ASAN Medical Center

울산대학교 의과대학
UNIVERSITY OF ULSAN COLLEGE OF MEDICINE

A-Fib with Sinus Nodal Dysfunction
Rate Control is Better

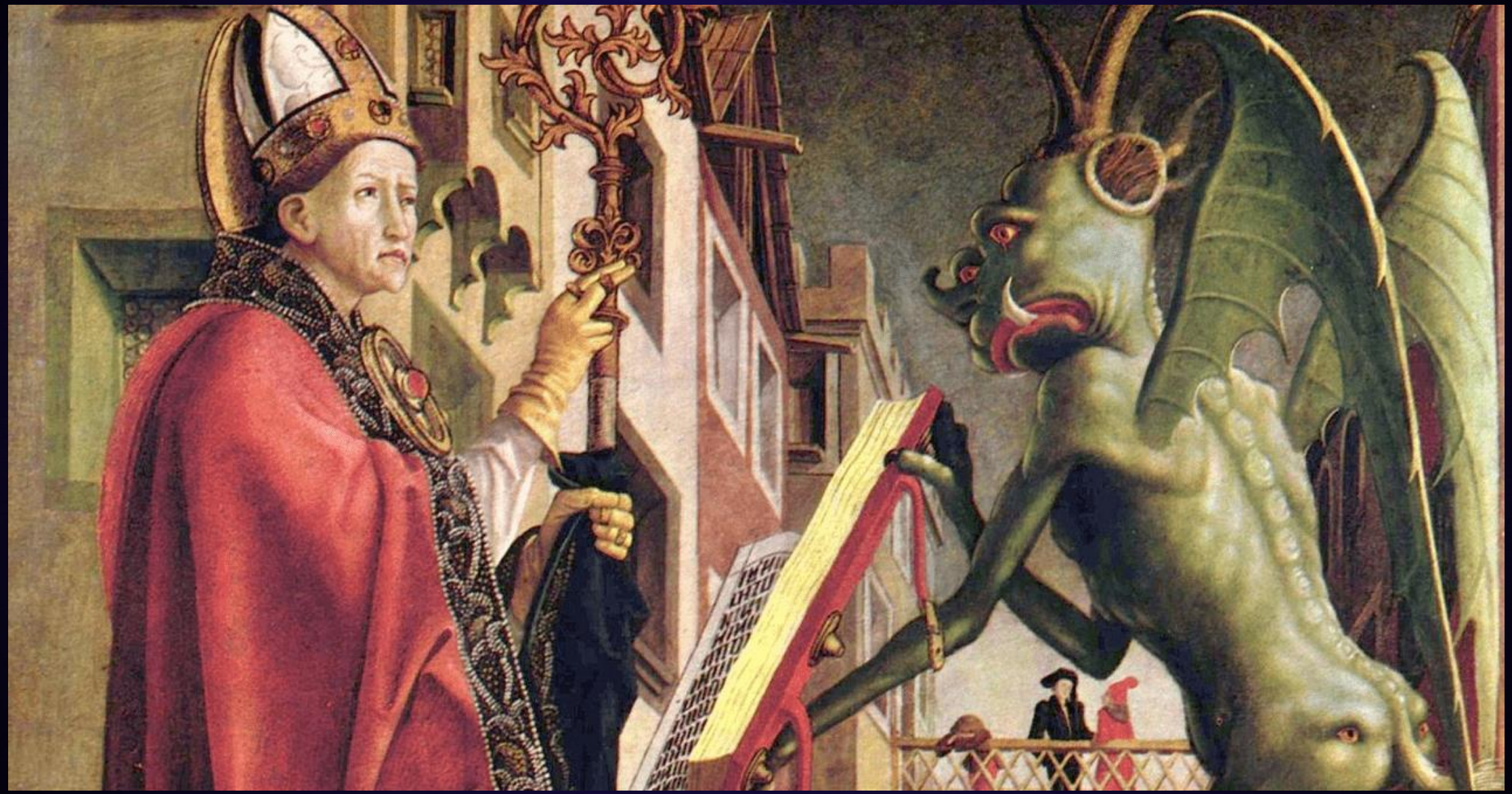
Ho Jin Kim, MD

Department of Thoracic and Cardiovascular Surgery

Asan Medical Center, University of Ulsan College of Medicine

Disclosure

- 2023-01 to 2024-04
- Pt with pre-op AF (N=74)
- Maze (N=71, 95.9%)
- No maze (N=3)
  - All redo cases
  - LAA closure (N=2)



How do we know that a AF patient has a ‘preop’ SND?

Association between SND and A-fib

REVIEW

Sinus Node Dysfunction and Atrial Fibrillation: A Reversible Phenomenon?

LARRY R. JACKSON II, M.D.,*,† BHARATH RATHAKRISHNAN, M.D.,‡
KRISTEN CAMPBELL, PHARM.D., C.P.P., B.C.P.S.,§ KEVIN L. THOMAS, M.D.,*,†
JONATHAN P. PICCINI, M.D., M.HS.,*,† TRISTRAM BAHNSON, M.D.,¶
JONATHAN A. STIBER, M.D.,† and JAMES P. DAUBERT, M.D.*,‡

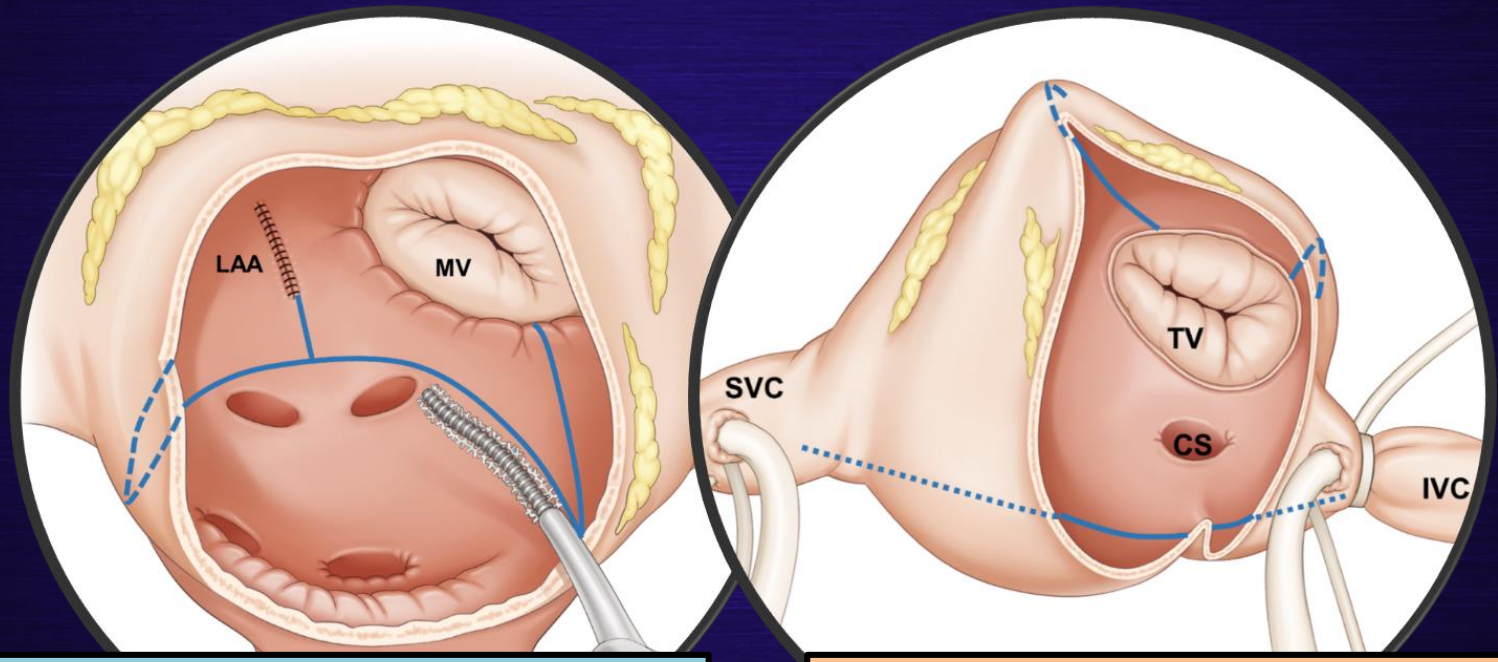
From the *Duke Clinical Research Institute; †Duke University School of Medicine, Durham, North Carolina; ‡Columbia University College of Physicians and Surgeons, New York City, New York; §Department of Pharmacy, Duke University Medical Center, Durham, North Carolina; and ¶Division of Adult Cardiac Electrophysiology, Duke University Medical Center, Durham, North Carolina

