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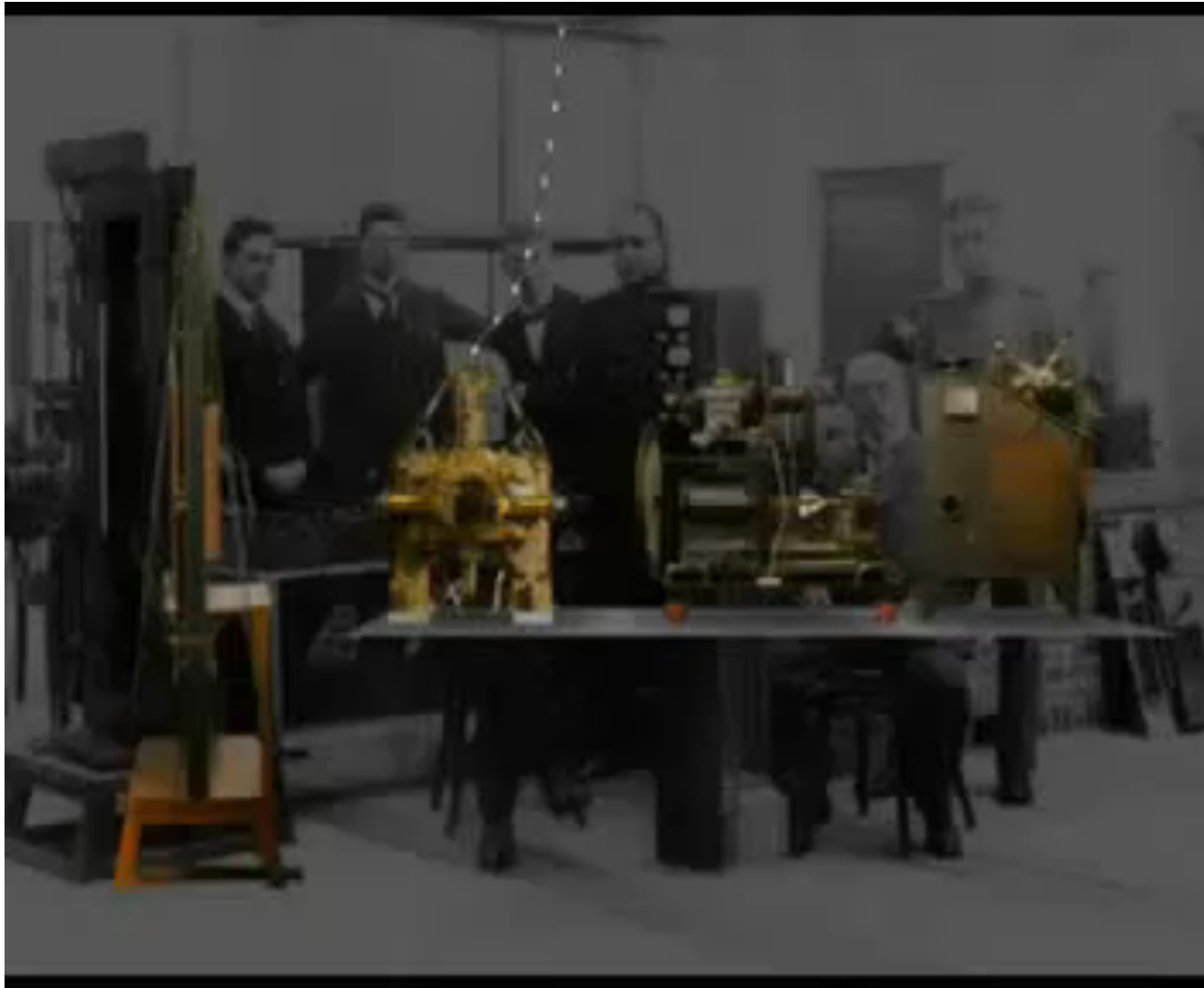
# ***Navigation and 3D Mapping***

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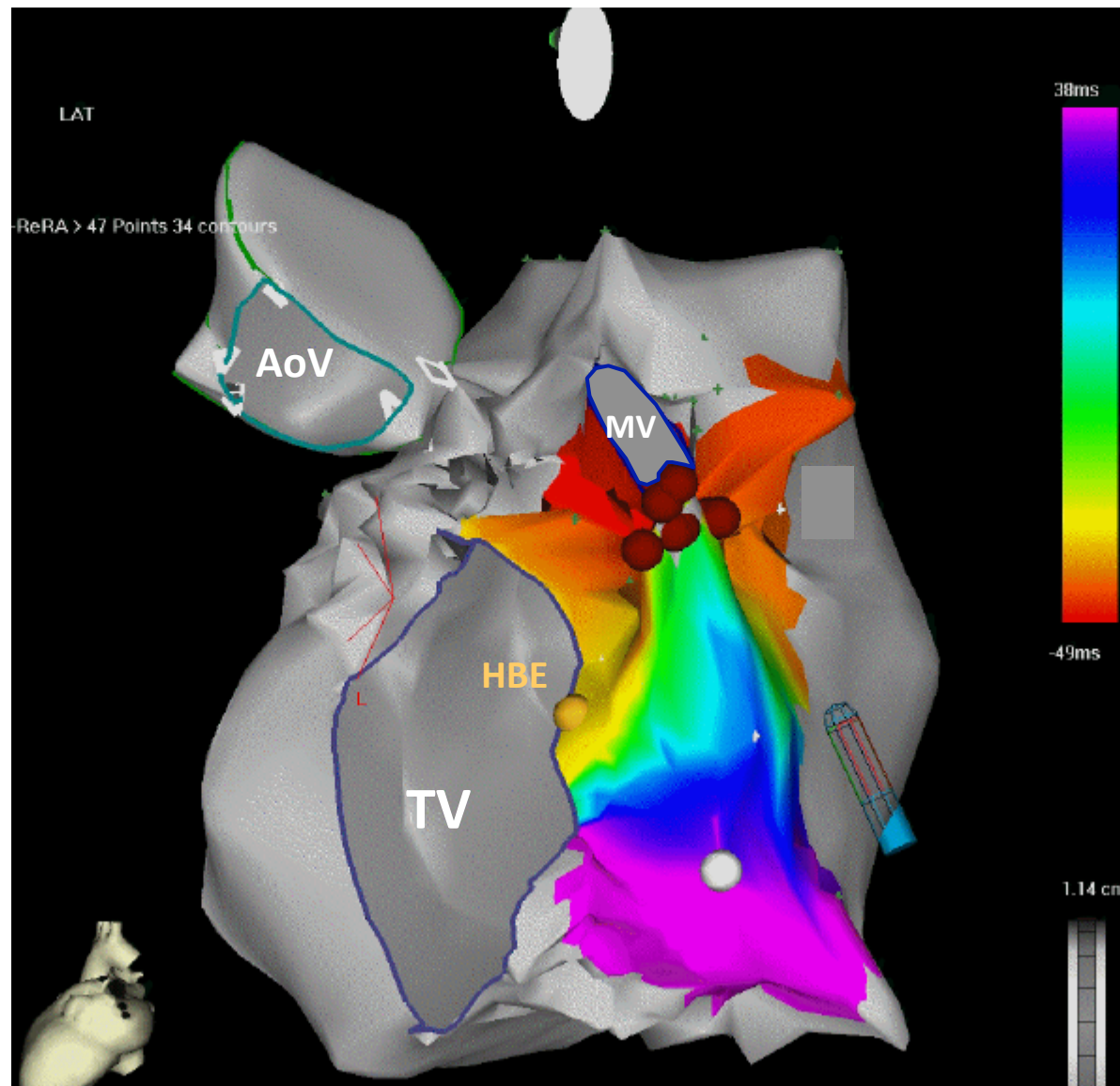


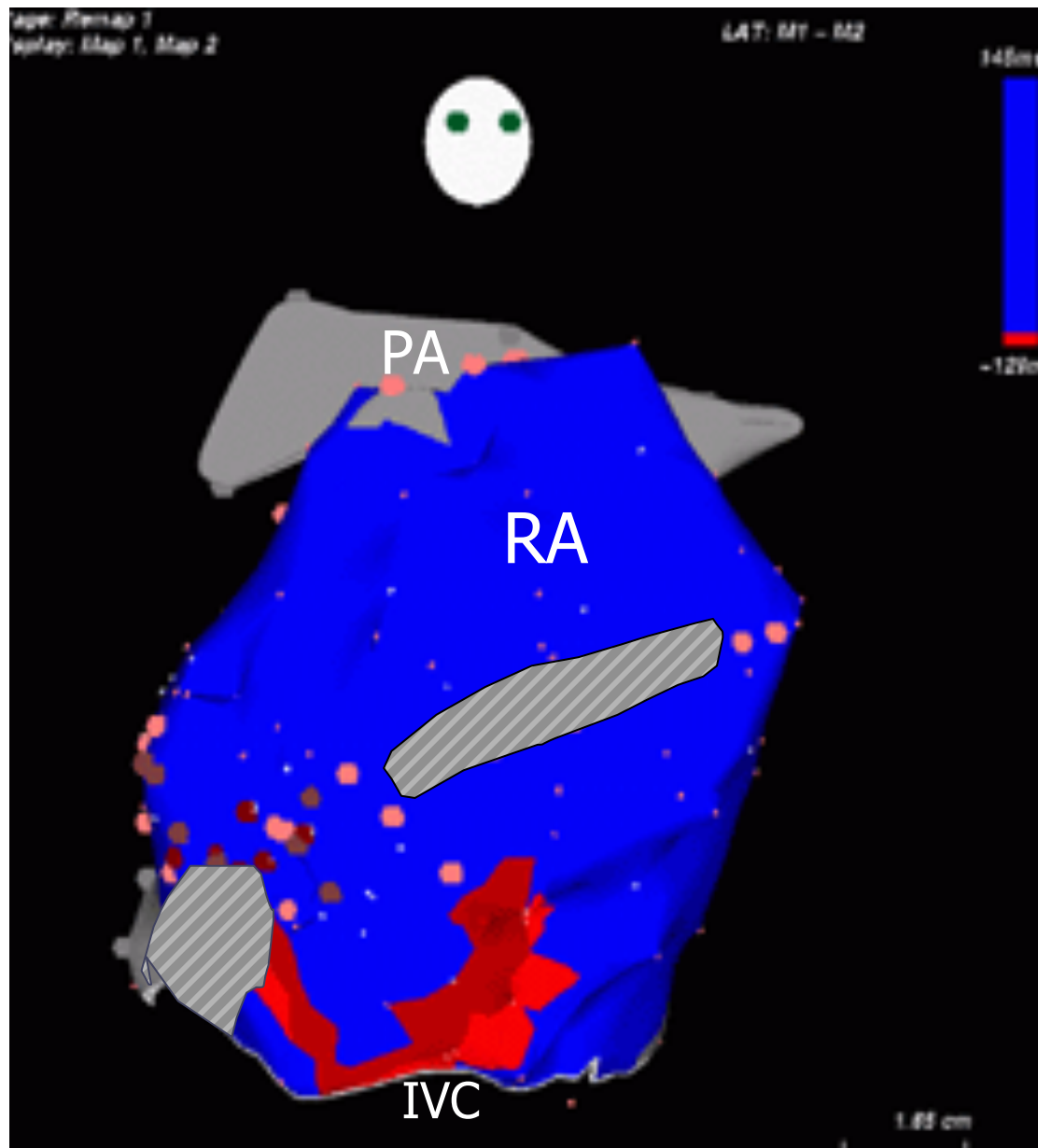
***Edward P. Walsh, MD  
Boston Children's Hospital  
Harvard Medical School***

***Pedirhythm VII  
February 2017***



*Shown with permission: The Wetenschappelijk Museum, Netherlands (JDB Graphics Co)*



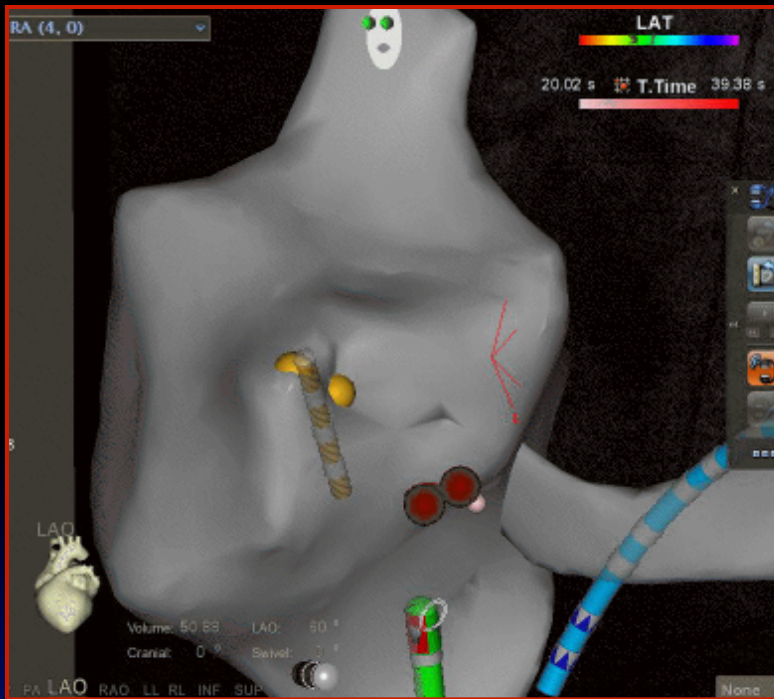




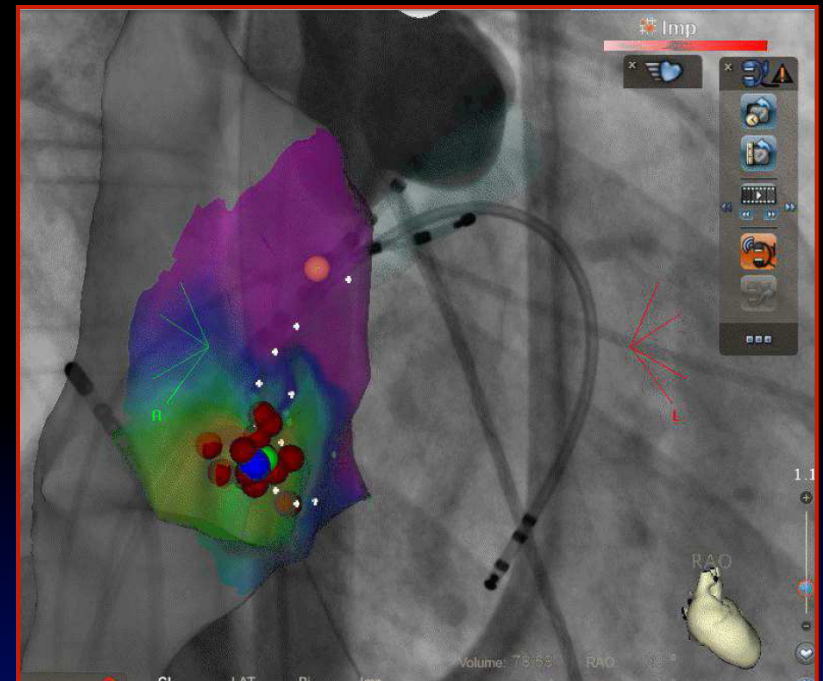
## ***Important Applications of 3D Mapping***

