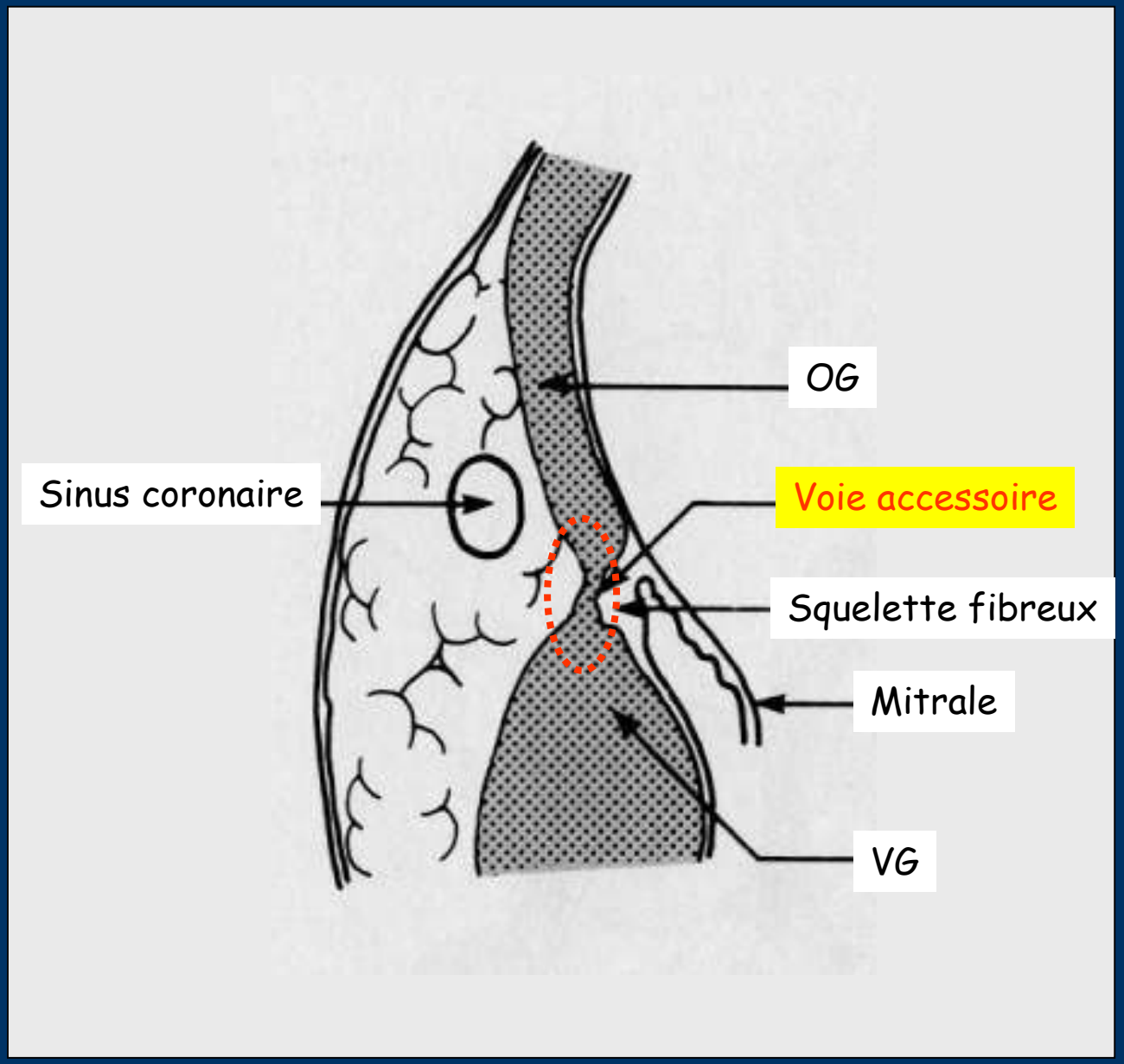
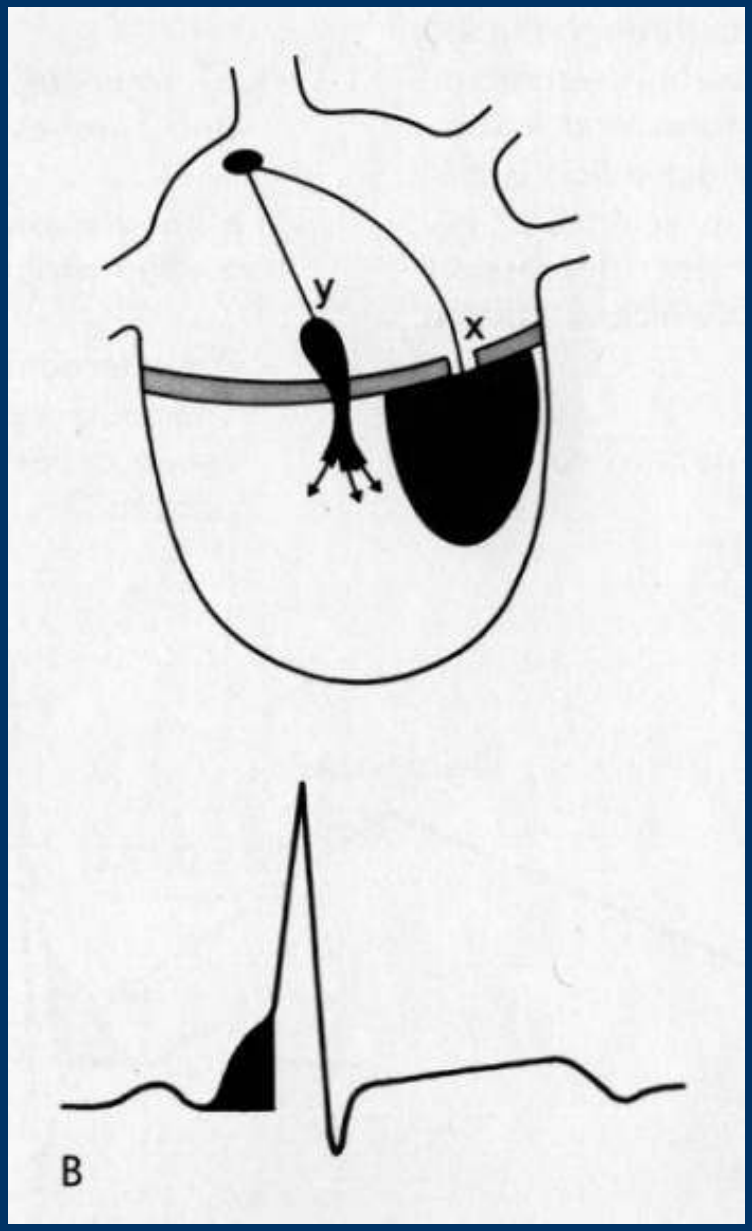
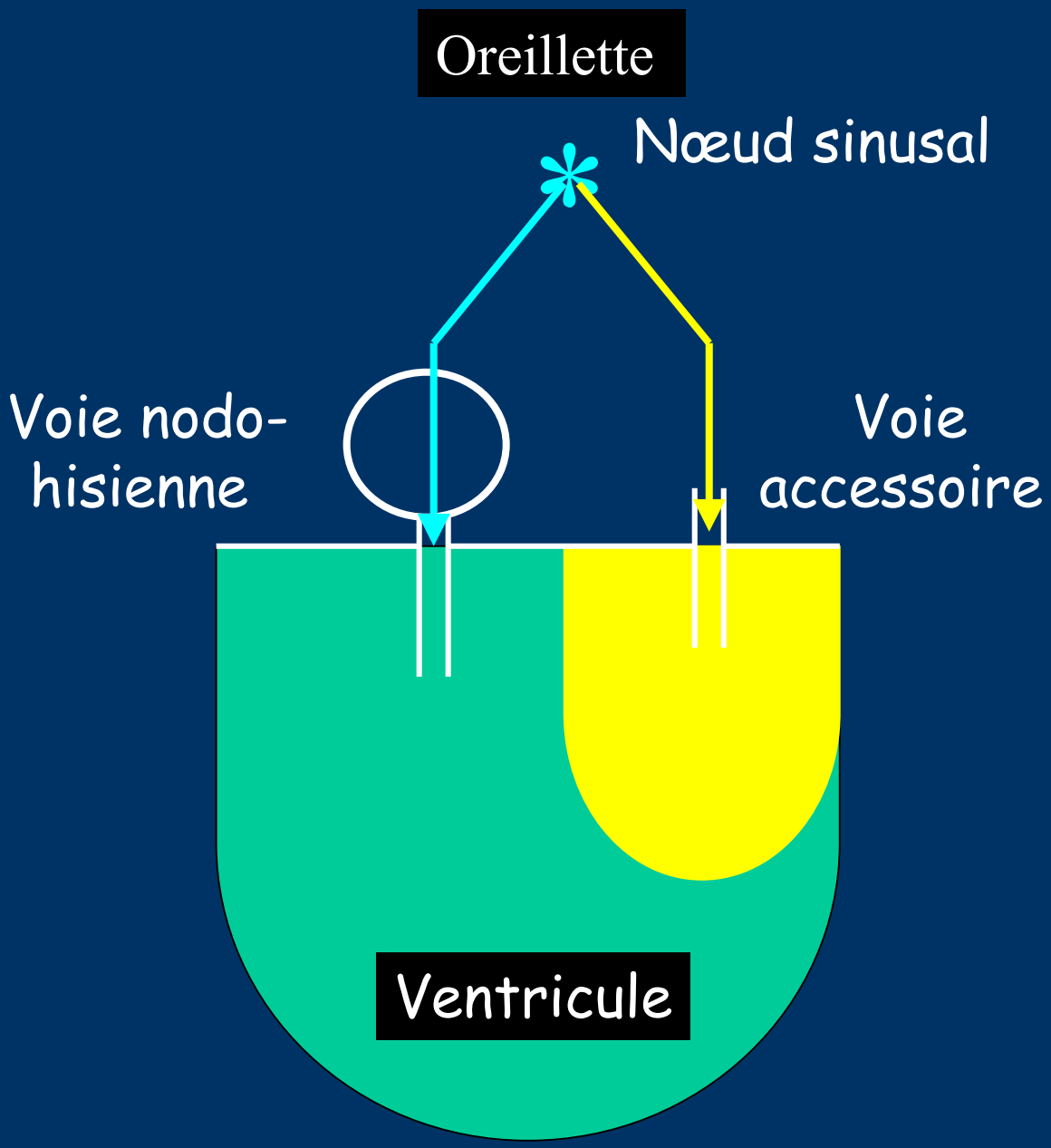
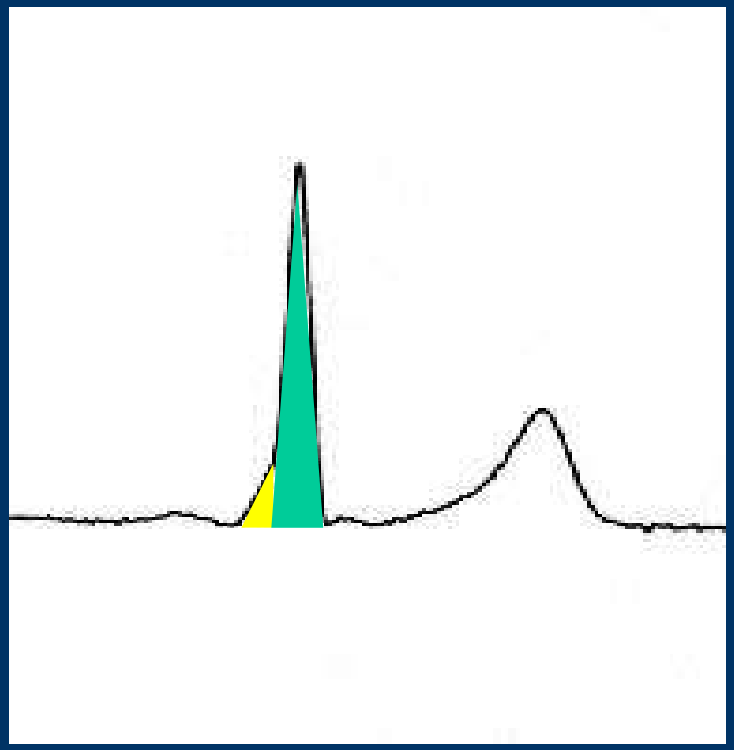
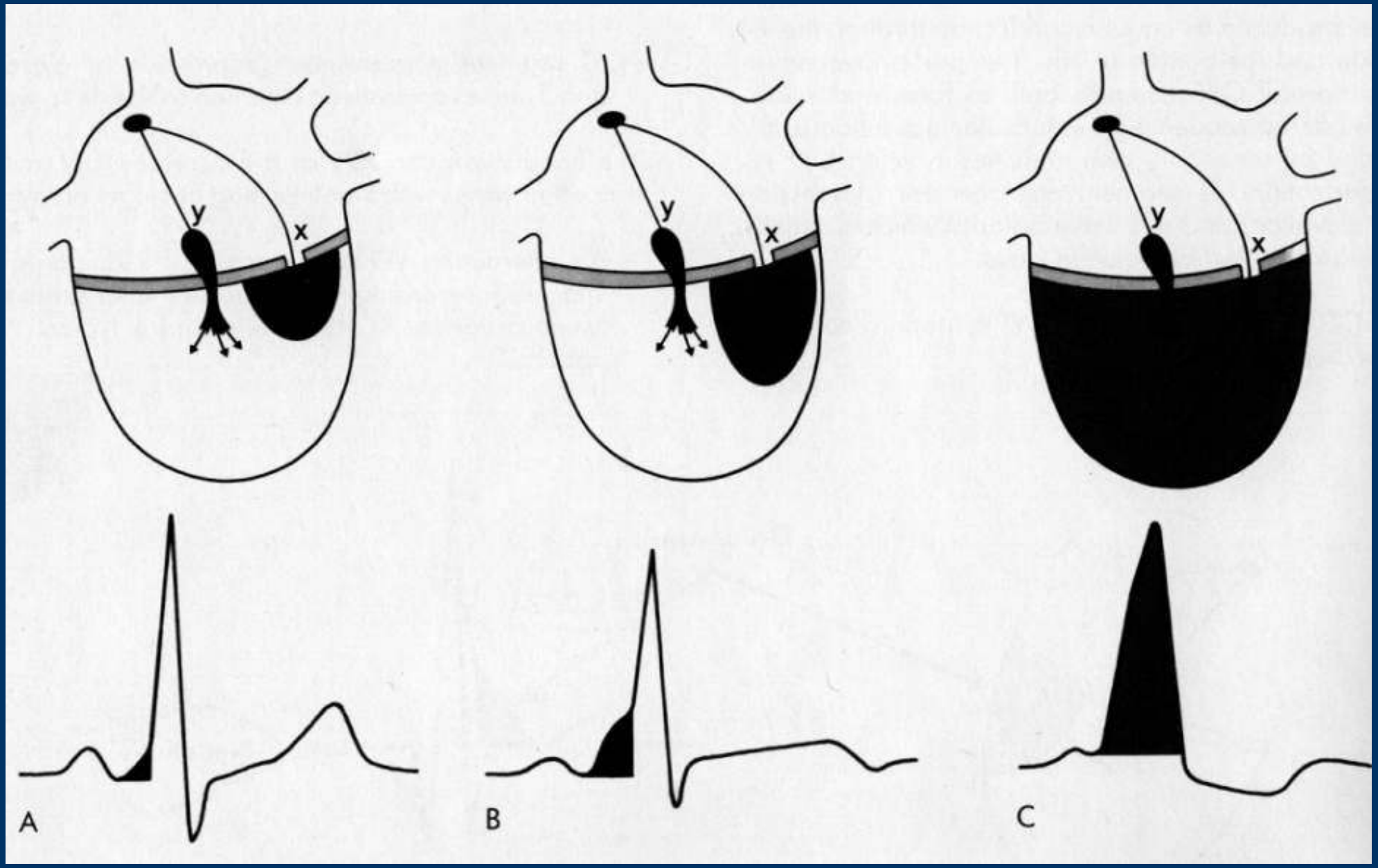

OG
Sinus coronaire
Voie accessoire
Squelette fibreux
Mitrale
VG

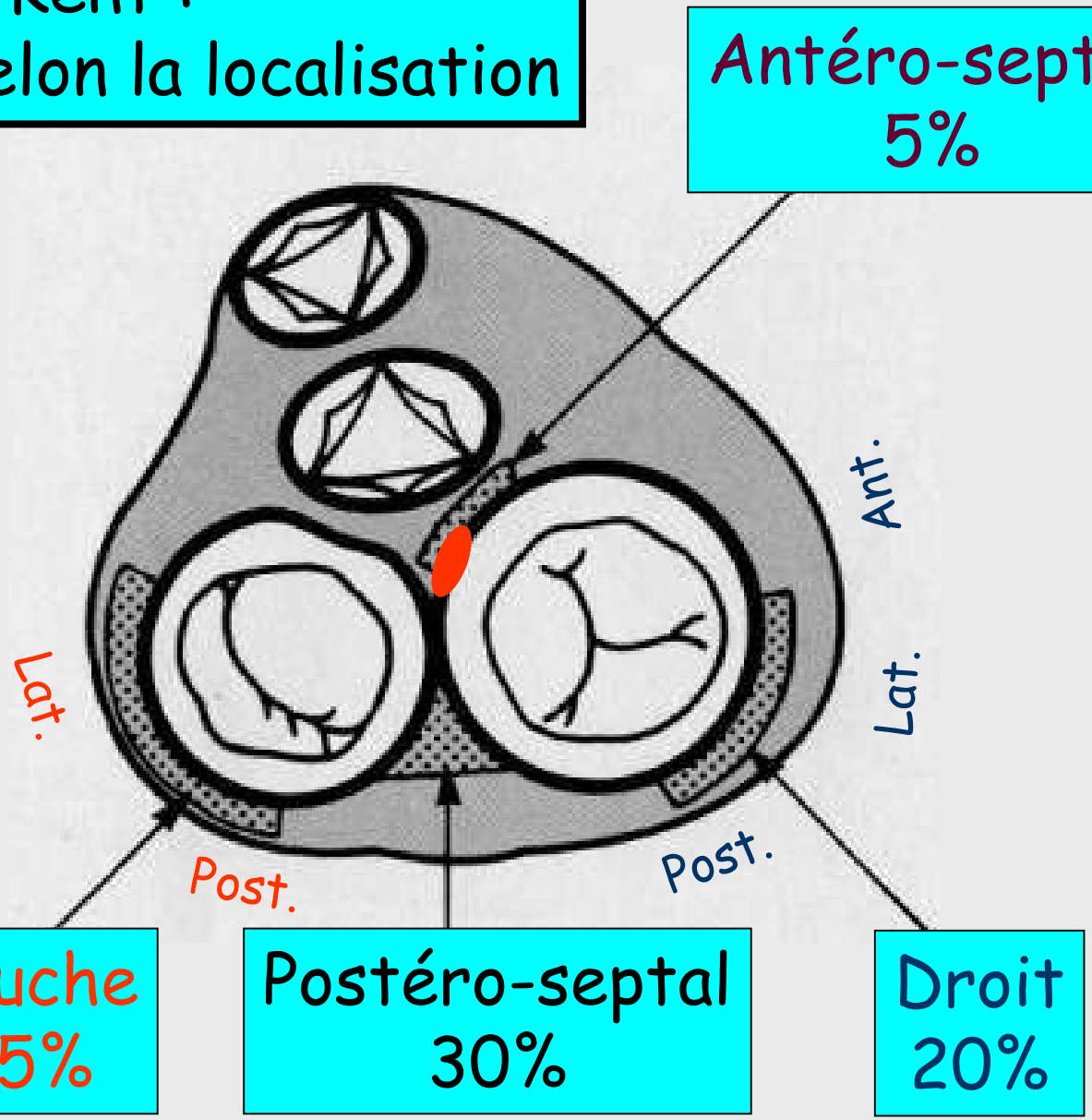

y
x
B

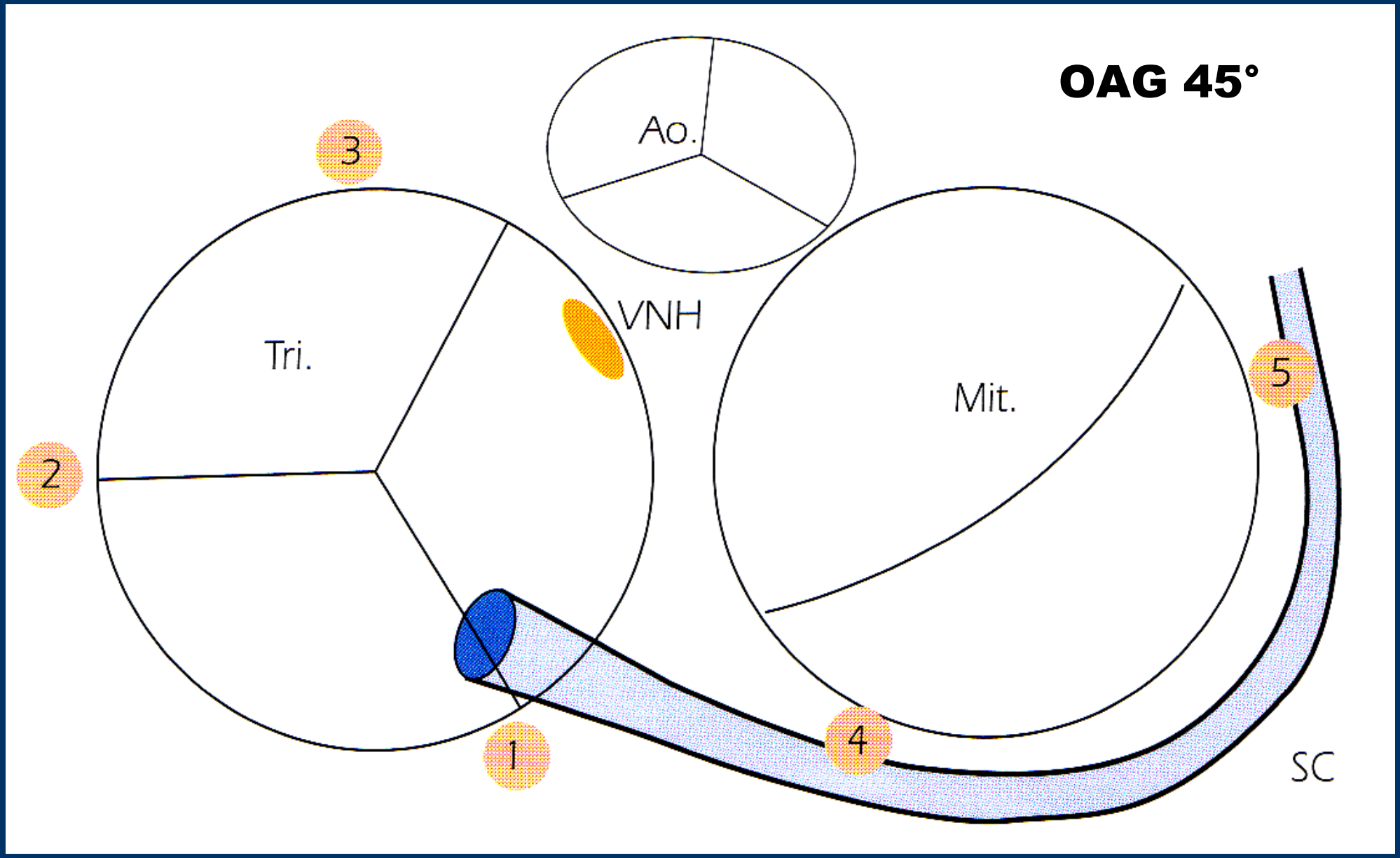

Oreillette
Nœud sinusal
Voie nodo-
hisienne
Voie
accessoire
Ventricule



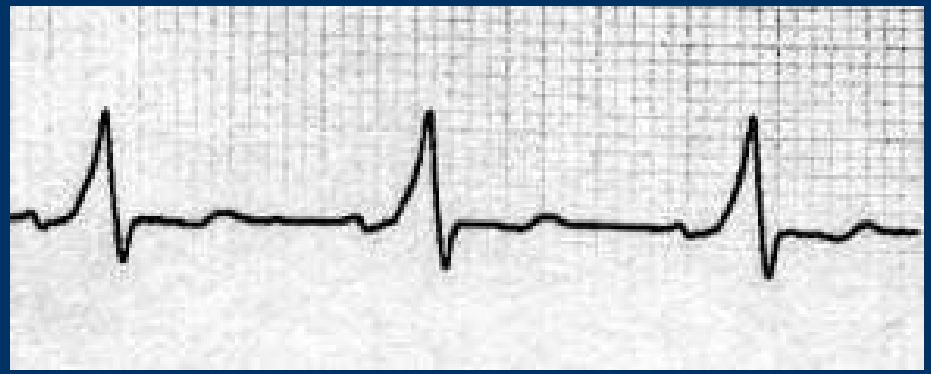

y
x
y
x
y
x
A
B
C

Faisceaux de Kent : répartition selon la localisation

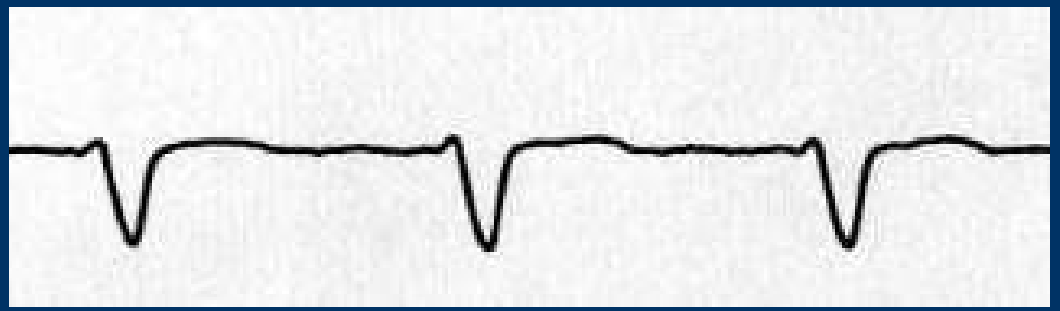



OAG 45°
Ao.
3
Tri.
VNH
Mit.
5
2
1
4
SC

Aspect en V1

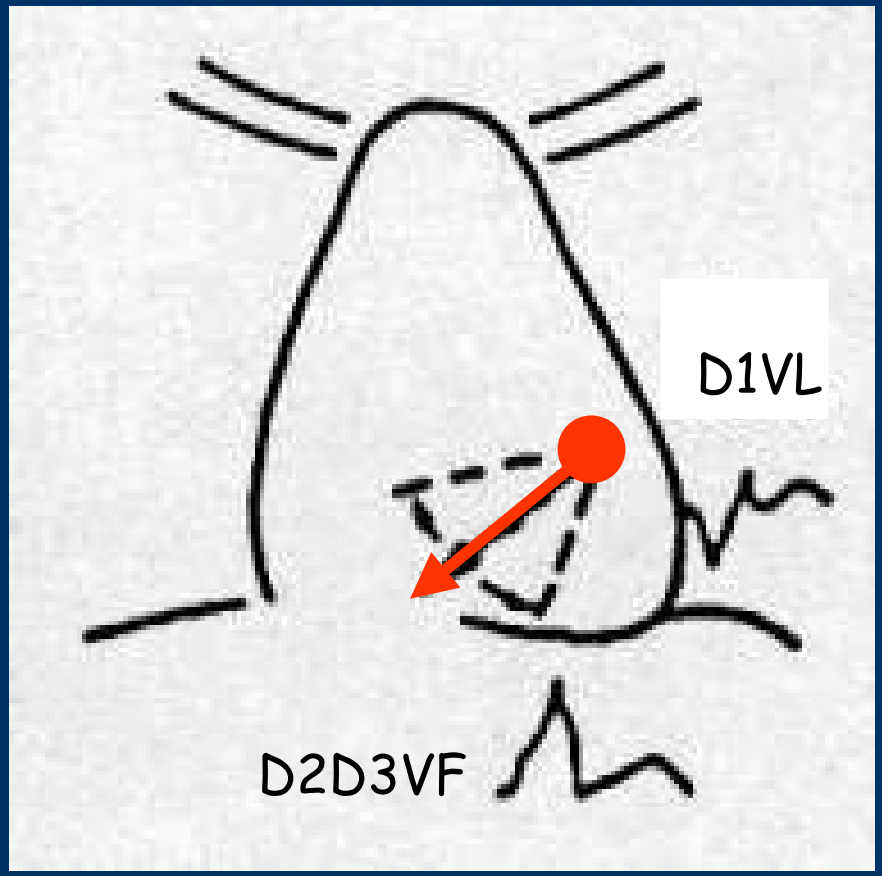


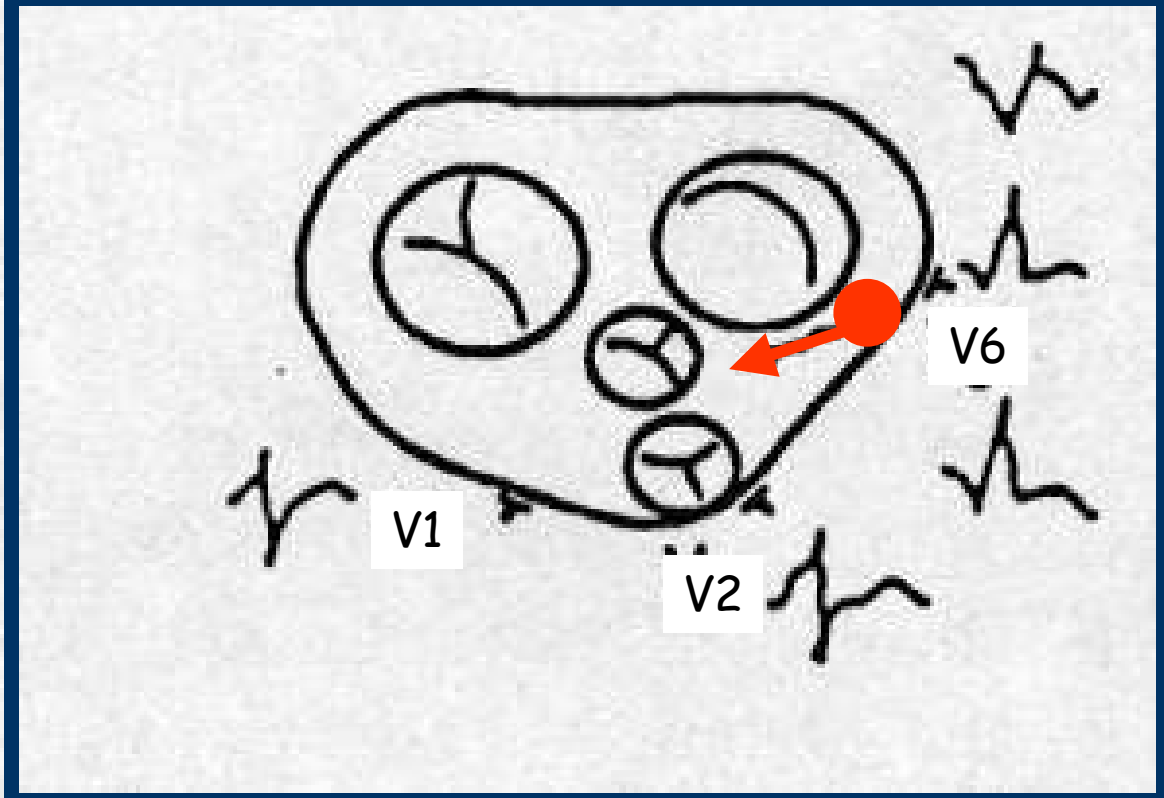
« Type A »



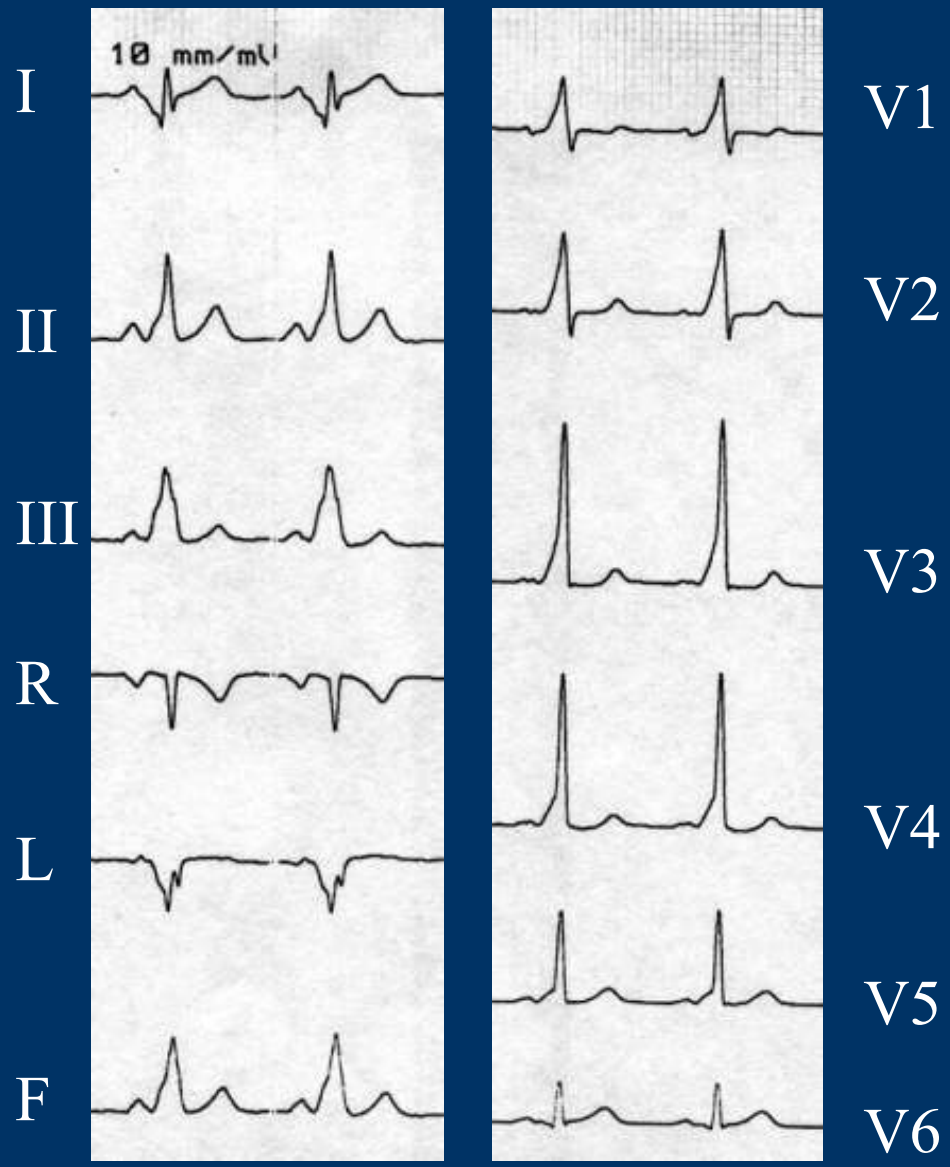
« Type B »

