JANUARY/FEBRUARY 2005 VOLUME 2 ISSUE 1

CHRONIC KIDNEY DISEASE BEST PRACTICE

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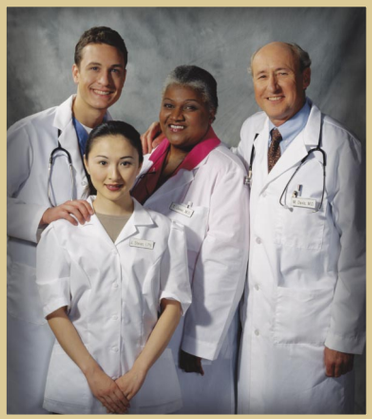

STRATEGIES TO INCREASE AV FISTULA USE IN A COMMUNITY-BASED NEPHROLOGY PRACTICE

by Lynne Treat, RN, Diane Seagrove, RVT, Chris Griffith, MD, and Vo Nguyen, MD

From 1996 to the present, the dialysis facilities in the Renal Care Group NW-Olympia increased the use of the arteriovenous fistula (AVF) as primary hemodialysis access from fewer than 40 percent of patients to greater than 80 percent. This compares to the DOPPS findings that only 31 percent of U.S. hemodialysis patients currently use an AVF as a permanent access. This increase in AVFs was accomplished with a multidisciplinary renal team approach to AV fistula creation.

Photo by Bonnie Dickhoff

L to R: Diane Seagroves, Vo Nguyen and Lynne Treat

The Renal Care Group NW-Olympia includes three dialysis units in the southwest Washington area serving 250 patients under the care of five nephrologists. In the 1990s in our practice area, the primary hemodialysis access consisted of AV grafts and catheters. Our patients experienced a very high rate of AV graft failure, requiring frequent and expensive surgical revisions. In 1996, the Olympia area vascular surgeons received a letter from the area medical review organization demanding that corrective steps be taken to decrease the high rate of vascular access revision surgeries.

The vascular surgeons teamed up with the area nephrologists to develop strategies to significantly increase AVFs and minimize the use of AV grafts. Although the National Kidney Foundation's *K/DOQI Clinical Practice Guidelines for Vascular Access* had not yet been published, many of the strategies that were implemented are similar to those in the current K/DOQI Guidelines. Implementing these strategies resulted in a gradual improvement in the numbers of patients with AVF as their permanent access—an increase that was sustained over time and continues today.

In 2002, the Network 16 Medical Review Board designated these strategies as the Best Practice in Vascular Access (described below). The multidisciplinary team from Olympia was then asked to join the Network 16 Vascular Access Quality Improvement Program and to organize workshops to present these strategies to dialysis programs with less than 40 percent of prevalent AVF rate. Workshops were held in several cities in the Pacific Northwest. Within one year of implementing the best practice strategies, these dialysis facilities increased their prevalent AVF rate by 8.5 percent. Dr. Vo Nguyen continues his advocacy for "Fistula First" as a member of the National Vascular Access Improvement Initiative Leadership Group.

STRATEGIES FOR AVF CREATION

1. Early Referral

Initiating dialysis without a fistula increases the risk for morbidity and mortality. Therefore, early referral of CKD patients to a nephrologist is important. Early referral also allows patients and families to psychologically prepare for the lifestyle changes involved with chronic kidney failure, and it allows time for choosing a dialysis modality and for dialysis access planning (e.g., preserving arm blood vessels for AVF placement).

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THROMBOLYTICS FOR HEMODIALYSIS CATHETER CLEARANCE

by Rowland J. Elwell, PharmD, Assistant Professor of Pharmacy Practice, Albany College of Pharmacy

All hemodialysis patients rely on vascular access for their dialysis treatment. Vascular access strategies include the timely placement of arteriovenous (AV) fistulas or synthetic AV grafts. Venous catheters can also be used, but should be considered a temporary access method. Unfortunately, prolonged catheter use is often necessary in patients for whom a fistula or graft cannot be maintained.

Failure of vascular access is a major cause of morbidity and inadequate hemodialysis, often resulting from thrombosis in the vascular access. Although access thrombosis is a concern

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STRATEGIES TO INCREASE AV FISTULA USE

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Early referral to a nephrologist also can facilitate preservation of remaining kidney function. Additionally, the nephrologist may prescribe calcitriol and phosphorus binder therapy to mitigate cardiovascular and bone metabolism problems related to secondary hyperparathyroidism and erythropoietin to treat anemia.

