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# **Catheter Reduction Program: Creating the Ideal Vascular Access Culture**

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# Fistula First Initiative

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- The superiority of an AVF over an AVG is an accepted fact.
- For this reason the National Vascular Access Improvement Initiative was launched by CMS and is generally referred to as Fistula First.
- FFBI Change Concepts are ideas that have been used by many facilities, providers and organizations. The Change Concepts provide the roadmap to implement the KDOQI vascular access recommendations
- First goal was to increase the number of fistulas used for hemodialysis in the United States to 50% for incident patients and 40% for prevalent patients by June of 2007. These goals were reached ahead of schedule.
- A new goal was set for 2009 to achieve 66% level for fistulas in prevalent patients. This goal has not been attained.

# Improving Fistula Rates

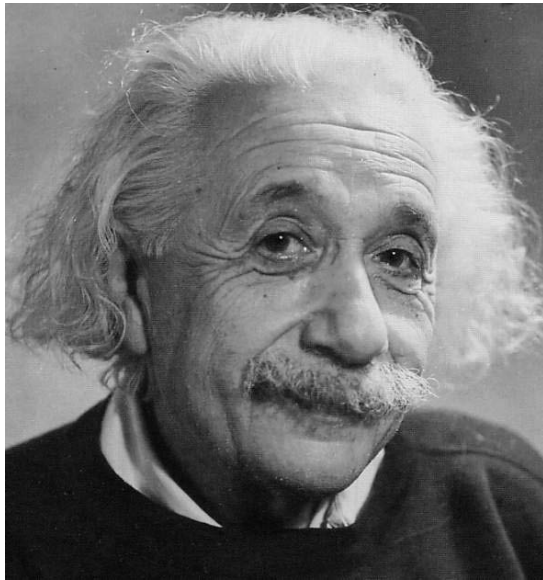
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In the ideal world:

- Patients have a functional fistula at the initiation of dialysis
- We create and use a new fistula within the first 90 days of dialysis
- We preserve functioning fistulas through monitoring and surveillance

The creation of a new, ideal vascular access culture directs the efforts of the nephrologist, the dialysis team, the vascular surgeon and the interventionist toward three goals :

- Assure that every new patient receives a fistula if possible
- Assure that every fistula created has an opportunity to mature and become a useable access
- Assure that every functioning fistula has the best opportunity for longevity



“The definition of insanity is doing the same thing over and over again and expecting different results”.

- Albert Einstein

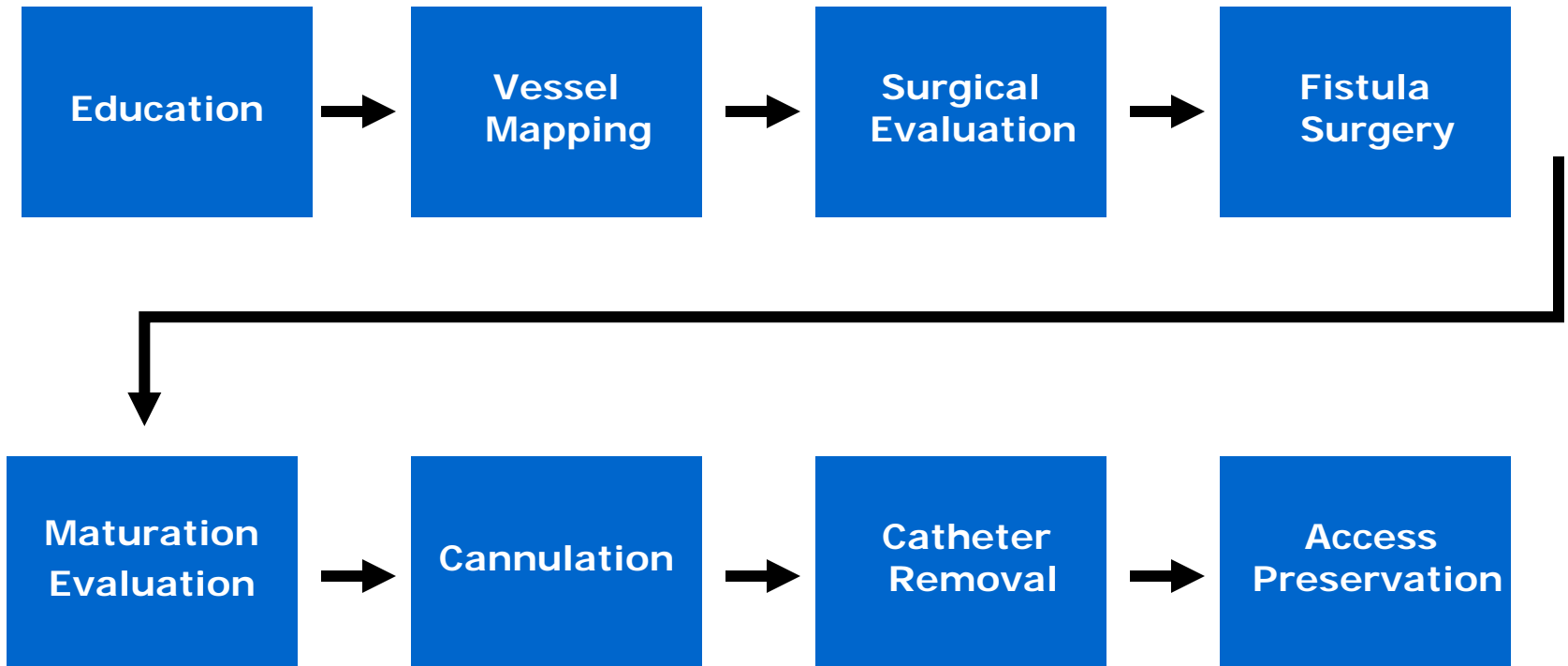
# Change Concepts to Increase AV Fistulas