- Normal Heart / Simple arrhythmia
  - Reduce X-ray exposure
  - Assist with catheter placement
  - Mark target location(s)
- Abnormal heart / Complex arrhythmia
  - All the above, plus.....
  - Help define anatomy
    - Merge (MRI, CT, angio, fluoro, ICE)
  - Help define substrate
    - Scars, voltage, split potentials
  - Map and define arrhythmia
    - Rapid high density mapping
  - Irrigation and tip-force sensing during ablation
  - Remap after ablation

# Non-fluoro / reduced fluoro (case examples)



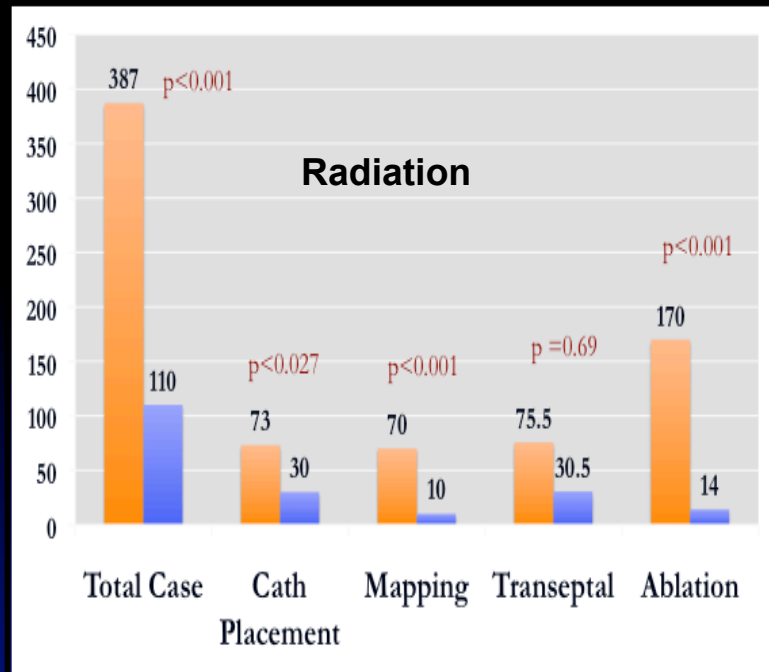
AVNRT  
(non-fluoro)



R-sided AP  
(3-D integrated with X-ray)

# Use of non-fluoroscopic localization during SVT ablation in children (ICE and 3-D)

Prospective, randomized fluoro vs. non-fluoro, n = 40 each

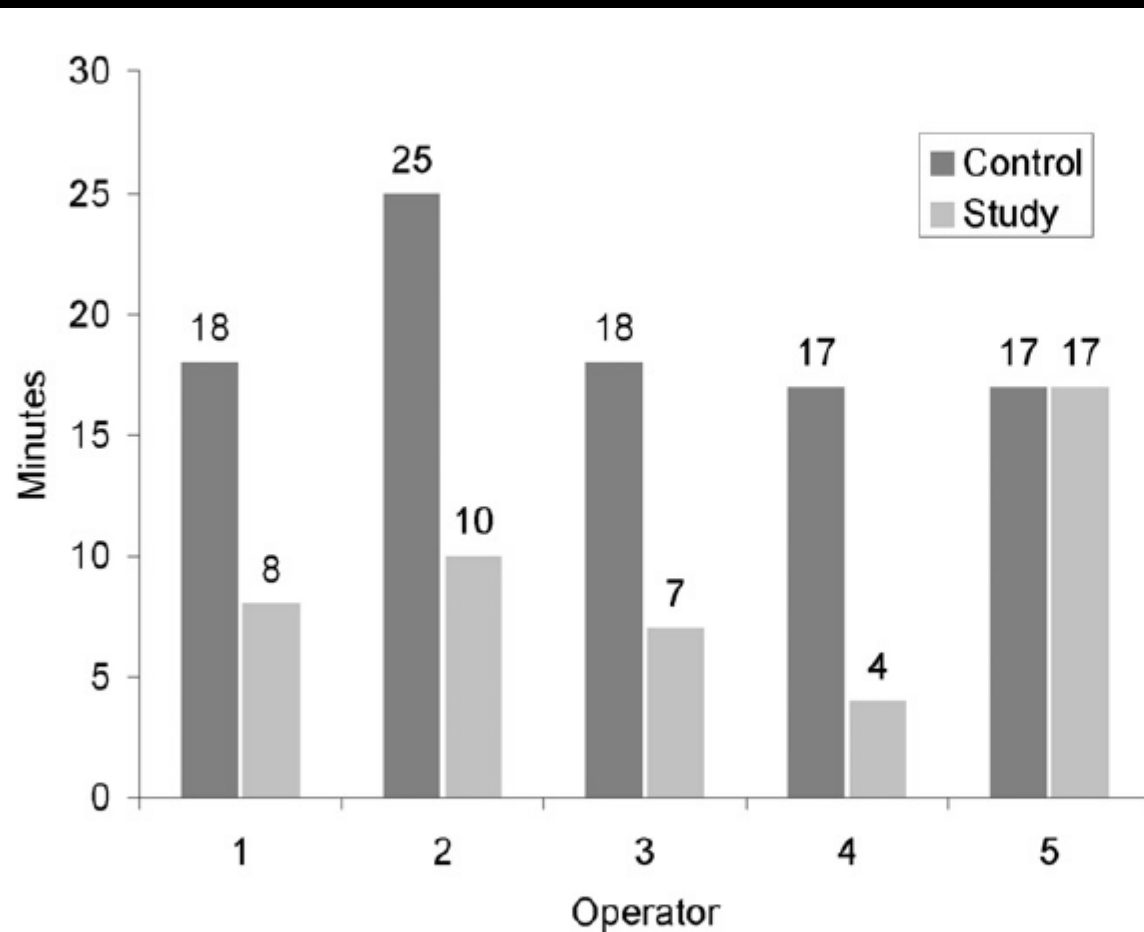


Acute success:

Fluoro (control): 95%

non-Fluoro (study): 100%

No complications either group.

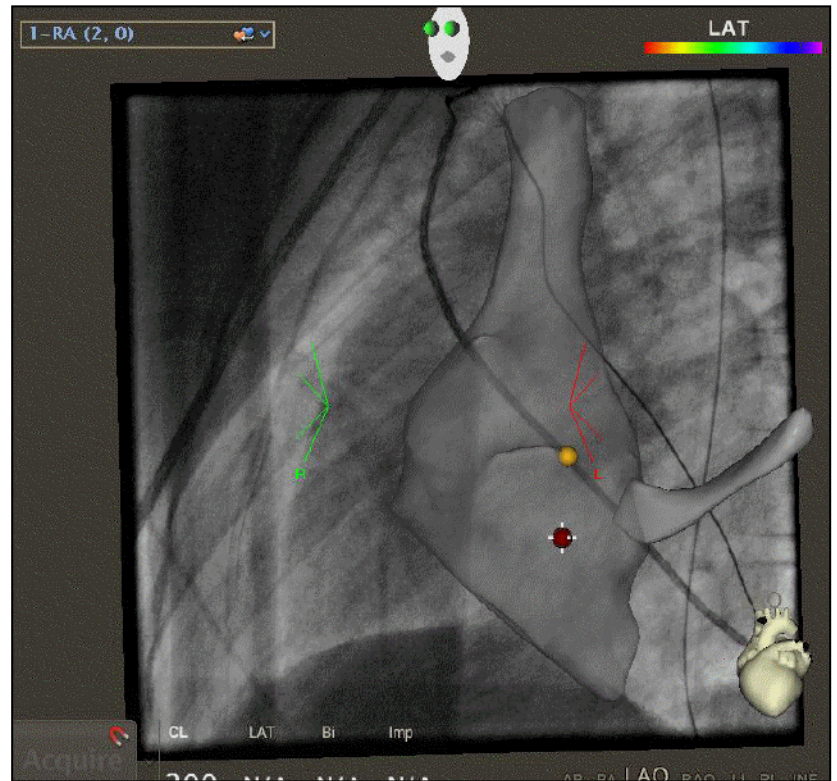
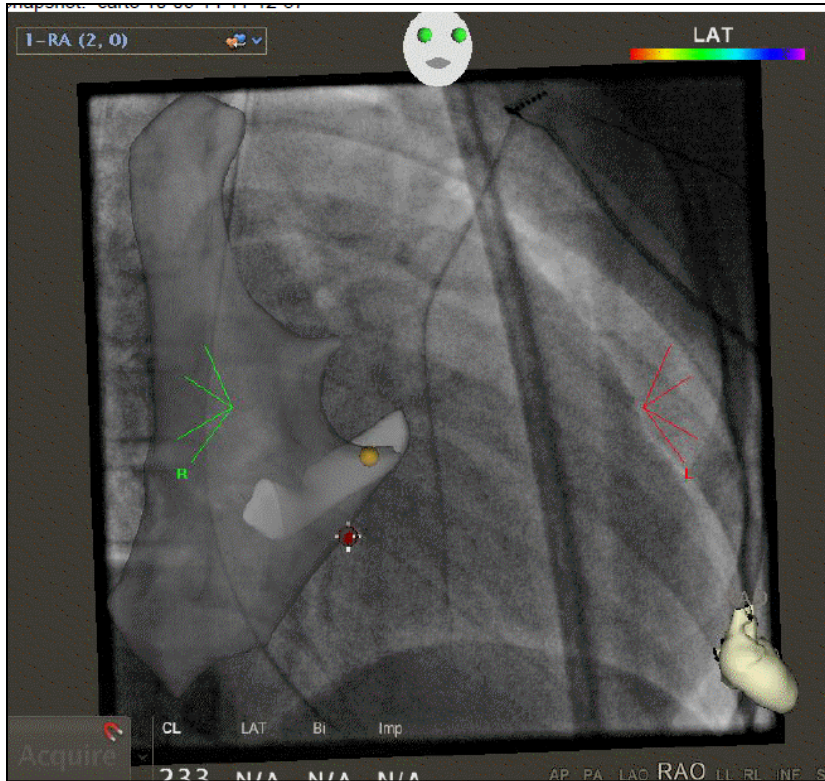


**Figure 4** Median fluoroscopy times by operator. Numbers above the

Miyake et al. HR 2011

# Best of Both Worlds

## Merge 3-D Shell / Spot Fluoro

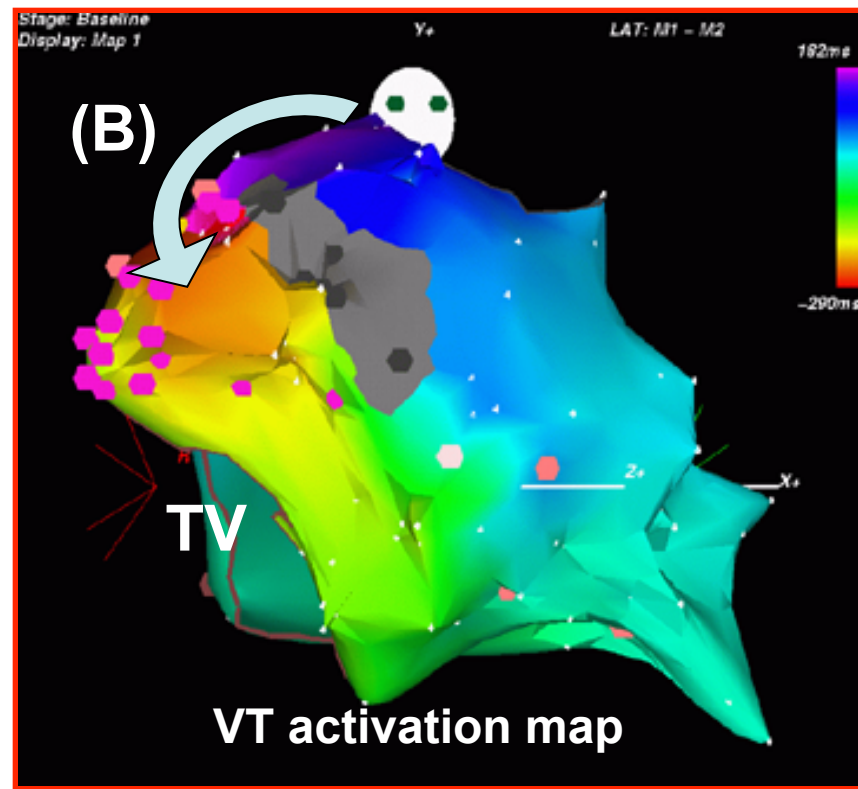
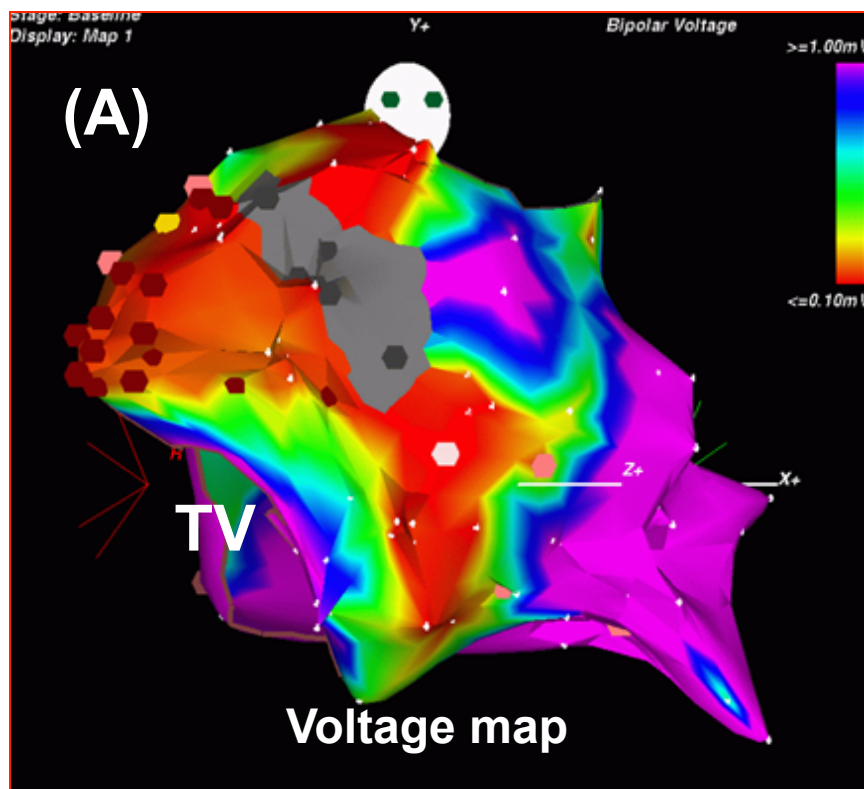


