Counterpoint: Minimally invasive bipolar radiofrequency ablation of lone atrial fibrillation: Early multicenter results

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The challenges facing surgeons performing surgical ablation for atrial fibrillation include the evolution of techniques and development of technologies that will provide maximum cure rates, reducing the clinical burden of atrial fibrillation and thereby enhancing quality of life and reducing health care costs. The surgical procedure itself must minimize mortality, morbidity, and disability.

Less invasive surgical approaches have been developed to avoid a sternotomy, avoid cardiopulmonary bypass, and approach the atrium through minimal access incisions and through ports. As surgeons, we desire ergonomic devices to perform reliable and transmural lines of ablation. Several energy sources in clinical use have limitations, such as energy loss from epicardial fat and the circulating blood pool. These technical challenges are compounded by the difficulty related to device design. The size, flexibility, and shape of the device often are the limiting factors in delivering the energy to epicardial surfaces when minimal access incisions are preferred.

Controversy remains regarding the appropriate lesion set. Surgeons are motivated to offer less invasive approaches to improve their referral base by adopting minimal access procedures. The procedure requires an effective lesion set, with minimal complexity that can be easily and reliably performed by all cardiac surgeons.

The electrophysiology of paroxysmal atrial fibrillation is most likely due to triggers from the pulmonary veins and the left atrium. Therefore, approaches that solely isolate the pulmonary veins will inevitably produce failures, inasmuch as 20% of the other triggers in nonpulmonary vein sites are in both the left or right atrium.¹ In more complex forms of atrial fibrillation, in which the patient is continuously in atrial fibrillation, it is not possible to perform the recommended full or modified Cox maze lesion set easily with current minimal access techniques and technologies.²

The Heart Rhythm Society published a consensus document in 2007 on catheter-based and surgical ablation of atrial fibrillation.³ This document updated the definitions of paroxysmal, persistent, and long-standing persistent atrial fibrillation. The term *long-standing persistent atrial fibrillation* now defines a state of continuous atrial fibrillation. Patients in this condition will be left in that rhythm and not undergo catheter or surgical ablation. The document clearly presents the current theories and electrophysiology of atrial fibrillation, discussing pulmonary vein triggers, drivers, rotors, and changes in left atrial substrate, in addition to the role autonomic ganglia may play in the mechanisms of the arrhythmia.

The data suggest that patients with intermittent atrial fibrillation are primarily converted from sinus rhythm to atrial fibrillation by triggers from the left atrial muscle residing in the pulmonary veins. The role played by the ganglionic plexi affecting inducibility and changes in the atrial muscle substrate is discussed. The role of the autonomic ganglia is an area of active investigation. The surgical consensus from the Heart Rhythm Society document recommended that the treatment of paroxysmal atrial fibrillation requires at a minimum full pulmonary vein isolation (tested intraoperatively to prove entrance and exit block before and after ablation), mapping and ablation of the autonomic ganglia, and the excision or exclusion of the left atrial appendage. It was noted that additional lesion sets would probably increase the cure rate, treat nonpulmonary vein trigger sites, and prevent flutter.

Patients who have continuous atrial fibrillation, in addition to having triggers, also have significant substrate changes in the atrial tissue. Therefore, pulmonary vein isolation alone, even with ganglia ablation and removal of the left atrial appendage, will lead to cure rates that are too low to justify a surgical approach based solely on pulmonary vein isolation. These patients require additional ablation lines, including the left and right atrial isthmus, and cryolesions to the coronary sinus, tricuspid valve and mitral valve annulus.

The accompanying article, presented by Beyer, Lee, and Lam, has several limitations. The sample size is small. The 100 patients operated on came from three different institutions, and the number from each institution was not given. All patients underwent bilateral mini-thoracoscopic, video-assisted pulmonary vein ablations as pairs (preablation and postablation study of entrance and exit block were recorded) using bipolar radiofrequency, ganglionic mapping and ablation, and removal of the atrial appendage. The authors included only patients undergoing stand-alone procedures. Only 39 of the patients had paroxysmal atrial fibrillation; the remainder were in persistent atrial fibrillation categories. The mean operative time was long (253 minutes), and the

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patients had long hospital stays (an average of 6.5 days). The complication rates were significant in that 5% of patients required a pacemaker, 3% had phrenic nerve injury, 3% had postoperative hemothorax, 1% had a pulmonary embolus, and 1% had a transient ischemic attack.

