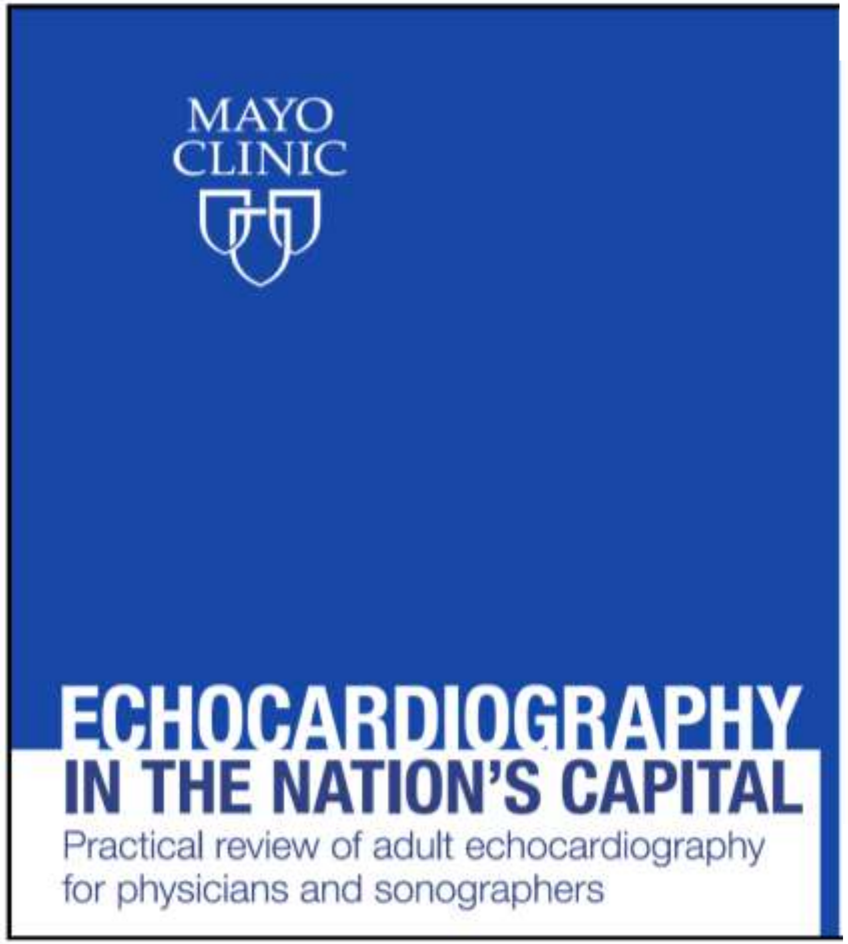
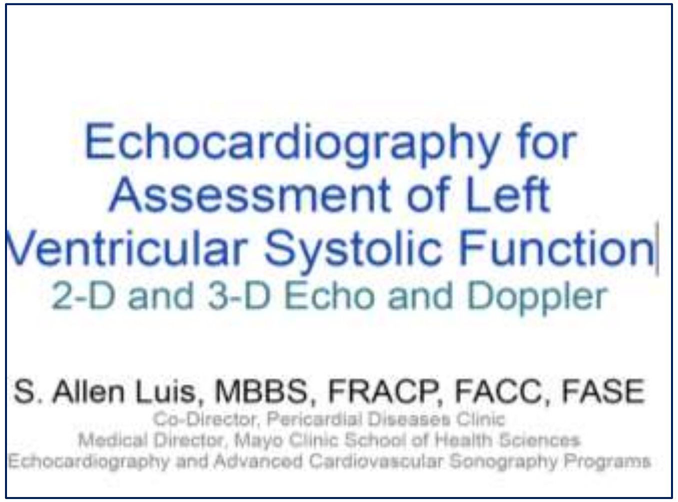


Congrès echo in the nation's capital

May 2019



take home messages

- Simpsons biplane method is recommended for LVEF assessment
- Consider contrast use where images suboptimal
- 3D is recommended when feasible
- GLS may help identify subclinical dysfunction

Commentaires:
- Attention au foreshortening, faire attention à être le plus bas possible en apical 4C
- La longueur du vg doit être superposable entre la 2C et la 4C
- bien regarder la pointe du vg , si elle bouge c'est qu'on la coupe…

Diastolic Function:
Basic Concepts** and **Practical Points

Amy West Pollak MD MS FAHA

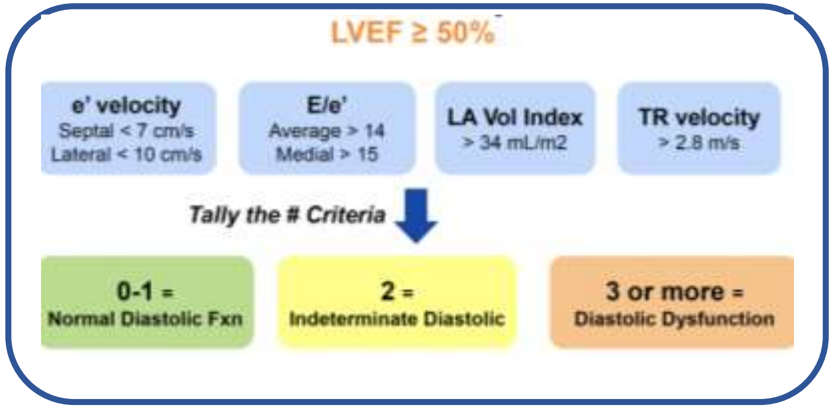
May 2, 2019

Take Home Points

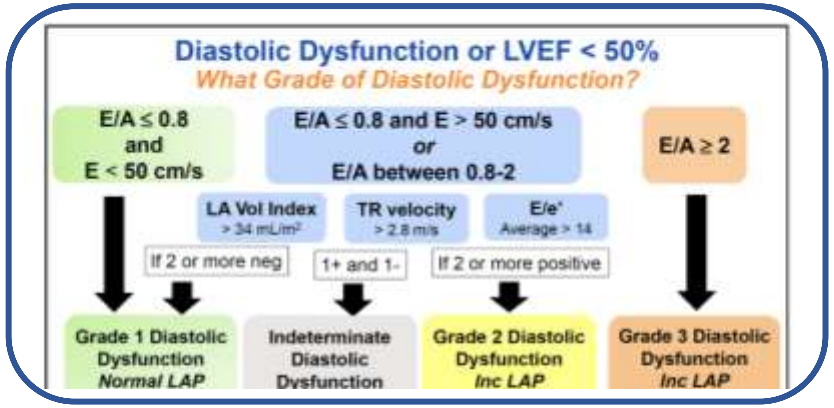
- If normal LVEF, then first decide if there is diastolic dysfunction based on 4 criteria:
  - e' velocity, E/e', LA volume index and TR velocity
  - Then determine grade
- If reduced LVEF look at E/A ratio first
- Caution with:
  - MAC
  - Afib
  - Measurement errors

LAP : pression OG
TR insuff tricuspide
IVRT: tps de relaxation isov

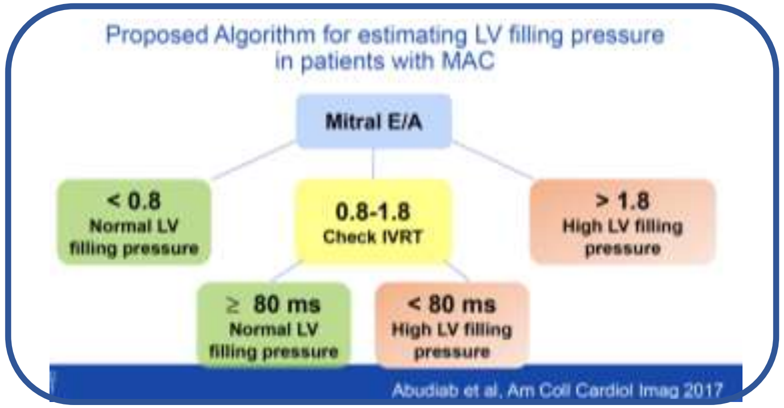
Si FEVG ≥50%



Si FEVG <50%



Si calcifications annulaires mitrales



Echocardiographic Assessment of Right Heart Pressures and Right Heart Function

Grace Lin, MD, FACC, FASE
Director, Heart failure Services
Mayo Clinic Rochester

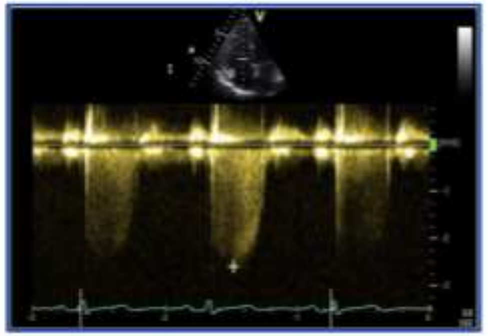
Take Home Points

- Non-invasive hemodynamic assessment by echo
  - Quantify PH
  - Can quantify increased afterload
    - Need other testing to identify type of PH
- No single measure of RV function
  - visual assessment
  - TAPSE or S', not RIMP alone
  - Consider strain, 3D volume

RV systolic pressure

RVSP = 4(V_{TRmax})^2 + RAP
- Normal: TR max <2.8 m/s
- PH: TR max > 3.4 m/s

RA pressure
- <5 mmHg: IVC ≤ 2.1 cm, >50% collapse with respiration
- 15-20 mmHg: IVC >2.1 cm, <50% collapse

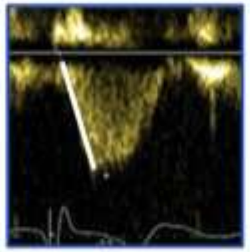


Paps par
V max de l'IT + POD

Mean PA pressure

PA Acceleration time
- Normal: > 130 ms
- PH: < 100 ms

Mean PAP = 90 – (0.62 x AT_{RVOT})
- Normal: <25 mmHg

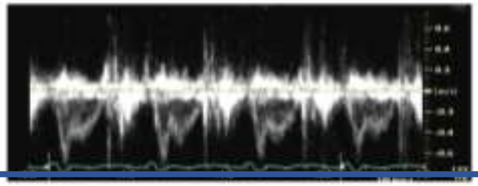


On va plus loin
avec le **flux d'éjection pulmonaire**:

temps d'accélération
si < 100ms : probable HTP
permet d'estimer la papm
90- (0.62x Tacc)

ex: si tacc =90ms, papm = 90-56=34mmhg

signe du W :
risque d'avoir des résistances vasculaires élevées…



Echocardiographic Assessment of Right Heart Pressures and Right Heart Function

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Mayo Clinic Rochester

Mean PAP = 4(V_{PRmax})^2 + RAP
- **Normal <25 mmHg**

Mean PAP = mean RV-RA gradient + RAP
- **Trace TR VTI to obtain mean gradient**
- **Normal <25 mmHg**

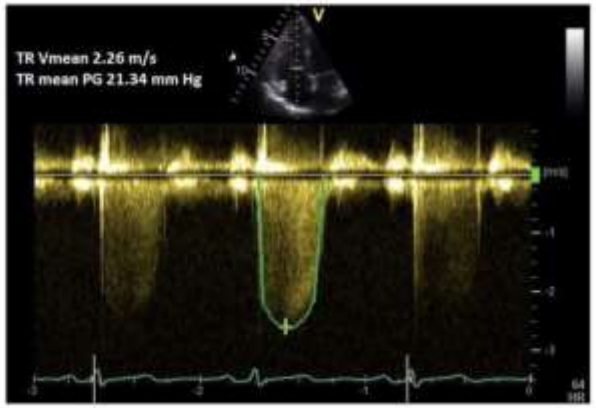


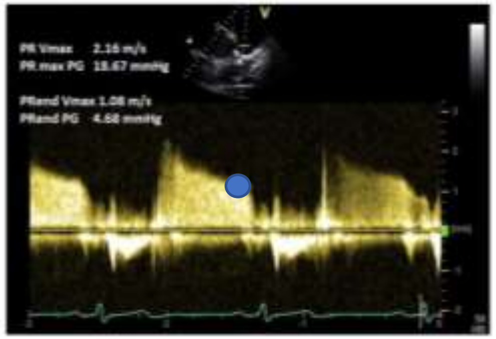
Fig. 5. Tricuspid regurgitation velocity-time integral method for measuring mPAP.

Moyen intéressant d’avoir la Papm:
on trace la vti de l’IT , on obtient le gradient moyen auquel on ajoute la POD
dans l’exemple: 21+ 10= 31mmhg > 25mmhg donc HTTP
attention : il faut une belle enveloppe de l’IT pour être fiable

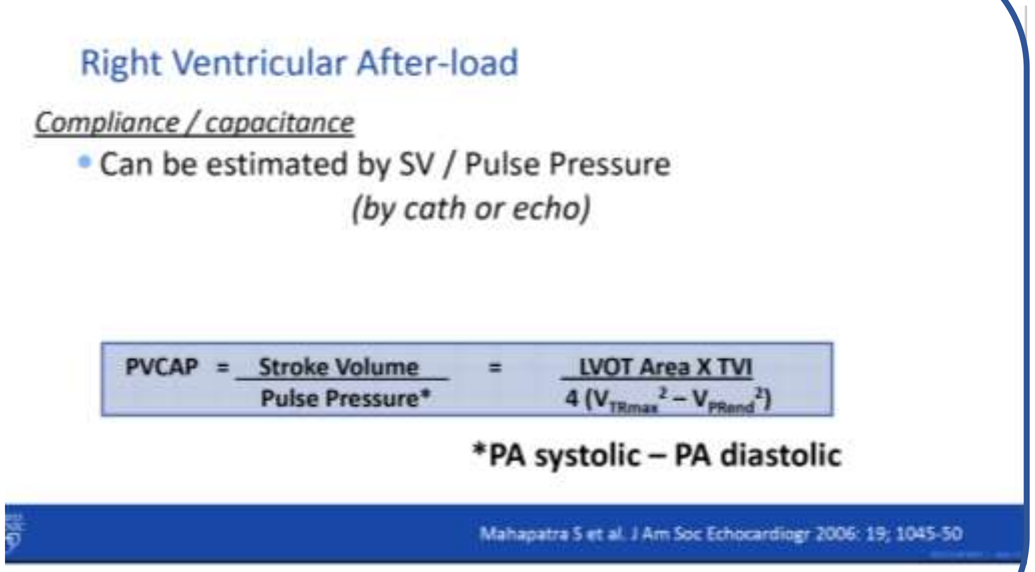
PA end diastolic pressure

PAEDP = 4(V_{endPR})^2 + RAP

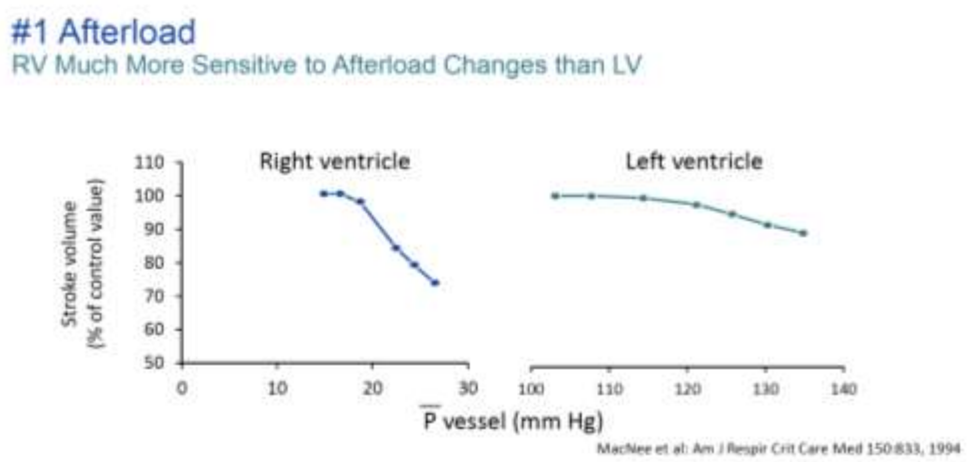
Mean PAP = 2/3 PAEDP + 1/3 PASP

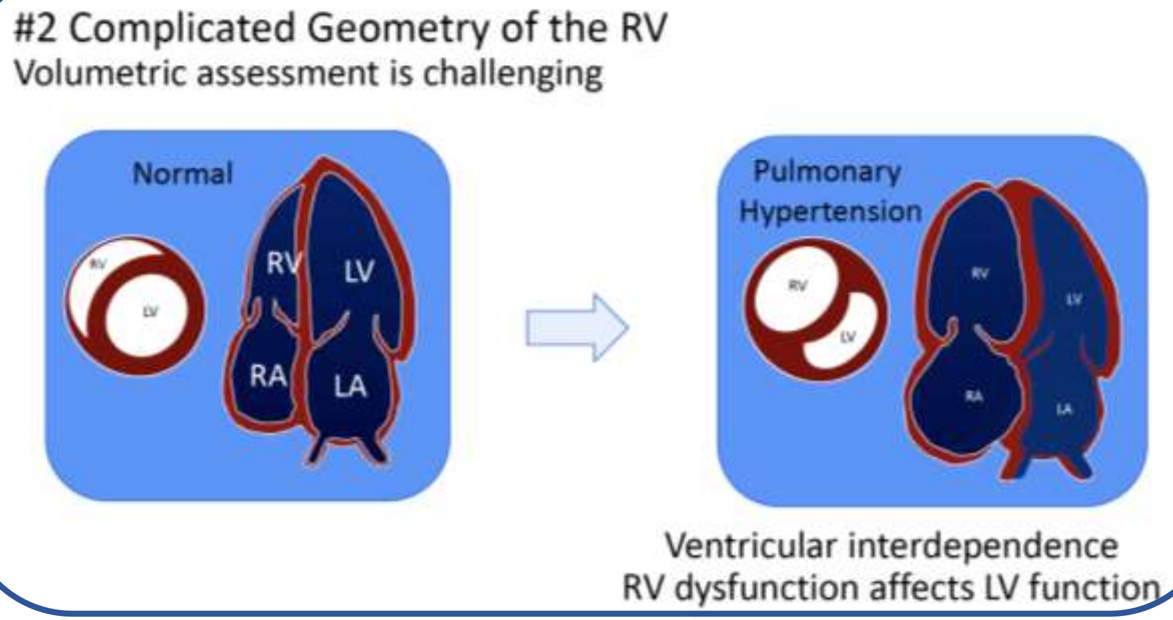


la papd est facile à avoir…
ne doit pas dépasser 10mmhg



Le VD est un être sensible à la post charge….





pour la fonction systolique vd,

- tenir compte de la post charge
- geometrie du vd+++
- multiparametrique+++
- TAPSE, S, FRS et strain de la paroi libre du VD

