# La valve X

1) Def : Fuite ou Sténose
2) Clinique : Triade (Dyspnée, Angor, Syncope, palpit…)
3) Examen : Souffle (eject. ou Regurg.)
4) Diagnostic : Echographie ==> (lésion, quantif, retentis, autres…)
5) Pronostic : Echographie
6) Surveillance : Echographie
7) Cathétérisme : Coro si risque ou doute Dg
8) Traitement : Med = 0 ➔ qd opérer ?

# Aorte ascendante

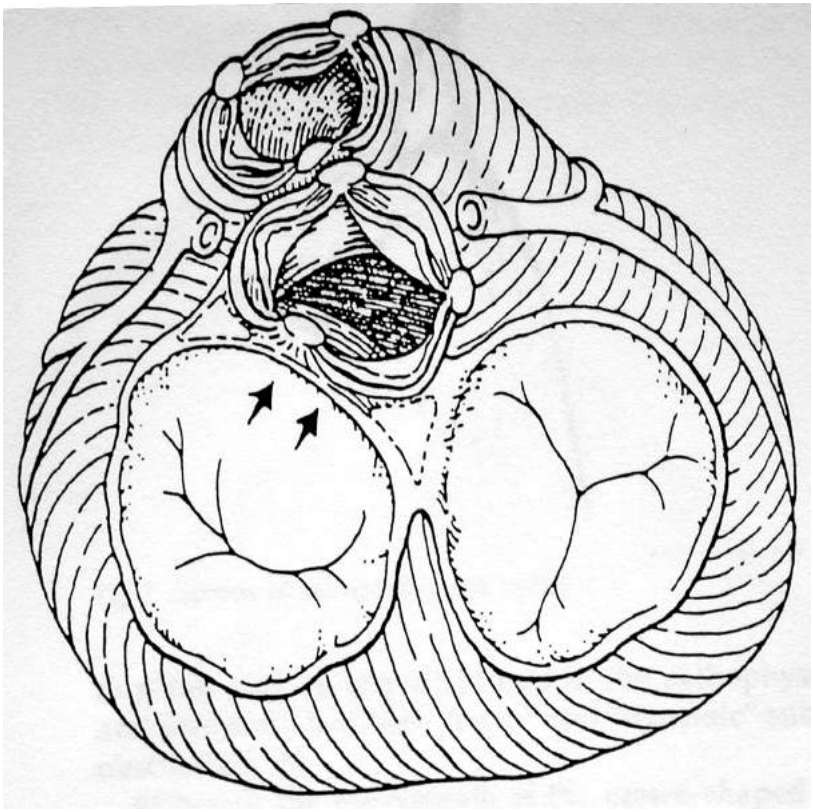
## La fonction

- 1 à 20 l/mn
- Systolo-diastolique
- Antéro et rétrograde

## Les structures

- Un anneau
- Trigones fibreux
- Sigmoïdes aortiques
- Jonction sino-tubulaire

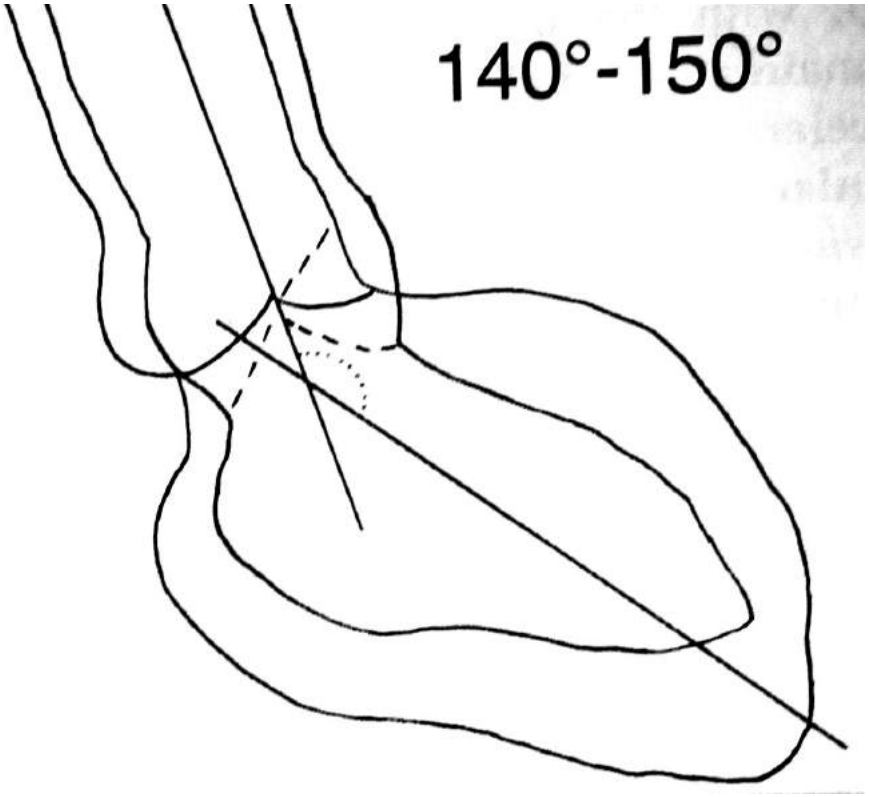
# Une structure dynamique



**Stentless et régression de la masse ventriculaire**

*(S Westaby  Ann Thorac Surg 1998;65:235-40)*

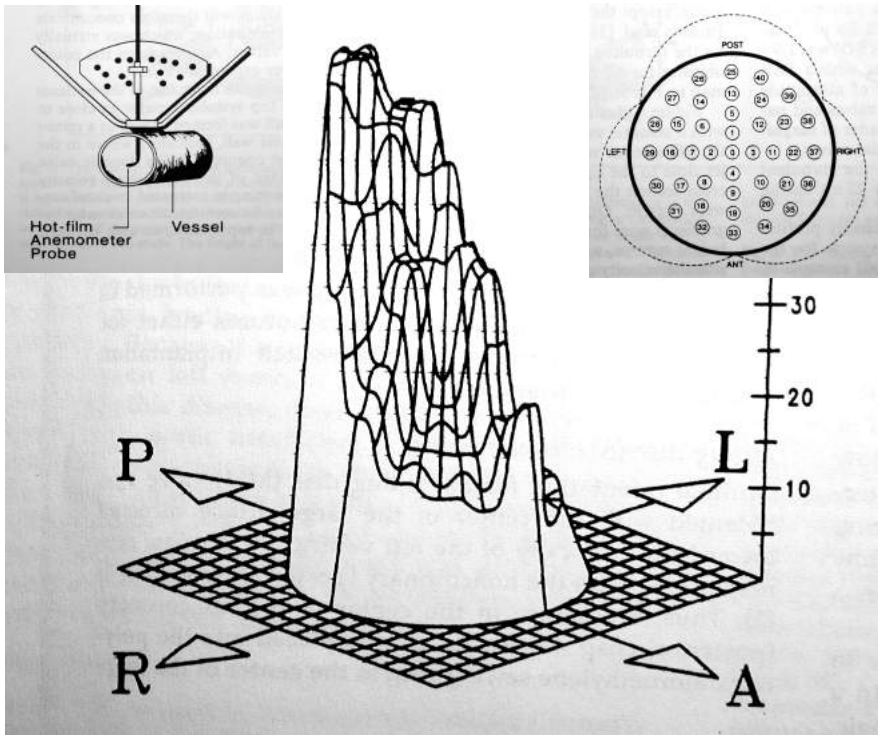
# Un flux pulsatile dans une courbe




*(J Laas Ann Thorac Surg 1999;68:1096-9)*

# Une anatomie asymétrique

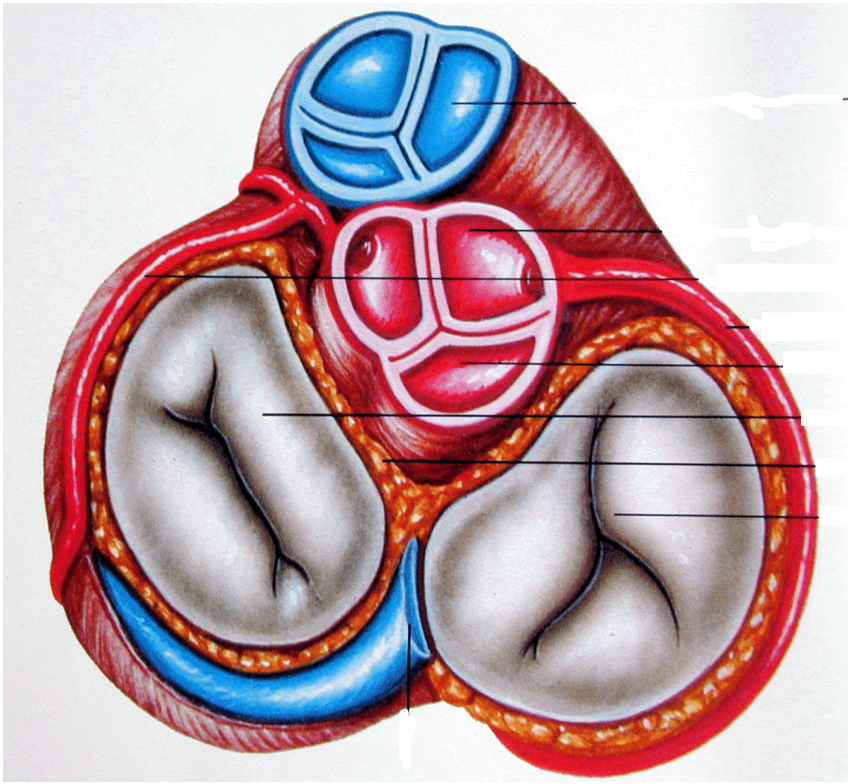
## Un flux asymétrique



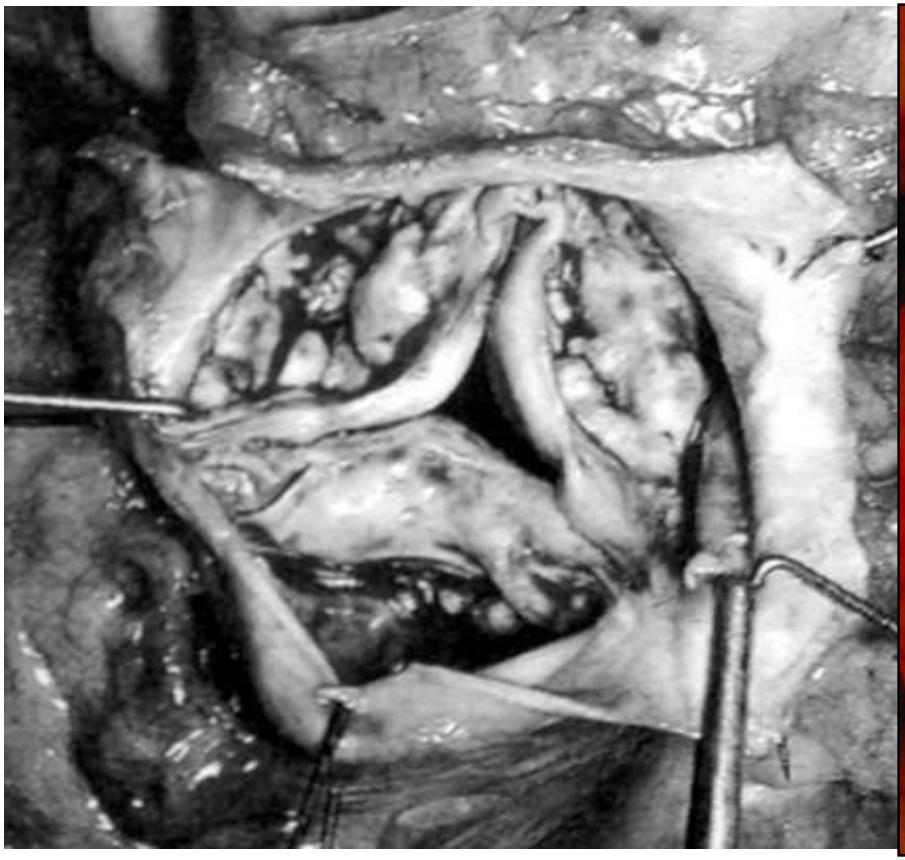


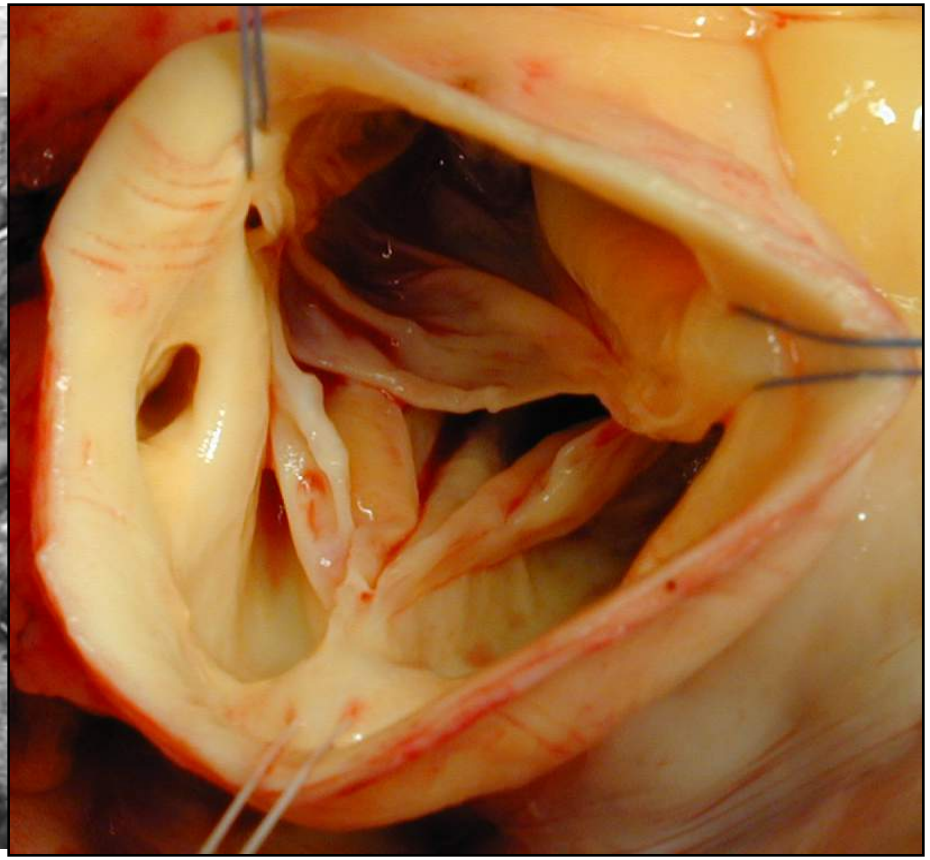
*(H Nygaard  Eur J Cardio-thorac Surg 1992;6:609-17)*

