After the Thrill is Gone

Minimally Invasive Options for Salvage, Maturation and Treatment of Hemodialysis Access

Rishi Razdan, M.D.

CONNECTICUT IMAGE GUIDED SURGERY

White Plains Vein & Vascular

After the Thrill is Gone

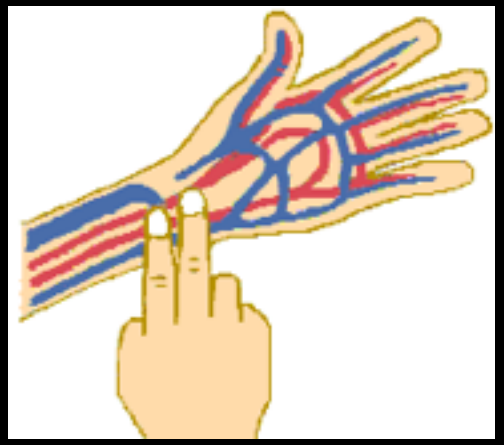
Minimally Invasive Options for Salvage, Maturation and Treatment of Hemodialysis Access

I. Physical Exam

II. Diagnosis

II. Intervention

IV. Recommendations

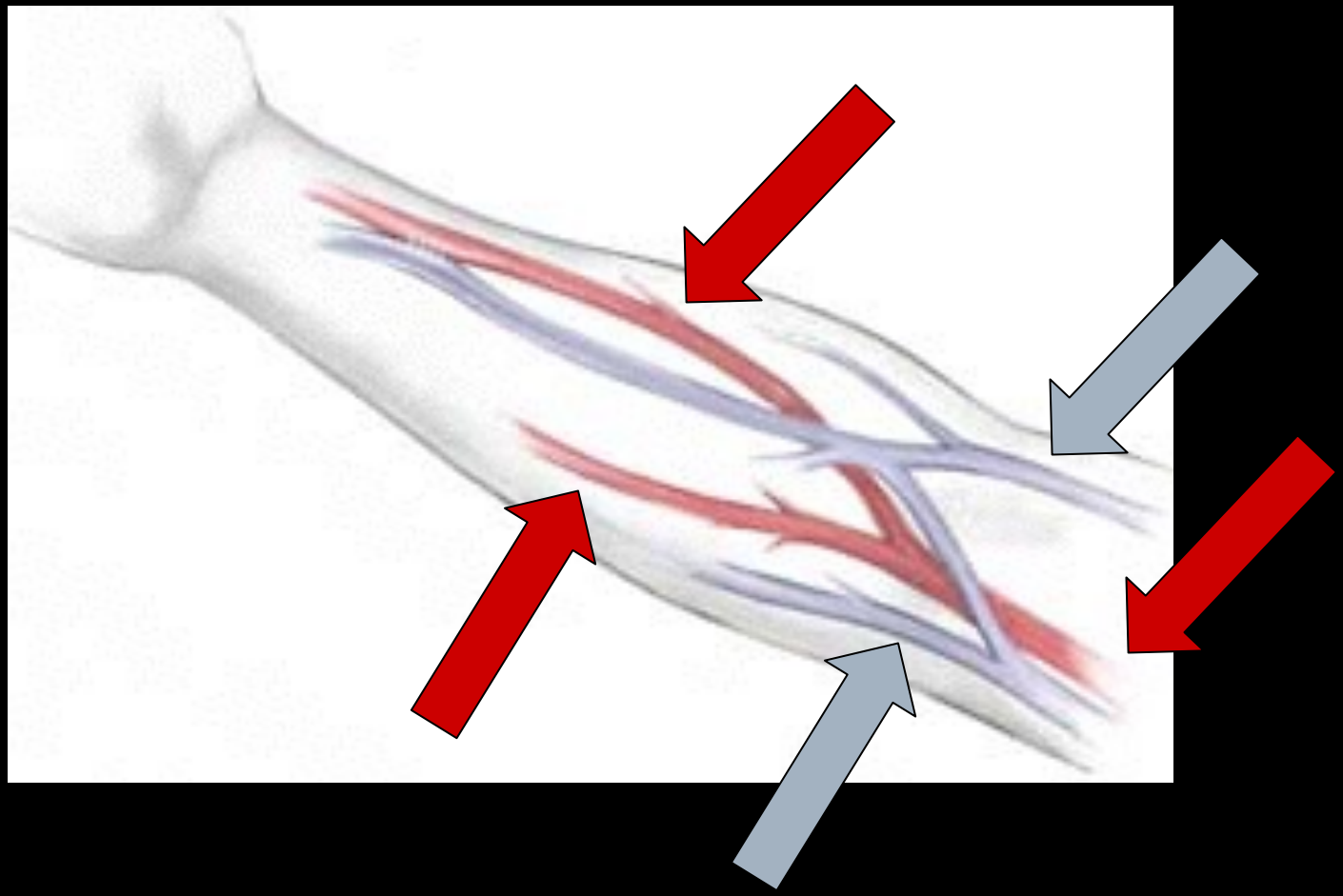


What is the most under utilized method of AVF assessment?

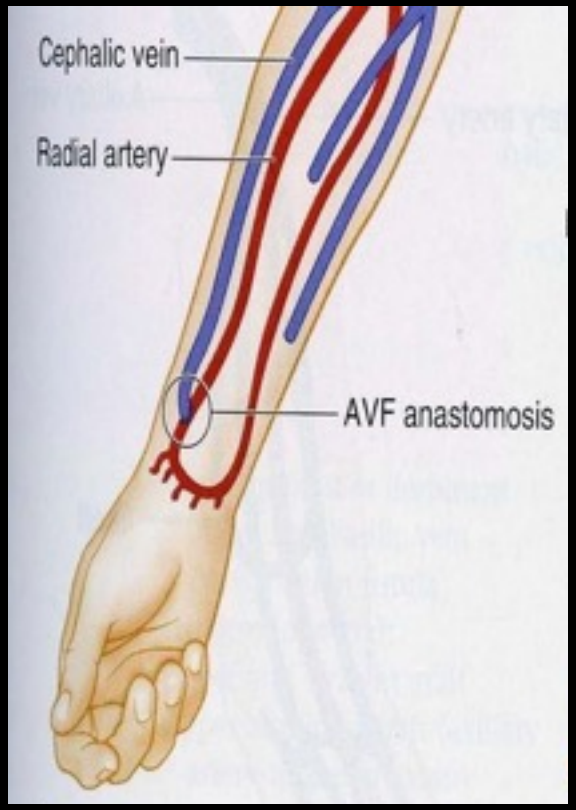
I. Physical Exam

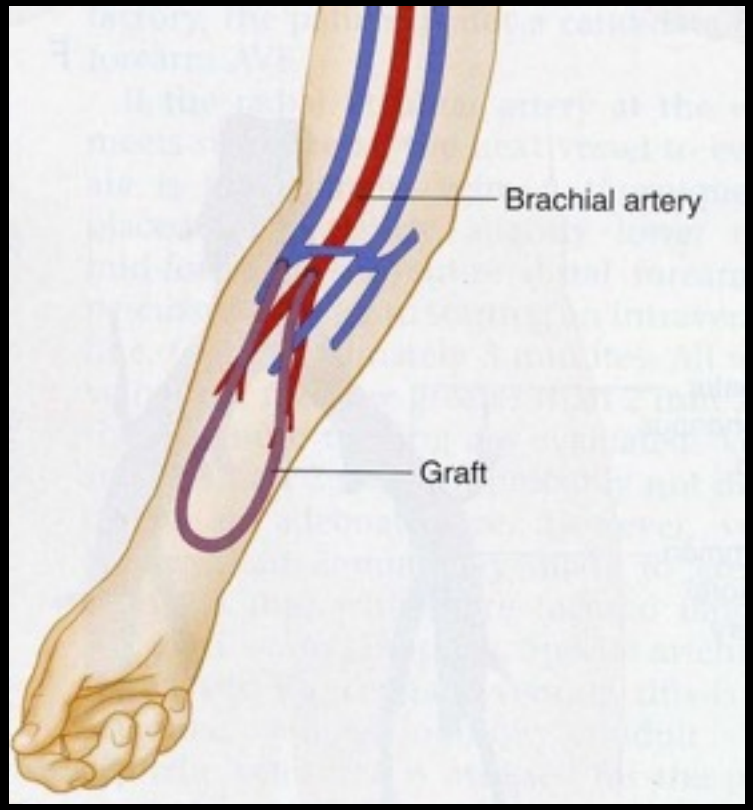
Are we Thrilling?

Vascular Anatomy



What type of Access?





Inspect

- Compare to other extremity
- Skin Color/Temperature
- Skin Integrity
- Edema
- Wound Healing
- Accessory Veins
- Cannulation Areas
- Aneurysms

Listen to the Patient & the Access

- Question the patient about their access
  - Changes
  - Pain
  - Bleeding/Drainage
  - Numbness
  - Temperature
- Listen to the Access
  - Bruit vs Pulse

Auscultation

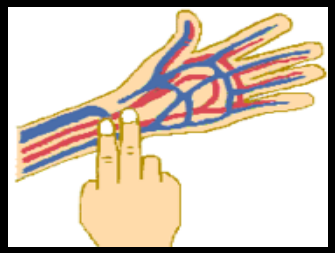
The Bruit

- Normal bruit is a continuous, soft, low pitched, swishing sound
- Is heard along the entire body of the vein.

Listen for changes in characteristics:

- Continuous to Discontinuous
- Soft low pitched swishing to High pitched or Shrill
- Absence

Palpate – Touch!



Pulses

- To assess inflow problems, the character of the radial and brachial pulses should be assessed.
- Markedly decreased or absent arterial pulse is indicative of potential access failure.

Temperature

- Warmth = possible infection
- Cold = decreased blood supply

“THE THRILL”

- VERY IMPORTANT
- Should be present at the anastomosis
- Diminishes minimally as you move up from the anastomosis
- Thrill can be felt at the site of a stenosis

II. Diagnosis of Access Complications

Evaluate for Complications

Diagnose

- Redness
- Drainage
- Poor Healing

} Infection

- Skin Color
- Edema
- Small Blue or Purple Veins
- Palpation?

