

Case report: femoral vein catheterization complicated by pseudoaneurysm, arteriovenous fistula and critical limb ischemia in a patient with end-stage renal disease

¹Marius Fodor, ²Dan Olinic, ³Dana Fodor

¹ Department of Vascular Surgery, Emergency County Hospital, Cluj-Napoca, Romania; ² Department of Interventional Angiology, Emergency County Hospital, Cluj-Napoca, Romania; ³ Department of Neurology, Rehabilitation Hospital, Cluj-Napoca, Romania.

Abstract. Vascular access is an important procedure in patients with end-stage renal disease. Repeated punctures for cervical or thoracic vein access can lead to serious complications (hemothorax, arterial lesions, venous stenosis or thrombosis) and prevent cervical venous access in the future. Therefore, a tunneled femoral vein catheter represents an option for long-term hemodialysis access. Pseudoaneurysm, arteriovenous fistula and critical lower limb ischemia are rare complications after femoral vein catheterization. We report the case of a patient who presented all the above-mentioned complications simultaneously. Surgery involved resection of the pseudoaneurysm, femoral venorrhaphy and venous graft for the superficial femoral artery. The patient had a positive postoperative evolution. The femoral vein route is a good option in hemodialysis patients when the cervical venous system is stenotic or thrombosed. It is mandatory to identify and treat possible lower limb-threatening complications of femoral vein access: pseudoaneurysm, arteriovenous fistula and critical limb ischemia.

Key Words: pseudoaneurysm, arteriovenous fistula, critical limb ischemia, femoral vein cannulation, hemodialysis.

Copyright: This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Corresponding Author: M. Fodor, email: drfodor@yahoo.com

Introduction

Vascular access is an important procedure in patients who need emergency hemodialysis or who lost their arteriovenous fistula (Polkinghorne et al 2013). The subclavian vein, the internal or external jugular vein and the femoral vein are used for venous access (Kuramochi et al 2006). The superficial femoral artery is a pathway for temporary dialysis vascular access when the central venous network is stenotic or obstructed (Frampton et al 2009). The frequent use of the subclavian vein route for catheter placement is not recommended because of the high risk of venous stenosis (MacRae et al 2005). The internal jugular vein is considered the first choice for vascular access in long-term hemodialysis (Rinat et al 2014). Infection, bleeding after catheter insertion and lesions of important cervical anatomical elements represent the most frequent complications in venous cervical access. Pseudoaneurysm, arteriovenous fistula and vein thrombosis are less frequent complications (Wadhwa et al 2012, Frykholm et al 2014).

In case of repeated punctures for cervical or thoracic vein access, serious complications (hemothorax, arterial lesion and venous stenosis or thrombosis) could occur and prevent cervical venous access in the future (Al-Hwiesh et al 2007). In such situations, a tunneled femoral vein catheter represents an option for long-term hemodialysis access. The femoral vein has the advantage of being easily compressible and not requiring an

X-ray after cannulation before beginning dialysis (Kuramochi et al 2006). The most frequent complications of a tunneled femoral vein catheter are difficulty walking, bleeding at the puncture site, infection and deep vein thrombosis (Ong et al 2013). Arteriovenous fistula and pseudoaneurysm are rare complications of femoral vein access (Kuramochi et al 2006).

Herein, we present a patient with simultaneous iatrogenic complications after the insertion of a tunneled femoral vein catheter.

Case report

A 76-year old male was included in a hemodialysis program 10 years ago. The patient had a history of bilateral stenosis of the internal jugular and subclavian veins after multiple cervical venous catheters for dialysis. He also had several arteriovenous fistulas, all of them complicated by thrombosis. Six months before this hospital admission, the patient had a tunneled femoral vein catheter for hemodialysis.

The patient was admitted to our department for rest pain and swelling of the left lower limb of 4 weeks duration and he also developed a leg ulcer (fig 1). The physical examination revealed a bruit and a pulsatile tumor in the left groin.

Arteriography showed a 4 cm diameter aneurysm and communication between the superficial femoral artery and the common femoral vein in the left inguinal area (figures 2 A and B). The anterior tibial artery, posterior tibial artery and peroneal



Figure 1 Left calf ulcer (arrow)

artery were visible in only one third of the upper calf area. The patient was diagnosed with arteriovenous fistula and pseudoaneurysm associated with critical lower limb ischemia after tunneled femoral catheterization.

Therefore, the patient was referred to the Department of Vascular Surgery. A temporary catheter was placed in the right external jugular vein for hemodialysis. The external iliac artery was explored and temporarily clamped. The pseudoaneurysm was isolated as it had a 10 mm connection with the superficial femoral artery and a 5 mm connection with the common femoral vein (figure 3A). A lateral venorrhaphy with polypropylene 5-0 was performed. The superficial femoral artery was reconstructed using a 5 cm heterolateral internal saphenous vein graft (figure 3B). A drain was placed before wound closure. The operation time was 110 minutes.