PACE 2017;40:442-450

Results: *SND affects up to one in five patients with AF. AF can lead to anatomical and electrophysiological remodeling in both at[i]al, atrial fibrosis, altered calcium channel [e]xpression, demonstrated in patients with AF and SND. Nonrandomized clinical trial data have failed to demonstrate whether any pacing strategy can reduce the risk of AF. Pulmonary vein isolation appears to decrease episodes of tachybrady syndrome and sinus pauses.*

Maybe higher with patients requiring surgery……

Maze vs. Medical Treatment



- Conversion to SR
- Symptomatic relief
- Thromboembolism/mortality ↓

- Procedure-related risk (?)
- Efficacy (?)
- Pacemaker

Maze: Procedure-Related Risk

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

Vinay Badhwar, MD, J. Scott Rankin, MD, Ralph J. Damiano, Jr, MD, A. Marc Gillinov, MD, Faisal G. Bakaeen, MD, James R. Edgerton, MD, Jonathan M. Philpott, MD, Patrick M. McCarthy, MD, Steven F. Bolling Harold G. Roberts, MD, Vinod H. Thourani, MD, Rakesh M. Suri, MD, Richard J. Shemin, MD, Scott Firestone, MS, Niv Ad, MD

Division of Cardiothoracic Surgery, West Virginia University, Morgantown, West Virginia (VB, JSR, NA); D Surgery, Washington University, St. Louis, Missouri (RJD); Division of Thoracic and Cardiovascular Surger Cleveland, Ohio (AMG, FGB, RMS); Department of Cardiothoracic Surgery, Baylor Plano Heart Hospital, P Department of Cardiothoracic Surgery, Sentara Heart Hospital, Norfolk, Virginia (JMP); Division of Cardiac University Feinberg School of Medicine, Chicago, Illinois (PMM); Department of Cardiac Surgery, University Michigan (SFB); Department of Cardiovascular Services, Florida Heart and Vascular Care at Aventura, Ave Division of Cardiothoracic Surgery, Emory University, Atlanta, Georgia (VHT); Division of Cardiothoracic S California Los Angeles David Geffen School of Medicine, Los Angeles, California (RJS); and The Society of Th Illinois (SF)

CrossMark

Executive Summary

Surgical ablation for atrial fibrillation (AF) can be performed without additional risk of operative mortality or major morbidity, and is recommended at the time of concomitant mitral operations to restore sinus rhythm. (Class I, Level A)

Surgical ablation for AF can be performed without additional operative risk of mortality or major morbidity, and is recommended at the time of concomitant isolated aortic valve replacement, isolated coronary artery bypass graft surgery, and aortic valve replacement plus coronary artery bypass graft operations to restore sinus rhythm. (Class I, Level B nonrandomized)

Ann Thorac Surg 2017;103:329-41

Surgical ablation for atrial fibrillation during aortic and mitral valve surgery: A nationwide population-based cohort study

Ho Jin Kim, MD,[a] Ye-Jee Kim, PhD,[b] Minju Kim, MSc,[b] Jae Suk Yoo, MD, PhD,[a] Dae-Hee Kim, MD, PhD,[c] Duk-Woo Park, MD, PhD,[c] Sung-Ho Jung, MD, PhD,[a] Suk Jung Choo, MD, PhD,[a] and Joon Bum Kim, MD, PhD[a]

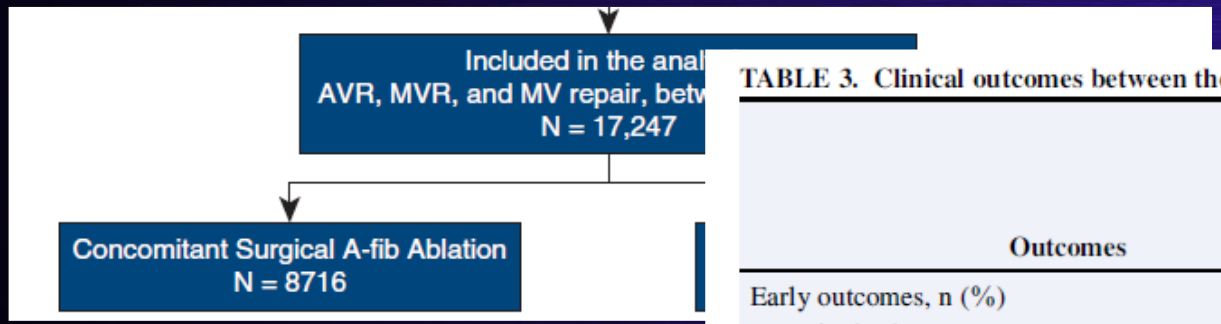
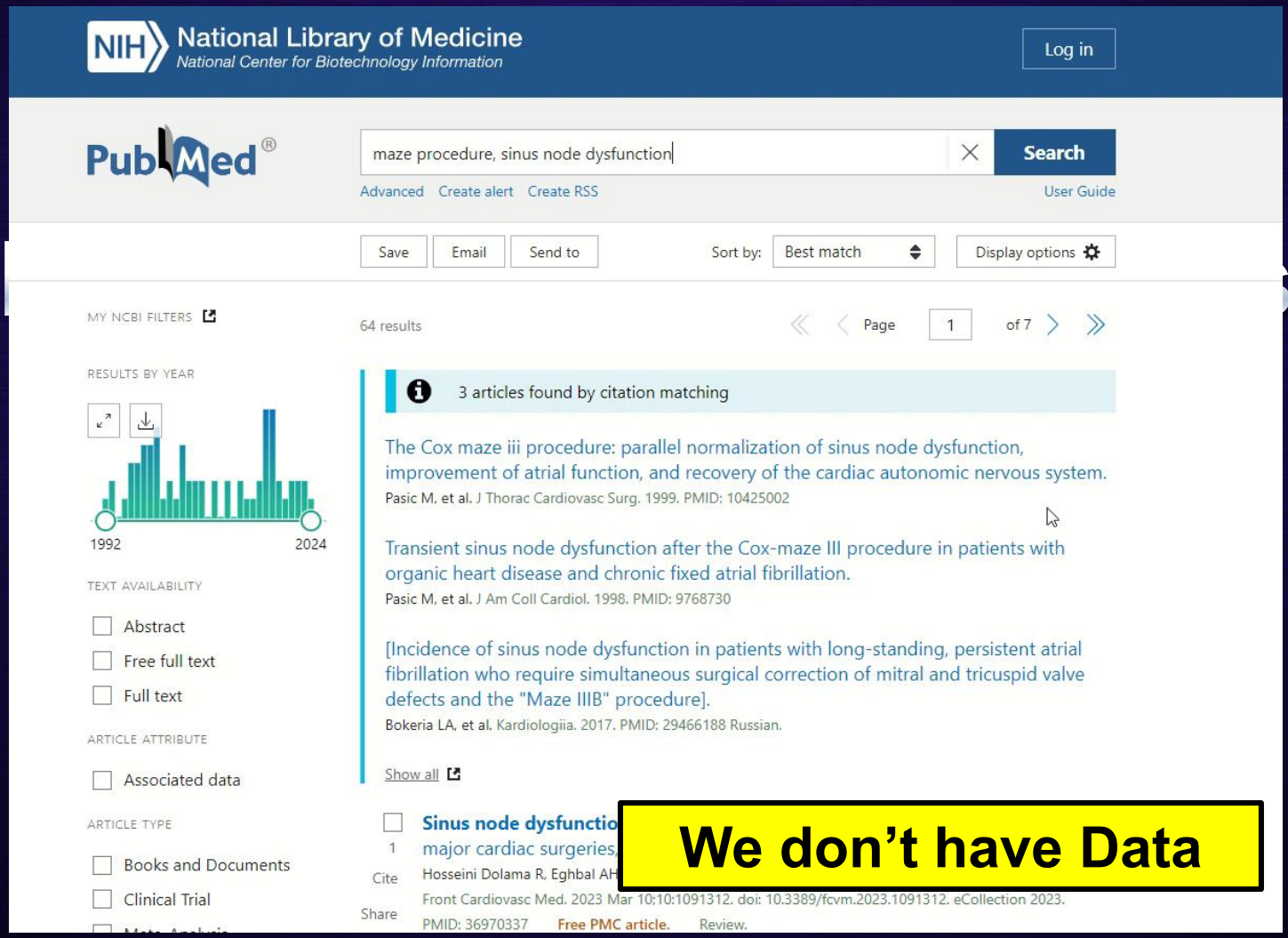


