



# How can new technologies help improving outcome and safety in interventional cardiology

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**Elettrostimolazione**

**Emodinamica**

**Elettrofisiologia**

**Strutturale**



**1987**

From direct current shocks to radiofrequency ablation

Smaller and controllable lesions

1987



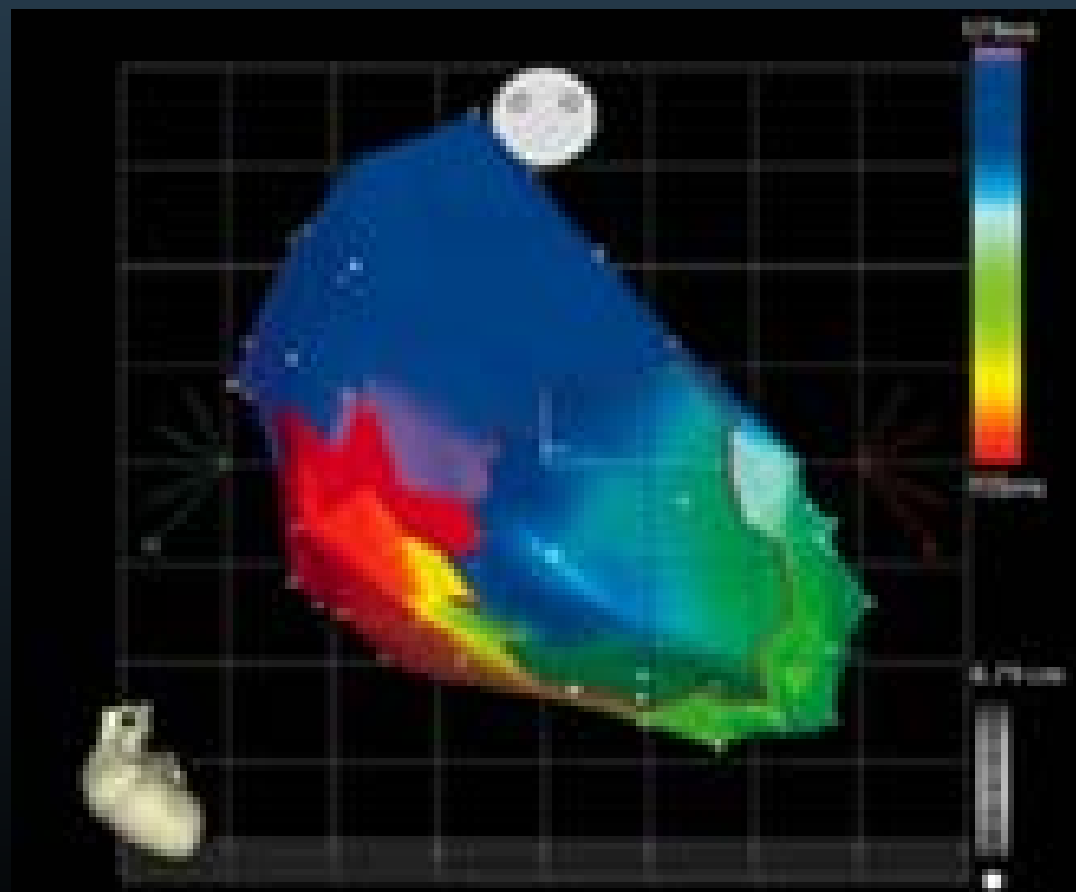
1995

Electroanatomic  
mapping system

Complex arrhythmias

X- rays reduction

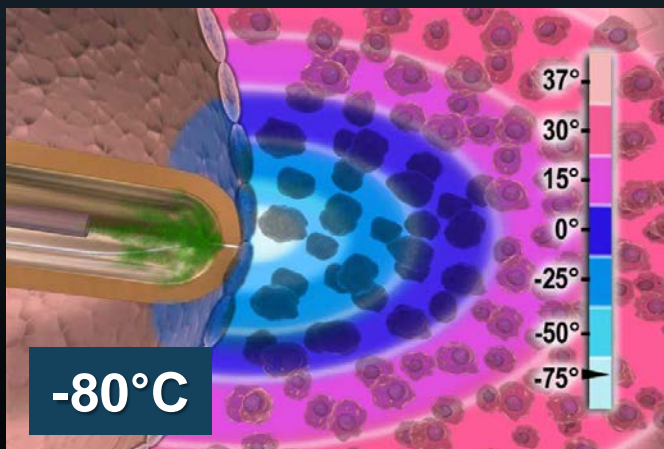
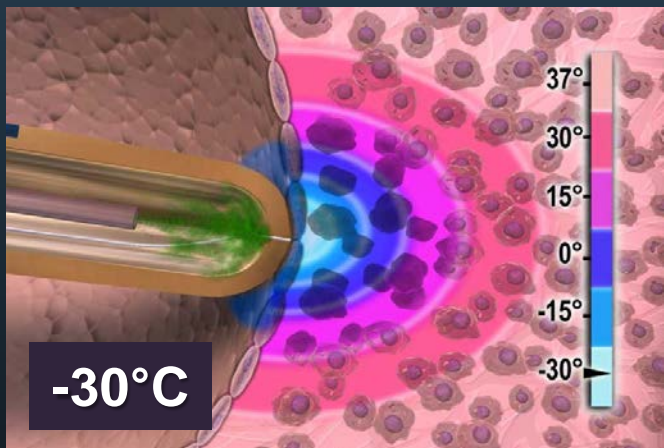
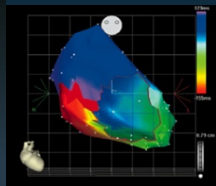
**AF:**  
from 94 min (1998)  
to 2.5 min (2015)



1987



1995



## 1998 Crioenergy

Test lesion

Ablation close to AV Node:  
parahissian WPW, Nodal tachycardia

AV Block Reduction :

Parahissian WPW: **RF 5%**

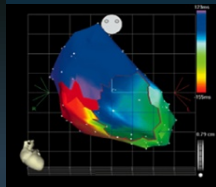
AVNRT: **RF 0.7-1.7%**

**Virtually  
0%**

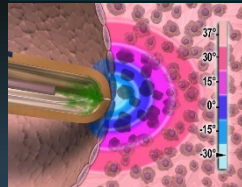
1987



1995



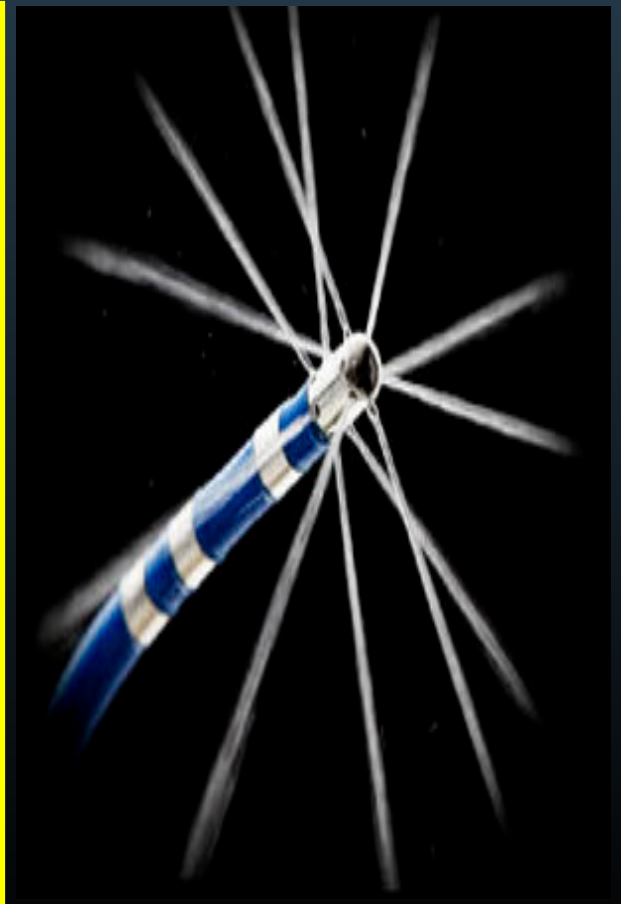
1998



## 2002 Irrigated tip

No charring

Larger lesion, left side



RF  
ablation  
cathete  
r

4 mm



RF ablation  
cooled  
catheter

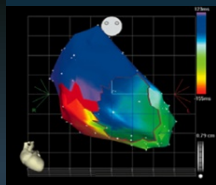
4 mm



1987



1995



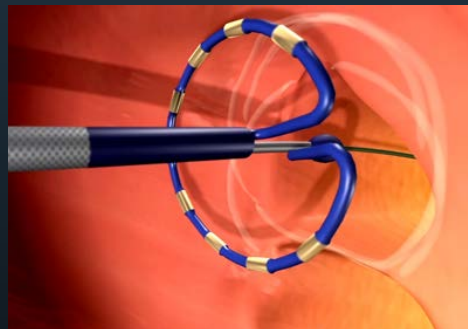
1998



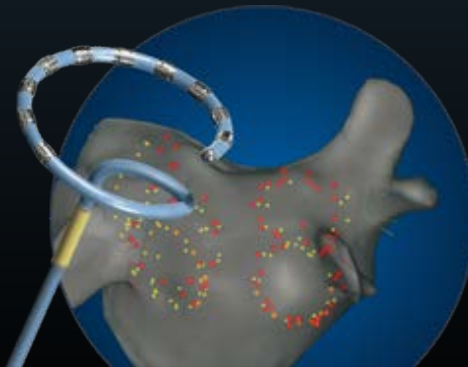
2002



## 2005 One shot system



Easy to use

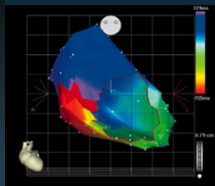


Efficacy comparable to  
traditional  
radiofrequency

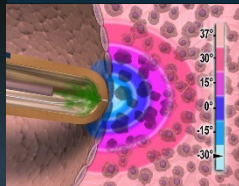
1987



1995



1998



2002

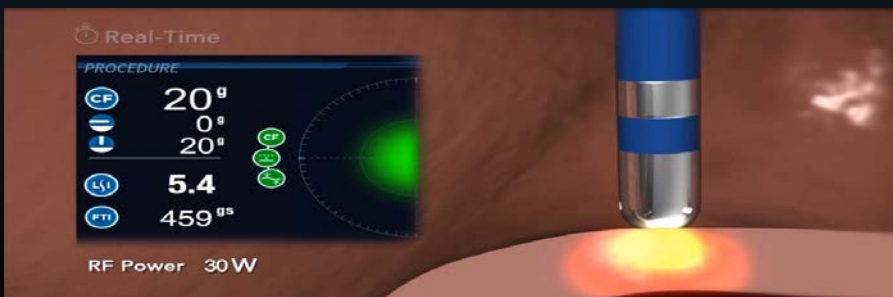


2005



**2010 Contact Force**

**Contact confirmation:  
more efficiency**



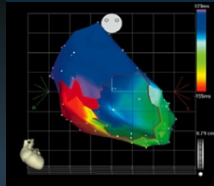
**Warning excessive strenght:  
more safeness**