The postoperative evolution showed pain relief and decreasing edema of the lower limb. The leg ulcer developed granulation tissue within 10 days and healed a few weeks later.

Postoperatively, the patient developed inguinal lymphorrhea, which was treated by aspiration drainage for 2 weeks.

The 6 months follow-up showed lack of edema in the lower limb and healing of the leg ulcer (comparative images: figure 4A and 4B). The Doppler Ultrasound demonstrated the permeability of the superficial femoral artery and of the common femoral vein.

Discussion

Central venous system catheterization is an important procedure, even if vascular access complications are a treatment challenge. Compared with cervical venous access, the femoral route allows easier access for long term hemodialysis (Les et al 2013). The complications of femoral vein access are also important:

bleeding at the puncture site, infection, deep vein thrombosis and difficulty walking (Rinat et al 2014).

Pseudoaneurysm, arteriovenous fistula and critical lower limb ischemia are rare complications after femoral vein catheterization. Our patient presented all the above-mentioned complications simultaneously. Thrombosis of the pseudoaneurysm communicating with the superficial femoral artery and common femoral vein can lead to acute lower limb ischemia or pulmonary embolism (Huseyin et al 2013). Spontaneous rupture of a false aneurysm is also a possible situation which requires emergency surgery. In our case, because the pseudoaneurysm was large and had the catheter inside, a minimally invasive procedure (stenting of the femoral artery or percutaneous thrombin injection) was not feasible (Belli et al 2014).

Femoral arteriovenous fistula can cause high-output heart failure due to increased peripheral venous flow (Belli et al 2014). Critical limb ischemia is the result of arterial steal syndrome caused by arteriovenous fistula in a patient with previous arteriopathy of the lower limbs, as it happened in our case.

This clinical experience allows us to make recommendations concerning femoral vein access for hemodialysis. It is advisable to take precautions and prevent unfortunate events by using a medial approach to the femoral vein in order to avoid the artery. Ultrasound guidance can help femoral vein cannulation when the femoral artery cannot be palpated (Prabhu et al 2010, Clark et al 2014). Critical limb ischemia with worsening of leg ulcers and increasing pain after femoral vein cannulation is a sign of possible arteriovenous fistula in the inguinal region associated with arterial steal syndrome or distal thrombosis in patients with previously stable arteriopathy of the lower limbs.

Conclusion

The femoral vein route is a good option in hemodialysis patients when the cervical venous system is stenotic or thrombosed. However, we have to keep in mind and identify in time the possible lower limb-threatening complications of femoral vein access: pseudoaneurysm, arteriovenous fistula and critical limb ischemia.

Informed Consent of Patient

The patient agreed for using his medical data for scientific aim.

References

- Al-Hwiesh AK, Abdul-Rahaman IS. Tunneled femoral vein catheterization for long term hemodialysis: a single center experience. *Saudi J Kidney Dis Transpl* 2007;18(1):37-42.
- Clark EG, Barsuk JH. Temporary hemodialysis catheters: recent advances. *Kidney Int* 2014;86(5):888-895.
- Frampton AE, Kessaris N, Hossain M et al. Use of the femoral artery route for placement of temporary catheters for emergency haemodialysis when all usual central venous access sites are exhausted. *Nephrol Dial Transplant* 2009;24(3):913-918.
- Frykholm P, Pikwer A, Hammarskjöld F et al. Clinical guidelines on central venous catheterisation. *Swedish Society of Anaesthesiology and Intensive Care Medicine. Acta Anaesthesiol Scand* 2014;58(5):508-524.
- Huseyin S, Yuksel V, Sivri N et al. Surgical management of iatrogenic femoral artery pseudoaneurysms: A 10-year experience. *Hippokratia* 2013;17(4):332-336.

