



## AV Fistulas in Most (All?) Patients



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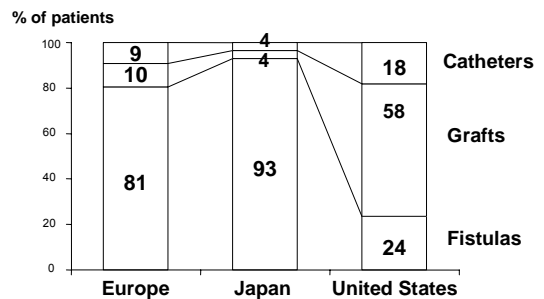
## Graft (vs AVFs) Problem

- Increased mortality risk
- More complications
- Short access survival (more procedures)
- Higher costs
- Too many grafts placed (too few AVFs)

## Graft (vs AVFs) Problem

- Morbidity and cost of vascular access constitutes an enormous burden for patients and ESRD programs in general...as much as 25% of total ESRD costs.  
*AmJKidneyDis. 34(2),1999,362-363*
- Grafts have 8 times greater risk of complications and need for additional procedures than AV Fistulas.  
*Am Society Neph 2000:377-385*

## High AVF Use Among Prevalent Hemodialysis Patients in Europe & Japan vs. U.S.<sup>1</sup>

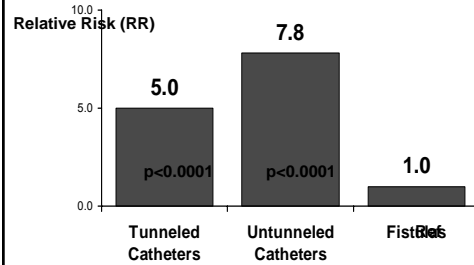


<sup>1</sup> Dialysis Outcomes and Practice Patterns Study (DOPPS)

## AV Fistula Rate: Europe=83%...USA=30%

- Adjusted for: Age
- Gender
- BMI
- Diabetes
- Vascular disease
- **We can't say our patients are sicker.**

## Risk of Access Infection is Greater for Catheters than Native AV Fistulas



\*adjusted for age, gender, continent (EUR vs US), and 15 classes of comorbidities; p values are for comparison to infection rate for fistulas.

## Relative mortality risk according to type of vascular access

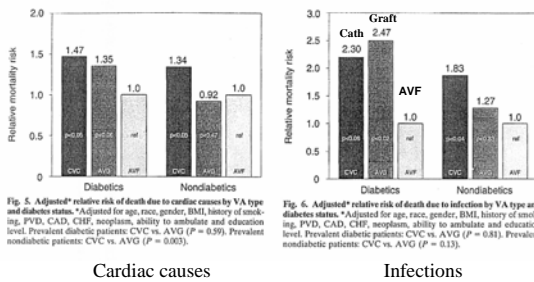
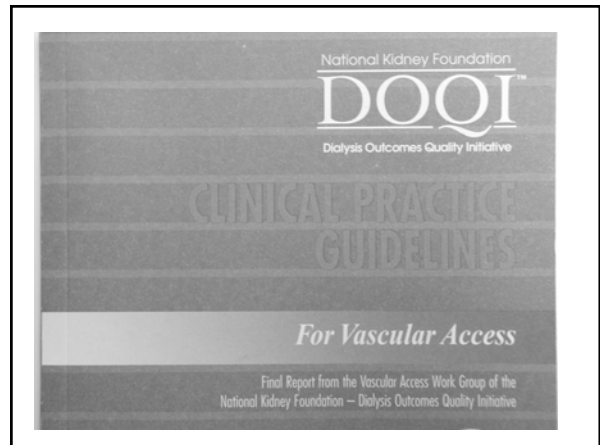


Fig. 5. Adjusted\* relative risk of death due to cardiac causes by VA type and diabetes status. \*Adjusted for age, race, gender, BMI, history of smoking, PVD, CAD, CHF, scapism, ability to ambulate and education level. Prevalent diabetic patients: CVC vs. AVG ( $P = 0.59$ ). Prevalent nondiabetic patients: CVC vs. AVG ( $P = 0.003$ ).

Fig. 6. Adjusted\* relative risk of death due to infection by VA type and diabetes status. \*Adjusted for age, race, gender, BMI, history of smoking, PVD, CAD, CHF, scapism, ability to ambulate and education level. Prevalent diabetic patients: CVC vs. AVG ( $P = 0.81$ ). Prevalent nondiabetic patients: CVC vs. AVG ( $P = 0.13$ ).

