Constrictive Pericarditis

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Pamela Youde Nethersole Eastern Hospital

Hong Kong Core Cardiology Certificate Course (Module 3)

7 April 2019

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Constrictive Pericarditis
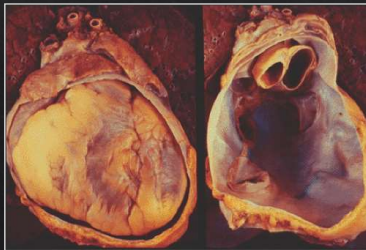## It is like something delicious

Hard Outside

Soft Inside

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Constrictive Pericarditis

Hard Outside

Soft Inside

Idiopathic
Tuberculosis
Prior cardiac surgery
Chest irradiation

Prior acute pericarditis
Rheumatologic disease
Malignancy
Trauma

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Constrictive Pericarditis

Hard Outside

Soft Inside

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Constrictive Pericarditis

Normal Systole

Abnormal Diastole

- Normal/rapid Early Diastole
- Abnormal Mid-Late Diastole

Clinical Effects:
- Diastolic Heart Failure
- Right Heart Failure

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Constrictive Pericarditis

Making Correct Diagnosis Is Essential
> Pericardectomy Is Curative

Presentations:
- SOB on Exertion
- Oedema
- Abdominal Distension
  (Liver Congestion / Ascites)
- Pleural Effusion
- Fatigue
- Atrial Arrhythmia

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Constrictive Pericarditis

But how To Make The Diagnosis ?

Presentations:
- SOB on Exertion
- Oedema
- Abdominal Distension
  (Liver Congestion / Ascites)
- Pleural Effusion
- Fatigue
- Atrial Arrhythmia

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Constrictive Pericarditis

But how To Make The Diagnosis ?

First: Be Suspicious

Unexplained
- R heart failure
- Pleural effusion

Prediposing conditions
- Tuberculosis
- Prior cardiac surgery
- Chest irradiation

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Constrictive Pericarditis
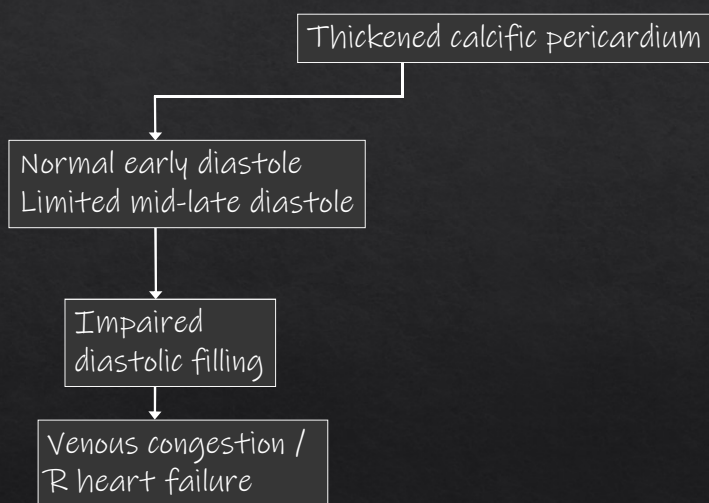
How To Make The Diagnosis ?

First: Be Suspicious

Then

Think of something Yummy

Look for something fancy

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

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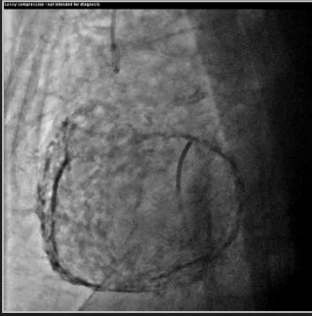## Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

CXR: Pericardial Calcification

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Constrictive Pericarditis
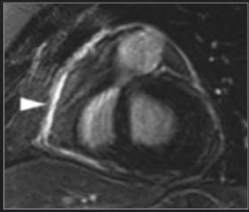### From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
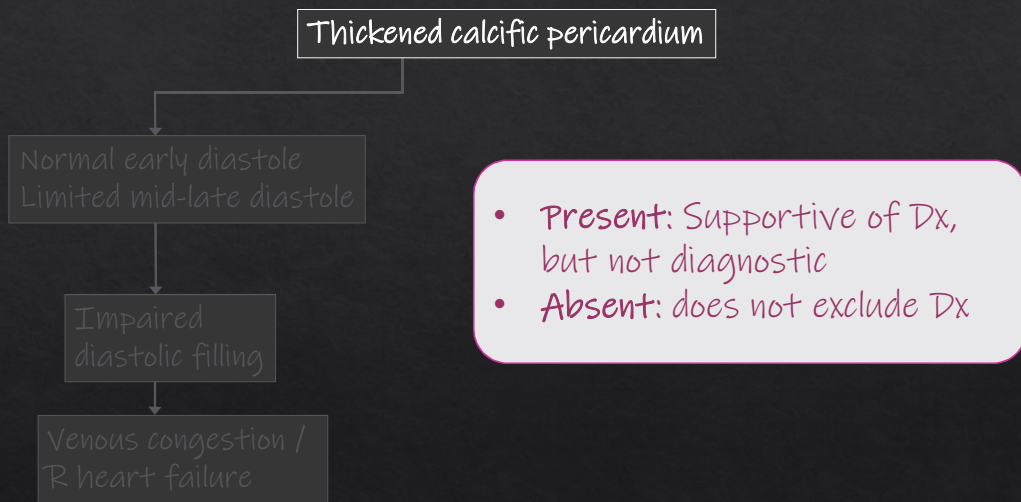R heart failure

Echo, CT, MRI...

