

I, (Joachim Hebe) DO NOT have a financial interest/
arrangement or affiliation with one or more
organizations that could be perceived as a real or
apparent conflict of interest in the context of the subject
of this presentation.

Ablation in Infants and Smaller Children

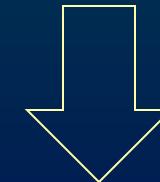
Access and Catheters

... Tipps and Tricks ...

Ablation in Infants and Smaller Children



difference?



EP-Treatment in Grown-up Patients

Ablation in Infants and Smaller Children

DGPK annual Meeting 1992 – Stuttgart - GER

... report about RFC-ablations in Kids – initial experience - J. Hebe ...

Ablation in Infants and Smaller Children



Ablation in Infants and Smaller Children



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Ablation in Infants and Smaller Children



Ablation in Infants and Smaller Children



für Dr. Hebe von Maximilian Niola



↑complication rate (< 15kg; < 5 yrs): ↑ ↔ compared to elder / bigger children (n.s.)

- overall increased risk for complications

Kugler JD et al; Am J Cardiol 1997;80:1438–1443

- in all studies more severe complications

Kugler JD et al; JCE 2002;13:336–341

(death, heart block, cardiac perforation, effusion, coronary injury)

2 / 118 kids – only few infants in study
close proximity: lesion – CA ?!

Schneider HE et al; Heart Rhythm 2009;6:461–467

1.3 – 2.2 % vrs. 0.1 %

Blaufox AD et al; Circulation 2001;104:2803–2808

- relation to higher N° / duration of RF applications

Blaufox AD et al; PACE 2004;27:224–229

- Cryo without reported complications / but lower success

La Page MJ et al; Am J Cardiol 2011;108:565–571

Ablation in Infants and Smaller Children

aspects:

- *technical*
- *design / size of tools*

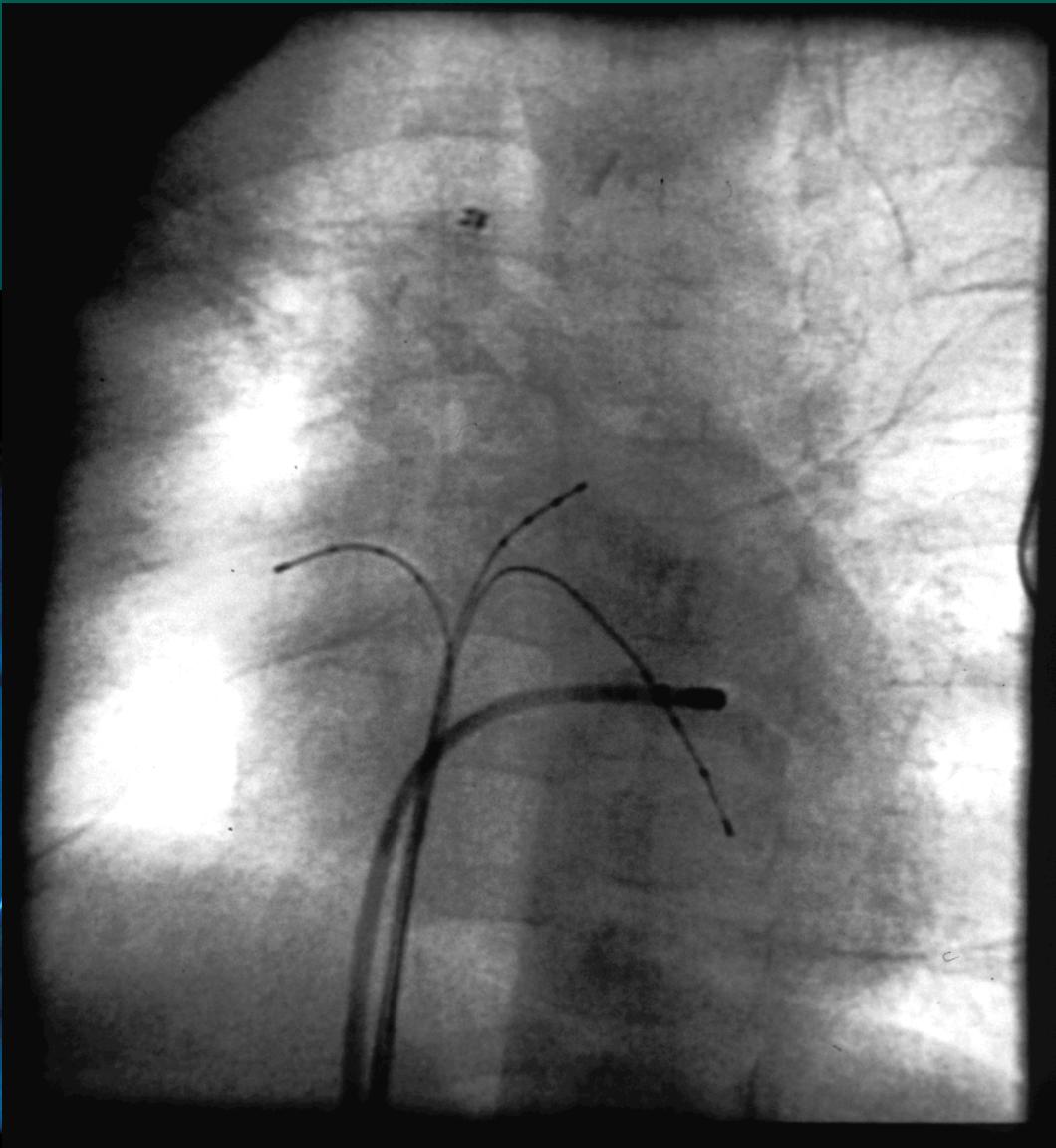
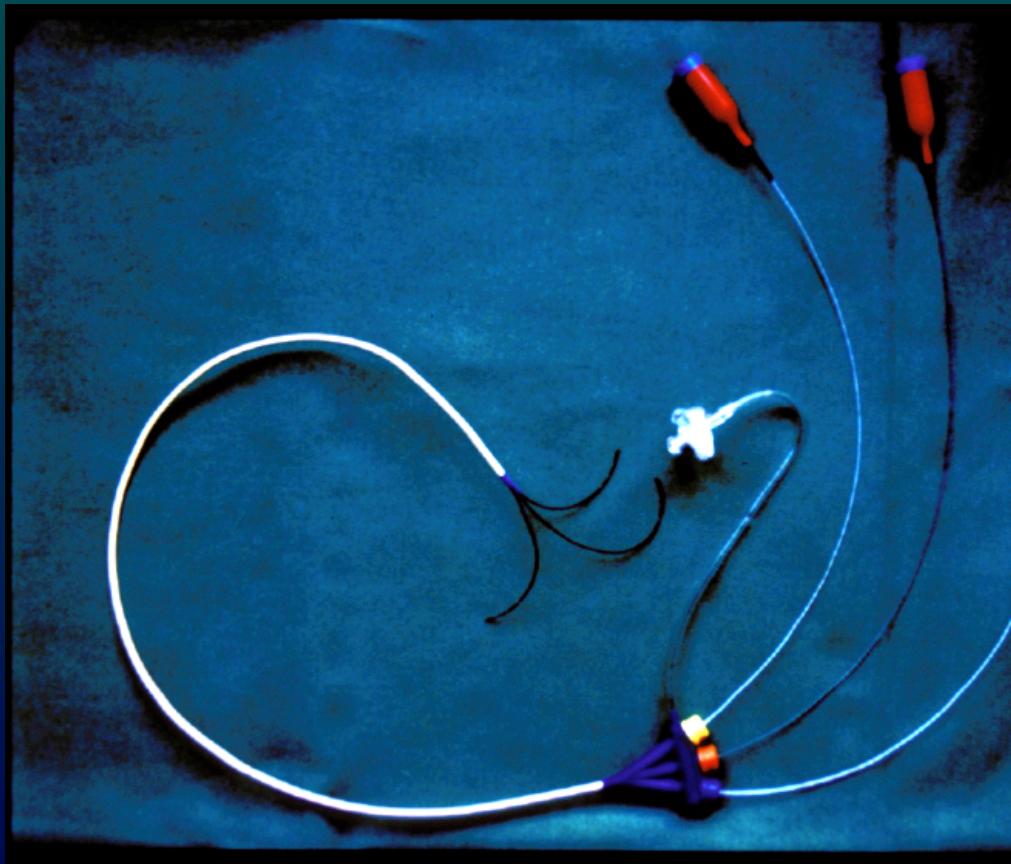
limitations

- *mapping-/ablation catheter: 6 – 8 F (4-8 mm tip)*
- *diagnostic catheter: 5 -7 F*
- „*adult“ pre-set f. energy delivery: 50 – 70 W/s; -70°C*

Ablation in Infants and Smaller Children

aspects:

technical



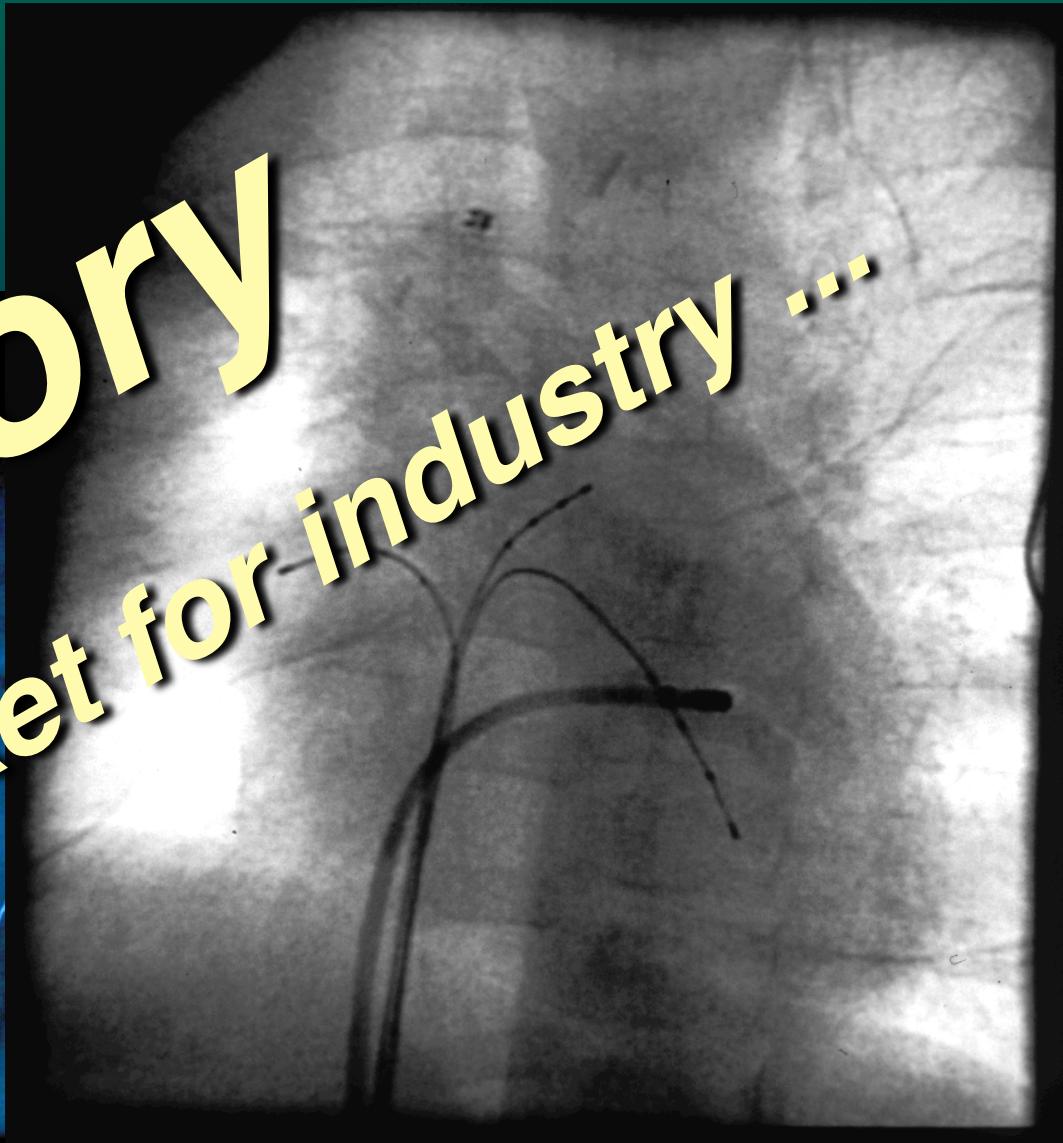
Ablation in Infants and Smaller Children

aspects:

technical

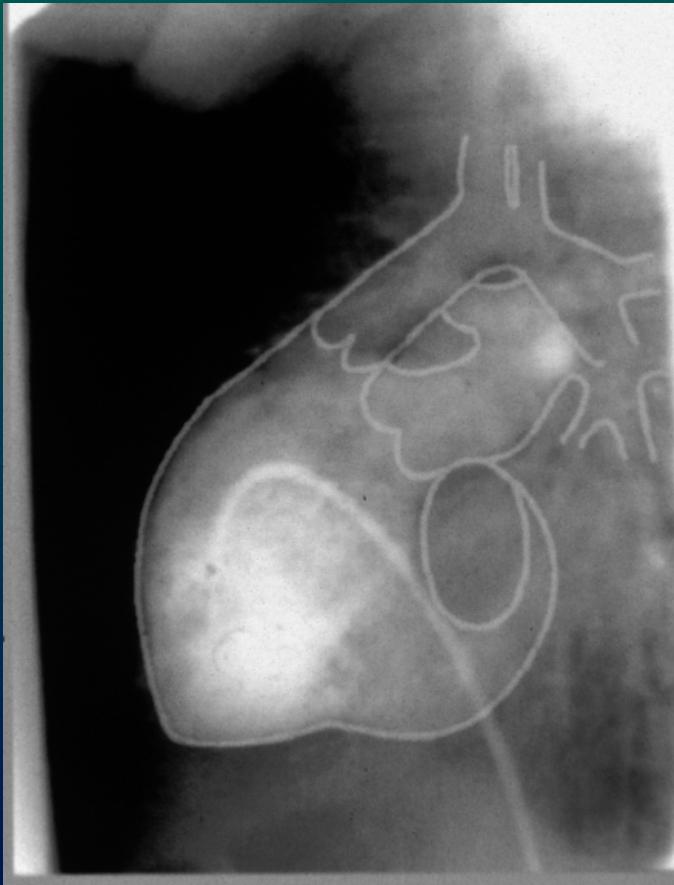


history
... no market for industry ...



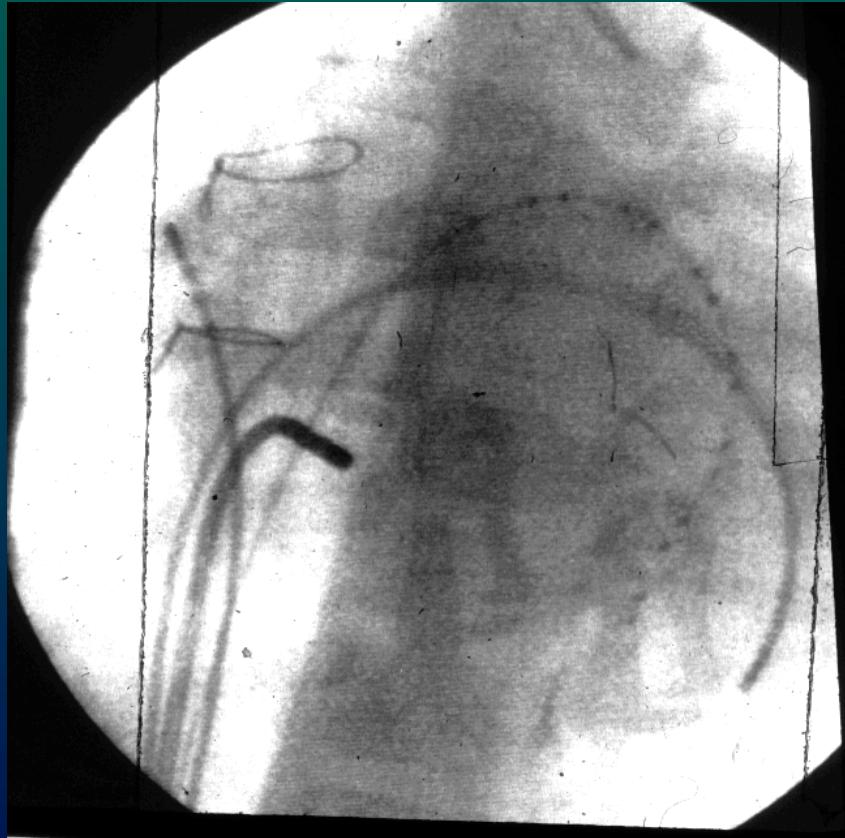
Ablation in Infants and Smaller Children