Dhingra: Access type...  
KI60(2001),1143-1451



## NKF-DOQI goal of access: maximize primary AVF's

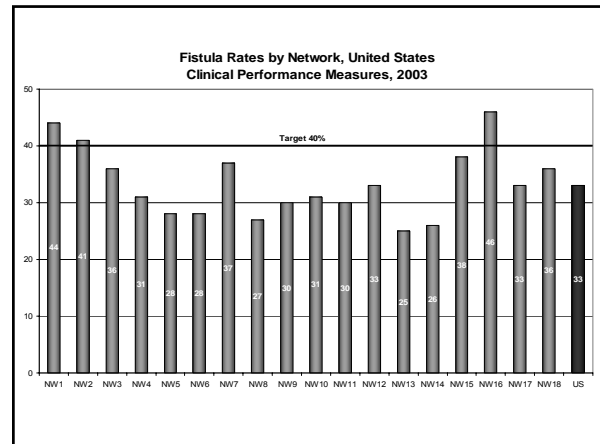
- At least 50% of all new elective patients should have dialysis by native AVF.
- 40% of prevalent patients should use a native AVF.
- Re-eval for native AVF with each access failure.
- Each center should track access results.

## NKF-DOQI goals for **initial** access **failure** rate

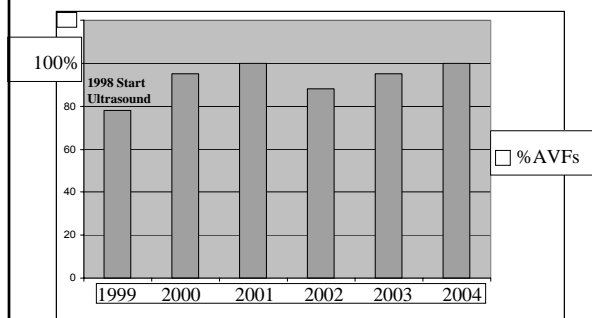
- Forearm straight grafts---15%
- Forearm loop graft-----10%
- Upper arm graft----- 5%
- Native AVF-----No guideline, encouraging as many attempted AVFs as possible
- ...Reports have shown up to 40% AVFs fail or fail to mature

## DOQI goals for cumulative patency rate

- All grafts---70%@ 1 year, 60%@ 2 years, 50%@ 3 years.(regardless of interventions)
- Native AVF's---No guidelines, encouraging AVFs.
- Closed grafts now often treated by interventionalist



## >350 Consecutive Vascular Access Operations



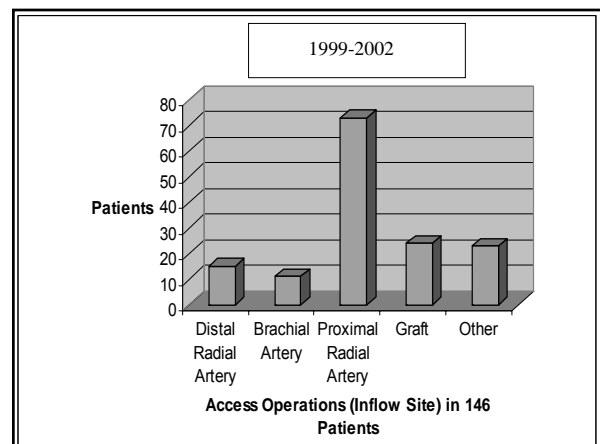
- Almost all local anesthetic with sedation, occasional axillary block.
- Outpatient unless otherwise hospitalized
- Perioperative antibiotics unnecessary

Dialysis and Transplantation  
Vol.32(5) May 2003,308-10

## Results: 1999-2002

- **Preoperative Ultrasound by the Operating Surgeon**
  - 46/47 (96%) had AVFs
  - Patency @ one yr = 97%
  - Patency @ 30 mos= 93%
- **Proximal Radial Artery AVF**
  - 111/146 (85%) AVFs
  - PRA AVF: N=73
  - Patency at one yr = 92%
  - Patency @ 42 mos= 80%

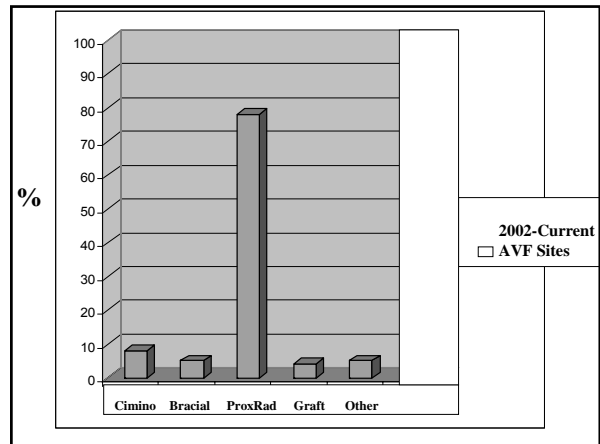
• (Am J Surg,186(6), Dec2002,568-572) • (J Am Col Surg,197(1), July2003,58-63)



