

# Kardiologie heute

Symposium im Unfallkrankenhaus Berlin  
am 07. Dezember 2012



## Bildgebung in der invasiven Elektrophysiologie

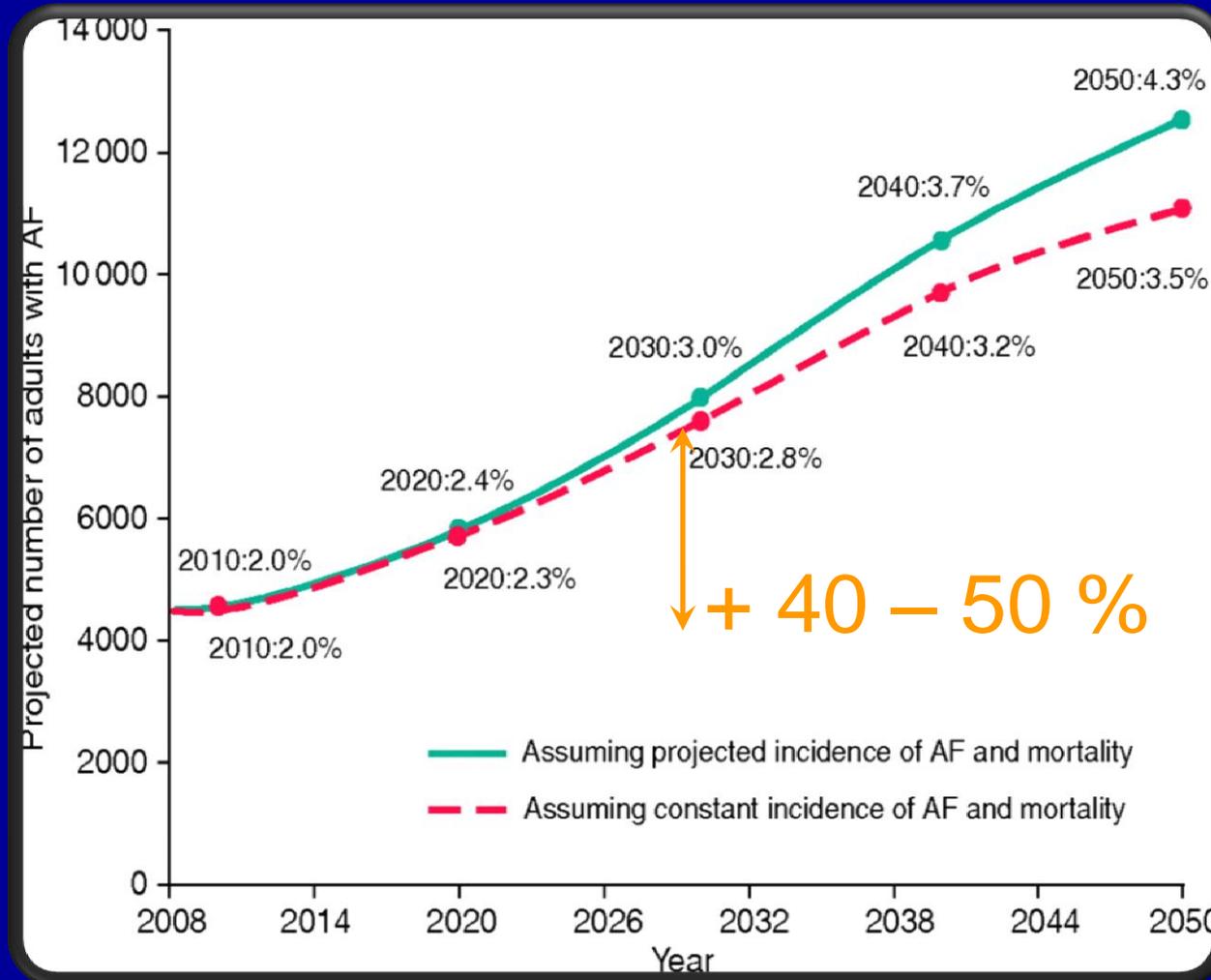


Philipp Sommer, Herzzentrum  
Universität Leipzig  
Abtlg. für Elektrophysiologie

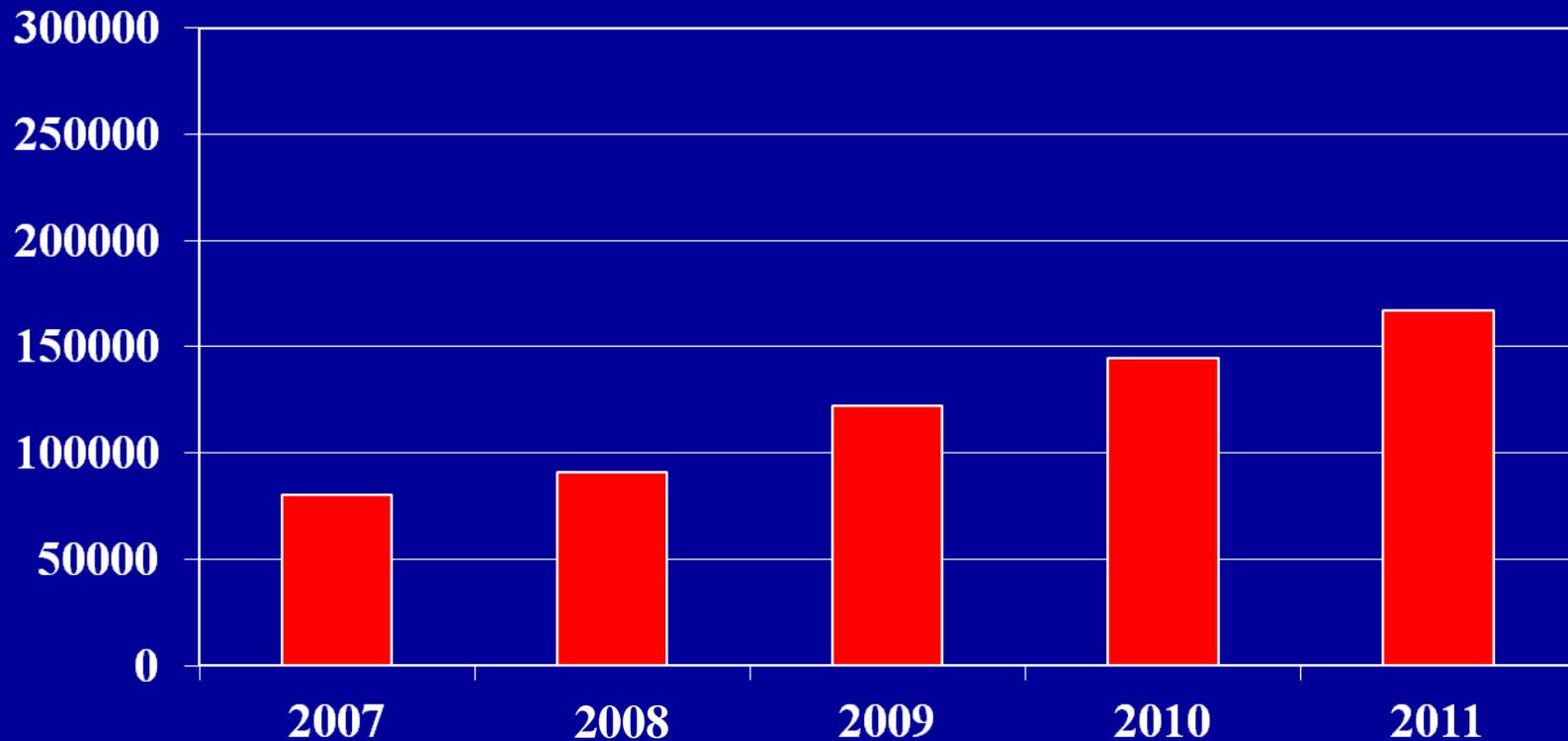
## Agenda:

- 1.) Einleitung
- 2.) Rolle der CT
- 3.) Rolle der MRT in Planung und Durchführung von Ablationen
- 4.) Reduktion der Fluoroskopiezeiten

# Epidemiologie von Vorhofflimmern



## Katheterablationen in Europa 2007 - 2011



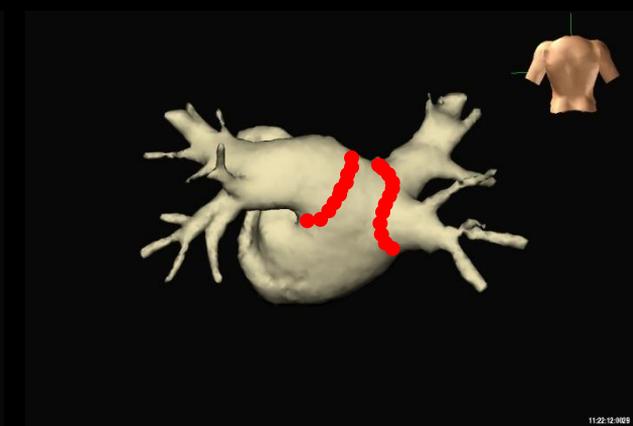
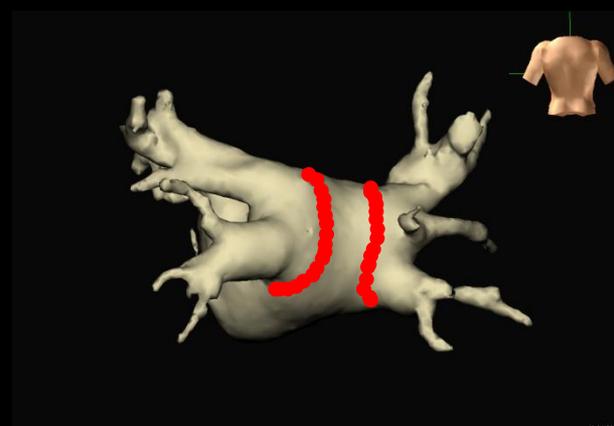
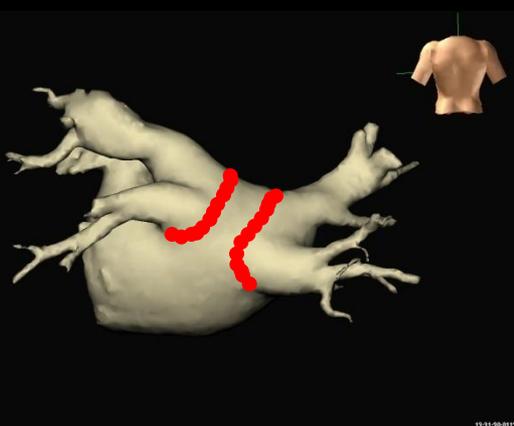
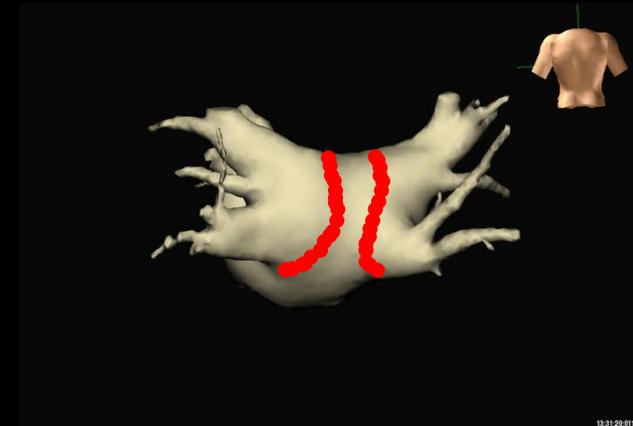
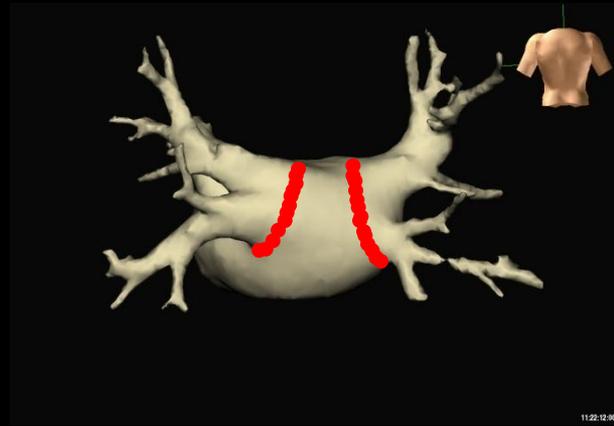
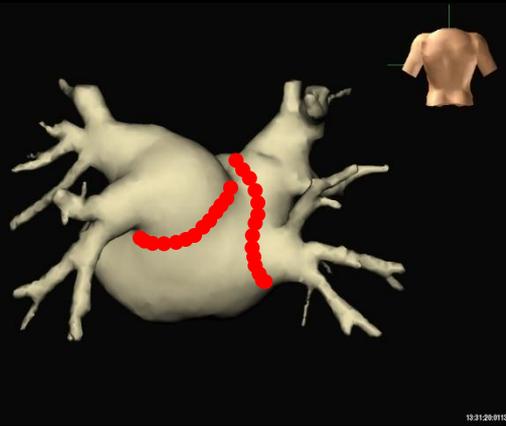