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- Routine CQI review of vascular access
- Timely referral to nephrologist
- Early surgical referral for AVF only evaluation and timely placement
- Surgeon selection based on best outcomes, willingness, and ability to provide access services
- Full range of surgical approaches to AV fistula evaluation and placement
- Secondary AV fistula placement in patients with AV grafts
- AV fistula placement in patients with catheters where indicated
- AV fistula cannulation training
- Monitoring and maintenance to ensure adequate access function
- Education for caregivers and patients
- Outcomes feedback to guide practice

# Catheter Reduction Process

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# Education

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- Types of vascular access
- Rationale for a fistula vs. catheter
- Psychosocial intervention if needed
- Family involvement if possible

Teaching aids:

- [www.fistulafirst.org](http://www.fistulafirst.org)
- [www.aakp.org/brochures/access-options](http://www.aakp.org/brochures/access-options)
- [www.kidneyschool.org](http://www.kidneyschool.org) - Chapter 8



# Vascular Mapping

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- Increases AVF placement and improves adequacy of AV fistulas
- Should be considered mandatory

## Arterial Requirements for AVF

- Pressure differential < 20 mmHg between arms
- Good brachial, ulnar, radial pulses and a patent palmar arch
- Arterial diameter 2.0 mm or greater at anastomosis point

## Venous Requirements for AVF

- Vein diameter 2.5 mm or greater at anastomosis point
- Absence of obstruction
- Straight segment for cannulation
- Within 1 cm of surface

# Surgical Evaluation

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- Vessel mapping results are reviewed for surgical evaluation
- Surgeons will fully evaluate all patients for an AV fistula
- Nephrologists refer to surgeons willing and able to meet the standards and expectations

# Goals of Fistula Surgery

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- Every patient receives a fistula if possible
- Surgeons utilize current techniques for AVF placement including vein transposition

# Evaluation of Fistula Maturity

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KDOQI Guideline 3.2.4 states:

If a fistula fails to mature by 6 weeks, a fistulogram or other imaging study should be obtained to determine the cause of the problem.

Determined at 4-6 weeks because increased blood flow occurs very early. There is no significant difference in the AVF blood flow in the second, third or fourth month after creation and vessel diameter changes very little.

- Robbin, Radiology 225: 59-64 in 2002

Study of radial-cephalic fistula maturation:

