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CLINICAL CASE

Ipsilateral jugular access to treat an otherwise inaccessible puncture-related arteriovenous fistula pseudoaneurysm: a technical note

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ABSTRACT

Background: **The standard approach for the endovascular treatment of a dysfunctional or occluded hemodialysis access in the upper limbs includes a direct intervention through the access itself or alternatively, when not feasible, through the brachial or radial artery access. Nonetheless, there are certain circumstances in which these approaches are not easily achieved.**
Methods: **An 89-year-old male with end-stage renal disease developed a pseudoaneurysm after an hemorrhagic complication of a recently transposed native basilic arteriovenous fistula secondary to a needle puncture. Dehiscence of the injured access with spontaneous arterial bleeding evolved as a consequence of the upper limb swelling, rendering therapeutic intervention of the access through a conventional route impossible. A fistulogram through puncture of the common femoral artery was performed to obtain an accurate diagnosis. However, this approach was insufficient to advance the covered stent with the intention of excluding the pseudoaneurysm, as the stent delivery system could not reach the desired site. Given that the covered stent insertion required a 9 Fr introducer, the radial artery approach was ruled out. Therefore, we chose a venous access via the ipsilateral internal jugular vein, which was punctured under ultrasound guidance.**
Results: **This strategy was useful to advance the stent and exclude the pseudoaneurysm successfully.**
Conclusions: **This technique should be considered for those individuals in whom conventional routes of approach for repairing dialysis accesses are not feasible or are extremely risky.**

Key words: **Covered stent, Jugular vein, Pseudoaneurysm, Vascular access**

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BACKGROUND

The endovascular treatment of dysfunctional or thrombosed hemodialysis fistulas represents the first line of therapy (1).

The preferred route for the endovascular treatment is through the same fistula, either native or prosthetic, carrying out retrograde, antegrade or combined approaches according to the characteristics of the lesions (2, 3).

The arterial approaches are left for atypical cases in which a venous puncture is difficult; this is usually associated with immature native fistulas (3-5).

Nonetheless, there are particular conditions in which conventional accesses are not possible, as in the case reported here. This patient developed a ruptured pseudoaneurysm with severe arm swelling, making it impossible to puncture the fistula. The treatment involved placing a self-expanding covered stent aimed at excluding the pseudoaneurysm, which was introduced through the internal jugular vein ipsilateral to the fistula (3-5).

CASE REPORT

We present an 89-year-old male patient with a past history of type 2 insulin-dependent diabetes mellitus, hypertension for the past 20 years, peripheral vascular disease and atrial fibrillation under oral anticoagulation. He has been on hemodialysis for the past 41 months due to diabetic nephropathy. In that time frame, three native arteriovenous fistulas (AVFs) were made; the first one was a left radiocephalic AVF which lasted 6 months while the

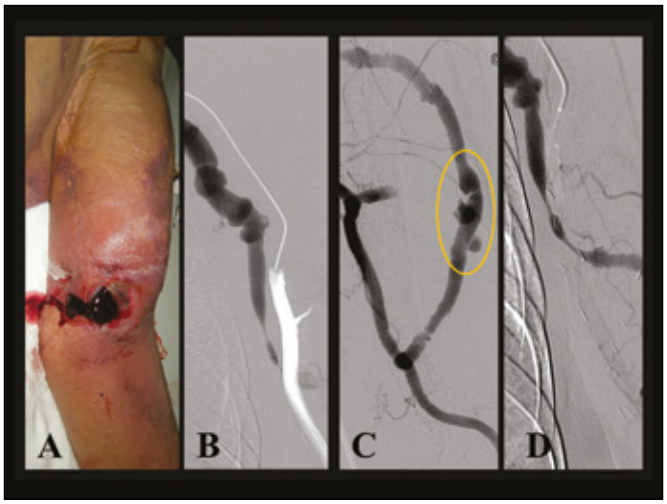

Fig. 1 - ***A)*** *Left upper limb after endovascular treatment and removal of the compressing dressing. A swollen arm along with dehiscence of the wound and abundant clots can be observed.* ***B)*** *Fistulogram through the arterial approach. An angiographic catheter can be seen along with the arterial blood flow through the brachial artery (white) and the venous blood flow (black)* ***C)*** *Fistulogram of a basilic transposition in which a pseudoaneurysm can be seen (circle).* ***D)*** *Extensive stenosis of the distal basilic vein.*

