Editorial

Redo cardiac surgery and atrial fibrillation: the ablation dilemma

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In patients undergoing cardiac surgery, atrial fibrillation (AF) is a frequent comorbidity. The arrhythmia is present in about half of patients undergoing mitral valve surgery and a quarter of aortic valve surgeries, partly due to structural abnormalities deriving from the underlying valvular disease (1). When present, AF is an independent predictor of a worse outcome after the surgery (2), and treatment of AF by concomitant surgical ablation (SA) ameliorates treatment outcomes. In the past decade, several randomized and observational studies found encouraging results of SA on restoration of sinus rhythm, quality of life, perioperative morbidity, and even mortality (3-6). Subsequently, SA for symptomatic AF patients concomitant with other cardiac surgery has been incorporated in the latest guideline recommendations (7,8).

In contrast to primary cardiac surgical procedures, however, whether rhythm surgery should be performed concomitant to redo surgical procedures is not known. Redo surgeries are often technically more demanding due to the presence of scar tissue, adhesions, and altered anatomy. They generally last longer and complications occur more frequently than in primary procedures (9). Adding SA to these already long and complex procedures is therefore less attractive, and it is not supported by strong efficacy data. Until recently, only two studies compared SA with non-SA with a focus on redo surgery. The first was an older observational study that included 96 patients undergoing redo mitral valve operations (10). In the SA group, sinus rhythm was restored in two-thirds of patients. Perioperative complications were comparable for the SA and the non-SA group, and early and late mortality were not significantly different in this relatively small group. The second was primarily focused on patients with congenital heart disease, who represent an entirely different patient group (11). Other, larger studies evaluating the efficacy of concomitant SA often either excluded patients undergoing redo surgeries, or they composed a minority of the included population (ranging from 2–19%), with none of them describing the efficacy results of redo patients separately (6,12-14).

The recent study by Kang *et al.* responded to this knowledge gap and added interesting new data to the landscape (15). This study presented described data on concomitant SA in the largest group of patients undergoing redo surgery so far. Patients undergoing a second or subsequent sternotomy for treatment of left-sided

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valvular disease, sometimes combined with right-sided valvular procedures or coronary artery bypass grafting, were retrospectively included. Those patients who had undergone concomitant SA were compared with those who did not. SA was performed at the discretion of the operator, and propensity score-adjusted multivariate analysis was performed between SA and non-SA patients. In total, 224 patients were included (73 patients in the SA group *vs.* 151 in the non-SA group) and followed for a median of 10 years after the surgery. The main conclusions were that patients who had undergone SA had better outcomes in terms of overall survival [hazard ratio (HR) =0.452; 95% confidence interval (CI): 0.218–0.936], sinus rhythm restoration (HR =0.505; 95% CI: 0.369–0.691), and a composite of thromboembolism and major bleeding (HR =0.338; 95% CI: 0.127–0.897).

The authors should be congratulated for their achievement in composing the largest cohort of redo surgery patients undergoing concomitant SA so far. Their results are encouraging, since they highlight that when the operator decided to perform SA, the procedure was accompanied by acceptable complication rates and a decrease in AF recurrence. The positive effect of SA on outcomes was even more outspoken than those in previous studies in patients with first surgeries, which found HRs for overall survival ranging from 0.67–0.84 (4-6).

However, several issues need consideration when interpreting the results. First, the potential of selection bias is a major concern. The study compared non-randomized patient groups, and the reader's eye is immediately drawn to several important differences in baseline characteristics between the SA and the non-SA group: patients who did not undergo SA were older, had a higher number of previous surgeries, underwent more complex surgeries, and more often had long-standing persistent AF. The authors aimed to correct for these differences using propensity score-adjusted multivariable analysis, but correction for all potential confounders would have been nearly impossible. The reason that SA was associated with drastically lower rates of postoperative low cardiac output syndrome (HR =0.328; 95% CI: 0.136–0.788) may therefore rather reflect a better initial condition than the effect of the SA itself. Additionally, the fact that the cardiopulmonary bypass time and the aortic cross clamp time were not significantly longer in the SA group, as opposed to in previous, randomized studies, may reflect the relatively smoother course of events in the SA group, and this may have augmented the favorable results in the SA group (4,16).

Second, what would have contributed to this manuscript is a sub-analysis of long-term outcomes in patients with successful restoration of sinus rhythm after SA versus those with non-successful SA. This might have helped to determine whether the more positive outcomes in the SA group are attributable to sinus rhythm restoration, rather than to a better initial condition (although, of course, sinus rhythm maintenance itself may also be a marker of better clinical condition). Unfortunately, although it was mentioned that postoperative complications did not differ in patients with and without sinus rhythm restoration, there is little information on other, long-term outcomes between these subgroups.

Third, the pragmatic follow-up that is inherent to retrospective studies complicates adequate judgement of absence of AF. As appropriately described in the limitation section, rhythm follow-up consisted of intermittent electrocardiogram (ECG)'s every few months, and no Holter recordings were performed. This may have led to an overestimation of successful SA procedures, as it is well known that intermittent rhythm monitoring seriously underestimates AF recurrences (17).

Last, the authors present data from a single-center study, and therefore local clinical practices may have impacted the study results. In addition, as the study was performed in Seoul, Korea, with a predominantly Asian population, some baseline characteristics of the study population were markedly different than in previously described cohorts in Western countries (e.g., body mass index, left atrium size) (6). This may reduce the generalizability to other geographic regions.

In conclusion, albeit the study by Kang and colleagues is limited by its retrospective design and there are several important factors to take into consideration in its interpretation, it certainly presents promising data in the largest cohort of patients undergoing redo surgery so far. The outcomes indicate that previously undergone cardiac surgeries are no reason for the operator to be discouraged from performing rhythm surgery during a redo procedure. However, further, randomized data are needed to definitively conclude whether the SA itself causes the better outcomes, or if these are the results of conscious or unconscious patient selection by the operator. Until these are available, operators should keep carefully balancing advantages and disadvantages of performing concomitant SA, and thus tailor each surgery to the individual patient.

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