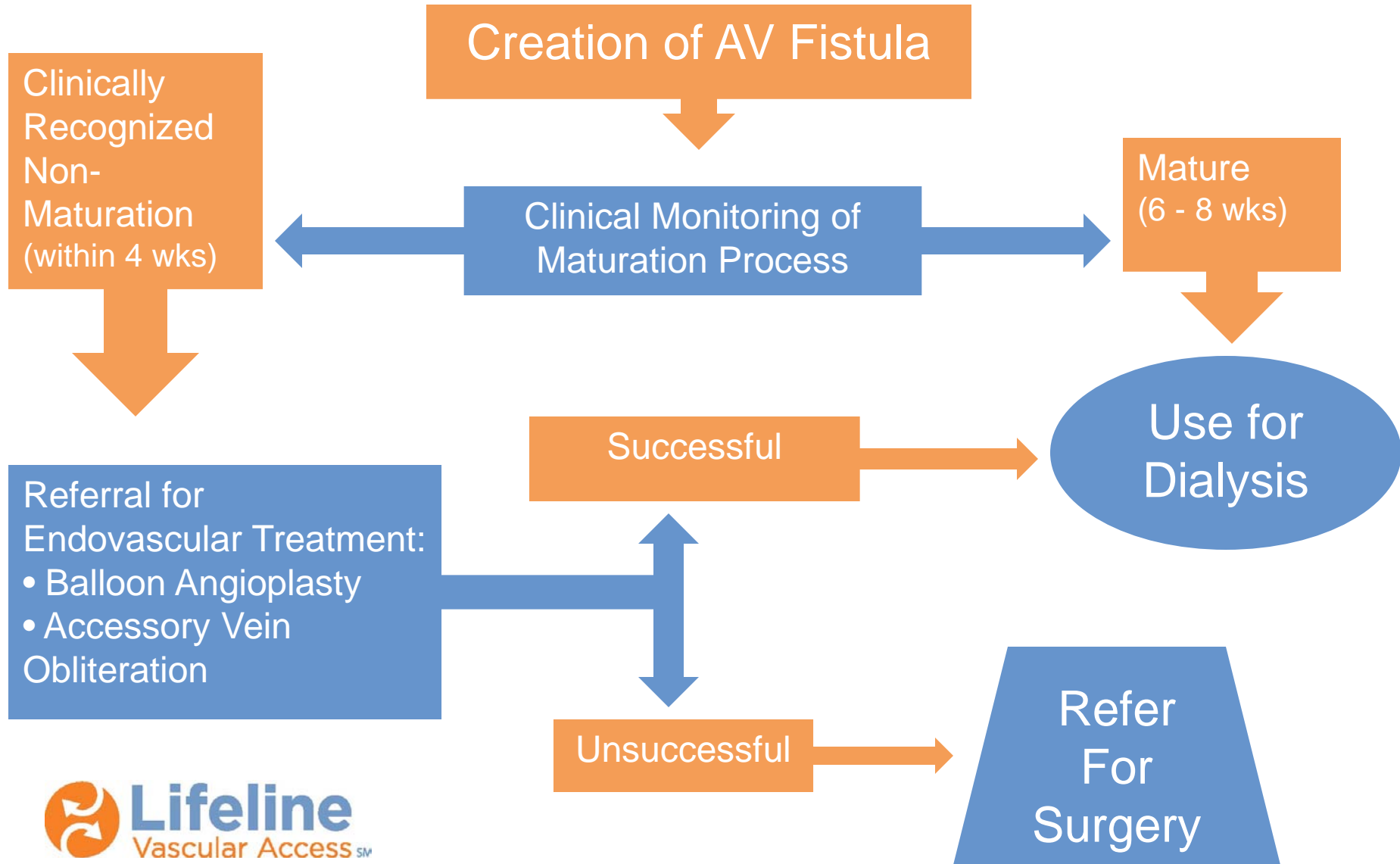
Day 1 - 754 ml/min

Day 7 - 799ml/min

Day 42 - 946 ml/min

- Tordoir et al: Nephrol Dial Transplant18:378-83, 2003

# Fistula Maturation



# Cannulation

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- Use experienced staff and teaching tools to train all appropriate dialysis staff on AVF cannulation
- Use protocols for initial dialysis treatments with new AVF patients
- Only “expert cannulators” should be allowed to use a new fistula
- Teach self-cannulation to patients who are interested and able

## General tips:

- Place the venous needle WITH the flow of blood
- Keep the tips of the needles at least 2 inches apart to prevent recirculation
- Keep the needles at least 1½ inches away from the anastomosis
- Rotate the puncture sites allowing 14 days for healing

# Catheter Removal

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**BUT, our work is not done!**

# Access Preservation

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As we have intensified our efforts to create more fistulas, it appears that the incidence of early failure has increased. Although the definitions have varied, studies of 20 to 25 years ago observed early failure rates in the range of 10 to 25 %. In more recent reports, the incidence has been higher, in the range of 20 to 60 %.

- Adopt standard procedures for monitoring, surveillance, and timely referral for the failing AVF

# Monitoring

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Evaluation of the access to detect signs that suggest pathology. Using clinical evaluation to monitor the vascular access is inexpensive, easily performed, noninvasive and reliable.

Consists of two components:

- Physical examination Inspection (look), palpation (touch), and auscultation (listen) prior to cannulation
- Recognition of clinical signs that indicate the presence of a stenotic lesion. These indicators include:
  - swelling of the access arm, breast and neck
  - the presence of collateral subcutaneous veins on chest and upper arm
  - frequent clotting of the access
  - prolonged bleeding from cannulation sites post-treatment
  - difficulty with needle placement
  - pain in the access arm or hand. and reliable

# Physical Assessment - Inspection

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- **Look** at whole patient:
  - Skin color of extremities (pallor, cyanosis)
  - Any swelling (symmetry)
  - Any aneurysms or pseudoaneurysms
  - Any signs and symptoms of infection
  - Presence of accessory veins
  - Developed upper arm vein with forearm graft
  - Capillary refill < 2-3 seconds

# Physical Assessment - Auscultation

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- **Listen** to the access
  - Use a stethoscope to listen to the bruit
  - Bruit is louder on the arterial side and decreases away from the anastomosis
  - Should be a low pitched, continuous, “whooshing” sound
  - A low pitched, continuous sound indicates low resistance
  - A high pitched, “whistling” sound is abnormal, indicates stenosis
  - Pitch changes at areas of stenosis

