

## Percutaneous antegrade transarterial treatment of traumatic radial arteriovenous fistula

### Travmatik radyal arteriyovenöz fistülün perkütan antegrad transarteriyel yolla tedavisi

Kudret Keskin, M.D., Ayhan Olcay, M.D., Fatih Eren, M.D.

Department of Cardiology, Türkiye Diyanet Vakfı 29 Mayıs Hospital, İstanbul

**Summary**– Traumatic arteriovenous fistulas (AVF) are almost exclusively the result of penetrating trauma and there is usually a history of hemorrhage. Typically, the patient demonstrates a thrill and bruit over the site of injury. We report a woman who presented with longstanding pain and swelling of the right hand due to radial AVF that possibly occurred following an injury to the right hand that happened 10 years prior to the date of admission. Since surgery was considered high risk due to multiple fistulas and previous surgery, percutaneous coil embolization was performed via the ipsilateral antegrade radial approach.

**Özet**– Travmatik arteriyovenöz fistüller çoğunlukla kanamanın eşlik ettiği delici travma sonucu oluşur. Tipik olarak hastalarda travma bölgesinde titreşim ve üfürüm tespit edilir. Bu yazıda, yaklaşık 10 yıl önce sağ el bileğine aldığı delici travma sonrası arteriyovenöz fistül gelişmiş olan ve sağ elde şişlik ve ağrı yakınması ile başvuran bir kadın hasta sunuldu. Gerek çoklu fistül olması gerekse öncesine ait cerrahi girişim hikayesi sebebiyle yeni bir cerrahi girişim riskli bulundu. Bu sebeple radyal arter yoluyla "coil" embolizasyonu yapıldı.

Traumatic arteriovenous fistulas (AVFs) are almost exclusively the result of penetrating trauma and there is usually a history of hemorrhage. Typically, the patient demonstrates a thrill and bruit over the site of injury.

We report a woman who had right hand injury 10 years previously that required surgical intervention and presented years later with longstanding pain and swelling of the hand due to AVF. Since surgery was considered high risk because of multiple fistulas and a previous surgery, percutaneous coil embolization was performed via an ipsilateral antegrade radial approach.

#### CASE REPORT

A 50-year-old woman presented with swelling of the right wrist and pain that included a history of right wrist trauma and accompanying surgical intervention 10 years previously. On examination, the right hand was warm, edematous and had prominent veins on the palmar surface. On auscultation and palpation a bruit

and thrill was noted. There was also a history of severe bleeding from the hand after heavy household work. An echo color Doppler examination revealed the presence of multiple AVF with turbulent high-velocity flow toward the veins in the wrist and palm; the collateral circulation was also evaluated and confirmed the presence of a patent ulnar artery. The patient was considered to be at high risk for conventional surgery due to multiple fistulas and previous surgery. So, we decided to proceed via a percutaneous embolization of the fistula. After a right antegrade radial artery puncture in the mid forearm, a 5F hydrophilic sheath (Terumo Corp. Somerset, NJ, USA) was introduced in order to have access for intervention down the radial artery. Radial angiography showed two large diameter and high volume AVF which seemed to be appropriate for closure, with multiple different sized fistulas nearby (Fig. 1a). A 2.5 Fr Cantata microcatheter (Cook Medical, USA) was advanced into the distal fistula through the sheath over a 0.014 inch

#### Abbreviation:

AVF Arteriovenous fistula

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Correspondence: Dr. Kudret Keskin, TDV 29 Mayıs Hastanesi, Vatan Cad., No: 3, 34091 Fatih, İstanbul.