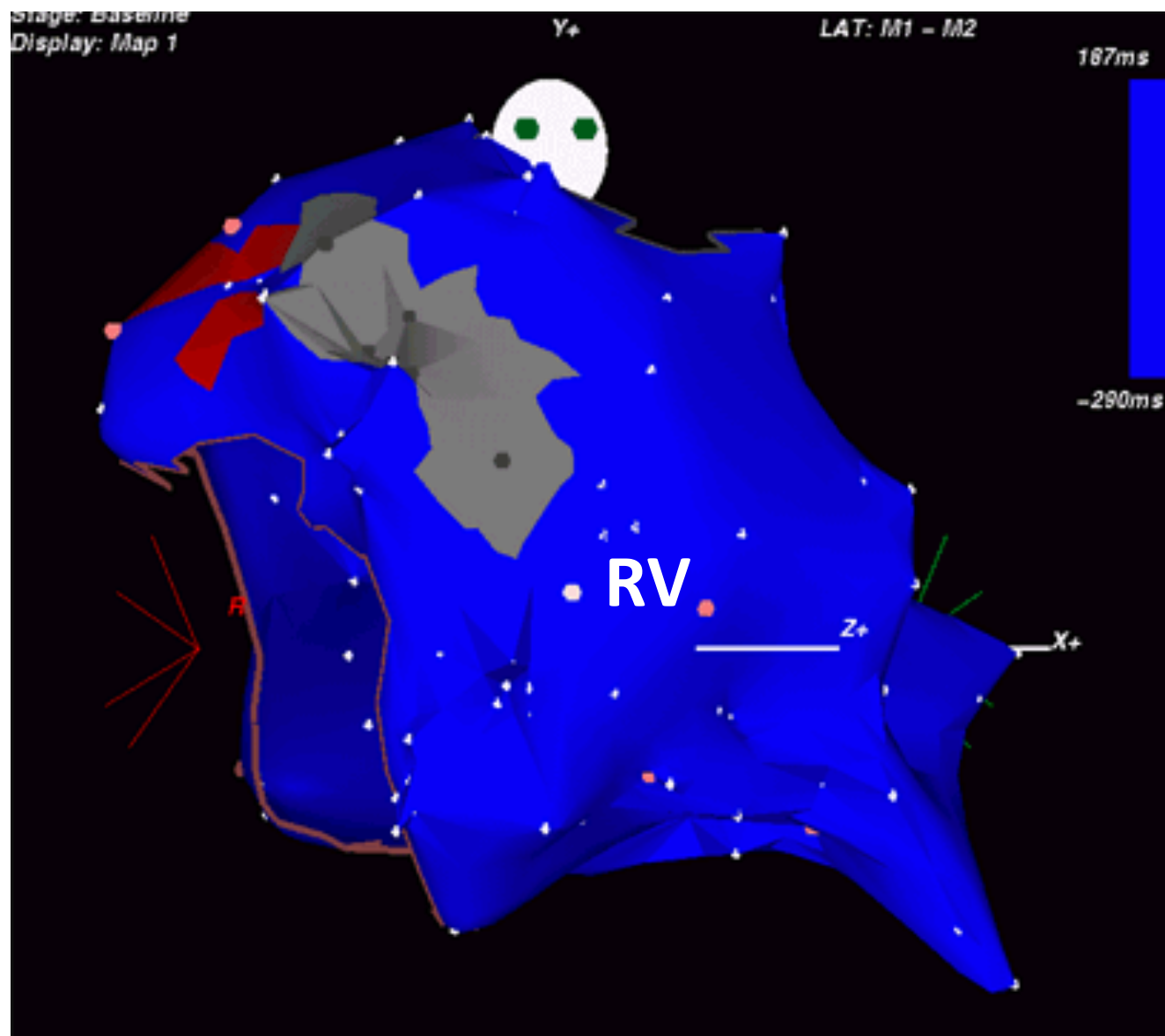
0.1 min fluoroscopy / case

## ***Important Applications of 3D Mapping***

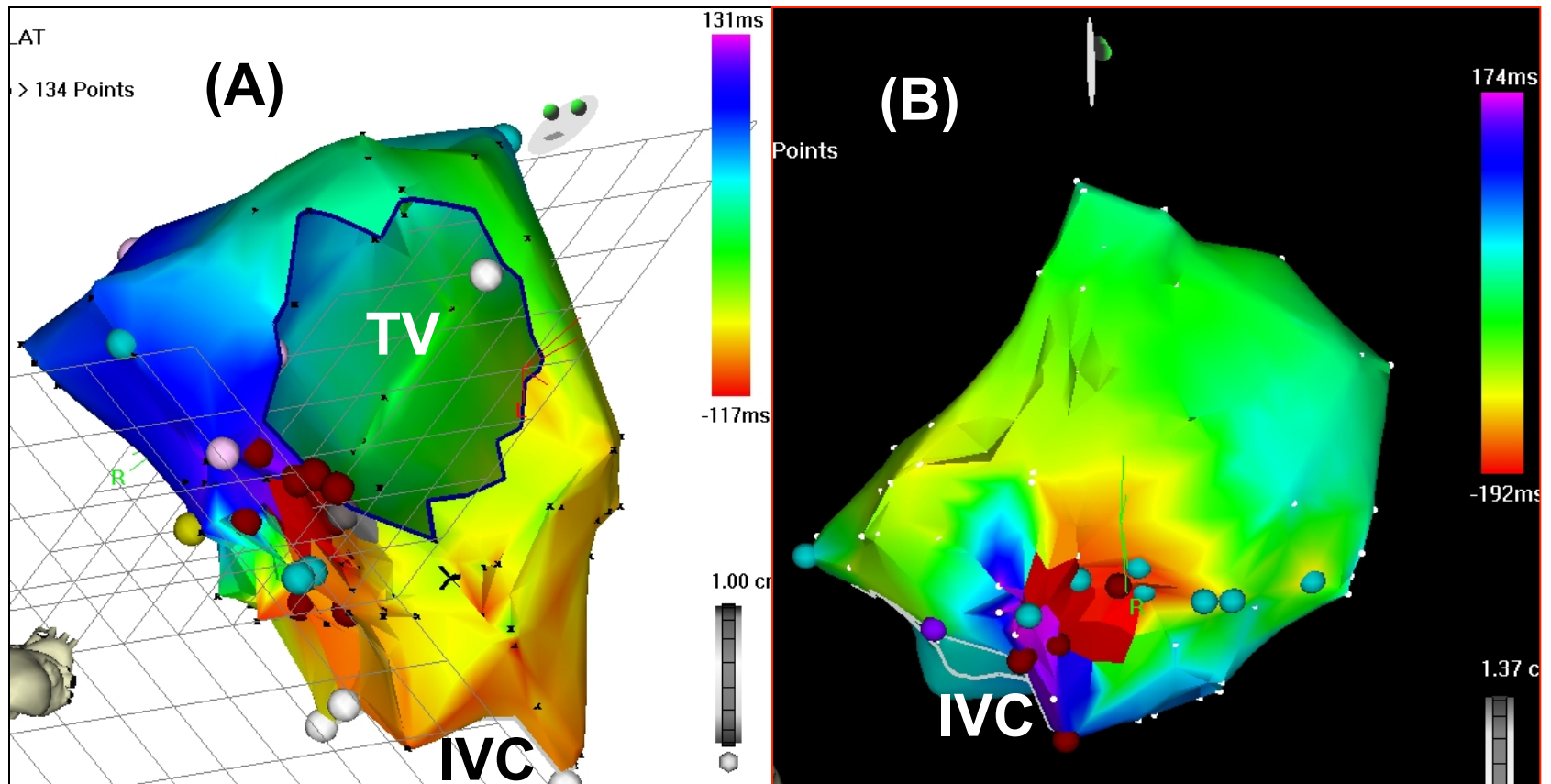
- Normal Heart / Simple arrhythmia
  - Reduce X-ray exposure
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- Abnormal heart / Complex arrhythmia
  - All the above, plus.....
  - Help define anatomy
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  - Help define substrate
    - Scars, voltage, split potentials
  - Map and define arrhythmia
    - Rapid high density mapping
  - Irrigation and tip-force sensing during ablation
  - Remap after ablation