The Olympia area nephrologists found it effective to send a letter to all primary care physicians in their practice area encouraging referral of patients at CKD Stage 2 or 3.

2. Patient Education

Nephrologists need to educate patients by discussing the benefits of AVF and the dangers of grafts and hemodialysis catheters. Patients should be encouraged to consider early placement of an AVF. In elderly patients and patients with diabetes mellitus, coronary artery disease, or peripheral vascular ischemic disease, access placement surgery should be scheduled as early as one year prior to renal replacement therapy.

The nephrologist should also inform patients about the potential need for more than one surgery (in patients with poor vessels) to achieve a mature AVF and the need for vein preservation for future AVF placement. Vein preservation involves limiting venopunctures and IV infusions to dorsal hand veins and posterior forearm basilic veins, as well as avoidance of central venous line and PICC catheters. This patient education strategy is consistent with K/DOQI Clinical Practice Guideline 8 (Timing of Access Placement).

3. Strong Relationships with Surgeons and Vascular Labs

To be successful, it is necessary to carefully select health professionals who share the goal of increasing use of AVFs. This means finding and collaborating with local surgeons who have the skills and interest in vascular access placement and severing ties with surgeons who are not receptive to AVF placement as the standard in dialysis access.

Building strong relationships with vascular labs is also useful. This means scheduling time for the nephrologist to become familiar with how the vascular lab conducts duplex arterial and venous mapping of potential vessels to use to create the AVF.

4. Professional Staff Education

Nephrologists should be educated in all aspects of fistula creation, including preoperative vein mapping and principles of vascular access surgery. Surgeons should be educated in routine preoperative vein mapping (physical examination or duplex mapping of arteries and veins), as well as the surgical technique of transposition of deeper upper arm and forearm veins in obese patients, the Gracz procedure and the brachial artery-forearm retrograde-flow cephalic vein AVF.

Nurses and patient care technicians with superior skills in cannulation of new or difficult AVFs can serve as resources and as mentors to less experienced staff. In addition, an access manager should be designated to supervise staff education on fistula cannulation techniques, the transition from graft to fistula cannulation and the buttonhole technique for AVF cannulation. The access manager should supervise the monitoring of access function for early intervention to prevent thrombosis.

5. Comprehensive Vascular Access Planning

Prior to performing surgery to create an AVF, some preparation is necessary. The following strategies are consistent with those outlined in K/DOQI Clinical Practice Guideline 2 (Diagnostic Evaluation Prior to Permanent Access Selection).

First, perform routine vascular mapping by duplex study or physical examination. Update protocols for duplex vascular mapping regularly to reflect evidence-based changes. Next, develop a written vascular access plan, defining the vessels to be used for AVF creation, and create an alternative plan in case the chosen vessels are found to be inadequate once surgery has been initiated.

Failed AV grafts should not be revised. Instead, make a long-term plan prior to graft failure to routinely create a secondary upper arm AVF when the forearm AV graft fails. Create a contralateral arm AVF in patients with upper arm AV grafts or forearm grafts without suitable upper arm veins, while the graft is still functioning.

To prevent vascular steal in upper arm AVF surgery, adjust the anastomosis size (less than 4 mm in upper arm fistula) to allow for adequate distal extremity flow. Perioperative duplex testing of flow in distal arteries should be conducted prior to closing the skin incision.

6. Close Post-Surgical Follow-Up

If the AVF fails to mature within 6 to 12 weeks (depending on the preoperative assessment of the vessels used to create the access), intervention will be necessary. Use physical exam, duplex vessel studies and/or fistulogram as assessment tools. This strategy is consistent with K/DOQI Clinical Practice Guideline 18 (When to Intervene—Primary AV Fistulae).

7. First-Time Cannulation of New AVF

For first-time cannulation of a new AVF, utilize the best "sticker" (the staff member with the best cannulation skills). Use #16 or #17 gauge fistula needles and low blood flow rate (200 mL/min). Also, consider the buttonhole cannulation technique.

