ACADEMIA SBCCV

Curso de Cirurgia Minimamente Invasiva da SBCCV

DATA: 25 e 26 de outubro de 2018

LOCAL: Hotel Tryp Paulista

Rua Haddock Lobo, 294, Cerqueira César, São Paulo

A EVOLUÇÃO DA CIRURGIA DE FIBRILAÇÃO ATRIAL

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Professor Emérito do Programa de Pós-Graduação do IC/FUC
Coordenador da Cardiologia e Cirurgia Cardíaca Pediátricas do HMV
Pesquisador CNPq

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Declaração de Potencial Conflito de Interesse

Nome do Palestrante:

Renato A. K. Kalil

Título da Apresentação:

A EVOLUÇÃO DA CIRURGIA DE FIBRILAÇÃO ATRIAL

Não possuo nenhum conflito de interesse relacionado a esta apresentação

O PROBLEMA

Apesar das claras evidências de maior mortalidade e morbidade, inclusive AVCs, nos portadores de FA, parcela significativa dos casos sequer é tratada com anticoagulação.

Estudos em reversão a RS ou controle de FC apresentam resultados que confundem o bom entendimento.
Ensaios clínicos mal desenhados aumentam a confusão.

Na ablação por cateter e na cirurgia, a diversidade de métodos e de desfechos avaliados confunde a comparação dos resultados.

O PROBLEMA

É certo que a ablação e a cirurgia bem indicadas, em casos bem selecionados, resultam em recuperação do RS em mais de 90% e com baixo risco.

Se isto resulta em menos desfechos clínicos não está comprovado por ECR.
Na forma de investigação atual não há perspectiva de consenso a vista.

A contaminação pelas questões de mercado, em detrimento da integração entre especialidades, prejudica ainda mais o consenso.

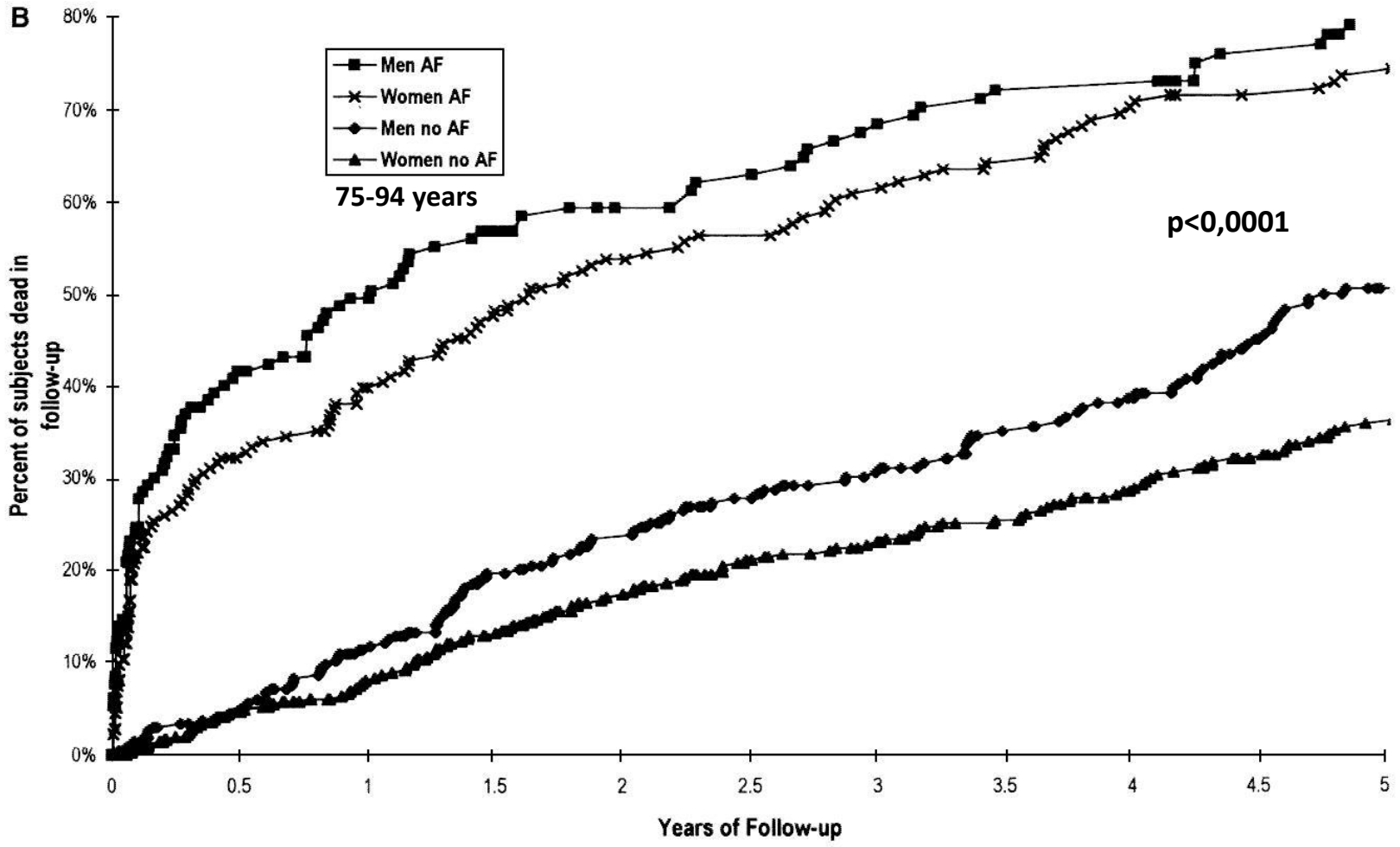
Nesse cenário, descrever o real espaço da cirurgia é um desafio.
À exceção da doença mitral e dos centros ou cirurgiões que praticam o IVP, onde as dúvidas estão deixando de existir

- *Cada verdade passa por 3 fases:*

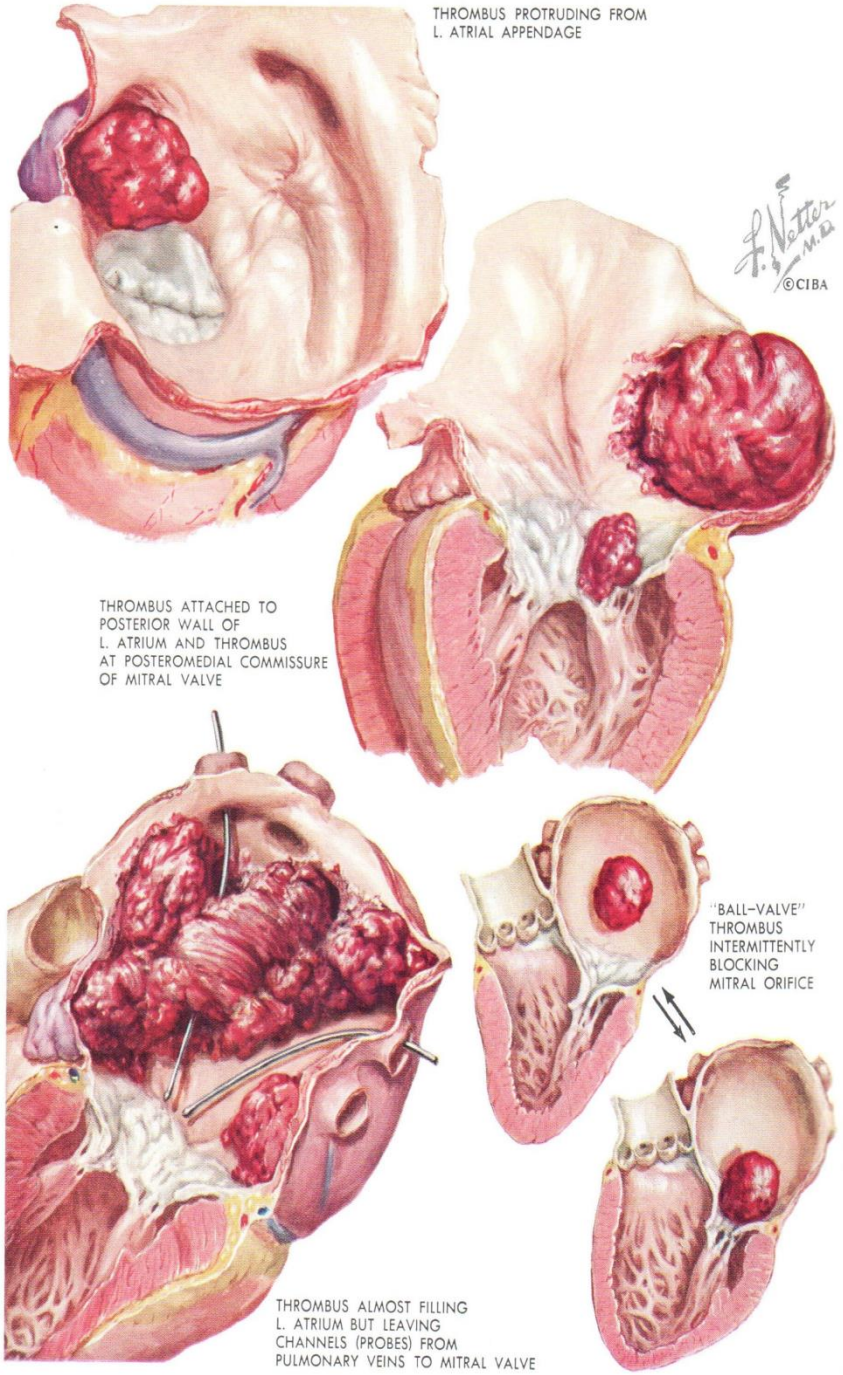
na primeira é ridicularizada, na segunda é violentamente combatida, na última passa a ser aceita como evidente

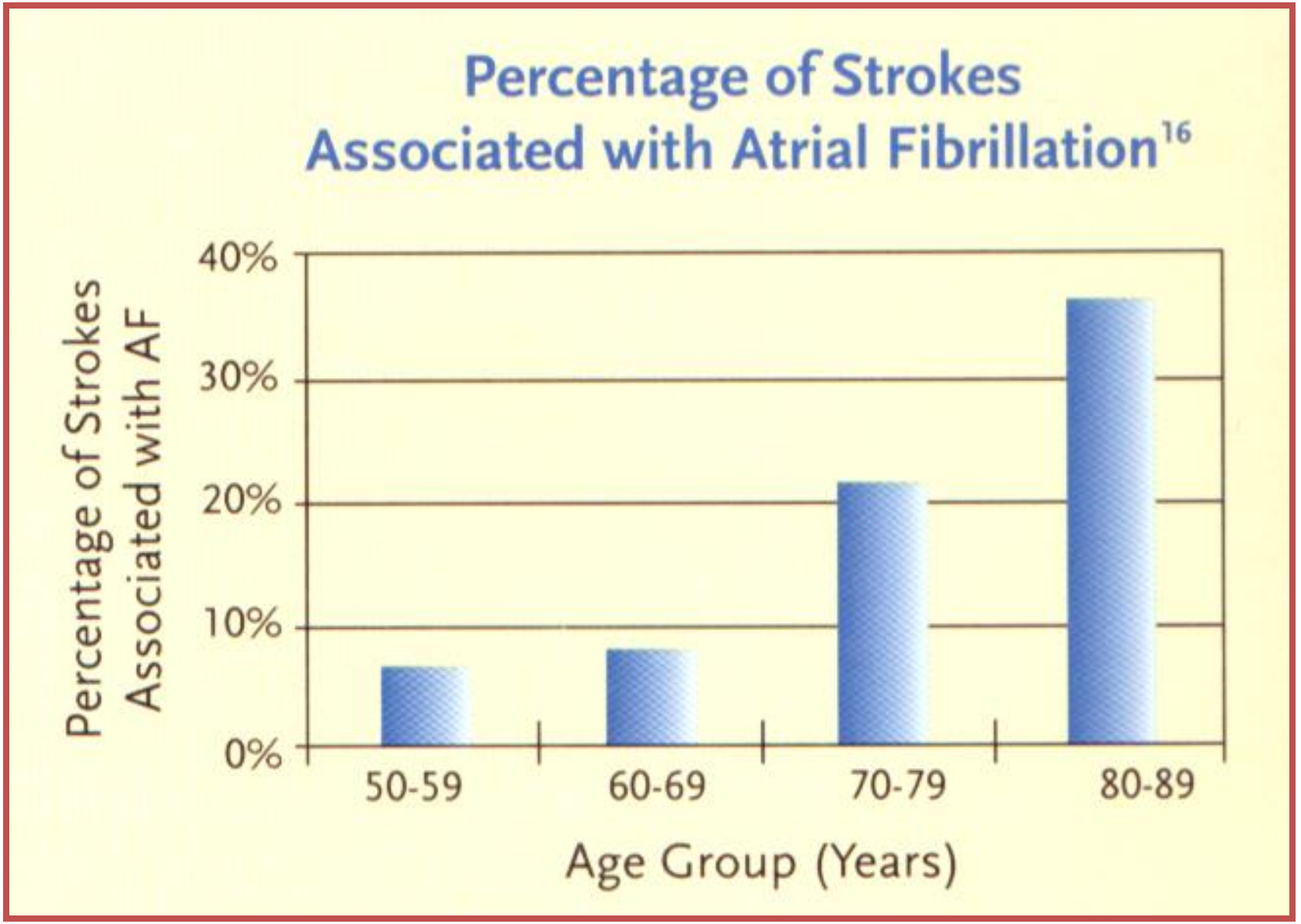
Schopenhauer

Atrial fibrillation and risk of death



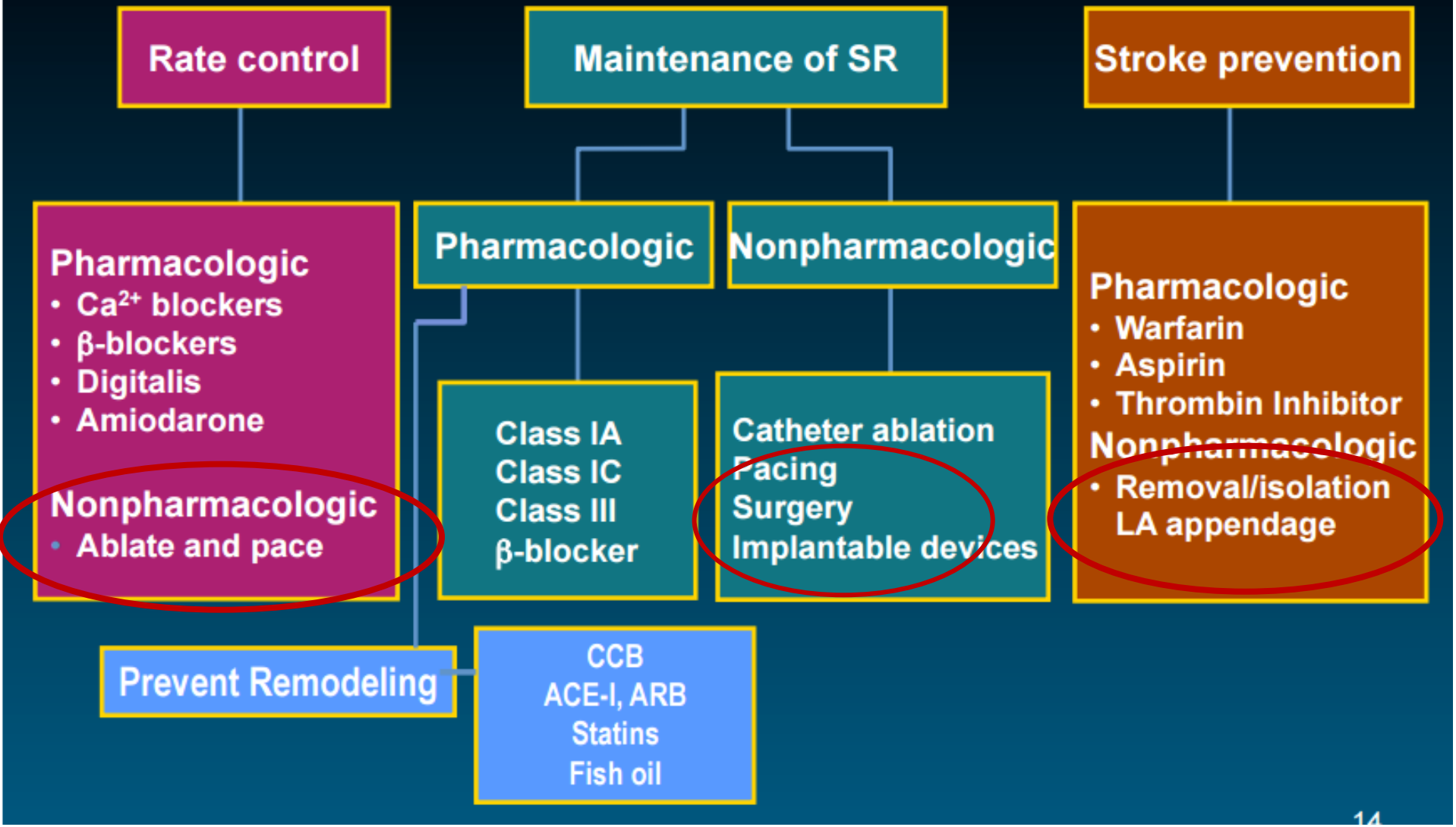
Benjamin, E.J. Circulation, 1998;98:946-952. Framingham