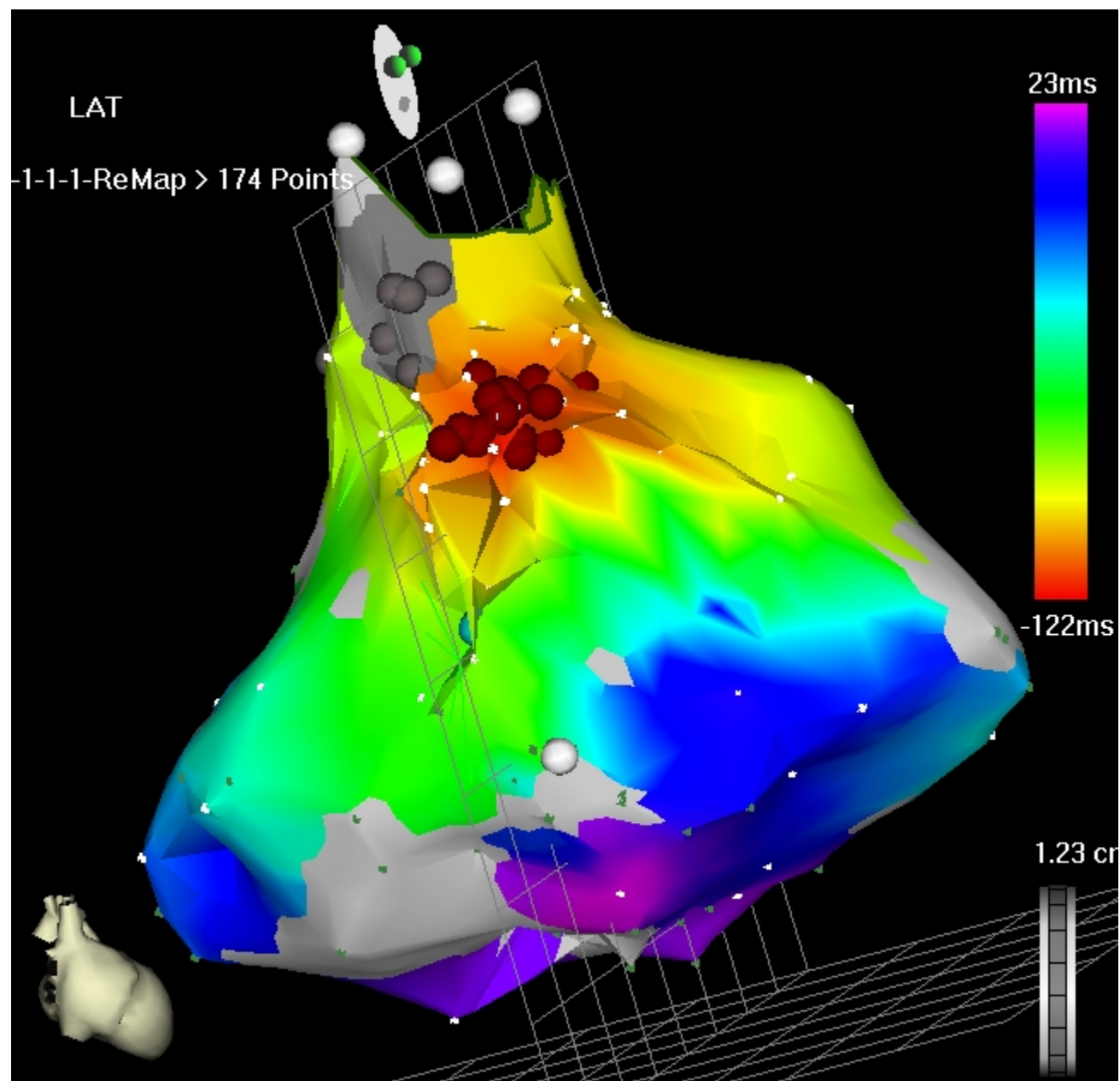








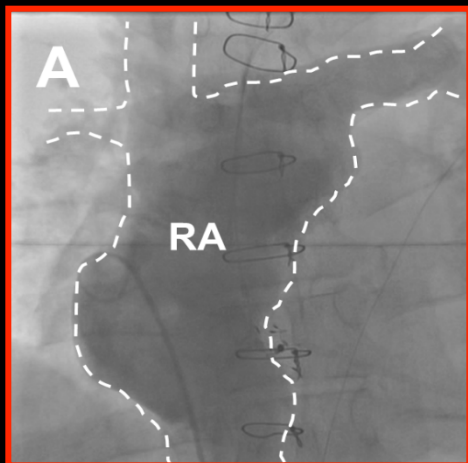




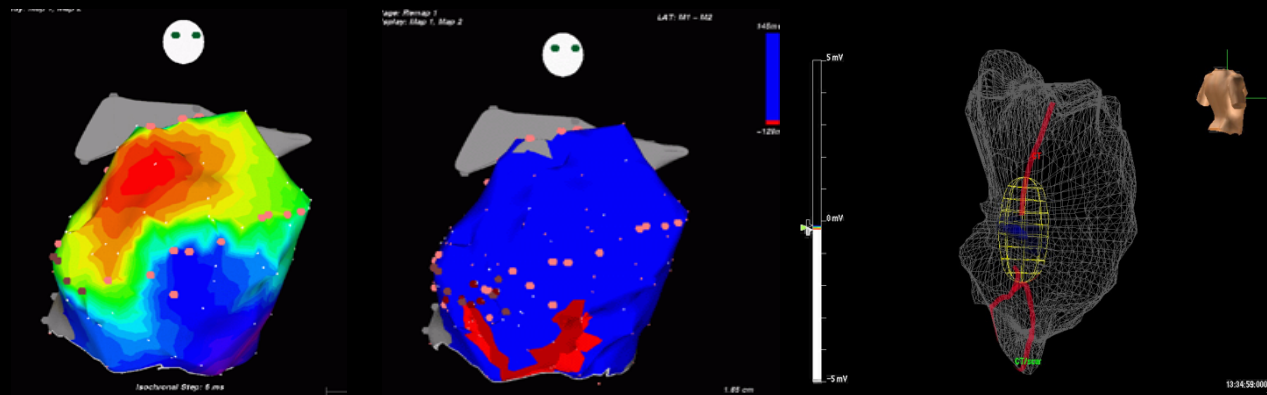
## ***3D Mapping Options***

- **CARTO**
- **NAVEX**
- **Others**

## Angiography



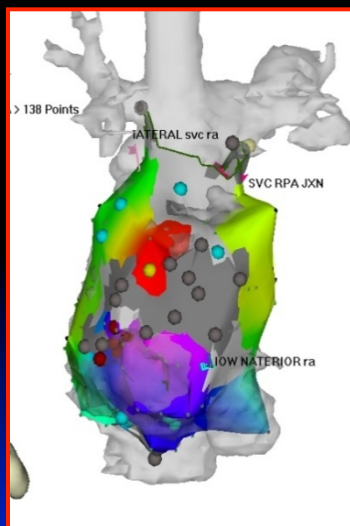
## 3-D electroanatomic mapping



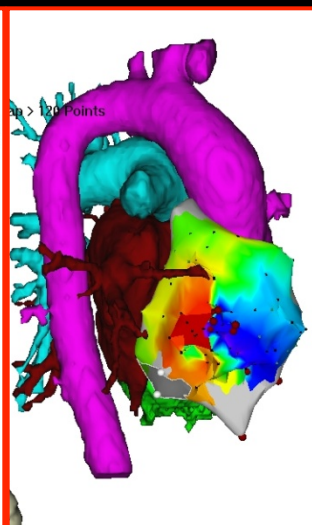
## Noncontact 3-D mapping

## Integrated angio / ICE / 3-D

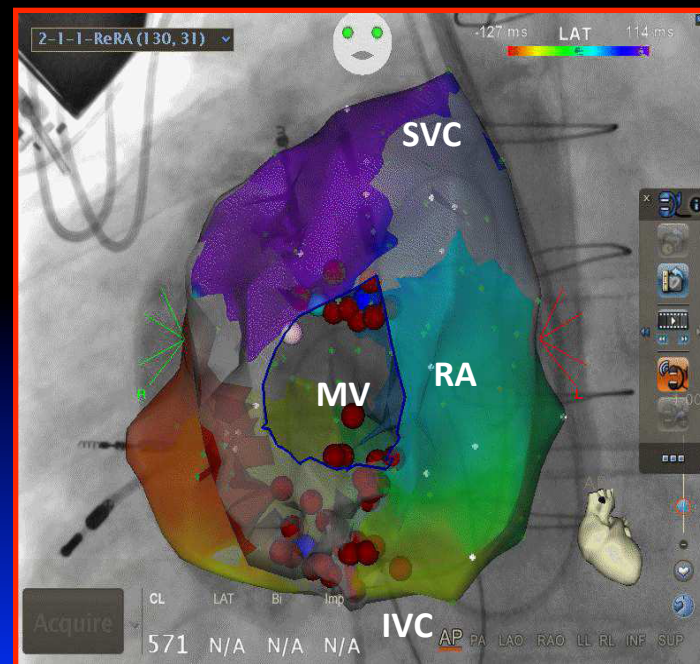
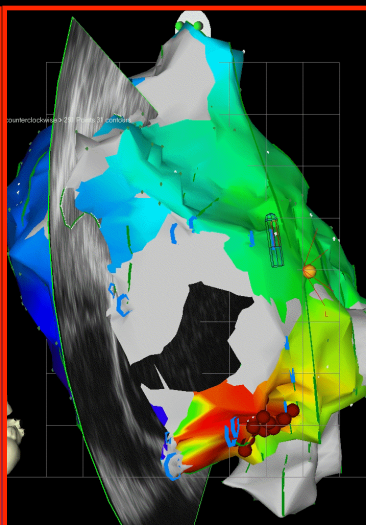
### 3-D merge (MRI)



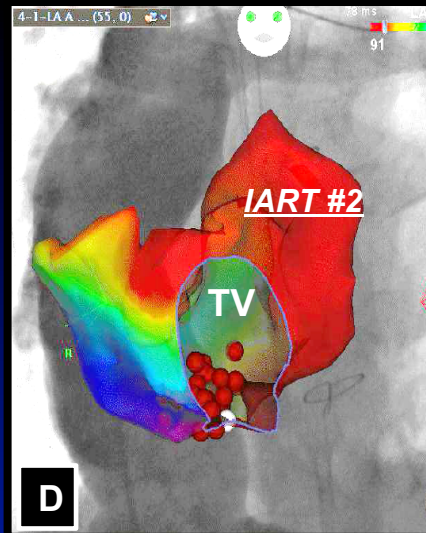
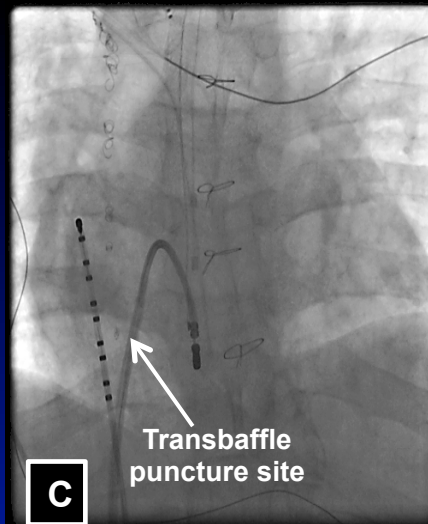
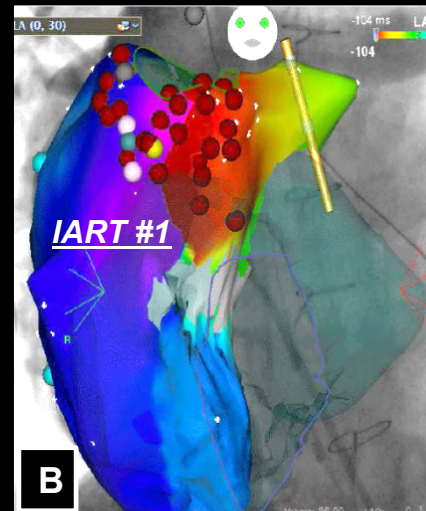
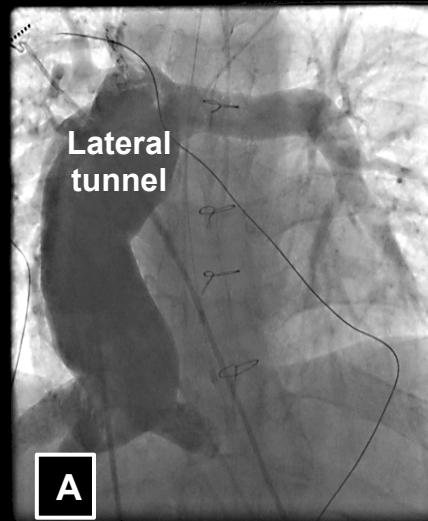
### 3-D merge (CT)



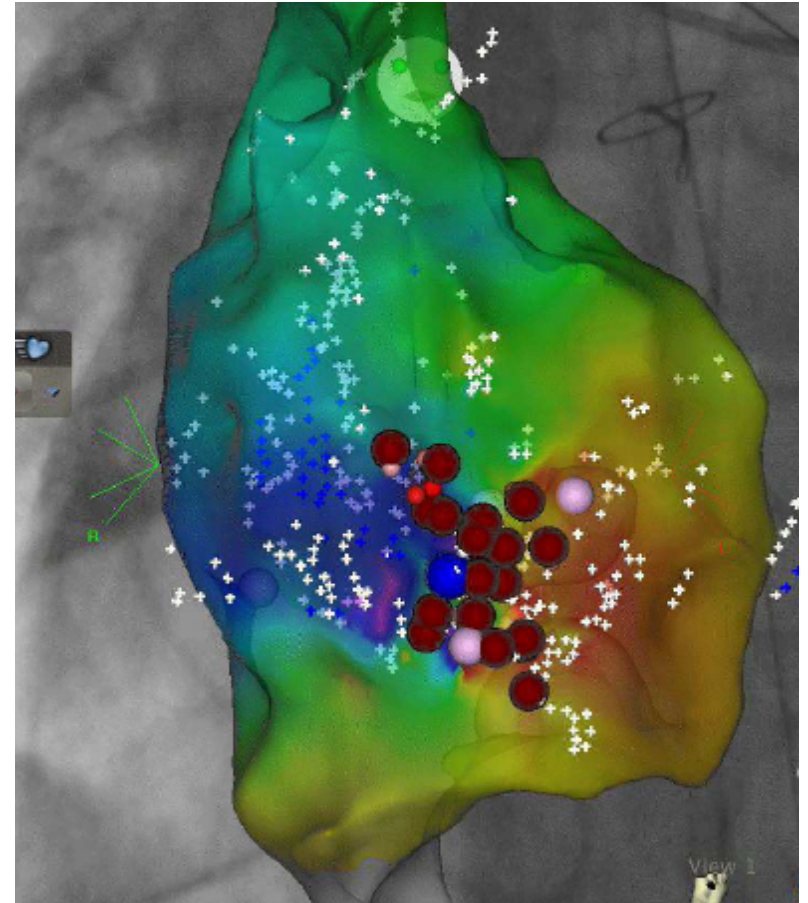
### 3-D merge (ICE)



