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Iatrogenic Femoral Arteriovenous Fistulas: Endovascular Treatment with Coil Embolization in Two Patients[1]

Eun Jung Ahn, M.D., Jin Soo Choi, M.D., Sung Mun Lee, M.D., Young Whan Kim, M.D.

An iatrogenic femoral arteriovenous fistula (AVF) is an uncommon but well-recognized complication that has followed diagnostic or interventional procedures. We report two cases of postcatheterization femoral AVF that were successfully treated with embolization using microcoils through a coaxial microcatheter. The fistulous tract of these patients could not be obliterated by ultrasound-guided compression.

Index words : Femoral artery
Arteriovenous fistula
Embolization, therapeutic

Transfemoral arterial catheterization is the most common access for diagnostic and interventional procedures. Potential complications of arterial catheterization are hematomas, arteriovenous fistulas (AVF), pseudoaneurysms, arterial occlusions, and peripheral embolization. The reported incidence of all vascular complications ranged from 1% to 9%, and the incidence of AVF varied from 0.006% to 0.86% (1, 2). An iatrogenic AVF is the result of a communication between artery and vein, following the percutaneous puncture of diagnostic or interventional procedures.

Manual compression of AVFs by ultrasound has been advocated as an alternative treatment, but may fail in 30% (3). Several alternative treatments for AVFs have been reported in previous studies (4–6). Percutaneous transcatheter embolization with a coil is a minimally invasive alternative to surgery for the lesion, when external manual compression has been unsuccessful.

[1]Department of Radiology, Dongsan Medical Center, Keimyung University School of Medicine
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Address reprint requests to : Jin Soo Choi, M.D., Department of Diagnostic Radiology, Dongsan Medical Center, Keimyung University College of Medicine, 194, Dongsan-dong, Jung-gu, Daegu 700-712, Korea.
Tel. 82-53-250-7767 Fax. 82-53-250-7766
E-mail: jschoi@dsmc.or.kr

Here we report our experience with two iatrogenic femoral AVFs, which were successfully treated with coil embolization.

Case Presentations

Case 1

A 65-year-old man was admitted to manage an acute myocardial infarction. A coronary angiography was performed using the right femoral approach and confirmed a single vessel with disease, which was treated with a percutaneous transluminal coronary angioplasty (PTCA). One day after the sheath removal for catheterization, a continuous bruit and an intense thrill were noticed at the right groin. A color Doppler ultrasound (CDU) examination was performed and showed an AVF between the right deep femoral artery (DFA) and the common femoral vein (CFV). Challenges to close the AVF by ultrasound-guided compression failed. Then, an angiography was performed using the left common femoral artery approach and showed an AVF between right DFA and CFV (Fig. 1A, B). The fistula was catheterized with a 3Fr microferret catheter (Cook, Bjaeverskov, Denmark) and two 3mm tornado platinum coils® (Cook, Bloomington, IN, U.S.A.) were placed in

the fistulous track. A follow-up angiography after embolization confirmed the obliteration of the AVF (Fig. 1C).