THROMBUS PROTRUDING FROM
L. ATRIAL APPENDAGE
F. H. Netter M.D.
©CIBA
THROMBUS ATTACHED TO
POSTERIOR WALL OF
L. ATRIUM AND THROMBUS
AT POSTEROMEDIAL COMMISSURE
OF MITRAL VALVE
"BALL-VALVE"
THROMBUS
INTERMITTENTLY
BLOCKING
MITRAL ORIFICE
THROMBUS ALMOST FILLING
L. ATRIUM BUT LEAVING
CHANNELS (PROBES) FROM
PULMONARY VEINS TO MITRAL VALVE

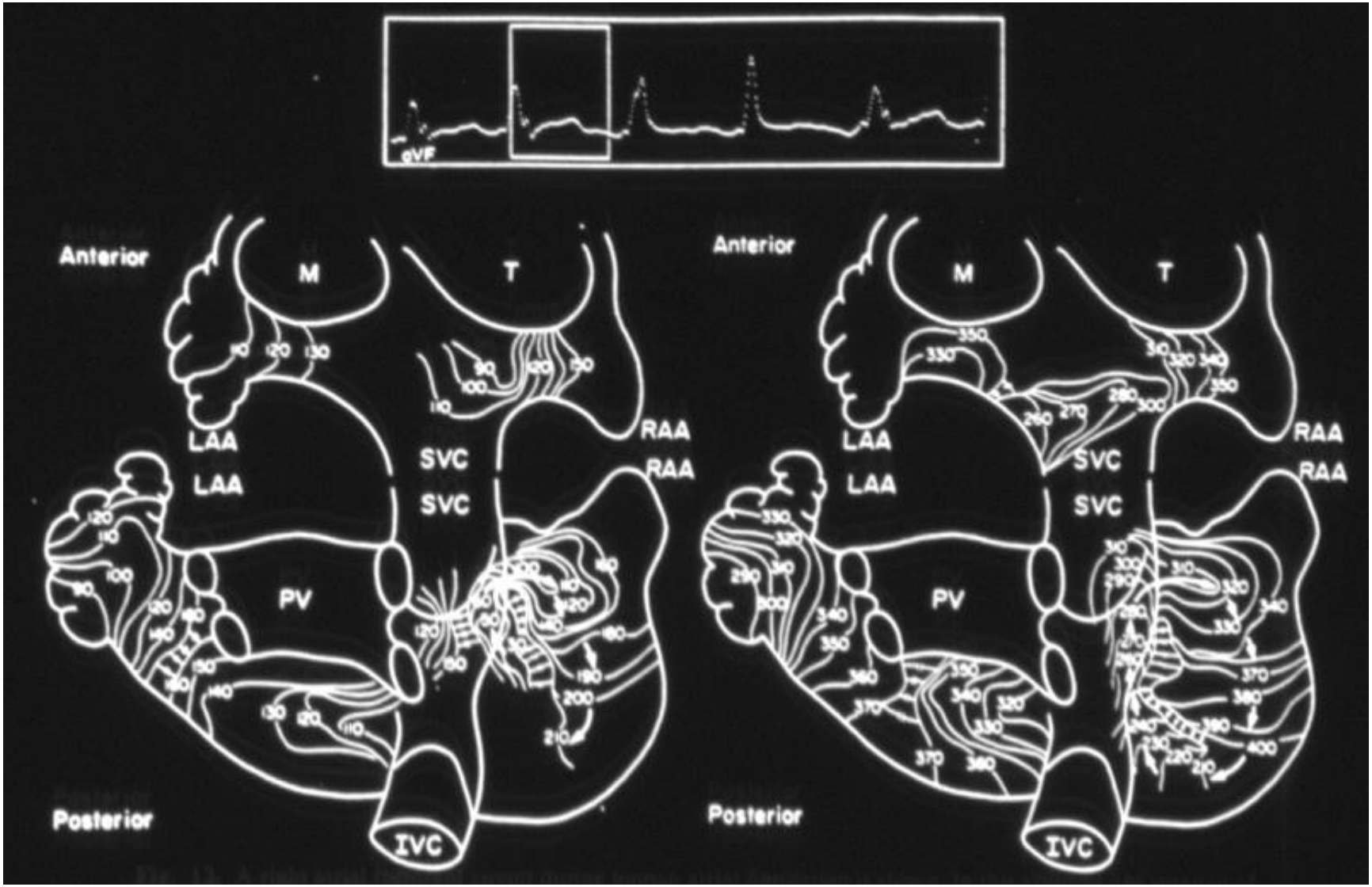


Wolf P, Abbott RD, Kannel WB. Atrial fibrillation: A major contributor to stroke in the elderly: The Framingham Heart Study, Arch Intern Med. 1987;147:1561-1564.

Treatment Goals and Strategies



Hugh Calkins, Johns Hopkins Medical Institutions


aVF
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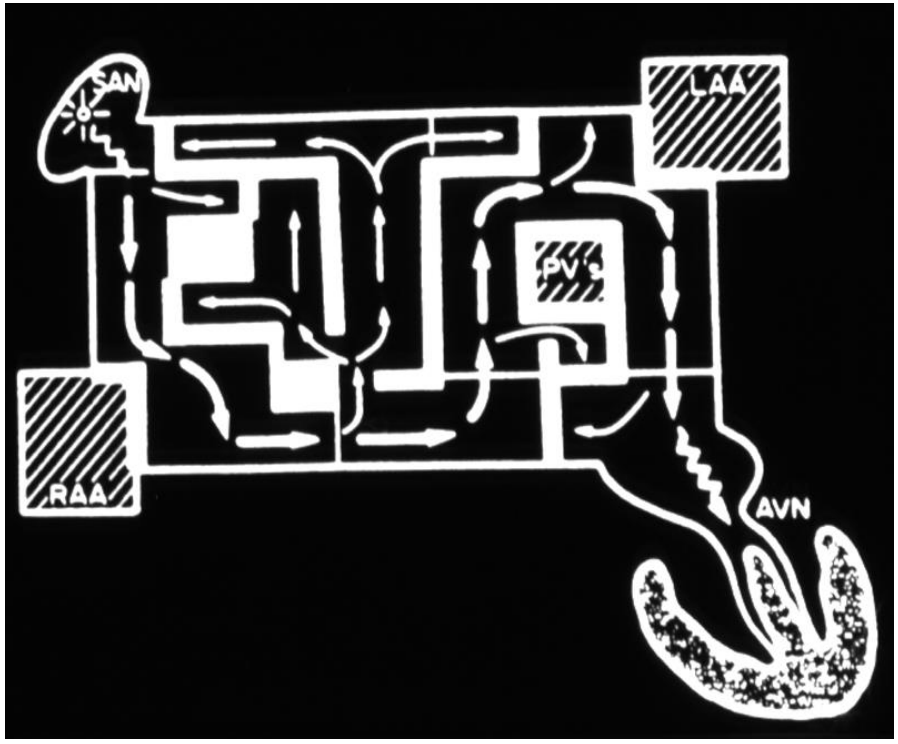
IVC
Posterior

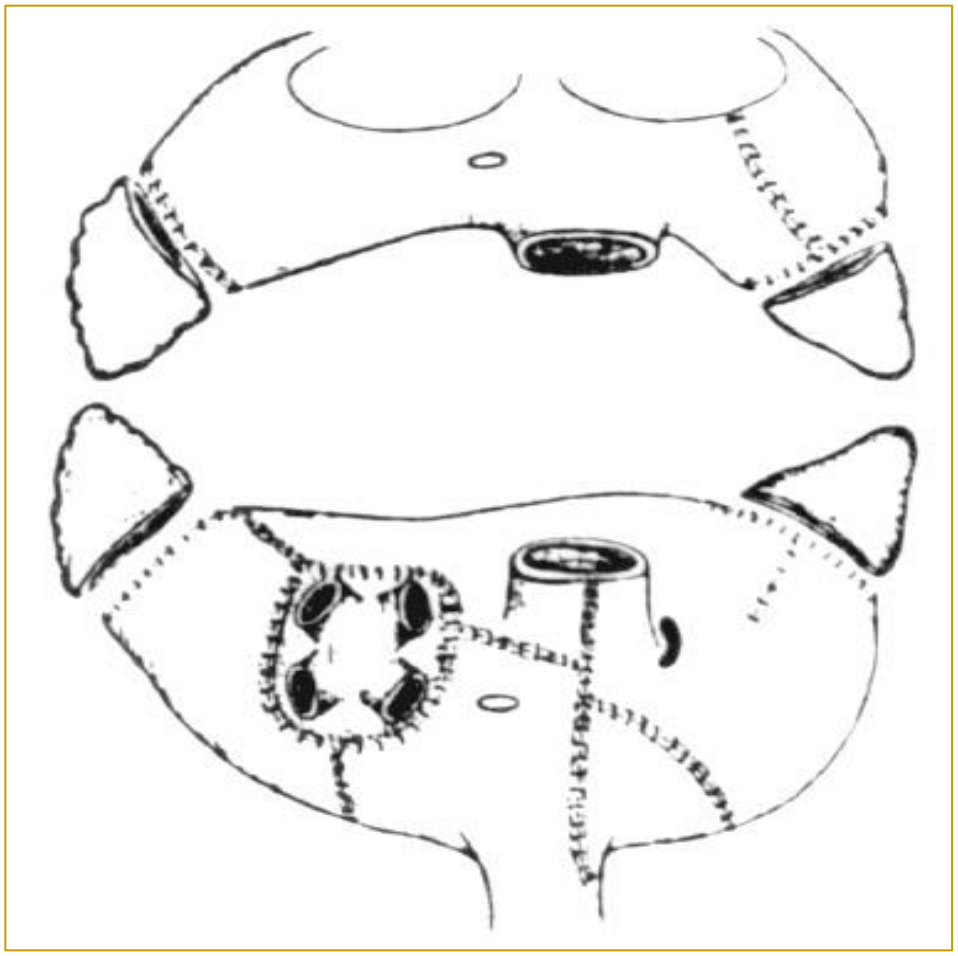
The Cox-Maze: A landmark procedure

James L. Cox



- 1987 - Barnes Hospital, Washington University St. Louis, Mo

Cox: Maze Procedure for Atrial Fibrillation



Ann Thorac Surg 1993;55:578-80

The Cox maze III procedure for atrial fibrillation: Long-term efficacy in patients undergoing lone versus concomitant procedures

TABLE 2. Patient demographics

	Lone Maze procedure	Concomitant maze procedure	*P* value
Age (y)	51.3 ± 10.5	58.8 ± 9.9	<.001
Sex (M:F)	90:22	53:33	.003
PAF:PTAF	72:40	45:41	.08
Pump time (min)	162 ± 35	201 ± 42	<.001
Crossclamp time (min)	93 ± 34	122 ± 37	<.001
Mortality	2/112, 1.8%	1/86, 1.2%	.99
Median ICU stay (d)	2	3	.007
Median LOS (d)	9	12	.01

PAF, Paroxysmal atrial fibrillation; *PTAF,* persistent atrial fibrillation; *LOS* length of stay.

