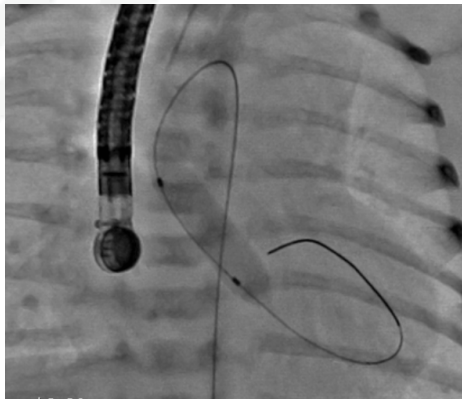
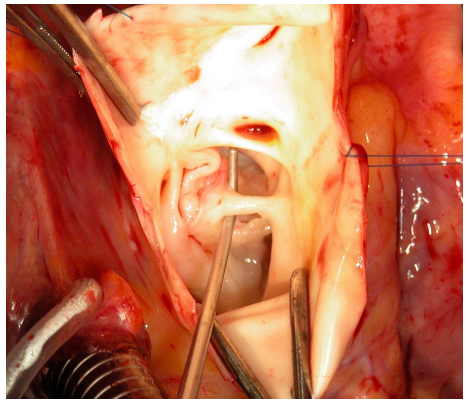
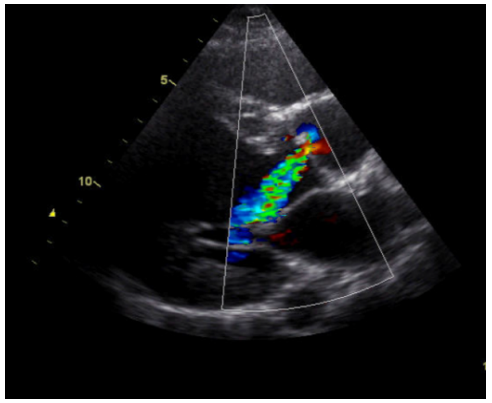
L'INSTITUT DE RYTHMOLOGIE ET MODÉLISATION CARDIAQUE
BORDEAUX

STÉNOSE AORTIQUE

INSUFFISANCE AORTIQUE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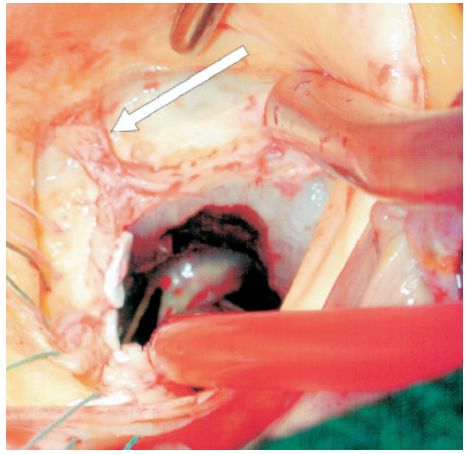
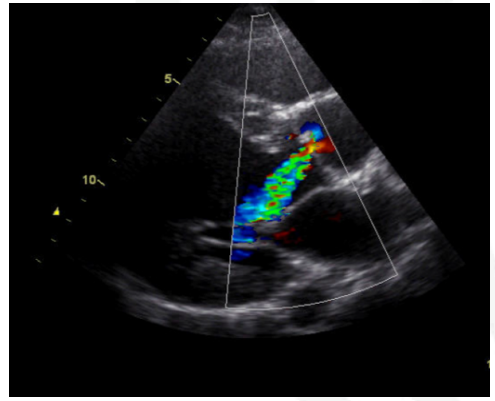
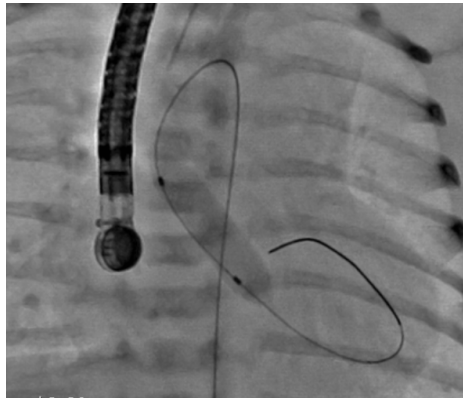
PLAN

- PHYSIOPATHOLOGIE
- ANATOMIE
- PRESENTATION CLINIQUE
- EVALUATION PARACLINIQUE
- TRAITEMENT
- CONCLUSION



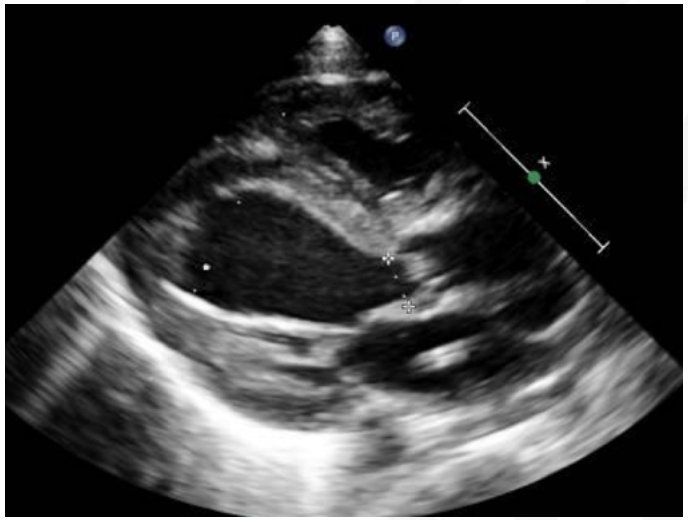


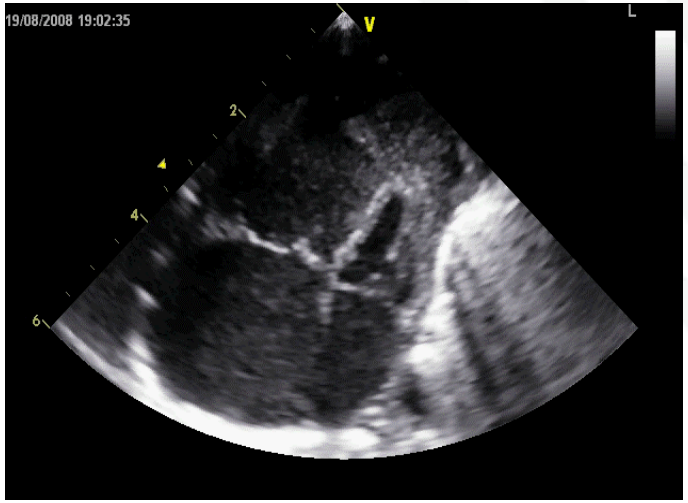


PHYSIOPATHOLOGIE

STÉNOSE AORTIQUE

- Pathologie anténatale
- Forme sévère type HLHS ducto dépendante
- Augmentation de la post charge du VG
- Hypertrophie concentrique
- Augmentation de la pression télédiastolique VG
- Diminution de la compliance du VG
- Ischémie sous endocardique
- Parfois fibrose endomyocardique





PHYSIOPATHOLOGIE

STÉNOSE AORTIQUE

Sténose aortique → Surcharge barométrique

↓

Atteinte myocardique

↓

Elevation PTDVG et POG

↓

FOP shunt G-D

↓

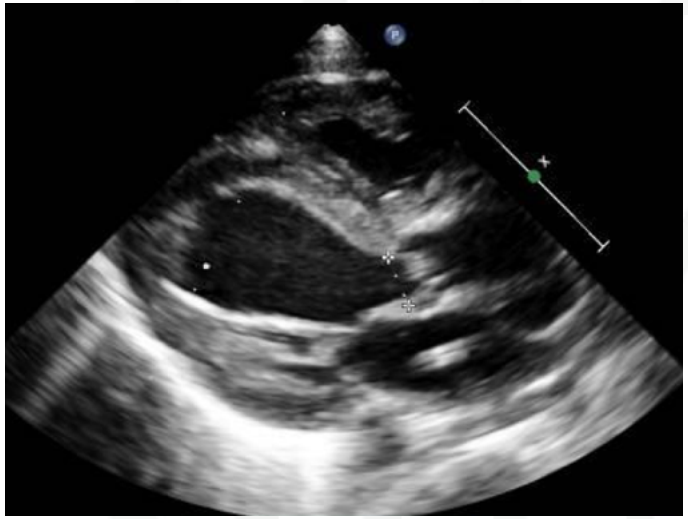
Baisse Précharge VG

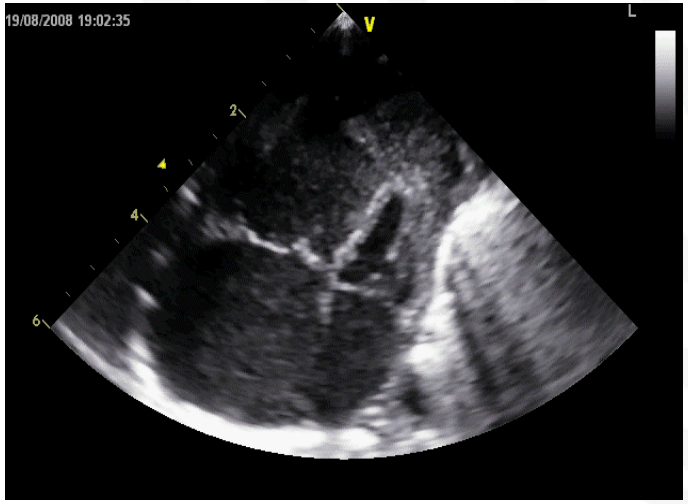
↑

Croissance VG

↑

HLHS





PHYSIOPATHOLOGIE

INSUFFISANCE AORTIQUE

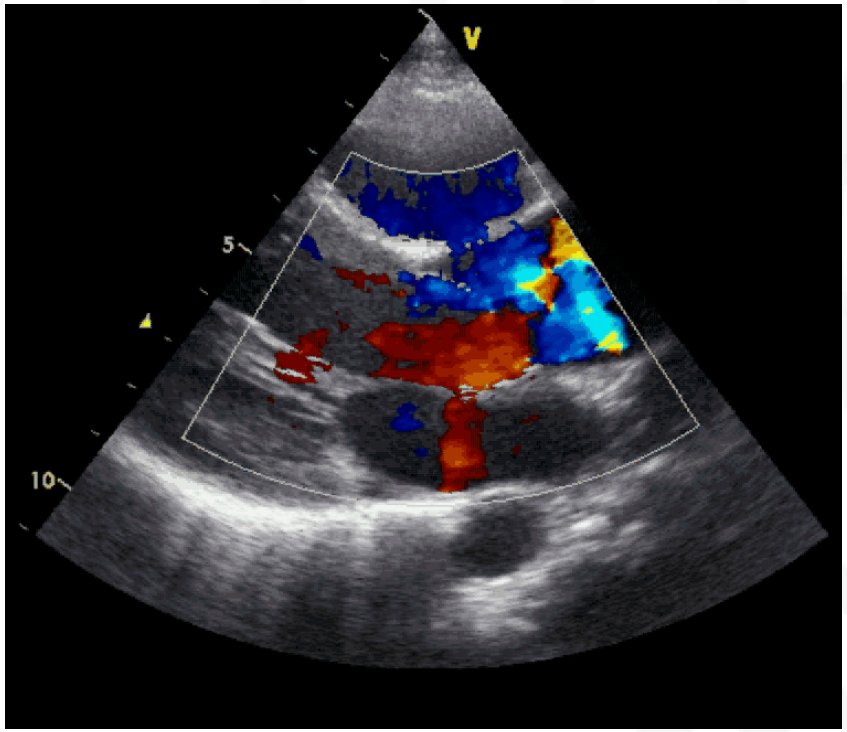
Acute AR

- Sudden large regurgitant volume imposed on normal size LV
- Rapid rise in LVEDP and LA pressure

=> Pulmonary oedema + cardiogenic shock; ischaemia

Chronic AR

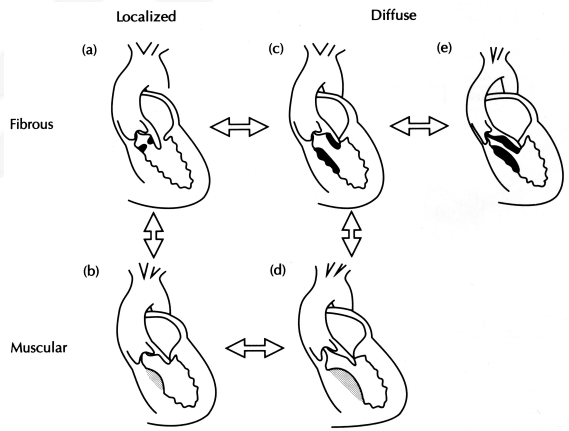
- Chronic volume load-> ↑LVEDV and compliance; eccentric LVH
- Reduced effective stroke volume, but preserved systolic function
- Eventually => ↑LVEDP + impaired LV systolic performance



