Does AF ablation reduce stroke risk?

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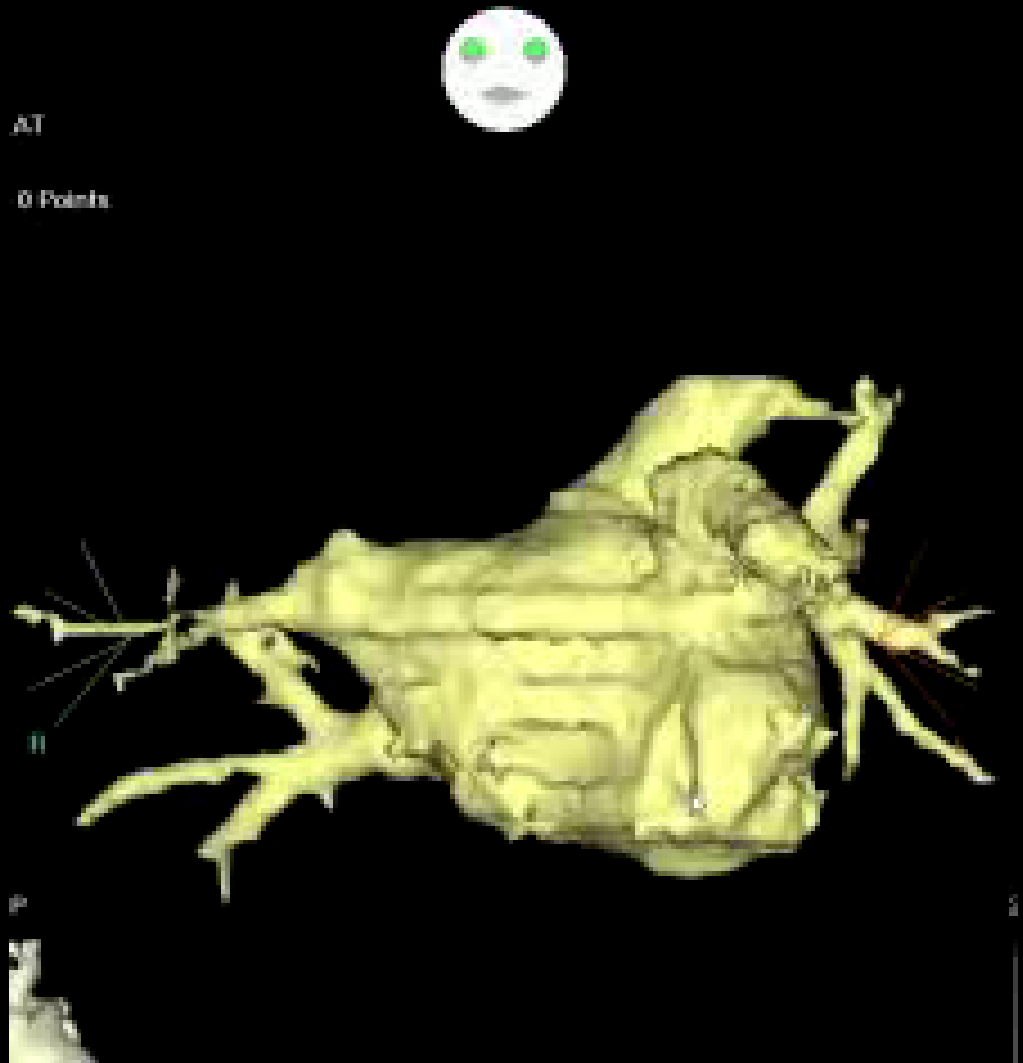
Conclusions

- We don’t know

What causes stroke in AF?

- We don’t know but almost certainly multifactorial

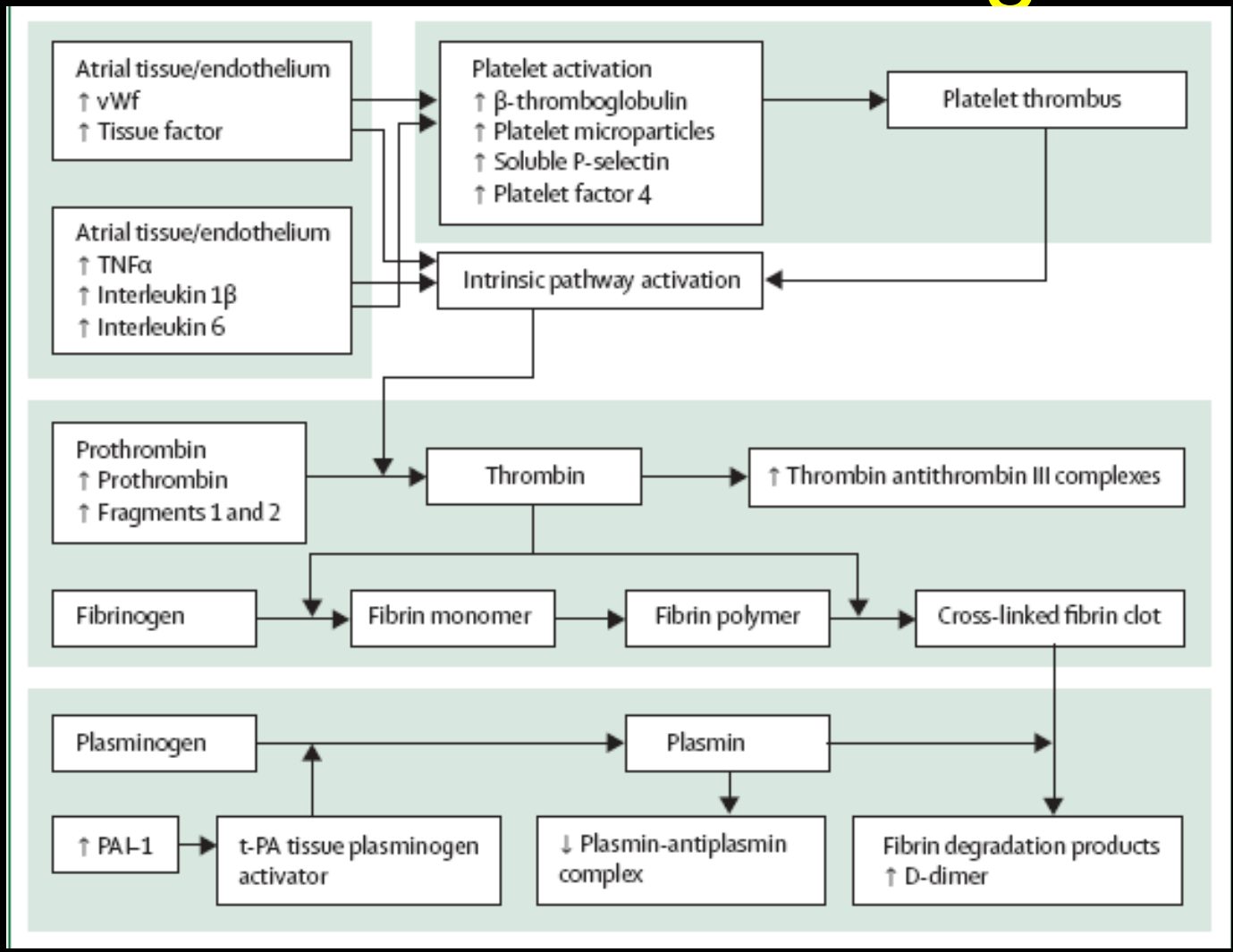
Why does stroke occur in patients with AF?