Echo in Heart failure: Implementing guidelines

Grace Lin, MD, FACC, FASE
Director, Heart failure Services
Mayo Clinic Rochester

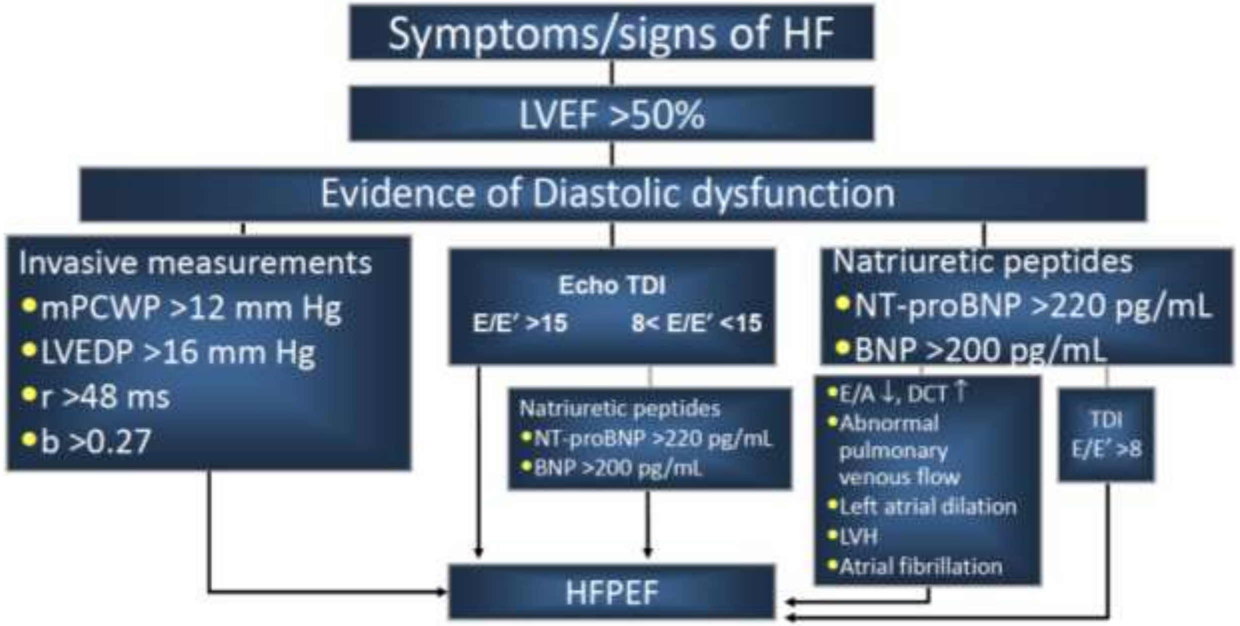
Quantification of EF is Important

- Critical decisions
  - EF ≤ 40%
    - Medical therapy for HFrEF: BB, ACE I, ARB, MRA, ARNI
  - EF ≤ 35%
    - ICD, CRT
  - EF ≤ 25%
    - Destination LVAD

Echo in Heart failure

- More than ejection fraction
- Comprehensive hemodynamic assessment
  - HFrEF and HFpEF
- Diagnosis
- Guide therapies

HFpEF Diagnostic algorithm



Alterations in Physiologic Response to Exercise in HFpEF

Parameter	Normal	HFpEF
Heart Rate	↑	Blunted response
Systolic blood pressure	↑	↑↑↑
Pulmonary capillary wedge pressure	↑ slightly	↑↑↑
Systemic vasodilatation	↑	Blunted response
Contractility	↑	Blunted response
Peripheral muscle oxygen extraction	↑	Minimal change
Cardiac output	↑	Blunted augmentation

Rappelons-nous que l'IC (même à FE préservée) implique un débit cardiaque insuffisant à l'effort

donc en echo d'effort normalement

le DC doit x2

et E /e' reste stable

Exercise Hemodynamics in HFpEF

Normal	Abnormal
E ↑	E ↑
e' ↑	e' ↔
E/e' ↔↓	E/e' ↑

Cardiac output does not augment appropriately

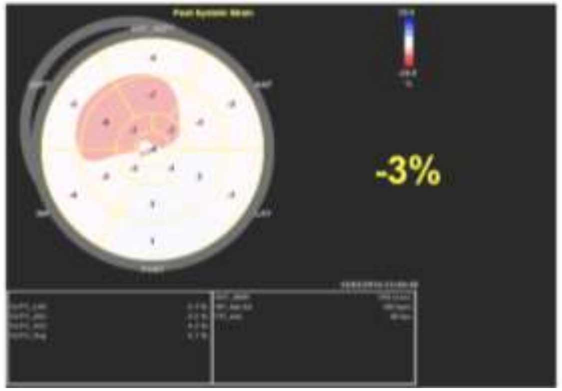
Echocardiographic Assessment in Patients with Infiltrative Cardiomyopathies

Rekha Mankad, MD

Amylose

strain = « cherry on top »

Global Longitudinal Strain



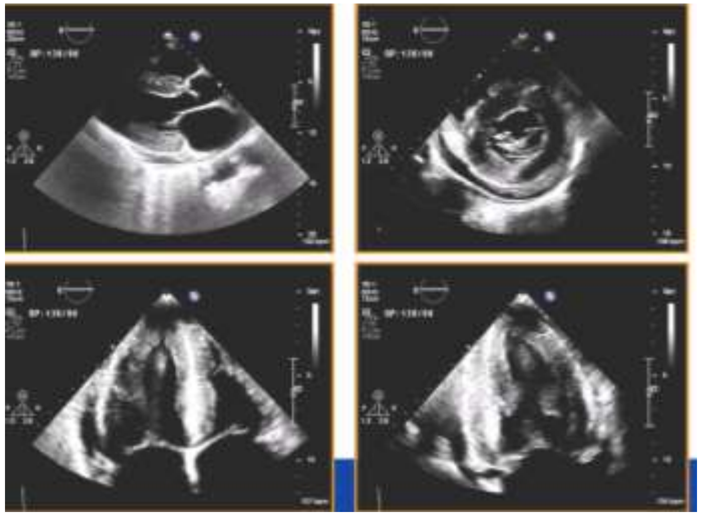
Clinical Clues to Cardiac Amyloidosis: Signs and Symptoms

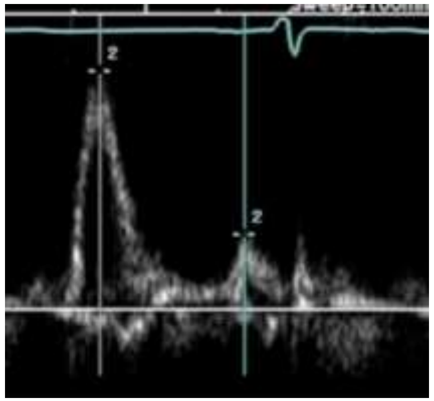
- **Dyspnea**
- **Fatigue**
- **Edema**
- **Ascites**

(Dyspnea, Fatigue, Edema, Ascites →) **Heart Failure: Right > Left**

- **Presyncope/syncope**
- **Weight loss/anorexia**
- **Neuropathy (autonomic or peripheral)**
- **Carpal tunnel syndrome**
- **Heart block, atrial fibrillation**

- **ECG**
  - **45% low voltage and pseudoinfarct**
  - **15% LVH**
  - **20% afib/flutter**
  - ***Absence of low voltage does not exclude***
- **Biomarkers: NT-BNP out of proportion to EF**

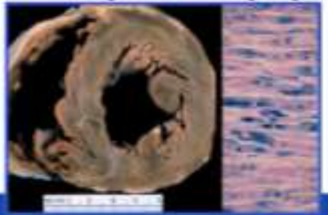




Hemochromatosis

- ↑ total body iron – intracellular deposits in heart, liver, pituitary, pancreas, gonads, skin
- Think of this when DCM seen in setting of hepatic dysfunction; diabetes, tanned skin
- Diagnosis is critical, since reversible
  - Males 9:1
  - 2-3/1000 population (1:400 of Northern European ancestry)
  - Ferritin usually > 500, transferrin > 50%
- Normal wall thickness (but can start as a restrictive CM too)
- Arrhythmias, conduction abnormalities

Intracellular iron – directly toxic to myocytes



Courtesy of William Edwards, MD

T2 *

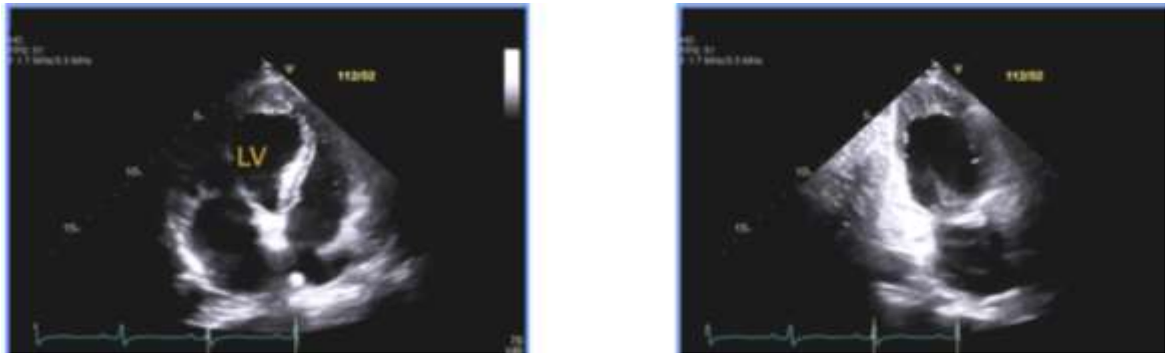
- T2* sequence is used to evaluate iron deposition in the myocardium
- The evaluation of the T2* relaxation time is an excellent noninvasive correlate of myocardial iron deposition and is a useful technique to follow response to iron-chelation therapy.
- Myocardial T2* has been shown to have no relation to serum ferritin and liver iron overload.
- T2* relaxation time predicts CHF and Arrhythmias

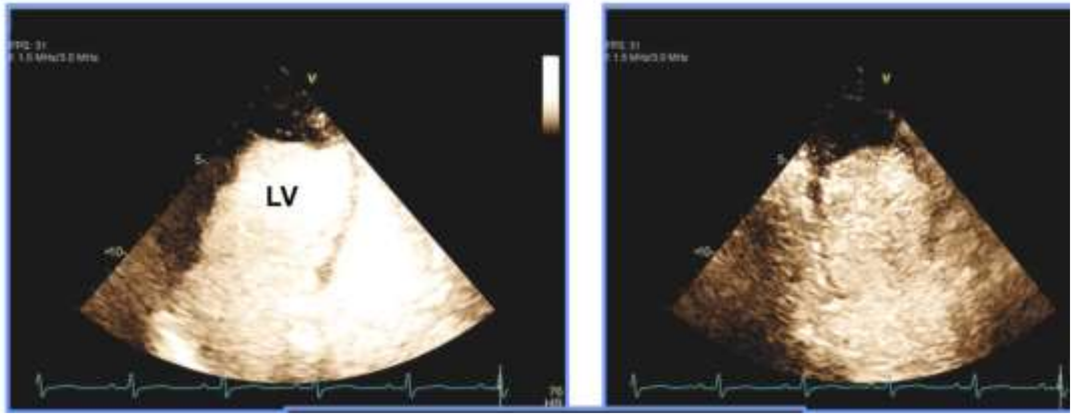
hemochromatosis

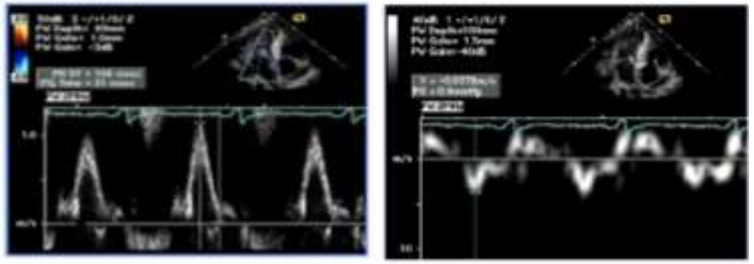
Circulation 2009;120:1961-8
Eur Heart J 2001;22:2171-9.

Hypereosinophilic Syndrome: Cardiac Manifestations

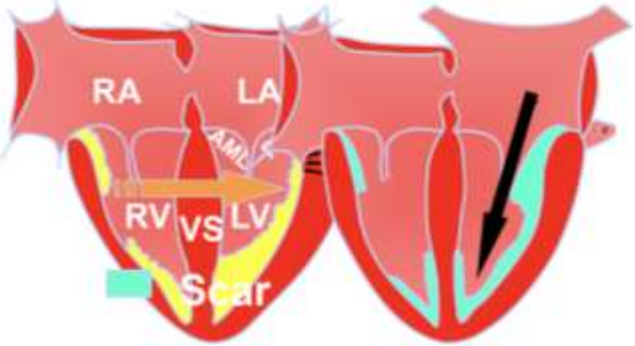
- Increase in eosinophil count or tissue hypereosinophilia along with organ damage due to the eosinophils
- CHF (dyspnea)
  - Restrictive Cardiomyopathy
  - Mitral regurgitation
- Systemic embolization







Natural History Hypereosinophilic Syndrome



Myocarditis → Thrombus → Fibrosis

Image courtesy of Leslie Elvert RDCS

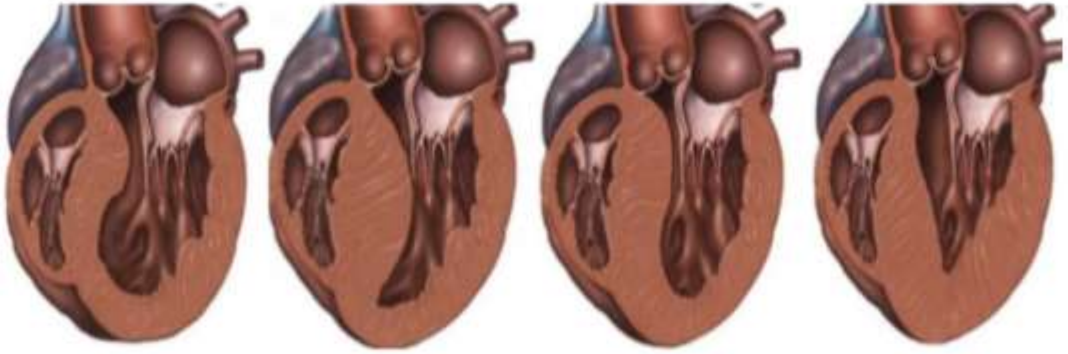
Augmentation de l’épaisseur du muscle
Toute augm d’épaisseur n’est pas une hypertrophie
≥ 15mm (ou moins parfois…)
Eliminer une autre cause: HTA, RAC, C. infiltrative

Echocardiography for Patients with Hypertrophic Cardiomyopathy

William R. Miranda, MD

05/02/2019

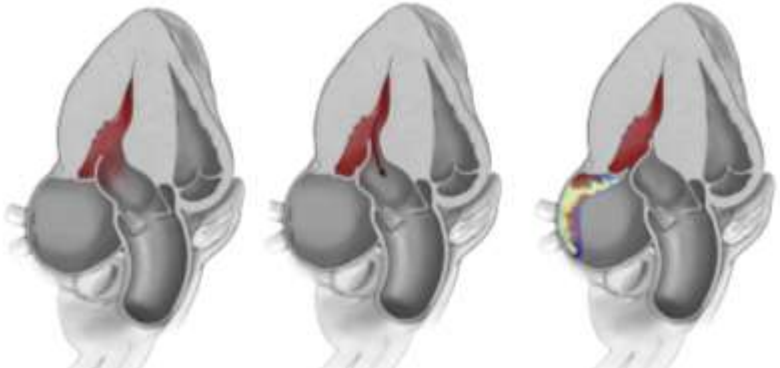
Variants/septal morphology



Summary

- What the clinician wants to know
  - Variant
  - Maximal thickness
  - Obstruction versus nonbstructive
- What the surgeon wants to know
  - SAM
  - Intrinsic mitral valve pathology

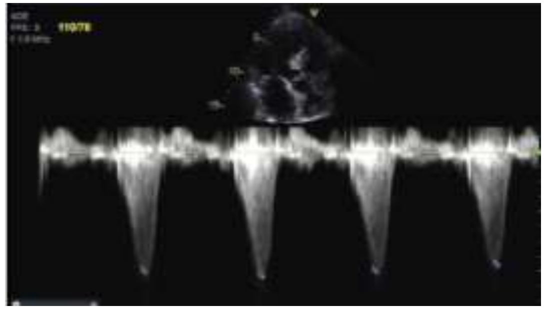
Systolic anterior motion of the mitral leaflets (SAM)



Obstructive versus nonobstructive HCM

- > 30 mmHg maximal instantaneous gradient

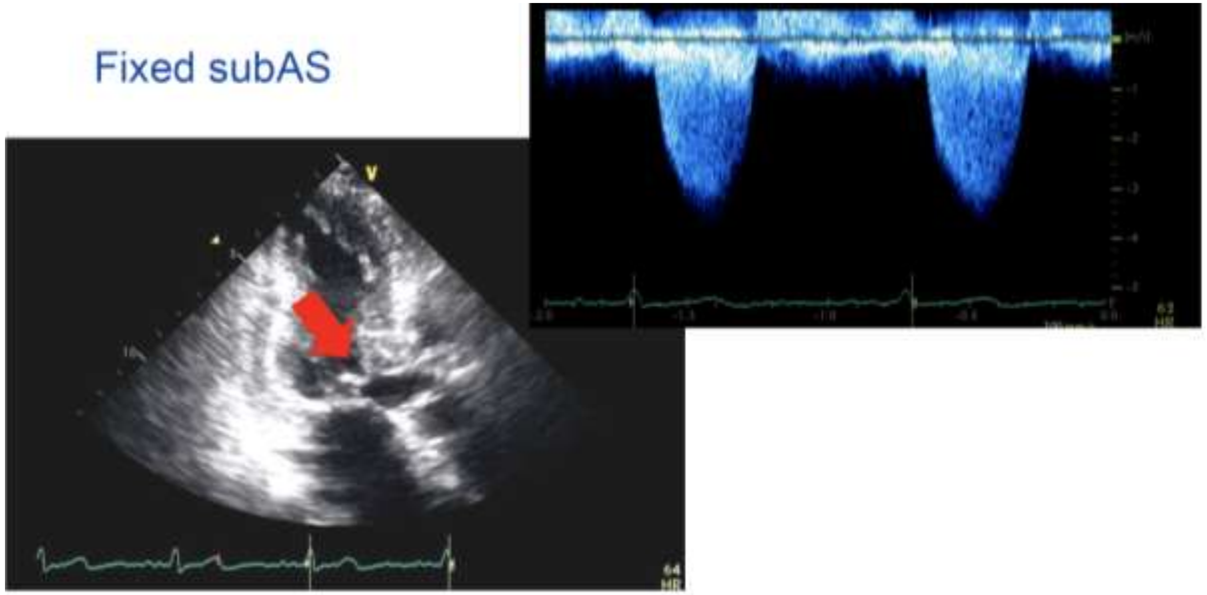
  severe > 50mmhg
- Only 1/3 obstruction at rest
- 1/3 latent obstruction
  - Need for additional steps



Beware of the mimickers

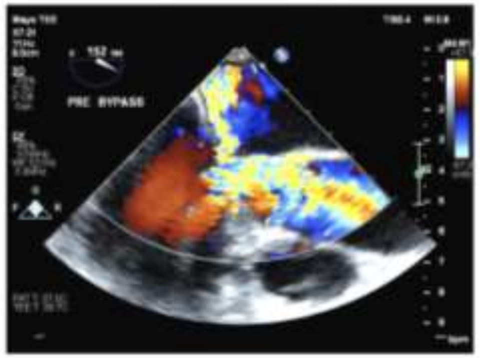
- Amyloid with dynamic LVOT obstruction
  - Strain, pericardial effusion
- Sub-aortic stenosis
  - Rounded CW signal instead of late-peaking
- Athlete's heart
  - Supranormal diastology
  - Only 2% with septal thickness >13 mm

Fixed subAS



What the surgeon wants to know?

