

# Behandeling AF volgens de laatste Richtlijnen;

## Pulmonaal Vene Isolatie

22 April 2013

Sabine Eijsbouts



**Gedreven  
door het  
leven.**



**catharina  
ziekenhuis**

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# Inhoud

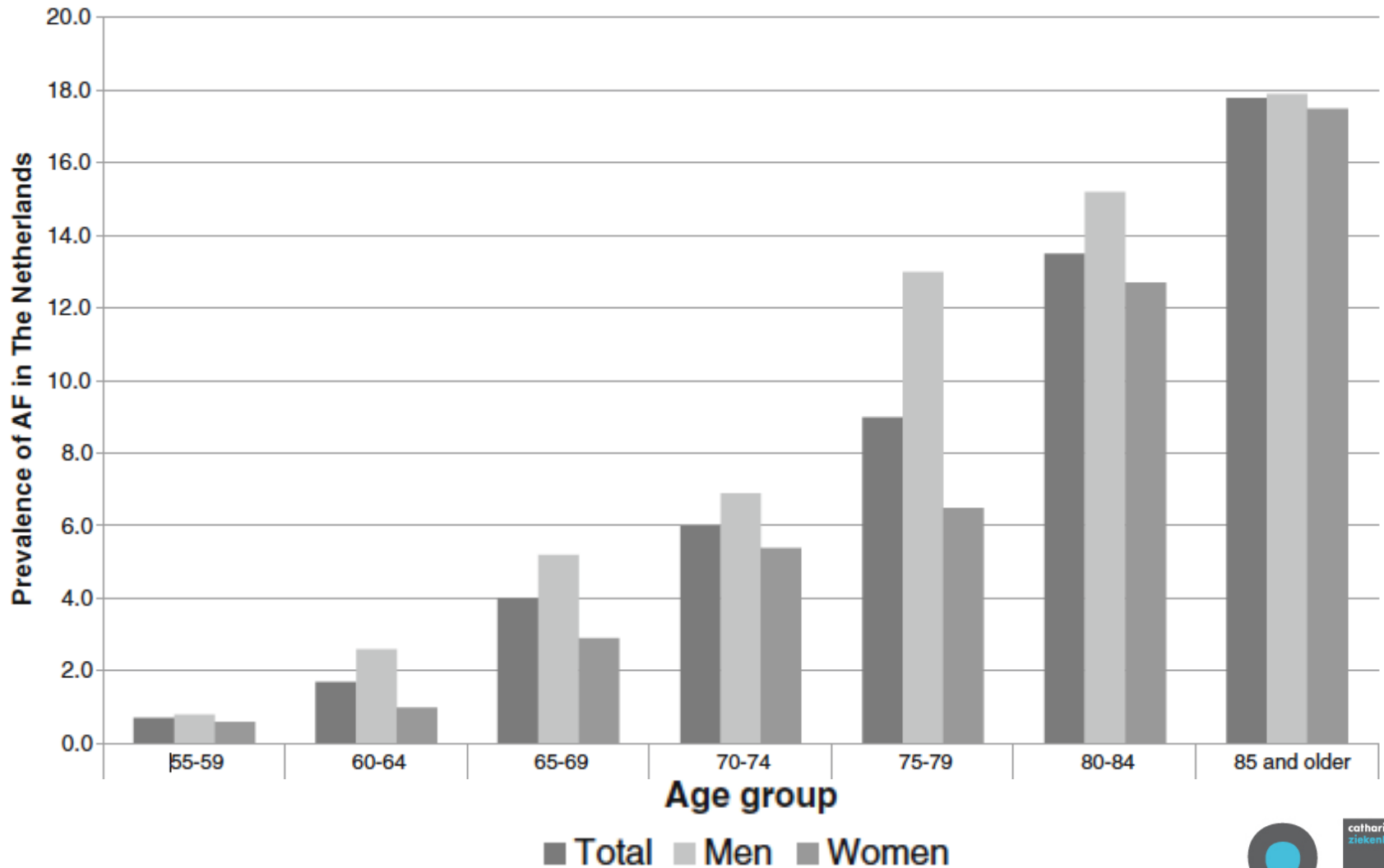
- AF in Nederland
- Mechanisme van AF
- Behandeling van AF (richtlijn 2012):
  - Medicamenteus
- **Pulmonaal Vene Isolatie**

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# AF in Nederland

- In Nederland lijden 300.000 mensen aan boezemfibrilleren
- In 2050: 1 miljoen
  - 1 op de 10 mensen ouder dan 80 jaar lijdt aan boezemfibrilleren
  - 1 op de 20 mensen tussen 60 en 70 jaar lijdt aan boezemfibrilleren
  - 1 op de 40 mensen tussen 40 en 50 jaar lijdt aan boezemfibrilleren

# Prevalentie van AF in Nederland



# Kosten van AF in Nederland

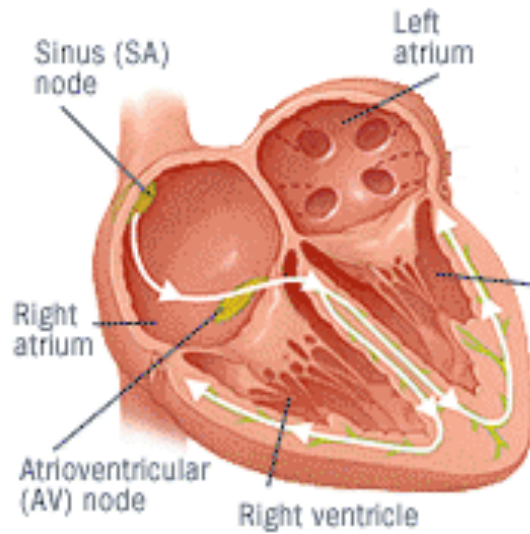
Age group (years)	Prevalence (%) [27]	Number of patients in the Netherlands in 2009	Total costs
55–59	0.7	7558	€ 17,593,862
60–64	1.7	17,644	€ 41,075,258
65–69	4.0	29,790	€ 69,351,027
70–74	6.0	35,876	€ 83,520,120
75–79	9.0	43,308	€ 100,821,443
80–84	13.5	45,404	€ 105,701,478
85–89	17.8	34,309	€ 79,870,444
90–94	17.8	11,812	€ 27,499,351
95 and older	17.8	3051	€ 7,102,956
55 and older	5.5	250,470	€ 583,093,264

Based on a population of 16,430,473 for the Netherlands in 2009

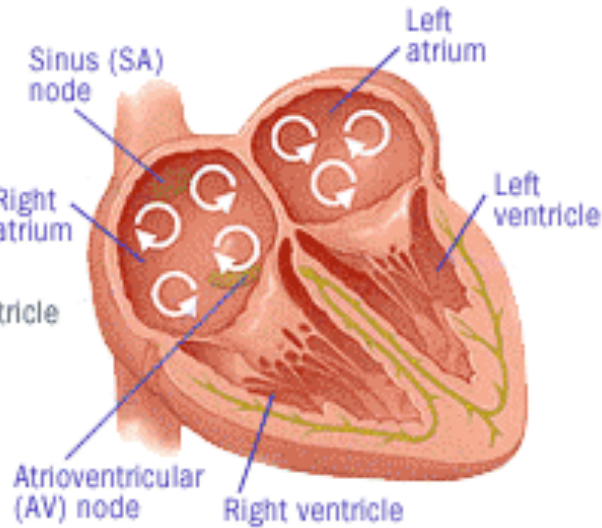


# Mechanisme AF

## Normal heart rhythm



## AFib (atrial fibrillation)



Normal heart rhythm



AFib



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# Mechanisme AF

## Sinusritme

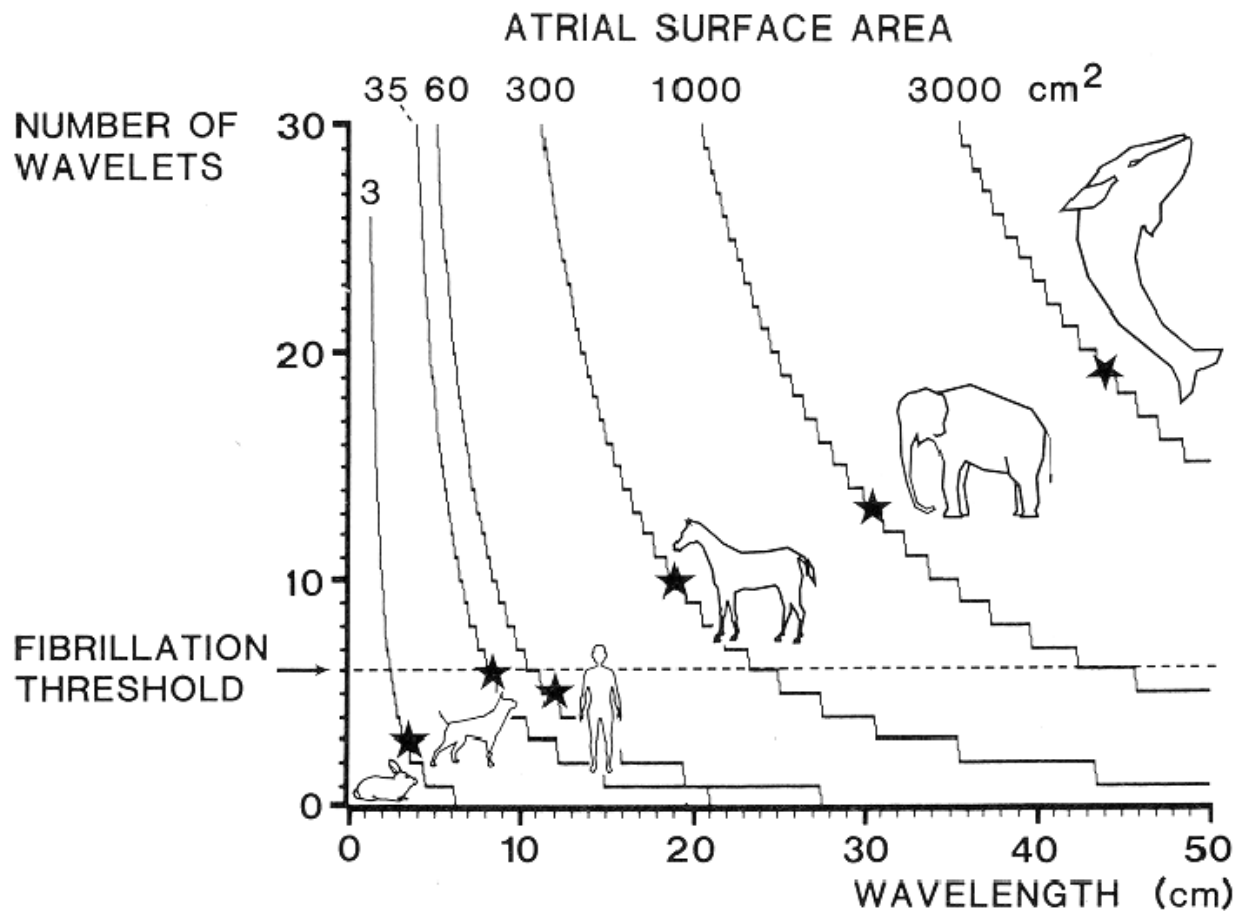


## Boezemfibrilleren



# Mechanisme AF

- “Multiple Wavelet Hypothesis”
- Stabiliteit wordt bepaald door Golflengte en Grootte van de Boezem

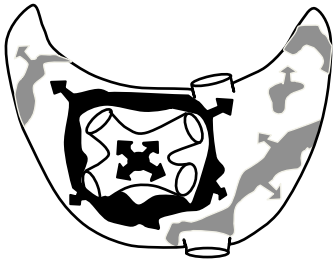




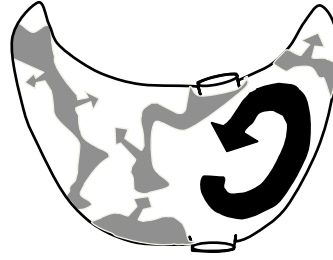
# Mechanisme AF

## Single Source

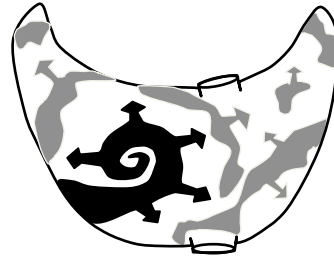
Automatic Focus



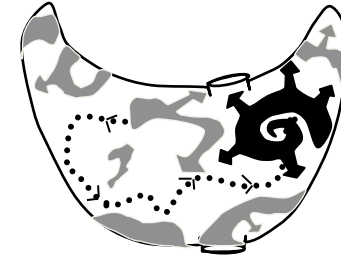
Mother Wave



Fixed Rotor

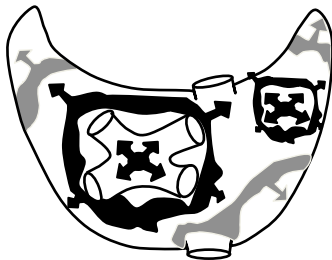


Moving Rotor

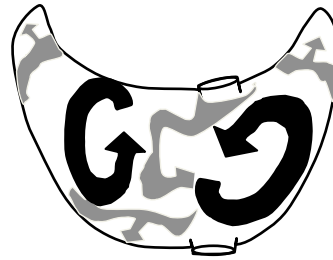


## Multiple Sources

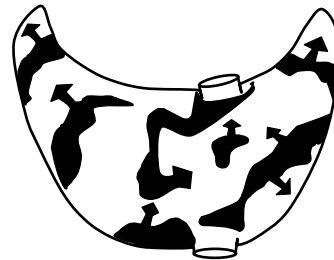
Multiple Foci



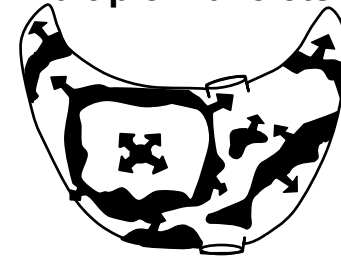
Multiple Circuits



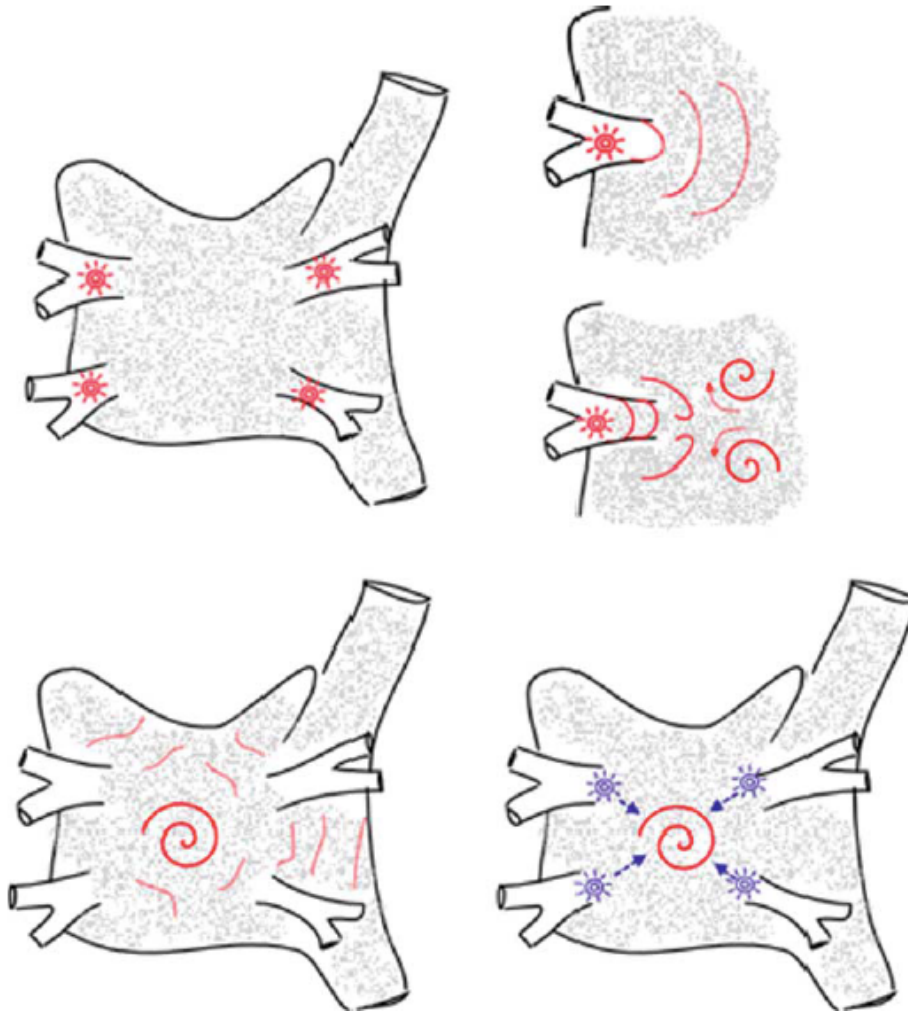
Multiple Wavelets



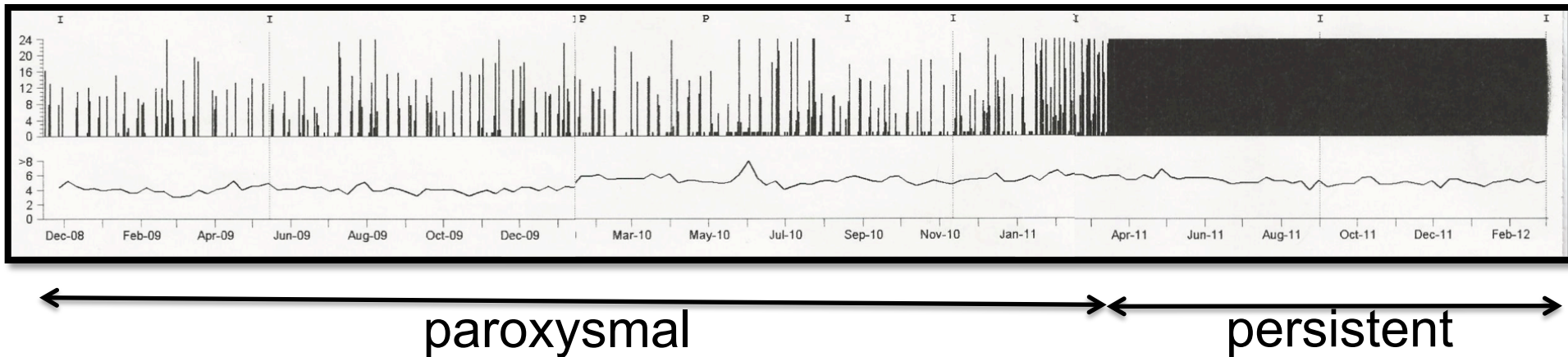
Focus +  
Multiple Wavelets



# Mechanisme AF: Triggers en Substraat



# AF begets AF



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# Paroxysmaal vs. Persistent spectrum

## Paroxysmaal

- Gaat vanzelf over < 1 week
- Weinig hartafwijkingen
- Relatief kort bestaand
- Oorzaak meestal alleen in longaders

## Persistent

- Stopt niet vanzelf
- Vaak andere hartafwijkingen
- Relatief lang bestaand
- Oorzaak (ook) in rest linker en rechter atrium



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# Paroxysmaal vs. Persistent spectrum



- Man, 45jr
- Korte aanvallen, 1-2 uur
- Geen andere ziekten
- LA 36 mm



- Man, 81jr
- 10 jr. continu AF
- Ernstige lekkage mitralisklep
- Slechte pompfunctie
- Pacemaker
- LA 58 mm



# 2012 HRS/EHRA/ECAS Expert Consensus Statement on Catheter and Surgical Ablation of Atrial Fibrillation

**TABLE I: TYPES AND CLASSIFICATION OF ATRIAL FIBRILLATION\*\***

<b>Atrial Fibrillation Episode</b>	An atrial fibrillation episode is defined as AF which is documented by ECG monitoring and has a duration of <u>at least 30 seconds</u> , or if less than 30 seconds, is present continuously throughout the ECG monitoring tracing. The presence of subsequent episodes of AF requires that sinus rhythm be documented by ECG monitoring between AF episodes.
<b>Paroxysmal AF*</b>	Paroxysmal AF is defined as <u>recurrent AF (<math>\geq</math> two episodes) that terminates spontaneously within 7 days</u> . Episodes of AF of $\leq$ 48 hours' duration that are terminated with electrical or pharmacologic cardioversion should also be classified as paroxysmal AF episodes.
<b>Persistent AF*</b>	Persistent AF is defined as continuous AF that is <u>sustained beyond seven days</u> . Episodes of AF in which a decision is made to electrically or pharmacologically cardiovert the patient after $\geq$ 48 hours of AF, but prior to 7 days, should also be classified as persistent AF episodes.
<b>Longstanding Persistent AF</b>	Longstanding persistent AF is defined as continuous <u>AF of greater than 12 months' duration</u> .
<b>Permanent AF</b>	The term permanent AF is not appropriate in the context of patients undergoing catheter or surgical ablation of AF, as it refers to a group of patients for which <u>a decision has been made not to restore or maintain sinus rhythm</u> by any means, including catheter or surgical ablation. If a patient previously classified as having permanent AF is to undergo catheter or surgical ablation, the AF should be reclassified.



