Endovascular Treatment of Juxta-anastomotic Venous Stenoses of Forearm Radiocephalic Fistulas: Long-term Results and Prognostic Factors

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ABSTRACT

Purpose: To evaluate long-term results of endovascular procedures in treatment of venous juxta-anastomotic stenoses (JASs) of native forearm radiocephalic arteriovenous fistulas (AVFs) and to identify prognostic factors influencing these results.

Materials and Methods: During a 124-month period, 147 endovascular interventions were performed in 75 forearm radiocephalic AVFs with JASs defined as stenoses located within the first 5 cm of the outflow vein. Prognostic factors included patient characteristics (age, sex, diabetes), AVF-related characteristics (location on forearm, age, maturity), stenosis-related characteristics (position relative to anastomosis, length, and degree), and degree of residual stenosis and delay of restenosis after the first endovascular procedure.

Results: At 1 and 3 years, access primary patency (PP) rates were 46.6% (95% confidence interval [CI], 36.3%–59.9%) and 25.5% (95% CI, 15.7%–41.6%) and assisted PP (APP) rates were 81.3% (95% CI, 72.6%–91.1%) and 63.2% (95% CI, 50.6%–79.0%), respectively. Stenosis degree of 50%–75% ($P = .017$), stenosis length of 10 mm or more ($P = .017$), and time before first restenosis of less than 6 months ($P = .03$) significantly increased the frequency of endovascular procedures during follow-up. However, only the degree of residual stenosis after the first endovascular treatment significantly affected long-term APP ($P = .039$). When residual stenosis was less than 50%, 1- and 2-year access APP rates were 84.6% (95% CI, 75.8%–94.4%) and 76.1% (95% CI, 64.6%–89.6%), respectively. When it was at least 50%, the respective APP rates were 62.3% (95% CI, 38.9%–99.9%) and 46.8% (95% CI, 22.4%–97.7%).

Conclusions: Endovascular treatment of JASs in forearm radiocephalic AVFs provides good long-term results except when the residual stenosis after the first procedure is 50% or more. In that case, the optimal treatment remains to be determined.

ABBREVIATIONS

APP = assisted primary patency, AVF = arteriovenous fistula, FEI = frequency of endovascular intervention, JAS = juxta-anastomotic stenosis, PP = primary patency

Stenosis of the outflow vein is a frequent complication in native arteriovenous fistulas (AVFs) created for hemodialysis. Reported totals of 38%–64% of these stenoses are located at the anastomosis or immediately downstream from it, ie, within the first 2–5 cm of the outflow vein (1–5). These stenoses are usually referred to as juxta-anastomotic stenoses (JASs) (6). The management of JASs in forearm AVFs remains controversial. Some authors consider the surgical creation of a new and slightly more proximal anastomosis as the preferred option in this location (7–9). This induces a small reduction in the length of the vein available for puncture, but may seem acceptable given the distal location of the stenosis. Alternatively, others favor the use of endoluminal techniques as first-line

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treatment. However, the restenosis rate after endovascular therapy is known to be high (3,4,10–14), and multiple therapeutic sessions may be needed to maintain long-term patency.

Primary patency (PP), assisted PP (APP), and secondary patency (SP) rates obtained after endovascular treatment of venous stenoses in native AVFs have been well reported in the literature (2–5,10–14), but most studies mix forearm and upper-arm AVFs, JASs and proximal stenoses, or stenoses and thromboses. As a consequence, the results obtained specifically in JASs of forearm AVFs seldom have been reported, with 1-year PP and APP/SP rates of 41%–60% and 64%–96%, respectively (6,15–17). Moreover, little is known about the prognostic factors that could influence the outcome of endovascular procedures in the specific group of JASs of forearm stenoses. One study could not identify any significant prognostic factor (16), whereas a stenosis at the anastomotic site itself and smoking significantly increased the risk of restenosis in another (17). Therefore, we undertook the present study to assess the long-term outcome of endovascular treatment of JASs in forearm AVFs, and to identify potential prognostic factors of failure that could orient patients toward first-line surgical management.

MATERIALS AND METHODS

Study Population

We retrospectively searched our hospital information system database for patients with a forearm AVF referred to our department for endovascular treatment of a JAS between January 2001 and May 2011. Synthetic or composite grafts were excluded. AVFs that had undergone previous endovascular treatments in other institutions were also excluded. In contrast, immature AVFs (defined as AVFs that did not develop sufficiently to be usable for dialysis) were included in the analysis.

JASs were defined as stenoses located at the anastomosis or within the first 5 cm of the outflow vein. Only stenotic segments with a greater than 50% reduction in their diameter were taken into account. AVFs with concomitant JASs and proximal stenoses (ie, located > 5 cm downstream of the anastomosis) were excluded. Arterial stenoses were also excluded.

The study population consisted of 75 AVFs in 73 patients (mean age at inclusion, 59 y ± 17 [standard deviation]; age range, 8–83 y). All were radiocephalic AVFs, and there were no ulnar–basilic AVFs. Eighteen AVFs were located on the right arm and 57 on the left arm. The mean interval between the creation of the AVF and the first endovascular intervention was 21 months ± 28 (range, 2–137 mo). **Table 1** details patient and AVF characteristics.

Table 1. Patient and AVF Characteristics

Characteristic	Incidence
Sex	
Male	47 (63)
Female	28 (37)
Diabetes	27 (36)
Type of AVF	
Upper third	11 (15)
Middle third	24 (32)
Lower third	40 (53)
Anatomic characteristics of stenosis	
Percentage of stenosis	
< 75%	35 (47)
≥ 75%	37 (49)
Occlusion	1 (1)
Unknown	2 (3)
Length of stenosis	
< 2 mm	10 (13)
[2-10 mm]*	29 (38)
[10–30 mm]*	25 (33)
[30–50 mm]*	33 (6)
≥ 50 mm	5 (7)
Unknown	2 (3)
Location relative to anastomosis	
< 2 cm	36 (48)
> 2 cm	36 (48)
Unknown	3 (4)
Age of AVF	
< 10 mo	30 (40)
≥ 10 mo	31 (41)
Unknown	14 (19)
Maturation	
Immature	13 (18)
Mature	52 (69)
Unknown	10 (13)
Interval before restenosis (n = 36)	
< 6 mo	17 (47)
≥ 6 mo	19 (53)
Residual stenosis	
< 50%	61 (81)
≥ 50%	11 (15)
Unknown	3 (4)

Values in parentheses are percentages.
AVF = arteriovenous fistula.
* [X – Y mm] indicates that stenoses with a length of X mm belong to the subgroup when stenoses with a length of Y mm do not belong to the subgroup.

Pretreatment Evaluation

Patients included in the study were referred for fistulography after AVF dysfunction was detected according to any of three criteria: clinical abnormality (repeated difficulty in cannulation, prolonged bleeding at cannulation sites, insufficient development after 3 mo, edema or pain of the hand), access dysfunction during dialysis (impossibility of obtaining a dialysis blood pump flow rate ≥ 250 mL/min in two consecutive dialysis sessions or repeated measurements of increased venous pressure [> 150 mm Hg] during dialysis), or abnormal color Doppler evaluation