Atrial fibrillation ablation techniques, imaging, complications, results

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Definitions

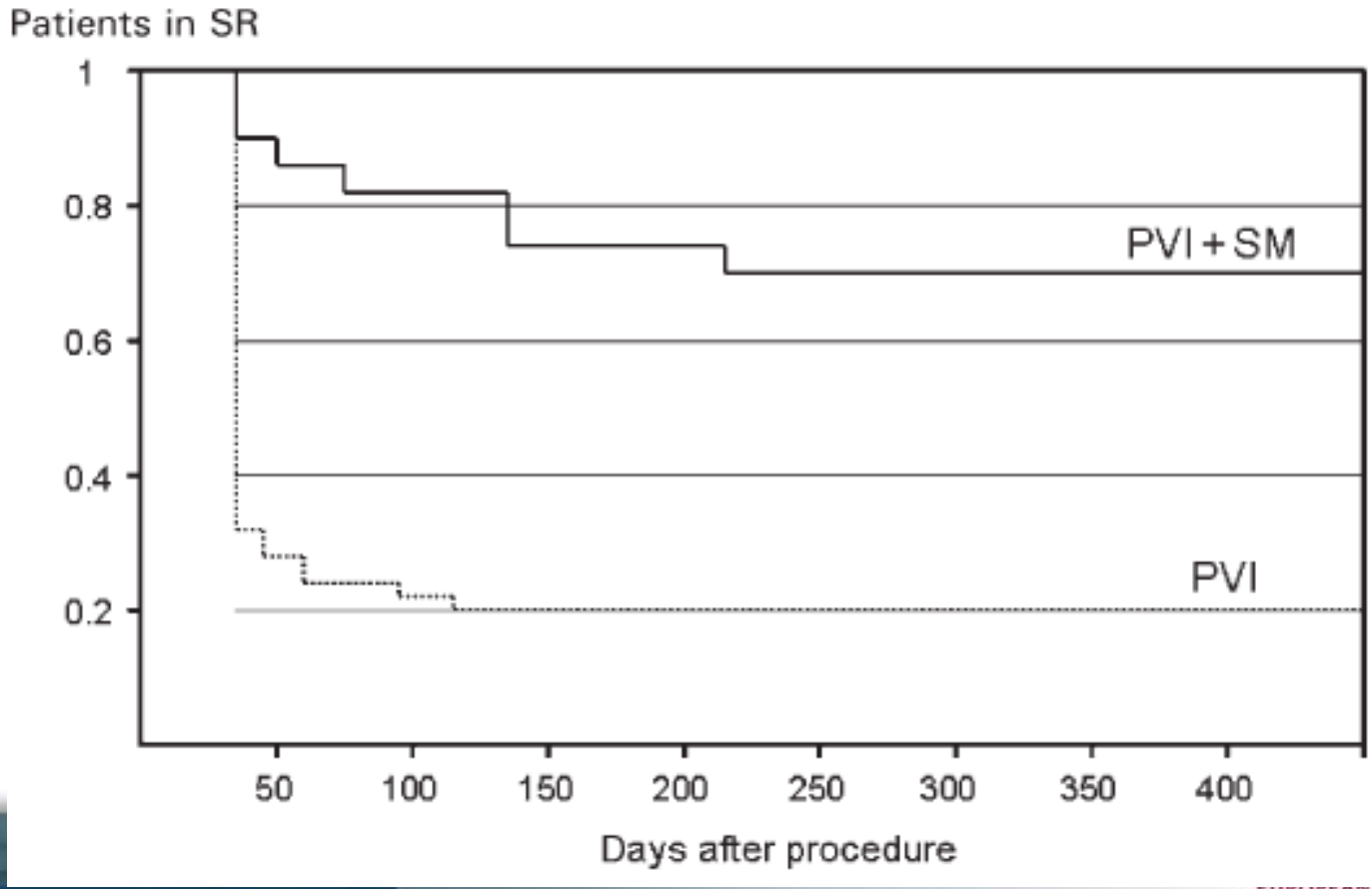
- PVI – segmental ostial isolation of individual veins guided by activation on PV mapping catheter
- WACA – Wide area ablation to enclose veins as pairs (with/without ablation between veins). May be guided by PV mapping catheter

Paroxysmal AF

- Pulmonary vein triggers majority of PAF
- Non venous triggers
- Autonomic modification
- Fractionated potentials/substrate modification