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Constrictive Pericarditis
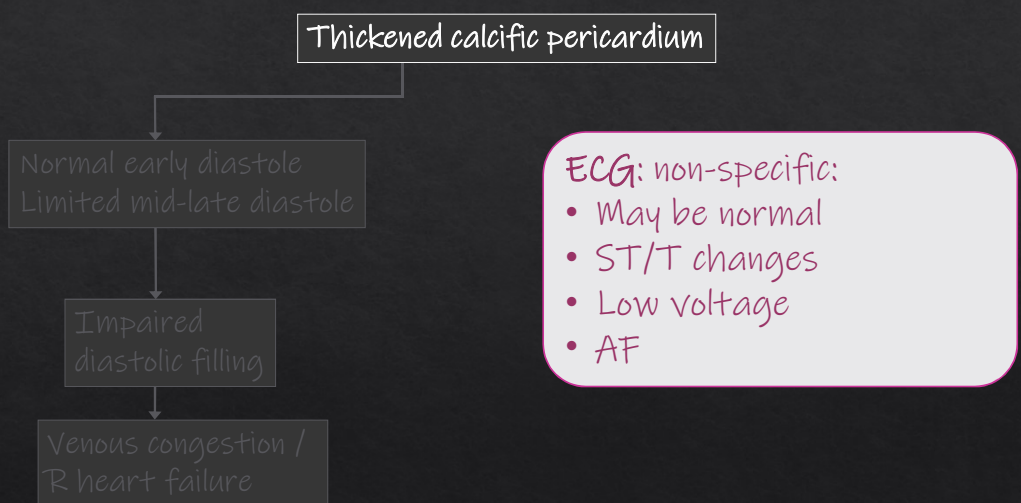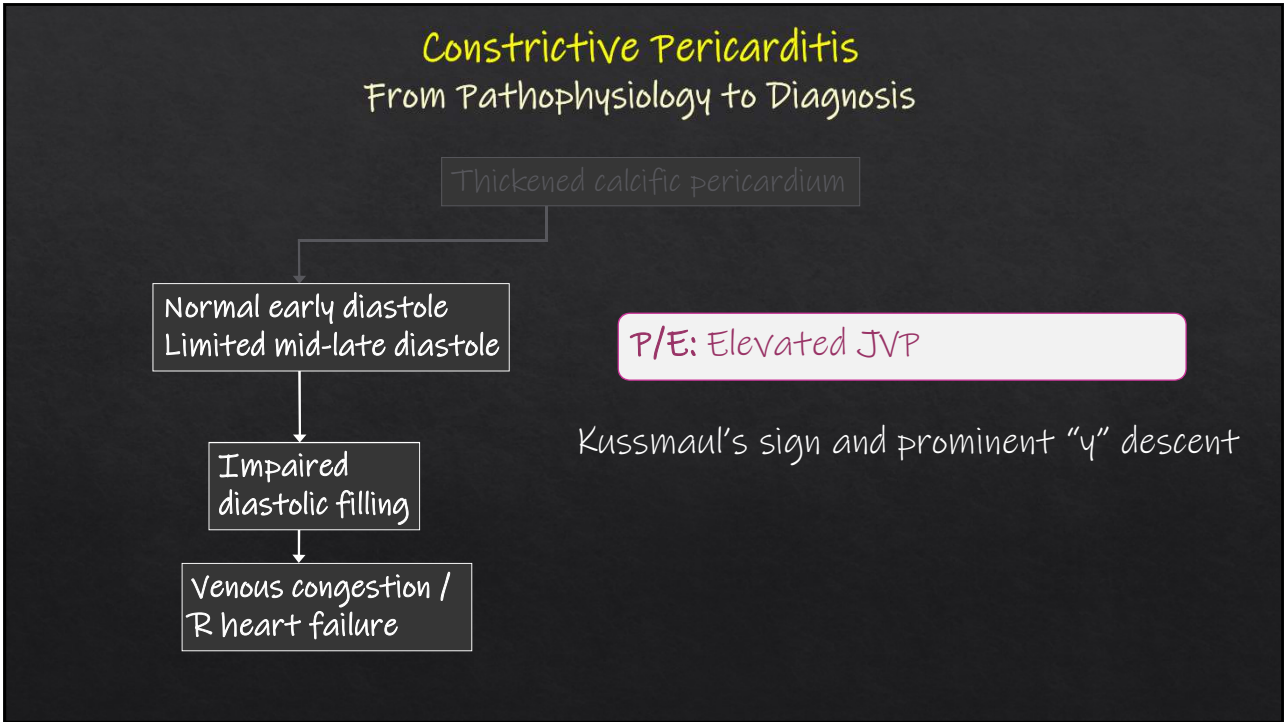From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

- **Present:** Supportive of Dx, but not diagnostic
- **Absent:** does not exclude Dx

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

ECG: non-specific:
- May be normal
- ST/T changes
- Low voltage
- AF

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

P/E: Elevated JVP

Kussmaul's sign and prominent "y" descent

Impaired
diastolic filling

Venous congestion /
R heart failure

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Echo: Dilated IVC & hepatic veins

Impaired
diastolic filling

Venous congestion /
R heart failure

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

Cath: Elevated RA pressure

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thicke...

Early diastolic flattening of LVPW

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Cardiac Cath:
- RA: Prominent "y" descent
- Dip-and-Plateau or Square Root Sign
- Equalization of diastolic pressures
  of 4 chambers

Impaired
diastolic filling

Venous congestion /
R heart failure

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

RA Pressure: Prominent y descent

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

LV Diastolic Pressure:
Dip and Plateua (Square Root Sign)

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Impaired diastolic filling

Venous congestion / R heart failure

Equalization of Diastolic Pressures
LV-RV Pressures

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Impaired diastolic filling

Venous congestion / R heart failure

Equalization of Diastolic Pressures

LV-RA Pressures

LV-PCWP Pressures

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Pericardial knock on P/E

Impaired
diastolic filling

Venous congestion /
R heart failure
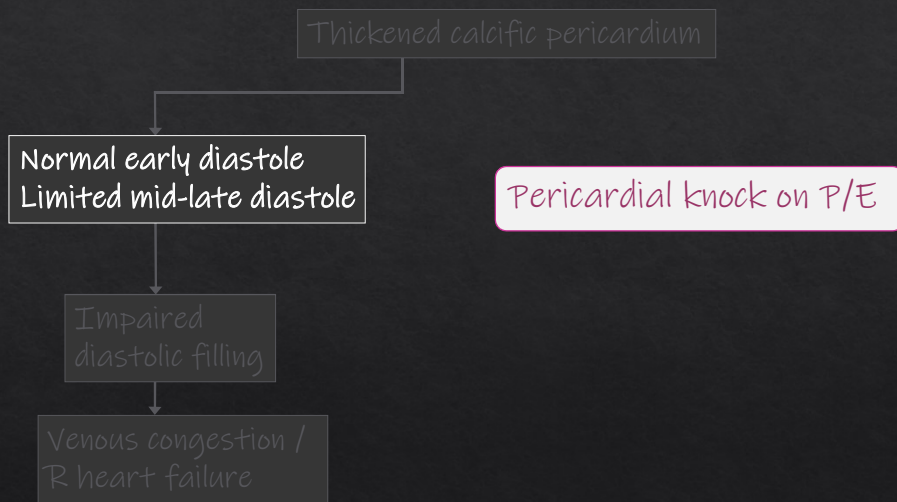
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Constrictive Pericarditis

How To Make The Diagnosis ?

