

LAA closure is best done with surgery

LAA closure is best done with surgery

Sacha P. Salzberg, MD, PD

Cardiovascular Surgeon

Heart Clinic, Hirslanden Hospital

Zurich, Switzerland



HEART CLINIC
ZURICH

hirslanden

LAA closure is best done with surgery

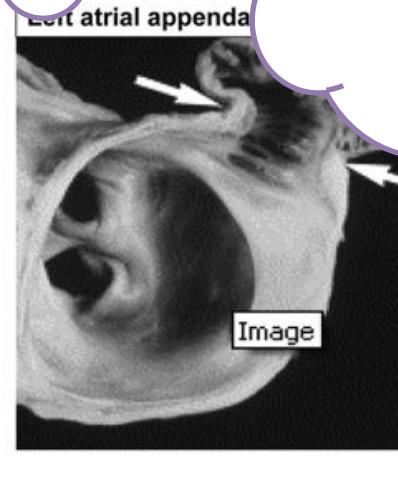
Disclosures:

Consultant & Proctor for
Atricure, Maquet and St. Jude Medical



LAA closure is best done with surgery

LAA Amputation first described in
1949 by J. Madden (a Surgeon) in the JAMA



**NO NEW-
NEWS !!!**

LAA closure is best done with surgery

Recommendations for LAA closure/occlusion/excision

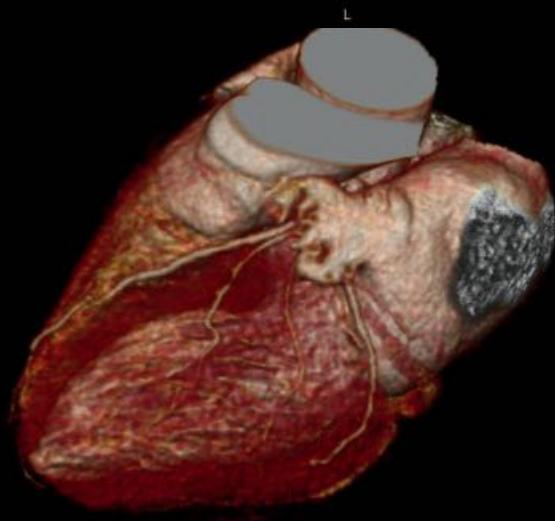
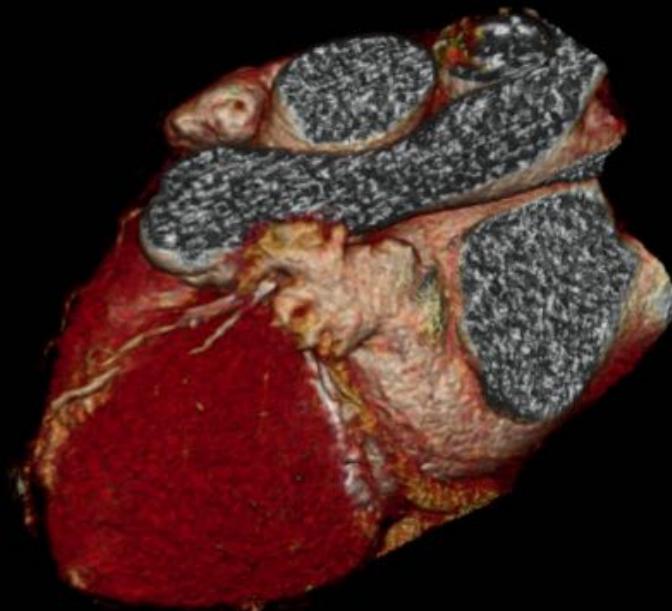
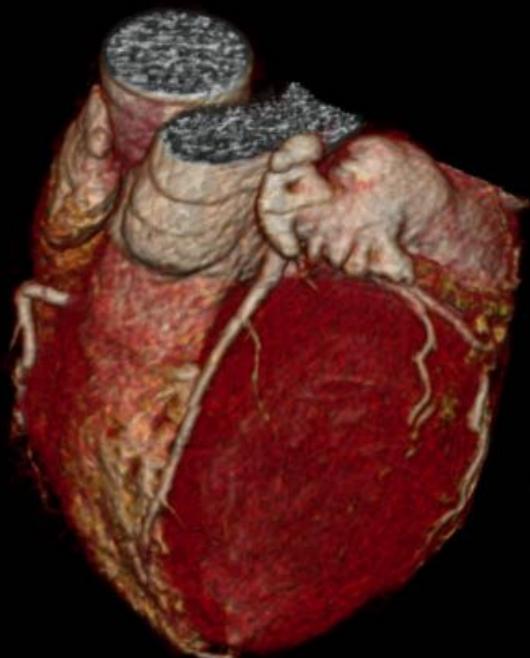
Recommendations	Class ^a	Level ^b	Ref ^c
Interventional, percutaneous LAA closure may be considered in patients with a high stroke risk and contraindications for long-term oral anticoagulation.	IIIb	B	115, 118
Surgical excision of the LAA may be considered in patients undergoing open heart surgery.	IIIb	C	

LAA = left atrial appendage.

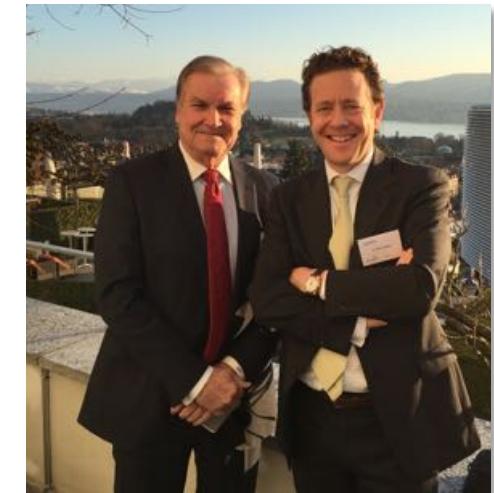
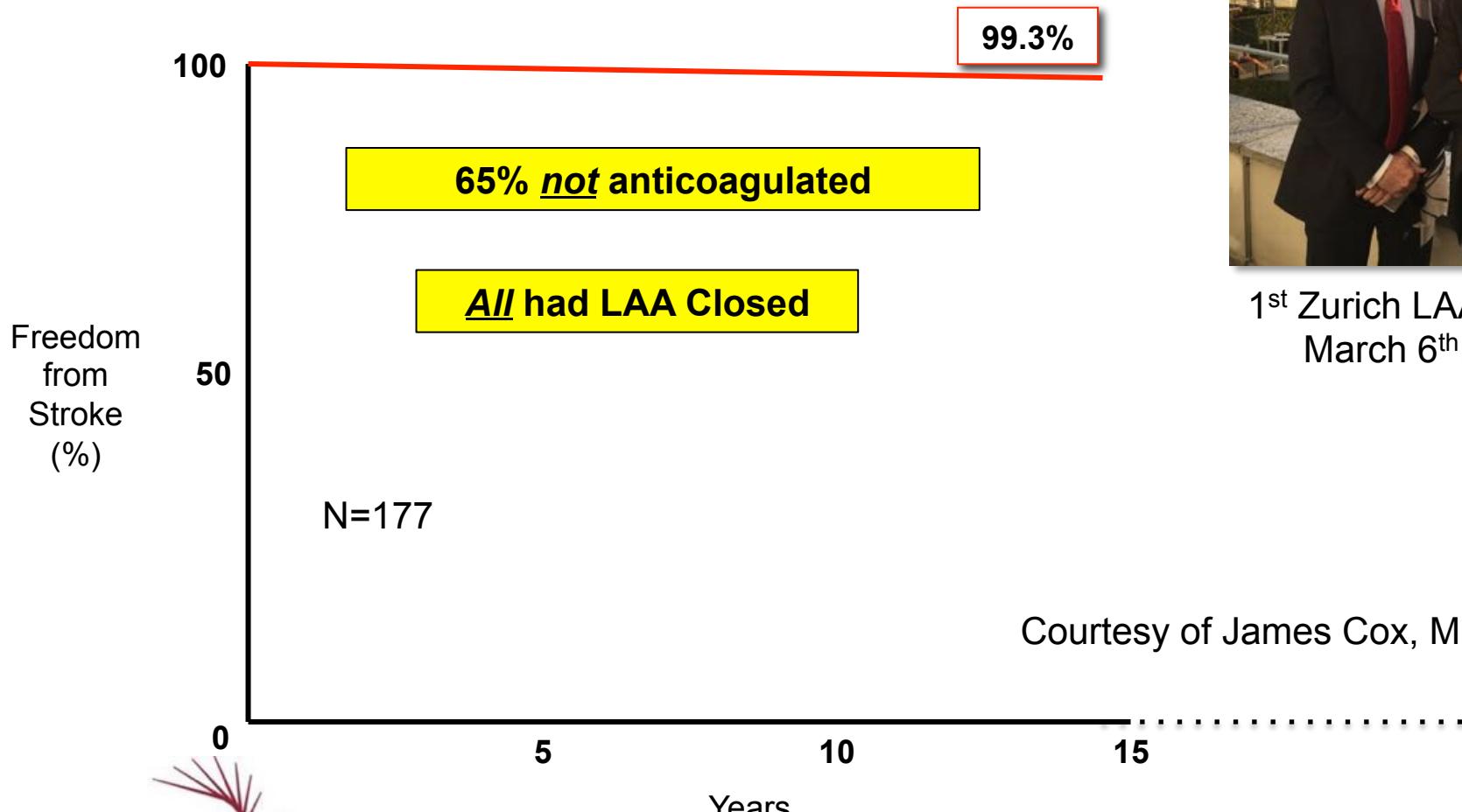
^aClass of recommendation.

^bLevel of evidence.

^cReferences.



Long-term freedom from stroke

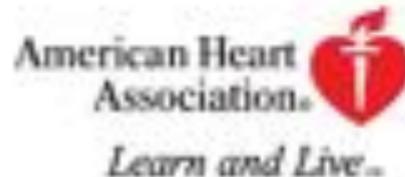


1st Zurich LAA Summit
March 6th, 2015

Damiano, et al: JTCVS, 2003

Circulation

JOURNAL OF THE AMERICAN HEART ASSOCIATION



Atrial Fibrillation Catheter Ablation Versus Surgical Ablation Treatment (FAST) : A 2-Center Randomized Clinical Trial

Lucas V.A. Boersma, Manuel Castella, Wim Jan van Boven, Antonio Bernacca, Aladdin Yilmaz, Mercedes Nodal, Elena Sandoval, Naiara Calvo, Josep Brugada, Johannes Kelder, Maurits Wijffels and Lluís Mont

Circulation published online November 14, 2011

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231-3143

Copyright © 2011 American Heart Association. All rights reserved. Print ISSN: 0009-7322. Online ISSN: 1524-4539

- Prospective randomized, multicenter
- n=124 either Catheter- or Thoracoscopic Ablation
- Freedom from AF @12mo:
35 vs 65% (P<0.0005) in favor of Thoracoscopic ablation



LAA closure is best done with surgery

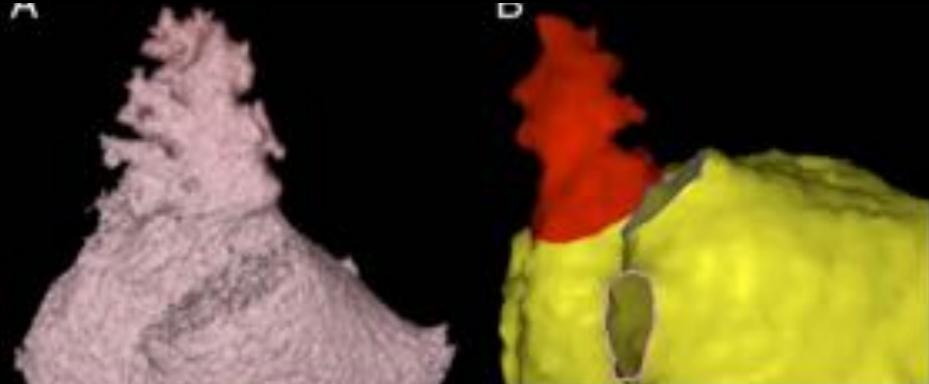
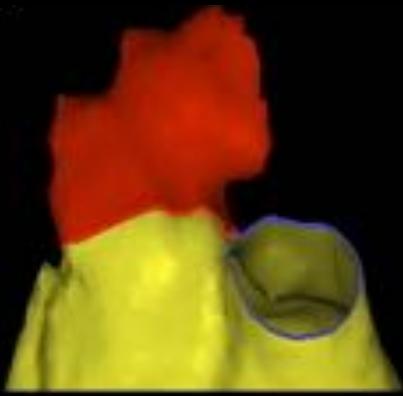
Safety after 12 months