TABLE 3. Clinical outcomes between the ablation and the no ablation groups

Outcomes	Original No. of events (rate) Ablation (n = 8716)	Original No. of events (rate) No ablation (n = 8531)	Original OR or HR/sHR (95% CI)	Original *P* value	IPTW-adjusted OR or HR/sHR (95% CI)	IPTW-adjusted *P* value
Early outcomes, n (%)						
Early death	242 (2.8)	338 (4.0)	0.69 (0.59-0.82)	<.001	0.94 (0.80-1.11)	.446
Cardiovascular death	201 (2.3)	292 (3.4)	0.67 (0.56-0.80)	<.001	0.88 (0.74-1.05)	.169
Noncardiovascular death	41 (0.5)	46 (0.5)	0.87 (0.57-1.33)	.524	1.34 (0.87-2.06)	.184
PPM implantation	149 (1.7)	110 (1.3)	1.33 (1.04-1.71)	.024	1.31 (1.03-1.67)	.030
Renal replacement therapy	497 (5.7)	728 (8.5)	0.65 (0.58-0.73)	<.001	0.91 (0.82-1.03)	.124
Bleeding requiring exploration	544 (6.2)	604 (7.1)	0.87 (0.78-0.99)	.027	0.91 (0.81-1.02)	.113
MCS support*	279 (3.2)	387 (4.5)	0.70 (0.59-0.81)	<.001	0.79 (0.68-0.92)	.002

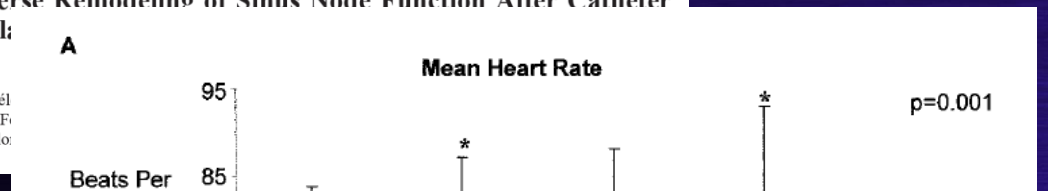
Maze Efficacy to Restore to NSR

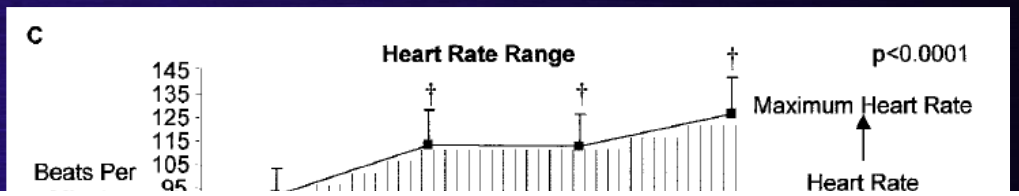


Catheter Ablation in AF Patients with SND

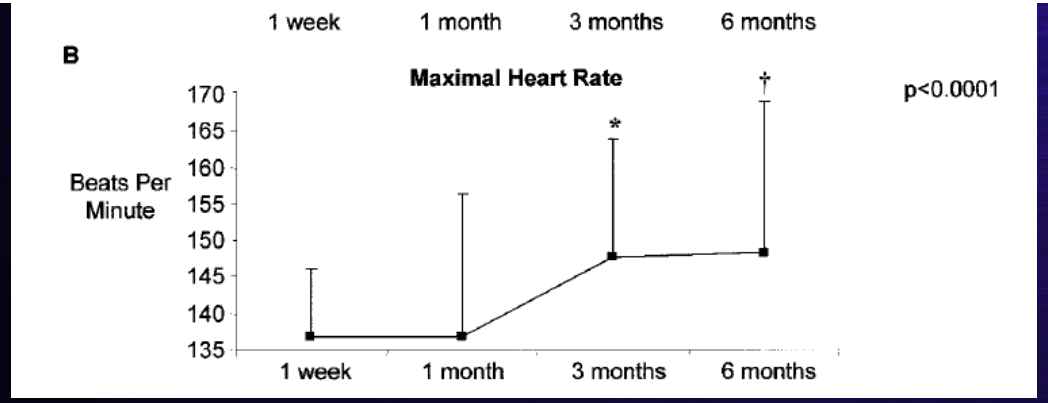
Brief Rapid Communication

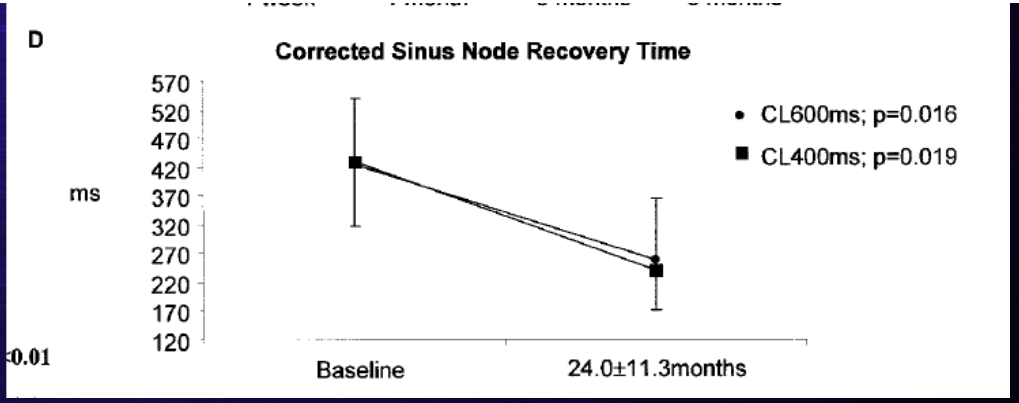
Reverse Remodeling of Sinus Node Function After Catheter Abl



