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Percutaneous transluminal angioplasty in haemodialysis patients with central or peripheral venous stenosis

Mehmet Yaman[a*], Musa Sahin[b], Hakki Simsek[b], Hasan Ali Gumrukcuoglu[b], Mustafa Tuncer[b], Yilmaz Gunes[c], Serkan Akdag[b]

[a] *Department of Cardiology, Faculty of Medicine, Ordu University Education And Research Hospital, Ordu, Turkey*
[b] *Department of Cardiology, Faculty of Medicine, Yuzunci Yil University, Van, Turkey*
[c] *Department of Cardiology, Faculty of Medicine, Hisar hospital, İstanbul, Turkey*

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*** Correspondence to:**
Mehmet Yaman
Department of Cardiology,
Faculty of Medicine,
Ordu University Education And Research Hospital
Ordu, Turkey
e-mail: dr.yaman@windowslive.com

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ABSTRACT

Dysfunction of arteriovenous fistulae (AVF), which result from peripheral or central venous occlusive illness, occurs very often in haemodialysis patients. In therapy, endovascular open procedures are prefered. Our study illustrated the clinical success of percutaneous transluminal angioplasty (PTA) for the treatment of these patient. A retrospective analysis was applied on patients presenting during a 2-years term with haemodialysis failure and ipsilateral arm swelling coherant with peripheral and/or central venous stenosis. PTA was performed as clinically and angiografically indicated. Technical success of PTA was defined less than 30% residual stenosis and clinical success was illustrated by resolution of pain and edema along with preservation of the AVF. Our study shows a subgroup of 26 patients that presented with symptomatic peripheral or central venous occlusive disease. Mean follow-up was 12.4 months (range, 3-24 months). PTA was successful in 26 patients 11 of whom were with central lesions and 15 of whom were with peripheral lesions. We were stated for central lesions PTA had a priority patency rates of 81.8%, 60%, 37.5% and supported primary patency rates of 90.9%, 70%, 62.5% at 3, 6, 12 months. For peripheral lesions, primary patency rates of 86.7%, 78.5%, 66.6% at 3, 6 and 12 months and assisted primary patency rates of 93.3%, 85.7% and 75%, separately. PTA for central and peripheral venous stenosis is be a successful and safe procedure in hemodialysis patients. In patients with lesions that are responsible for dilation, continuous functional access in the affected extremity is sustained, especially for patients with peripheral venous stenosis.

1. Introduction

In patients with end-stage renal disorder, vascular access stays the Achilles' heel of maintenance haemodialysis (Tang et al., 1998). Adequate arterial influx and venous outflow is important for appropriate function of hemodialysis access in chronic haemodialysis patients (Aytekin et al., 2004). Dysfunction of arteriovenous fistulae and grafts appears frequently in haemodialysis patients and significantly makes contribution to morbidity and hospitalization in the dialysis population (Windus, 1993). There are countless etiologies of symptomatic lesions; however, they most commonly conclude from prolonged central venous catheterization in the setting of end-stage renal illness and ipsilateral