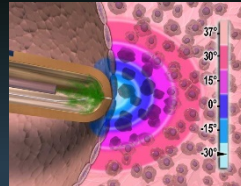
1987



1995



1998



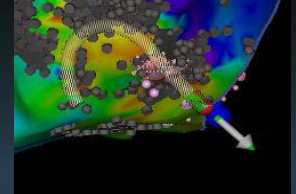
2002



2005



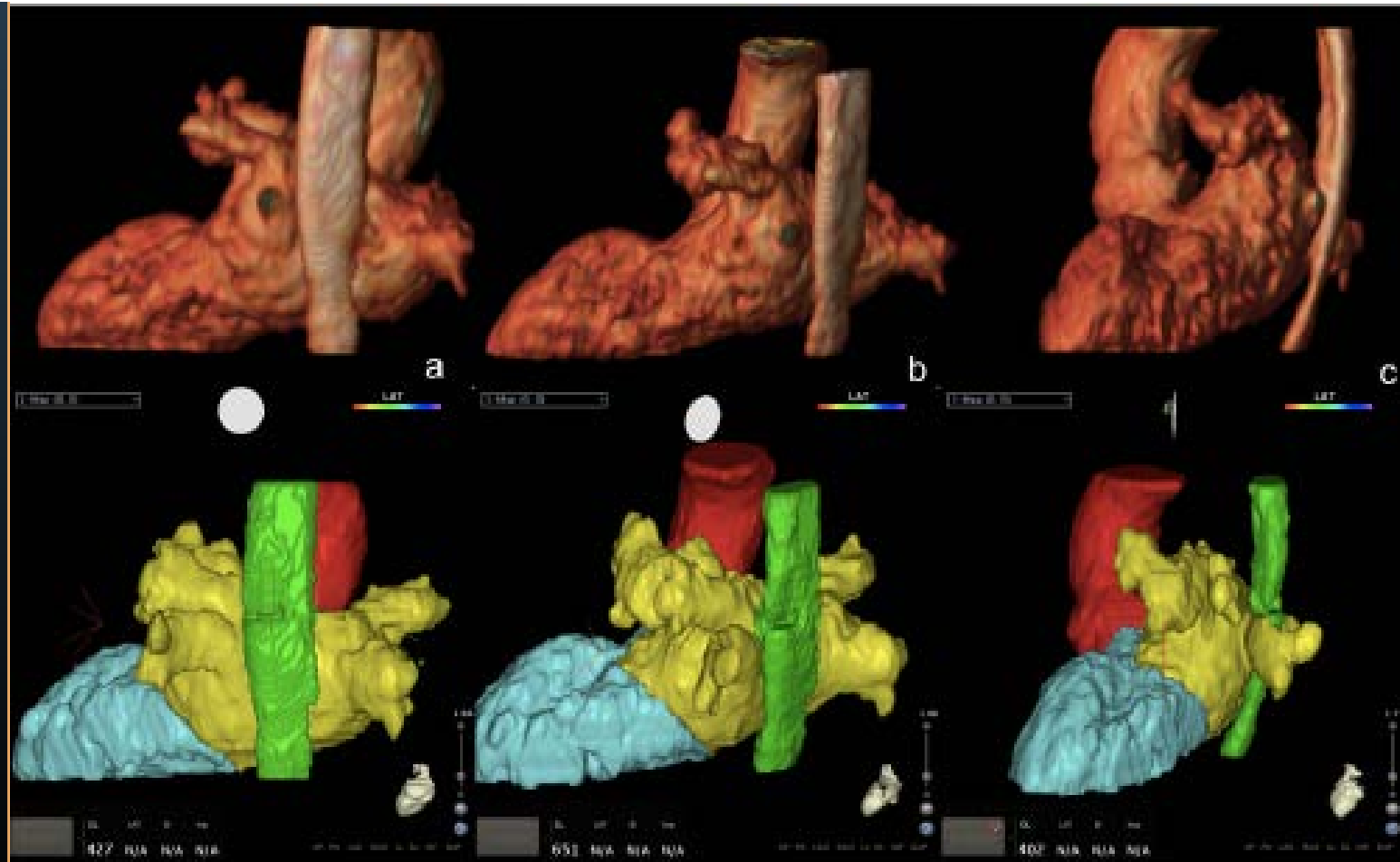
2010



2014-2015

# Use of oral gadobenate dimeglumine to visualise the oesophagus during magnetic resonance angiography in patients with atrial fibrillation prior to catheter ablation

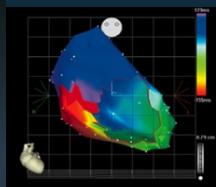
Riccardo Faletti<sup>1</sup>, Alessandro Rapellino<sup>1\*</sup>, Francesca Barisone<sup>1</sup>, Matteo Anselmino<sup>2</sup>, Federico Ferraris<sup>2</sup>, Paolo Fonio<sup>1</sup>, Fiorenzo Gaita<sup>2</sup> and Giovanni Gandini<sup>1</sup>