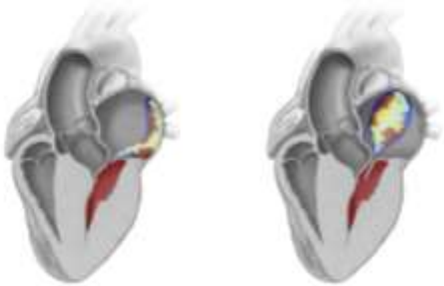
- Is there SAM?
- Is the primary mitral valve pathology?
  - Direction of the MR jet
- Septal thickness
- Degree of AR



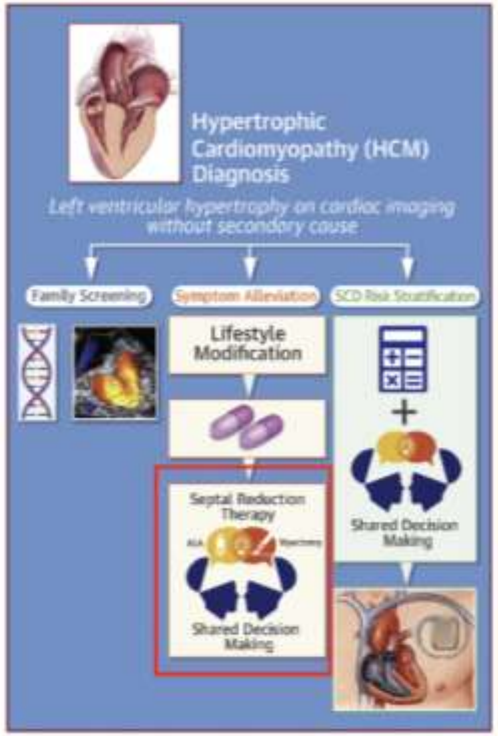
Accuracy of Jet Direction on Doppler Echocardiography in Identifying the Etiology of Mitral Regurgitation in Obstructive Hypertrophic Cardiomyopathy

Posteriorly-directed jet

PPV 97% SAM-mediated MR

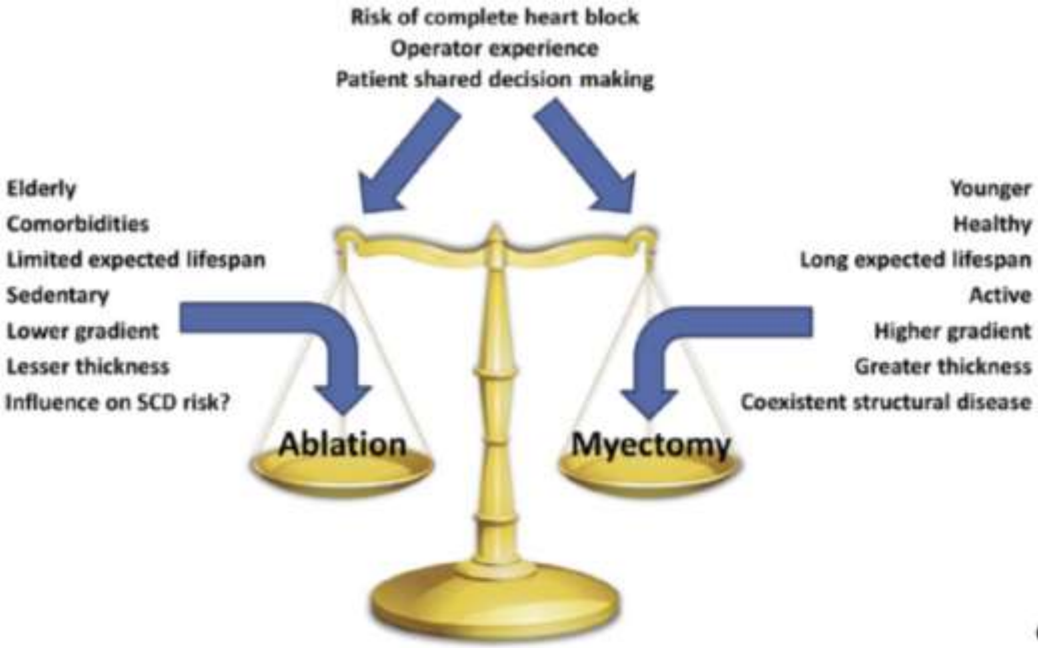


management of HCM



Geske JB. JACC HF 2018

Septal myectomy versus septal ablation

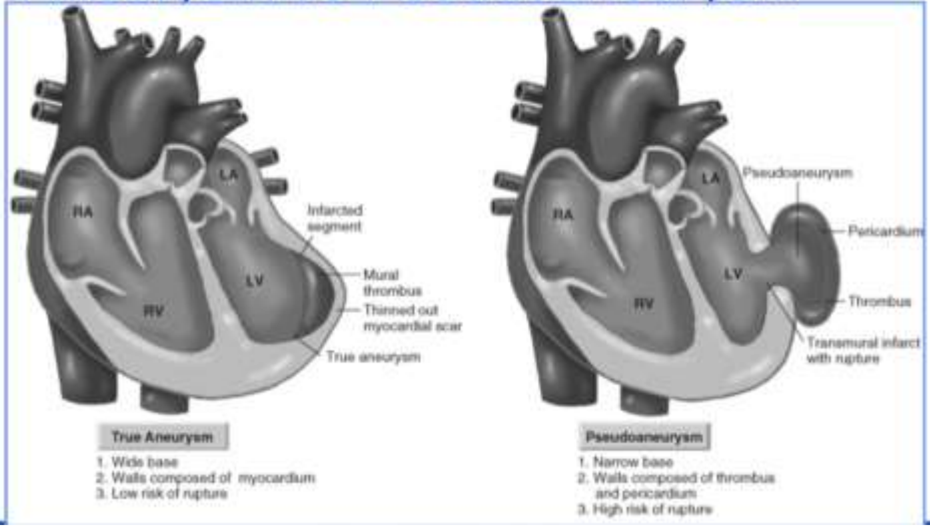


Geske JB. JACC HF 2018

Echocardiography Cases: Mechanical Complications of Myocardial Infarction

Sunil Mankad, MD, FACC, FCCP, FASE

LV Aneurysm *vs* Pseudoaneurysm

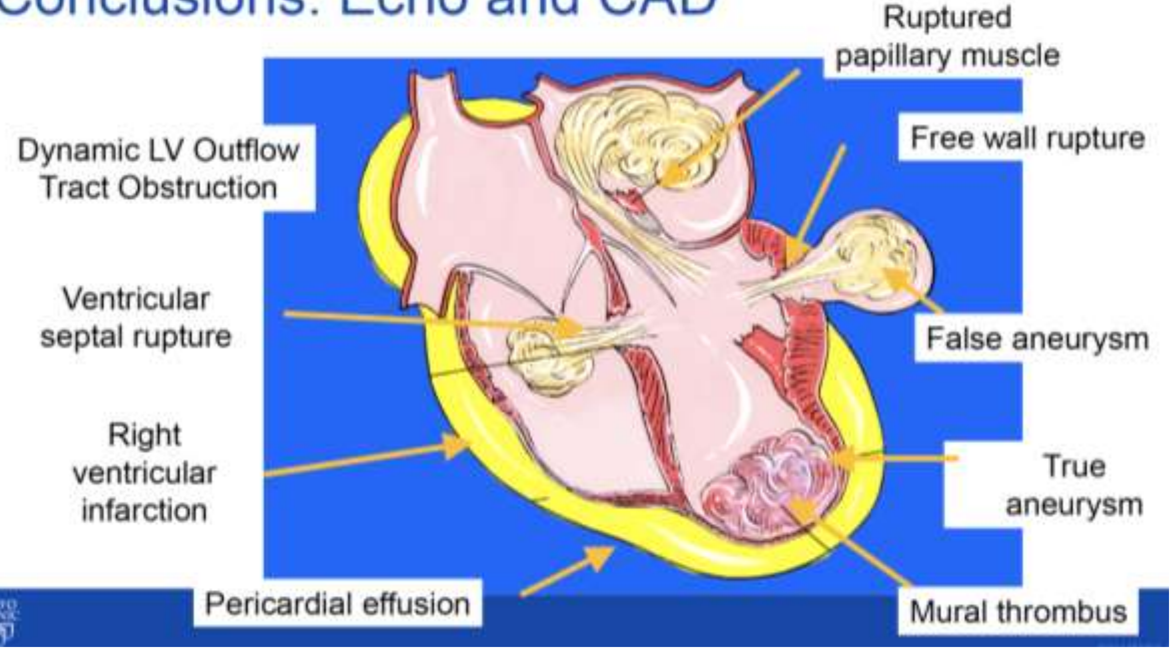


Differential Diagnosis of a New Loud Systolic Murmur Following MI

	VSD	Pap Musc Rupt.	LVOT Obst.
Location	Anterior or Inferior	Inferior > Anterior	Usually Anterior (Apical)
Signs	Low Cardiac Output	Pulmonary Edema	Hypotension
Hemodynamics	O_2 step-up (RA→PA) > 10%	V wave on PCWP tracing	Dynamic LVOT Obstruction
Treatment	Operation	Operation	Fluids, β -blocker, α-agonist

Adapted from Oh JK et al. Echo Manual 3rd Edition

Conclusions: Echo and CAD



Echocardiography for Aortic Valve Stenosis: Comprehensive 2-D and Doppler Assessment

Peter C. Spittell, M.D.

May 3, 2019

Valvular Aortic Stenosis
Age Related Etiology

Congenital (uni- or bicuspid): <30 yrs

Calcified bicuspid: 40 – 60 yrs

Rheumatic: <65 yrs

Senile degenerative: >75 yrs (most common cause of aortic stenosis)

Subvalvular Aortic Stenosis

Fixed

- ✓ discrete membrane or muscular band

Dynamic

- ✓ HOCM
  - obstruction in mid-late systole
  - varies with loading conditions

- Often accompanied by AR
  - due to turbulent jet on aortic valve

Subvalvular Aortic Stenosis

- Diagnosis:
  - when there is a high Doppler gradient and normal AV
  - may need TEE
- Treatment:
  - surgery (complete cure)
  - prevent progressive AR
  - resection indicated in most patients
    - especially if severe or symptomatic

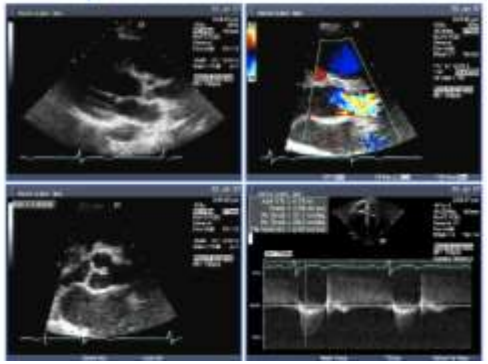
Summary

- Continuity and modified Bernoulli equations
- Accurate measurements
  - Zoom for LVOT diameters
  - Using PEDOF probe
  - Multiple windows
- Special morphologies, associated lesions
- Low gradient states
  - Reduced LVEF
  - Reduced stroke volume index

Supravalvular Aortic Stenosis

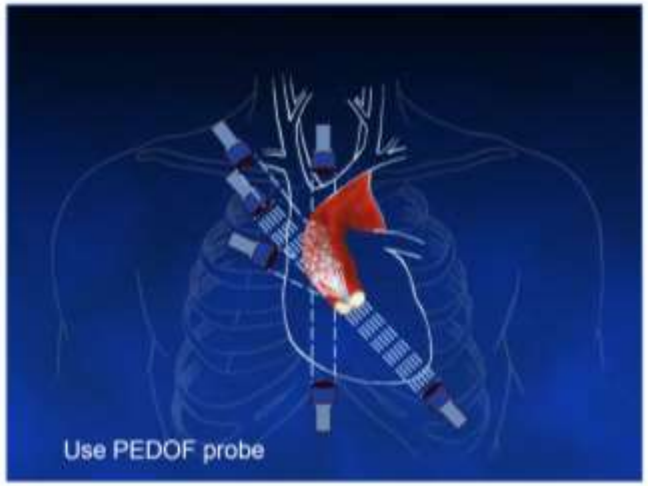
- Uncommon, usually a congenital abnormality
- Flow acceleration above the AV
  - typically at the sinotubular junction
  - single discrete narrowing
  - long tubular hypoplasia

Supravalvular Aortic Stenosis



Aortic Stenosis
Peak Jet Velocity

CW Doppler – measure valve TVI

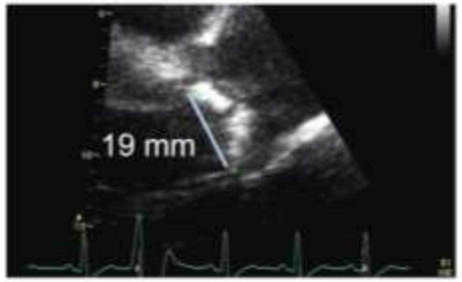


Recommendations for Grading of AS Severity

	Aortic Sclerosis	Mild	Moderate	Severe
Peak velocity (m/s)	< 2.5	2.6 – 2.9	3.0 – 4.0	>4.0
Mean gradient (mm Hg)	-	<20	20 - 40	>40
AVA (cm^2)	-	>1.5	1.0 – 1.5	< 1.0
Indexed AVA (cm^2/m^2)	-	>0.85	0.6 – 0.85	< 0.6
Velocity ratio	-	> 0.50	0.25 – 0.50	< 0.25

Discordant AVA and MG
AVA ≤ 1cm² and MG < 40 mm Hg

- Measurement error
  - suboptimal CW Doppler signal across AV
- LVOT issues
  - falsely small LVOT measurement
  - assume circular LVOT
  - 2D vs. 3D TTE/TEE vs CT
  - inherently small LVOT
- Low-Flow Low-Gradient (LVEF < 50%)
  - true severe AS vs pseudo severe AS
- Paradoxical Low-Gradient (LVEF ≥ 50%)
  - low stroke volume index (< 35 cc/m^2)
  - high afterload (SBP + MG)/SVi – valvuloarterial impedance



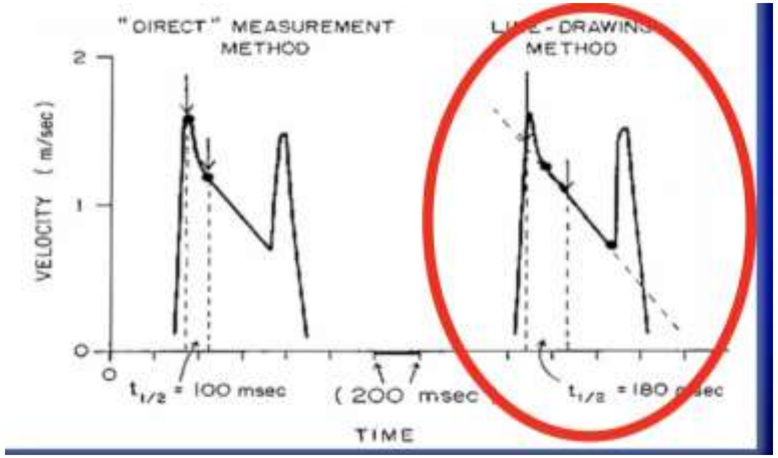
Low Gradient Severe Aortic Stenosis
Mean gradient ≤40 mm Hg, AVA ≤1 cm^2, AVAi ≤0.6 cm^2/m^2

Includes the following conditions:

- Classical LFLG AS
  - SVi ≤35 ml/m^2, mean gradient ≤40 mm Hg, EF <50%
- Paradoxical LFLG AS
  - SVi ≤35 ml/m^2, mean gradient ≤40 mm Hg, EF ≥50%
- NFLG AS
  - SVi >35 ml/m^2, mean gradient ≤40 mm Hg, EF ≥50%

