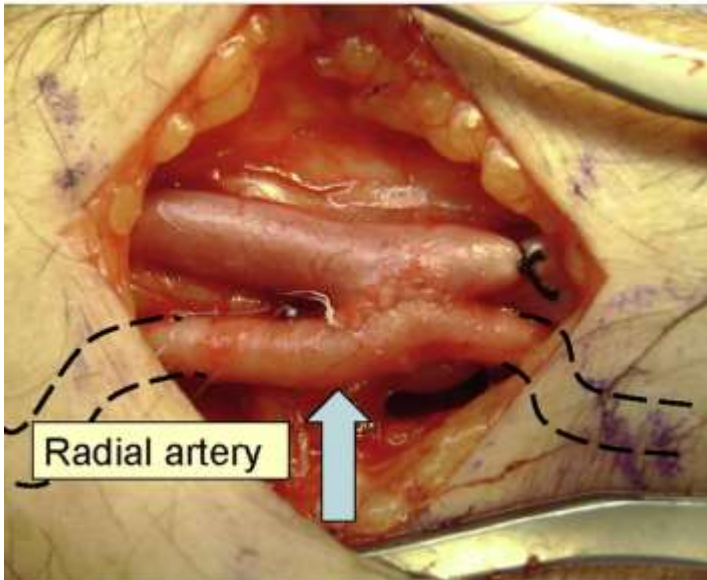
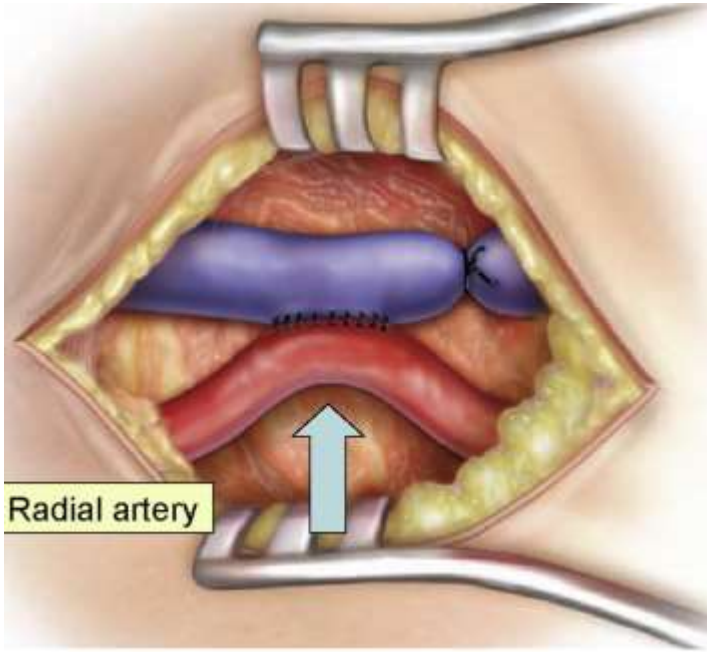