Associations of stroke with AF

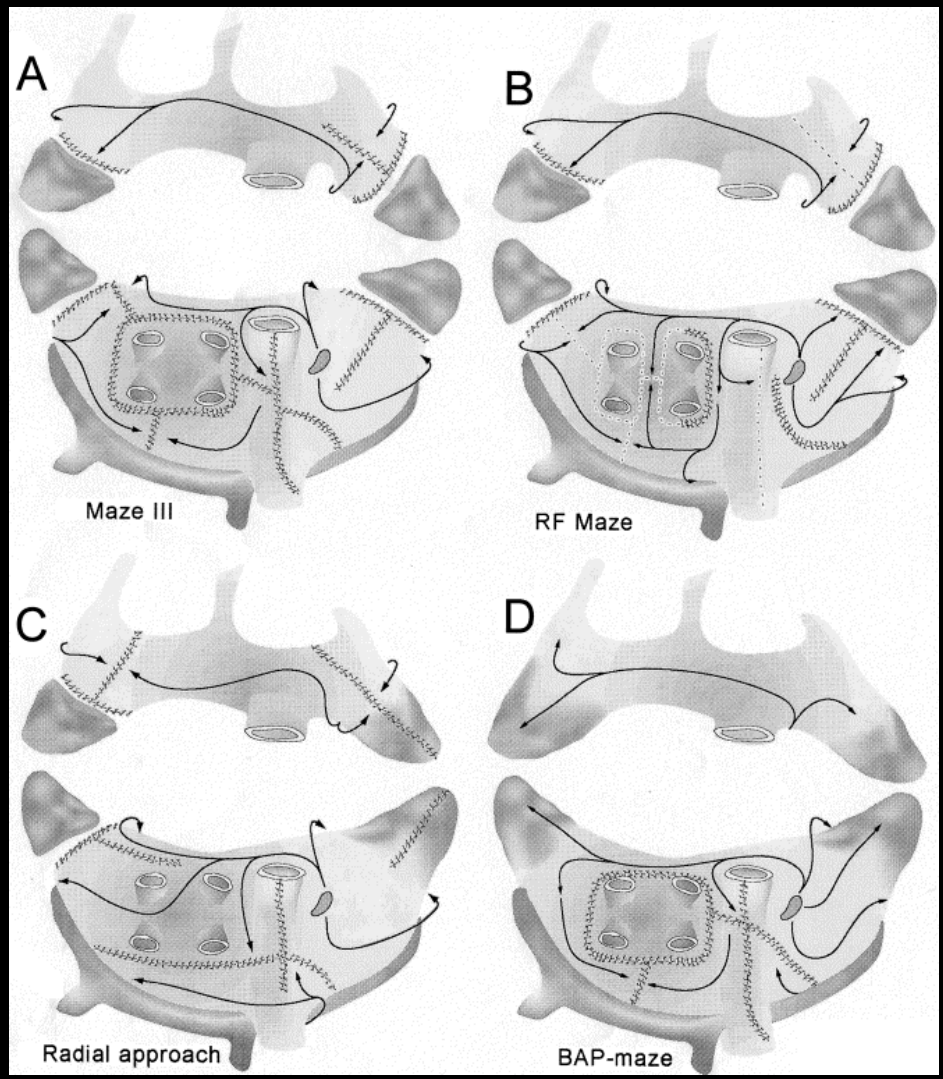
- Age
- Diabetes
  - Hypercoagulable state
- Spontaneous contrast
  - Hypercoagulable state
- LV failure
  - Mechanical
- LA dilation
  - Mechanical

