Background
In patients with non-valvular atrial fibrillation, an estimated 90% of thrombi are located in the left atrial appendage. The WATCHMAN device is a left atrial appendage closure device that is an alternative therapeutic option to reduce the risk of systemic embolization in patients who are intolerant of long-term oral anticoagulation. It can be deployed in the left atrial appendage using a transseptal approach via the femoral vein. Transhepatic venous access is an alternative route for the delivery of the device in a patient with difficult vascular access.

Case summary
An 81-year-old man with persistent non-valvular atrial fibrillation, heart failure with reduced ejection fraction (HFrEF), and diabetes mellitus was deemed a poor candidate for anticoagulation due to recurrent falls and gastrointestinal bleeding. He was selected for a left atrial appendage closure. The initial procedure was aborted after significant resistance to device advancement was encountered in the right femoral vein. Lower extremity venography demonstrated totally occluded femoral and iliac veins bilaterally. The decision was made to implant the device via a transhepatic approach. The procedure had no complications and the patient was discharged on rivaroxaban and aspirin after 3 days.

Discussion
Transhepatic venous access is a viable option in patients with poor femoral access for implantation of the WATCHMAN device. It can be done safely. Knowledge of this procedural alternative can greatly enhance patient care.

Keywords
Transhepatic access • Left atrial appendage closure device • Atrial fibrillation • LAA • WATCHMAN device • Case report

Learning points
• Operators should be familiar with alternative venous access sites so that it can be considered in patients with poor femoral access.
• The large calibre of the hepatic vein makes it a suitable access site for the accommodation of sheaths for transseptal access.
• A multidisciplinary approach with an interventional radiologist is recommended when undertaking these more complicated alternative techniques.
Introduction

In patients with non-valvular atrial fibrillation (AF), an estimated 90% of thrombi are located in the left atrial appendage (LAA). The WATCHMAN device (Boston Scientific, Plymouth, MN, USA) is a LAA closure device that is an alternative therapeutic option to reduce the risk of systemic embolization in patients who are intolerant of long-term oral anticoagulation. It is a single lobe occluder with a nitinol frame that is deployed in the LAA using a transseptal approach via the femoral vein. Transhepatic venous access is an alternative route for the delivery of the device in a patient with difficult vascular access. This is a case of a patient with poor femoral venous access who underwent successful LAA closure with the WATCHMAN device via transhepatic venous access.

Timeline

Case presentation

An 81-year-old man with a history of persistent non-valvular AF, heart failure with reduced ejection fraction (HFrEF), diabetes mellitus, and hypertension (CHADS2-VASc score 6 and HAS-BLED score 3) was deemed a poor candidate for anticoagulation because of recurrent falls and history of GI bleeding. He was selected for the WATCHMAN device. The initial procedure was aborted after significant resistance to device advancement was encountered in the right femoral vein. Bilateral lower extremity venography demonstrated totally occluded femoral and iliac veins bilaterally (Figure 1). Given no transvenous access to the inferior vena cava, the decision was made to implant the device via a transhepatic approach.

Under general anaesthesia and fluoroscopic guidance, percutaneous transhepatic access to the right hepatic vein was achieved by an interventional radiologist under sterile condition (Figure 2). First, a...
Figure 2  Transhepatic access. Under general anaesthesia, fluoroscopic-guided percutaneous transhepatic access to the right hepatic vein was achieved (A, B) and after device delivery, two vascular closure plugs were deployed in the hepatic vein thereby achieving haemostasis (C–F).

Figure 3  Device delivery. A 27-mm WATCHMAN device was chosen after angiography of the left atrial appendage. Under apnoeic conditions, the device was deployed.
A skin incision was made below the costal margin at the mid-axillary line. The trajectory of the needle was guided by the visualization of the hepatic vein. The needle was advanced with intermittent gentle aspiration until blood is obtained, and then the contrast was injected to visualize entry into the hepatic vein. Once the needle entered the hepatic vein, a 0.035-inch wire was advanced to the left superior pulmonary vein. The SL1 was exchanged for a Boston Scientific double curve WATCHMAN 14 Fr delivery sheath. A 6 Fr pigtail catheter was utilized to direct this sheath into the LAA. A 27-mm WATCHMAN device was chosen after the angiography of the LAA (Figure 3). Under apnoic conditions, the device was deployed (Video 1) with angiography and TOE confirming the seal of the appendage. The 16 Fr delivery sheath was then utilized to perform final venograms. After device delivery, the vascular sheath was injected with contrast for hepatic venography. A 6 Fr Terumo destination sheath was then advanced into the lumen of the 16 Fr sheath and we sequentially deployed two 10-mm Amplatzer occluding plugs (AGA Medical, St. Paul, MN, USA) in the tranhepatic tract. The plugs were sequentially forming a characteristic dog bone appearance (Video 2). Complete hemostasis was achieved. Final TOE demonstrated no significant pericardial effusion. Due to the manipulation of the vasculature in that area, he was monitored for 48 h to rule out any signs and symptoms of bleeding. After his vital signs, physical exam and labs remained stable for 48 h, oral anticoagulation with rivaroxaban and antiplatelet therapy (with aspirin) was started. He had an uneventful hospitalization and was discharged home after 3 days. No adverse events were reported at follow-up. He was instructed to continue rivaroxaban and aspirin for 6 weeks, switch to aspirin and clopidogrel until 6 months, and after that aspirin alone.

**Discussion**

Transhepatic venous access has been used for years for invasive paediatric procedures. It is a viable option in patients with poor femoral access for implantation of the WATCHMAN device. It is a feasible alternative for patients with poor peripheral access and can be done safely. The first and most important step is the knowledge of this alternative approach. Our case was assessed by a team including an interventional radiologist and electrophysiologist. It was the experience of both operators that made this feasible. Prior to the procedure, understanding the liver anatomy and the surrounding structures are important. Taking a detailed history and performing a physical exam should be done. Past medical history including any history of liver disease, bleeding tendencies, or coagulopathy should be addressed. Prior surgical history, a list of the medications that the patient is taking including anticoagulants and antiplatelet therapies are important as well. Like any other procedure, this alternative access has potential complications including bleeding, perforation of gallbladder, portal vein thrombosis, liver haematoma, or retroperitoneal bleed. Post-catheterization care is similar to any other cardiac catheterization and the patient does not require monitoring in the intensive care unit.
Lead author biography

Pegah Zare in an Internal Medicine Resident at Aventura Hospital and Medical Center in Aventura, Florida. She attended Hormozgan University of Medical Sciences where she received her medical degree and graduated in 2014. She is interested in pursuing a career in cardiology.

Supplementary material

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

References

1. Morcos R, Al Tahii H, Bansal P, Manam R, Maini B. Transhepatic vascular access for implantation of a watchman left atrial appendage closure device. Reports 2018; 1:15.
2. Van Niekerk CJ, Pandey AC, Nelson T, Wang H, Gibson DN. Successful left atrial appendage closure using a percutaneous hepatic venous approach. HeartRhythm Case Rep 2019;5:545–548.

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

Consent: We confirm that the authors of this case report have made every attempt to obtain written authorization and would like to confirm that this manuscript contains no patient identifiers and is anonymous. Thus, this manuscript is compliant with all relevant HIPAA, Common Rule, and institutional regulations. This case report has also obtained permission from the local institution.

Conflict of interest: none declared.