Non Surgical Dialysis Access Interventions and Evaluations

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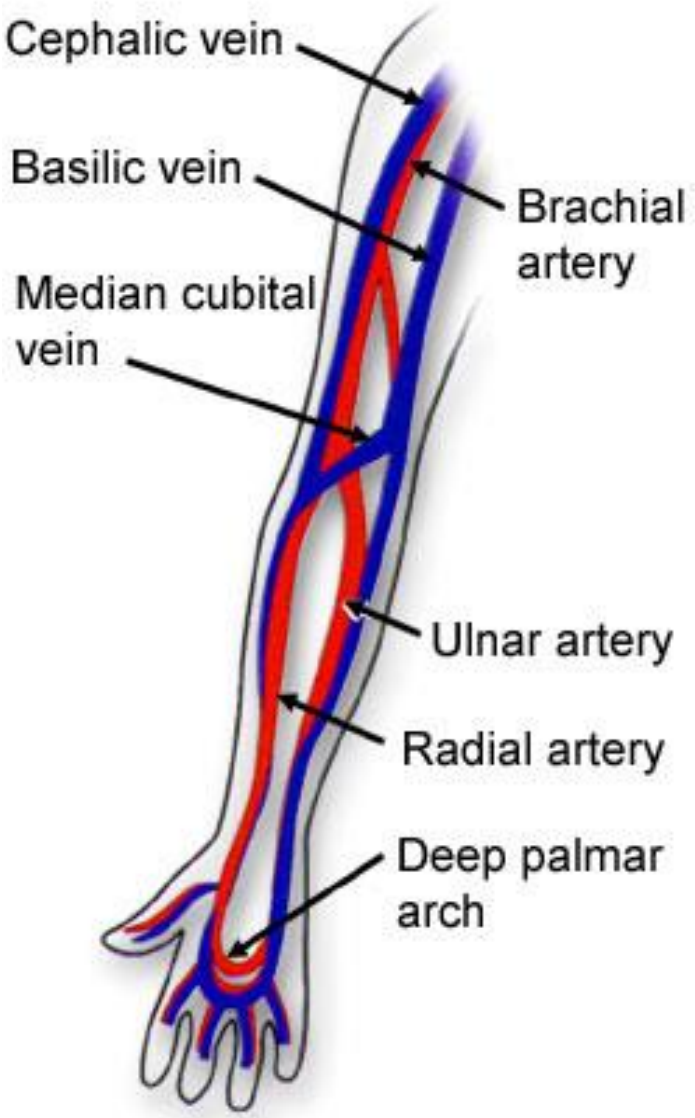
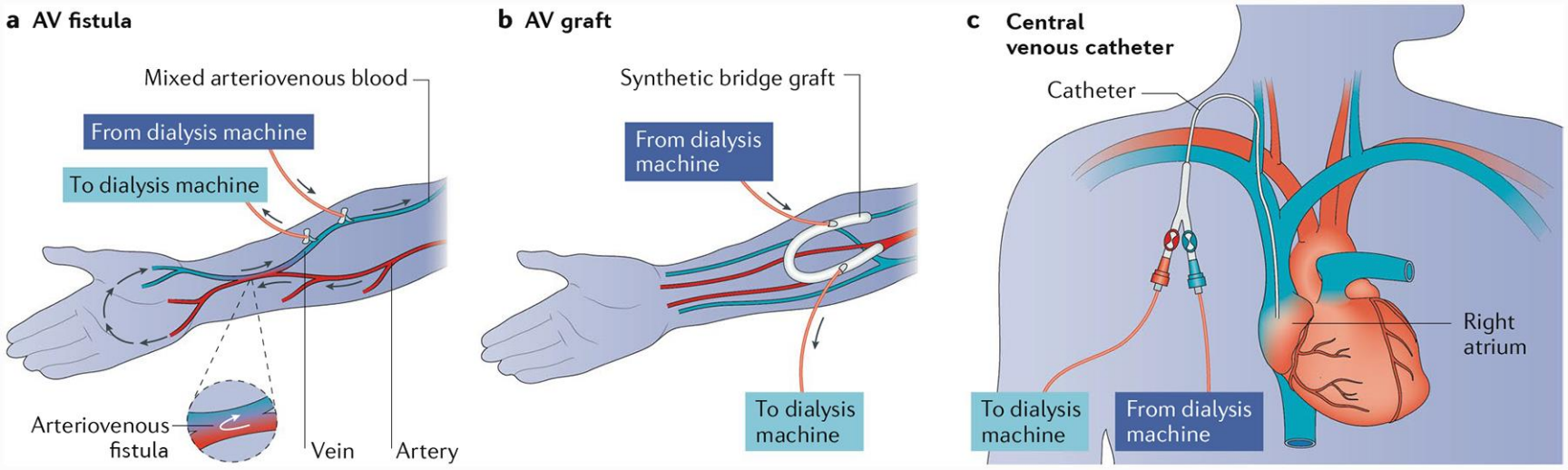
Scribner In Service
March 27, 2023

- Vein anatomy
- Types of fistulas and grafts
- Stenosis complication
- Fistulogram
- Duplex ultrasound
- Goal is to maintain the flow