Tel: +90 212 - 543 29 29 e-mail: keskinkudret@yahoo.com

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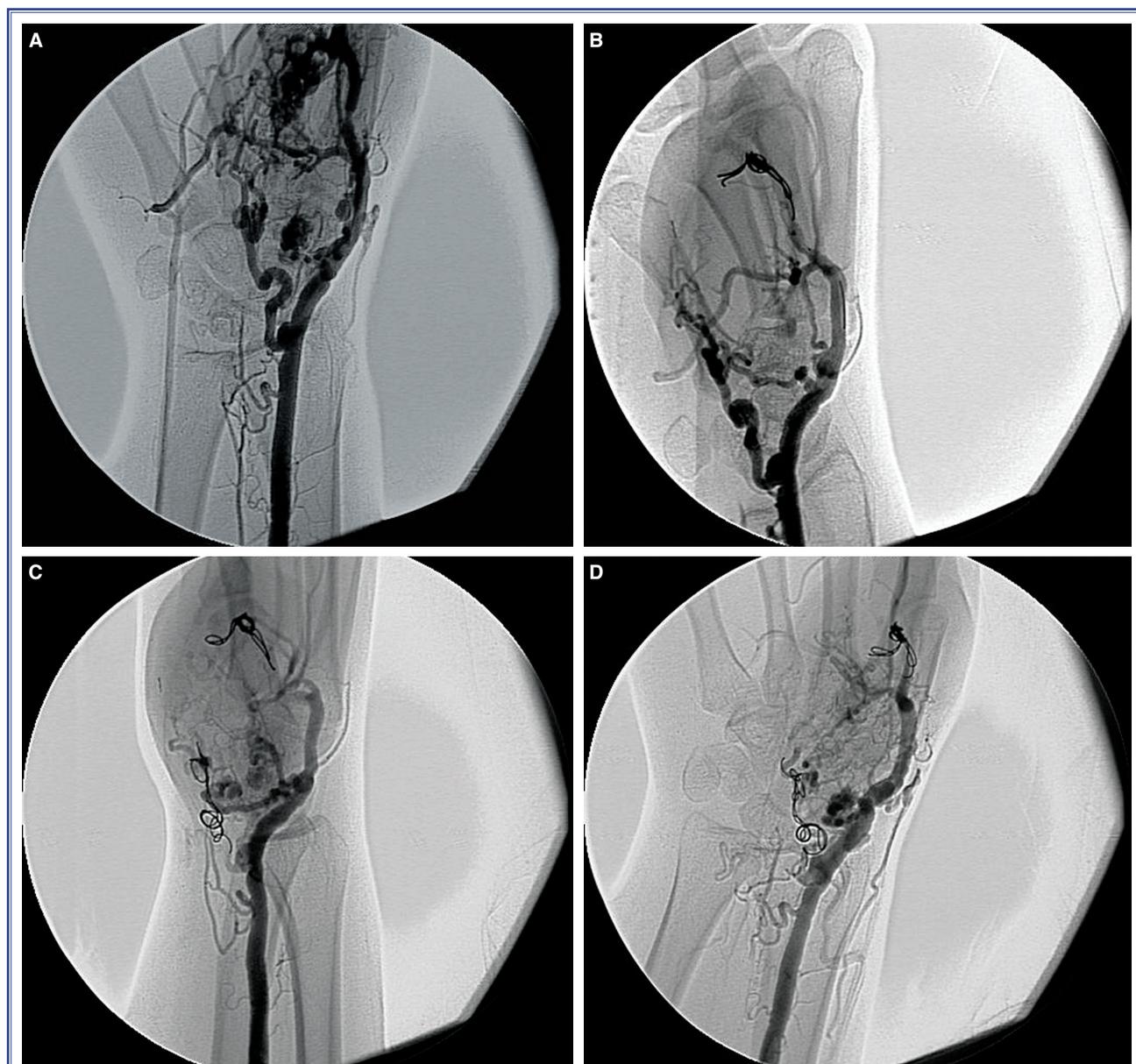


