

Anomalies de connexion des artères coronaires chez l'adulte (ANOCOR)

Anciens et nouveaux concepts

Pierre Aubry (Paris), Xavier Halna du Fretay (Orléans),
Patrick Dupouy (Antony), Phalla Ou (Paris), Jean-Pierre Laissy (Paris)
Jean-Michel Juliard (Paris), pour le groupe ANOCOR

24 mars 2015 Hôpital BICHAT

Anomalies de connexion des artères coronaires (ANOCOR)

COHORTE ANOCOR



GACI

Groupe Athérome et Cardiologie Interventionnelle
de la Société Française de Cardiologie





Rationale

- Rare abnormalities (5/1000 coronary angiography)
- Sudden cardiac death
- Heterogeneous management
- Lot of case reports
- Lack of established evidence-based guidelines
- **Need of a risk stratification model**
- No prospective studies with large cohorts

Recruited patients
n=490

Non enrolled patients
n=18

- 6 non ANOCOR
- 6 ANOCOR with missing data
- 4 anatomical variants
- 1 doubleton
- 1 out of time

Enrolled patients
n=472

Anomalous connections of the coronary arteries (ANOCOR)

Prospective cohorts

ANOCOR cohort (n=472)

- France (interventional cardiologists)
- 2010-2013 (recruitment period)
- 15 to 99 years of age

AAOCA cohort (n=198*)

- US (congenital heart surgeons)
- 1998-2008 (retrospective study)
- 2009- (prospective study)
- 0 to 30 years of age

* as of june 2012

ANOCOR: anomalous connections of the coronary arteries

AAOCA: anomalous aortic origin of coronary artery



Study endpoints

- Primary endpoint:
 - determine the therapeutic strategy of diagnosed patients with ANOCOR

- Secondary endpoints:
 - identify the circumstances of diagnosis
 - describe the frequency of each type of ANOCOR
 - evaluate the morbimortality in the follow-up period according to the initial therapeutic strategy

Angiographic committee

- Patrick Dupouy
- Jean-Michel Juliard
- Jean-Pierre Laissy
- Phalla Ou

Steering committee

- Pierre Aubry
- Candice Estellat
- Reza Farnoud
- Xavier Halna du Fretay

Anomalies de connexion des artères coronaires (ANOCOR)

EMBRYOLOGIE

Anomalies de connexion des artères coronaires (ANOCOR)

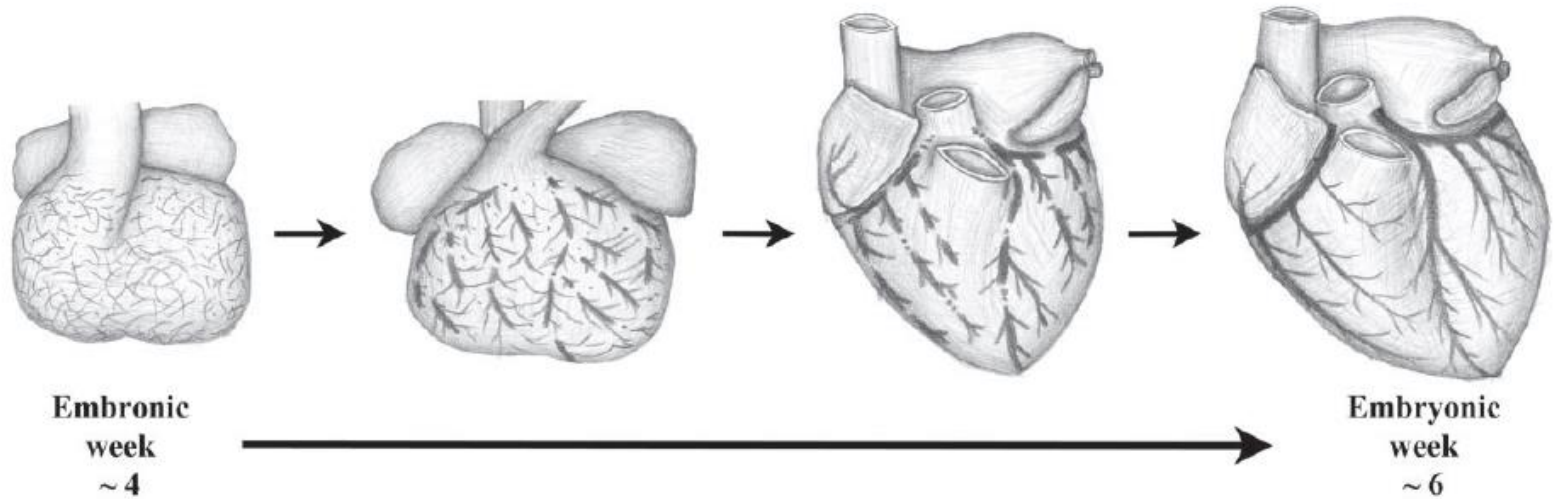


Figure 2. Development of coronary vessels during embryogenesis.

Lluri G. Clin Cardiol 2014
Bogers AJ. Anat Embryol 1989

Anomalies de connexion des artères coronaires (ANOCOR)

Anomalie d'origine

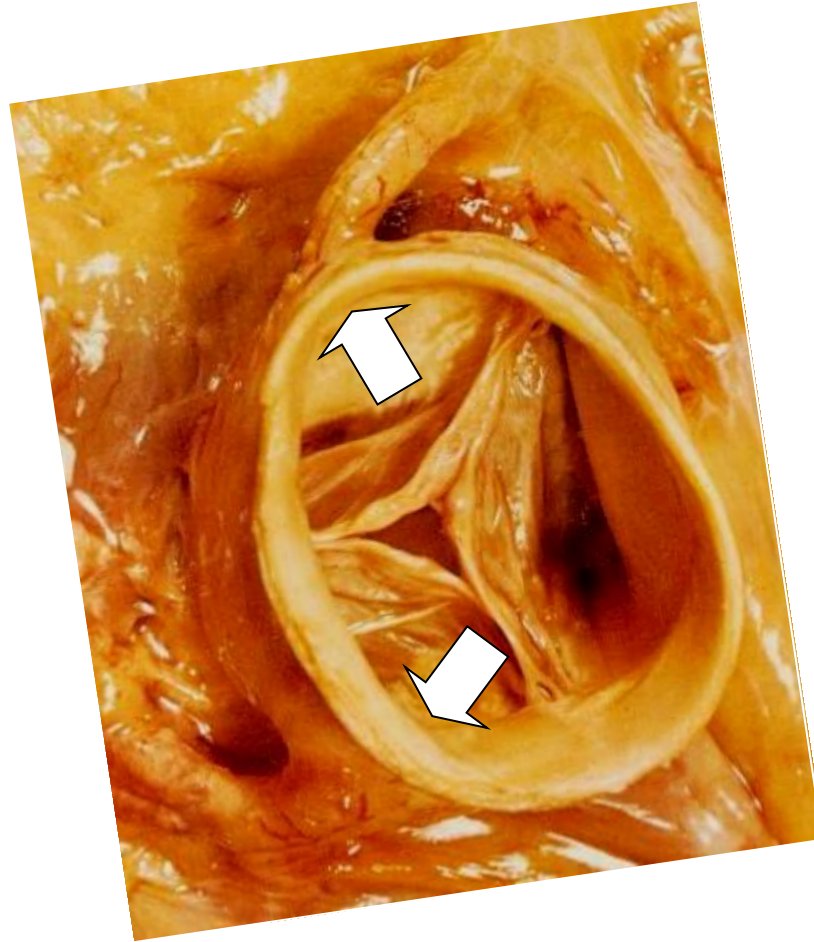
Anomalie de connexion

Anomalies de connexion des artères coronaires (ANOCOR)

ANATOMIE

Anomalies de connexion des artères coronaires (ANOCOR)

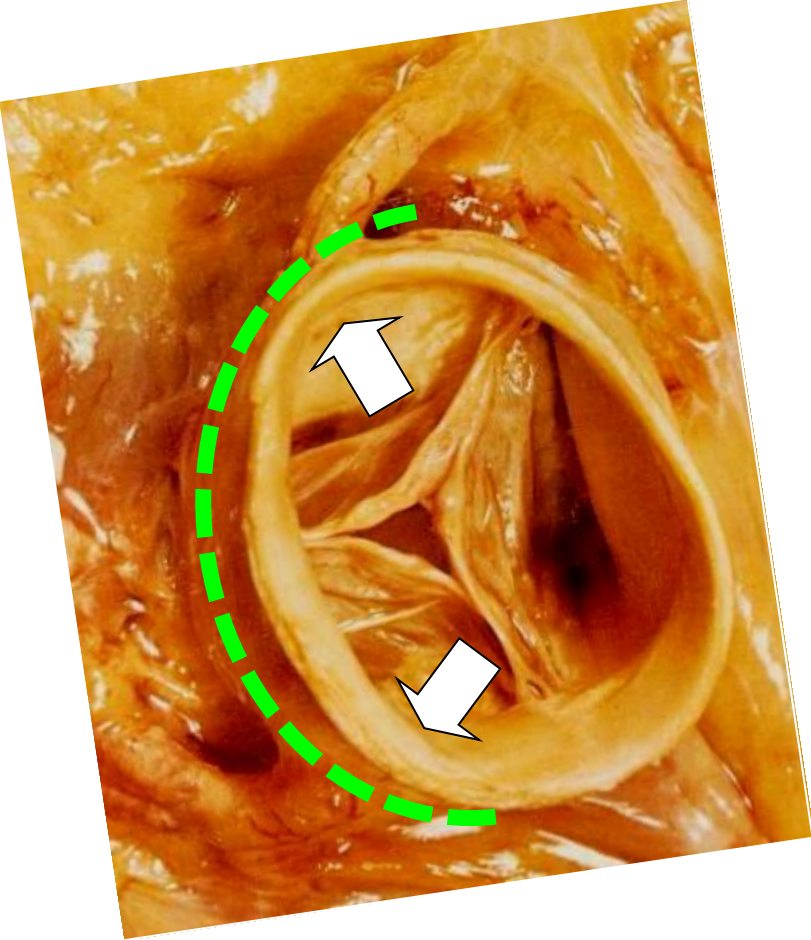
CD



TC

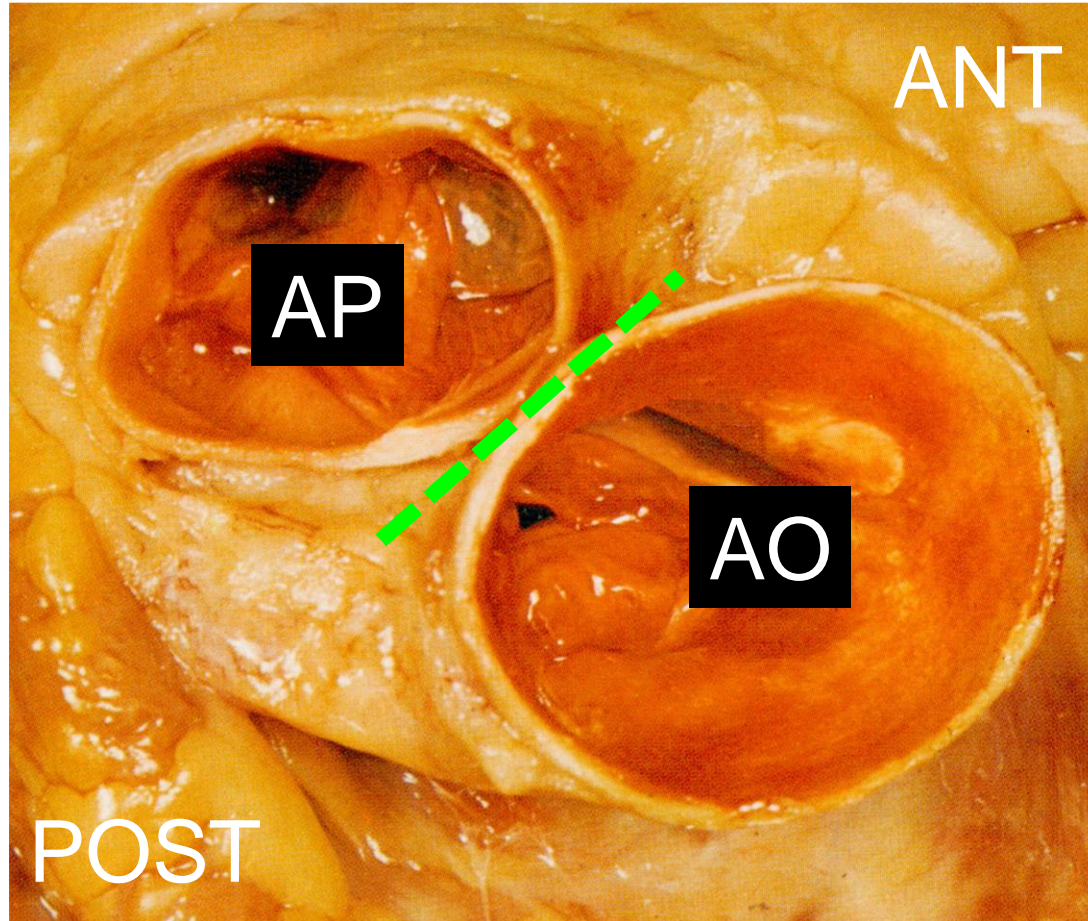
Anomalies de connexion des artères coronaires (ANOCOR)

CD

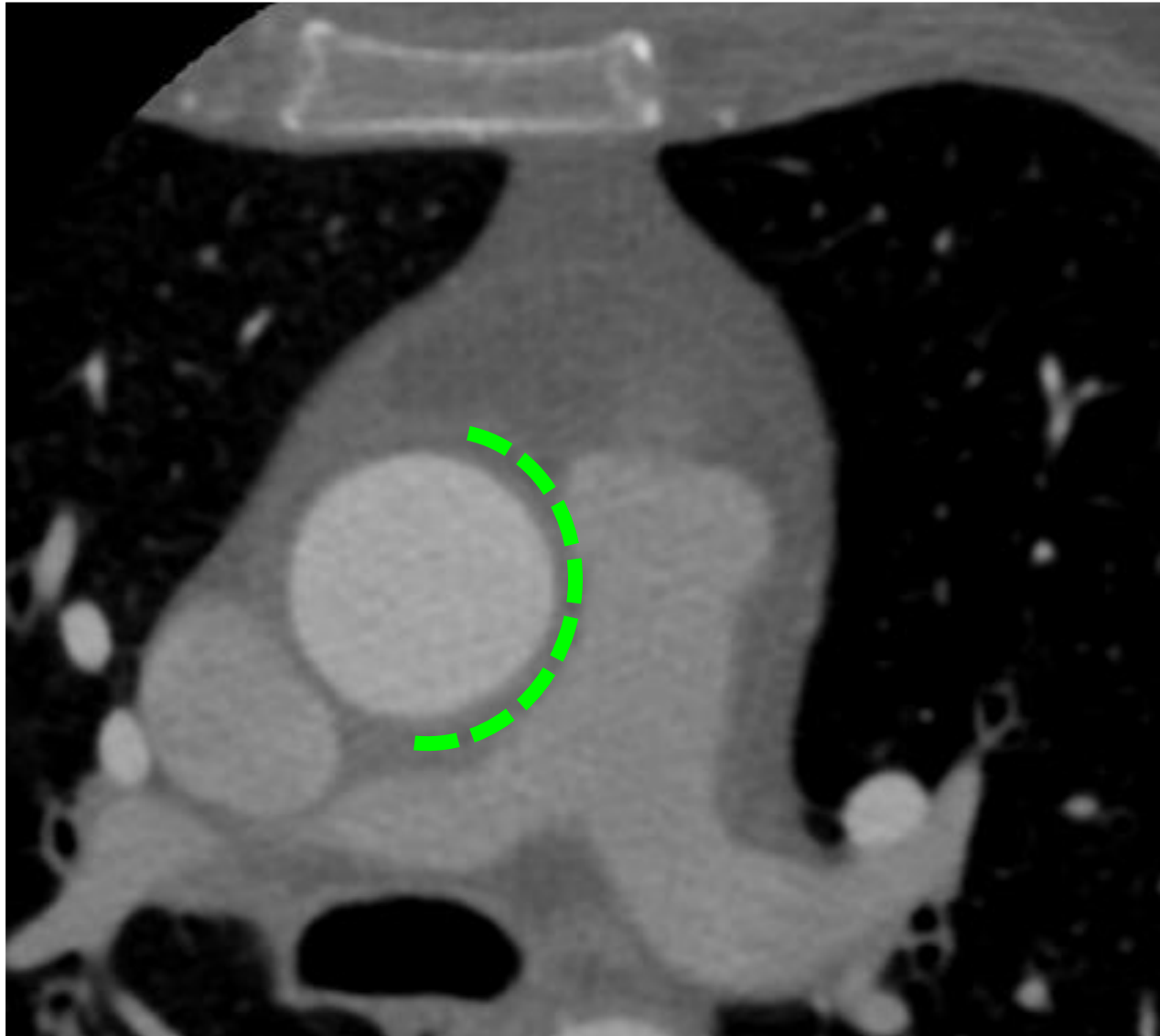


TC

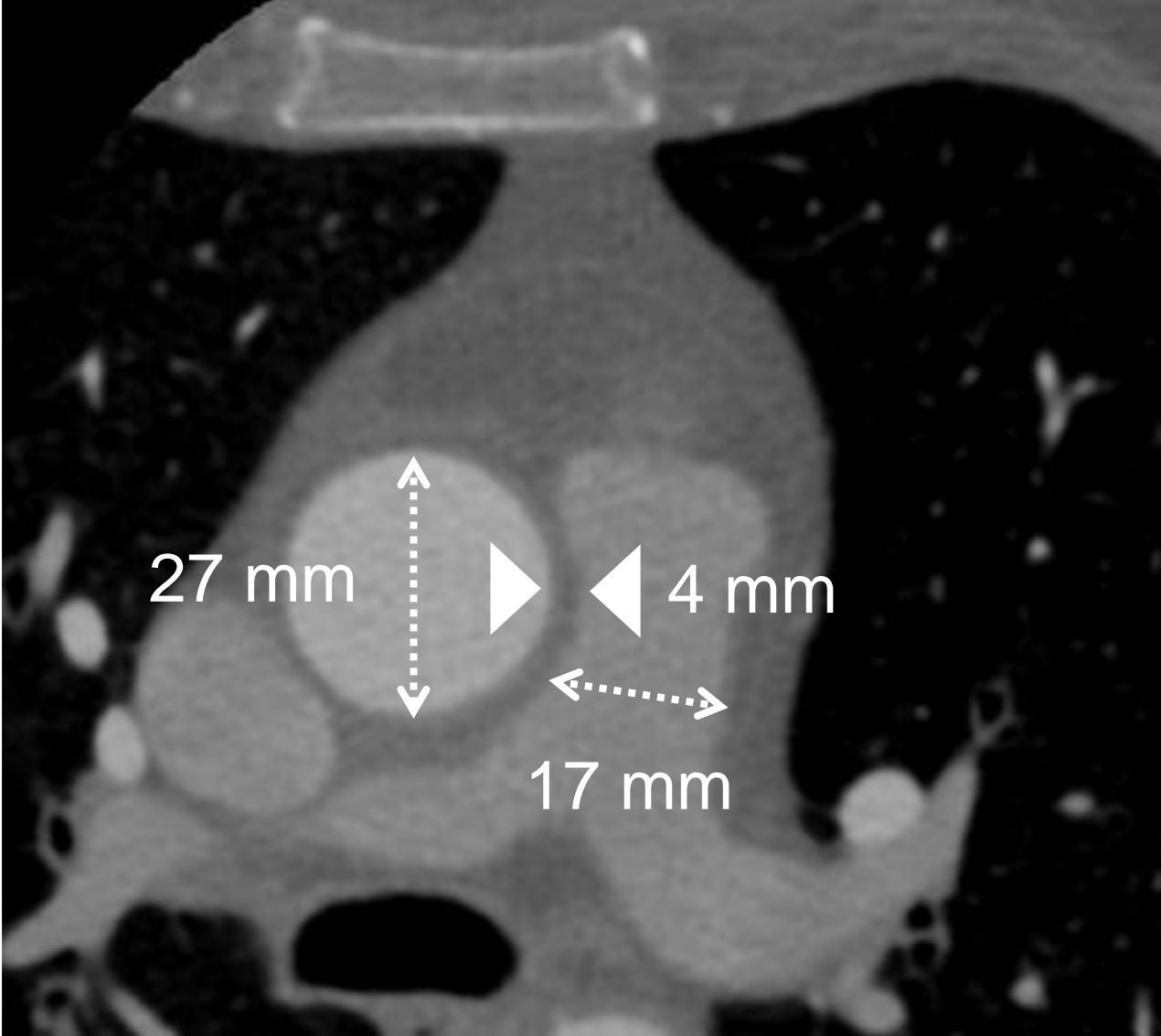
Anomalies de connexion des artères coronaires (ANOCOR)



