

Freedom from atrial arrhythmias after classic maze III surgery: A 10-year experience

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See related editorial on page 1253.

Objectives: We studied the persistence of favorable outcome, the occurrence of new atrial arrhythmias, and sinus node dysfunction in patients who underwent the maze III procedure.

Methods: Preoperative, in-hospital, and follow-up data of 203 patients who underwent the maze III procedure between June 1993 and June 2003 were collected. A total of 139 patients underwent the maze procedure for lone atrial fibrillation, and 64 patients underwent the maze procedure and concomitant cardiac surgery.

Results: There was no 30-day postoperative mortality. During a mean follow-up of 4.0 ± 2.6 years, 12 patients (6%) died (2 cardiac related). At the end of follow-up, freedom from supraventricular arrhythmias was 80% for the lone atrial fibrillation group and 64% for the concomitant atrial fibrillation group. Freedom from stroke during follow-up was 100% in the lone atrial fibrillation group and 97% in the concomitant group. Multivariate analysis revealed that rhythm at 1-year follow-up ($P < .001$; odds ratio 9.56, 95% confidence limits 3.92-23.31) and preoperative left atrium dimension ($P = .028$; odds ratio 1.06 for every millimeter, 95% confidence limits 1.01-1.12) were predictors of success at the end of follow-up.

Conclusions: This study shows that the favorable results of the maze III procedure in terms of freedom from supraventricular arrhythmias persist in most patients for at least 4 years.

The unmodified maze III operation is considered the most successful design for exclusion, and channeling of left atrial (LA) and right atrial (RA) areas to eliminate atrial fibrillation (AF) resulting from random reentry or initiated by rapidly firing foci.^{1,2} The surgically created pathways preclude AF, preserve sinus node function, and maintain atrial contraction and filling in the majority of patients who undergo the procedure. The avoidance of intraoperative mapping of atrial arrhythmias is a clear advantage.

Since 1990, many reports have addressed the favorable effects of maze III surgery in patients undergoing concomitant cardiac surgery, predominantly mitral valve surgery.³⁻¹⁰ However, there are few reports focusing on maze III surgery performed exclusively for symptomatic and drug-refractory AF without detectable cause (lone AF).^{4,6,11,12}

The results of percutaneous methods to abolish AF with radiofrequency or ice-cooled catheter ablation techniques, of which the design and landmarks frequently mimic those of the maze III surgery, are improving.^{2,13,14} Until now it is unclear how to identify patients with AF who most profit from the various non-pharmacologic AF therapies. Thus far, patients treated with catheter ablation have predominantly paroxysmal AF (PAF). Despite the absence of associated cardiac

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J Thorac Cardiovasc Surg 2006;132:1433-40
0022-5223/\$32.00

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doi:10.1016/j.jtcvs.2006.06.048

Abbreviations and Acronyms

AF	= atrial fibrillation
AFL	= atrial flutter
AV	= atrioventricular
CAF	= chronic atrial fibrillation
CL	= confidence limit
CVA	= cerebrovascular accident
LA	= left atrial
OR	= odds ratio
PAF	= paroxysmal atrial fibrillation
RA	= right atrial

disease, smaller left atria, and shorter follow-up, the success rate cannot match that of maze surgery.

Our 10-year experience with maze III surgery enabled us to determine whether the initially favorable effects of this surgery continue in the long term. For this reason we performed a single-center outcome study to define the predictors of long-term AF suppression and to evaluate the maintenance of normal sinus node function and freedom from other supraventricular arrhythmias.