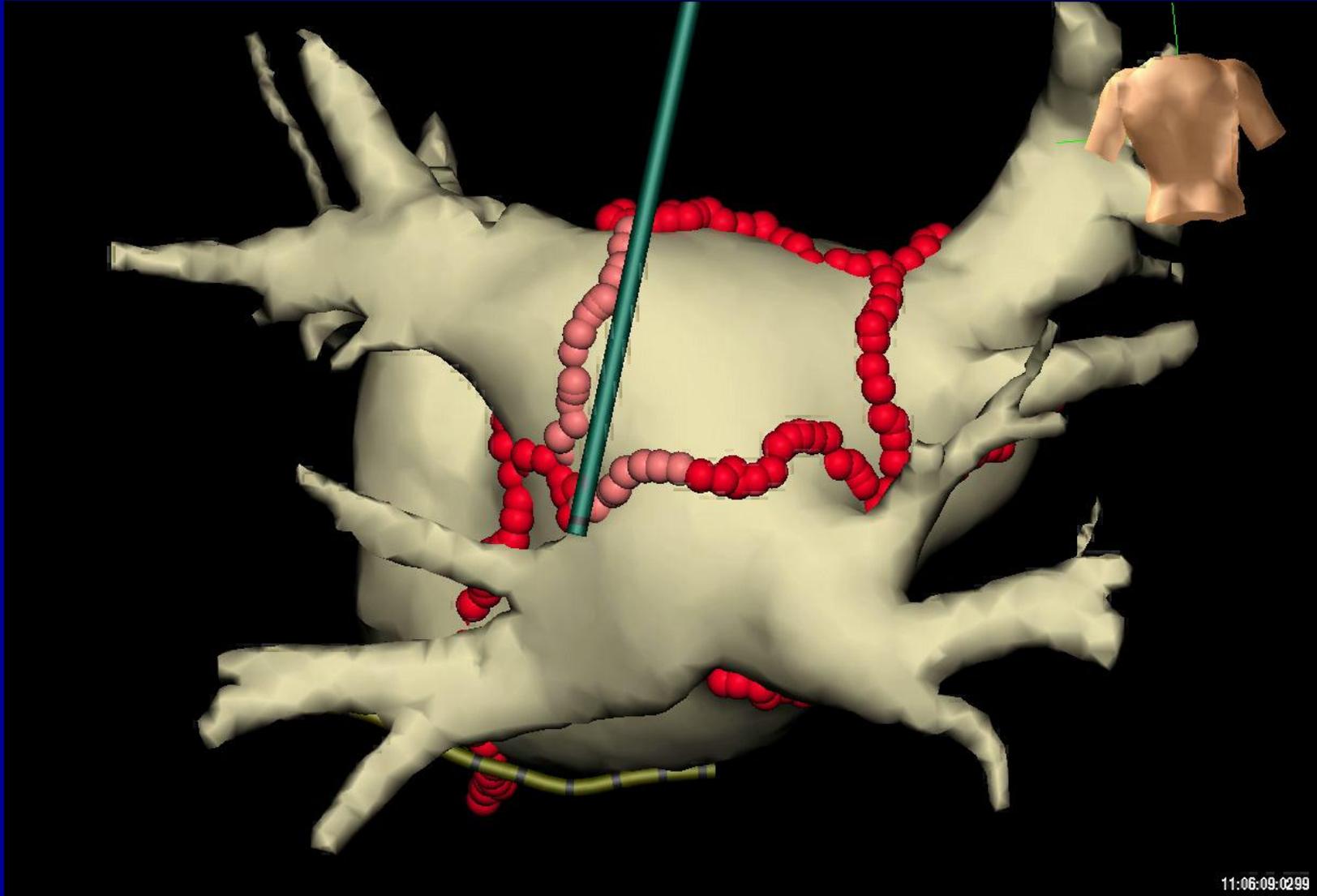
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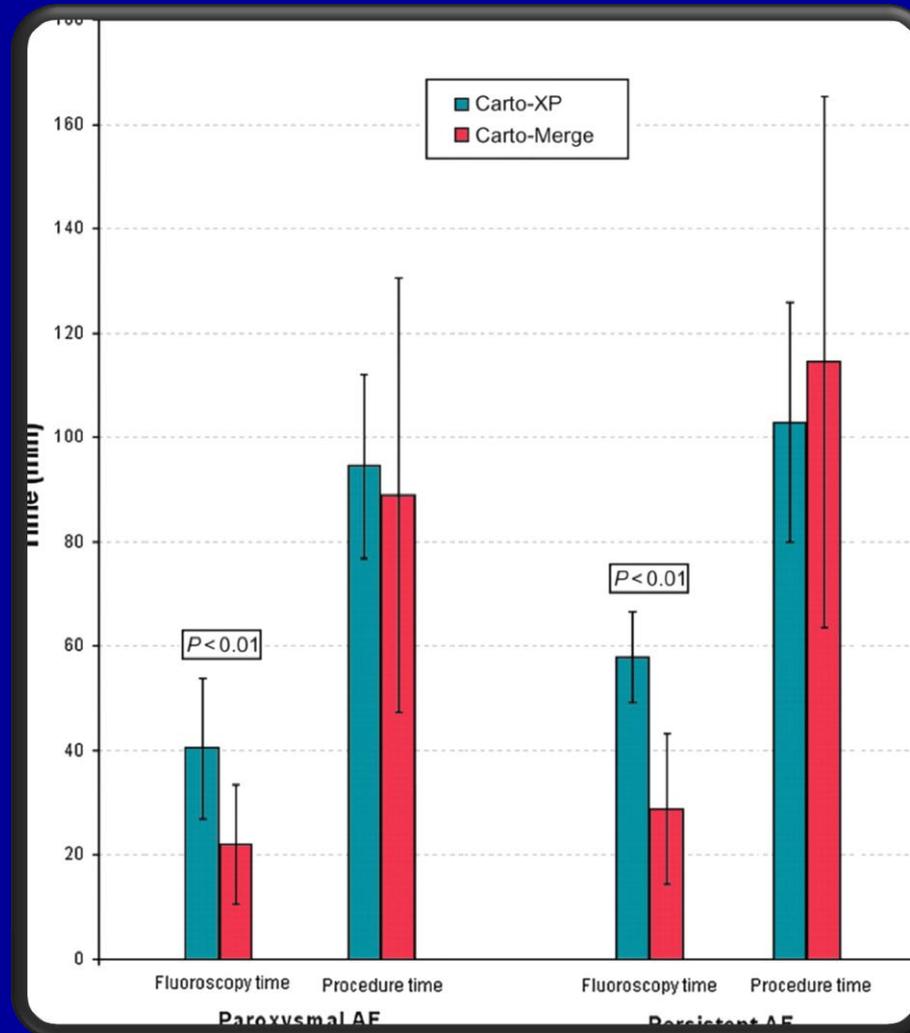
# Individuelle Anatomie der PV und des LA



## Electroanatomical mapping vs. CT integration



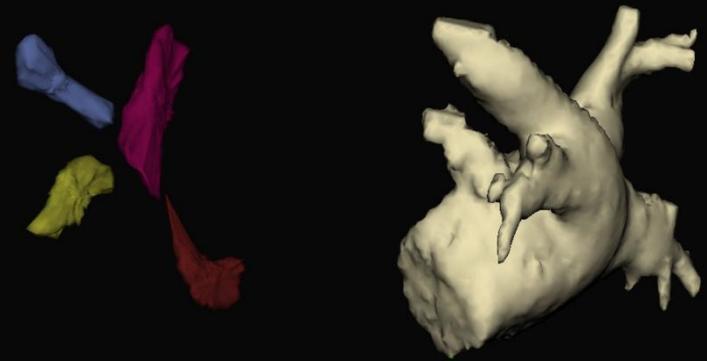
## Fluoroskopie- und Prozedurzeiten bei PAF (li.) und CAF (re.)



## Registrierung der PV Geometrien mit CT Modell



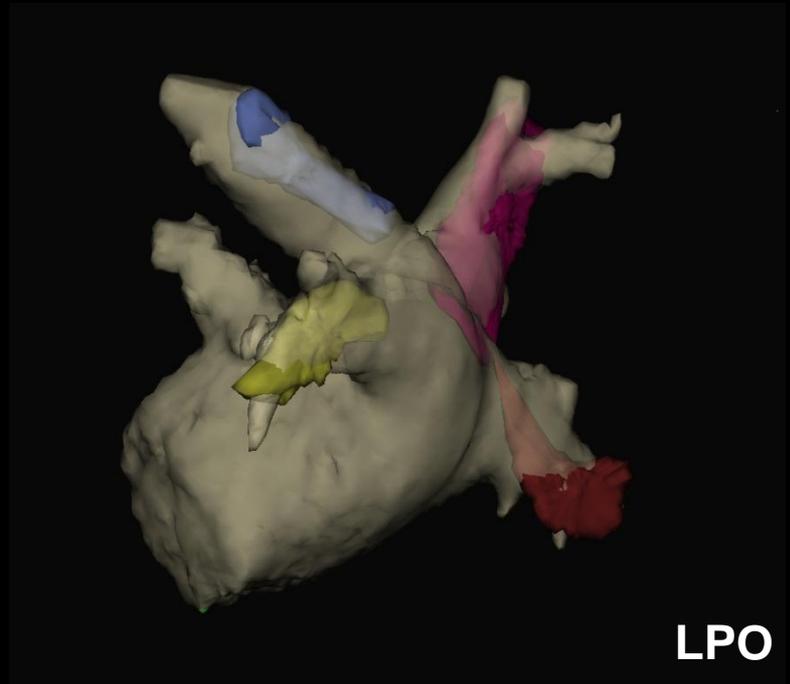
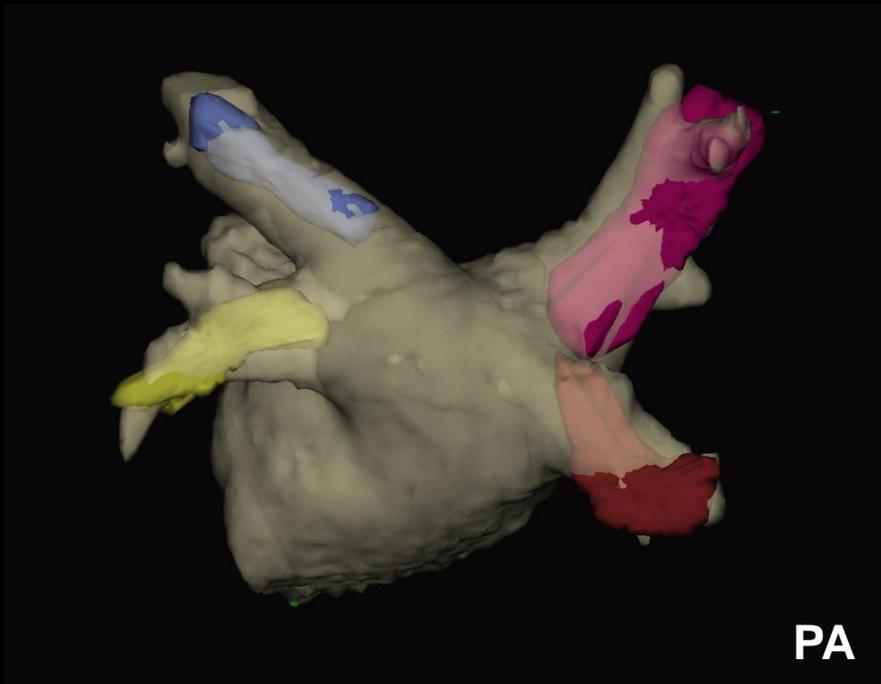
PA

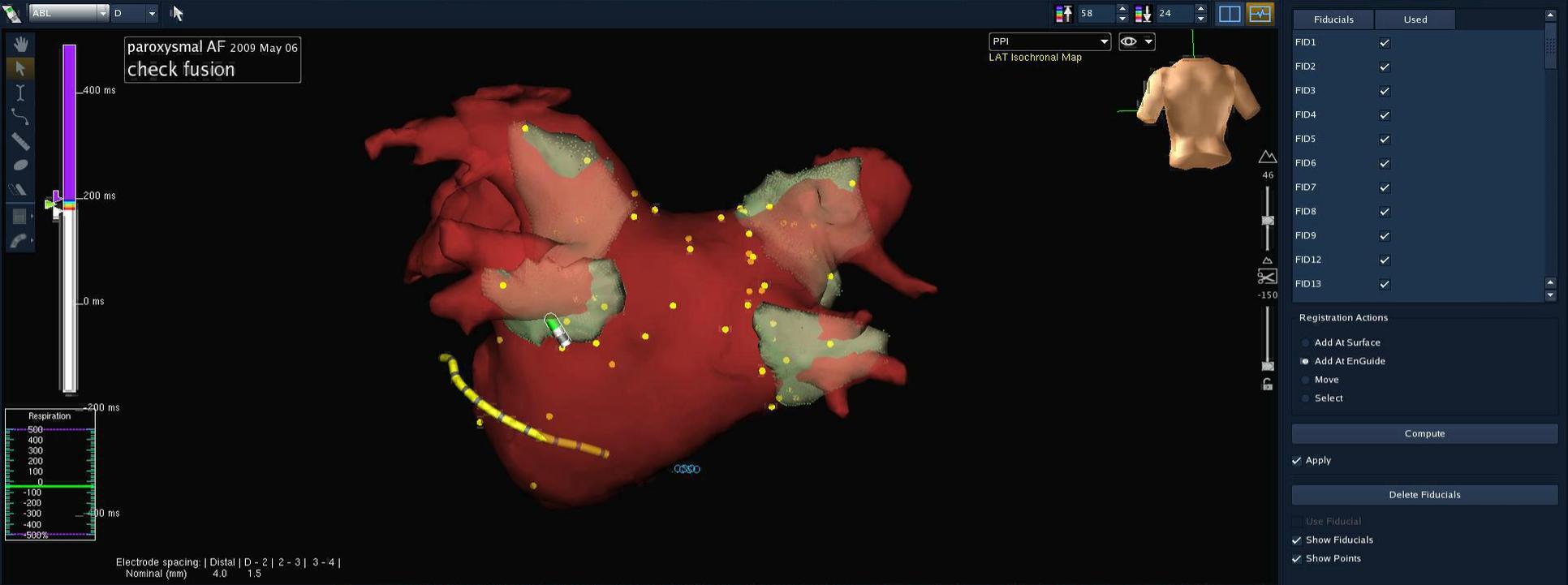


LPO



RPO





| Fiducials | Used                                |
|-----------|-------------------------------------|
| FID1      | <input checked="" type="checkbox"/> |
| FID2      | <input checked="" type="checkbox"/> |
| FID3      | <input checked="" type="checkbox"/> |
| FID4      | <input checked="" type="checkbox"/> |
| FID5      | <input checked="" type="checkbox"/> |
| FID6      | <input checked="" type="checkbox"/> |
| FID7      | <input checked="" type="checkbox"/> |
| FID8      | <input checked="" type="checkbox"/> |
| FID9      | <input checked="" type="checkbox"/> |
| FID12     | <input checked="" type="checkbox"/> |
| FID13     | <input checked="" type="checkbox"/> |

