Results of Cryoablation for Atrial Fibrillation Concomitant With Video-Assisted Minimally Invasive Mitral Valve Surgery

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Interest in minimally invasive video-assisted mitral valve surgery (MIMVS) is rapidly growing. Data on concomitant atrial fibrillation (AF) ablation to MIMVS are still lacking. The present study investigates the long-term results of AF cryoablation concomitant to MIMVS. From October 2006-September 2014, 68 patients with mitral valve disease (age 65.9 ± 11.1 years, 34 men out of 68 patients, Euroscore log 5.4 ± 4.5) and drug-resistant AF underwent MIMVS via right minithoracotomy and concomitant left-sided AF endocardial cryoablation (Cryoflex Medtronic, Minneapolis, MN). Patients were independently followed up by cardiological outpatient visits and underwent electrophysiological study when indicated. In total, 44 out of 68 patients (64.7%) underwent mitral valve repair and 8 patients (11.8%) also received concomitant tricuspid valve surgery. One procedure was electively converted to full sternotomy (1.5%). Total clamp time was 97.6 ± 22.8 minutes. In March 2015, 60 patients were alive and completed the follow-up after a mean of 3.4 ± 2.0 years following the procedure. In all, 48 patients (80%) presented sinus rhythm throughout the whole follow-up. Freedom from AF was respectively 95%, 87%, and 72% at 1, 3, and 5 years, respectively. We recorded 2 pacemaker implants (3.3%). A total of 3 patients suffered symptomatic recurrences (2 atypical atrial flutter and 1 atrial fibrillation) and underwent transcatheter ablation—all the 3 patients remained in stable sinus rhythm for the remaining follow-up. In conclusions, given the favorable long-term sinus rhythm maintenance rates of concomitant cryoablation, MIMVS can also be offered to patients with symptomatic AF. AF transcatheter ablation may easily avoid further symptomatic recurrences.

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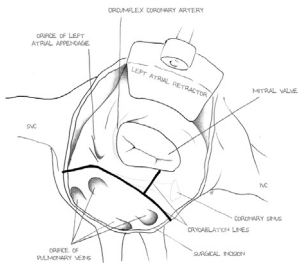
Keywords: atrial fibrillation, minimally invasive mitral valve surgery, surgical ablation, Cryoablation atrial



Cryoablation lesion set performed in the study population.

Central Message

Cryoablation concomitant to minimally invasive mitral valve surgery offers favorable long-term sinus rhythm maintenance rates.

Perspective Statement

Interest in minimally invasive mitral valve surgery (MIMVS) is rapidly growing, however data on long term results of concomitant AF ablation are still lacking. Cryoablation concomitant to MIMVS resulted to be highly effective in maintaining SR on long-term follow-up. Minimally invasive surgery can also be offered to symptomatic AF patients. AF transcather ablation may avoid recurrence.

INTRODUCTION

Interest in minimally invasive mitral valve surgery (MIMVS) through a video-assisted minithoracotomy approach is rapidly growing since when it was first introduced in the mid-1990s.[1] A number of large studies have demonstrated the feasibility of performing MIMVS aiming to achieve similar safety and efficacy to conventional surgery with the added advantages of reduced trauma, improved cosmesis, and shorter hospitalization.[2,3]

Atrial fibrillation (AF) is the most common cardiac arrhythmia observed in clinical practice and confers an increased incidence of thromboembolic events and mortality.[4] A substantial increase in the incidence of AF has been reported in patients with indications for mitral valve (MV) surgery, and it has also been demonstrated to be a profound risk factor for mortality.[5] The weight of this evidence has provided the impetus for the combination of surgical AF treatment and core cardiac surgical intervention, with the hope of synergistic improvements in both sinus rhythm (SR) maintenance and risk of morbidity and mortality.[6,7]

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Concomitant surgical AF ablation and MV surgery have proved to offer improved short-term and mid-term SR maintenance compared with patients undergoing MV surgery only. No differences were found between these 2 groups in terms of 30-day mortality, all-cause mortality, pacemaker (PM) implantation, stroke, and thromboembolic events.[8] The advent of alternative energy sources has greatly simplified the original "cut-and-sew" technique to create transmural lines transforming surgical ablation into an easier, safer and faster procedure to be associated to MIMVS.[9,10] Recently published guidelines have called for long-term follow-up studies on this topic.[11-14] However, data on follow-up after concomitant AF ablation to MIMVS are still missing. The present study investigates the long-term results of AF cryoablation concomitant to MIMVS.