First: Be Suspicious

Then

Think of something Yummy

Look for something fancy

Thinking of fancy relationships
makes your mind clearer

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Constrictive Pericarditis
The Fancy Relationship of Mr. Right & Ms. Left

Enhanced Ventricular Interdependence
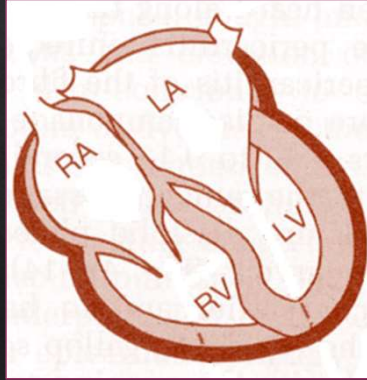
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Constrictive Pericarditis
Enhanced Ventricular Intedependence
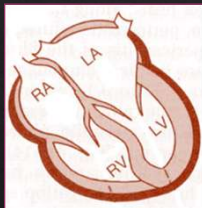
Septal bouncing On M-Mode or 2D
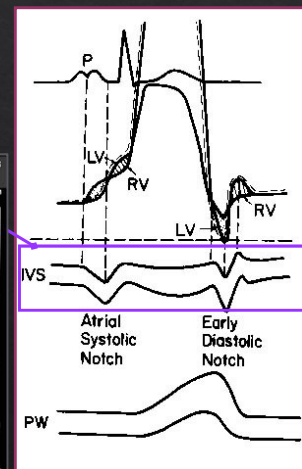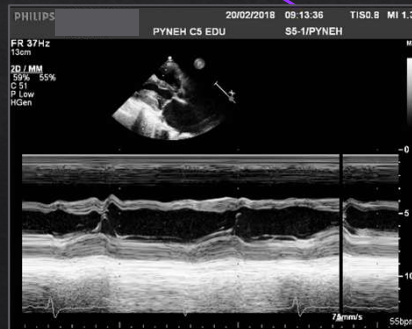
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Constrictive Pericarditis
Enhanced Ventricular Intedependence

Septal bouncing
On M-Mode or 2D
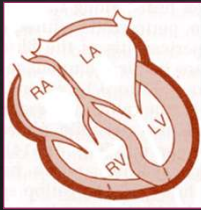
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Constrictive Pericarditis
Enhanced Ventricular Intedependence

Septal bouncing
On M-Mode or 2D
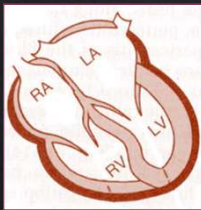
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Constrictive Pericarditis
The Fancy Relationship of Mr. Heart & Ms. Lung

Dissociation of intrathoracic and intracardiac pressures

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Constrictive Pericarditis
Dissociation of Intrathoracic and Intracardiac Pressures

Exaggerated respiratory variation in MV/Pulm Vein flow
Inspiratory dec in mitral "E" (>25%)

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Constrictive Pericarditis
Dissociation of Intrathoracic and Intracardiac Pressures Together with Enhanced Ventricular Interdependence

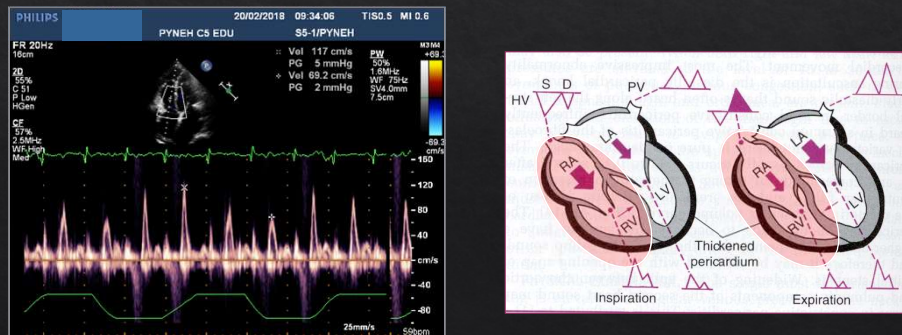Ventricular septal shift to left during inspiration

Insp   Exp
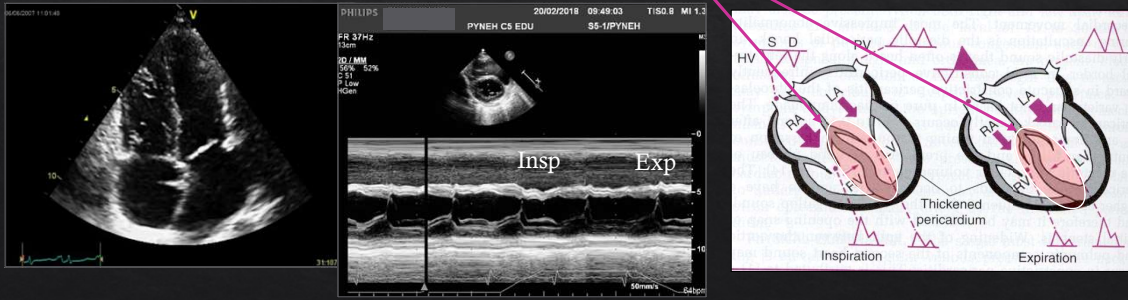
33

Constrictive Pericarditis
Dissociation of Intrathoracic and Intracardiac Pressures Together with Enhanced Ventricular Interdependence

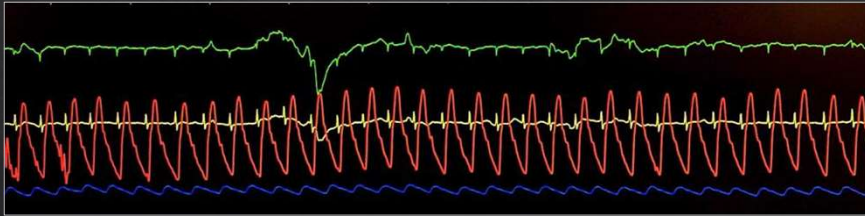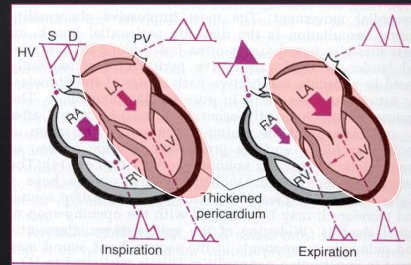Exaggerated respiratory variation in TV flow (usu >40% with inspiration)

