Iatrogenic False Aneurysms in the profunda femoral artery
following ORIF

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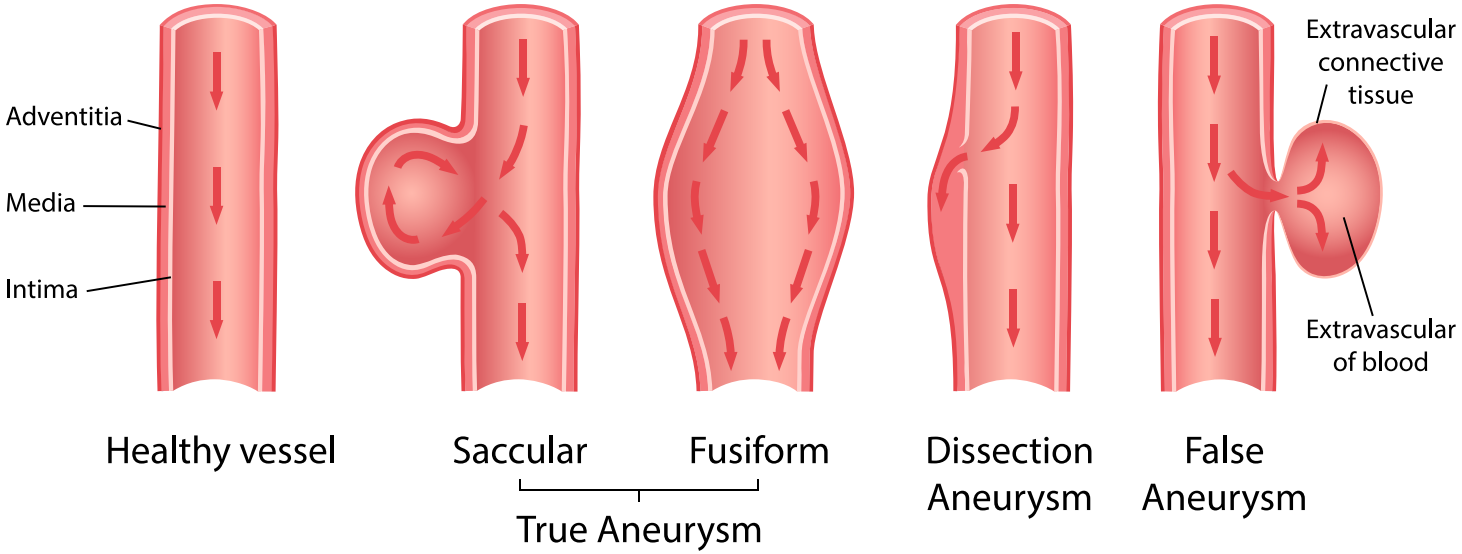
Types of Aneurysm



True: dilatation of 3 layers of the arterial wall (intima, media and adventitia)

Dissecting: tear in intima

False aneurysm (FA): outpouching between the tunica media and the adventitia. Caused by a breach in the vessel wall.

False Aneurysm

Etiology

- Trauma - particularly penetrating trauma
- Iatrogenic - medical intervention (arterial catheterisation, biopsy, surgery)

- Myocardial infarction
- Fibromuscular dysplasia
- Regional inflammatory process
- Vessel injury (vascular Behcet, giant cell arteritis, Takayasu, lupus, polyarteritis nodosa)
- Penetrating atherosclerotic ulcer

Location of FA's

Can involve any vessel in the circulatory system (most commonly arteries)

- Peripheral vessels
  - common femoral artery due to femoral punctures during catheter access
  - Radial artery or vein due to punctures: cannulas, needles
  - Popliteal artery

- Abdominal: traumatic aortic FA
- Carotid artery FA
- Myocardial FA in any cardiac chamber
- Visceral arteries (hepatic, gastroduodenal, splenic, peri-pancreatic, renal)

FA Features and treatment

Clinical Signs

- Pulsatile lump (if superficial)
- Patient may experience pain
- FA may be deep and only evident with other imaging modalities - CT

Ultrasound

- Turbulent flow characteristic yin-yang may be seen on colour, and forward and reverse flow with Pw.

Treatment

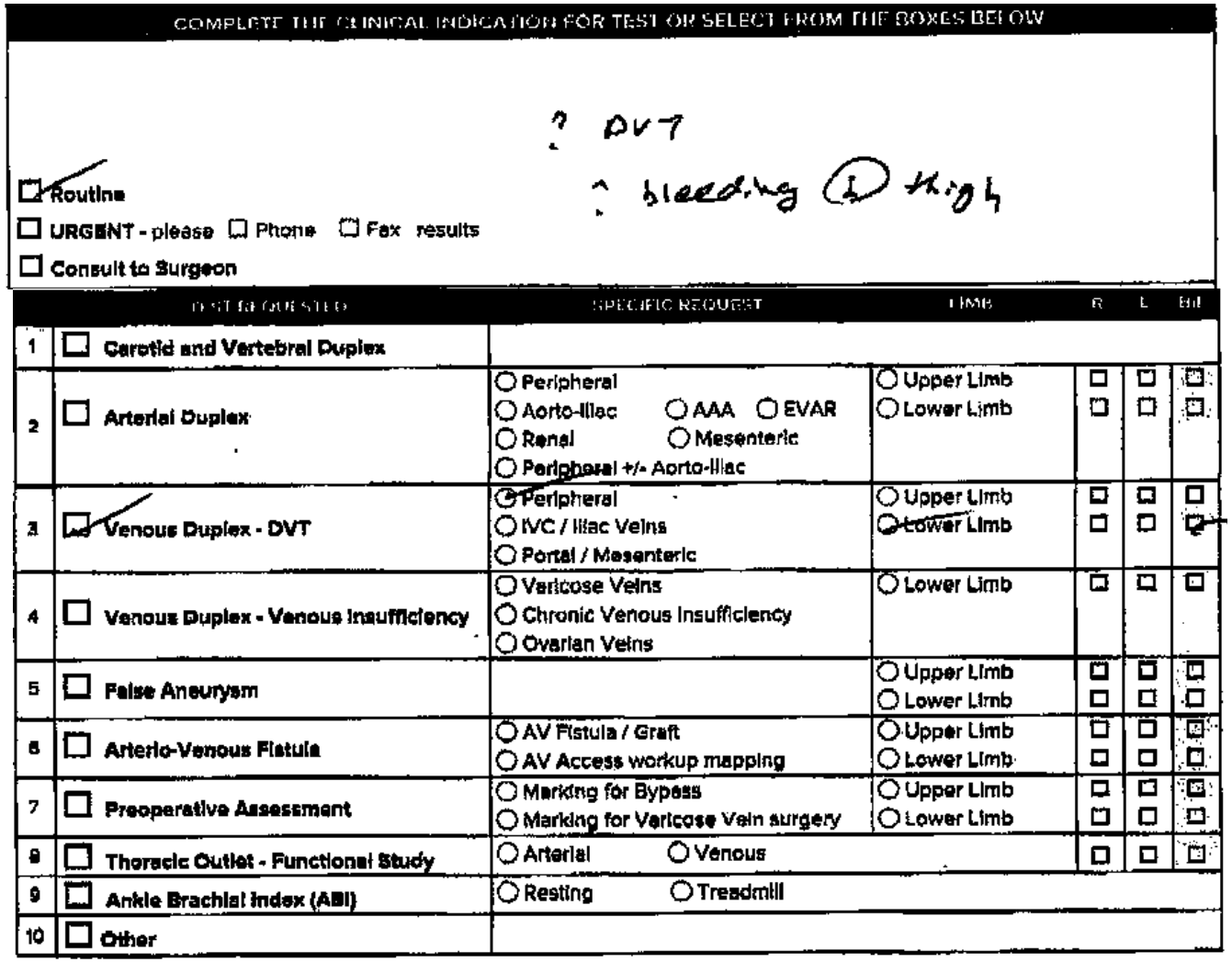
- Ultrasound probe compression for 10 minute intervals over the neck (66 to 86% success rates). Gummer et. al. 2020.
- Ultrasound guided thrombin injection and fibrin based tissue glue (96-100% success rate). Gummer et. al. 2020, Renner et. al. 2013.
- Surgical repair (covered stents, coils or ligation). Renner et. al. 2013, Najmi et. al. 2021.

