

Radio-anatomie cardiaque

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Techniques

Structures

Radiographie standard

Echocardiographie

Scintigraphie

KT et coronarographie

Tomodensitométrie

Imagerie par résonance magnétique

Parois

Cavités

Valves

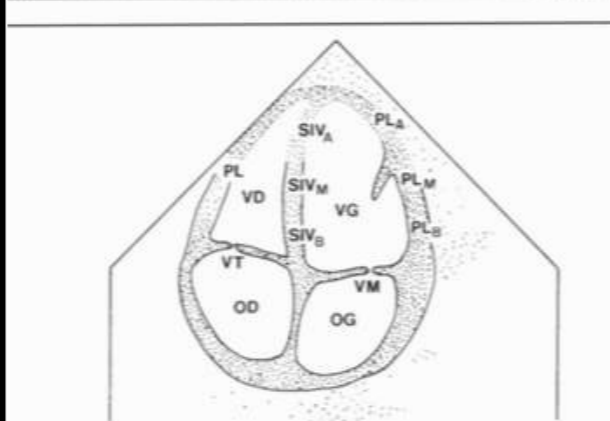
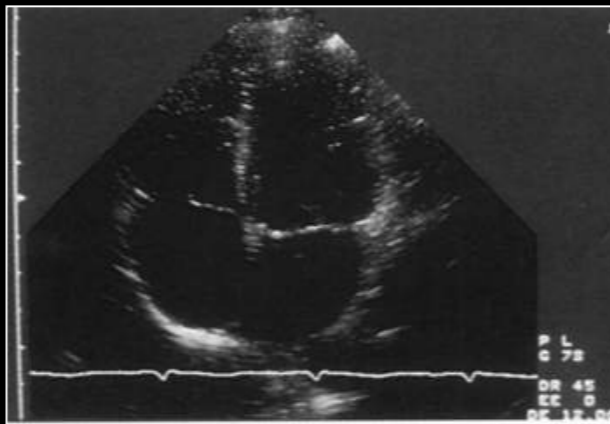
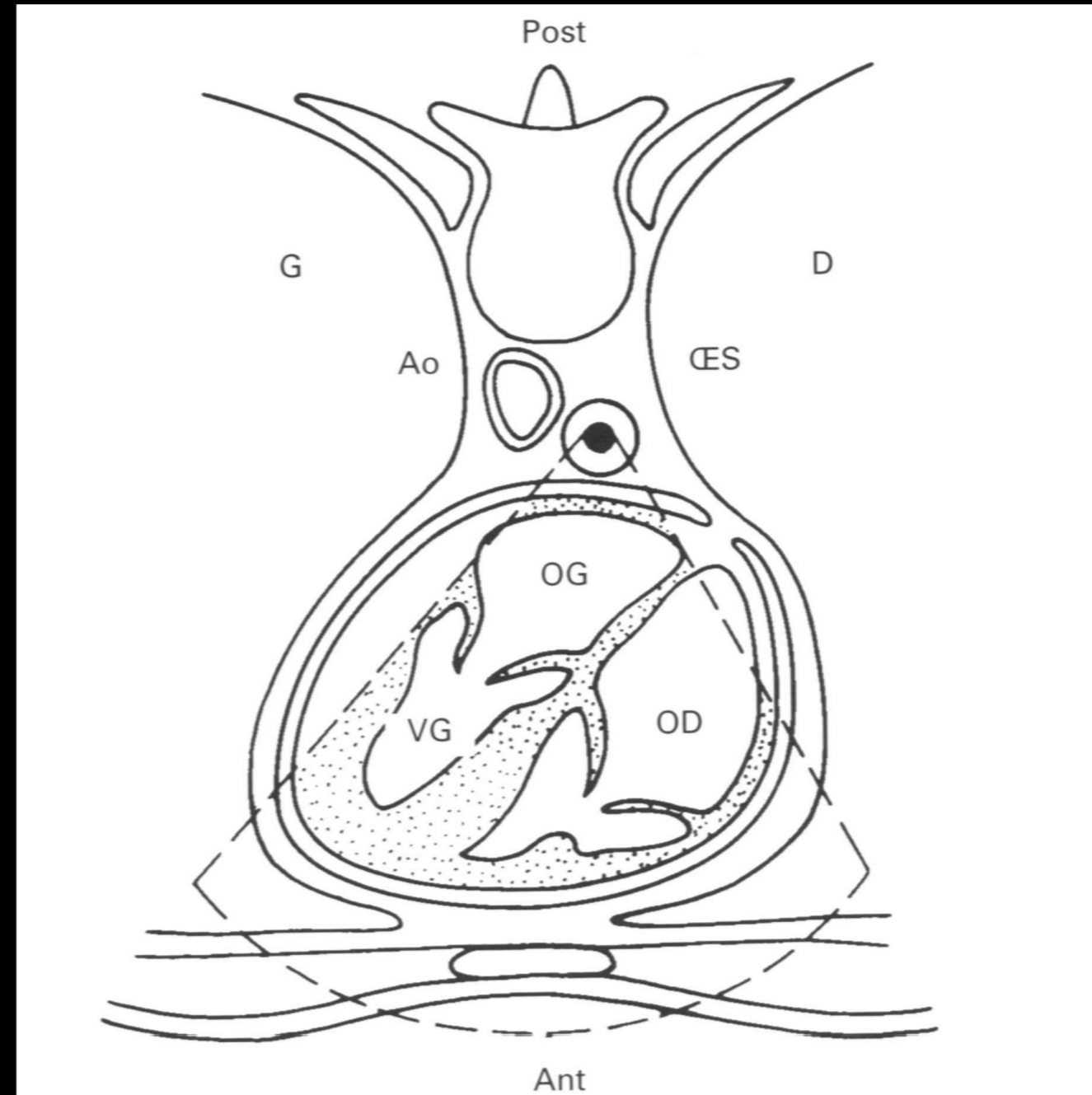
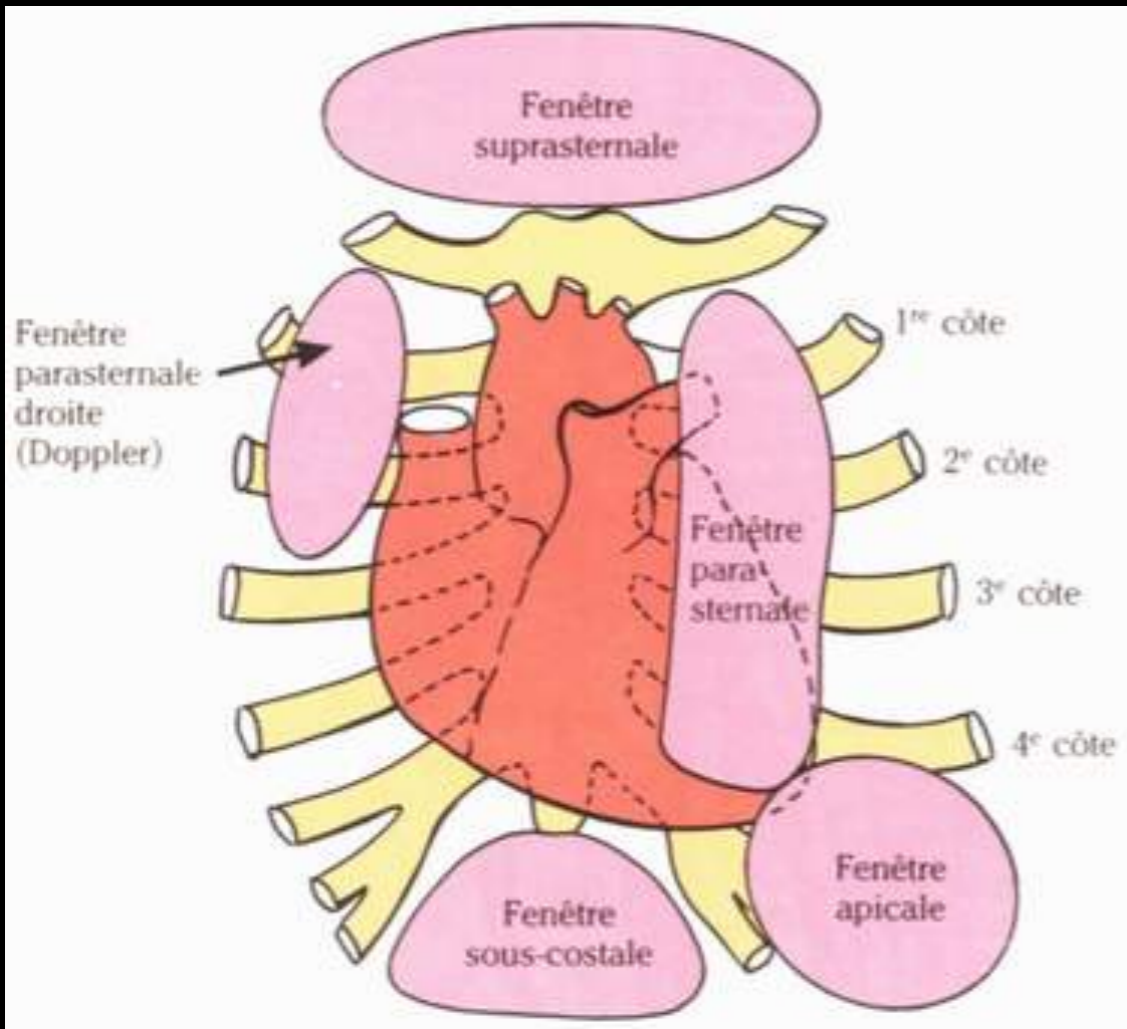
Vaisseaux

Systeme cardionecteur

Péricarde

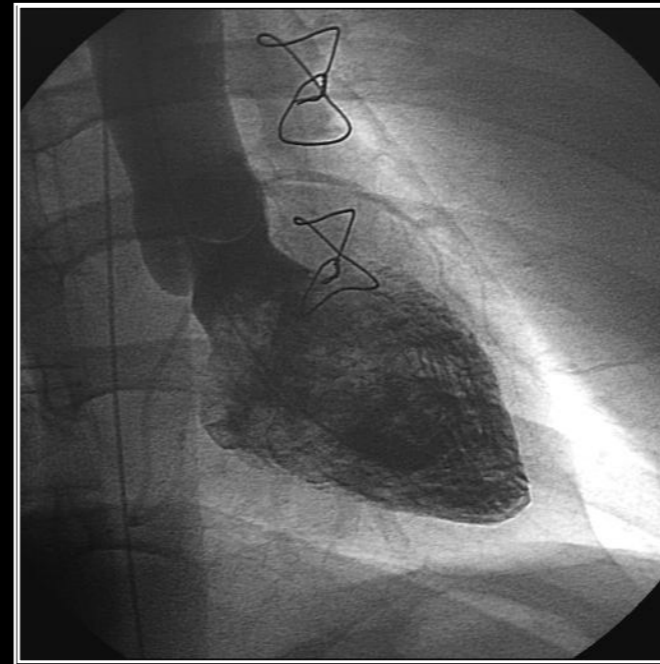
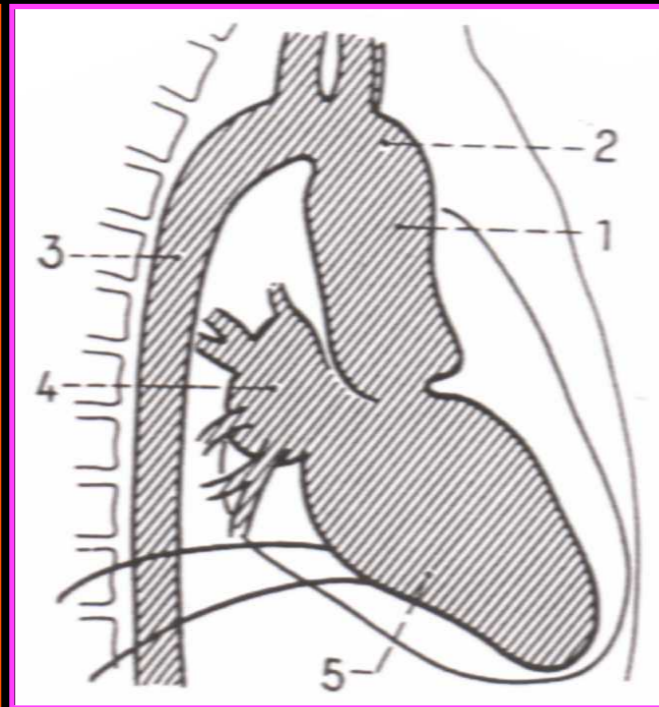
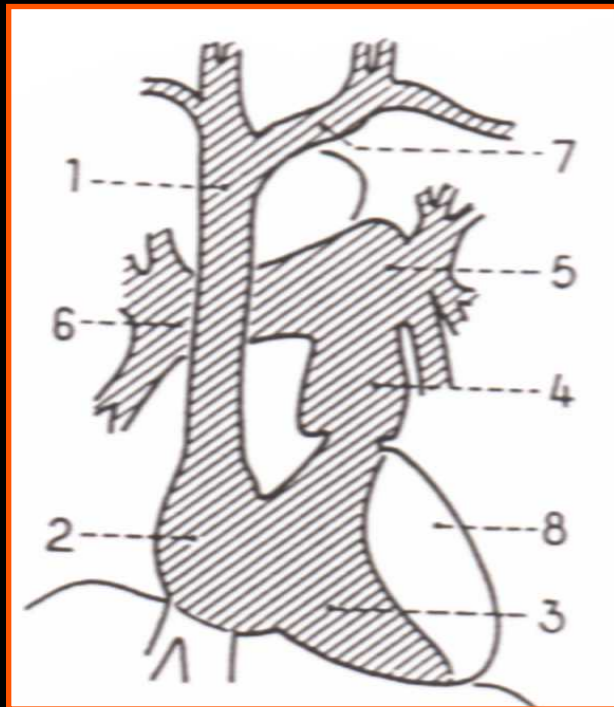
Morphologie & Fonction

ECHOCARDIOGRAPHIE



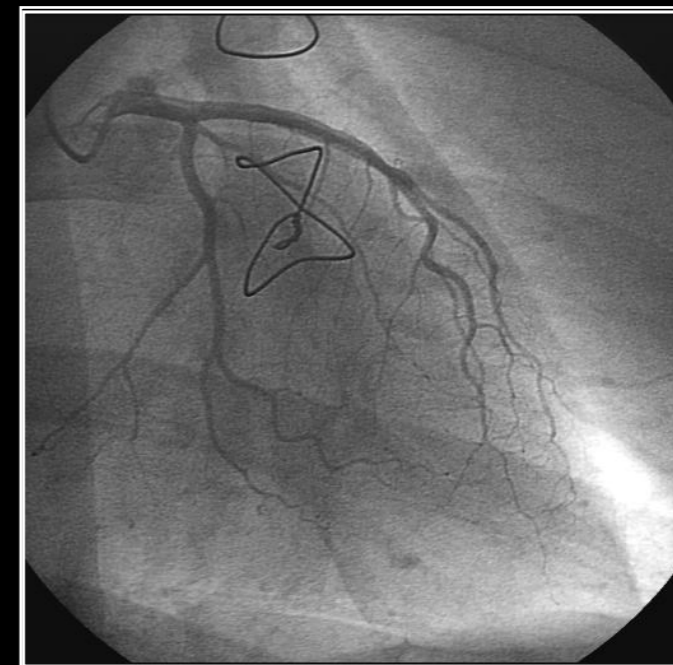
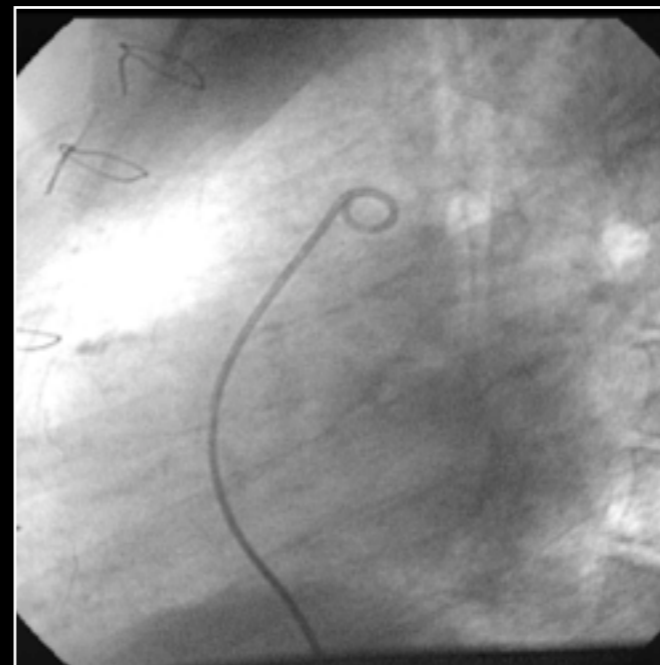
CATHETERISME CARDIAQUE

taille des cavités, cinétique, fuite valvulaire, siège et taille des gros vx, pressions

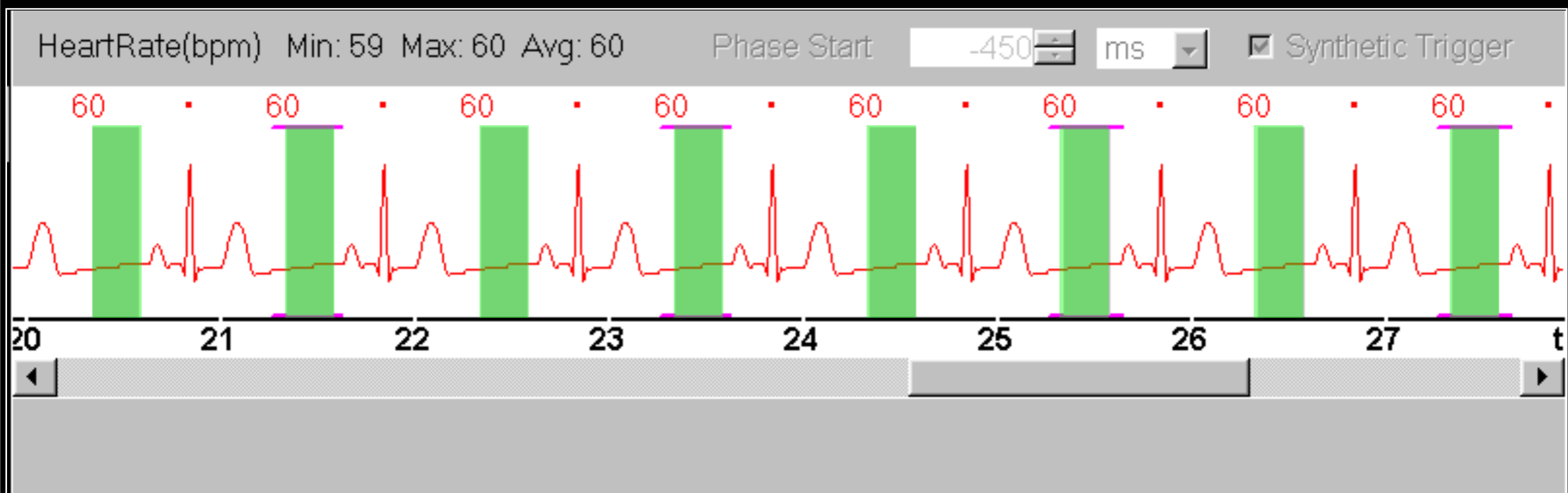
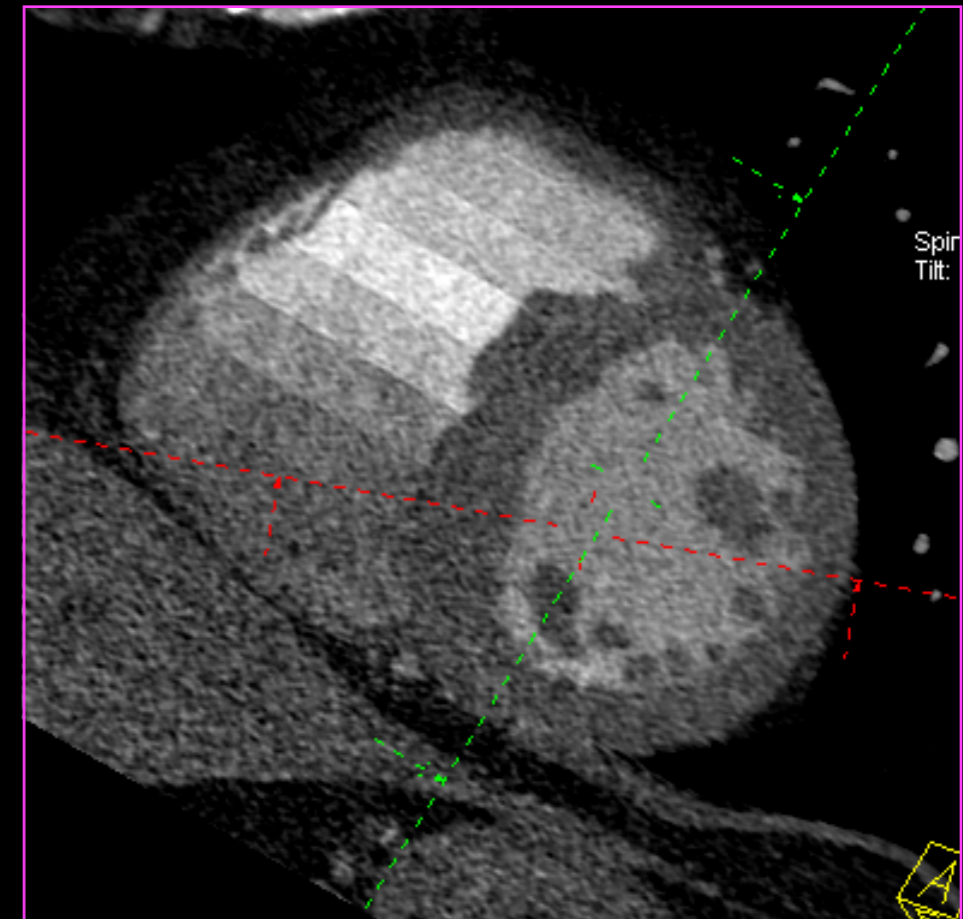
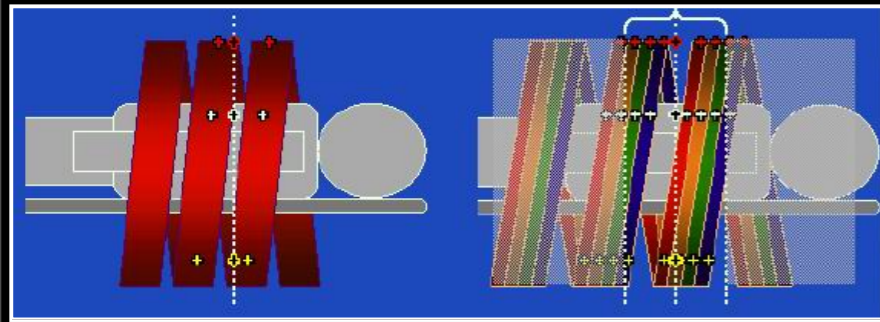


1 Veine Cave Supérieure
2 Oreillette Droite
3 Ventricule Droit
4 Tronc Artère Pulmonaire
5 Artère Pulmonaire Gauche
6 Artère Pulmonaire Droite
7 Tronc Veineux Innominé Gauche
8 Ventricule Gauche

1 Aorte
2 Crosse aortique
3 Aorte descendante
4 Oreillette gauche
5 Ventricule gauche



TDM



synchronisation **prospective** (tous les deux cycles) ou **rétrospective**

IRM

Synchronisation ECG +/- respiration

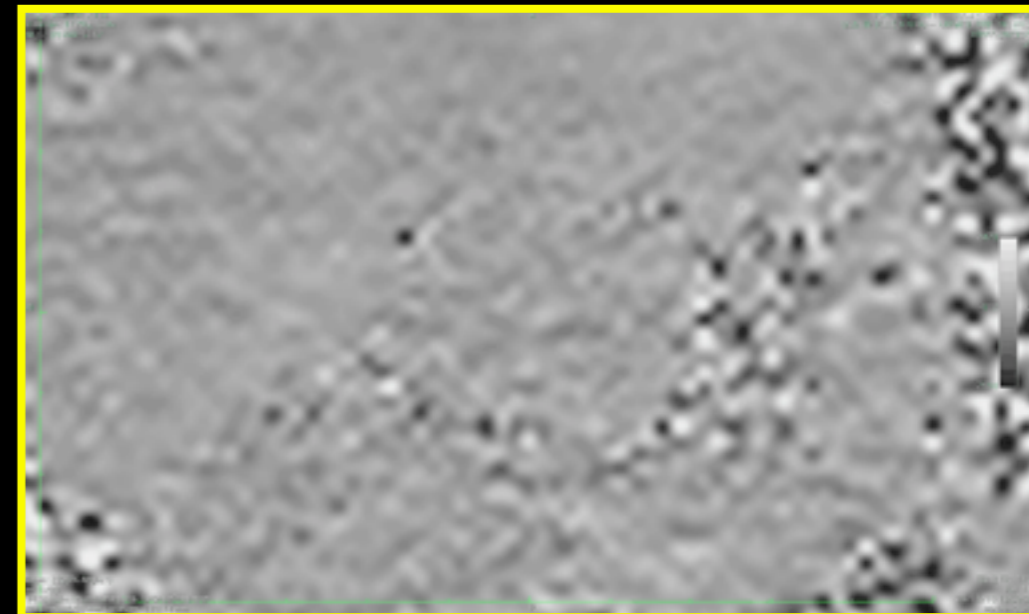
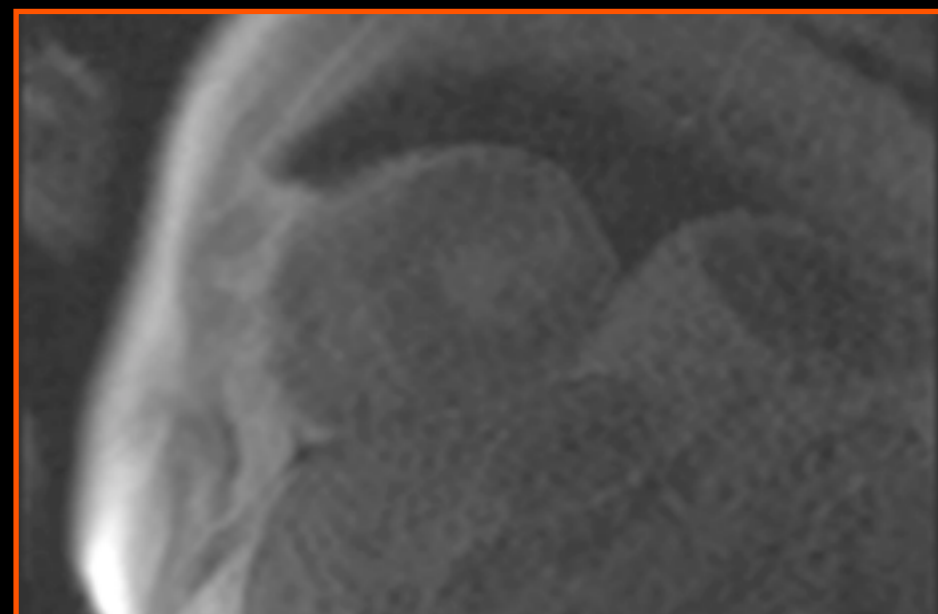
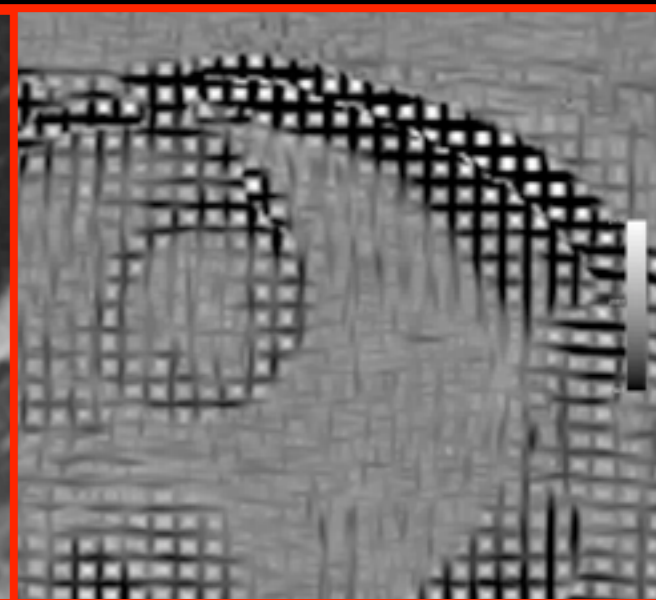
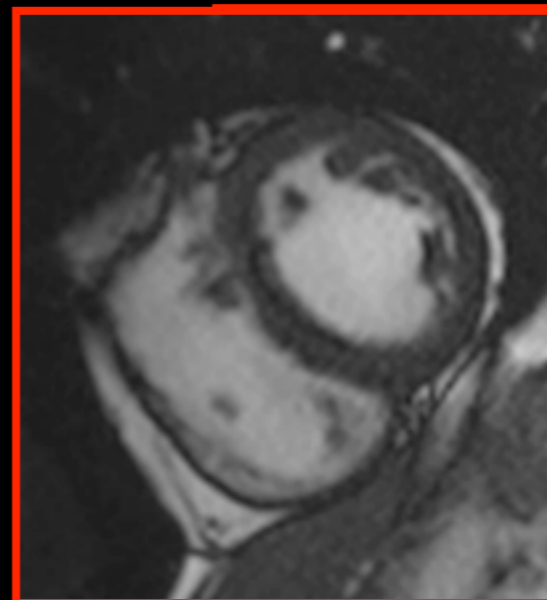
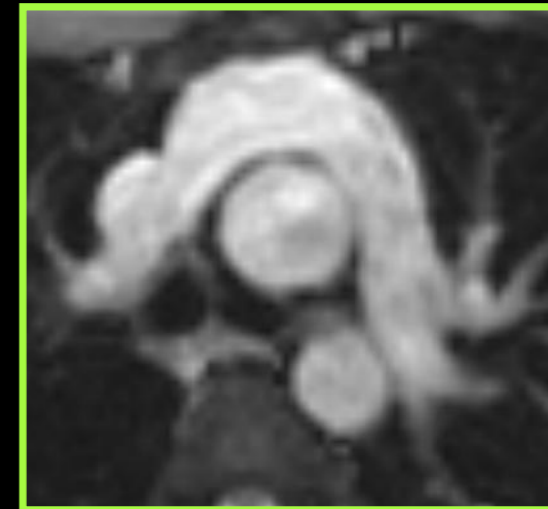
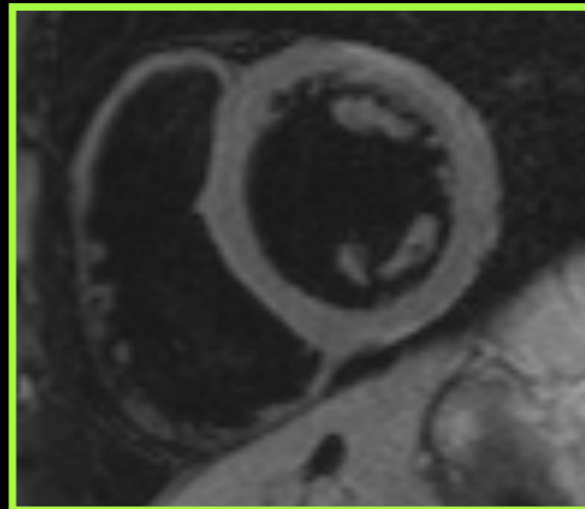
Morphologie: spin écho, ARM

Fonction: cinéIRM (SSFP), tagging

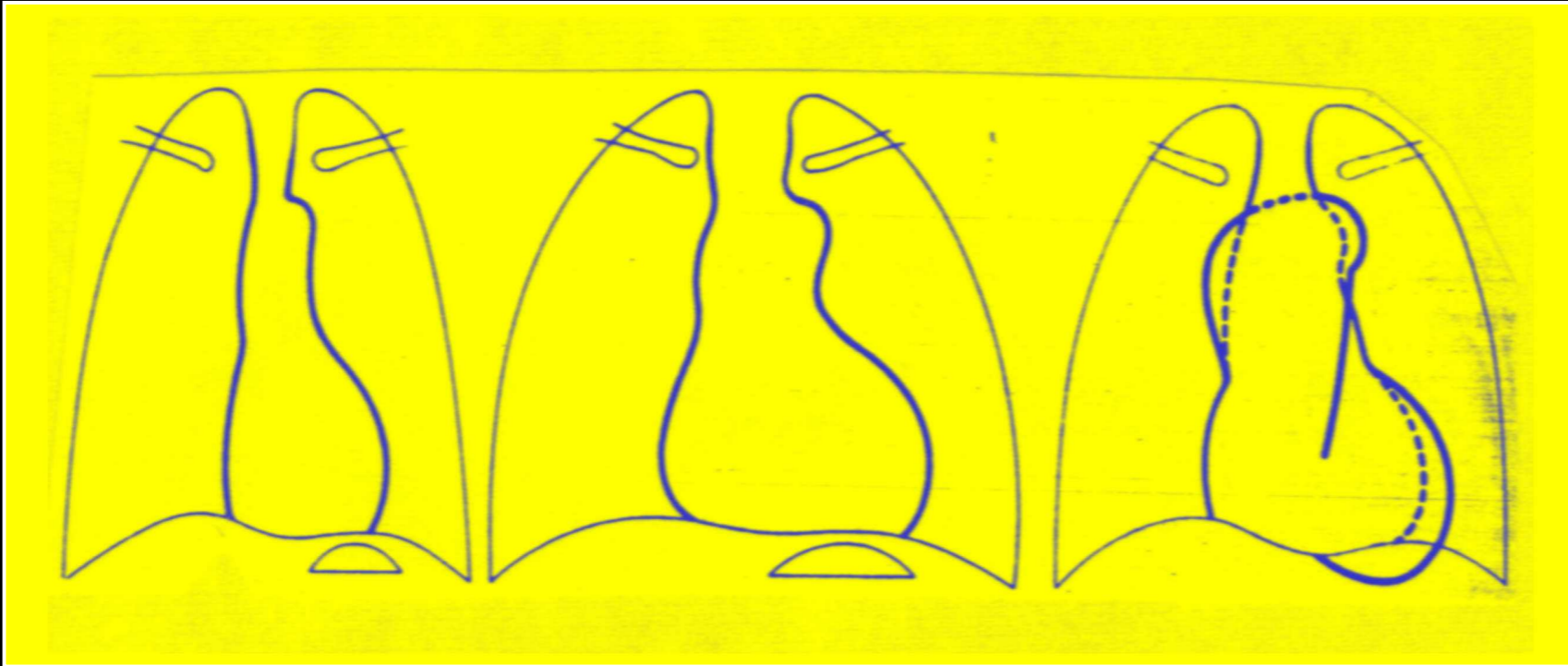
Flux: contraste de phase

Viabilité / fibrose: rehaussement tardif

Perfusion



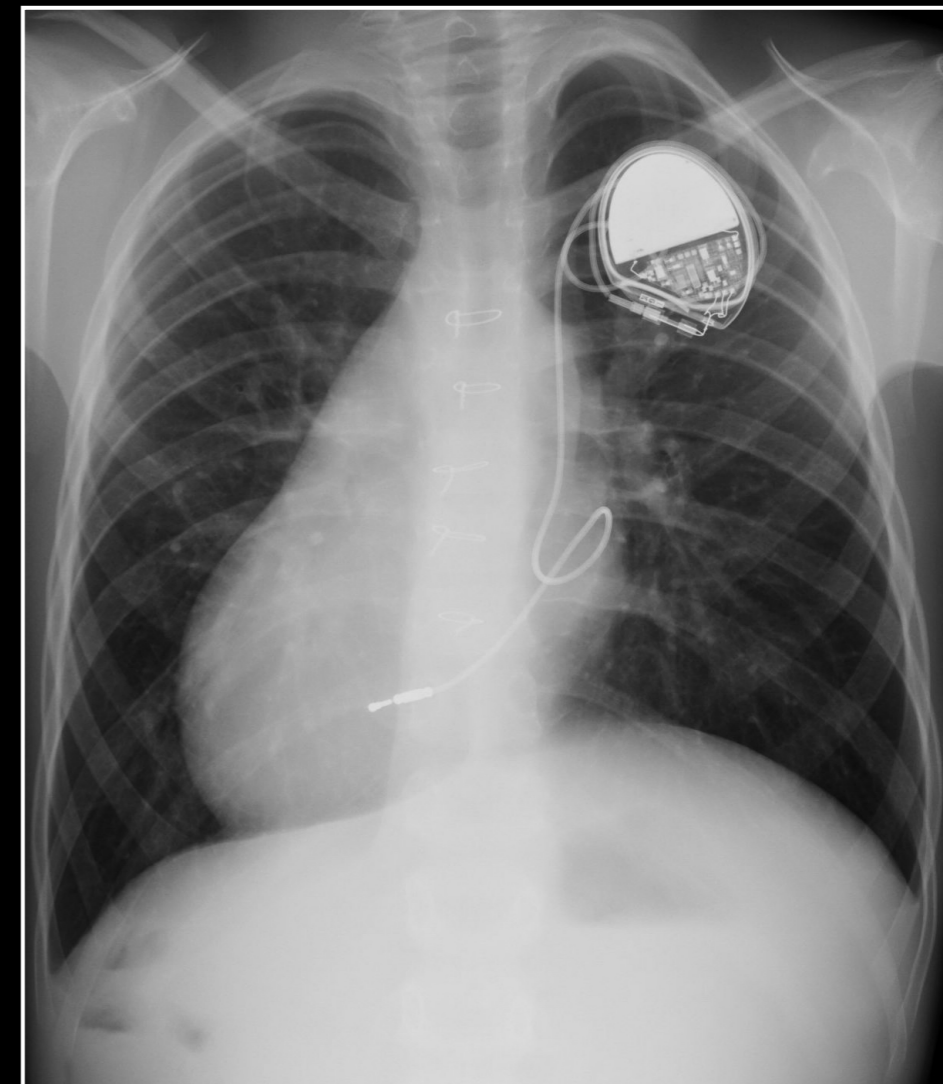
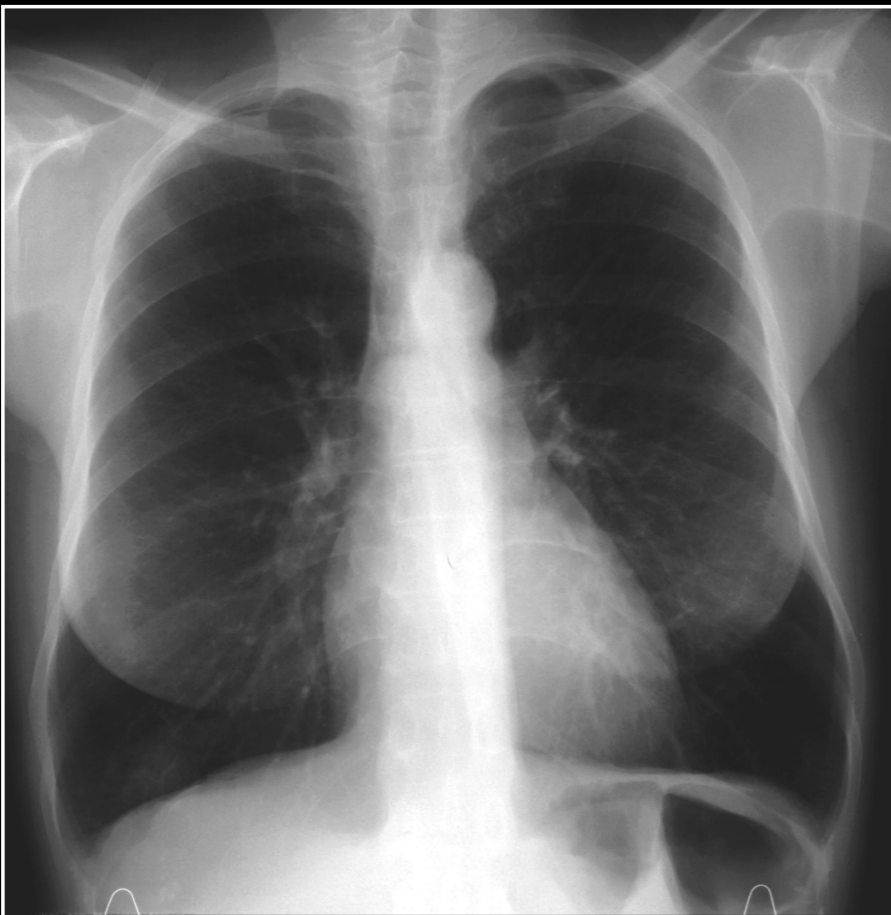
Taille et position



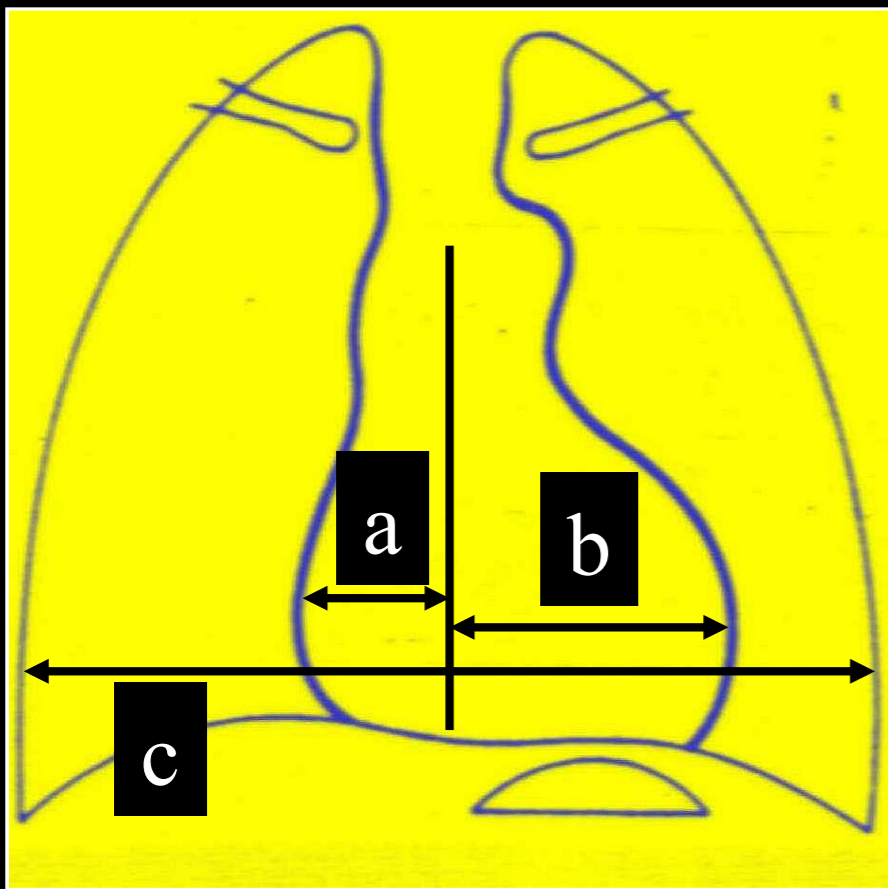
longiligne

bréviligne

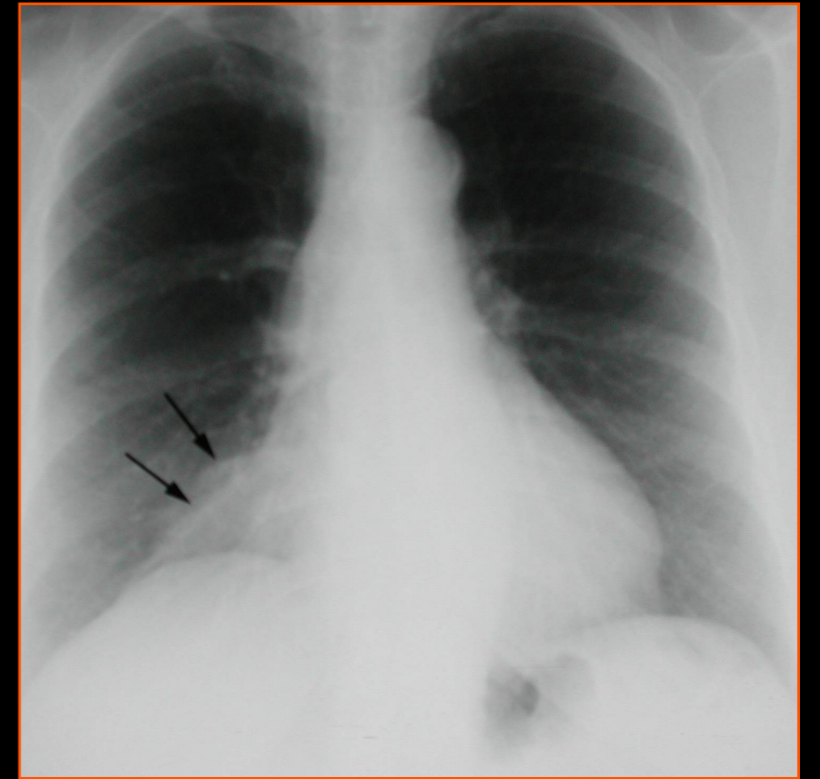
âgé



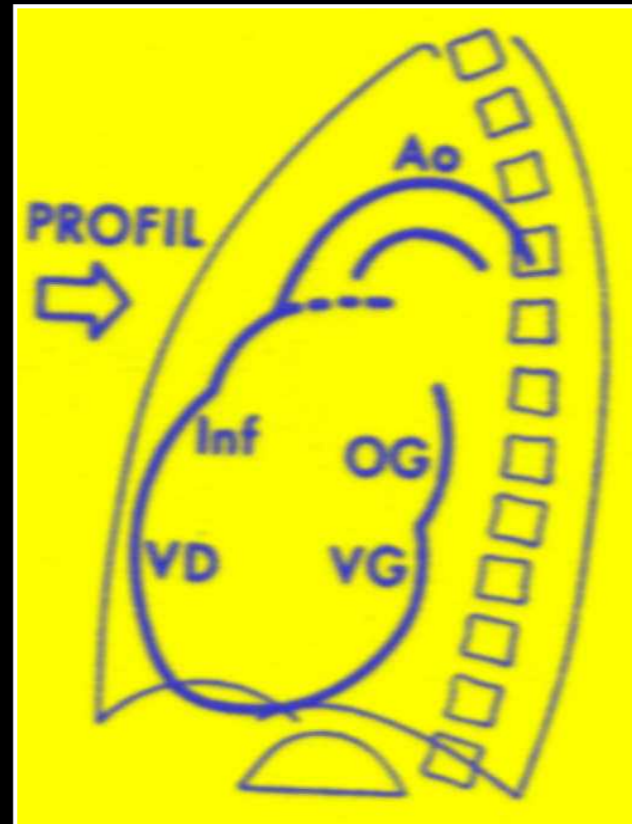
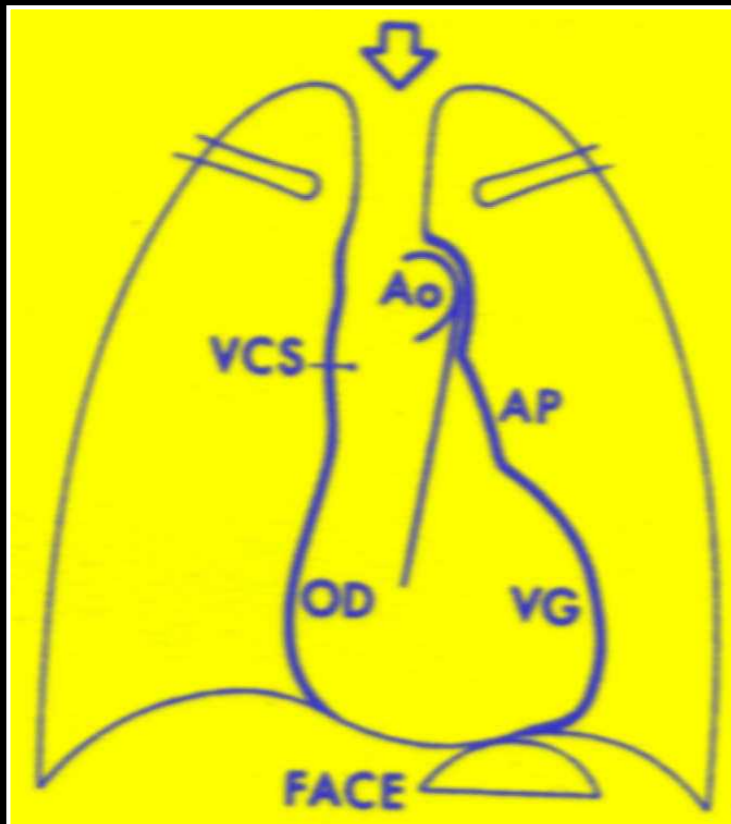
Volume du coeur



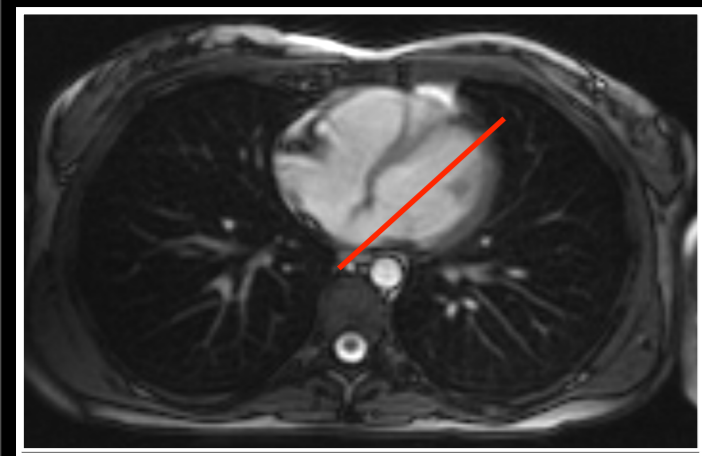
Degré d'inspiration
Distance foyer-film < 1,80m
Frange graisseuse épiscopordique
Forme du thorax (pectus, scoliose)



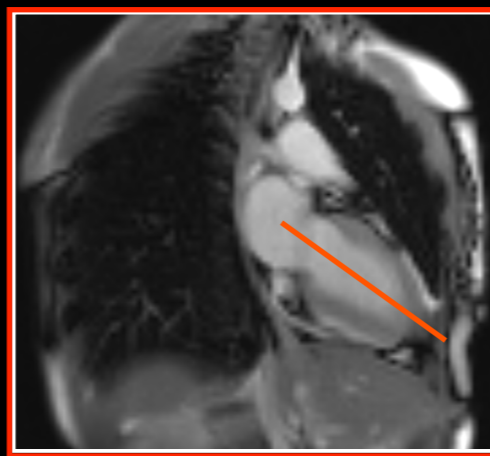
Index cardio-thoracique
 $(a+b)/c$: normal < 0,50



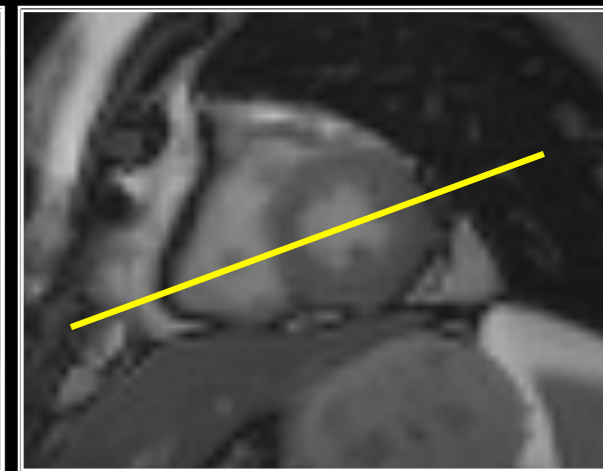
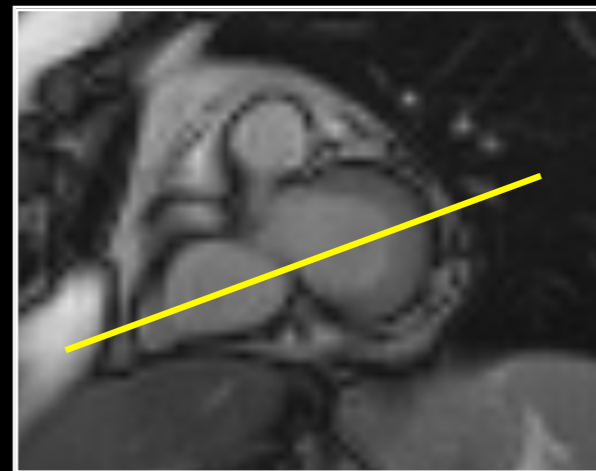
Orientation, Plans des coupes