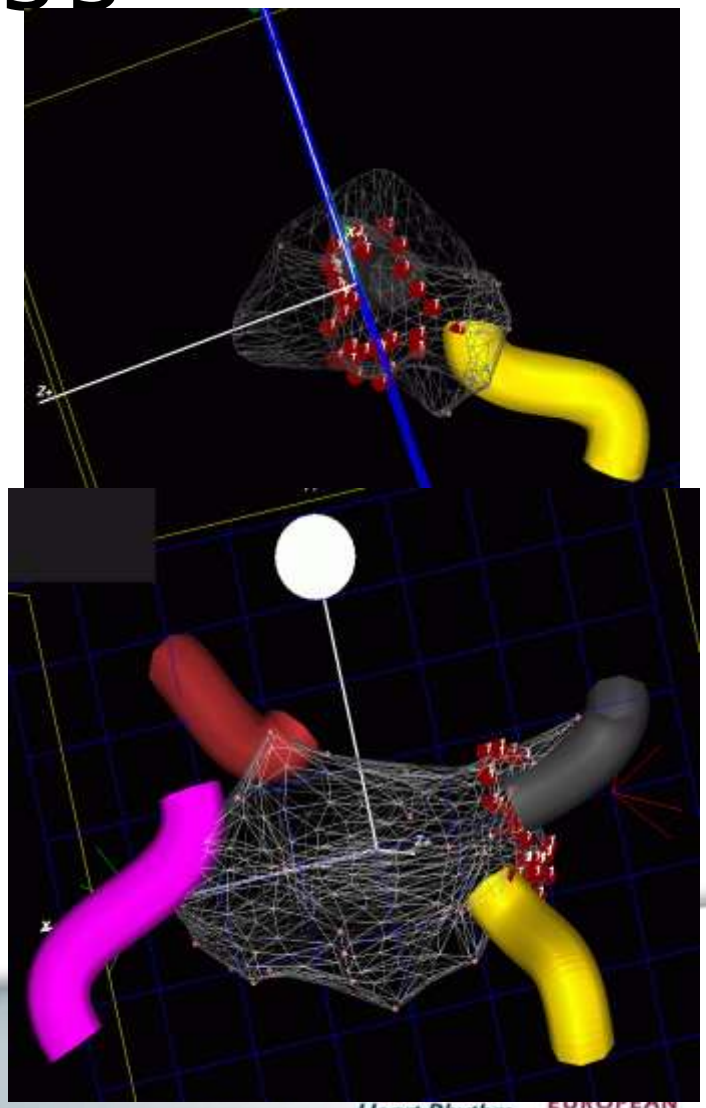
Persistent AF

- PV isolation is not sufficient



Willems et al EHJ 2006

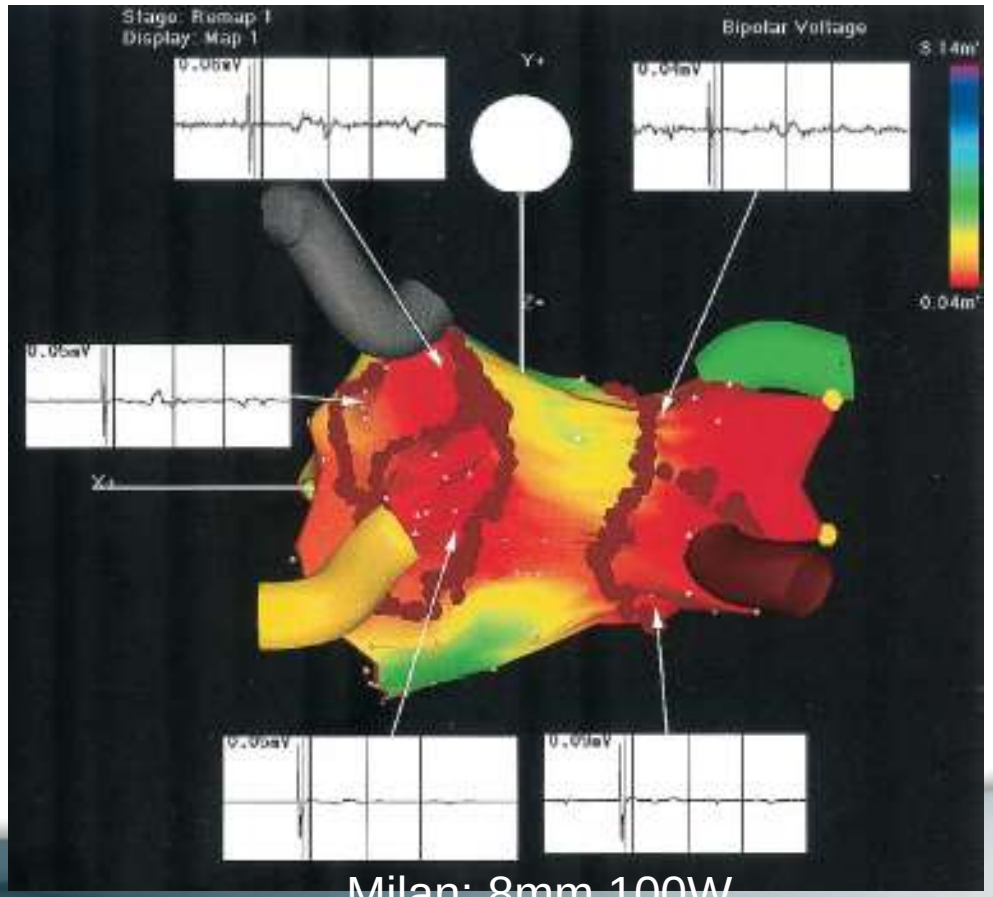
Target PV trigger



LIMITED BY:

- Absence of spontaneous ectopy
- Multiple triggers

Wide area circumferential ablation



Milan: 8mm 100W

Pappone et al

PVI vs WACA

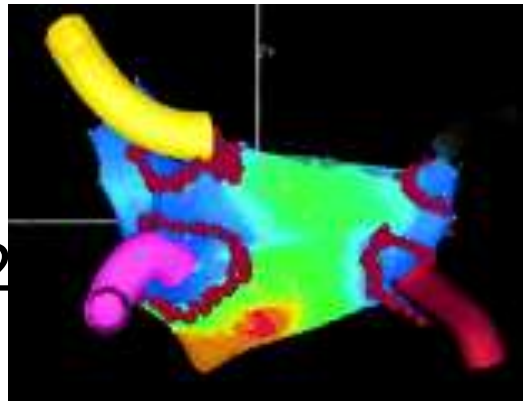
- WACA with no assessment of isolation
  - Cheaper
  - Simpler
  - Quicker
  - ?As effective

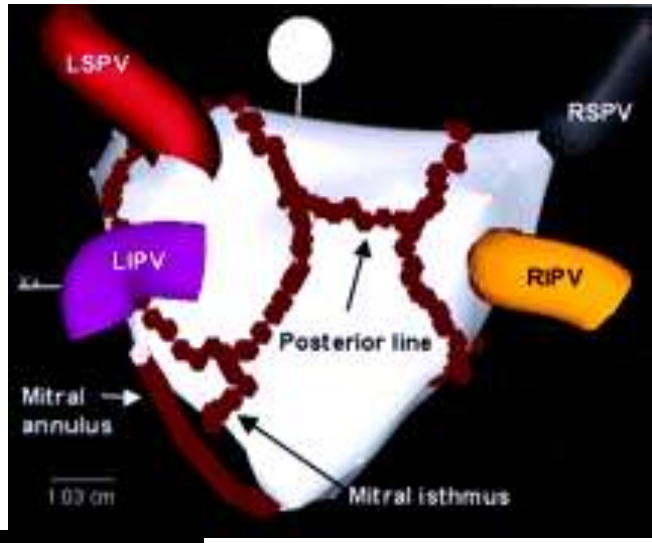
Disadvantages of WACA without isolation

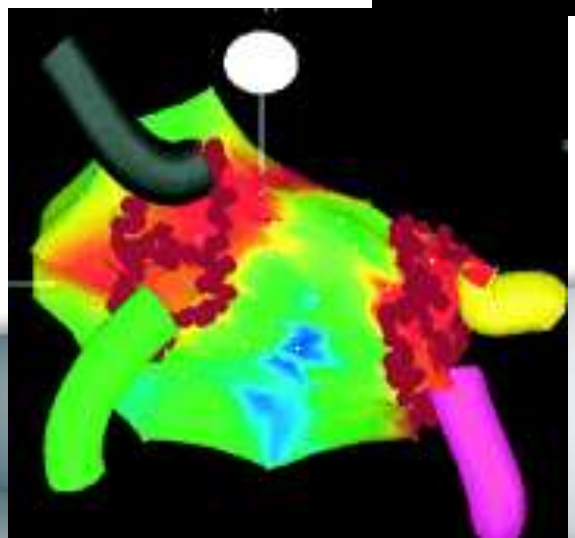
- No clear end point
- Dependent on operator experience and skill
- No definition of “WACA” varies

Wide encirclement without isolation

- Pappone 2002 n=72
  - 68% success (32 on drugs)
  - Overall complications (permanent and parox) 0.8% (2 tamponade)
  - Atachy not reported follow up by transtelephonic monitoring