Adverse Outcomes

- Infection leading to sepsis
- Rupture with catastrophic internal bleeding can lead to shock – life threating Ahmed et. al. 2001, Renner et.al. 2013.
- Distal embolisation with ischemia

Case Study 1

15.01.19 74 year old male MC



COMPLETE THE CLINICAL INDICATION FOR TEST OR SELECT FROM THE BOXES BELOW

? DVT

? bleeding (L) thigh

☑ Routine
☐ URGENT - please ☐ Phone ☐ Fax results
☐ Consult to Surgeon

	TEST REQUESTED	SPECIFIC REQUEST	LIMB	R	L	Bil
1	☐ Carotid and Vertebral Duplex					
2	☐ Arterial Duplex	○ Peripheral ○ Aorto-Iliac ○ AAA ○ EVAR ○ Renal ○ Mesenteric ○ Peripheral +/- Aorto-Iliac	○ Upper Limb ○ Lower Limb	☐ ☐	☐ ☐	☐ ☐
3	☑ Venous Duplex - DVT	○ Peripheral ○ IVC / Iliac Veins ○ Portal / Mesenteric	○ Upper Limb ○ Lower Limb	☐ ☐	☐ ☐	☐ ☑
4	☐ Venous Duplex - Venous Insufficiency	○ Varicose Veins ○ Chronic Venous Insufficiency ○ Ovarian Veins	○ Lower Limb	☐	☐	☐
5	☐ False Aneurysm		○ Upper Limb ○ Lower Limb	☐ ☐	☐ ☐	☐ ☐
6	☐ Arterio-Venous Fistula	○ AV Fistula / Graft ○ AV Access workup mapping	○ Upper Limb ○ Lower Limb	☐ ☐	☐ ☐	☐ ☐
7	☐ Preoperative Assessment	○ Marking for Bypass ○ Marking for Varicose Vein surgery	○ Upper Limb ○ Lower Limb	☐ ☐	☐ ☐	☐ ☐
8	☐ Thoracic Outlet - Functional Study	○ Arterial ○ Venous		☐	☐	☐
9	☐ Ankle Brachial Index (ABI)	○ Resting ○ Treadmill				
10	☐ Other					

Referral from Lady Davidson Hospital

- ? DVT
- ? Bleeding in left thigh ? Hematoma 2.5 x 2.5 cm raised area

- Scan classified non-urgent
- FA not ticked on the referral

Case study 74 year old male MC

History

- Height 173 cm, weight 73 kg
- Trauma- cleaning pool and fell forward with all weight on right leg
- Bilateral TKR 5 years prior. The metal implant has contributed to fracture of distal femur
- ORIF distal right femur 29.12.20
- IHD, AF, OA, Asthma