# Un Stress asymétrique

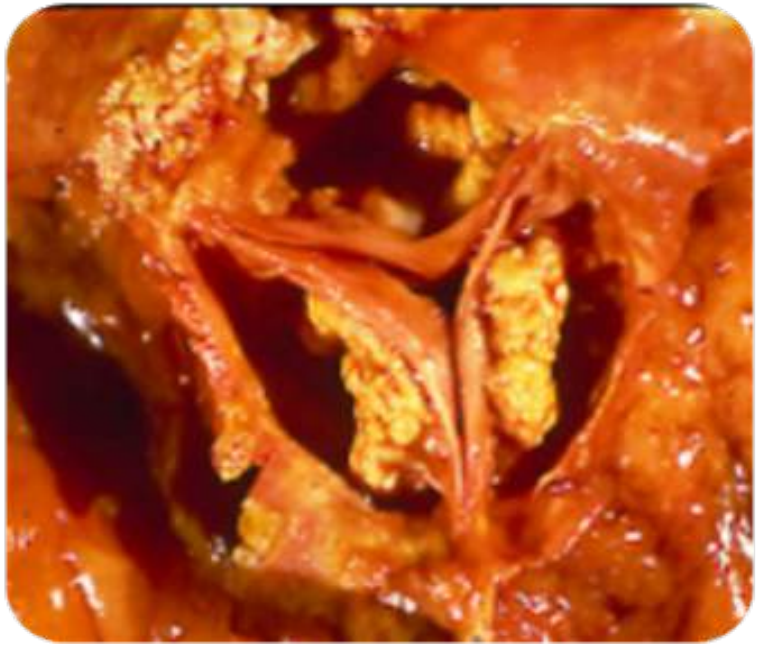


# Le Rétrécissement Aortique





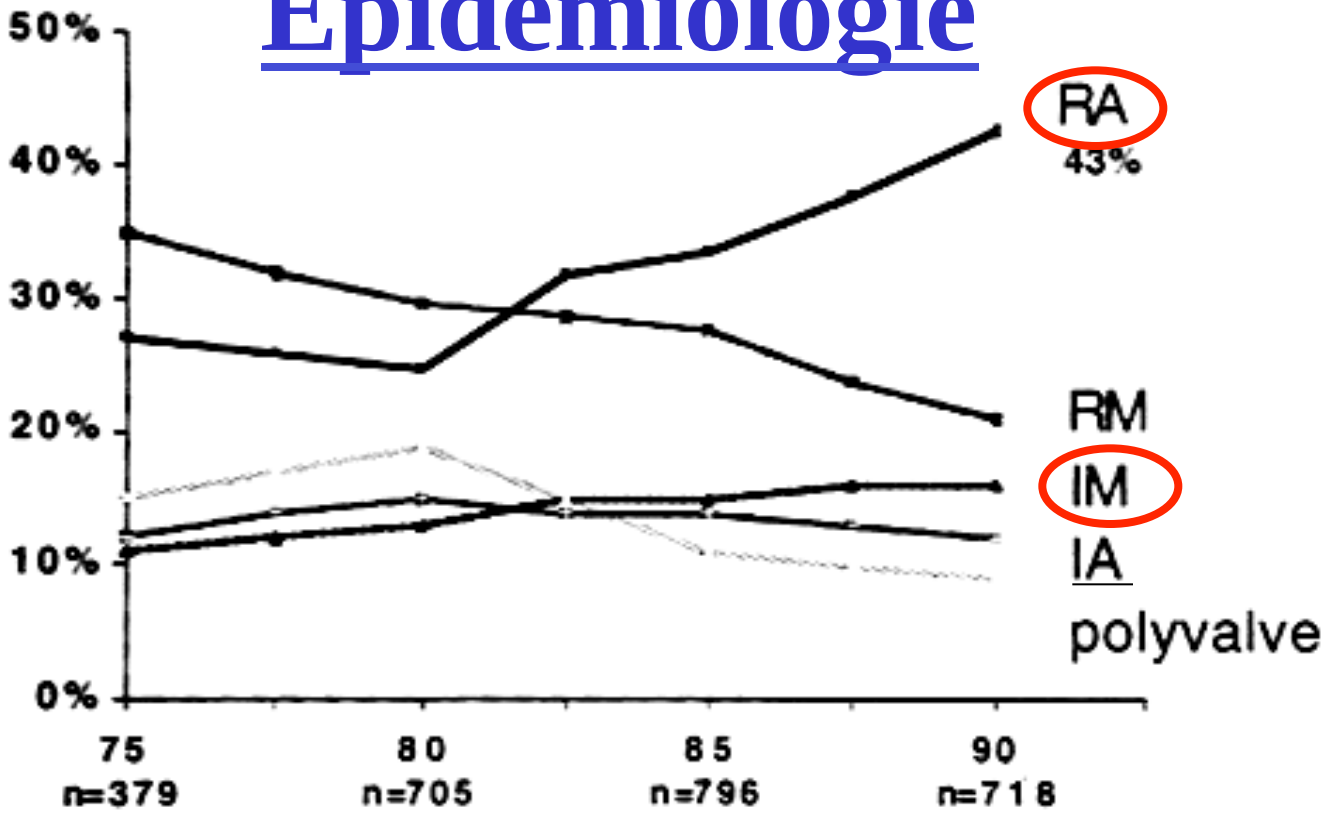
# Définition



- RA = Sténose
- IA = Insuffisance
- Maladie = RA + IA

- Obstacle à l'éjection du ventricule gauche
  - Sténose Valvulaire Aortique
    - Dégénératif : *Maladie de Monckeberg*
    - Congénital et «dégénératif » : *Bicuspidie vieillie*
  - Sténose de la voie d'éjection du VG
    - Congénital : *Diaphragme sous-valvulaire*
    - *Bourrelet septal sous-aortique*

# Epidémiologie

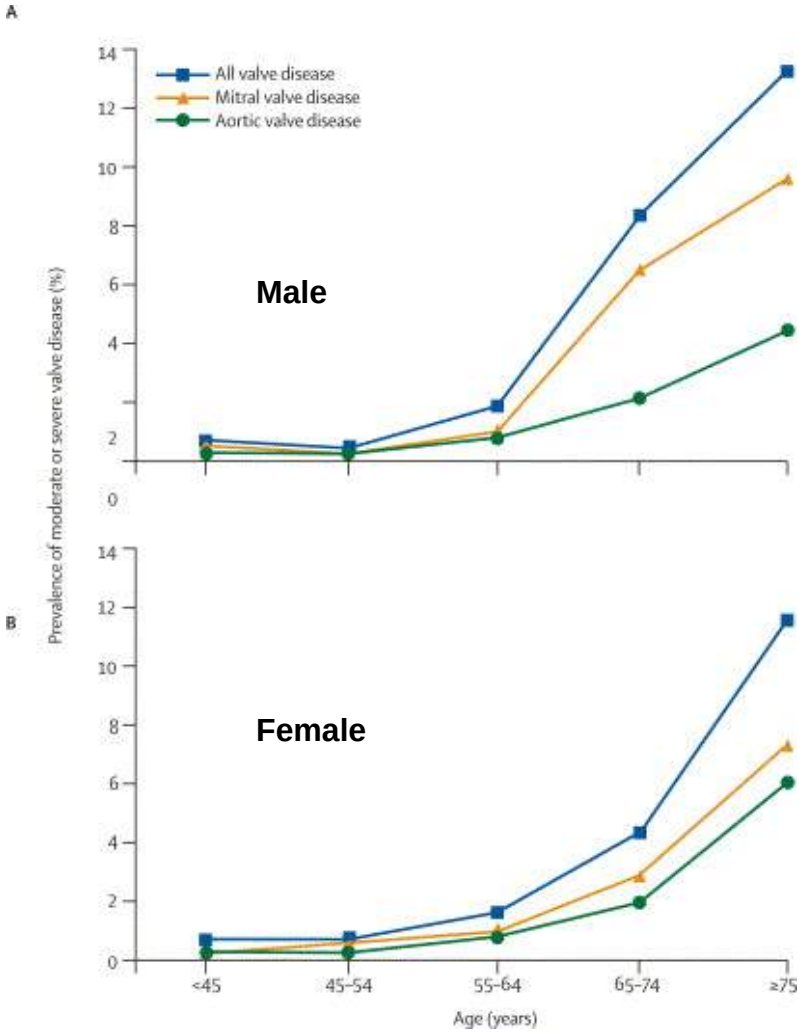



Évolution du type de valvulopathie opérée sur une période de 20 ans. Au terme de cette période, la sténose aortique est devenue la plus fréquente des valvulopathies opérées (27 à 43 p. 100 $p < 0.001$).

- 2/3 Hommes > 1/3 Femmes (plus si Pts âgés)

# Epidémiology

- AS is primarily a disease of the elderly[1,2]
  - Prevalence increases with an increase in age of population
  - Trend for higher prevalence in men than in women
- 5% if Age > 75 years
- 3% severe ➔ half asymptomatic

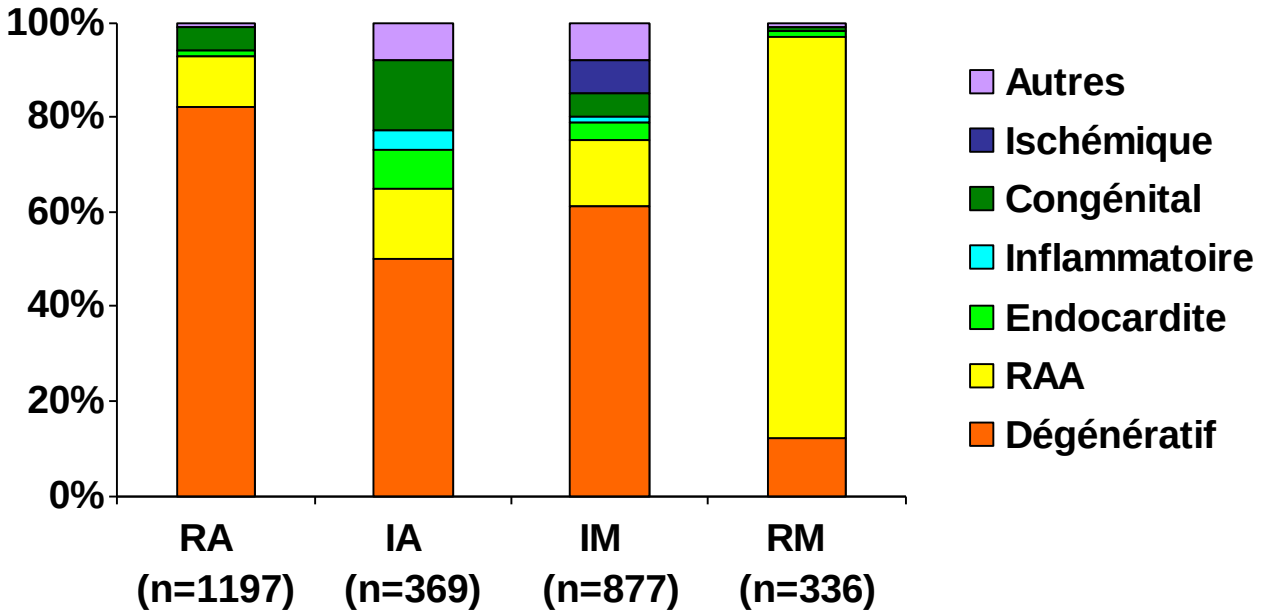



[1]Supino PG, Borer JS, et al. Heart Fail Clin 2006; 2: 379-393.