1987



1995



1998



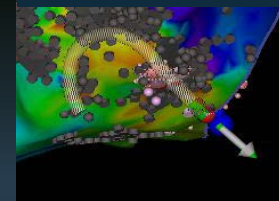
2002



2005



2010



# 2014-2015

**Common  
Flutter**

**Atypical  
Flutter**

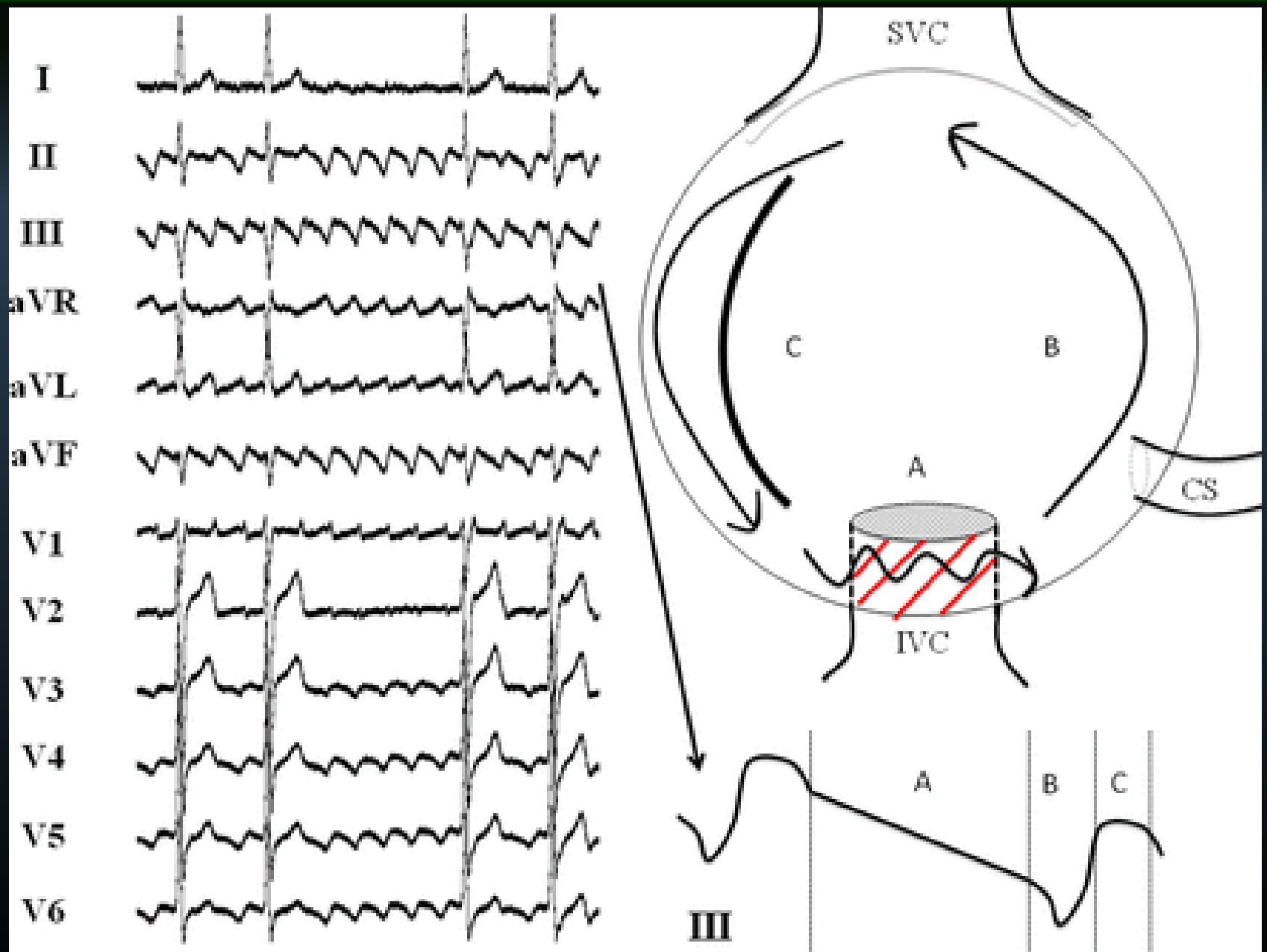
# Macroreentrant arrhythmia

Reentrant circuit

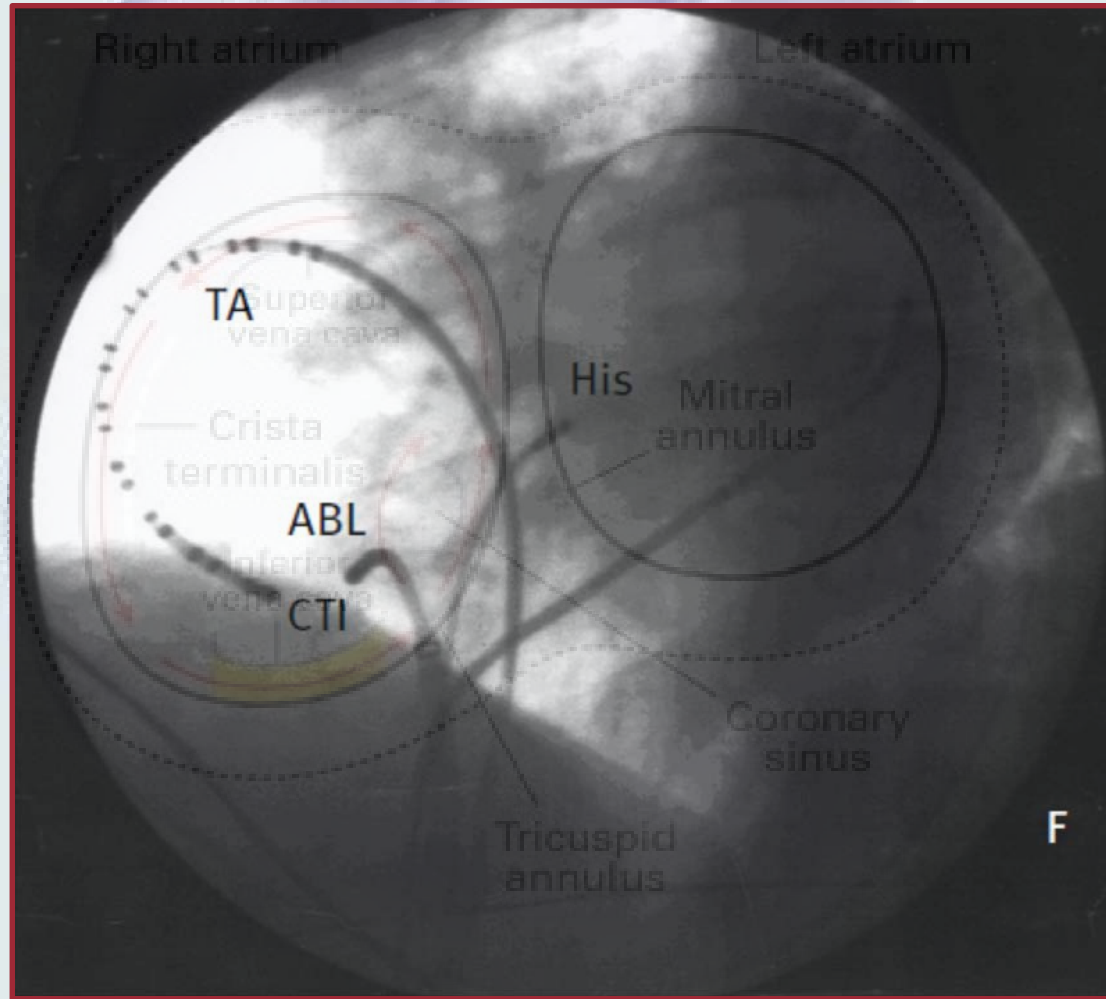
Critical Isthmus



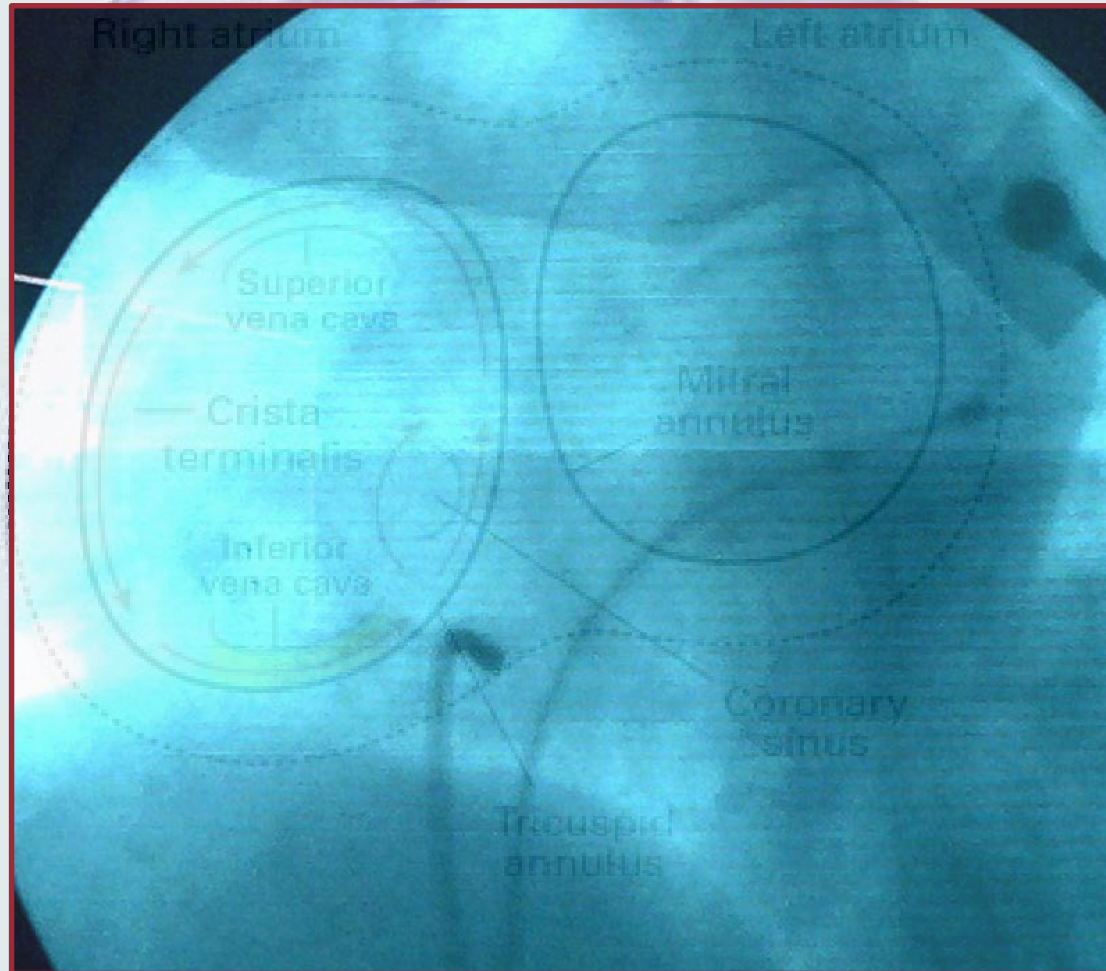
# Common Flutter



# Common Flutter

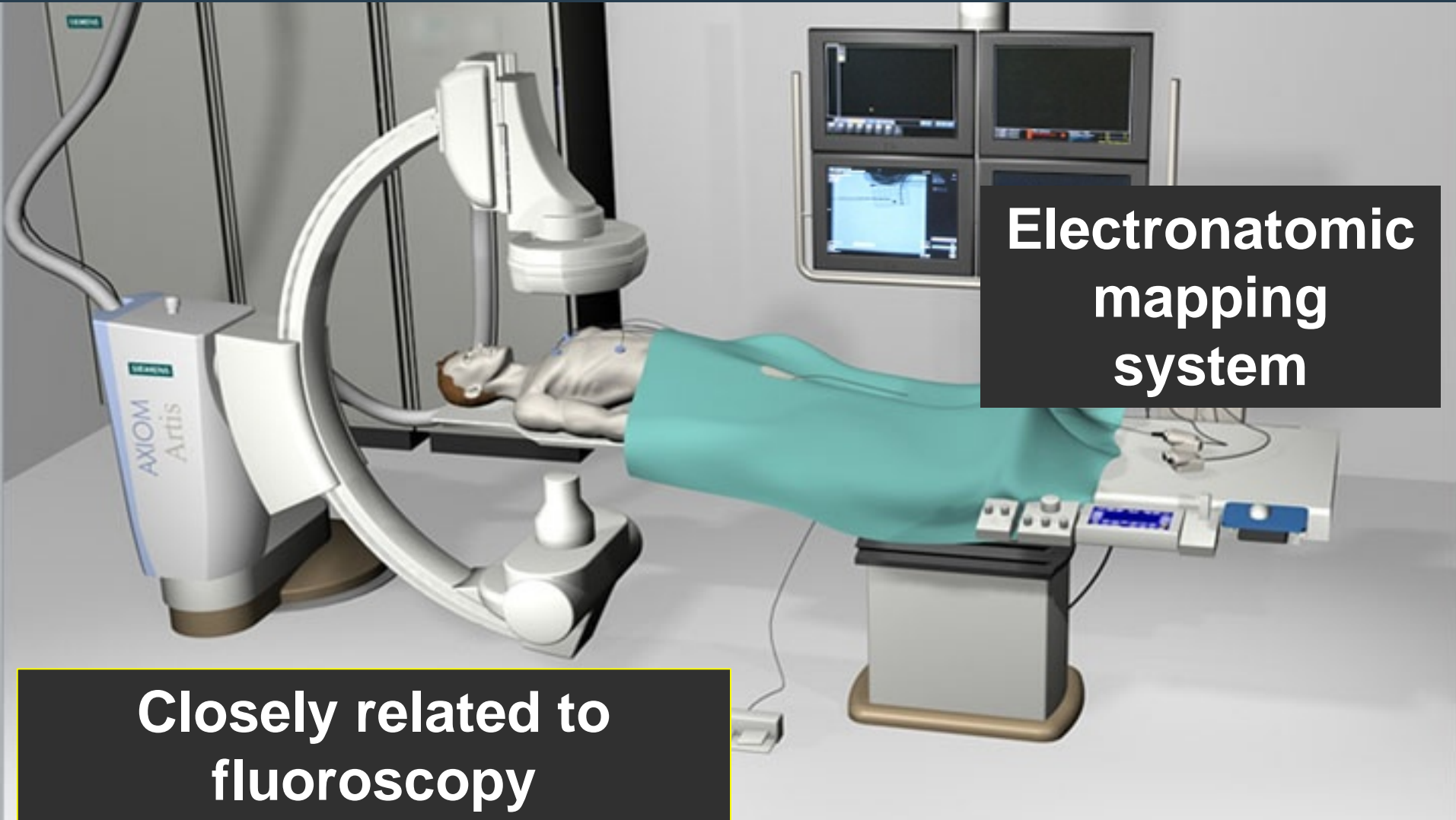


# Common Flutter





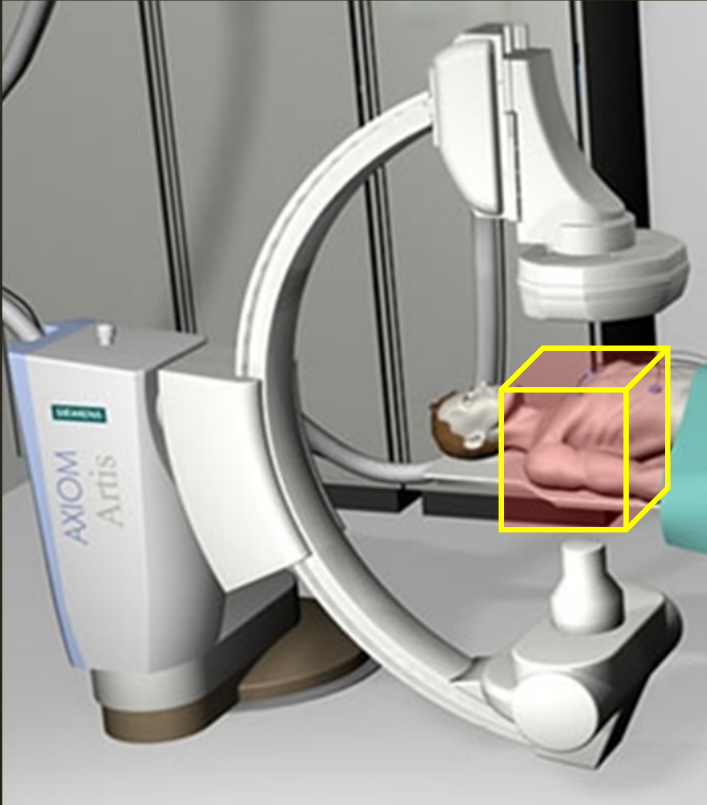
# MEDIGUIDE



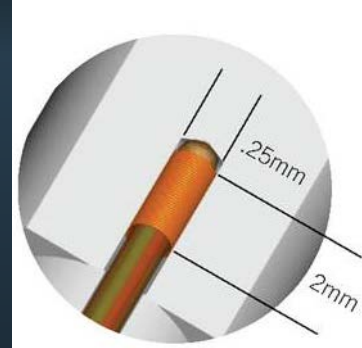
**Electronatomic  
mapping  
system**

**Closely related to  
fluoroscopy**

# Mediguide: **Sensor**



**Magnetic field  
generator**



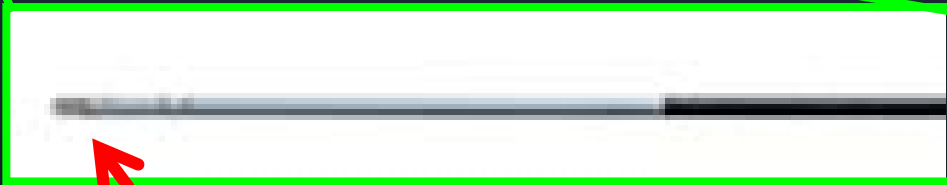
**Sensor**

**Coil**  
**0.25 x 2 mm**

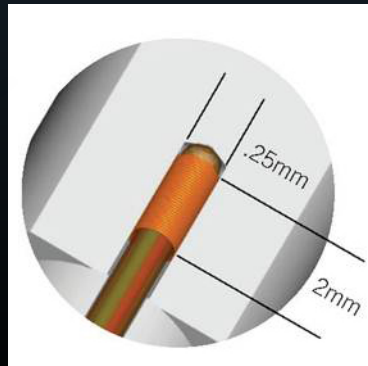
Integrated in tools  
(catheters, wires)

# Mediguide enabled catheter

Diagnostic	OD	Electrodes (Spacing)	Electrode Size	Curve
Livewire Diagnostic Catheter, MediGuide Enabled	6 F	10 (2-5-2)	2 mm tip 1 mm bands	Medium Sweep

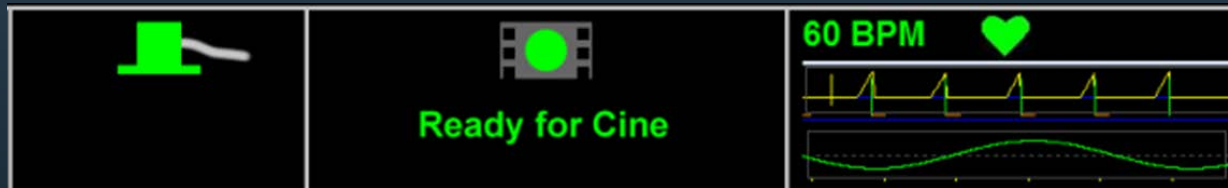


Encapsulated sensor located here



# Mediguide: X-ray integration

Acquiring ECG-gated cine loop



Fluoroscopy (no need for fluorography)

3 cardiac cycles


Loop repeated, ECG synchronized

# Mediguide: X-ray integration

St Jude gMPS 2

25

7/20/1962  
1/23/2015  
8:47:10 AM



cm 20  
LAO:34 / CR:0.1

[Live] [0000] Zoom: 1.0 SID: 98 LAO: 34 CA: 1

Turn Magnet OFF

St Jude gMPS 1

Procedure


Tools Setup Cine Reset Zoom Crop

New Close Patient Setup Tools About Exit

Livewire Out of MB

Ready for Cine

78 BPM



ST. JUDE MEDICAL

# Mediguide: X-ray integration

The image displays the Mediguide software interface for CS positioning, featuring two X-ray views side-by-side. The left view is labeled 'St Jude gMPS 2' and the right view is labeled 'St Jude gMPS 1'. Both views show a top-down perspective of the heart with catheters and ablation points. The left view shows a green ablation point, while the right view shows a blue ablation point. The interface includes a toolbar with various tools like 'Live Wire', 'Port2', 'Port3', 'IVC', 'CS OS', 'CS Park', 'More Land marks', 'Assign LM', 'Show LM', 'Hide All LM', and 'Undo Last'. A 'Turn Magnet OFF' button is visible in the bottom right of the left view. The bottom right corner shows a heart rate of 82 BPM and an 'Irregular heart rate' warning. The St. Jude Medical logo is in the bottom right corner.

