# Vascular access in hemodialysis patients older than 80 years

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***Objective:*** **There is a worldwide surge in numbers of elderly people requiring hemodialysis accompanying the prevailing increase in longevity. There is a trend for central venous catheters to be preferentially placed in elderly patients, whereas others recommend routine use of grafts for surgical access. In our center, age has not been a consideration in deciding to construct arteriovenous access for hemodialysis. We reviewed our experience with arteriovenous access surgery in all hemodialysis patients aged 80 years and older to determine if this approach is justified in terms of patency and life expectancy.**

***Methods:*** **A retrospective study was made of all patients aged 80 years and older who had surgery from January 2005 to December 2009 at our national vascular access referral center. All patients had preoperative mapping and had fistula construction if the vein size was at least 3 mm. Otherwise they had brachiobasilic or brachioaxillary grafts. All patients had routine access surveillance by Doppler ultrasound (duplex) and physical examination at regular intervals, and interventions were carried out according to the findings. Type of access, success rate, maturation, primary and secondary patency, and patient survival in the age group older than 80 years were noted.**

***Results:*** **During the study period, 134 patients had 146 new accesses. There were 128 autogenous accesses (30 forearm, 91 upper arm, and seven transposed basilic veins) and 18 prosthetic accesses. Overall primary patency was 39%, 33%, and 23% at 12, 24, and 36 months. Secondary patency was 92%, 83%, and 77% at 12, 24, and 36 months. There was no significant difference in patency between the different types of accesses and between diabetic and nondiabetic patients. Eleven upper arm and four forearm fistulas had delayed maturation or nonmaturation. The relative risk for delayed maturation or nonmaturation of forearm fistulas (13.3%) compared with brachial-cephalic fistula (12.1%) was 1.1030 (95% confidence interval, 0.3973-3.204; $P = .8571$). Median patient survival was 38 months, with 49 dying during follow-up.**

***Conclusions:*** **Contrary to recent recommendations favoring grafts for hemodialysis in patients older than 80 years, most elderly patients in this study were found to have vasculature that was suitable for autogenous access construction, with patency rates similar to those of their younger counterparts when adequate preoperative planning and postoperative maintenance were carried out. Age alone should not disqualify patients older than 80 years from access surgery for hemodialysis, nor should age disqualify these patients from the Fistula First Initiative. (J Vasc Surg 2015;61:177-83.)**

Renal replacement therapy has special implications for older patients, who constitute the fastest growing sector of the incident end-stage renal disease population.[1] The increased life expectancy of patients with chronic illnesses has resulted in a considerable increase in the number of older patients requiring dialysis. Improvements in dialysis care have also contributed to the increasing numbers of older dialysis patients.

Increasing age is related to lower maturation rates, poorer fistula patency, and lower life expectancy of the hemodialysis patient. Older hemodialysis patients are more likely than younger individuals to have poor-quality arm veins because of prior medical interventions and to have atheroma or medial calcification affecting their radial or brachial arteries.[2] Such patients are more susceptible to symptomatic steal syndrome because of inflow stenosis. Because of the presence of multiple comorbidities in these elderly patients, any disturbance of this delicate equilibrium is likely to lead to serious complications. For these reasons, many octogenarian patients have hemodialysis access through a tunneled cuffed catheter.[3] However, one study has shown that patients older than 75 years with autogenous vascular access can have patency that is similar to that of younger patients.[4]

Notwithstanding current recommendations, there has been a recent trend away from the Fistula First Initiative in the age group older than 80 years,[5] with age being one of the four predictive factors used by Lok et al to predict failure to mature in fistulas.[6] In our center, the patient's age has not been a consideration in the decision to construct arteriovenous hemodialysis access, with the oldest patient to have access surgery aged 94 years. We studied patients older than 80 years who had hemodialysis access construction in our center to determine the type of access that was constructed, the success rate of the operations, the maturation rates and the patency of the accesses, and the mortality rates in these older patients.

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## METHODS

**Study design.** This was a retrospective study of patients in our hemodialysis access registry that is maintained separately from hospital records and includes all patients undergoing hemodialysis access construction, including any subsequent follow-up and intervention. The study was approved by the Ethics Committee of the Shaare Zedek Medical Center and exempted from obtaining patient consent.

**Study population.** The Vascular Access Center at Shaare Zedek Medical Center is a referral center for vascular access surgery receiving patients for construction and maintenance of arteriovenous accesses from all over Israel. In the year 2012, 442 access operations were performed, of which 357 were for new access construction and 65 were surgical revisions of existing accesses. The study included all patients older than 80 years with end-stage renal disease who underwent hemodialysis access construction from January 2005 to December 2009, when follow-up also stopped.