Fielder hydrophilic guidewire. The 0.014 inch guidewire was withdrawn and 4 uncontrolled 0.018 inch, 7 mm length Hilal microcoils (Cook Medical, USA) twice the size of the fistula diameter were deployed successfully (Fig. 1b). Following embolization of the first site, an attempt was made to embolize the more proximal fistula but because of tortuosity it was difficult to deliver the floppy wire and the microcatheter to the site. Therefore a 5F LIMA diagnostic catheter was engaged into the radial sidebranch and a 0.014 inch Fielder wire (Asahi Intecc, Japan) was advanced

into the target area. Again, 4 uncontrolled 0.018 inch, 6 mm length Hilal microcoils (Cook Medical, USA) were deployed successfully through the microcatheter (Fig. 1c). Five minutes after the procedure, both fistulas were found to be closed and the procedure was finished (Fig. 1d).

## DISCUSSION

Percutaneous embolization is an effective and minimally invasive alternative to open surgery. The easiest



**Figure 1.** (A) Angiogram prior to intervention showing multiple arteriovenous fistulas and hypertrophied radial artery. (B) Angiogram after first microcoil embolization (distal location). (C) Angiogram after second microcoil embolization (proximal location). (D) Final angiogram showing almost total occlusion.

AVF to treat by percutaneous embolization are those with a single communication. However this case had multiple communications and we elected to treat only the largest connections. We did not want to close all AVF because it was not desirable to compromise the entire circulation of the radial artery and it was technically difficult to access the small ones. This should be considered as an option in some patients where alternative techniques such as surgery are not feasible. Although traumatic AVF are rare, in the era of transradial coronary interventions, iatrogenic AVF are occurring at an increasing frequency.<sup>[1]</sup> Not all AVF require treatment and indications for treatment include disabling symptoms such as pain, swelling, edema and bleeding. In addition to traditional surgical treatment and coil embolization, implantation of a covered stent would be another option which has been previously described by Summaria et al., especially if there is a single AVF.<sup>[2]</sup> Our case was considered unsuitable for a covered stent due to the location and the presence of multiple fistulas.

From a technical point of view, the site of the coil occlusion is important because getting too close to the orifice of the artery may jeopardize the arterial flow while too being too close to the drainage orifice may cause the coil to go into the venous circulation.<sup>[3]</sup> For the long term, fistula leak is another consideration and an adequate amount of coil deployment is important. Within a few minutes the flow should be diminished. Patency of the ulnar artery before radial intervention is crucial in order to avoid limb ischemia.

Onyx (Irvine, California) is a liquid embolic agent which is comprised of an ethylene-vinyl alcohol copolymer, dimethyl sulfoxide, and tantalum. It can be delivered through microcatheters directly into a vascular defect or AVF in a very controlled manner. After delivery of the embolic material, the liquid quickly transforms into a solid polymer cast, thereby sealing off the vessels in the AVF from blood flow.<sup>[4]</sup> The successful percutaneous treatment of an AVF may also

require a focused sclerosant, but with this our concern was the possibility of the sclerosant entering the deep venous system and producing venous thrombosis. A new generation of vascular plugs seem to offer a therapeutic option for AVF closure, since it was a “1 shot” procedure that avoids the risk of accidental coil migration. Amplatzer Vascular Plug was originally designed to occlude peripheral arteriovenous malformations and could also be used in our case.<sup>[5]</sup>

In conclusion, percutaneous intervention of AVF is a safe alternative to surgery especially in high risk patients. To our knowledge this is the first description of a successful radial posttraumatic AVF closure by microcoil embolization via an antegrade radial approach.

**Conflict-of-interest issues regarding the authorship or article: None declared.**

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**Key words:** Arteriovenous fistula; coronary vessel anomalies/therapy; echocardiography, Doppler; embolization, therapeutic; fistula/therapy.

**Anahtar sözcükler:** Arteriyovenöz fistül; koroner damar anomalisi/ tedavi; ekokardiyografi, Doppler; embolizasyon, terapötik; fistül/ tedavi.