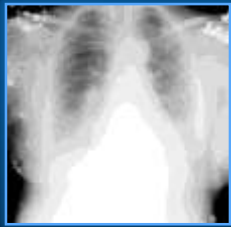


What is Diastology?



Clinical Problem:
The heart cannot fill with blood

Result: high filling pressures and low output



What is Diastology?

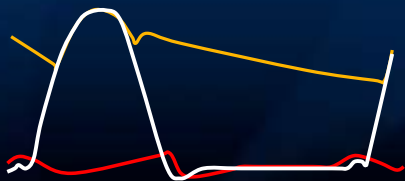
- Understand how the heart fills
 - Normally
 - Abnormally
- Apply to the patient with a low EF
- Evaluate the patient with “heart failure” and a normal EF

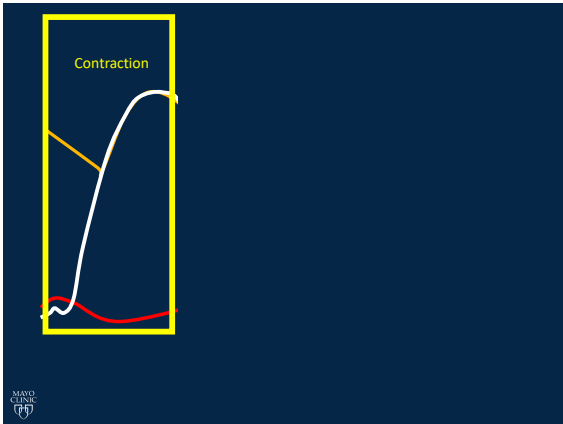


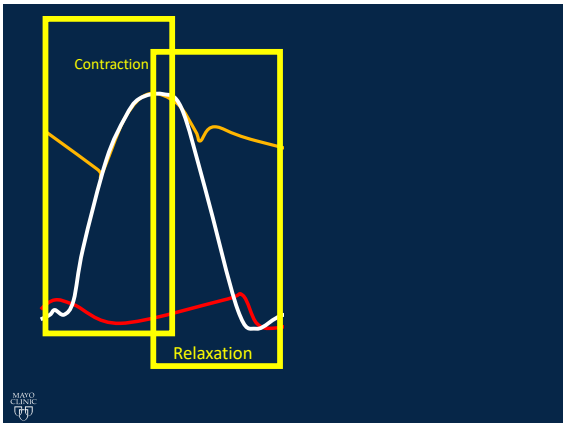
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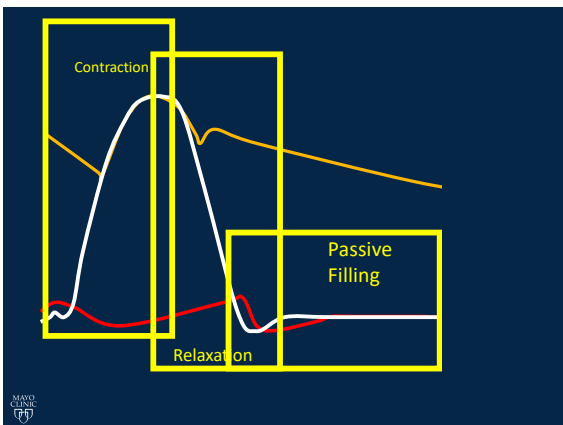


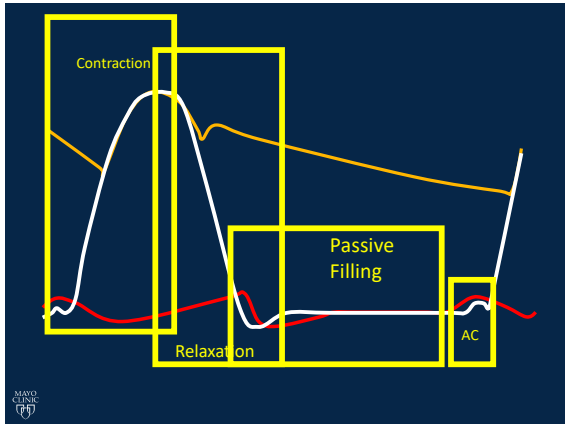
Contraction
Relaxation
Active and passive filling
Atrial contraction