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Constrictive Pericarditis

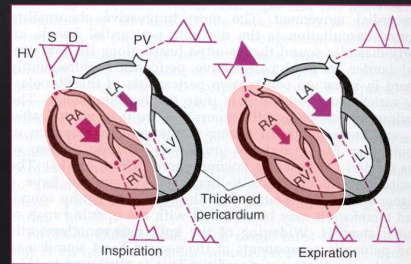## Dissociation of Intrathoracic and Intracardiac Pressures
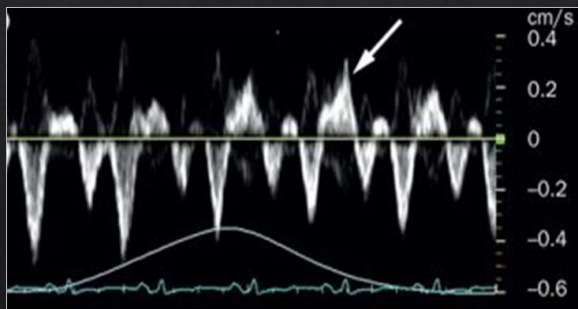

Pulsus Paradoxus

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Constrictive Pericarditis

Dissociation of Intrathoracic and Intracardiac Pressures
Together with Enhanced Ventricular Interdependence

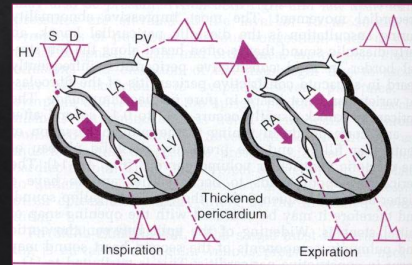Hepatic venous flow:
- Diastolic flow reversal in expiration

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Constrictive Pericarditis

Dissociation of Intrathoracic and Intracardiac Pressures Together with Enhanced Ventricular Interdependence
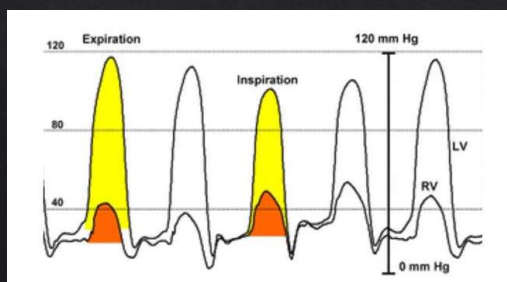
Cardiac Cath

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Constrictive Pericarditis

Dissociation of Intrathoracic and Intracardiac Pressures Together with Enhanced Ventricular Intedependence

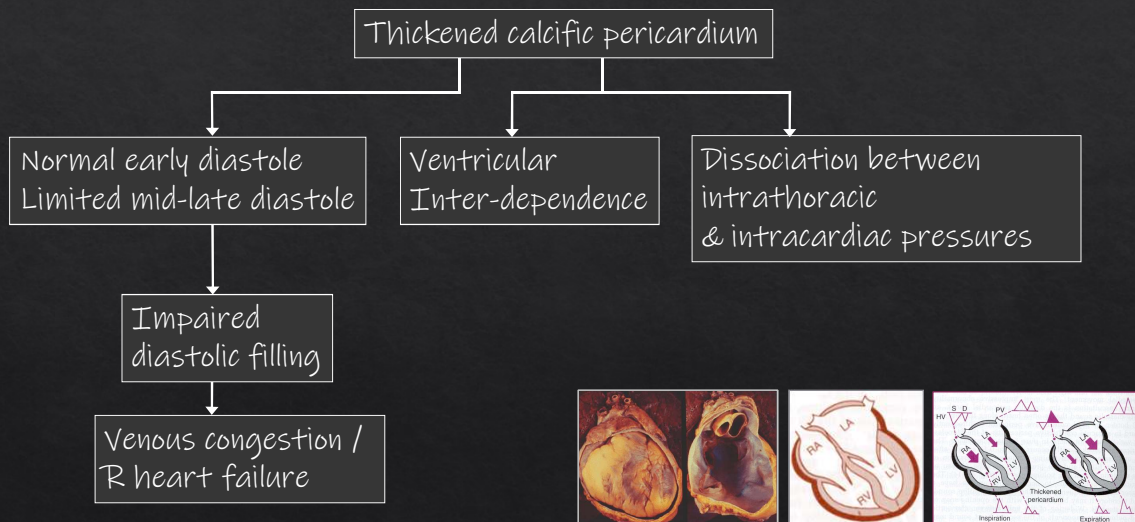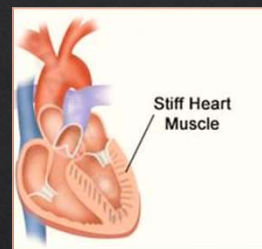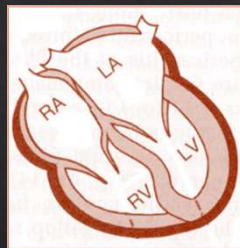Discordance in LV-RV Pressures with Respiration

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Constrictive Pericarditis
From Pathophysiology to Diagnosis

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Ventricular
Inter-dependence

Dissociation between
intrathoracic
& intracardiac pressures

Impaired
diastolic filling

Venous congestion /
R heart failure

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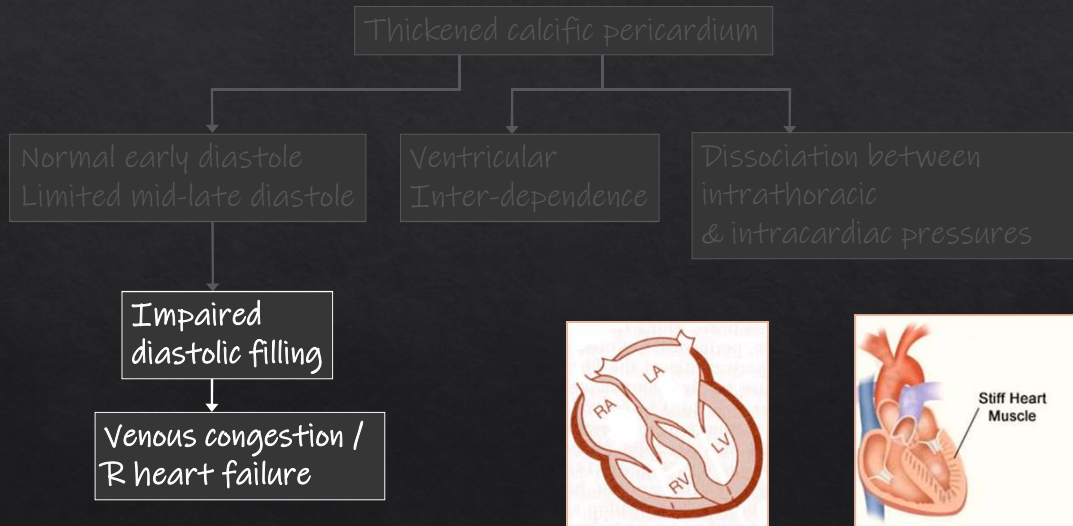## Constrictive Pericarditis Vs Restrictive Cardiomyopathy

