Successful left atrial appendage closure using a percutaneous hepatic venous approach

Christoffel J. van Niekerk, MD,* Amitabh C. Pandey, MD,*† Trevor Nelson, MD,‡
Huan Wang, MD,§ Douglas N. Gibson, MD, FHRS*

*From the *Division of Cardiology, Scripps Clinic, La Jolla, California, †Scripps Research Translational Institute, Scripps Research, La Jolla, California, ‡Division of Interventional Radiology, Scripps Clinic, La Jolla, California, and §Division of Anesthesiology, Scripps Memorial Hospital La Jolla, La Jolla, California.*

Introduction

Prevention of stroke[1] in patients with atrial fibrillation (AF) is of paramount importance. Oral anticoagulation (OAC) has been shown to be effective in reducing stroke risk but is associated with increased risk of bleeding.[2] For patients with AF who are poor candidates for OAC, left atrial appendage closure (LAAC) has been shown to be a viable alternative for prevention of stroke.[3] With the increasing frequency of LAAC, challenging clinical scenarios are being encountered that may limit the delivery of this important therapy. LAAC is typically performed using common femoral venous access, approaching the right ventricle through the inferior vena cava (IVC). As LAAC becomes more common, patients with obstructions in the IVC are being encountered. There have been previous reports of electrophysiological procedures conducted through nontraditional vascular access.[3–8] Here we describe, to our knowledge, the first case of a transhepatic access and successful deployment of a Watchman device without leaving an indwelling catheter at the access site.

Case report

We report an 87-year-old man with a history of permanent AF with a CHA_2DS_2-VASc of 5 and a HAS-BLED score of 4. His history included multiple ischemic strokes when OAC was discontinued because of recurring gastrointestinal (GI) hemorrhage. Attempts to embolize splanchnic arteries failed to stop GI bleeding. During one of his many hospitalizations he developed deep vein thrombosis and was treated with IVC filter placement. Previous attempts at LAAC had been unsuccessful owing to lack of vascular access, with complete occlusion of the IVC demonstrated by venography.

The procedure was performed under sterile conditions in the electrophysiology laboratory while the patient was under general anesthesia. Vascular access was obtained with the assistance of an interventional radiologist. Percutaneous access to the hepatic vein was obtained from the right midaxillary line using the right intercostal approach with a 21 gauge needle and AccuStick dilator (Boston Scientific, Marlborough, MA) system advanced under fluoroscopic and ultrasound guidance for cannulation. Subsequently, a 5F RIM catheter (Merit, Tijuana, Mexico) was utilized in order to direct a 0.32-inch Amplatz SS wire (Boston Scientific) into the superior vena cava (SVC) (Figure 1A). Over the 0.32-inch wire, a long 6F dilator and sheath were advanced to the SVC. A second Amplatz wire was placed through the sheath to the SVC as a safety wire to be used in case of loss of access to the SVC.

Subsequently, an 8.5F SL1 sheath (Abbott, Chicago, IL) was advanced over 1 of the 0.32-inch wires into the high right atrium (Figure 1B). A Baylis transseptal needle (Baylis Medical, Montreal, Canada) was utilized for transseptal catheterization under direct visualization with transesophageal

KEY TEACHING POINTS

- Percutaneous transhepatic access is a feasible alternative access for placement of a left atrial appendage closure device.
- An interdisciplinary team–based approach with interventional radiology ensures successful access even in difficult conventional access techniques.
- Use of an Amplatzer plug (Abbott, Chicago, IL) for closure of access in addition to Gelfoam (Pfizer, New York, NY) ensures excellent hemostasis for transhepatic access.

KEYWORDS Access; Amplatz plug; Atrial fibrillation; Closure; Left atrial occlusion; Transhepatic; Watchman
(Heart Rhythm Case Reports 2019;5:545–548)

Dr Pandey is supported through the NIH NCATS CTSA Award (KL2TR002552) to Scripps Research Translational Institute. Dr Gibson provides speaking, proctoring, and consulting for Boston Scientific. Drs van Niekerk, Pandey, Nelson, and Wang have no conflicts of interest to disclose.