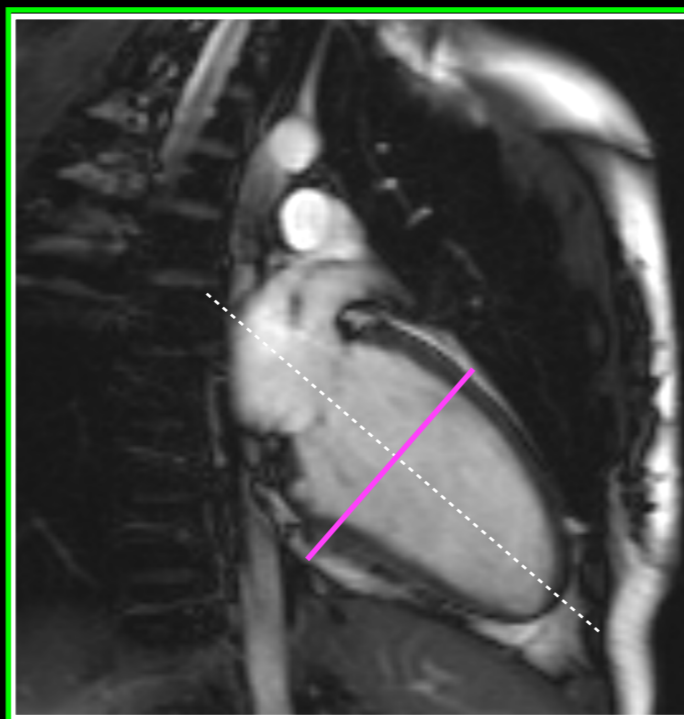
Horizontal



Faux grand axe



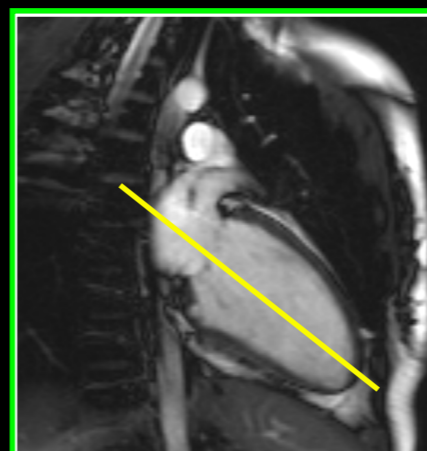
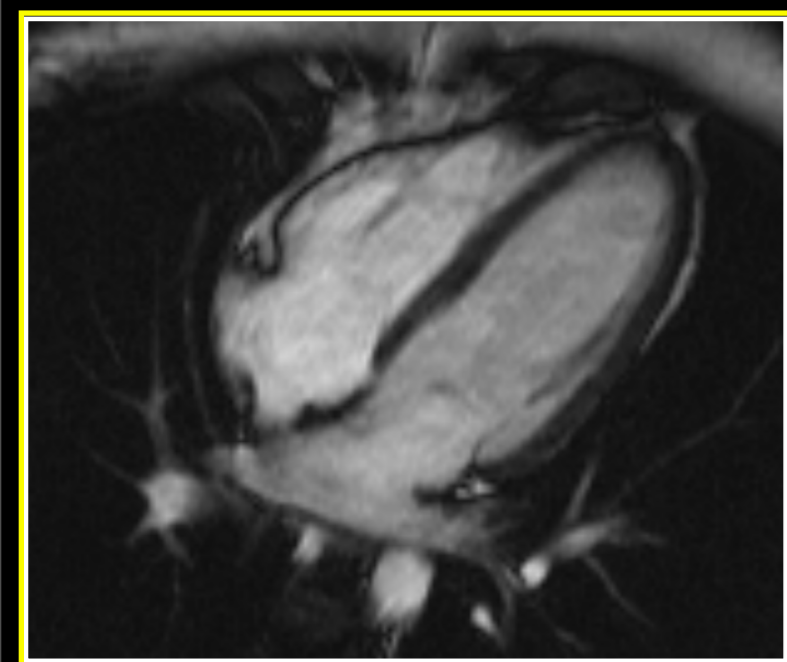
Faux 4 cavités
4 cavités



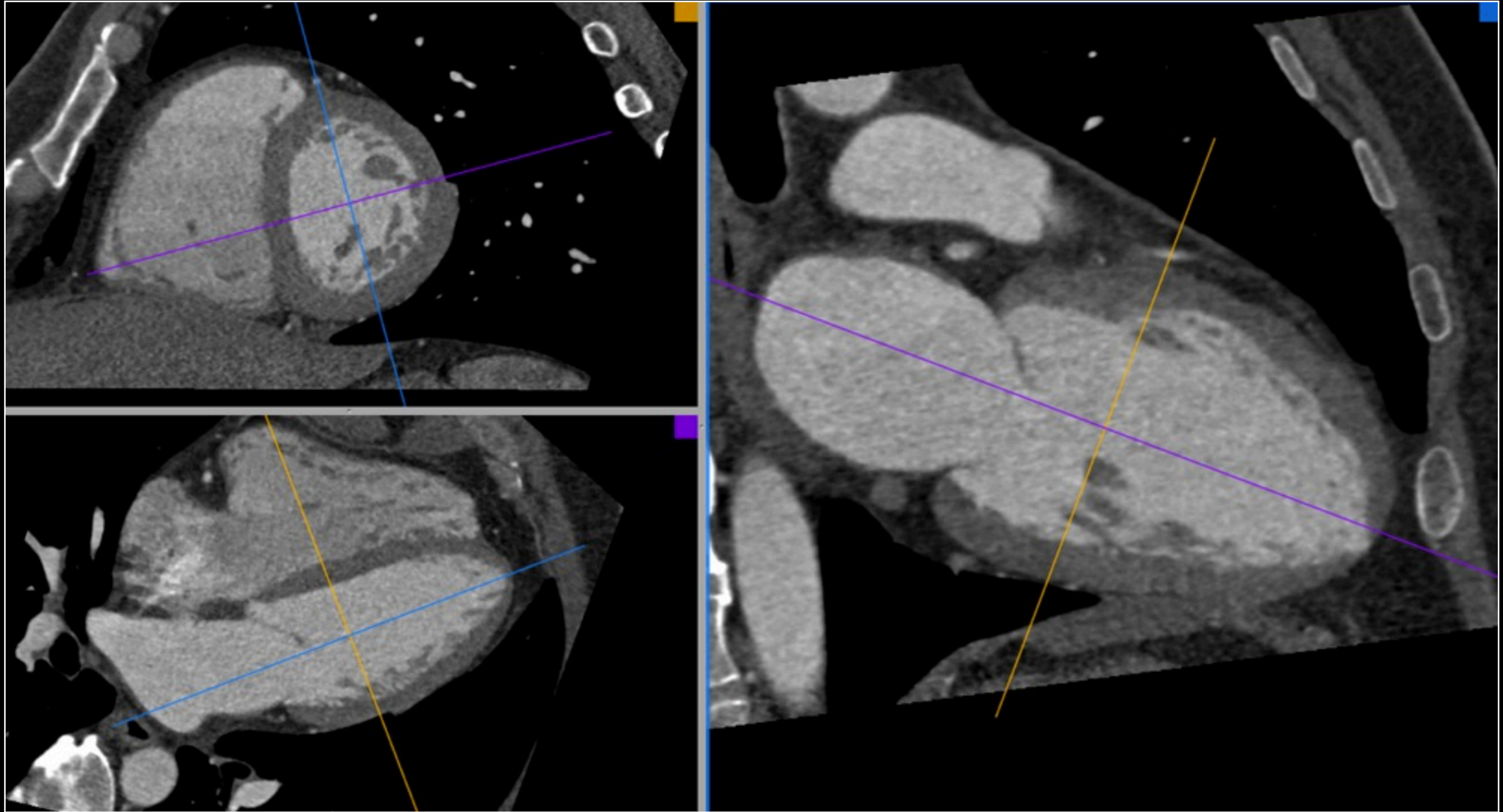
Grand axe



Petit axe

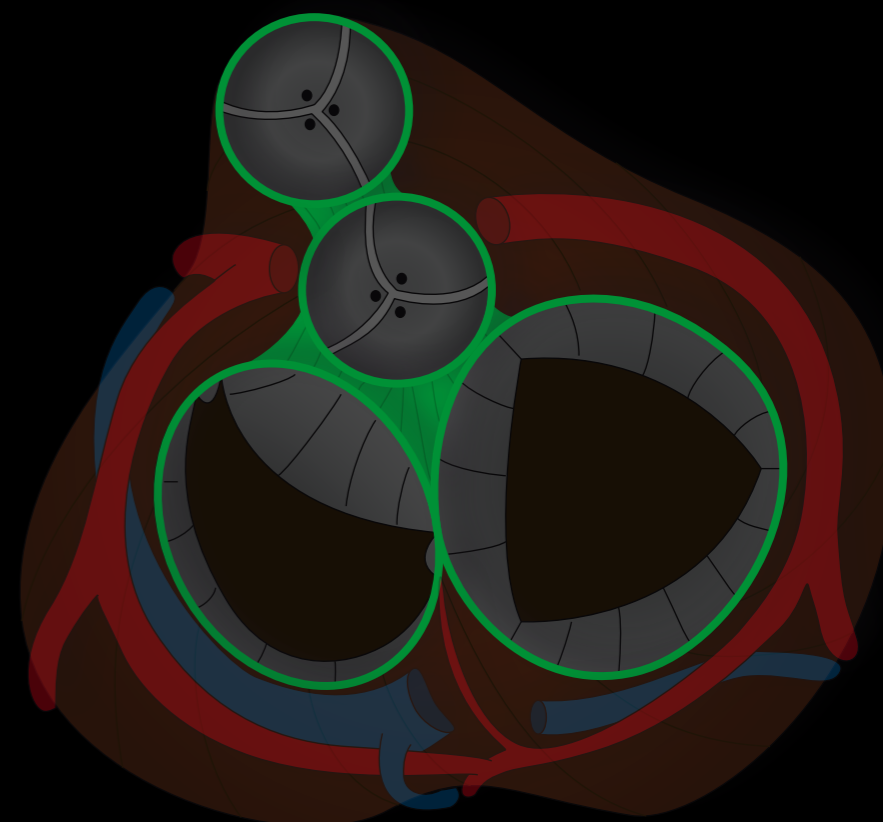
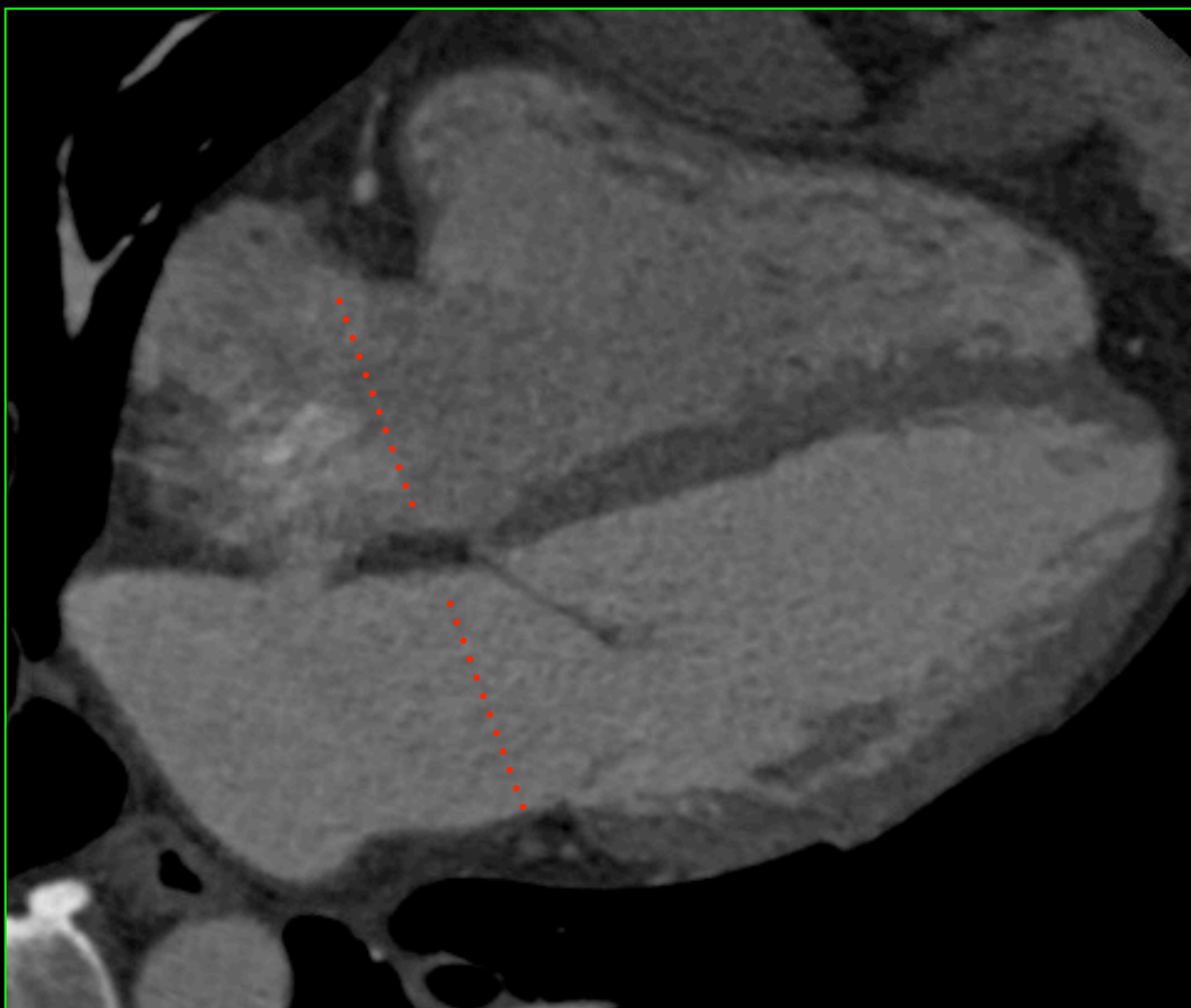
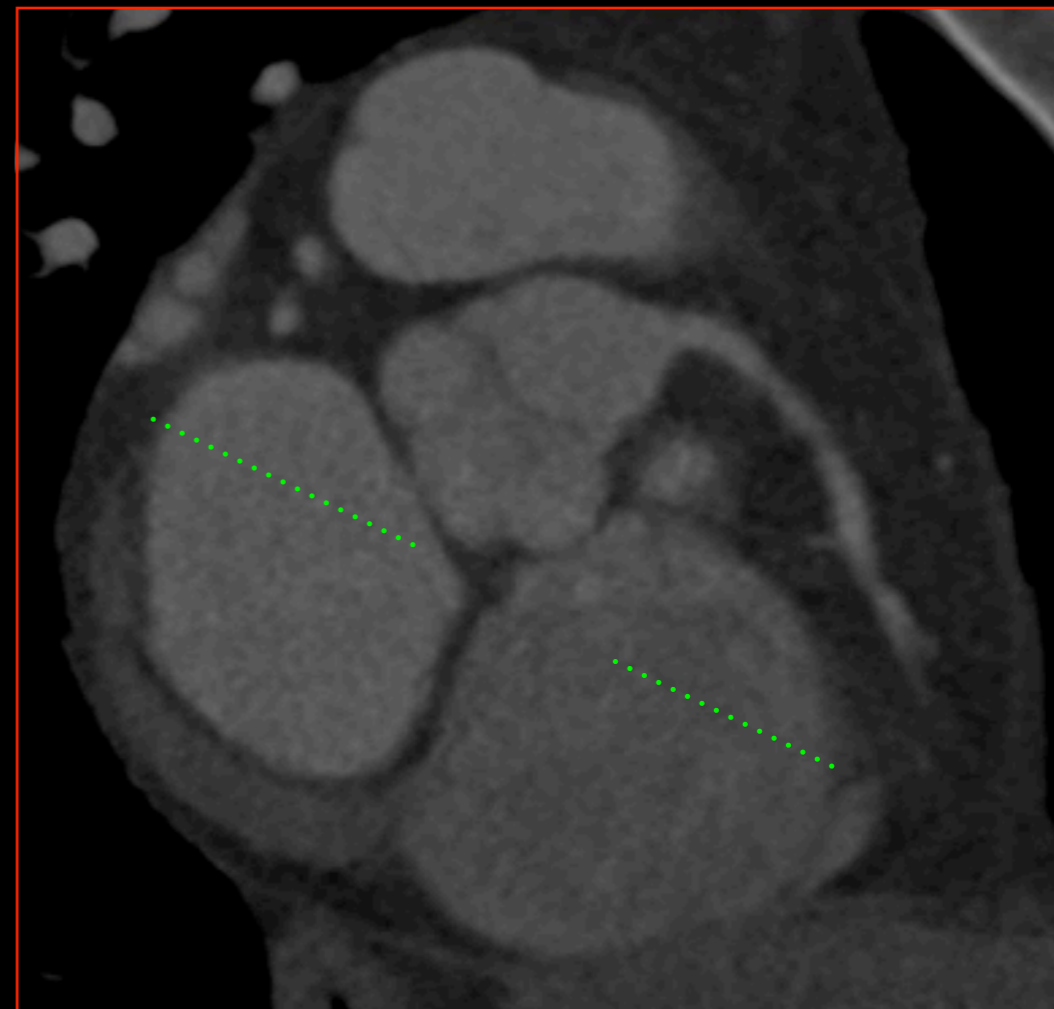


Plans des coupes



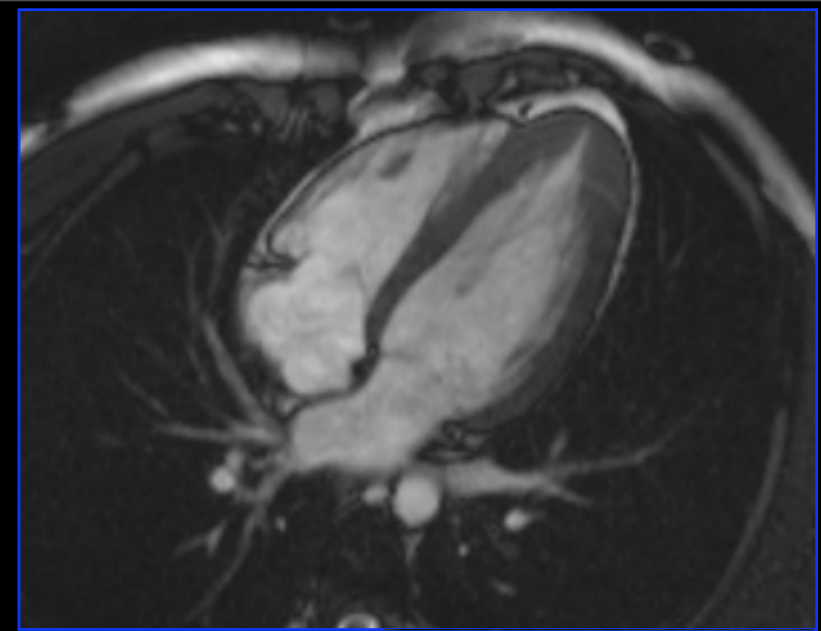
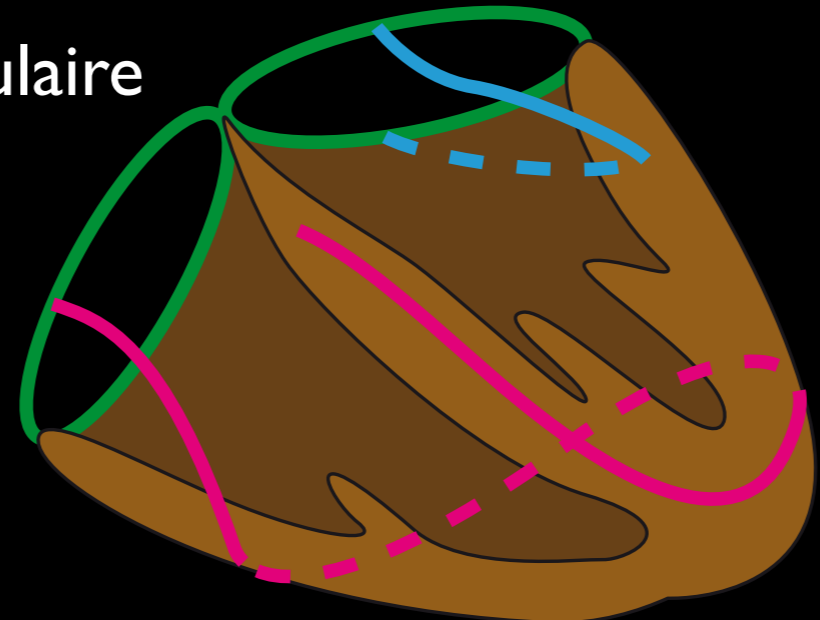
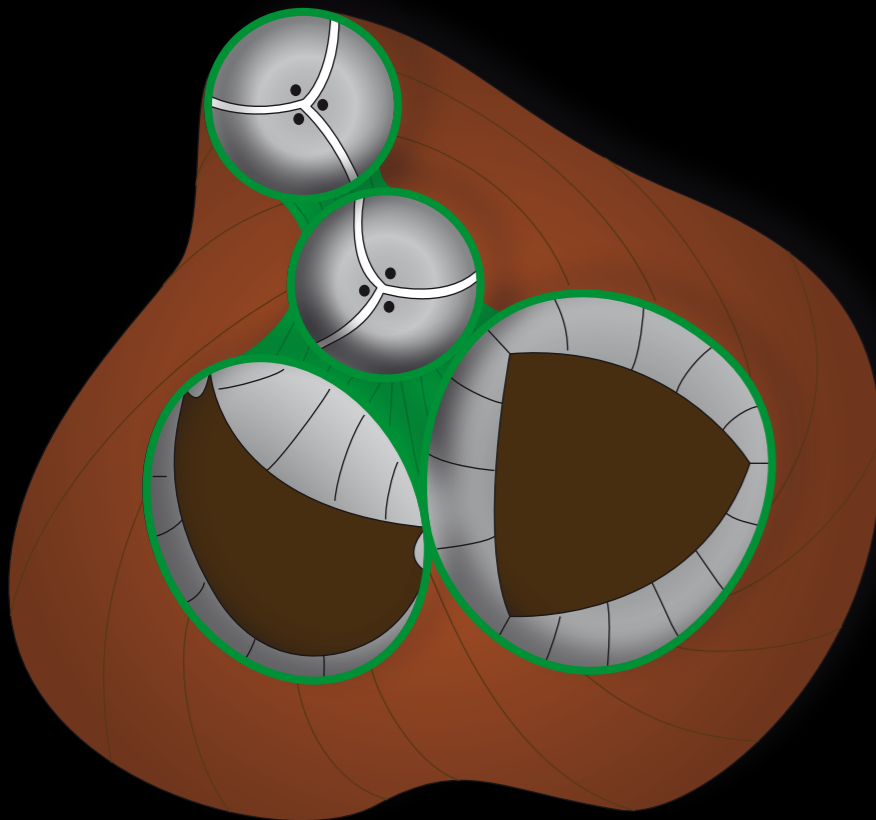
Parois

Cercles tendineux & noyau fibreux central du coeur

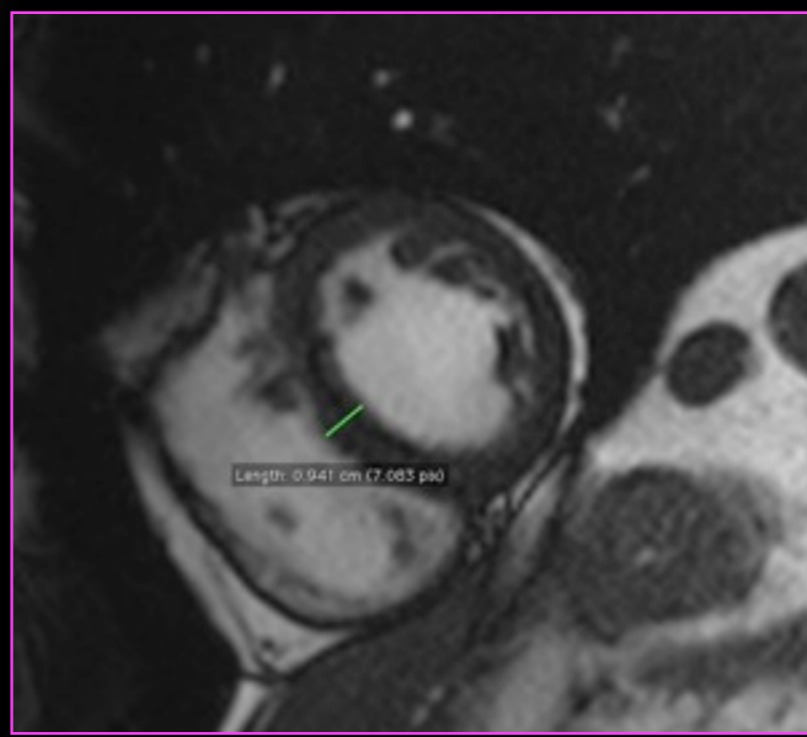


Parois

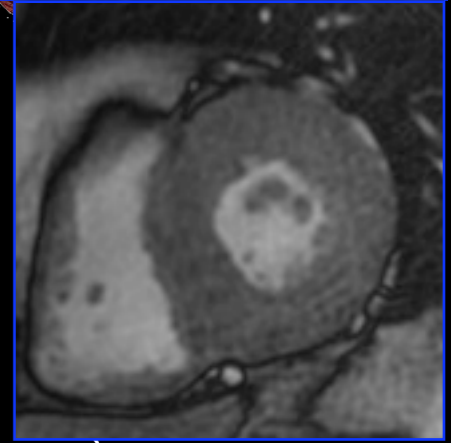
Architecture musculaire



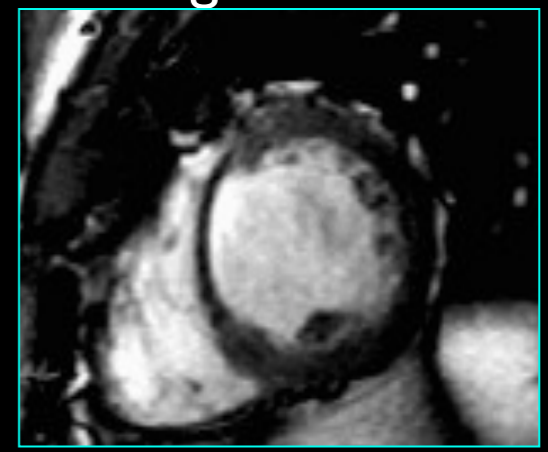
- raccourcissement:
- fibres: 10%
 - **longitudinal**: 15%
 - **diamètre**: 50%
 - fraction d'éjection: 65%



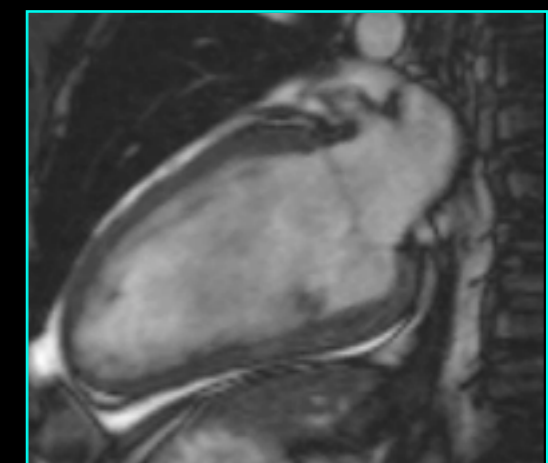
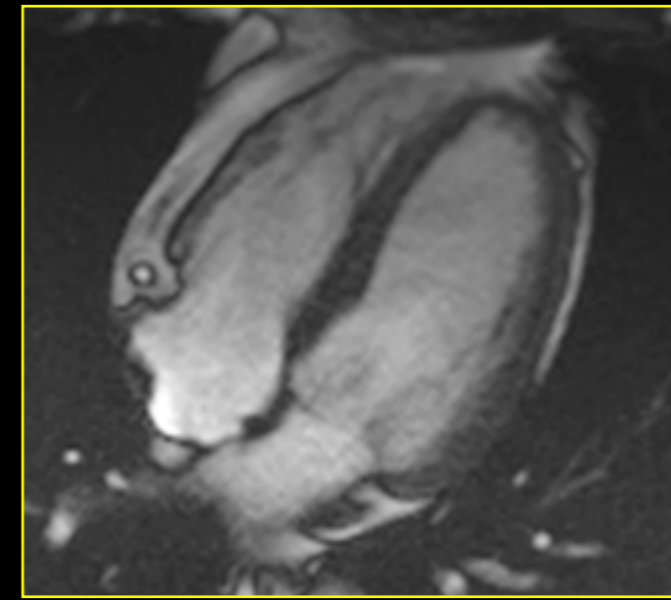
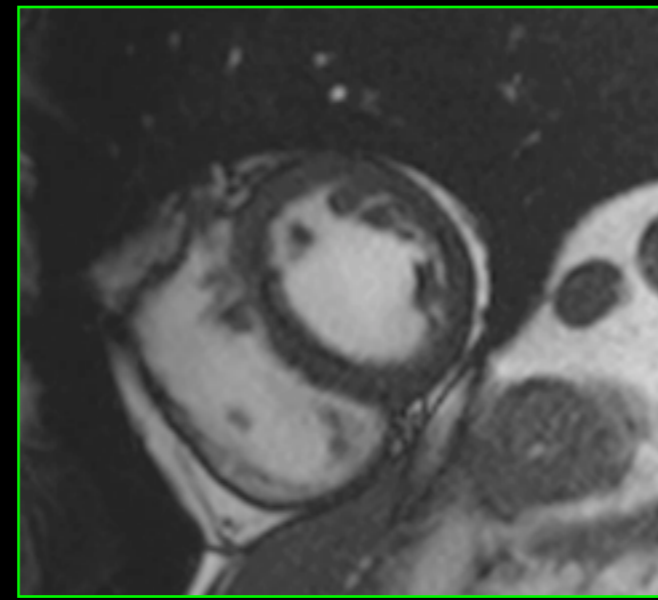
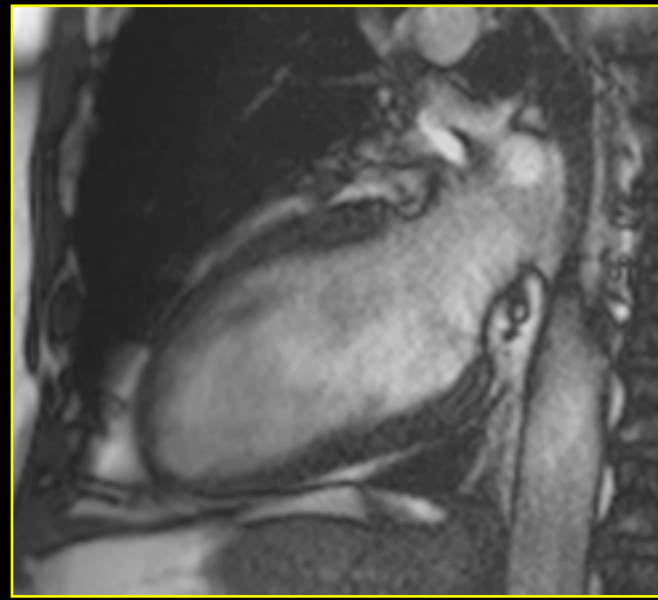
- épaisseur: **MCH**
- atrium: 2 mm
 - VD: 3 à 5 mm
 - **VG**: 5 à 12 mm



épaississement homogène

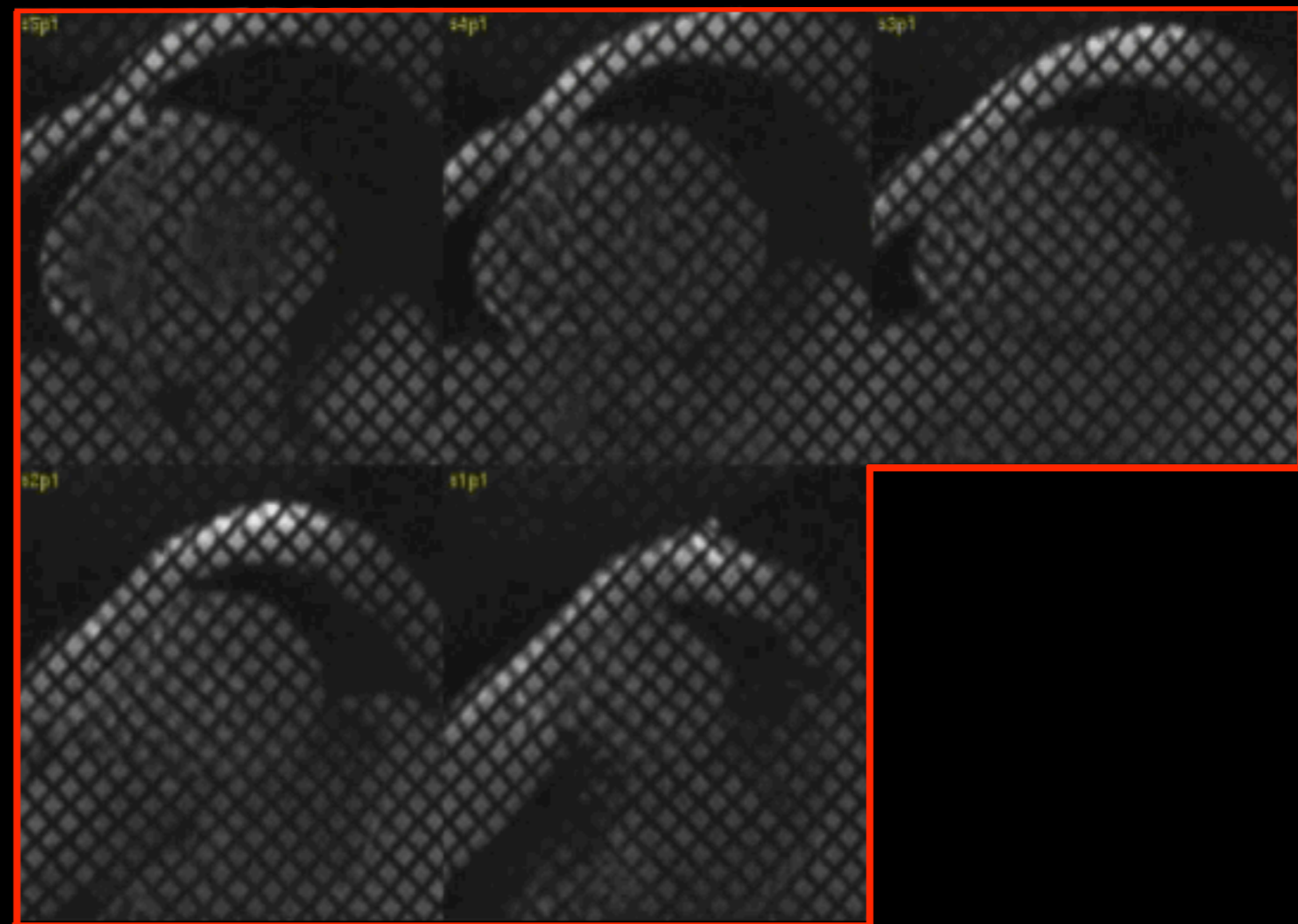
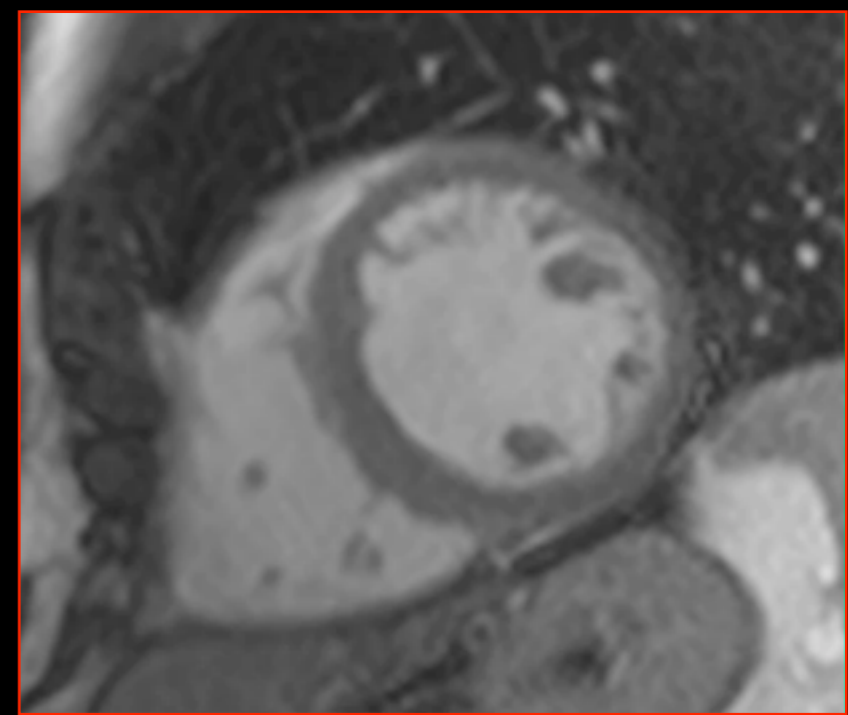
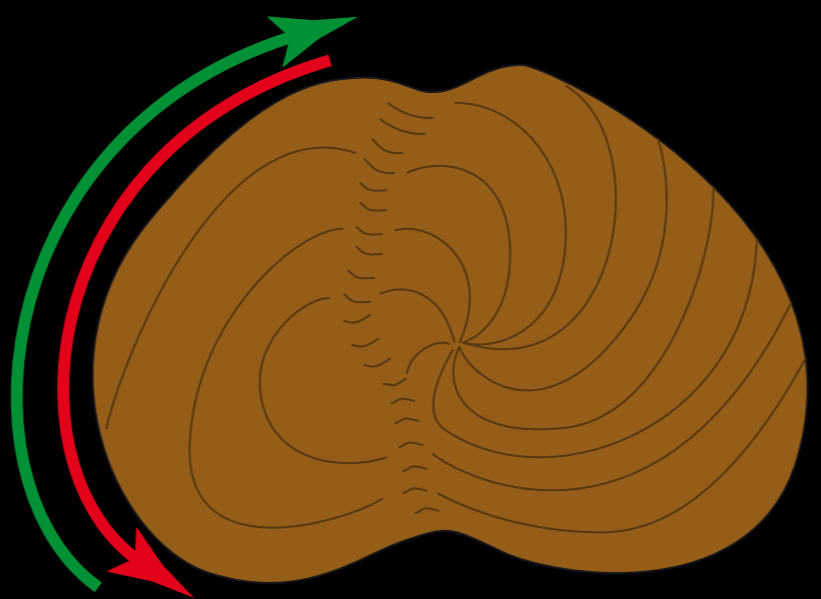
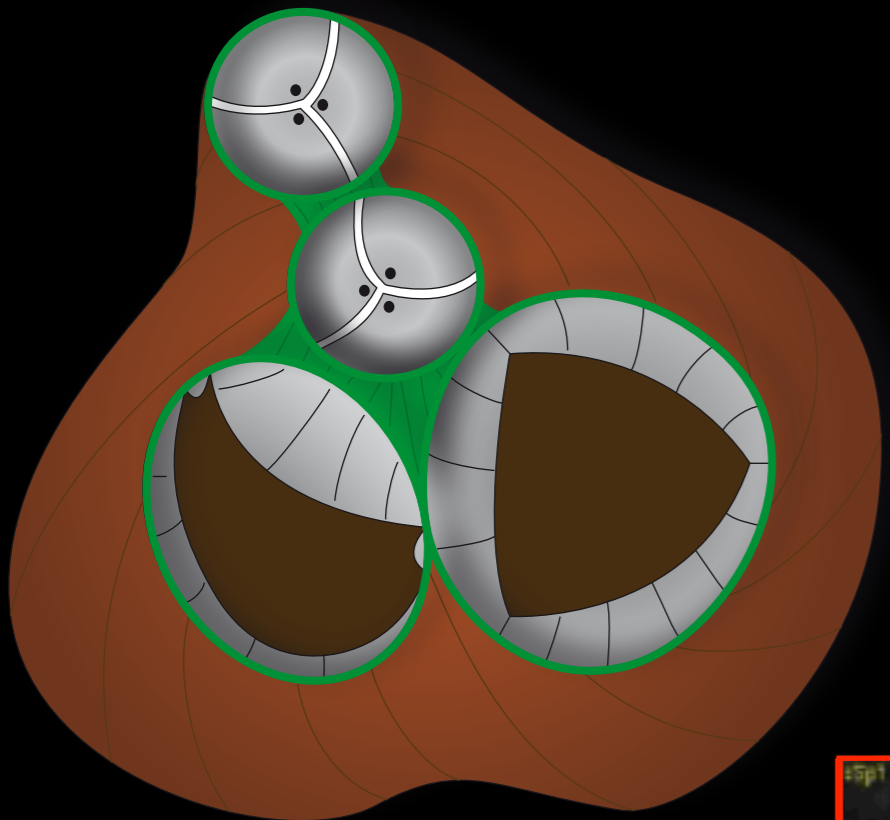


IDM



Parois

Systole
Diastole

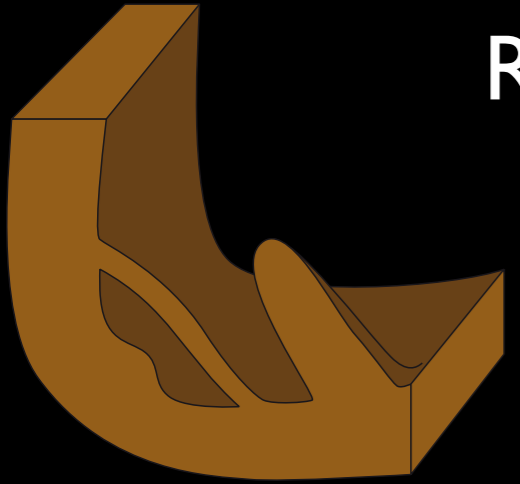


Parois

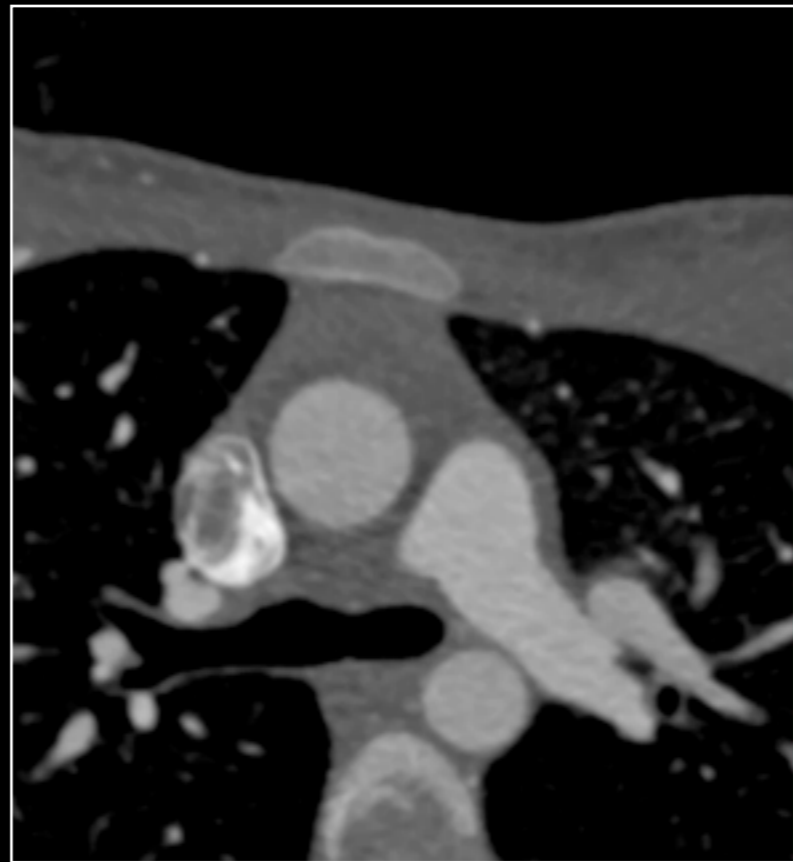
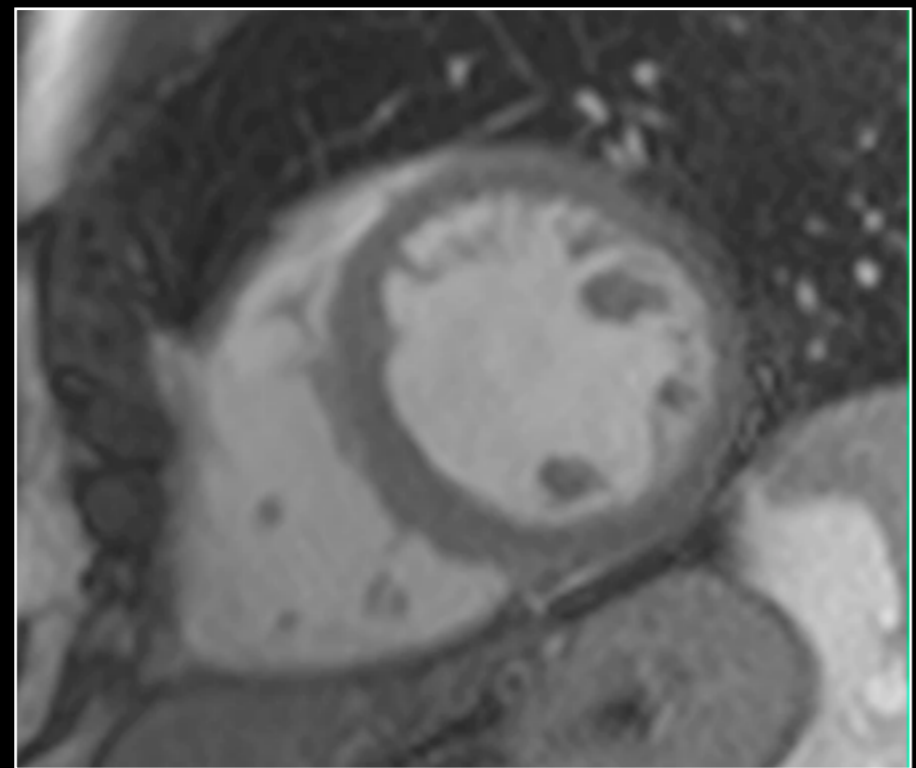
Nomenclature

Epicarde
Myocarde
Endocarde

Reliefs



Muscles papillaires
Trabécules
Colonnes charnues



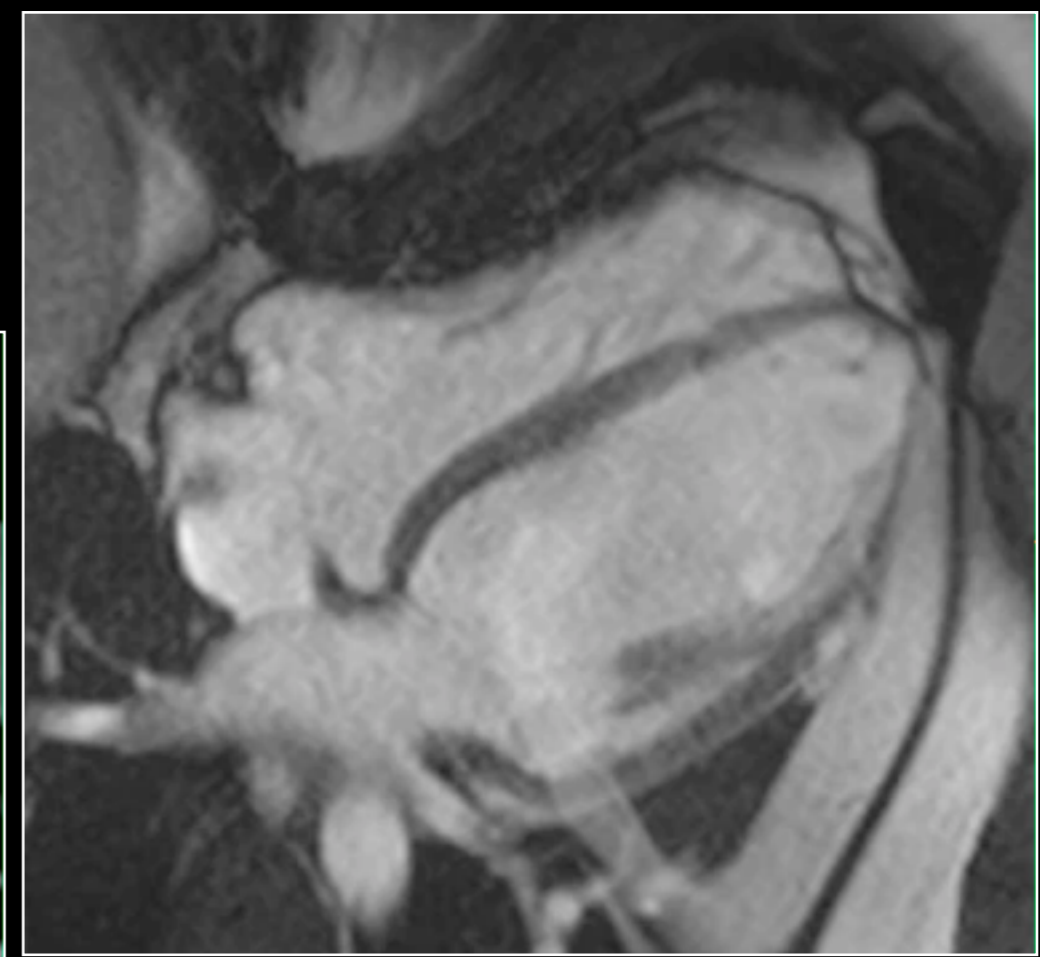
Libre

Septale

Antérieure

Latérale

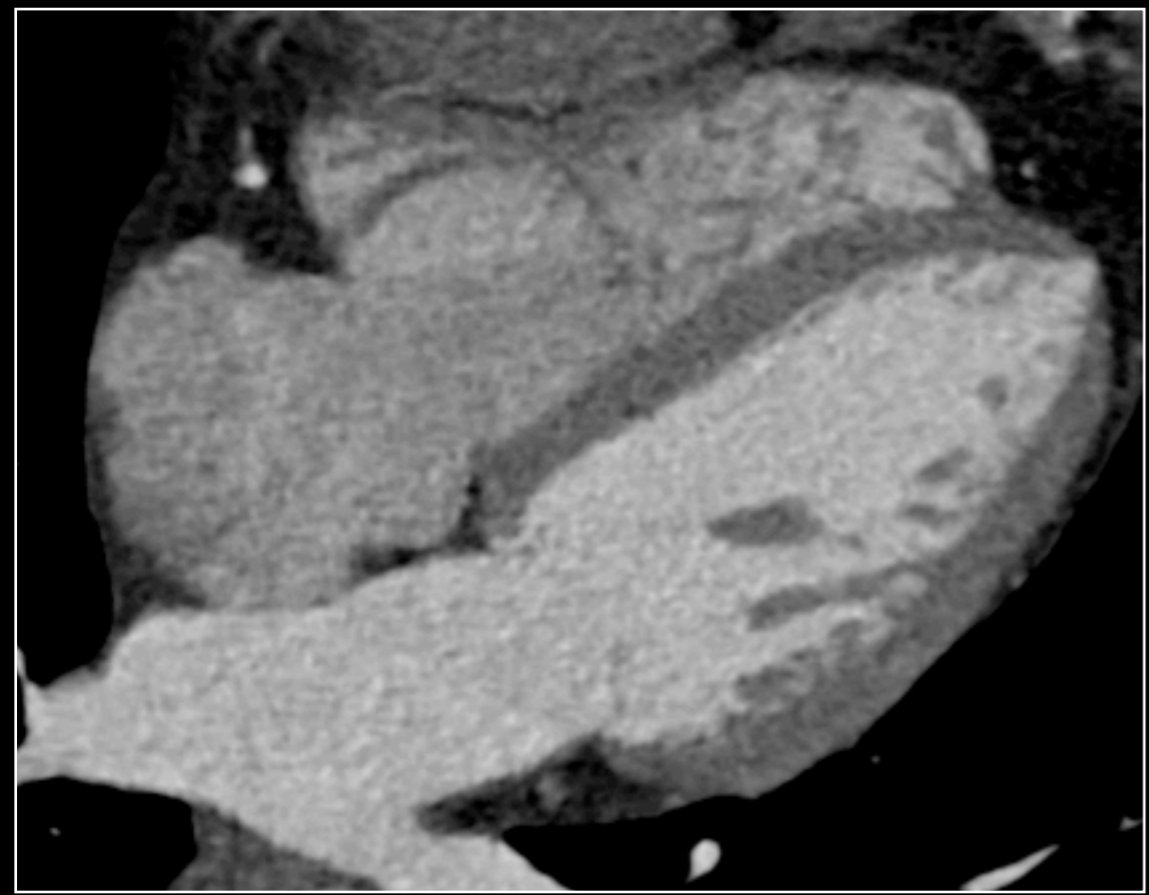
Inférieure



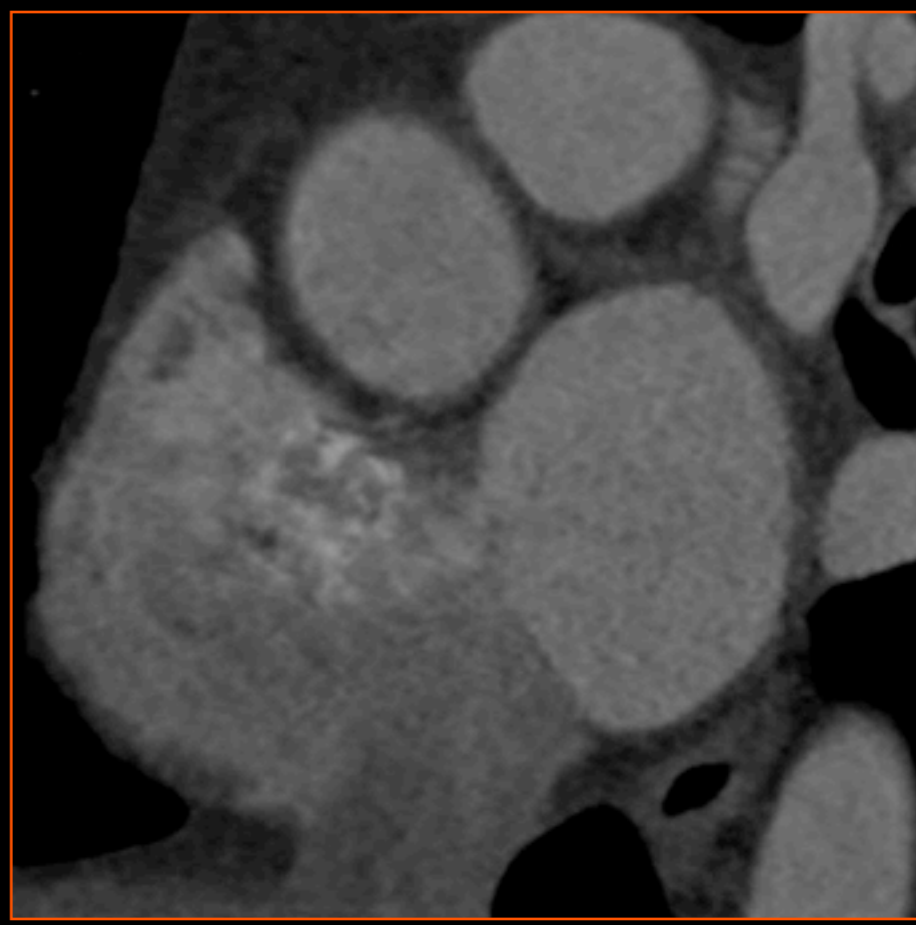
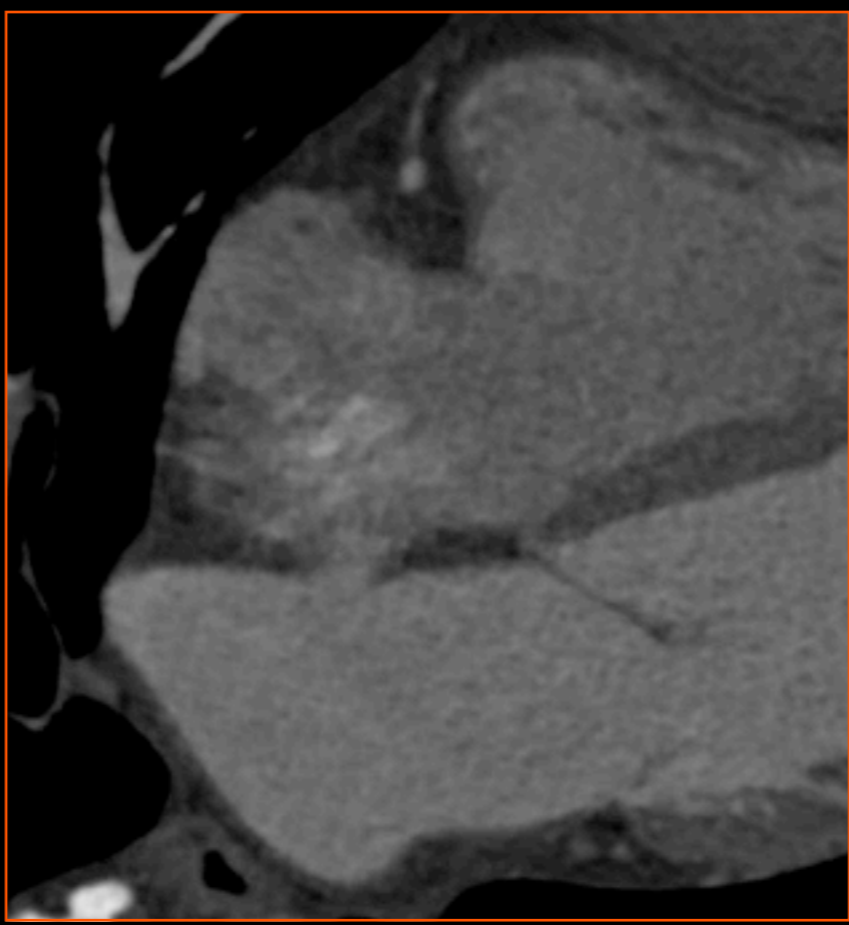
Parois