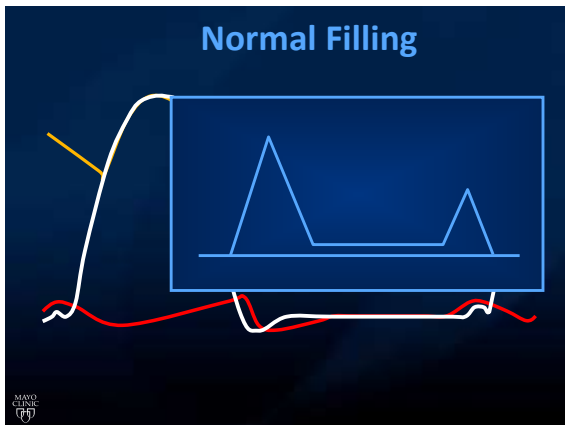




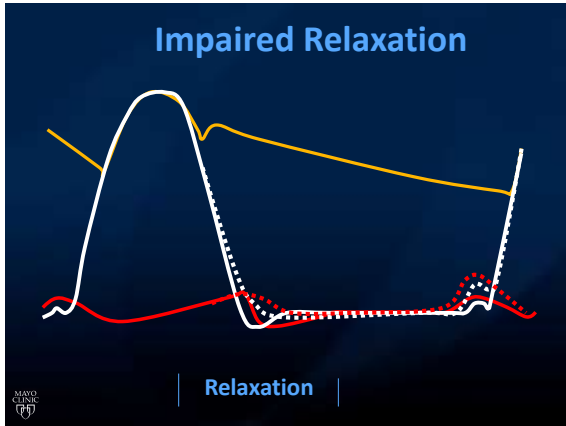


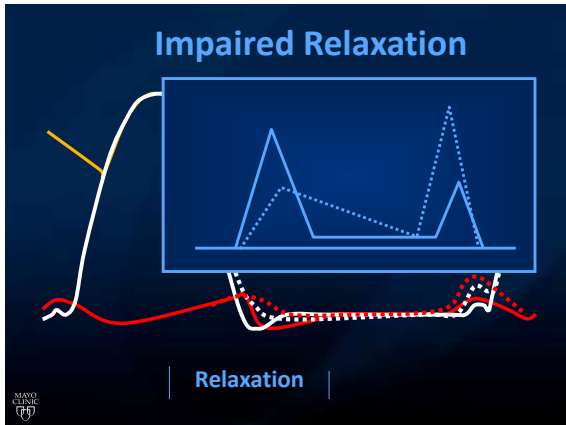


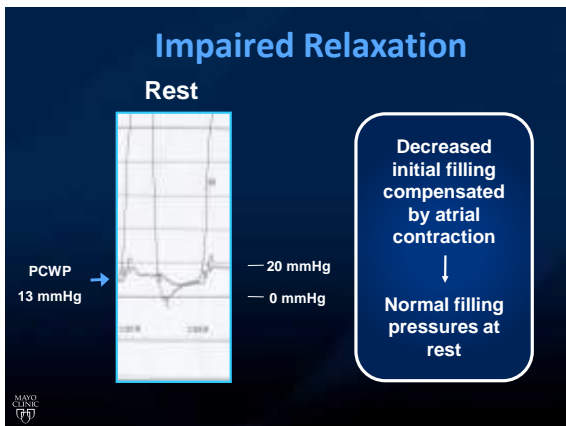


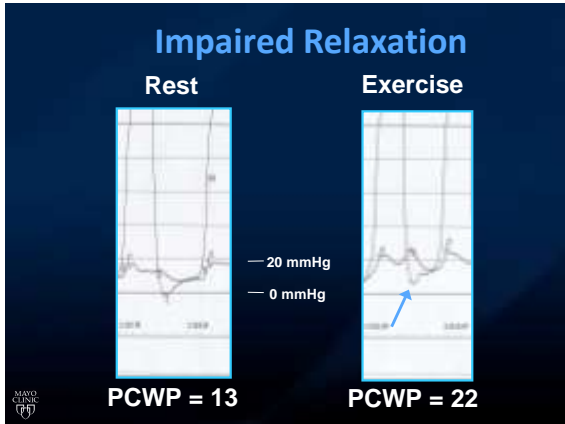


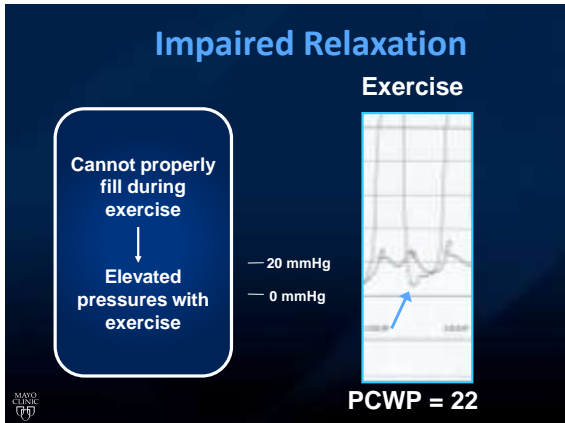


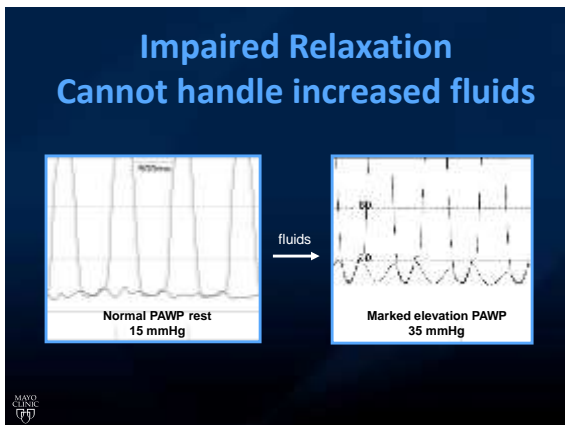


