ΠΡΕΠΕΙ Η ΧΕΙΡΟΥΡΓΙΚΗ ΚΑΤΑΛΥΣΗ ΤΗΣ ΚΟΛΠΙΚΗΣ ΜΑΡΜΑΡΥΓΗΣ ΝΑ ΠΡΟΣΤΕΘΕΙ ΑΠΑΡΑΙΤΗΤΩΣ (STANDARD OF CARE) ΣΤΙΣ ΚΑΡΔΙΟΧΕΙΡΟΥΡΓΙΚΕΣ ΕΠΕΜΒΑΣΕΙΣ ?

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DEFINITION

- **ATRIAL FIBRILLATION:**
- Supra-ventricular arrhythmia characterized by uncontrolled atrial excitation at a rate of >300 BPM
- **Paroxysmal**: self-terminating, usually within 48 hours up to 7 days
- **Persistent**: is an AF episode which either lasts longer than 7 days or terminates by pharmacological cardio-version or CVE
- **Long-standing persistent**: when it is decided to adopt a rhythm control strategy
- **Permanent**: when the presence of the arrhythmia is accepted and a rhythm control is no longer pursued

M. Haensig et al. Cardiology Research and Practice 2012.

PREDISPOSING RISK FACTORS

- Age
- Male sex
- Genetic predisposition
- Hypertension
- Diabetes mellitus
- Sleep Apnea Syndrome
- Obesity
- Excessive alcohol use
- Pericarditis
- Smoking
- Hyperlipidemia
- Coronary artery disease
- Hyperthyroidism
- Obstructive Pulmonary disease
- Heart Failure
- Excessive excersise

M. S. Link et al. Circulation 2016. 134:339-352

HISTORY

- 1987: **Cox-Maze I procedure** → a "cut and sew" technique designed to create lines of scar tissue in order to terminate the macro re-entry circuits in the atria

  Because of the high incidence of postoperative complications this procedure has been modified twice and resulted in the

- **Cox-Maze III procedure = Gold standard for surgical treatment of AF**

  Is uptake has been limited , mainly related to the high level of technical difficulty , increased operation time and risk of bleeding

- Melby and colleagues → **Cox-Maze IV procedure**

  Ablation, minimally invasive method, faster and safer

J. L. Cox et al. The journal of thoracic and cardiovascular surgery 1991. 101: 569-83
S. J. Melby et al. Annals of surgery 2006. 244: 583-92

ENERGY SOURCES for AF ABLATION

- **Radiofrequency ablation**: creates a lesion with heat (>60° C) and can be delivered with or without saline irrigation at the tip of the catheter.
- **Cryo-ablation**: produces lesions in the tissue by applying a very low localized temperature (-80° C) that yields freezing or necrosis due to vasoconstriction.
- **Laser**: is performed with special catheters designed to create a circumferential lesion set around each PV.
- **Microwave energy**
- **High-intensity focused ultrasound**: has been recently discouraged due to the risk of atrio-esophageal fistula

Cryo-ablation is, next to radiofrequency ablation, the most frequently employed alternative method to create linear, continuous and transmural lesions

These new techniques significantly reduce the time of the procedure

M. S. Link et al. Circulation 2016. 134:339-352
I. Romero et al. Cardiovascular Therapeutics 2014.242-252

CONCOMITANT AF WITH OTHER HEART DISEASES

- In (1-3.5%) of pts with AVD undergoing OHS
- In 1-8,7% of patients with CAD undergoing CABG
- In 30–50% of patients with MVD undergoing OHS

Gillinov M, Journal of Interventional Cardiac Electrophysiology 2007.
Romero I, et al. Cardiovascular Therapeutics 2014.
Geidel S, et al, Thorac Cardiovasc Surg 2011.

MATERIALS and METHODS

BIPOLAR and MONOPOLAR ABLATION

Modern radiofrequency energy ablation devices, Atricure Isolator SynergyTM Ablation Clamp (left),Medtronic CardioblateTM BP2 (middle), and Estech CobraTM Surgical Probe (right).