} Central or Outflow Vein Stenosis

- Absent Thrill

} Thrombosis

- Poor Thrill

} Immature AVF

- Hands:
  - Cold
  - Painful
  - Numb
- Fingers:
  - Discolored
  - Lesions

} Steal Syndrome

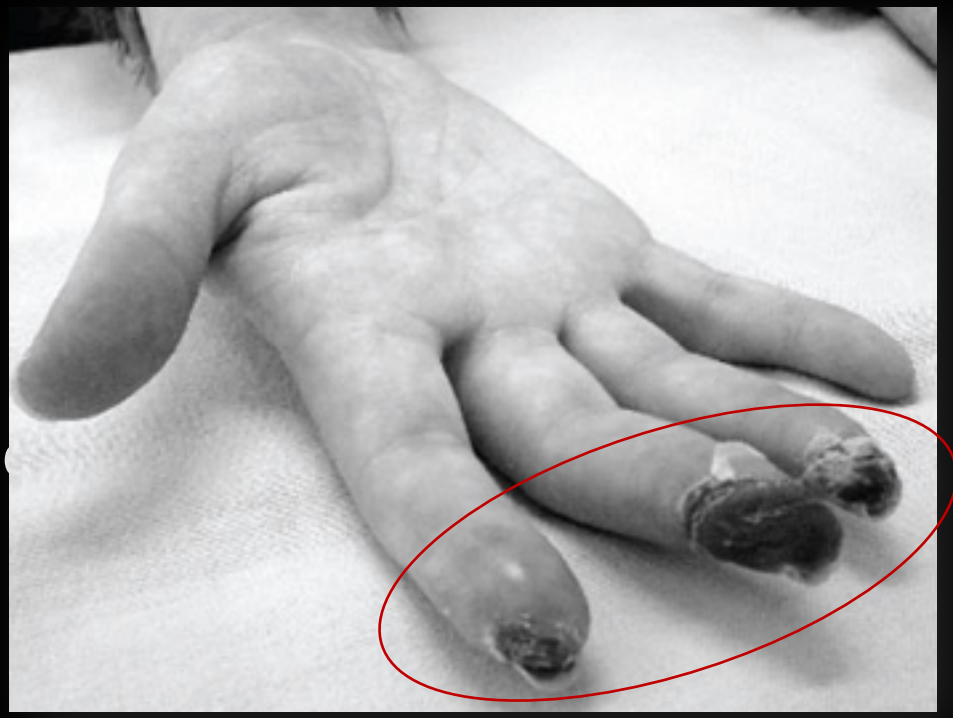
- Cannulation sites:
  - Over used
  - Under used
- Aneurysms

} Use of Access

Diagnose

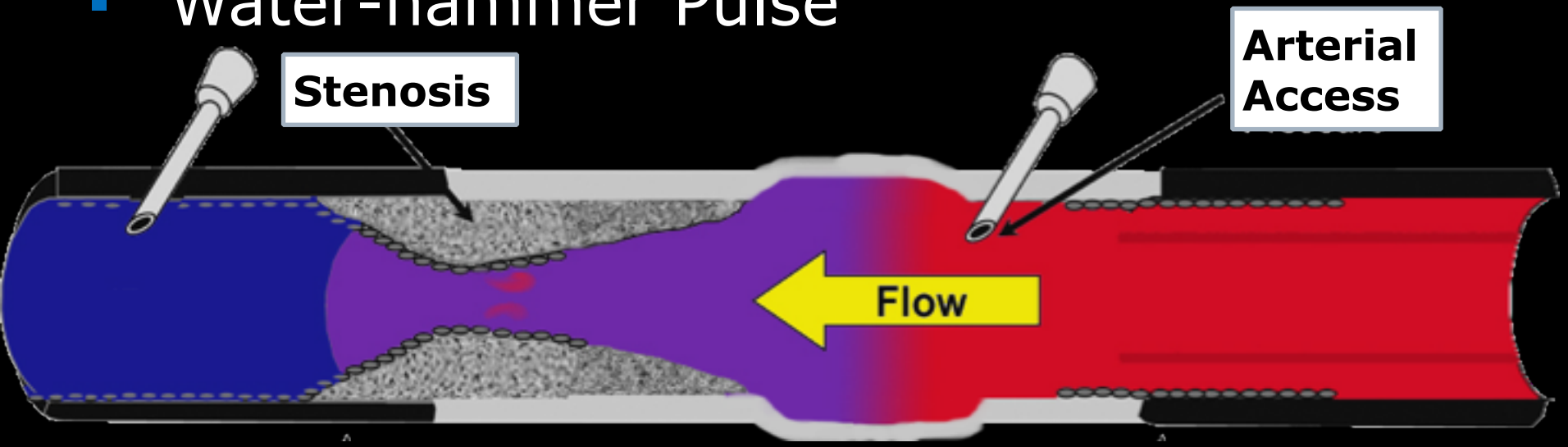
1. Steal Syndrome

- Decreased blood supply to the hand
- Hand will be cold
- Causes hypoxia (lack of oxygen) to the tissues of the hand resulting in severe pain and nail bed discoloration.
- Neurologic damage to the hand can occur resulting in mobility limitations.
- Most evident during dialysis



2. Stenosis

- Palpation on inflow side of stenosis will have increased tension (pulsatile)
- Palpation on outflow side of stenosis will have decreased tension (diminished)
- Water-hammer Pulse



Traffic Jam

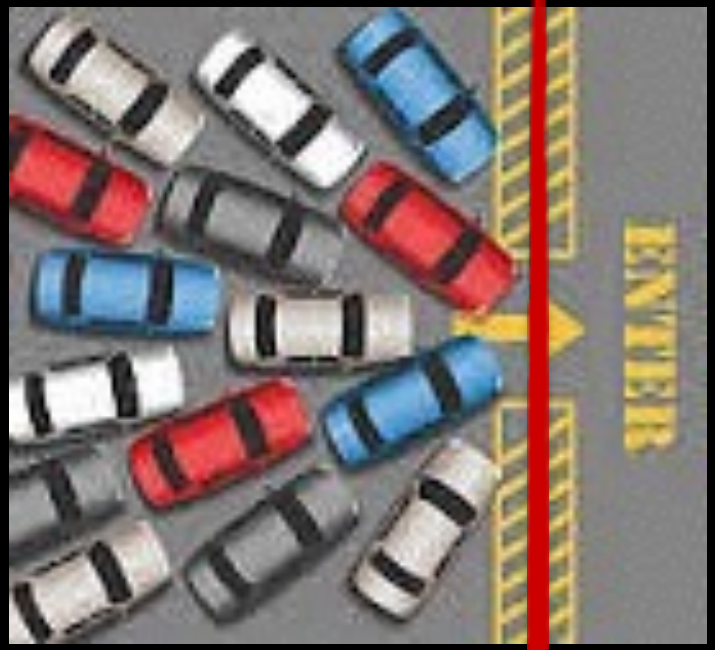
Fistula Jam

Stenosis

Diagnose

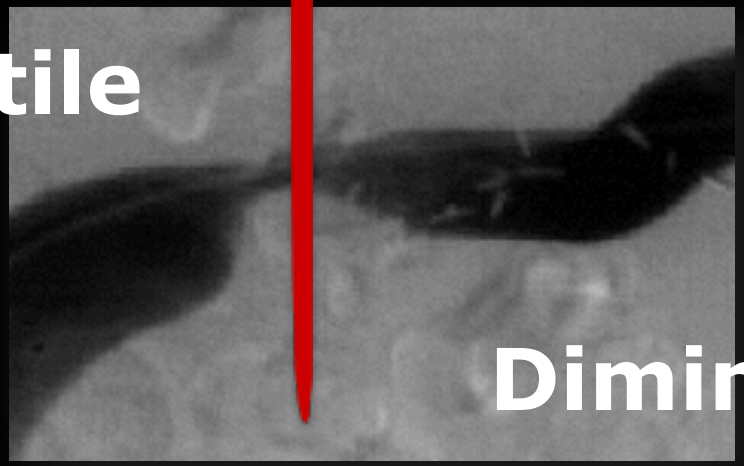
Pulsatile

Diminished



Flow

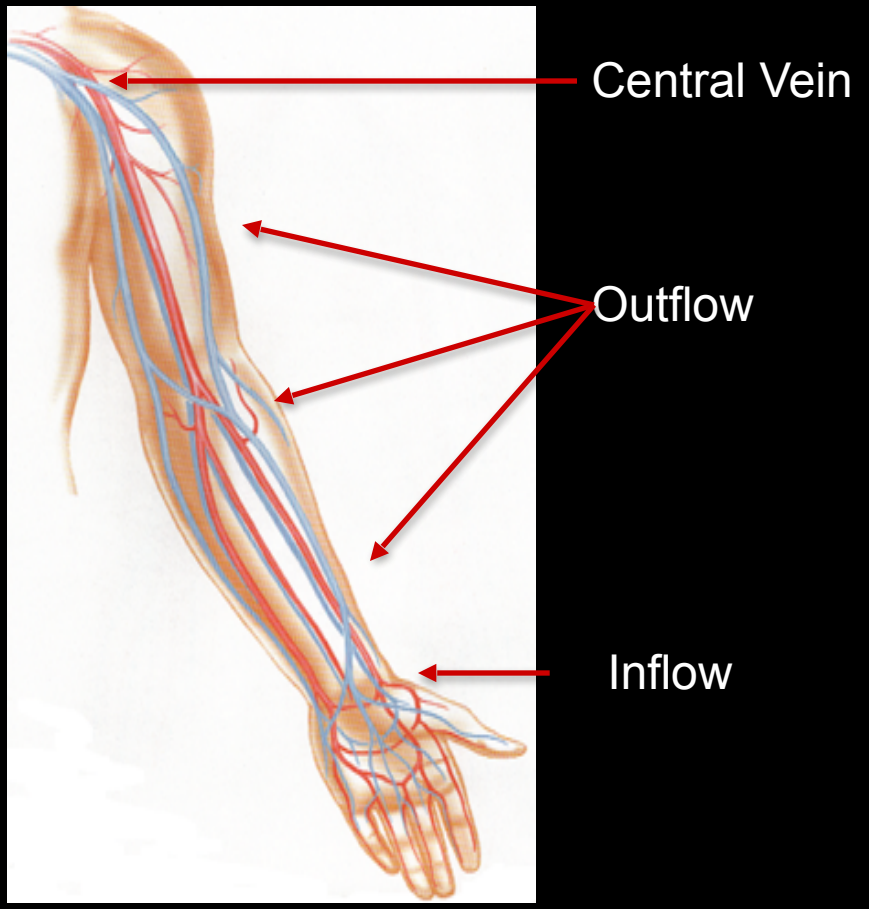
Pulsatile



Diminished

Types of Stenoses and Their Presentations

- Central Vein
  - Arm swelling
  - HVP
  - Thrombosis
  - Low Flows
- Outflow
  - HVP
  - Thrombosis
  - Low Flows
  - Difficulty Cannulating
  - Recirculation
  - Prolonged bleeding
- Inflow
  - HAP
  - Low KT/V (kinetics)
  - Low Flows