Abnormalities of clotting in AF

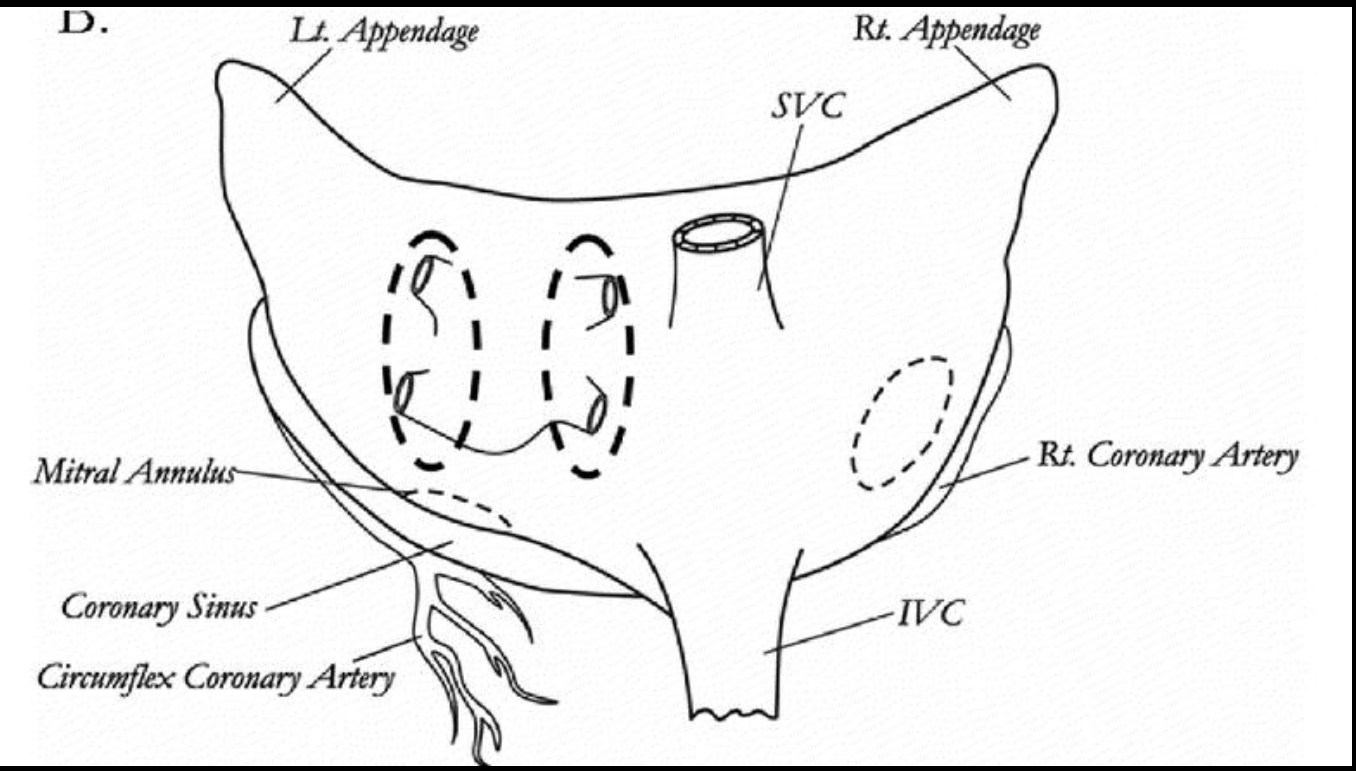


Watson et al Lancet 2009

What are the surgical approaches to AF



Surgical AF ablation procedures – non C+S

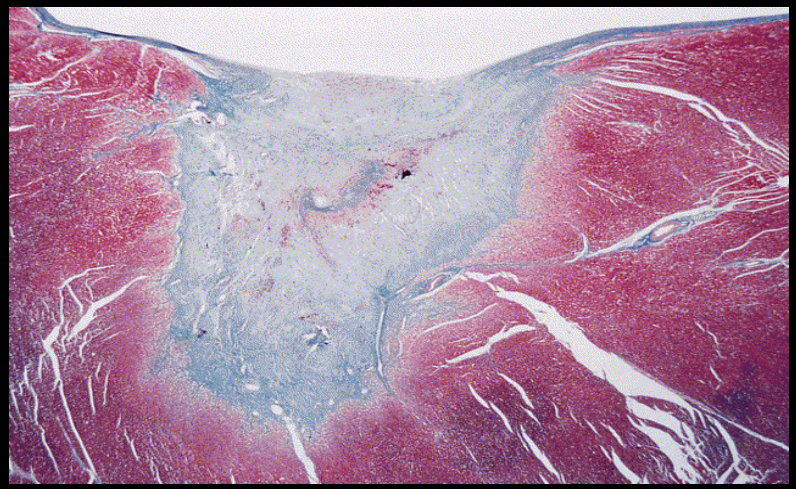


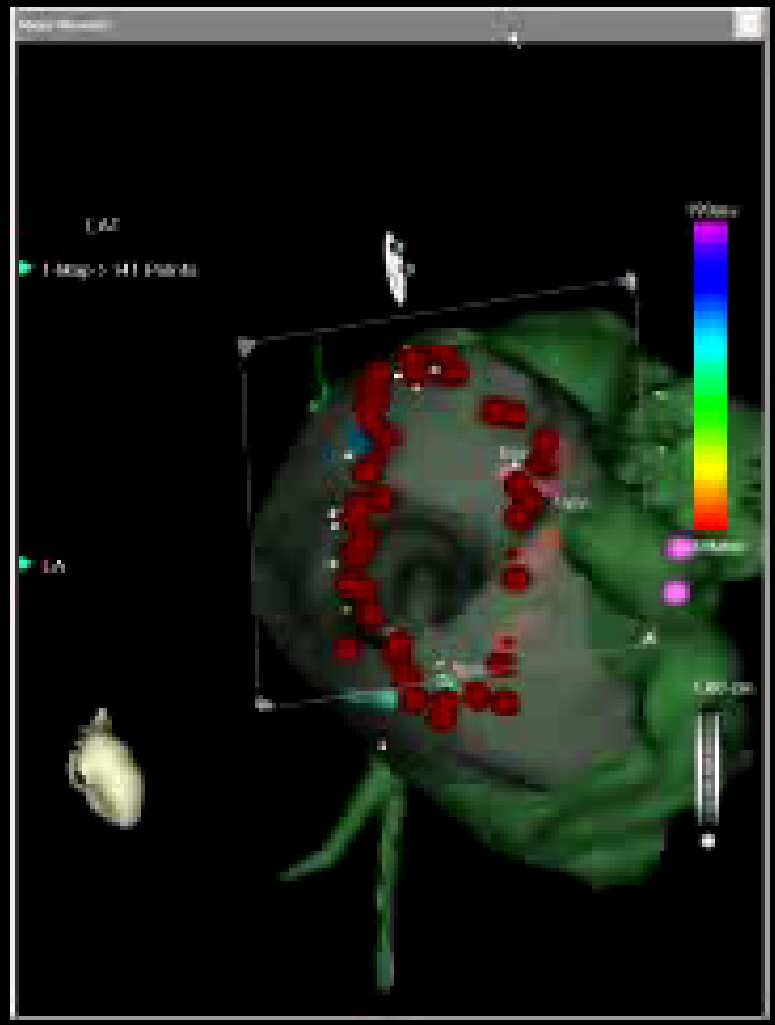
- Adequate for Paroxysmal
- Minimally invasive

Melby et al Ann Surg 2006

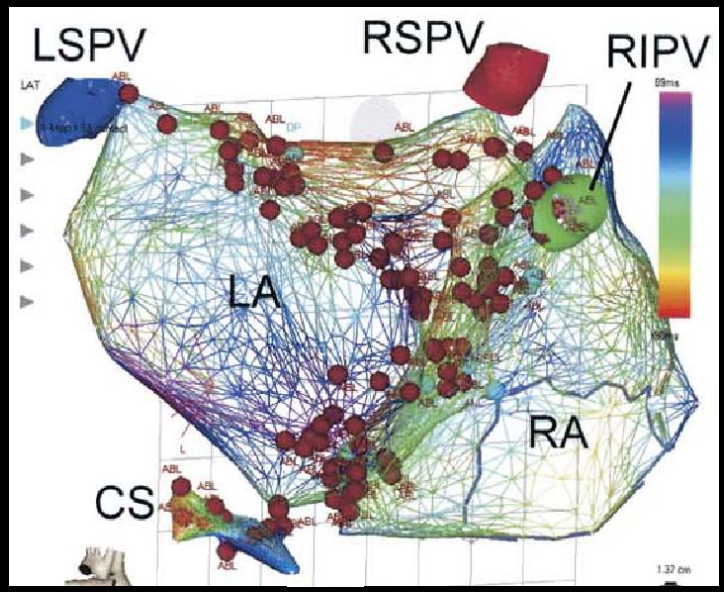
Catheter ablation of AF

- PV isolation





The substrate – persistent AF



Fractionated potential ablation

Ganglionic plexi ablation

Linear Ablation

If ablation reduces stroke risk

- Then:
  - Mechanical function is relevant and restored
- And/or
  - Inflammation, endothelial dysfunction and coagulation associated with AF is reversed as a result of SR

Is mechanical function relevant?

