

TOPICS IN ATRIAL FIBRILLATION

Imaging for atrial fibrillation ablation

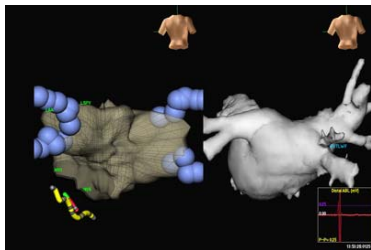


The anatomy of the left atrium and its connections to the pulmonary veins is complex and varies considerably between patients.

During the ablation procedure we use x-ray **cine fluoroscopy** to steer our catheters into the left atrium, **intra-cardiac echo** or **ICE** (cardiac ultrasound via a catheter positioned in the left atrium) is used to provide close up detail of the pulmonary veins. However, fluoroscopy and ICE only provide 2-dimensional information.

Our **electro-anatomical mapping system** can generate a 3-dimensional geometry of the left atrium by sweeping the catheters around the inside of the left atrium. The co-ordinates of each catheter location is recorded and used to build a 3D computer image.

Our latest advance is the development of a more detailed 3D image from standard CT scan images obtained prior to the ablation procedure. Computer software is used to recreate a **3D CT Image** of the left atrium. This provides very detailed information of the pulmonary veins and their connections to the atrium. This 3D image can then be imported into the mapping system for the procedure and is 'registered' or co-ordinated with the image obtained by the mapping system. This information saves time during the procedure and allows for more accurate placement of the ablation lesions.



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WHAT'S NEW IN ATRIAL FIBRILLATION: Relationships Between Atrial Tachyarrhythmias and Symptoms. Strickberger A, et al. Heart Rhythm 2005;2:125-131.

The purpose of this study was to correlate patient-reported symptoms of atrial fibrillation (AF) with the underlying rhythm in patients who had a permanent pacemaker. *Findings:* The major finding in the study was that in patients who have a bradycardia indication for pacing about 95% of documented atrial tachyarrhythmia episodes were asymptomatic and symptoms attributed to AF were associated with atrial tachyarrhythmias only approximately 15% of the time.

Recovered Pulmonary Vein Conduction as a Dominant Factor for Recurrent Atrial Tachyarrhythmias after Complete Circular Isolation of the Pulmonary Veins – Lessons from Double Lasso Technique. Ouyang F, et al. Circulation 2005;111:127-135.

This study characterized the electrophysiological findings in patients with and without atrial tachyarrhythmias (ATa) after pulmonary vein isolation (PVI). *Findings:* A repeat procedure was performed in 26/29 patients with recurrent ATa and in 7 volunteers. Recovered PV conduction was noted in 80% of patients with recurrent ATa and none was observed in the 7 volunteers. After repeat PVI and identification and ablation of non-PV foci or macroreentrant AT 24 of 26 remained free of ATa without antiarrhythmic drugs at 6 months.

Clinical Presentation, Investigation, and Management of Pulmonary Vein Stenosis Complicating Ablation for Atrial Fibrillation. Packer DL, et al. Circulation 2005;111:546-554.

This study looked at the clinical presentation and interventional management of pulmonary vein (PV) stenosis in patients who underwent PV ablation for AF. *Findings:* In the 23 cases the most common symptoms were dyspnea on exertion or rest, cough, and chest pain. The mean stenosis was 80.4%. All patients underwent balloon angioplasty and 7 patients had a stent placed in the PV. All 23 patients had substantial reduction in symptoms within 1 hour after treatment; however, 14 of those patients developed recurrent symptoms at 3.2 ± 2.8 months after the initial intervention (restenosis). Thirteen patients underwent a second procedure, 3 underwent three procedures and 1 patient underwent four procedures. On long-term follow-up at 18 ± 12 months 15 patients remain asymptomatic.

ASK THE EXPERT – I've heard about pulmonary vein stenosis after atrial fibrillation ablation, is this a concern?



Answer: This is a very timely question, particularly in light of the recent article by Packer, et al. as summarized above. Certainly, pulmonary vein (PV) stenosis is a well-known potential complication of atrial fibrillation (AF) ablation, and indeed it is a concern. The prevalence of this complication varies and is dependent upon a number of factors. Reports in the literature vary from <1% to $\approx 20\%$.

In my opinion, the experience of the EP doing the procedure is the most important factor determining this risk. A recent review of the European experience with AF ablation documented PV stenosis rates approaching 20% in centers performing < 50 PV isolation procedures. (Jais, P. Presented at NASPE 23rd Annual Scientific Sessions, 2002). Other reports also note this "learning curve" (Saad EB, et al. Circulation 2003;108:3102-3107; Leite L, et al. PACE 2002;25:559 Abstract).

Other very important factors that reduce the risk of PV stenosis include the use of intracardiac echocardiography (ICE) to monitor catheter positioning and ablation, reduction in energy delivery, and avoidance of ablation within the PV (that is, ablate at the PV orifice or more on the atrial side).

At the University of Virginia we have had one symptomatic PV stenosis in 400+ patients over the last 5 years. I believe the reason for this very low incidence is our overall experience, the use of ICE in every case to precisely know where the ablation is being performed and our limiting the energy delivery when we are at the PV ostium.