Causes of Stenosis

- Injury during surgical creation
- Needle stick injury to vessel wall
- Shear stress / turbulent flow
- Previous CV catheterization
- Fibrosis
- Valve
- Iatrogenic – Poorly sized stent **

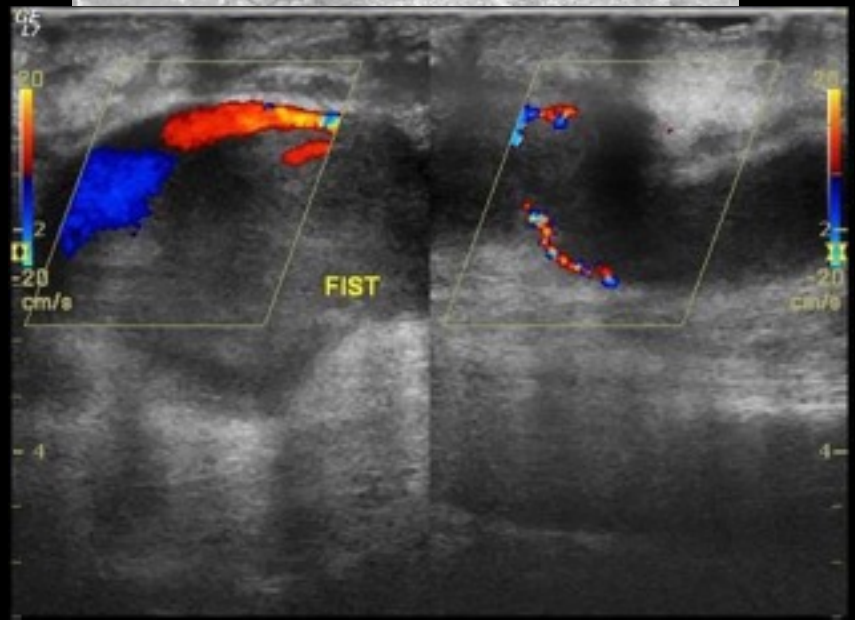
3. Aneurysms

- Caused by sticking needles in the same general area.
- Cause stenosis formation because of turbulence
- Downstream stenosis causing increased backpressure and potential for vein enlargement

Diagnose

4. Thrombosis in Hemodialysis Access

- Early causes:
  - No pre-op mapping
  - Surgical manipulation
  - Arterial or AA stenosis
- Late causes:
  - Poor blood flow
  - Hypotension
  - Hypercoagulability
  - Compression



5. Immature Fistula - Natural maturation of an AVF

- Soft ⟶ firm and thin ⟶ thick wall
- Diameter of vessel increasing (2mm →→ 4mm)
- No collaterals detracting form the main conduit
- Visualize and palpate sites appropriate for cannulation

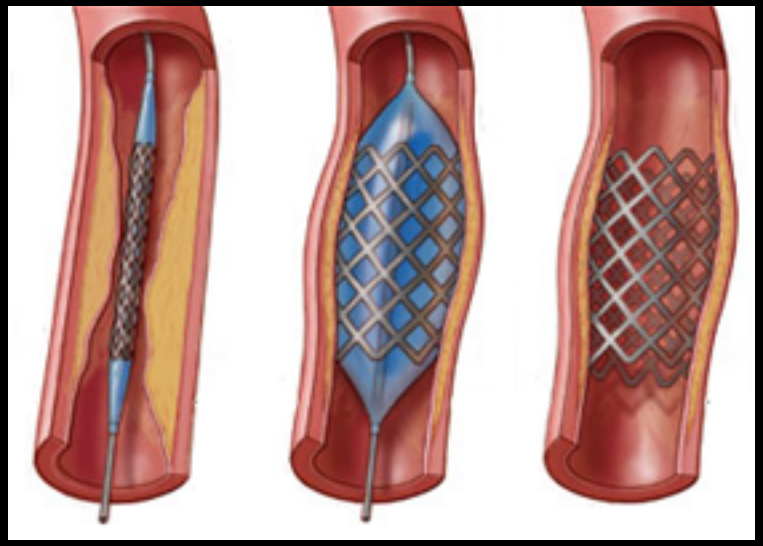
When is a fistula immature and in need of referral

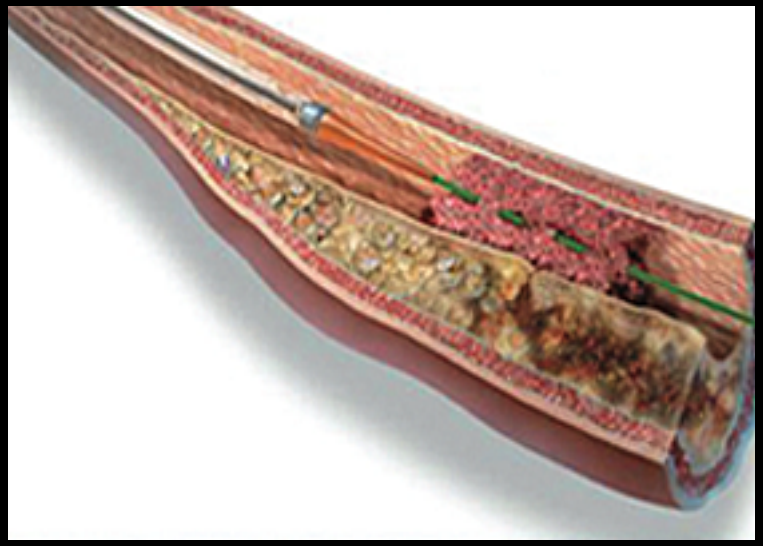
- No measurable increase in vein diameter or poor definition at 4-8 week post AVF creation
- The patient should be referred back to the interventionalist/ surgeon for evaluation

