

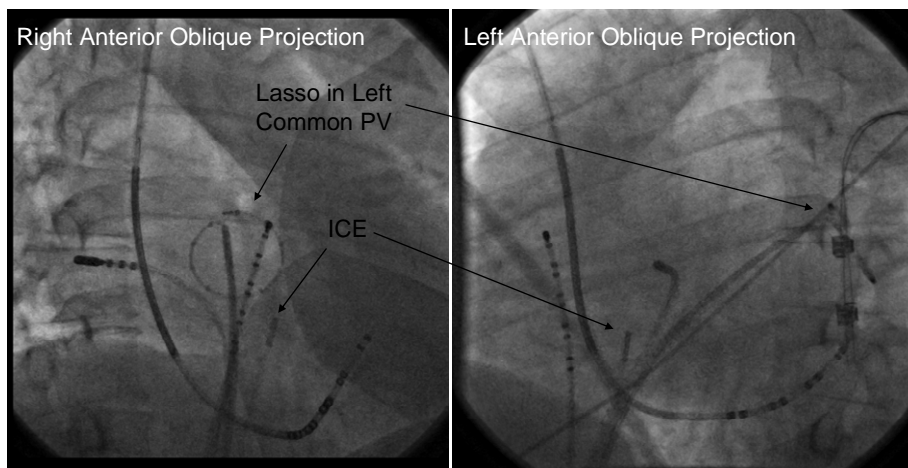
AF Ablation

Catheter Ablation of Atrial Fibrillation at the University of Colorado at Denver and Health Science Center

The Atrial Fibrillation (AF) Ablation Program at UCDHSC strives to achieve the highest level of efficacy while maintaining the safest approaches that have been thoroughly evaluated by experienced high-volume academic centers. Each patient with AF is evaluated and treated with an individualized approach based on the arrhythmia history and the results of the electrophysiologic study (EPS) performed at the time of the procedure.

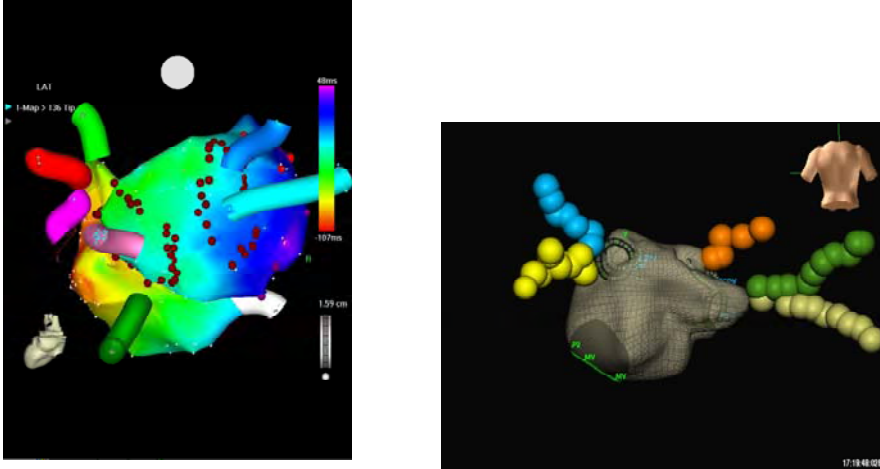
An AF ablation begins with catheters placed in the heart from the right and left femoral veins and right internal jugular vein. After an EPS has been performed, two transseptal punctures are made using intracardiac echocardiographic (ICE) guidance and fluoroscopy. Once the left atrium has been accessed, high dose intravenous anticoagulation (heparin) is started to prevent blood clots from forming on the equipment in the left atrium, thereby greatly reducing the risk of a stroke from the procedure. A circular mapping catheter (Lasso) and an ablation catheter are advanced through the sheaths in position into the left atrium (Figure 1).

Figure 1. Catheters are positioned in the heart and across the atrial septum using fluoroscopic and ICE guidance.



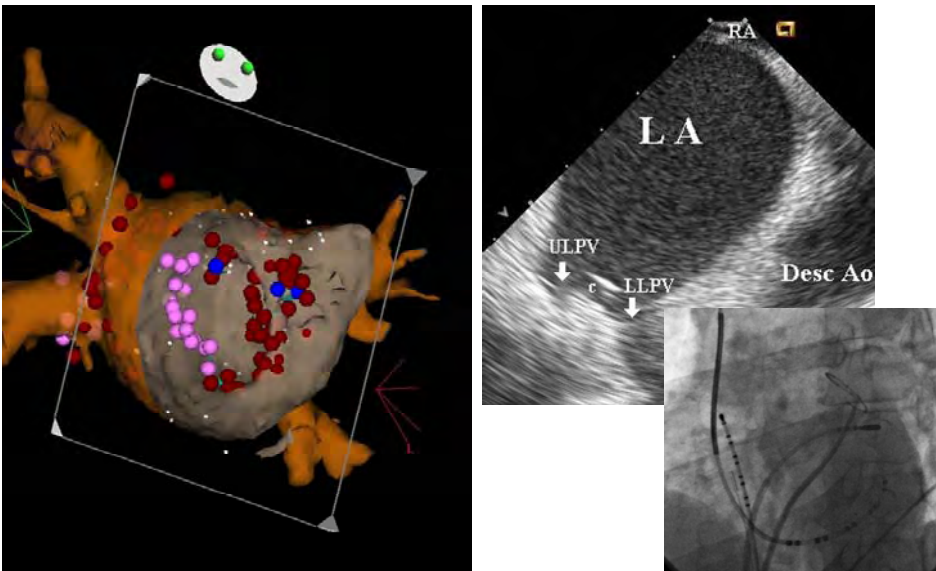
The catheters are positioned in various locations around the left atrium to localize the various atrial premature beats that are found to initiate AF during the infusion of high doses of isoproterenol (up to 20 mcg/min). Most of these AF triggers typically arise from within or around the pulmonary veins (PVs); however, AF triggers can occasionally include atrioventricular nodal reentrant tachycardia (AVNRT) or possibly non-PV atrial tachycardia. Most patients have multiple irritable foci from multiple veins, necessitating the isolation of all 4 PVs. If a person has demonstrated a history of persistent or permanent AF, all PVs are isolated empirically whether or not they are considered arrhythmogenic because the veins are thought to also participate in the maintenance of atrial fibrillation. Prior to PV isolation, a computerized 3-dimensional image is created of the left atrium using the NavX or CARTO electroanatomical mapping system (Figure 2).

