Radiofrequency ablation for atrial fibrillation as an associated procedure with mitral valve surgery

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Introduction

Atrial fibrillation (AF) is linked to a lower chance of survival and a higher chance of having a stroke. Patients seeking mitral valve surgery have an incidence rate of 30–50%. After mitral valve surgery, only 10% of individuals get spontaneous sinus rhythm return. The current gold standard treatment for AF control is Cox-Maze III, but its degree of intricacy prevents it from being used widely. The advent of innovative tissue-ablation methods [such as radiofrequency (RF) ablation and cryoablation] and newer insights into the pathophysiological processes of AF have prompted repeated attempts to ablate AF during cardiac surgery. Both unipolar and bipolar energy sources have been used to introduce more straightforward techniques. Each of them has a unique set of benefits and disadvantages. Some of the drawbacks of unipolar RF ablation may be solved by bipolar RF ablation. In patients with paroxysmal, persistent, or permanently AF and mitral valve disease who needed surgical treatment, this study attempted to assess the clinical outcomes of adding RF modified-Maze surgery (using the Medtronic Cardioblate Surgical Ablation System) to the standard surgical care.

Patients and methods

A total of 38 patients with mostly rheumatic pathology were included in a prospective, multicenter, 6-month follow-up cohort research between November 2016 and November 2019. Only two patients had mitral valve repairs. The majority of patients (94%) required mitral valve replacement, either alone or in conjunction with other valve or coronary artery bypass surgeries. All patients had a modified-Maze technique employing a bipolar RF ablation device. The equipment was the Cardioblate BP2 irrigated RF surgical ablation system from Medtronic. The RF radiation was applied following the manufacturer's instructions. A single burn was defined as the application of RF energy to tissue up to the energy generator showed the creation of a lesion (a 'transmural' indication light/label appeared on the generator display). Before administering a burn, the clamp irrigation was evaluated in accordance with manufacturer recommendations. Before continuing with additional ablation, the ablation clamp jaws were cleaned of char and blood residue after each lesion. To ensure transmurality, the same spot received two applications of the clamp. For the purpose of restoring sinus rhythm, patients were monitored.

Results

In our study, the use of this technique resulted in sinus rhythm restoration in 60.5% during the early postoperative period, whereas 34.2% had episodes of paroxysmal AF and 18.4% showed restoration of sinus rhythm later on during the follow-up period of 24±2 weeks, including two (5.3%) patients with permanent pacemaker with atrial capturing and those who received cardioversions after recorded arrhythmias during follow-up with a total number of 30 (78.9%) patients who showed restoration of sinus rhythm.

Conclusion

Despite Cox-Maze procedure being the gold standard for AF ablation, left-sided RF Maze procedure is potentially an easier, practical, and promising procedure with comparable results. However, while performing this surgery, care must be exercised with patients who have left atrial hypertrophy and protracted AF. No clear cut-off numbers can be set yet owing to the small sample size in this study. Modification of the lesion sets and techniques are yet to be investigated to arrive at the best technique for ablation with reproducible results. With the current technological advances, devices that would ensure transmural lesions and simple techniques are needed.

Keywords:
ablation, atrial fibrillation, radiofrequency

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Introduction

Atrial fibrillation (AF), which affects 30–50% of patients undergoing mitral-valve surgery, is linked to a decreased chance of survival and an increased risk of stroke. Only 10% of individuals having mitral valve surgery get spontaneous sinus rhythm recovery [1]. The risk of systemic embolization, exercise tolerance, and long-term mortality are all elevated when AF persists following surgery [2]. The development of open surgical techniques for AF ablation has resulted in its widespread use during cardiac surgery. Their safety and efficacy, however, have not yet been thoroughly shown. Successful ablation in individuals with prior persistent or long-standing persistent AF having mitral-valve surgery is predicted to enhance long-term results. An intricate surgical treatment for the management of AF is the Cox-Maze III surgery. The 1992 treatment, which includes making a 'Maze' of surgical incisions in both the right and left atria, is intended to stop the spread of the macro-reentrant circuits that are considered to be the cause of AF. The advent of various tissue-ablation methods [such as radiofrequency (RF) ablation and cryoablation] and newer understandings of the pathophysiological principles behind AF have prompted repeated attempts to ablate AF during cardiac surgery [3].