Materials and Methods**Inclusion for Maze Surgery**

Patients with symptomatic PAF or chronic AF (CAF) were offered maze III surgery. AF was classified as paroxysmal if spontaneous episodes of sinus rhythm intervened with bouts of AF. AF without documented sinus rhythm for more than 1 week was classified as CAF. The classification of persistent and permanent AF could not be applied because this surgery was first performed in 1993, whereas the AF classification was established later.¹⁵ In the lone AF group, failure of more than 3 antiarrhythmic drugs and more than 1 attempted DC cardioversion were required before acceptance for surgery. In the concomitant AF group, these criteria were not a prerequisite for cardiac surgery. Reasons to exclude patients from maze surgery were documented incompetent sinus node,¹² LA diameter greater than 90 mm,¹⁶ impaired left and/or right ventricular function,¹⁷ and calcified LA wall. Previous failed radiofrequency catheter ablation of the atria to eradicate AF was no reason to exclude a patient from maze surgery. Verbal consent for surgery was obtained after extensive oral information about the surgery and its alternatives was given.

Preoperative Studies

The years of presence of PAF or CAF were determined. The number of failed antiarrhythmic drugs and DC cardioversions were noted. Standard electrocardiogram, 2-channel Holter recordings, and bicycle stress testing were used to document AF and to exclude sinus node disease and abnormal cardiac conduction. Two-dimensional and pulsed-wave Doppler echocardiographic studies were performed to measure cardiac chamber size and function and to diagnose structural cardiac disease. Left and right-sided heart catheterization and coronary angiographies were performed to identify abnormalities.

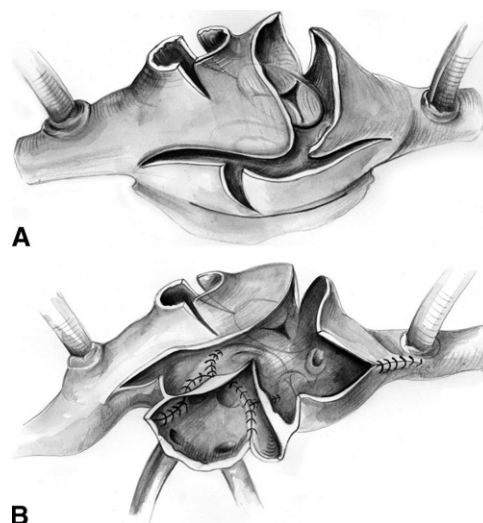


Figure 1. Unmodified maze III procedure. A, Incisions on the right atrium. Amputation of the right auricle and from this opening 2 perpendicular incisions, 1 in the free wall and 1 toward the tricuspid annulus, where a cryolesion is placed at the annulus. A longitudinal atriotomy lateral in the superior caval vein extends to the inferior caval vein. A perpendicular incision from the longitudinal incision to the tricuspid annulus, where a second cryolesion is placed. An incision is placed in the septum. B, Incisions on the left atrium. Amputation of the left auricle. The pulmonary veins are separated from the remainder to the heart in a button. Two connecting lesions from the button are made: 1 to the left auricle and 1 to the mitral valve. One cryolesion is placed at the mitral annulus and one at the coronary sinus, which is exposed through this last incision.

Surgical Procedure

The maze III operation was carried out as described in the initial reports¹⁸ and as mentioned before by our group (Figure 1).¹²

Postoperative Methods

Antiarrhythmic drugs were administered if AF persisted more than 12 hours. Electrical cardioversion was carried out if antiarrhythmic drugs failed. The temporary epicardial pacemaker wires served to pace in case of bradycardia, to diagnose postoperative arrhythmias and, in subgroups, to attempt to induce AF. If sinus node function failed after more than 14 days postsurgery, a rate-responsive atrioventricular (AV) pacemaker was implanted.

Follow-up Studies

The majority of patients who underwent surgery for lone AF were followed at our own outpatient department at 6 weeks, 3 and 6 months, and then annually. Patients were asked about palpitations, symptoms of cerebrovascular accidents (CVAs), and daily lifestyle and exercise tolerance. Holter monitoring and bicycle stress testing¹⁹ were performed (systematically at our own institution for approximately half of the series and sporadically at other institutions) to detect atrial arrhythmias and sinus node incompetence. Echocardiographic studies were performed. Most of the patients who underwent surgery for concomitant AF were followed by the

referring cardiologist, who was responsible for the timing and examinations of the follow-up.

