

Predictors of Successful AV Fistula Maturation

Clinical Update: Advances in Hemodialysis Vascular Access

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Overview

- Dialysis access and complications
 - 20% of hospitalizations
 - \$1 billion annually
- NCF Dialysis Outcome Quality Initiative (DOQI)
 - Optimal management guidelines
 - Evidence-based

Perspective

- Stringent patient selection
 - Younger
 - Male
 - Non-diabetic
 - Few co-morbidities
 - Lower expectations (lower flows)

Perspective

- Liberal patient selection
 - Older
 - Female
 - Diabetic
 - Multiple co-morbidities
 - High expectations (high flows)

Perspective

- Increased utilization of grafts
- Increased complications
 - Thrombosis
 - Stenosis
 - Infection
 - Steal

Perspective

- Surveillance programs (prophylaxis)
 - Frequent
 - Labor intensive
 - Costly
- Re-emergence of AV fistula
 - DOQI guidelines
 - 50% prevalence
 - 40% useable

AV Fistulas

- General characteristics
 - Created with low morbidity/mortality
 - Requires a period of maturation for use
 - Increase in size over time
 - Increase in flow over time
 - Lower complications than AVG

AV Fistulas

- Early primary failure higher than grafts
 - Thrombosis
 - Failure of maturation
- Cumulative one-year patency
 - Include primary failures
 - AVF = graft
 - Exclude primary failures
 - AVF > graft

AV Fistulas

- Major advantage (Payoff)
 - Successful maturation
 - Subsequent complications and interventions ↓ 7-fold
- Challenge
 - Maximize prevalence
 - Minimize primary failures
 - Develop sound clinical and logistical approaches to this challenge

Factors Affecting Fistula Prevalence

- Geographic variations
 - Local
 - Regional
 - International
- Practice variations
 - Surgeons
 - Centers
- Patient factors
 - Gender
 - Race
 - Age
 - Diabetes

AV Fistula

- Radiocephalic (forearm)
- Brachiocephalic (upper arm)
- Brachiobasilic (upper arm)
- Primary failure – forearm > upper arm

AV Fistula

- Venous requirements
 - Luminal diameter 2.5mm or greater
 - Patent
 - Relatively straight
 - Superficial
 - Continuity with patent central veins
- Arterial requirements
 - Pressure differential < 20 mm
 - Patent palmar arch
 - Arterial lumen 2.0 mm

AV Fistula Maturation

- Timing of referral
 - Early – AV fistula
 - Late – catheter, graft
 - DOQI
 - Serum creatinine > 4mg/dL
 - Cr Cl < 25 cc/min
 - 4 months prior to initiation

AV Fistula Maturation

- Adequate dilation
- Adequate flow
 - Access flow 100 cc/min > dialysis flow
 - International variation
 - USA – 400 cc/min
 - Europe – 300 cc/min
 - Japan – 200 cc/min
- Adequate wall thickening
- Adequate location

AV Fistula Maturation

Pre-Op Assessment

- Access history
- Physical exam
 - Pulses
 - Vein pattern
 - Allen's test
- Vascular mapping
 - Caliber
 - Patency
 - Phlebitic changes
 - Neutralizes demographic impact
- Venogram