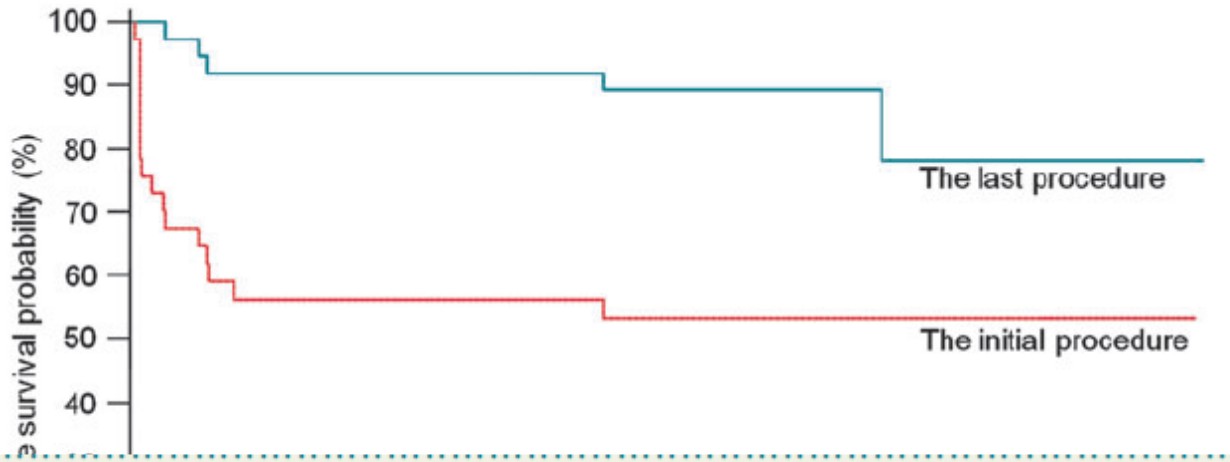


Conclusion—Prolonged sinus pauses after paroxysms of AF may result from depression of sinus node function that can be eliminated by curative ablation of AF. This is accompanied by improvement in parameters of sinus node function, suggesting reverse remodeling of the sinus node. (***Circulation***. **2003;108:1172-1175.**)

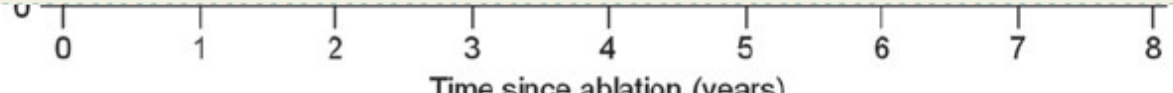




Catheter Ablation in AF Patients with SND



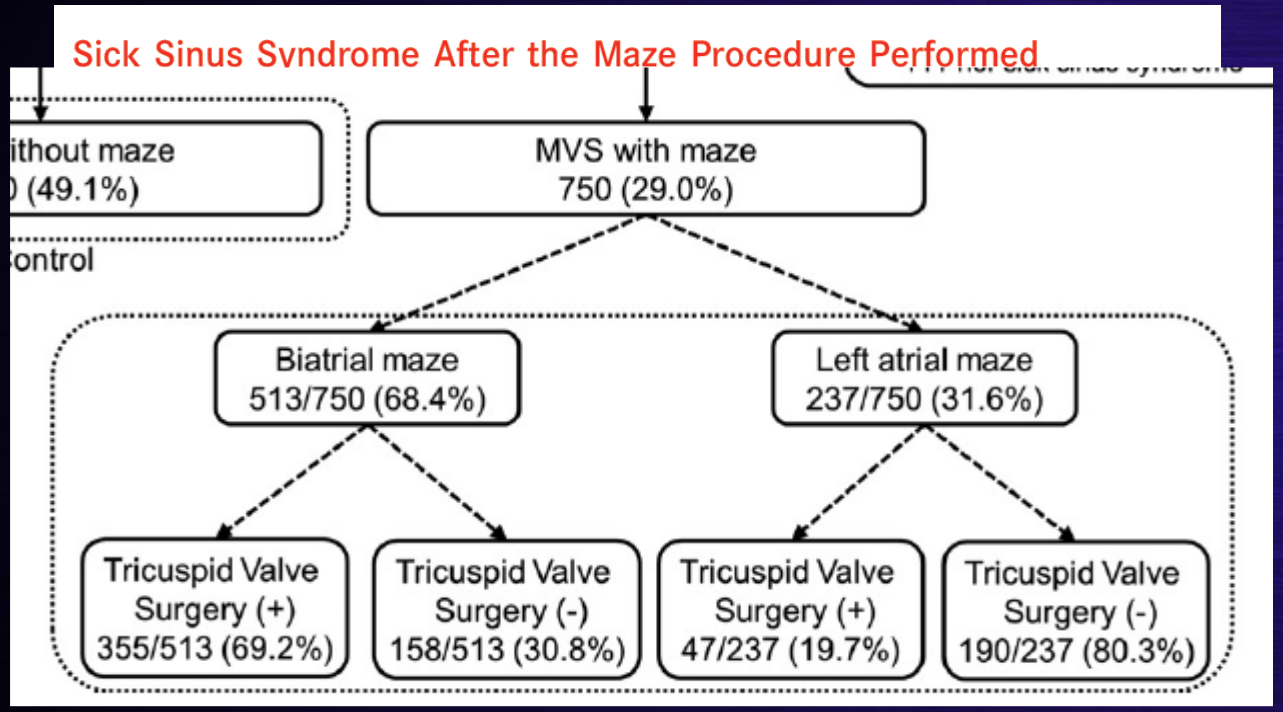
Conclusion Catheter ablation can eliminate both AF and prolonged sinus pauses in the majority of TBS patients. Nevertheless, such patients should be continuously followed-up, because gradual progression of sinus node dysfunction can occur after a long period of time.