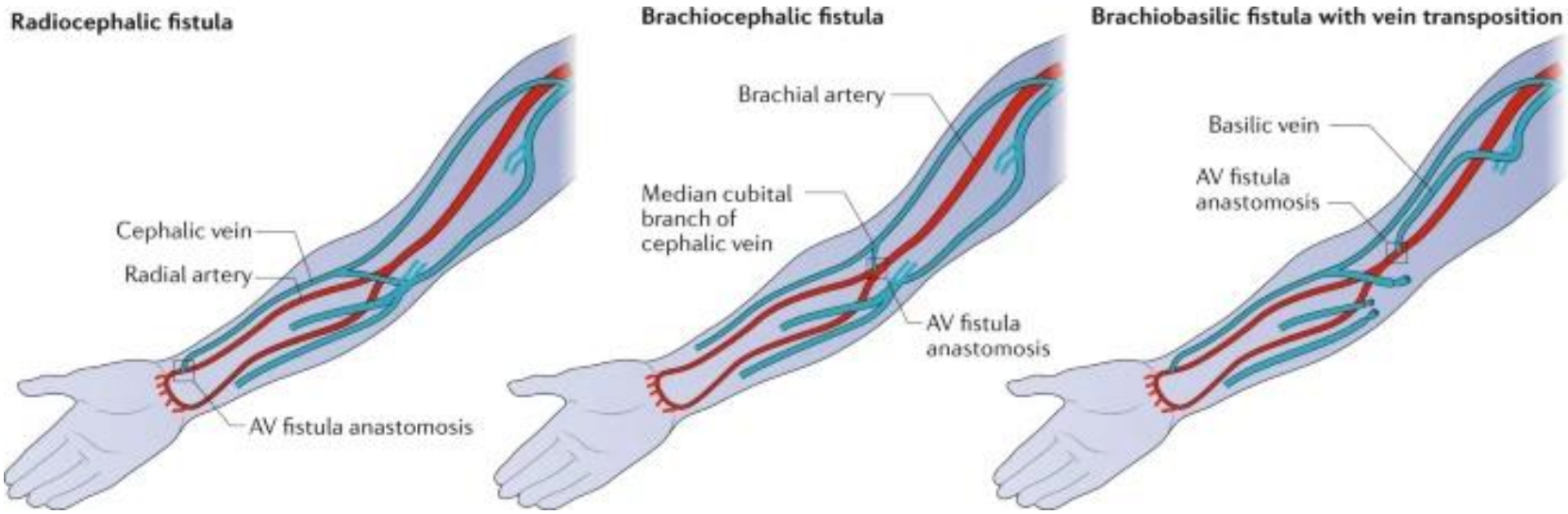
Upper extremity vasculature



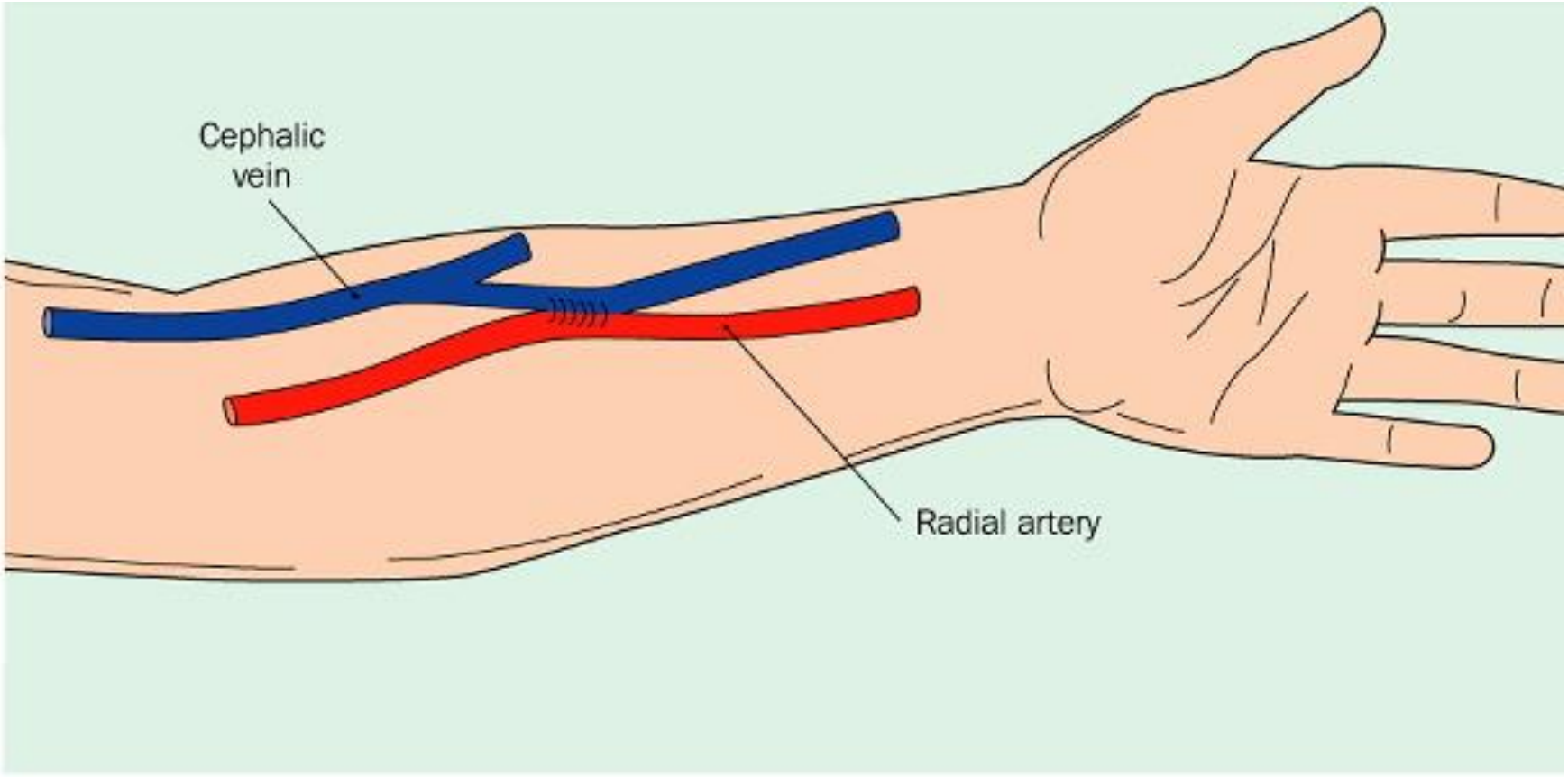


Nat Rev Nephrol, 2020 Oct;16(10):586-602.