AV Fistula Maturation

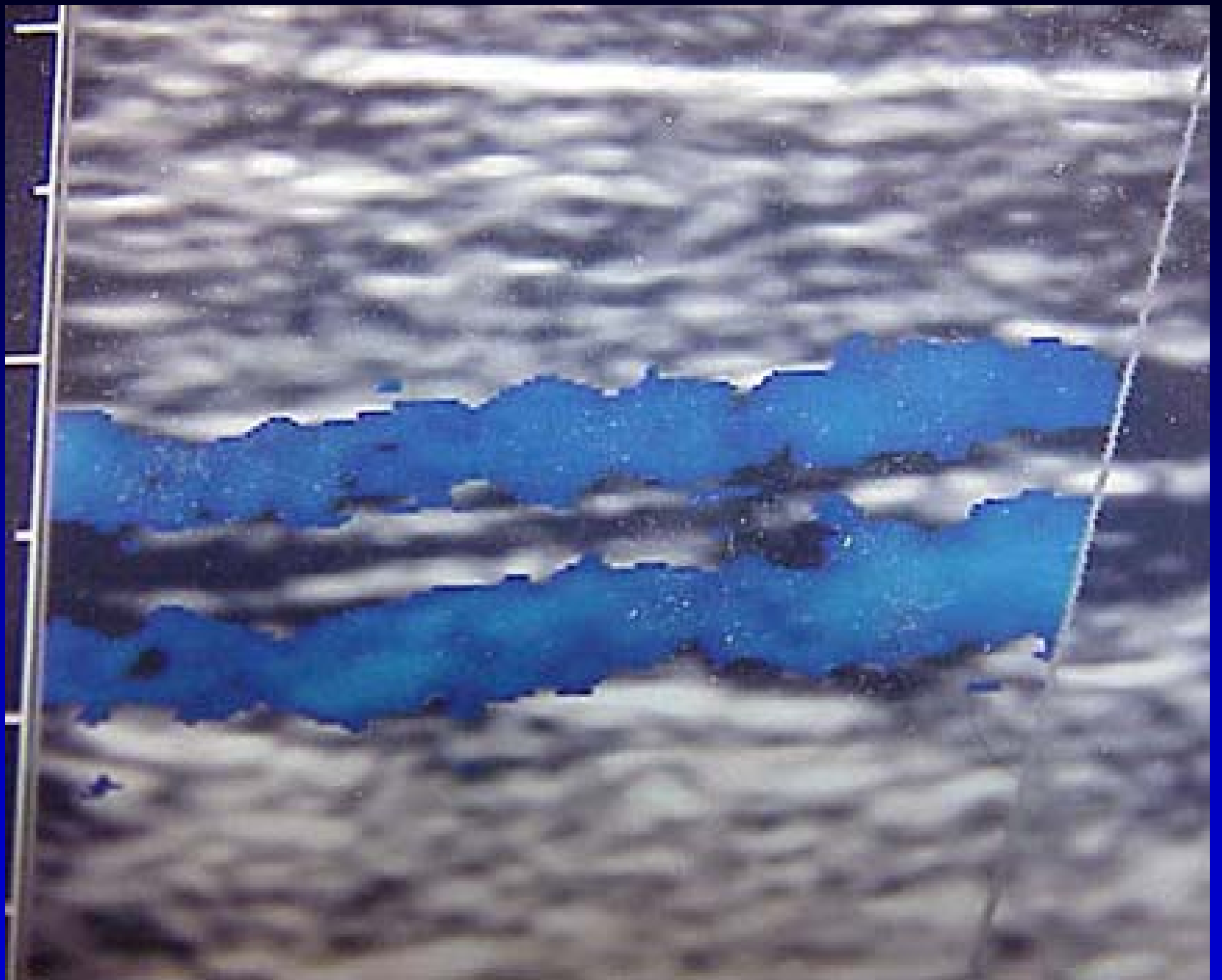
Vascular Mapping

- Transverse measurements
 - Minimum vein 25 mm, artery 20 mm
- Stenosis
- Thrombosis
- Sclerosis
- Calcifications