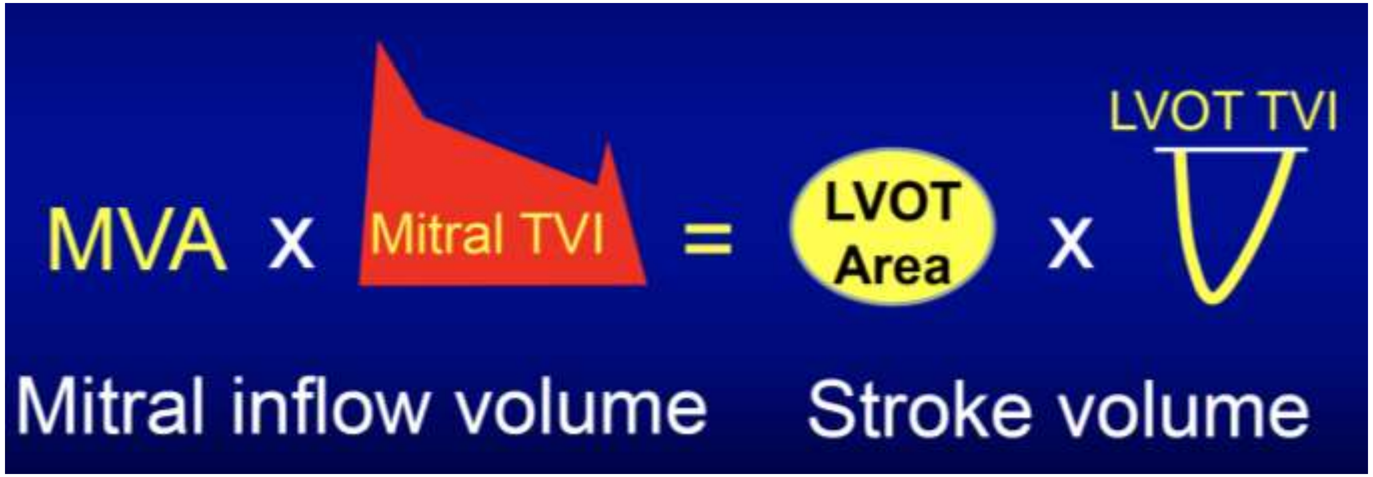
Echocardiography for Mitral Stenosis

Sorin Pislaru, MD, PhD
pislaru.sorin@mayo.edu



Mitral Stenosis

Rheumatic	Degenerative
Commissural fusion	**Annular calcification**
• Leaflets: thick at tips • Chordae: thick/ retracted • Short posterior leaflet • Calcification: late • MS > MR	• Leaflets: thick at base • Associated with atherosclerosis, HTN, AS • MR > MS



pas fiable si FA, IM ou IAo

Mitral Stenosis Severity

	Progressive	Severe	Very severe
MVA (cm^2)	>1.5	1.0-1.5	<1.0
MG (mmHg)	<5	5-10	>10
PHT (ms)		>150	>220
PASP (mmHg)	-	>30 (50)	>30 (70)

Young (rheumatic) : 3D > PHT > continuity

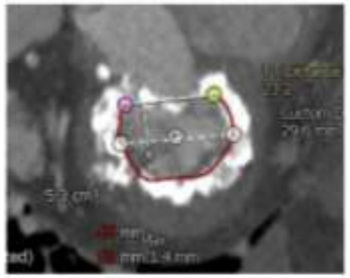
Old (calcific): continuity > planimetry ~~PHT~~

Valvuloplastie

Key Questions: Valvuloplasty

- Chance of Success?
  - Commissural calcification
  - Wilkins/Abascal Score
- Contraindications?
  - MR >2+
  - Thrombus in LAA

Cardiac CT



- Measure annular dimensions
- Determine fluoroscopy deployment angle
- Determine Landing zone
- Transeptal puncture location
- Estimate risk of LVOT obstruction

TMVR

Key Questions: TMVR

- Chance of Success?
  - Circumferential Calcification
- Contraindications?
  - Neo-LVOT
  - Thrombus in LAA

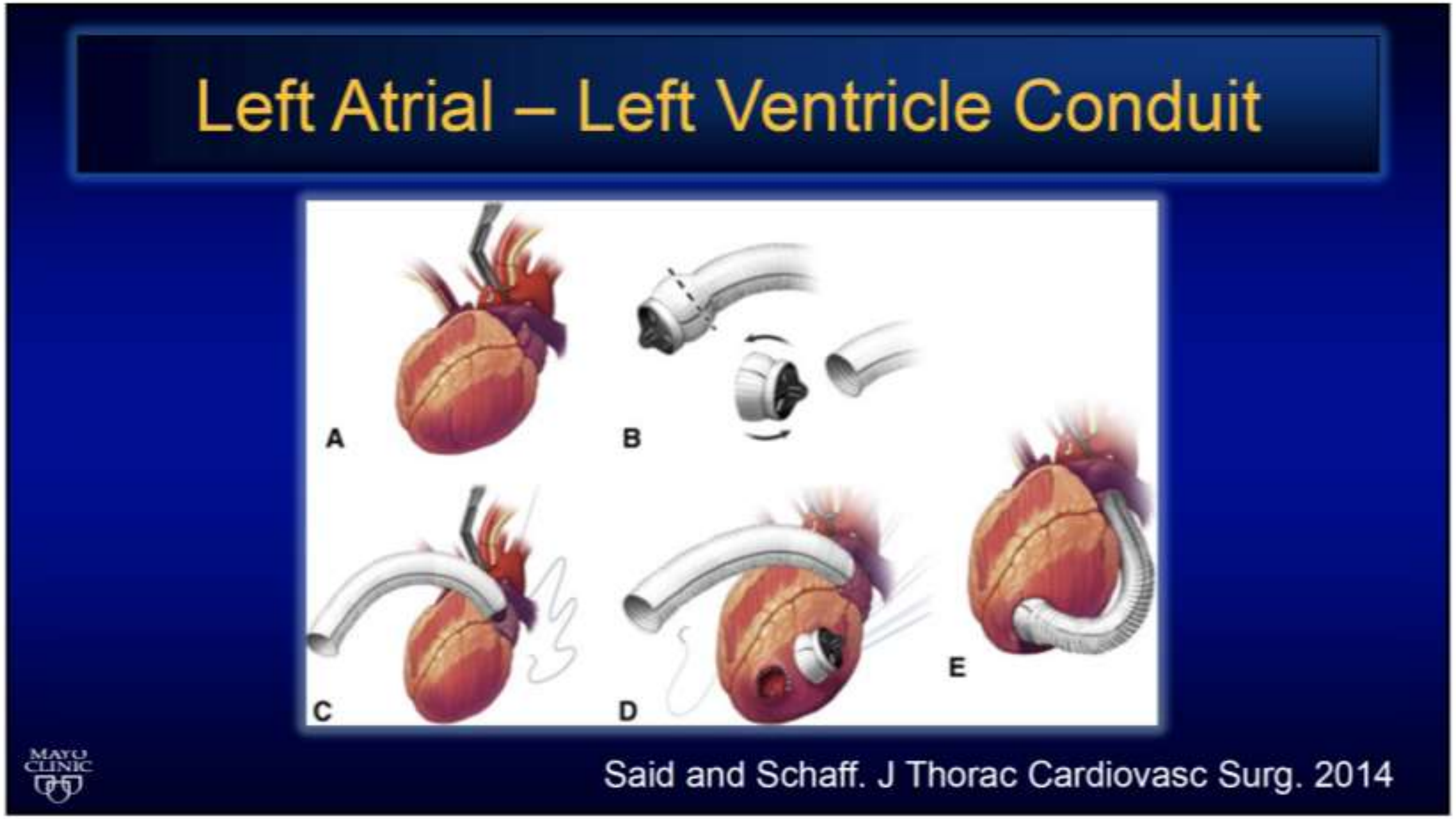
Estimate Risk of LVOT Obstruction

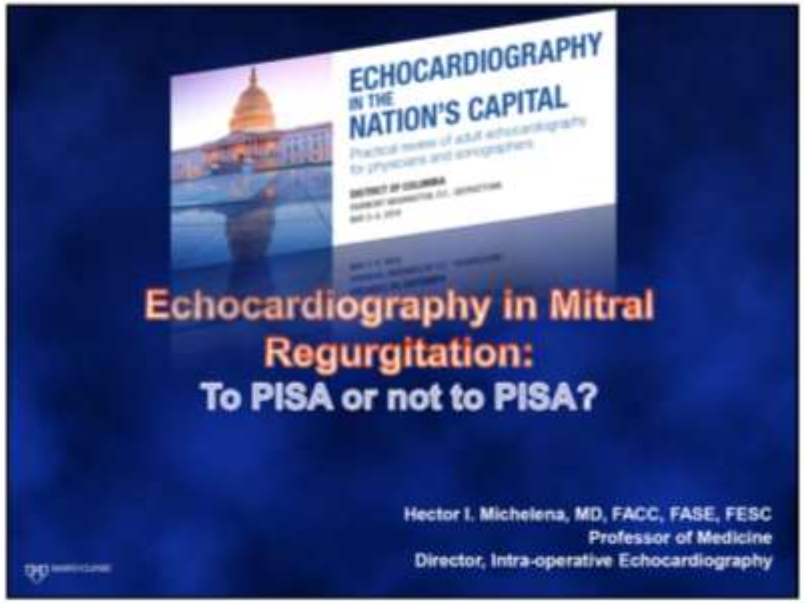
LVOT in systole

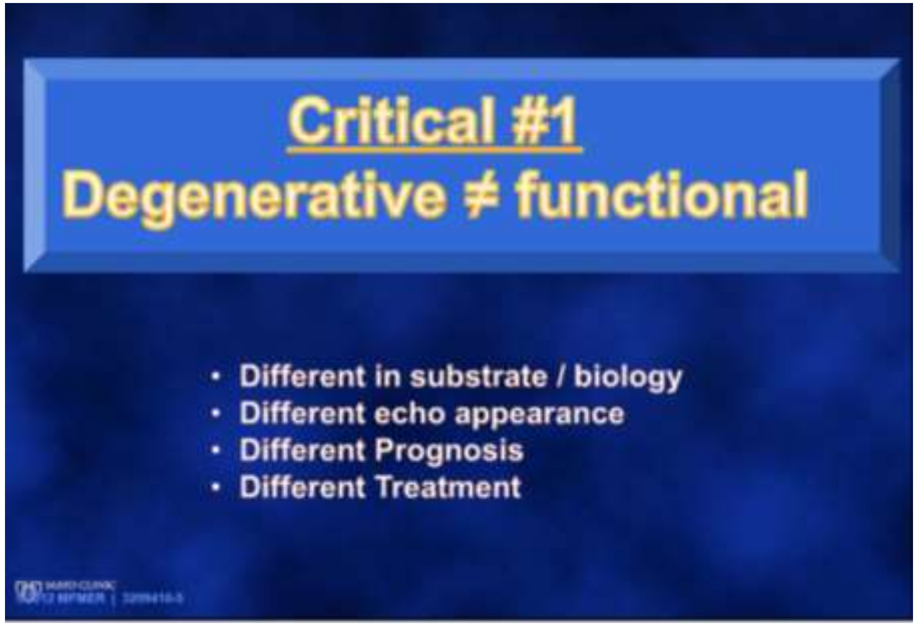
Neo-LVOT with virtual valve in place

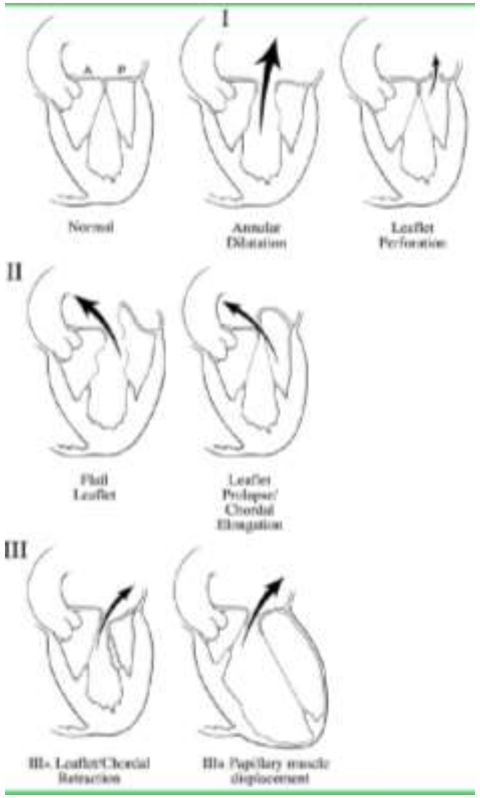
>250mm² low risk but <190mm is high risk (Wang et al, JACC 2016)

si vraiment trop calcifiée…





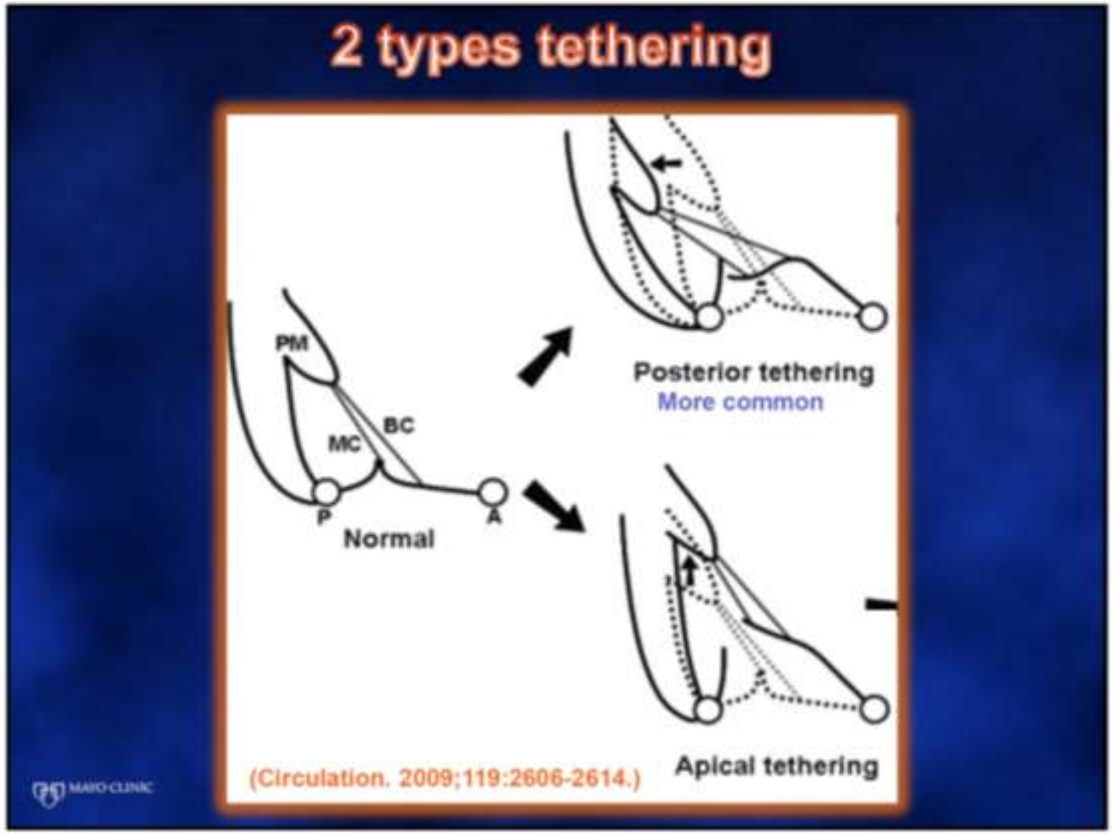




L'echo doit fournir 3 informations au chirurgien

- le mécanisme de la fuite
- L'étiologie
- la sévérité de fuite

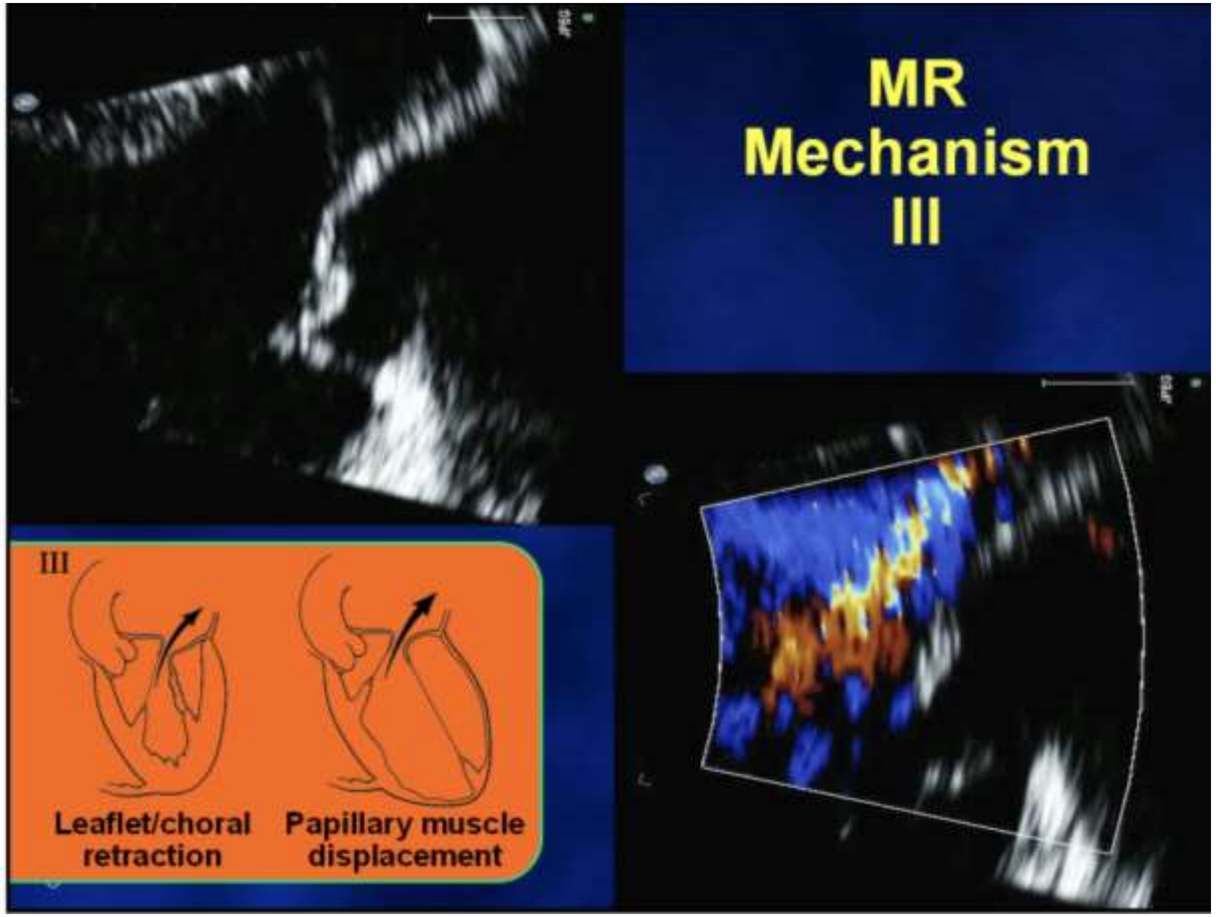
Dans l'IM ischémique chronique, il y a deux types de tenting mitral



Un par déplacement postérieur du pilier et de la PVM
(faux prolapsus de la valve antérieure et restriction pvm)