Septum interatrial

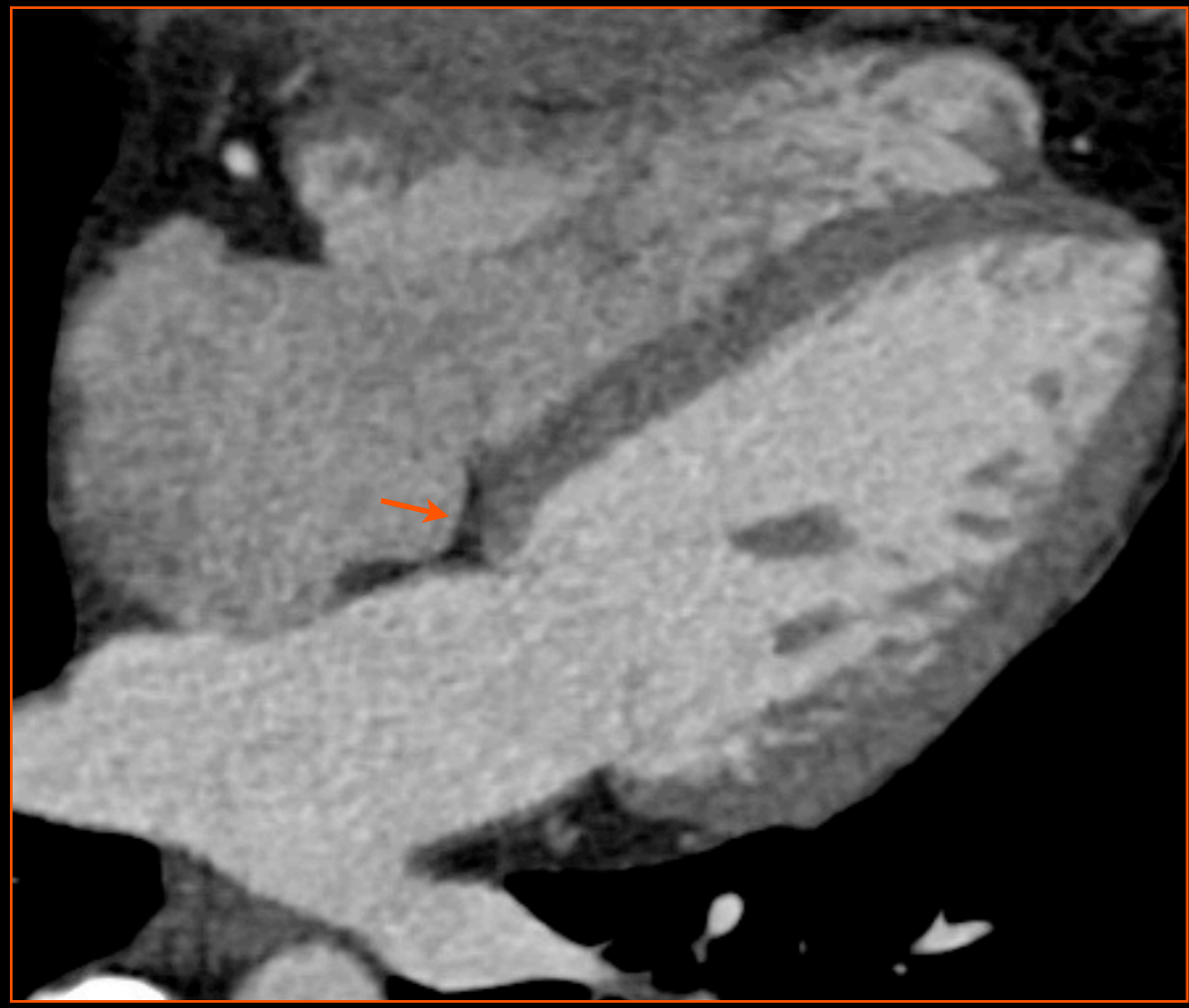
Musculaire



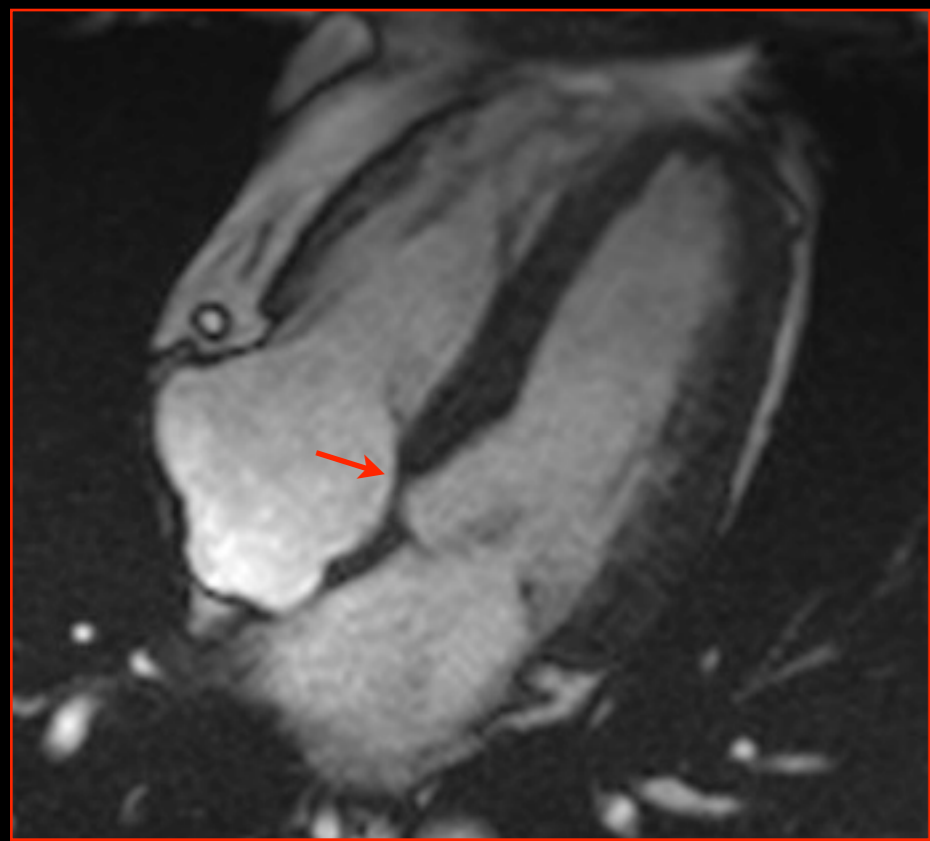
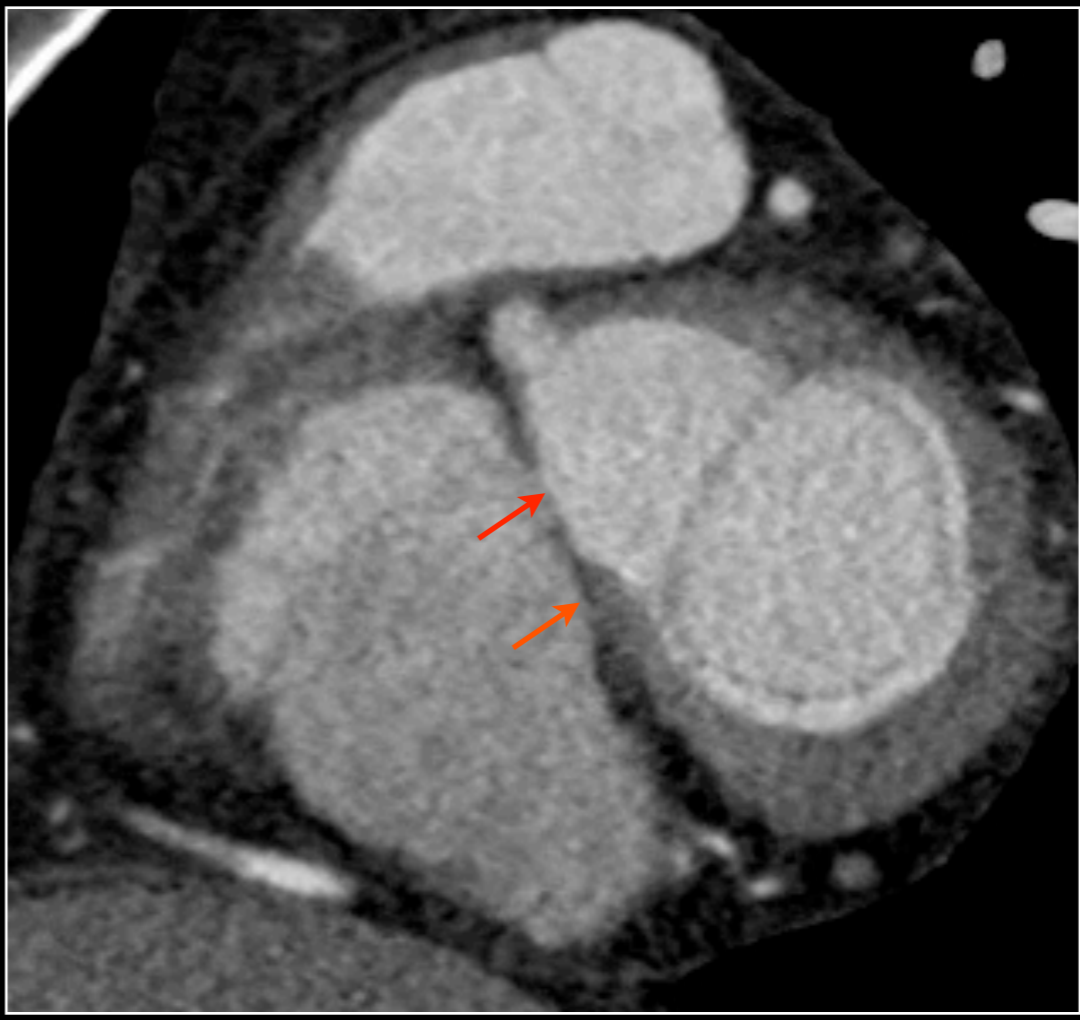
FOP (20%)
CIA (5%)



Parois



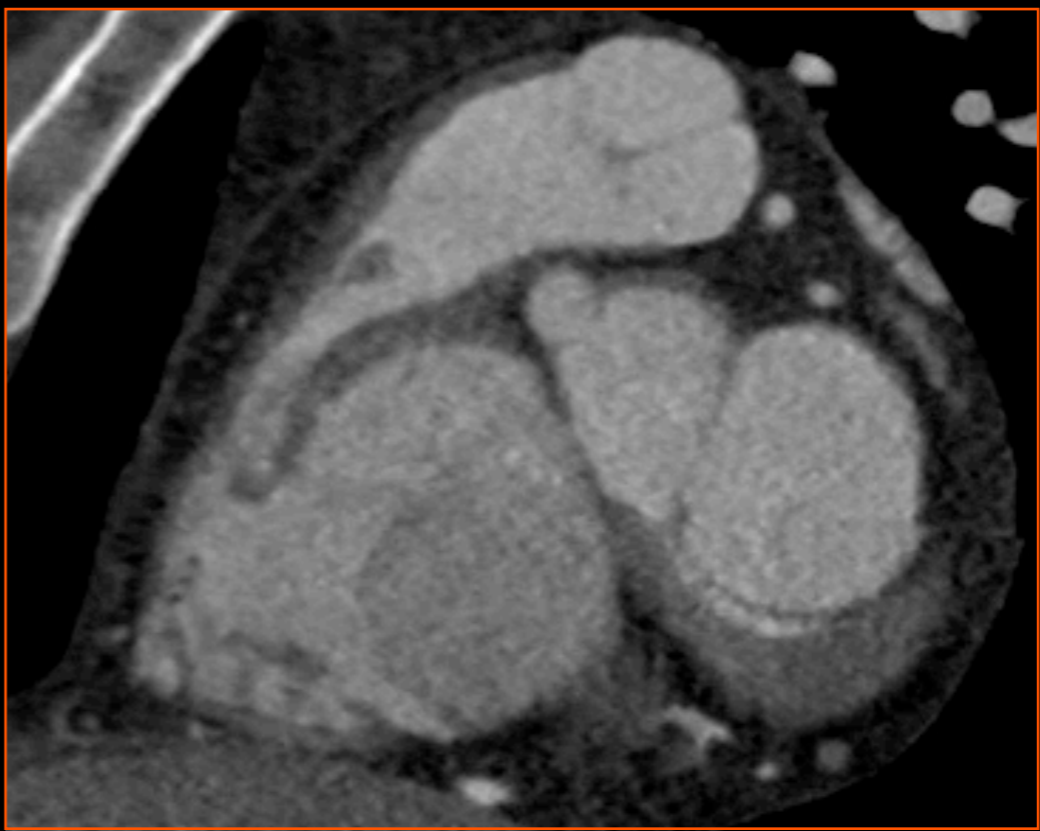
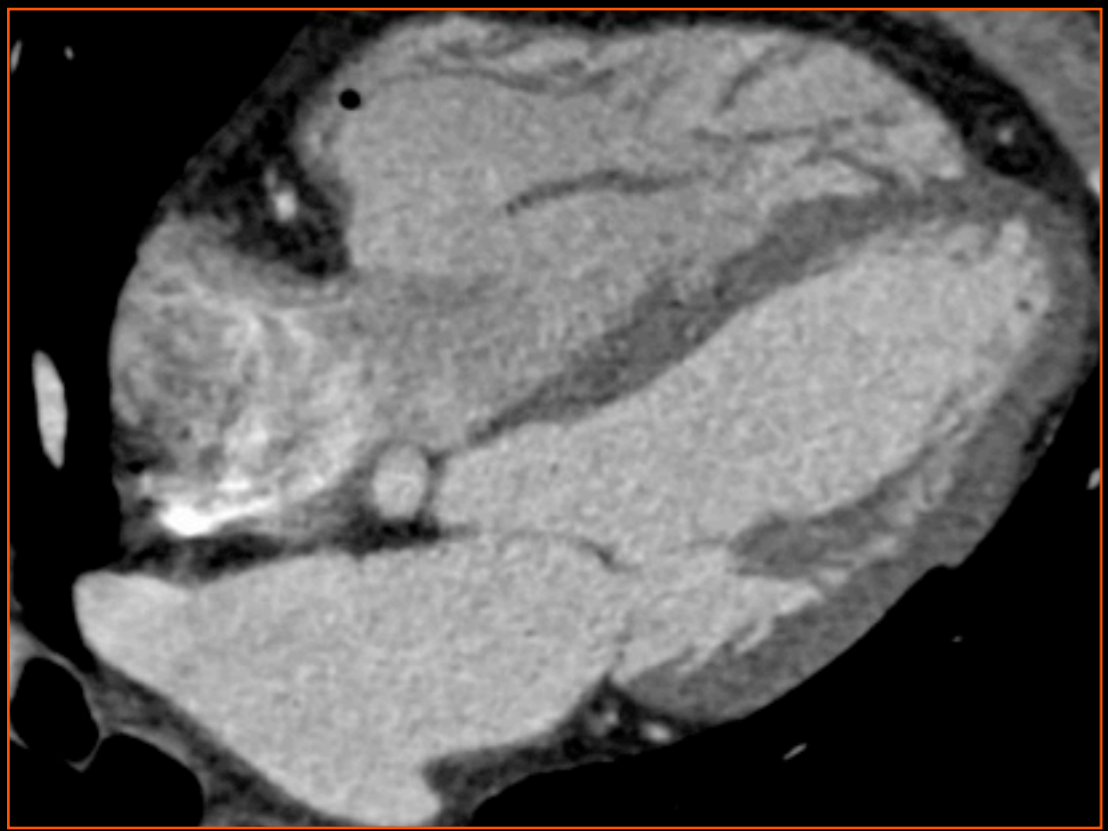
Septum atrioventriculaire



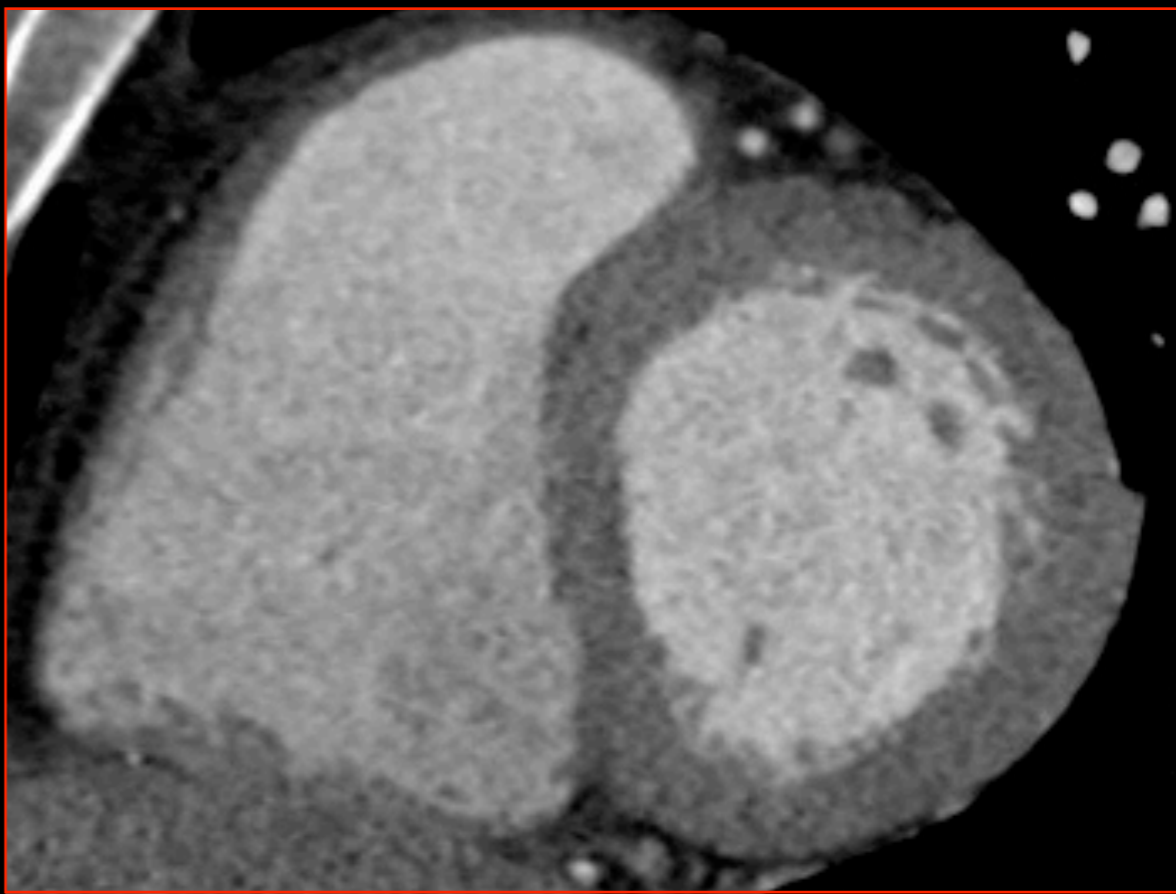
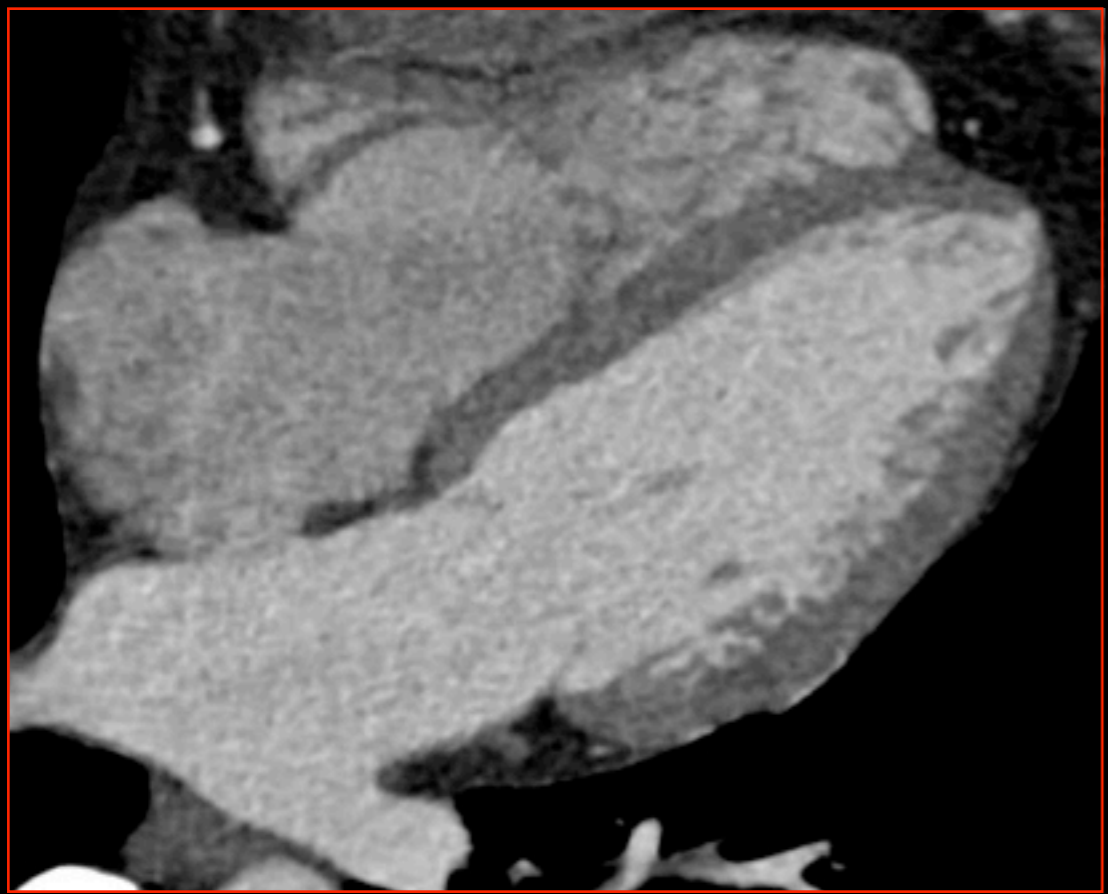
Musculaire
Membraneux

Parois

Septum interventriculaire



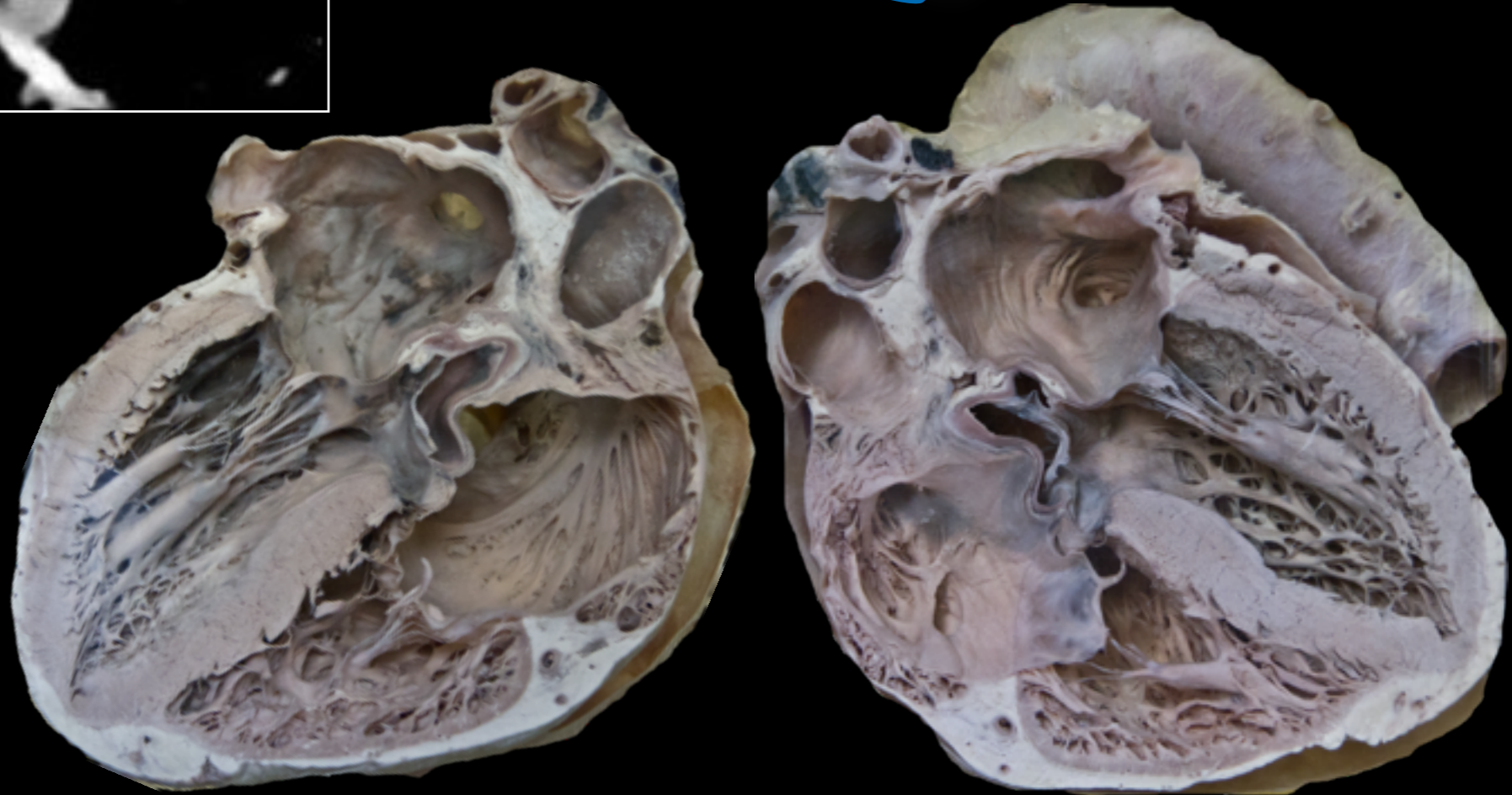
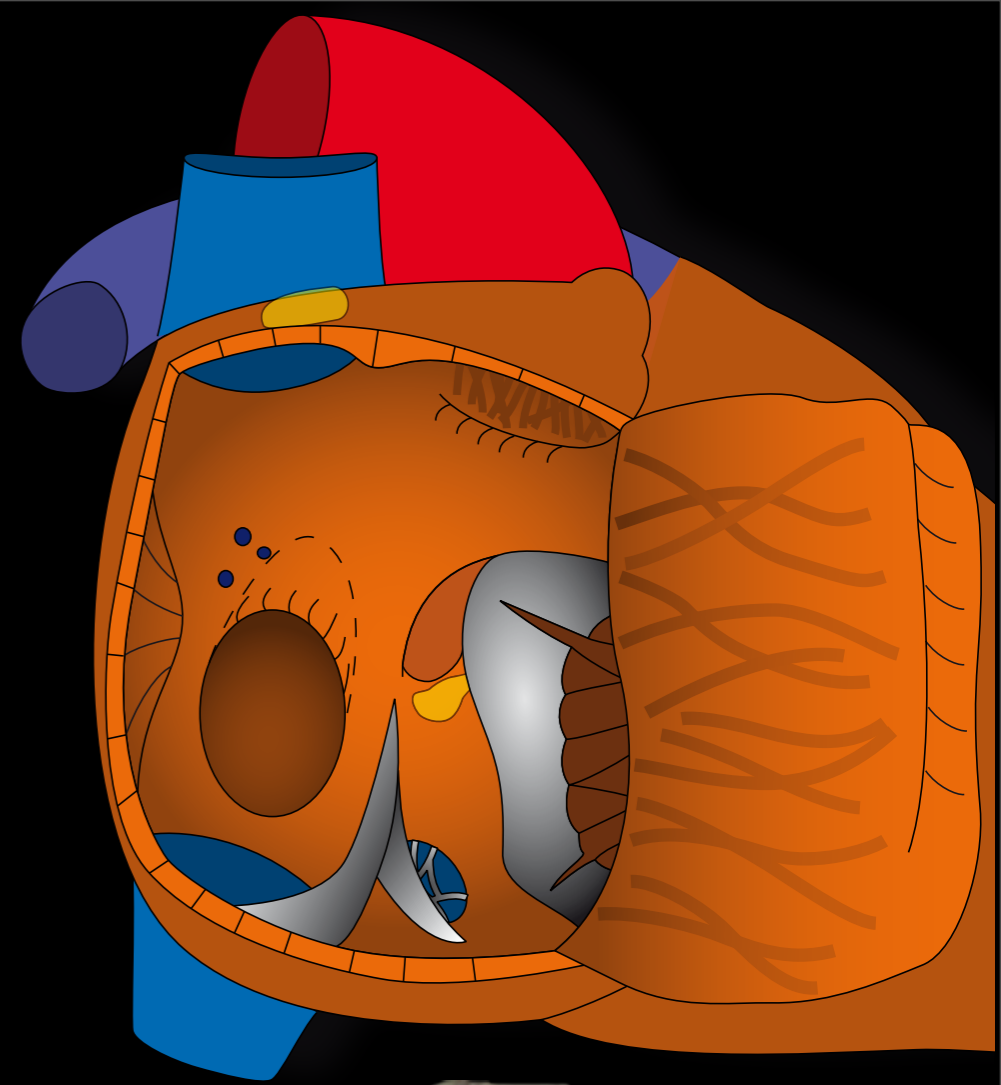
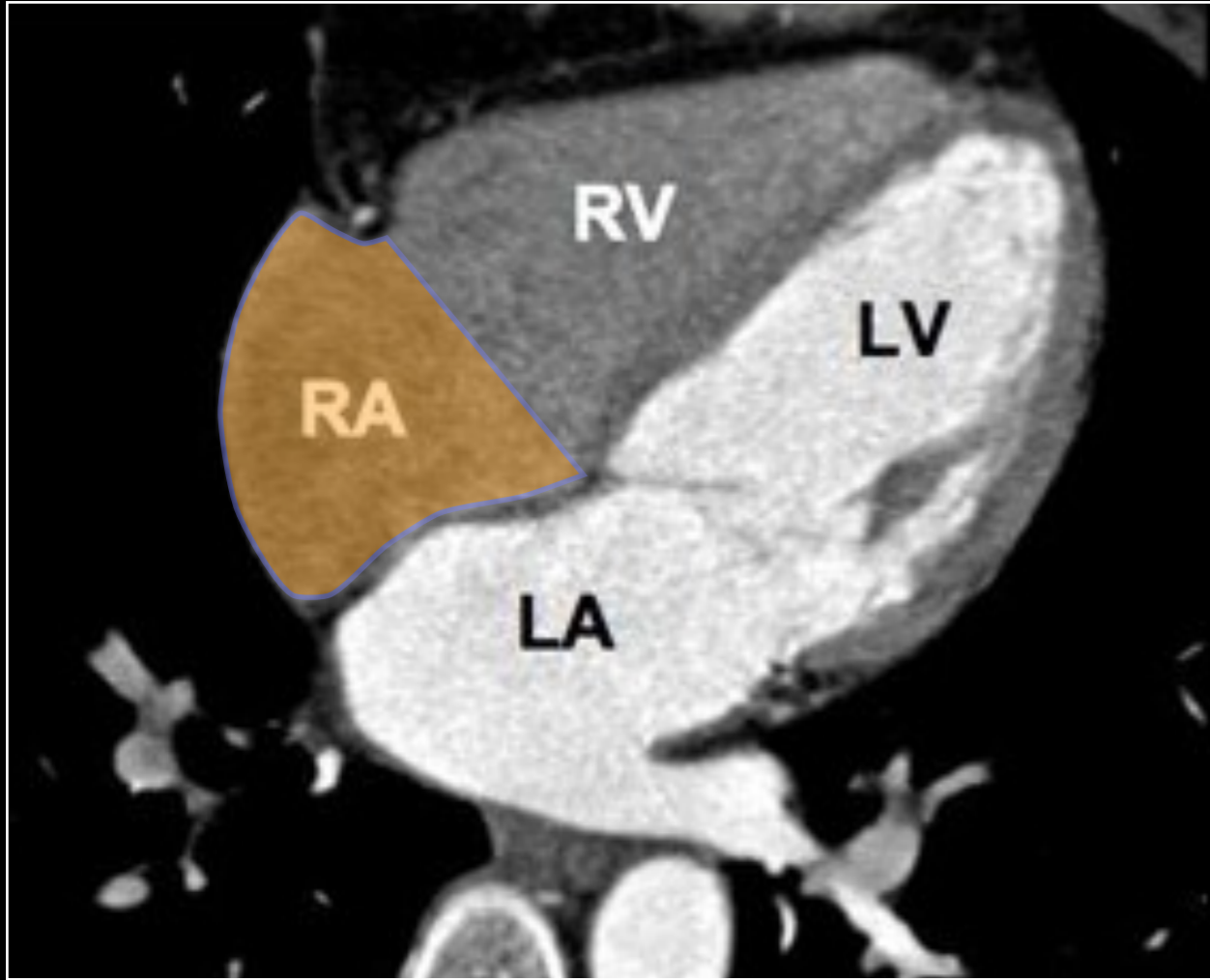
Membraneux

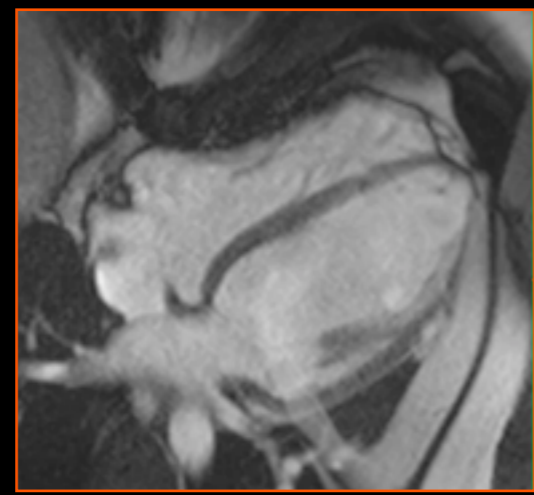
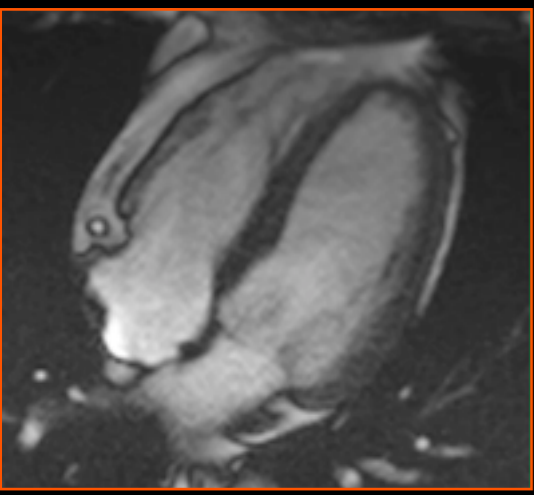
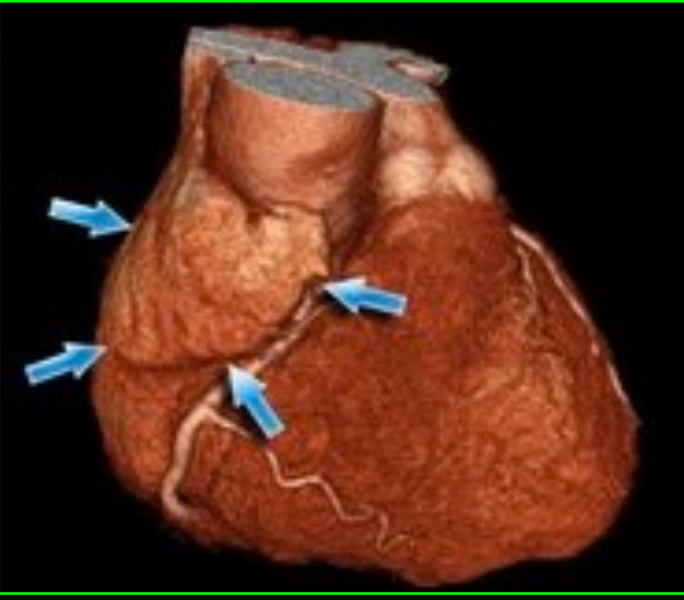
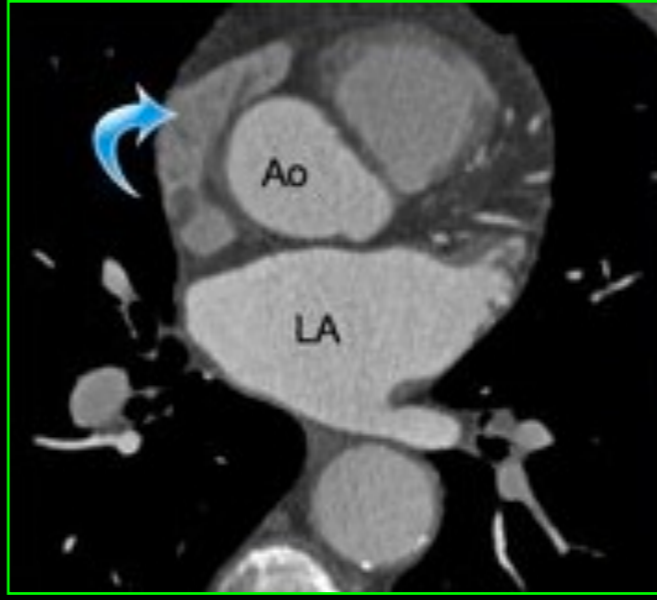
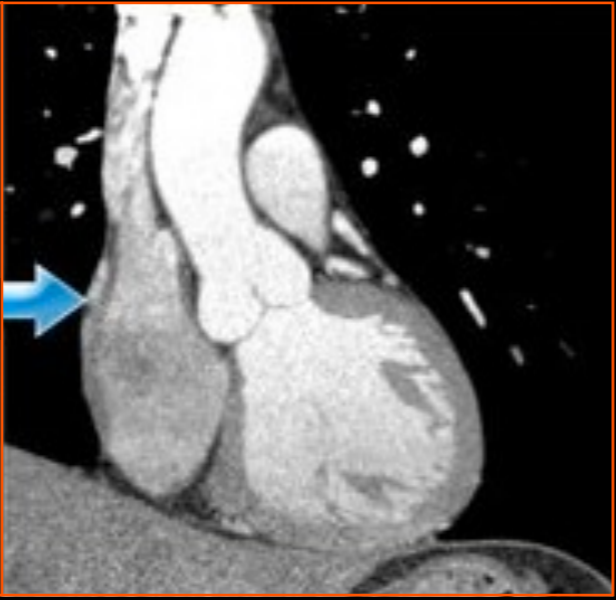
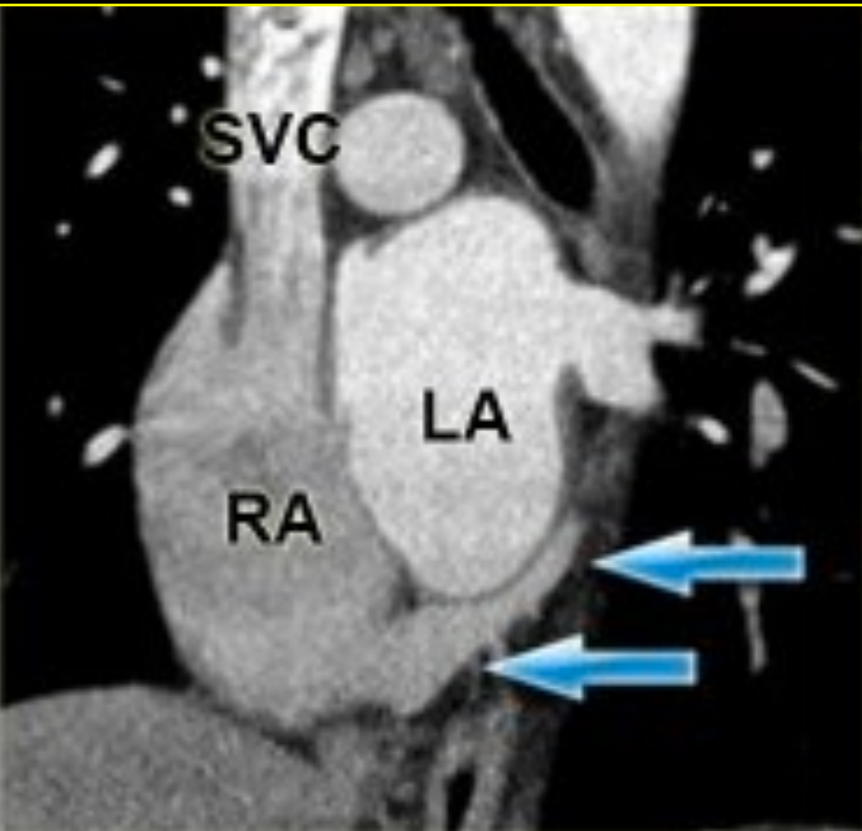
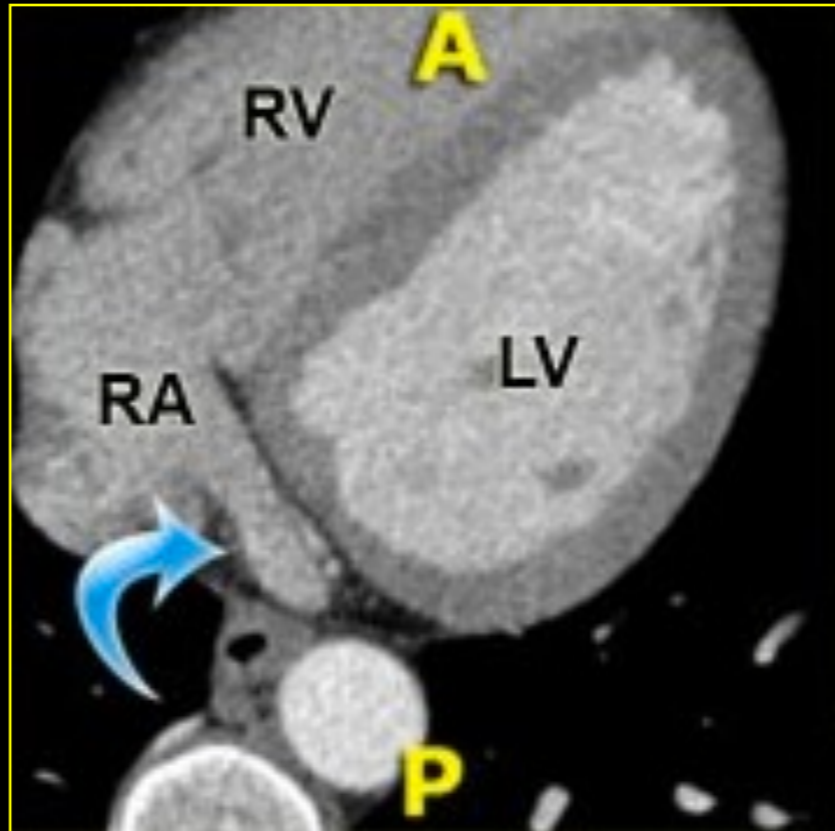
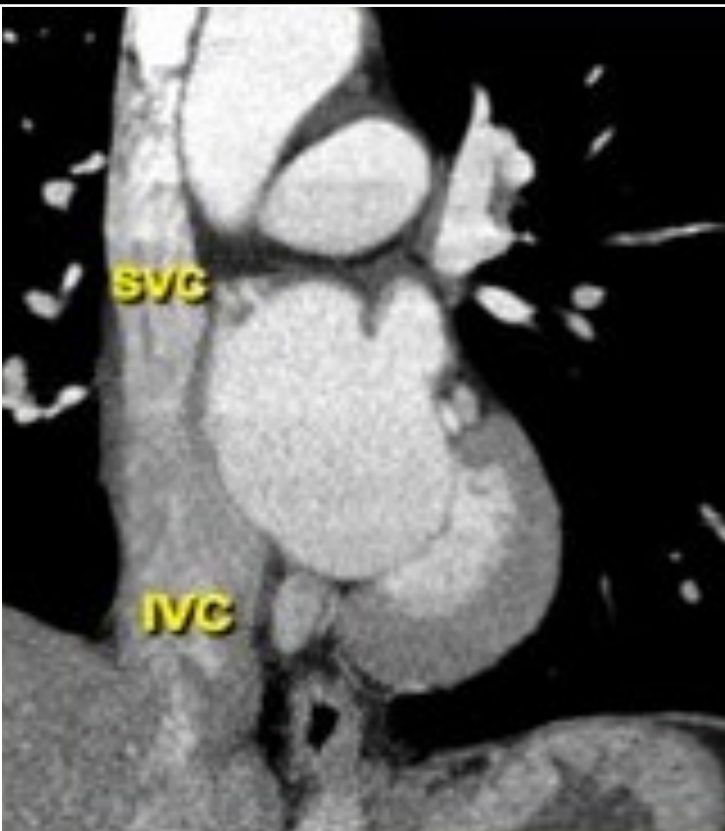


Musculaire

Cavités

Atrium droit

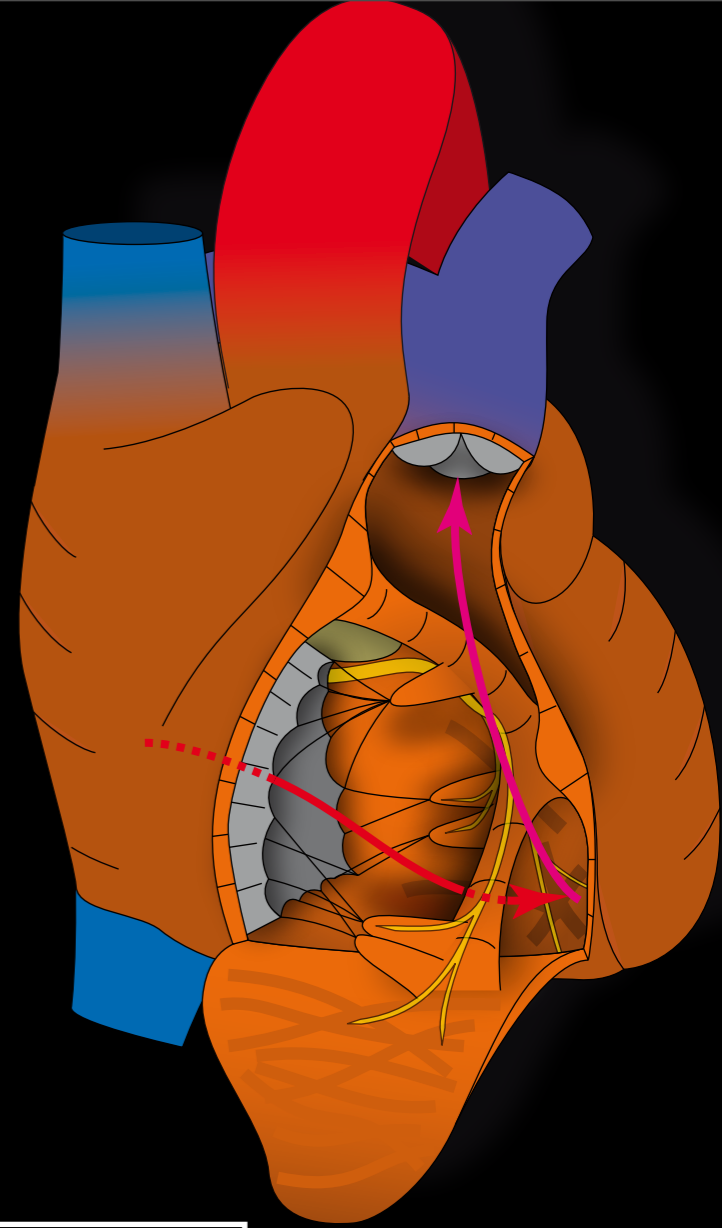
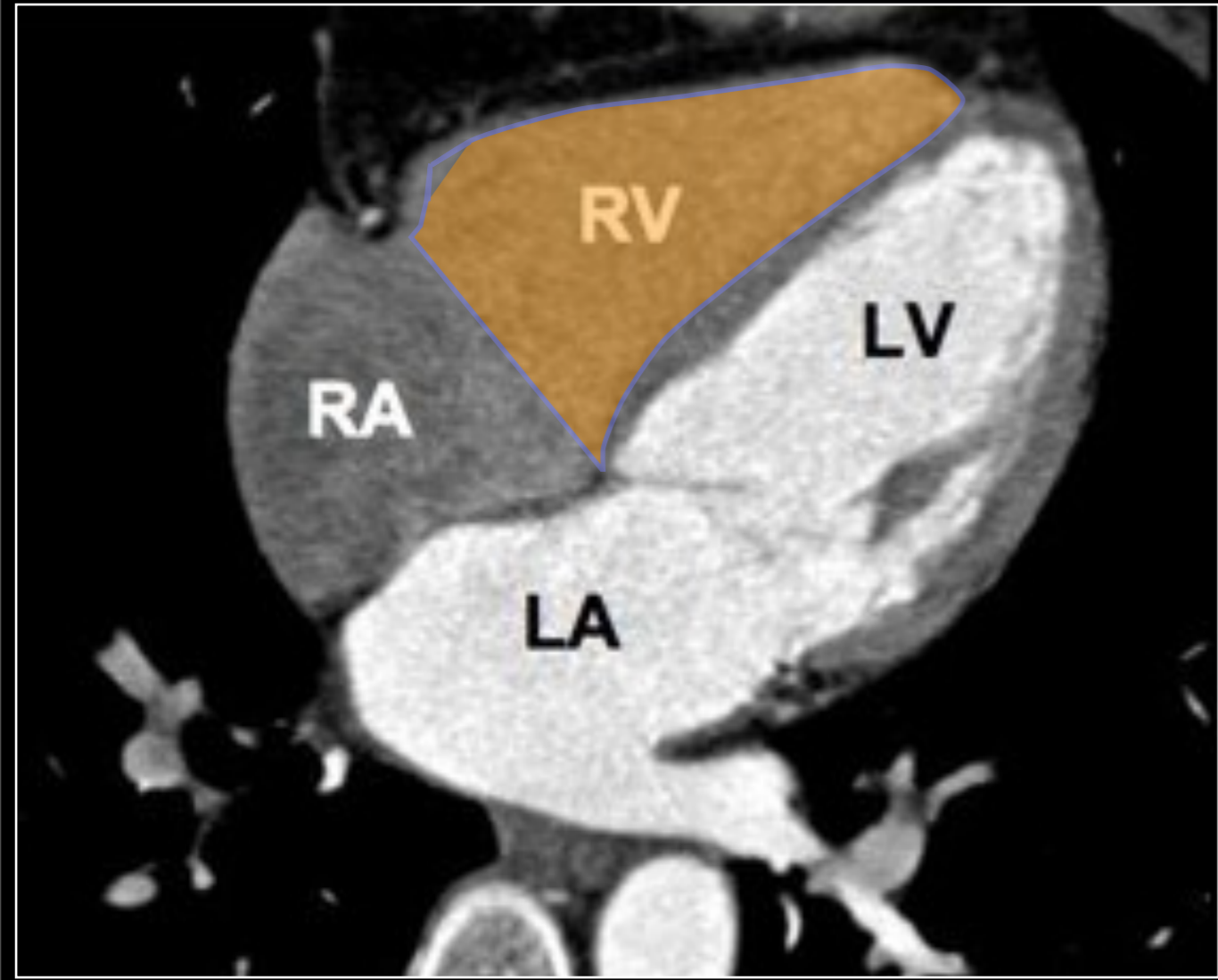