- Is stroke caused by coagulation within the static appendage?
  - The commonest site
  - 25% are thought to be non-appendage

Does exclusion of the appendage reduce stroke?

- Can be performed as part of a procedure
- Results of exclusion may be surrogate for function restoration

Results of surgery?

- Number of articles on pubmed for maze atrial fibrillation: 659
- After limit of randomised controlled trial: 11
  - 2 not related
  - 1 by same authors
  - 1 not available
  - 6 ablation vs no ablation for MV patients

What about surgery

- RCT’s limited pts (30-60) and follow up (10 – 12 months)
- Event rates too low but trend to lower embolic stroke in ablation group

Surgical ablation of AF

- Cox Maze early and late stroke/TIA rates
- group 1 = prior CVA

	Group 1	*Group 2*	*Total*
Perioperative (<3 mo)	1.7% (n = 58)	0.4% (n = 248)	0.7% (n = 306)
Follow-up (3 mo-11.5 y)	0% (n = 50)	0.5% (n = 215)	0.4% (n = 265)

	Group 1	*Group 2*	*Total*
Perioperative (<3 mo)	1.7% (n = 58)	0.4% (n = 248)	0.7% (n = 306)
Follow-up (3 mo-11.5 y)	2% (n = 50)	0.5% (n = 215)	0.8% (n = 265)

Cox J Thorac Surgery 1999

Surgical ablation of AF

- 100% cure of AF (98% without drugs)
- LA transport 93%
- Pts lost to follow up unclear
- Explanation:
  - LAA occlusion
  - Restoration SR

Cox J Thorac Surgery 1999

Questions raised by Surgical experience

- Why have results never been replicated?
- Does SR restoration reverse inflammatory process?
- No post-op warfarin – is this process instantaneous?

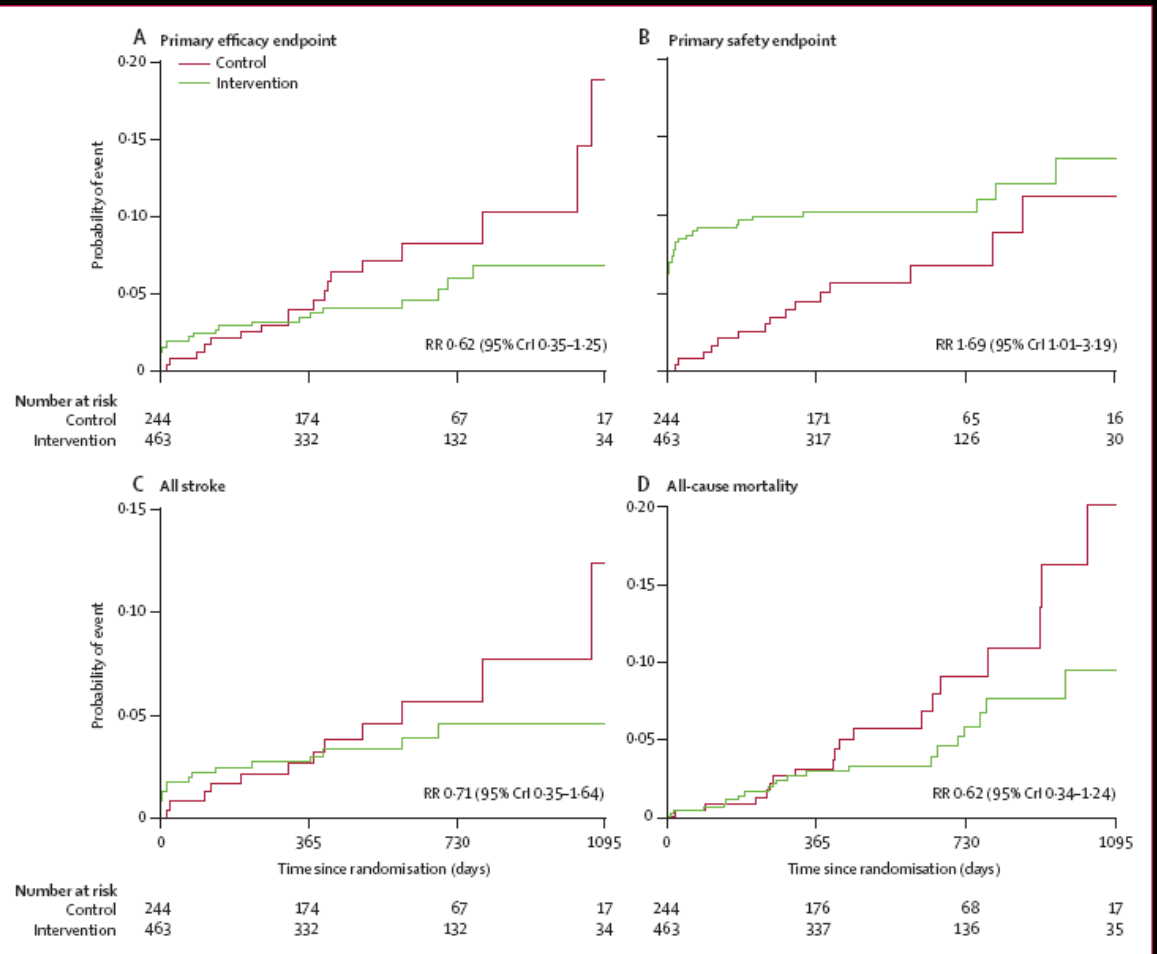
Percutaneous occlusion

- Protect AF
  - N=707
  - Mod-high risk
  - Mean age 70
  - Warfarin 45 days after
  - Aspirin for life