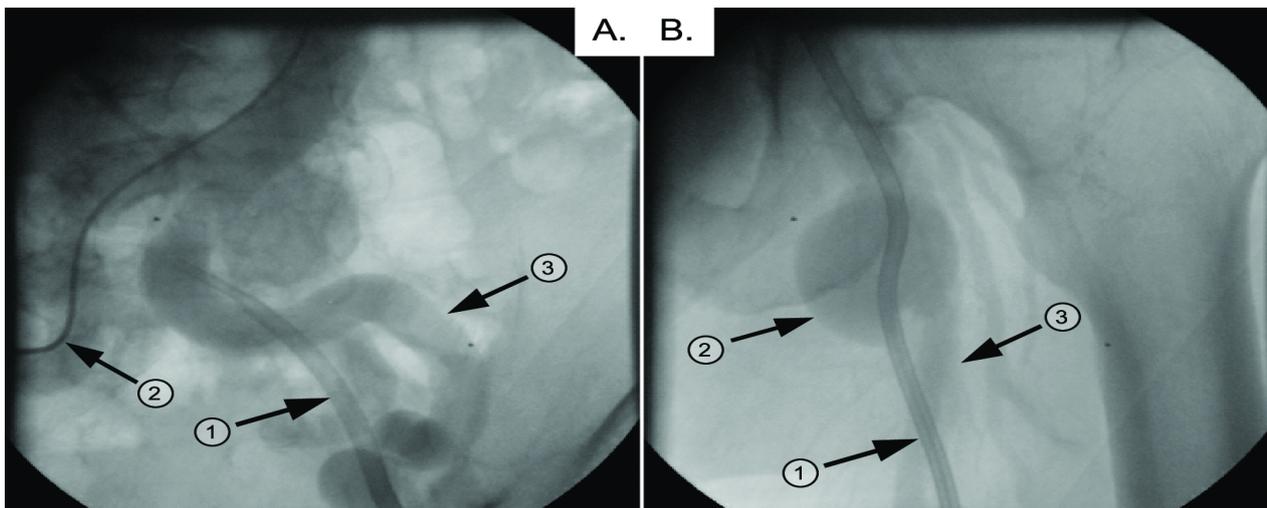


Figure 2 Arteriography: A. 1- Tunneled venous catheter; 2- Right common iliac artery; 3- Left common iliac artery; B. 1- Tunneled venous catheter; 2- Pseudoaneurysm with arteriovenous fistula; 3- Superficial femoral artery

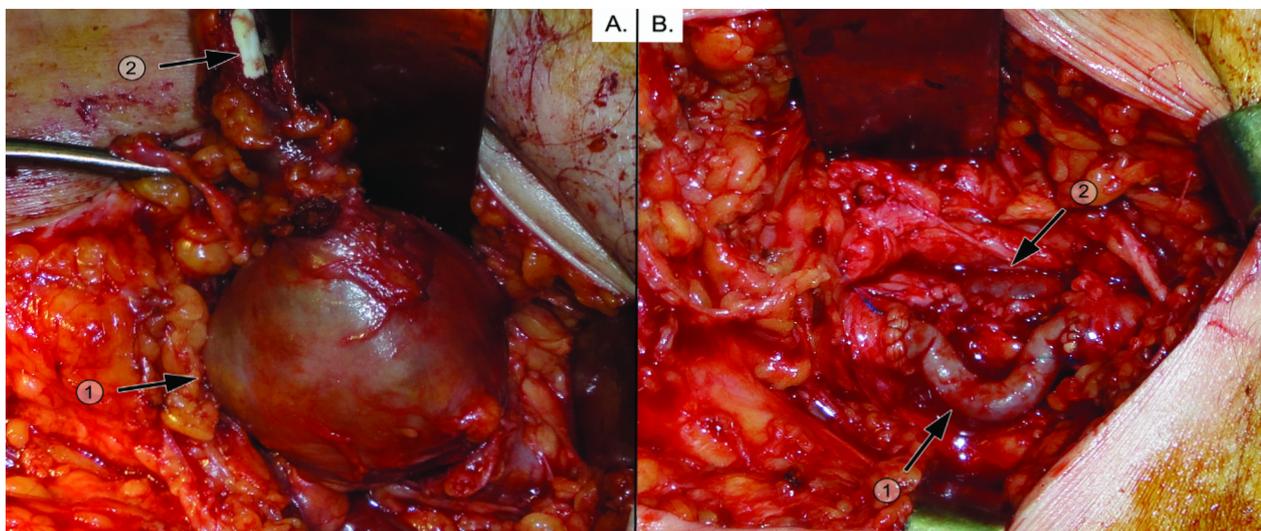


Figure 3 Intraoperative images: A. 1- Pseudoaneurysm; 2- Tunneled venous catheter; B. 1- Saphenous vein graft; 2- Sutured common femoral vein