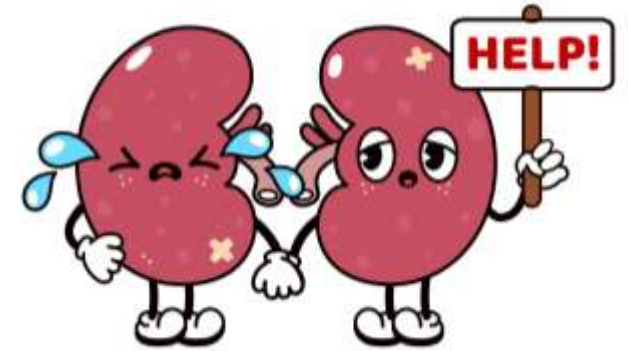
# Haemodialysis Access Assessment

Tanyah Ewen

Chief Clinical Vascular Scientist



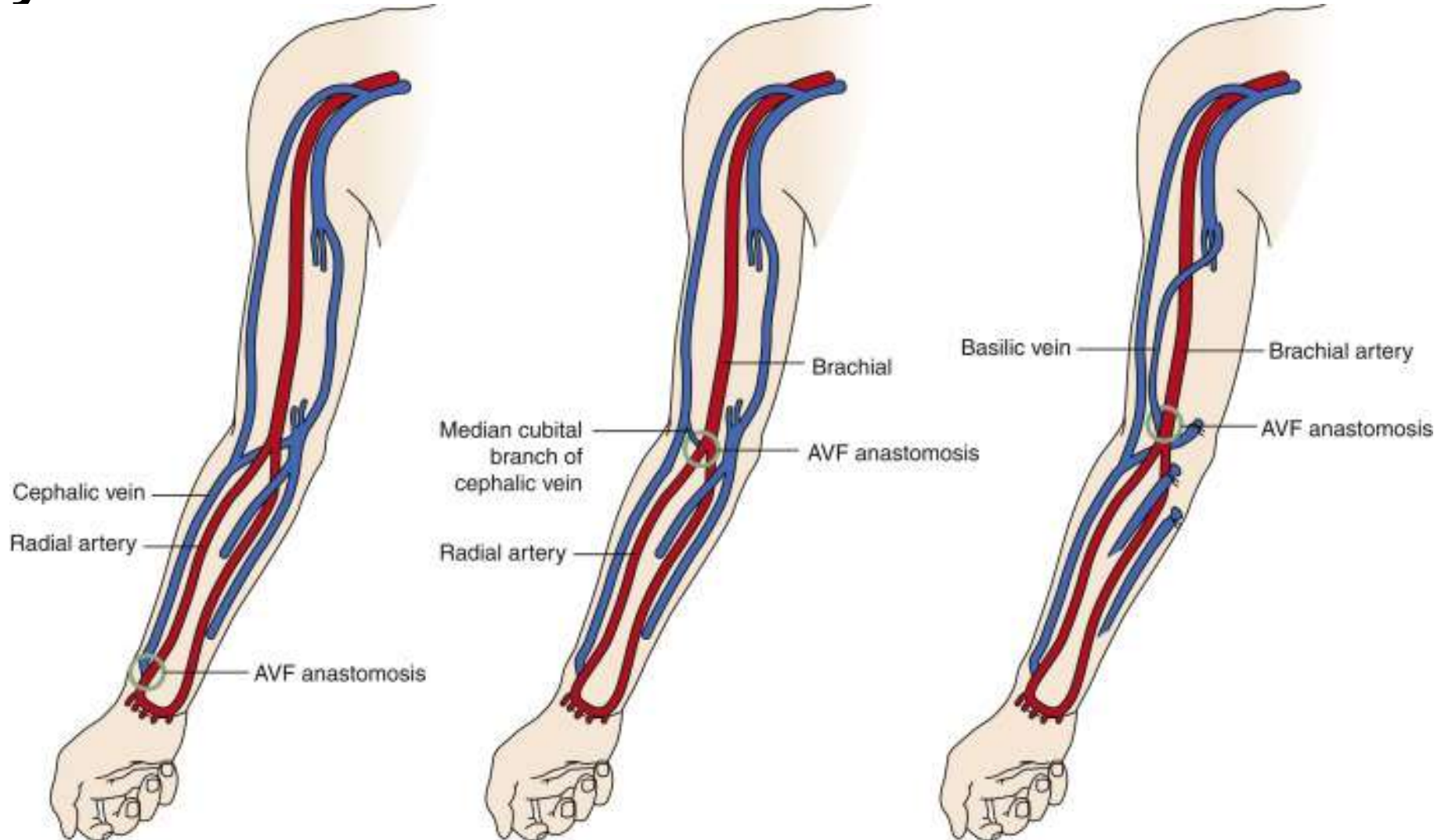
# Introduction



- Circa 25,000 patients in the UK require haemodialysis
  - All require a reliable vascular access
  - Options are Arteriovenous Fistula, Arteriovenous Graft or catheter
- Today, we'll discuss duplex US in the management of AVF and AVG
  - AVF is preferred access
  - Creation and maintenance can be difficult
  - Patency hindered by development of stenotic lesions, which can lead to thrombosis and failure
  - Other complications – i.e. Venous hypertension, aneurysm, infection, CHF
- Duplex
  - Role in pre-operative planning
  - Identifying problems and planning intervention
  - Its role in surveillance of asymptomatic cases is unclear