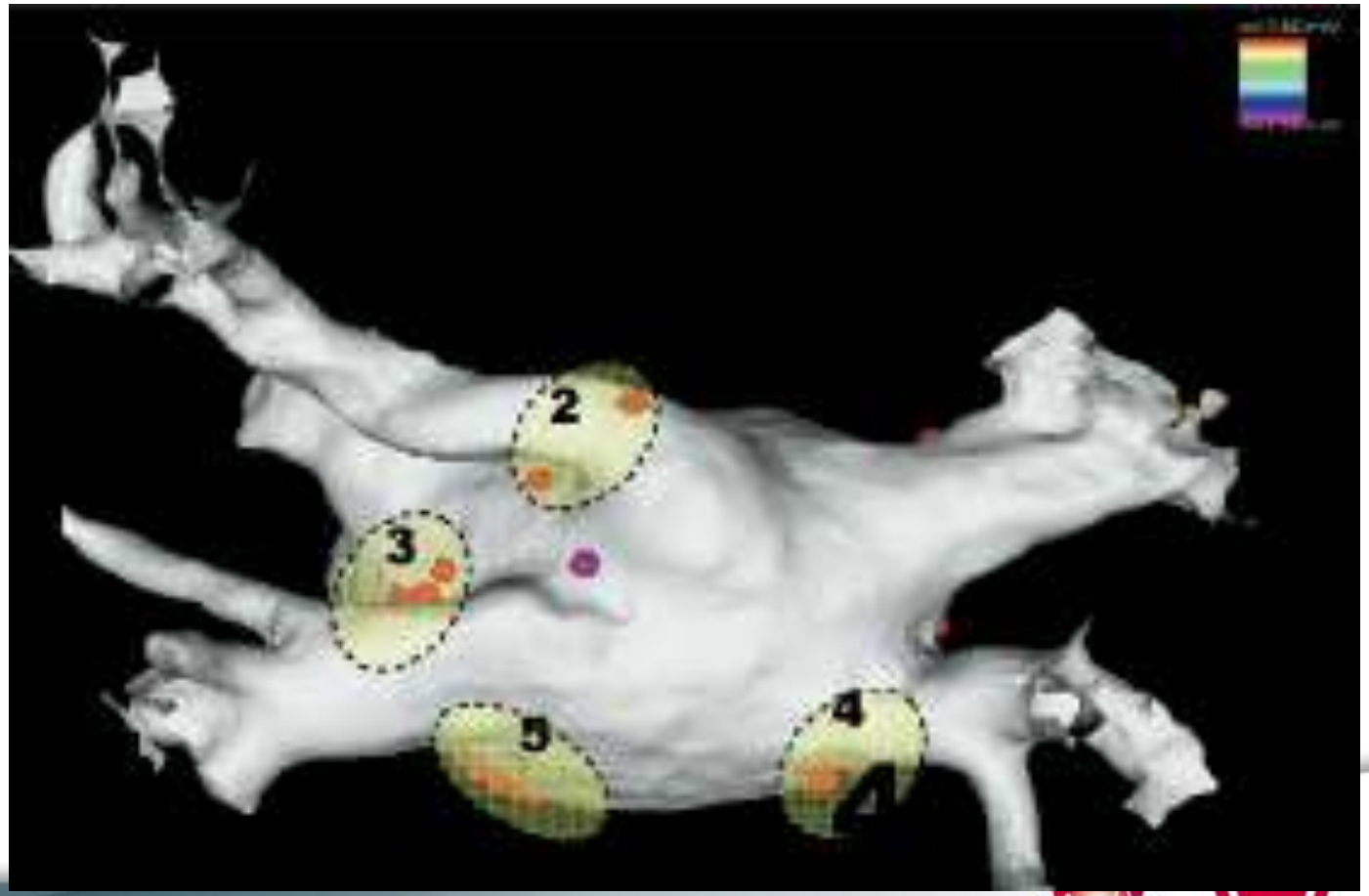






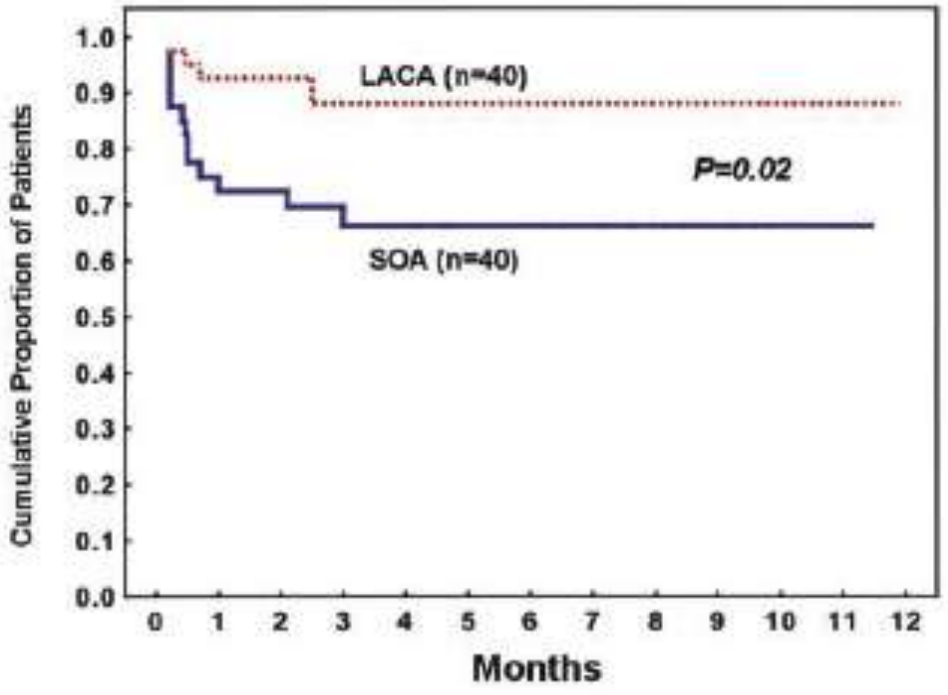
Sites of ganlgionic plexi

The wider the line the greater the success rate

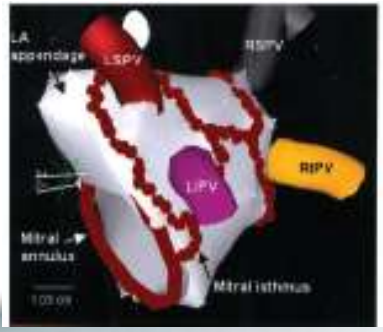


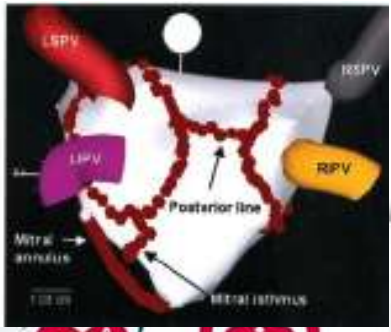
Danik et al Am J C 2008

PVI vs WACA



- 8mm tip
- Ablation of signal within lines
- 50W

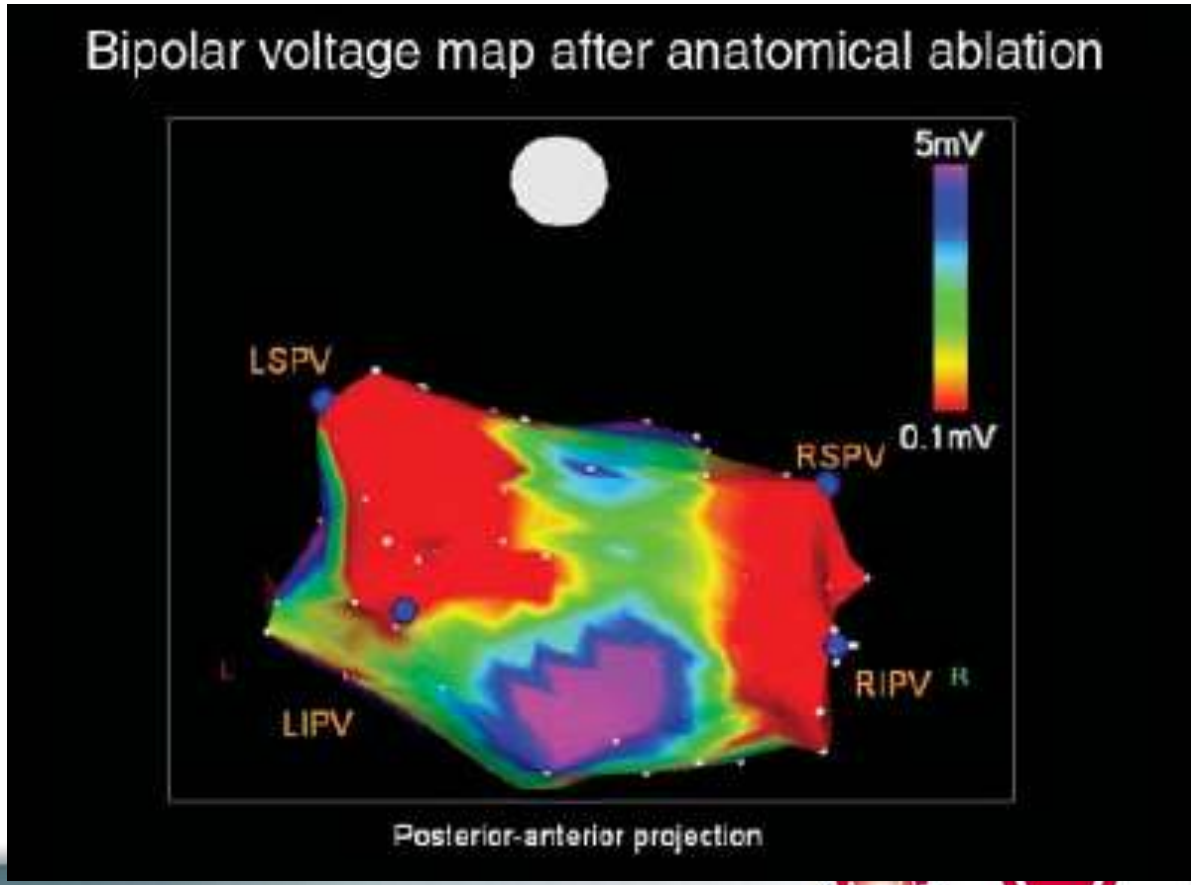




Oral et al Circulation 2003

PVI vs WACA

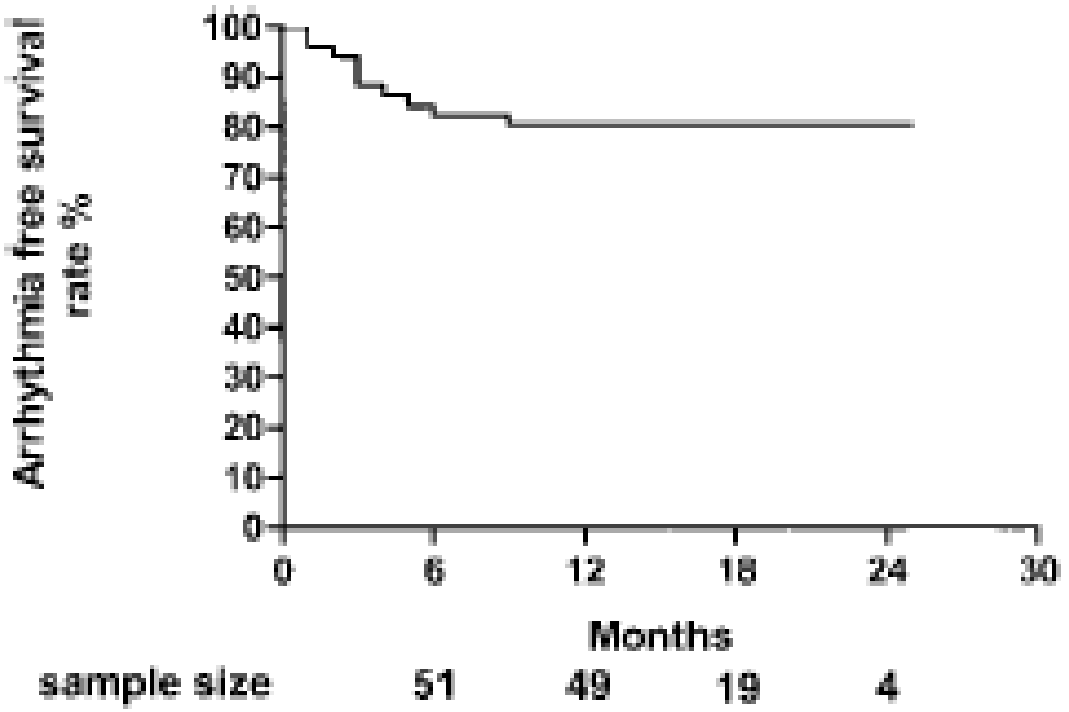
- N=20
- No ablation within lines
- Veins isolated individually
