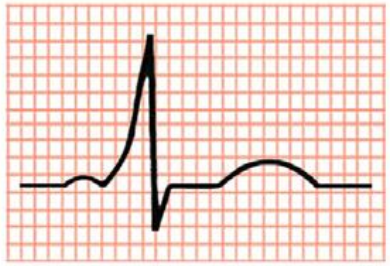
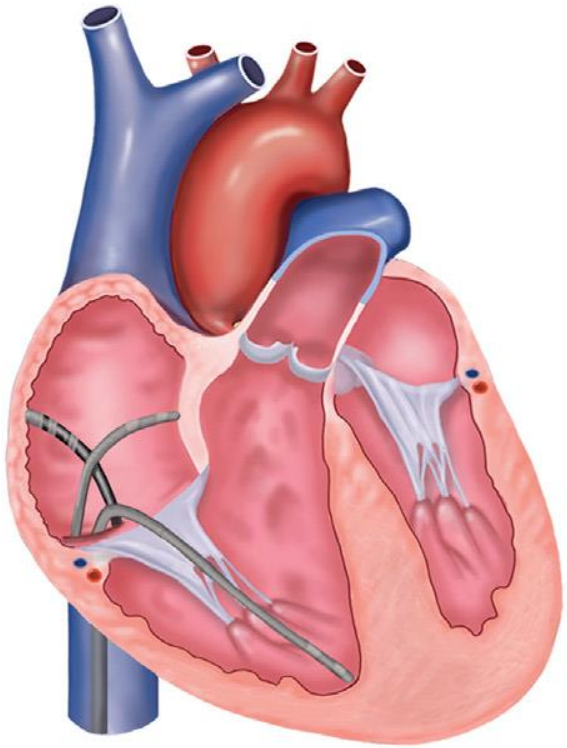
UNIVERSITÉ FRANÇOIS - RABELAIS TOURS

CHRU HÔPITAUX DE TOURS





WPW de l'enfant

Dr. Bertrand PIERRE

Hôpital Trousseau - C.H.R.U. Tours

DE LA

TACHYCARDIE ESSENTIELLE PAROXYSTIQUE

Par L. BOUVERET,

Agrégé, médecin des hôpitaux de Lyon.

Léon Bouveret (1850-1929)

The American Heart Journal

VOL. V AUGUST, 1930 No. 6

Original Communications

BUNDLE-BRANCH BLOCK WITH SHORT P-R INTERVAL IN HEALTHY YOUNG PEOPLE PRONE TO PAROXYSMAL TACHYCARDIA

LOUIS WOLFF, M.D., BOSTON, MASS., JOHN PARKINSON, M.D., LONDON, ENG., AND PAUL D. WHITE, M.D., BOSTON, MASS.

The American Heart Journal

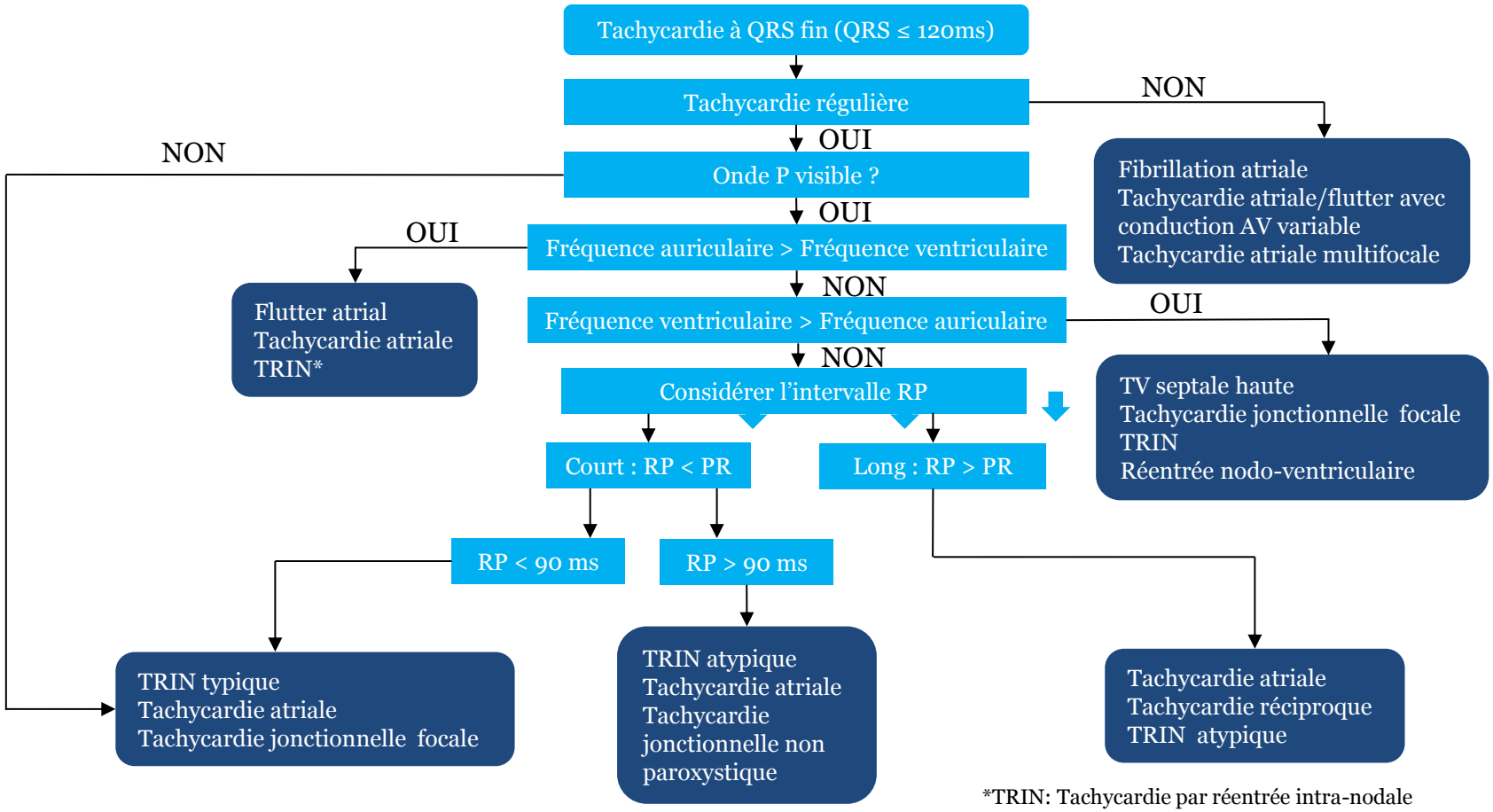
VOL. VIII FEBRUARY, 1933 NO. 3

Original Communications

THE MECHANISM OF PRODUCTION OF SHORT P-R INTERVALS AND PROLONGED QRS COMPLEXES IN PATIENTS WITH PRESUMABLY UNDAMAGED HEARTS: HYPOTHESIS OF AN ACCESSORY PATHWAY OF AURICULO-VENTRICULAR CONDUCTION (BUNDLE OF KENT)*

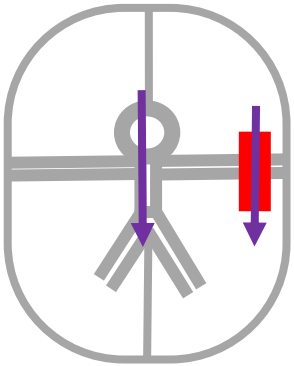
CHARLES C. WOLFERTH, M.D., AND FRANCIS CLARK WOOD, M.D.
PHILADELPHIA, PA.

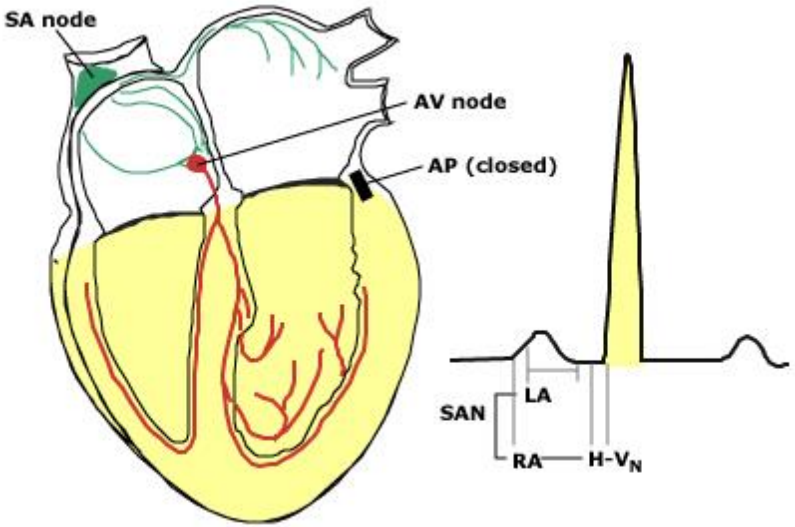
Diagnostique différentiel d'une TSV

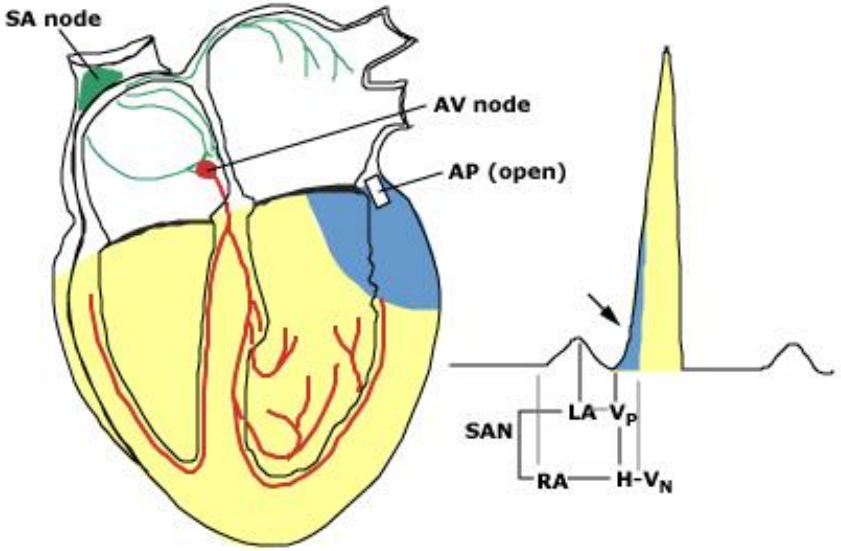


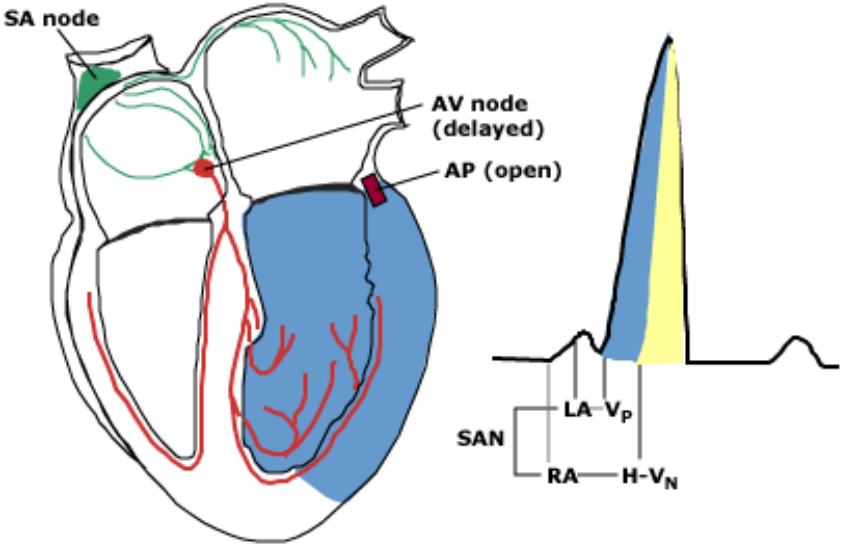
*TRIN: Tachycardie par réentrée intra-nodale

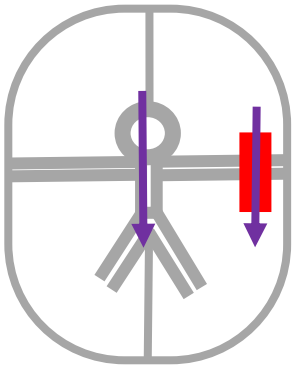
Voie accessoire / conduction antérograde



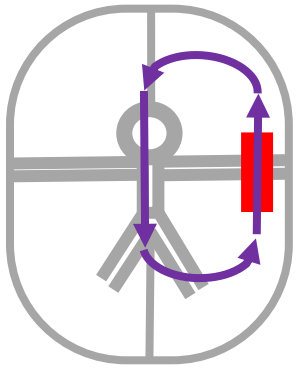




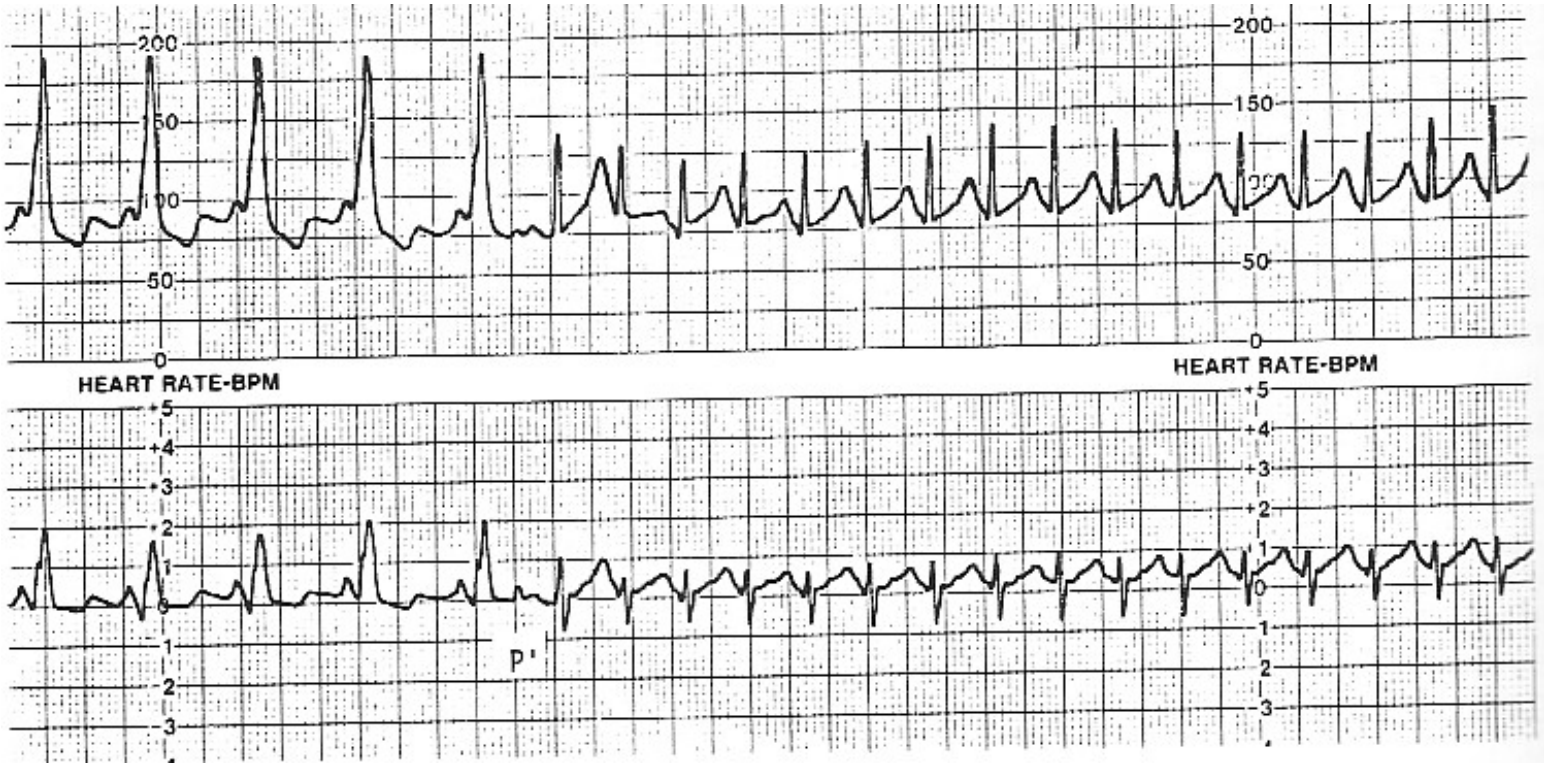




RS + pre-excitation



Tachycardie jonctionnelle



Pre-excitation ventriculaire **= Voie accessoire avec conduction antérograde**

Prévalence pre-excitation= 0,1-0,3 % population générale

Syndrome de WPW**= tachycardie paroxystique + pre-excitation ventriculaire**

TJ sans pre-excitation et sans cardiopathie = pas de risque vital

Risque palpitations (Tachycardie jonctionnelle) / rare syncope

Nécessite arrêt de l'effort / manœuvre vagal

Ttt prophylactique : Betabloquant / inhibiteur calcique bradycardisant

Risque mort subite ? Nécessite d'exclure une pre-excitation latente

If competitive athletic activity is desired, curative treatment by ablation should be considered. Ablation outcome is equally safe and has similar acute success rates in athletes and non-athletes.[495] If the PSVT is only sporadic and transient and not associated with haemodynamic consequences, even when it develops during exercise, or in cases where ablation is not desired or unsuccessful, sports activity is permissible when there is no increased risk of a fatality from a potential loss of consciousness (such as motorsports drivers, parachute jumpers, divers, and so on).

5.6.3.2 Prognostic and symptomatic relevance of pre-excitation

It has been estimated that one third of patients with WPW syndrome may develop AF and, in such cases, rapid conduction over the AP can lead to ventricular fibrillation (VF) and sudden death. Given the fact that AF is more common in athletes, pre-excitation constitutes a prognostic concern in athletes. The risk for sudden death in patients with pre-excitation varies in population-based studies from 0.15–0.20%, and usually presents during exercise or emotional stress.[496]

Ablation of the AP is recommended in competitive and recreational athletes with pre-excitation and documented arrhythmias. In the event of transient, infrequent well-tolerated arrhythmia (even during exercise), good anticipation of an ablation procedure with increased risk (e.g. anteroseptal AP), or reluctance of the athlete to undergo ablation, management should be guided by assessment of the antegrade conduction characteristics of the AP using either non-invasive tests or an invasive electrophysiological (EP) study.

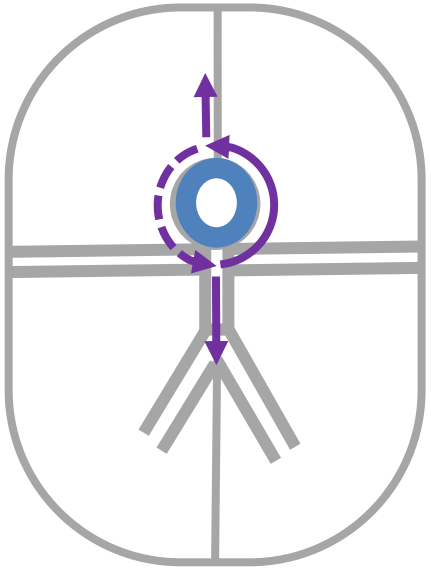
Non-invasive investigation examines for intermittent pre-excitation on ECG or Holter, for abrupt disappearance of pre-excitation after administration of a low dose of class I drugs, or for its abrupt disappearance during an exercise test.[497] In cases of a long refractory period and hence low risk for sudden death, continuation of sports activity is permitted without ablation on the understanding that sporting activity should be stopped in the event of recurrence of palpitations.

In competitive athletes with asymptomatic pre-excitation an EP study is warranted to evaluate the risk for sudden death. In the event of a high-risk finding (*Table 15*), ablation of the AP is recommended. For athletes who refuse ablation, or if the procedure is associated with high risk, such as an anteroseptal accessory pathway, participation in competitive sports activities can be discussed on an individual case by case basis including the use of pharmacological therapy, although there are currently no data about its efficacy. Sports in which the potential loss of consciousness could be fatal should be discouraged.

In recreational athletes with asymptomatic pre-excitation, risk assessment may first be pursued via non-invasive testing.[497] The sensitivity of non-invasive screening for AP properties that facilitate a fast ventricular response to AF/AFL is good, but its specificity is low.[498]

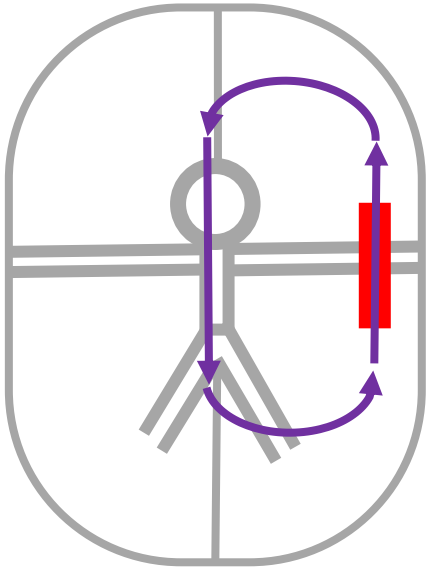
Of note, in children younger than 12 years, the risk of AF-induced VF and sudden death is very low. Generally, a conservative approach