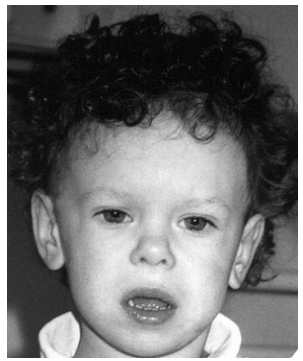
ANATOMIE

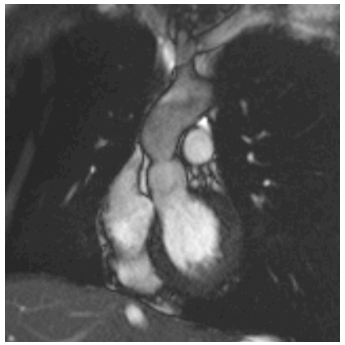
STÉNOSE AORTIQUE

SOUS-VALVULAIRE

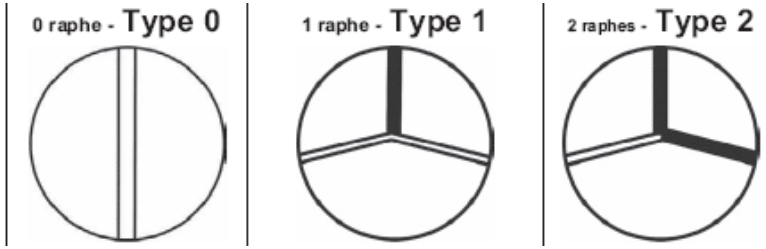


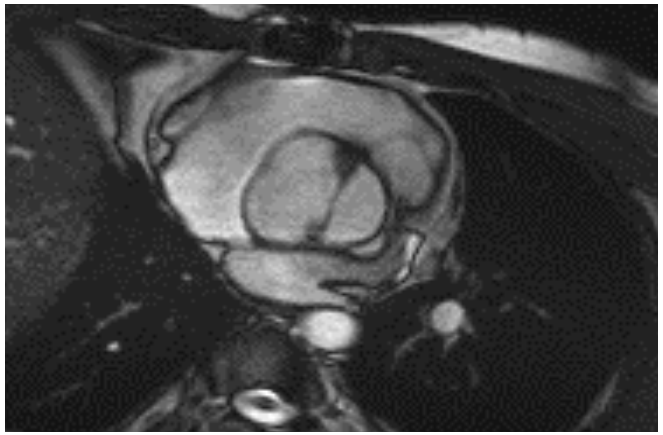
SUPRA-VALVULAIRE





BICUSPIDIE





INSUFFISANCE AORTIQUE

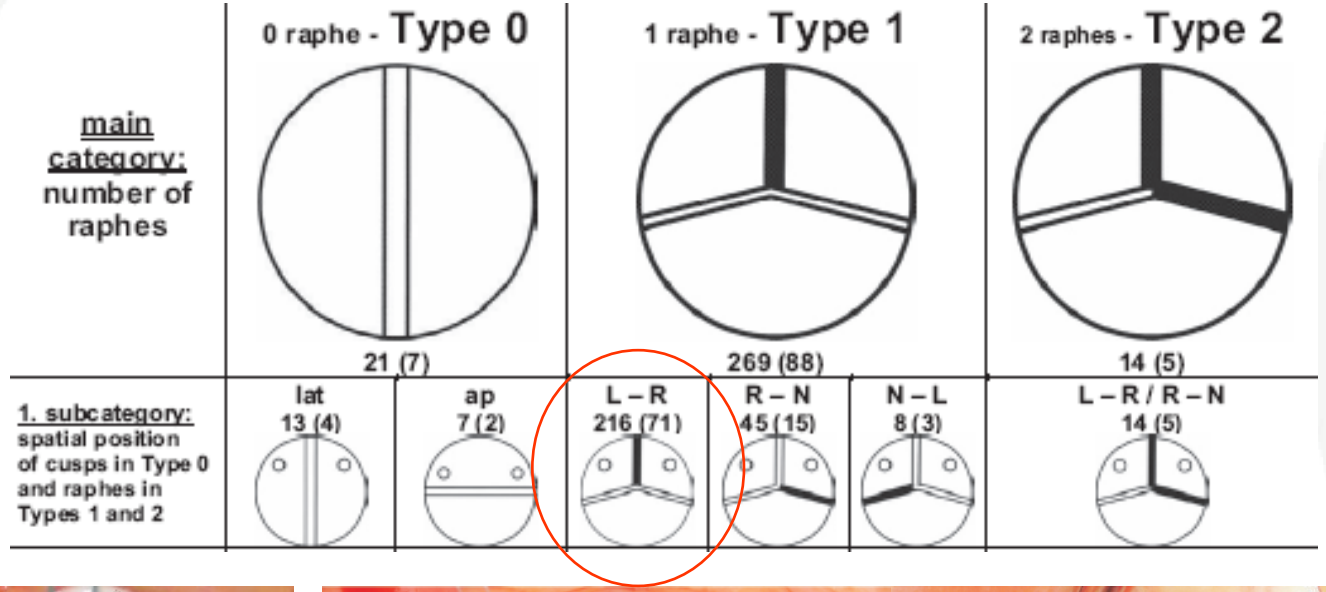
CONGENITALE

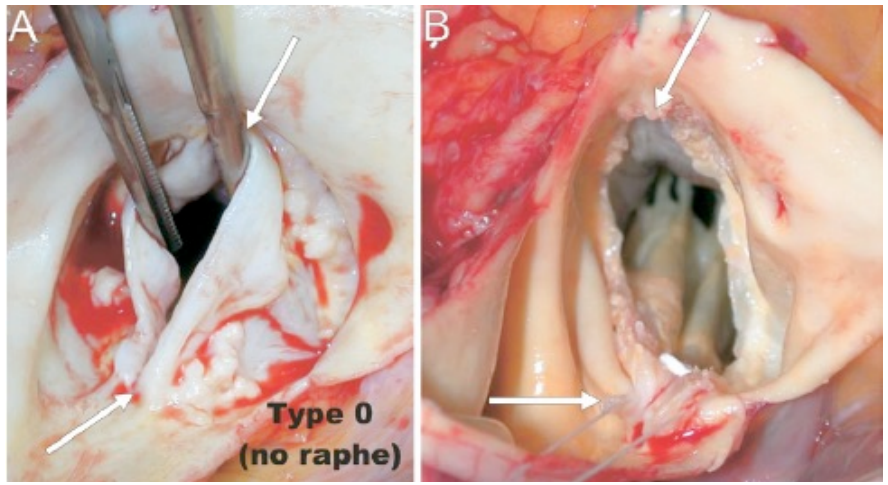
- Marfan
- Laubry-Pezzi

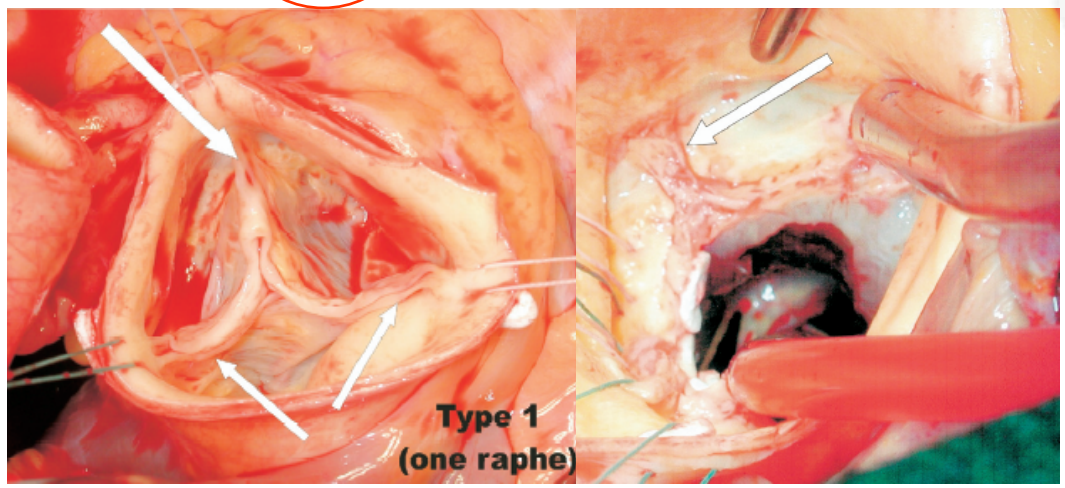
ACQUISE

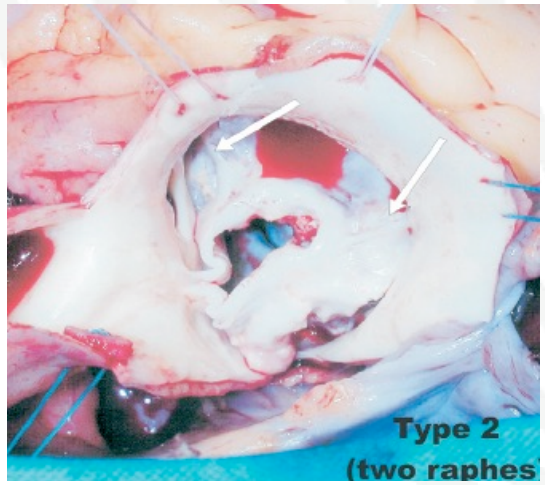
- Endocardite
- RAA
- Iatrogène
- Aortite
- Traumatique

ANATOMIE





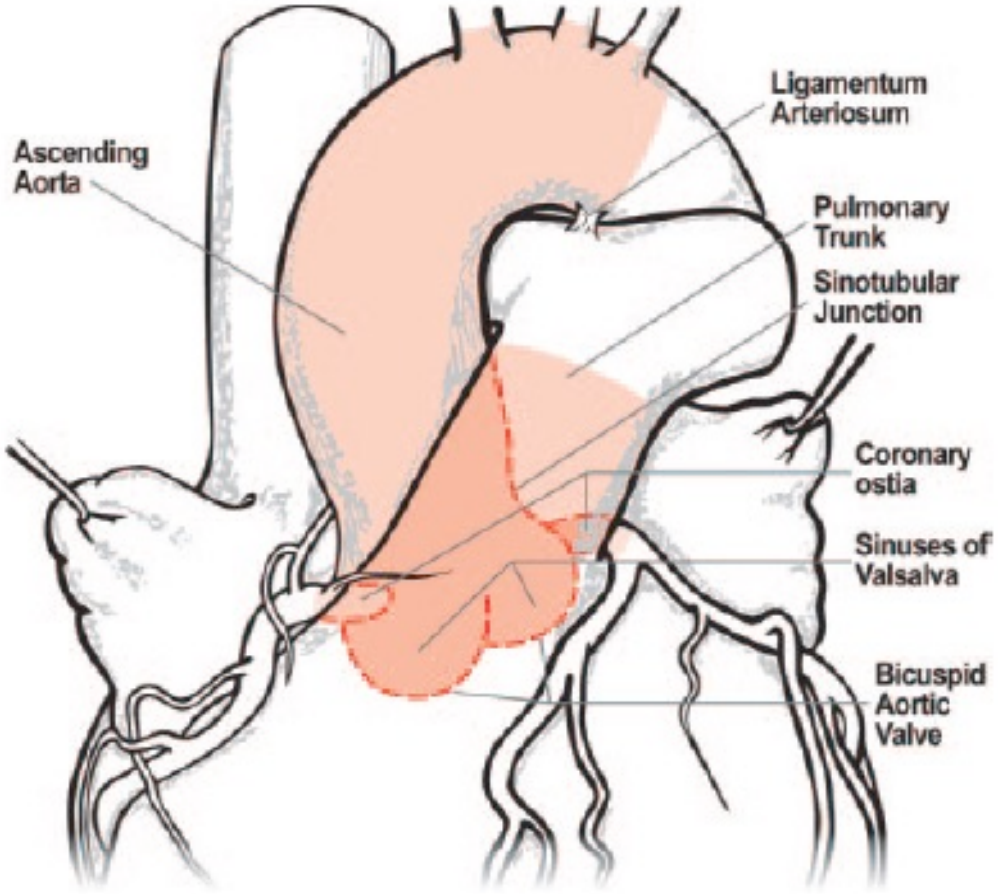


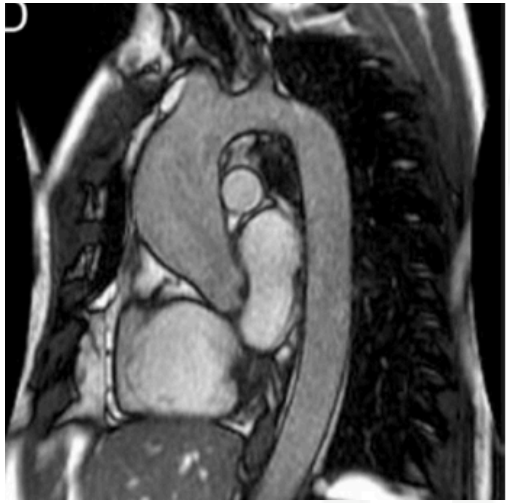


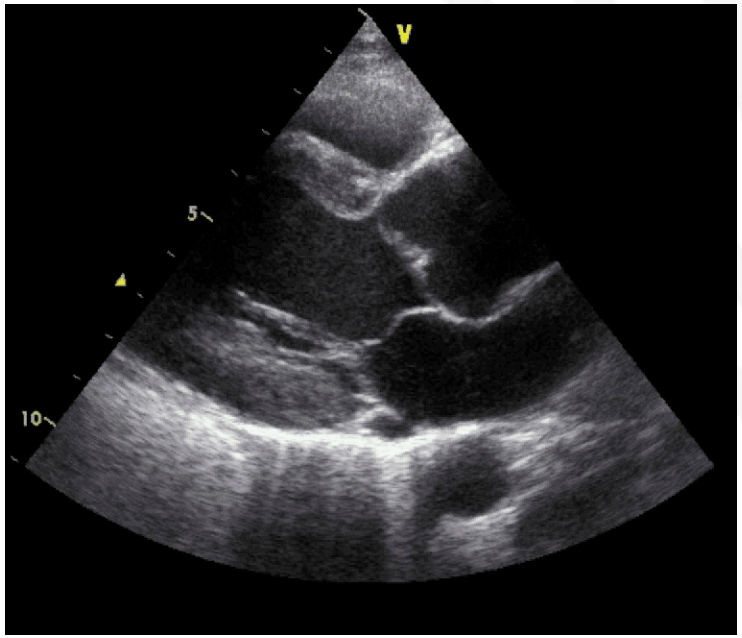
Sievers et al. J Thorac Cardiovasc Surg. 2007

ANATOMIE

AORTOPATHIE







PRESENTATION CLINIQUE

STÉNOSE AORTIQUE

- Sténose aortique critique néonatale
  - Valvulaire
  - Ducto-dépendance
- RAo du nourrisson et de l'enfant
  - Tableau chronique
  - Rao sous-valvulaire
  - Rao valvulaire
  - Rao supra valvulaire

INSUFFISANCE AORTIQUE

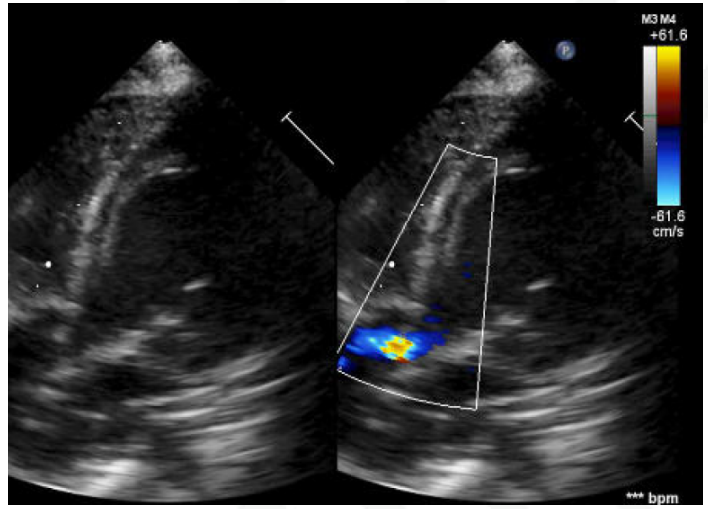
Table 16. Natural History of Aortic Regurgitation

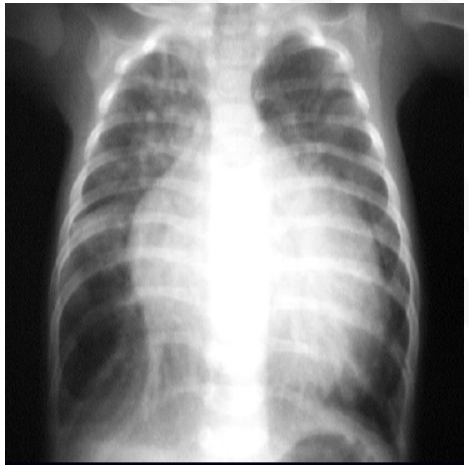
Asymptomatic patients with normal LV systolic function[268–277]	
Progression to symptoms and/or LV dysfunction	Less than 6% per y
Progression to asymptomatic LV dysfunction	Less than 3.5% per y
Sudden death	Less than 0.2% per y
Asymptomatic patients with LV dysfunction[281–283]	
Progression to cardiac symptoms	Greater than 25% per y
Symptomatic patients[284–288]	
Mortality rate	Greater than 10% per y

PRESENTATION CLINIQUE

STÉNOSE AORTIQUE CRITIQUE

- Choc cardiogénique, insuffisance circulatoire aigue
- Signes de collapsus
- Souffle de RA de faible intensité (bas débit)
- Pouls périphériques diminués sans asymétrie tensionnelle