Holmes et al Lancet 2009

Percutaneous occlusion

- Equivalence to warfarin



Holmes et al Lancet 2009

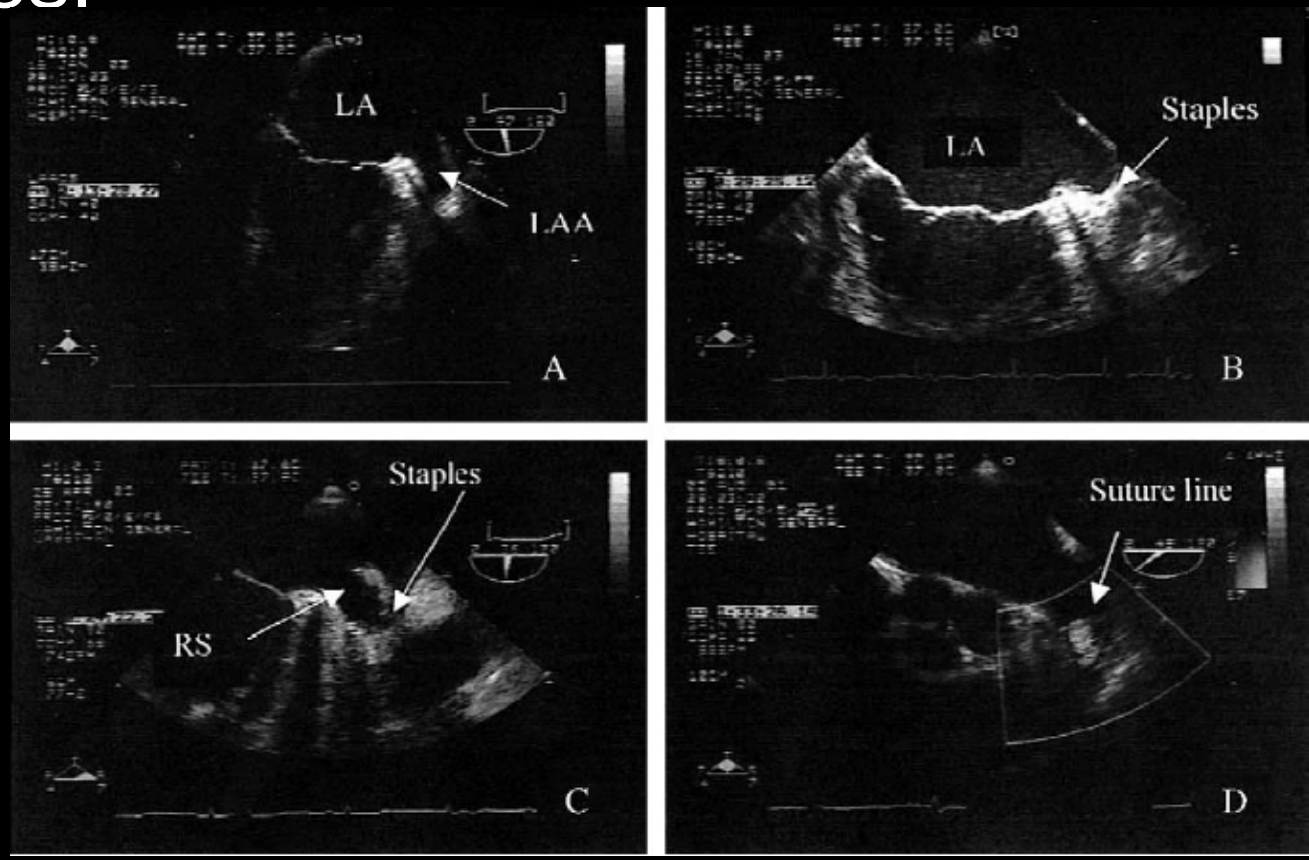
LAA occlusion

- This appears critical for stroke reduction
- How effective is it?
  - N=77 staple or suture occlusion assessed by TOE
  - 7 Tears requiring repair

Healey et al Am H J 2005

LAA occlusion

- Occlusion rates:
  - 45% suture
  - 71% staple



Healey et al Am H J 2005

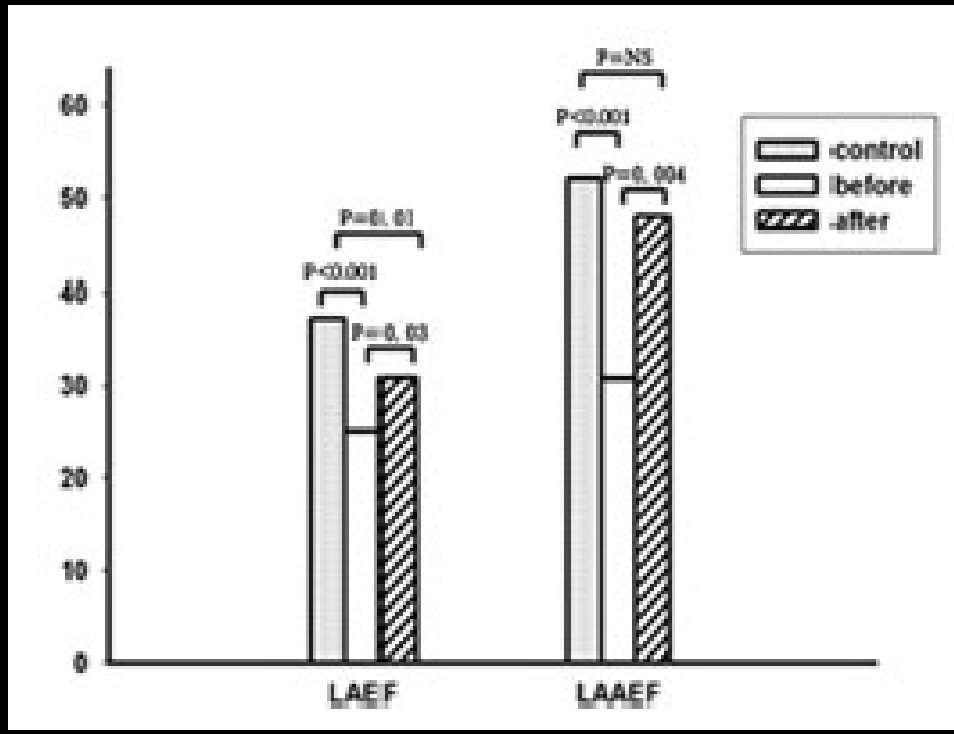
Stroke prevention in AF

- Matching warfarin appears to be dependent on mechanical factors only – specifically LAA occlusion
- Can it really be that simple?