Collection of Data

The inpatient and outpatient clinic files were searched for baseline, 1-year follow-up, and end of follow-up data. If data were incomplete, questions about follow-up were mailed to the referring cardiologist for the completion of latest follow-up data. If the investigators were not able to procure recent or complete information, the general practitioner was also consulted. As a last resort, the patients were contacted by phone. This was the case for only 5 patients. For the patients who most recently underwent operation, we only accepted a follow-up of at least 6 months. Follow-up was gathered from December 1, 2003, to March 31, 2004.

Variables Studied During Follow-up

The time and reason of death were noted. Rhythm was documented at every contact with the patient. Echocardiographic data were examined at 1 year and at the end of follow-up, including LA diameter (long axis) in the parasternal view, largest RA diameter, grade of mitral valve regurgitation, and left ventricular ejection fraction. The reason for pacemaker implantation and occurrence of CVA and transient ischemic attack were noted. The use of oral anticoagulation and antiarrhythmic drugs was studied. Antiarrhythmic drugs included all beta-blockers and calcium antagonists prescribed as antihypertensive treatment but with a possible heart rate-slowing effect. Postoperative occurrence of congestive heart failure, onset of valvular pathology, and DC cardioversion were noted.

Definitions

All foramen ovale or atrial septal defect closures without a patch were considered to be found coincidentally and categorized as "lone AF surgery." All atrial septal defects requiring a patch were considered to be a separate cardiac abnormality and qualified as "concomitant AF surgery."

A regular atrial rhythm less than 100 beats/min at rest was labeled as normal sinus rhythm. Whenever AF occurred, the patient was categorized as having AF. All runs of 3 or more atrial beats were categorized as supraventricular tachycardia.

Success was labeled as the absence of symptomatic or asymptomatic AF, atrial flutter (AFL), and other atrial tachyarrhythmias more than 6 months after surgery. Implantation of a pacemaker for incompetent sinus node function or AV block did not rule out "success."

Failure was defined as symptomatic or asymptomatic AF, AFL, and other atrial tachyarrhythmias occurring more than 6 months after surgery. Pacing after His bundle ablation for intractable atrial arrhythmias was also categorized as a failure.

Statistical Analysis

All values are expressed as mean \pm standard deviation. For hypothesis testing in categorical variables, the Fisher exact test was used. For normally distributed data, a paired or an unpaired *t* test was used. Non-normally distributed data were compared by the Mann-Whitney *U* test. Kaplan-Meier curves for freedom from AF could not be constructed because the precise time of AF recurrence after the operation could often not be determined. A multivariate

analysis was carried out with the use of logistic regression to determine factors influencing surgical success (see definition) more than 1 year after surgery. The following factors were considered: age, type of preoperative AF, preoperative duration of AF longer or less than 5 years, preoperative CVA or transient ischemic attack, history of preoperative radiofrequency ablation, concomitant procedure or not, aortic crossclamp and cardiopulmonary bypass time, and highest degree of postoperative AV block. All calculations were performed with SAS v 8.2 (SAS Inc, Cary, NC).

Results

Preoperative Data

Between June 1993 and June 2003, 203 consecutive patients underwent the unmodified maze III operation: 139 for lone AF and 64 for a concomitant procedure. AF caused a mean of 2.5 symptoms before surgery; the most frequent symptoms in the lone group were palpitations (83.2%), fatigue (46.0%), dyspnea on exertion (33.6%), vertigo (20.4%), chest pain (18.2%), syncope (8.0%), and decreased exertion capacity (8.0%). In the concomitant group, symptoms were hard to attribute specifically to AF because of the associated pathology. Five patients in the concomitant group experienced congestive heart failure preoperatively. In the lone AF group, male gender dominated, and patients were younger, had more PAF, and showed smaller atrial dimensions than the concomitant AF group (Table 1). The duration of AF could be determined more accurately in the lone group and is probably underestimated in the concomitant AF group. The high number of different antiarrhythmic drugs tried and the number of failed catheter ablations and DC cardioversions performed reflect the large effort to prevent and treat AF in the lone AF group (Table 1).

