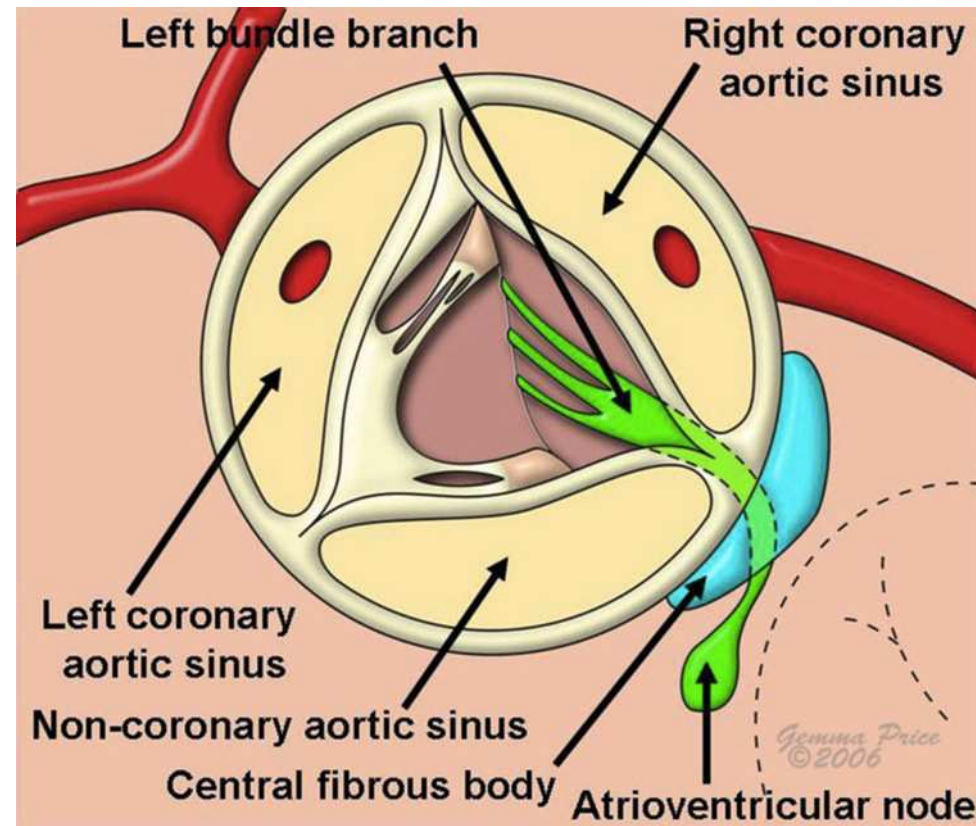


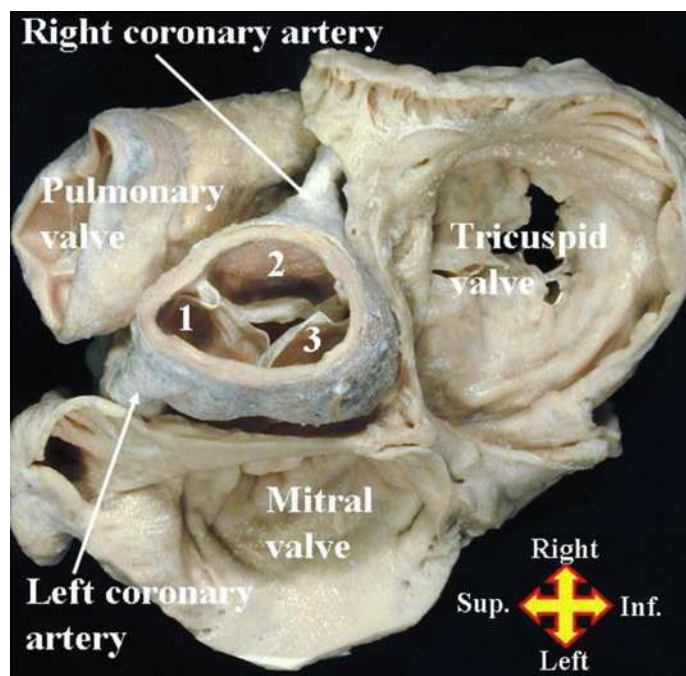
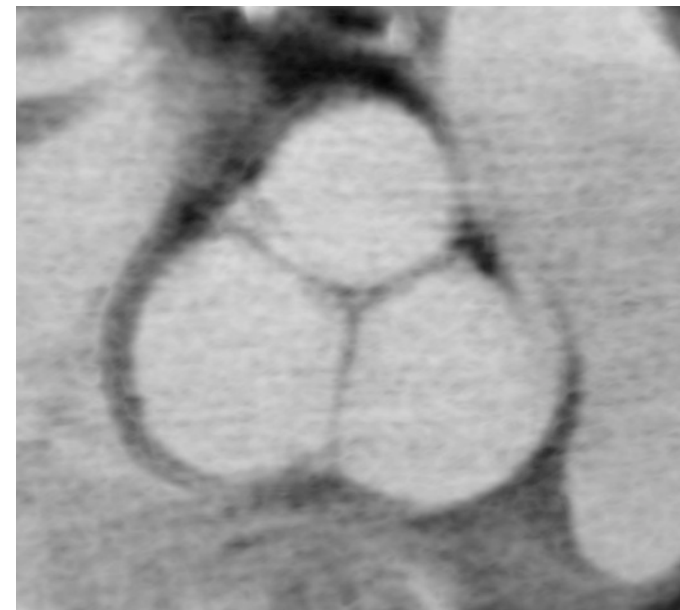
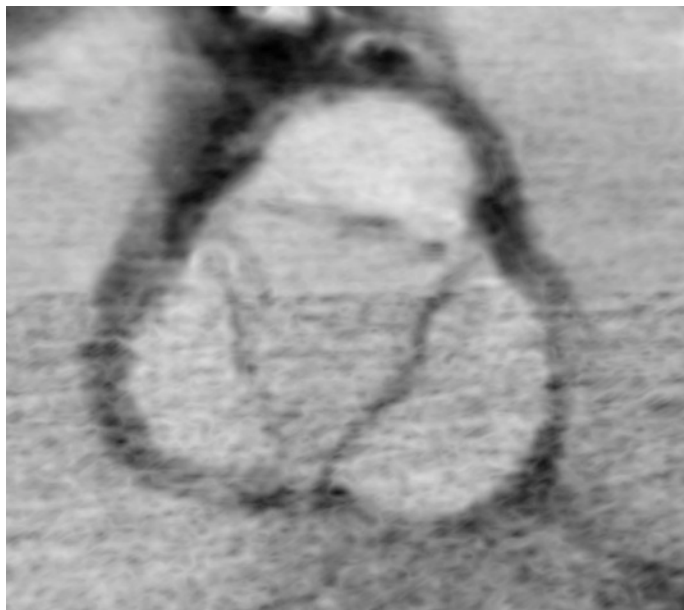
Valve aortique

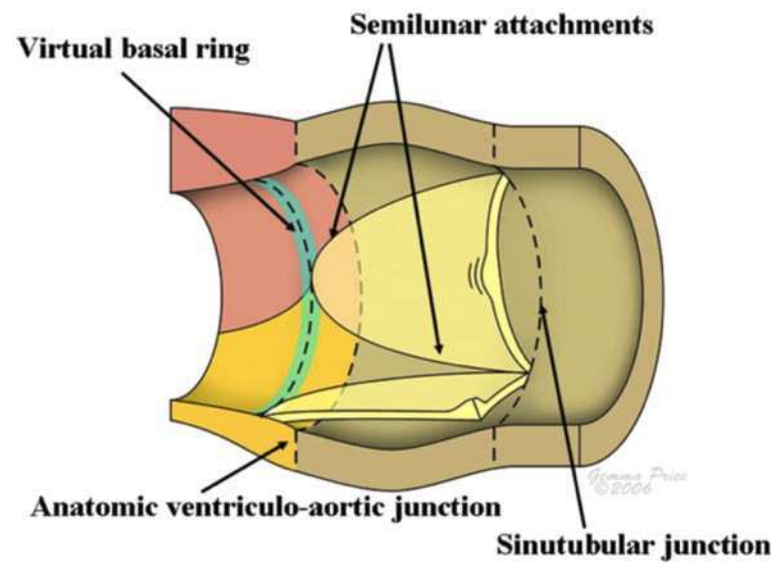
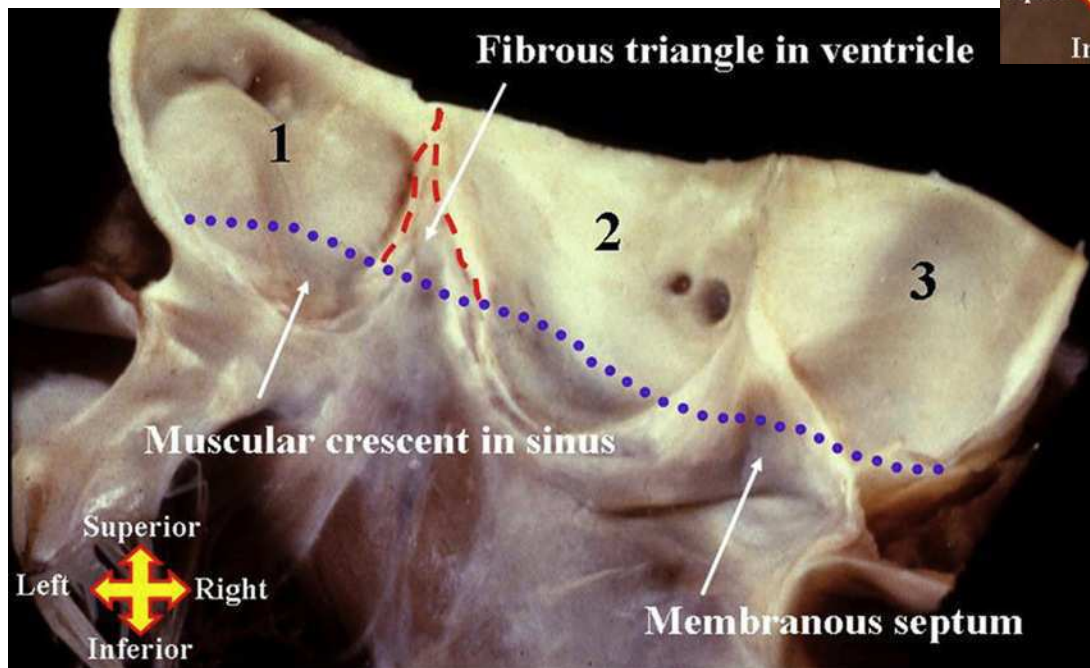
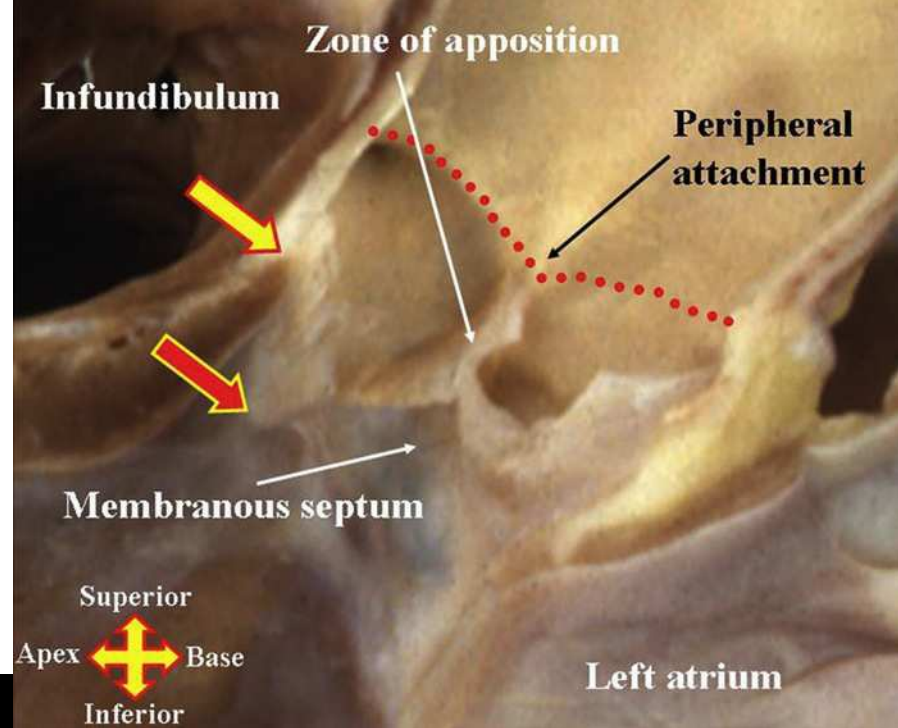
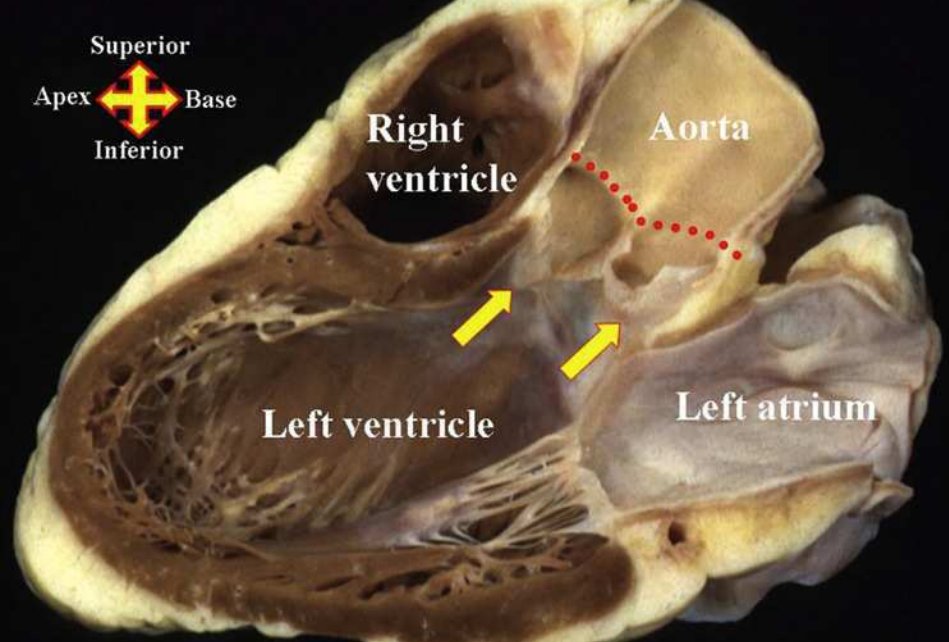
Anatomie, physiologie,
pathologies et traitement