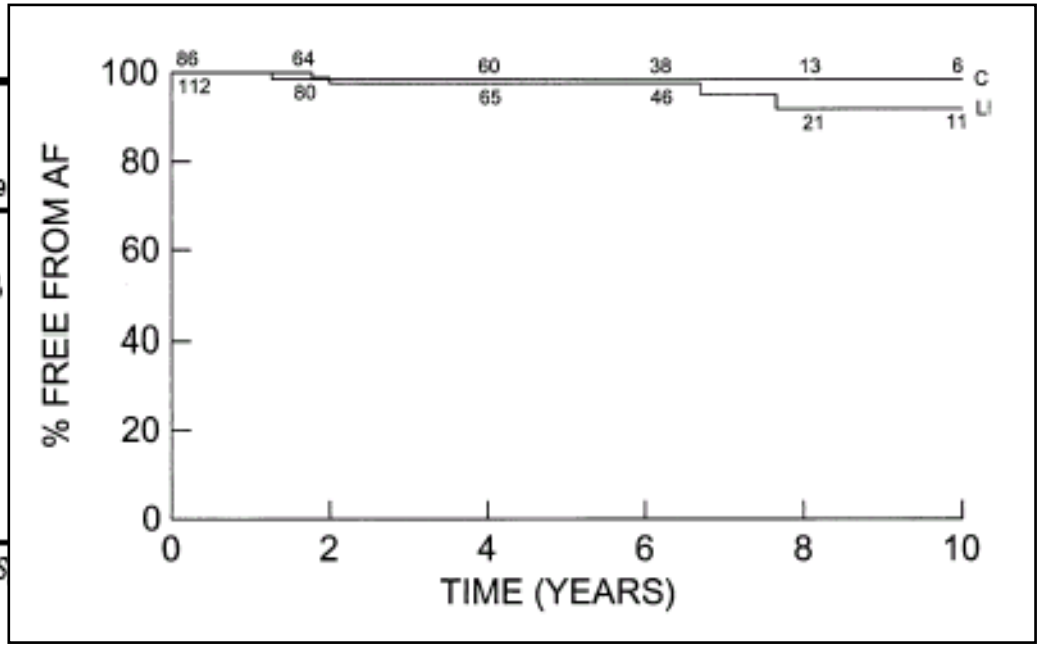
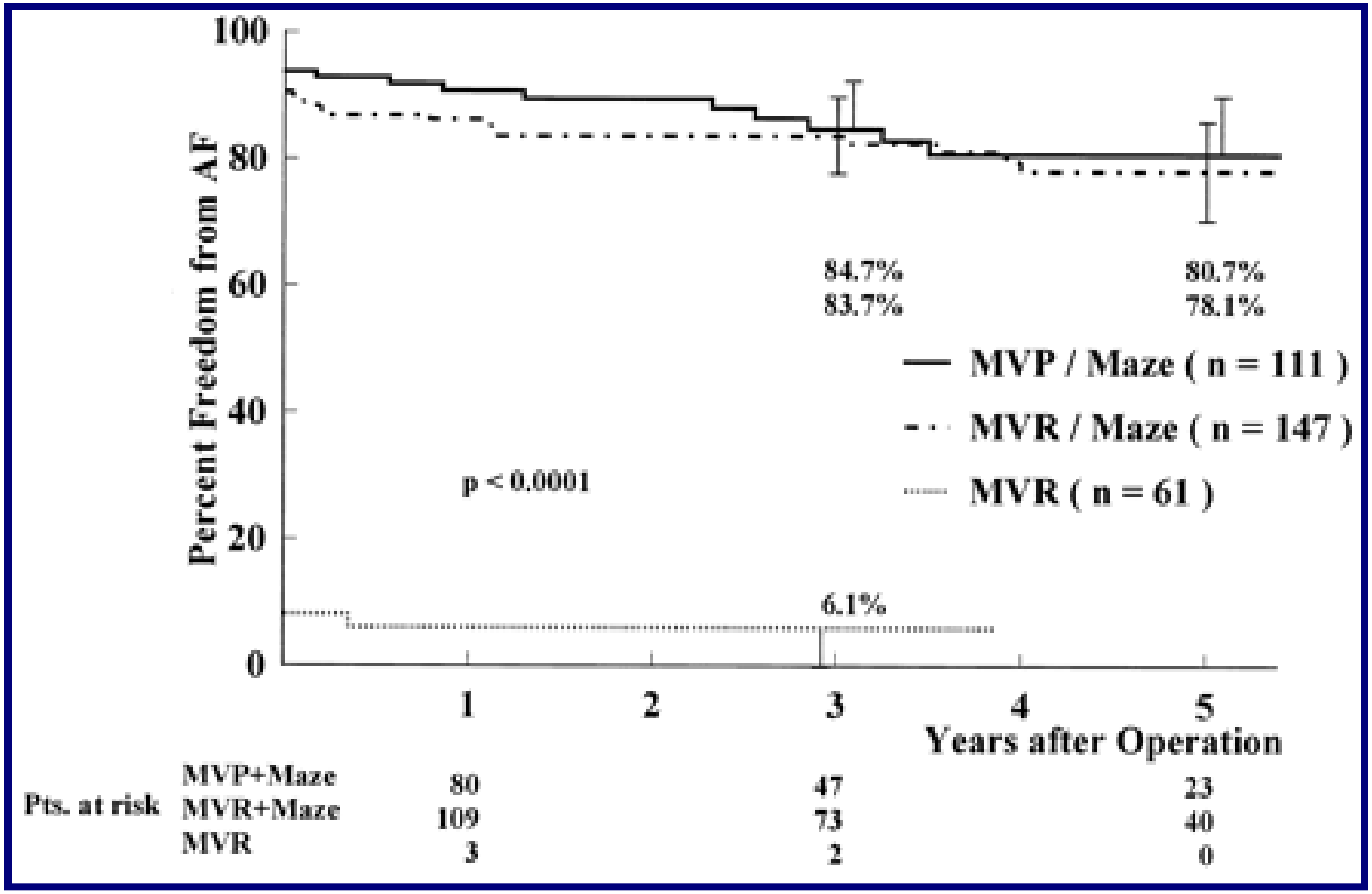
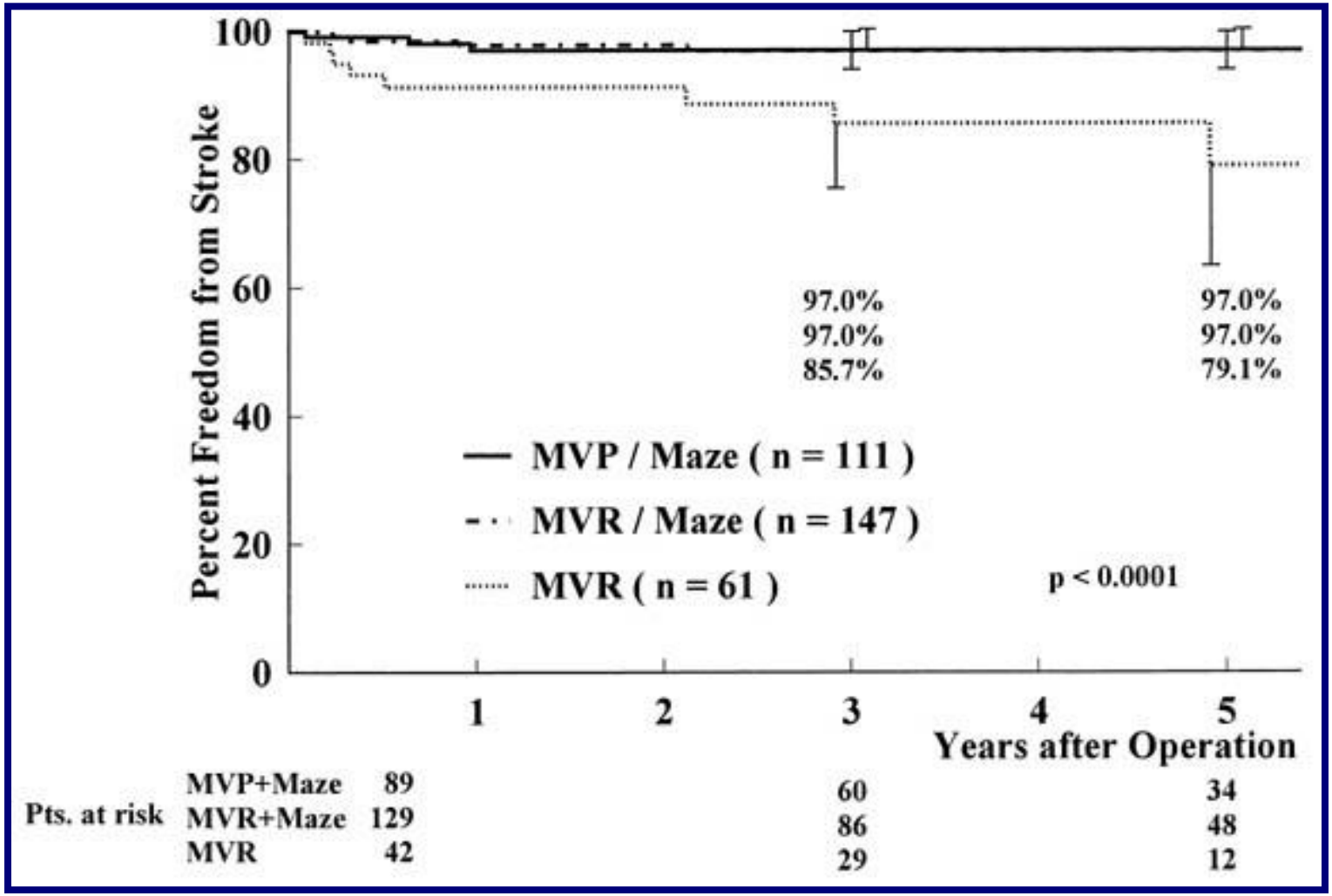


Figure 1. Kaplan-Meier survival analysis of freedom from recurrent AF. The numbers on each line indicate the number of patients at risk. There was no difference in the long-term estimate of freedom from AF between the lone maze group *(L)* and the concomitant group (*C*; *P* = .64).

J Thorac Cardiovasc Surg 2003;126:1822-8



Freedom from recurrence of atrial fibrillation *(AF)* curves for MVP/maze (*solid line*, n = 111), MVR/maze (*long and short dashed line*, n = 147), and MVR (*dotted line*, n = 61) groups. *Error bars* indicate 95% confidence interval. *P* < .0001 by log-rank test.
Impact of Cox maze procedure on outcome in patients with atrial fibrillation and mitral valve disease. Bando, Ko. et col. J Thorac Cardiovasc Surg, 2002;(3) 124:575-583



Freedom from late stroke curves for MVP/maze (*solid line*, n = 111), MVR/maze (*long and short dashed line*, n = 147), and MVR (*dotted line*, n = 61) groups. *Error bars* indicate 95% confidence interval. *P* < .0001 by log-rank test. *Impact of Cox maze procedure on outcome in patients with atrial fibrillation and mitral valve disease. Bando, Ko. et col. J Thorac Cardiovasc Surg, 2002;(3) 124:575-583*

Long-term outcomes after surgery for rheumatic mitral valve disease:
valve repair versus mechanical valve replacement

n=540
Repair =122
Replacement =418

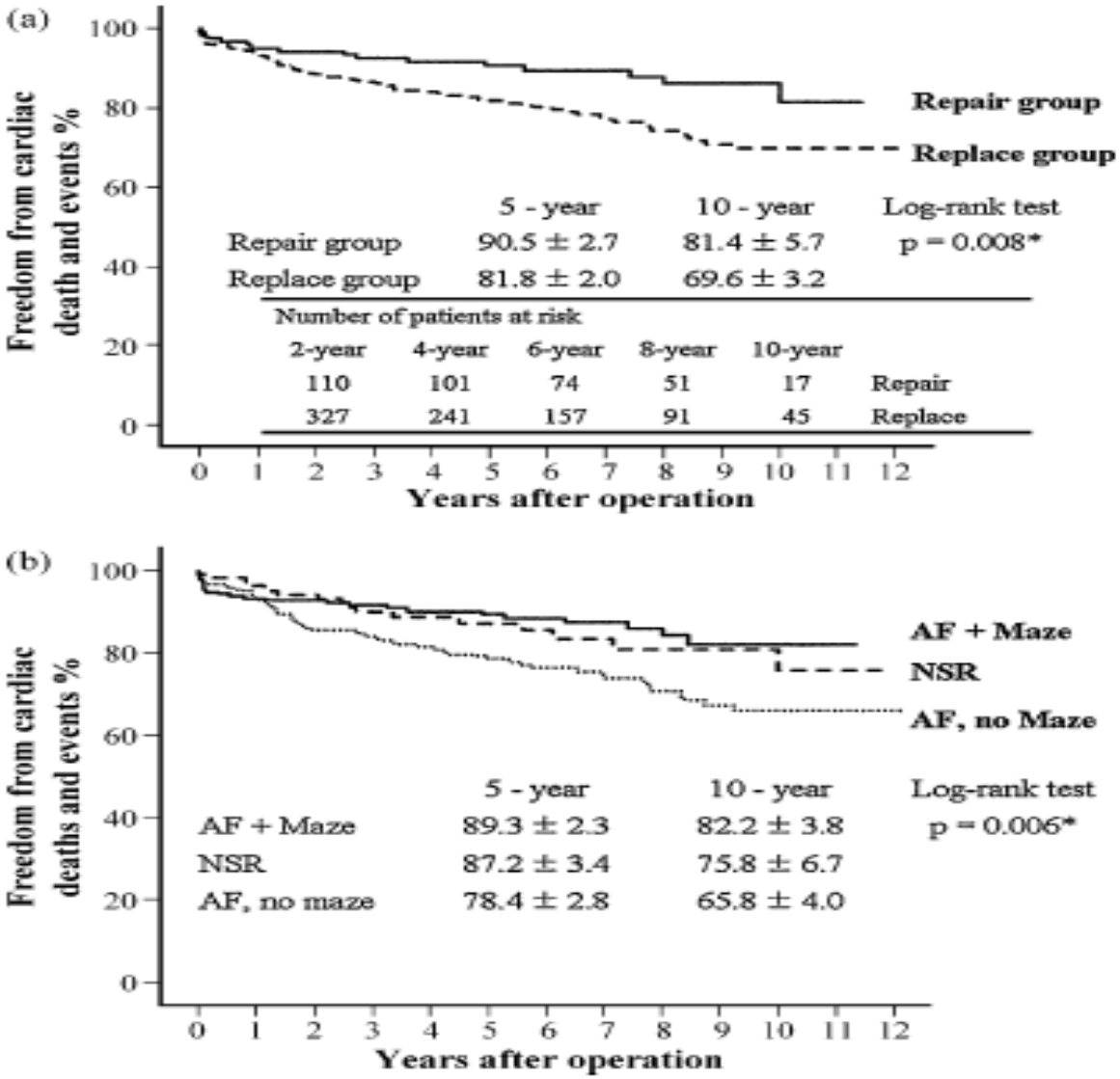
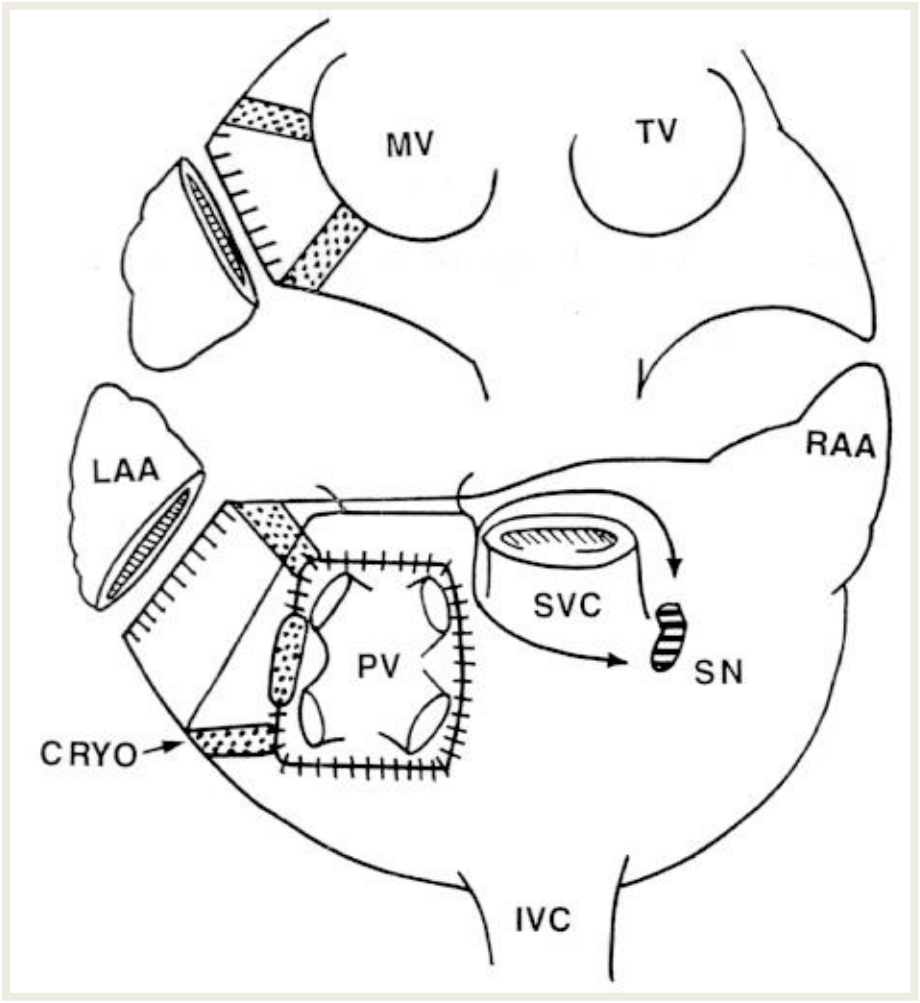


Fig. 2. Unadjusted Kaplan–Meier curves for freedom from cardiac death and major events. (a) Outcomes following MV repair versus replacement. (b) Outcomes according to the presence of atrial fibrillation and undergoing a maze procedure.