	Major	CA N=63	SA N=62	P-value
Stroke	1	-	-	
TIA	1	-	-	
Pneumonia	1	-	-	
Hydrothorax	1	-	-	
Heart failure	1	-	-	
SAB causing	1	-	-	
Pericarditis	1	-	-	
Fever unknown	1	-	-	
Reus	1	-	-	
PV stenosis >70% symptomatic	-	-	-	
Total	8 (13.1%)	7 (11.5%)	p=0.6	
	Minor			
Gross haematomabised	2 (3.2%)	-	-	

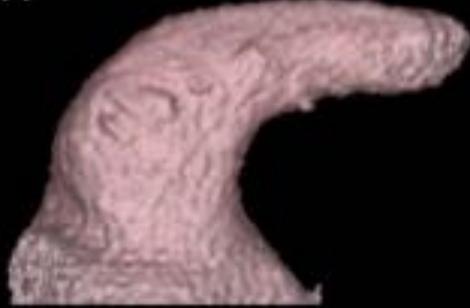
LAA excluded by
stapler in all
Thoracoscopic
ablations



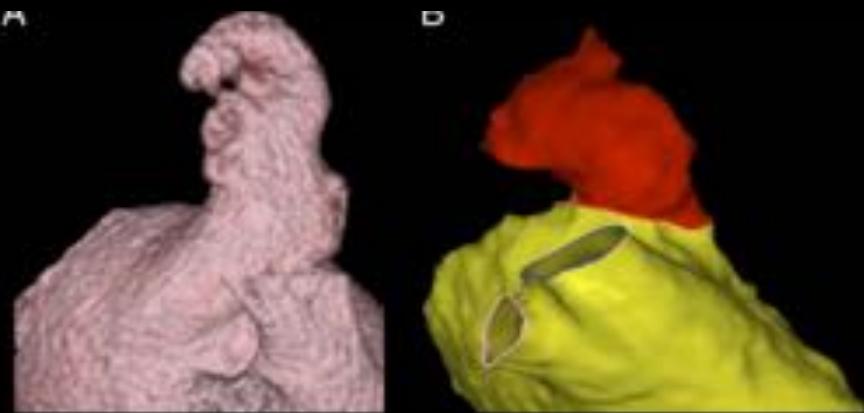
Coliflower



Kaktus



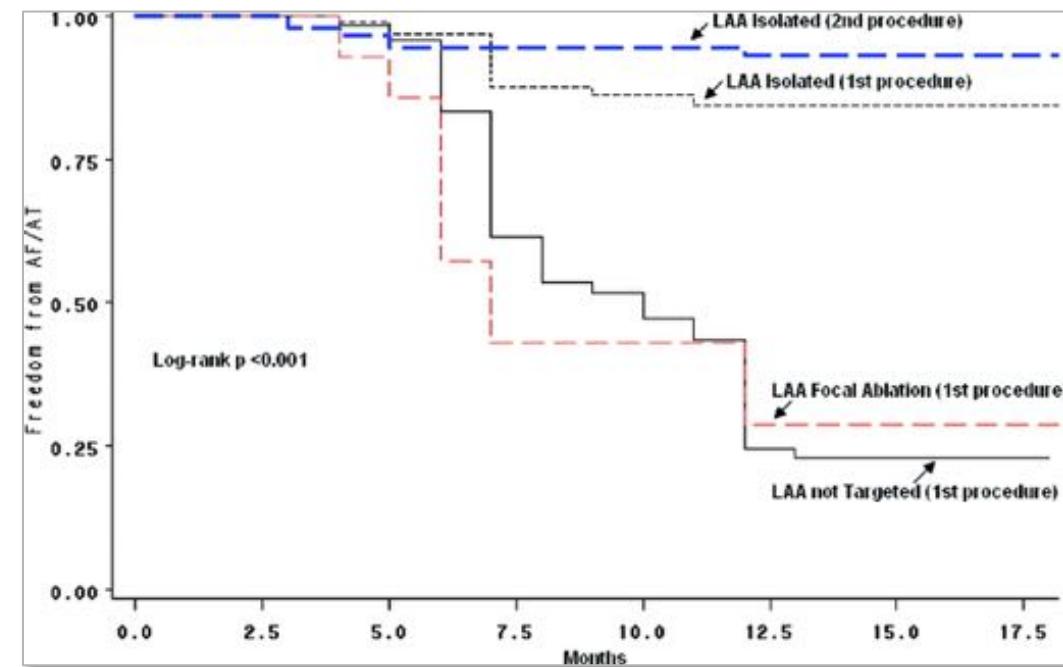
Chicken Wing



Windsock

LAA closure is best done with surgery

Electrical Isolation during ablation



- RCT
- N=173 – LSP AF
- Ablation w and w/o LAA
- Success at 24 months
(Freedom from AF off AAD)
76 vs. 56% for Ablation with LAA

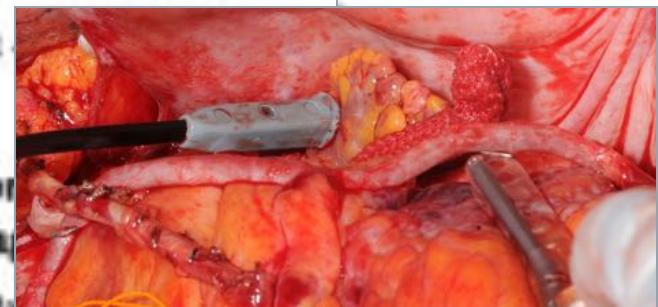
Di Biase, L. et al. Circulation 2010;122:109-118

Di Biase et al. ESC 2015

LAA closure is best done with surgery

Interactive Cardiovascular and Thoracic Surgery 11 (2012) 416–419
doi:10.1016/j.icvts.2012.05.016 Advance Access publication 30 May 2012

ORIGINAL ARTICLE



Epicardial left atrial appendage clip occlusion also provides the electrical isolation of the left atrial appendage

Christoph T. Stoeck^a, Jan Steffel^b, Maximilian Y. Emmert^c, Andre Plass^c, Srijoy Mansinghani^c, Volkmar Falk^c and Sacha P. Salzberg^{a*}

^a Department of Cardiovascular Surgery, University Hospital Zurich, Zurich, Switzerland

^b Clinic of Cardiology, University Hospital Zurich, Zurich, Switzerland

^c Clinic of Cardiology, Department of Medicine, University of Virginia, Charlottesville, VA, USA

* Corresponding author. Department of Cardiovascular Surgery, Clinic für Kardiologie und Vaskulärer Chirurgie, Universitätsspital Zürich, Winterthurerstrasse 190, 8057 Zürich, Switzerland. Tel.: +41 44 2551111; fax: +41 44 2554457; e-mail: sachalitzberg@klinikus.ch (S.P. Salzberg).

Received 23 December 2011; received in revised form 21 February 2012; accepted 25 February 2012

- N=10 patients in Sinus
- OPCAB, PVI & LAA Clip
- Intraoperative Testing
(before/after Clipping)

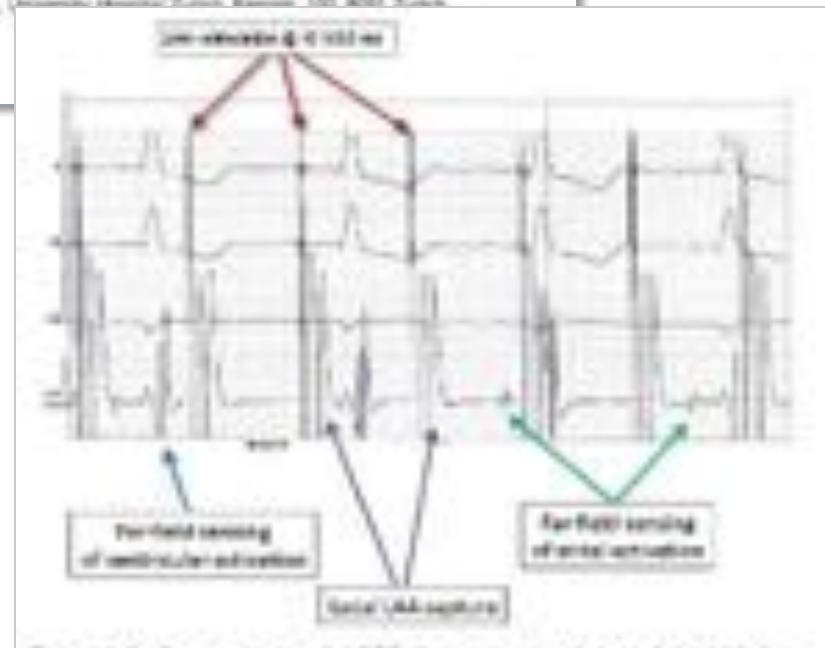
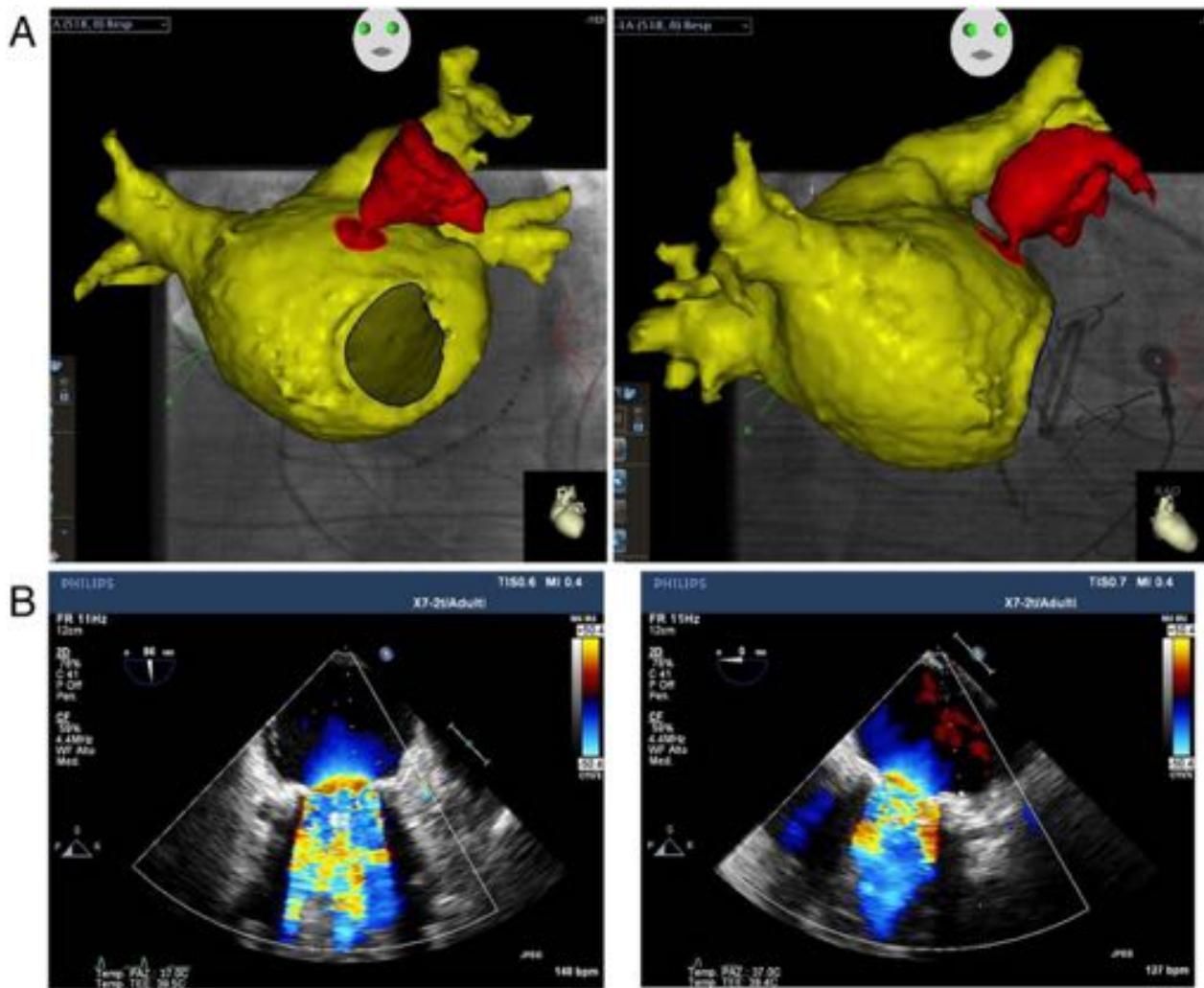


Figure 4. Surface and epicardial ECGs during the stimulation of the LAA during installing an seal block from the LAA.