St Jude gMPS 2

St Jude gMPS 1

Turn Magnet OFF

St. JUDE MEDICAL

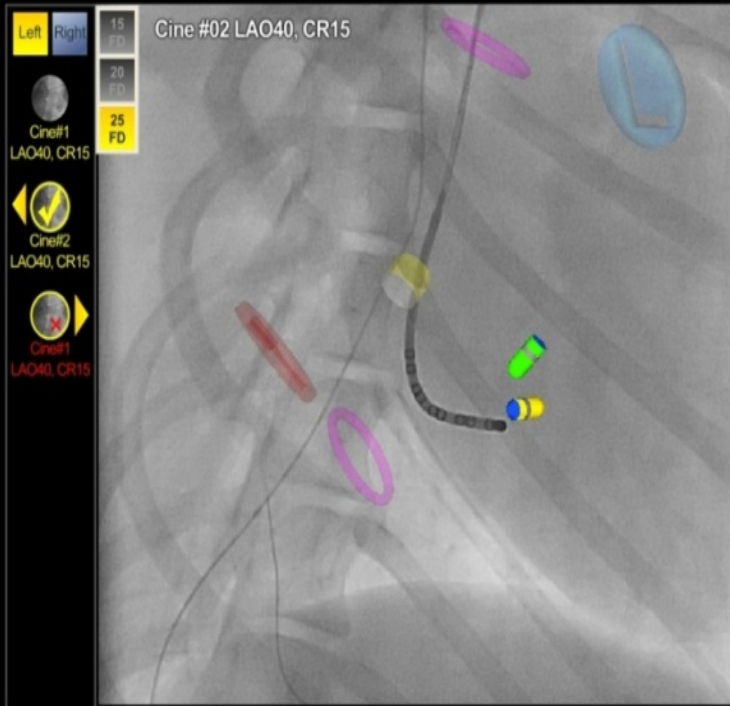
82 BPM

Irregular heart rate

ECG EP Curve

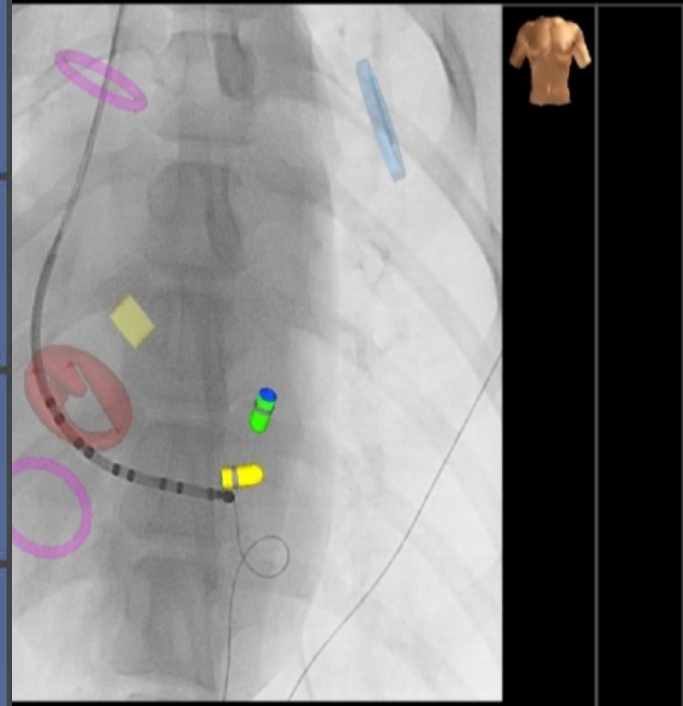
CS positioning

# Mediguide: Landmark types



## Landmarks

 IVC	 SVC	 RVOT
 CS OS	 CS Park	 RAA
 RIPV Ostium	 RSPV Ostium	 Point Mark
 LIPV Ostium	 LSPV Ostium	 OS



Procedure Landmark Cineloop

Tools CS gABL Port 3 Marks IVC CS OS CS Park IHI More Land Marks Assign LM Show LM

Assign LM Show LM Undo Last

Close

Motion Sensor Out of Range

Ready For Cineloop

Detector Out of Range

80 BPM

Smith John ID# 23456789



# Mediguide: His Landmark

St Jude gMPS 2

25

\* 7/20/15 8:47:10 ZZZ

cine #1 LAO 34 CA 1

cine #2 RAO 30 CA 1

PointMark

cm 25 LAO 34 CA 1

[Cine #1] [0048] Zoom: 1.0 SID: 98 LAO: 34 CA: 1

St Jude gMPS 1

\* 7/20/15 8:48:27 ZZZ

PointMark

cm 25 RAO 30 CA 1

[Cine #2] [0050] Zoom: 1.0 SID: 98 RAO: 30 CA: 1

Turn Magnet OFF

ST. JUDE MEDICAL

Procedure Landmark Cine

Tools Setup Live as Cine Reset Zoom Un Crop

Live Wire Port2 Port3 Marks IVC CS OS CS Park More Landmarks

Assign LM Show LM Hide All LM Undo Last

Livewire

Ready for Cine

60 BPM



# Mediguide: Common Flutter Ablation

**St Jude gMPS 2**

25

Cine #1 LAO 34 CA 2

Cine #2 LAO 34 CA 2

Cine #3 RAO 34 CA 2

Cine #4 LAO 34 CA 2

PointMark

RAA IVC

cm 25 LAO 34 1 0

[Cine #4] [0054] Zoom: 1.2 SID: 100 LAO: 34 CA: 2

Turn Magnet OFF

**St Jude gMPS 3**

Right atrium

Left atrium

Superior vena cava

Crista terminalis

Inferior vena cava

Mitral annulus

Coronary sinus

Tricuspid annulus

**St Jude EnSite**

No Sig

Procedure Landmark Cine

Tools Live as Cine Reset Zoom Un-Crimp

Port1 Live Wire Abl Cath Marks IVC CS OS CS Park More Land marks Assign LM Show LM Hide All LM Undo Last

2 Livewi Ablati

HR= 71 bpm 840 ms BP= -31/-33/-33 mmHg

Power=30 Temp.=35 Imp.=84 Time=10

CS p [0.5]

CS 7-8 [0.5]

CS 5-4 [0.5]

CS 3-4 [0.5]

CS d [0.5]

ABL d [0.3]

ABL p [0.3]

aVF [1.0]

V1 [1.0]