III. Treatment and Intervention

Cases

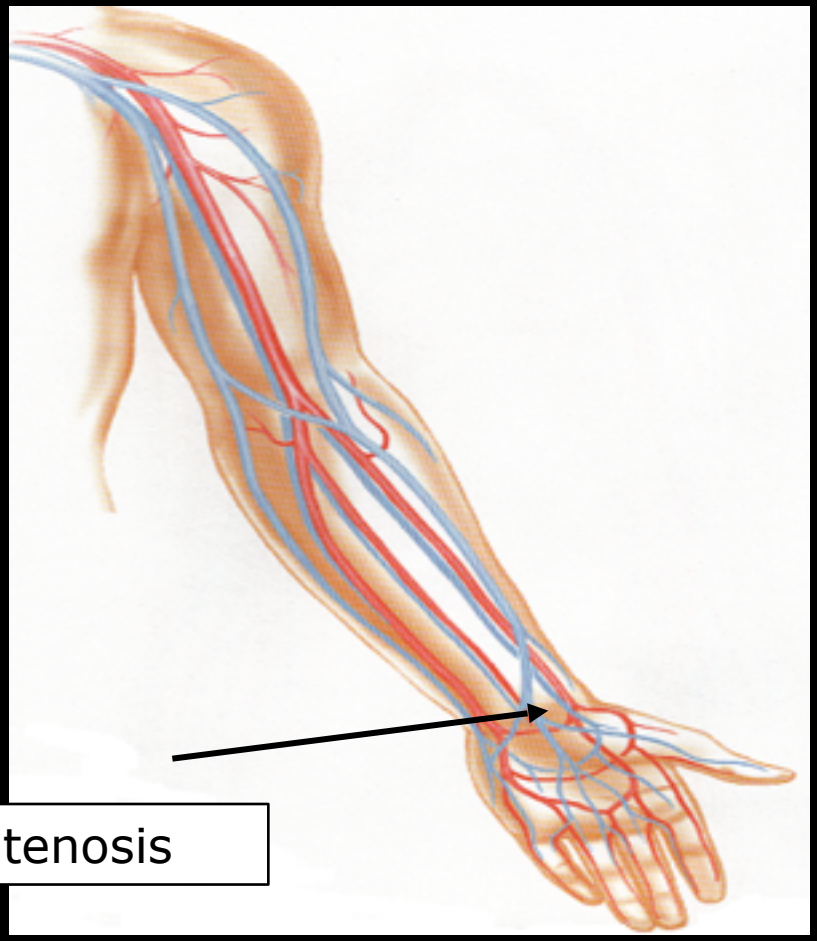
Bringing the "Thrill" Back





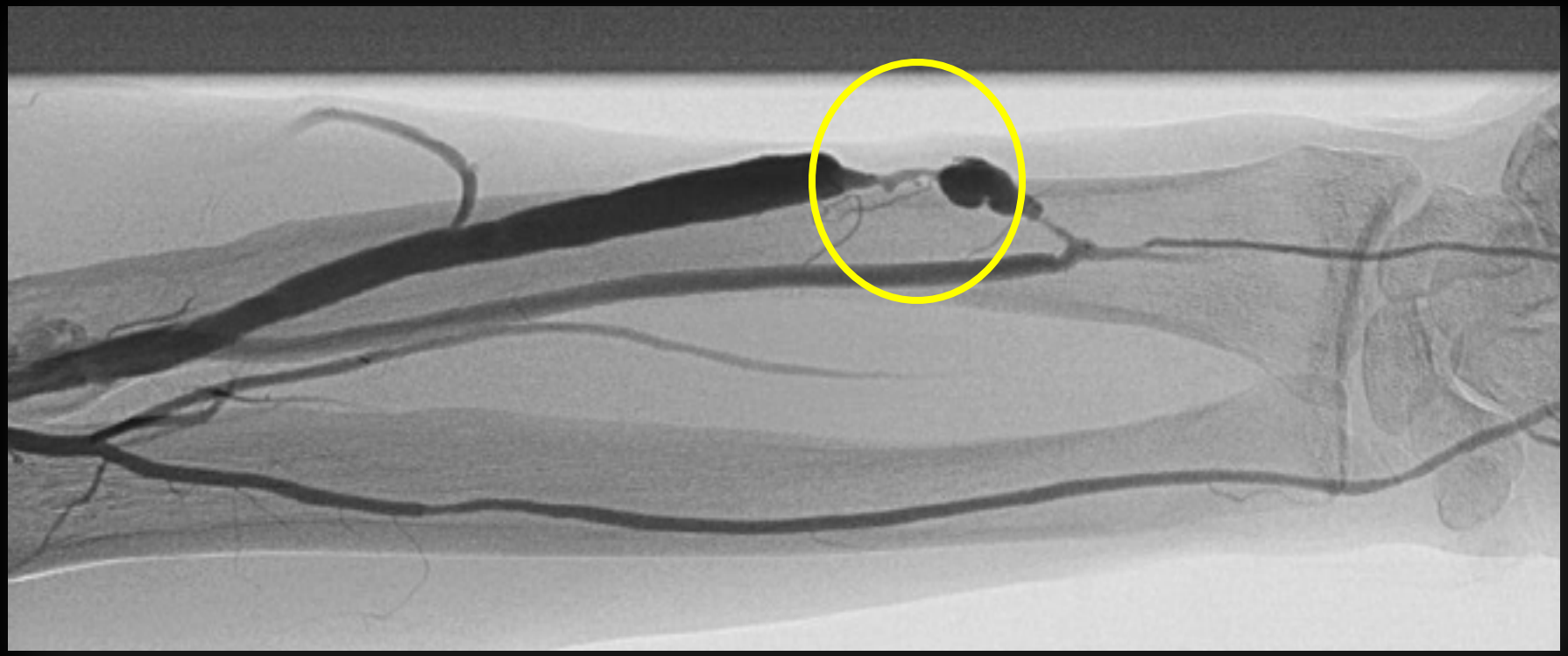
Case 1: Juxta-Anastomotic Stenosis

- Prevents appropriate pressurized flow to arterialize the vessel
- Common Cause of early AVF failure
- Can be felt as a flat spot just before the start of the fistula
- Presents as low flows, difficulty cannulating, low Kt/V

