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Iatrogenic arteriovenous fistula with a saclike widening

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Abstract

Iatrogenic pseudoaneurysm affects 2–8% of the population undergoing endovascular therapy. Arteriovenous fistula occurs in about 1–1.5% of patients.

A very rare combination of the arteriovenous fistula with a large widening resembling a pseudoaneurysm is presented.

An ultrasound examination performed at 2 months after an electrophysiological study revealed the presence of an abnormal sac over the right superficial femoral artery. Doppler mapping detected the presence of blood flowing into the sac. Simultaneously, a jet of enhanced blood flow was seen between the anomalous sac and the femoral vein. A contrast-enhanced CT angiography revealed the iatrogenic arteriovenous fistula between the right superficial femoral artery and the femoral vein with the saclike widening.

Currently, there is no clear and consistent definition of the complication presented. The patient was referred for surgical management and his further recovery was uneventful.

Key words: complication, pseudoaneurysm, arteriovenous, fistula

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Background

Iatrogenic pseudoaneurysm (PSA) is the most frequent serious complication of percutaneous vascular interventions. It is estimated to affect 2–8% of the population undergoing endovascular therapy [1, 2]. Morphologically, it consists of a sac or sacs that communicate with the arterial lumen directly or via a neck [3]. Arteriovenous fistula (AVF) is another iatrogenic complication of catheterization procedures that occur in about 1–1.5% of patients [4–7]. Here we describe a very rare iatrogenic complication, namely an arteriovenous fistula with a large widening resembling a pseudoaneurysm. To date, there was no proper name for this type of complication.

Case report

An ultrasound examination performed at 2 months after an electrophysiological procedure (puncture of right femoral venous with F8 sheath and ablation of tricuspid-venous isthmus) revealed the presence of an abnormal sac 12 × 13 × 4 mm in size over the right superficial femoral artery. Doppler colour flow mapping (CFM) detected the presence of blood flowing into the sac (Fig. 1A). Simultaneously, a jet of enhanced blood flow (at low intensity) was seen between the anomalous sac and the lumen of the femoral vein (Fig. 1B). Pulse-wave Doppler ultrasound (PW) detected the spectrum of blood flowing into the sac lumen at high velocity of 3.53 m/s together with the constant blood flow in the

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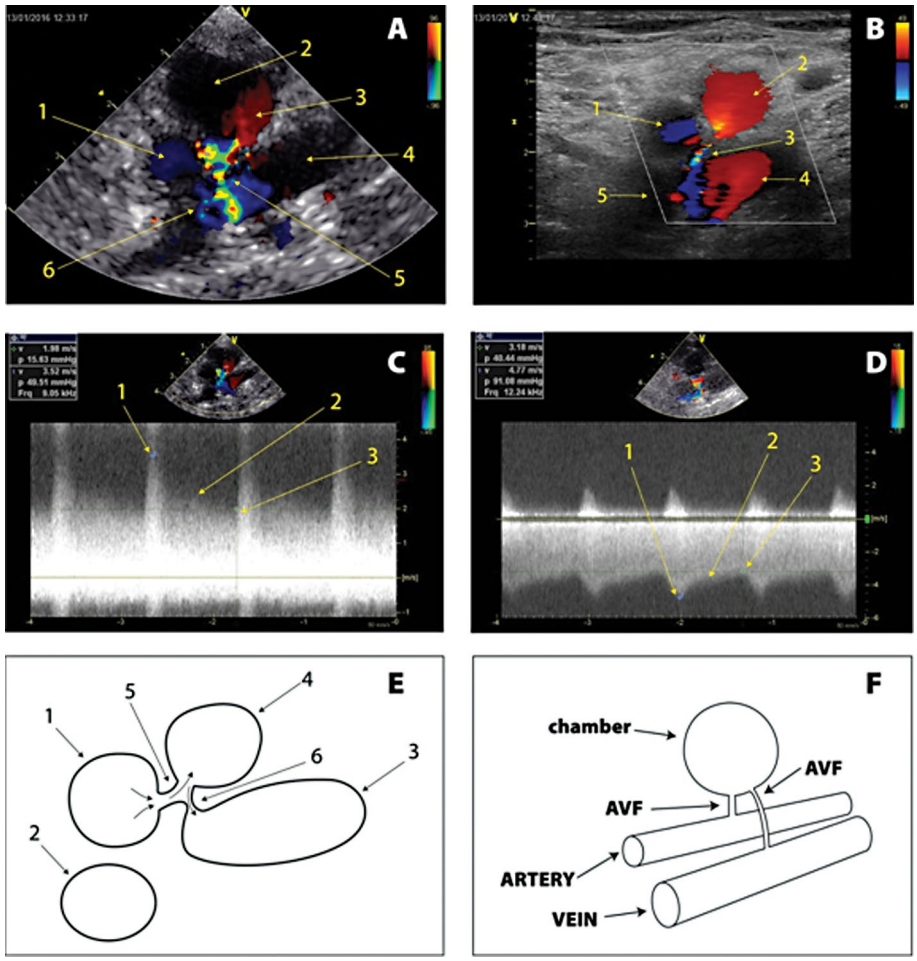