8. Monitoring of AVF Function

Ongoing monitoring of AVF function should include the following:

- Measure venous pressures at dialysis blood flow rate of 200 mL/min
- Assess for decreased dialysis adequacy (Kt/V or URR)
- Assess for increases in time to achieve hemostasis after fistula needles are removed
- Utilize intra-access blood flow rate monitoring
- Plan for placement of new AVF in contralateral arm if current AVF needs angioplasty every two

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to three months in order to treat stenosis (This strategy is consistent with K/DOQI Clinical Practice Guideline 19 [Treatment of Stenosis Without Thrombosis in Primary AV Fistulae]).

9. Late Referral Recommendations

When there is a late referral for ESRD care, an AV graft should not be placed. Instead, begin the patient on hemodialysis using a tunneled dialysis catheter. Place an AVF within one to two weeks of the start of dialysis treatments. Patients should also be encouraged to consider peritoneal dialysis as a transitional or permanent renal replacement therapy, depending on the availability of home dialysis education at the time the patient needs the therapy. Patients with severe ischemic vascular disease leading to severe steal syndrome or recurrent failure of fistula surgery should be encouraged to consider peritoneal dialysis permanently. This strategy is consistent with K/DOQI Clinical Practice Guideline 29 (Maximizing Primary Fistulae) and Guideline 30 (Use of Catheters for Chronic Dialysis).

Conclusion

With the development of a vascular access planning process, utilizing strategies based on the principles of the *K/DOQI Clinical Practice Guidelines for Vascular Access*, and active participation of all members of the renal multidisciplinary team, the goal of 80 to 90 percent AVF is achievable in dialysis programs in the U.S., regardless of the levels of patient co-morbidity. ■

Reference:

K/DOQI Clinical Practice Guidelines for Vascular Access; Update 2000. *Am J Kidney Dis.* 2001;37 (Suppl 1):S137-181.

NATIVE ARTERIOVENOUS FISTULA USE: Findings from the DOPPS

by Ronald L. Pisoni, PhD, MS, Senior Research Scientist and Director of DOPPS Analytical Support, University Renal Research and Education Association

Three types of vascular access are used for hemodialysis patients—the native arteriovenous fistula (AVF), synthetic graft and central vein catheter. While each offers benefits, extensive research has shown that the AVF provides the greatest overall benefit. In 1997, the National Kidney Foundation's *K/DOQI Clinical Practice Guidelines for Vascular Access* recommended that at least 50 percent of new ESRD patients should initiate hemodialysis with an AVF and 40 percent of prevalent hemodialysis patients should be dialyzing with an AVF.[1]

The extent to which these guidelines have been effective is demonstrated by results from the Dialysis Outcomes and Practice Patterns Study (DOPPS). In the United States, AVF use rose from 24 percent in 1997–1998 to 31 percent during 2002–2003.[2] In six other countries participating in the DOPPS from 1996 to 2001, the level of AVF use among hemodialysis patients was two- to four-fold higher than that achieved in the U.S., ranging from 67 percent in the United Kingdom to 93 percent in Japan (Figure 1). This much greater use of AVF in Japan and European countries has been observed even after considering differences in patient characteristics across countries and has served as a model for achievement of AVF use in the U.S. and other countries.

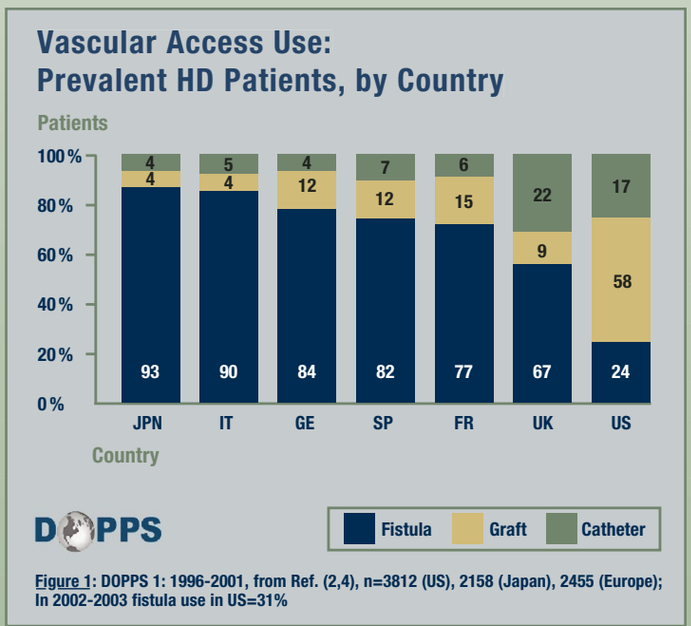

Figure 1: DOPPS 1: 1996-2001, from Ref. (2,4), n=3812 (US), 2158 (Japan), 2455 (Europe); In 2002-2003 fistula use in US=31%