POWER

TEMP

IMPED

CYCLES 10 on 22/09/2014 at 9:25:02 141

POWER	TEMP	IMPED	TIMES	Done
30	35	84	10	0:08:35
30	35	84	10	0:10:00

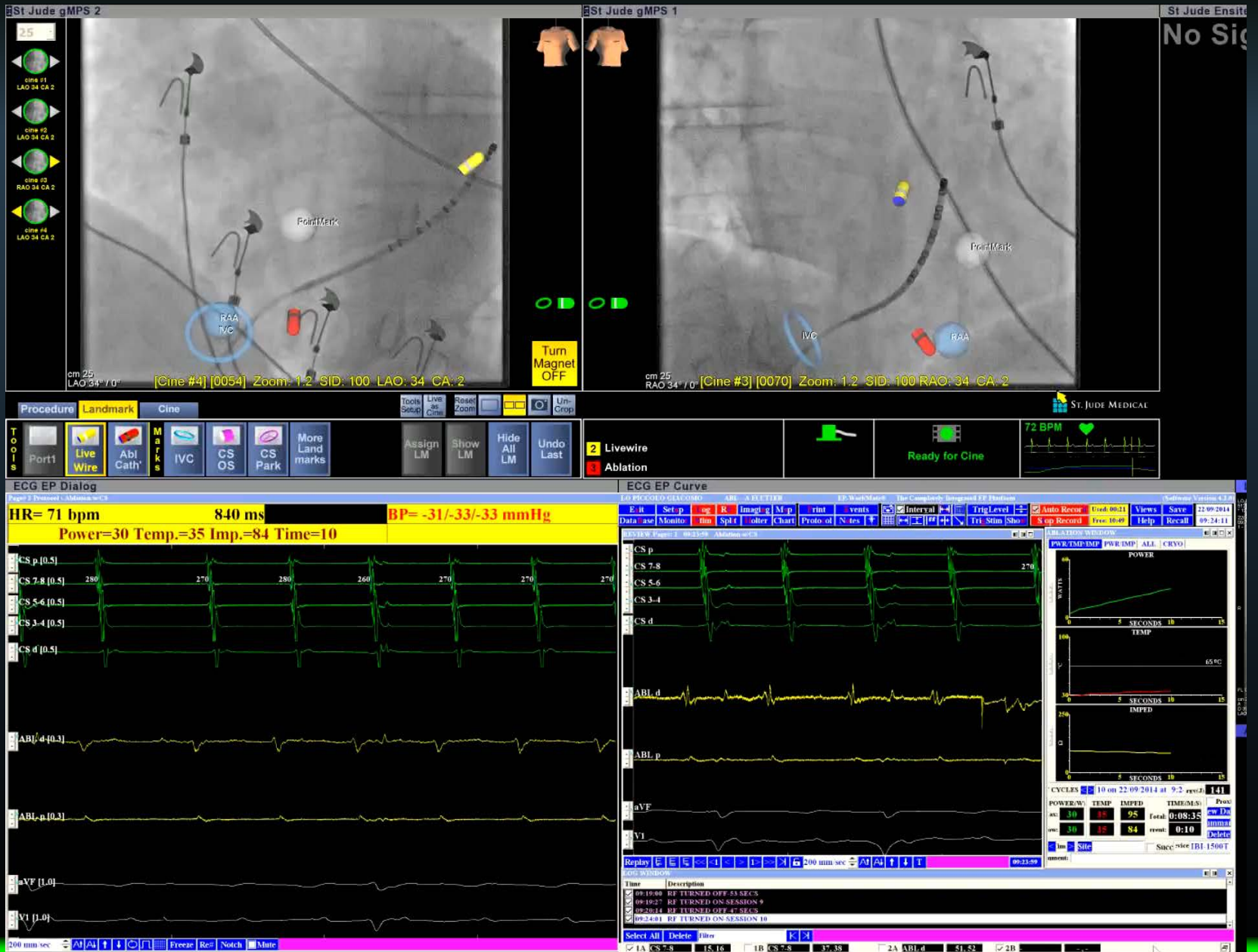
Time Description

- 08:10:00 RF TURNED OFF SUCCESS
- 08:10:05 RF TURNED ON SESSION 9
- 08:10:10 RF TURNED OFF SUCCESS
- 08:10:15 RF TURNED ON SESSION 10

Select All Delete Print

1A CS 7-8 15.1 1.0 CS 5-4 15.1 1.0 ABL d 31.5 1.0

# Atrial Flutter: Procedure



# Mediguide: Common Flutter Ablation

Mediguide X-Ray

Traditional X-Ray

5,30 min

11 min

## Fluoroscopy Reduction

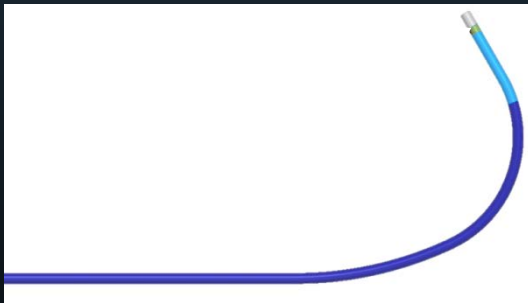


# Mediguide: **Procedures**

**CRT**

# CRT : Delivery Tools

Delivery Tool	OD (Fr)	ID (Fr)	Models
CPS Direct +, MediGuide Enabled outer catheter	10.1	8	115°
			135°
			Wide
CPS Aim +, MediGuide Enabled inner catheter	7.9	5.9	90° subselector
			135° subselector
			CSL cannulator



Outer catheter hub

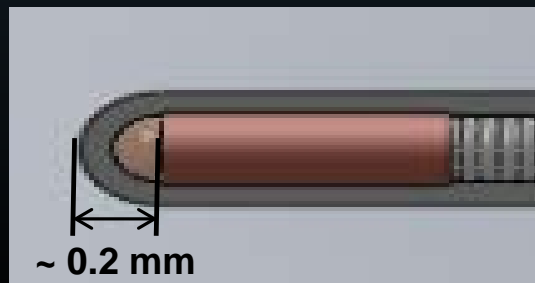
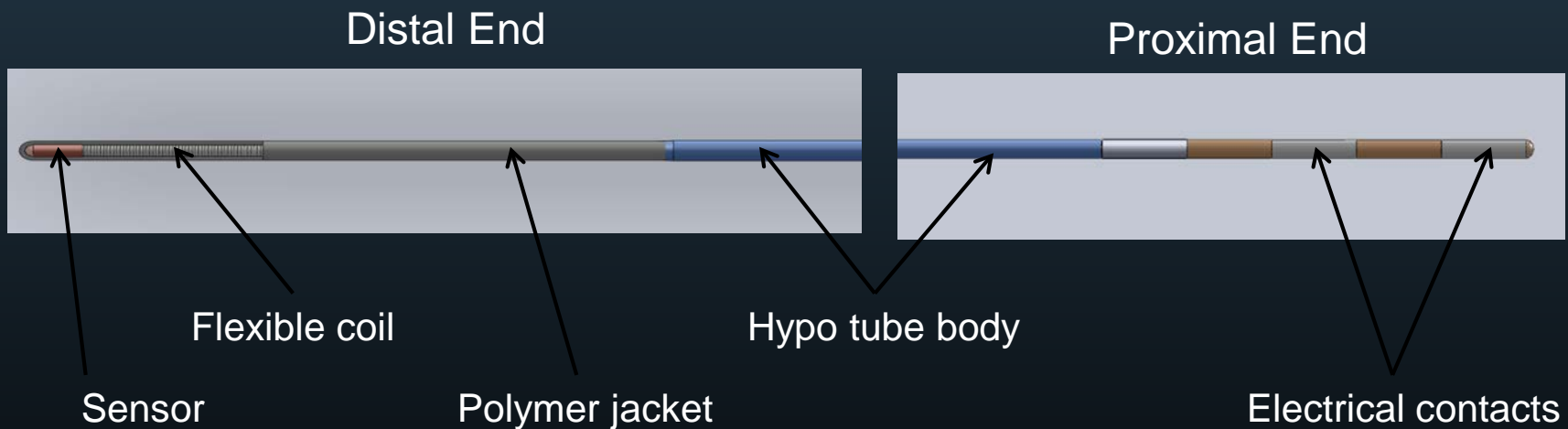


Inner catheter hub

\*510K and CE Mark pending

# CRT : Guidewire

Delivery Tool	OD	Length	Models
CPS Courier +, MediGuide Enabled, Guidewire	0.014"	195 cm	Soft
			Medium
			Extra Firm