LAA closure is best done with surgery



Alberto Pozzoli et al. Eur Heart J 2015;eurheartj.ehv424

LAA closure is best done with surgery

IMAGES IN INTERVENTION

Transcatheter Left Atrial Appendage Closure After Incomplete Surgical Ligation

Takashi Matsunaga, MD; Manso Nakamura, MD; Wei-Loung Yew, MD;

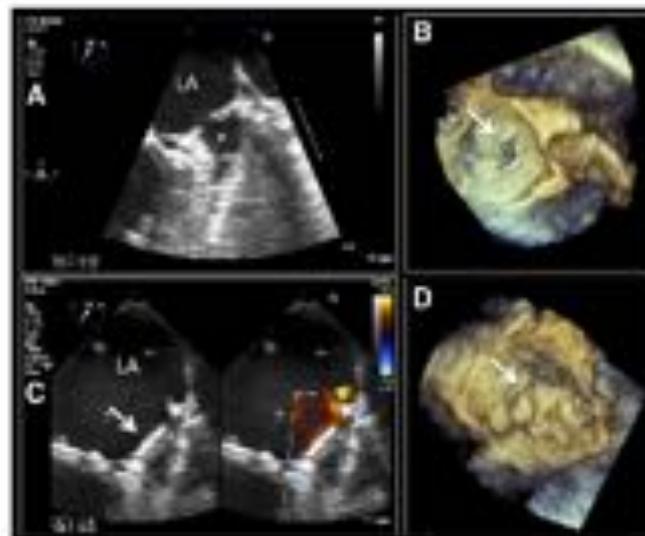
Robert J. Siegel, MD; Salihur Kar, MD

Los Angeles, California

An 82-year-old woman with chronic atrial fibrillation on full anticoagulation with warfarin was referred for a repair attempt to close the left atrial appendage (LAA) with a transcatheter, transseptal approach. In April 2011, she underwent surgical mitral and tricuspid repair, ligation of the LAA, and unsuccessful MAZE procedure. A subsequent transesophageal echocardiogram

(TEE) demonstrated residual communication (arrowhead and white arrow) between the left atrium and LAA by pulsed and color flow Doppler (Figs. 1A, 1B).

Following successful transseptal puncture under general anesthesia and TEE guidance, the baseline LAA angiogram was performed (Fig. 2A). Given its antithrombotic property and the sufficient



Panel 1. (A) and (B) TEE images of LAA and (C) device being deployed.

Baseline study (A and B) showed the residual communication between the left atrial appendage (LAA) and left atrium (L, white arrow). Post device deployment (C and D) no residual flow was seen across the device (arrow) and the device was well-seated (arrow).

PHILIPS

19/04/2011 17:17:03 TIS0.2 MI 0.5

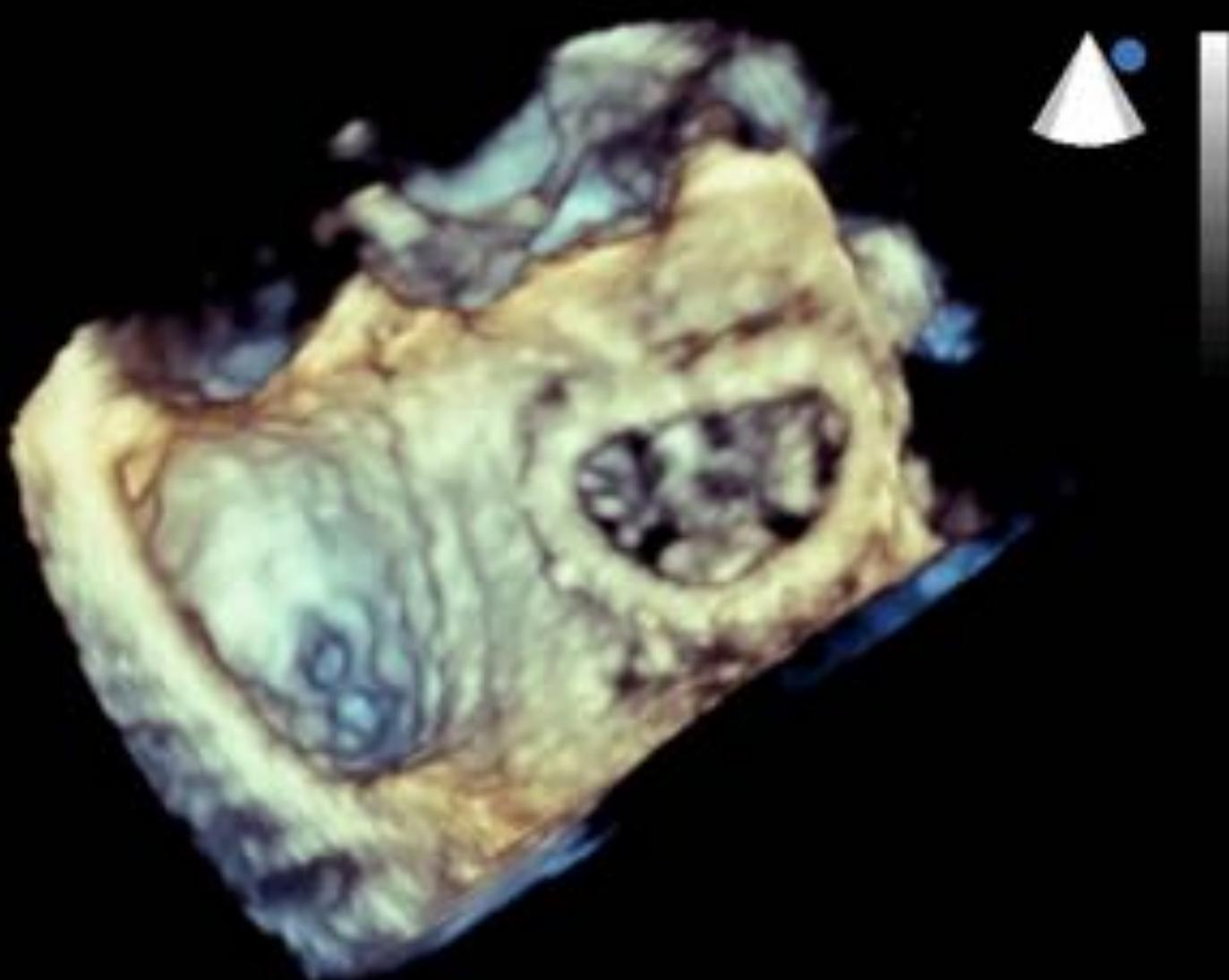
X7-2t/Adult

FR 8Hz
8.5cm

3D Beats 1

M4

3D
3D 35%
3D 40dB



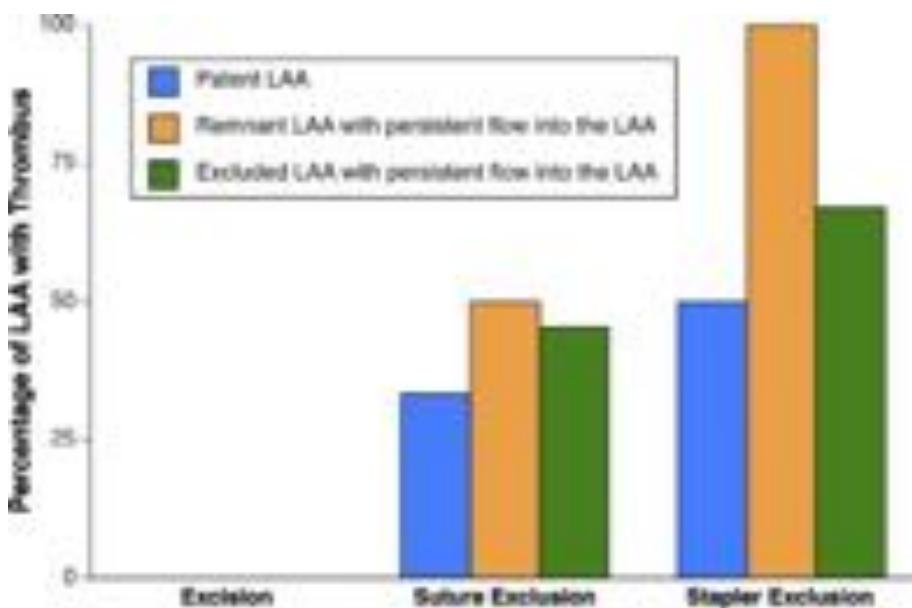
JPEG

PAT T: 37.0C
TEE T: 39.1C

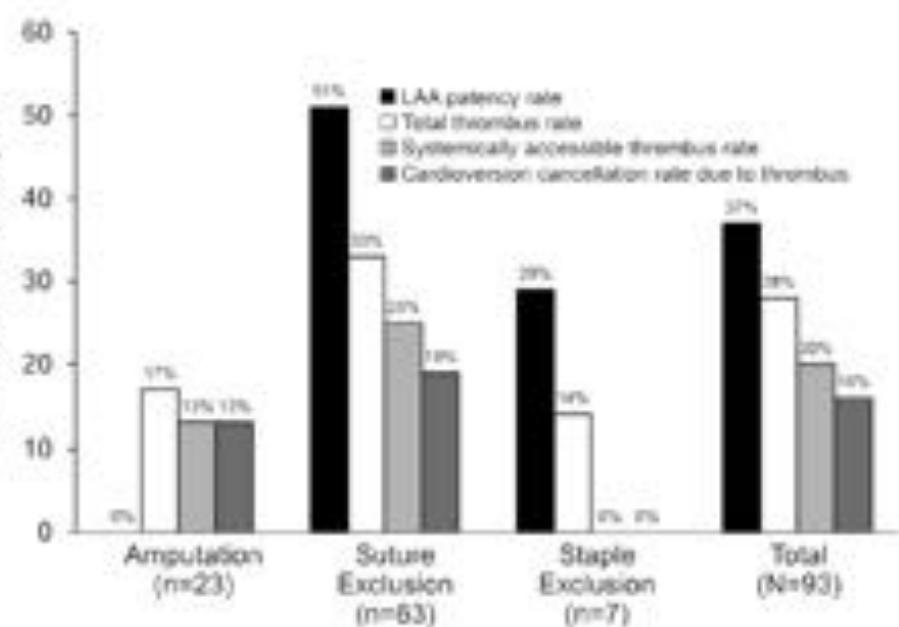
51 bpm

LAA closure is best done with surgery

“Surgical closure” doesn’t work!