f, 1.5 yol, DILV, malpos. GA, straddl. TV, atrioseptectomy, FAT

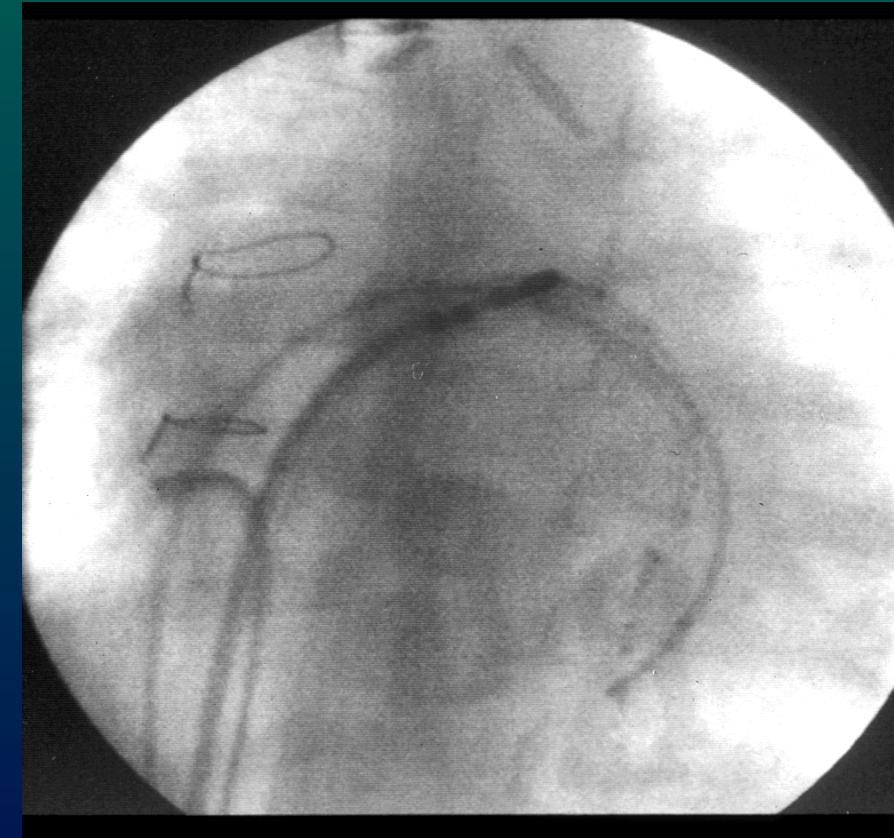


Focal Atrial Tachycardia

f, 1.5 yol, DILV, malpos. GA, straddl. TV, atrioseptectomy, FAT



Map at IAS-inferior rim - HIS

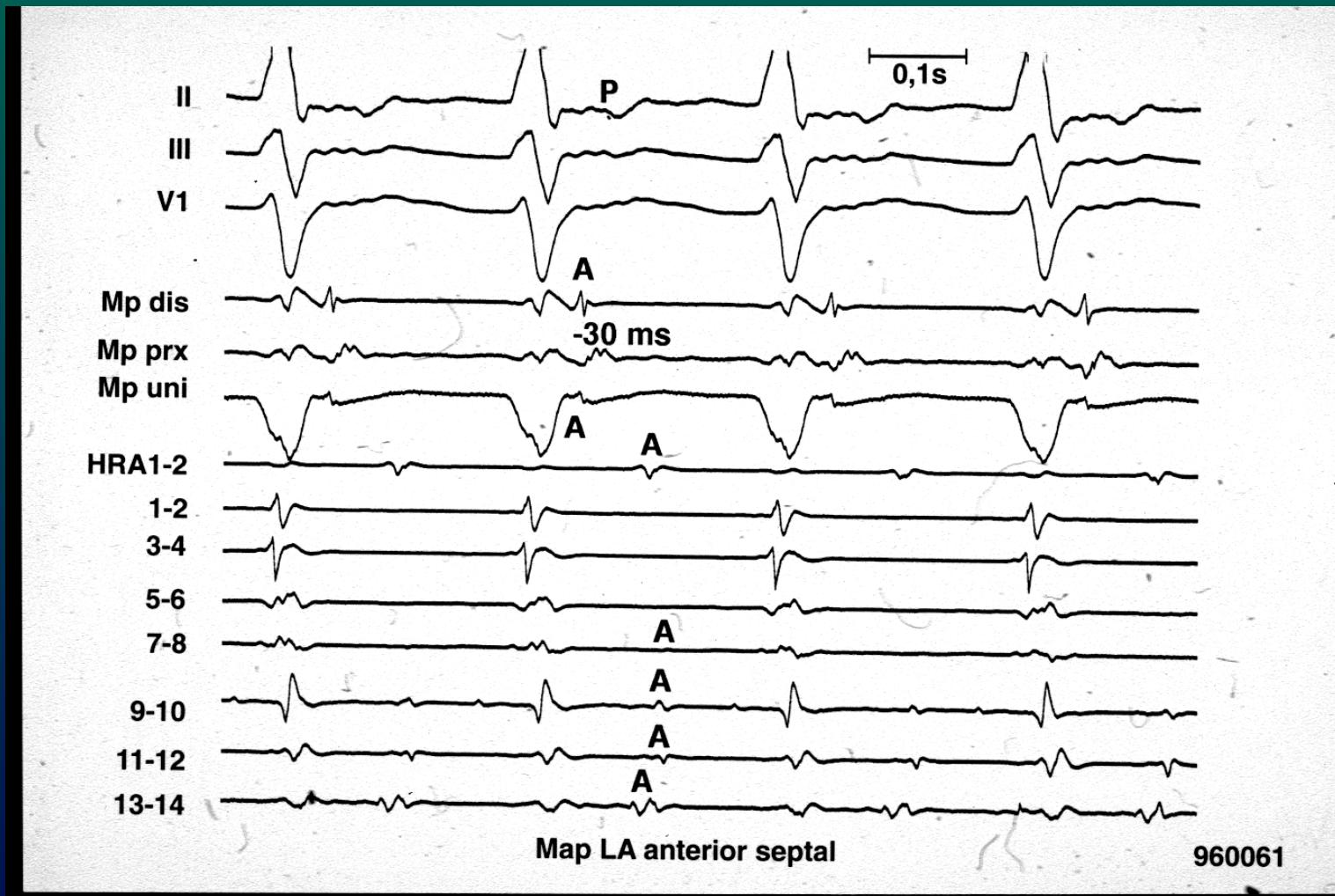


Map at IAS-superior rim - FAT

LAO 30°

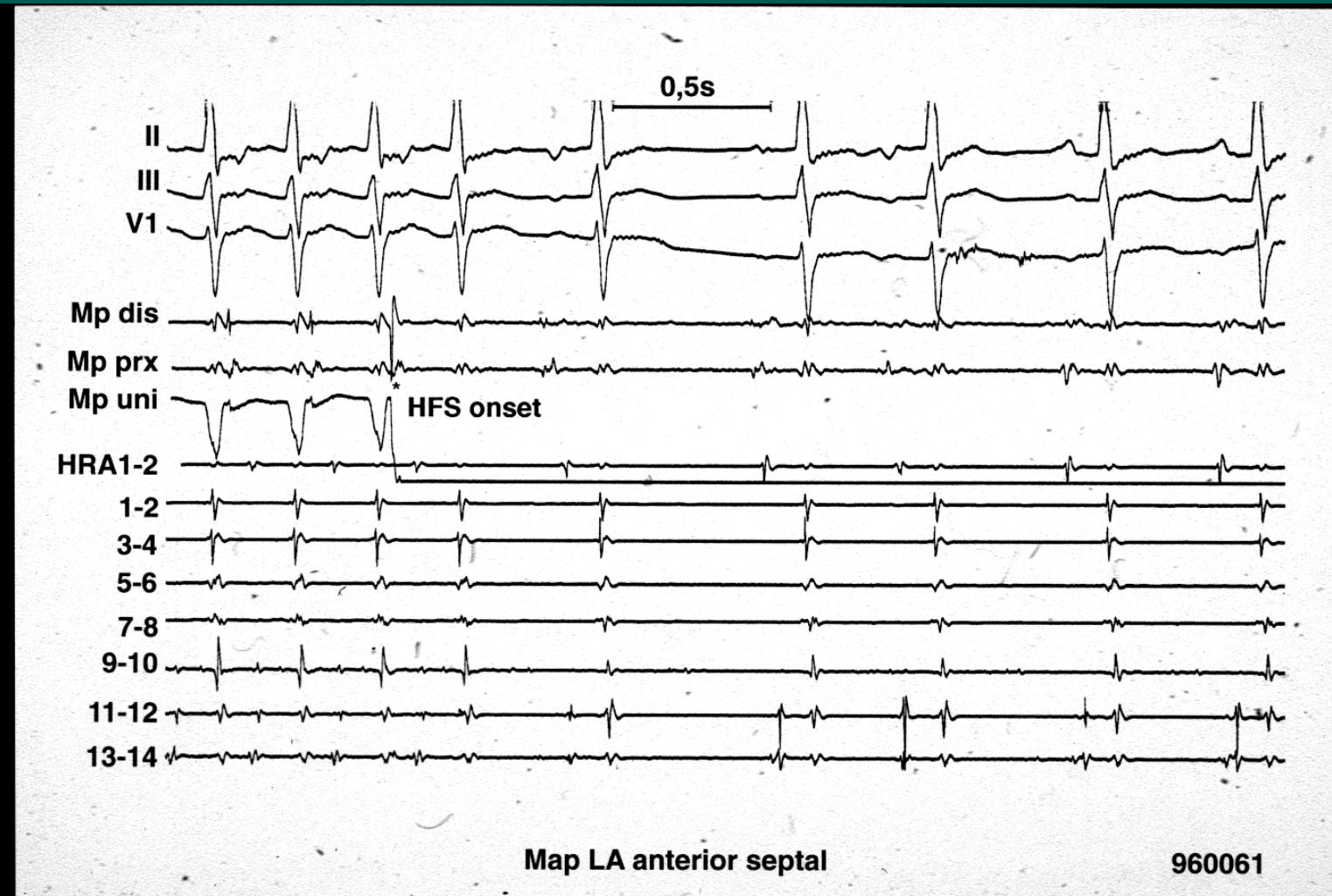
Ablation in Infants and Smaller Children

f, 1.5 yol, DILV, malpos. GA, straddl. TV, atrioseptectomy, FAT



Ablation in Infants and Smaller Children

f, 1.5 yol, DILV, malpos. GA, straddl. TV, atrioseptectomy, FAT



Ablation in Infants and Smaller Children

aspects:

- *technical*

- *design / size of tools*

options

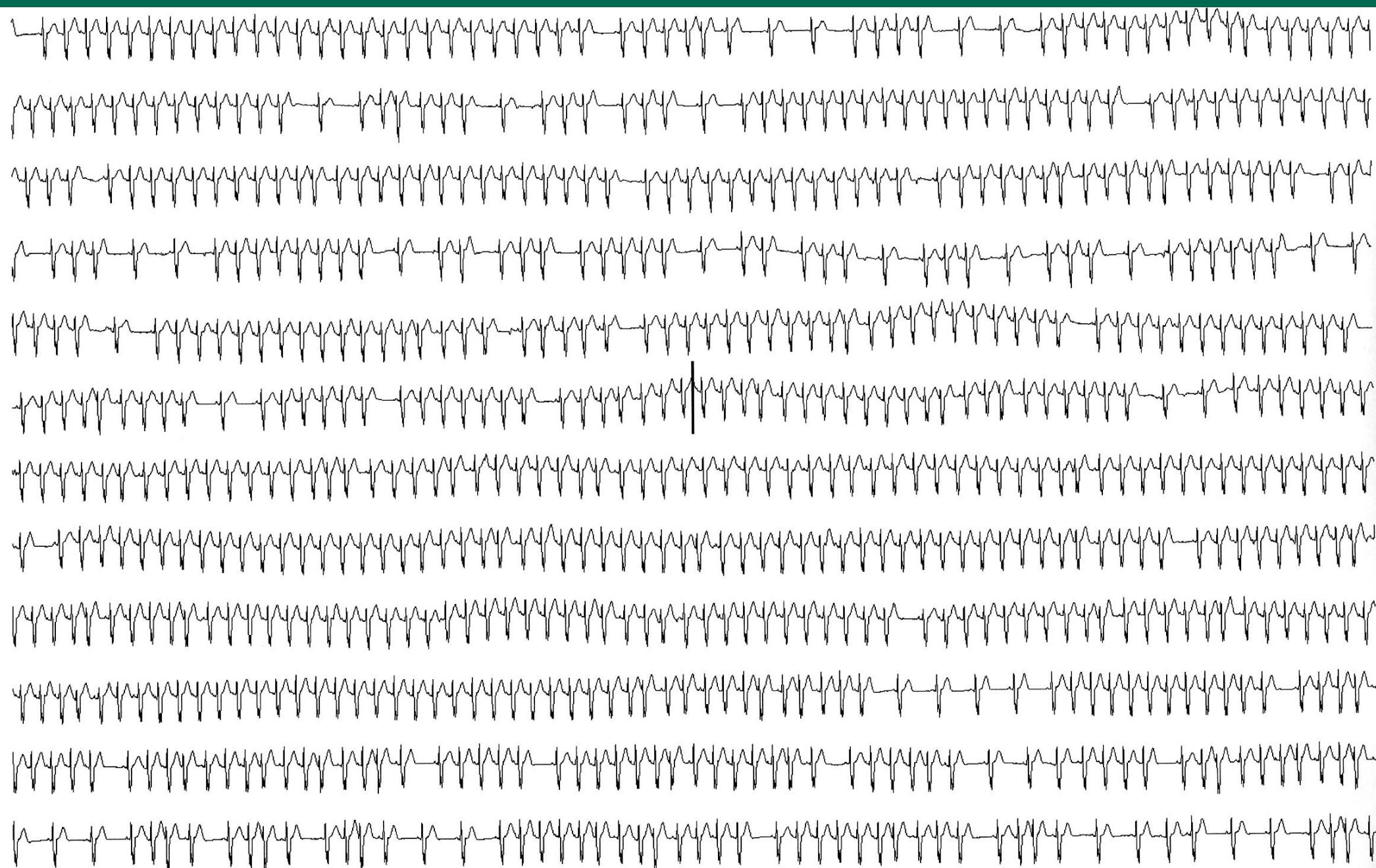
- *reduction N° of mapping-/ablation catheter*
- *use of oesophageal / pacemaker-leads*
- *implementation of 3-D-EA-navigation*

- „*titration*“ of *RF-energy delivery: 10 - 30 W/s; -55°C*
- *strict avoidance of „cooled“ RF !!*
- *Cryo-energy, if applicable (size / stiffness cath)*

Ablation in Infants and Smaller Children

m, 5.5 mo., 5.3 kg

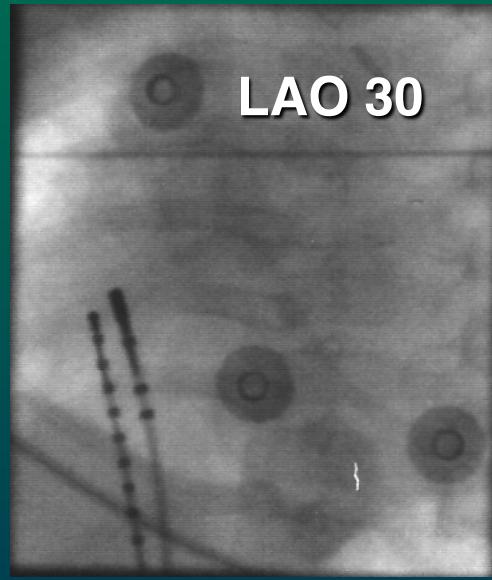
- VSD, patch-closure at age 3 mo.
 - reduced phys. + normal mental development
 - permanent FAT
 - impaired LV-fx
 - dx while routine control
 - AA-drug failure (IC, Amio)
-
- 1. RF-procedure (Mar 06): 1. FAT
 - 2. RF-procedure (Mar 06): 2. FAT





RAO 30

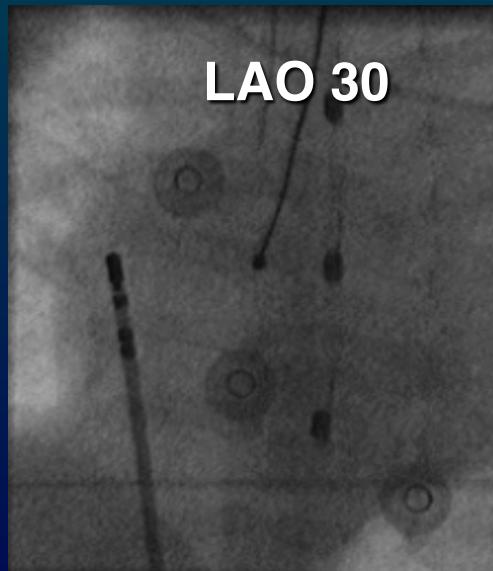
dorsal free RA wall



LAO 30

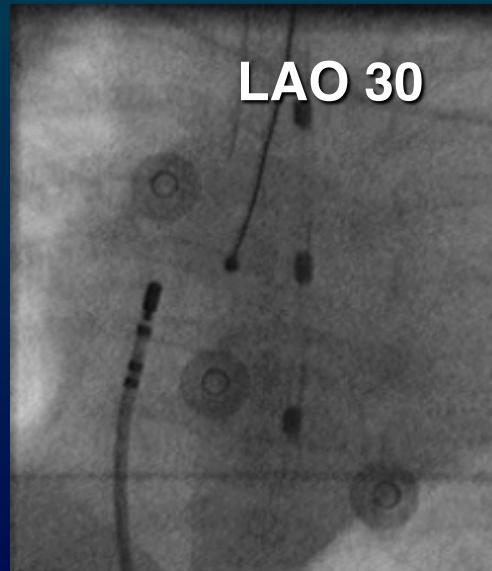
FAT 1

lateral to scar



LAO 30

„old position“



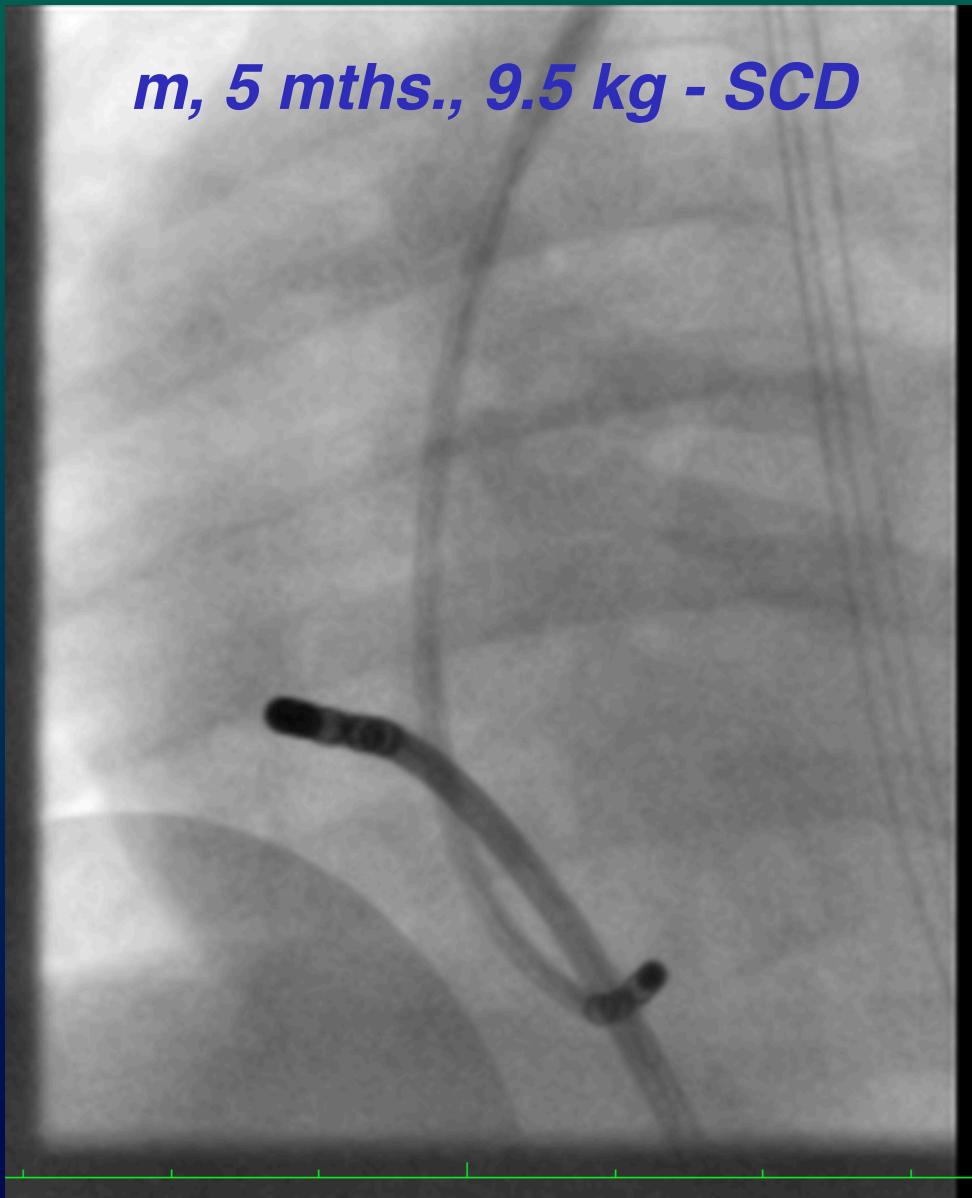
LAO 30

FAT 2

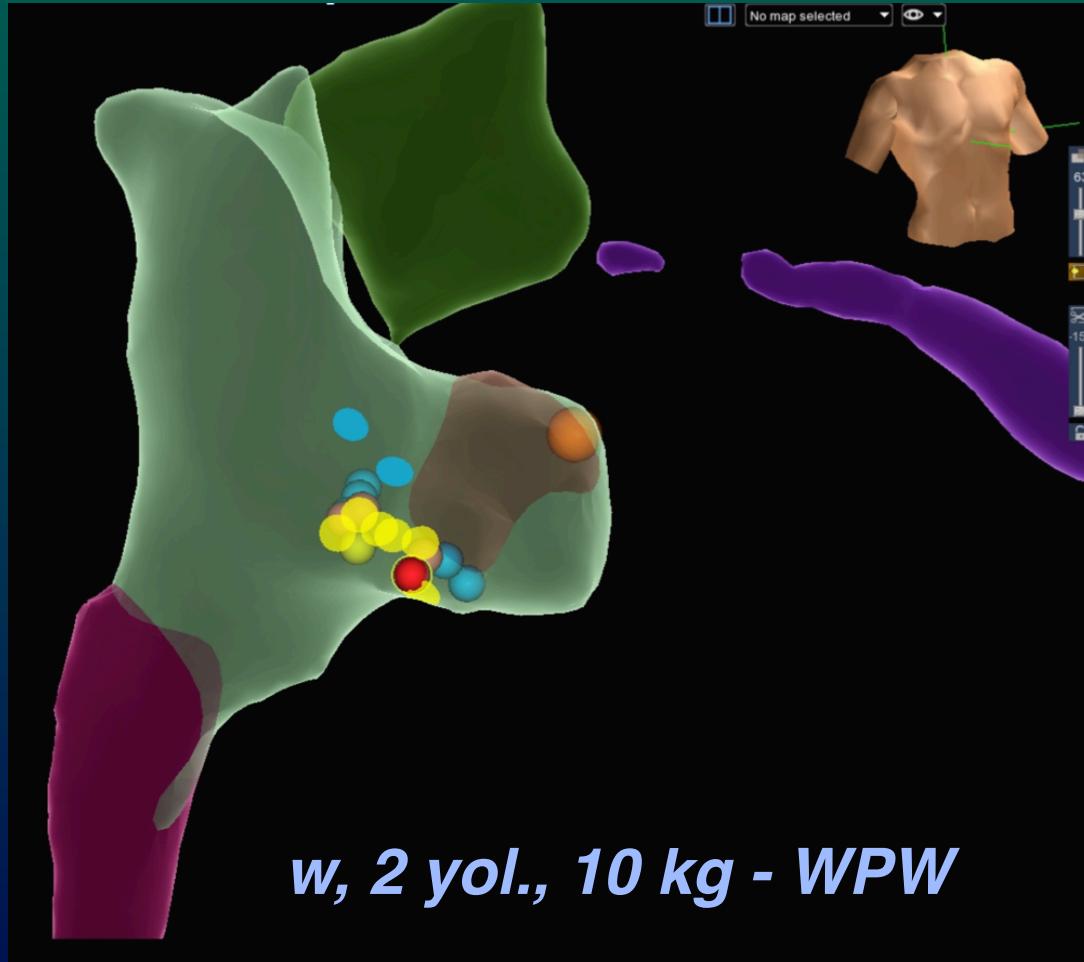
medial to scar

Ablation in Infants and Smaller Children

m, 5 mths., 9.5 kg - SCD



w, 2 yол., 10 kg - WPW



Ablation in Infants and Smaller Children

aspects:

- *technical*
 - *design / size of tools*
- *experience*
 - *limited in small anatomy*

limitations

Catheter Ablation Adults Germany

2010: 44.607 pts

(14.700 A.Fib. Ablations)

Bruckenberger Report 2010

2015: 61.995 pts

(26844 A.Fib. Ablations)

DGK Report „Leistungszahlen HK-Labore“ 2016

Catheter Ablation Children Germany

2010: 500 – 700 pts

2016: < 800 pts

.. no official data ..

