**EDITORIAL COMMENT**

**Hybrid Thoracoscopic and Transvenous Catheter Ablation of Atrial Fibrillation**

**Is This the Answer We Are Searching For?**

Hugh Calkins, MD

*Baltimore, Maryland*

During the past decade, catheter ablation of atrial fibrillation (AF) has emerged as an important treatment option for patients with symptomatic AF refractory to 1 or more antiarrhythmic agents. Electrical isolation of the pulmonary vein musculature (PVI) has been identified as the primary end point for both catheter-based and surgical AF ablation procedures (1). Despite the widespread adoption of catheter ablation for treatment of patients with AF, the long-term efficacy of the procedure needs to improve, especially for patients with persistent and long-standing persistent AF.

In this issue of the *Journal*, Pison et al. (2) report the results of an ambitious prospective single-center study of 26 consecutive patients who underwent a hybrid thoracoscopic surgical and transvenous catheter ablation procedure over a 21-month period. These patients were followed closely for a mean of 470 ± 154 days with serial 7-day Holter monitoring. Ablation success was defined in accordance with the Heart Rhythm Society, European Heart Rhythm Association, and European Cardiac Arrhythmia Society consensus document as freedom from AF, atrial flutter, or atrial tachycardia lasting 30 seconds or longer after a 3-month blanking period. Fifteen patients had paroxysmal AF, 10 persistent AF, and 1 long-standing persistent AF. One or more catheter ablation procedures had previously failed in 10 patients. The ablation strategy involved a combined minimally invasive, off-pump thoracoscopic surgical approach using the Atricure bipolar radiofrequency clamp (Atricure, West Chester, Ohio), a bipolar radiofrequency linear pen, and a conventional endocardial irrigated radiofrequency catheter ablation system (ThermoCool, Biosense Webster, Diamond Bar, California).

The use of endocardial catheter ablation allowed the completion of lesion sets that could not be completed surgically, especially the mitral isthmus line and the cavo-tricuspid isthmus ablation line. Endocardial ablation, guided by epicardial mapping rather than a 3-dimensional mapping system, was also used to fill gaps in the surgically applied lesions. The precise lesion set in a given patient was tailored on the basis of concomitant disease (patients with chronic obstructive pulmonary disease had the left pulmonary veins isolated with a cryoballoon, PVI in 26, posterior box in 22, bicalve line in 9, mitral isthmus in 3, and CTI in 3). The mean procedure time was 280 ± 84 min, with a range of 195 to 505 min. Follow-up visits, which included 7-day Holter monitoring, were set up at 3, 6, 9, 12, and 18 months after ablation. All procedures were performed at a single center by the same cardiac surgeon and electrophysiologist. The single procedure success rate was 83%. With the inclusion of repeat endocardial ablation procedures performed in 2 patients, the success rate increased to 92%.

The only complication that occurred was a pleural effusion requiring drainage in 1 patient. The investigators conclude that a combined transvenous endocardial and thoracoscopic epicardial ablation procedure for paroxysmal and recent persistent AF has a single-procedure success rate of 83% at 1 year and that recurrent arrhythmias can be addressed with catheter ablation or antiarrhythmic drug therapy.

This landmark study is a welcome addition to the published research on catheter and surgical AF ablation. I commend Pison et al. (2) for their enormous efforts to complete this novel clinical trial.

Despite the small number of patients, the duration, intensity of monitoring, and completeness of follow-up are to be commended. The remarkably low complication rate speaks to the expertise of the operators and center and is also to be congratulated. In writing this editorial, I am charged with helping interpret the results of this study in the context of both my own experience with catheter ablation as well as the considerable body of previously published research on catheter and surgical AF ablation. I would like to offer 2 thoughts for readers’ consideration.