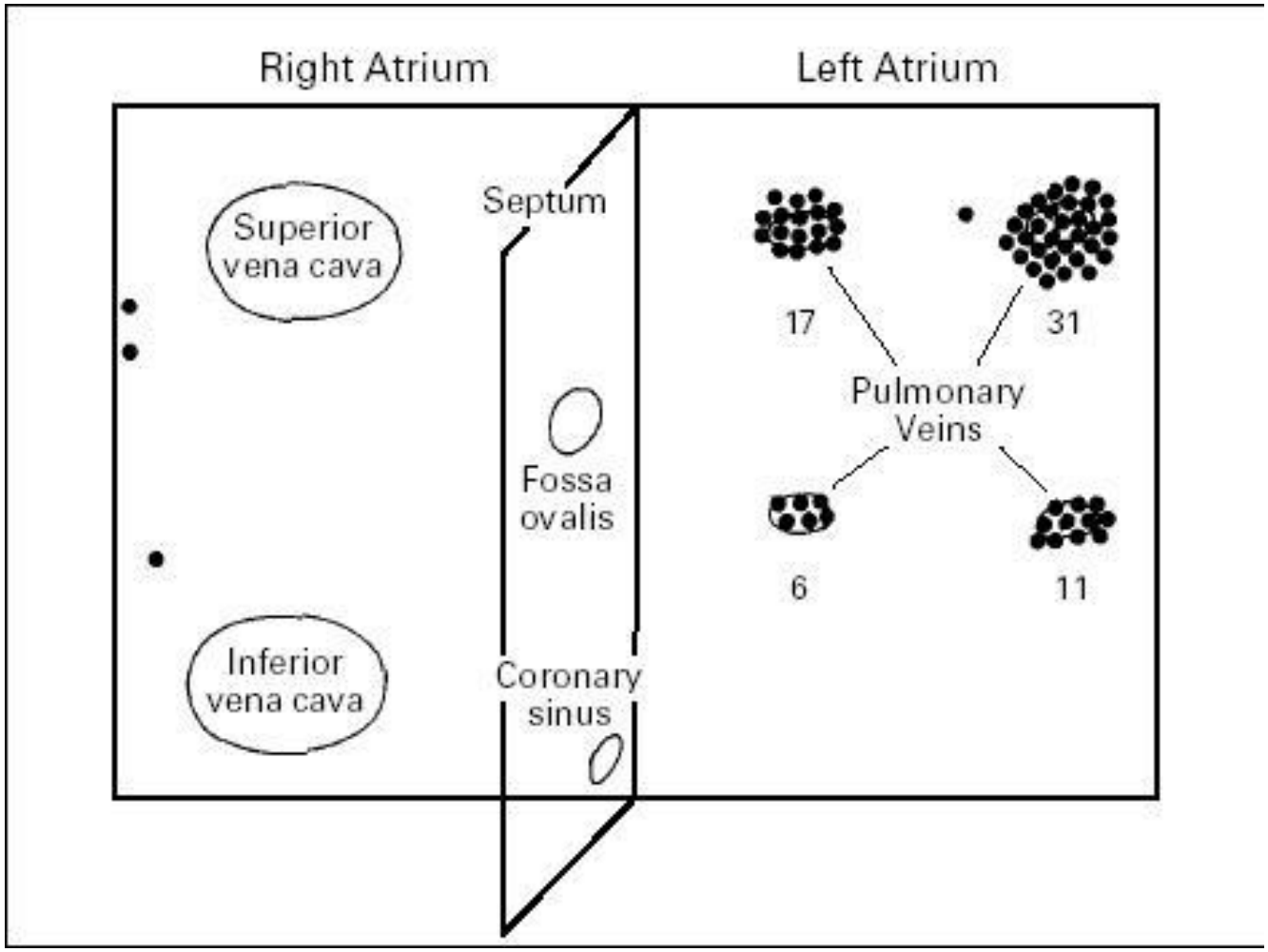
J.B. Kim et al. (Seoul)
European Journal of Cardio-thoracic Surgery 37 (2010) 1039—1046



Left Atrial Procedure for Atrial Fibrillation.
Sueda, T. et al. Ann Thorac Surg 1996;62:1796-800.

Fibrilação Atrial Permanente: Ablação por cateter ou Cirurgia

Focos Ectópicos em Veias Pulmonares



Haissaguerre M. NEJM 1998;339:659-66

Técnica cirúrgica simplificada pode ser eficaz no tratamento da fibrilação atrial crônica secundária a lesão valvar mitral?

Renato A. K. KALIL*, Gustavo G. LIMA*, Rogério ABRAHÃO*, Márcio L. STÜRMER*, Álvaro ALBRECHT*, Paulo MORENO*, Tiago L. L. LEIRIA*, Leonardo M. PIRES*, João Ricardo M. SANT'ANNA*, Paulo R. PRATES*, Ivo A. NESRALLA*

IVP n=7 **Labirinto n=57**

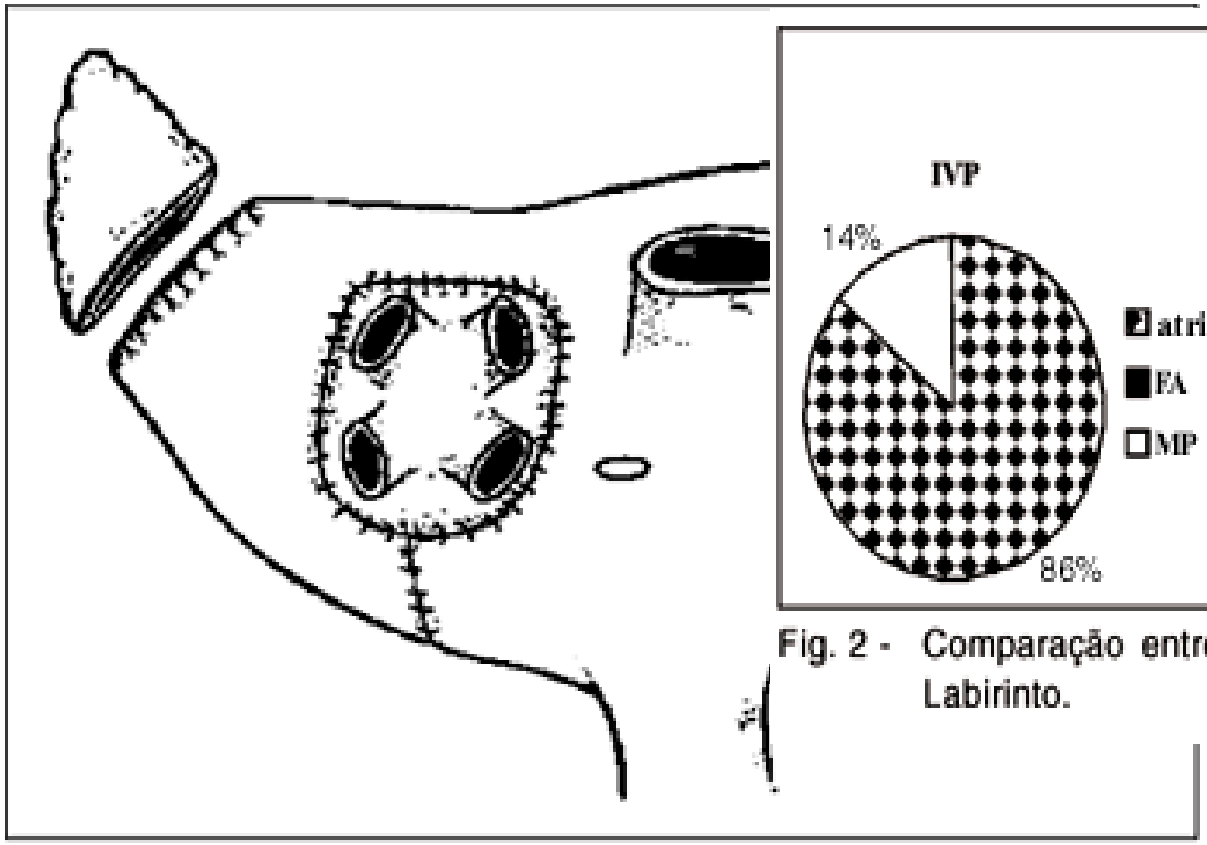


Fig. 1 - IVP visão anatômica e esquemática.

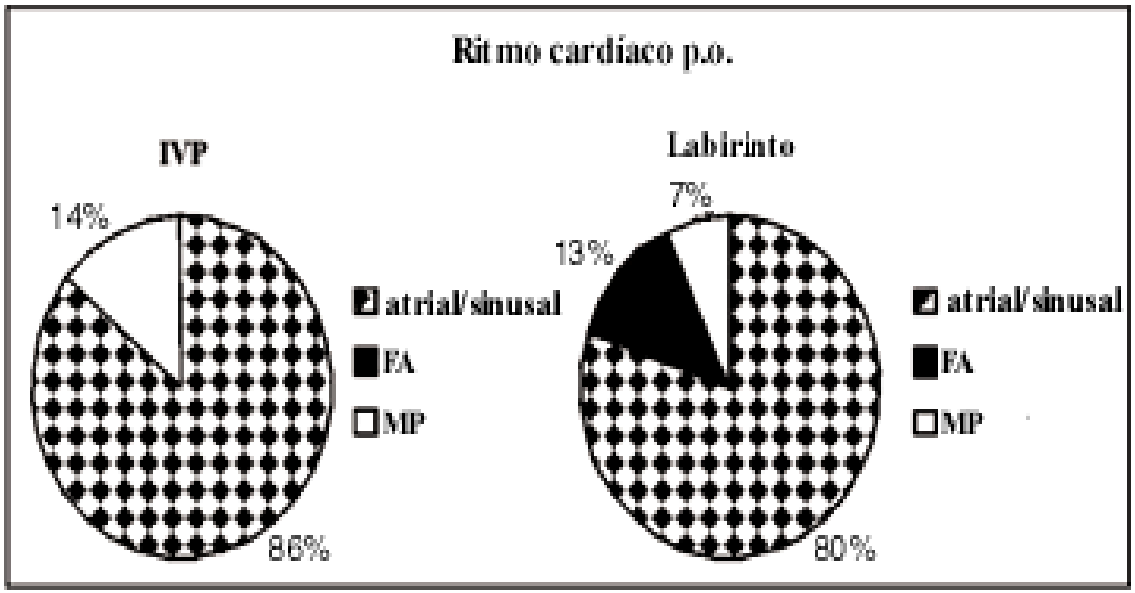


Fig. 2 - Comparação entre os ritmos cardíacos das séries IVP e Labirinto.

Rev Bras Cir Cardiovasc vol.15 n.2 São Paulo Apr./June 2000

Simple Surgical Isolation of Pulmonary Veins for Treating Secondary Atrial Fibrillation in Mitral Valve Disease

Renato A. K. Kalil, MD, PhD, Gustavo G. Lima, MD, MSc, Tiago L. L. Leiria, MD, Rogério Abrahão, MD, Leonardo M. Pires, MD, Paulo R. Prates, MD, and Ivo A. Nesralla, MD, PhD

Instituto de Cardiologia do Rio Grande do Sul, Fundação Universitária de Cardiologia, Porto Alegre, Brazil

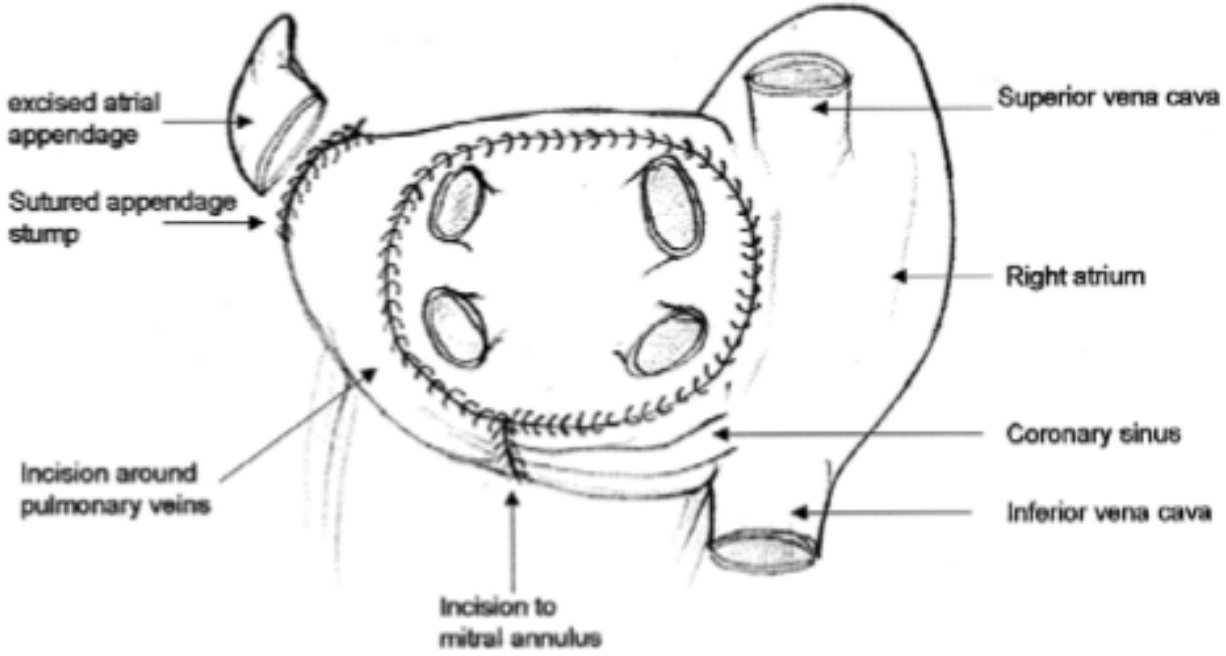
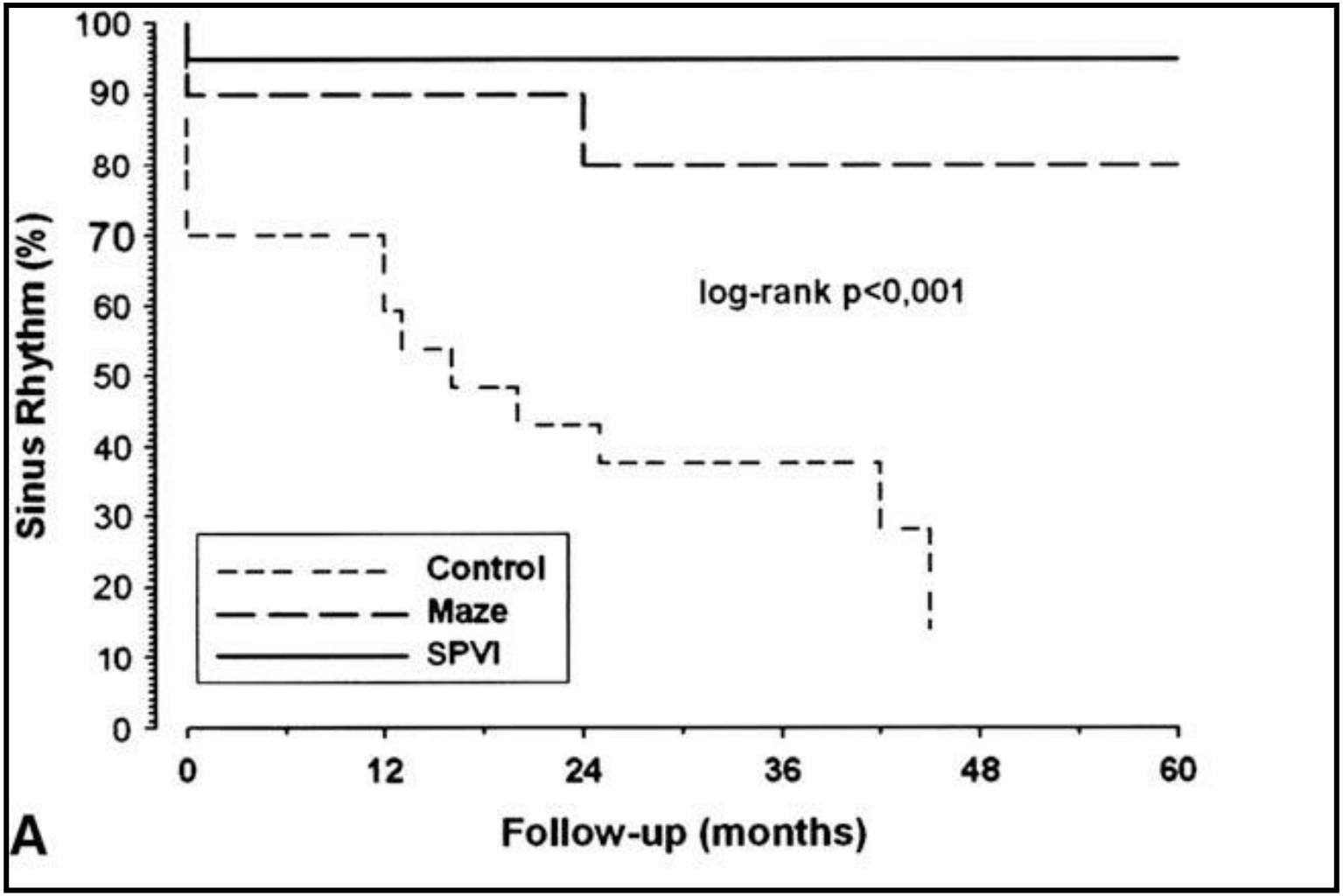


Fig 1. Three-dimensional posterior view of the heart after the procedure showing the suture line around the four pulmonary veins, exclusion of left atrial appendage, and perpendicular incision directed into the mitral annulus. (Reprinted from Kalil RAK, et al, Ann Thorac Surg; 2002;73:1022, with permission.)