[2]Nokomo VT, Gardin JM, et al. Lancet 2006; 368: 969-71.

# Epidémiologie

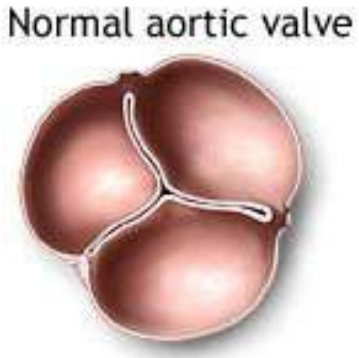
**Etiologies des mono-valvulopathies natives opérées « Euro Heart Survey »**



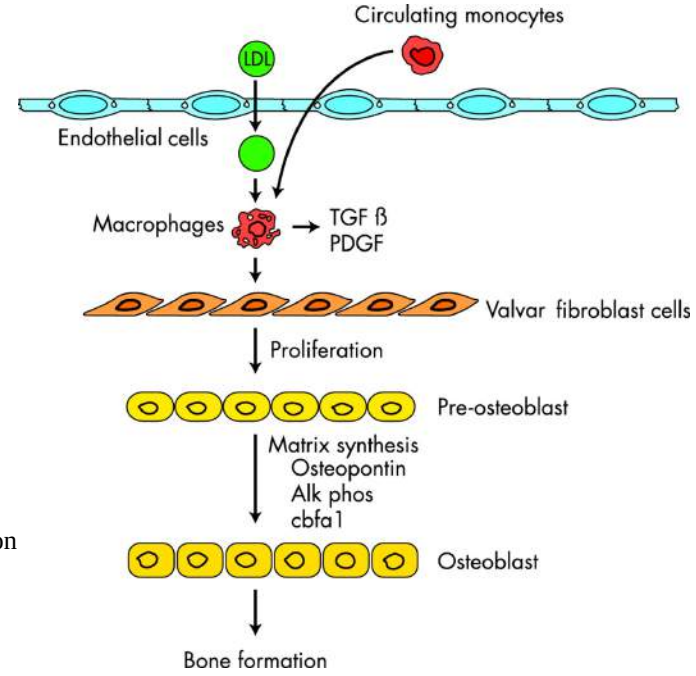

- 38 % > 70 ans
- 29 % Réopération valvulaire

# Etiology: *Calcific Aortic Stenosis*

- **Mechanism of stenosis is similar to atherosclerosis**[1]
  - Mainly solid calcium deposits within the valve cusps
  - Similar risk factors to Coronary Artery Disease (CAD)
  - High coincidence of CAD and AS in same individual[2]
  - 6th, 7th, and 8th decades of life




American Accreditation HealthCare Commission (ADAM)

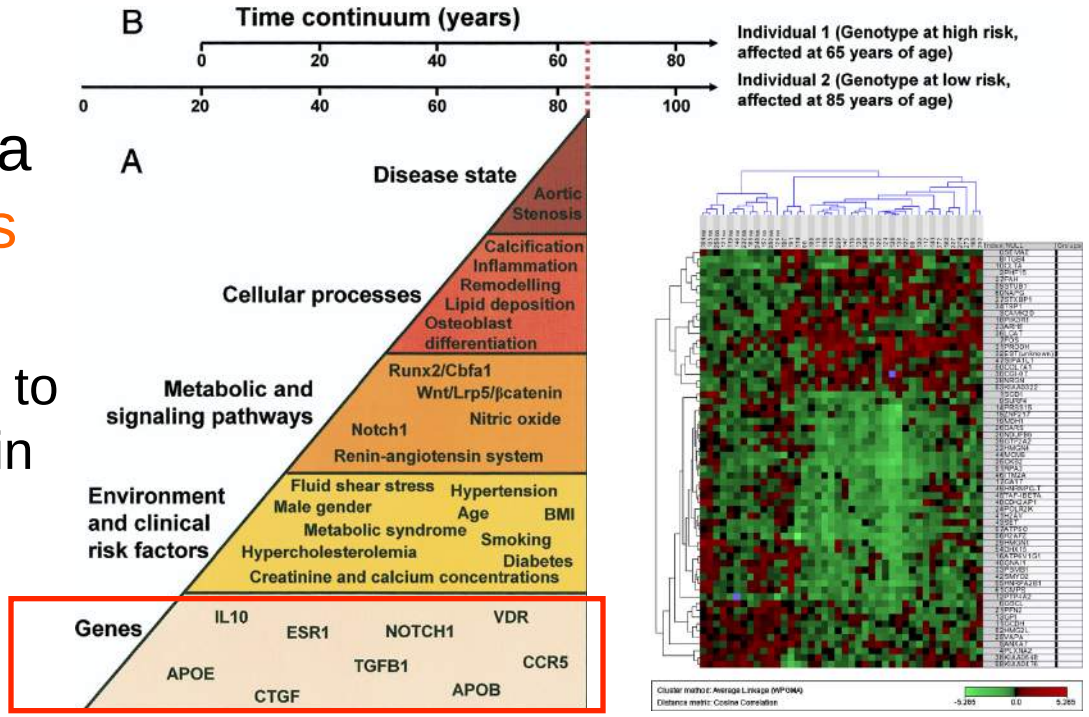



[1]*Otto CM, Lind BK, et al. Circulation 1994; 90: 844-53.*

[2]*Otto CM, Lind BK, et al. New Eng J Med 1999; 341: 142-147.*

# Etiology : Genetic

- While many factors are predicted to cause AS, a genetic predisposition is anticipated
  - All of the genes reported to be associated with AVS in at least one published study are shown at the base of the triangle




[1]*Bosse Y, Mathieu P, et al. J Am Coll Cardiol 2008; 51: 1327-36.*

# Etiologies

- **1) RA « dégénératif » Maladie de Monckeberg = 80 % / Âge**
  - ***Athérome, HTA, Chlamydiae pneumoniae ➔ processus actif***
  - ***Traitement par les Statines ➔ non ???***

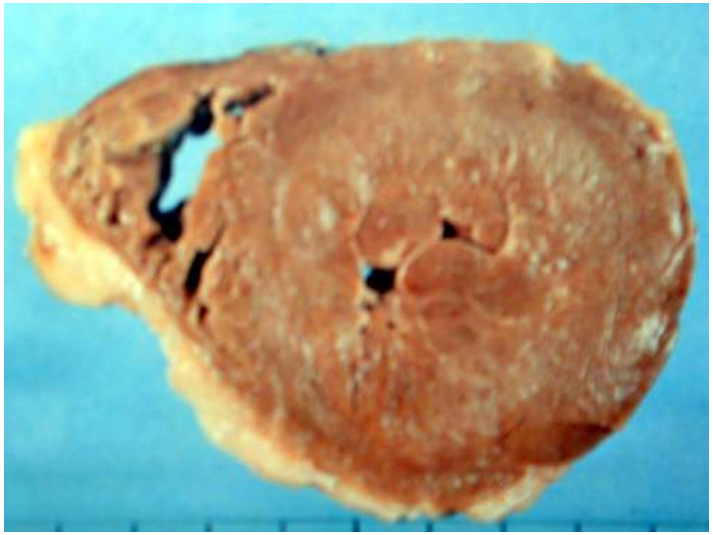
- **2) Bicuspidie congénitale = 15 %**
  - ***1 à 2 % de prévalence, dégénérescence accélérée***
  - ***Association à : Coarctation, canal artériel, Dilatation Ao. Asc…***

- **3) RAA**
  - ***Jeune, Poly-valvulaire, Maladie avec sténose prédominante***

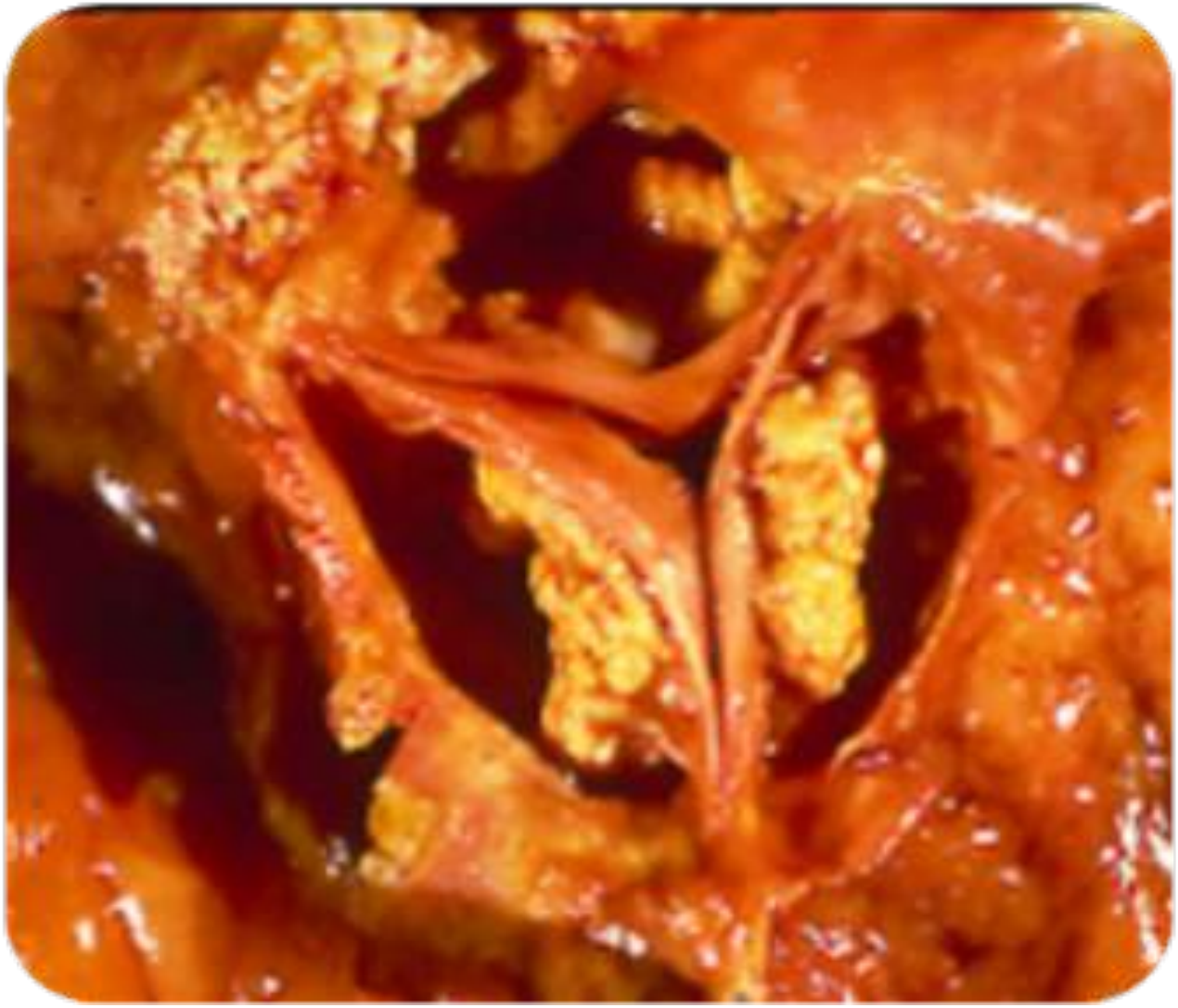
- **4) Causes rares**
  - ***Congénitaux, Paget, IR des dialysés….***