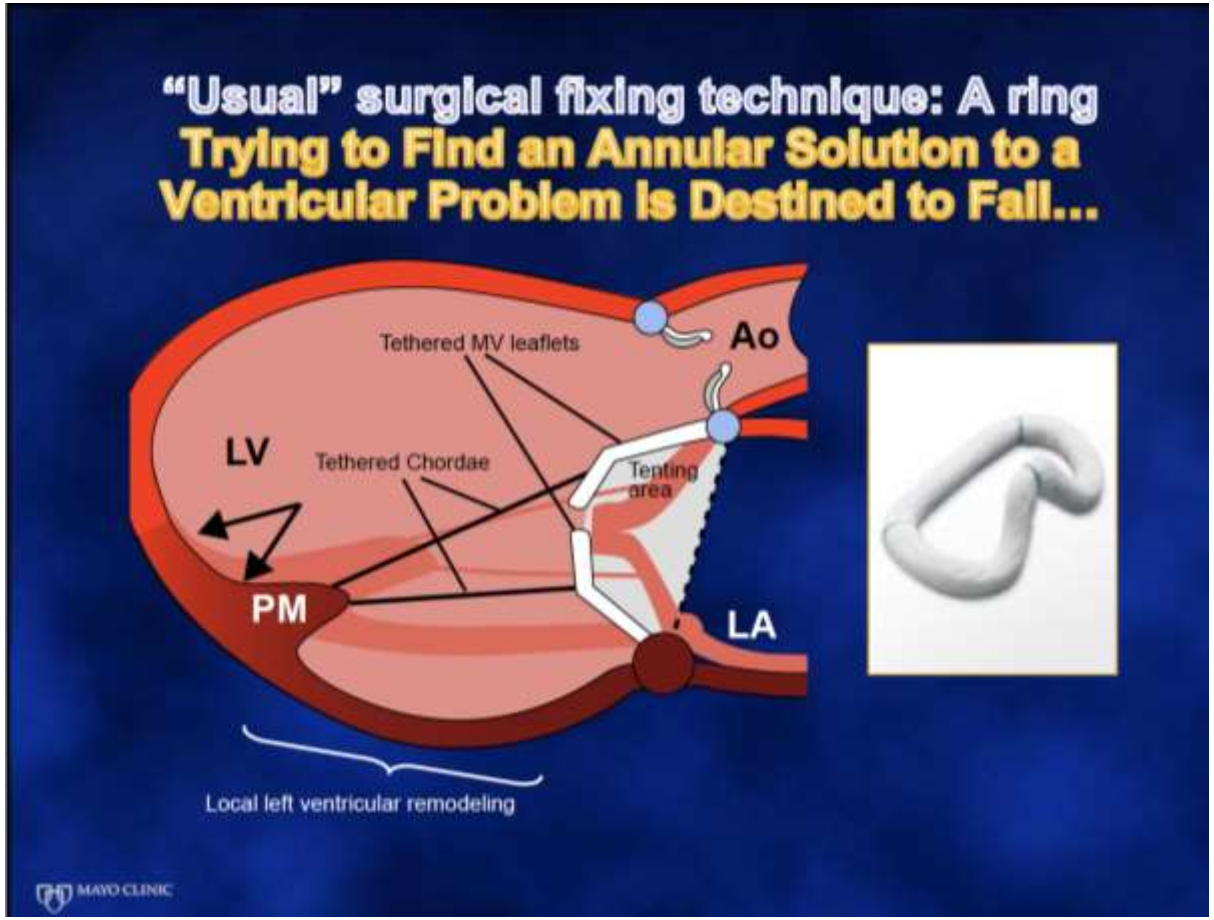
un par déplacement apical du pilier tirant sur la gvm
(restriction des deux feuillets prédominant
sur le feuillet anetrieur)

Dans l’im restrictive



Penser à évaluer l’appareil sous valvulaire et en particulier un déplacement apical du pilier dans les gros vg ischémiques avec anévrysme….

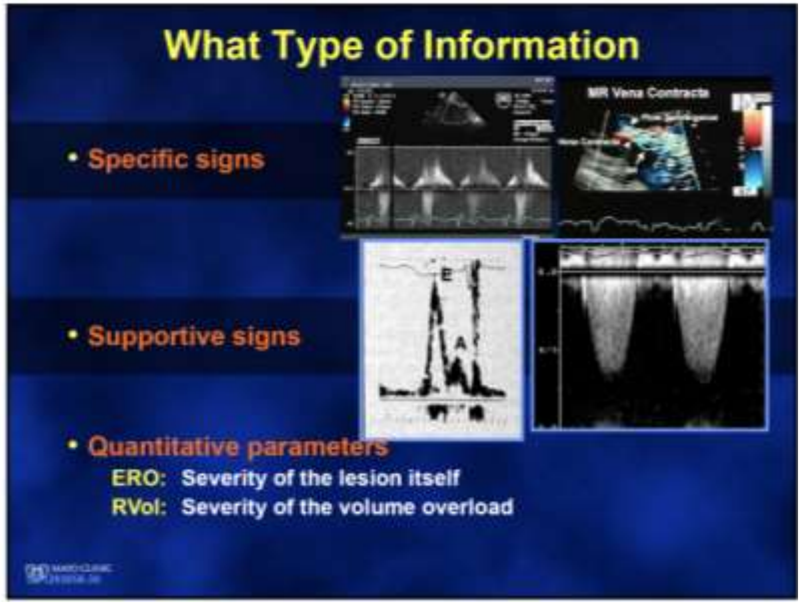
- Lorsque l’im est un problème <u>ventriculaire,</u> l’annuloplastie de la valve est souvent insuffisante…



Quantification de l’IM

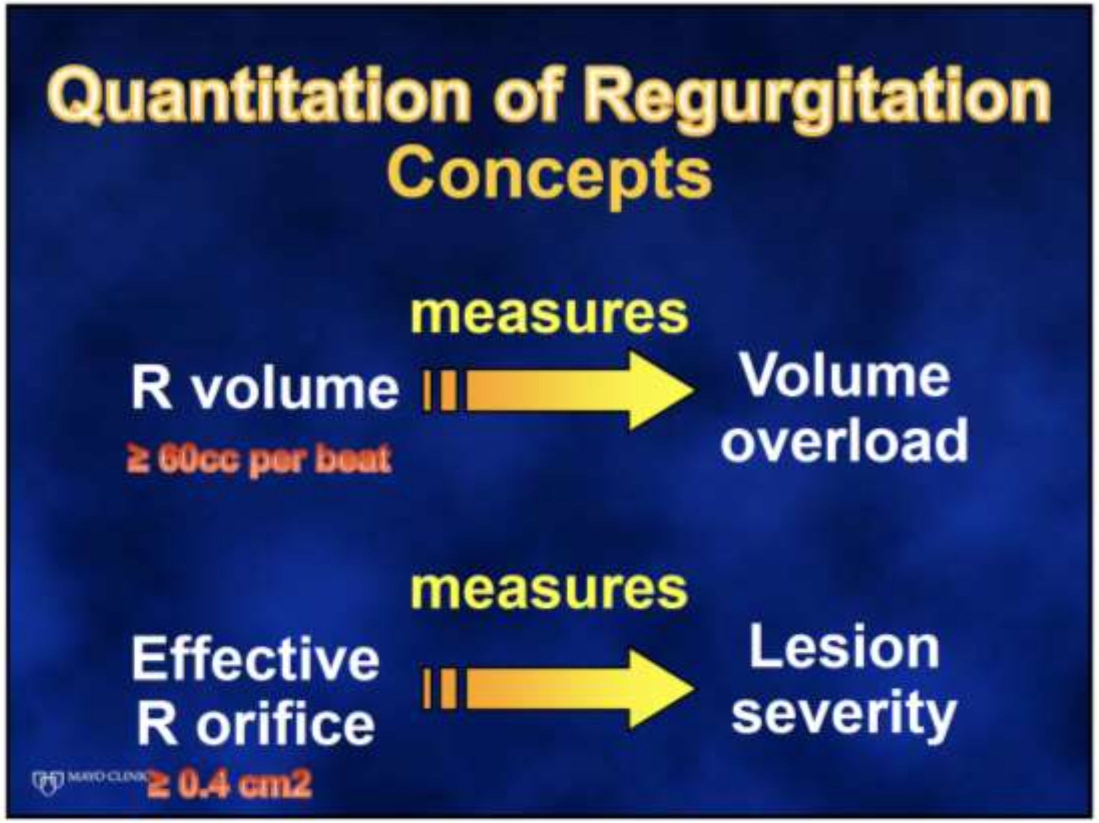
Quantifier une IM , ce n’est pas que MESURER

Il y a des critères semi quantitatifs
inversion du flux veineux pulmonaire, VC
vitesse de E, aspect du flux mitral en DC



et après les mesures de PISA (SOR, VR)

on voit bien l’approche d’un cardiologue de bloc opératoire….où la décision et la quantification se font dans des conditions de guerre où l’on dispose de quelques minutes pour agir….



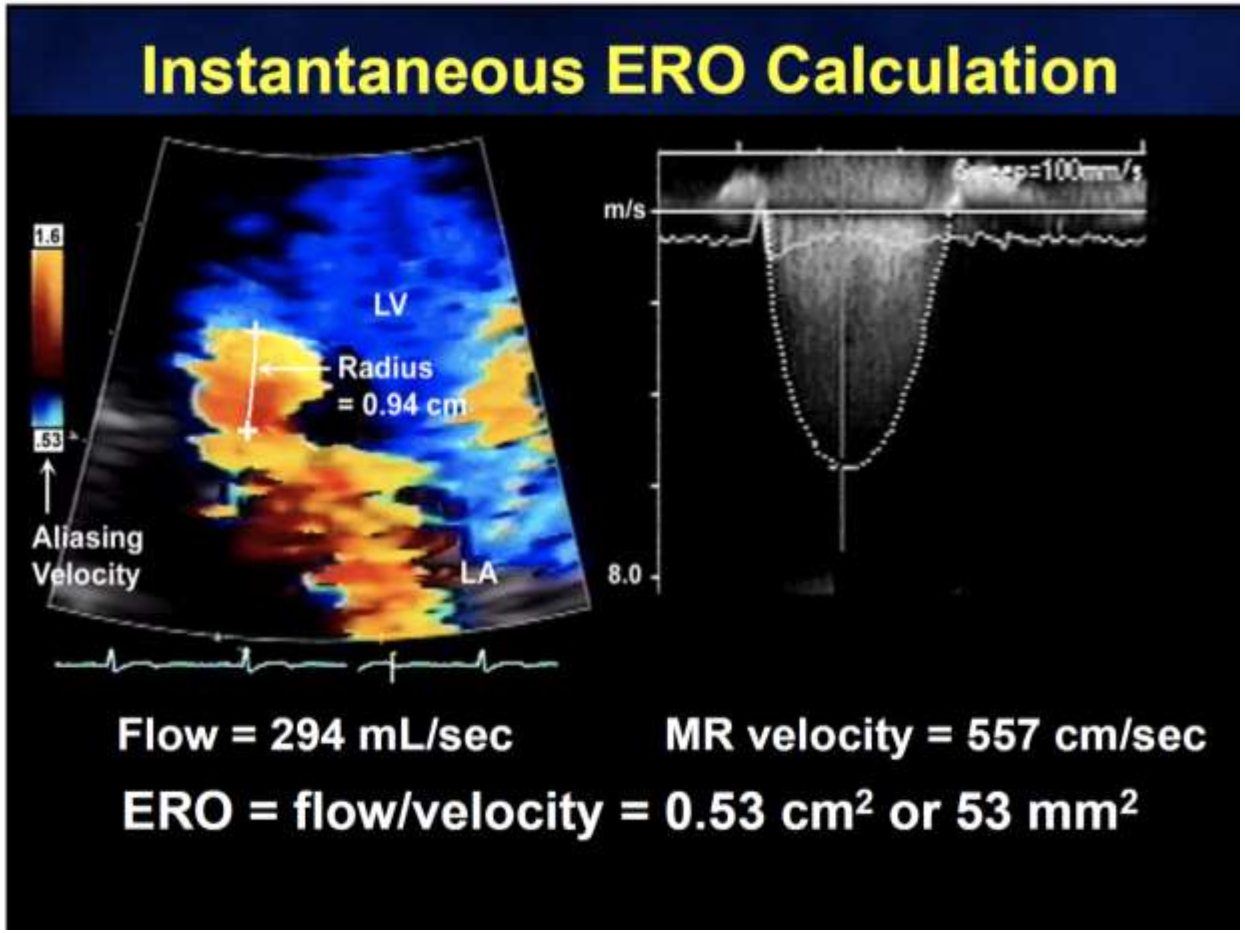
Concepts très importants :

le Volume Régurigitant traduit la répercussion volumique de la fuite

la SOR traduit la taille de la lésion

ceci est à retenir pour comprendre l’importance du VR dans les IM non holosystoliques (le trou peut être gros mais ça régurgite pas longtemps)

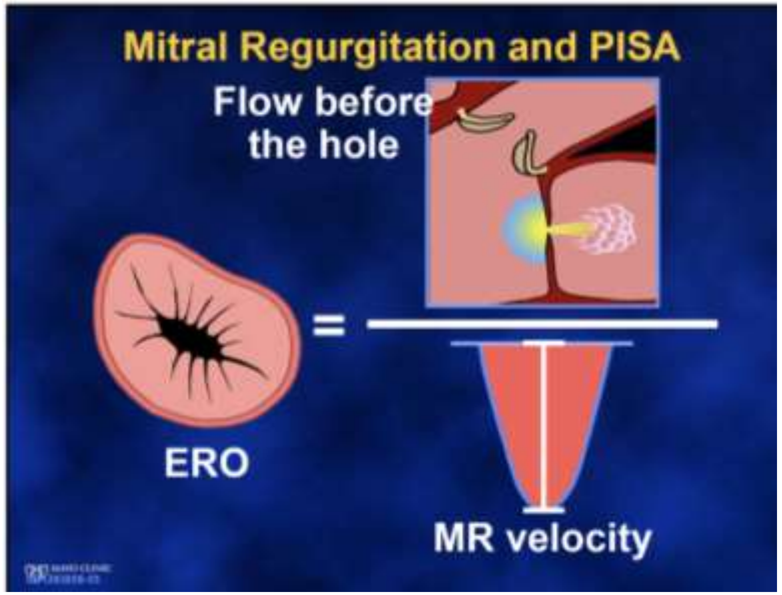
PISA

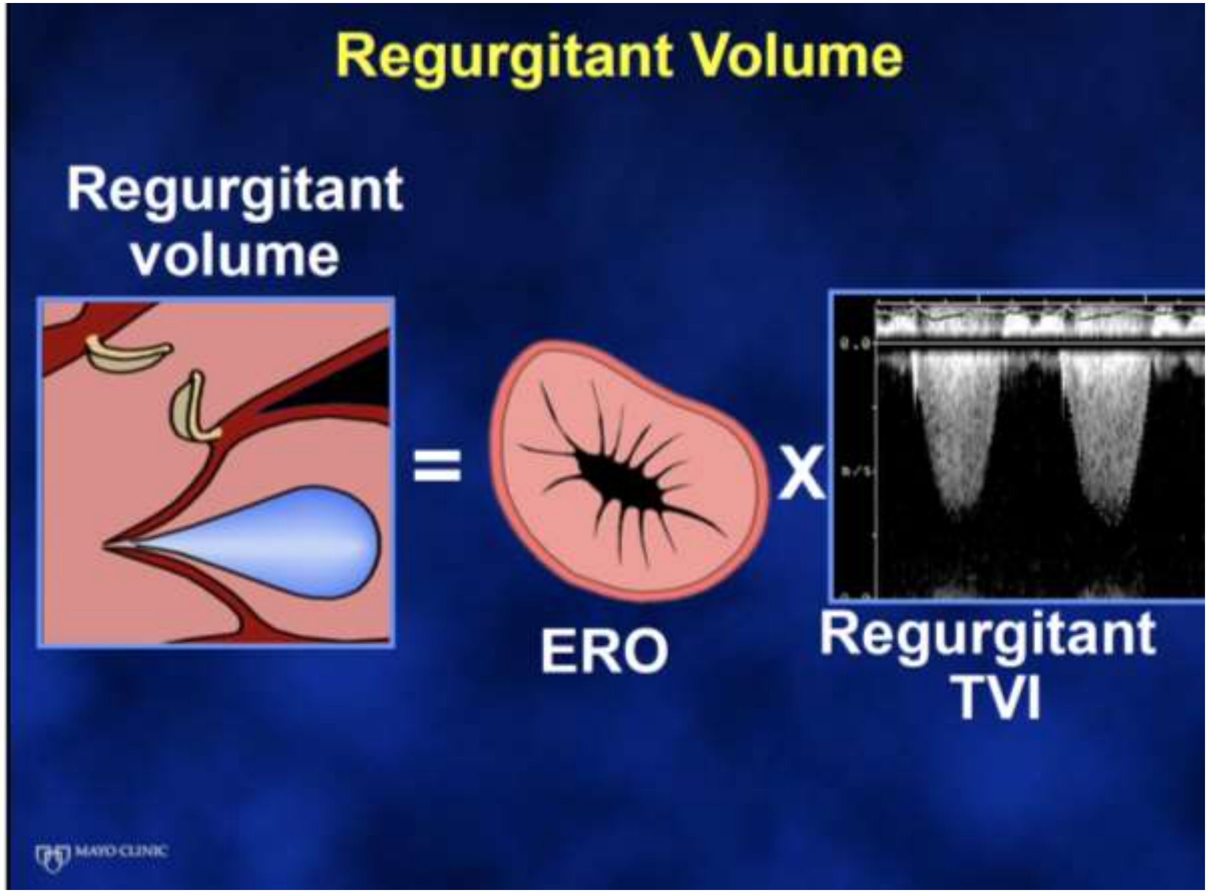


- attention quand à se mettre

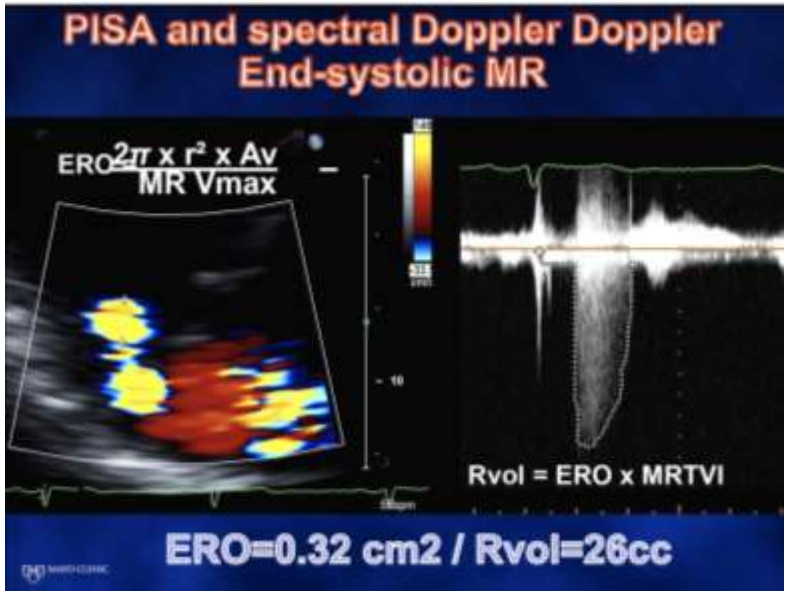
entre 30 et 40 cm/s pour la limite du nyquist….