Perioperative Data

As expected, the duration of extracorporeal circulation and crossclamp time were considerably longer in patients with concomitant surgery (Table 2). In the lone AF group, 8 atrial septal defects/foramen ovale were closed, and 1 strumectomy and 1 open lung biopsy were performed. In 64 patients in whom surgery was combined with the maze operation, 77 procedures were carried out, including 27 mitral valve replacements, 24 mitral valve repairs, 10 coronary artery bypass grafts, 6 tricuspid valve repairs, 8 atrial septal defect closures, 1 aortic valve replacement, and 1 transection of a Kent bundle for Wolff-Parkinson-White syndrome. There was no difference in postoperative AV block, grading of the AV block, and incidence of temporary pacing between the 2 groups (Table 2).

There was no 30-day mortality. In 33 patients of the lone AF group, 46 in-hospital complications were identified: tamponade in 5%; fever of unknown origin, congestive heart failure, and pneumonia in 4.6% each; and pneumothorax, lung atelectasis, bleeding and rethoracotomy, uri-

TABLE 1. Baseline characteristics of 203 patients treated with maze III surgery

	Lone AF 139 (68%)	Concomitant procedures 64 (32%)	P value
Male/female (%)	85.6/14.4	65.6/34.4	.003
Mean age (y)	50.7 ± 8.1	58.1 ± 10.9	<.0001
Duration of AF (No. of patients)	(139)	(56)	
Mean (months)	84 ± 60.7	51 ± 49.8	<.001
Minimum	8	2	
Maximum	360	216	
Type of AF (No. of patients)	(139)	(63)	
Paroxysmal	108 (77.7%)	34 (53.1%)	<.001
Chronic	31 (22.3%)	30 (46.9%)	
LA diameter (No. of patients)	(124)	(57)	
Mean (mm)	41.9 ± 7.6	51.7 ± 9.8	<.001
Minimum	28	35	
Maximum	68	74	
RA diameter (No. of patients)	(90)	(12)	
Mean (mm)	53.0 ± 6.1	57.0 ± 6.9	.04
Minimum	38	44	
Maximum	70	64	
Preoperative CVA	3 (2.2%)	2 (3.1%)	.65
Preoperative TIA	7 (5.0%)	3 (4.7%)	1
Antiarrhythmic drugs (No. of patients)	(132)	(62)	
Drugs per patient	4.9 ± 1.7	2.5 ± 1.6	<.001
No. of patients with previous 1 or more treatments for arrhythmia	22 (15.8%)	3 (4.6%)	.023
Mean No. of preoperative electrical cardioversions	3.0	1.2	.002

CVA, cerebrovascular accident; TIA, transient ischemic attack; AF, atrial fibrillation; LA, left atrial; RA, right atrial.

nary retention, and pleural effusion in 1.4% each. In the concomitant group 30 patients experienced 33 postoperative complications: tamponade in 7.7%; bronchitis/pneumonia in

7.7%; bleeding and rethoracotomy in 4.6%; transient peripheral neurologic deficit in 4.6%; and congestive heart failure, urinary tract infection, permanent neurologic deficit, and atel-