- 45% isolated



Hocini Eur H J 2005

Results are not always easy to interpret

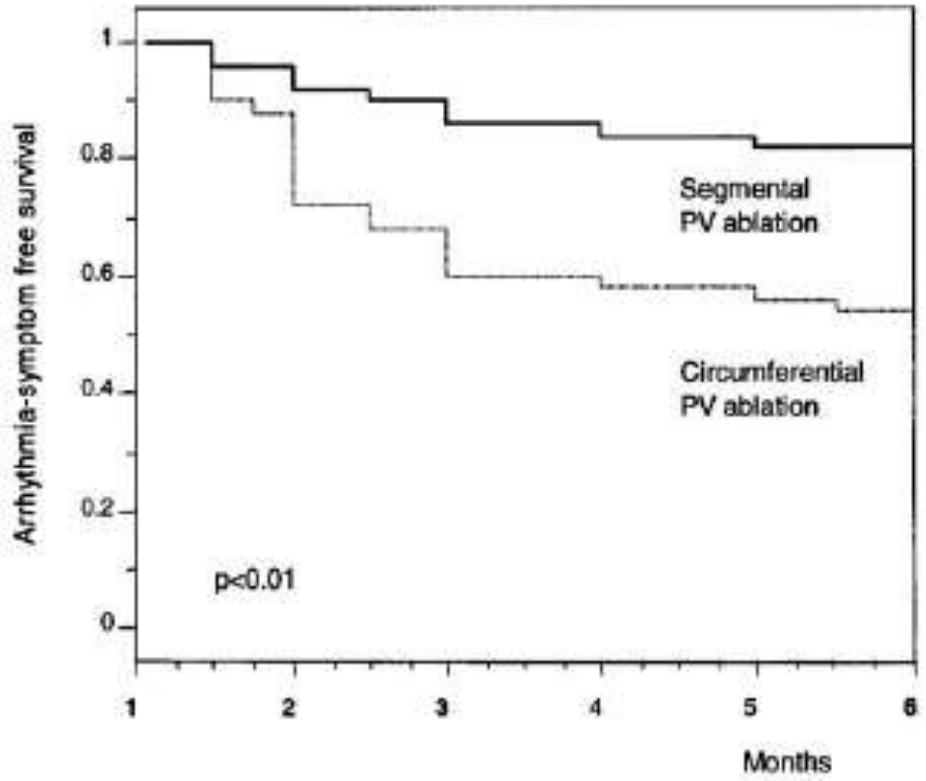
- WACA
- 65% on drug



Stabile et al Circ 2003

PVI vs WACA

- N=100

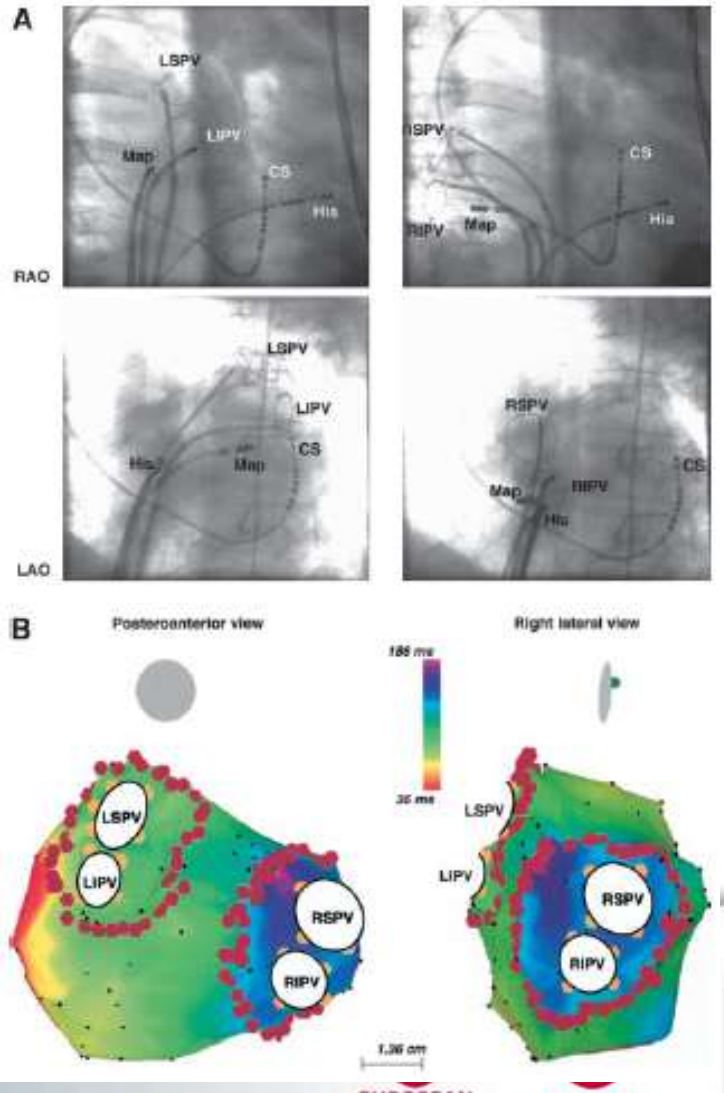


Patients at risk			
Segmental PV ablation	50	46	41
Circumferential PV ablation	50	43	27

Kirch et al Circ 2005

Wide encirclement with electrical isola

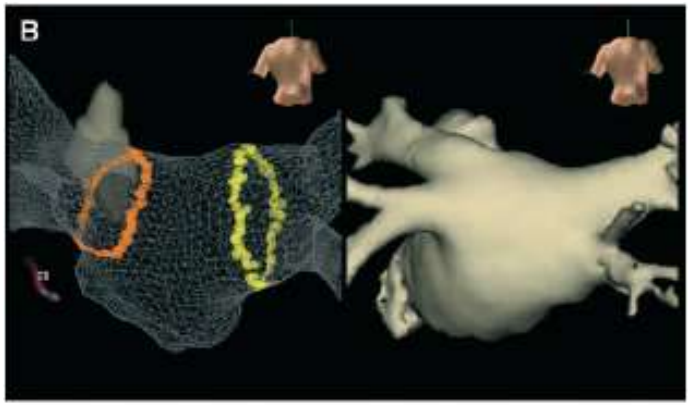
- Double lasso technique
- N=41
- Recurrence 25%
- PV reconnection in all undergoing repeat procedure