Address reprint requests and correspondence: Dr Christoffel J. van Niekerk, Scripps Clinic, 9898 Genesee Ave, AMP 300, La Jolla, CA 92037. E-mail address: vanniekerk.christoffel@scrippshealth.org.

https://doi.org/10.1016/j.hrcr.2019.08.006

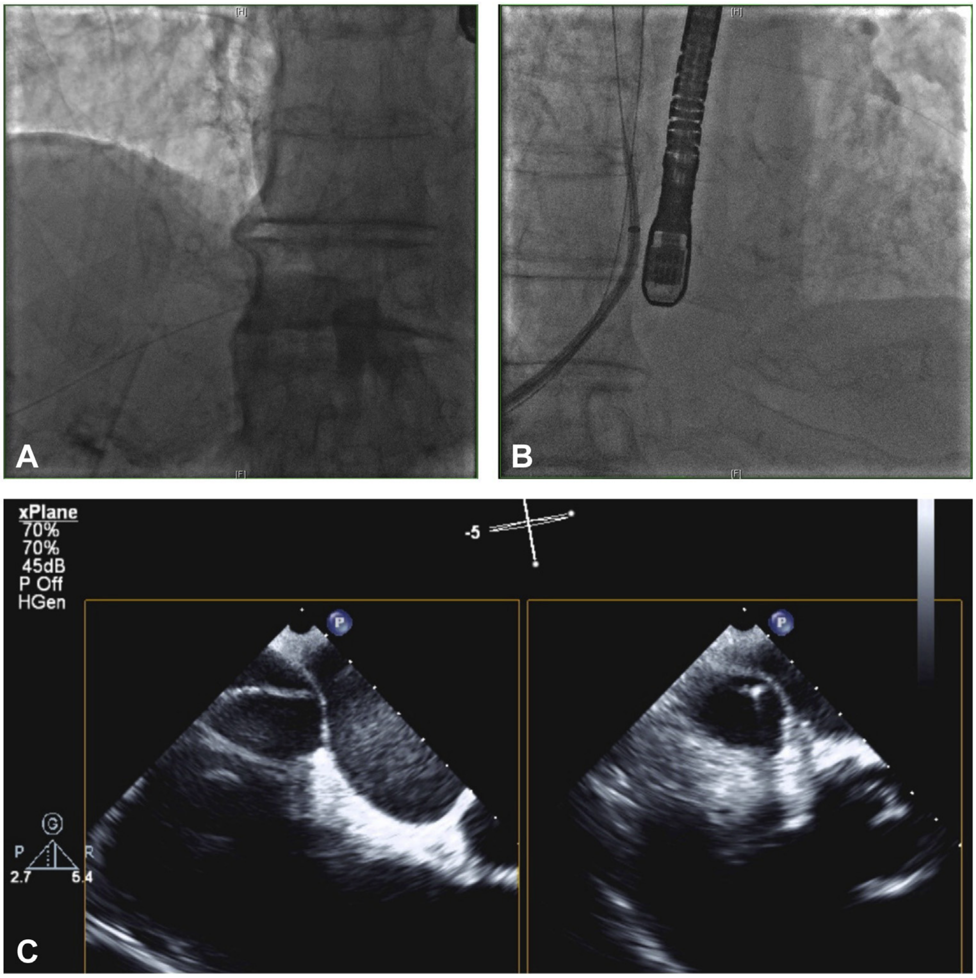

Figure 1 Hepatic access and subsequent transseptal puncture. **A:** Fluoroscopic image showing placement of 0.32-inch Amplatz SS wire (Boston Scientific, Marlborough, MA) in the hepatic vein. **B:** Transhepatic SL1 sheath (Abbott, Chicago, IL) advanced over wire to right atrium with a second safety wire in the superior vena cava. **C:** Transesophageal echocardiogram showing the position of the Baylis transseptal needle (Baylis Medical, Montreal, Canada) at the superior aspect of the atrial septum.

echocardiography (Figure 1C). The transseptal needle had to be shaped outside of the body to account for the angle of approach from the hepatic venous system to the right atrium as opposed to the standard approach from the IVC. Heparin was administered in order to achieve and maintain an activated clotting time of 250 seconds. Once the dilator of the SL1 sheath was in the left atrium, an 0.32-inch Amplatz SS wire was placed into the left upper pulmonary vein. Over this wire the 14F Double Curve Watchman Access Sheath (WAS) (Boston Scientific) was advanced into the left atrium (Figure 2A). Because of the angle of approach, more counterclockwise rotation than usual was required for cannulation of the left atrial appendage. A 30-mm Watchman device (Boston Scientific) was successfully deployed at the left atrial appendage ostium without difficulty using standard techniques (Figure 2B and C, Supplemental Figure 1). After LAAC, the WAS was withdrawn from the body, leaving a guidewire in place. A 6F side arm sheath and dilator were advanced over this wire and hepatic venography was performed (Figure 3A). A 12-mm Amplatzer Vascular Plug II (Abbott, Chicago, IL) was partially deployed through this sheath and venography was repeated (Figure 3B). The sheath was withdrawn from the liver and the second disc of the Amplatzer plug was deployed at the surface of the liver. A 5F Kumpe (Cook, Bloomington, IN) catheter was inserted over the safety wire that was left in place from the beginning of the case. Hepatic venography was repeated once again, demonstrating excellent hemostasis. Gelfoam (Pfizer, New York, NY) slurry was injected as the Kumpe catheter was removed from the liver to allow for safe hemostasis. Once hemostasis was confirmed at the cutaneous access site, the safety wire was removed. The patient was observed overnight and discharged on OAC as per protocol post-LAAC. No procedural complications were identified during the hospital stay or at the 45-day follow-up visit, at which time OAC was discontinued.