AV Fistula Maturation

Vascular Mapping

- Tourniquet
 - Cephalic
 - Basilic
 - Brachial
 - Subclavian
 - Jugular

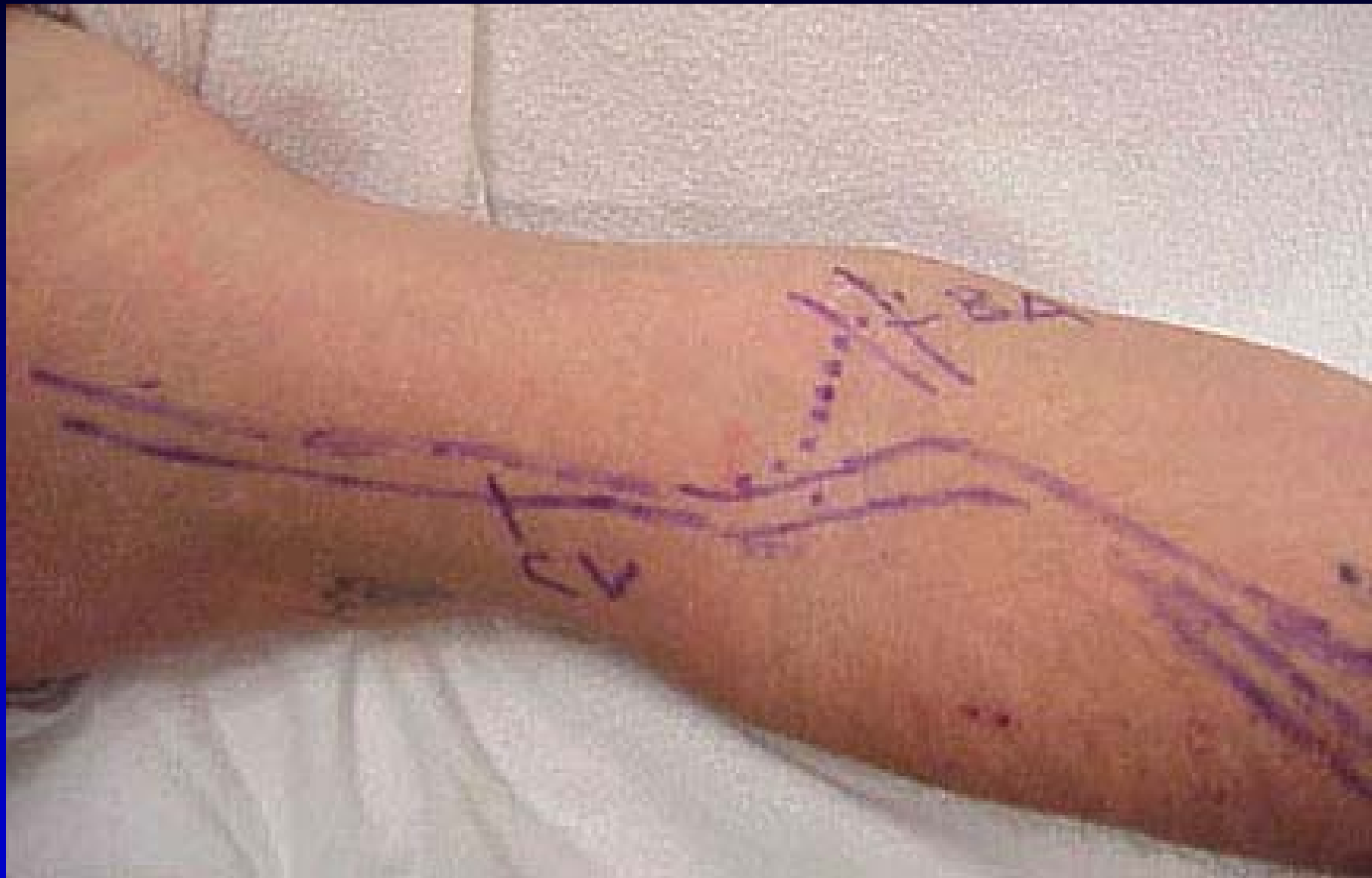


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AV Fistula Maturation

Vascular Mapping

- Outcomes
 - ↑ % fistulas placed
 - ↓ Primary fistula failure
 - ↑ % fistulas in use

AV Fistula Maturation

Vascular Mapping

- Malovrh
 - Pre-op I.D. < 1.5 mm → 36% patency
 - Pre-op I.D. > 1.5 mm → 83% patency
 - Higher flows
- Robbin, et al.
 - Exam vs. vein mapping
 - Fistula selection changed 31% patients following review of scan