Ablation in Infants and Smaller Children

aspects:

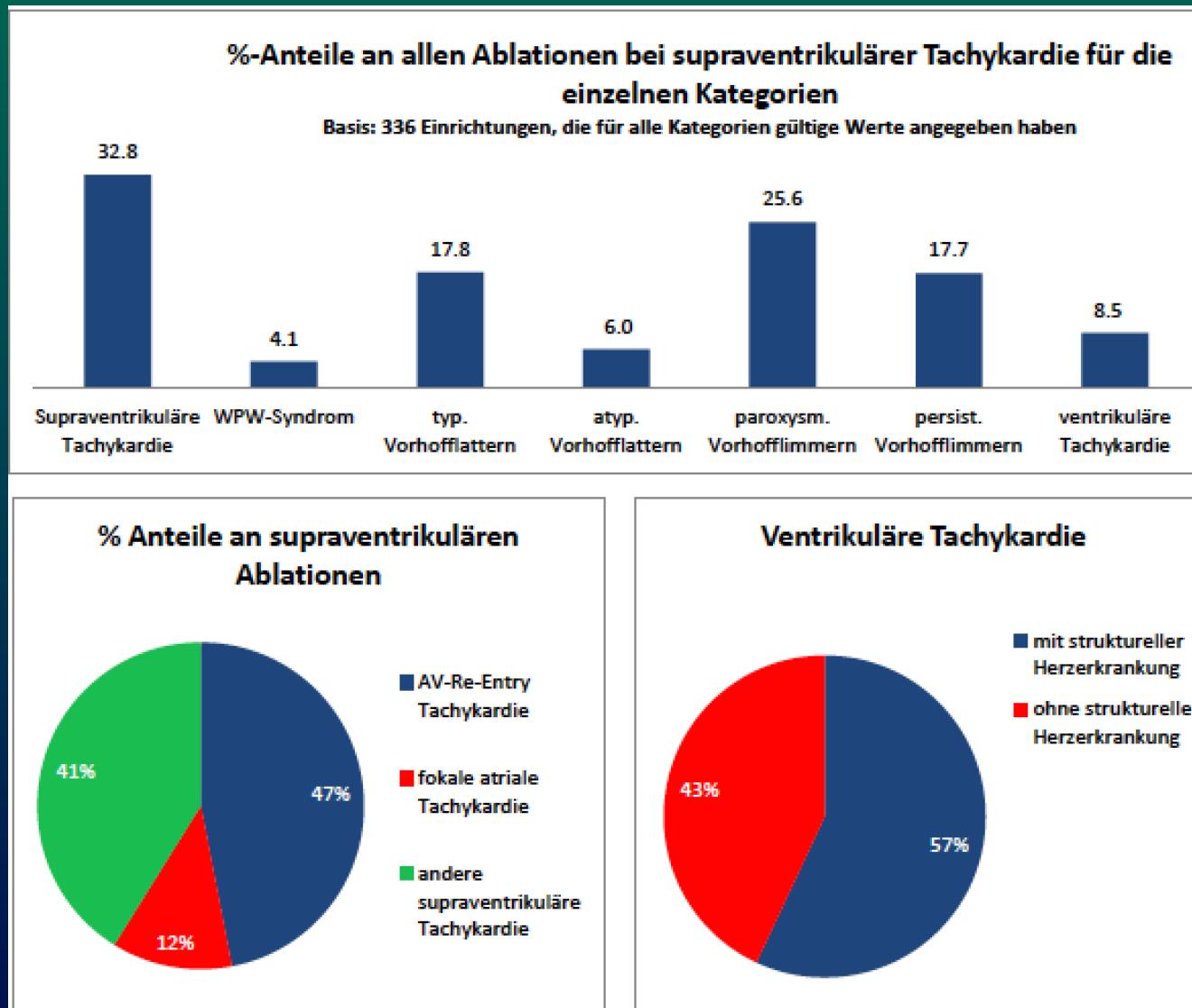
- *technical* - *design / size of tools*
- *experience* - *limited in small anatomy*
- *biological* - *distribution arrhythmia type / substrate*



- *Focal Atrial Tachy (FAT)*
- *JET*
- *WPW*
- *PJRT*
- *AVNRT*

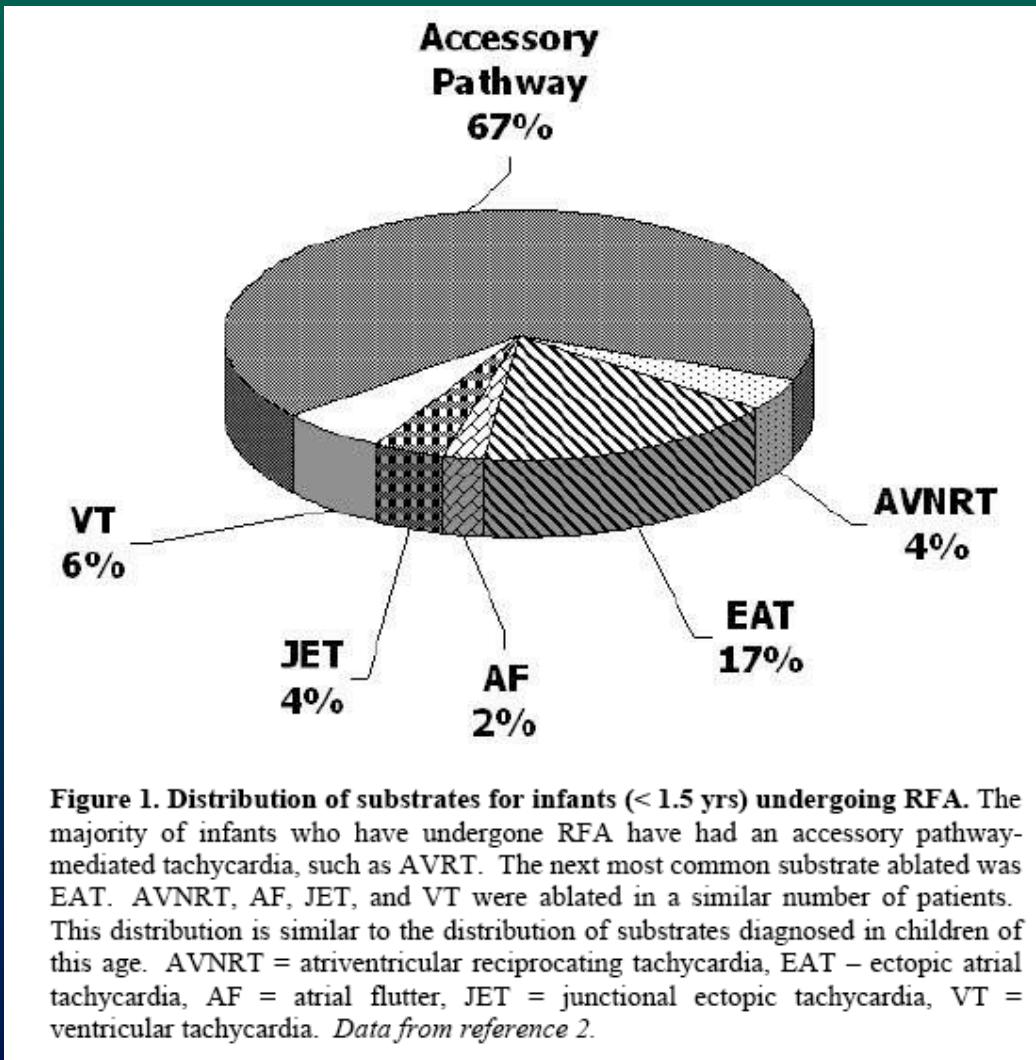


Distribution Arrhythmia Substrates – Adults (> 18 yrs) – RFAblation - GER



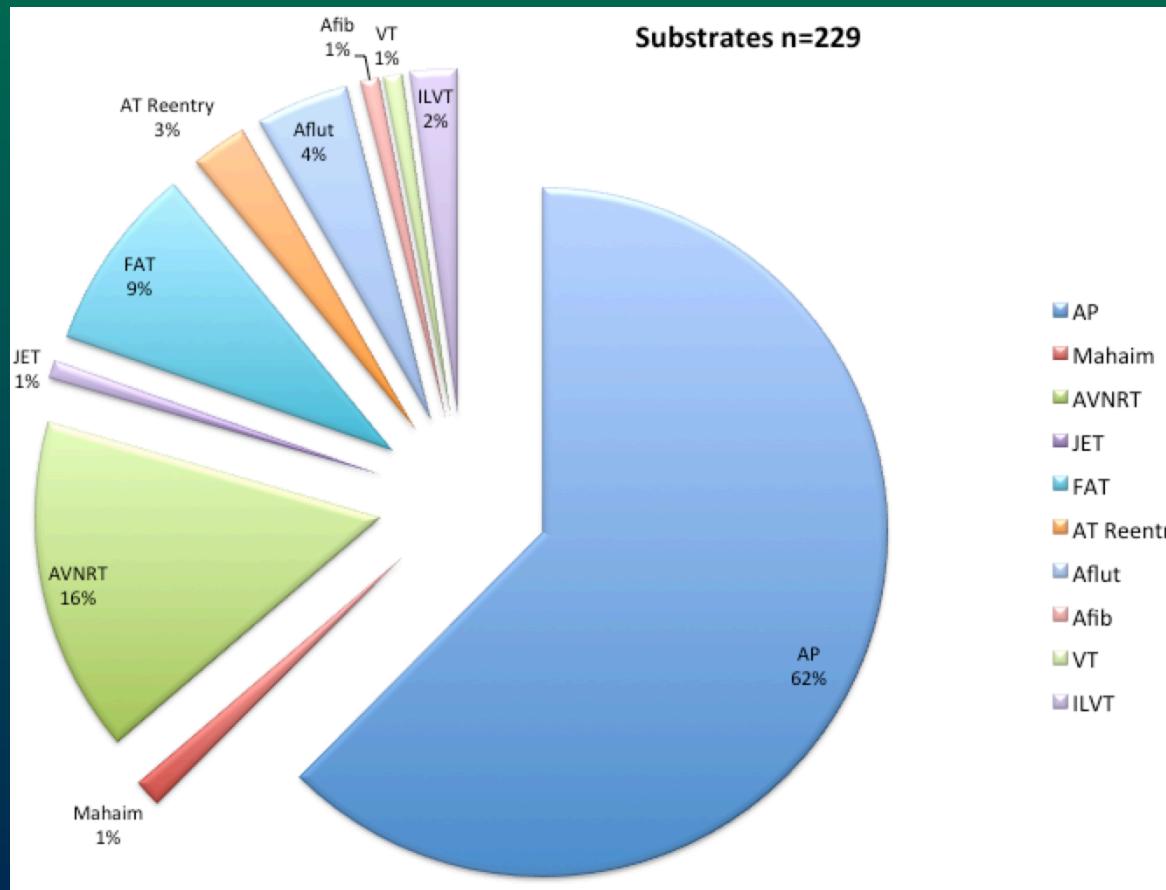
- **SVT** 32.8 %
 - FAT
 - WPW
- **AT / Afib** 67.1 %
- **VT** 8.5 %

Distribution Arrhythmia Substrates – Infants (< 1.5 yrs) - RFAblation



FAT	17 %
JET	4 %
AVRT	67 %
AVNRT	4 %

Distribution Arrhythmia Substrates – Children (< 6 yrs)



Total N° 192 pts - 34 pts

non-identified substrate (i.e. inactive FAT) - 158 pts — tot. 229 substrates

- 10 pts — multi substrate type
- 6 pts — multi-(2-6)-focal AT
- 20 pts — multi-(2-4)-AP

Ablation in Infants and Smaller Children

aspects:

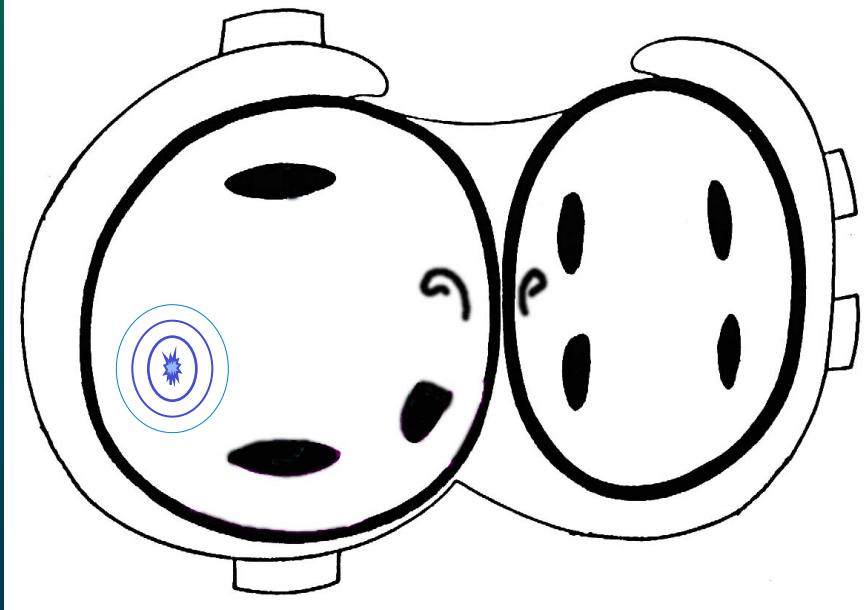
- *technical* - *design / size of tools*
- *experience* - *limited in small anatomy*
- *biological* - *distribution arrhythmia type / substrate*

options

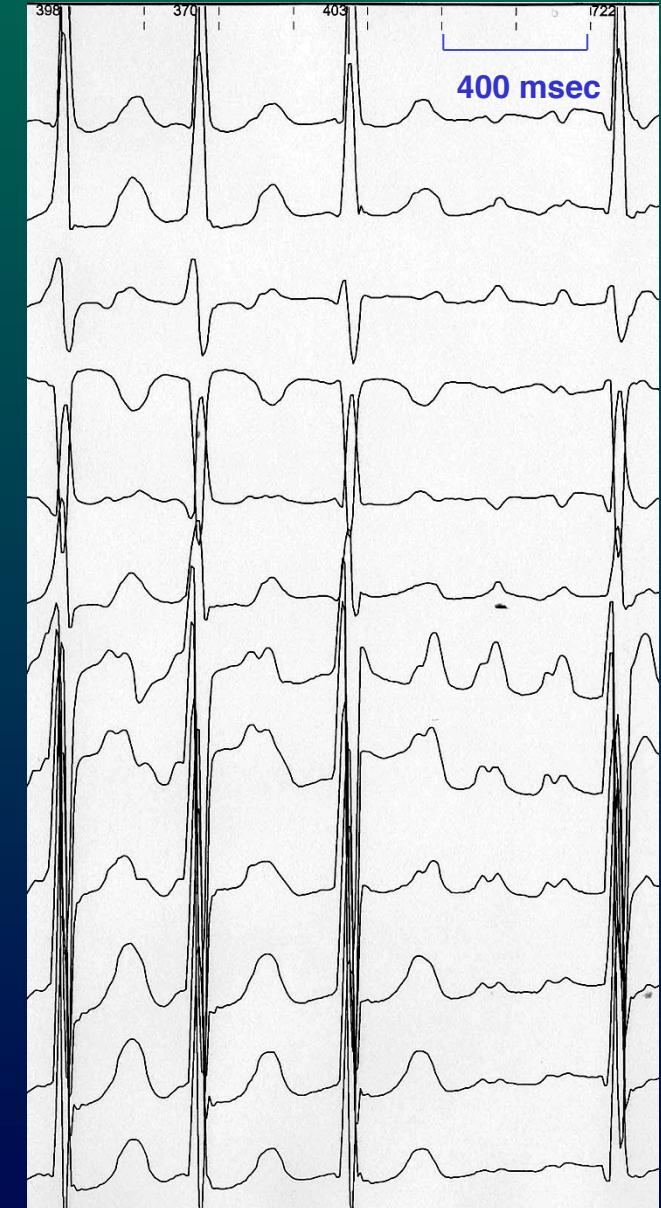
- *non-invasive dx: age-adapted likelihood of substrates
natural courses / outcomes*

-> straight forward procedures (reduction cath-N°)

Focal Atrial Tachycardia



- enhanced automaticity
 - focal origin of arrhythmia
 - preferential sites:
 - *crista terminalis*
 - *RA / LA appendages*
 - *PV-ostia*
-
- *adjacent to scars*

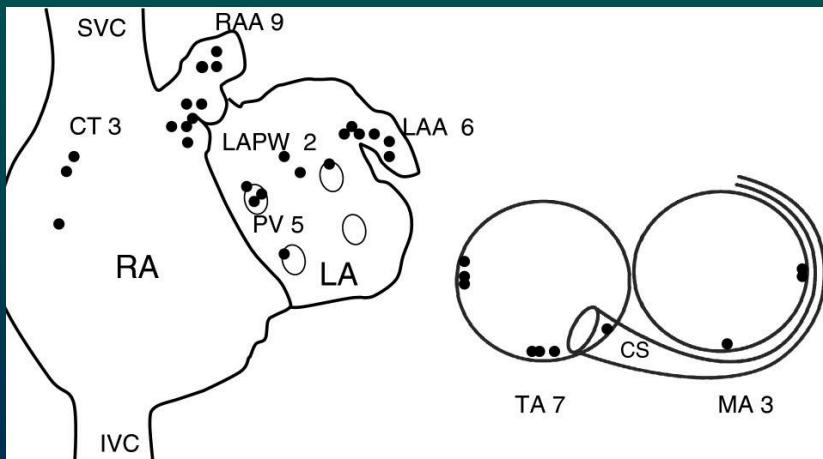


„Electrophysiologic studies and radiofrequency catheter ablation of ectopic atrial tachycardia in children“

retrospective study – 10 yrs period – single center - Wakayama, Japan

35 patients - 39 RFCA for FAT

10 (28%) pts tachycardia-induced cardiomyopathy (TCM)



- RA: 19 pts (54%)
 - right atrial appendage (RAA) (n = 9, 25%)
 - tricuspid annulus (n = 7, 20%)
 - crista terminalis (n = 3)
- LA: 16 pts (46%)
 - left atrial appendage (LAA) (n = 6, 17%)
 - pulmonary veins (n = 5, 14%)
 - mitral annulus (n = 3)
 - posterior wall of the left atrium (n = 2).

- success: 35 / 35 pts
- recurrence: 0 / 35 (fu-up 2 to 8 yrs)
- LV-fx improved in 10 / 10 pts with TCM

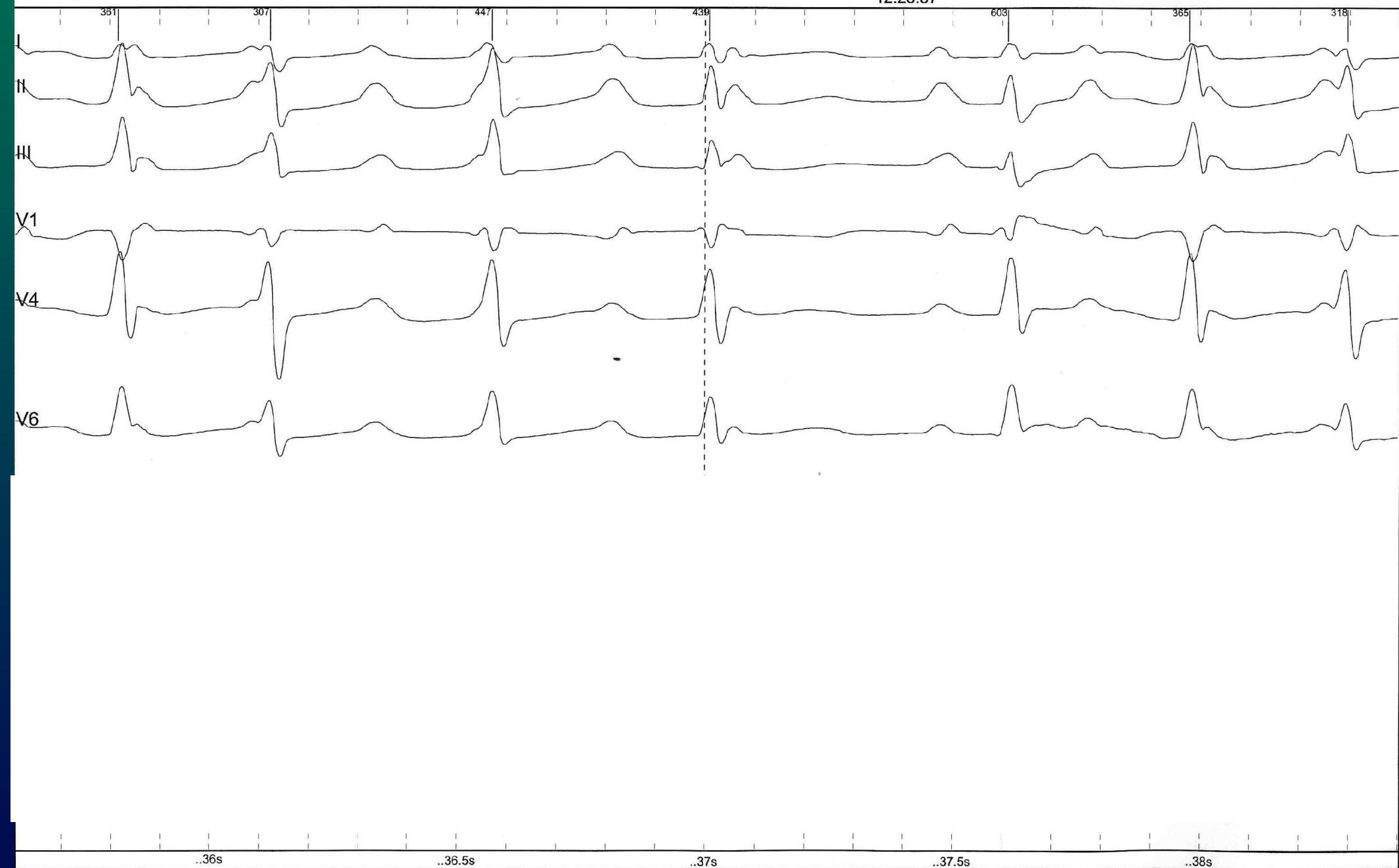
„The origin of EAT in children differed from its origin in adults“

„The authors conclude that RFCA is a safe and effective treatment option for children with refractory EAT and should be considered early in the course of their illness“