Voie accessoire latérale gauche





Dérivation V1



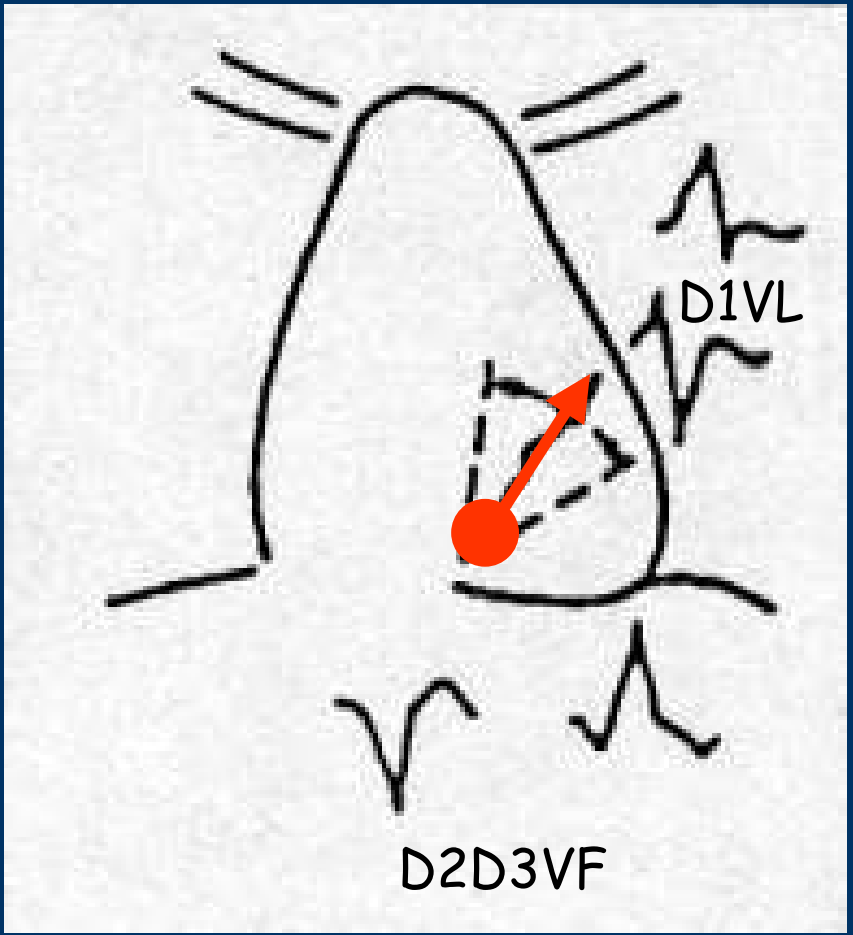
QRS et Δ positifs

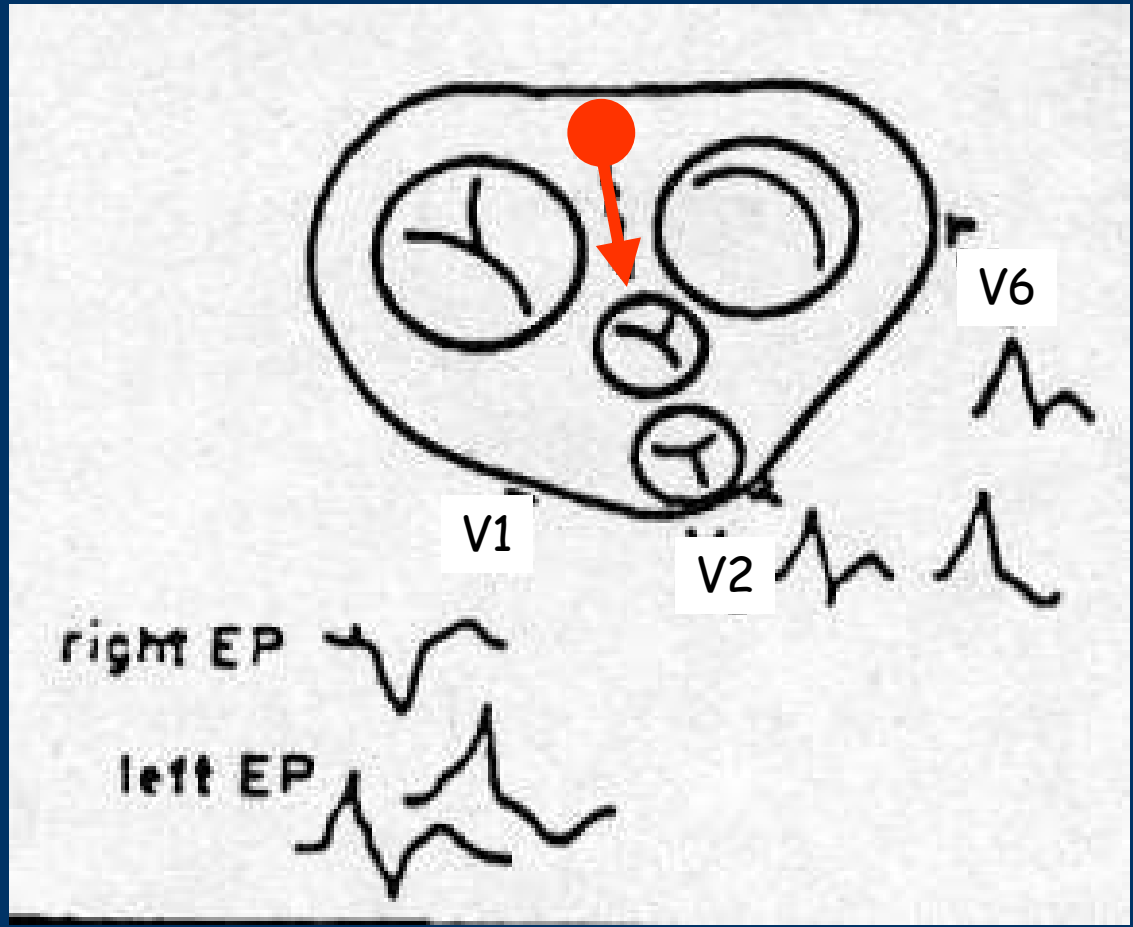
Fx de Kent Gauche

Onde Δ iso. ou négative I,L,V_5,V_6

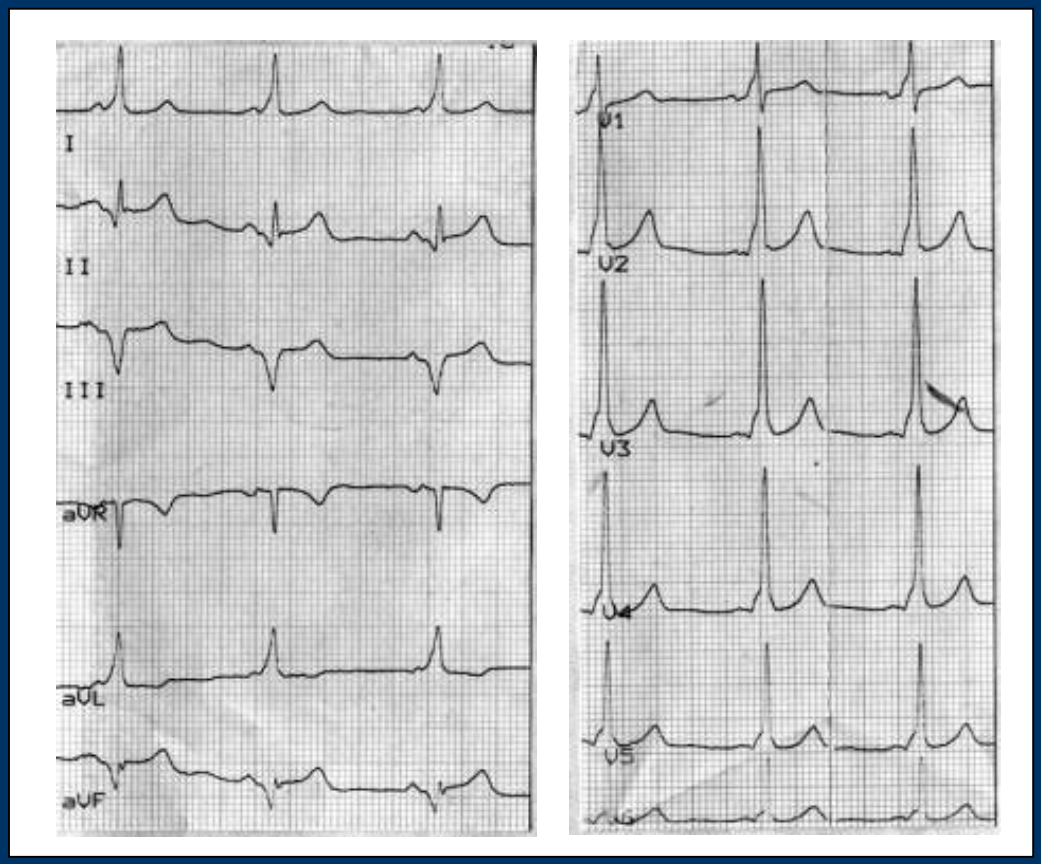
Latéral

Voie accessoire postéro-septale





Dérivation V1



QRS et Δ positifs

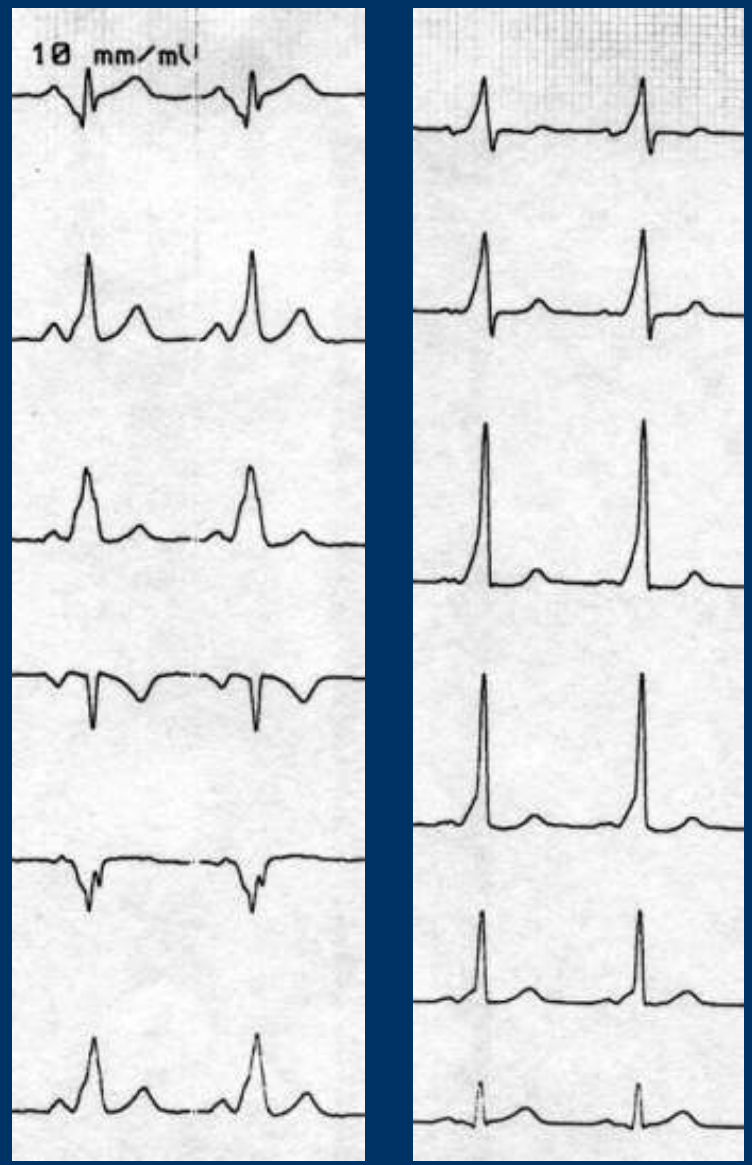
Fx de Kent Gauche

QRS et Δ négatifs II, III VF

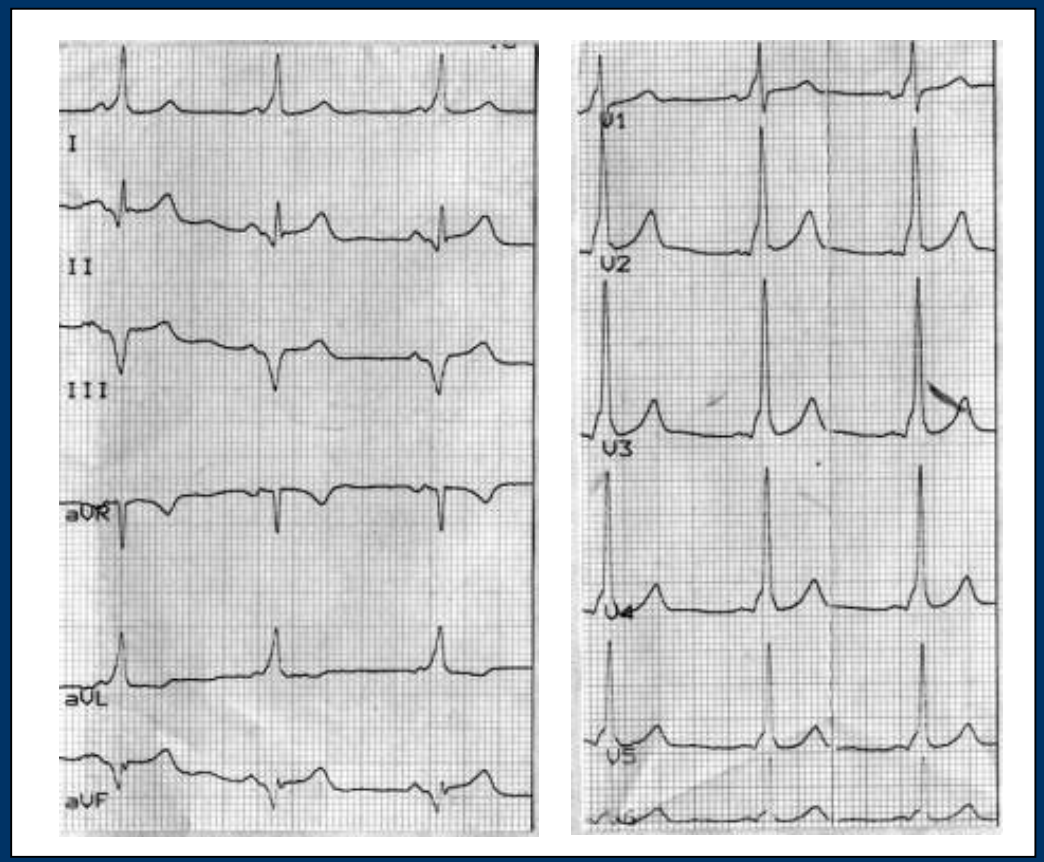
Postérieur ou postéro-septal

Gauche

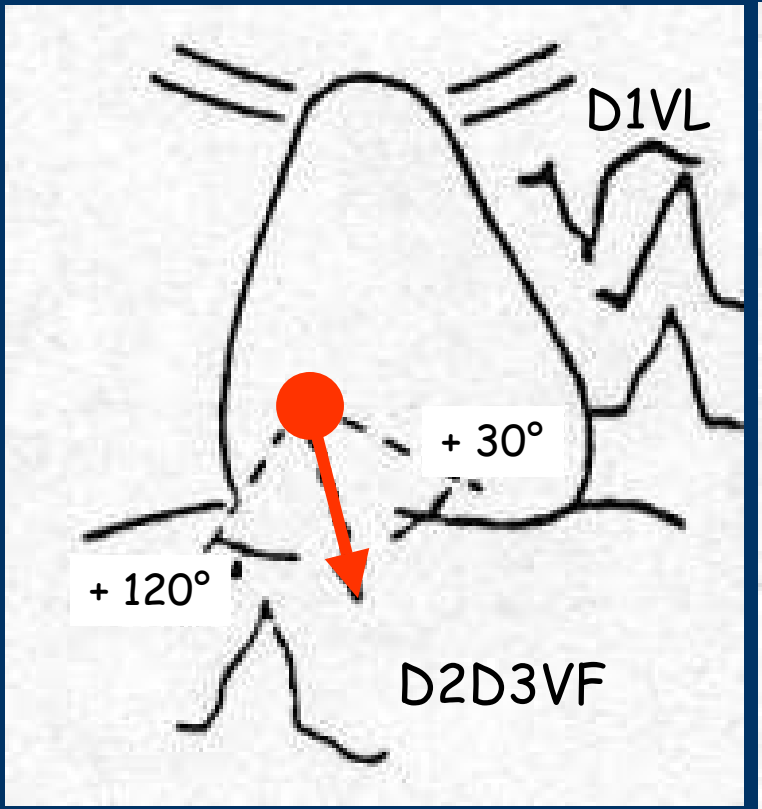
Latéral

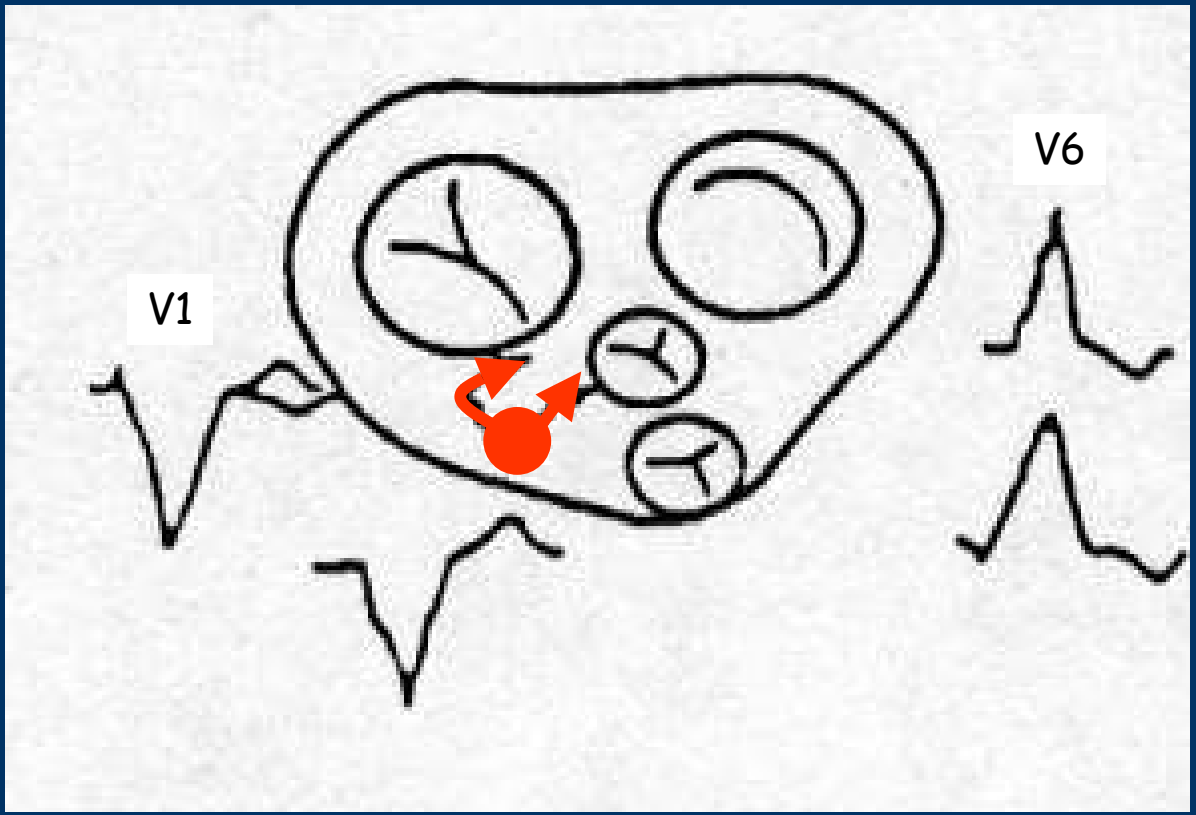


Postérieur



Voie accessoire antéro-septale droite





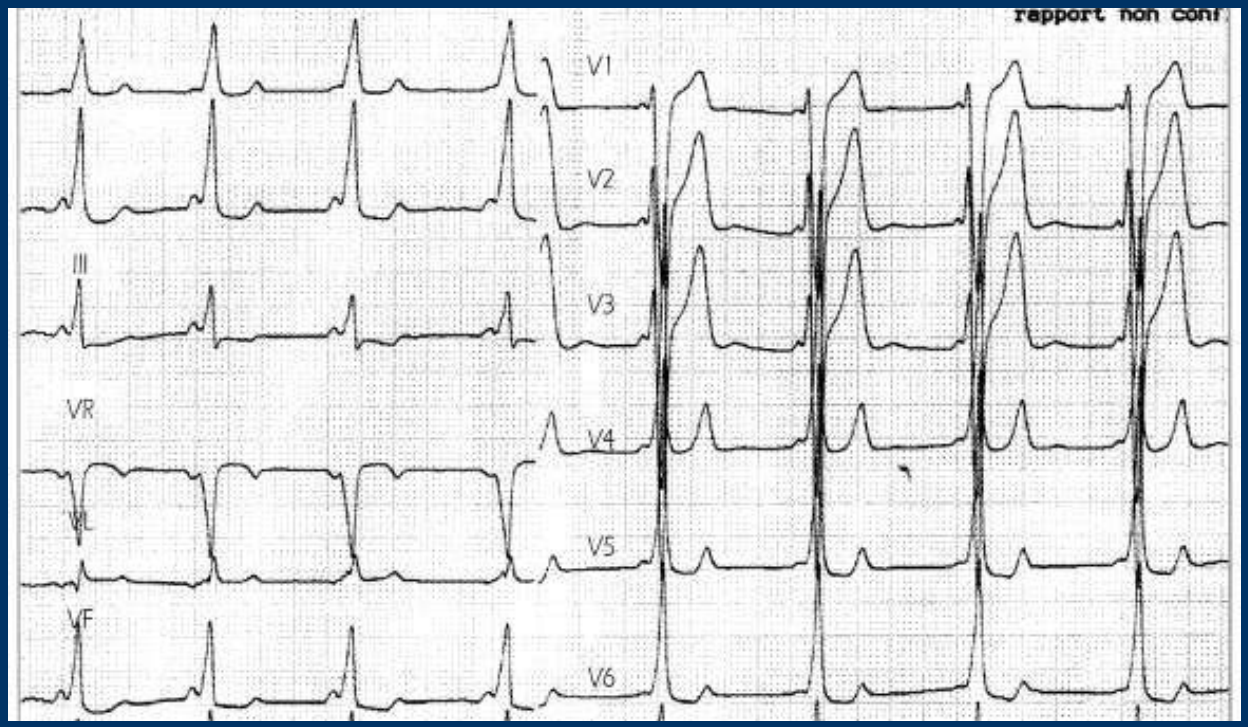
Dérivation V1

QRS et Δ négatifs

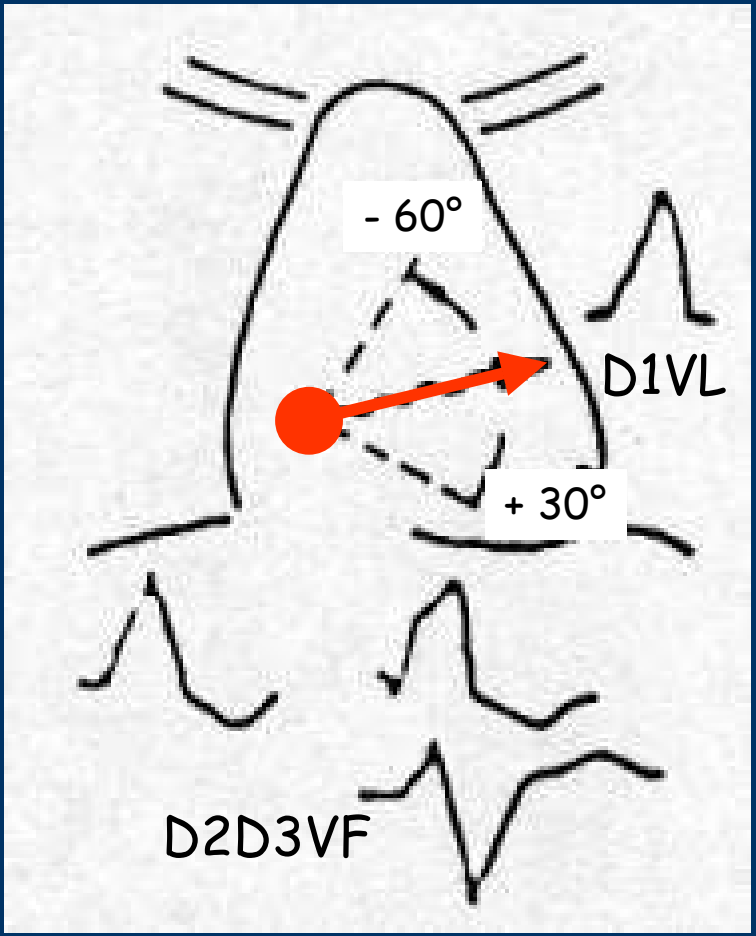
Fx de Kent Droit

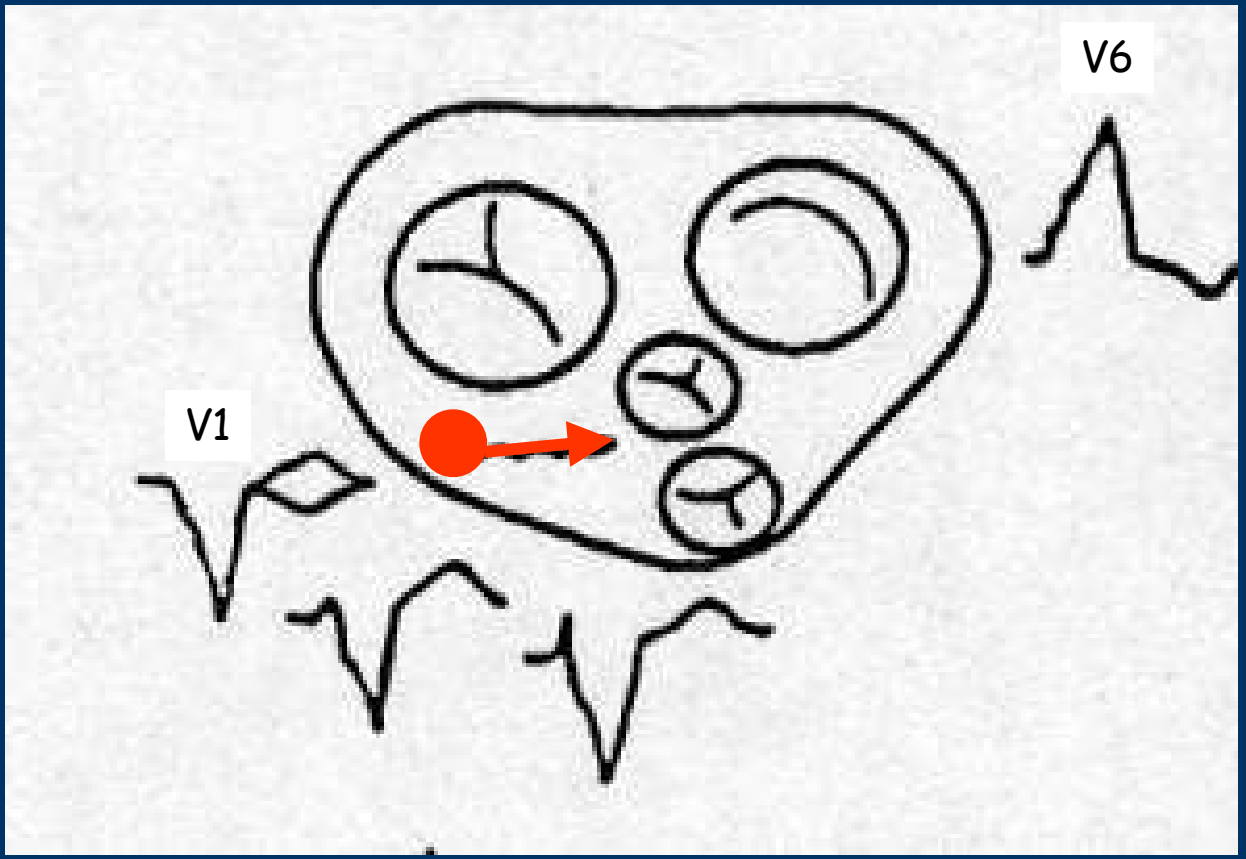
Axe inférieur

Antéro-septal



Voie accessoire droite latérale





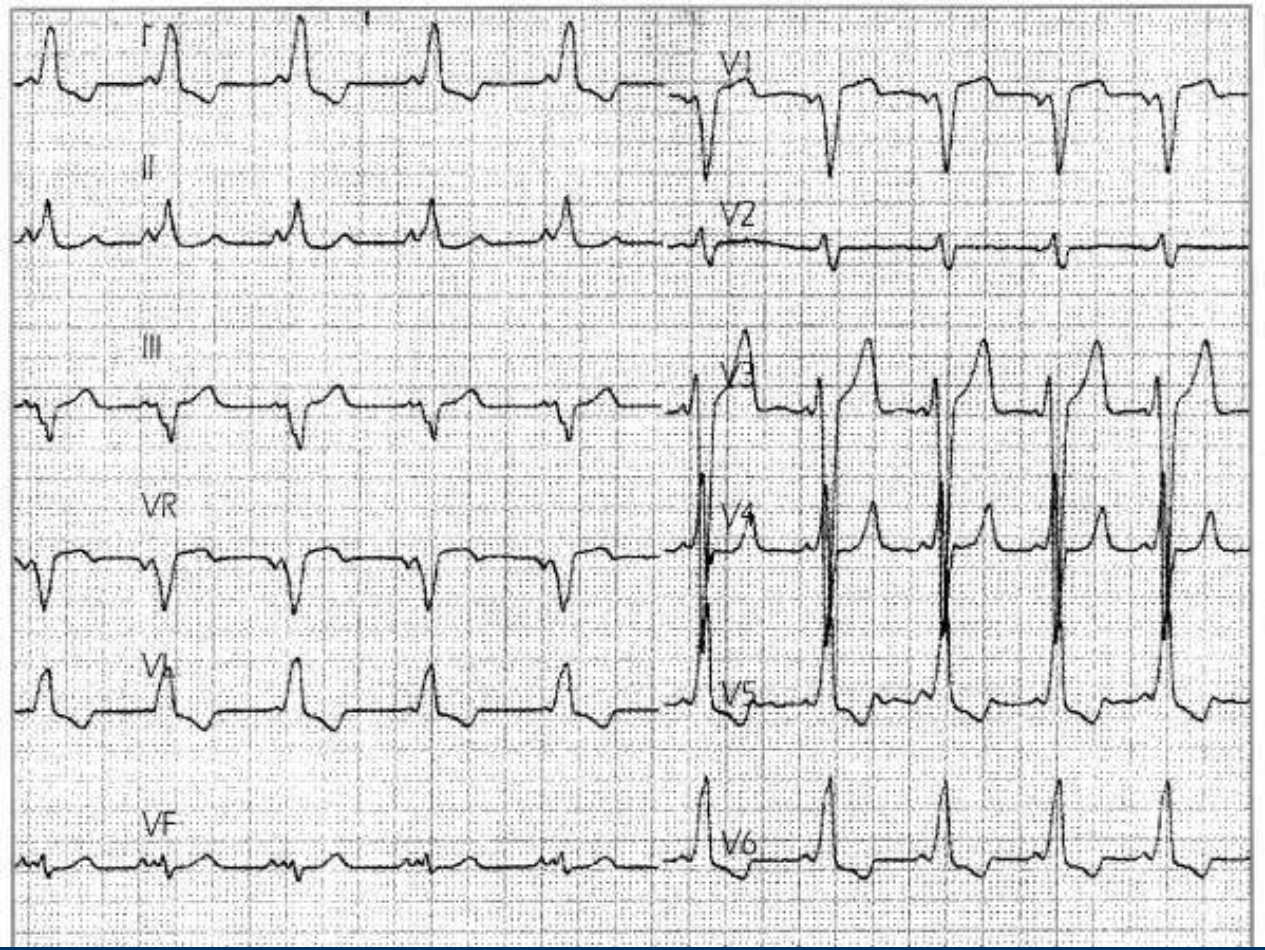
Dérivation V1

QRS et Δ négatifs

Fx de Kent Droit

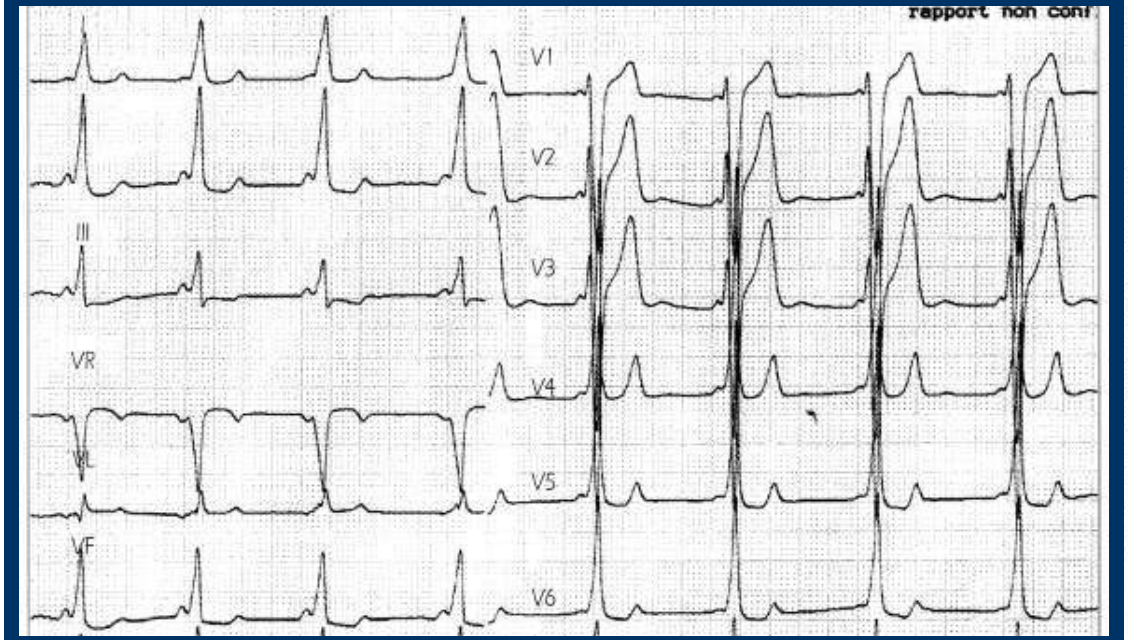
Axe gauche

Paroi libre VD

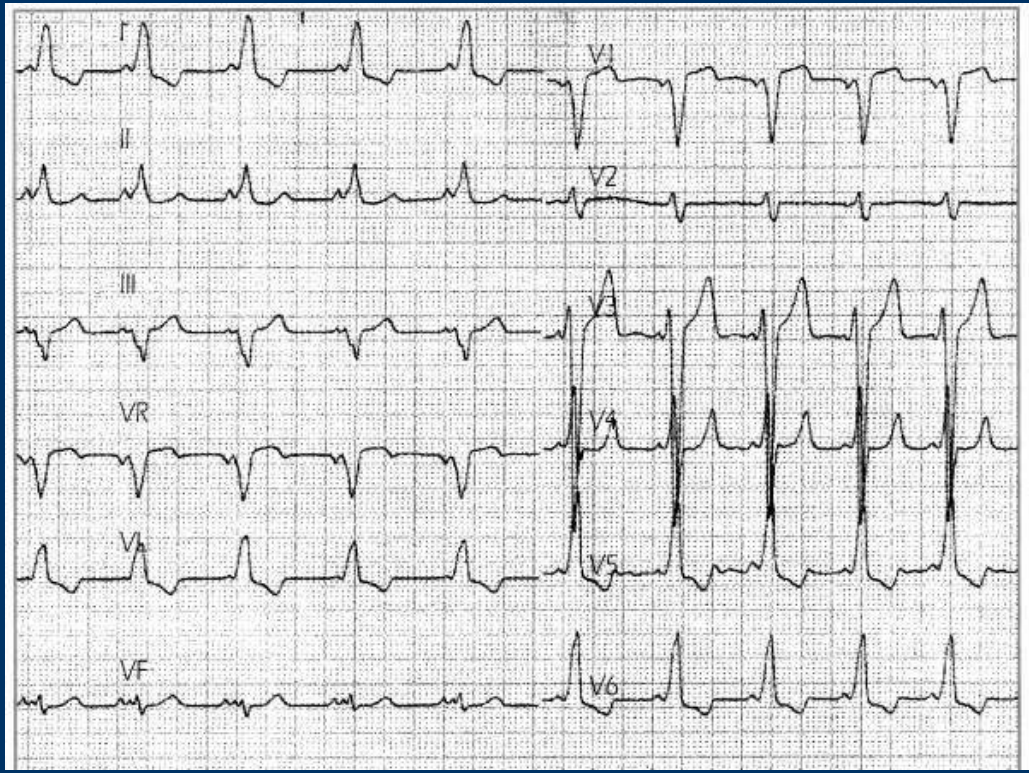


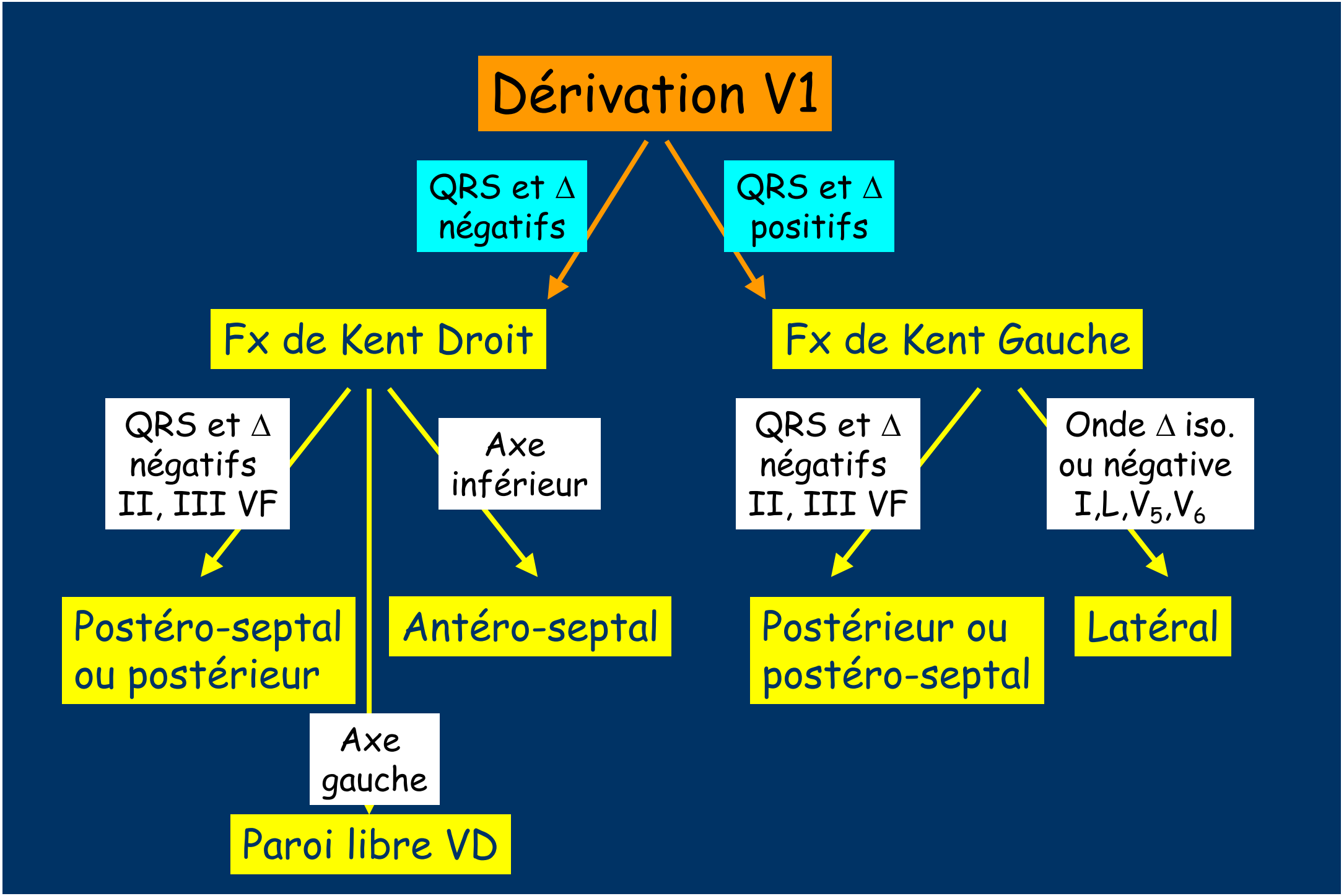
Droite

Antéro-septal

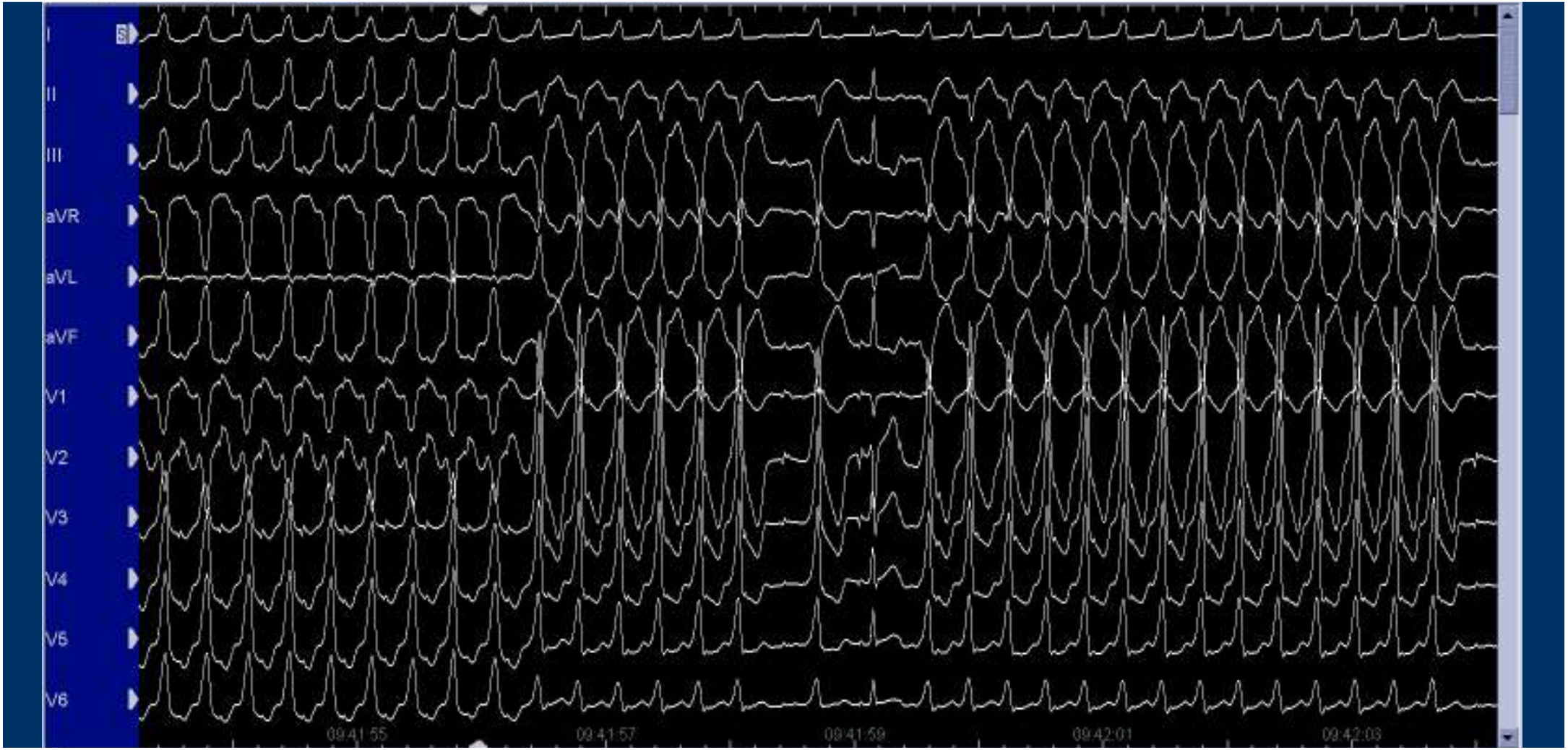


Paroi libre

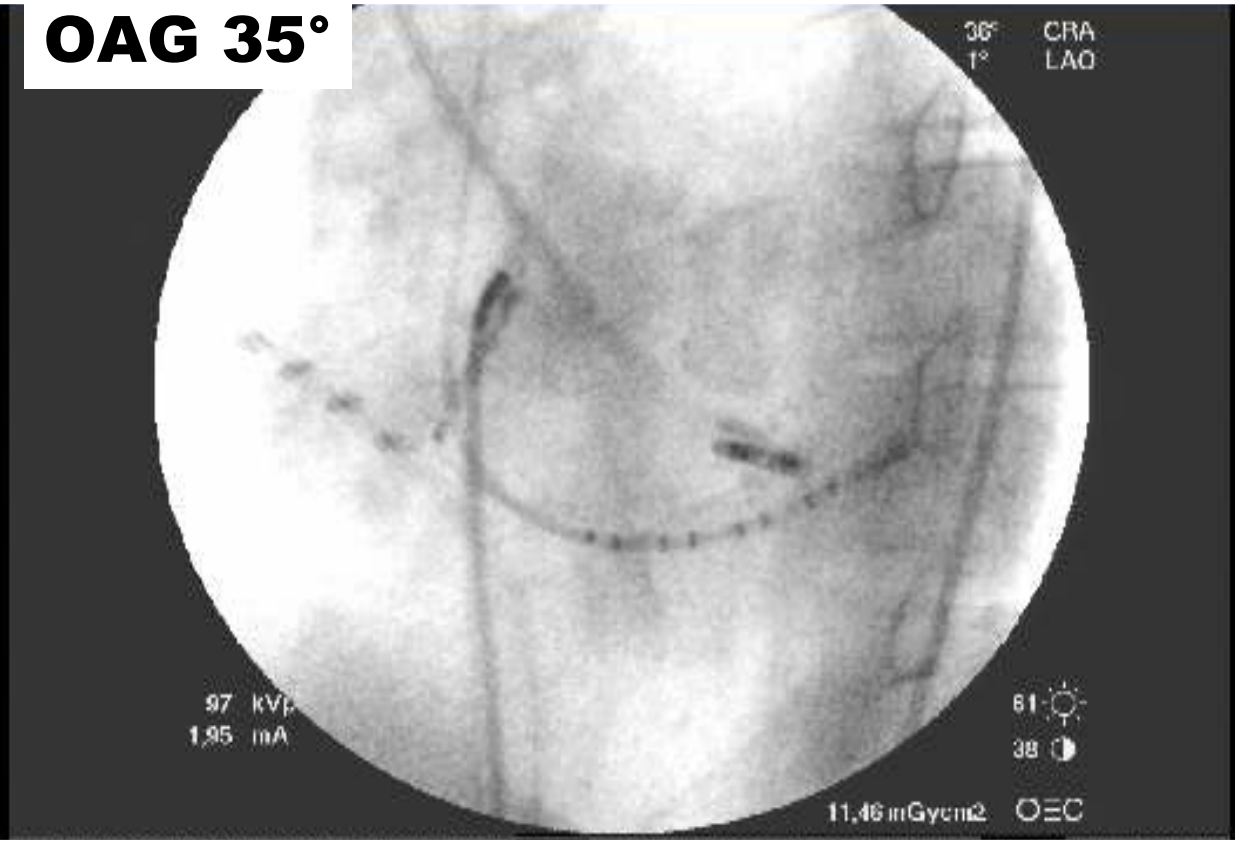