Both are uncommon causes of diastolic heart failure presenting with unexplained venous congestion

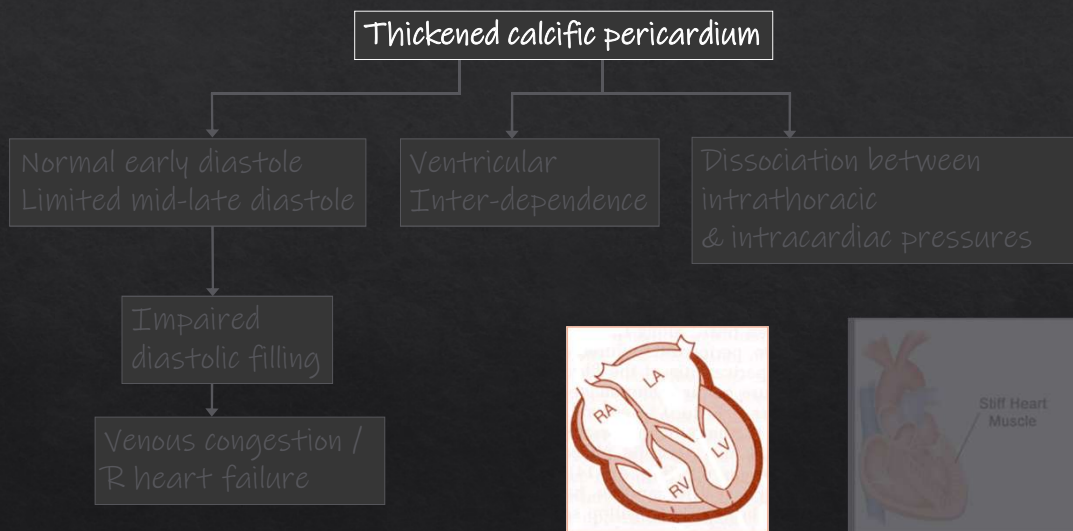Constrictive pericarditis is potentially curable

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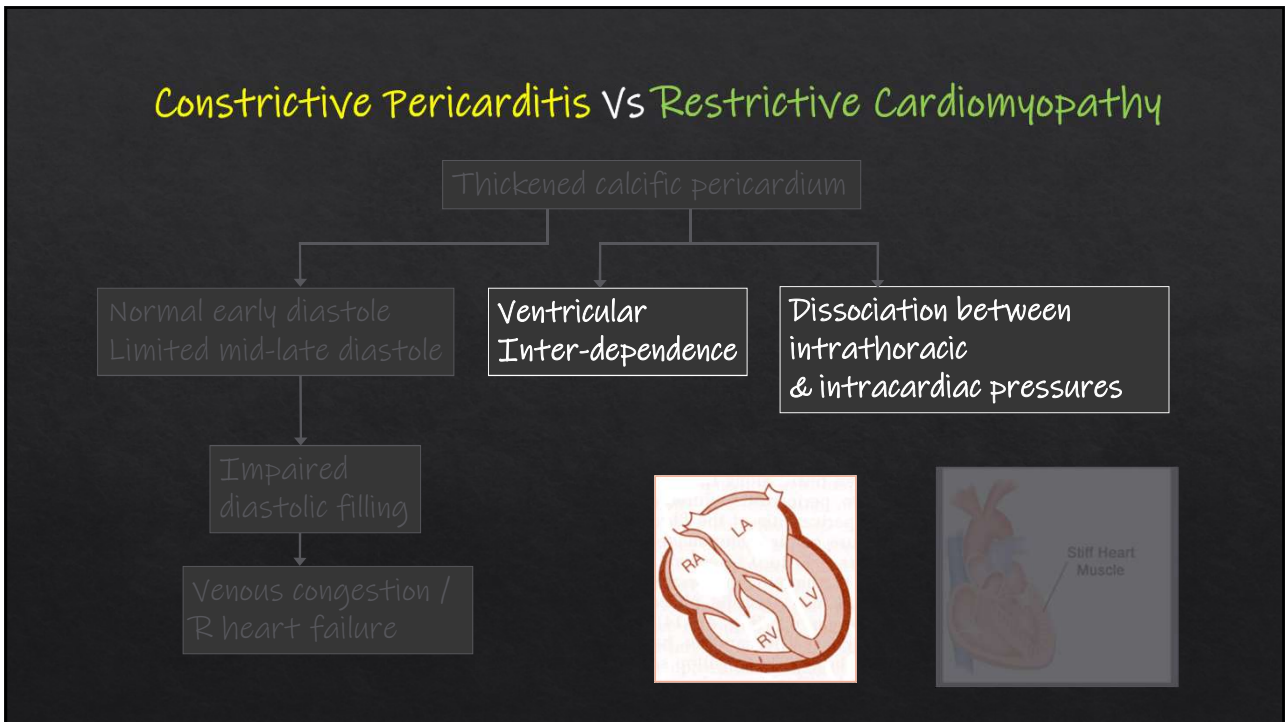## Constrictive Pericarditis Vs Restrictive Cardiomyopathy

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Ventricular
Inter-dependence

Dissociation between
intrathoracic
& intracardiac pressures

Impaired
diastolic filling

Venous congestion /
R heart failure

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Ventricular
Inter-dependence

Dissociation between
intrathoracic
& intracardiac pressures

Impaired
diastolic filling

Venous congestion /
R heart failure

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Ventricular
Inter-dependence