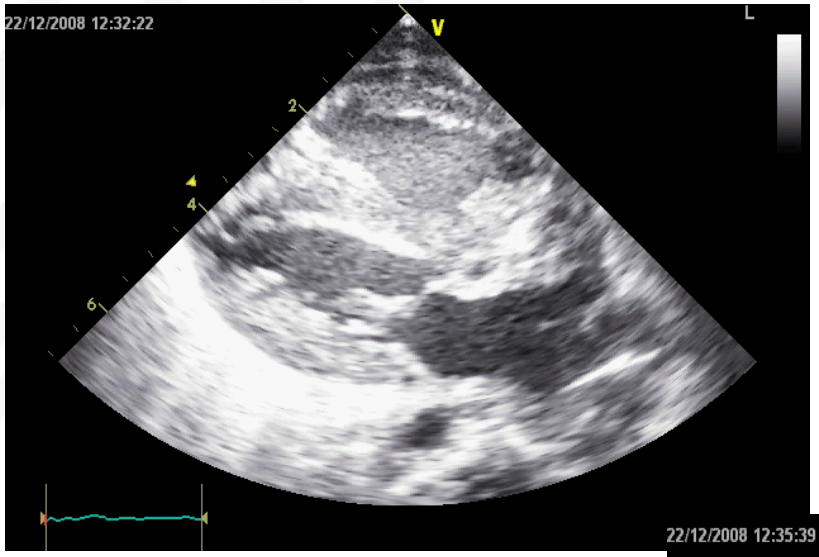


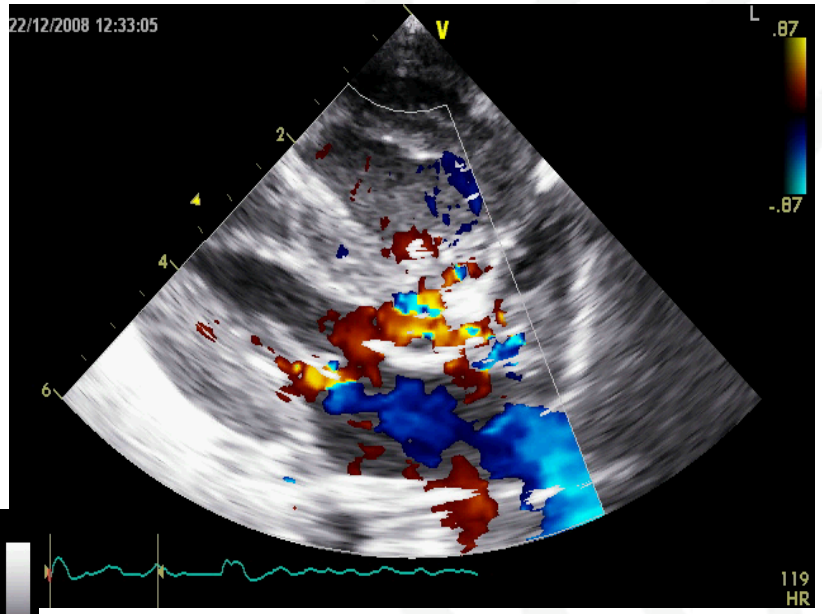


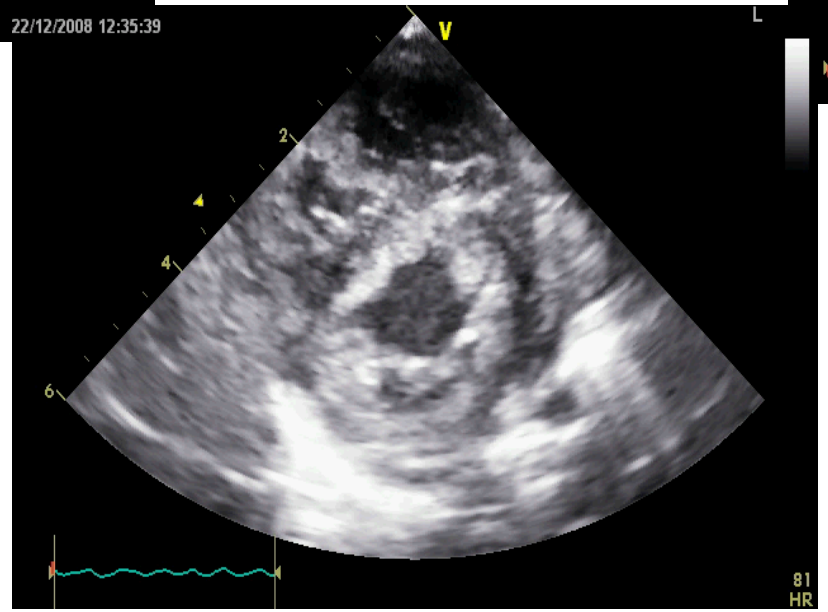
EVALUATION ECHOGRAPHIQUE

- Diagnostic positif: sténose - fuite
- Anatomie de la valve aortique
- Sévérité: gradient, ducto-dépendance
- Retentissement
  - Géométrie VG
  - Fonction ventriculaire gauche
  - HTAP
- Recherche de lésions associées sur l'ensemble de la voie gauche (mitrale, coarctation?), autres (shunts…)

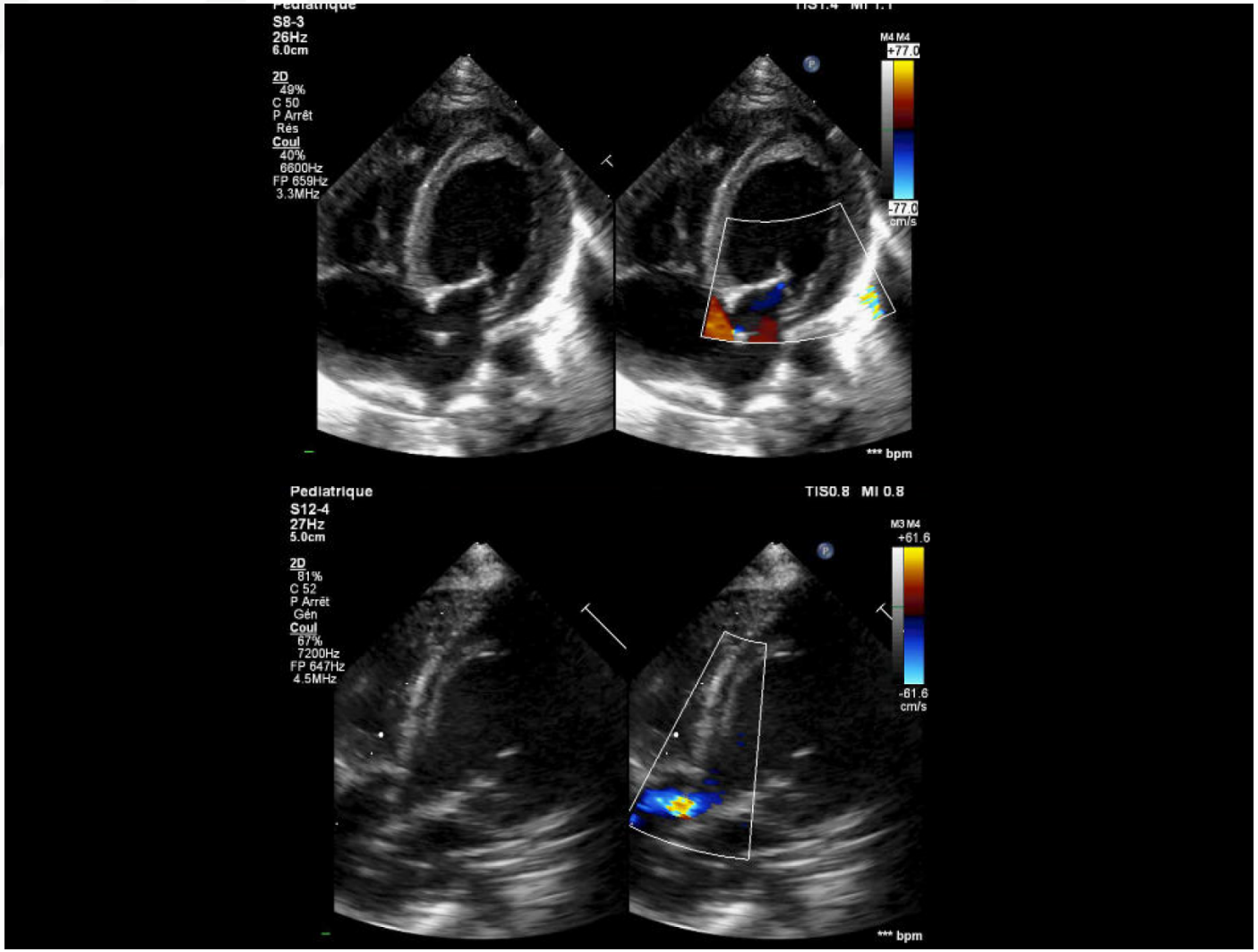
EVALUATION ECHOGRAPHIQUE

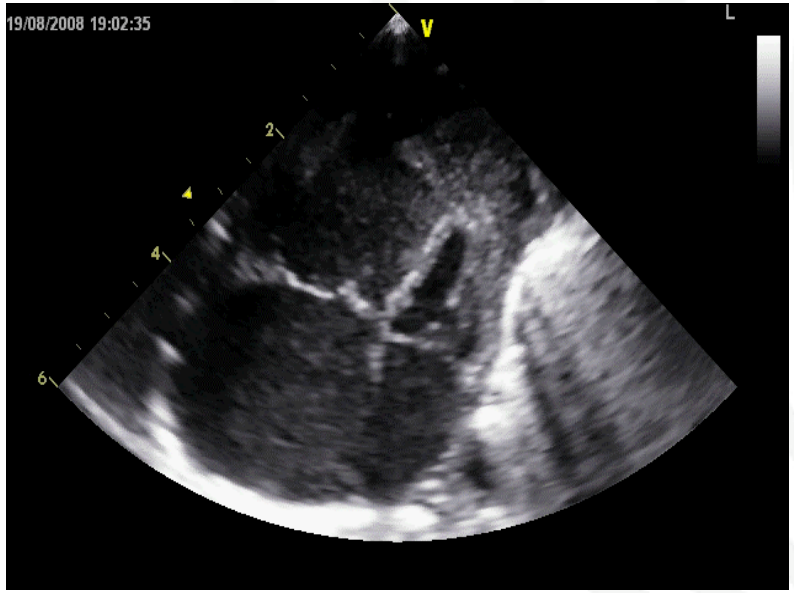






EVALUATION ECHOGRAPHIQUE





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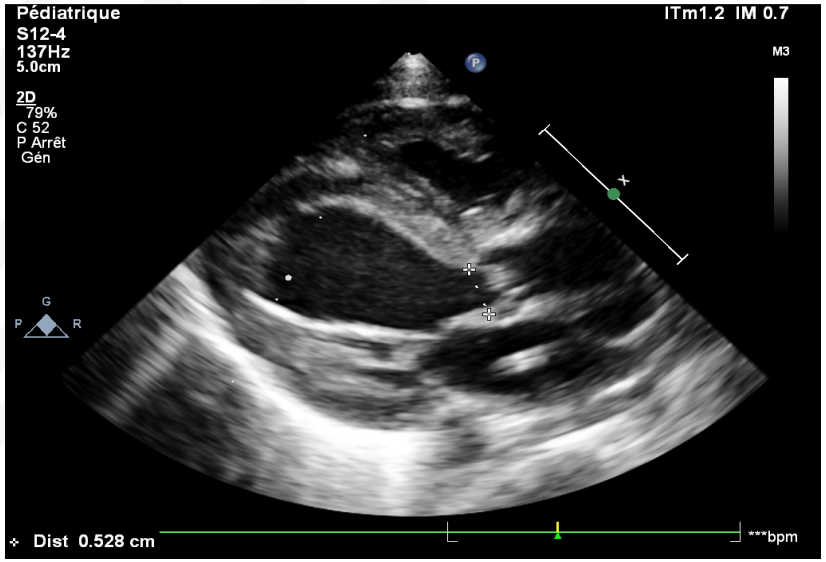