Figure 1. A — USG picture with colour flow mapping (CFM) presented by the sectorial head. Transverse projection of blood vessels and arterio-venous fistula (AVF). 1 — right superficial femoral artery (RSFA), 2 — chamber of AVF, 3 — the inflow of blood stream into iatrogenic chamber, 4 — right femoral vein (RFV), 5 — the inflow of blood stream into the right femoral vein, 6 — right deep femoral artery (RDFA); **B** — USG picture with CFM presented by a linear head. Transverse projection of blood vessels and AVF. 1 — RSFA, 2 — chamber of AVF, 3 — inflow of bloodstream into RFV, 4 — RFV, 5 — RDFA; **C** — Pulse wave (PW) measurement of bloodstream inflow into iatrogenic chamber. 1 — peak velocity of shunt flow, 2 — continuous blood flow velocity, 3 — end velocity blood shunt flow; **D** — continuous wave (CW) Doppler measurement of bloodstream inflow into RFV. 1 — peak velocity of shunt flow, 2 — continuous blood flow velocity, 3 — end velocity blood shunt flow; **E** — the scheme of USG picture presented on Panel A. 1 — RSFA, 2 — RDFA, 3 — RFV, 4 — chamber of AVF, 5 — AVF channel between RSFA and chamber, 6 — AVF channel between chamber and RFV; **F** — the another scheme of AVF with chamber morphology like iatrogenic pseudoaneurysm (PSA)

same direction until the next inflow wave commenced (Fig. 1C). Continuous-wave Doppler ultrasound (CW) identified the blood flowing into the lumen of the right femoral vein at a peak velocity of 4.77 m/s (Fig. 1D). The velocity blood flow declined to 3.18 m/s immediately before the next velocity peak. Based on the ultrasound image we were unable to establish whether the patient had two separate complications, i.e. a pseudoaneurysm and an arteriovenous fistula or a morphologically atypical variant of the single one. For this reason, the patient underwent contrast-enhanced CT angiography. The study revealed the presence of the contrast agent flowing from the right superficial femoral artery to an anomalous pouch and then from the anomalous pouch to the lumen of the right femoral vein (Fig. 2A, B). Offline image reconstruction showed the anomalous sac and the contrast medium in the right femoral vein (Fig. 2C). At enhanced spatial resolution a communicating channel between the anomalous pouch and the right femoral artery was visualized on the side of the femoral vein (Fig. 2D). Based on these diagnostic tests we made the diagnosis of the iatrogenic arteriovenous fistula between the right superficial femoral artery and the femoral vein with the saclike widening (Fig. 1E, F). Currently, there is no clear and consistent definition of the complication. Additionally, the patient was treated with Warfarin (INR 1,9). The patient was referred for surgical management and his further recovery was uneventful (Fig. 3).

