

Communications Inter-Ventriculaires

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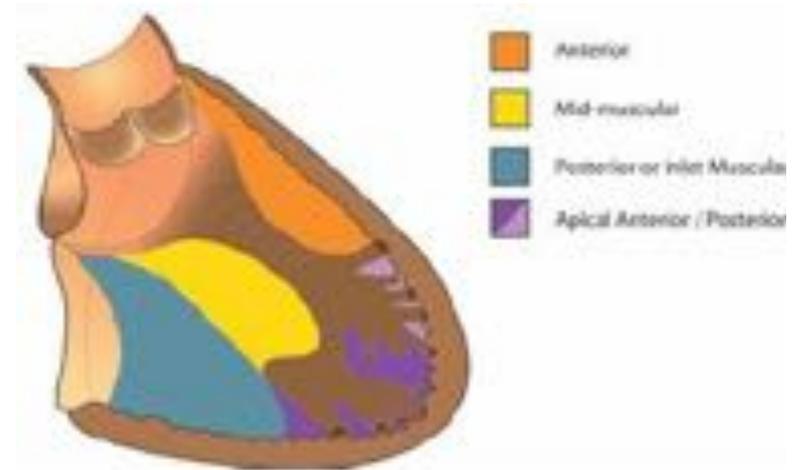
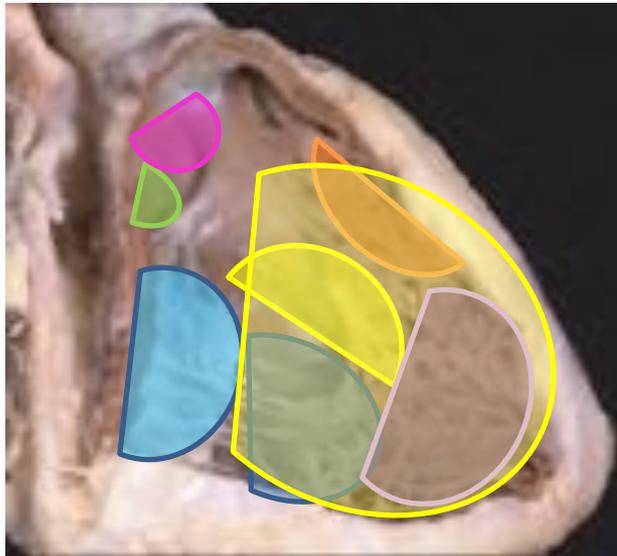
Clément Karsenty, Yves Dulac,

CHU Toulouse

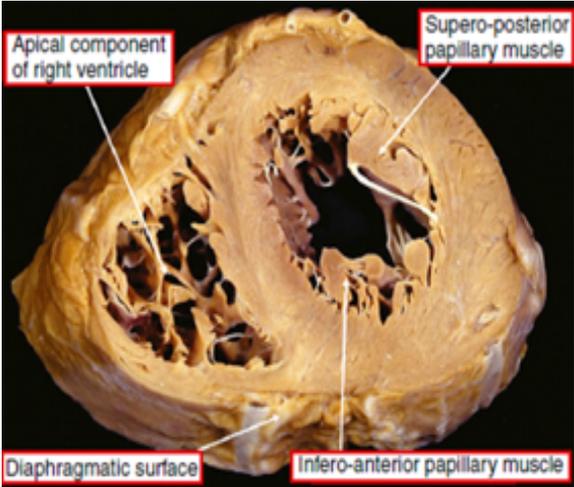
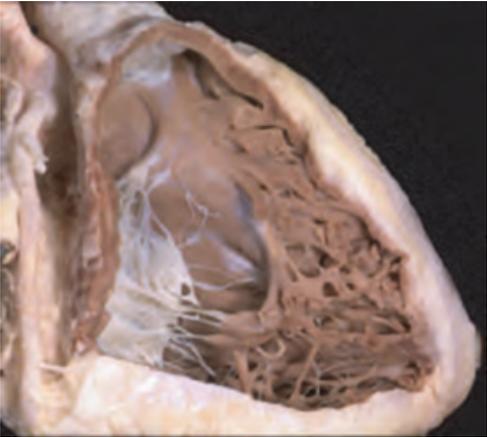
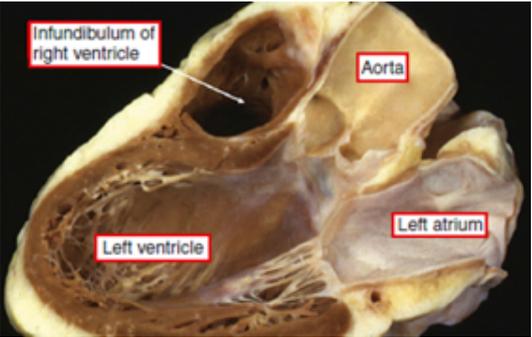
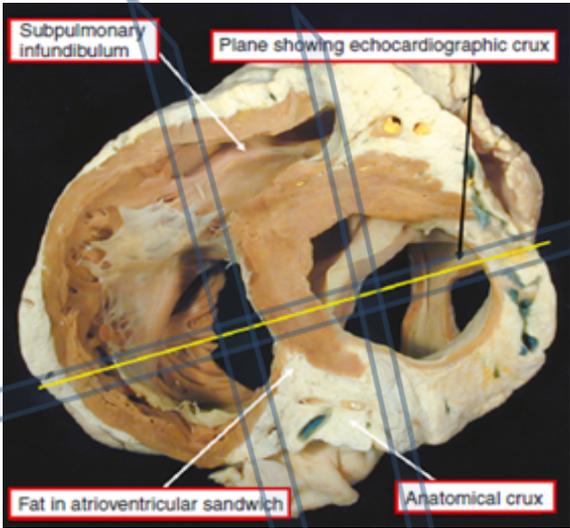
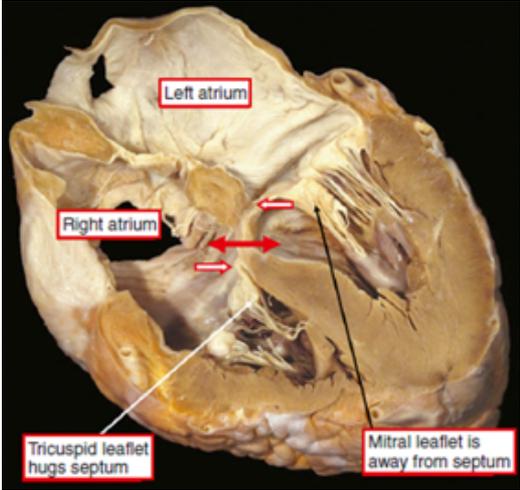
Partie 1

- Classification
- Physiopathologie
- Anatomie et échocardiographie
- Physiologie et doppler

Classification



Anatomie



Classification Embryo-Anatomique

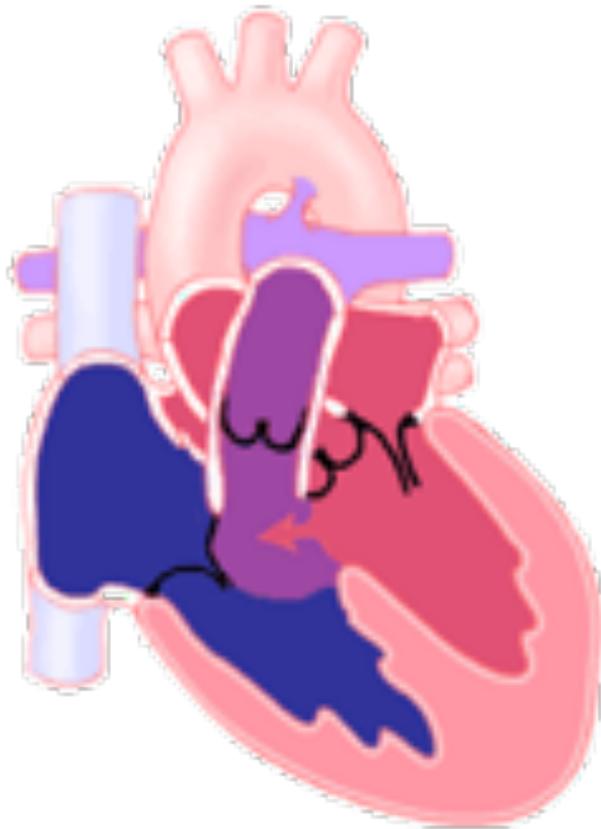
Type de defect		Continuité fibreuse	Origine embryologique	Stade du dévpt cardiaque		
MUSCULAIRES	Midmuscular	NON	Compaction du myocarde, trabéculations	Vie foetale		
	Apical					
	Inlet muscular					
CENTRALES PERIMBRANEUSES sans malalignement		OUI (feuillelet septal tric/Ao)	Formation du septum mbraneux (bourgeons endoc du canal AV)	Vie foetale		
CIV de l'OUTLET (voie d'éjection)	CIV par malalignement (aortic overriding)	Avec continuité fibreuse Ao-tric (extension mb)	OUI (feuillelet antérieur tric/Ao)	Crête neurale cardiaque et second champ cardiaque antérieur	Wedging	
		Bords musculaires	NON (bords musculaires)			
	CIV juxta-artérielles Continuité fibreuse Valve Ao/valve pulm	Avec continuité fibreuse Ao-tric (extension mb)	OUI (feuillelet antérieur tric/Ao)			Bourgeons endocardiques de la voie d'éjection
		Bords musculaires	NON (bords musculaires)			
CIV de l'INLET (CIV d'admission)	Jonction auriculo-ventriculaire commune (CAV)	OUI (tricuspide/mitrale)	Second champ cardiaque postérieur Bourgeons du canal	Septation AV		
	Malalignement septum interA/interV (Straddling tricuspide)		Convergence Formation de la jonction AV	Convergence		

L Houyel

Classification Hémodynamique

- CIV de type I (maladie de Roger) :
restrictive sans shunt significatif
- CIV de type IIa :
restrictive avec shunt gauche-droite significatif
- CIV de type IIb :
avec shunt gauche-droite significatif et HTAP
- CIV de type III :
syndrome d'Eisenmenger
- CIV de type IV :
sténose infundibulaire

Classification Hémodynamique



QP

PAP

1 =



2a =



2b =



3 =

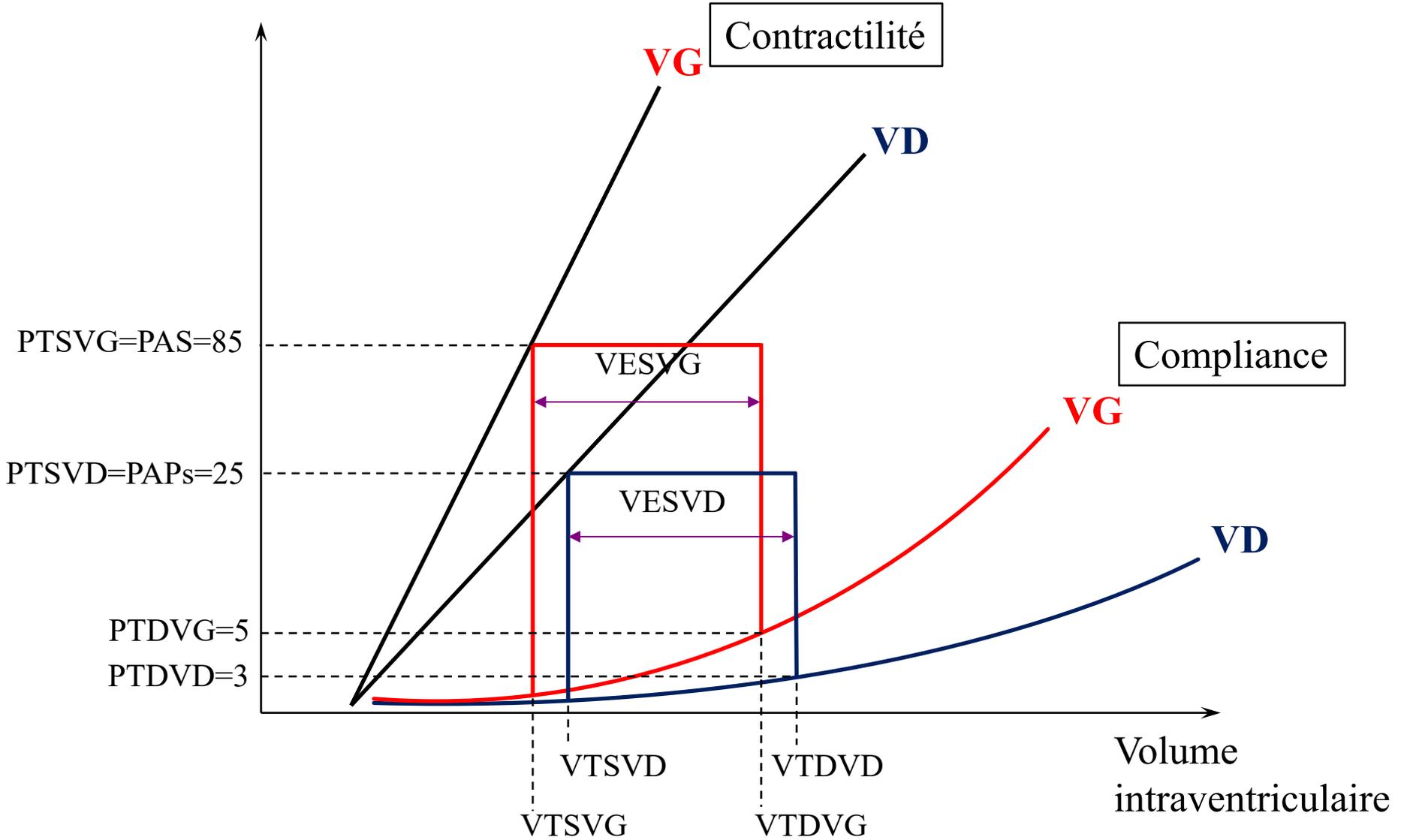


4 =



Pression
Intraventriculaire
(mmHg)