Kanderian et al, JACC 2008

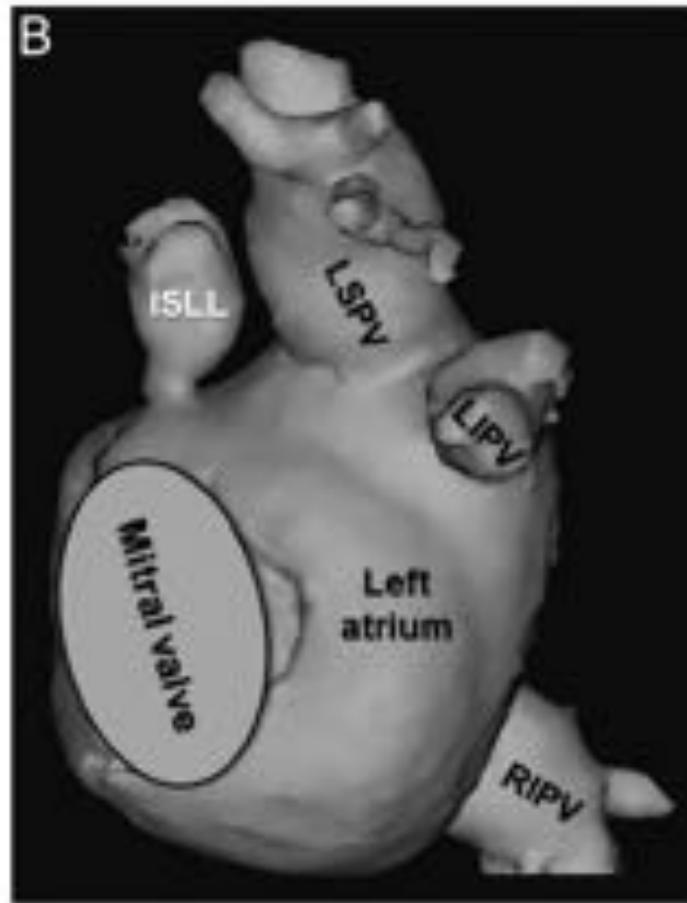
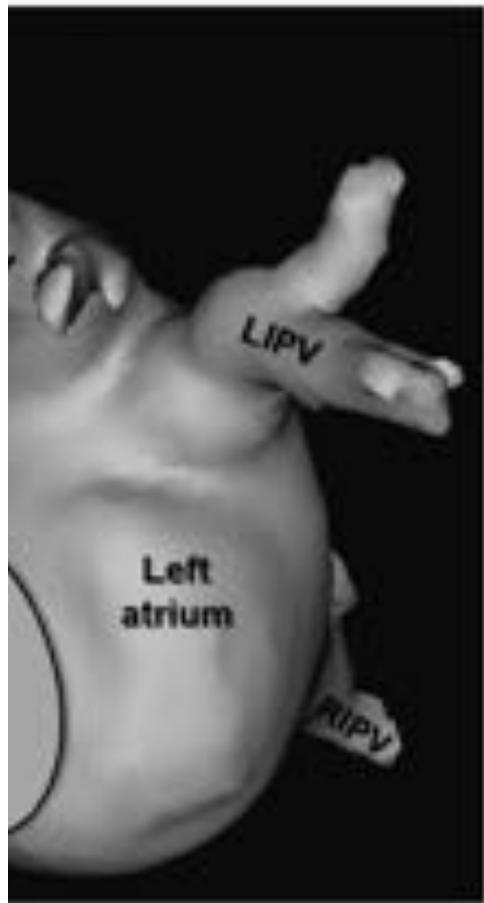


Cullen et al, Ann Thorac Surg 2015

LAA closure is best done with surgery

Mode of Failure

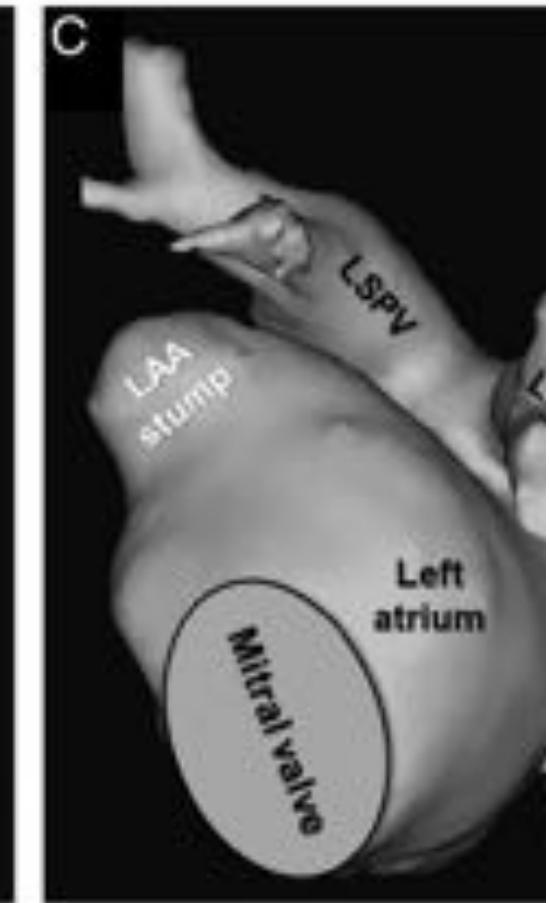
N=72 concomitant LAAc Amputation vs. Ligation



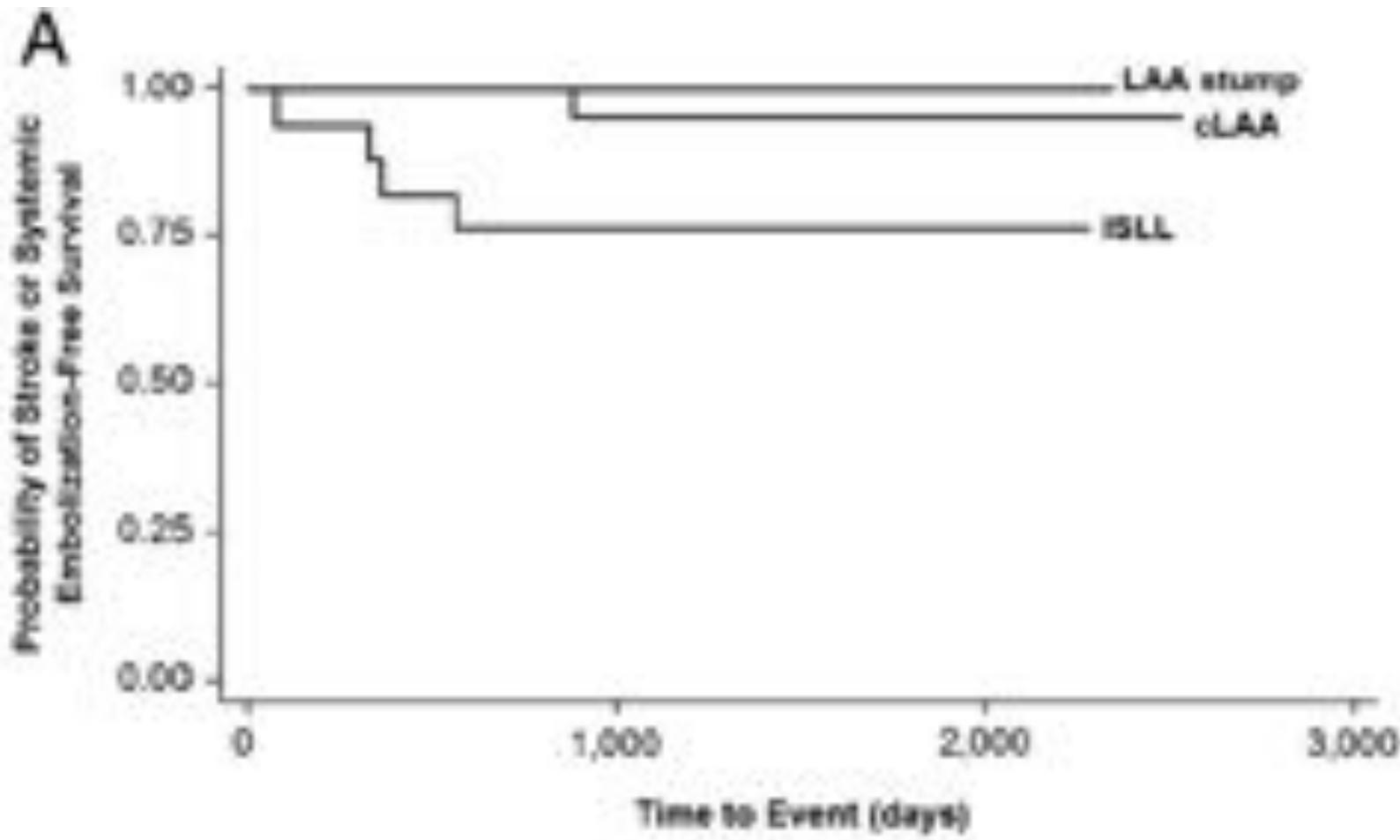
64% complete closure

24% incomplete

12% Stump



LAA closure is best done with surgery



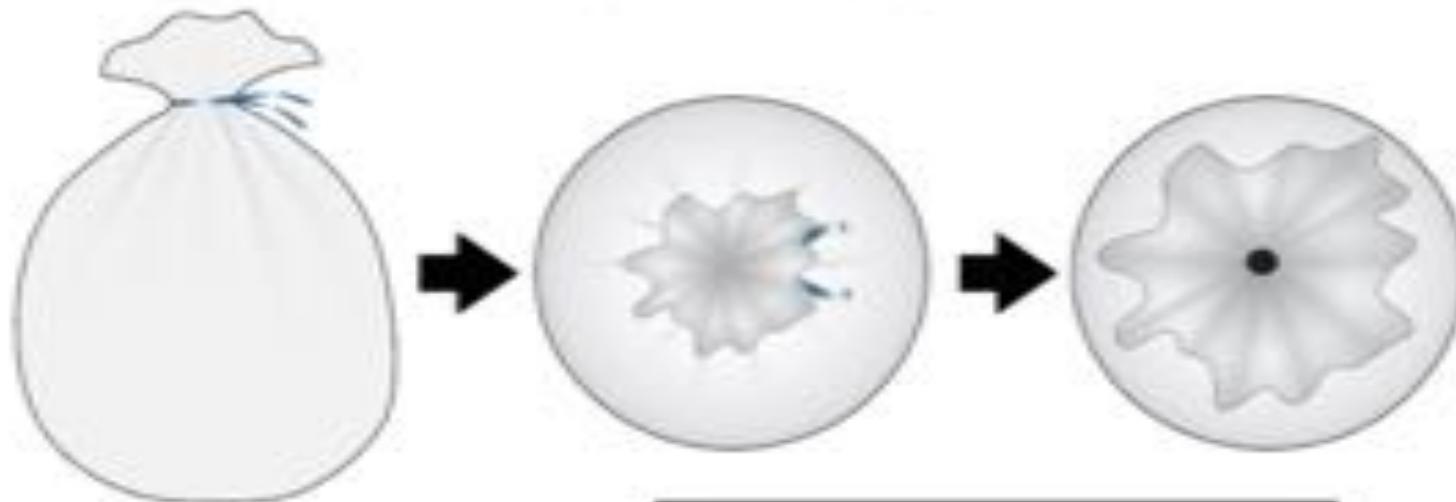
Assessing the Immediate and Sustained Effectiveness of Circular Epicardial Surgical Ligation of the Left Atrial Appendage

- n=12 concomitant ligation
- Endoloop®
- TEE and pre-discharge ✓
- At 3 month FU 75% perfused on CT