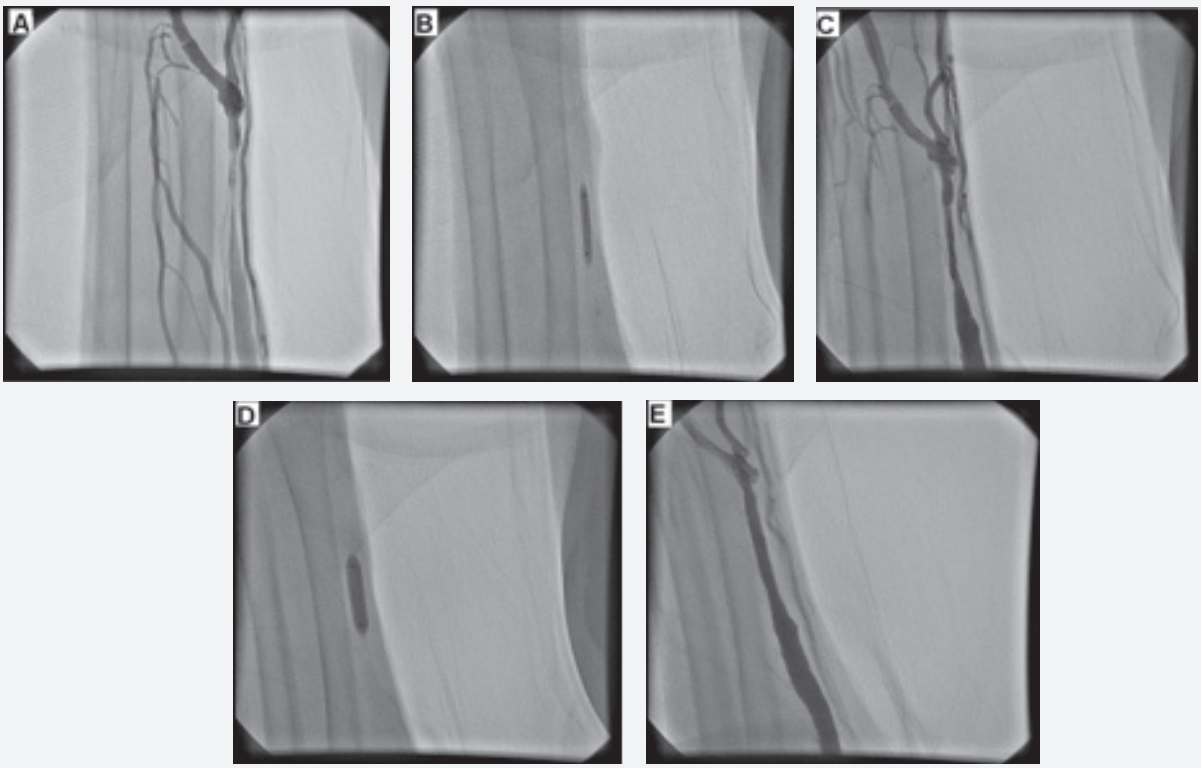

Fig. 1. Succesful PTA of Obstructed Cephalic venous. **A:** Thrombosed 95% stenosis, with marked chollaterals; **B:** First PTA procedure; **C:** Diminished chollaterals after first PTA; **D:** Second PTA procedure by bigger than peripheric ballon; **E:** Technical success; **PTA:** Percutaneous transluminal angioplasty

arteriovenous fistula (AVF). The effect of stenoses in these patients has been reported to be as high as 50% (Hernandez et al., 1998).

Stenosis or obstruction of a draining vein of a functioning vascular access can cause venous hypertension with associated pain, incapacitating swelling, and even ulceration (Mcnally et al., 1987). In therapy for symptomatic peripheral or central venous occlusive disease, endovascular open procedures are prefered. Surgical approaches need general anesthesia and has a high surgical morbidity in an end-stage renal disease setting. In addition, patency rates have not been significantly better than with endovascular techniques and extensive reconstructions might not be reasonable in a group of patients with multiple comorbidities (Wisselink et al., 1993; Bhatiai et al., 1996; Kalman et al., 1998).

At our institution, peripheral/central venography and percutaneous transluminal angioplasty (PTA) are used regularly for diagnosis and treatment of symptomatic venous stenosis or obstruction in hemodialysis patient. Our study was undertaken to describe the clinical success of PTA for the treatment of symptomatic venous stenosis or obstruction and failing AVF associated with significant and disabling upper-extremity edema.

2. Materials and methods

The study was performed under the recommendations of World Medical Association Declaration of Helsinki. A retrospective analysis was performed of patients presenting with hemodialysis for two years (between january 2014 and december 2015), prolonged posthemodialysis bleeding, difficult needle cannulation of the access, or ipsilateral arm or neck swelling appropriate with peripheral and/or central venous stenosis or occlusion. Patients underwent upper-extremity and central venography, and these patients with at least one peripheral or central venous lesion were involved.

All medical records were revised for demographic and clinical data. Details of the interference were gained by a review of the operative reports and angiograms (Fig. 1). Central veins were defined as the axillary vein, subclavian vein, brachiocephalic vein, or superior vena cava. The location of the lesion and severity of stenosis were noted in Table 1.