**Courbe Pression-Volume
Coeur normal**

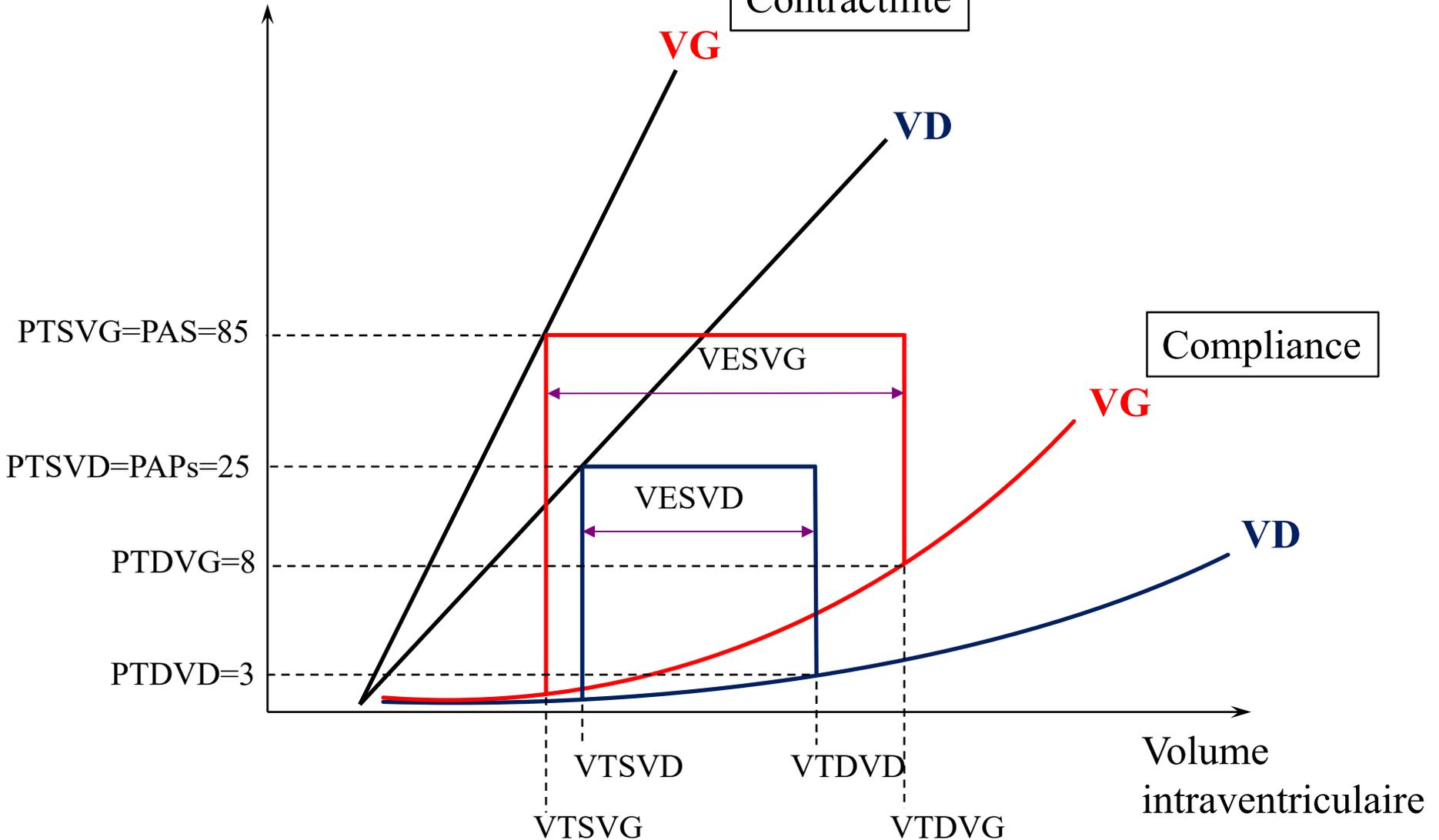


Physio CIV IIa

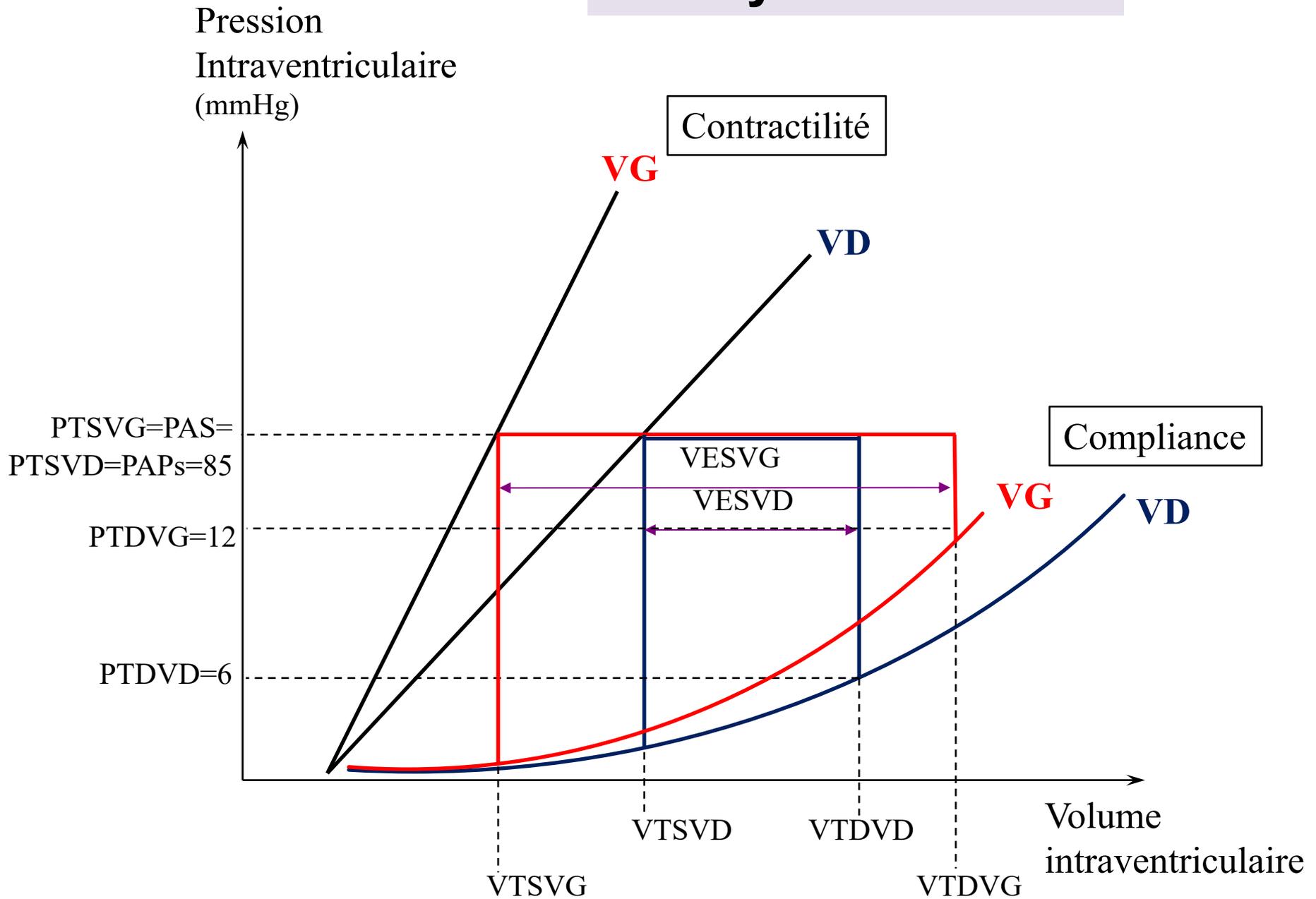
Pression
Intraventriculaire
(mmHg)

Contractilité

Compliance



Physio CIV IIb



Physio CIV

- **Surcharge volumétrique des cavités gauches**
 - DTDVG : Z-score $\geq +2$
- **Pressions artérielles pulmonaires**
 - PVDs (PAPs) : IT, Gradient max CIV
 - PAPd, PAPm : IP
 - Courbure septale

The image shows a screenshot of a medical software interface. At the top, there is a 'Clear' button and a 'Z-Scores' header. Below this is a grid of icons for different cardiac parameters: Cardiac Structures, M-Mode, Aorta, Coronary Arteries, Discriminant Score, and Fetal Echo. Below the grid, there are 'Cancel', 'M-Mode', and 'Menu' buttons. The main area displays a list of parameters with input fields and units. The 'LV Diastolic Diameter' field is circled in red. The 'Detroit Dubois BSA: N/A' field is also visible at the top of the parameter list.

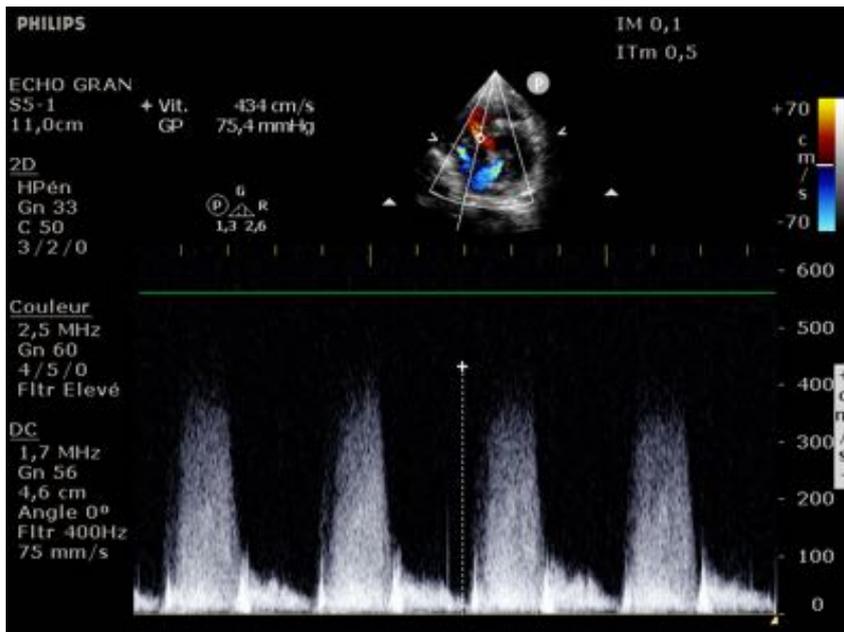
Parameter	Unit
Detroit Dubois BSA: N/A	
IVSd	mm
LV Diastolic Diameter	mm
LVESD	mm
Fractional Shortening	
LVPWd	mm
Additional Parameters	

Pression Artérielle Pulmonaire

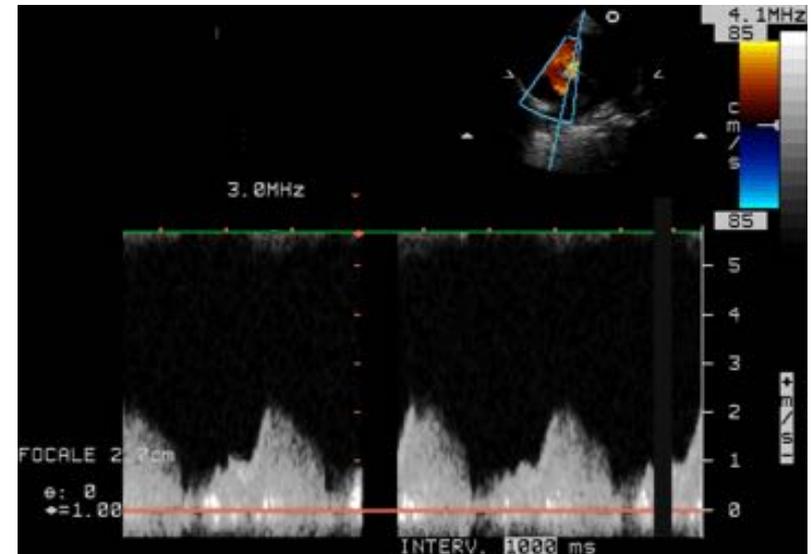
Bernouilli : doppler CIV

Gradient transventriculaire maximal = $PVGs - PVDs = 4v^2$

$PVDs = PAOs - 4v^2 = PAPs$ (absence de sténose pulmonaire)

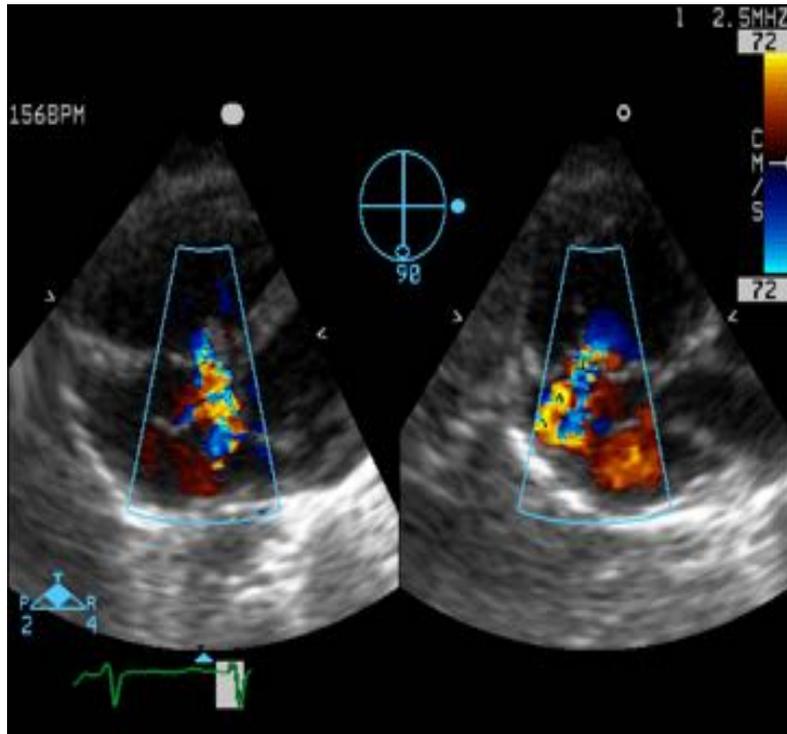


Shunt véloce =
CIV restrictive



Shunt non véloce =
CIV non restrictive

Pression Artérielle Pulmonaire



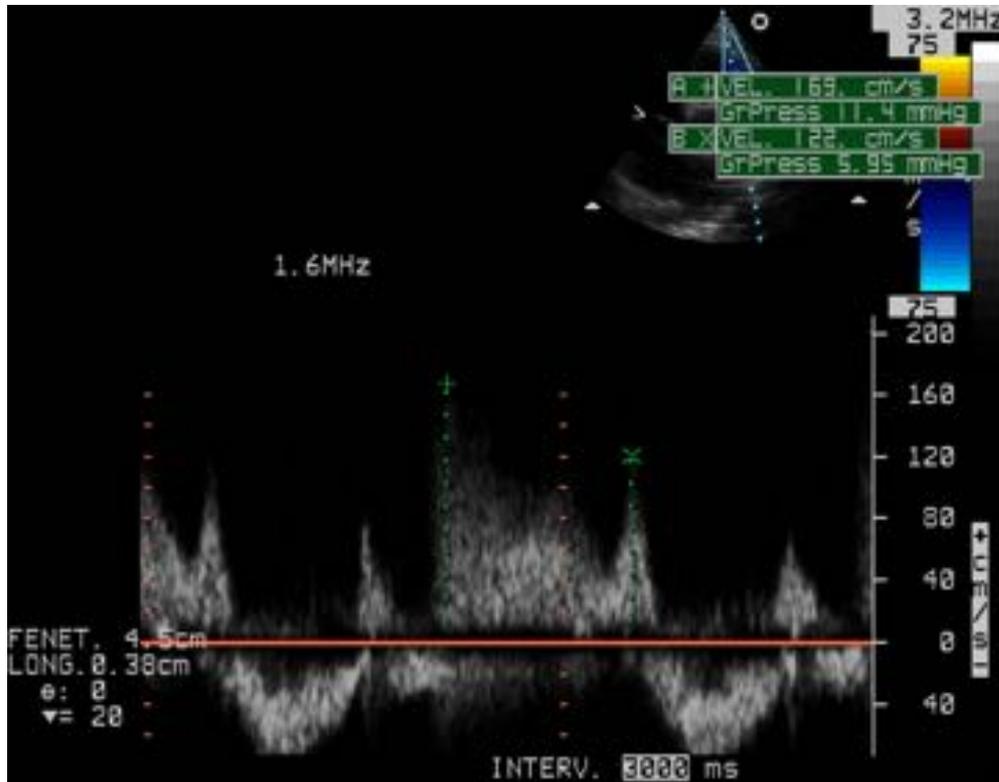
Bernouilli : doppler IT

$$\text{PVDs} - \text{PODs} = 4 V^2$$

$$\text{PAPs} = \text{PVDs} = 4V^2 + 5$$

La vélocité de l'IT est le reflet de la pression ventriculaire droite et donc artérielle pulmonaire en l'absence de sténose valvulaire pulmonaire

Pression Artérielle Pulmonaire

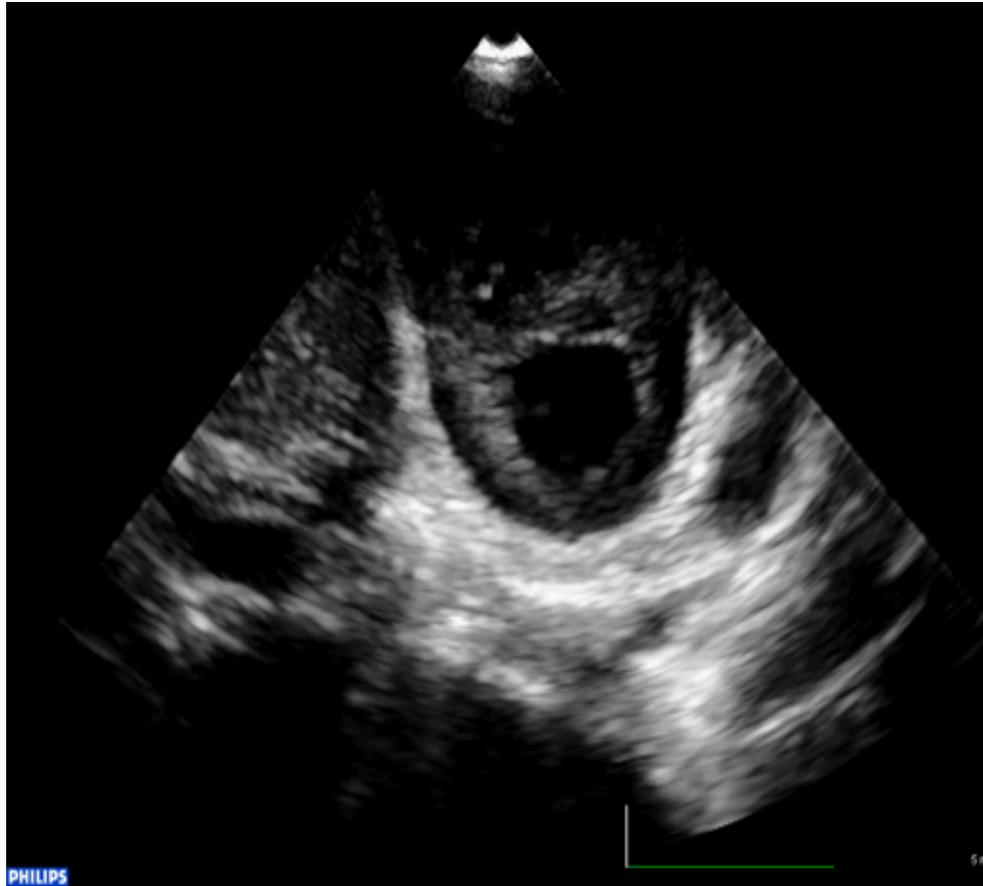


Bernouilli : doppler IP
PAP m = protodiastole
PAP d = télédiastole

$$PAP = 4V^2 + 5$$

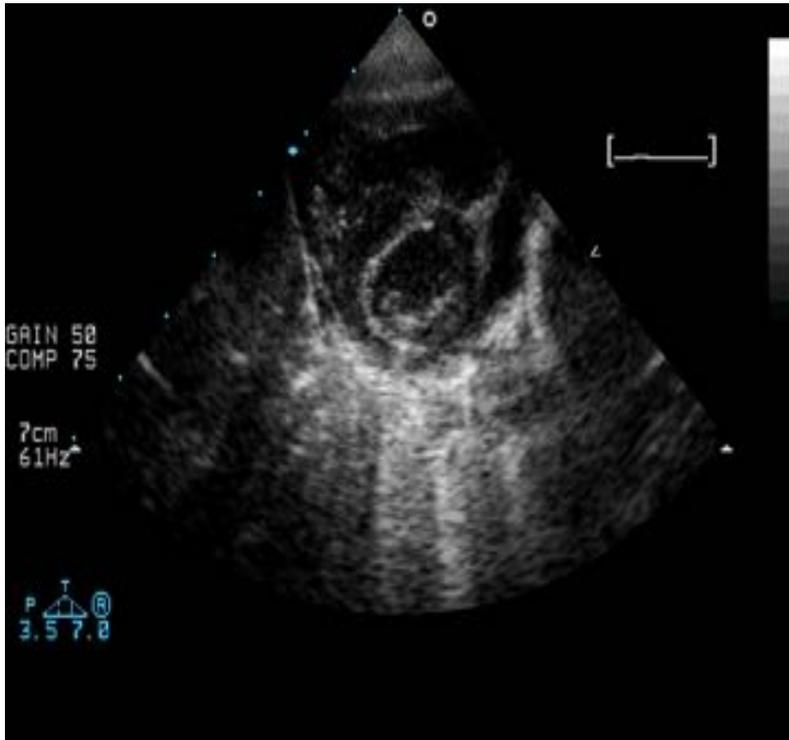
Seule l'IP permet d'estimer les pressions moyenne et diastolique de l'AP