Anatomie de la valve aortique

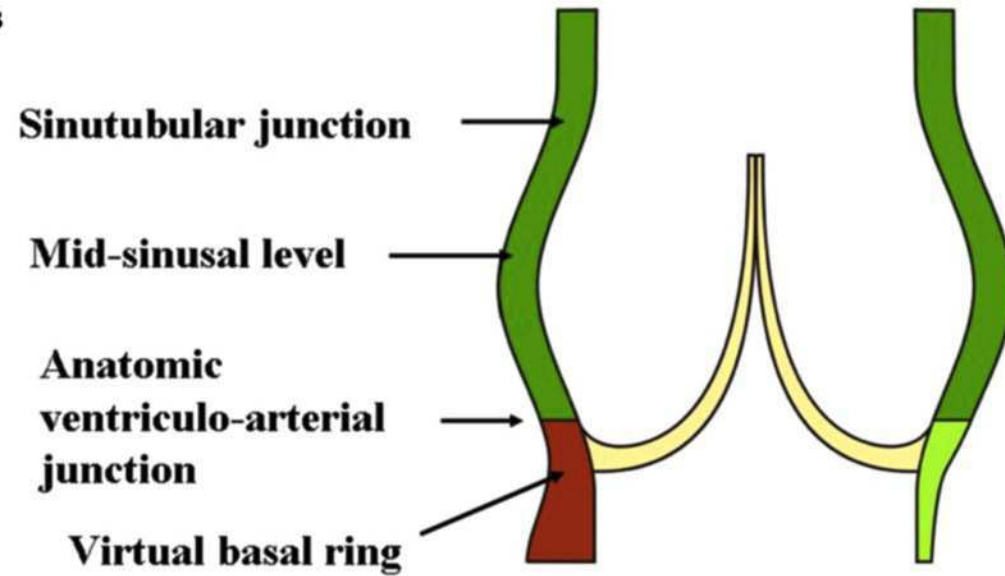
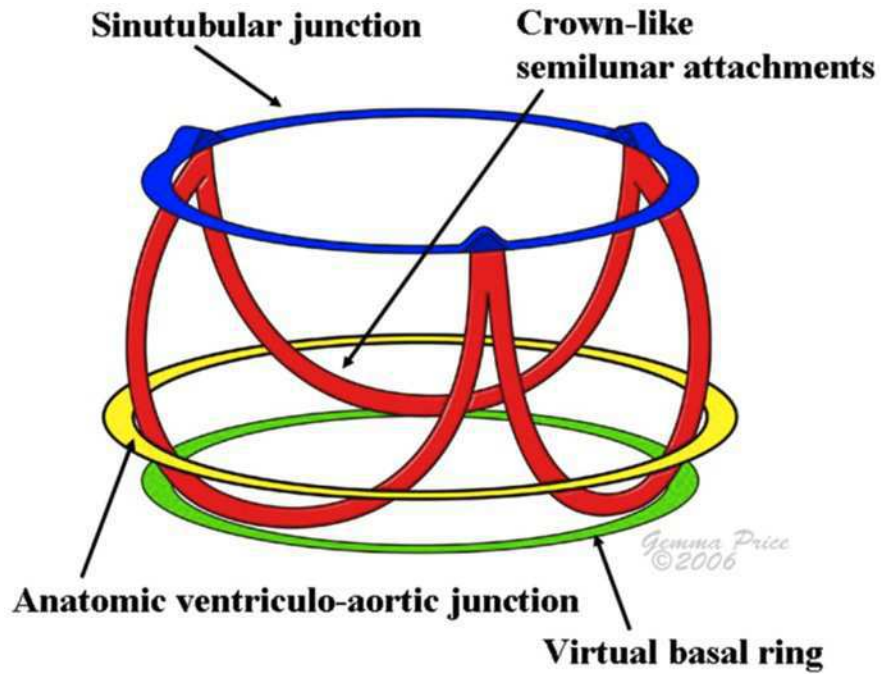
- +++ Anderson RH. The surgical anatomy of the aortic root. Multimedia Manual of Cardiothoracic Surgery. 2007 Feb. 19;2007(0219):2527-0.
- 3 feuillets (cusps, valvules ou sigmoïdes) / sinus
 - Postérieur (non coronaire)
 - Antérieur gauche (coronaire gauche)
 - Antérieur droit (coronaire droit)

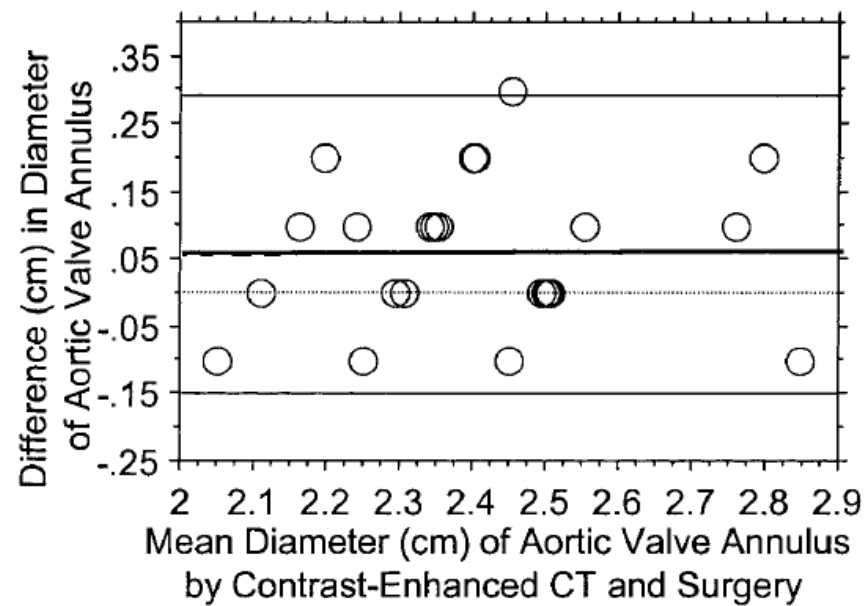
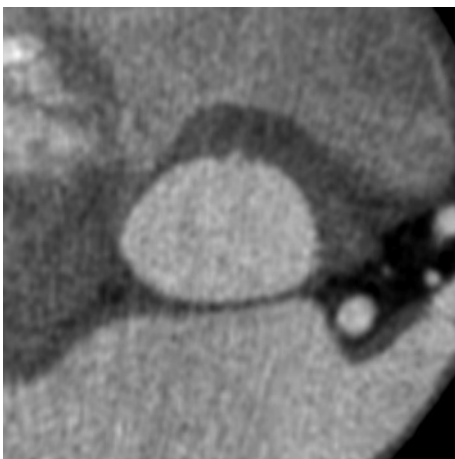