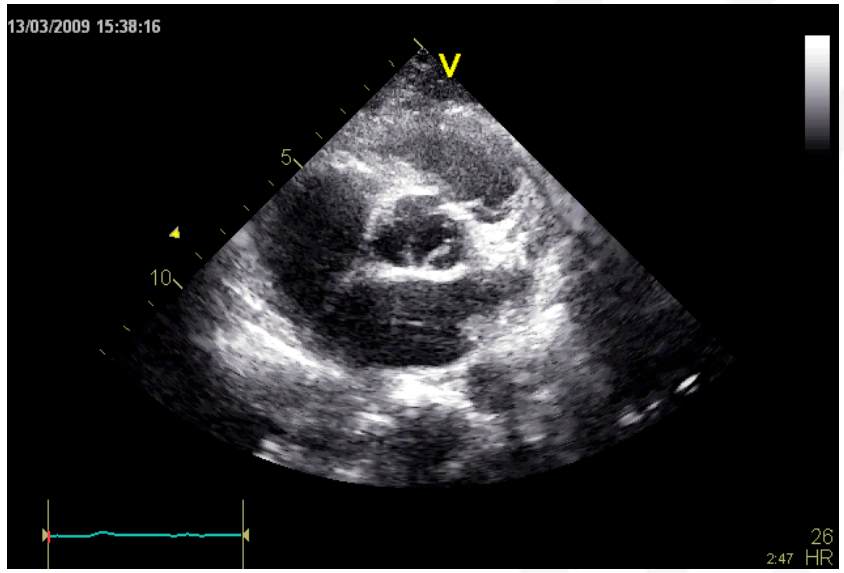

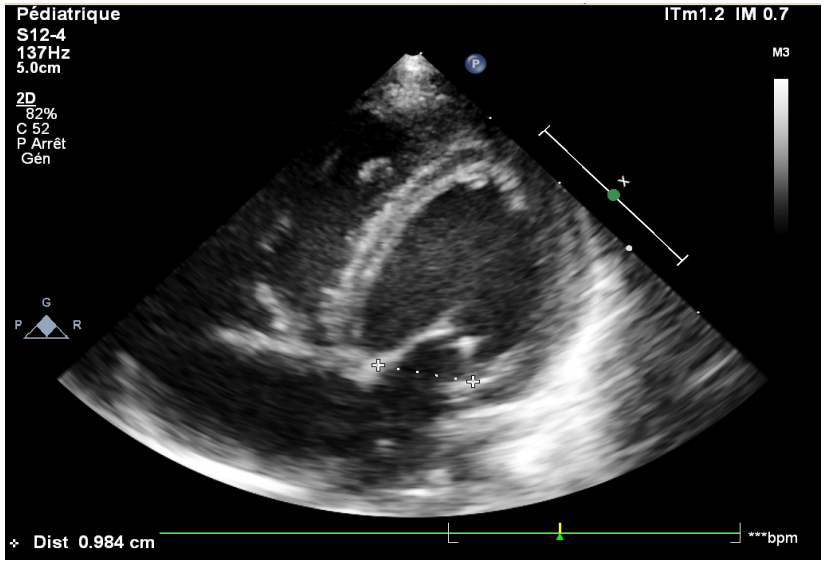

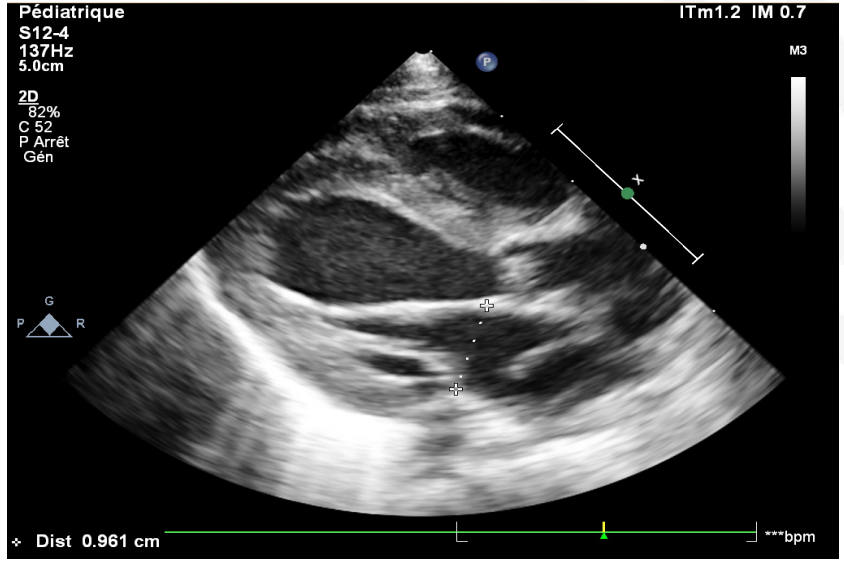

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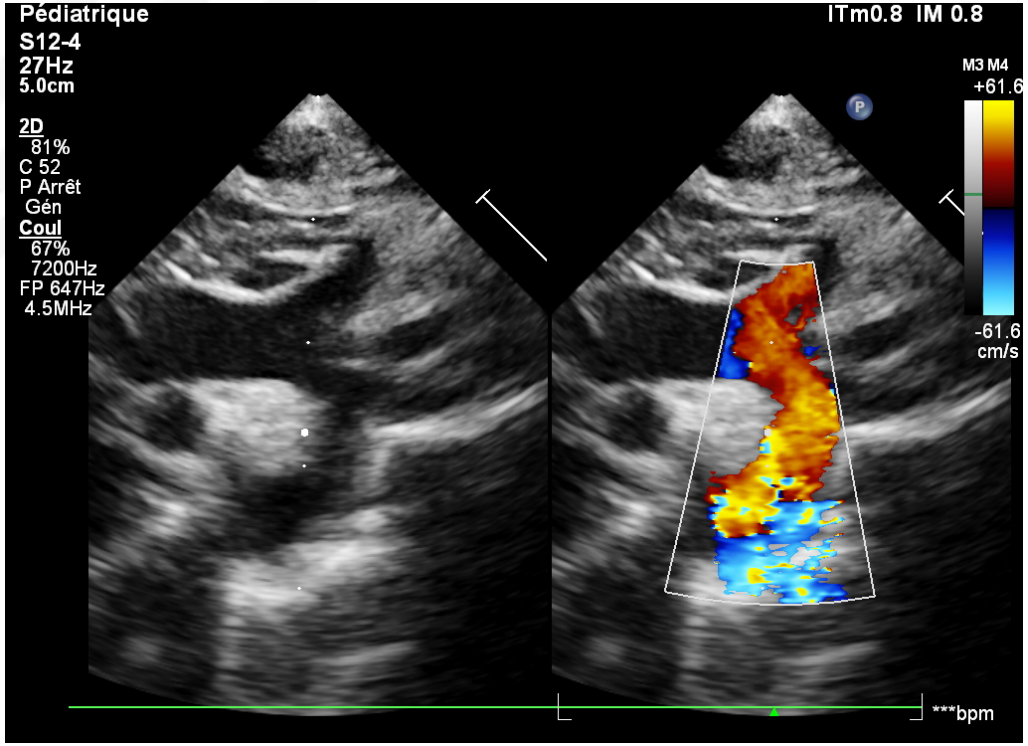

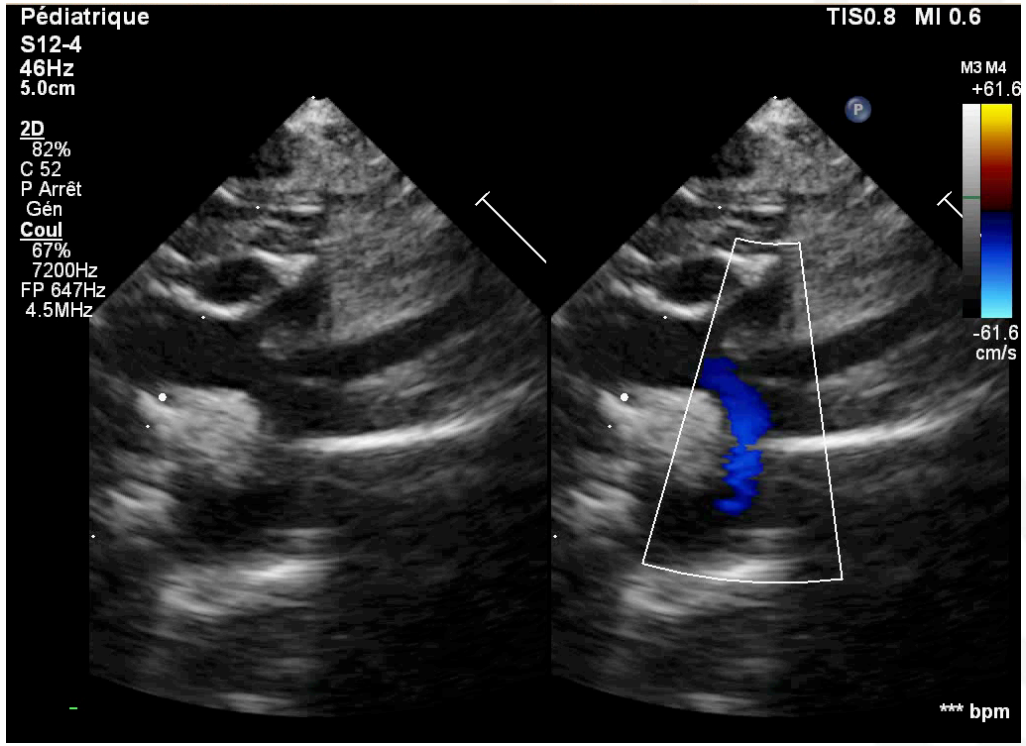

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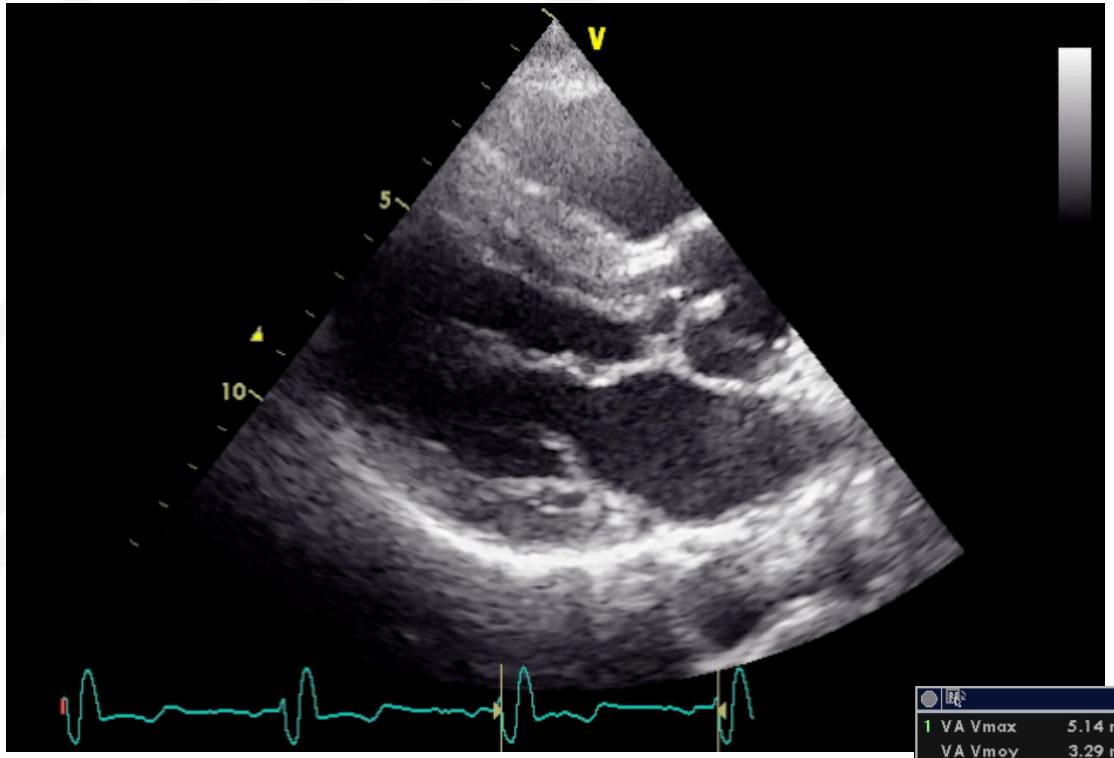

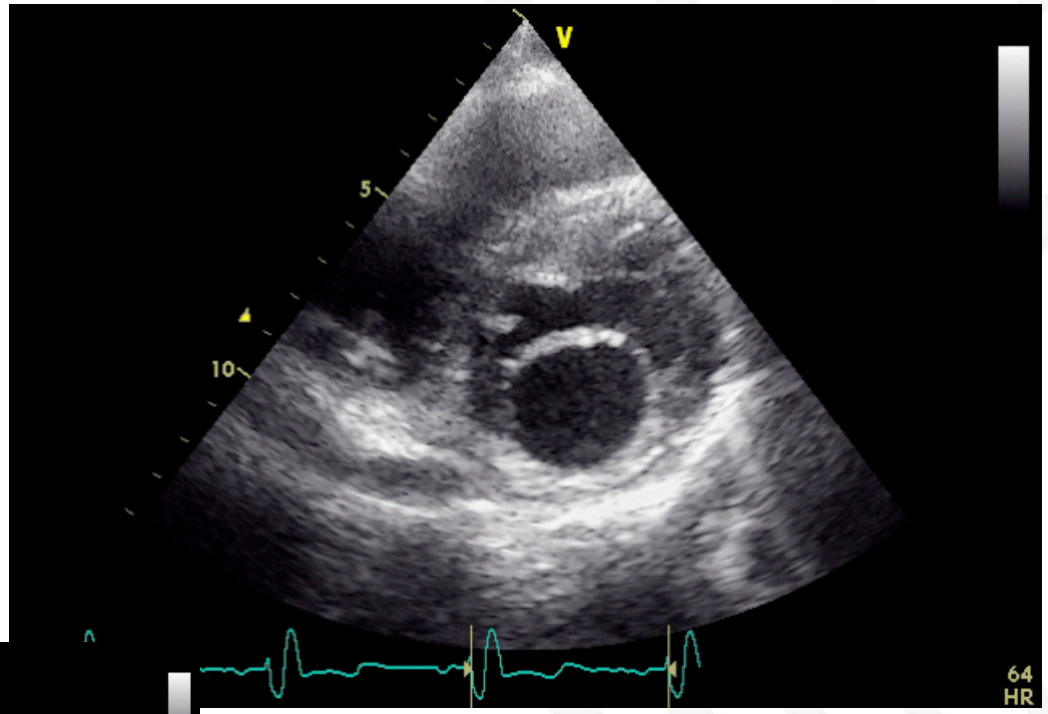

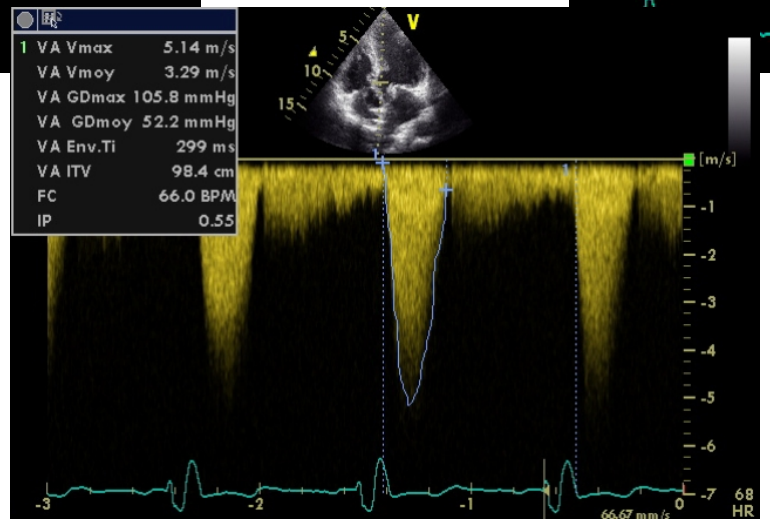

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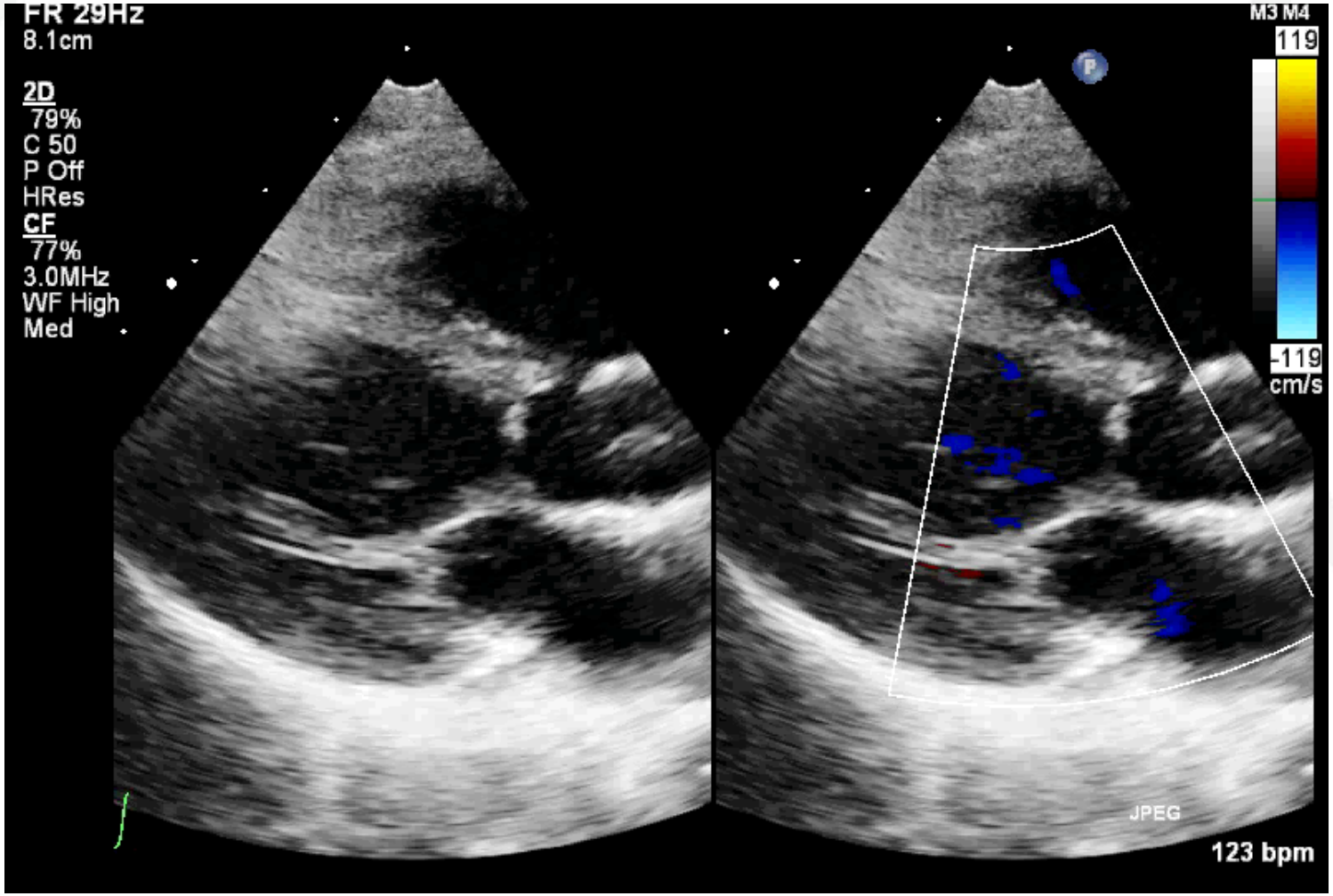