Does mechanical function return after catheter ablation?

- For paroxysmal AF yes

LA/LAA EF after PAF ablation on 4D CT

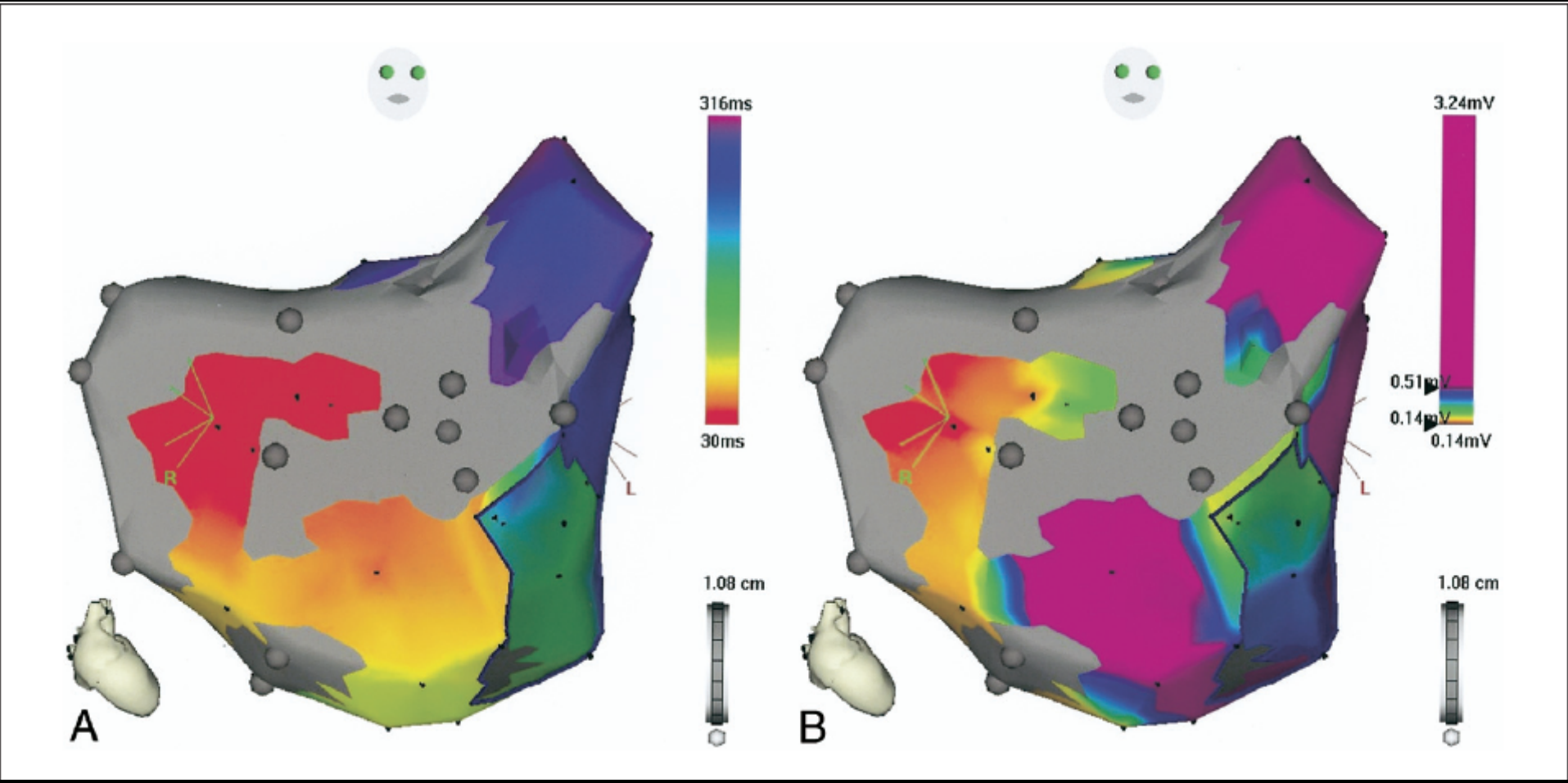


Tsao et al JCE 2009

Does mechanical function return after catheter ablation

- For persistent AF:
  - No convincing data
  - Difficult to characterise
  - Procedures progressively more aggressive and extensive

How much atrial function remains?



Takahashi et al JACC 2007

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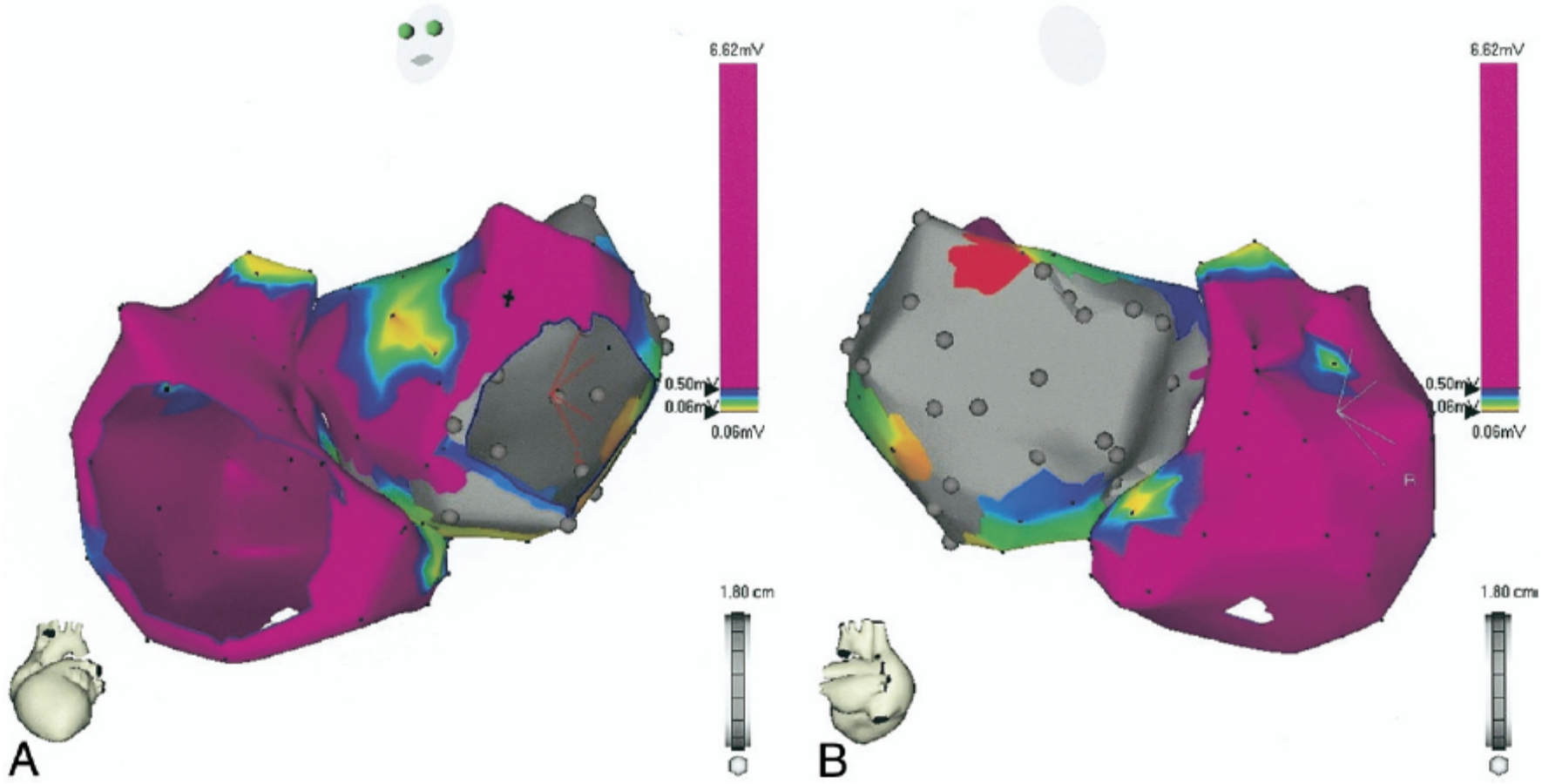