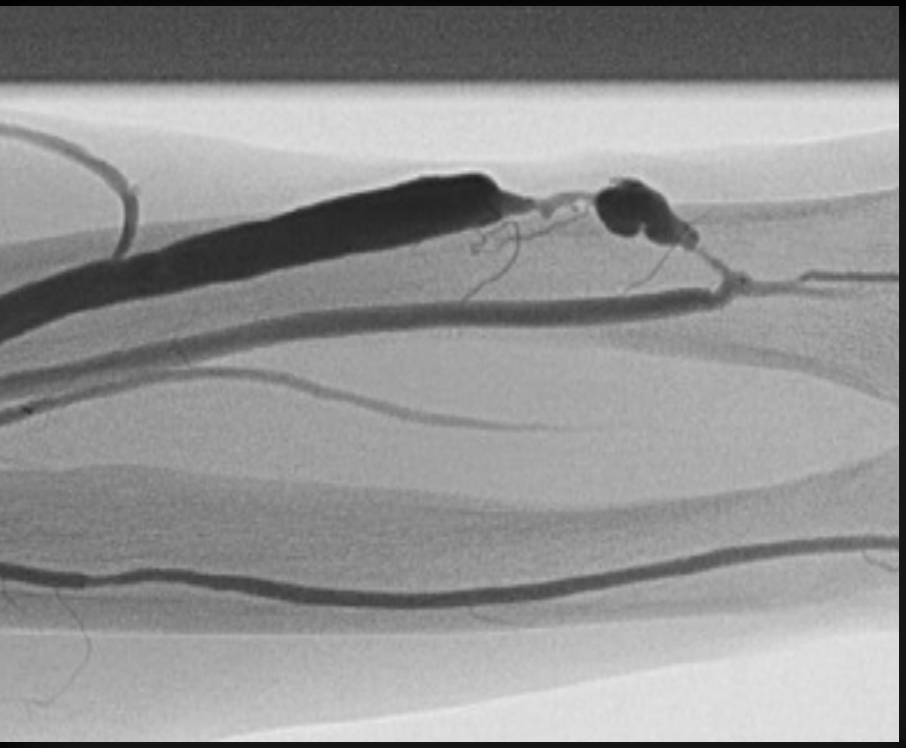


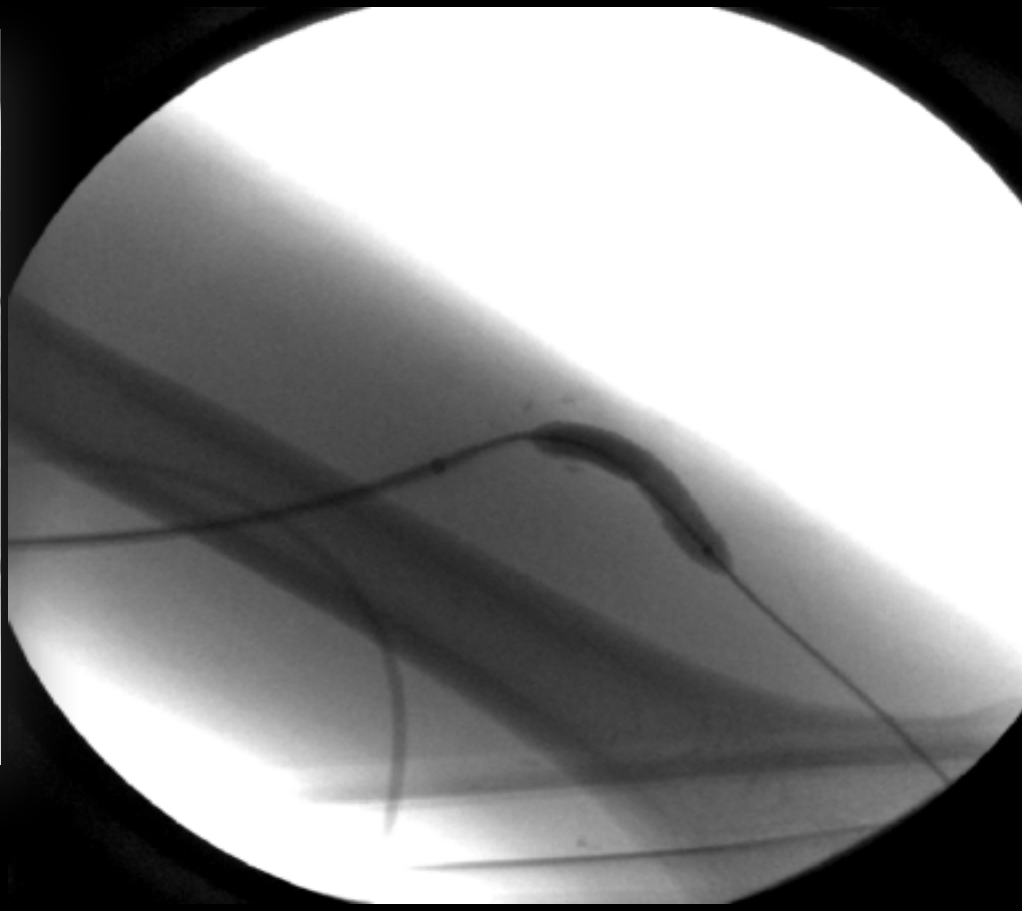
Inflow Stenosis

Juxta-Anastomotic Stenosis

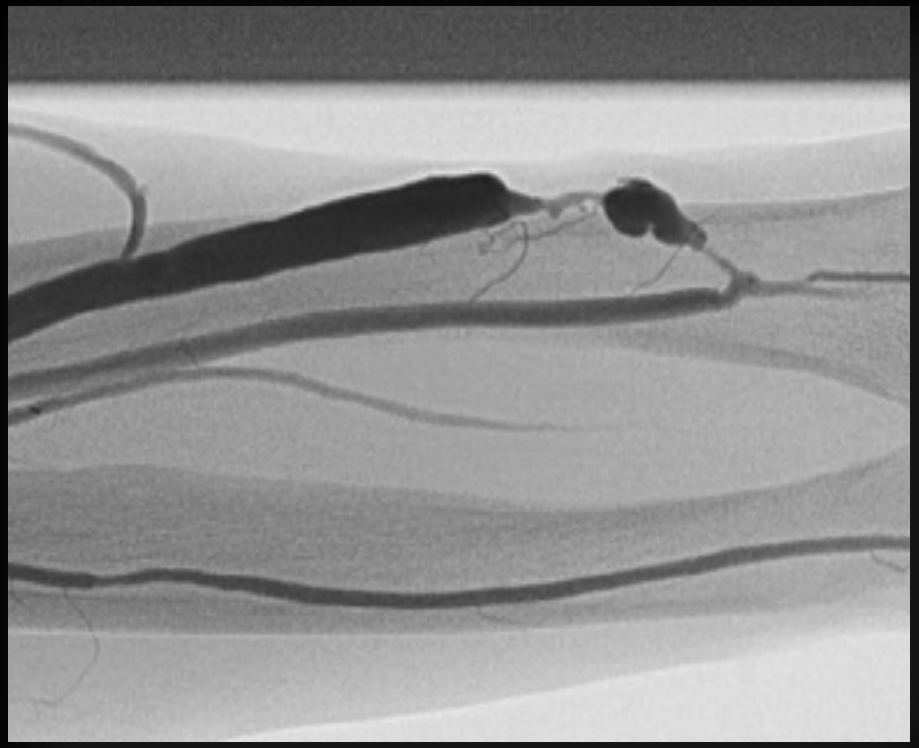


Juxta-Anastomotic Stenosis

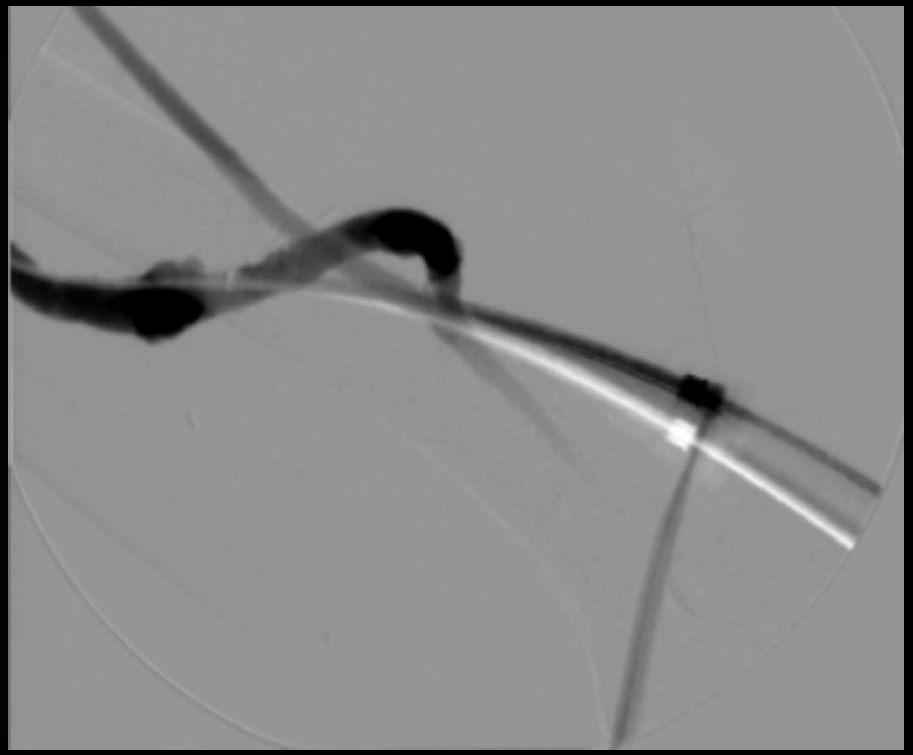




Juxta-Anastomotic Stenosis



Pre Intervention



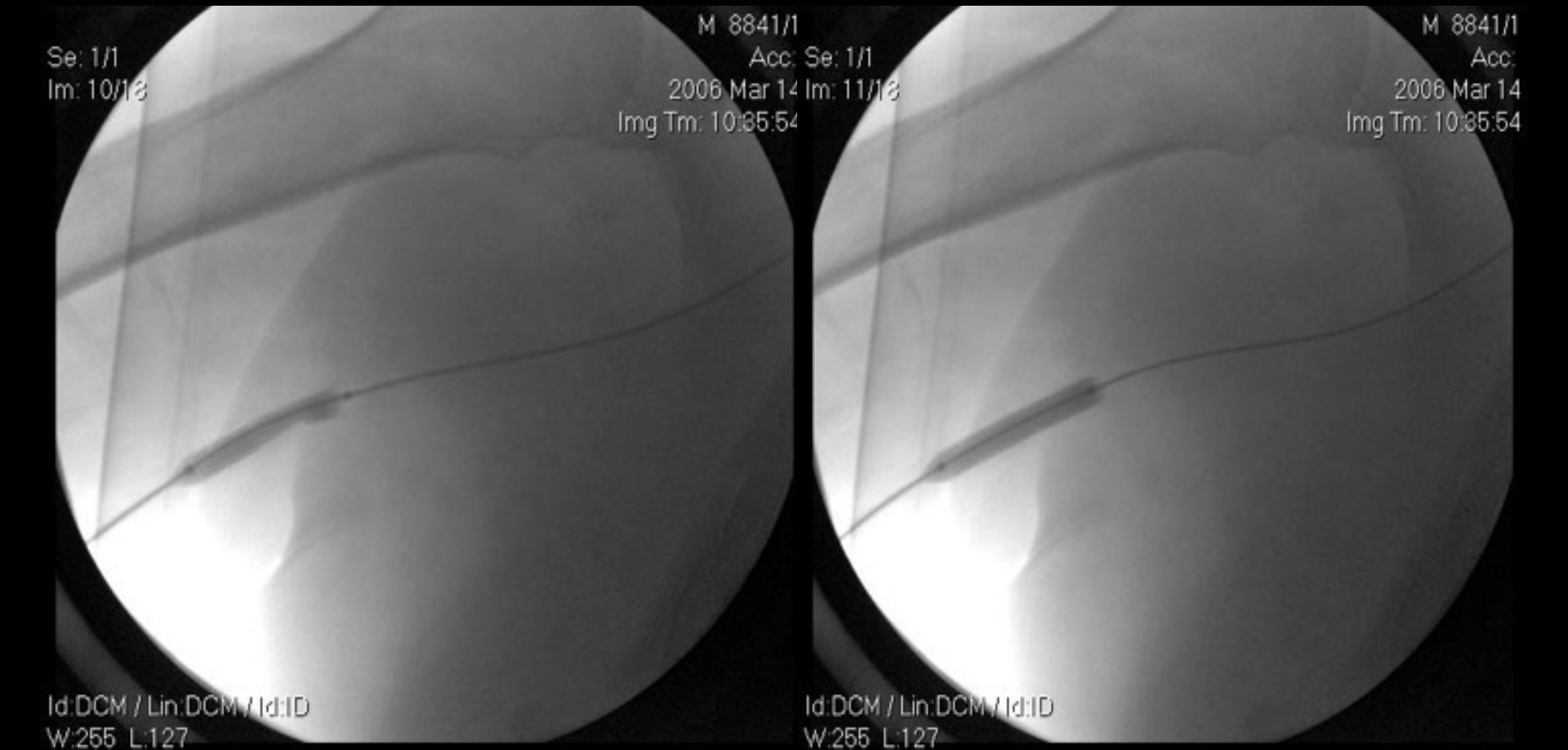
Post Intervention

Case 2: Venous anastomotic stenosis (aka Outflow stenosis)

- High Venous Pressure
- Prolonged Bleeding
- No collateral veins in the chest or back area, but may be present around fistula.
- Swelling may or may not be present
- Pulsatility noted on physical exam.

Intervention

Intervention

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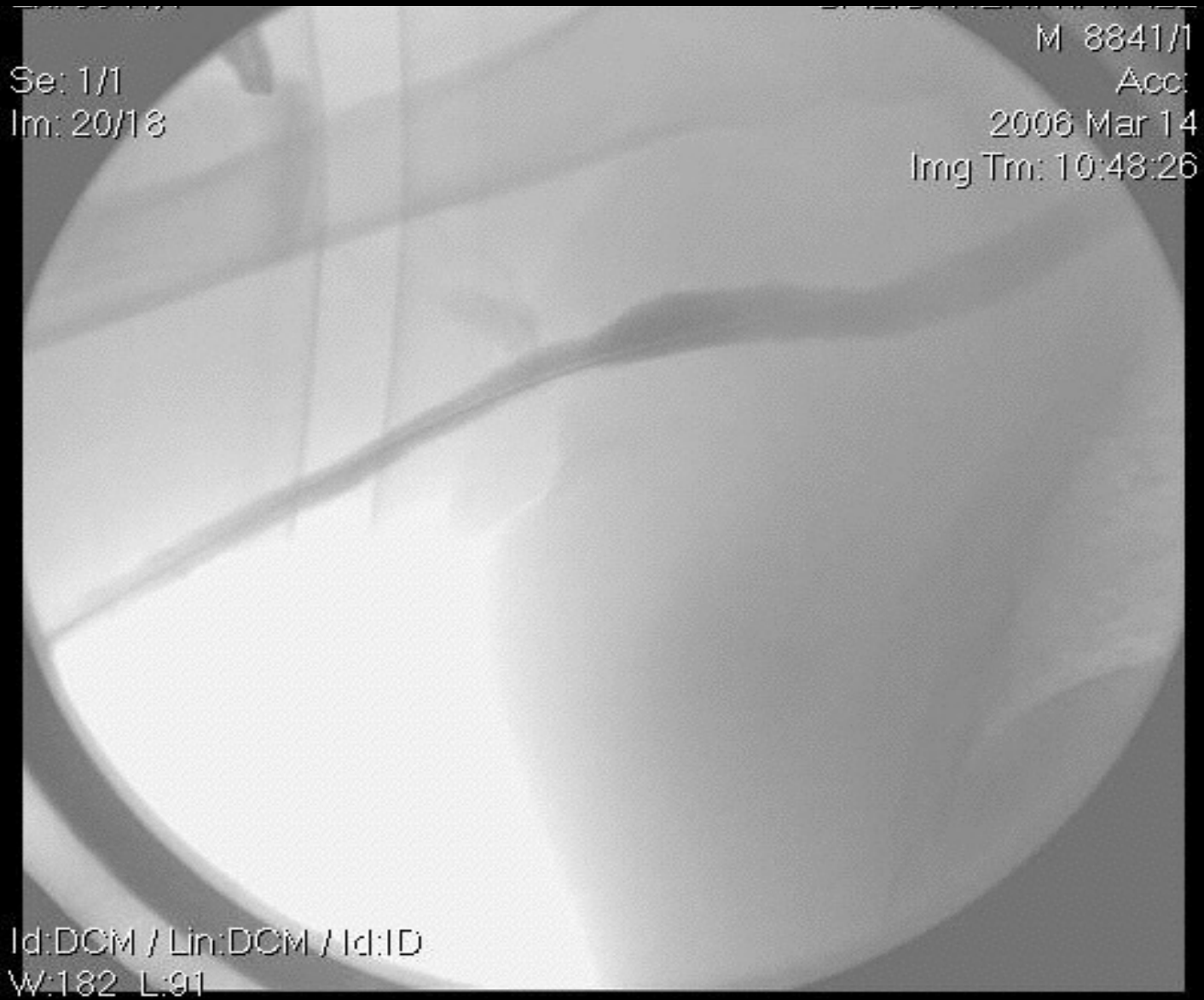
Intervention