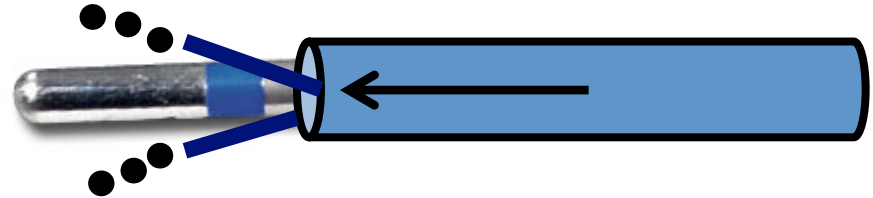
# Atrial Flutter s/p Fontan



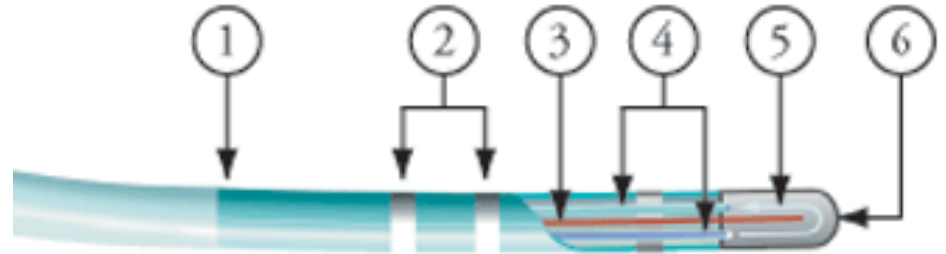




**EP fellow irrigation**



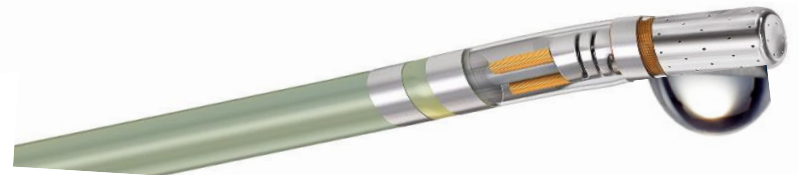
**Closed irrigation**



**Open irrigation**

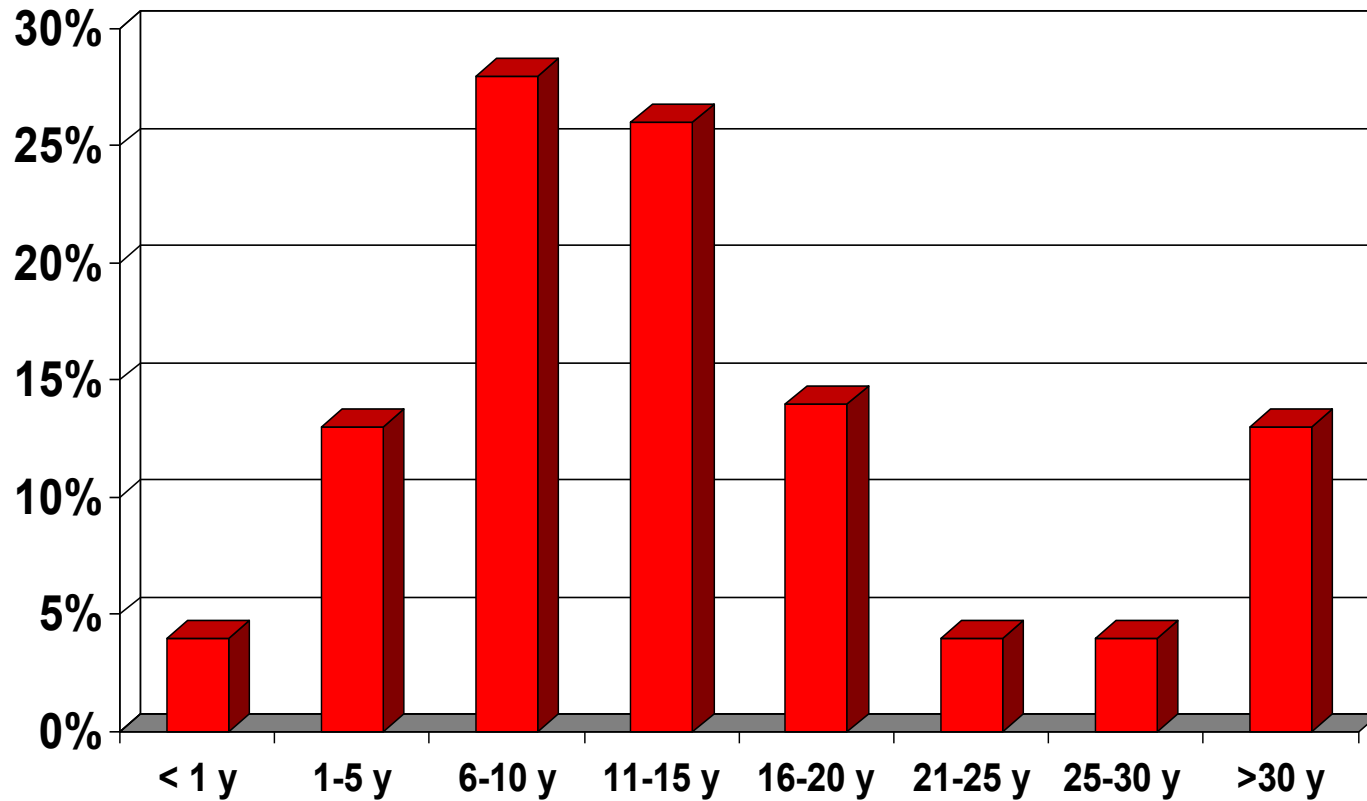


**Open irrigation / contact force**



# Catheter Ablation Procedures by Age

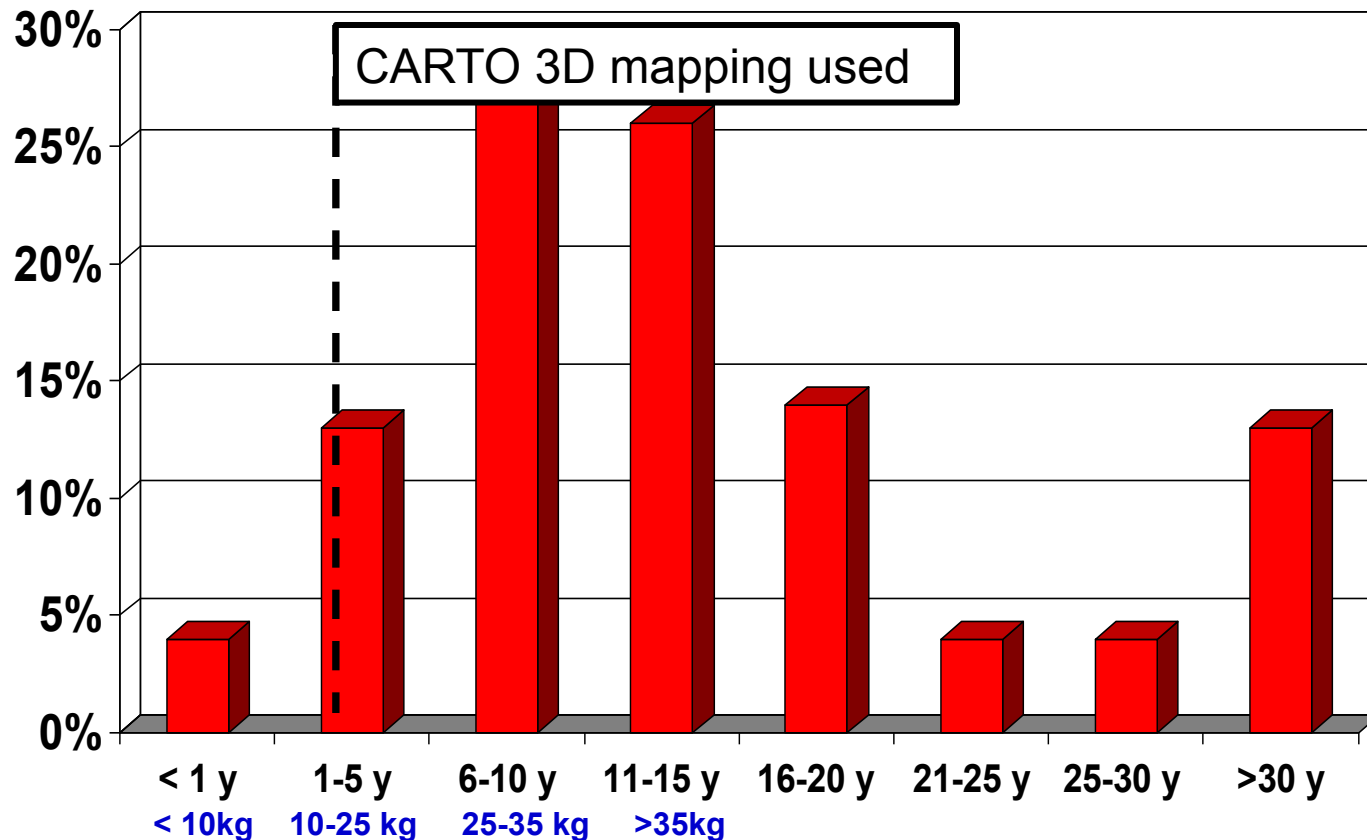
Boston Children's Hospital



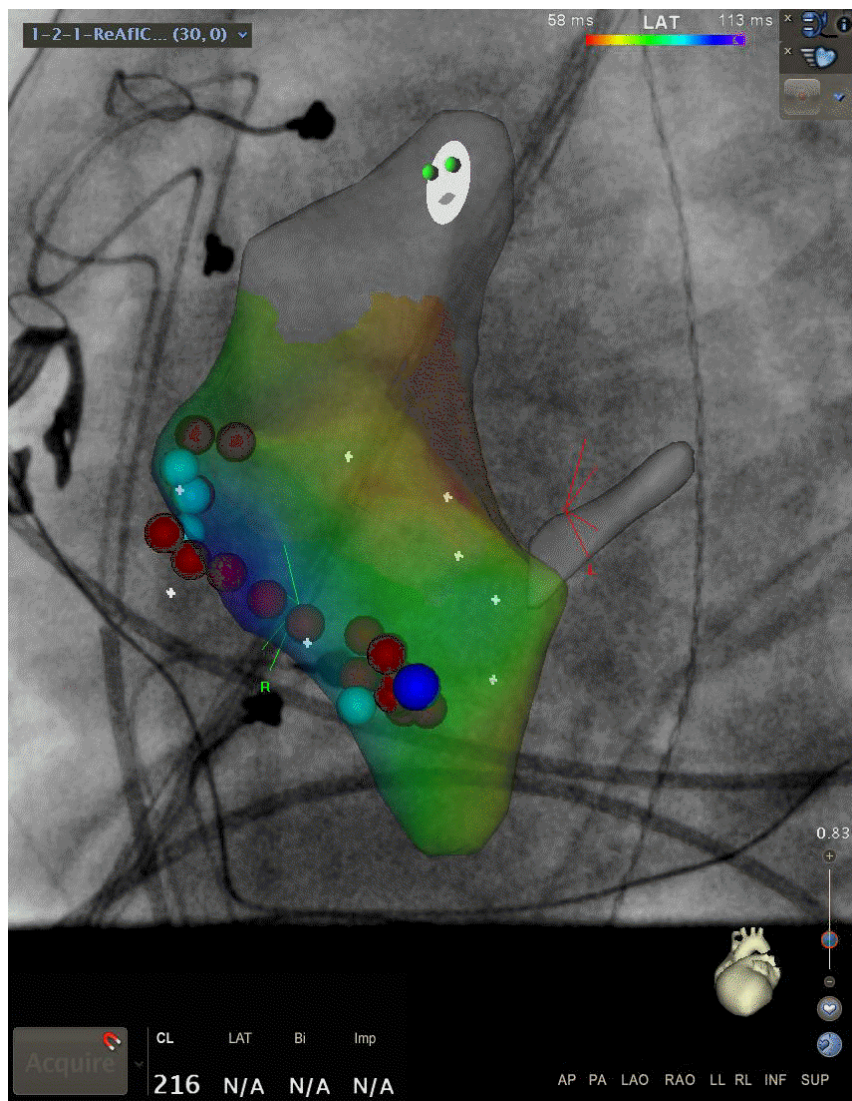