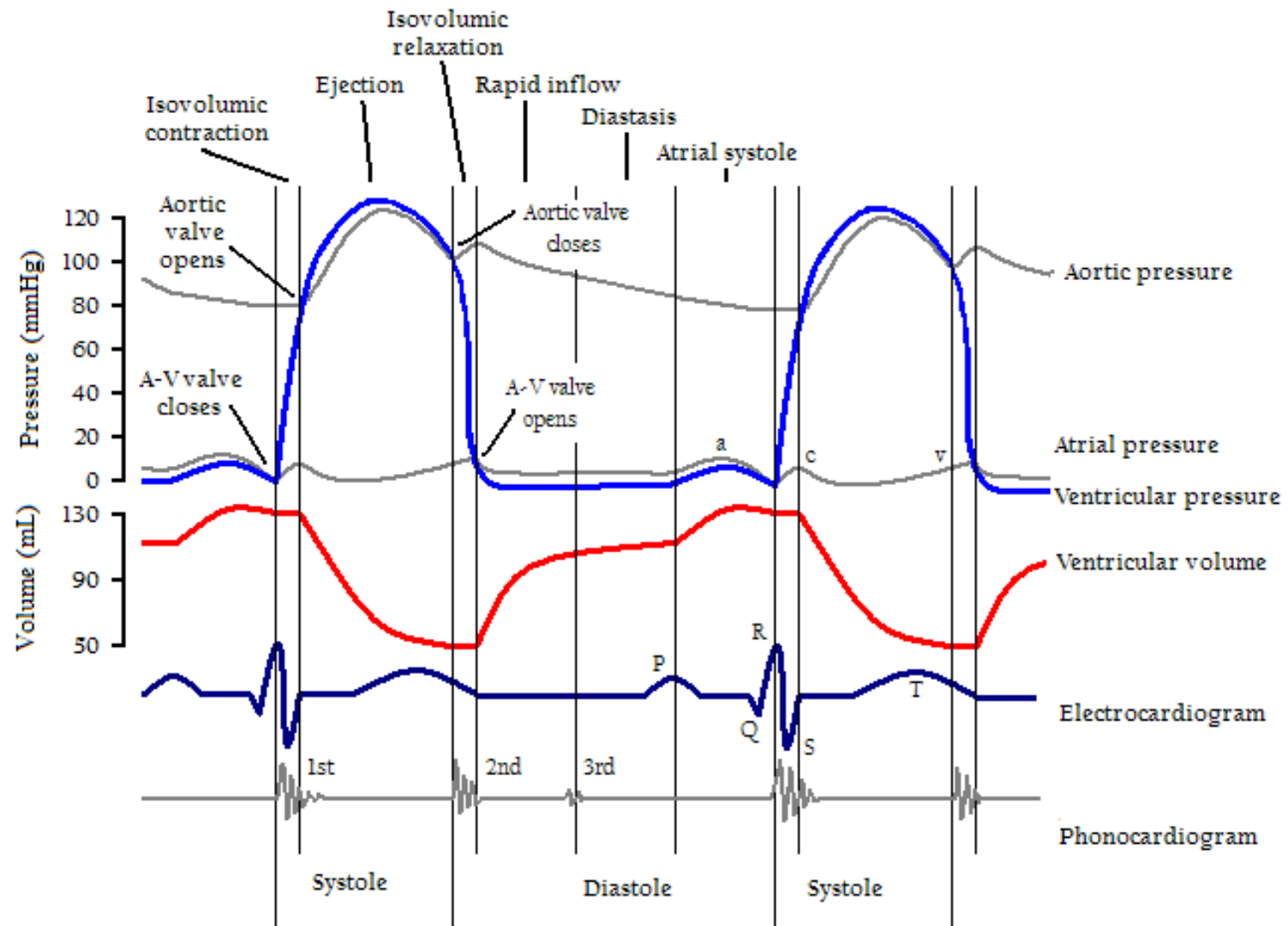
La racine aortique





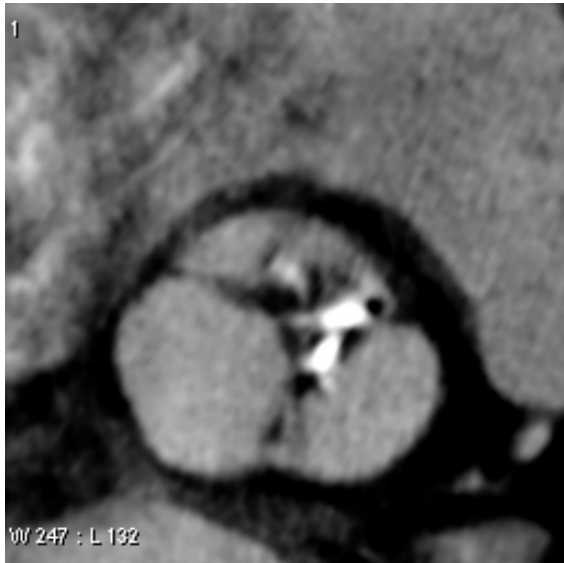
Willmann JK et al. Electrocardiographically Gated Multi-Detector Row CT for Assessment of Valvular Morphology and Calcification in Aortic Stenosis. Radiology. 2002 Aug. 12;225(1):120-128.

Physiologie

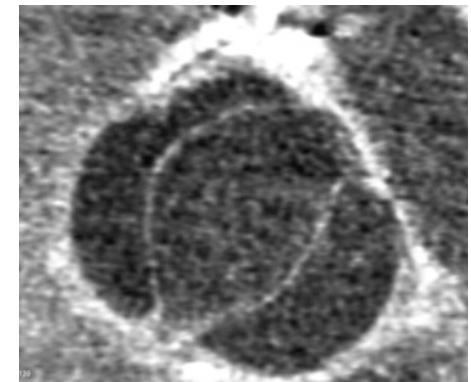
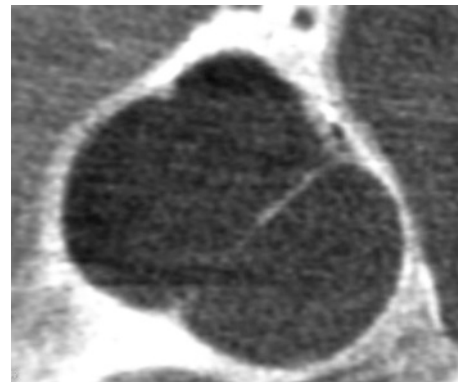


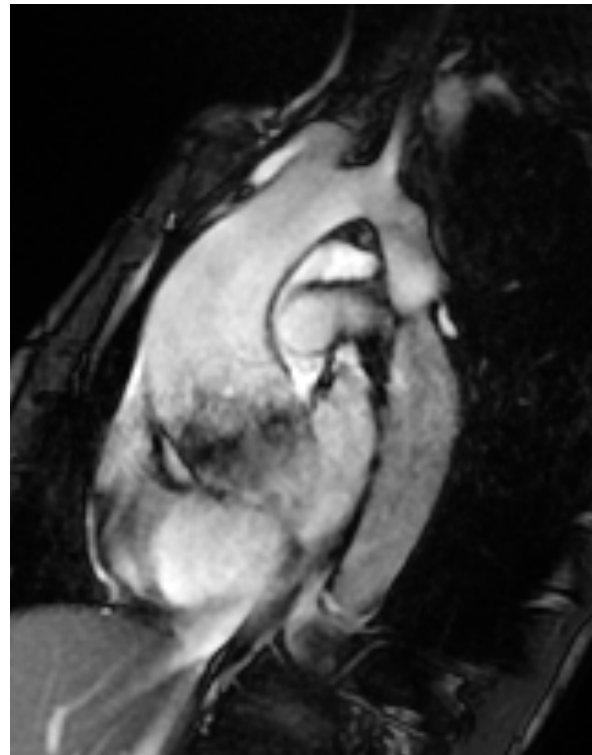
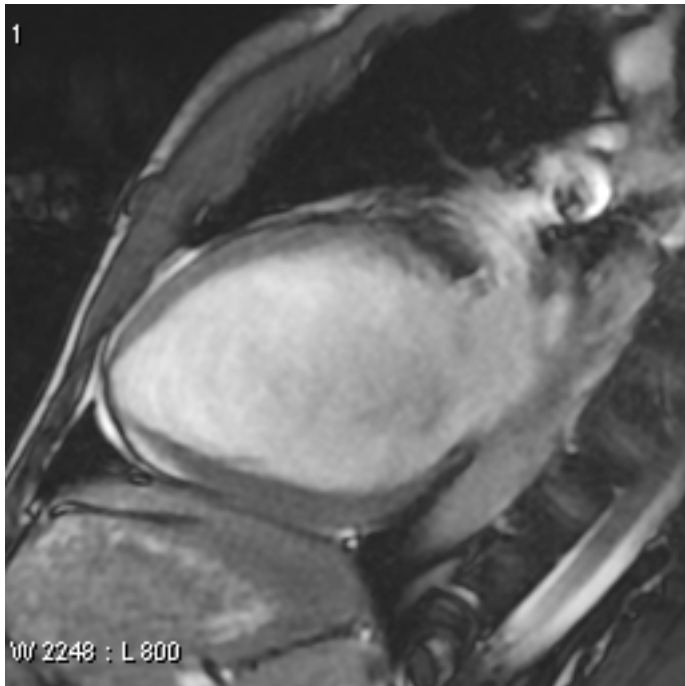
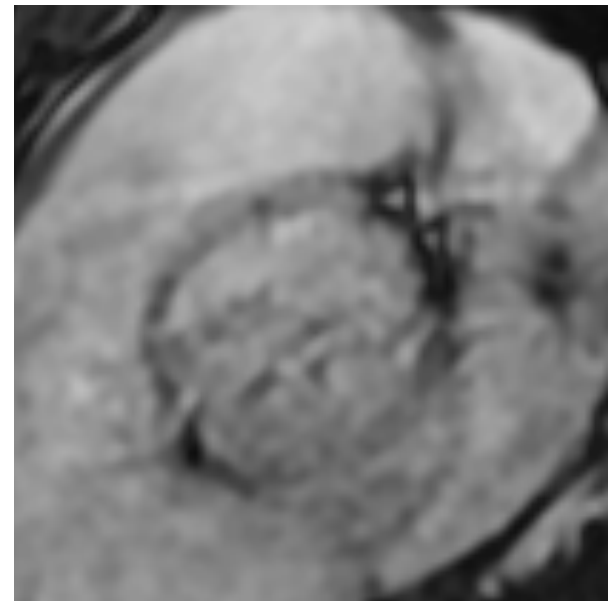
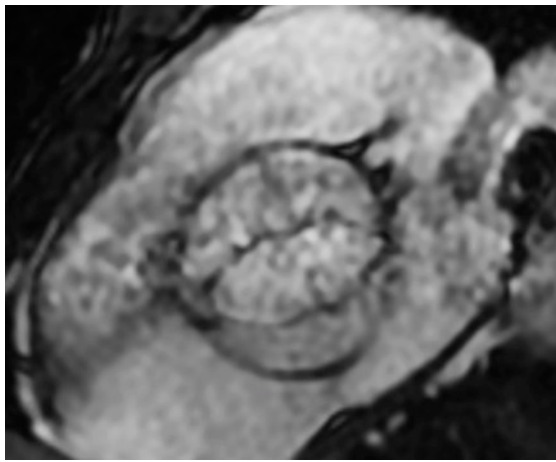
Bicuspidie aortique

- Fausse : 3 cusps (et commissures dont un raphé)