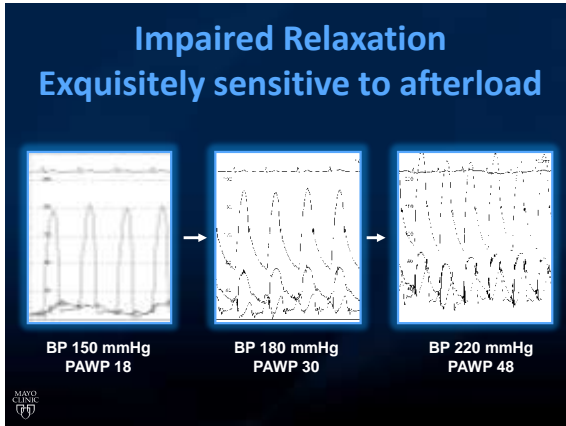


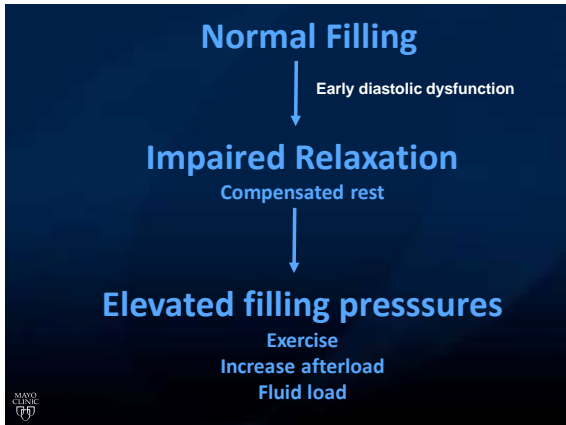


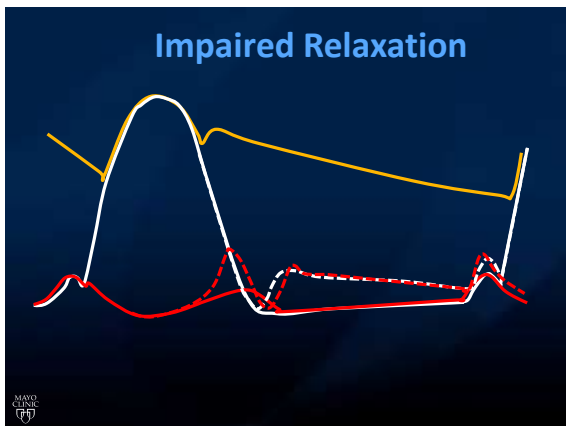


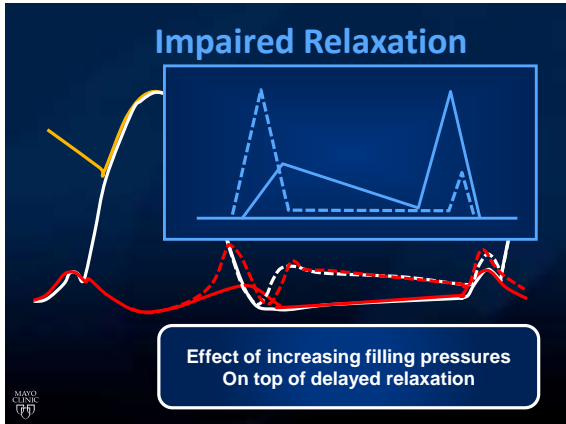


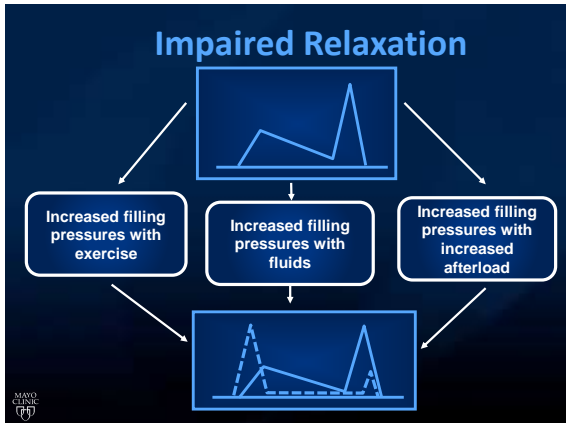


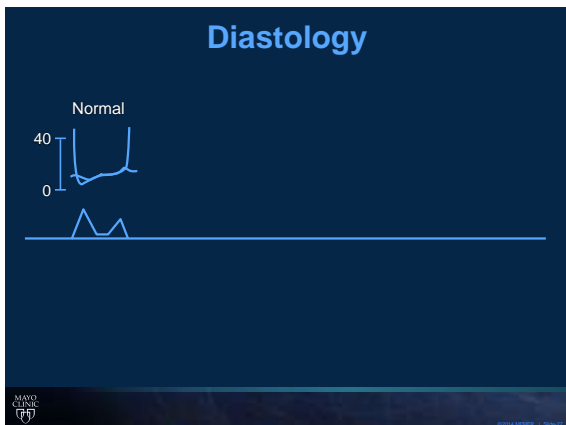


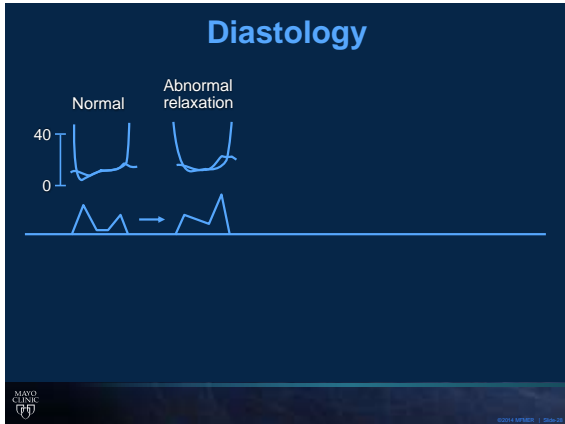


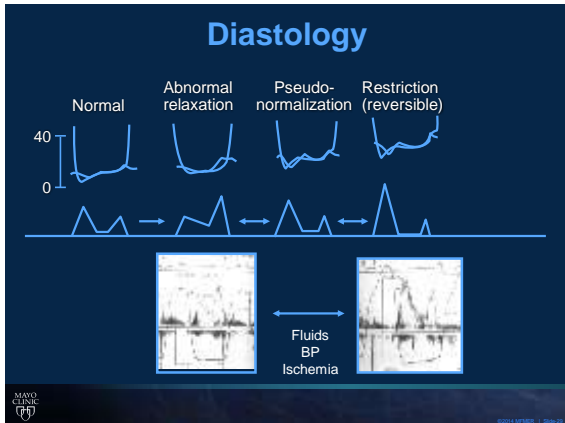