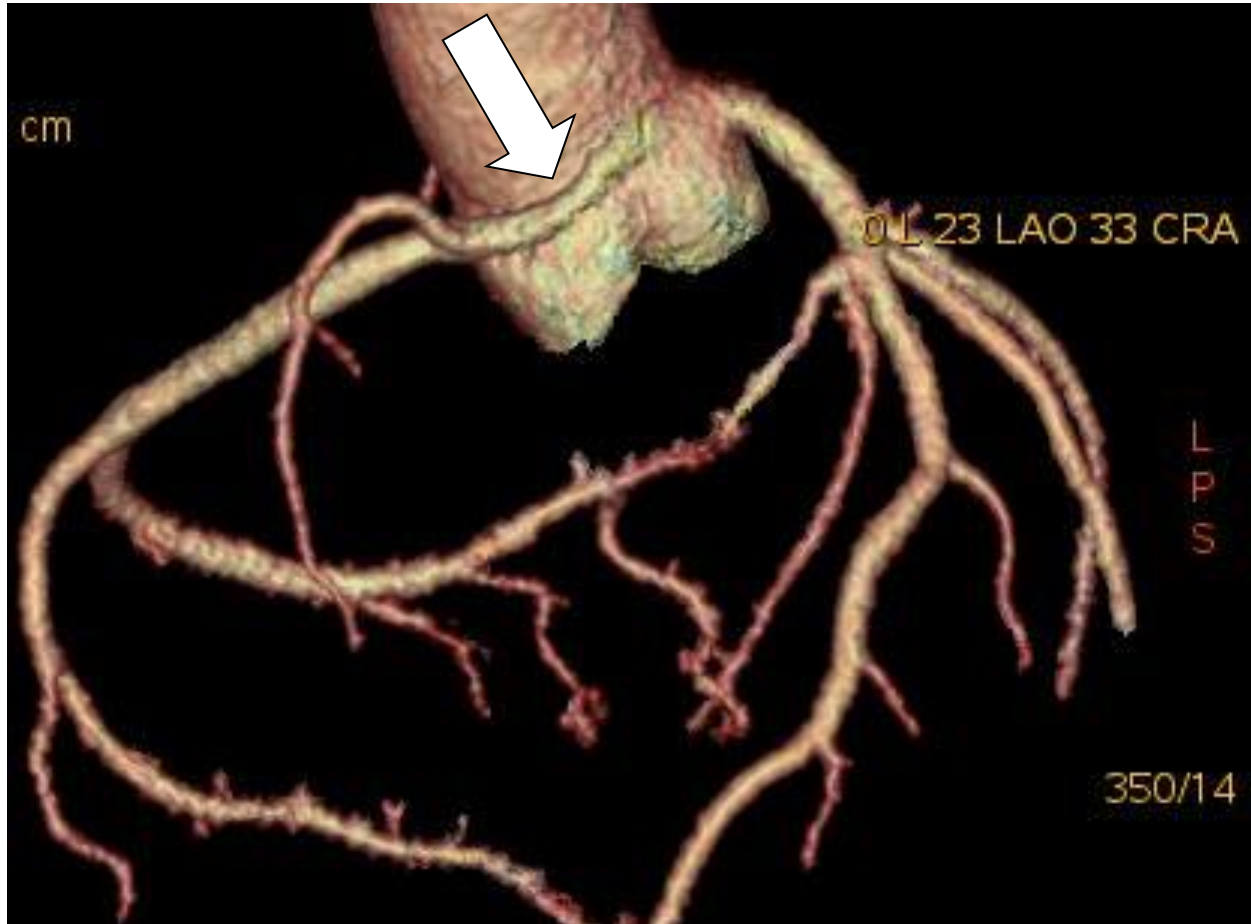
Anomalies de connexion des artères coronaires (ANOCOR)



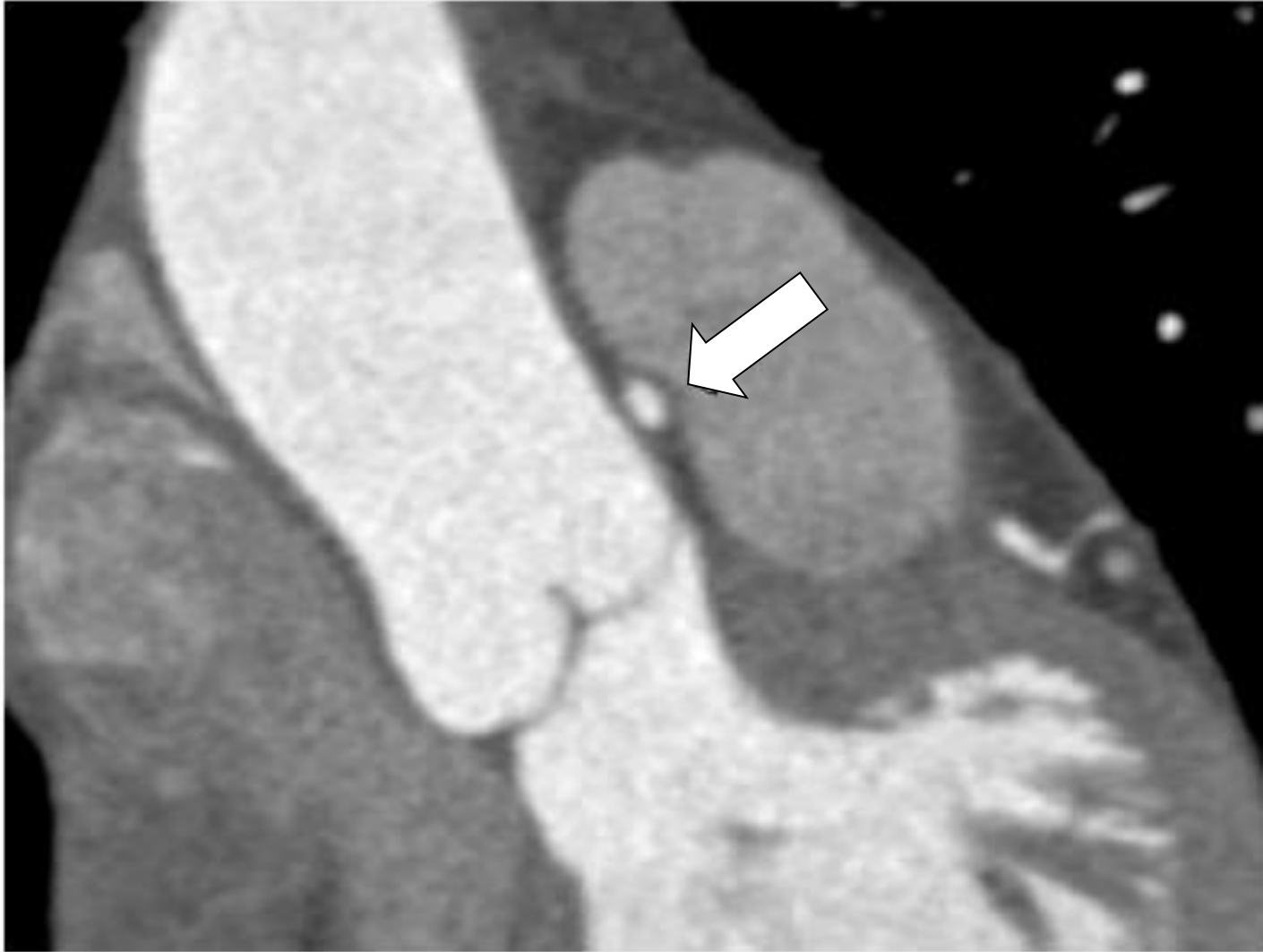
Anomalies de connexion des artères coronaires (ANOCOR)



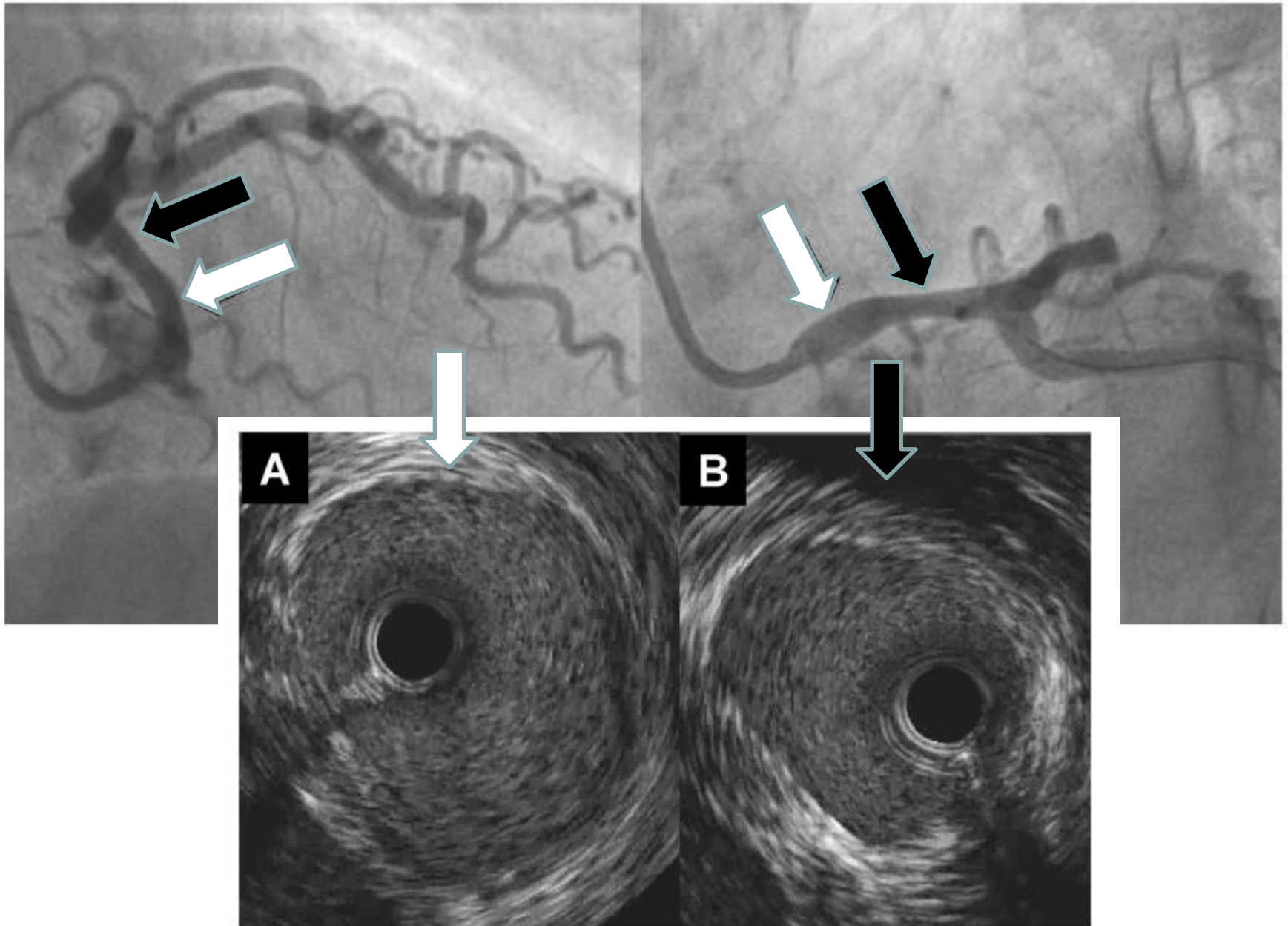
Anomalies de connexion des artères coronaires (ANOCOR)



Anomalies de connexion des artères coronaires (ANOCOR)



Anomalies de connexion des artères coronaires (ANOCOR)



Anomalies de connexion des artères coronaires (ANOCOR)

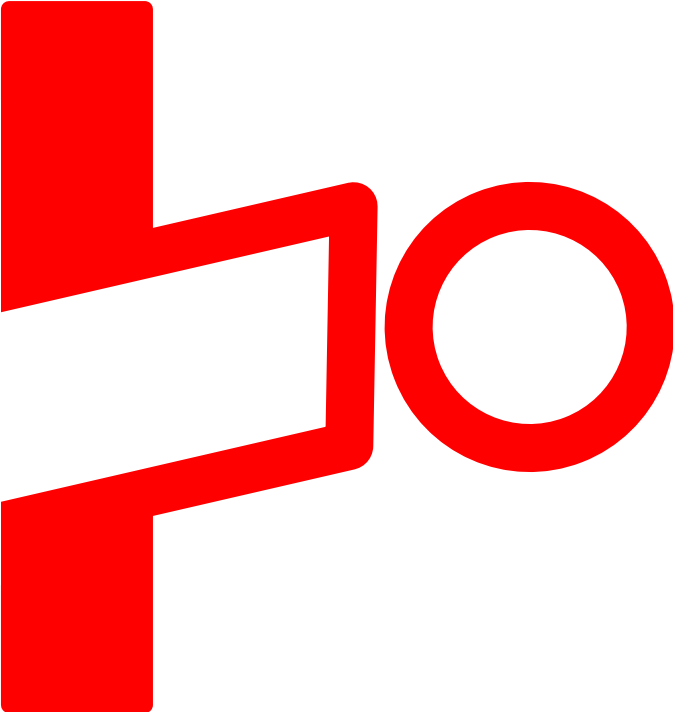
Compression artérielle
Adaptation artérielle

Anomalies de connexion des artères coronaires (ANOCOR)