AV Fistula Maturation

Vascular Mapping

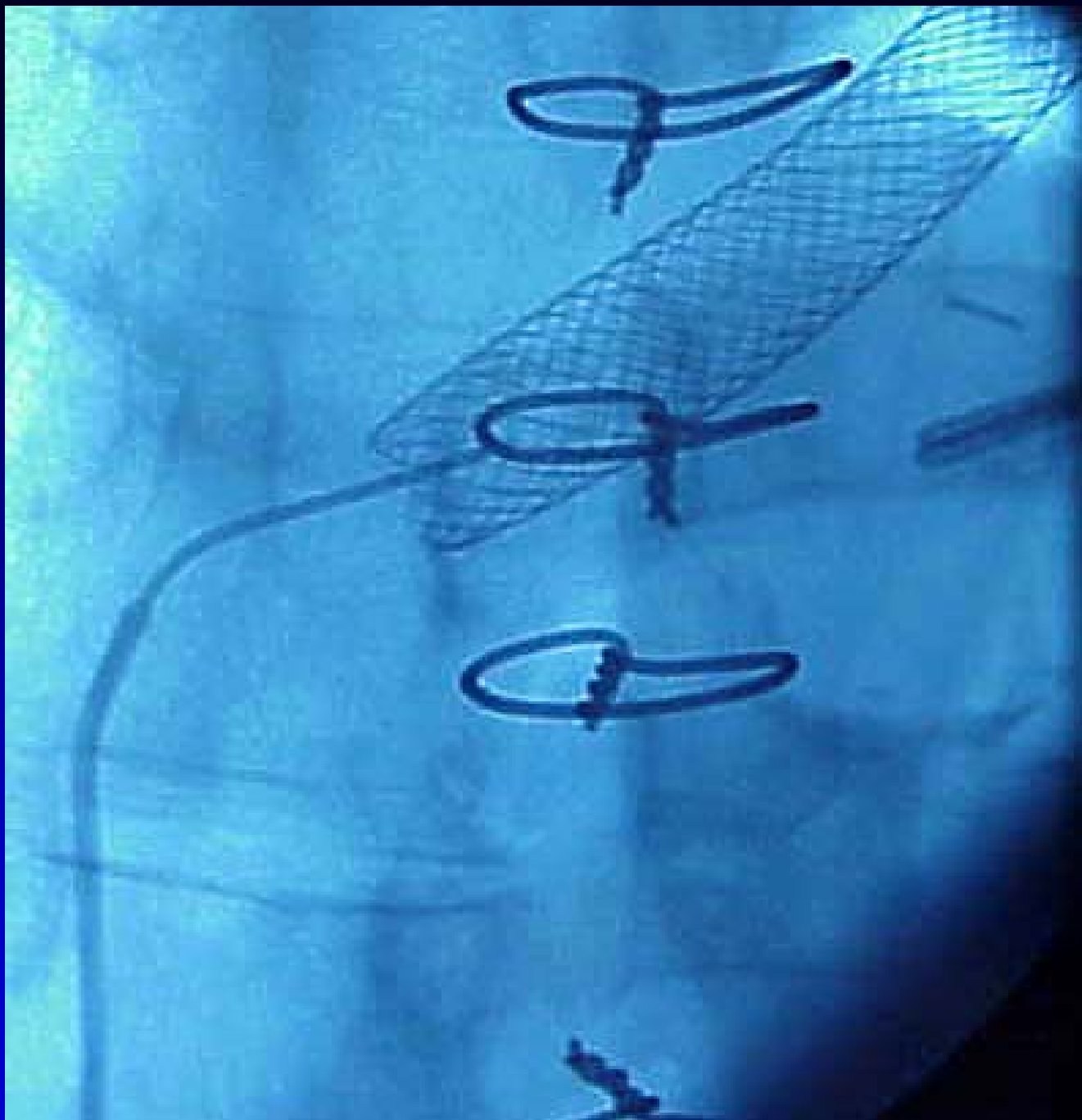
- Outcomes
- Adequacy of fistula increased in all groups and sites
- Placement less likely in
 - Women
 - AA
 - advanced age
 - DM
 - obese