Ann Thorac Surg 2002;73:1169-1173.

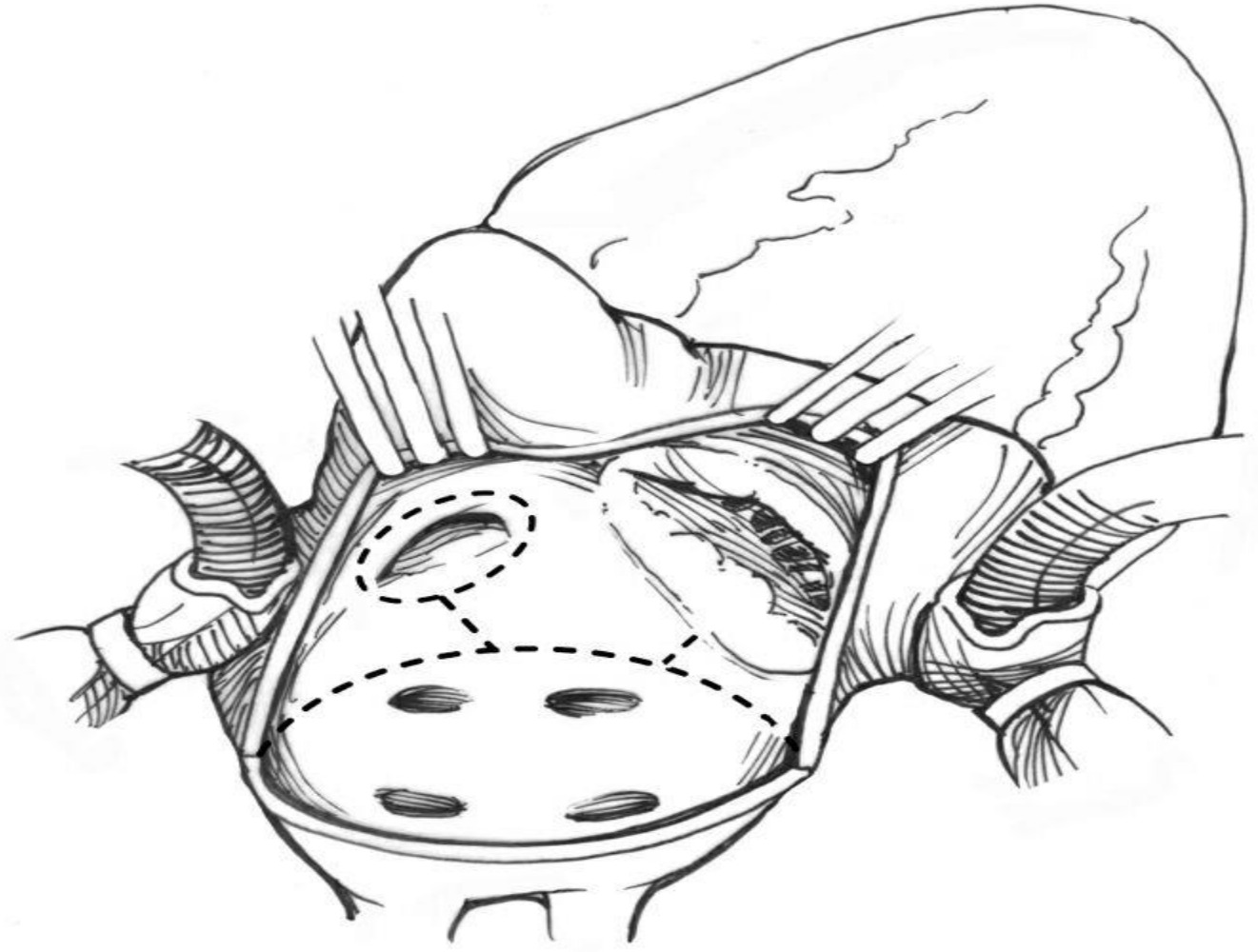


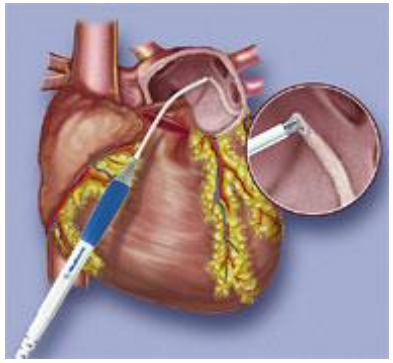
Randomized study of surgical isolation of the pulmonary veins for correction of permanent atrial fibrillation associated with mitral valve disease

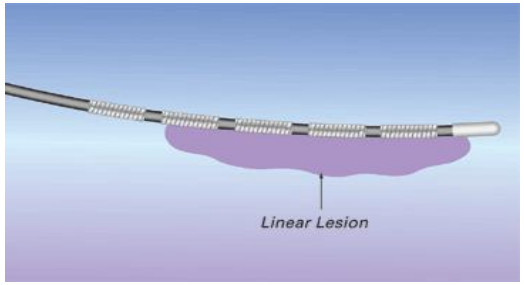
Alvaro Albrecht, MD, Renato A. K. Kalil, MD, PhD, Luciana Schuch, MD, Roge´rio Abraha˜o, MD, Joao Ricardo M. Sant'Anna, MD, PhD, Gustavo Lima, MD, PhD, FACC, and Ivo A. Nesralla, MD, PhD

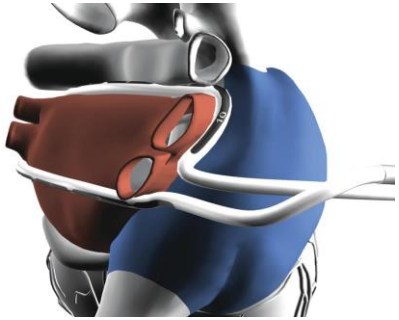
J Thorac Cardiovasc Surg. 2009 Aug;138(2):454-9.

Mini-Maze Procedure









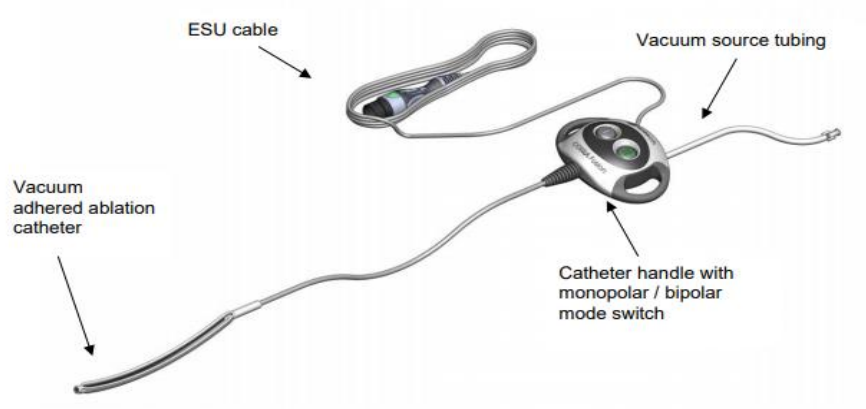
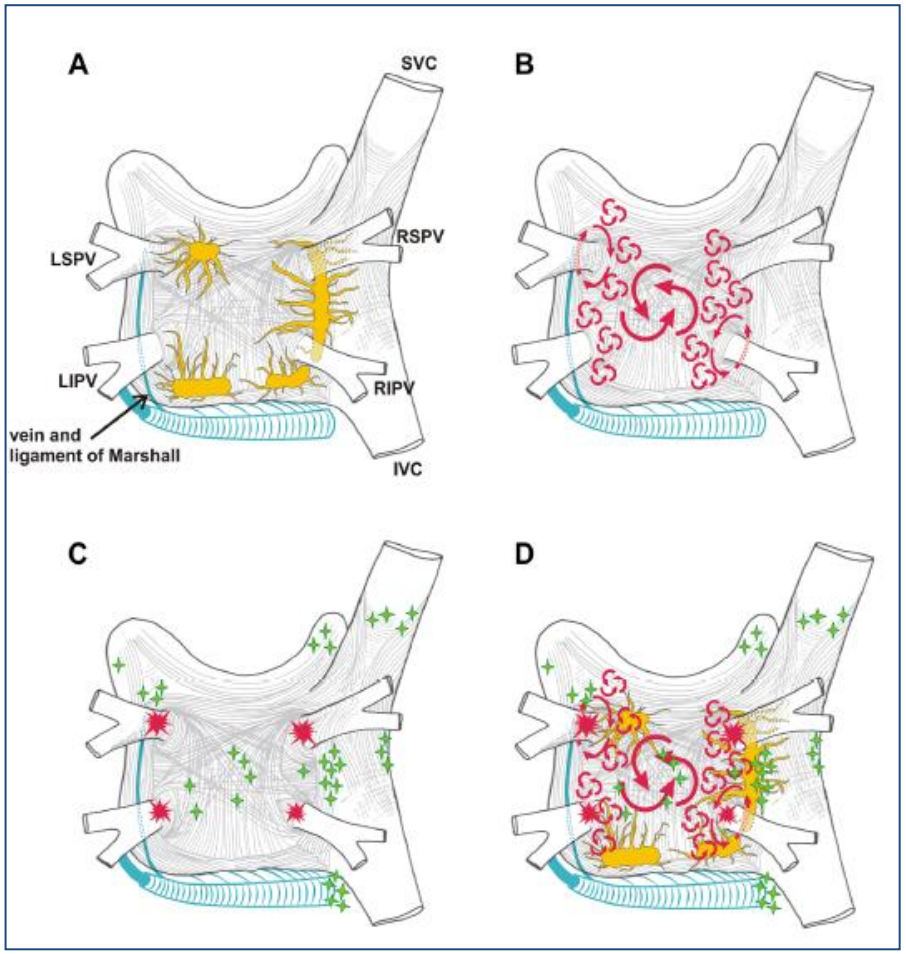
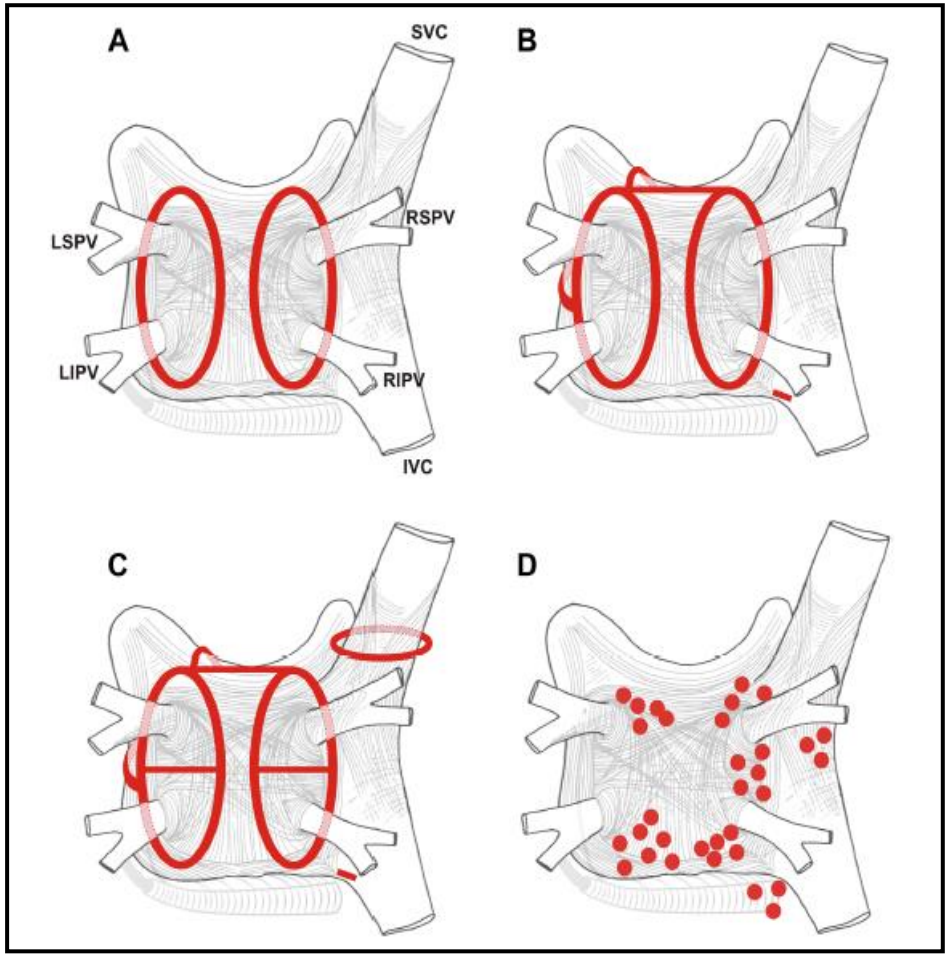


Figure 2. Features of the COBRA Fusion Ablation Probe

The Cobra Fusion™ comprises a flexible distal ablation Probe, designed to conform to the specific anatomy of the tissue to be ablated. The distal section of the Probe allows for one to six 25 mm electrodes to be



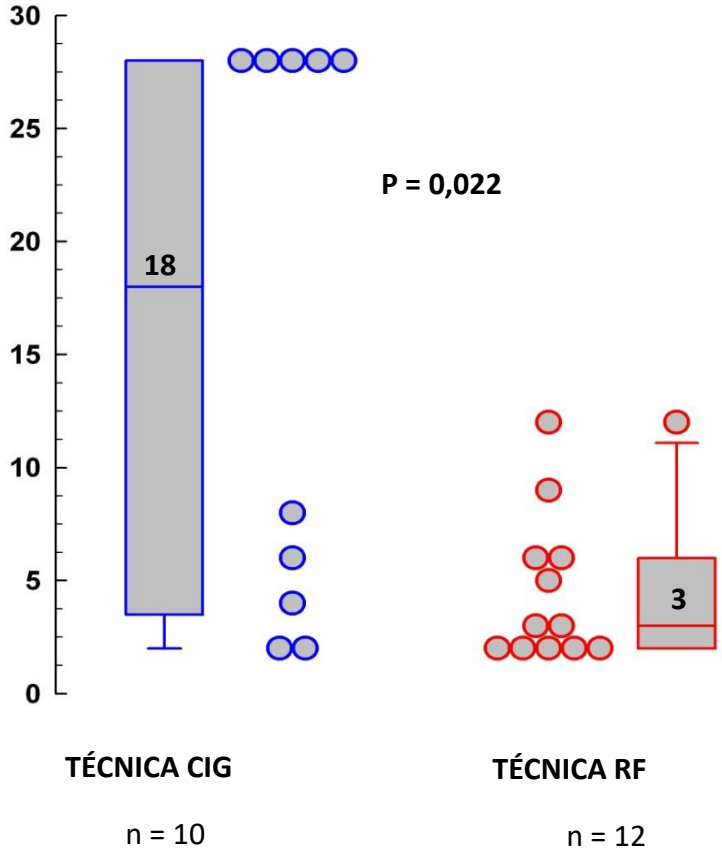


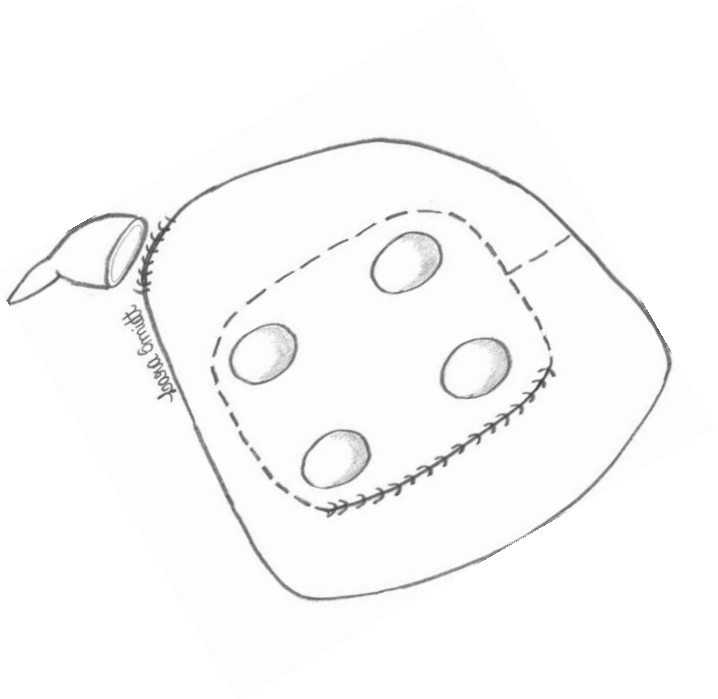
HRS/EHRA/ECAS Expert Consensus Statement on Catheter and Surgical Ablation of Atrial Fibrillation: Recommendations for Personnel, Policy, Procedures and Follow-Up