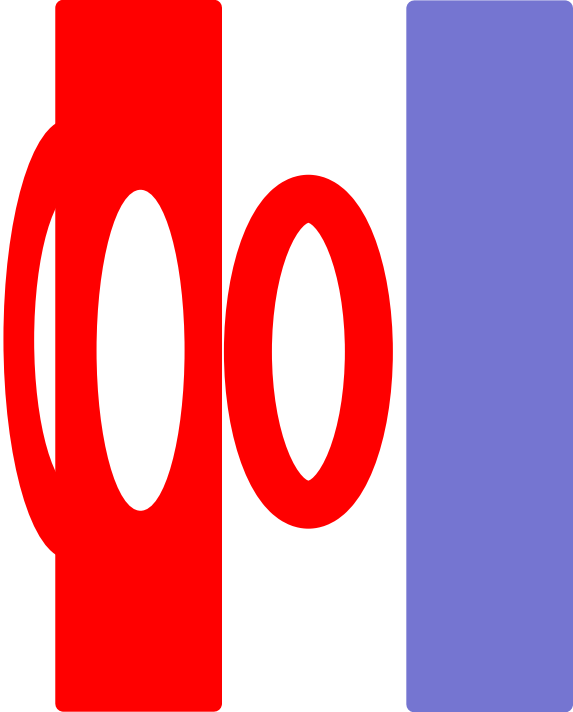
CONNEXION INTRAMURALE

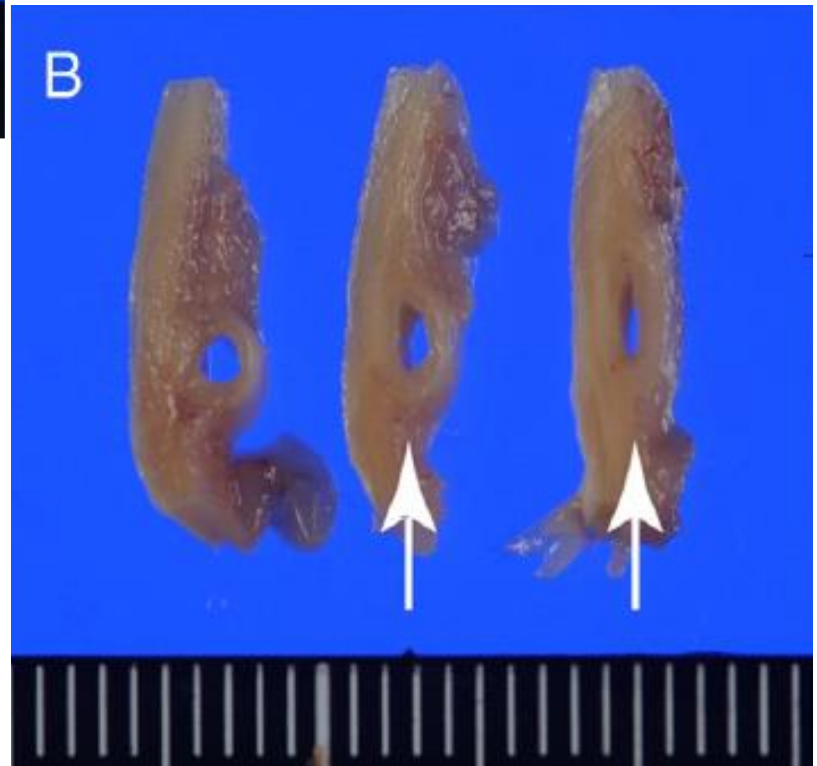
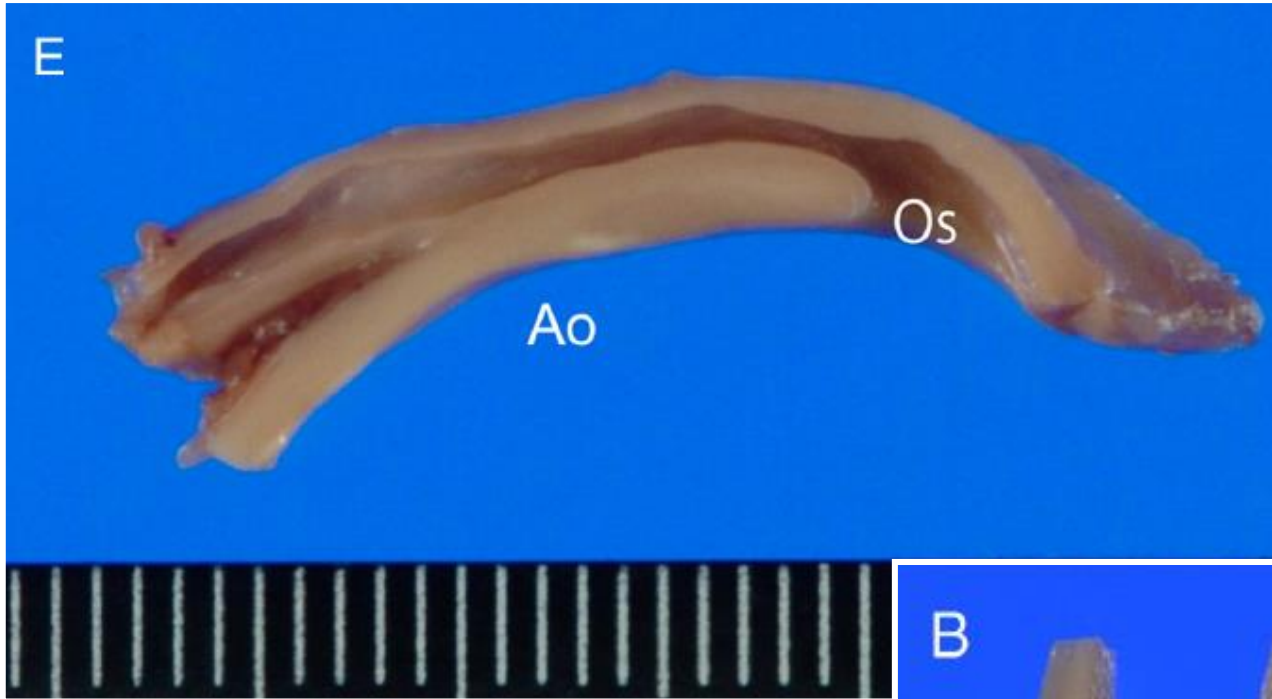
Anomalies de connexion des artères coronaires (ANOCOR)

connexion
extramurale



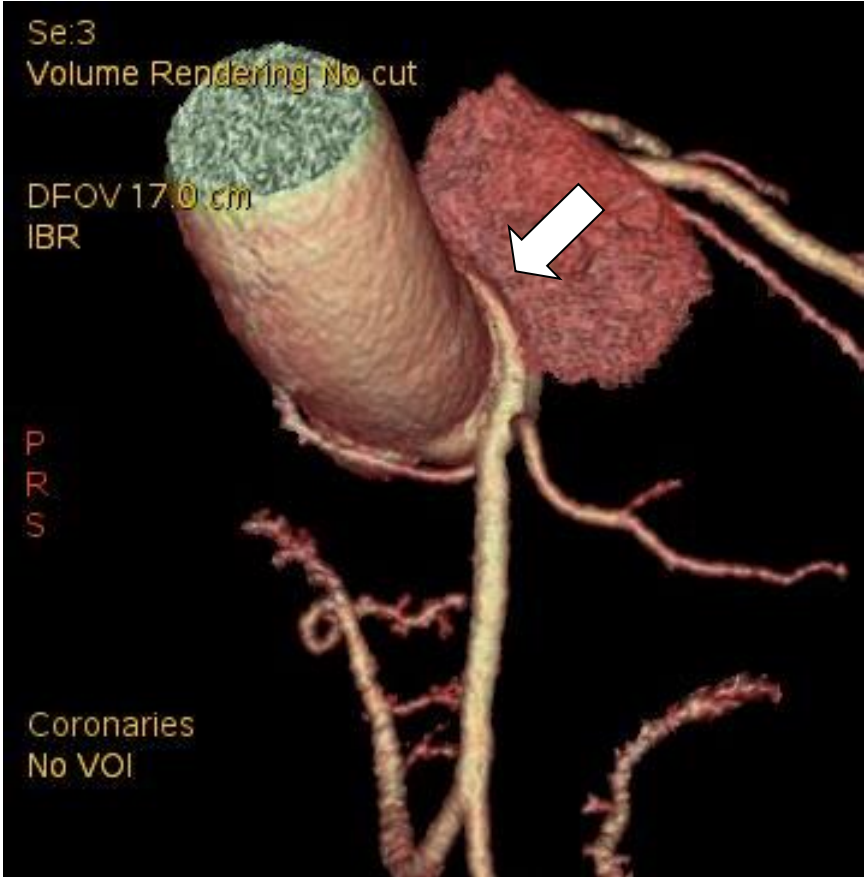
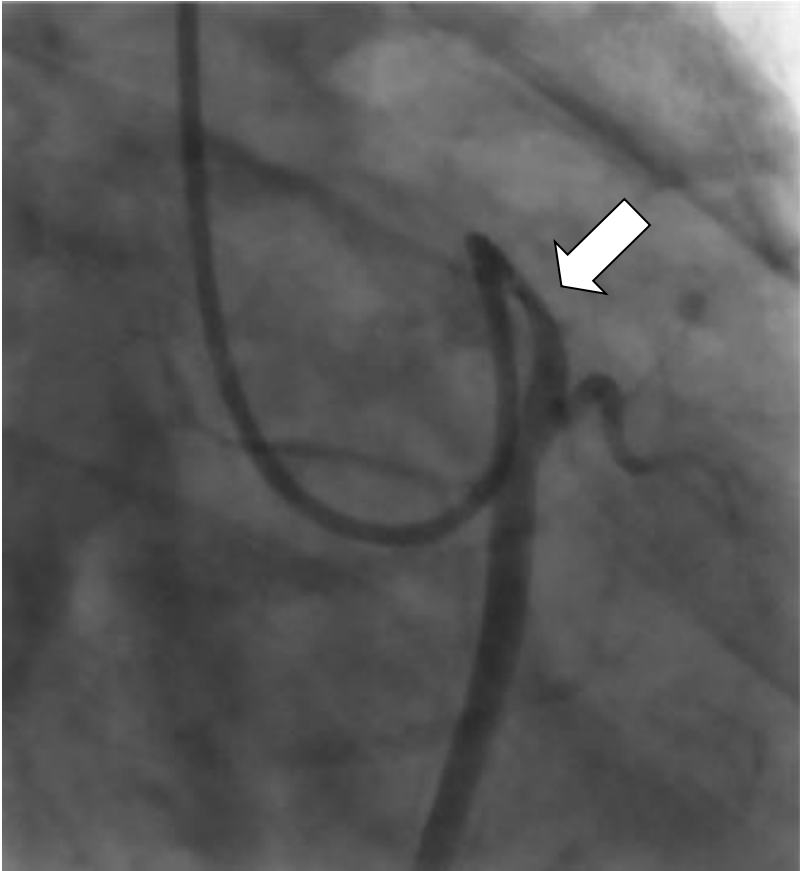
connexion
intramurale





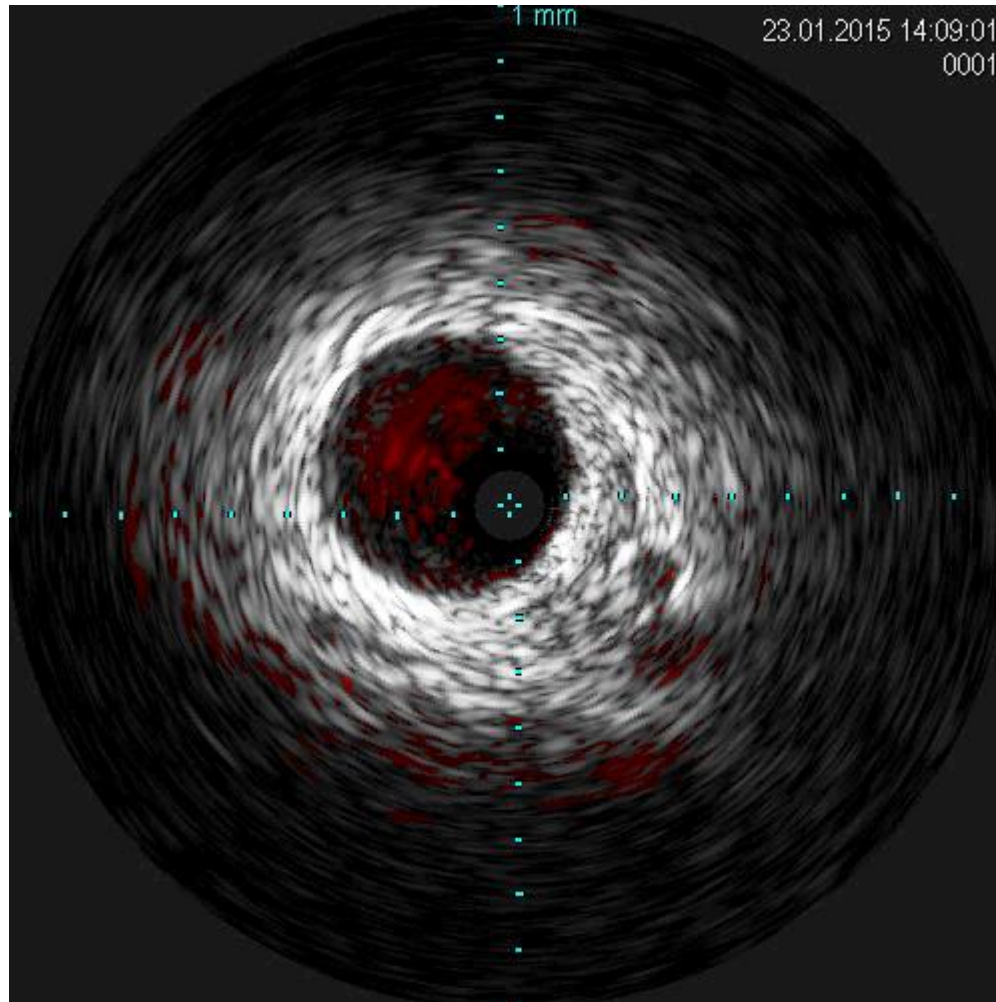
Right ANOCOR with an intramural course
Hata Y et al.
Cardiovasc Pathol 2014

Anomalies de connexion des artères coronaires (ANOCOR)



Anomalies de connexion des artères coronaires (ANOCOR)

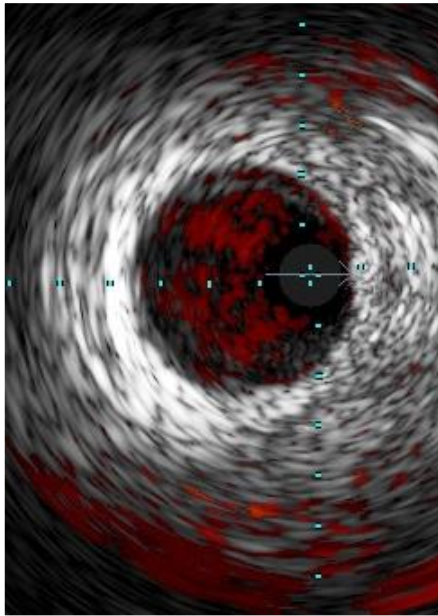
Echographie endocoronaire



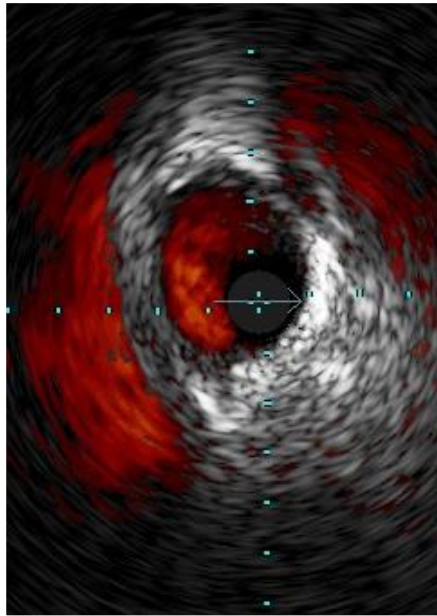
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Echographie endocoronaire

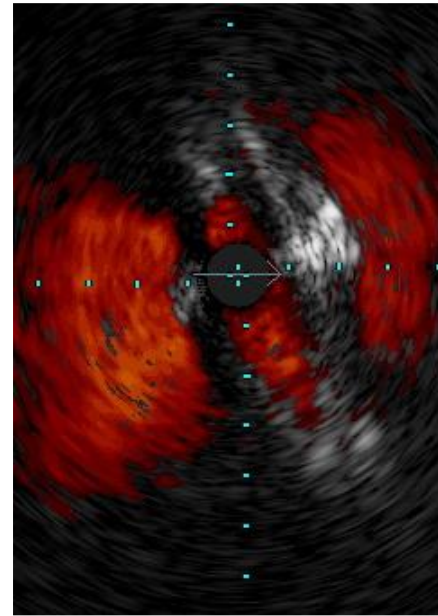
extramural



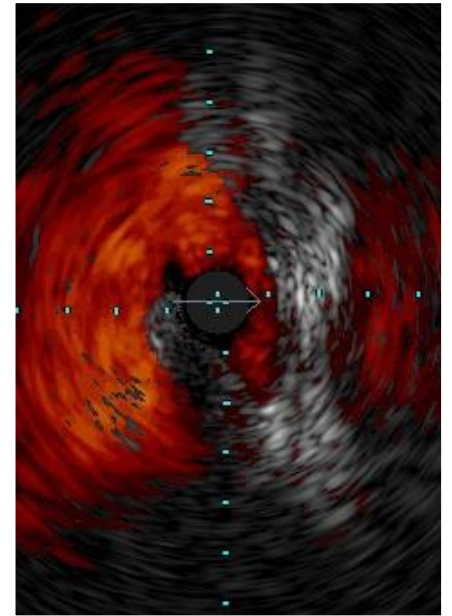
juxtamural



intramural



ostium



Anomalies de connexion des artères coronaires (ANOCOR)

PREVALENCE

Anomalies de connexion des artères coronaires (ANOCOR)

PREVALENCE

- Echographie 2/1000
- Coronarographie 5/1000
- Scanner coronaire 12/1000

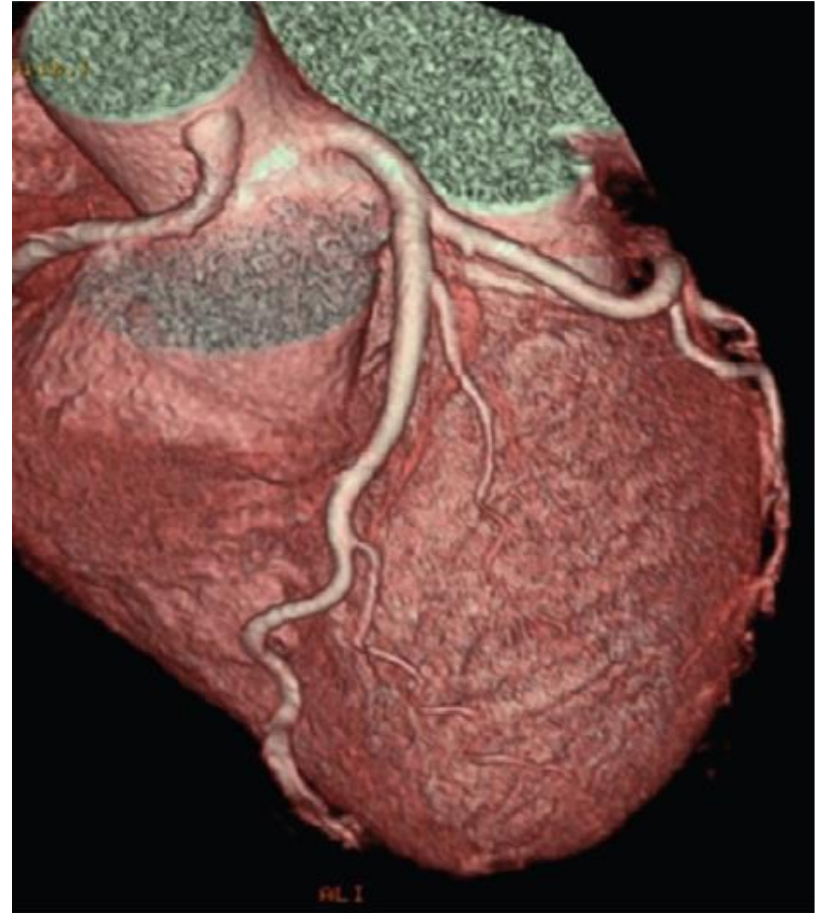
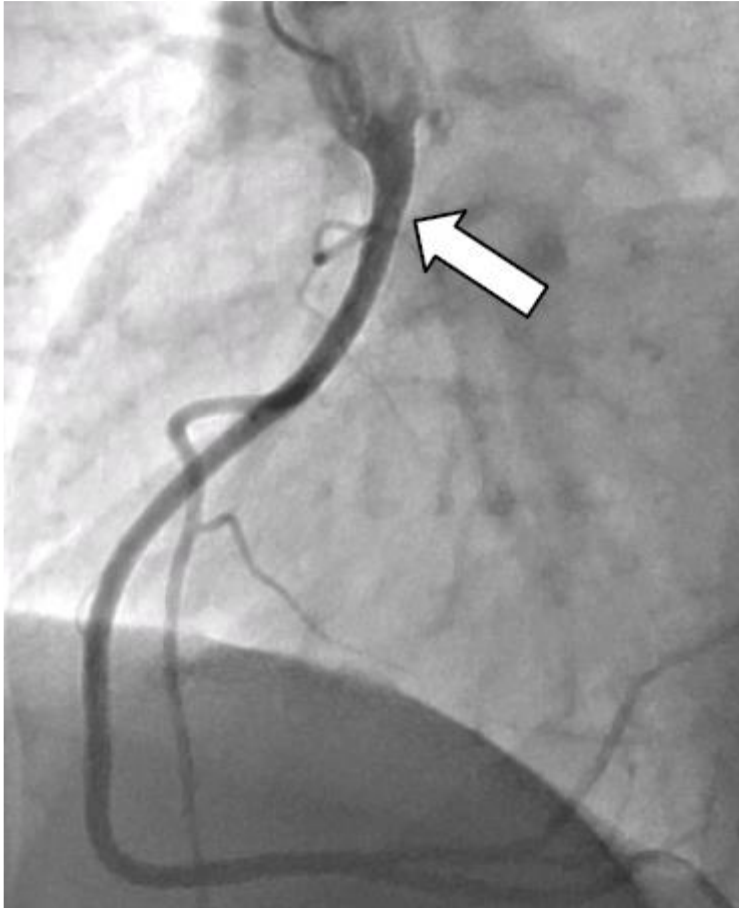
Anomalies de connexion des artères coronaires (ANOCOR)

artère coronaire unique



Anomalies de connexion des artères coronaires (ANOCOR)

Connexion dans l'aorte ascendante



Anomalies de connexion des artères coronaires (ANOCOR)

Prévalence dans la population générale

1 à 2/1000*

* estimation

Incidence à la naissance

?