Dissociation between
intrathoracic
& intracardiac pressures

Impaired
diastolic filling

Venous congestion /
R heart failure

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy

Mitral Flow

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy

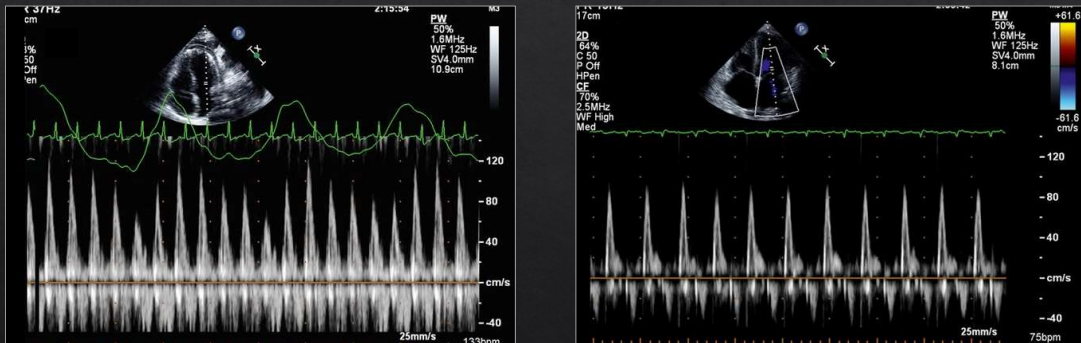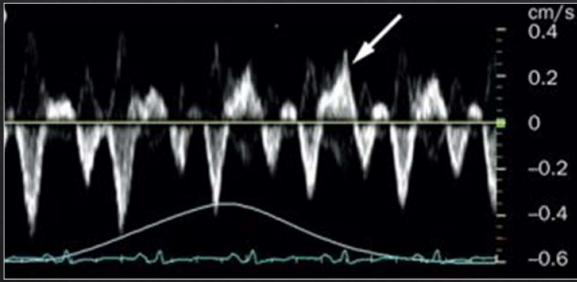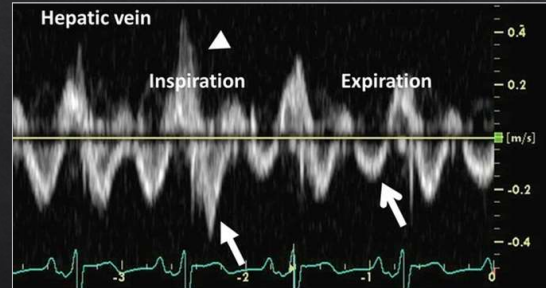### Hepatic Venous Flow

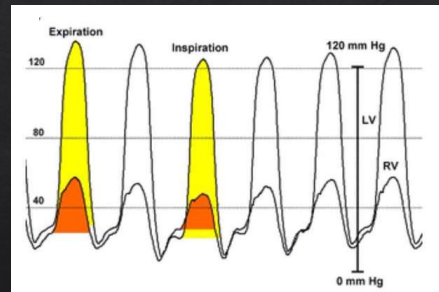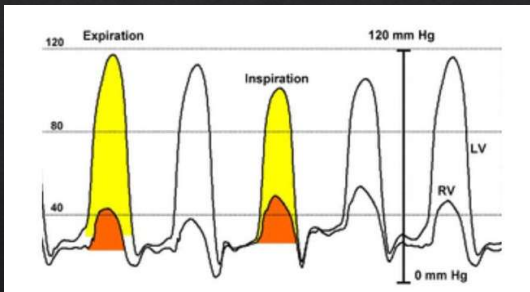Predominantly on Expiration

Predominantly on Inpiration

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy
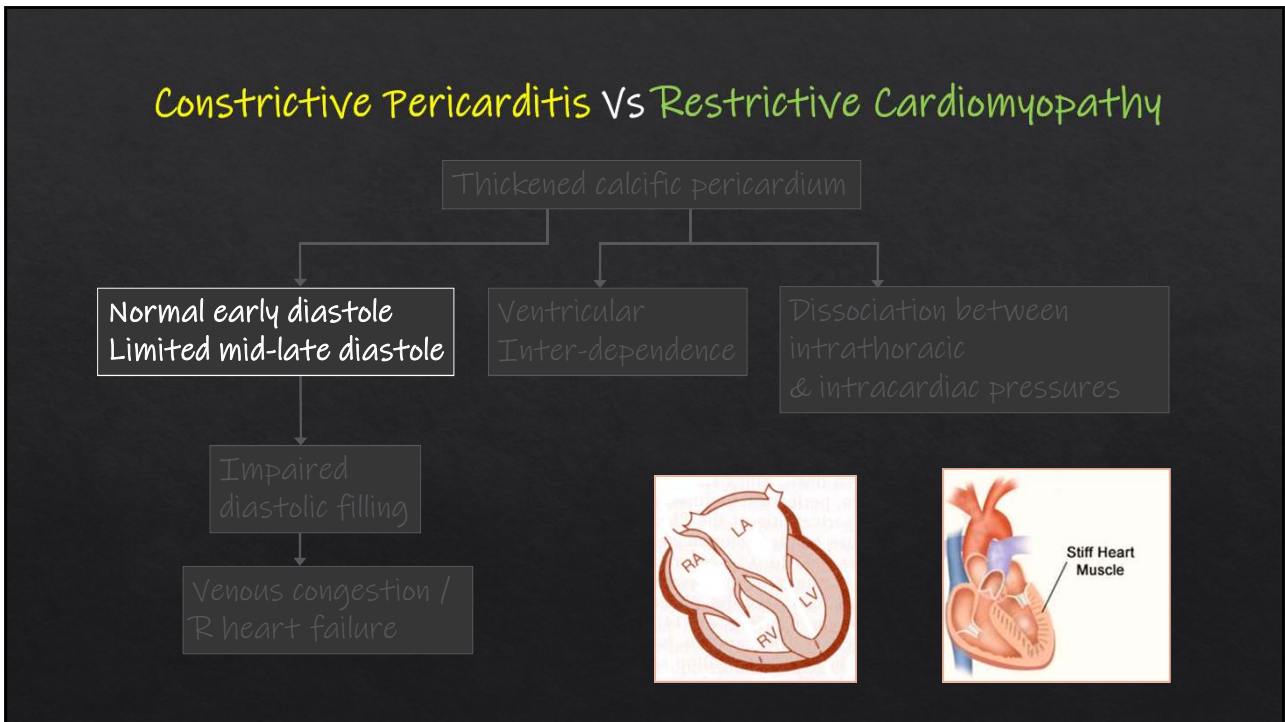
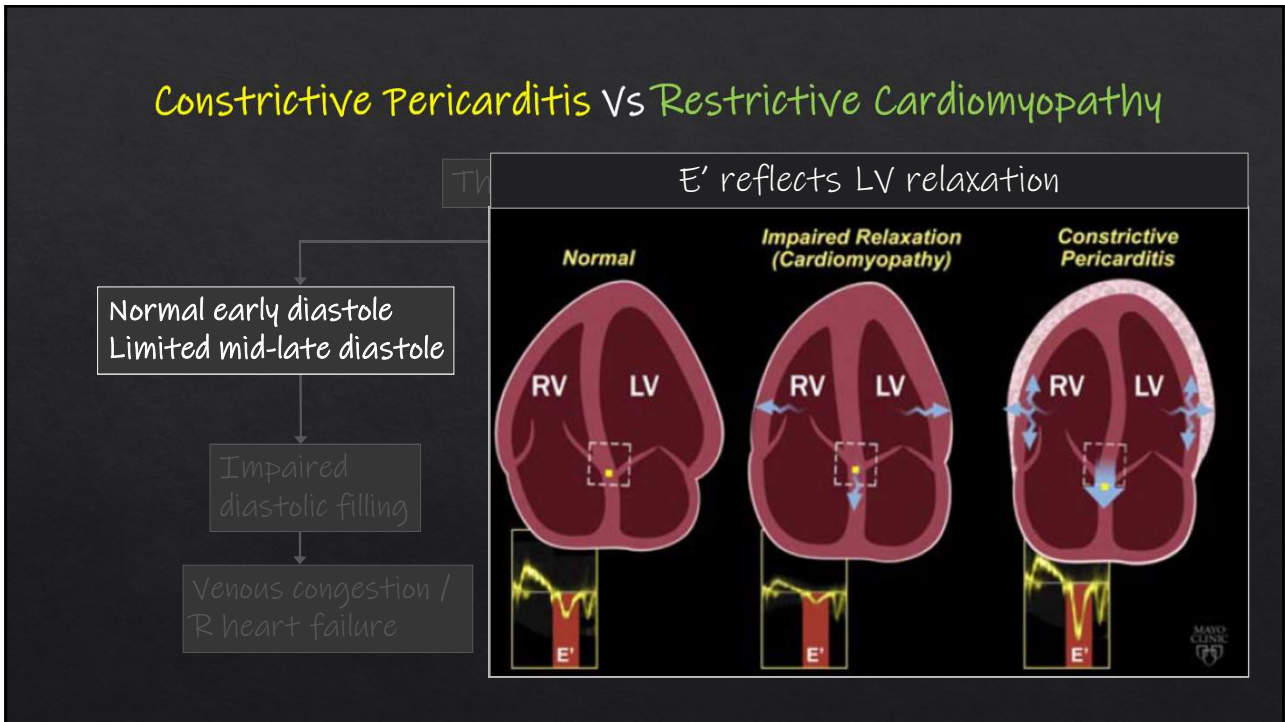Discordance in LV-RV Pressures