The Cox-Maze approach did not become widely used despite its effectiveness. Owing to its intricacy, technical difficulty, and related hazards, few cardiac surgeons were ready to add the surgery to coronary revascularization or valve treatments. Groups all around the world have substituted straight lines of ablation for the usual cut-and-sew Cox-Maze incisions to streamline the process and make it more practical for the common surgeon. High-intensity focused ultrasound, cryoablation, RF radiation, and microwave energy are some of the energy sources employed to form these ablation lines [4].

The different technologies may be divided into two main categories: those that employ a bipolar clamp and those that use a unipolar energy source. Cryoablation, unipolar RF energy, and high-intensity focused ultrasound are examples of unipolar energy sources that emit either heat or cold from a single source. When an ablation causes a transmural lesion, the unipolar devices cannot consistently inform the surgeon when it has occurred. Owing to the fact that the majority of these ablation devices were licensed for clinical use without dose-response testing, they occasionally cause collateral cardiac damage and further cardiac damage [5,6].

Additionally, the fixed depth of penetration of these energy sources makes their application from the epicardial surface of the beating heart or in pathologically thickened atria difficult [7]. Some of these drawbacks have been solved by bipolar RF ablation [8]. The energy is focused and causes distinct lesions because it is applied between two electrodes that are tightly spaced and placed in a clamp device's jaw. Collateral or further cardiac injury is less likely as the energy is contained inside the clamp's jaws. The restriction of employing these tools is that they can only remove tissue that can be clamped inside the tool's jaws. This has reduced the possibility of lesion sets, especially in the heart that is beating. To execute a full Cox-Maze III lesion set, these devices needed supplementary unipolar ablation as they were unable to completely ablate the right and left atrium isthmus [9]. Despite significant drawbacks, the introduction of these novel ablation technologies has helped the surgical treatment of AF by facilitating performance among general cardiac surgeons of a time-consuming and technically challenging procedure. It has been demonstrated that reproducing the whole Cox-Maze lesion set with linear lines of ablation is both technically possible and clinically successful. AF surgical ablation has gained widespread acceptance. However, there is little proof of its usefulness and safety.

In patients with paroxysmal, chronic, or permanent AF and mitral valve disease who need surgical therapy, the aim of this clinical research was to assess the clinical effects of combining RF modified-Maze surgery with routine surgical care.

The lack of remissions after 6 months and conversion to a normal sinus rhythm (NSR) are indicators of the device's effectiveness. Atrial capture combined with atrial pacing is also regarded as successful. Other outcomes, like as mortality and thromboembolic events, need to be evaluated in patients transitioned to NSR.

Patients and methods

A multicenter prospective cohort research design was used in this study. Both the local research ethics committee and the Cardiothoracic Department at Ain Shams University gave its approval.

Written informed consent was obtained from the patients. The study was approved by the Department of surgery, Faculty of Medicine, Ain Shams University.

The patients were recruited in the research between November 2016 and November 2019. At the Cleveland Clinic-affiliated Dar Al-Fouad Hospital Private Hospital, Ain Shams Cardiac Academy Hospital, and Ain Shams University Specialized Hospital, patients

had mitral valve surgery in addition to RF ablation. The following inclusion and exclusion criteria were applied to determine if a participant was eligible for this research (Table 1).