Courbure Septale

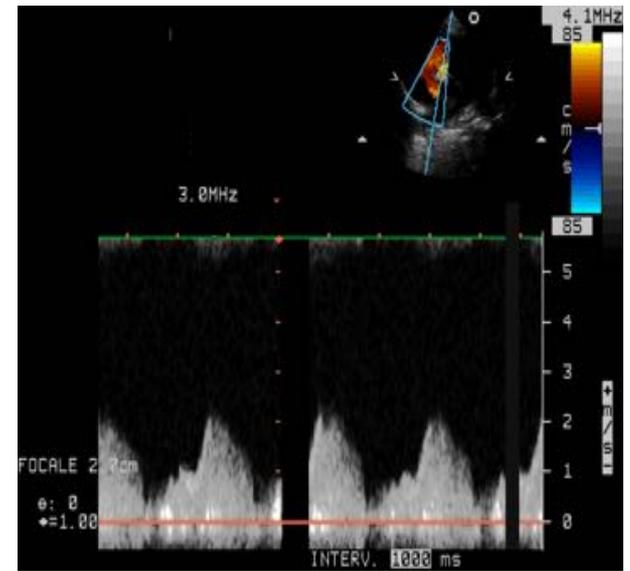


Courbure septale aplatie en systole =
CIV non restrictive

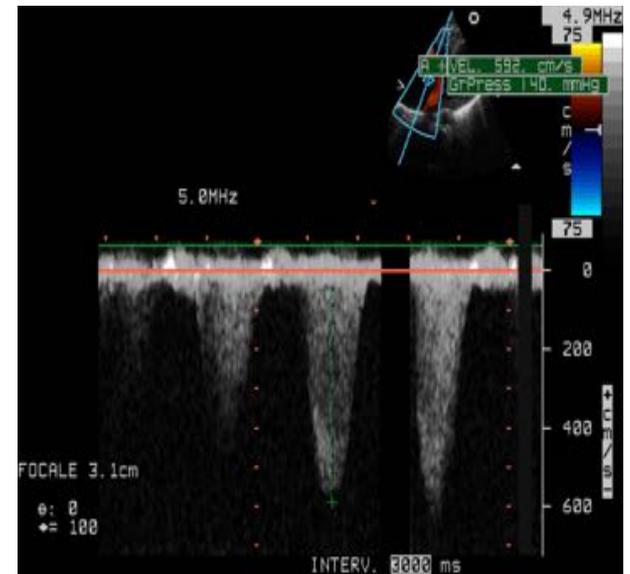
CIV non restrictive



Courbure septale

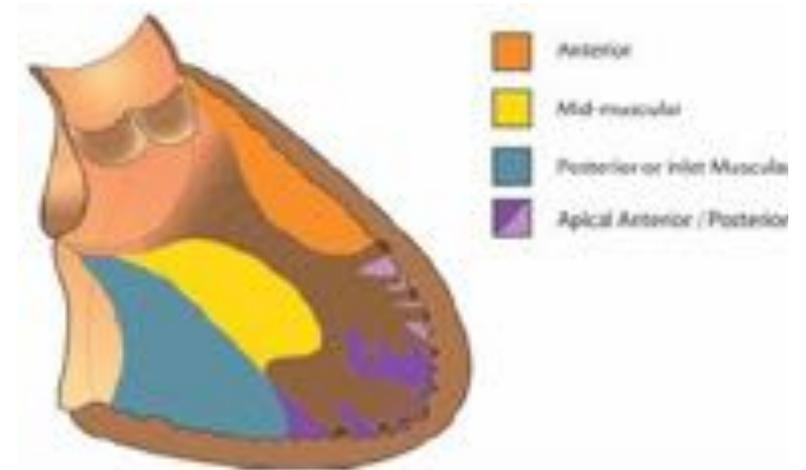
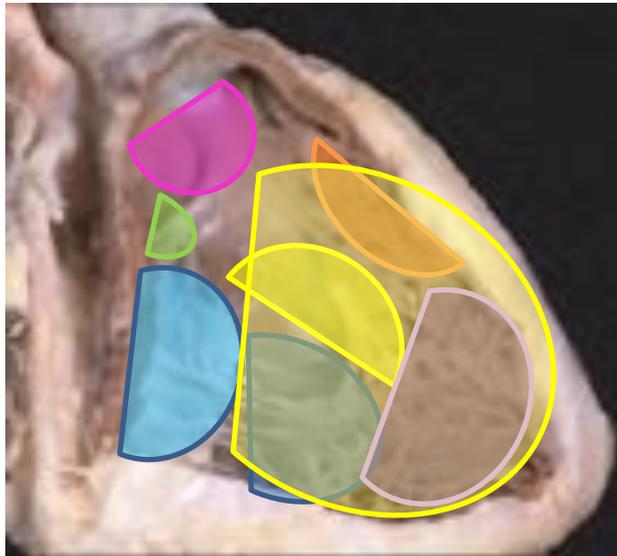


doppler CIV

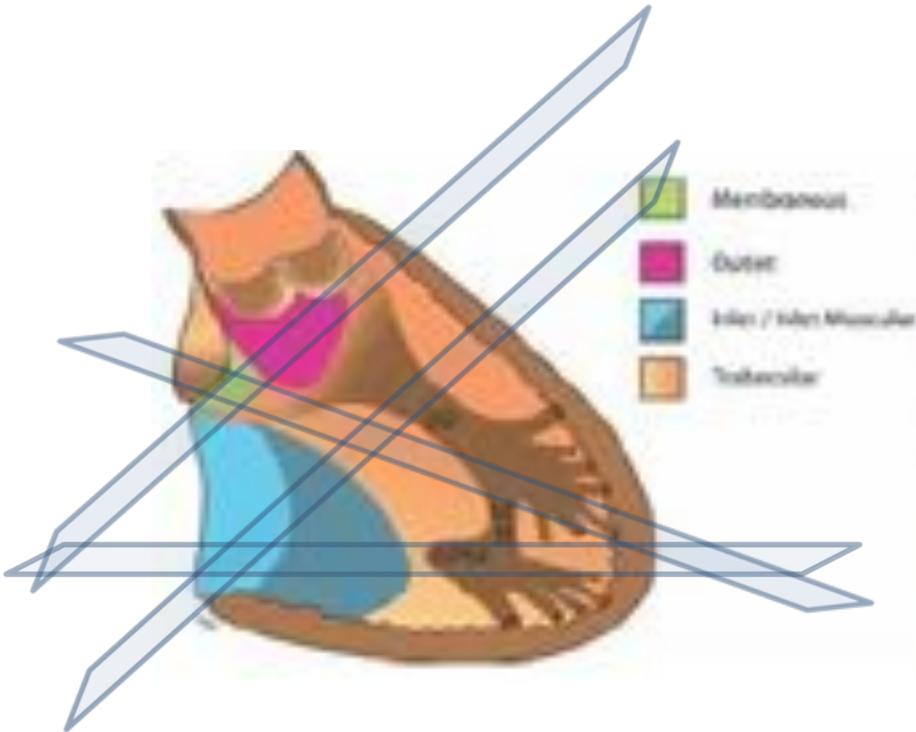
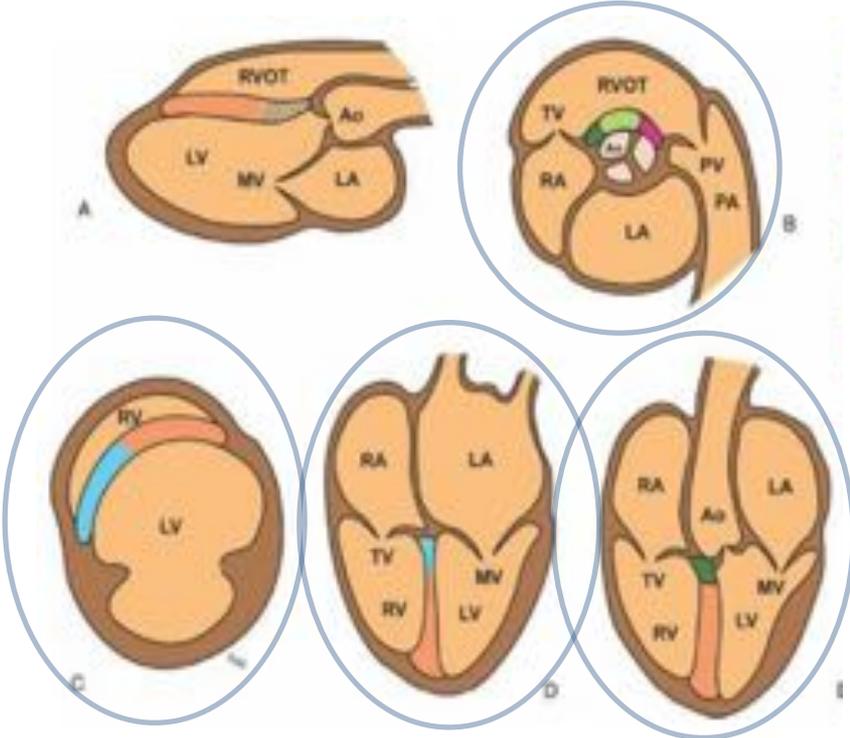


doppler IT

Classification



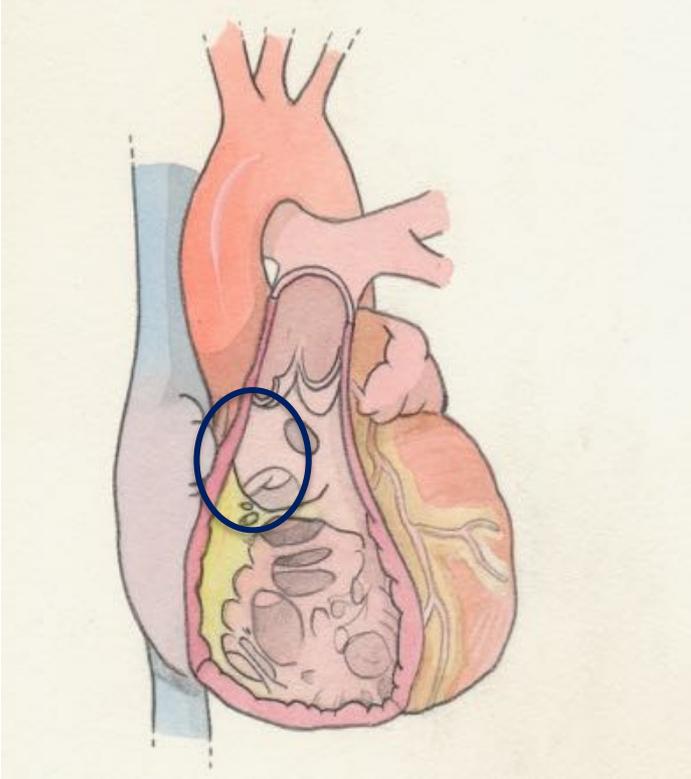
Anatomie Echo



Partie 2

- Evolution des CIV péri-membraneuses
- Evolution des CIV musculaires
- CIV et Fuite aortique

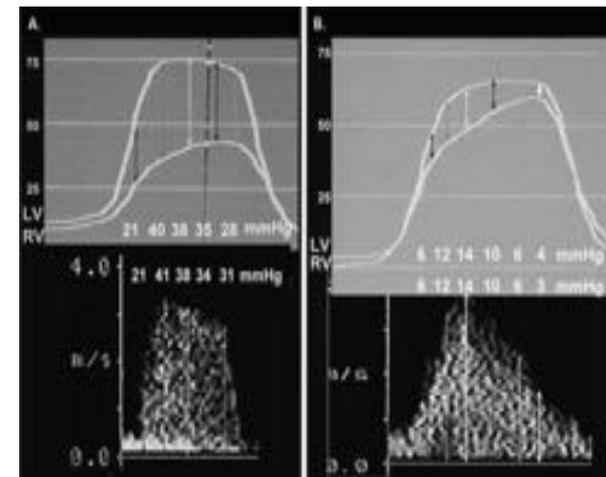
CIV péri-membraneuse



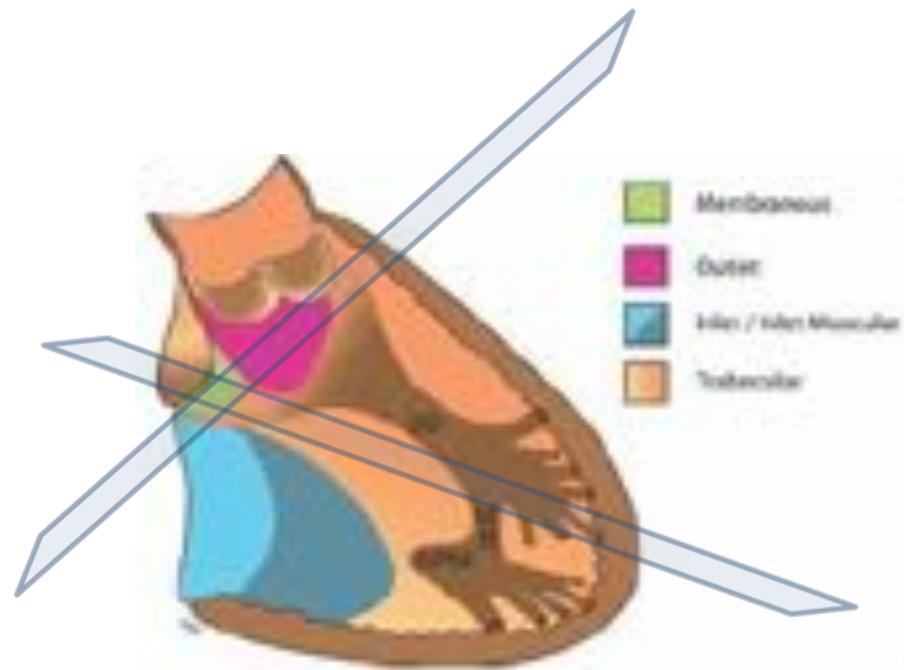
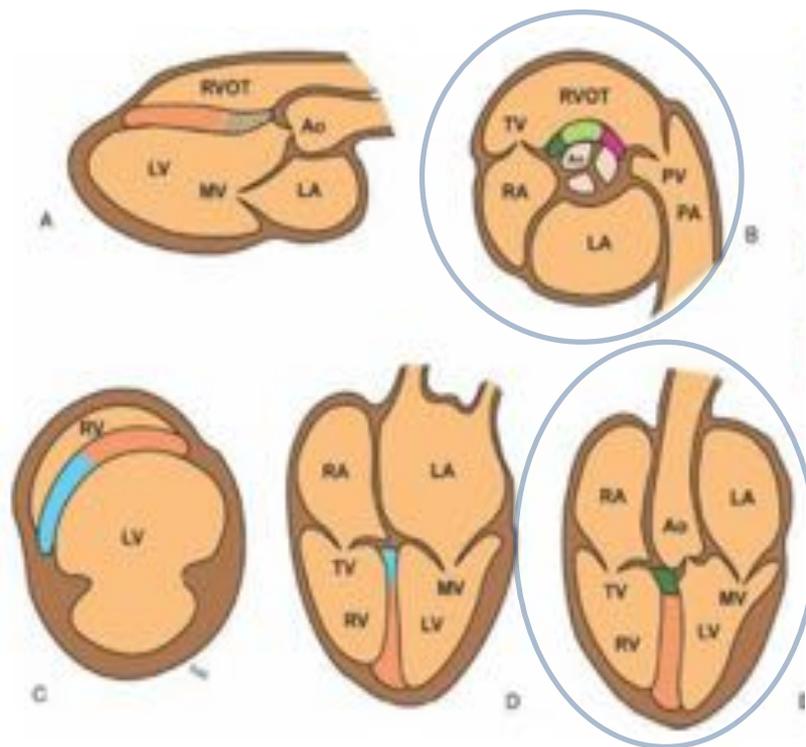
La fermeture de la CIV PM se fait à partir de la valve tricuspide (anévrisme du septum membraneux)