Anomalies de connexion des artères coronaires (ANOCOR)

REPARTITION

1000 ANOCOR

	480	330	180	10
Artère	circonflexe	droite	tronc/IVA	divers
Trajet	rétro aortique*	pré aortique*	variable	variable
Risque	non	oui	variable**	variable***

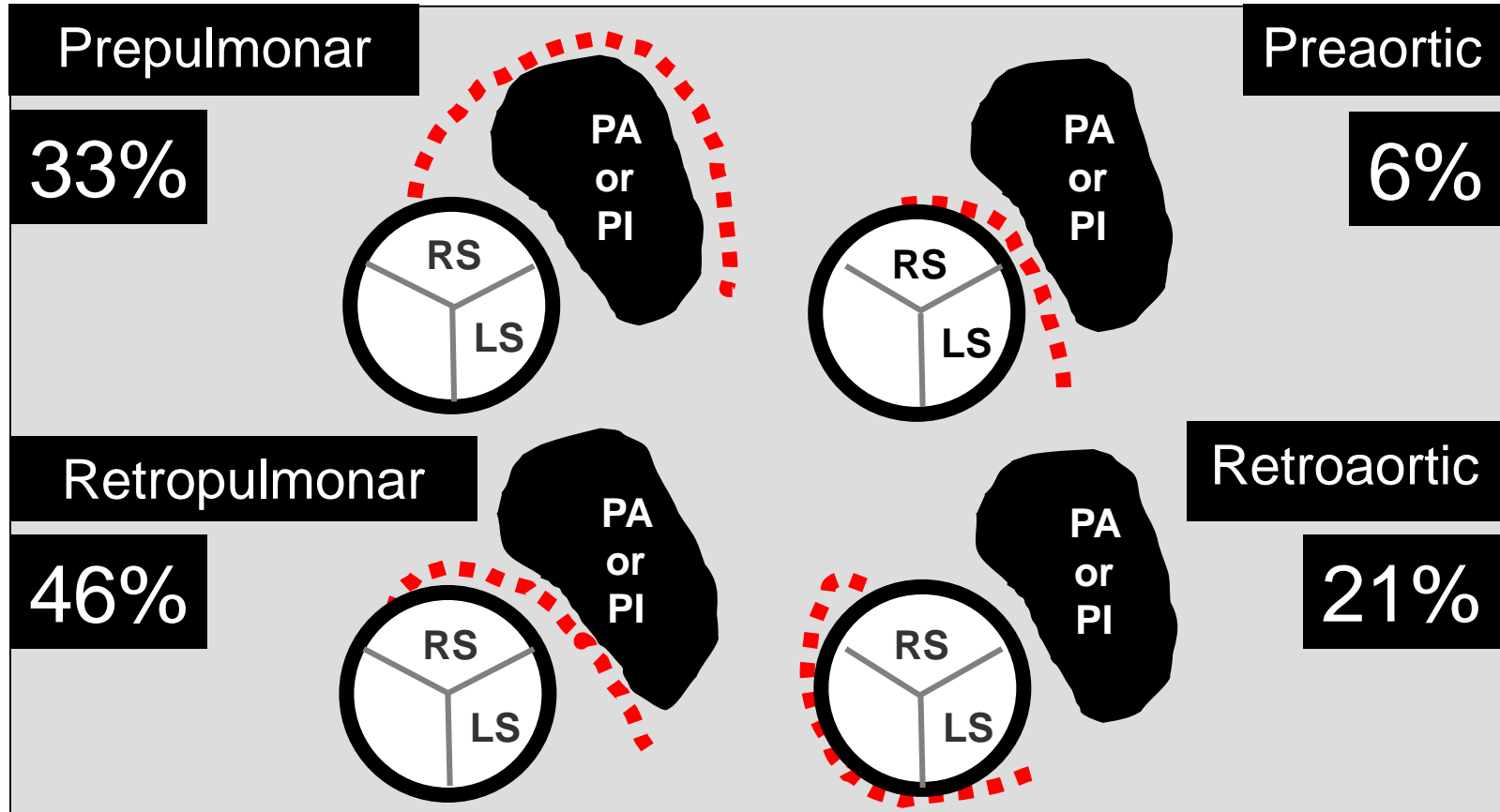
>95% des cas

** selon le trajet

*** selon la connexion et le trajet

Anomalous connections of the coronary arteries (ANOCOR)

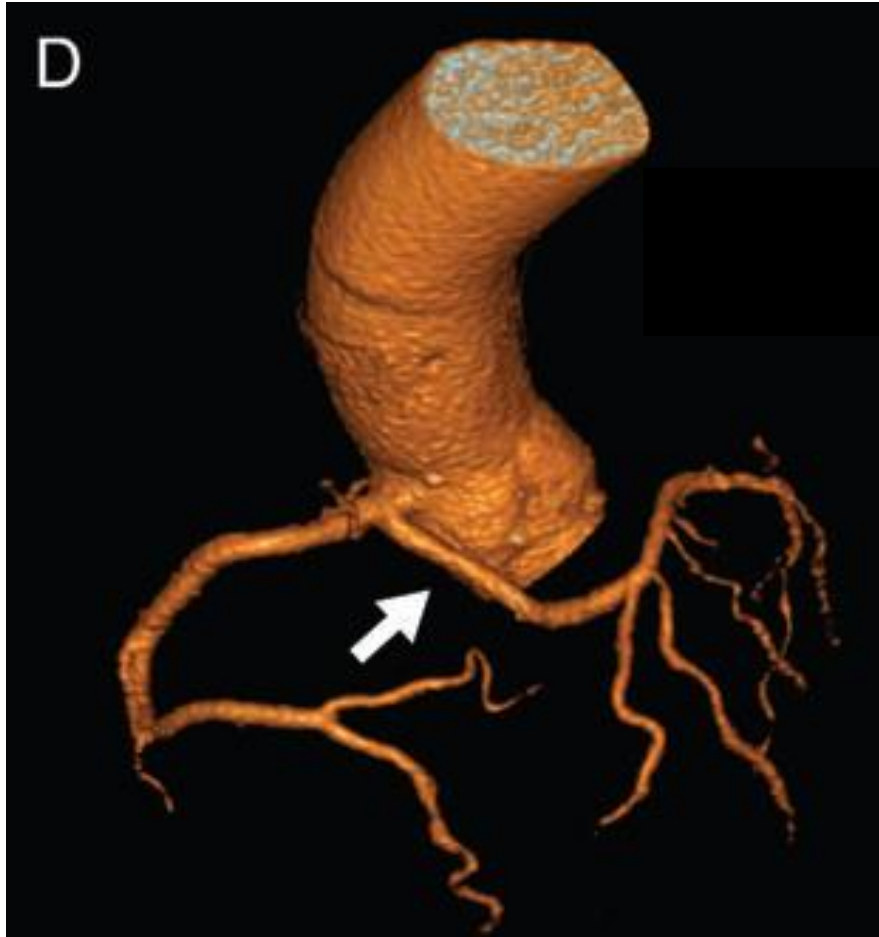
Ectopic left main courses



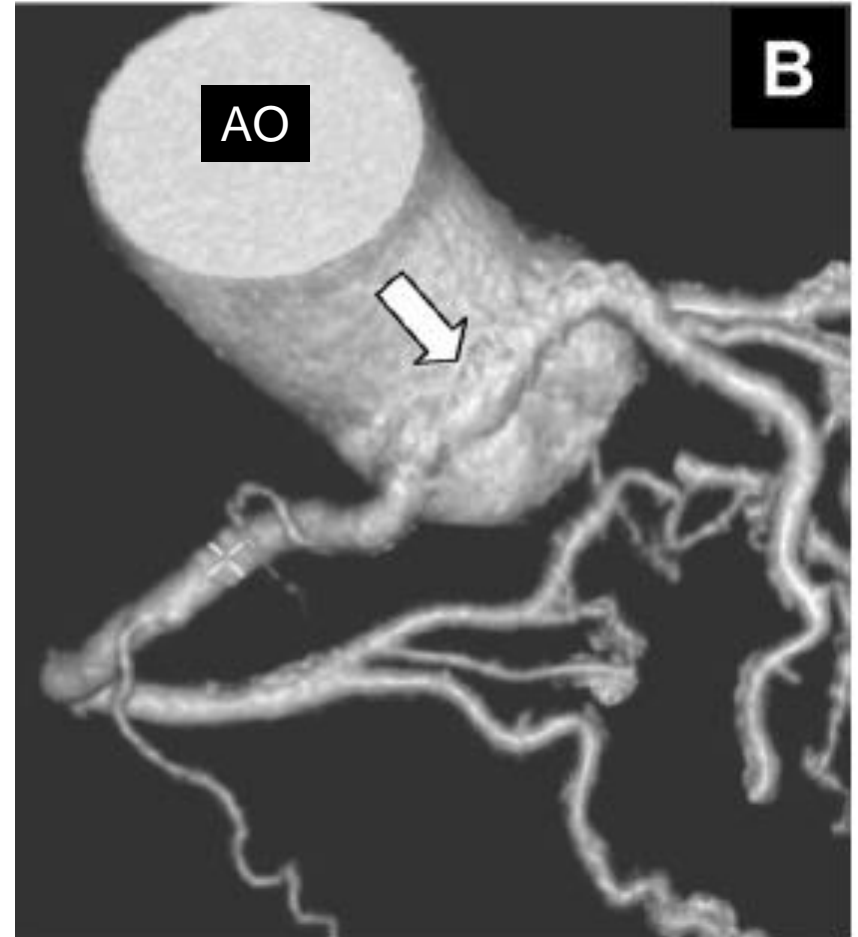
PA: pulmonary artery, PI : pulmonary infundibulum
LS: left sinus, RS: right sinus

Anomalies de connexion des artères coronaires (ANOCOR)

Trajet rétro pulmonaire

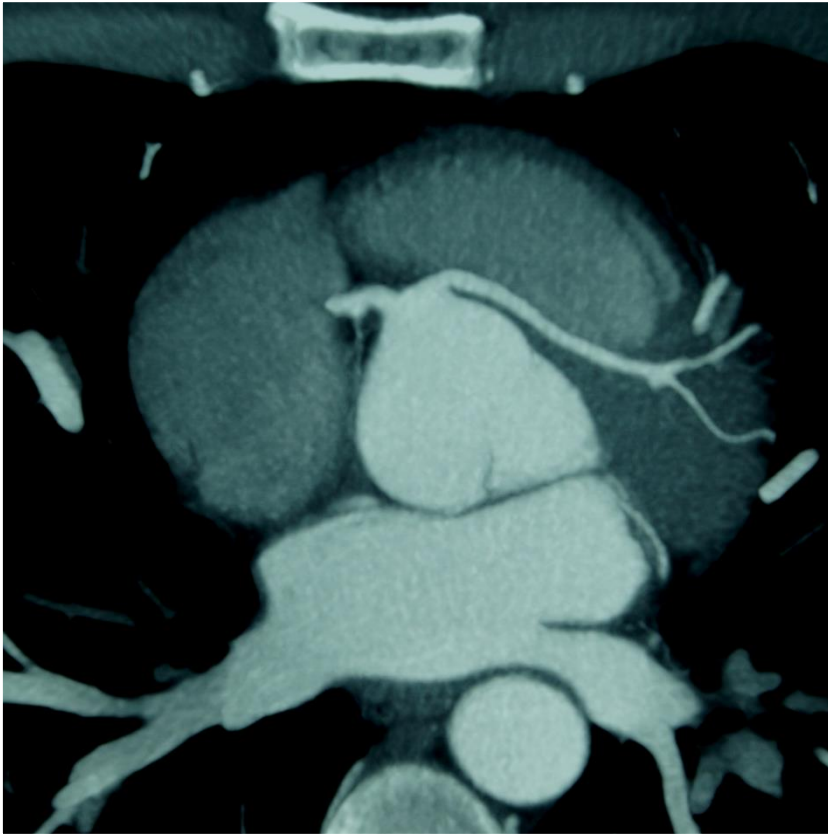


Trajet pré aortique

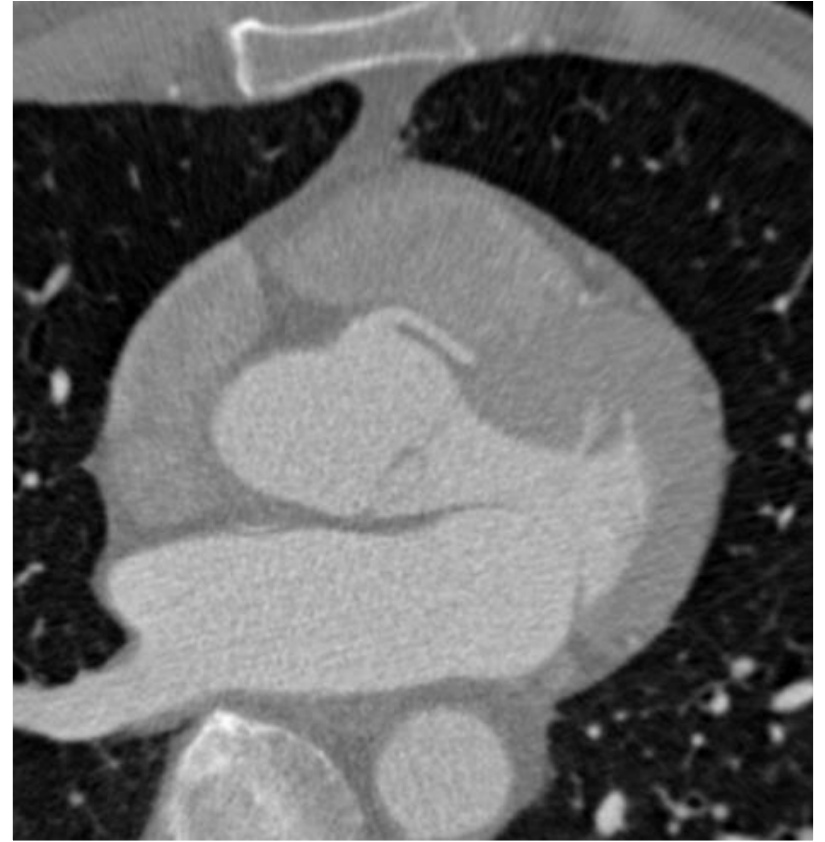


Anomalies de connexion des artères coronaires (ANOCOR)

Trajet rétro pulmonaire



Trajet pré aortique



Anomalies de connexion des artères coronaires (ANOCOR)

Trajet inter artériel

Trajet inter aortico pulmonaire

Trajet pré aortique

Trajet rétro pulmonaire

Anomalies de connexion des artères coronaires (ANOCOR)

RISQUES

Anomalies de connexion des artères coronaires (ANOCOR)