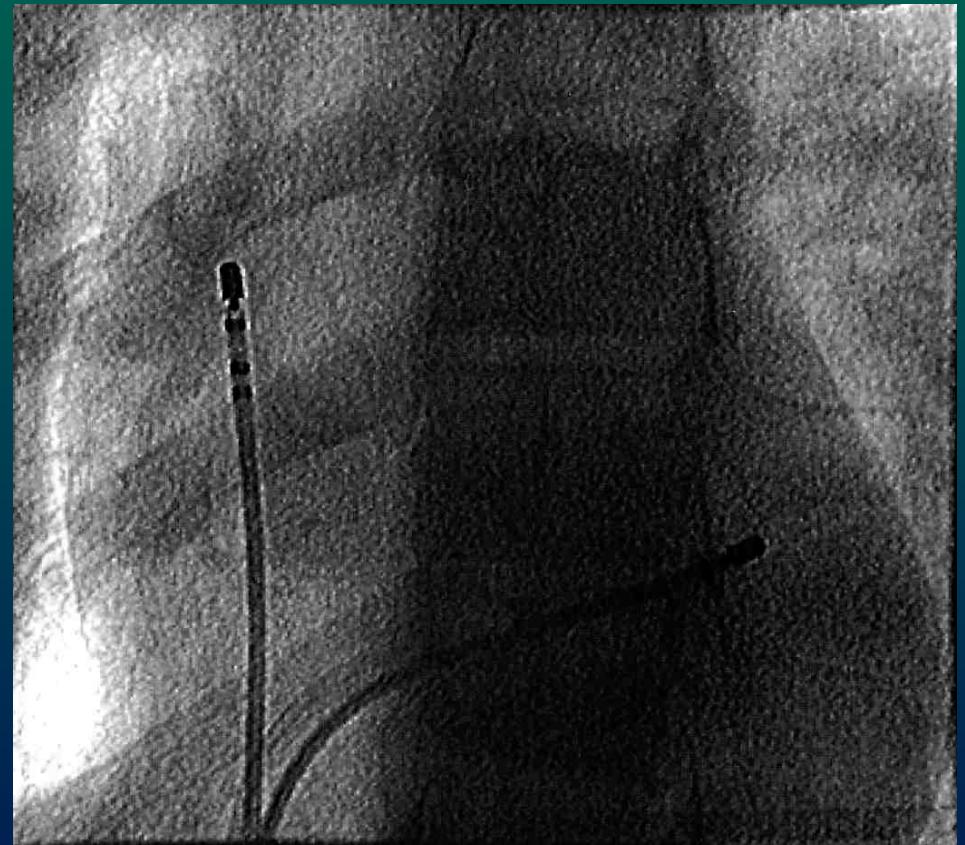
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EPControl

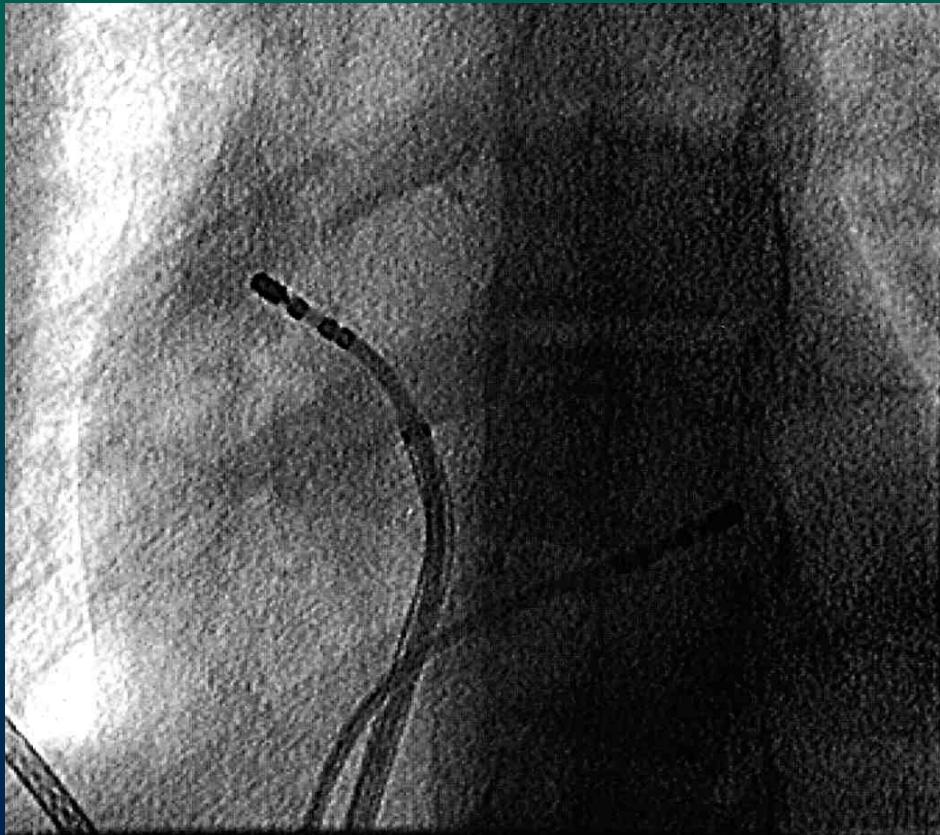


w 7 yol, FAT - PV septal-superior

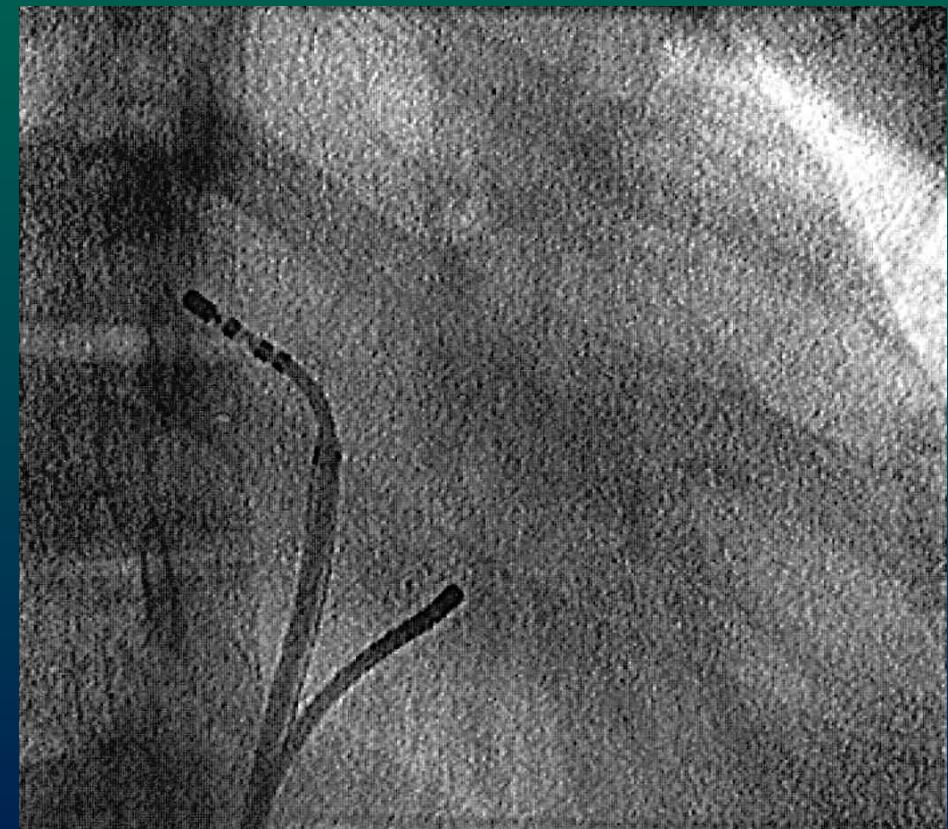


LAO 30°

w 7 yol, FAT - PV septal-superior

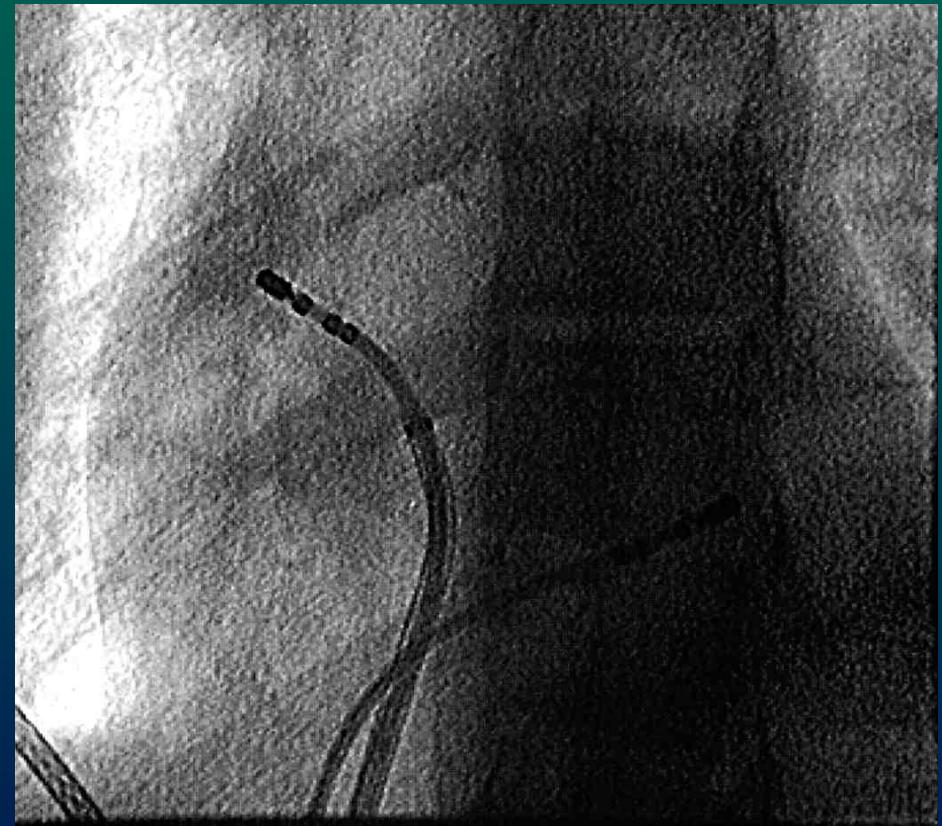
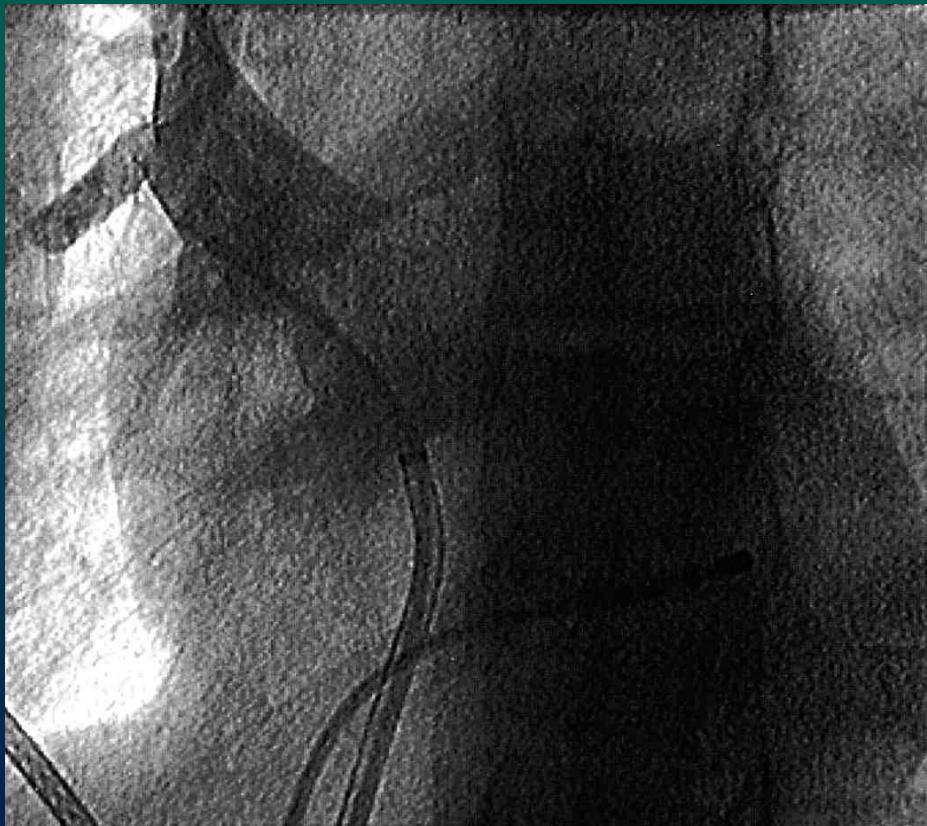