# Physical Assessment - Palpation

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## Feel the access

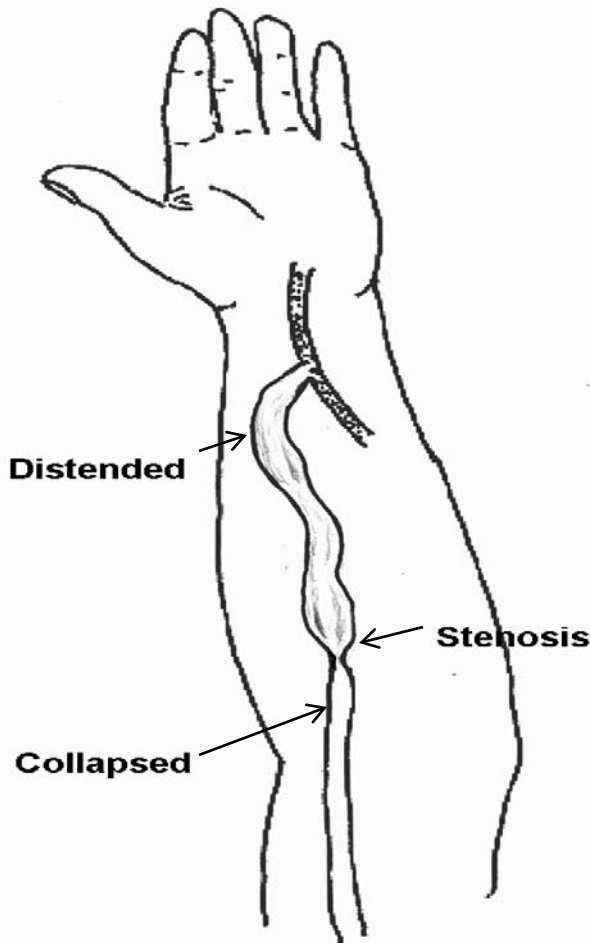
### Examination of Anastomosis

- The thrill (the “buzz”) is the indicator of flow
  - Strong – good flow
  - Weak – poor flow
  - Systolic & diastolic components – good flow
- The pulse is the indicator of downstream resistance
  - Soft – low resistance, no stenosis
  - Hard – high resistance, stenosis present

### Examination of Body of Fistula

- Pulsatility indicates downstream resistance
- Hyperpulsatility indicates high resistance associated with stenosis
- Feel the entire length of the access for dips

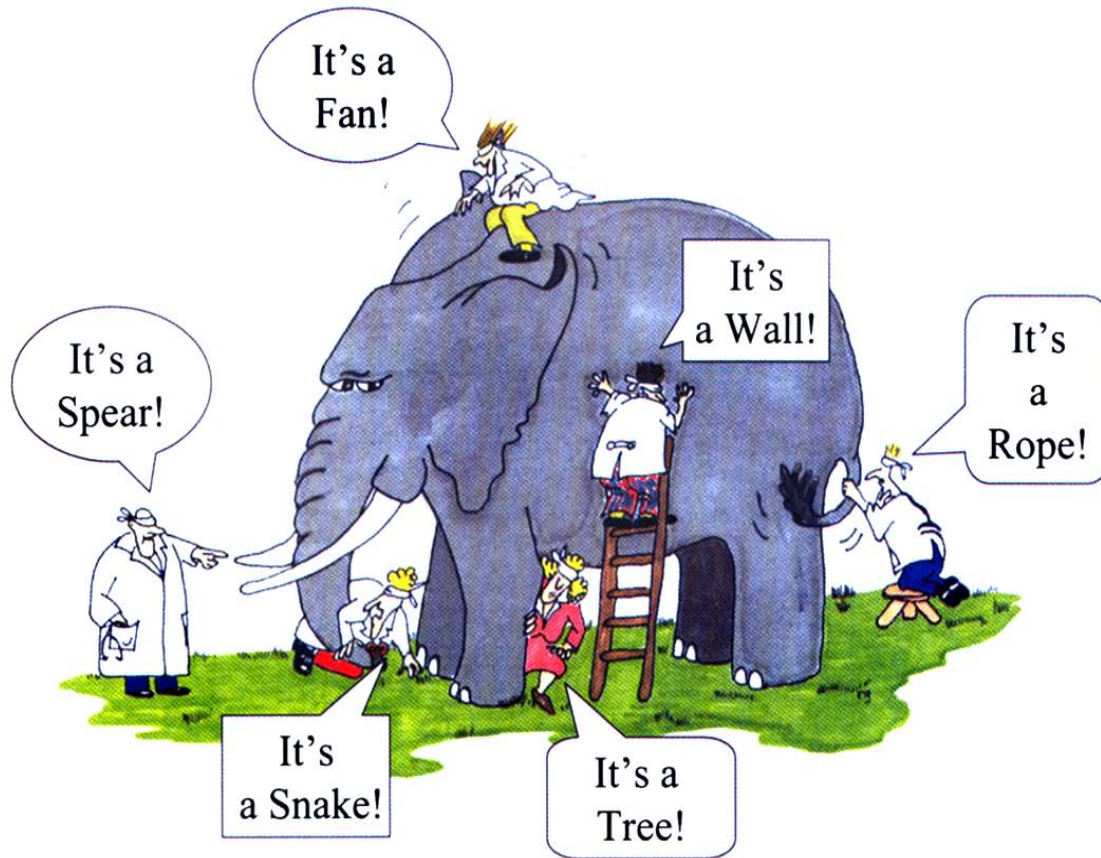
# Free Fistulogram - Arm Elevation



- Raise the access arm above the heart
  - The fistula should collapse or soften significantly
  - Fistula with slow collapse (draining) indicative of downstream stenosis
  - Fistula with engorged area indicates a stenosis near distension

# Look at the Whole Picture

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# Surveillance

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Involves the use of a variety of tests to detect access dysfunction:

- Intra-access blood flow measurement over time is the best surveillance method available for assessing AV fistula function and detecting dysfunction.
  - Transonics
  - Fresenius Twister lines
- Access recirculation measurement
  - A fistula may remain patent but not provide enough blood flow to meet the prescribed blood pump rate, resulting in underdialysis.
  - A recirculation study will determine if the AV fistula blood flow is not sufficient to meet the prescribed blood pump flow rate.

