WHY IS FREEDOM FROM ATRIAL FIBRILLATION STILL LOWER WITH ENDOSCOPIC PULMONARY VEIN ISOLATION THAN WITH THE COX MAZE III PROCEDURE?

To the Editor:

We read with great interest the recent article by Yilmaz and coworkers.¹ We have some brief comments. Since its first description in the *Journal* in 1991 by Cox and colleagues, the Cox maze procedure and its subsequent modifications have been the most frequently used option for patients with intractable supraventricular arrhythmias, with the results heavily scrutinized. Although reported results have varied somewhat, long-term success (freedom from atrial fibrillation [AF] recurrence) rates as high as 96% have been reported.² Despite its remarkable success, the procedure has not been widely adopted by surgeons or cardiologists, in part because of its complexity and technical difficulty. As a result, only a few surgeons have gained sufficient experience, and many have waited for less-invasive or simpler approaches to treat those extremely common arrhythmias. With modern and less invasive technologies, Yilmaz and coworkers¹ reported for the first time a completely endoscopic approach. In their experience, 78% of patients remained free from AF recurrence at a mean follow-up of 9 months. The reasons for this lower rate of success are unclear. Among potential mechanisms, one

could be the nonuniform lesion depth and the absence of transmural. Indeed, several perioperative details could contribute to this phenomenon: incomplete surface contact between the energy source and the left atrial tissue, a thick and fibrotic left atrial wall, and high cardiac output during ablation, causing loss of heat energy.³

Whether the observed clinical success was improved by the associated partial cardiac denervation, thereby overcoming the potential absence of transmural, remains a matter of speculation. Indeed, reinnervation is a mechanism that has been suggested explain recurrence of AF after radiofrequency catheter ablation in the atrium in an animal model.⁴ In a recent study by Kangavari and associates,⁵ radiofrequency catheter ablation was followed by an elevation in nerve growth factor concentration in peripheral veins from days 1 to 3 after the procedure. The paracrine effect of this growth factor could explain nerve sprouting, reinnervation, and recurrence of AF during follow-up. A better understanding of this recent observation, as well as the design of new algorithms to circumvent these possible limitations (such as heat gradient), could enhance the long-term outcome of totally endoscopic procedures.

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Reply to the Editor:

The Cox maze III procedure remains the criterion standard for treatment of standalone atrial fibrillation (AF), as well as for AF with concomitant disorders; however, it has not gained widespread acceptance because of its invasive nature.¹ The questions arise of whether all the lesions are necessary to cure AF and whether it is necessary to expose all patients with AF to such a complex operation. Electrophysiologic studies have already identified the critical role of initiating foci, situated mainly at the orifices of the pulmonary veins.² There is evidence suggesting that ganglionated plexuses (GPs) play an important role in the initiation and maintenance of AF.³ Adding GP ablation to pulmonary vein isolation (PVI) increases efficacy in elimination of AF.⁴

The original cut-and-sew maze procedure has been abandoned in part because of these considerations and because less invasive methods of surgical treatment for standalone AF are being developed. PVI is performed by ablation of the left atrium at the entry site of the pulmonary veins, targeted autonomic denervation, and left atrial appendage amputation, resulting in electrical isolation.

The success rate with PVI alone theoretically could reach 90% for paroxysmal AF with normal atrial diameter, because most of the triggering foci are situated at the pulmonary vein ostia. In cases of persistent or long-standing AF, the role of a dilated left atrium as the substrate factor and its interplay with the trigger is important. PVI alone cannot reach the ideal success rate of 90% in cases of associated valve disease or left ventricular impairment.

The ability of dry bipolar radiofrequency ablation to produce 100%

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permanent transmural lesions epicardially on the beating heart has been documented.⁵ The lesions in our study were limited to PVI, and conduction block was confirmed intraoperatively.

High-frequency stimulation with the unipolar multifunctional pen was performed to locate and ablate GPs in the fatty pads around the pulmonary veins; however, GPs at the left posteromedial, posterior descending, and superior atrial locations could not be reached in our study. In our series, no postoperative GP mapping was routinely performed, and the role of reinnervation thus remains uncertain.

Patients in persistent or long-standing AF have associated changes in the left atrial substrate as a result of dilatation and passive mechanical stretching.

This condition with atrial fibrosis can itself be arrhythmogenic, and it is therefore likely that PVI alone will be insufficient in such cases, with more extensive lesions needed to achieve a higher success rate.

Our policy is to perform a thoracoscopic procedure first, even for patients with long-standing standalone AF. Only patients with refractory AF after a thoracoscopic procedure eventually undergo a maze III procedure.

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