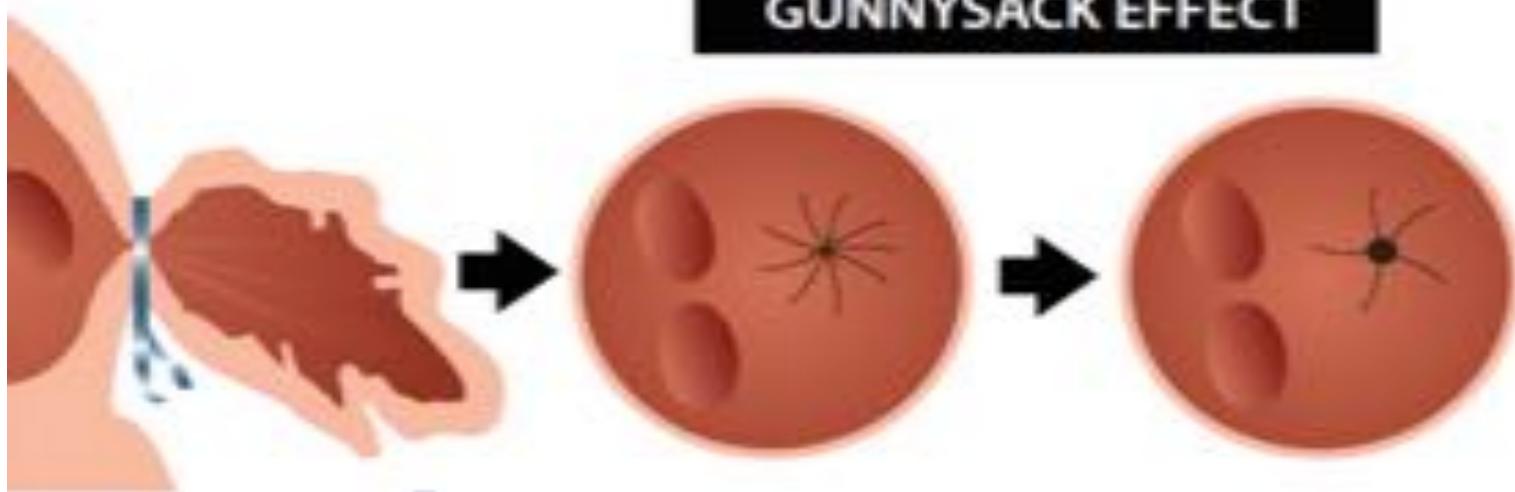


LAA closure is best done with surgery

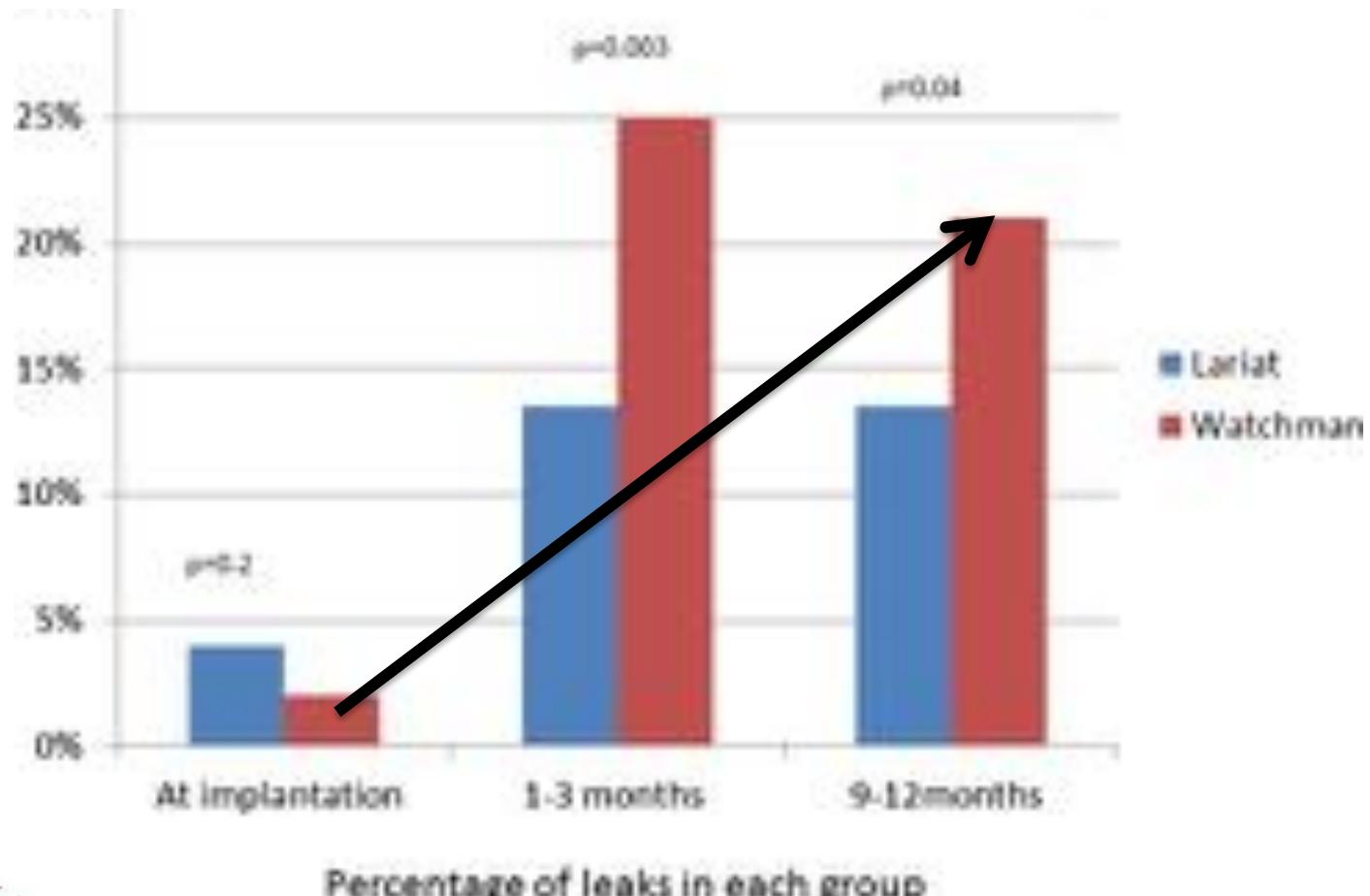
A) Leak Mechanism in Epicardial Ligation



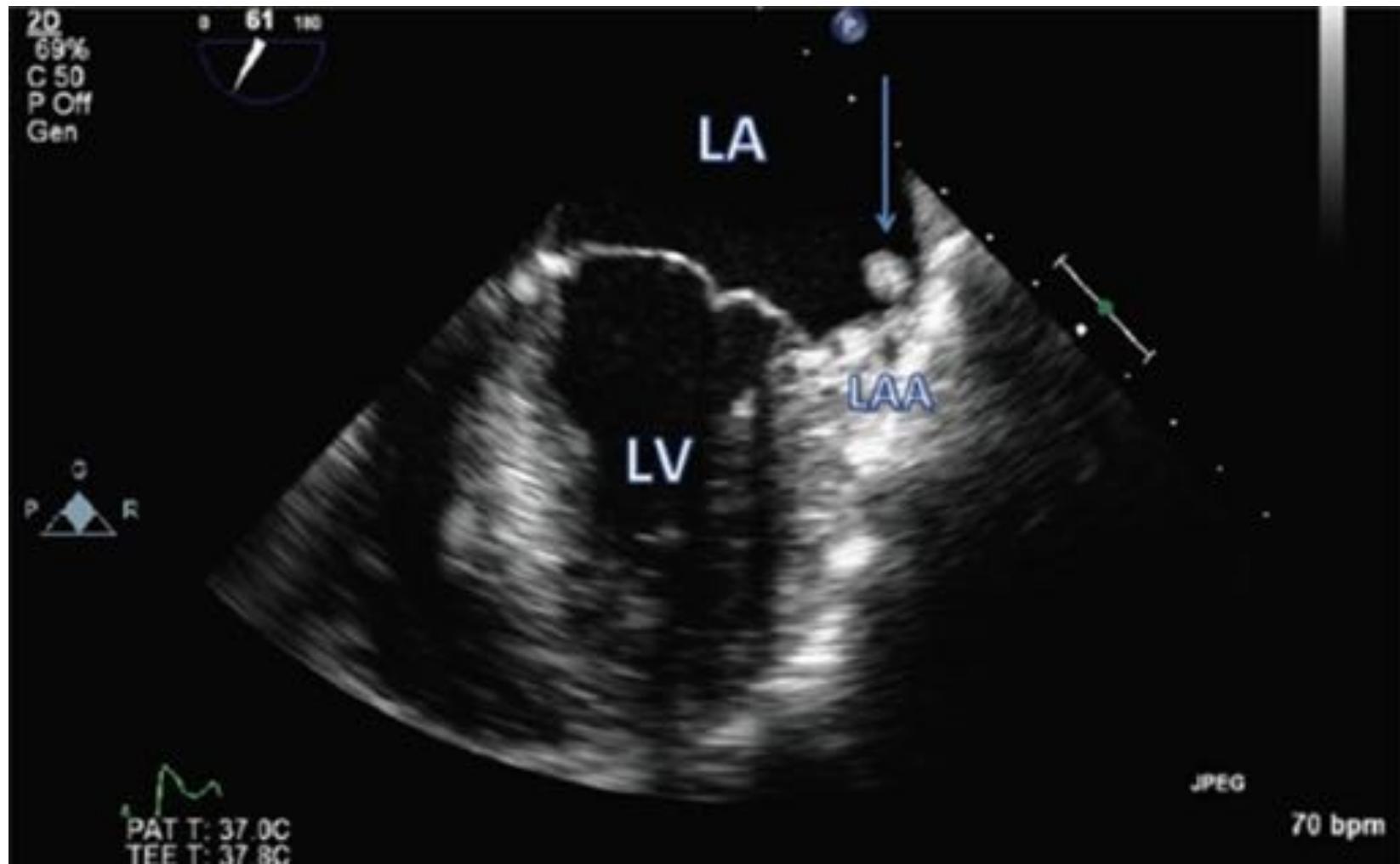
GUNNYSACK EFFECT



Understanding the differences of leaks and their clinical implications



A transesophageal image of an endocardial left atrial pedunculated thrombus (arrow) seen 3 months after left atrial appendage closure.



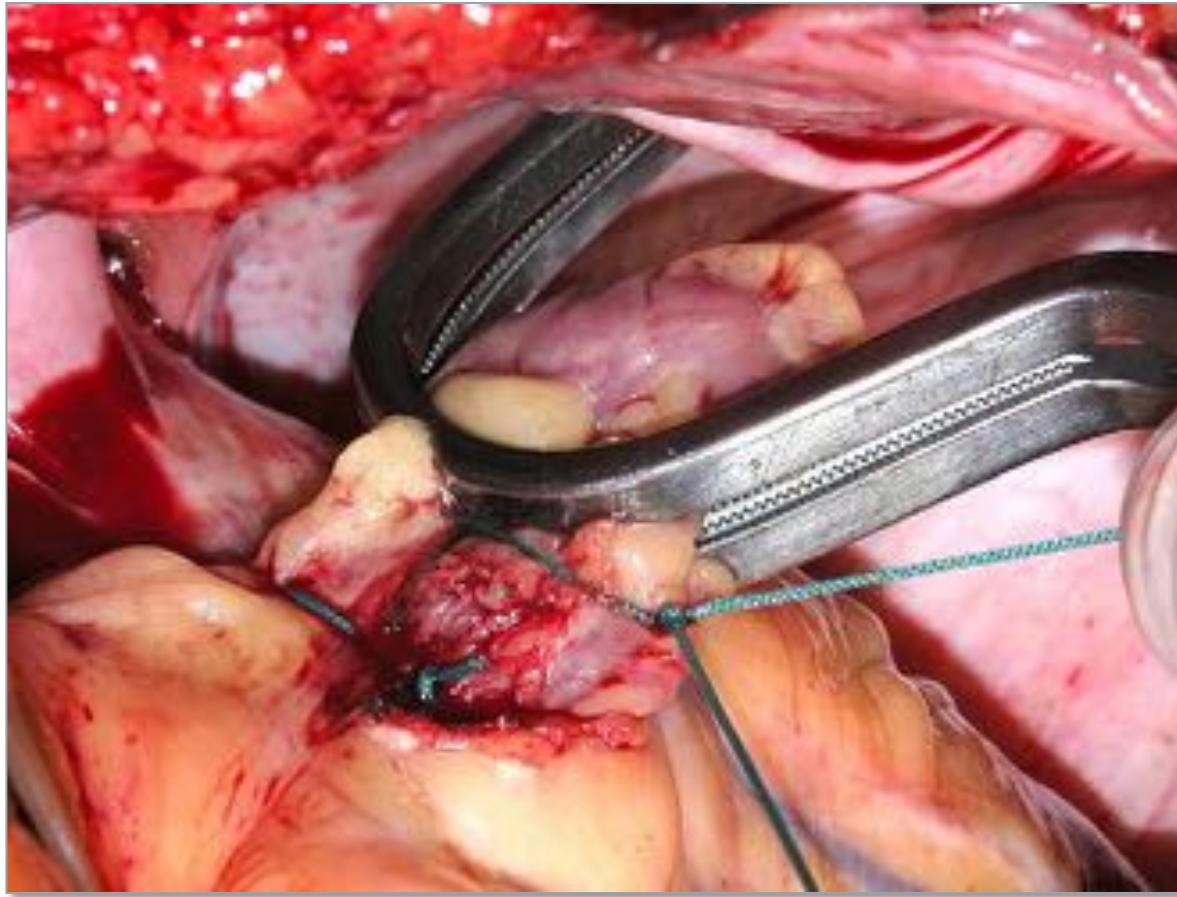
Evaldas Giedrimas et al. Circ Arrhythm Electrophysiol.
2013;6:e52-e53



Copyright © American Heart Association, Inc. All rights reserved.