# Surveillance

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- Pre-pump arterial pressure
  - Indicates the ease or difficulty with which the blood pump is able to draw blood from the access (inflow)
  - A significant restriction of inflow will cause an excessively negative pre-pump arterial pressure
  - Fistula dysfunction is often caused inflow problems. An excessively negative pre-pump arterial pressure is often the earliest indication of such a problem.

# Early Fistula Failure

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Problems have generally fallen into three categories

- Lesions that should have been detected with good vessel mapping,
  - artery that is too small or the presence of arterial disease
  - vein that is too small or veins that are fibrotic or stenotic due to past trauma such as venipuncture
- Inflow Problems
  - arterial anastomosis or juxta-anastomotic stenosis
- Outflow Problems
  - presence of accessory veins

# Late Fistula Failure

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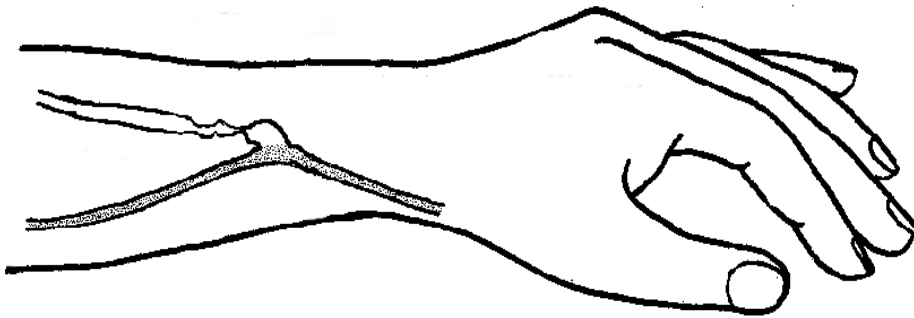
- Failure that occurs after 3 months
- Primary causes of late failure:
  - venous stenosis
  - thrombosis
  - acquired arterial lesions

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# Case Studies

# AA or Juxta-anastomotic Stenosis

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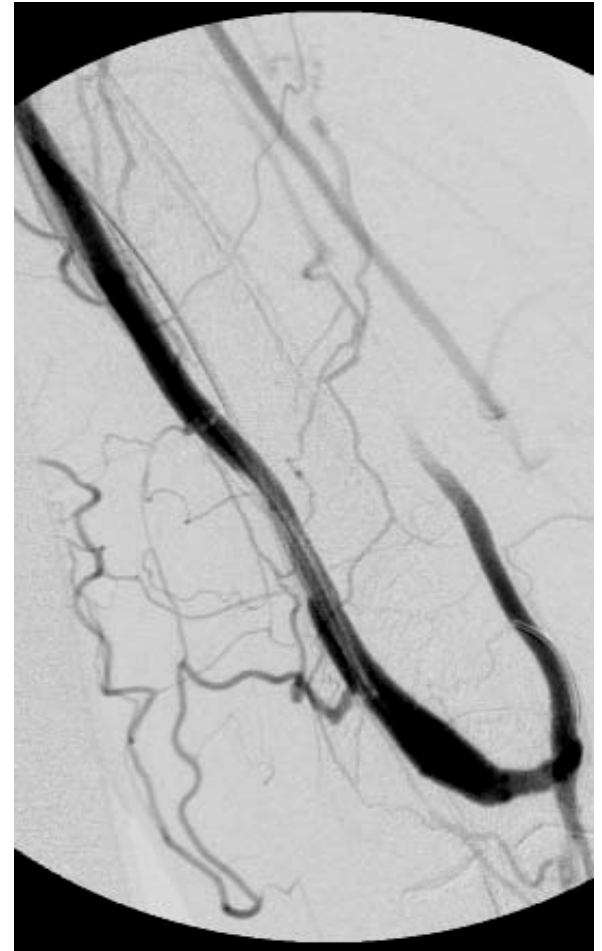


Patient was referred for difficult and painful cannulation.

Low arterial pressure, poor clearances and low transsonics are noted.