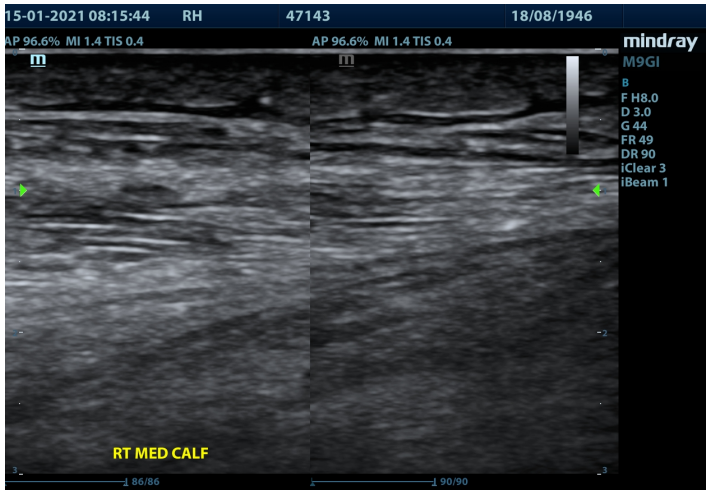
DVT Findings 15.01.21

Clinical

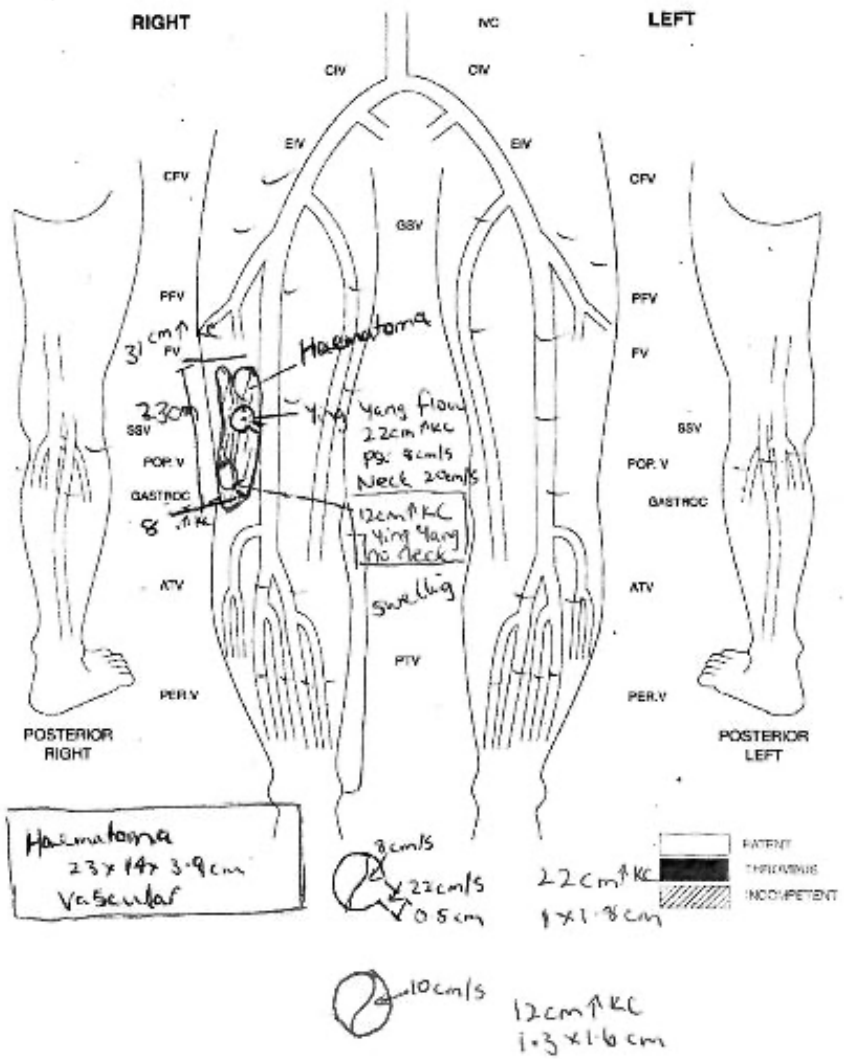
- 16 days post ORIF
- Right leg swollen with a slightly compressible lump (2.5 x 2.5 cm) mid-distal lateral thigh
- Thigh firm from the prox-mid to distal thigh on the anterior – lateral aspect

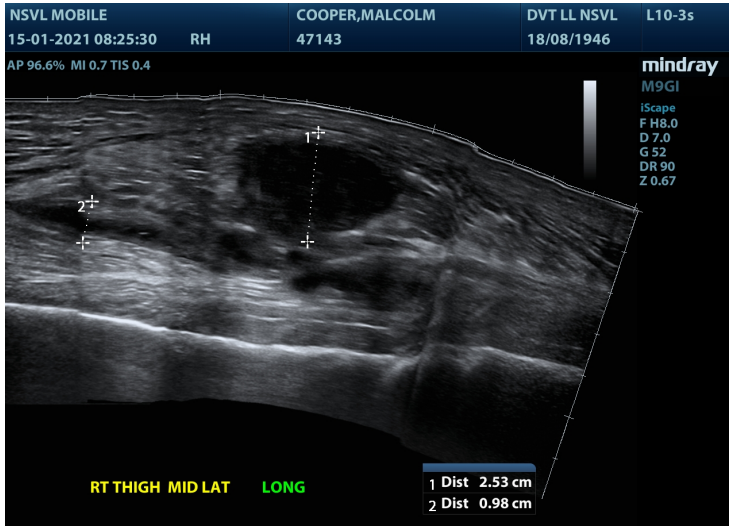
Ultrasound

- No DVT detected, lower limb oedema noted
- Hematoma 23 x 14 x 3.9 cm



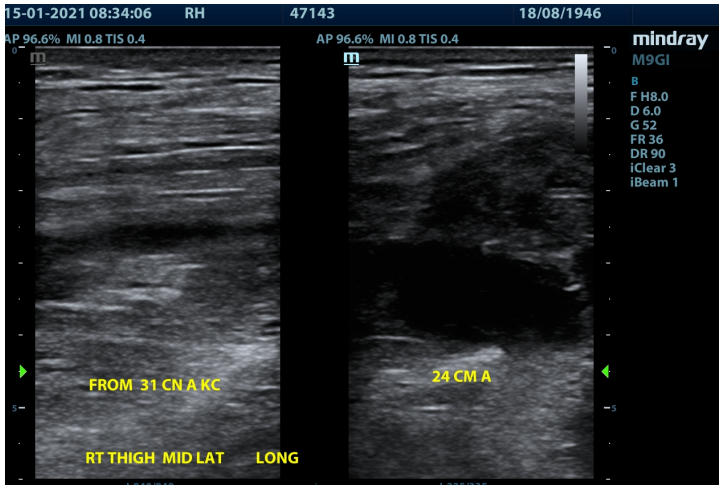
Work sheet 15.01.21

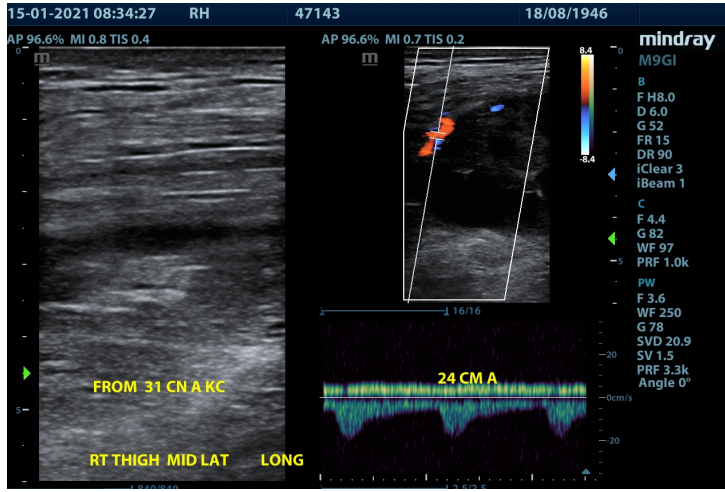




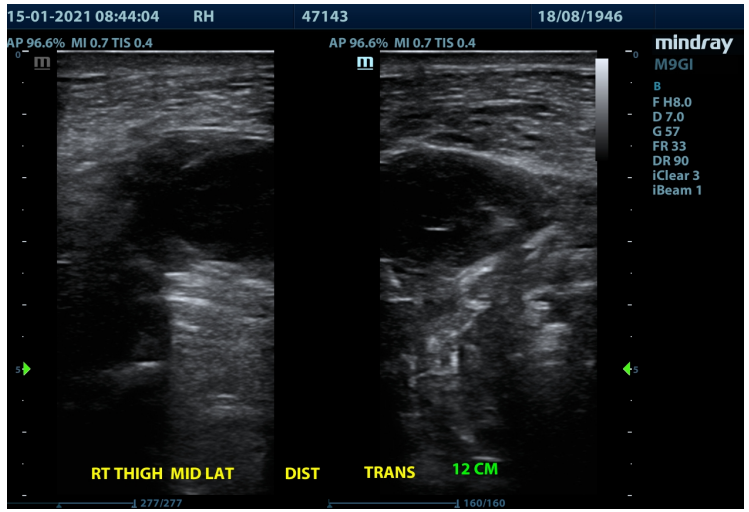
B Mode

- Heterogeneous with hyperechoic and anechoic (smooth walled 2.5 x 2.5 cm)
- Size 23 x 14 x 3.9 cm