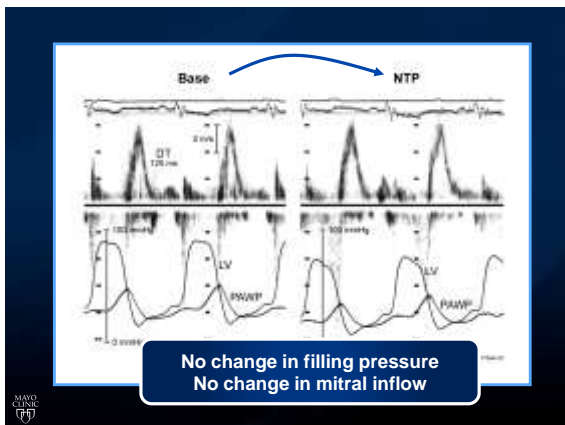


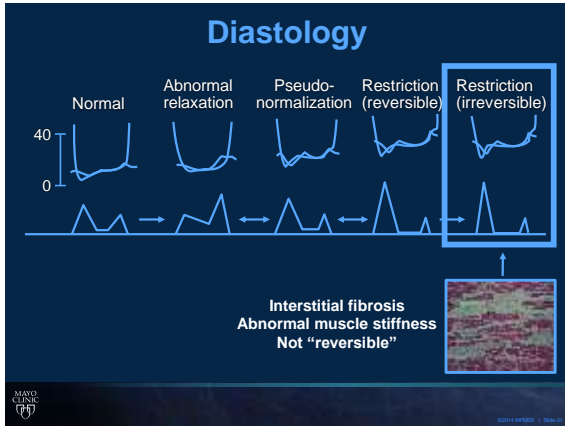


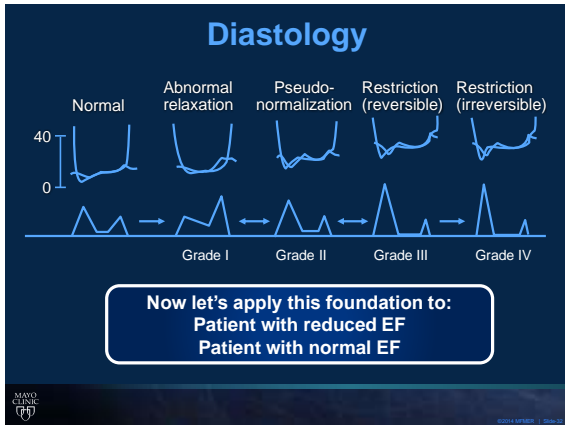




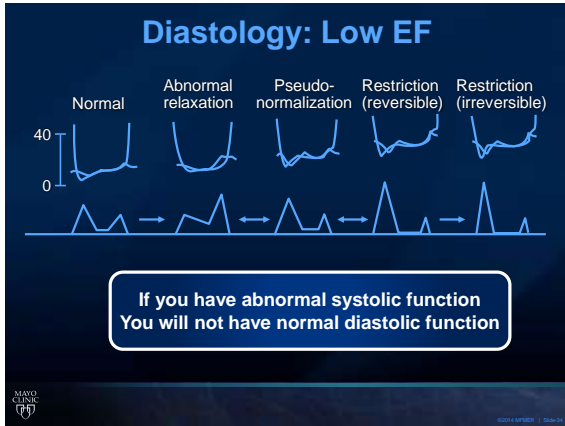


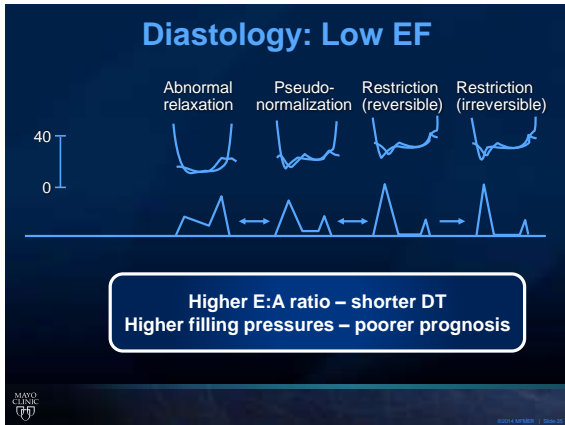


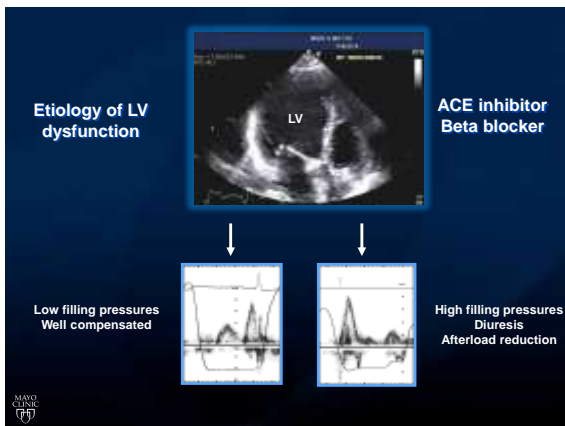


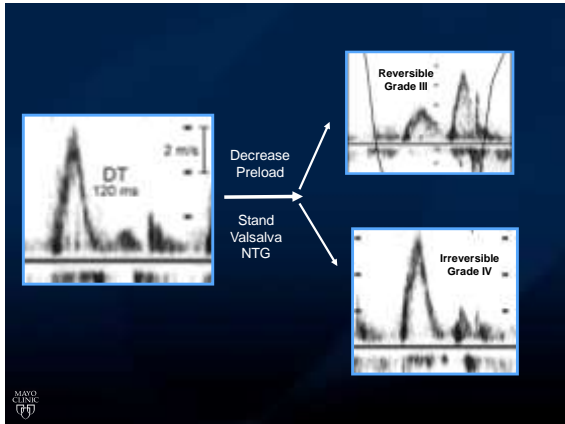