TABLE 2. Perioperative data

	Lone AF 139 (68%)	Concomitant procedures 64 (32%)	P value
Duration of ECC (No. of patients)	(136)	(63)	
Mean (minutes)	114 ± 18.5	148 ± 30.6	<.0001
Minimum	76	84	
Maximum	182	259	
Duration of aortic crossclamp (No. of patients)	(136)	(63)	
Mean (minutes)	61 ± 18.1	90 ± 22.5	<.0001
Minimum	37	60	
Maximum	149	150	
No. of additional flutter treatments	3 (2.2%)	0	.553
Transient in-hospital AV block (No. of patients)	(135)	(64)	
1	28 (20.5%)	19 (29.2%)	
2	11 (8.1%)	8 (12.3)	
3	1 (0.7%)	3 (4.6)	
Total	16 (11.9%)	8 (12.3)	.214
Patients requiring pacing (No. of patients)	(139)	(64)	
Temporary	69 (49.6%)	31 (48.4%)	
Definitive	2 (1.4%)	1 (1.6%)	
Total	71 (51.1%)	32 (50%)	.763
Duration of hospital stay (d)			
Median	9.0 ± 4.0	10.0 ± 5.3	<.001

ECC, Extracorporeal circulation; AV, atrioventricular.

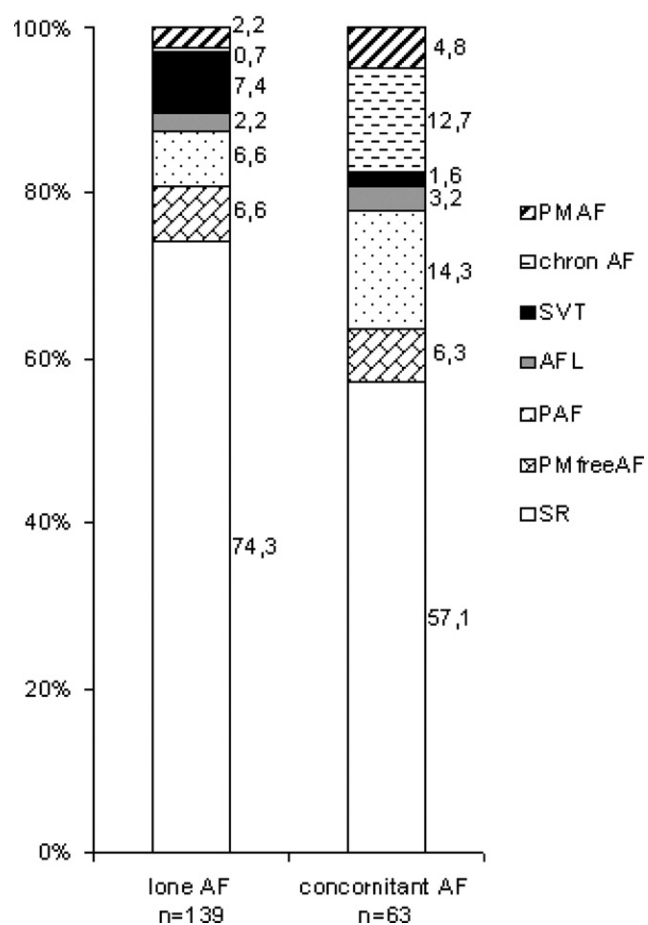


Figure 2. Rhythms at the end of follow-up. FU, Follow-up; PMAF, atrial fibrillation and pacemaker; chron AF, chronic atrial fibrillation; SVT, supraventricular tachycardia; AFL, atrial flutter; PAF, paroxysmal atrial fibrillation; Pm free AF, freedom from atrial fibrillation with pacemaker implanted; SR, sinus rhythm; AF, atrial fibrillation.

ectasis in 3.1% of the patients. In 1 patient the right coronary artery located in the wall of the RA was damaged, which was repaired with a venous bypass graft.

Follow-up Observations

Data were complete in 84.7% for the 1-year follow-up and in 97% for the latest follow-up. The total follow-up time was 796 patient years with a mean of 4.0 ± 2.6 years per patient.