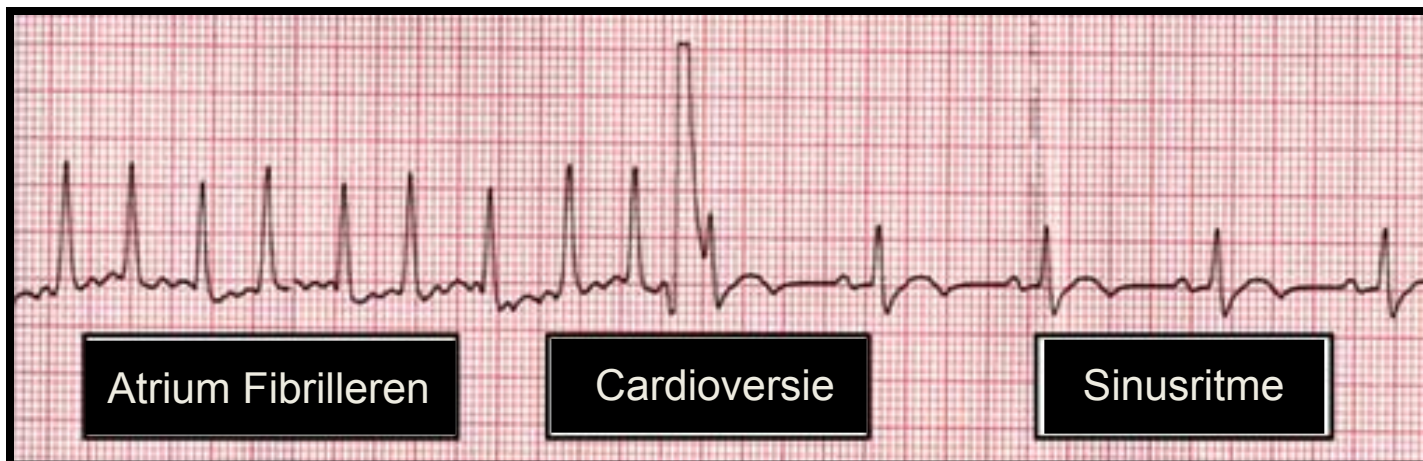
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# Behandeling AF

- Ritme regulatie
  - SR nastreven**
    - Medicamenteus
    - Cardioversie
    - Catheterablatie
    - Chirurgie
- Frequentie regulatie
  - AF accepteren**
    - Medicamenteus
    - Ablatie/pacemaker
- Antistolling
  - ASA
  - VKA's (vitamine K antagonisten)
  - NOAC's

# Behandeling AF: Acuut

1. Spontaan
  - meestal  $< 1$  dag
2. Geneesmiddel
  - Infuus
  - “Pill in the Pocket”
3. Cardioversie





# Guidelines: Aanbeveling en Mate van Bewijs

Classes of recommendations	Definition	Suggested wording to use
Class I	Evidence and/or general agreement that a given treatment or procedure is beneficial, useful, effective.	Is recommended/is indicated
Class II	Conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of the given treatment or procedure.	
<i>Class IIa</i>	<i>Weight of evidence/opinion is in favour of usefulness/efficacy.</i>	Should be considered
<i>Class IIb</i>	<i>Usefulness/efficacy is less well established by evidence/opinion.</i>	May be considered
Class III	Evidence or general agreement that the given treatment or procedure is not useful/effective, and in some cases may be harmful.	Is not recommended

Guidelines zijn richtlijnen, niet in steen geschreven protocollen

Level of evidence A	Data derived from multiple randomized clinical trials or meta-analyses.
Level of evidence B	Data derived from a single randomized clinical trial or large non-randomized studies.
Level of evidence C	Consensus of opinion of the experts and/or small studies, retrospective studies, registries.

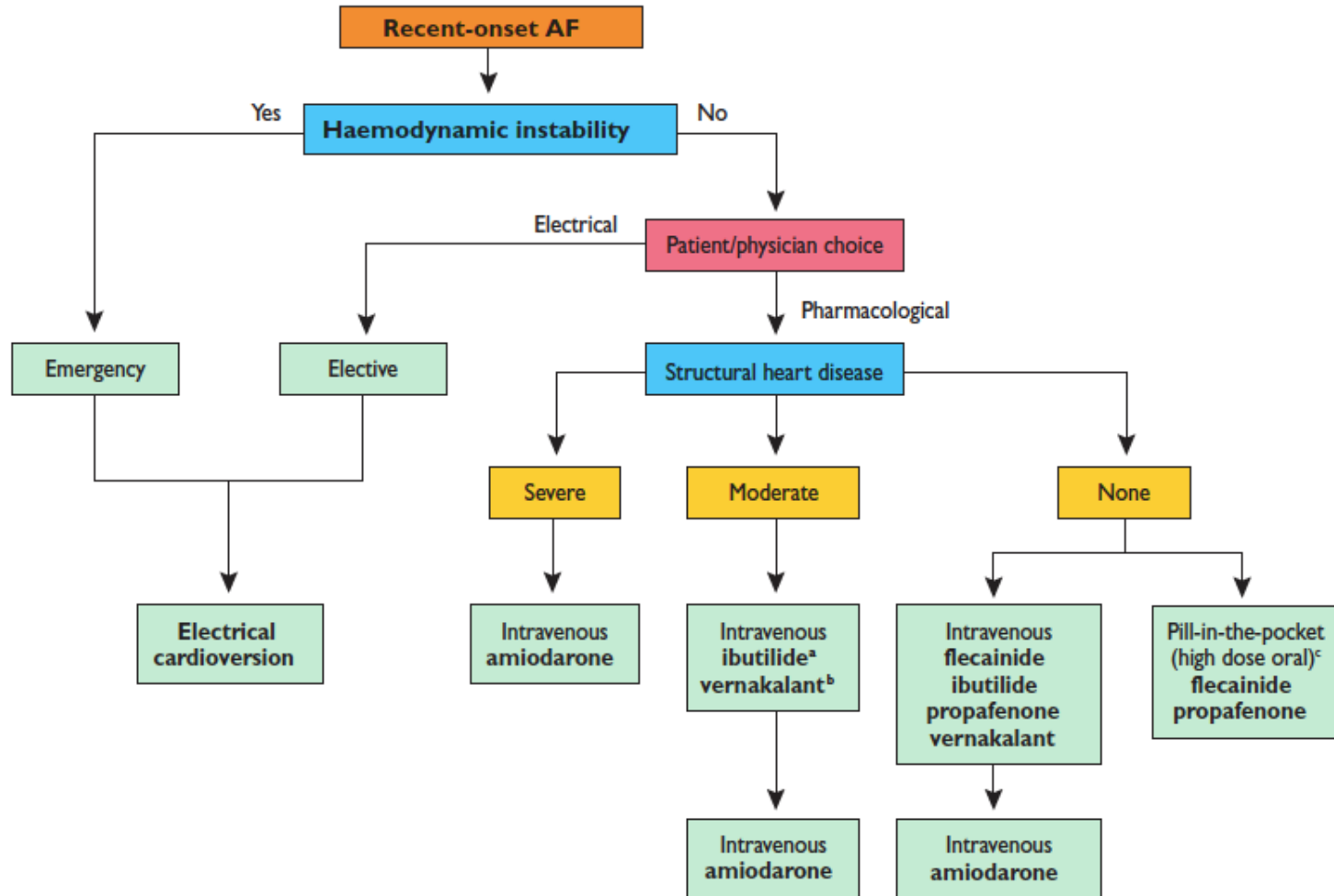


# ESC Guidelines 2012: Recent-onset AF

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>	Ref <sup>c</sup>
When pharmacological cardioversion is preferred and there is no or minimal structural heart disease, intravenous <u>flecainide</u> , <u>propafenone</u> , <u>ibutilide</u> , or <u>vernakalant</u> are recommended.	I	A	120, 121, 123, 124, 126, 127, 131–134
In patients with AF ≤7 days and moderate structural heart disease [but without hypotension <100 mm Hg, NYHA class III or IV heart failure, recent (<30 days) ACS, or severe aortic stenosis], intravenous vernakalant may be considered. Vernakalant should be used with caution in patients with NYHA class I–II heart failure.	IIb	B	120, 121, 124, 128
Intravenous vernakalant may be considered for cardioversion of postoperative AF ≤3 days in patients after cardiac surgery.	IIb	B	122



# ESC Guidelines 2012: Recent-onset AF



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# Behandeling AF: Voorkomen nieuwe Episode

1. Geneesmiddelen
2. Catheter-ablatie
3. Chirurgisch
4. onderliggende oorzaak!

- Hypertensie
- Hartfalen
- Hyperthyreoidie
- Ischemie
- Kleplijden

- Alcohol
- WPW-syndroom
- COPD en OSAS
- Obesitas
- Nierfalen
- Diabetes Mellitus



# Behandeling AF: Geneesmiddelen

## Beta-blokkers *(Metoprolol, Sotalol)*

- Minder effectief preventie AF
- Voorkomt hoge hartslag bij AF

## Klasse I middelen *(Tambocor, Ritmonorm)*

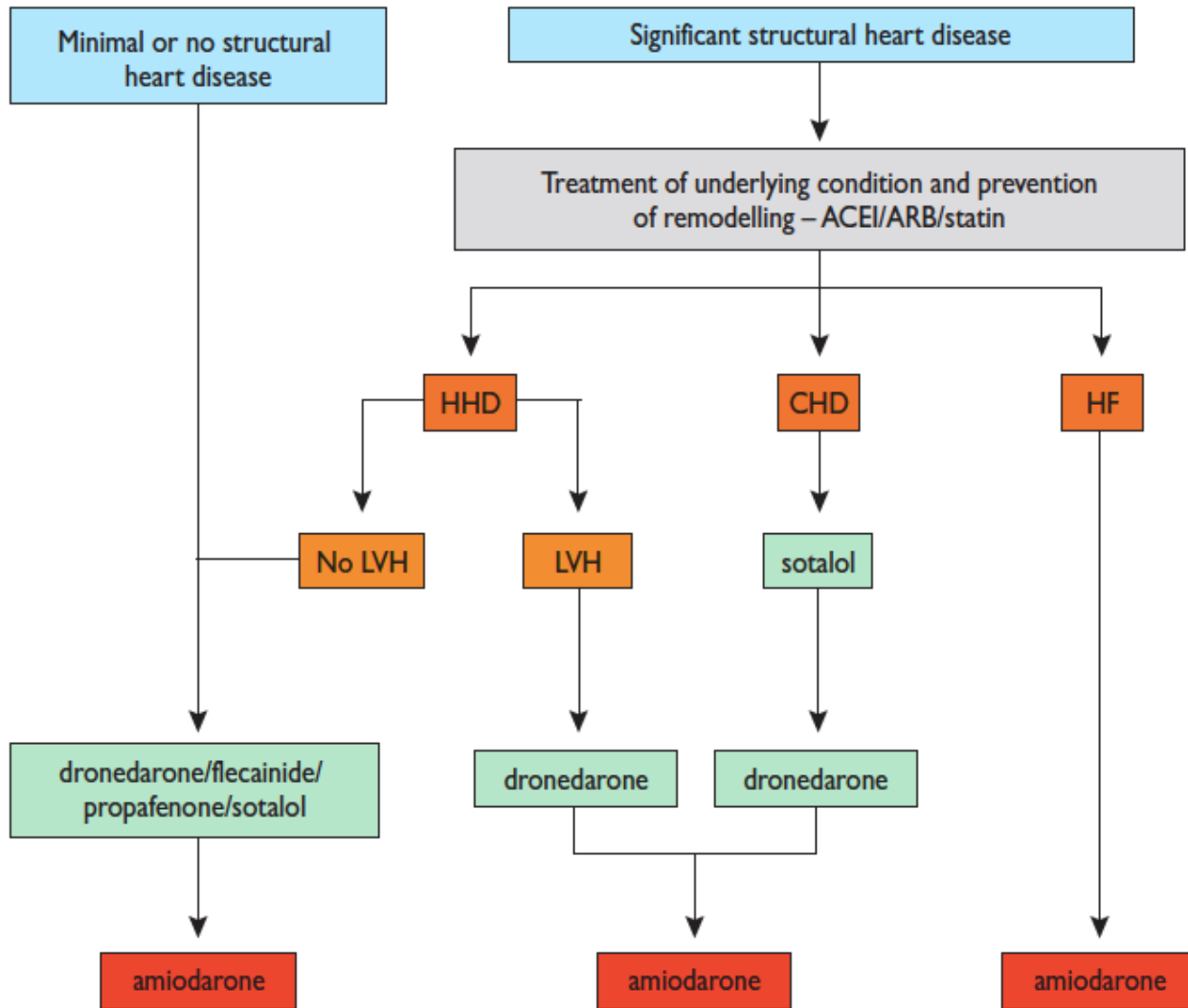
- Effectief preventie AF
- Combinatie met betablokker

## Klasse III: Amiodarone

- Meest effectief
- Meeste bijwerkingen



# ESC Guidelines 2012: Medicamenteuze Behandeling AF



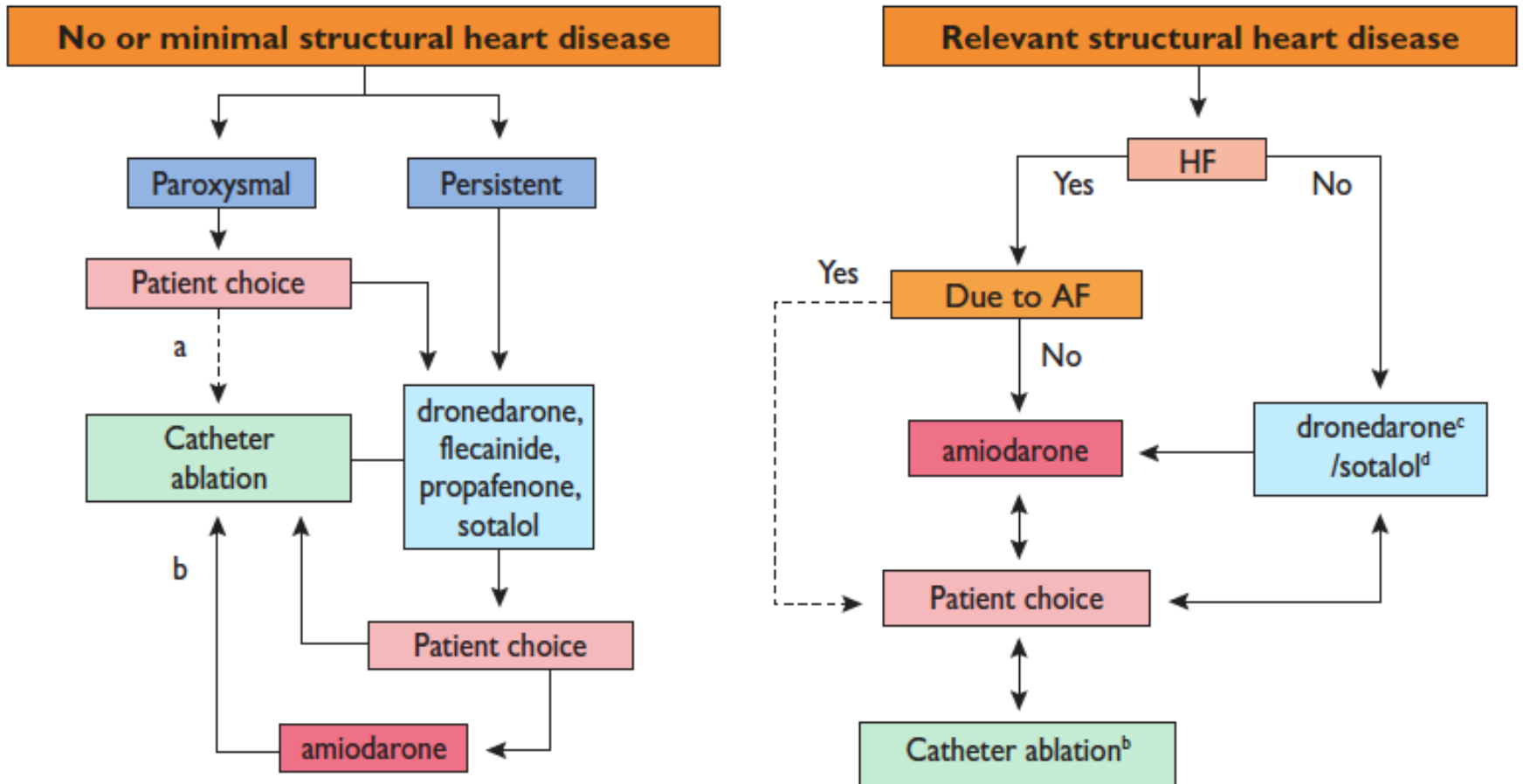
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# Behandeling AF: Catheterablatie

- Catheterablatie
  - Sinds 1990
  - AF: sinds ± 2000
- Ablatie methoden:
  - RF-ablatie
  - Cryo-ablatie



# ESC Guidelines 2012: Catheter ablatie van AF





# ESC Guidelines 2012: Catheter ablatie van AF

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>	Catheter ablation of AF should target isolation of the pulmonary veins.	IIa	A
<p>Catheter ablation of <u>symptomatic paroxysmal AF</u> is recommended in patients who have symptomatic recurrences of AF on <u>antiarrhythmic drug therapy</u> (amiodarone, dronedarone, flecainide, propafenone, sotalol) and who prefer further rhythm control therapy, when performed by an electrophysiologist who has received appropriate training and is performing the procedure in an experienced centre.</p>	I	A	<p>Catheter ablation of AF should be considered as first-line therapy in selected patients with symptomatic paroxysmal AF as <u>an alternative to antiarrhythmic drug therapy</u>, considering patient choice, benefit, and risk.</p>	IIa	B
			<p>When catheter ablation of AF is planned, continuation of oral anticoagulation with a VKA should be considered during the procedure, maintaining an INR close to 2.0.</p>	IIa	B
			<p>When AF recurs within the first 6 weeks after catheter ablation, a watch-and-wait rhythm control therapy should be considered.</p>	IIa	B



