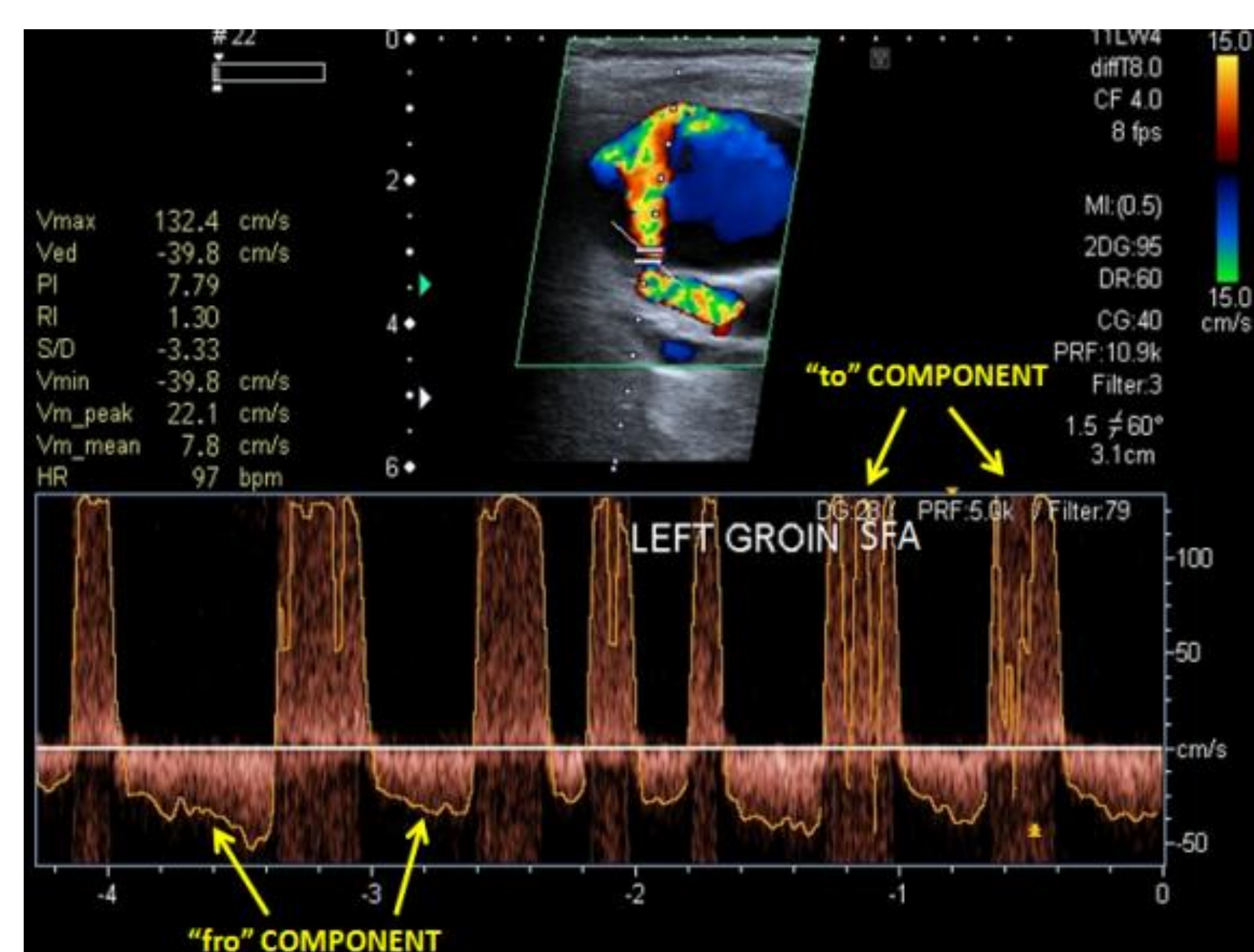


Figure 6. LS spectral Doppler image demonstrates a biphasic "to-and-fro" waveform in the communicating neck between the SFA and PSA chamber. The "to" component represents blood entering the chamber during systole, while the "fro" component represents blood exiting during diastole (Mahmoud et al., 2015).

TREATMENT

US findings indicated a recanalised PSA, resulting from a persistent defect in the left proximal SFA. Surgical correction was planned for the patient. In anticipation of this, a CT lower leg angiogram was performed 2 days later.



Figure 7. CT angiogram demonstrates a haematoma anterior to the proximal left SFA, with no visible arterial flow within the PSA. The PSA had spontaneously thrombosed. As a result, no further intervention was required. To ensure resolution of the PSA, the patient was scheduled for a follow up US at 2 and 6 weeks. At both follow ups, the PSA remained thrombosed and by the final follow up, had markedly reduced in size.

DISCUSSION

PSAs may have life threatening complications including rupture and limb ischaemia. Accurate diagnosis and appropriate management is therefore essential. This patient had a number of risk factors for the development of a PSA including advanced age, anticoagulation, female gender and arterial wall calcification (Lisowska et al., 2011). In addition, arterial puncture occurred below the common femoral artery. Huseyin et al. (2013) report a low puncture site to be one of the most important risk factors for the development of a PSA. This case study demonstrates an unusual outcome in the management of a femoral PSA. Although US guided thrombin injection was successful initially, the PSA recanalised. Additionally, the recanalised PSA spontaneously thrombosed. PSAs less than 2 cm in diameter are reported to thrombose spontaneously while larger PSAs require intervention (Huseyin et al., 2013).

As the number of coronary angiogram procedures continue to increase, an increase in associated complications, such as the femoral PSA, is also likely (Lisowska et al., 2011).

B-mode and Doppler US play an essential role in the diagnosis and follow up of a PSA. Diagnostic confidence is achieved when a triad of US findings are demonstrated:

1. Echolucent sac adjacent to a vessel on B-mode,
2. "Yin-yang" sign on colour Doppler,
3. "to-and-fro" waveform on spectral Doppler.

REFERENCES

1. Huseyin, S., Yuksel, V., Sivri, N., Gur, O., Gurkan, S., Canbaz, S., Ege, T. and Sunar, H. (2013) 'Surgical Management of Iatrogenic Femoral Artery Pseudoaneurysms: A 10-year Experience', *Hippokratia*, 17(4), pp. 332-336.
2. Kassem, H.H., Elmahdy, M.F., Ewis, E.B. and Mahdy, S.G. (2013) 'Incidence and Predictors of Post-Catheterization Femoral Artery Pseudoaneurysms', *The Egyptian Heart Journal*, 65(3), pp. 213-221.
3. Lisowska, A., Knapp, M., Usowicz-Szaryńska, M., Koziaradzka, A., Musial, W.J. and Dobrzycki, S. (2011) 'Iatrogenic Femoral Pseudoaneurysms-A Simple Solution of Inconvenient Problem?', *Advances in Medical Sciences*, 56(2), pp. 215-221.
4. Mahmoud, M.Z., Al-Saadi, M., Abuderman, A., Alzimami, K.S., Alkhorayef, M., Almagli, B. and Suleiman, A. (2015) '"To-and-fro" Waveform in the Diagnosis of Arterial Pseudoaneurysms', *World Journal of Radiology*, 7(5), pp. 89-99.
5. Stone, P.A., Campbell, J.E. and AbuRahma, A.F. (2014) 'Femoral Pseudoaneurysms After Percutaneous Access', *Journal of Vascular Surgery*, 60(5), pp. 1359-1366.