- Vraie : 2 cusps

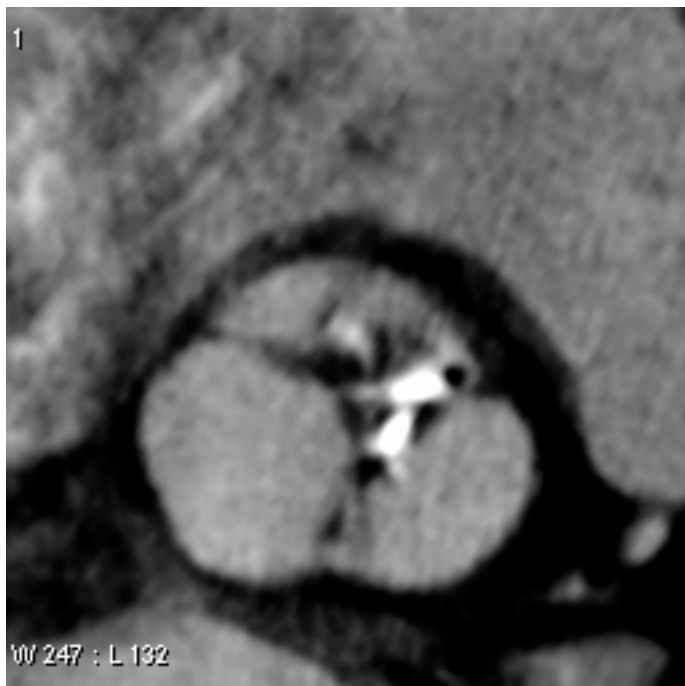




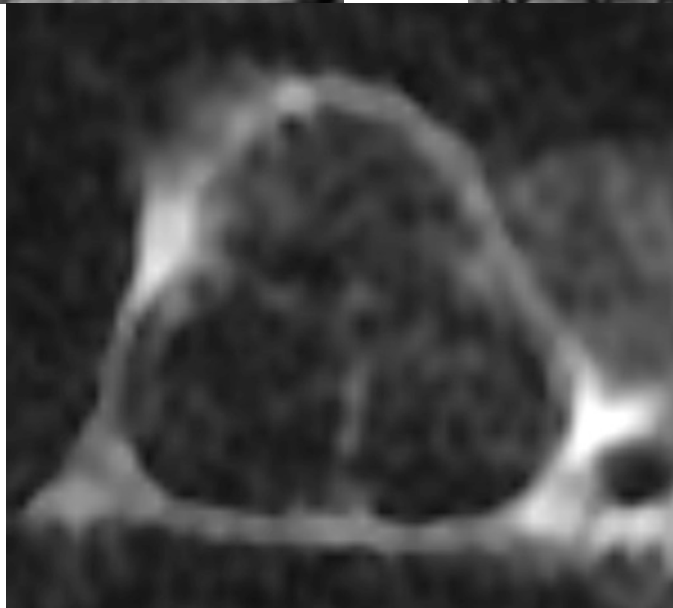
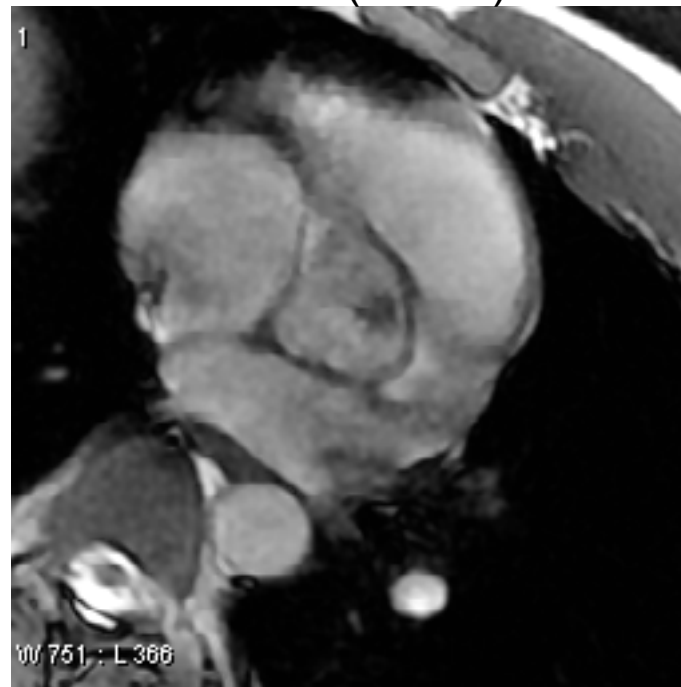
Bicuspidie

Souvent isolée

Association à :
 Anévrisme de
 l'aorte ascendante
 Coarctation
 Anévrismes artériels
 cérébraux
 Turner



SSFP (Fiesta)



DIR-FSE (« sang noir »)

Insuffisance aortique

- Définition
 - Incontinence des feuillets valvulaires aortiques en diastole
 - ⇒ régurgitation dans le VG d' une fraction du volume sanguin éjecté
 - ⇒ Dilatation VG et hypertrophie (sauf si IA aiguë)
 - ⇒ Insuffisance cardiaque
 - ⇒ En aval : augmentation de la PAS et chute de la PAD, pour maintenir le débit
 - ⇒ Insuffisance coronarienne fonctionnelle

Table 16. Natural History of Aortic Regurgitation

Asymptomatic patients with normal LV systolic function^{268–277}

Progression to symptoms and/or LV dysfunction	Less than 6% per y
Progression to asymptomatic LV dysfunction	Less than 3.5% per y
Sudden death	Less than 0.2% per y

Asymptomatic patients with LV dysfunction^{281–283}

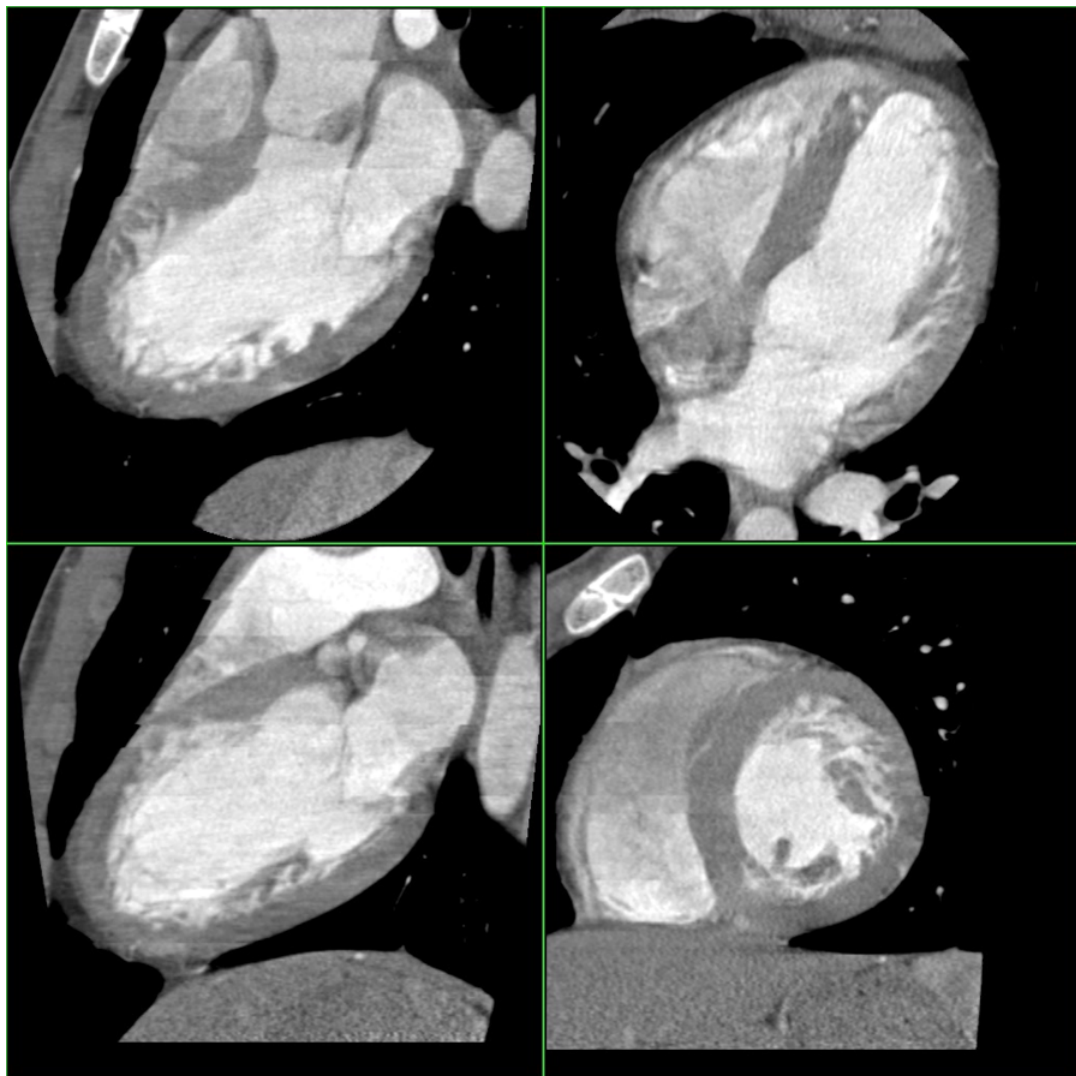
Progression to cardiac symptoms	Greater than 25% per y
---------------------------------	------------------------

Symptomatic patients^{284–288}

Mortality rate	Greater than 10% per y
----------------	------------------------

LV indicates left ventricular.

ACC/AHA Guidelines for the management of patients with valvular heart disease



IA : étiologies

- IA aiguë
 - Endocardite
 - Dissection
 - Traumatisme thoracique
- IA chronique
 - Maladie annulo-ectasiente
 - RAA
 - Endocardite
 - Congénitale (bicuspidie)
 - Aortite (syphilis, SAA, polyarthrite rhumatoïde...)

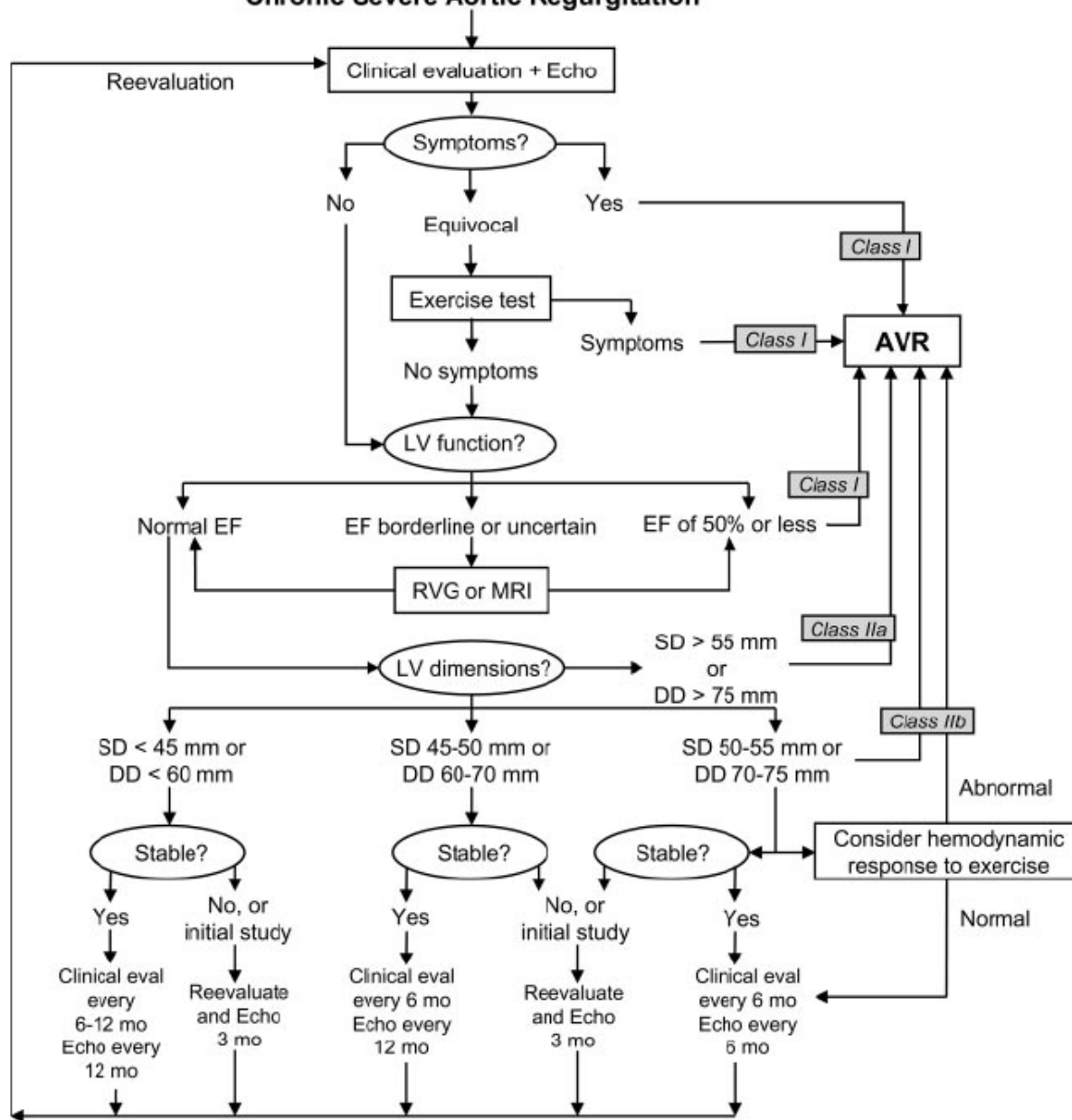
IA : Diagnostic

- **Signes fonctionnels** (peu spécif. et tardifs):
 - Asthénie, fatigabilité à l'effort
 - Dyspnée d'effort voire de repos (IC)
 - Douleur angineuse
- **Signes cliniques:**
 - Souffle diastolique maximum au foyer aortique, irradiant le long du bord G du sternum, timbre doux et humé
 - Signes périphériques:
 - Elargissement de la PA différentielle
 - Hyperpulsatilité artérielle
 - Signes d'insuffisance cardiaque
- **Examens complémentaires:** Echocardiographie +++