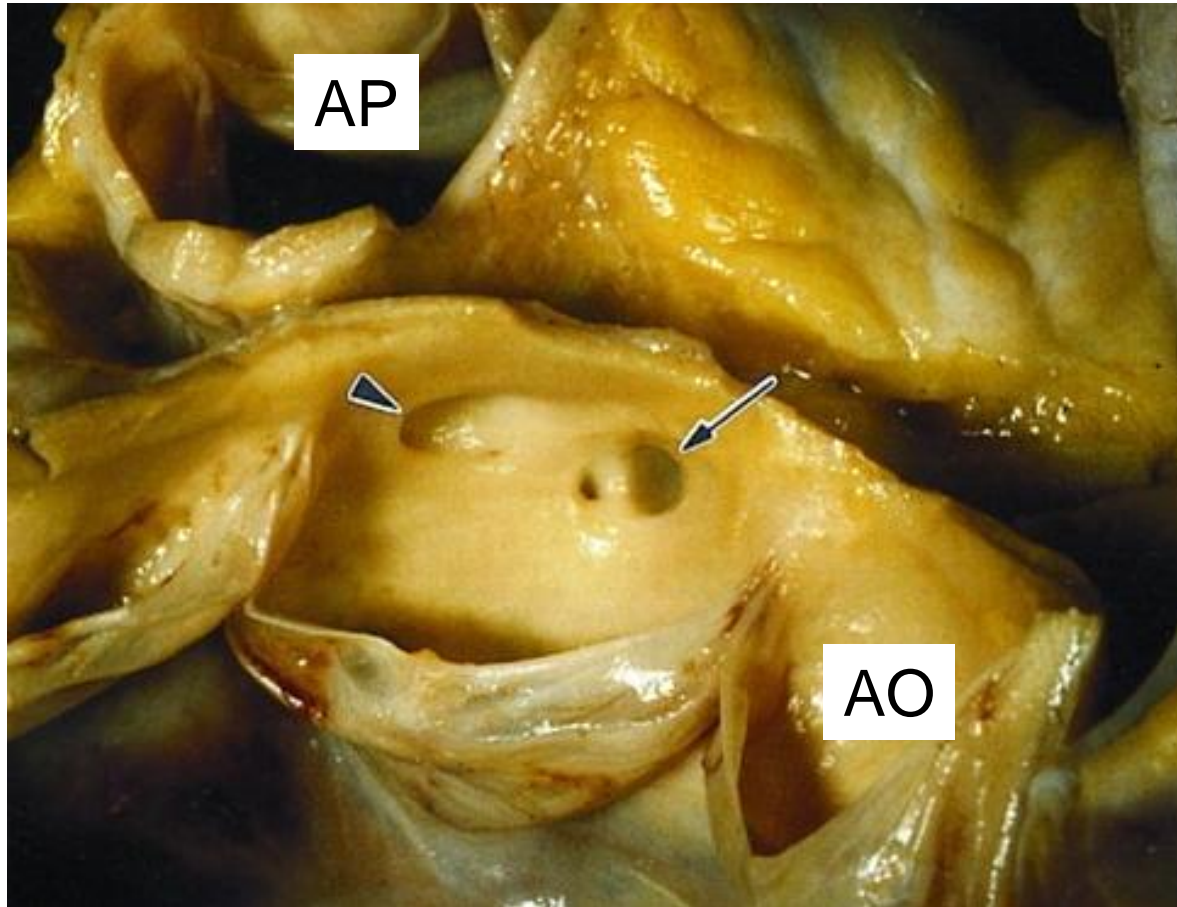
Présentation clinique

Absence de symptôme	possible
Douleur thoracique	possible
Dyspnée	rare
Palpitations	possible
Lipothymie	possible
Syncope	possible
SCA ST -	rare
SCA ST +	très rare
Mort subite	rare
Lien avec l'effort	fréquent

Anomalies de connexion des artères coronaires (ANOCOR)

MORT SUBITE

Anomalies de connexion des artères coronaires (ANOCOR)



Anomalies de connexion des artères coronaires (ANOCOR)

Table 1. Causes of Sudden Death in 387 Young Athletes*

Cause	No. of Athletes	Percent
Hypertrophic cardiomyopathy	102	26.4
Commotio cordis	77	19.9
Coronary artery anomalies	53	13.7
Left ventricular hypertrophy of indeterminate causation†	29	7.5
Myocarditis	20	5.2
Ruptured aortic aneurysm (Marfan syndrome)	12	3.1
Arrhythmogenic right ventricular cardiomyopathy	11	2.8
Tunneled (bridged) coronary artery‡	11	2.8
Aortic valve stenosis	10	2.6
Atherosclerotic coronary artery disease	10	2.6
Dilated cardiomyopathy	9	2.3
Myxomatous mitral valve degeneration	9	2.3
Asthma (or other pulmonary condition)	8	2.1
Heat stroke	6	1.6
Drug abuse	4	1.0
Other cardiovascular cause	4	1.0
Long QT syndrome§	3	0.8
Cardiac sarcoidosis	3	0.8
Trauma causing structural cardiac injury	3	0.8
Ruptured cerebral artery	3	0.8

Anomalies de connexion des artères coronaires (ANOCOR)

MORT SUBITE

Risque annuel

?

Anomalies de connexion des artères coronaires (ANOCOR)

MORT SUBITE

Cause

Anomalies de connexion des artères coronaires (ANOCOR)

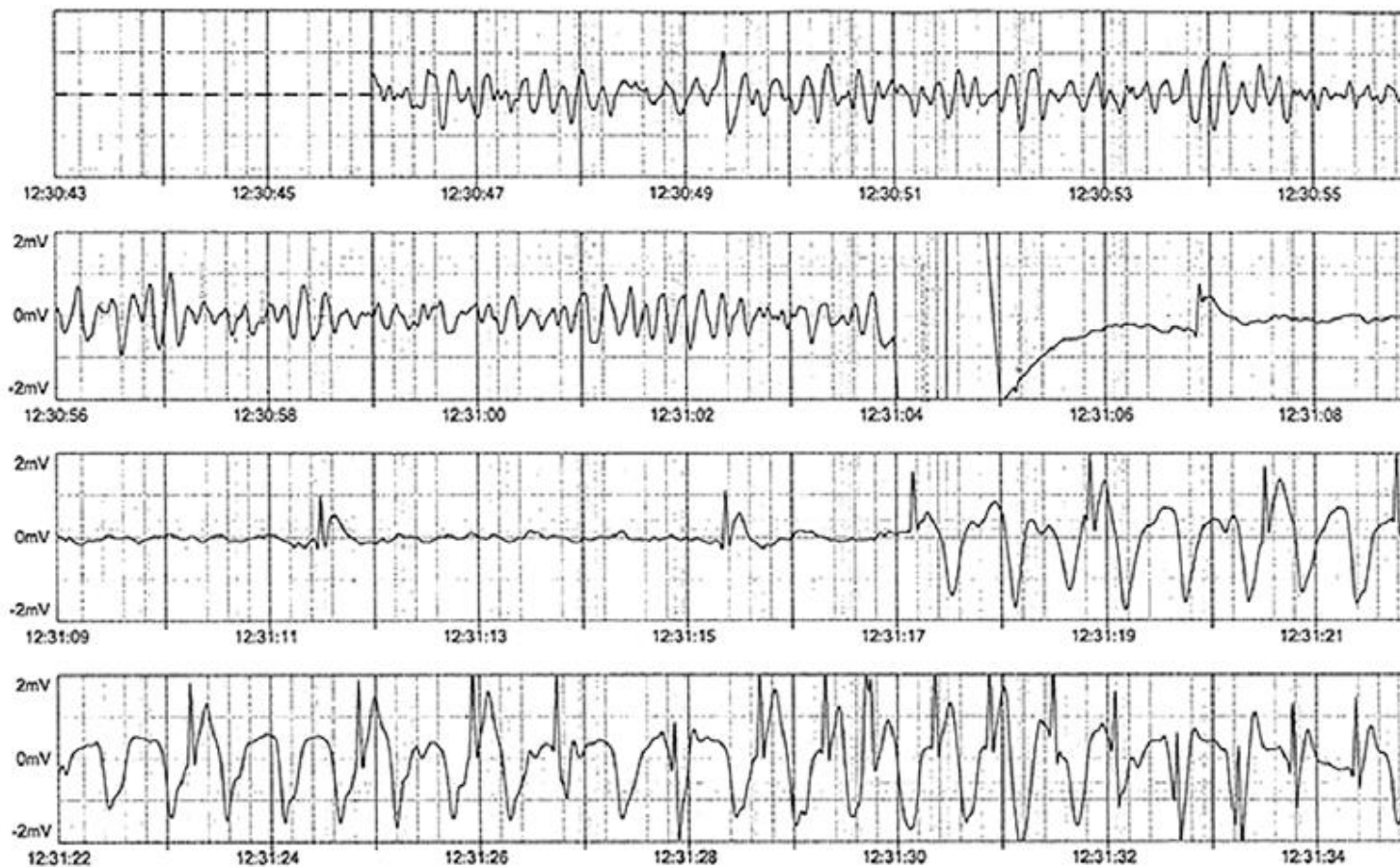


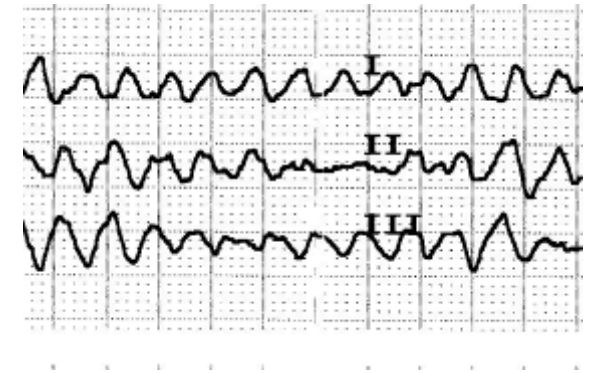
Figure 1. ECG recording from an automated external defibrillator

Anomalies de connexion des artères coronaires (ANOCOR)

FIBRILLATION VENTRICULAIRE

Anomalies de connexion des artères coronaires (ANOCOR)

Mécanismes de la fibrillation ventriculaire



Anomalies de connexion des artères coronaires (ANOCOR)

Mécanismes de la fibrillation ventriculaire

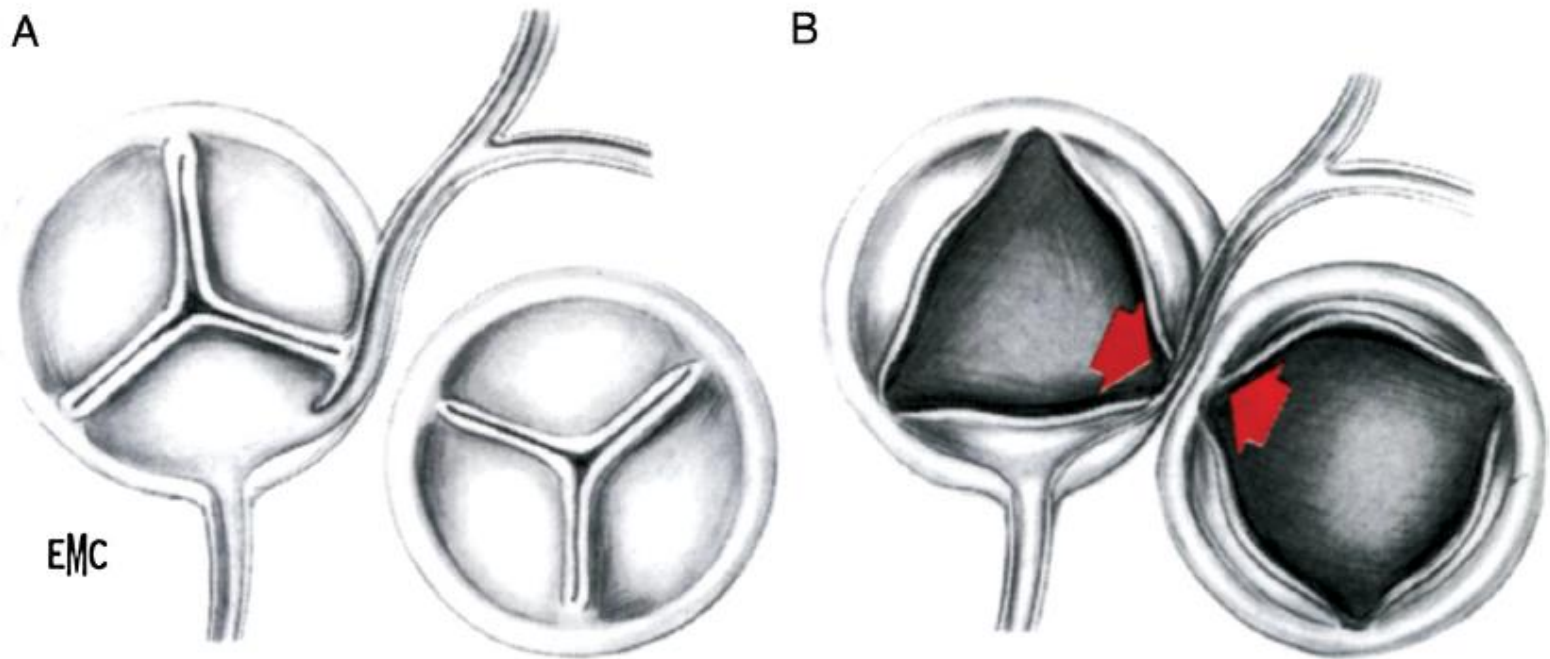
- FV ischémie myocardique dépendante
- Zones de fibrose myocardique
- Seuil arythmogène bas
- Association de plusieurs mécanismes
- Association fortuite

Anomalies de connexion des artères coronaires (ANOCOR)

COMPRESSION EXTRINSEQUE

Anomalies de connexion des artères coronaires (ANOCOR)

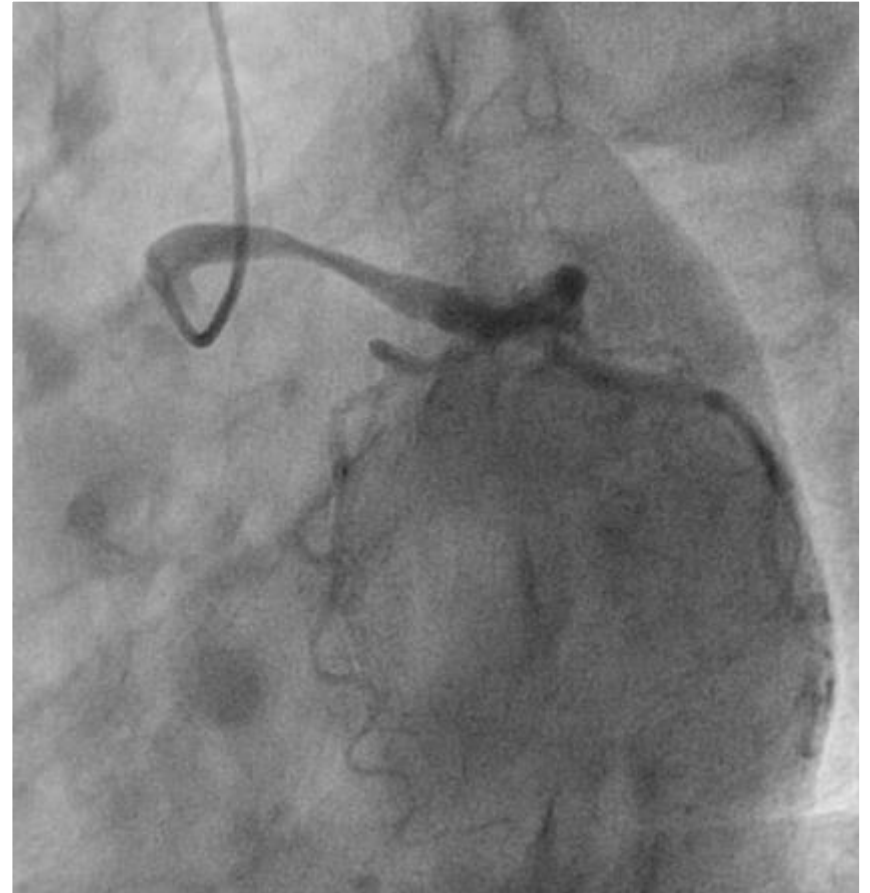
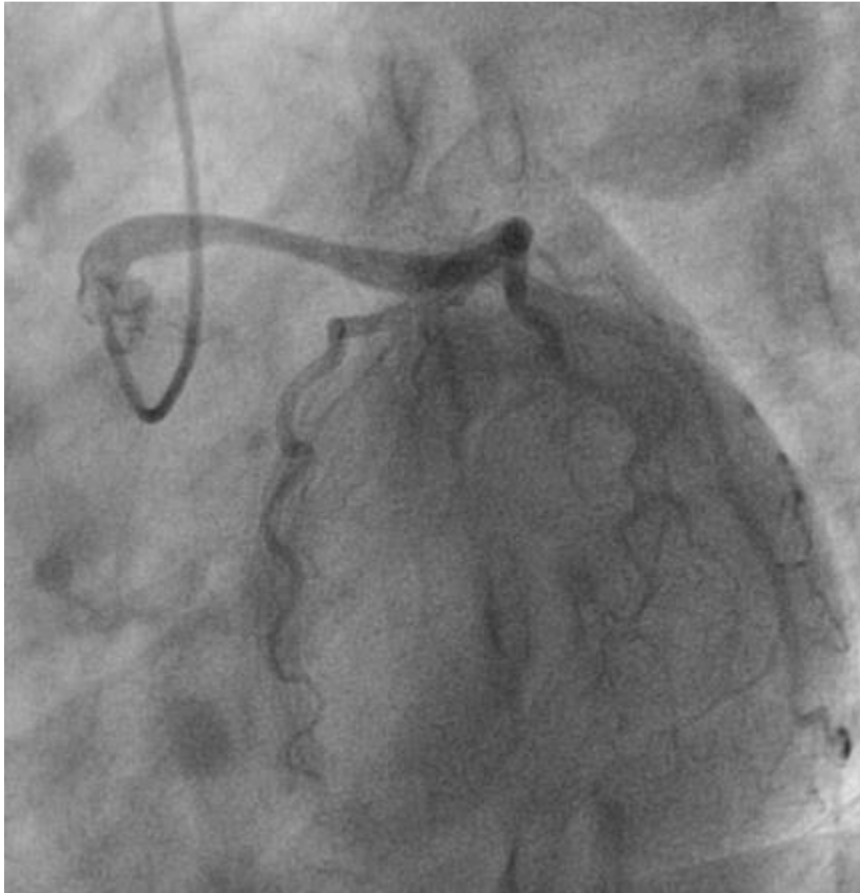
Compression à l'effort : pas démontrée