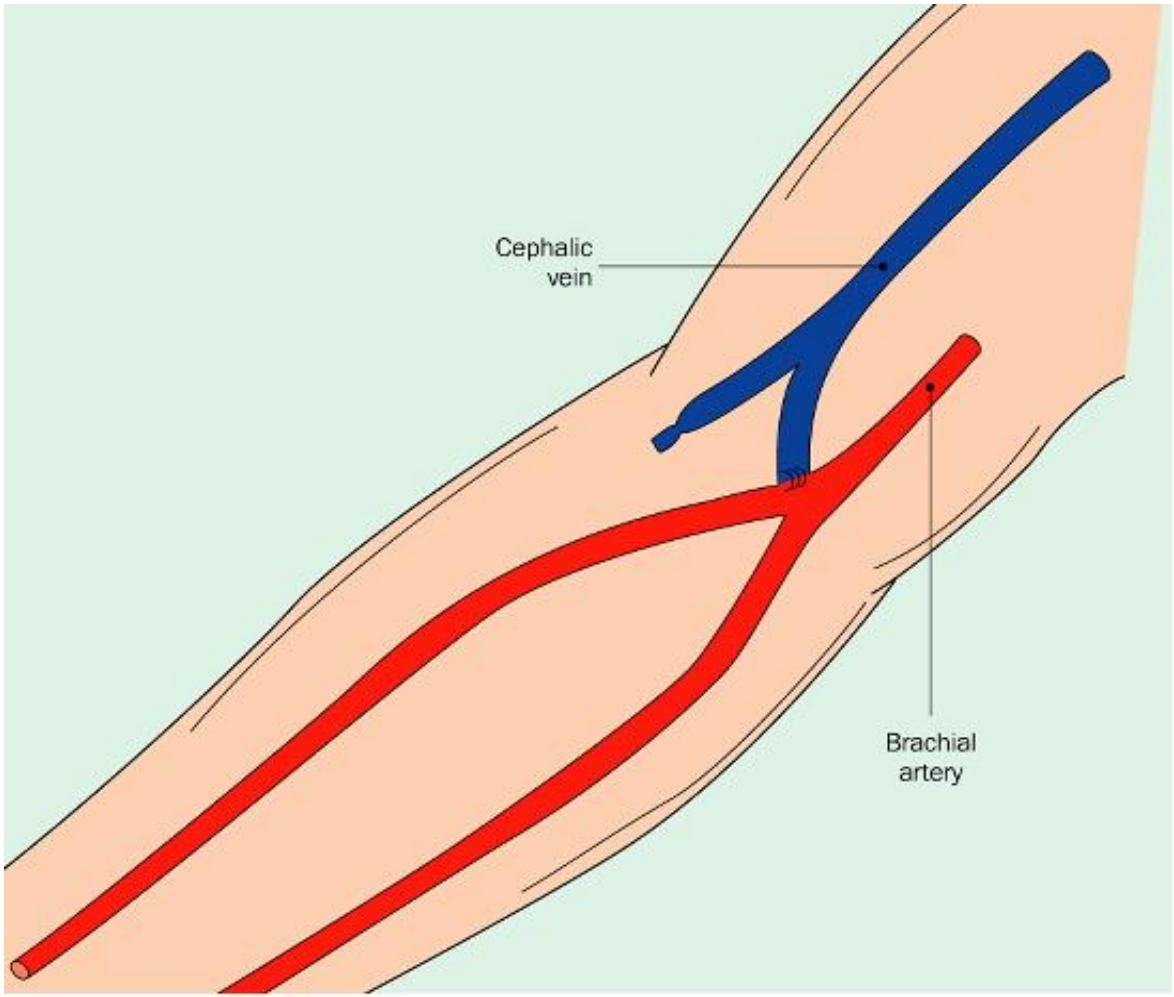
Types of Fistulas



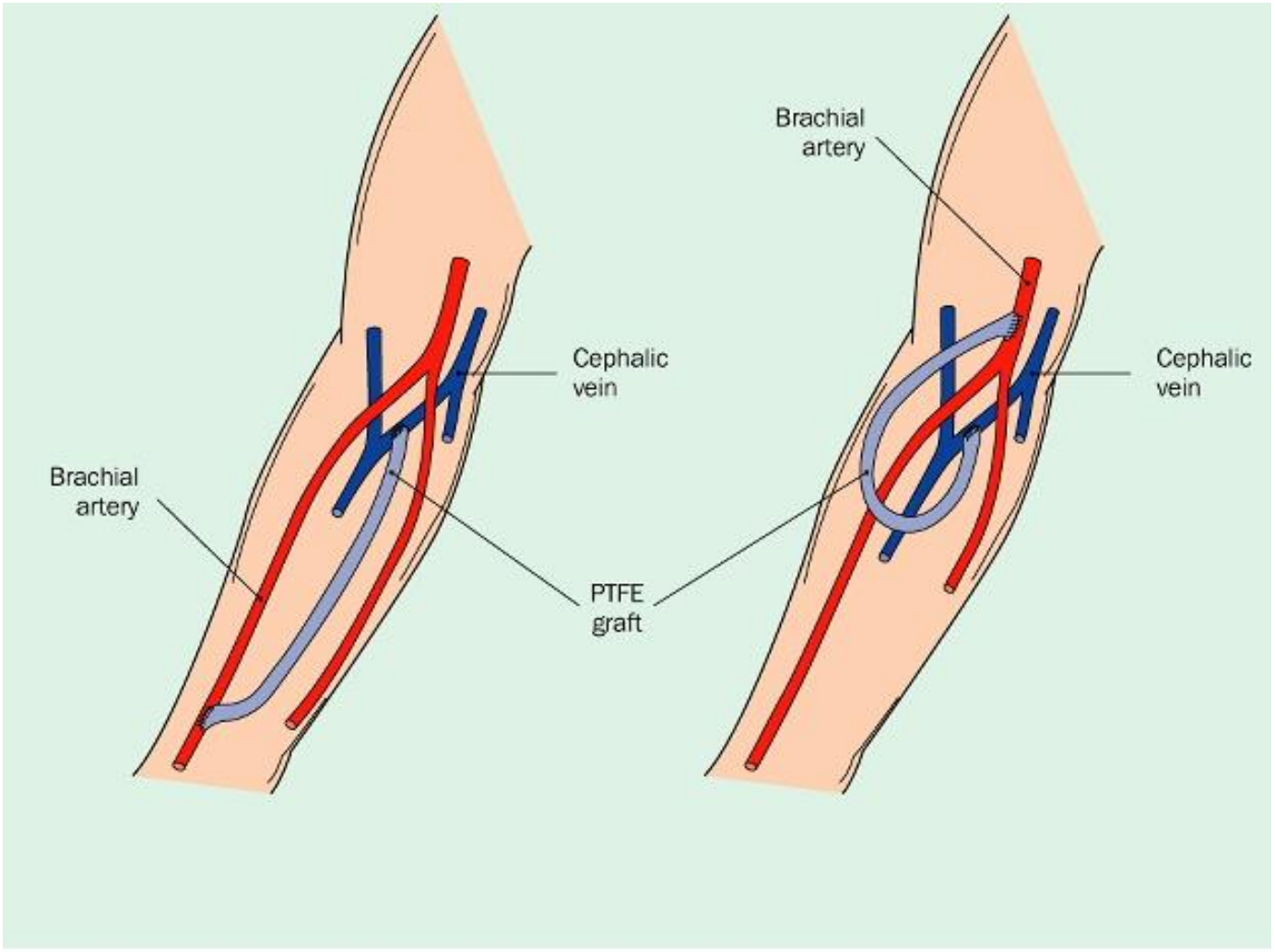
Radiocephalic fistula



Brachiocephalic fistula



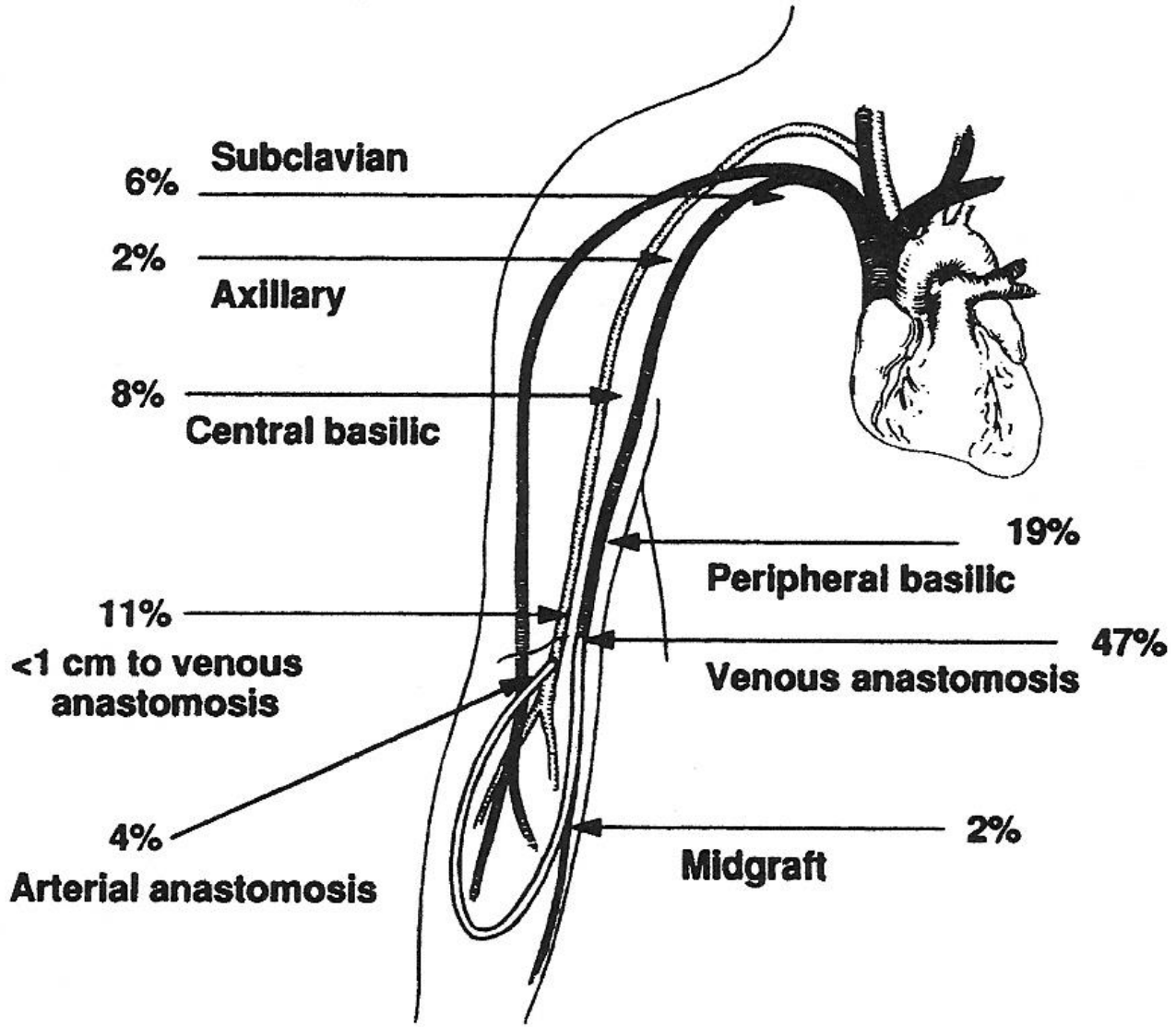
Arm grafts



Causes of graft loss

- Infection
- Pseudoaneurysm
- Perigraft hematoma or seroma
- Anastomotic stenosis
  - Venous anastomosis in 85%
- Graft thrombosis

Stenosis locations



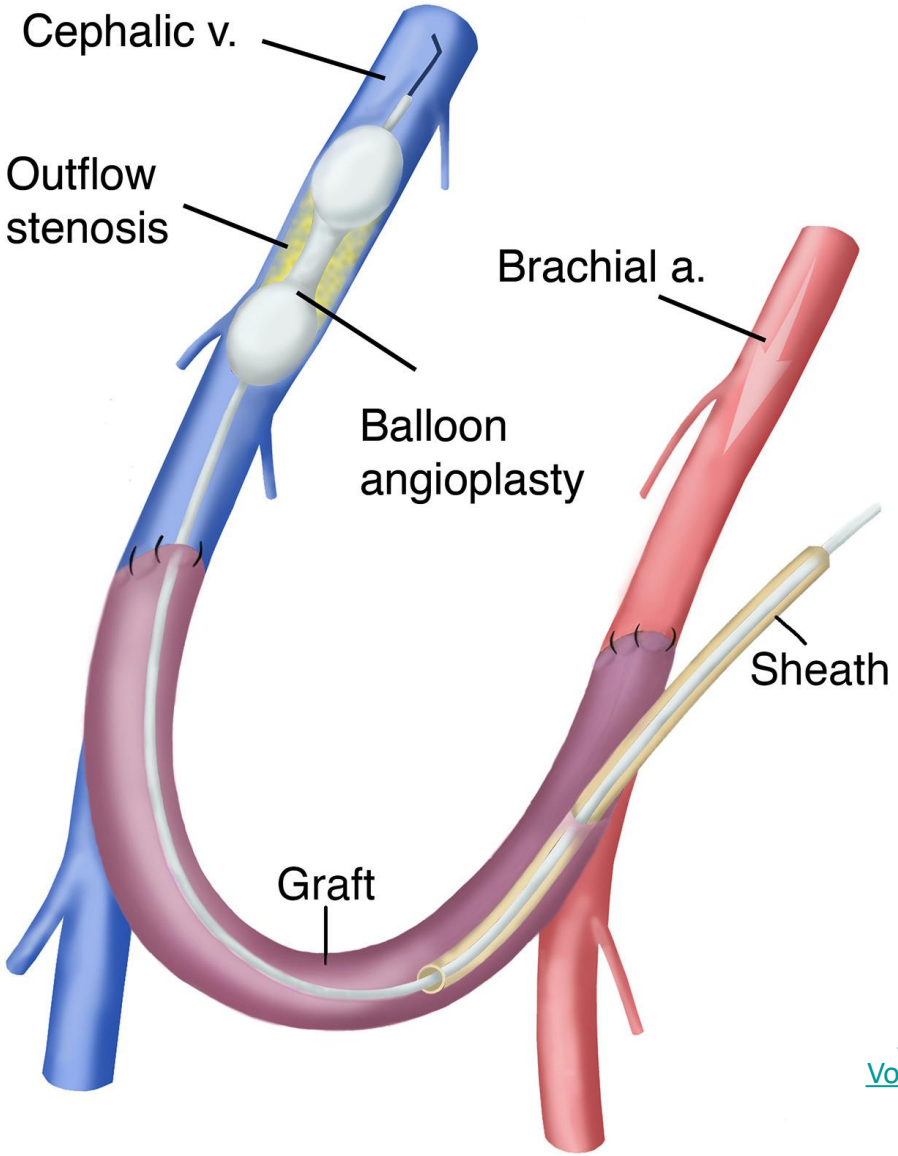
Indications for fistulography

- Prolonged bleeding
- Access-side edema
- Pain in arm during dialysis
- Elevated venous pressures
  - Increasing trend
  - >100-150 with Qb 200
- Excessively negative arterial pressures
- Difficult cannulation
- Clot aspiration