## Results:2002-July 2004

- 138 operations in 129 patients
- 6/126 AVFs failed
- 4 AVFs revised (2-JAS, 2-Outflow) = 3/4 open
- Four thigh and two upper arm grafts (any role for arm grafts?)
- Ultrasound used in all patients prior to surgery
- No steal syndromes
- No infections (One graft ligated for bleeding-hospitalized)
- 96% AV Fistulas
- 95% AVF patency (3 successful revisions)
- No admissions for complications of dialysis access in AVF patients.

•My Changing Surgical Approach to AV Fistula Construction: Network 13 Newsletter,Jan 2004



134 consecutive access operations without a graft

## Patient Demographics N = 134 NAVFs

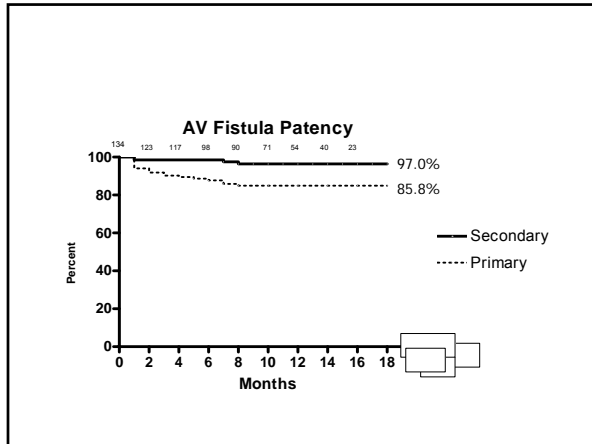
- Female 61
- Diabetic 68
- Obesity 31
- Previous access operations 34
- Two or more access operations 25

Table 2 – Vascular Access Operations According to Arterial Inflow Site

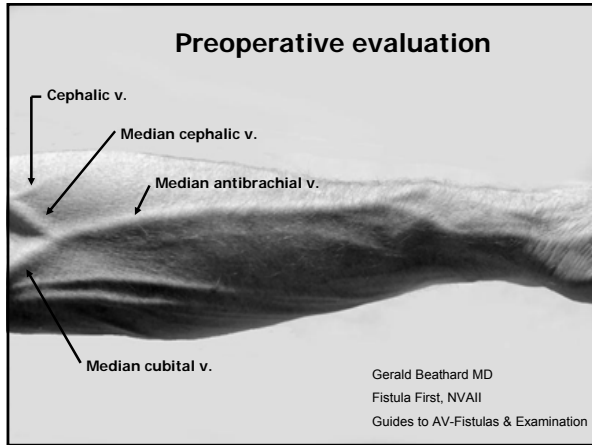
Direct AV Fistulas	Number of Operations
• Distal radial artery (wrist/cimino)	11
• Proximal radial artery	105
• Brachial artery	11
<b>Transposition AV Fistulas</b>	
• Radial artery/basilic vein	3
• Brachial artery/basilic vein	3
• Femoral artery/saphenous vein	1
<b>Total</b>	<b>134</b>

Table 3 – Access Patency in 100 AV Fistulas

Direct AV Fistulas	Overall (assisted) Patency %	Primary Patency %	Mean Follow-up, Months (range)
• Distal radial artery (wrist/cimino) N=11	100	90.9	7 (1-16)
• Proximal radial artery N=105	97.1	91.4	11(1-17)
• Brachial artery N=11	90.9	72.7	13 (1-15)
<b>Transposition AV Fistulas N=7</b>	100	71.4	9 (2-18)
<b>Total N=134</b>	<b>97.0</b>	<b>85.8</b>	<b>11 (1-18)</b>



Preoperative evaluation and  
Ultrasound mapping



**Arterial Evaluation**

**Goals: Normal pressure inflow  
Avoid steal syndrome**

- Clinical examination... Brachial, radial, ulnar arteries
- Bilateral upper extremity blood pressure
- Patent Palmar Arch : Allen test (normal arch)
- Ultrasound : Arterial lumen  $\geq 2.0$  mm

**Venous Evaluation**

- Most problems causing failure of vascular access are venous
- Ultrasound Mapping finds:
  - Feasibility
  - Best arm
  - Best site

