Usefulness of transpedal intervention for inferior epigastric artery bleeding following catheter ablation: a case report

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Received 3 November 2021; first decision 2 February 2022; accepted 21 April 2022; online publish-ahead-of-print 26 April 2022

Background
Cardiovascular interventions may result in access-site complication, including inferior epigastric artery (IEA) bleeding. The IEA injury is generally treated through surgery and transcatheter embolization; however, additional complications should be avoided in the bailout procedure. Here, we present a case of catheter ablation complicated by IEA haemorrhage that we managed by transcatheter embolization using a transpedal intervention (TPI).

Case summary
A 58-year-old man underwent catheter ablation for symptomatic paroxysmal atrial fibrillation. Pulmonary vein isolation was performed uneventfully via catheterization of the right femoral artery and vein access. After the procedure, he complained of persistent abdominal pain and had a palpable mass in the lower right abdomen. Computed tomography angiography (CTA) revealed a haematoma in the right rectus abdominis with signs of active bleeding from a branch of the right IEA. We performed transcatheter arterial embolization through a TPI to stop bleeding and avoid further complication. No leakage of contrast media was detected after embolization using a microcoil and the abdominal pain improved. We did not observe any serious intraprocedural complications.

Discussion
Catheter ablation procedures may be complicated by access-site complications such as active bleeding. Arterial embolization is a feasible treatment approach to control the resulting haemorrhage. Embolization through the transpedal route (TPI) could be an effective bailout technique in the setting of emergent transcatheter arterial embolization to achieve haemostasis and avoid further complication.

Keywords
Transpedal intervention • Transcatheter embolization • Complication of catheter ablation • Endovascular treatment • Bailout • Case report

ESC curriculum
9.3 Peripheral artery disease • 5.3 Atrial fibrillation • 7.4 Percutaneous cardiovascular post-procedure

Learning points
- Catheter ablation procedures may be complicated by access-site complications such as active bleeding.
- Embolization through the transpedal route could be an effective bailout technique in the setting of emergent transcatheter arterial embolization to achieve haemostasis and avoid further complication.
Introduction

Cardiovascular interventions may result in access-site complications, including inferior epigastric artery (IEA) bleeding. The IEA injury is generally treated through surgery and transcatheter embolization; however, additional complications should be avoided during the bailout procedure. Here, we have presented a case of catheter ablation complicated by IEA haemorrhage that we managed by transcatheter embolization using a transpedal intervention (TPI). The TPI can be an effective bailout technique to avoid further complications.

Timeline

Day 1: Patient was admitted to our hospital for management of symptomatic paroxysmal atrial fibrillation by catheter ablation.
Day 2:
14:40: Catheter ablation was completed uneventfully.
21:00: Patient complained of sustained abdominal pain and palpable mass in the lower abdomen.
22:00: Computed tomography angiography revealed a haematoma in the right rectus abdominis with signs of active bleeding from a branch of the right inferior epigastric artery (IEA).
23:40: We successfully managed IEA haemorrhage by transcatheter embolization using a transpedal intervention.
Day 4: The patient was discharged in a stable condition.

Case report

A 58-year-old Japanese man, with a history of hypertension and hyperlipidaemia, was initially diagnosed with symptomatic paroxysmal atrial fibrillation (PAF) about a year ago. At that time, he was prescribed an anti-arrhythmic drug, pilsicainide 50 mg three times a day and edoxaban 60 mg daily, for the primary prevention of thromboembolic events. He remained in normal sinus rhythm for about 1 year, followed by recurrence of atrial fibrillation (AF) with frequent episodes of palpitation. According to current guidelines given by the European Society of Cardiology, catheter ablation for AF refractory to anti-arrhythmic drug has a Class I indication. He was admitted to our hospital for the management of symptomatic PAF by catheter ablation. At admission, he was on an anti-arrhythmic drug to control PAF, but had no treatment for other comorbidities. The physical examination revealed the following: blood pressure, 150/80 mmHg and heart rate 70 bpm. There was no cardiac murmur and pulmonary rales. Blood tests showed serum creatinine of 0.70 mg/dL, haemoglobin of 13.5 gm/dL. The electrocardiogram showed a normal sinus rhythm.