AV Fistula Maturation

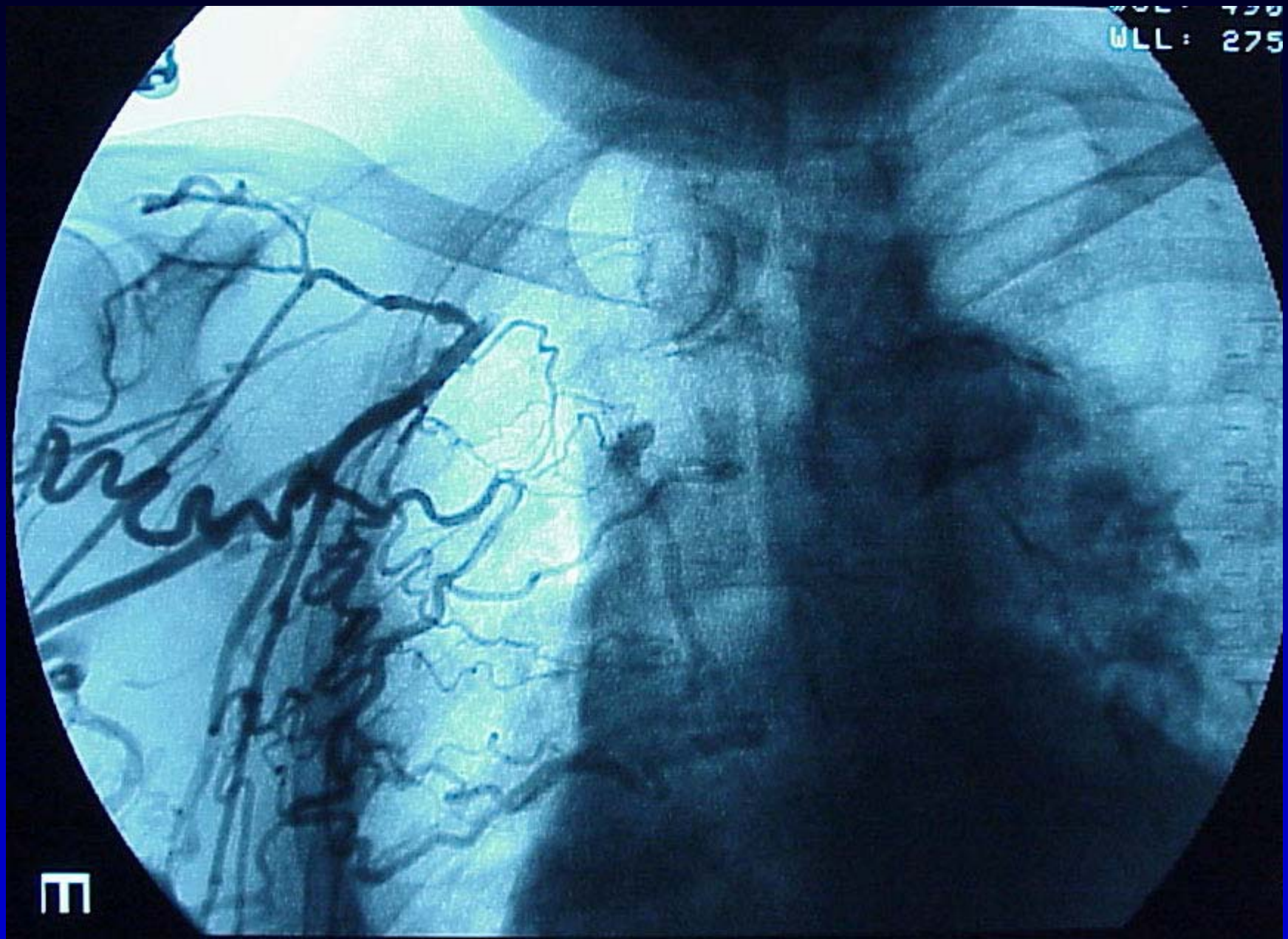
Venography

- Disadvantages
 - Veins only
 - Phlebitis induction
 - Contrast administration
 - Expense
- Advantages
 - Central vein interrogation






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AV Fistula Maturation

Assessment of Successful Maturation

- Cannulation
- Adequate flow
 - 500 ml/min
- Vein diameter
 - 4 mm
-  Subclavian vein flow





AV Fistula Maturation

- Early indicators
 - ↑ fistula flow @ 24 hours, 1 week
 - ↑ arterial inflow @ 24 hours, 1 week, 4 weeks
 - ↑ fistula caliber
- Early detection of failures facilitates timely intervention or placement of new access

AV Fistulas

- Causes of early fistula failure
 - Inflow problems
 - Pre-existing arterial anomalies
 - Anatomically small
 - Atherosclerosis
 - Acquired
 - Anastomotic stenosis
 - Outflow problems
 - Pre-existing venous anomalies
 - Anatomically small
 - Fibrosis
 - Accessory veins (side branches)