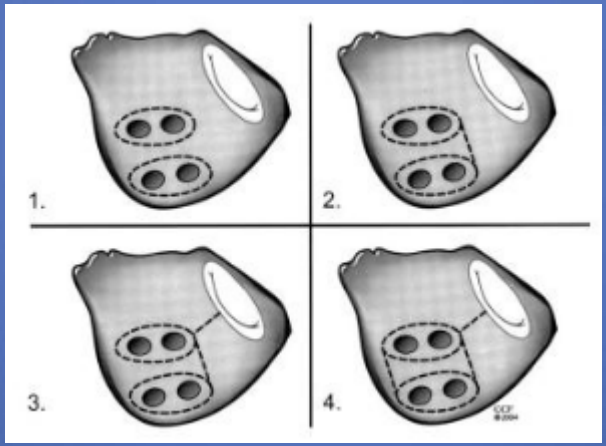
CobraTM Revolution Bipolar Clamp (Estech, San Ramon, CA, USA).

Argon-based ATS CryoMazeTM surgical ablation system.

M. Haensig et al. Cardiology Research and Practice.2012

LOCATION of LESION

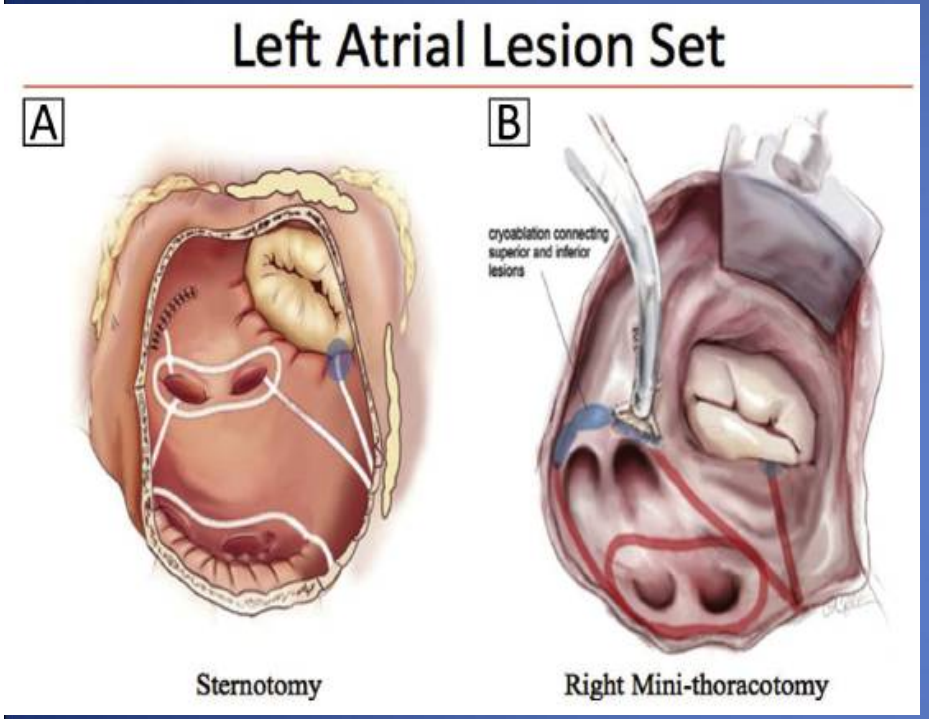
- Ipsilateral Pulmonary Vein isolation (box lesion)
- Posterior linear lesion connecting the ipsilateral Pulmonary Veins at the roof of the left atrium
- Lesion connecting the lateral Pulmonary Veins to the mitral annulus