Fistulogram

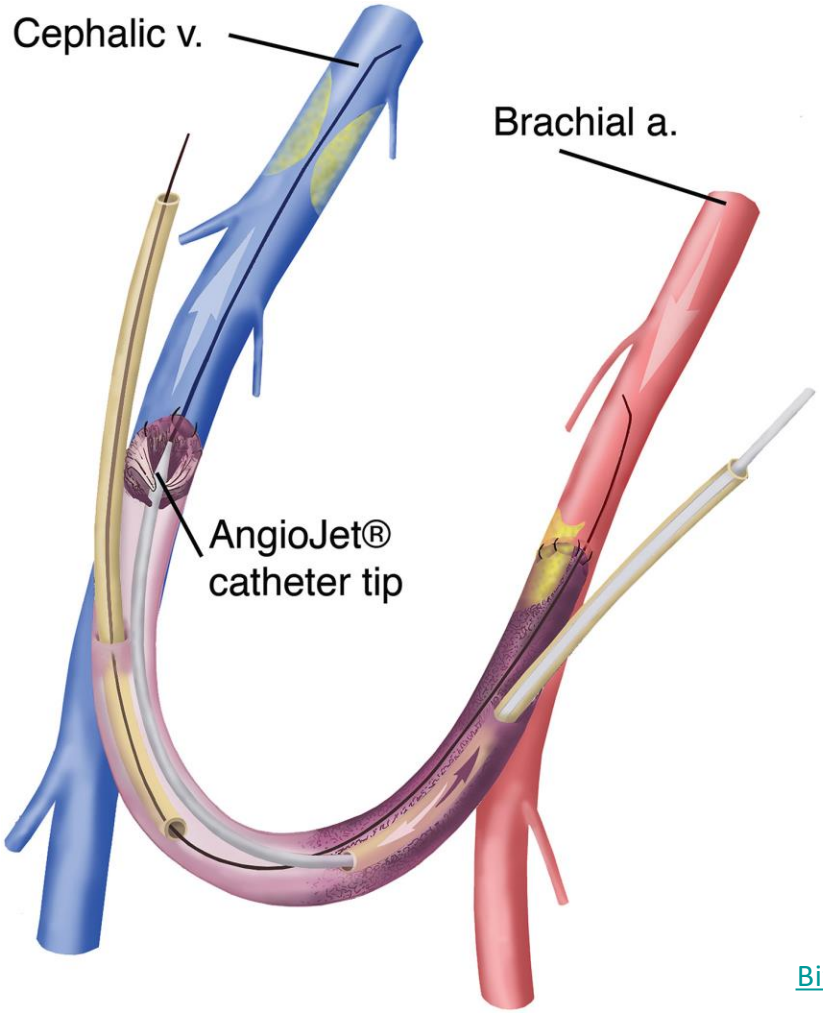
- Needle inserted near apex
- dilute dye injected (5-10 mL)
- Venous outflow imaged
- BP cuff inflated arterial anastomosis imaged
  - Angioplasty as indicated
    - >50% narrowing
  - Needle changed over a wire for a sheath and balloon wire advanced

Balloon Angioplasty



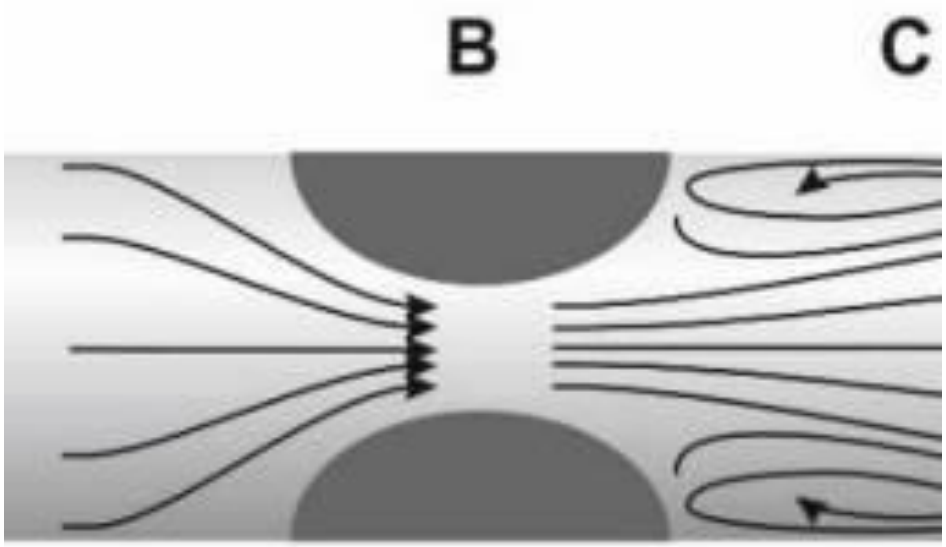
JACC: Cardiovascular Interventions
Volume 3, Issue 1, January 2010, Pages 1-11

Declot



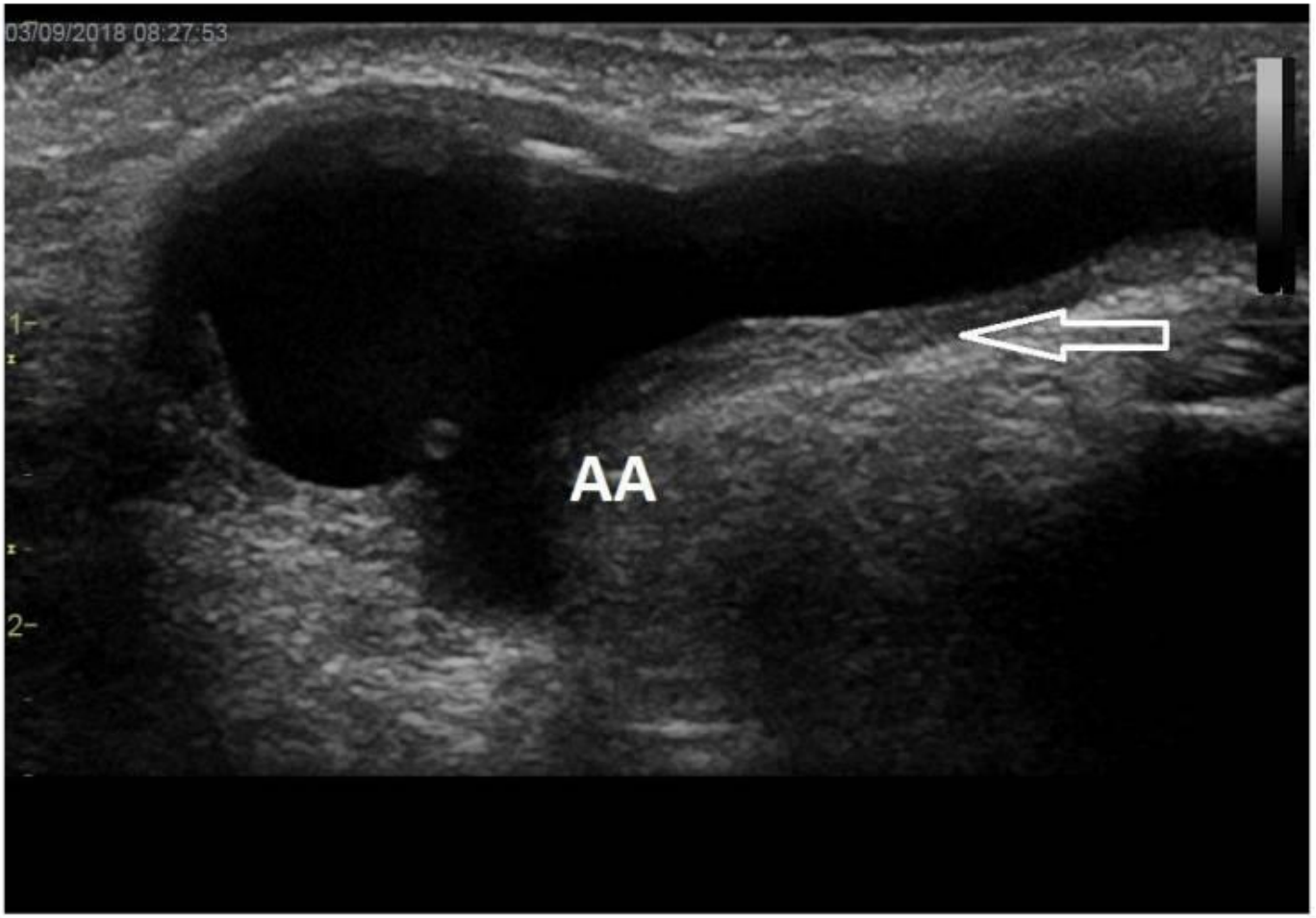
Bittl, JACC: Cardiovascular Interventions Volume 3, Issue 1, January 2010, Pages 1-11

