

# The Art and Science of the Jugular Venous Pulse

André M. Mansoor  
Physical Diagnosis PDX  
[www.pdxpdx.com](http://www.pdxpdx.com)

No conflicts of interest to disclose



# A Quote

*The inability to properly assess the pressure level and wave contour of the internal jugular veins should encourage the cardiologist interested in heart failure to either learn and develop skill in this component of the physical examination or move to another area of cardiovascular medicine.*

- Carl Leier



# Overview

- This presentation is divided into 3 objectives/sections:
  1. How to **identify** the jugular venous pulse
  2. How to perform a **quantitative** assessment of the jugular venous pulse
  3. How to perform a **qualitative** assessment of the jugular venous pulse
- Multimedia quiz to follow



# Section 1: Identification

- *Most important component*
  - Cannot perform quantitative or qualitative assessment without first identifying the jugular venous pulse
- The jugular venous pulse is visible in MOST patients
- Where can it be found?
  - Right internal jugular vein
  - Left internal jugular vein
  - External jugular veins
  - Elsewhere?



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# Section 1: Identification

- Steps:

1. Position the patient

- a. Start at 30-45° for most patients
- b. Neck and torso must be in same plane
- c. Add or remove pillows as needed to relax the sternocleidomastoid

2. Observe the neck from a tangential perspective

3. Locate movement in the neck

- a. Your viewing window is between the clavicle and the jaw
- b. Manipulate angle to bring waveform into this window

4. Is the movement venous or arterial?



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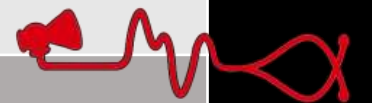
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# Section 1: Identification



Strategies for differentiating venous and arterial pulsations:

Characteristic	Arterial	Venous
<u>Waveform</u>	Single peak, quick, sharp 	Double peak, undulating 





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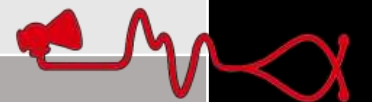
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<u>Most striking feature*</u>	Outward movement	Inward movement (X/Y troughs)

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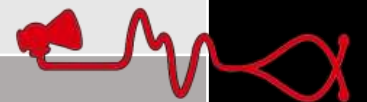
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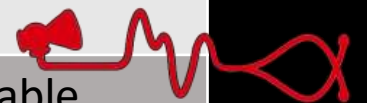
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<u>Patient positioning (angle)</u>	Unaffected	Varies with position
<u>Respiratory cycle</u>	Unaffected	Affected by respiratory cycle
<u>Abdominojugular reflux*</u>	Unaffected	Pulse moves upward



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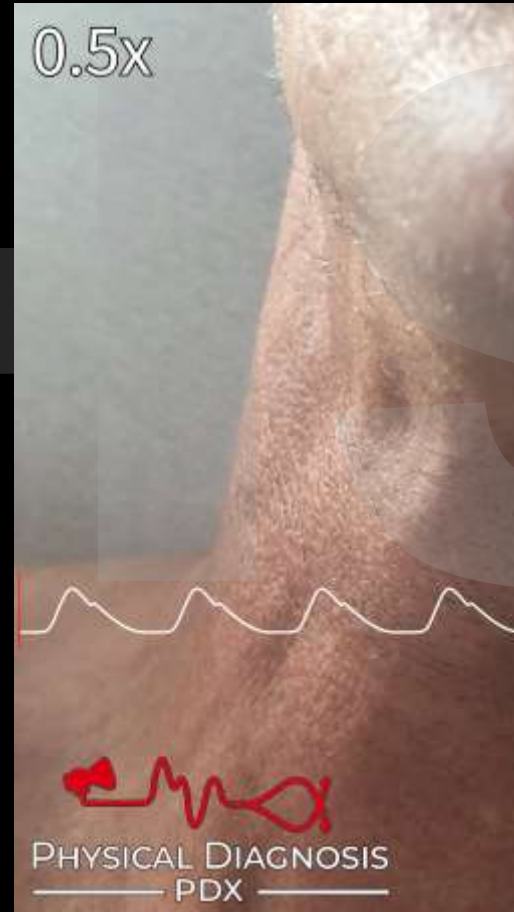
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<u>Abdominojugular reflux*</u>	Unaffected	Pulse moves upward
<u>Palpation</u>	Palpable	Almost always non-palpable



