Should All Inflow Stenoses Be Treated in Failing Autogenous Hemodialysis Fistulae?

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ABSTRACT

Purpose: To determine whether angioplasty of inflow stenosis in malfunctioning but patent autogenous hemodialysis fistulae has an impact on postintervention primary patency in patients without a clinical indicator of inflow-related access malfunction.

Materials and Methods: Medical records for 76 procedures in 62 patients with inflow stenoses undergoing fistulography in nonthrombosed mature autogenous fistulae without an inflow-related indication of access malfunction over a 5-year period were reviewed retrospectively. Control and treatment arms were defined as patients with untreated (26 procedures in 23 patients) and treated (50 procedures in 39 patients) inflow stenoses, respectively. All patients in both arms of the study had concurrent intrafistula and/or venous outflow stenosis, which were treated successfully with angioplasty. The clinical endpoint was defined as return for a failing or thrombosed access (ie, primary patency). A two-tailed unpaired Student t test was performed to compare primary patency and percent inflow stenosis in treatment (angioplasty) and control (untreated inflow stenoses) groups, with significance defined at $P < .05$. Kaplan–Meier analysis was performed.

Results: There was no significant difference in percent inflow stenosis between control and treatment arms ($P = .95$). There was no significant difference in access patency between the two groups (139 and 124 d for control and treated groups, respectively; $P = .95$). No procedural complications occurred in either arm of the study.

Conclusions: Angioplasty of inflow stenosis in failing autogenous fistulae without an appropriate clinical indicator of an inflow pathologic process does not improve postintervention primary patency.

ABBREVIATION

K/DOQI = Kidney Disease Outcomes Quality Initiative

In contrast to synthetic vascular dialysis grafts, which most commonly develop stenosis at or near the venous anastomosis, the spatial distribution of stenoses in autogenous fistulae is more heterogenous and multifocal, and varies according to the type of fistula created (1,2). According to the literature, approximately 38%–64% of these stenoses are located at the anastomosis or immediately (2–5 cm) downstream from it, with the remainder being found in the artery, outflow vein, and central venous system (1–4).

To complicate matters, these inflow lesions often coexist with other downstream stenoses, making it challenging to establish a one-to-one correspondence between lesion location and clinical indicator of failure (ie, difficult puncture, poor flow, recirculation). One approach adopted by many interventionalists is to simply perform angioplasty in all stenoses encountered (2). However, theoretical risks exist with this approach, including precipitating steal in otherwise asymptomatic patients and high-output heart failure, as well as the

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inherent costs associated with angioplasty of inflow stenosis, including the use of an additional sheath and balloon catheter in cases in which antegrade access was initially made (5,6). An alternative approach is to use catheter-based flow measurements as supplemental information in determining the hemodynamic significance of a stenosis and making intraprocedural decisions based on the data (7,8).

The purpose of the present study was to determine whether angioplasty of asymptomatic inflow stenoses in failing autogenous fistulae has an impact on postintervention primary patency.

MATERIALS AND METHODS

Patient Selection and Characteristics

This retrospective study was approved by our institutional review board and was carried out in full compliance with the Health Insurance Portability and Accountability Act. The underlying hypothesis driving this research was that treatment of asymptomatic inflow stenoses would not yield measurable benefit in terms of patency compared with autogenous fistulae with similar stenoses that were left untreated. To test this hypothesis, medical records of patients undergoing percutaneous angioplasty for nonthrombosed mature hemodialysis fistulae at two hospitals in a large university-based tertiary-care medical center between January 2006 and December 2010 were reviewed. Patients were identified from a prospectively collected quality-assurance database generated from our main quality-assurance database (HI-IQ; Conexsys, Woonsocket, Rhode Island). Inclusion criteria included inflow segment stenosis with or without concurrent outflow stenosis in patients being followed in our department. Patients with nonmaturing autogenous fistulae were excluded because, in immature fistulae, inflow stenoses are generally considered the primary cause of immaturity and are thereofore universally treated (9). Patients with a history or physical examination findings suggestive of inflow pathologic conditions (and thereby symptomatic) were excluded. Such findings included negative arterial pressures during hemodialysis, difficult puncture, aspirating thrombus from the arterial cannulation site as a result of low flow, infiltration of surrounding soft tissues as a result of repeated unsuccessful cannulation, and collapsed fistula (10–12). After application of exclusion criteria, indications for fistulography for qualified patients in the study included access pulsatility, increased venous pressure or resistance, cannulation site bleeding, and aneurysms. Patients with a history of poor blood flow were excluded because, without documentation of physical examination findings consistent with outflow-related access malfunction (ie, pulsatility), there is no way to reliably exclude inflow-related malfunction based on this history alone. According to the National Kidney Foundation Kidney Disease Outcomes Quality Initiative (K/DOQI) guidelines (13), inadequate flow to support the prescribed dialysis blood flow is an appropriate indication for percutaneous intervention. Moreover, the guidelines explicitly state that decreased access flow may be observed in the absence of elevated dynamic or static pressures, ie, an inflow problem (13).

The control group was defined as patients with untreated inflow stenoses and comprised 23 patients who underwent 26 procedures. The treatment arm was defined as patients with treated inflow stenoses and comprised 39 patients who underwent 50 procedures. Patient demographics are outlined **Table 1**. Eleven patients contributed data points to the same or both arms of the study over multiple visits to our department.

Technical Aspects

An inflow stenosis was defined as a narrowing (focal or diffuse) in one or more of the following vascular segments supplying the fistula: perianastomotic inflow artery, arteriovenous anastomosis, perianastomotic vein (within 1 cm of the anastomosis), and venous inflow (segment between visible arterial cannulation site and anastomosis) (1,3). Decisions regarding lesion treatment were at the discretion of the attending interventional radiologist: treatments were performed by one of eight board- and Certificate of Added Qualification–certified

Table 1. Demographic, Clinical, and Patient Outcome Information

Characteristic	Control (n = 23)	PTA (n = 39)
Sex		
Male	13	22
Female	10	17
No. of data points	26	50
Mean patient age (y) ± SD	62 ± 20	66 ± 15
Access type		
Forearm (radiocephalic)	3	10
Upper arm		
Brachiocephalic	5	12
Transposed basilic vein	14	17
Other (thigh)	1	
Initial presentation		
Pulsatility, increased bleeding	19	26
Arm swelling	4	4
Aneurysm	4	7
Dialysis indicators	4	18
Follow-up		
Access site thrombosis	3	5
Inflow lesion with associated clinical indicator	3	6
Outflow lesion	20	39
Mean primary patency (d)	139	124

PTA = percutaneous transluminal angioplasty; SD = standard deviation.