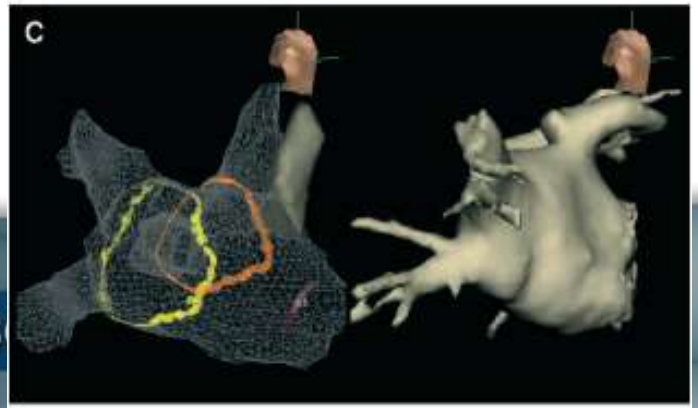


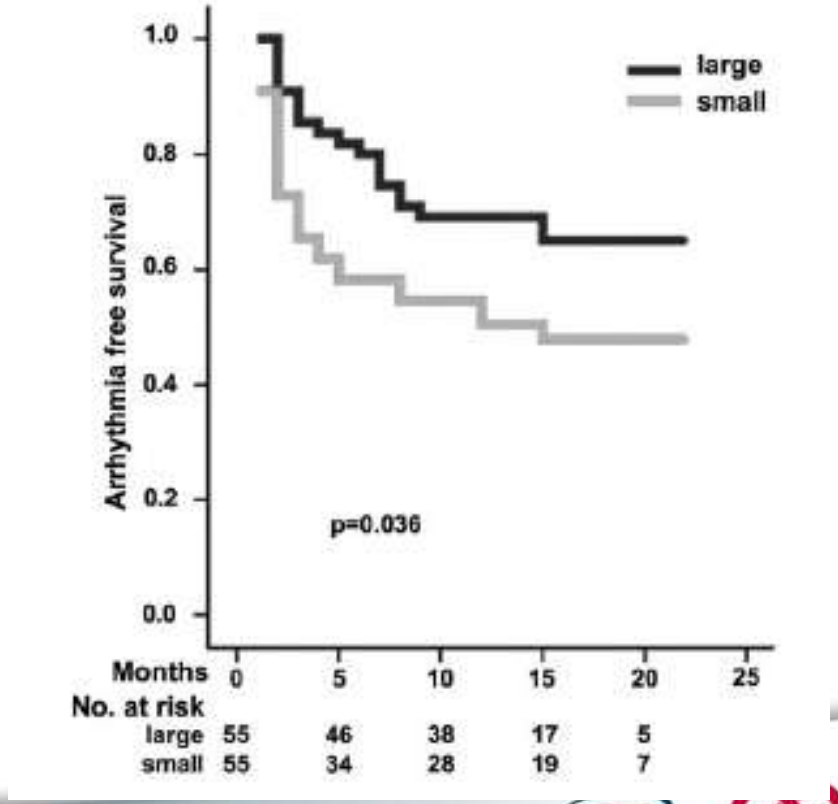
Ouyang et al. Circ 2004

Segmental vs Wide encirclement - with electrical isolation

- Single PV cath – irrigated, same powers for both
- PAF and persistent

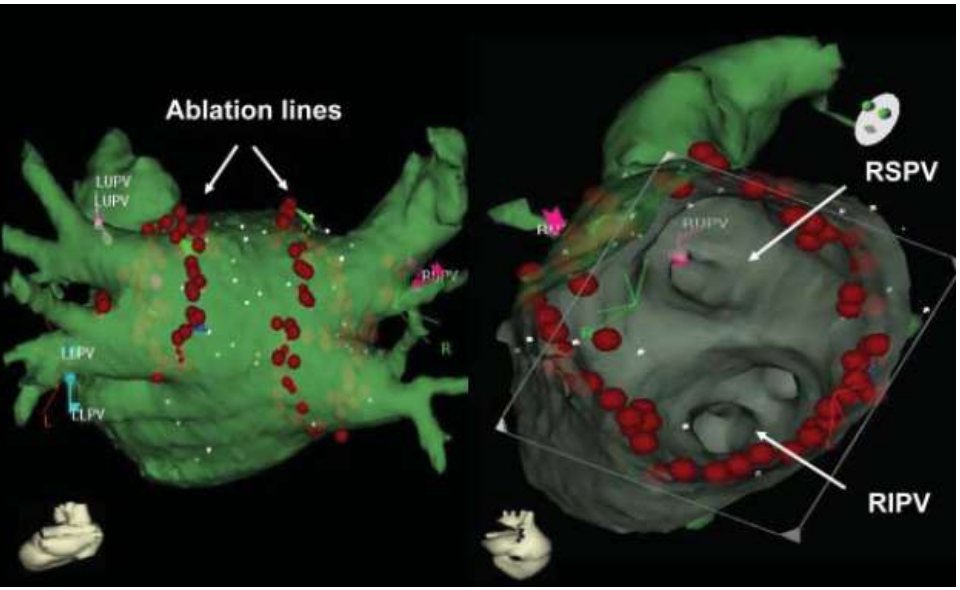


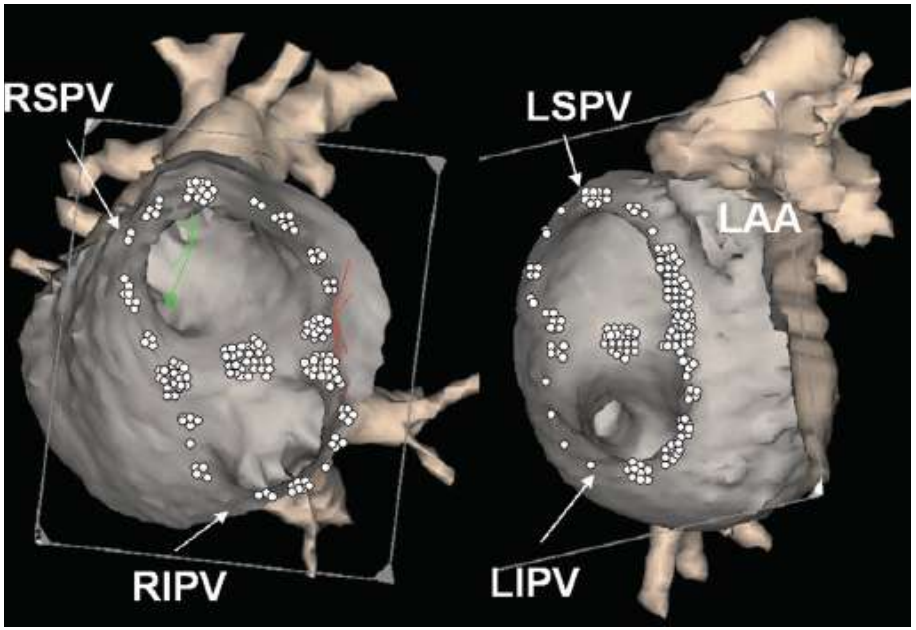




Arentz Circ 2007

Sites resistant to isolation





- Resistance 2°
  - epicardial fibres?
  - thickened myocardium?