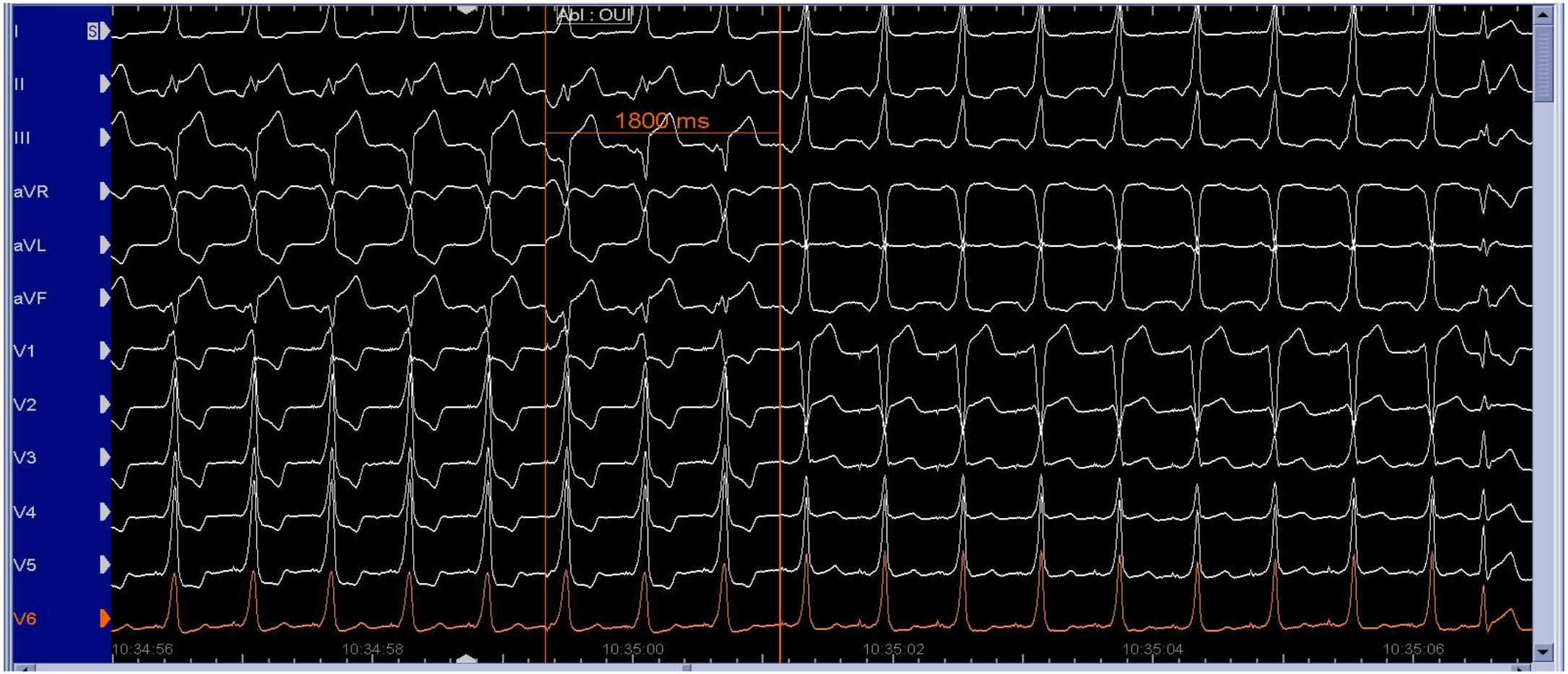

Dérivation V1
QRS et Δ négatifs
QRS et Δ positifs
Fx de Kent Droit
Fx de Kent Gauche
QRS et Δ négatifs II, III VF
Axe inférieur
QRS et Δ négatifs II, III VF
Onde Δ iso. ou négative I,L,V5,V6
Postéro-septal ou postérieur
Antéro-septal
Postérieur ou postéro-septal
Latéral
Axe gauche
Paroi libre VD

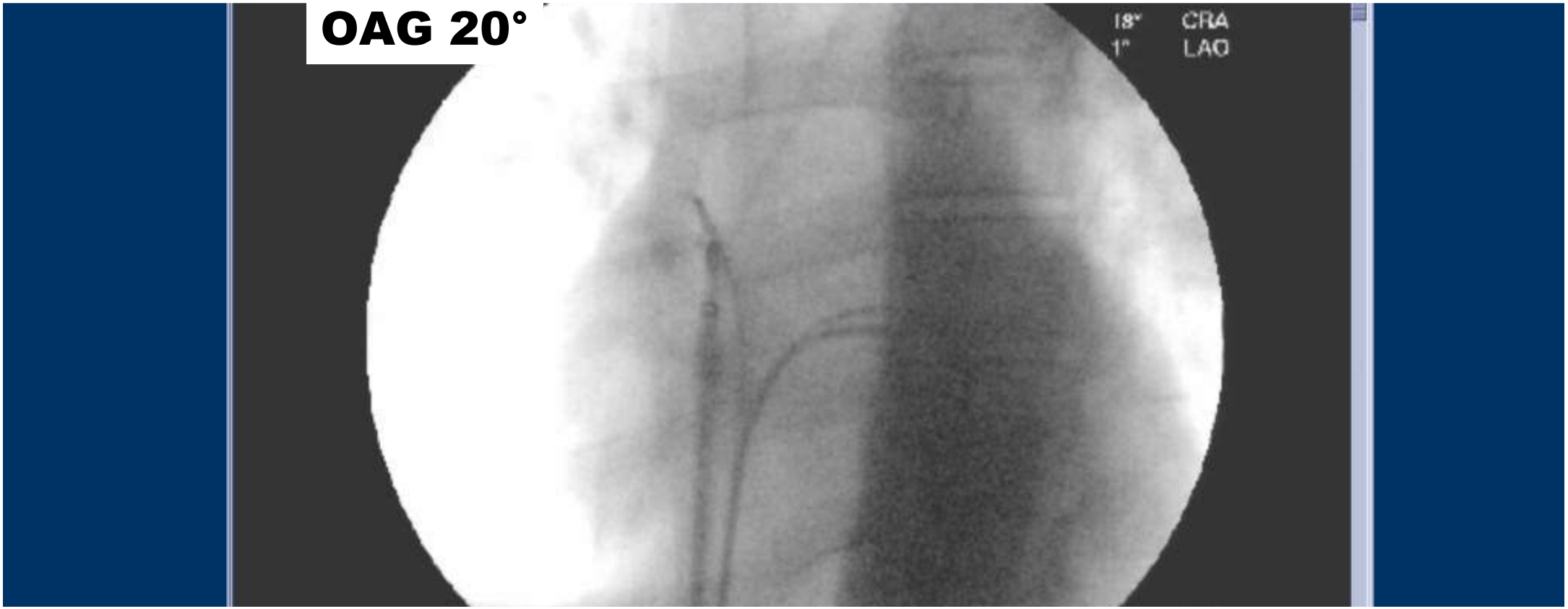

I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
08:35:36
08:35:38
08:35:40
08:35:42
08:35:44
08:35:46


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
09:41:55
09:41:57
09:41:59
09:42:01
09:42:03

OAG 35°



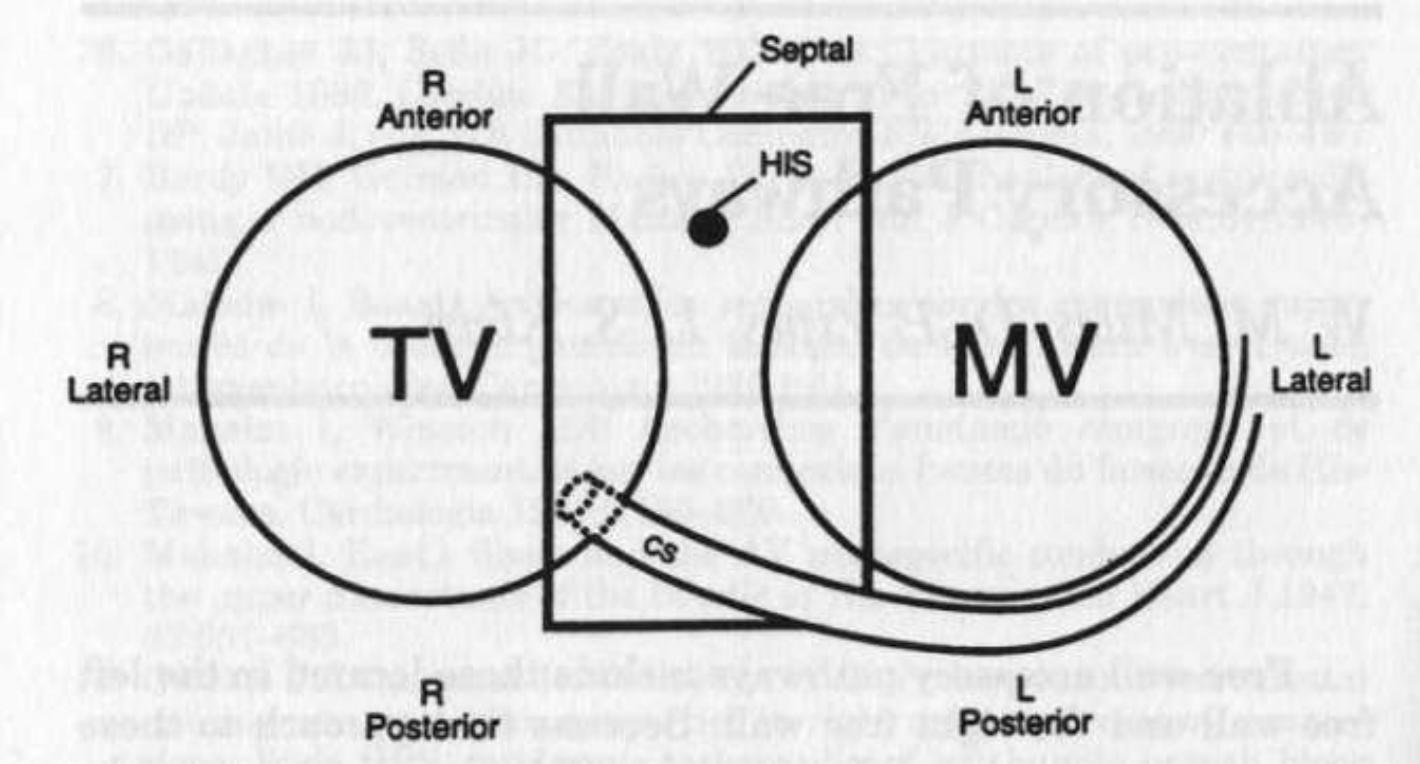

Abl : OUI
1800 ms
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
10:34:56
10:34:58
10:35:00
10:35:02
10:35:04
10:35:06

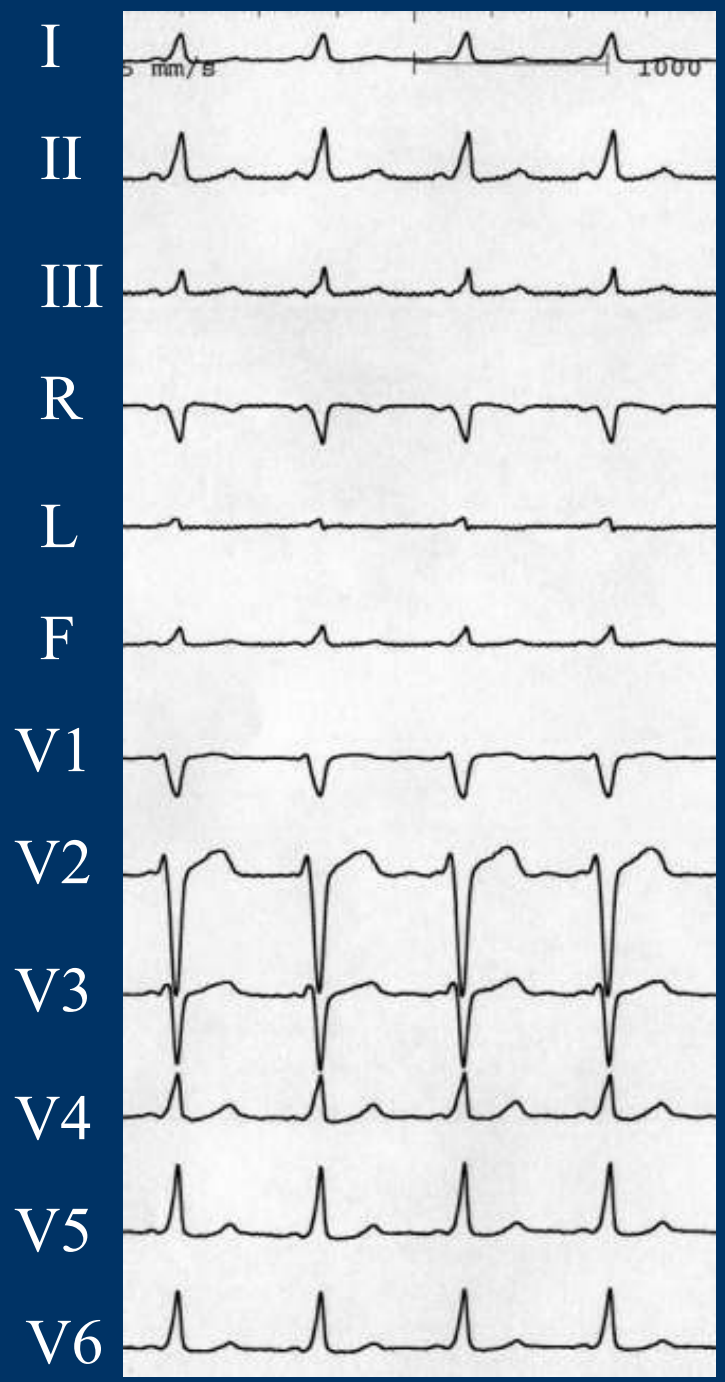

OAG 20°
18°
CRA
1°
LAO

Ablation des voies accessoires : Cartographie conduction antérograde

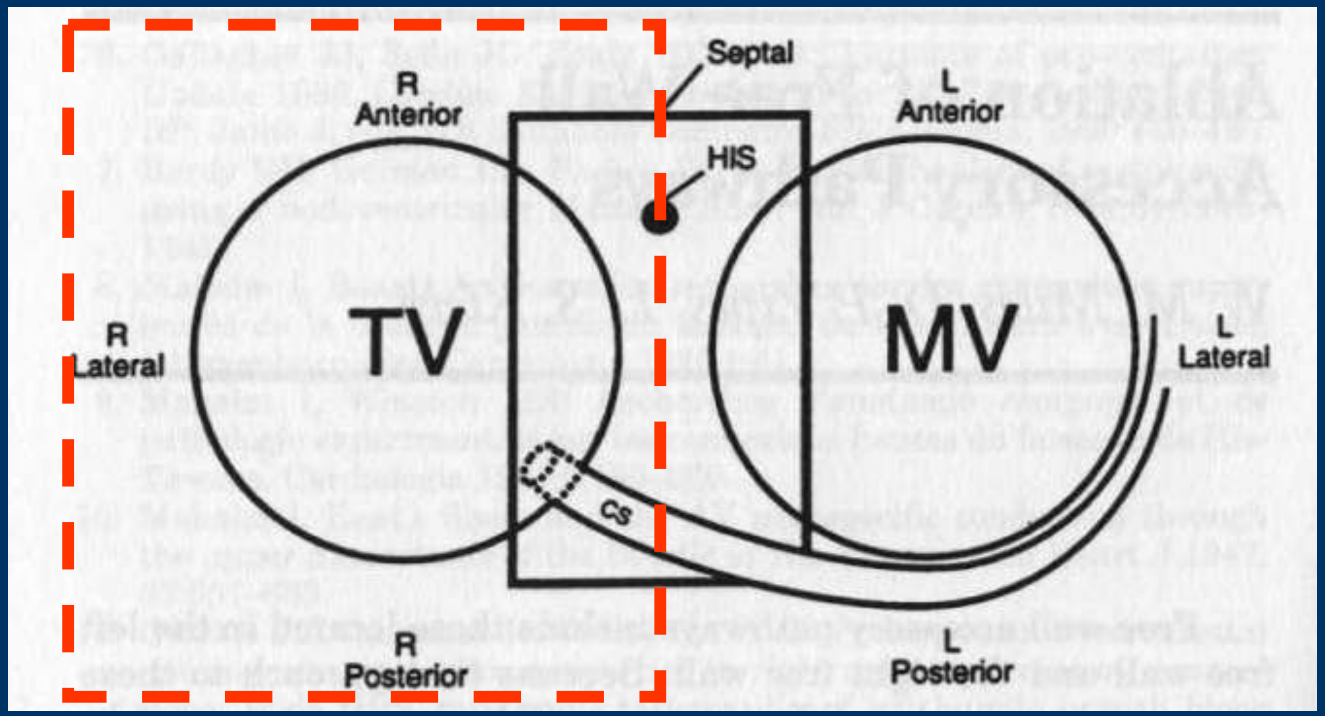
- Bon contact avec l'anneau : électrogrammes A et V bien voltés et stables
- Positionnement sur l'anneau :
  - début de l'électrogramme ventriculaire local le plus précoce possible par rapport à l'onde delta
  - Si utilisation de l'électrogramme ventriculaire unipolaire : aspect « P-QS » (absence de positivité du ventriculogramme)