La CIV PM a un rapport étroit avec la valve aortique

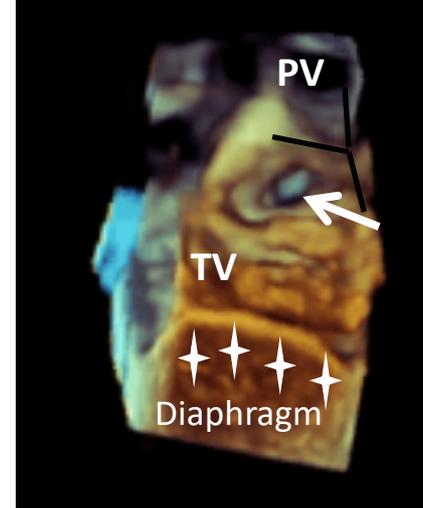
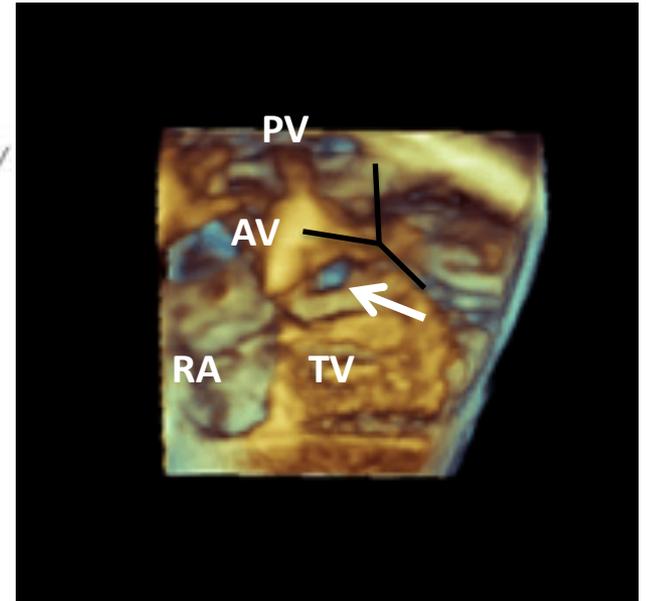
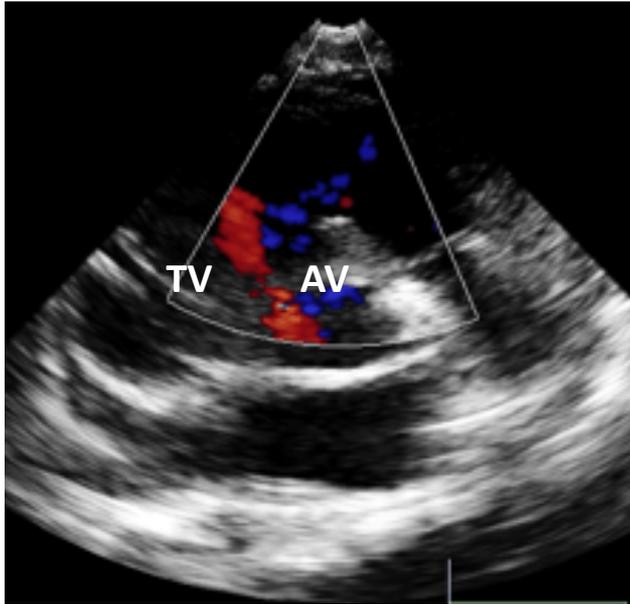
CIV péri-membraneuse



CIV péri-membraneuse

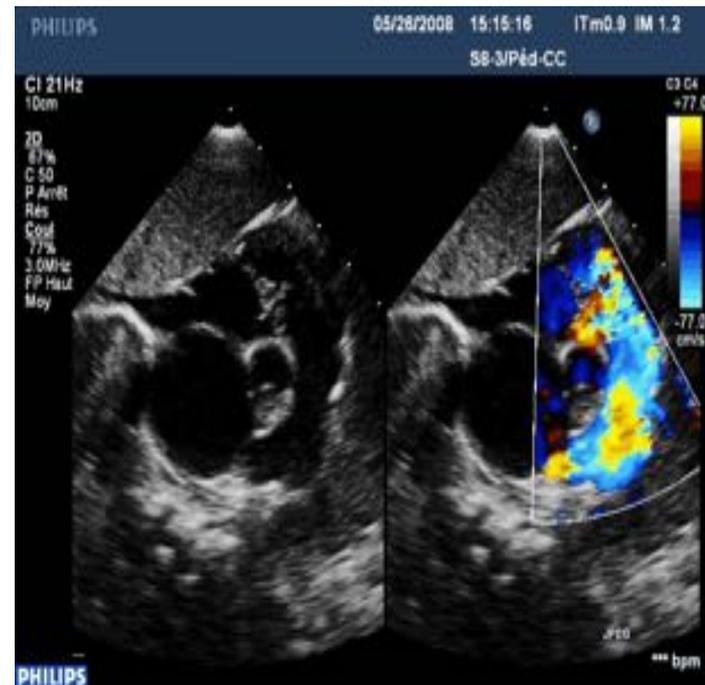


CIV péri-membraneuse

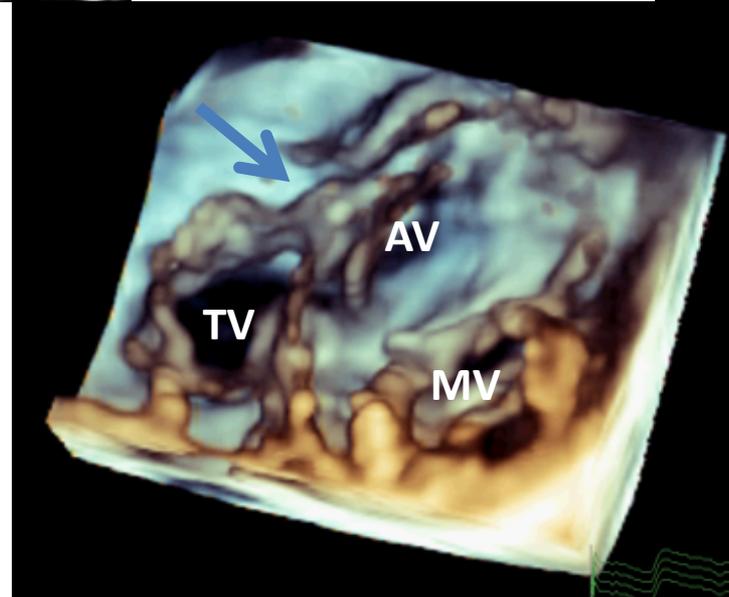
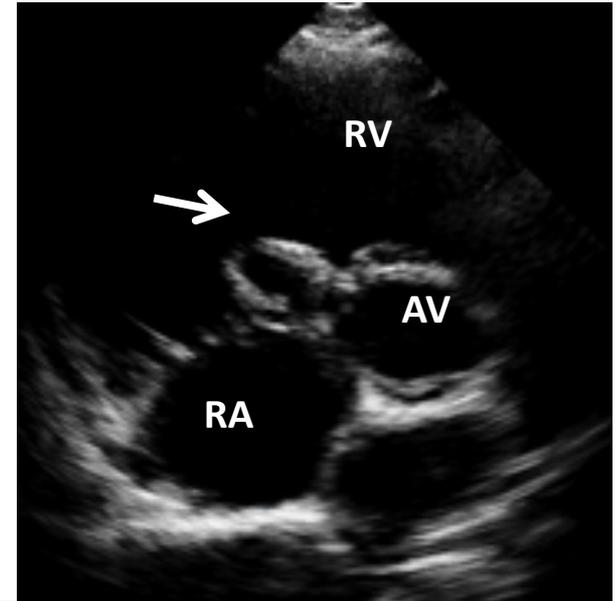
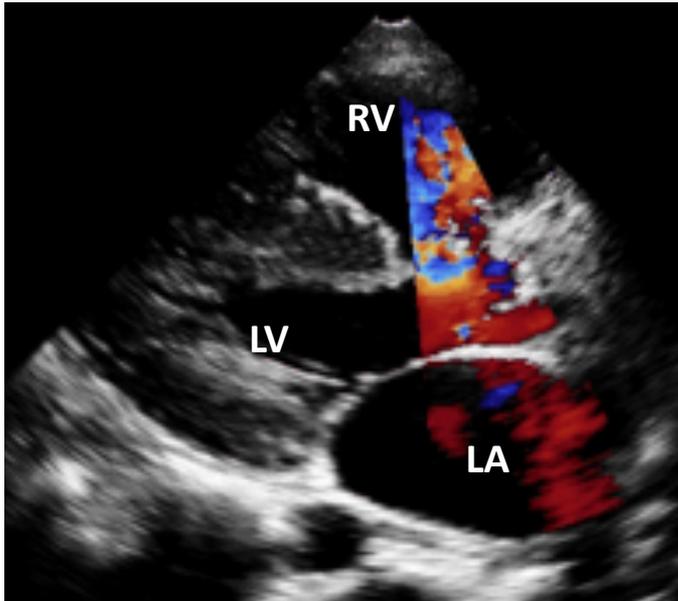


CIV péri-membraneuse

Incidence parasternale petit axe et sous-costale + doppler couleur : Défaut septal regardant la tricuspide



Anévrisme du Septum Membraneux



Gerbode

Bernouilli 

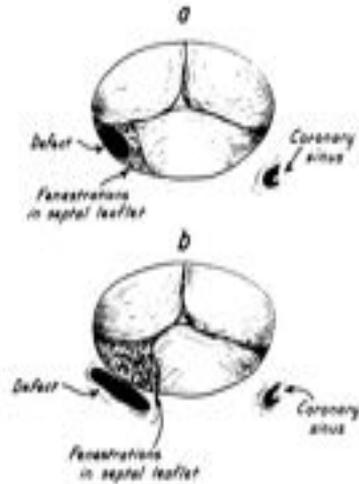
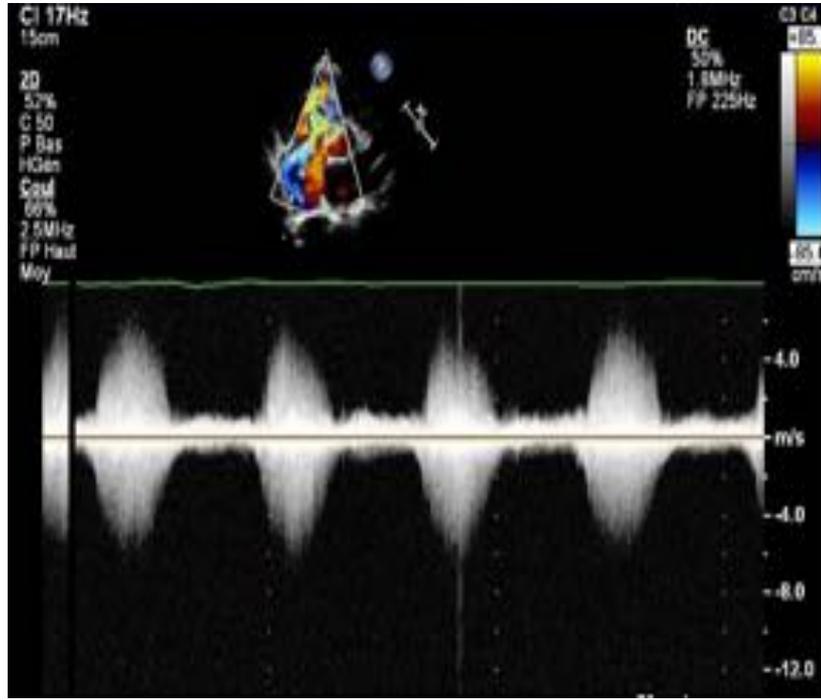
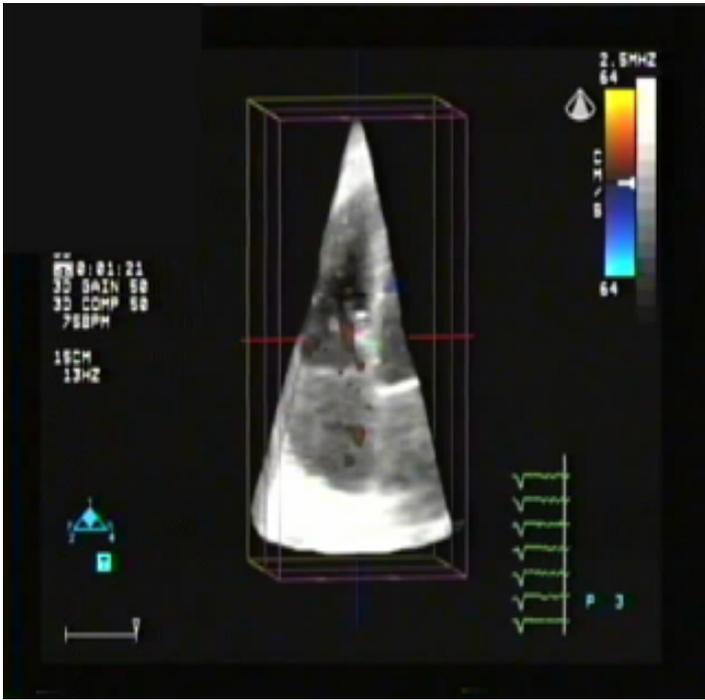
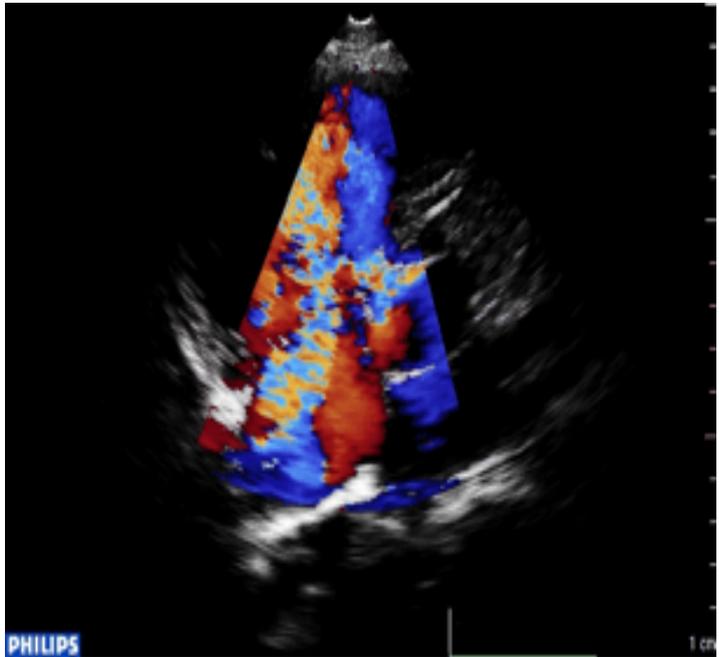


FIG. 4. Drawing showing the essential aspects of left ventricular-right atrial shunt. a) Type of defect in 4 out of the 5 patients. b) Type of defect in Case 3.