- Registration Actions
- Add At Surface
  - Add At EnGuide
  - Move
  - Select

Compute

Apply

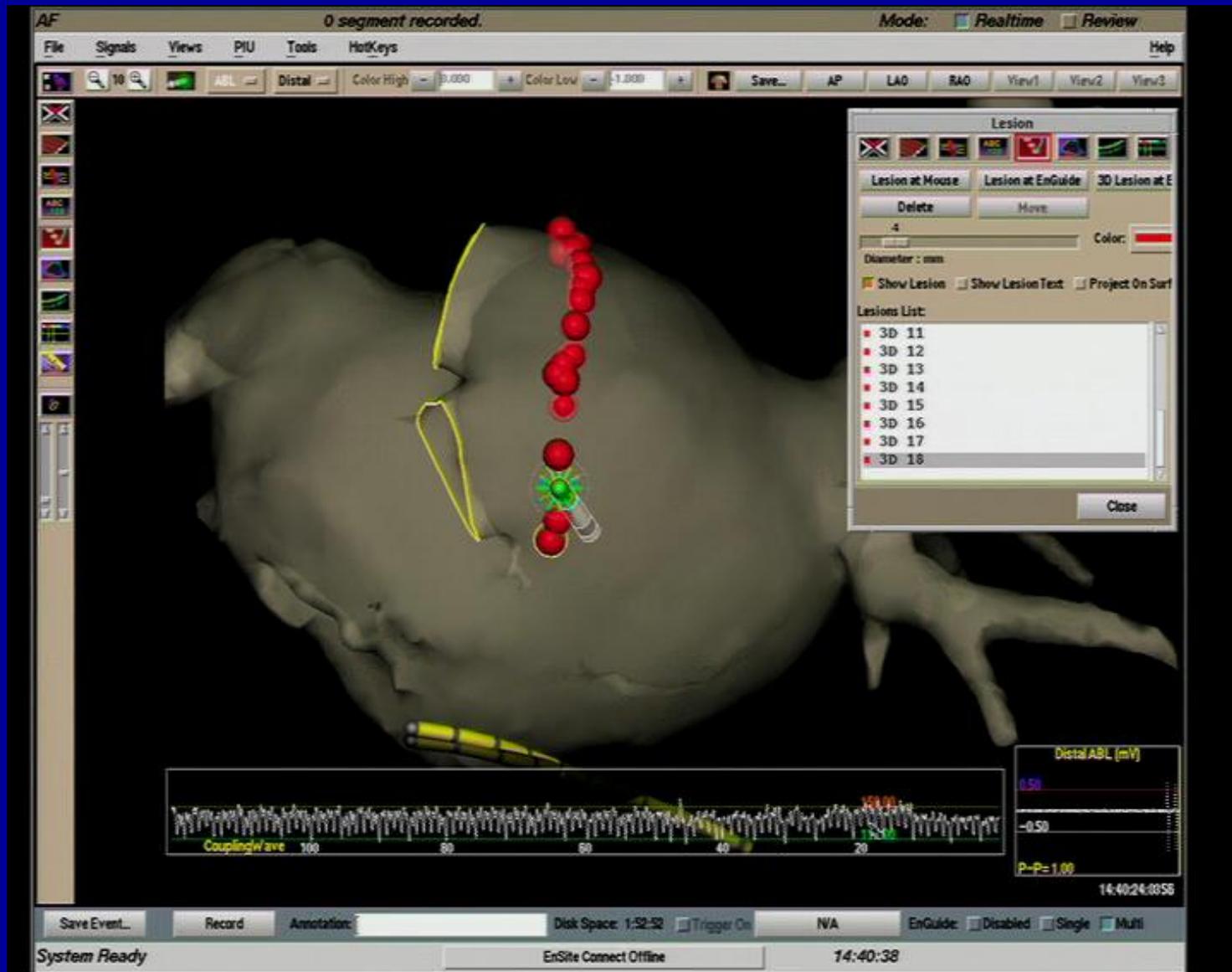
Delete Fiducials

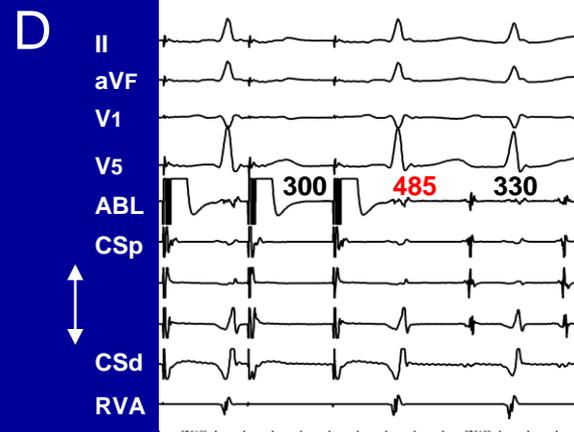
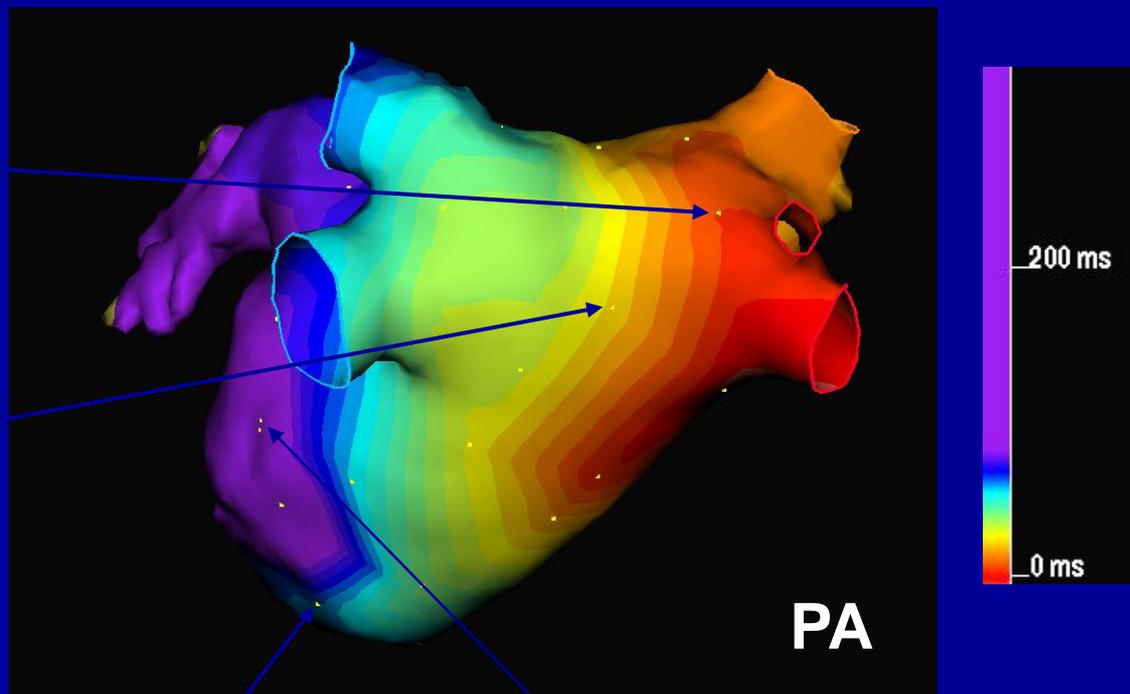
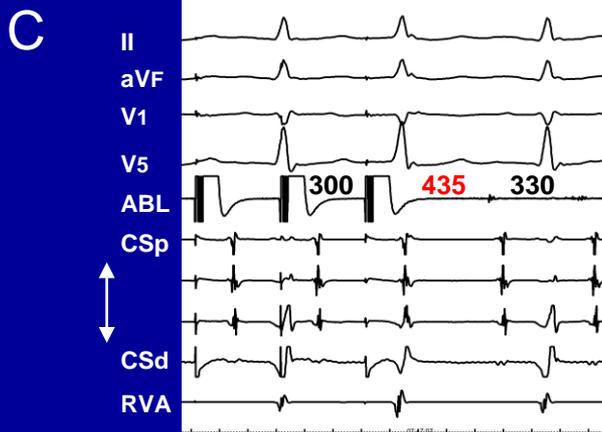
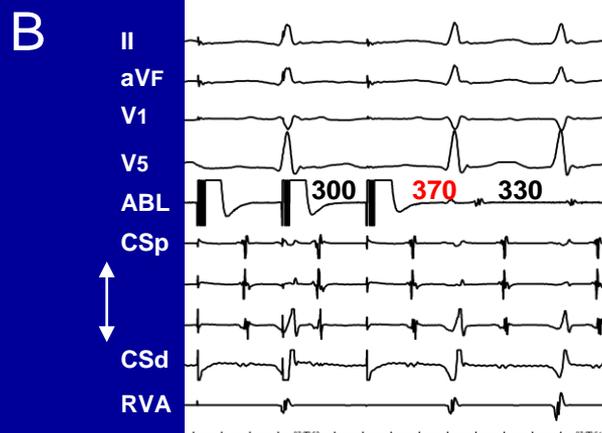
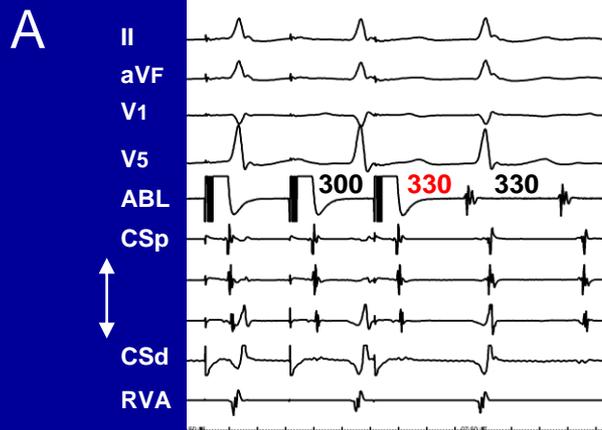
- Use Fiducial
- Show Fiducials
- Show Points