# 2012 HRS/EHRA/ECAS Expert Consensus Statement on Catheter and Surgical Ablation of Atrial Fibrillation

**CLASS LEVEL**

## INDICATIONS FOR CATHETER ABLATION of AF

### Symptomatic AF refractory or intolerant to at least one Class 1 or 3 antiarrhythmic medication

**Paroxysmal:** Catheter ablation is recommended\*

I A

**Persistent:** Catheter ablation is reasonable

IIa B

**Longstanding Persistent:** Catheter ablation may be considered

IIb B

### Symptomatic AF prior to initiation of antiarrhythmic drug therapy with a Class 1 or 3 antiarrhythmic agent

**Paroxysmal:** Catheter ablation is reasonable

IIa B

**Persistent:** Catheter ablation may be considered

IIb C

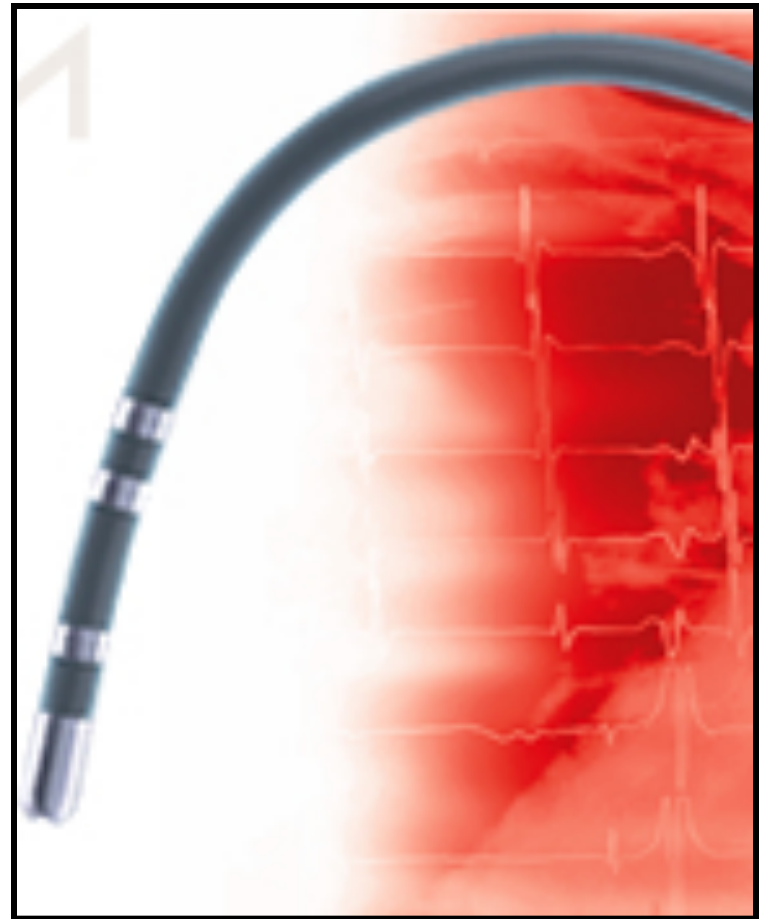
**Longstanding Persistent:** Catheter ablation may be considered

IIb C



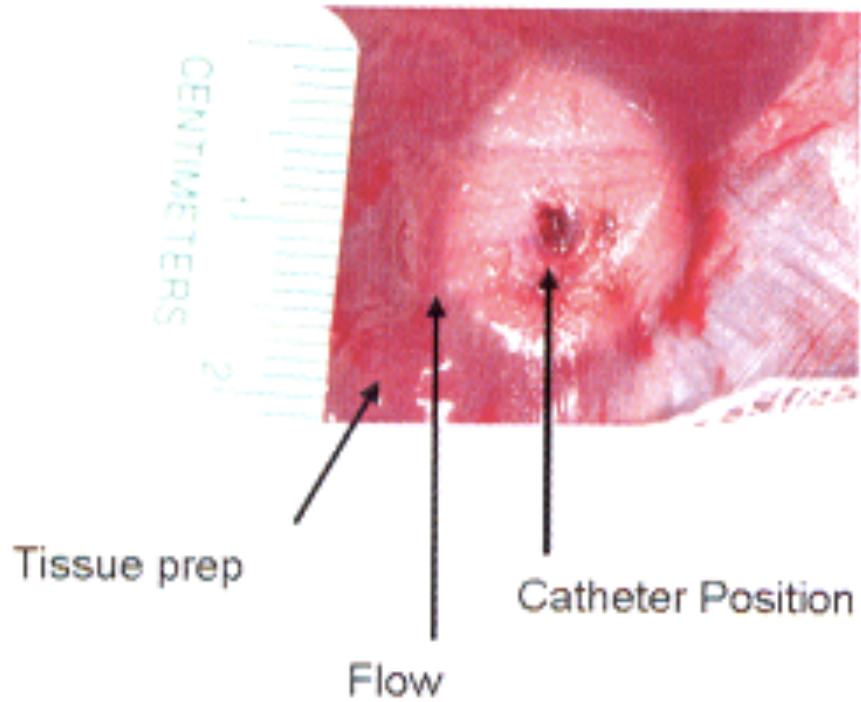
# RF Ablatie

- Hoog frequente wisselstroom (300kHz)
- Klein littekentje
- Temp 50-60 °C
- Stuurbare catheter
- Pijn: soms

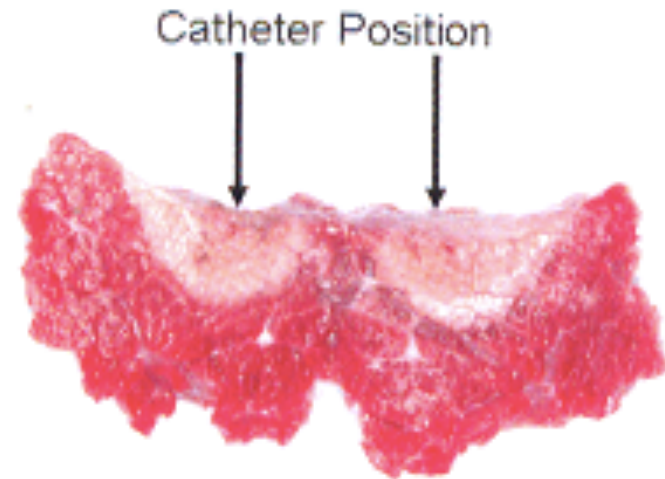


# RF Ablatie

Open-Irrigated Lesion Surface



Open-Irrigated Lesion Cross-Section

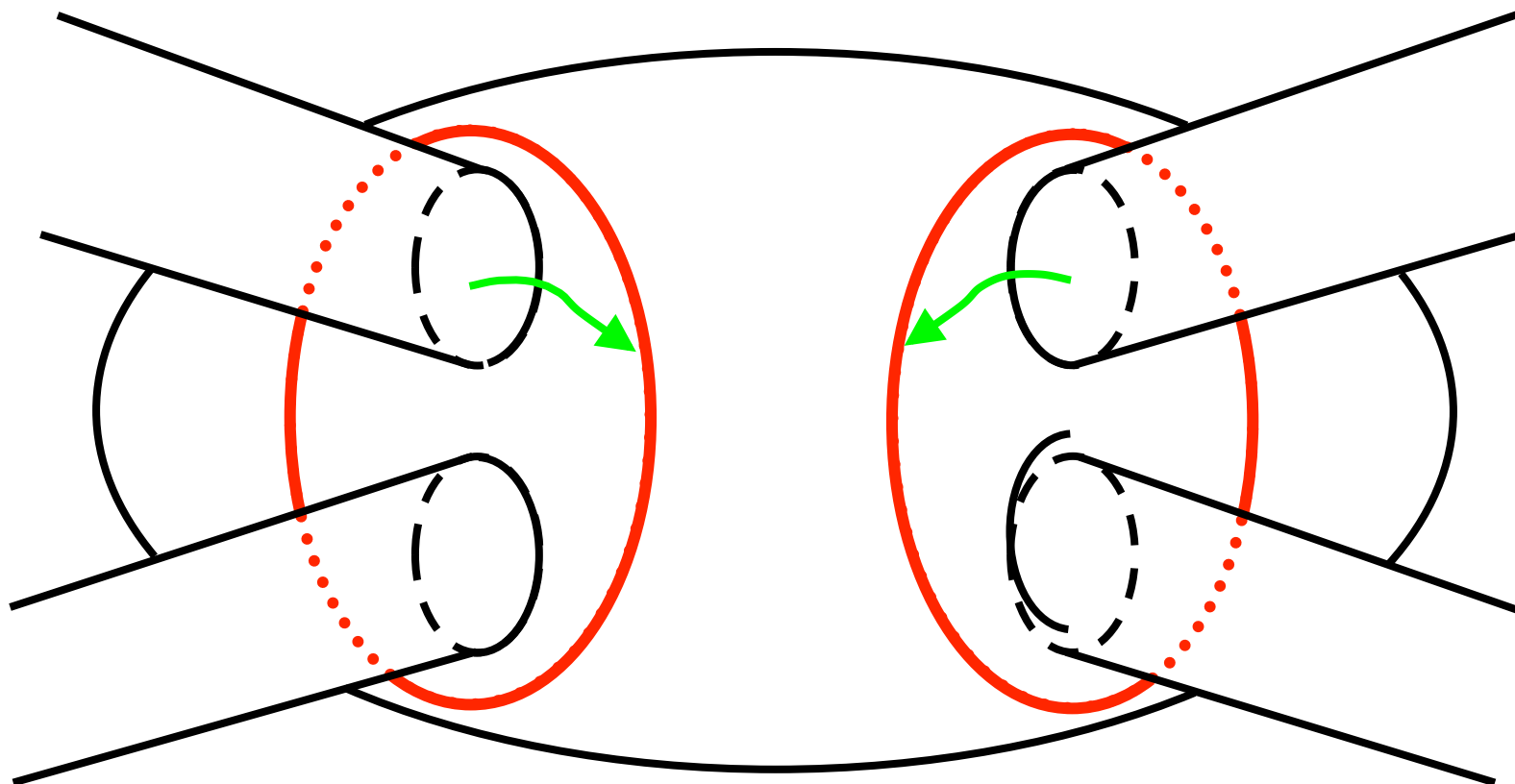


# Catheter Ablatie van AF: PVI

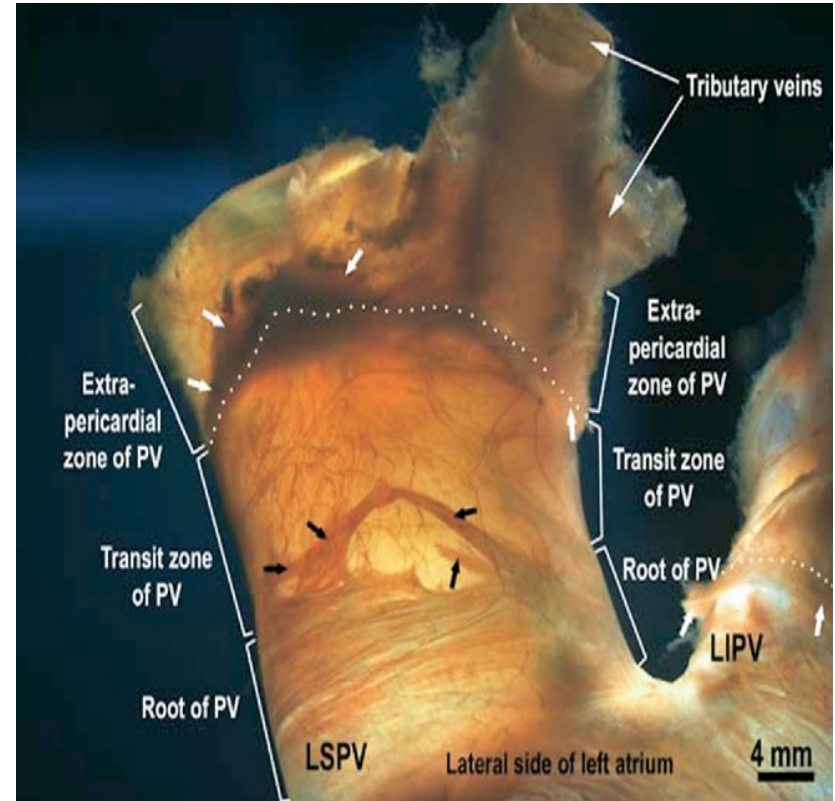
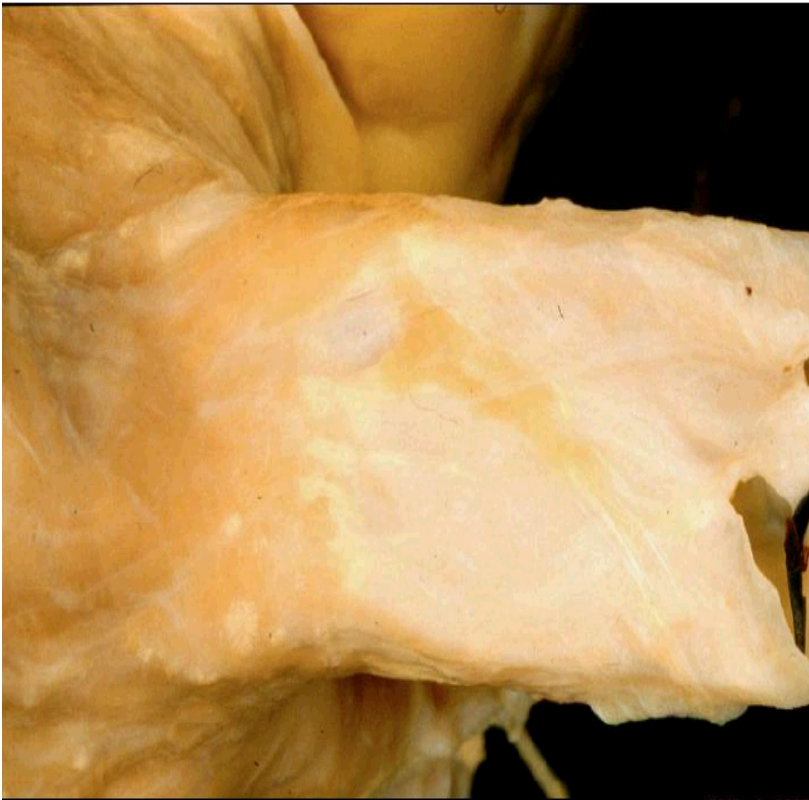
Pulmonaal vene isolatie = weghalen (isoleren) triggers en modificeren substraat