Twelve patients (5.9%) died during follow-up, 1 because of colon carcinoma in the lone AF group (0.7%). Two of the other 11 deaths (17.2%) in the concomitant AF group were attributable to cardiac complications: asystole (1) and ventricular fibrillation (1). The remainder were attributable to carcinoma (4), cerebral sarcoidosis (1), CVA (1), dementia (1), and unknown cause (2).

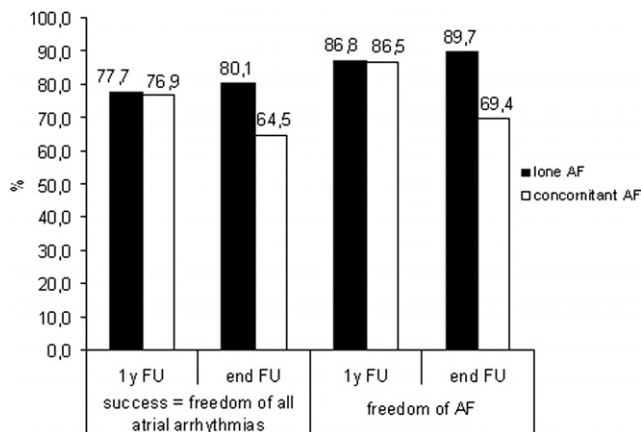


Figure 3. Surgical success and freedom from AF of the maze III procedure at 1 year and end of follow-up. AF, Atrial fibrillation; FU, follow-up.

Rhythm Results

The rhythms at the end of follow-up are depicted in Figure 2. Freedom from AF at the latest follow-up was 89.7% for the lone AF group and 69.4% for the concomitant AF group. By applying our definition of success, freedom from any atrial arrhythmia was 77.7% and 76.9% at 1 year and 80.1% and 64.5% at the latest follow-up for the lone AF group and the concomitant AF group, respectively (Figure 3). In the lone AF group, 41.1% of the patients with supraventricular arrhythmias were free from palpitations; this was 30.0% in the concomitant AF group. During follow-up, transcatheter ablation was carried out in 3 patients for recurrent drug-refractory AF but was successful in only 1 patient. In the remaining 2 patients, drug treatment was continued with other combinations.

For the whole group, multivariate analysis revealed that (1) surgical success (see definition) at the end of follow-up was strongly related to the absence of AF at 1 year after surgery ($P < .001$; odds ratio [OR] 9.56, 95% confidence limit (CL) 3.92-23.31); (2) preoperative LA diameter correlated with the occurrence of AF at the end of follow-up ($P = .028$; OR 1.06 for every millimeter, 95% CL 1.01-1.12); and (3) failure at 1-year follow-up was related to the preoperative duration of AF of more than 5 years ($P = .066$; OR = 2.06, 95% CL: 0.95-4.46). No correlation was found between the preoperative duration of AF and the latest follow-up results.

We could not demonstrate a significant ($P > .05$) difference of success between the lone AF group and the concomitant AF group.

Of the patients with surgical success, freedom from antiarrhythmic medication at the latest follow-up was 75.9% in the lone group and 63.2% in the concomitant group. Freedom from oral anticoagulants was 90.7% in the lone AF group and 50.9% in the concomitant AF group. Eighty-eight per-

ACD

TABLE 3. Echocardiographic data

	Baseline		1 year		End	
	n	Average \pm SD	n	Average \pm SD	n	Average \pm SD
Lone AF			$P = .0413$			
LA (mm)	124	41.9 \pm 7.5	73	40.7 \pm 6.8	64	40.8 \pm 8.8
RA (mm)	90	53.6 \pm 6.1	73	50.6 \pm 6.1	47	53.5 \pm 6.5
Concomitant AF			$P < .0001$			
LA (mm)	57	51.7 \pm 9.8	43	44.3 \pm 7.3	40	48.8 \pm 10.1
RA (mm)	15	56.7 \pm 6.9	39	51.0 \pm 8.8	28	54.0 \pm 9.3
EF in lone AF						
EF (%)			71	55.3 \pm 11.0	60	57.0 \pm 9.6
EF in concomitant AF						
EF (%)			38	53.3 \pm 8.4	33	50.9 \pm 10.9
MI in lone AF					$P = .0001$	
MI (n/4)			71	0.3 \pm 0.5	66	0.5 \pm 0.6
MI in concomitant AF						
MI (grade 0-4)			41	0.4 \pm 0.8	45	0.4 \pm 0.6