Figure 2. Electroanatomical Mapping using CARTO (panels A) and NavX (Panel B) assists in the left atrial mapping portion of the procedure. These mapping systems improve the safety of the procedure by reducing exposure to X-ray fluoroscopy and defining accurate left atrial anatomy prior to ablation.



PV isolation is achieved by delivering a series of closely-spaced radiofrequency ablation lesions on the atrial tissue just outside each PV ostium, thereby encircling the vein without placing lesions within the vein itself. To guide ablation and place the RF lesions at their precise intended locations, the electroanatomical map, Lasso catheter, fluoroscopy, and ICE images are all used (Figure 3).

Figure 3. The use of multiple imaging modalities (3D Electroanatomical Mapping, ICE, and X-ray Fluoroscopy) guides catheter ablation.



The end-point of the procedure is sustained PV isolation and failure to induce AF or atrial flutter. Following the procedure, sheaths are removed from the neck and both groins after reversal of anticoagulation. Patients are given heparin and coumadin that night, assuming no contraindications.

Extreme care is taken to avoid any potential complication; however there remain significant risks associated with AF ablation. The most serious risks include cardiac perforation and tamponade, stroke, PV stenosis, and atrio-esophageal fistula formation, which can be fatal. In addition, there are risks related to vascular access and the transseptal puncture, including arterial pseudoaneurysm or arterial-venous fistulae formation, hematoma, pericardial effusion, pneumothorax, bleeding, and infection. The risk of serious complications is low but cannot be predicted.

Published success rates of the procedure have varied greatly depending on the duration of follow-up, the AF subtype, and the definition used in the study. We believe that the procedure is effective in maintaining sinus rhythm either off anti-arrhythmic medication or on well-tolerated but previously ineffective medication in 80% of patients. The reason for procedural failure is almost always due to the reconnection of isolated PVs that can occur weeks or months later. Therefore, many patients who fail their first AF ablation will be able to maintain sinus rhythm if a repeat procedure is performed and the PVs are isolated again. Our goal is to completely relieve all symptoms and free patients from the life-long medication requirements that accompany a diagnosis of AF. However, because the procedure can make a previously symptomatic AF patient have episodes of asymptomatic AF, we do not recommend discontinuation of anticoagulation unless there is rigorous outpatient telemetry monitoring proving long-term maintenance of sinus rhythm with a minimal risk of stroke.

For more information on ablation of atrial fibrillation, we recommend the following articles available online and through our office:

Haissaguerre M, Jais P, Shah DC, Takahashi A, Hocini M, Quiniou G, Garrigue S, Le Mouroux A, Le Metayer P, Clementy J. Spontaneous initiation of atrial fibrillation by ectopic beats originating in the pulmonary veins. New England Journal of Medicine. 1998;339:659-666.

Marchlinski FE, Callans D, Dixit S, Gerstenfeld EP, Rho R, Ren JF, Zado E. Efficacy and safety of targeted focal ablation versus PV isolation assisted by magnetic electroanatomic mapping. Journal of Cardiovascular Electrophysiology. 2003;14:358-365.

Lin WS, Tai CT, Hsieh MH, Tsai CF, Lin YK, Tsao HM, Huang JL, Yu WC, Yang SP, Ding YA, Chang MS, Chen SA. Catheter ablation of paroxysmal atrial fibrillation initiated by non-pulmonary vein ectopy. Circulation 2003;107:3176-83.

Callans DJ, Gerstenfeld EP, Dixit S, Zado E, Vanderhoff M, Ren JF, Marchlinski FE. Efficacy of repeat pulmonary vein isolation procedures in patients with recurrent atrial fibrillation. J Cardiovasc Electrophysiol 2004;15:1050-5

Gerstenfeld EP, Callans DJ, Sauer W, Jacobson J, Marchlinski FE. Reentrant and Nonreentrant Focal Left Atrial Tachycardias Occur after Pulmonary Vein Isolation. Heart Rhythm 2005; 2:1195-1202.

Gerstenfeld EP, Sauer W, Callans DJ, Dixit S, Lin D, Russo AM, Beldner S, McKernan M, Marchlinski FE. Predictors of success after selective pulmonary vein isolation of arrhythmogenic pulmonary veins for treatment of atrial fibrillation. Heart Rhythm. 2006;3:165-170.

Sauer WH, Alonso C, Zado E, Cooper JM, Lin D, Dixit S, Russo, AM, Verdino RJ, Ji S, Gerstenfeld EP, Callans DJ, Marchlinski FE. Atrioventricular Nodal Reentrant Tachycardia in Patients Referred for Atrial Fibrillation Ablation: Response to Ablation that Incorporates Slow Pathway Modification. Circulation 2006; 114: 191-195