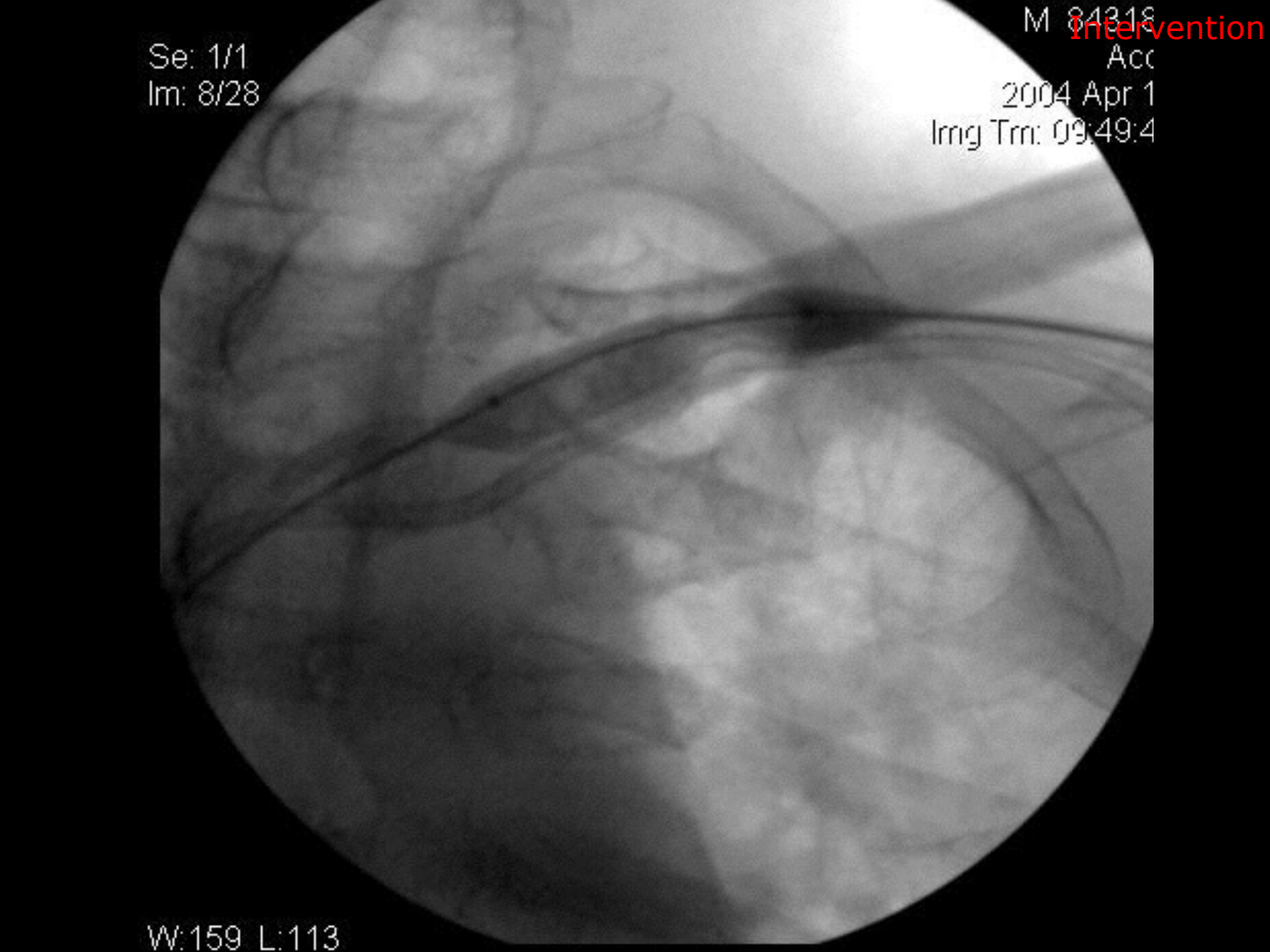
Intervention

Case 3: Central Stenosis (outflow)

- Prolonged Bleeding
- Swelling of the access bearing extremity
- High venous pressure
- Low Access Flows
- Collateral veins over chest and/or back
- Pulsatility vs Thrill (depending on collaterals)


Collateral veins over the chest and back

Central Stenosis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Post Intervention

Case 4: Immature Fistula

- Poor thrill.
- Difficulty with cannulation
- 12 week old fistula
- No collateral veins in the chest or back area
- Difficult to palpate.

Maturation Process

- Staged sequential dilatation between 2-8 weeks
- Limited controlled extravasation
- Flow rerouting of forearm AVF into basilic
- Accessory vein ligation and coil embolization as needed
- Remove catheter after successful HD


Intervention
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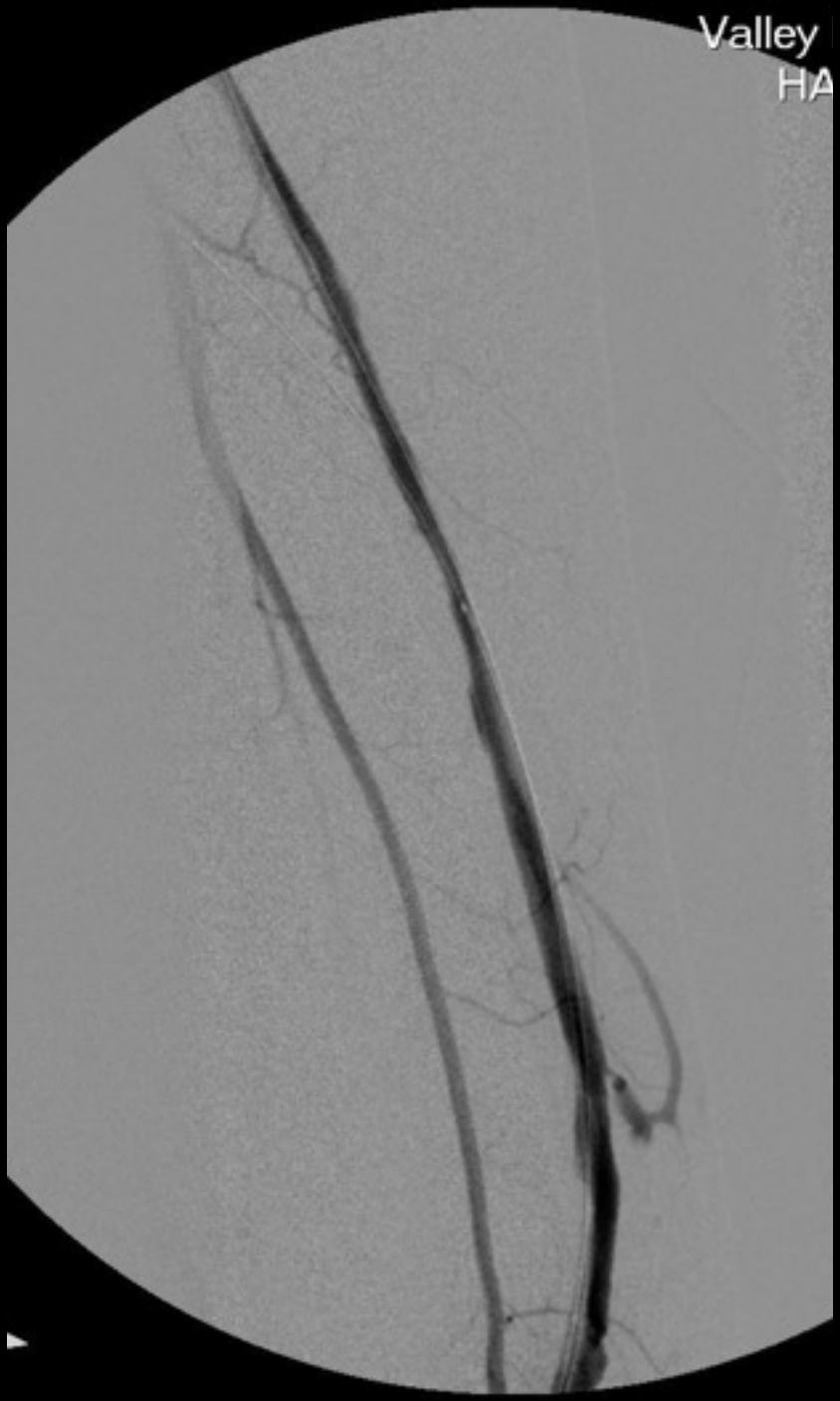
Valley
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Intervention


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Intervention

Case 5: Steal Syndrome (upper arm AVF)

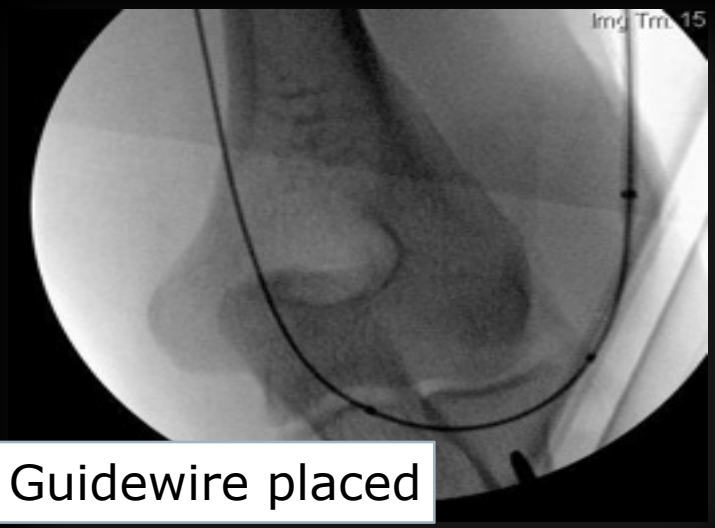
- Excellent Thrill - Hyperdynamic
- Well functioning fistula
- Severe pain and/ or necrosis of fingertips
- Numbness and Tingling in the hand

M.I.L.L.E.R. Procedure

- Minimally Invasive Limited Ligation Endothelial Revision
- Banding of the AVF or Graft to increase blood flow to the affected extremity and reduce flow in the access
- Outpatient procedure that corrects the problem and maintains the access flow

MILLER Banding Procedure

1.