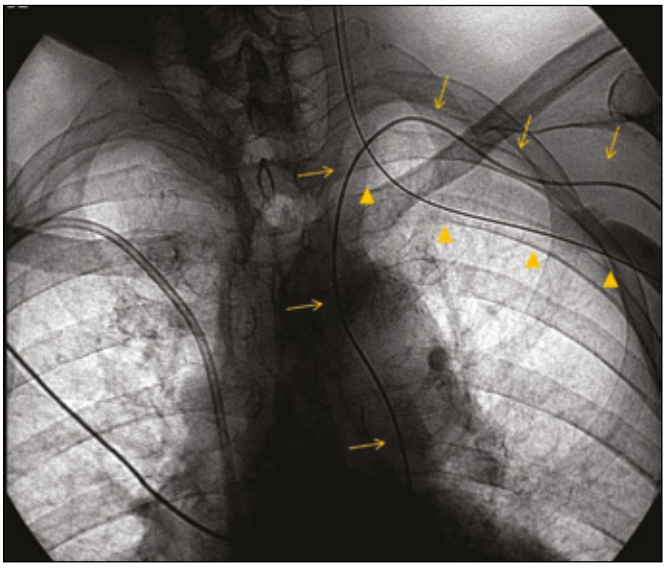

Fig. 2 - *Fluoroscopic image showing both approaches. The arrows show the femoral catheter through which the fistulogram was performed, while the arrowheads point the internal jugular approach through which the treatment was performed.*

second was a left brachiocephalic AVF that developed thrombosis 24 months later.

A venography found only a basilic vein available for another native fistula. Thus, a basilic vein transposition on the left arm was performed in two steps and was punctured 4 months later. Immediately after the second use of the access, a needle infiltration occurred and severe hematoma developed. Dehiscence of the arterial wound (Fig. 1A) with spontaneous arterial bleeding evolved with upper limb edema. In order to confirm and to eventually exclude the pseudoaneurysm and treat any possible venous stenosis, a fistulogram was performed.

PROCEDURE

In the present case, due to impossibility of puncturing the left upper limb, a fistulogram through the right femoral artery was performed. The left brachial artery was selectively catheterized with a 4 Fr hydrophilic catheter, and a set of sequential angiographic images were obtained (Fig. 1B). The images revealed a pseudoaneurysm located at the body of the fistula (Fig. 1C) along with a basilic vein stenosis in the upper third of the arm (Fig. 1D).

From the femoral access, the stent delivery system could not reach the pseudoaneurysm area. Given that the covered stent passes through a 9 Fr introducer, the radial artery approach was ruled out, so we chose the ipsilateral jugular access. The left internal jugular vein was punctured under ultrasound guidance and a 9 Fr sheath was inserted. The left subclavian vein was catheterized with a Sidewinder C1 hydrophilic catheter; then the catheter and a 0.035" hydrophilic guidewire were advanced to the brachial artery (Fig. 2). We exchange of hydrophilic guidewire by another stiff hydrophilic guidewire (Terumo®, Tokio, Japan) for more support to advance the stentgraft until their deployment site. Over this guidewire an 8 x 60 mm self-expanding covered nitinol stent (Fluency; Bard Peripheral Vascular, Tempe, AZ, USA) was released within the basilic vein, excluding the pseudoaneurysm. Subsequently, the stent was dilated with a balloon of similar dimension to prevent eventual leakages (Fig. 3A). A high-pressure balloon angioplasty of the stenotic lesion was then carried out and a final angiographic sequence shows the exclusion of the pseudoaneurysm and improvement of the stenosis (Fig. 3B). A strong thrill was then perceived throughout the basilic vein course.