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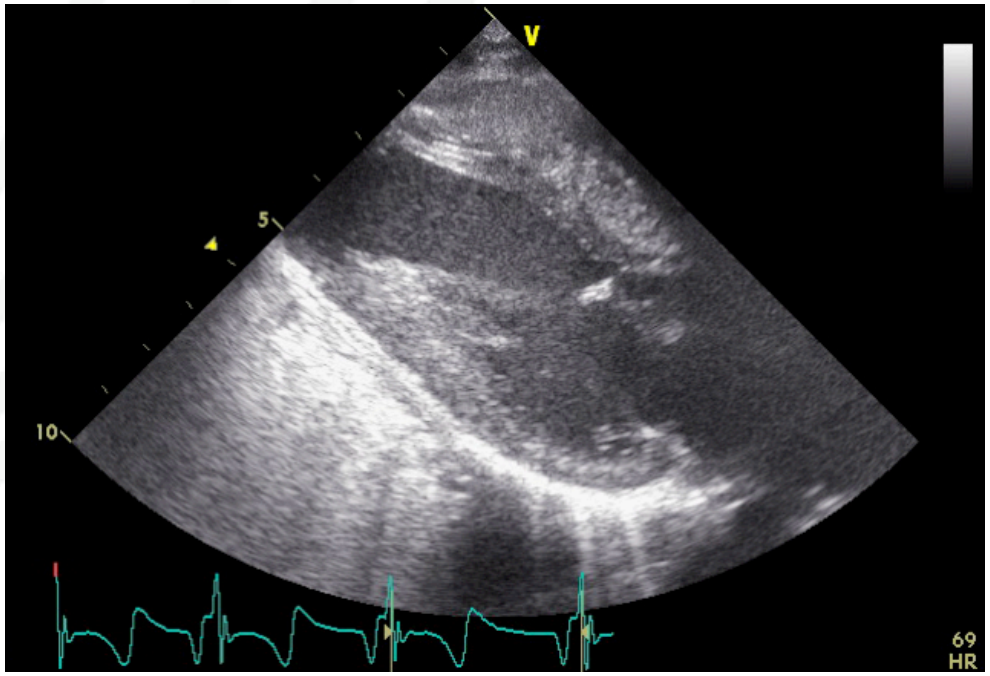

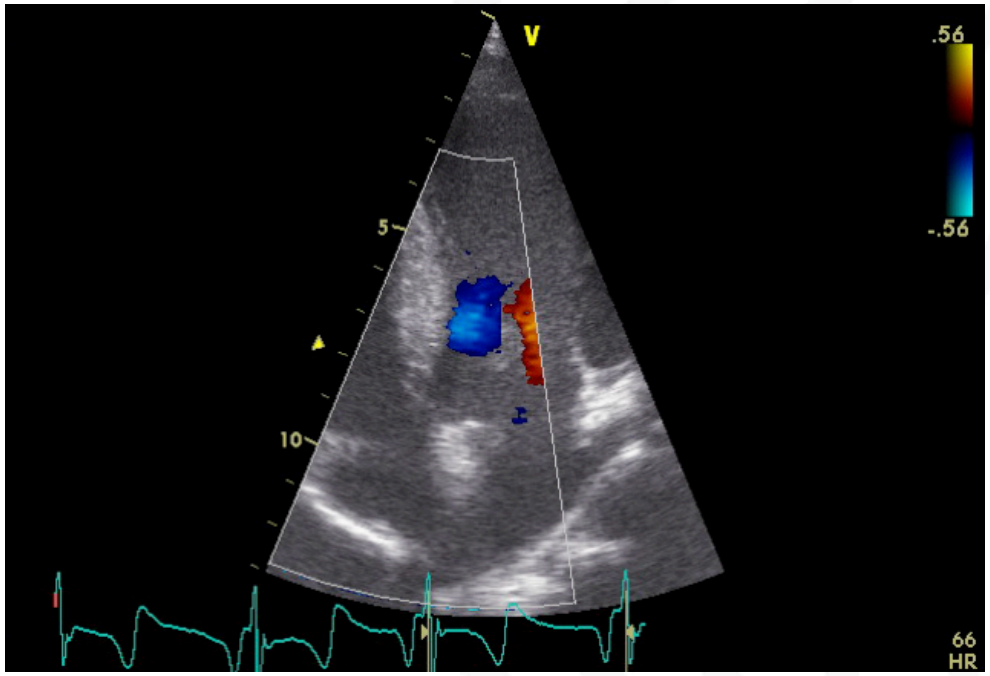

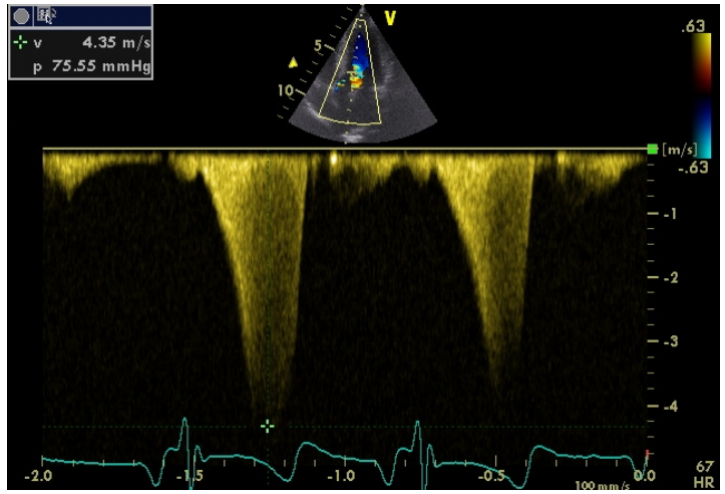

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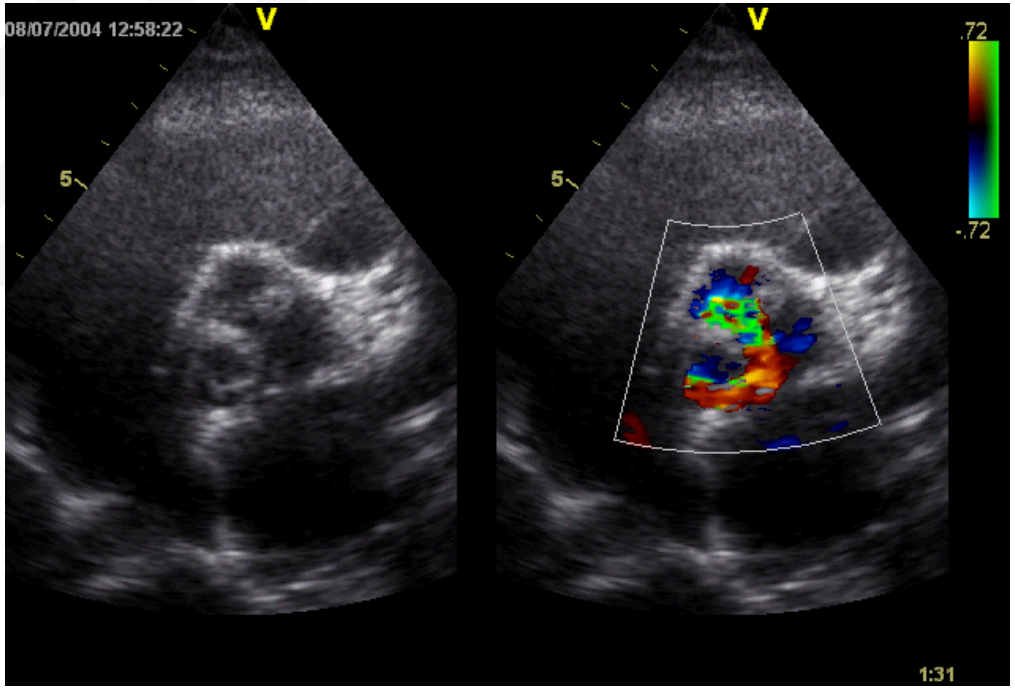
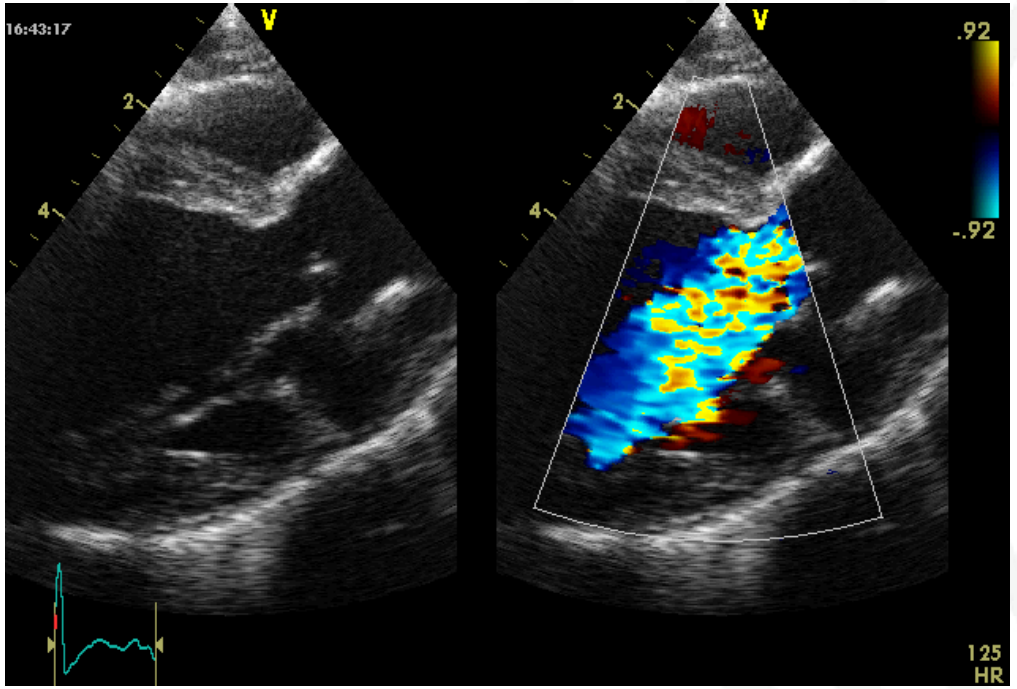
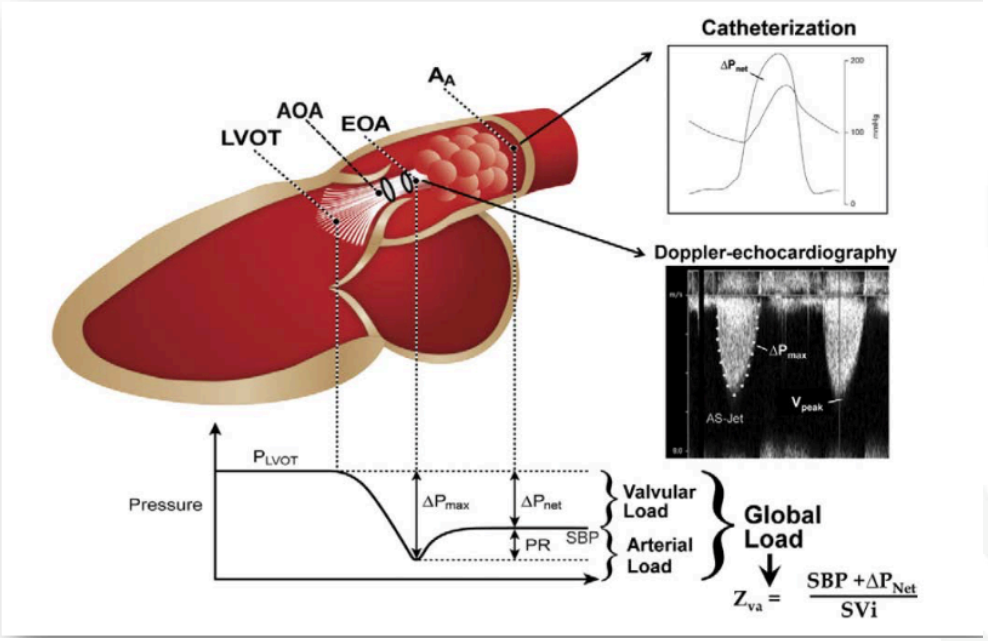