IA : Traitement

- **TTT médical :**
 - Régime hyposodé et diurétiques
 - IEC
 - Prévention de l'endocardite
- **TTT chirurgical :**
 - Remplacement valvulaire aortique +/- remplacement de l'aorte ascendante (intervention de Bentall)
 - Si IAo symptomatique ou altération de la fonction VG
 - Survie : 50-60% à 10 ans

Chronic Severe Aortic Regurgitation



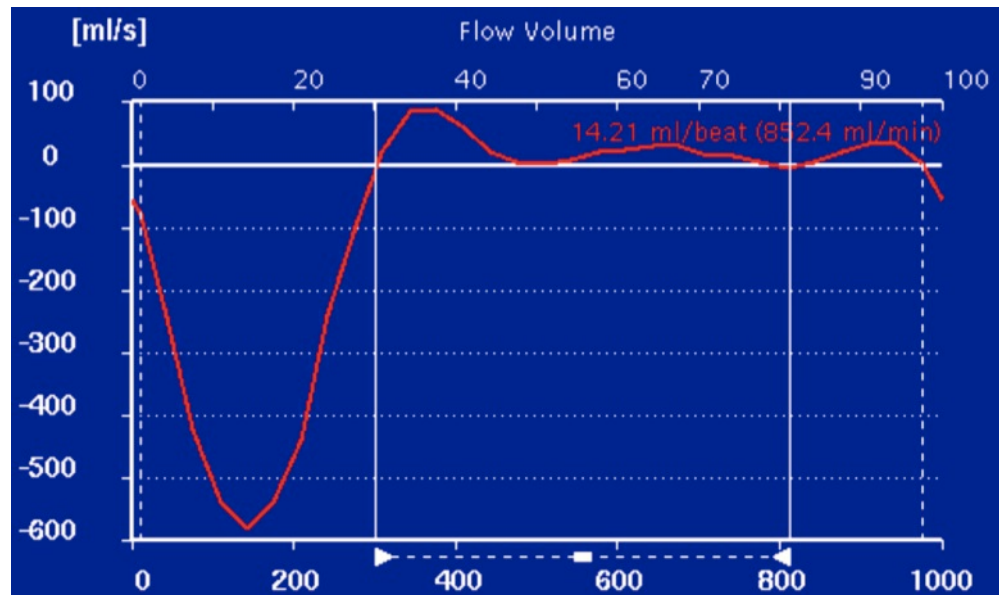
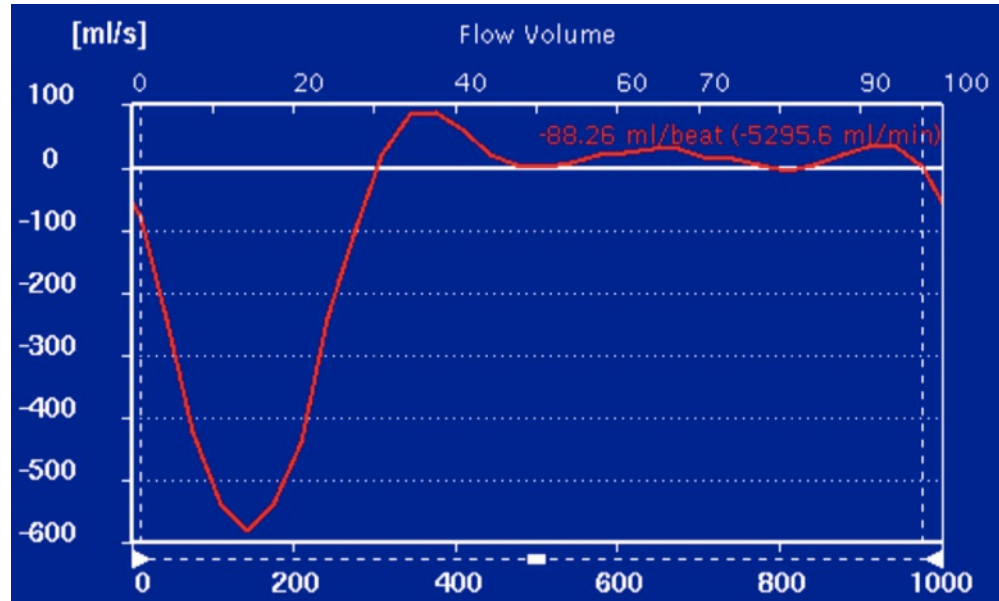
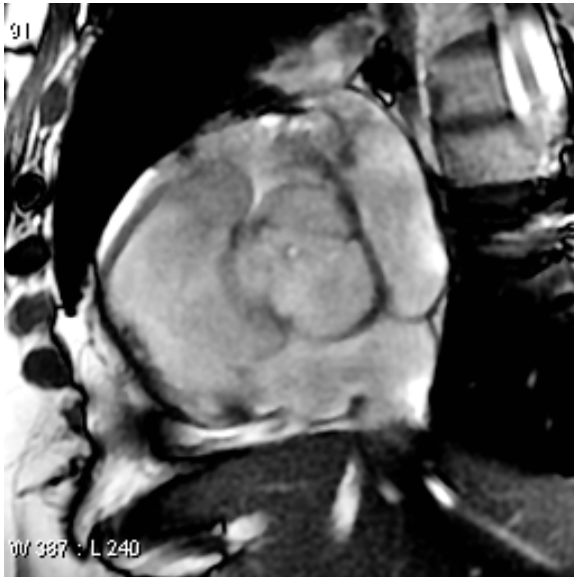
Quantification



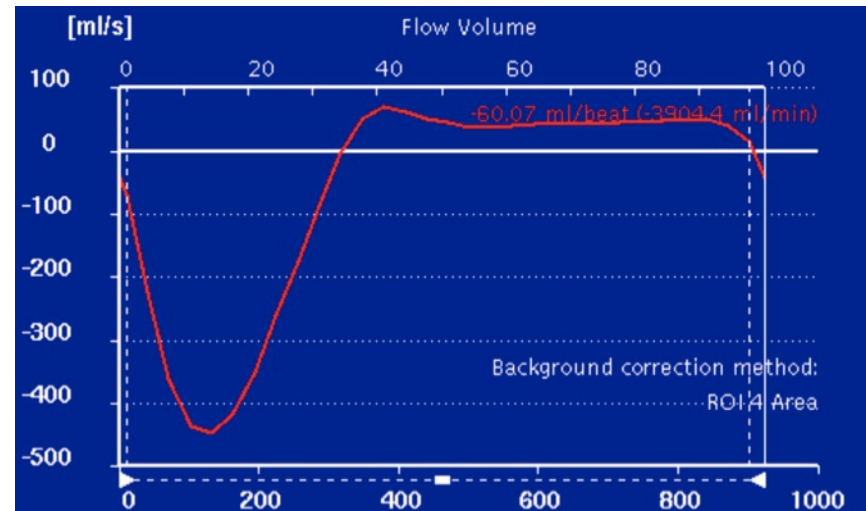
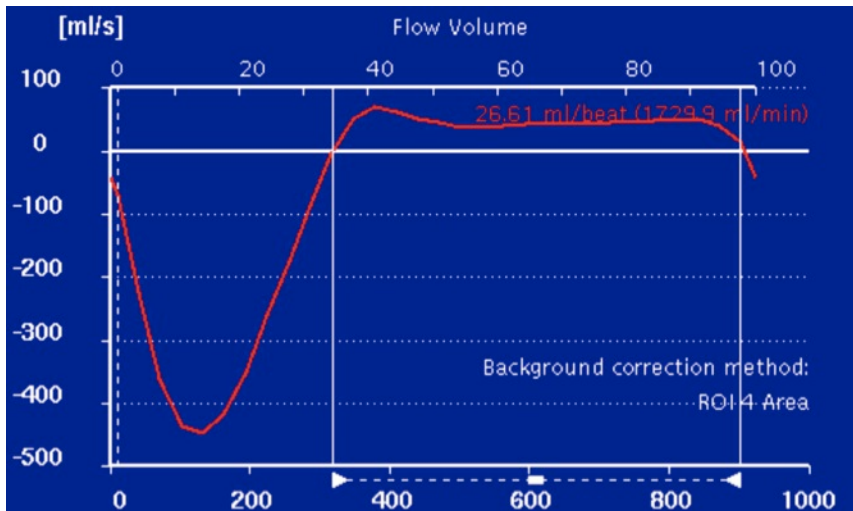
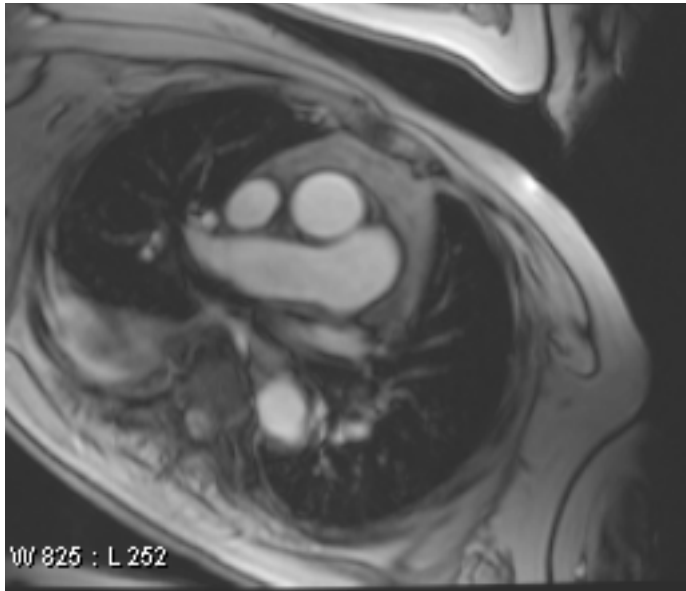
Scanner

