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MINI-FOCUS ISSUE: COMPLICATIONS

ADVANCED

CASE REPORT: CLINICAL CASE

Covered Stent Implantation for Treatment of Iliac Vein Rupture During Percutaneous Left Atrial Appendage Occlusion

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ABSTRACT

An 82-year-old woman who experienced an iatrogenic external iliac vein perforation during a left atrial appendage occlusion procedure was successfully treated by endovascular graft implantation. We report the short- and long-term outcomes of the procedure. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2020;2:894–7) © 2020 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

HISTORY OF PRESENTATION

An 82-year-old woman was admitted to our institution for an elective percutaneous left atrial appendage occlusion (LAAO) procedure with an Amplatzer Amulet (Abbott Medical, Santa Clara, California) device.

LEARNING OBJECTIVES

- To report an unusual complication during structural heart disease intervention.
- To introduce a nonsurgical endovascular approach for the management of iatrogenic iliac vein perforation and to report follow-up.

MEDICAL HISTORY

The patient had a significant history of paroxysmal atrial fibrillation complicated by a transient ischemic attack, pulmonary vein isolation, hypertension, previous episode of lower gastrointestinal bleeding without any reported etiology, and a recent cerebral hemorrhage.

DIFFERENTIAL DIAGNOSIS

There was no differential diagnosis at this stage.

INVESTIGATIONS

The patient had atrial fibrillation with a high risk for thromboembolic stroke (CHA_2DS_2-VASc score: 4). She had experienced a spontaneous left capsule-thalamic

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hematoma under rivaroxaban therapy 1 month before and was formally contraindicated for long-standing oral anticoagulation. Therefore, she was referred for percutaneous LAAO after a cardiac computed tomography (CT) scan for procedural planning.

INITIAL MANAGEMENT

The procedure was performed under general anesthesia with transesophageal echocardiography (TEE) guidance in a hybrid operating room. The maximal diameter of the left atrial appendage (LAA) neck was measured to 16 mm and led to the implantation of an 18-mm Amplatzer Amulet device. The right common femoral vein was punctured, and the dedicated 8.5-F Swartz SL1 sheath (Abbott Medical) was then advanced into the right atrium for transseptal puncture in the postero-inferior position with no particular difficulty. The upper left pulmonary vein was then catheterized, a bolus of unfractionated heparin (100 IU/kg) was given, and an Amplatz stiff exchange wire (Cook Medical, Bloomington, Indiana) was placed in the vessel.

A first attempt to insert the 12-F Amplatzer Torqvue (Abbott Medical) access sheath was terminated due to frictions related to femoral venous kinks. Thus, a 16-F Sentrant vascular sheath (Medtronic, St. Paul, Minnesota) was carefully inserted to increase the local support and the Torqvue sheath was finally delivered to the LAA.

The Amulet device was successfully deployed and released in the correct position within the LAA after a single deployment. The prosthesis was stable during the final tug test, and TEE control revealed no peri-device leak (Figure 1).

The hemodynamics status of the patient subsequently promptly degraded at the end of the procedure. TEE revealed no pericardial effusion, but selective phlebography through the femoral venous sheath revealed a complete external iliac vein rupture with massive extravasation of contrast into the retroperitoneum (Figure 2). This breach was likely created by the tip of the Torqvue system during the first insertion attempt.

SUBSEQUENT MANAGEMENT

The patient was placed under vasopressor drug support, and protamine was administered. Two units of red blood cells (RBCs) and 2 U of fresh frozen plasma were immediately transfused. The venous rupture was repaired by the implantation of 10- × 37-mm Begraft (Bentley Innomed GmbH, Hechingen, Germany) and 10- × 59-mm V12 (Atrium Medical Corporation, Hudson, New Hampshire) balloon-expanding covered stents. Post-stenting control phlebography revealed a residual leakage. Post-dilation, a 10- × 60-mm Mustang balloon (Boston Scientific, Marlborough, Massachusetts) was applied to optimize the seal (Figure 2).

An immediate post-procedural CT scan identified a medium abundance retroperitoneal hematoma extending to the right iliac fossa and the presence of the 2 stents within the right external iliac vein with