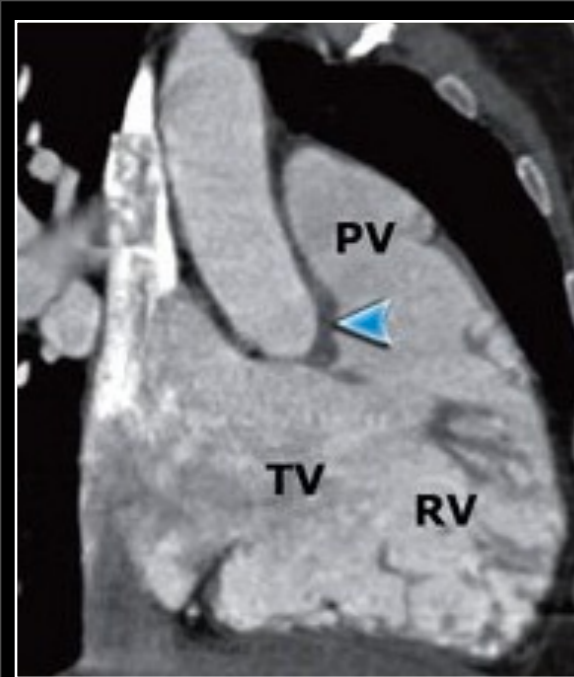


- veines caves
- sinus coronaire (sillon coronaire gauche)
- crête terminale
- auricule droit

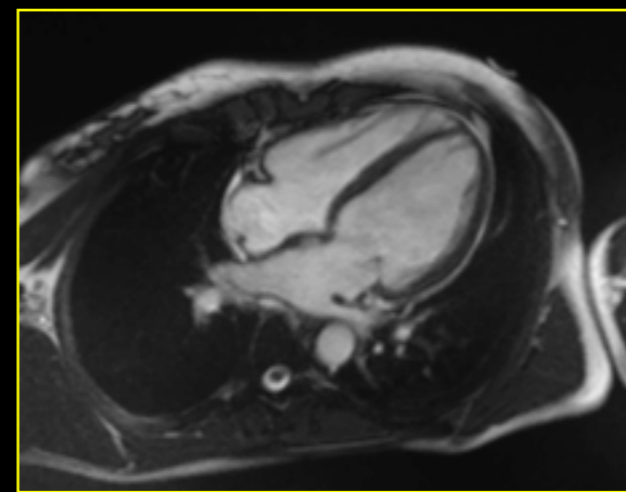
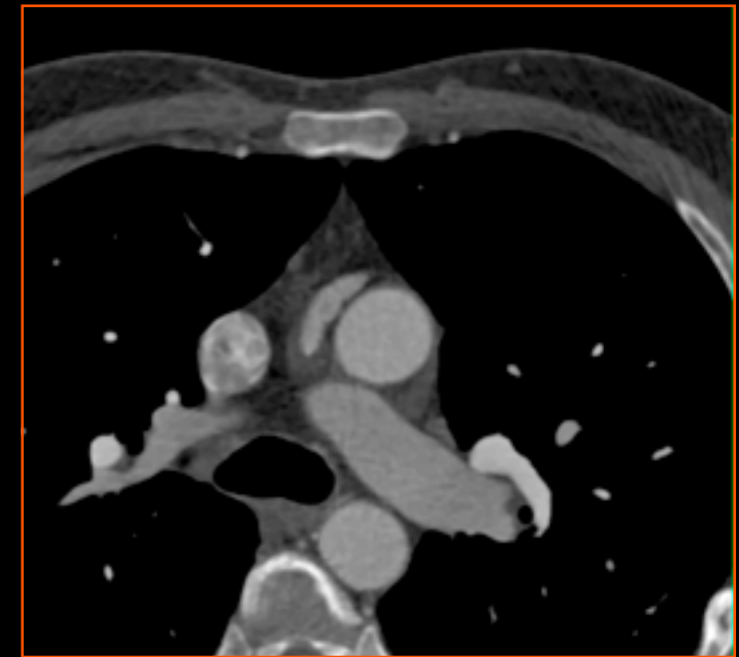
Cavités

Ventricule droit

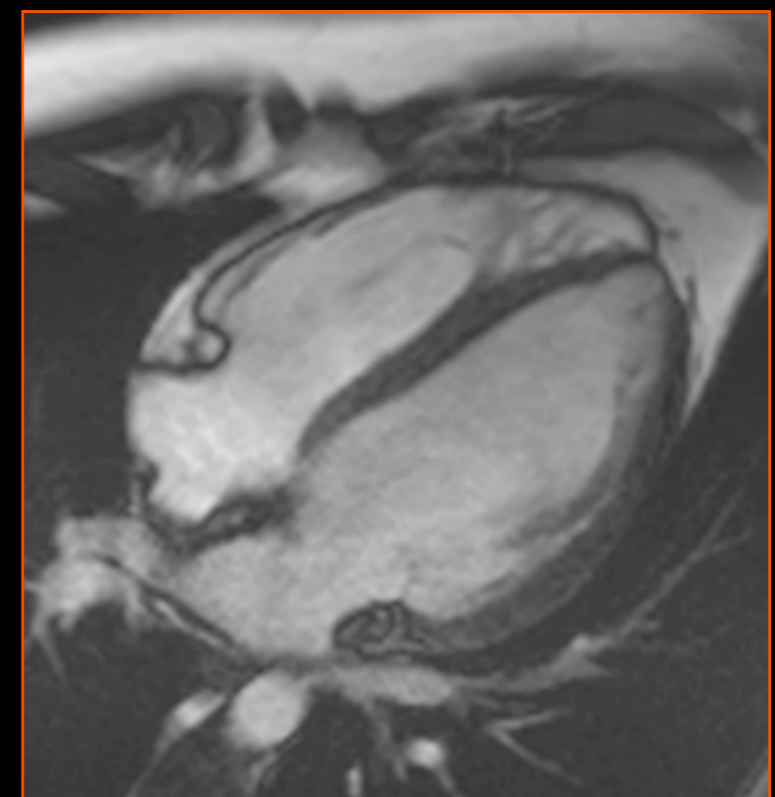
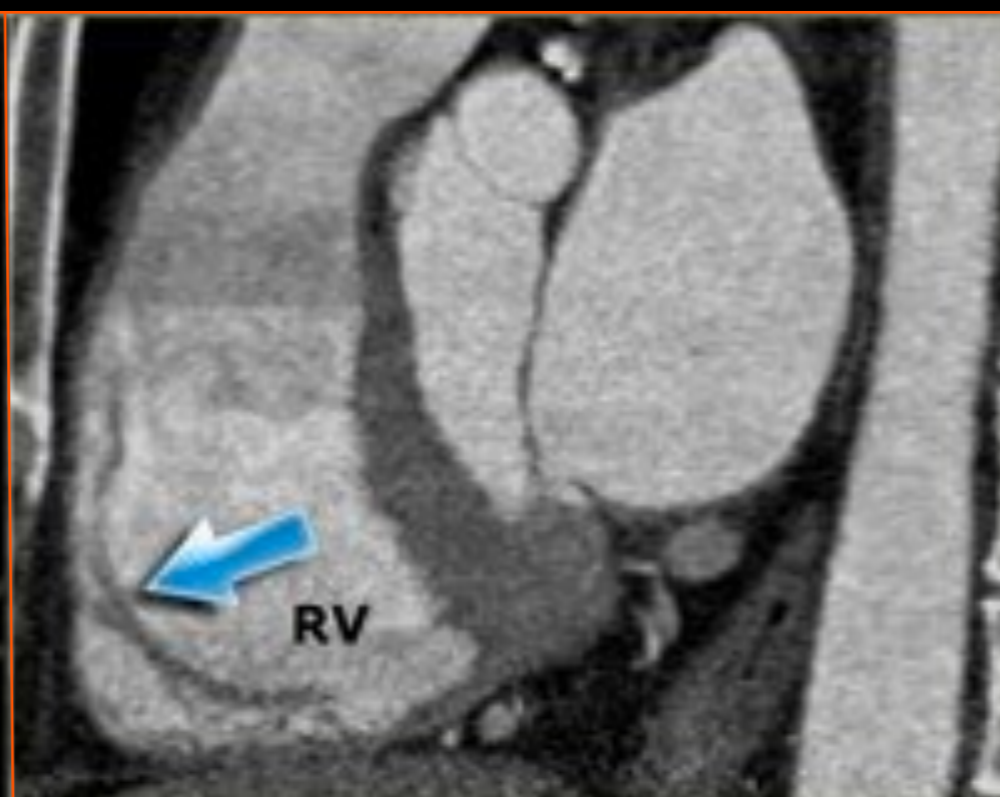
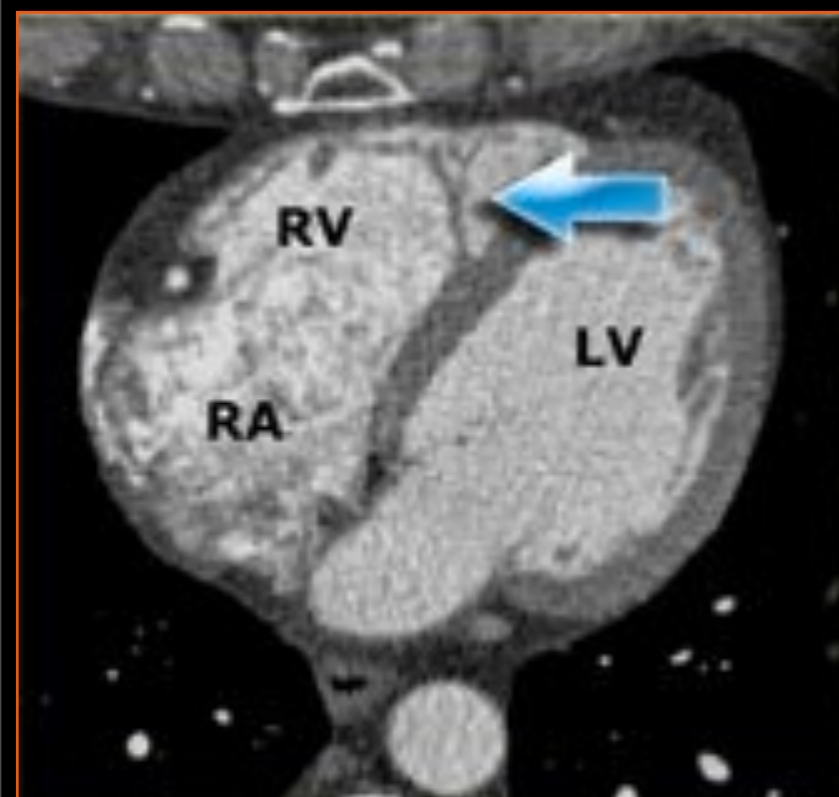




double discordance

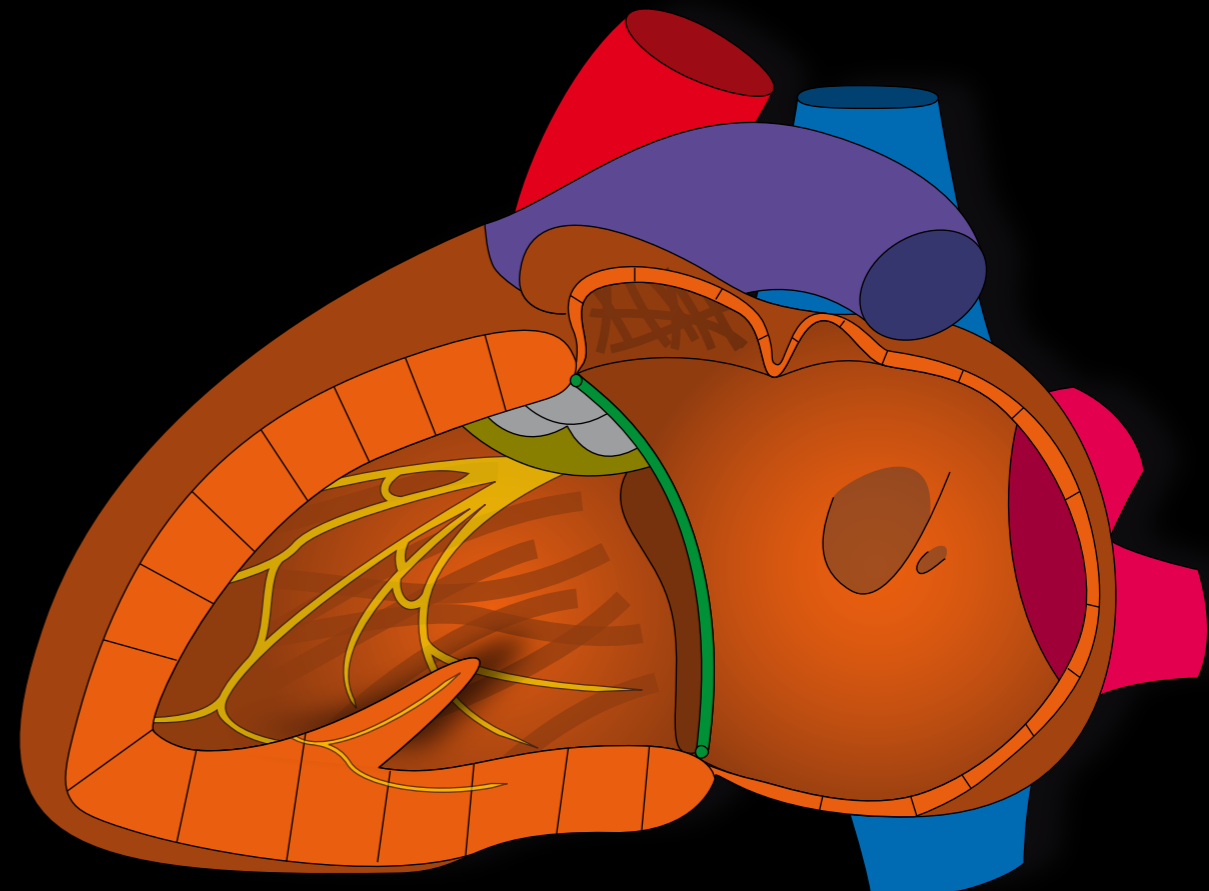
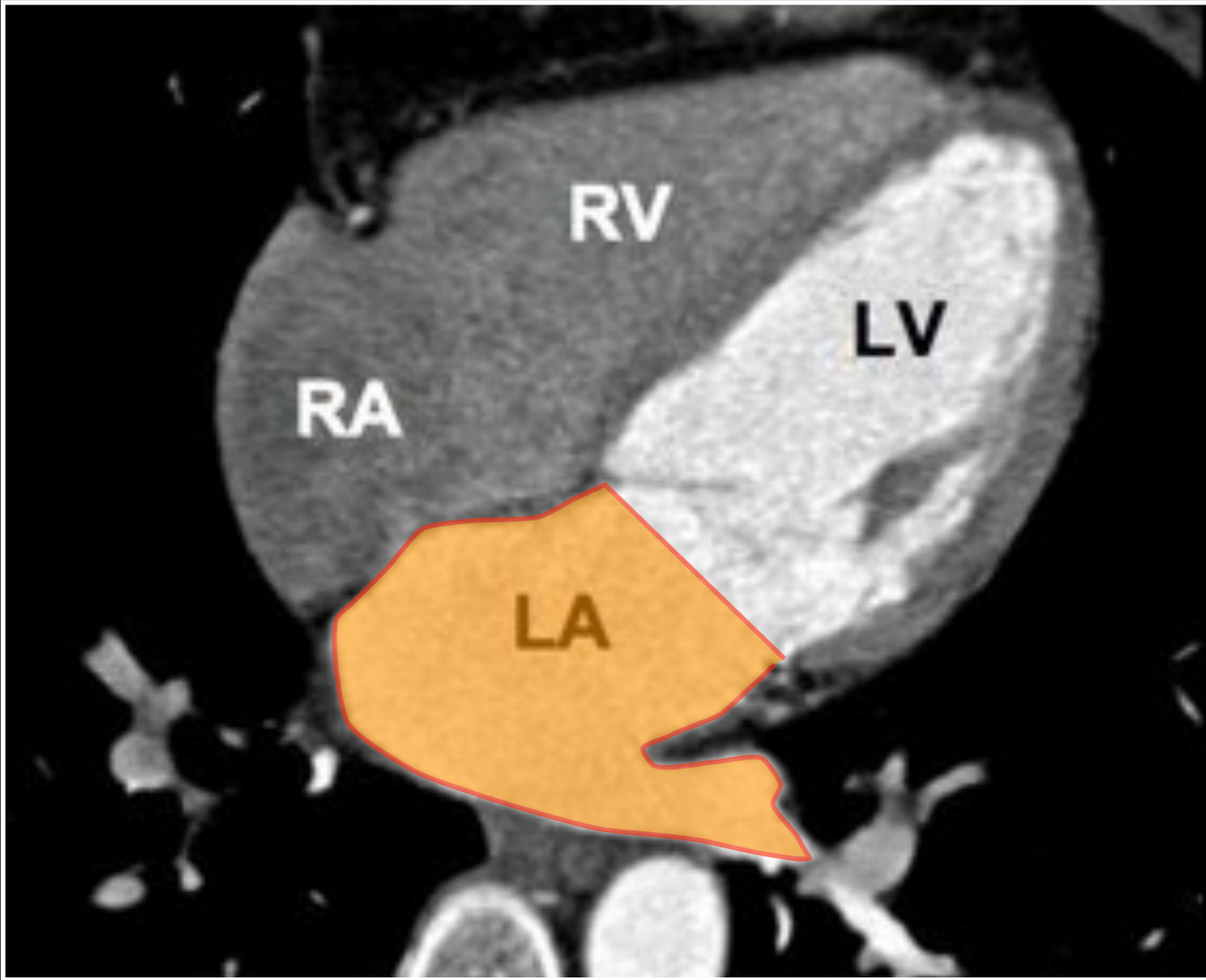


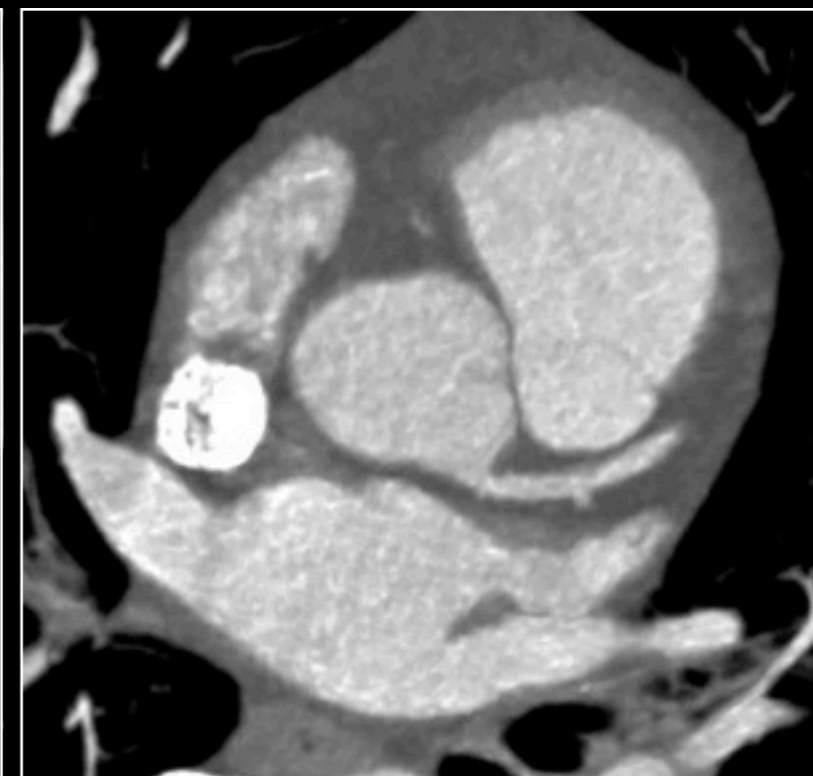
- crête supra-ventriculaire
- muscles papillaires
- trabécule septo-marginale = VD



Cavités

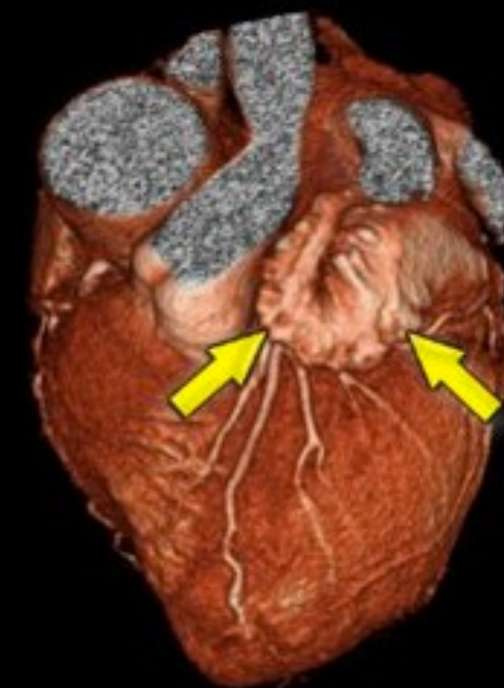
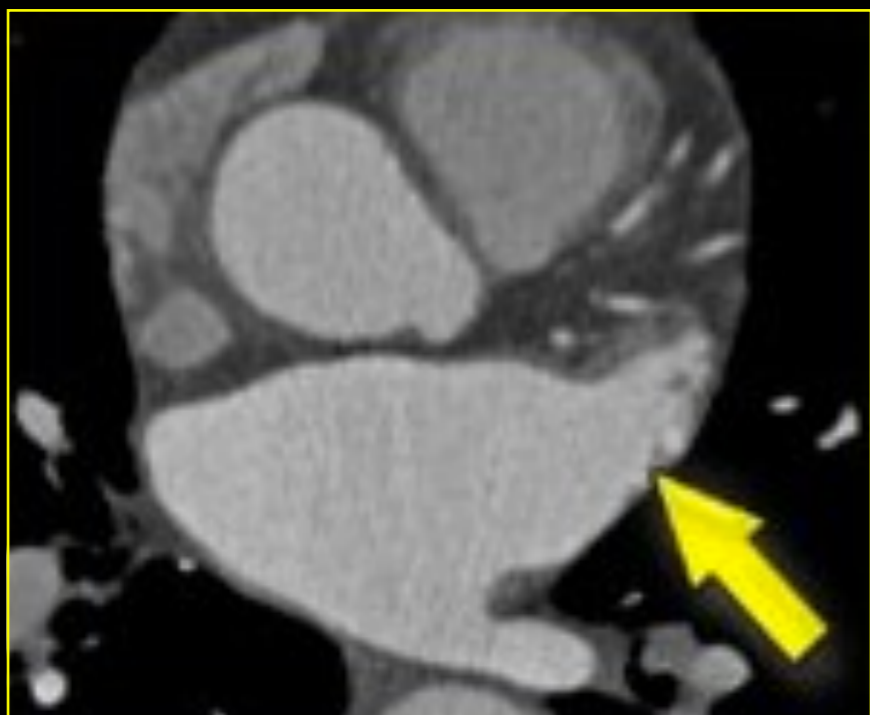
Atrium gauche





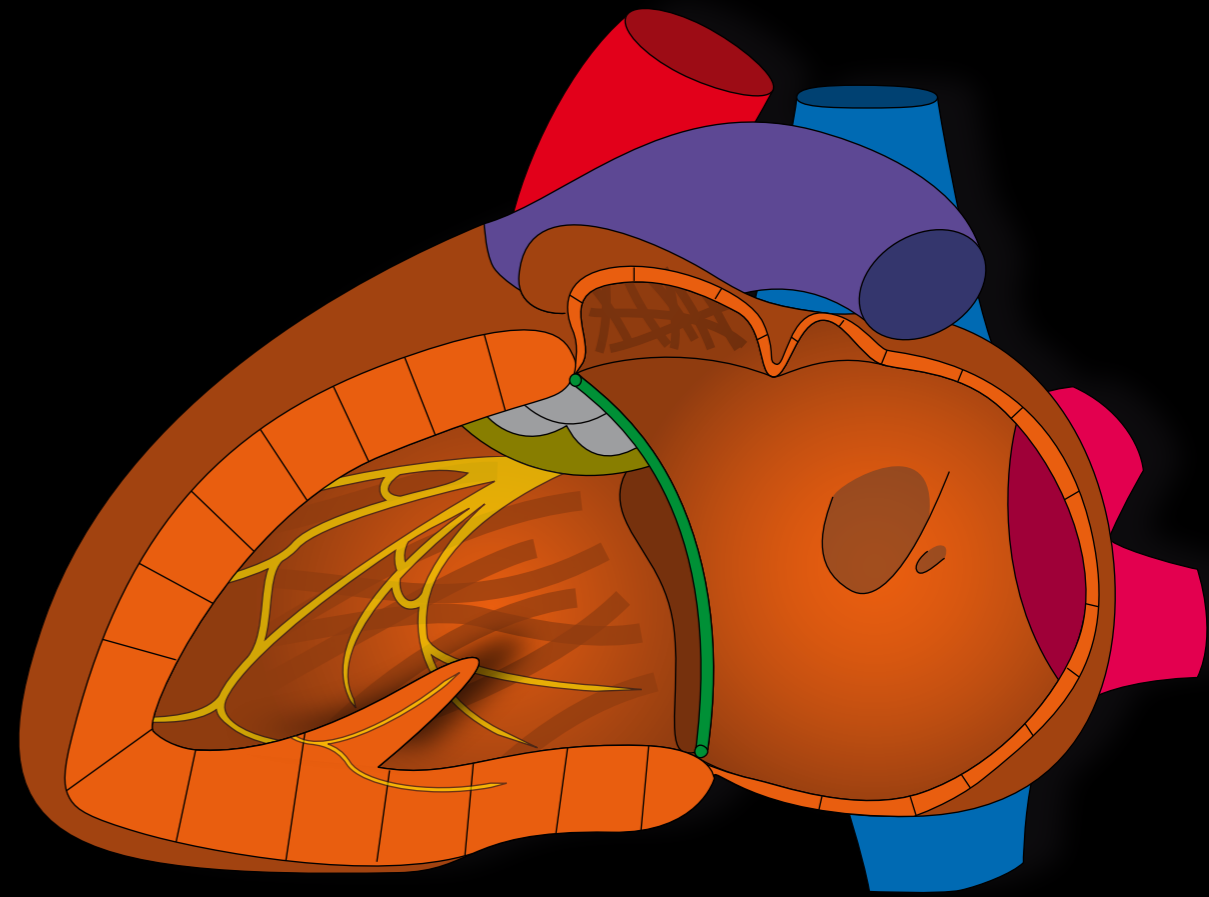
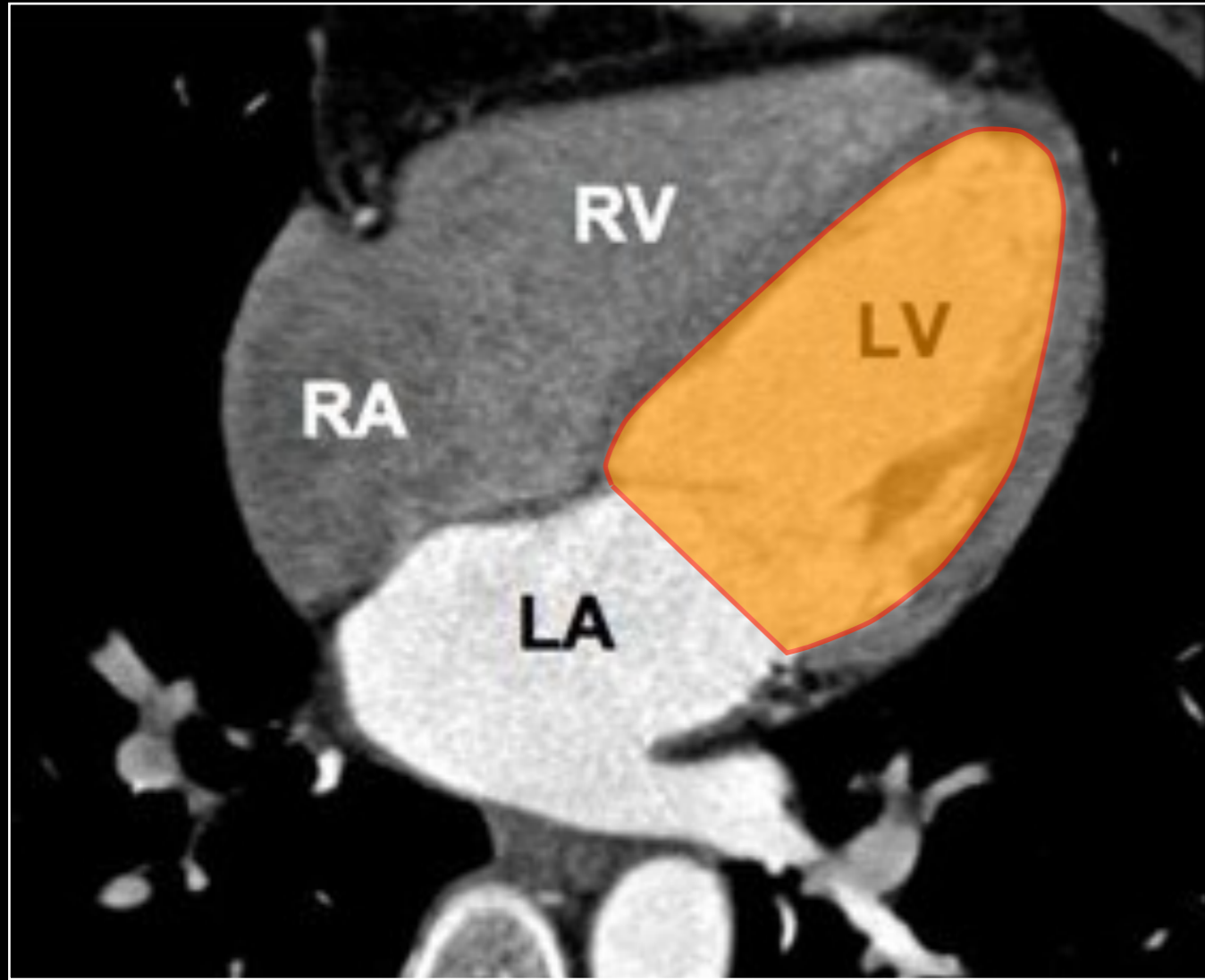
- veines pulmonaires

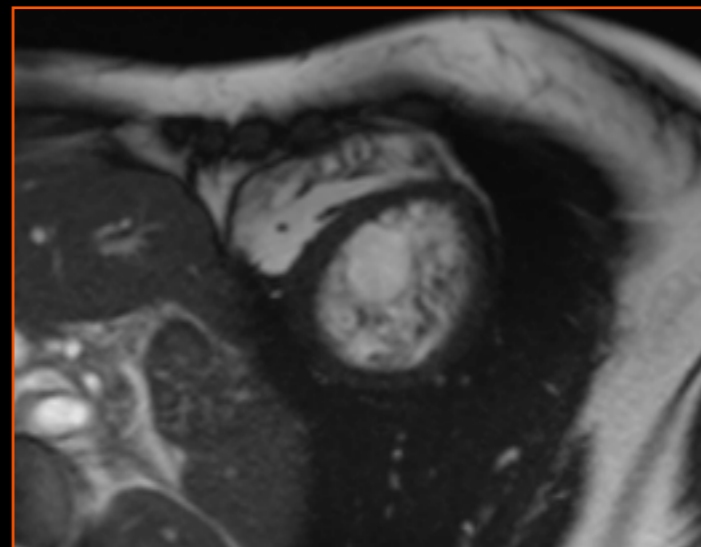
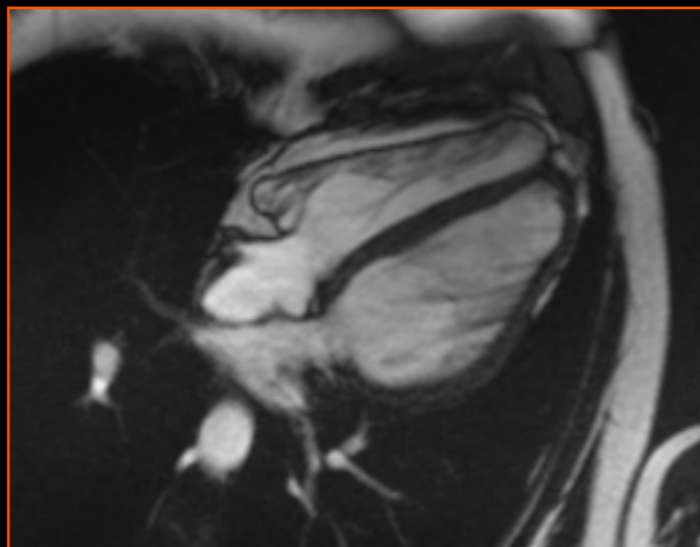
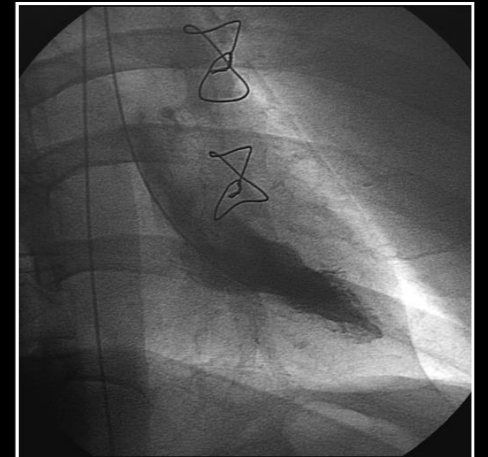
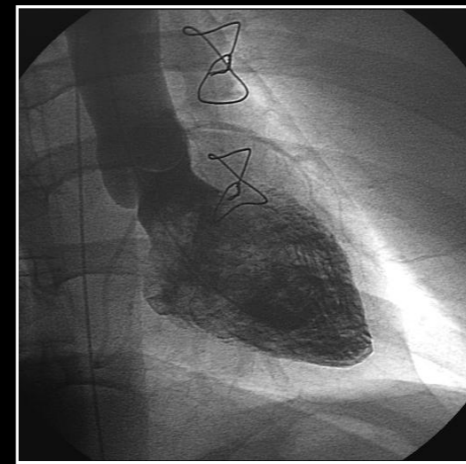
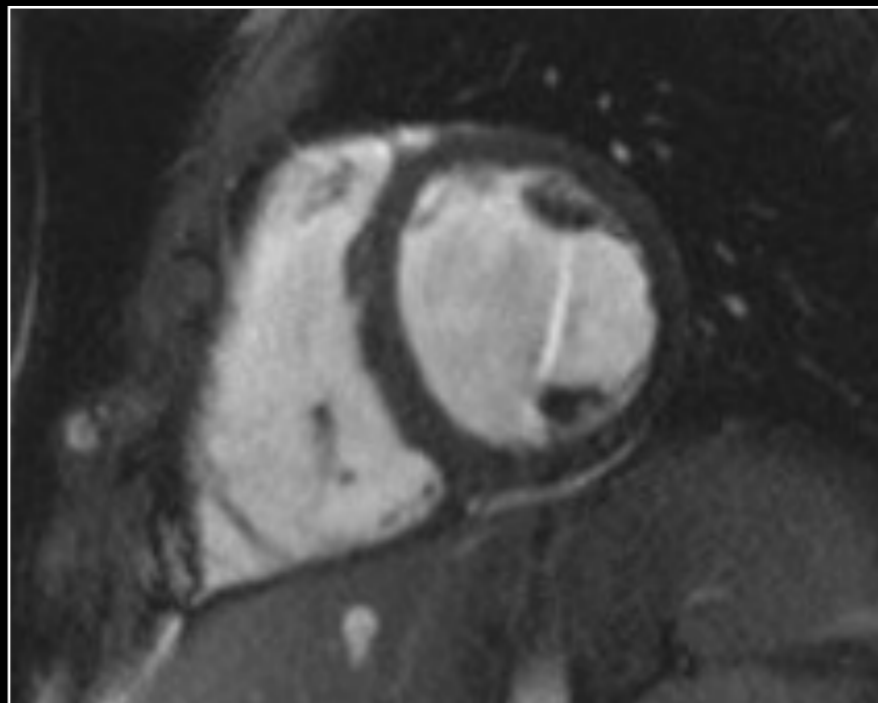
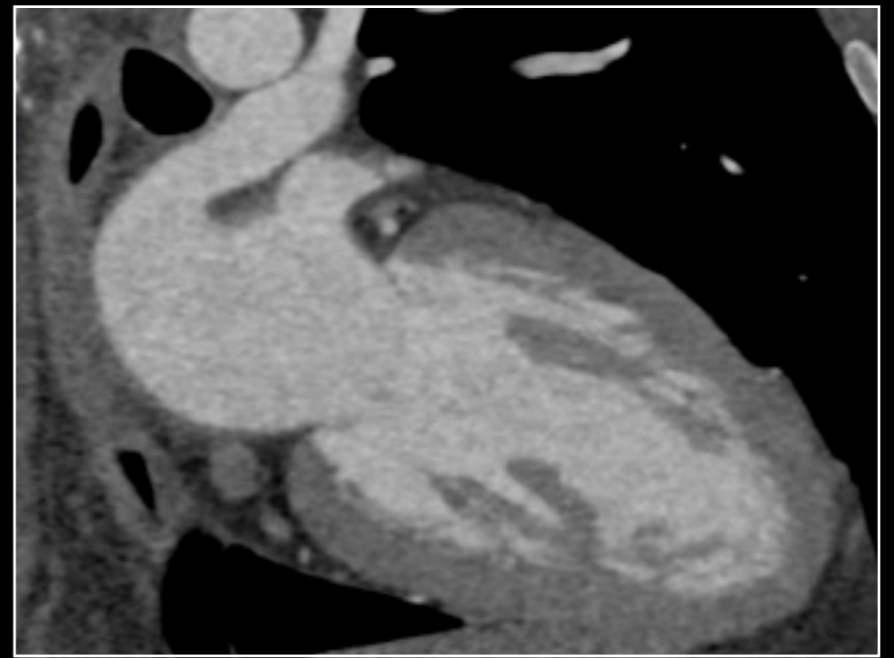
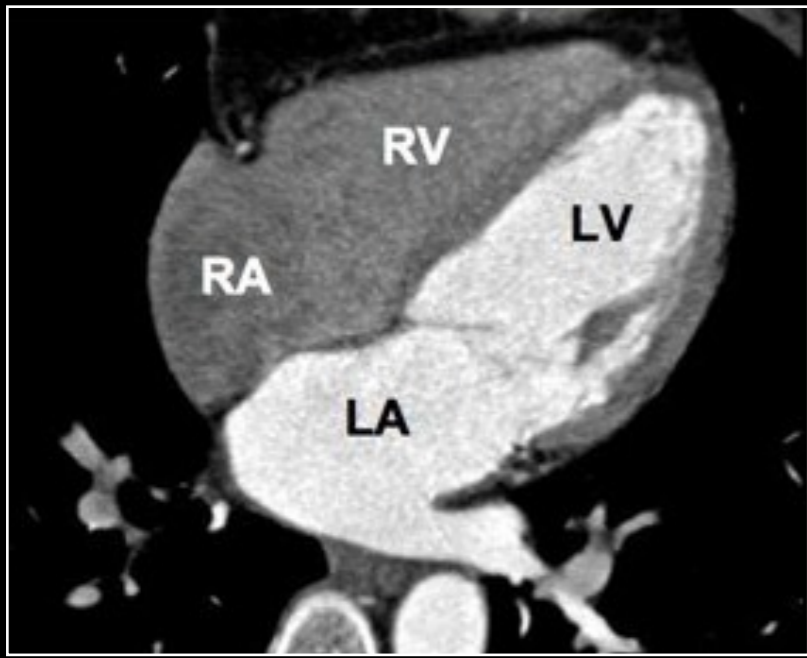
- auricule gauche



Cavités

Ventricule gauche





non compaction

Fonctions Cardiaques

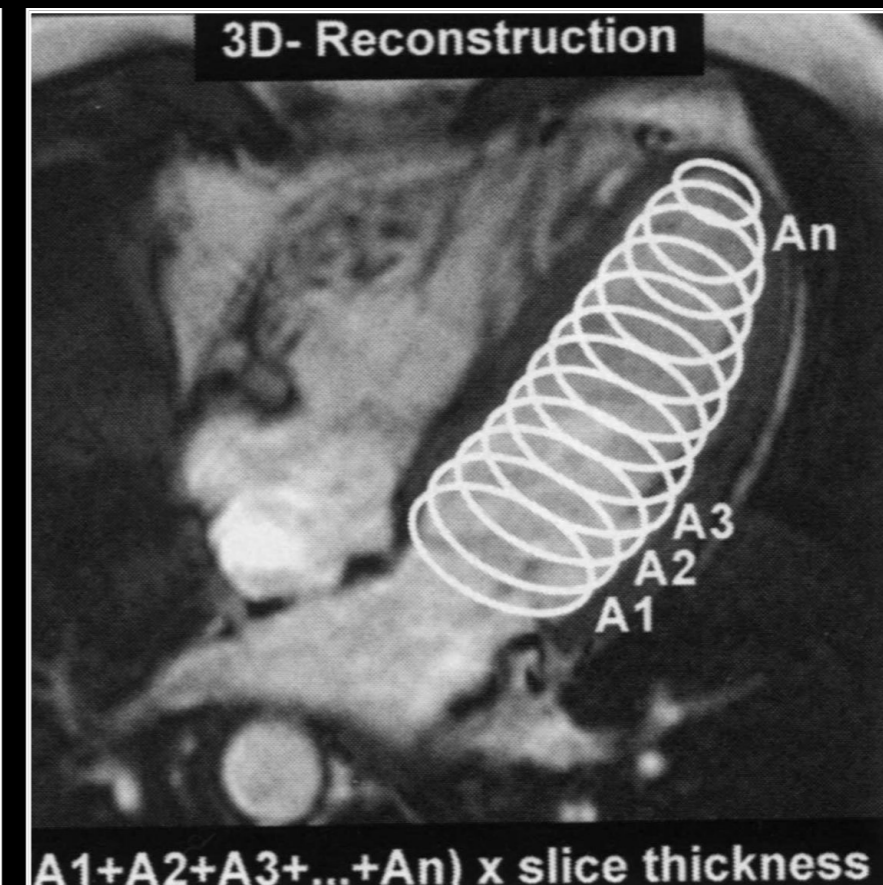
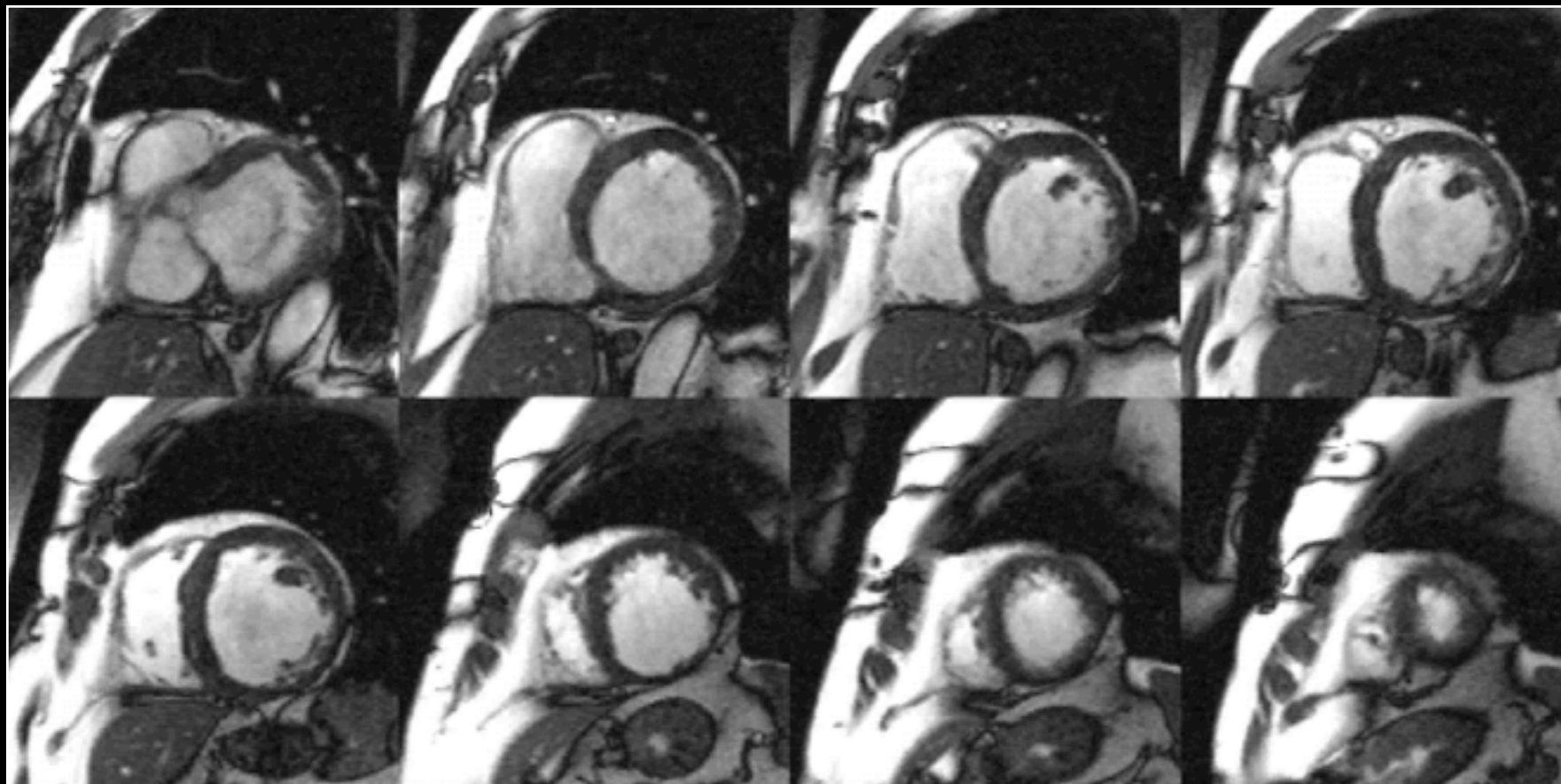
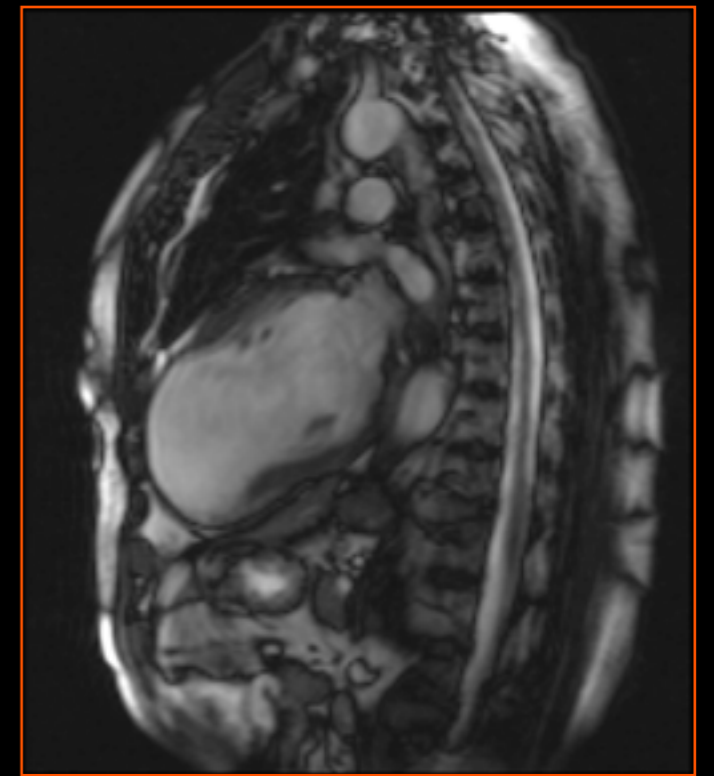
Globale ou régionale
Ventriculaire ou atriale
Droite ou gauche
Systolique ou diastolique

Critères qualitatifs: Déplacement et épaisseur pariétaux

Paramètres quantitatifs:

Mesurés: volumes télé-systolique et télé-diastolique, volume musculaire ventriculaire, vitesses

Calculés: fraction d'éjection, volumes d'éjection, débit, masse ventriculaire ($\rho=1,05\text{g/cm}^3$), épaisseur absolue ou relative



Fonction systolique

Dessin

Édition

Région activée

Édition

Propagation

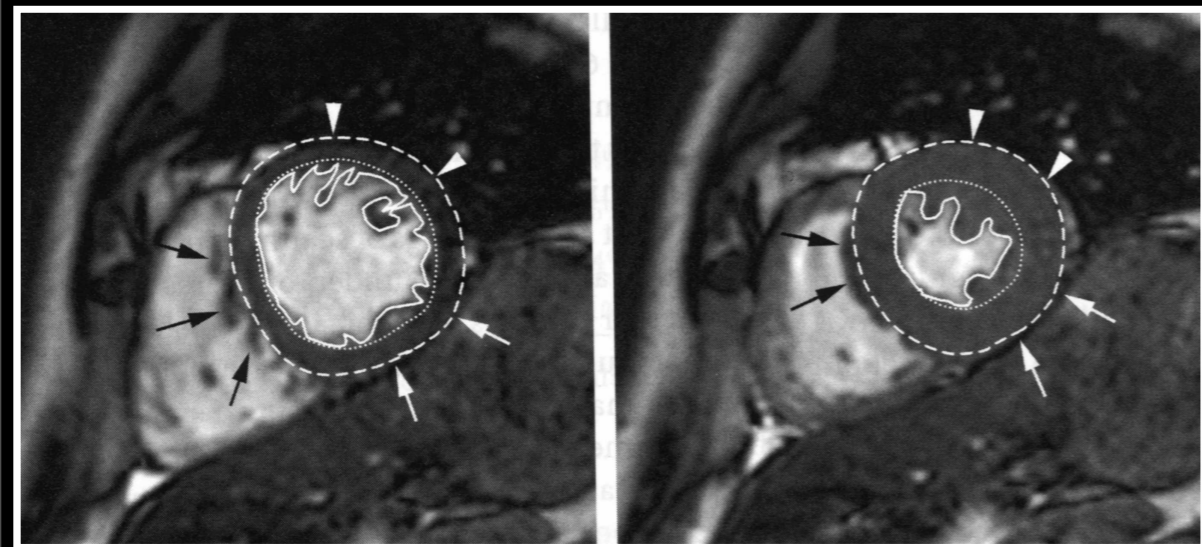
Région activée

Visual.

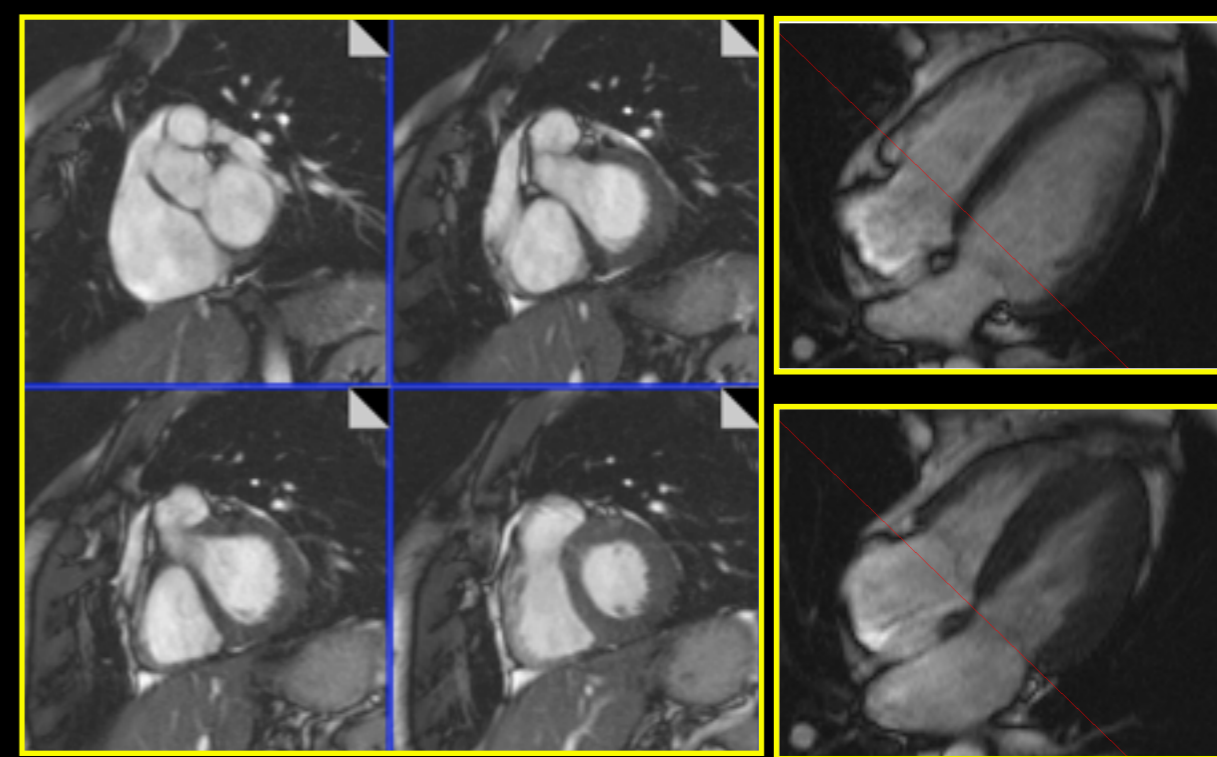
Lent — Rap.