SD, Standard deviation; AF, atrial fibrillation; LA, left atrial; RA, right atrial; EF, ejection fraction; MI, mitral incompetence.

cent of the patients of the concomitant AF group without mechanical valves did not use anticoagulation.

Pacemaker Implantation

At the latest follow-up, 14 patients (10.4%) in the lone AF group and 7 patients (11.1%) in the concomitant group had a pacemaker. Two of the pacemakers in patients of the lone AF group were already implanted before the maze operation. In the lone AF group, pacemakers were implanted for sick sinus syndrome (6), for total AV block (2), for bradycardia (2), and after His ablation (4). In the concomitant group, pacemakers were implanted for sick sinus syndrome (3), for total AV block (1), and after His ablation (3).

Stroke

In the lone AF group, no CVA occurred during follow-up. In the concomitant AF group, 2 patients had a CVA. One patient had an intracerebral bleed attributable to an elevated international normalized ratio (5.7); he used oral anticoagulants for a mechanical valve in the mitral position. The other patient had an embolic stroke while using oral anticoagulants after mitral valve repair. Both patients were in sinus rhythm.

Sinus Node Function

One half of the patients in the lone AF group (63/139) underwent maximal heart rate exercise testing during follow-up in the appropriate condition: no heart-slowng medication and not in AF or other atrial tachyarrhythmias. The mean maximal heart rate was 90% \pm 3% of the predicted value. In the concomitant AF group, 23 patients

fulfilled these criteria, and the mean of the maximal heart rate was 91% \pm 11% of predicted.

Echocardiography

Echocardiography showed a significant reduction of the LA dimensions in both groups at 1-year follow-up compared with baseline characteristics, but the dimensions increased again afterward (Table 3). The mitral regurgitation in the lone AF group increased significantly during follow-up and increased nonsignificantly in the concomitant AF group.

Discussion

Success was defined as freedom from AF, AFL, and other supraventricular arrhythmias. According to our definition, the cumulative medium-term freedom from these arrhythmias can be determined by the preoperative LA diameter. The success at the end of follow-up can be predicted at 1 year after the operation. This observation indicates that success persists during follow-up and depends on the preoperative LA diameter. Other clinical risk factors could not be determined. The duration of preoperative AF significantly influenced only the 1-year results. The absence of a significant correlation with success at the end of follow-up may be attributable to a lack of power. Our definition of success, determined by the absence of all atrial arrhythmias, because they all affect the patient, deviates strongly from success criteria used by others. If we use freedom from AF, as many authors do, our success is 89.7% for lone AF and 69.4% for concomitant AF at the end of follow-up.

Differences in Success

Multivariate regression analysis did not show a significant difference in success between the 2 groups. The differences of success at the end of follow-up were attributable to baseline differences, especially LA diameters (Table 1). Preoperative LA diameters were larger in the concomitant group, reflecting a more extensive cardiac disease process, in part because of the high incidence of mitral valve disease. A correlation between LA dimension and long-term results has clearly been identified by others.³ The absence of a significant difference between the lone and concomitant AF groups was also identified by others.⁴

Our data show a significant decrease in LA diameter as a result of the operation, partly because of the suture line and partly because of the treatment of mitral valve pathology. Although not significant, there is a larger increase in atrial diameters of the concomitant AF group during follow-up as a consequence of more degenerated substrate and more progressed disease. Recent evidence demonstrates that aggressively reducing the size of giant left atria can positively influence the success.²⁰ No atrial size reduction was performed in our patients.