Planimétrie ±

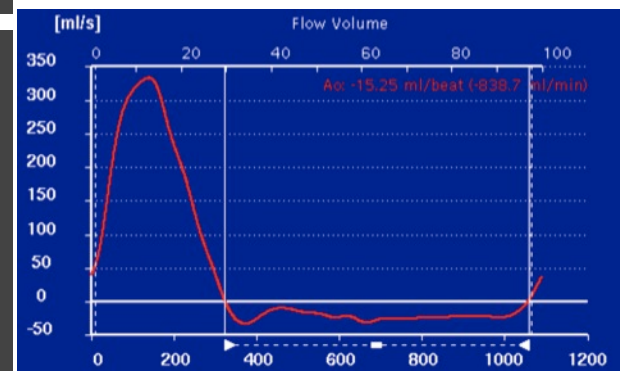
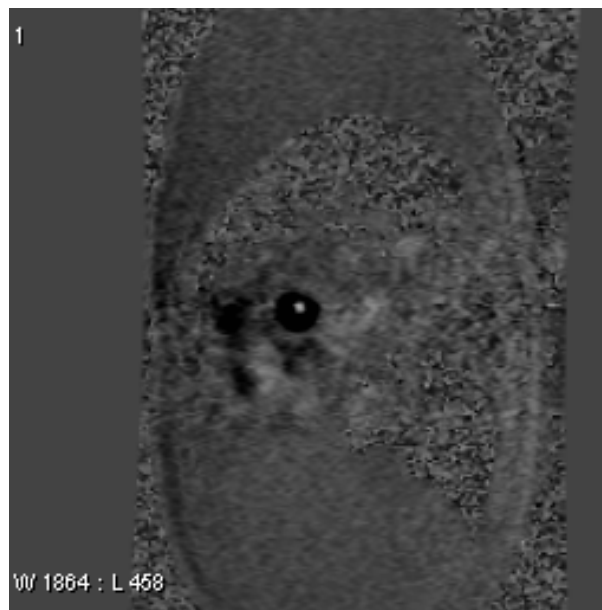
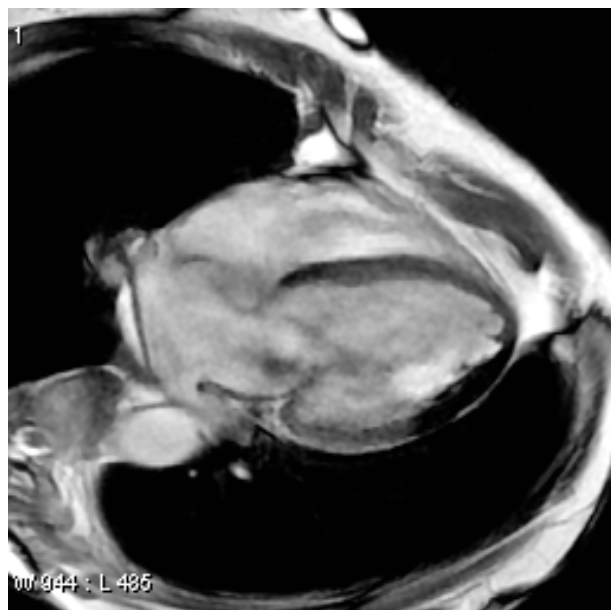
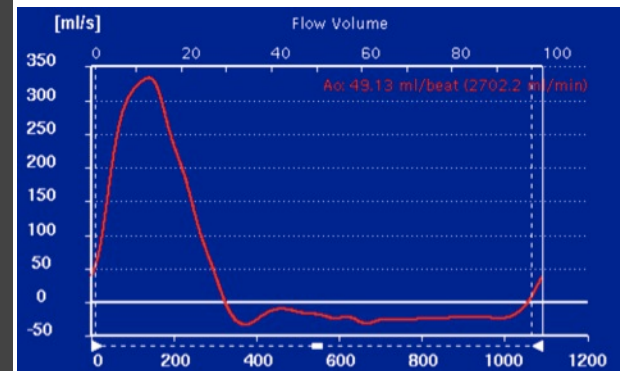
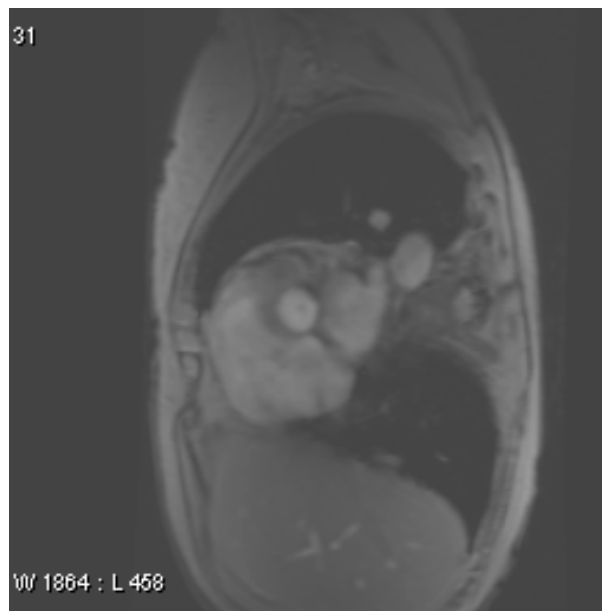
IRM



IRM : contraste de phase



IRM



Rétrécissement aortique

- Définition
 - Diminution de l' orifice d' ouverture
 - ⇒ Obstacle à l' éjection du VG -> augmentation de la post-charge
 - ⇒ Hypertrophie VG, puis dilatation à un stade plus évolué
 - Surface aortique normale $\sim 3 \text{ cm}^2$
 - RA serré $< 0,8 \text{ cm}^2$

RA : Etiologies

- **RAo dégénératif:**
 - Dégénérescence liée à l'âge
 - Fréquence +++, >70 ans
 - Calcifications valvulaires avec perte de souplesse et de mobilité
 - = maladie de Monckeberg
- **RAo post RAA**
 - + rare de nos jours en France
 - Svt associé à d'autres valvulopathies
 - Adulte jeune le + svt
 - Fusion des commissures et rétraction des valves
- **RAo congénital**
 - 15% des cas
 - Atteinte Valvulaire (bicuspidie ++), supraV, sousV

RA : Diagnostic

- **Signes fonctionnels:**
 - Asymptomatique → découverte fortuite
 - SF=RAo serré, symptôme à l'effort
 - Syncopes ou lipothymies
 - Angor
 - Dyspnée
- **Signes cliniques:**
 - Souffle systolique, foyer aortique, râpeux, irradiant vers les carotides
 - Recherche de signes d'insuffisance cardiaque
- **Examens complémentaires:**
 - Echocardiographie +++ : confirmation et diagnostic de sévérité
 - ECG, RP, cathétérisme cardiaque

RA : Evolution

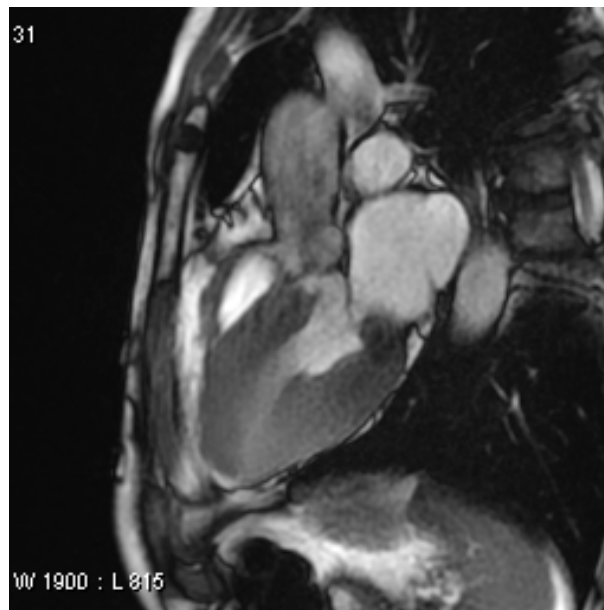
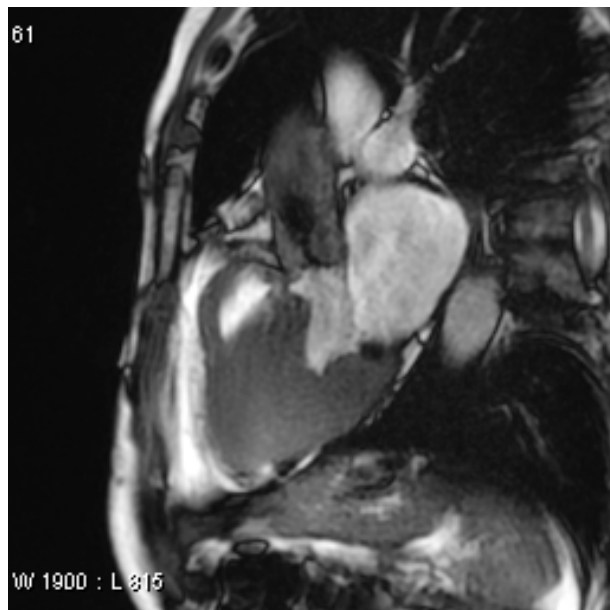
- Tout RAO serré a un pronostic sévère même asymptomatique
- En cas de symptômes survie sans TTT allant de 2 à 5 ans (mort subite 1/3)
- Surveillance régulière nécessaire car l' évolution vers un RAO serré peut être rapide
- Complications:
 - Endocardite infectieuse
 - Embolie calcaire (coronaire, oculaire, artérielles périphériques)
 - TDR
 - IDM

RA : Traitement

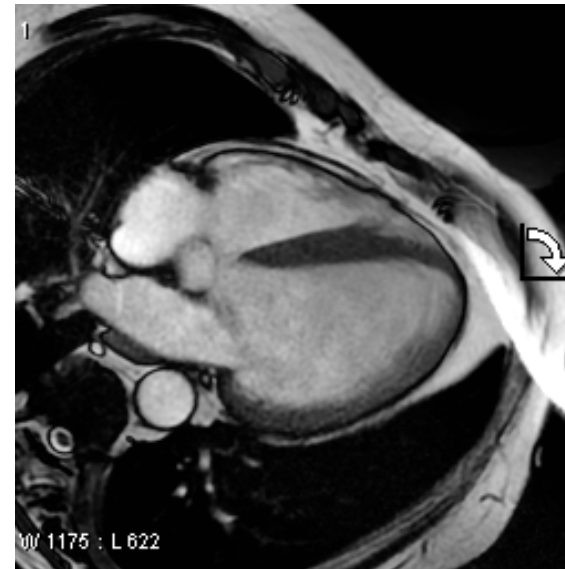
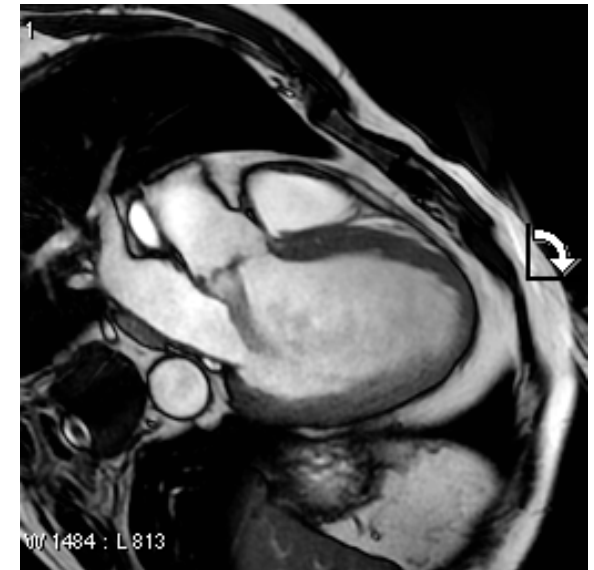
- Seul efficace = RVA (chirurgie ou TAVI)
- Mortalité opératoire entre 5-10%
- Survie 70% à 5 ans.
- Prévention de l'endocardite



Quantification RA



IRM : planimétrie



IRM : contraste de phase

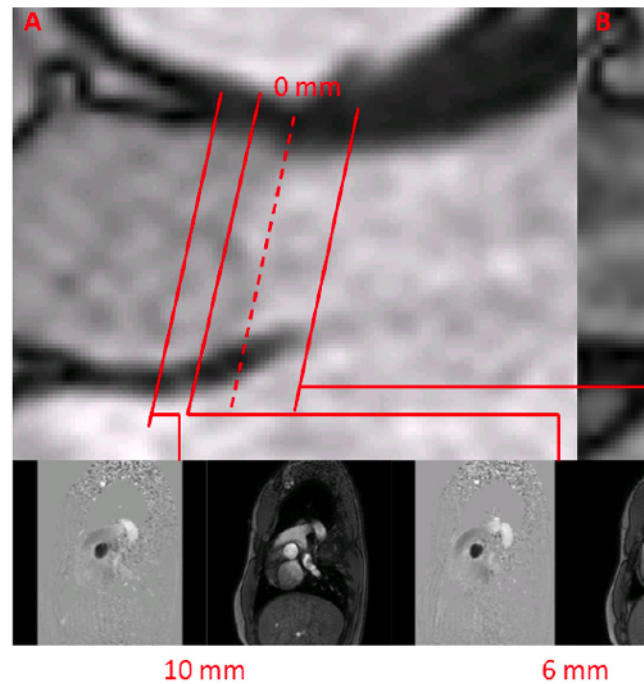


Figure 1 Image planes used for CMR measurements. Panel A shows the flow upstream from aortic valve plane (used as the 0 mm reference) and at +6 and +10 mm. Panel B shows the sectional area of the LVOT is measured at the -12 mm position.