EVALUATION ECHOGRAPHIQUE

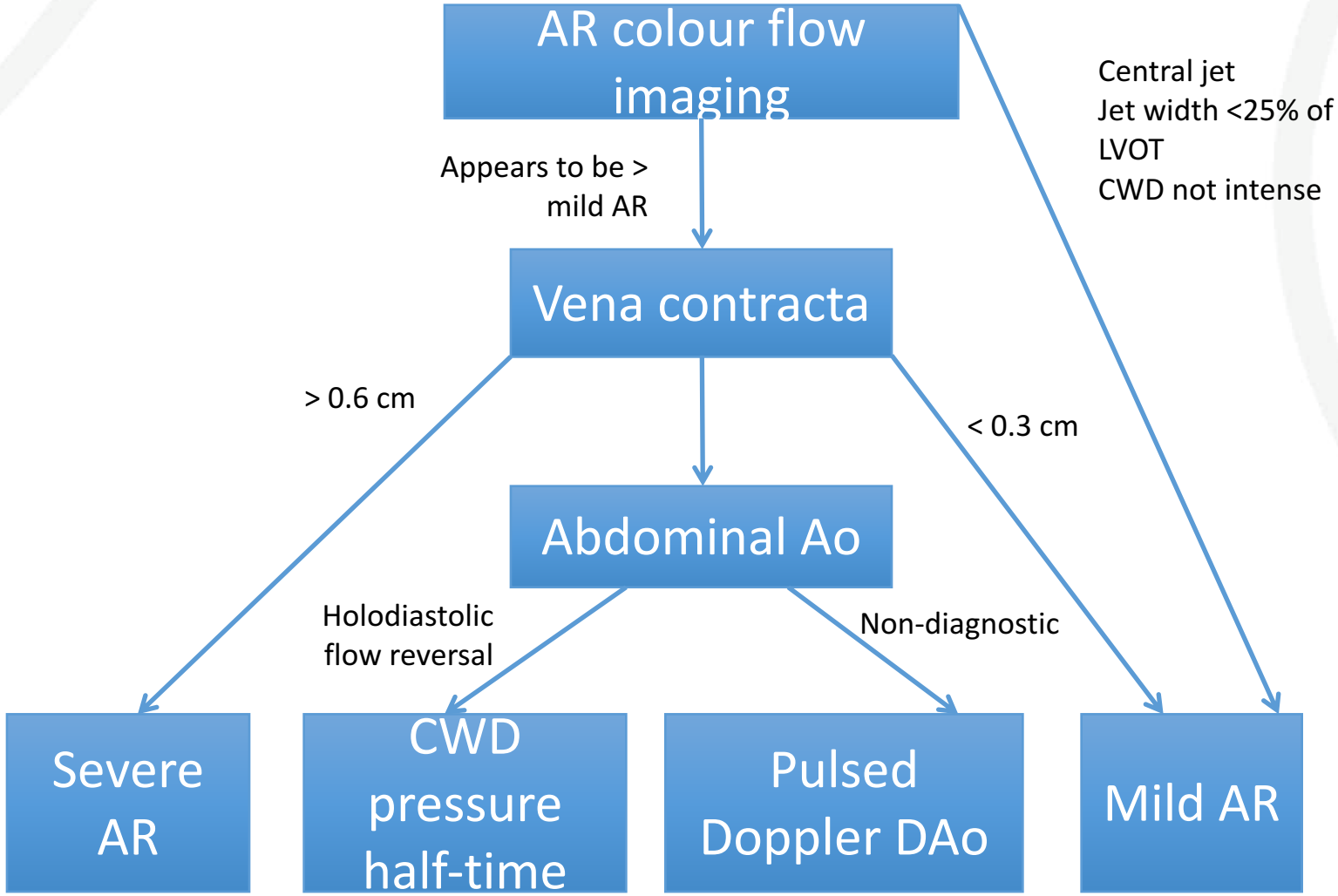
STÉNOSE AORTIQUE SEVERE

- Peak aortic jet velocity:
  > 4 m/s
- Mean gradient:
  > 40 mmHg
- Valve effective orifice area:
  ≤ 1 cm^2
  ≤ 0.6 cm^2/m^2



EVALUATION ECHOGRAPHIQUE

INSUFFISANCE AORTIQUE SEVERE



EVALUATION ECHOGRAPHIQUE

Revised Rhodes formula

Changes: MiV excluded, EFE inserted, Z-scores applied

Score: 10.98 x BSA + 0.56 x AoV z-score + 5.89 x Long axis ratio – 0.79 presence of grade 2 or 3 EFE – 6.78

Discriminate score:

< - 0.65 univentricular circulation

> - 0.65 biventricular circulation

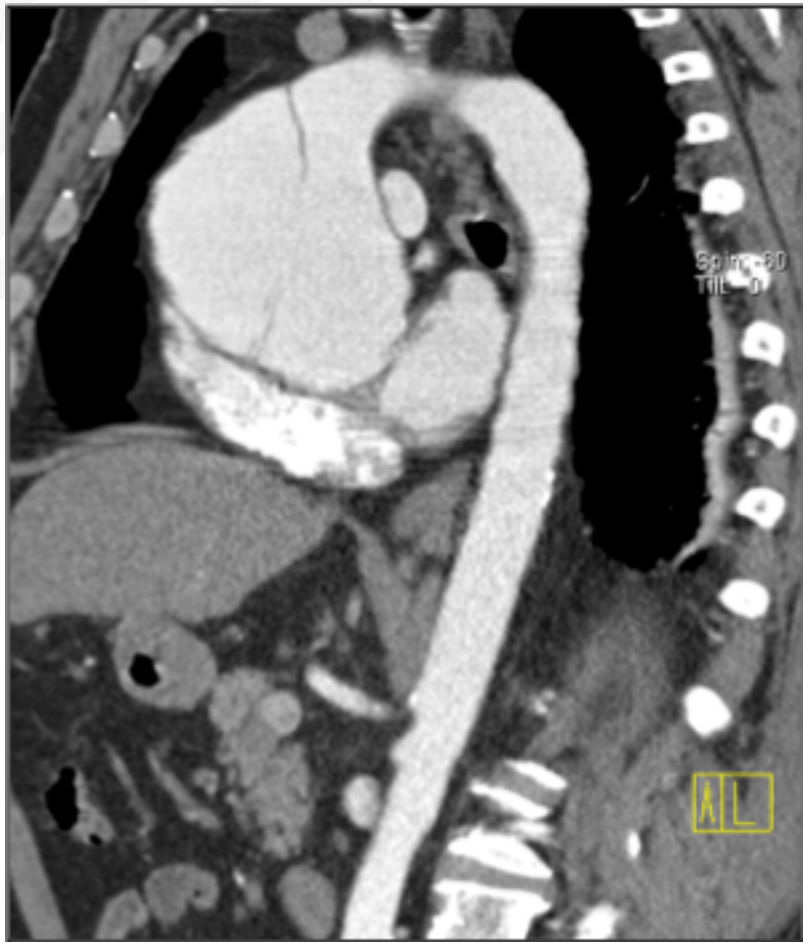
- With old formula **77% correctly selected** for biventricular circulation

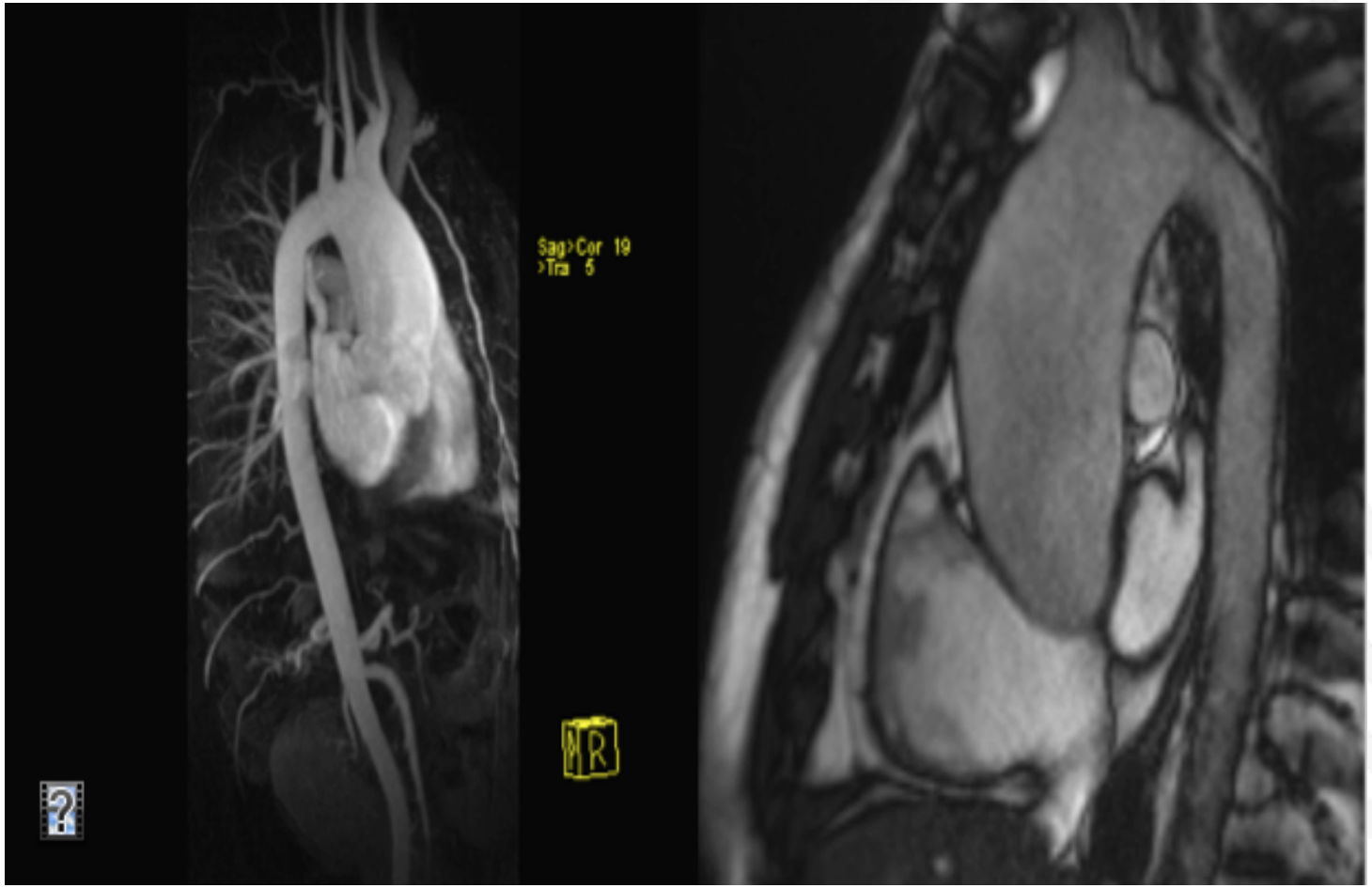
- With new formula **90% correctly selected** for biventricular circulation

Colan SD, JACC 2006

IMAGERIE DE COUPE

AORTE ASCENDANTE ET BICUSPIDIE



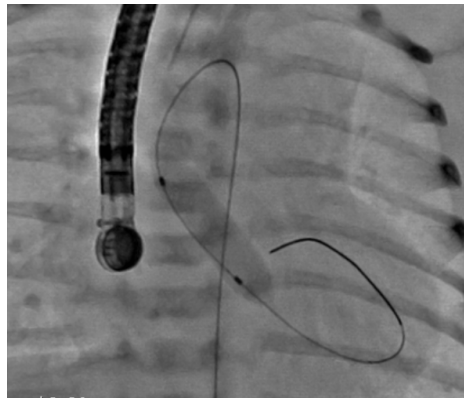


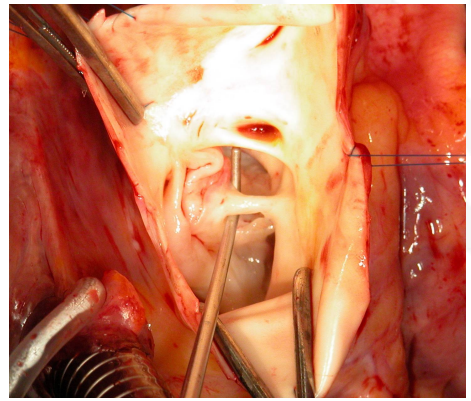
TRAITEMENT

STENOSE AORTIQUE

- Symptômes
- Gradient moyen > 40mmHg
- Sténose sous valvulaires: apparition IAo

- Valvuloplastie au ballon VS chirurgie en cas de sténose valvulaire
- Chirurgie dans les autres types d'anatomie

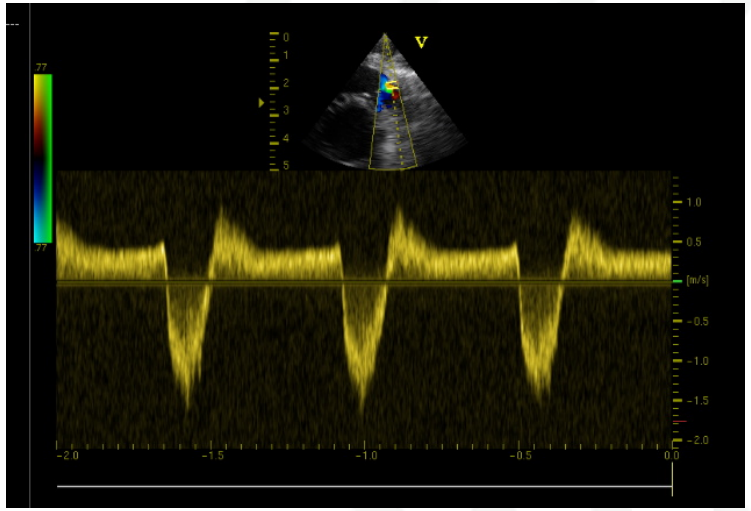


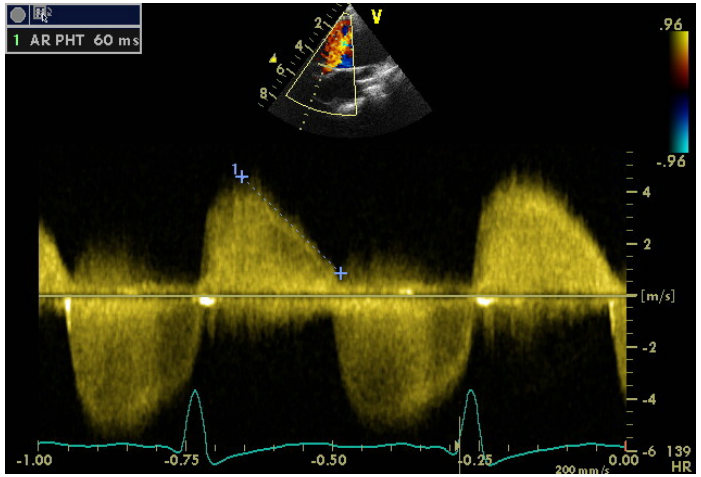


TRAITEMENT

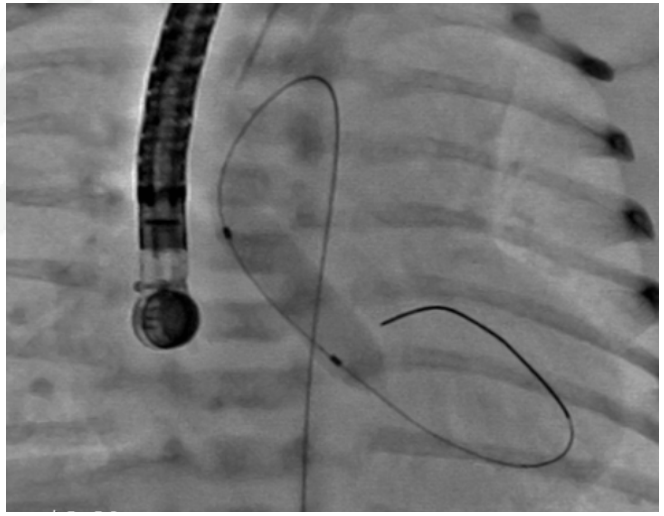
INSUFFISANCE AORTIQUE

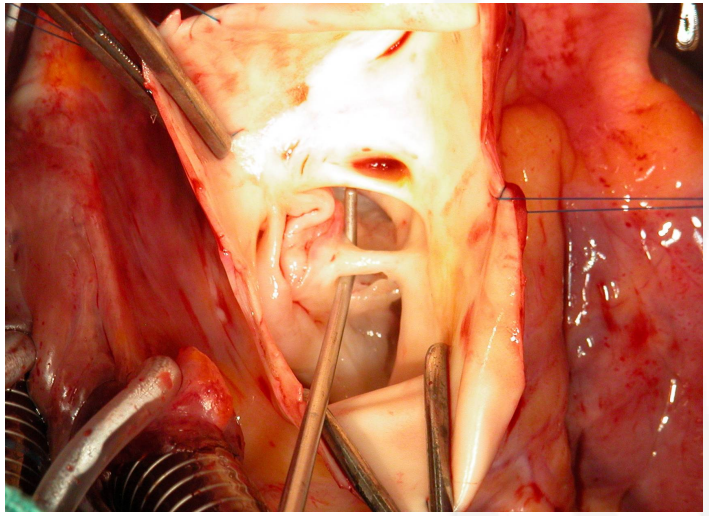
- Symptômes
- Asymptomatiques:
  - Critères d'IAo sevère,
  - Dilatation significative VG (DTSVG>25mm/m2),
  - Altération FEVG