Découpe

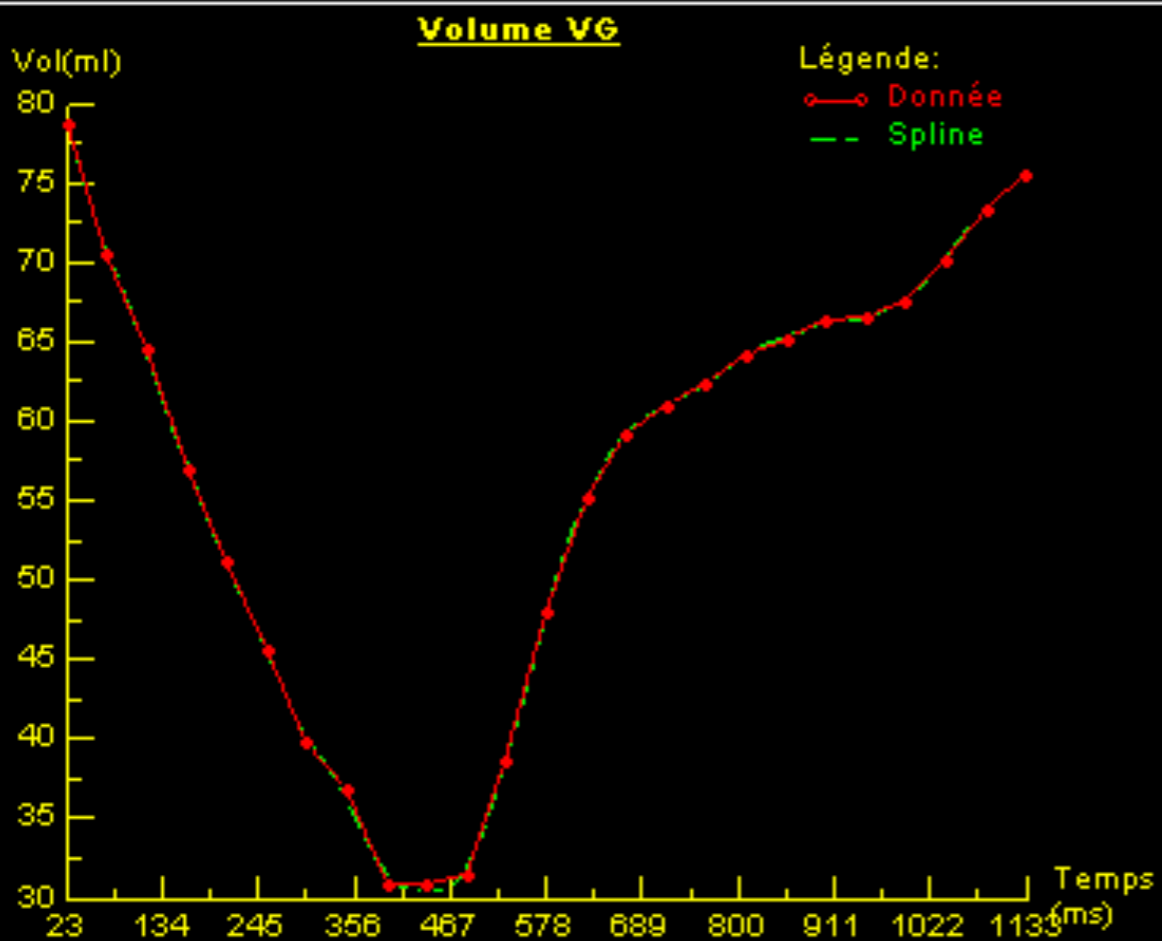
volumes cavitaires, épaissement pariétal
masse musculaire



déplacement du plan atrio-ventriculaire



ID patient : MPI000000008479 l'examen : 30/09/2004
 Taille patient : 170.00 cm Poids patient : 78.00 kg. Fréq. card. : 60 Batt./min



Vérifiez FD&FS. L'ordinateur a jugé les réglages FD&FS insuffisamment précis.
 Vérifiez les contours. Ils semblent ne pas correspondre à l'anatomie.

ID patient : MPI000000008479 l'examen : 30/09/2004
 Taille patient : 170.00 cm Poids patient : 78.00 kg. Fréq. card. : 60 Batt./min

Ventricule gauche - absolu

Fonction cardiaque			Plage normale (F) (IRM)	Unités
Fraction d'éjection	EF	60.9	56.00 ... 78.00	%
Volume fin de diastole	FDV	78.8	52.00 ... 141.00	ml
Volume fin de systole	FSV	30.8	13.00 ... 51.00	ml
Volume battement	SV	48.0	33.00 ... 97.00	ml
Débit cardiaque	CO	2.88	2.65 ... 5.98	l/min
Masse myocardique (à FD)		58.4	75.00 ... 175.00	g
Masse myocardique (moyenne)		65.4 ± 4.7	75.00 ... 175.00	g

Données remplissage et éjection

Taux d'éjection max.		184.4	n.a.	ml/sec
Temps d'éjection max.		23.1	n.a.	msec
Taux de remplissage max.		205.5	n.a.	ml/sec
Temps remplissage max. de FS		107.8	n.a.	msec

Vérifiez FD&FS. L'ordinateur a jugé les réglages FD&FS insuffisamment précis.
 Vérifiez les contours. Ils semblent ne pas correspondre à l'anatomie.

ID patient : MPI000000008479 l'examen : 30/09/2004
 Taille patient : 170.00 cm Poids patient : 78.00 kg. Fréq. card. : 60 Batt./min

Ventricule gauche - normalisé

Fonction cardiaque			Plage normale (F) (IRM)	Unités
Volume fin de diastole	FDV	41.6	41.00 ... 81.00	ml/m ²
Volume fin de systole	FSV	16.3	11.90 ... 20.74	ml/m ²
Volume battement	SV	25.3	26.00 ... 56.00	ml/m ²
Indice cardiaque	CI	1.52	1.75 ... 3.80	l/min/m ²
Masse myocardique (à FD)		30.8	63.00 ... 95.00	g/m ²
Masse myocardique (moyenne)		34.5 ± 2.5	63.00 ... 95.00	g/m ²

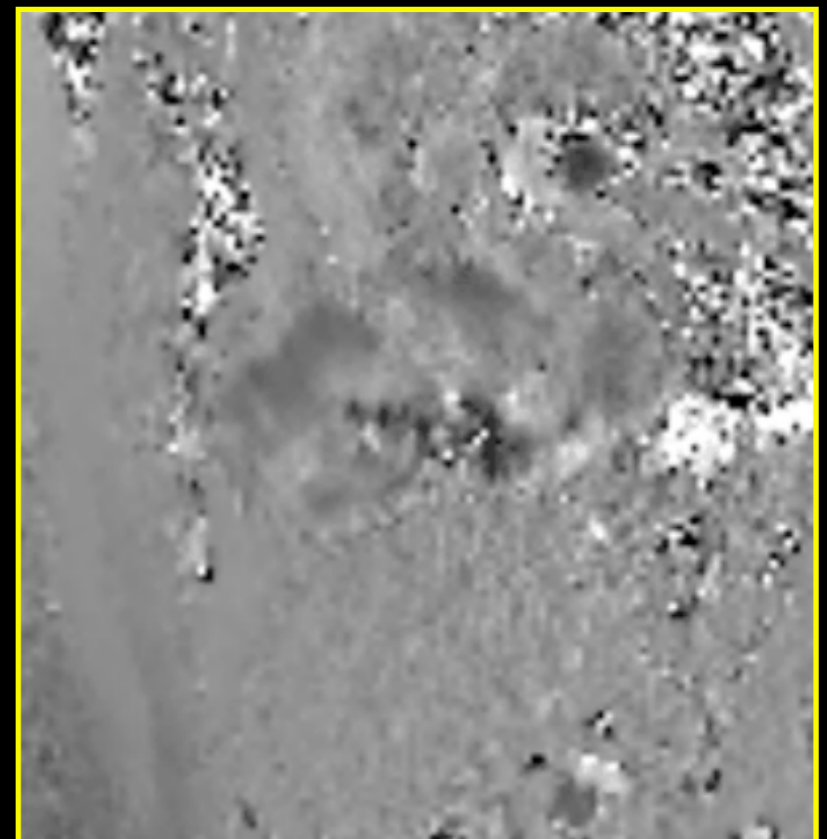
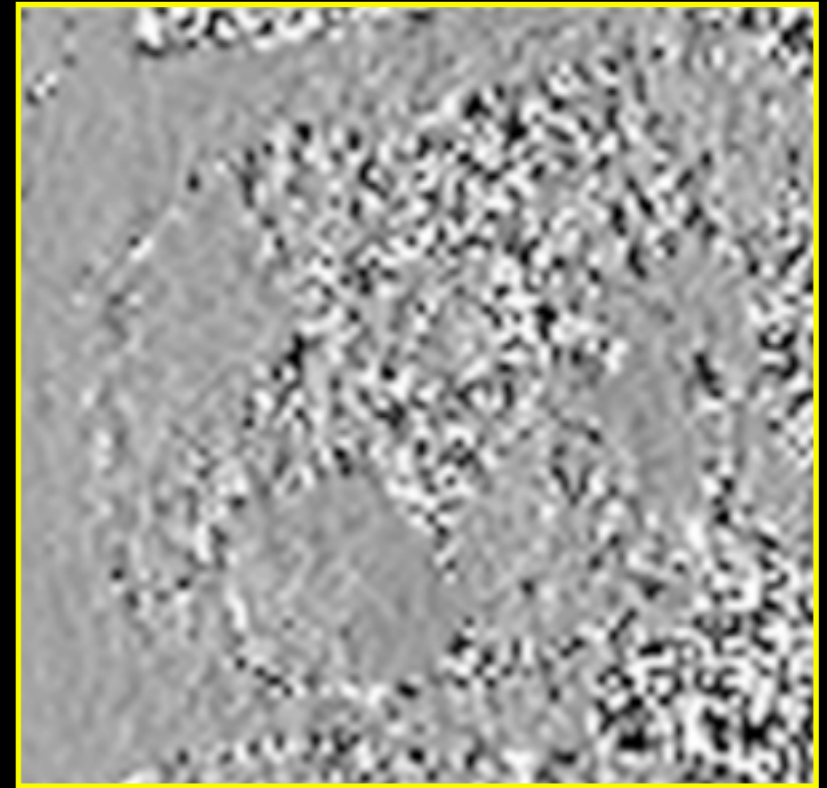
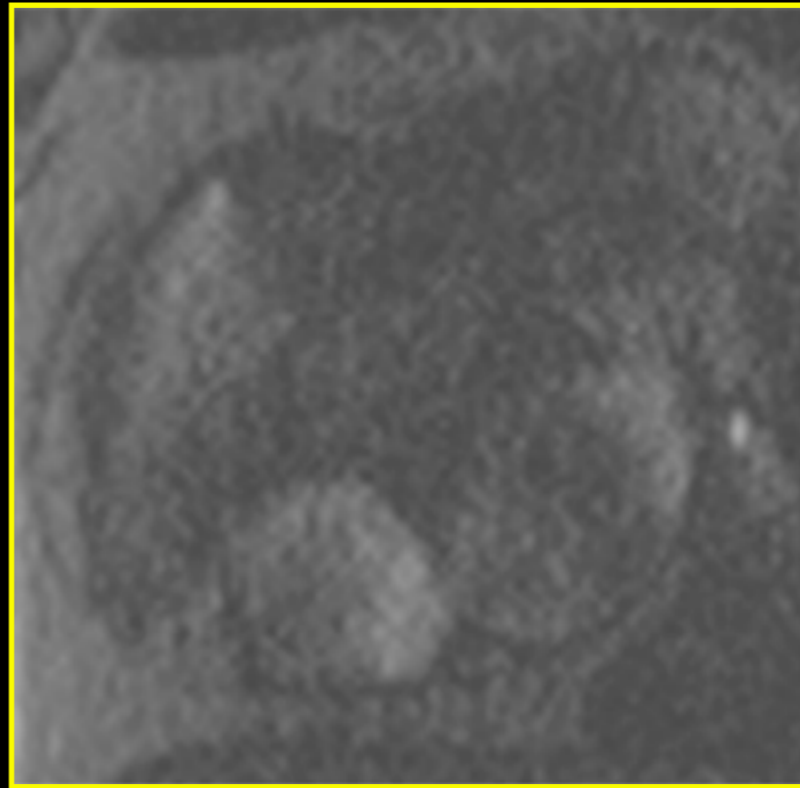
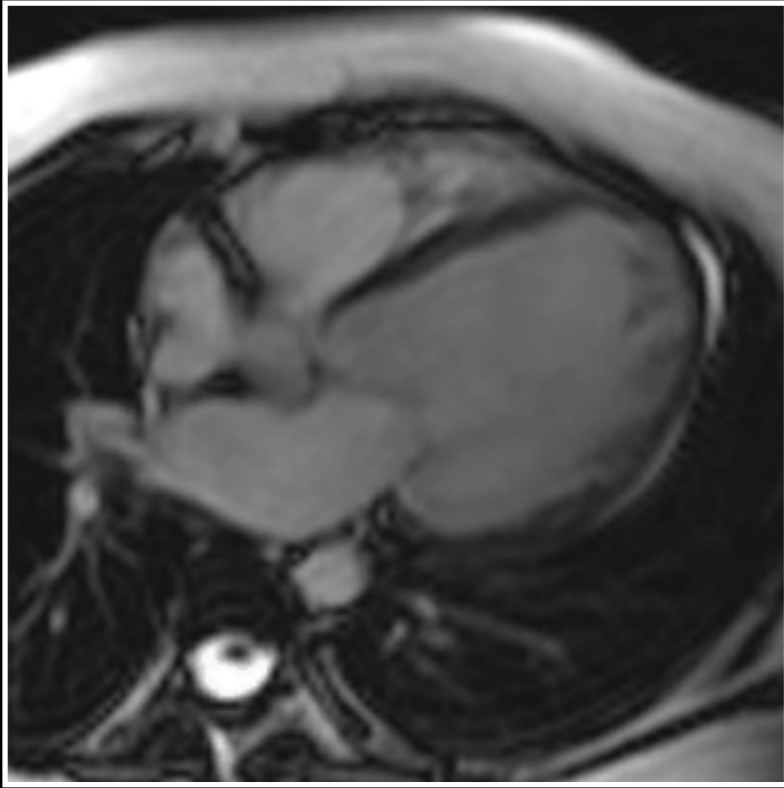
Données remplissage et éjection

Taux d'éjection max.		2.3	n.a.	EDV/sec
Taux de remplissage max.		2.6	n.a.	EDV/sec

		Hommes	Femmes
VG	VTD (ml/m ²)	69 ± 11	61 ± 10
	VTS (ml/m ²)	23 ± 5	21 ± 5
	FE (%)	65 ± 10	65 ± 10
	Masse (g/m ²)	91 ± 11	79 ± 8
VD	VTD (ml/m ²)	80 ± 13	67 ± 10
	VTS (ml/m ²)	32 ± 8	26 ± 6
	FE (%)	60 ± 7	63 ± 8

mesure des volumes: volume d'éjection d'une cavité
antérograde et rétrograde

mesure du volume d'éjection antérograde ou rétrograde par vélocimétrie (contraste de phase)



Fonction diastolique ventriculaire

Masse ventriculaire télé-diastolique: compliance ventriculaire

Variations de volume de la cavité dans le temps et leur vitesse : taux de remplissage maximum (augmentation maximale de volume entre deux phases), délai du pic par rapport à la télé-systole

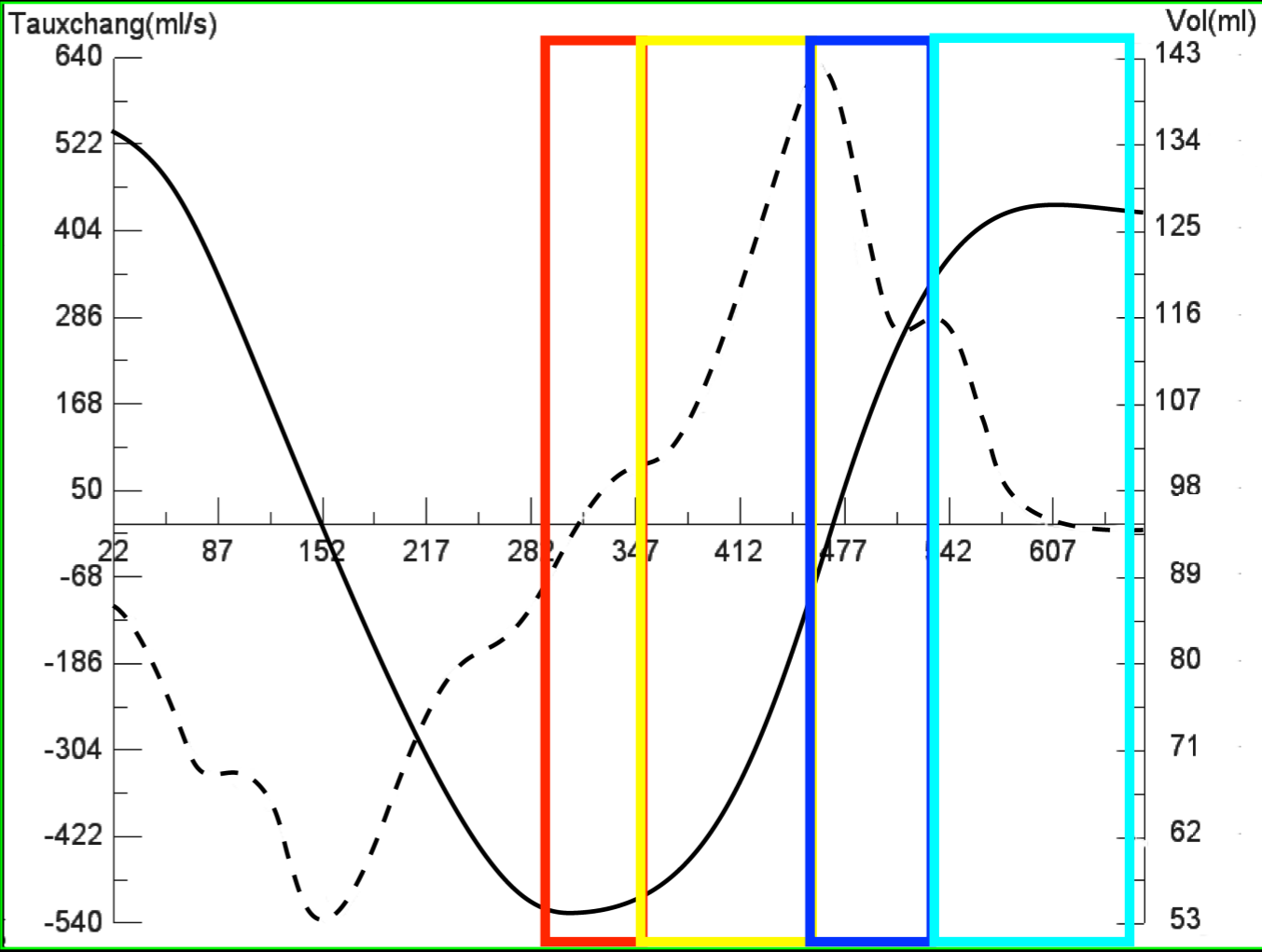
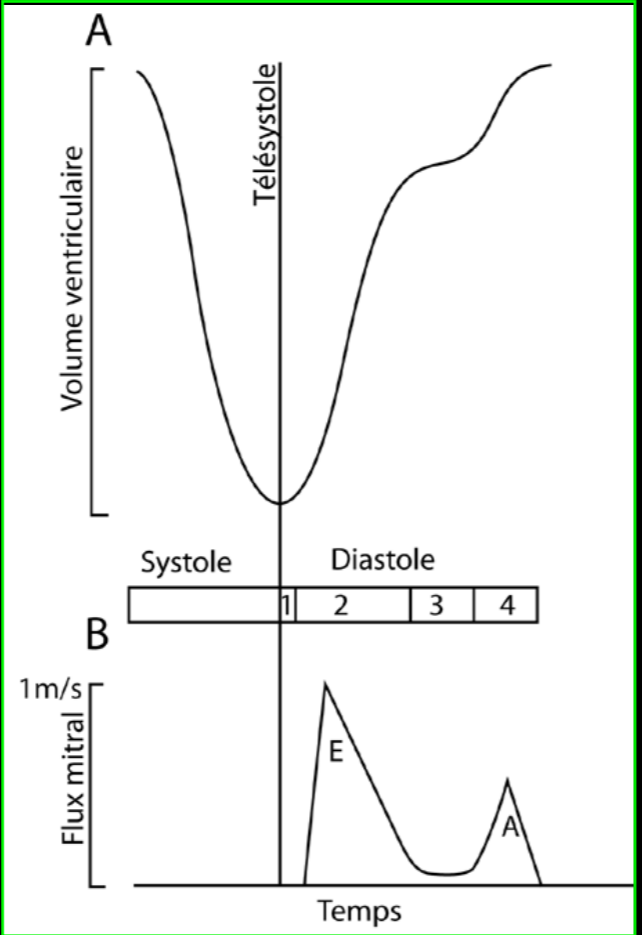
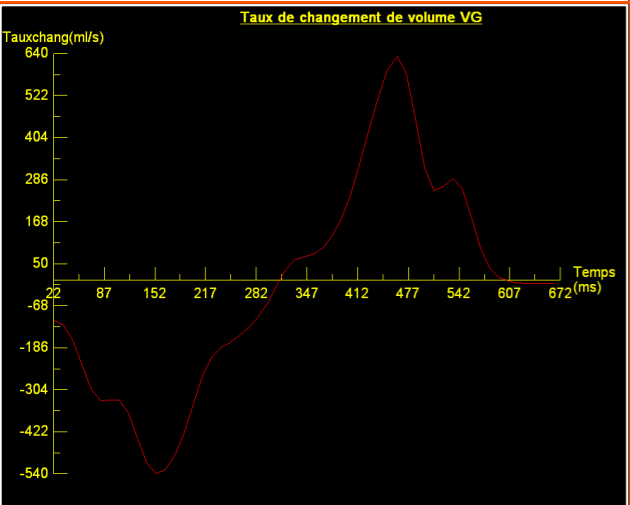
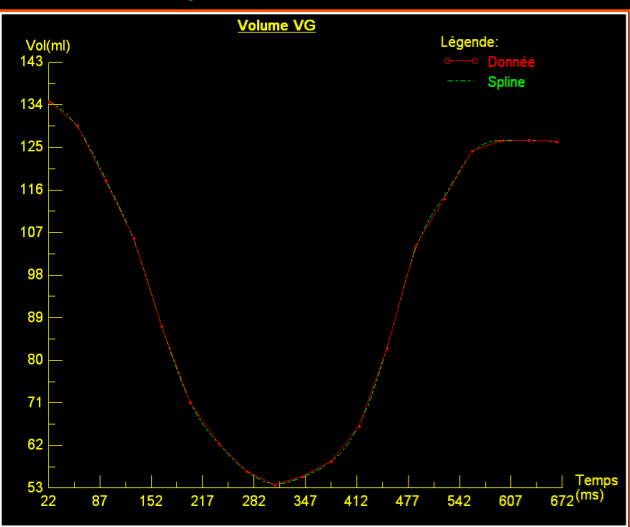
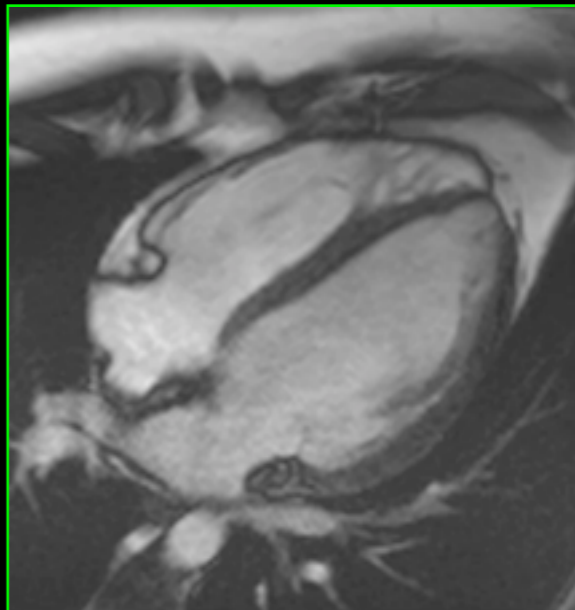
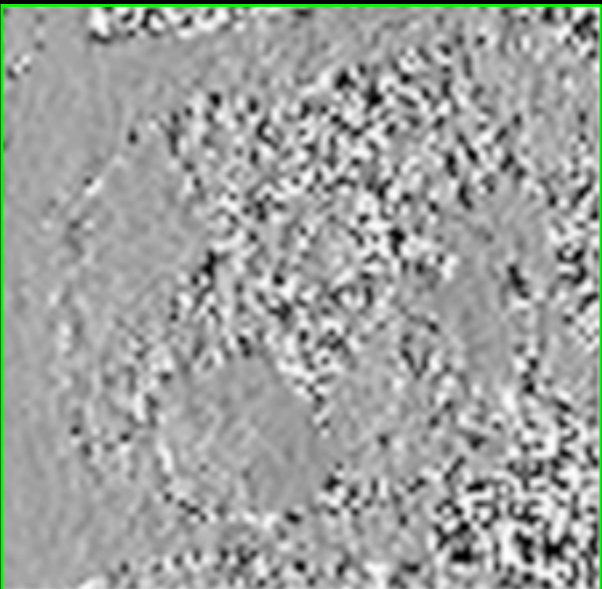
Quantification des volumes atriaux

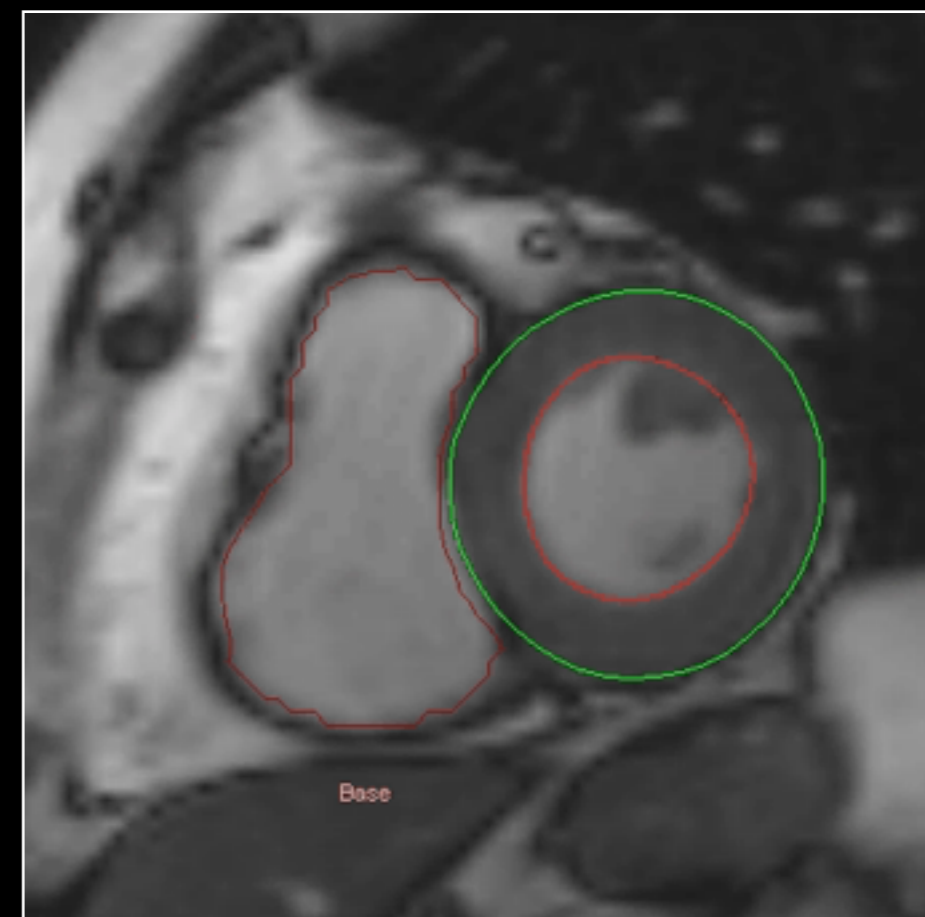
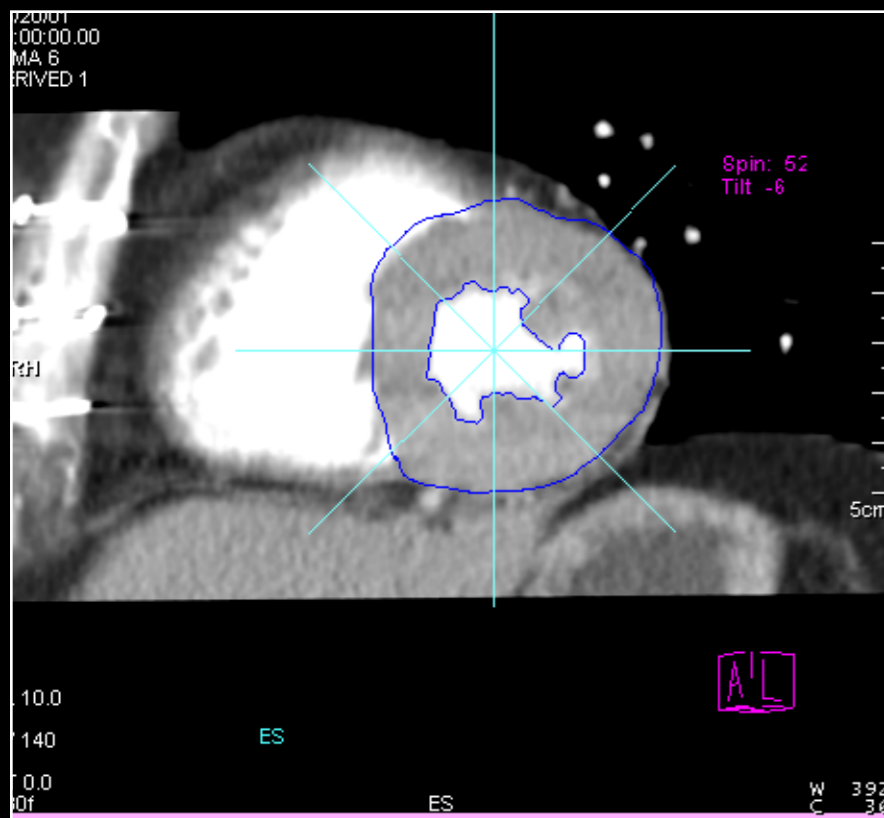
Flux veineux atrial

Flux atrio-ventriculaire (E/A > 1,5)

- Relaxation isovolumique (valves fermées) (60 à 80 ms)
- Remplissage rapide
- Remplissage lent
- Systole atriale

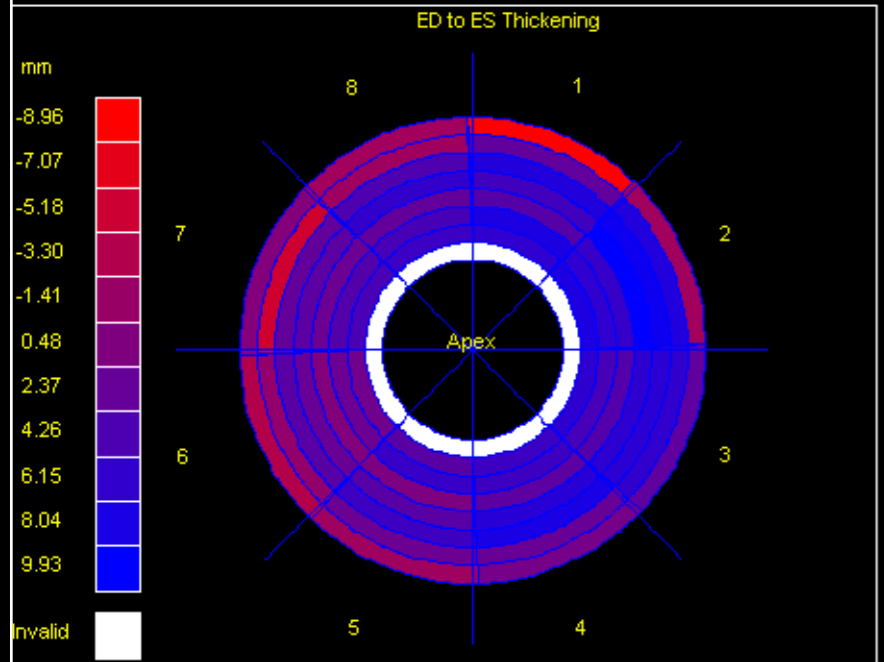
E/A < 1: anomalie de la relaxation
E/A > 2: altération de la compliance





Thickening Bulls Eye Graph

Patient Name: [REDACTED]
 Patient ID: 34161 Examination Date: 20010320
 Patient Height: 71.00 in. Patient Weight: 158.00 lbs. R to R Interval: 840 ms.



ED -> ES Thickening Results Table

Patient Name: [REDACTED]
 Patient ID: 34161 Examination Date: 20010320
 Patient Height: 71.00 in. Patient Weight: 158.00 lbs. R to R Interval: 840 ms.

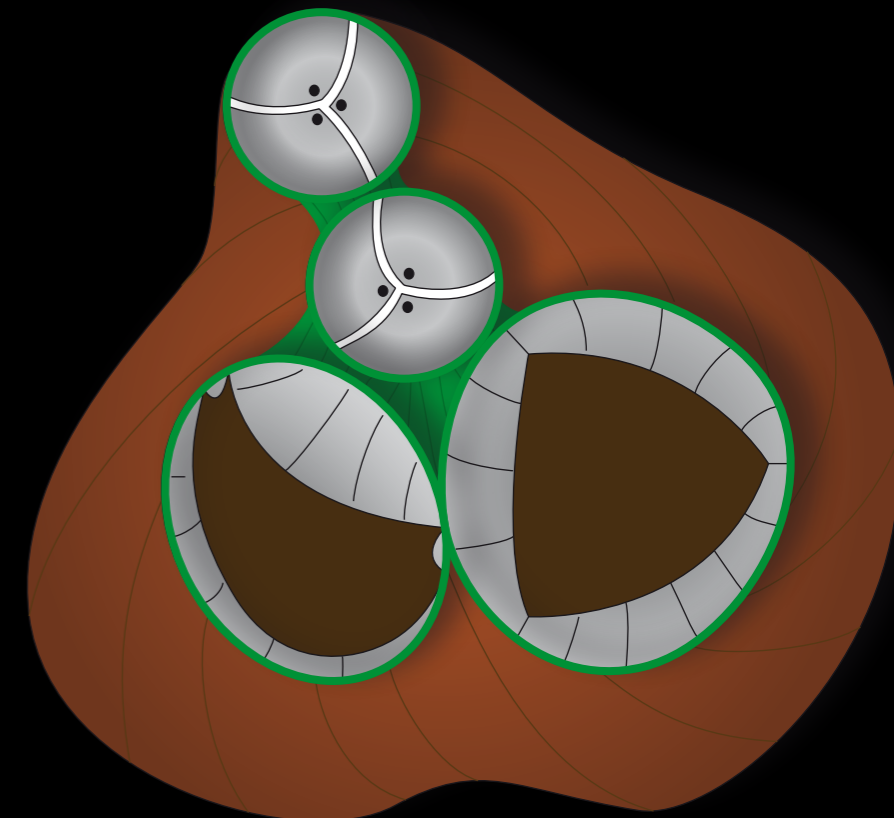
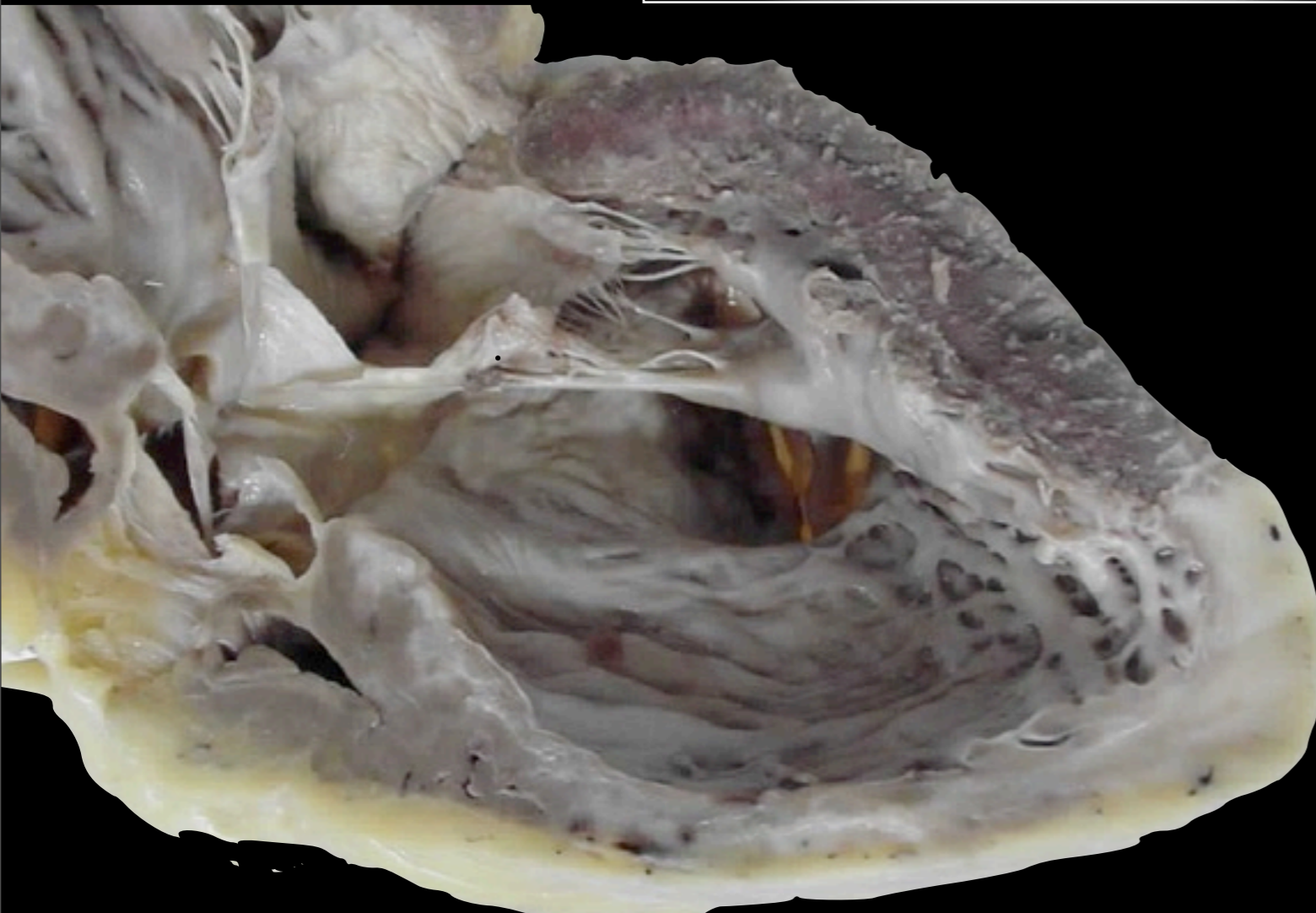
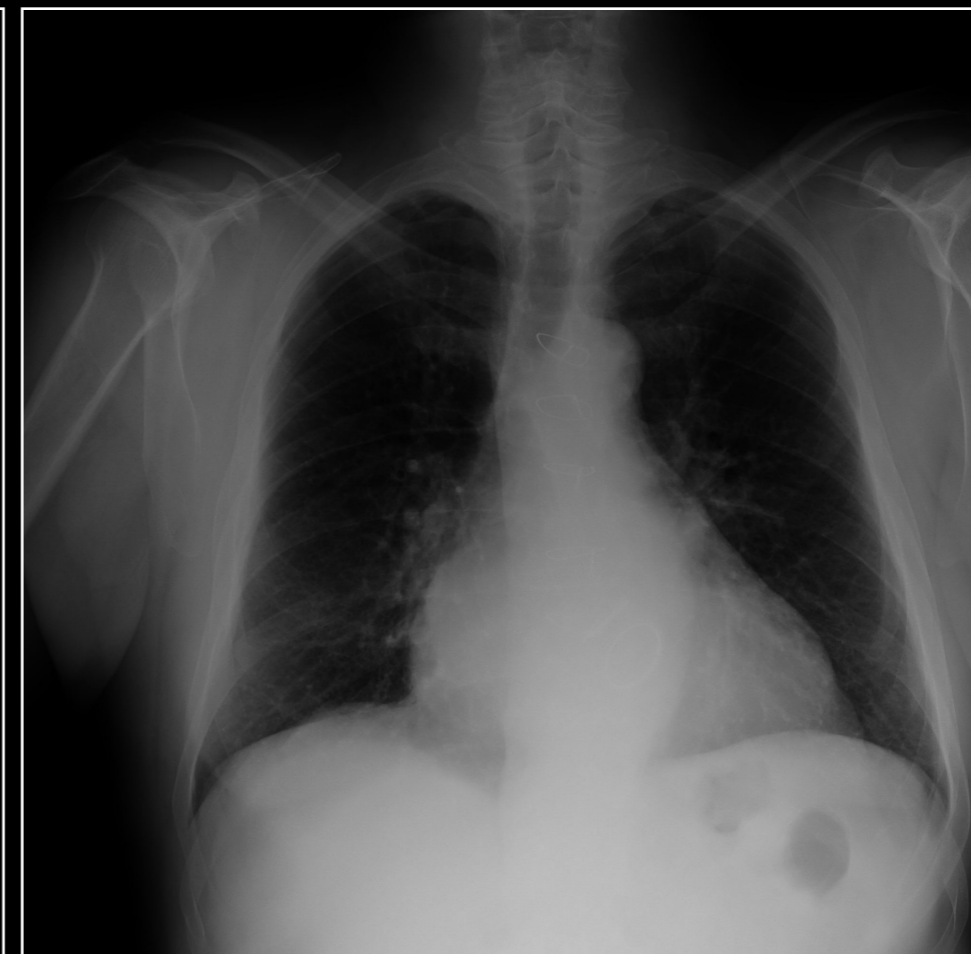
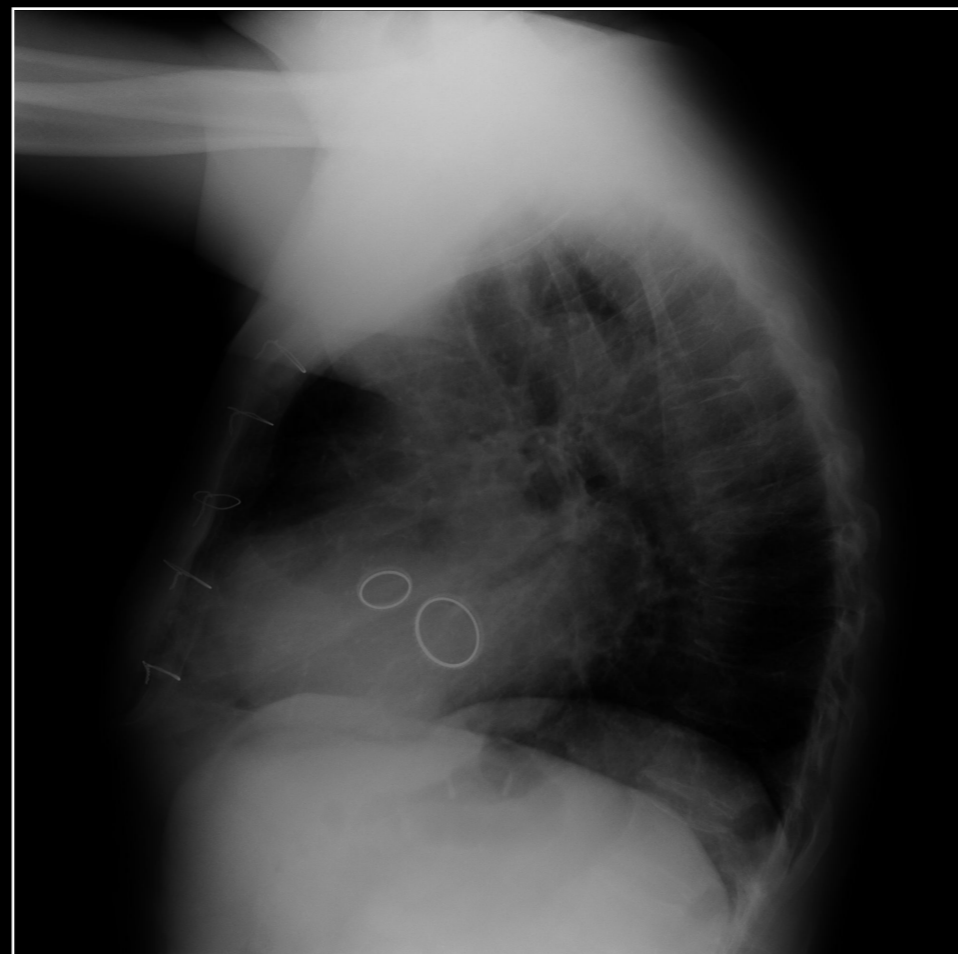
ED to ES thickening for: Slice 1 Table
 From Slice Position 42 to 32 mm 1 of 8

Sector	ES Thickness (mm)	Thickening (mm)	% Thickening (%)
1	4.39	-8.96	-67.11
2	9.24	-2.03	-17.99
3	12.64	2.83	28.84
4	8.05	1.18	17.10
5	6.00	-1.97	-24.73
6	5.06	-3.37	-39.96
7	5.29	0.08	1.63
8	4.98	-2.13	-29.96

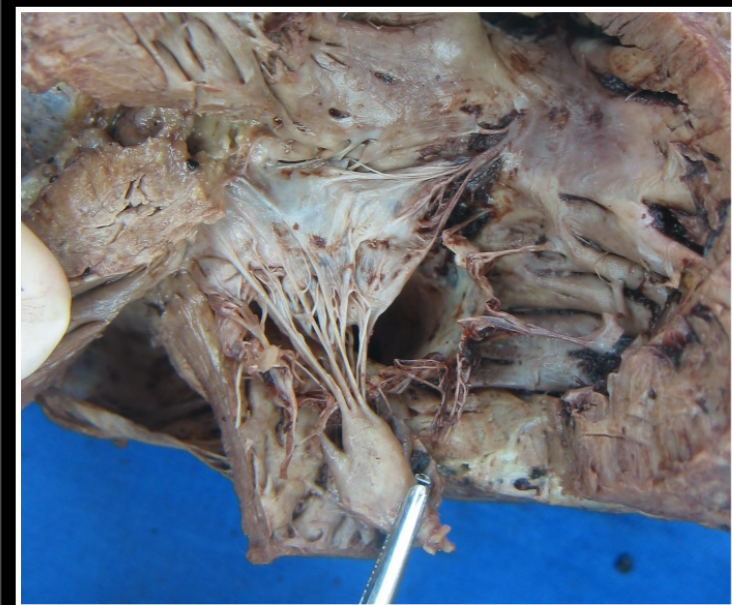
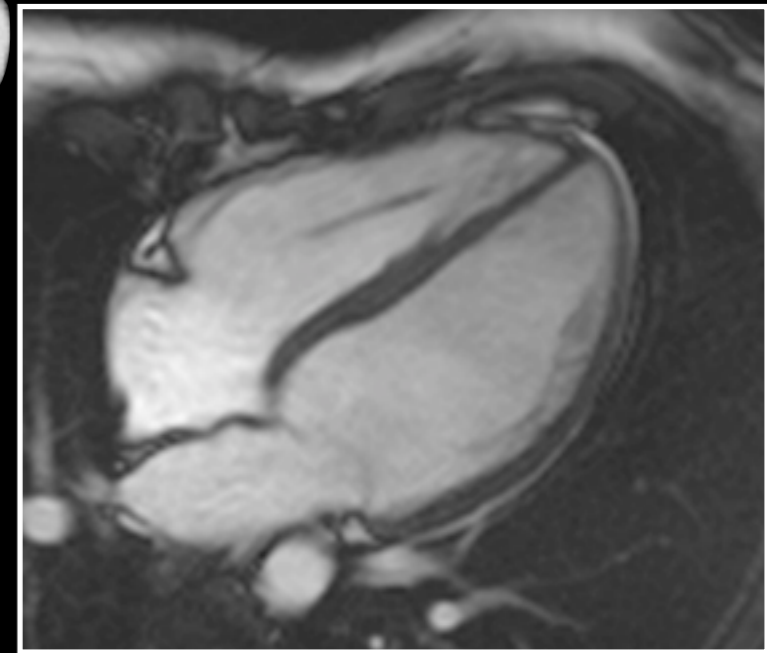
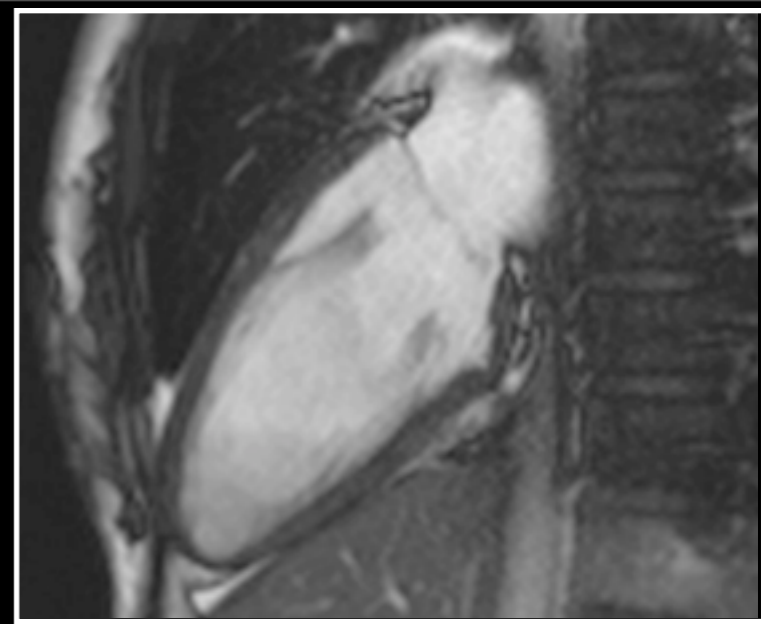
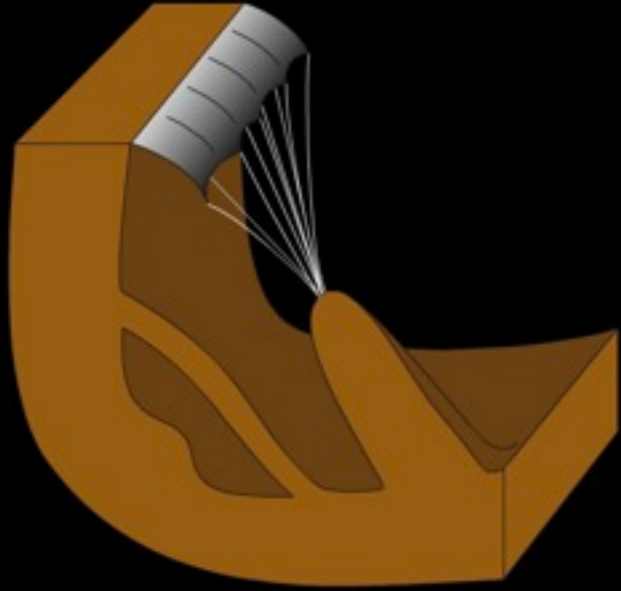
épaisseur
 épaissement

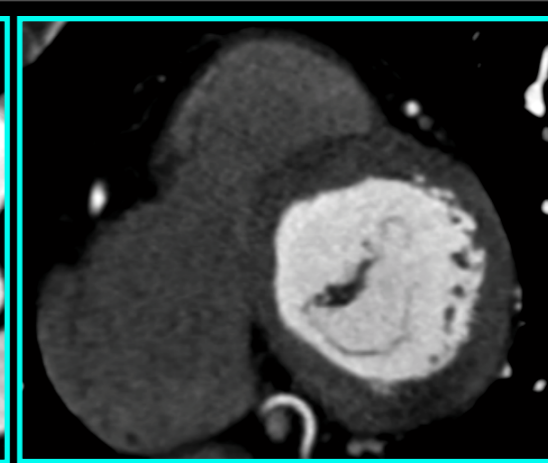
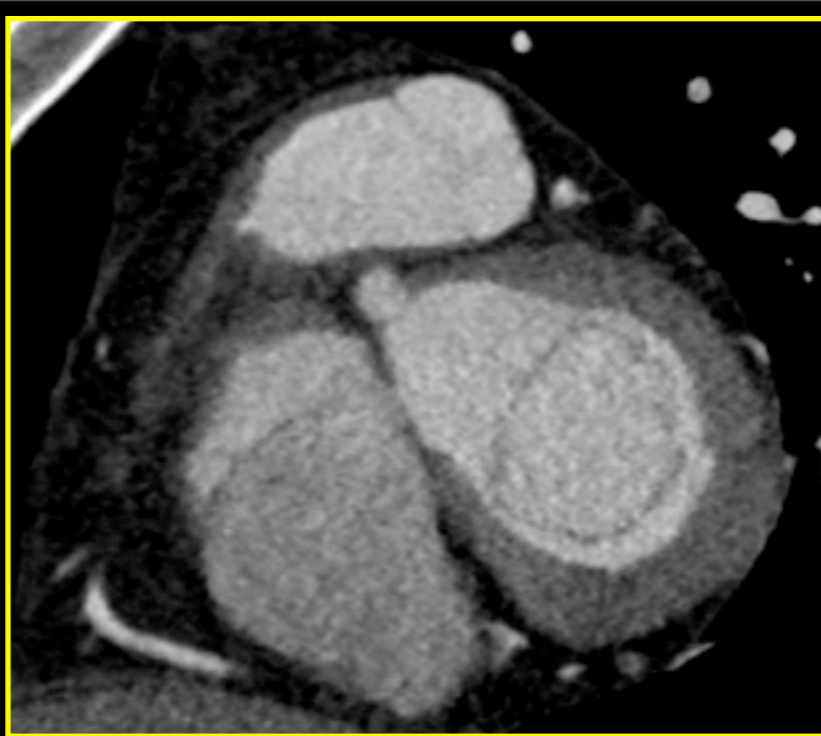
Valves