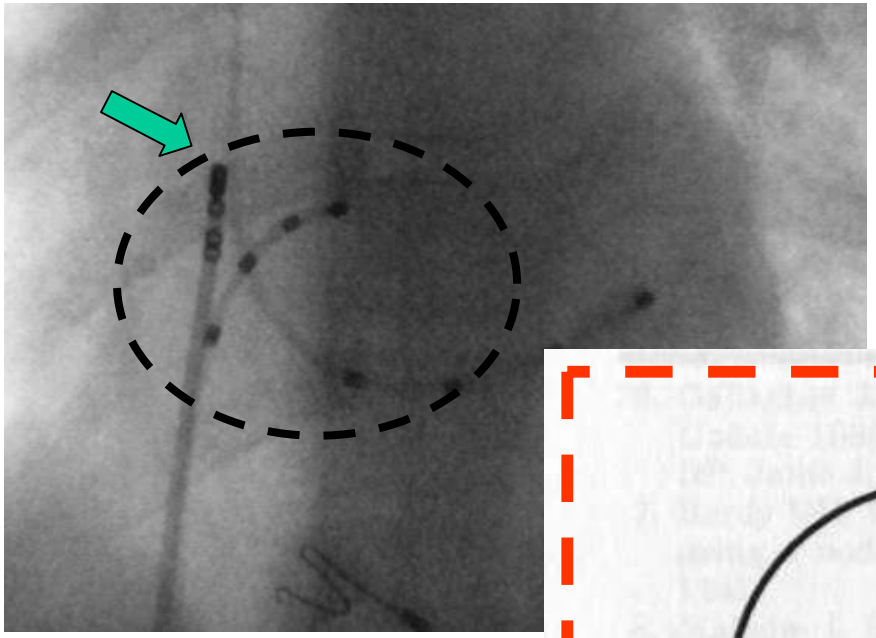
Incidence OAG

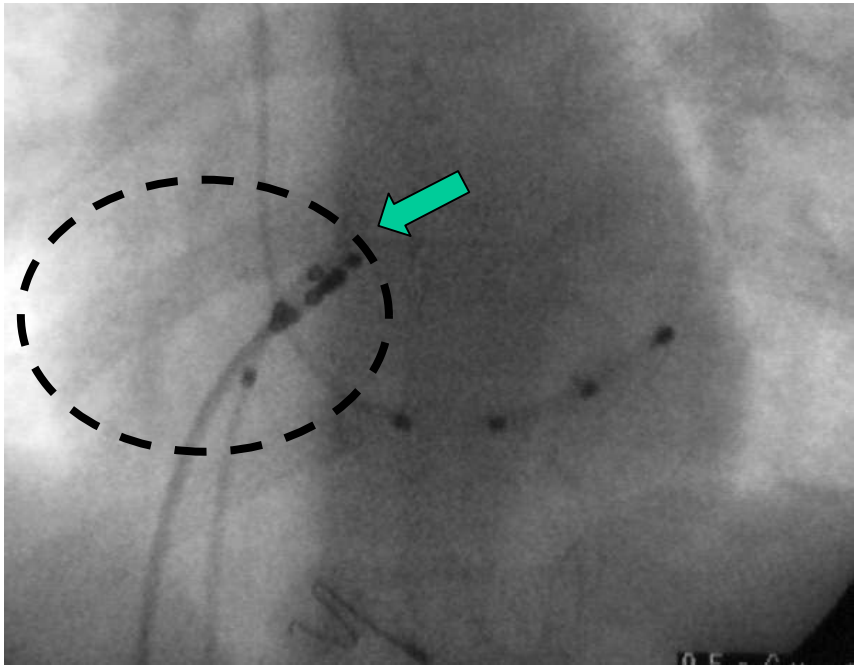


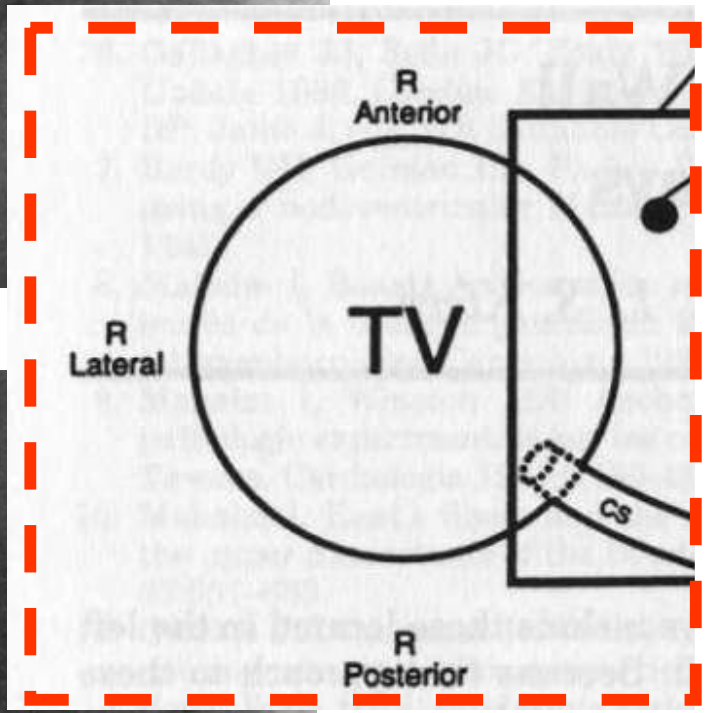


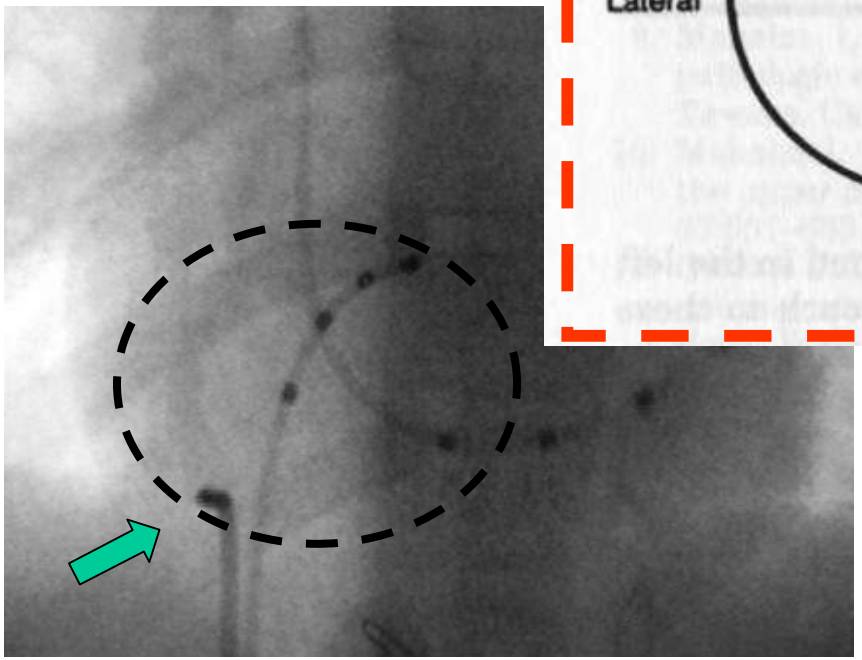
Ablation voies accessoires droites

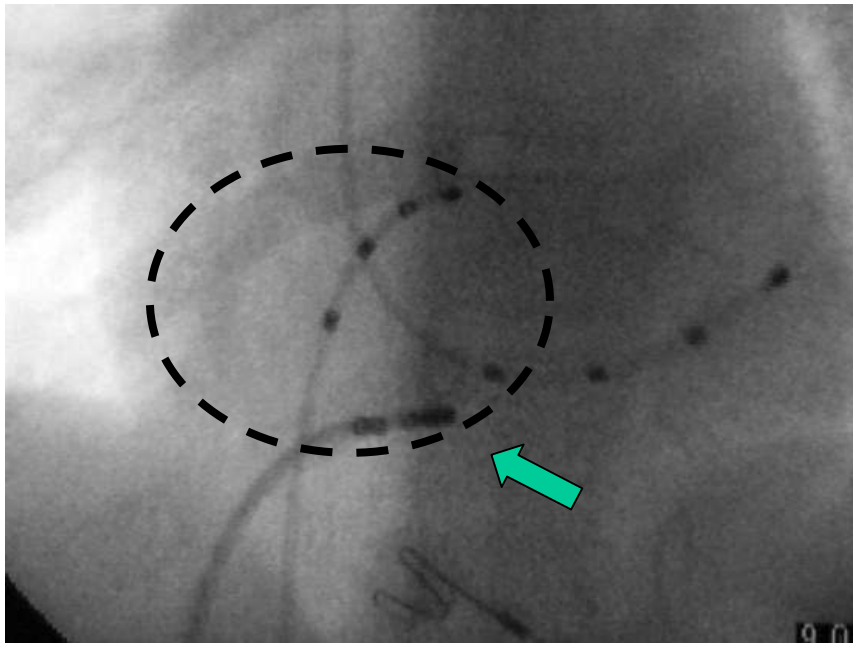


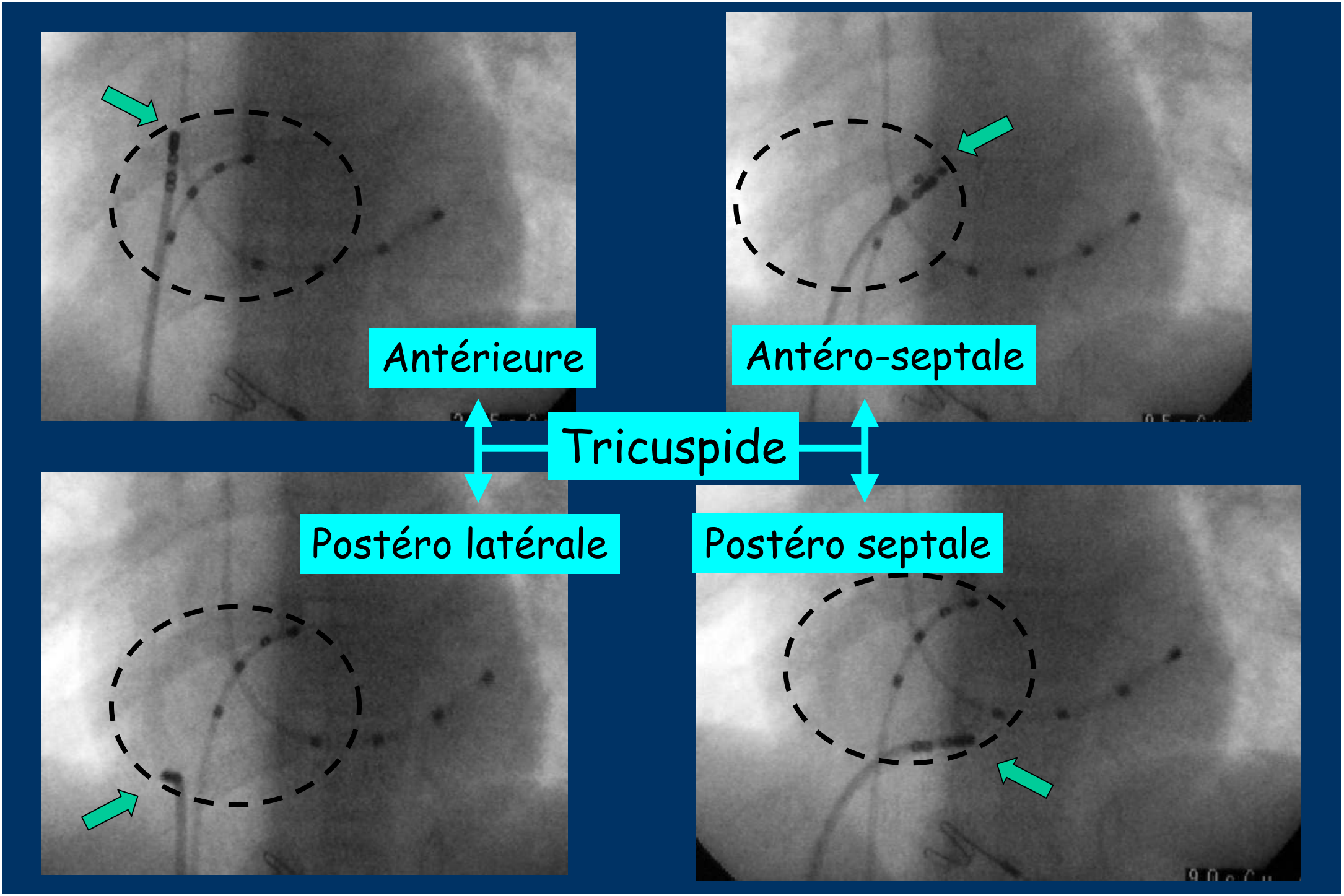


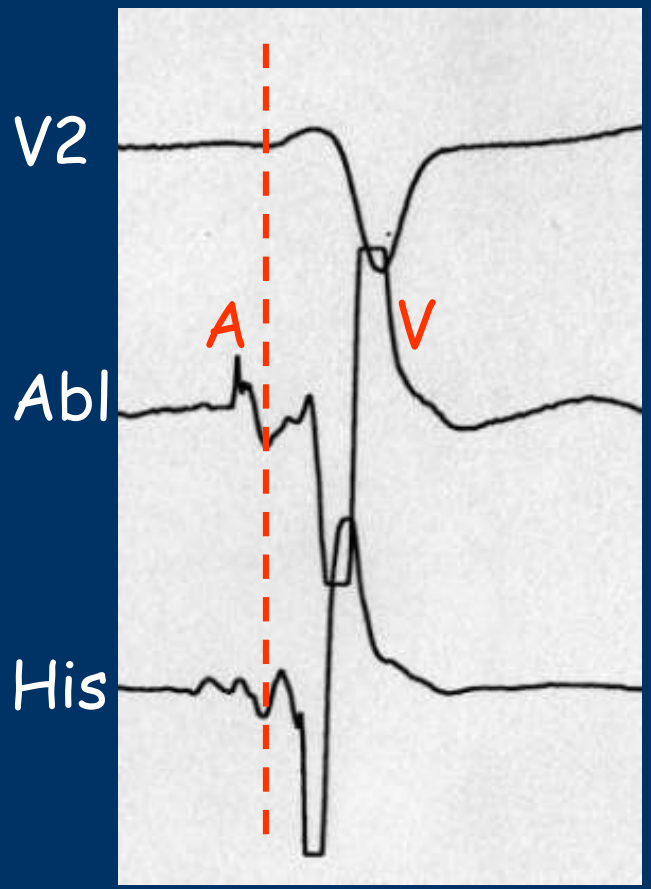


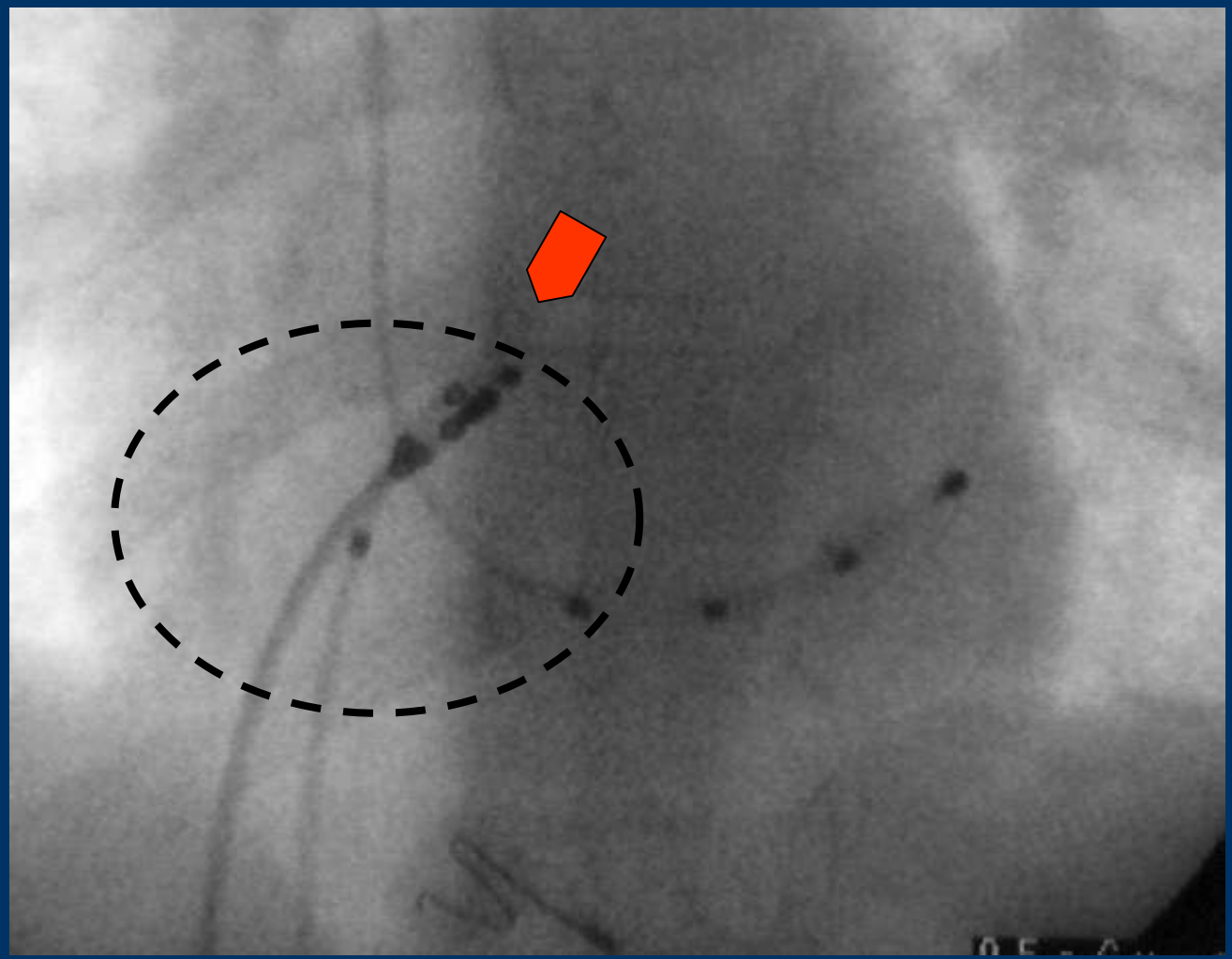

R
Anterior
R
Lateral
TV
CS
R
Posterior

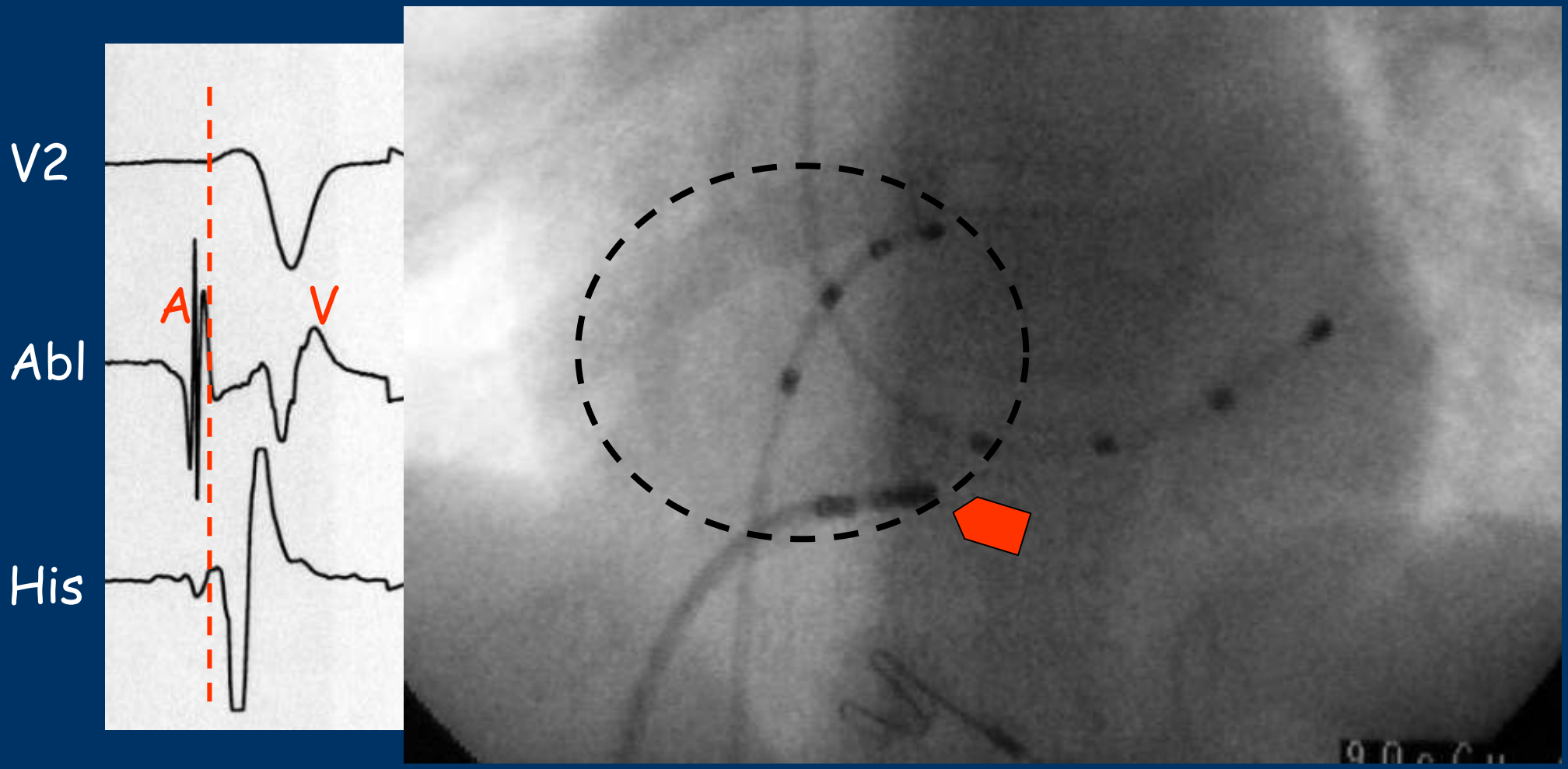


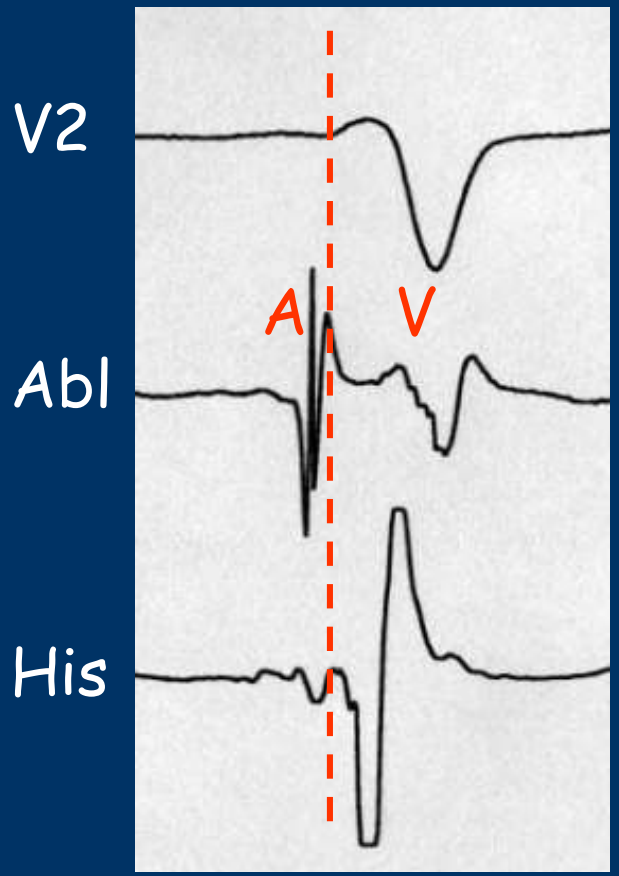


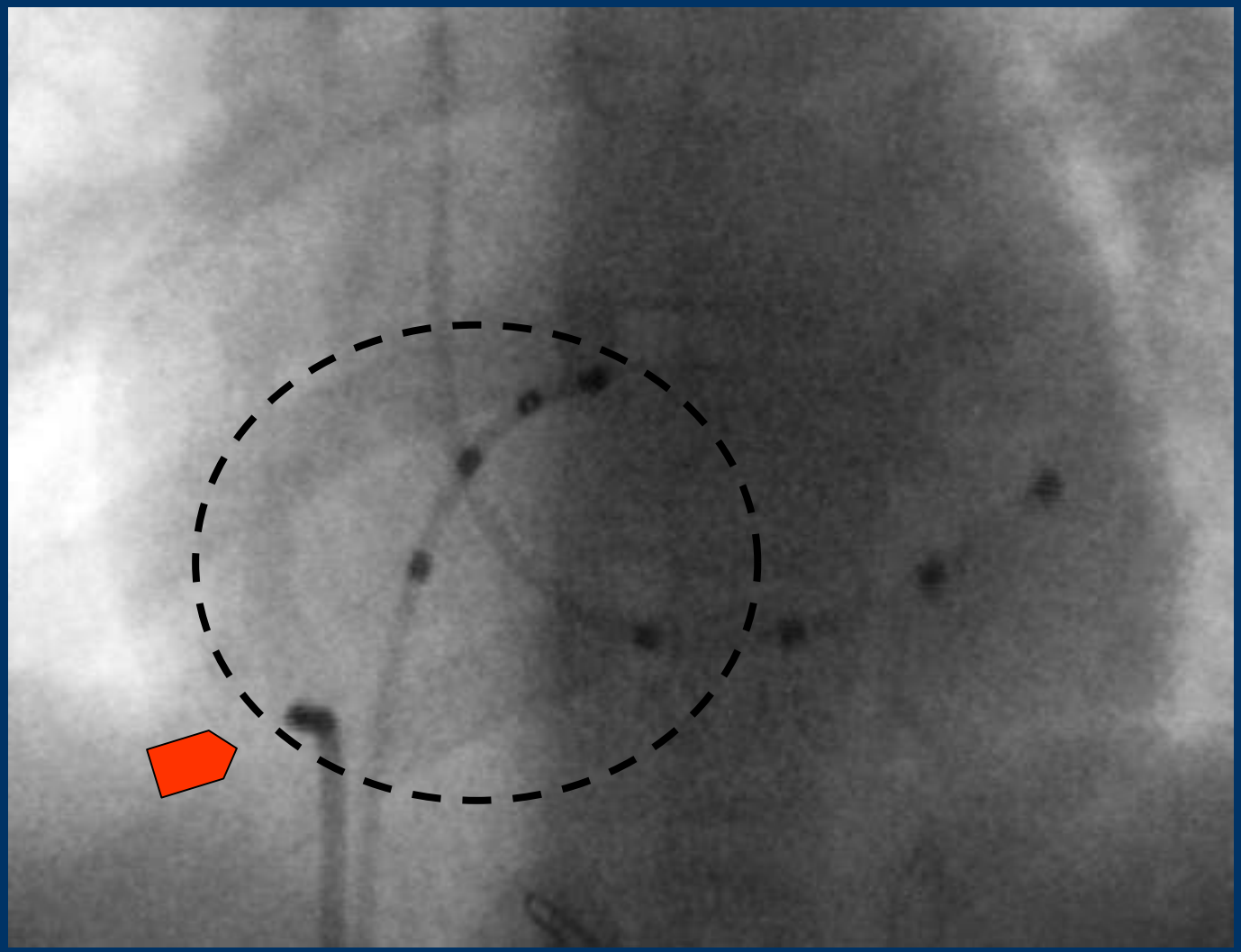

Antérieure
Antéro-septale
Tricuspide
Postéro latérale
Postéro septale

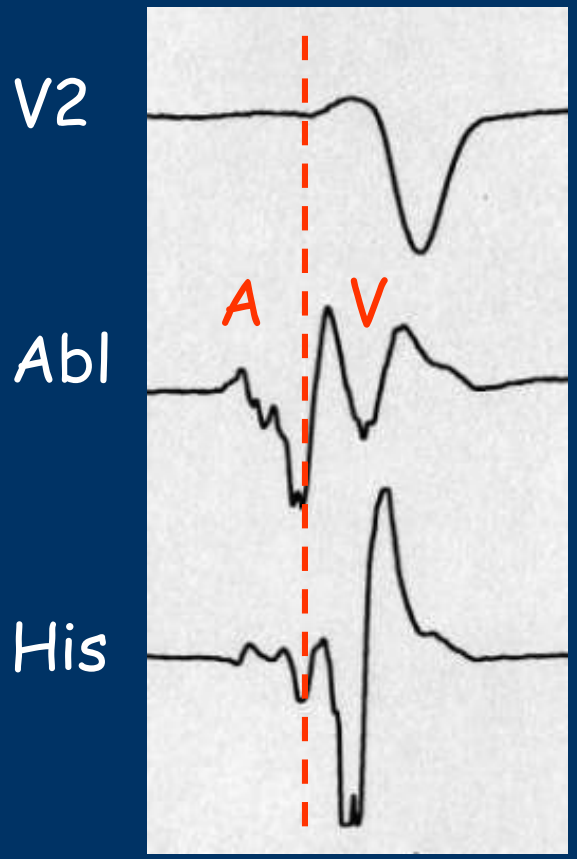

V2
A
V
Abl
His

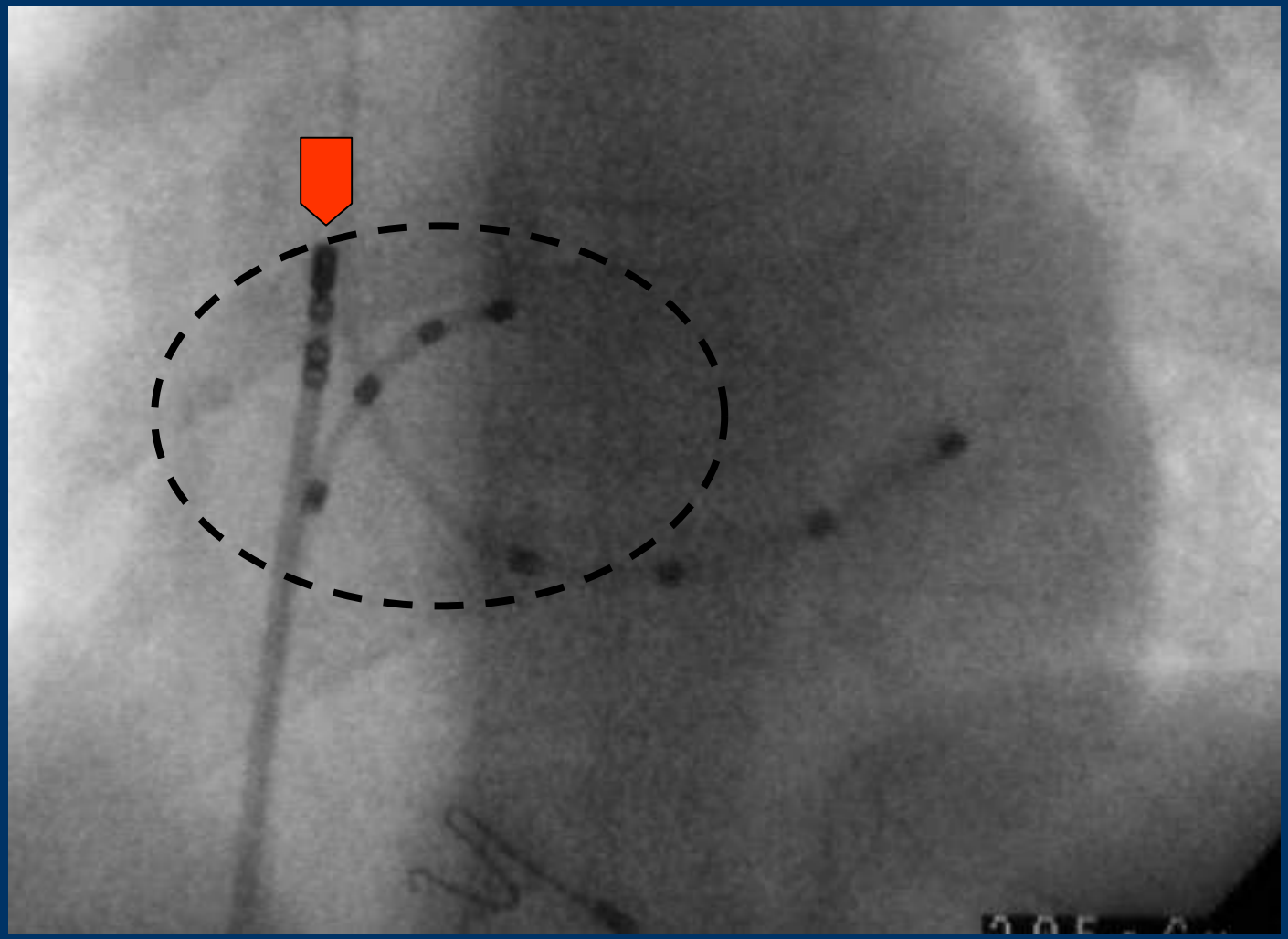


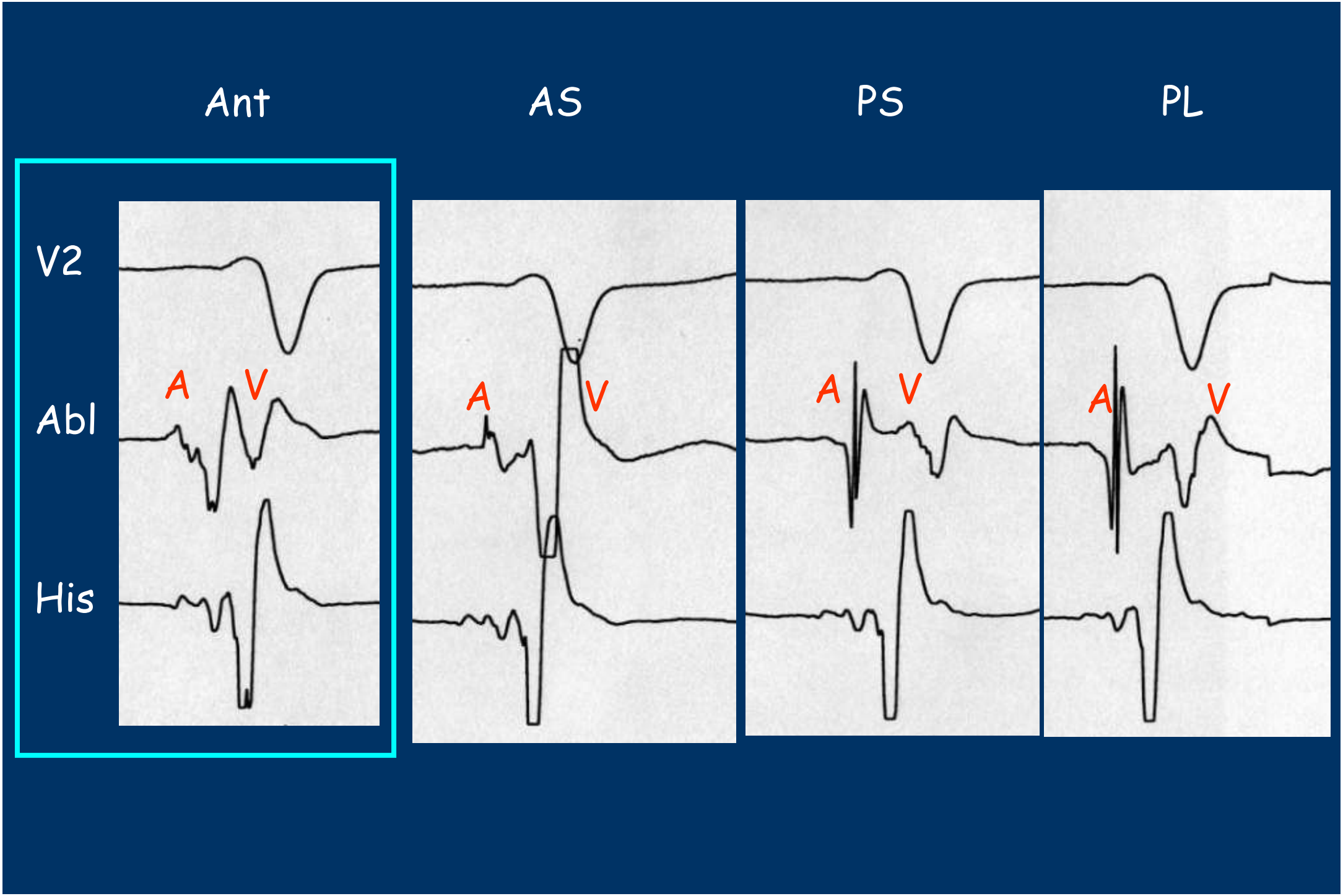

V2
Abl
His
A
V


V2
A
V
Abl
His

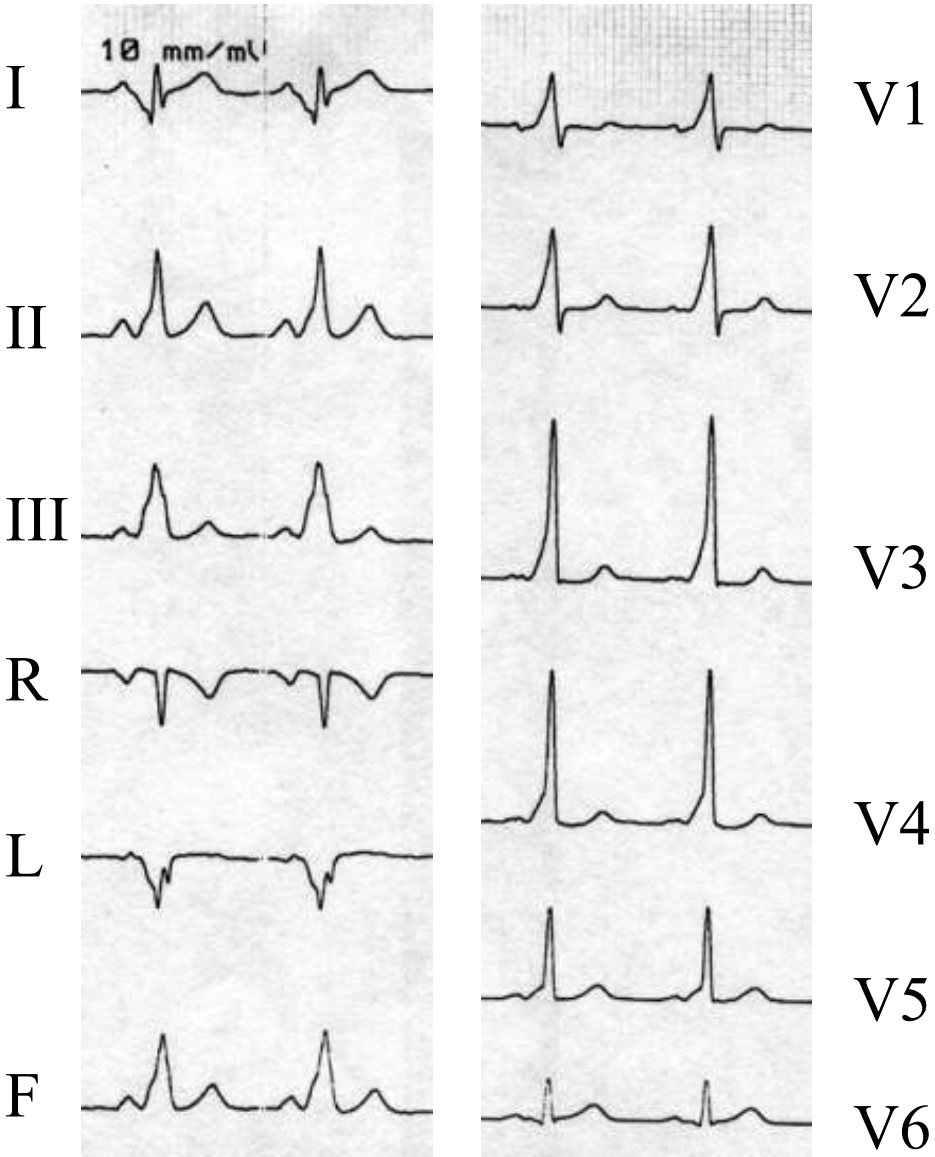


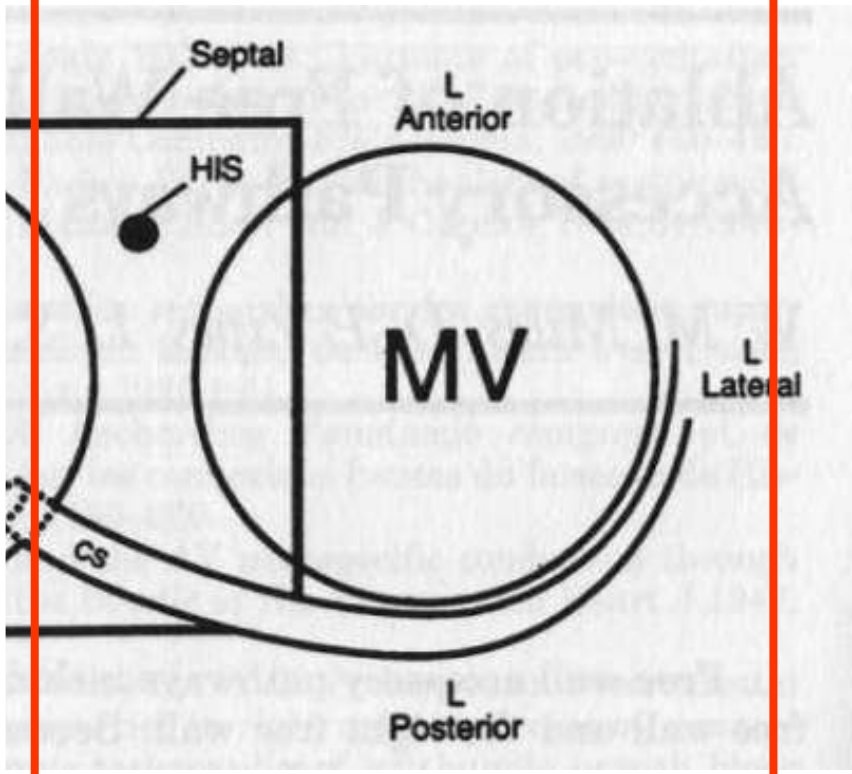

V2
A
V
Abl
His



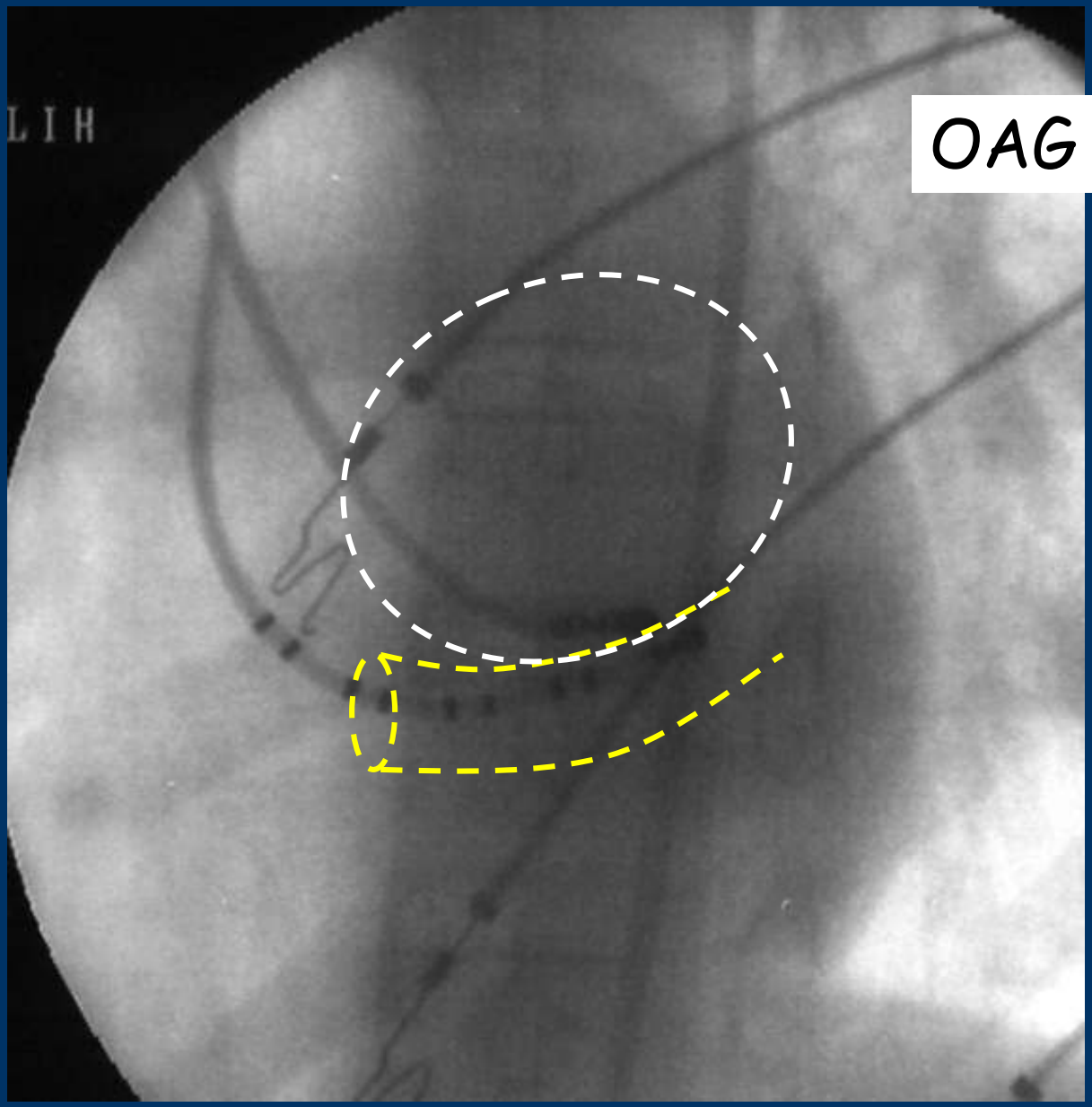

Ant
AS
PS
PL
V2
Abl
His
A
V
A
V
A
V
A
V

Ablation voies accessoires gauches





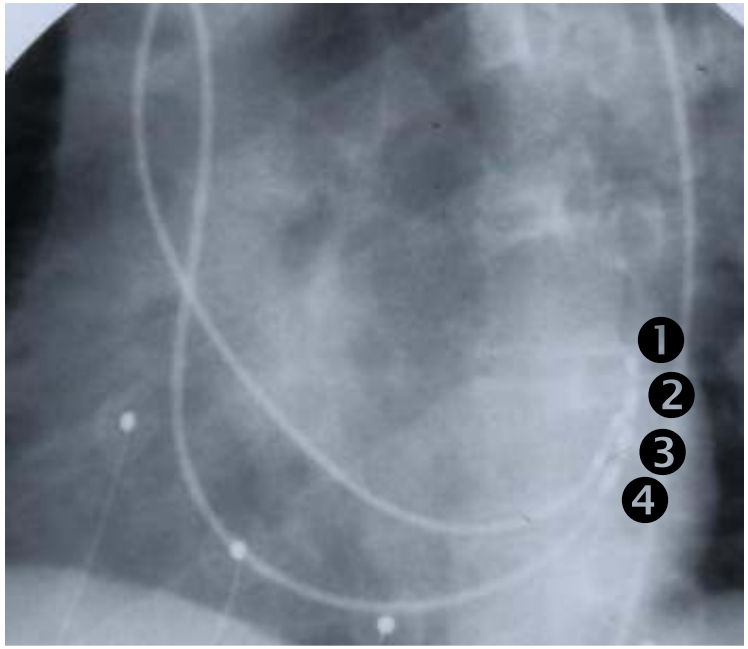
Ablation VA postérieure gauche

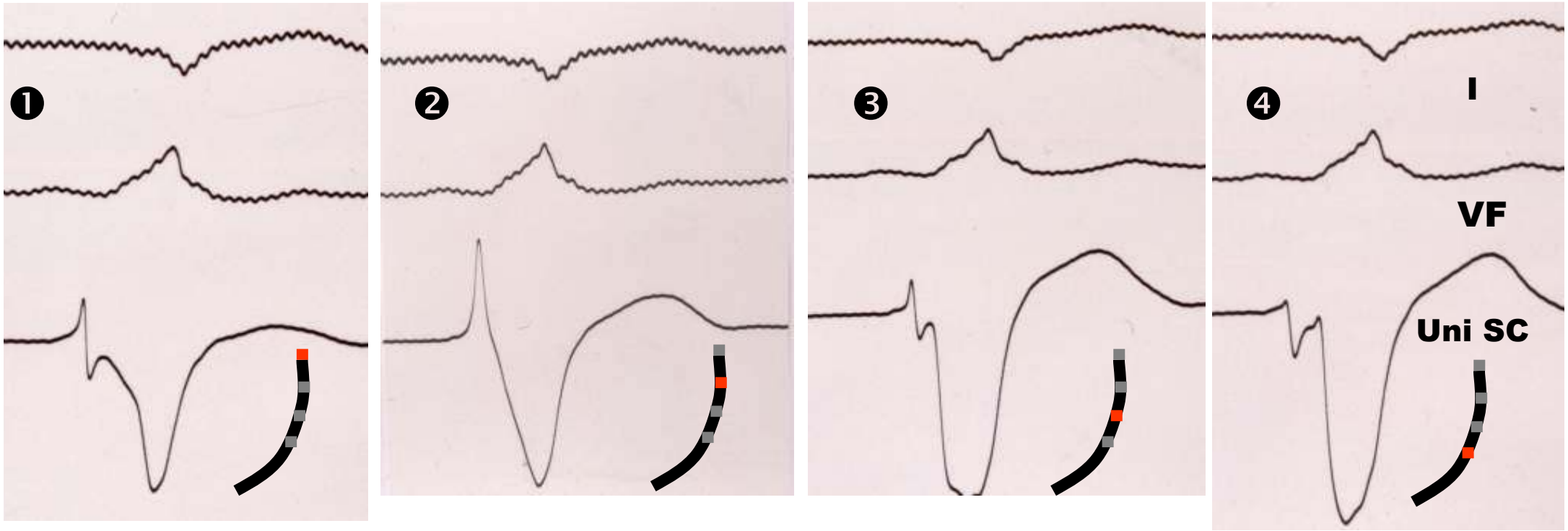


OAG 30°

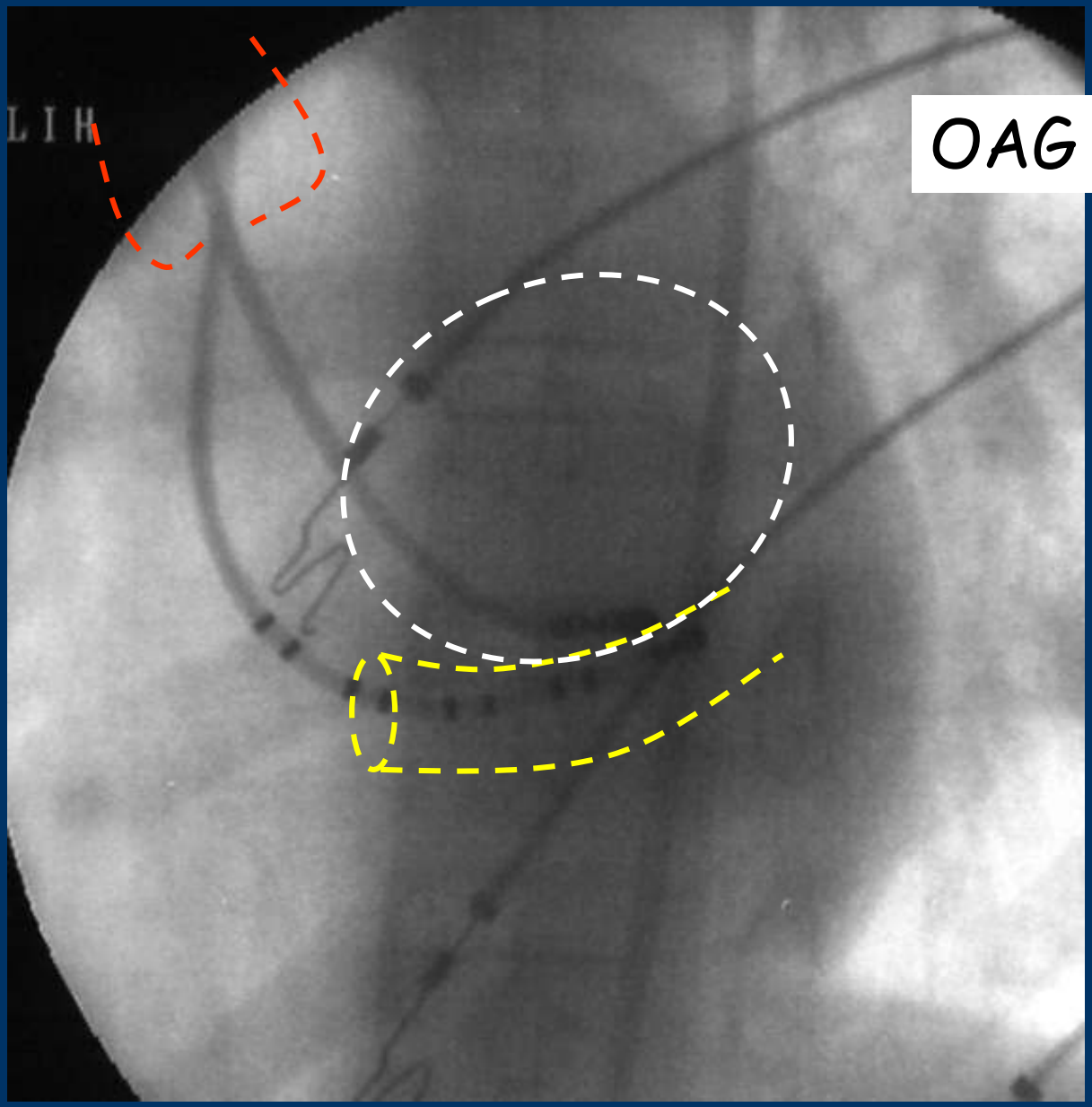
Cartographie VA Lat gauche

Utilisation de l'unipolaire



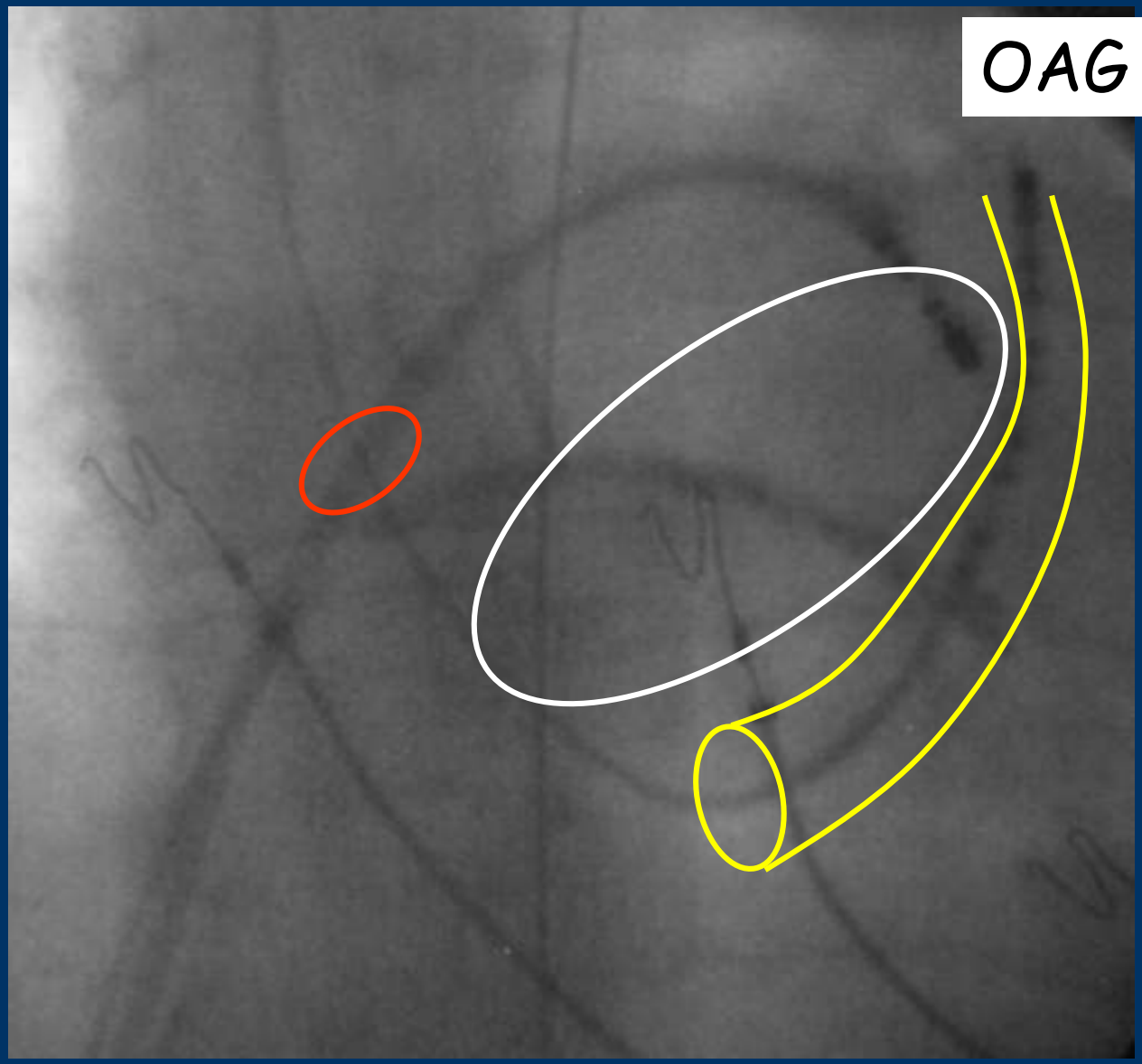