Duplex ultrasound



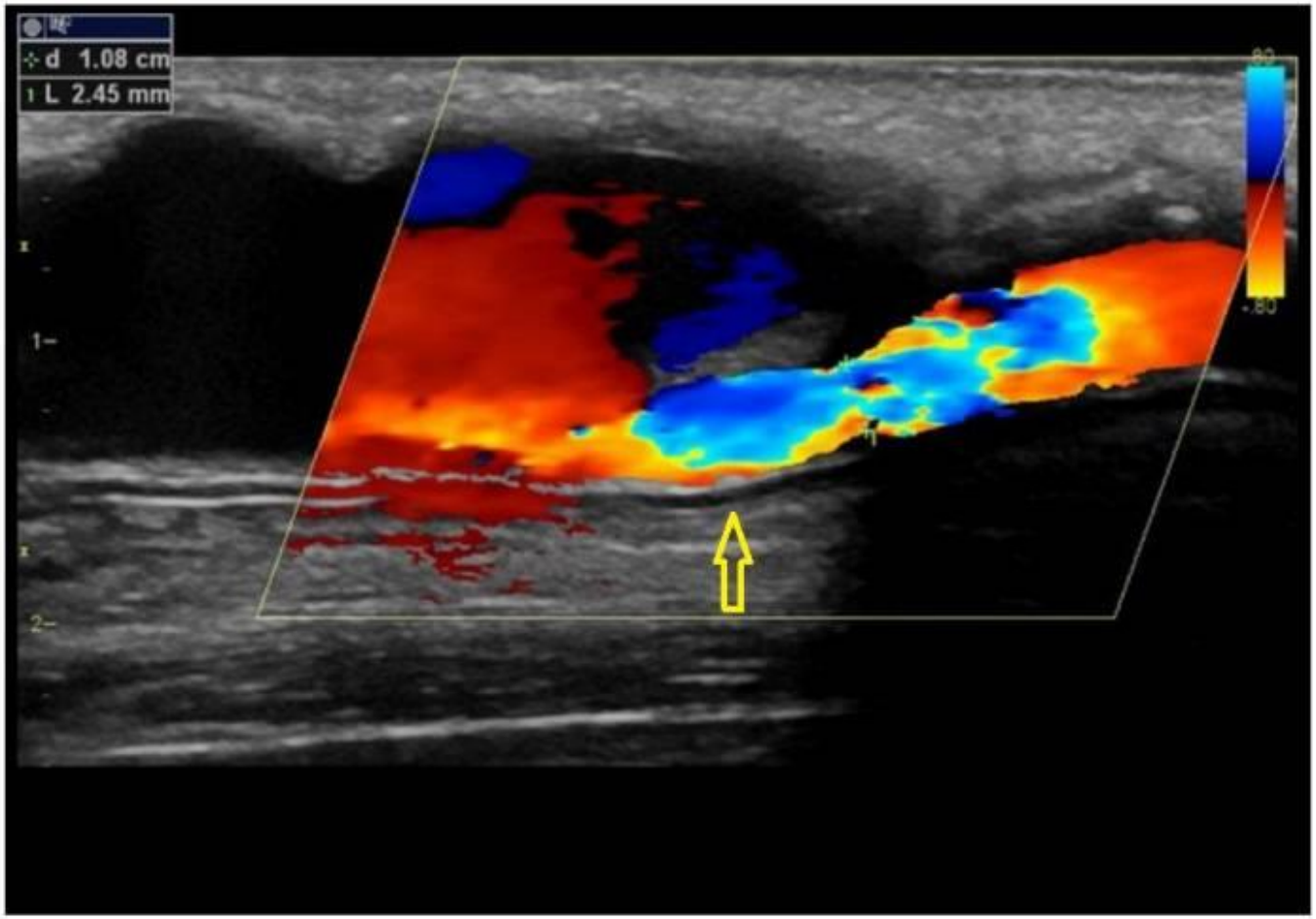
Malik et al, Diagnostics(Basel). 2022 Aug; 12(8): 1979

Duplex

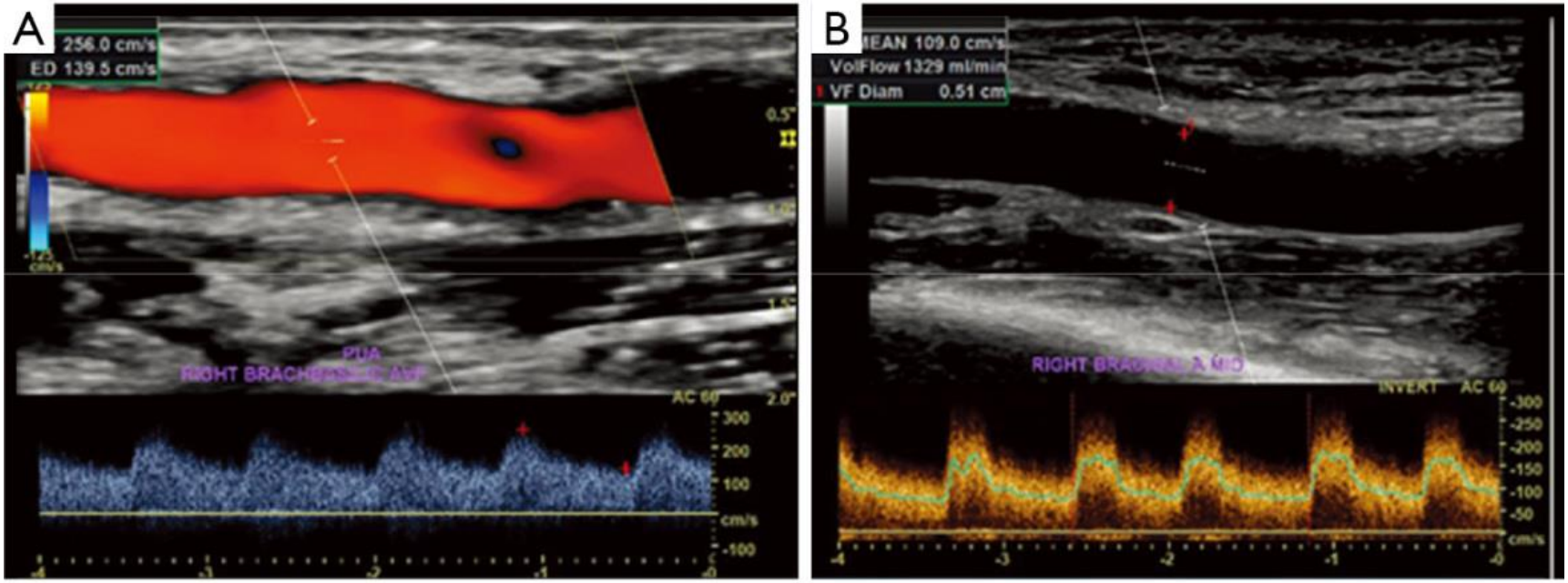


Malik et al, Diagnostics(Basel). 2022 Aug; 12(8): 1979

Duplex



Malik et al, Diagnostics(Basel). 2022 Aug; 12(8): 1979



Saati, et al. Cardiovasc Diagn Ther. 2023 Feb 28;13(1):190-195

SIGNIFICANT	BORDERLINE
Main criteria	
Diameter reduction by >50%	
Peak systolic velocity increase > 2–3x	
+Additional criteria (≥1)	
Residual diameter < 1.9–2.0 mm	
Flow volume decrease by >25% *	
Flow volume < 600 mL/min for AVGs, <500 mL/min for AVFs	

Complex ultrasound criteria of a significant vs. borderline stenosis.