(bizarre cette diapo….)


Mitral Regurgitation and PISA
Flow before the hole
=
ERO
MR velocity


Regurgitant Volume
Regurgitant volume
=
X
ERO
Regurgitant TVI
MAYO CLINIC

exemple d’IM mesotelesystolique



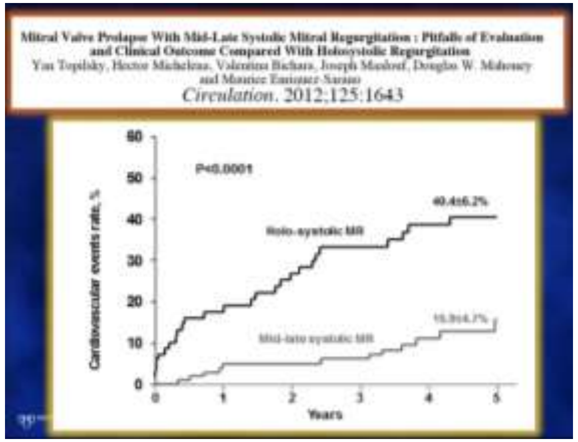
Tracez ce que vous voyez !

n’imaginez pas ce qu’il n ‘y a pas en protosystole

Tenez compte du VR +++++ (même taille d’orifice mais moins longtemps !)

pour une même SOR le VR est très différent etre les IM holo et mesotele

d’où un pronostic différent !



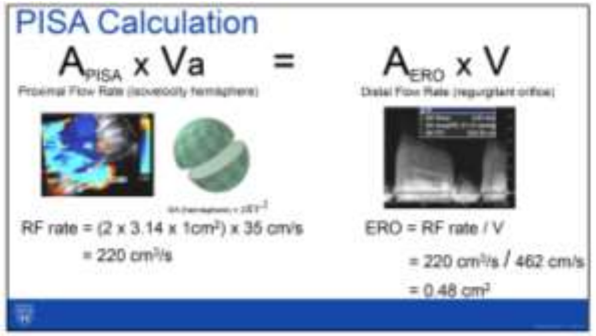
- La mitrale qui applaudit de Michelena à la fin de son topo…, je pense que cela traduisait la maestria de l’orateur !

L'effet de cette présentation ayant été benzodiazépine-like,
je me permets de faire bref avec les quelques messages importants…

Aortic Regurgitation

Darrell B. Newman

May 2nd, 2019



Quantitative Assessment of AR

Criteria for Severe AR	
Regurgitant volume	>60 mL
Regurgitant fraction	>50%
ERO	>0.3 cm^2

Le seuil de sévérité de la SOR c'est 0.3 dans l'IAO (et pas 0.4 comme ds l'IM!)

N'oubliez pas le « 50-50 » cher à eric Abergel !
(indication chir ds iao asympto si FE < 50 et dts > 50)

Le seuil de DTS à 50 est probablement trop haut et à l'avenir , il faudra plutôt retenir un seuil indexé à 20mm/m2 (plutot que 25mm/2)

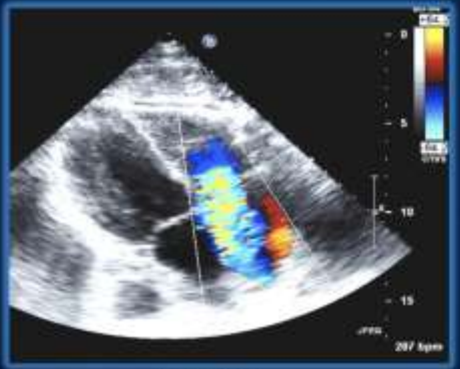
Pensez à l'effet doppler telediastolique de la crosse et de l'aorte abdo)

"The Right Stuff"

Echocardiographic Assessment of Pulmonary and Tricuspid Valves

Sorin Pislaru, MD, PhD
pislaru.sorin@mayo.edu

Functional TR (90%)



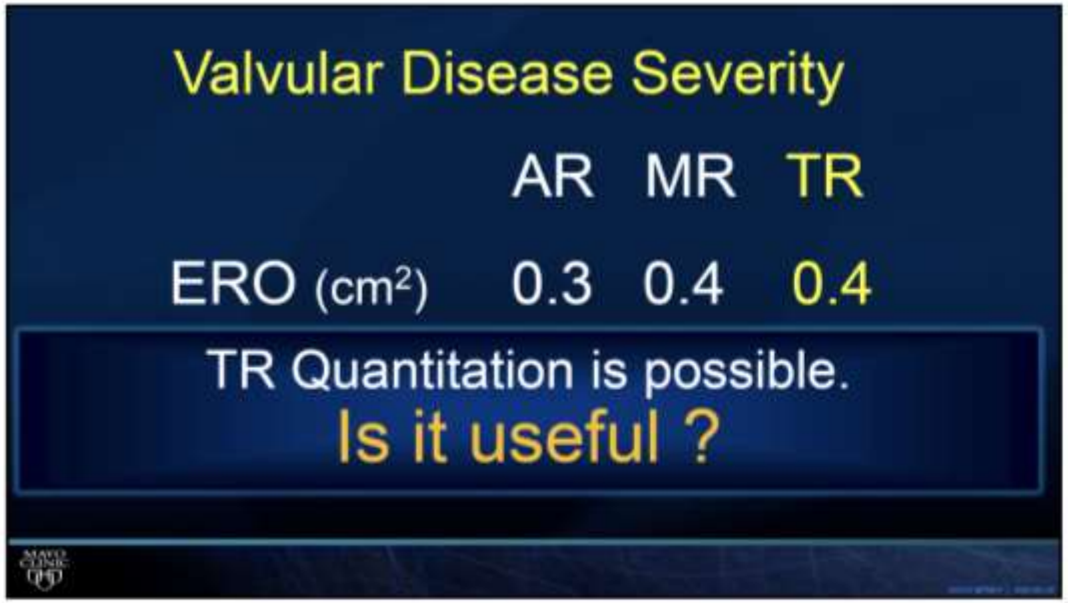
- Mechanism
  - Tethered leaflets
  - Dilated TV annulus
  - RV Remodeling
- Cause
  - RV pressure overload (pulmonary HTN)
  - RV volume overload (ASD)
  - RV myocardial disease: Infarction, dysplasia
  - Idiopathic

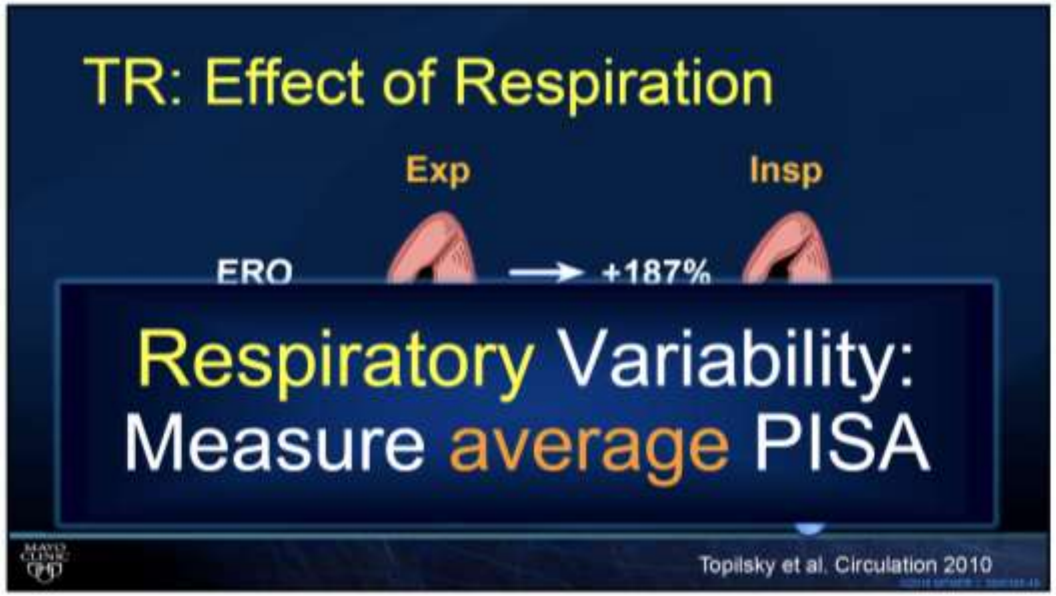
MAYO CLINIC

Organic TR (10 %)

Abnormal leaflets and/or support apparatus

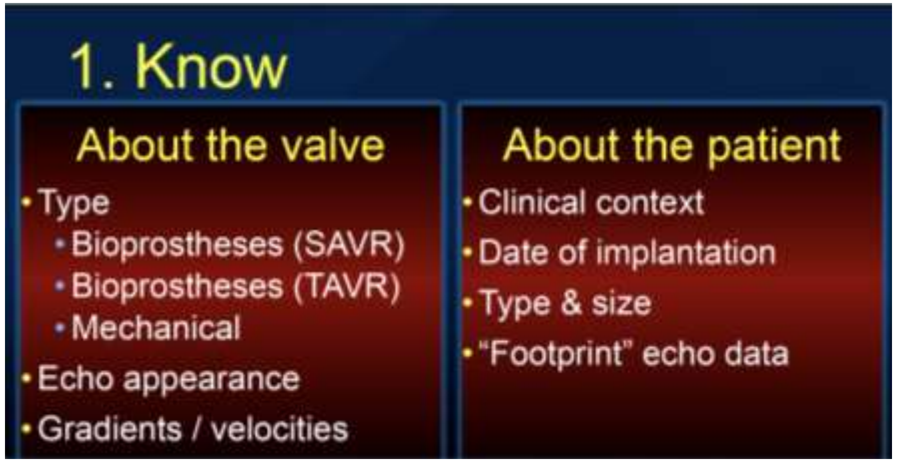
- Degenerative
- Endocarditis
- Traumatic
- Congenital (Ebstein)
- Rheumatic
- Radiation
- Carcinoid
- Hypereosinophilia
- Drug-induced: (ergots, anorectics)
- PPM or ICD lead


Valvular Disease Severity
AR MR TR
ERO (cm²) 0.3 0.4 0.4
TR Quantitation is possible.
Is it useful ?


TR: Effect of Respiration
Exp
Insp
ERO
+187%
Respiratory Variability:
Measure average PISA
Topilsky et al. Circulation 2010

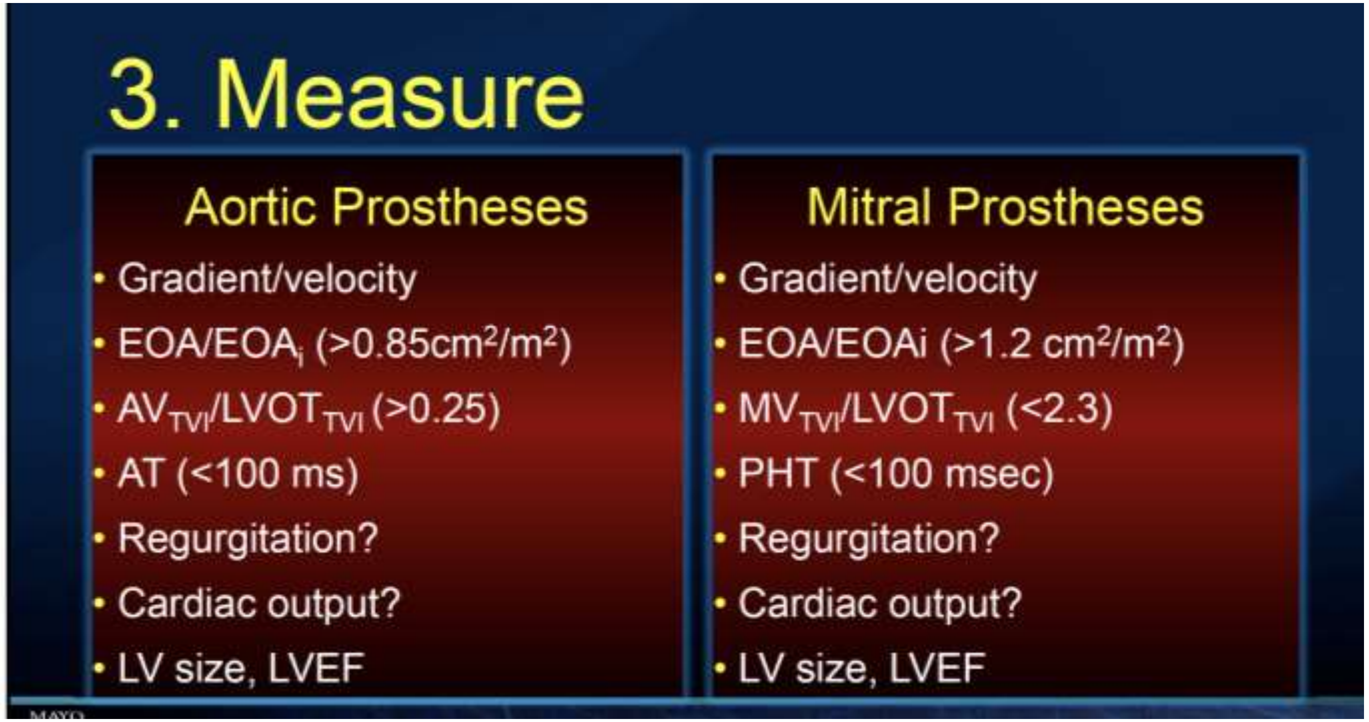
Echocardiography for Prosthetic Valves

Sorin Pislaru, MD, PhD
pislaru.sorin@mayo.edu

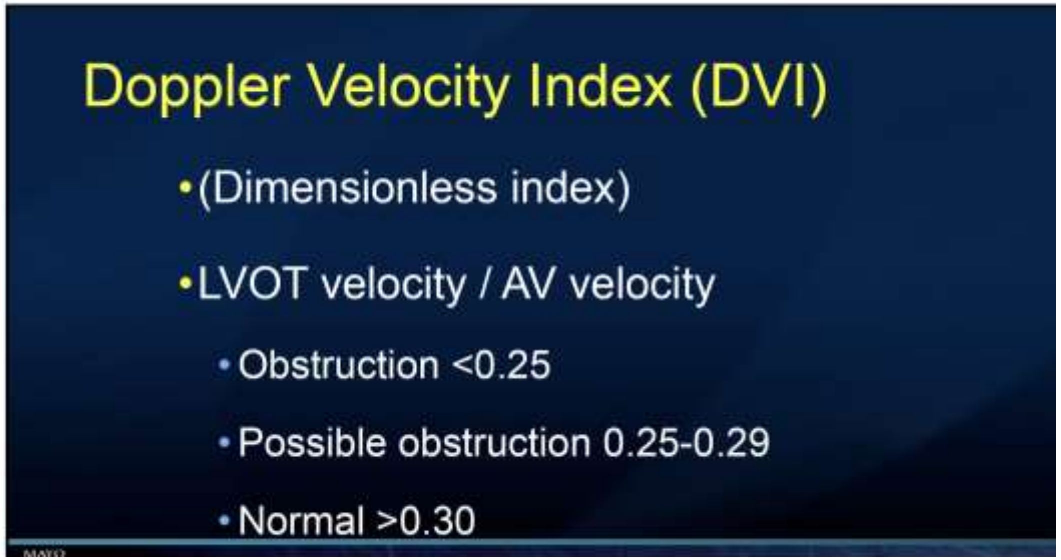


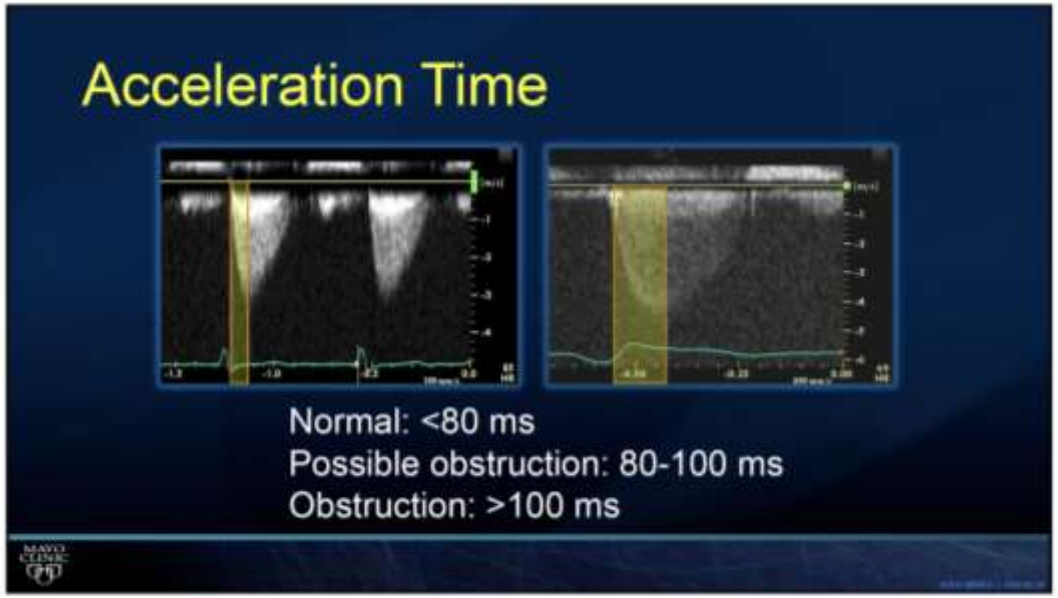
Know: type, taille de la valve prothétique, date d'implantation

Watch : aspect de la valve , jeu valvulaire, doppler couleur

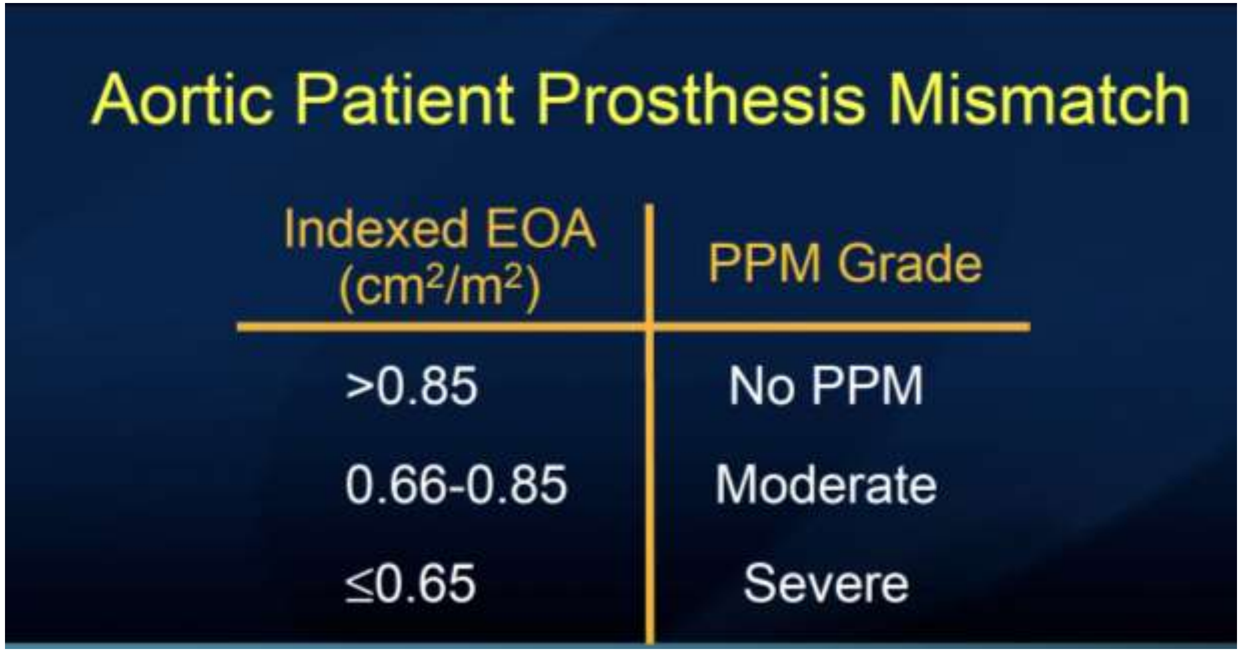


Mesurer le diamètre de la LVOT sur le 2D
et ne pas utiliser la taille de la prothèse!