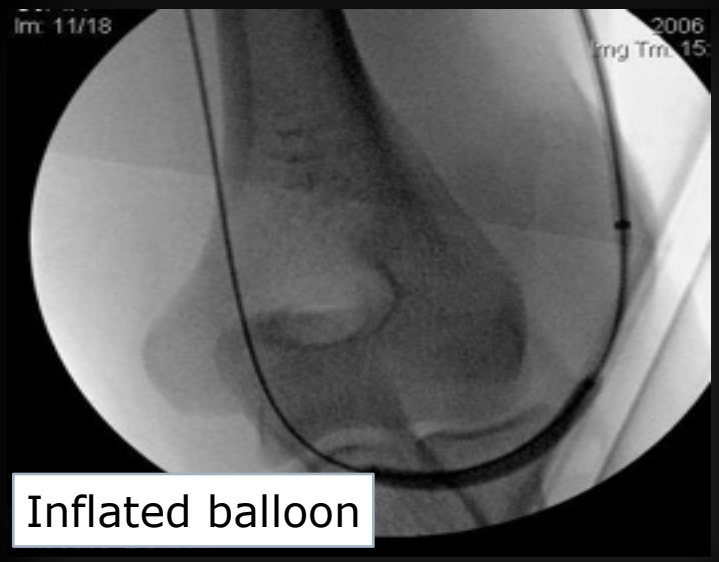


Guidewire placed

2

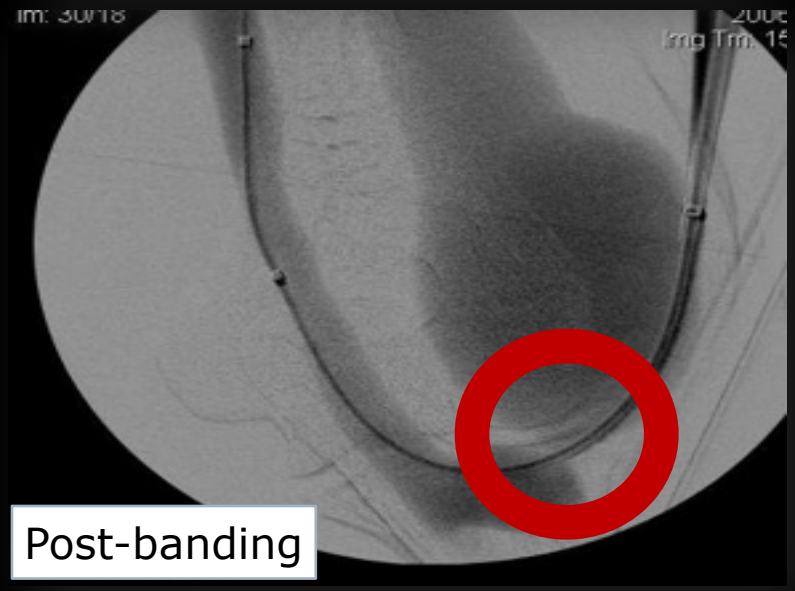
Visualization of vessel, guidewire in place

3



Inflated balloon

4



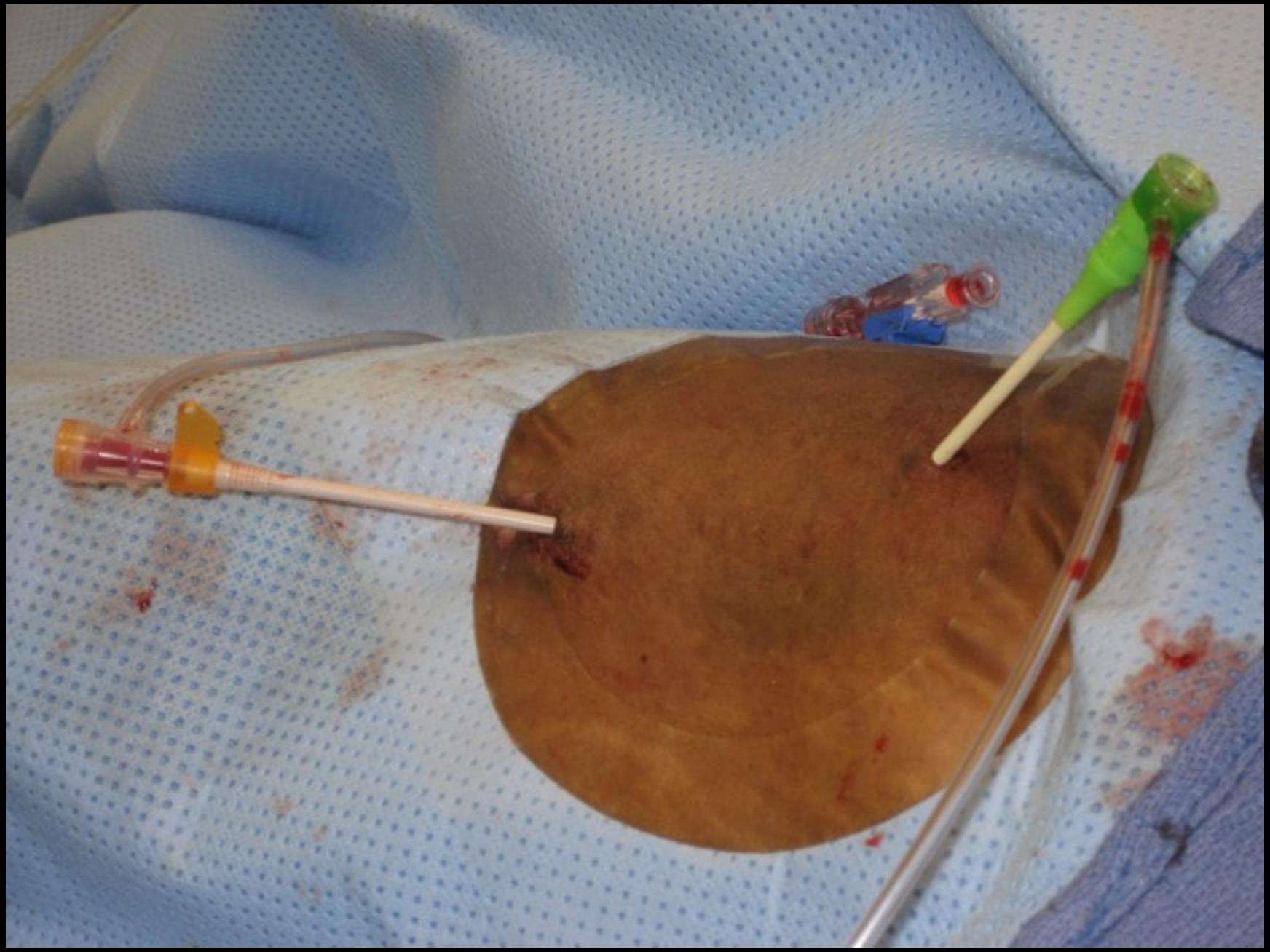
Post-banding

Intervention

Case 6: Thrombosed Access

- Patient access has no flow and thrill
- Needle cannulation clotted blood
- Hypotensive episodes or coagulopathic
- Use of clamps?