Heart Rhythm, Vol 4, No 6, June 2007

Efetividade das linhas de bloqueio cirúrgico e por radiofrequência

•	TÉCNICA CIG n=10	TÉCNICA RF n=12	P
Ritmo Sinusal	8	7	0,38
Uso de Amiodarona	1	11	<0,001





Pires LM et al (PACE 2010; 33:1249–1257)

(n = 4), roof-dependent left AT (n = 1), focal AT arising from the coronary sinus (n = 1), and right-sided ATs (n = 2). All spontaneously running ATs were successfully eliminated using EAM and subsequent RF catheter ablation. No major complications were noted. Minor complications included 5 large groin hematomas (7.1%), defined as coloration of the skin covering an area larger than a clenched fist, and 1 atrioventricular fistula (1.4%),

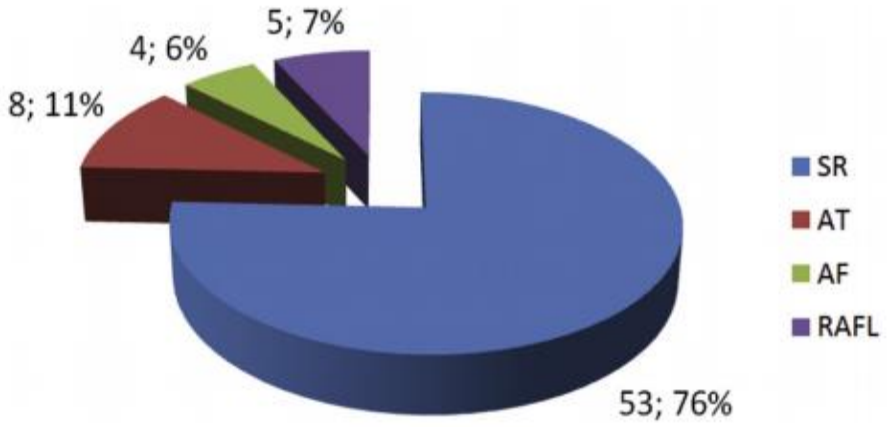


Fig 1. Cardiac rhythm in patients after epicardial surgical ablation at beginning of electrophysiologic examination: atrial fibrillation (AF, green); atrial tachycardia (AT, red); right atrial flutter (RAFL, purple); and sinus rhythm (SR, blue).

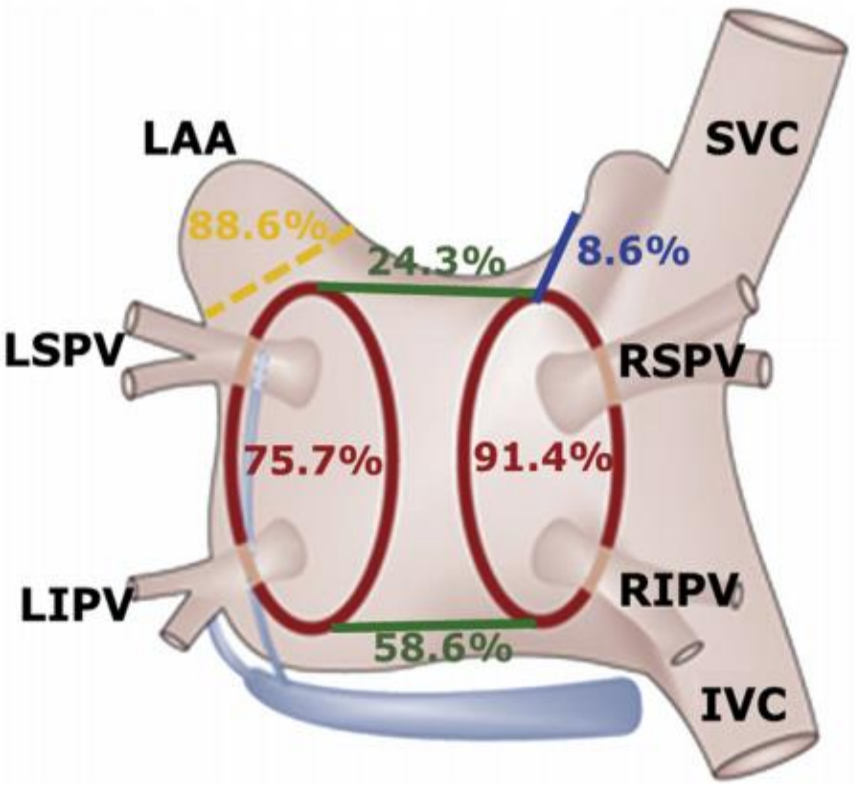


Fig 2. Success rate of epicardially created circumferential and linear lines as assessed a median of 87 days after index procedure. (IVC = inferior vena cava; LAA = left atrial appendage; LIPV = left inferior pulmonary vein; LSPV = left superior pulmonary vein; RIPV = right inferior pulmonary vein; RSPV = right superior pulmonary vein; SVC = superior vena cava.)

Bulava et al. Ann Thorac Surg 2017; 104:2024-9

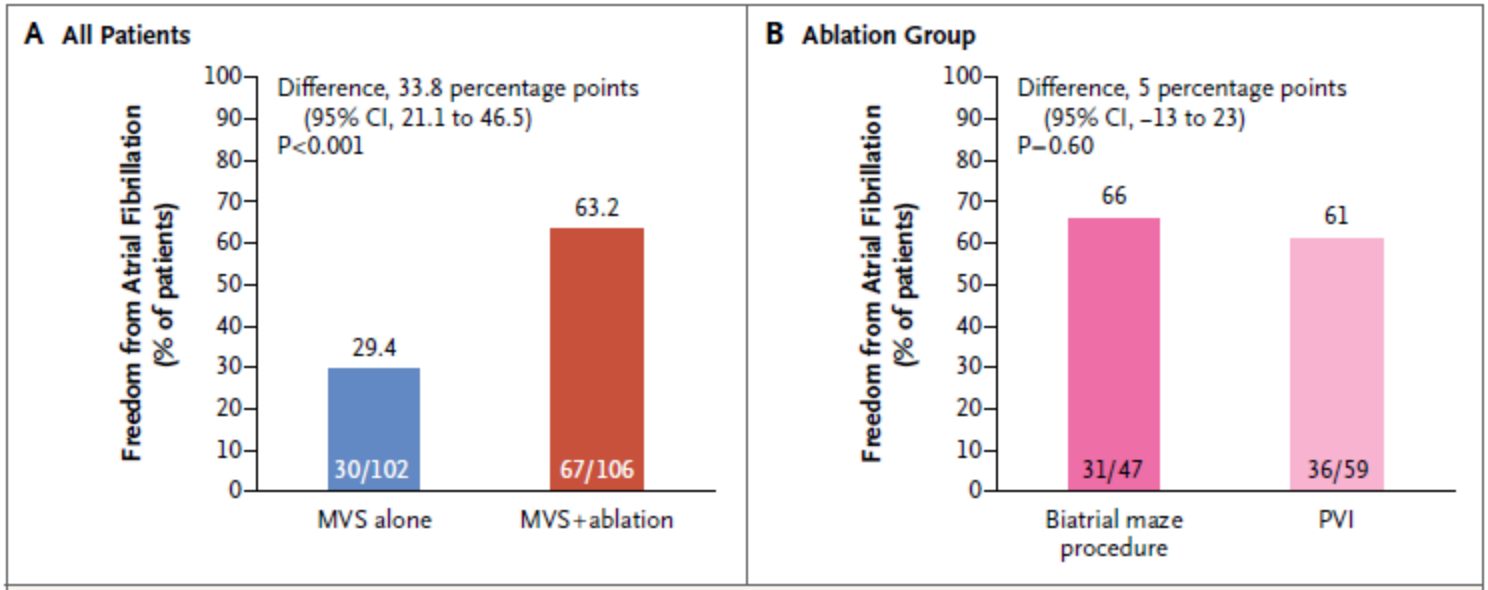


Figure 1. Freedom from Atrial Fibrillation.

Freedom from atrial fibrillation was defined as the absence of the condition at both 6 months and 12 months, as assessed by means of 3-day Holter monitoring. MVS denotes mitral-valve surgery, and PVI pulmonary-vein isolation.

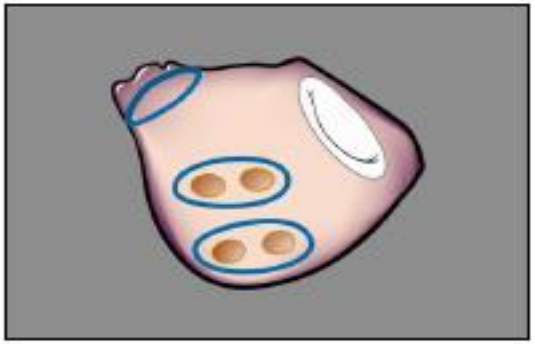
Gillinov M et al. N Engl J Med 2015;372:1399-409.

Table 2. Clinical End Points, Serious Adverse Events, and Hospitalizations at 1 Year.

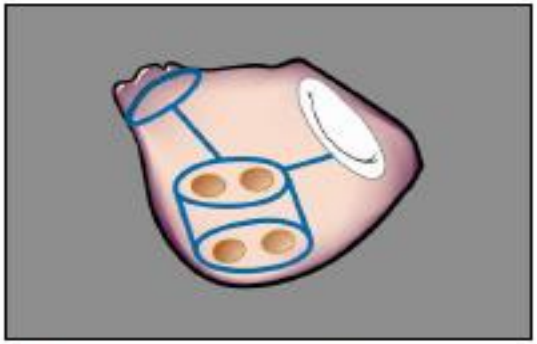
End Point or Event	Mitral-Valve Surgery Alone (N=127)	Mitral-Valve Surgery plus Ablation (N=133)	P Value
	no. of patients (%)		
Clinical end points			
Death	11 (8.7)	9 (6.8)	0.57
Stroke	2 (1.6)	4 (3.0)	0.68
Increase of one or more classes in NYHA classification*	4 (3.9)	7 (6.1)	0.46
Rehospitalization for heart failure	7 (5.5)	12 (9.0)	0.28
Mitral-valve reoperation	2 (1.6)	1 (0.8)	0.62
Composite end point†	26 (20.5)	31 (23.3)	0.58
	no. of events (no./100 patient-yr)		

Gillinov M et al. N Engl J Med 2015;372:1399-409.

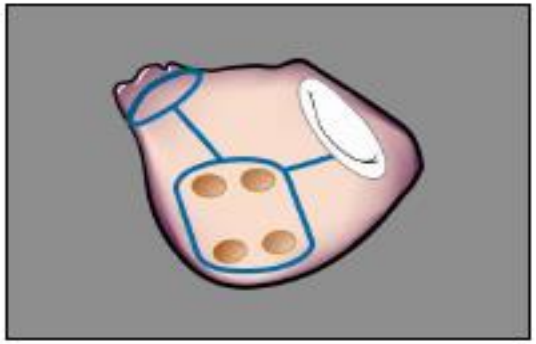
Figure S1. Depiction of Lesion Sets in Ablation Arm



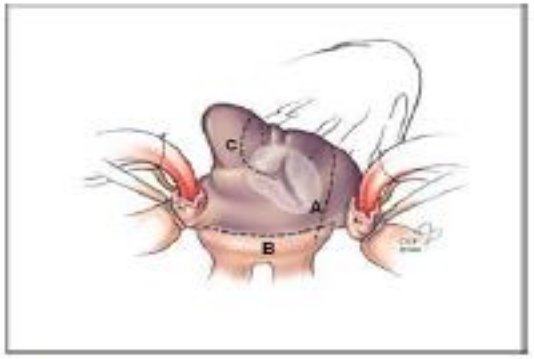
PVI lesion set with bipolar device. White oval depicts mitral valve. Four orange circles depict pulmonary vein orifices.



Left atrial component of biatrial lesion set with bipolar device. White oval depicts mitral valve. Four orange circles depict pulmonary vein orifices.

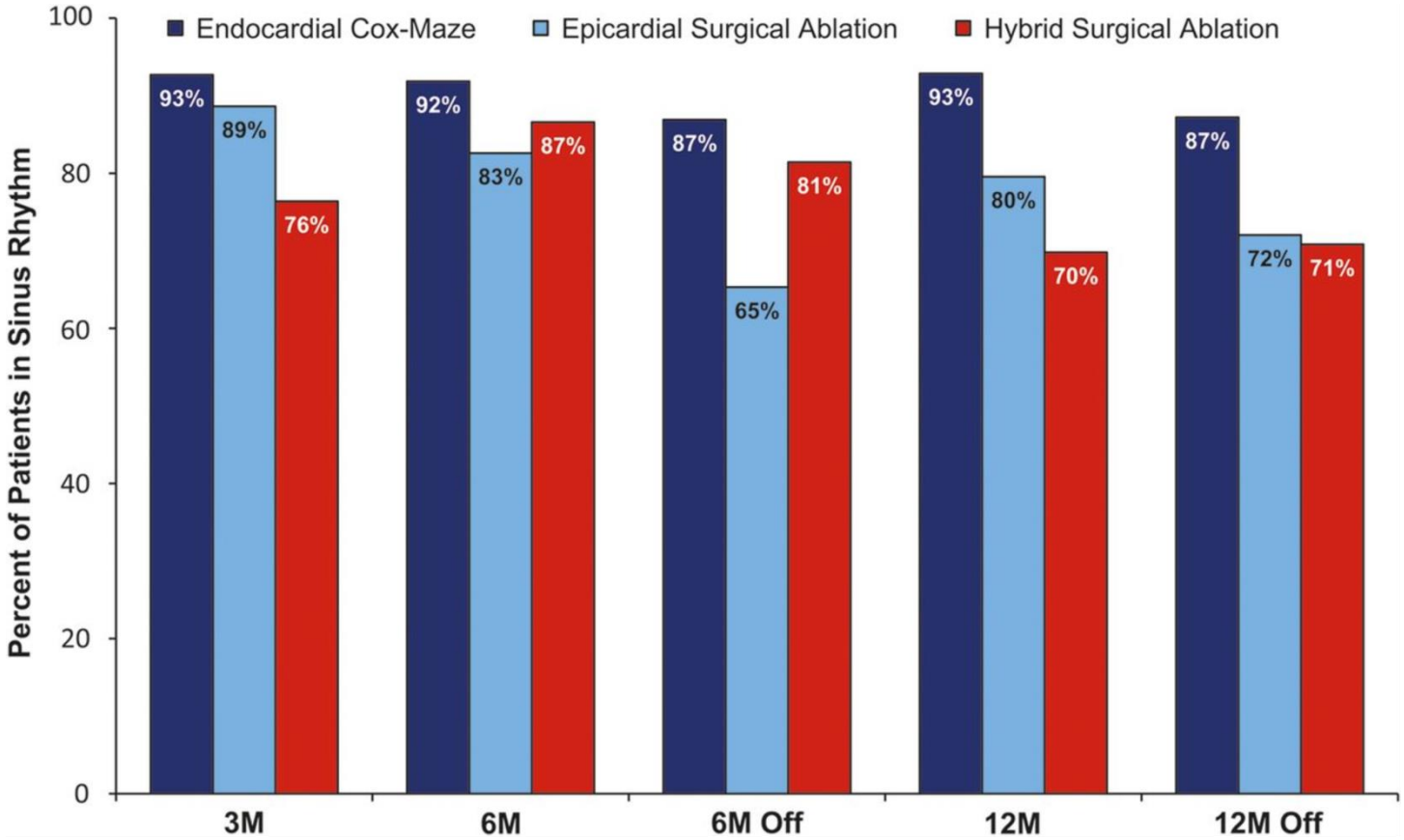


Biatrial lesion set with unipolar device. White oval depicts mitral valve. Four orange circles depict pulmonary vein orifices.