N’oubliez pas l’indice de permeabilité



Aortic Patient Prosthesis Mismatch

Indexed EOA (cm^2/m^2)	PPM Grade
>0.85	No PPM
0.66-0.85	Moderate
≤0.65	Severe

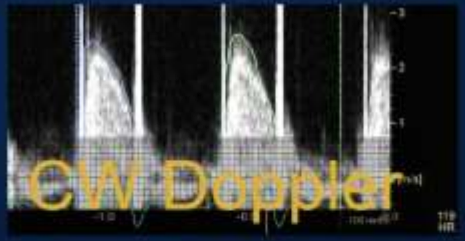
Mitral Prostheses

- Mean gradient @ Heart rate
- Pressure half-time
  - Normal: <130 ms
  - Possible stenosis: 130-200 ms
  - Stenosis: >200 ms
- Effective Orifice Area (EOA): by continuity equation
- MVP ratio
- Presence, location, & severity of regurgitation

Mean gradient

- Highly dependent on heart rate and flow
- Bioprostheses: 5-6 mmHg
- Mechanical: up to 10-12 mmHg in ball-cage, bileaflet

Mitral Valve Prosthesis Ratio



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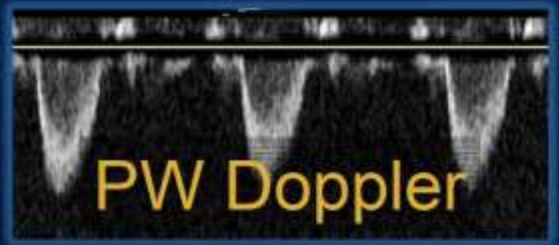


MV TVI / LVOT TVI

Normal: < 2.3

4. Putting All Together:

High Gradients

- Thrombus
- Pannus
- Degenerative (tissue valve)
- Regurgitation
- High output
- Prosthesis-patient mismatch
- Pressure recovery phenomenon

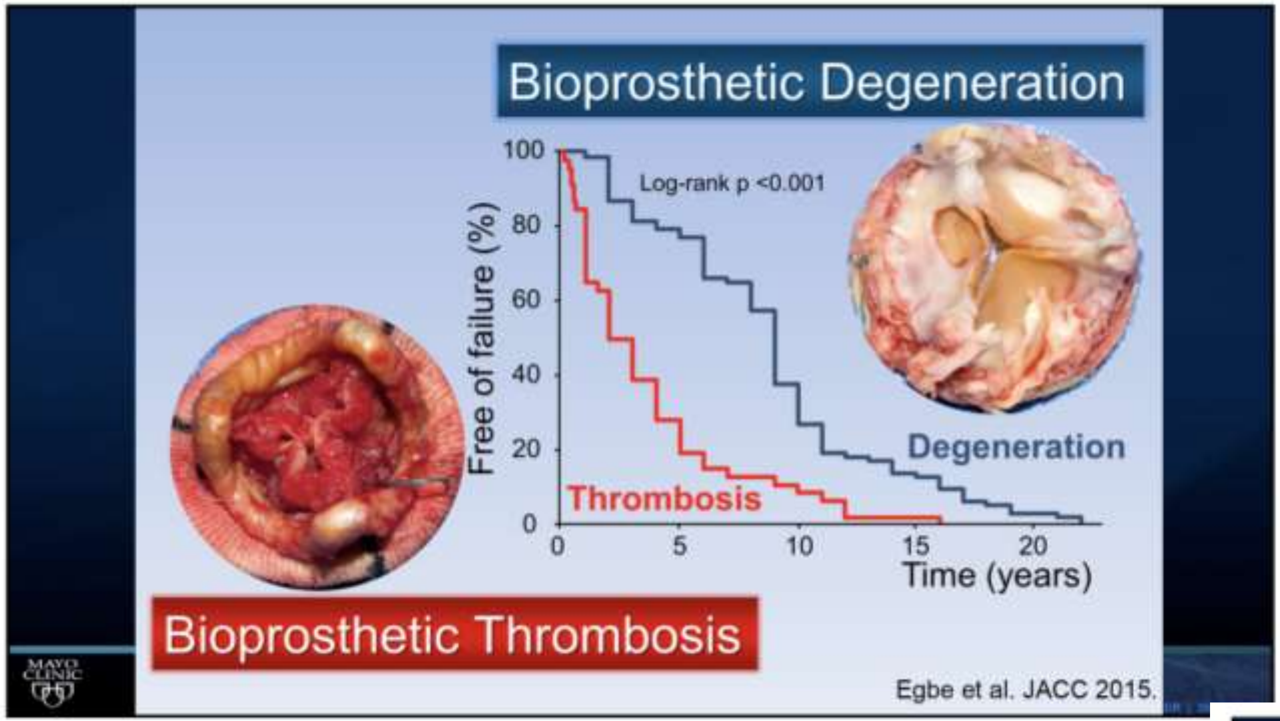
Elevated Aortic PV Gradients

	Obstruction	High flow	P-P Mismatch	Pressure Recovery
Gradients	Elevated	Elevated	Elevated	Elevated
DVI	Reduced	Normal	Normal	Reduced
EOA	Reduced	Normal	Normal	Reduced
EOA index	Reduced	Normal	Reduced	Reduced
Δ in EOA/DVI vs. bsl	Yes	Yes	No	No
Abnormal leaflet motion	Yes	No	No	No

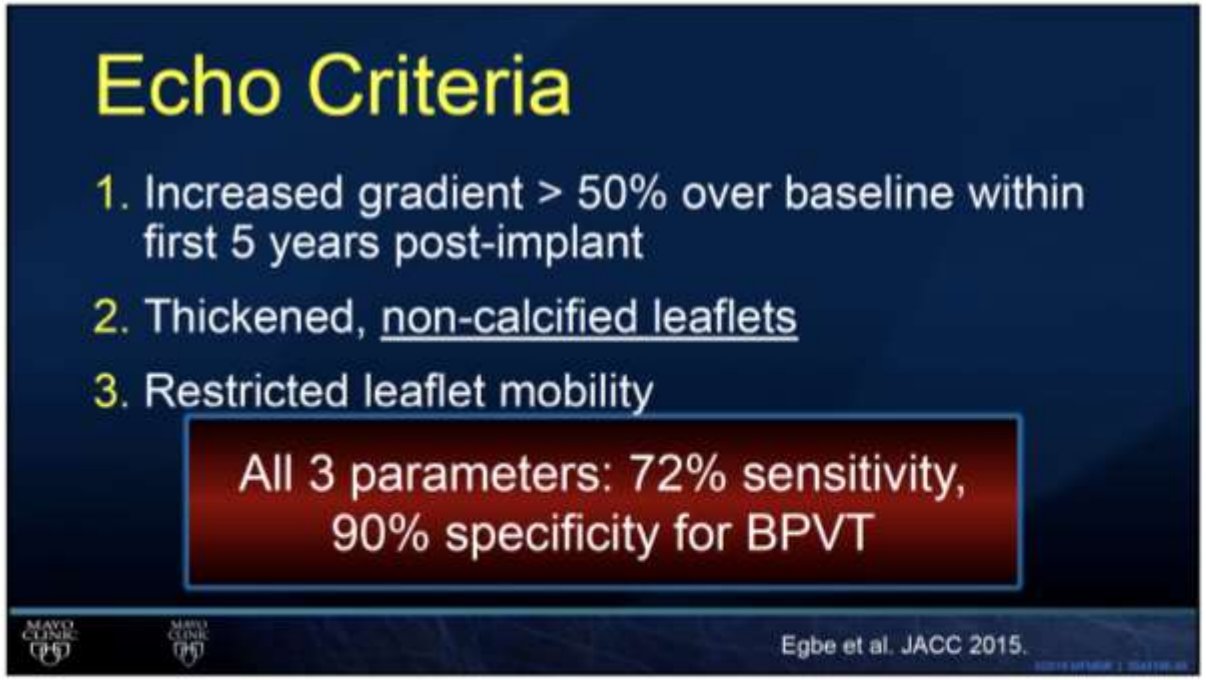
Pislaru et al. JACC Imaging 2015

Il y a finalement 4 causes de gradient élevé:

- obstruction
- hyper débit
- mismatch
- pressure recovery



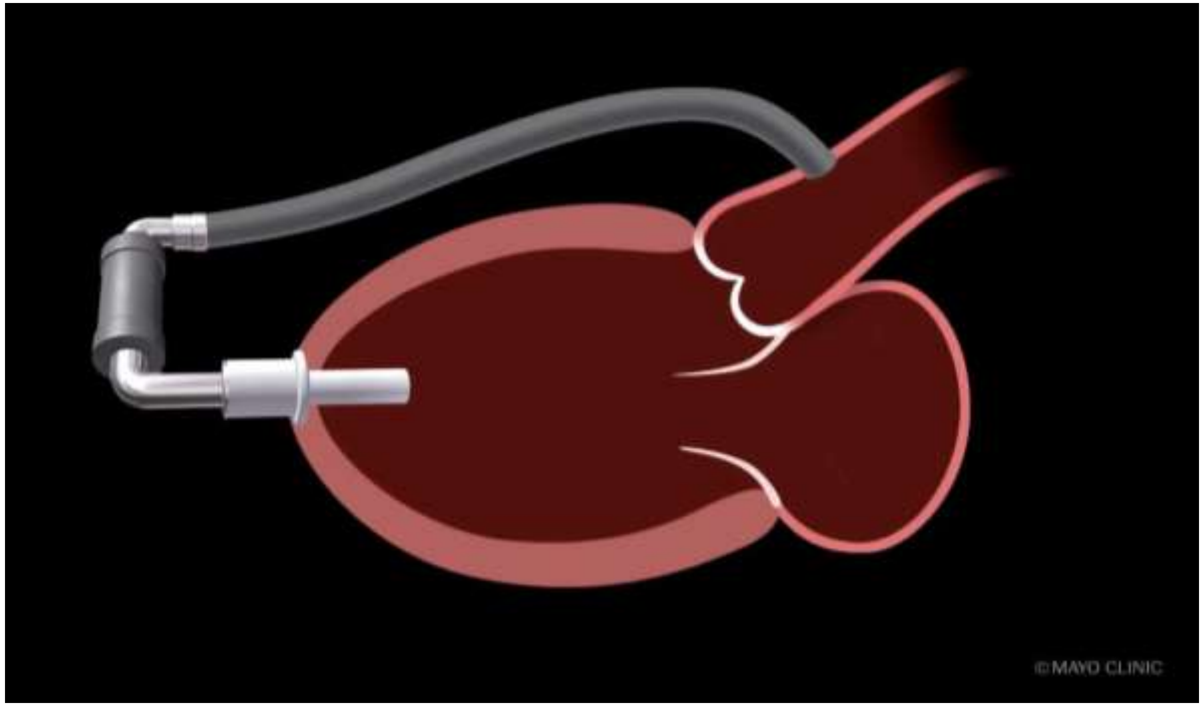
Thrombose de bioprothèse



A la mayo, la surveillance écho des bioprothèses , c'est tous les ans….

Heart Failure, Transplant and VADs: Role of Echocardiography

Grace Lin, MD, FACC, FASE
Director, Heart failure Services
Mayo Clinic Rochester



Role of Pre-operative Assessment for LVAD: Patient Selection

- High risk for complications
- Biventricular vs Univentricular support
  - LV size and EF
  - Right ventricular function
  - Shunts (PFO or ASD)
  - Valve disease
  - Intra-cardiac thrombi

Eliminer : - FOP
- dysfonction VD
- IAo

Surveillance LVAD

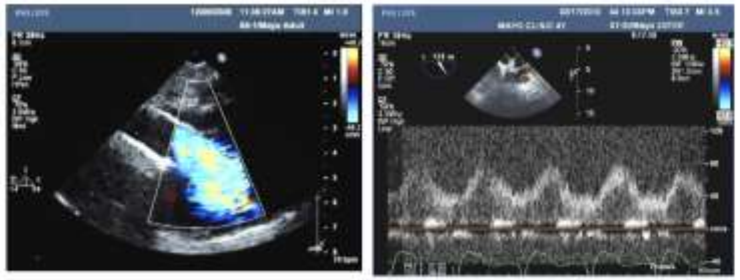
Role of Surveillance Echo in LVAD

- LV dimensions and EF
- Ventricular Septal Position
- Aortic valve opening
- Aortic regurgitation
- Mitral regurgitation
- RV function and tricuspid regurgitation
- Cannula

LV unloading
LVAD v. LV function

supra sternale

Outflow Cannula: All LVADs
High parasternal or right parasternal

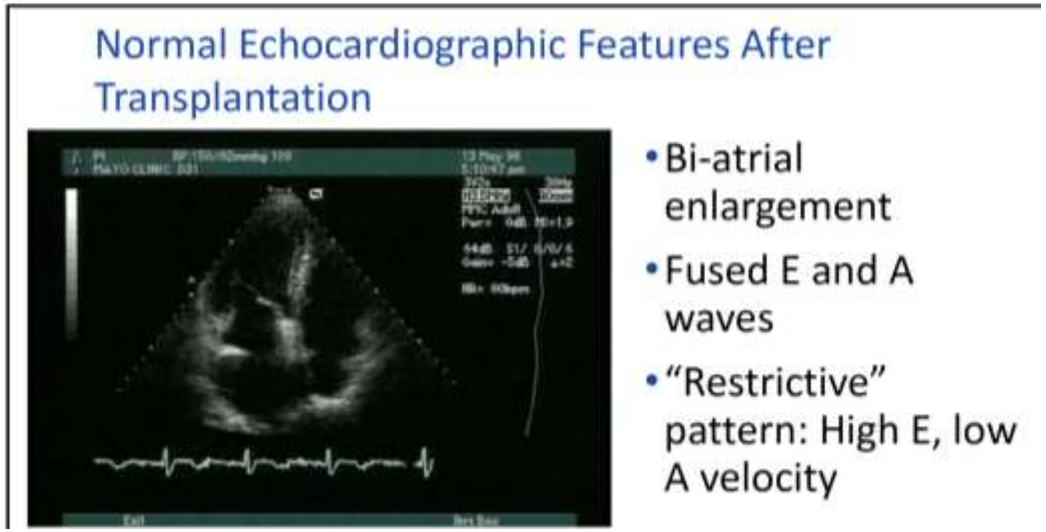


Cannula velocity <1.5 m/s

Role of Surveillance Echo in LVAD

- Ramp (speed) studies
  - Optimization
  - Pump thrombosis
  - Alarms
- Cardiac output
  - In absence of AR, aortic valve opening or PR:
  - RVOT output = LVAD output

transplatation



tachycardie liée à la dénervation cardiaque

Rejet: hvg, dysfct diastolique

Signs of rejection

Left Ventricle

- ↑ wall thickness
- ↑ LV mass
- ↓ systolic function
  - > 10% ↓ in EF
- Strain

Diastolic Function

- ↓ MV deceleration time
- ↓ TDI E' velocity
- Increased E/E' ratio

Diastolic function more sensitive than LVEF

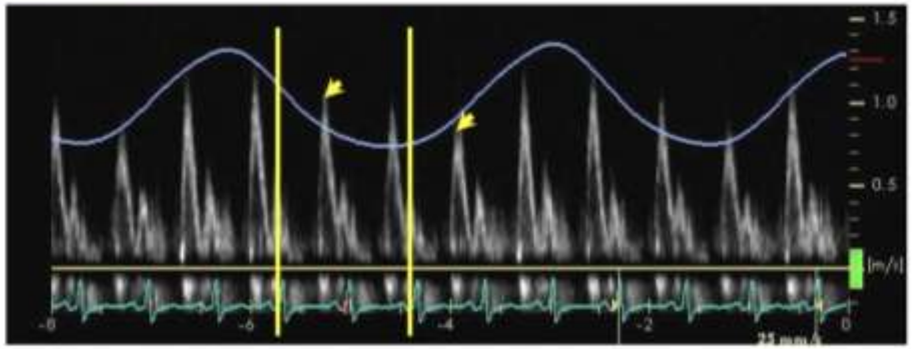
Long term Assessment

- Left ventricular size and function
  - Coronary artery disease
  - Immunosuppressive hypertension
- Post-biopsy complications
  - Ventricular septal defect
  - Tricuspid valve dysfunction
- Rejection

