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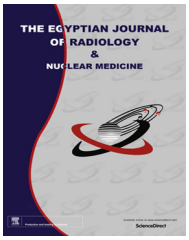

ORIGINAL ARTICLE

Endovascular management of peri-anastomotic venous stenosis in renal dialysis arterio-venous fistula

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KEYWORDS

Fistuloplasty;
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AVF

Abstract Endovascular treatment of the malfunctioning fistula can involve a combination of angioplasty, stenting and the use of thrombolysis with low reported mortality and morbidity. The primary aim of the study was to determine the primary patency and primary assisted patency rates of angioplasty for the treatment of perianastomotic stenosis of renal dialysis arterio-venous fistulas (AVFs). The secondary purposes were to identify the factors that may impact restenosis rate and to evaluate the need for close surveillance of AVF. This is a retrospective analysis of AVF angioplasty for peri-anastomotic stenosis. Between August 2009 and March 2012, 44 patients with autologous AVF were treated with percutaneous transluminal angioplasty (PTA). The technical success rate was 100%. 23 of the 44 patients (52.3%) required repeated intervention during the follow-up period. Our primary patency rate at 1 year was 62.5% and the primary assisted patency rate was 96.9% at 1 year. No immediate post-procedure complications.

Conclusion: Endovascular management of peri-anastomotic stenosis in renal dialysis AVF is an effective approach with low morbidity and mortality rates. The higher primary assisted patency compared to the primary patency rate emphasizes the need for close surveillance of AVF and low threshold for early re-intervention.

1. Introduction

The increasing number of patients with end-stage renal disease has broadened the need for reliable vascular access (1).

Since the advent of hemodialysis in 1944 and the subsequent use of AVF as a long-term vascular access, there has been a drastic increase in both the availability of hemodialysis and long-term survival of patients with chronic renal failure (2).

Either a radio-cephalic or brachiocephalic AVF created using the patient's native vein provides the best possible vascular access for hemodialysis (3).

Two factors are necessary for an AVF to be usable as dialysis access; it must have adequate blood flow, and it must have a size that will allow for cannulation (4).

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Increasing fistula prevalence depends on improving the maturation of fistulas that fail to mature and enhancing the long-term patency of mature fistulas (5).

Dysfunction of AVF occurs frequently in hemodialysis patients and contributes significantly to morbidity and hospitalization in the dialysis population (3).

Early fistula failure is frequently due to anatomic lesions that may exist anywhere within the access circuit. Arterial inflow lesions include anatomically small vessels and atherosclerotic disease, which are found in an increasing portion of the elderly, and patients with hypertension and diabetes. Arteriovenous anastomotic and venous swing point stenoses are commonly seen acquired lesions, as these are the sites of surgical creation and mobilization of the artery and vein. Venous outflow and central venous lesions, may be due to pre-existing anomalies, such as anatomically small veins, fibrotic or stenotic veins, or sites of prior puncture or catheter placement. In addition, venous outflow problems may be due to accessory veins or side branches (6–9).

A reduction of vessel diameter 50% associated with a reduction in access flow during dialysis or previous thrombosis, indicates the need for intervention. In radiocephalic AVF, 55–75% of stenoses are located close to the AV anastomosis and 25% in the outflow tract (10,11).

The traditional therapy for failing hemodialysis access has been surgical revision where a patch of angioplasty is usually performed to correct vascular narrowing due to a venous anastomosis stenosis (12).

These stenoses can also be treated by percutaneous transluminal angioplasty (PTA) whose main advantages are usually a better preservation of the venous capital, immediate availability of the fistula for dialysis, and a slightly less invasive nature. Although many studies have reported the results of angioplasty or surgery in the management of failing AVF, few studies have specifically evaluated these anastomotic stenoses (13).

Therefore, the primary aim of the study was to determine the primary and primary assisted patency rates of endovascular management in the treatment of perianastomotic stenosis of renal dialysis AVF. The secondary purposes were to identify the factors that may impact restenosis rate and to evaluate the need for close surveillance of AVF.

2. Materials and methods

This is a retrospective analysis of AV fistula angioplasty for peri-anastomotic stenosis.

Between August 2009 and March 2012, 44 patients (27 men, 17 women), aged 36–89 years with a mean of 64.3 ± 14.4 years with autologous AVF were treated with percutaneous angioplasty. 25 patients had a radio-cephalic AVF, 14 had a brachiocephalic AVF and 5 had brachiobasilic AVF.

10 procedures were performed on non-maturing fistulas in patients who were not yet on dialysis. One patient had a mature fistula, but did not start dialysis yet.

Patients were diagnosed with AVF stenosis during surveillance Doppler ultrasound or referred by nephrologists.

All patients had a Doppler ultrasound examination first to assess patency and flow volume of the AVF. The Doppler criteria for intervention included the following: 1. Visible lumen narrowing on gray scale ultrasound and aliasing on color Doppler at the site of stenosis; 2. Fistula flow volume of <400 ml/min in pre-dialysis fistula; and <600 ml/min in patients on dialysis.

The procedure was performed under local anesthesia. Retrograde puncture of the outflow vein of the AV fistula was performed in all cases in a standard Seldinger technique, and a 6 Fr sheath was inserted. The peri-anastomotic stenosis was negotiated with a 0.035-in. hydrophilic-coated guide-wire and a diagnostic catheter, followed by the balloon catheter passed over the guide-wire. The size of the balloon chosen was depending on the diameter of the normal vessel adjacent to the area to be dilated. The balloon sizes used in our study ranged from 4 to 10 mm with 6 mm balloon being the most commonly used size. Under pressure control, the balloon was inflated slowly until the waist disappeared (Fig. 1).

We inserted Misago (Terumo, Tokyo, Japan) self-expandable metallic stents in the primary setting in 7 cases due to vessel re-stenosis after balloon angioplasty. The stents' sizes were either 7 or 8 mm in diameter and all were 40 mm in length.

All patients were on surveillance program, and the routine is to have the first Doppler examination one month

Fig. 1a 6 French sheath retrograde insertion in left cephalic vein. 5 French catheter in left radial artery. Angiogram shows tight stenosis at the perianastomotic segment of the radio-cephalic AVF.