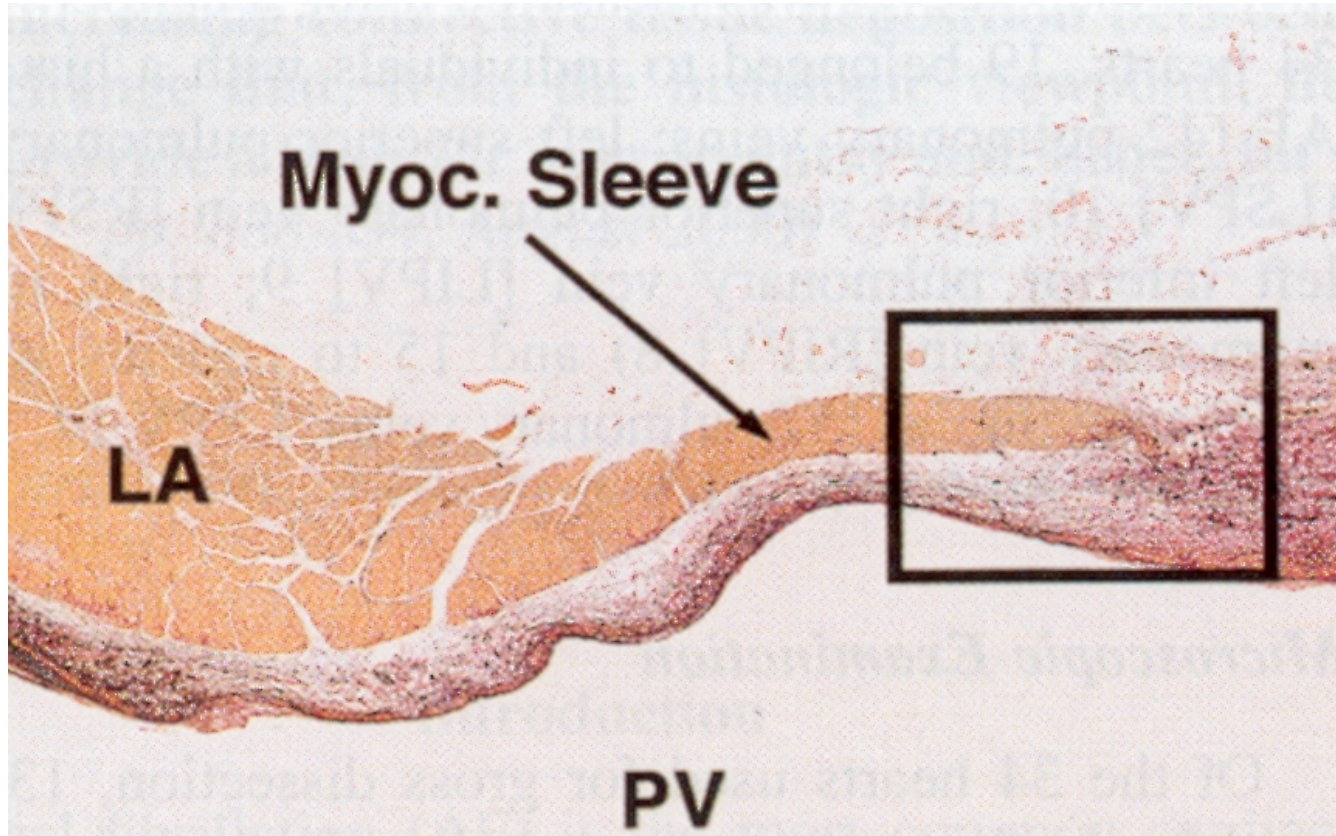
# Pulmonaal Vene Isolatie



# Anatomie Pulmonaal Vene

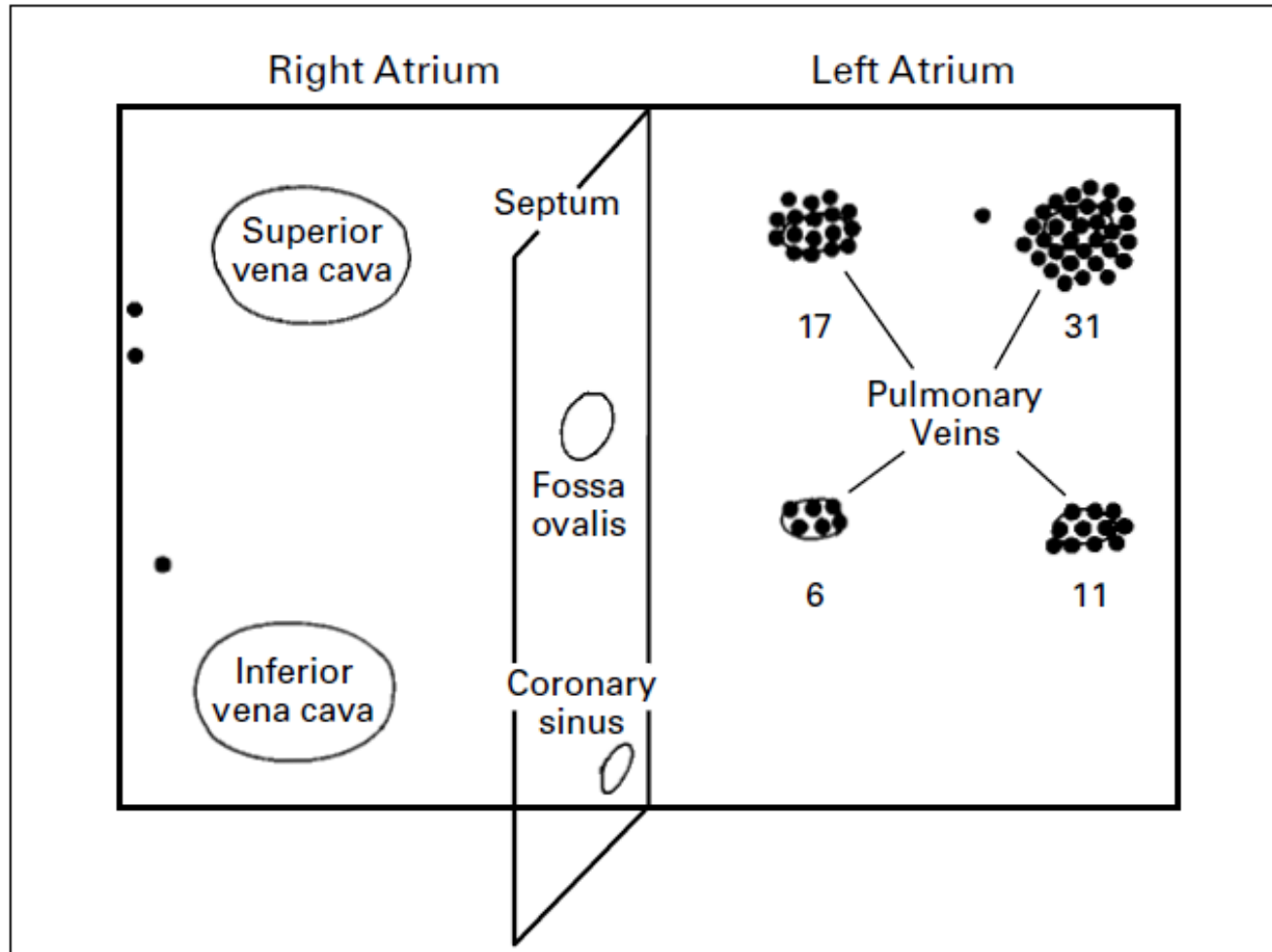


# Triggers uit de Pulmonaal Vene

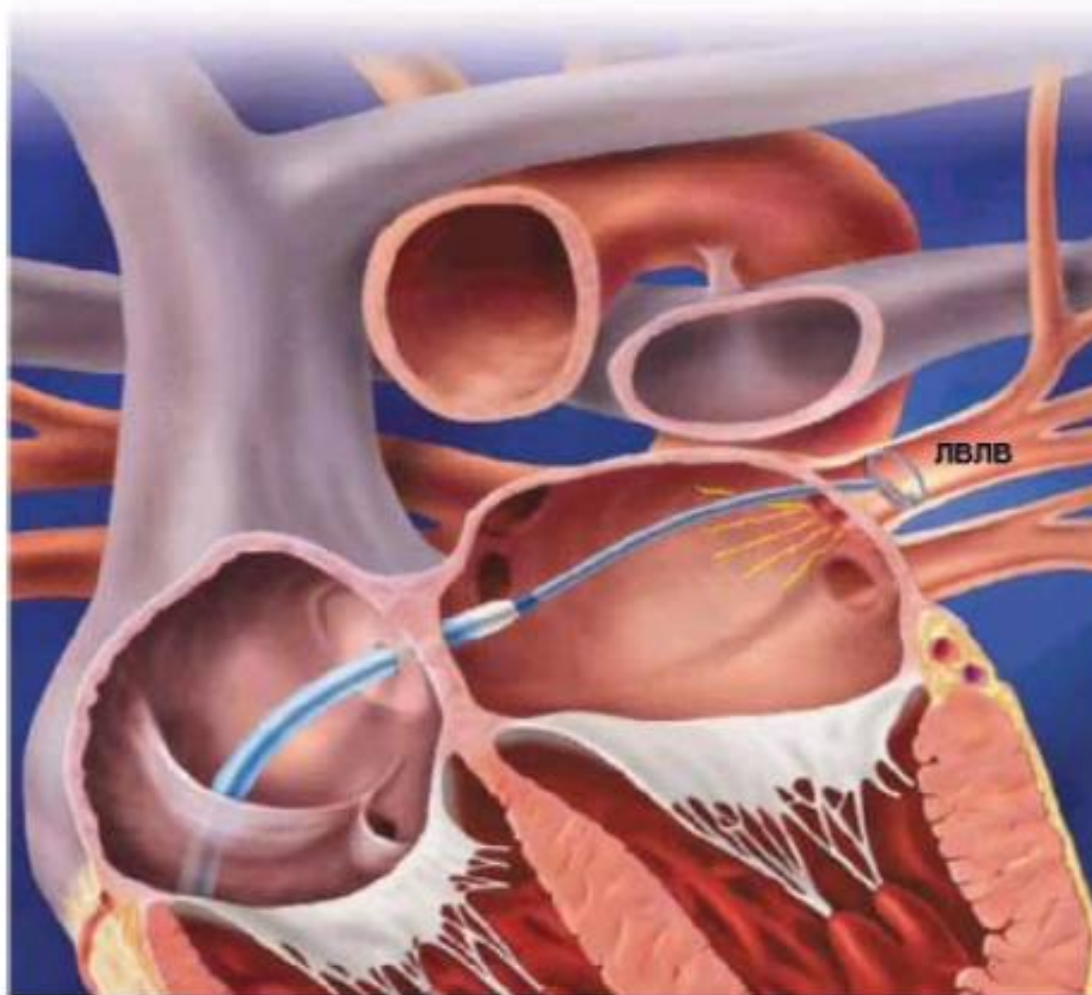




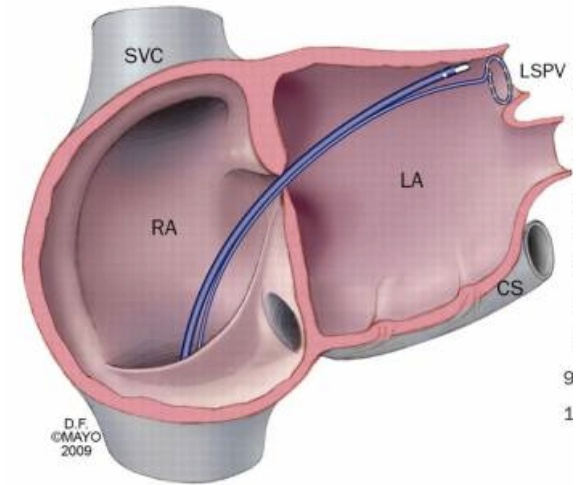
# Historie: Spontaneous Initiation of Atrial Fibrillation by Ectopic Beats Originating in the Pulmonary Veins



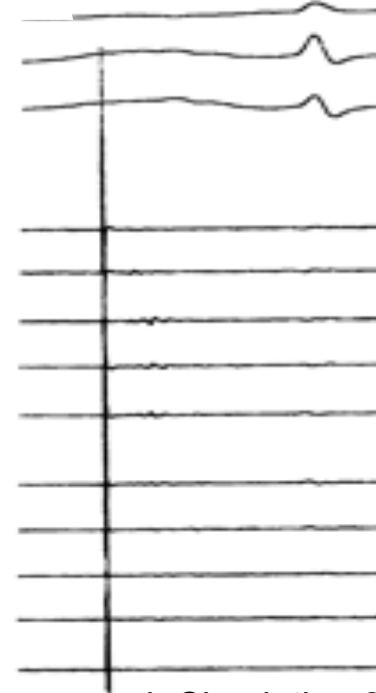
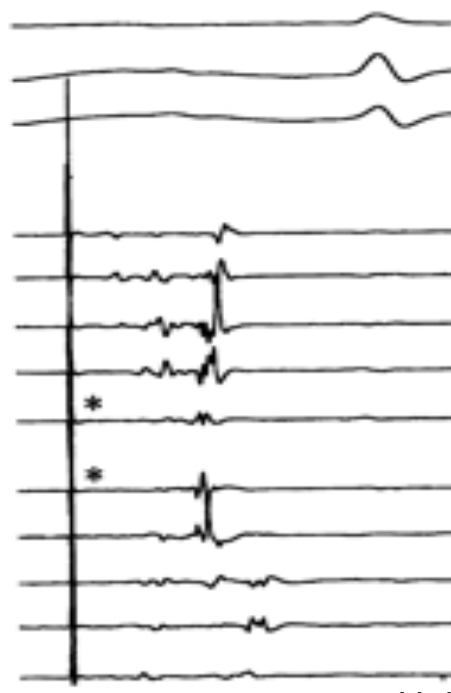
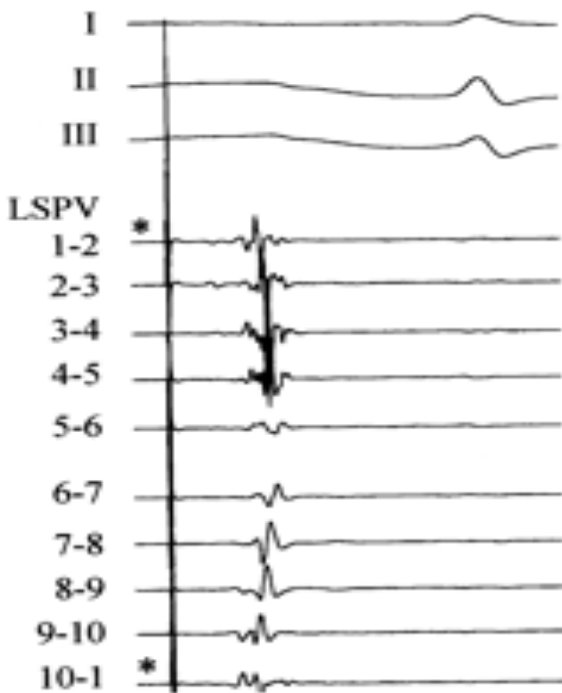
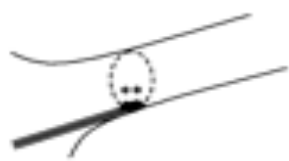
# Ostiale PVI: Haïssaguerre



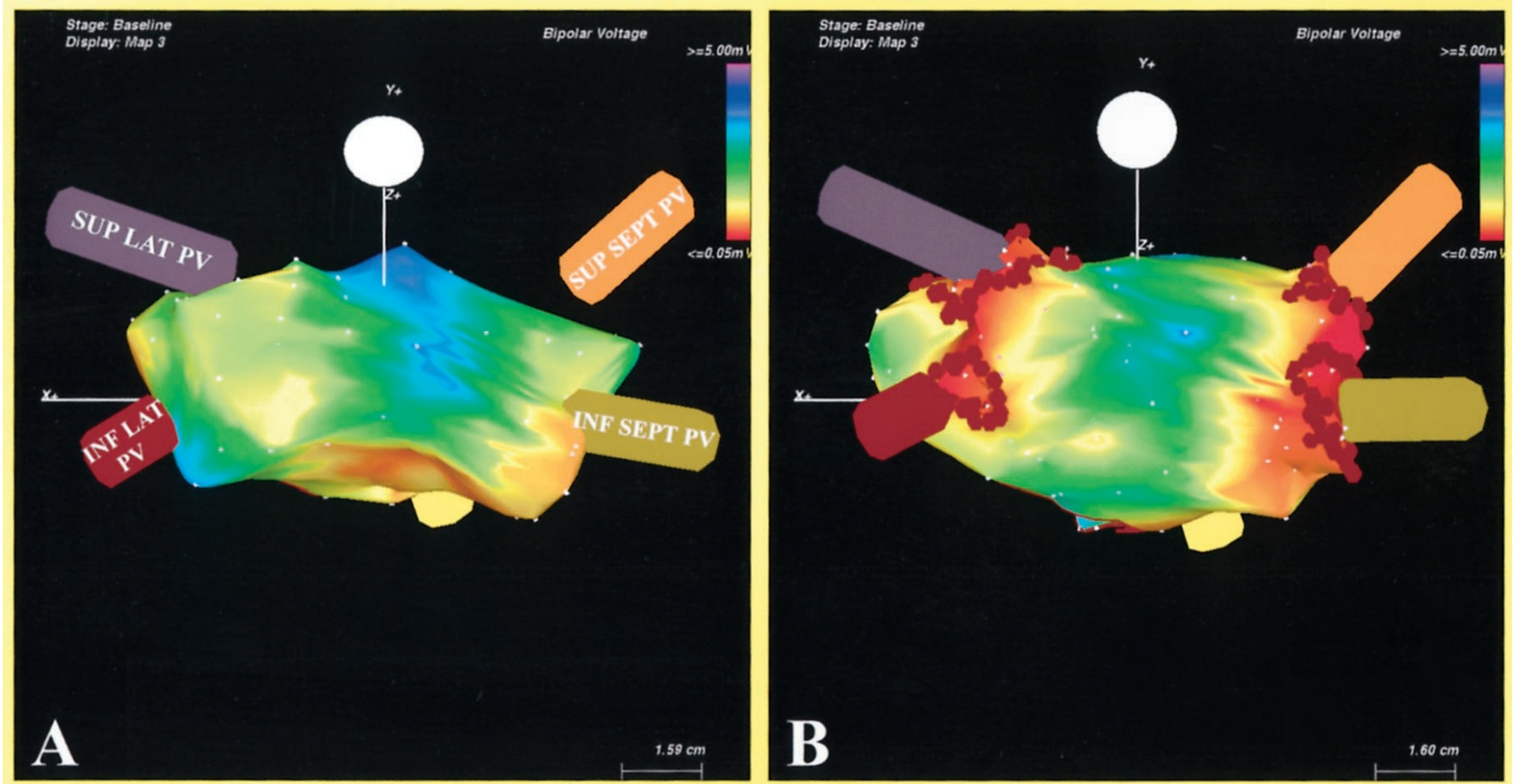
# Ostiale PVI



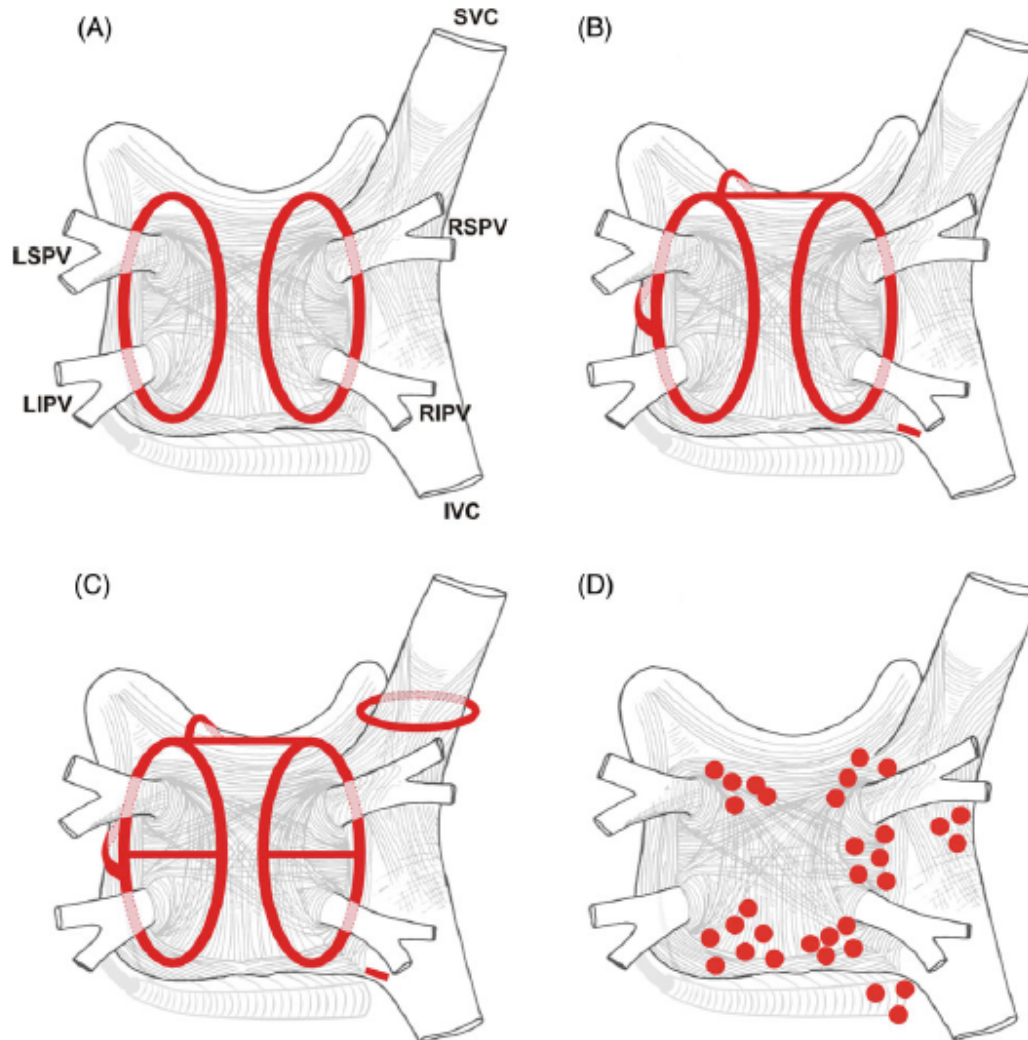
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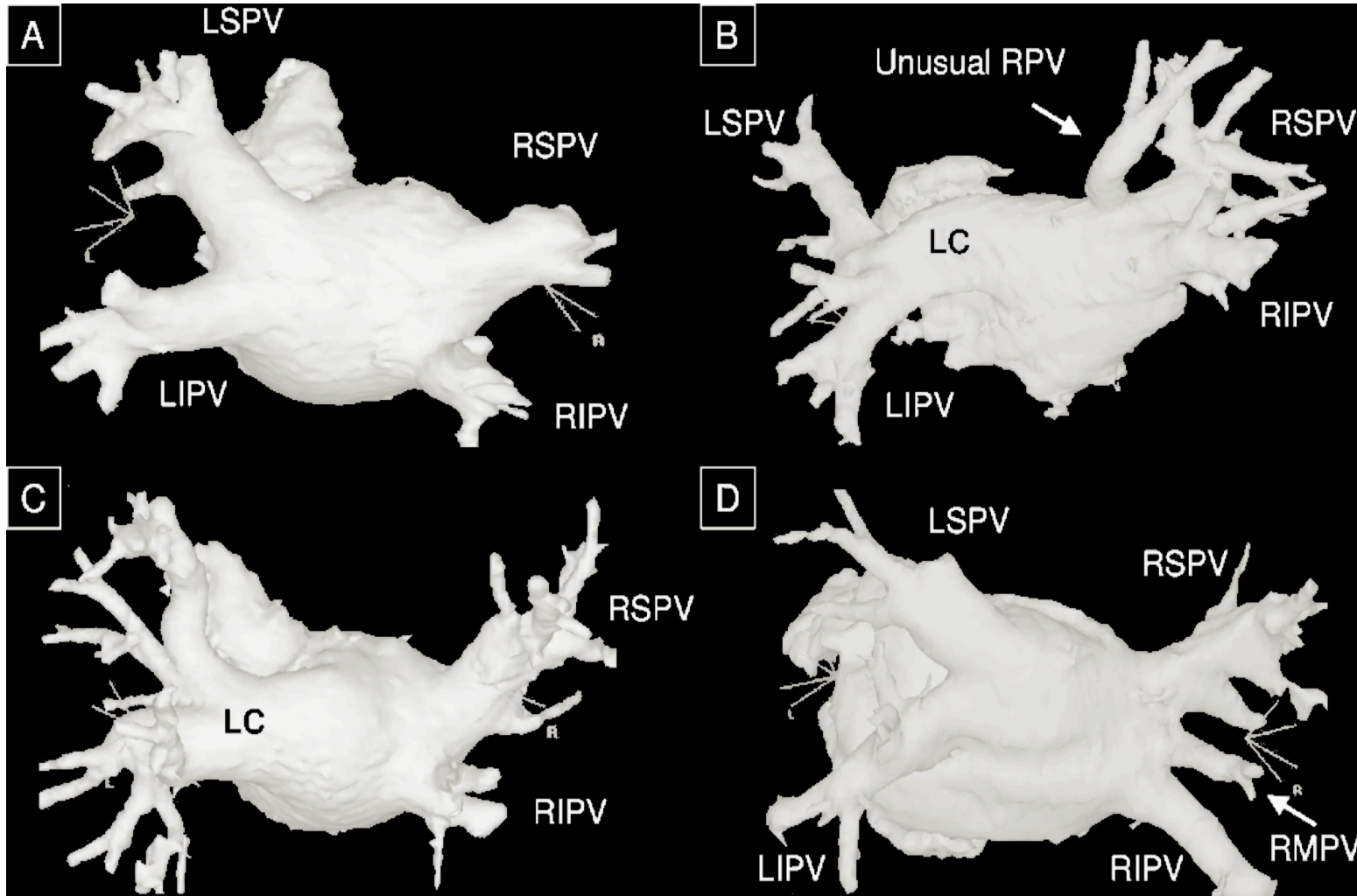
# Circumferential Radiofrequency Ablation of Pulmonary Vein Ostia: PV isolation with electroanatomic guidance