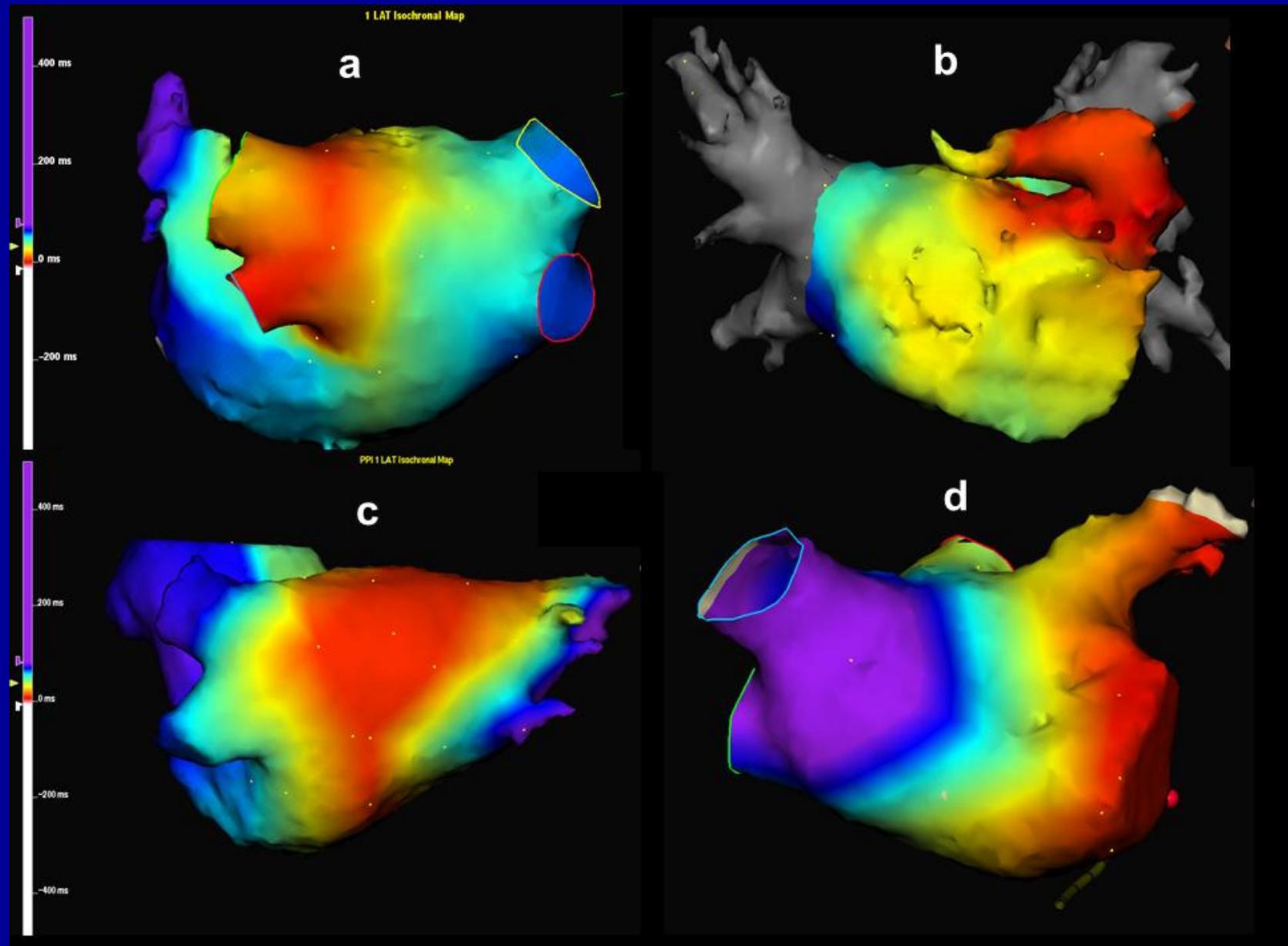
Segment check fusion

## Ablation im registrierten CT/ MRT Modell

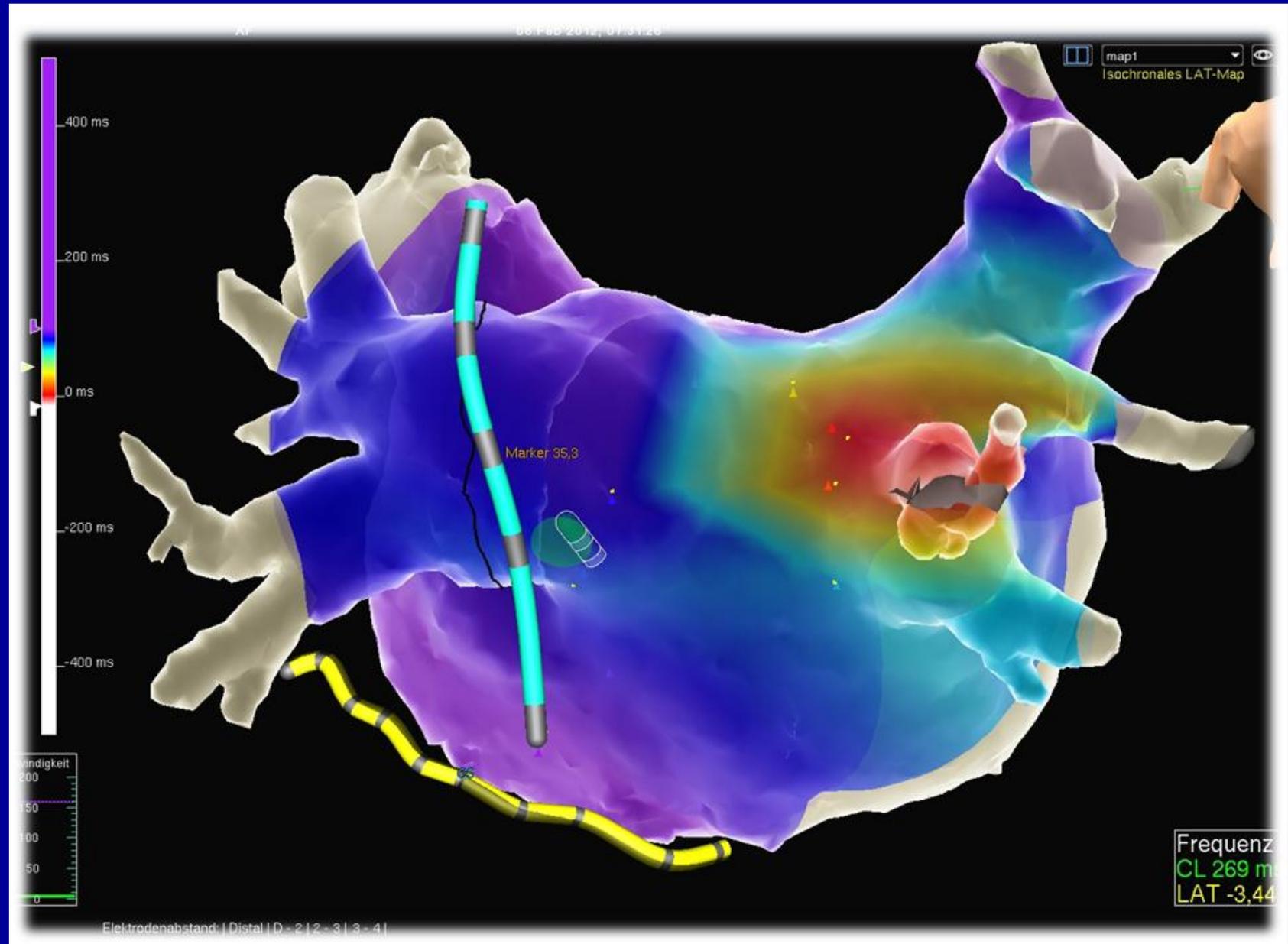




# Stellenwert bildgebender Verfahren in der invasiven EP



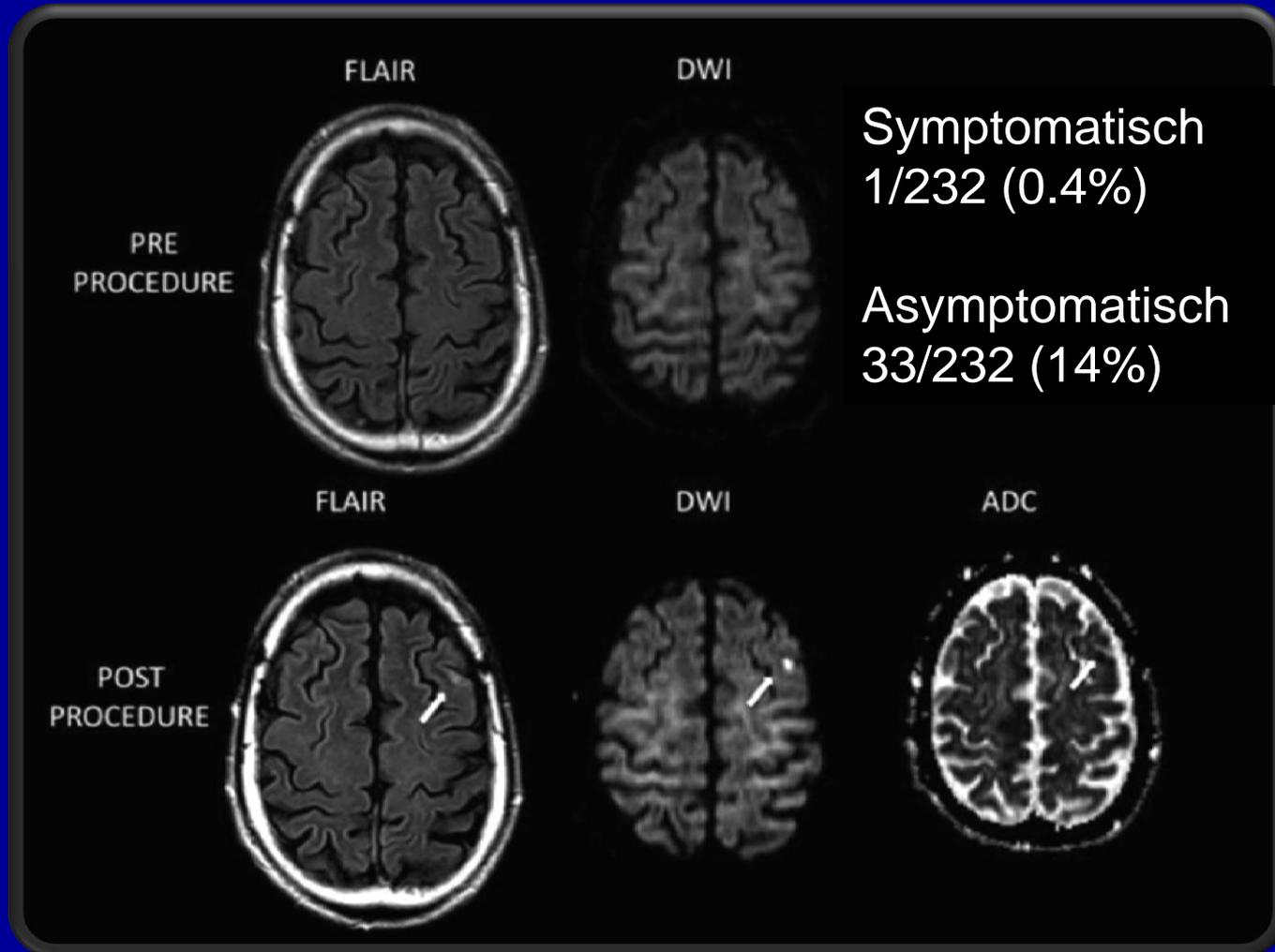
# Stellenwert bildgebender Verfahren in der invasiven EP



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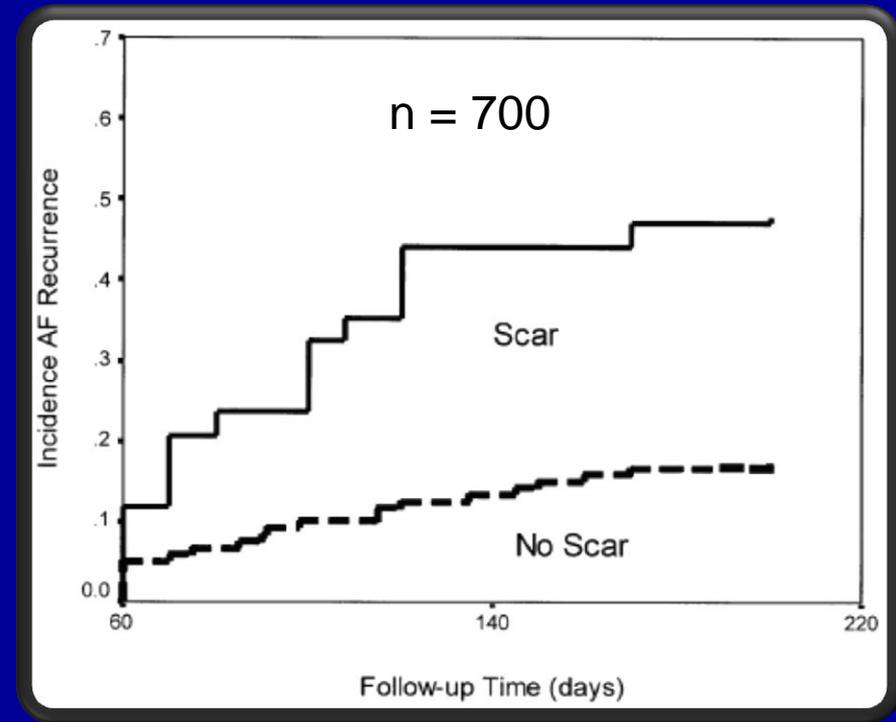
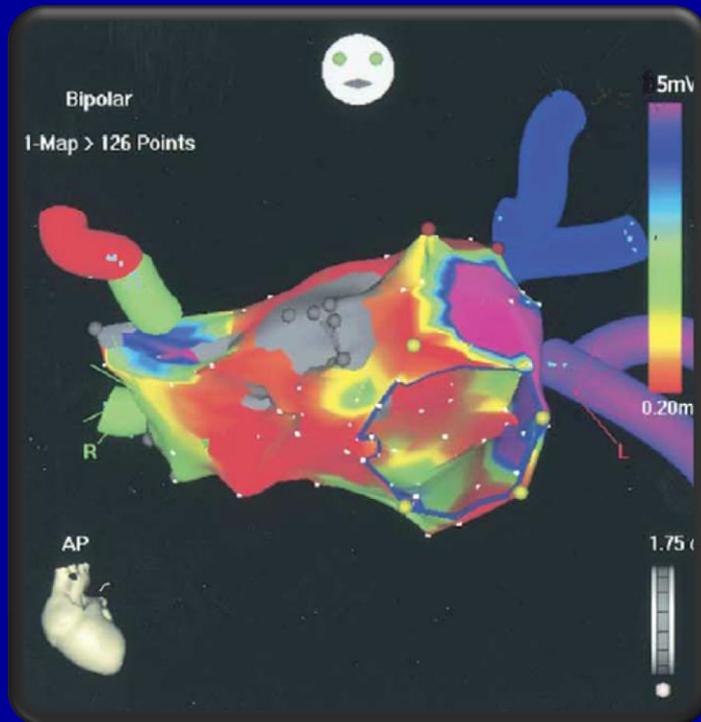
## Detektion asymptomatischer Thrombembolien