Raisky O, Vouhé P. EMC 2007

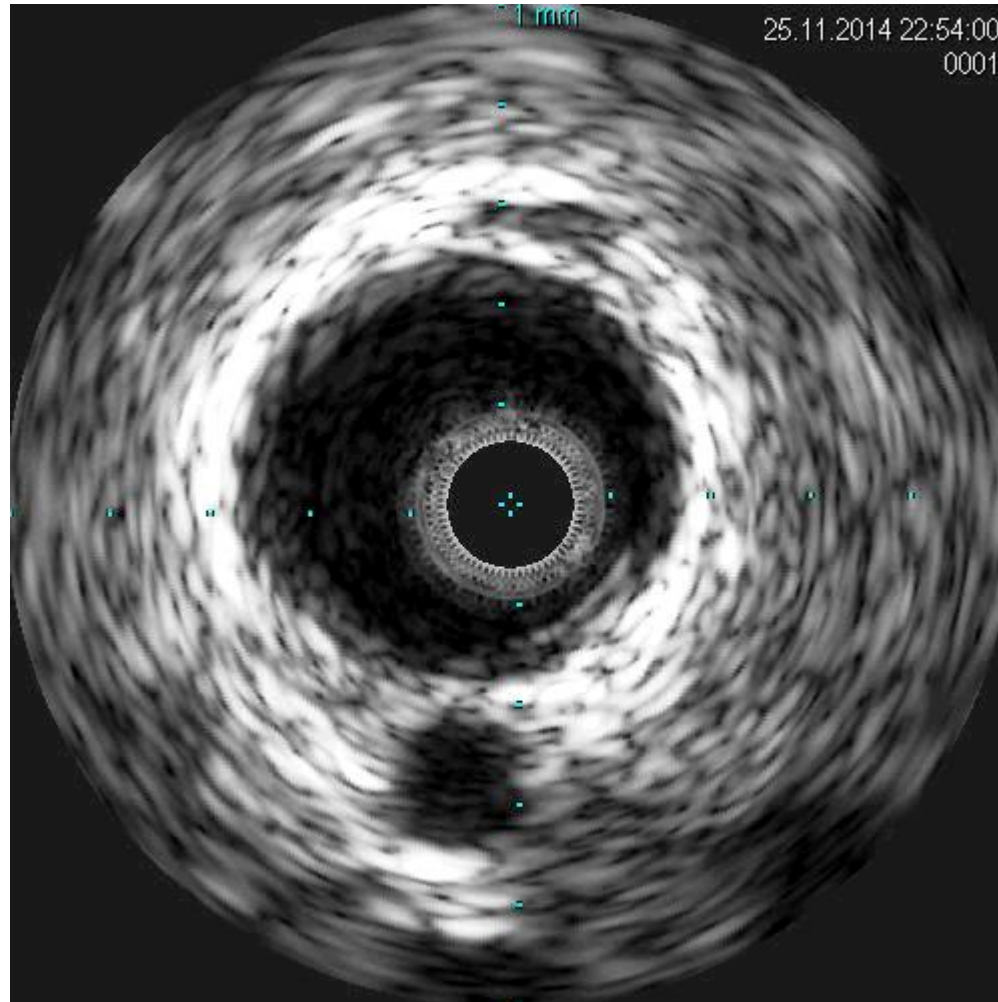
Anomalies de connexion des artères coronaires (ANOCOR)

Compression dynamique spontanée



Anomalies de connexion des artères coronaires (ANOCOR)

Echographie endocoronaire

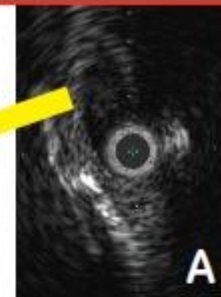
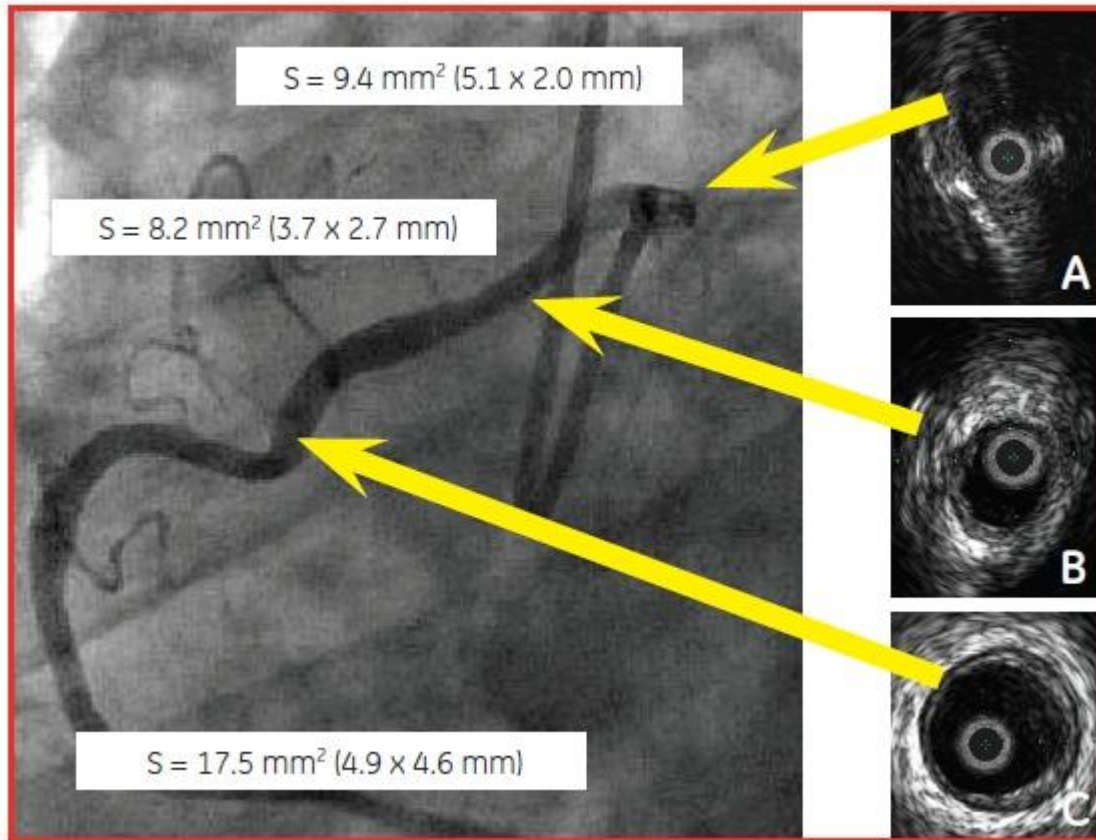


Anomalies de connexion des artères coronaires (ANOCOR)

ISCHEMIE MYOCARDIQUE

Anomalies de connexion des artères coronaires (ANOCOR)

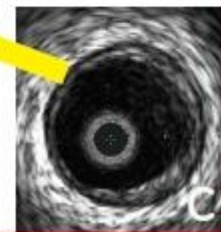
Echographie endocoronaire



segment intramural

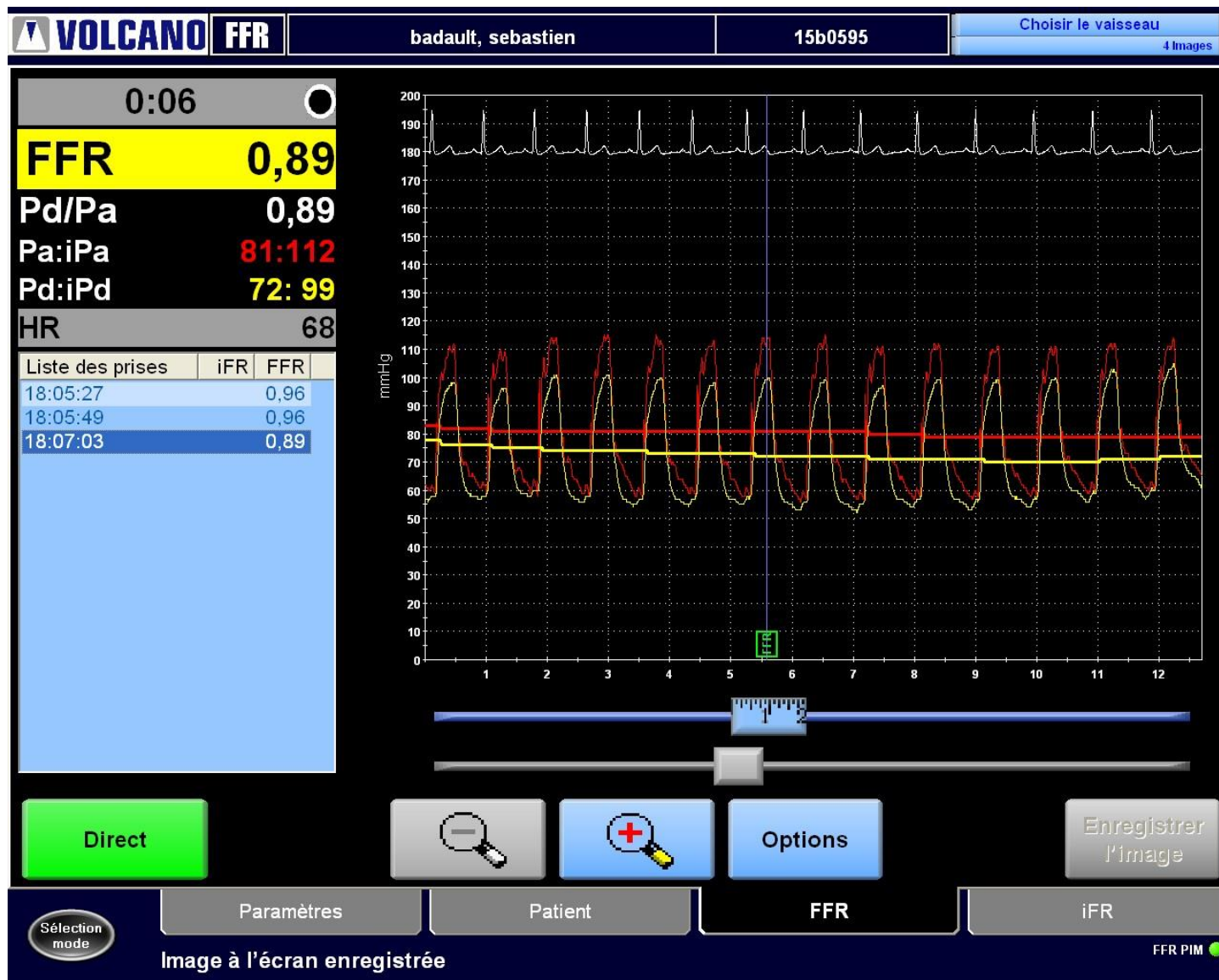


segment juxtamural



segment extramural

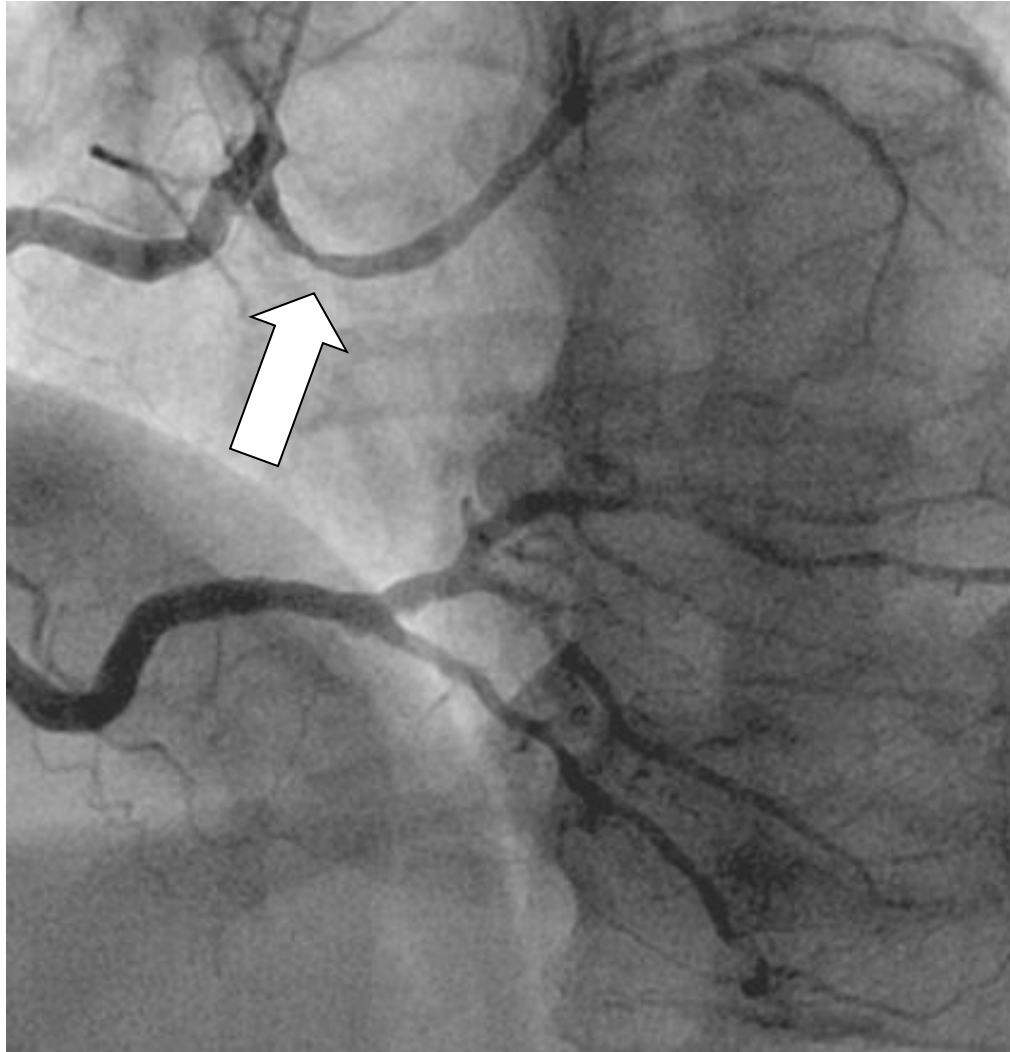
Anomalies de connexion des artères coronaires (ANOCOR)



Anomalies de connexion des artères coronaires (ANOCOR)

ATHEROME

Anomalies de connexion des artères coronaires (ANOCOR)

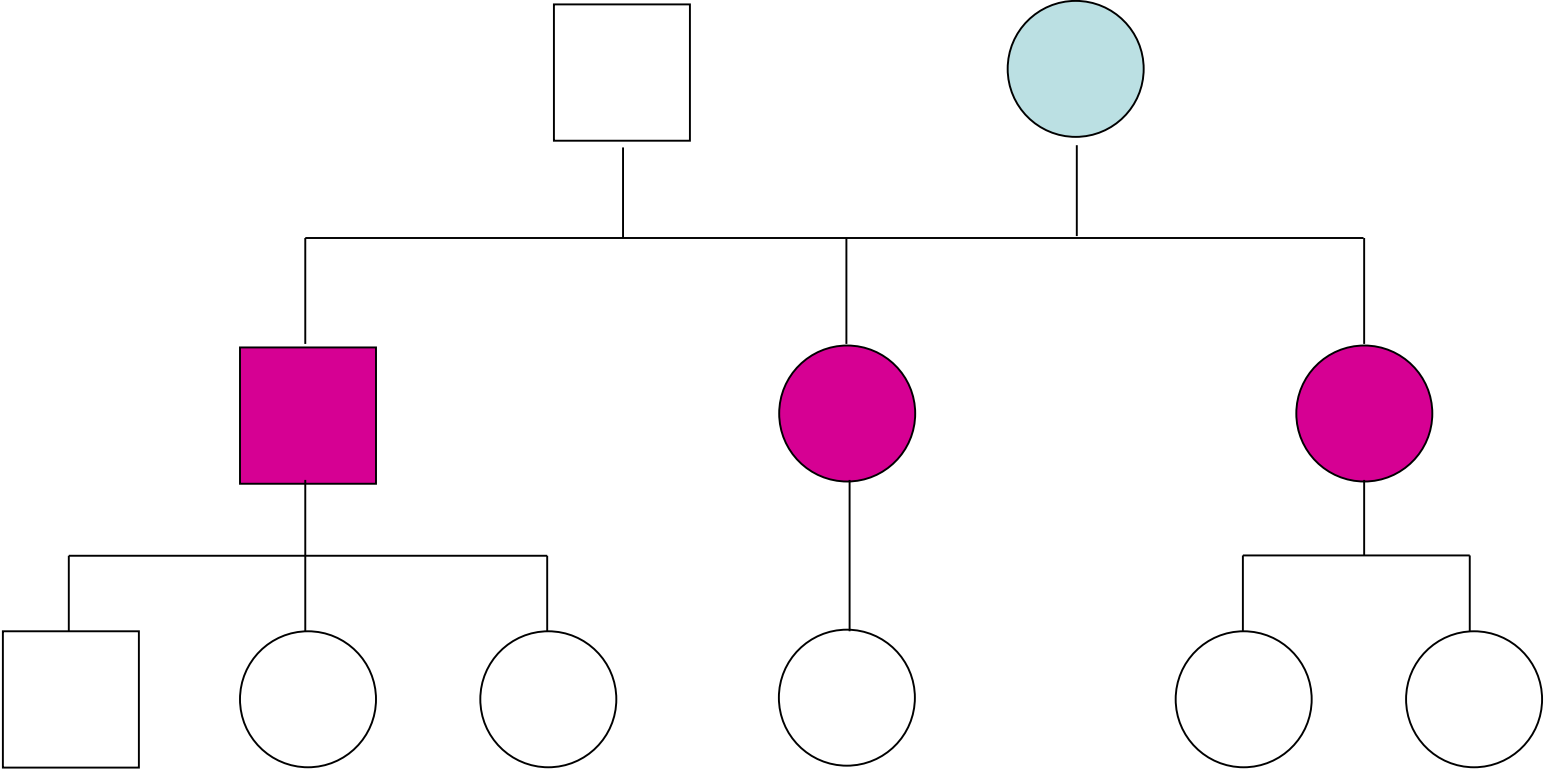



Anomalies de connexion des artères coronaires (ANOCOR)

GENETIQUE

Anomalies de connexion des artères coronaires (ANOCOR)

Famille B.