- atrioventriculaires:
mitrale et tricuspide
- ventriculo-artérielles:
aortique et pulmonaire



Valves appareil sous-valvulaire

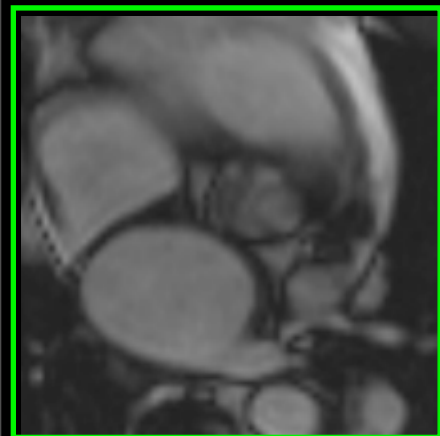




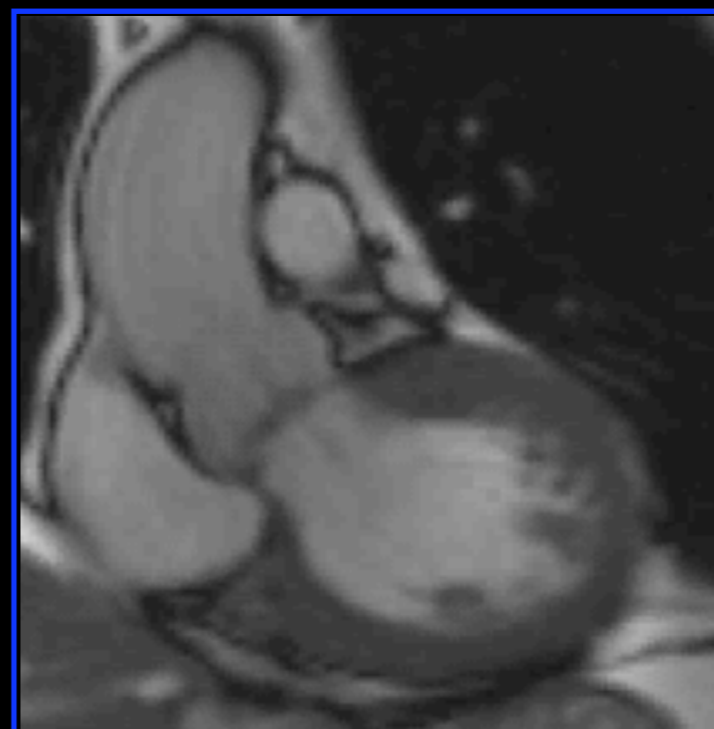
fibro-élastome

végétation

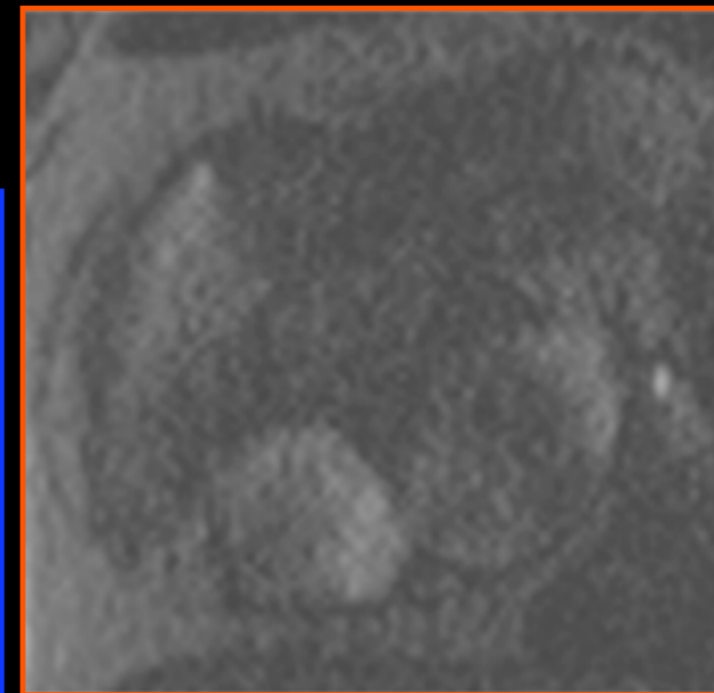
fines



bicuspidie

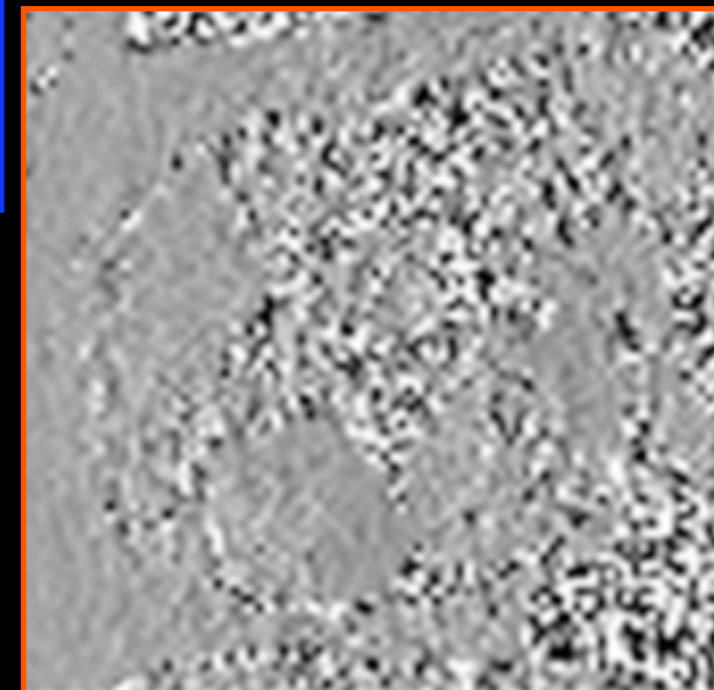


maladie aortique

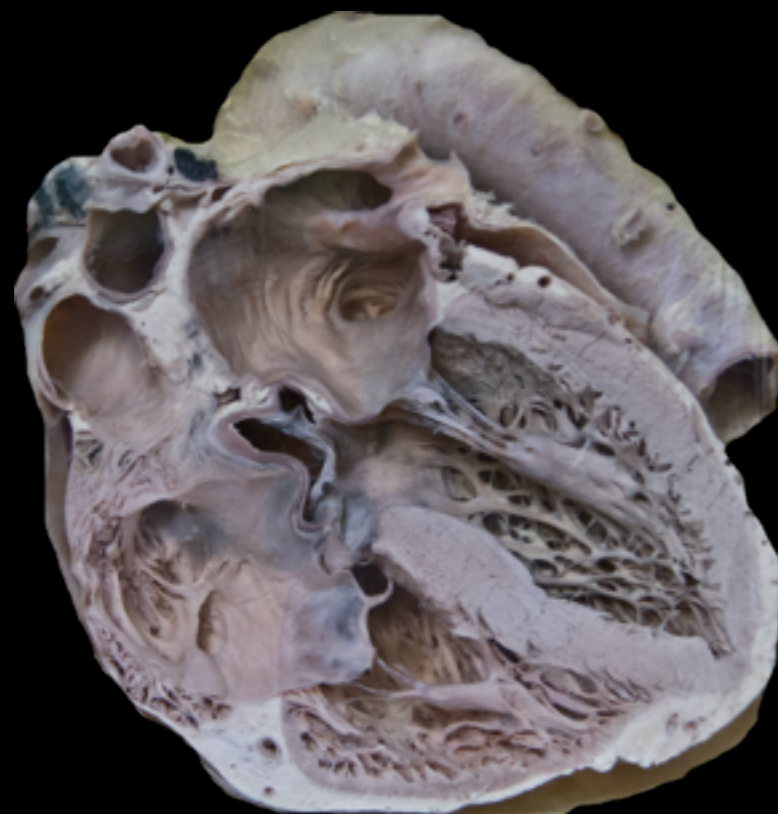


ouverture large

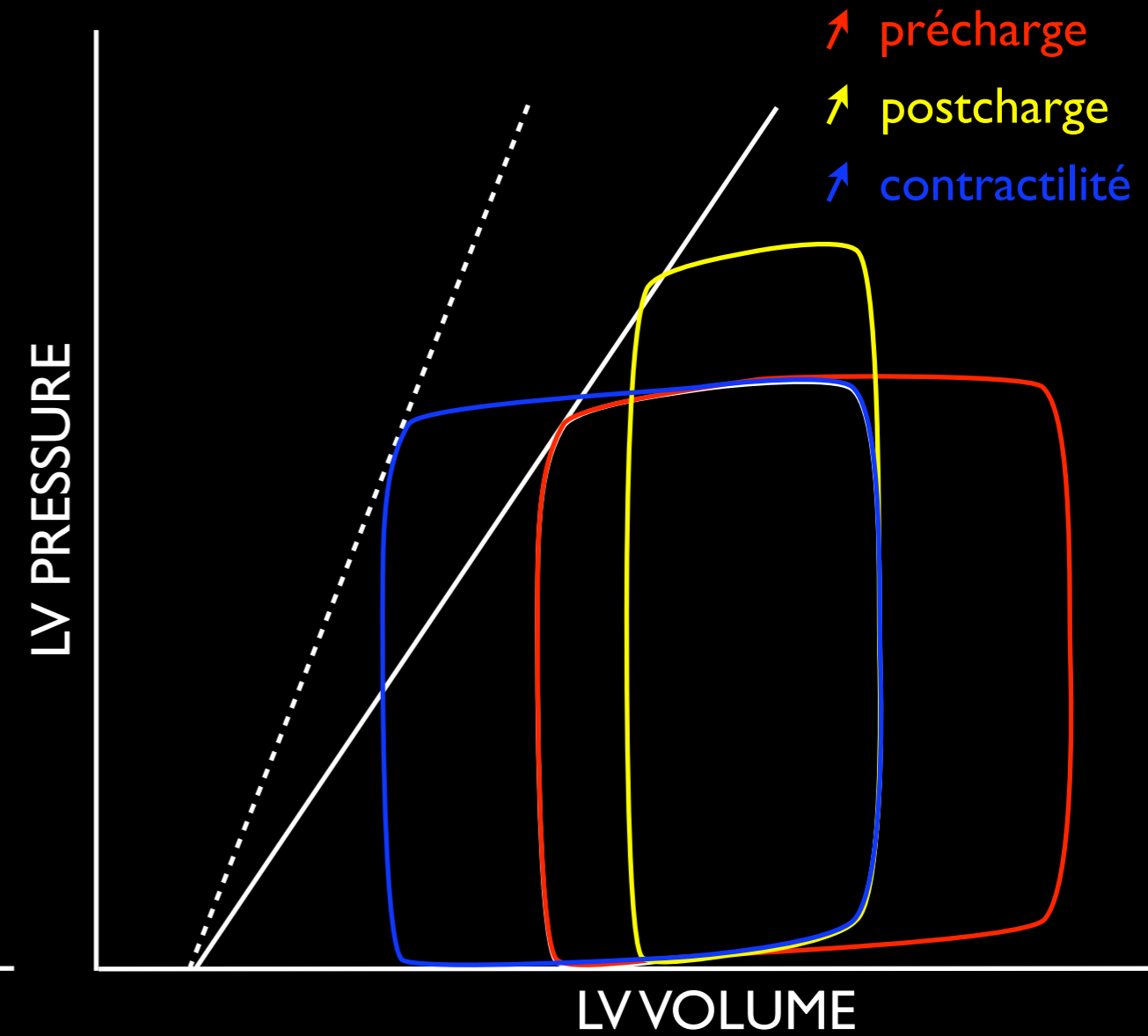
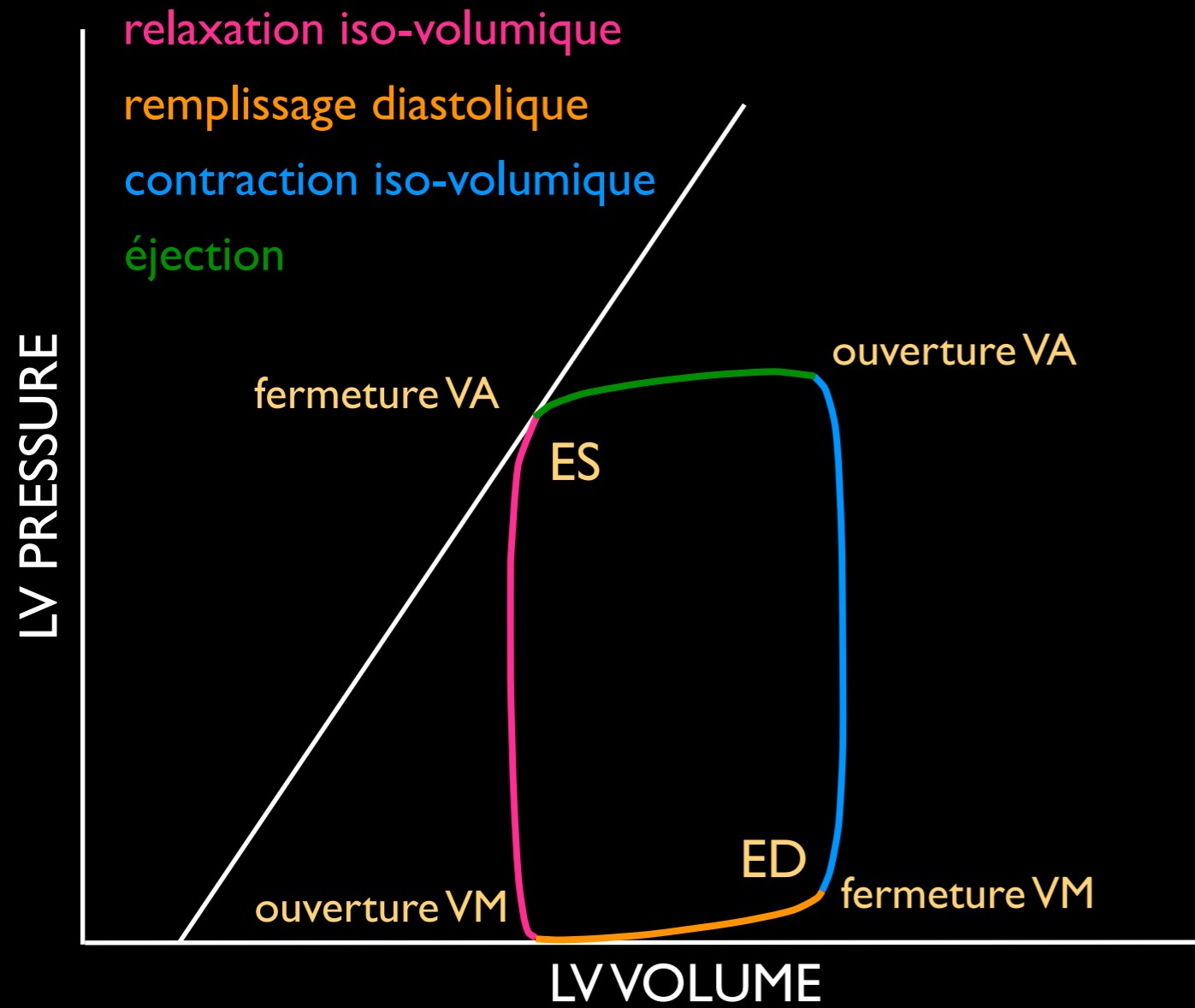
continence



RA

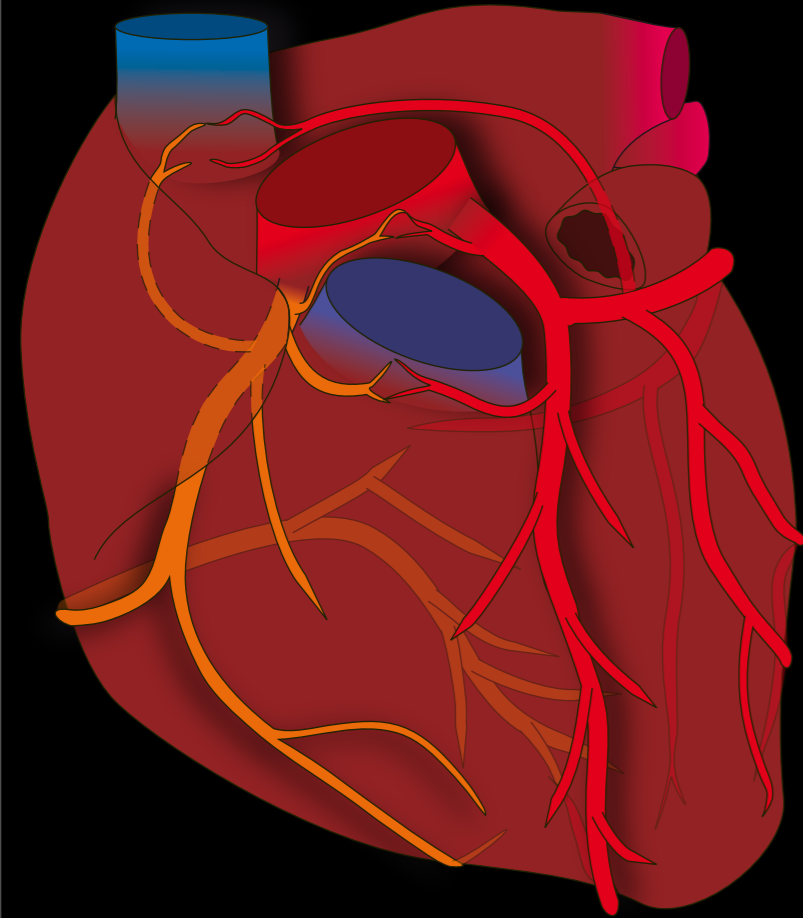


Hémodynamique

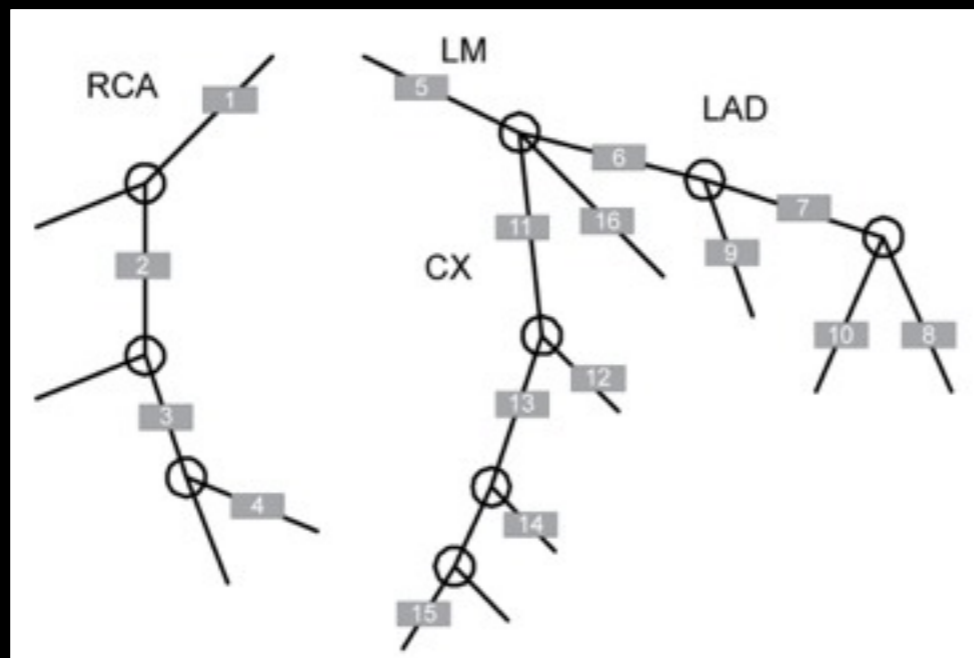
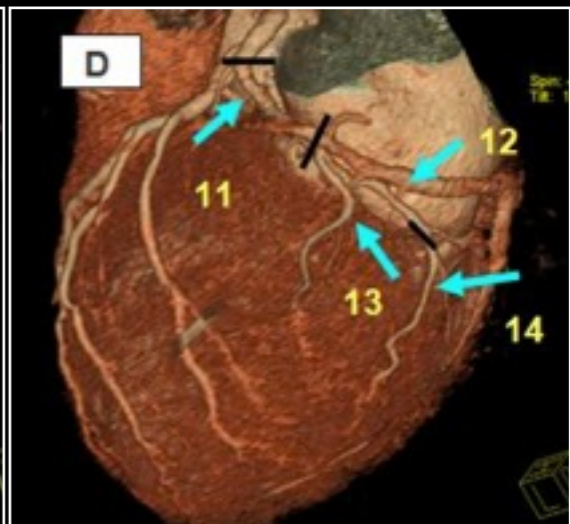
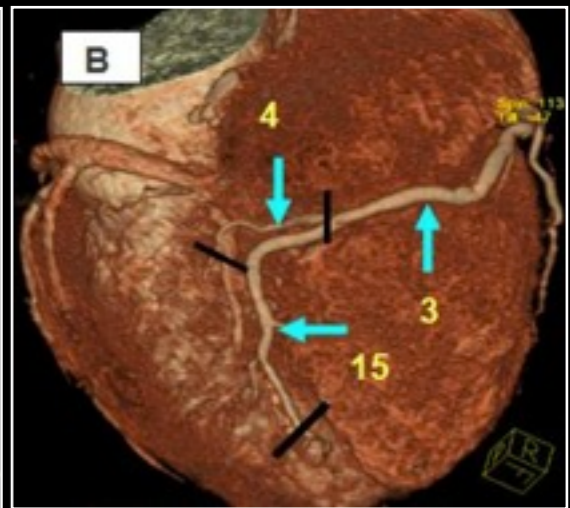
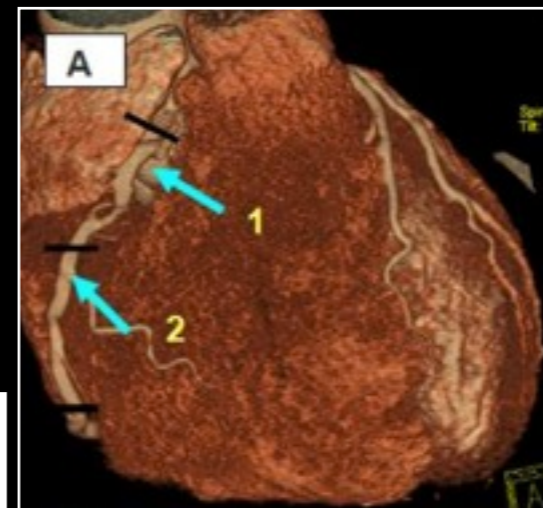


Circulation coronaire

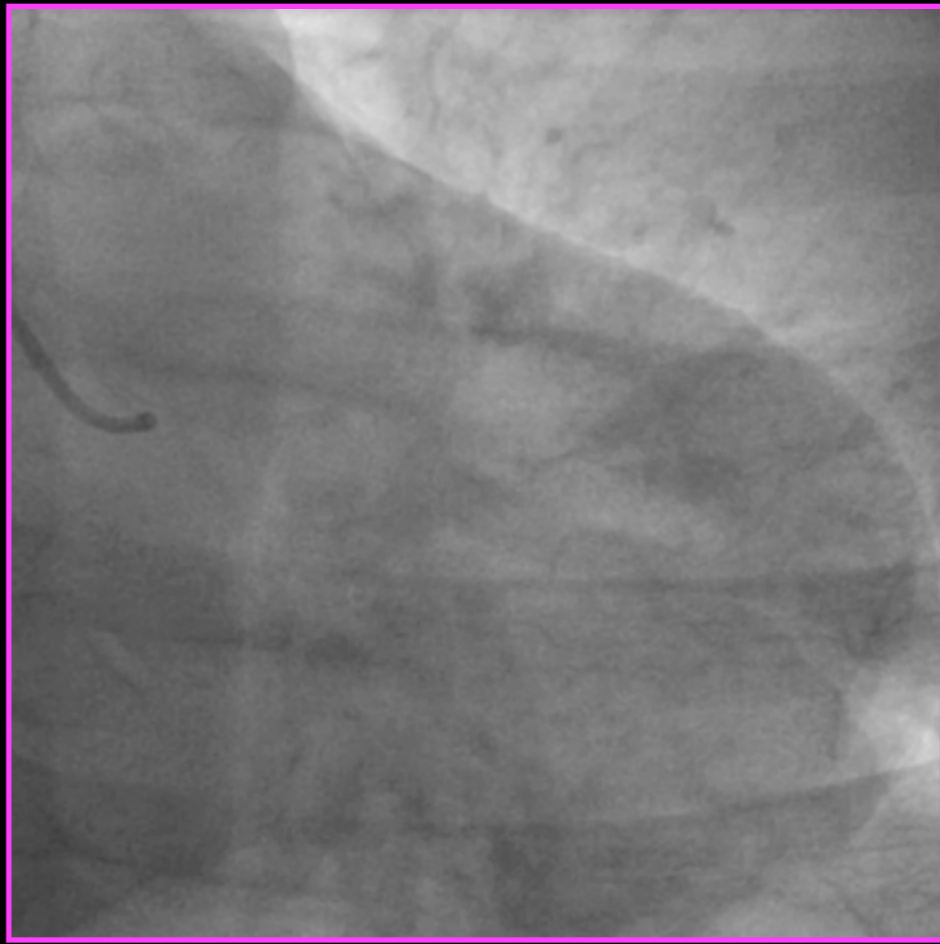
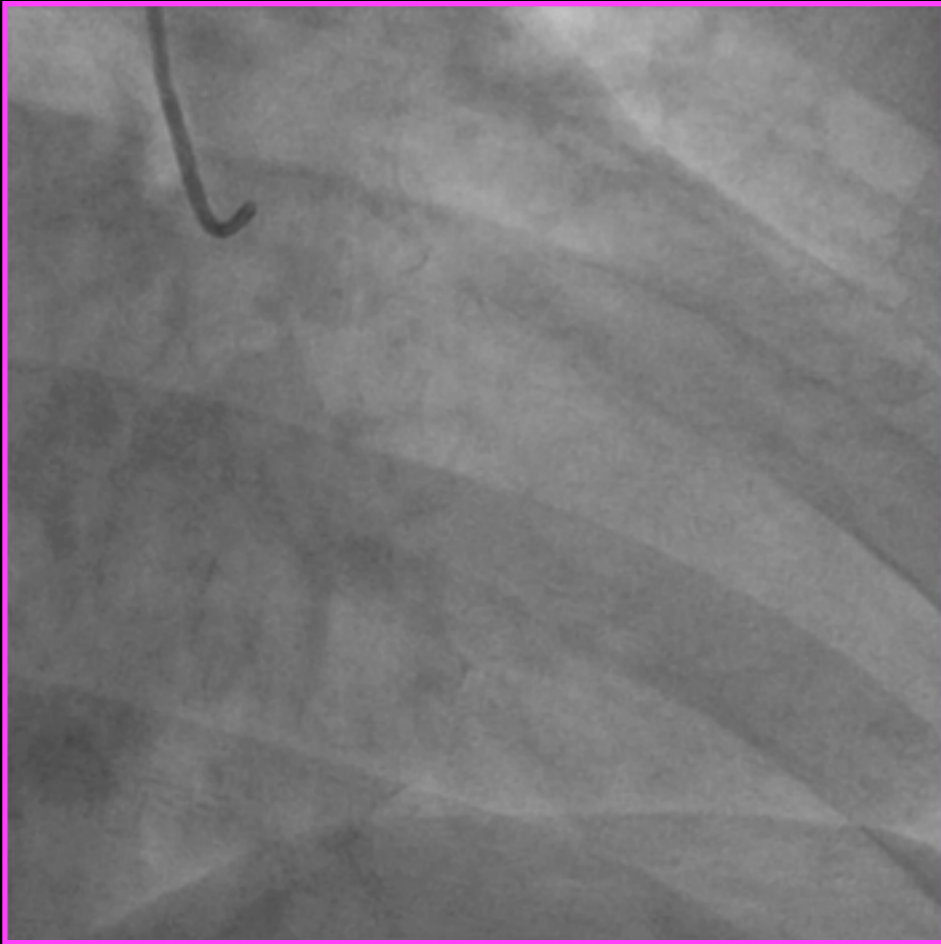
artères



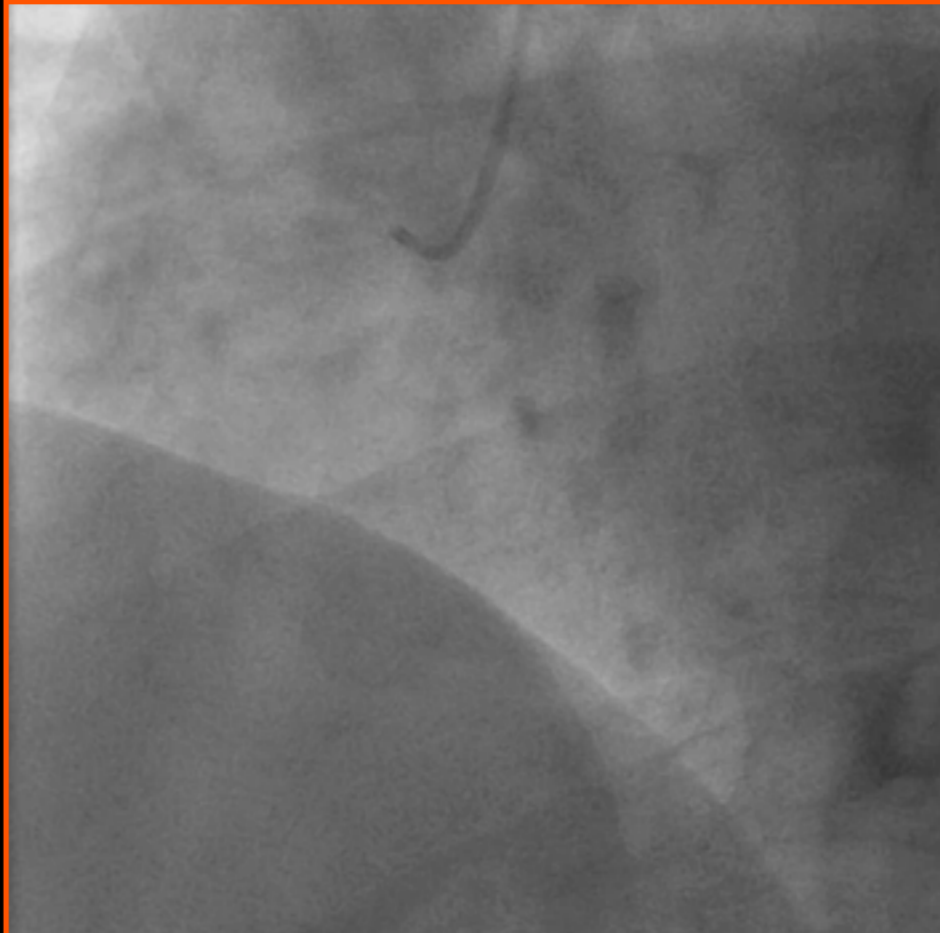
anastomoses

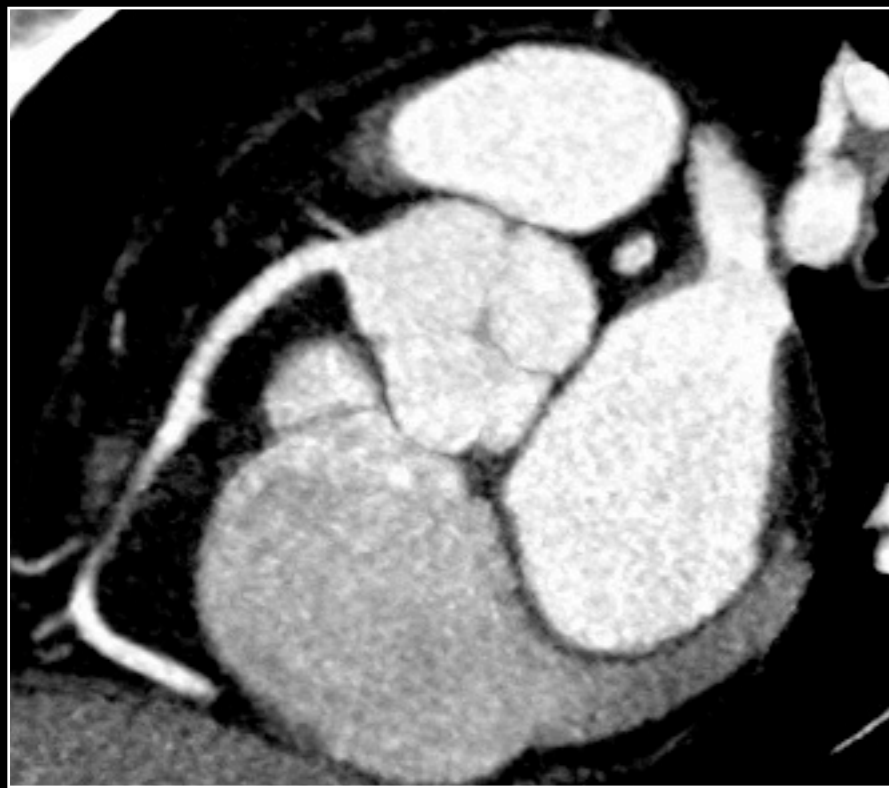
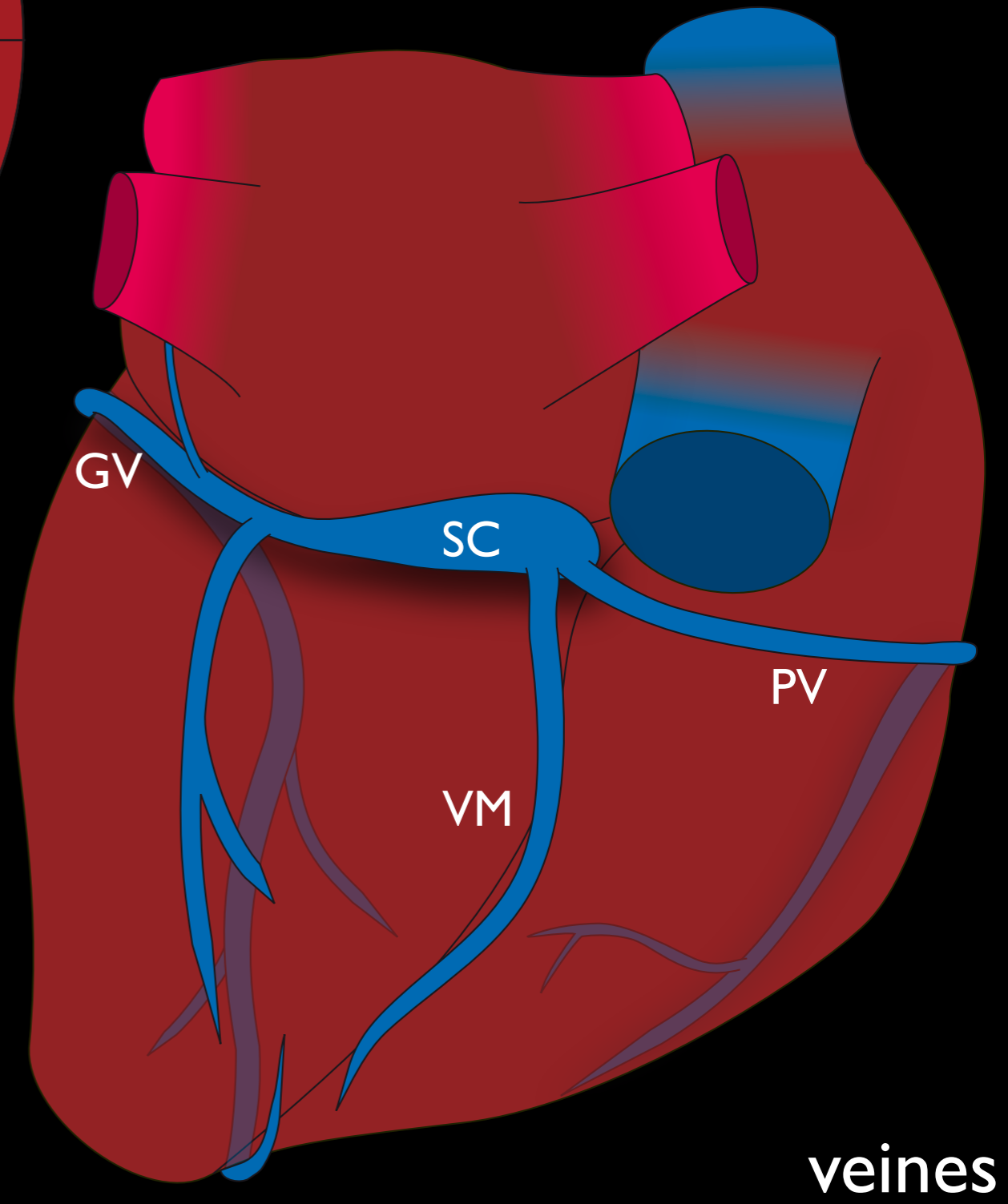
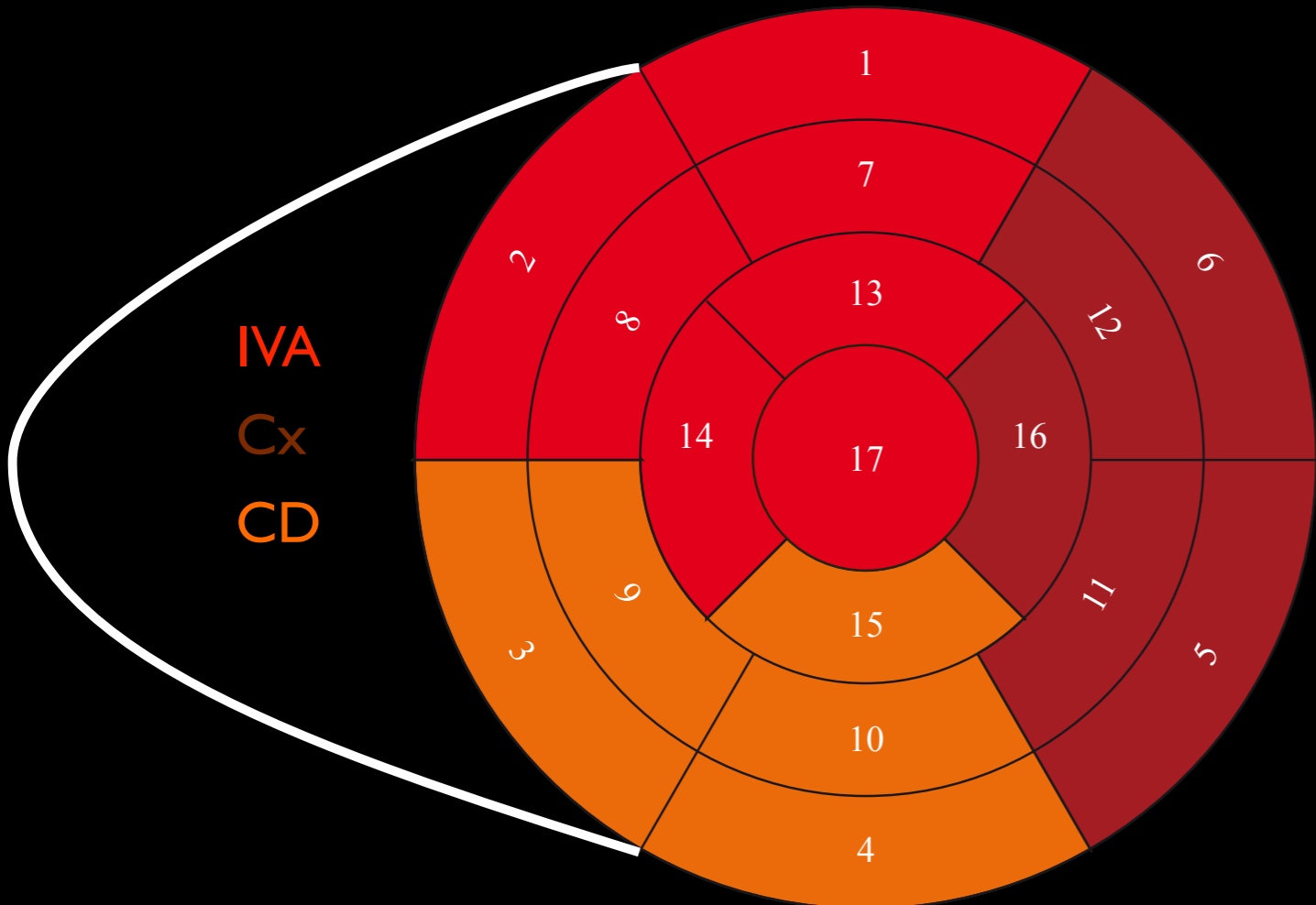


coronaire gauche



coronaire droite



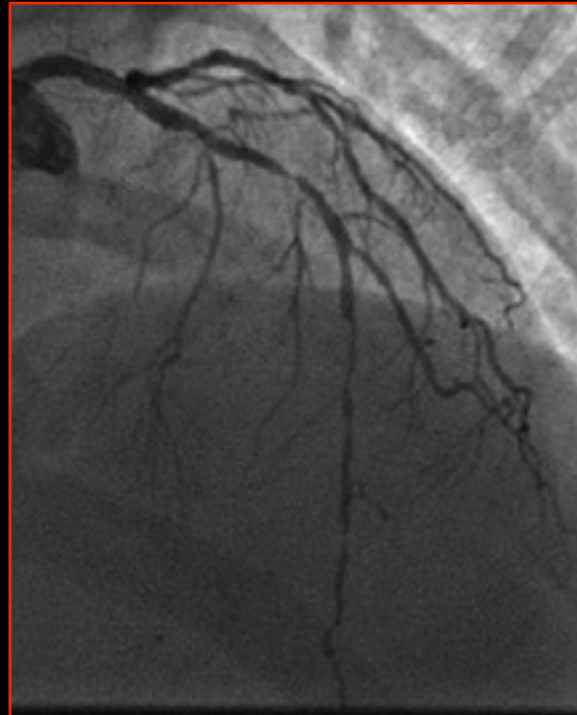
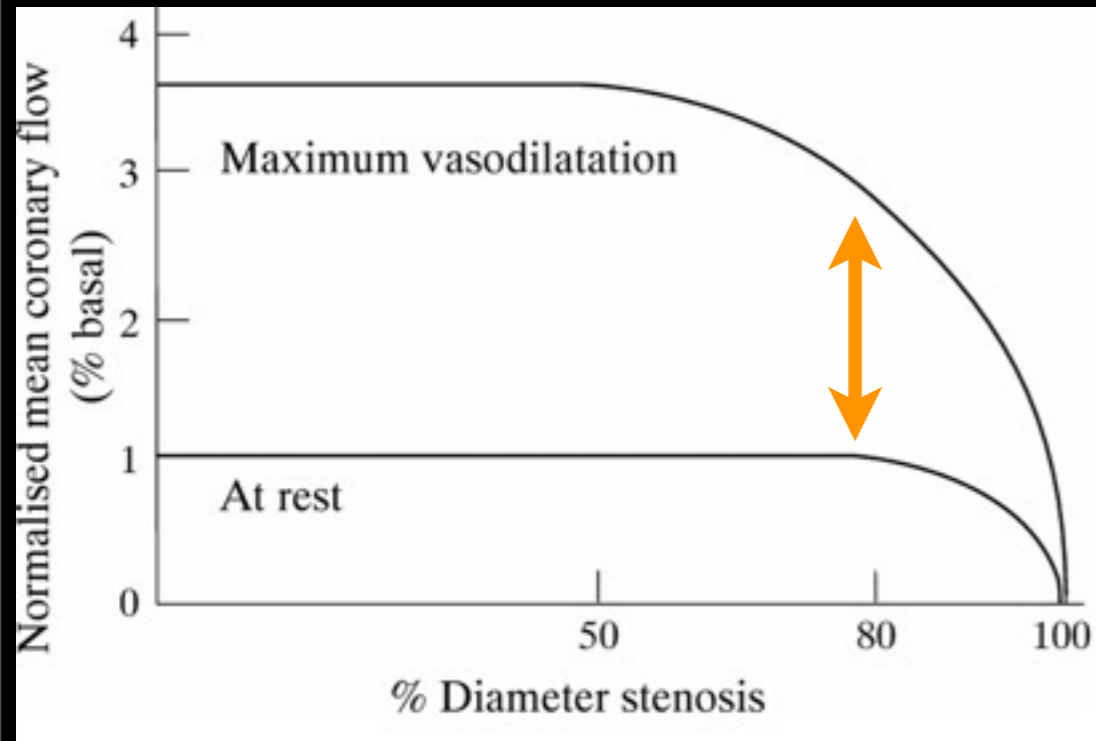


Circulation coronaire physiologie

Perfusion diastolique, fragilité du sous-endocarde

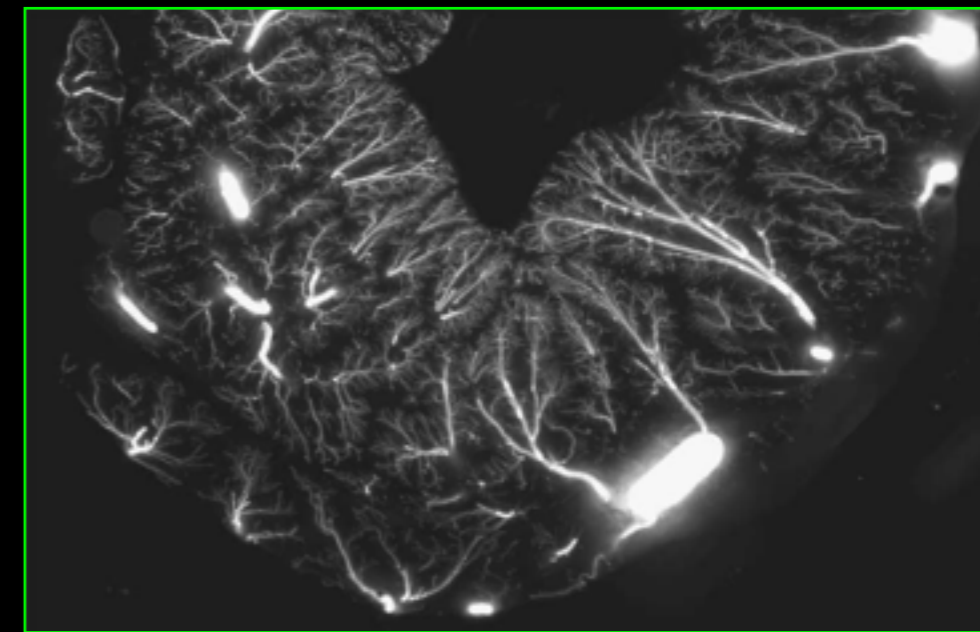
Adaptation du débit à l'effort

réserve coronaire



↑ CAPACITANCE

↓ RESISTANCES
MICROCIRCULATION

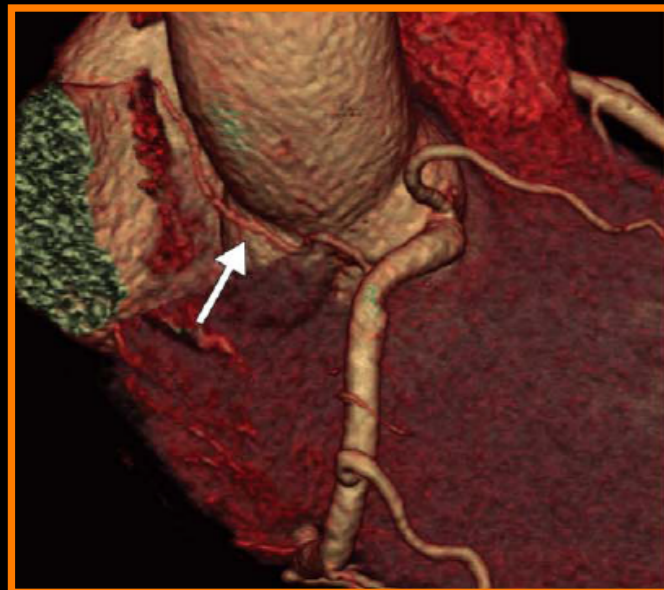
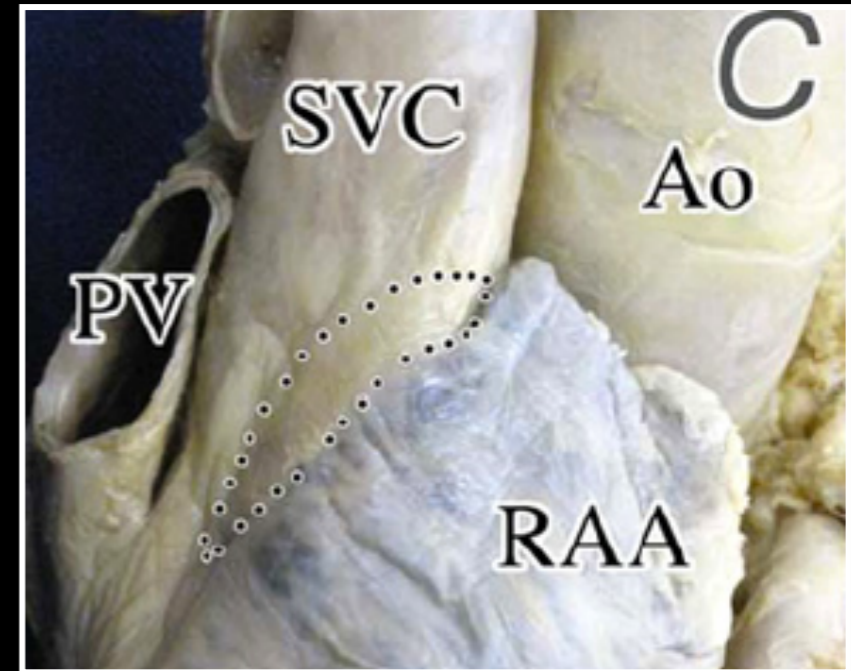
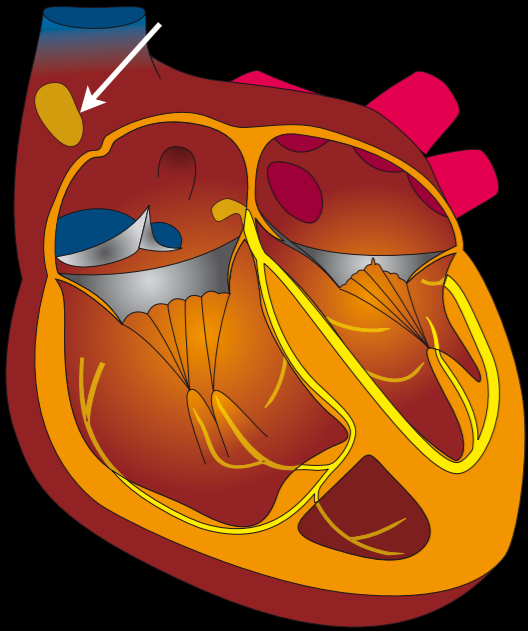


- plus loins des troncs épicaudiques
- plus fins et sensibles à la pression pariétale
- plus sensibles à la pression endocavitaire