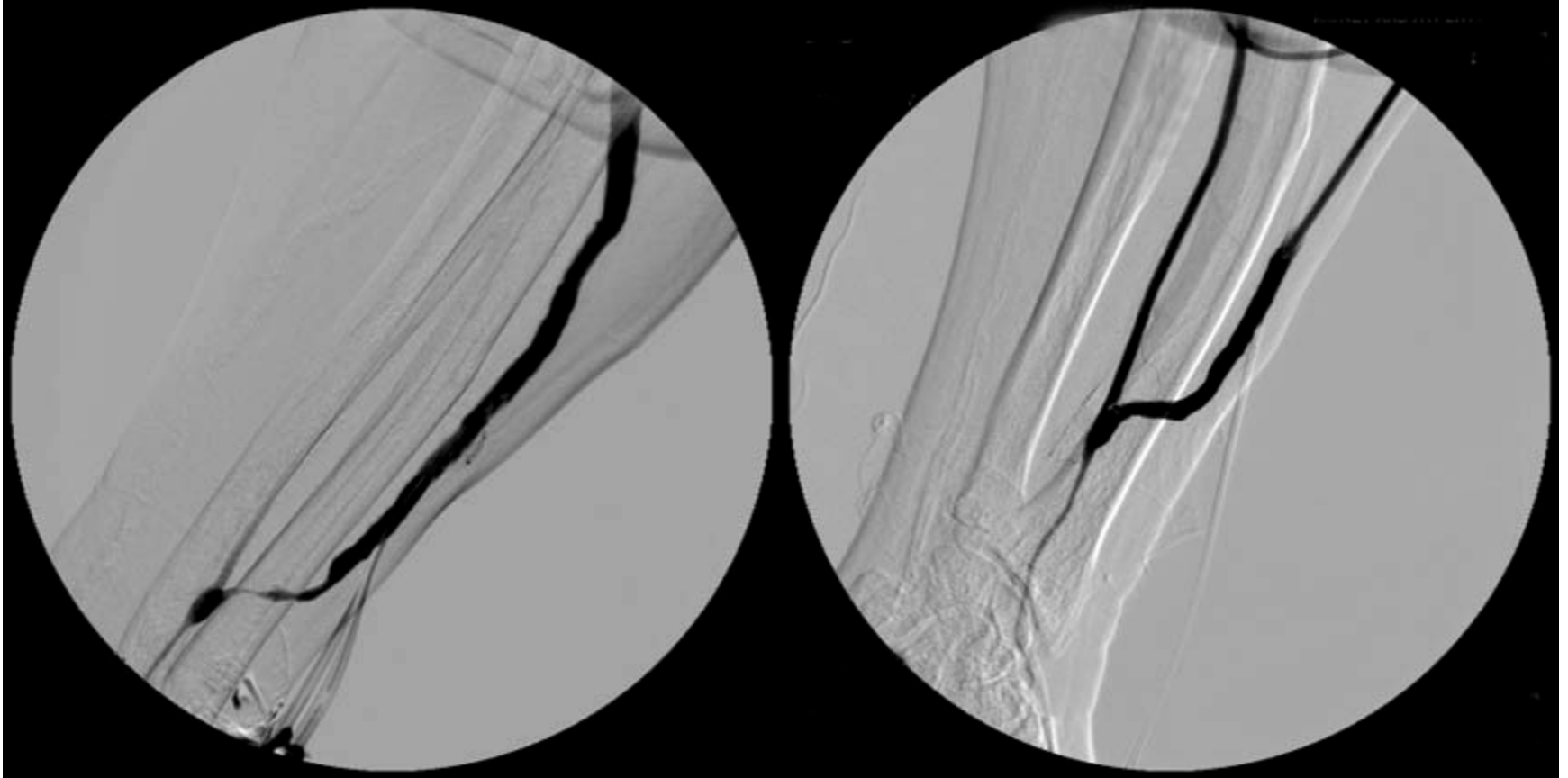
Affects vein segment at or adjacent to the anastomosis  
Easily diagnosed by physical exam  
A very common cause of early failure  
Results in poor inflow so the AV Fistula fails to develop

# Arterial Anastomotic Stenosis



# Juxta-anastomotic Stenosis

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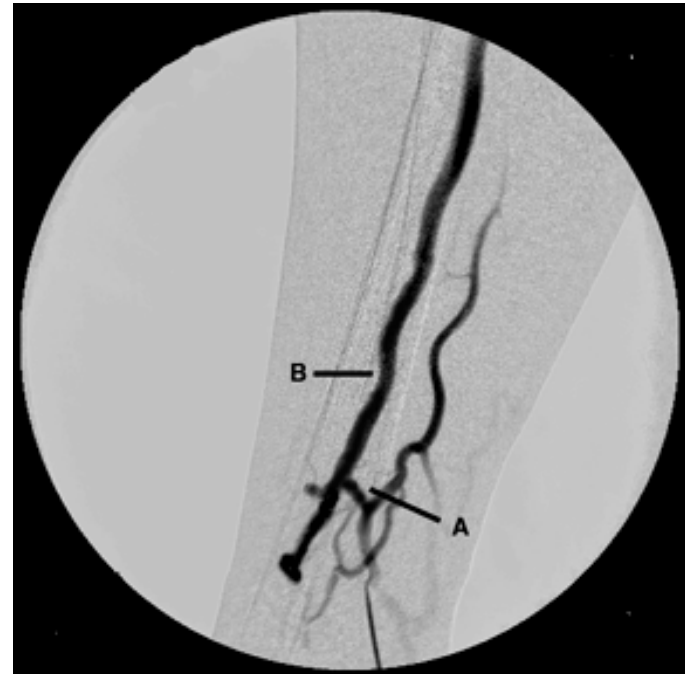


# Accessory (Draining) Veins

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Patient was referred for evaluation of a non-maturing fistula.