Predicts success

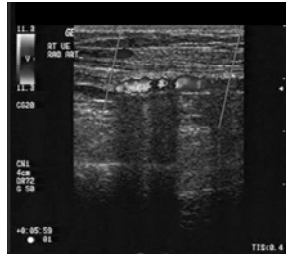
**Ultrasound  
Technical Considerations**

- Choose correct probe.....  $\geq 7.5$  MHz
- Venous tourniquet
- Set shallow focal depth!
- Contact probe pressure only!
- Adjust gain
- Sweep, then focus exam
- Preoperative marking of vessels and branching sites is often useful

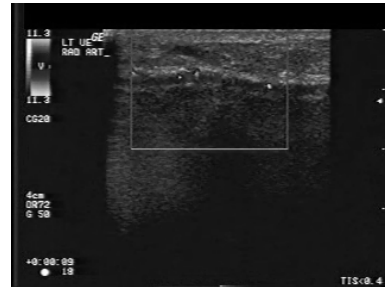
## Preoperative ultrasound

Possible problems with the distal radial artery:

- ..Bidirectional flow
- ..Calcifications
- ..Obstruction
- ..Size (<2.0 mm)
- ..velocity/wave form



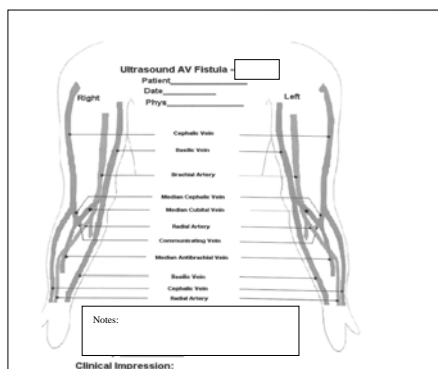
## Radial artery ultrasound (distal and proximal)



## Vein Mapping

- **Mandatory evaluation prior to vascular access surgery**
- $\geq 2.5$  mm vein size through forearm
- Open venous conduit through forearm
- Vein will distend and compress easily
- Best done by the operating surgeon ..... (my opinion/experience)

## Forearm ultrasound



## Pre-operative mapping



## Post operative evaluation

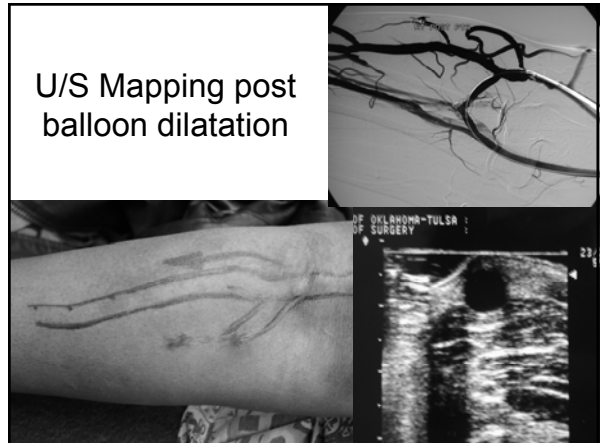
## AV Fistula not clearly mature at 1 month?

- Your ultrasound and examination will focus the problem(s) and guide the request to the interventionalist.
- List problems: inflow, outflow, access site....?
- Pass guidewire through anastomosis in each AVF.
- Extended angioplasty ALL marginal outflow veins.
- Expect to open occluded segments if outflow available.

## Finding YOUR Interventionalist

- Interested in "Solving the Puzzle"
- Performs pre and post procedure examinations
- Understands concepts / procedure goals:
  - Poor inflow
  - Poor outflow
  - Difficult cannulation
- Will go to access meetings with you
- Will call you during procedures for problems

## U/S Mapping post balloon dilatation



## Monitoring/Evaluation of Established AV Fistulas

- Venous pressure 100mm/Hg @200 flow(or trend)
- Kt/V < 1.3 (DOKI <1.2)...(or trend)
- Recirculation = 10% or less
- Flow = 350-400 ml/minute
- Exam and ultrasound by the surgeon!

## Why AV Fistulas, Not Grafts?

- |   |  |
|---|--|
| • <u>Patient benefits:</u>                              | • <u>Surgeon benefits:</u>                   |
| • Patients with AVFs live longer                        | • High patient and nephrologist satisfaction |
| • Patients with AVFs have 8x fewer access complications | • Simple, safe outpatient procedures         |

↓ ↓

**Avoid or markedly decrease hospital admissions and emergency operations for infection, bleeding, steal syndrome, and thrombosis.**