LAA closure is best done with surgery

These days are over...



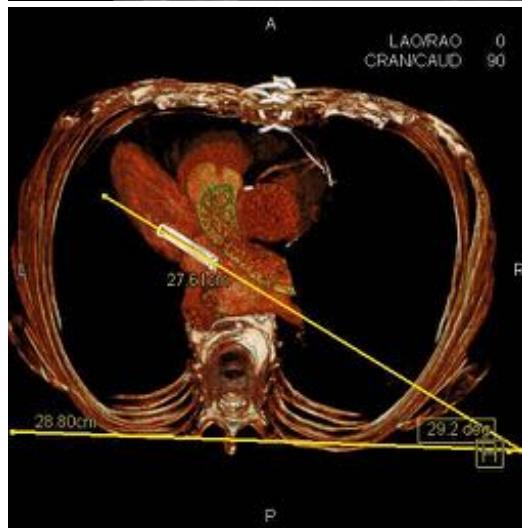
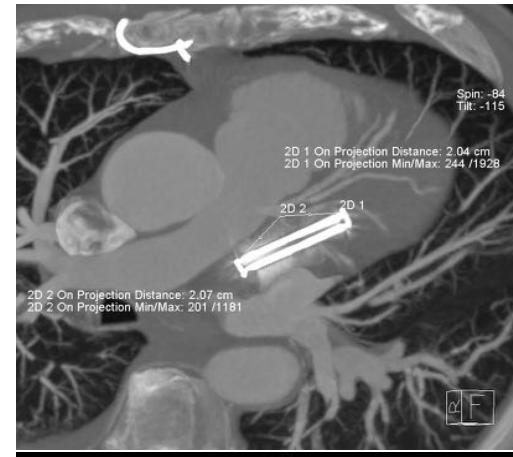
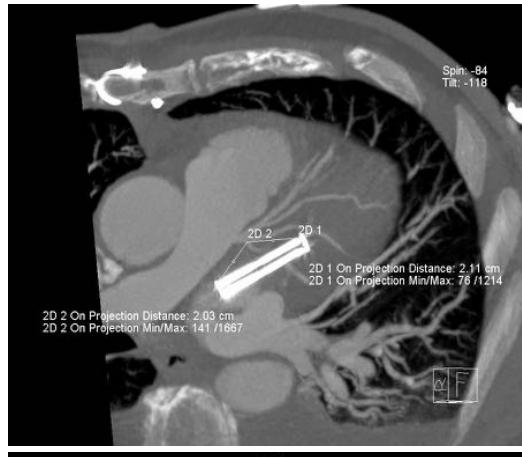
LAA closure is best done with surgery



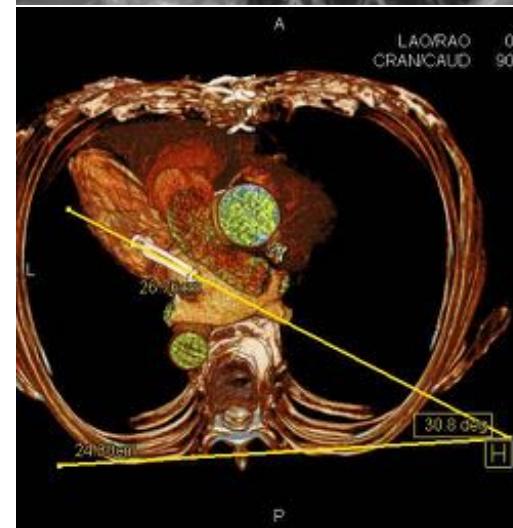
LAA closure is best done with surgery

Assessment of Stability

Distance to Cx Artery



Discharge



36 mo. FU



LAA Clip Occlusion Durability



preop



postop



1year



2years



3years



7.5years

Zurich LAA Clip experience

- n=291 2008-2015
- patients undergoing cardiac surgery

Perioperative

Stroke	3	(surgery-related)
TIA	1	

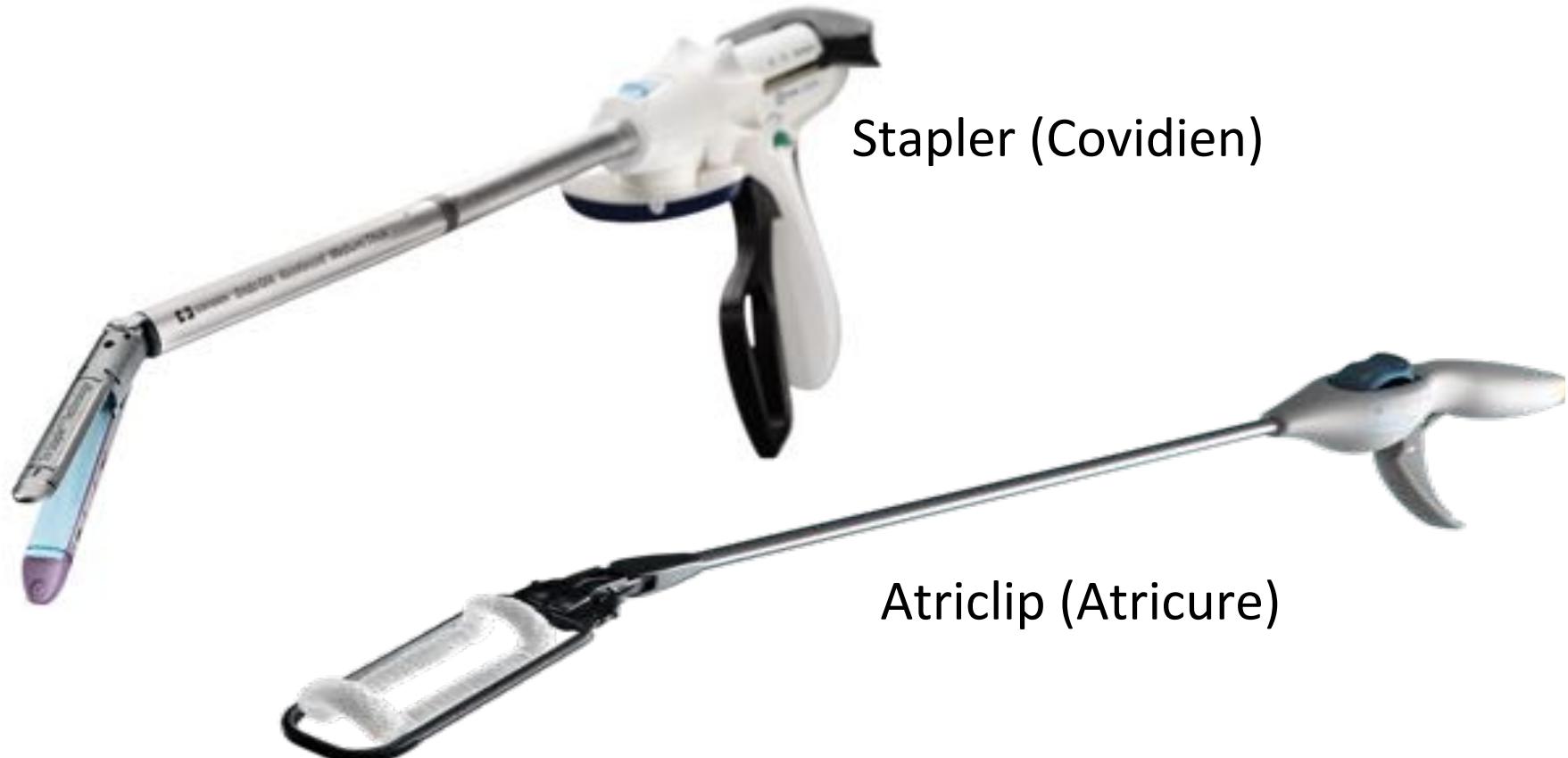
Expected:

Mean CHADSVASC	3.07 ± 1.5 (0.0,8.0)	3.2%
----------------	--------------------------	------

Follow Up	Patient years	Rate/100pt.yrs
Stroke	2	826.8pt/yr
TIA	4	826.8pt/yr

LAA closure is best done with surgery

Surgical Devices for stand alone minimally invasive LAA occlusion



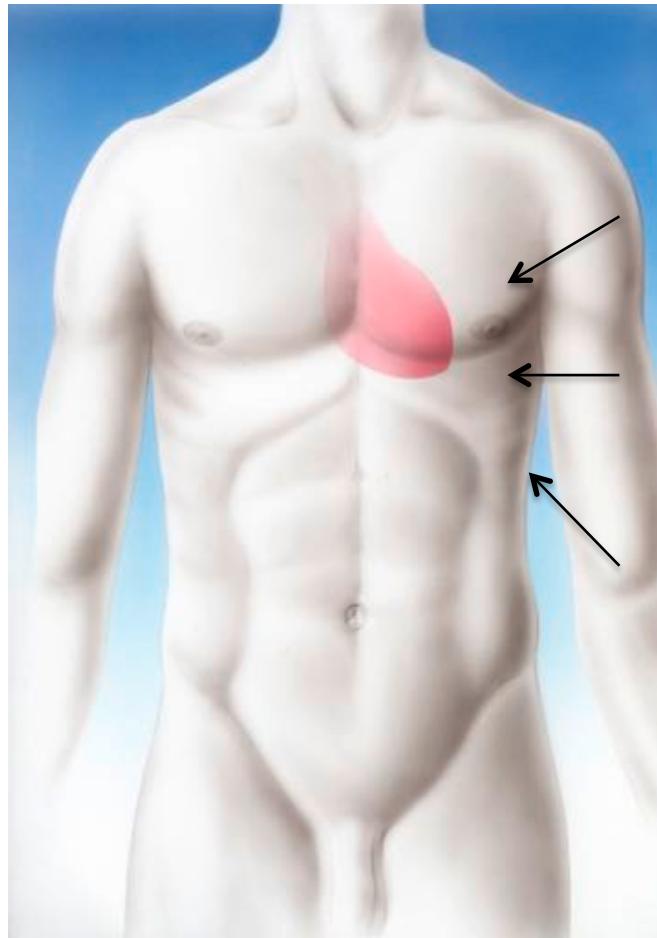
Stapler (Covidien)