Ablation VA postérieure gauche

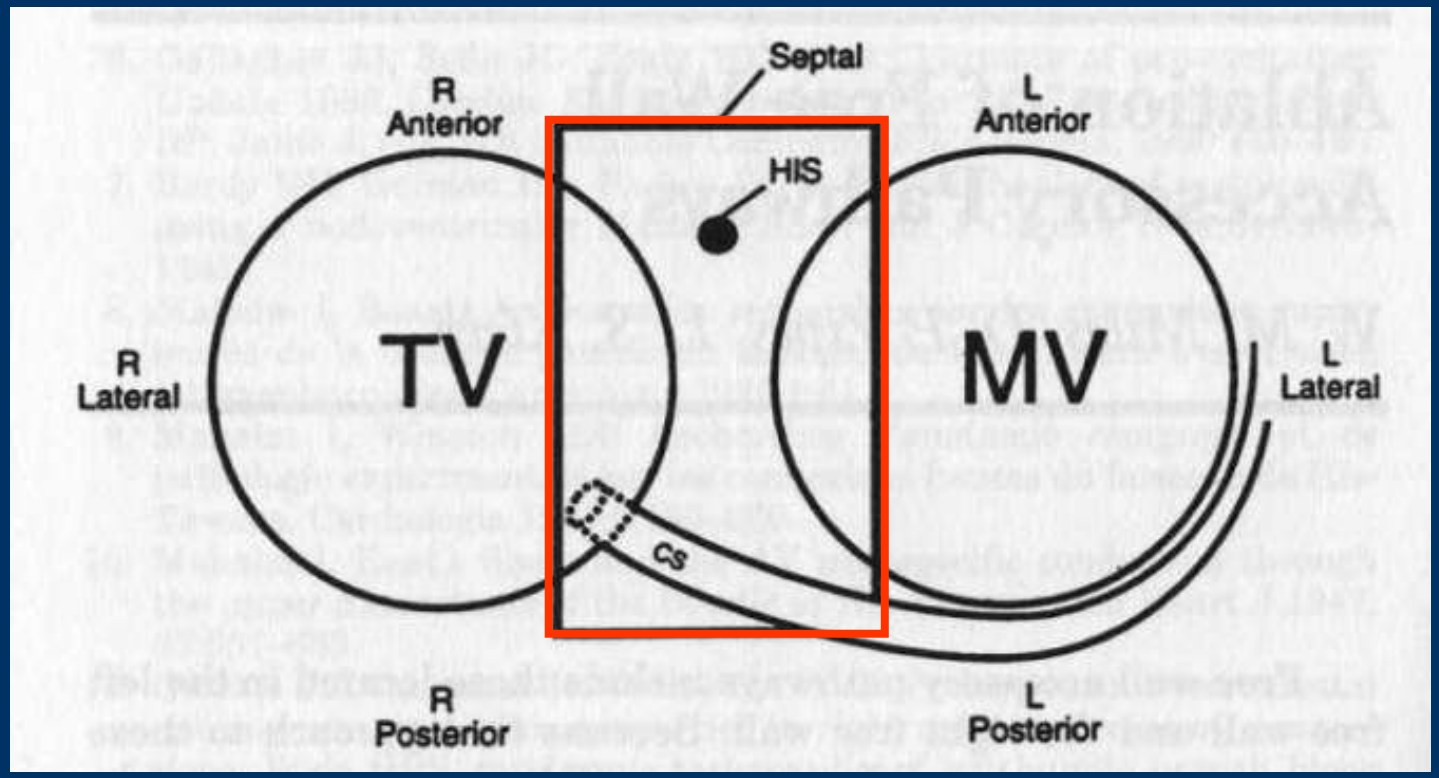


OAG 30°

Ablation VA latérale gauche

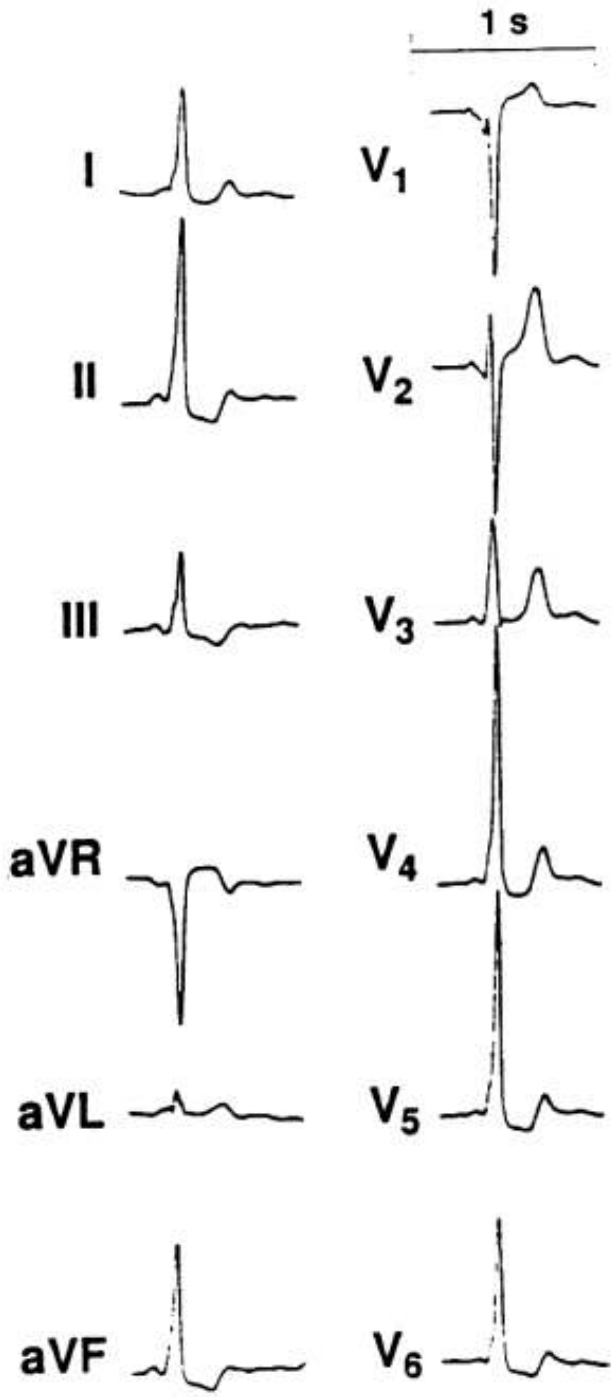


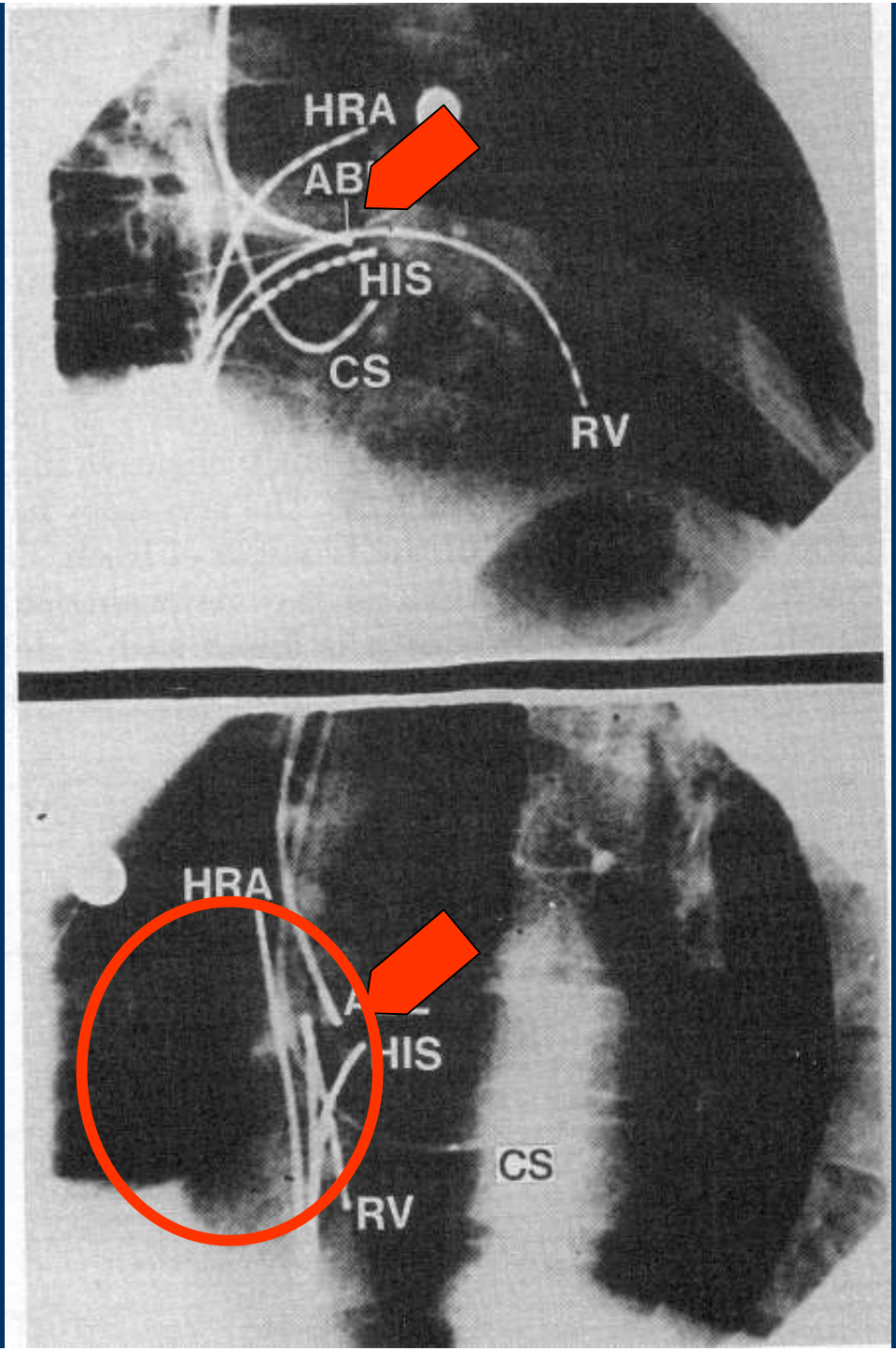
Ablation voies accessoires septales



Voies accessoires antero-septales

- Enregistrement simultané His et Potentiel VA
- ECG : Delta + D1D2D3 VL VF
- Abord par voie haute



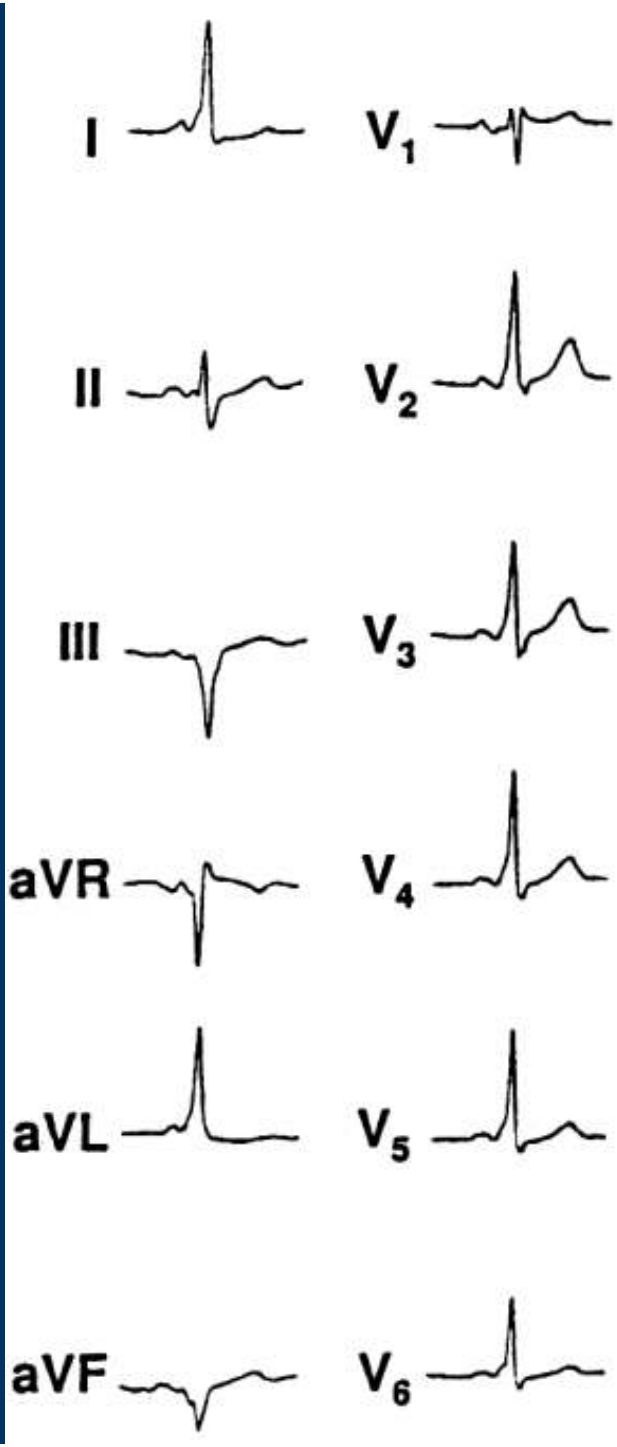


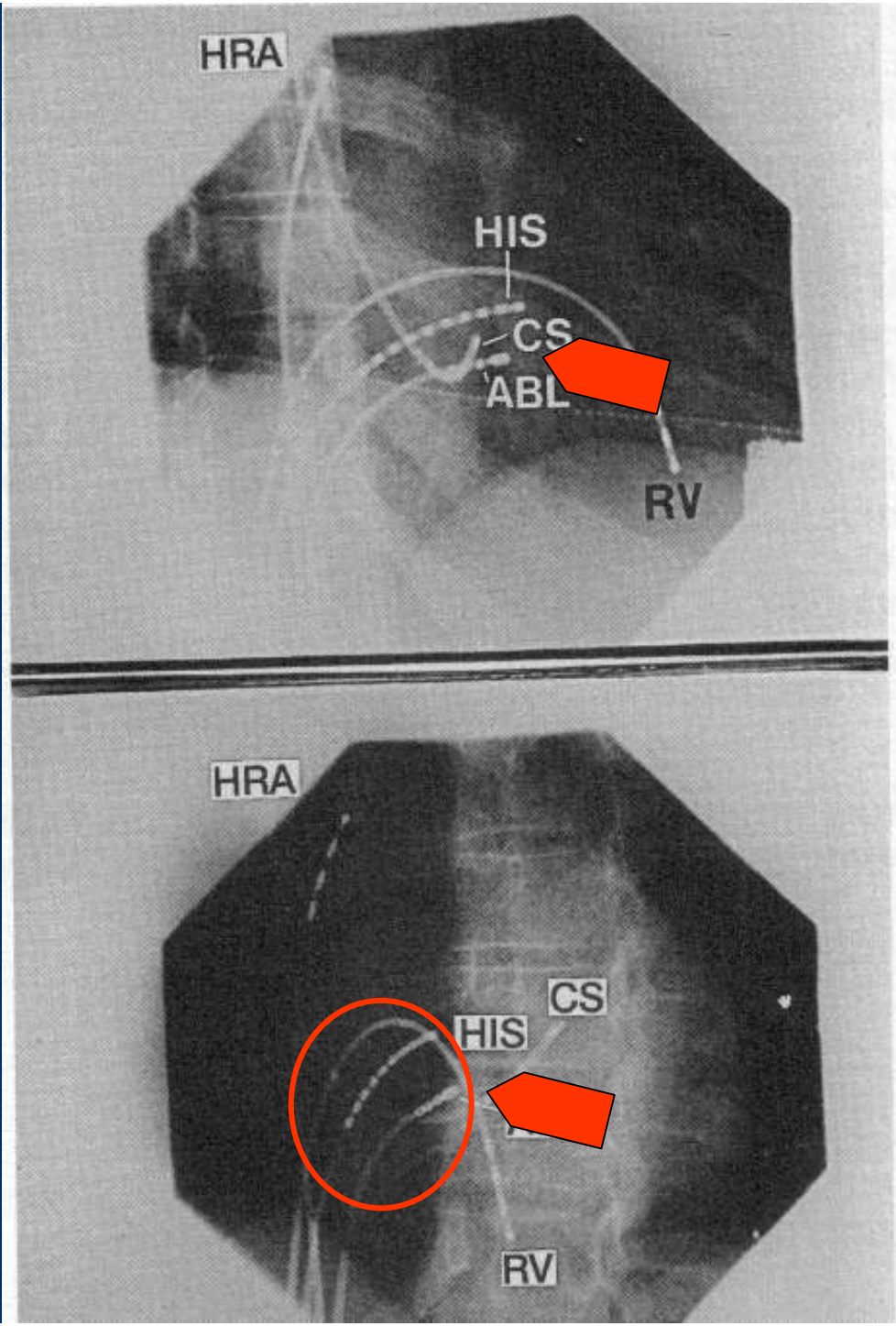
OAD

OAG

Voies accessoires septales moyennes (« mid-septal »)

- Entre le cathéter hisien et l'ostium du SC
- ECG : Delta + D1D2 VL et V2 à V6
  Delta – D3 VF
  Delta iso en V1
- Cathéter le plus ventriculaire possible


I
V1
II
V2
III
V3
aVR
V4
aVL
V5
aVF
V6


HRA
HIS
CS
ABL
RV
HRA
CS
HIS
RV

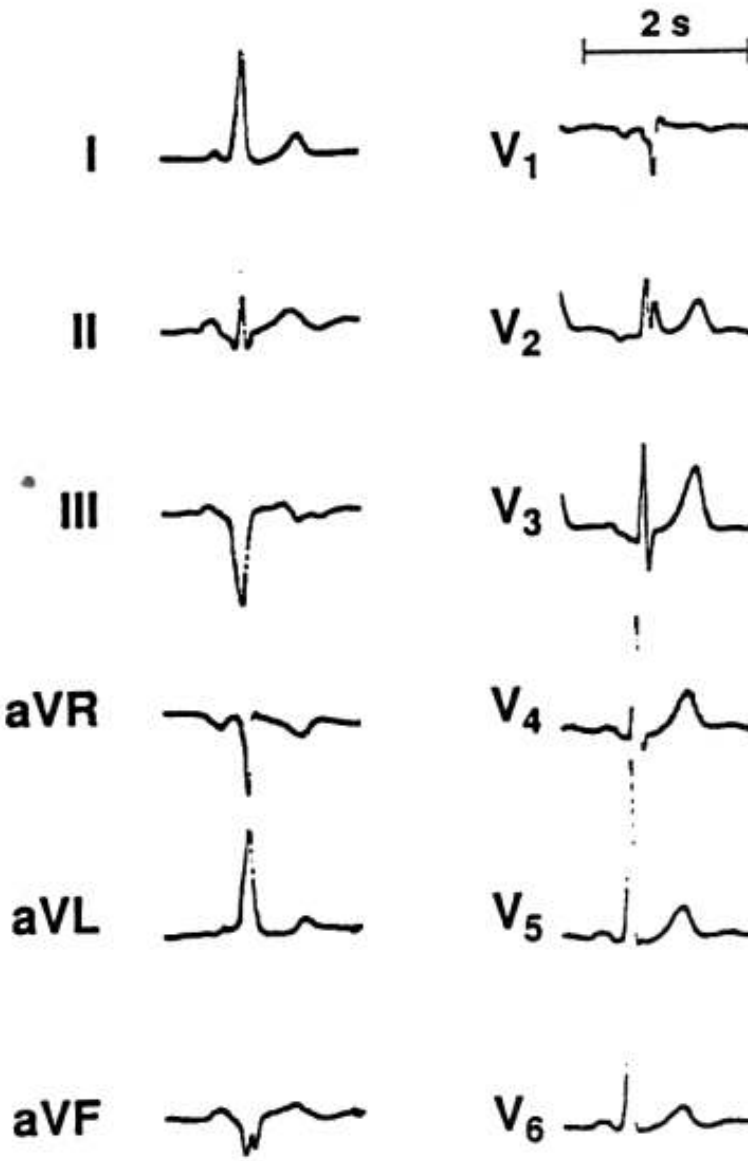
OAD

OAG

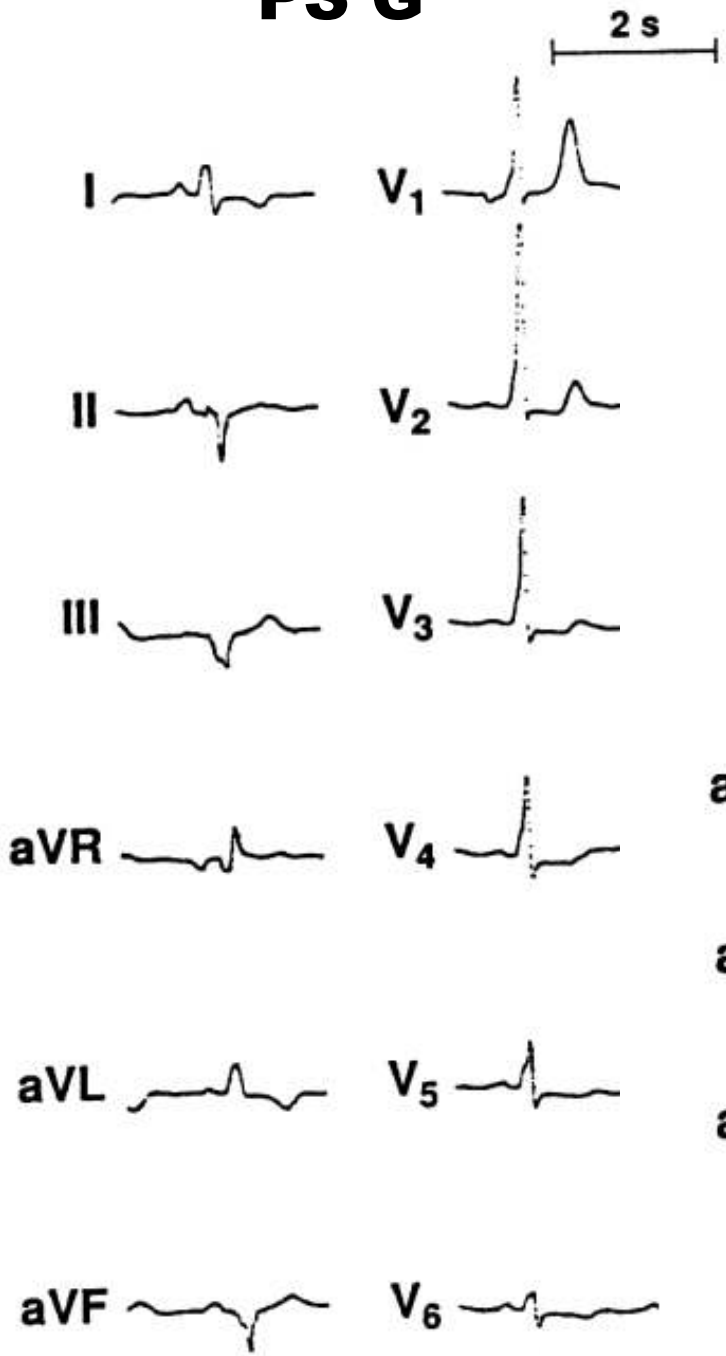
Voies accessoires postéro-septales

- Près de l'ostium du SC sur la tricuspide (dt) ou dans les 1er cm du SC (G)
- ECG : Delta – D2D3 VF et V1 (Dt)
  Delta – D2D3 VF et + V1 (G)
  Delta – profonde en D2D3 VF et + V1 (dans la veine cardiaque moy.)
- Penser aux abords dans le SC

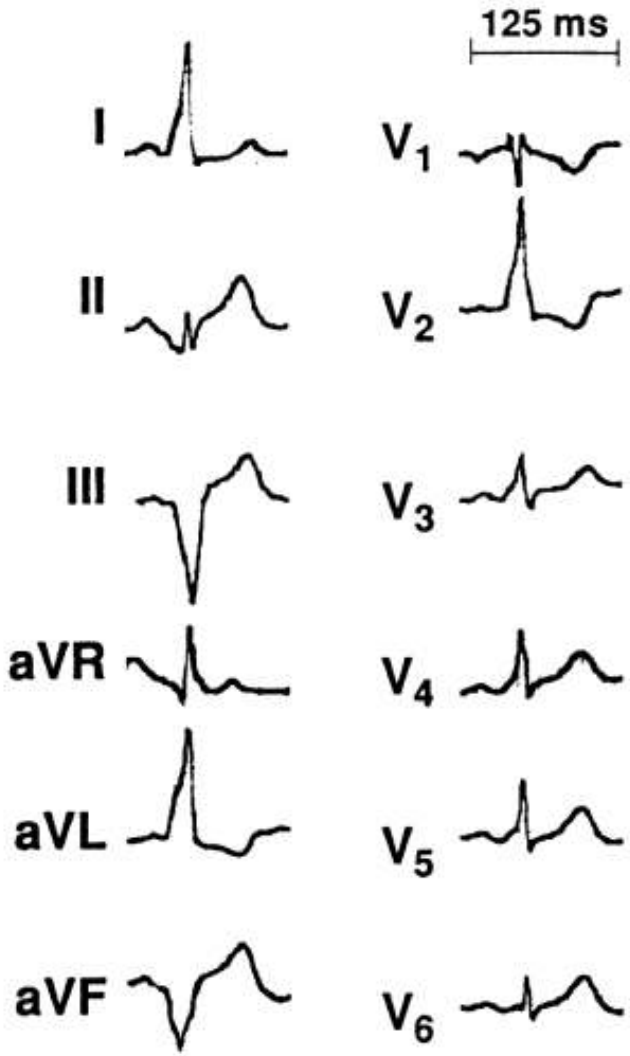
PS Dt



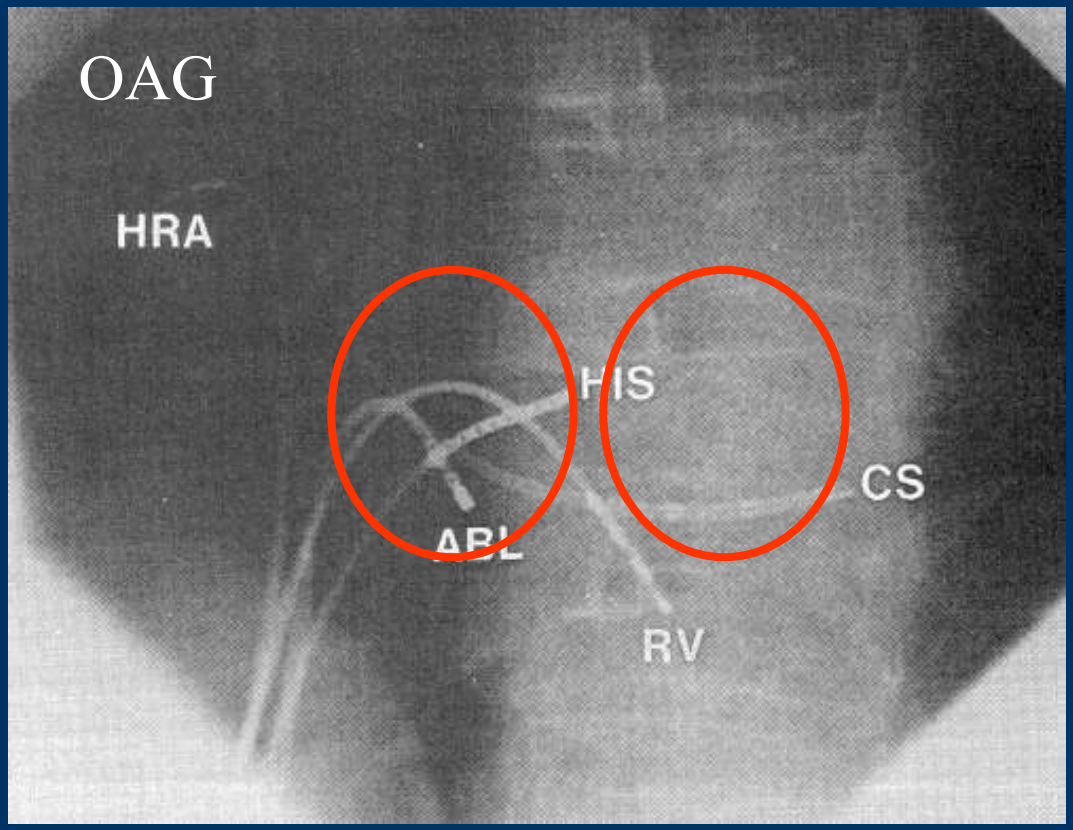
PS G



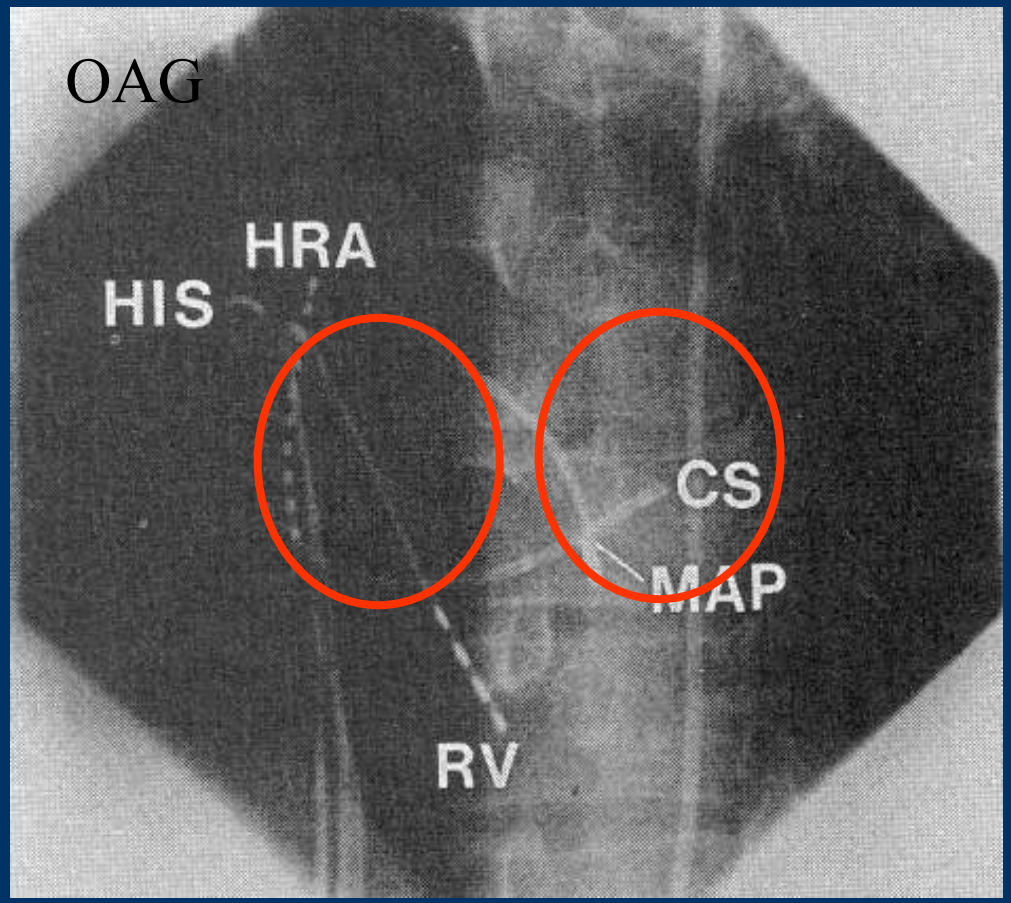
PS « SC »