TRAITEMENT





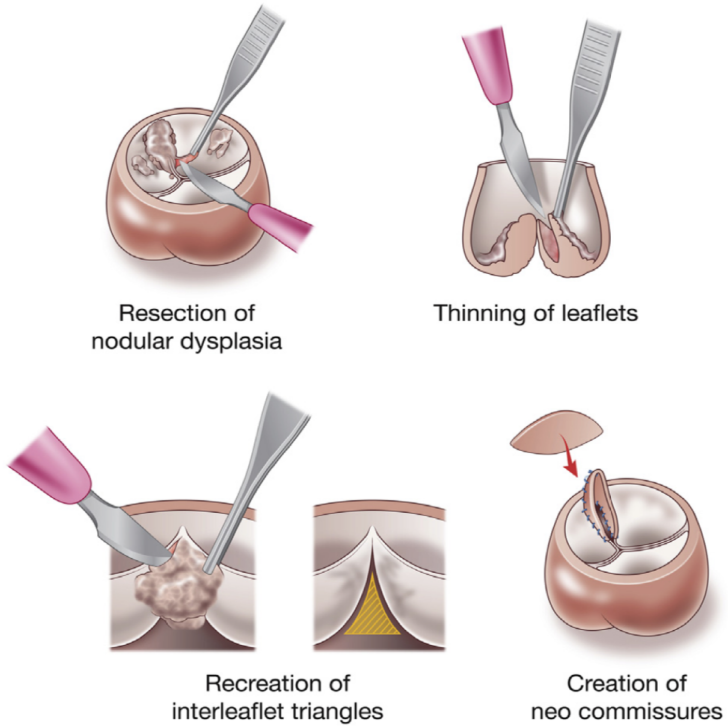
- Valvuloplastie au ballonnet décrite au début des 1980's
- Alternative à la chirurgie
- Absence d'études multicentriques/essais randomisés comparant les 2 techniques
- Impossible de trancher à ce jour

TRAITEMENT

Congenital Heart Disease

Surgical Valvotomy and Repair for Neonatal and Infant Congenital Aortic Stenosis Achieves Better Results Than Interventional Catheterization

Javariah Siddiqui, MBBS,* Christian P. Brizard, MD,†‡ John C. Galati, PHD,§‖
Ajay J. Iyengar, MBBS,*¶ Darren Hutchinson, MD,# Igor E. Konstantinov, MD, PHD,†‡
Gavin R. Wheaton, MD,** James M. Ramsay, MD,†† Yves d'Udekem, MD, PHD†‡¶
Melbourne, Adelaide, and Perth, Australia



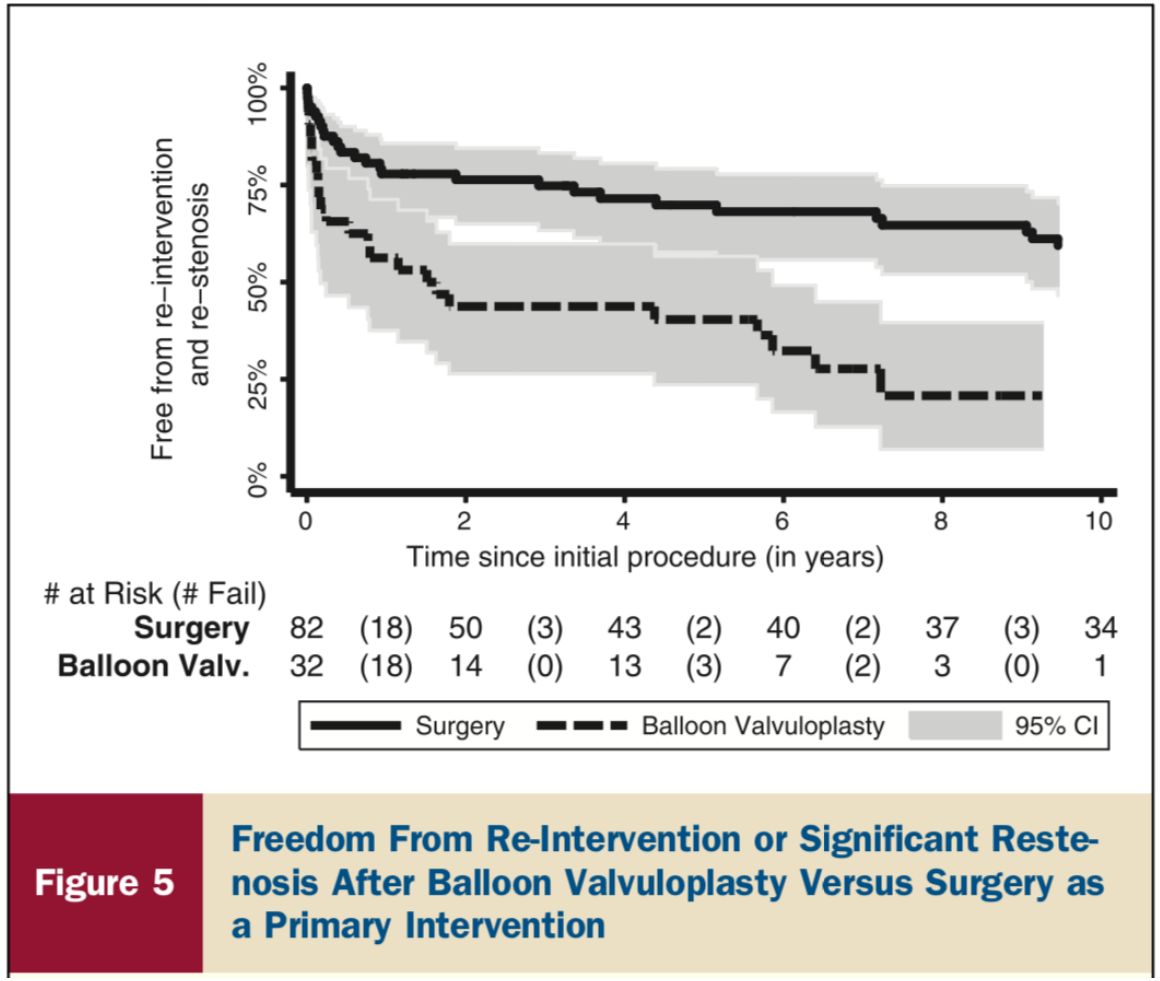


Figure 5 **Freedom From Re-Intervention or Significant Restenosis After Balloon Valvuloplasty Versus Surgery as a Primary Intervention**

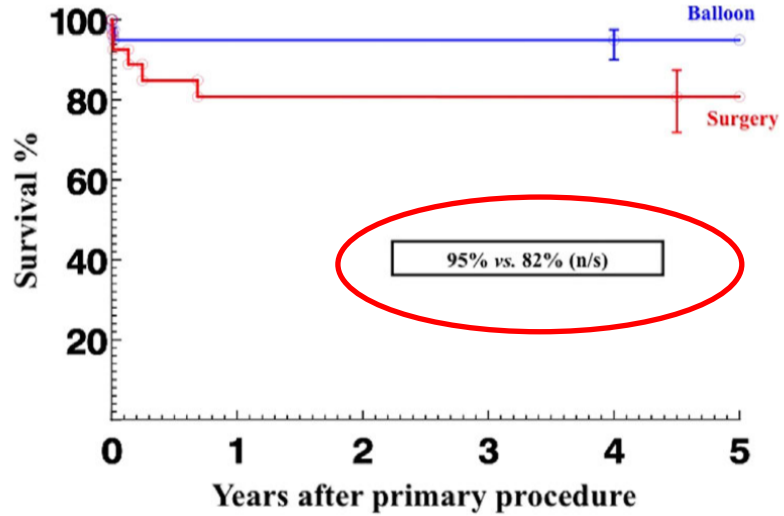
Siddiqui et al. JACC 2013

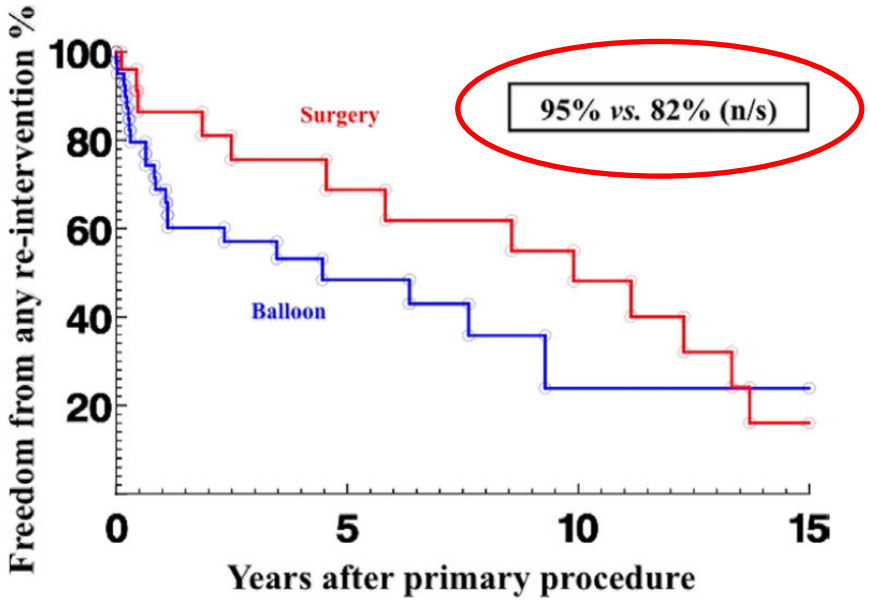
TRAITEMENT

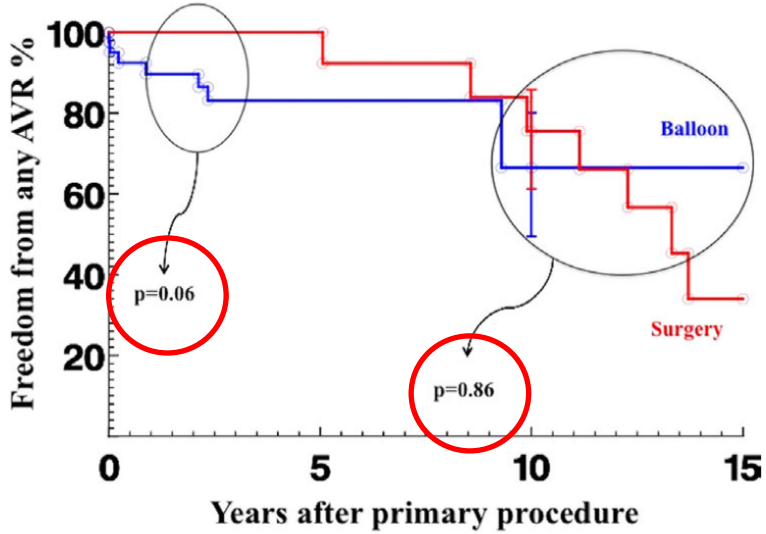
Neonatal Aortic Stenosis is a Surgical Disease: An Interventional Cardiologist View

Lee Benson

The application of balloon valvotomy as primary treatment for neonatal congenital aortic stenosis is contentious. In this debate, we discuss data comparing outcomes of a percutaneous and surgical strategy between two tertiary centers that have adopted opposite therapeutic strategies. The outcomes with surgical and balloon therapies appear comparable. These contemporaneous data validate the empiric switch to primary balloon valvotomy in the modern era.