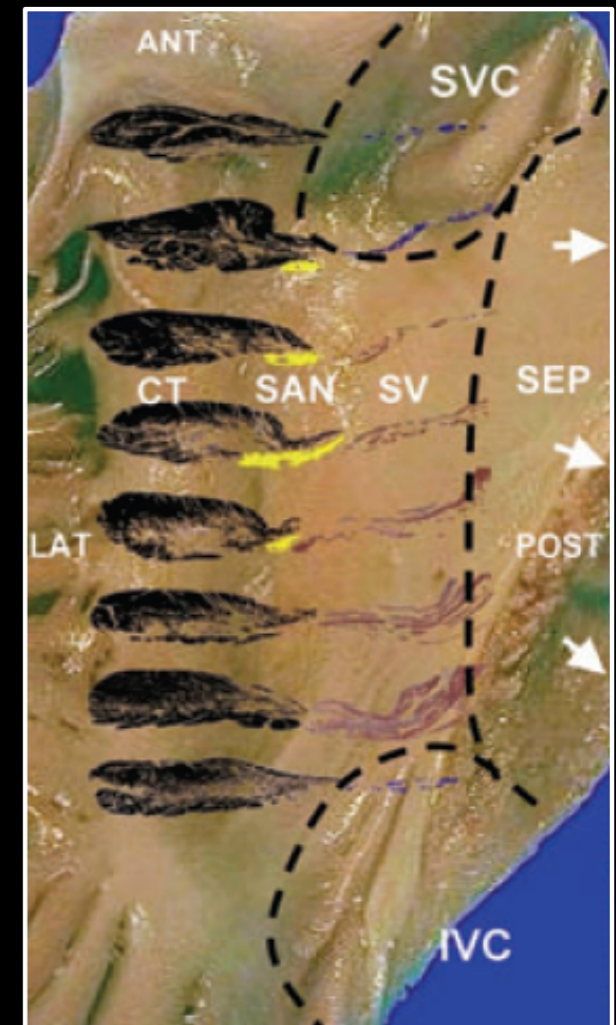
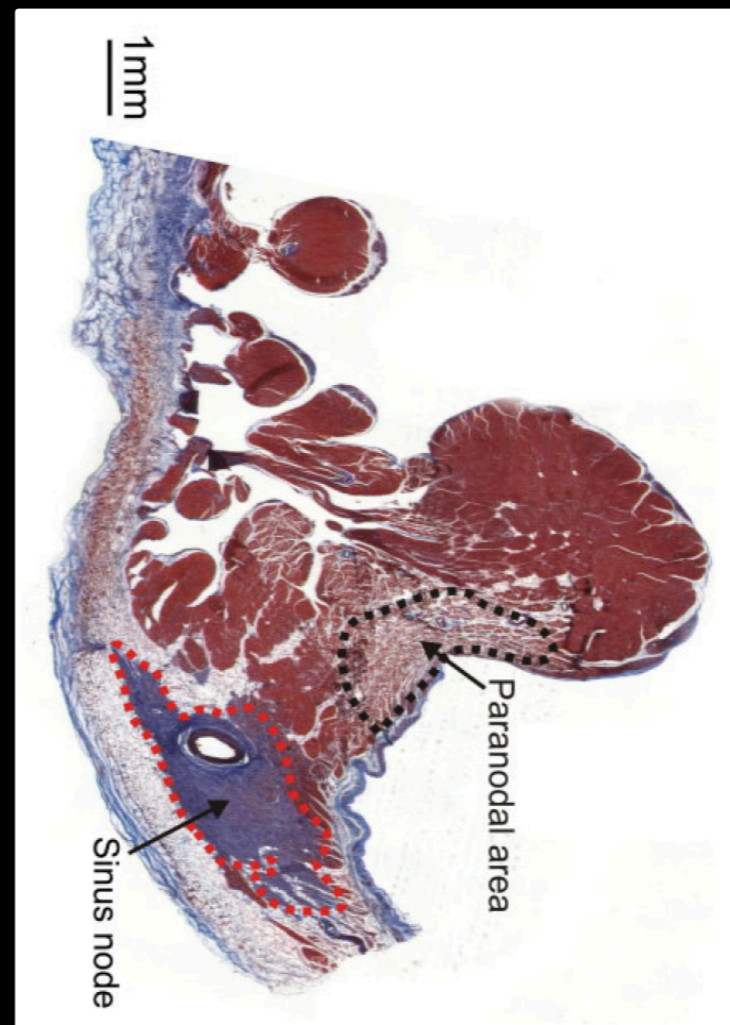
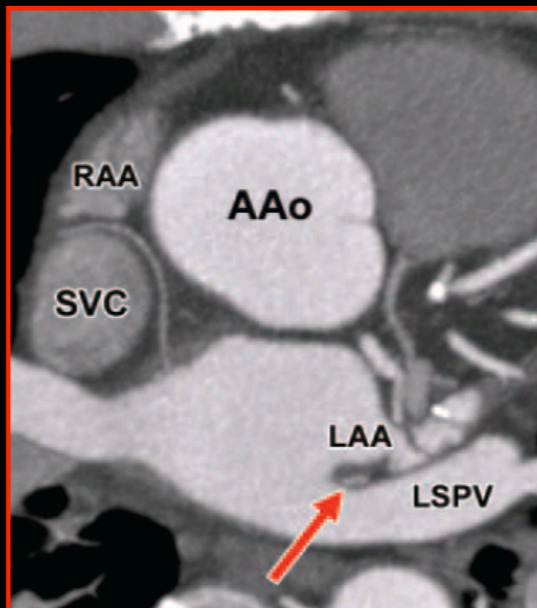
Q_{stress} / Q_{rest}

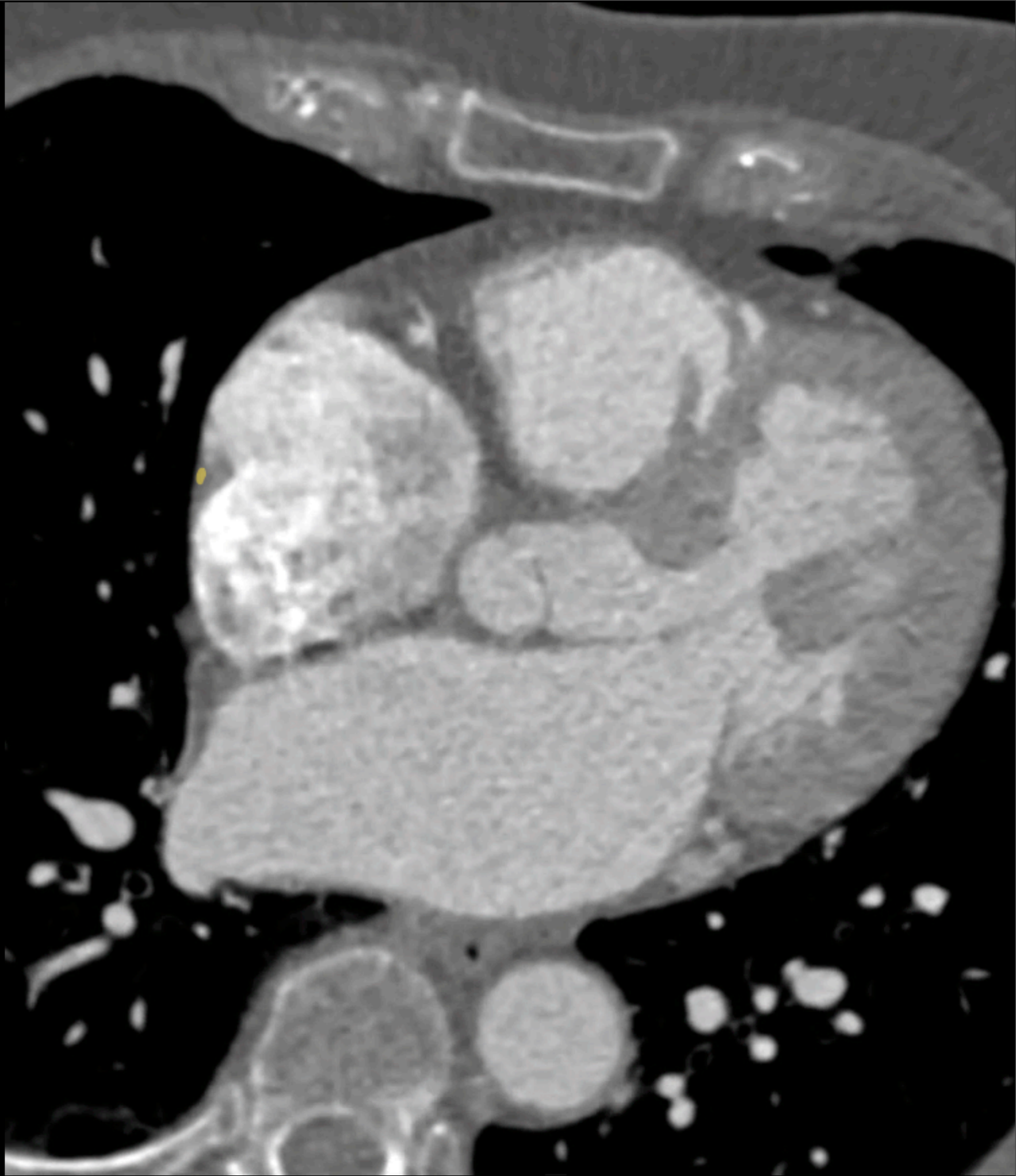
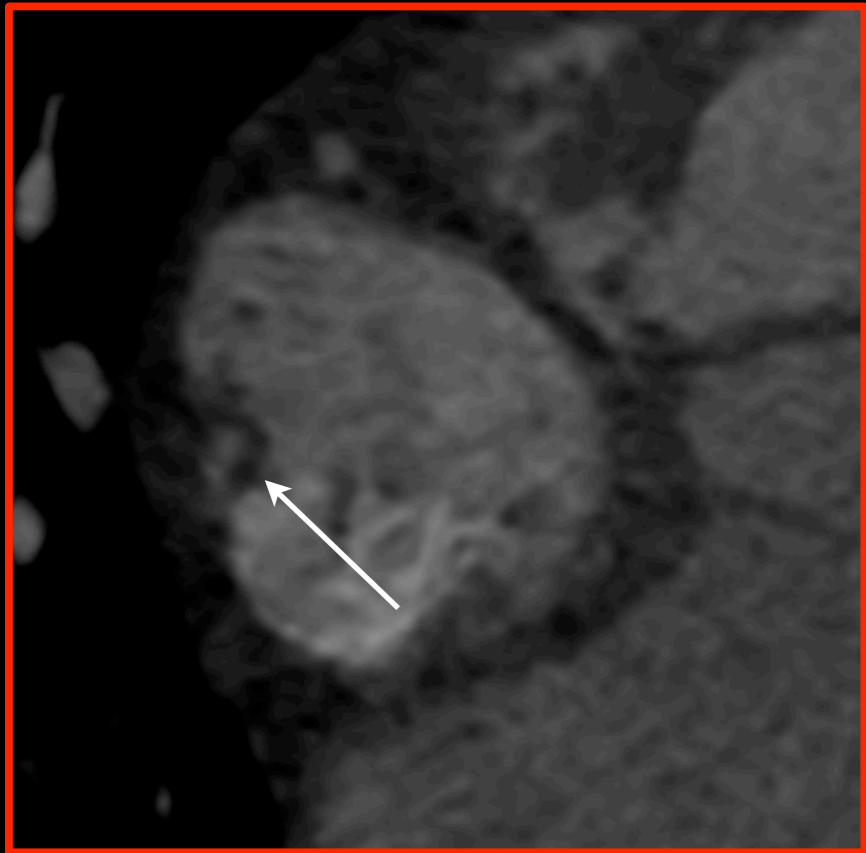
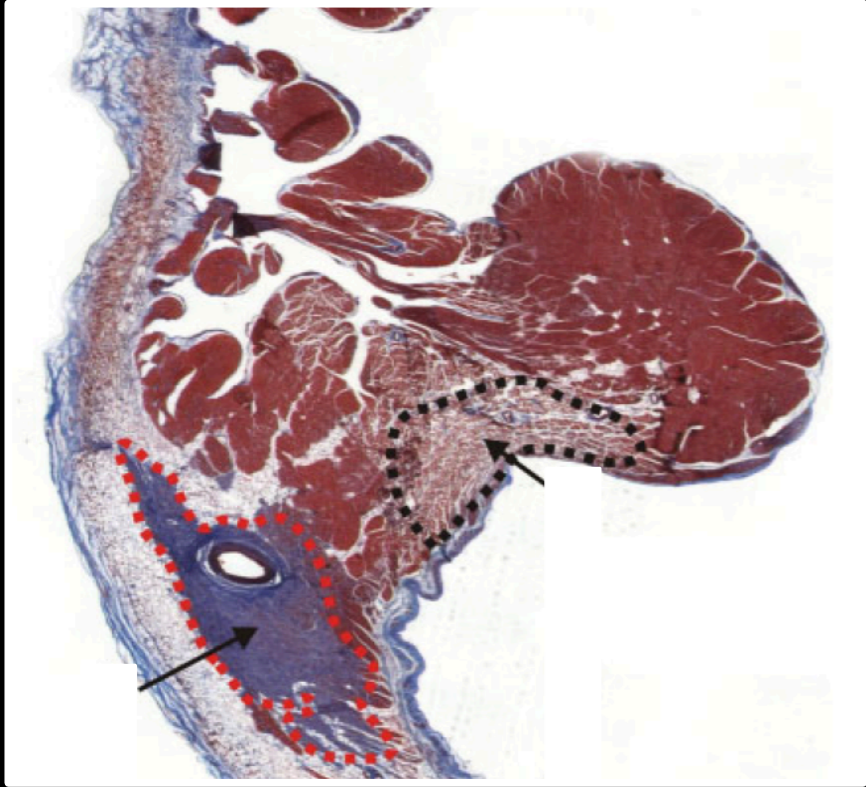
Systeme cardionecteur

appareil atrio-necteur
noeud sino-atrial



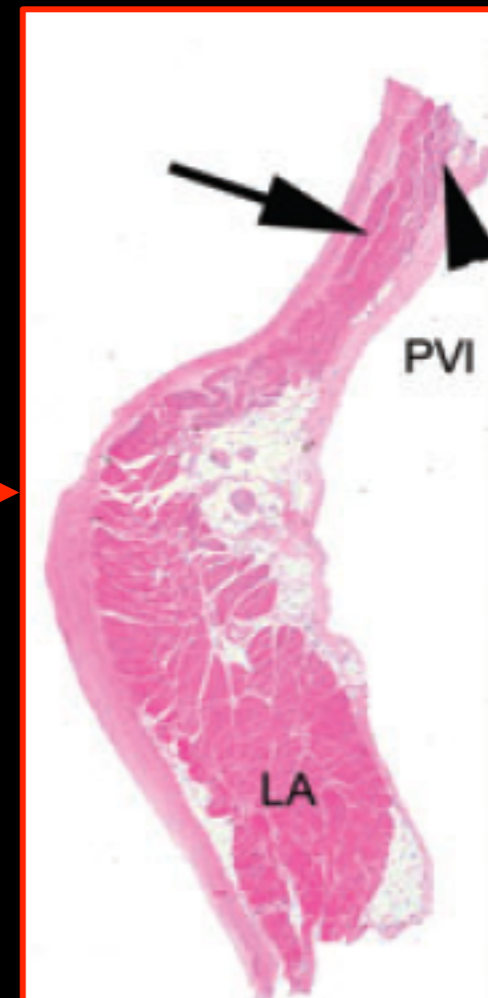
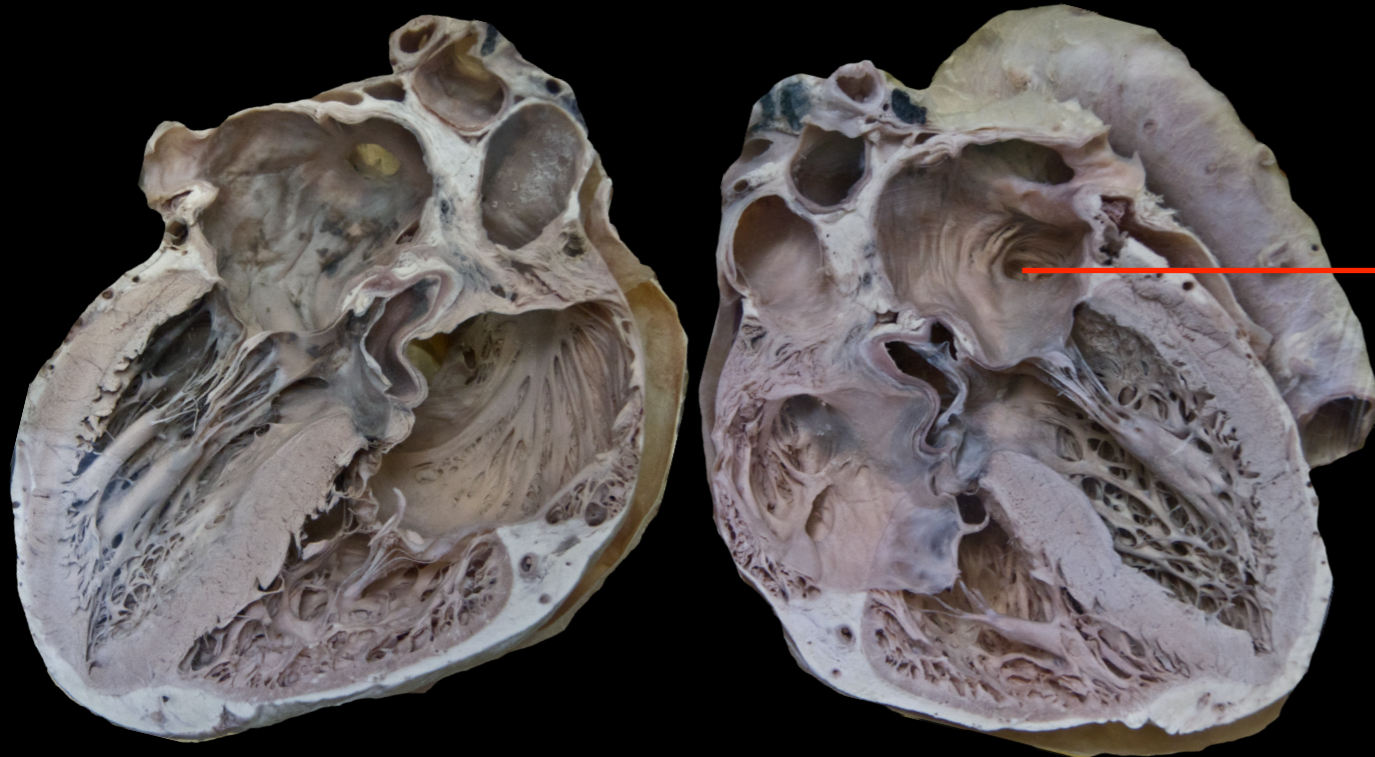
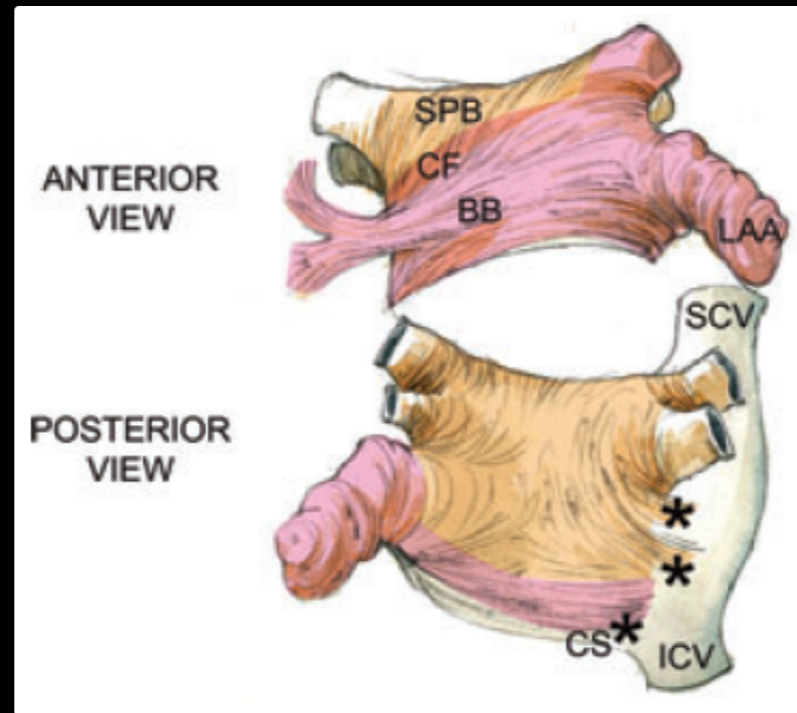
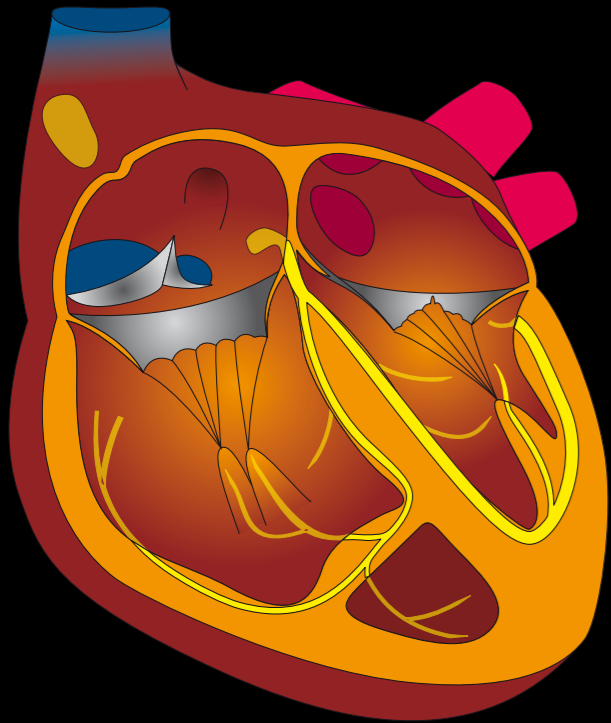
CD dans 70%
CG dans 30%





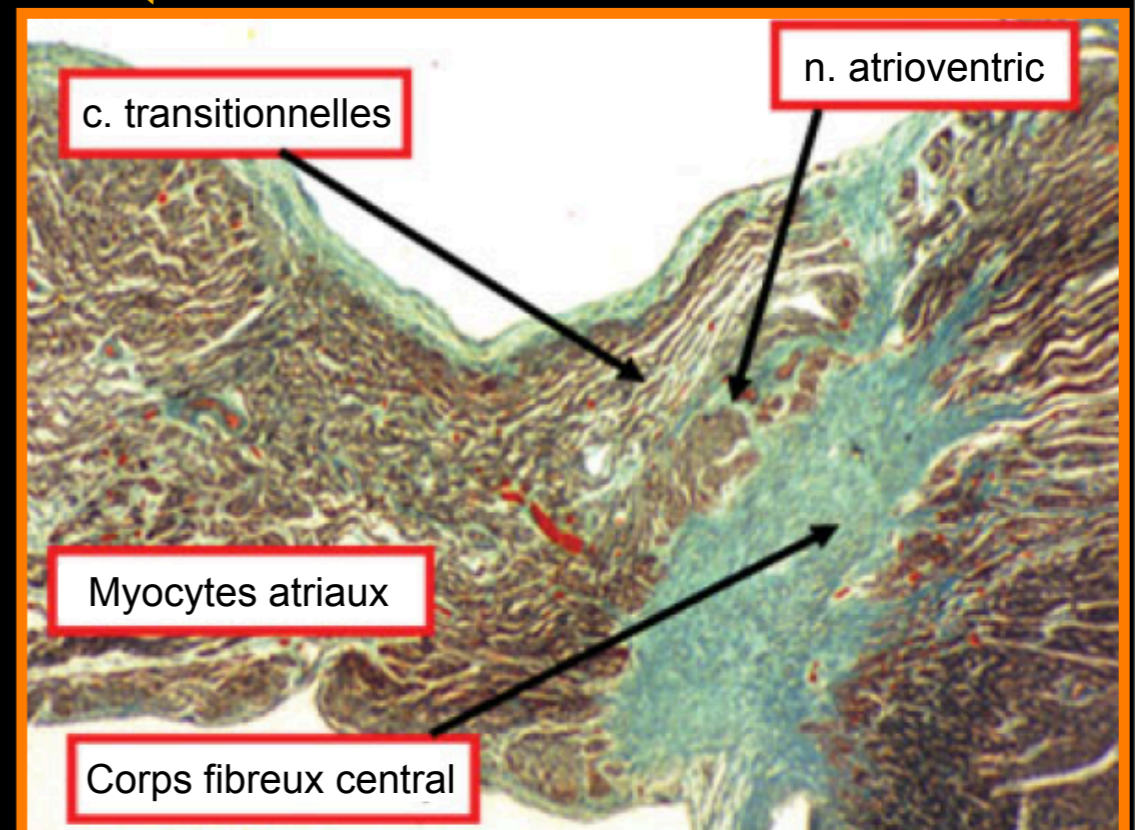
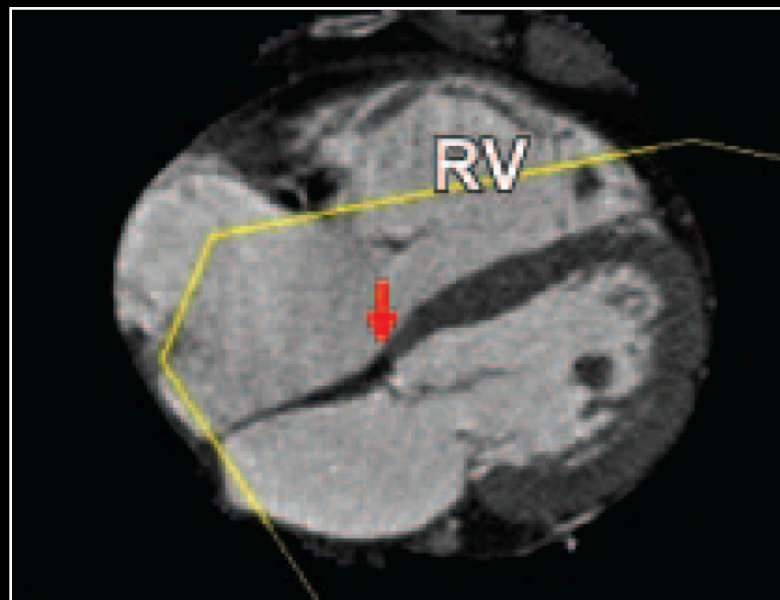
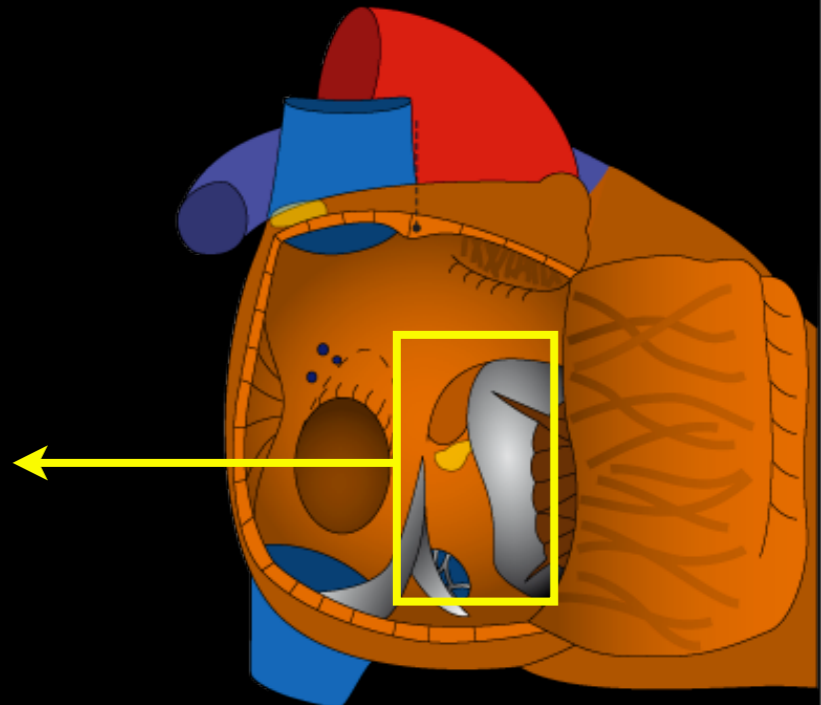
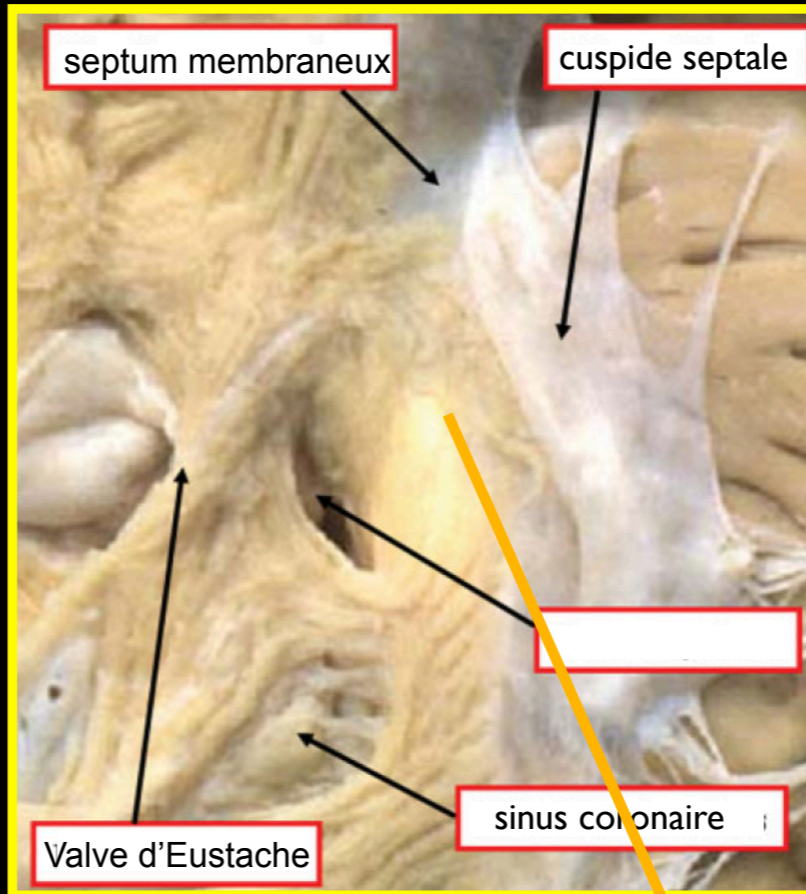
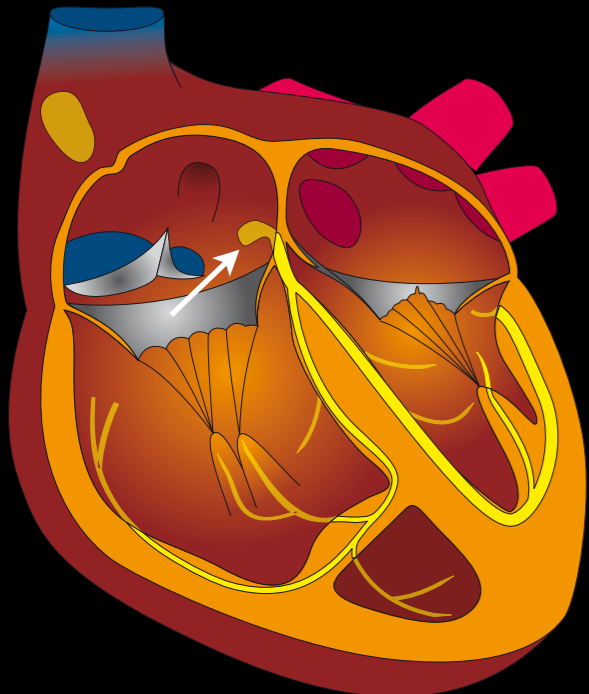
Systeme cardionecteur

appareil atrio-necteur
connexions intra et interatriales



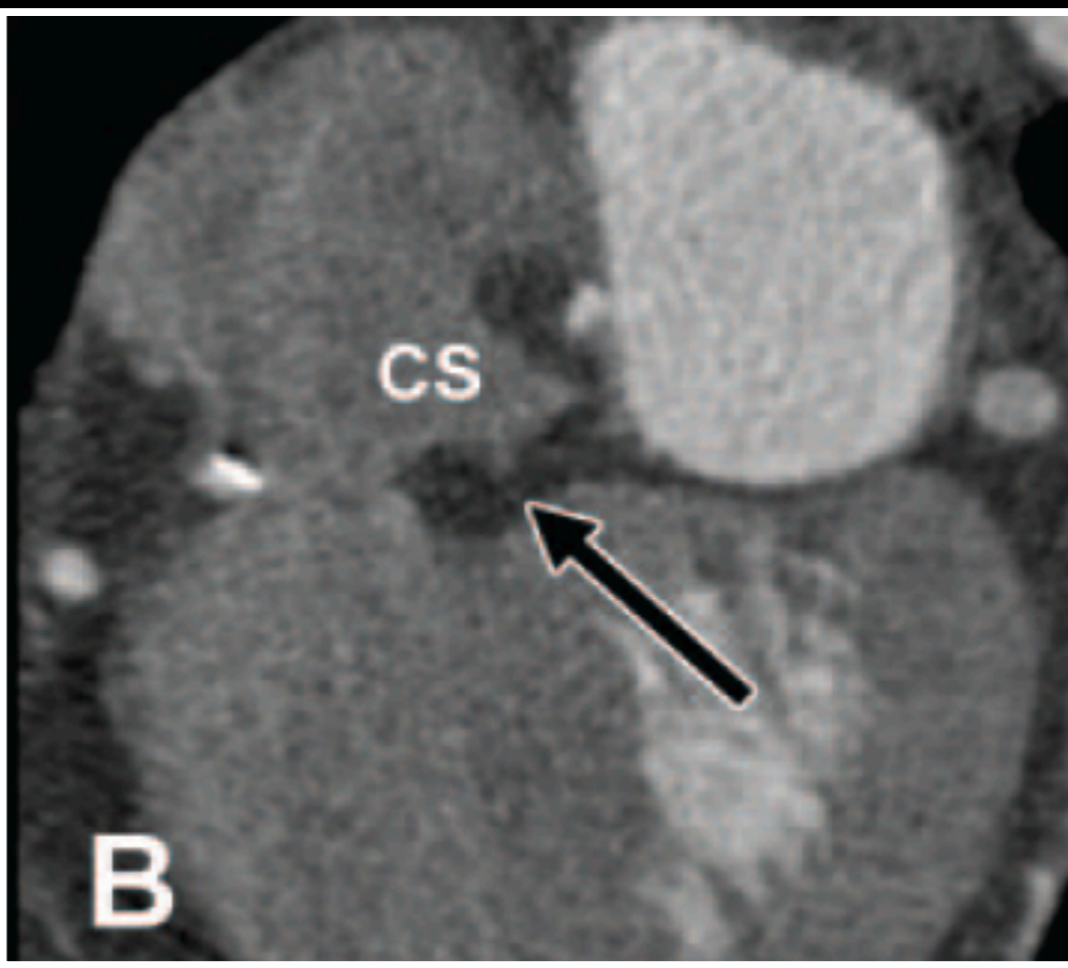
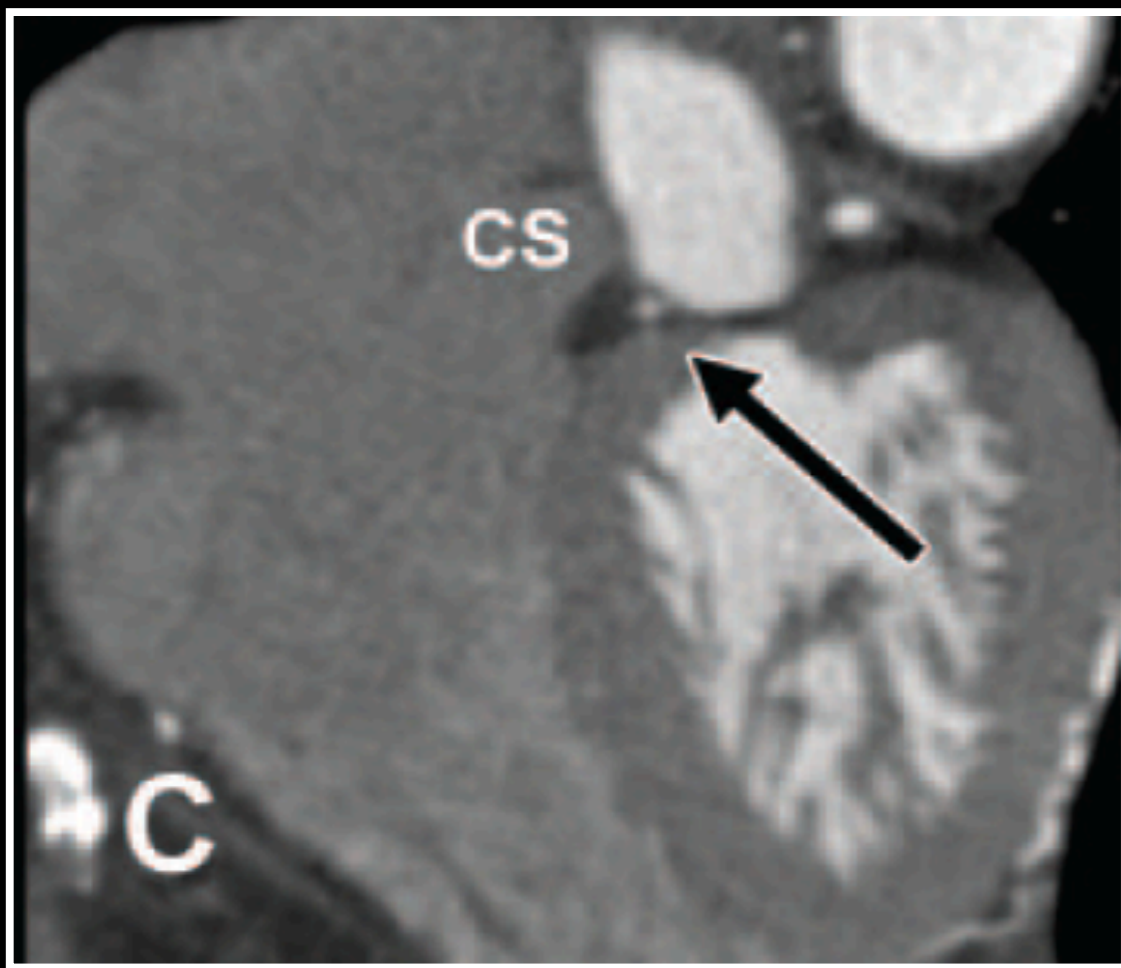
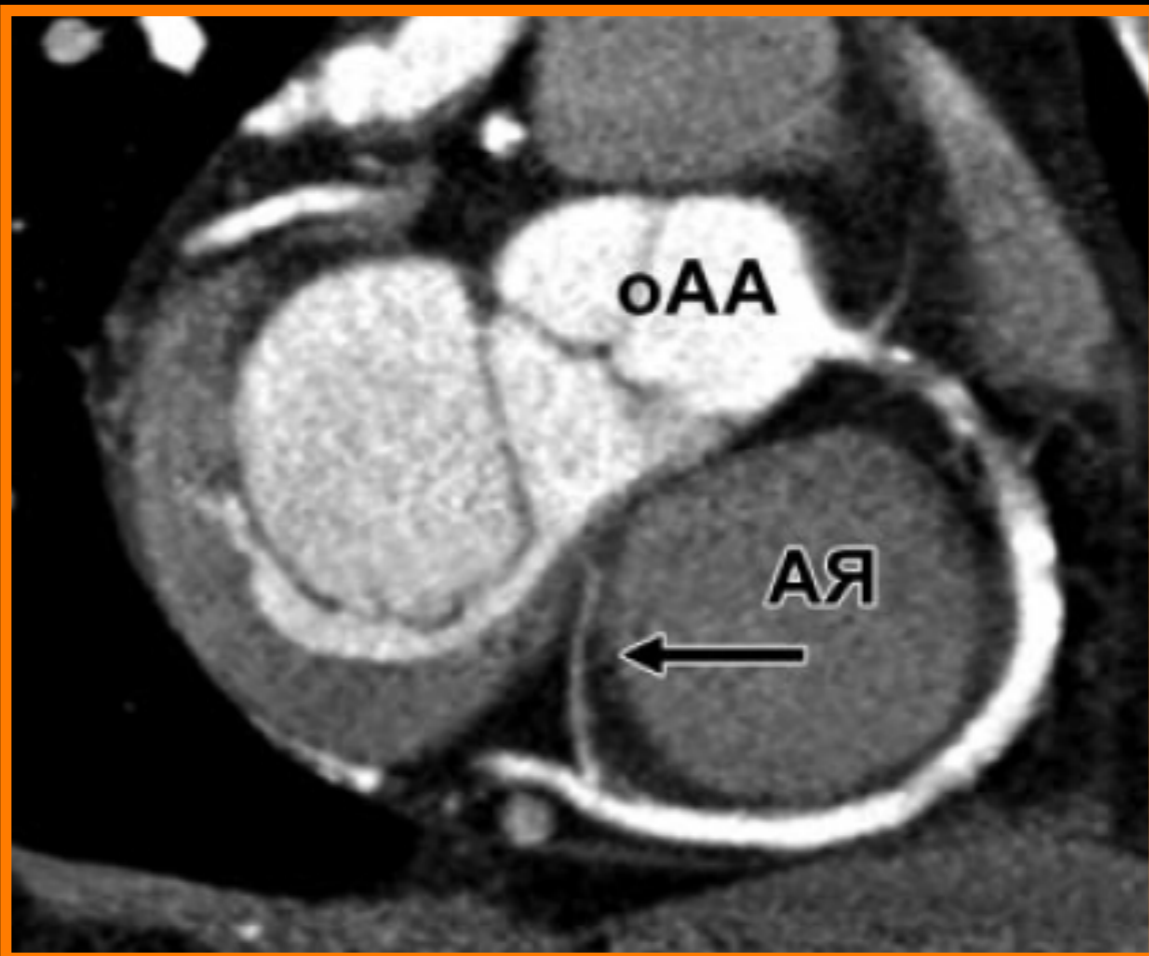
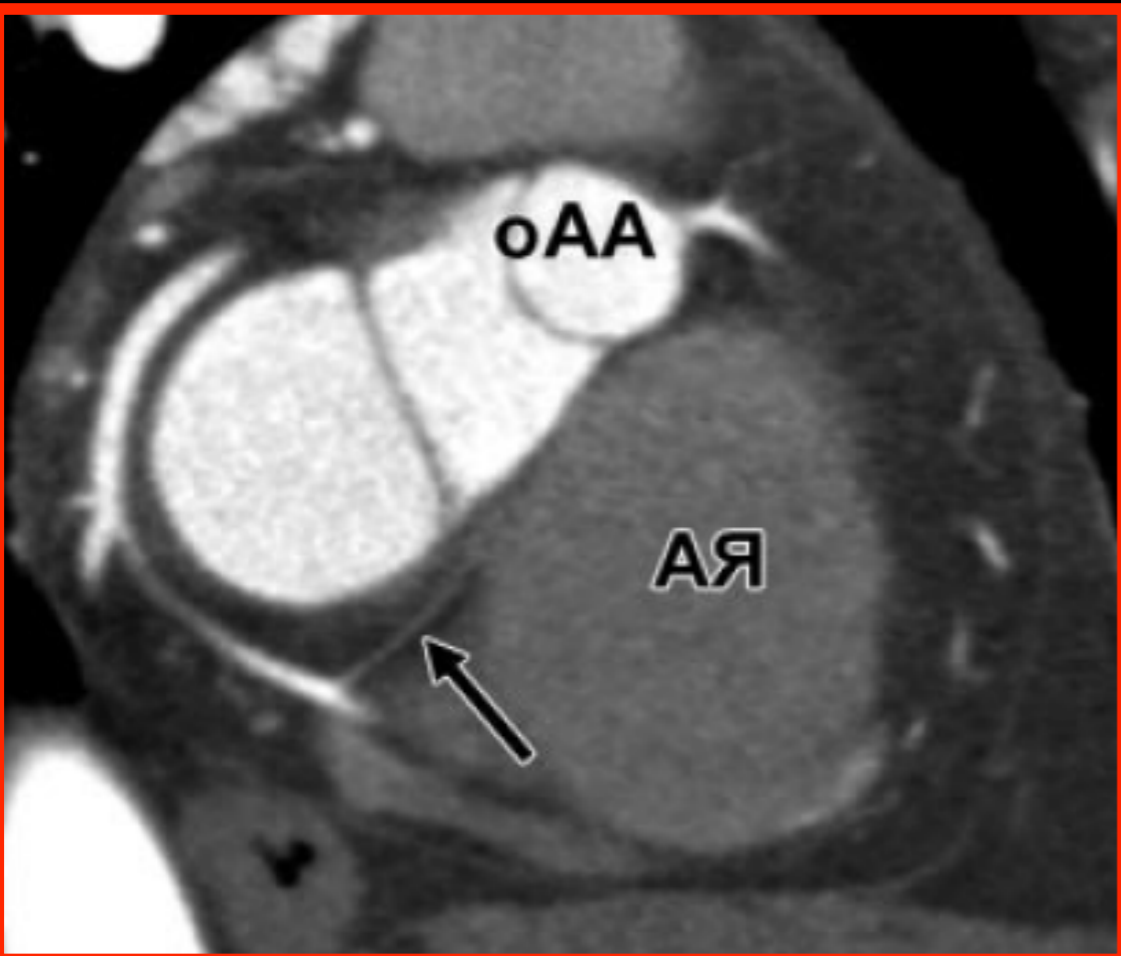
Systeme cardionecteur

appareil ventriculo-necteur noeud atrioventriculaire



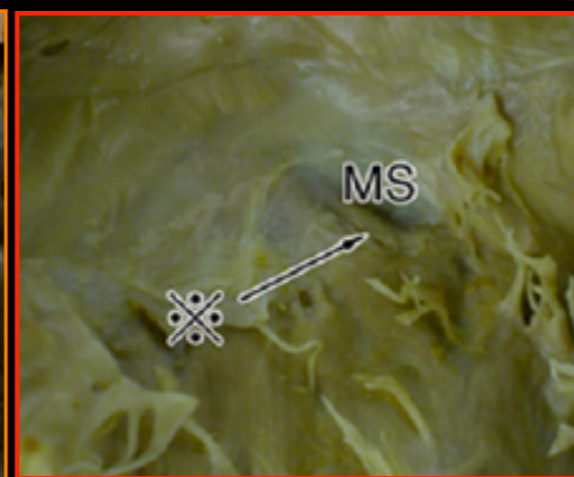
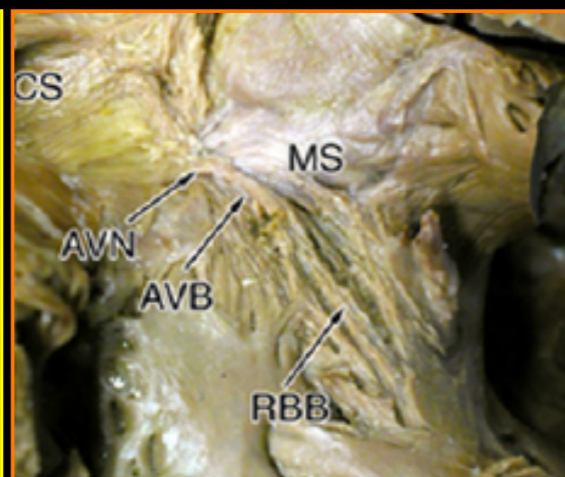
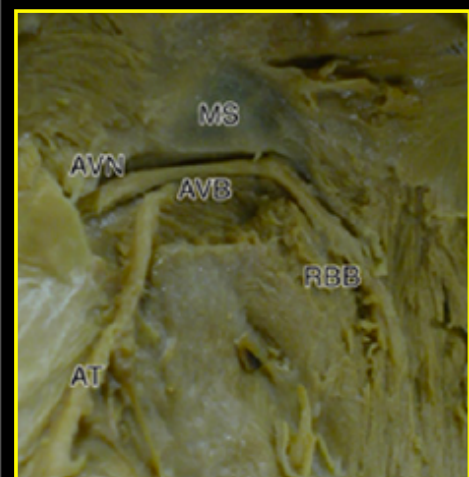
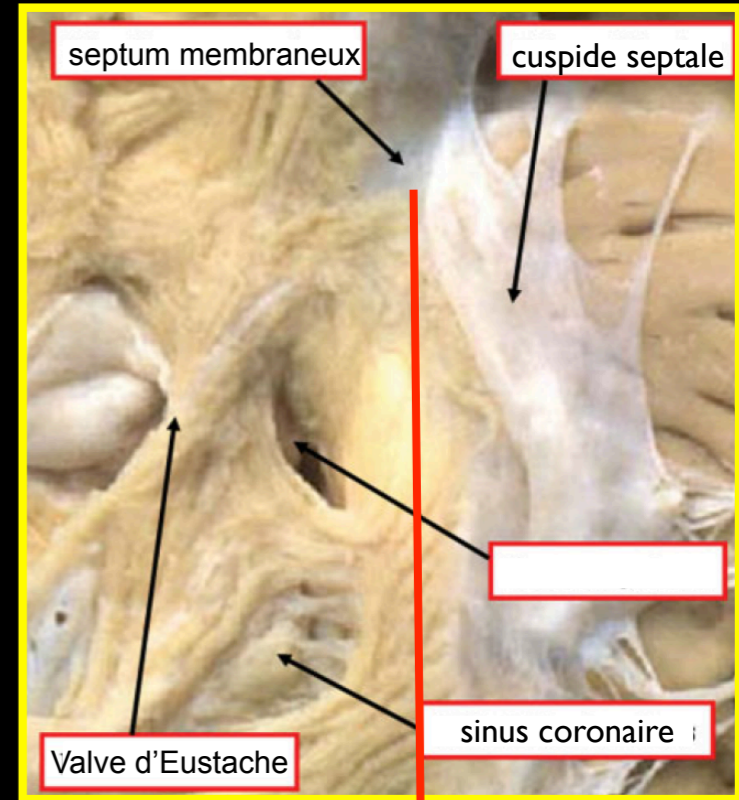
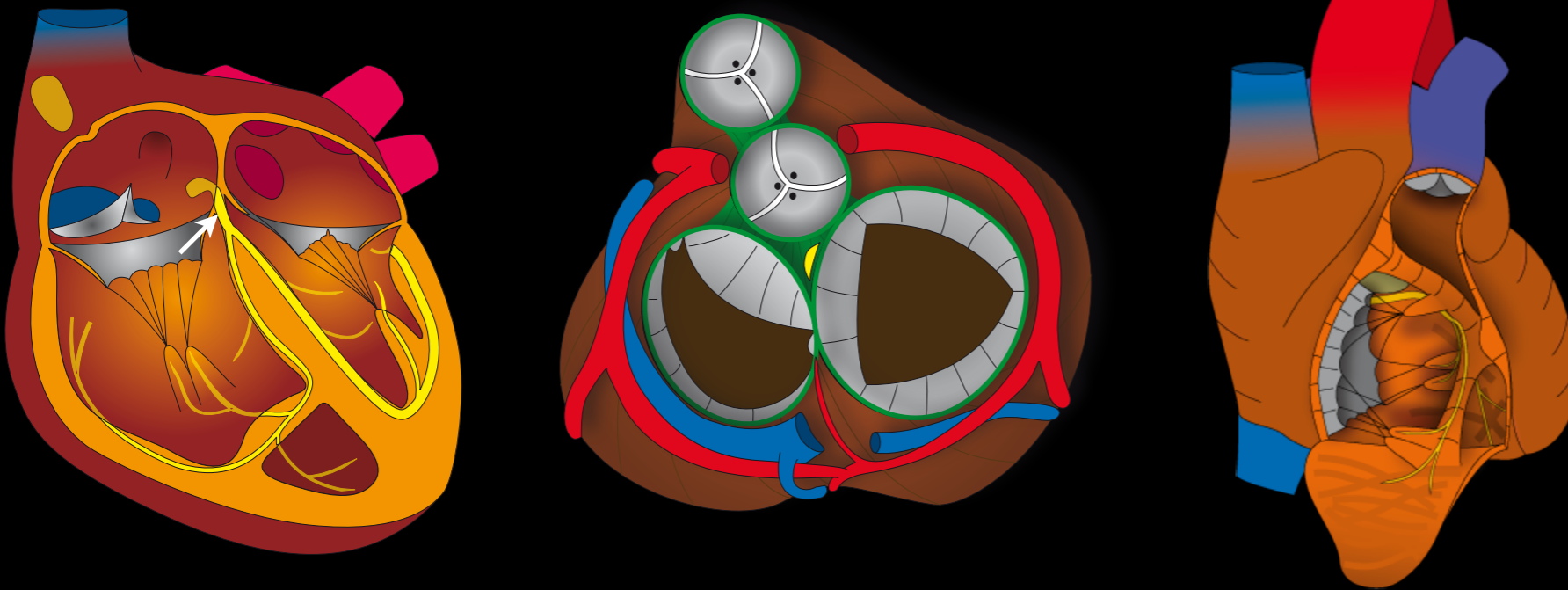
Cx: 10%