Takahashi et al JACC 2007

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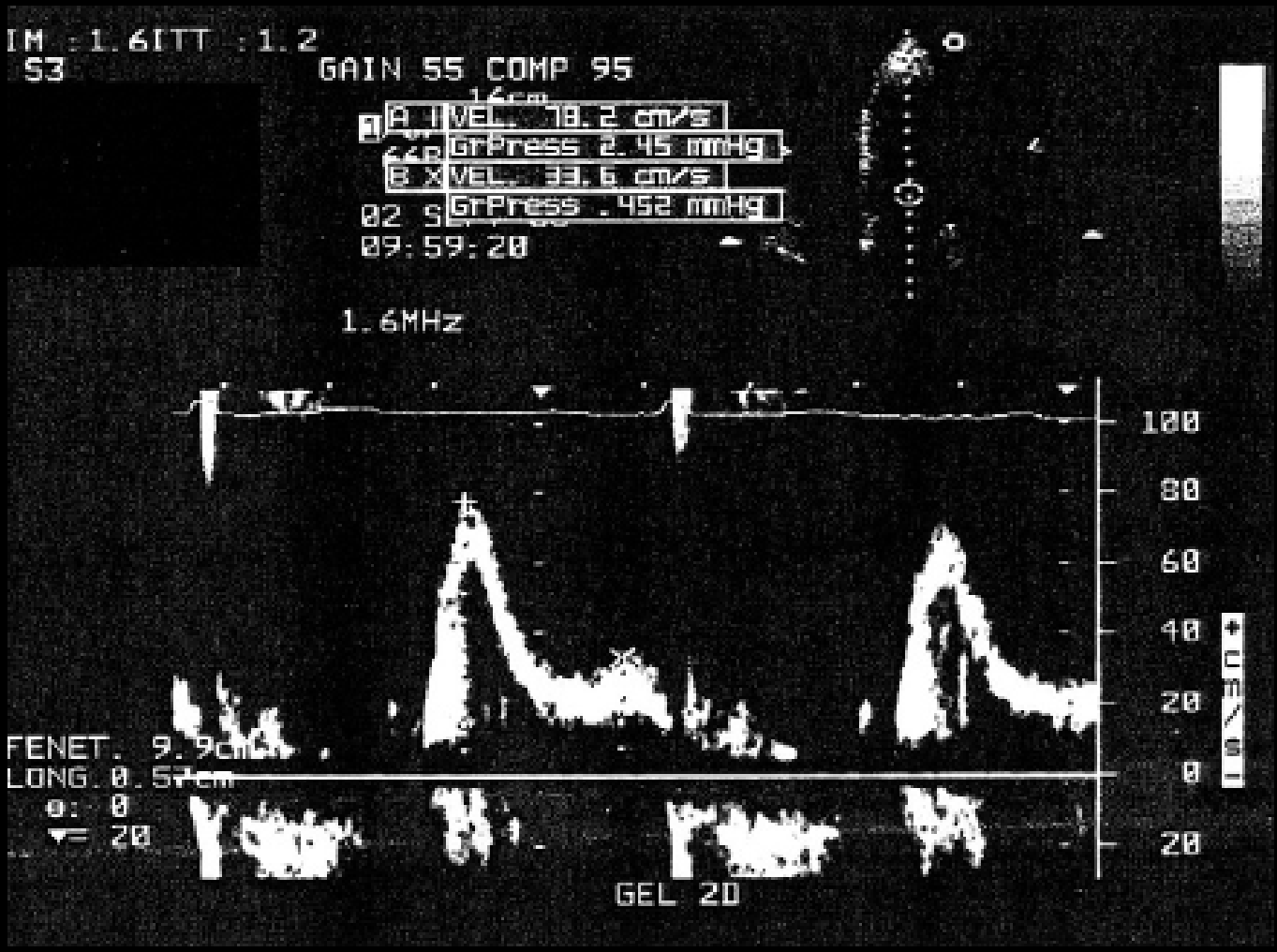
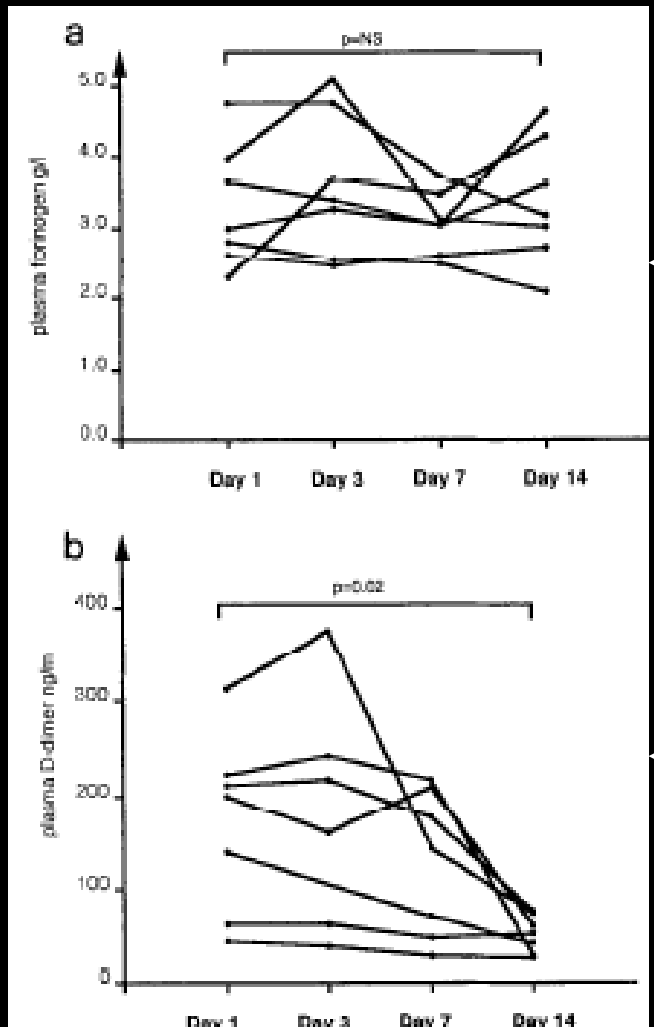