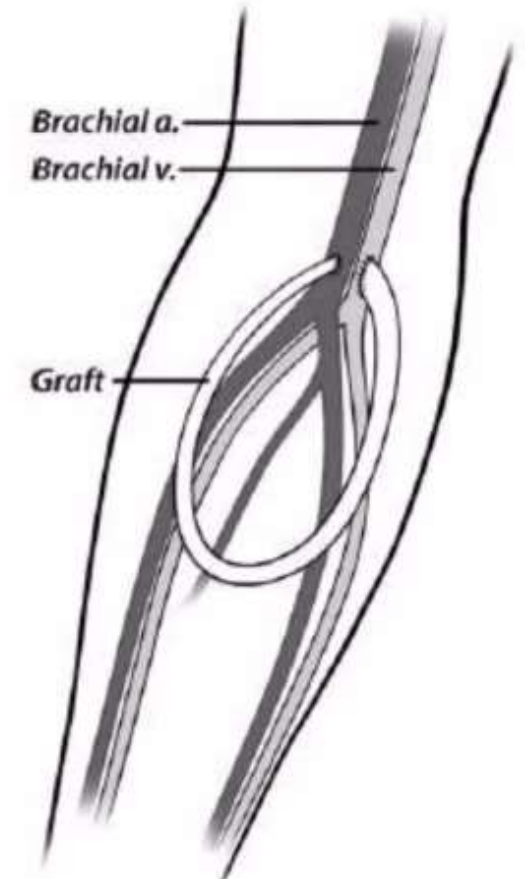
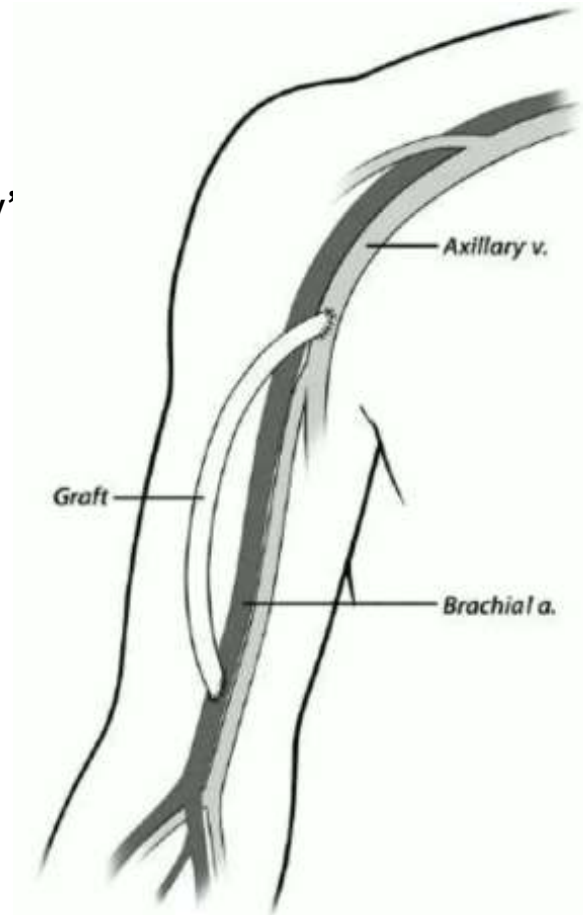
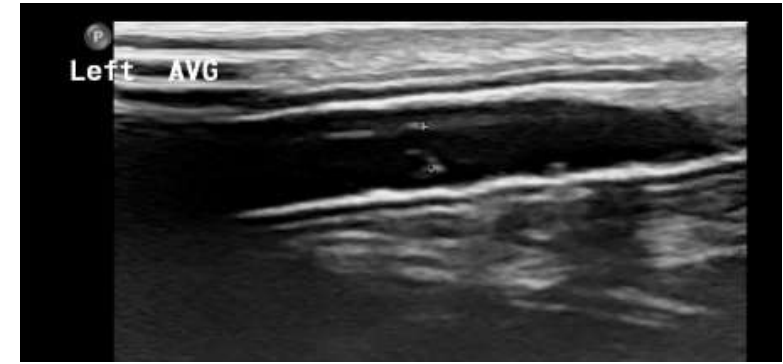
# AVF Anatomy

- Radiocephalic
- Brachiocephalic
- Brachiobasilic
  - Transposition
  - Long scar
  - Limited length
- Endovascular