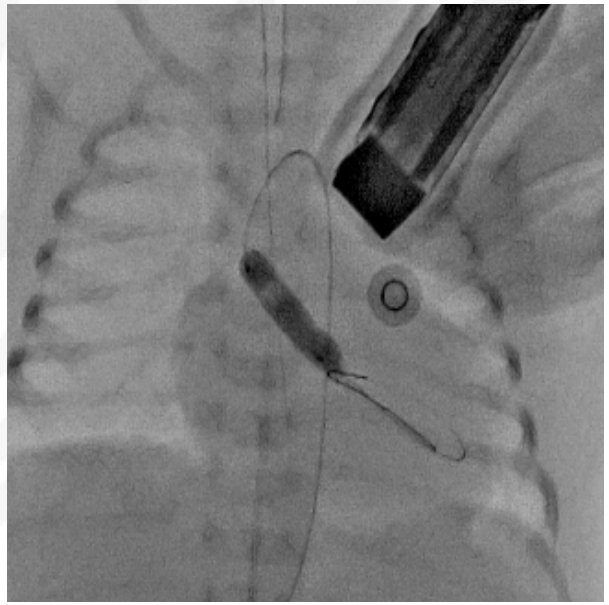


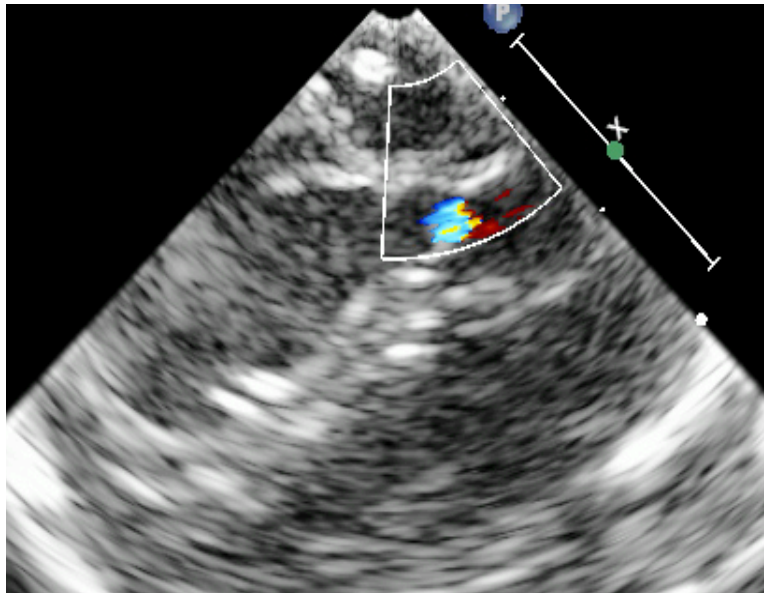




Benson et al. Semin Thorac Cardiovasc Surg Pediatr Card Surg Ann 2016

TRAITEMENT



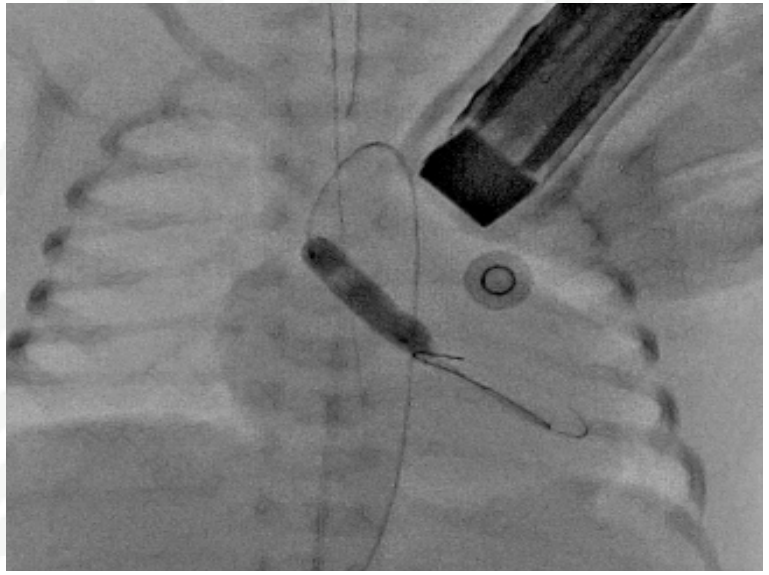


Recommendations for Aortic Valvuloplasty

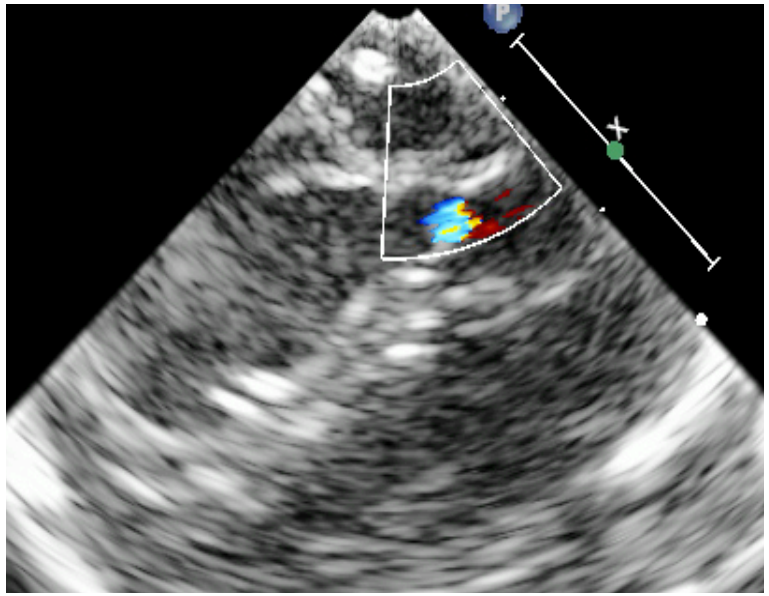
Class I

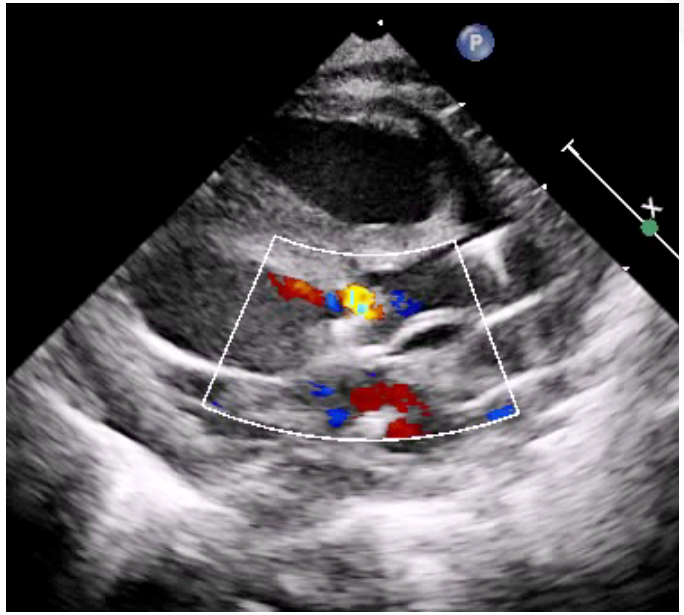
1. Aortic valvuloplasty is indicated regardless of valve gradient in the newborn with isolated critical valvar AS who is ductal dependent or in children with isolated valvar AS who have depressed left ventricular systolic function (*Level of Evidence: B*).
2. Aortic valvuloplasty is indicated in children with isolated valvar AS who have a resting peak systolic valve gradient (by catheter) of ≥50 mm Hg† (*Level of Evidence: B*).
3. Aortic valvuloplasty is indicated in children with isolated valvar AS who have a resting peak systolic valve gradient (by catheter) of ≥40 mm Hg† if there are symptoms of angina or syncope or ischemic ST-T-wave changes on electrocardiography at rest or with exercise (*Level of Evidence: C*).

TRAITEMENT

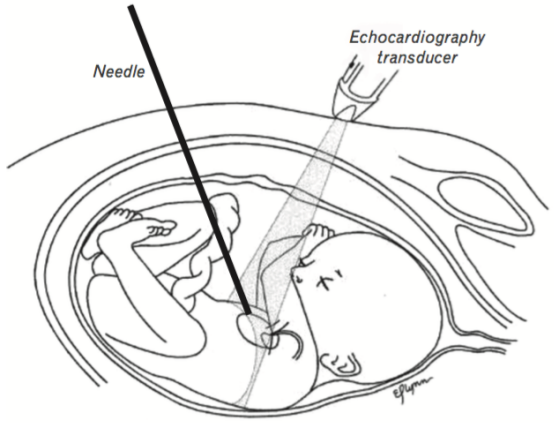


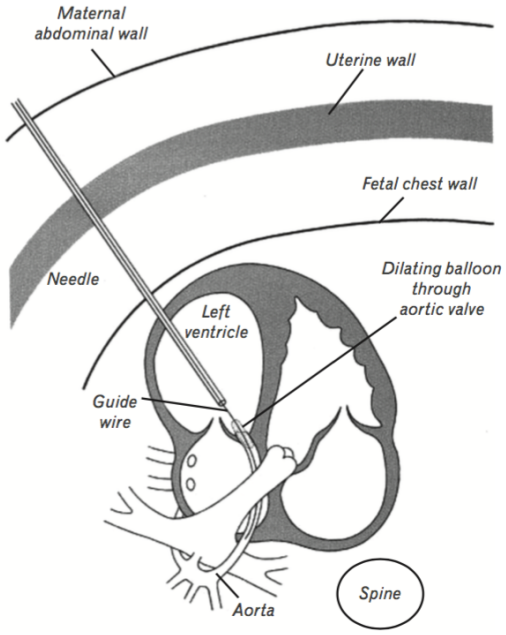
- Abord: AFD, carotide, VFD
- Guidance échographique+++: ETO ou ETT
- Ballonnet à basse pression ou coronaires
- ratio ballon/anneau entre 0.9 et 1.0
- Evaluer fuite aortique+++

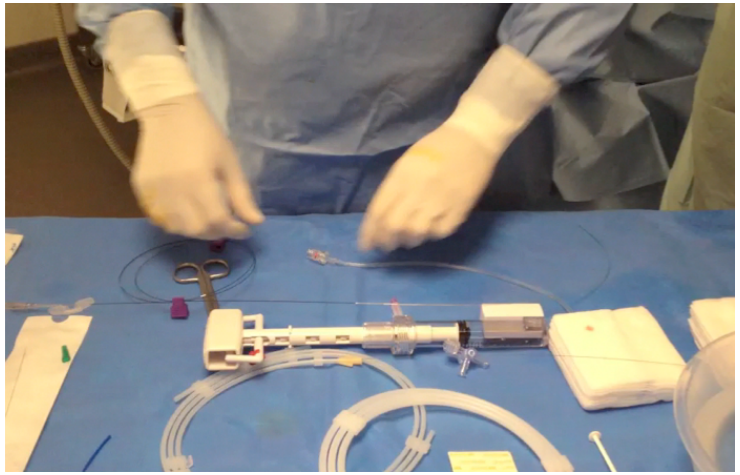


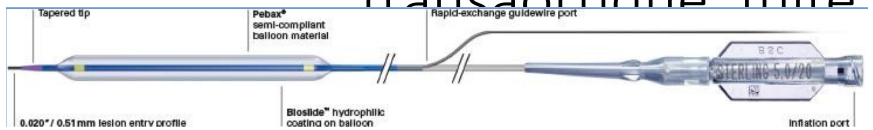


DILATATION FŒTALE IN UTERO









ASPECTS TECHNIQUES

- **Environnement obstétrical**: 2 prénatalistes + 1 cardiologue
- **Anesthésie:**
  - Mère: analgésie péri-durale
  - Fœtus: AG + curarisation
- **Abord:**
  - Position fœtale+++
  - Ponction échoguidée (Aiguille 17-18 G),
  - Approche transthoracique = **VG**
  - Guide coronaire VG=>Ao
  - Ballonnet coronaire (ratio ballon/anneau Ao 1/1)
- **Contrôle écho**: péricarde, fonction VG, flux transaortique, fuite aortique

DILATATION FŒTALE IN UTERO

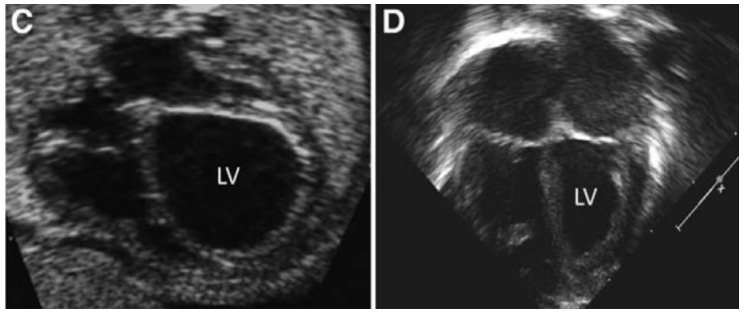
Nous ne pouvons pas afficher cette image pour l'instant.

Courtesy of Pr. Younes

VALVULOPLASTIE AORTIQUE IN UTERO

SELECTION DES PATIENTS

- **Sténose aortique sévère évoluant vers une hypoplasie du cœur gauche**
  - Défaillance VG
  - Flux retrograde dans l'aorte transverse
- **Possibilité de conversion en BiV**: Z scores: VG>0, Anneau aortique > - 3.5, Anneau mitral > - 2
- **Mère** (et grossesse) ne présentant **pas de contre-indication à la procédure**
- **Avis de centres experts…**



Freud et al. Curr Opin Pediatr 2016
McElhinney et al. Circulation 2009

VALVULOPLASTIE AORTIQUE IN UTERO

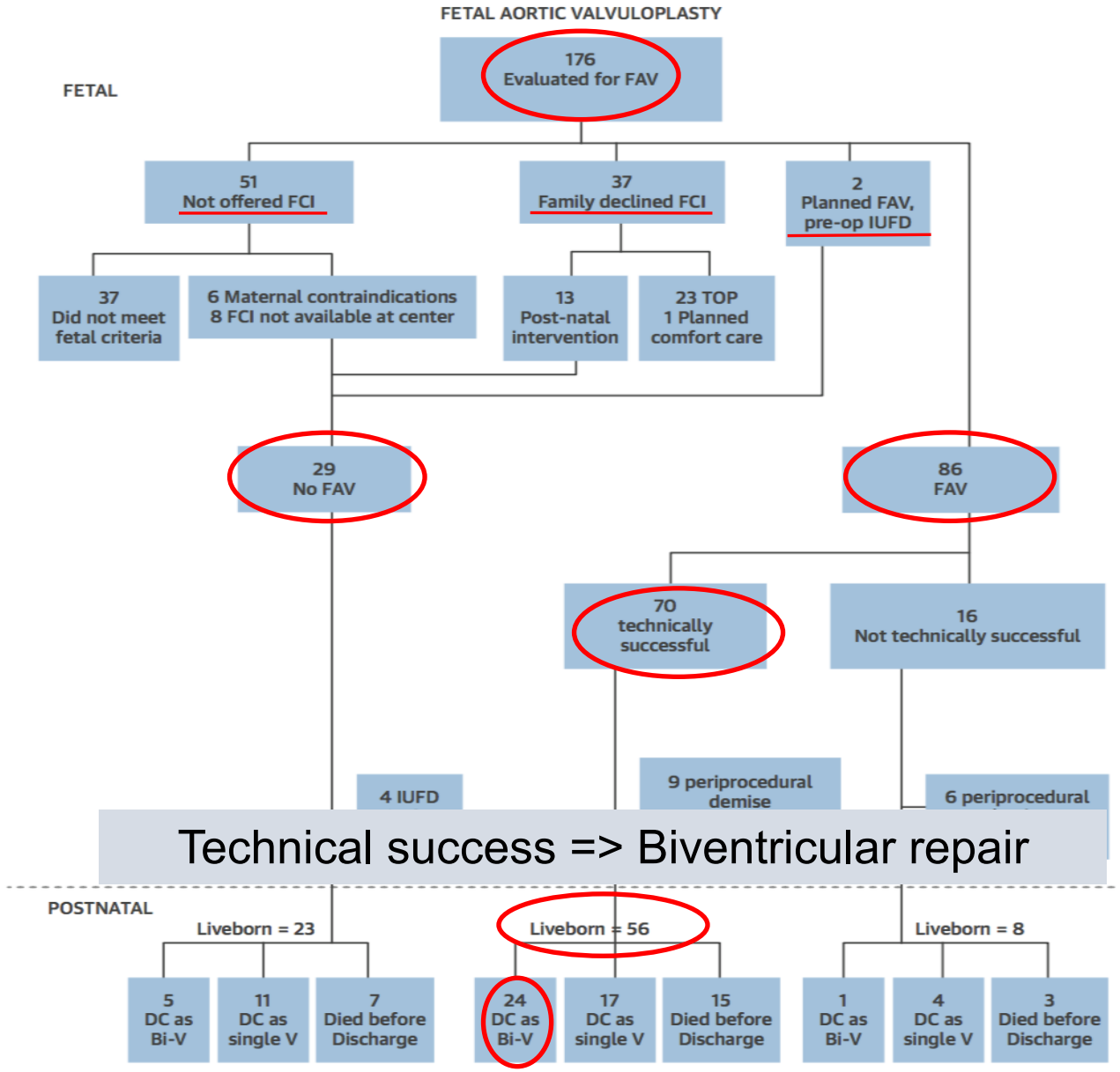
RESULTATS

International Fetal Cardiac Intervention Registry

TABLE 3 Pregnancy Outcomes Among FCI Patients by Procedure Type

Parameter	Total	Aortic Valvuloplasty
Maternal-fetal patients	145	86
GA at intervention (weeks)	26.4 (19.3-36.4)	25.0 (19.3-34.4)
Complications		
Fetal death	16 (11)	10
Bradycardia requiring treatment	47 (32)	29
Hemopericardium requiring drainage	42 (29)	16
Balloon rupture	6 (4)	4
Maternal complication	0	
Pregnancy outcome post-intervention		
Termination	6 (4)	6
Periprocedural demise (<48 h)	9 (6)	5
Late intrauterine demise	2 (1)	1
Term birth	77 (53)	49
Preterm birth (<37 weeks) birth	29 (20)	15
Not stated/in utero	6	0
Survival to first hospital discharge	71 (49)	46

Moon-Grady et al. JACC 2015



CONCLUSIONS

- Pathologie complexe, évolutive
- Evaluation filière gauche
- Compréhension lésion
- Nombreuses possibilités thérapeutiques
- Sélection des patients => Traitement adapté