 Absence ANOCOR

 ANOCOR droite

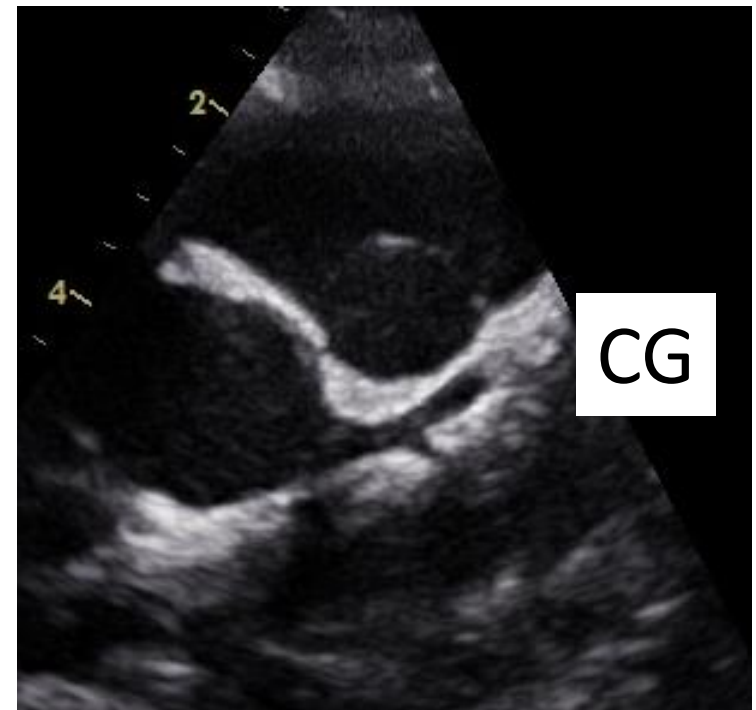
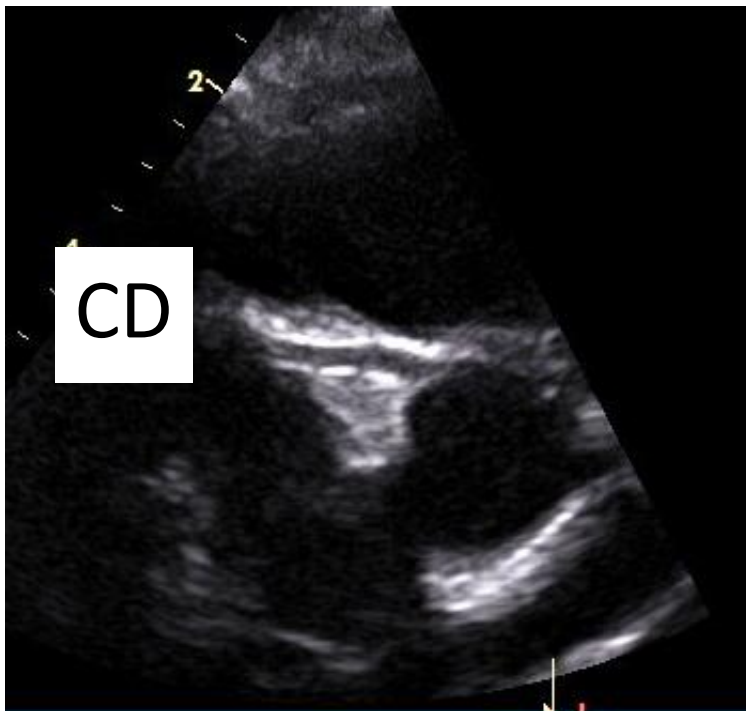
 Statut inconnu

Anomalies de connexion des artères coronaires (ANOCOR)

DEPISTAGE

Anomalies de connexion des artères coronaires (ANOCOR)

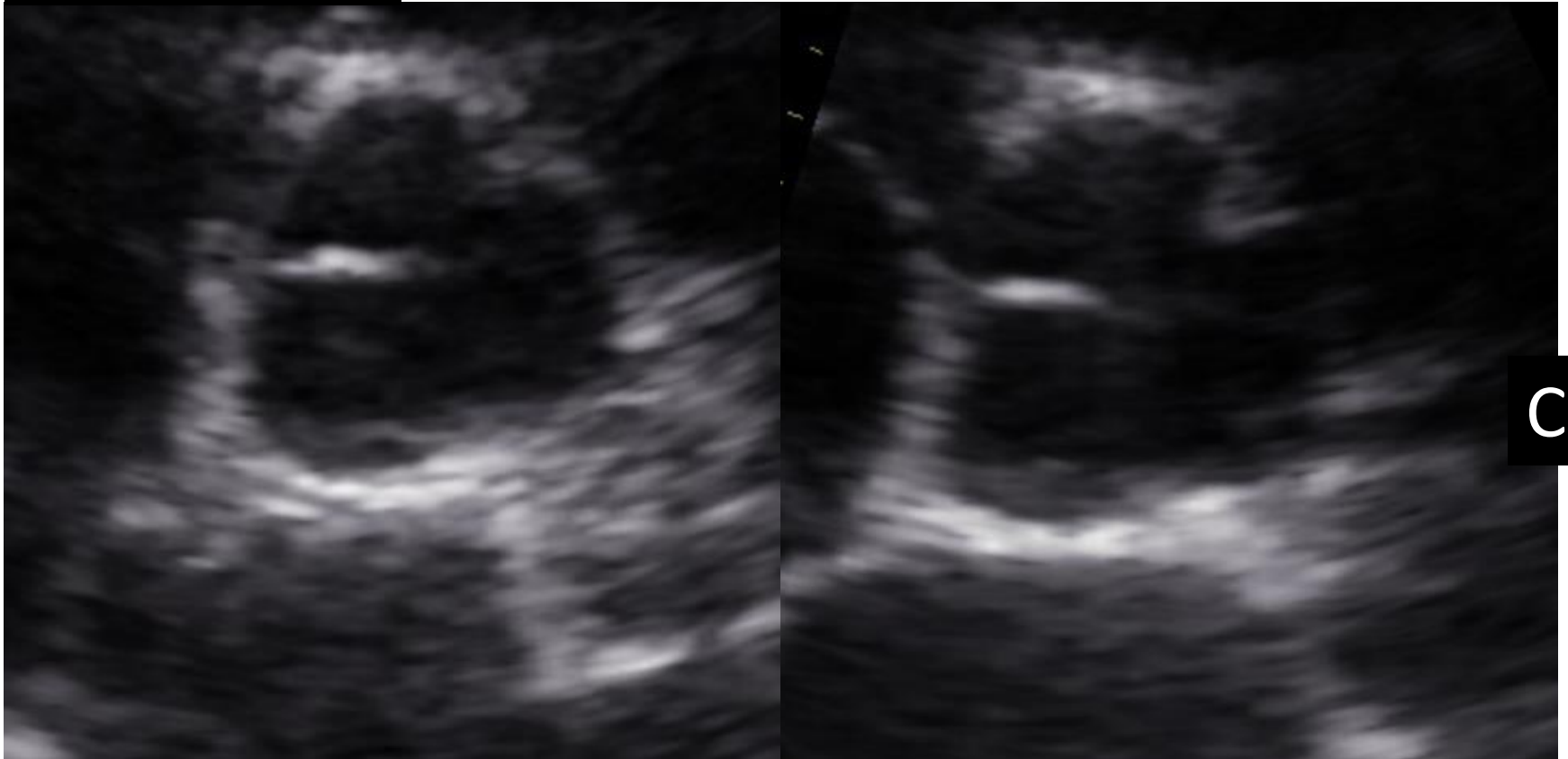
Enfant de 11 ans sans ANOCOR



Anomalies de connexion des artères coronaires (ANOCOR)

Adulte de 42 ans avec ANOCOR droite

CD non vue



CG

Anomalies de connexion des artères coronaires (ANOCOR)

CHIRURGIE

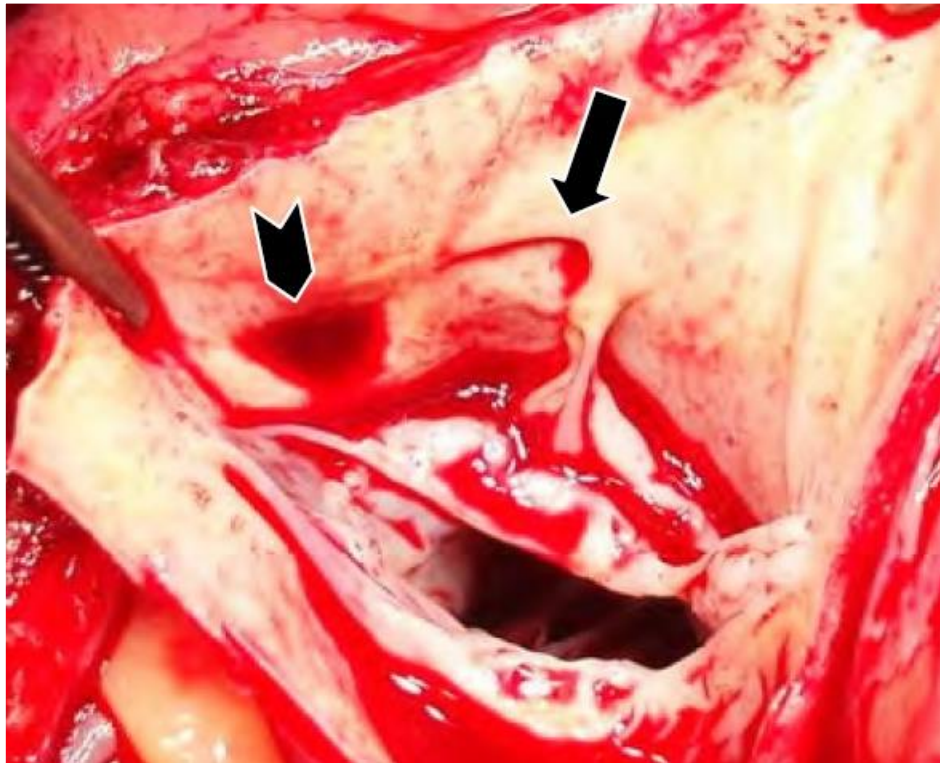
Anomalies de connexion des artères coronaires (ANOCOR)

Pontage coronaire

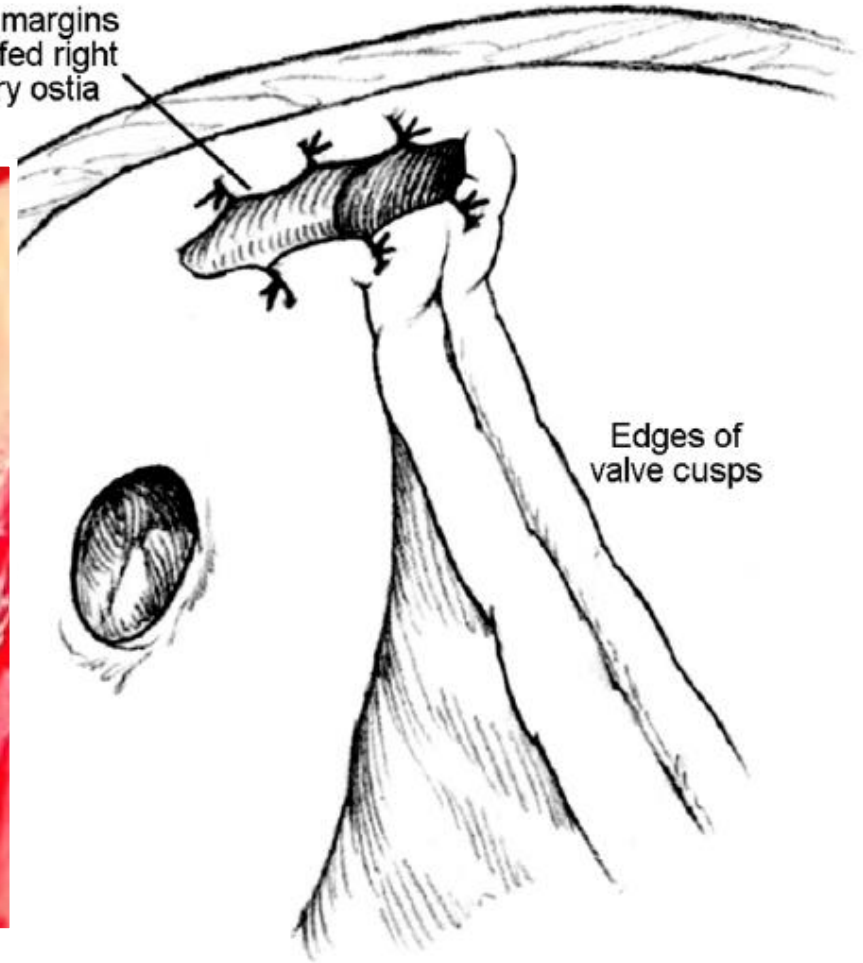
Correction

Anomalous connections of the coronary arteries (ANOCOR)

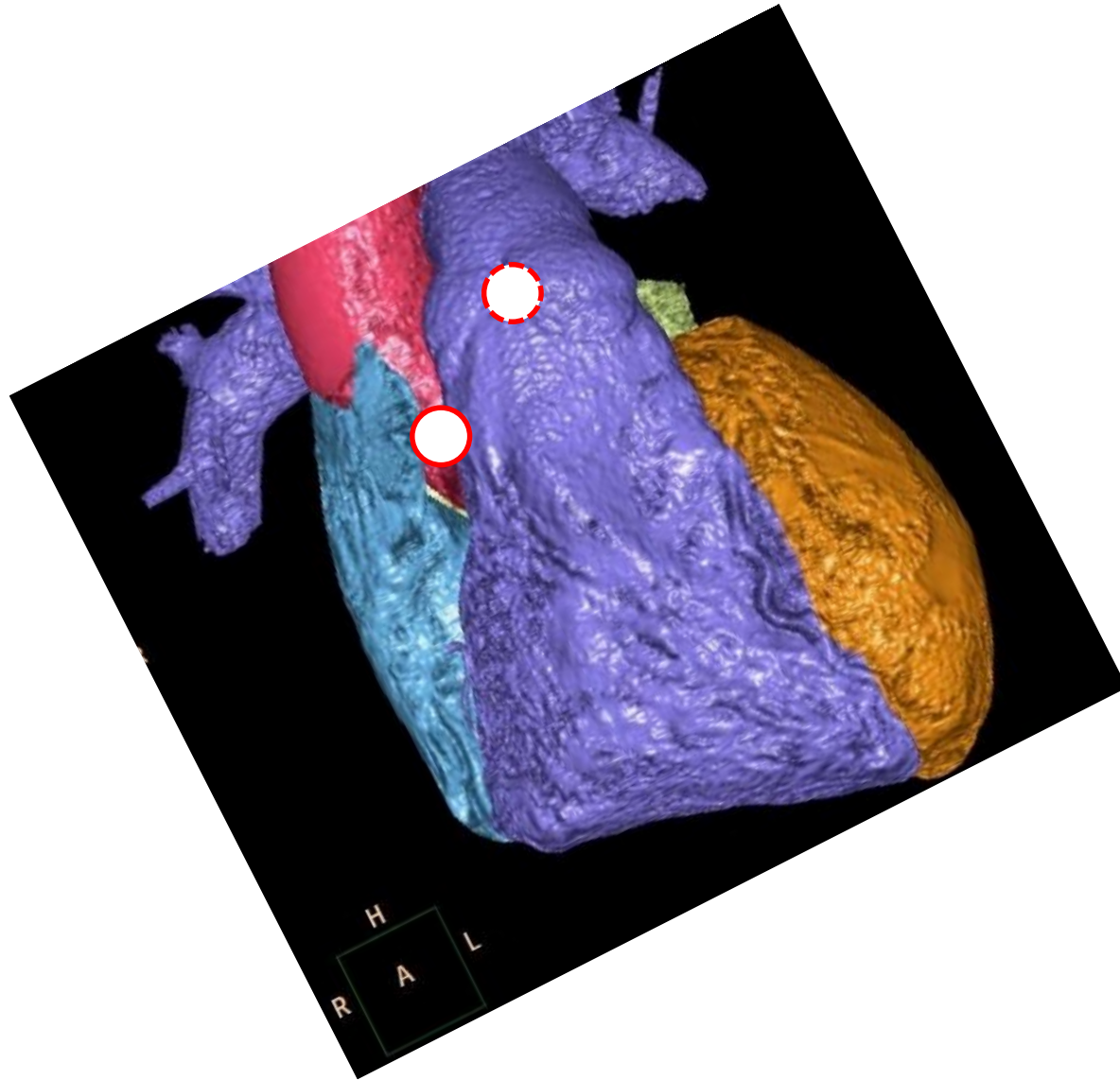
Surgical unroofing technique



Sutured margins
of unroofed right
coronary ostia

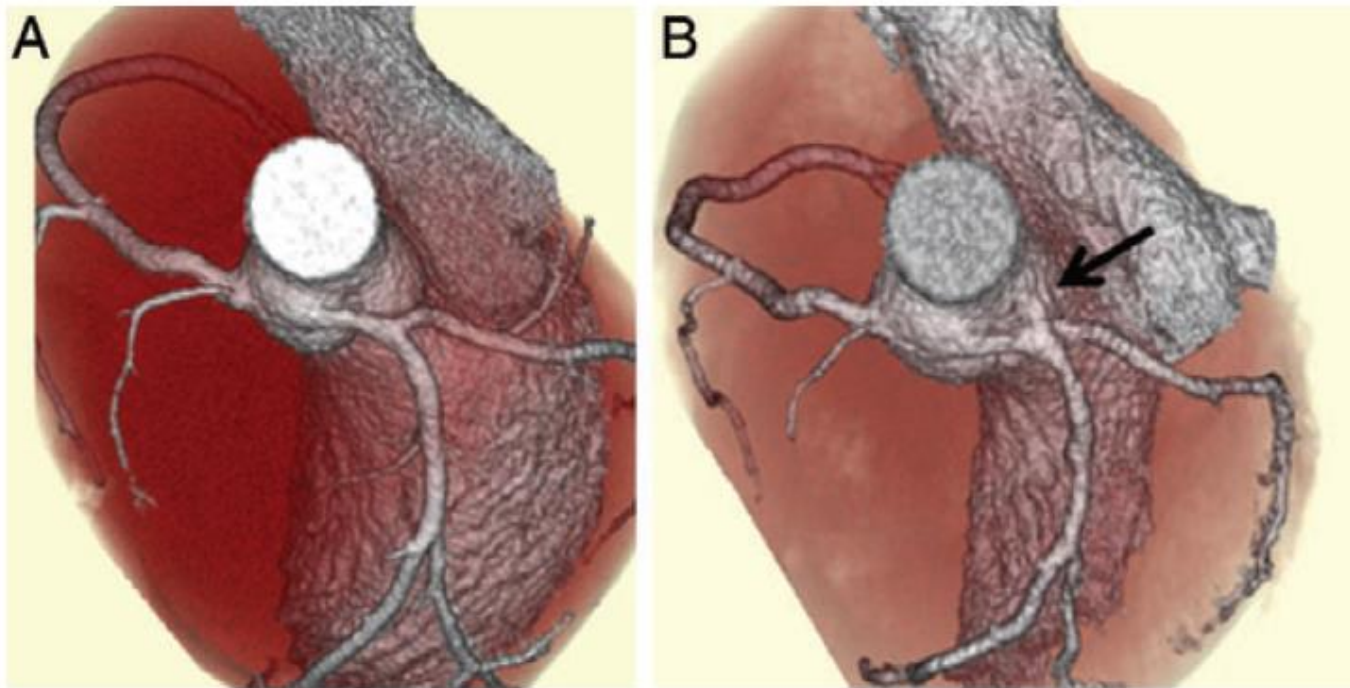


Anomalies de connexion des artères coronaires (ANOCOR)