Discussion

Patients presenting for LAAC frequently have multiple comorbid conditions and, occasionally, limitations to access through the standard approach via the femoral vein. Ideally

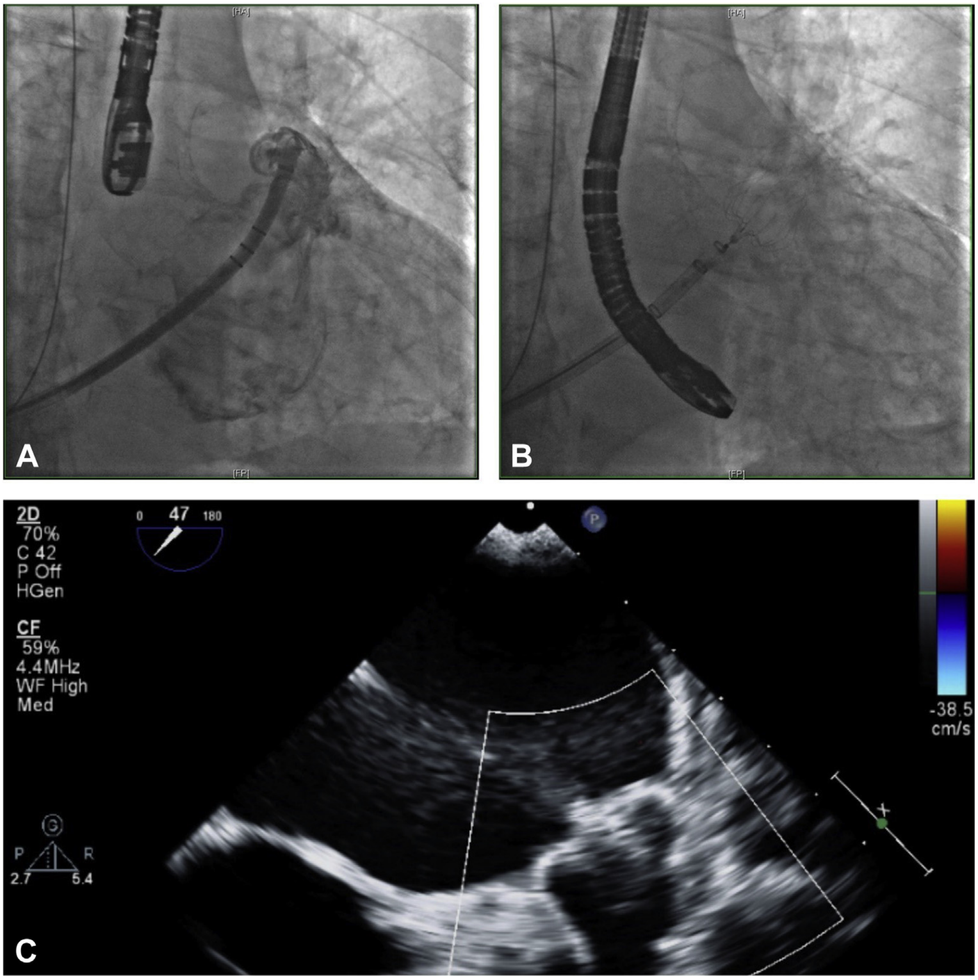

Figure 2 Watchman deployment. **A:** Fluoroscopic image showing the Watchman Access Sheath (Boston Scientific, Marlborough, MA) in the left atrial appendage (LAA). **B:** LAA closure device deployment showing excellent positioning. **C:** Transesophageal echocardiogram Doppler with no residual flow and a perfectly seated device.

this procedure is performed from an inferior approach owing to catheter design and stability.[4,5] The challenge with alternative sites for access and LAAC include vessel caliber, transseptal puncture using available technologies, and maneuverability of the WAS from the alternative access. Furthermore, more invasive routes requiring surgical cutdown and subsequent repair would be more involved than the minimally invasive nature of LAAC. Furthermore, often LAAC will be completed while the patient is on OAC, further complicating surgical approaches. The hepatic vein presents a target that is easily accessible and has been reported previously to be technically feasible for ablation of AF.[5–8] While transhepatic central venous access has been well described for multiple pediatric applications, adult use for cardiac cases is sparsely described in the literature, most commonly as alternative access for ablation procedures.[3–8] Reasons for inability to access include complete iliofemoral occlusion, congenitally absent IVC, and surgical ligation of the IVC.[3] Our case presents an alternative multidisciplinary team–based approach to LAAC via hepatic venous access with successful closure of the access site using an Amplatzer plug and Gelfoam. This method does not require an indwelling large-bore catheter to be left in place at the access site. One potential risk of this closure technique would be a failed occlusion, which can be mitigated by careful vessel size estimation and plug oversizing. Additional risks include plug embolization to either the right atrium or pulmonary artery or, conversely, the plug falling into the peritoneal cavity. This is why it is especially important to maintain a second safety wire and dual access for a port placement venogram (Figure 3C).