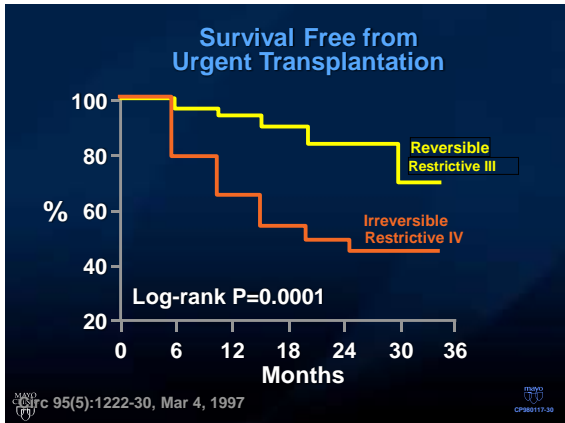


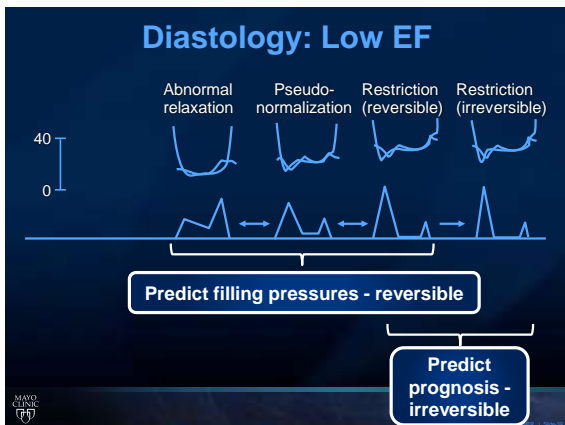








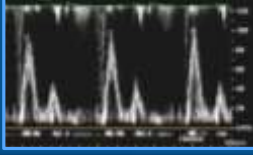





What is Diastology?

- Understand how the heart fills
 - Normally
 - Abnormally
- Apply to the patient with a low EF
- Evaluate the patient with “heart failure” and a normal EF





Looks restrictive