TRIN



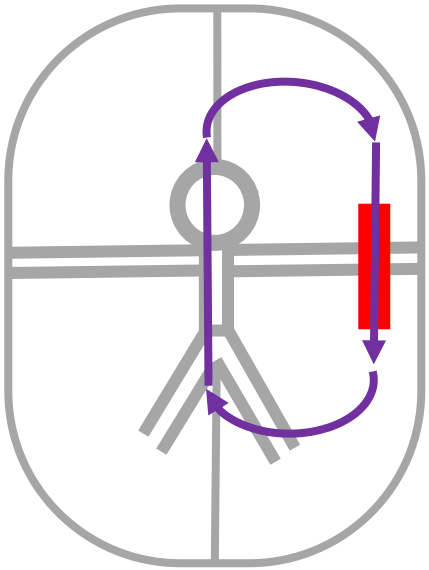
RP'< 90 ms

TJ orthodromique
Voie accessoire



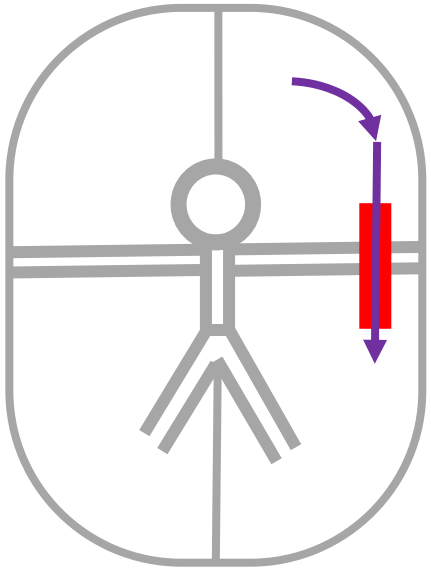
RP'> 90 ms

TJ antidromique
Voie accessoire

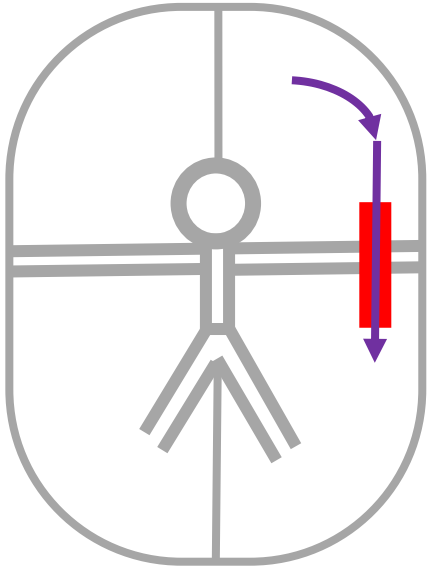


QRS larges

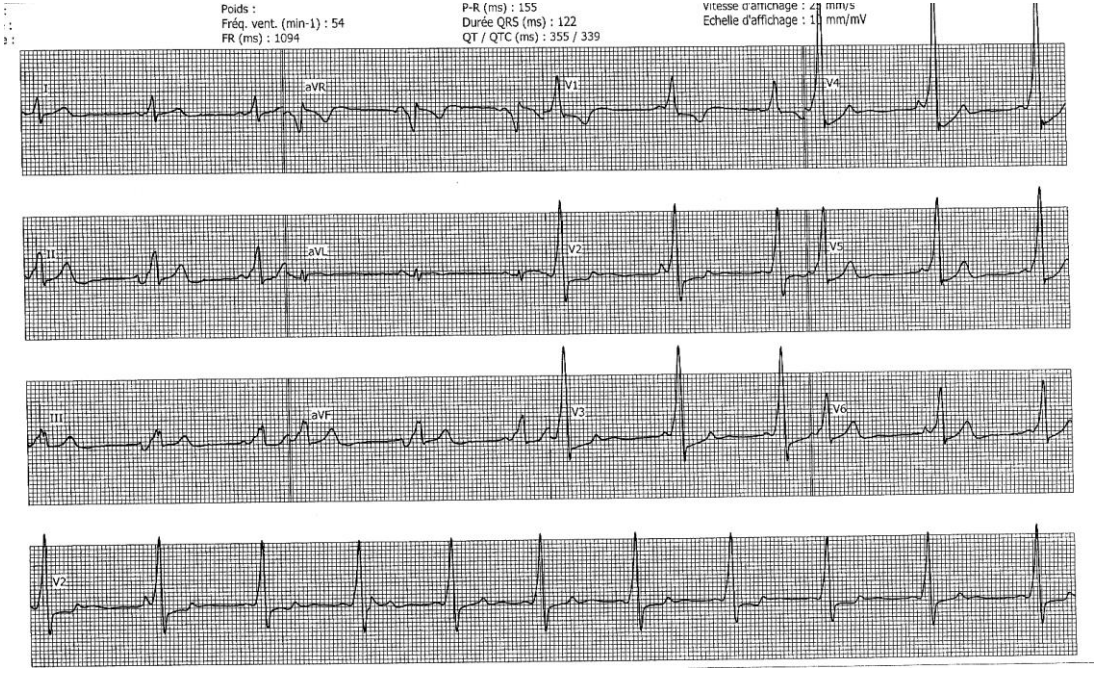
Fibrillation atriale
+
Voie accessoire antérograde



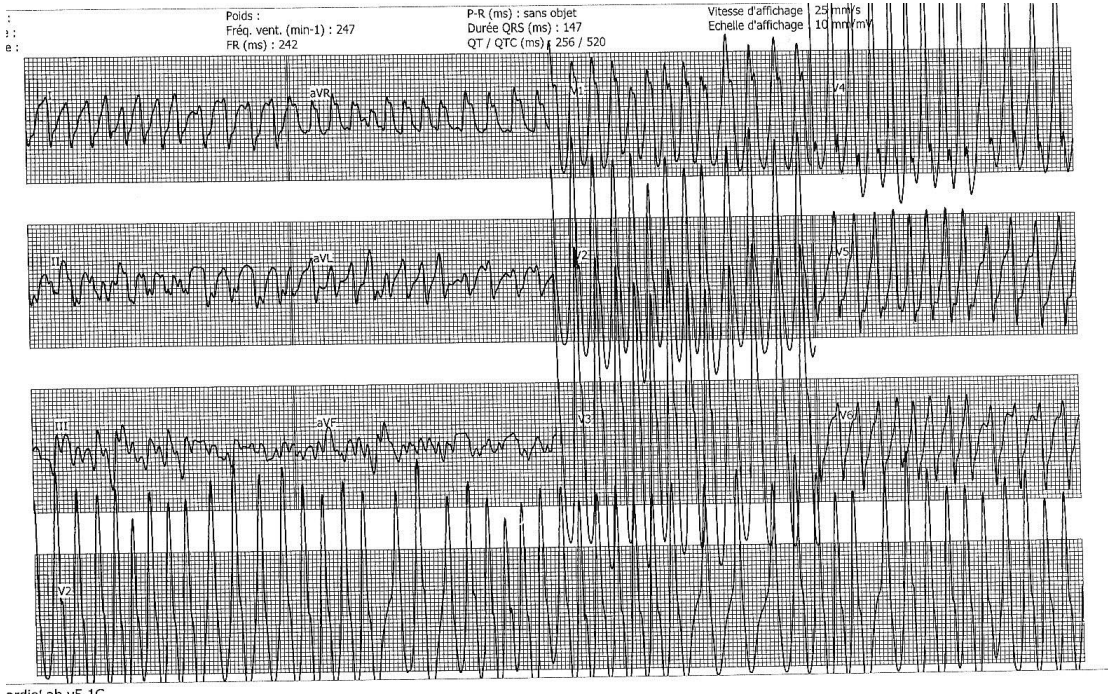
Voie accessoire antérograde

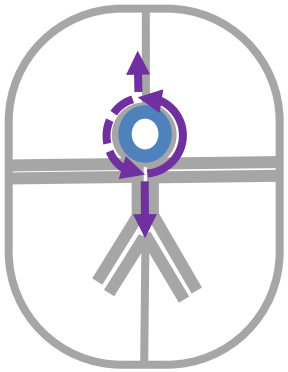


RS

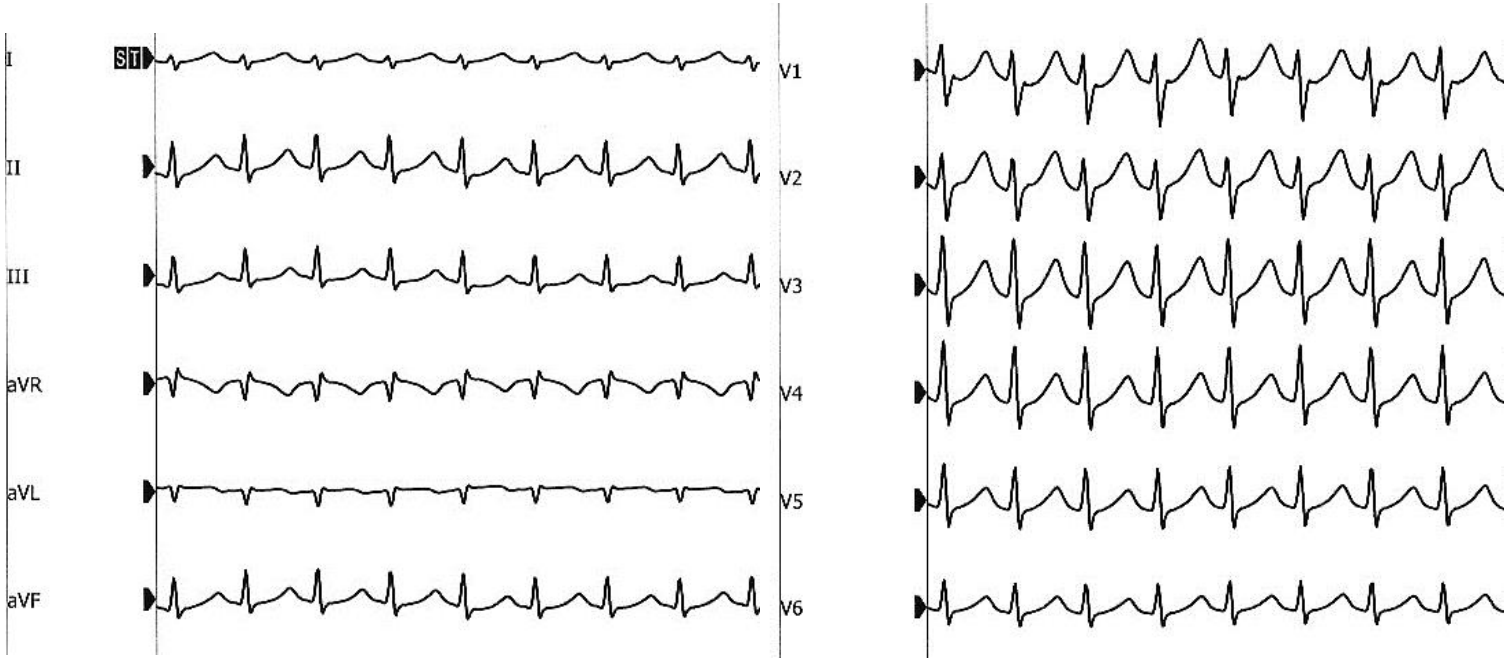


FA

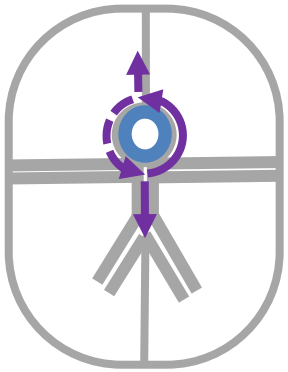




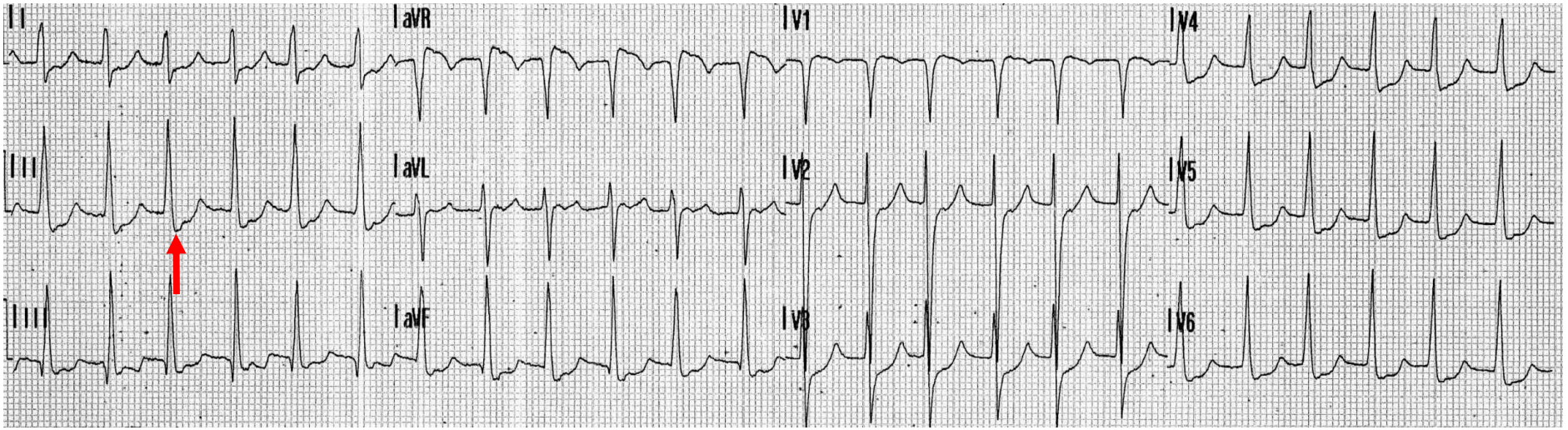
Tachycardie ré-entrante intranodale (TRIN)



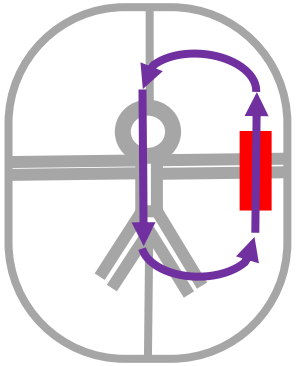
Pas d'onde P visible



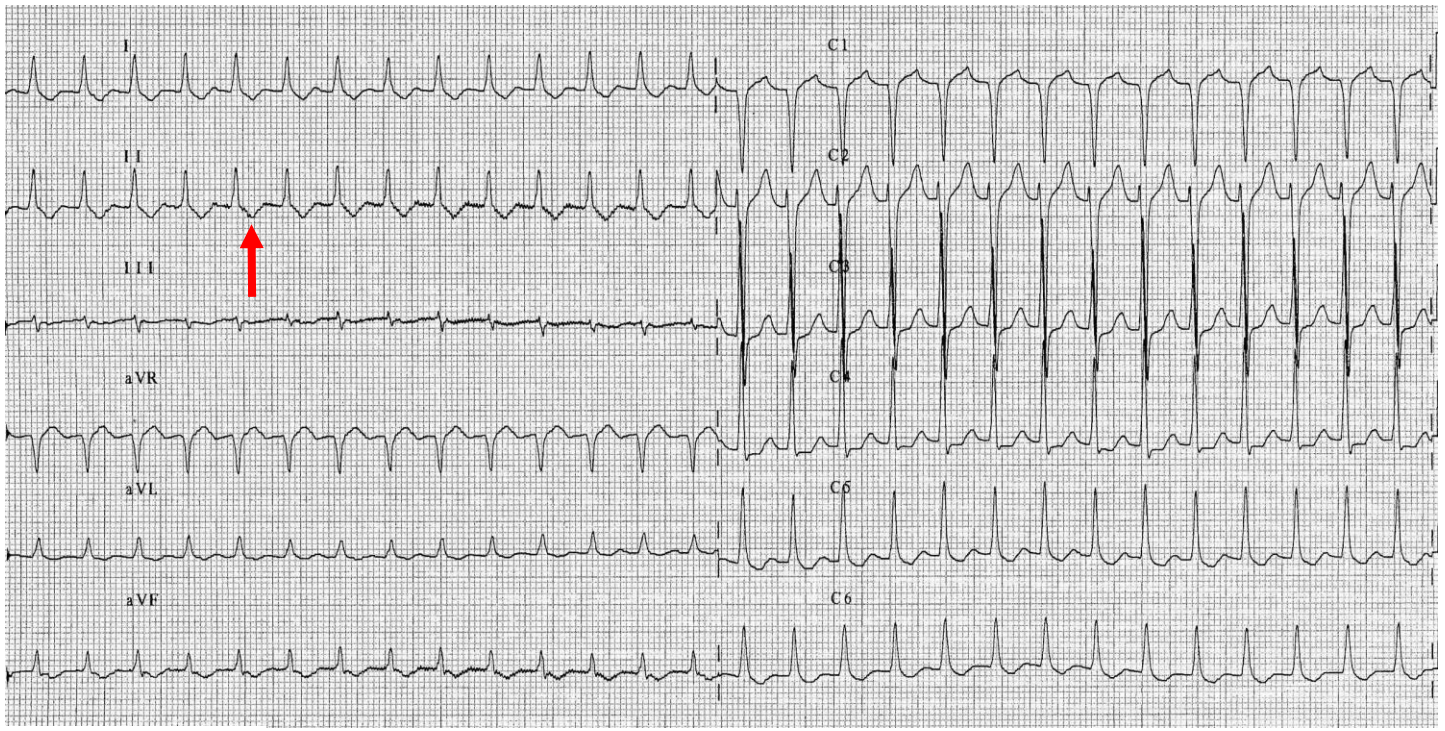
Tachycardie ré-entrante intranodale (TRIN)



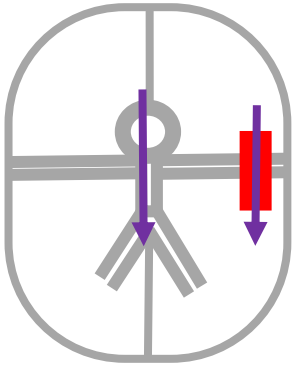
RP'< 90 ms



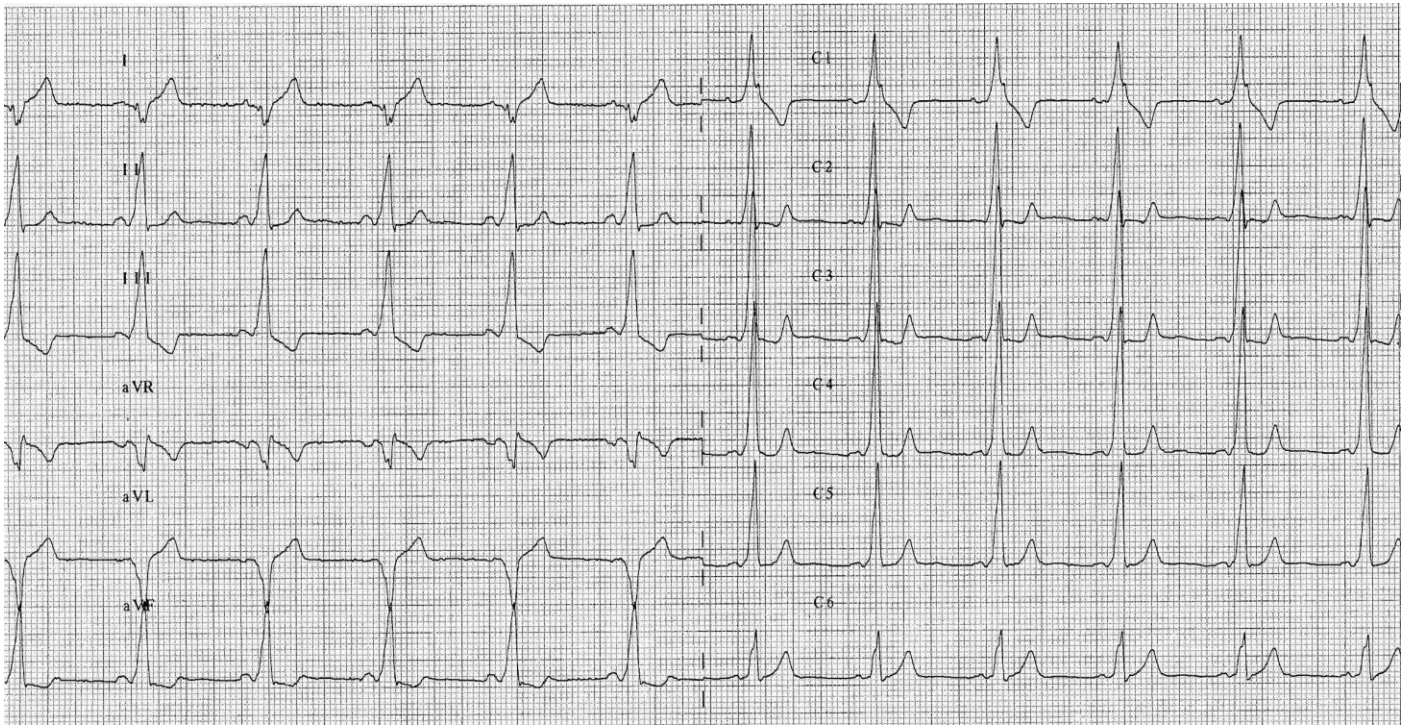
Tachycardie ré-entrante atrio-ventriculaire par une voie accessoire orthodromique



RP'> 90 ms

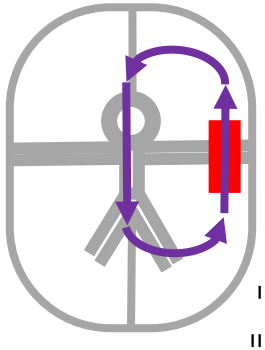


Voie accessoire avec conduction anterograde / WPW

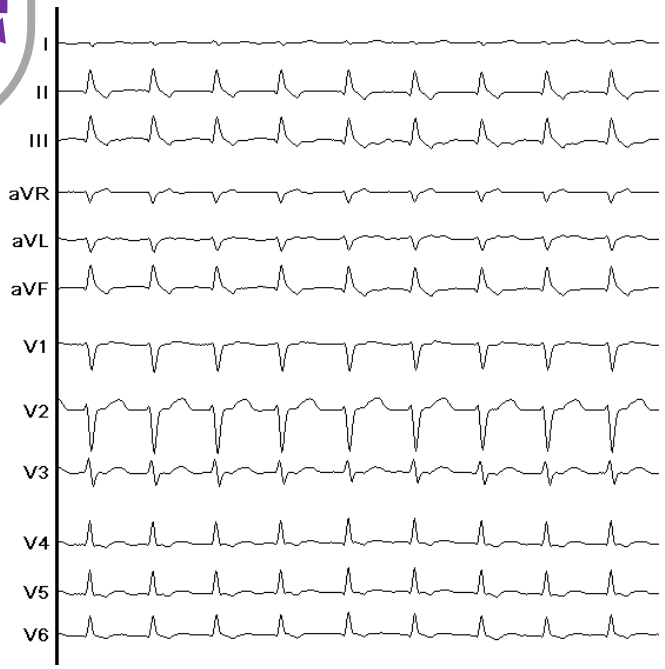


Préexcitation ventriculaire visible en rythme sinusal

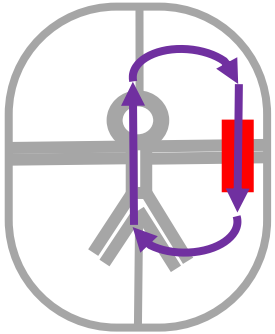
Tachycardie ré-entrante atrio-ventriculaire par une voie accessoire



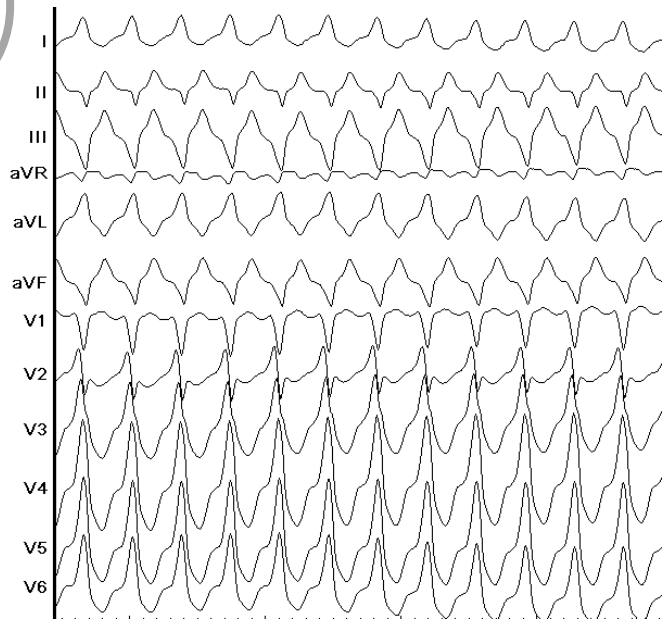
Orthodromique



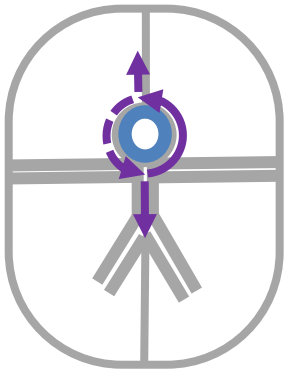
RP'> 90 ms



Antidromique

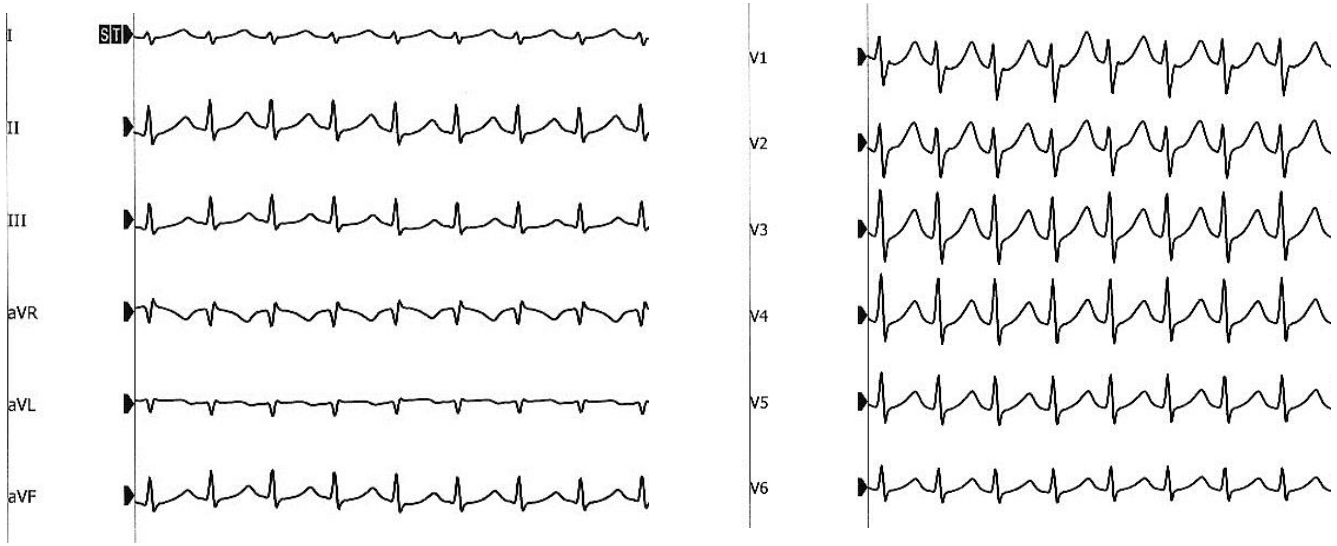


QRS larges

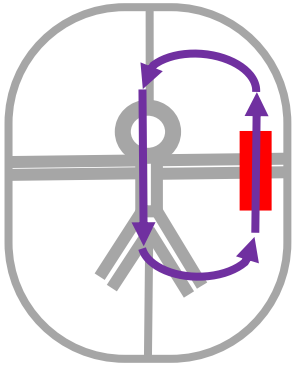


Tachycardie ré-entrante intranodale (TRIN)