On the next day of admission, cryoablation was performed under conscious sedation, with dexmedetomidine and fentanyl. One internal jugular (7 Fr), three femoral venous, and one femoral arterial access were gained. The right femoral vein/artery punctures were performed by the Seldinger technique. An 8.5 Fr steerable sheath (Agilis™ NxT steerable introducer; Abbott, St Paul, MN, USA), a 9 Fr long sheath (Radifocus®; Terumo, Tokyo, Japan), and an 8.5 Fr transseptal sheath (Swartz™; Abbott) were placed in the right femoral vein, while a 4 Fr long sheath (Radifocus®; Terumo) was placed in the right femoral artery. The 8.5 Fr transseptal sheath was exchanged with the 15 Fr FlexCath Advance steerable sheath (Medtronic, Minneapolis, MN, USA) for cryoballoon ablation. The activated clotting time was controlled between 300 and 350 s, using heparin. Cryoballoon catheter (Arctic Front Advance™; Medtronic), Achieve™ mapping and guiding catheter (Medtronic) were used for the pulmonary vein isolation (PVI). Each targeted PV was occluded by the proper positioning of balloon, and the PVI was completed. After successful PVI, haemostasis at the femoral puncture site was achieved by figure of eight-suture technique and by additional manual compression after removal of the sheaths. Once the haemostasis was achieved, a period of 6 h of bed rest, followed by groin compression bandage was indicated. Several hours later, the patient complained of sustained abdominal pain and a palpable mass in the lower right abdomen. Computed tomography angiography (CTA) revealed a haematoma in the right rectus abdominis, with signs of active bleeding from a branch of the right IEA (Figure 1). We suspected a complication associated with the puncture and planned transcatheter arterial embolization to stop the bleeding.

We performed a TPI to avoid further complications (Video 1). We gained access to the right posterior tibial artery (PTA) by ultrasound-guided puncture using a micropuncture access set (Cook Medical, Bloomington, IN, USA) and inserted a 6 Fr sheath (Glidesheath Slender®; Terumo) through the puncture. We used a 6 Fr Judkins right 4.0 guide catheter to intubate the IEA ostium (Figure 2A). A 0.014 guidewire (Cruise®; Asahi Intec, Aichi, Japan) was carefully advanced to the bleeding lesion with the support of a microcatheter (Transit microcatheter; Johnson & Johnson, New Brunswick, NJ, USA). Angiography from the tip of the microcatheter revealed extravasation from a branch of the right IEA (Figure 2B). This was embolized using a microcoil (Tornado® Embolization Microcoil; Cook Medical; Figure 2C). No leakage of the contrast media was observed after the procedure (Figure 2D), and the abdominal pain improved.

The patient was satisfied with this procedure, because he was able to sit-up immediately, was ambulated soon after the procedure, and was discharged 2 days later, in a stable condition. At the 1 month follow-up visit, the patient had no clinical symptom or cardiac events. The electrocardiogram showed normal sinus rhythm and the ultrasound evaluation showed patent PTA, with antegrade flow.

Discussion

The common aetiologies of IEA injury are iatrogenic events during femoral artery puncture, catheter insertion, surgical trauma, and abdominal paracentesis. Tsurukiri et al. reported that in iatrogenic IEA injury, 11% of cases were occurred by percutaneous puncture at the femoral site. Anti-coagulant therapy is one of the risk factors for bleeding. The IEA injuries have been treated through surgery and transcatheter embolization.
In this case, we planned transcatheter arterial embolization to control the bleeding. First, we planned to gain access to the right femoral artery by ultrasound-guided puncture. However, CTA revealed that distance between the access site and the IEA was short, and an intervention via the right femoral artery was considered impossible. Additionally, we expected that the contralateral approach via the left femoral artery and transradial artery approach would be difficult, due to the origination angle of the IEA from the external iliac artery. In addition, as it was necessary to avoid further access-site complications, a TPI was selected. We gained right PTA access by ultrasound-guided puncture using a micropuncture access set (Figure 3). The vessel size was rather small, so we recommended ultrasound-guided puncture in TPI. Doppler can confirm artery and vein, also can indicate needle entry into true lumen even if there is no back bleeding, and can be achieve high success rate with no complication.