Legend: Two main criteria and at least one additional criterion characterized a significant stenosis. If only 1–2 main criteria are present, the stenosis is borderline, and re-evaluation is indicated within 6–8 weeks. Significant stenoses are indicated to correction. * Flow volume decrease by >25% if the previous value was <1000 mL/min. Stenoses characterized by none or only 1 main criterion are considered non-significant.

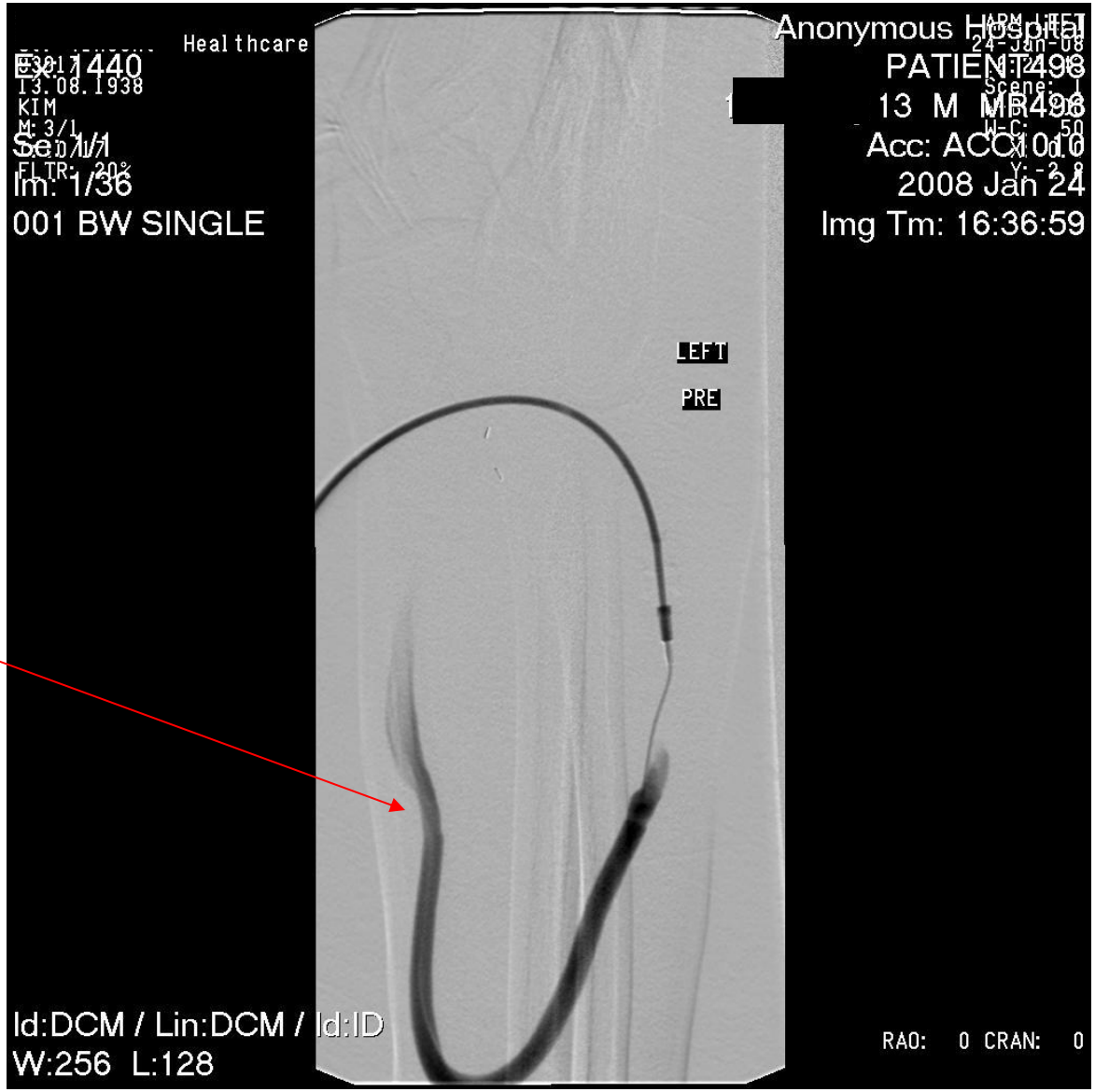
Malik et al, Diagnostics(Basel). 2022 Aug; 12(8): 1979

AVF or AVG stenosis			
Patent	Absence of significant velocity shift or stenosis (i.e., <50%)		
For lesions within AVF or AVG or at venous anastomosis			
50–99% stenosis	2:1 ratio or PSV doubling from the proximal adjacent segment with visual narrowing on grey scale and/or color image		
For lesions at arterial anastomosis only of AVF or AVG			
50–99% stenosis	3:1 ratio or PSV tripling from the inflow artery approximately 2 cm upstream from arterial anastomosis		
Volume Flow			
	Adequate	Marginal	Inadequate
AVF	>700 mL/min	500–700 mL/min	<500 mL/min
AVG	>800 mL/min	600–800 mL/min	<600 mL/min

Duplex vs Fistulogram

- Duplex is noninvasive
- Duplex gives information about flow
- Fistulogram involves vessel trauma
  - Hammer/nail phenomenon
- Done for less obvious problems

Brachiocephalic AVG



Venous anastomosis

Brachiocephalic AVG

Venous outflow stenosis

Brachiocephalic AVG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Anonymous Hospital
PATIENT498
M MR498
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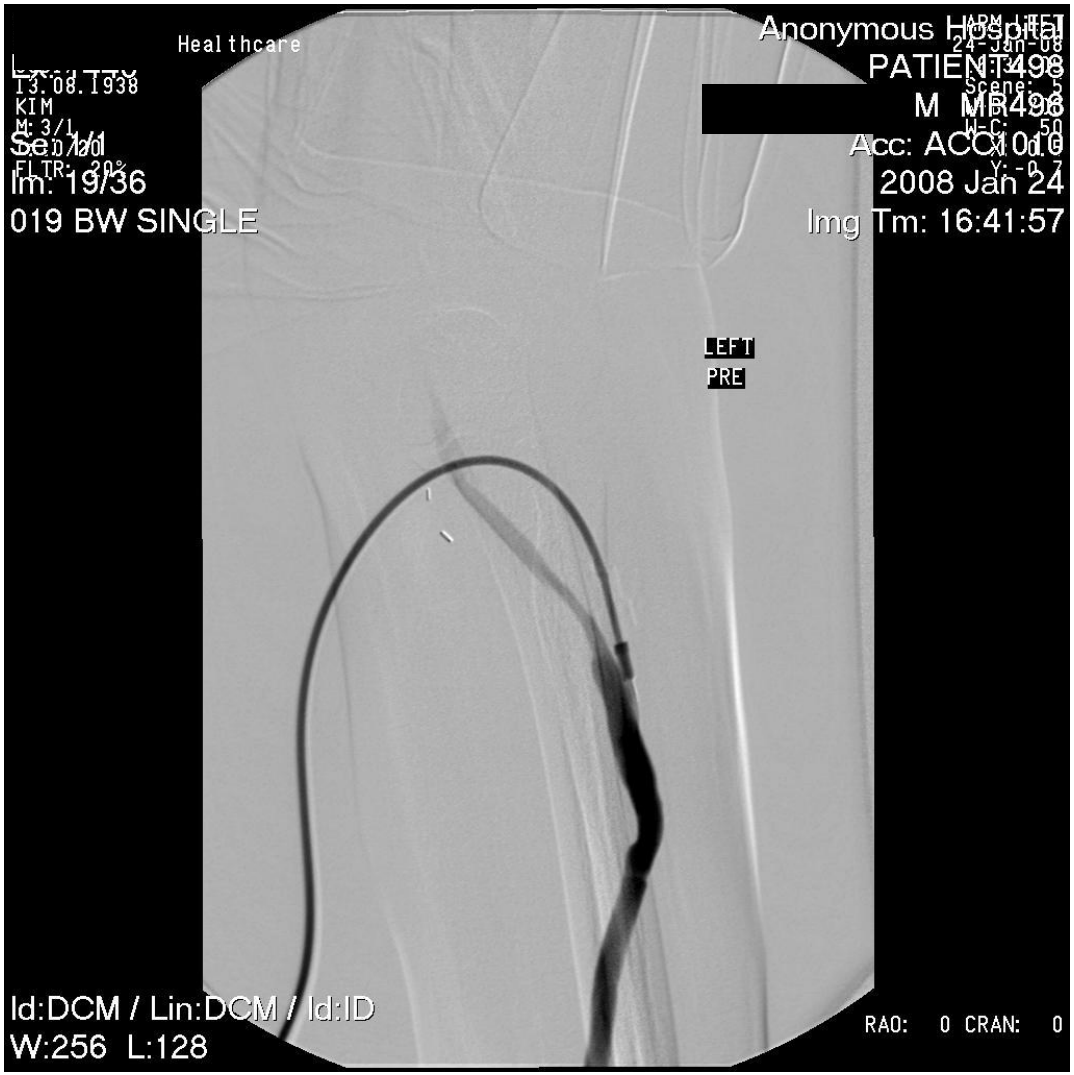
Reflux into arterial anastomosis

