CASE CONFERENCE

Mark A. Chaney, MD
Victor C. Baum, MD
Section Editors

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Use of the Lariat Device for Left Atrial Appendage Closure

Megan J. Lanigan, MD,* Mark A. Chaney, MD,† Sandeep Nathan, MD, MSc,‡ Atman P. Shah, MD,‡ and Andrew J. Feider, MD§

ATRIAL FIBRILLATION (AF) is the most common cardiac arrhythmia in the world and is estimated to affect more than 3 million people in the United States, with a projected increase to more than 5 million people in the US by the year 2050.[1] AF is an independent risk factor for stroke and is associated with a four- to five-fold increased risk of embolic stroke compared with those individuals without AF. Oral anticoagulation therapy with warfarin or other agents (dabigatran, apixaban) significantly reduces the risk of stroke in this population; however, anticoagulation carries inherent risks.[1–3] Anticoagulation with warfarin is difficult to manage, given a narrow therapeutic range; and newer oral anticoagulants are easier to administer still involve risk of bleeding. Evidence has shown that 90% of thrombi that develop in patients with nonvalvular AF originate from the left atrial appendage (LAA).[2] Therefore, LAA exclusion has been presented as a potential means of reducing the risk of AF-related stroke in patients with contraindications to or intolerance of oral anticoagulation. The Lariat snare device (SentreHeart, Inc, Redwood City, CA), a percutaneous LAA closure device, recently has been investigated as a potential means of LAA occlusion that avoids surgical exposure (minithoracotomy/median sternotomy) and its associated morbidity.[1–3] The procedure involves insertion of a magnet-tipped catheter across the interatrial septum into the LAA from femoral vein access, which connects with a magnet-tipped catheter inserted into the pericardium. After the magnet connection is ensured, the Lariat snare device is positioned around the LAA. A balloon is inflated in the LAA, which guides the Lariat snare around the LAA, and the snare is then closed, excluding the LAA. A permanent suture is then placed once LAA exclusion is ensured (Fig 1).[1–3]

The present case conference describes a patient with AF, significant risk factors for AF-related stroke, and clinical contraindication to oral anticoagulation therapy who underwent LAA exclusion with the Lariat snare device. It highlights a successful LAA exclusion in the patient and illustrates some of the various methods being investigated to achieve this goal in patients with AF.

CASE PRESENTATION*

A 73-year-old female (height 165 cm, weight 76 kg) with paroxysmal AF, multiple comorbidities, and a history of a significant gastrointestinal bleed, presented to the authors' institution for percutaneous LAA exclusion via the Lariat snare device. She had a past medical history significant for AF, asthma, chronic obstructive pulmonary disease, diabetes, hypertension, sick sinus syndrome, severe mitral regurgitation, moderate tricuspid regurgitation, congestive heart failure, hyperthyroidism, nonobstructive coronary artery disease, peripheral arterial disease, carotid stenosis, and diverticulosis. Past surgical history was significant for an atrioventricular node ablation and defibrillator implantation, a right ventricular lead revision, a generator replacement and defective lead change, and a cataract removal. She had a 34-pack-year history of smoking but quit 20 years ago. She had been followed and managed at the authors' institution for several years and was admitted to the hospital approximately 1 year before the date of this surgery for a significant gastrointestinal bleed thought to be due to her diverticulosis while on warfarin, therapy for her AF. At the time of admission for her gastrointestinal bleed, she was therapeutic on her warfarin with an international normalized ratio (INR) of 2.4. She presented with bloody stools and was noted to have a hemoglobin level of 6.1 gm/dL, requiring transfusion. At that time, she was taken off warfarin given significant concerns for further bleeding episodes with the severe diverticulosis. She had been maintained on aspirin (81 mg per day) but given her significant comorbidities, she remained at high risk of AF-related stroke so was now presenting for percutaneous LAA exclusion.

On the day of surgery, preoperative daily medications consisted of acetaminophen, albuterol inhalation, amlodipine, aspirin, alphagan eyedrops, calcium carbonate, carvedilol, docusate, furosemide, novolin insulin subcutaneous sliding scale with meals, latanoprost eyedrops, lisinopril, k-dur,

*M.J. Lanigan and M.A. Chaney

*From the *University of Minnesota Medical Center, Minneapolis, MN, †Department of Anesthesia and Critical Care, University of Chicago Medical Center, Chicago, IL, ‡Department of Medicine, Section of Cardiology, University of Chicago Medical Center, Chicago, IL; and §Department of Anesthesiology; and Northwestern University Feinberg School of Medicine.*

Address reprint requests to Mark A. Chaney, MD, Department of Anesthesia and Critical Care, University of Chicago Medical Center, 5841 S. Maryland Ave, MC 4028, Chicago, IL E-mail: mchaney@dacc.uchicago.edu

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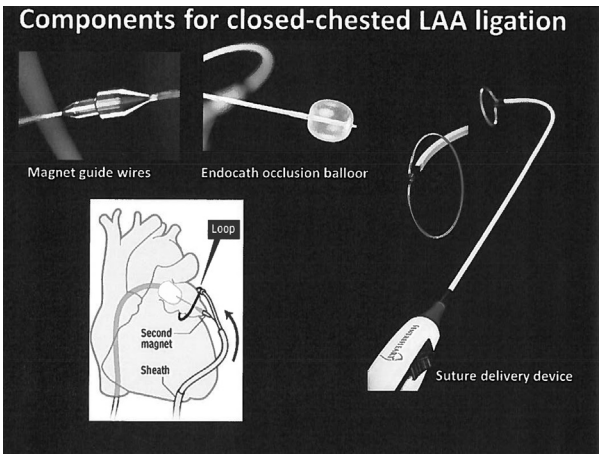

Fig 1. Image of components of the Lariat suture delivery device and the procedure. Reprinted from a presentation entitled Sentre-Heart-PLACE Procedure with the LARIAT Suture Delivery Device, with permission from Randall Lee MD, PhD. http://www.pcronline.com/Lectures/2012/Sentreheart-PLACE-procedure-with-the-LARIAT-suture-delivery-device.