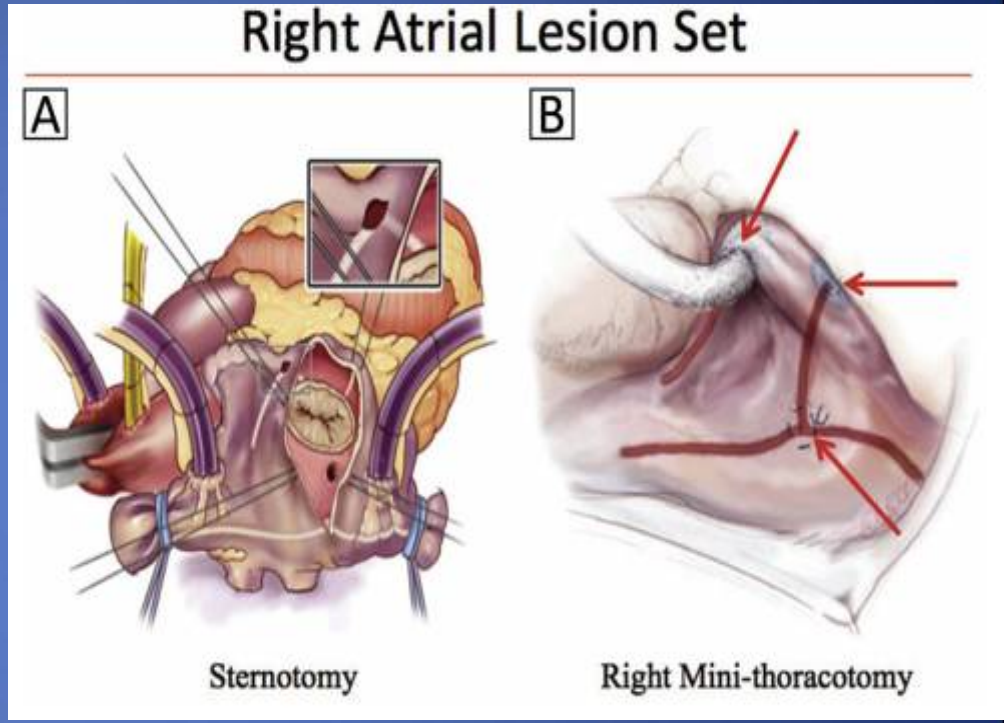


Schematic representation of left atrial lesion sets created with bipolar RF. White ovals represent mitral valve, sets of 4 black ovals represent pulmonary veins, and dashed lines represent sites of ablation.

M. Gillinov et al. The Journal of Thoracic and Cardiovascular Surgery 2005.

LESION SET CONSIDERATIONS





Left and Right Lesion Sets for Cox maze IV procedure: (A) Most linear lesions are created with bipolar radiofrequency clamps; shaded in blue are cryo-lesions at the mitral isthmus (and left pulmonary veins for minimally invasive approach). (B) Linear lesions also can be created with Cryo-ablation if required for Mini-thoracotomies or reoperations.