# Catheter Ablation Procedures by Age

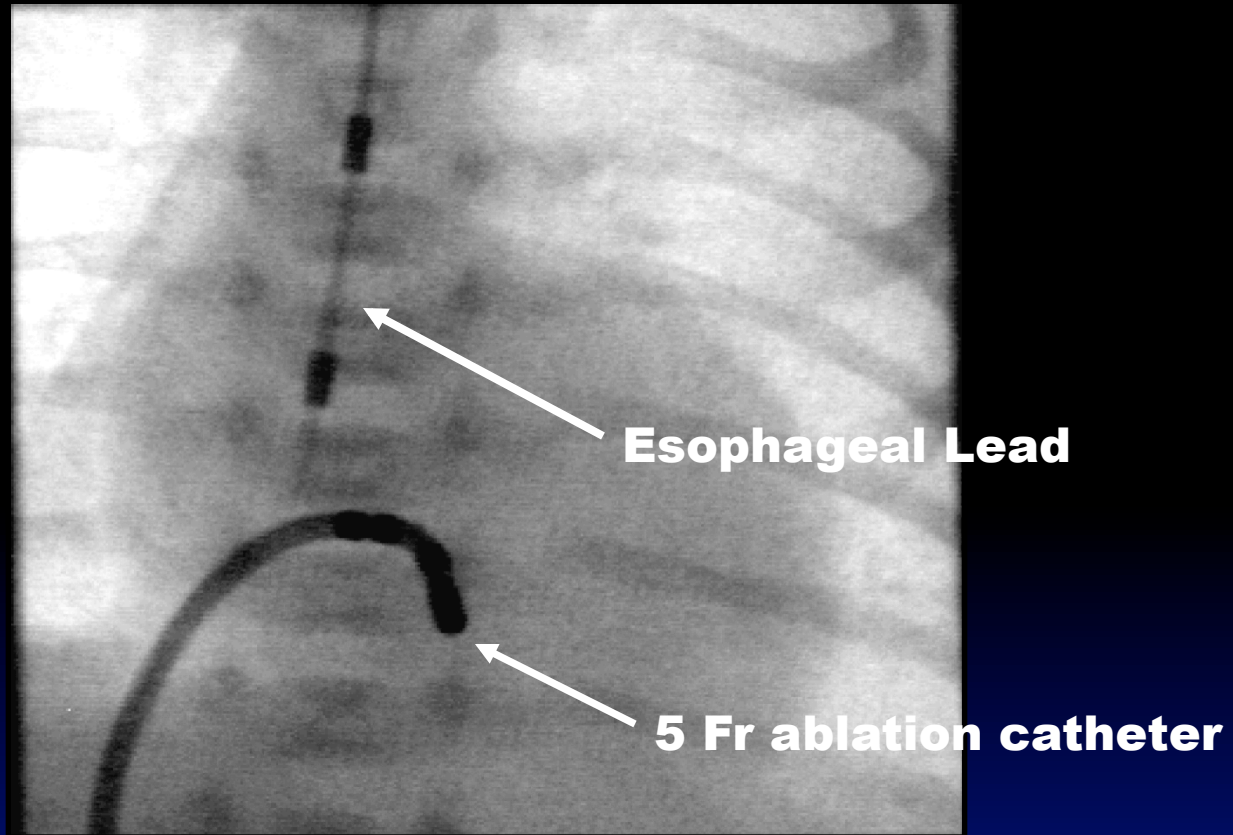
Boston Children's Hospital



10.4 kg , IART, s/p CCAVC



## 1.4 Kg, Tachy-Induced Myopathy

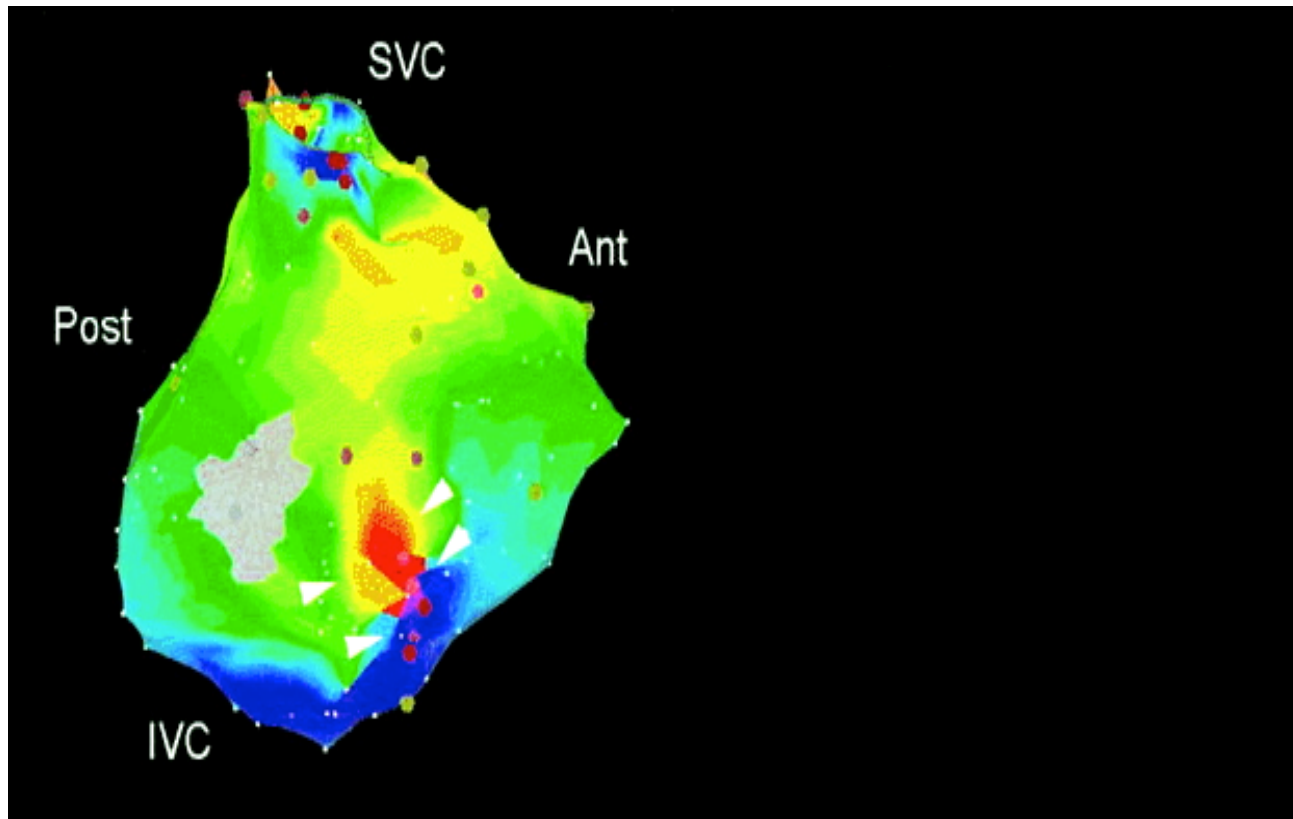


## ***3D Mapping Options***

- **CARTO**
- **NAVEX**
- **Others**

***No 3D system is a substitute for accurate signal interpretation, careful diagnostic analysis, anatomic knowledge, and application of fundamental EP principles***

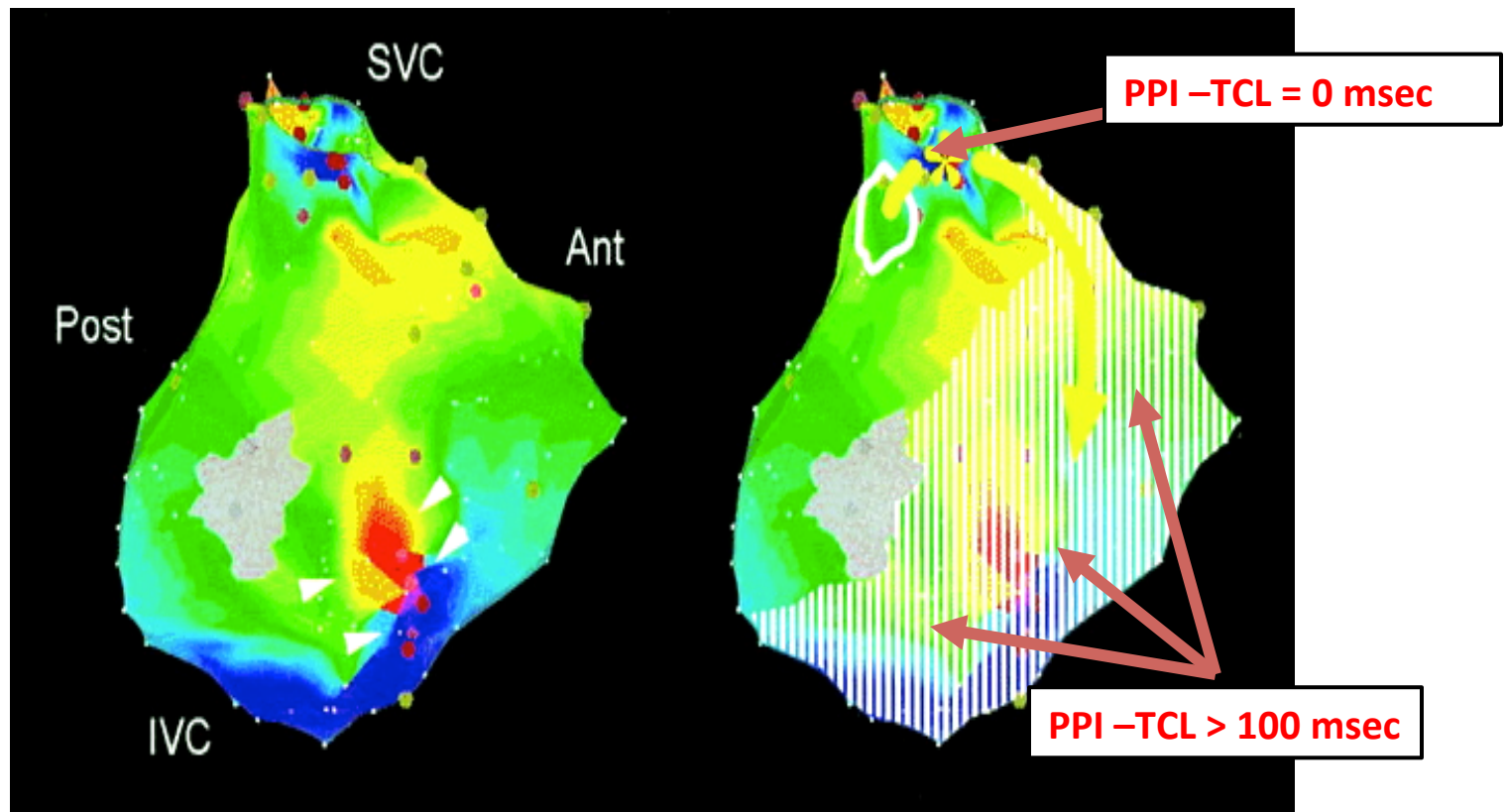
# ***Importance of Entrainment Maneuvers***