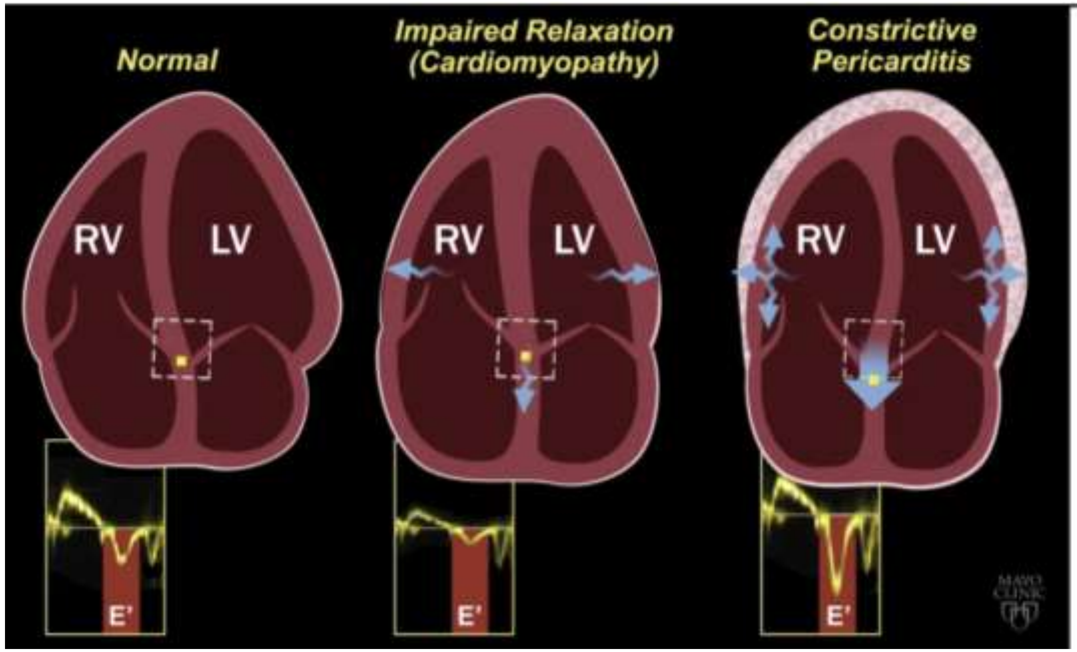
Echocardiography in Pericardial Disease and Constriction

S. Allen Luis, MBBS, FRACP, FACC, FASE
Co-Director, Pericardial Diseases Clinic
Medical Director, Mayo Clinic School of Health Sciences
Echocardiography and Advanced Cardiovascular Sonography Programs

Mitral Inflow

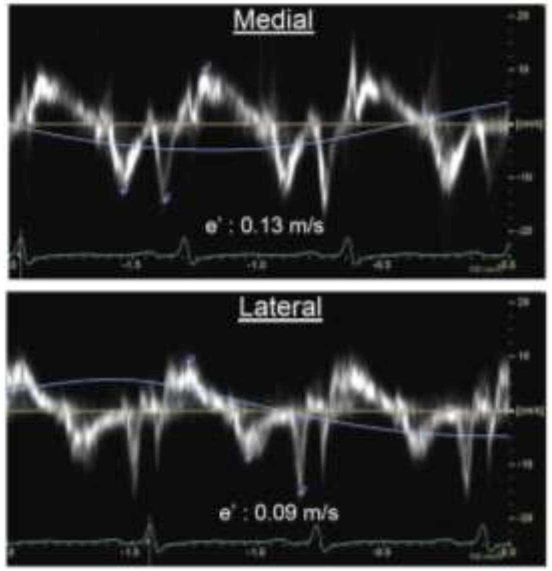


- Typically high E velocity, shortened deceleration time and decreased A velocity
- E velocity between expiration (higher) and inspiration (lower) compared
- > 25% respirophasic variation is significant
- Can also assess tricuspid inflow but pattern reversed and > 40% significant

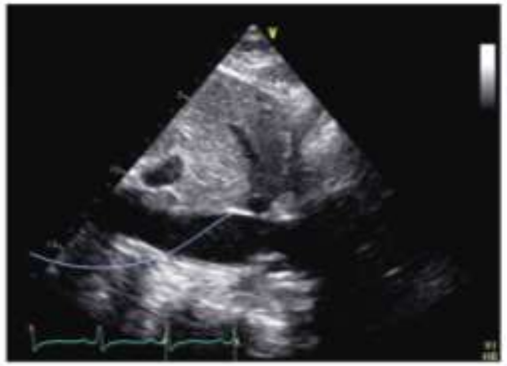


Tissue Doppler

- Tissue Doppler velocities preserved
- Medial TDI > Lateral TDI ('annulus reversus')
- E/e' ratio should not be used to assess LV filling pressures
- Useful to distinguish constrictive and restrictive physiology

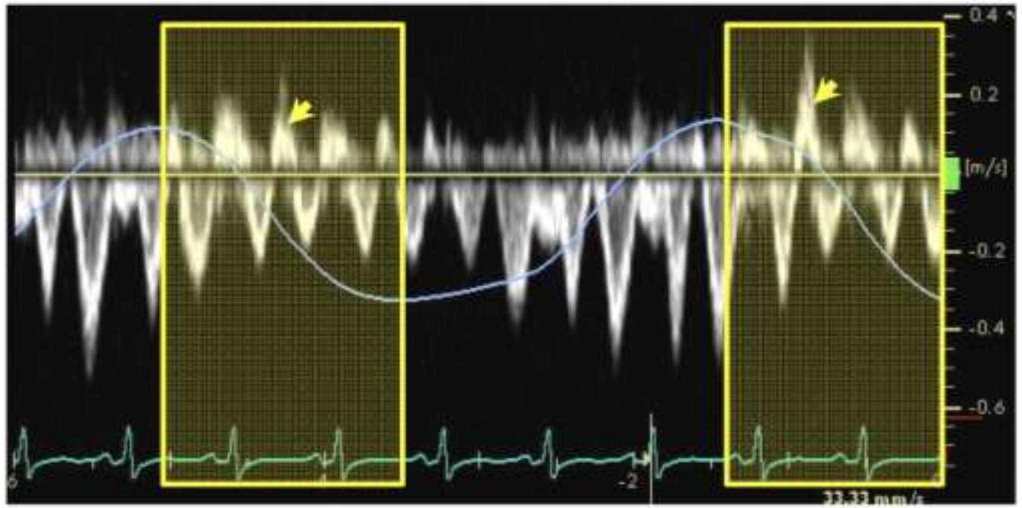


Inferior Vena Cava



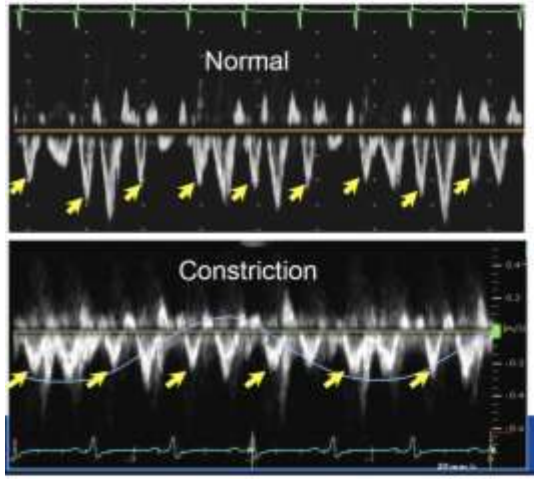
- Dilated IVC with reduced or absent inspiratory collapse
- IVC may be less plethoric if over-diuresed

Hepatic Veins in Constriction



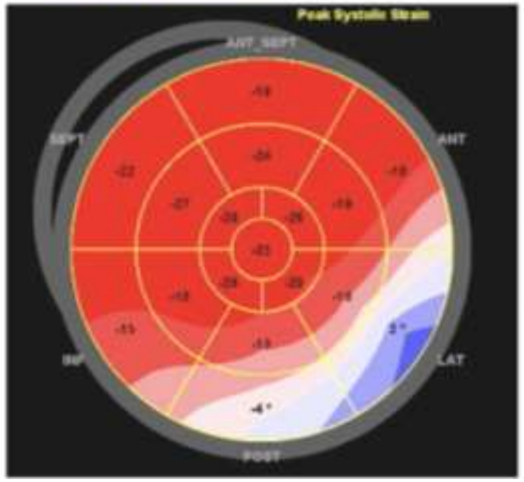
Expiratory diastolic flow reversals in the hepatic veins

Superior Vena Cava in Constriction



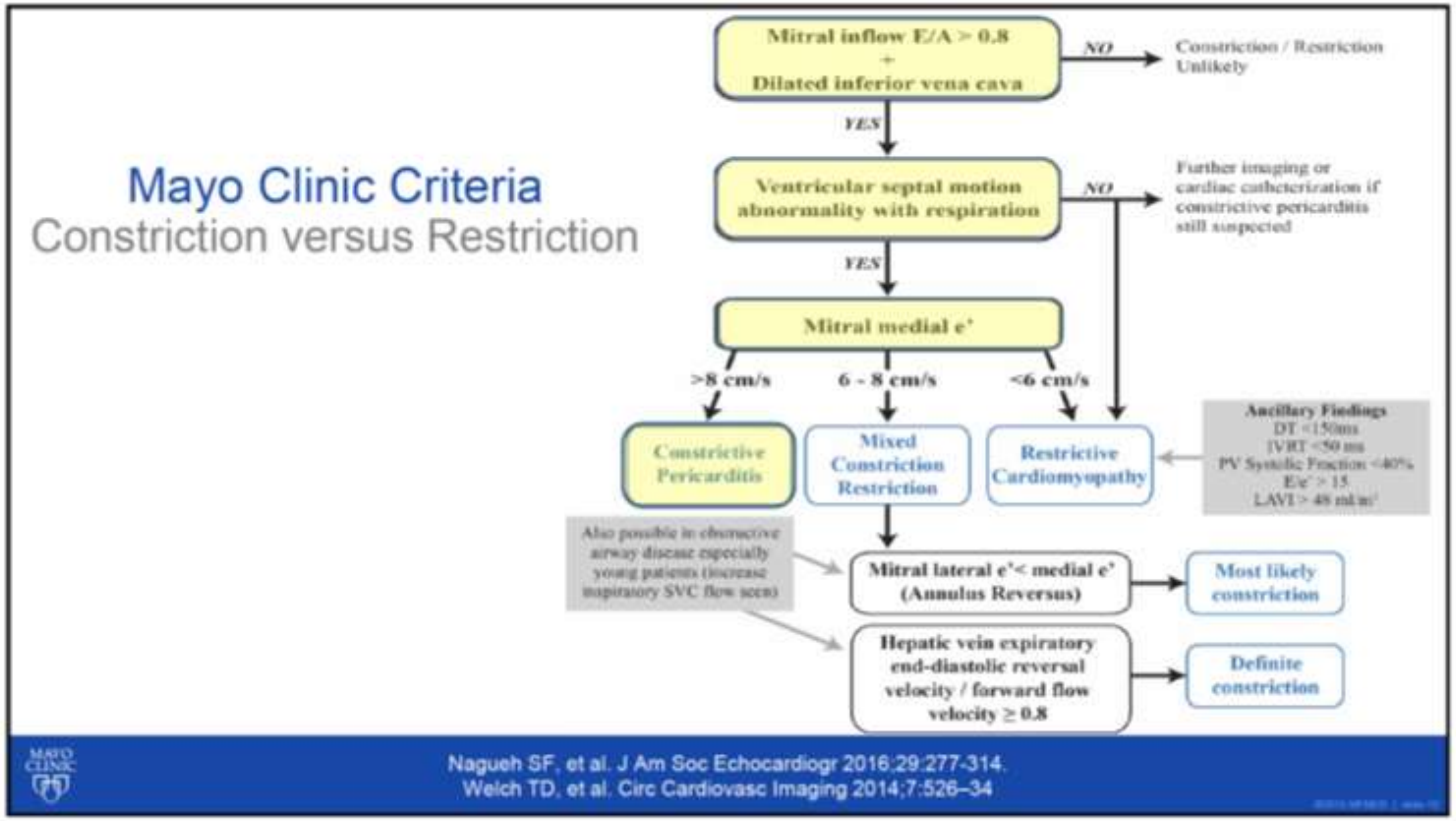
- Loss of respirophasic variation in systolic component of SVC flow.
- Useful to distinguish severe lung disease or exaggerated respiratory effort where SVC flow variation preserved

Left Ventricular Global Longitudinal Strain in Constriction



- Provides supportive information
- Reduced in the tethered segments
- Lateral walls has lower regional strain than septal segments

attention si IDM lateral…

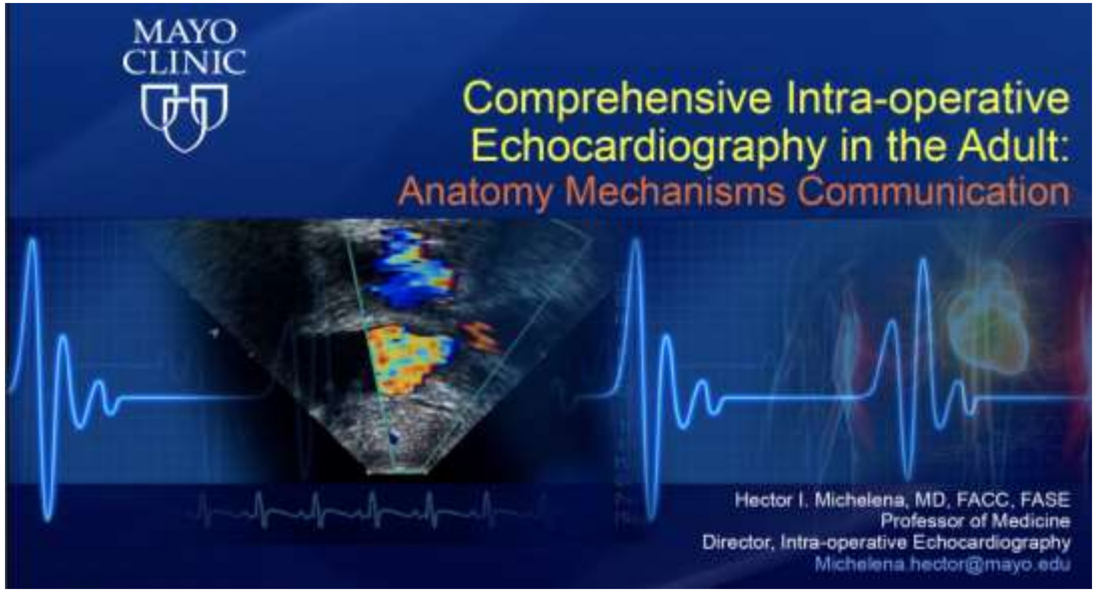


flux mitral

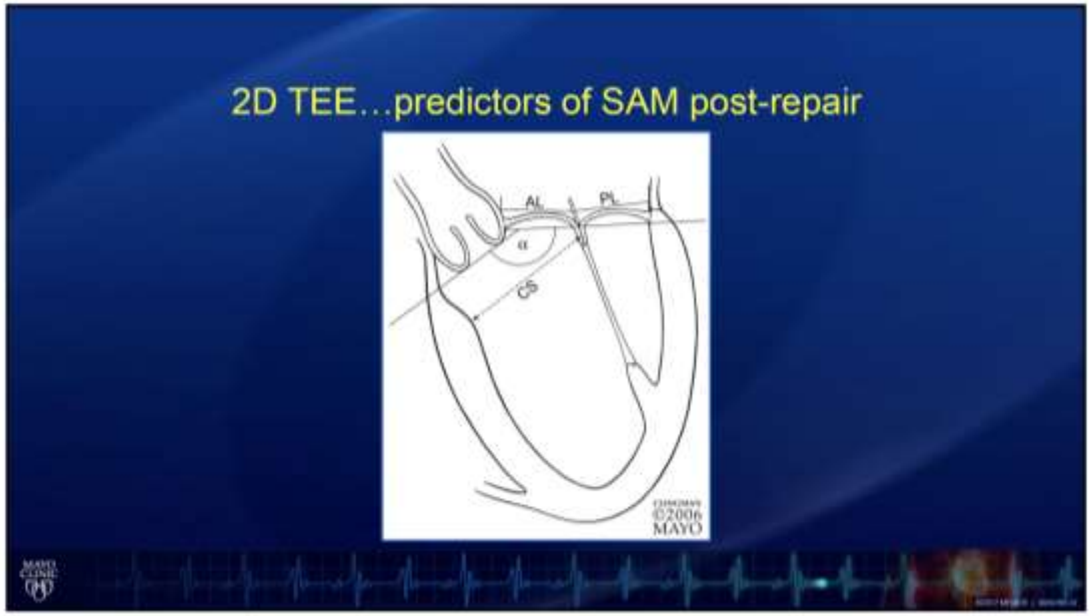
SIV?

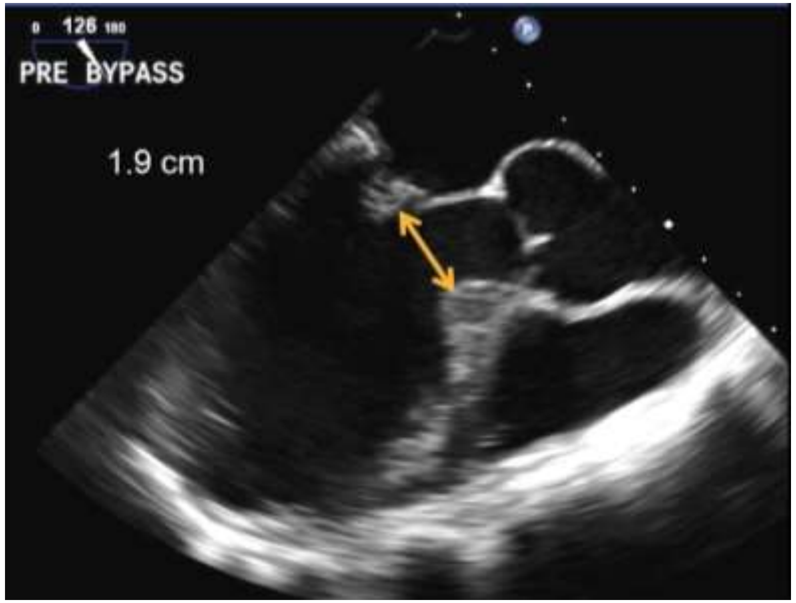
e' medial > 8 PCC

FVSH



- pre bypass :
  - check the aorta (porcelaine?)? cannulation site? descending aorta





< 2.5 cm = RISQUE DE SAM+++