Intervention



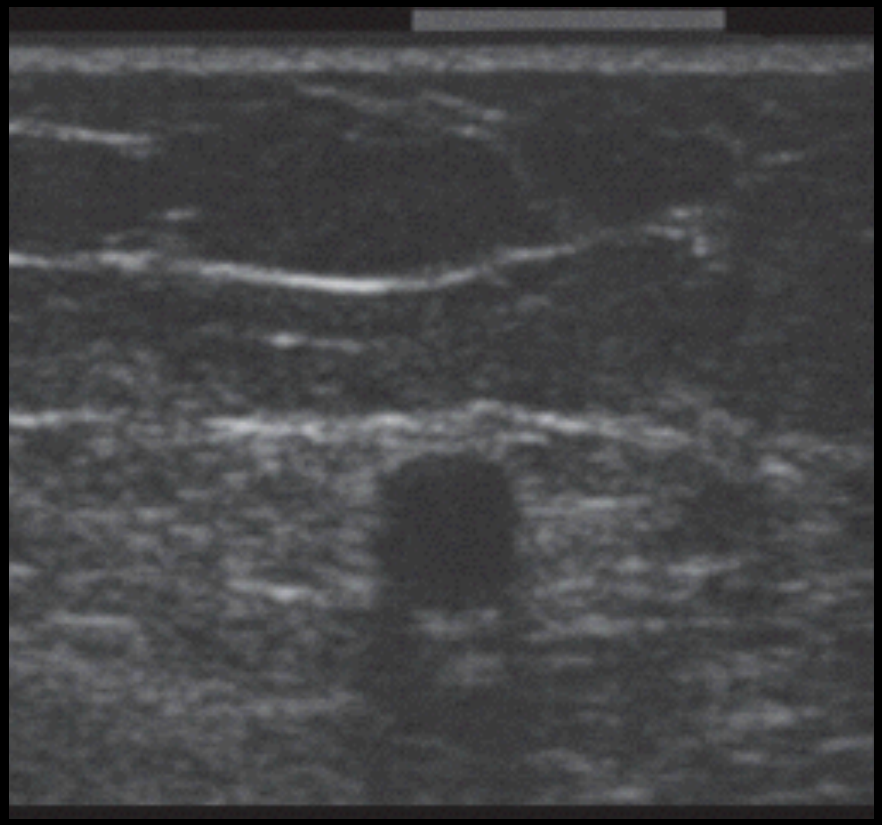
Intervention

Intervention

Intervention

Case 7: Difficulty cannulation in Deep fistula – Localized Liposuction

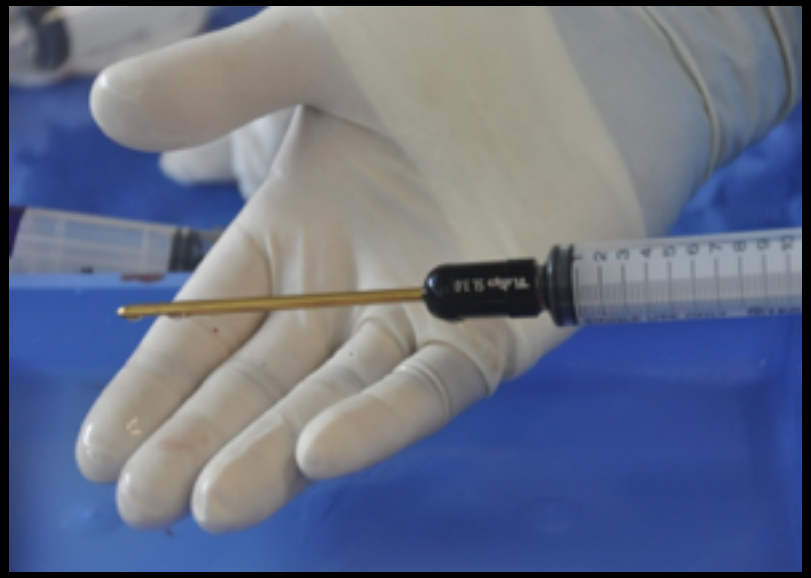
- Difficulty palpating
- Immature, but not really.
- Imaging demonstrates reasonable size, but deep location (11 mm).



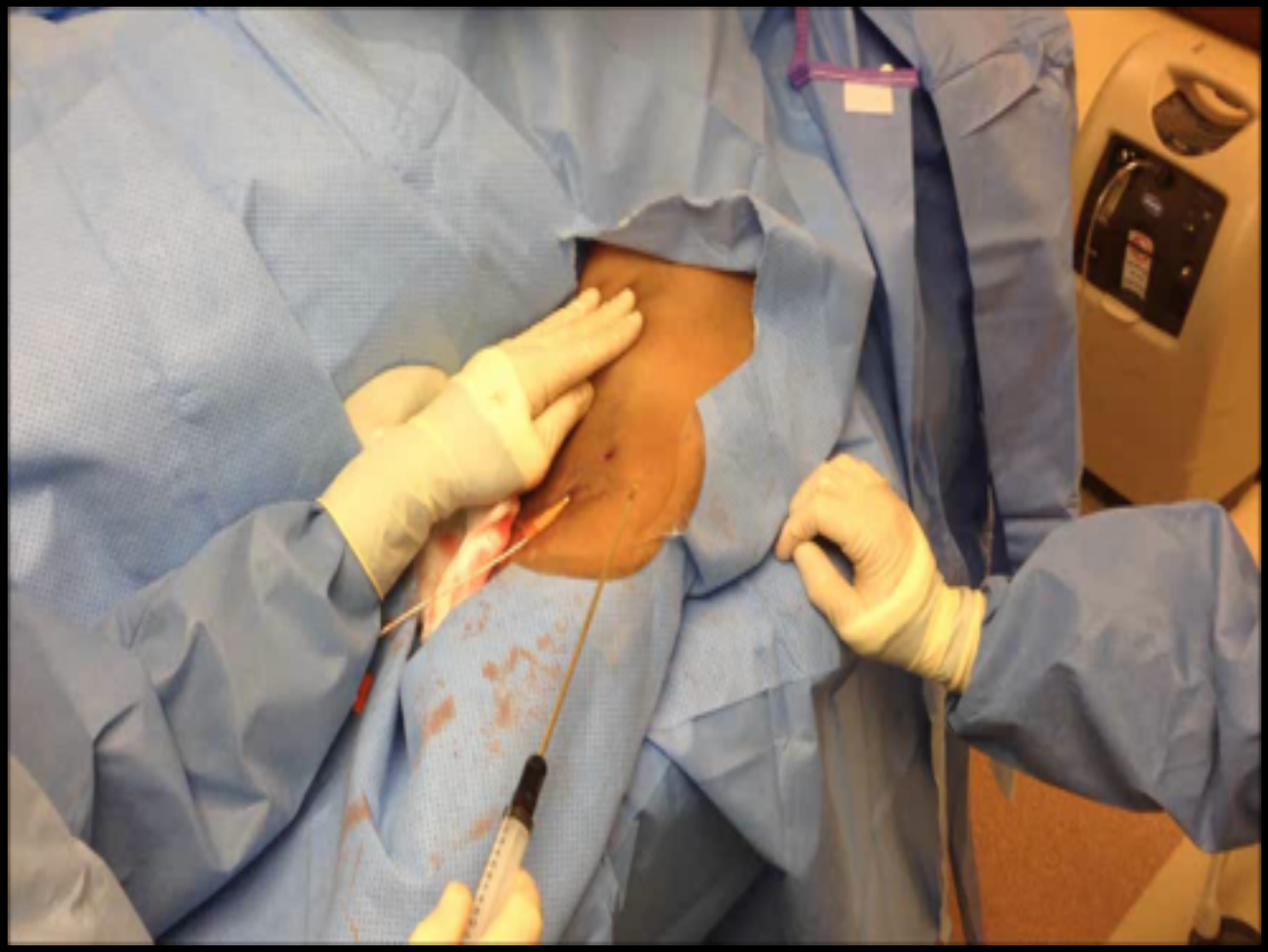
Liposuction of deep arm fistula

- Minimize surgical intervention
  - Surgical superficialization
- Avoid catheters and minimize catheter time

- Technique:
  - Removal of fat
    - Above access
    - Both lateral gutters



Localized Liposuction



IV. Recommendations

- Use a tourniquet
- Avoid using Clamps
- Hold with 2 finger technique
- Warm Compresses
- Maintain blood pressure
- Add Anticoagulant for thrombogenic patients

Top 5 Reasons To Use a…

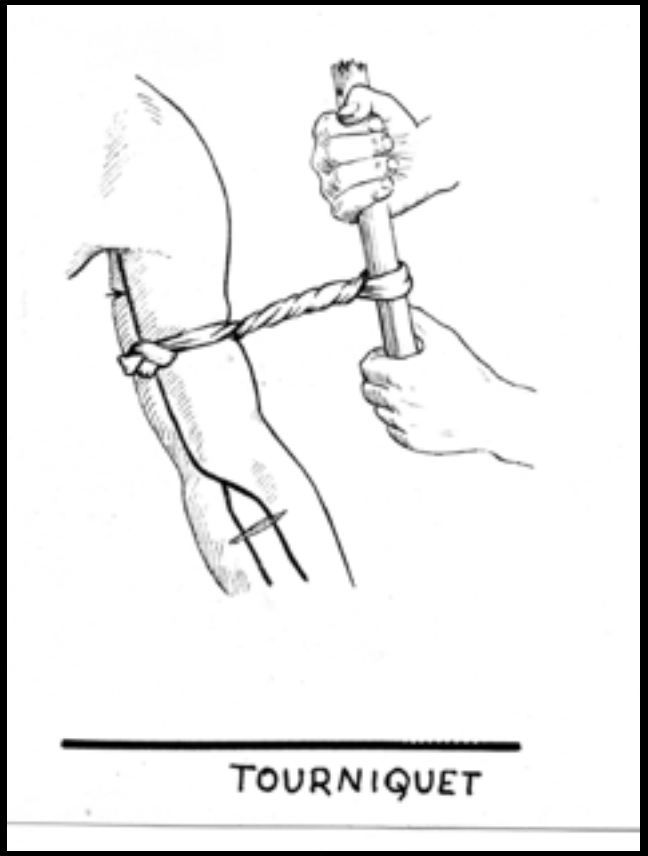
#1. Prevents vessel damage and infiltration

#2. Gives more area for cannulation

#3. Puts tension on the wall decreasing pain

#4. Firms up the access for assessing

#5. Allows you to see the vessel margins



Clamps

- Optimally, staff, patient or patient's family should hold sites
- If clamps need to be used, be sure they are adjustable
- Clamps should never be left on longer than 20 minutes –
- Bleeding longer than 20 minutes needs addressed
- Over compression of the vessel along with hypotension can cause the access to clot off

Holding Sites

- Use double digit pressure to hold sites post dialysis.
- Patients use 1 finger pressure for bleeding access site.

Maintain Blood Pressure

- Laminar Flow.
- Importance in graft vs Fistula.
- Important not only during HD.

Warm Vs. Cold Compresses

- Cold in acute bleeding
  - Promote vasoconstriction and tamponade effect
- Warm to be used in subacute – late bleeding.
  - Promote lymphatic drainage and improve mobilization of interstitial fluid (infiltration/ hematoma/ecchymosis)

Conclusions – After the Thrill is Gone

- Use the Physical Exam to identify problems with the THRILL.
- Diagnose the cause of the absent THRILL.
- Refer for Intervention in order to restore the THRILL.
- Use Recommendations to maintain the THRILL.

Make that access a Thriller!

- Put on a glove to keep that hand warm!