

EDITORIAL COMMENT

Simple LA Surgical Ablation or Perfect Biatrial Surgical Ablation Eternal Theme?*



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Atrial fibrillation (AF), which is among the common arrhythmias in clinical practice, is associated with adverse complications such as ischemic strokes, systemic thromboembolisms, heart failure affecting the mortality, and a healthy life expectancy (1). Approximately 30% of the patients who undergo cardiac surgery are complicated AF. The Cox maze procedure was developed in 1987 (2) and is the standard surgical procedure for the treatment of AF. Recent advancement in the technology associated with energy sources for creating atrial incisions, such as cryoablation and bipolar radiofrequency ablation instead of a “cut and saw” method, have made the procedure simpler and less invasive (3-5). The maze procedure for patients with persistent and long-standing persistent AF has had an AF-free rate of 79% without antiarrhythmic drugs and 90% with drugs at 5 years after the surgery (6). Therefore, surgery for AF associated with structural heart disease is considered to be an effective treatment option during concomitant cardiac surgery. Currently, concomitant surgical ablation of AF is recommended for patients with AF who undergo cardiac surgery regardless of left atrial (LA) incision/no-LA incision procedures (7,8). It has been reported that a biatrial incision is more effective for the maintenance of sinus rhythm than a LA incision alone is (9). On the other hand, a multicenter randomized controlled trial revealed that there were no differences in the rate of

freedom from AF between a biatrial maze and only a pulmonary vein isolation (10). The efficacy and overall safety of surgical ablation lesion sets for the treatment of AF during cardiac surgery remain to be solved.

In this issue of *JACC: Asia*, Kim et al. (11) compared the effect of surgical ablation between LA ablation and biatrial ablation during cardiac surgery on AF recurrence and the clinical outcomes including the all-cause of mortality and pacemaker implantations. The study design was a large-scale retrospective analysis using a cardiac surgery database in a single center. The study population consisted of an LA surgical ablation group (n = 796) and biatrial surgical ablation group (n = 1,169). Kim et al. (11) found that the LA surgical ablation reduced early deaths and dialysis as compared to the biatrial surgical ablation. However, there was no significant difference in the AF recurrence, pacemaker implantations, and overall mortality between the 2 groups. Kim et al. (11) provided us with valuable information on the effect of an LA and biatrial surgical ablation on the clinical outcome and sinus rhythm maintenance in patients with AF. However, there are several unresolved clinical issues that need to be addressed.

First, the present study had a retrospective design with a large-scale study population. As Kim et al. (11) described in their study limitations, the operator's selection bias might have affected the results of the study. An operator might prefer to perform a biatrial surgical ablation for patients with a lower risk of surgery or for patients with right atrial (RA) involvement of structural remodeling associated with tricuspid valve disease or right-sided atrial cardiomyopathy. The location and distribution of the arrhythmogenic substrates of AF in both atria are diverse especially in patients with persistent or long-standing persistent AF. The majority of the patients in this study had more than a mitral valve surgery, such as a combined surgery for the tricuspid valve, aortic valve, or a coronary

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artery bypass graft surgery. The remaining patients received nonmitral valve surgery. Therefore, the clinical background and underlying heart disease of the patients exhibited a heterogeneity affecting the interpretation of the study. Although the electrocardiogram findings of AF (ie, absence of P waves, presence of fibrillation waves, and an irregular ventricular response) are quite similar among the patients with AF, different etiologies and therapeutic strategies should be considered.

Second, Kim et al. (11) showed that a biatrial surgical ablation did not increase the risk of a pacemaker implantation. Permanent pacemaker implantations were needed in 1.0% per year in the LA group and 1.5% per year in the biatrial group. It was speculated that the main cause of the pacemaker implantation in the biatrial surgical ablation group was caused by sinus node dysfunction. If the patients had already developed sinus node dysfunction at the time of the cardiac surgery, the patients might have eventually needed a pacemaker implantation regardless of a RA incision. Indeed, Kim et al. (11) found that aging and tricuspid valve surgery, which might cause fibrotic changes in the atrium, were independent predictors of a permanent pacemaker implantation after cardiac surgery. Those patients already had coexisting sinus node dysfunction associated with underlying heart disease or other pathophysiological conditions (12). There is another possible mechanism of the cause of pacemaker implantations after a biatrial surgical ablation. Atrial structural remodeling of the RA especially in the sinus node area and atrial septum might have affected the conduction disturbances from the sinus node to the atrioventricular node in the atria by adding an RA incision mimicking sick sinus syndrome. In those cases, sinus arrest or atrioventricular block occurred after the cardiac surgery despite the fact that the sinus node function was almost normal. It is difficult to predict the benefit and risk of an RA lesion set before cardiac surgery especially in patients with more than mitral valvular disease. An evaluation of the progression and distribution of RA structural remodeling and the sinus node activation pattern along with the sinus node function (if any) by using an electroanatomical mapping system might give us important information. Patients who have a healthy RA with a normal sinus node function but an advanced low voltage zone indicating LA structural remodeling, require only an LA surgical ablation set. On the other hand, in the case of advanced structural remodeling of the RA, optimized ablation lesions in the RA to preserve the sinus node propagation might be planned for the prevention of a pacemaker implantation after surgery. Although a previous study (13) demonstrated

that there was no difference in pacemaker implantations between the LA and biatrial surgical ablation groups, we should consider that some selected cases have a potential risk of a pacemaker implantation caused by an additional RA lesion set. Careful follow-up will be needed after a biatrial surgical ablation especially in patients with advanced atrial remodeling of the RA.

Finally, Kim et al. (11) showed that a new onset of dialysis was significantly higher in the biatrial ablation group than LA ablation group. A longer total procedure time including the aortic cross-clamping time in the biatrial ablation group might have been associated with early complications. It is still unclear whether only an LA surgical ablation reduces the risk of dialysis without increasing the AF recurrence rate. A new onset of dialysis after cardiac surgery associated with a maze procedure should be avoided as much as possible in terms of the quality of life and health economics. Further study will be needed to clarify these issues.

In summary, Kim et al. (11) made an important contribution to understanding the status of the surgical atrial lesion set for the treatment of AF during concomitant cardiac surgery. Cardiac surgeons used to believe that a complex lesion set in both atria would obtain a better clinical outcome in reward for a higher surgical operation risk. Simplifying the lesion set of the maze procedure along with a better rhythm outcome would be ideal. However, some selected patients require a biatrial incision to obtain sinus rhythm. Because of the diverse nature of the structural remodeling of the atria in patients with persistent or long-standing persistent AF concomitant with structural heart disease, it might be difficult to plan a large-scale randomized trial between the LA maze alone and biatrial maze. To reduce the early complications caused by a biatrial surgical ablation, collaboration between the electrophysiologist and cardiac surgeons might be helpful to develop a tailor-made surgical ablation lesion set leading to fewer complications and a better outcome after cardiac surgery. A simple LA surgical ablation versus a perfect biatrial surgical ablation might be an eternal theme.

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