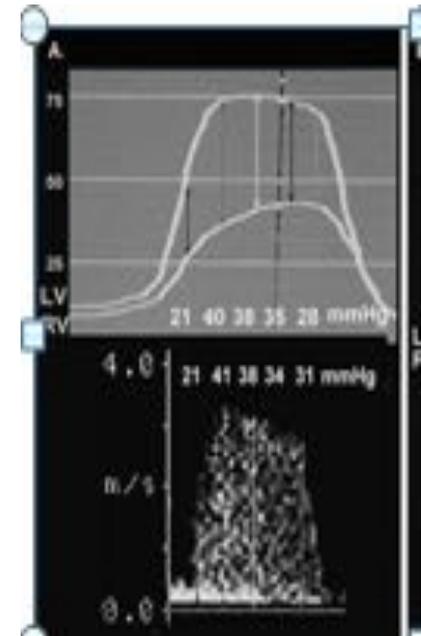


CIV péri-membraneuse

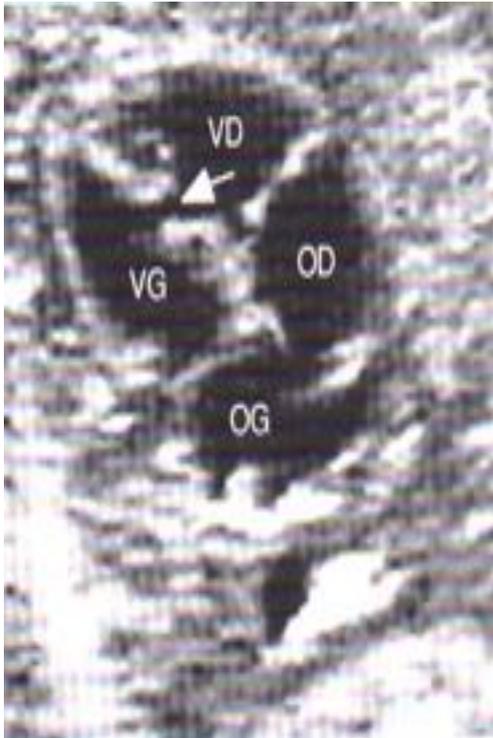
- Evolution la plus fréquente vers la fermeture spontanée par un anévrysme septum membraneux totale ou partielle (maladie de Roger)
- En cas de shunt ventriculaire très symptomatique malgré le traitement médical et/ou d'HTAP la CIV doit être fermée par chirurgie avant l'âge de 6 mois
- L'apparition d'une fuite valvulaire aortique et/ou d'une déformation de la cusp aortique est une indication opératoire à fermer la CIV même à faible shunt.
- Le risque d'endocardite infectieuse est faible mais persiste tant qu'un shunt persiste (lésion de jet sur la valve tricuspide)

CIV musculaire

La petite CIV trabéculée
dépistée sur un SS chez le
nouveau-né se ferme toujours
spontanément dans la 1^{ère}
année de vie.



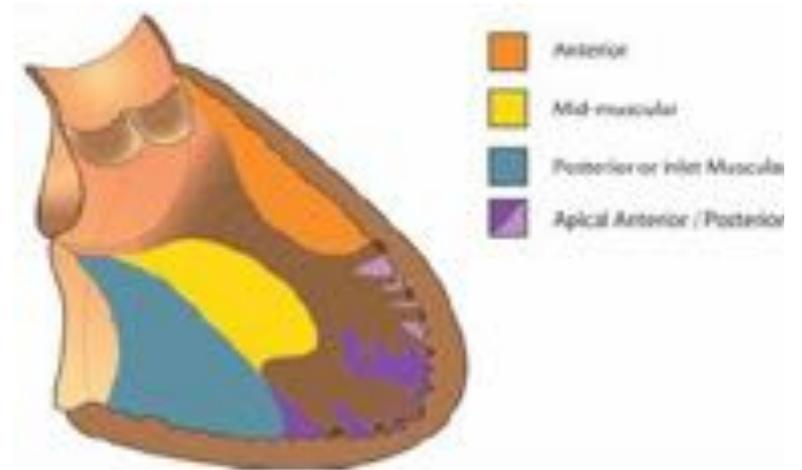
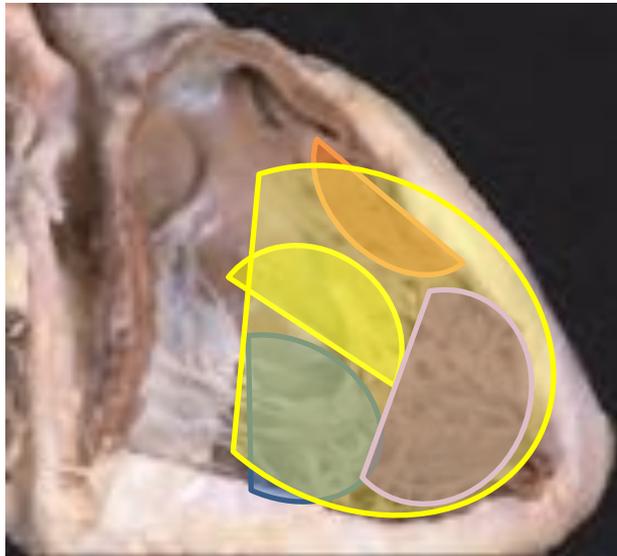
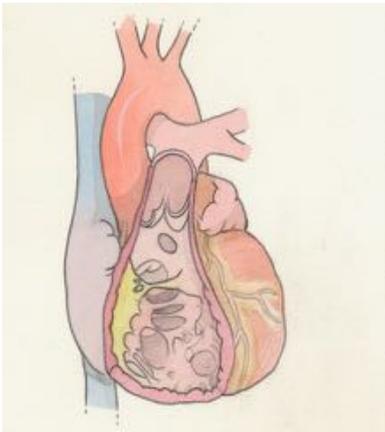
CIV large anténatale



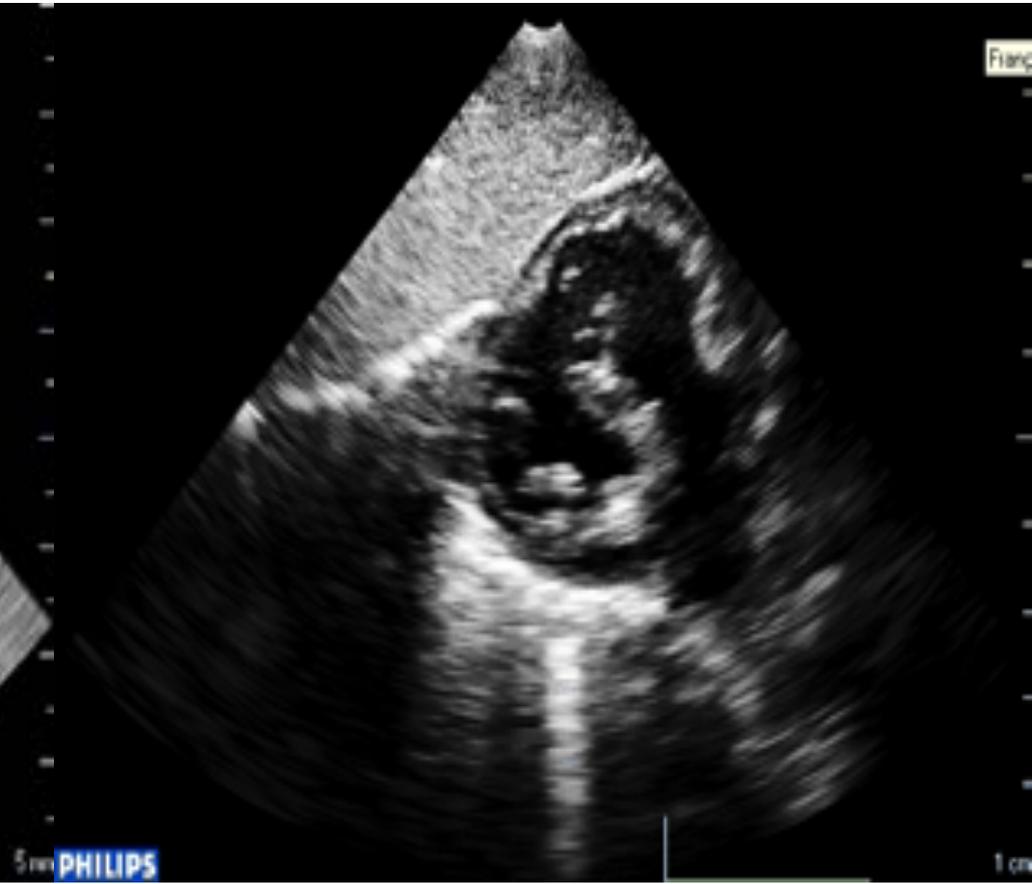
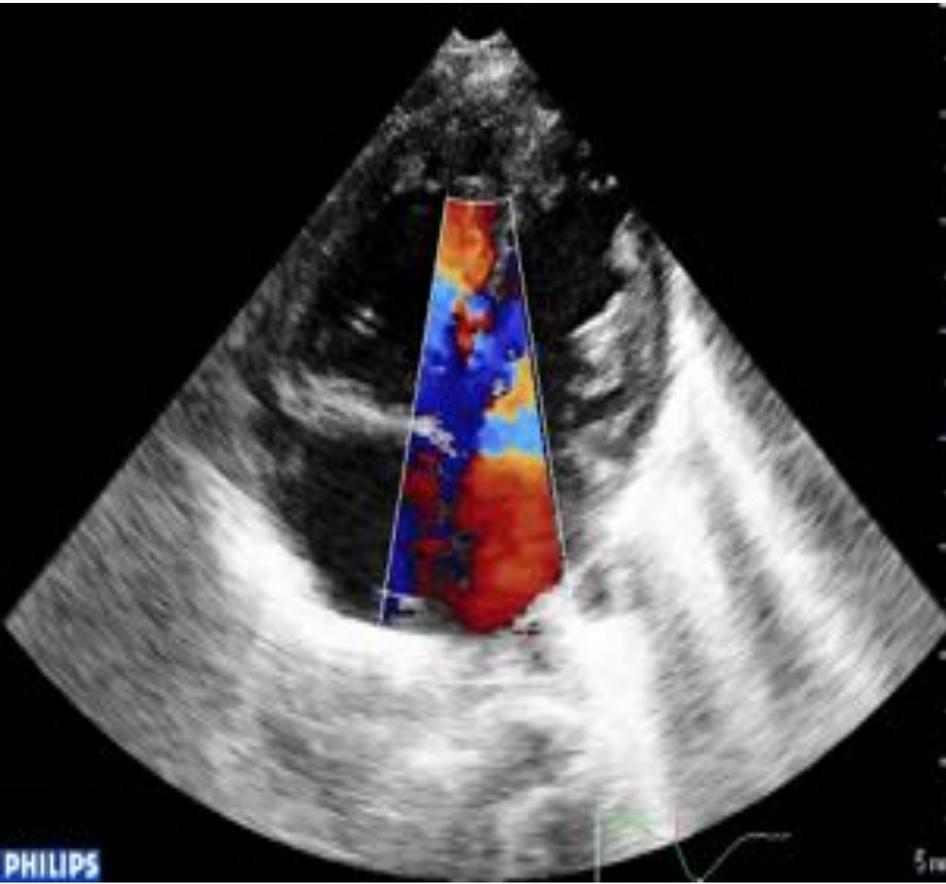
59 fœtus : 20% anomalie K :

- 2 T21
- 5 T18
- 2 T13
- 2 del22q11
- 1 del5

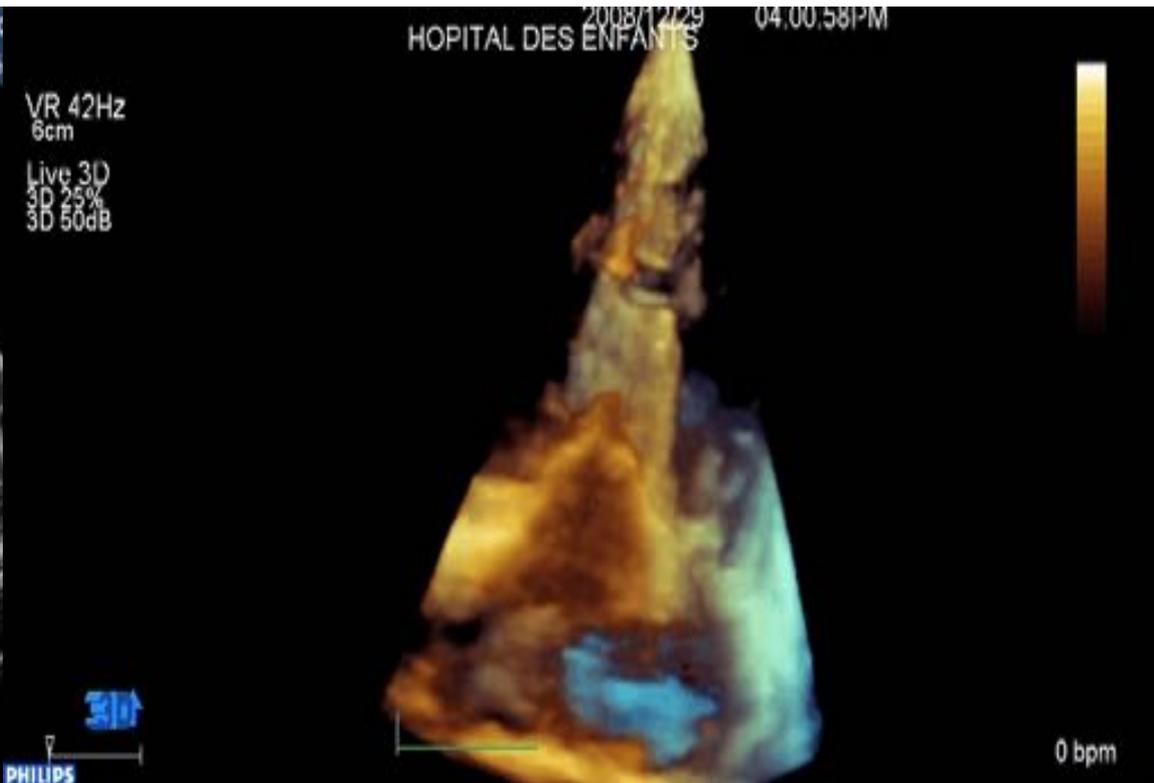
CIV musculaire



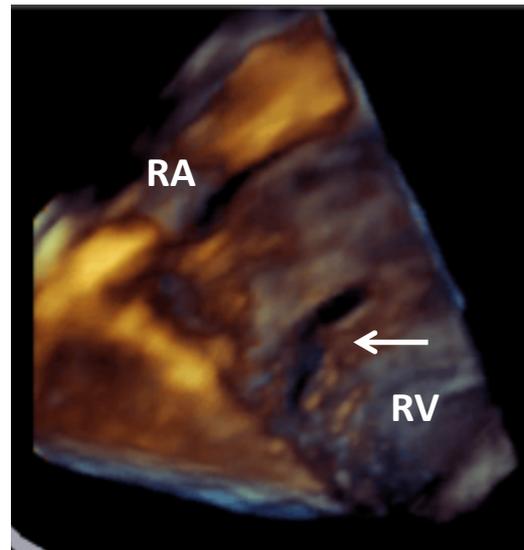
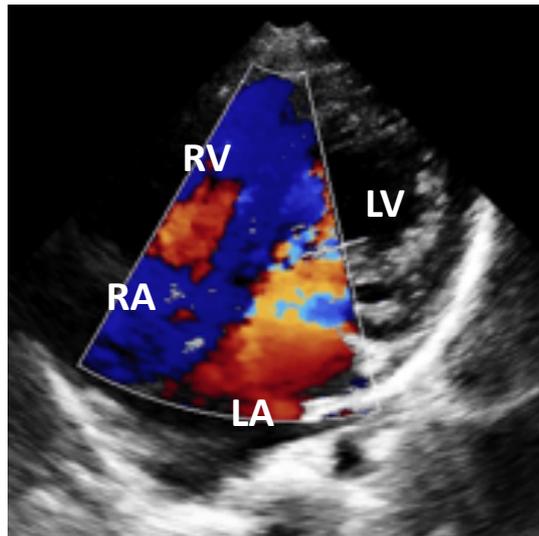
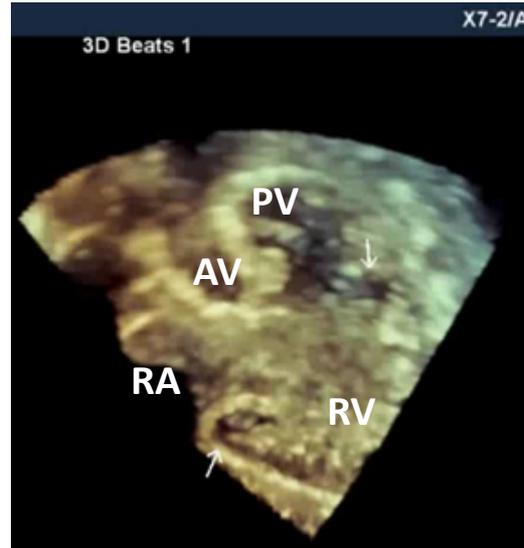
Clv musculaire