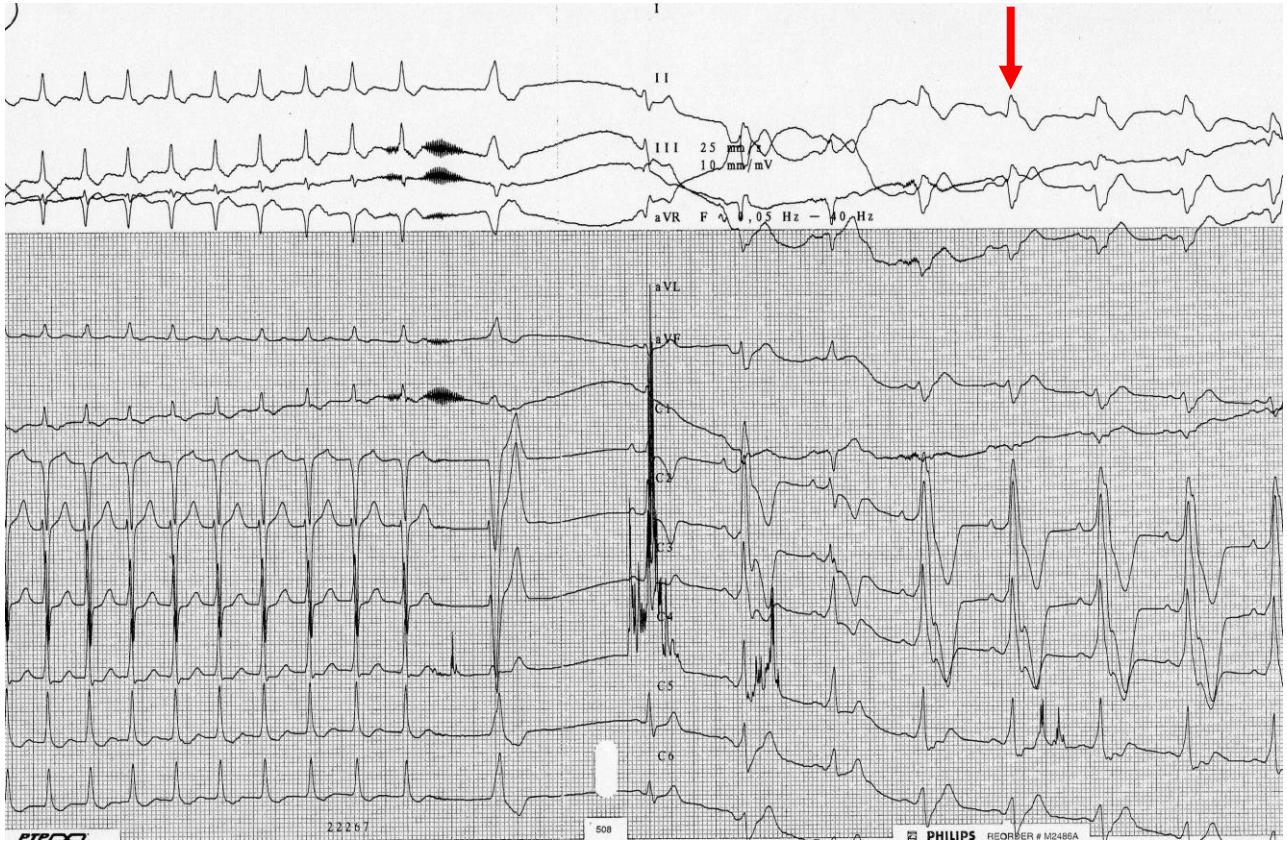
Saut de conduction



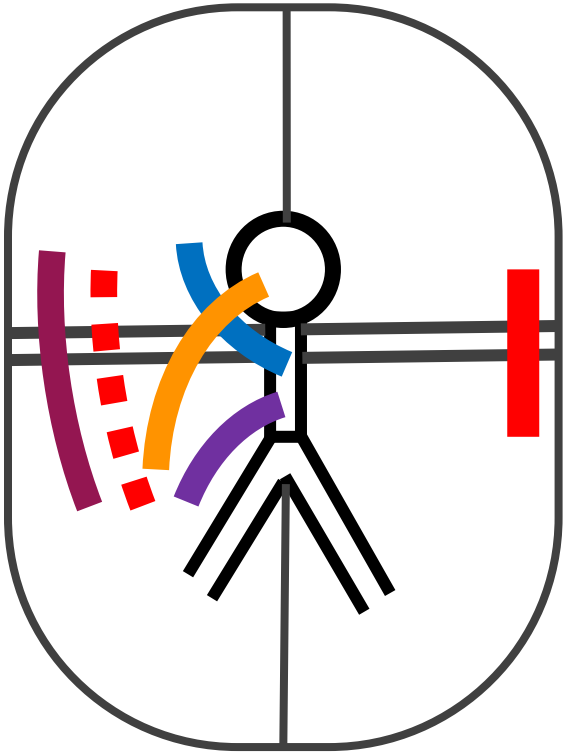
Pas d'onde P visible



Tachycardie ré-entrante atrio-ventriculaire par une voie accessoire orthodromique



Accessory pathway (AP)



no specific atrial pacing site increase delta wave
Complete AV block with adenosine

Accessory pathway without AVRT

Atrio-Hisian — Short PR / no Delta wave

Fasciculo-ventricular — Normal PR / Delta wave

Accessory pathway with AVRT

Atrio-Ventricular — Short PR / Delta wave
Ortho / antidromique AVRT

Ventriculo-atrial — Normal PR / no Delta wave
Retro decremental / no antero
PJRT

Atrio-fascicular — Normal PR / no Delta wave
Antero decremental / no retro
Antidromique AVRT LBBB / left axis (Mahaim)

Nodo-Ventricular — Normal PR / no Delta wave
Antero + retro decremental
Ortho / antidromique AVRT

Voies accessoires atypiques

Preexcitations partielles (pas de TSV)

- *Atrio-Hisienne* (Voie nodale accélérée): PR court (AH court)/ pas d'onde Delta
- *Fasciculo-ventriculaire* (His →SeptumV): PR normal / Onde Delta (HV court)

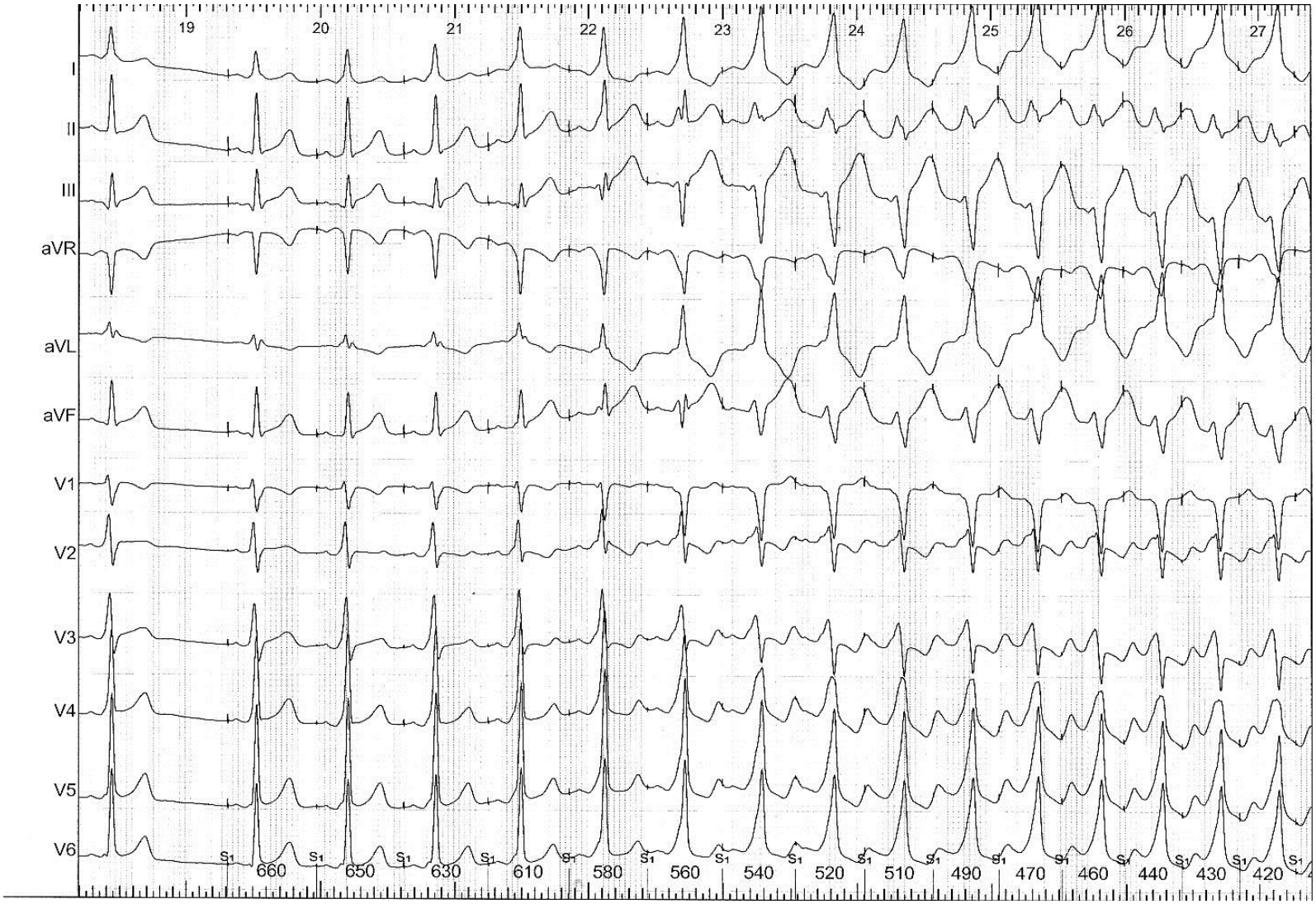
Preexcitations à conduction lente et décrementielle (TSV)

- *Atrio-fasciculaire/ventriculaire:* uniquement antérograde (Mahaim)
  - PR↗ (AH ↗) Onde Delta↗ (H→V)
  - L'aspect de preexcitation ↗ si stim atriale à proximité (Latérale droite)
  - TSV antidromique BBG / axe G
- *Ventriculo-atriale:* uniquement rétrograde (PJRT)
  - TSV orthodromique QRS fins RP'>P'R

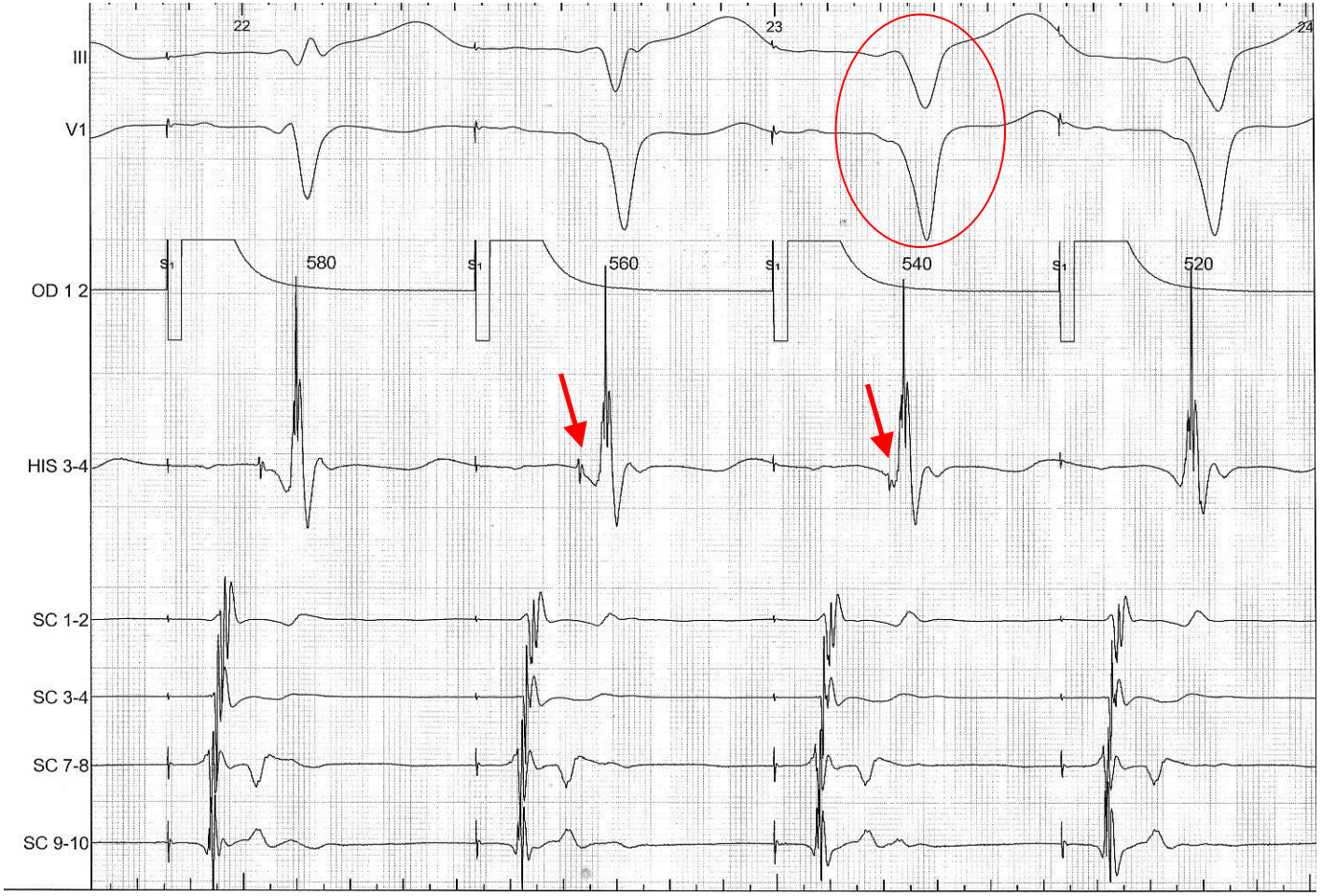
Prexcitations nodo-fasciculaire/ventriculaire (TSV)

- TSV Anti / orthodromique
- Aspect de preexcitation identique qq soit le site de stim atriale
- Bloc AV sous Adenosine

Conduction A-V: stimulation atriale croissante

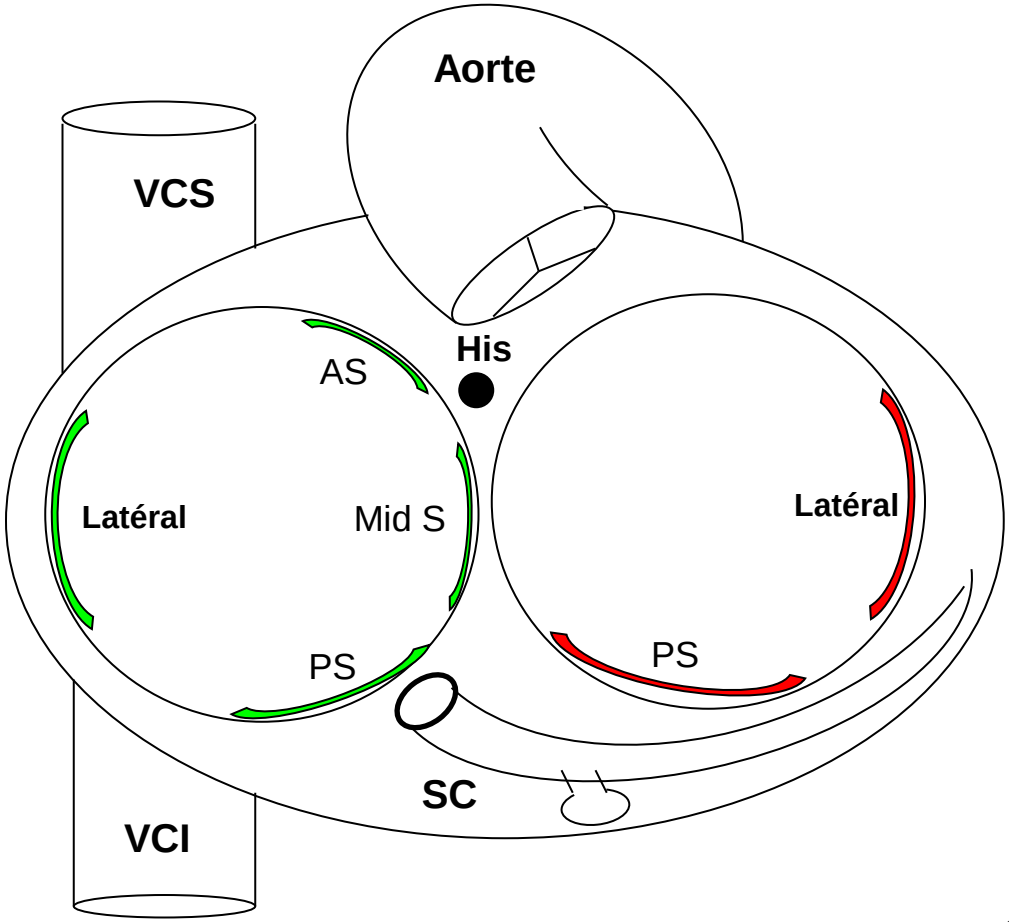


Conduction A-V: stimulation atriale croissante



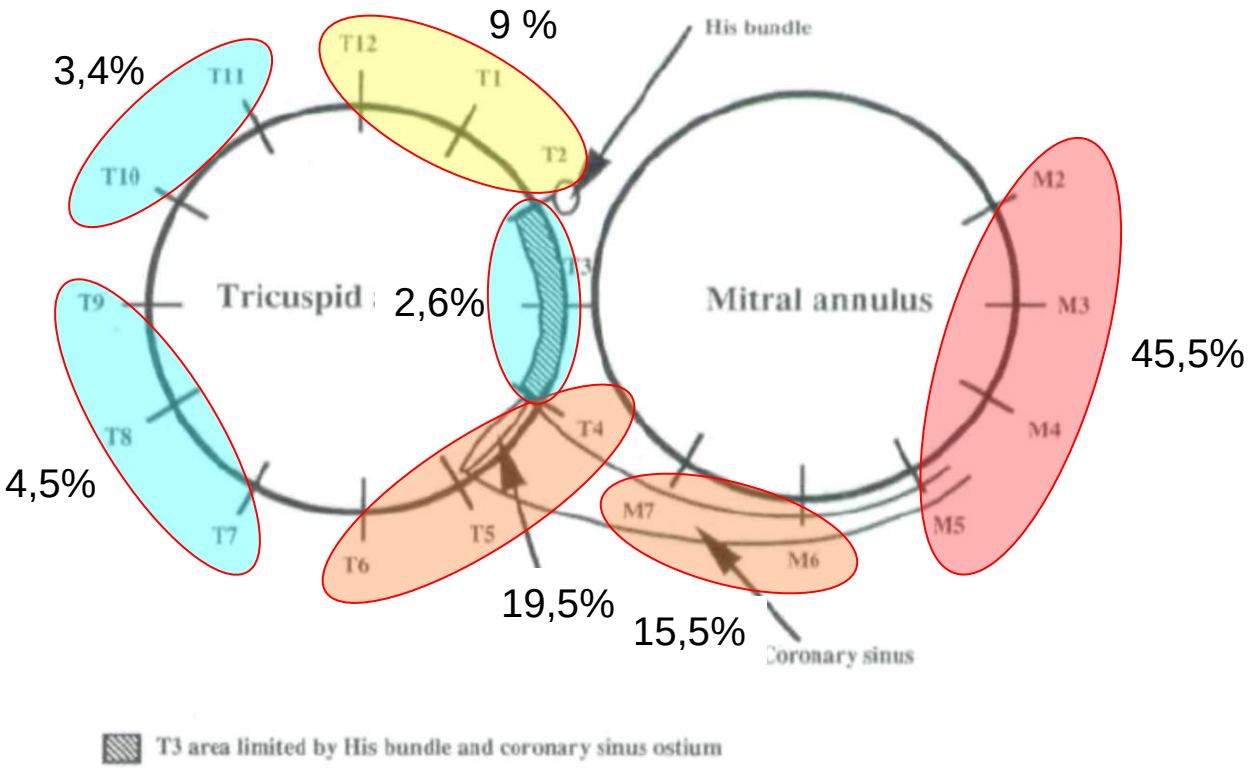
Conduction V-A: stimulation ventriculaire croissante