LAO 30°



RAO 30°

w 7 yol, FAT - PV septal-superior

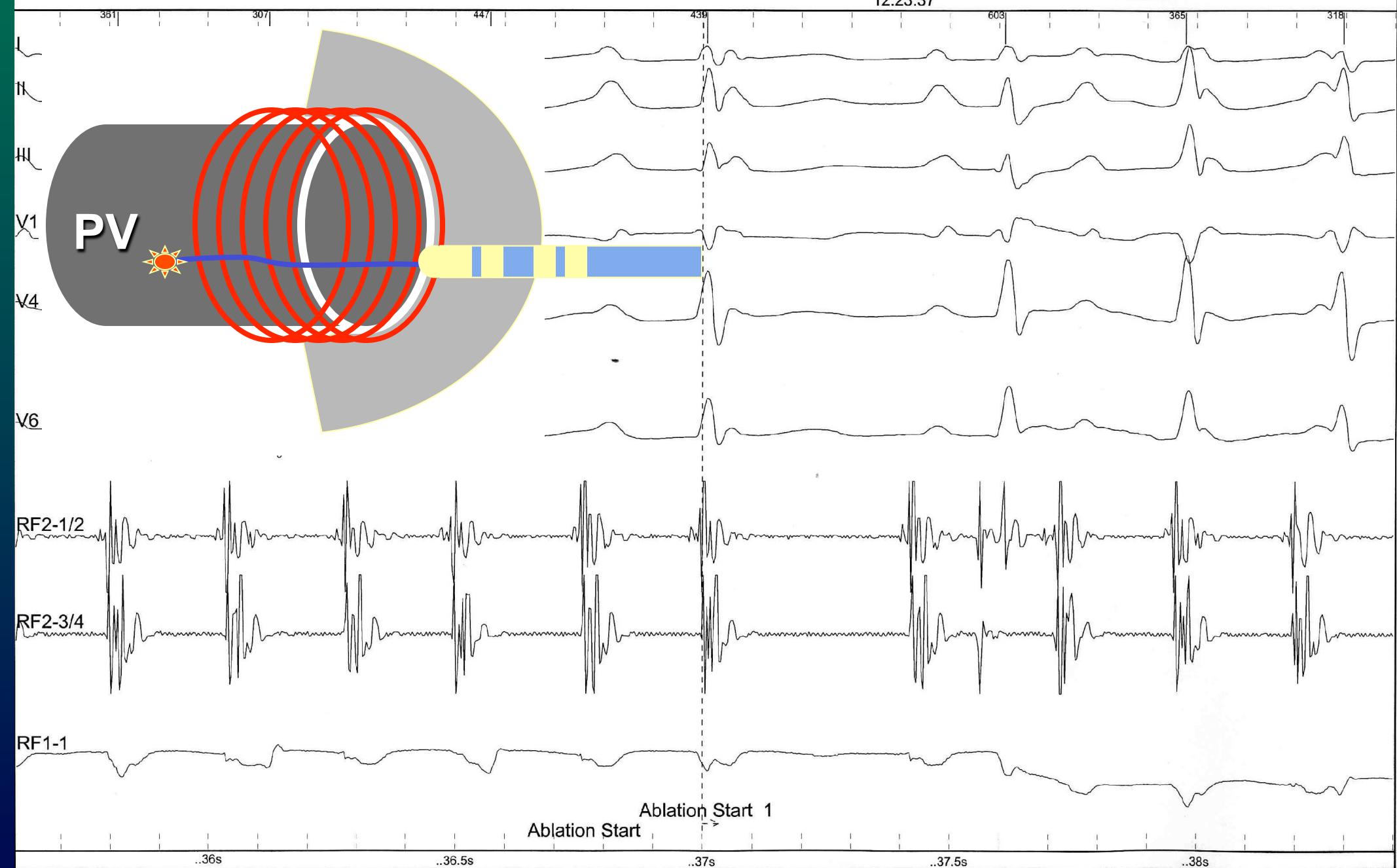


LAO 30°

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12:23:37

EPControl



ID: 204262

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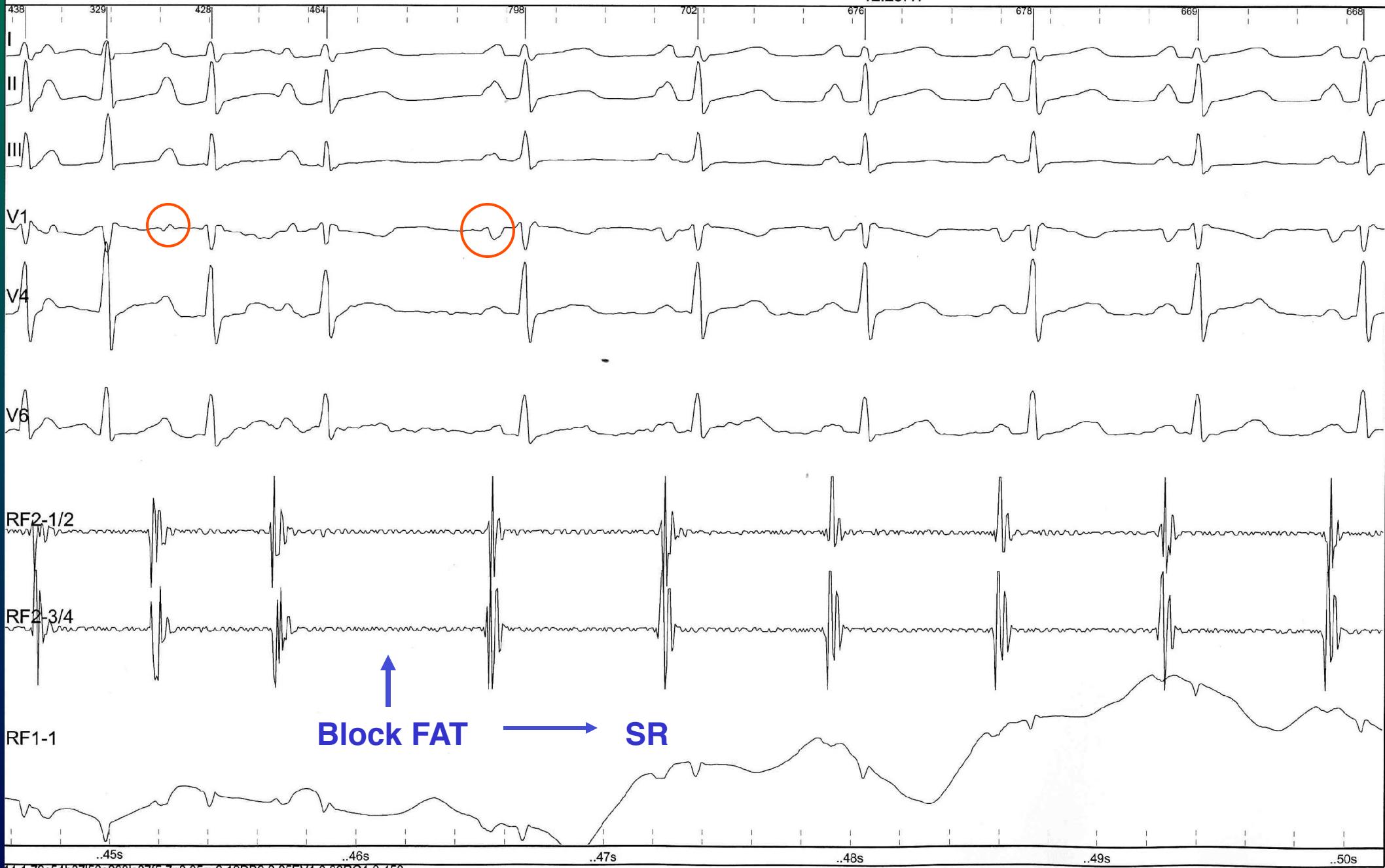
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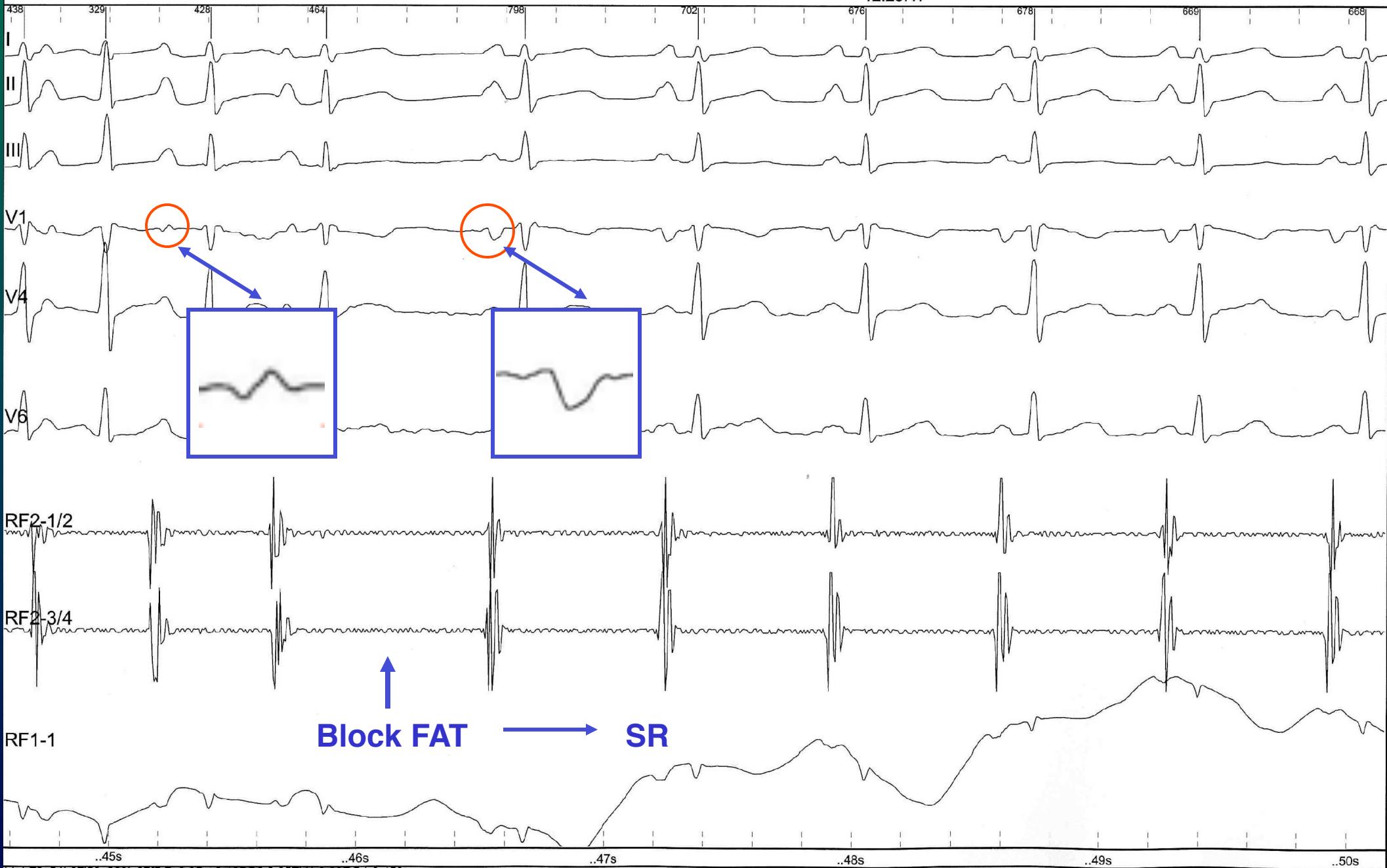
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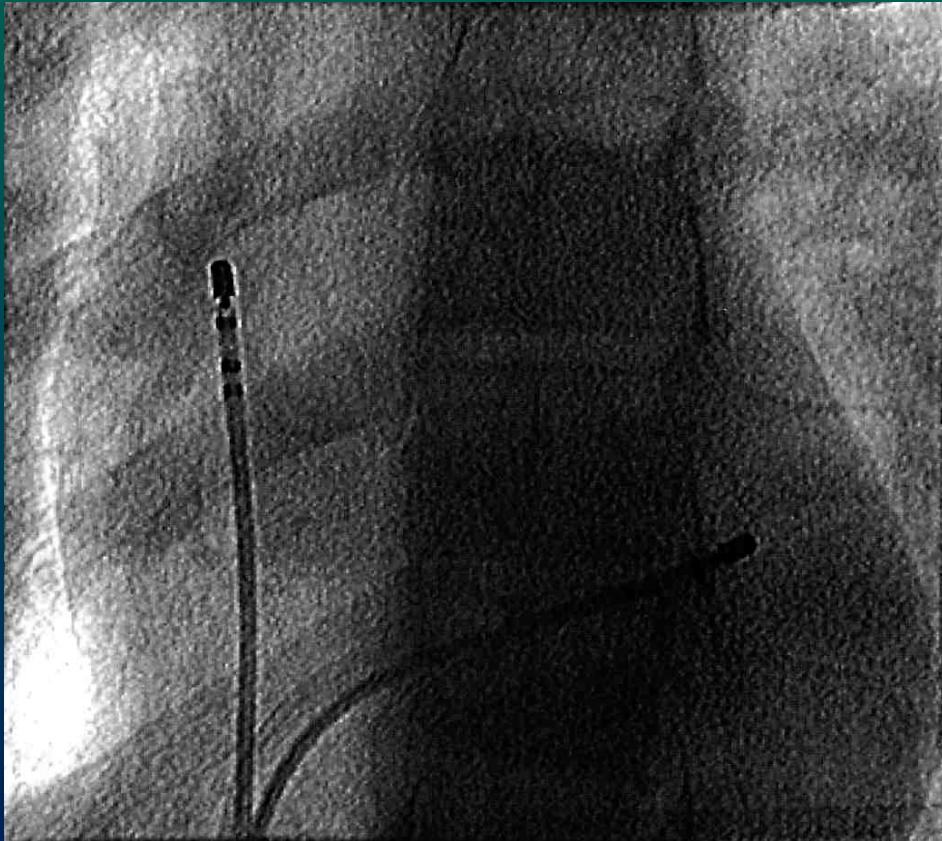
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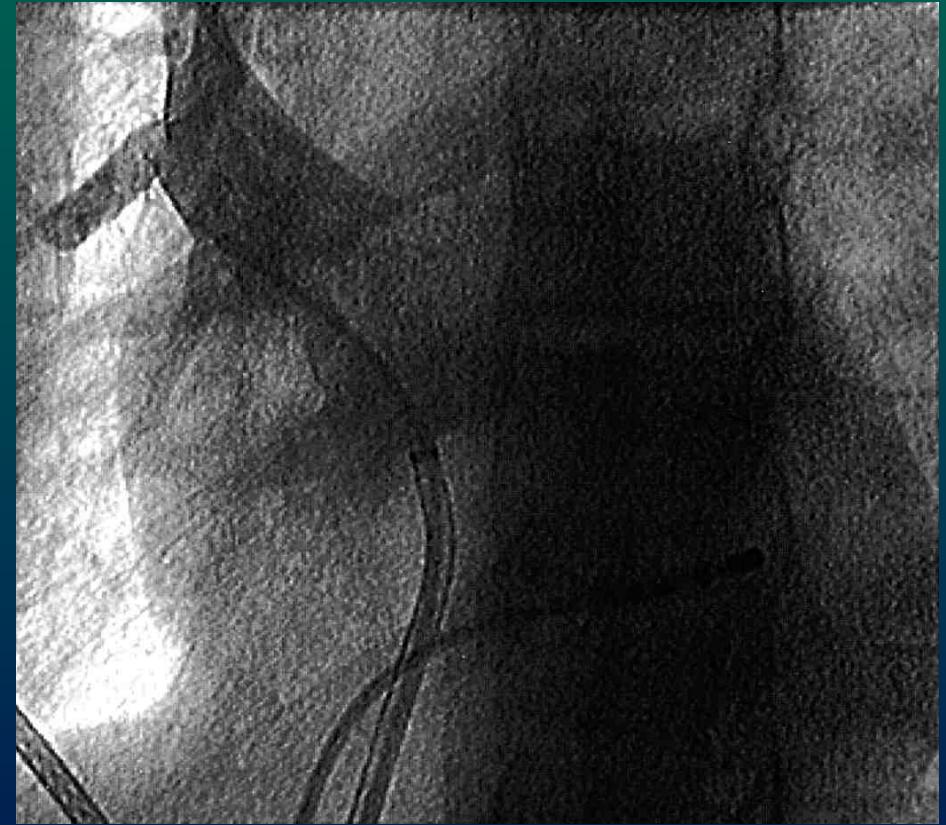
EPControl



w 7 yol, FAT - PV septal-superior



Map in RA



LAO 30°

Map in LA/PV

ID: 204262

27.04.2004
12:24:06

EPControl

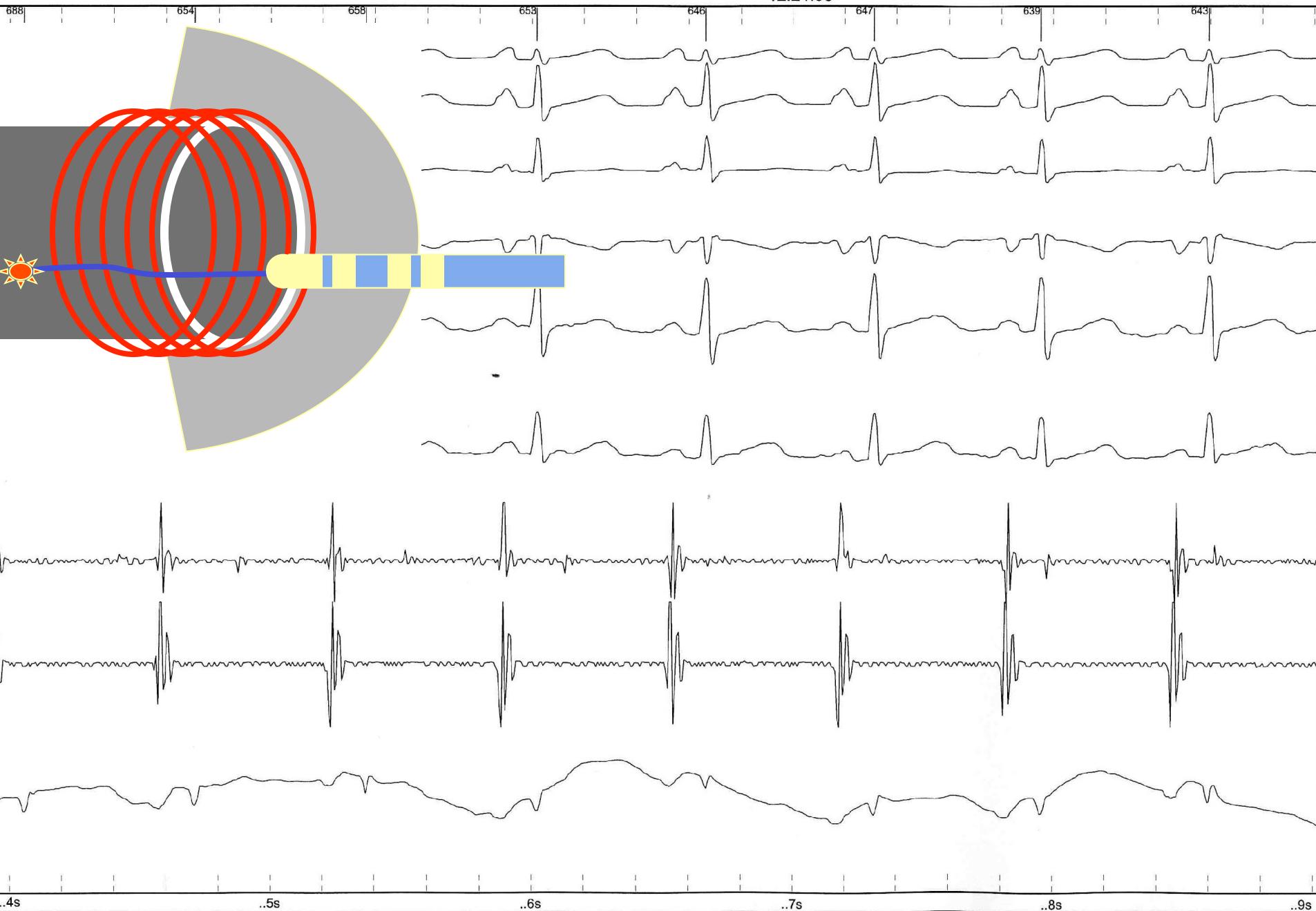


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27.04.2004

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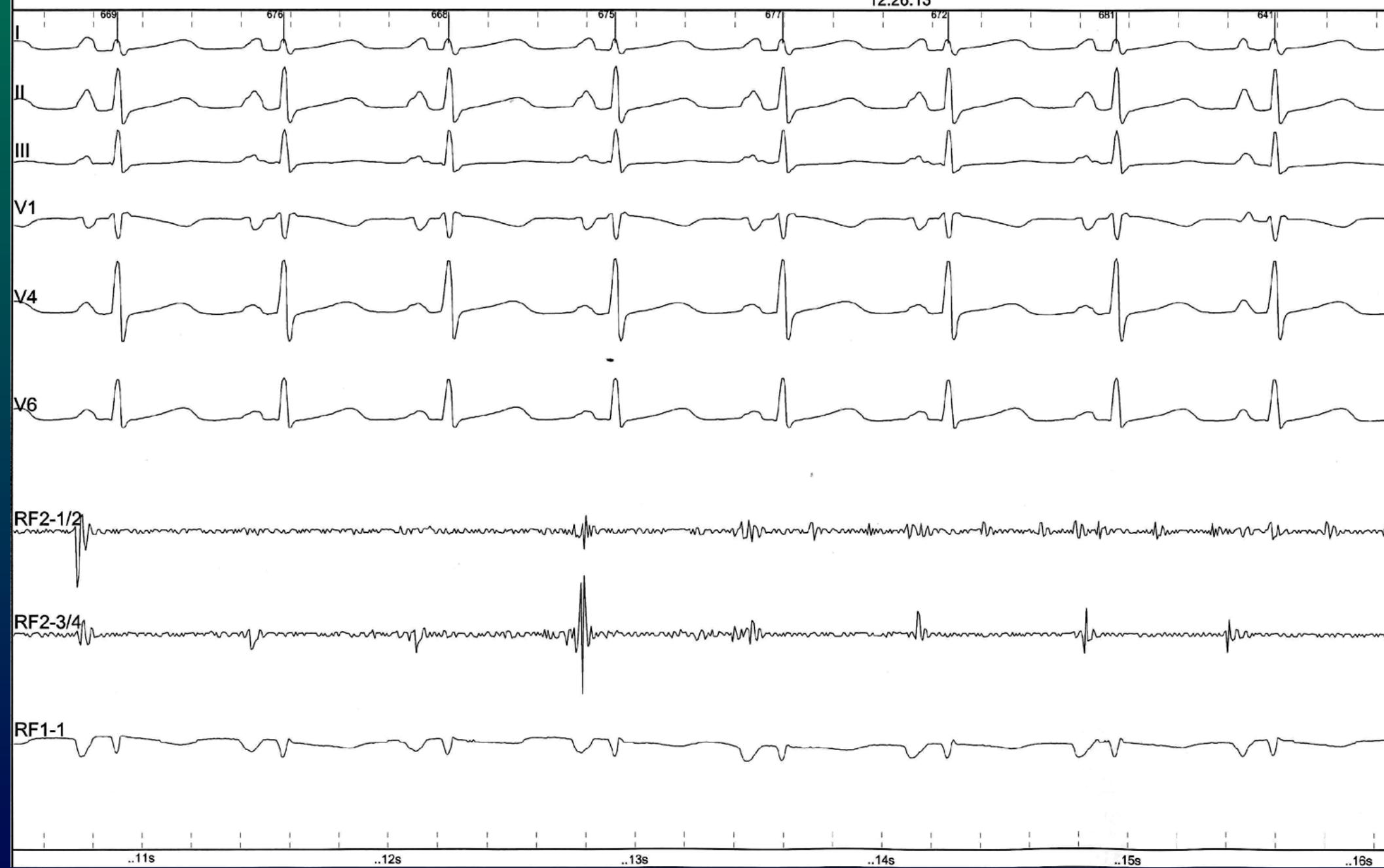
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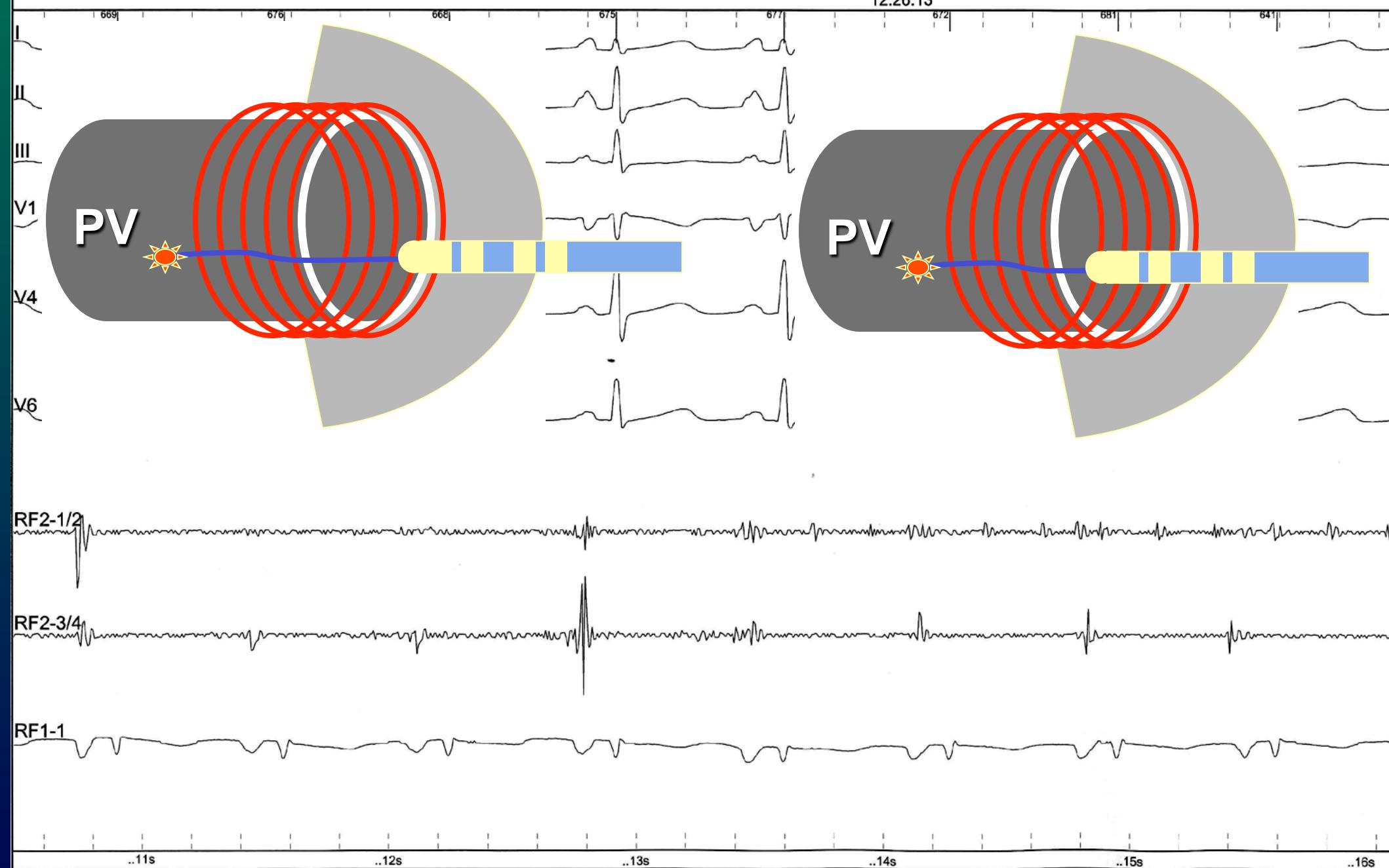
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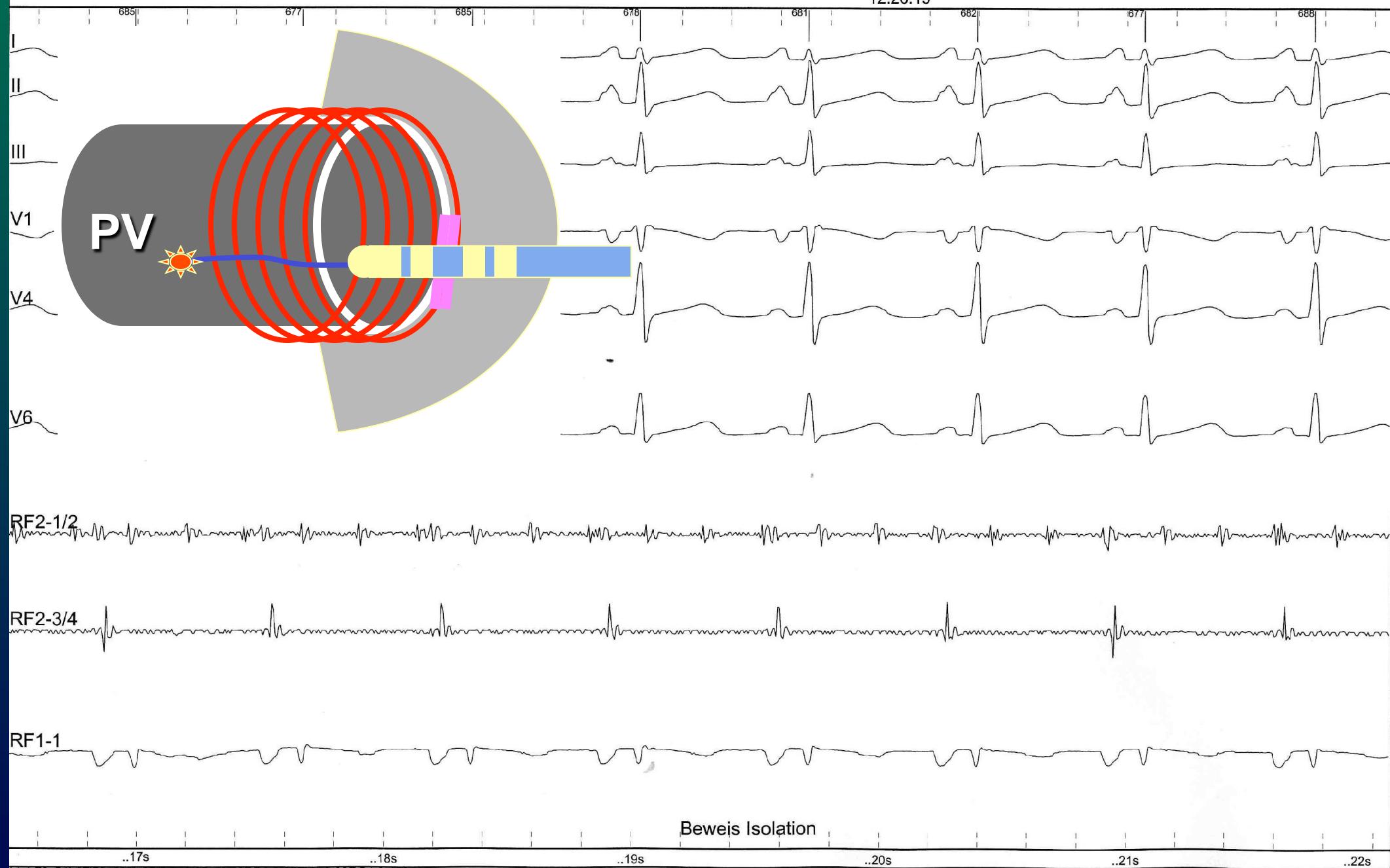
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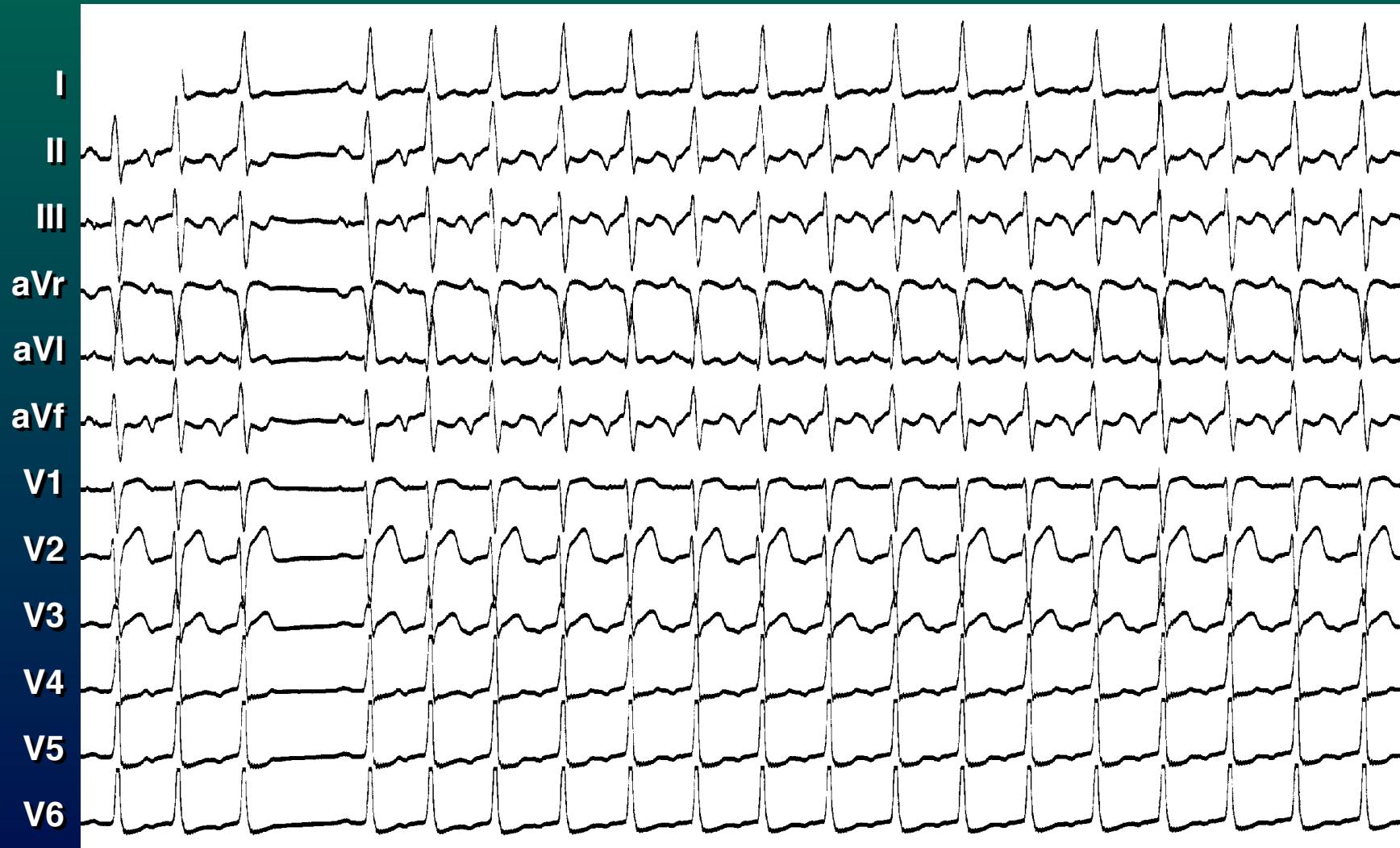
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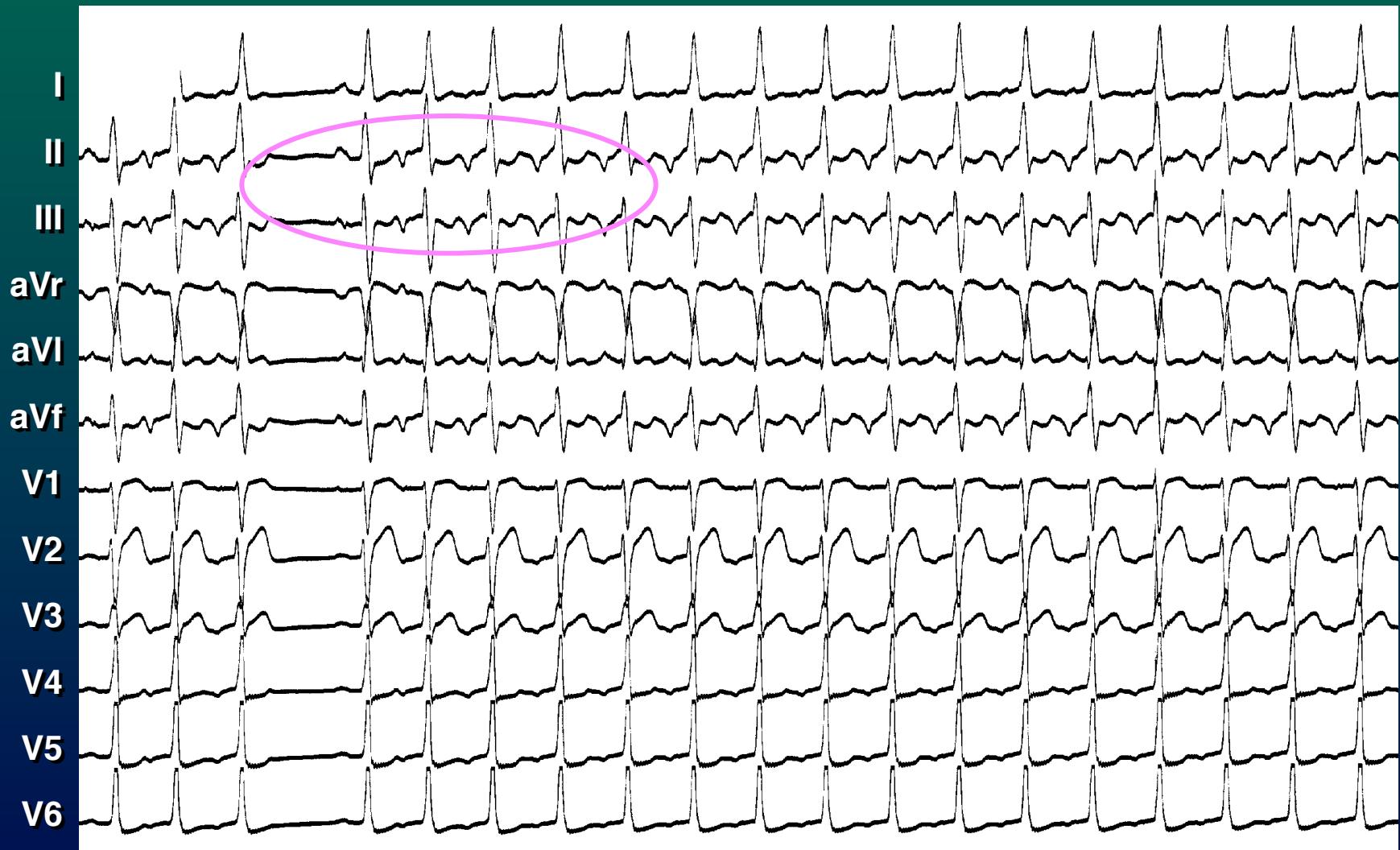
EPControl