Takahashi et al JACC 2007

Stroke reduction with AF ablation

- How important is LA transport?
  - Stroke > in patients with lower LAA velocity and EF
  - Stroke in patients with larger LA

Does sinus rhythm reverse thrombogenesis?



- D dimer levels post cardioversion

← With warfarin

← Without warfarin

Lip et al Int J Cardiol 1995

Does catheter ablation reduce stroke

- Catheter ablation results in considerable endothelial disruption
- How that affects hypercoagulability is unknown
- Is it balanced against restoration of SR?

Does ablation reduce stroke?

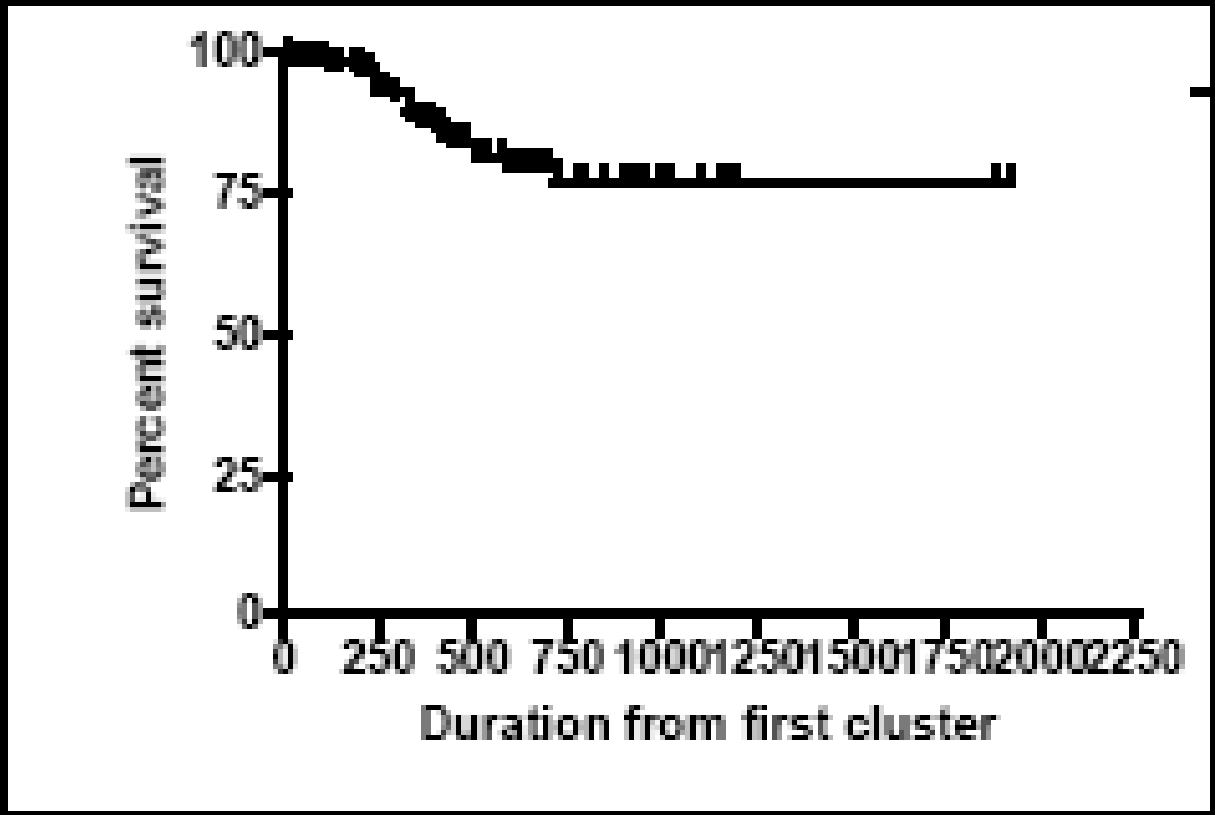
- Case controlled study

	Ablation Group (n = 589)	Medical Group (n = 582)	
	No. of Patients		Total
Death			
Cardiovascular causes	18	59	77
Congestive heart failure	8	23	31
Myocardial infarction	8	10	18
Sudden*	0	12	12
Ischemic stroke†	2	14	16
Noncardiovascular causes	20	24	44
Respiratory failure	5	7	12
Cancer	8	9	17
Infection	3	2	5
Other	4	6	10
Total	38	83	121
	No. of Events		Total
Adverse event‡			
Congestive heart failure	32	57	89
Myocardial infarction	7	8	15
Peripheral embolism	1	3	4
TIA	8	27	35
Ischemic stroke	4	15	19
Hemorrhagic stroke	2	7	9
Total	54	117	171
No. of patients with events	46	98	144

Pappone et al JACC 2003

Is sinus rhythm maintained?

- Recurrence of AF after successful catheter ablation – all comers



Personal data

Conclusion

- Stroke aetiology highly complex
- Not just a pump thing
- SR may reduce stroke risk
- Ablation may achieve this but at what cost and over how long?

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