In the U.S., only 15 percent of hemodialysis patients began therapy using an AVF in 1997–1998, with a similar level seen in 2002–2003. In contrast, 48 percent of hemodialysis patients in the United Kingdom and 60 to 83 percent of patients in France, Germany, Italy, Spain and Japan use an AVF when initiating chronic dialysis. Thus, the level of AVF use among patients first starting chronic dialysis in the U.S. is substantially lower than the K/DOQI Guideline recommendation of more than 50 percent AVF use, and also is substantially lower than in other countries.

The DOPPS has shown that access survival was 80 percent longer for AVFs than for grafts, when considering time to first failure of the access in new hemodialysis patients. The number of procedures or interventions for grafts was three times greater than for AVFs.[3] These interventions included hospitalizations and outpatient care for clot removal, surgical access revision, angioplasty, and pseudo aneurysm repair. Furthermore, the rate of vascular access infection with cuffed, tunneled catheters and untunneled catheters was five and eight times greater, respectively, than for AVFs.[4]

DOPPS has also shown that certain patient characteristics were associated with a reduced likelihood of having an AVF, including being older, female or obese, or having diabetes, peripheral vascular disease, coronary artery disease or angina pectoris. However, numerous published reports indicate how specific surgical techniques and thorough pre-operative evaluations can result in successful creation of an AVF for patients with a wide range of characteristics.

These results from the DOPPS underscore the advantages of the fistula as the access of first choice for hemodialysis patients. The Fistula First program, an effort to increase AVF use for hemodialysis patients, is currently under way in the U.S. Participation by all centers in this program will serve to increase AVF use, leading to better vascular access outcomes and fewer complications for hemodialysis patients. ■

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THROMBOLYTICS FOR HEMODIALYSIS CATHETER CLEARANCE

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with AV grafts and fistulae, most cases occur in venous catheters. Although the incidence of catheter thrombosis depends upon the duration of use, thrombotic complications have been reported in up to 46 percent of dialysis catheters.

Catheter thrombosis is generally suspected when blood cannot be aspirated from the catheter, yet saline flows in freely. However, it is important to rule out other sources of obstruction, such as a malpositioned catheter. If a catheter-related thrombus is suspected, saline flushes are an effective and safe approach to clear the obstructed catheter. Over the past few years, the use of thrombolytics to treat catheter thrombosis has grown considerably.

Thrombolytics dissolve blood clots by converting plasminogen to plasmin, which then degrades fibrin, a major structural component of the clot. The thrombolytics commonly used in dialysis patients are alteplase (Cathflo) and reteplase (Retavase). Urokinase (Abbokinase) was removed from the market in 1999 due to potential safety concerns. At present, only alteplase is FDA-approved for central venous catheter clearance.

Alteplase and reteplase have been found to be safe and effective at restoring catheter blood flow following thrombosis. Because they dwell in the catheter, in direct contact with the clot, systemic exposure is limited. Some of the drugs may enter the bloodstream; however circulating plasma levels should not reach pharmacological concentrations.

Although studies have examined the efficacy of alteplase and reteplase in restoring catheter blood flow, no study has directly compared them. Overall, they appear to have similar efficacy, and, when used appropriately, catheter clearance rates of 80 to 90 percent are seen.

Alteplase, available in single-use vials (2mg/2mL), is administered by instilling 2 mg into each catheter port. After 30 minutes of dwell time, catheter function should be assessed by attempting to aspirate blood and catheter contents. If catheter function is not restored, allow an additional 90 minutes of dwell time (120 minutes total) before reassessing catheter function. If catheter function is still not restored, this entire process may be repeated one additional time. Once catheter function is restored, the drug and residual clot should be removed by aspirating 4 to 5 mL of blood and gently irrigating the catheter with normal saline.

Reteplase is administered in a similar fashion. It has been studied at doses ranging from 0.5 to 3.0 units/port. Reteplase is only available in 10 unit vials, which must be reconstituted and divided into separate doses that can be frozen and stored until used. However, this must be performed under sterile conditions and is not usually feasible in outpatient dialysis centers. ■

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