12 Above knee crease

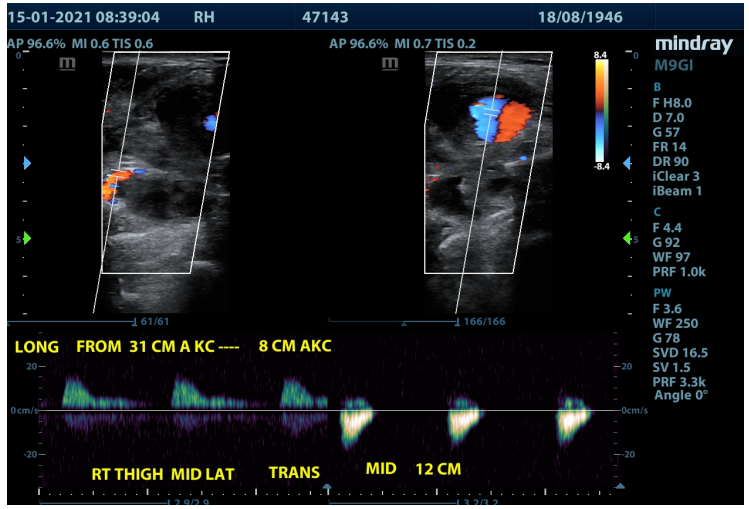


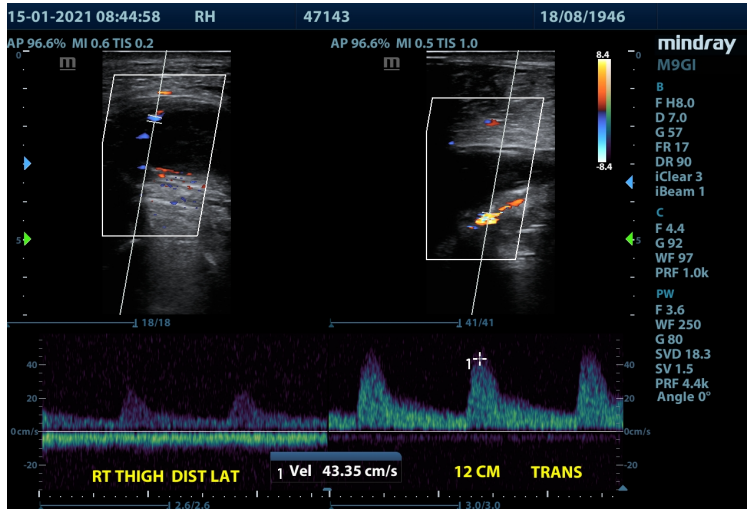
B Mode

- Anechoic region, smooth margins
- FA component 1.3 x 1.6 cm, 1.4 cm below surface

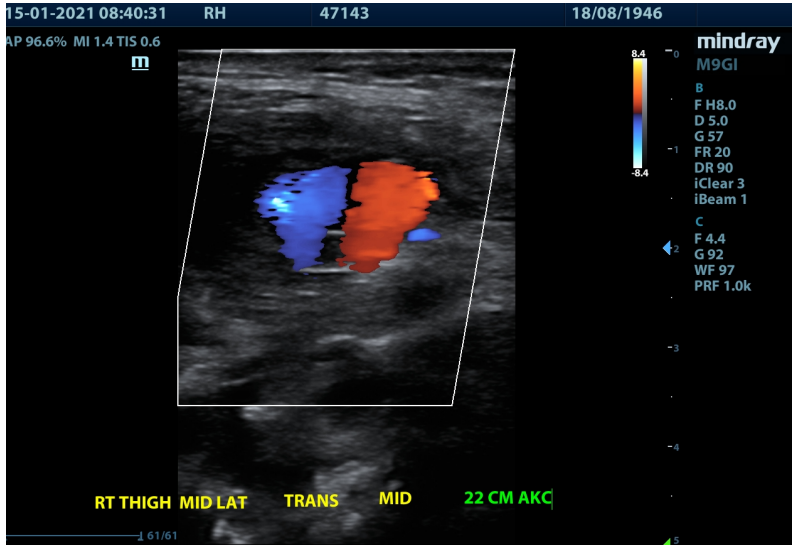
Colour and Pw

- Vascular arterial flow surrounding the anechoic region
- Yin yang , forward reverse flow
- No neck established
- Origin of flow into the FA not determined