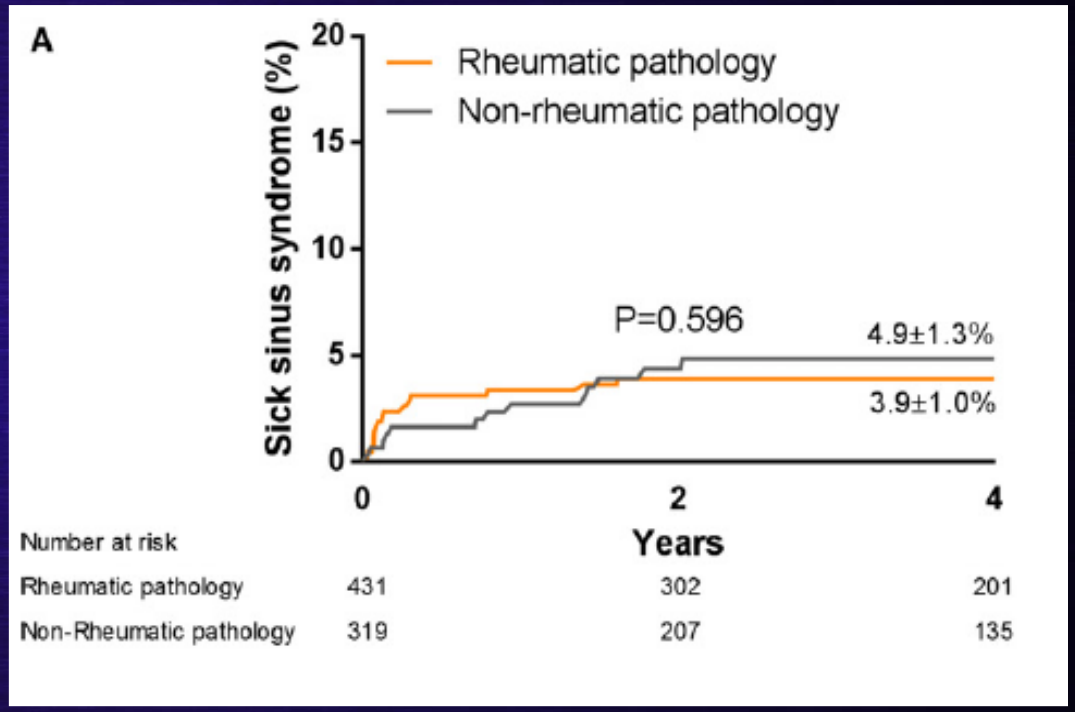


Number at risk									
The initial procedure	37	20	20	20	16	6	4	3	0
The last procedure	37	34	34	34	33	18	6	4	0

Figure 2 Fl **Figure 1** The Kaplan–Meier curve of the freedom from AF after the initial (dashed line) and last (solid line) ablation procedures.

Sinus Node Dysfunction after Maze





J Am Heart Assoc. 2018;7:e009629

Pacemaker after Maze

Surgical
mitral va
cohort st

Ho Jin Kim,
Dae-Hee Kim
Suk Jung Cho

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MCS support*	279 (3.2)	387 (4.5)	0.70 (0.59-0.81)	<.001	0.79 (0.68-0.92)	.002
Overall outcomes, n (%/PY)						
Death	1596 (2.7)	2628 (4.1)	0.65 (0.61-0.69)	<.001	0.86 (0.80-0.92)	<.001
Cardiovascular death	890 (1.5)	1491 (2.3)	0.62 (0.57-0.68)	<.001	0.78 (0.71-0.86)	<.001
Noncardiovascular death	706 (1.2)	1137 (1.8)	0.68 (0.62-0.74)	<.001	0.97 (0.87-1.08)	.570
Ischemic stroke or SE	505 (0.9)	875 (1.3)	0.64 (0.57-0.72)	<.001	0.62 (0.55-0.71)	<.001
Major bleeding	2208 (5.2)	2491 (5.4)	0.98 (0.93-1.04)	.509	1.03 (0.96-1.10)	.455
Hemorrhagic stroke	247 (0.5)	284 (0.5)	0.99 (0.84-1.18)	.922	0.89 (0.73-1.09)	.261
PPM implantation	467 (0.9)	257 (0.5)	1.99 (1.70-2.32)	<.001	1.78 (1.49-2.13)	<.001
Heart failure requiring admission	1018 (2.1)	1319 (2.5)	0.84 (0.78-0.92)	<.001	0.87 (0.79-0.96)	.005
Composite of death, stroke, bleeding, and heart failure	3899 (9.9)	4959 (12.1)	0.80 (0.77-0.83)	<.001	0.89 (0.85-0.93)	<.001

J Thorac Cardiovasc Surg 2024;167:981-993

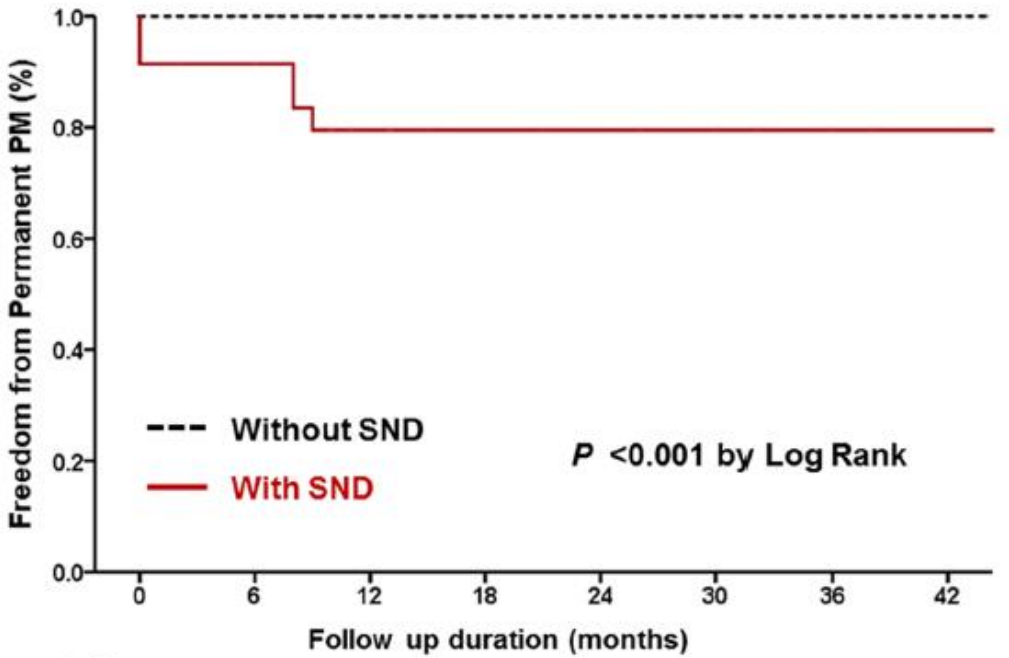
Pacemaker after Maze

RESEARCH ARTICLE

Sinus node dysfunction after surgical atrial fibrillation ablation with concomitant mitral valve surgery: Determinants and clinical outcomes

Darae Kim[1], Chi Young Shim[1]*, Geu-Ru Hong[1], In Jeong Cho[1], Seung Hyun Lee[2], Hyuk-Jae Chang[1], Sak Lee[2], Jong-Won Ha[1], Byung-Chul Chang[2]

1 Cardiology Division, Severance Cardiovascular Hospital, Yonsei University College of Medicine, Seoul, Republic of Korea, 2 Department of Thoracic and Cardiovascular Surgery, Yonsei University College of Medicine, Seoul, Republic of Korea



Numbers at risk

Without SND	165	163	163	163	163	163	163	163
With SND	37	33	30	30	30	30	30	30

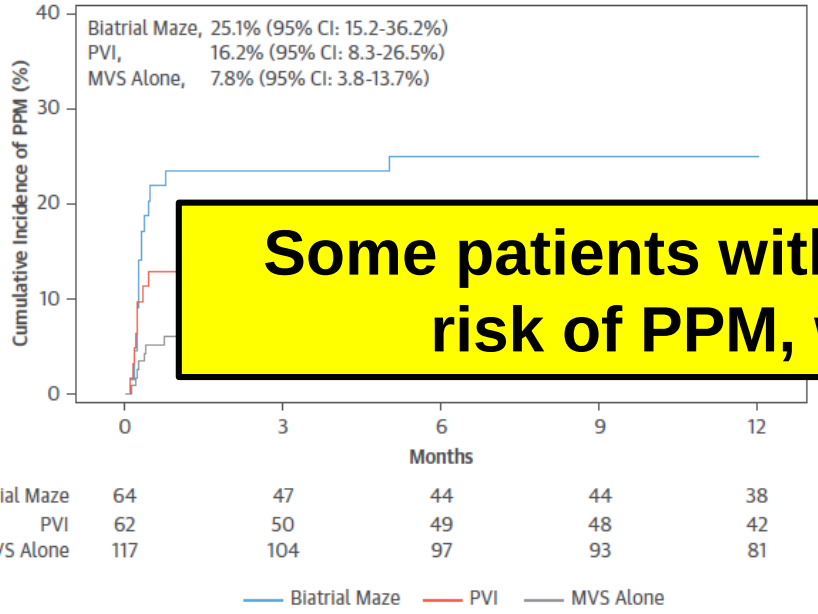
Fig 2. Time to event curves for permanent pacemaker implantation.

