HOSPITAL PHYSICIAN®

NEPHROLOGY BOARD REVIEW MANUAL

Vascular Access for Hemodialysis

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Vascular access has remained the Achilles' heel of renal replacement therapy since the Quinton-Scribner shunt was introduced in 1960 and permitted repeated access to the circulation.[1] Use of this external arteriovenous (AV) shunt allowed for chronic hemodialysis (HD) in the outpatient setting, but infections and thrombosis were frequent. Autologous AV fistulas, introduced by Brescia and Cimino in 1966,[2] surmounted many problems associated with external shunts and became the primary vascular access technique outside the United States.[3]

Early alternative surgical techniques for constructing implantable vascular accesses used autologous saphenous vein grafts in the upper extremities to form bridge AV anastomoses. However, complications (eg, thrombosis, pseudoaneurysm) and high 1-year failure rates were common, and cumulative patency 2 years postconstruction was only 20%.[4] Therefore, these early vein grafts were replaced as newer technologies (eg, implantable bovine heterografts) became available. Currently, synthetic grafts composed of polytetrafluoroethylene (PTFE) are the alternatives of choice to autologous AV fistulas.

The rapid growth of U. S. End-Stage Renal Disease (ESRD) Program has been accompanied by a decreased use of native AV fistulas in favor of PTFE grafts and permanent central venous catheters.[5,6] The decrease in formation of AV fistulas has been predominantly attributed to a primary failure of AV fistulas secondary to diabetes, increased age, and comorbidities of the dialysis population.

The chronic HD population in the United States has grown to approximately 300,000 since Medicare coverage was extended in 1972 to patients with ESRD. The current cost of treating the Medicare population of HD patients is more than $15 billion annually;[7] half this amount is spent on delivery of HD procedures, and the other half is associated with the morbidity and hospitalizations of ESRD patients. In addition, approximately one fourth of all hospitalizations for ESRD patients and one half of all hospitalization costs are attributable to vascular access–related morbidity.[8]

This manual reviews important steps in the management of vascular access, including the timing of initial placement, preoperative evaluation of patients, types of accesses (catheters, native AV fistulas, PTFE grafts), monitoring techniques, complications, and prevention strategies. More detailed reviews are available for readers interested in additional study.[9,10]

TIMING AND PLACEMENT OF VASCULAR ACCESSES

CASE PRESENTATIONS

Patient 1

A 37-year-old man is referred to the nephrology clinic by his primary care physician for initial evaluation of chronic renal insufficiency and arterial hypertension.

The patient's history is significant for hypertension that was diagnosed at age 18 years; since that time, the patient has followed his treatment regimen irregularly. Previous evaluation of the patient revealed no secondary causes of hypertension. The patient has a strong family history of hypertension.

At the time of presentation, the patient denies any specific symptoms. Physical examination reveals signs of hypertensive cardiomyopathy. His blood pressure is 170/105 mm Hg, and his serum creatinine level is 6.0 mg/dL. Retroperitoneal ultrasound reveals relatively small kidneys with increased echogenicity.

Patient 2

A 55-year-old man is referred from a diabetic specialty clinic to a nephrology clinic for evaluation of increased serum creatinine levels and nephrotic range proteinuria.

The patient reports the recent onset of lower extremity swelling and dyspnea on exertion. His past medical history is significant for a 7-year history of