Kistler et al JCE 2006

Complications

- In theory:
  - Segmental isolation associated with:
    - PV stenosis
  - Wide encirclement
    - Oesophageal fistula

Complications

	Segmental PVI	Wide encirclement
PV stenosis	1.5% (non clinical)	1.5% non-clinical
Tamponade	1.5%	1.5%
Oesophageal Fistula	?	0.05-0.4%
Stroke	0.1	0.1
Death	Unrelated to technique	

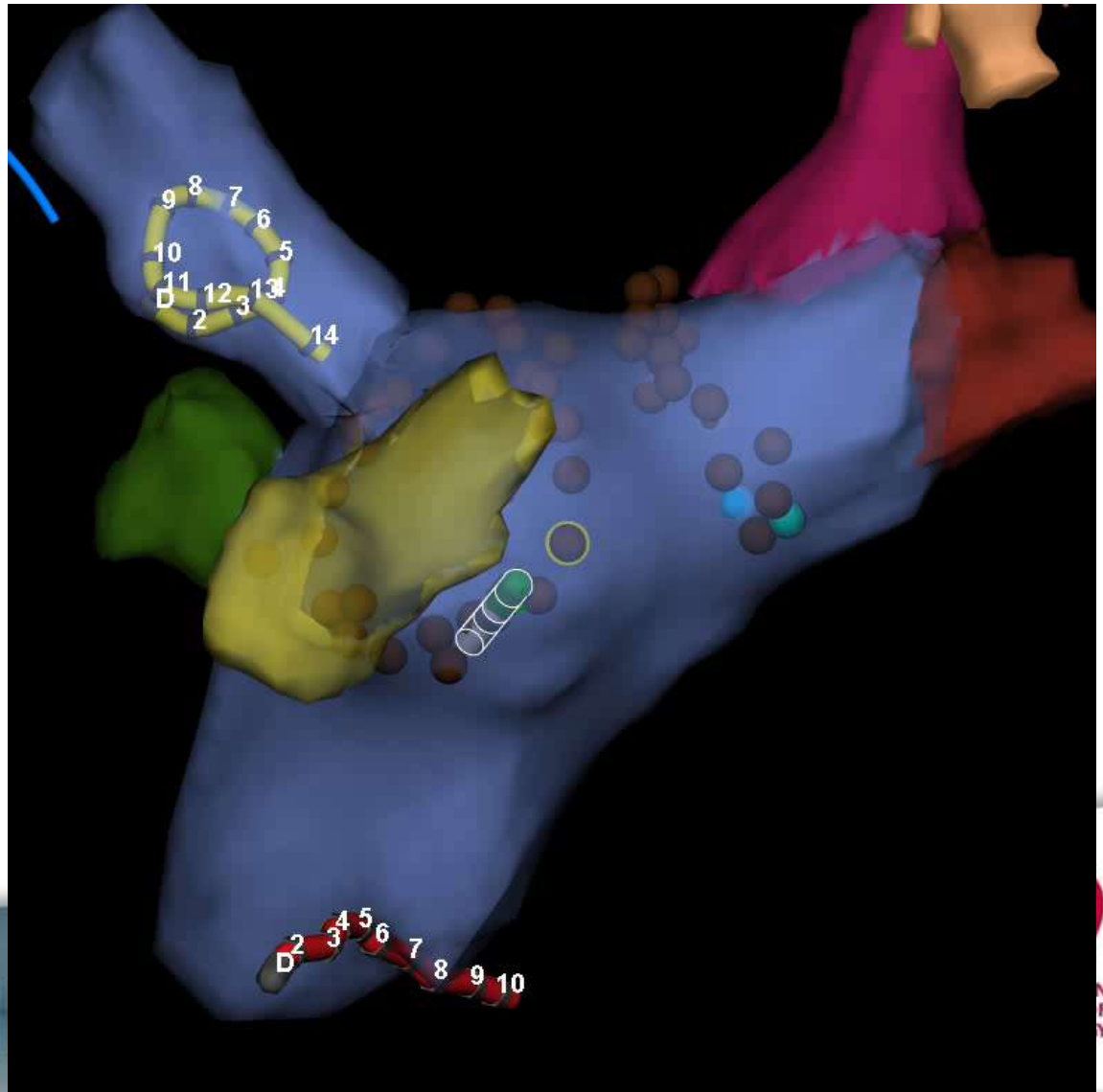
Pappone et al Circ 2004 Cappato JACC 2009

How do we interpret these data?

- There is little proof that PVI or WACA are superior
- Recurrence with isolation is rare therefore:
  - Isolation seems to be important for success in many
  - Safer ablation is probably away from the vein

How do we do it in practice?

- On warfarin (INR 2-3.5)
- Single PV catheter
- Wide encirclement



Procedural Endpoints

1. Electrical isolation of all veins
2. Termination of AF during Ablation.
3. Verification of Linear Ablation sets important to prevent recurrence and LA flutter.

Goal of AF Ablation

- Trigger elimination
- Substrate Modification
- Minimum number of RF applications

Endpoints – electrical isolation of all veins

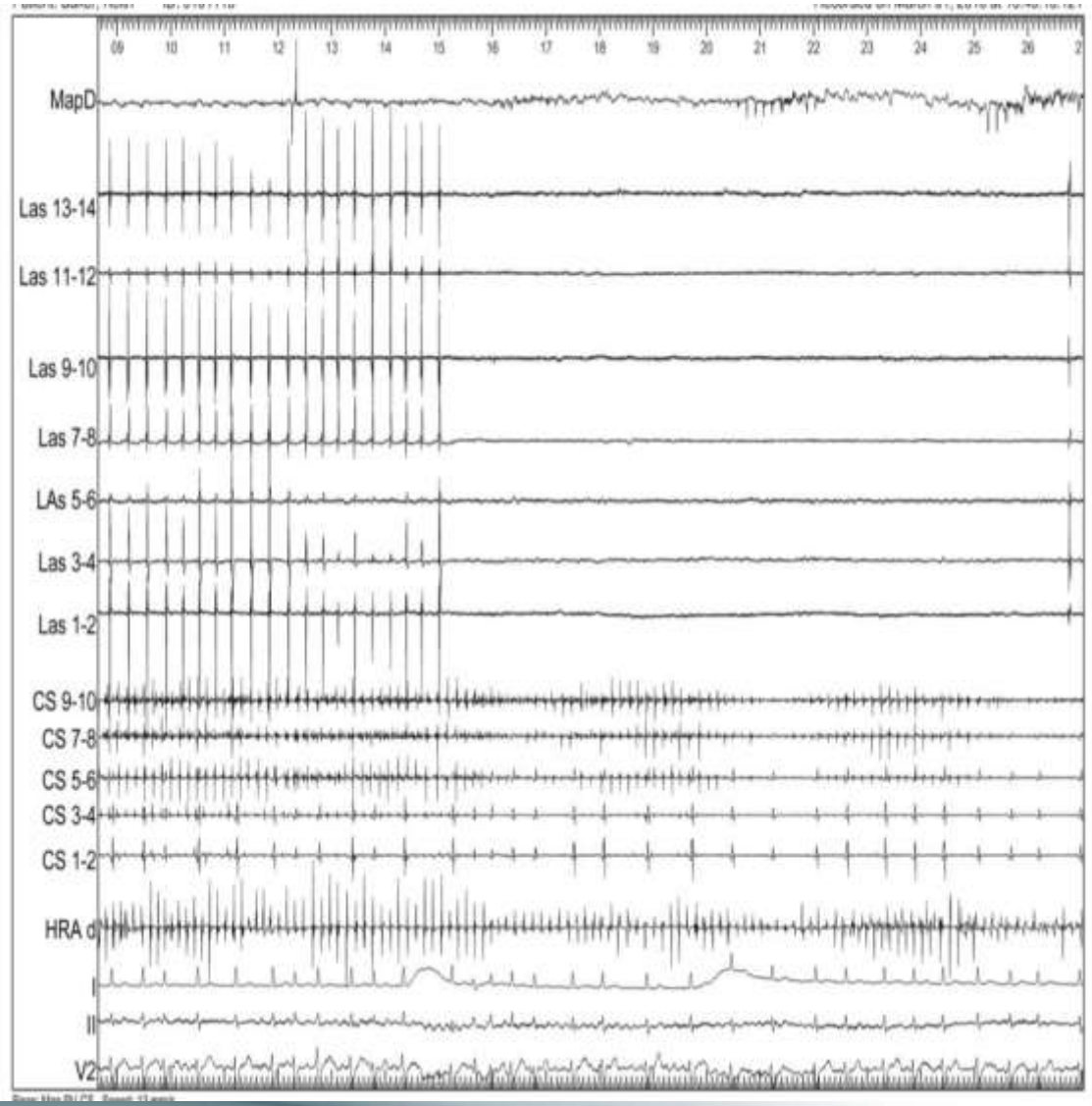
- Validated by PV catheter demonstrating:
  - Change in electrical signal – separation of local from far-field
  - Silent veins
  - Dissociated potential
  - PV pace capture without LA capture

Endpoint - isolation of all veins

- Change in electrical signal
  - Continuous monitoring helpful particularly in LUPV