**Preoperative planning and surgery.** All patients had preoperative examinations clinically and with color-coded Doppler ultrasound imaging to plan construction of the access in the outpatient clinic by the surgeon performing the operation.[7,8] All preoperative and follow-up Doppler ultrasound examinations were performed by one of the two dedicated access surgeons (D.S., I.G.). Forearm veins were examined with a 5-cm blood pressure cuff inflated to 60 mm Hg for at least 3 minutes and after exercising the hand and gently tapping the veins. Forearm autogenous accesses were constructed only if the veins dilated to a minimum of 3 mm on Doppler ultrasound and radial artery diameter was 1.5 mm or more. If these criteria were not met, the access was constructed above the elbow, again in veins that were a minimum of 3 mm in diameter. Basilic vein transposition was preferred to prosthetic access if the basilic vein diameter was at least 4 mm. Prosthetic accesses with tapered 4- to 7-mm stretch expanded polytetrafluoroethylene (Gore-Tex; W. L. Gore and Associates, Flagstaff, Ariz) were constructed only in patients without suitable veins above the elbow (calcified arteries were deemed acceptable as long as the pulse was palpable). In addition to the suitability of the vessels for access construction, the draining veins and feeding arteries were examined for stenosis of >50% in veins and arteries or arterial peak systolic velocity (PSV) ratio of >3 for the narrowed segment. If these were present or suspected on Doppler ultrasound and there were no suitable vessels on the contralateral side, patients were referred for preoperative angioplasty or had endovascular treatment during the access surgery. All anastomotic configurations were end to side. The operations were performed by the same access surgeons under regional anesthetic block, with full heparinization and prophylactic antibiotics in grafts and transpositions, as ambulatory procedures without hospitalization.

**Postoperative follow-up.** All patients entered our routine access surveillance and maintenance program.[7,8] Sutures were removed on postoperative days 10 to 14, and patients with grafts were referred to hemodialysis. All patients were examined by Doppler ultrasound 1 month after surgery and then every 3 months, when a complete evaluation was carried out of the inflow arteries supplying the fistula, anastomoses, and outflow of the draining veins.

**Table I.** Demographic data for 134 patients having 146 new hemodialysis access operations during the study period (January 1, 2005, to December 31, 2009)

| *Demographic* | *No. (%)* |
|---|---|
| Total patient No. | 134 (100) |
| Gender | |
| Male | 88 (66) |
| Female | 46 (34) |
| Hypertension | 98 (73) |
| Ischemic heart disease | 60 (45) |
| Congestive heart failure | 32 (24) |
| Diabetes mellitus | 53 (40) |
| Cerebrovascular accident | 6 (4) |
| Peripheral vascular disease | 11 (8) |

**Criteria for endovascular interventions during follow-up.** The following criteria were used as indications for angiographic assessment and possible intervention in autogenous accesses: delayed maturation (vein diameter <5 mm and flow <500 mL/min at 6 weeks); Doppler ultrasound findings of hemodynamically significant stenosis; and clinical signs of failing access, such as high venous pressure, difficulties in achieving hemostasis after withdrawal of needles, and nonefficient renal replacement therapy.

In grafts, Doppler ultrasound criteria for angiography were PSV at the venous anastomosis >6.0 m/s or ratio of venous anastomosis PSV to midgraft PSV >3:1 or measured flow <600 mL/min. Stenosis >50% was considered hemodynamically significant.

**Patency and survival.** Primary patency was the interval from the time of access placement until any intervention designed to maintain or to re-establish patency, access thrombosis, or the time of measurement of patency. Secondary patency was the interval from the time of access placement until access abandonment, thrombosis, or the time of patency measurement including intervening manipulations (surgical or endovascular interventions) designed to re-establish functionality in thrombosed accesses.[9] Secondary patency was considered the most important end point because it reflects the total time that the access is in use.

**Statistical analysis.** Findings were recorded in a spreadsheet (Microsoft Office Excel 2003; Microsoft Corporation, Redmond, Wash). Statistical analysis was carried out with Excel and Prism statistical software (Prism v 3.0; GraphPad Software Inc, San Diego, Calif). Kaplan-Meier survival curves were used to estimate access survival.

## RESULTS

In our center from January 2005 to December 2009, 134 patients 80 years of age and older had 146 new arteriovenous accesses constructed (Table I). Twelve patients had