Looks bad

28 y/o competitive tri-athlete
Mild DOE after 20 miles

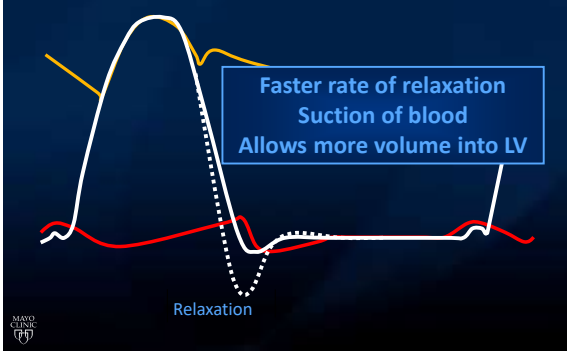


In patients with systolic dysfunction
Higher E:A and shorter DT
Higher filling pressure
Poorer prognosis

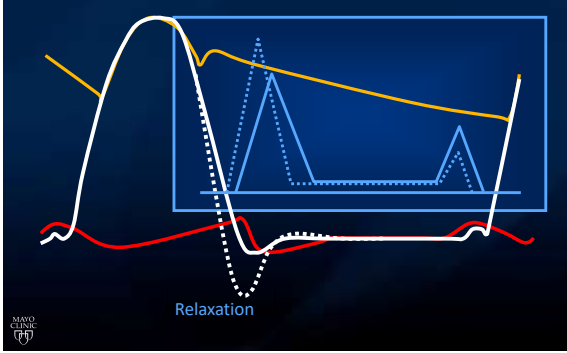
**There is a major difference
for patients with normal EF**