# Arteriovenous Graft

- Not as durable as AVF
- Higher rates of infection
- Useful if superficial veins unsuitable
- Usable within 2-4 weeks
- Operative note – critical to understanding AVG ‘anatomy’
- Synthetic material
  - Polytetrafluoroethylene (PTFE)
  - Dacron
- Biological
  - Saphenous vein
  - Bovine ureter
  - Bovine carotid artery



# Pre-operative Assessment

- Used to map arm vessels
  - Helps determine best location
  - Vessel suitability / depth
  - Helps to determine likelihood of maturation
  - Can provide both functional and morphological information
- Patients who have had multiple AVF

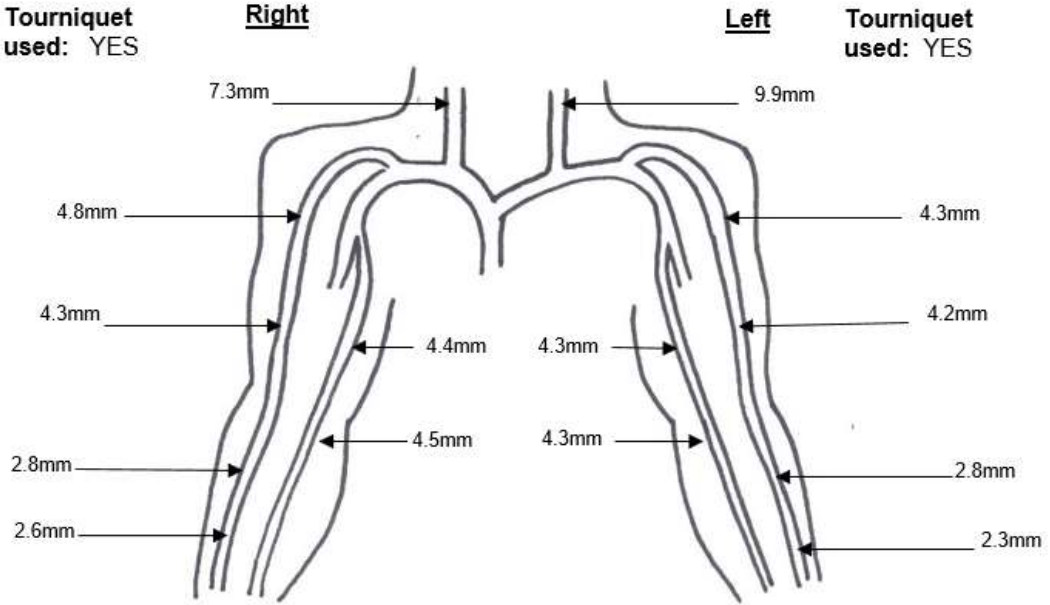




# Pre-operative Assessment Sample Report

Brachial Pressure: Right \_\_\_\_\_ Left \_\_\_\_\_

<u>VENOUS EXAM</u>			<u>ARTERIAL EXAM</u>		
(N)=Normal (S)=Stenotic (O)=Occluded					
	Right	Left		Right	Left
Internal Jugular	N	N	Brachial PSV	83 cm/s	76 cm/s
Innominate	N	--	Radial PSV	70 cm/s	65 cm/s
Subclavian	N	N	Ulnar PSV	51 cm/s	47 cm/s
Axillary	N	N			
Cephalic Upper	N	N	<b>Arterial Measurement in mm</b>		
Lower	N	N	Brachial Artery	3.8mm	4.1mm
Basilic Upper	N	N	Radial Artery	2.4mm	2.2mm
Lower	N	N	Ulnar Artery	1.9mm	2.1mm



**COMMENTS:** Good vessels bilaterally.

# Rules of 6 for AVF

- Usability for haemodialysis
  - Flow volume  $>600\text{ml/min}$
  - Vein diameter  $>6\text{mm}$
  - Vein depth  $<6\text{mm}$
  - Vein length  $>6\text{cm}$  (2 needles 3-4cm apart)
  - Vein maturity  $>6$  weeks before use