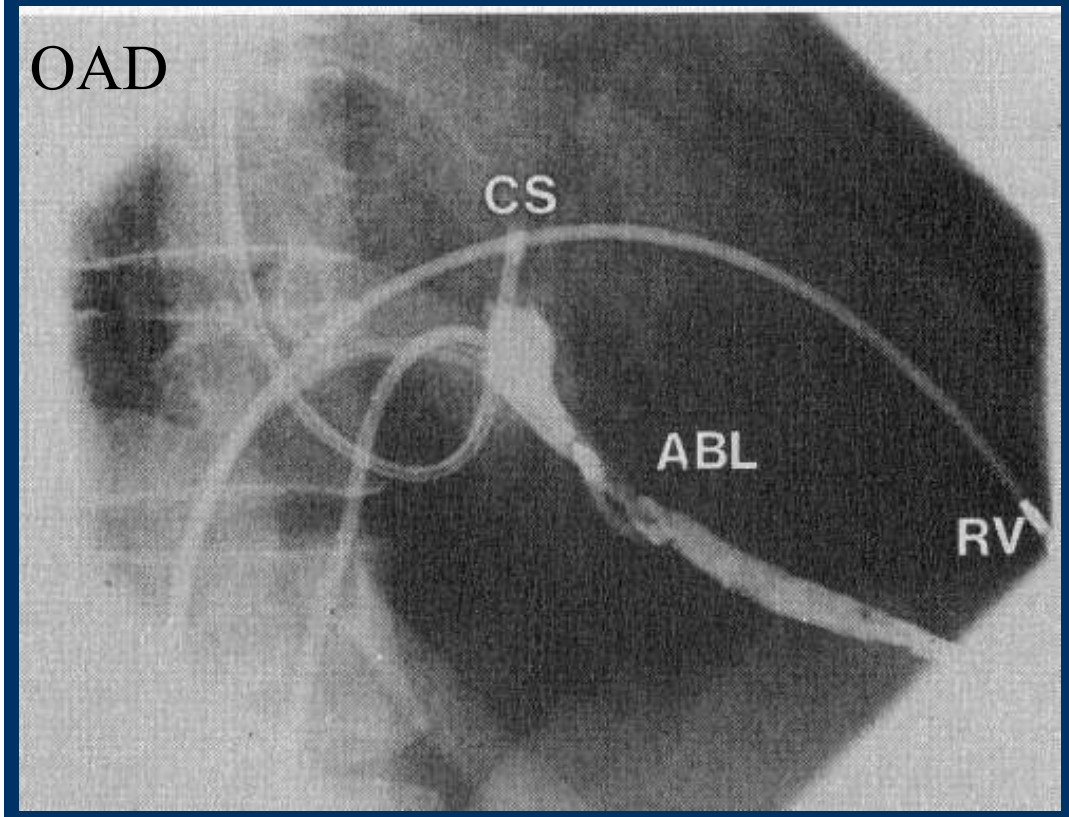
PS Dt



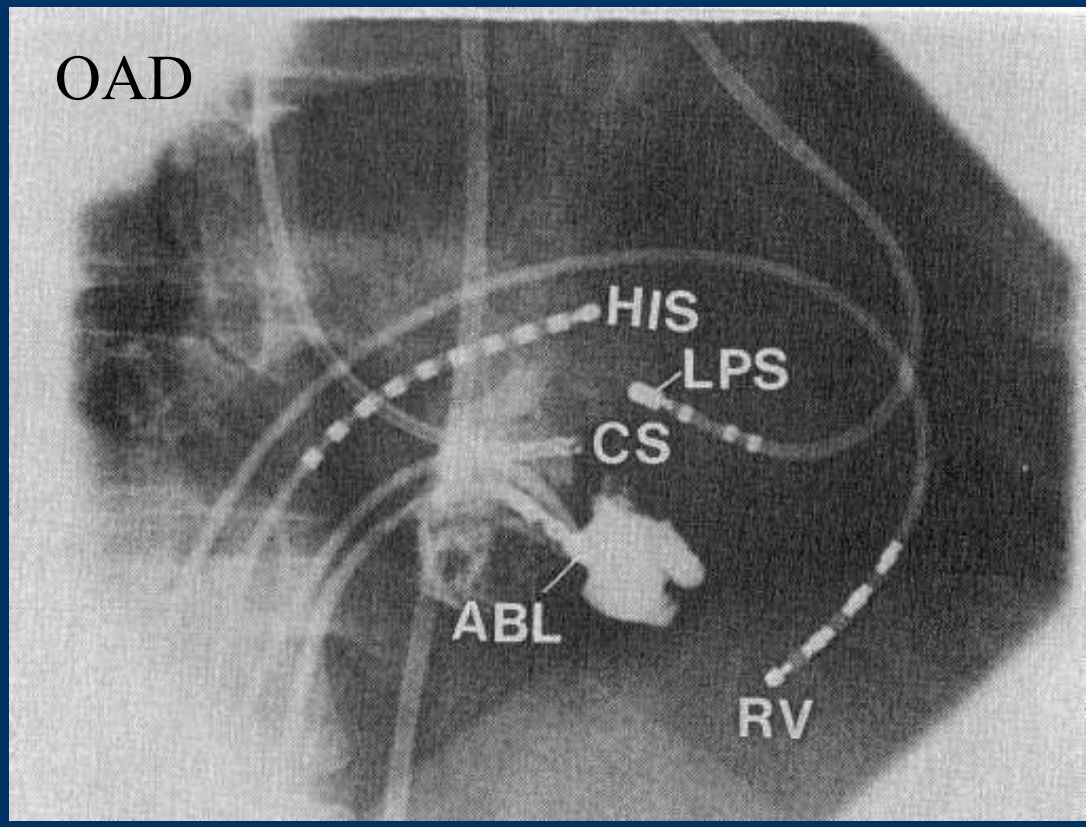
PS G



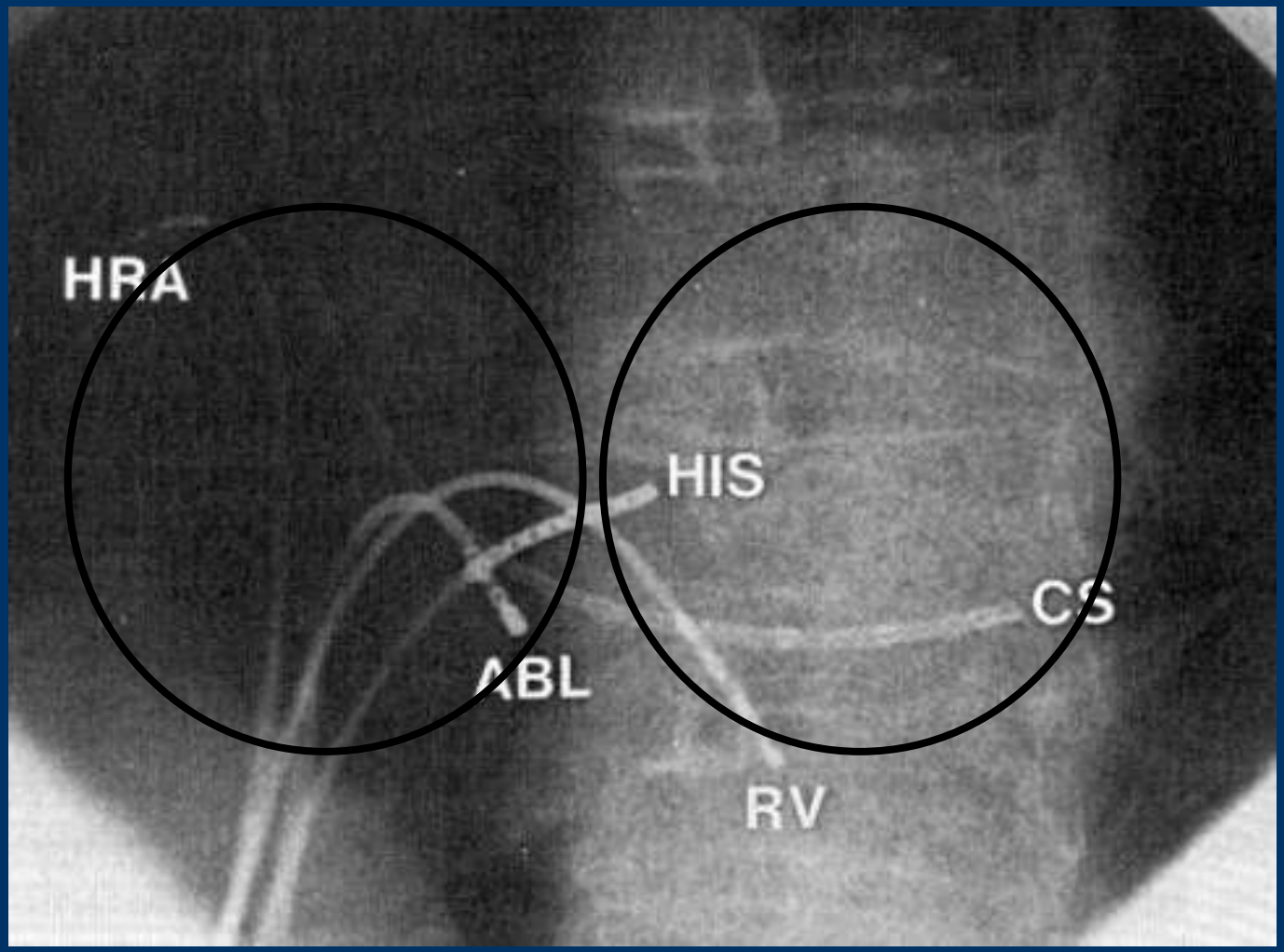
V C Moy



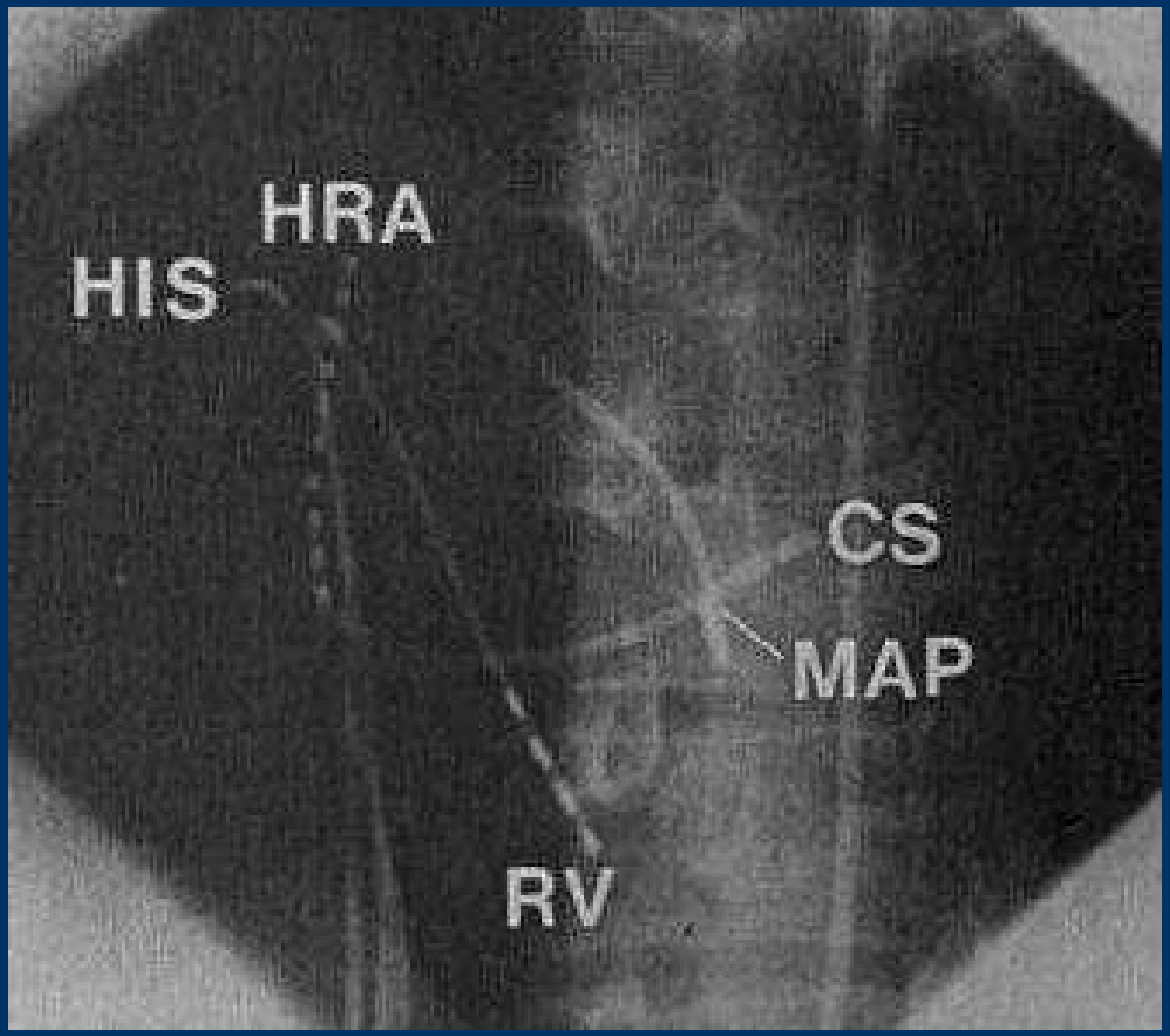
Diverticule du CS

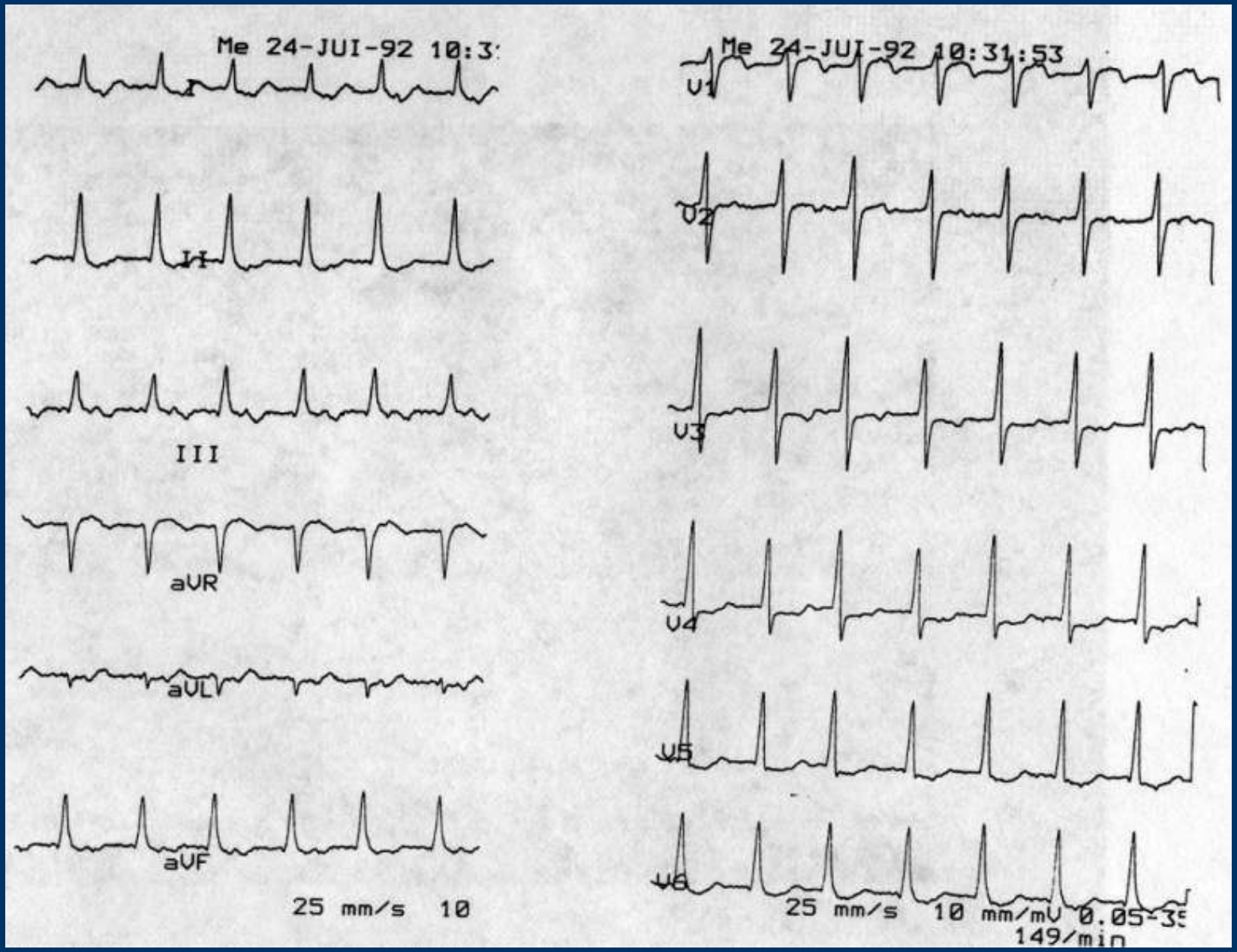


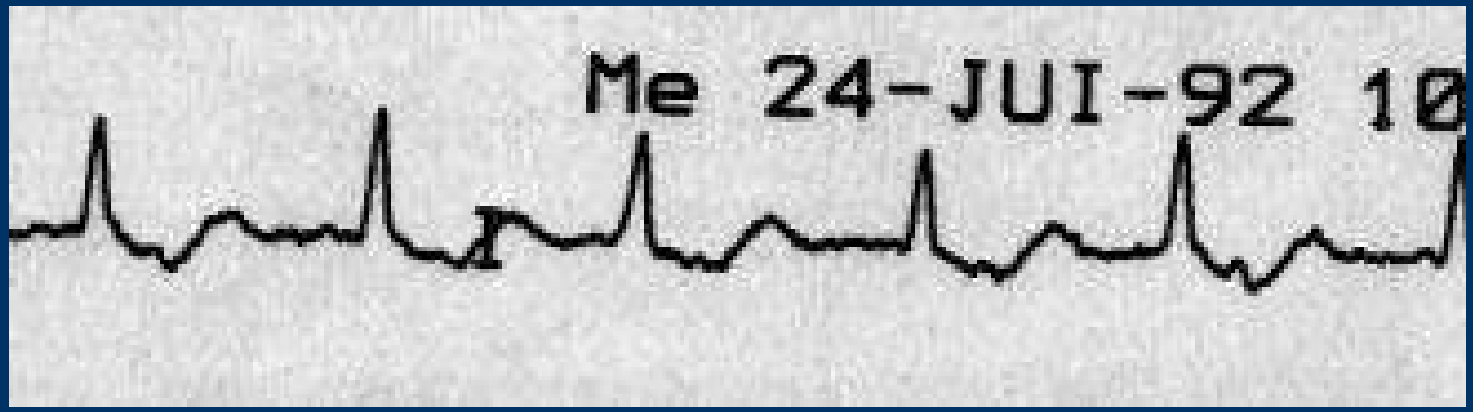
Ablation VA postéro-septales



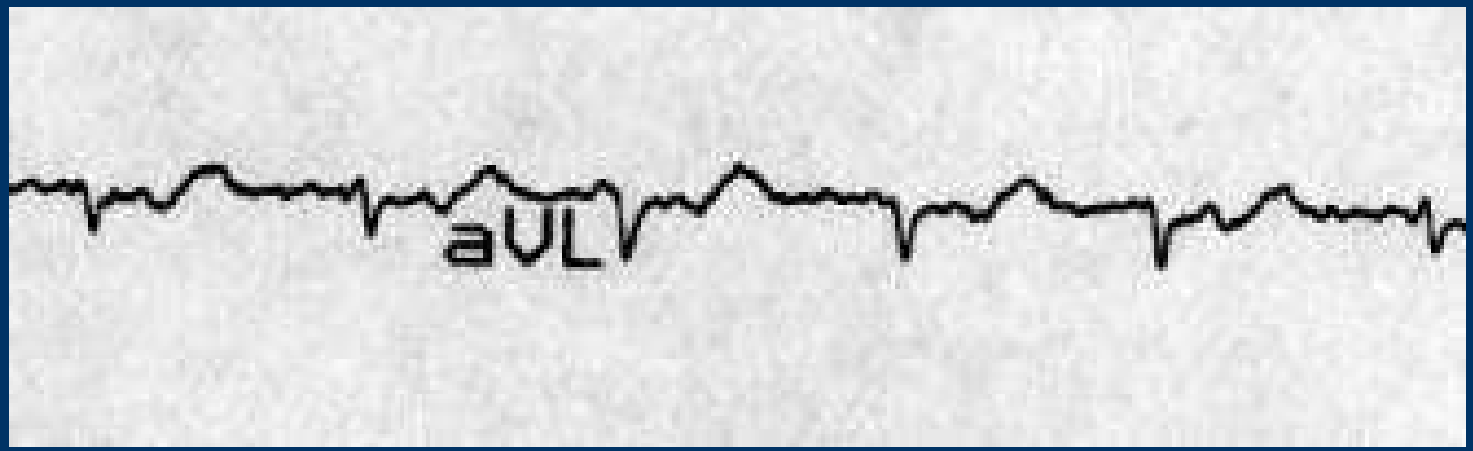
Ablation VA postéro-septales (anevrysme du SC)




Me 24-JUI-92 10:3
I
II
III
aVR
aVL
aVF
25 mm/s 10
Me 24-JUI-92 10:31:53
V1
V2
V3
V4
V5
V6
25 mm/s 10 mm/mV 0.05-3
149/min



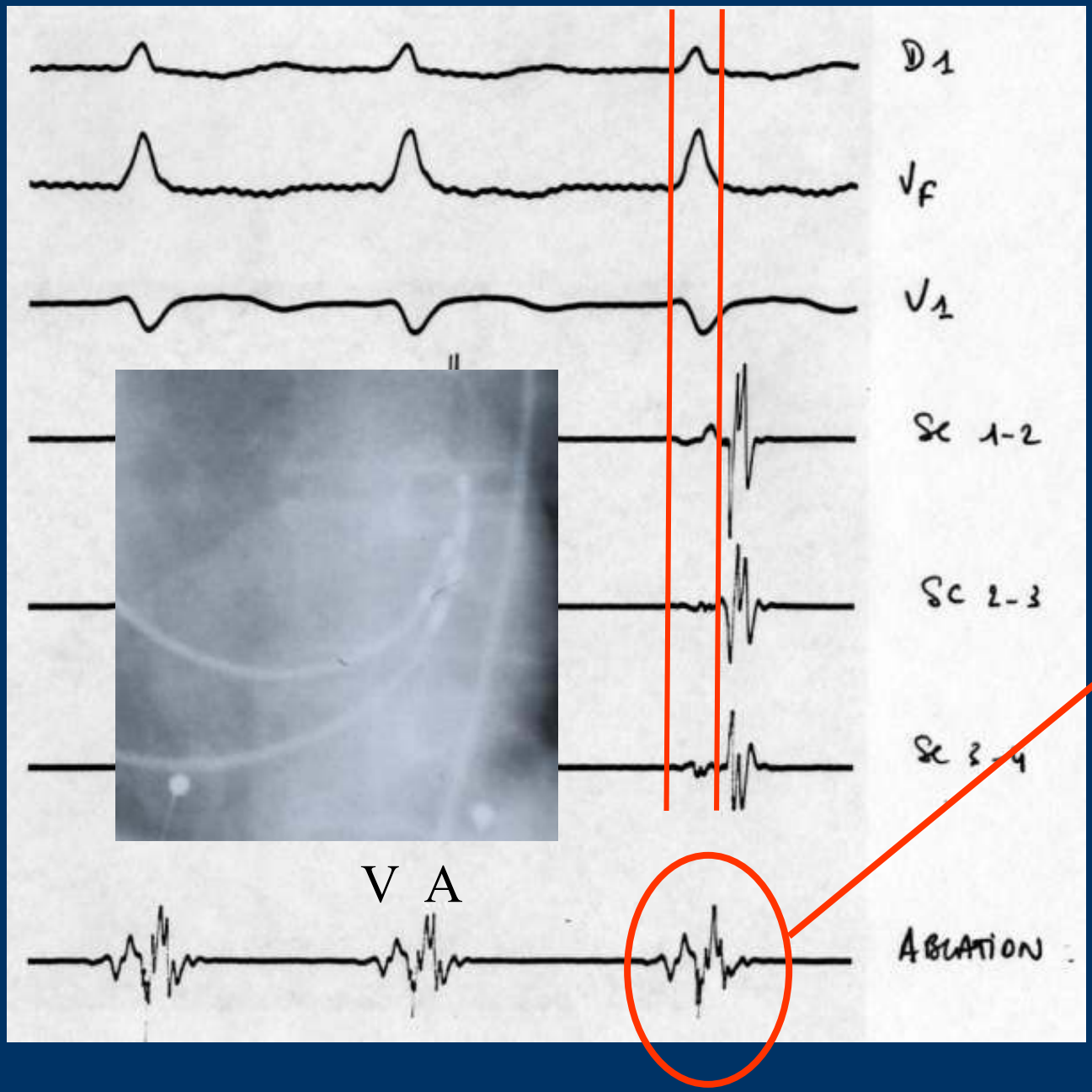
I

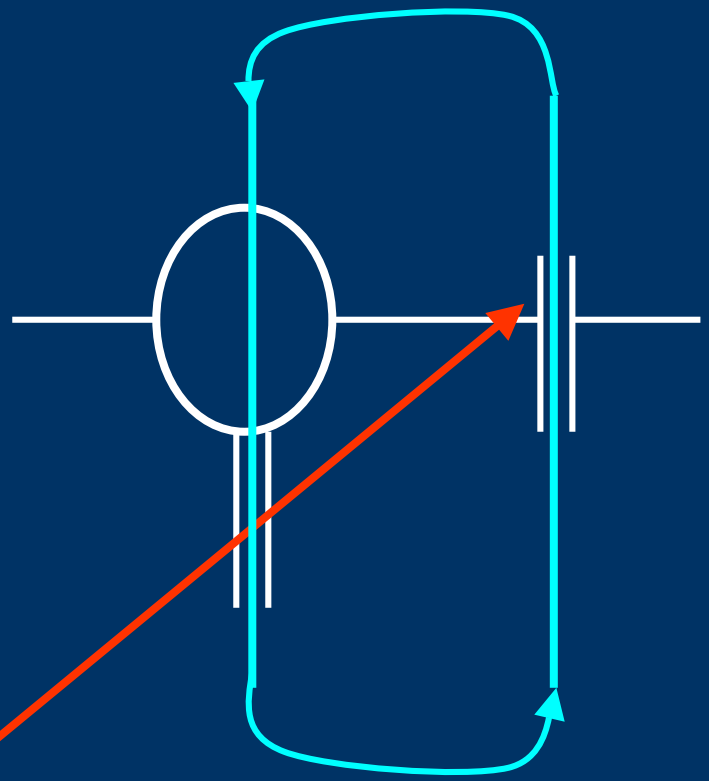


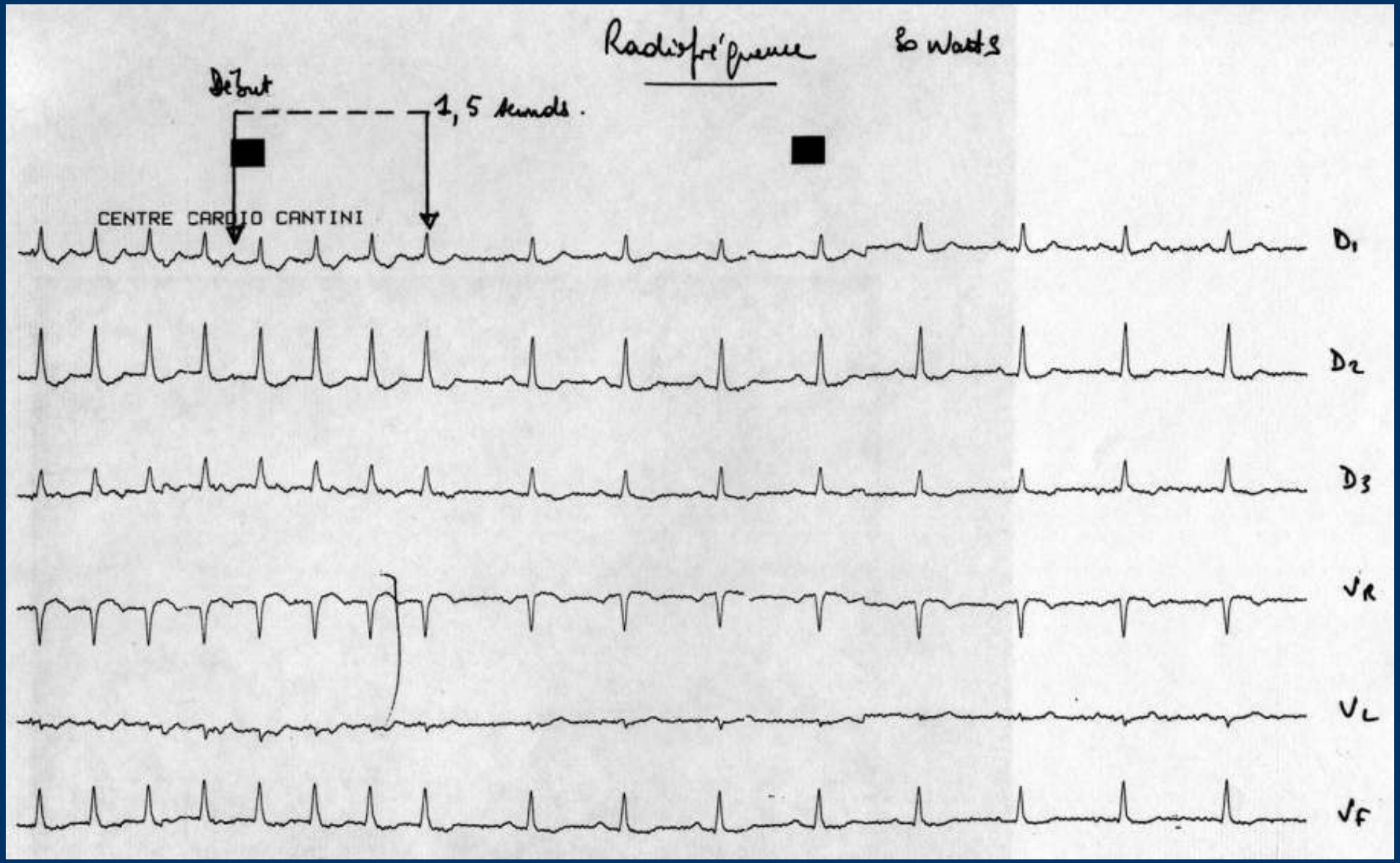
VL

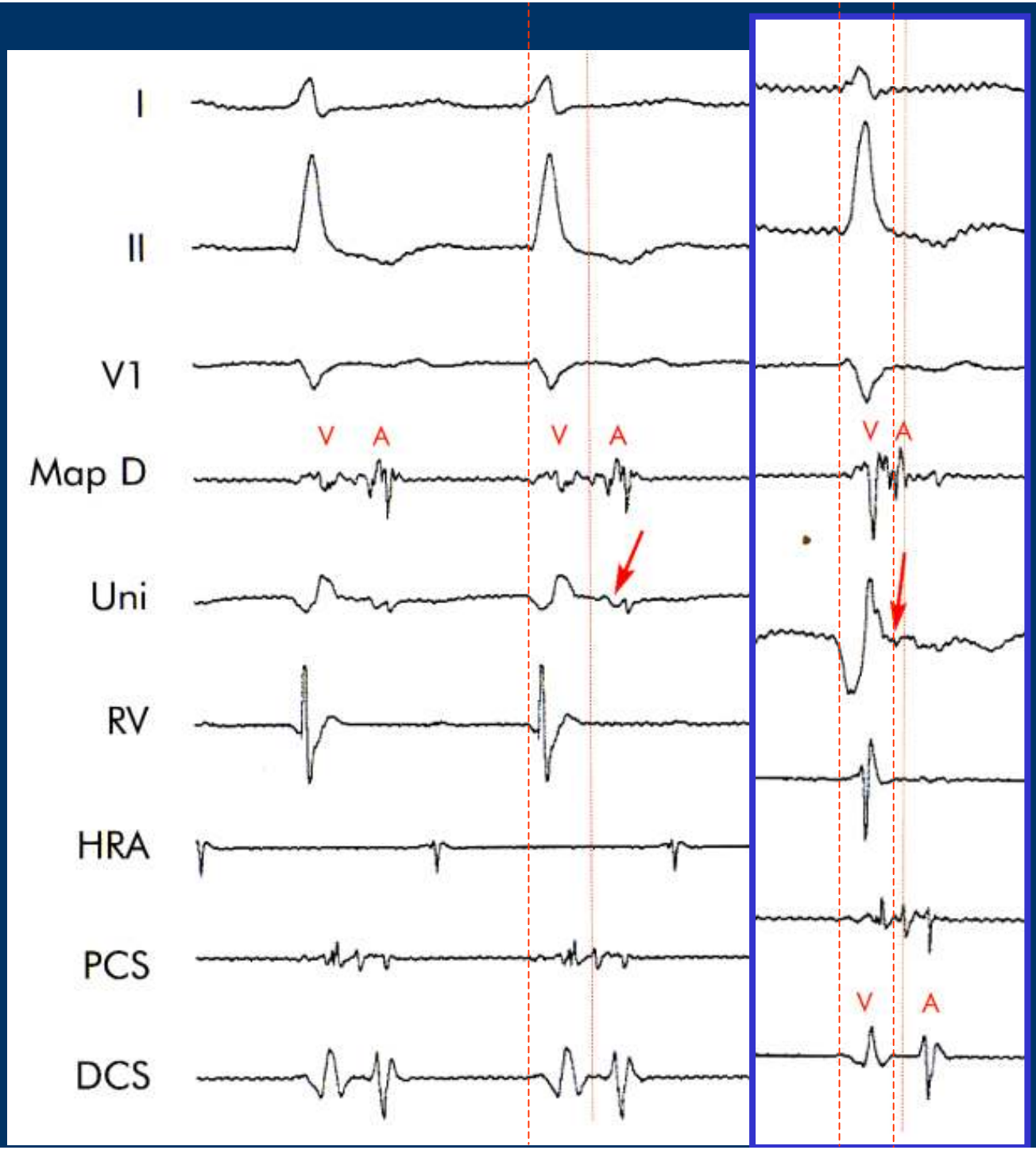
Ablation des voies accessoires : Cartographie conduction rétrograde

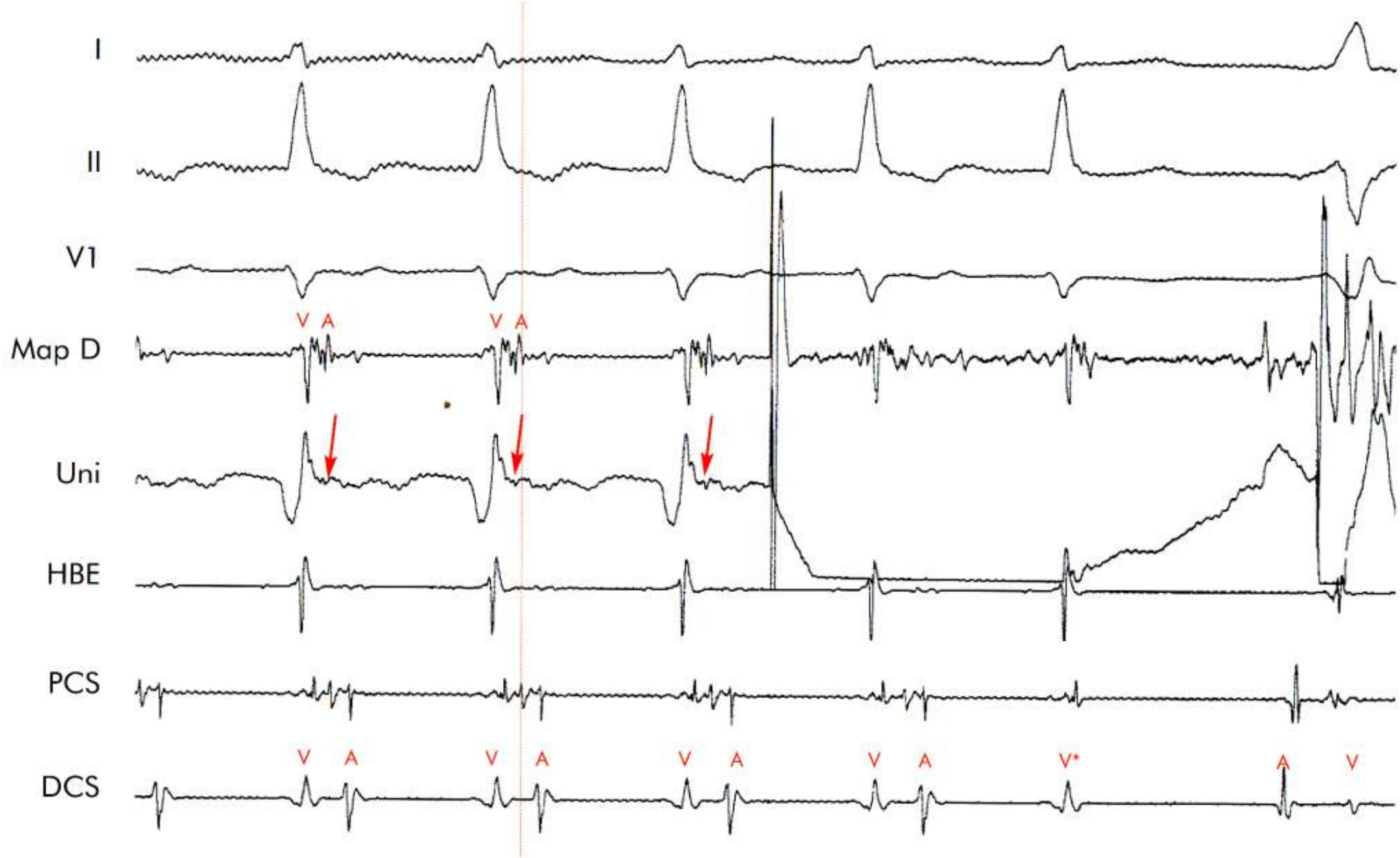
- Bon contact avec l'anneau : électrogrammes A et V bien voltés et stables
- Positionnement sur l'anneau :
  - début de l'électrogramme atrial (rétrograde) le plus précoce possible par rapport à une référence non locale (pied du QRS par exemple)