In the presence of epicardial fat and for the lines to the mitral valve annulus, a bipolar device with a 'double ablation' pattern was used for the left atrial ablation pattern. The left pulmonary vein to atrial appendage line, the mitral annulus to pulmonary vein line, the right pulmonary vein to atrial appendage line, and the linking line between the left and right pulmonary veins were all part of the ablation scheme of the left atrium. A transverse ablation line was constructed across the free wall of the right atrium (isolating the right atrial appendage). Excision of the left atrial appendage has been shown to improve left atrial contraction recovery as well as SR conversion. In most cases, biological valves were used.

The traditional median sternotomy with aortic and bicaval cannulation was performed on all patients. Following the start of cardiopulmonary bypass (CPB), the left atrial appendage and both pulmonary veins were isolated.

The equipment was the Cardioblate BP2 irrigated RF surgical ablation system from Medtronic. The RF radiation was applied following the manufacturer's instructions. When RF energy is delivered to tissue, a burn is considered to have occurred when the energy generator shows that a lesion has been made (a 'transmural' indication light or label appears on the generator display). Before administering a burn, the clamp irrigation was evaluated in accordance with manufacturer's recommendations. The ablation clamp jaws were cleaned of char and blood after each lesion to prepare for the next ablation. To guarantee transmurality, the clamp was applied twice at the same spot.

Table 1 Inclusion and exclusion criteria

Exclusion criteria	Inclusion criteria
Patients had previous surgery	Age between 18 and 75 years
Patients had pericardial adhesions	Planned for mitral valve surgery
Patients in AF with no organic heart disease	Ventricular ejection fraction greater than 20%
Patients who had undergone a prior ablation procedure for AF	Paroxysmal AF by history
	Permanent or persistent AF lasting more than 6 months
	Agreeing to participate in the study

Bipolar equipment was used to execute bilateral pulmonary vein isolations on beating hearts while using CPB. The left atrial wall was clamped from the right-sided left atriotomy to the mitral annulus to create a connecting line after the aorta had been cross-clamped, with the jaw clearly holding the posterior mitral annulus. The left atrium appendage was removed and overstitched. At the conclusion of the bypass, a transverse ablation line was drawn across the base of the right atrial appendage to isolate it. When necessary, cardioversion was carried out after the cross-clamp was removed.

An intensive rhythm control method was given to the patients. All patients received amiodarone, beginning intraoperatively at 300 mg and continuing postoperatively in the ICU at 900 mg over a 24-h period, unless contraindicated. Antiarrhythmic treatment was given to patients for a minimum of 3 months. After a 24-h Holter tape has ruled out asymptomatic AF in patients with no history of postoperative palpitations or an event monitor has demonstrated absence of AF in patients with a history of postoperative palpitations, antiarrhythmic medications were stopped if patients are in stable SR for 3 months.

All patients received anticoagulant medication (warfarin) for a minimum of 3 months.

Clinical results were evaluated upon discharge, 3 months later, and 6 months following surgery. ECGs were also recovered. A 6-month follow-up echocardiogram was conducted.

Statistical Package for the Social Sciences was used to update, code, tabulate, and add data to a computer (SPSS 15.0.1 for Windows, 2001; SPSS Inc., Chicago, Illinois, USA). For quantitative parametric data, the data were displayed as mean and SD, and for quantitative nonparametric data, median and interquartile range. Quantitative data were presented using frequency and percentage. In line with the type of data acquired, appropriate analysis was conducted. To examine quantitative data, Student t or Mann–Whitney tests were used, whereas χ^2 and Fisher exact tests were used to assess qualitative data.

Results

A total of 38 patients who underwent mitral valve surgery at Dar Al-Fouad Hospital and Ain Shams University Hospitals throughout the research period matched our inclusion criteria and had complete follow-up information were included in this research study. Their mean age was 46.0 13.3 years. Overall, 22

(58%) patients and 25 (66%) had rheumatic mitral valve disease and pulmonary hypertension, respectively. The average PAP was 48.1 8.7 mmHg. There were no patients in New York Heart Association (NYHA) Class IV. Only two individuals had congestive heart failure, and six patients also had concurrent coronary artery disease (Tables 2 and 3).