# Anatomo Pathologie

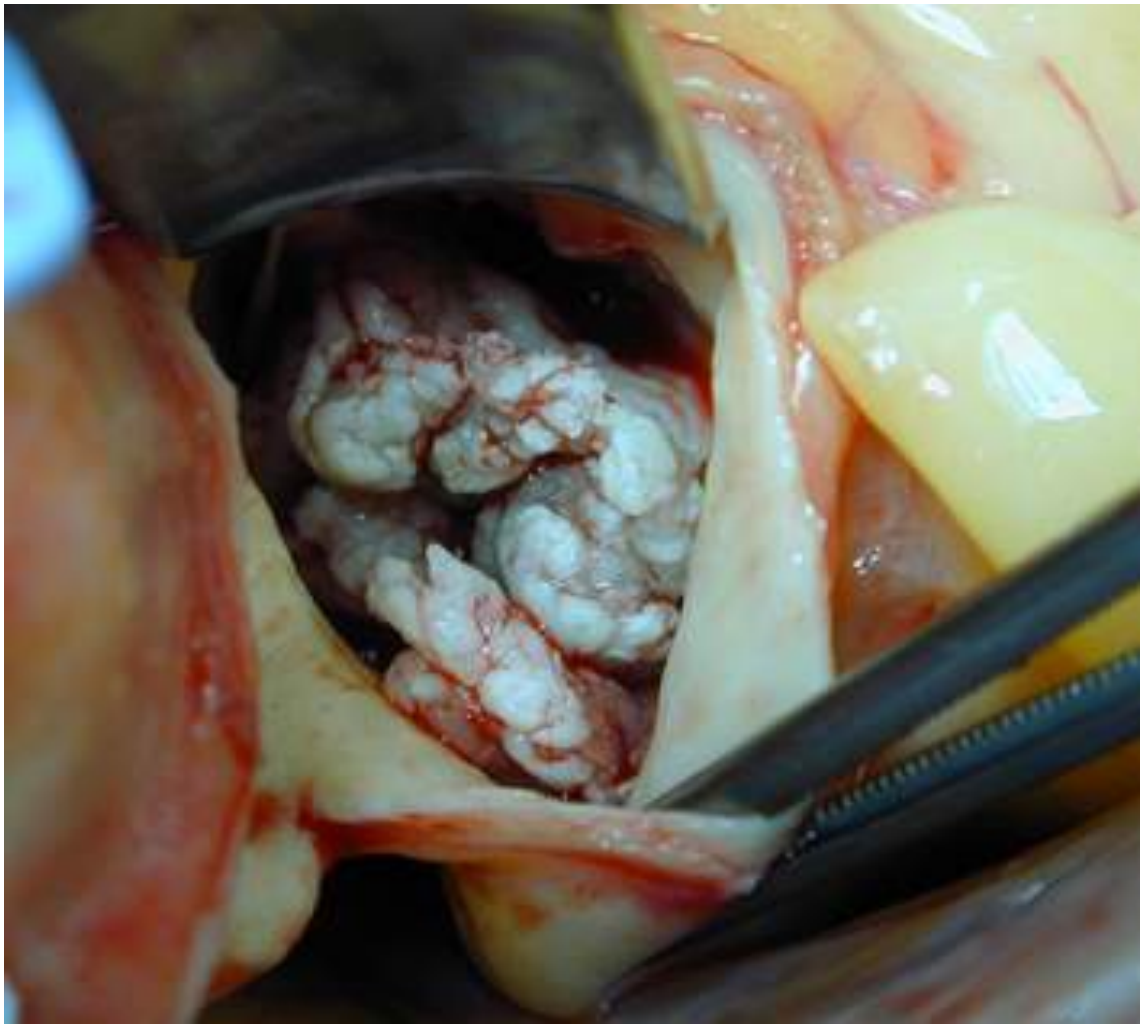
- **1) RA dégénératif**
  - **Calcification figeant les valves en position fermée**
- **2) Bicuspidie congénitale**
  - **Idem, Raphé médian, Anneau plus large**
  - **Aorte Ascendante dilatée**
- **3) RAA**
  - **Fusion commissurale et fibrose**
- **4) Lésions extra-valvulaires**
  - **Dilatation Ao Asc Asymétrique**
  - **HVG concentrique, Coronaropathie associée**



# Anatomo Pathologie

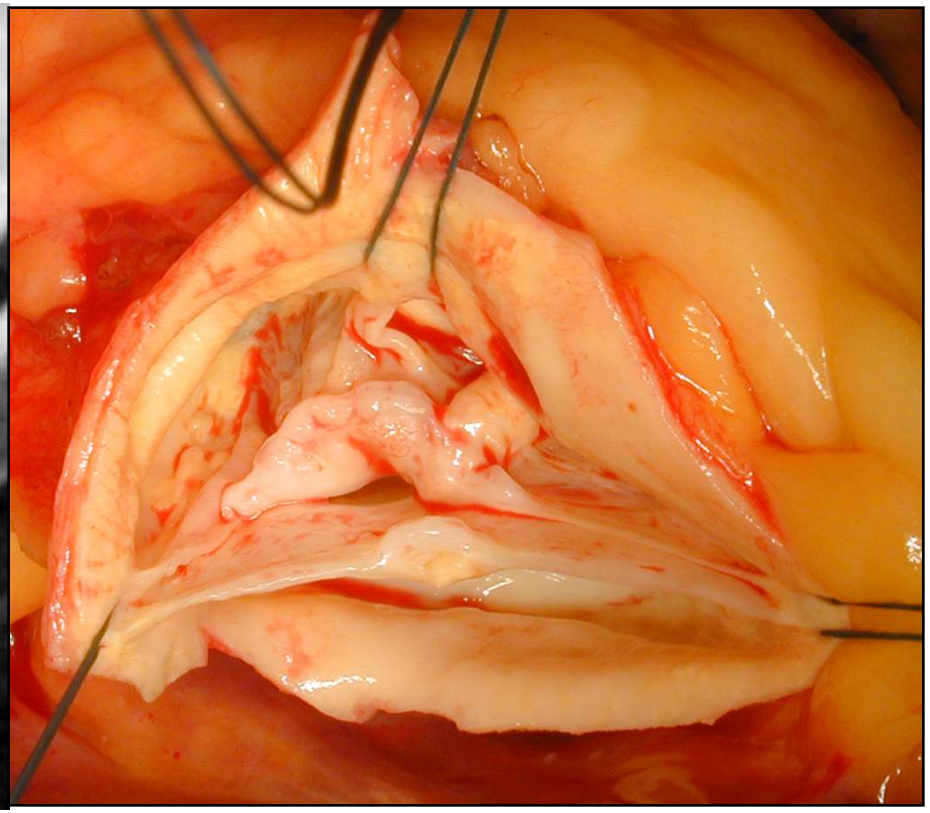


# Anatomo Pathologie



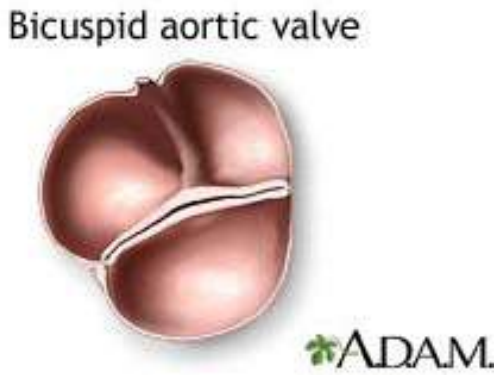
# Anatomo Pathologie

# Anatomo Pathologie

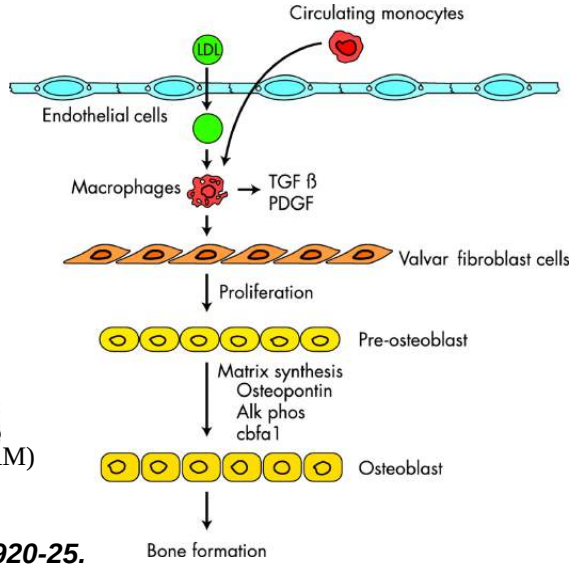


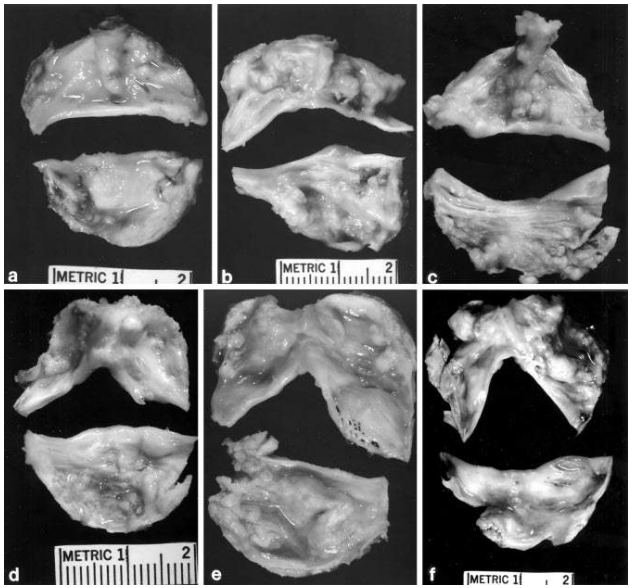
# Etiology: *Calcific Bicuspid Valves*

- **Bicuspid valve** contributes more to the total number of cases of AS than disease of the tricuspid valve[1,2]
  - Exists in 1-2% of livebirths (with a 2:1 male:female ratio)
  - Process that leads to stenosis of a bicuspid aortic valve is presumably similar to tricuspid valve
  - Stenosis typically presents earlier in the 5th-6th decade of life




American Accreditation HealthCare Commission (ADAM)

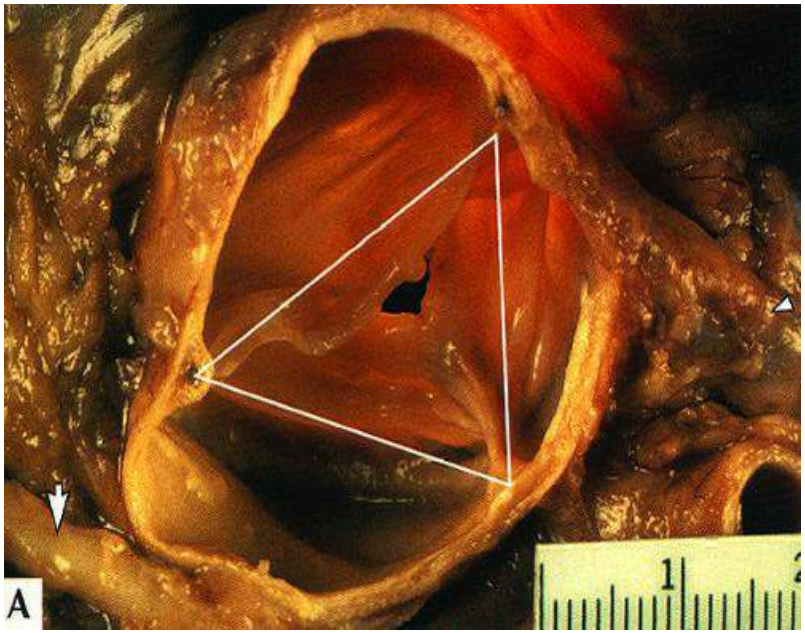



[1]*Roberts WC, Ko, JM. Circulation 2005; 111: 920-25.*

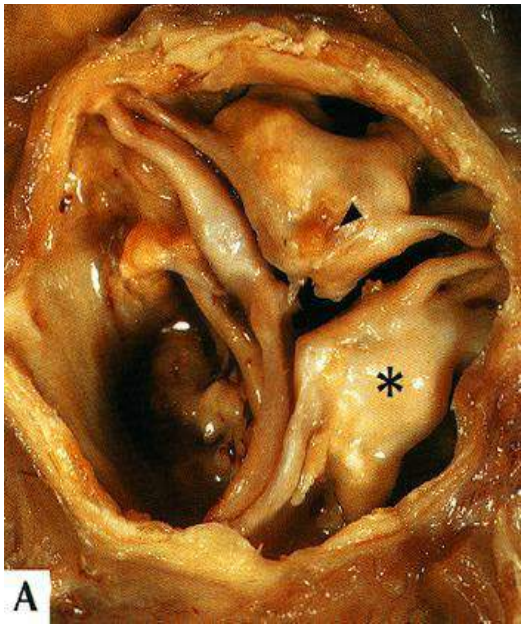
[2]*Aboulhosn J, Child JS. Circulation 2006; 114: 2412-22.*