ABBREVIATIONS AND ACRONYMS

CT = computed tomography

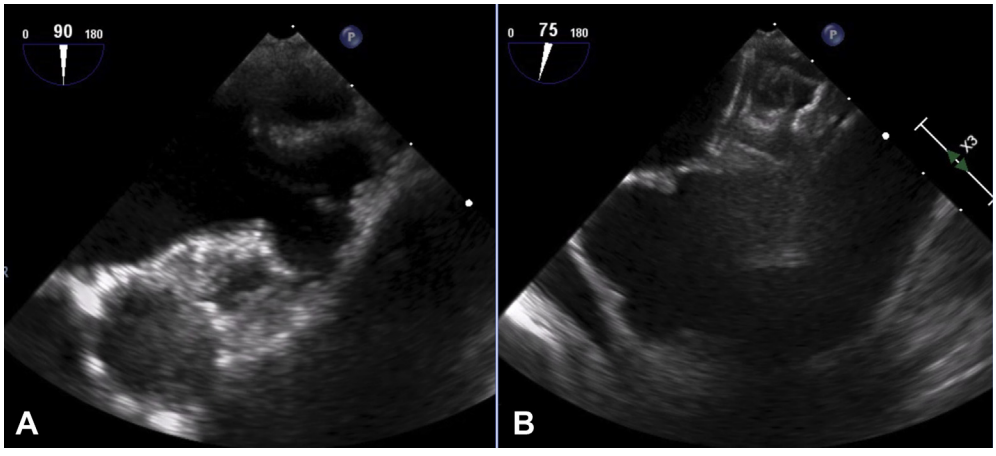
LAA = left atrial appendage

LAAO = left atrial appendage occlusion

RBC = red blood cells

TEE = transesophageal echocardiography

FIGURE 1 Left Atrial Appendage



Left atrial appendage analyzed by TEE **(A)** before and **(B)** after Amplatzer Amulet implantation.

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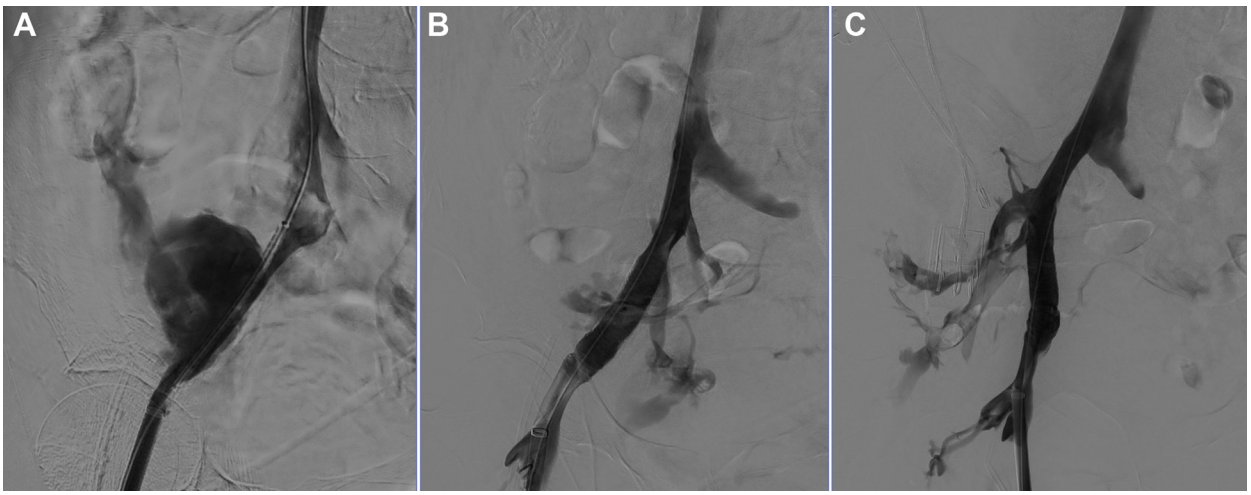
FIGURE 2 Right External Iliac Vein Perforation



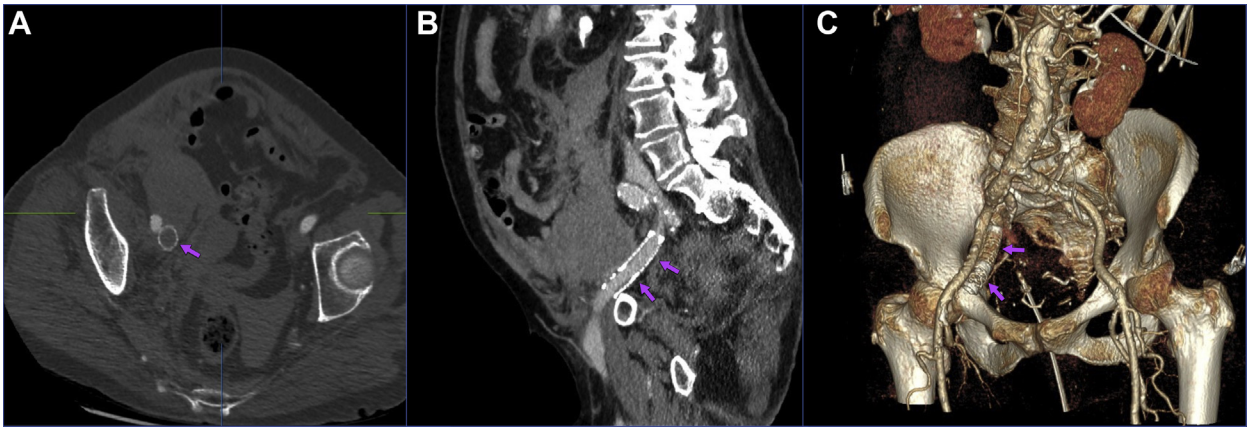
Right external iliac vein perforation was identified by **(A)** phlebography and **(B and C)** sealed after implantation of 2 covered stents.