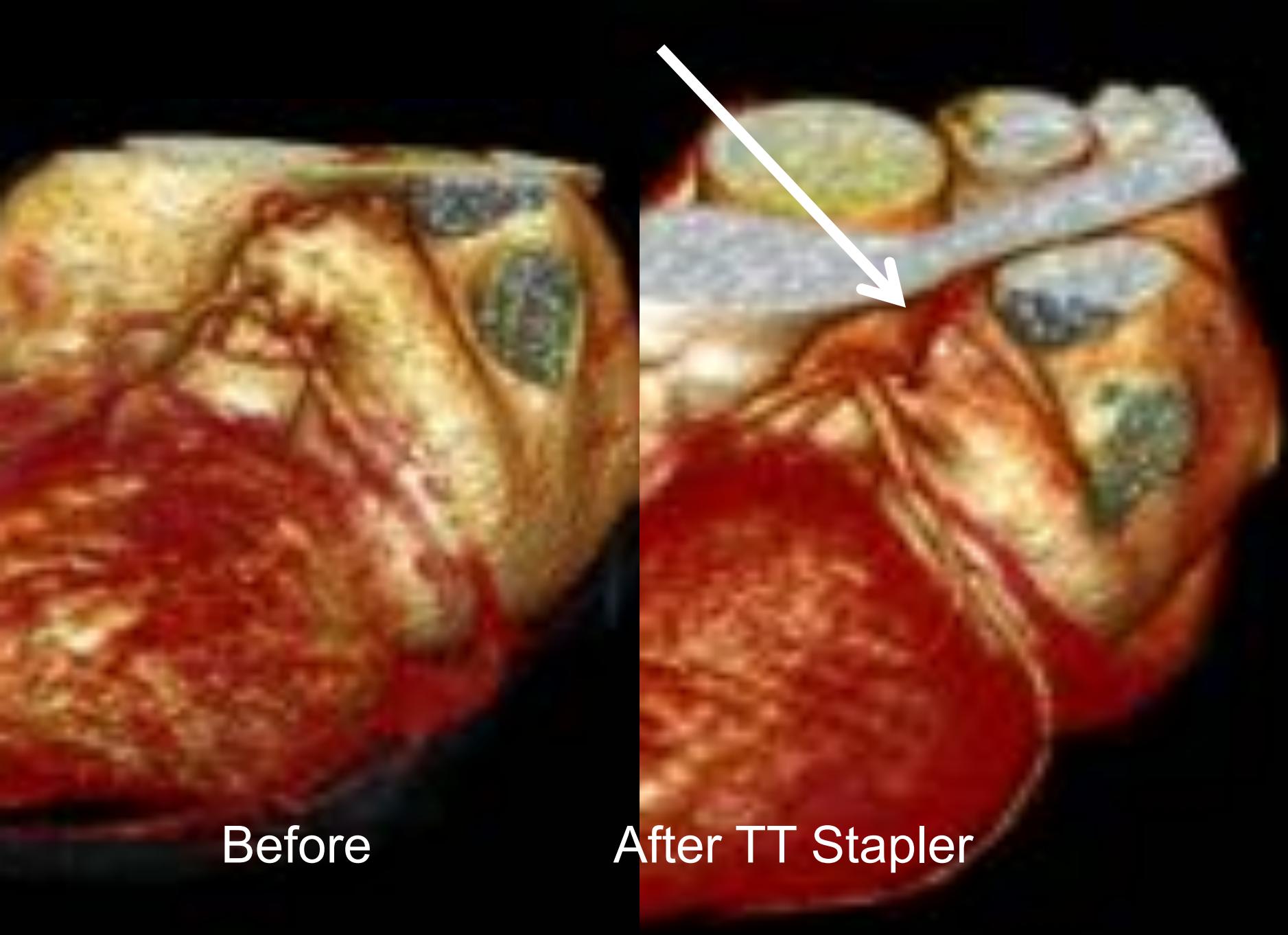
Atriclip (Atricure)



LAA closure is best done with surgery

Minimally Invasive Stand Alone Options





Before

After TT Stapler

The image shows the journal cover of the International Journal of Cardiology. At the top left is the Elsevier logo. In the center, the journal title 'International Journal of Cardiology' is displayed above the subtitle 'Journal homepage: www.elsevier.com/locate/ijcardiol'. To the right is a small thumbnail image of the journal cover. Below the main title, there is a red heart icon with the text 'Cardiovascular'. The article title 'Minimal invasive surgery for atrial fibrillation: an updated review' is prominently displayed in large green text. Below the title, the authors' names are listed: Mark La Meir^{1,2}, Sandro Gelsomino^{1,3*}, Fabiana Luci^{1,2}, Laurent Pison¹, Andrea Colella², Roberto Lorusso², Elena Crudeli², Gian Franco Gensini², Harry G. Crijns¹, and Jos Maessen¹. A small note at the bottom indicates that the research was funded by the Fondazione Italiana per la Ricerca sul Cancro (FIRC). The journal issue is identified as 'Europace (2013) 35, 110–122 doi:10.1093/europace/eus216'.

- Documented LAA Removal in >90%
- No Stroke/TIA (Mortality 0%)



LAA closure is best done with surgery

Journal of the American College of Cardiology
Vol. 46, No. 4, 2005
© 2005 by the American College of Cardiology Foundation
Published by Elsevier Inc.

Vol. 46, No. 4, 2005
ISSN 0735-1095/\$ - see front matter
doi:10.1016/j.jacc.2005.01.021

Thoracoscopic Stand-Alone Left Atrial Appendectomy for Thromboembolism Prevention in Nonvalvular Atrial Fibrillation

Toshiya Ohnaka, MD,* Mikio Niizumi, MD,* Takahiro Nomura, MD,* Motoyuki Hisagi, MD,*
Takahiro Ota, MD,† Toru Miyanai, MD*

Tokyo, Japan

Objectives

N=30 with 3 month FU

Background

Methods

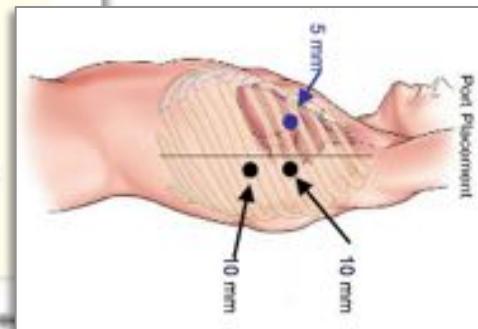
Thirty patients (mean age, 74 ± 8.0 years) who had had thromboembolisms were selected. A subgroup of 20 patients (mean age, 78 years; mean CHA₂D₂VASc score, 4.3) urgently needed an alternative treatment to anti-coagulation; warfarin was contraindicated due to haemorrhage side effects in 13; the international normalized ratio was uncontrollable in 7, and increased bleeding effects had developed immediately after the warfarin dose was reduced for one.

Results

Thoracoscopic surgery was successfully performed without complications. Follow-up for 3 to 36 months showed no recurrence of thromboembolism.

Conclusions

Thoracoscopic stand-alone LAA complete LAA closure prevents thromboembolism.



LAA closure is best done with surgery

Surgical Devices for LAA occlusion



Atriclip (Atricure)





24.08.2015 08:04
PHILIPS

TIS0.1 JPEG CR 20:1
MI 0.0

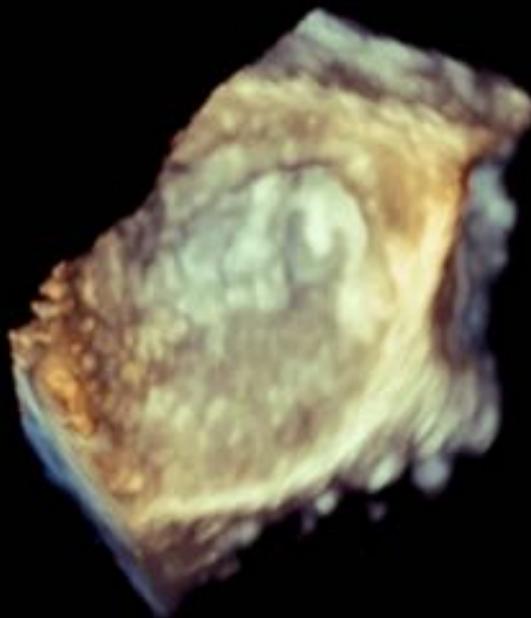
CX7-2t/Adult

M4

FR 14Hz
5.8cm

3D Beats 1

3D
3D 52%
3D 40dB



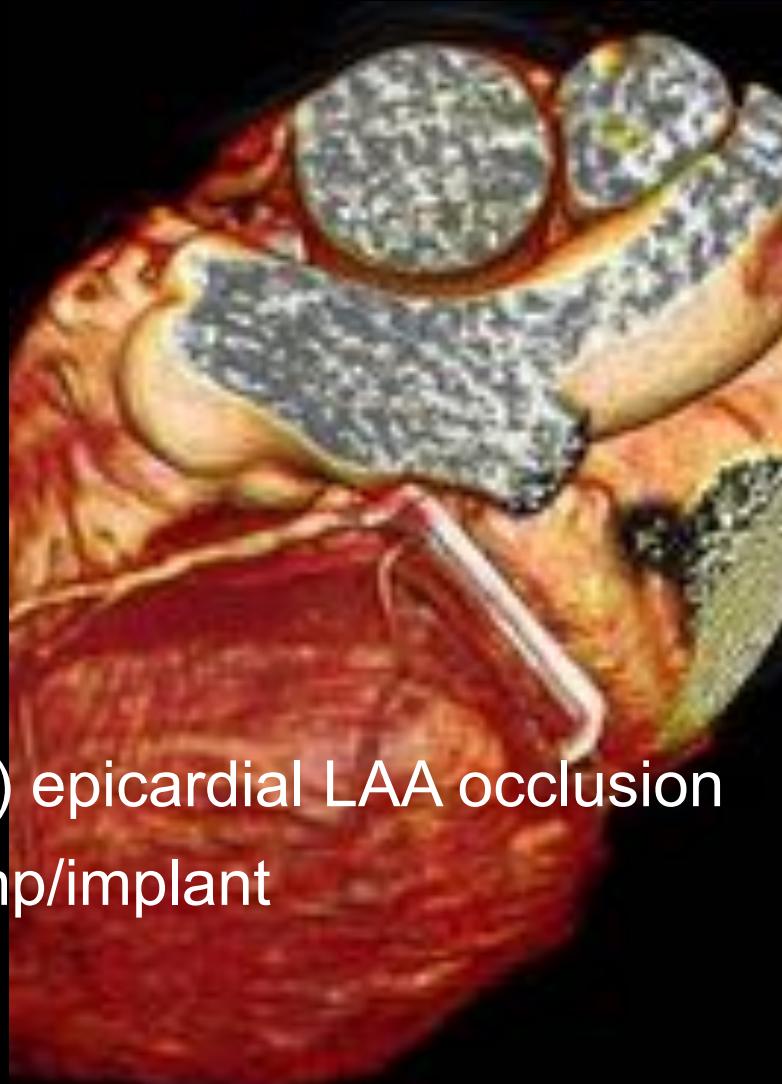
PAT T: 37.0C
TEE T: 39.1C

JPEG

54 bpm



Safe & durable (>3y) epicardial LAA occlusion
No endocardial stump/implant
Electrical isolation



Salzberg et. al., Eur J Cardiothorac Surg. 2014 Jan;45(1):126-31.
Starck et al., Interact Cardiovasc Thorac Surg. 2012 Sep;15(3):416-8.
Salzberg et al., J Thorac Cardiovasc Surg. 2010 May;139(5):1269-74

LAA closure is best done with surgery

Patient, Procedure and Device Selection

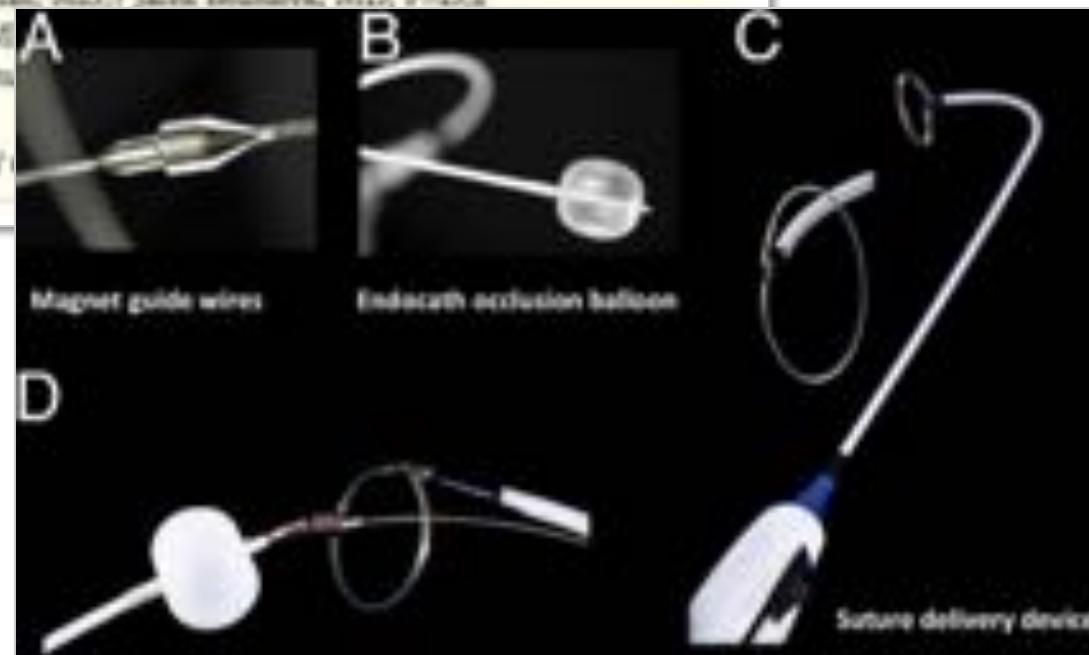


Percutaneous Left Atrial Appendage Suture Ligation Using the LARIAT Device in Patients With Atrial Fibrillation