Right atrial lesions in those receiving biatrial lesion set. White oval represents the tricuspid valve. Dashed lines represent ablation lines.

Supplement to: Gillinov AM, Gelijns AC, Parides MK, et al. Surgical ablation of atrial fibrillation during mitralvalve surgery. N Engl J Med. DOI: 10.1056/NEJMoa1500528

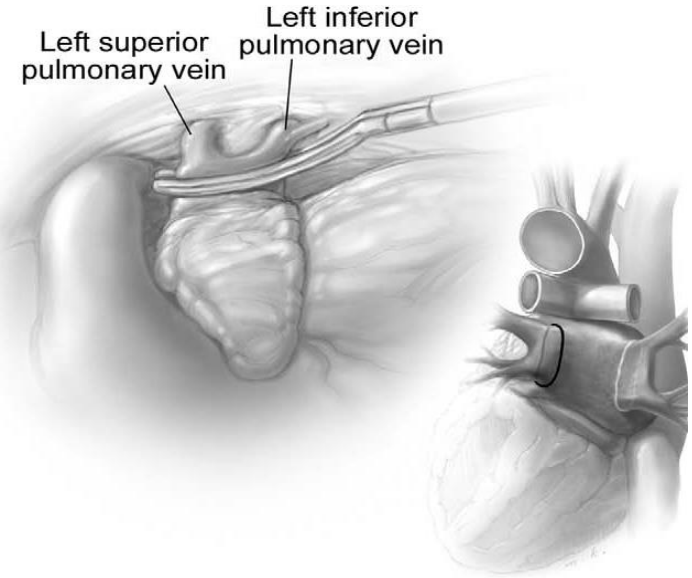


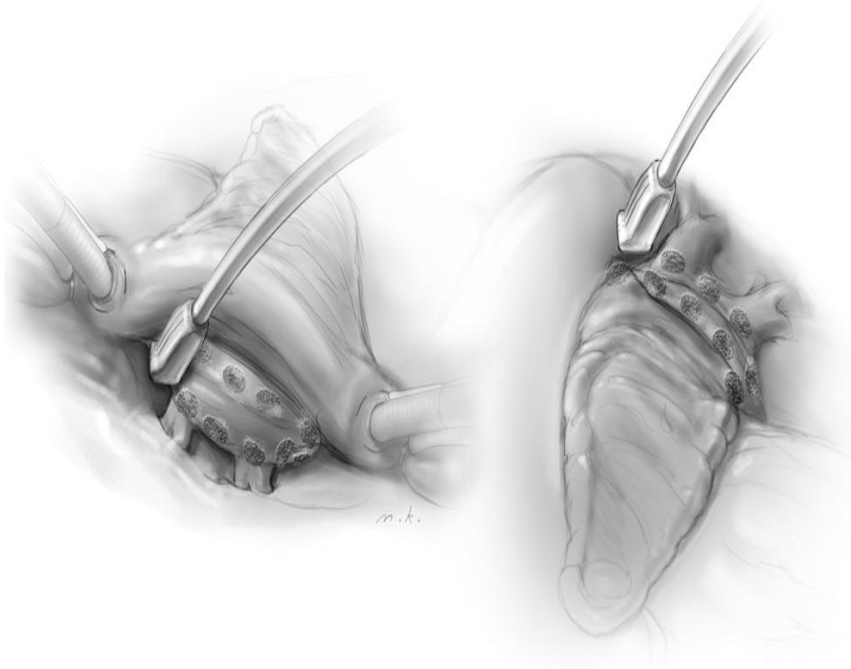
A systematic review of minimally invasive surgical treatment for atrial fibrillation: a comparison of the Cox-Maze procedure, beating-heart epicardial ablation, and the hybrid procedure on safety and efficacy †

n= 1877 in 37 selected reports

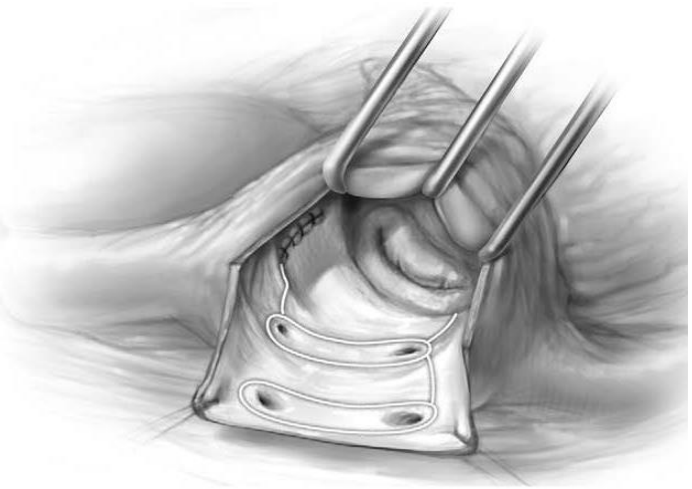
Eur J Cardiothorac Surg. 2015;48(4):531-541. doi:10.1093/ejcts/ezu536

Left Atrial Ganglion Ablation as an Adjunct to Atrial Fibrillat Surgery in Valvular Heart Disease





A



N=20

Follow-up = 1 ano

Freedom from AF = 90% X 50% RF alone

Ware AL et al (Mayo Clinic)
Ann Thorac Surg 2011;91:97–103

SPECIAL REPORT

The Society of Thoracic Surgeons 2017 Clinical Practice Guidelines for the Surgical Treatment of Atrial Fibrillation

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Fig 1. Left atrial lesion sets for Cox maze IV procedure. (A) Most linear lesions are created with bipolar radiofrequency clamps; shaded in blue are cryolesions at the mitral isthmus (and left pulmonary veins for minimally invasive approach). (B) Linear lesions also can be created with cryoablation if required for minithoracotomies or reoperations [64]. (Figure 1B © [2014] Beth Croce.)

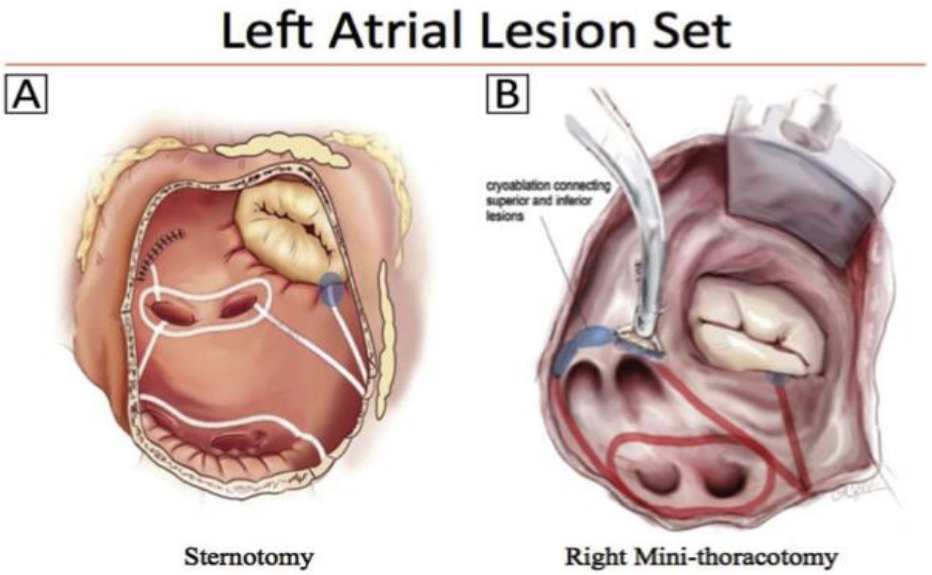
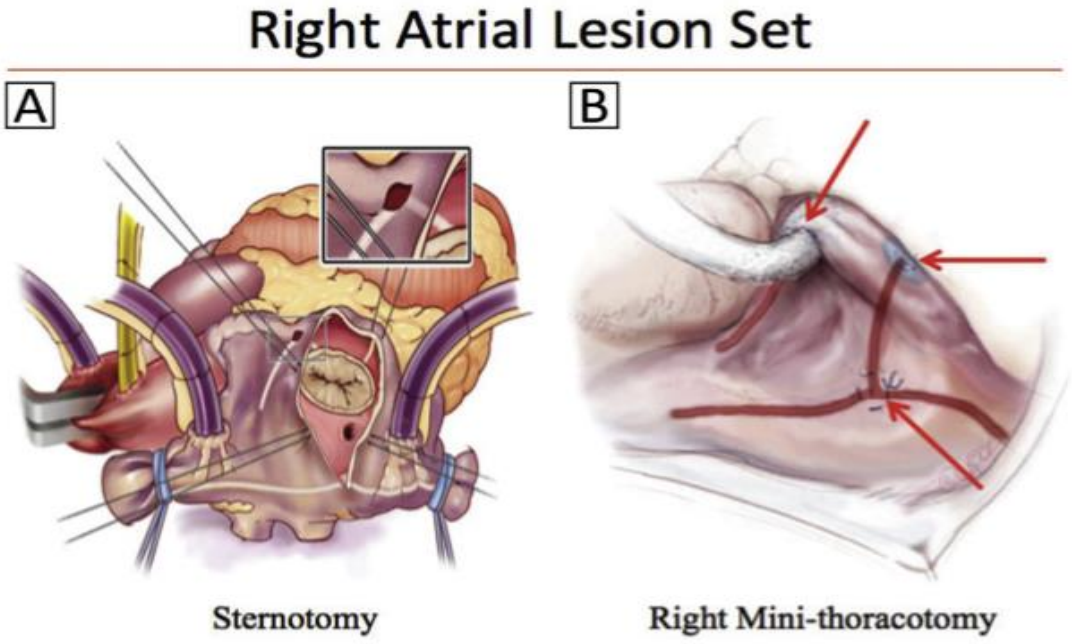


Fig 2. Right atrial lesion sets for Cox maze IV procedure. (A) Most linear lesions are created with bipolar radiofrequency clamps, and cryolesions are placed at two points on the tricuspid annulus through direct vision or small pursestring sutures (red arrows). (B) Linear lesions also can be created with cryoablation if required for minithoracotomies or reoperations [64]. (Figure 2B © [2014] Beth Croce.)



Obs.: No mention to "cut and sew" techniques in this guideline

Patient Selection

Patient Selection for AF Ablation

Variable	More Optimal Patient	Less Optimal Patient
Symptoms	highly symptomatic	minimally symptomatic
Class 1 and 3 drugs failed	≥ 1	0
AF type	paroxysmal	longstanding persistent
Age	younger (< 70 yrs)	older (≥ 70 yrs)
LA size	smaller (< 5 cm)	larger (≥ 5 cm)
Ejection fraction	normal	reduced
Congestive heart failure	no	yes
Other cardiac disease	no	yes
Pulmonary disease	no	yes
Sleep apnea	no	yes
Obesity	no	yes
Prior stroke/TIA	no	yes

Shown in the table are some of the many variables which may impact patient selection for catheter ablation of AF, either because they impact patient outcomes or they reflect the severity of the patient's symptoms and response to antiarrhythmic drug therapy. It is important to recognize that there are no absolute cut-offs to determine which patients are and are not candidates for AF ablation. Although this table has suggested certain age and left atrial size cut-offs to determine which patients are better candidates for AF ablation, these are estimates and are not based on large prospective clinical trials.

The only absolute contraindications for AF ablation identified by the consensus writing group were the presence of a left atrial thrombus or the inability of a patient to be systemically anticoagulated during and following the ablation procedure.

Estimated Outcomes and Risks of AF Ablation

Success	Single Procedure	Multiple Procedures
Optimal patient	60% - 80%	80% - 90%
Less optimal patient	50% - 70%	70% - 80%
Poor candidate	< 40%	40% - 60%
Major complication rates:	**2% - 12%**	
Left atrial flutter	2% - 5%	
Vascular/access related	1% - 5%	
Cardiac tamponade	0.5% - 3%	
Stroke	0.5% - 2%	
PV stenosis	< 1%	
Phrenic nerve injury	< 0.5%	
Esophageal perforation	< 0.2%	
Mitral valve entrapment	< 0.1%	
Acute coronary occlusion	< 0.1%	
Death	< 0.1%	

The estimates provided on this table are not based on the outcomes of large prospective multicenter clinical trials. These estimates are based on a review of the published literature. It is recognized that the outcomes of AF ablation depend on a large number of variables including those shown in the table. In addition, the technique and tools used may also impact outcomes. And finally, the experience of the operator and of the ablation center at which the procedure is performed also impact success and complication rates.

Contemporary Outcomes of Surgical Ablation in USA

N= 86,941

48.3% (42,066) underwent surgical ablation

Mitral valve repair or replacement (MVRR) operations at 68.4% (14,693 of 21,496)

Isolated CABG at 32.8% (9,156 of 27,924).

Badhwar V, Rankin JS, Ad N, et al. Surgical ablation of atrial fibrillation in the United States: trends and propensity matched outcomes. Ann Thorac Surg 2017;104:493–500.

Brazilian ByPass Registry: AF + Valve = 12/1722 = 0.7%

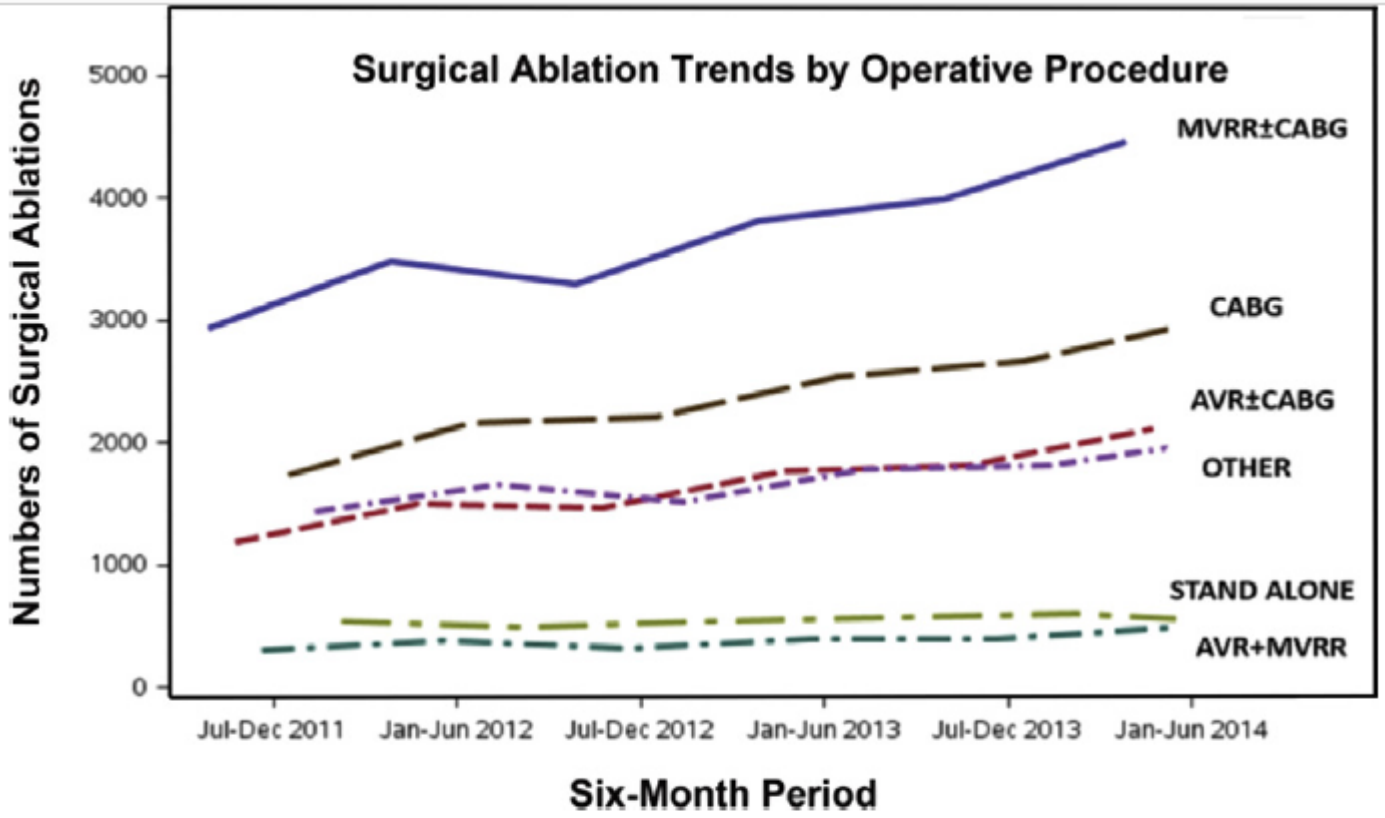


Fig 1. Trends of surgical ablation in the United States by operative procedure. (Reproduced from [7] with permission from The Society of Thoracic Surgeons.) (AVR = aortic valve replacement; CABG = coronary artery bypass graft surgery; MVRR = mitral valve repair/replacement.)