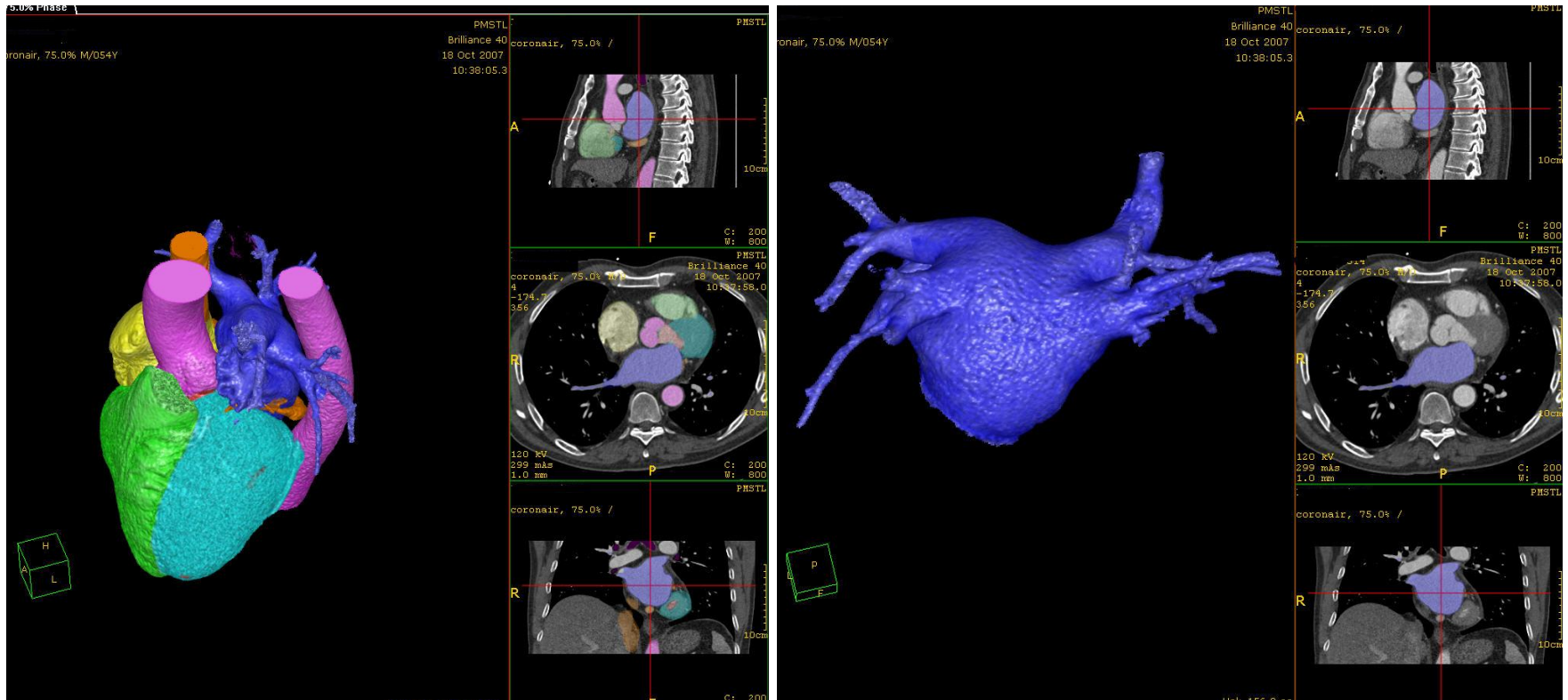
# Technieken AF Ablatie



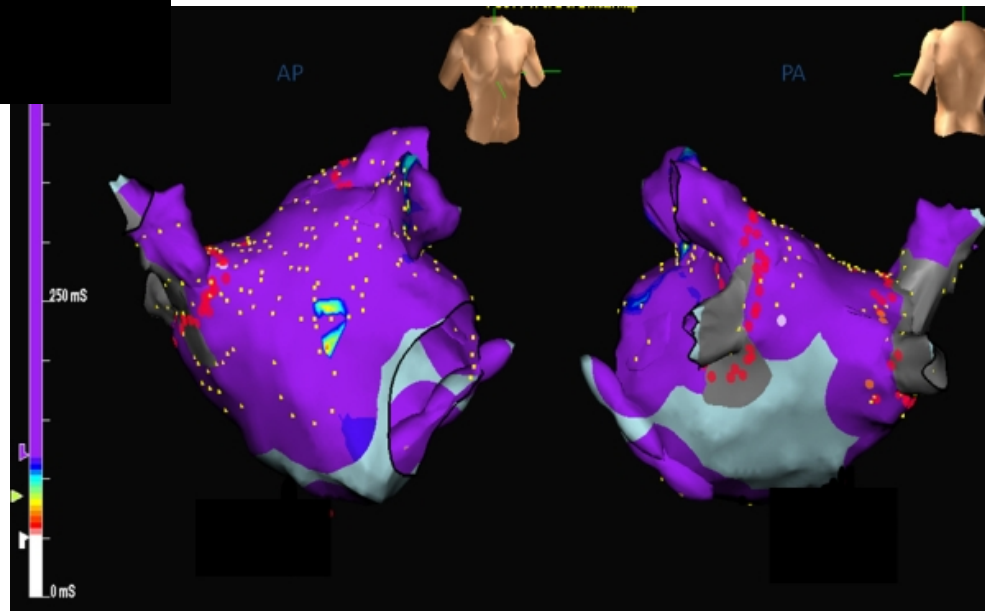
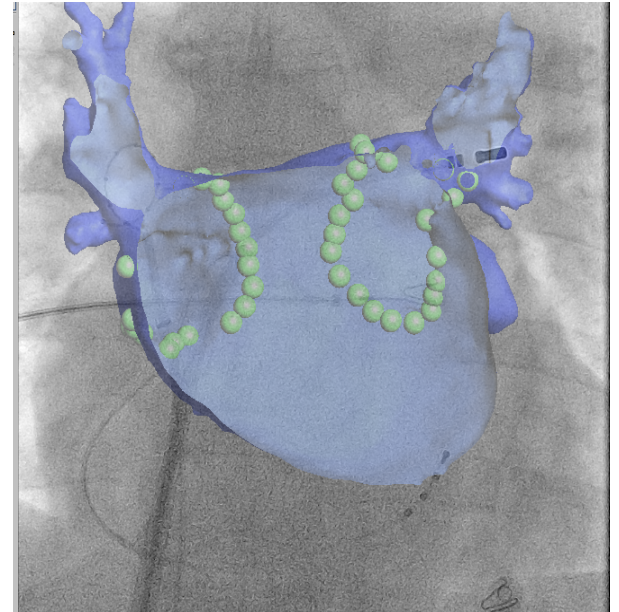
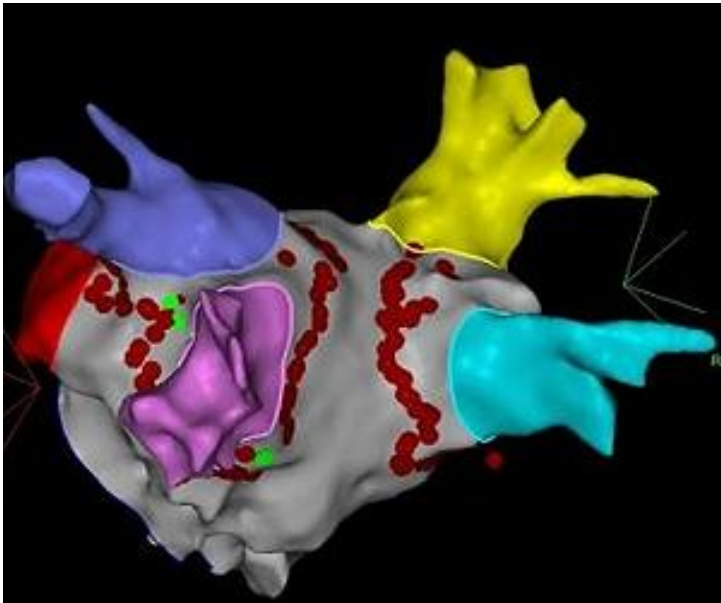
# Anatomie van de Pulmonaal Vene