negligible residual venous leakage. No further endovascular therapy was proposed (Figure 3). The patient was admitted to the intensive care unit, and subsequently received 2 other RBC units but remained stable. She was discharged from the intensive care unit under double antiplatelet therapy (aspirin 75 mg/day + clopidogrel 75 mg/day).

DISCUSSION

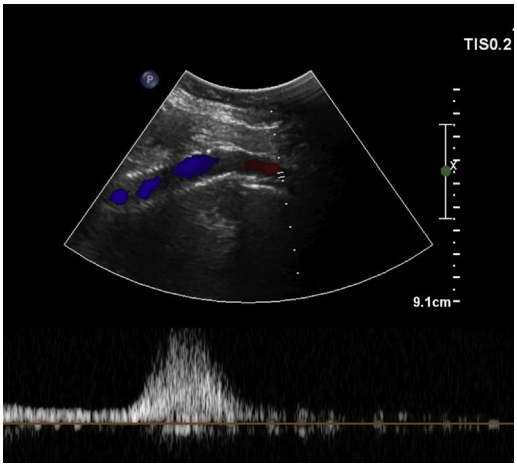
Ilio-femoral venous wounds are rare but represent a major and life-threatening condition that requires urgent management due to massive blood loss. These lesions are mostly reported in the setting of penetrating or blunt trauma (pelvic fractures) (1,2) but can also occur during venous line placement within kinked vessels (3). Although open surgery is the preferred treatment option, endovascular therapy might be proposed in selected cases. To the best of our knowledge, this case is the first description of an iatrogenic iliac vein laceration during structural heart disease intervention that was successfully treated with endovascular grafts. The endovascular option was preferred in this situation because the venous

FIGURE 3 Post-Procedural Angio-CT Scan



Post-procedural angiography computed tomography (CT) scan depicting the endograft **(purple arrows)** in the right external iliac vein without any sign of compression and correct flow.

FIGURE 4 6-Month Follow-Up Doppler Analysis



Six-month follow-up Doppler analysis of the right external iliac vein depicting correct endograft patency.

femoral introducer and the inferior vena cava wire were already in adequate position at the time of the diagnosis, and covered stents were likely to be promptly implanted. Although self-expanding covered stents might represent the best device in this situation because of their potential larger diameter and more flexible profile, we implanted a balloon-expanding stent because of its availability in the emergency context. The short- and long-term outcomes of venous endograft use in this setting was potentially affected by 2 factors in this situation. The first was the need of appropriate device sizing: this aspect involved an oversized diameter compared with the vessel dimensions to complete optimal sealing and to avoid subsequent migration (which is a classic complication of arterial stents placed in a venous position) (4). This step was completed using the quantitative angiography data of the patient and anatomical charts. The second issue was the choice of the optimal post-procedural anticoagulation and/or antiplatelet regimen. In this case, we implanted an arterial covered stent in a venous position for a non-thromboembolic disease. Although still debated, the use of oral anticoagulation is advised in patients with arterial endografts for atherosclerotic disease (5) or in patients with chronic obstructive venous thrombotic disease treated by conventional stents (6). However, this option was not possible in our patient due to the formal contraindication to an anticoagulant. Thus, we opted for antiplatelet therapy and observed stent patency 1 year after the procedure with no recurrent bleeding events. This adequate outcome might be related to the absence of underlying vascular disease and on the position of the grafts within the right external iliac vein (which avoids external compression by the surrounding structures) (4).

FOLLOW-UP

Double antiplatelet therapy was continued for 6 months then switched to single aspirin antiplatelet therapy. The patient did not experience any recurrent hemorrhagic or ischemic events following the LAAO procedure. The lower limb vascular Doppler analyses performed at 1, 6, and 12 months revealed good patency of the venous iliac grafts (**Figure 4**).

CONCLUSIONS

Iliac vein perforation during cardiovascular percutaneous interventions is uncommon. We report the first use of covered stents to seal the perforation and observed a good evolution during follow-up. This technique may be considered to treat this infrequent complication.

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KEY WORDS complication, endovascular grafts, iliac vein, left atrial appendage occlusion