Localisation des voies accessoires



OAG

Localisation des voies accessoires



Basiouny -JCE 1999, 10, 1340-1349

Ablation des voies accessoires: Récidive

Taux de récidive globale= 12%

<u>Dépend de la localisation:</u>

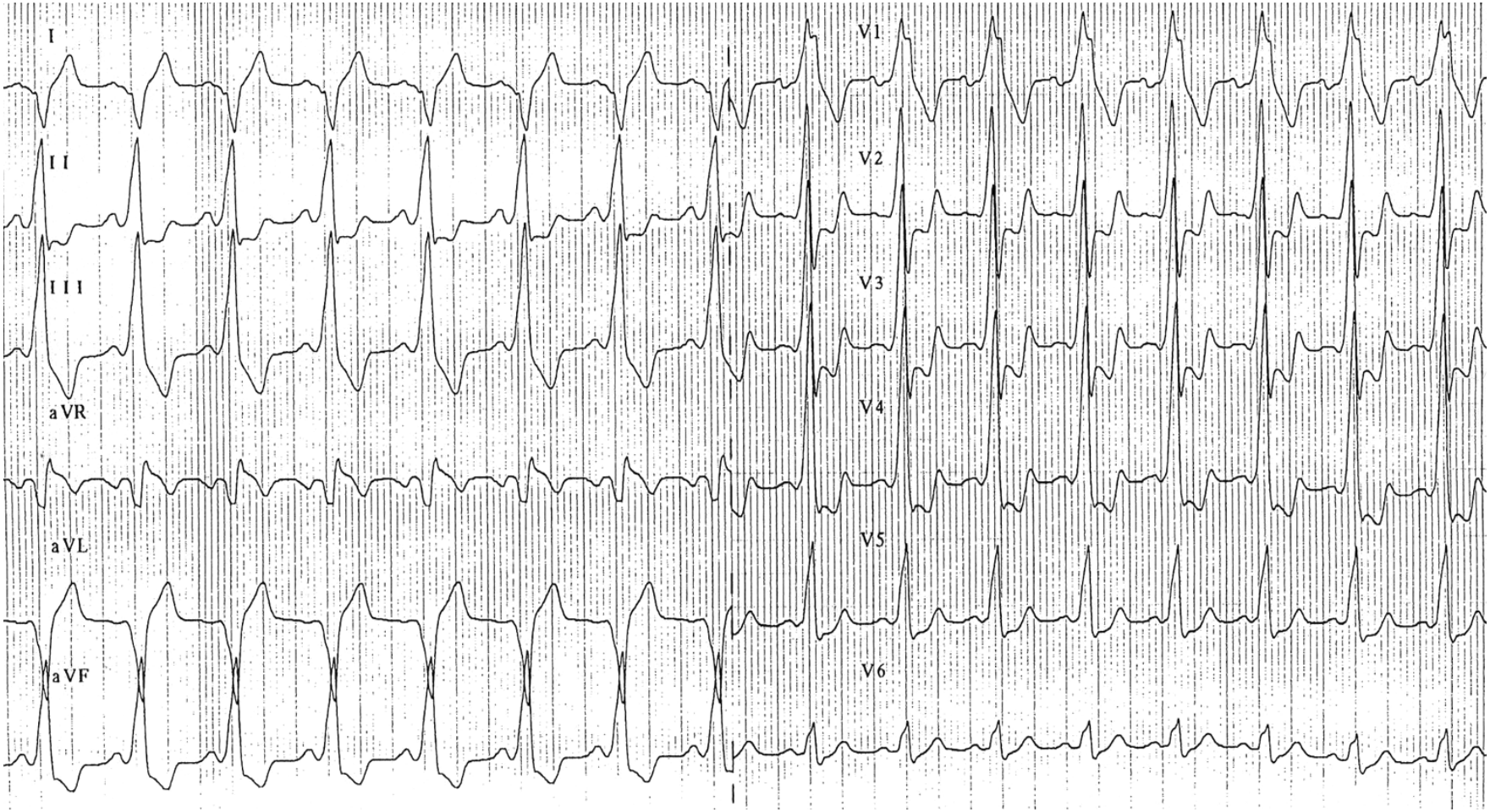
- Latérales droit = 21,5 %
- Antéro-septales = 19,1%
- Postéro-septales = 15,1 %
- Latérales gauche = 8,1%

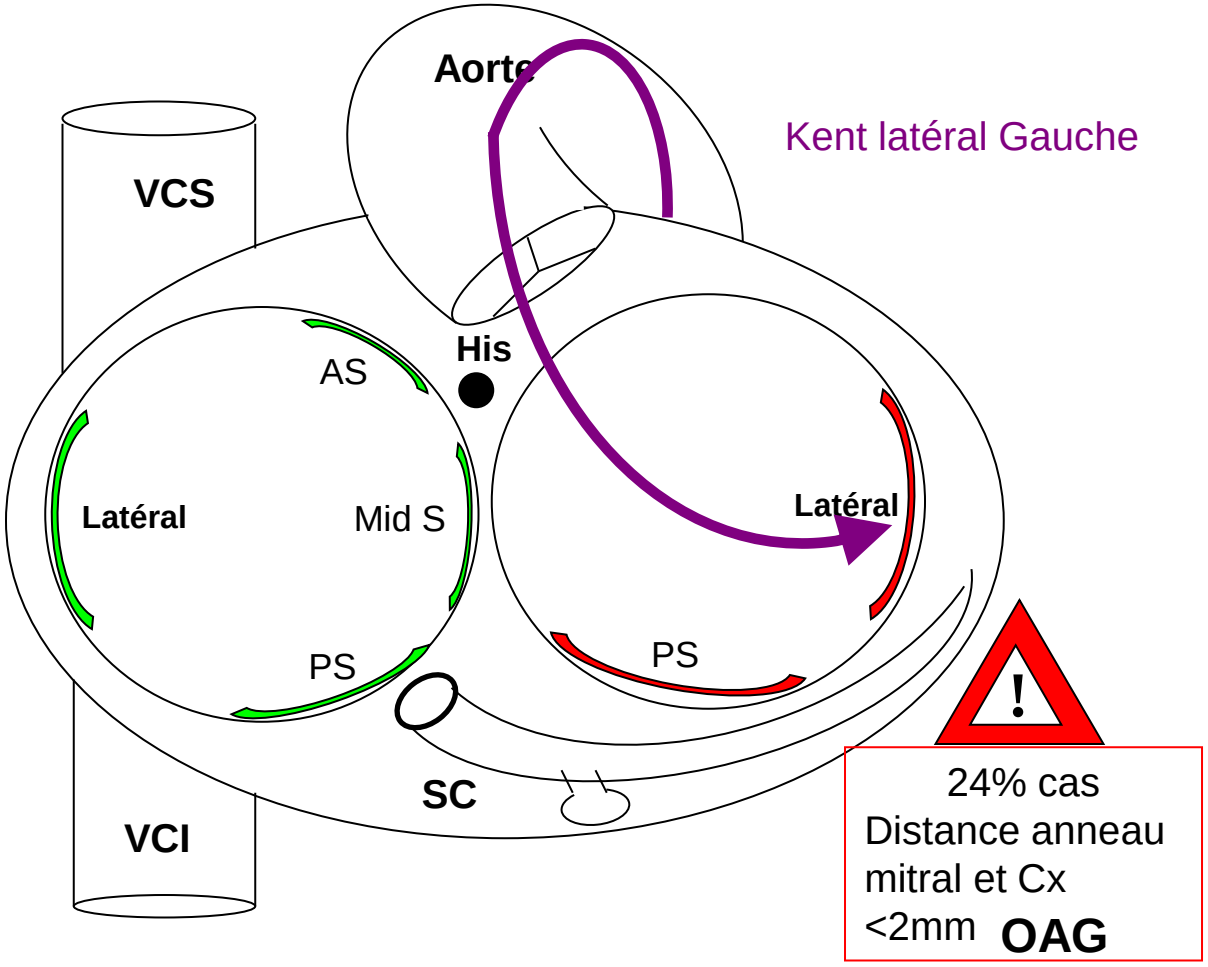
50% avant 24H

50 % avant 1 mois

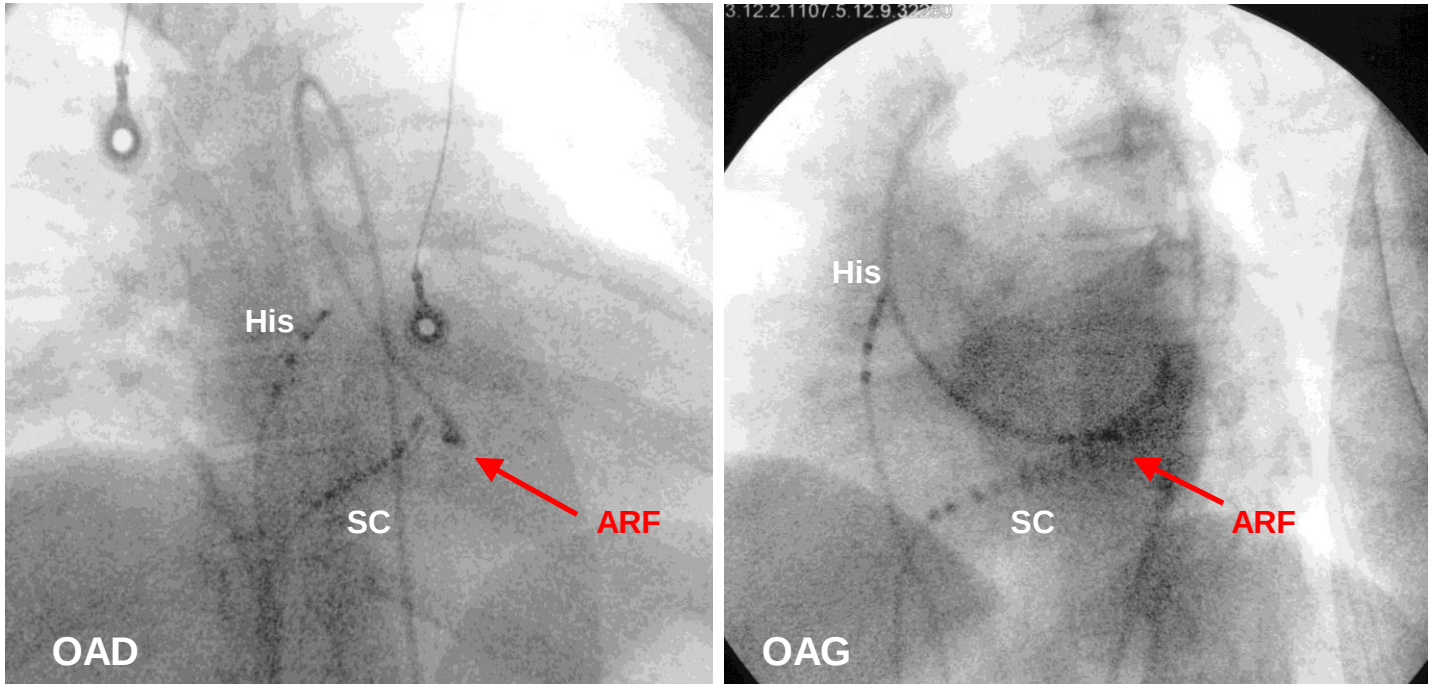
Langberg - JACC 1992, 19, 1588-1592
Swartz- Circulation 1993, 87, 487-499

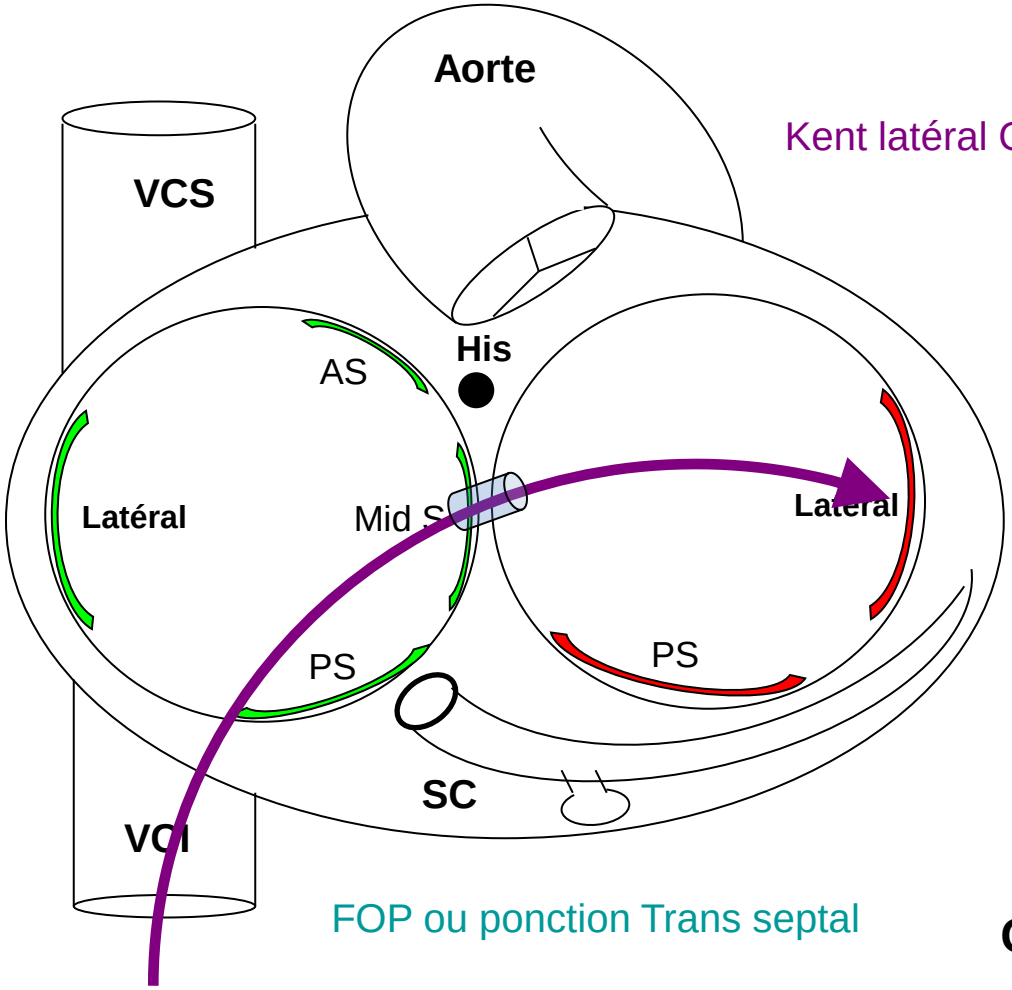
latéral Gauche




Aorte
Kent latéral Gauche
VCS
His
AS
Latéral
Mid S
Latéral
PS
PS
SC
VCI
!
24% cas
Distance anneau mitral et Cx <2mm
OAG

Ablation Kent Latéral Gauche



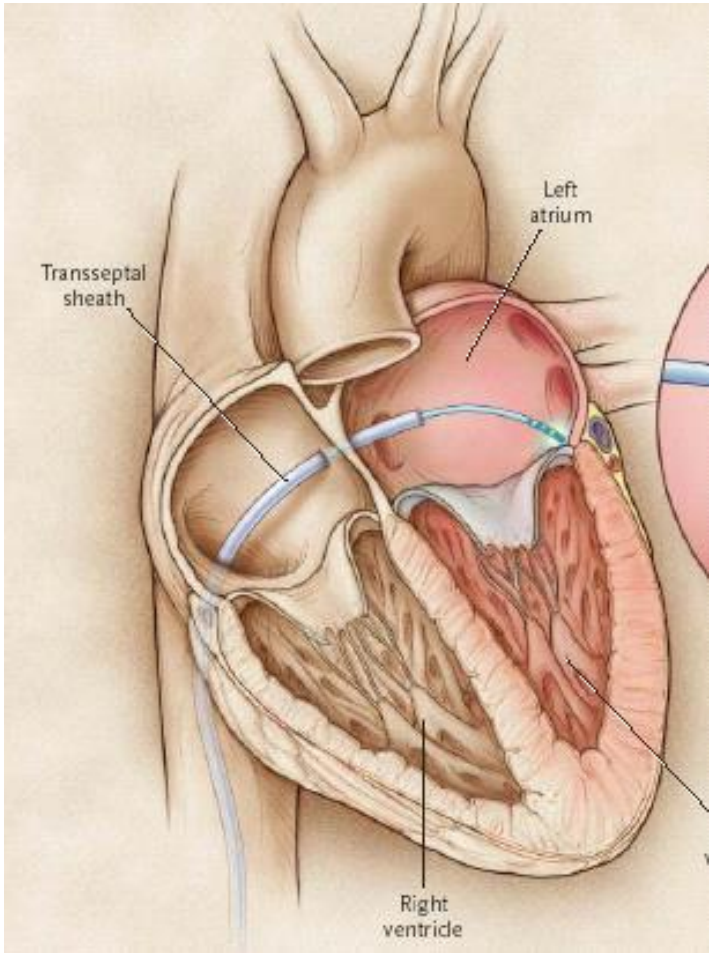


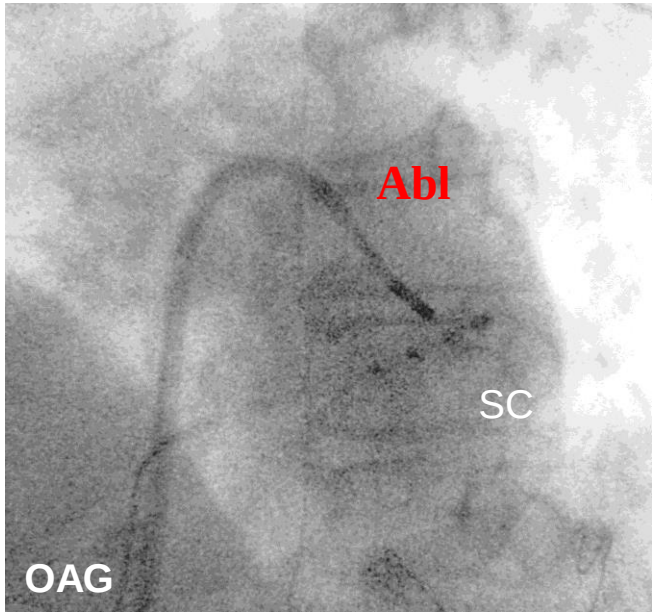
Kent latéral Gauche

FOP ou ponction Trans septal

OAG

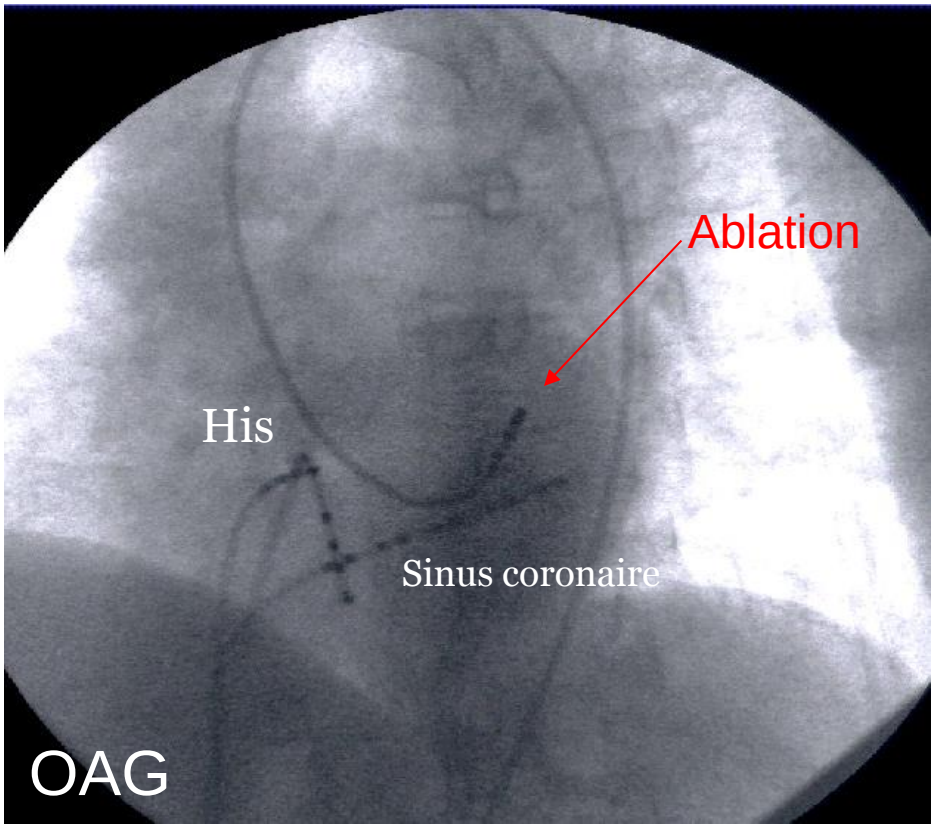
Voie trans septale





Swartz- Circulation 1993, 87, 487-499

Procédure d'ablation



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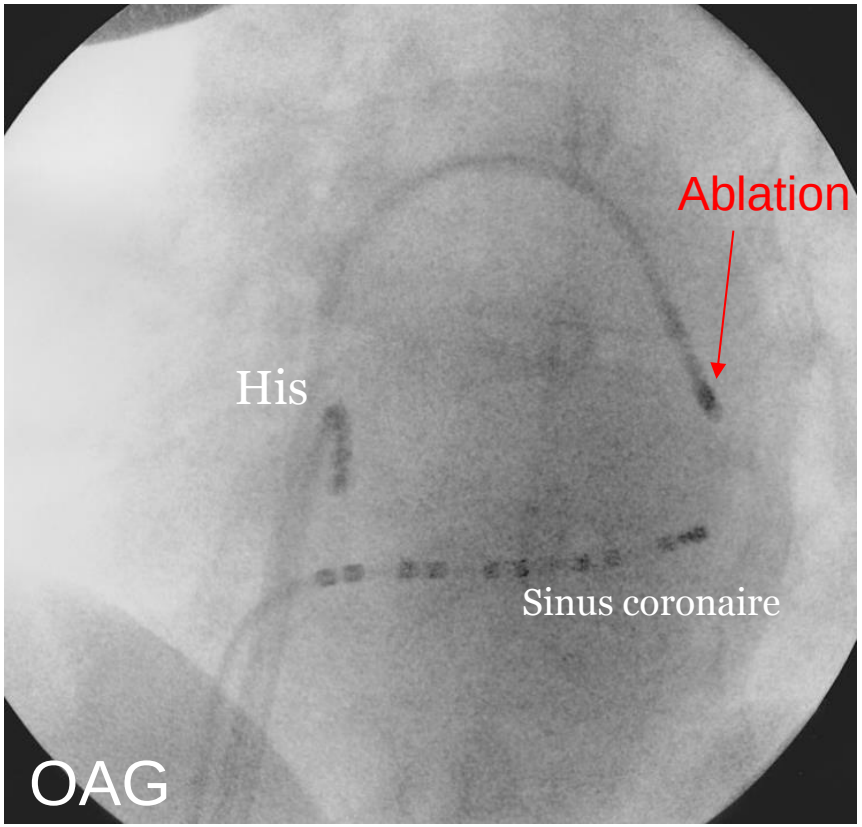

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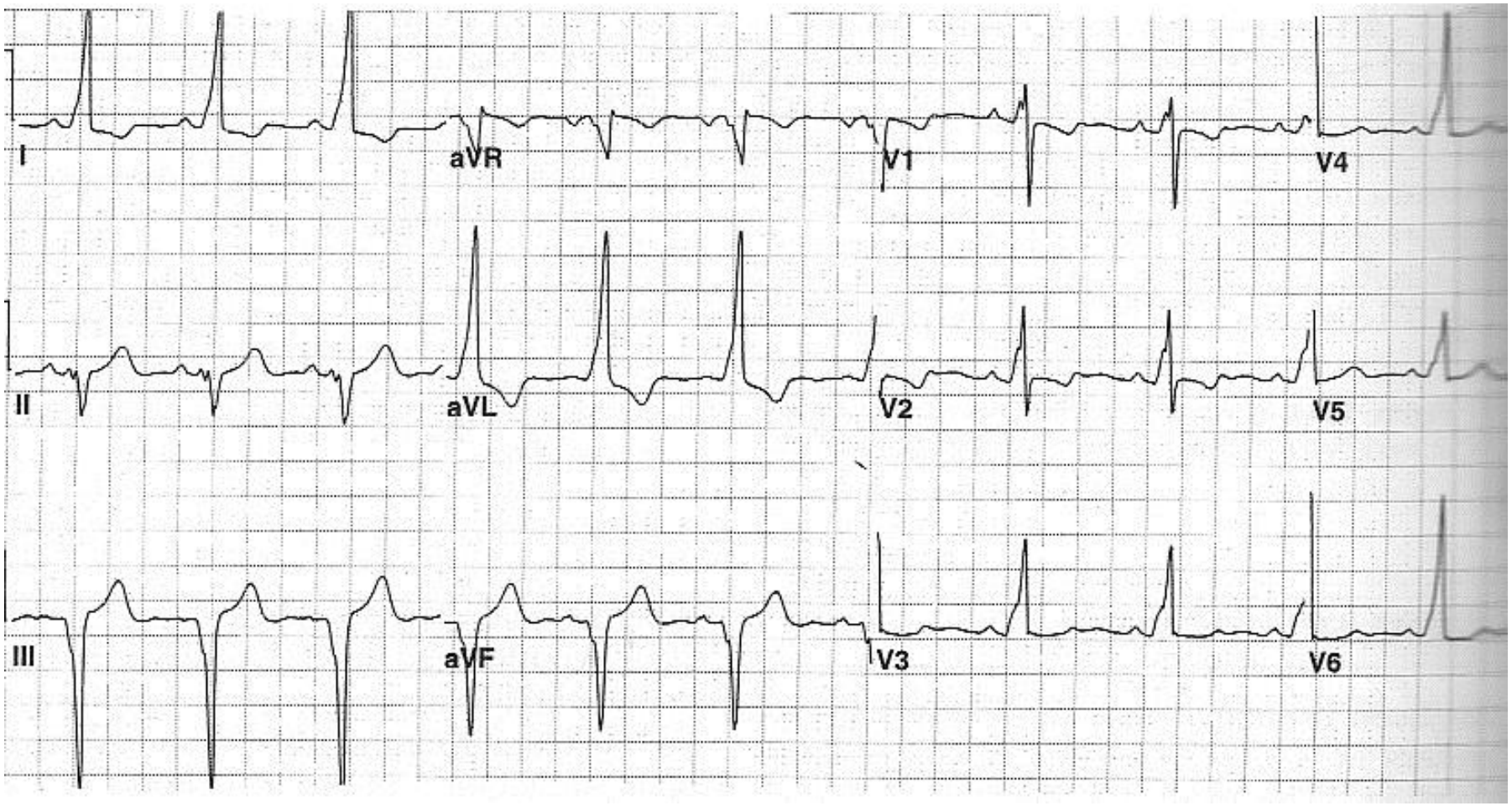