The patients had a mean follow-up time of 13.6 ± 8.2 months. The cardiac rhythm at last follow-up in the entire cohort was sinus rhythm in 86% of patients. However, 92% of the patients who had paroxysmal atrial fibrillation were in sinus rhythm. Only 72% of patients with long-standing persistent atrial fibrillation were in sinus rhythm. The authors report that two thirds of the patients had discontinued their antiarrhythmic drugs.

These authors performed a less invasive procedure using a reliable energy source. They ablated autonomic ganglia and excised the left atrial appendage. The minimal access approach restricted their lesion set to ablation of pulmonary veins in pairs. Therefore, their best results were predictable. The patients with paroxysmal atrial fibrillation were mechanistically most likely to be cured with pulmonary vein ablation alone. The patients with more complex persistent atrial fibrillation were less likely to achieve normal sinus rhythm.

The protocol and method of reporting results in this particular study followed, in part, the guidelines for reporting outcomes in atrial fibrillation published by Shemin and co-workers⁴ from The Society of Thoracic Surgeons Workforce on Evidence Based Surgery, as well as the consensus document from the Heart Rhythm Society.³ However, there were important data missing. The specific protocol for antiarrhythmic drug management and anticoagulation management were not described, nor was the cardioversion protocol. The method of atrial fibrillation monitoring postoperatively, the time intervals, and the duration of monitoring were not described. The authors analyzed atrial fibrillation "at last follow-up." It is more appropriate to report rhythm results at specific time intervals. It should be noted that Kaplan-Meier analysis of the outcome for recurrence of atrial fibrillation is a flawed method because of the intermittent nature of the arrhythmia.⁴

The operations performed were clearly minimal access and avoided the use of sternotomy and cardiopulmonary bypass. However, the operative times and the lengths of stay were long. The quality of life for the patients was not rigorously analyzed after the procedure. No postoperative echocardiographic data were supplied. No information was given regarding the need for repeat electrophysiologic studies or procedures. The complication rates were significant. One patient had a transient ischemic attack. There was no mention whether or not there were other complications resulting from anticoagulation. Data were not reported on postprocedural arrhythmias, such as atrial flutter.

The literature on atrial fibrillation is difficult to read because of the lack of clear definitions and guidelines for reporting results. This was the motivation for The Society of Thoracic Surgeons Workforce on Evidence Based Surgery to create a peer-reviewed consensus document containing standards and guidelines for reporting data and outcomes for the surgical treatment of atrial fibrillation.⁴

Complementing this publication is the consensus statement on catheter and surgical ablation for atrial fibrillation published in 2007 by the Heart Rhythm Society. If all authors followed the guidelines for reporting outlined in these two consensus statements, the comparability of results from article to article and institution to institution would be greatly enhanced.

In summary, this article reports the results of a stand-alone, minimally invasive operation for atrial fibrillation in patients with paroxysmal and persistent atrial fibrillation. The procedural aspects of the operation are well reported and consistent with reported recommendations only for paroxysmal atrial fibrillation. However, for patients with more complex atrial fibrillation, the results of an operation based primarily on a pulmonary vein isolation lesion set are probably not justified because of inferior results. Additional technologies or tools must be available to provide additional ablations lines to enhance the outcomes in these patients.

Perhaps a hybrid approach is best: Initially, a minimal access surgical procedure performed through limited ports with a highly reliable energy source that can create pulmonary vein isolation. Then, electrophysiologic mapping during the same procedure can be performed by the electrophysiologist, and the additional lines of ablation, created by a catheter-based method, would include connecting lines, the left atrial isthmus line, and the right atrial isthmus line. Combining technologies appears to make great sense. These approaches present the opportunity to potentially enhance the cure rates by performing a single ablation procedure with surgeons and electrophysiologists working together instead of in parallel.

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