An important piece of the puzzle for understanding the benefits of concomitant ablation of atrial fibrillation in cardiac surgery

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Surgical treatment of atrial fibrillation (AF) has come a long way since the early days of the Cox-maze III procedure (CM-3), introduced by James Cox in the late 80's (1). Back then, there was no catheter ablation therapy available for AF and CM-3 was offered as a stand-alone treatment for drug-refractory AF in carefully selected patients. In time, these patients were instead referred for catheter ablation, and surgical focus shifted to concomitant treatment of AF in patients undergoing valve or coronary artery bypass (CABG) operations. The extensive cutting and sewing of CM-3 was replaced by surgical cryo- or radiofrequency ablation, making the procedures easier and much better tolerated by the patients. At present, there is wide agreement that the full biatrial lesion set of the original CM-3, although performed with ablation instruments, Cox-maze IV (CM-4), is the technique of choice for best results concerning postoperative freedom from AF.

Almost all cardiac surgeons will regularly encounter patients scheduled for mitral valve, aortic valve or CABG surgery, who also have AF. To be a good arrhythmia surgeon, you have to be a believer in the fact that persistent normal sinus rhythm (NSR) is better for the patient than persistent AF. Any cardiac surgeon can testify that a heart in AF, as compared to NSR, appears off-beat, strained and inefficient. When actually looking at a heart in AF, it's quite easy to imagine that such a disruptive condition will eventually influence long-term cardiac performance and related mortality. In accordance, numerous studies have shown inferior long-term survival for cardiac surgical patients in AF as compared to NSR. Patients who develop new-onset AF after cardiac surgery have a less favorable prognosis than patients who don't get postoperative AF (2).

Thus, the addition of concomitant surgical ablation in cardiac surgical patients with AF is now being increasingly accepted, learned and performed among surgeons (3). Moreover, experts in the field have recently put together guidelines (4,5) to help surgeons to further adapt and use these methods. In mitral valve patients with AF scheduled for surgery, the addition of concomitant surgical ablation is now clearly recommended (Class IA). But what are the real benefits of concomitant surgical AF ablation, benefits that are on top of those achieved by the valve repair or revascularization that was the main indication for cardiac surgery in the first place?

Numerous studies, mostly case series but also some randomized, have consistently shown a higher percentage of patients in NSR up to 1 year after concomitant surgical ablation (6). This has been proven and is clear. What is less clear are the real long-term clinical benefits from restoring NSR in these patients. Naturally, the primary goal of surgical AF ablation is to give the patients less arrhythmia-related symptoms, better QoL, less risk of stroke and ultimately, a longer life. In truth, there is a certain lack of data regarding these outcomes in AF patients undergoing concomitant surgery. The recent study by Musharbash and co-workers from Washington University in St Louis (7) fills a large portion of this gap. Based on a large institutional data-base, late survival in patients with a history of AF

undergoing concomitant CM-4 (n=438) were compared to patients with AF untreated during surgery (n=1,510) and with operated patients without a history of AF (n=8,911). For an optimal comparison in this retrospective analysis, a propensity score matching was conducted between groups. Not surprisingly, the CM-4 cohort showed greater survival compared to the Untreated AF cohort (HR =0.47; 95% CI, 0.26–0.86, P=0.014). Ten-year survival was 62% for CM-4 versus 42% for the Untreated AF group. In concordance, there was no difference in long-term survival between CM-4 and the No AF group.

So from this study, there is a strong indication that performing concomitant CM-4 with CABG or valvular surgery will increase long-term survival in these patients. The strength of the study is in its solid background and design, coming from a pioneering institution in the field of surgical treatment of AF. There were large patient cohorts with a long follow-up time being compared in the propensity score matching, and all results pointed in the same direction. Ultimately, the authors found that after adjusting all covariates using a Cox regression model, preoperative AF remained an independent predictor of mortality with an adjusted HR of 1.38 (95% CI, 1.04–1.83, P=0.025).

In fairness, there were limitation to the study which could have affected the results. The completeness of follow-up to 10 years was 75–80% in the CM-4 group and even lower (63–74%) in the two other groups of comparison. Also, there was no information on rhythm status in the three groups. From previous reports (8), we can assume that the long-term freedom from AF in the CM-4 group would be around 80%, but how many patients in the Untreated AF and No AF groups were in AF at the time of follow-up? In the propensity analysis, the "healthiest" patients from the Untreated AF group were selected for the match, and it is likely that some of these patients would spontaneously have converted back to NSR just by the valve procedure itself. Furthermore, some patients in the No AF group would be likely to develop AF in the long run after surgery. Finally, the study didn't analyze specific causes of death. Therefore, we can't be completely assured that the results reflect differences in cardiac or stroke death related to the given cardiac treatment. Previous studies have shown a very low incidence of ischemic stroke after the CM-3 procedure (9), but there is a heterogeneity in data regarding late stroke after concomitant CM-4 (5).

In conclusion, the study by Musharbash *et al.* brings significant information to the issue of the clinical benefits of adding surgical ablation (CM-4) to other cardiac operations in patients with AF. We know that cardiac surgical patients in AF have poorer outcomes and that surgical ablation restores sinus rhythm. Now we have a clearer picture that treating structural heart disease and the arrhythmia in the same surgical procedure will increase long-term survival. This is very important information for justifying the expanded use of concomitant surgical ablation. In the future, prospective studies including long-term analysis of rhythm and incidence of stroke, would advance our knowledge further.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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