Soft, Medium, and Extra Firm

# CRT : Venography

St Jude gMPS 2

9/23/2014  
11:37:43 AM

cm 25  
RAO 1° / CAUD

[Cine #5] [0042] Zoom: 1.1 SID: 102 RAO: 1 CA: 3

St Jude gMPS 1

\* 5/0/091  
9/23/2014  
11:21:31 AM

cm 25  
LAO 30° / CAUD

[Cine #4] [0026] Zoom: 1.0 SID: 102 LAO: 30 CA: 3

Procedure Landmark View **Cine** Angio Survey 3D

Tools Setup Fuse Cine Live as Cine Reset Zoom

Left Cine Right Cine

Left Display Cine Right Display Cine

St. JUDE MEDICAL

1 Livewire 1 Out of MB  
2 Outer  
3 Wire 1 Disengaged

Ready for Cine

64 BPM

# CRT : catheter

St Jude gMPS 2

9/23/2014  
11:21:30 AM

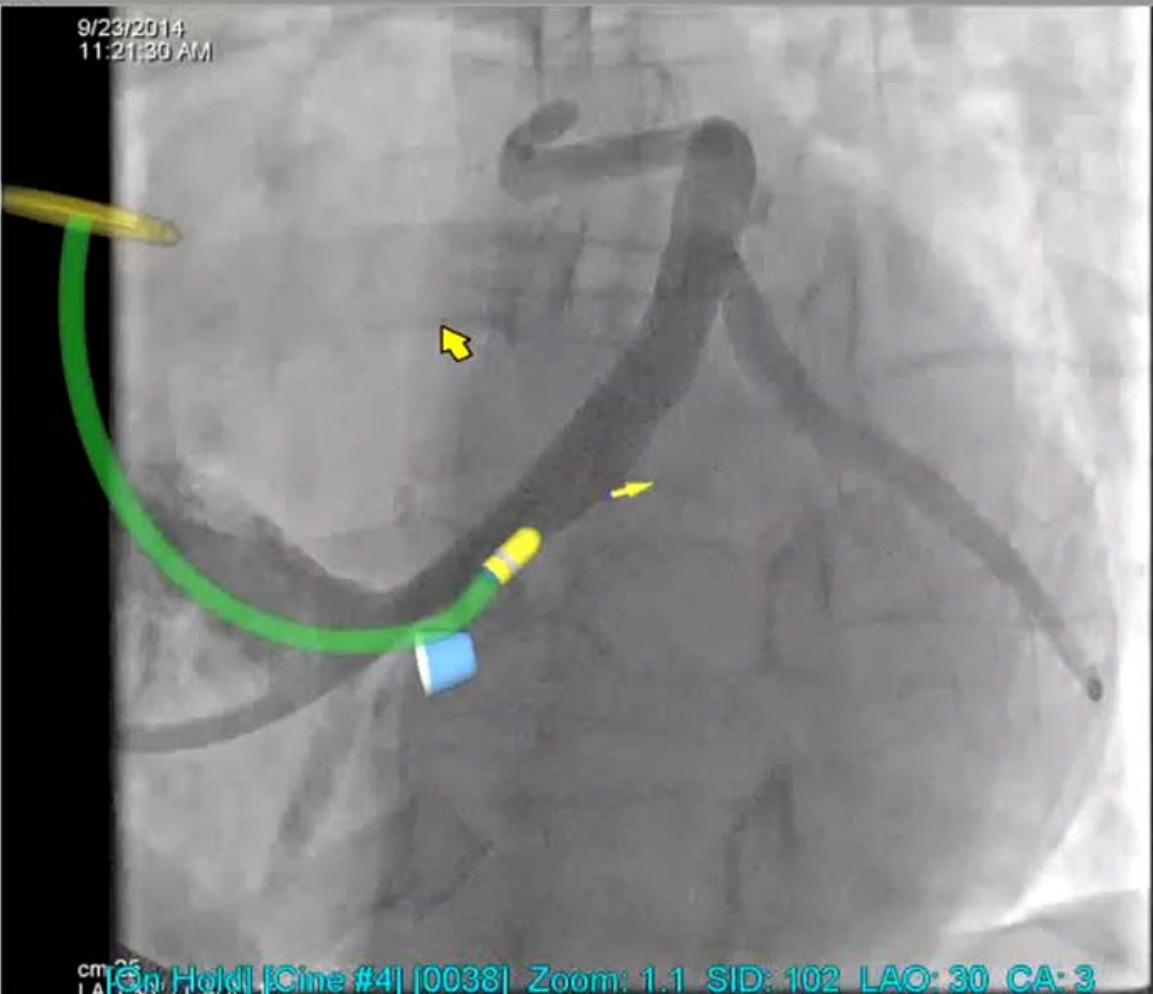
25

cine #1  
RAO 2 CA 3

cine #2  
LAO 35 CA 3

cine #3  
LAO 30 CA 3

cine #4  
LAO 30 CA 3



cm 25  
LAO 30 CA 3

Turn Magnet OFF

Procedure Landmark View Cine Angio Survey® 3D

Tools Setup Fuse Cine Live as Cine Reset Zoom

Start Left Cine End

Start Right Cine End

Left Display Cine

Right Display Cine

Live Assist



# CRT : catheter

St Jude gMPS 2

25

Live Fluoro

5/8/1991  
9/23/2014  
11:32:01 AM

cine #1  
RAO 2 CA 3

cine #2  
LAO 35 CA 3

cine #3  
LAO 30 CA 3

cine #4  
LAO 30 CA 3

cm 25  
LAO 30

[Live] [0001] Zoom: 1.0 SID: 102 LAO: 30 CA: 3

Turn Magnet OFF

Procedure Landmark View Cine

Tools Setup Fuse Cine Live as Cine Reset Zoom

Road Map

Start Left Cine End

Start Right Cine End

Left Display Cine

Right Display Cine

Live Assist

# Mediguide: **CRT** e radioesposizione

## CRT

**Mediguide X-Ray**

**8 min (min 2.5)**

Common Flutter

Atypical Flutter

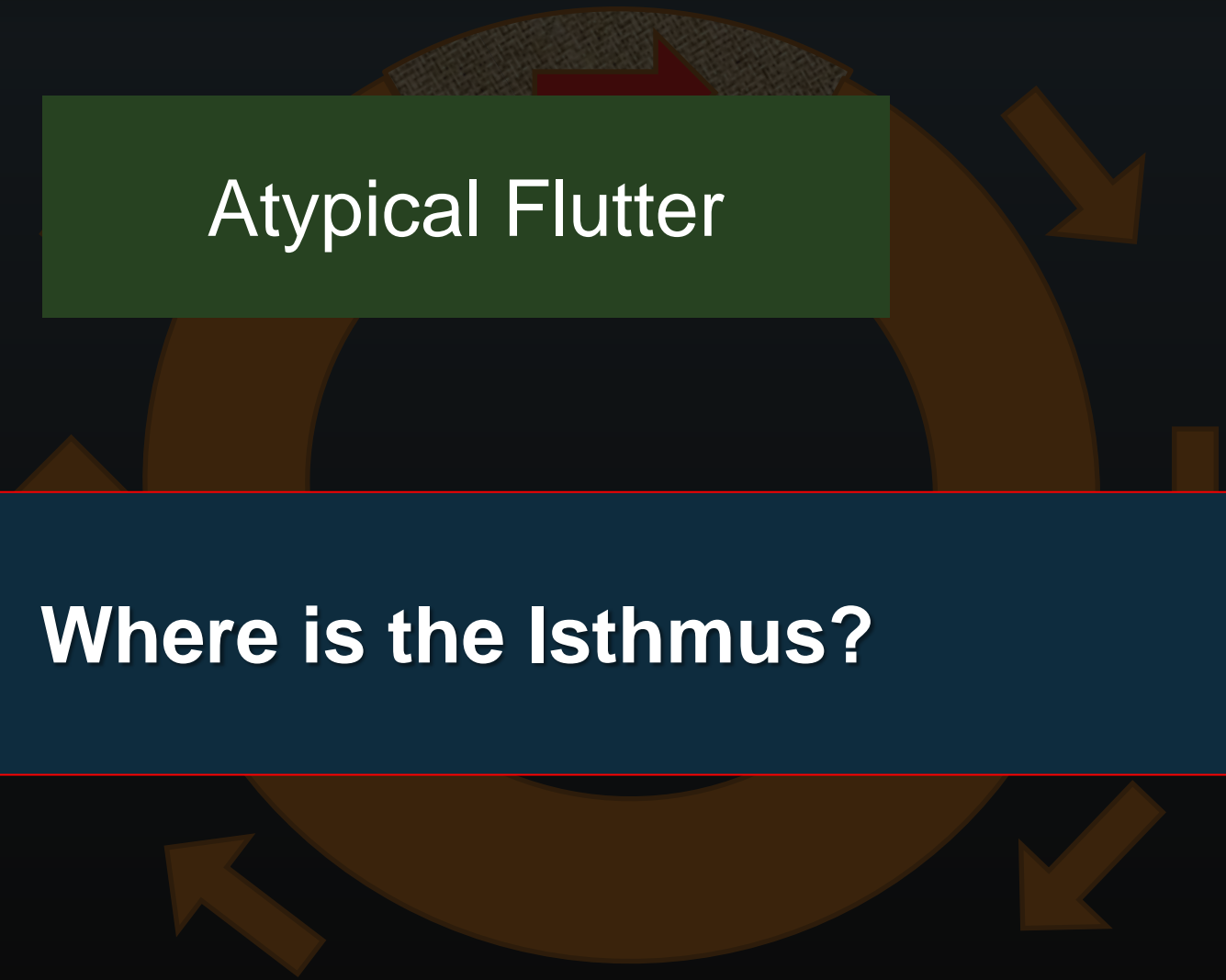
# Macroreentrant arrhythmia

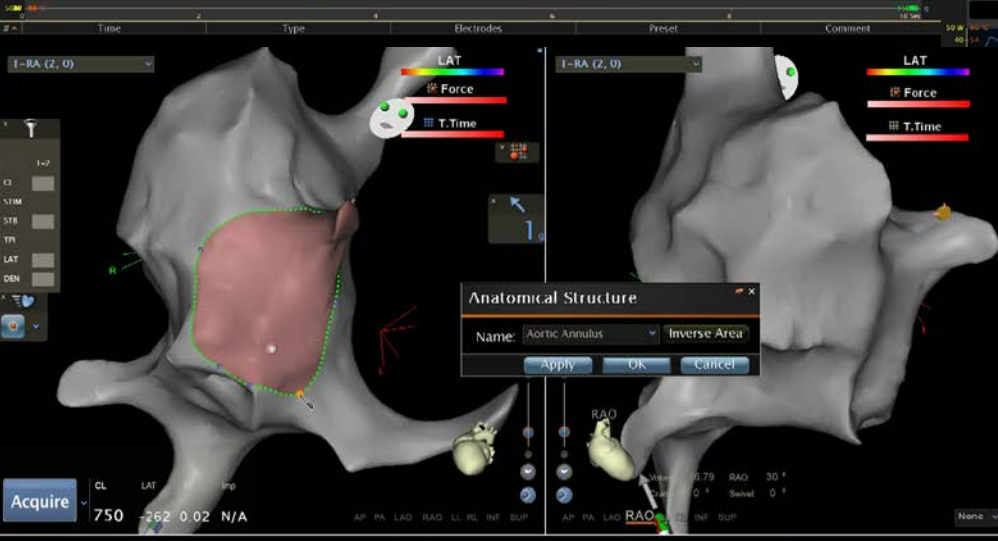
Reentrant  
circuit

Atypical Flutter

Where is the Isthmus?