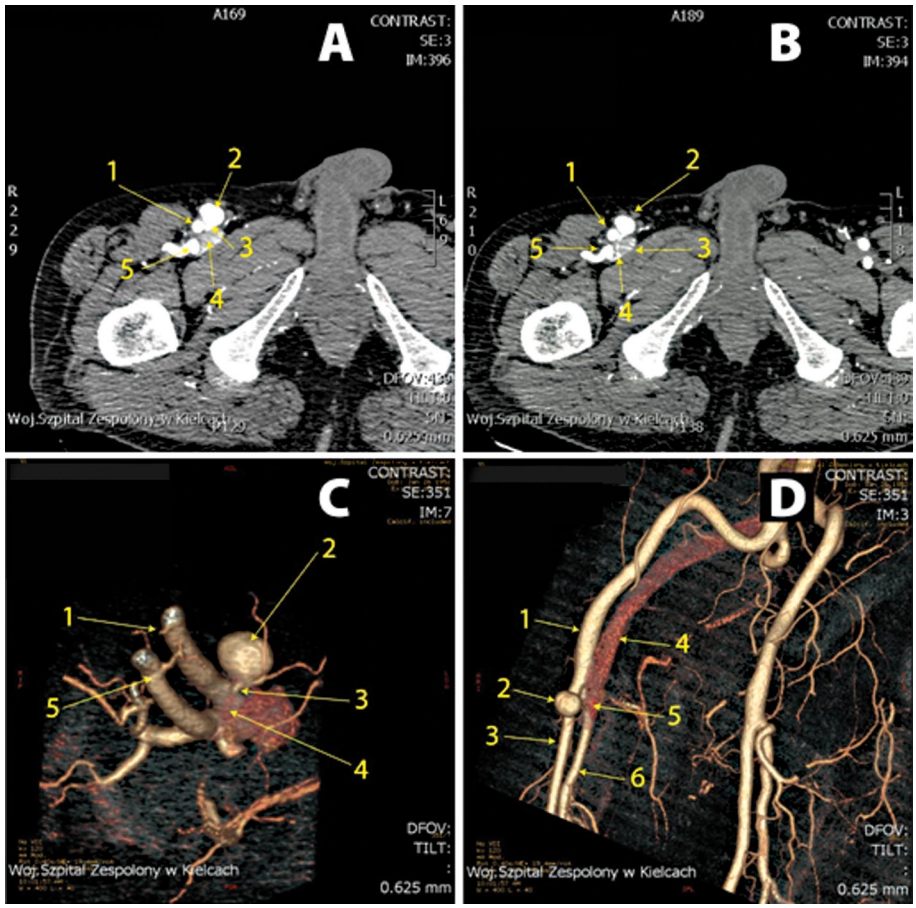

Figure 2. A — transverse section of computed scan (CT) with contrast flow (level of inflow into the iatrogenic chamber). 1 — RSFA, 2 — chamber of AVF, 3 — contrast flow into the iatrogenic chamber, 4 — RFV, 5 — RDFA. **B** — transverse section of CT with contrast flow (level of inflow into RFV). 1 — RSFA, 2 — chamber of AVF, 3 — RFV, 4 — the inflow of contrast stream into RFV, 5 — RDFA; **C** — CT reconstruction of AFV morphology. 1 — RSFA, 2 — chamber of AVF, 3 — AVF channel between RSFA and chamber, 4 — the inflow of contrast stream into RFV, 5 — RDFA; **D** — Another view of CT reconstruction of AFV morphology. 1 — right common femoral artery (RCFA), 2 — chamber of AVF, 3 — RSFA, 4 — RFV, 5 — the inflow of contrast stream into RFV, 6 — RDFA. Abbreviations as in Figure 1