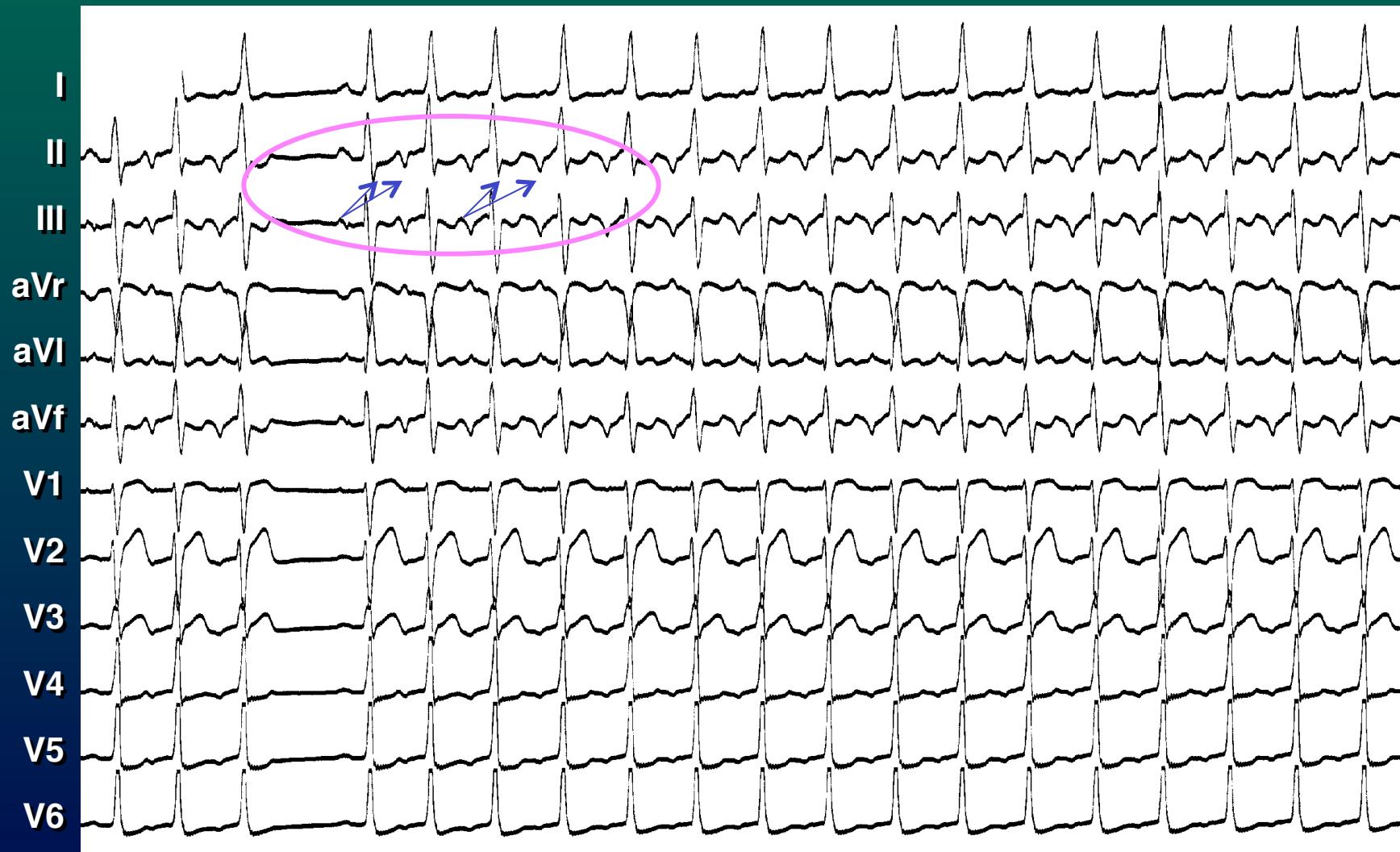
DD: long – R – P (FAT vrs. PJRT)



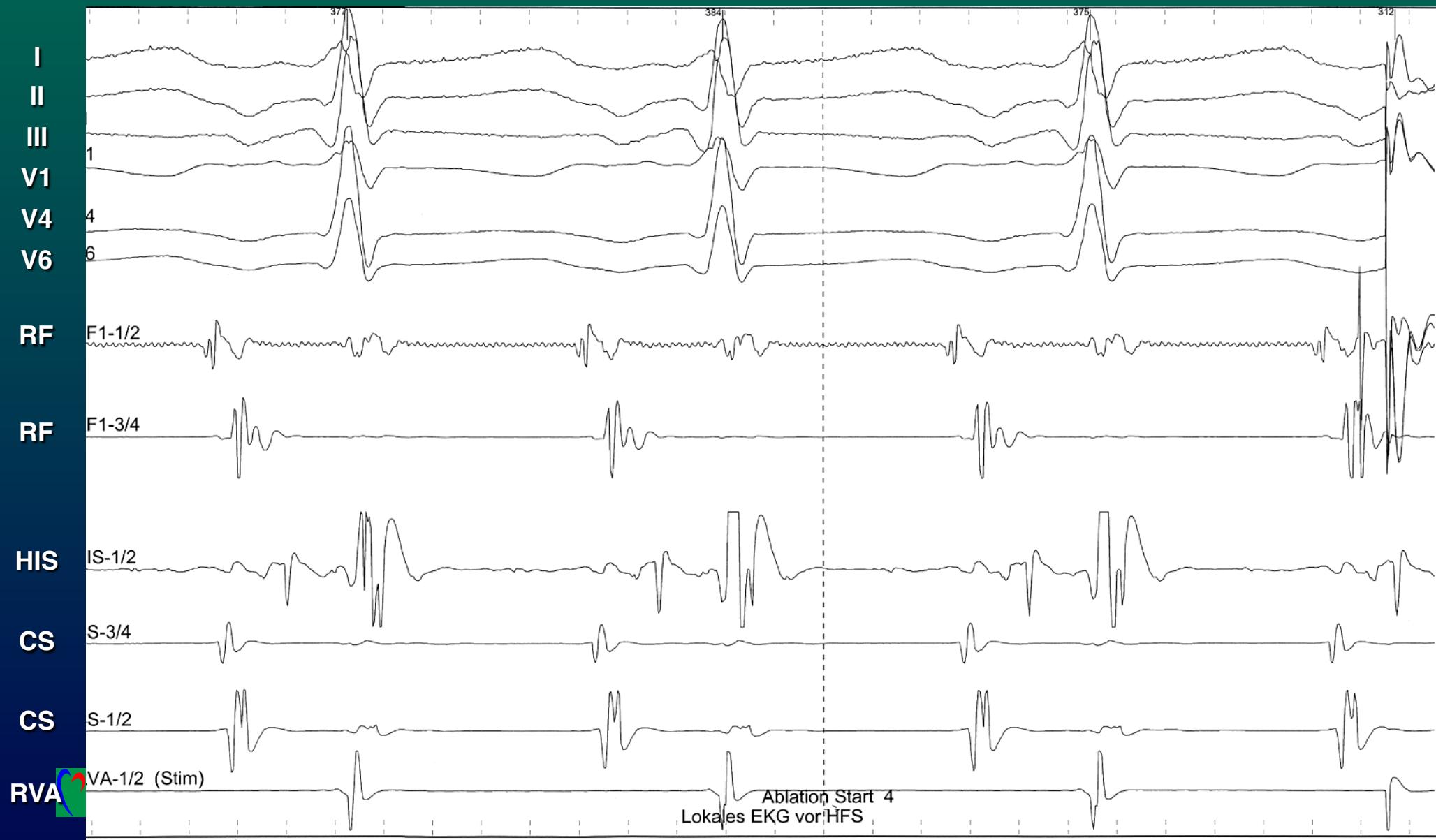
DD: long – R – P (FAT vrs. PJRT)



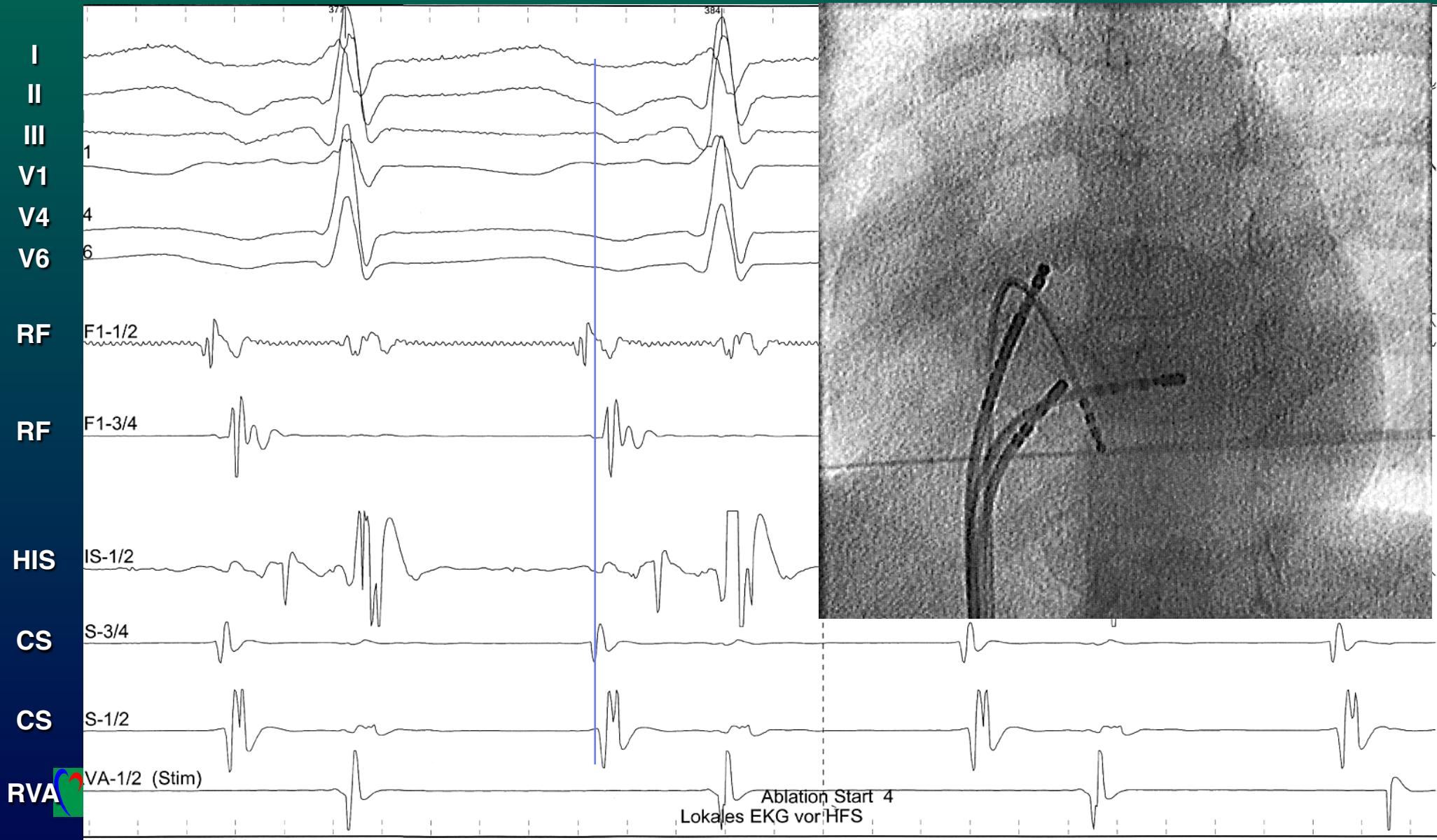
Permanent Junctional Reentrytachycardia (PJRT)



Permanent Junctional Reentrytachycardia (PJRT)



Permanent Junctional Reentrytachycardia (PJRT)



Permanent Junctional Reentrytachycardia (PJRT)



Ablation in Infants and Smaller Children

aspects:

- *technical*
 - *design / size of tools*
 - *limited in small anatomy*
 - *distribution arrhythmia type / substrate*
 - *sensitivity against fluoroscopy*
- *experience*
- *biological*

Ablation in Infants and Smaller Children

aspects:

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 - *distribution arrhythmia type / substrate*
 - *sensitivity against fluoroscopy*

options

- *3 – D – electro-anatomic navigation*

f, 21 yol., 63 kg M.Ebstein, WPW



M.Ebstein, WPW

f, 21 yol., 63 kg

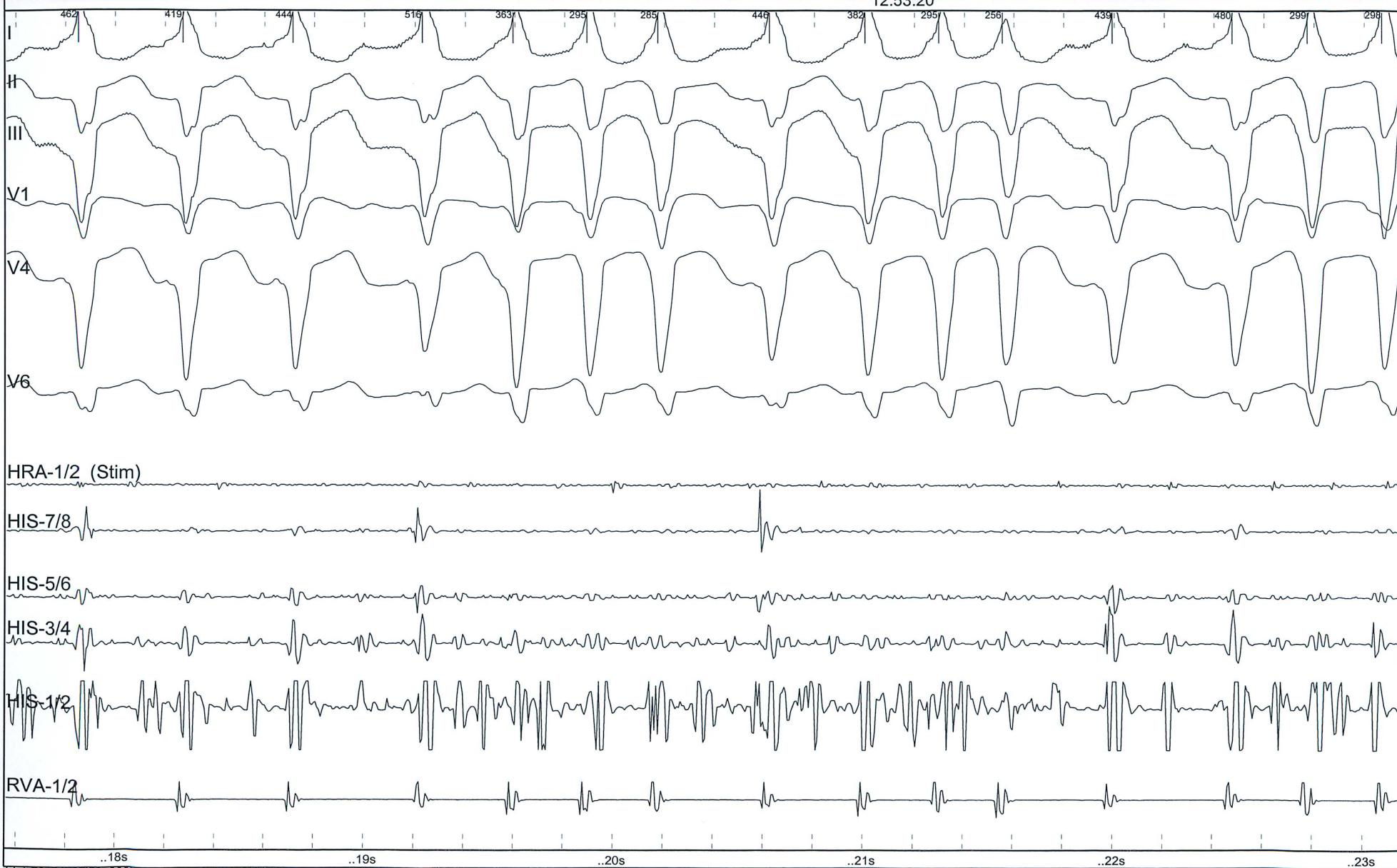
- 2 x failed attempt f. RFC-ablation 1. Univ. Hosp. aged 10 yol
- 2 x failed attempt f. RFC-ablation 2. Univ. Hosp. aged 11 + 14 yol
- recurr. symptomatic tachycardia,
 - recurr. pre-syncpe, fainting
- skin lesion right shoulder (secondary to X-ray)

Name:
ID: 20120408

Printout 5
25.04.2012
12:53:20

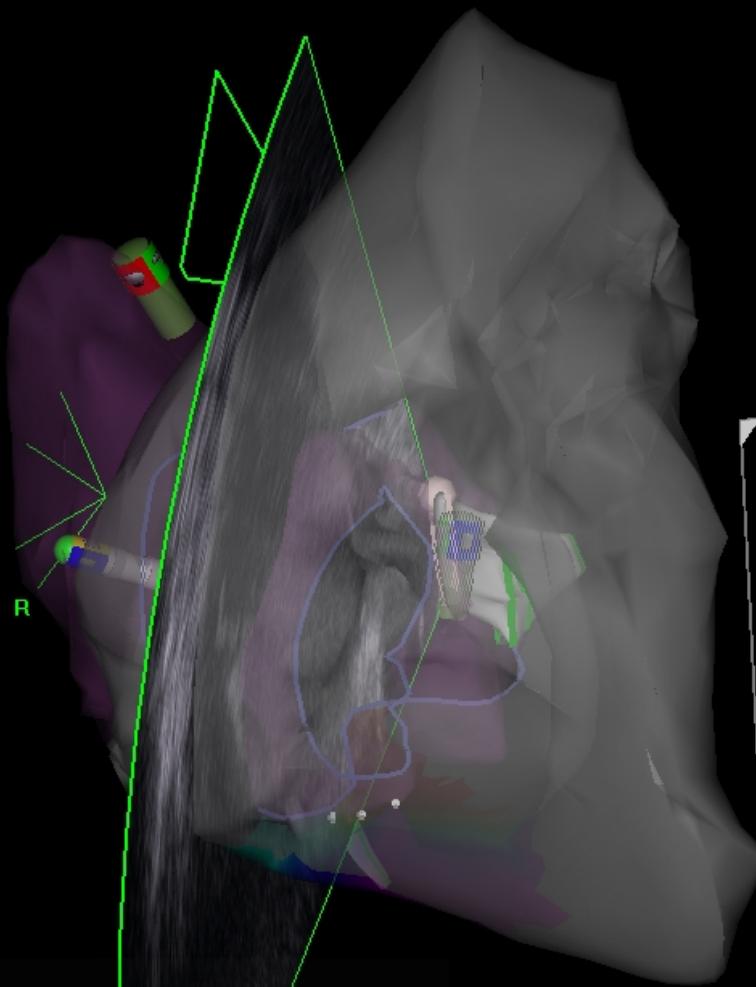
BIOTRONIK
EPControl

50mm/s



3-RA (0, 36) ▾

-74 ms -67 ms
-74 -67
LAT

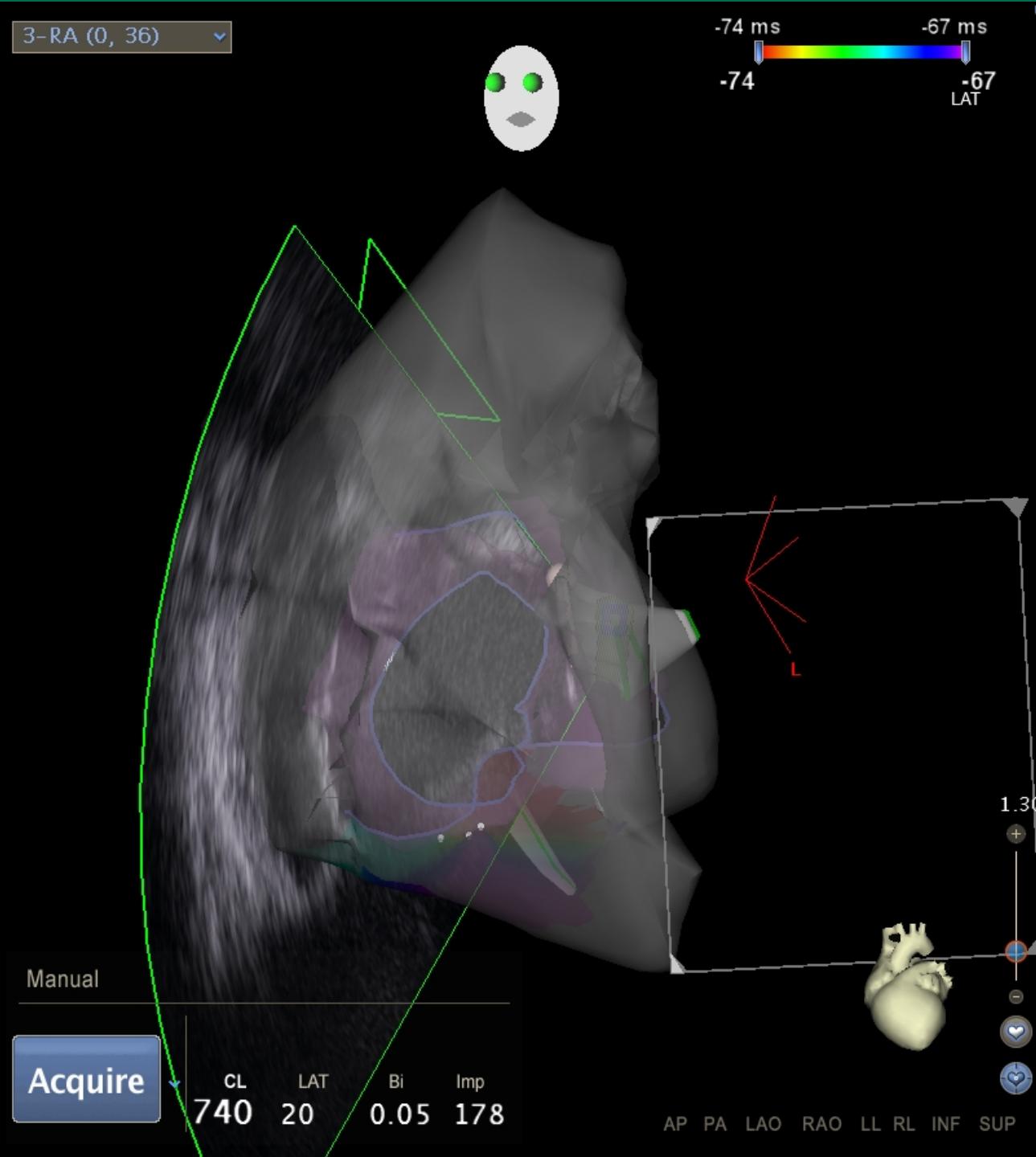


Manual

Acquire ▾

CL LAT Bi Imp
757 18 0.05 182

AP PA LAO RAO LL RL INF SUP



3-RA (0, 36) ▾

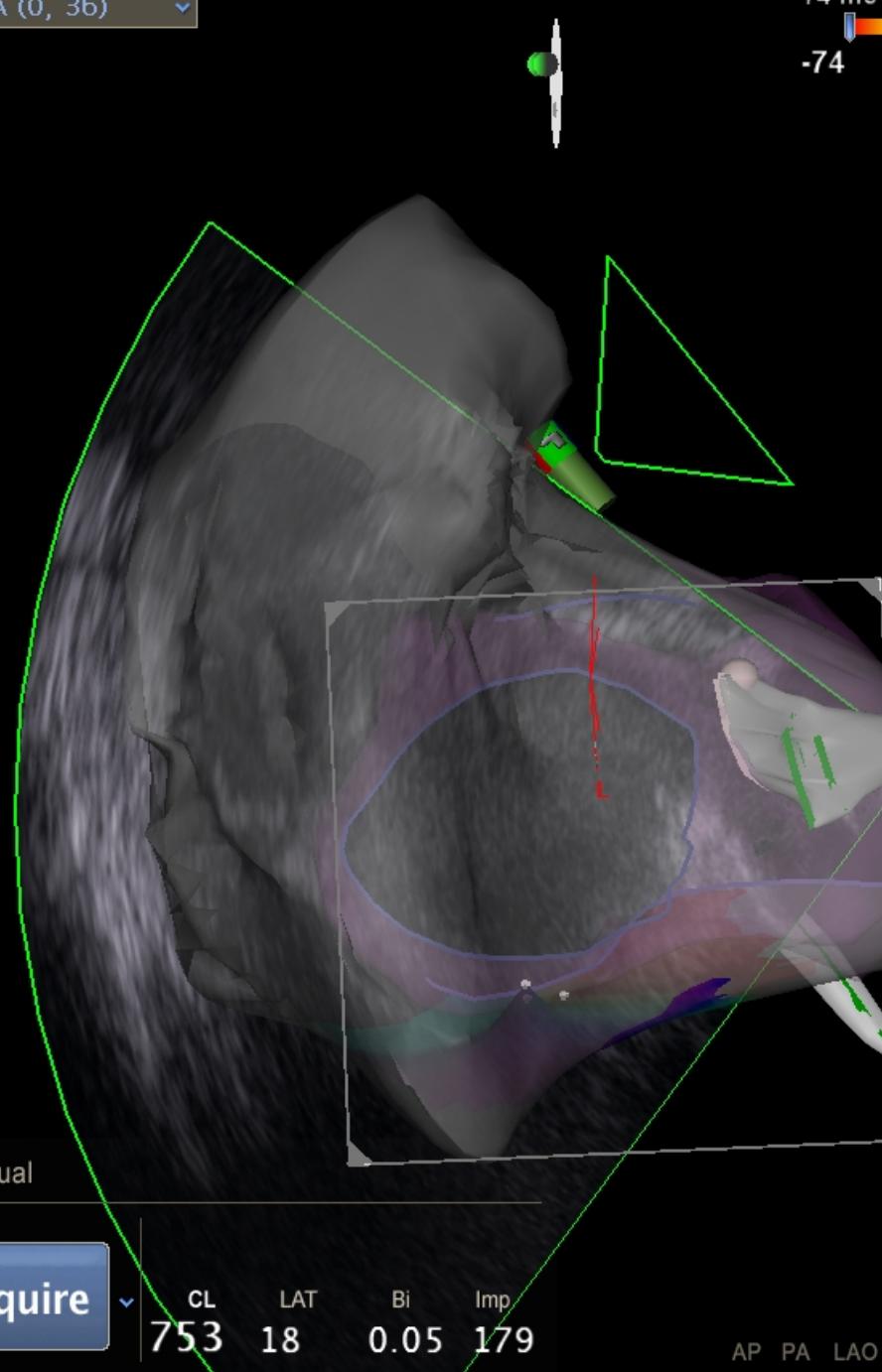
-74 ms

-67 ms

-74

-67

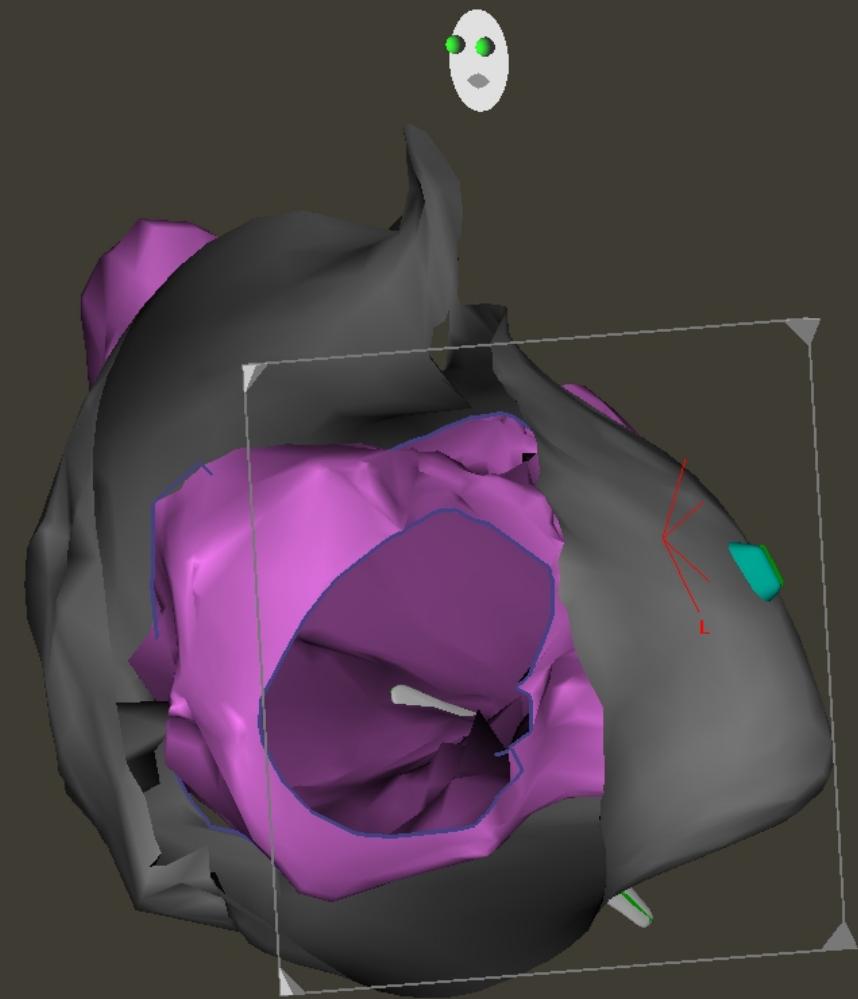
LAT



3-RA (0, 36)



LAT



0.90



+

-

0

Manual

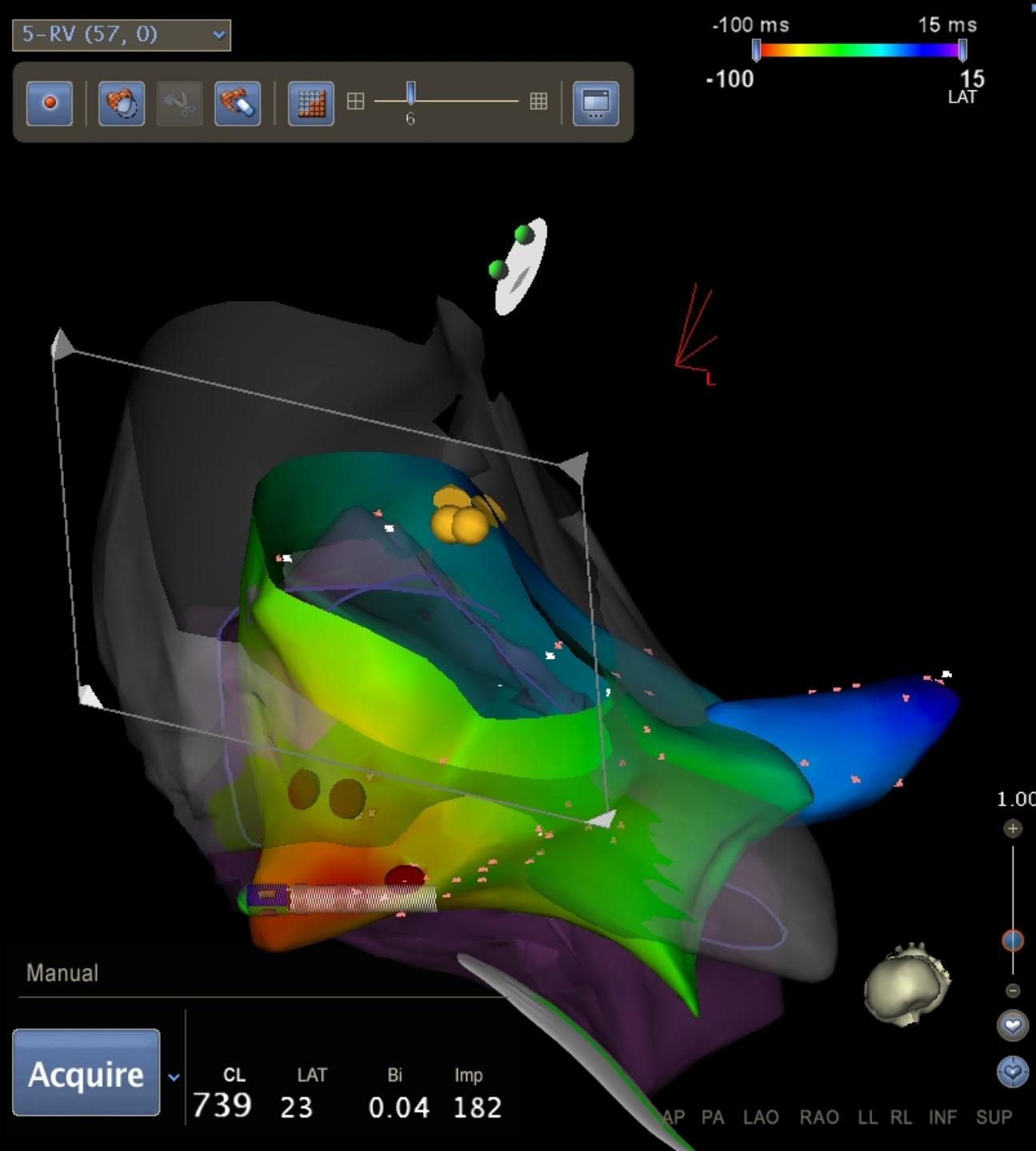
Acquire

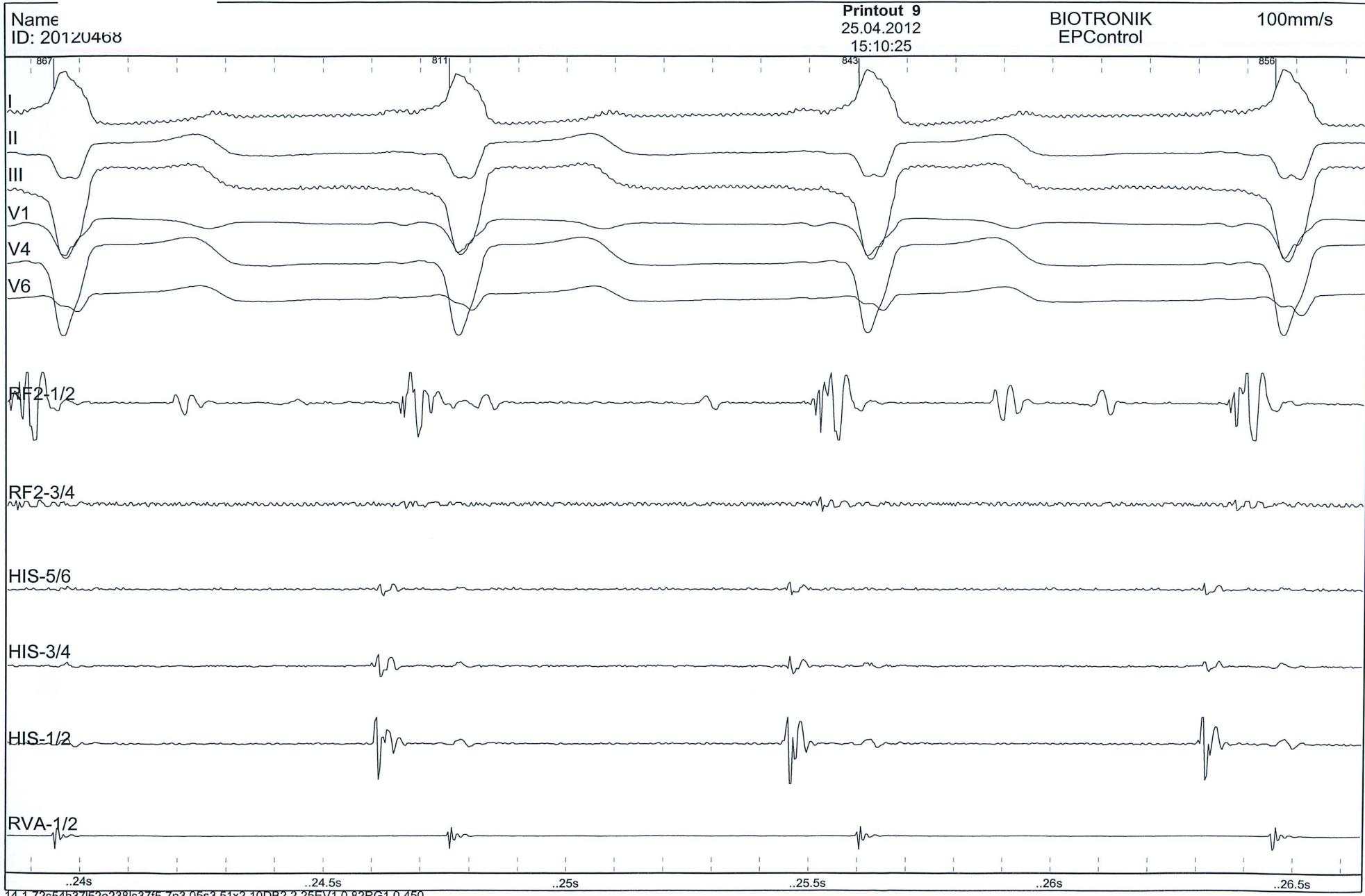
CL

LAT

Bi

Imp



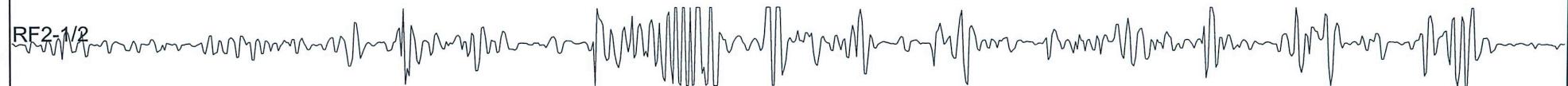


Name
ID: 20120468

Block akzessor. Leitungsbahn währ. 2. S
25.04.2012
15:11:20

BIOTRONIK
EPControl

50mm/s



Block akzessor. Leitungsbahn währ. 2. Stromappl.