## Valve aortique normale

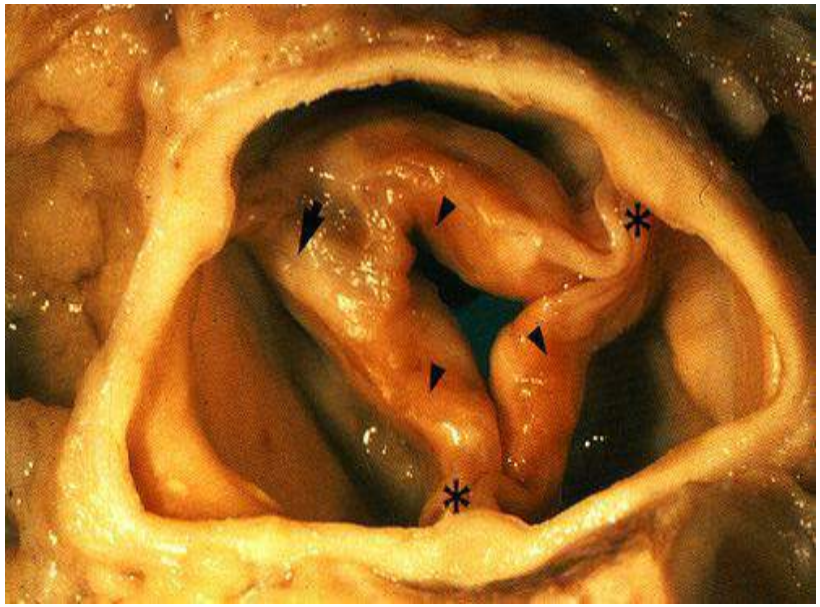



## Valve aortique bicuspide non calcifiée


## RAC dégénératif



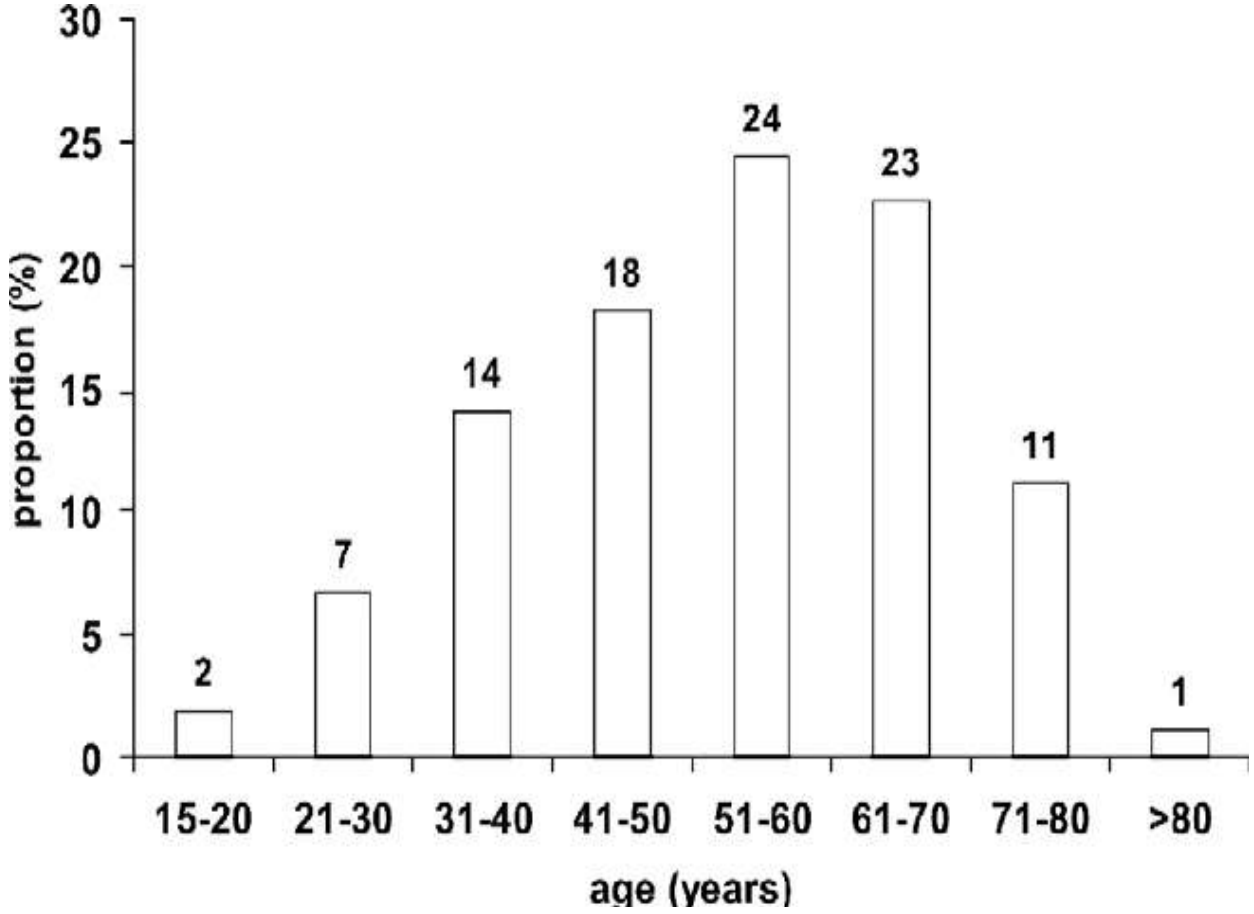

## RAC rhumatismal



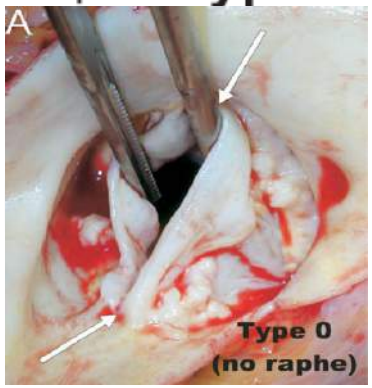
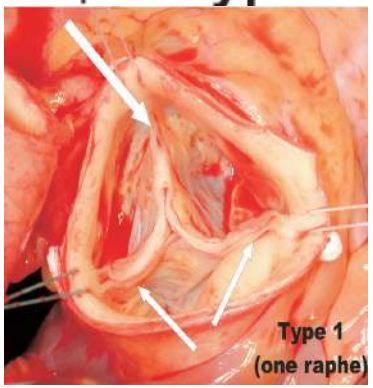
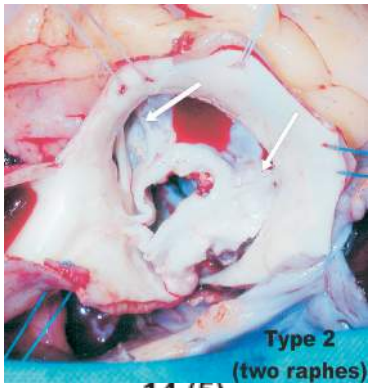
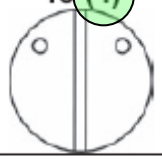
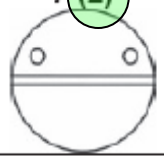
## RAC sur bicuspidie

# A classification system for the bicuspid aortic valve from 304 surgical specimens

Hans-H. Sievers, MD, and Claudia Schmidtke, MD, MBA J Thorac Cardiovasc Surg 2007;133:1226-33



# Bicuspid Valves

| main category: number of raphes | 0 raphe - Type 0 | | 1 raphe - Type 1 | | | 2 raphes - Type 2 |
|---|---|---|---|---|---|---|
| |   21 (7) | |   269 (88) | | |   14 (5) |
| 1. subcategory: spatial position of cusps in Type 0 and raphes in Types 1 and 2 | lat 13 (4)  | ap 7 (2)  | L – R 216 (71)  | R – N 45 (15)  | N – L 8 (3)  | L – R / R – N 14 (5)  |
| 2. subcategory: VALVULAR FUNCTION | | | | | | |
| I | 6 (2) | 1 (0.3) | 79 (26) | 22 (7) | 3 (1) | 6 (2) |
| S | 7 (2) | 5 (2) | 119 (39) | 15 (5) | 3 (1) | 6 (2) |
| B (I + S) | | 1 (0.3) | 15 (5) | 7 (2) | 2 (1) | 2 (1) |
| No | | | 3 (1) | 1 (0.3) | | |

# Bicuspid Valves ➔ *AAA*

Aortic aneurysms (diameter > 5 cm) were present in 90 (29.6%) patients, with involvement of the aortic root in 18 (5.9%), ascending aorta in 88 (28.9%), aortic arch in 2 (0.7%), and descending aorta in 1 (0.3%). A significantly higher proportion of aneurysms of the ascending aorta was present in BAV type 2 (valve with two raphes; $P = .022$;

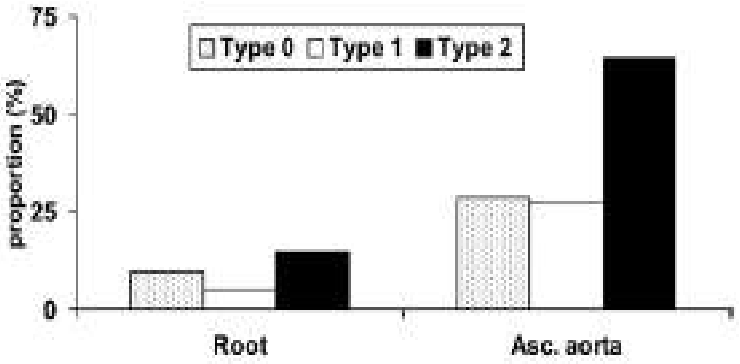
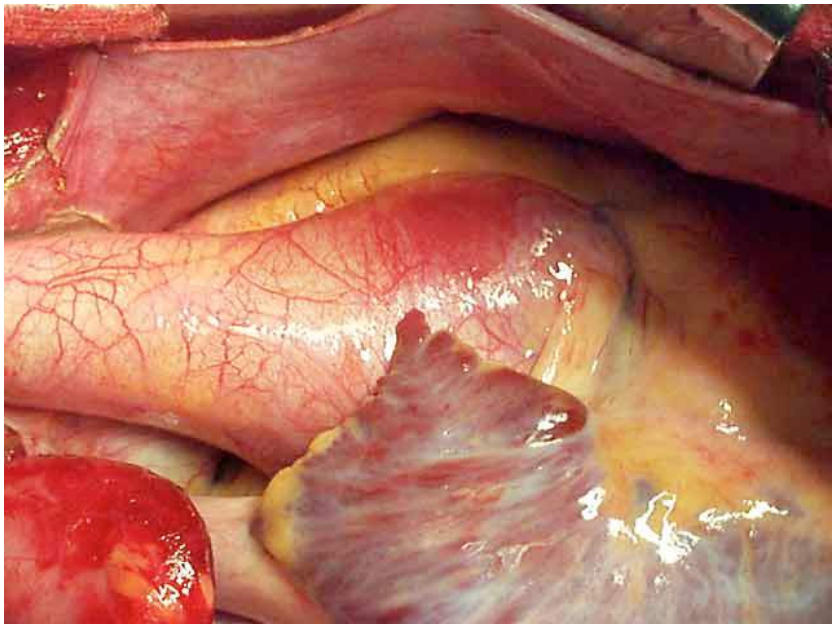



Figure 7. Proportion of an aneurysm of the aortic root or ascending aorta in relation to the type of bicuspid aortic valve. A bicuspid aortic valve type 2 (valve with two raphes) was associated with a significantly ($P = .022$) higher proportion of aneurysms.