## MRT zur Narbenidentifikation

- Begrenzte Aussagekraft der klinischen Klassifikation des Vorhofflimmerns in paroxysmal/ persistierend.
- Bedeutung linearer Läsionen/ CFAE Ablationen unklar
- PV-abhängiges vs. substratabhängiges Vorhofflimmern
- Limitierter prädiktiver Wert anderer Parameter wie LA Größe, Anamnesedauer, Alter des Patienten)

## Visualisierung und Bedeutung von Narben im LA



### Voltage definitions:

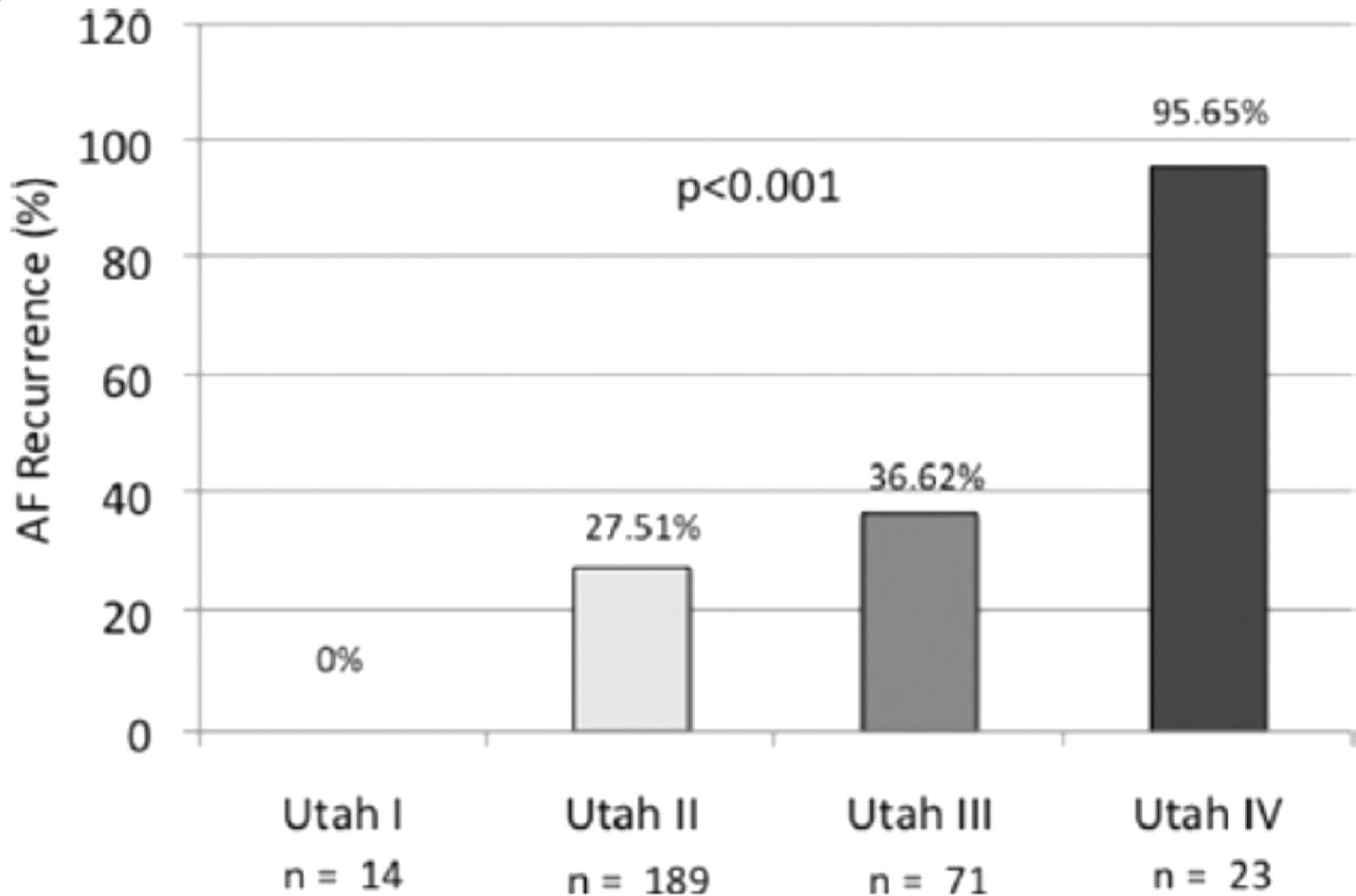
scar < 0.05 mV

diseased myocardium < 0.5 mV

healthy myocardium > 0.5 mV

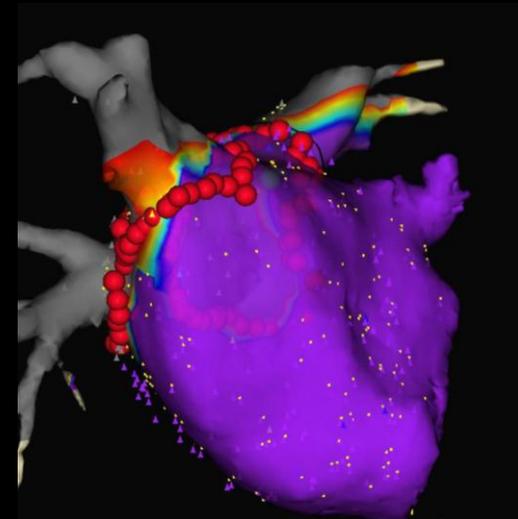
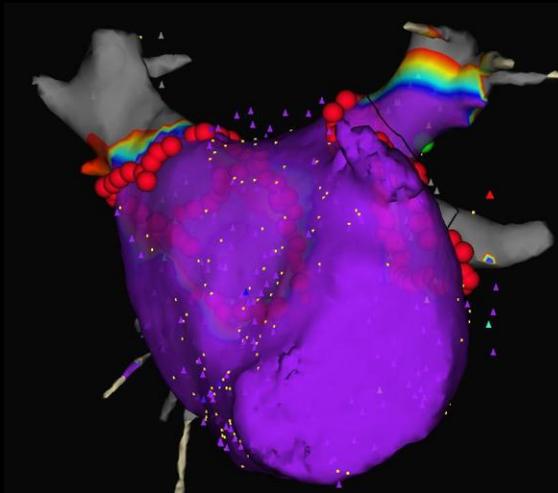
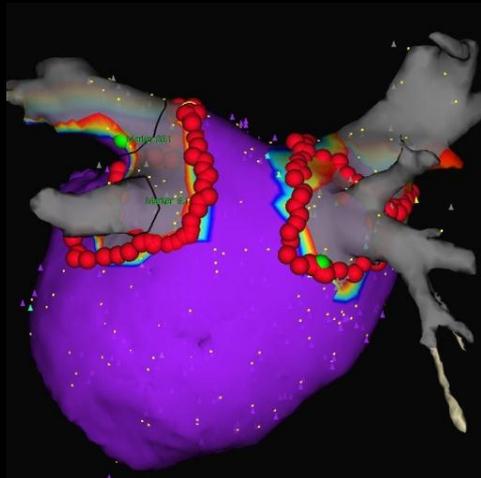
# Stellenwert bildgebender Verfahren in der invasiven EP

## Visualisierung des Erfolgs bei AF-Patienten



## Individualisiertes Läsionskonzept entsprechend Fibrose

### Voltage Map nach zirkumferentieller PV Isolation



Mapping Punkte: 120

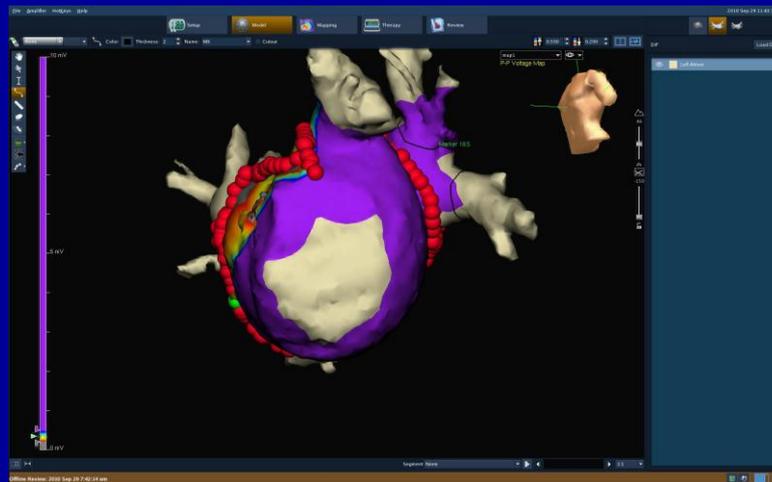
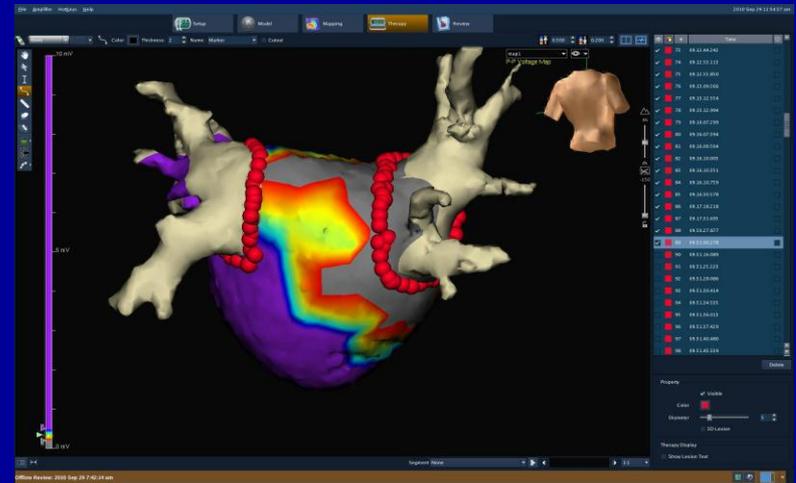
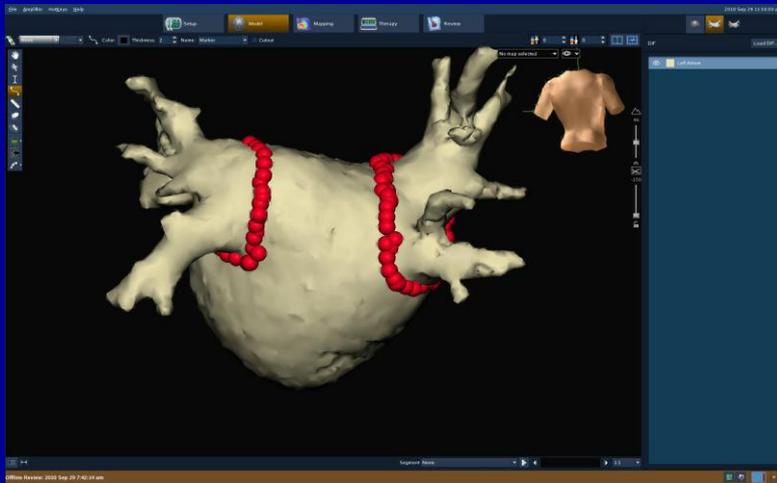
Low Voltage : 0.2 - 0.5 mV

