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LETTERS TO THE EDITOR

A 16 Gauge Sheath Needle Used as an Introducer System for PTA of Arteriovenous Fistulas Minimizing Venous Injury

Percutaneous treatment of hemodynamically significant stenoses of native hemodialysis fistulas or grafts reduces the rate of thrombosis and prolongs the average useful life of the access [1–5]. Puncture of the venous portion of the arteriovenous fistula either antegrade or retrograde represents the standard choice of diagnostic approach to mature fistulas. Once diagnostic phlebography gives the indications for percutaneous transluminal angioplasty (PTA), the dilation is performed after direct puncture of the distal venous or arterial portion of the fistula in the direction of, but far enough removed from, the stenosis. Alternatively, fistulography may be performed by micropuncture of the brachial artery, or after inserting a transvenous catheter across the anastomosis from a proximal venous puncture. In these cases, retrograde venous puncture represents the standard approach, and in selected cases a transarterial brachial approach is also used in order to negotiate the stenosis better . In other cases in which the stenosis is sited at the draining vein far from the anastomosis, the same retrograde venous approach could be used to insert a sheath of 5 Fr or more, to negotiate the stenosis and dilate it.

Clinical and ultrasound (US) color Doppler examination of fistulas can detect the location of lesions, suggesting the best puncture site, either venous antegrade or retrograde, in order to perform the diagnostic fistulography and treatment through the same access, thus reducing the complication rate related to multiple accesses and the number of possible sites of intimal hyperplasia.

In the technique presented here, we used only one puncture and also the same diagnostic 16 gauge sheath needle transformed into an introducer sheath for a 3 Fr balloon catheter.

Case Reports

Case 1

A 66-year-old woman presented with high venous pressure during hemodialysis sessions of her humero-cephalic arteriovenous fistula. Previous US Doppler examination had detected a significant stenosis at the cephalic vein in the arm. The functional life of the fistula before the first endovascular intervention was 7 months. We punctured the draining vein in antegrade fashion, using a 16 gauge sheath needle (Neo Delta Ven 1, Delta Med, Viadiana, Italy) (Fig. 1) and performed a diagnostic fistulography with visualization of the outflow tract to the right atrium. To enable reflux across the arterial anastomosis, a blood pressure cuff was inflated above the elbow to suprasystolic pressure for several seconds during contrast material injection. The patient was monitored with pulse oximetry, blood pressure measurement, and electrocardiography. A focal stenosis was diagnosed at the draining vein. We applied an Y adapter (Y-Adapter 118'' I.D., Gateway Plus, Boston Scientific, Tullamore, Ireland) to the proximal hub of the 16 gauge sheath needle and through it inserted a 0.014 inch wire (Crosswire NT, Terumo, Europe) negotiating the stenosis, and a 6 × 20 mm high-pressure balloon catheter of 3.2 Fr profile (Sasuga, Boston Scientific, NY)(Fig. 2) was positioned with the aid of digital road mapping control. After the intravenous administration of 5000 units of heparin, we inflated the balloon to 18 atm for 3 min. We achieved a good technical result (residual stenosis <30%) and were able easily to withdraw the balloon out of the sheath needle. After the endovascular intervention, the sheath needle was immediately removed, and the puncture site was manually compressed for 5–10 min, after which a purse-string suture was applied. Normal venous pressures were recorded in the following hemodialysis sessions.

Case 2

A 67-year-old man presented with failing distal radio-cephalic hemodialysis fistula (high venous pressure). A previous US Doppler examination detected a significant anastomotic stenosis. The functional life of the fistula before the first endovascular intervention was 4 months. We punctured the draining vein in retrograde fashion toward the anastomosis, using a 16 gauge sheath needle (Neo Delta Ven 1, Delta Med, Viadiana, Italy), and performed a diagnostic fistulogram with visualization of the outflow tract to the right atrium. To enable reflux across the arterial anastomosis, a blood pressure cuff was inflated above the elbow to suprasystolic pressure for several seconds during contrast material injection. The patient was monitored with pulse oximetry, blood pressure measurement, and electrocardiography. A focal anastomotic stenosis was diagnosed. We applied an Y adapter (Y-Adapter 118'' I.D., Gateway Plus, Boston Scientific, Tullamore, Ireland) to the proximal hub of the 16 gauge sheath needle and through it we inserted a 0.014 inch wire (Crosswire NT, Terumo, Europe) negotiating the anastomosis, and a high-pressure 3 × 20 mm balloon catheter of 3.2 Fr profile (Sasuga, Boston Scientific, NY) was positioned with the aid of digital road mapping control. After the intravenous administration of 5000 units of heparin, we inflated the balloon to 18 atm for 3 min. We achieved a good technical result (residual stenosis <30%). After the endovascular intervention, the sheath needle was immediately removed, and the puncture site was manually compressed for 5–10 min, after which a purse-string suture was applied. Normal hemodialysis through the fistula was initiated on the following day.