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

COSTS

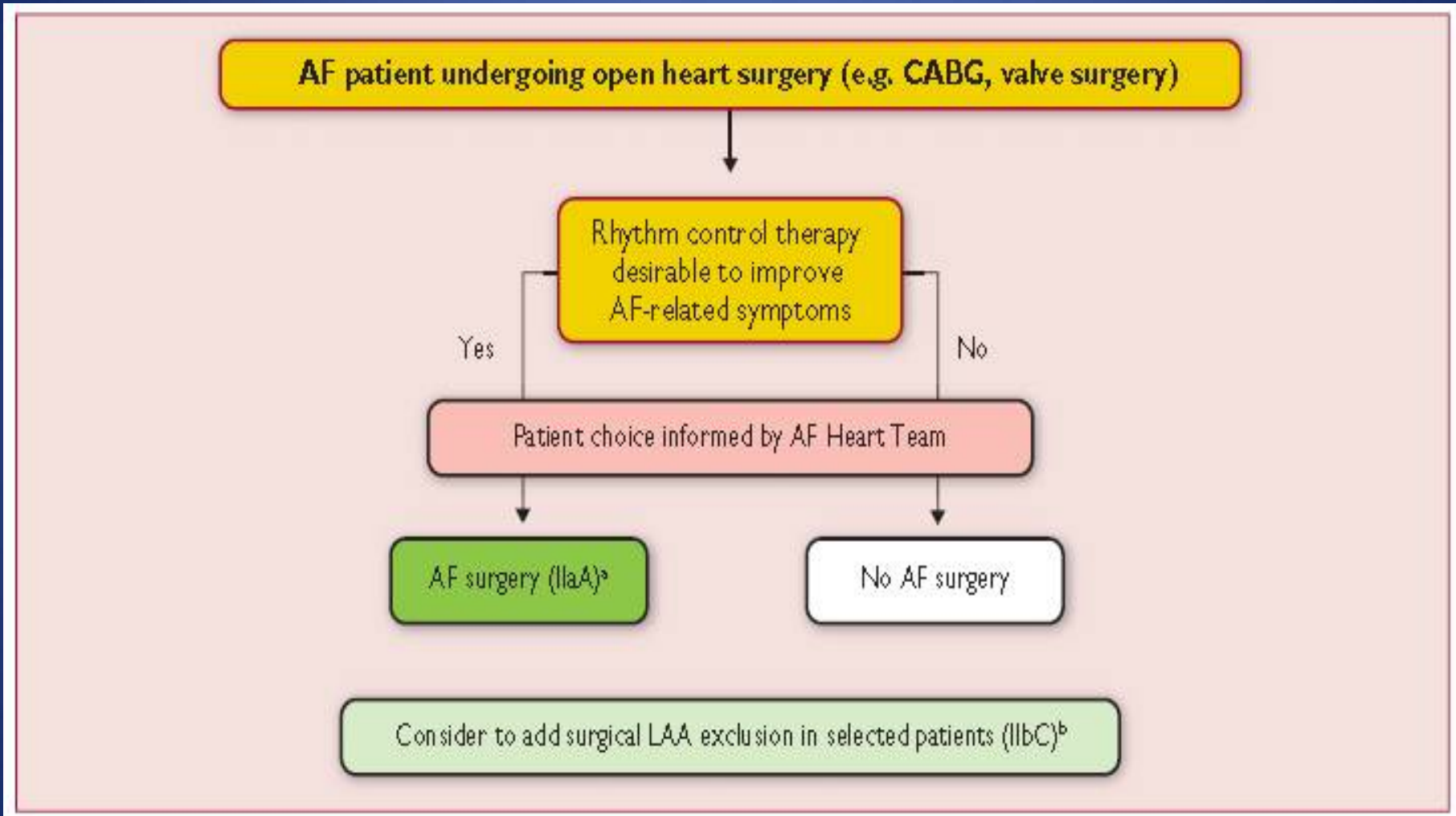
- Probe 1650 EURO
- Clamp 2800 EURO

GUIDELINES ACCORDING TO AHA/ACC 2014

- **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. (Level of Evidence: B)

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

GUIDELINES ACCORDING TO ESC 2016



Surgical rhythm control in patients with atrial fibrillation undergoing cardiac surgery

2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS

GUIDELINES ACCORDING TO STS 2017-1

Clinical Practice Guidelines for the Surgical Treatment of AF

- Surgical ablation for 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)
- Surgical ablation for symptomatic AF in the absence of structural heart disease that is refractory to class I/III antiarrhythmic drugs or catheter-based therapy or both is reasonable as a primary stand-alone procedure, to restore sinus rhythm. (Class IIA, Level B randomized)
- Surgical ablation for symptomatic persistent or longstanding persistent AF in the absence of structural heart disease is reasonable, as a stand-alone procedure using the Cox-Maze III/IV lesion set compared with pulmonary vein isolation alone. (Class IIA, Level B nonrandomized)
- Surgical ablation for symptomatic AF in the setting of left atrial enlargement (‡4.5 cm) or more than moderate mitral regurgitation by pulmonary vein isolation alone is not recommended. (Class III no benefit, Level C expert
- opinion)

V. Badhwar Ann Thorac Surg 2017;103:329–41)

RESULTS FOR CONCOMITANT ABLATION TO OTHER CARDIAC SURGERY -1

- The cut-and-sew Cox-Maze III procedure is extremely effective, eliminating AF in 80–95%; however, it has been supplanted by newer operations that rely upon alternate energy sources to create lines of conduction block. Early and midterm results are good with a variety of technologies. Choice of lesion set remains a matter of debate, but success of ablation appears to be enhanced by a bi-atrial lesion set and exceeds 90% in some series.
- AF is also found in 1-8,7% of patients with coronary artery disease undergoing bypass surgery. Long-term persistent AF before surgery and a larger left atrium were predictive of postoperative persistent AF return
- ($P < 0.01$).

M. Gillinov. Journal of Interventional Cardiac Electrophysiology 2007.
I. Romero et al. Cardiovascular Therapeutics 2014.
S. Geidel Thorac Cardiovasc Surg 2011.