**IART s/p Atrio-Pulmonary Fontan for TA**



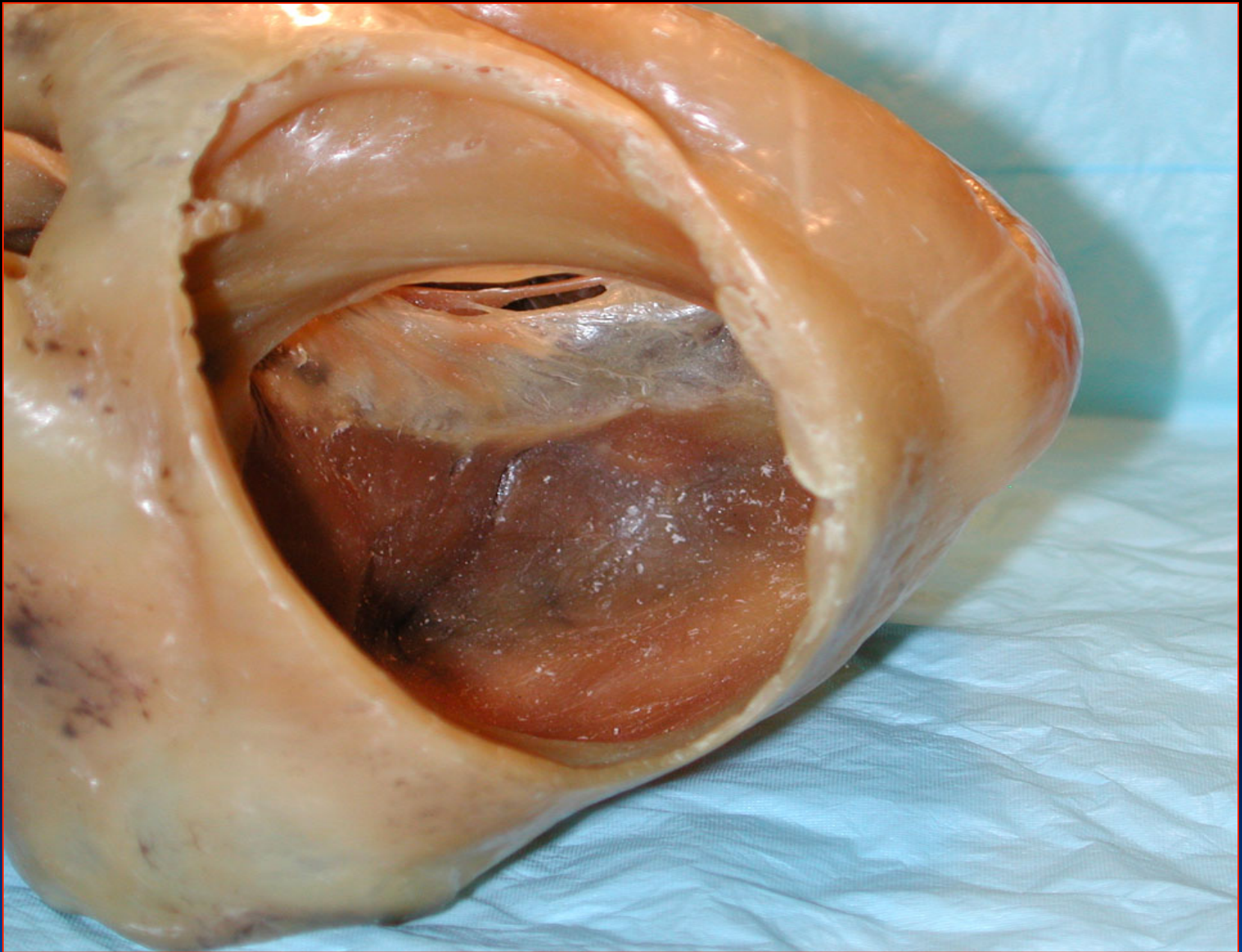
# *Importance of Entrainment Maneuvers*



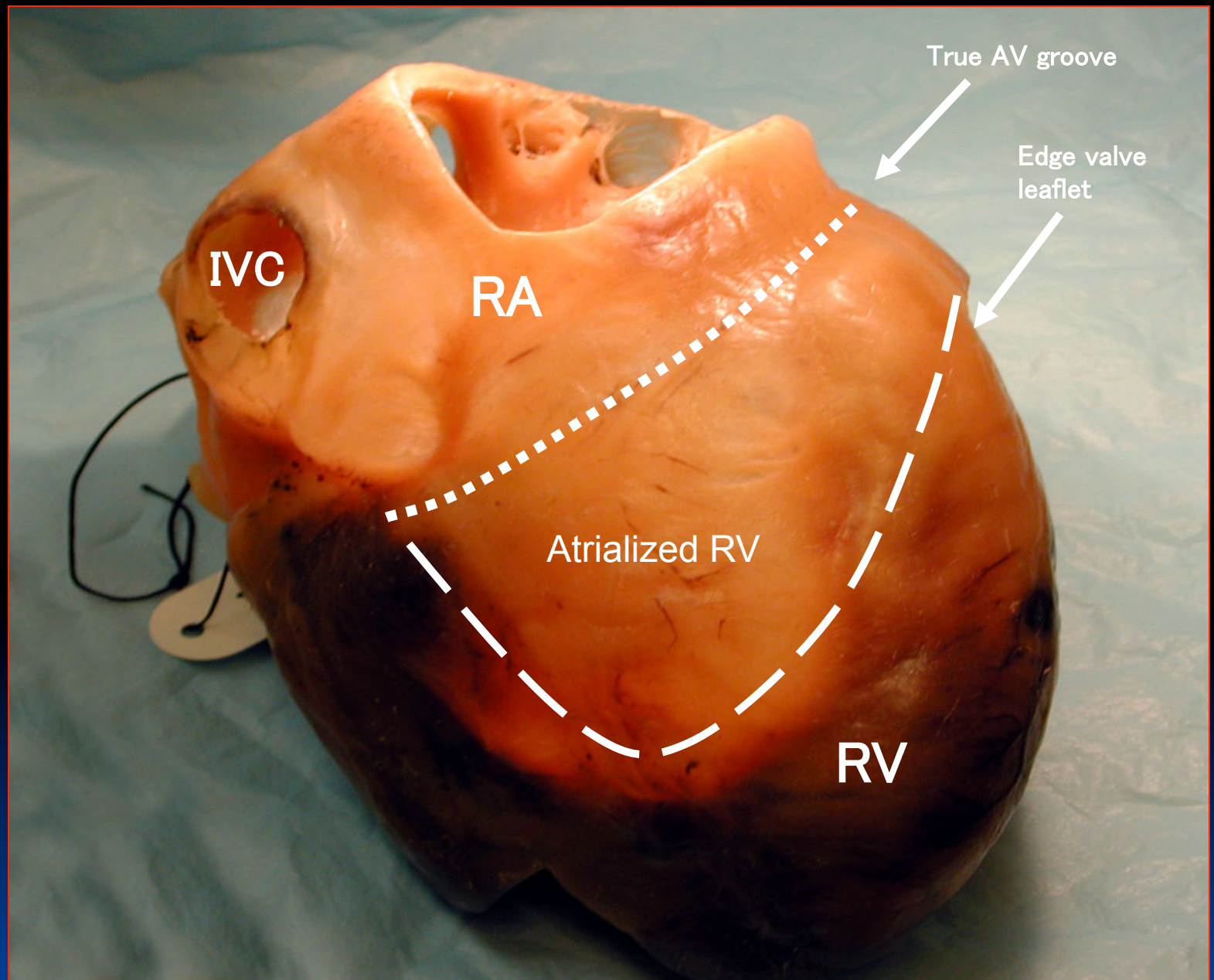
IART s/p Atrio-Pulmonary Fontan for TA

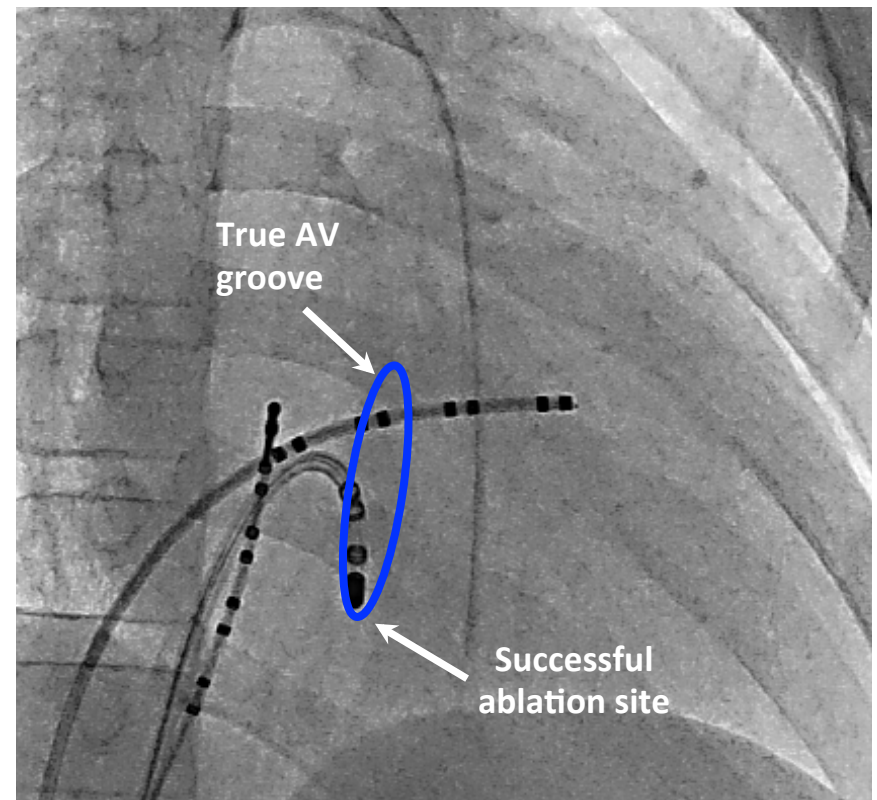
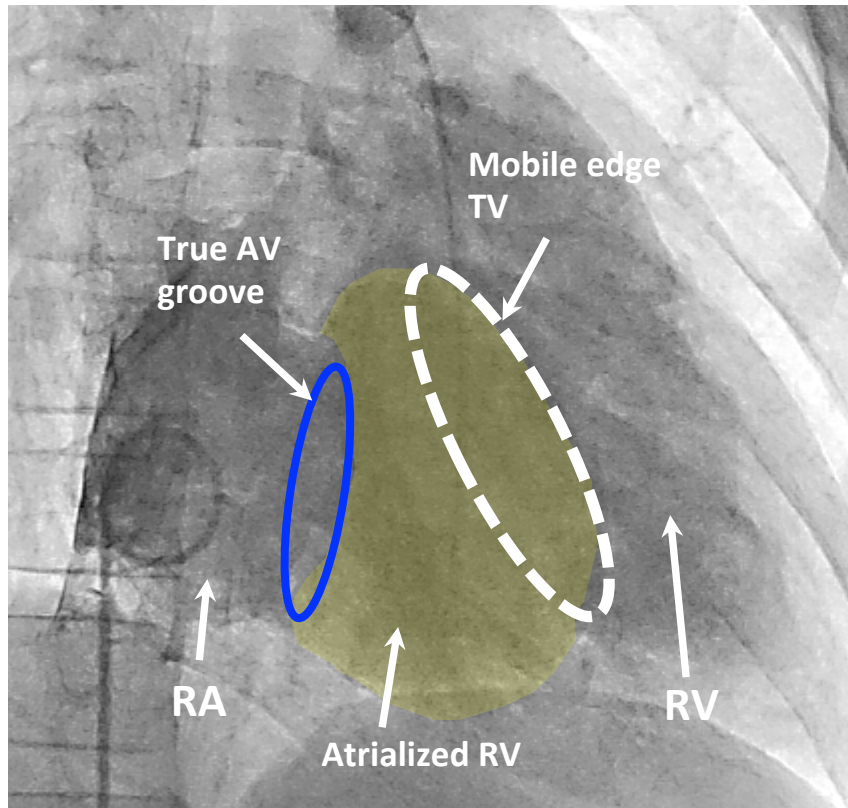


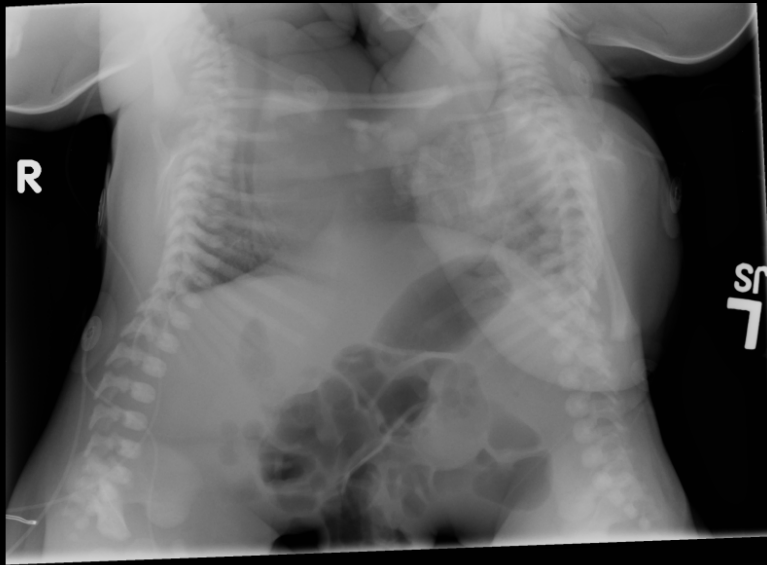








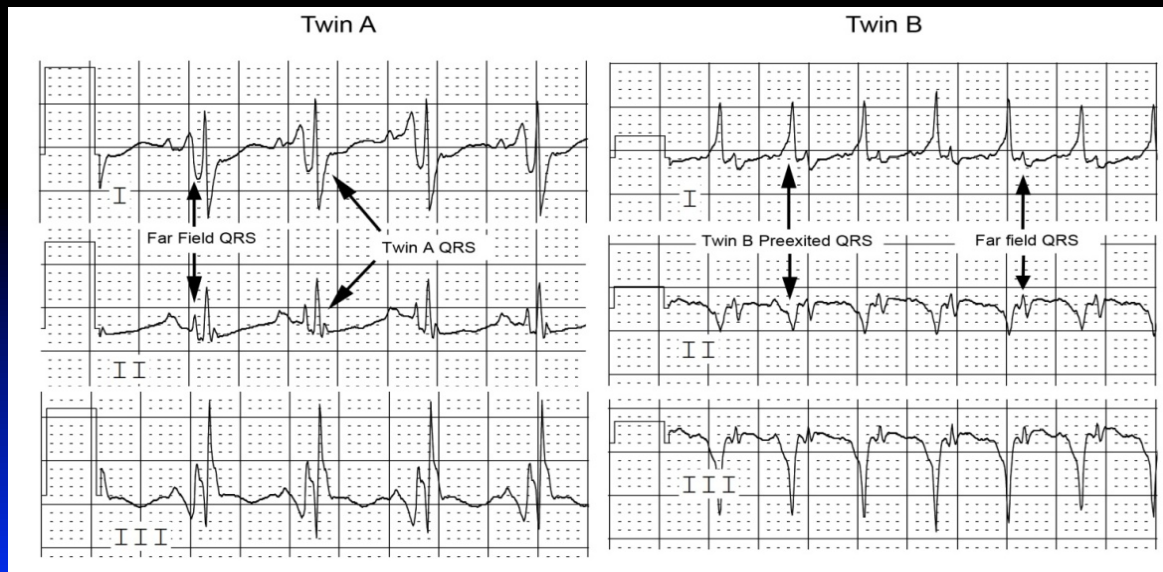
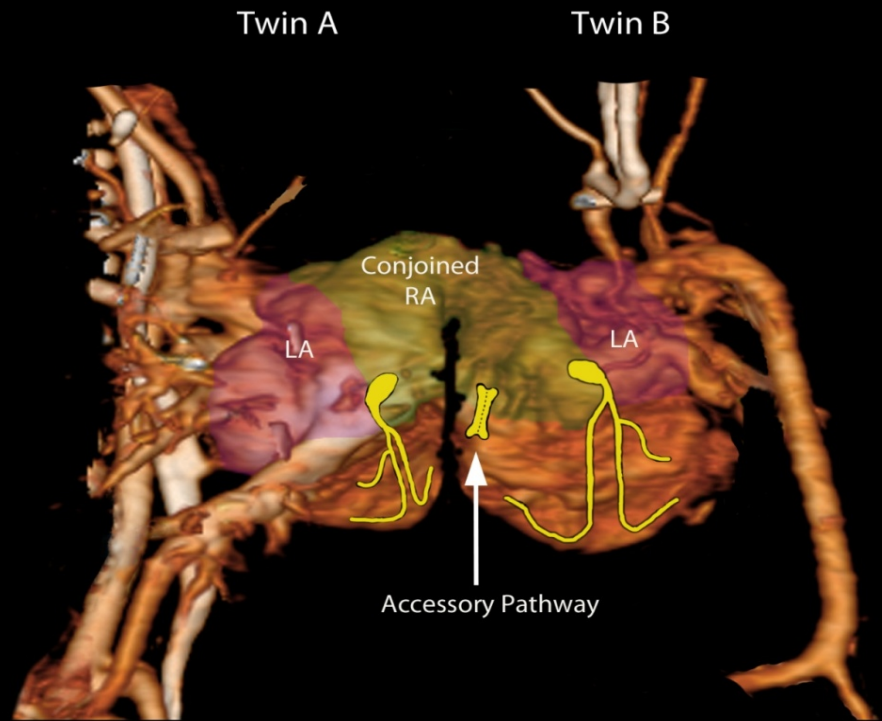