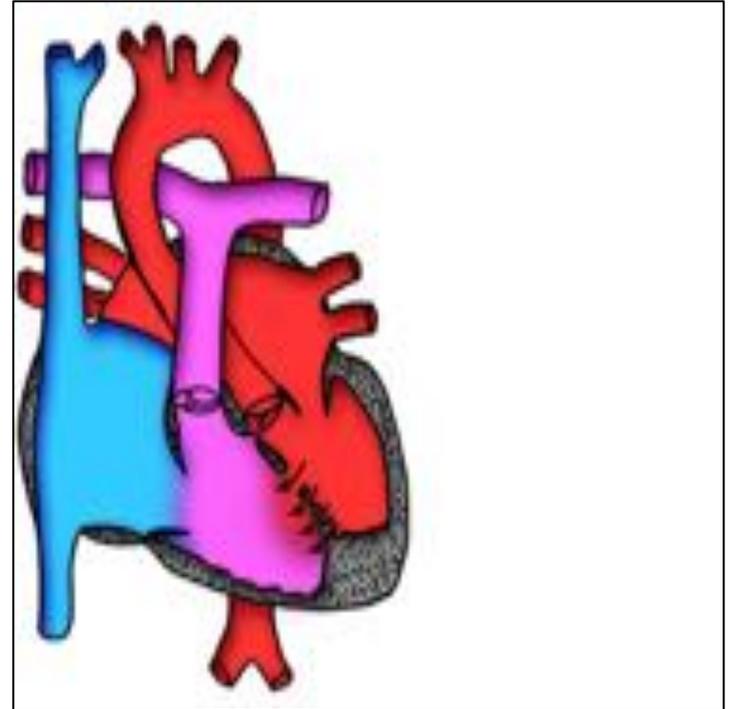
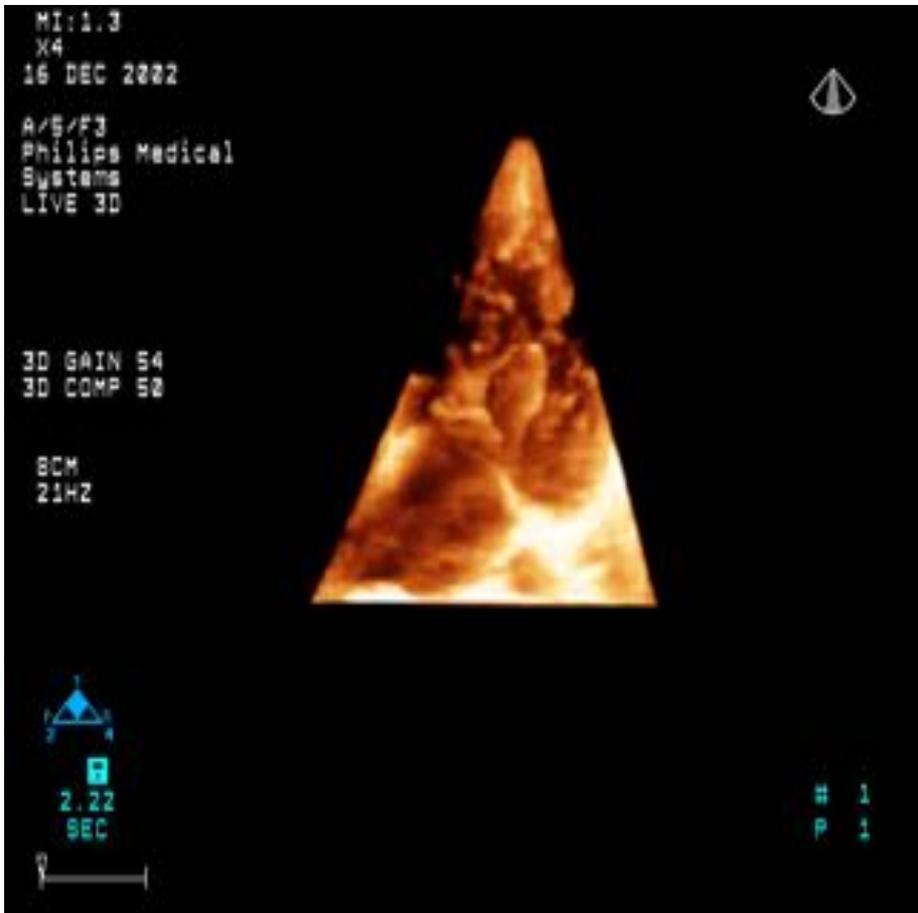
CIV musculaires multiples



CIV musculaires

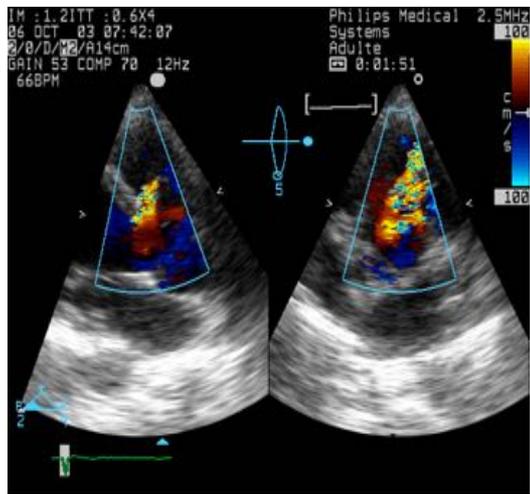


CIV musculaires

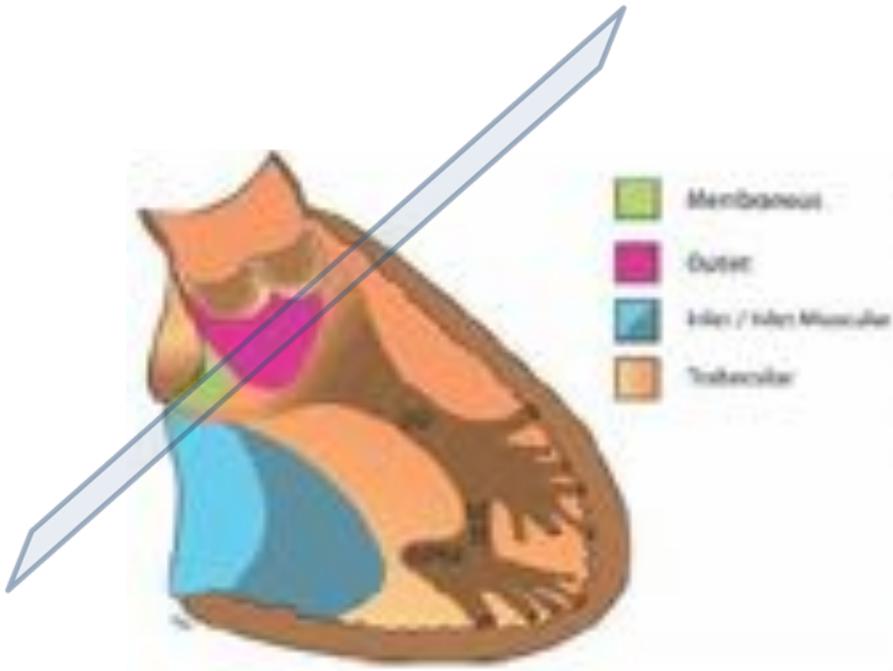
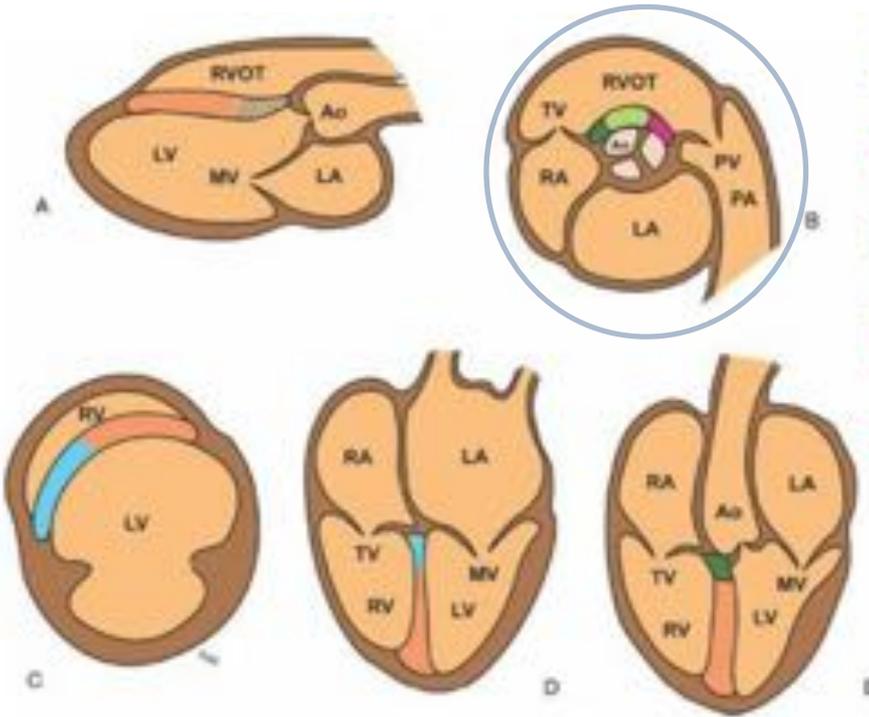


Trabécules VD

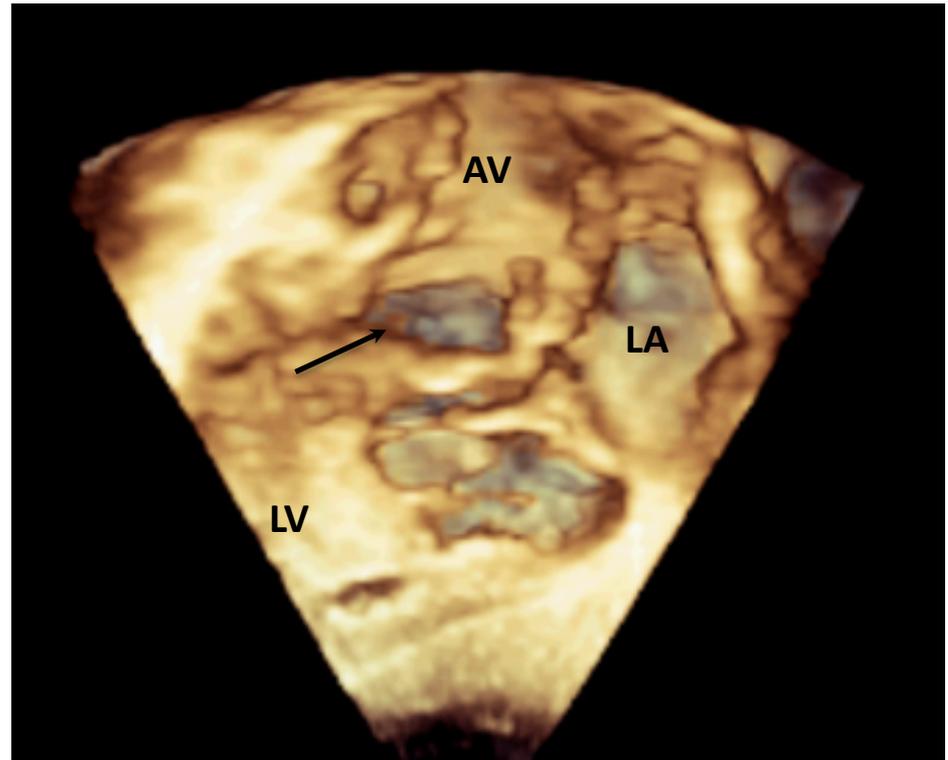
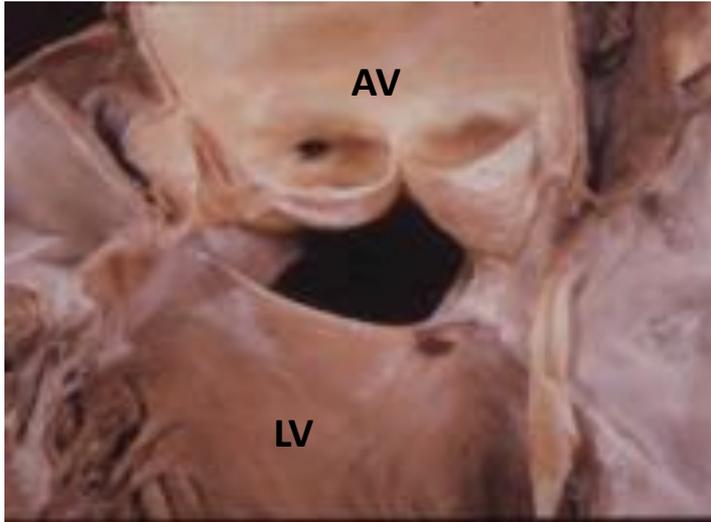
Fro



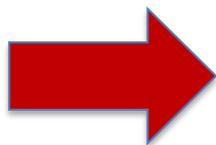
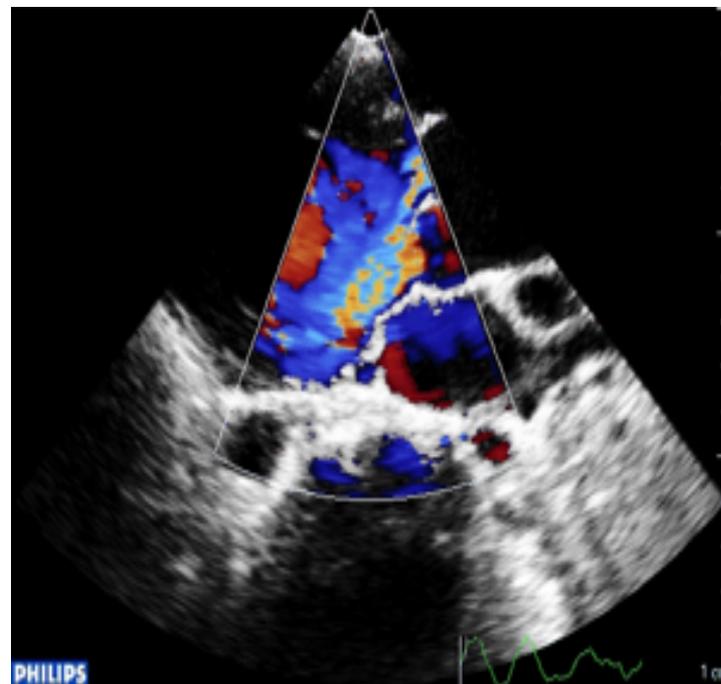
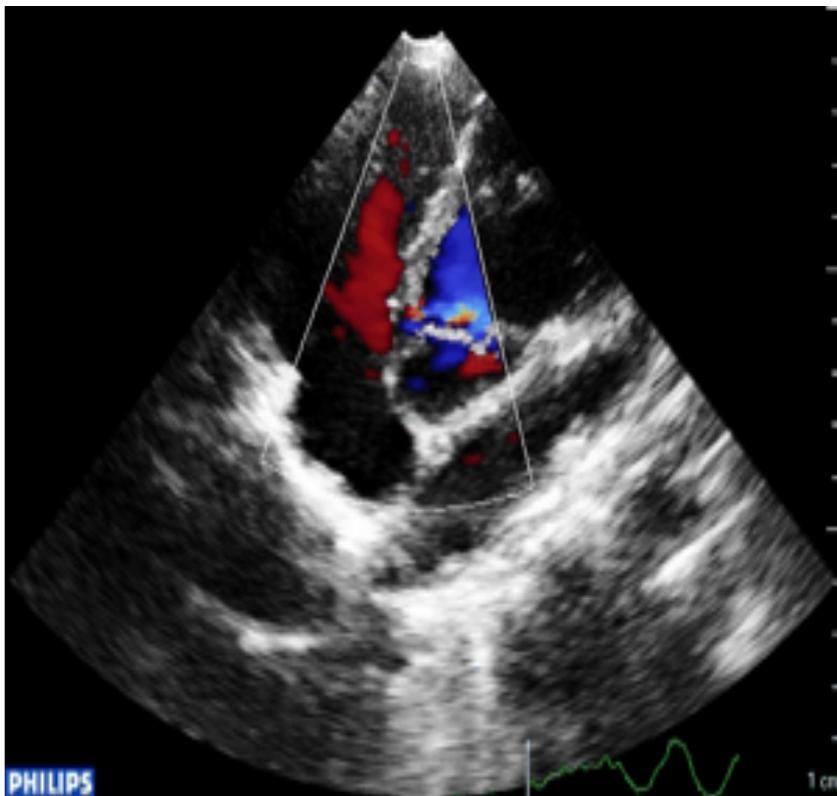
CIV Outlet



CIV Outlet



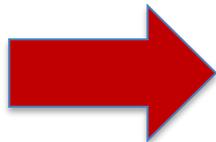
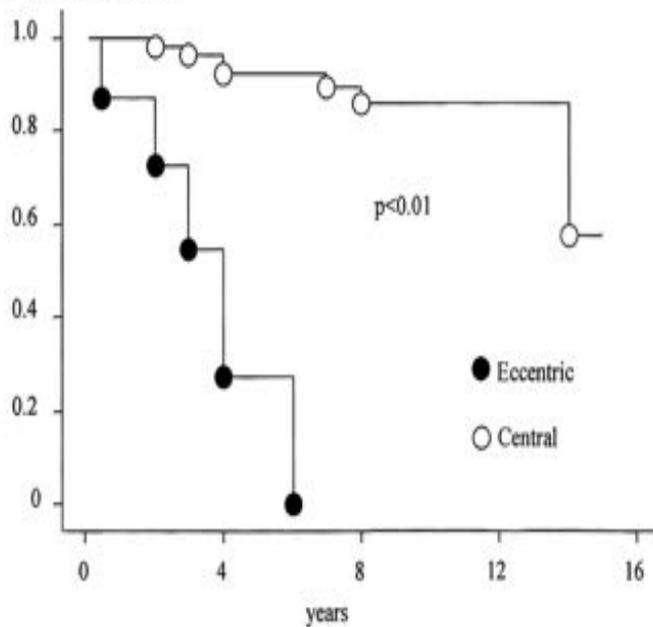
CIV et Fuite aortique