Table 2 Patient characteristics and preoperative variable

Patients number	*N*=38
Age (years) (mean±SD)	46.0±13.3
Sex [*n* (%)]	
Male	20 (52.6)
Female	18 (47.4)
BMI (mean±SD)	24.6±9.5
Persistent atrial fibrillation [*n* (%)]	38 (100)
NYHA class [*n* (%)]	
Class II	12 (31.6)
Class III	26 (68.4)
CHF [*n* (%)]	2 (5.3)
HTN [*n* (%)]	14 (36.8)
CAD [*n* (%)]	6 (15.8)
RHD [*n* (%)]	22 (57.9)
P. HTN [*n* (%)]	25 (65.8)
Antiarrhythmic medications [*n* (%)]	
Bisoprolol	13 (34.2)
Digoxin	25 (65.8)
Anticoagulants [*n* (%)]	
Warfarin	38 (100)
Mitral stenosis[*n* (%)]	30 (78.9)
Mitral regurgitation[*n* (%)]	33 (86.8)
EF % (mean±SD)	55.5±6.7
LAD (mean±SD)	53.8±6.6
PAP (mean±SD)	48.1±8.7

CHF, congestive heart failure; NYHA, New York Heart Association.

Table 3 Operative details

Variables	*N*=38
CPB time (min)	
Mean±SD	103.5±21.5
ACC time (min)	
Mean±SD	62.9±10.7
MVR	
n (%)	36 (94.7)
Type of valve [*n* (%)]	
Mechanical	11 (28.9)
Tissue	25 (65.8)
Mitral valve repair	
n (%)	2 (5.3)
Concomitant CABG	
n (%)	6 (15.8)
Concomitant tricuspid	
n (%)	8 (21.1)
Cardioversion required after cross-clamp	
n (%)	32 (84.2)
Total ablation time	
Mean±SD	21.5±3.1

CPB, cardiopulmonary bypass.

The mean bypass time was 103.5 min with the aortic clamp time of around 63 min. A total of 36 (66%) patients had mitral valve replacements, mostly biological tissue valves. Six patients had concomitant coronary bypass surgery and eight have had additional tricuspid valve procedure. Overall, 32 patients required cardioversion after cross-clamp. The average ablation time was about 22 min.

The mean follow-up time was 24 weeks. A total of 30 patients were successfully converted to sinus rhythm, including those with pacemaker with atrial capturing. Two patients required placement of a permanent pacemaker. Immediate sinus rhythm restoration was recorded in 23 patients and other 15 patients experienced different types of arrhythmias, two patients had heart block and were kept on pacemaker, and other 13 patients received cardioversion, where five of them showed restoration of sinus rhythm during the follow-up period (Table 4).

Table 4 Postoperative data among the participants

Variables	*N*=38
Follow-up duration (weeks)	
Mean±SD	24±2
Pacemaker	
n (%)	2 (5.2)
Arrhythmia	
n (%)	15 (39.5)
Duration of onset of arrhythmia (weeks)	
Mean±SD	1±0.5
Type of arrhythmia	
AF, *n* (%)	10 (26.3)
Atrial flutter, *n* (%)	3 (7.9)
3rd degree heart block, *n* (%)	2 (5.2)
Pt. received cardioversions	
n (%)	13 (34.2)
Pt. returned to NSR after cardioversion	
n (%)	5 (13.2)
Atrial contraction associated with conversion to NSR	
+ve, *n* (%)	30 (78.9)
The effectiveness of atrial contraction of transmitral flow	
+ve, *n* (%)	30 (78.9)
NYHA Class [*n* (%)]	
Class I	23 (60.5)
Class II	15 (39.5)
Conversion to SR (including those with pacemaker with atrial capturing)	
n (%)	30 (78.9)
Remained in permanent AF	
n (%)	8 (21.1)
Episodes of paroxysmal AF	
n (%)	13 (34.2)
Duration of onset of episodes of paroxysmal (weeks)	
Mean±SD	4±2

NSR, normal sinus rhythm; NYHA, New York Heart Association.