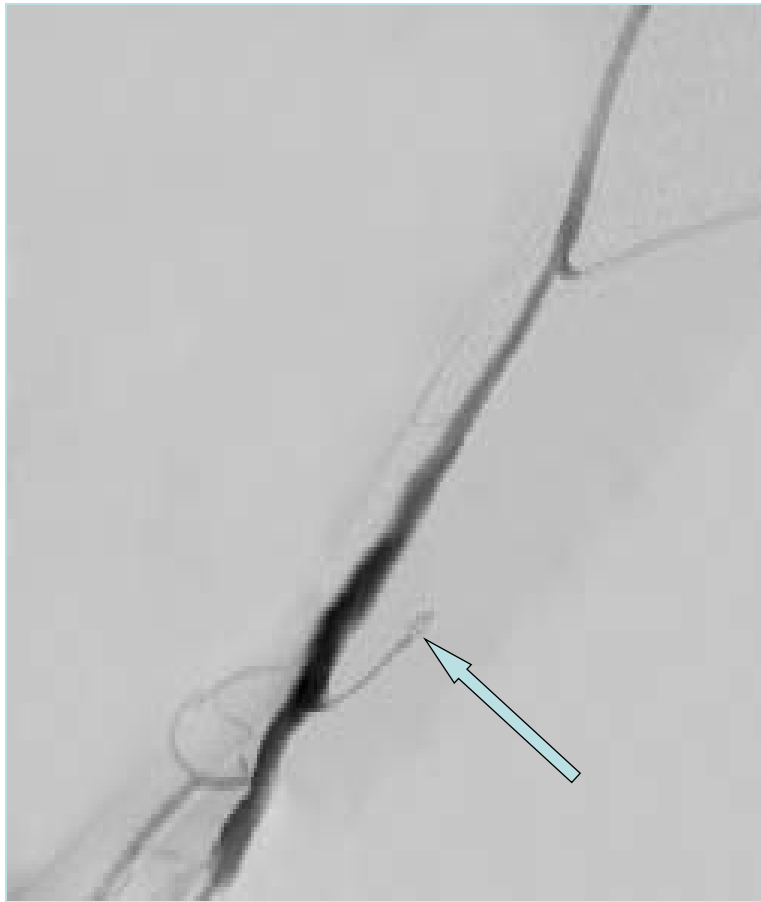
Difficult cannulation and infiltrates were reported.



Accessory veins divert blood flow from the fistula. Reduced flow and pressure on the vein wall prevents maturation and can result in early fistula failure.

# Coil Embolization

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# Outflow Stenosis

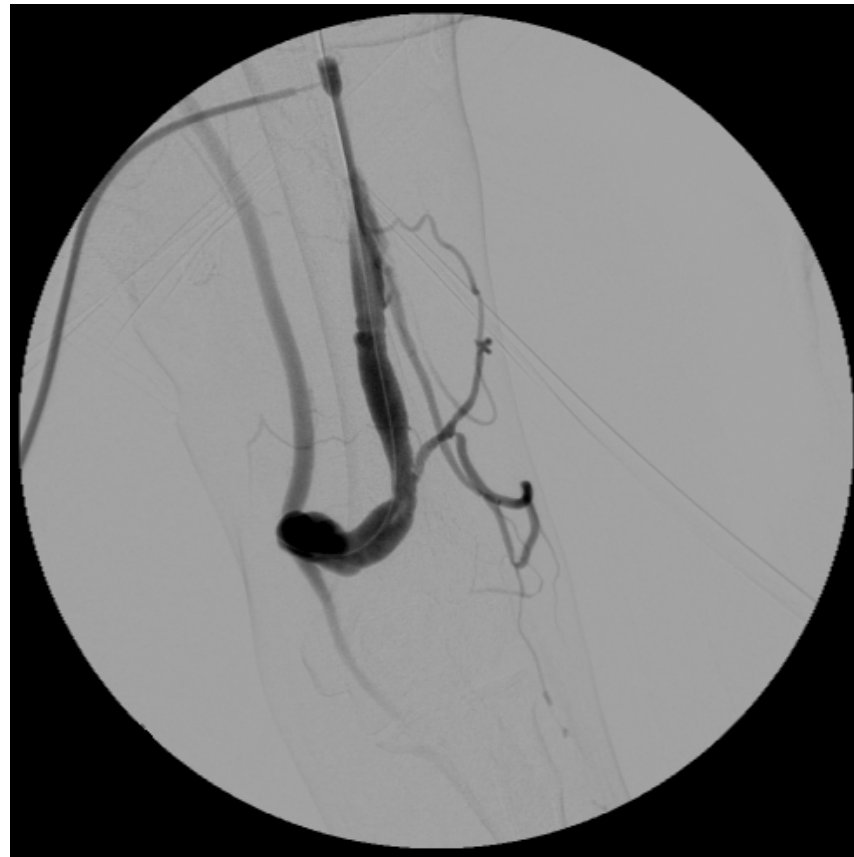
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Patient was referred because of increasing aneurysm size  
Lower portion of fistula is hyper-pulsatile  
Obvious stenosis at junction of lower and middle third of fistula



# Outflow Stenosis

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# Central Vein Stenosis

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Patient was referred for evaluation of edema in the access arm.