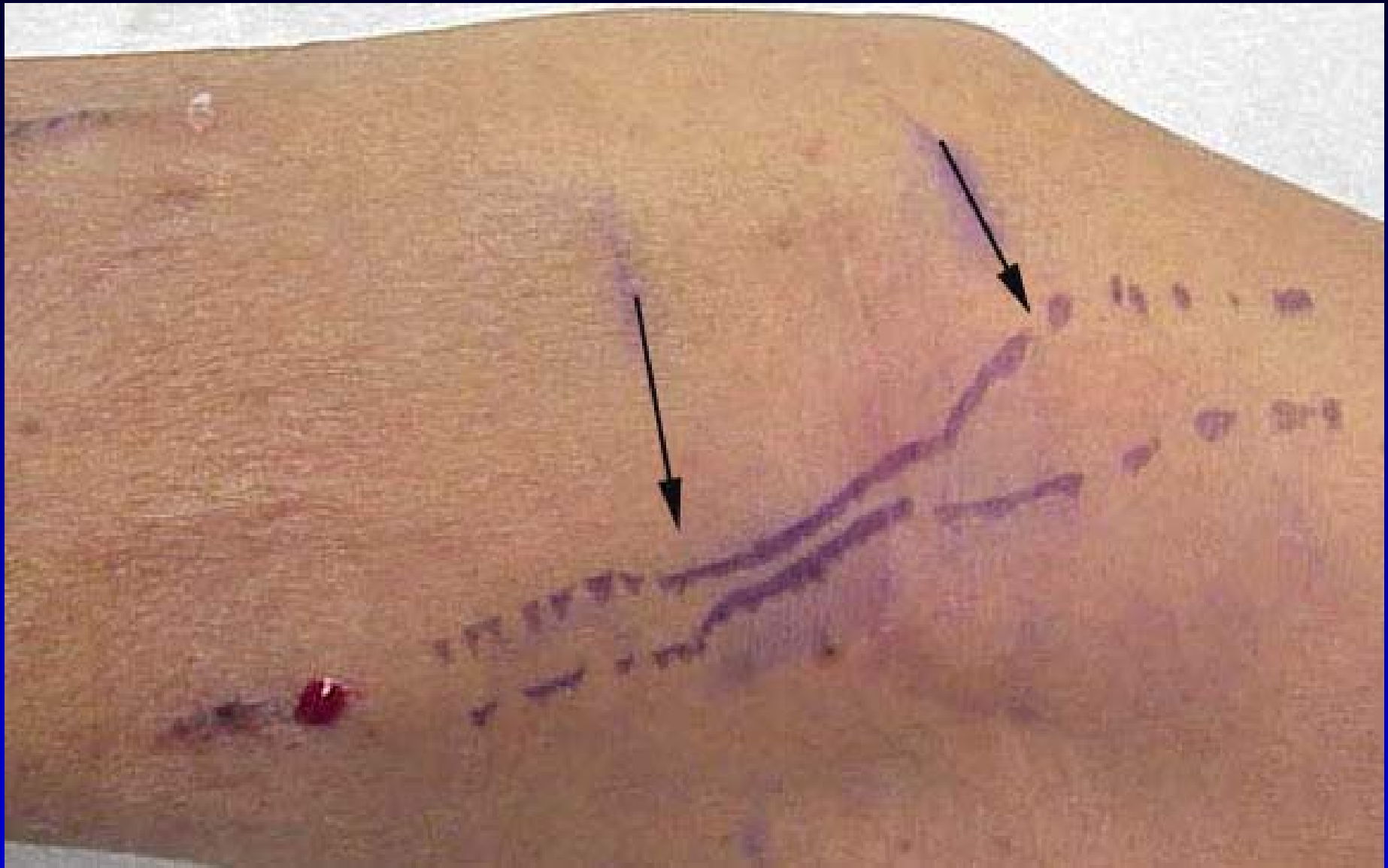




AV Fistulas

Causes of Late Graft Failure

- Stenosis
 - Anastomotic
 - Fistula
 - Central veins
 - Arterial
- Thrombosis
- Aneurysm
- Excessive flow
 - Heart failure
 - Steal
- Infection









Secondary AV Fistulas

- After primary fistula failure
- After failed AVG
- Lower patency and maturation rates

AV Fistula Maturation

- Primary vs. secondary procedure
- Rx with anti-platelet agents
- Hand/arm exercises
- Surgeon experience and case volume

Summary

- AV fistulas – fewer complications and subsequent interventions compared to grafts
 - Fewer hospitalizations
- AVF access selection influenced by many factors
 - Timing of referral
 - Patient demographics
 - Nephrologist/surgeon/nurse preference
 - Patient anatomy

Summary

- Successful maturation AVF
 - Vascular mapping
 - Vessel caliber
 - Fistula flow
 - Patient demographics
 - Surgeon's experience
 - Nursing skills
 - Early monitoring – early intervention

Conclusion

Adoption of specific measures and routines, including multidisciplinary approach, early referral for access, experienced surgeons utilizing routine pre-operative mapping techniques, as well as dialysis centers with experienced, well-trained staff will increase the prevalence of functional AV fistulas in this complex patient population.