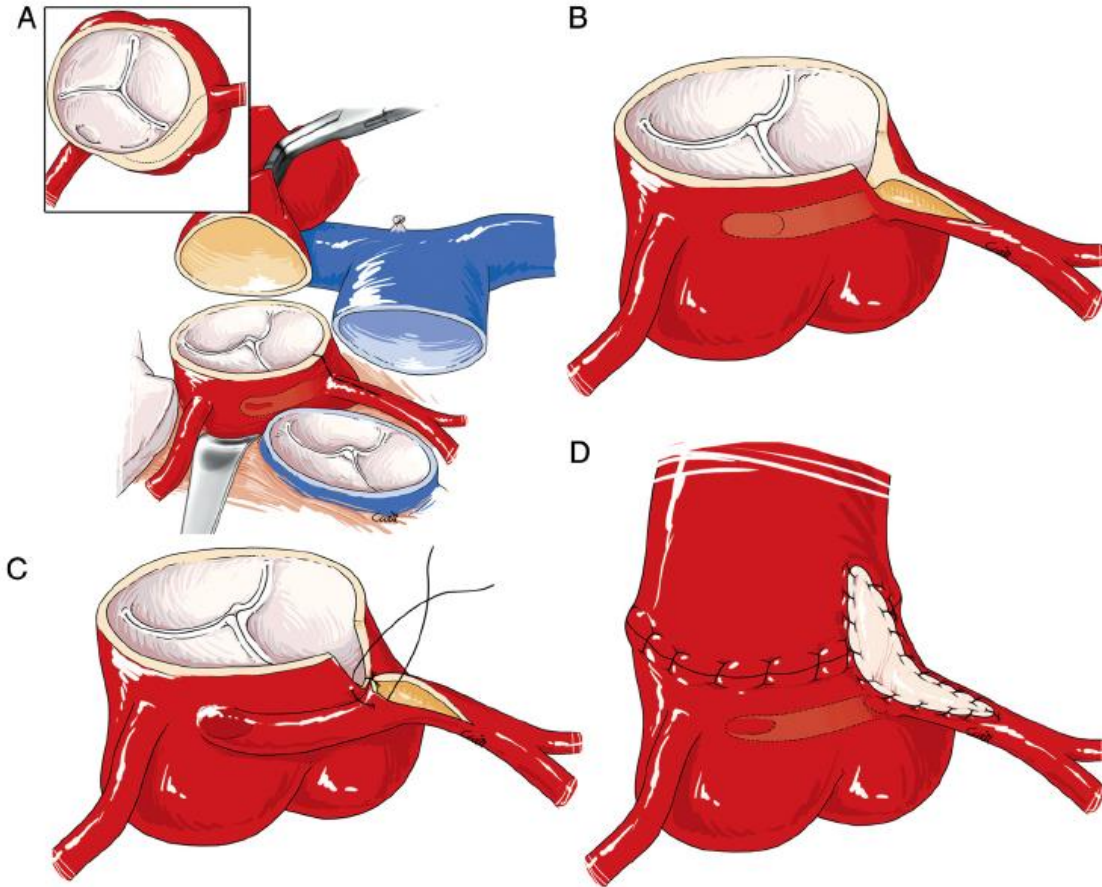
Anomalous connections of the coronary arteries (ANOCOR)

Neo Ostium creation



Anomalous connections of the coronary arteries (ANOCOR)

Neo Ostium creation



Anomalies de connexion des artères coronaires (ANOCOR)

ANGIOPLASTIE

Anomalies de connexion des artères coronaires (ANOCOR)



Anomalies de connexion des artères coronaires (ANOCOR)

LITTERATURE

European Heart Journal

Journal of the European Society of Cardiology

CARDIOVASCULAR FLASHLIGHT

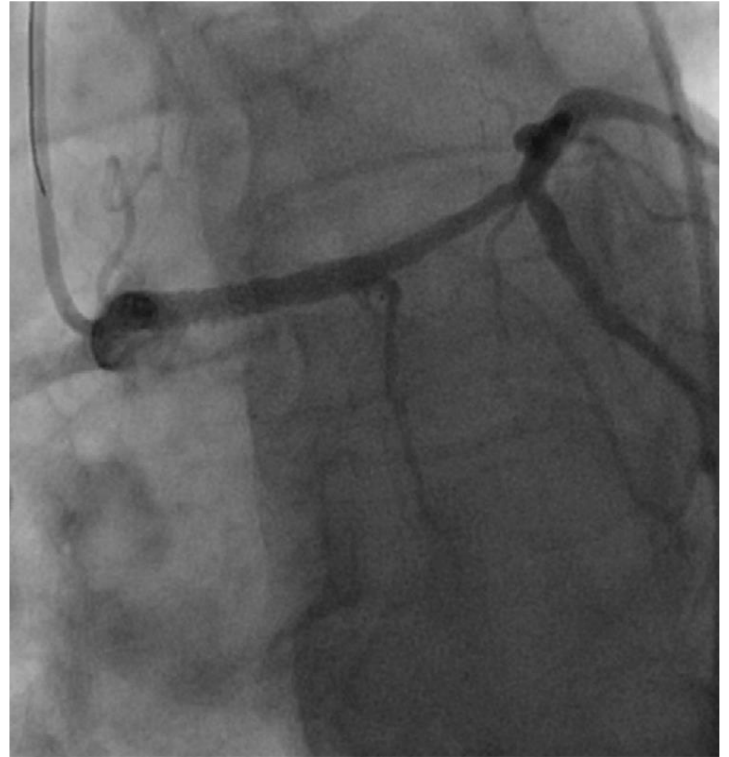
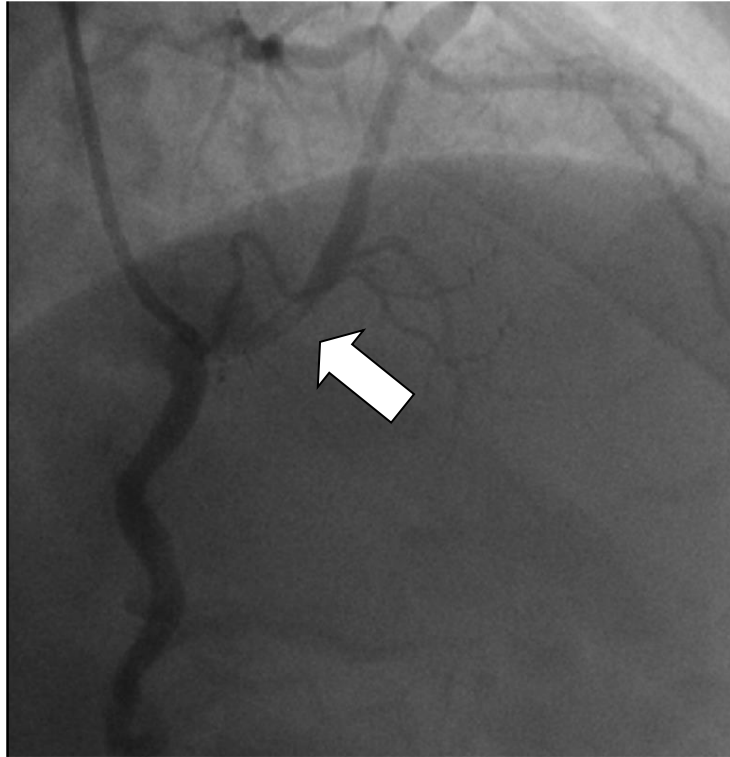
doi:10.1093/eurheartj/ehu470

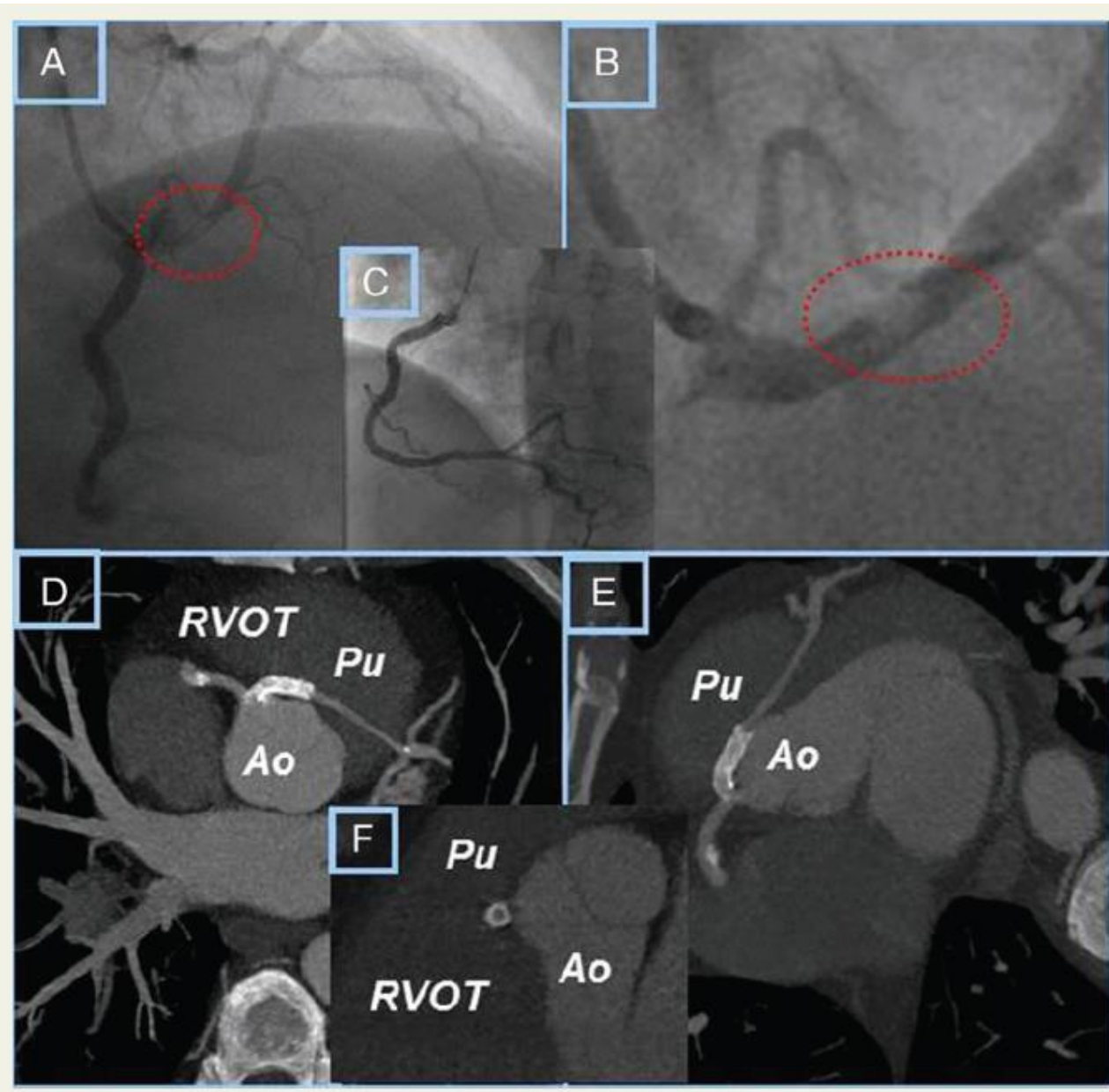
Online publish-ahead-of-print 10 December 2014

Aborted cardiac death in a previously healthy young adult: coronary angiography and cardiac computed tomography reveal an unexpected diagnosis

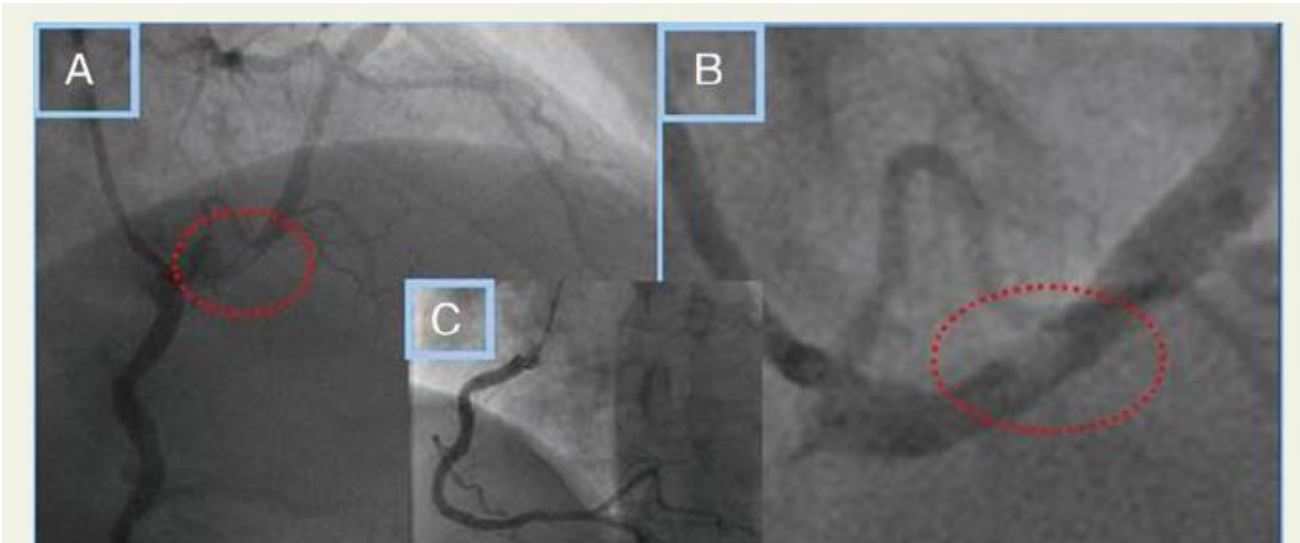
G. Korosoglou*, R. Bekeredjian, H.A. Katus, and E. Chorianopoulos

Eur Heart J 2015,36:528

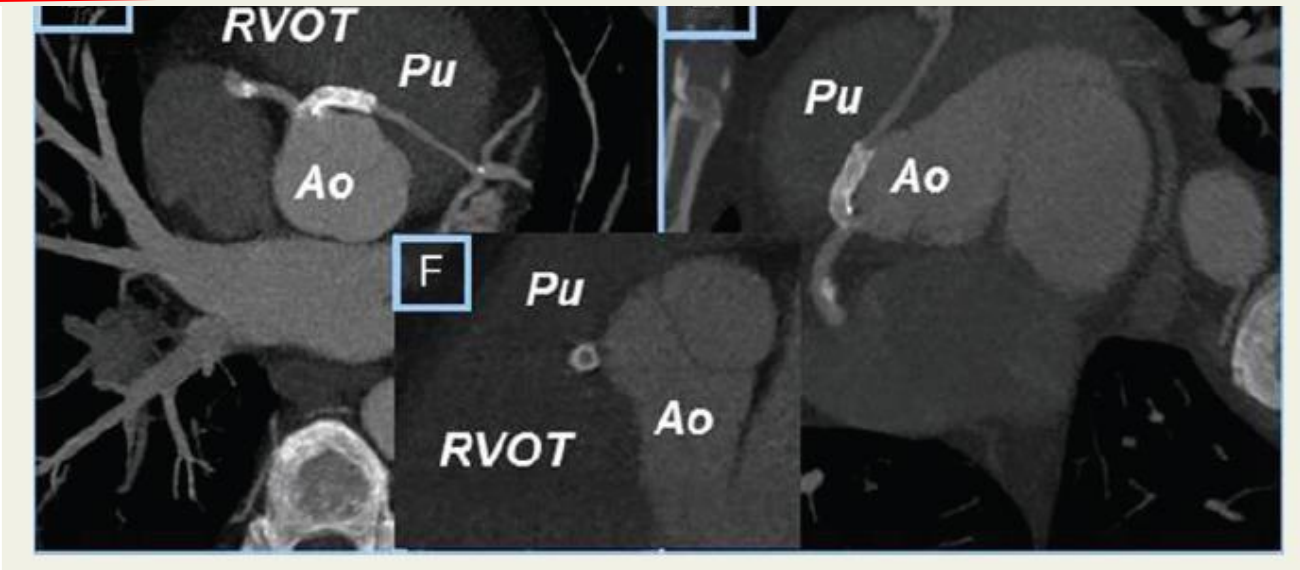




Erroneous interpretation



with diabetes, may have contributed to thrombus formation. To our knowledge, this is the first case reporting thrombosis in a coronary vessel due to compression between the aorta and pulmonary artery as the underlying cause of an aborted cardiac death in a patient without significant atherosclerotic lesions.



Anomalous connections of the coronary arteries (ANOCOR)

	Significant CAD	ANOCOR
Prevalence	high	very low
Typical angina	frequent	rare
Stress-induced ischaemia	often	rare
Lumen area reduction	50-100%	30-70%
FFR < 0.85	frequent	rare
Thrombus	possible	no
Vasospasm	possible	no
Myocardial infarction	frequent	rare
Sudden cardiac death	non rare	rare
Exercise-related sudden death	rare	frequent
Causes of death	multiple	malignant arrhythmia
Treatments	Rx - PCI - CABG	sport restriction, surgery