https://doi.org/10.1371/journal.pone.0203828.g002

PLOS ONE 2018

Pacemaker after Maze

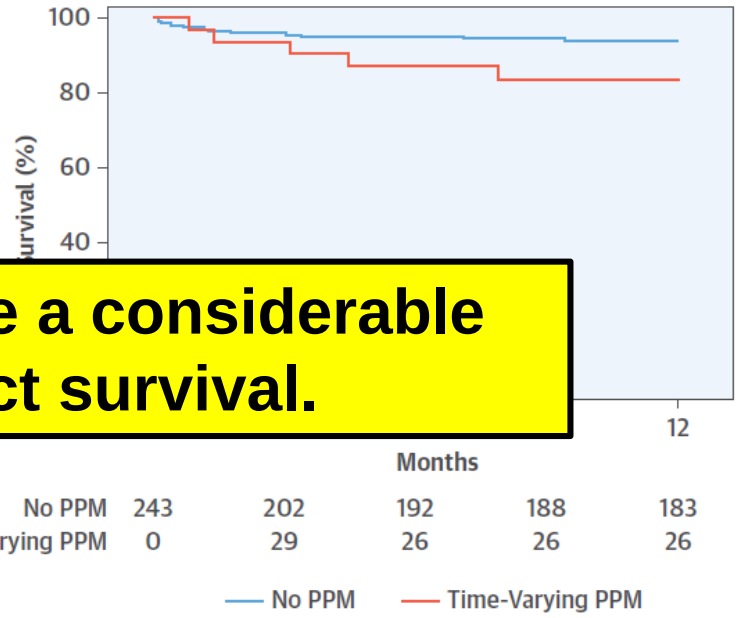
FIGURE 1 Cumulative Incidence of PPM Placement by Randomization Assignment Nonparametric Estimates of the Cumulative Incidence Functions for PPM Implantation With Death as a Competing Risk Over 12 Months After MVS With or Without A Concomitant Ablation Procedure



CI = confidence interval; MVS = mitral valve surgery; PPM = permanent pacemaker; PVI = pulmonary vein isolation.

Some patients with SND may have a considerable risk of PPM, which may affect survival.

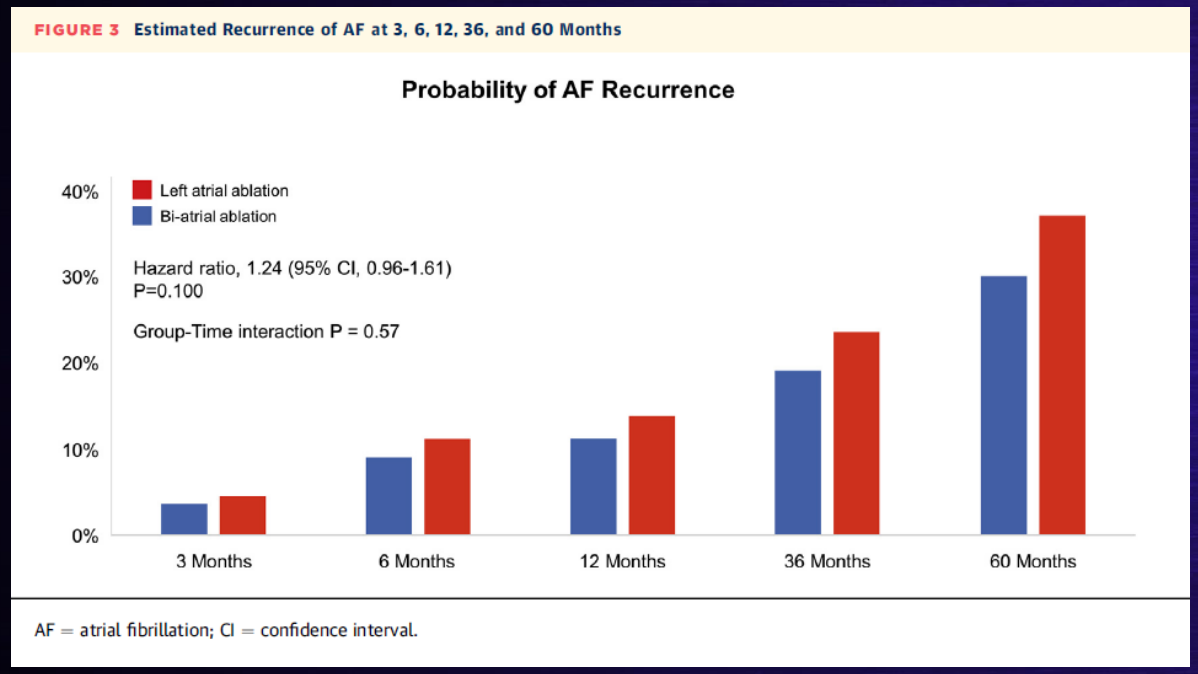
CENTRAL ILLUSTRATION Permanent Pacemaker Placement and Survival

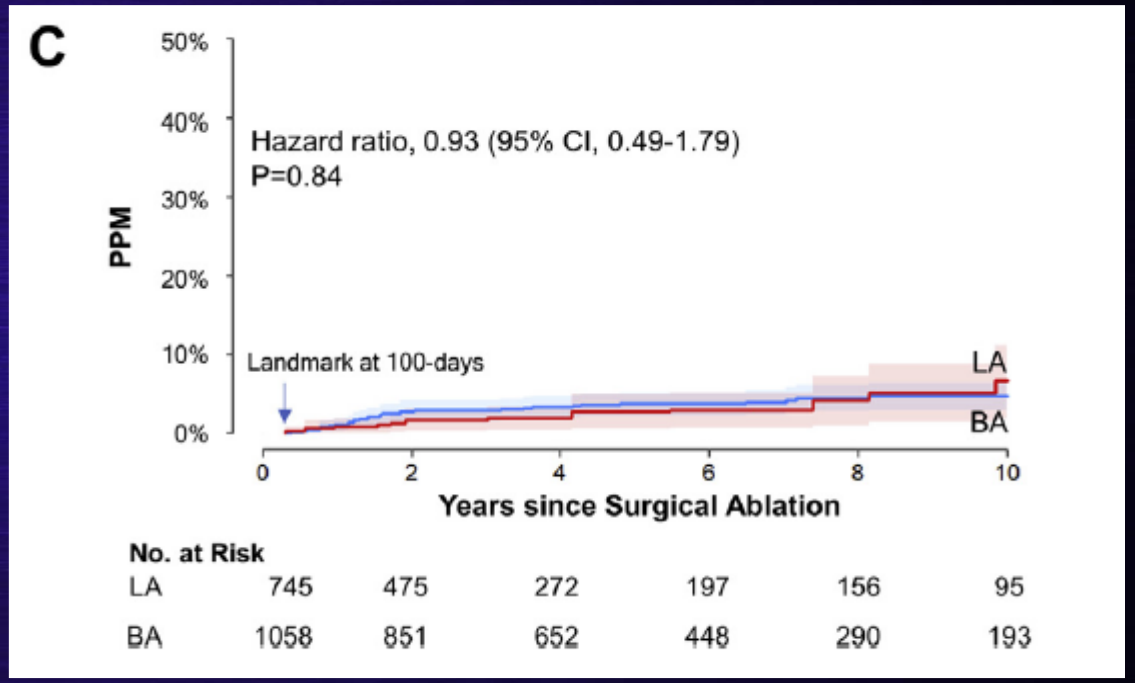


DeRose, Jr., J.J. et al. J Am Coll Cardiol. 2019;73(19):2427-35.