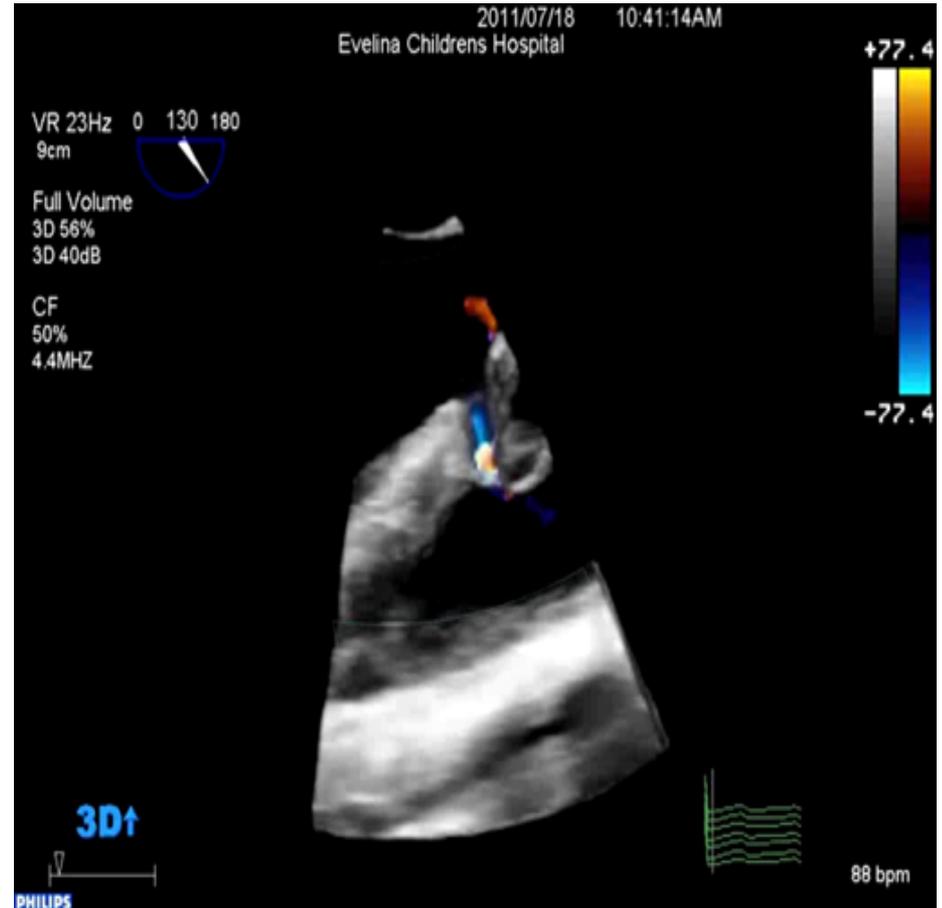
Chirurgie

CIV et Fuite aortique

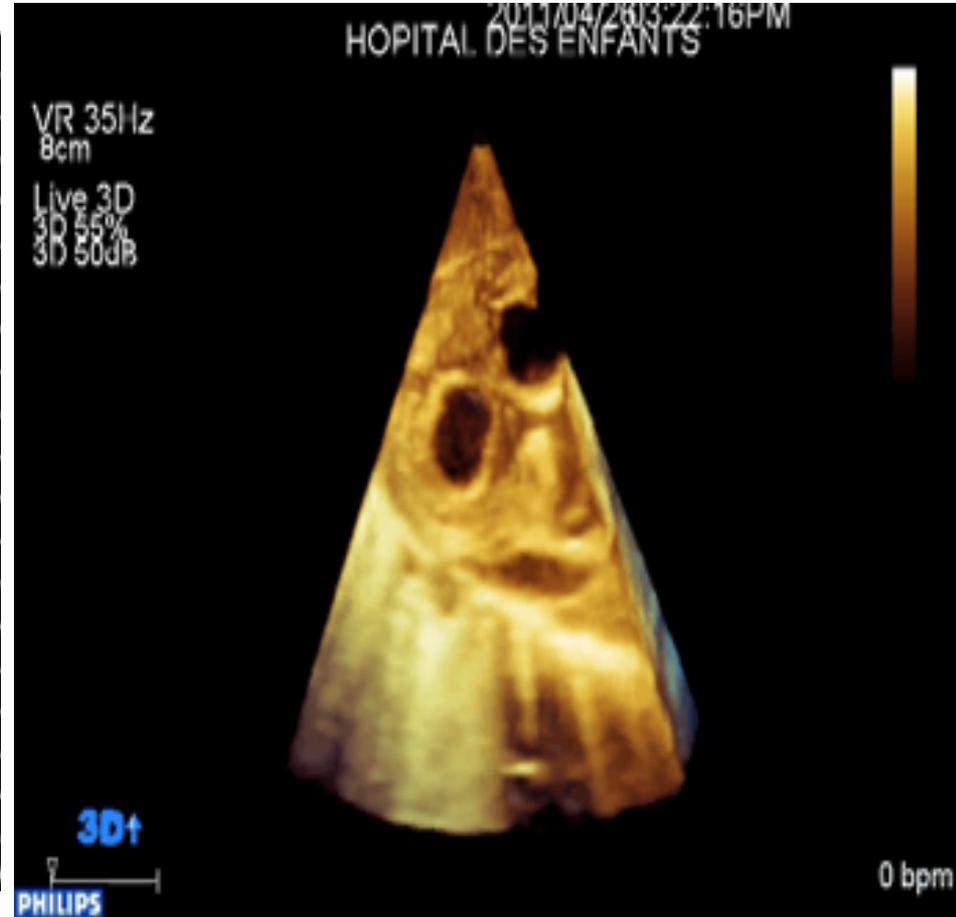
Freedom from moderate AR



Chirurgie



CIV inlet



Fente de la Valve Mitrale

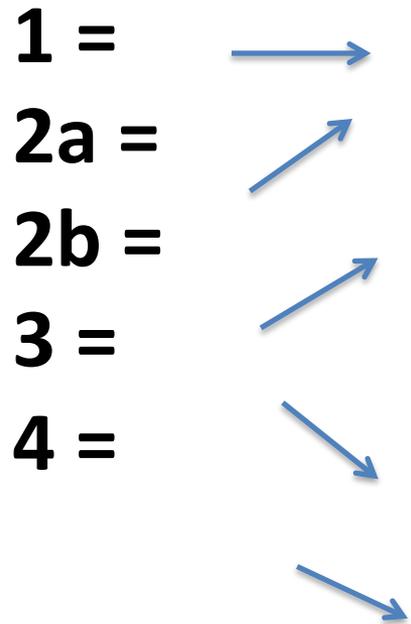
Partie 3

- Traitement médical
- Chirurgie
- Cathétérisme

Indications thérapeutiques

QP

PAP



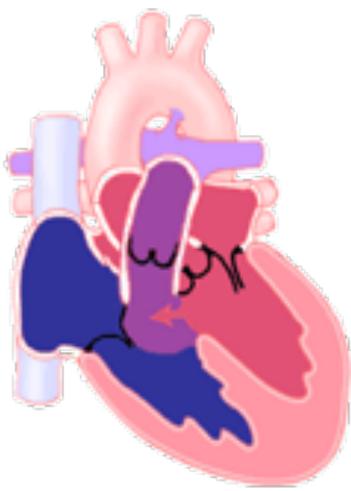
= écho/an ; +/- Osler

2a = ttt médical shunt

2b = chirurgie < 6 mois

3 = ttt médical HTAP

4 = chirurgie élektive



Traitement Médical Shunt

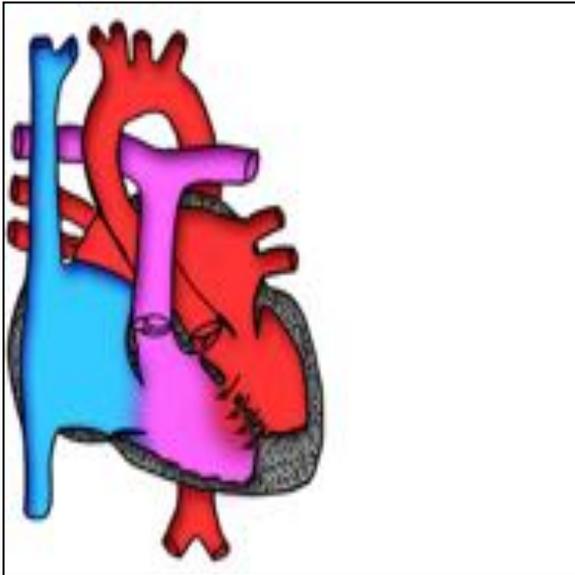
- **Diurétiques : furosémide (2 mg/kg) +/- spironolactone (3 à 5 mg/kg)**
- **Vasodilatateurs artériels : captopril (Noyada : 0,3 mg/kg/prise x 3)**
- **Diététique : fractionnement des têtées, régime hypercalorique et au besoin gavage gastrique**
- **Kinésithérapie respiratoire en cas de surinfection et prévention des bronchiolites par injection d'anticorps (synagis)**
- **Contrôle du taux d'hémoglobine (15g/l) par transfusion sanguine et traitement ferrique pour augmenter la viscosité sanguine**

Indications à la chirurgie

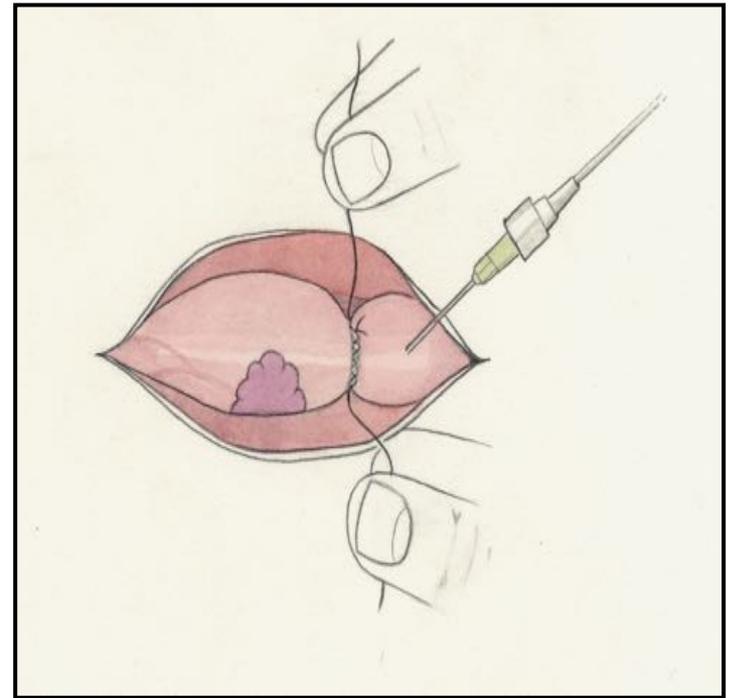
- **Symptomatologie respiratoire ou absence de prise pondérale malgré traitement médical**
- **CIV non restrictive avant 6^{ème} mois**
- **CIV et fuite et/ou prolapsus de la valve aortique**
- **CIV avec obstacle infundibulaire**

Cerclage pulmonaire

Coeur fermé

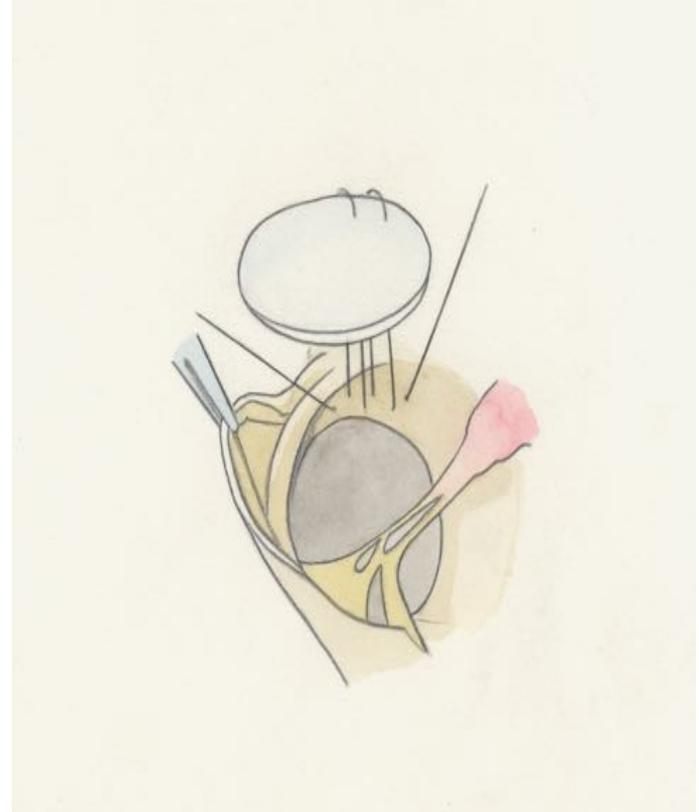
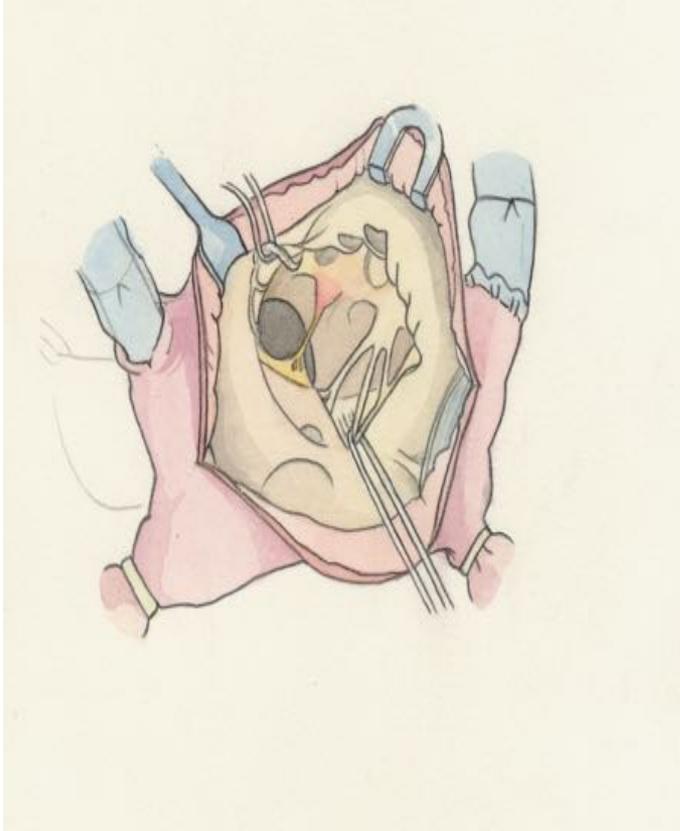