Previous Publications

Our success is similar to that of other large series,^{3,5,7} but seems to be inferior to others.⁴ A reason could be the application of a cryolesion only at the inside of the coronary sinus instead of circumferentially.²¹ Five patients had a left-sided flutter during follow-up catheter mapping. However, the main reason for the difference in reported results is caused by our strict definition of success and the rigorous documentation of supraventricular arrhythmias.^{22,23} Whereas most authors define success as freedom from *only* AF, we used a more strict definition of success. After all, many patients free from AF still have tachycardia. In contrast with other authors,^{4,8} we did not rely on subjective patient information obtained by phone contact. Up to 41% of our patients with postoperative AF had no palpitations. The occurrence of asymptomatic episodes of supraventricular tachycardias, even in patients who have had symptomatic episodes before, was already proven.²⁴

In-Hospital and Late Survival

No 30-day mortality was present in our series, and the cardiac death rate during follow-up was minimal (1%), which may be explained by the fact that the patients in the lone AF group were young and fit with little comorbidity. Despite the complexity of the operation, mortality and morbidity are minimal in most large series.

Antiarrhythmic Drugs

The freedom from antiarrhythmic drugs is low because many patients used beta-blocking agents, digoxin, or calcium antagonists for reasons other than suppression or pre-

vention of AF and supraventricular arrhythmias. The percentage of patients receiving antiarrhythmic drugs is in line with other groups.⁵

Pacemaker

The incidence of postoperative pacemaker implantation is in the range of what other authors found, notwithstanding the fact that normal sinus node function was requested for surgery. Incidences up to 16% can be found.⁸ Could extensive mobilization of the superior caval vein, and thus damage to the sinus node region, play a role or have we failed to document sick sinus syndrome preoperatively in a few patients? Abolition of AF, but with an implanted pacemaker, does not necessarily mean a failure because atrial transport can be maintained, and antiarrhythmic drugs and oral anticoagulants can be withdrawn.

Stroke

In recent years it has become clear that the maze operation is also highly successful in the prevention of ischemic CVA,^{5,25} which was also the case in our series.

Comparison With Modified Maze Operations

Because of the complexity and duration of classic maze III surgery, many attempted to simplify the design and application of the original concept.²⁶⁻²⁸ Until now it has been unclear whether these therapies are as efficacious as the full maze procedure. To our knowledge, no randomized studies have been published comparing the full cut-and-sew maze procedure with operations with a more simple lesion pattern or using other energy devices. A recent review found no difference.²⁹

Indications for Surgical Treatment of Atrial Fibrillation

Our current strategy is to offer maze surgery to symptomatic patients with lone AF if antiarrhythmic drugs, cardioversions, and percutaneous catheter ablation failed or AF and AFL coexist; the latter because catheter ablation of both arrhythmias will require lengthy procedures with a long exposure to radiation.

For patients with concomitant AF, the threshold is lower for performing an additional maze procedure to treat AF because of the severe consequences of AF. In the future, ablation devices will simplify the creation of lesions in atrial myocardium. Most patients undergoing a concomitant procedure can benefit from AF surgery, especially patients in whom oral anticoagulants can be withdrawn and the surgical risk is acceptable.

Study Limitations

The definitions applied for surgical success are not widely used because of a lack of consensus.^{22,23} This complicates a fair comparison of the surgical success with that of other

institutions. Lack of intensive and long duration electrocardiographic recordings of the cardiac rhythm, because these registrations could negatively influence the result of the study.

Conclusions

This study shows that the favorable unmodified maze III results of abolishment of AF and other atrial arrhythmias in patients with and without additional cardiac surgery persist for at least 4 years after surgery and can be predicted at the end of the first year after maze surgery. This outcome can be used for preoperative patient information and postoperative strategy of patient care.

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