Initial Clinical Experience

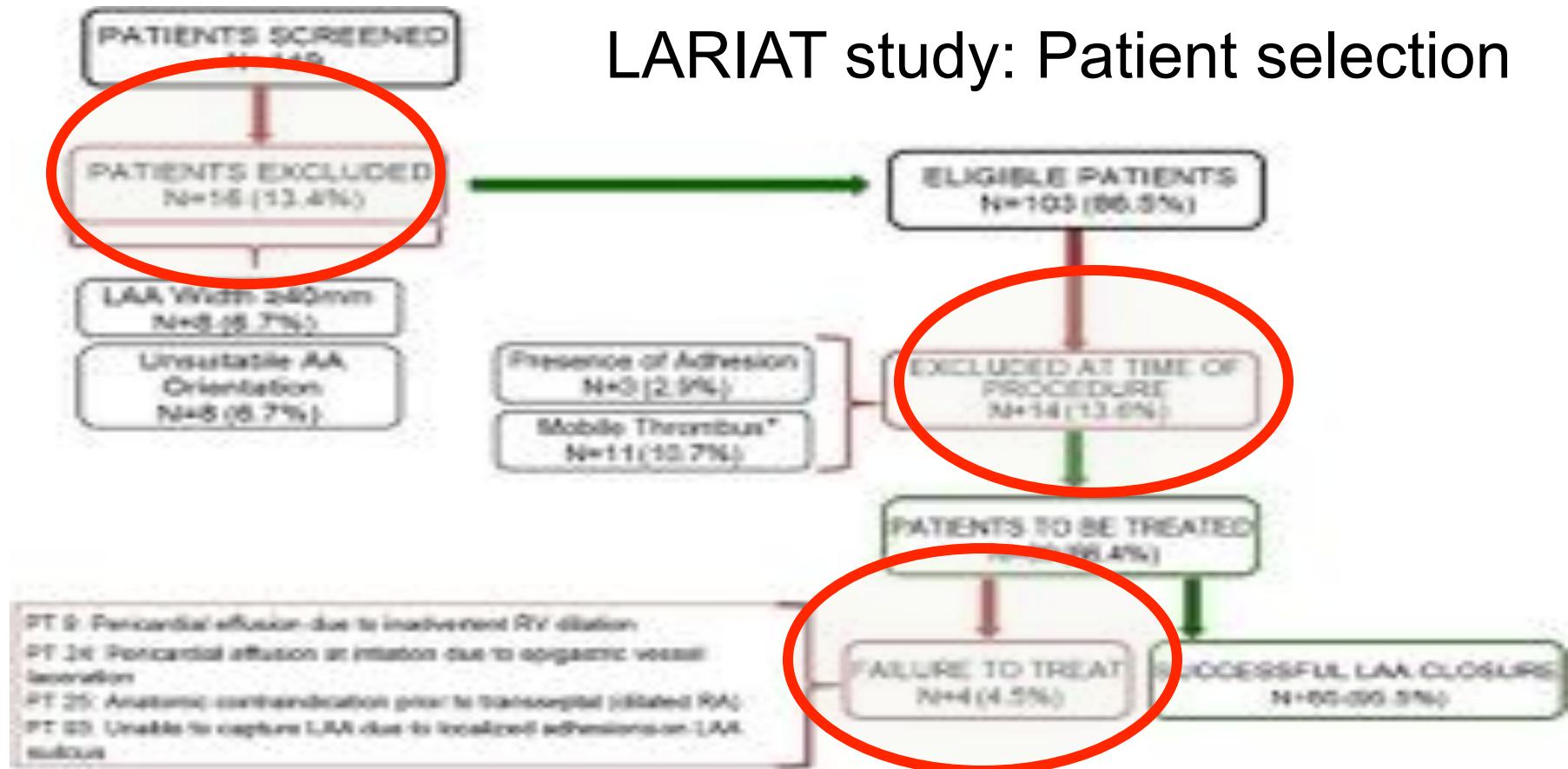
Krystian Baran, MD, PhD,* Frederick T. Hsu, MD,† Jacek Bednarek, MD, PhD,‡
Jacek Myc, MD, PhD,* Boguslaw Kapelak, MD,‡
Jacek Latalowski, MD, PhD,‡ Stanislaw Banas, MD,‡
Randall J. Lee, MD, PhD§¶

Kielce, Poland; San Francisco, California, and U.S.A.



LAA closure is best done with surgery

LARIAT study: Patient selection

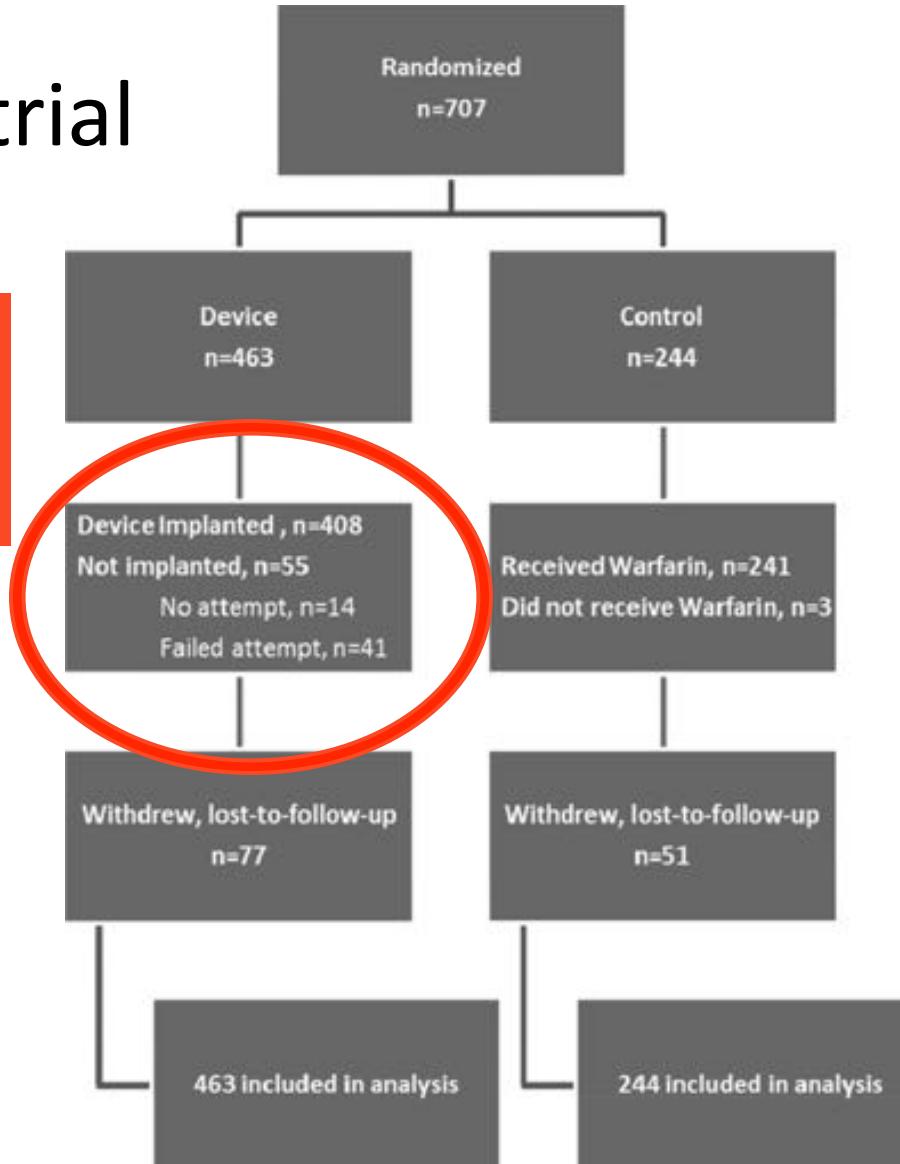


= 30 % not treated!!!!



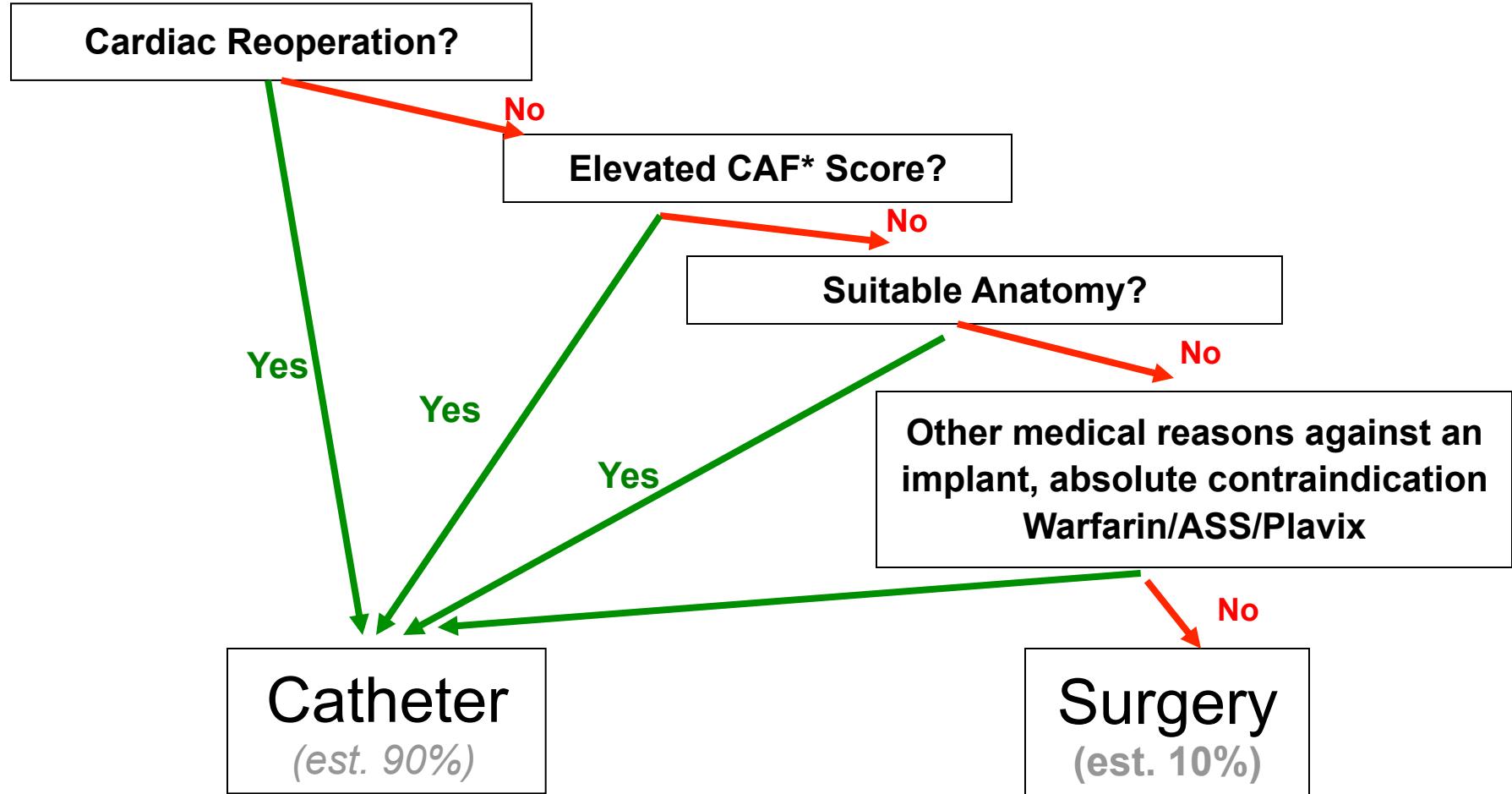
Protect AF trial

=12% not treated!



LAA closure is best done with surgery

“Heart Team” Approach for stand alone LAA therapies



* Sündermann et al.. Eur J Cardiothorac Surg. 2011

Conclusions: LAA Management

- ✓ 100% LAA closure/removal/exclusion is mandatory
- ✓ No touch vs. half touch!
- ✓ Endocardial (Percutaneous) closure appealing and non invasive – hence attractive!
- ✓ Epicardial closure is safe, effective and durable however invasive – hence not popular!
- ✓ Heart Team recommended