22 cm Above knee crease

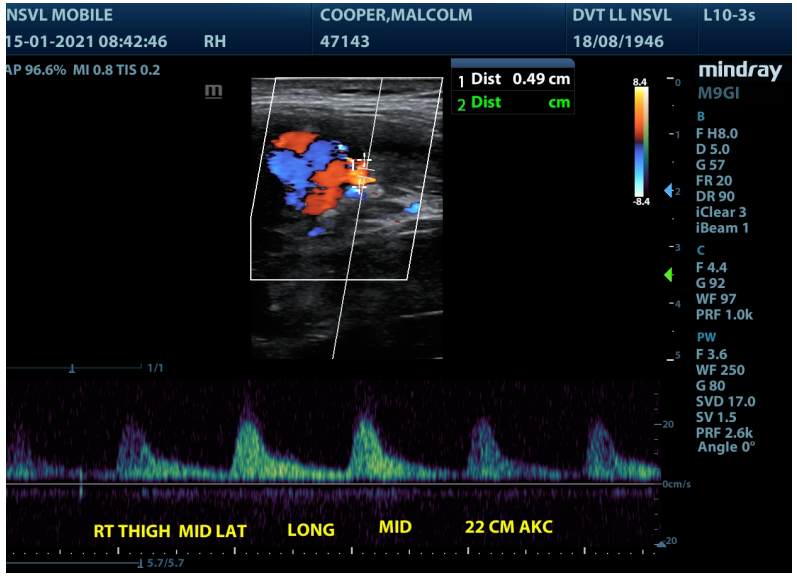


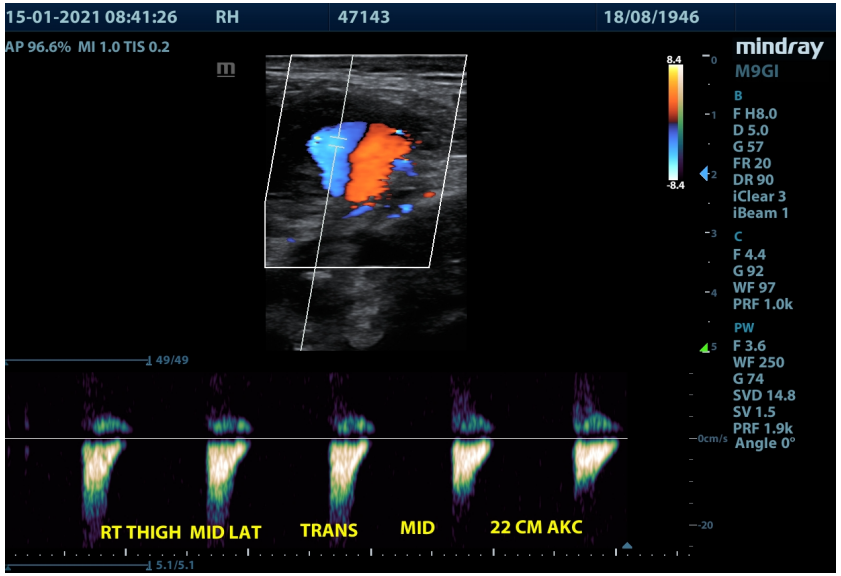
B Mode

- Anechoic region with smooth margins,
- FA component 1 x 1.8 cm, 1 cm below surface.
- Hyperechoic regions

Colour and Pw

- Yin yang, forward and reverse flow
- Neck seen but could not be joined to an artery
- Origin of flow into the FA not determined





Urgent Angiogram 16.01.21

Operative Findings:

Abdominal aorta: normal

Left: common femoral region was normal.

Right: A pseudo aneurysm of a branch of the lateral circumflex femoral branch of the profunda femoris artery was found

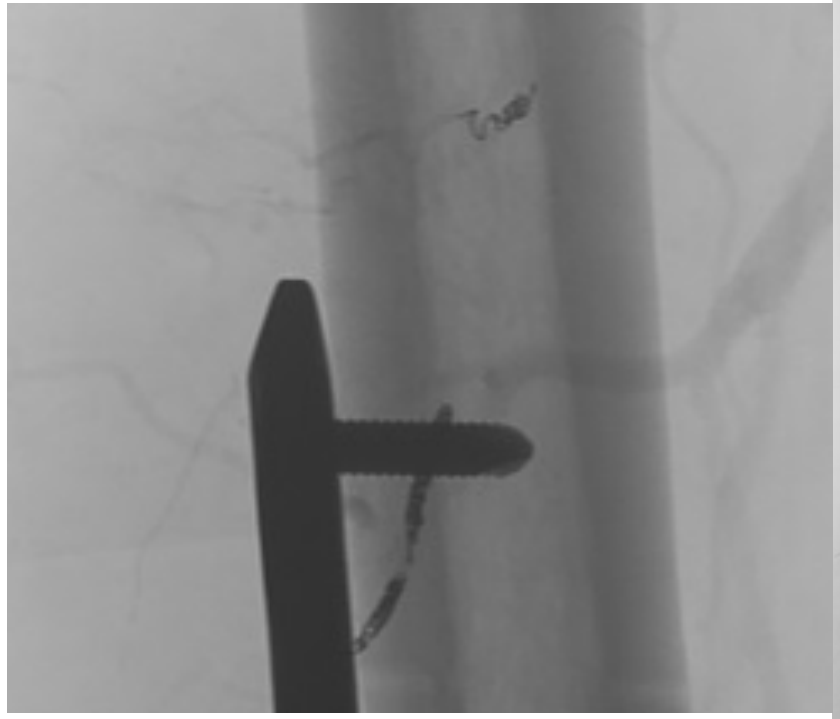
A second small aneurysm was identified more proximally

Angiogram 16.01.21

Operative Technique:

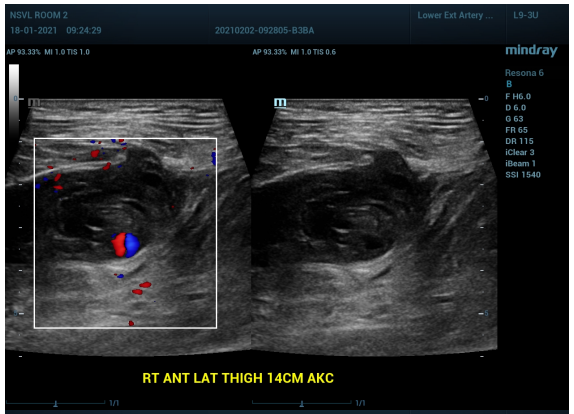
Both FA's were occluded with endovascular coils.

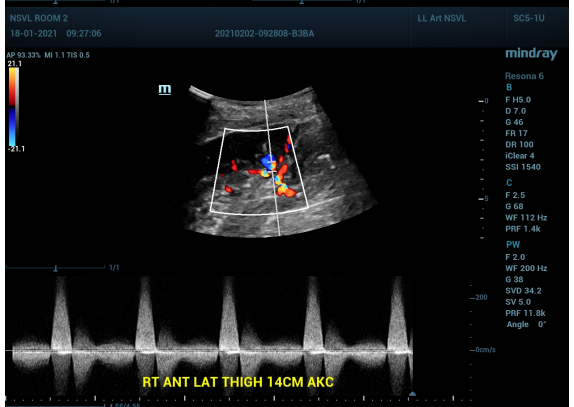
Multiple 3 and 2 mm coils were placed in the feeding vessels.

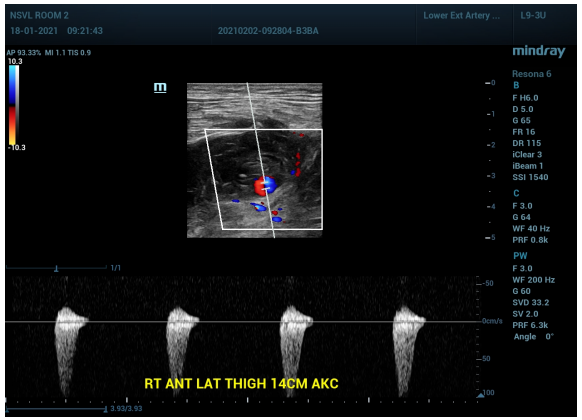


Ultrasound – Post Op 18.01.21

- ICU for right thigh observation
- Experienced acute pain in right thigh
- Referred for duplex Doppler ultrasound to review for FA







Findings:

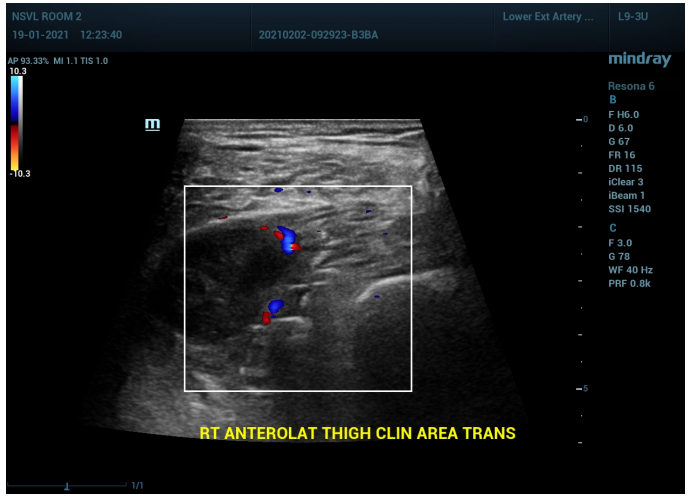
- The previous hematoma is seen
- A segment 14 cm AKC that exhibits yin yang flow
- Origin of flow unable to be determined by ultrasound

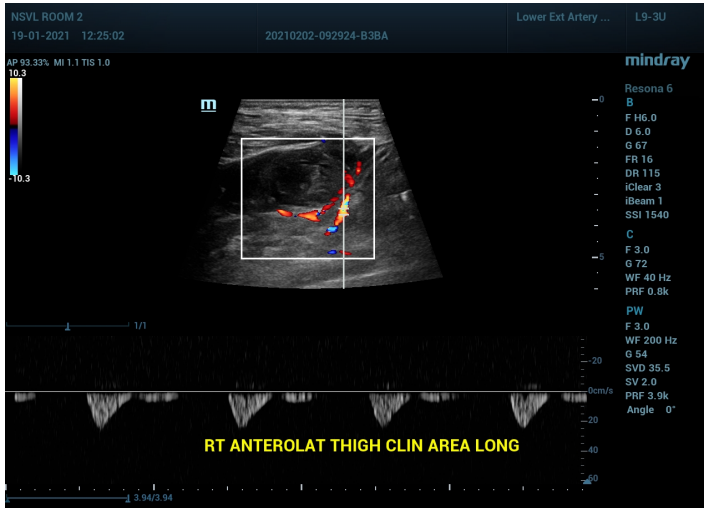
Repeat CT angiogram 18.01.21

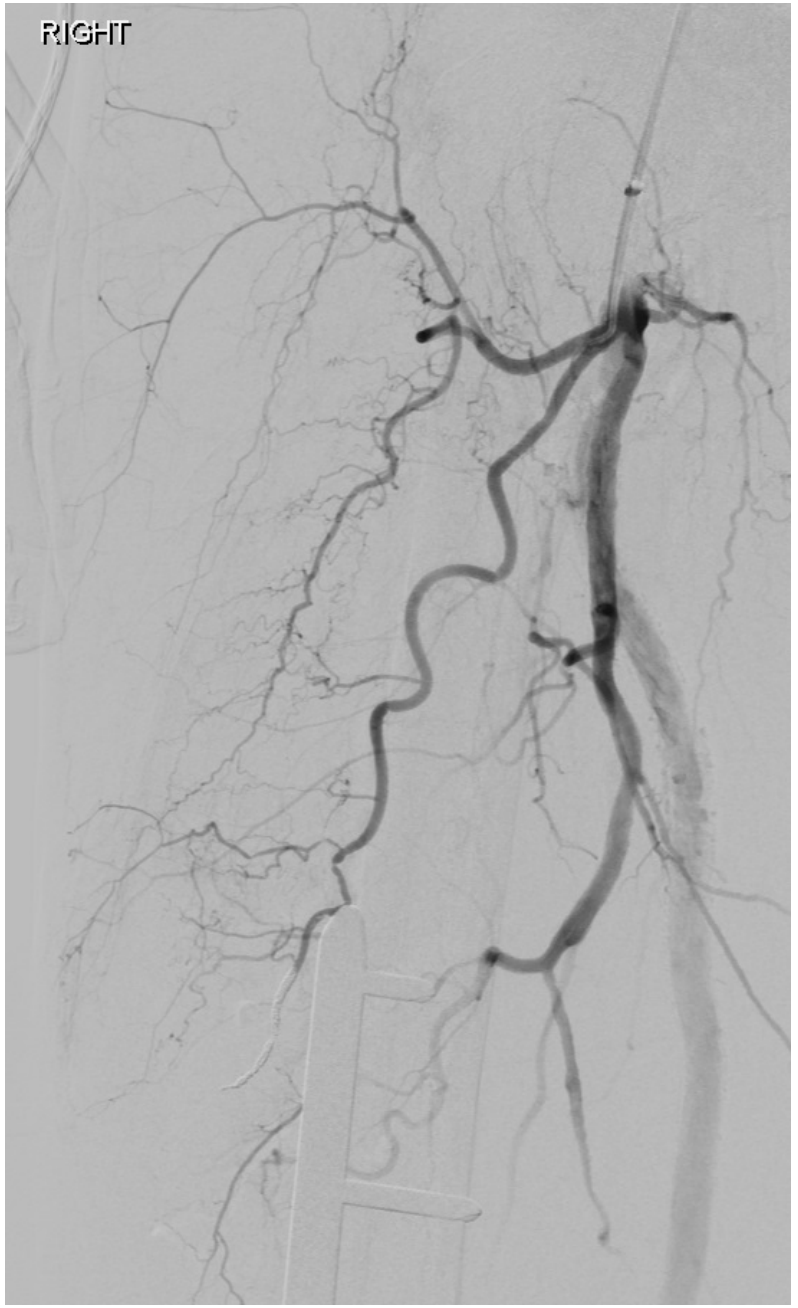
Successful cannulation

No evidence of either FA's were seen

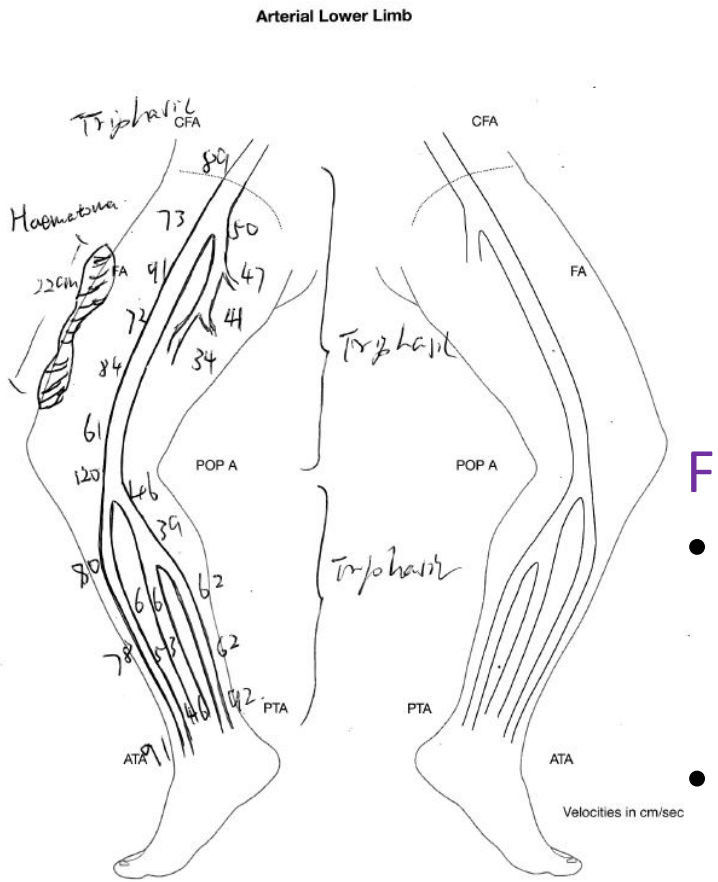
Ultrasound 19.01.21 : no evidence of FA's