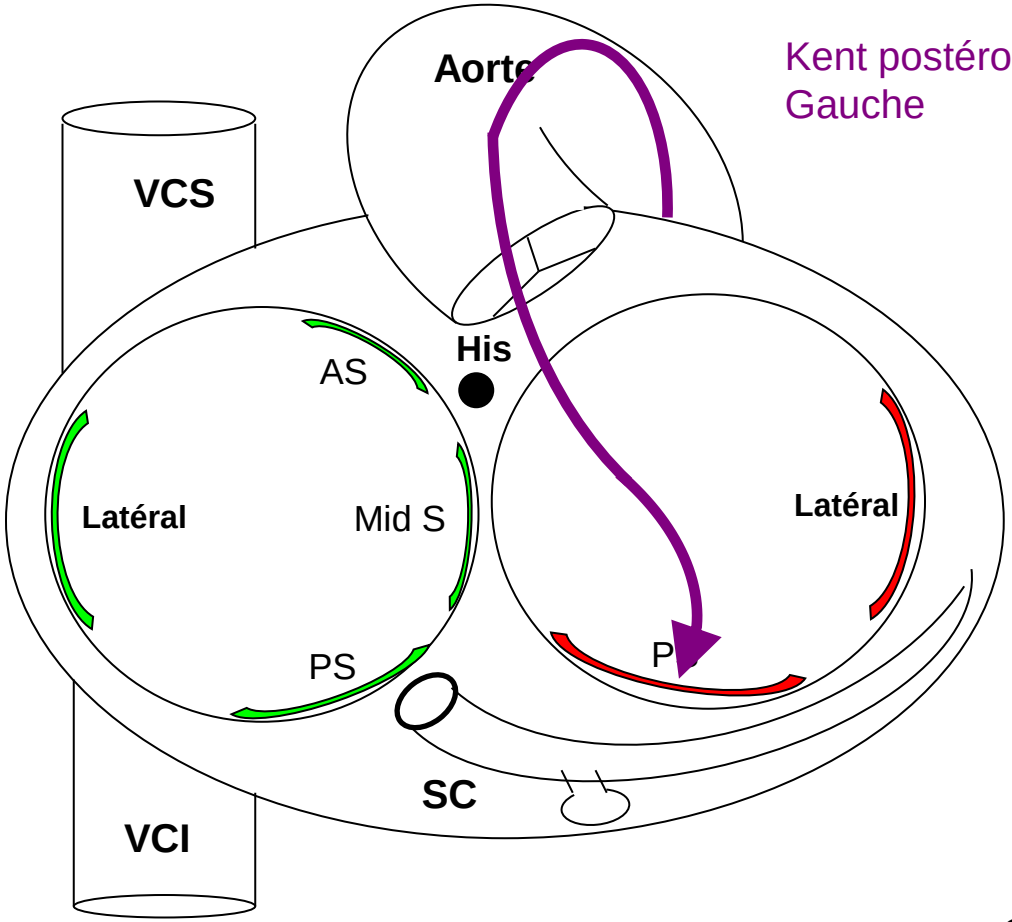
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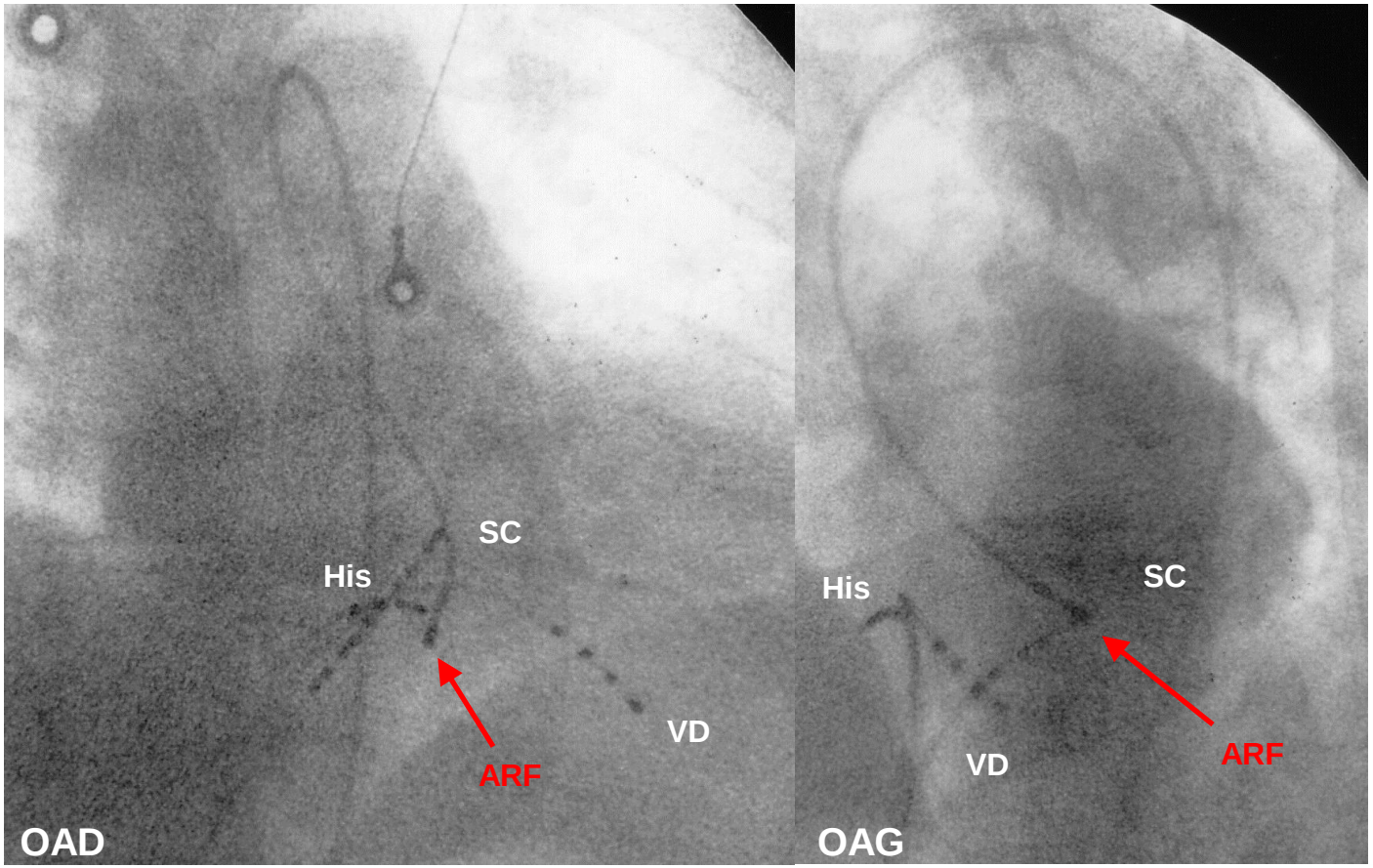

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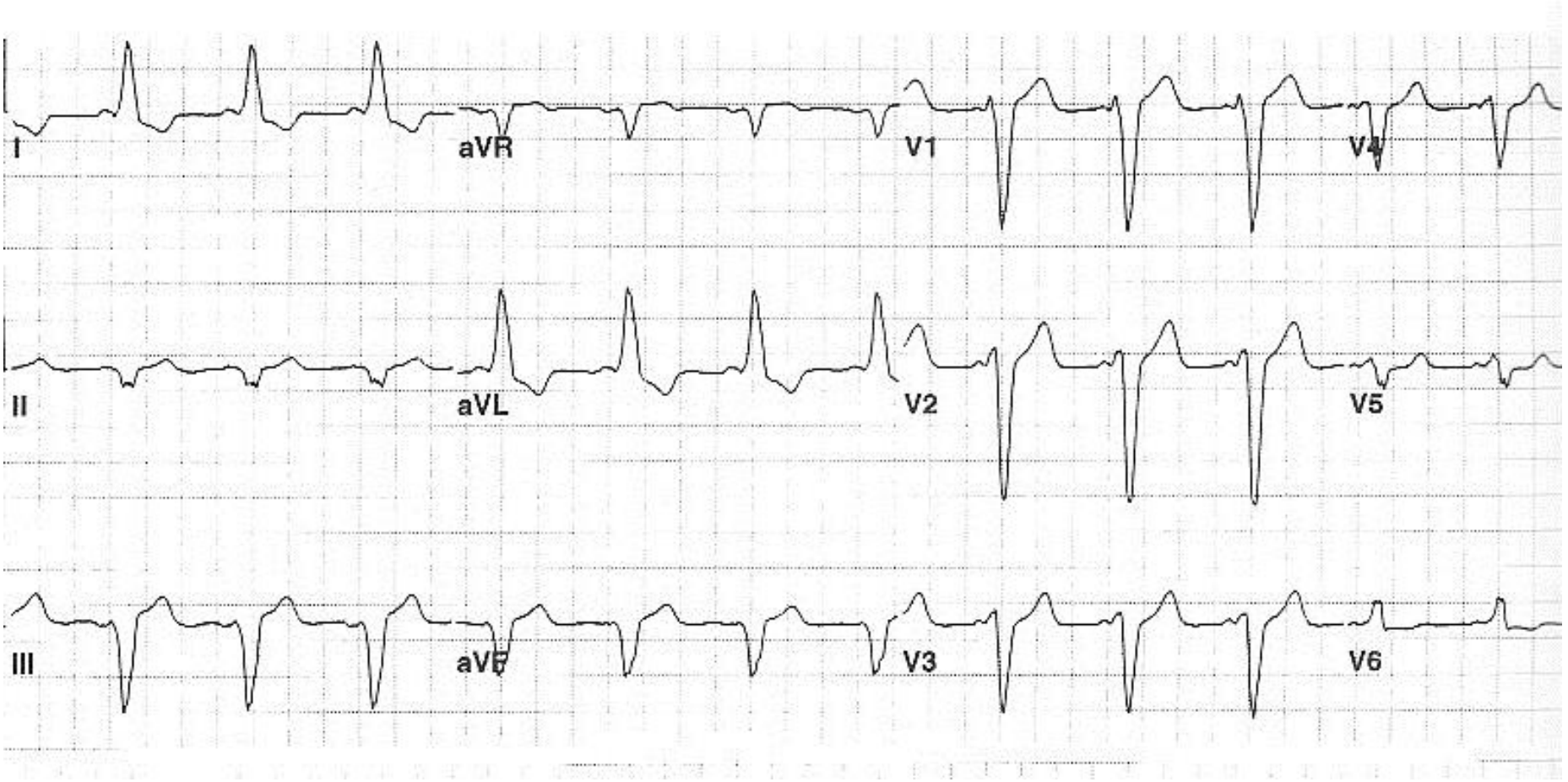

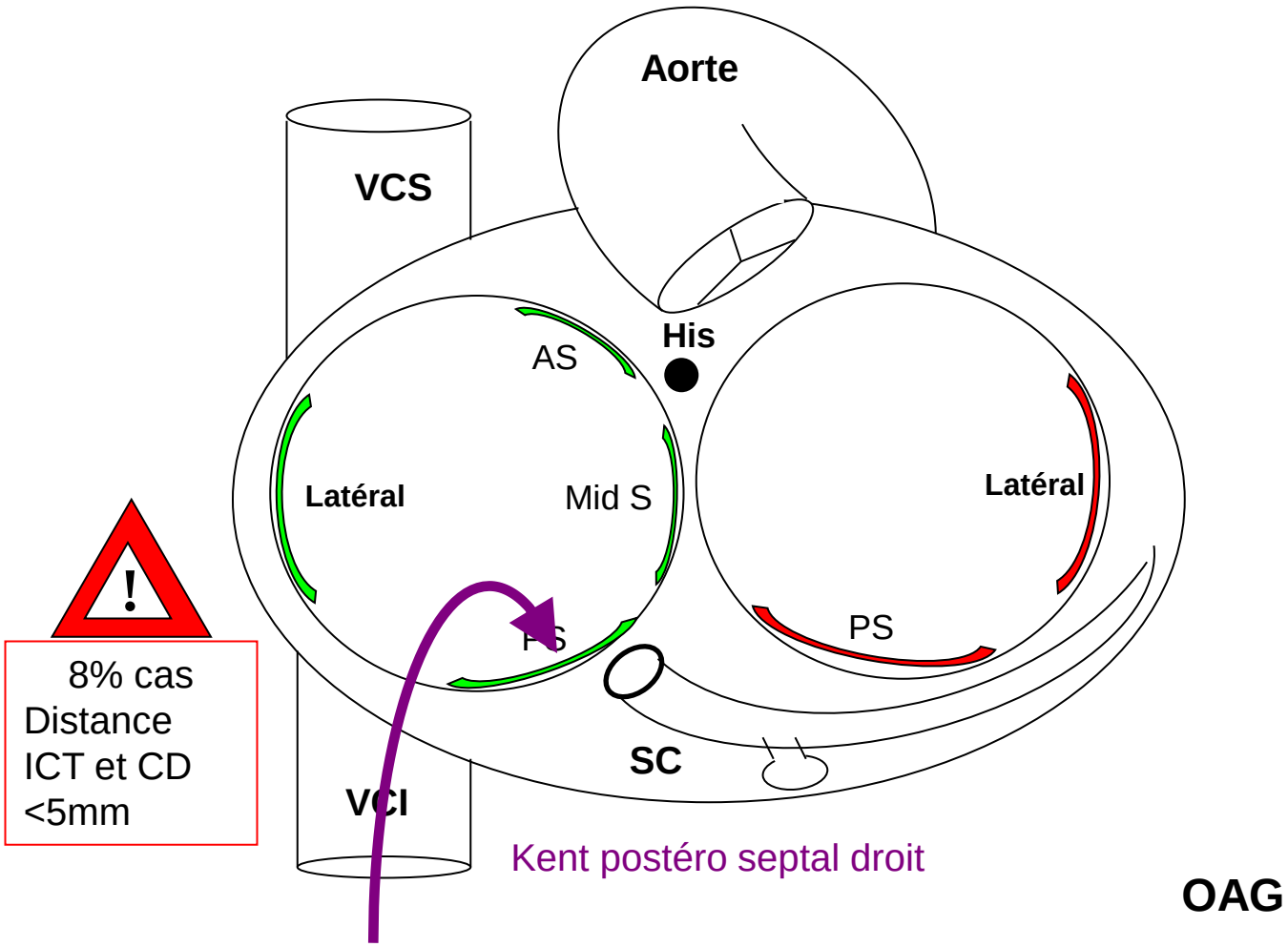
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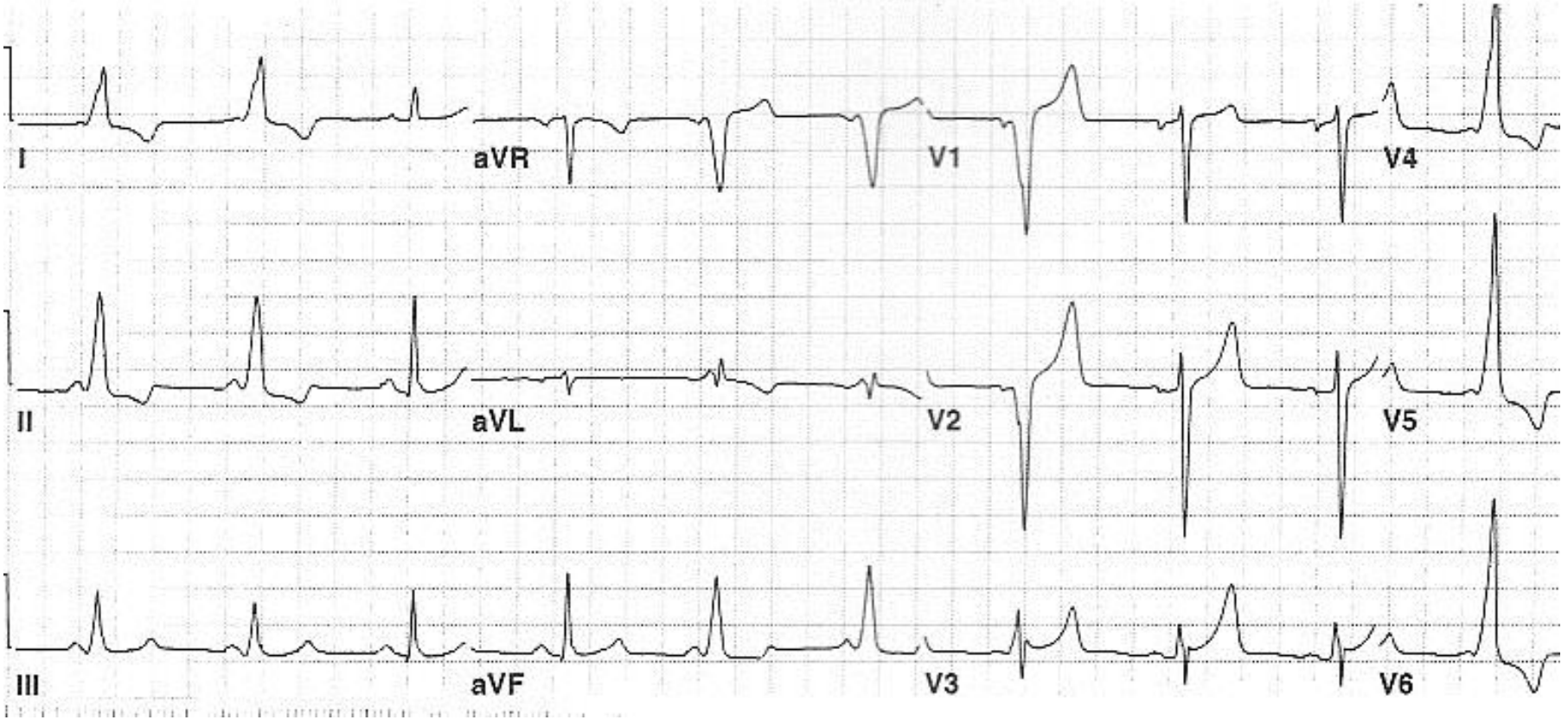

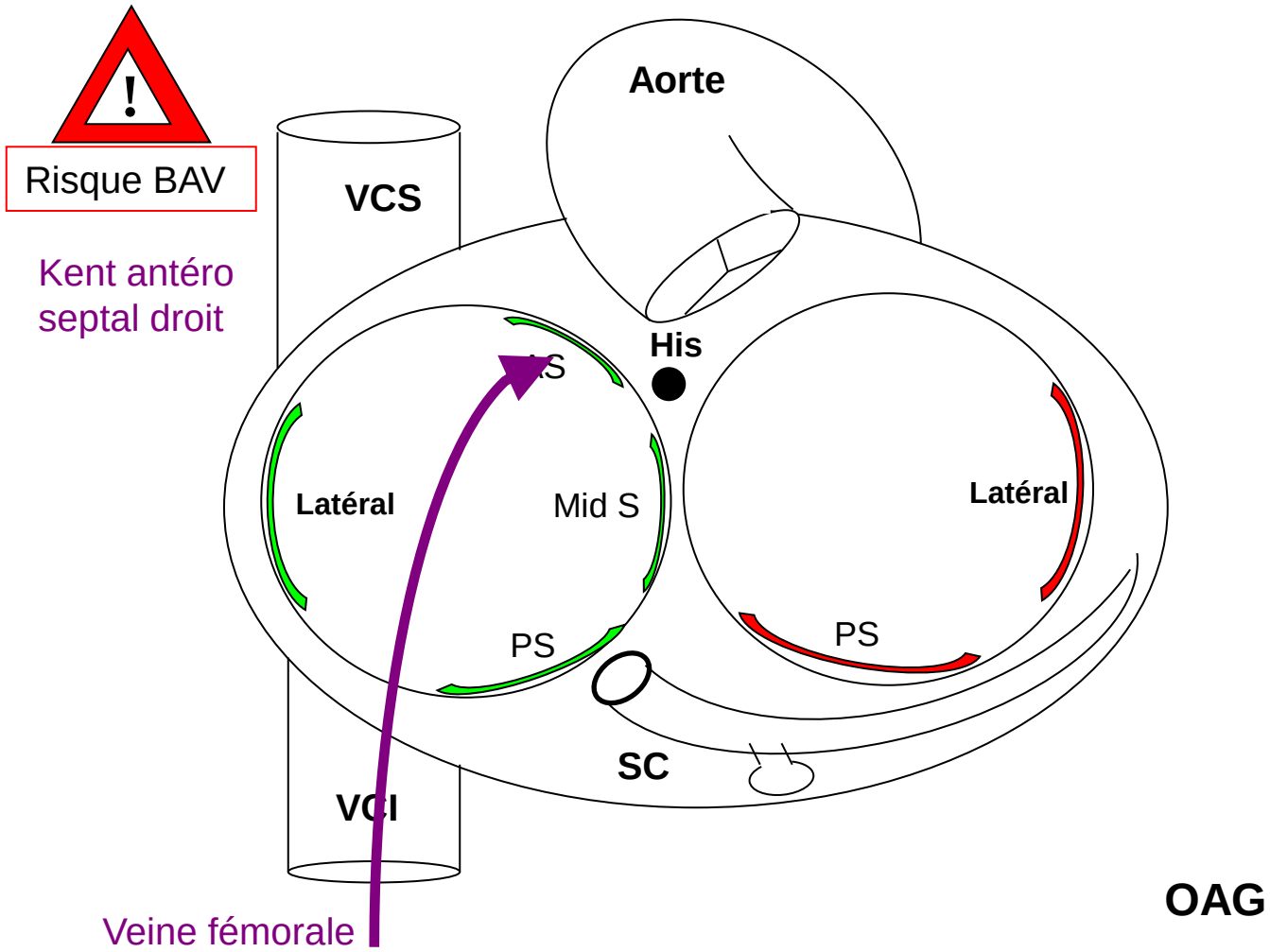
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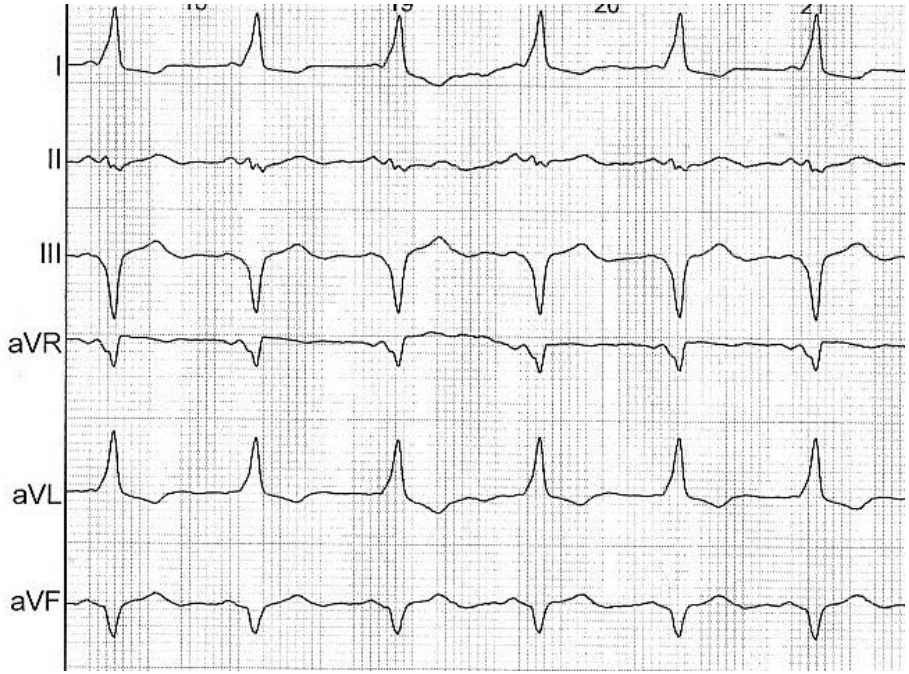