RESULTS FOR CONCOMITANT ABLATION TO OTHER CARDIAC SURGERY -2

"Surgical Ablation of Atrial Fibrillation during Mitral-Valve Surgery"

- Methods

  260 pts with persistent or long-standing persistent AF who required mitral valve surgery underwent either surgical ablation (ablation group= 133 pts) or no ablation (control group= 127 pts) during the mitral-valve operation.

  Patients in the ablation group underwent further randomization to pulmonary vein isolation (67 pts) or a bi-atrial maze procedure (66 pts). All patients underwent closure of the left atrial appendage. The primary end point was freedom from atrial fibrillation at both 6 months and 12 months

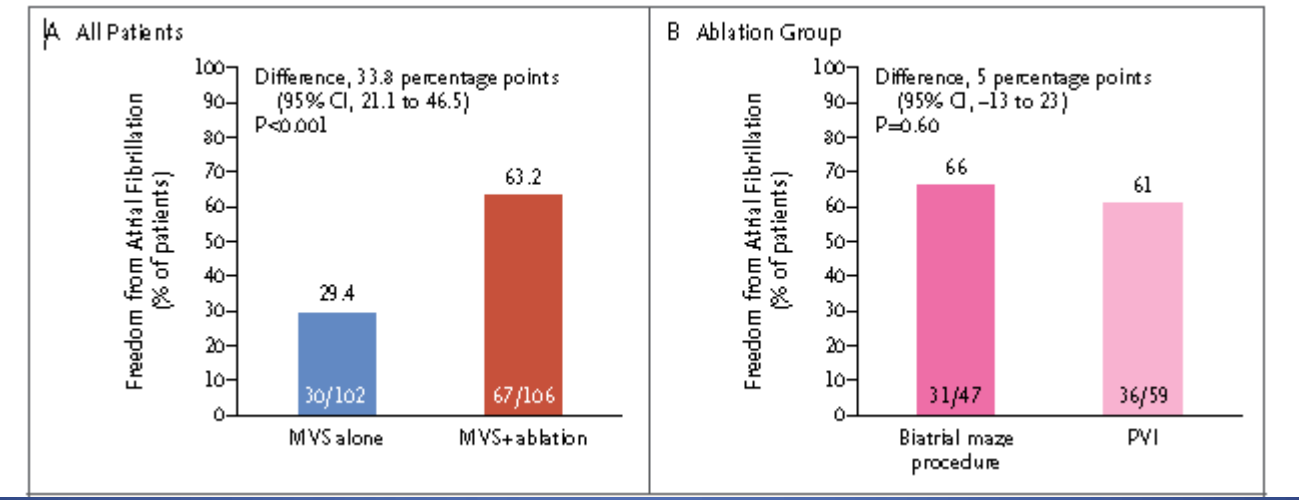
  The duration of cardio-polmonary bypass was approximately 15 min longer in the ablation group than in the control group (P= 0.03).

M. Gillinov. The new england journal of medicine 2015.

RESULTS FOR CONCOMITANT ABLATION TO OTHER CARDIAC SURGERY -3

Results

More pts in the ablation group than in the control group were free from AF at both 6 and 12 months (P<0.001). There was no significant difference in the rate of freedom from atrial fibrillation between patients who underwent pulmonary-vein isolation and those who underwent the bi-atrial maze procedure (P = 0.60). 1y mortality was 6.8% in the ablation group and 8.7% in the control group (P= 0.57).



Freedom from Atrial Fibrillation.

Freedom from AF= the absence of the condition at both 6 months and 12 months, as assessed by means of 3-day Holter monitoring. MVS: mitral-valve surgery, PVI: pulmonary-vein isolation

M. Gillinov. The new england journal of medicine 2015.

CONCLUSIONS

- The surgical approach can be used with promising short-term results in patients who **can not be treated** by the interventional technique
- Intra-operative AF ablation during cardiac surgery **may render SOBERING RESULTS in unselected patients**
- The individualization (or selection) of operated patients is needed to achieve the best results and the lower costs
- The factors for individualization are related to the volume of left atrium, the age of the patient, the comorbidity, the concomitant cardiac disease, and the longevity of persistent AF
- Surgeon's experience seems to be important to the success of ablation surgery

Σας ευχαριστώ !!!