# Indications for duplex assessment

- Thrombotic flow-related / dysfunction
  - Stenosis
  - Thrombosis
- Non-thrombotic flow-related / dysfunction
  - Aneurysm
  - Steal syndrome
  - Failure to mature (cannot be used successfully for HD 6/12 beyond creation)
- Infective issues
  - Any infection involving the access
  - Intraluminal, extraluminal, peri-access i.e. cannulation site





# Patient preparation

- Upper extremity AVF/AVG
  - Patient positioned often supine, with arm relaxed and extended out to side
  - Can be performed with patient sitting
- Thigh AVF/AVG
  - Patient should be supine



# AV Fistula Duplex Assessment

- Flow volume - Obtained from brachial artery
- Assess inflow artery and take peak systolic measurement
- Follow draining vein from anastomosis recording peak systolic velocities

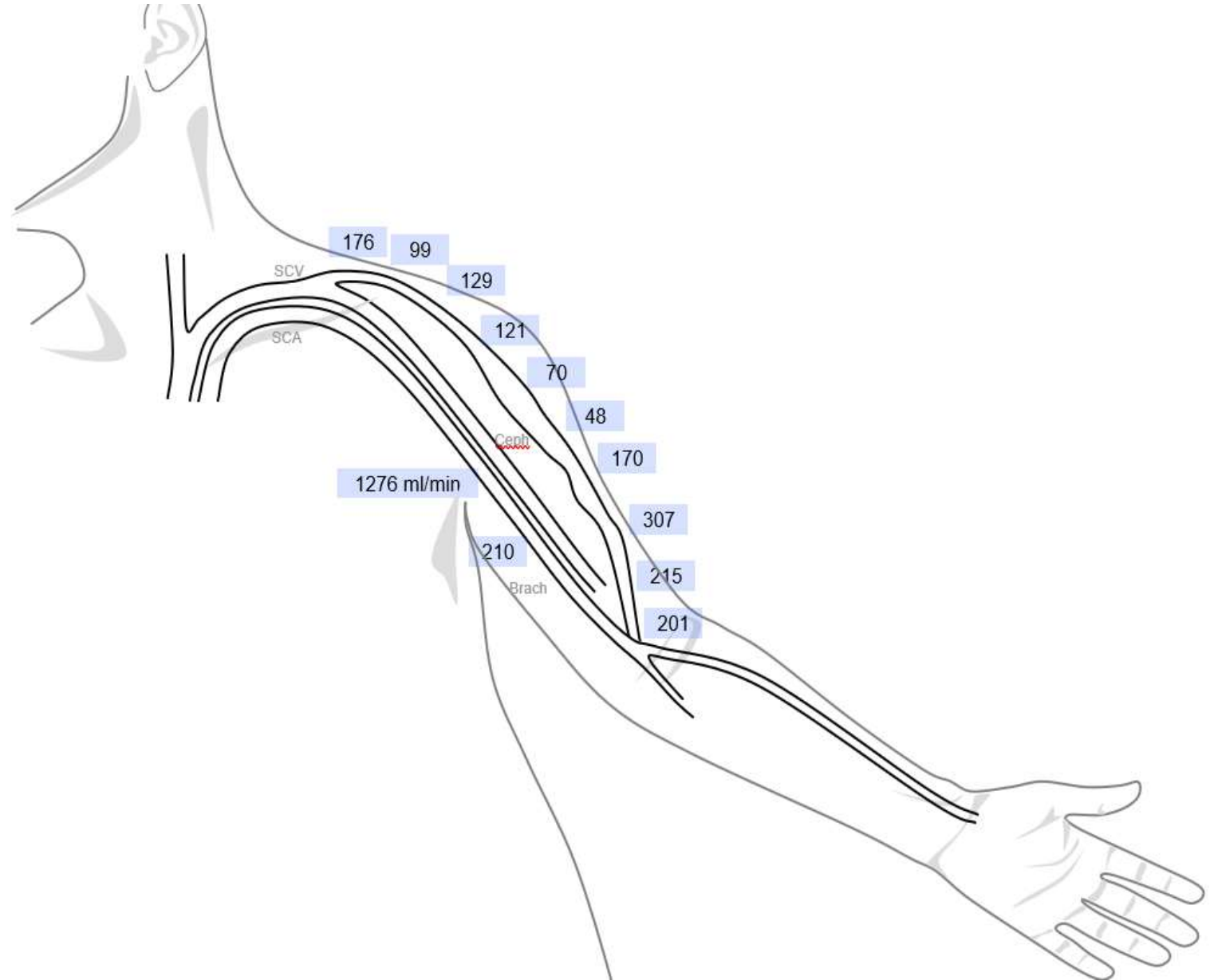


# Measurement of flow volume

- Sample volume width to cover whole of vessel
- Correct angle of isonation
- Sample volume at same site of diameter measurement
- Diameter measurement perpendicular to axis
- Calculation -  $V_f = \text{Cross-sectional Area} \times \text{Time Averaged Velocity}$