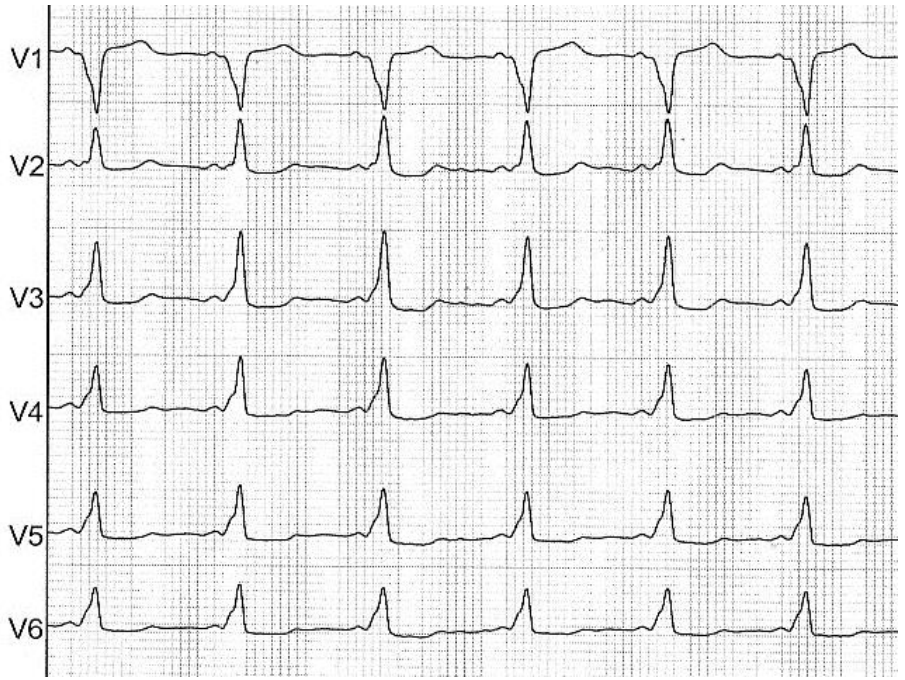

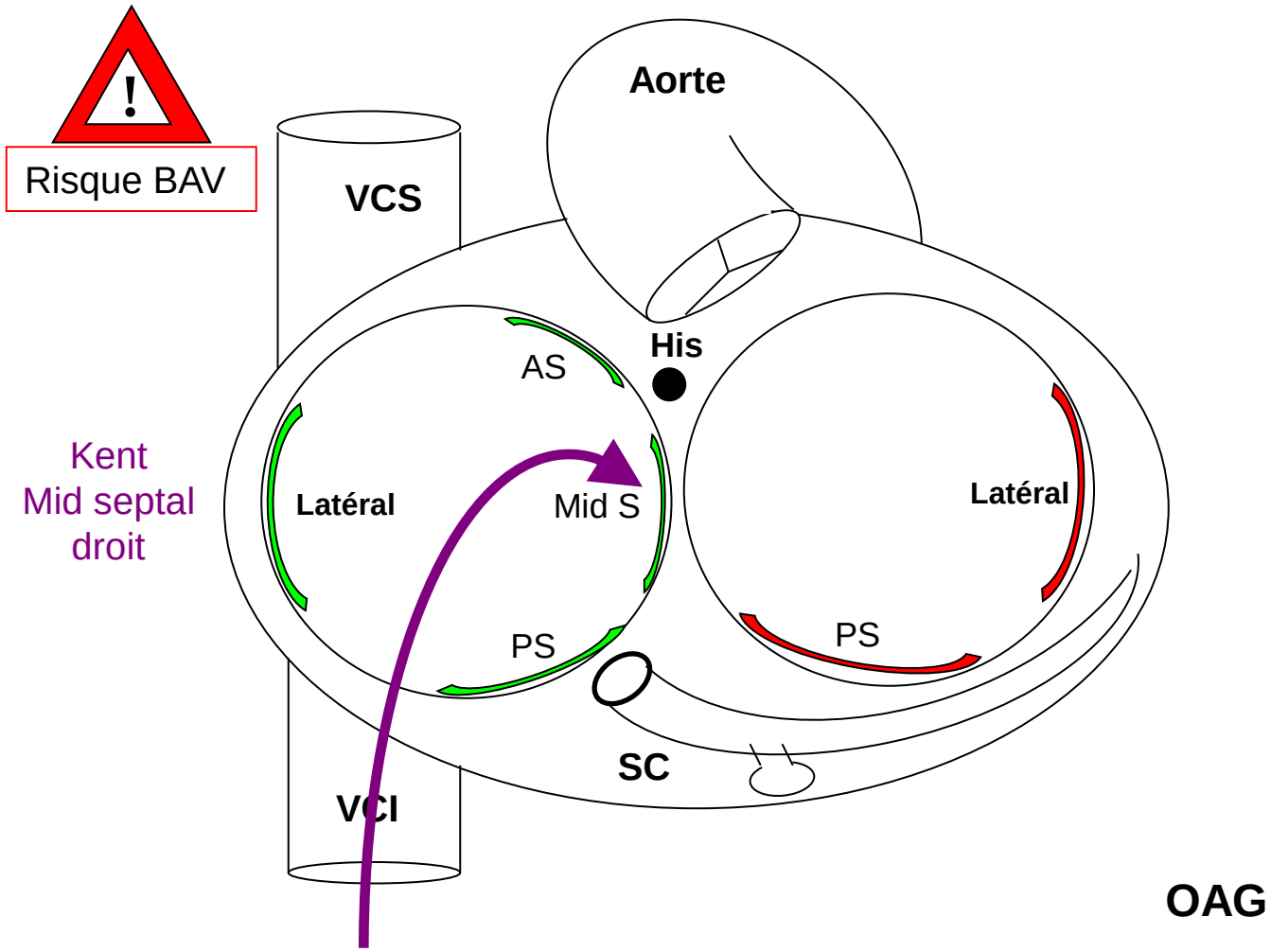
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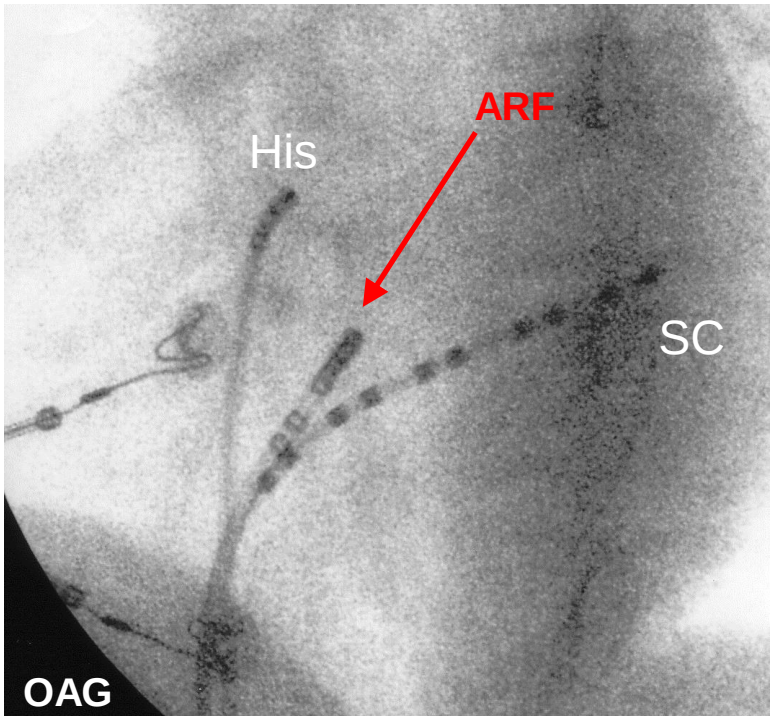

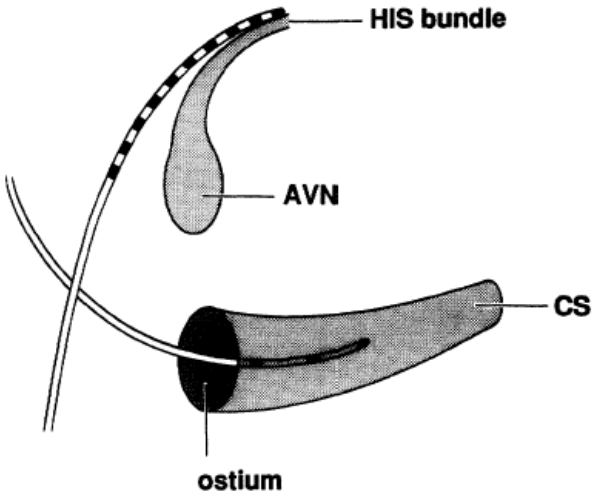

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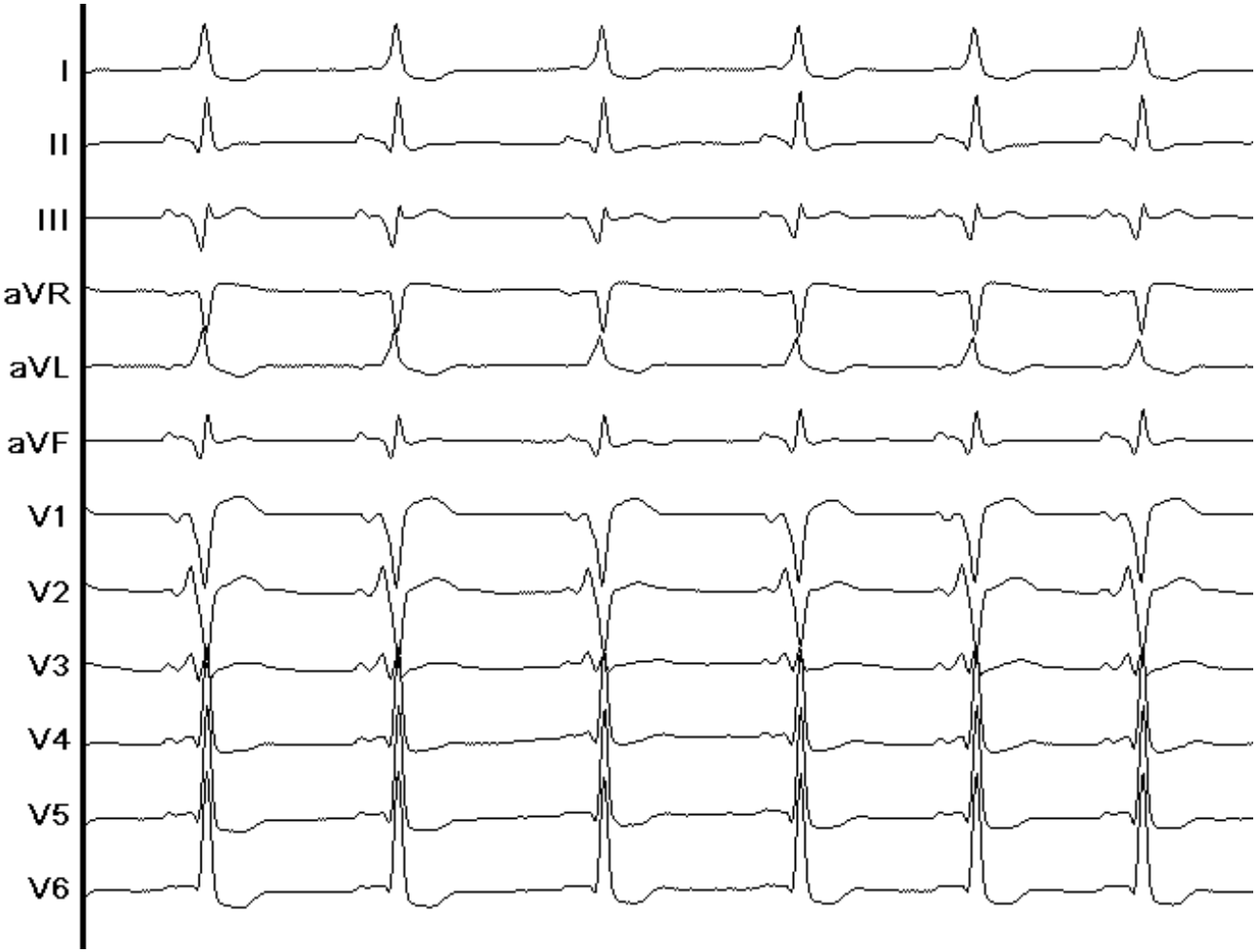

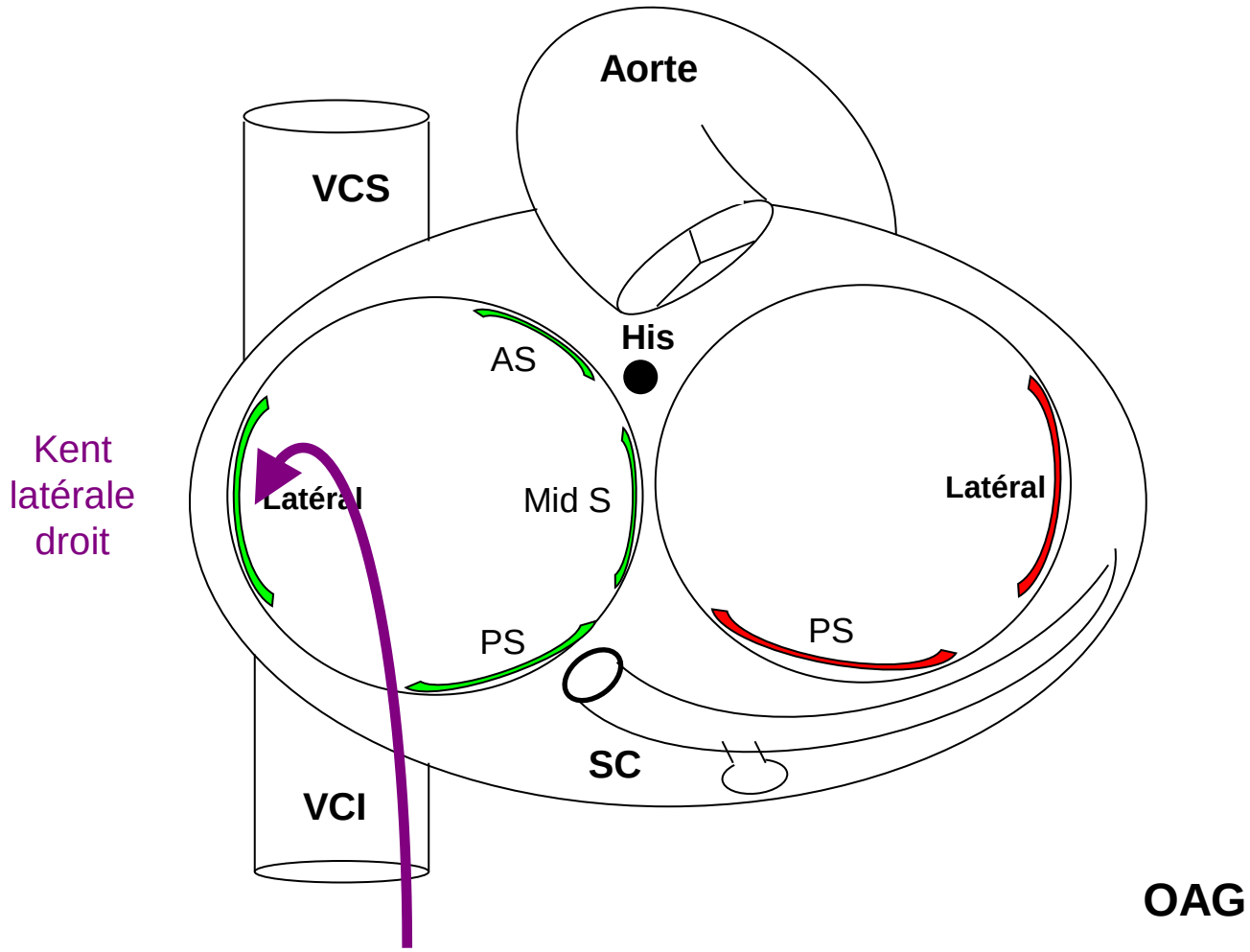
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2019 ESC Guidelines for the management of patients with supraventricular tachycardia

The Task Force for the management of patients with supraventricular tachycardia of the European Society of Cardiology (ESC)

Developed in collaboration with the Association for European Paediatric and Congenital Cardiology (AEPC)

Recommendations for the management of patients with asymptomatic pre-excitation		
Performance of an EPS, with the use of isoprenaline, is recommended to risk stratify individuals with asymptomatic pre-excitation who have high risk occupations/hobbies,[c] and those who participate in competitive athletics.	I	B
Catheter ablation is recommended in asymptomatic patients in whom electrophysiology testing with the use of isoprenaline identifies high-risk properties, such as SPERRI ≤250 ms, AP ERP ≤250 ms, multiple APs, and an inducible AP-mediated tachycardia.	I	B
Catheter ablation is recommended in high-risk patients with asymptomatic pre-excitation after discussing the risks, especially of heart block associated with ablation of anteroseptal or mid-septal APs, and benefits of the procedure.	I	C
Invasive risk stratification with an EPS is recommended in patients without "low risk" characteristics at non-invasive risk stratification.	I	C

Table 15 Findings during an invasive electrophysiological study (with the use of isoprenaline) indicating an accessory pathway with increased risk of sudden death

Findings
Inducibility of AVRT or AF[499]
A pre-excited R-R during AF ≤250 ms[498]
An antegrade refractory period ≤250 ms[498]
Presence of multiple accessory pathways[493]
Septal location of the accessory pathway (mainly posteroseptal and midseptal)[493, 497]

AF = atrial fibrillation; AVRT = atrioventricular re-entrant tachycardia.

Recommendations for exercise and sports participation in individuals with paroxysmal supraventricular tachycardia and pre-excitation

Recommendations	Class[a]	Level[b]
In individuals with palpitations, a comprehensive assessment to exclude (latent) pre-excitation, structural heart disease, and VAs is recommended.[500]	I	B
Participation in all sports activities is recommended in individuals PSVT without pre-excitation.[500]	I	C
Ablation of the accessory pathway is recommended in competitive and recreational athletes with pre-excitation and documented arrhythmias.[500]	I	C
In competitive/professional athletes with asymptomatic pre-excitation, an EP study is recommended to evaluate the risk for sudden death.[497,500]	I	B
In competitive athletes with PSVT but without pre-excitation, curative treatment by ablation should be considered.	IIa	C

Recommendations for exercise and sports participation in individuals with paroxysmal supraventricular tachycardia and pre-excitation		
In individuals with palpitations, a comprehensive assessment to exclude (latent) pre-excitation, structural heart disease, and VAs is recommended.	I	B
Ablation of the accessory pathway is recommended in competitive and recreational athletes with pre-excitation and documented arrhythmias.	I	C
In competitive/professional athletes with asymptomatic pre-excitation, an EP study is recommended to evaluate the risk for sudden death.	I	B

Association of Weight With Ablation Outcomes in Pediatric Wolff-Parkinson-White

Analysis of the NCDR IMPACT Registry

2023

Christopher M. Janson, MD, CCDS, CEPS-P,[a,b] Maully J. Shah, MBBS, FHRS, CCDS, CEPS-P,[a,b] Kevin F. Kennedy, MS,[c] V. Ramesh Iyer, MD, MRCP,[a,b] Shashank Behere, MD,[d] Tammy L. Sweeten, MS,[a,b] Michael L. O'Byrne, MD, MSCE[a,b,e,f]

TABLE 1 Comparison of Patient Characteristics According to Group

	Weight <30 kg (n = 624)	Weight ≥30 kg (n = 3,832)	*P* Value
Patient characteristics			
Male	362 (58)	2,163 (56)	0.50
Age, median (IQR), y	7 (6-9)	14 (12-16)	**<0.001**
Weight, median (IQR), kg	24.1 (20.9-27.3)	58.4 (46.7-71.3)	**<0.001**
Arrhythmia history (preprocedural)			
SVT	278 (45)	1,105 (29)	**<0.001**
Atrial fibrillation	1 (0.2)	26 (0.7)	0.10
Preprocedure beta-blocker	165 (27)	534 (14)	**<0.001**
Preprocedure antiarrhythmic	57 (9)	146 (4)	**<0.001**
Primary procedural indication			**<0.001**
Evaluation of specific arrhythmia	517 (83)	2,920 (76)	
Evaluation of risk for ventricular tachyarrhythmia	59 (9)	544 (14)	
Evaluation of event or symptoms suggesting arrhythmia	41 (7)	350 (9)	

Values are n (%), or median (IQR). **Bold** indicates statistical significance.
SVT = supraventricular tachycardia.

TABLE 2 Comparison of EPS Findings According to Group

	Weight <30 kg (n = 624)	Weight ≥30 kg (n = 3,832)	*P* Value
Arrhythmia induced			
AVRT: orthodromic	409 (66)	2,108 (55)	**<0.001**
AVRT: antidromic	21 (3)	134 (3)	0.80
Atrial fibrillation	76 (12)	710 (19)	**<0.001**
No arrhythmia induced	115 (20)	909 (26)	**0.001**
Missing data	51	371	
AP type			**0.003**
Bidirectional conduction	441 (77)	2,566 (74)	
Antegrade-only conduction	84 (15)	671 (19)	
Retrograde-only conduction at EPS (concealed)	38 (7)	140 (4)	
Antegrade-only, decremental conduction (Mahaim)	3 (0.5)	26 (0.8)	
No AP identified	7 (1)	65 (2)	
Missing data	51	364	
AP location			**<0.001**
Right-sided, nonseptal	99 (20)	648 (21)	
Right-sided, septal	126 (25)	1,032 (33)	
Left-sided, nonseptal	231 (46)	1,165 (37)	
Left-sided, septal	17 (3)	129 (4)	
Coronary sinus	34 (7)	135 (4)	
Missing data	117	723	

Values are n (%).
AP = accessory pathway; AVRT = atrioventricular re-entrant tachycardia; EPS = electrophysiology study.