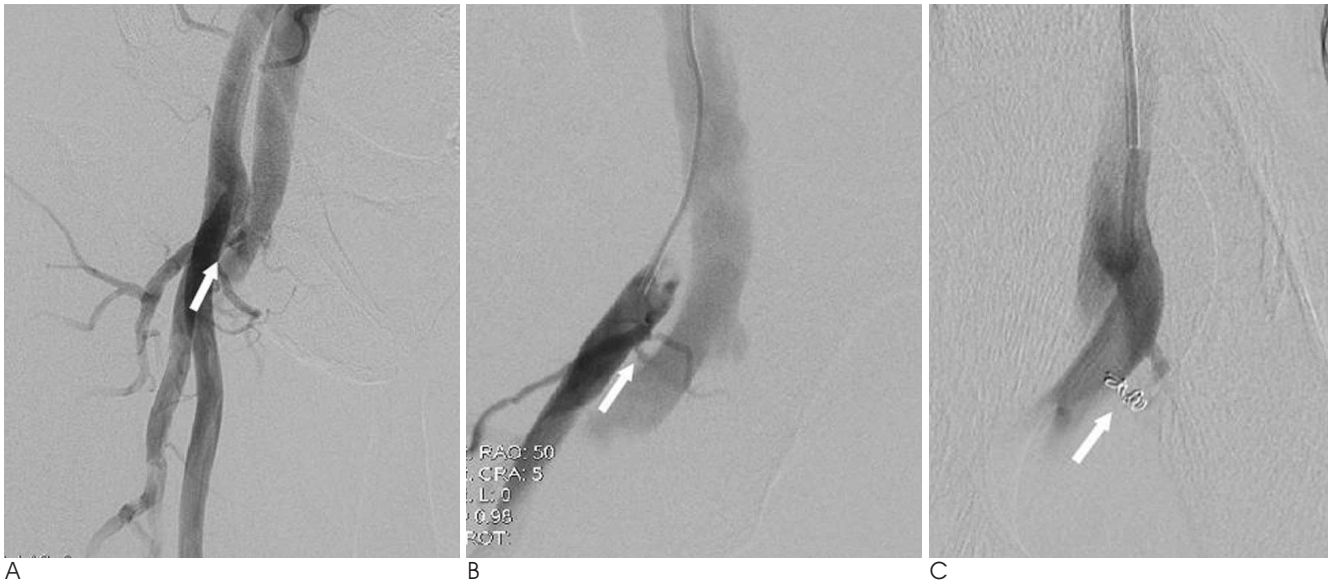
Case 2

A 74-year-old man admitted due to angina symptoms and underwent a PTCA using the right femoral approach. On the next day, a continuous bruit and a palpable thrill was detected at the right groin. A CDU examination showed an AVF between the right DFA and CFV. Both manual and ultrasound-guided compression failed to close the AVF. Then, an angiography was performed through the contralateral common femoral artery, which demonstrated an AVF between the right DFA and CFV (Fig. 2A, B). A coaxial microferret catheter was placed into the fistula and 5mm tornado platinum coils® were delivered into the fistulous track. The first coil migrated to venous system and was embolized in the left upper segmental pulmonary artery without clinical symptoms. One coil was correctly placed in the fistulous tract. Closure of the AVF was demonstrated immediately after the embolization angiography and CDU examination (Fig. 2C).

Discussion

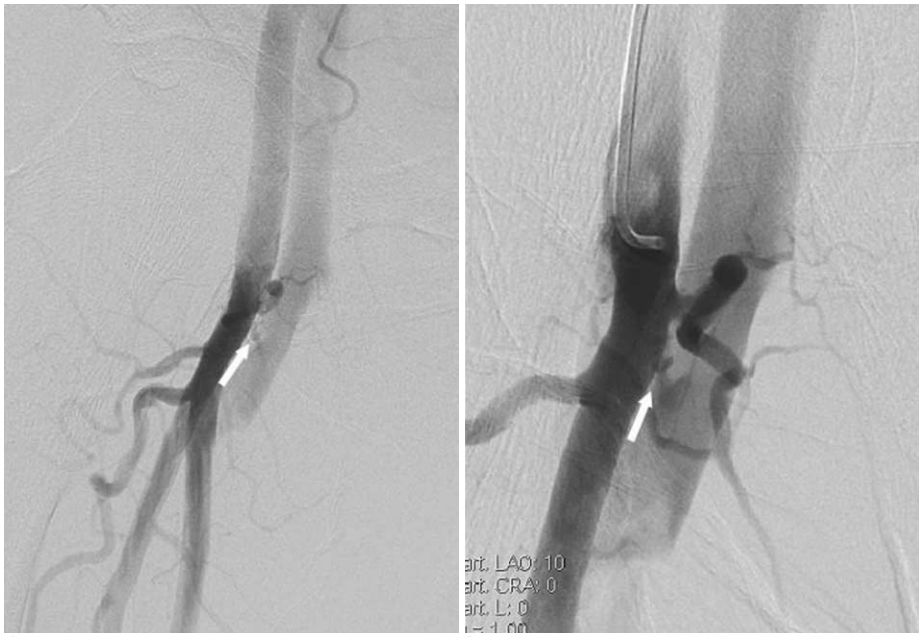
An iatrogenic femoral AVF is caused by the transfixation of an artery and a vein by the needle. Puncture of both vessels often occurs when performed below the level of the femoral head, where the artery and vein are in antero-posterior relation. Other causal factors include catheterization or complex interventional procedures when employing large catheters or introducer sheaths, antegrade catheterization, obesity, difficult or repeat arterial puncture, simultaneous puncture of both artery and vein, anticoagulant or thrombolytic therapy and heavily calcified artery, medial calcinosis, arterial hypertension, and hemodialysis or diabetic patients (4). Marsan et al. reported the relatively high incidence of AVFs following cardiac angiographies and mentioned that a very significant factor in the formation of AVFs is the distal location chosen for the cutaneous entry point and vascular puncture (7). The femoral crease that is used as a landmark by many angiographers for common femoral artery is unreliable. To avoid distal puncture and reduce the possibility of AVF formation, another study suggests that the femoral head or inguinal ligament should be used as a landmark (7).