# AVF Sample Report



<b>Normal Access</b>	<b>Findings</b>
PSV	Range 100 – 400 cm/s
EDV	Range 60 – 200 cm/s
Diameter	Uniform throughout without aneurysmal dilatation
Flow Volume	Range 500 – 1600 ml/min
Intimal Hyperplasia	Minimal
<b>AVF/AVG Flow Volume Range</b>	<b>Findings</b>
Normal AVF/AVG	500 – 1600 ml/min
Compromised graft	<500 ml/min
Venous hypertension / CHF	>1600 ml/min
<b>AVF Stenosis</b>	
Flow Velocity	>400 cm/s with presence of stenotic AVF/inflow artery ratio of 3 or greater indicates >50% stenosis
Flow Ratio	>3 velocity ratio between AVF/inflow artery >50% >4 velocity ratio >75%

# Duplex findings for abnormalities

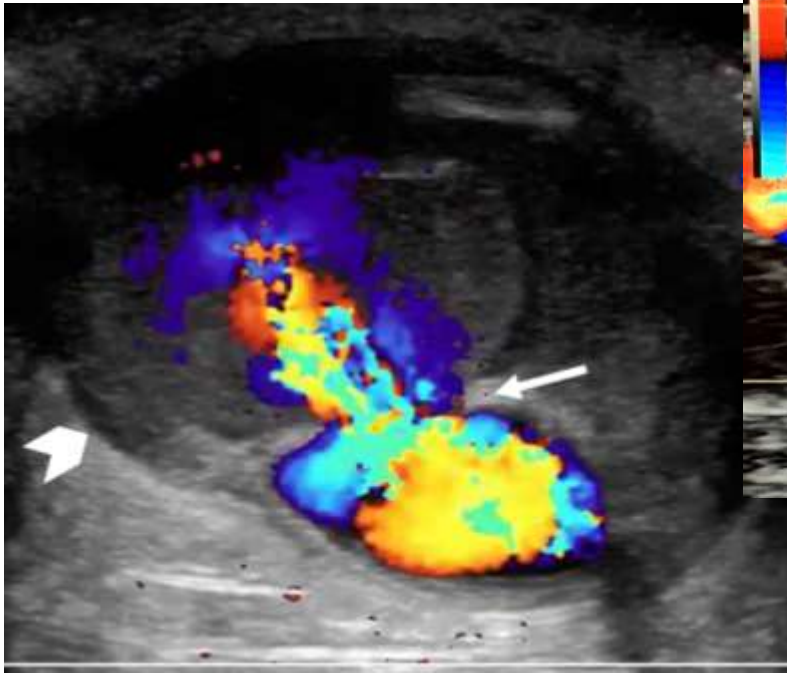
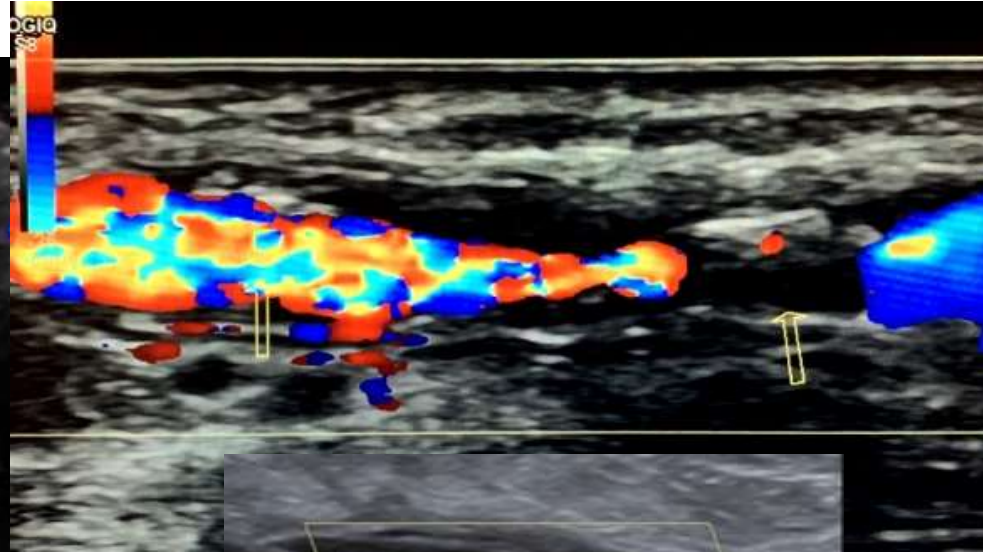
- To determine patency of AVF/AVG and/or other associated abnormalities
  - Pseudoaneurysm
  - Pulsatile thrill
  - Loss or decreased thrill
  - Excessive bleeding post dialysis
  - Hand pain, coolness (steal syndrome)
  - Venous hypertension