# CT Scan van de Pulmonaal Vene

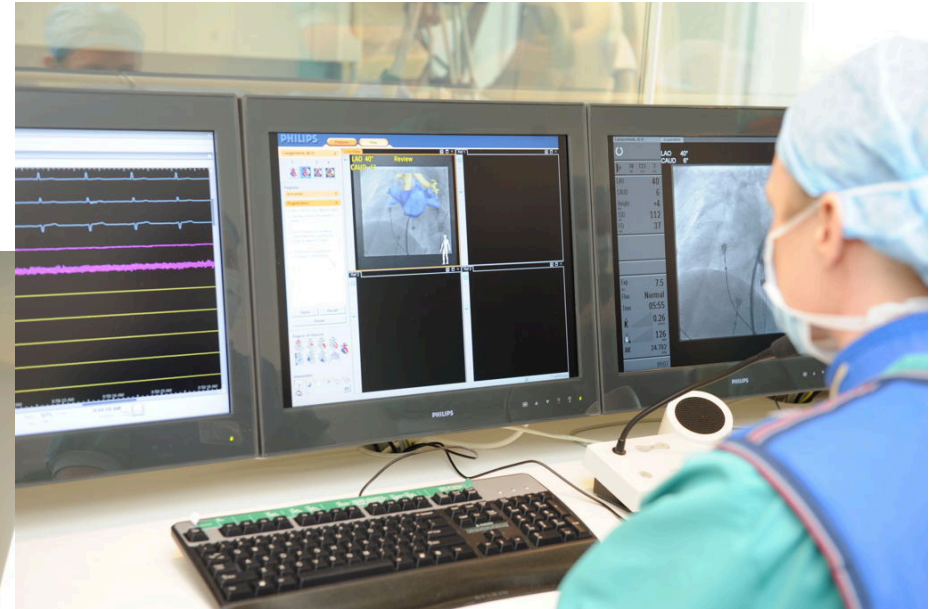


# Beeldvormende systemen

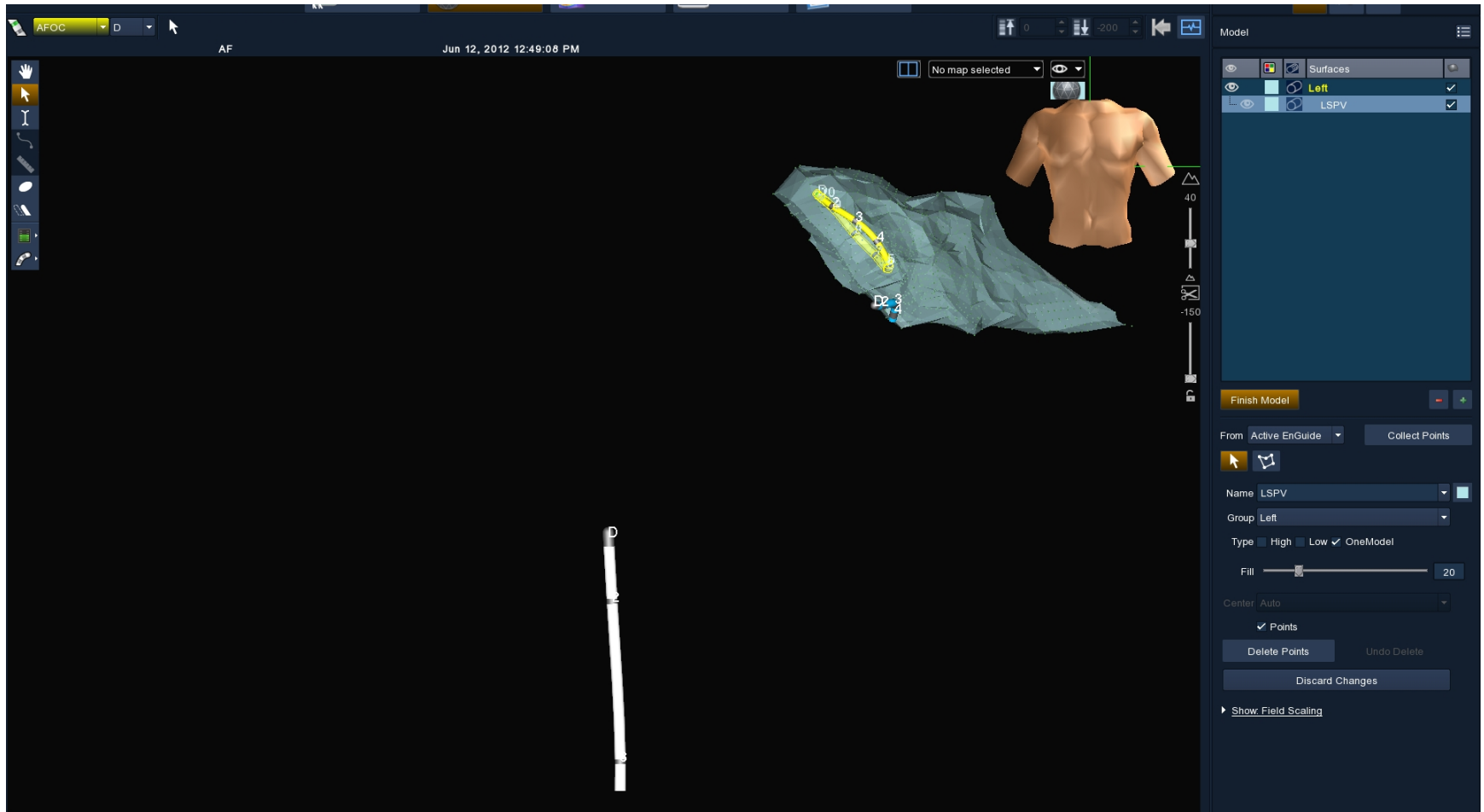




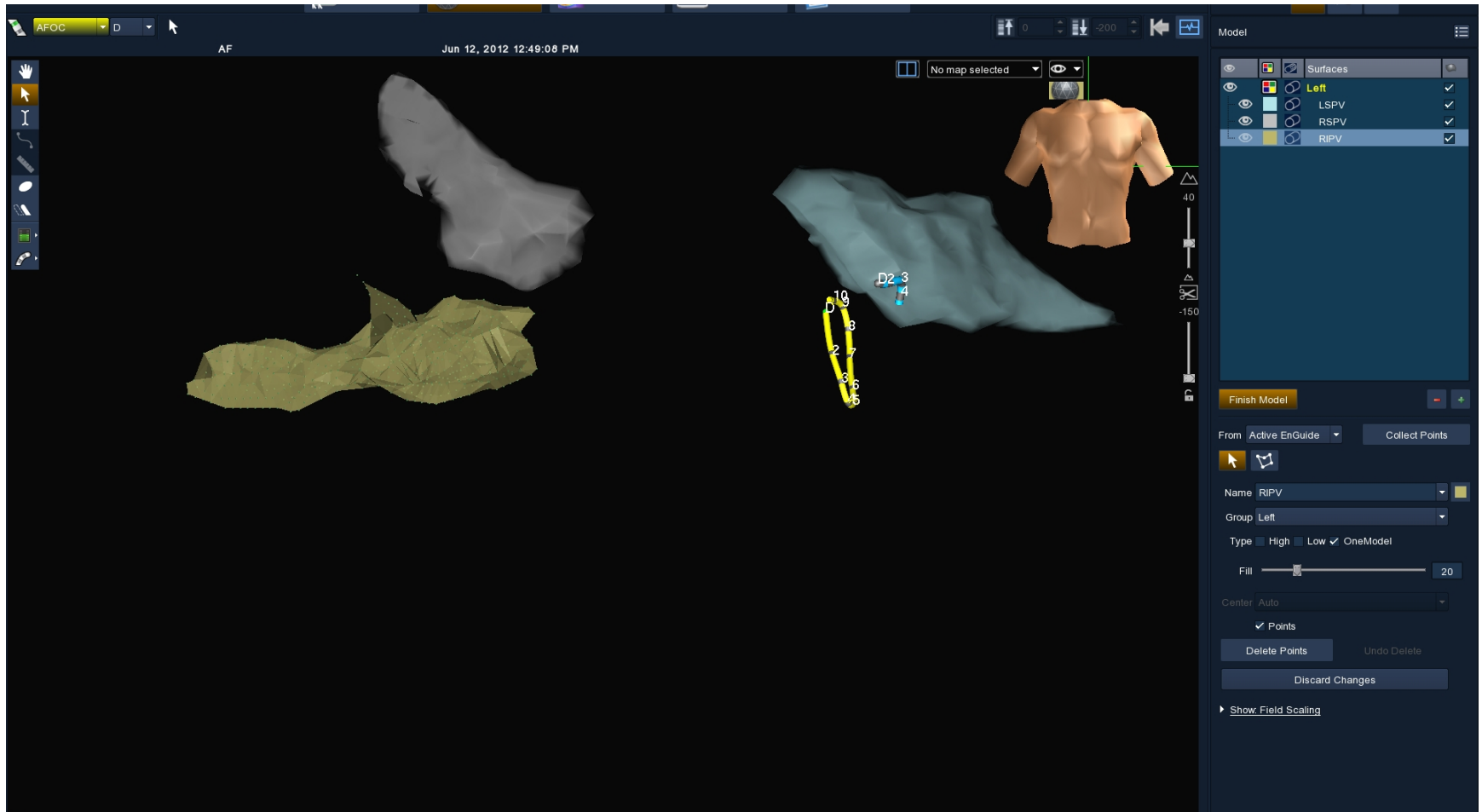
# EP technicians Team



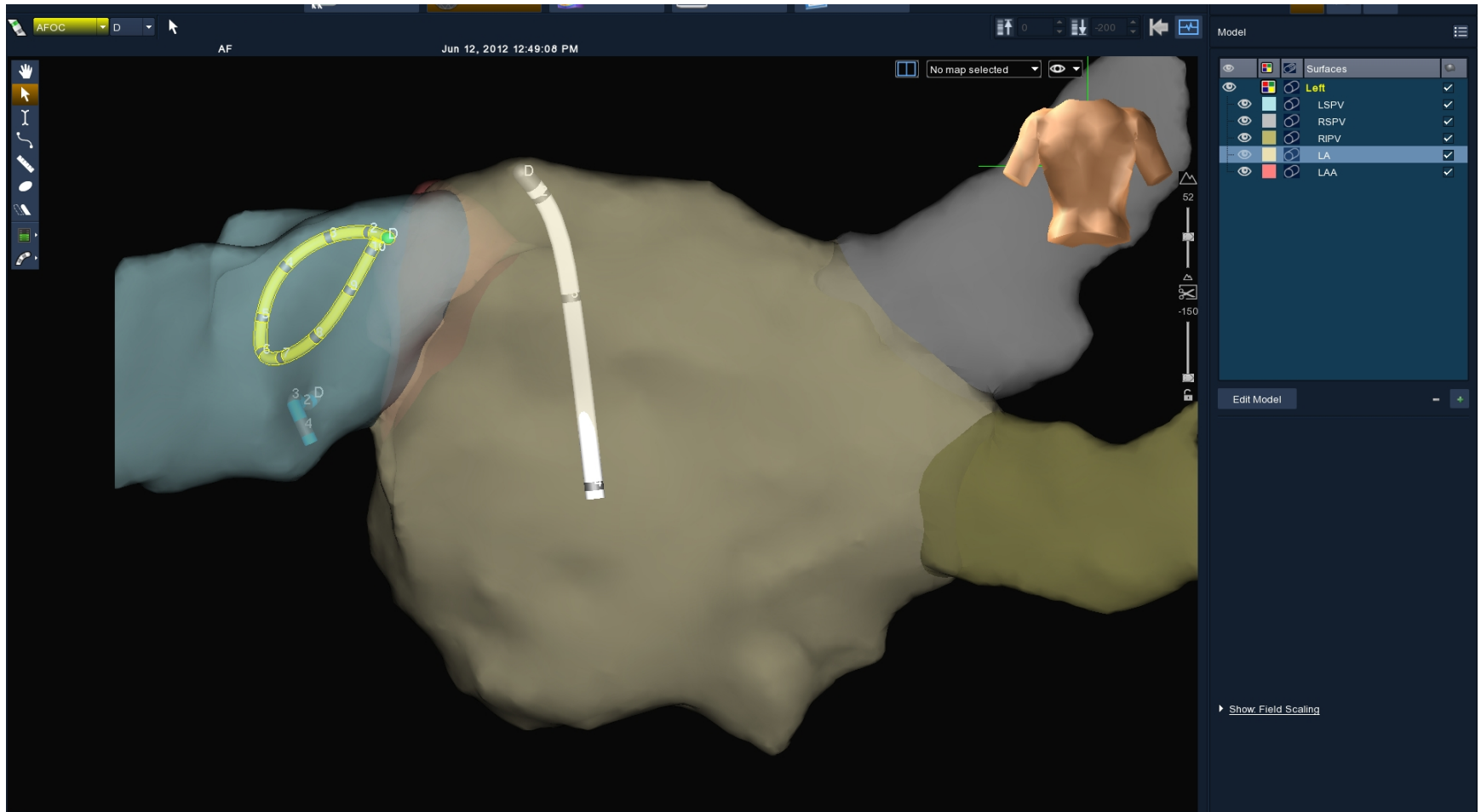
# Linker Atrium Mapping



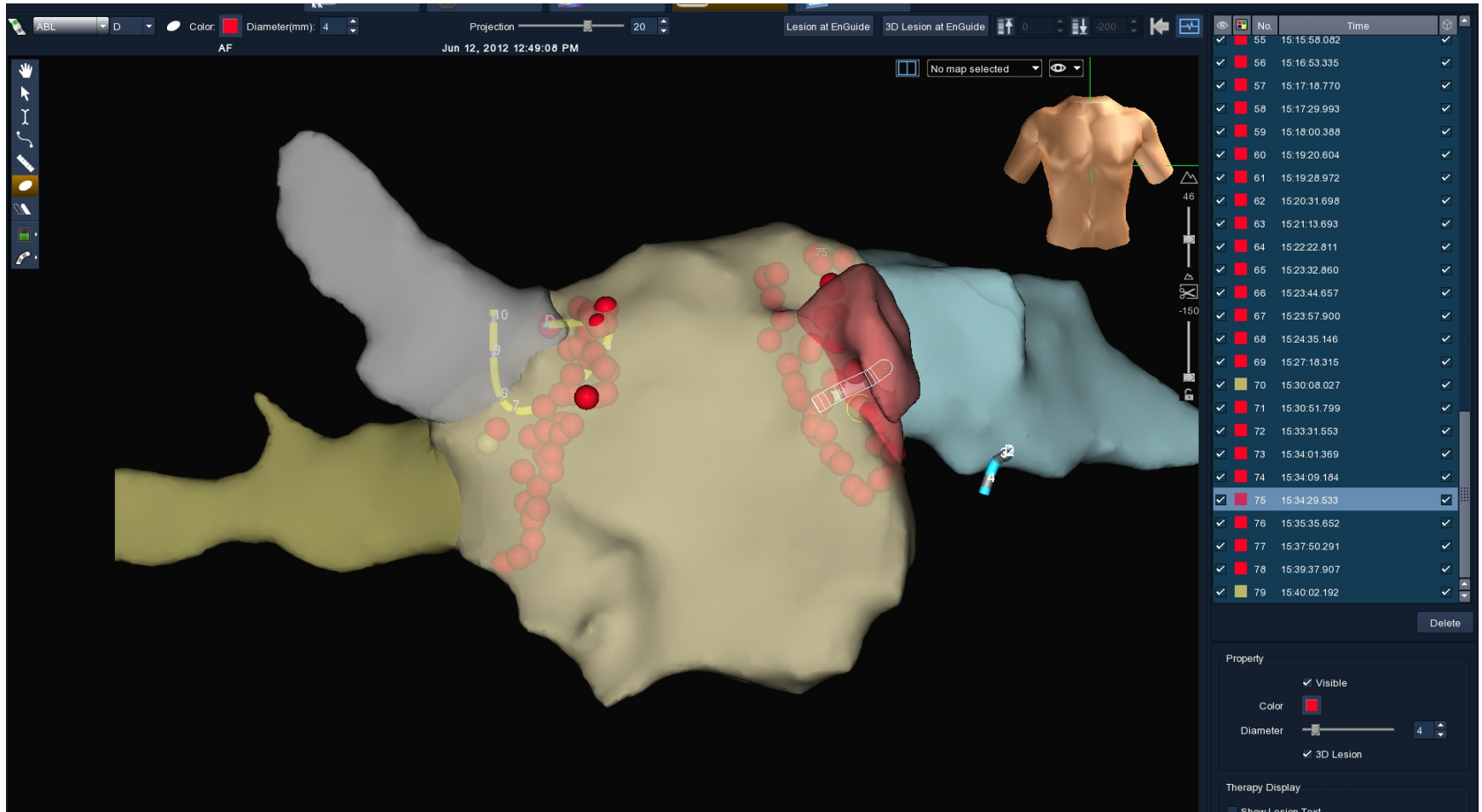
# Linker Atrium Mapping



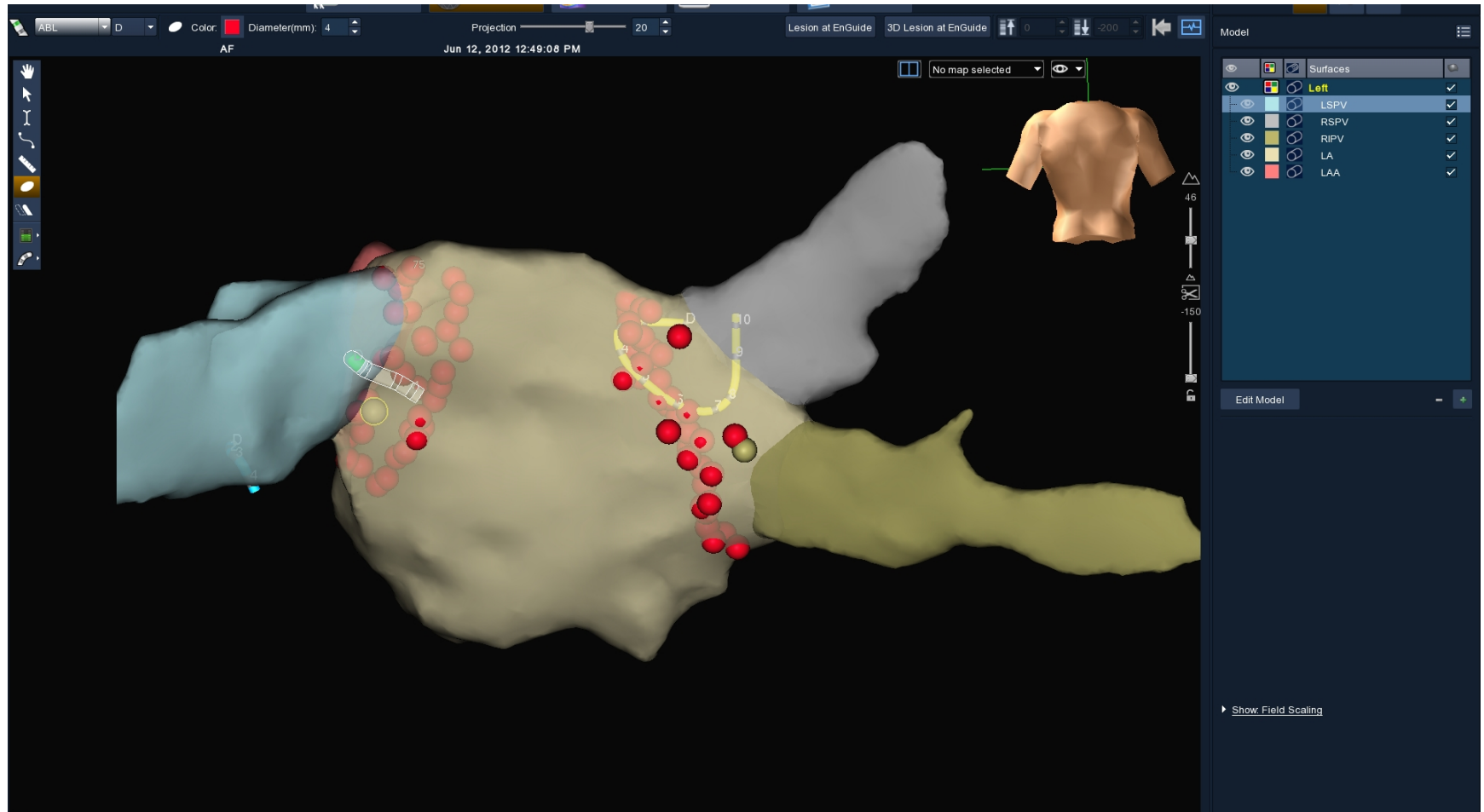
# Linker Atrium Mapping



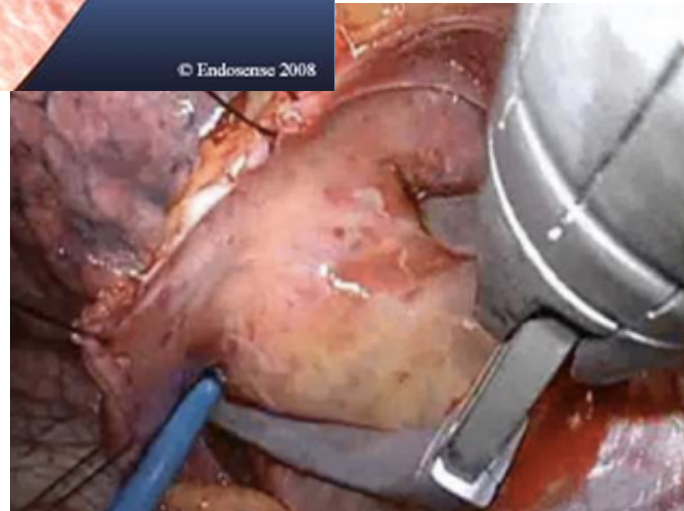
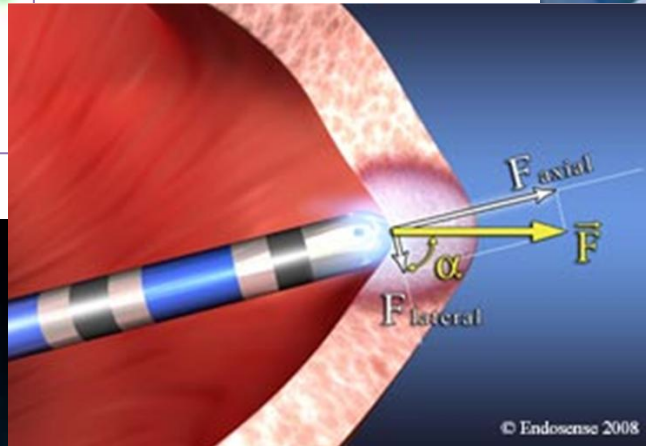
# Linker Atrium Ablatie



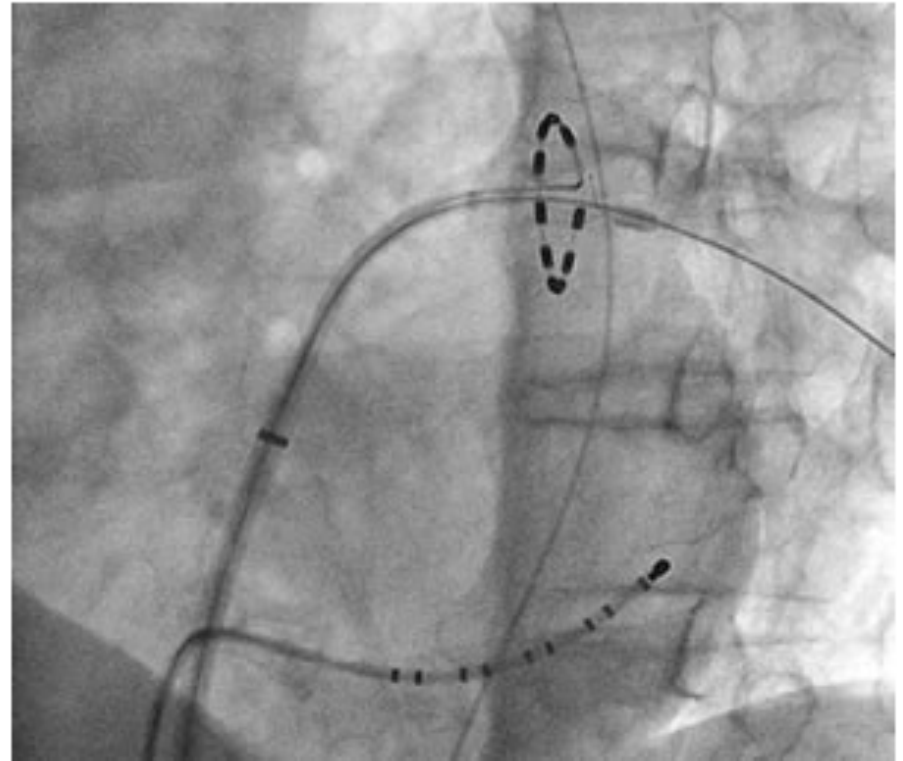
# Linker Atrium Ablatie



# Verschillende Methode

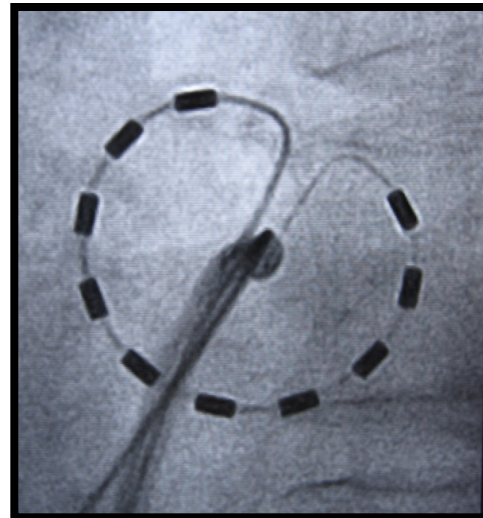
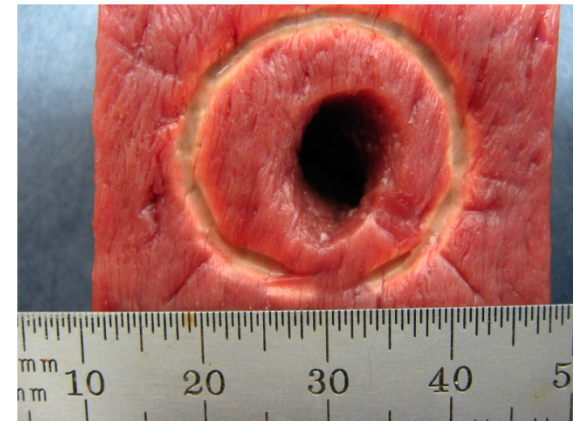
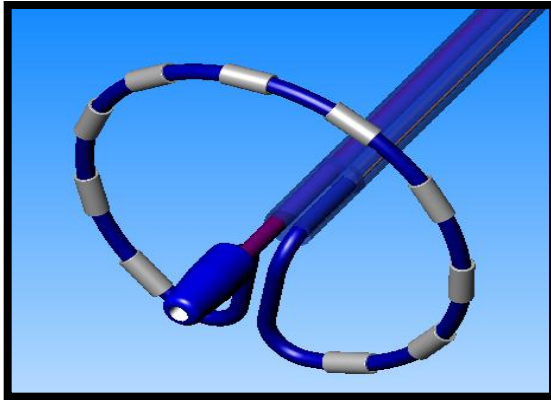


