

Persistent atrial fibrillation after radiofrequency ablation: considerations in treating rheumatic mitral valve disease patients

“Catheter-based procedures may be effective to treat recurrent arrhythmias after ineffective surgical ablation procedures for atrial fibrillation after mitral valve replacement.”

Keywords: atrial fibrillation • atrial tachycardia • catheter radiofrequency ablation • maze procedure • rheumatic heart disease • valve surgery

Atrial fibrillation (AF) in patients with rheumatic heart disease (RHD) results from hemodynamic consequences of valvular or myocardial heart disease and from direct tissue injury of the atrial myocardium by the underlying inflammatory process [1]. About 60% of patients with rheumatic valve disease develop AF. Several studies have clearly demonstrated a low probability of sinus rhythm recovery in patients with preoperative AF undergoing valve surgery for RHD [2,3]. Atrial fibrillation persistence is associated with worse clinical outcomes that include functional status, exercise capacity, quality of life and overall survival. A retrospective analysis was performed on a total of 793 patients who underwent mitral valve replacement with or without tricuspid valve repair [4]. At a mean follow-up of 8.6 ± 2.4 years of patients with preoperative AF, survival was 88.7%, compared with 96.6% in patients with preoperative sinus rhythm ($p = 0.002$).

Several technical approaches and different energy sources have been employed to restore sinus rhythm in patients undergoing valve surgery.

The proper way to verify success after an AF ablation procedure is controversial; continuous rhythm monitoring should be the gold standard of follow-up, but very few studies use it, thus results reported in literature are not easily comparable. It is conceivable that in patients followed with periodic ECG

evaluation asymptomatic AF recurrences may occur, thus the true effectiveness might remain unknown. The surgical results of the maze procedure for AF associated with rheumatic mitral valve disease have been known to be less effective than for lone or nonrheumatic AF [5]. Preoperative patients characteristics (age, NYHA functional class at the time of surgery, type of prosthetic valve, proportion of paroxysmal and persistent AF, duration of the arrhythmia), concomitant surgical procedures (including vagal denervation) other than the modalities of success rate evaluation at follow-up, may explain the large variability (55–80%) of results reported in literature [6–9].

In a recent paper, our group demonstrated in patients undergoing radiofrequency (RF) ablation associated with mitral valve surgery that an increased left atrial area (HR: 1.07 per unit increase; 95% CI: 1.01–1.13) and rheumatic etiology of valve disease (HR: 4.52; 95% CI: 1.65–12.4) were significantly associated with the risk of persistence of AF at hospital discharge [10]. Less than 20% with atrial diameter greater than 55 mm and rheumatic mitral disease recovered sinus rhythm. At 6-year follow-up persistent sinus rhythm (SR) and overall survival in patients with rheumatic mitral valve disease in comparison with degenerative mitral (mitral valve prolapse) who underwent RF ablation and valve surgery were, respectively, 58 and 64%, and 84 and 90%.



Carlo Rostagno
Dipartimento Medicina
Sperimentale e
Clinica, Università di
Firenze, Medicina pre
e postoperatoria, AOU
Careggi, Viale Morgagni 85,
50134 – Firenze, Italy
carlo.rostagno@unifi.it

A different catheter-based procedure has been proposed as an alternative to surgical RF treatment at the time of mitral valve surgery: hemodynamic correction of valve disease might induce 'structural' atrial changes favoring successful RF catheter ablation. Liu *et al.* [11] randomly assigned patients with RHD and long-lasting AF undergoing surgery for valvular heart disease to saline-irrigated cooled-tip radiofrequency ablation performed in the same surgical session, or to catheter-based radiofrequency ablation (including circumferential pulmonary veins isolation [PVI] in combination with left atrial linear ablation and ablation of complex fractionated atrial electrograms) 6 months postoperatively. Patients randomized to the surgical procedure had a significantly lower rate of AF recurrences after 15 months and underwent repeat procedures for recurrent AF less frequently compared with patients undergoing catheter ablation. At a mean follow-up of 54 months, patients who underwent surgical RF ablation had a significantly higher freedom from atrial tachyarrhythmias (ATa) compared with catheter ablation patients (29/48 vs 15/47; $p = 0.005$) [12]. Catheter-based mapping and ablation of recurrent ATa showed larger amounts of macroreentrant atrial tachycardias (ATs) in patients treated with surgical RF ablation and a higher incidence of pulmonary vein recovery in catheter-treated patients.

Recurrence of AF and/or development of AT after RF ablation associated with mitral valve surgery in rheumatic valve disease may impair quality of life and increase long-term risk of stroke and mortality. Catheter-based procedures may be effective to treat recurrent arrhythmias after ineffective surgical ablation procedures for AF after mitral valve replacement. Mamchur *et al.* [13] included in their study ten consecutive patients (age 48 ± 7 years) with long-persistent AF associated with a rheumatic valve disease, treated by mitral valve replacement with a biological prosthesis and surgical RF ablation procedure. Hemodynamically significant AF, requiring repeated cardioversions, occurred in all patients in the late postoperative period. From 1 to 3 years after the surgery catheter ablation was performed, including reisolation of pulmonary veins with the ablation of ganglionic plexi or linear lesions on the roof of the left atrium and mitral isthmus. Restoration of SR during ablation was achieved in all of the cases and they were free from recurrence at 9 months follow-up.

AT is not an uncommon complication after mitral valve replacement in RHD. Chen *et al.* [14] reported 21 consecutive RHD patients with AT after valve replacement. The mean interval between the occurrence of symptomatic AT and the surgical intervention was 38.2 ± 48.7 months. The initial procedure was performed

on average 8 months after first onset of AT. Electroanatomic mapping demonstrated 18 cavotricuspid isthmus-dependent atrial flutter, five right atrial free wall AT and two left AT. Acute success was obtained in 95% (20/21) patients. Radiofrequency catheter ablation needed to be repeated in nine patients, and newly developed left AT was identified in five patients after the first right AT ablation. After a mean follow-up of 42.7 ± 17.3 months, only 33% of the patients remained free of ATs, while 14 and 53% of the patients had AT recurrence or development of AF, respectively.

When patients with RVD and mitral valve prosthesis who were undergoing treatment for recurrent AT after catheter ablation of long-standing persistent AF were compared with a matched control group without RVD a higher incidence of macro or localized re-entrant ATs were identified (87 vs 78.3%) [15]. Patients having greater than or equal to two ATs were more frequent in the RVD group than in the control (78.6 vs 41.1%; $p = 0.001$). In the RVD group, ATs were successfully terminated 64.3% patients in comparison with 80.4% in control ($p = 0.10$). After a mean follow-up of 13 months, 16 patients (57.1%) from the RVD group and 45 patients (80.4%) from the control were free of further recurrence ($p = 0.02$).

RHD is characterized by creation of severe tissue injury of the atrial myocardium as a substrate for development and persistence of AF. Recurrences of AF and rate of complex AT are high in patients with RHD after RF ablation associated with mitral valve surgery. Moreover, 15–20% needed definitive pacing. A catheter-based procedure may be useful in treating AF recurrences and late ATs; however, despite a high early success rate, long-term results are poor. Finally, no clear demonstration has been provided of an improvement in terms of quality of life and survival.

In their Editorial, Auer and Brugada [16] underscore the need for reconsidering AF treatment associated with mitral valve surgery in patients with RHD. The need for persistent anticoagulation in patients with mechanical prosthesis; the high risk of severe procedure-associated complications; and, the high risk of recurrences and of late procedure-related arrhythmias make them conclude that "*clinical benefit of this procedure has to be more thoroughly assessed*".

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