Isthmus

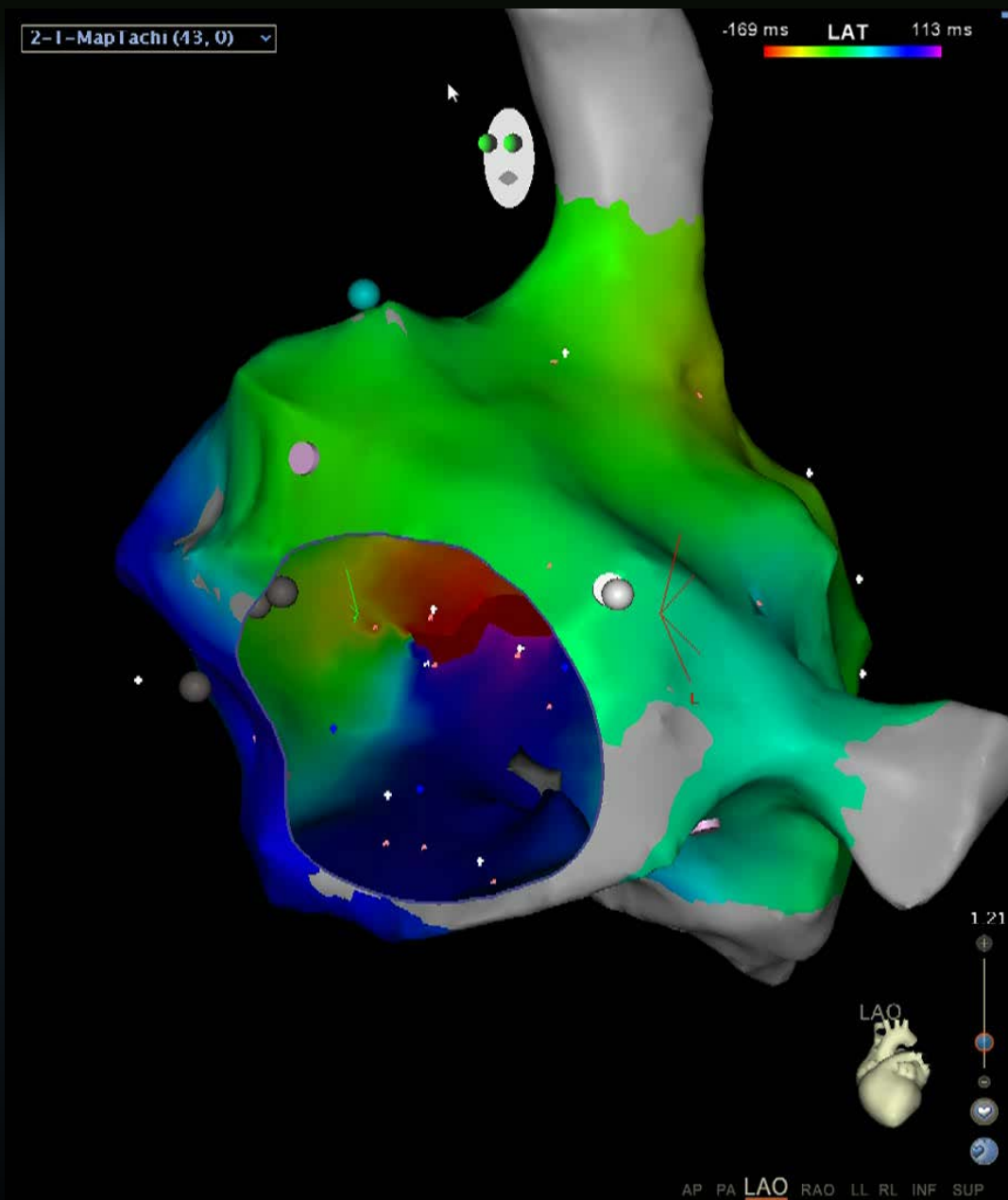




Anatomical map

# Point by point mapping

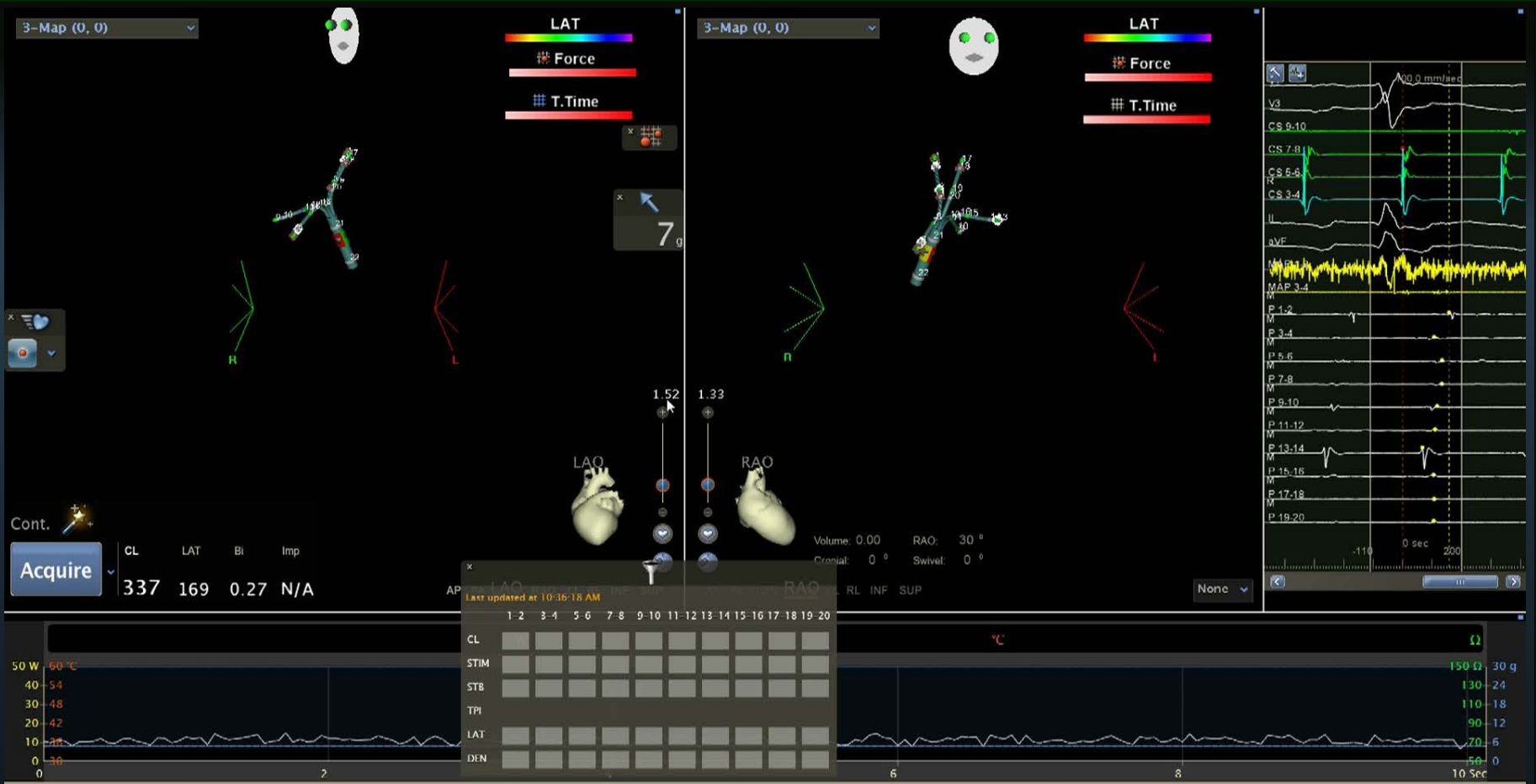




**Point by point  
acquisition**

**Electro  
Anatomical  
map**

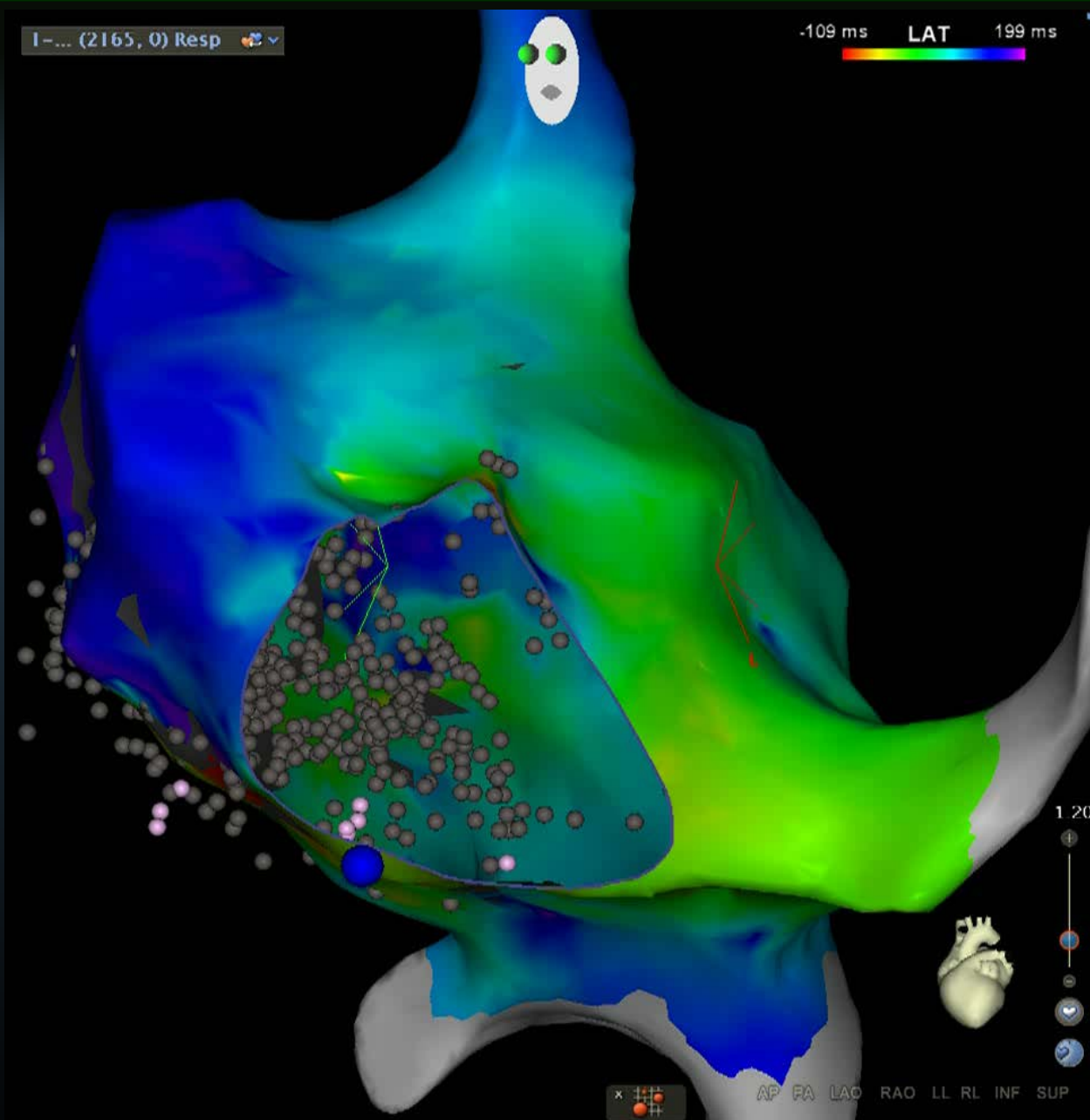
**Red: critical  
isthmus**



**Automatic mapping**

**High density**





**Automap**

**High  
density**

**Better  
definition  
isthmus  
region**

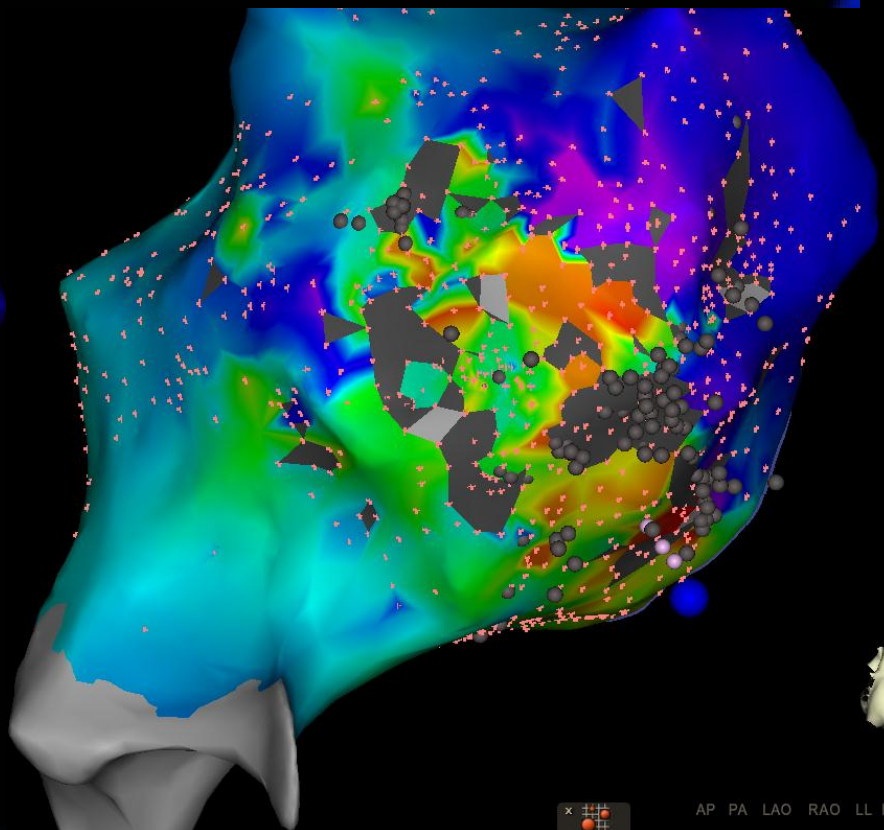
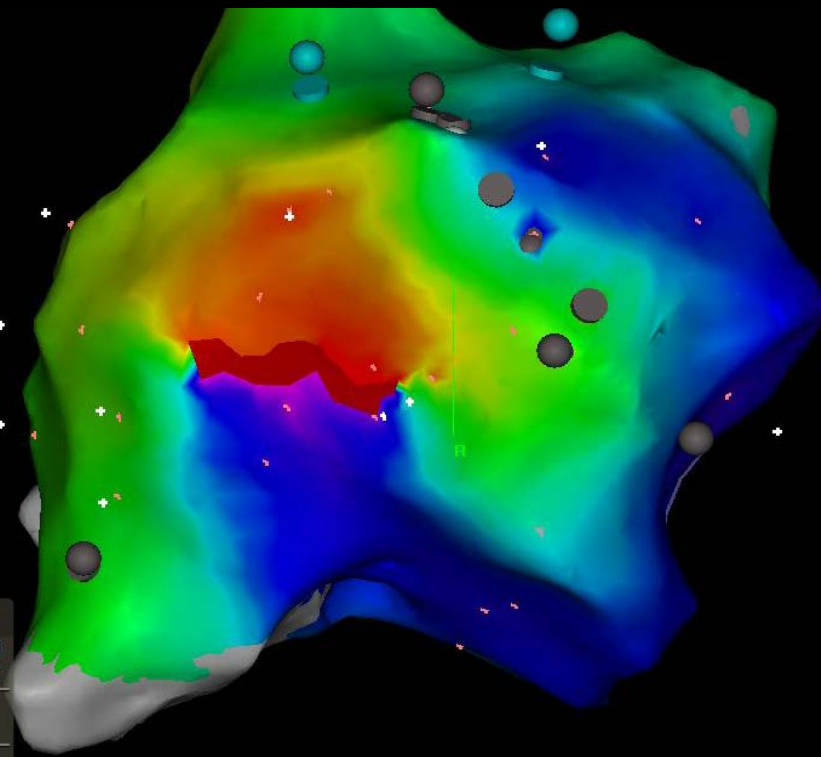
# Standard Electroanatomic Map

# High density Electroanatomic Map

2-1-MapTachi (43, 0) ▼

1-... (2165, 0) Resp ▼

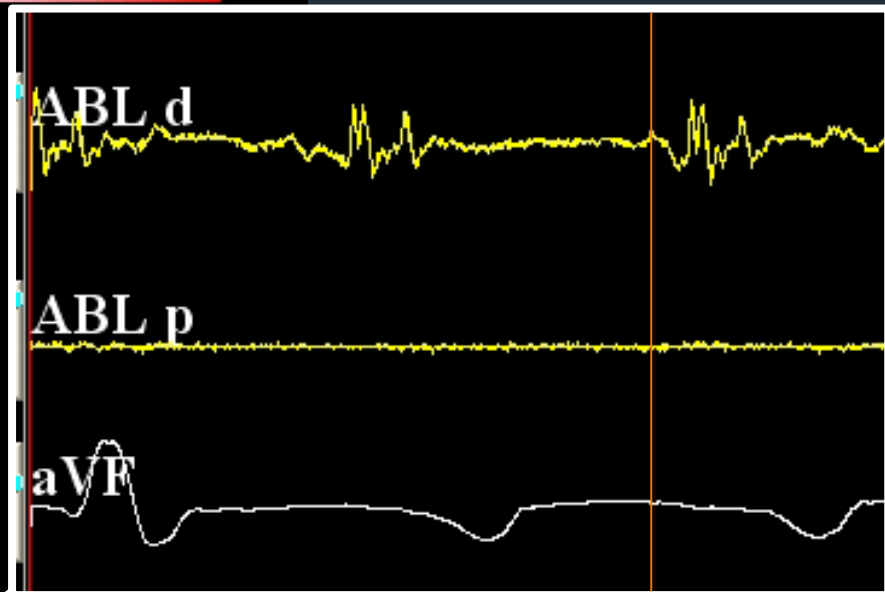