Other common access closure techniques were considered, such as collagen hemostats; however, we believe these would be unreliable at closing the vessel and would have a high risk of embolization through such a large venotomy site.

Although transhepatic access for LAAC was described previously,[3] it required an indwelling catheter to remain in place even after the patient's discharge from the implant hospitalization. In turn, the case presented here allowed for discharge and follow-up as per usual protocol with LAAC, without short- or long-term indwelling catheters or other strategies that had to be employed in other cases of alternative access for LAAC.

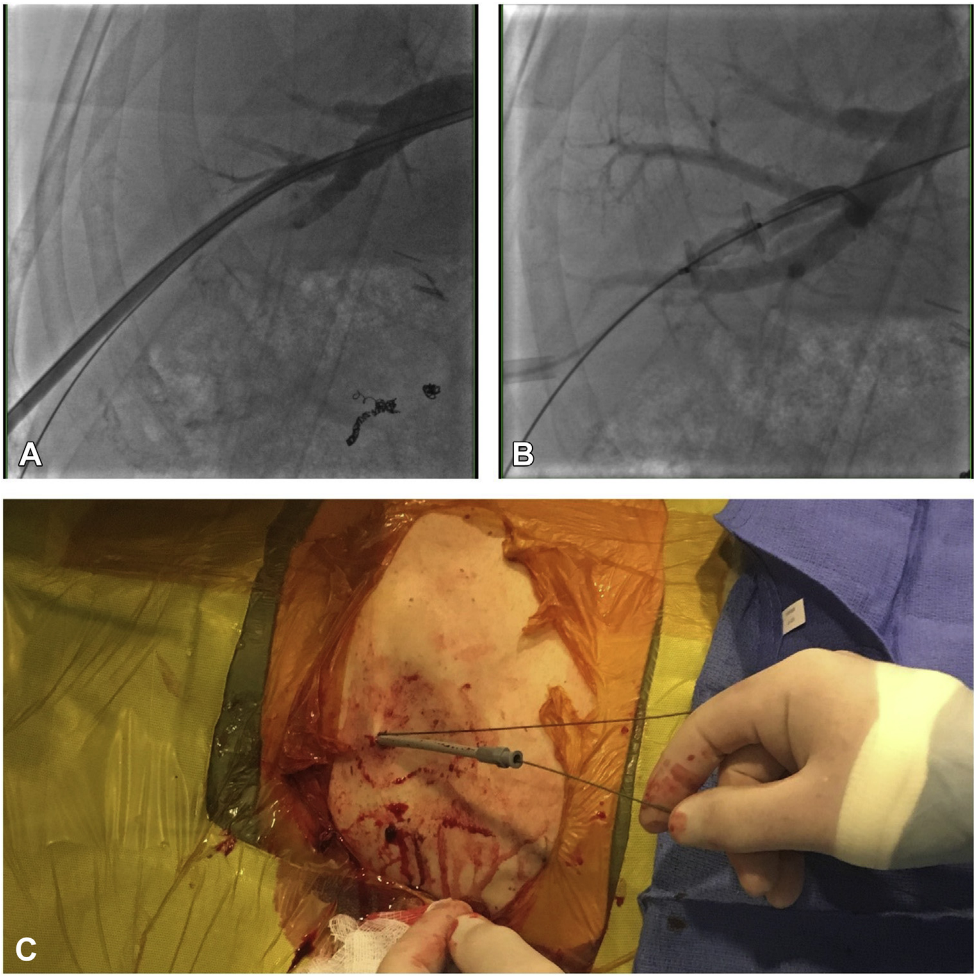

Figure 3 Sheath removal and closure. **A:** Hepatic venography pre-closure with 2 guidewires in place. **B:** Amplatzer plug (Abbott, Chicago, IL) deployed with no contrast extravasation. **C:** Positioning of the access sheath with additional safety wire.

Conclusion

We present a case of successful LAAC through alternative access via transhepatic access obtained with interdisciplinary collaboration. This case demonstrates that alternative access can be used for successful LAAC in patients unable to tolerate OAC, as in our patient, who had several significant GI bleeds and complete occlusion of the IVC.

Appendix

Supplementary data

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.hrcr.2019.08.006.

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