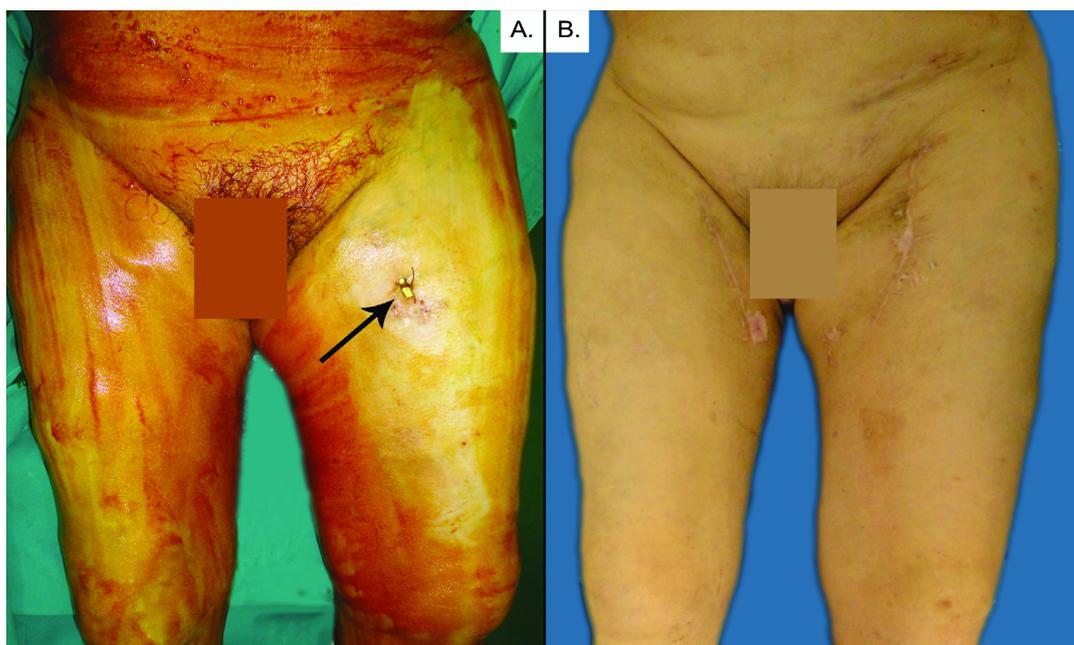


Figure 4 Comparative images: A. Preoperative aspect: edema of left thigh and partially sectioned femoral vein catheter (arrow); B. Six months postoperatively

- Kuramochi G, Ohara N, Hasegawa S *et al*. Femoral arteriovenous fistula: a complication of temporary hemodialysis catheter placement. *J Artif Organs* 2006;9(2):114-117.
- Leś J, Wańkiewicz Z. Methods of central vascular access for haemodialysis. *Anaesthesiol Intensive Ther* 2013;45(3):171-176.
- MacRae JM, Ahmed A, Johnson N *et al*. Central vein stenosis: a common problem in patients on hemodialysis. *ASAIO J* 2005;51(1):77-81.
- Ong S, Barker-Finkel J, Allon M. Long-term outcomes of arteriovenous thigh grafts in hemodialysis patients: a comparison with tunneled dialysis catheters. *Clin J Am Soc Nephrol* 2013;8(5):804-809.
- Polkinghorne KR, Chin GK, MacGinley RJ *et al*. KHA-CARI Guideline: vascular access - central venous catheters, arteriovenous fistulae and arteriovenous grafts. *Nephrology* 2013;18(11):701-705.
- Prabhu MV, Juneja D, Gopal PB *et al*. Ultrasound-guided femoral dialysis access placement: a single-center randomized trial. *Clin J Am Soc Nephrol* 2010;5(2):235-239.
- Rinat C, Ben-Shalom E, Becker-Cohen R *et al*. Complications of central venous stenosis due to permanent central venous catheters in children on hemodialysis. *Pediatr Nephrol* 2014;29(11):2235-2239.
- Wadhwa R, Toms J, Nanda A *et al*. Angioplasty and stenting of a jugular-carotid fistula resulting from the inadvertent placement of a hemodialysis catheter: case report and review of literature. *Semin Dial* 2012;25(4):460-463.
- Yabanoglu H, Aydogan C *et al*. Surgical interventions for late complications of arteriovenous fistulas. *Int Surg* 2014;99(4):467-474.

Authors

- Marius Fodor, Department of Vascular Surgery, Emergency County Hospital, 3-5 Clinicilor Street, 400006, Cluj-Napoca, Cluj, Romania, EU, email: drfodor@yahoo.com
- Dan Olinic, Department of Interventional Angiology, Emergency County Hospital, 3-5 Clinicilor Street, 400006, Cluj-Napoca, Cluj, Romania, EU, email: dolinic@yahoo.com
- Dana Fodor, Department of Neurology, Rehabilitation Hospital, 46-50 Viilor Street, 400437, Cluj-Napoca, Cluj, Romania, EU, email: fodordana@yahoo.com

Citation Fodor M, Olinic D, Fodor D. Case report: femoral vein catheterization complicated by pseudoaneurysm, arteriovenous fistula and critical limb ischemia in a patient with end-stage renal disease. *HVM Bioflux* 2017;9(3):67-70.

Editor Ștefan C. Vesa

Received 11 April 2017

Accepted 7 June 2017

Published Online 23 July 2017

Funding None reported

**Conflicts/
Competing
Interests** None reported