Discussion

After the first disappointing reports related to the percutaneous treatment of hemodialysis access problems, obviously due to inadequate material and lack of experience, interventional radiological procedures now represent the first therapeutic choice in

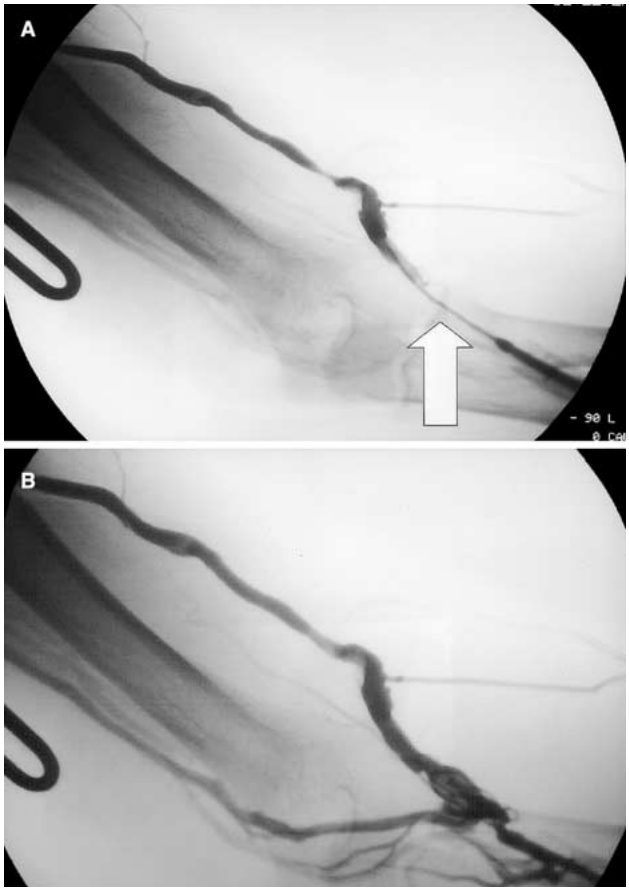

Fig. 1. (A) Diagnostic fistulography through an antegrade venous puncture with a 16 gauge sheath needle (white arrow) shows a stenosis in the venous portion of the fistula treated by PTA (B).

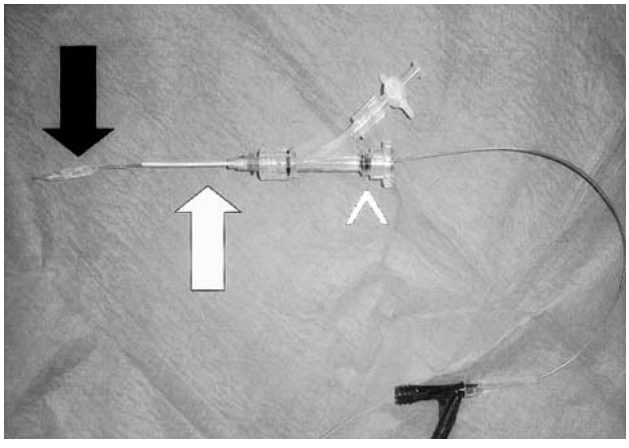

Fig. 2. The way in which, using a Y adapter (arrowhead), we are able to transform the 16 gauge sheath needle into an introducer sheath (white arrow) for a 3 Fr balloon catheter (black arrow).

several conditions, results being comparable to those of surgery with lower morbidity rates [1].

However, the percutaneous puncture of a fistula tract, either arterial or venous, carries potential immediate complications such as bleeding or pseudoaneurysm formation, or even late sequelae such as stenosis at the puncture site due to intimal hyperplasia [1, 6]. Dialysis fistulas are punctured routinely with 14–16 gauge devices. However, there is an obvious difference between puncturing a draining vein with a 16 gauge sheath needle compared with a 5 Fr or larger vascular introducer sheath as commonly used to perform PTA in vascular accesses.

Using the technique described above we are able to perform both diagnostic and therapeutic interventions through the same hole and through the same 16 gauge sheath needle; this means that performing a PTA could have only the same risk of related complications and intimal hyperplasia at the puncture site as a normal hemodialysis session. This has been made possible by the development of new devices and the availability of small-profile high-pressure balloons able to achieve pressures of about 20 atm, but has increased the cost of these procedures due to the expensive material used.

In the case of hemodialysis fistula, even if this new technique can be used only in selected cases, we think that it could be a way to make an interventional procedure minimally invasive, thus preserving efficacy; furthermore we think that, in the future, the development of small-profile balloons able to achieve a larger diameter (more than 7 mm) and higher pressure will enlarge the field of application of this technique in arteriovenous fistulas.

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