The TPI has mostly been used for secondary access when the antegrade superficial femoral artery intervention fails. Furthermore, it is also used in below-knee revascularization and as a bailout technique for the retrieval of a dislodged catheter, guidewire, or stent during complex peripheral interventions. All previous reports have used 4 Fr sheath in TPI. Recently, Sanghvi et al. reported that the use of a 6 Fr sheath is safe. Moreover, some reports suggest that the primary use of a TPI for the treatment of peripheral artery disease is safe. We have discussed the usefulness of TPI as the primary access route for bailout procedure, as it helps to achieve haemostasis easily.

Figure 1 Computed tomography angiography revealing a haematoma in the right rectus abdominis with signs of active bleeding from a branch of the right inferior epigastric artery (white arrow). (A) Transversal tomographic image. (B) Sagittal tomographic image. (C) Arbitrary cross sectional image. (D) Three-dimensional computed tomography angiography. Short distance between the puncture site and the inferior epigastric artery.
The advantages of this method compared with a contralateral approach via the femoral artery are as follows: (i) avoiding the femoral access-site complications, (ii) shortening the time to post-procedural ambulation, which improves patient satisfaction and leads to earlier discharge, and (iii) providing a more coaxial and straightforward approach without the various difficulties encountered with the contralateral femoral artery approach.

The limitations of this method are as follows: (i) distal vessels may become occluded by the catheter-induced injury and the long-term haemostasis can cause lower limb ischaemia. Caution should be exercised when delivering a catheter, to avoid dissection of vessels, and the haemostasis time should be shortened. (ii) This method requires a small guiding catheter system, which may limit haemostasis. (iii) The number of cases reported is relatively small. Further research is required to study the implementation of this technique in routine practice.

To the best of our knowledge, this is the first case to describe the use of a TPI for IEA injury after catheter ablation. Nonetheless, we did not observe any serious intraprocedural complications. This method could be an effective method to prevent further complications encountered during femoral access.

Figure 2 Angiography results. (A) Target lesion (white arrow). (B) Angiography revealed extravasation from a branch of the right inferior epigastric artery (white arrow). (C) Branch embolization using a microcoil. (D) Final angiography showing successful occlusion of the vessel.
**Lead author biography**

Dr Hirofumi Kusumoto studied Medicine at Kindai University (Japan). Since 2016, he is cardiology resident at Osaka Medical College Hospital. Since 2018, he works as cardiologist in the Higashi Takarazuka Satoh Hospital. He has been undertaking percutaneous coronary intervention and electrophysiology ablations for the last 5 years.

**Supplementary material**

Supplementary material is available at European Heart Journal – Case Reports online.

**Acknowledgements**

The authors thank the staff in the catheterization laboratory in Higashi Takarazuka Satoh Hospital for their excellent assistance. They also thank Editage (www.editage.com) for English language editing.

**Slide sets:** A fully edited slide set detailing these cases and suitable for local presentation is available online as Supplementary data.

**Consent:** The authors confirm that written consent for submission and publication of this case report, including image(s) and associated text has been obtained from the patient in line with COPE guidance.

**Ethics approval:** No ethical compliance was required.

**Conflict of interest:** None declared.

**Funding:** None declared.

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**Figure 3** Access pathway. (A) Echo-guided puncture using 21 gauge micropuncture needle. (B) Advancement of the 0.018 inch wire through micropuncture needle under echo and fluoroscopic guide. (C) Microsheath insertion. (D) Advancement of the 0.035 inch wire through the microsheath. (E) Microsheath is replaced by the 6 Fr sheath.
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