Discussion

AF is a frequent arrhythmia, with a prevalence of morbidity and death [10]. The most frequent cause of AF in our institution is valve disease, which is a problem that assumes greater significance, because the resulting increased burden of morbidity and mortality affects a relatively younger population. This is owing to the high prevalence of rheumatic heart disease in our institution. As people get older, AF is more common in those with rheumatic mitral valve disease. Individuals with AF are at a higher NYHA class, have more severe left ventricular dysfunction, and have larger left atrial enlargement when compared with patients with mitral valve disease who do not have AF. The most damaged valve in these individuals is the mitral valve. Overall, 70% of the valve heart disease associated with AF is caused by mitral stenosis, mitral regurgitation, and tricuspid regurgitation. In an Echo Doppler investigation, Diker *et al.* [11], discovered that just 1% of patients with aortic valvular disease had AF, compared with 29% of patients with isolated mitral stenosis, 16% with isolated mitral regurgitation, and 52% with combined mitral stenosis and regurgitation.

The 38 patients in this research had a mean age of 46 years and a prevalence of rheumatic valve disease of 57.9%, which accounts for the somewhat lower mean age. All of these patients had chronic AF, and 68.4% of them had poorer functional classes than NYHA Class III – two of whom had congestive heart failure. All patients with a history of persistent AF who were scheduled for mitral valve surgery for mitral regurgitation (rheumatic, degenerative, or ischemic) or mitral stenosis (rheumatic) were also scheduled for AF surgery, with patients chosen in accordance with the inclusion criteria of the study. When compared with earlier studies that found that severely dilated left atria more than 80 mm were a significant predictor of AF recurrence postablation, the patients' mean left atrial diameter was 53 ± 6.6 mm [10].

The Maze approach was first used to treat AF surgically, and it has now become the industry standard (AF) [12]. Despite having outstanding outcomes, with more than 90% of patients being AF free, the operation was initially not widely used owing to its complexity and accompanying morbidity [13]. The Maze process has increased in popularity as additional ablative energy sources have become accessible [14]. To prevent coronary artery damage, a unipolar device is preferable for mitral and tricuspid annulus lesion sets when using a radiofrequency ablation (RFA) device. However, a unipolar device might result in partial transmurality, spread thermal damage, and take more time [15].

In this study, right atrial appendage isolation was performed at the conclusion of bypass, with a mean CPB of 103.5 21.5 min. Bipolar clamps were used to ensure transmural left atrial lesions were set while also isolating the left atrial appendage and bilateral pulmonary veins on CPB before applying an aortic cross-clamp and the mitral line. The average ACC duration was 62.910.7 min, whereas the average ablation duration was 21.53.1 min.

In accordance with their wishes, patients who were females in the childbearing stage and older patients who were concerned about the negative effects of anticoagulation and the likelihood of regaining a NSR through ablation had valve replacement with biological valves.

The Maze treatment was formerly thought to treat AF by isolating the posterior left atrium, which includes all four pulmonary veins, and making many incisions in the right and left atria. There has not been any conclusive proof that all the incisions are necessary to cure AF, even though the labyrinth treatment cured AF in the great majority of patients, and that not all the incisions are needed necessary for ending AF in every single patient. In patients with persistent AF, Sueda *et al.* [16] merely isolated the posterior left atrium without making any incisions in the right atrium and discovered that 74% of the patients were free of AF throughout a follow-up period of up to 3 years [16].

Melo *et al.* [17] adapted the treatment to patients with persistent AF and even further simplified it by isolating the right and left pulmonary veins. Overall, 64% of the patients were in sinus rhythm during the course of a 3–6-month follow-up [17].