It must be recognized and appreciated that this is the first publication to report the outcomes of a “hybrid” thoracoscopic surgical and transvenous catheter ablation procedure for AF. As outlined in the report, there exists a clear rationale for this approach, as some ablation lesions that are incorporated into the well-established Cox maze lesion cannot be accomplished using a minimally invasive, off-pump surgical approach. And other lesions that are part of this ablation strategy may be more successfully applied using currently available surgical ablation tools (i.e., PVI, where the rate of permanent long-term PVI with catheter ablation...
is limited). Consistent with their hypothesis was the very high single-procedure efficacy of this approach. However, the enthusiasm for this “hybrid” ablation strategy must be tempered by some important limitations that must be recognized with both the ablation strategy and the design of this study. It is unfortunate that the investigators did not choose to take on a series of patients with long-standing persistent AF, especially a series of patients with long-standing AF of many years’ duration and dilated left atria, for it is in this subset of patients that the results of catheter ablation have been most disappointing. Hopefully, the investigators are carrying out this trial at the present time. Another limitation of the “hybrid” ablation strategy is that it is a logistical nightmare. Not only are experts in both catheter ablation and surgical ablation required, but they must both be available in the same hospital, on the same day, at the same time, and for as long as 8 h (the longest procedure in this report required 505 min). This may explain why it required 21 months to perform the 26 procedures in this trial. It is my impression that it is extremely rare to have tremendous expertise with catheter ablation and surgical AF ablation at the same institution. Most centers are expert at one or the other. Further studies need to examine the feasibility of a staged hybrid approach, in which the surgical ablation is performed on a separate day from the catheter ablation part of the study. Once a staged strategy is considered, one wonders if it would be preferable to perform the surgical ablation with PVI first and perform the catheter ablation part of the procedure only if AF recurs after the initial surgical procedure. I suspect that for some patients, all that is needed is PVI.

The remarkably high ablation success rate reported in this trial is truly remarkable. This important result has implications for the entire field of AF ablation, because it is further evidence that AF ablation procedures that are based on the cornerstone of PVI are effective, especially for treatment of patients with paroxysmal and early persistent AF. And when performed by highly experienced operators at experienced centers, these procedures can be performed safely. What remains less clear is the important issue of which lesions or lesion sets are needed and what is the best end point for the procedure. This study does little to provide new knowledge that can be applied to this important question. This statement reflects the fact that most patients in this series had paroxysmal AF, and only 1 patient had long-standing persistent AF. Furthermore, ablation lesions with the exception of PVI were “tailored” on the basis of inducibility, concomitant patient diseases, AF type, and operator preference. The resultant “special sauce” applied to each patient may not be replicable by other centers and operators. As noted previously and shown on a patient-by-patient basis in Table 1 of the report (2), the only standard lesion applied to all patients was PVI. Despite the theoretical benefit of a hybrid approach to accomplish a complete mitral line and cavotricuspid line, these lesions were each created in only 3 of the 26 patients.

At the end of the day, is hybrid thoracoscopic and transvenous catheter ablation of AF the answer we are searching for? In my opinion, the answer is “not yet,” and certainly not on the basis of the very limited worldwide experience with this approach. It is clear that more research is needed. In particular, I would like to see the results of a much larger, multicenter trial of “hybrid AF ablation” that targets a population of patients with long-standing persistent AF and dilated left atria. Those involved in this field are grateful to Pison et al. (2) for bringing forth the concept of “hybrid AF ablation.”

Reprint requests and correspondence: Dr. Hugh Calkins, Johns Hopkins Hospital, 530 Carnegie, 600 North Wolfe Street, Baltimore, Maryland 21287-6568. E-mail: hcalkins@jhmi.edu.

REFERENCES

1. Calkins H, Kuck KH, Cappato R, et al. 2012 HRS/EHRA/ECAS expert consensus statement on catheter and surgical ablation of atrial fibrillation: recommendations for patient selection, procedural techniques, patient management and follow-up, definitions, endpoints, and research trial design: a report of the Heart Rhythm Society (HRS) Task Force on Catheter and Surgical Ablation of Atrial Fibrillation. Developed in partnership with the European Heart Rhythm Association (EHRA), a registered branch of the European Society of Cardiology (ESC) and the European Cardiac Arrhythmia Society (ECAS); and in collaboration with the American College of Cardiology (ACC), American Heart Association (AHA), the Asia Pacific Heart Rhythm Society (APHRS), and the Society of Thoracic Surgeons (STS). Endorsed by the governing bodies of the American College of Cardiology Foundation, the American Heart Association, the European Cardiac Arrhythmia Society, the European Heart Rhythm Association, the Society of Thoracic Surgeons, the Asia Pacific Heart Rhythm Society, and the Heart Rhythm Society. Heart Rhythm 2012;9:632–96.

Key Words: ablation • arrhythmia • atrial fibrillation • catheter ablation of atrial fibrillation • surgical atrial fibrillation ablation • thoracoscopic atrial fibrillation ablation.