Badhwar V, Rankin JS, Ad N, et al. Surgical ablation of atrial fibrillation in the United States: trends and propensity matched outcomes. Ann Thorac Surg 2017;104:493–500.

Quoted in Ann Thorac Surg 2018;106:8–13

Surgical Efficacy

- *Depends on transmurality and lesions design*
- *"Cut &Sew" warrants transmurality*
- *RF, cryo, microwaves, diathermy, ultrasound, etc are associated to variable success indices*
- *Complete PV isolation in a "box lesion" like design confers > 90% SR (similar to Cox-Maze III/IV) in all AF modalities, being lone or associated to structural disease, paroxysmal or long term.*

Surgical Risks

- *Surgical mortality when associated ~= 2%*
- *Surgical mortality for lone AF ~= 1%*
- *Morbidity ~= 10% (reop for bleeding, prolonged ventilation and LOS, infection, bradicardia, pacemaker, others)*

STS 2017 Guidelines Surgical Ablation AF

Class

I, A - ***at mitral valve surgery, to restore SR***
I, B - ***at Ao, CABG, Ao+CABG, to restore SR***

IIa, B – ***for lone symptomatic AF refractory to drugs and catheter***
IIa, B – ***Cox-Maze III/IV lesion set is reasonable as compared to PVI alone***

III – ***PVI alone is not recommended in LA>4.5cm or moderate MR***

IIa, C – LAA exclusion in conjunction to ablation, for embolism prevention
IIa, C – LAA exclusion in AF patients at time of cardiac surgery

I, C – ***Multidisciplinary assessment, planning and follow up are beneficial***

Ann Thorac Surg 2017; 103: 329-41

2014 AHA/ACC/HRS Guideline for the Management of Patients with Atrial Fibrillation

6.5. Surgical Maze Procedures: Recommendations

CLASS IIa

1. An AF surgical ablation procedure is reasonable for selected patients with AF undergoing cardiac surgery for other indications. *(Level of Evidence: C)*

CLASS IIb

1. A stand-alone AF surgical ablation procedure may be reasonable for selected patients with highly symptomatic AF not well managed with other approaches (440). *(Level of Evidence: B)*

Brazilian Society of Cardiology Guidelines for AF

Quadro 8 – Recomendações para o tratamento cirúrgico da fibrilação atrial.

Recomendações	Classe	Nível de Evidência
Pacientes com FA sintomática que serão submetidos a cirurgia cardíaca	IIA	B
Cirurgia para tratamento exclusivo da FA em pacientes com FA sintomática, em quem o tratamento clínico ou a ablação por cateter tenham falhado ou não possam ser realizados	IIB	C
Pacientes com fibrilação assintomática que serão submetidos a cirurgia cardíaca por outra causa quando possível e com mínimo risco	IIB	C
Procedimentos híbridos (cirúrgicos epicárdicos e por cateter endocárdicos) podem ser realizados para tratar pacientes com FA persistente ou persistente de longa duração, sintomáticos, refratários a uma ou mais drogas AA das classes I e III, nos quais houve falha na ablação por cateter ou esta não pôde ser realizada	IIB	C

FA: fibrilação atrial; AA: antiarrítmicas.

Sala Cirúrgica Híbrida

Instituto de cardiologia
Fundação Universitária de Cardiologia

Past experience with catheter ablation and surgery for AF has provided several lessons that should impact how a hybrid procedure is conducted. Those lessons include:

1. The maze pattern of lesions is more effective for LSPAF than any other lesion pattern.

2. Maze procedures are too invasive to be feasible as first-line AF therapy, even for LSPAF.

4. A Maze procedure cannot be performed by thoracoscopic surgery alone.

5. A Maze procedure cannot be performed by catheter ablation alone.

6. EP's are excellent at localizing and closing the "gaps" of failed surgical lesions.

7. EP's are excellent at creating conduction block in narrow, confined areas of the atrium.

These lessons suggest that if the ultimate goal of a hybrid procedure for AF is to attain the best possible outcomes by the least invasive technique, the ideal hybrid procedure would be one that combines catheter ablation and surgery to create a final pattern of lesions that adhere to the concept of a Maze procedure.

Cox JL, Churyla A, Malaisrie SC, Pham DT, Kruse J, Kislitsina ON, McCarthy PM, A Hybrid Maze Procedure for Long-Standing Persistent Atrial Fibrillation, *The Annals of Thoracic Surgery* (2018), doi: 10.1016/j.athoracsur.2018.06.064.

Bi-Atrial Macro-Reentry in LSPAF

Figure 1. The red circles represent the actual macro-reentrant circuits that have been documented during atrial fibrillation. Note that they can and do occur in both the right atrium and left atrium. The long reentrant circuit in the right atrium, that may travel either anterior or posterior to the SVC orifice, and the reentrant circuit around the tricuspid valve are the ones responsible for typical atrial flutter. The long circuits crossing the inferior left atrial isthmus between the inferior pulmonary veins and the mitral annulus, one of which is passing through the coronary sinus, are the pathways of post-intervention atypical left atrial flutter, also known as peri-mitral flutter. SVC=superior vena cava.

Cox JL, Churyla A, Malaisrie SC, Pham DT, Kruse J, Kislitsina ON, McCarthy PM, A Hybrid Maze Procedure for Long-Standing Persistent Atrial Fibrillation, *The Annals of Thoracic Surgery* (2018), doi: 10.1016/j.athoracsur.2018.06.064.

Completed Thoracoscopic Lesions

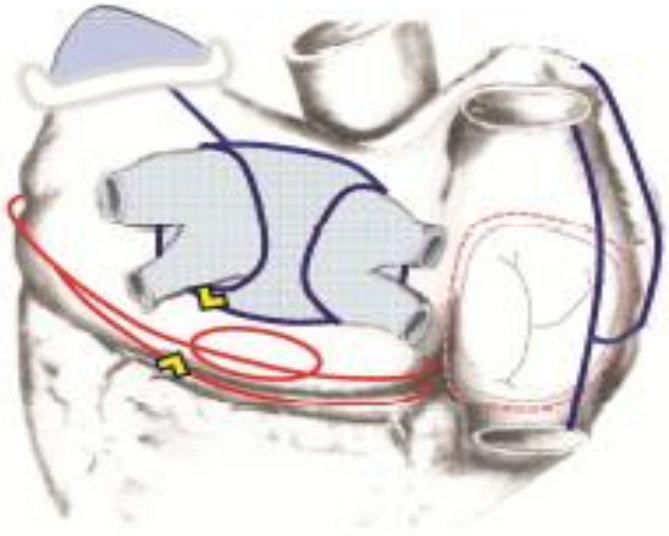


Figure 6. This diagram shows the completed thoracoscopic procedure that is the initial step in the staged Hybrid Maze Procedure. The LA lesions and procedures include:

1. PVI with a box lesion
2. LSPV-to-LAA lesion
3. Epicardial AtriClip across the base of the LAA
4. Placement of radiopaque vascular clips

The RA lesions include:

1. SVC-IVC lesion
2. RA free-wall lesion

CTI=cavo-tricuspid isthmus, LAA=left atrial appendage, LSPV=left superior pulmonary vein, PVI=pulmonary vein isolation, RA=right atrial

Cox JL, Churyla A, Malaisrie SC, Pham DT, Kruse J, Kislitsina ON, McCarthy PM, A Hybrid Maze Procedure for Long-Standing Persistent Atrial Fibrillation, *The Annals of Thoracic Surgery* (2018), doi: 10.1016/j.athoracsur.2018.06.064.

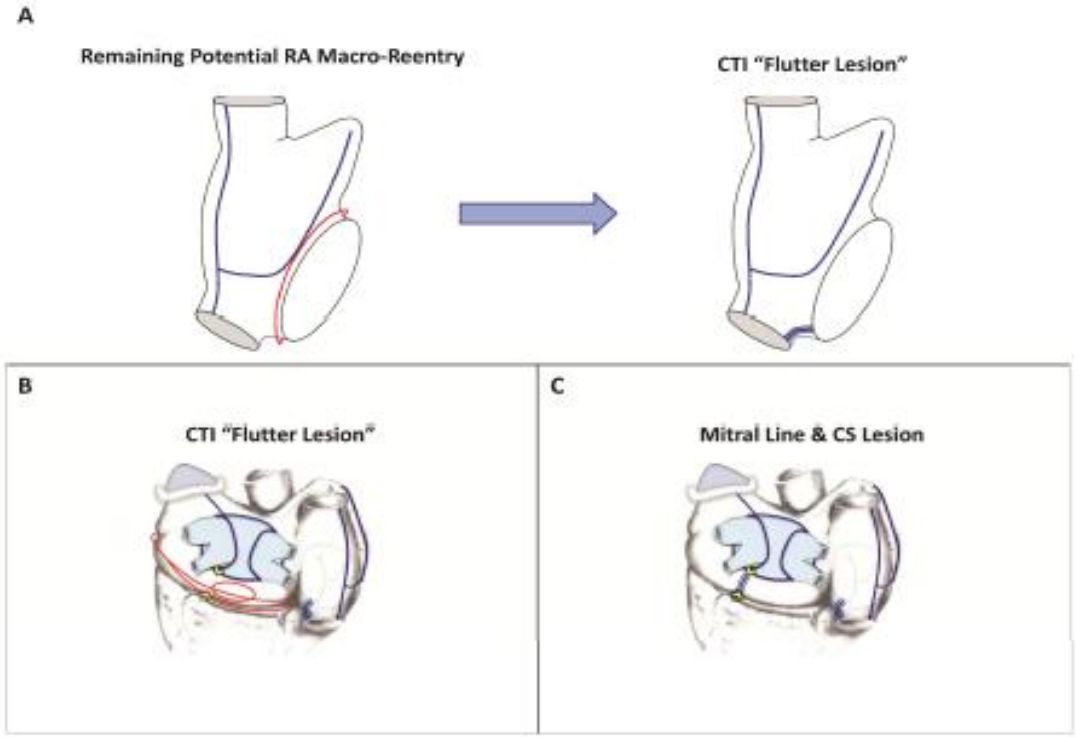


Figure 7. These are the lesions that may be necessary to perform at the time of the obligatory follow-up catheter ablation following the blanking period, which is recommended to be 90 days. (A) All patients should receive a CTI lesion in the RA to preclude future development of atrial flutter due to a peri-tricuspid macro-reentrant circuit. (B) If the patient has developed peri-mitral flutter during the blanking period, or if peri-mitral flutter can be induced during the follow-up catheter ablation stage, conduction across the LA isthmus should be created. (C) This is accomplished by creating both a mitral line in the atrial myocardium and a circumferencial lesion in the coronary sinus in the same plane as the mitral line. It is essential to create the coronary sinus lesion first so that when the more difficult mitral line is created, the interventional electropyhsiologist will be able to determine when the mitral line is complete. If the mitral line is performed first, its apparent inability to block conduction across the LA isthmus might well be because of conduction through the coronary sinus, leading the electrophysiologist to think that the mitral line is incomplete and difficult to perform.

CIT-cavotricuspid isthmus, LA=left atrial, RA=right atrium.

Cox JL, Churyla A, Malaisrie SC, Pham DT, Kruse J, Kislitsina ON, McCarthy PM, A Hybrid Maze Procedure for Long-Standing Persistent Atrial Fibrillation, *The Annals of Thoracic Surgery* (2018), doi: 10.1016/j.athoracsur.2018.06.064.

Hybrid Maze Procedure

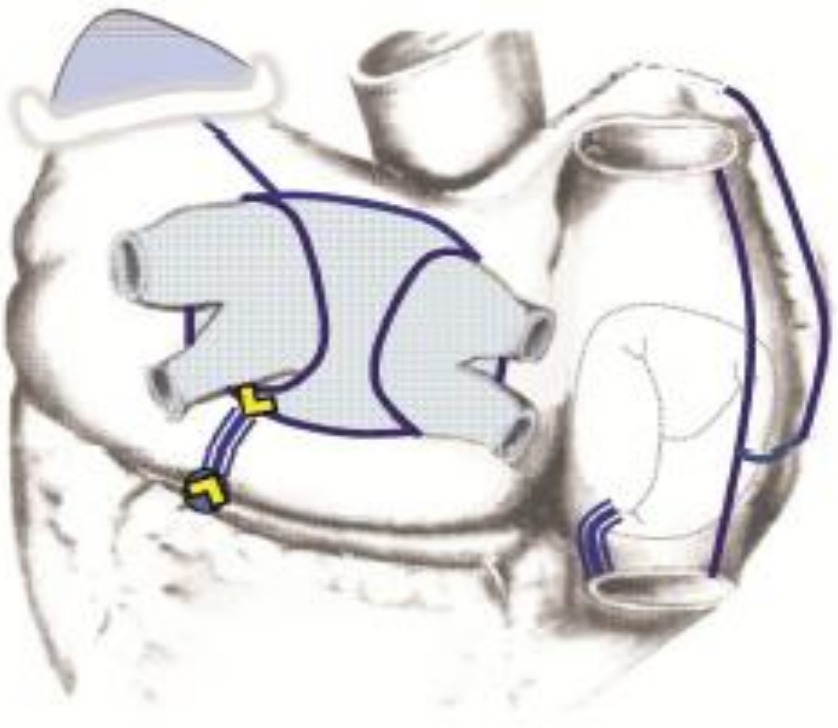


Figure 8. These are the completed lesions of the Hybrid Maze Procedure. Assuming that all of the lesions are complete and placed in these positions, the results of this Hybrid Maze Procedure will be identical to those of a surgical Maze procedure. It should be noted, however, that some 85-90% of patients will not develop post-thoracoscopy peri-mitral flutter and will not have inducible peri-mitral flutter at the time of the follow-up catheter ablation. In this case, those patients will not need a complete Maze procedure.

Cox JL, Churyla A, Malaisrie SC, Pham DT, Kruse J, Kislitsina ON, McCarthy PM, A Hybrid Maze Procedure for Long-Standing Persistent Atrial Fibrillation, *The Annals of Thoracic Surgery* (2018), doi: 10.1016/j.athoracsur.2018.06.064.

O talento do inovador consiste em ver o que todos viram e pensar o que ninguém pensou

Claude Bernard,

fisiólogo

Conclusões

- *A cirurgia é eficaz para reversão a RS em FA refratária, com redução da mortalidade e do risco de AVC, com melhora na qualidade de vida.*
- *Indicação é necessária na FA permanente em pacientes que vão a cirurgia cardíaca. Mandatória na mitral.*
- *Ablação com RF e outras energias é eficaz quando apropriadamente aplicadas. Corte e sutura garante transmuralidade e eficácia*
- *FA PRIMÁRIA: Associar EF e MICS contribui positivamente para melhores resultados*

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HOSPITAL MOINHOS DE VENTO

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