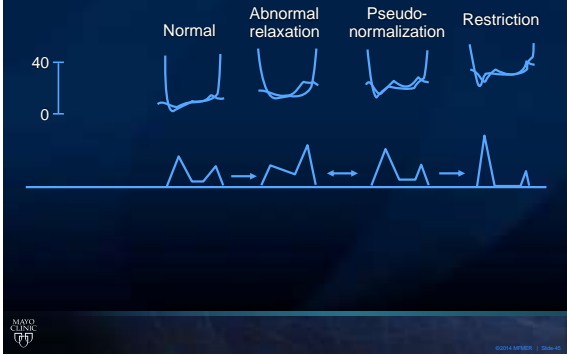
Suction: enhanced relaxation

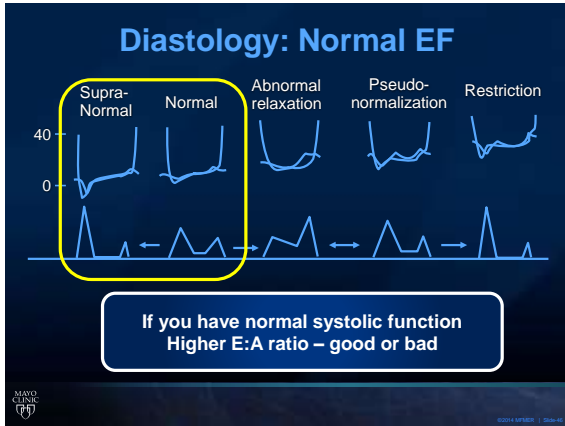


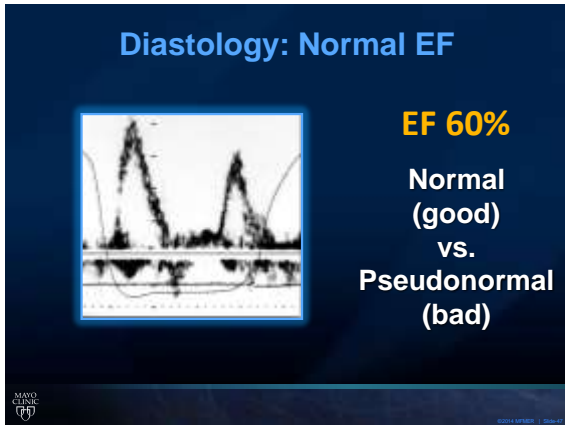
Suction: enhanced relaxation

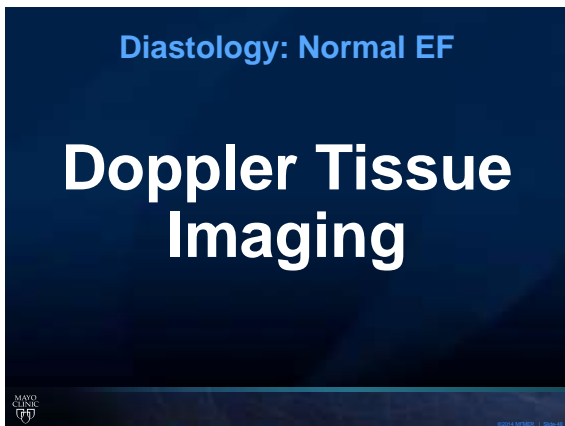


Diastology: Normal EF



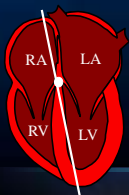






Diastology: Normal EF

End diastole



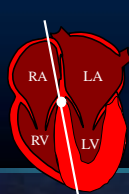
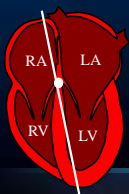
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Diastology: Normal EF

End diastole



Systole



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Diastology: Normal EF

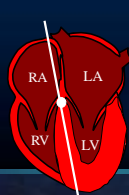
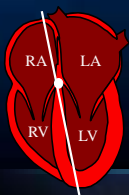
End diastole



Systole



Relaxation

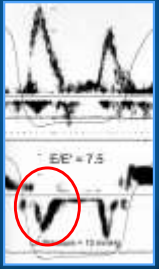


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Diastology: Normal EF

Tissue Doppler
Annular motion

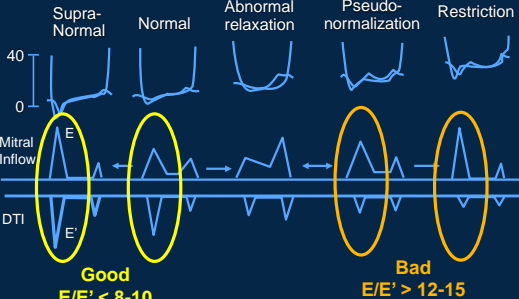
E' is the rate of ventricular relaxation
Higher E' = faster relaxation



MAND CLINIC

Diastology: Normal EF

Supra-Normal Normal Abnormal relaxation Pseudo-normalization Restriction



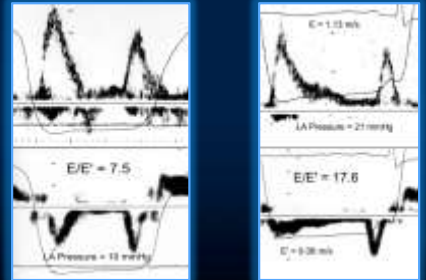
Mitral Inflow
DTI

Good $E/E' < 8-10$

Bad $E/E' > 12-15$

MAND CLINIC

Diastology: Normal EF



Normal diastolic function
Normal filling pressures

Abnormal diastolic function
Very high filling pressures

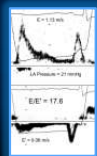
MAND CLINIC

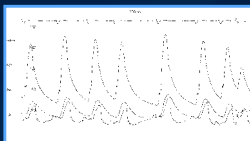
Now let's evaluate the patient with known heart failure (elevated JVP, rales, CXR congestion, elevated BNP) but preserved EF



**Clinical presentation of heart failure
Normal systolic function**

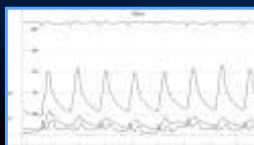
74 y/o woman – history HTN and DM
Severe SOB after holidays
Exam: BP 190/88, rales, S3
EF 66%
E/E' 17





BP 190/88
PA = 70/30 mmHg
Mean LAP = 30 with
"V" 55 mmHg

BP 122/65
PA = 35/15 mmHg
Mean LAP = 12 with
"V" 20 mmHg

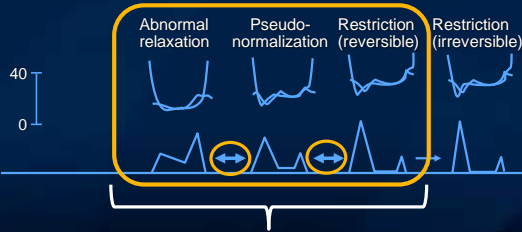


This is HFpEF Heart Failure Preserved EF

74 y/o woman – history HTN and DM
Severe SOB after holidays
Exam: BP 190/88, rales, S3
EF 66%