The development of femoral artery AVFs represents a continuing problem after a vascular diagnostic and interventional procedure. For most patients, watchful waiting and ultrasound-guided compression have been an effective method of treating such complications (3, 8). However, in patients requiring a continuous anticoagulant regimen, in those with large AVFs or in patients suffering from painful groin hematomas, the compression method is less successful (5, 9). Although surgical repair of AVFs is safe and definitive, the troublesome compli-

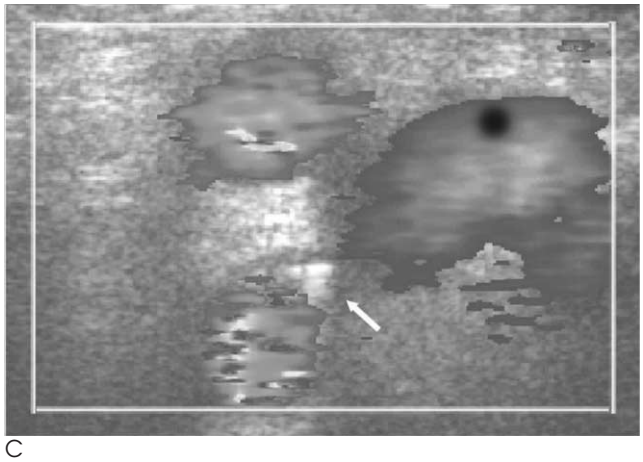


A B C

Fig. 1. A 65-year-old man presented with bruit at the right groin.
A, B. An AVF is originating from the right DFA with short segment fistula (arrow).
C. Angiography obtained immediately after coil embolization shows complete closure of the fistula (arrow).



A B



C

Fig. 2. A 74-year-old man presented a continuous bruit and a palpable thrill at the right groin.
A, B. A high flow AVF is originating from the right DFA with short segment fistula (arrow).
C. Follow-up color Doppler ultrasound shows complete closure of the fistula (arrow) after embolization with coil.

cations include wound infection, bleeding, neuralgia, septicemia, limb swelling, and scar formation that may make future groin access difficult (6). Another alternative treatment of AVFs with implantation of stent-grafts, represents an approach currently under clinical investigation (5). However, potential issues such as stent deformity and kinking, the loss of branch vessels after placement, stenosis and occlusion, or the misplacement of stents prevents a final evaluation of this therapeutic alternative thus far (9, 10). Percutaneous coil embolization of AVFs is another therapeutic option of iatrogenic femoral AVFs (4). This method is relatively easy and cost effectiveness compared to surgical repair and implantation of a stent graft. The important aspect for this method is the selection of a fistula and the exact placement of the coil within the fistula neck. The fistulous track is uneven and anchors coils of 3-5 mm. Coil migrations may cause a potential problem due to high flow within the fistula. We have experienced a case of coil migration and it resulted in an asymptomatic embed at the pulmonary artery. Coils must match up to the length and diameter of the fistulous tract to prevent of distal migration. Moreover, manual compression or balloon inflation at the venous site may be helpful during the coil embolization.

In conclusion, our study suggests that a transcatheter embolization of iatrogenic femoral AVFs with a microcoil may be a safe and effective treatment, which is easy to perform in experienced hands and relatively inexpensive.

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의인성 넓적다리 동정맥루: 코일색전술 2예[1]

[1]계명대학교 의과대학 영상의학과학교실

안은정 · 최진수 · 이성문 · 김영환

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