# Physiopathologie

*Hypertrophie concentrique*

Fonction systolique conservée

Baisse de la compliance

Risque ischémique accru

*Insuffisance cardiaque*

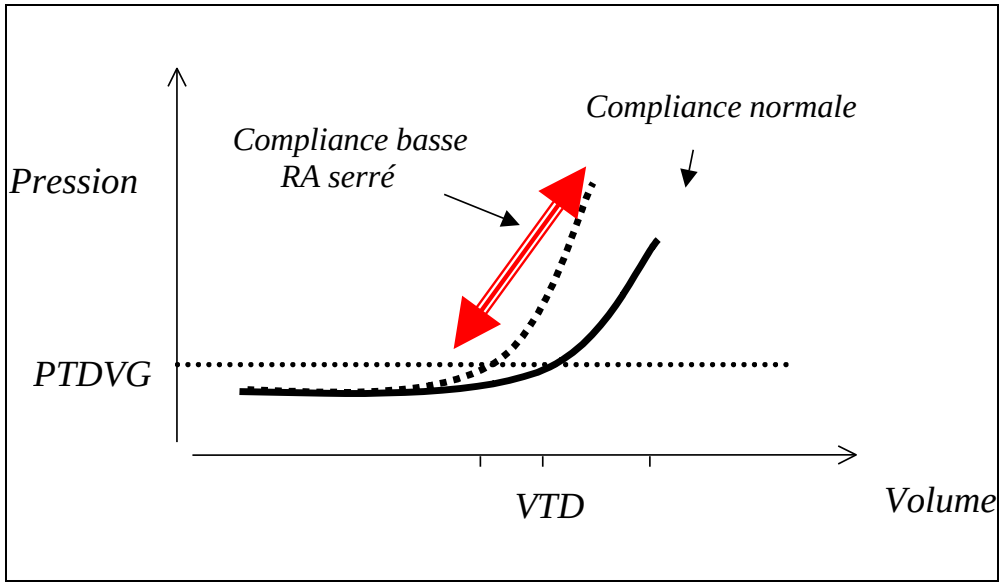
# RA: *HVG et variations de volémie*

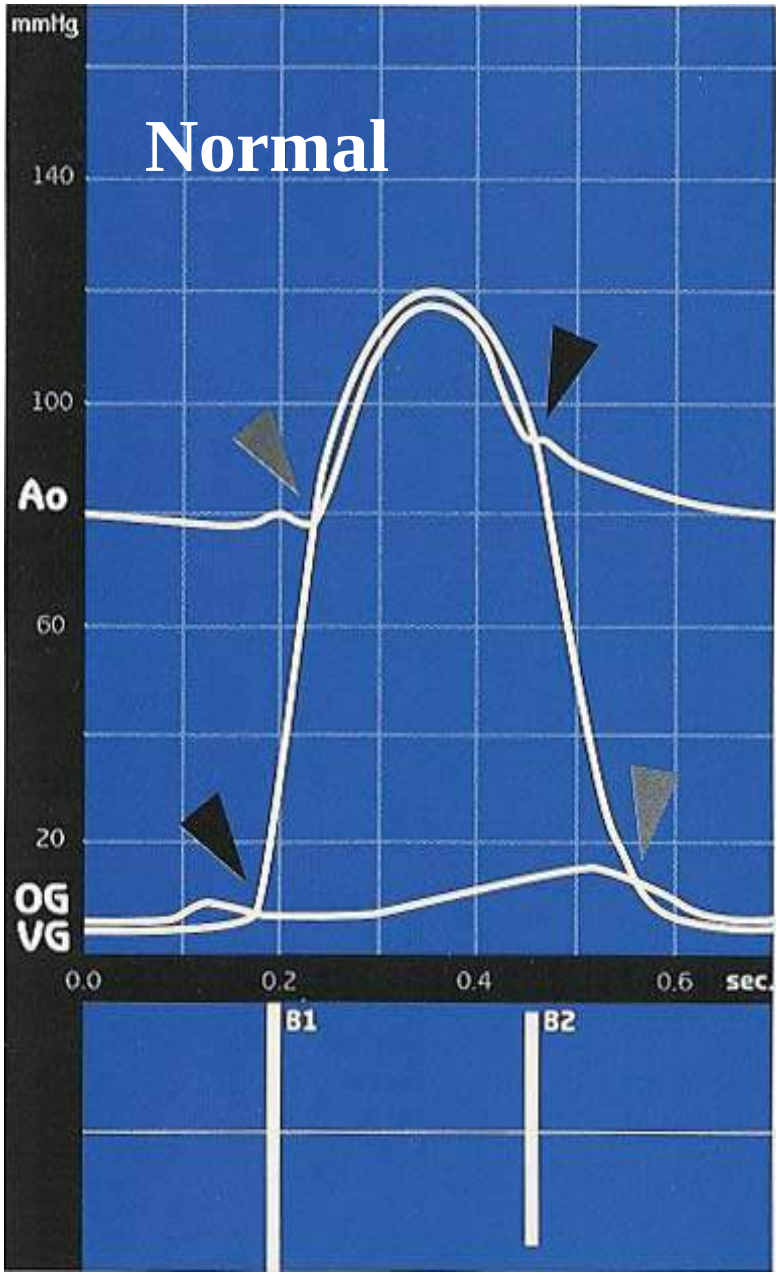
- Hypovolémie
- Baisse du tonus veineux
- Perte de la contraction auriculaire

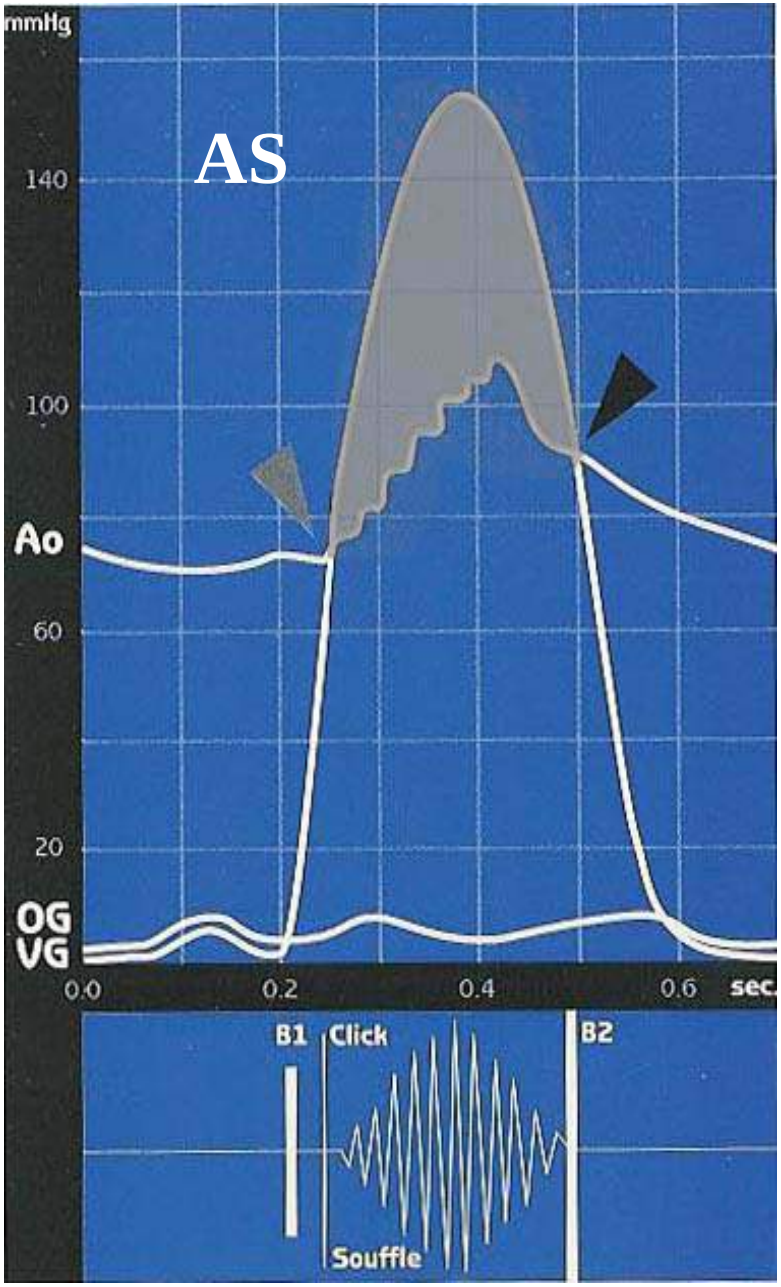
Hypervolémie

***Baisse du VES et de la PA***

***OAP***

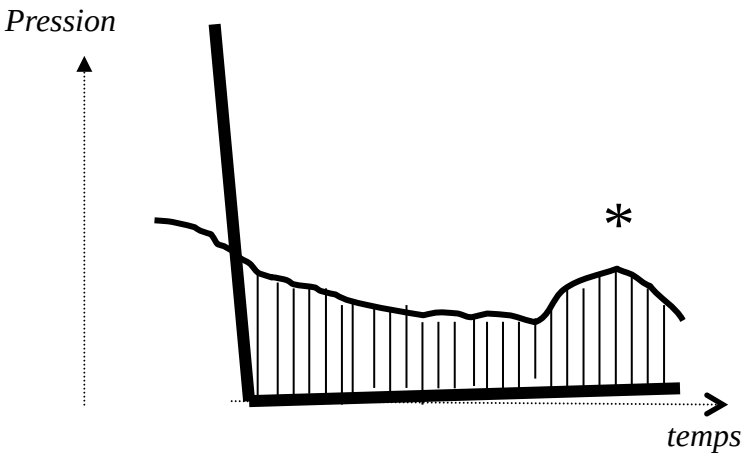



Normal
mmHg
140
100
Ao
60
20
OG
VG
0.0
0.2
0.4
0.6
sec.
B1
B2


AS
mmHg
140
100
Ao
60
20
OG
VG
0.0
0.2
0.4
0.6
sec.
B1
Click
B2
Souffle

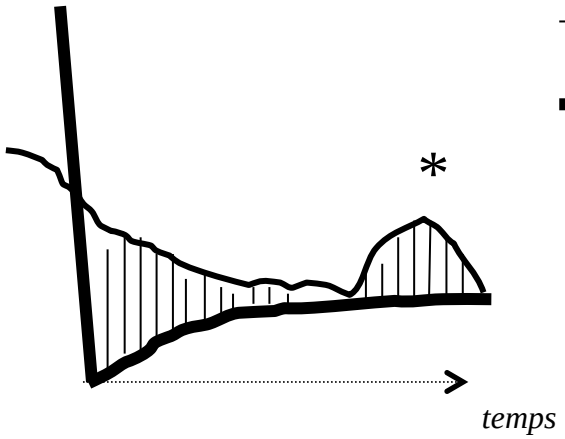
# RA: *HVG concentrique et contraction auriculaire*

**Ventricule normal**




Contraction oreillette : 10 à 15% du remplissage ventriculaire

**Trouble de compliance**




Contraction oreillette : --> ***40%*** du remplissage ventriculaire

— Pression OG

▬ Pression VG

*: contraction OG

# Physiopatholgie

- **Ischémie myocardique**
  - **Angor sans lésion coronaire**
    - **Durée d'ejection, stress parietal, HVG,**

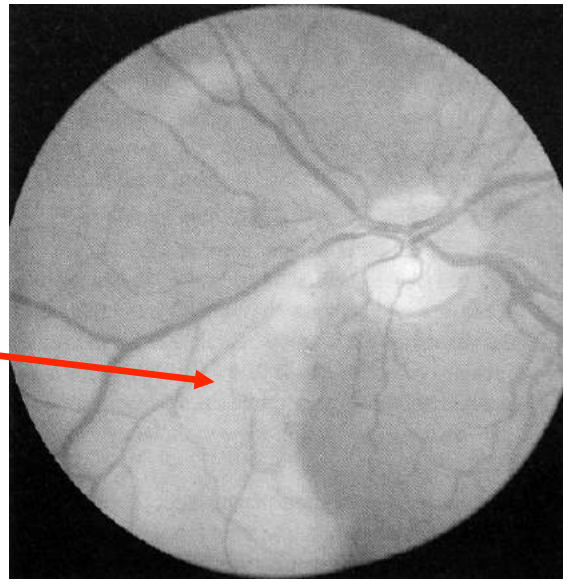
- **Histoire naturelle du RA**
  - **Phase compensée**
    - **Seul le débit à l'effort est affecté**
    - **FE Conservée, Gradient augmenté**
  - **Phase décompensée**
    - **FE altérée, Gradient diminué, P droite et remplissage élevées**

# Histoire Naturelle

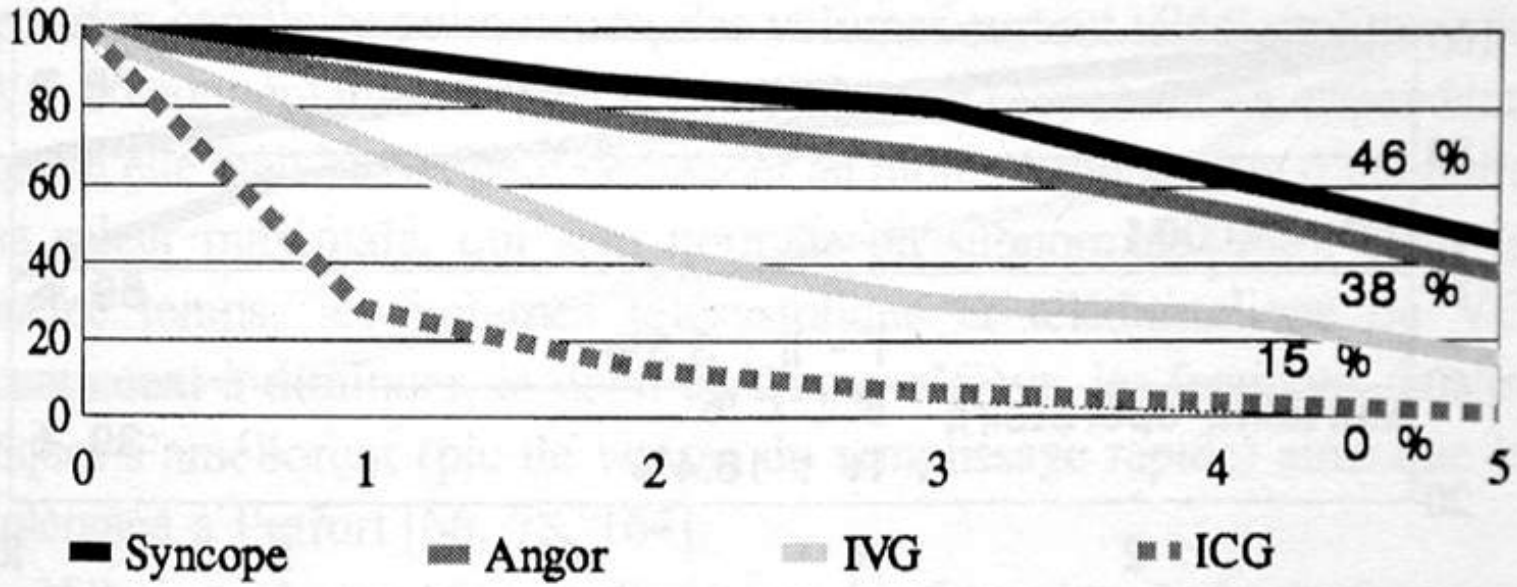
- **Progression VARIABLE de la sténose**
  - **7 à 16 mmHg / an**
  - **Progresseurs rapides ➔ - 0,1 à 0,2 $cm^2$ / an**

- **Période Asymptomatique (Mort subite rare < 1 %)**
  - **Surveiller FE (attention si < 50 %)**

- **Période Symptomatique**
  - **En général à partir de S<1$cm^2$ mais très variable**
  - **Complications :**
    - **EI**
    - **Embolies systémiques**
  - **Survie moyenne**
    **= 3 à 4 ans si Angor ou Syncope**
    **= 2 ans si IVG**