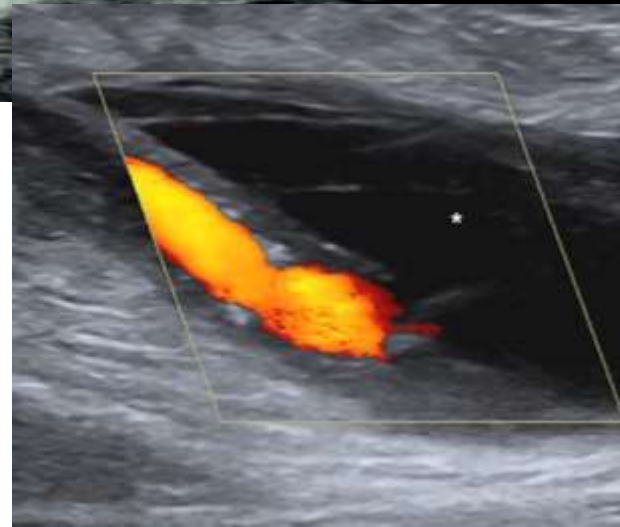


# Complications

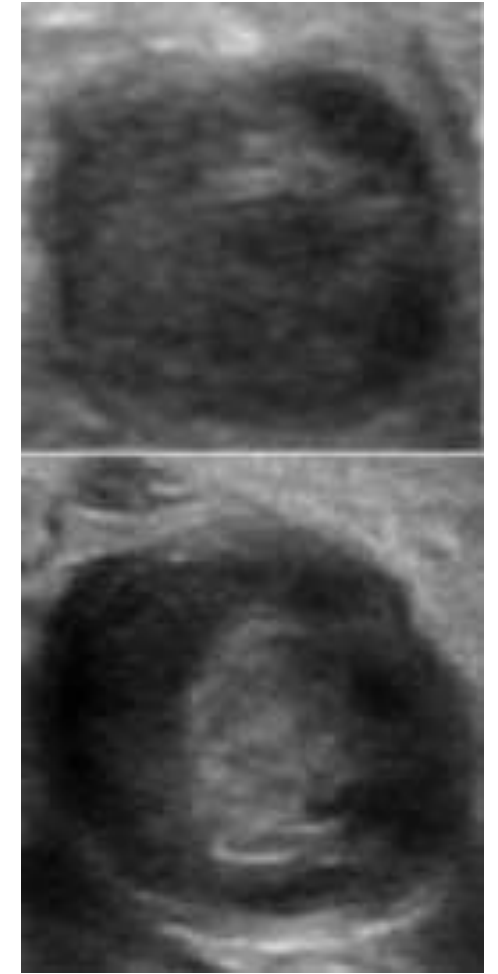
Stenosis



Pseudoaneurysm



AVG Infection



Occlusion / Thrombosed

# Summary

- AVF preferred haemodialysis access option
  - Over 25,000 patients on HD within the UK
  - Increasing by 5% each year
- Duplex has a role in pre-operative planning
- A central role in identifying AVF complications
  - Planning IR / vascular interventions
- Important to be familiar with AVF anatomy



**Any  
Questions  
?**

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