Our actual standard is two or more inflations for 40 to 60 seconds with systemic heparinization (5000 IU heparin, intravenously) prior to balloon inflation. Technical success of PTA was defined by completion venography in two views from different angles demonstrating less than 30% residual stenosis and clinical success was illustrated by resolution of

Table 1. Location of lesions and severity of stenosis

Location	n=26	Mean % Stenosis Range
Brachiocephalic vein	2 (7.6%)	83 ± 10 (75-90)
Subclavian vein	6 (23.0%)	84 ± 7 (75-95)
Axillary vein	3 (11.5%)	90 ± 5 (85-95)
Cephalic vein	7 (26.9%)	86 ± 7 (80-100)
Basilica vein	5 (19.2%)	86 ± 10 (75-100)
Median cubital vein	3 (11.5%)	85 ± 5 (80-90)

pain and edema along with preservation of the AVF. Primary patency was defined as the interval from the time of intervention until thrombosis or the time of measurement of patency. Assisted primary patency was defined as the lack of occlusion of the vessel after the primary intervention but containing any interventions to treat restenosis.

Patients were evaluated during routine follow-up with clinical success defined by an improvement in symptoms. The duration of the symptom-free period was decided from patient history and physical examination. In cases of an ipsilateral AVF, the status of the fistula was taken note at each time point. Failure was defined by recurrence of symptoms that lead to repeat venography and PTA. Generally, patients were released on the day of the procedure after clinical evaluation. Long-term anticoagulation or antiplatelet therapy was not prescribed.

3. Results

Seventy-seven patients underwent venography during the study term. The current study shows a subgroup of 26 patients presented with symptomatic peripheral or central venous occlusive illness defined by hemodialysis failure, prolonged posthemodialysis bleeding, difficult needle cannulation of the access, or ipsilateral arm or neck swelling. Follow-up was available for each treated patient with an average of 12.4 months (range, 3-24 months). There were 10 men and 16 women with an average age of 54.1 (range 20-75) years. In all patients, there was an ipsilateral arteriovenous fistula. No patient in the current study had a past of pacemaker insertion.

All procedures were performed percutaneously. There were 11 lesions on the right and 15 on the left. The position of the lesion and severity of stenosis, eleven of which central and fifteen of which peripheral in venous, were noted in Table 1. The degree of stenosis was greater than 75% in all cases.

Initial percutaneous angioplasty was technically successful in 26 patients, 11 of whom were with central lesions and 15 of whom were with peripheral lesions. After PTA, we repeated the same process with a bigger size ballon in eight cases of which resudial stenous was more than 30%. In these eight cases, resudial stenosus decreased below 30%. There were no procedure-related complications at the access site, venous perforations, or deaths.

In all of the patients with succesful PTA, edema in arm and increased venous pressure were improved. PTA procedure was performed to patients with repeated semptoms during follow-up. We were reported for central lesions PTA and peripheral lesions PTA in table 2.

Table 1. Patency rates of central and peripheral lesions

	3 month	6 month	12 month
Central Lesions PTA			
Priority patency rate	81.8%	60%	37.5%
Assisted priority patency rates	90.9%	70%	62.5%
Peripheral Lesions PTA			
Priority patency rates	86.5%	78.5%	66.6%
Assisted priority patency rates	93.3%	85.7%	75%

PTA: Percutaneous transluminal angioplasty

4. Discussion

In chronic hemodialysis patients with AVF, stenosis or occlusion of the central and/or peripheral veins that concludes in considerable edema of the arm is a formidable problem because it very often necessitates closing the vascular access, which is sometimes the last one available (Moriniere et al., 1997). The primary aim in this setting is to assure symptomatic relief for the patient while maintaining function of the associated AVF when present (Bhatiai et al., 1996).

Percutaneous interventional technique can be done under local anesthesia, is well-tolerated by the patient, and is associated with shorter hospitalization time than surgery. As long as surgical repair techniques result in significant morbidity, percutaneous interventional techniques have been widely used in the management of stenosis or occlusion of the symptomatic central and/or peripheral veins. PTA has seen to be an effective, safe, and comparatively inexpensive procedure with a high technical success rate (Glanz et al., 1987; Ingram et al., 1988). Stent solely should be deployed when in response to failed PTA, or when there is quick restenosis or vessel perforation but never as an initial therapy.