Max. Voltage: 4.3 mV

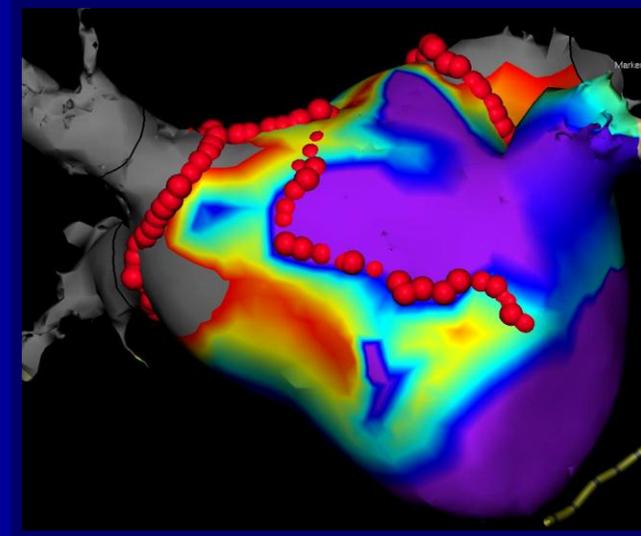
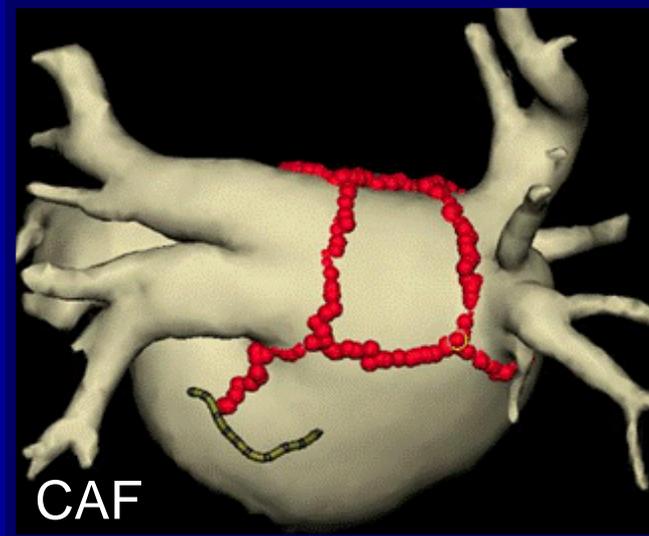
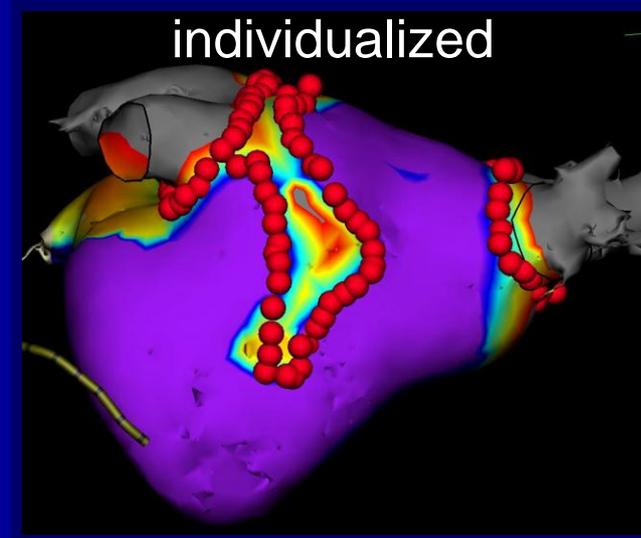
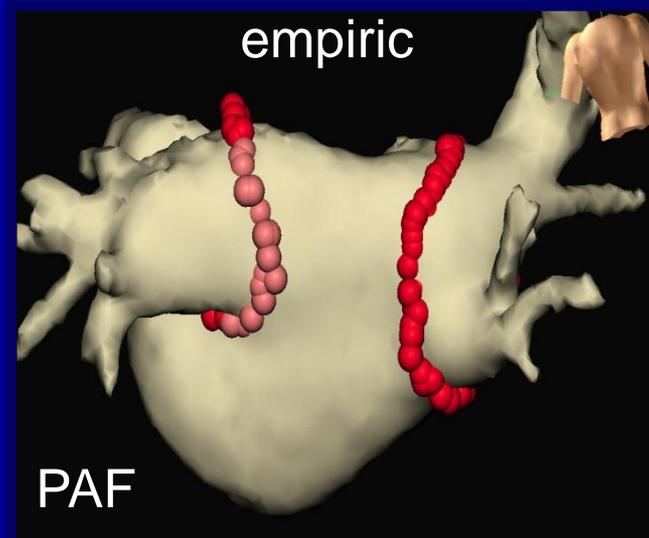
Follow-up @ 6 Mo: Sinusrhythmus

# Stellenwert bildgebender Verfahren in der invasiven EP

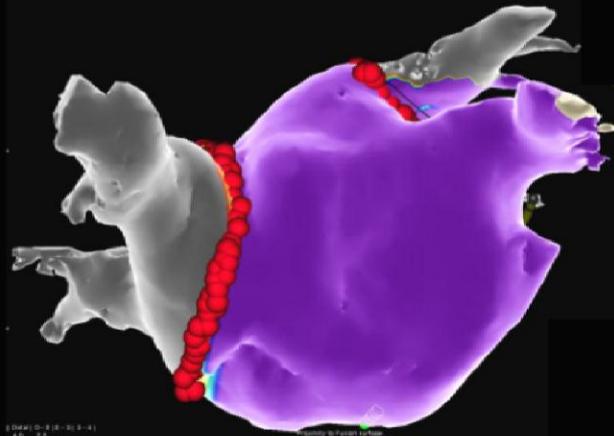
## Individualisierte Behandlung von AF



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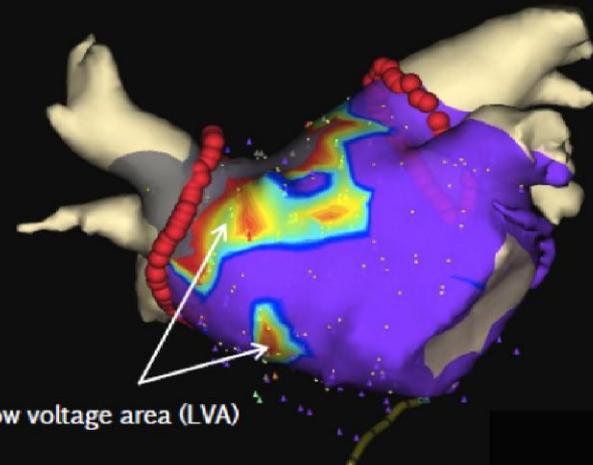
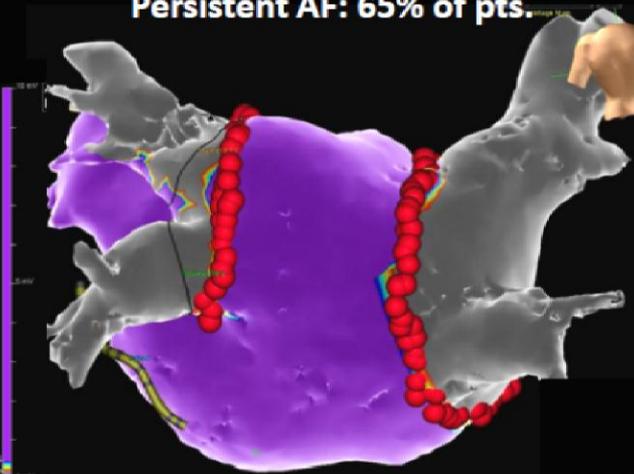
## Individualisierte Behandlung von AF



### „Healthy“ Left Atrium

Paroxysmal AF: 90% of pts.

Persistent AF: 65% of pts.

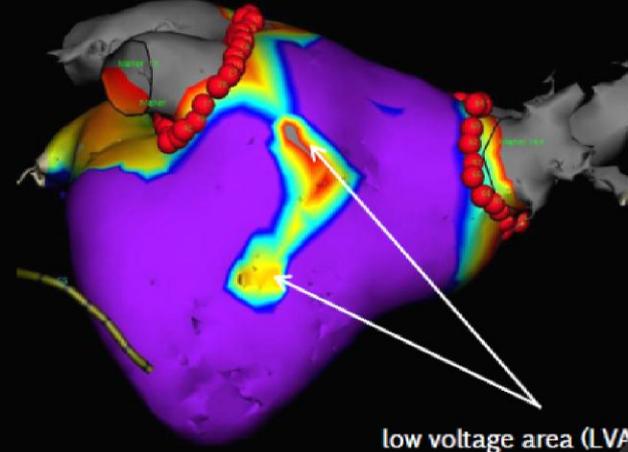


low voltage area (LVA)

### Left Atrium With Substrate

Paroxysmal AF: 10% of pts.

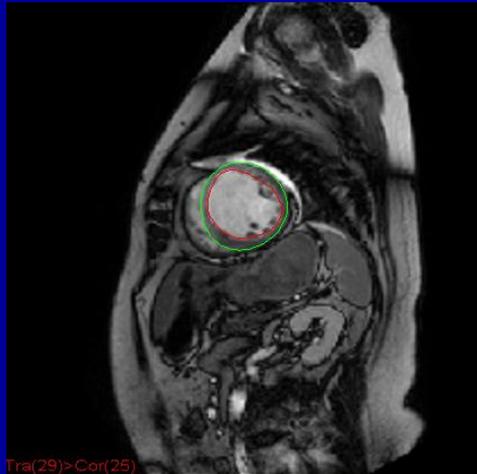
Persistent AF: 35% of pts.



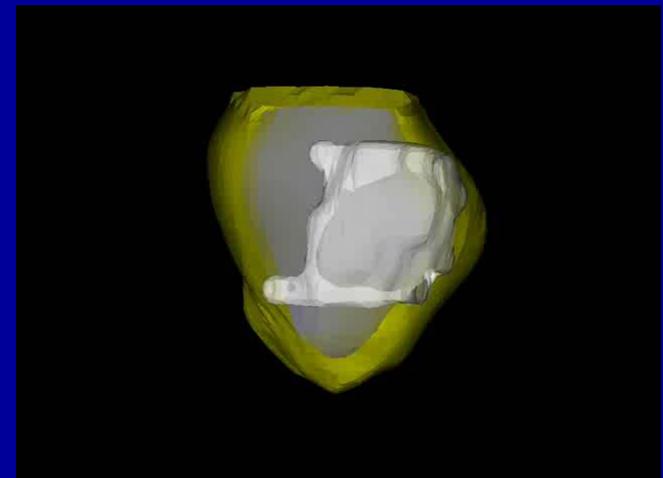
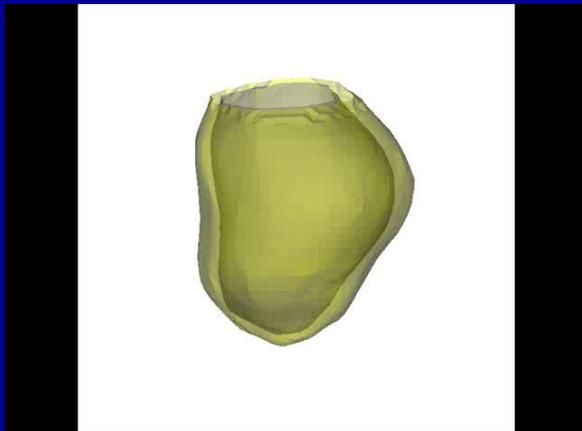
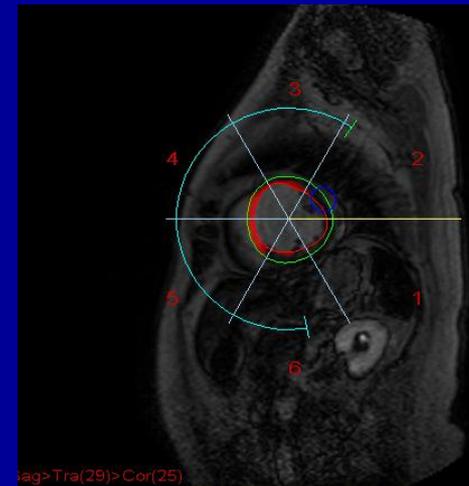
low voltage area (LVA)

## Nachweis von Ventrikelnarben mittels Kardio MRT

Cine MRI enables 3D+t reconstruction of epicardial and endocardial walls

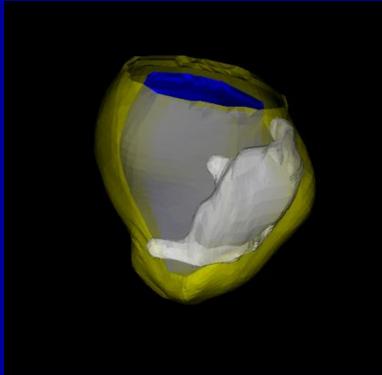


DE-MRI allows precise identification and delineation of scar tissue



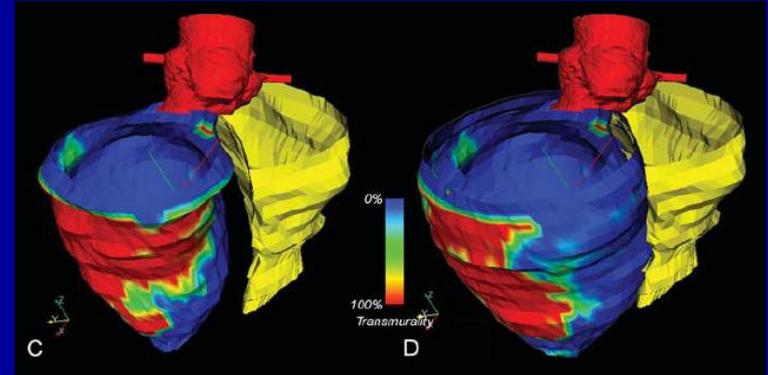
# Anatomische Informationen

## Multi-surface rendering

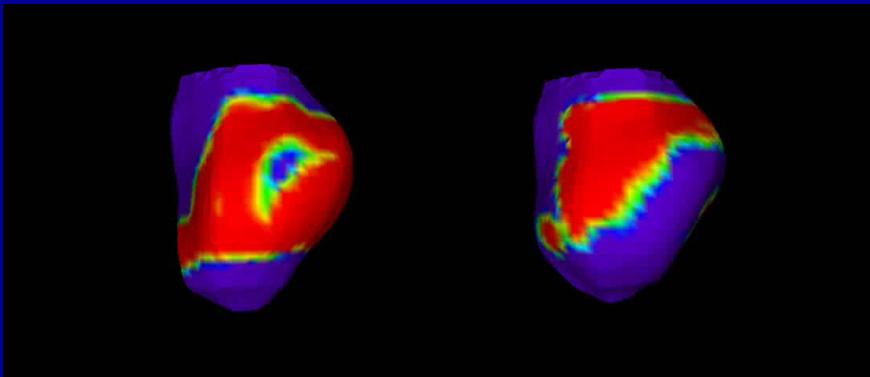


- Other anatomical regions?
- Static vs. Dynamic?