Garcia J, Kadem L, Larose E, Clavel M-A, Pibarot P. Comparison of Transthoracic Doppler Echocardiography for the Estimation of Effective Orifice Area by CMR. 2011 Apr. 28;13(1):25.

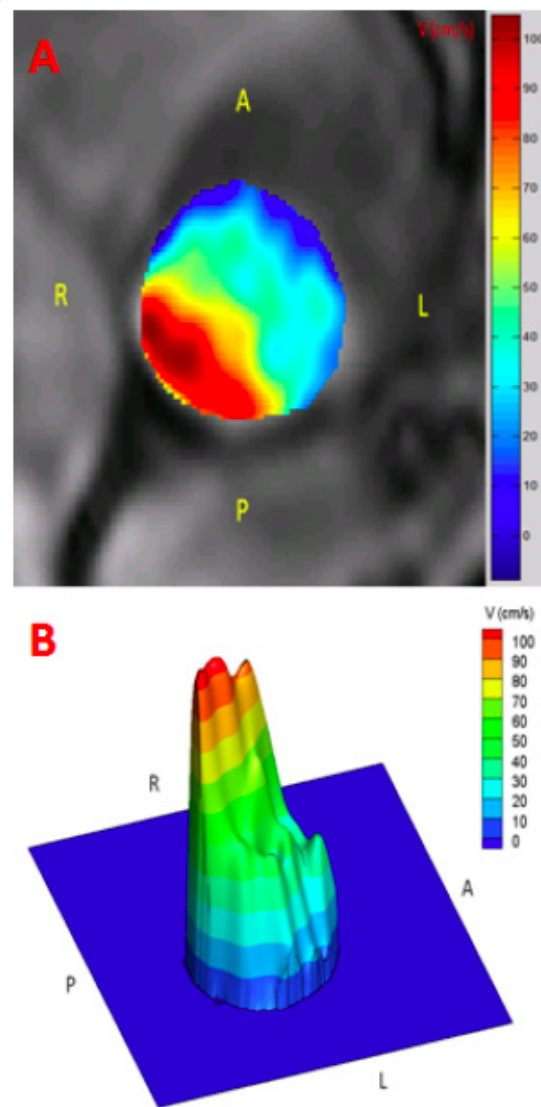


Figure 4 Flow velocity profile obtained by CMR in the LV outflow tract (LVOT). The figure shows the flow velocity profile within the LVOT in a patient with AS. Panels A and B show the 2D and 3D flow velocity profile.

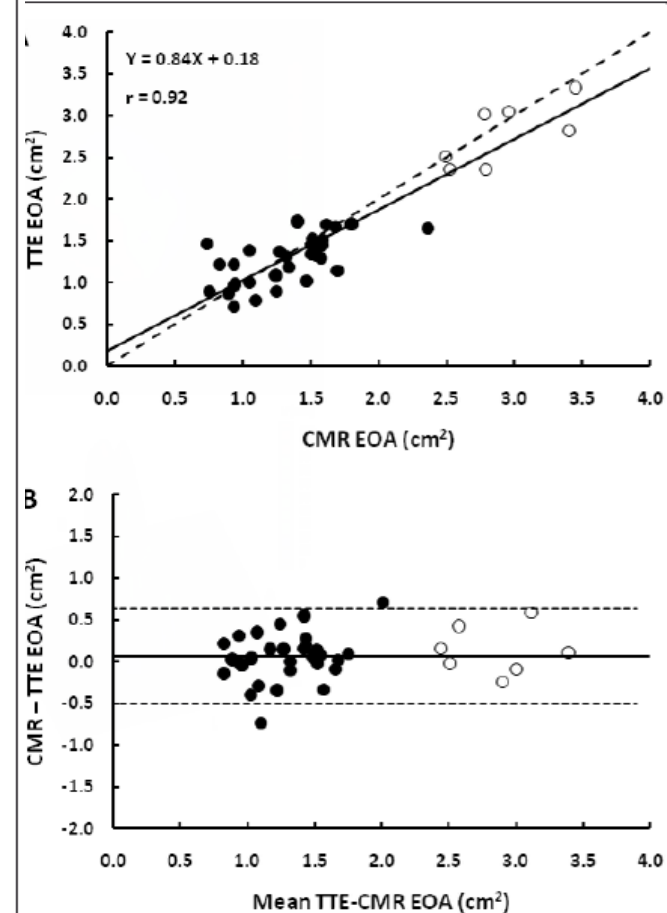


Figure 5 Comparison of valve effective orifice area (EOA) measured by TTE versus by CMR. Panel A shows the Pearson correlation plot. The solid line is the regression line and the dashed line is the identity line. Panel B shows the Bland-Altman plot. The solid line is the mean bias and dashed lines are ± 1.96 standard deviations lines.

Table 2. Select Studies Validating Indices of Aortic Stenosis by CMR

First Author (Year)	Principle	Reference Standard	n	r	Mean Difference±1 SD (CMR—Echo)	CMR Reproducibility*: Mean Difference±1 SD
Velocity/gradients						
Kilner ²³ (1993)	$\dot{V}_{\max}$	TTE	26†	...	−0.10±0.46 m/s	0.11±0.29 m/s‡
Eichenberger ²⁴ (1993)	peak ΔP	TTE	15	...	2.6±13.3 mm Hg	...
	mean ΔP			0.96	−0.6±8.5 mm Hg	
Sondergaard ²⁵ (1993)	$\dot{V}_{\max}$	TTE	12	...	−0.88±0.91 m/s	...
Caruthers ²⁶ (2003)	peak ΔP	TTE	24	0.82	...	r=0.94§
	mean ΔP			0.87		
Physiological valve area						
Caruthers ²⁶ (2003)	continuity equation	TTE	24	0.83	...	r=0.94§
Anatomic valve area						
John ²⁷ (2003)	planimetry	TEE	40	0.96	0.02±0.08 cm ² ¶	0.07±0.06 cm ² ‡ 0.05±0.04 cm ² #
Kupfahl ²⁸ (2004)	planimetry	TEE	32	...	0.02±0.21 cm ²	0.03±0.05 cm ² ‡ −0.02±0.06 cm ² #
Debl ²⁹ (2005)	planimetry	TEE	25	0.86	0.13±0.16 cm ² ¶	...
Reant ³⁰ (2006)	planimetry	TEE	39	0.58	0.01±0.14 cm ²	0.03±0.14 cm ² ‡
					(Echo—CMR)	0.02±0.07 cm ² #
Schlosser ³¹ (2007)	planimetry	TEE	32	0.82	0.15±0.13 cm ²	0.75**‡

n Indicates sample size; TTE, transthoracic echocardiography; peak ΔP , peak pressure gradient; mean ΔP , mean pressure gradient; and TEE, transesophageal echocardiography.

If not stated in the publication, statistics were calculated from the data provided in the manuscript. If this was not performed or data were not provided, a designation of “not available” (...) was given.

*Reported as mean difference±1 SD; if not available, the statistical test provided by the author is stated.

†This analysis included 17 aortic stenosis and 9 mitral stenosis measurements.

‡Interobserver reproducibility.

§Interstudy reproducibility.

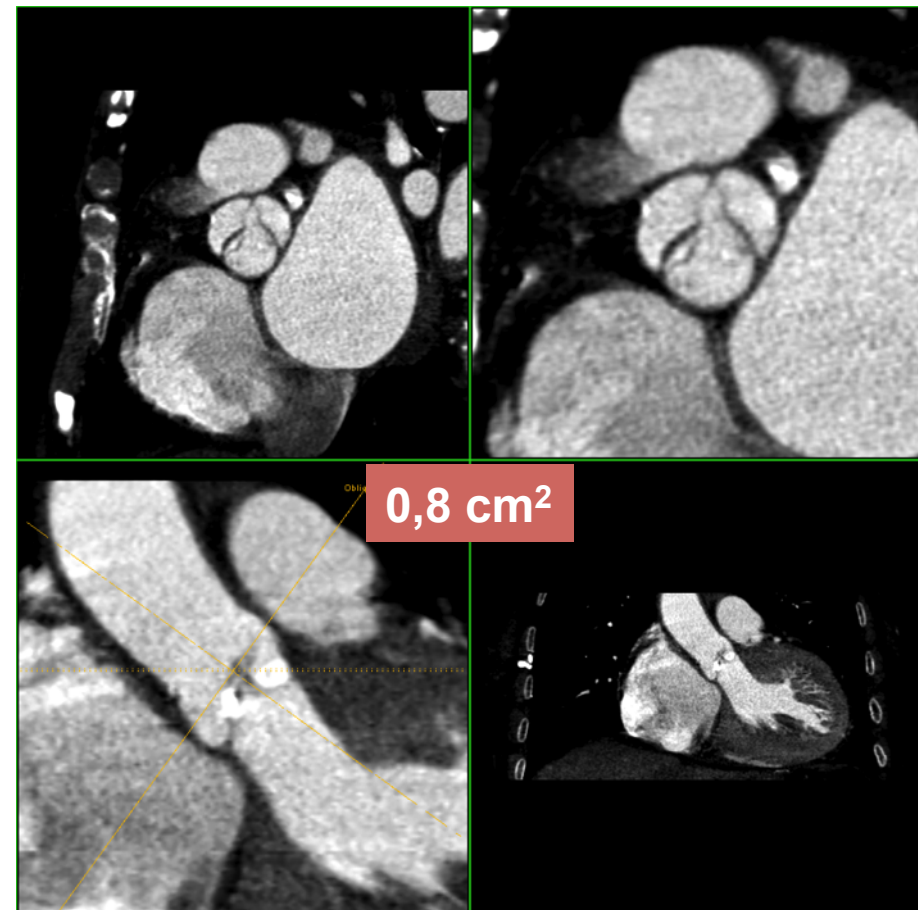
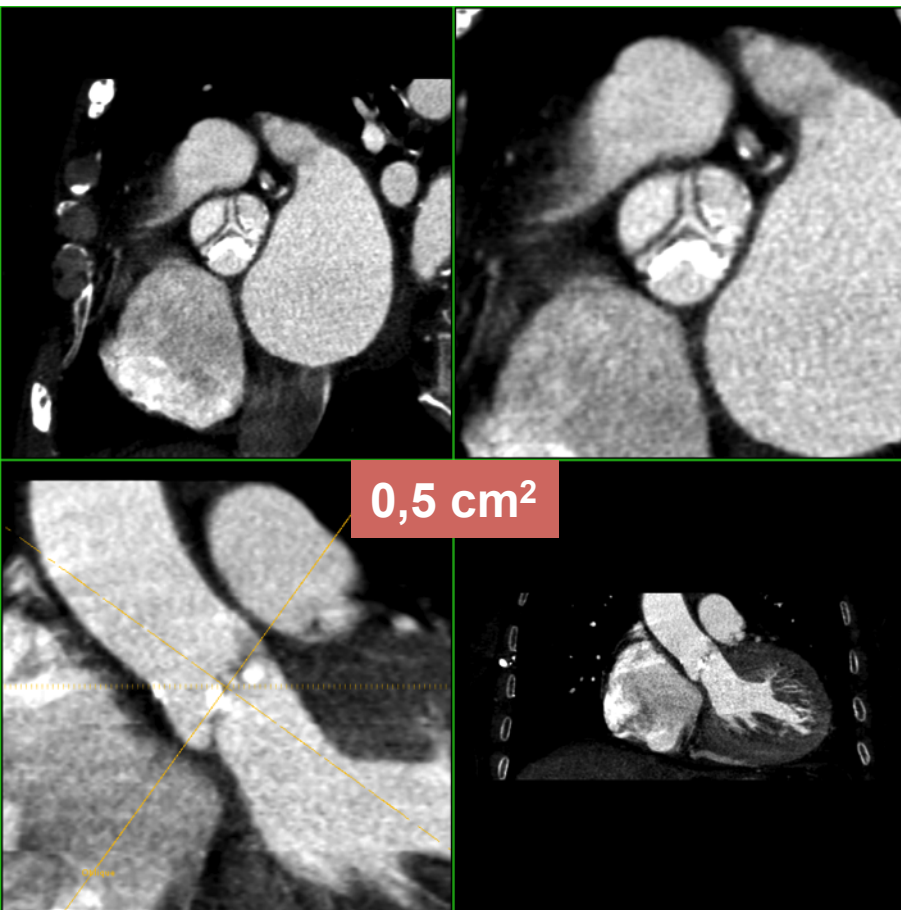
||Cine MRI pulse sequence was gradient echo; the other planimetry studies used an SSFP cine sequence.