CD: 90%

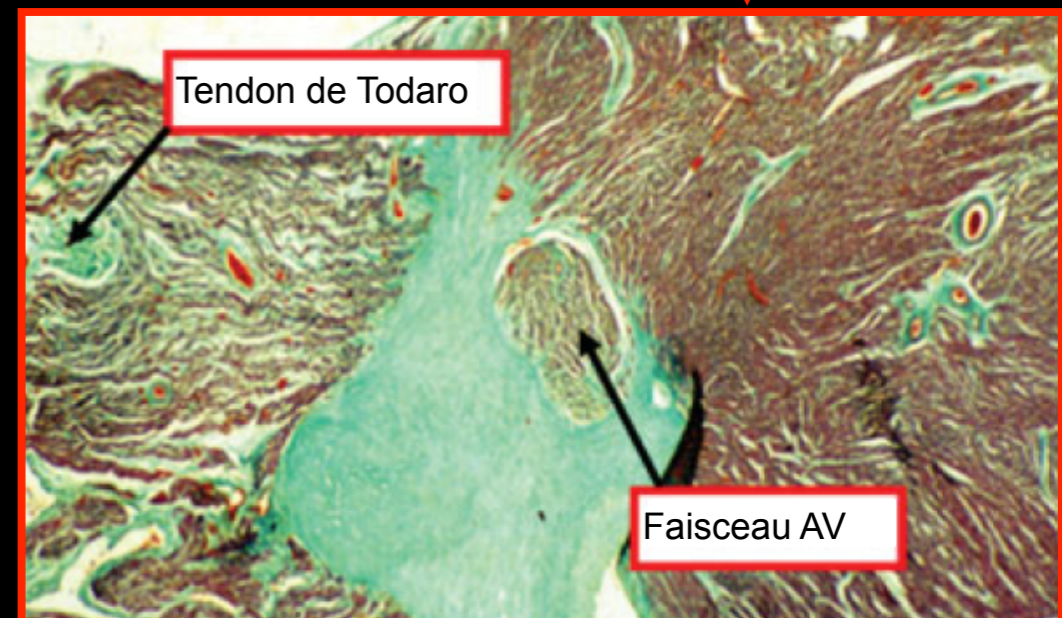
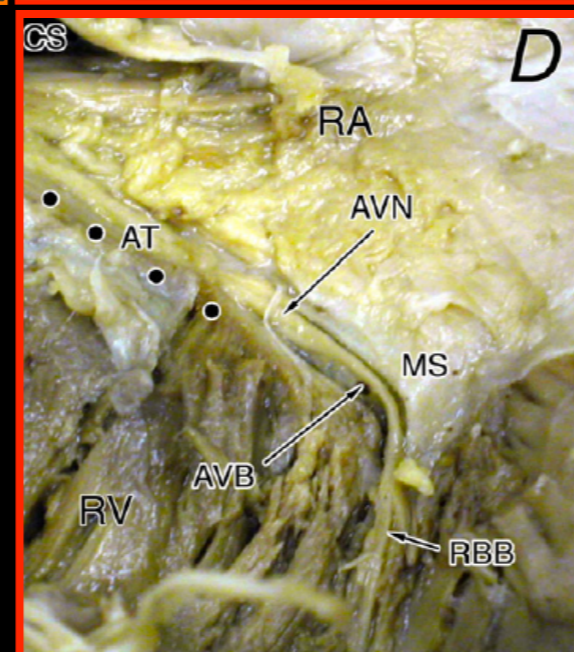
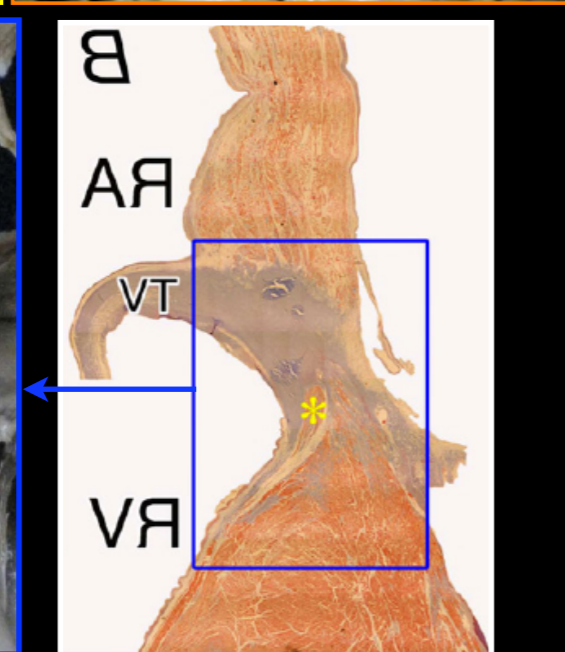
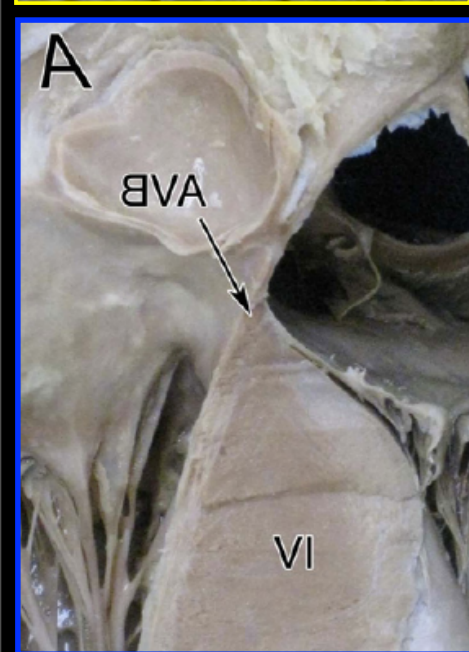


Systeme cardionecteur

appareil ventriculo-necteur faisceau atrioventriculaire

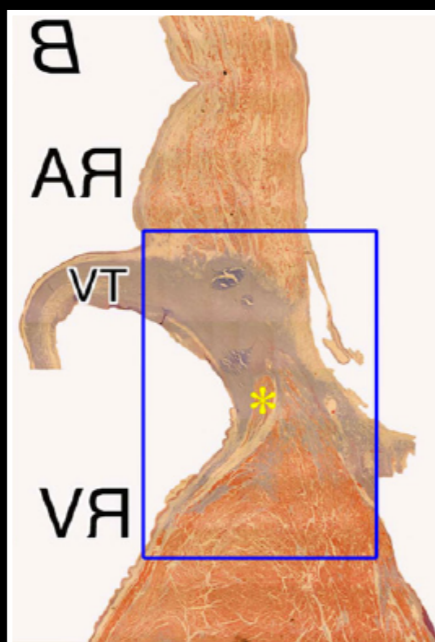
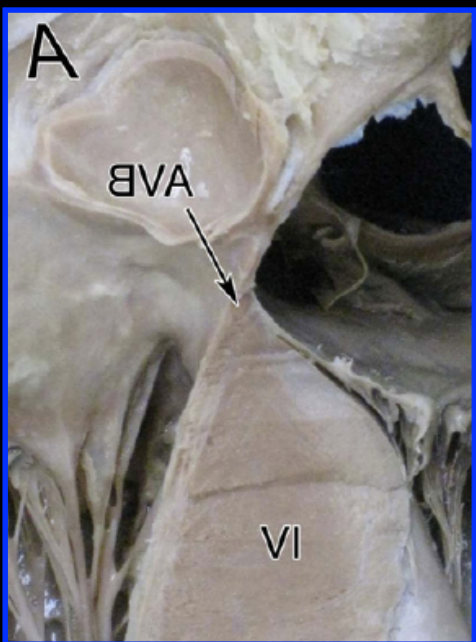
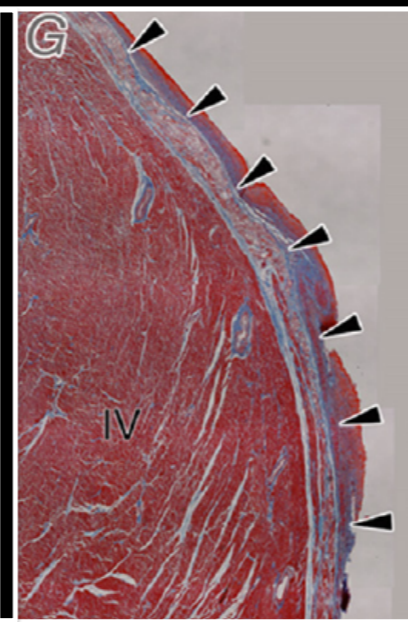
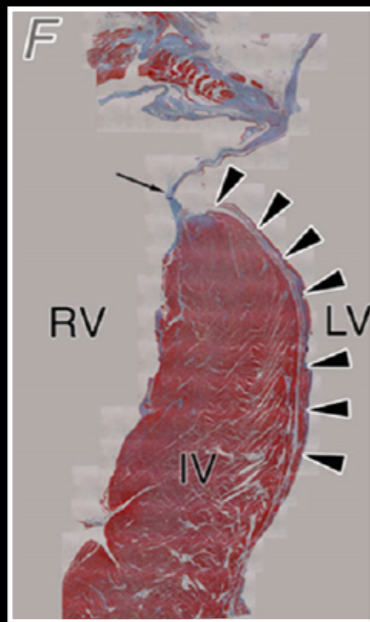
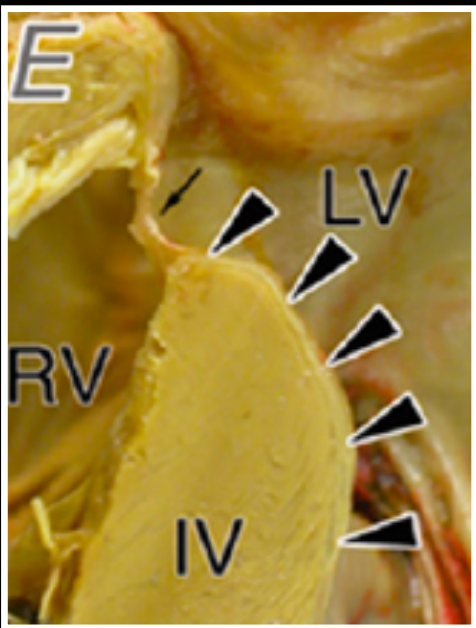
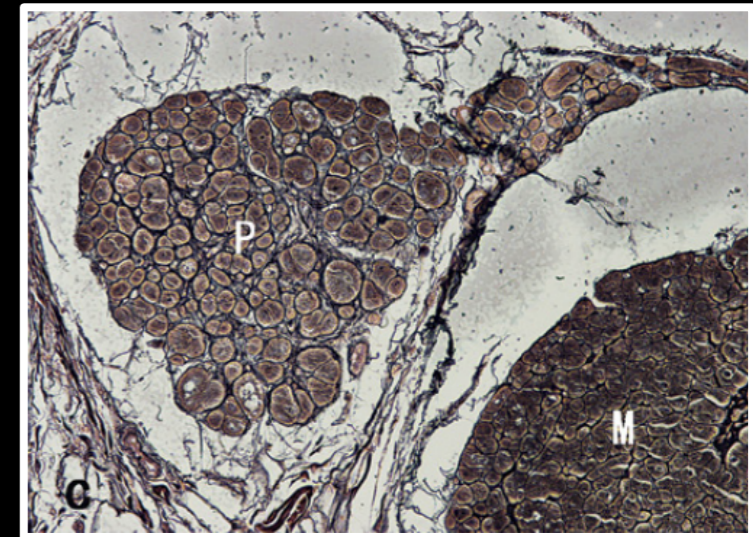
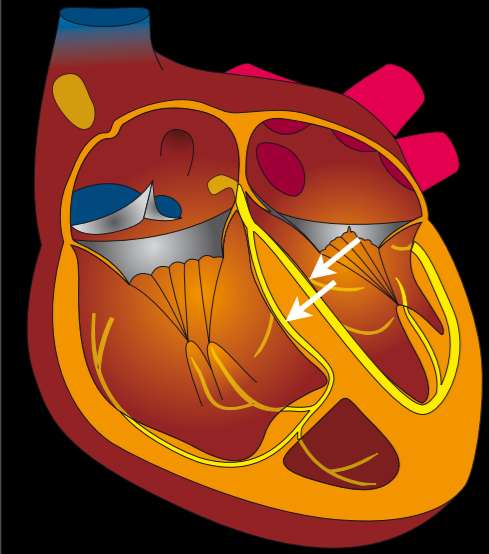


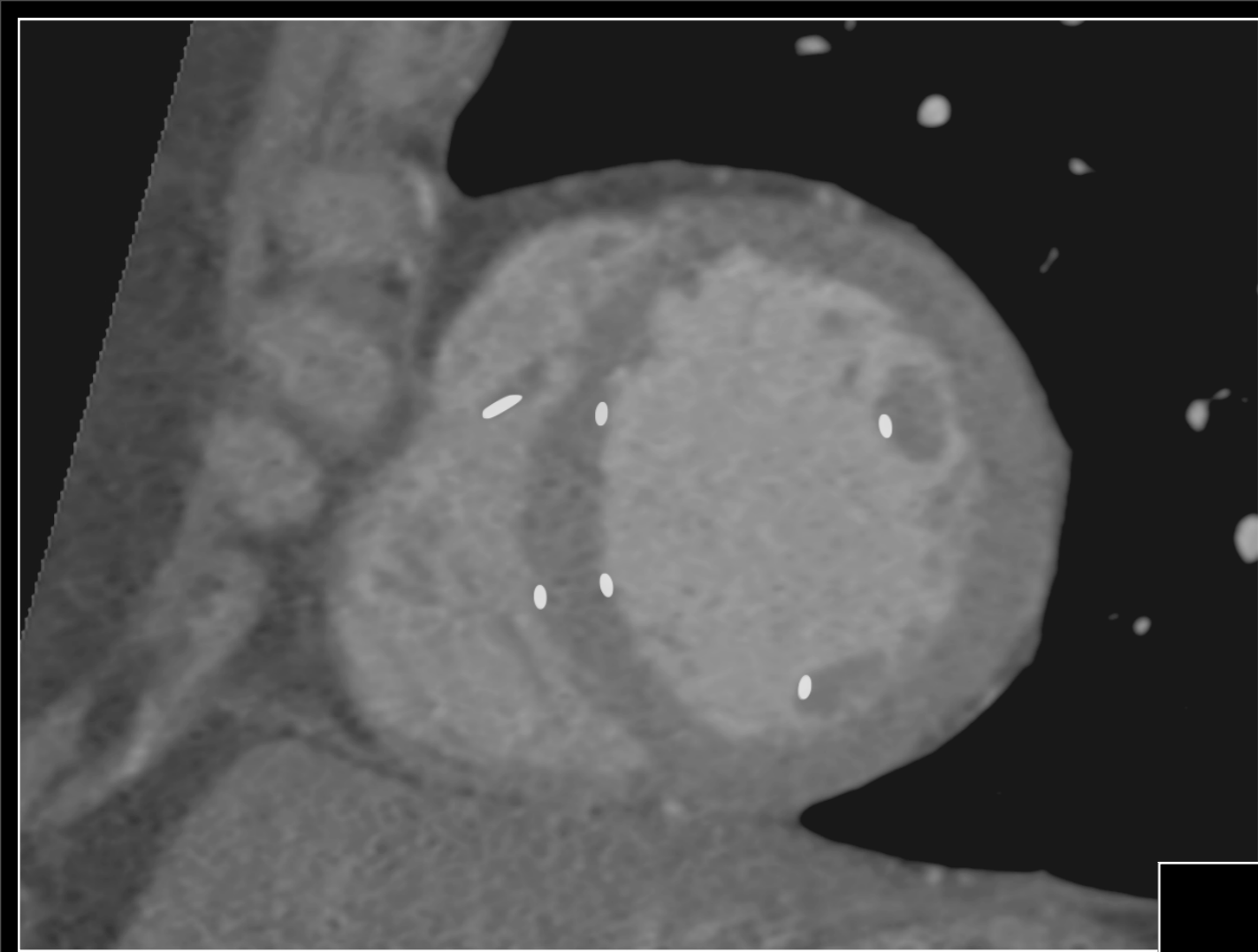
- type I: limite SIV Mb SIV Mu: 47%
- type II: dans le SIV Mu: 32%
- type III: dans le SIV Mb: 21% (protégé ou non)



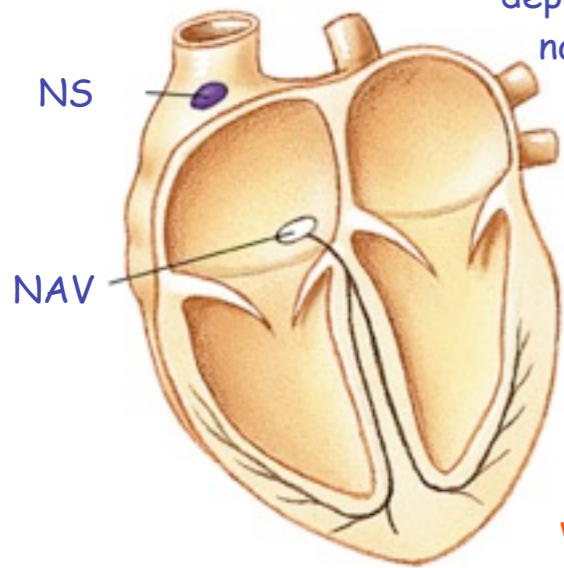
Systeme cardionecteur

appareil ventriculo-necteur
branches du faisceau AV



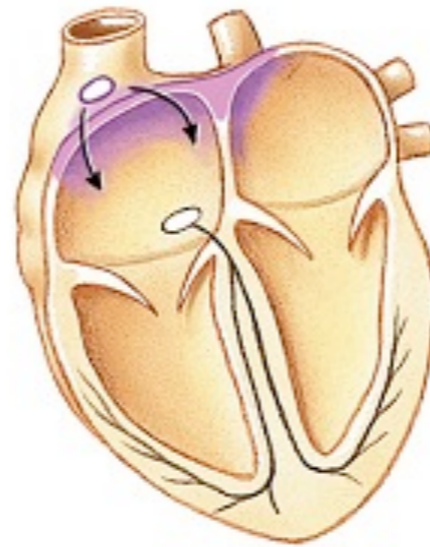


dépolarisation du
nœud sinusal



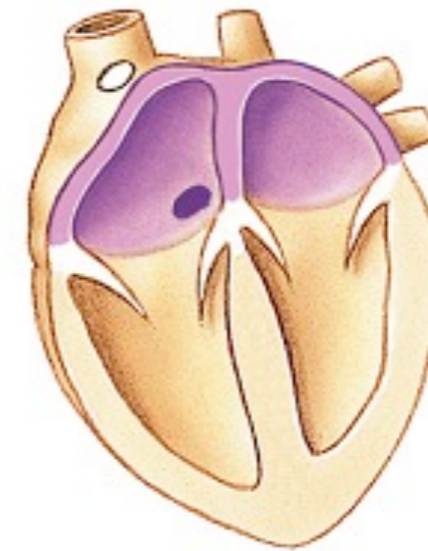
$V_c = 0,05 \text{ m/s}$

dépolarisation du
myocarde
auriculaire



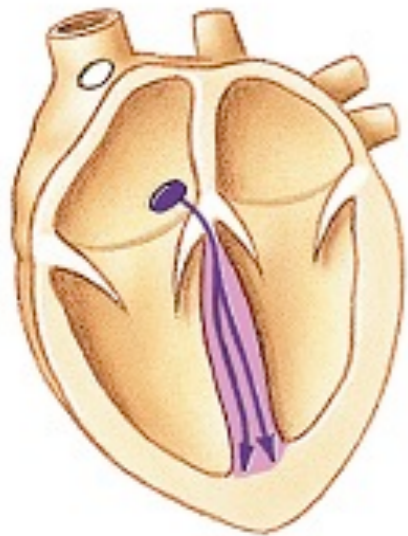
$V_c = 1 \text{ m/s}$

dépolarisation du
nœud septal :
ralentissement de
la conduction



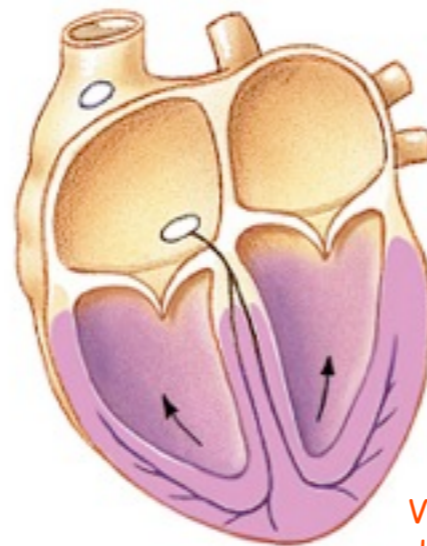
$V_c = 0,05 \text{ m/s}$

Conduction rapide de
l'excitation vers l'apex
du cœur par le
faisceau de His

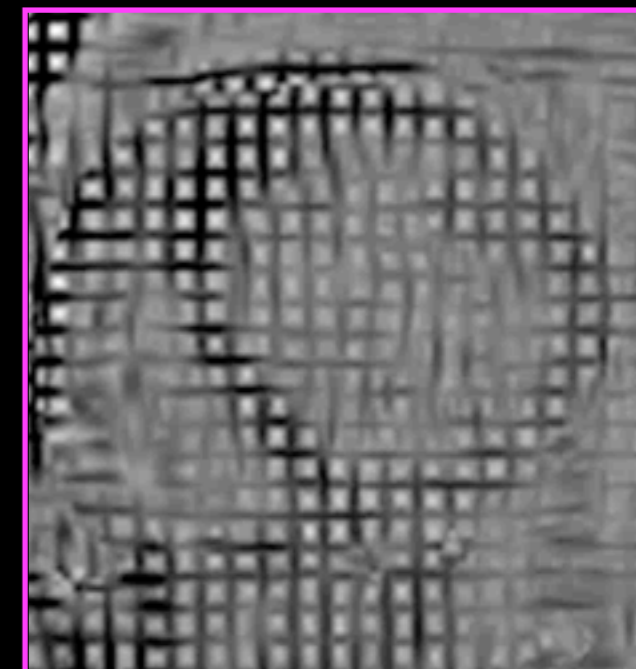
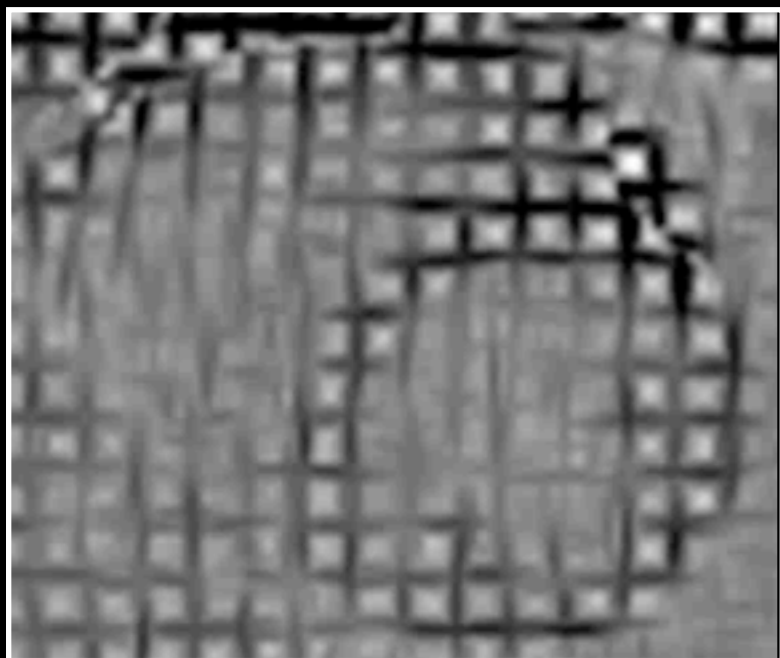
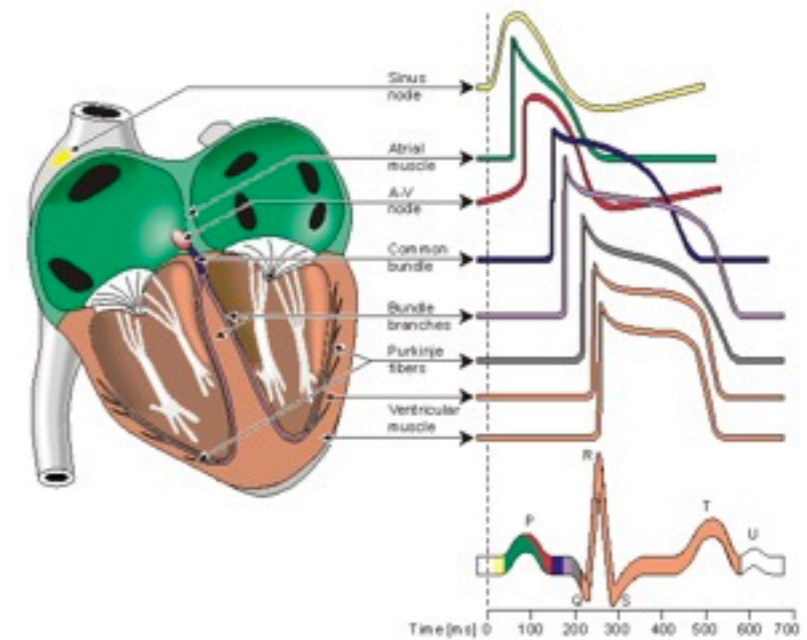


$V_c = 1 \text{ m/s}$

La dépolarisation
remonte à partir de
l'apex vers les
oreillettes

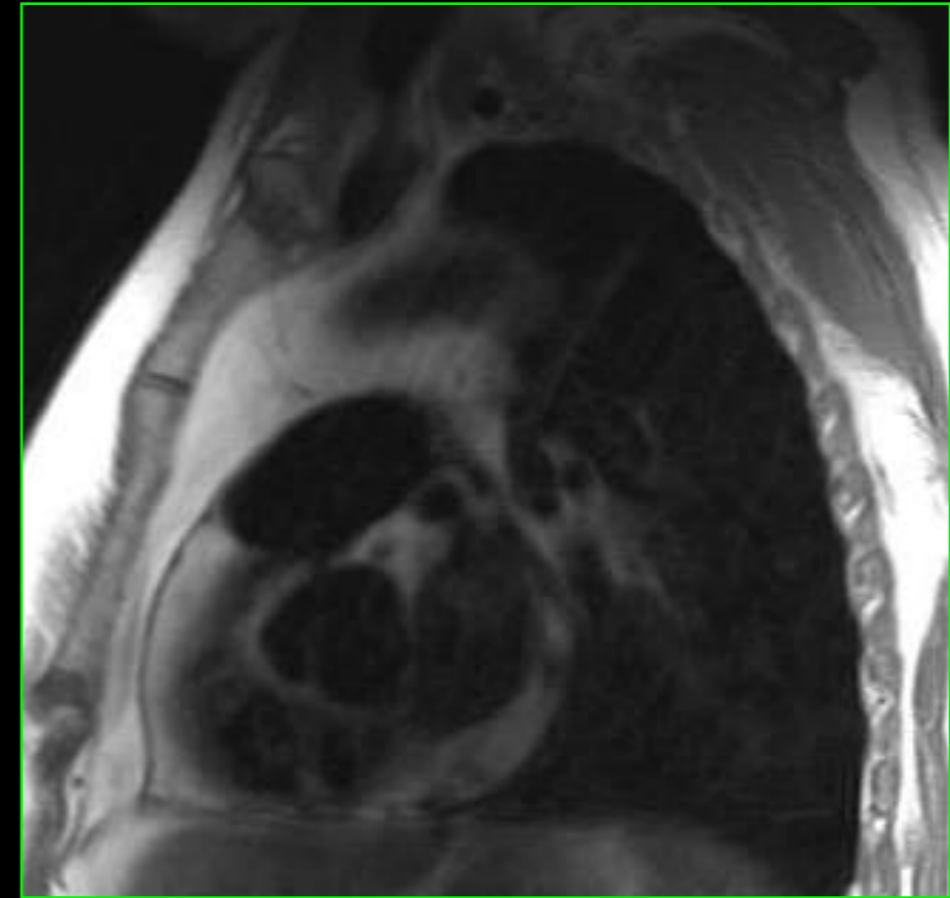


$V_c = 4 \text{ m/s}$ dans le réseau
de Purkinje

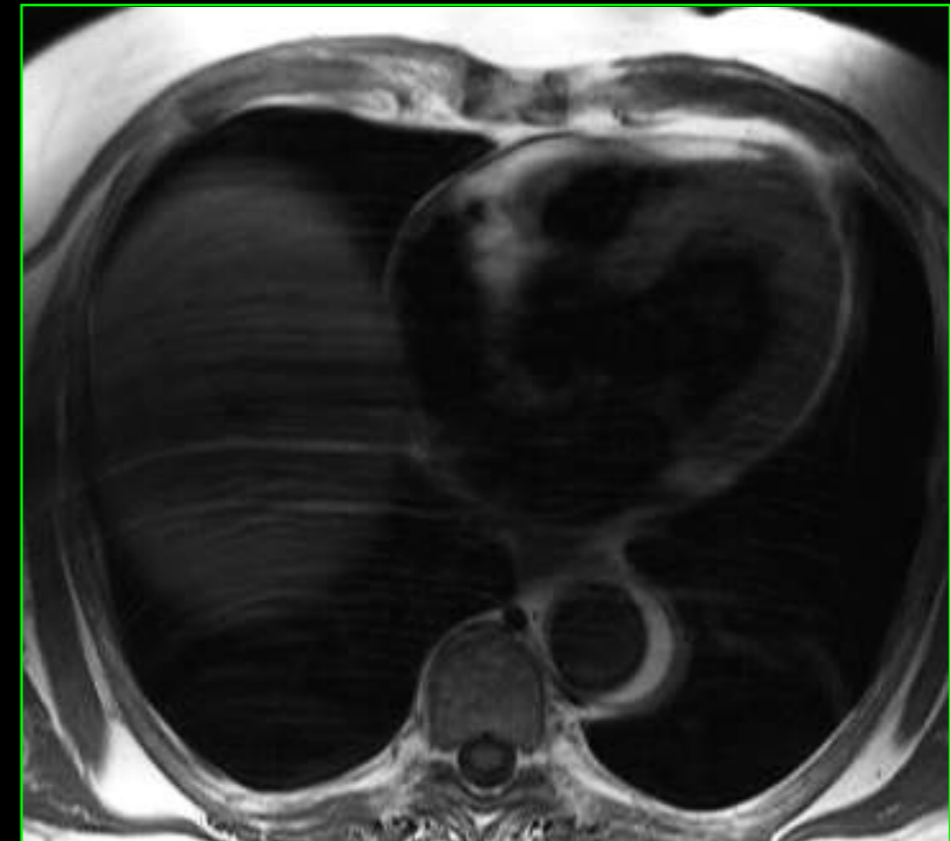
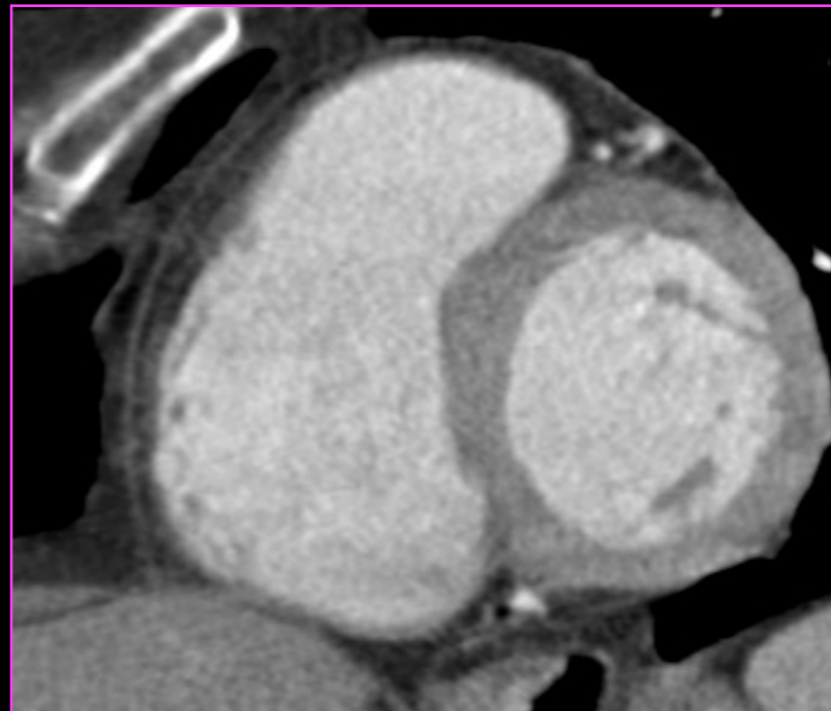


BBG

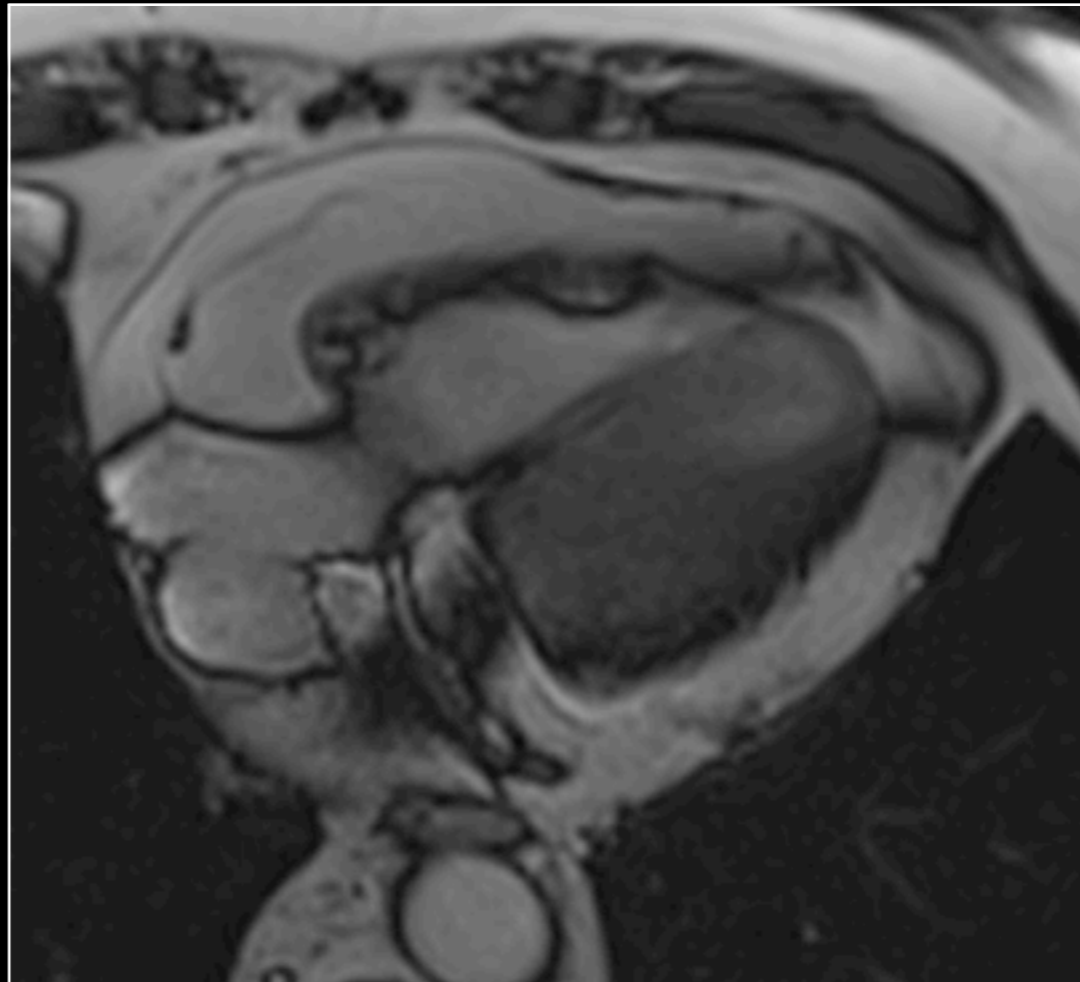
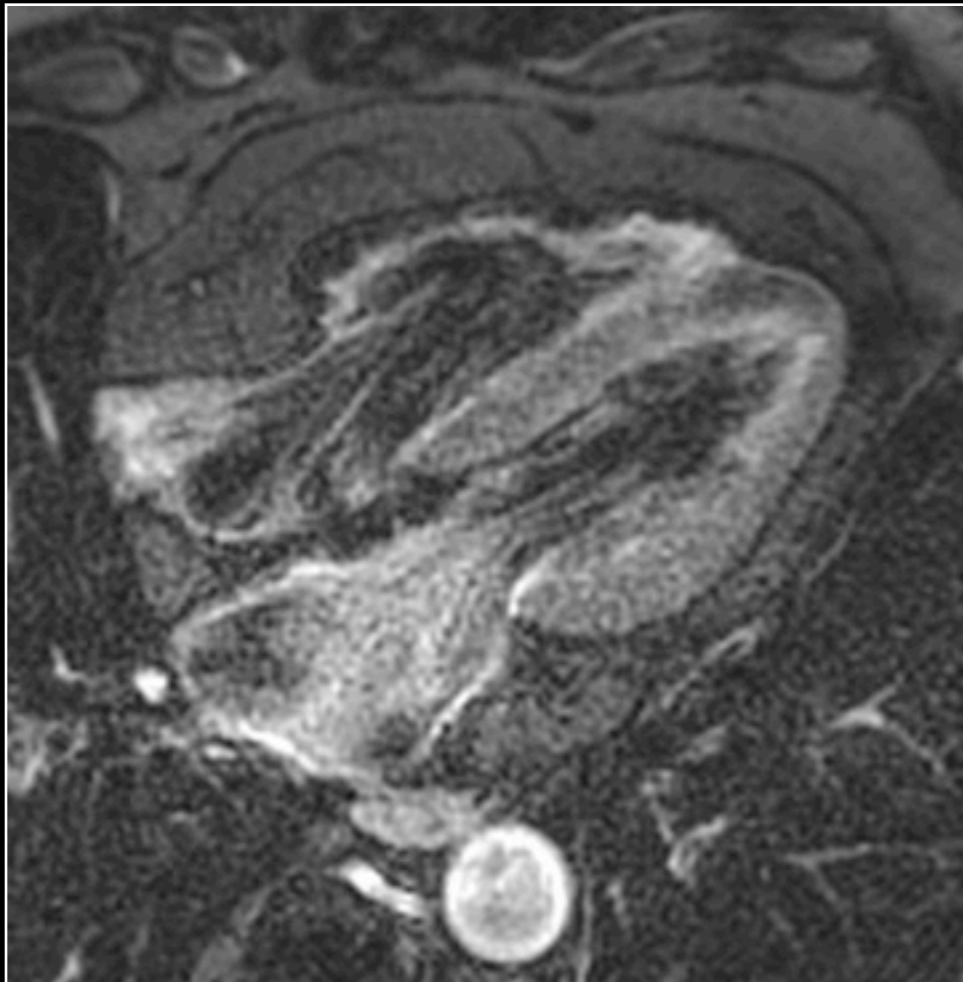
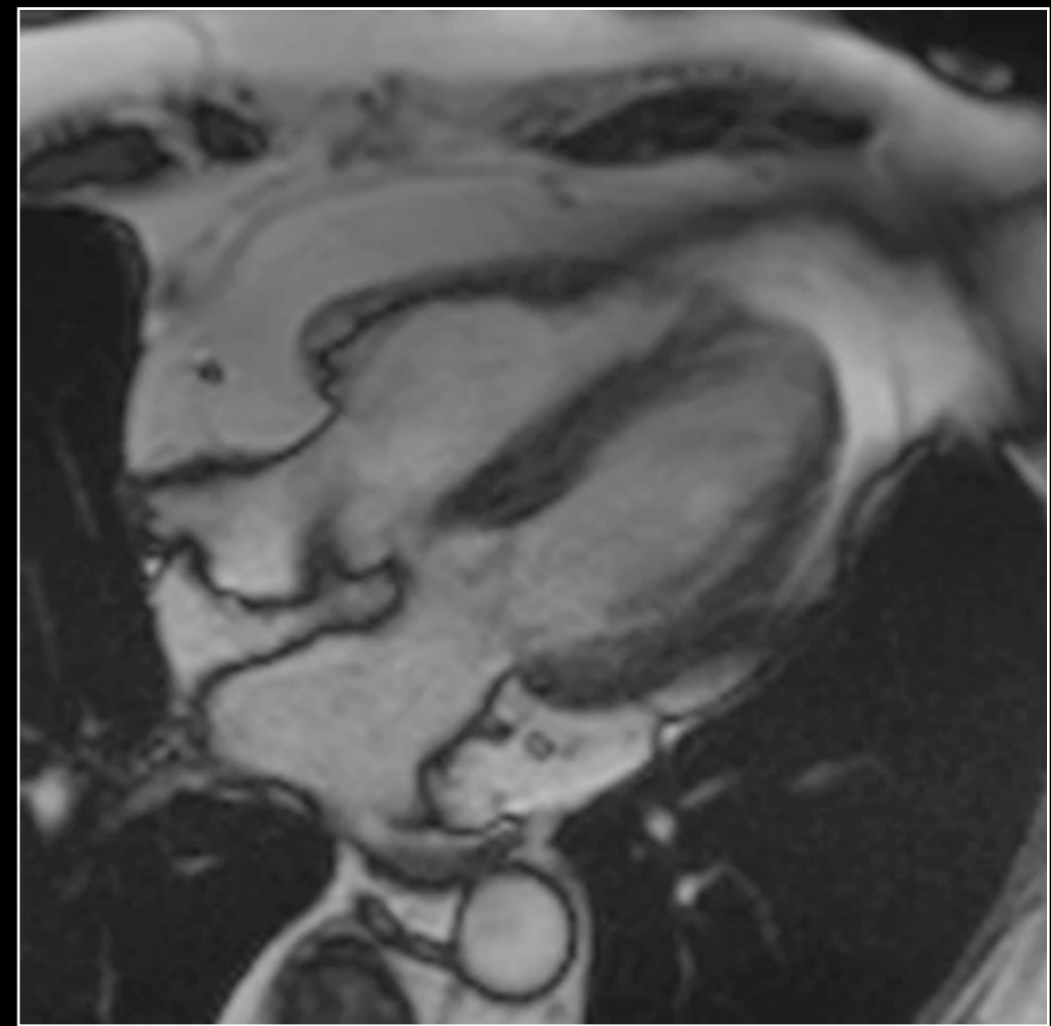
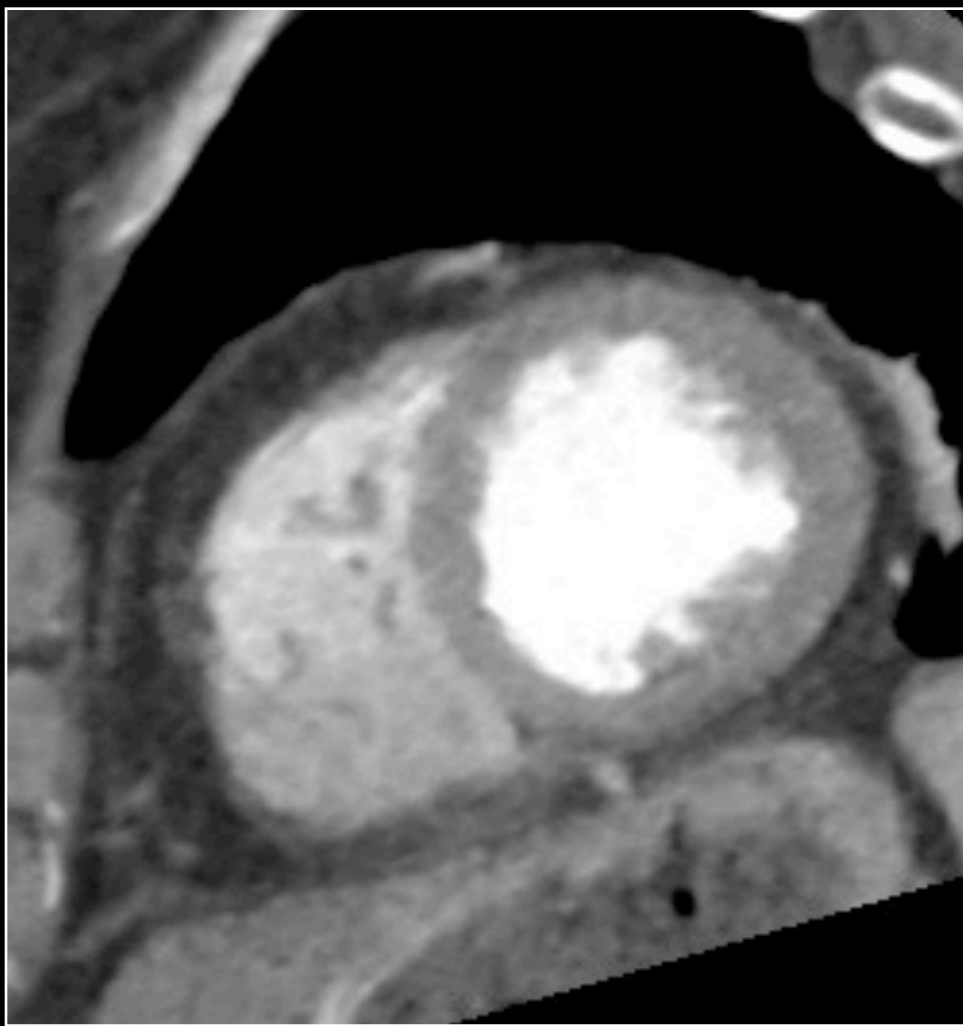
Péricarde



- entouré par la graisse péricardique et la graisse sous-épicardique
- épaisseur < 2 mm (pathologique à partir de 4 mm)
- pas visible partout
- pas de rehaussement



graisse d'abondance
variable

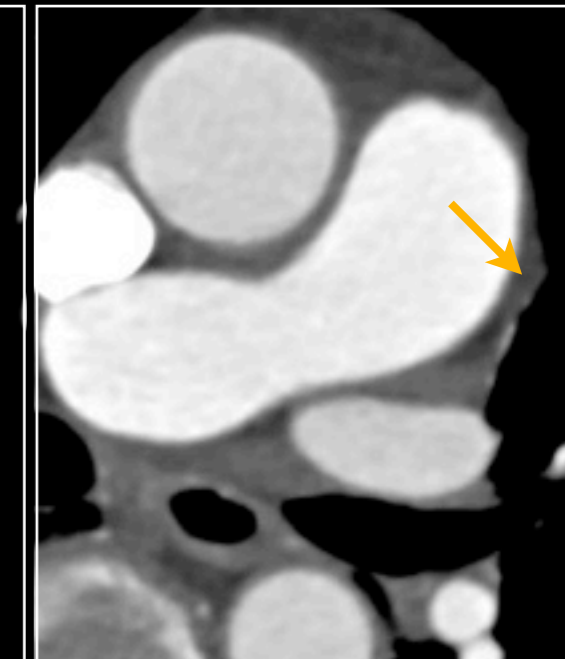
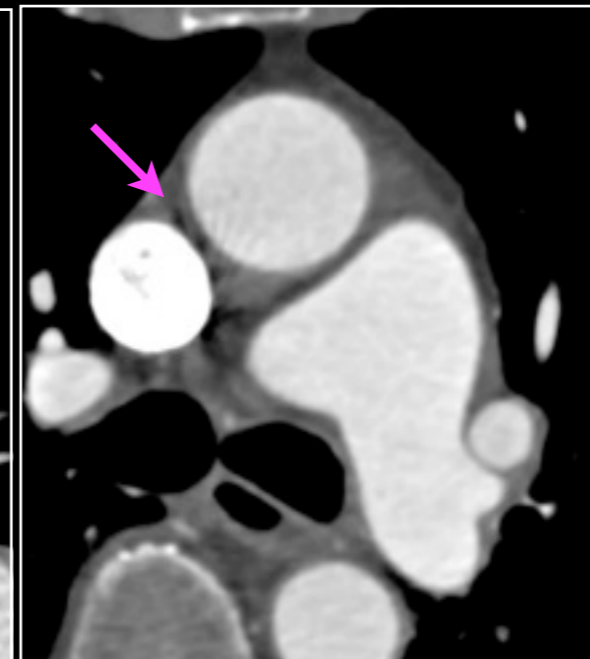
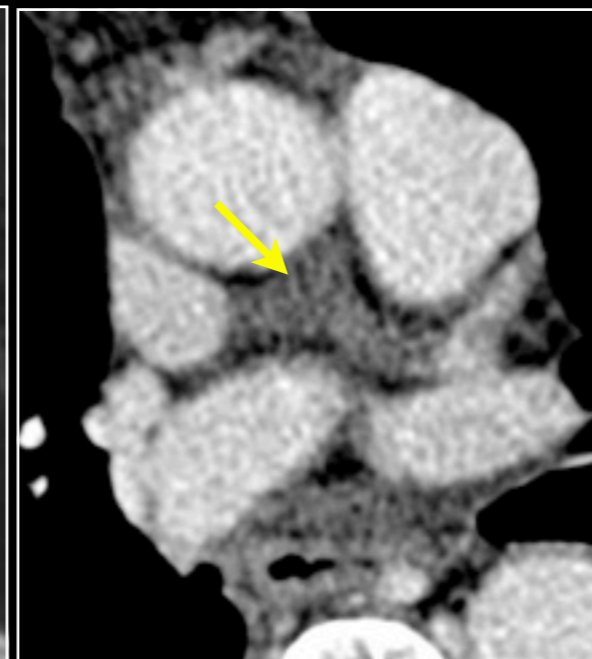
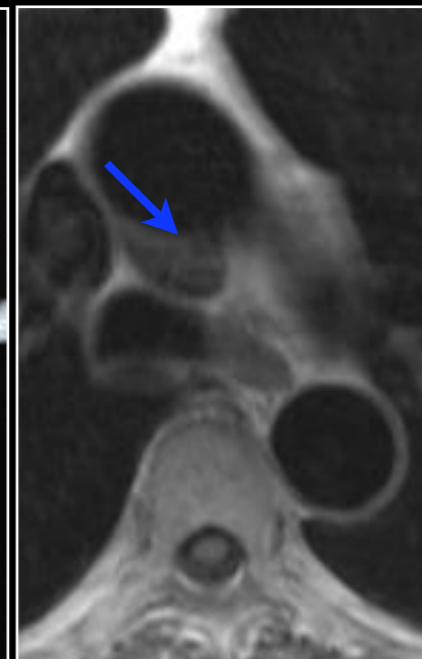
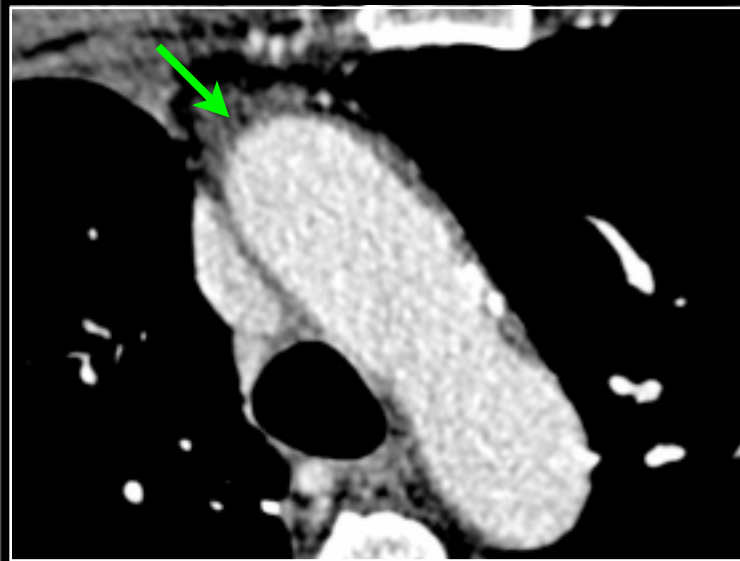
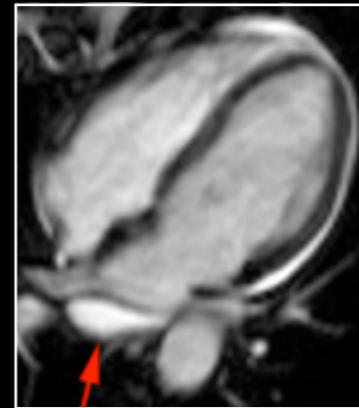
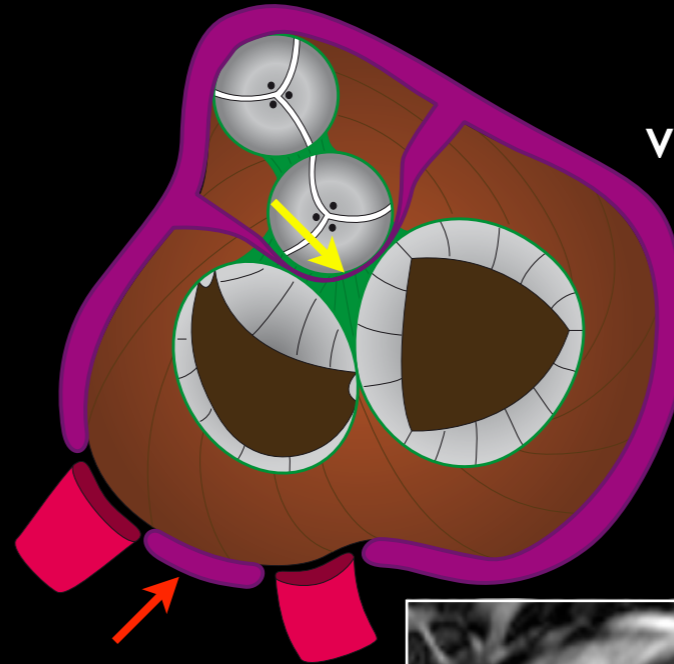
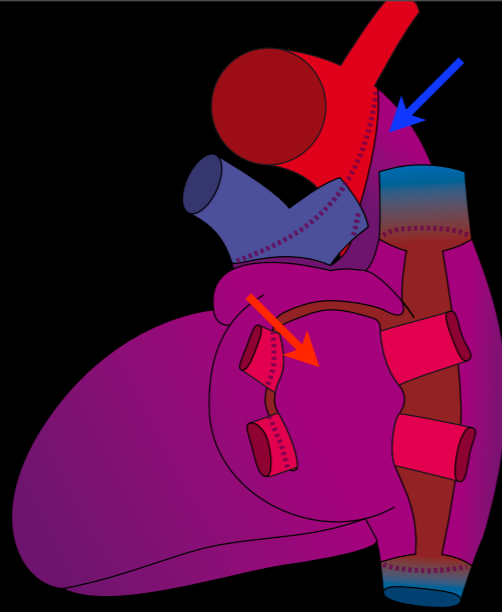
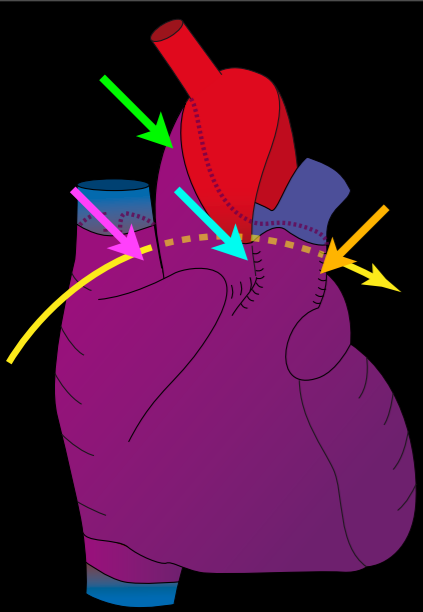


récessus de la cavité péricardique

cavité péricardique: 15 à 50 ml de liquide sécrété par le feuillet séreux

fonctions:

- limite la dilatation ventriculaire en diastole et le reflux ventriculo-atrial en télé-diastole
- adapte le volume d'éjection du VD à celui du VG
- égalise la compliance des ventricules (interdépendance des remplissages VD et VG)
- fixe le coeur
- diminue les frottements
- protège des processus médiastinaux





The End