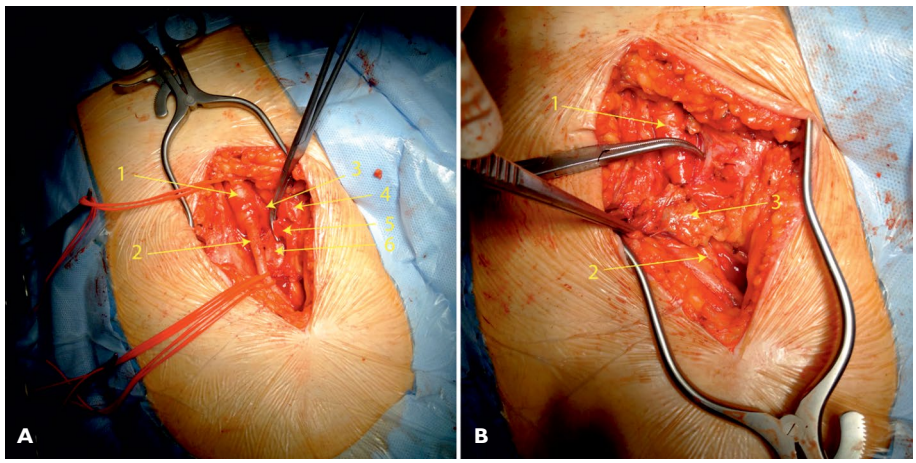

Figure 3. Photo taken during the operation. **A:** 1 — right common femoral artery (RCFA), 2 — RSFA, 3 — RFV, 4 — deflected cavity of aneurysmal AVF, 5 — collapsed channel between deflected cavity and RFV, 6 — AVF channel between RSFA and chamber. **B:** 1 — right common femoral artery (RCFA), 2 — RSFA, 3 — deflected cavity of aneurysmal AVF

Conclusion

Iatrogenic complications of endovascular procedures via the transfemoral access (TFA) are most frequently detected by ultrasound. This modality is sufficient for the diagnosis of pseudoaneurysms and arteriovenous fistulae. Even if they coexist in the same patient they are most frequently separate complications, that is the inflow of PSA is located in a different place than the opening of the fistula. In the present case, an unusual image of blood flow into the pouch on colour flow mapping suggested an atypical variant of this complication. In patients with pseudoaneurysms, the characteristic feature of Doppler spectrum is the to-and-fro pattern of blood flow. At systole, blood flows into the sac whereas it is reversing at diastole. In the present case, the Doppler spectrum of blood flow was unidirectional resembling the spectrum of blood flow in the arteriovenous fistula. To verify the initial diagnosis contrast-enhanced CT angiography was performed which confirmed the presence of the communicating channel between the femoral artery and the sac and between the sac and the femoral vein. Iatrogenic pseudoaneurysms are most frequently treated with percutaneous embolization using ultrasound-guided thrombin injection which has emerged as the effective treatment modality [3, 8, 9]. The concomitant presence of an arteriovenous fistula and a pseudoaneurysm generates a very high-pressure gradient between the artery and the venous vessel. For this reason, it is impossible to inject thrombin into the pseudoaneurysm as it may leak into the vein and activate thrombus formation which may later cause pulmonary embolism [10]. In certain cases, arteriovenous fistulae may be treated conservatively as spontaneous closure can occur in about 1/3 of them [11]. However, it applies only to isolated AVF. In the remaining cases interventional treatment is taken into account, however alternative strategies such as surgical management, stent implantation or coil placement are recommended for PSA coexistent with AVF [12–15]. Establishing the correct diagnosis of complications that occur after interventional procedures via the transfemoral access requires taking into account all potential morphological variants, and sometimes different imaging modalities, including contrast enhancement. According to our knowledge, our patient is the fourth case described in the literature [16–18]. For all authors, the main problem was to determine the name for such a complication. The name used so far has been iatrogenic venous pseudoaneurysm but it does not mean the coexistence of these two complications separately in one patient.

Conflict of interest

None.

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