Association of Weight With Ablation Outcomes in Pediatric Wolff-Parkinson-White

Analysis of the NCDR IMPACT Registry

2023

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TABLE 3 Comparison of AEs According to Group

	Weight <30 kg (n = 624)	Weight ≥30 kg (n = 3,832)	*P* Value
Cardiac arrest	1 (0.2)	0	**0.01**
Embolic stroke	0	0	-
Tamponade	0	2 (0.05)	0.60
Pacemaker placement	0	0	-
Unplanned cardiac surgery	1 (0.2)	0	**0.01**
Unplanned vascular surgery	1 (0.2)	0	**0.01**
Composite MAE	2 (0.3)	2 (0.05)	**0.04**
AV block (includes transient)	4 (0.6)	6 (0.2)	**0.02**
New valvular regurgitation	0	0	-
RBBB	2 (0.3)	10 (0.3)	0.80
LBBB	0	0	-
Bleeding event	1 (0.2)	7 (0.2)	0.90
Other vascular complications requiring treatment	1 (0.2)	1 (0.03)	0.10
Composite any AE	6 (1.0)	16 (0.4)	0.10

Values are n (%). **Bold** indicates statistical significance.

AE = adverse event; AV = atrioventricular; LBBB = left bundle branch block; MAE = major adverse event; RBBB = right bundle branch block.

TABLE 4 Comparison of Ablation Outcomes According to Group

	Weight <30 kg (n = 624)	Weight ≥30 kg (n = 3,832)	*P* Value
Ablation success (n = 3,935 with ablation attempted)	536 (95) (n = 565 with ablation attempted)	3,091 (92) (n = 3,370 with ablation attempted)	**0.009**
Ablation deferred	59 (9)	460 (12)	0.07
Ablation deferred due to proximity to AV node	3 (0.5)	18 (0.5)	0.50
Composite of ablation deferred and ablation failed	88 (14)	739 (19)	**0.001**
Ablation energy source			
Cryo only	59 (11)	369 (11)	0.70
RF only	464 (83)	2,742 (82)	0.60
RF + Cryo	39 (7)	246 (7)	0.70
Irrigated RF	25 (4)	242 (7)	**0.02**
Ablation time, s	240 (129-436)	281 (166-518)	0.30
No. of ablation lesions	6 (4-11)	7 (4-11)	**0.007**
Procedure time, h	2.3 (1.7-3.1)	2.5 (1.8-3.3)	**0.03**
Fluoroscopy time, min	3 (0.1-7.5)	2.4 (0.1-6.7)	0.70

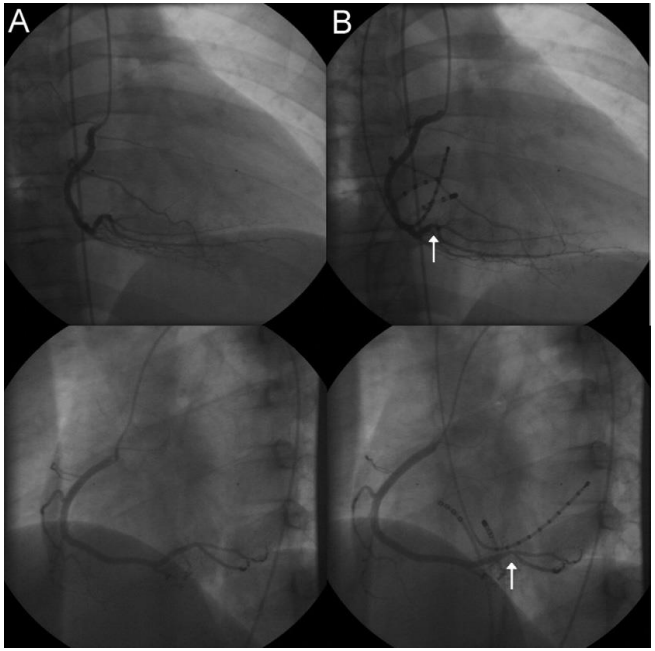
Values are n (%) or median (IQR).

AV = atrioventricular; Cryo = cryoablation; RF = radiofrequency.

Incidence of coronary artery injury immediately after catheter ablation for supraventricular tachycardias in infants and children

Heike E. Schneider, MD, Thomas Kriebel, MD, Verena D. Gravenhorst, MD, Thomas Paul, MD

From the Department of Pediatric Cardiology and Intensive Care Medicine, Georg-August-University Goettingen, Germany.



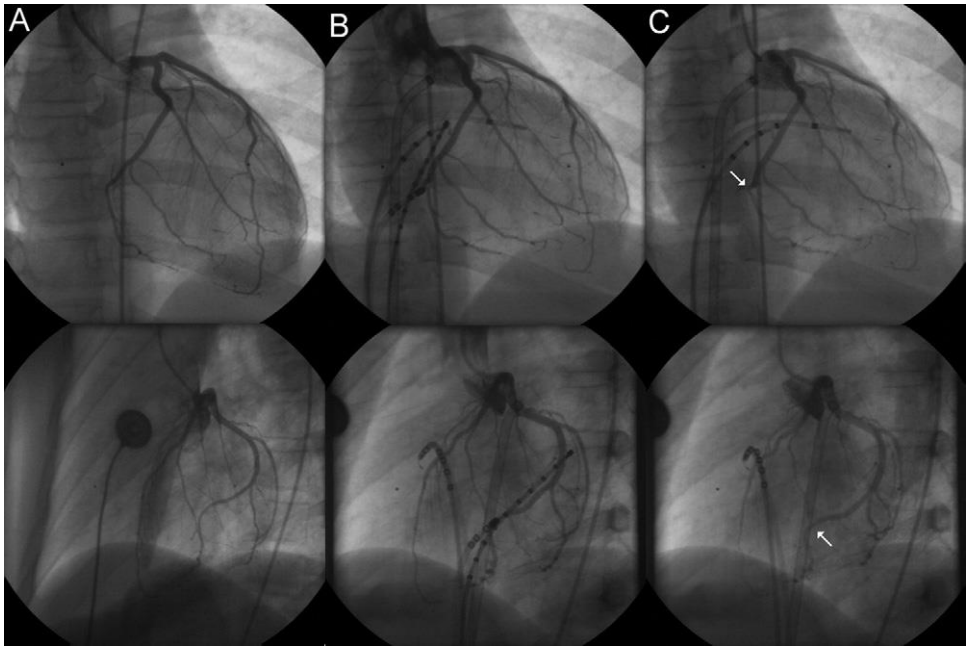


Table 1 Demographic data

	Energy source	N	Age (yr) [median (range)]	Weight (kg) [median (range)]	Stenosis
All patients		212	12 (0.3–20.4)	47 (5.5–130)	2
AP		112	11 (0.3–20.4)	44 (5.5–93)	
	RFA	83			2
	Cryo	9			0
	Both	20			0
AVNRT		84	12 (1.3–20)	51 (9–130)	
	RFA	25			0
	Cryo	37			0
	Both	22			0
AP + AVNRT		16	14 (11.4–17.8)	56 (44.7–73.2)	
	RFA	10			0
	Cryo	2			0
	Both	4			0

AP = accessory pathway; AVNRT = atrioventricular nodal reentrant tachycardia; both = radiofrequency energy application (RFA) and cryoenergy (Cryo).

Incidence of coronary artery injury immediately after catheter ablation for supraventricular tachycardias in infants and children

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Table 3 Location of radiofrequency ablations that resulted in coronary artery narrowing in case reports

Reference	Location of RFA	Age at RFA	Presumed mechanism of injury	Sequelae
Nakagawa and Jackman, 2007[15]	Right posteroseptal AP	9 years	Direct thermal damage	Chronic stenosis of distal RCA
Raio et al, 2005[16]	Ablation for atrial flutter	70 years	Direct thermal injury	Distal RCA occlusion, stent implantation
Takahashi et al, 2005	Ablation in CS for AF	46 years	Direct thermal injury	LCx occlusion, stent implantation
Blaufox et al, 2004	Ablation for AVNRT	2.5 years	Direct thermal damage	80% stenosis of left posterior branch of RCA, medical management, resolved
Duong et al, 2004	Right posteroseptal AP	25 years	Direct thermal damage	Occlusion of a posterolateral branch of RCA, angioplasty
dePaola et al, 2003	Right posteroseptal AP	12 years	Direct thermal damage	Occlusion of distal RCA, angioplasty
Dinckal et al, 2003	Left lateral AP, remote from LAD	32 years	Embolic or thrombotic	LAD occlusion, symptoms after 10 days, stent implantation
Paul et al, 2003	Left lateral AP	5 weeks	Direct thermal injury	LCx occlusion, mitral insufficiency, MVR
Bertram et al, 2001	One patient with Ebstein's anomaly, right posteroseptal AP	6 years	Direct thermal damage	Chronis stenosis of posterolateral branch of RCA, medical management
Bertram et al, 2001	One patient with Ebstein's anomaly, right free-wall AP	4 years	Direct thermal damage	Chronic stenosis of marginal branch of RCA, medical management
Strobel et al, 2001	Right posteroseptal AP	8 years	Direct thermal damage	Occlusion of posterolateral branch of RCA, stent implantation
Khanal et al, 1999	Right posteroseptal AP	12 years	Direct thermal damage	Occlusion of distal RCA, stent implantation
Pons et al, 1997	Idiopathic LV VT	24 years	Traumatic	Chronic LMCA occlusion, coronary bypass surgery
Chatelain et al, 1995	Left lateral AP	45 years	Direct thermal damage	Occlusion of first marginal branch of LCx, small infarct, no intervention
Hope et al, 1995	Retrograde mapping in left posteroseptal region	40 years	Embolic/thrombotic or direct trauma	LMCA occlusion, angioplasty, urokinase
Kosinski et al, 1993	Left-sided AP	17 years	Embolic or direct trauma	LMCA occlusion, emergency angioplasty and surgery, death

AF = atrial fibrillation; AP = accessory pathway; AVNRT = AV-nodal reentrant tachycardia; CS = coronary sinus; LAD = left anterior descending artery; LCx = left circumflex artery; LMCA = left main coronary artery; LV VT= left ventricular tachycardia; MVR = mitral valve replacement; RCA = right coronary artery; RFA = radiofrequency ablation.

Table I. Factors affecting decision for invasive investigation (electrophysiological study) of children with asymptomatic WPW

Indications	2018 Survey		2003 Survey	*P* value: 2003 vs 2018
	Optimal	Minimum	Optimal	
Age for electrophysiology study (y)	8 (IQR 6-8) Range 4-10	5 (IQR 4-7) Range 3-10	10 Range 1-13	*
Weight for electrophysiology study (kg)	20 (IQR 18-22.5) Range 15-25	16 (IQR 15-20) Range 5-25	Not assessed	NA

Nonelectrophysiological factors	Strongly influence decision for electrophysiology study	Strongly Influence decision to ablate	No influence	2003 Survey: Strongly influence decision for electrophysiology study	
Career plans incompatible with asymptomatic WPW (eg, military service)	72% (81)	88% (99)	2% (2)	88% (38)	**.03**
Competitive athlete	70% (79)	80% (71)	11% (12)	86% (37)	**.04**
Congenital heart disease	73% (82)	74% (83)	10% (11)	81% (35)	.25
ADHD	33% (37)	28% (32)	59% (67)	44% (19)	.18
Need for psychotropic medications	38% (43)	35% (40)	51% (58)	39% (17)	.86
Reactive airways disease	27% (31)	32% (36)	58% (66)	49% (21)	**.01**
Parental or patient preference in favour of procedure	73% (83)	73% (83)	5% (6)	Not assessed	NA

J Pediatr 2019;213:88-95

Table II. Quoted rates of success, complications, and recurrences following ablation for asymptomatic WPW.

	2018			2003	
Category	**RF ablation**	**Cryoablation**	***P* value RF vs cryoablation**	**RF ablation**	***P* value (RF 2018 vs 2003)**
Major complication					
Median (IQR)	1% (0.5-1) Range 0.1%-5%	0.5% (0.5-1) Range 0.1-5%	**.04**	NA	NA
<1%	79%	88%	.07	63% (27)	**.04**
<2%	93%	99%	.06	77% (33)	.007
Acute success					
Median (IQR)	95% (94-97) Range 80%-100%	90% (85-95) Range 70%-99.9%	**<.001**	NA	NA
>90%	87%	46%	**<.001**	98%	**.04**
>95%	31%	8%	**<.001**	74%	**<.001**
Recurrence rate (%)					
Median (IQR)	5% (3%-7.5%) Range 1%-18%	10% (7-15%) Range 2-50%	**<.001**	NA	NA
<5%	69%	13%	**<.001**	56%	**.03**
<10%	95%	61%	**<.001**	86%	.06

J Pediatr 2019;213:88-95

2019 APHRS expert consensus statement on three-dimensional mapping systems for tachycardia developed in collaboration with HRS, EHRA, and LAHRS

Young-Hoon Kim[1] | Shih-Ann Chen[2] | Sabine Ernst[3] | Carlos E. Guzman[4] | Seongwook Han[5] | Zbigniew Kalarus[6] | Carlos Labadet[7] | Yenn-Jian Lin[2] | Li-Wei Lo[2] | Akihiko Nogami[8] | Eduardo B. Saad[9] | John Sapp[10] | Christian Sticherling[11] | Roland Tilz[12] | Roderick Tung[13] | Yun Gi Kim[1] | Martin K. Stiles[14]

Use of 3D mapping in supraventricular tachycardias

Recommendation	Class	LOE	References
In pediatric patients or pregnant patients undergoing SVT ablation, the use of a 3D mapping system is recommended to reduce radiation exposure to a minimum and to reduce the risk of complications such as total AV block.	I	C-LD	84,89–91
In patients with midseptal or parahisian pathways undergoing SVT ablation, the use of a 3D mapping system is recommended to reduce radiation exposure and to reduce the risk of complications such as total AV block.	I	C-LD	87
The use of a 3D mapping system is reasonable for redo ablation procedures or cases with impaired catheter stability (eg, right-sided free-wall pathways), after catheter dislodgement during ablation (eg, due to tachycardia termination) or when consecutive mapping from different anatomical sites (eg, atrium, ventricles, coronary sinus, aortic root) is performed to facilitate the ablation procedure, to better understand the anatomy to reduce procedure duration and radiation exposure for both the patient and the operator.	IIa	C-LD	81,92–95
For localizations of APs with lower success and higher recurrence rates, such as right-sided APs, it is reasonable to use a 3D mapping system to reduce procedure and fluoroscopy time.	IIa	B-R	78

Abbreviations: 3D, three-dimensional; AV, atrioventricular; AP, accessory pathway; LOE, level of evidence; SVT, supraventricular tachycardia.

Role of 3D mapping systems for fluoro-less approach to catheter ablation

Recommendation	Class	LOE	References
3D mapping system is recommended to lower radiation exposure to enable "ALARA" principle or zero-fluoroscopy procedure for all patients, especially for children and during pregnancy.	I	C-LD	22,79,324,350

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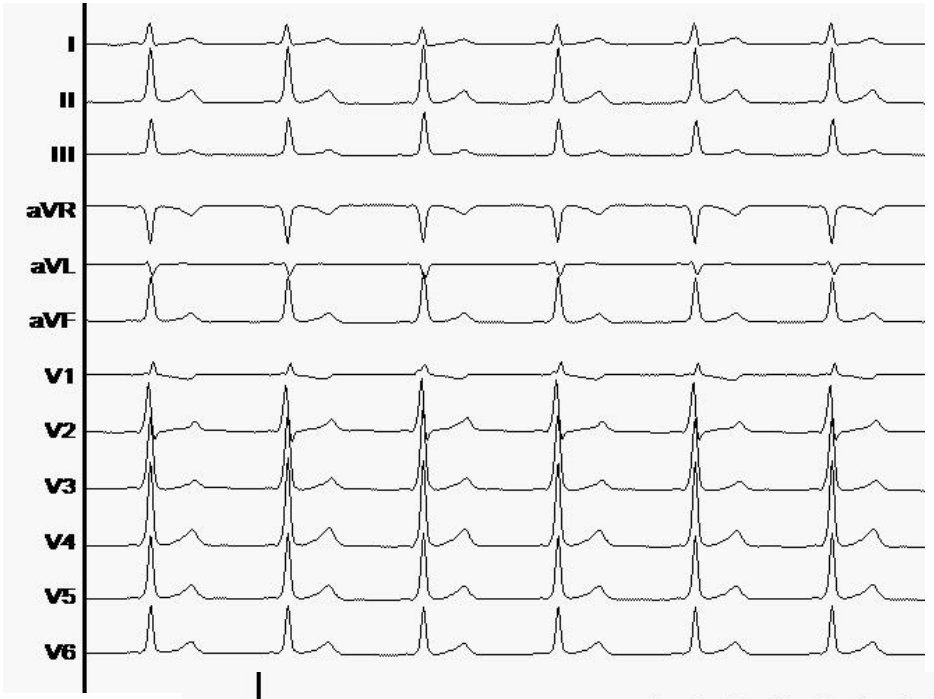
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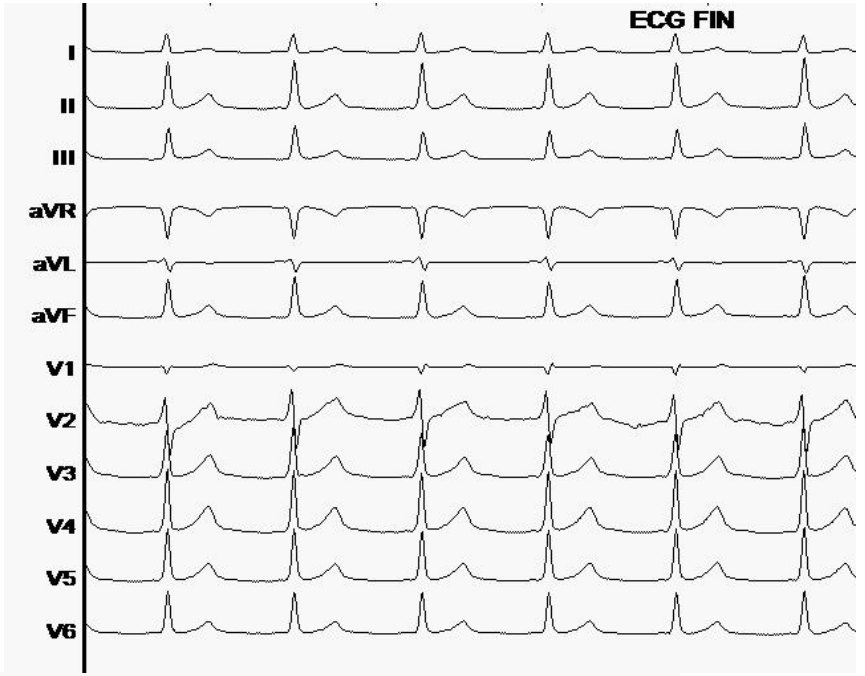
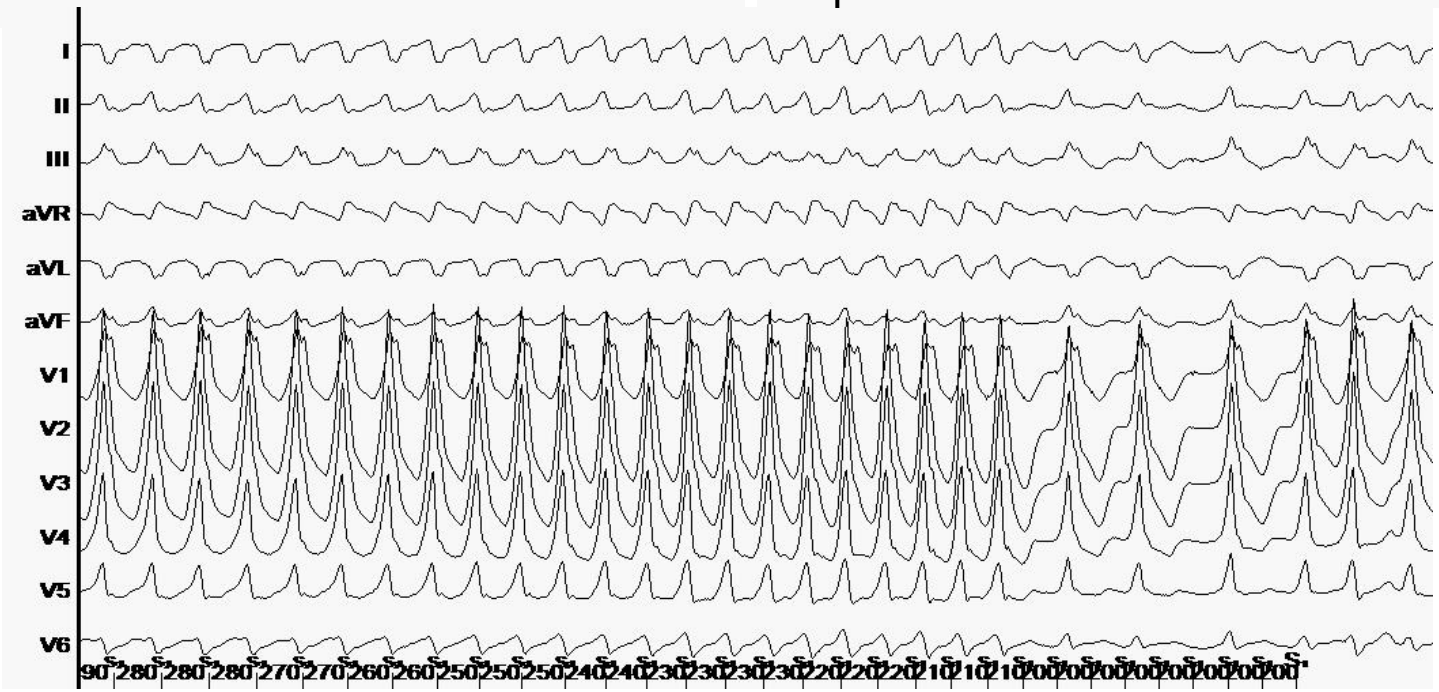
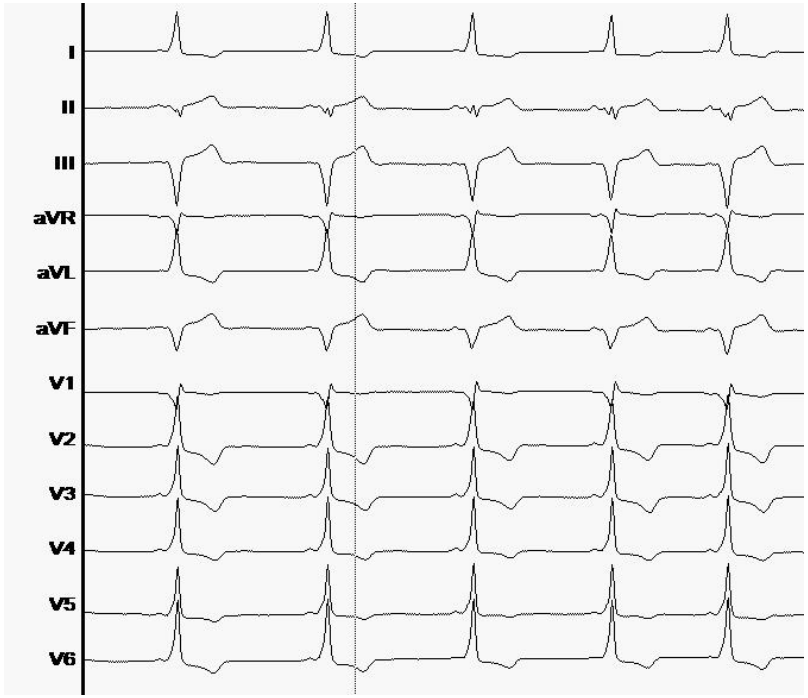
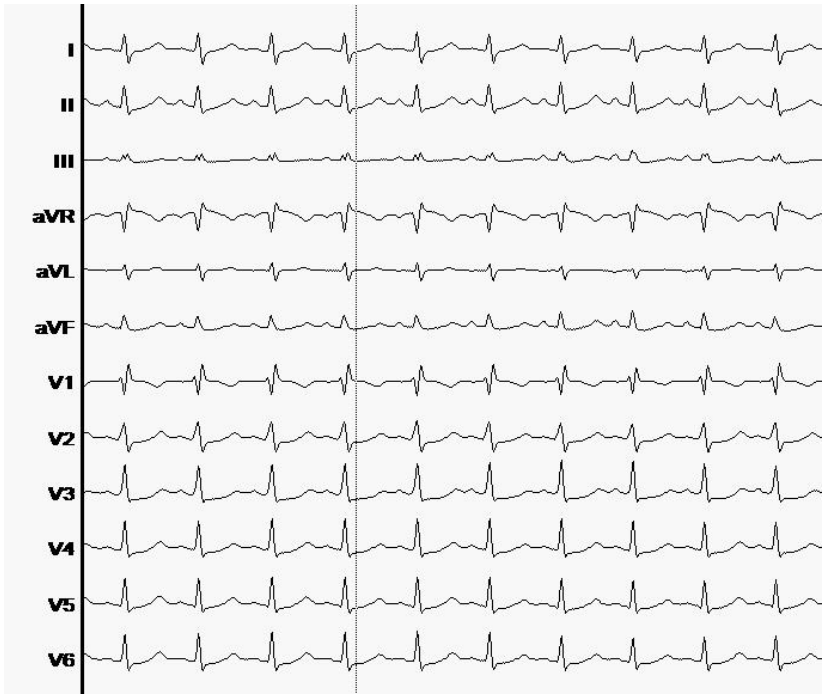
V5
V6