Although such streamlined treatments had a lower success rate for AF than the Maze technique, they had the advantage of minimizing surgical blood loss, cardiac arrest rates, and procedure time frames. In 2008, Benussi *et al.* [18] used a single bipolar RF device to demonstrate a full left atrial ablation, with good clinical mid-term outcomes. At 6 months and 1 year, 84 and 81% of people were free from AF, respectively [18].

In our study, the use of this technique led to the restoration of sinus rhythm in 60.5% of patients during the immediate postoperative period, whereas 34.2% experienced episodes of paroxysmal AF, and 18.4% later during the 24- and 2-week follow-up period, including two (5.3%) patients with permanent pacemakers with atrial capturing, which is regarded as a success according to protocol, and those who

underwent cardioversions after recording arrhythmia during follow-up (78.9%). Early postablation arrhythmia results from atrial lesions that took longer to heal than expected, an inflammatory reaction to the surgery, and very little macroreentry that completely reacted to the antiarrhythmic medication amiodarone. The NYHA class improved (functional improvement), and there were no postoperative cerebrovascular events or postoperative deaths throughout the observation period. Preoperative and postoperative Echo data differed statistically significantly, necessitating additional analysis. With the restoration of sinus rhythm, functional atrial contraction was restored in every patient.

We discovered that the outcomes of other investigations agreed with our own. Chiappini *et al*. [19], conducted a meta-analysis and found 6 non-randomized trials with 451 patients with AF receiving concurrent RFA and cardiac surgery. At a mean follow-up of 13.8 months, the overall survival rate was 97.1, and 76% of patients were AF free [19].

Biatrial, left atrial, and pulmonary vein isolation Maze treatments were compared with a control no-Maze group by Srivastava *et al.* [20]. At 6 months, the Maze treatments had an excellent success rate (over 50%) for SR maintenance. There was no statistically significant difference across the various Maze techniques; however, the SR conversion rate for biatrial, left atrial, and pulmonary vein isolation Maze was statistically significant when compared with the control group (P=0.001). For the Maze process, an additional cross-clamp operation took an average of 5–7 min [20].

In patients with chronic or permanent AF, Von Oppell *et al.* [13] compared those having Cardioblate RF ablation and concurrent surgery with those undergoing cardiac surgery alone. At 1 year, Cardioblate ablation restored SR substantially more often (75 vs. 39%, P=0.019). For Cardioblate surgeries, a cross-clamp and bypass procedure added an average of 30 min to the operating time. According to the authors, after performing the first six cases with bipolar-only ablation, it was challenging to guarantee a confluent ablation line between the left pulmonary veins and the annuli of the mitral and tricuspid valves with the bipolar device alone without possibly damaging coronary arteries. Then, for these lines, a monopolar pen was employed.

The use of Cobra RF ablation on patients with AF having concurrent cardiac surgery was investigated by Raman *et al.* [21] and Benussi *et al.* [14]. In his study of 132 individuals with various types of AF in 20 centers, Raman and colleagues discovered that the rates of SR maintenance were 84% at 3 months (72 of 87), 90% at 6 months (45 of 50), and 100% at 12 months (but only n=12). Extra cross-clamp time of 12–14 min was needed for these operations. Comparatively, Benussi evaluated 90 patients with persistent or resistant AF and found that 79% of them were still in SR at 3 months, 87% at 6 months, and 89% at a year. Conclusions derived from these success rates may not be trustworthy despite the high success rate appearing to be the case owing to the poor follow-up rates (50% at 12 months).

The study by Onorati *et al.* [22] concentrated on patients with heart failure undergoing RF ablation and mitral surgery. At 6, 12, and 18 months, the SR prevalence was good at 74, 64, and 64%, respectively. They demonstrated a connection between treating cardiac failure and recovering SR. Overall, 94% of patients with SR were free from congestive heart failure, compared with 69% of patients with AF (P=0.018). When patients with SR were compared with patients with AF at 6 months (1.4 vs. 2.7) and 18 months (1.2 vs 1.9, P=0.0001), the NYHA class was also improved [22].