Concordance in LV-RV Pressures

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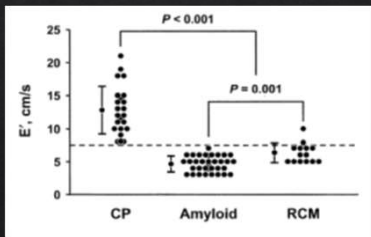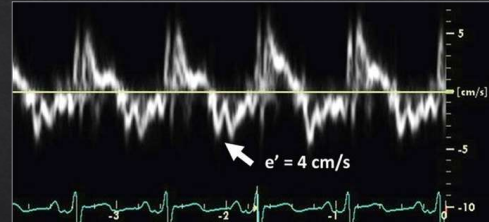
Constrictive Pericarditis Vs Restrictive Cardiomyopathy

Thickened calcific pericardium

Normal early diastole
Limited mid-late diastole

Ventricular
Inter-dependence

Dissociation between
intrathoracic
& intracardiac pressures

Impaired
diastolic filling

Venous congestion /
R heart failure

RA | LA | RV | LV

Stiff Heart Muscle

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy

Th...

E' reflects LV relaxation

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

Normal | Impaired Relaxation (Cardiomyopathy) | Constrictive Pericarditis

RV | LV

E'

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy

e' = 4 cm/s
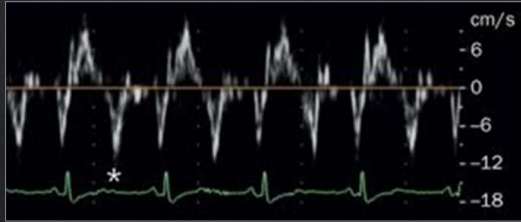
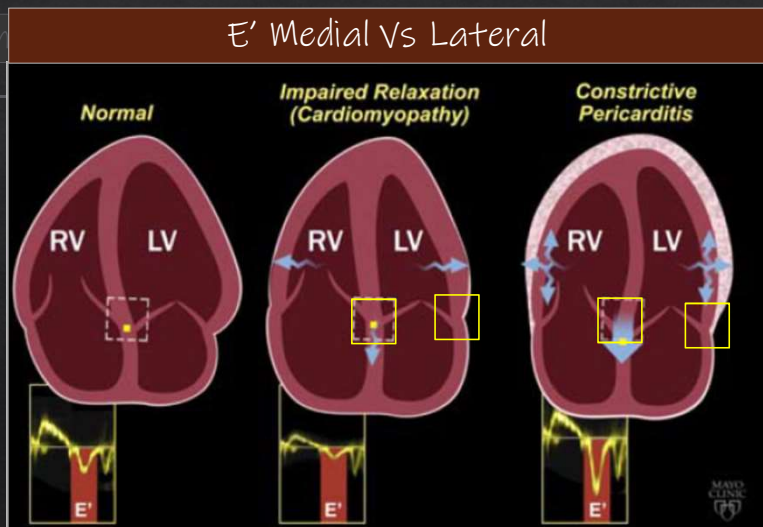Medial E' >/= 8 cm/s suggests constrictive pericarditis

Ha JW, et al. AJC 2004

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy

E' Medial Vs Lateral

Normal early diastole
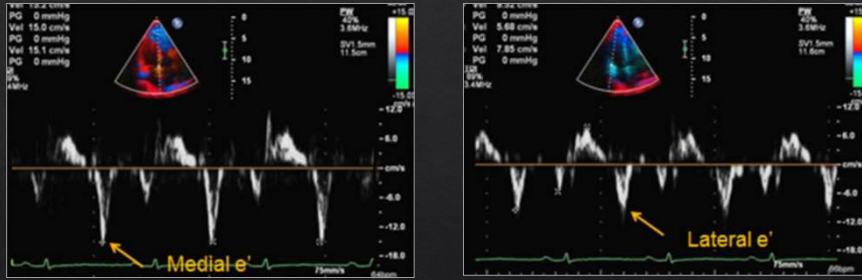Limited mid-late diastole