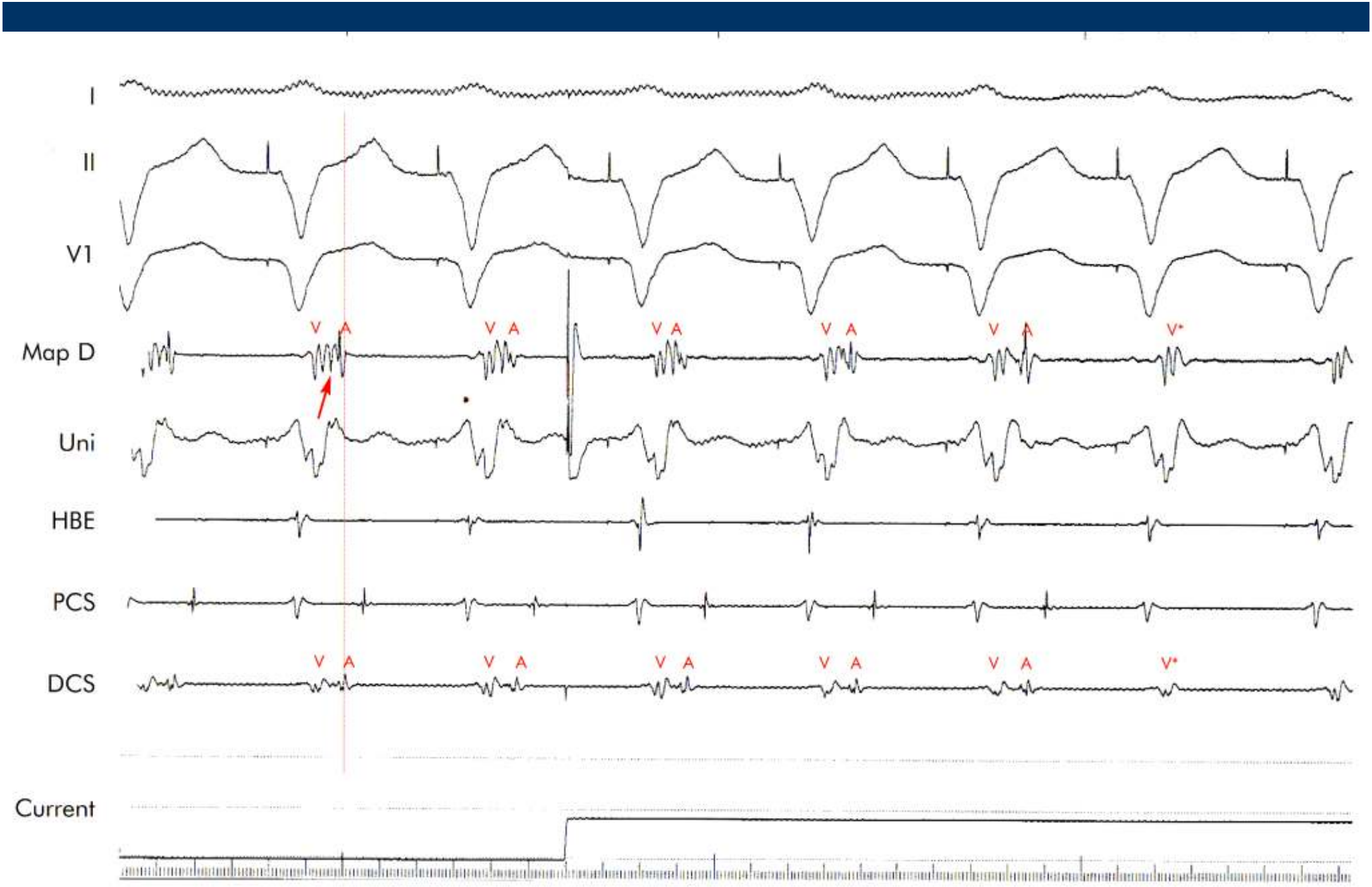

D1
VF
V1
Sc 1-2
Sc 2-3
Sc 3-4
V A
ABLATION

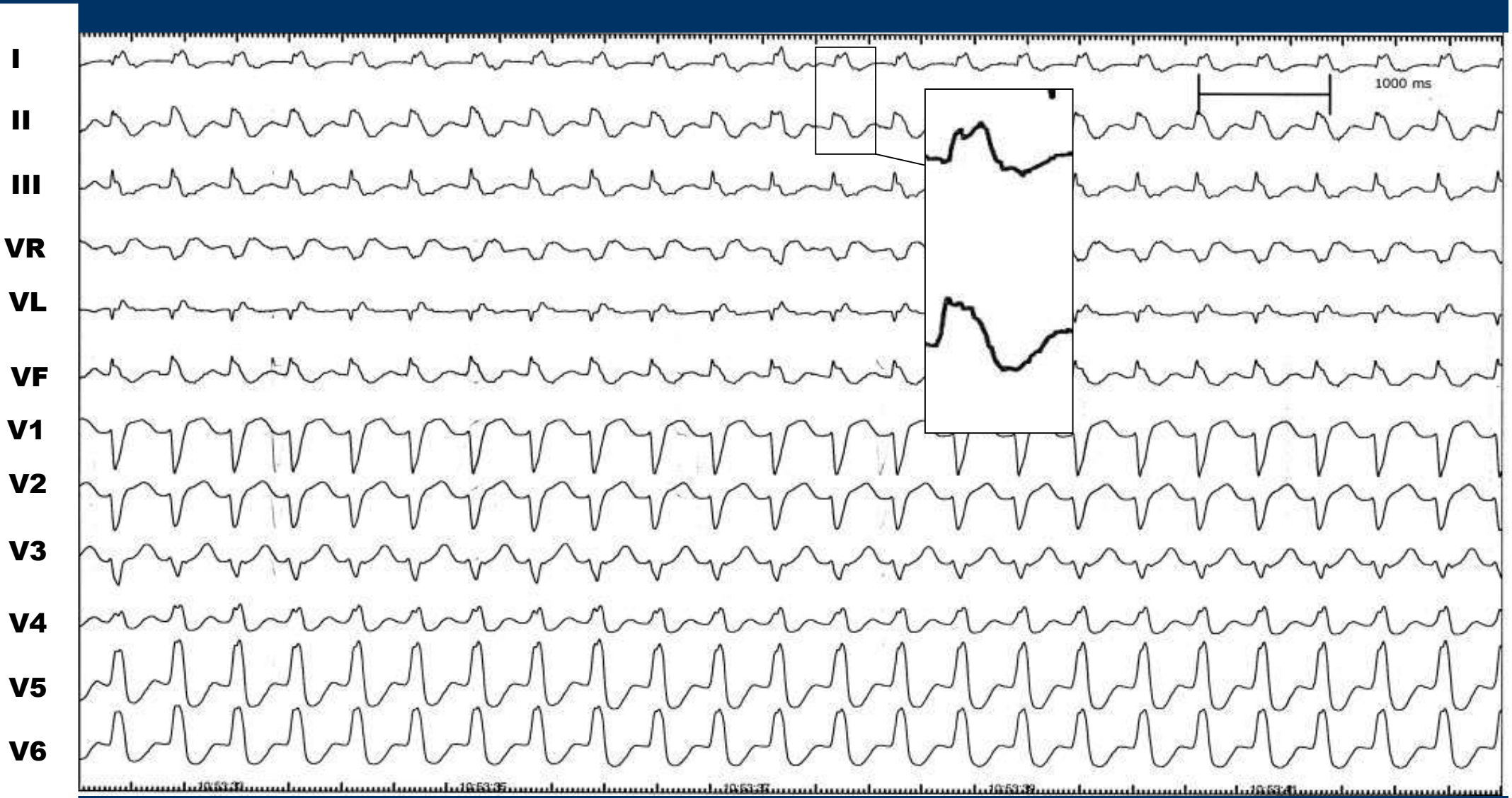

Oreillette (A)
Ventricule (V)

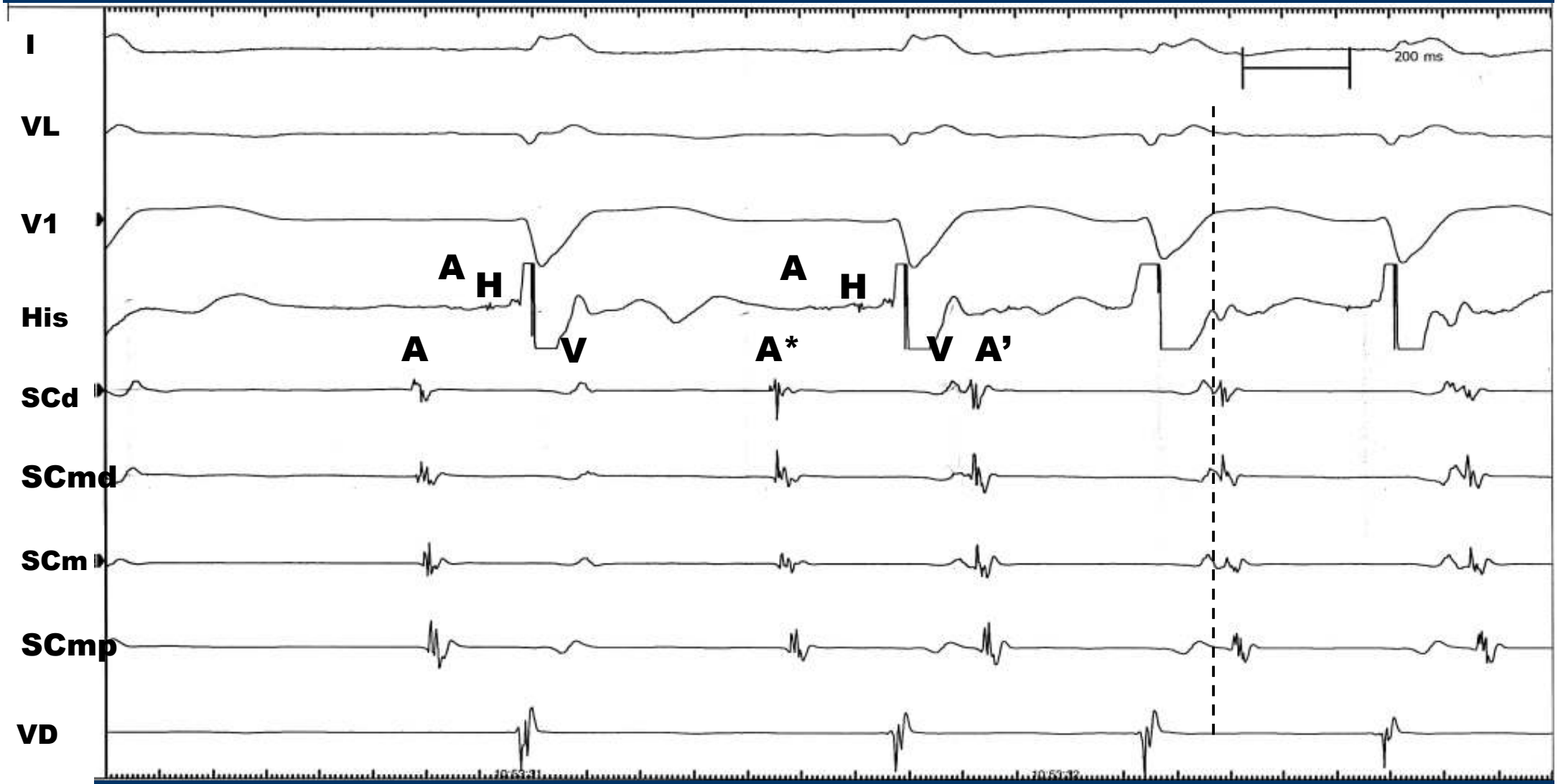

Radiofréquence
80 Watts
Début
1,5 secondes.
CENTRE CARDIO CANTINI
D1
D2
D3
VR
VL
VF


I
II
V1
Map D
Uni
RV
HRA
PCS
DCS
V
A
V
A
V
A
V
A

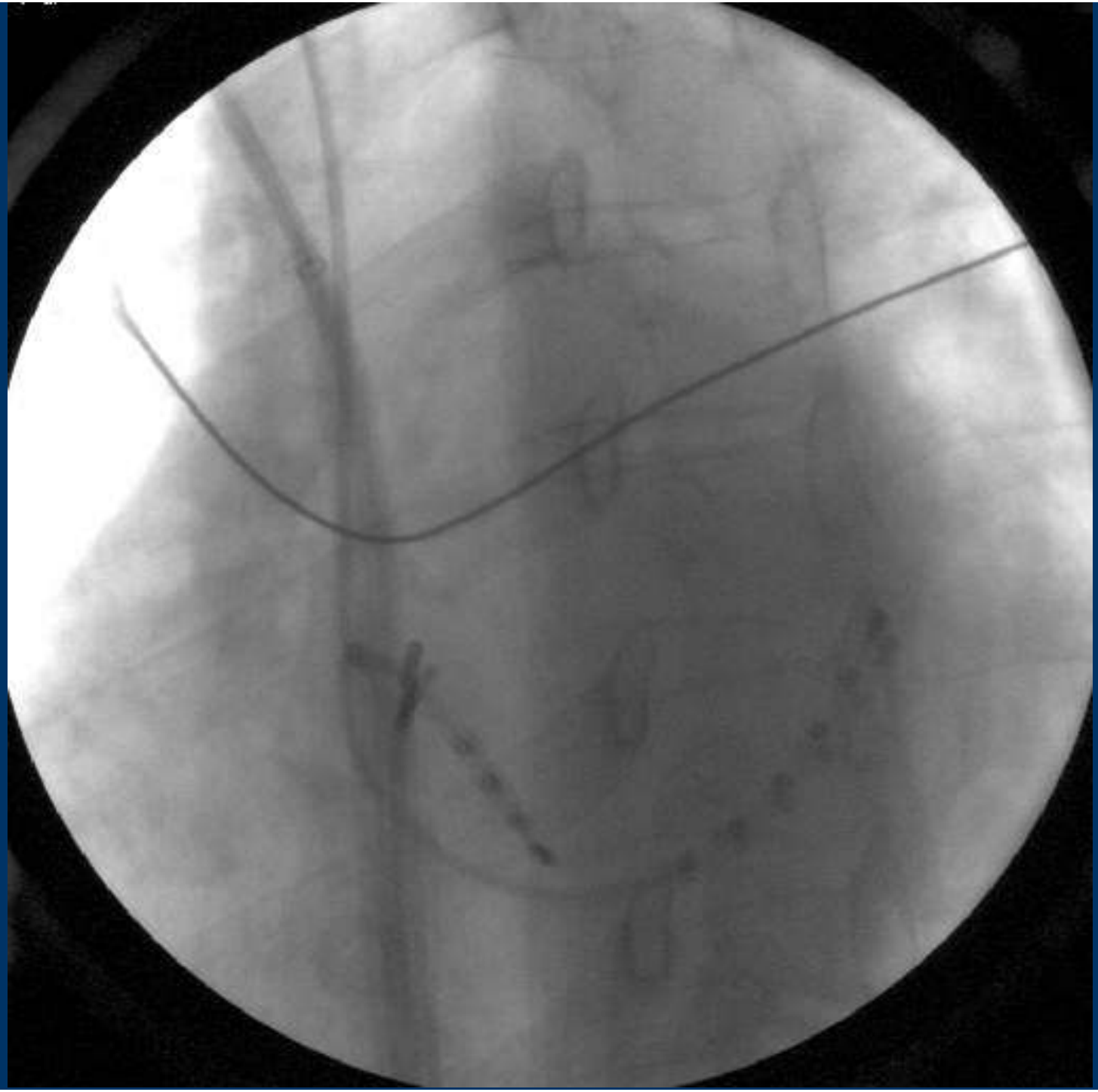

I
II
V1
Map D
Uni
HBE
PCS
DCS
V A
V A
V A
V A
V A
V*
A
V

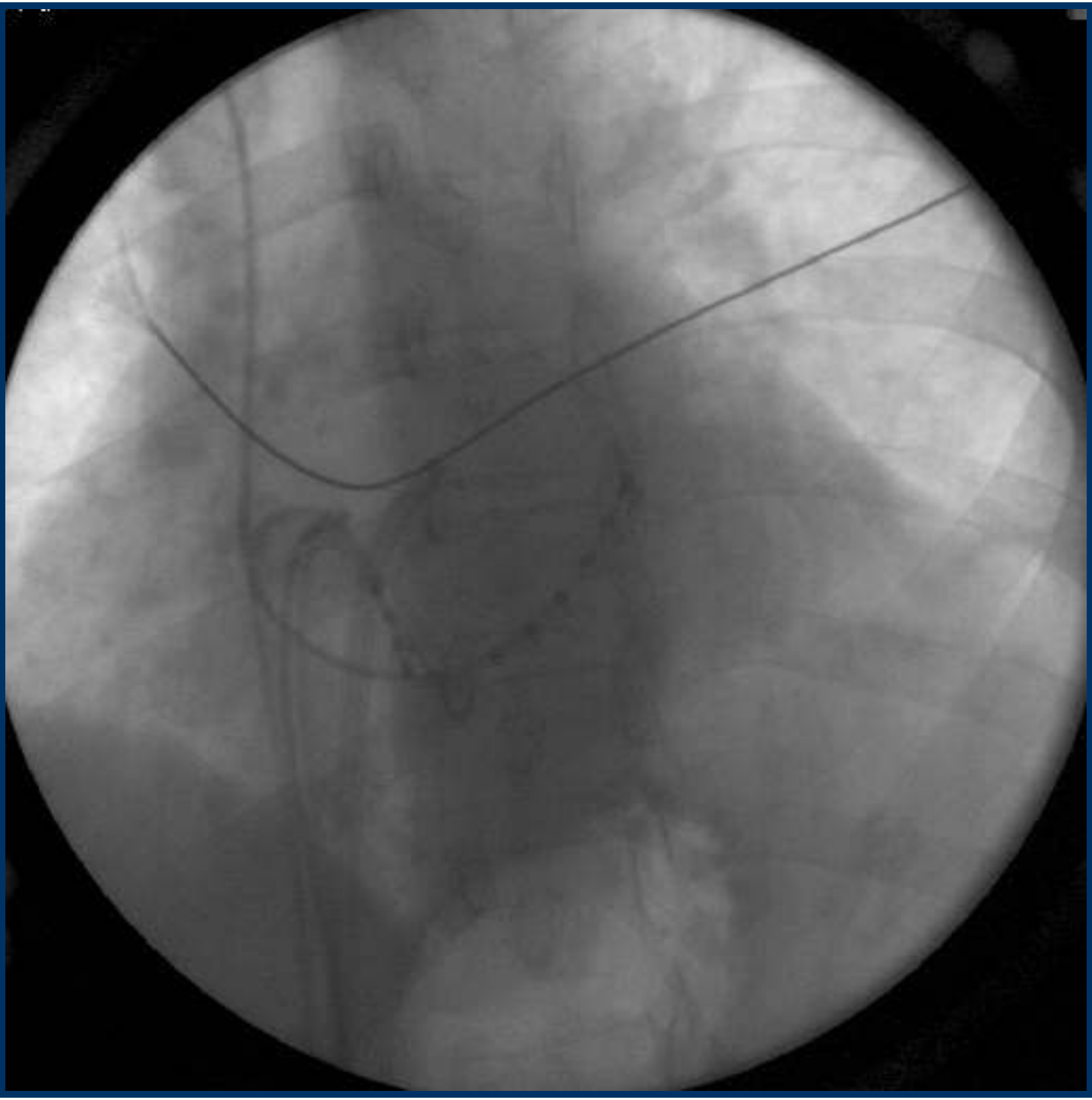

I
II
V1
Map D
Uni
HBE
PCS
DCS
Current
V A
V A
V A
V A
V A
V*
V A
V A
V A
V A
V A
V*

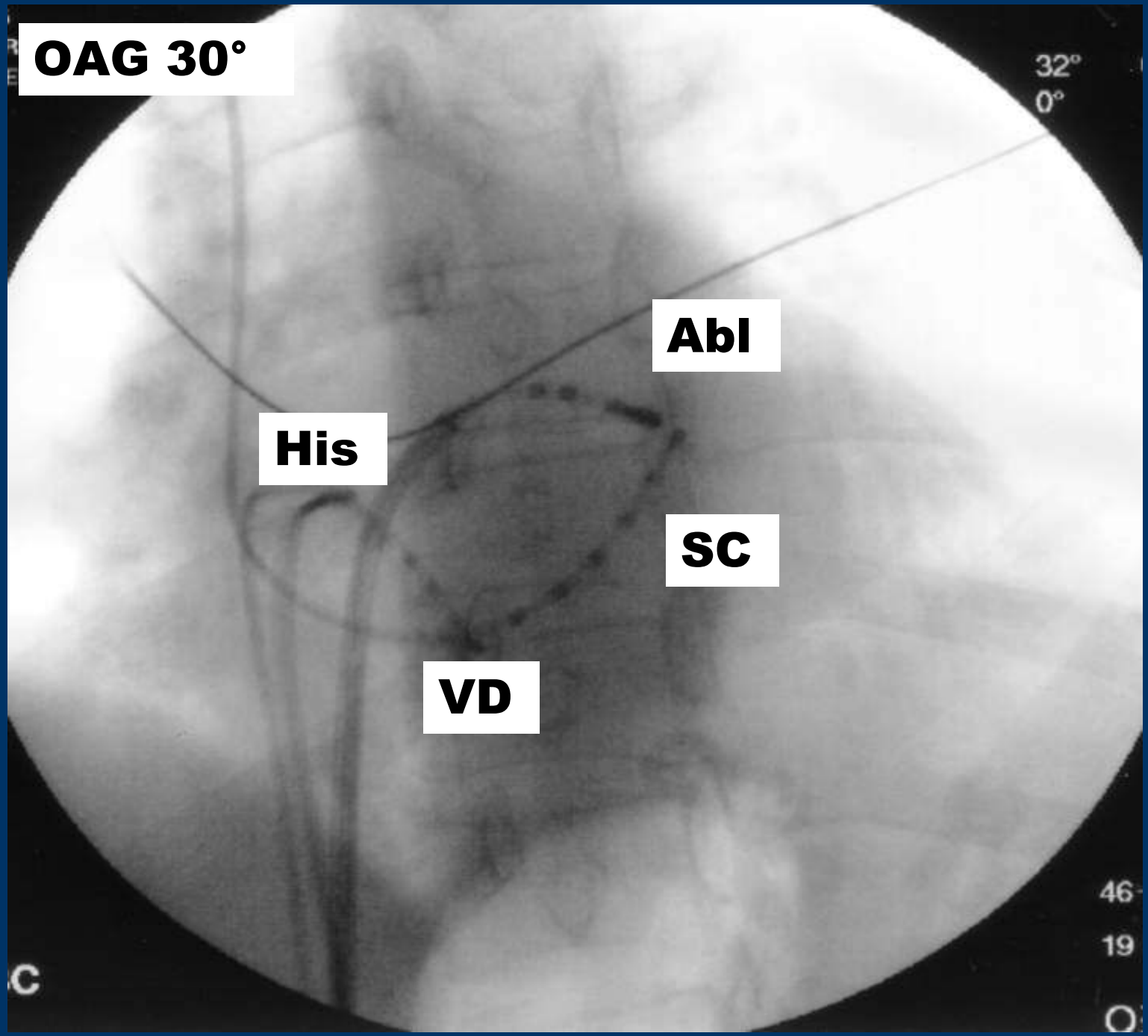

I
II
III
VR
VL
VF
V1
V2
V3
V4
V5
V6
1000 ms

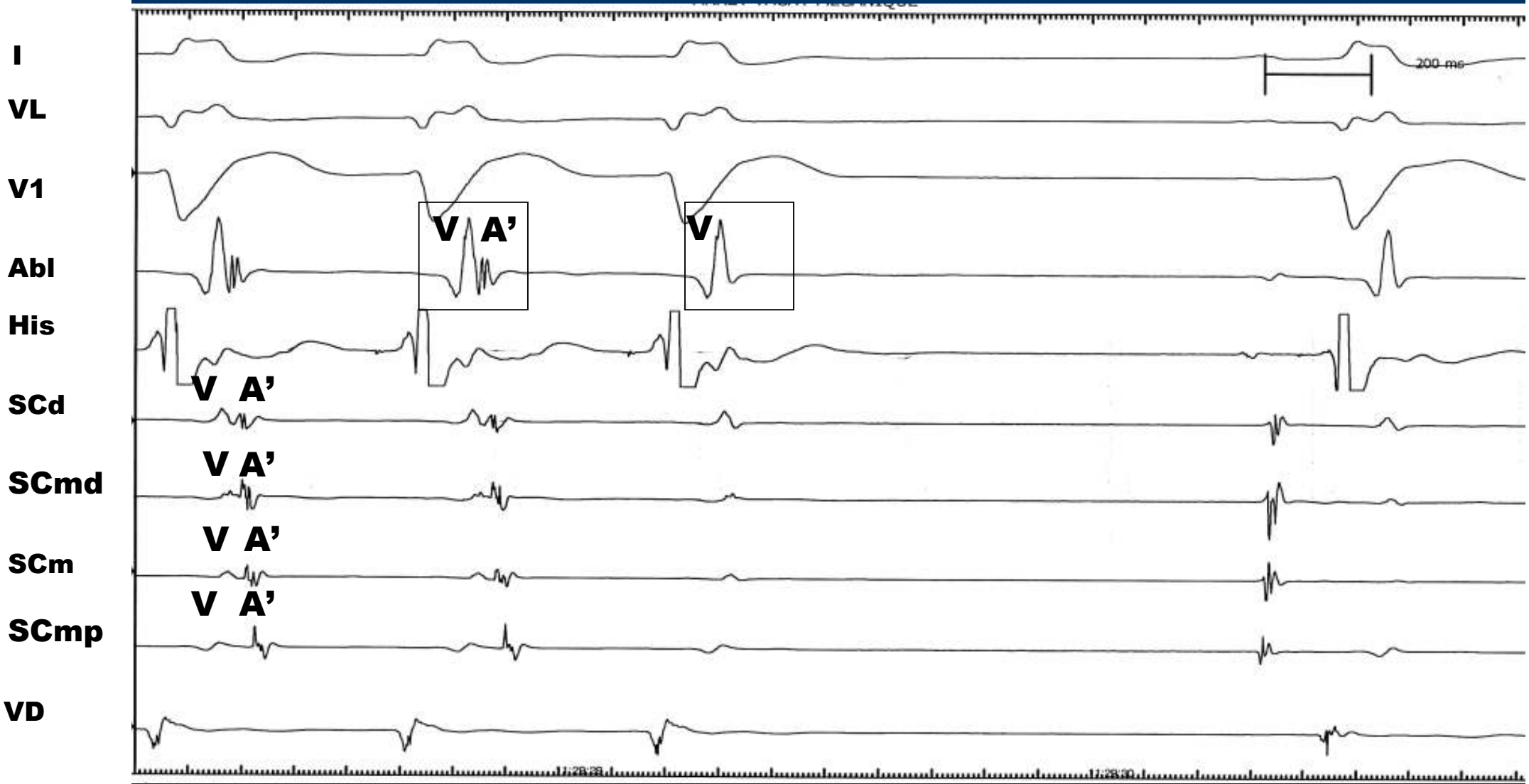

I
VL
V1
His
SCd
SCmd
SCm
SCmp
VD
200 ms
A
H
A
H
A
V
A*
V
A'

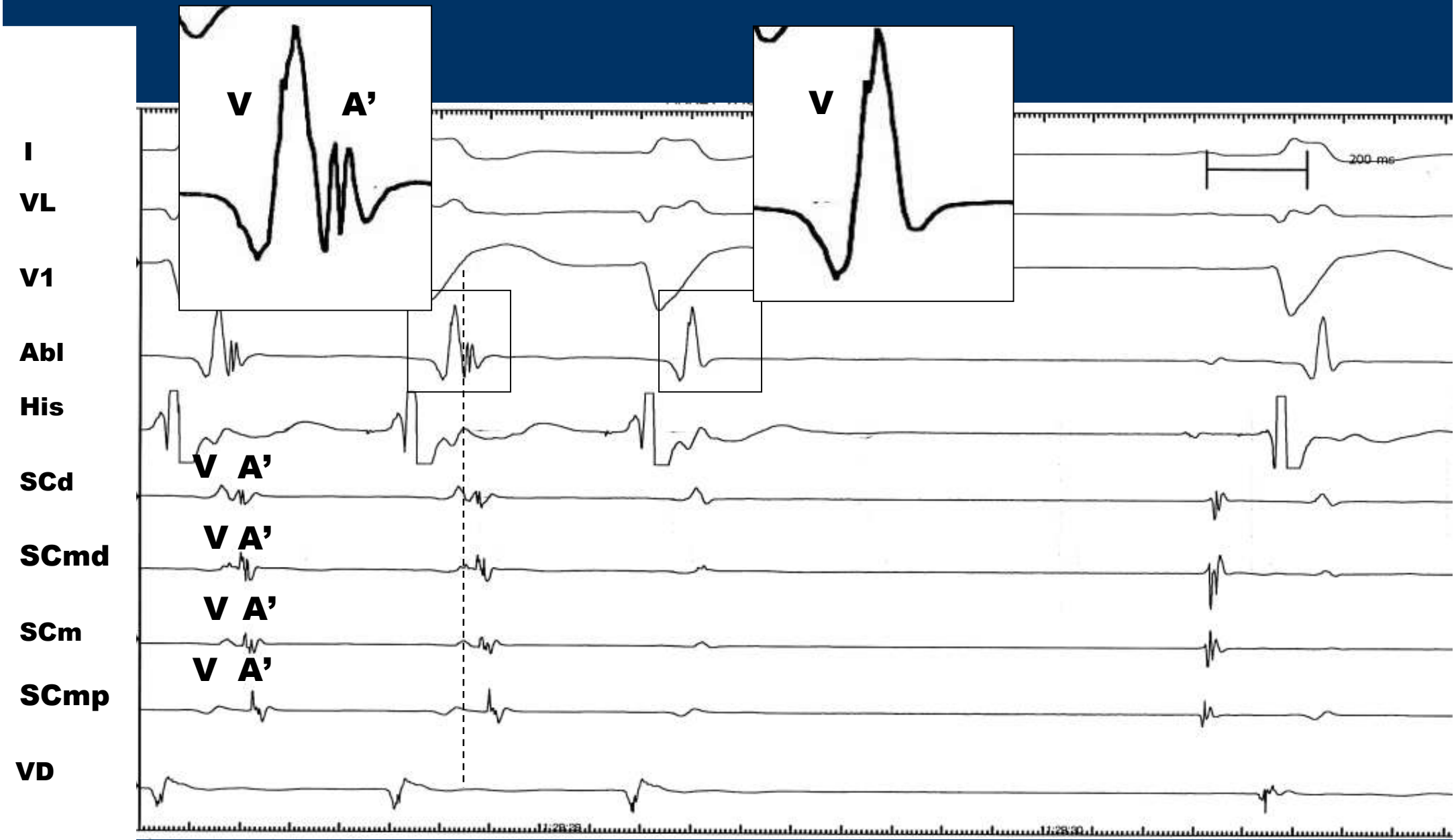

I
VL
V1
His
SCd
SCmd
SCm
SCmp
VD
V
A'
100 ms

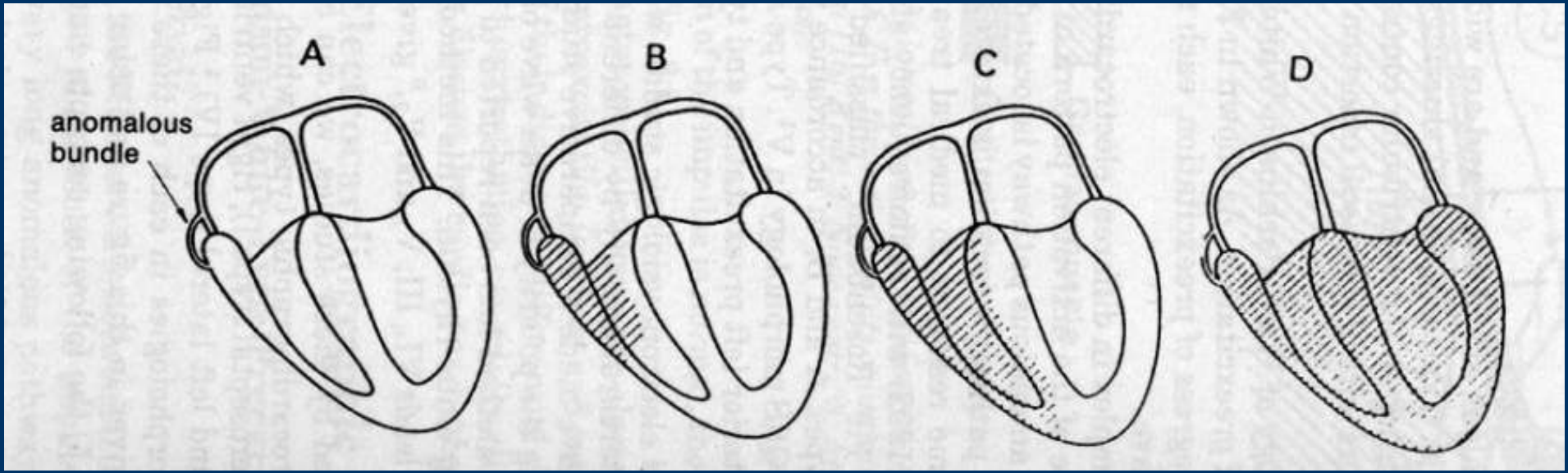


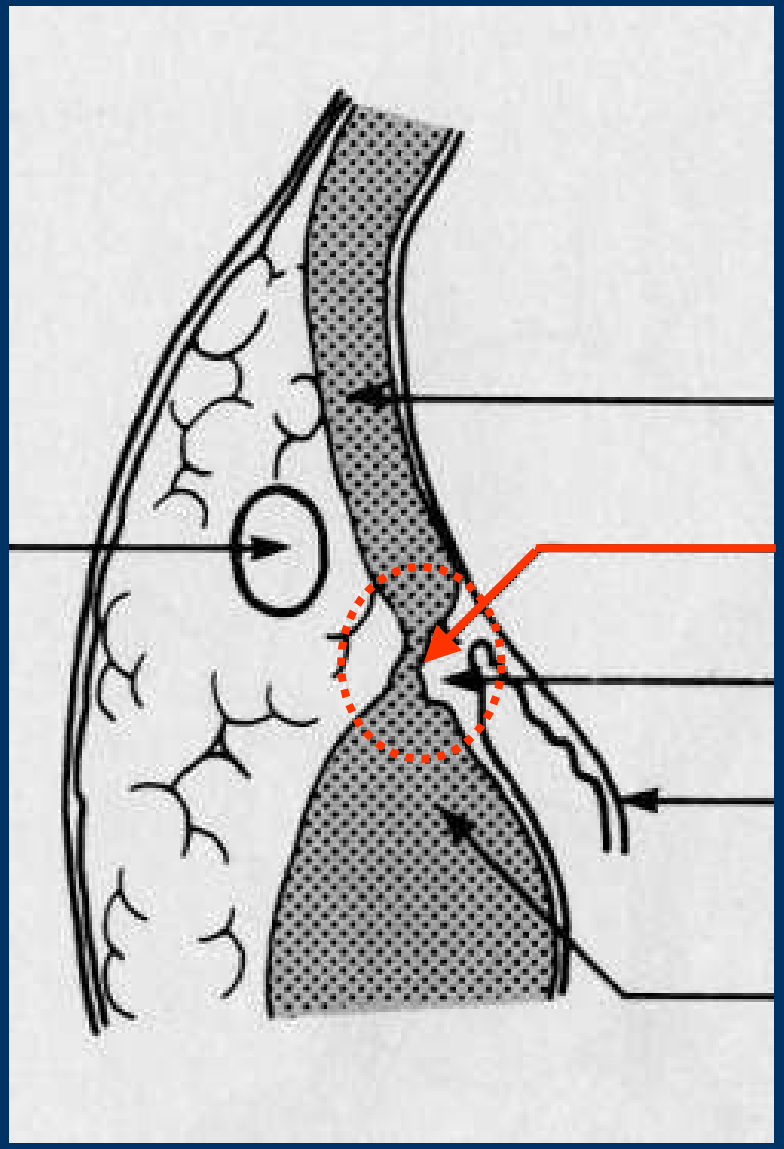


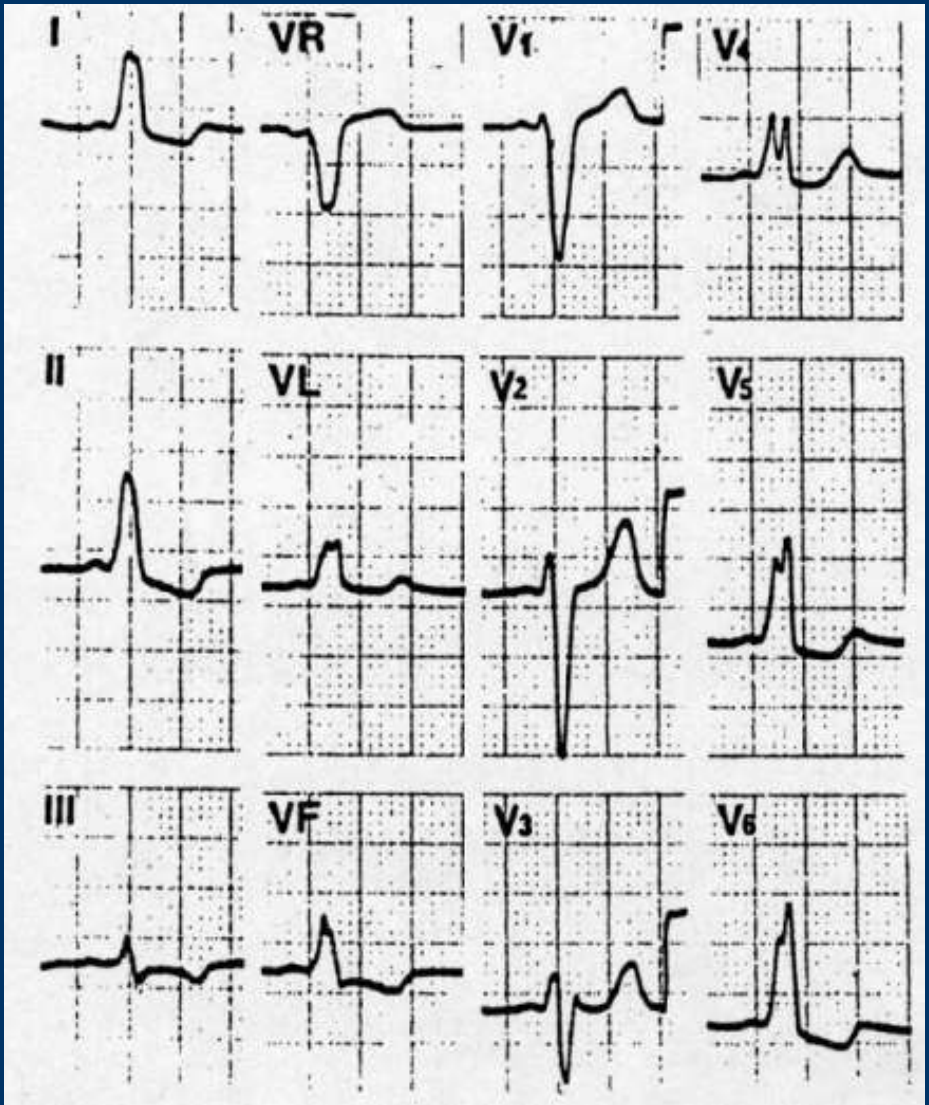

OAG 30°
Abl
His
SC
VD
32°
0°
46
19


I
VL
V1
Abl
His
SCd
SCmd
SCm
SCmp
VD
V A'
V
V A'
V A'
V A'
V A'
200 ms

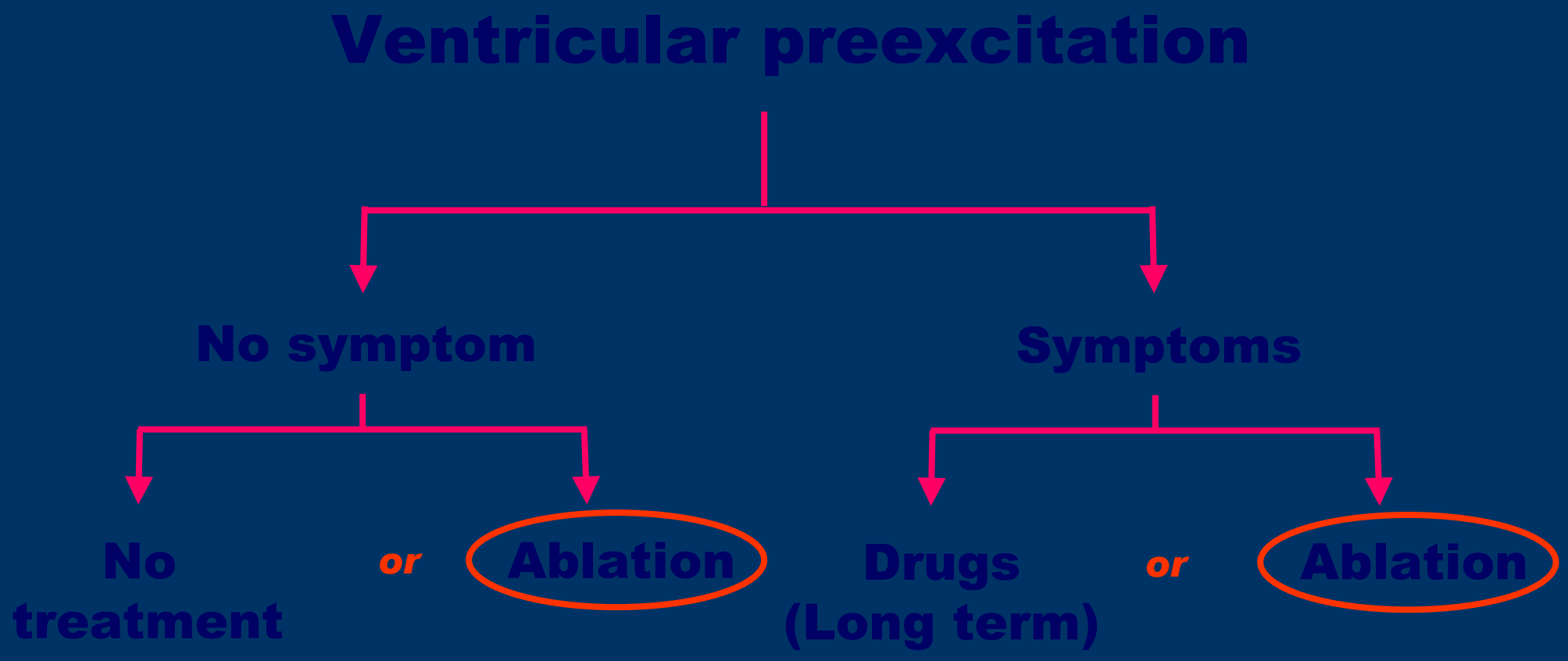

I
VL
V1
Abl
His
SCd
SCmd
SCm
SCmp
VD
V
A'
V
V
A'
V
A'
V
A'
V
A'
200 ms


A
B
C
D
anomalous
bundle


OG
Sinus coronaire
Voie accessoire
Squelette fibreux
Mitrale
VG


I
VR
V1
V4
II
VL
V2
V5
III
VF
V3
V6

Ventricular preexcitation – Therapeutic options



Drug therapy in patients with AP

	Patients	Success rate	Follow Up
Propafenone	11	100% (+ beta-)	9 months
Flecainide	20	85%	15 months
Sotalol	17	81%	36 months

ACC/AHA/ESC Guidelines for the management of patients with supra ventricular arrhythmias,2003

Drug therapy in WPW patients

WPW syndrome	Recommendation	Class	Level of evidence
Arrhythmia, well tolerated	Flecainide, Propafenone, Sotalol, Amiodarone, Beta-blockers	IIa	C !