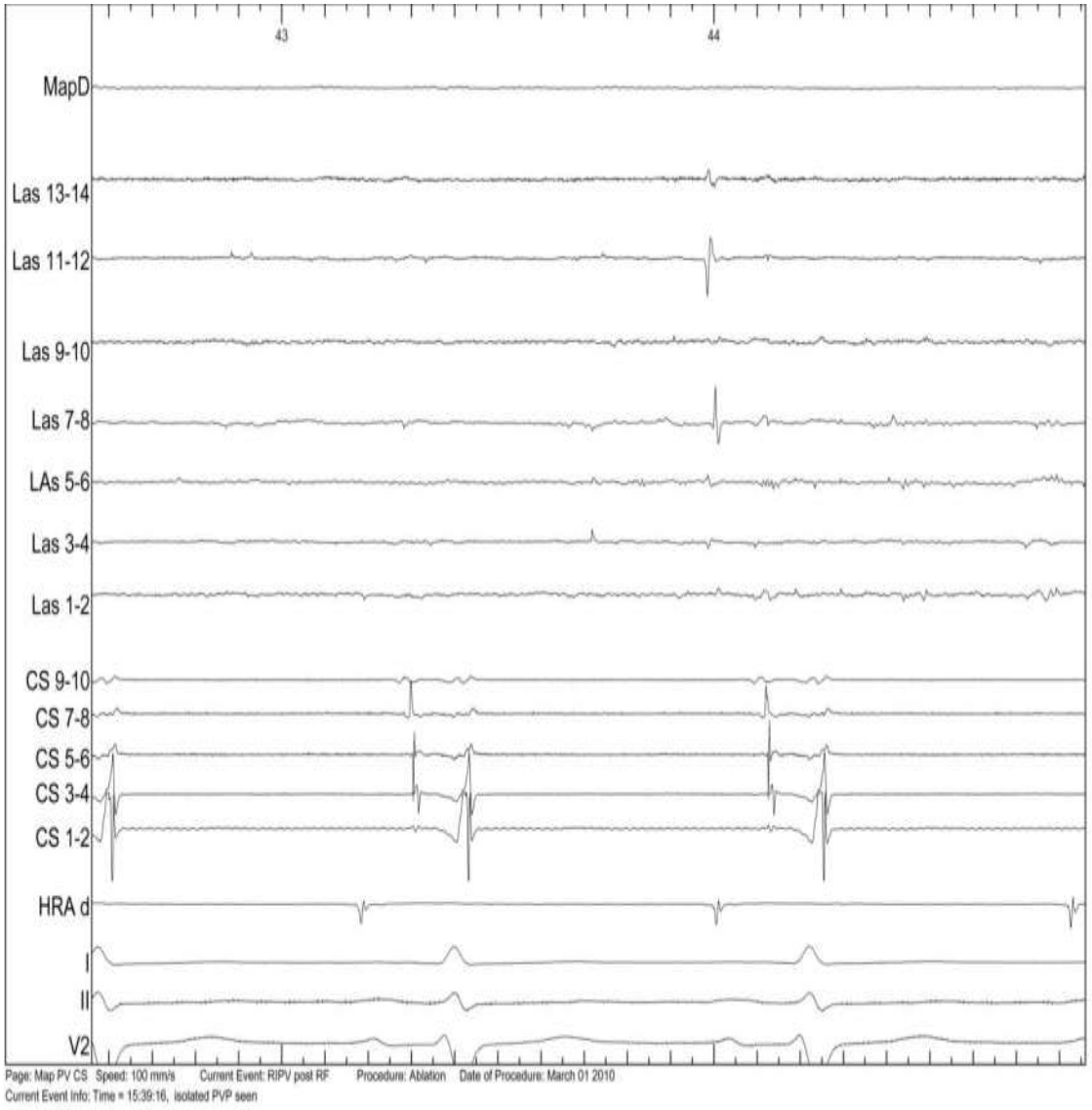
Endpoints – isolation of all veins

- Silent veins
  - Usually only RPV and sometimes LLPV



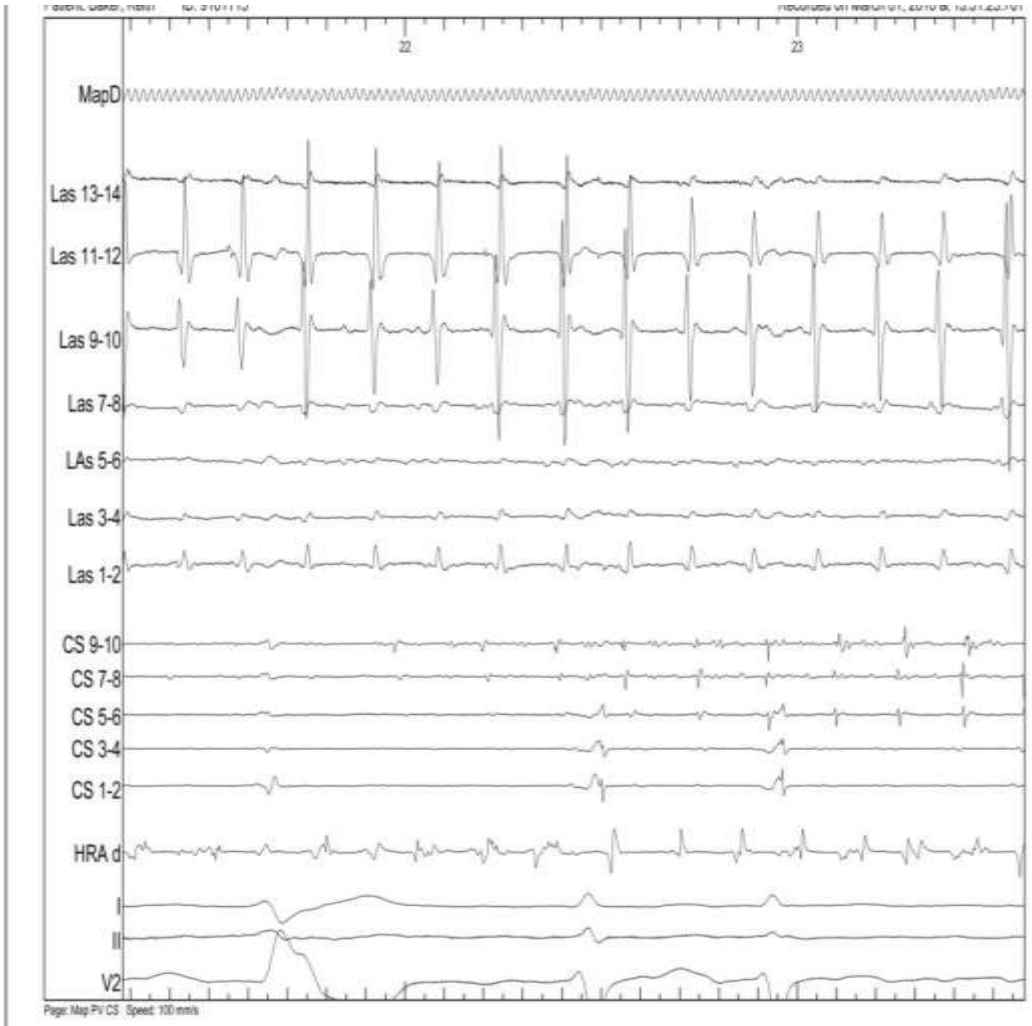
Electrical - isolation of all PVs

- Dissociated potentials
  - Usually decrease in frequency after PVI
  - Can be triggered by cath manipulation



Endpoint - isolation of all veins

- Ive isolated the LLPV but didn't have my lasso in the LUPV– what do I do?
- LUPV signals after llpv isolation