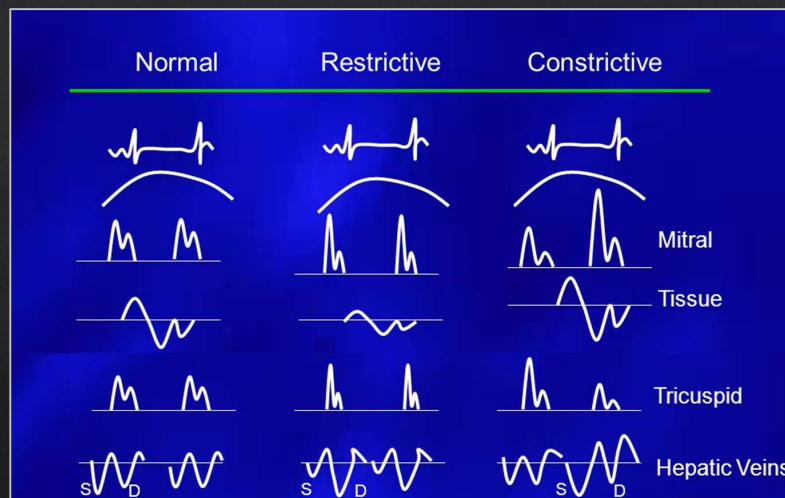Impaired diastolic filling

Venous congestion /
R heart failure

Normal | Impaired Relaxation (Cardiomyopathy) | Constrictive Pericarditis

RV LV

E'

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy

Annulus reversus: Medial E' > Lateral E'

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy

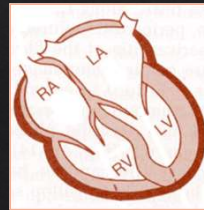Adapted from Hoit B, Circulation 2002

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Constrictive Pericarditis

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

Venous congestion /
R heart failure

- RA: Prominent "y" descent
- Dip-and-Plateau or Square Root Sign
- Equalization of diastolic pressures
  of 4 chambers

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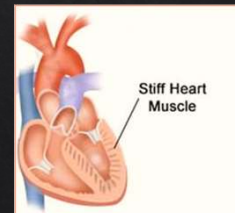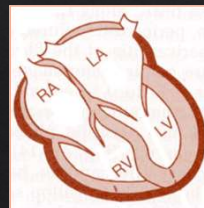## Constrictive Pericarditis Vs Restrictive Cardiomyopathy

Normal early diastole
Limited mid-late diastole

Impaired
diastolic filling

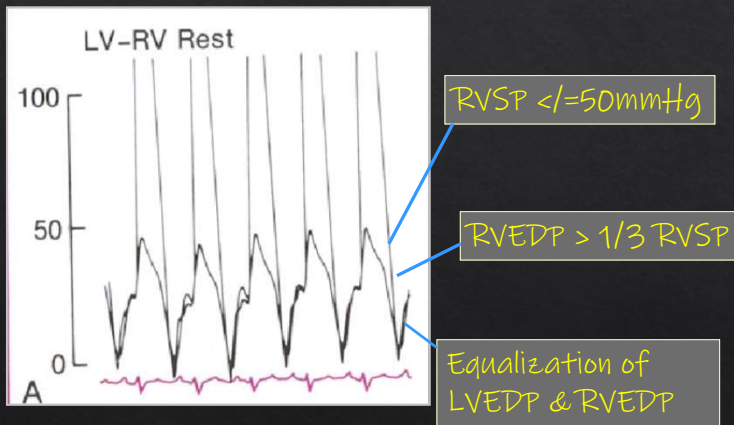Venous congestion /
R heart failure

Overlapping features on Cardiac Cath:
- RA: Prominent "y" descent
- Dip-and-Plateau or Square Root Sign
- Equalization of diastolic pressures
  of 4 chambers

Stiff Heart
Muscle

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Constrictive Pericarditis Vs Restrictive Cardiomyopathy

RVSP </=50mmHg

RVEDP > 1/3 RVSP

Equalization of LVEDP & RVEDP

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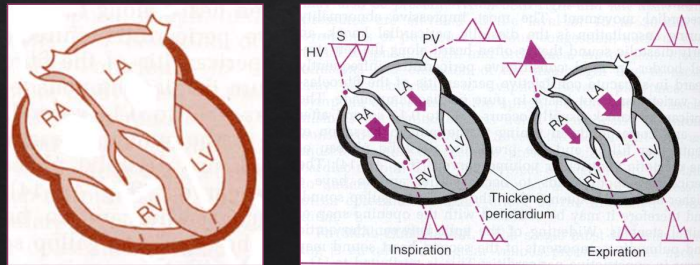## Constrictive Pericarditis Vs Restrictive Cardiomyopathy

When doubt persists...

Endomyocardial biopsy

Surgical Exploration

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Summary

When Suspicious of Constrictive Pericarditis...

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When Suspicious of Constrictive Pericarditis...

◈ Look in **pulse** something you seldom did

Pulsus paradoxus

◈ Look in JVP something you easily missed

Kussmaul's sign Prominent y descent

◈ Look in ECG something not so drastic

ST/T changes Low voltage

◈ Look in CXR something not specific

Pericardial calcification

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When Suspicious of Constrictive Pericarditis...

On Echo, look for...

◈ Septal bouncing that may save your day

◈ A deep breath in pushes the septum away (toward LV)

◈ Pericardium may look thick and bright

◈ Diastolic flattening (of LVPW) is a common sight

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When Suspicious of Constrictive Pericarditis...

On Echo, look for...

◈ Mitral flow drops with breathing ... inspiratory

◈ Tricuspid flow increases on the contrary

◈ Medial E' commonly greater than eight

◈ Lateral E' is a little bit sick

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When Suspicious of Constrictive Pericarditis...

On Echo, look for...

◈ Inspiration does not collapse the IVC

◈ Expiration increases diastolic flow reversal in hepatic vein, you see?
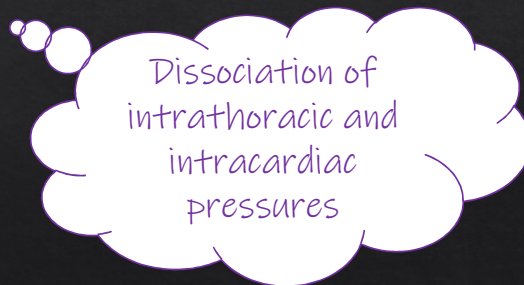
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When Suspicious of Constrictive Pericarditis...

On Cardiac Cath, look for...

◈ RA pressure raised with rapid descent "y"

◈ Dip-and-plateau, also called "square-root sign"

◈ Diastolic pressures in all chambers raised and equal

◈ Discordance in LV-RV pressures is something special

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When Suspicious of Constrictive Pericarditis...

◈ Think of something yummy

◈ Look for something fancy

Enhanced ventricular interdependence

Dissociation of intrathoracic and intracardiac pressures

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Thank you!

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