MATERIALS AND METHODS

Since October 2006, MIMVS represents the standard approach to MV surgery in our unit. From October 2006-September 2014, out of 781 consecutive MIMVS, 68 patients with concomitant drug-resistant AF (13% paroxysmal and 87% persistent or long-standing persistent) underwent video-assisted MIMVS via right minithoracotomy through the fourth intercostal space and concomitant left-sided AF cryoablation (Cryoflex Medtronic, Minneapolis, MN). Each patient in our study signed a written informed consent to undergo surgical or

Table 1. Preoperative Characteristics of the Study Population Stratified by AF Relapses at Follow-Up. Values Reported as Counts and Percentage if not Differently Stated. *P* Value by Pearson Chi-Square/Fisher Exact Test or ANOVA.

	N = 68	AF Relapse (*N* = 12/68 17.6%)	SR Maintainance (*N* = 56/68 82.4%)	*P* Value
Age, y	65.9 ± 11.1	65.9 ± 7.2	65.2 ± 11.7	0.845
Male sex, *N* (%)	34 (50.0%)	3 (4.4%)	25 (36.8%)	0.086
NYHA class ≥III, *N* (%)	31 (45.6%)	11 (16.2%)	20 (29.4%)	**0.016**
Body surface area, mq	1.75 ± 0.31	1.71 ± 0.20	1.76 ± 0.34	0.627
Obesity (BMI > 30), *N* (%)	10 (14.7%)	2 (2.9%)	8 (11.8%)	0.611
Smoking, *N* (%)	18 (26.5%)	3 (4.4%)	15 (22.1%)	0.373
COPD, *N* (%)	4 (5.9%)	1 (1.5%)	3 (4.4%)	0.611
Hypercholesterolemia, *N* (%)	21 (30.9%)	7 (10.3%)	14 (20.6%)	0.110
Hypertension, *N* (%)	36 (52.9%)	9 (13.2%)	27 (39.7%)	0.373
Diabetes, *N* (%)	5 (7.4%)	0 (0.0%)	5 (7.4%)	0.269
Dysthyroidism, *N* (%)	8 (11.8%)	2 (2.9%)	6 (8.8%)	0.481
Previous cerebrovascular accidents, *N* (%)	6 (8.8%)	1 (1.5%)	5 (7.4%)	0.728
Type of atrial fibrillation				
Paroxysmal, *N* (%)	9 (13.2%)	1 (1.5%)	8 (11.8%)	**0.010**
Persitent/LS persistent, *N* (%)	59 (86.8%)	11 (16.1%)	48 (70.6%)	
Atrial fibrillation duration, d	787.3 ± 1082.2	943.4 ± 1173.3	745.7 ± 1066.8	0.579
Left ventricular ejection fraction	56.5 ± 10.4	55.6 ± 7.5	56.7 ± 11.1	0.774
Etiology of MV disease				
Degenerative	37 (54.4%)	5 (7.4%)	32 (47.1%)	0.575
Rheumatic	16 (23.5%)	5 (7.4%)	11 (16.2%)	
Functional	15 (22.1%)	2 (2.9%)	13 (19.1%)	
Left atrial AP diameter, mm	53.1 ± 10.1	53.2 ± 9.6	53.1 ± 10.5	0.985
Left atrial SI diameter, mm	65.3 ± 9.7	61.7 ± 14.8	66.5 ± 7.7	0.301
TV regurgitation > 2+/4+	16 (23.5%)	3 (4.4%)	13 (19.1%)	0.142
PAPs, mmHg	45.4 ± 13.8	40.3 ± 10.6	47.3 ± 14.5	0.152
EuroSCORE log	5.4 ± 4.5	4.7 ± 2.1	5.4 ± 4.2	0.176

AP, anteroposterior; BMI, body mass index; COPD, chronic obstructive pulmonary disease; LS, long-standing; MV, mitral valve; NYHA, New York Heart Association functional class; PAPs, systolic pulmonary artery pressure; SI, superoinferior; TV, tricuspid valve.
Bold values are significant values if $p < 0.05$