



Simultaneous epicardial atrial fibrillation ablation and left atrial appendage ligation: early considerations

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Clinical vignette

A 69-year-old Jehovah's Witness female patient was referred for symptomatic long-standing atrial fibrillation (AF) after remote percutaneous closure of patent foramen ovale with Amplatzer (Abbott, Illinois, USA). To minimize trans-septal puncture-related and bleeding risks, the patient was scheduled for simultaneous left atrial appendage (LAA) exclusion via subxiphoid pericardioscopic access and posterior left atrial epicardial AF ablation (Convergent procedure) using a trans-axillary video-assisted mini-thoracotomy.

Surgical techniques

Preparation

Cardiac computed tomography angiography (CTA) is routinely performed to assess left atrium and LAA size and morphology. The patient enters the operating room equipped with transesophageal echocardiography (TEE). Under general anesthesia, the patient is intubated using a double-lumen endotracheal tube for selective bronchial ventilation. Routine monitoring lines, external defibrillator pads, temporary transvenous pacing device and TEE probe are placed, and sterile surgical field prepared.

LAA exclusion: exposition

After TEE excludes any LAA thrombus, LAA exclusion with the LARIAT device (SentreHEART, Palo Alto, USA) is performed. A 3–4 cm skin incision in the left mid-axillary

line is used to access the third intercostal space (ICS). An Alexis wound retractor (Applied Medical, Rancho Santa Margherita, USA) is placed, selective right lung ventilation initiated, and the left lung deflated using a wet gauze. From this single incision, a 5-mm zero-degree endoscope is placed and used to visualize the surgical field as a video-assisted trans-axillary mini-thoracotomy.

LAA exclusion: operation

The pericardium is incised 3 cm above the phrenic nerve and stay sutures placed to retract the pericardium. The LAA is identified and the LARIAT sheath is advanced into the pericardial space under video-assisted guidance. Using gentle mobilization with a peanut sponge, the LAA is surrounded at its base by the LARIAT snare, which is then tightened using the preloaded surgical suture. During this maneuver, TEE is used to confirm correct snare positioning and effective LAA exclusion, as well as monitoring left ventricular regional function and mitral valve (MV) regurgitation (to exclude the risk of MV annulus distortion and left circumflex artery obstruction) (1). Color doppler is used to assess residual blood flow into the LAA and after five minutes the suture is tightened a second time and cut.

LAA exclusion: completion

A left pleural chest tube is placed from the same skin incision, the pericardium is partially closed, the left lung is ventilated, and the skin incision is sutured.

Epicardial ablation: exposition

An esophageal temperature probe is placed to monitor the temperature during the epicardial ablation procedure. A vertical 4 cm skin incision is made above the xiphoid process and the underlying muscular fascia is vertically opened taking care not to injure the peritoneum. The posterior pericardium is transversally incised and an inferior stay suture is placed. 5,000 IU of heparin is administered.

Epicardial ablation: operation

From this single incision, a pericardioscopic cannula is placed and a 5-mm zero-degree endoscope inserted and used to navigate into the pericardial sac and visualize the posterior cardiac structures. Firstly, the right inferior pulmonary vein is identified and then the endoscope is moved to the right of the surgeon to visualize the left inferior pulmonary vein. The vacuum-assisted unipolar radiofrequency EPI-Sense device (AtriCure, USA) is advanced via the oblique sinus, epicardial ablations are made around the right and left pulmonary veins, and two rows of parallel vertical lesions are performed on the posterior wall of the left atrium (2). During each ablation, 30 Watt of thermic power is applied to the epicardial surface for 90 s with continuous cold saline irrigation to reduce collateral injury. Typically, 20–30 ablation lines are performed.

Epicardial ablation: completion

The EPI-Sense device and endoscope are removed, a pericardial chest tube is placed, and the incision closed. The postoperative course was unremarkable and the patient was discharged home asymptomatic and in sinus rhythm, which was maintained at last follow-up (three months from surgery), allowing medical therapy de-escalation.

Comments

AF and the associated risk of stroke is an increasing public health challenge that carries a significant burden of mortality and morbidity worldwide (3). Patients with long-standing symptomatic AF or contraindications to medical treatment are increasing, creating the need for alternative interventional/surgical strategies. Concomitant minimally-invasive LAA exclusion and epicardial ablation procedure are herein described.

Advantages

The inability to perform a safe trans-septal puncture is usually a contraindication to the LARIAT procedure (1). However, a single video-assisted trans-axillary mini-thoracotomy access allows a straightforward advancement of the LARIAT and proper delivery under direct vision without endocardial guidance. This access minimizes the risk of right ventricular perforation during subxiphoid access, even in the presence of pericardial adhesions, which can be surgically removed. Moreover, in this specific clinical case, the video-assisted mini-thoracotomy provided safe access to control potential life-threatening bleedings.

Compared to other thoracoscopic clip-based devices for LAA exclusion, the LARIAT snare design features enhanced versatility, malleability, and limited dimensions. Moreover, the LARIAT device does not require intraoperative LAA sizing, thus expediting the procedure and fitting almost all patients. It also provides a more accurate LAA exclusion than the bulky clip design of other devices, where aligning to the LAA may be challenging in some morphological variants. Finally, the LARIAT procedure achieves both mechanical and electrophysiological exclusion of the LAA, not usually possible with endovascular LAA occlusion devices.

To date, we have successfully performed a total of four LARIAT cases using video-assisted mini-thoracotomy access without endocardial guidance. Three cases were conducted from the third mid-axillary left ICS (as described here), due to unfavorable anatomy for standard subxiphoid delivery. In the fourth patient, a single mini-thoracotomy in the fifth left anterior ICS was adopted for concomitant NeoChord (NeoChord Inc., St. Louis Park, USA) MV repair, the Epi-Sense procedure and LAA exclusion.

The posterior left atrial epicardial ablation is known to maximize the efficacy of endocardial lesions, allowing a more complete and profound electric exclusion of atrial arrhythmogenic foci (2,4). Moreover, the LARIAT can produce electrical exclusion of the LAA. In the presented case, the patient is currently followed up for endocardial completion of the Convergent procedure.

Caveats

Compared to other devices, the LARIAT is relatively more expensive. Navigating the posterior pericardial space with an endoscope has a learning curve.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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