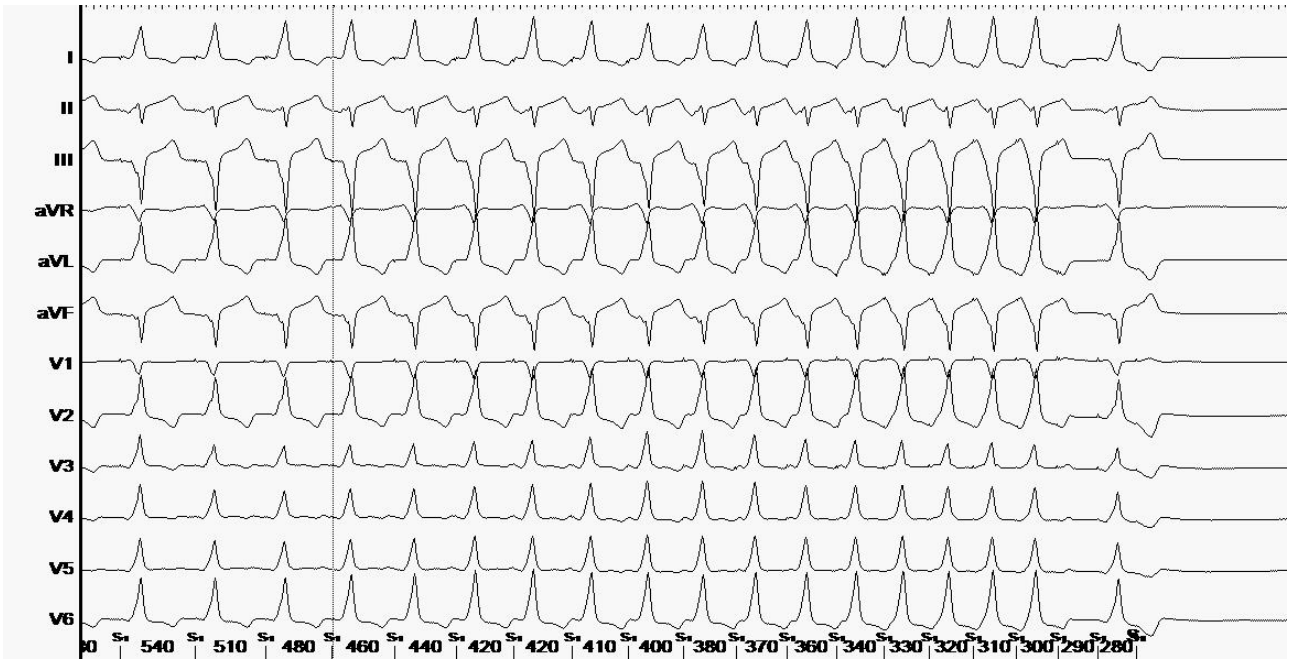

ECG FIN
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6


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

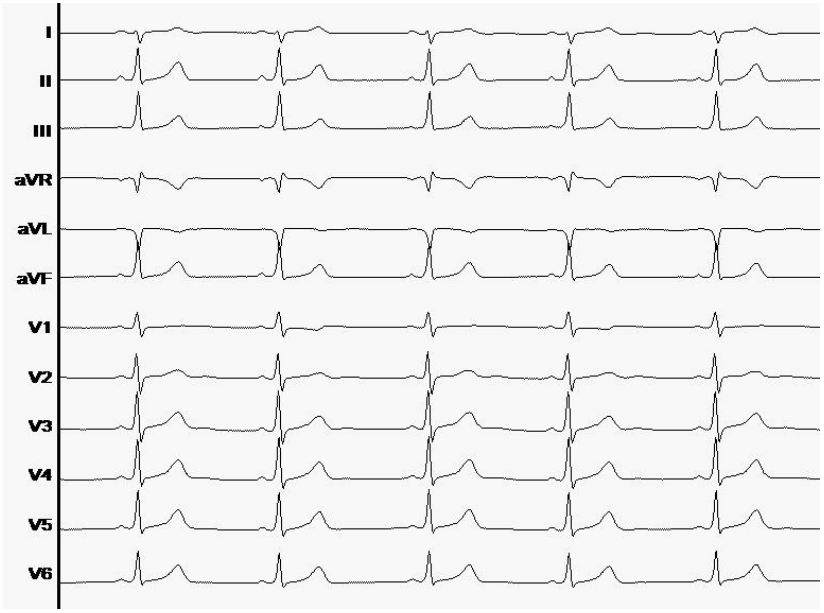
16 ans

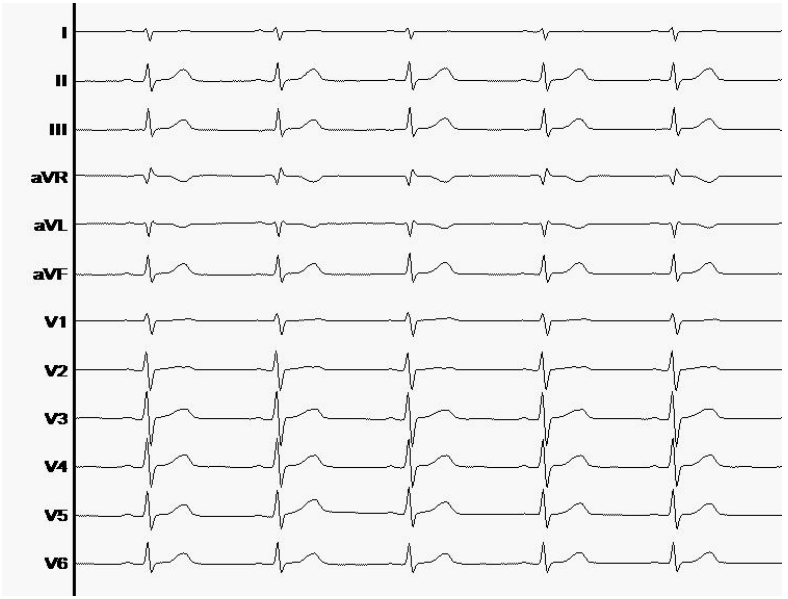

I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6

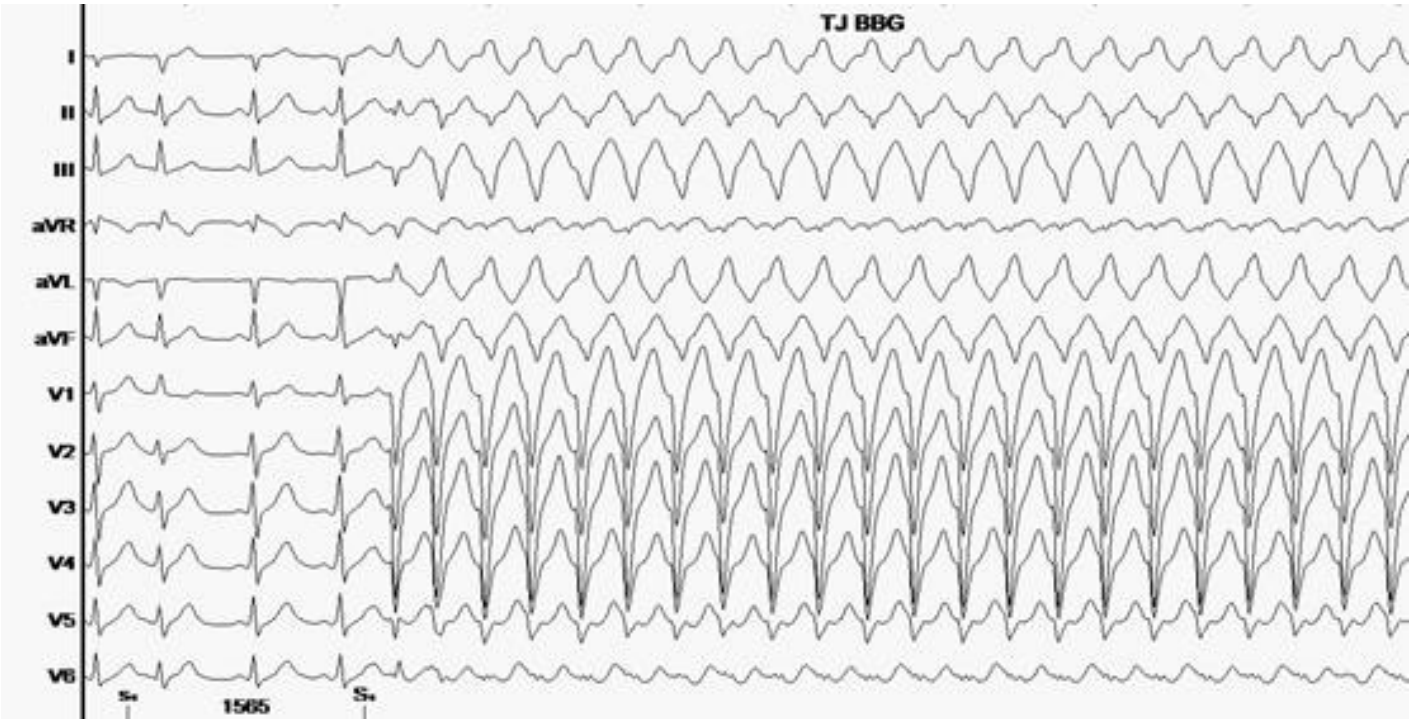

I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
S1 540 S1 510 S1 480 S1 460 S1 440 S1 420 S1 420 S1 410 S1 400 S1 380 S1 370 S1 360 S1 340 S1 330 S1 320 S1 310 S1 300 S1 290 S1 280 S1

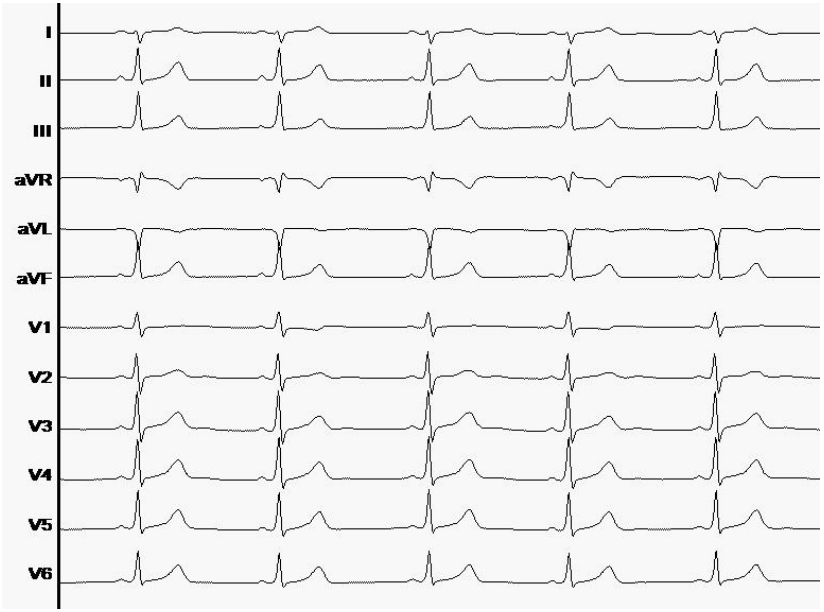
15 ans

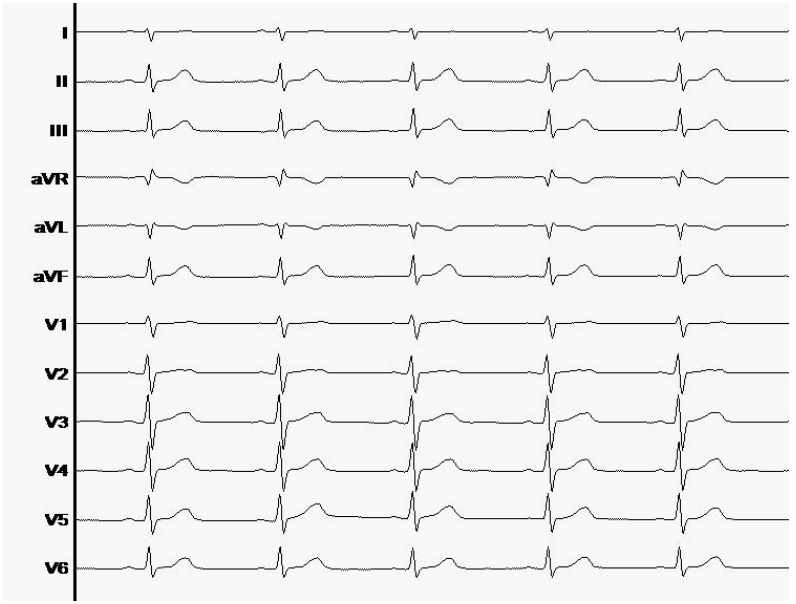

I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6


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

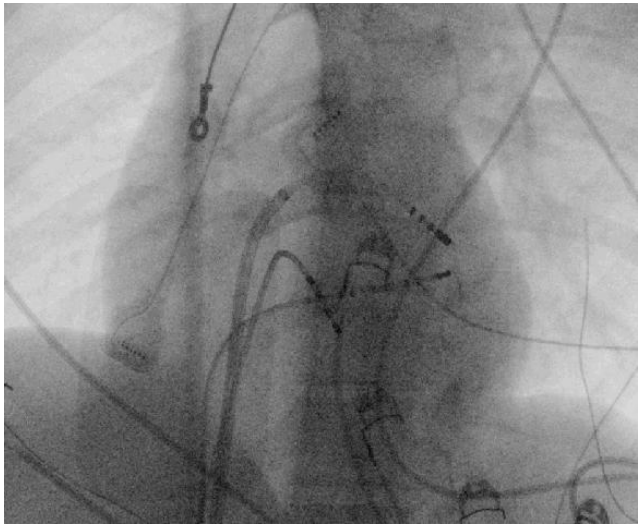

TJ BBG
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
1585

15 ans

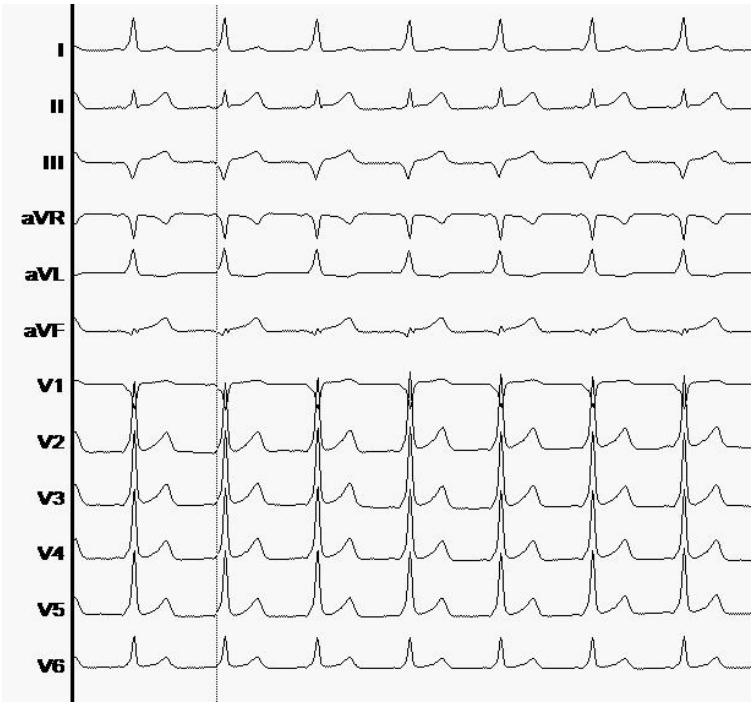

I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6


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

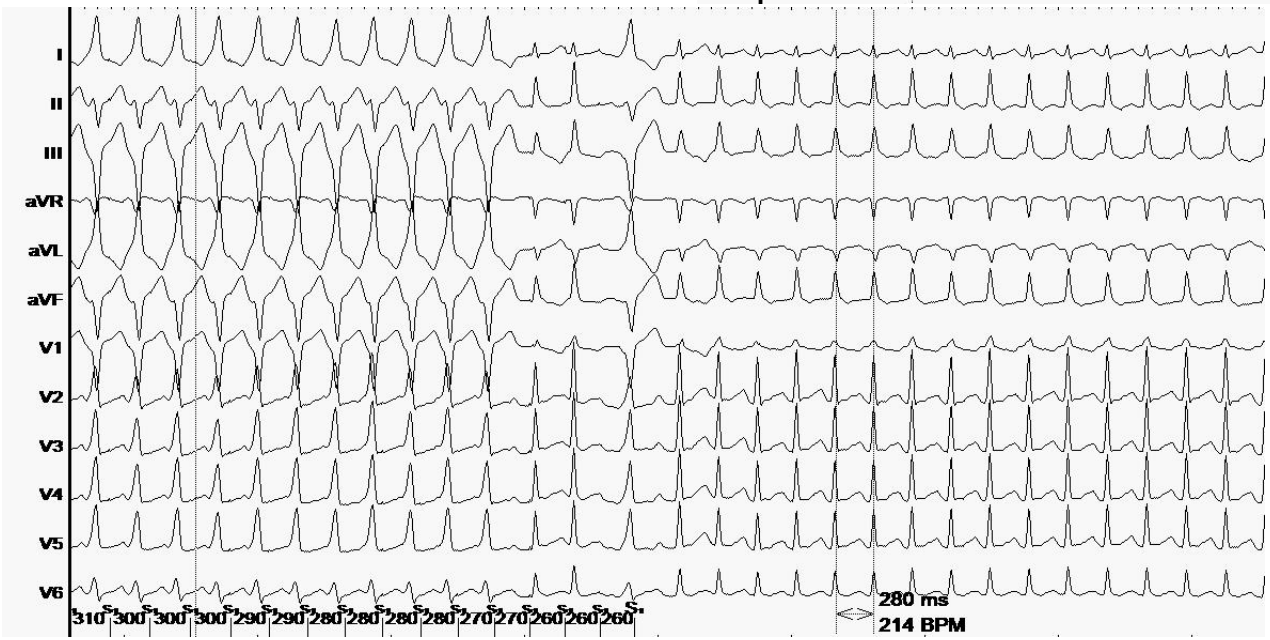

I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
1820



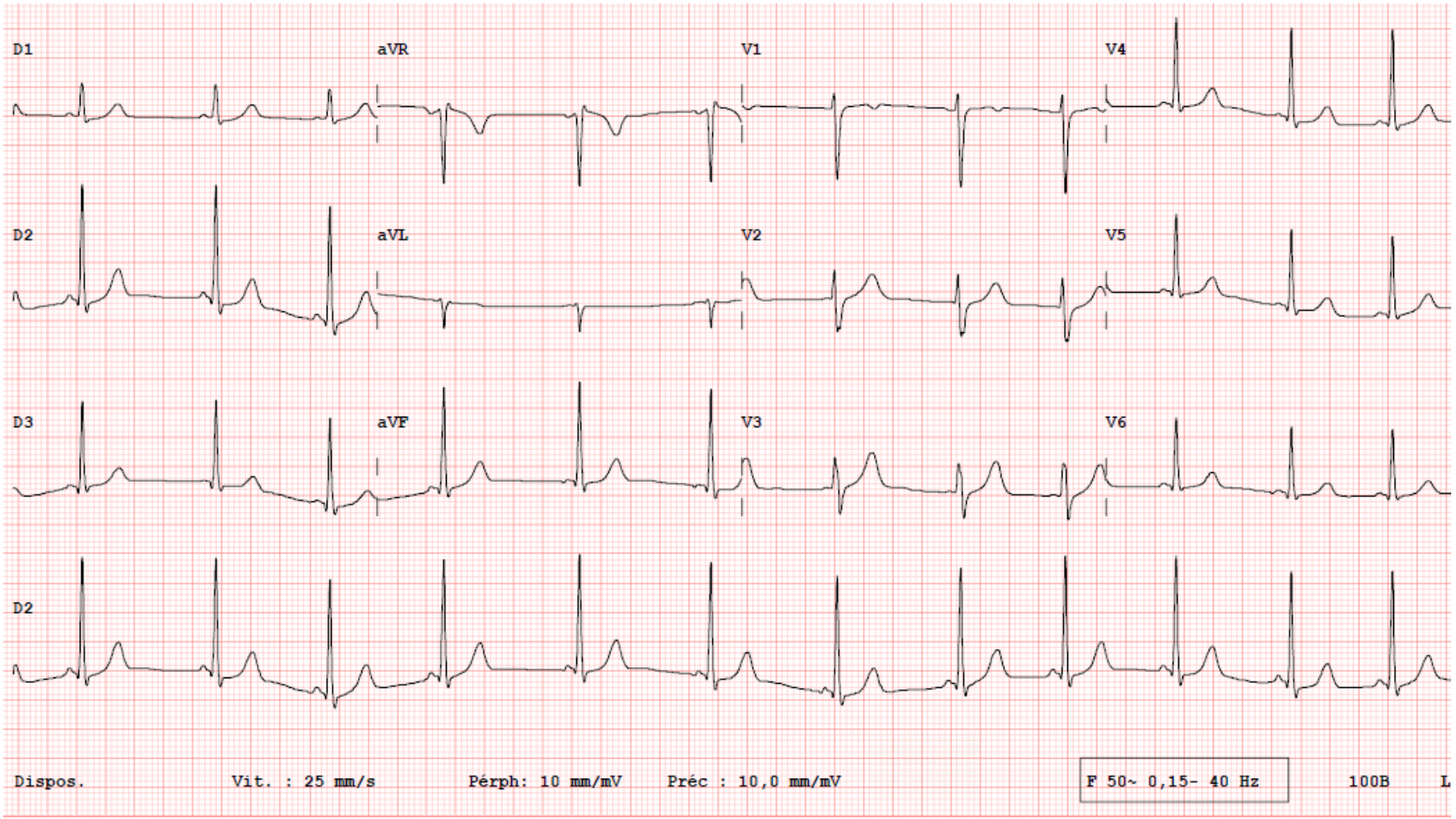
15 ans


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


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


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
310 300 300 300 290 290 280 280 280 280 270 270 260 260 260
280 ms
214 BPM

16 ans


D1
aVR
V1
V4
D2
aVL
V2
V5
D3
aVF
V3
V6
D2
Dispos.
Vit. : 25 mm/s
Périph: 10 mm/mV
Préc : 10,0 mm/mV
F 50~ 0,15- 40 Hz
100B
L