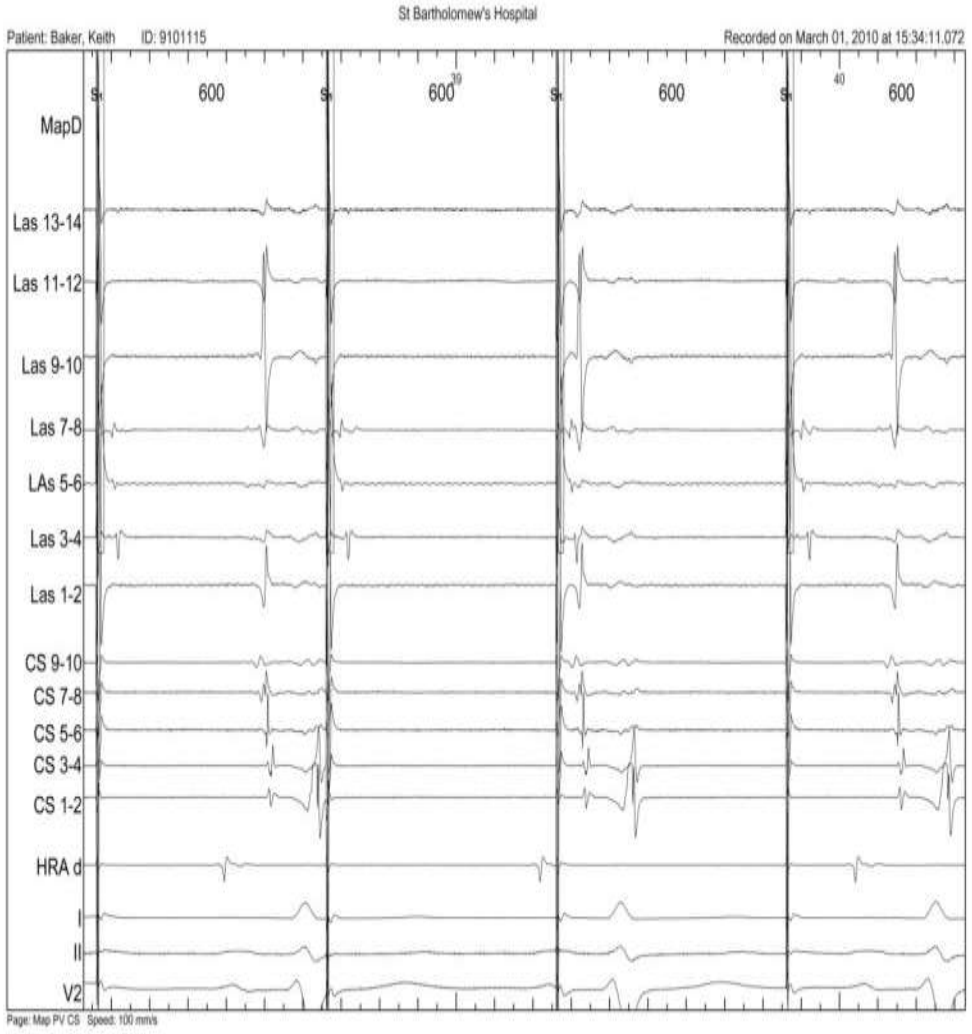


Endpoints – isolation of all veins

- Pacing from map cath in llpv with PV cath in LUPV

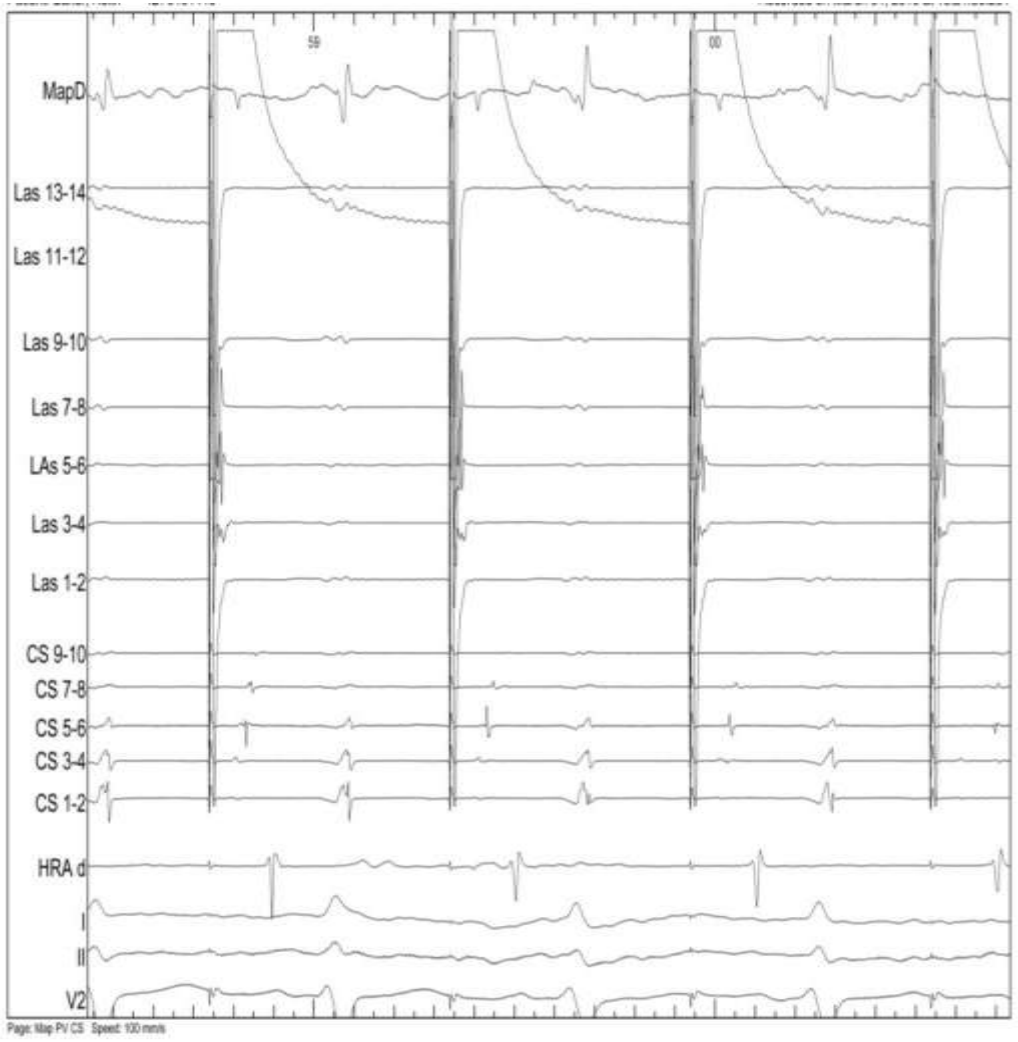
Endpoints – isolation of all veins

- Pacing from PV cath capturing local PV potential



Endpoints validation of lines

- Mitral isthmus line
  - Pacing from Lasso in LAA



Principal Procedural Endpoints

1. Termination of AF during Ablation –
   - Controversial probably similar recurrence because of PV reconnection but does indicate good ultimate prognosis
2. Verification of Ablation sets important to prevent recurrence and LA flutter.
3. Non-inducibility of AF following Ablation
   - Little evidence
4. Waiting/adenosine/isoprenaline
   - Some evidence

Conclusions

- Wide encirclement is theoretically better
- Validation of PV isolation is critical
- Balancing success (power/temp) with safety is where the skill comes in

Question 1

- Catheters are in the standard positions what is the most likely diagnosis?

a) Typical AVNRT
b) AVRT with left sided pathway
c) AVRT with posteroseptal pathway
d) Pre-excited AVRT
e) AVRT with right sided accessory pathway

Question 2

- Catheters are in the standard positions the following is shown:

a) Orthodromic AVRT

b) Typical AVNRT

c) Atypical AVNRT

d) Antedromic AVRT with septal pathway

e) Antedromic AVRT with lateral pathway

Question 3

- The following is standard for ablation of AVRT:

a) Power 30W, Temp 60^0, Time 60s

b) Cooled RF – Power 30W, Temp 45^0, Time 60s

c) Power 60W, Temp 60^0, Time 60s

d) Cryo for 2 minutes

e) Cryo for 4 minutes

Question 4

- The following are useful techniques for distinguishing AVNRT from AVRT :

a) His synchronous Ventricular premature beats advance A
b) A PPI-TCL of <115msecs
c) A preexcitation index of >85msec
d) All of the above
e) None of the above

Question 5

- Pathways with mahaim characteristics always:

a) Connect nodofascicular
b) Connected to the V at the AV annulus
c) Decrement
d) Block conduction with pressure
e) Result in orthodromic tachycardia