HFpEF – heart failure preserved EF



Concept of "ventriculo-vascular coupling"
Baseline abnormal relaxation (HTN, CAD)
Exacerbated by BP, excess salt, ischemia
Responds well to treatment

Treatment of HFpEF

Treatments that improve symptoms
Rx BP
Decrease salt

Direct Effect on Diastolic Function

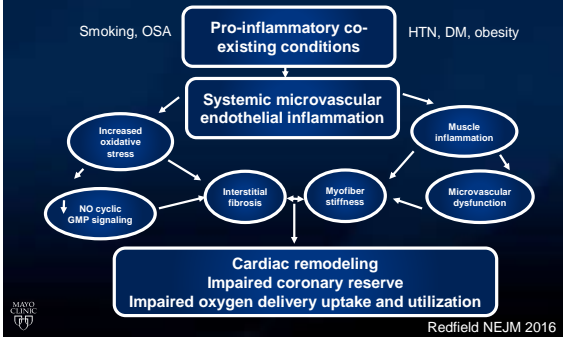
Drugs that don't work

- ACE Inhibitor
- ARB blockers
- Beta blockers
- Calcium blockers
- Sildenafil

Drugs that may work

- Aldosterone antagonist
- ARNI

Emerging pathophysiology: Inflammation and the endothelium



Emerging pathophysiology: Inflammation and the endothelium

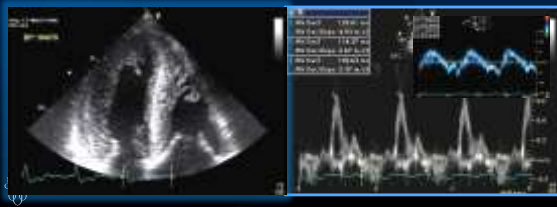
Smoking, OSA | Pro-inflammatory co-existing conditions | HTN, DM, obesity

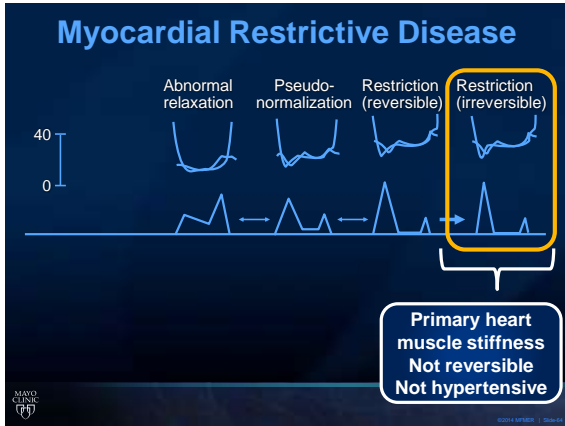
Treatments that work!!!
Diet and exercise
Weight loss
CPAP

Redfield NEJM 2016

Clinical presentation of heart failure Normal systolic function

55 y/o man – progressive DOE 6 months
 Edema and ascites
 Exam: BP 90/60 JVP elevated 20 cm
 No murmur S3 present





Clinical presentation of heart failure
Normal systolic function

This is NOT HFpEF!

- Not hypertensive
- Predominant ascites, edema
- Marked elevation JVP
- Clear lungs

55 y/o male - progressive DCM 6 months
Edema and ascites
Exam BP 145/90 JVP elevated 30 cm
No murmur S2 present

Clinical presentation of heart failure
Normal systolic function

Severe myocardial restrictive disease

1. Amyloidosis
2. Radiation heart
3. Sarcoid, HCM

55 y/o male - progressive DCM 6 months
Edema and ascites
Exam BP 145/90 JVP elevated 30 cm
No murmur S2 present


Clinical presentation of heart failure
Normal systolic function

Severe myocardial restrictive disease

1. Amyloidosis
2. Radiation heart
3. Sarcoid, HCM

Further workup

- Bloods
 - Sed rate
 - Free light chains
 - Ferritin
- MRI scan
- Pyrophosphate scan
- Endomyocardial biopsy




Clinical presentation of heart failure
Normal systolic function

“True” HFpEF
Ventriculo-vascular Coupling

Episodes pulmonary edema
Hypertensive
Responsive to:
Diuretics,
Vasodilators

Restrictive Myocardial Disease

Right heart failure
Hypotensive
Not responsive to:
Diuretics,
Vasodilators



Clinical presentation of heart failure
Don't forget this one



Apical 4-Chamber View




Clinical presentation of heart failure
Normal systolic function

“True” HFpEF
Ventriculo-vascular
Coupling

Restrictive
Myocardial
Disease


Constrictive
Pericarditis



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