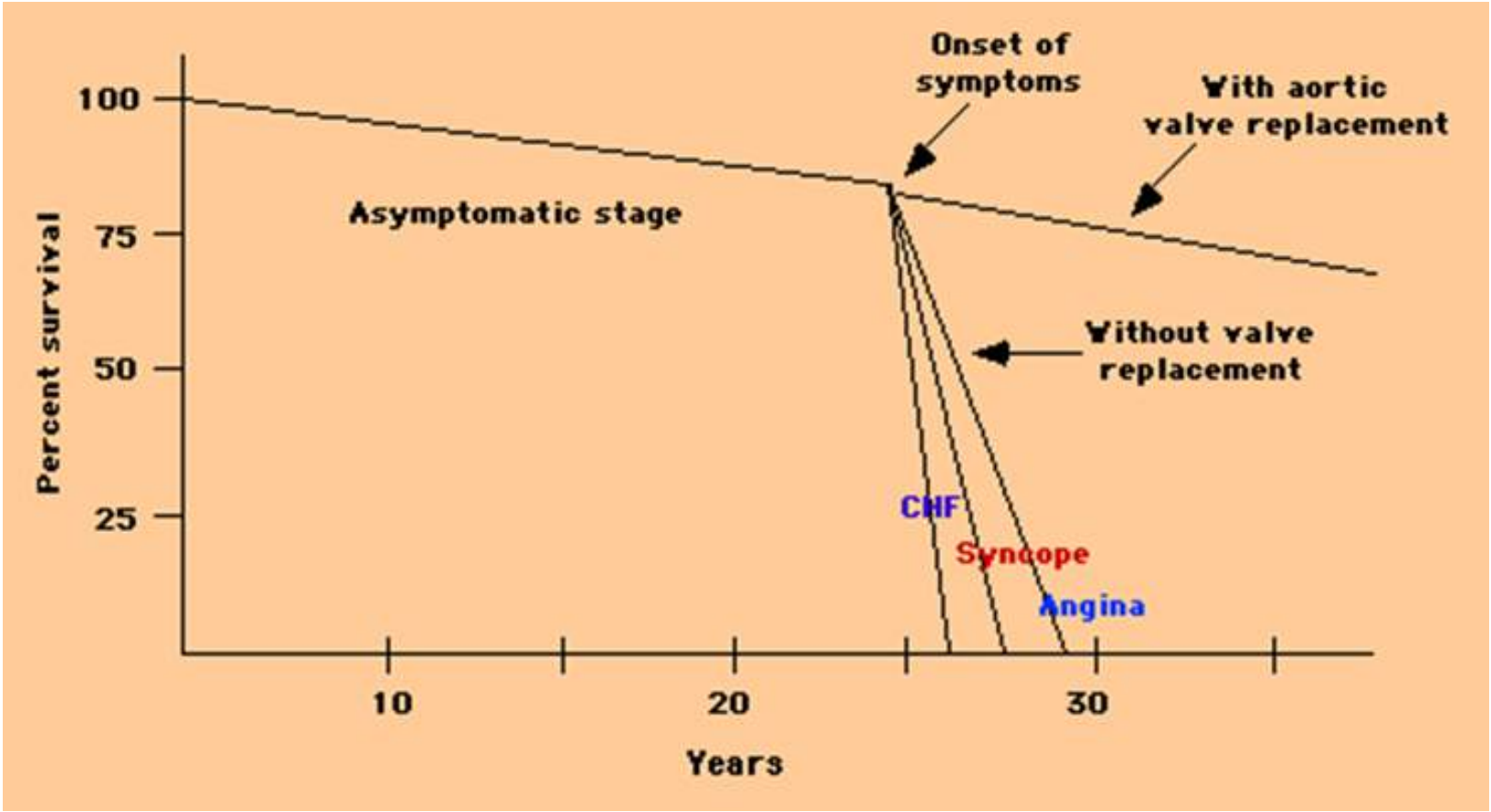


# Histoire Naturelle




Taux de survie observés dans une population de 200 patients atteints de sténose aortique après l'apparition des symptomes. L'âge moyen est de 49 ans. À 5 ans, le taux est de 46 p. 100 après syncope ; 38 p. 100 après angor ; 15 p. 100 après les premiers signes d'insuffisance ventriculaire gauche (IVG) ; 0 p. 100 après les premiers signes d'insuffisance cardiaque globale (ICG). D'après Acar et al.

# Histoire Naturelle




Ross J, Braunwald E, *Circulation, July 1968*

# Signes Cliniques

**Dégénératif découvert après 70 ans**

**RAA et congénitaux souffle très ancien**

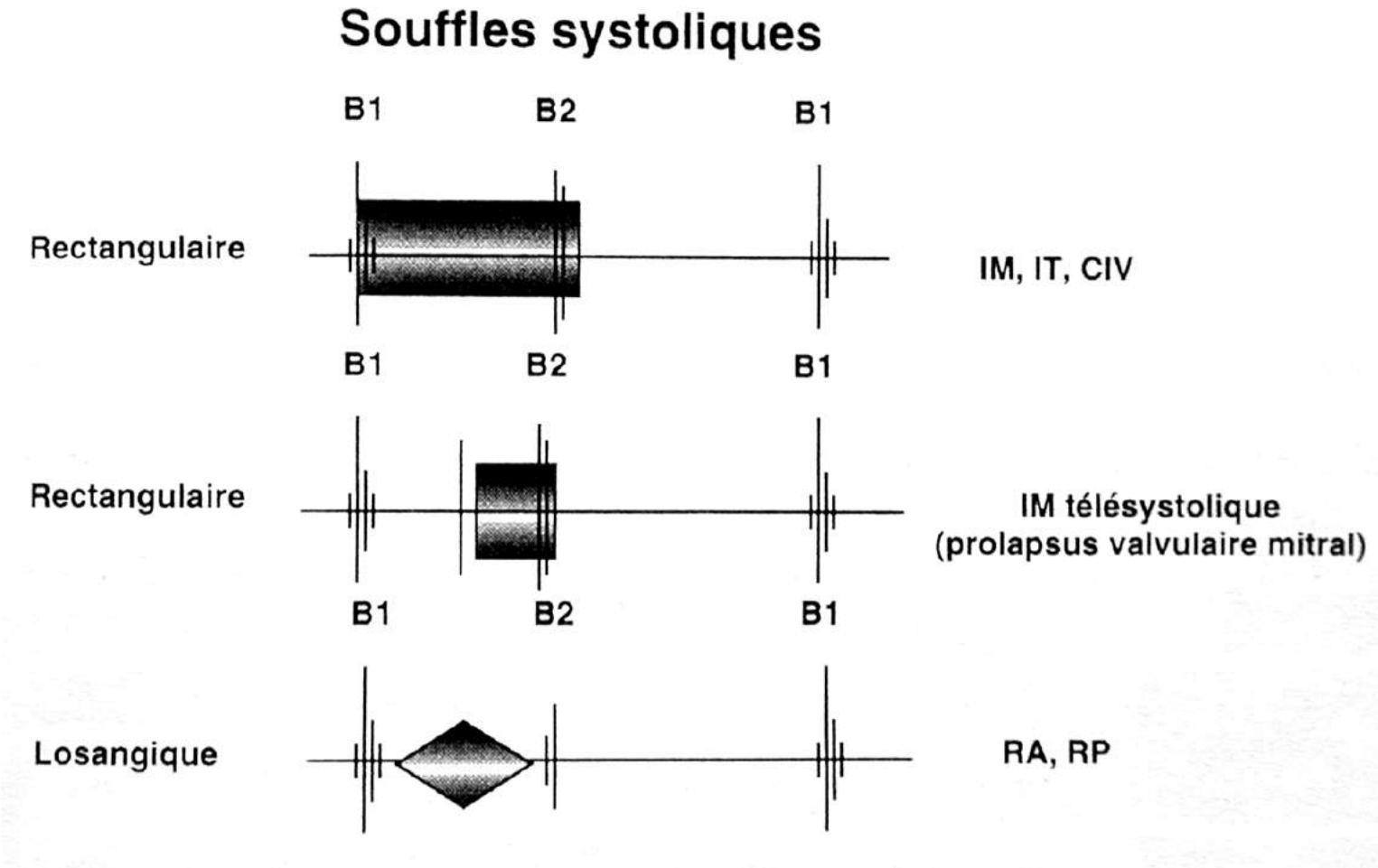
**Longtemps asymptomatiques**

- **Symptomes : « La triade aortique »**
  - **2/3 Angor** ***(Lésions coronaires dans plus de 30 %)***
  - **½ Syncope ou malaise d'effort**
  - **1/3 Dyspnée d'effort**

# Signes Cliniques

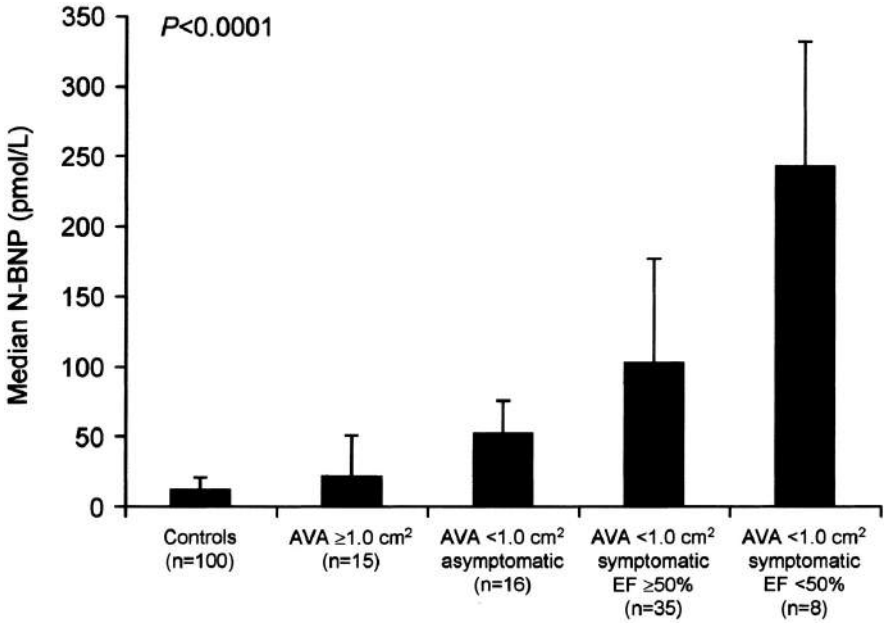
- **Examen Physique** : ***peu contributif***
  - **TA pincée**
  - **Choc de pointe étalé en bas et à G**
  - **Frémissement systolique « irradiation »**

# Auscultation



# Diagnosis: Biomarkers

- Brain Natriuretic Peptide (BNP)
  - Thought to be a marker of both hypertrophy and use of preload reserve to maintain compensation[1]
  - Studied extensively in patients with AS[1,2]
    - Symptomatic patients have higher concentrations of BNP than individuals without symptoms
    - Asymptomatic patients who develop symptoms shortly after BNP measurement have higher concentrations of this peptide than those who remain asymptomatic
    - Wide range of values of BNP foreshadow symptom onset in various studies preventing any cutoff from being sufficient to aid clinical management




[1]Berger-Klein J, Klaar U, et al. Circulation 2004; 2303-08.

[2]Weber M, Hausen M, et al. Heart 2006; 91: 1639-44.

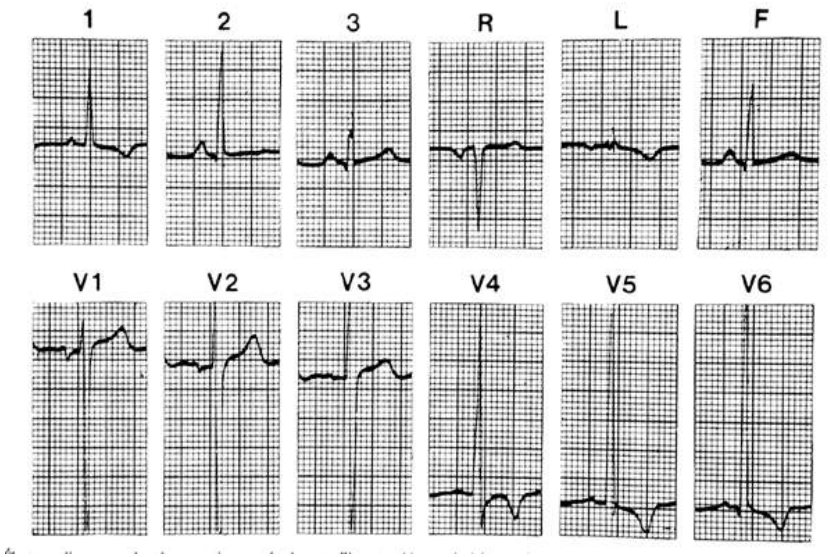
Figure: Gerber IL, Stewart RAH, et al. Circulation 2003; 1884.