ACC/AHA/ESC Guidelines for the management of patients with supra ventricular arrhythmias,2003

RF ablation in WPW patients

	Left free wall	Antero septal	Postero septal	Right free wall
NonT° Control				
Calkins, 1991	152/161	13/15	41/44	46/47
Jackman, 1991	106/106	13/13	40/43	15/15
Chen, 1993	63/69	10/11	30/32	25/27
Swartz, 1994	74/76	21/21	13/13	8/12
Haissaguerre, 1994	282/286	40/41	73/77	30/32
	97%	**96%**	**91%**	**88%**
T° Control				
Calkins, 1994	257/270	39/40	86/98	83/92
	95%	**98%**	**88%**	**90%**

Complications associated with ablation of AP

	Pts (N)	Complic.	Death
MERFS, 1993	2222	4.4%	0.13%
NASPE, 1995	5427	1.8%	0.07%
Atakr, 1999	500	--	0.2%

AV Block 0.17-1.0 %
Tamponade 0.13-1.1 %

Complications d'ablations 1993-1995-1999

	N	Complications	Tamponade	BAV	IdM	AVC	DC
MERFS 1993	2222	4,4% (98)	0,72% (16)	0,63% (14)	0	0,49% (11)	0,13% (3)
NASPE 1995	5427	1,8% (99)	0,13% (7)	0,17% (9)	0,06% (3)	0,15% (8)	0,07% (4)
ATAKR 1999	500	N/A	N/A	1% (5)	N/A	0,2% (1)	0,2% (1)

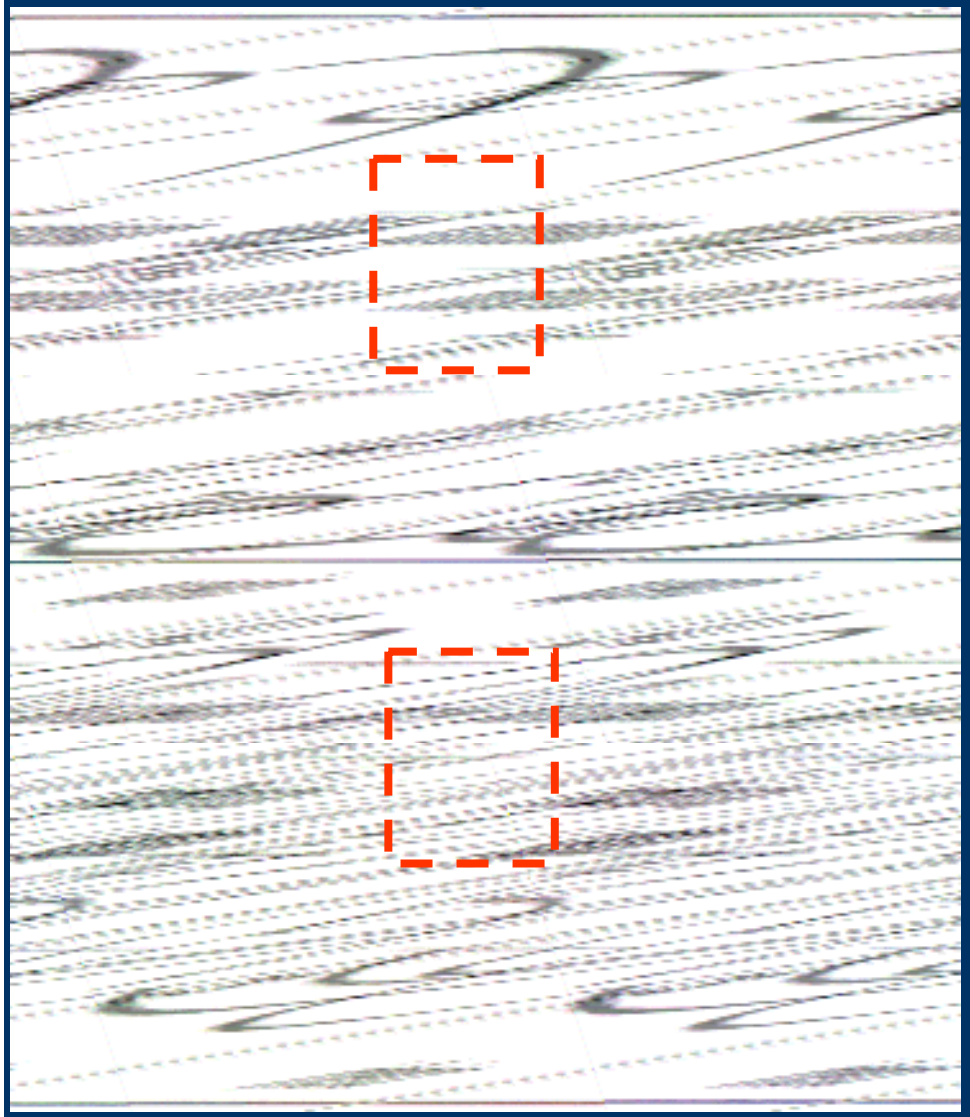
Ablation des voies accessoires : résultats
NASPE Registry (N = 654 pts)

- WPW gauches (62% des pts) : 93% succès
- WPW septaux (27% des pts) : AS : 84% succès; PS : 88,8% succès
- WPW droits (11% des pts) : 96,4% succès

Ablation des voies accessoires : complications
NASPE Registry (N = 654 pts)

- WPW gauches : 5% de complications (épanchement péricardique; point de ponction; occlusion coronaire)
- WPW septaux : 4,8% de complications (BAV, épanchement, pneumothorax, saignement)
- WPW droits : 2, 4% de complications (BAV; thrombo-embolie)

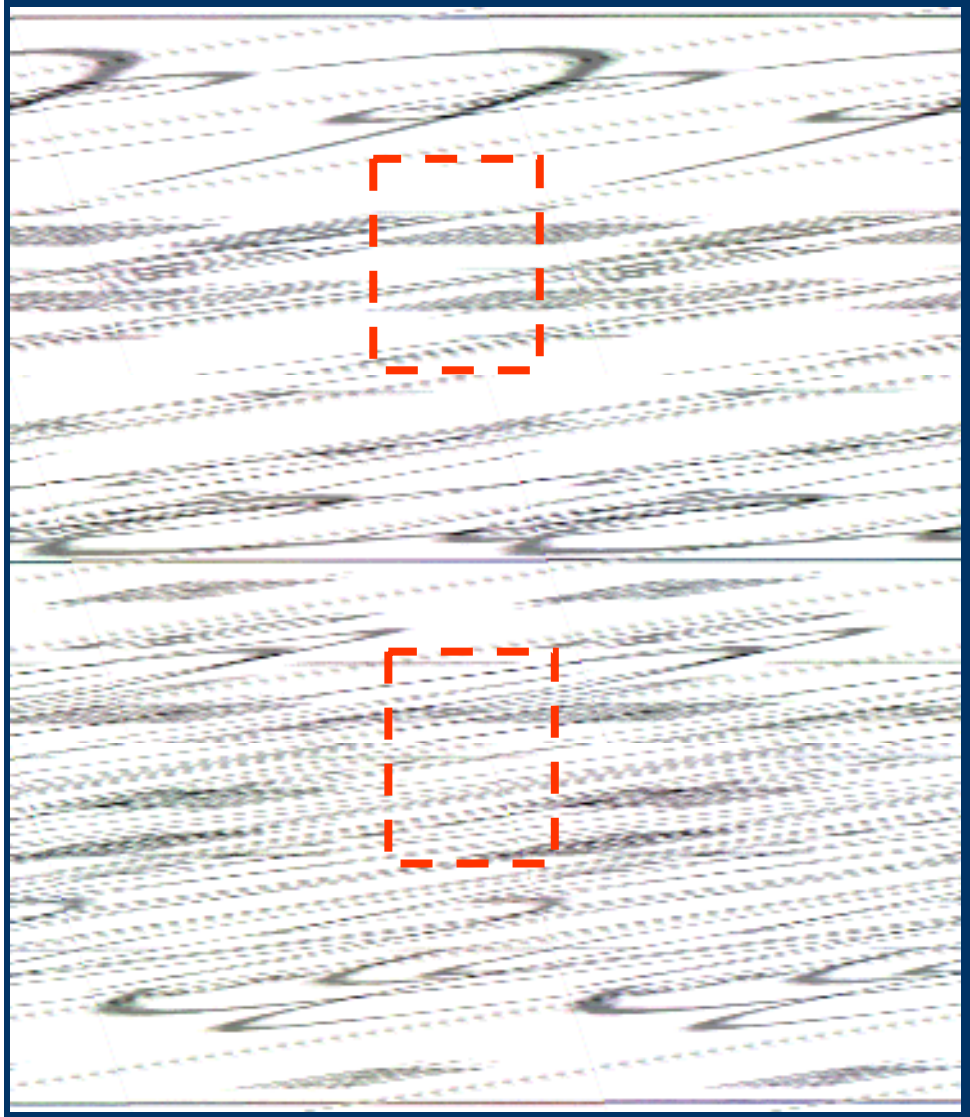
RF ablation of parahissian and midseptal pathways



Anteroseptal pathways

		N	AVB	RBBB
Jackman	1991	13	0	38%
Lesh	1992	7	0	57%
Calkins	1992	10	20%	--
Swartz	1993	10	0	--
Kay	1993	19	0	--
Kuck	1994	33	0	6%
Jazayeri	1994	15	0	20%
Tai	1996	23	4%	--

RF ablation of parahissian and midseptal pathways



Midseptal pathways

		N	AVB
Lesh	1992	6	0
Calkins	1992	5	0
Swartz	1993	11	0
Kay	1993	11	1 (T)
Kuck	1994	21	0
Jazayeri	1994	10	0
Yeh	1994	10	4 (T) 1 (P)
Haissaguerre	1994	8	0
Tai	1996	8	0

Cryoablation of septal AP

Gaïta et al, *J Cardiovasc Electrophysiol 2003*

N = 20 patients

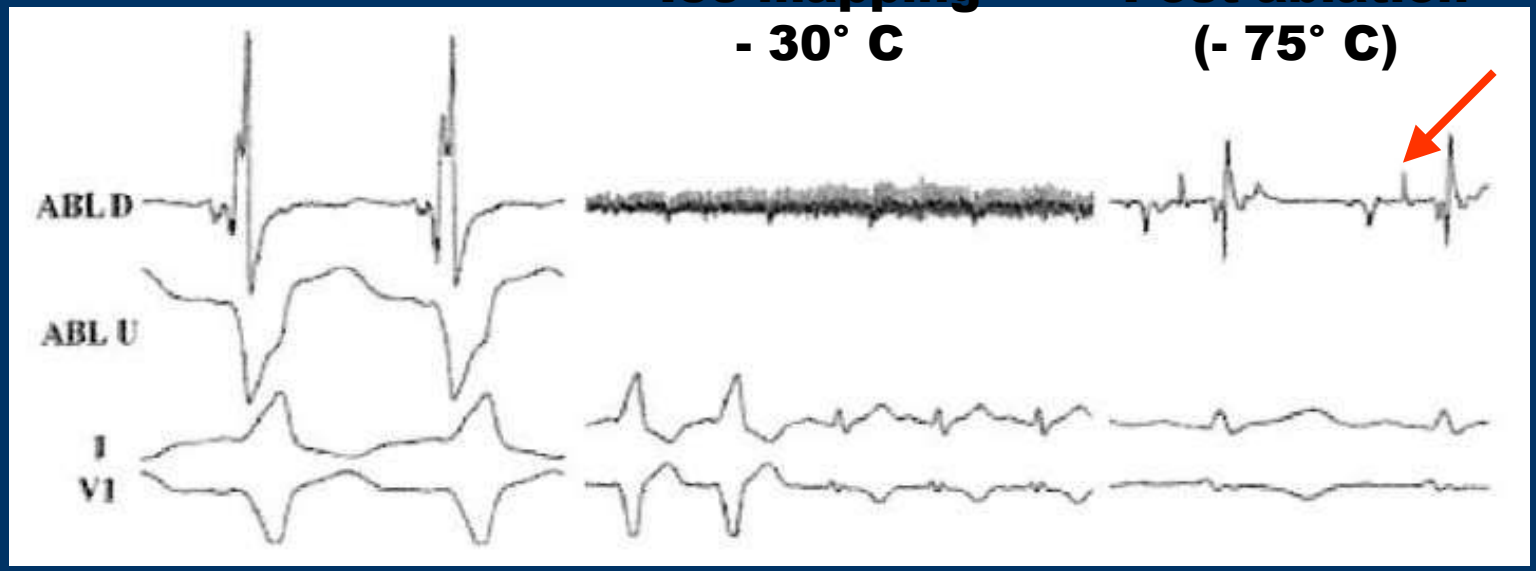
100% success rate
20% recurrence
No complication

Ice mapping
- 30° C

Post ablation
(- 75° C)

H

Para-hissian AP



Ablation therapy in WPW patients

WPW syndrome	Recommendation	Class	Level of evidence
Arrhythmia, well tolerated	Ablation	I	B
Arrhythmia, poorly tolerated	Ablation	I	B

ACC/AHA/ESC Guidelines for the management of patients with supra ventricular arrhythmias,2003

Ventricular preexcitation – The asymptomatic patient

Ventricular preexcitation

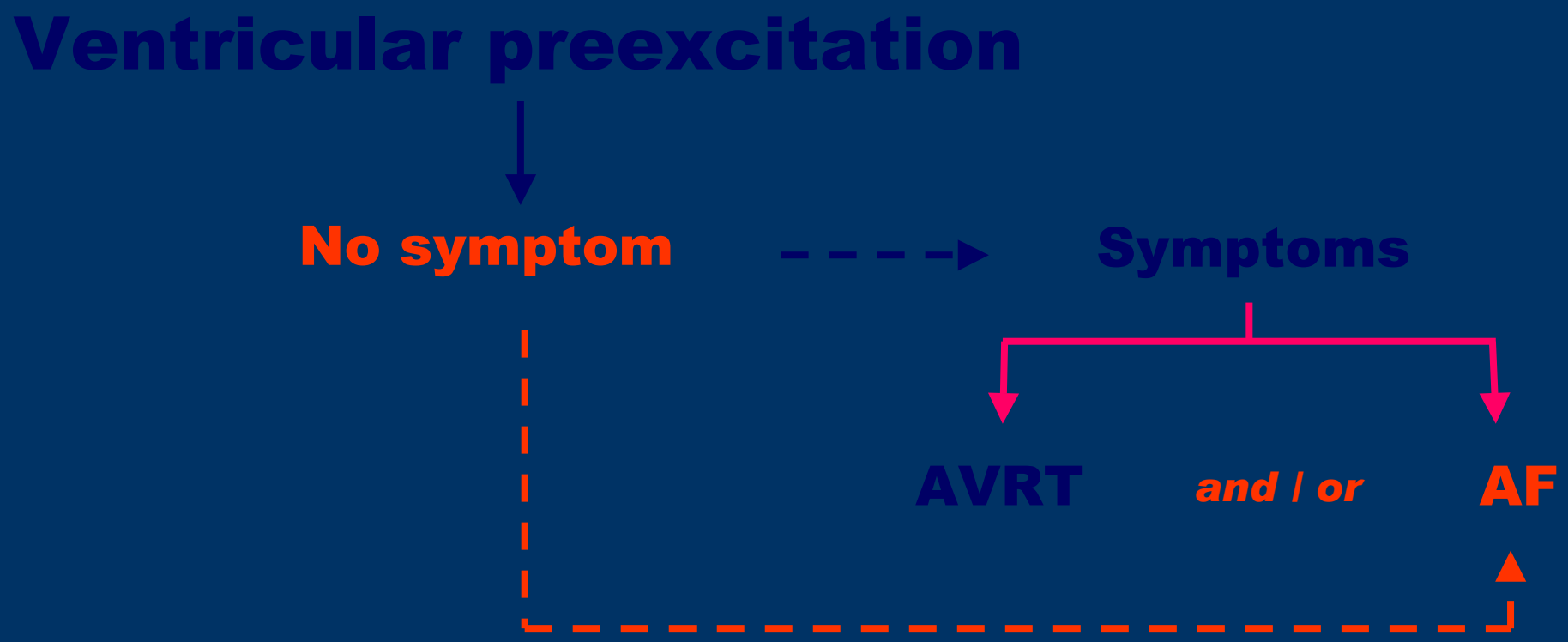
↓

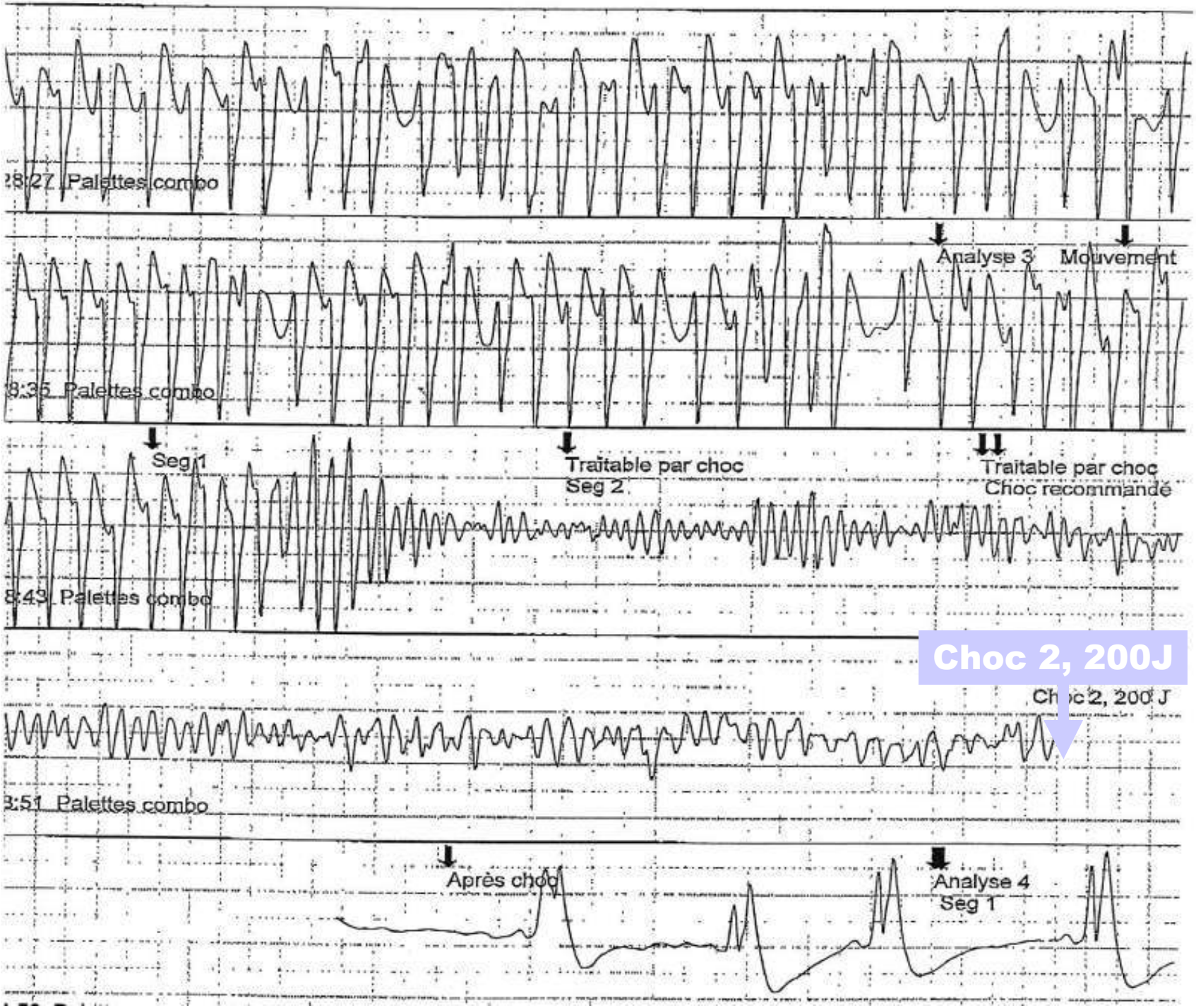
No symptom - - - - ▸ **Symptoms**

↓

AVRT *and / or* **AF**

Ventricular preexcitation – The asymptomatic patient




2 mn 08 s
28:27 Palettes combo
Analyse 3
Mouvement
2 mn 20 s
8:35 Palettes combo
Seg 1
Traitable par choc
Seg 2
Traitable par choc
Choc recommandé
2 mn 28 s
8:43 Palettes combo
Choc 2, 200J
Choc 2, 200 J
2 mn 36 s
8:51 Palettes combo
Après choc
Analyse 4
Seg 1
2 mn 44 s

VF as the 1st manifestation

Klein, 1979	3/25
Montoya, 1991	6/23
Timmermans, 1995	8/15

Uncommon after 30 y.

SCD incidence in the WPW Syndrome

	Pts (N)	SD (N)	SD (pt-Y)
Smith (1964)	50	0	0.0000
Berkman (1968)	128	1	<0.0009
Flensted-Jensen (1969)	47	4	<0.006
Gillette (1979)	105	2	0.0039
Guize (1985)	170	1	0.0014
Munger (1993)	113	2	0.0015

Risk assessment

Non invasive markers (intermittent, treadmill test, AA drugs):

PPV = 12% !

Invasive markers:

- Shortest preexcited RR interval < 250 ms during AF
- Multiple accessory pathways
- Inducible reciprocating tachycardia

Superior to nonivasive tests

Risk assessment ?

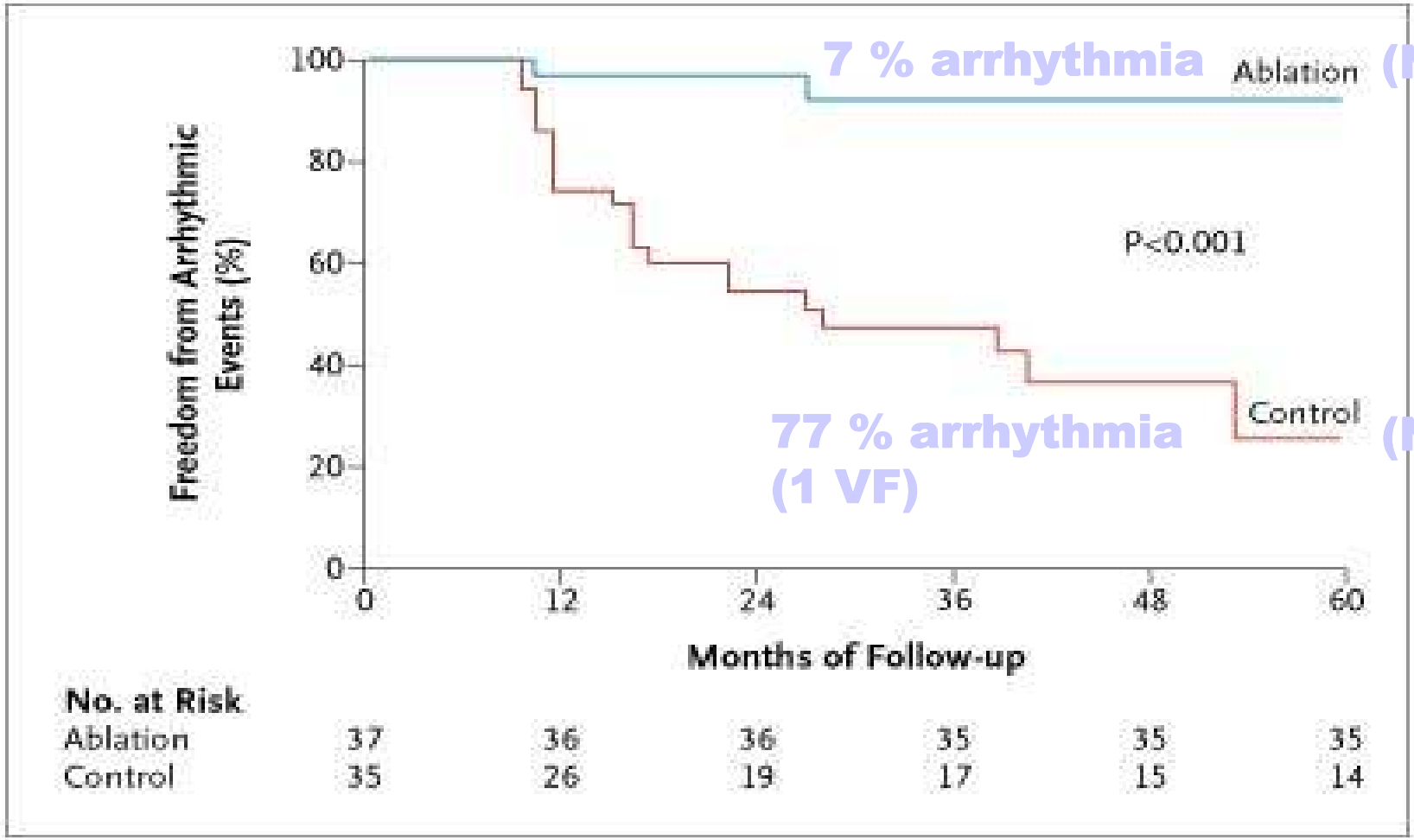
- Shortest preexcited RR interval (AF) < 250 ms

Sensitivity	95%
Positive predictive value	5.6%
Negative predictive value	99.9%

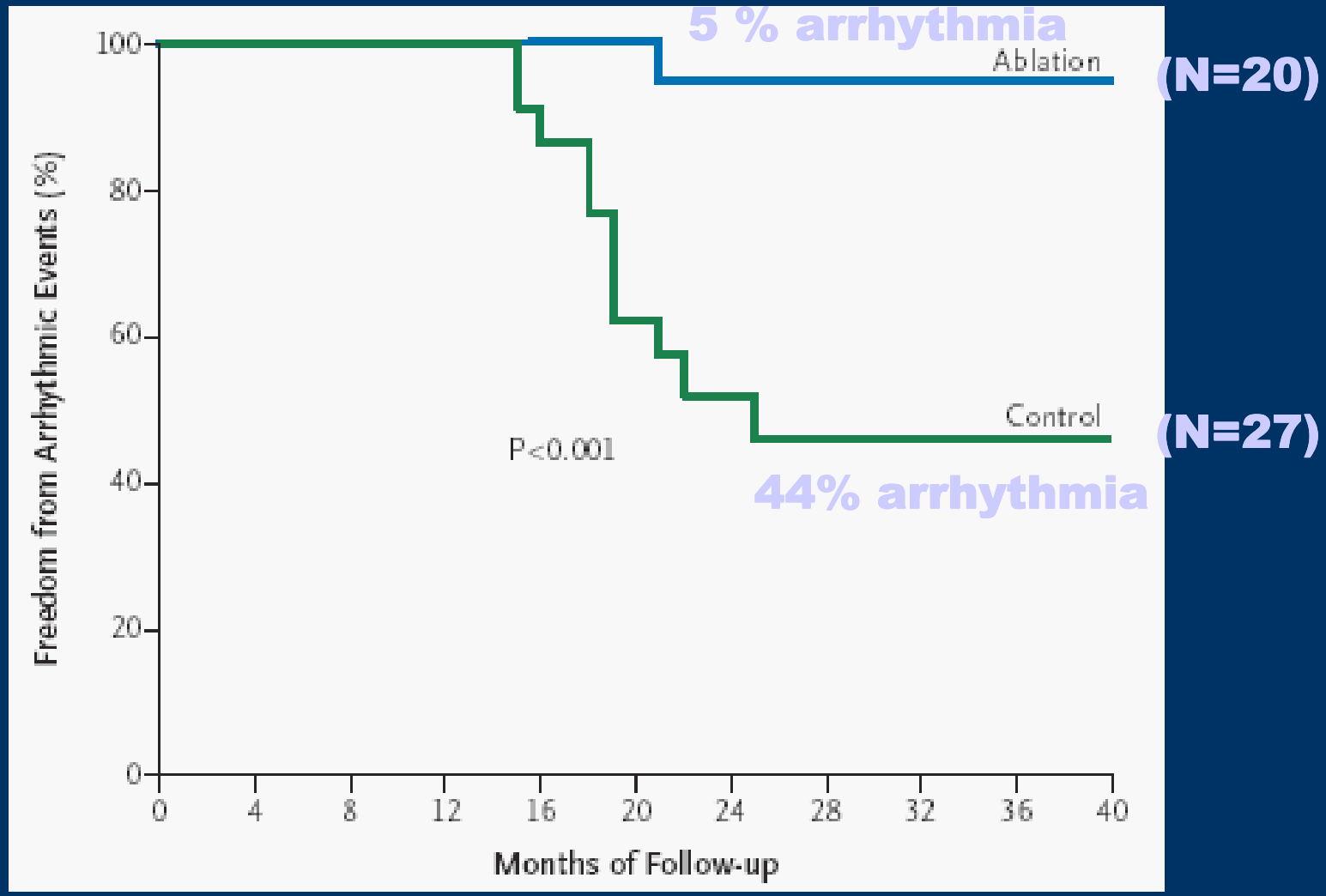
… for a SCD risk of 1% à 10 years

Asymptomatic Patient – EP study

A Randomized study of ablation in WPW syndrome (Pappone et al NEJM 2003)



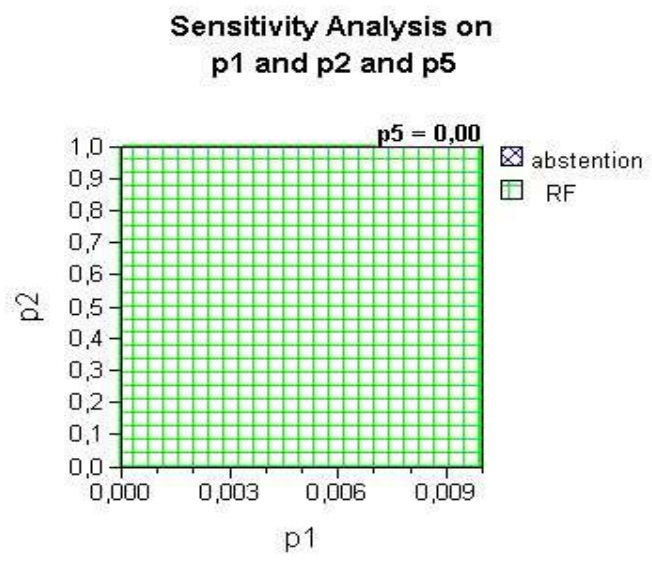
A Randomized study of ablation in WPW syndrome in children (5-12 y) (Pappone et al NEJM 2004)



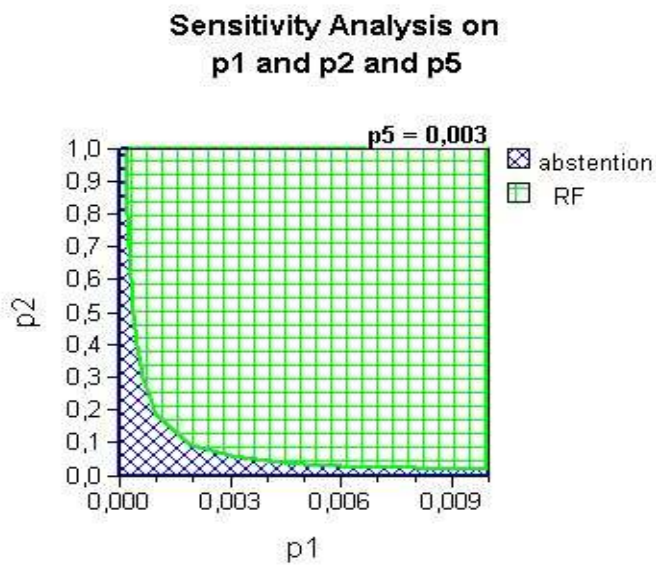
Decision tree : Sensitivity analysis

from F. Cadi
Thèse Médecine Lyon
2005

p1 = SCD risk
p2 = RF ablation succes rate
p5 = Severe complication of RF

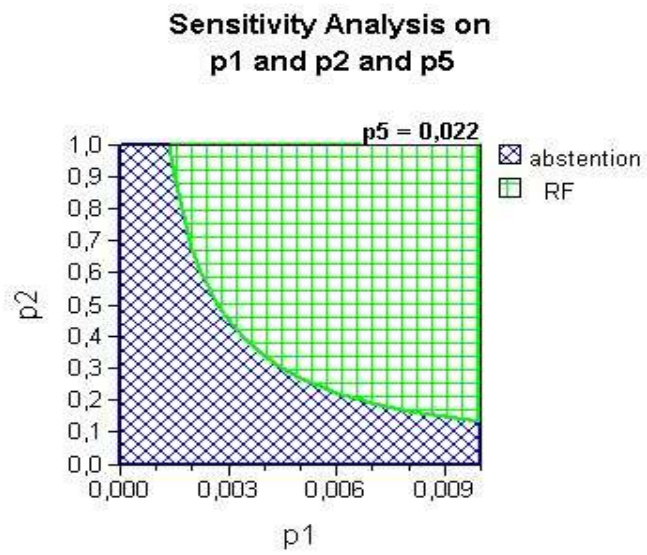


Severe complication rate = 0



Severe complication rate = 3/1000

Severe complication rate = 22/1000 (MERFS)



Asymptomatic patients

Ventricular preexcitation	Recommendation	Class	Level of evidence
Asymptomatic	None	I	C
	Ablation	IIa	B

ACC/AHA/ESC Guidelines for the management of patients with supra ventricular arrhythmias,2003

Recommendations in WPW patients

ACC/AHA/ESC Guidelines for the management of patients with supra ventricular arrhythmias,2003

Ventricular preexcitation	Recommendation	Class	Level of evidence
Arrhythmia well tolerated	Ablation	I	B
Arrhytmia, poorly tolerated	Ablation	I	B
Asymptomatic	Ablation	IIa	B

Ablation des voies accessoires : Indications

- Absolues : FA rapide conduite par la VA
- Consensuelles : pts symptomatiques malgré un trt bien conduit (localisation non dangereuse surtout)
- Discutables :
  - pts symptomatiques en première intention (localisation non dangereuse uniquement)
  - pts asymptomatiques (activités, souhaits…) selon les résultats de l'EEP (localisation non dangereuse uniquement)