# Pulmonary Vein Ablation Catheter (PVAC)

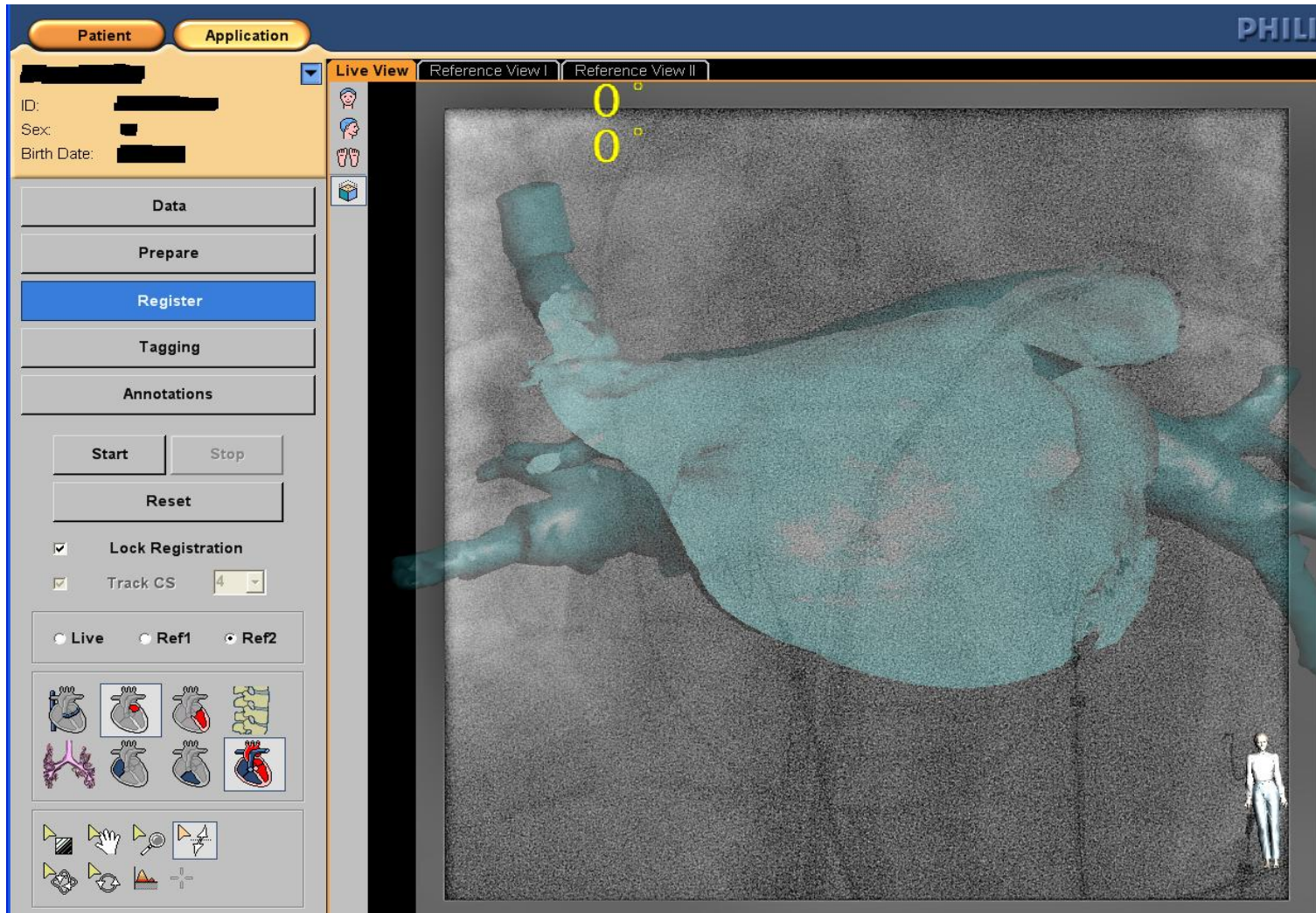




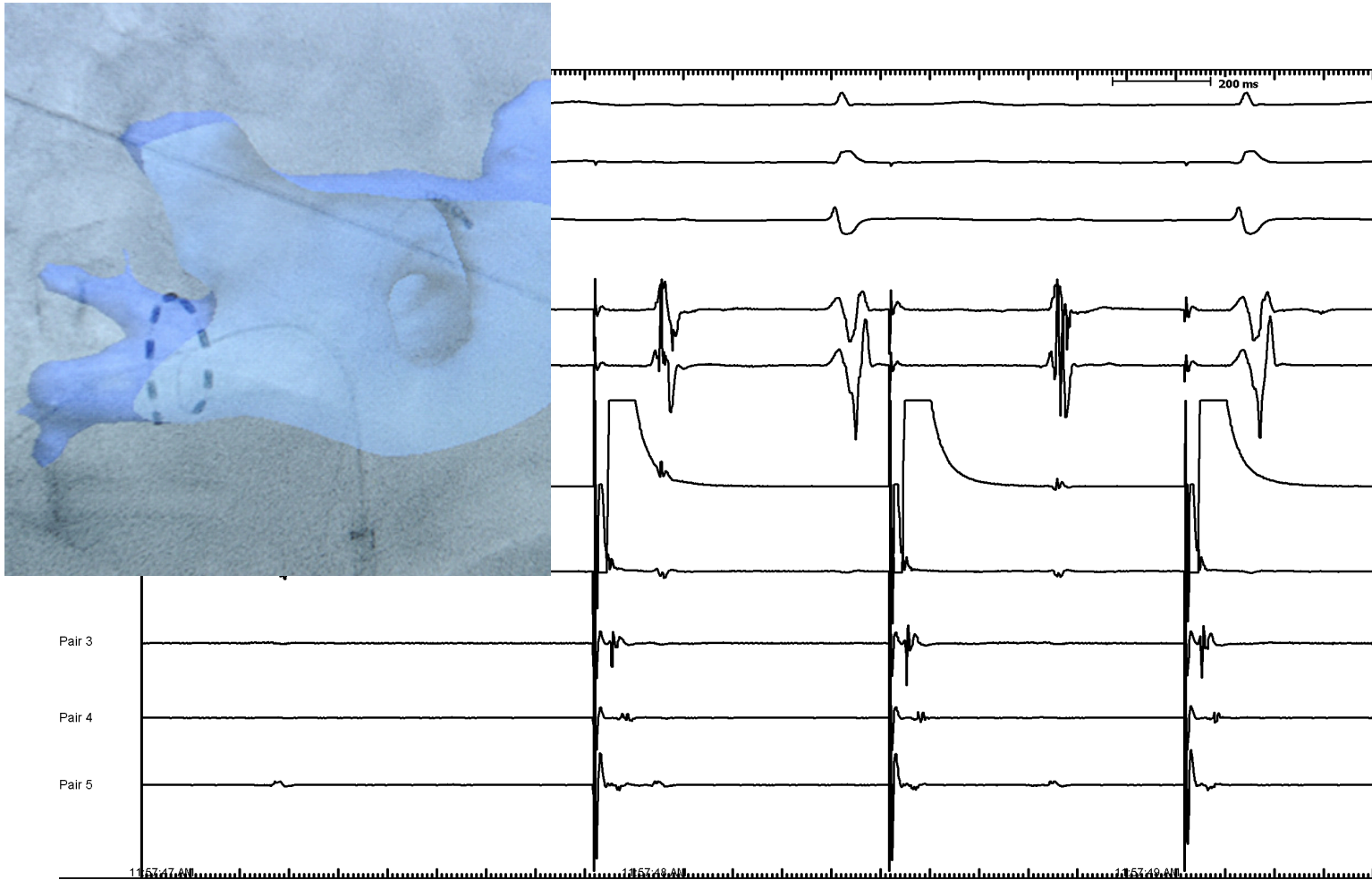
# Pulmonary Vein Ablation Catheter (PVAC)



# EP-navigator



# Eindpunt PVI: Exit block



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# PVI: Complicaties

Kleine complicaties.....*kleine kans*

Bloeding lies      5-10%

Tamponade        1-2%

Klaplong           <1%

Grote complicaties.....*heel kleine kans*

TIA – beroerte

PV stenose

N. Frenicus

Slokdarm



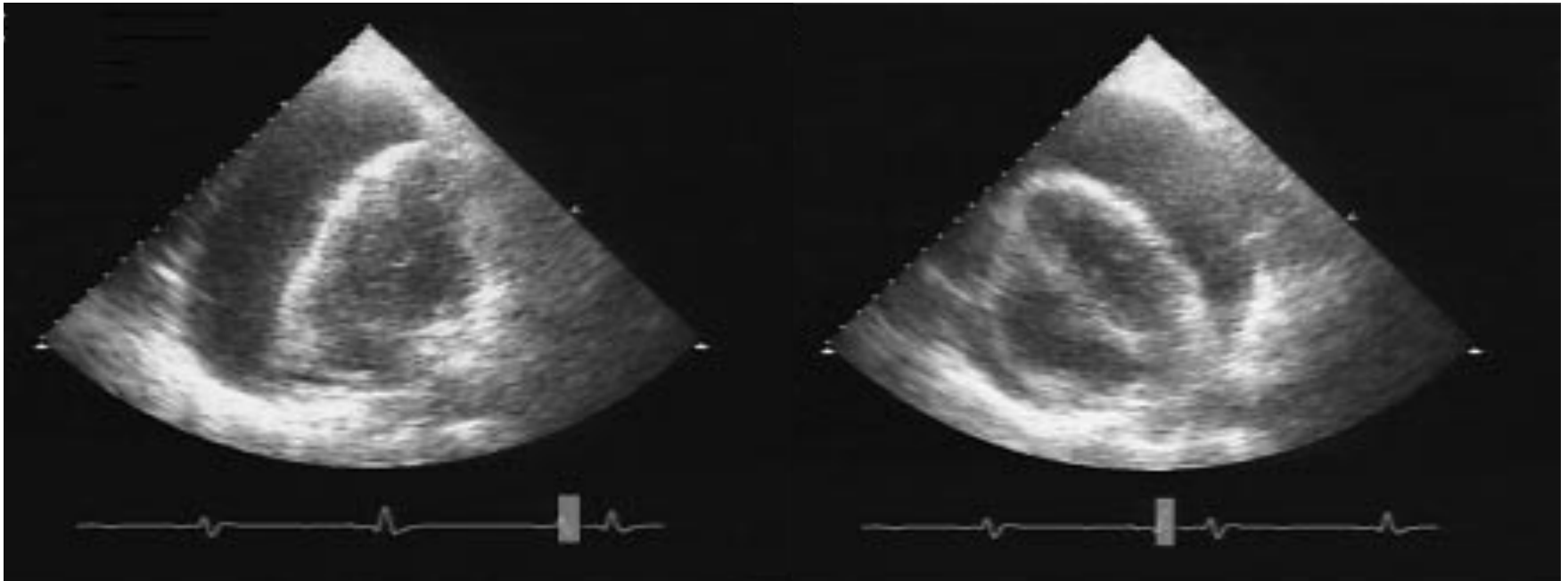
# PVI: Complications

**TABLE 4. Major Complications**

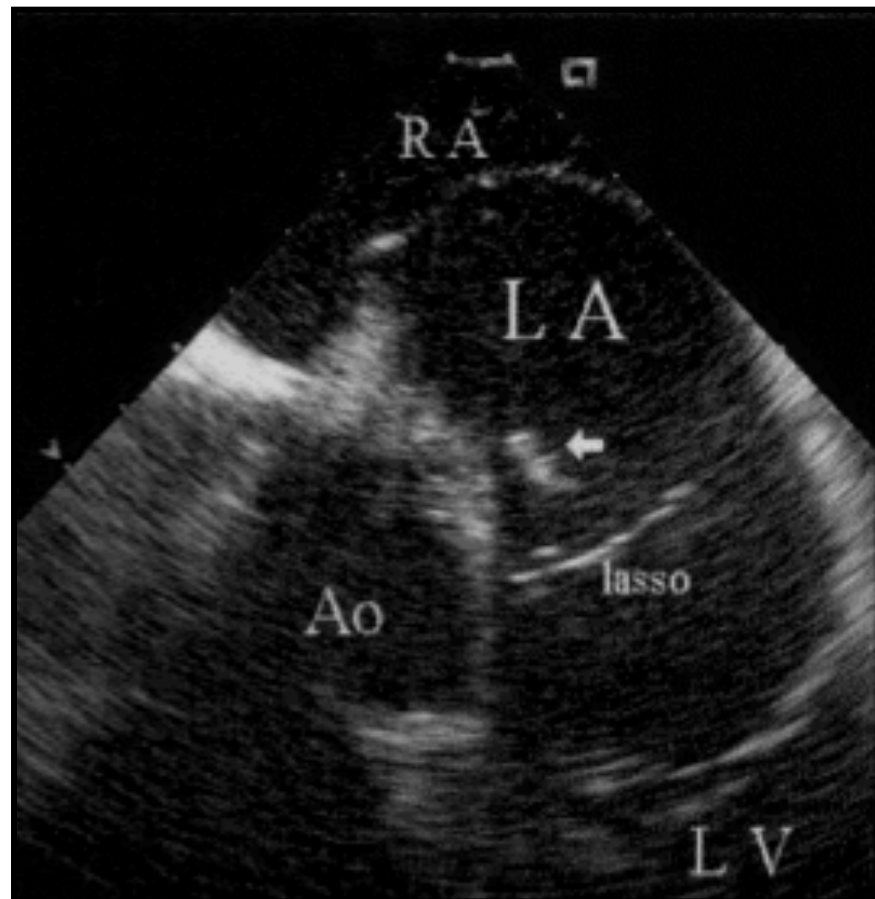
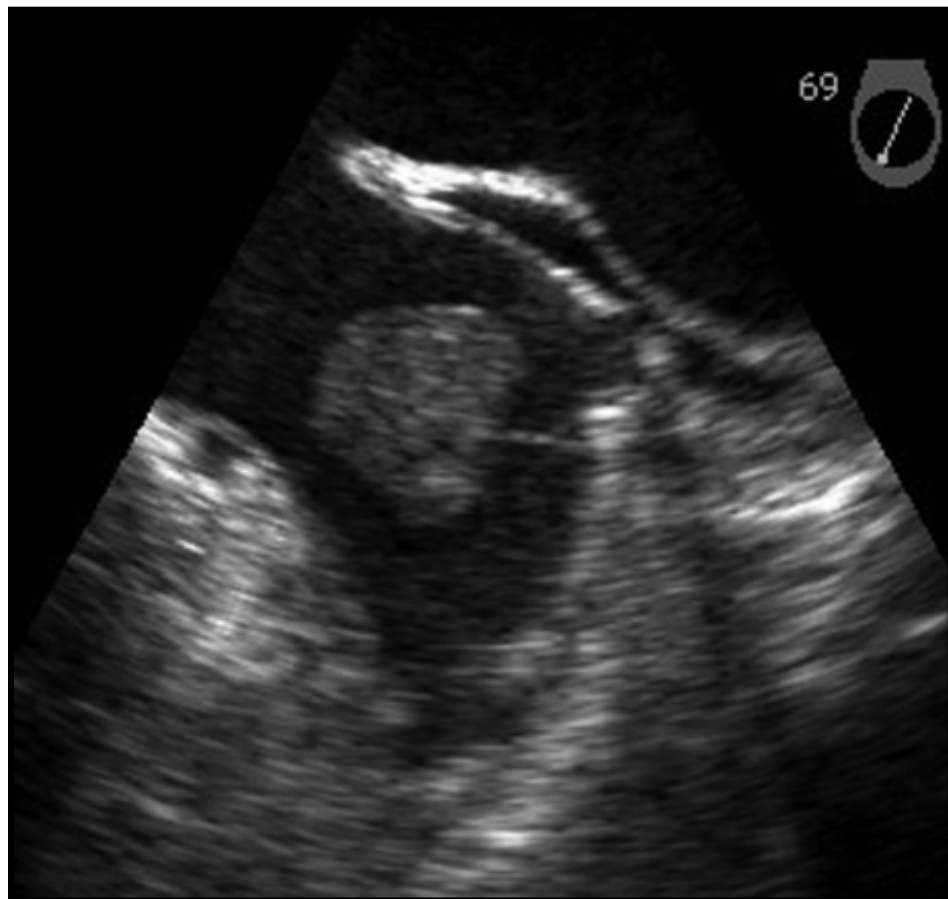
Complication Type	No. of Patients	% of Patients
For all types of procedures (n=8745 patients)		
Periprocedural death	4	0.05
Tamponade	107	1.22
Sepsis, abscesses, or endocarditis	1	0.01
Pneumothorax	2	0.02
Hemothorax	14	0.16
Permanent diaphragmatic paralysis	10	0.11
Femoral pseudoaneurysm	47	0.53
Arterovenous fistulae	37	0.42
Valve damage	1	0.01
Aortic dissection	3	0.03
For procedures involving left atrial ablation (n=7154 patients)		
Stroke	20	0.28
Transient ischemic attack	47	0.66
PV stenosis		
No. with >50% stenosis		
Acute	23	0.32
Chronic	94	1.31
No. with closure		
Acute	2	0.03
Chronic	15	0.21
Patients with symptoms		
Acute	3	0.04
Chronic	41	0.57
Patients undergoing intervention		
Percutaneous	51	0.71
Surgical	2	0.03
Grand total	524	5.9



# Tamponade



# Linker Atrium Stoltsel



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# Stolselvorming LA: Preventie

Voor:

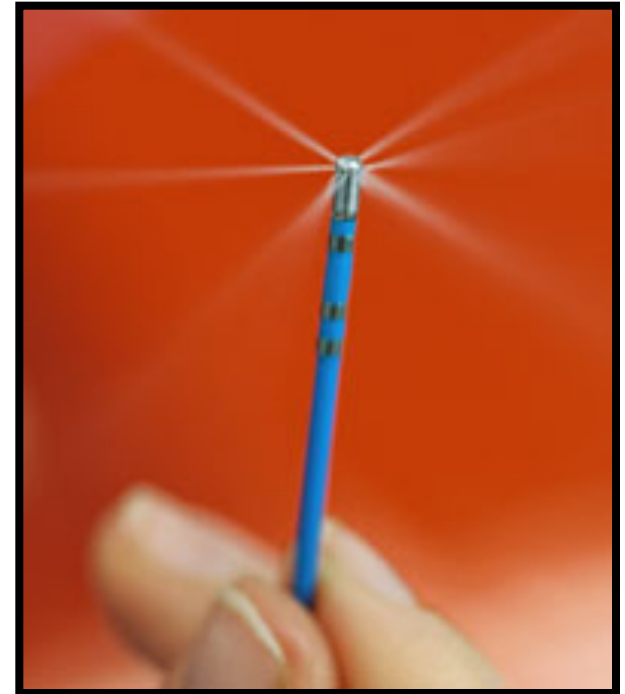
- $\geq 4$  wk bloedverdunners
- Soms slokdarmmecho

Tijdens:

- Heparine
- Gekoelde ablatiecatheter

Na:

- 3 mnd. bloedverdunners



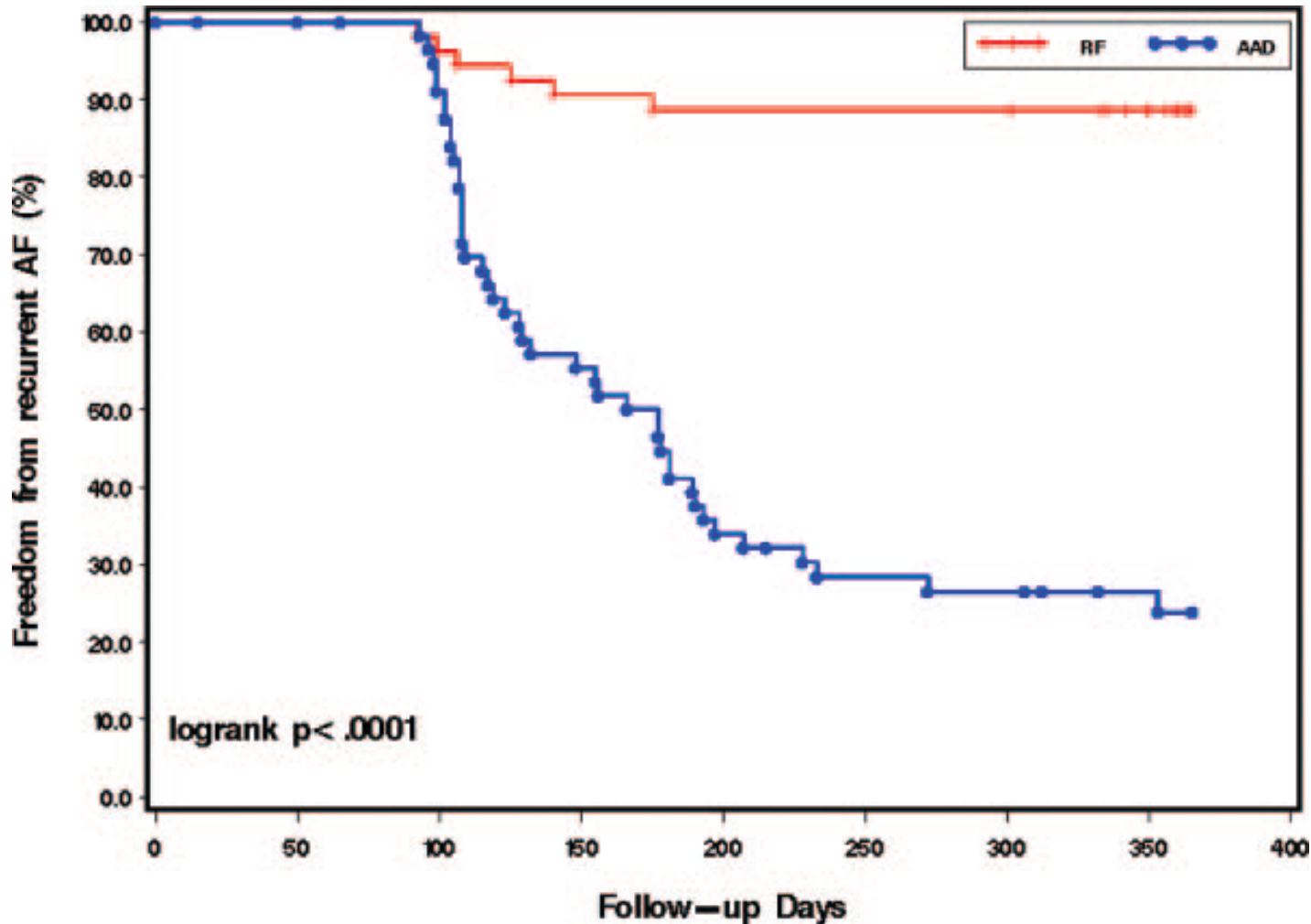


# Success Rate PVI

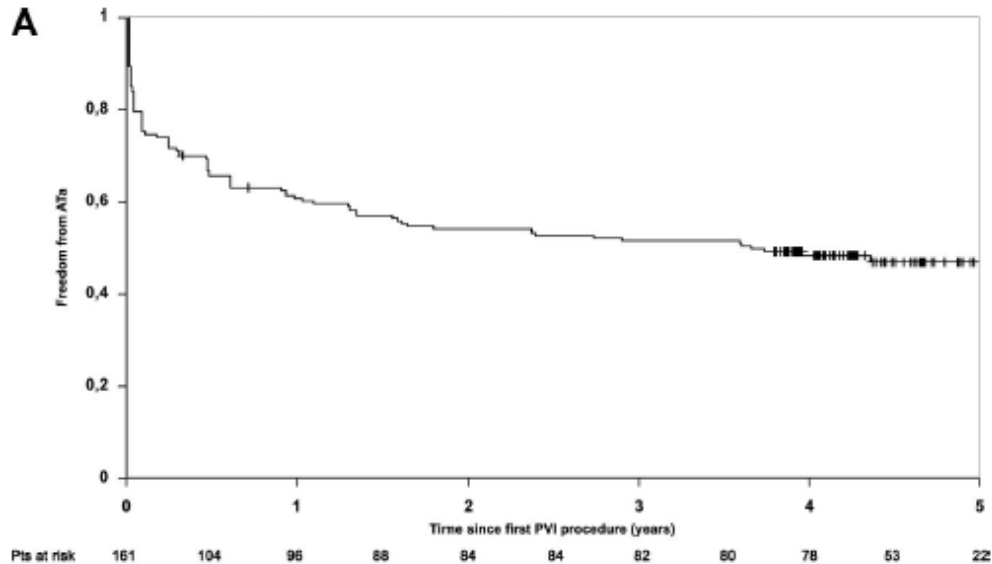
**TABLE 2. Success Rates Relative to Number of Procedures Performed per Center**