The wound was treated topically and showed improved healing with reduced arm edema following endovascular treatment. Vancomycin (1 g after each hemodialysis session) for 20 days plus long-term aspirin (100 mg/day) and clopidogrel (75 mg/day for 3 months) were prescribed. A double-lumen hemodialysis catheter was temporarily placed in the right jugular vein. After 20 days, the fistula was successfully punctured and hemodialysis was performed, without any complication since then.

DISCUSSION

The endovascular approach to treat hemodialysis fistulas through conventional approaches such as native fistula or prosthetic graft punctures or even brachial artery puncture cannot be performed in some circumstances (1-5). A number of studies in which the radial route has

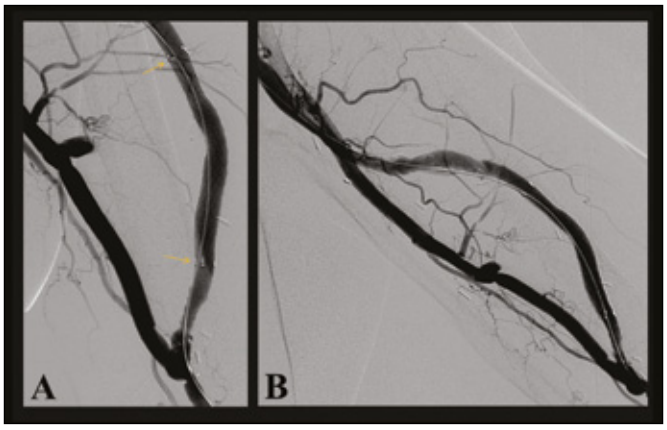

Fig. 3 - ***A)*** *Angiographic picture immediately following placement of the covered stent where the excluded pseudoaneurysm can be observed (arrows show the proximal and distal stents).* ***B)*** *Final angiographic evaluation displaying fistula patency, the excluded pseudoaneurysm and the venous stenosis after angioplasty.*

been used to repair nonfunctioning and/or thrombosed native fistulas or prosthetic grafts have been reported in recent years (6-8). Wu et al rescued 48 thrombosed radiocephalic fistulas using a 7 Fr introducer positioned through the radial route. No evidence of complications at the puncture site was reported in that study and a palpable radial pulse was noticed in all patients after the procedure (8).

Even though the femoral artery route was used for diagnostic purposes in our case, this route was unsuitable for treatment. The 117 cm stent delivery system is not long enough to reach distally beyond the pseudoaneurysm. Given that the introducer required to place the stent is 9 Fr, the radial vein approach was not considered a feasible route.

Therefore, a venous access via the internal jugular vein ipsilateral to the fistula was chosen as the last option. This approach is scarcely reported in the medical literature, but it has been used for approaching not only native fistula but also prosthetic grafts in the upper limbs (9, 10). However, difficult central venous catheterization in the presence of venous valves has been described.

An average delay of 3 minutes versus 40 seconds when fistulas were treated by the conventional compared with the jugular approach has been reported by Basile and colleagues in 41.65% of the cases. This strategy notably reduced the operator exposure to radiation from 10.5 to 8.3 Gy/cm^2 (10). The jugular access, especially when it is carried out under ultrasound guidance, is extremely safe and effective, with a 99.9% technical success and a 2.3% complication rate (11).

To our knowledge, no data regarding the use of this approach to treat hemodialysis vascular access pseudoaneurysms are available in the medical literature. An alternative option would have been open surgery, had our approach been unsuccessful. Moreover, a post-op angiogram and an angioplasty would have been necessary to treat the venous stenosis.

We conclude that this technique used should be considered for those individuals in whom conventional routes of approach for repairing dialysis accesses are not feasible or are extremely risky.

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