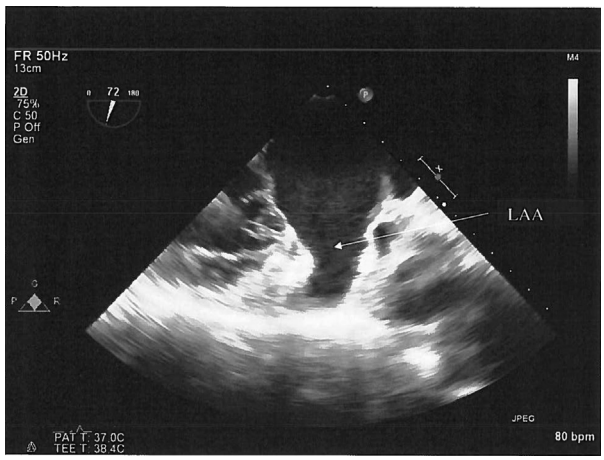

Fig 2. Transesophageal echocardiography image showing initial left atrial appendage free of thrombus.

prednisone, simvastatin, timolol eyedrops, and tiotropium inhalation. Preoperative physical examination revealed a frail-appearing female with decreased breath sounds throughout her lung fields and dyspnea with minimal activity. She was paced via an internal pacemaker and had a loud holosystolic murmur. Laboratory results showed a creatinine of 1.2 mg/dL, hemoglobin of 10.1 gm/dL, platelet count of 144,000 /uL, INR of 1.2, and a partial thromboplastin time of 37.7 seconds. Transthoracic echocardiography 2 years prior showed an ejection fraction of 57%, diastolic dysfunction, moderately decreased right ventricular function with moderate right ventricular dilation, a severely dilated left atrium, moderately dilated right atrium, severe mitral regurgitation, and moderate tricuspid regurgitation.

In the hybrid operating room standard monitors were placed and uneventful induction of general anesthesia was performed with midazolam, propofol, fentanyl, and vecuronium. An endotracheal tube was inserted without difficulty. After intubation, a left brachial arterial catheter was inserted after several unsuccessful attempts at inserting a radial arterial catheter. A transesophageal echocardiography (TEE) probe was inserted easily and a pre-procedure examination showed normal left ventricular function, moderately decreased right ventricular function, severe mitral regurgitation, severe tricuspid regurgitation, a severely dilated left atrium, and no left atrial or left atrial appendage thrombus (Figs 2 and 3). A baseline arterial blood gas was obtained, which showed a P_aO_2 of 90 mmHg on 100% F_IO_2.

The surgical procedure performed was percutaneous LAA closure with the Lariat device. The chest and bilateral groin areas were prepped, right femoral venous access was obtained with an 8-Fr sheath, and right femoral arterial access was obtained with a 5-Fr arterial sheath that was later up-sized. Pericardial access then was obtained via subxiphoid insertion of a Tuohy needle advanced under fluoroscopic guidance to the anterior cardiac border into the pericardial space. An 8-Fr sheath was advanced over a wire into the subxiphoid position and a Wholey wire was advanced through the sheath and into the pericardial space. Serial dilations were performed for placement of a 14-Fr sheath and a SofTIP guide cannula was advanced to the anterolateral border of the heart. An intravenous heparin bolus and infusion were started at this point with a goal to maintain activated coagulation time values greater than 250 seconds during the procedure. The 8-Fr sheath in the right groin was exchanged for an 8.5-Fr sheath that was advanced into the superior vena cava. Transseptal access was obtained under TEE and fluoroscopic guidance (Figs 4 and 5). The sheath was guided into the LAA with confirmation via angiography and a magnet-tipped endocardial wire then was advanced into the tip of the LAA. A ballon-tipped catheter was advanced over the wire with TEE guidance (Figs 6 and 7). An epicardial magnet-tipped guidewire was advanced through the pericardial sheath and positioned to meet the endocardial wire with magnetic attachment. The Lariat suture delivery device was advanced over the epicardial guidewire and used to snare the LAA at the base. Anatomic variations necessitated multiple guidewire and Lariat adjustments with ultimate successful positioning. The Lariat was closed with near-complete

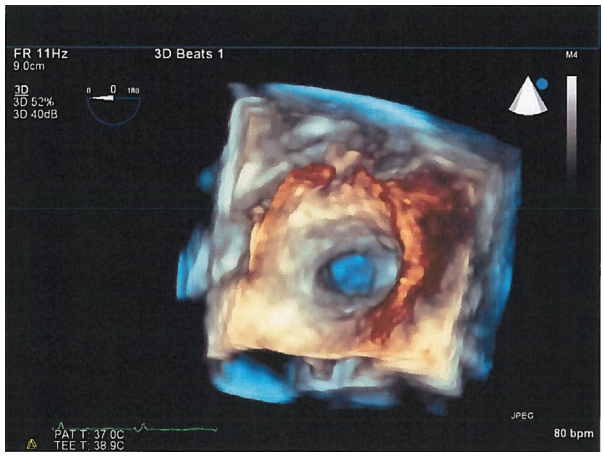

Fig 3. 3D transesophageal echocardiography image showing initial left atrial appendage free of thrombus.