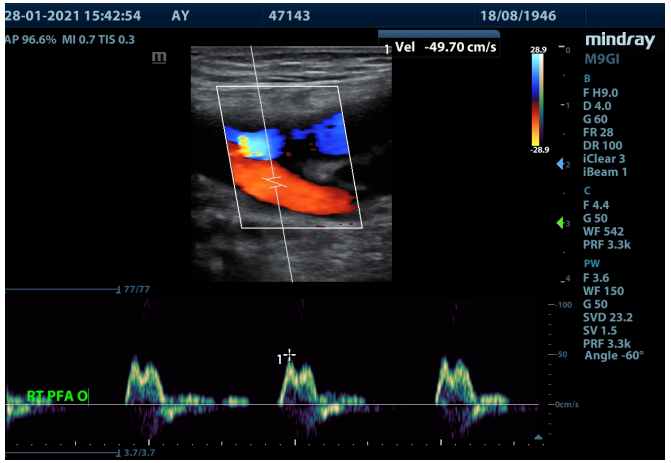


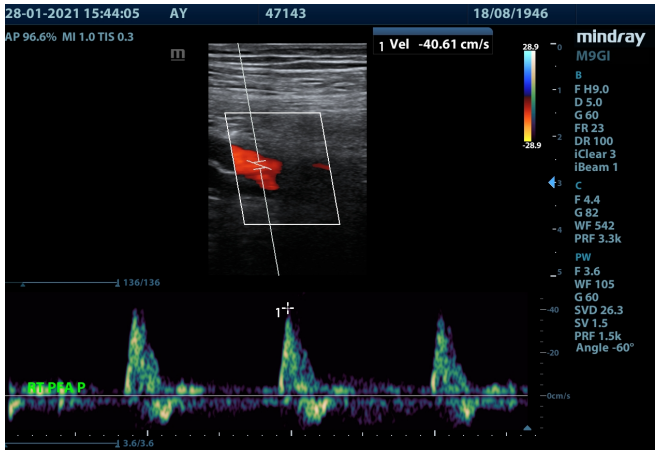


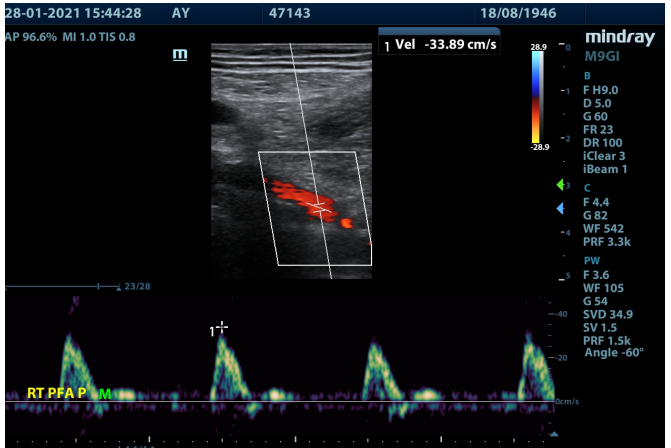


Arterial study 28.01.21 (12 days post coiling)









Findings:

- SFA – triphasic waveforms, no stenosis
- PFA – braches traced, no connection with the hematoma was established

Discussion

Literature Review of Iatrogenic FA's

- Incidence for Iatrogenic FA's is increasing
  - 0.5% for diagnostic procedures. Ahmad et. al. 2008.
  - 10% for therapeutic procedures. Truong et. al. 2013.

- The average time of FA onset varies from 5 to 6 days after catheter removal. Lenartova and Tak 2003.
  - 12 days after catheter removal, FA in SFA. Renner et. al. 2013.

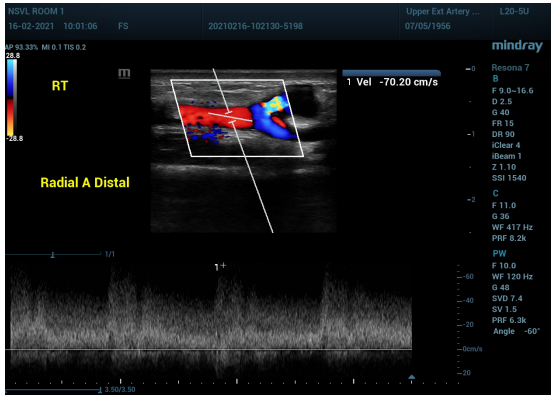
- FA's may present weeks to years after trauma. Najmi et. al. 2021.