Extended Kaplan-Meier curve assessing the effect of a permanent pacemaker (PPM) on survival probability using method by Snappin et al. (12). Median observation time was 1.3 months (interquartile range: 0.4 to 3.4 months) for patients who died.

Repair Failure after Maze





JACC Asia 2021;1:203-214

Repair Failure after Maze

TABLE 6 Final Multivariable Model for Pacemaker Implantation

	HR	95% CI	*P* Value
Age (by 1-y increment)	1.02	1.001-1.04	0.037
TV surgery	1.64	1.02-2.62	0.042
LA size (by 1-mm increment)	1.02	1.00-1.04	0.055
NYHA functional class III or IV	1.47	0.98-2.20	0.064
LA vs BA ablation	0.71	0.43-1.18	0.187

Candidate variables were initially screened with univariable analyses. Clinically significant variables with a $P < 0.10$ in univariable models were used in the final multivariable model (LA vs BA ablation, age, AF duration, diabetes mellitus, chronic kidney disease, hemoglobin, NYHA functional class III or IV, LA diameter, significant TR, year of surgery, MV surgery, TV surgery, LA appendage treatment). Variables that remained in the multivariable model using backward elimination technique were retained in the final multivariable model. A model for permanent pacemaker implantation (PPM) was built using Fine and Gray competing risk analyses that accounted for all-cause death as a competing risk.

BA = bi-atrial; CI = confidence interval; HR = hazard ratio; LA = left atrium; MV = mitral valve; NYHA = New York Heart Association; TV = tricuspid valve.

TABLE 5 Final Multivariable Repeated Measures Model of Atrial Fibrillation After a 3-Month Blanking Period

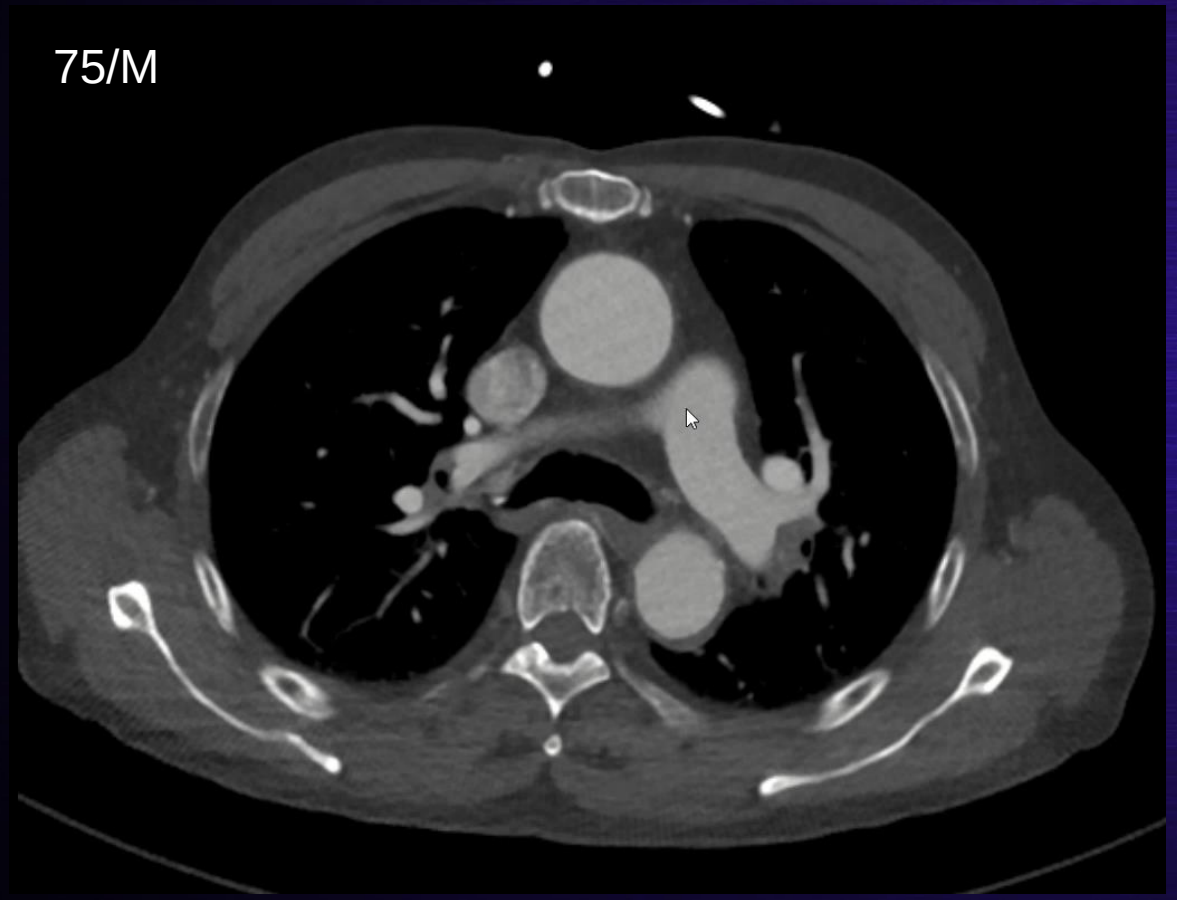
	Odds Ratio	95% CI	*P* Value
Time, mo			
3	-	-	-
6	2.43	1.93-3.05	<0.001
12	3.11	2.46-3.93	<0.001
36	5.50	4.29-7.05	<0.001
60	8.83	6.69-11.65	<0.001
Early AF recurrence (<3 mo)	2.16	1.59-2.95	<0.001
Age (by 1-y increment)	1.03	1.02-1.05	<0.001
Persistent AF	1.61	1.07-2.41	0.022
AF duration (by 1-y increment)	1.04	1.02-1.06	<0.001
LA size (by 1-mm increment)	1.03	1.02-1.05	<0.001
Significant TR (≥grade 3)	1.66	1.19-2.30	0.003
AAD use (<3 mo)	2.16	1.68-2.77	0.001

Candidate variables were initially screened with univariable analyses. Significant variables with a $P < 0.05$ in univariable models were used to build a full multivariable model. The full multivariable model was built with all variables screened from univariable analyses (time, early AF recurrence, age, AF type, AF duration, congestive heart failure, chronic kidney disease, history of CVA, hemoglobin, peripheral arterial disease, significant TR, TV surgery, use of mechanical valve, LA appendage treatment, LA size reduction, AAD use). Only variables with a $P < 0.05$ in the full multivariable model were retained in the final multivariable model.

AAD = anti-arrhythmic drug; AF = atrial fibrillation; CI = confidence interval; CVA = cerebrovascular accident; LA = left atrium; TR = tricuspid regurgitation.