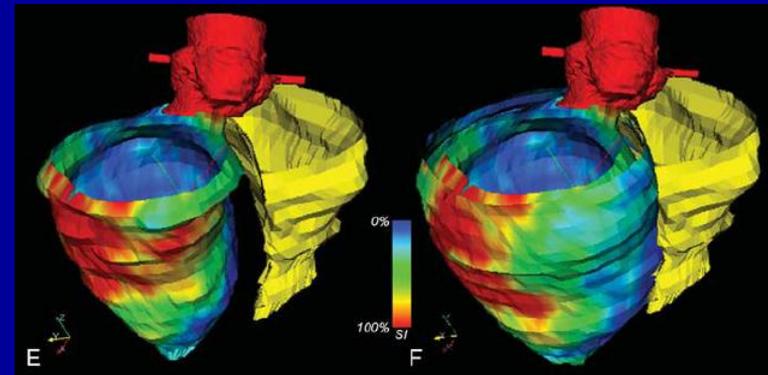
## Transmurality



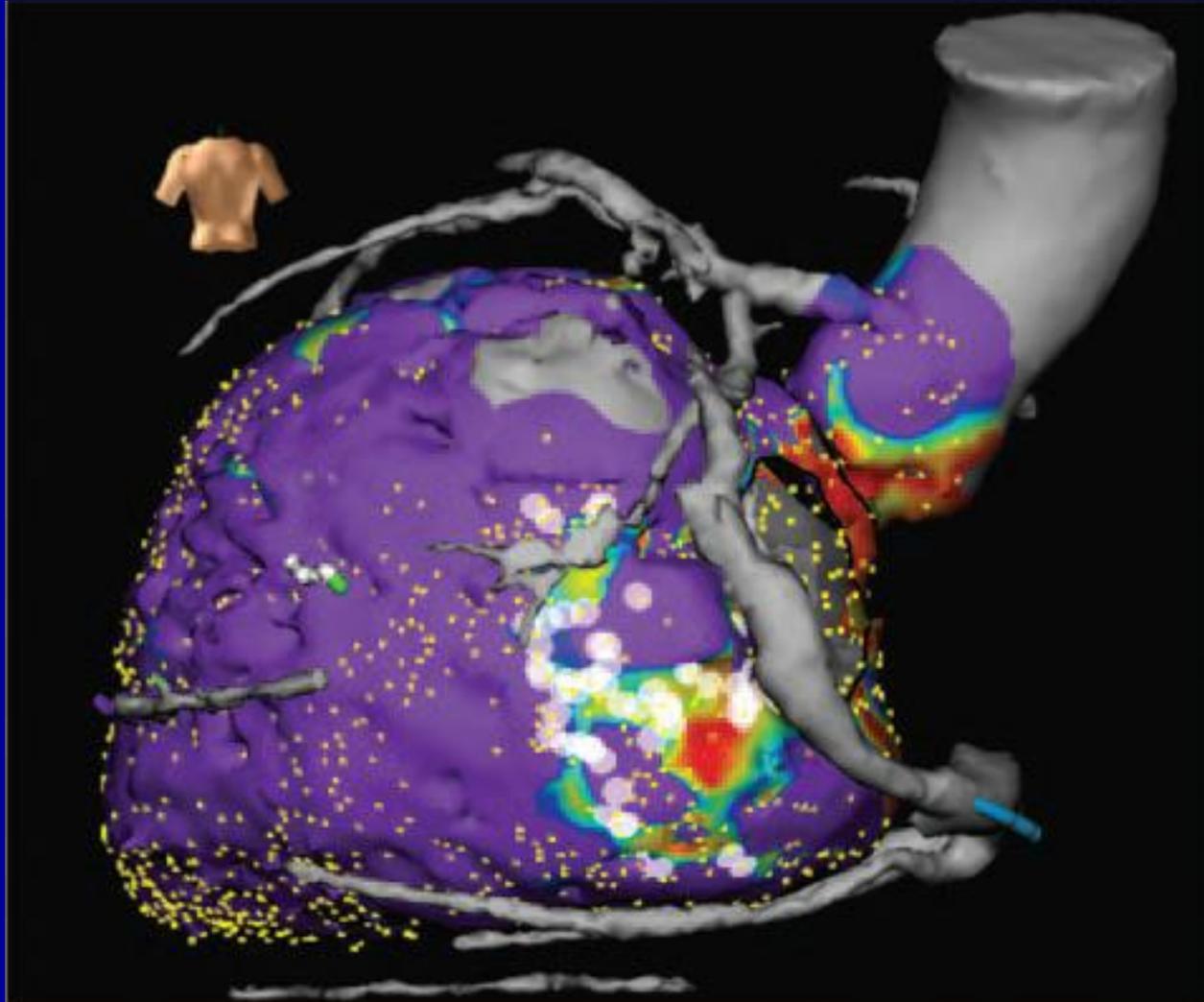
## Distance from 3D scar



## Signal intensity – border zone



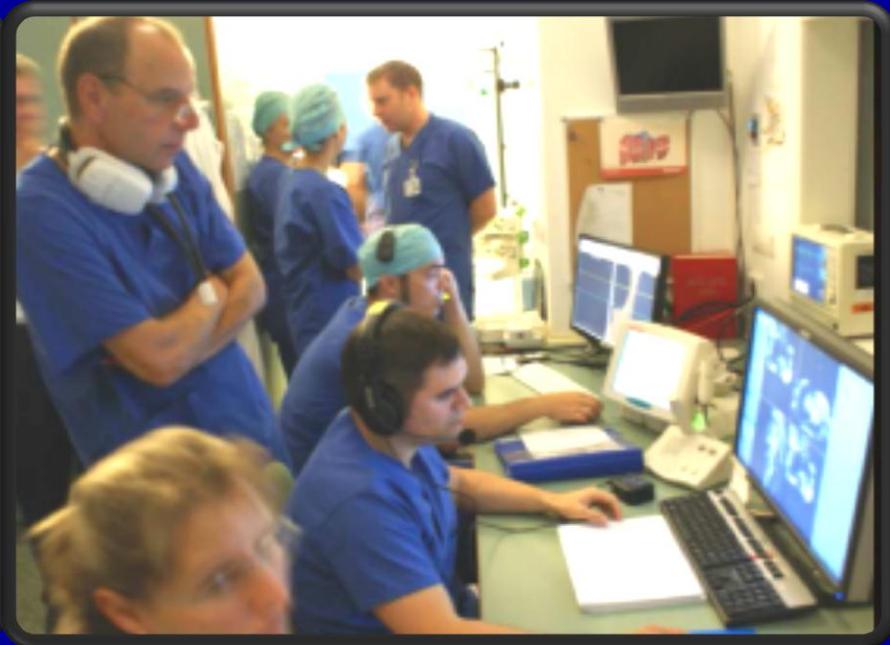
# Epikardiale Ablation



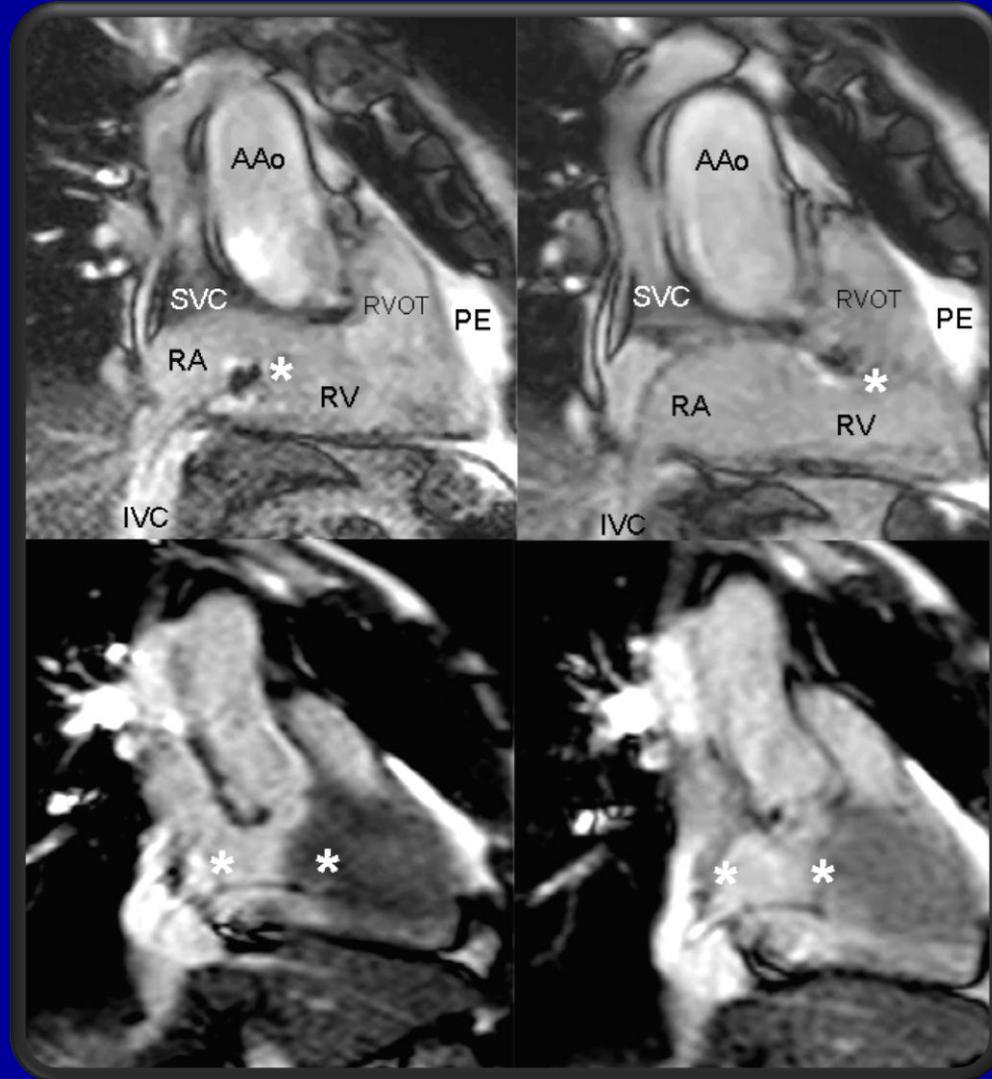
# Vision einer Image-geführten VT Ablation



## ImriCor: EPU/ Ablation im MRT



## ImriCor: EPU/ Ablation im MRT



## Agenda:

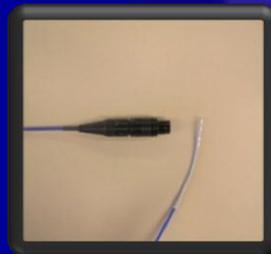
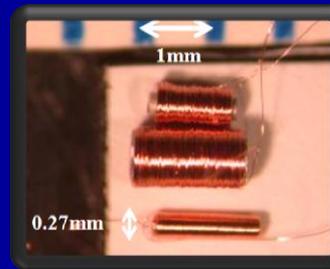
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## Future of intracardiac catheter navigation (Mediguide)

3D electromagnetic field  
integrated into the  
fluoroscopy detector



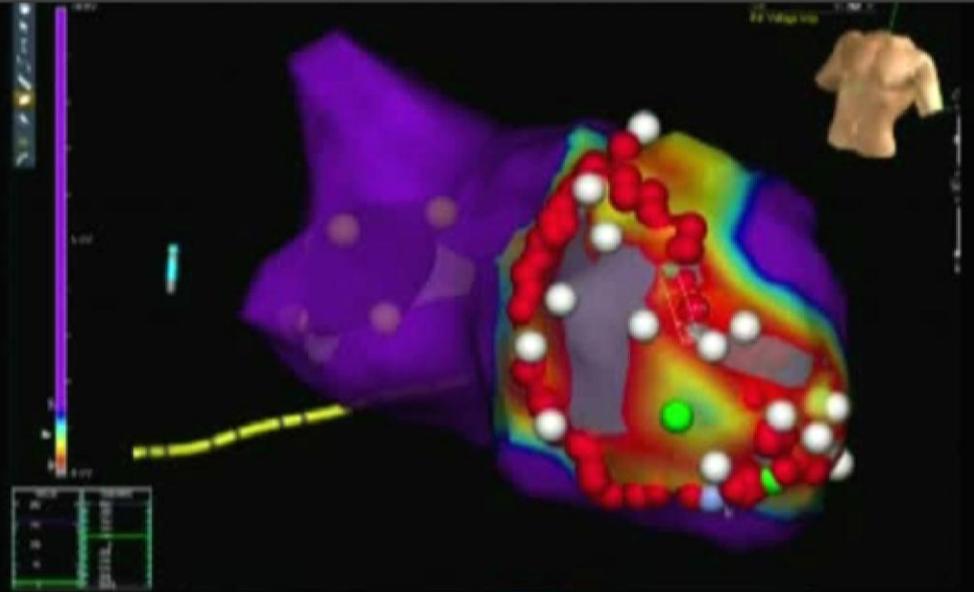
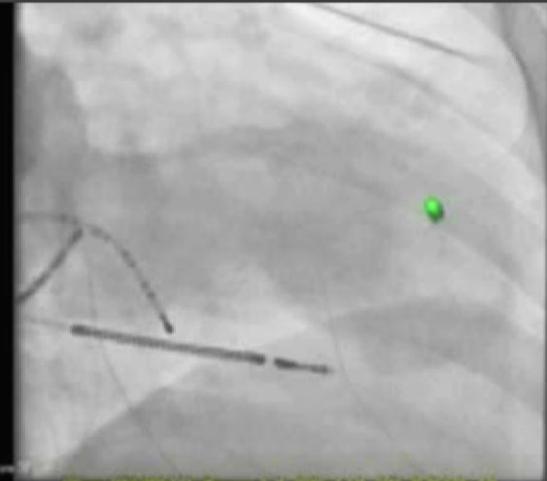
miniaturized sensor  
technology