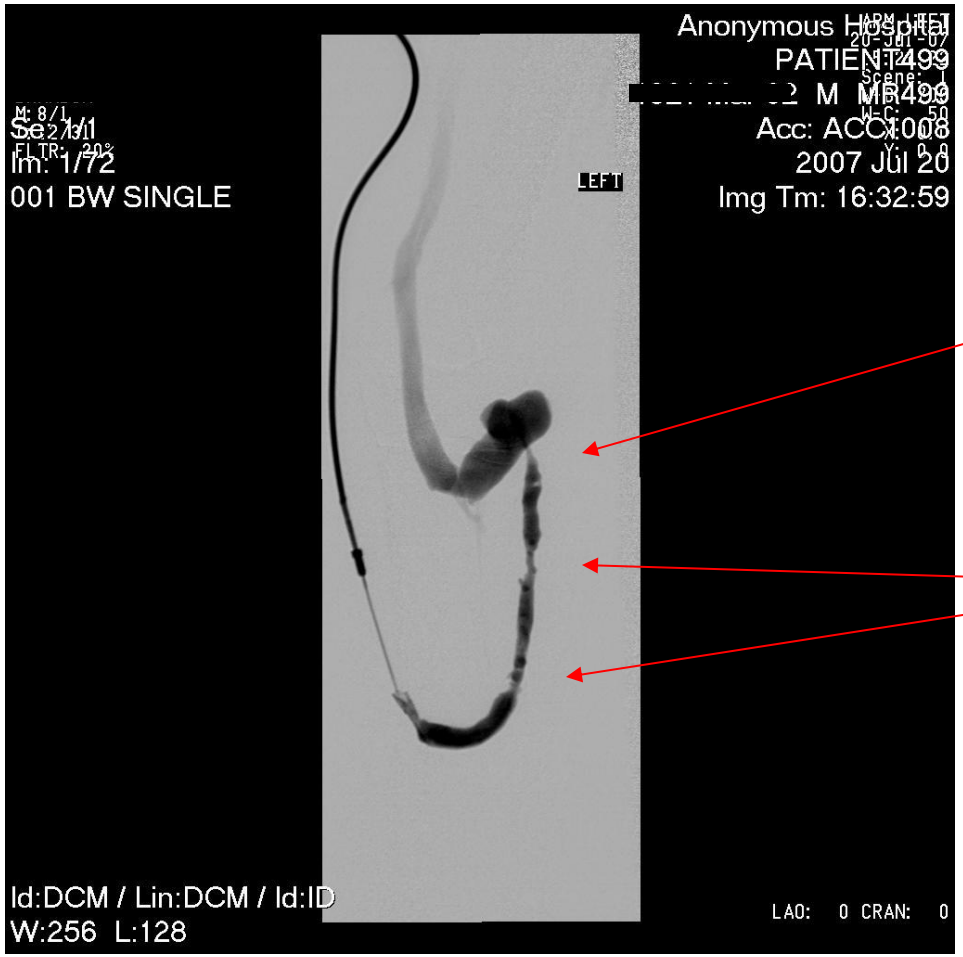


Arterial inflow

angioplasty

Post-angioplasty

Brachiobasilic AVG



Venous anastomosis

Venous limb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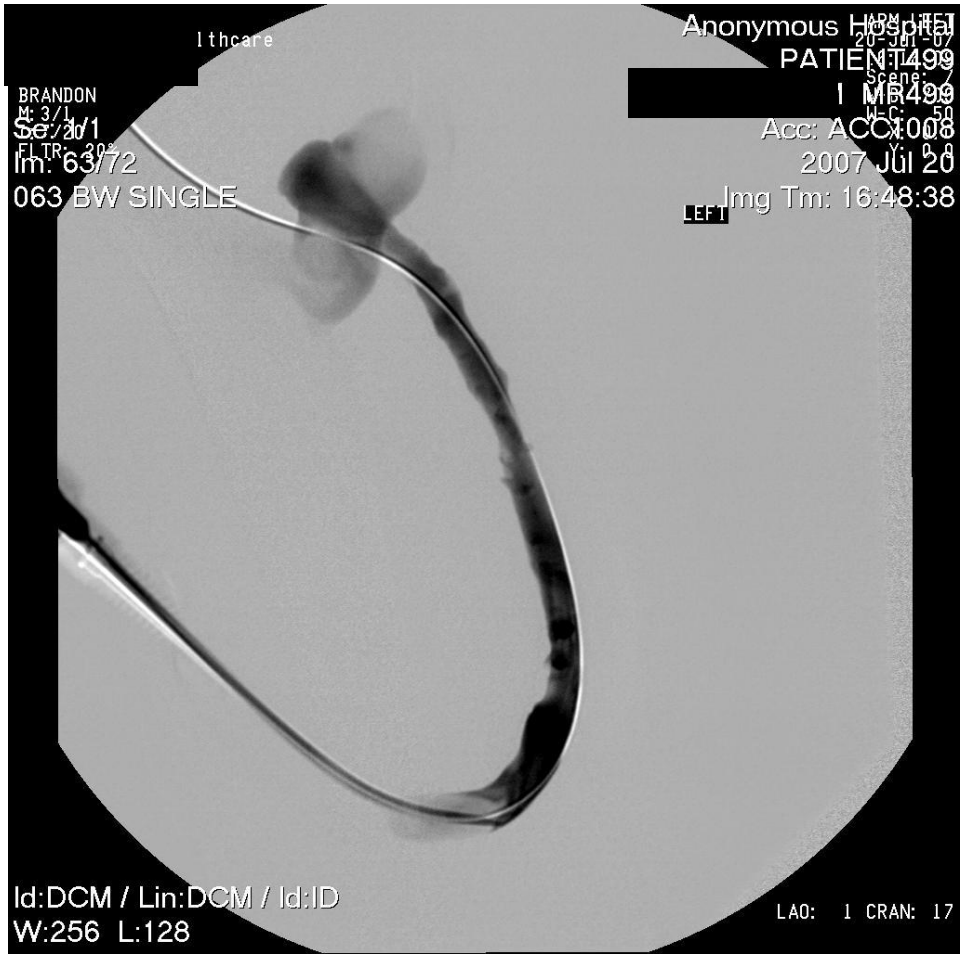
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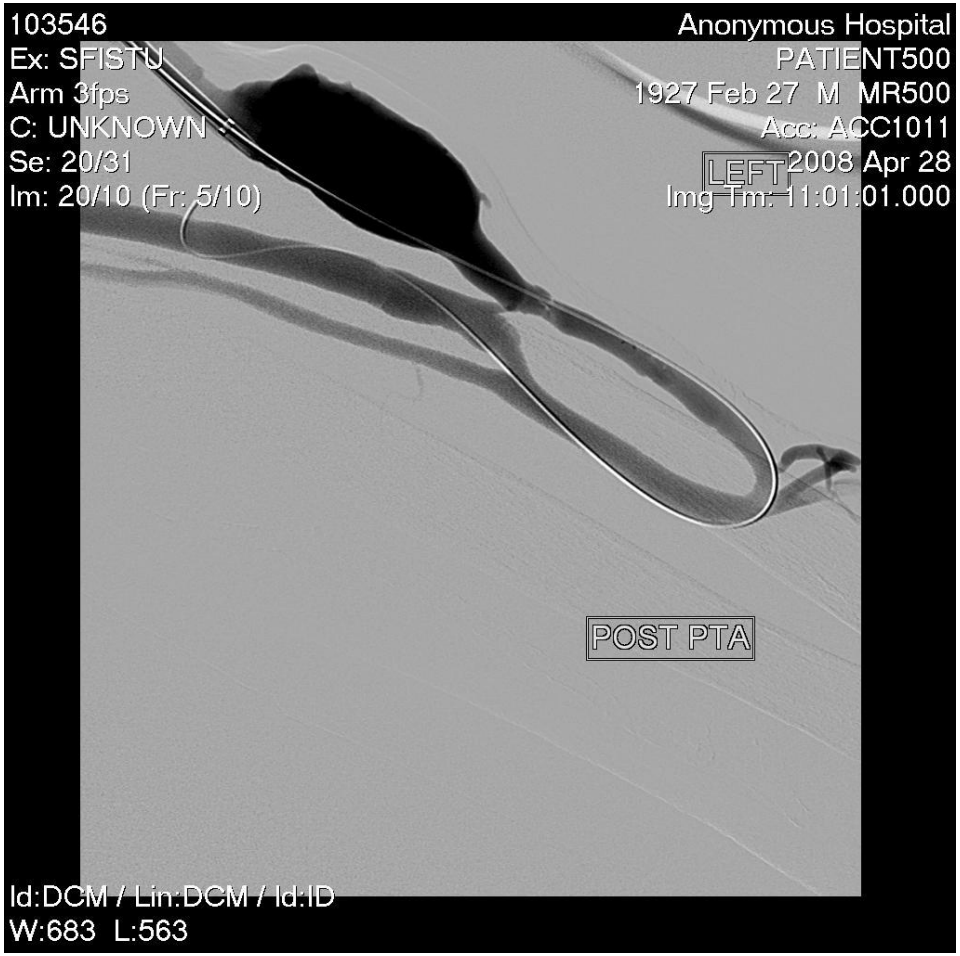
Post angioplasty