..19s

..20s

..21s

..22s

..23s

M.Ebstein, WPW

f, 21 yol., 63 kg

- 2 x failed attempt f. RFC-ablation 1. Univ. Hosp. aged 10 yol
- 2 x failed attempt f. RFC-ablation 2. Univ. Hosp. aged 11 + 14 yol
- recurr. symptomatic tachycardia,
 - recurr. pre-syncpe, fainting
- skin lesion right shoulder (secondary to X-ray)
- now: successful ablation 1 AP, RA postero-lateral

25.4.12 EP-Bremen

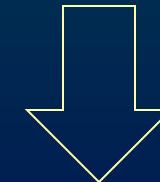
proc. duration 4.5 hrs

fluo-time 1.5 min. / < 10 cGy cm²

Ablation in Infants and Smaller Children



difference?



EP-Treatment in Grown-up Patients

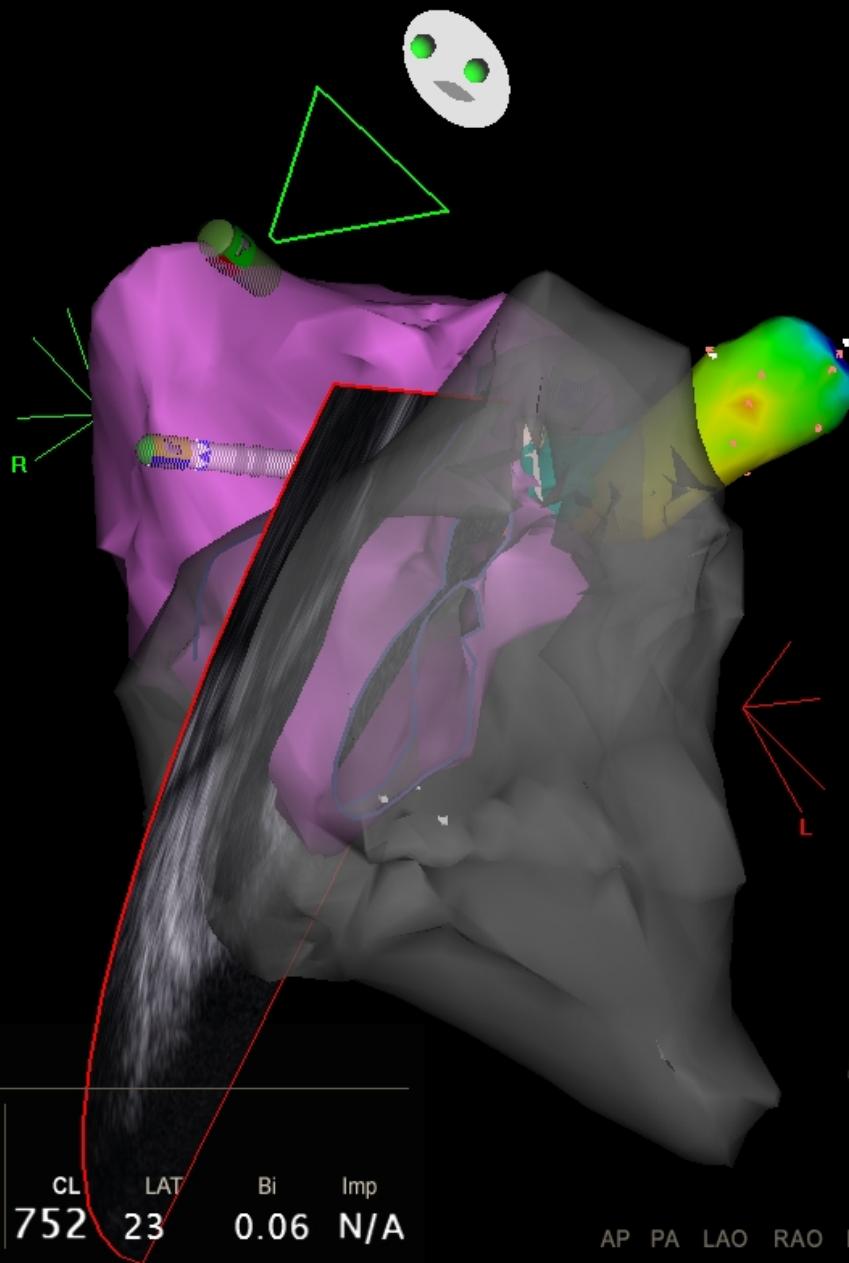
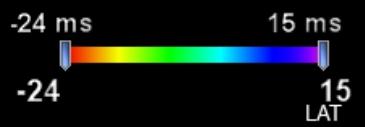
Ablation in Infants and Smaller Children

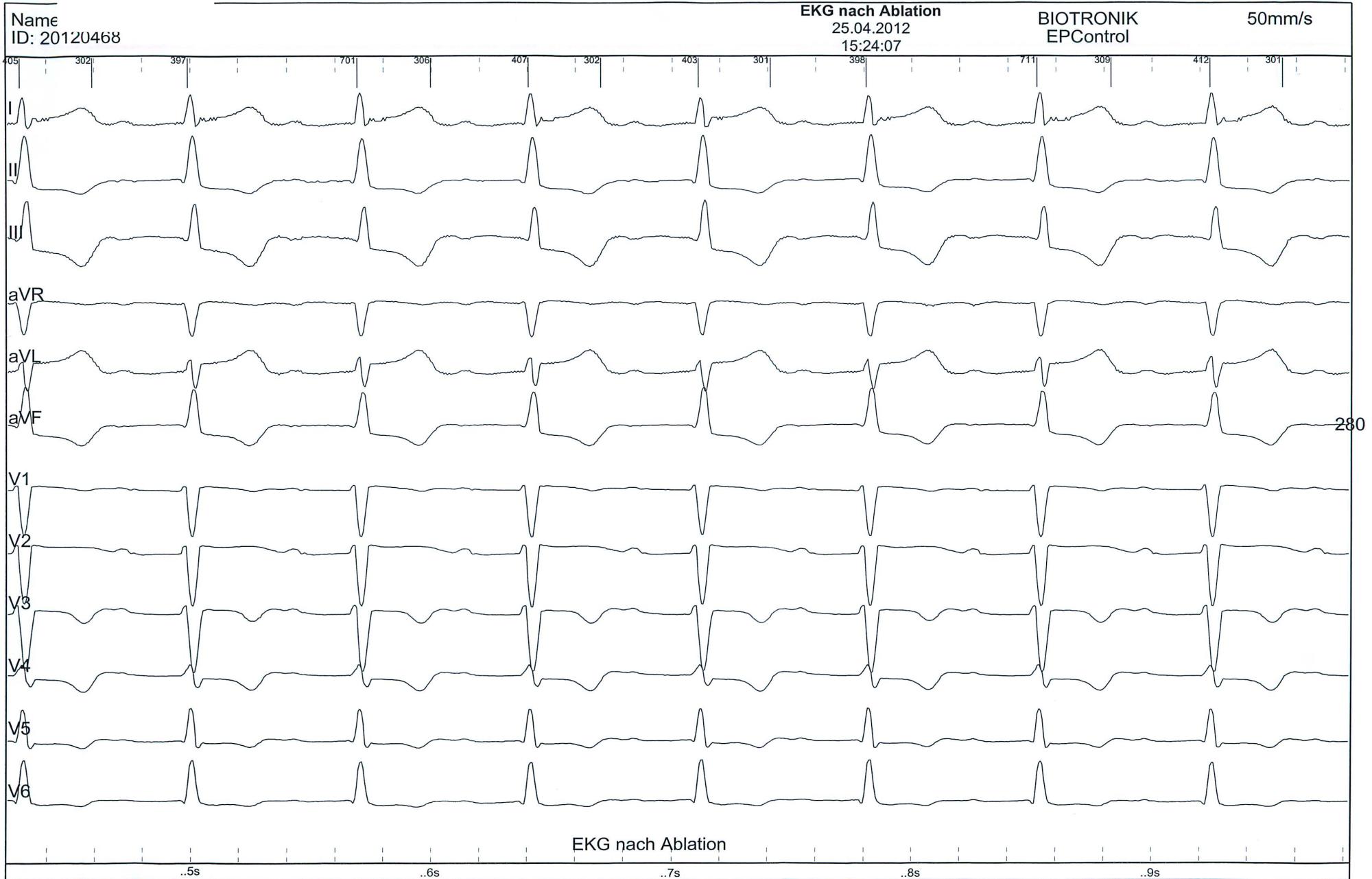
- access and catheters: tips and tricks -

- *no specific designed / sized tools for cath.-ablation*
- *mostly anecdotal experience (< 1 yol) - no „big data“*
- *no evidence for age-/size-related „energy-settings“ (RF/Cryo)*
- *age-related distribution of substrates helps in:*
 - *ddiff (indication)*
 - *reduction / tailoring of ep-setting (N° cath.)*
- *use of Cryo-energy may lower complication rate*
- *use of 3-D-EA-technology reduces / eliminates fluo-induced*



3-RA (0, 36)





Ablation in Infants and Smaller Children



... thoughts ...



... concerns ...

... limited vascular access / risk for injury!

... lesion growth?

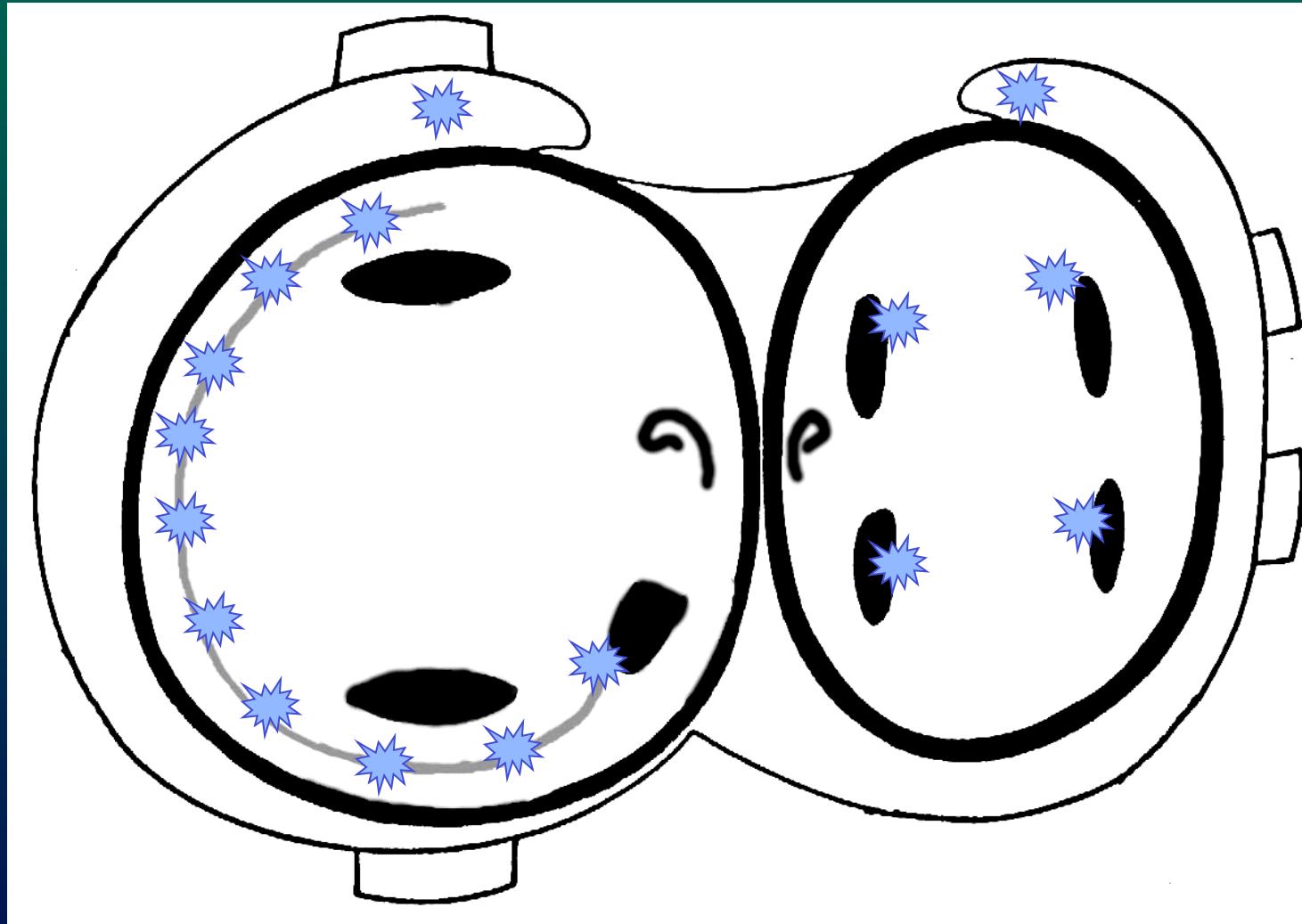
... coronary art. damage?

... when she/he's grown up – can decide alone !

... risk of radiation?

... sequelae for whole life!

Focal Atrial Tachycardia





Im Klassenraum

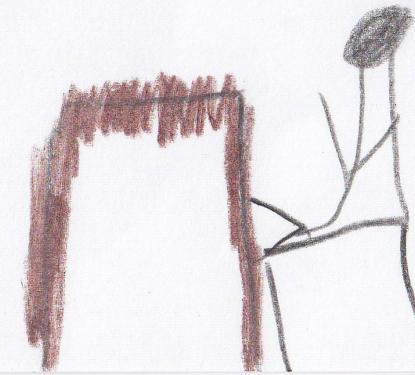
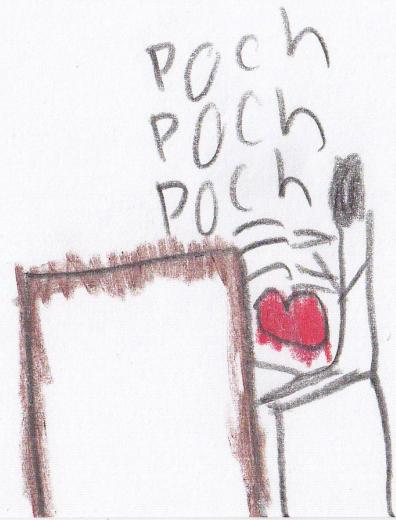
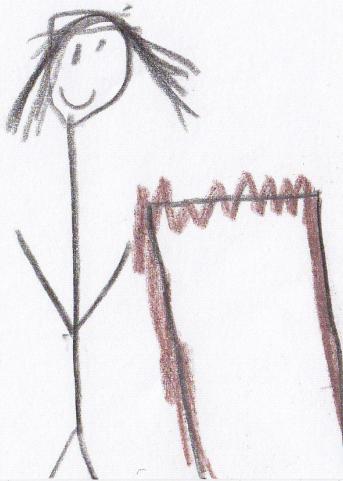


Ich gehe nach Bremen und lasse mich operieren, dass ich kein Herzrasen mehr habe.

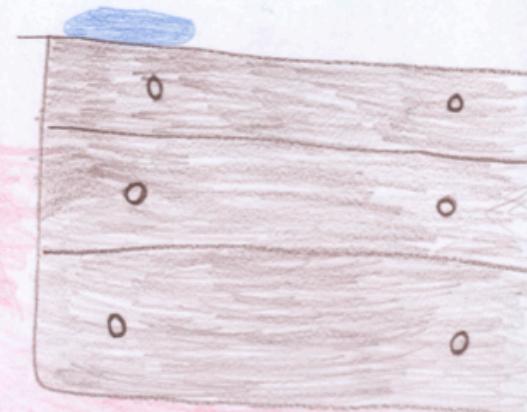


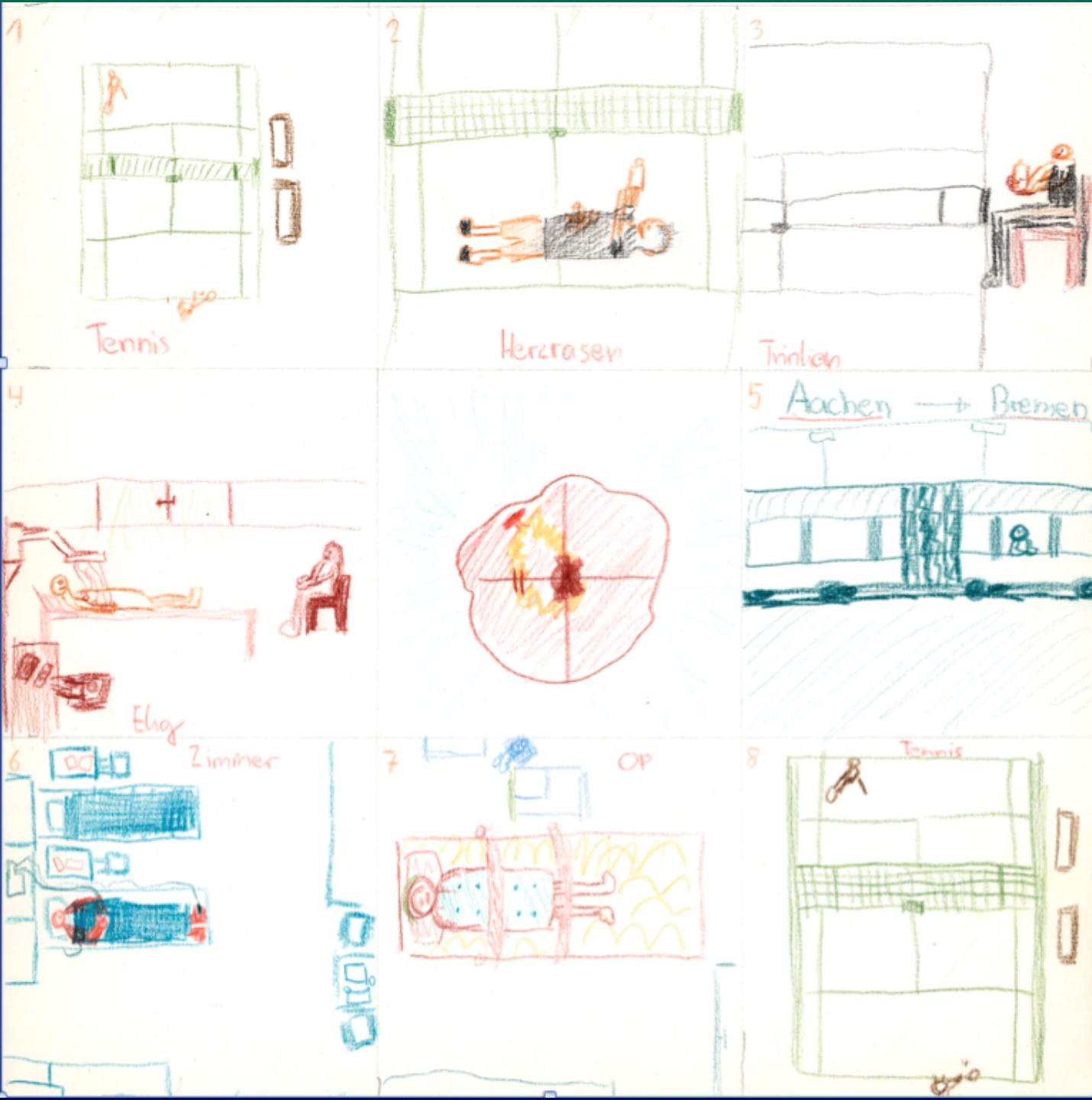
Kilian

Tik
Tik
Tik



Melissa







02.08.05
mat



Vor der Op



von Marcella

Nach der Op



Danke
mir gehts
gut