JACC Asia 2021;1:203-214

Case #1

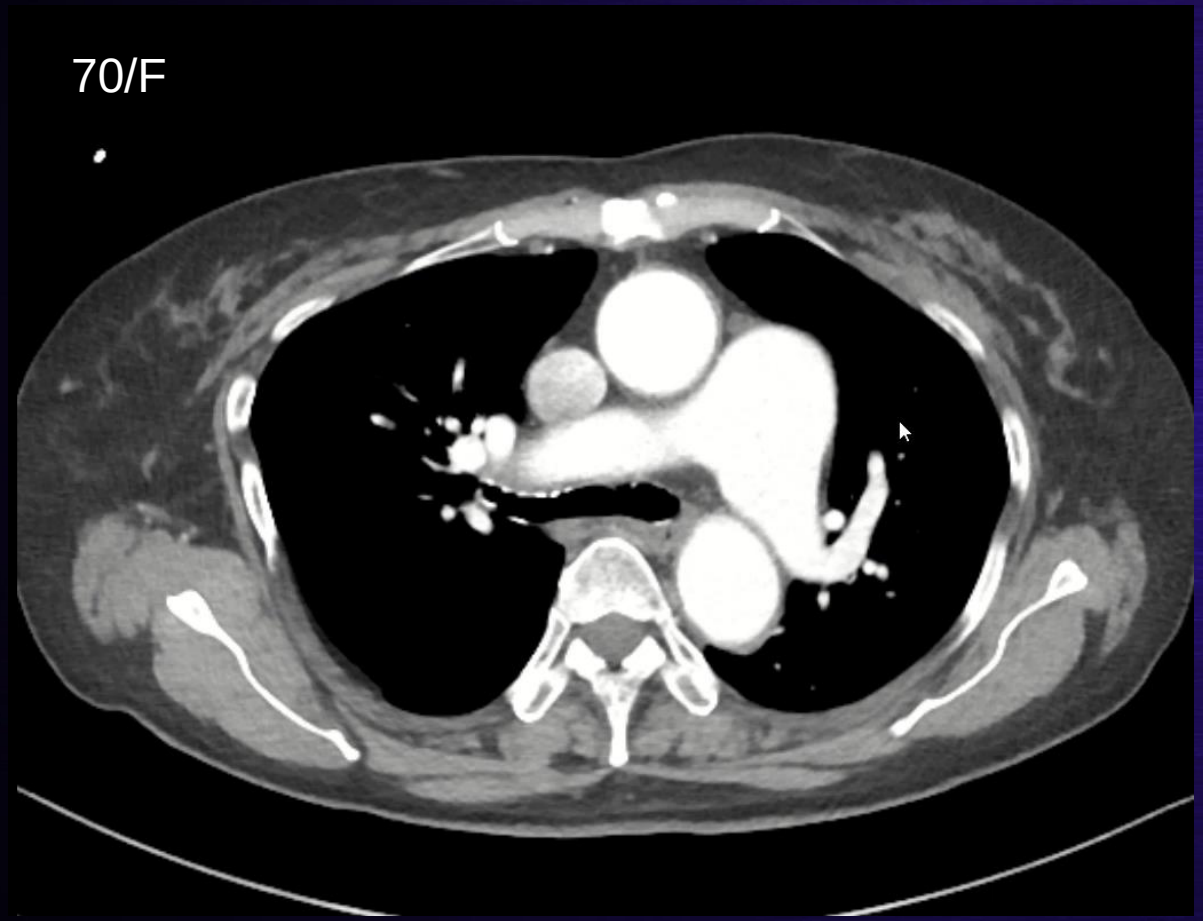


수술 소견(Operative Finding)

1. Pre OP diagnosis : TR4, A-fib s/p MVR (SJ 31mm), AVR (SJ 21mm) (96'', AMC)
2. Post OP diagnosis : TR4, A-fib
3. OP name : TVR (Mosaic 33mm) via Rt. mini-thoracotomy under beating heart
4. approach : Rt. Ant. lat. mini-thoracotomy
   Right lung adhesion was seen with chest wall
5. Pump
   A-line : Rt. FA
   V-line : Rt. FV
6. Valve inspection

tricuspid valve - severe annular dilatation

Case #2



현병력(Present Illness)

#1. s/p MVR SJ 29mm, LAAO d/t rheumatic MSR(1997.6.10)
#2. Severe TR
#3. AFib
#4. HF
#5. Anemia

#6. Moderate rheumatic AS

수술 소견(Operative Finding)

CPB) ascending aorta/RFV/SVC

RAtomy-transeptal approach to LA
previous LAA internal obliteration-> flow communication +, re-closure with CV 4-0.
intact prosthetic MV with small amount of pannus

AV-rheumatic, commmissural fusion
AVR with SJ Regent 23mm, 16 figure-of-eight stitches, Cor KNOT x 16

TR-annular enlargement
TAP with MC3 28mm, 9 horizontal stitches

post TEE: no PVL, mild TR

Case #3

58/M

#1. A.fib, s/p TFCA (2017.11.01)

#2. s/p DVR (AVR + MVR) (2002, 을지병원): pannus formation of AV

수술 후 진단명(Postoperative Diagnosis)

failure of prosthetic cardiac valve(mechanical)[Pannus formation(AV), Pannus formation (MV), hemolytic anemia, s/p AVR, MVR(2002), A-fib, tachy-brady syndrome, h/o stroke]

수술 후 수술명(Postoperative Name)

redo aortic valve replacement[Redo-sternotomy, redo AVR(SJR 21mm), redo MVR(ATS 27mm), LAAIO]
redo mitral valve replacement

*MV

-noticed defect at anterolat. commissure to p1 area

-previous MV takedown and MVR (ATS 27mm) with non-everting pledgetted mattress sutures(x14)

-tachy-brady syndrome hx 있어 maze시행없이 LAAIO 시행(4-0 Gore-tex suture double layered)

2023.04.17 CS 외래 내원 시 Hb 5.9 확인되어 ER refer 되었습니다. 이후 수술 계획 수립하기 위해 입원

My Thought

- Maze in AF patients with SND
  - No (or paucity) of evidence in the literature
  - Efficacy and ppm insertion

- PPM after maze in AF patients with SND
  - May be higher, which may affect survival

- Decision to do maze
  - Safety profile, estimated success rate of maze
  - May be better to leave AF in very selected patients


감사합니다
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Asan Medical Center

Clinical Investigations

Sinus Node Dysfunction Is Associated With Higher Symptom Burden and Increased Comorbid Illness: Results From the ORBIT-AF Registry

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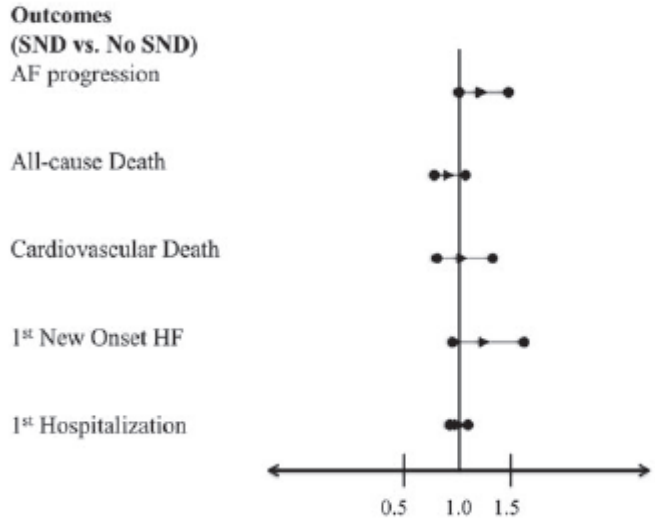

No difference in clinical outcomes

failure; HR, hazard ratio; SND, sinus node dysfunction.

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Results: Overall, 1710 (17.7%) out of 9631 patients had SND at enrollment.