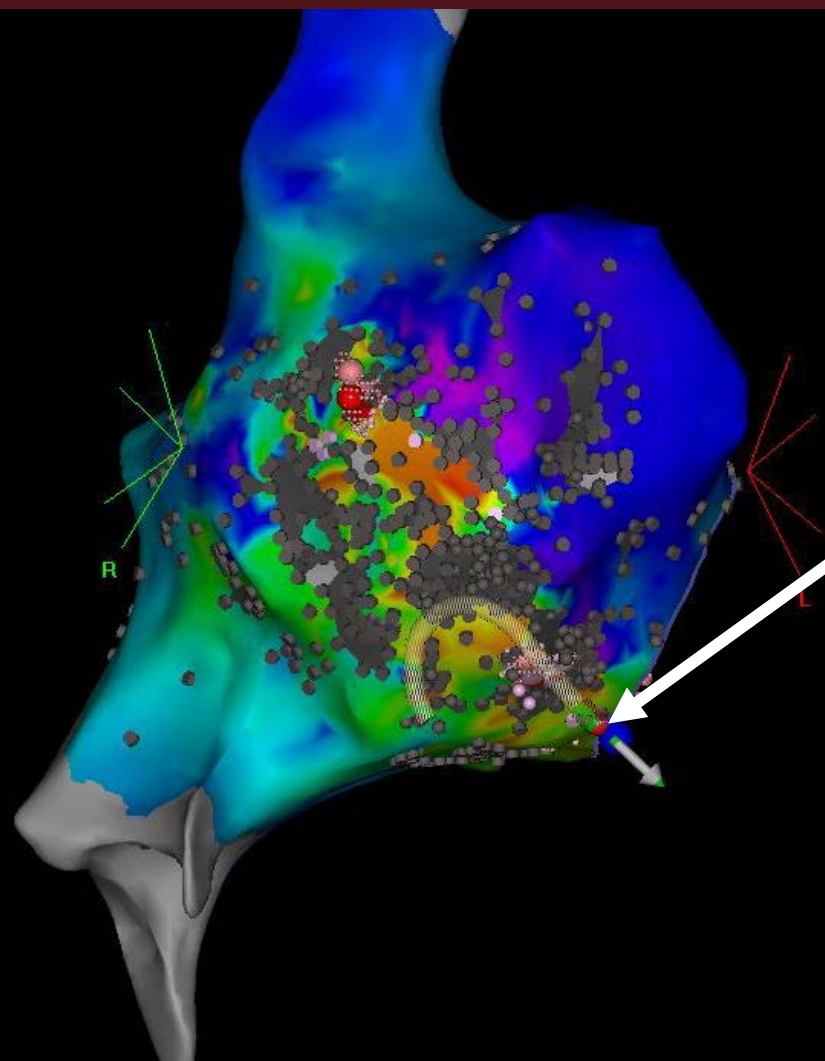
T 199 ms



AP PA LAO RAO LL RL INF SUP

# Mesodiastolic Potential

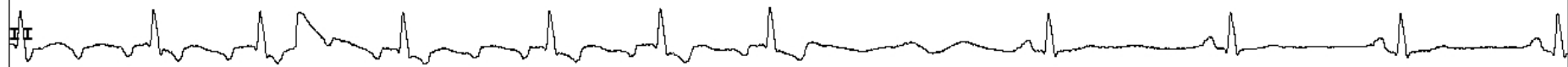
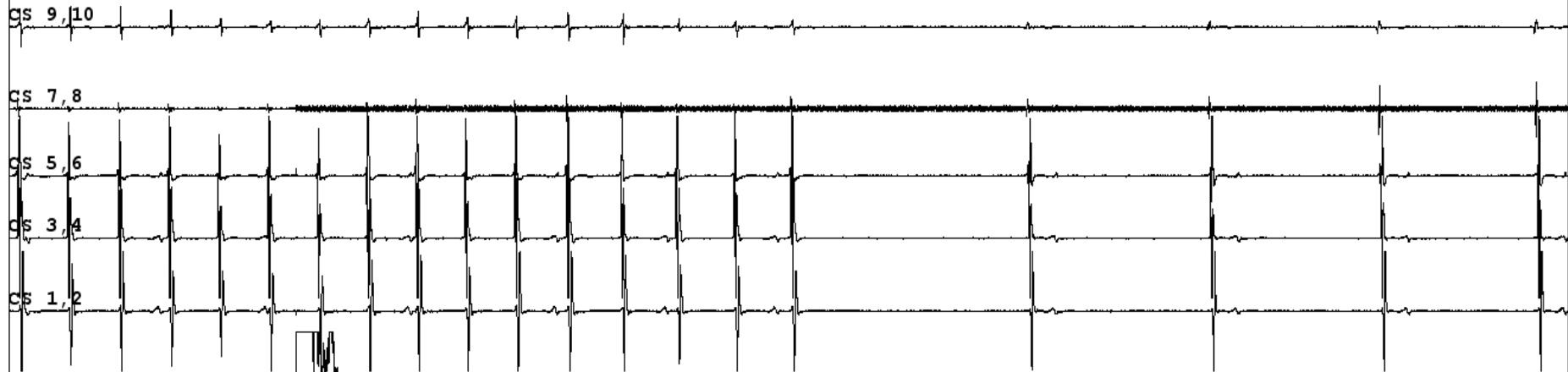
ms LAT 199 ms  
Force 10 g  
s T.Time 16.35 s



2.03



RF TURNED ON-SESSION 1



# Conclusions

Technological advances extended interventional cardiology capabilities, allowing treatment of more complex arrhythmias **(electroanatomical, high density mapping)**

At the same time they increased safety **(cryolesion, force sensors, x-ray reduction)**

Correct interpretation of **ECG and endocavitary signals** is always necessary