CIV multiples
Petit poids
Comorbidité



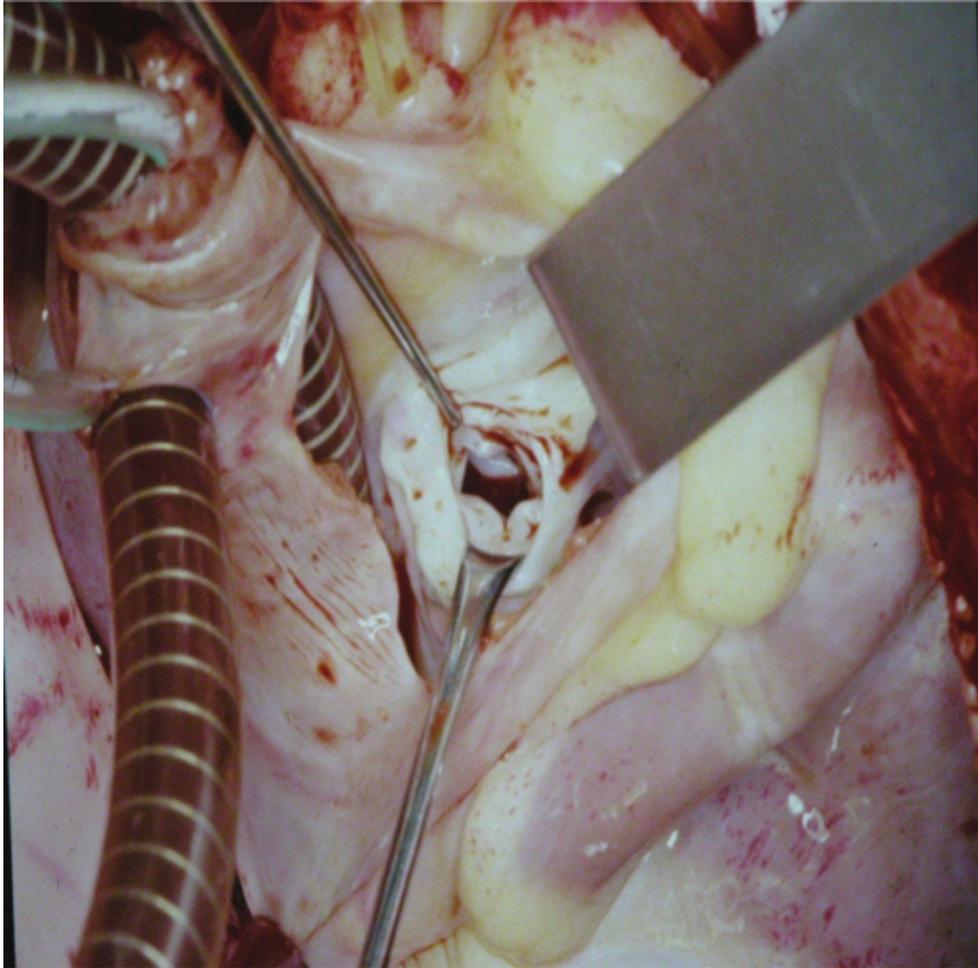
Fermeture chirurgicale

Circulation extra-corporelle



Sternotomie ; Voie atriale droite ; Suture patch

CIV péri-membraneuse



Haut

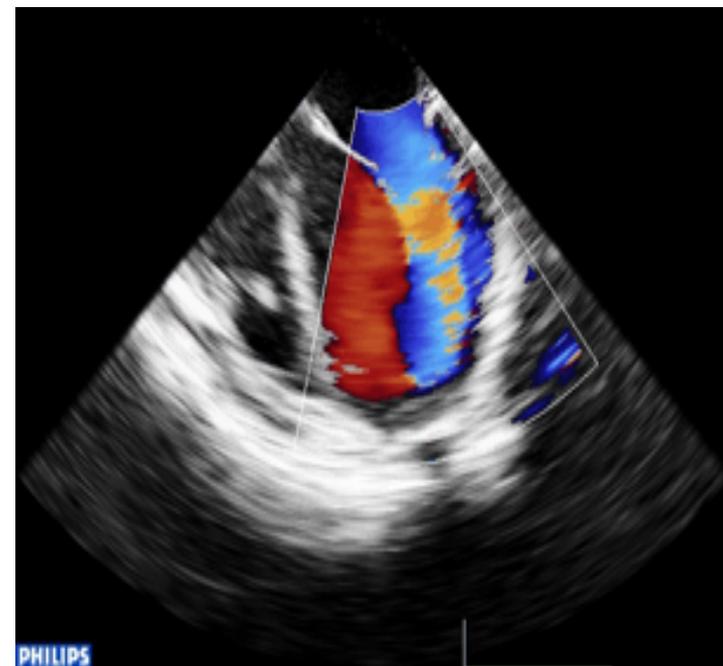
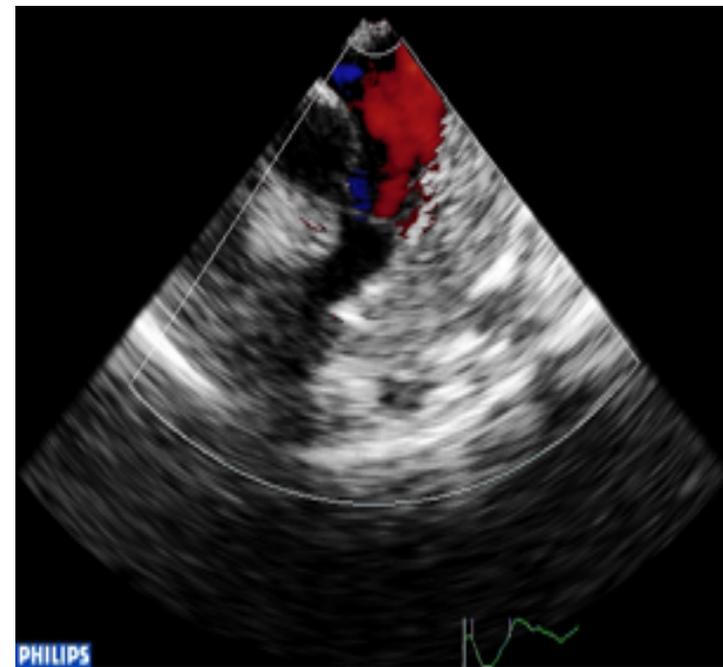
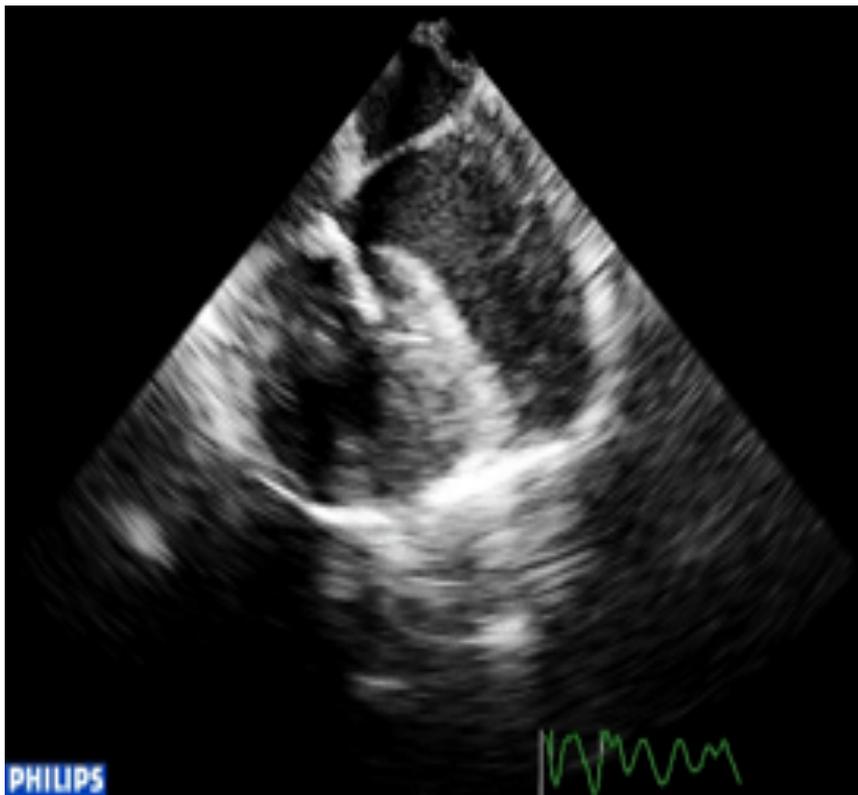
OD avec
canules
caves

CIV

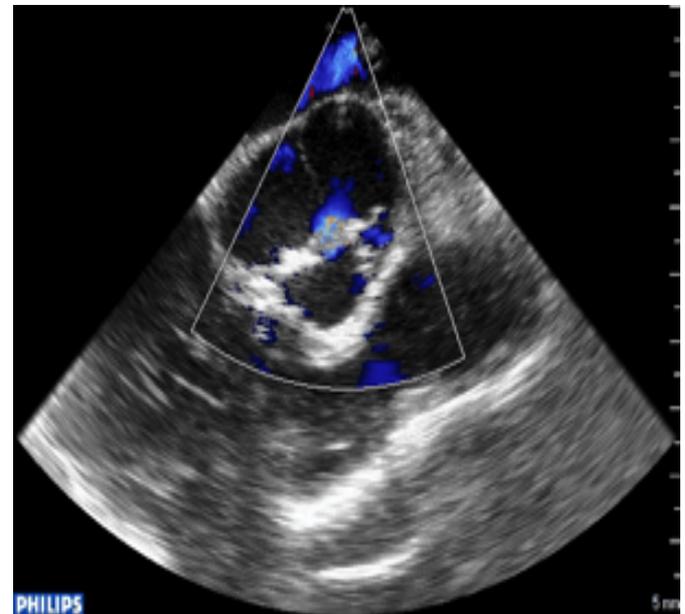
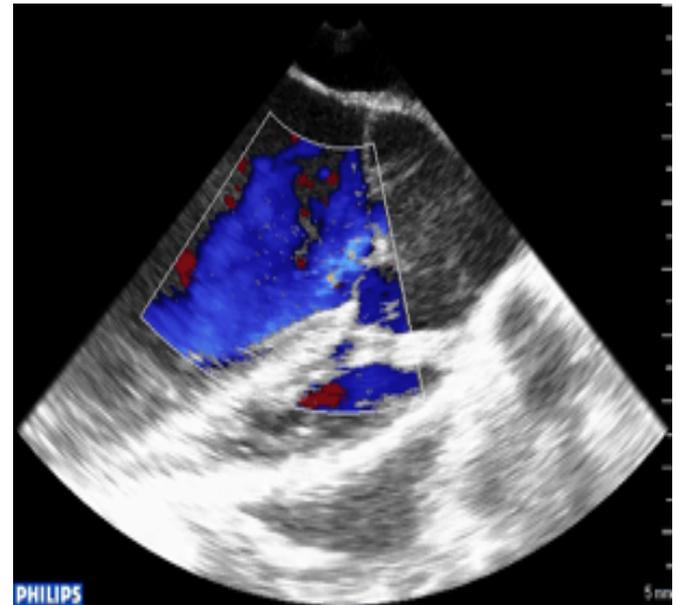
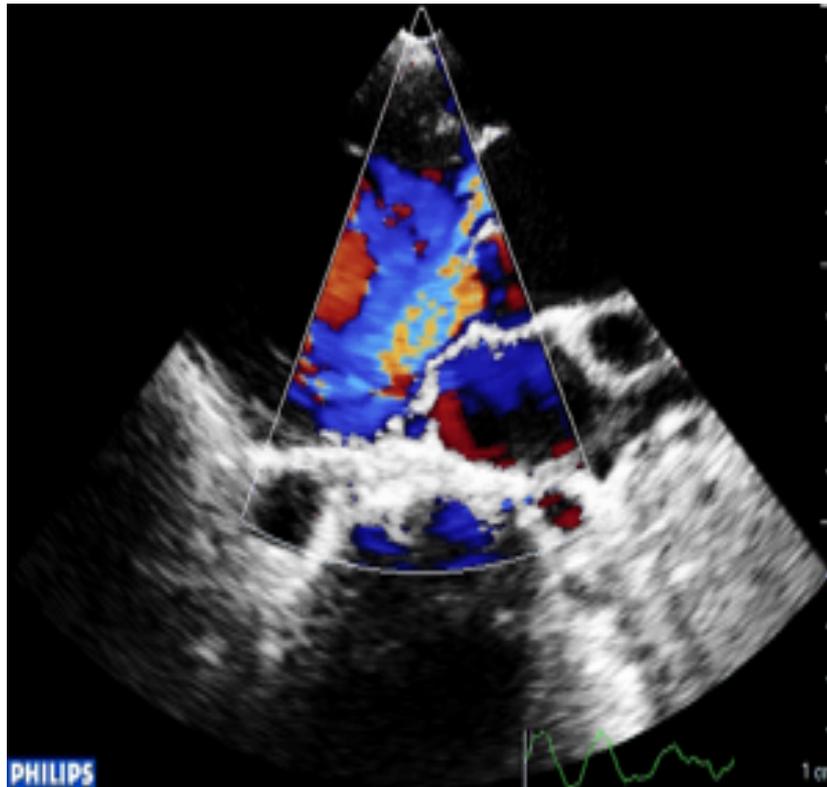
VD

Bas

ETO post-opératoire



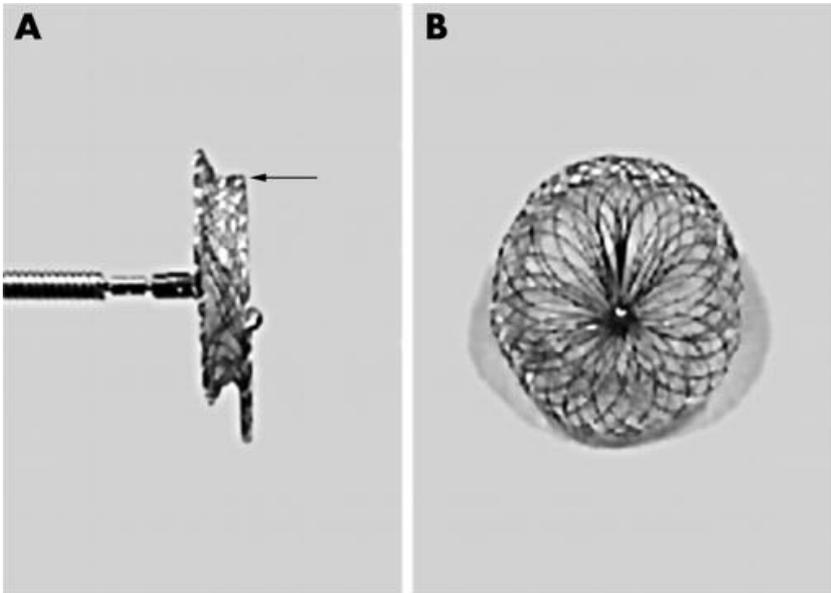
CIV et Fuite Aortique



Indications au Cathétérisme Interventionnel

- **Débatu (bénéficie-risque)**
- **Discuté chez enfant > 8 kg avec CIV à gros débit**
- **Evaluation écho +++ :**
 - **Z score VG > 2**
 - **Anévrysme septum membraneux**
 - **Absence de prolapsus valve aortique**
- **Team expérimenté (cathétériseur et échographiste)**

Fermeture percutanée



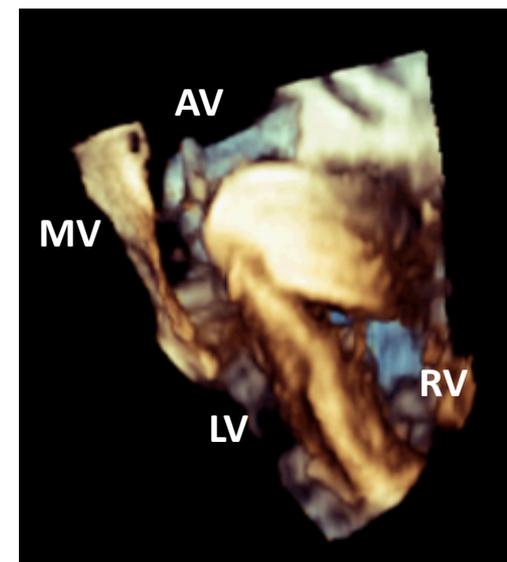
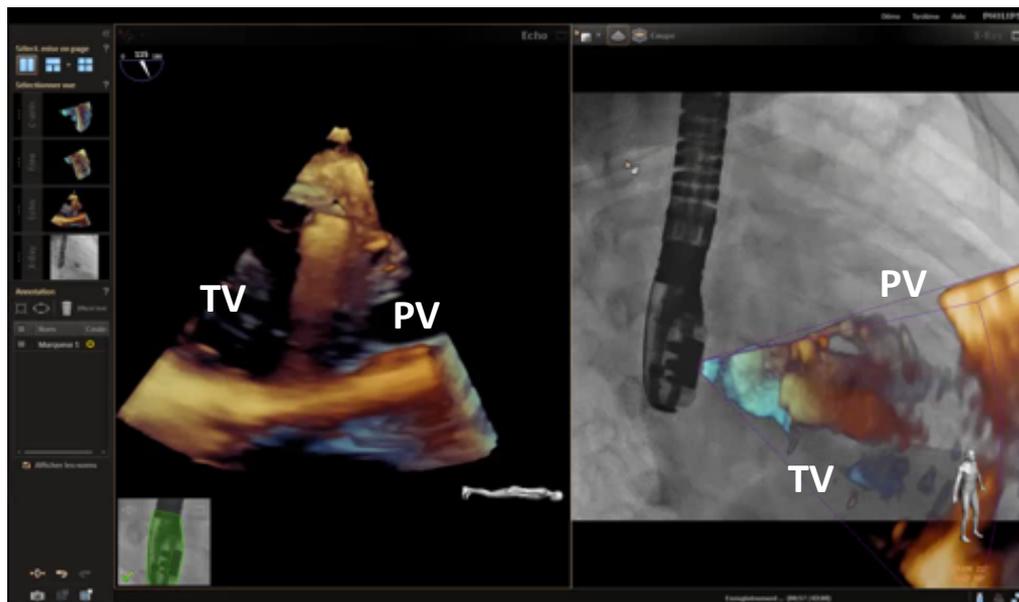
CIV PM : Complications BAV

CIV M : Hybride

Fermeture percutanée



Valve Aortique
Valve Tricuspide



Mots Clés CIV

- Anatomie
- Gradient : Restriction
- Courbe Pression-Volume
- Coupes Echocardiographiques
- Evolution spontanée
- Indications chirurgicales