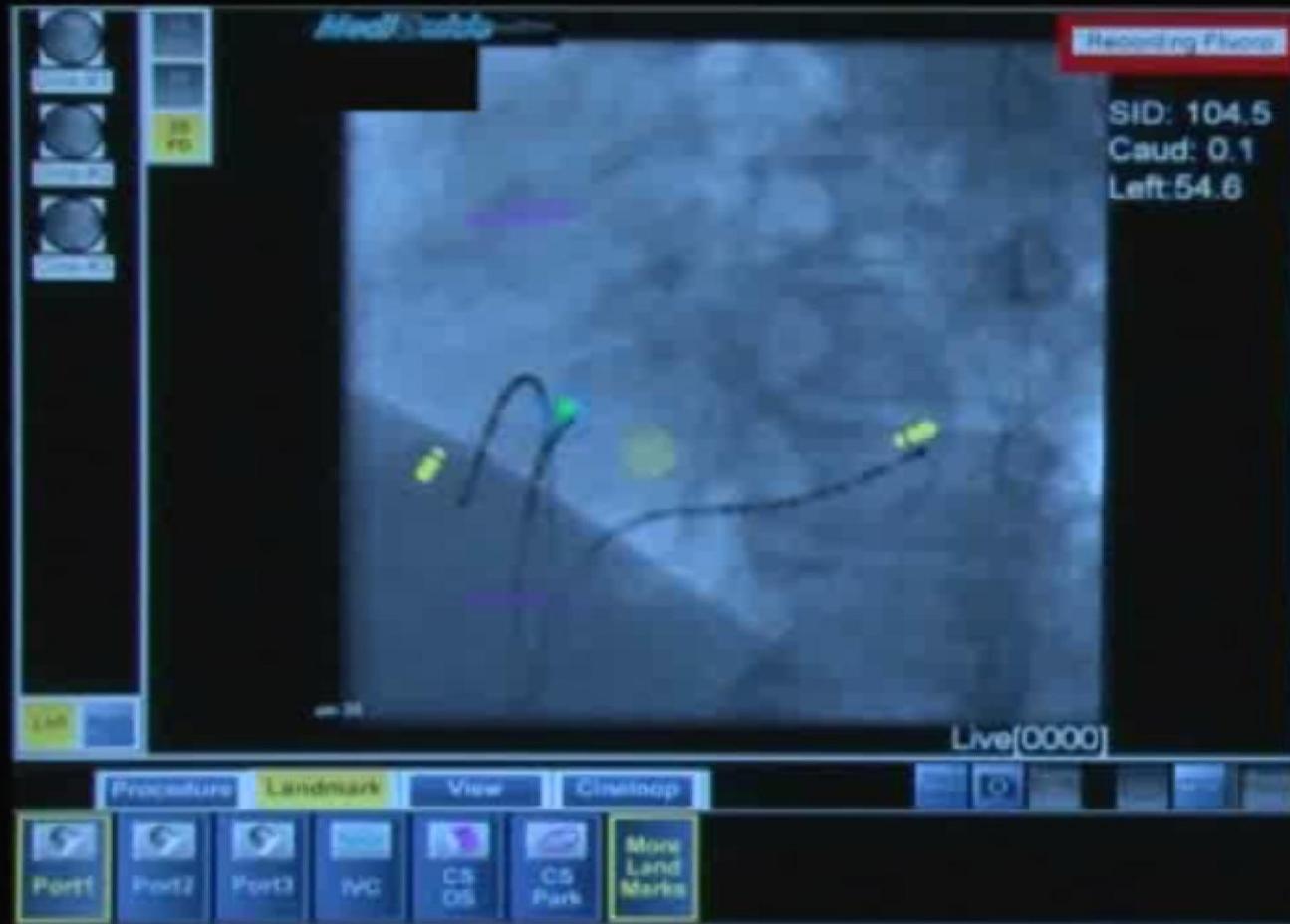
integration with  
3D cardiac mapping  
system (NavX)



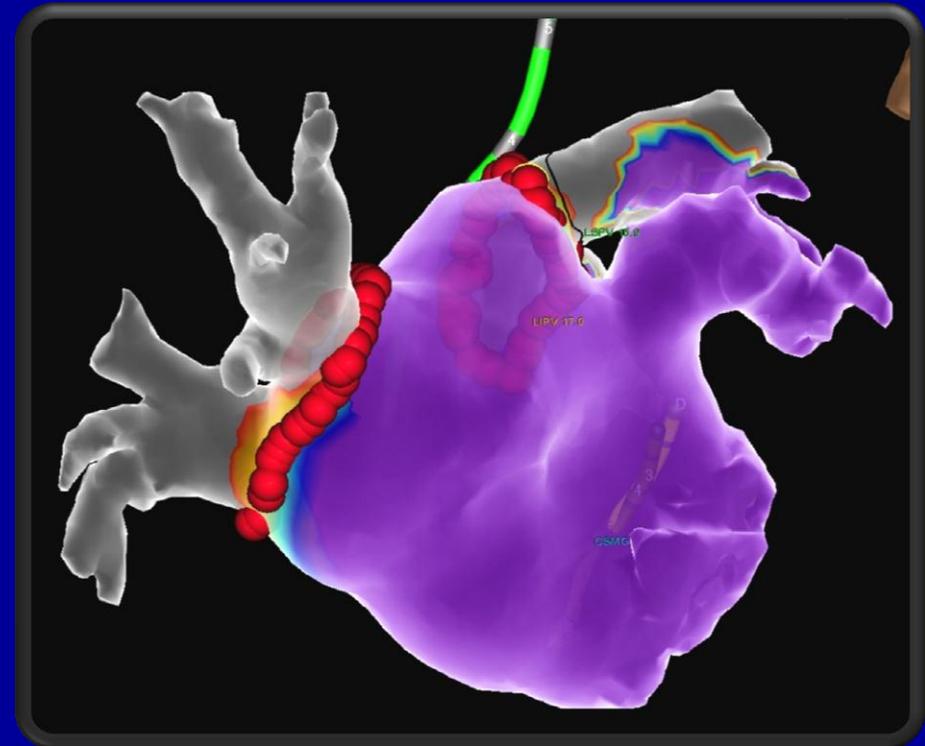
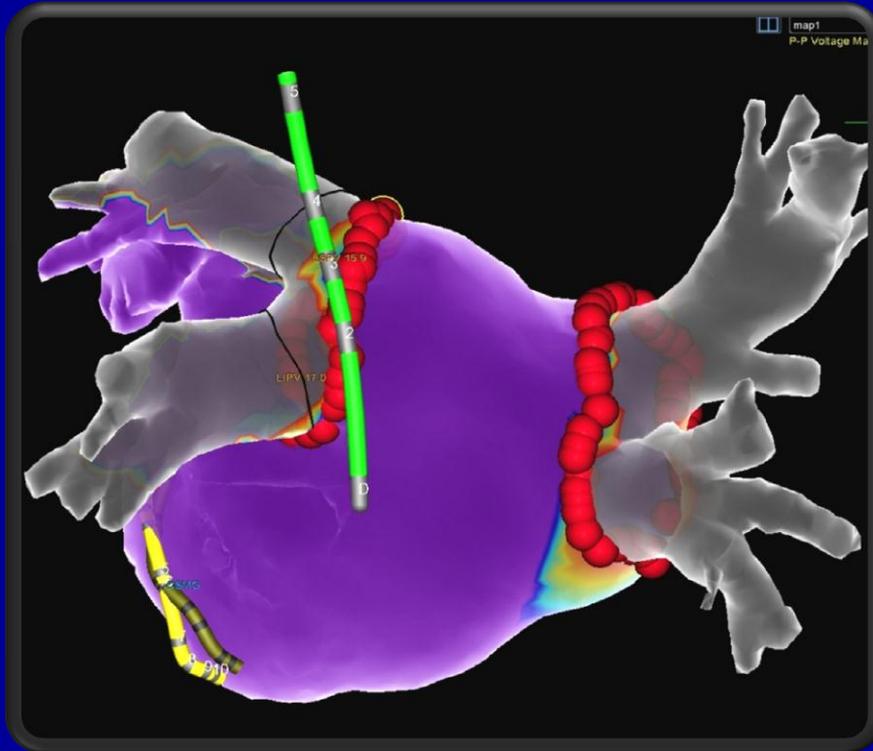
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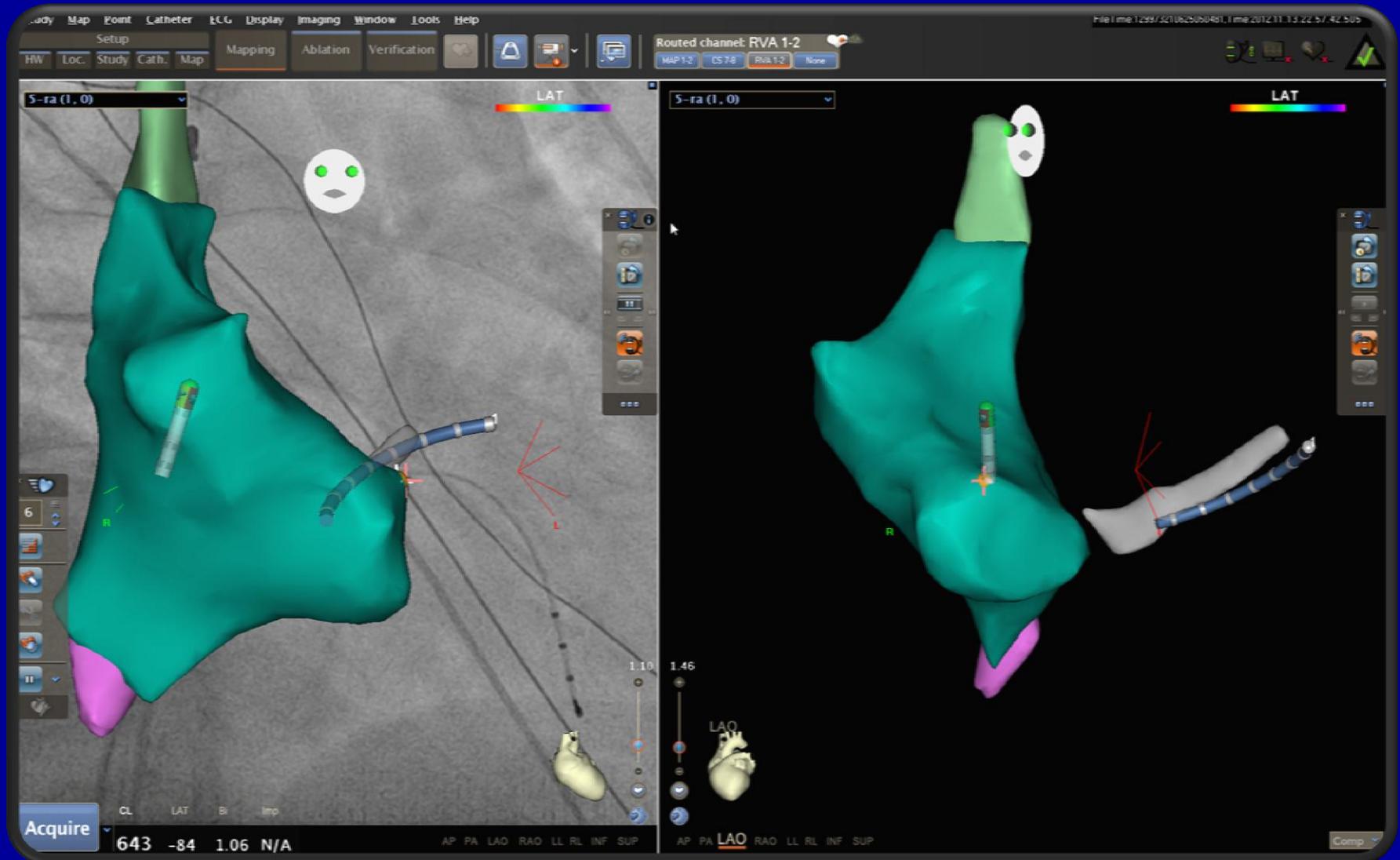
## MediGuide (gMPS): AF Ablation



## PVI mit MediGuide®: 40s Fluoroskopie



## Fluo-Overlay mit Carto 3®: Alara



## Zusammenfassung

- Kardiale Bildgebung ist in der EP von großer Relevanz in
  - 1.) Vorbereitung und Planung eines Eingriffs  
(Substratanalyse bei VT, potentiell auch bei AF)
  - 2.) Durchführung eines Eingriffs (Bildintegration)
- Kombination anatomische/funktionelle Informationen wünschenswert, derzeit „under progress“.
- In naher Zukunft können evtl. substratbezogene Ablationen im MRT direkt durchgeführt werden.

**Vielen Dank!**