Retrospective comparisons between Cobra endocardial and epicardial monopolar RF ablation and bipolar ablation were made by Martìn-Suàrez *et al.* [15]. When compared with epicardial monopolar ablation, the overall incidence of SR was greater using endocardial monopolar ablation or bipolar RF ablation (P=0.01). Bipolar ablation significantly increased overall independence from AF compared with either monopolar endocardial or epicardial ablation (P=0.01) [15].

Bipolar RF ablation from Atricure (West Chester, Ohio, USA) was used by Gillinov *et al.* [23] on patients with permanent, chronic, and paroxysmal AF who were undergoing concurrent cardiac surgery. Using ECG follow-up at 1, 3, and 12 months, AF recurrence was evaluated. The prevalence of AF reached a high at 38% two weeks after surgery. The prevalence rose to 16% at 1 year after falling to 13% at 6 months. In contrast, Geidel *et al.* [24] used a longer follow-up but achieved identical outcomes using either Cobra monopolar or Atricure bipolar RF ablation only on patients with persistent AF. The SR conversion rate was 73 and 77% at 3 and 30 months, respectively. At 30 months, there was a 96% survival rate. Bipolar ablation took less time than monopolar ablation for both the ablation itself and the entire process. Owing to the quicker technique, the potential to forgo doing a traditional left atriotomy, and a higher assurance of transmurality, the authors strongly advise bipolar RF.

At 3, 6, and 12 months, the research by Tekumit *et al*. [25] revealed that SR conversion rates were 75, 78, and 79%, respectively. They came to the conclusion that the left atrium bipolar RFA did not considerably lengthen the cardiac bypass period and that there were no notable procedural problems. They also proposed that partial lesions, rather than the conventional Cox-Maze III full lesions, would still be useful in the management of AF. According to Benussi *et al*. [18], performing the mitral line with bipolar RFA is risk free and economical. The bipolar RFA group was compared with a control group that had mitral line surgery using unipolar RFA. The SR recovery rate was not significantly different; however, there was a substantial cost difference (the cost of the ablation devices per patient in the control group was &z.euro;2403 compared with &z.euro;1245 in the research group; *P*=0.0001).

In a prospective study by Lin *et al*. [26], patients were randomized to receive MW (*n*=94) or RF (n=93) ablation. There was a substantial difference in the percentage of patients still in SR at every follow-up time point, from discharge to 24 months, favoring RF ablation over MW ablation. According to the authors, the lower success rates of MW compared with RF ablation may have been caused by transmurality ambiguity and the continuation of the lesions.

Although using such a strategy in patients with rheumatic valvular illness and AF has not been extensively studied, 57.9% of patients in our research had rheumatic valve disease.

Limitations of the study

The current study has a number of limitations that should be taken into account, including the small sample size owing to the few resources and the possibility that surveillance electrocardiography may miss an AF recurrence that occurs between clinical follow-up visits. Therefore, it is possible to overestimate the genuine rate of AF recurrence in this patient sample. Additionally, many of our patients kept using antiarrhythmic medications (including amiodarone). As none of the patients received a postoperative electrophysiologic test, the precise reason why each patient's AF recurred is unknown. Without such an examination, it is impossible to determine the cause and location of failures such conduction gaps or unsuccessful interruptions of reentry.

Conclusion

Even though the Cox-Maze treatment is still the gold standard for AF ablation, the left-sided RF Maze approach is significantly simpler, more useful, and has great promise for producing outcomes that are on par with the Cox-Maze procedure. While performing this surgery, care must be exercised with patients who have left atrial hypertrophy and protracted AF. The small sample size in this study made it impossible to establish precise cutoff values. Modification of lesion sets and techniques are yet to be investigated to arrive at the best technique for ablation with reproducible results. With the current technology advances, devices that would ensure transmural lesions in a relatively simple technique are needed.

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Conflicts of interest

There are no conflicts of interest.

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