¶Mean absolute difference.

#Intraobserver reproducibility.

**Kendall's statistic.

Quantification RA : CT



Attention aux points de mesures +++

Rôle du scanner : bilan pré ttt +++

- (Planimétrie)
- Évaluation des amas calciques
- Critères d'opérabilité
 - Voies d'abord
 - Taille de l'anneau

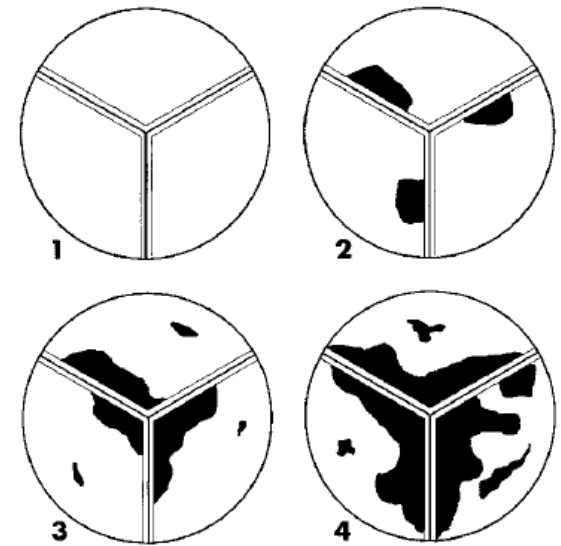
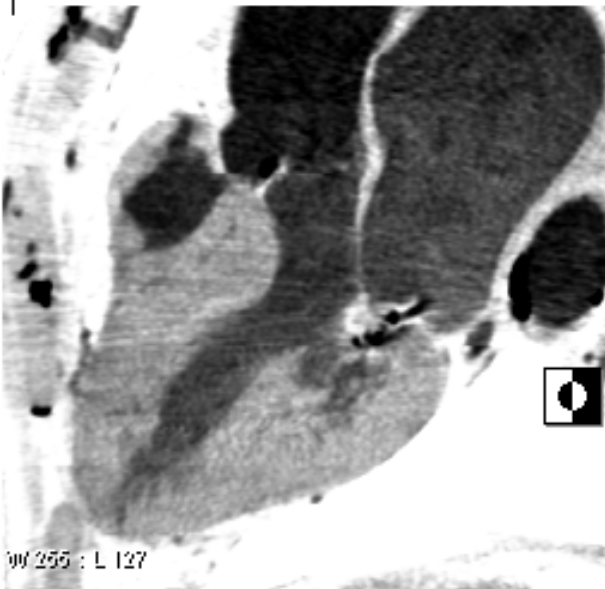
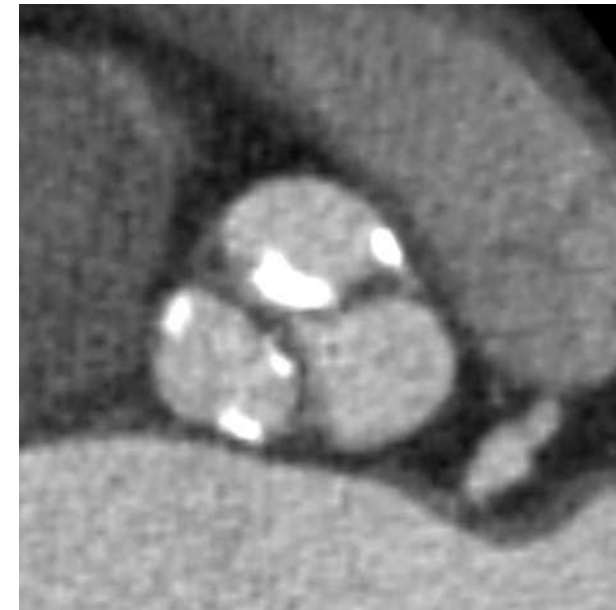
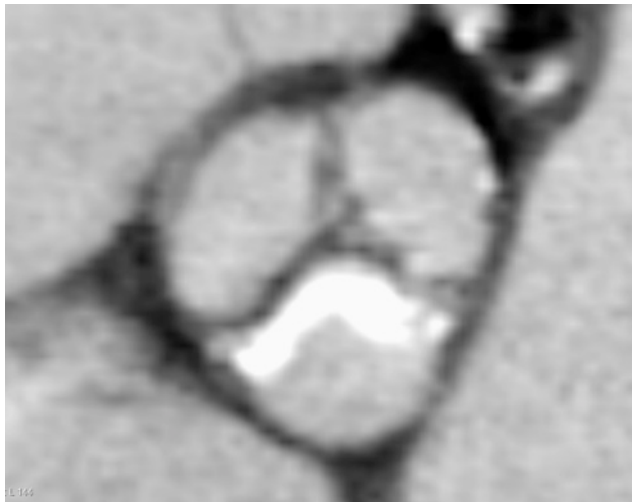
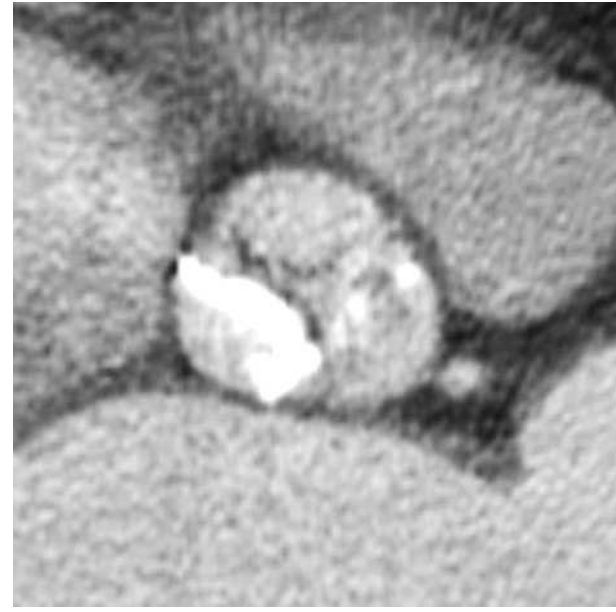
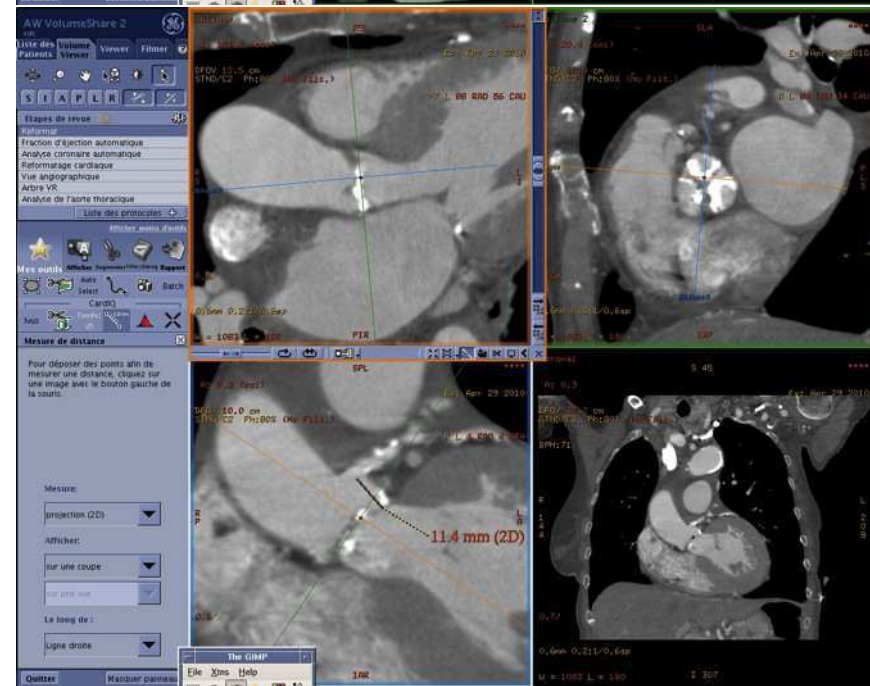
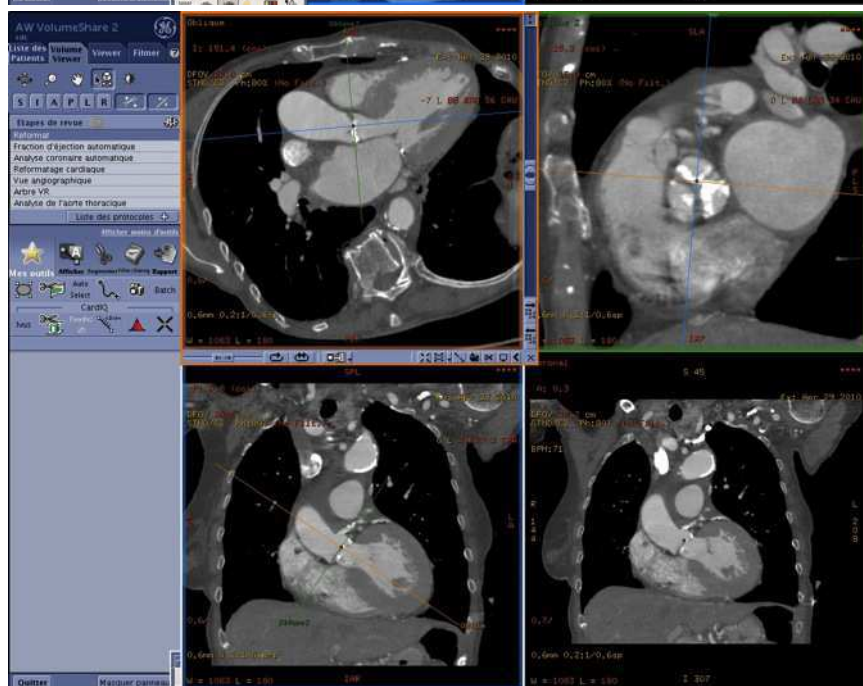


Figure 1. Diagrams of different grades of aortic valve calcification. Grade 1 (1), no calcification; grade 2 (2), mild calcification (small isolated spots of calcification); grade 3 (3), moderate calcification (multiple larger spots of calcification); and grade 4 (4), heavy calcification (extensive calcification of all aortic valve leaflets).



Bilan avant TAVI

- Mesures :
 - Anneau aortique
 - Sinus de Valsalva
 - Jonction sino-tubulaire
 - Maximum Ao ascendante
 - Minimum Ao abdominale
 - Minimum artères iliaques
 - Angulation des artères iliaques
 - Hauteur des ostia coronaires par rapport au plan annulaire
- Extension des calcifications
 - Valve aortique
 - Aorte et iliaques
- dépistage autre pathologie



Points clés

- Scanner : morphologie
 - Évaluation IA ou RA : planimétrie
 - Évaluation retentissement IA ou RA $\pm$
 - Dilatation et /ou hypertrophie VG
 - Dilatation Ao
 - Bilan pré-opératoire ++
- IRM : fonction
 - Évaluation IA ou RA : subjective, planimétrie, contraste de phase
 - Évaluation retentissement IA ou RA ++
 - Dilatation et /ou hypertrophie VG
 - Dilatation Ao
 - Recherche de fibrose associée