Brachiocephalic AVF

Brachial artery

Post angioplasty



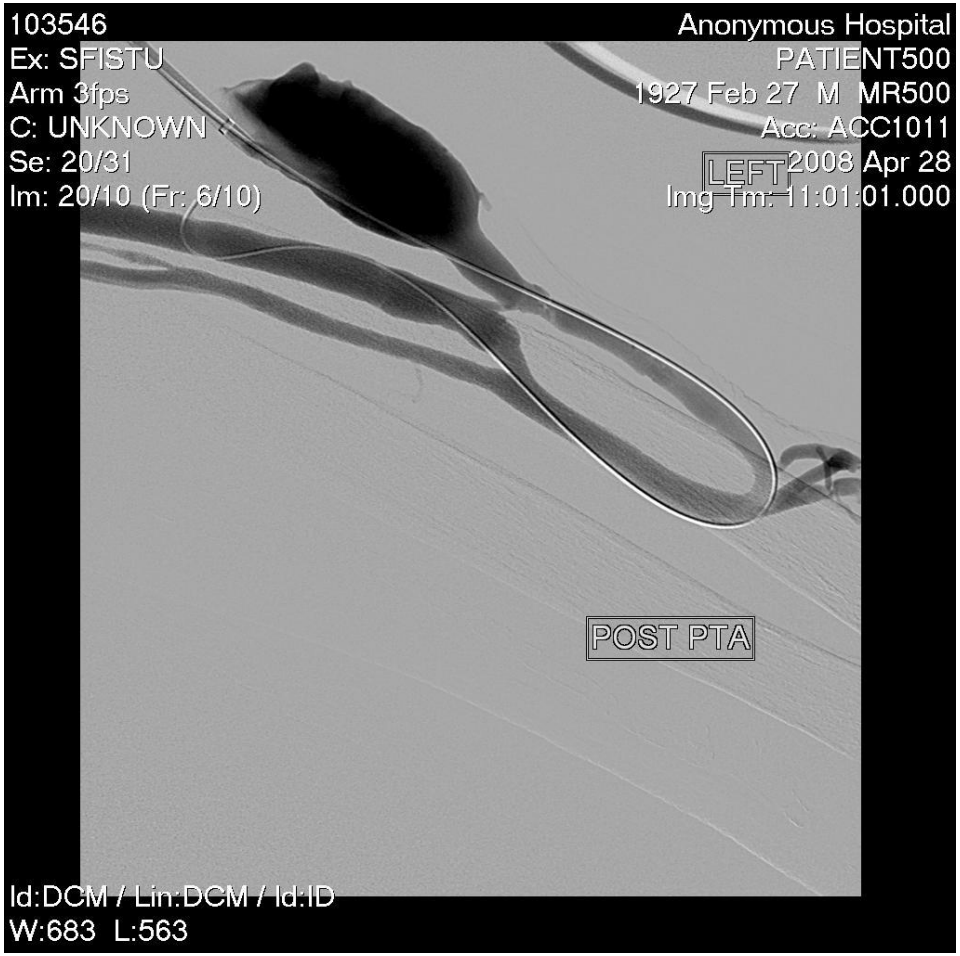

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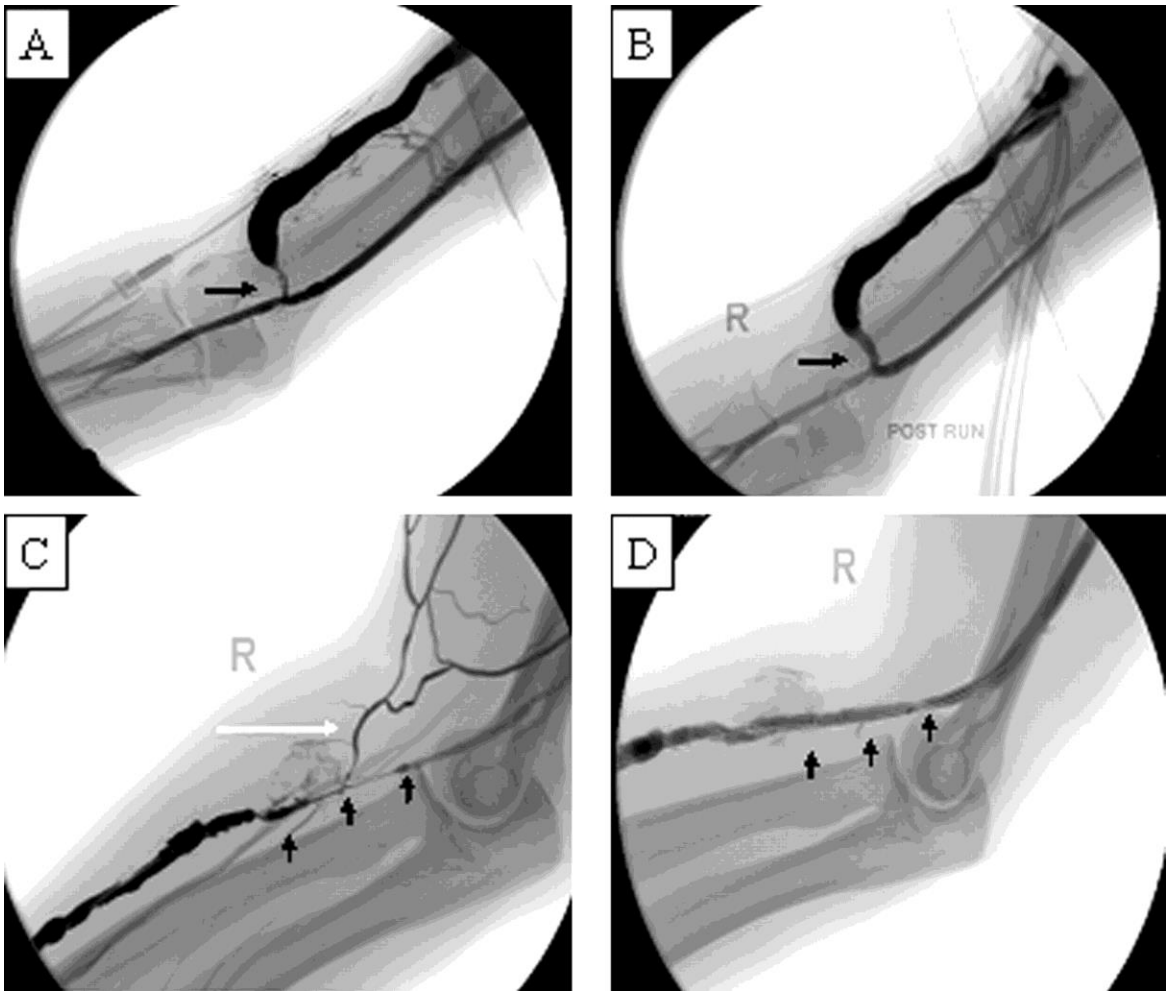
Figure 1. A sample of two vascular lesions that were encountered during salvage procedures on "failing to mature" arteriovenous fistulas (AVF)



Nassar, G. M. et al. Clin J Am Soc Nephrol 2006;1:275-280

CJASN

Take home points

- Goal is to keep the access functioning
- Call nephrologist's office when you see problems
- Telling a patient to go see their surgeon usually not appropriate