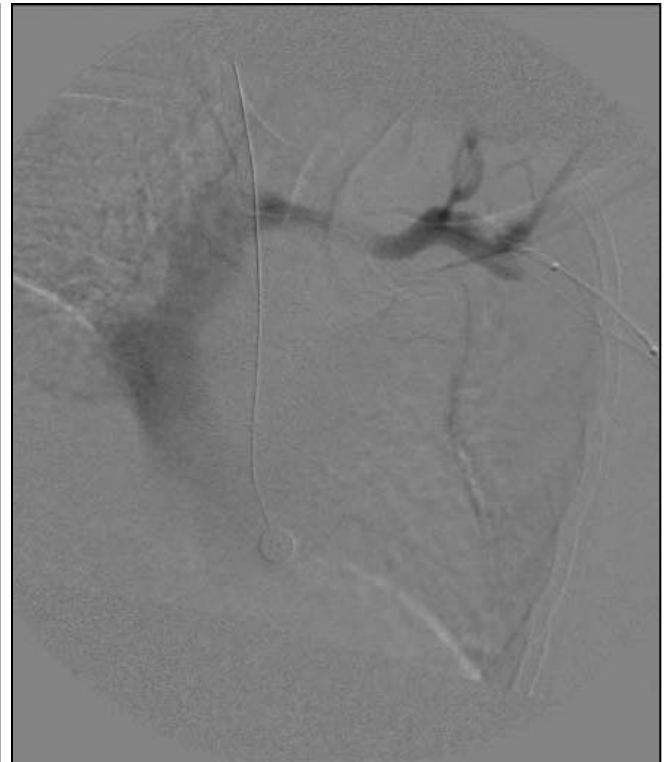
High venous pressure prolonged bleeding time and decreased clearances are noted.

History of previous left sided dialysis catheters



# Central Vein Stenosis

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# Graft Dysfunction

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Patient was referred for prolonged bleeding, high venous pressure and increasing aneurysm size.

Recirculation and decreased clearances were reported.



# Venous Anastomosis

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# Secondary Fistulas

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- “Sleeves up” exam. Examine the outflow vein of all forearm graft patients to identify who may have a suitable upper outflow vein for elective secondary AV fistula conversion in the upper arm.
- Nephrologists refer to surgeon for placement of secondary AVF before failure of AVG

# Secondary Fistulas



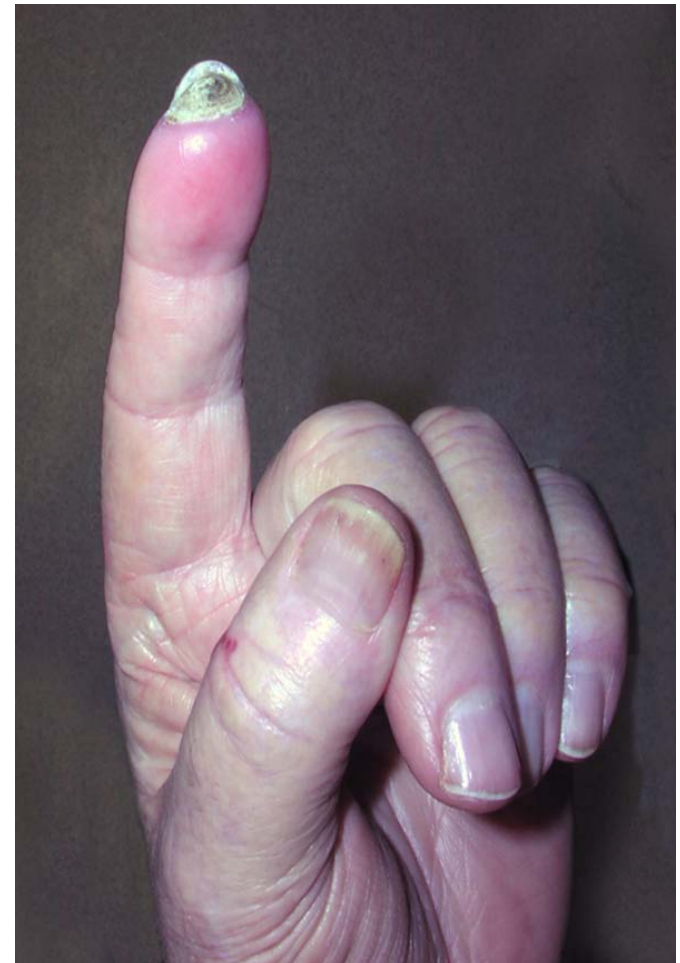
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# Complications

# Steal Syndrome

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- Blood flow to the hand decreases following AVF/AVG creation. Blood is diverted into the access. The hand and fingers can become very cold and painful or turn white or blue.
- Necrotic fingertips can result. Surgical attention is needed immediately to save the fingers and hand.
- Steal syndrome is seen more often after upper arm vascular access creation in patients with smaller arteries or PVD.



# Pseudoaneurysm

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# Pseudoaneurysm with Ulcerations

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# Summary:

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## **Adequate access = adequate dialysis**

- The patients dialysis access is their lifeline  
It is the job of the entire team to try to maintain it
- Staff education is key
- Begin a monitoring and surveillance program
- Recognize the early signs of access dysfunction and take action

# Early Detection is Critical



Why, your fever is way down.