# ECG et Epreuve d'effort

HVG = *Sokolow augmenté*
*+ troubles de la repolarisation*
*dans les précordiales gauches.*

HAG = *P négatif en V1 (si sévère)*

Ischémie et troubles conductifs



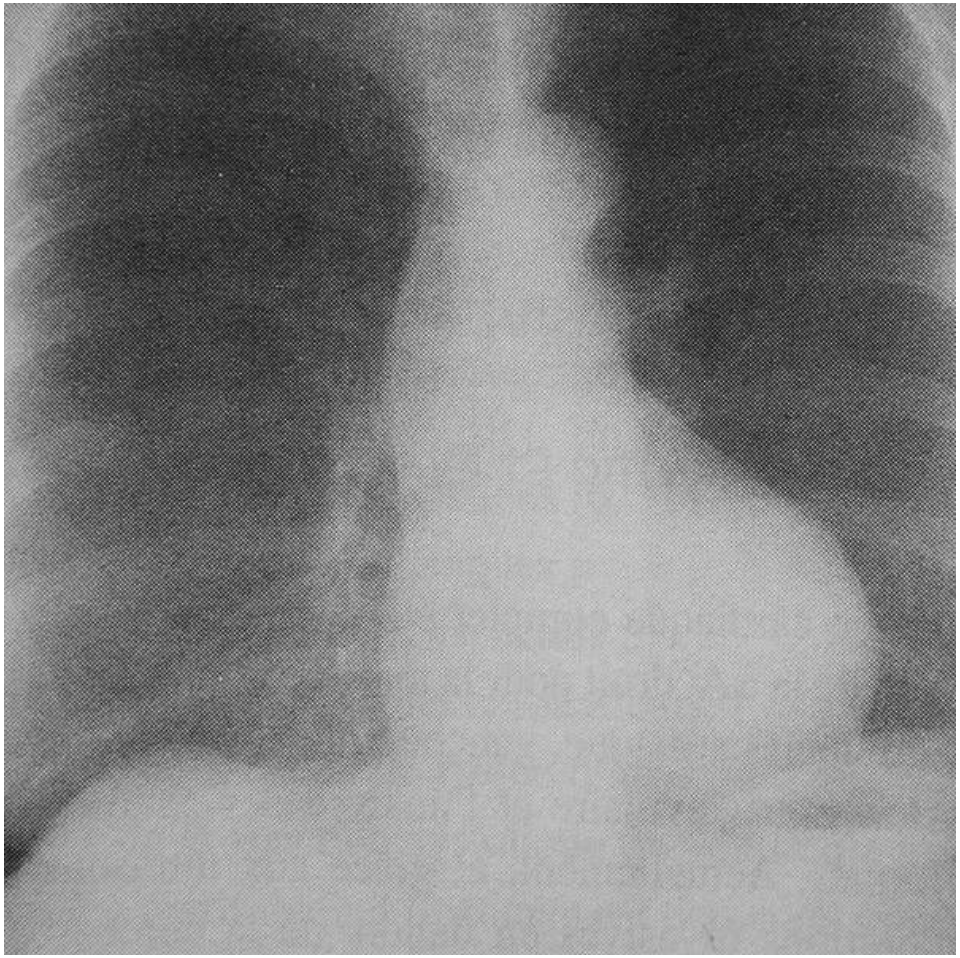

**ECG d'effort ➔ contre-indiqué si RA serré symptomatique**

**40 % des asymptomatiques ont une EE ++**

***- Absence de montée tensionnelle***

***- Hyper excitabilité VG +++***

# Radiologie



- **HVG**
**Concentrique**

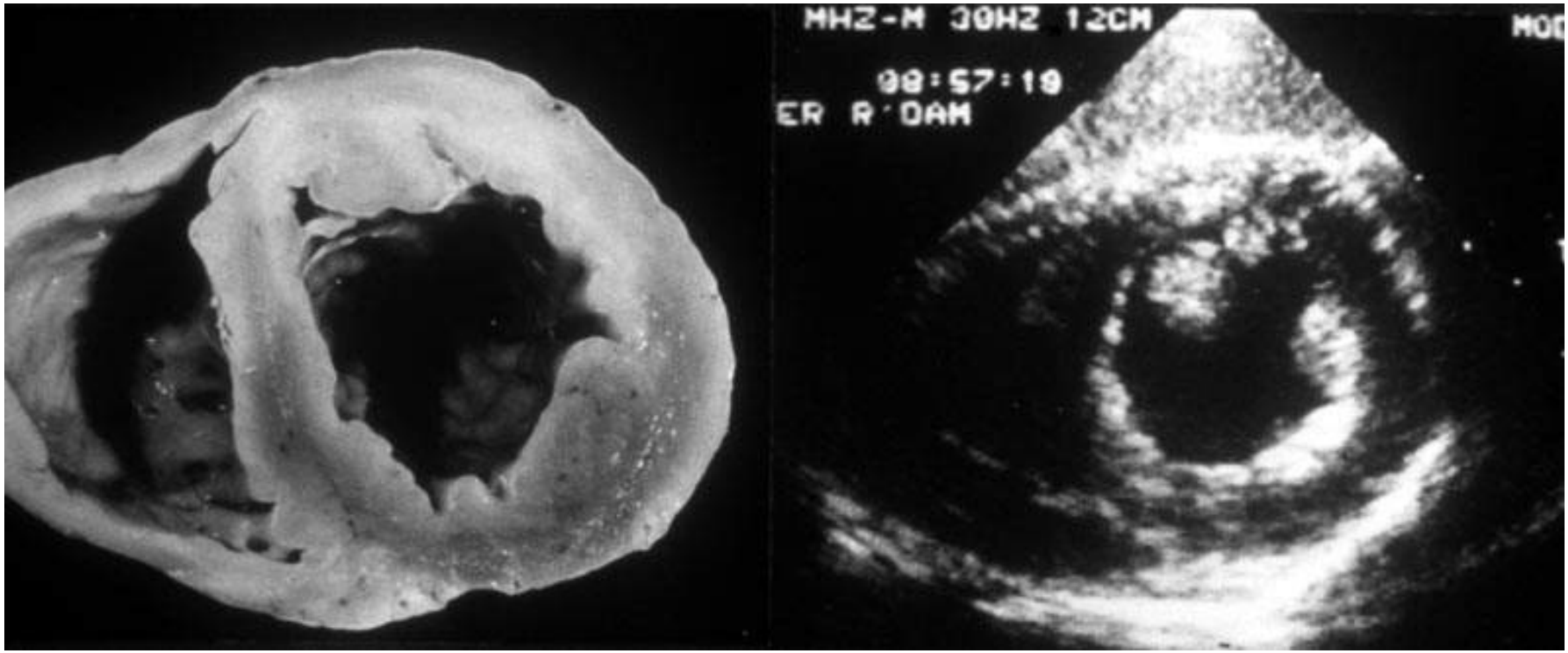
- **Calcifications**
**Valvulaires Aortiques**

# **Diagnosis**: *Studies*

- Electrocardiogram is non-diagnostic
  - Usually shows evidence of left-ventricular hypertrophy
  - Left-atrial abnormality is typical
  - Non-specific ST-wave and T-wave abnormalities are common
- Chest radiograph is non-specific
  - Rare cases show calcification of the aortic valve in lateral view

Photograph: Cardiovascular Institute, Peking University

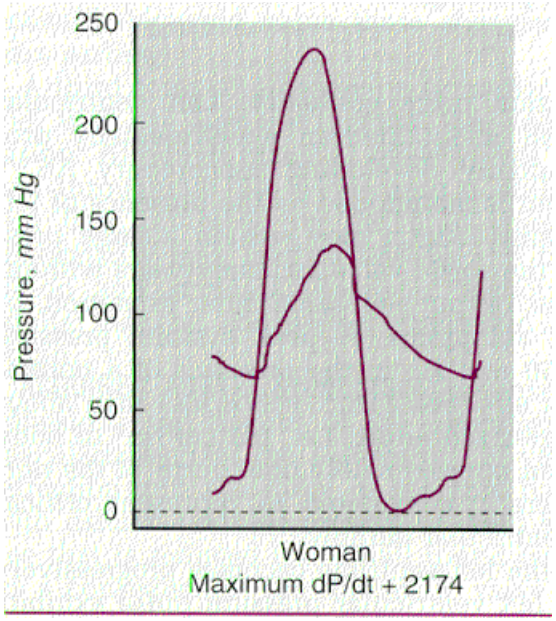
# Echographie

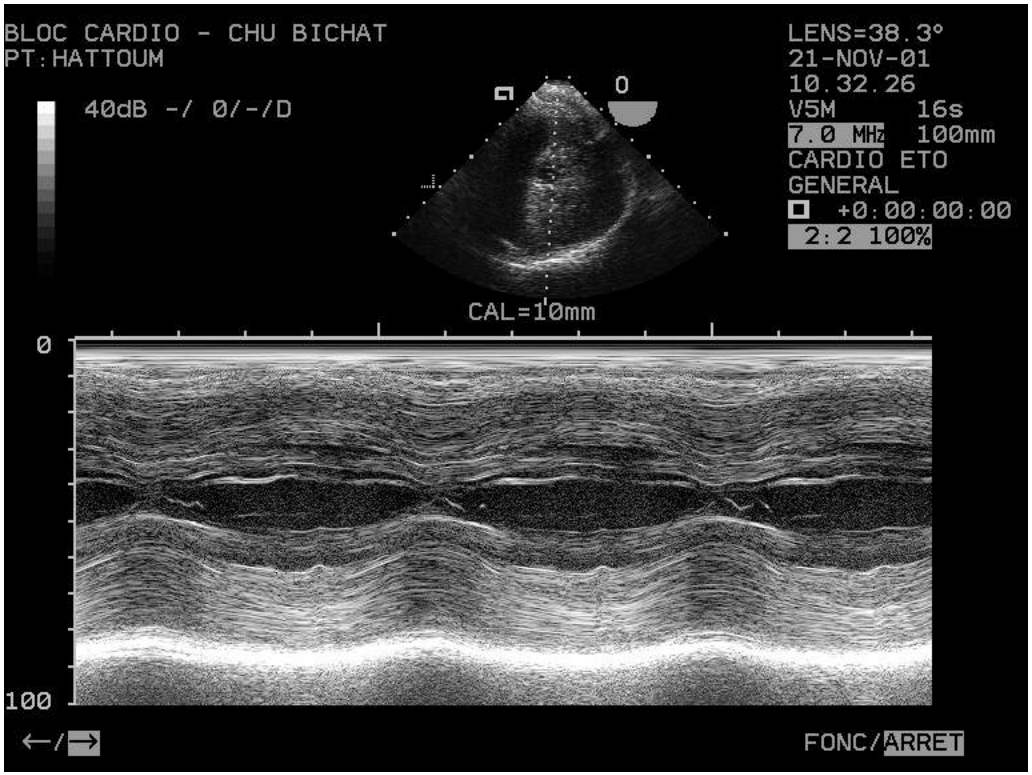



**HVG ➔ Septum > 15 mm**

# Echographie

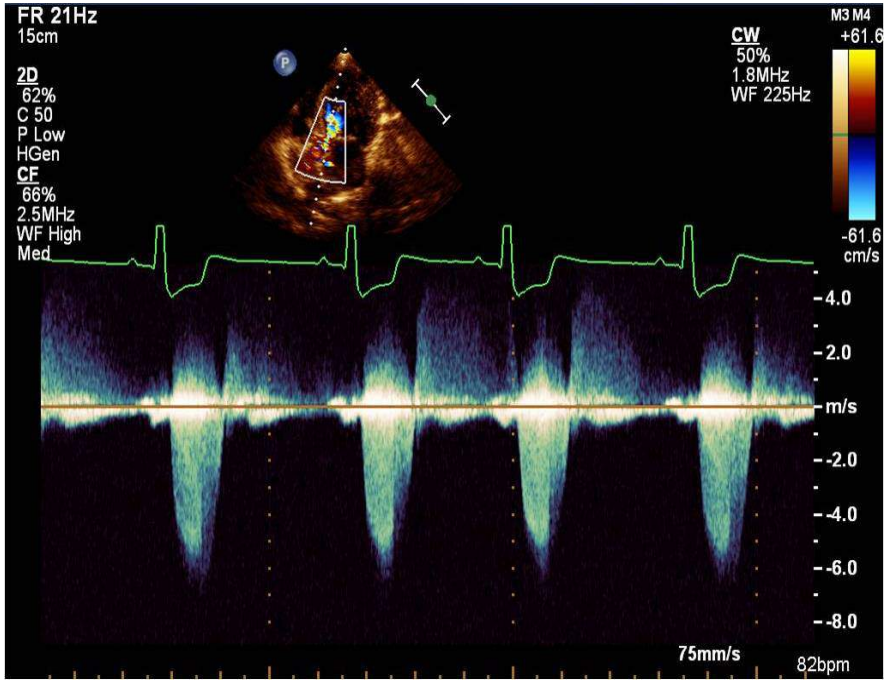
**Surcharge de pression** → **Hypertrophie pariétale concentrique**



# Diagnosis: *Studies*

- Echocardiogram regularly establishes the diagnosis
  - Left-ventricular function
  - Extent of hypertrophy
  - Amount of valve calcification
  - Transvalvular pressure gradient
  - Aortic valve area
    - Not easily seen because the orifice is small and irregular
    - Area of outflow tract, outflow velocity, and velocity of the flow at the valve can be used to calculate the valve area




Photograph: Louisiana State University School of Veterinary Medicine