No. of Procedures per Center	No. of Centers	No. of Patients	Success Without AADs			Success With AADs			Overall Success	
			n	Rate, %	(Range), %	n	Rate, %	(Range), %	n	Rate, %
1–30	35	547	163	29.8	(14.5–43.6)	165	30.1	(18.7–46.5)	328	59.9
31–60	15	639	214	33.5	(20.8–46.6)	217	34.0	(20.4–48.1)	431	67.5
61–90	12	923	341	36.9	(18.3–51.2)	311	33.7	(16.7–50.3)	652	70.6
91–120	7	728	258	35.4	(24.1–48.7)	221	30.4	(22.8–39.0)	594	81.6
121–150	4	556	187	33.6	(22.6–46.5)	160	28.8	(20.9–37.1)	347	62.4
151–180	4	671	297	44.3	(32.8–51.9)	199	29.7	(23.1–37.8)	496	74.0
181–230	3	607	320	52.7	(42.1–63.0)	138	22.7	(18.3–25.9)	458	75.4
231–300	3	830	519	62.5	(55.7–70.4)	236	28.4	(22.3–35.6)	755	91.0
>300	7	3244	2069	63.8	(50.3–76.5)	514	15.8	(8.8–24.5)	2583	87.9
Total	90	8745	4550	52.0	(14.5–76.5)	2094	23.9	(8.8–50.3)	6644	75.9

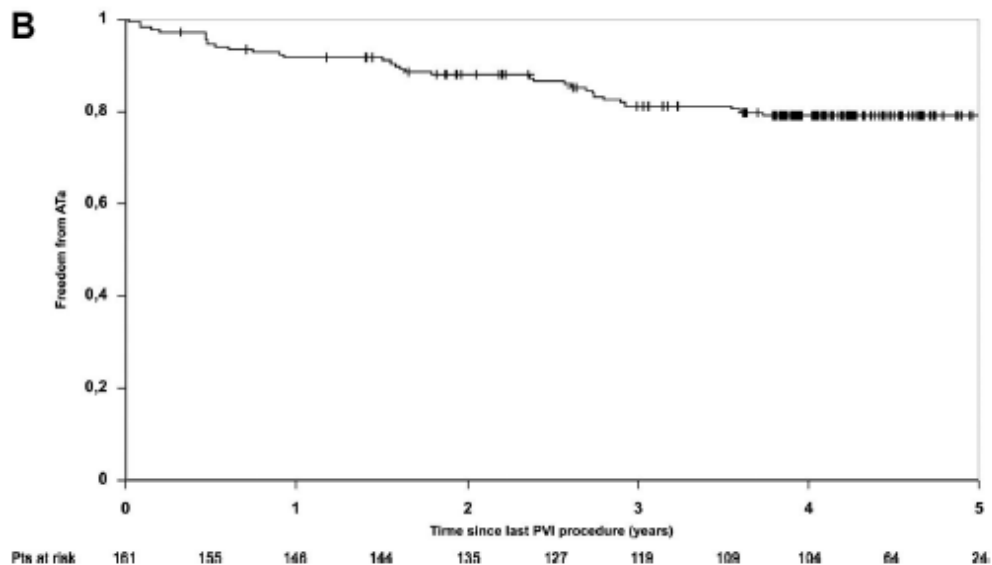
# Catheter Ablation Versus Antiarrhythmic Drugs for Atrial Fibrillation: The A4 Study



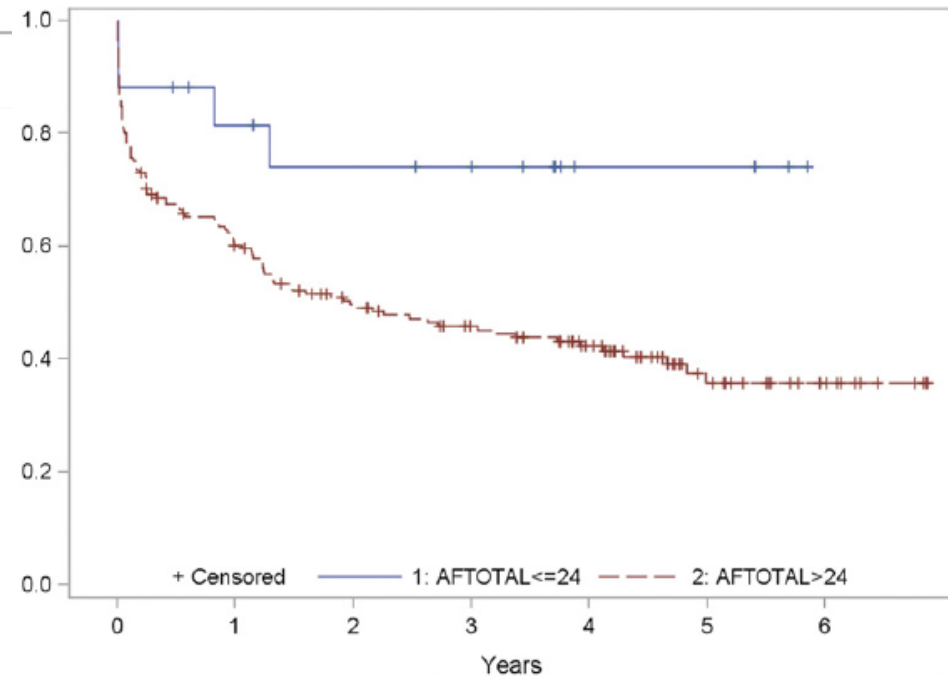
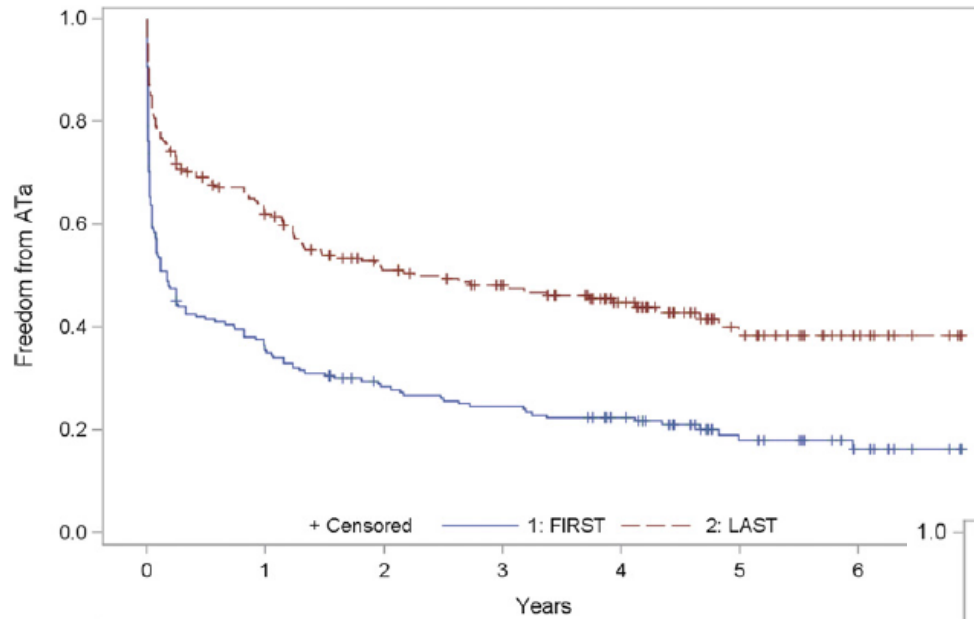
# Paroxysmal AF Ablation: Long term outcome



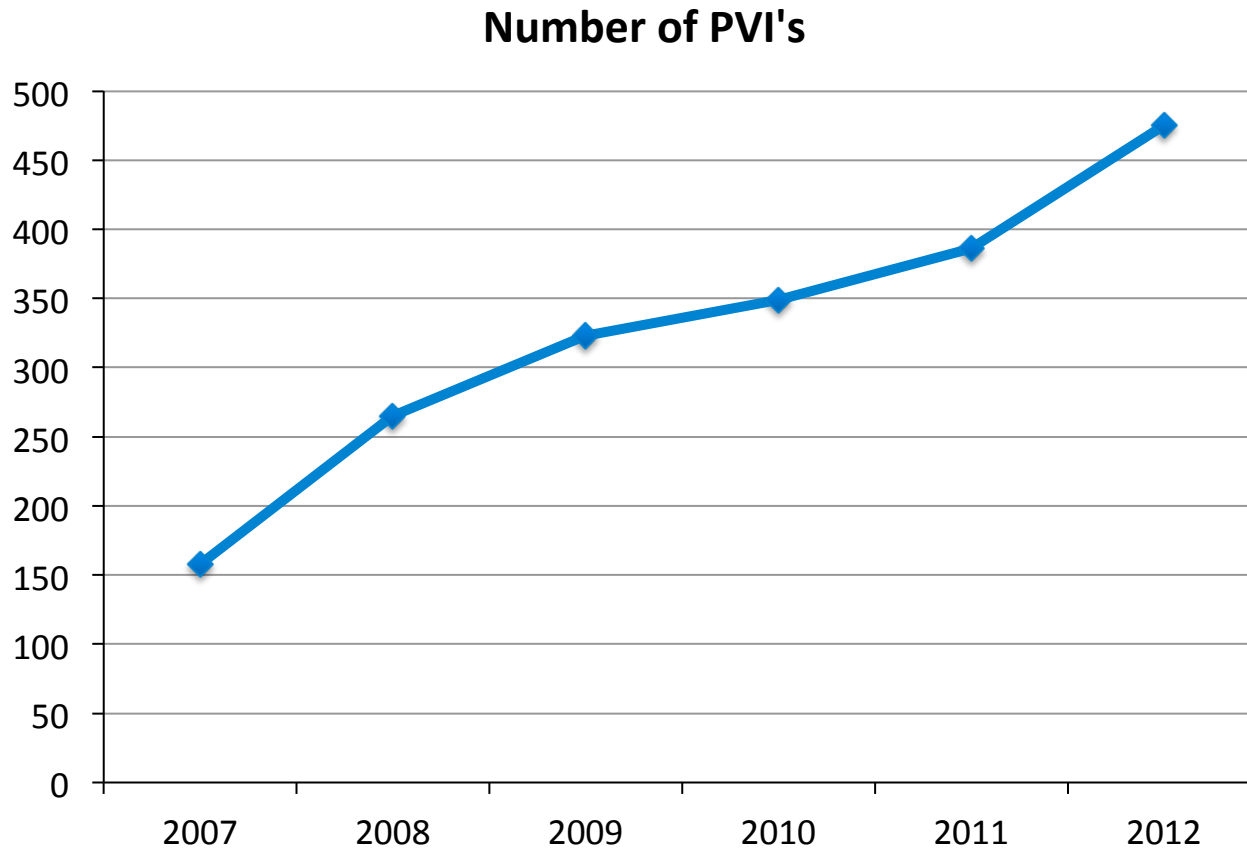
- N=161
- N=66, 2nd procedure (41%)
  - 94% recovery of conduction
- N=12, 3rd procedure
  - 67% recovery of conduction
- 2.4% progression to chronic AF



# Long-standing Persistent AF Ablation: Long term outcome



# Aantallen PVI's in het Catharina



# Resultaten PVI in CZE

697 Pt, 1013 Procedures

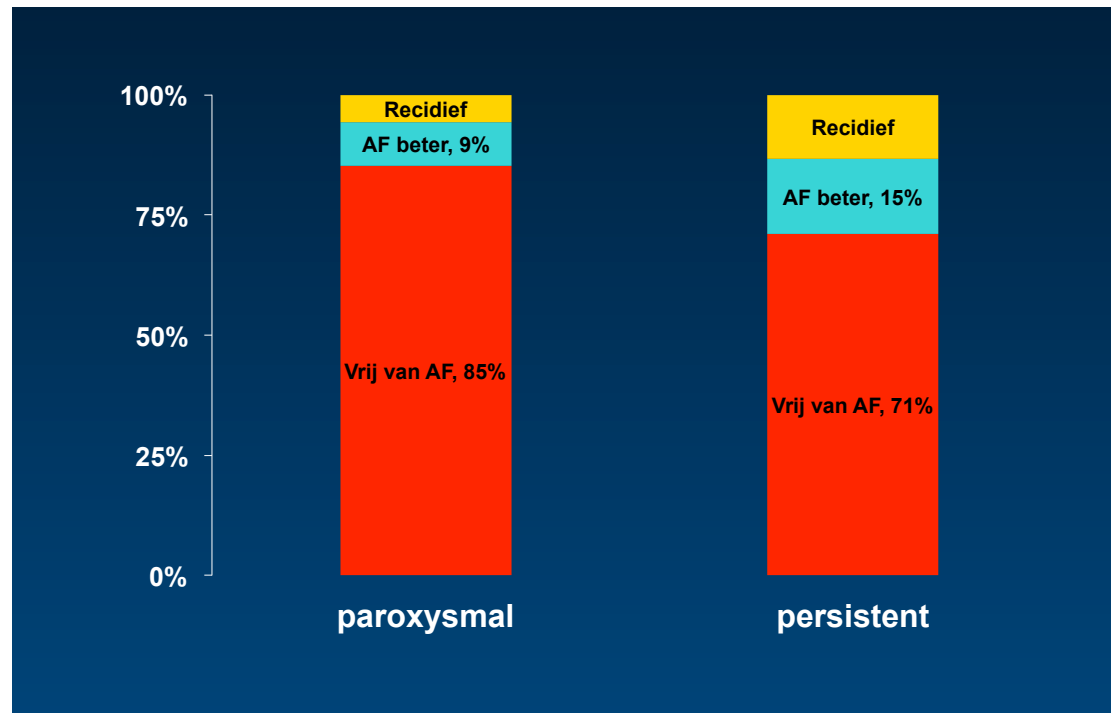
Type AF:

- Paroxysmaal 77%
- Persistent 21%
- Permanent 1%

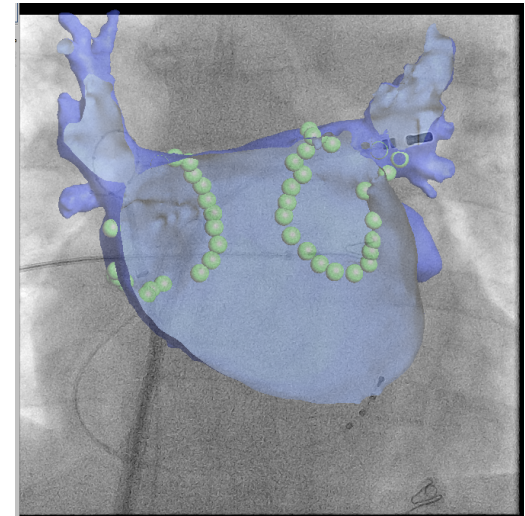
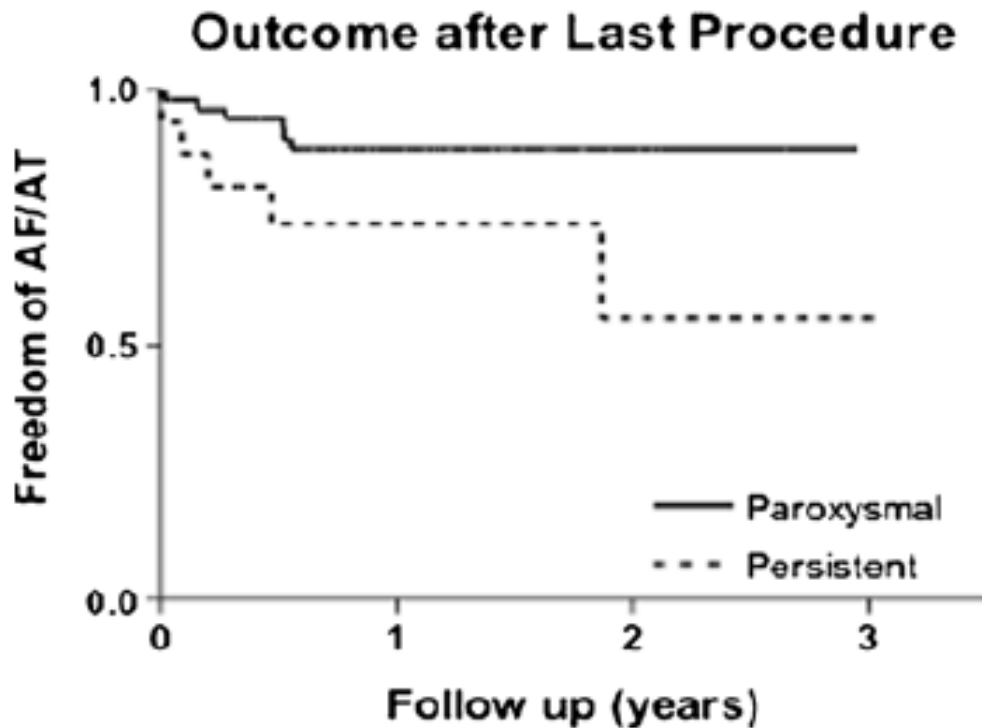
Aantal Procedures:

- 1 65%
- 2 27%
- >2 8%

Complicaties 3%



# Follow up na PVI met EP-navigator - Catharina experience -



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# Conclusies

- Pulmonaalvenenisolatie is de beste behandeling voor paroxysmaal (IA) en persisterend AF (IIaB).
- Technieken zijn nog volop in ontwikkeling.
- Vele vragen nog onbeantwoord:
  - effect op prognose.
  - uitkomsten bij ouderen.
  - aanpak bij persisterend AF.