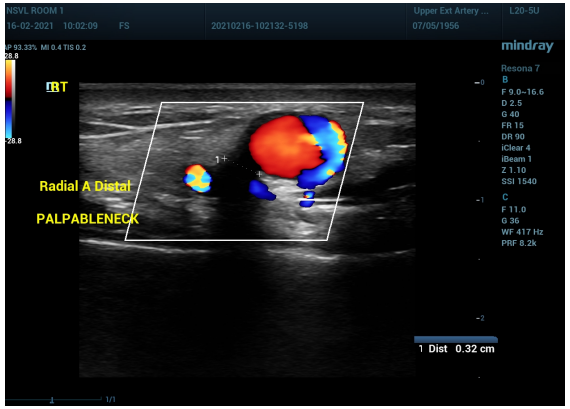
Case Study 2

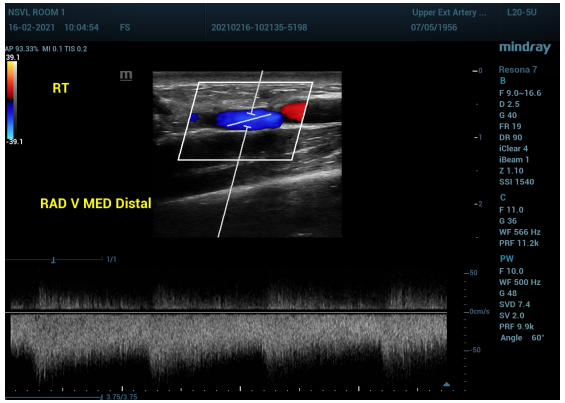
16.02.21 64 year old male

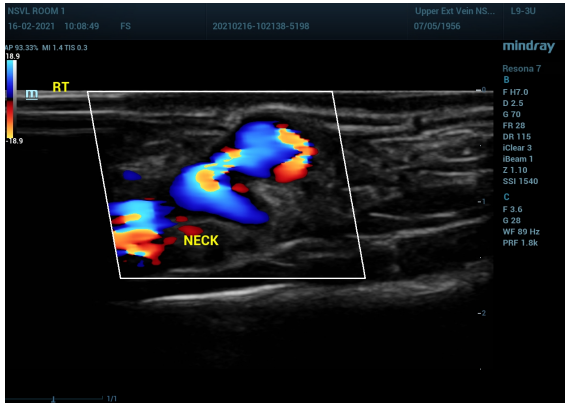
- Patient had a history of past cannulation several years ago and now had a superficial pulsatile lump at the wrist

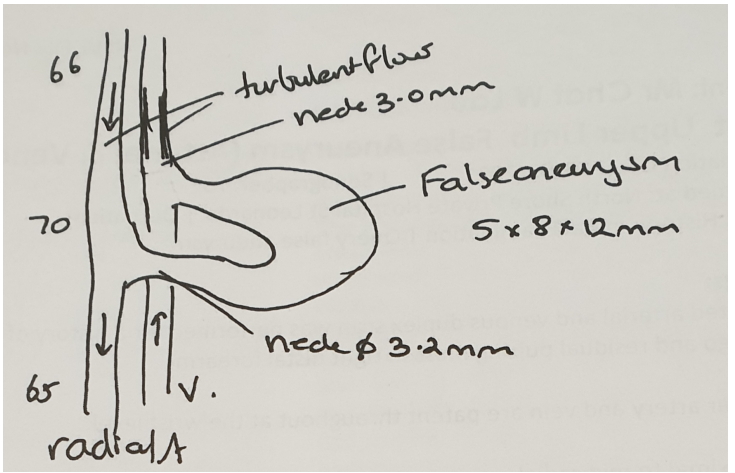
- Arterial and venous FA forming fistula. Venous FAs are much more uncommon Coombs et. al. 2016.











FA Rupture Renner et. al. 2013

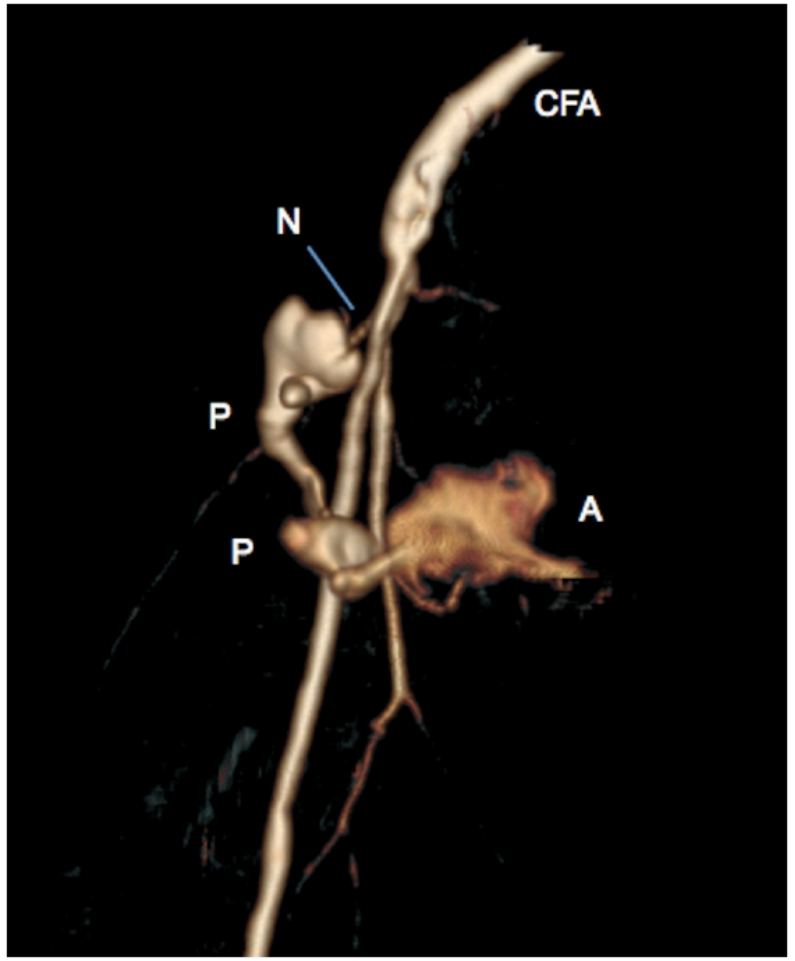
79-year-old female patient was admitted to ICU for acute respiratory failure developed FA on day 12

Day 12 after catheter removal

- severe sharp pain in her right groin.
- Hypotension (70/50 mmHg) and a voluminous mass in the right groin

Doppler ultrasound: internal blood flow

CT confirmed large hematoma (23 × 20 × 10cm), with an arterial breach of the right superficial femoral artery FA. Successfully treated with stenting.



3D view computed tomography angiography image of the right groin: large pseudoaneurysm (P) communicating with the right superficial femoral artery through a pseudoaneurysm nec (N). Femoral common artery (CFA). Active bleeding (A).

Conclusion

- Use of B mode, colour and pulse wave - vital
- FA's occur from any vessel and don't necessary only involve the major branches
- US does not always find the vascular origin
- Can have delayed onset after trauma, catheterisation or surgery.

This case study shows a late onset of FA, diagnosed 17 days after surgery.

- May need to be surgically treated
- Don't assume there is only 1 FA.

References

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- *Case Report* Life-Threatening Rupture of a False Aneurysm after Femoral Arterial Catheterization: Unexpected Delay after a Common Procedure Julie Renner,1 Pierre Pasquier,2 Elisabeth Falzone,3 Faye Rozwadowski,4 and Stéphane Mérat2 *1 Department of Anesthesiology and Intensive Care, Be´gin Military Teaching Hospital, 69 avenue de Paris, 94160 Saint-Mande´, France 2 Intensive Care Unit, Be´gin Military Teaching Hospital, 94160 Saint-Mande´, France*
  3 Intensive Care Unit, Percy Military Teaching Hospital, 92140 Clamart, France
  4 Naval Branch Health Clinic, United States Navy, Lakehurst, NJ 08733-5006, USA Correspondence should be addressed to Julie Renner; julierenner2403@yahoo.fr Received 21 February 2013; Accepted 4 April 2013
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