In our study, we present 77 consecutive patients with eleven of which central and fifteen of which peripheral venous stenosis or occlusion and an average follow-up of 12.4 months. Most studies in literature are concerned with the treatment of central venous lesions in haemodialysis patient. Different from these studies, our study consisted of two groups one of them with central venous lesions and other group with peripheral venous. For central lesions PTA had a primary patency rate of 81.8% at three months, 60% at six months, and 37.5% at 12 months. Assisted primary patency rates were better, with an improvement to 90.9% patency at three months, 70% at six months and 62.5% at 12 months. And for peripheral lesions PTA had primary patency rates of 86.7%, 78.5% and 66.6% at three, six and 12 months and assisted primary patency rates of 93.3%, 85.7% and 75%, respectively. However, to

achieve better assisted primary patency rates, multiple interventions were needed. In our study, primary patency rates and assisted primary patency rates of peripheral lesions were better than of central lesions. Because of the high frequency of elastic recoil, the recurrence rate for central venous lesions after PTA was higher than that for peripheral lesions (Scott et al. 2004). So, during follow-up central venous lesions needs more interventions after initial PTA.

Oderich et al. (2000), Haage et al. (1999), used PTA + stent as an initial treatment of central venous stenosis or occlusions. Oderich et al. (2000), presented 40 central venous obstructions that were treated with 50 stents. Over a mean follow-up of 16 months, primary patency rates of 27% and 9% one and two years and secondary patency rates of 71% and 39%, respectively were reported. Another series by Haage et al. (1999), evaluated 50 patients who experienced stent placement as the primary cure for central venous obstruction. They reported primary patency rates of 56% and 28% at 1 and 2 years, respectively.

But we are agree with Scott et al. (2004) used PTA treatment of central venous stenosis or occlusions and Glanz et al. (1987) used percutaneous trans venos angioplasty (PTVA) treatment of central and peripheral venous lesions. Scott et al. (2004) presented 35 central venous stenoses that were treated with PTA. Transvenous angioplasty had a primary patency rate of 85% at 30 days, 55% at six months, and 43% at one year. Assisted primary patency rates were better, with an improvement to 80% patency at one year and 64% at two years. Glanz et al. (1987) performed PTA to hemodialysis patients with stenosis or occlusion of the central and/or peripheral veins that concludes in considerable edema of the arm, reported an initial success rate of 82% and six, 12-month primary patency rates were 57%, 45%, respectively.

The results of our study, like Scott and Glanz studies are similar to the Oderich and Haage studies, without the use of stents. Disadvantages of stent placement consist of potential collateral vein obstruction, shortening and migration of the stent (Verstanding et al., 2003), infection (Pruitt et al., 2002), and the loss of outflow in the extremity if the stent should fail. The SIR guidelines do not recommend the routine use of stents to avoid restenosis and state that the role of stents has yet to be fully defined (Aruny et al., 1999). Three prospective randomized studies have found that stent placement does not provide an advantage over successful angioplasty (Beathard, 1993; Quinn et al, 1995; Hoffer et al., 1997).

Owing to the negative consequences of central and peripheral venous stenosis, catheterization of the central and peripheral veins should be avoided when at all possible. Even when stents were placed for stenosis after failed balloon angioplasty, the primary patency was never the same as that for successful balloon angioplasty alone. Thus, we reccommend improving the success rate of balloon angioplasty and reducing the use of stents. Furthermore, more reinterventions may be needed to maintain secondary patency compared with balloon angioplasty alone.

The present study had some study limitations. This article lie inherently in the design of the study and the present study was limited by the small patient population, particularly in the subgroups, and by its retrospective design. Further studies with large group of patients are needed to make correct decision.

Finally PTA for central and peripheral venous stenoses appears to be a successful and safe procedure that is effective and enhances in hemodialysis patients.Succesfuly intervention is achieved only with surveillance and repetitive interventions, but it seem to be devoid of major morbidity. In patients who had successfully intervention, especially for patients with peripheral venous stenosis is maintained continuous functional access in the affected extremity.

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