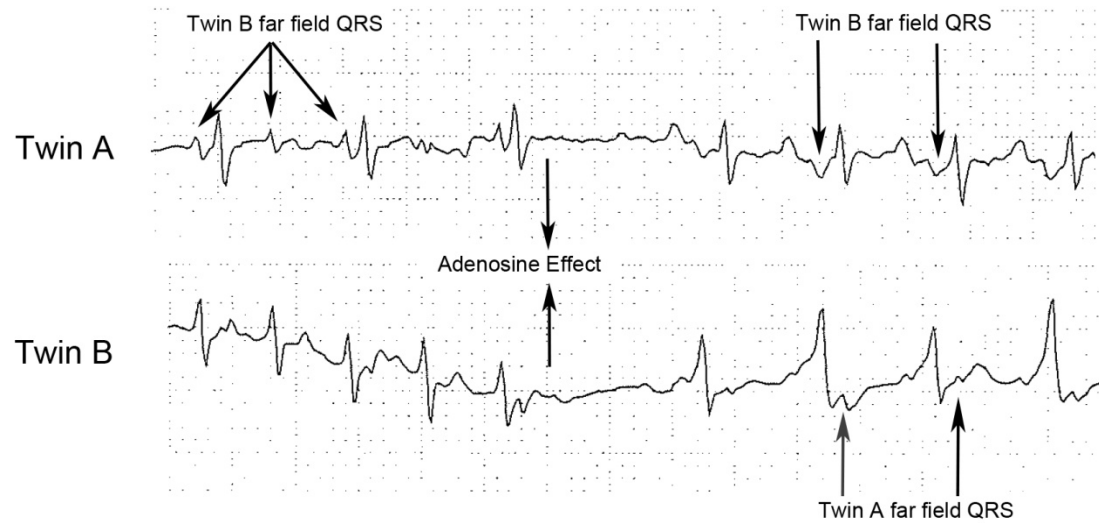
twins A

Portable

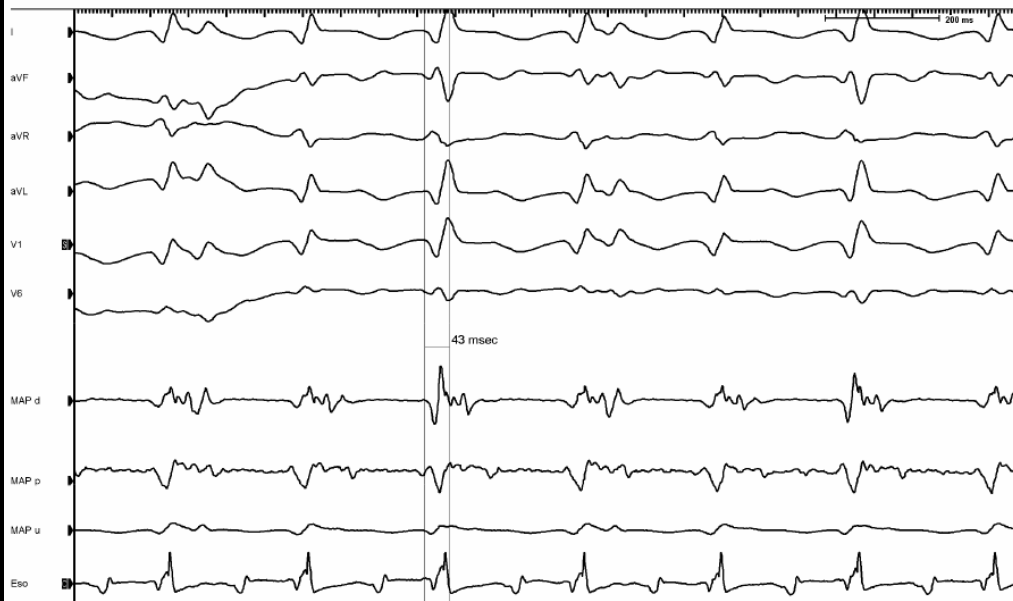
twins B



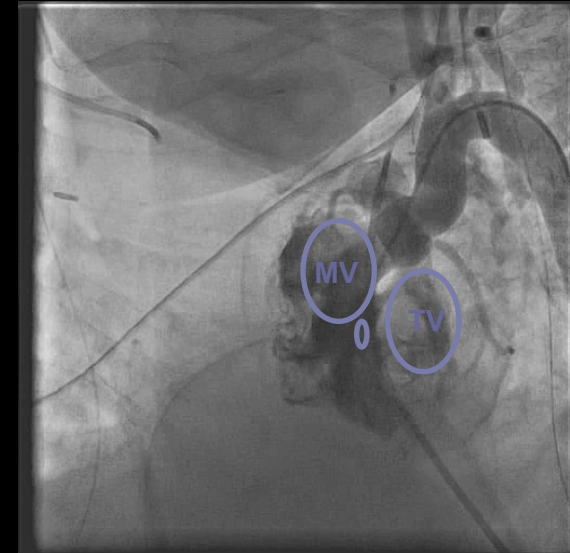




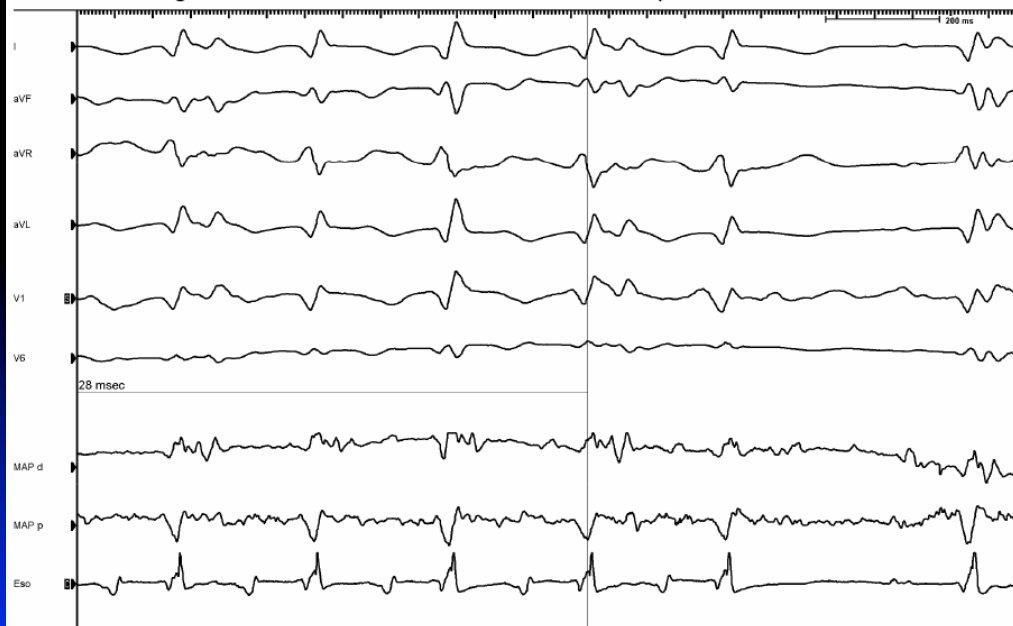
VA interval on success site of 45 ms with no isoelectric time



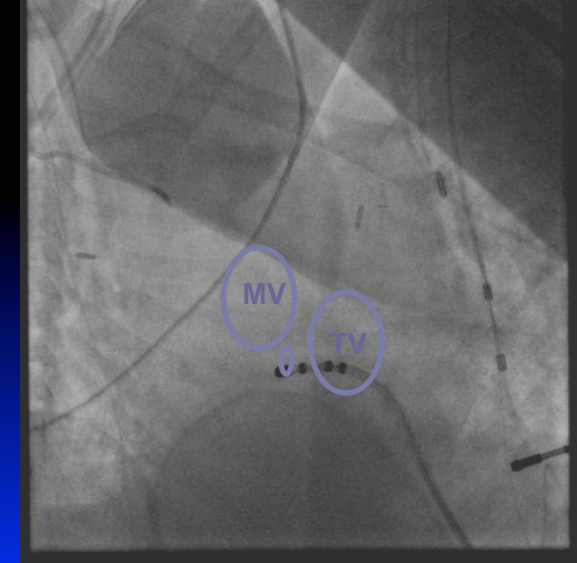
RF Ablation (age 4 mos)



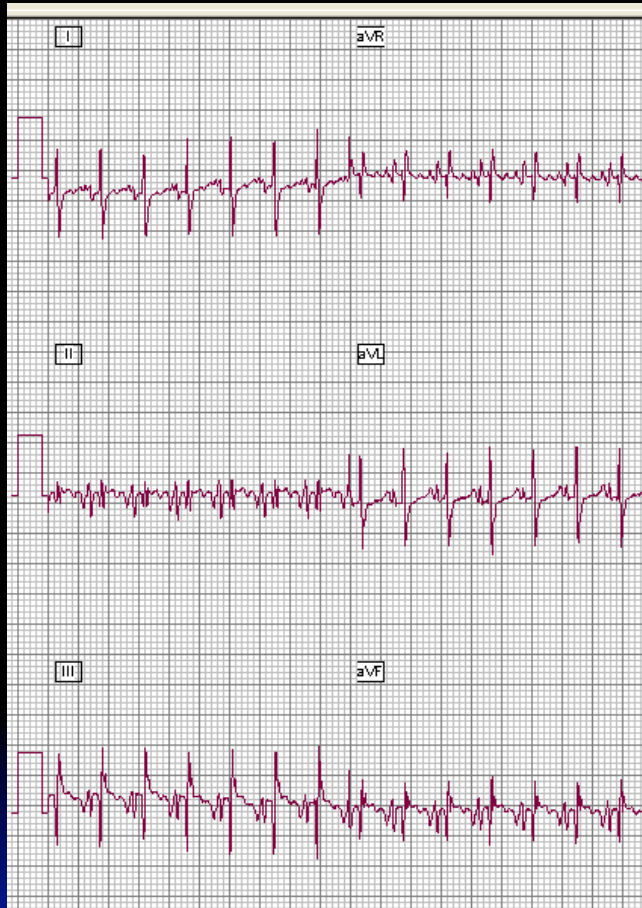
Successful retrograde termination of SVT at 1.7 seconds and no preexcitation



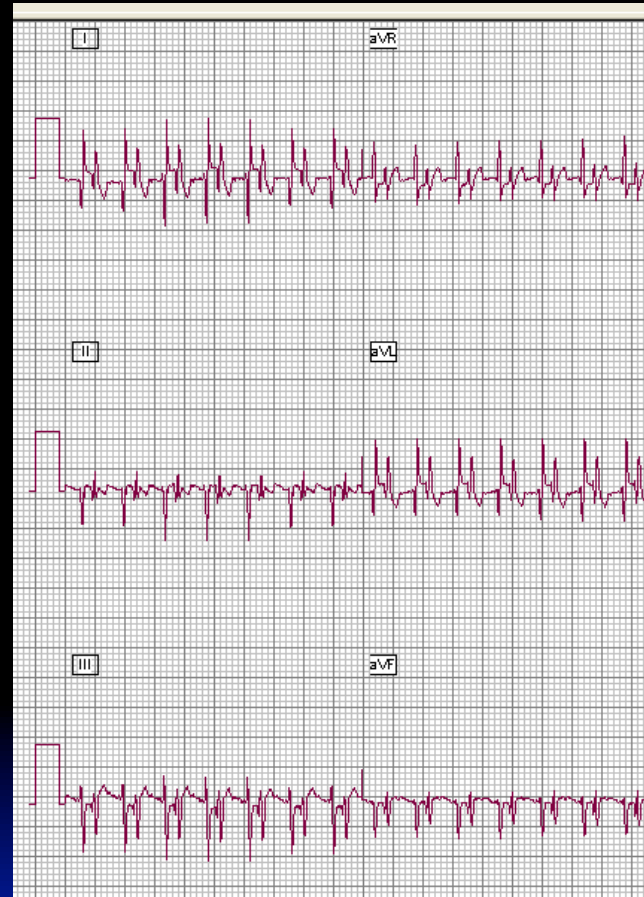
ea of Success LAO  
wer. Kaelynn  
09110  
1/14/2012  
UDY 1



## Post-ablation

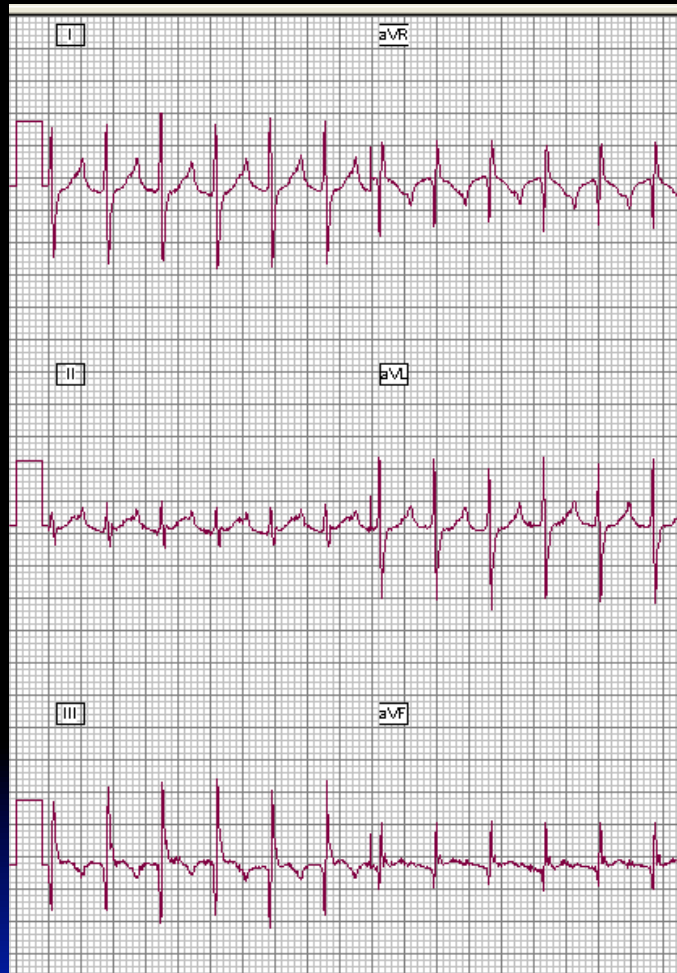


Twin A

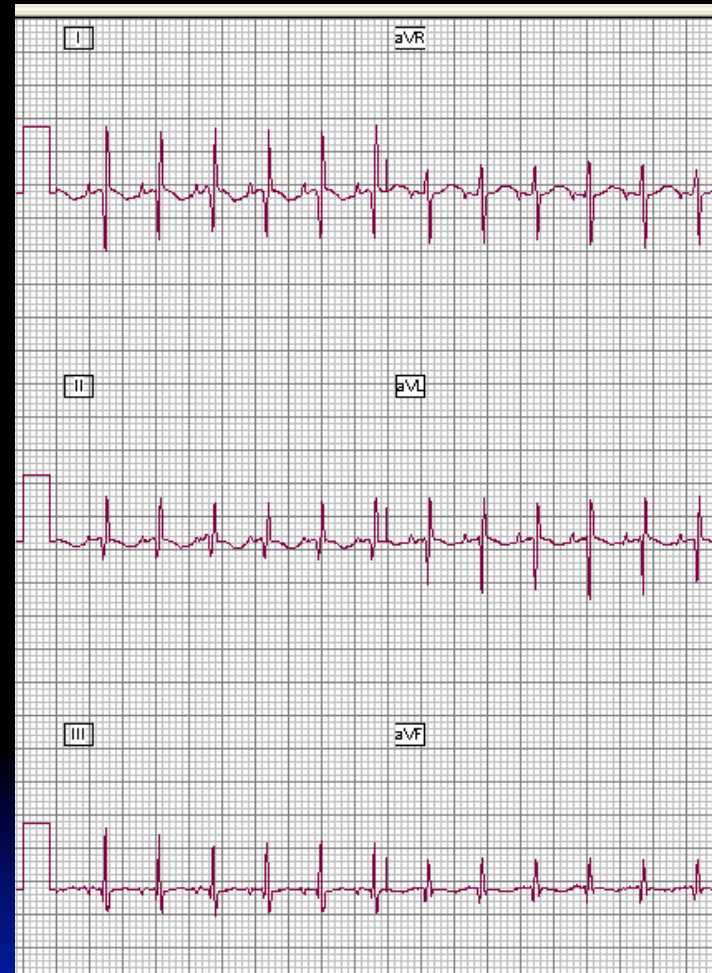


Twin B

## Post-separation age 5 mos



Twin A



Twin B

# *Technical Advances*



1902



2017



# ***Ablation with 3D mapping in Small Children***

## ***Conclusions***

- **Small children require certain technical modifications in order to perform ablation safely and effectively.**
- **CHD distorts anatomy and creates unique increase the challenge of ablation even for relatively simple substrates, such as AVNRT and AP's.**
- **3D mapping is an invaluable technical advance for improvement in safety and efficacy of catheter ablation**