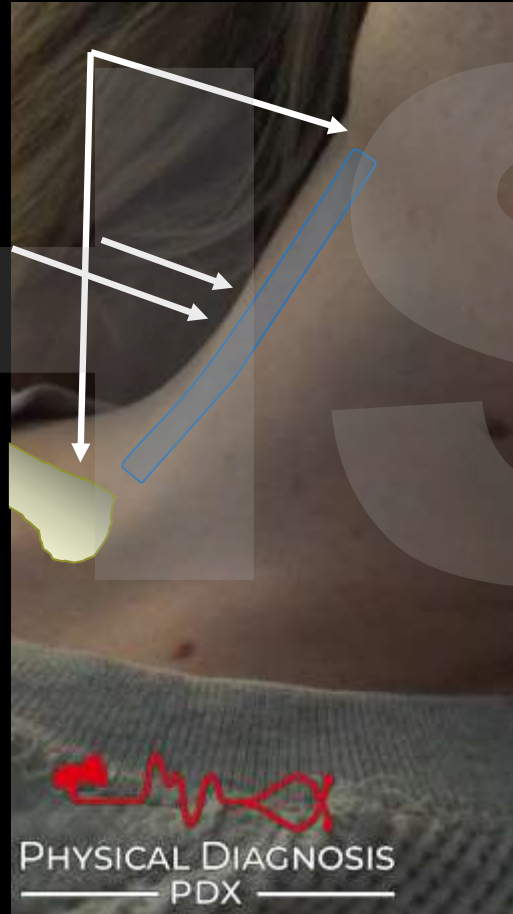
# What is the Nature of This Pulsation?



# Normal Carotid Pulse



# Normal Venous Pulse



# Abdominojugular Reflux



# Abdominojugular Reflux



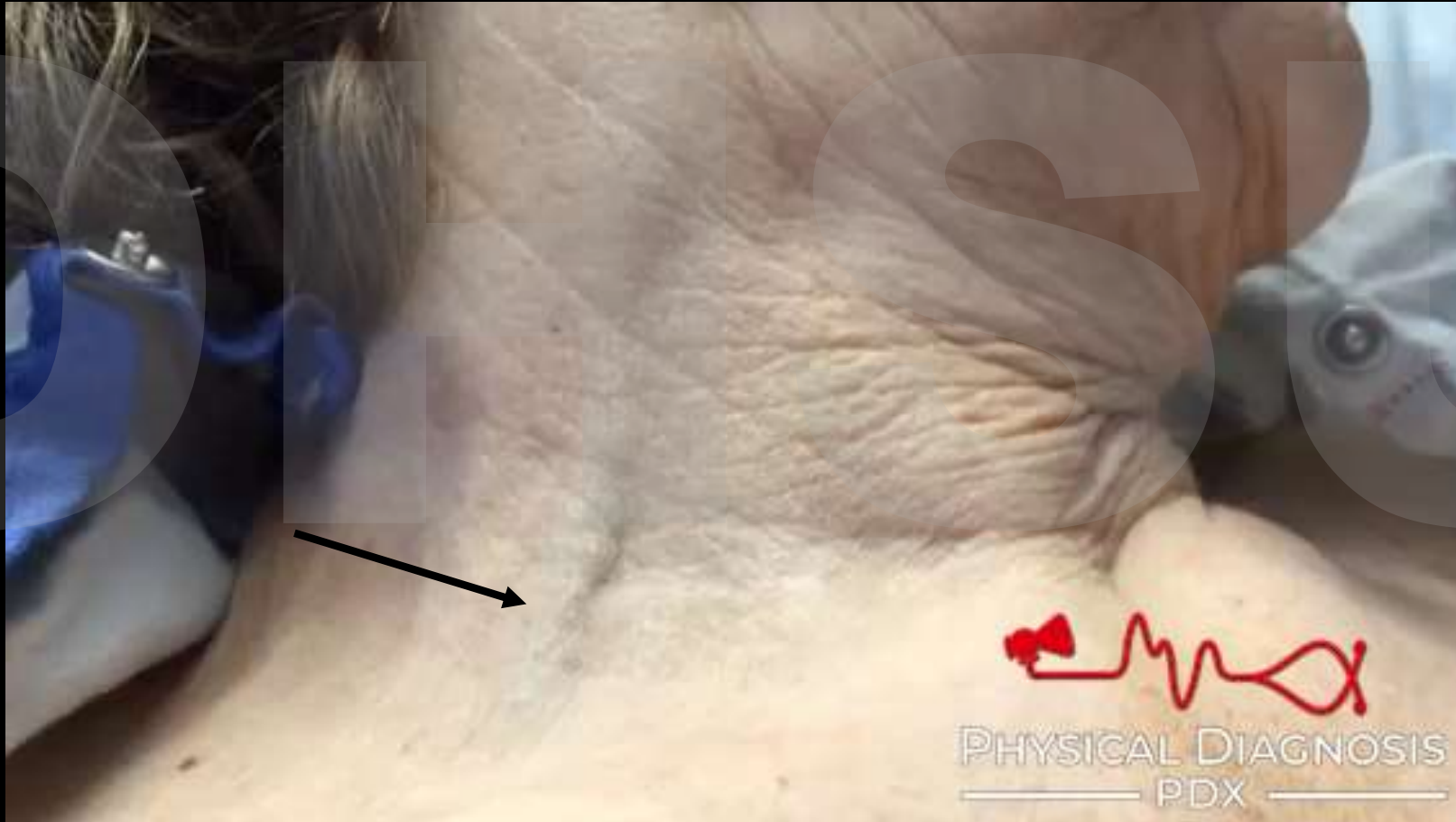
If the R Internal Jugular is Unavailable...



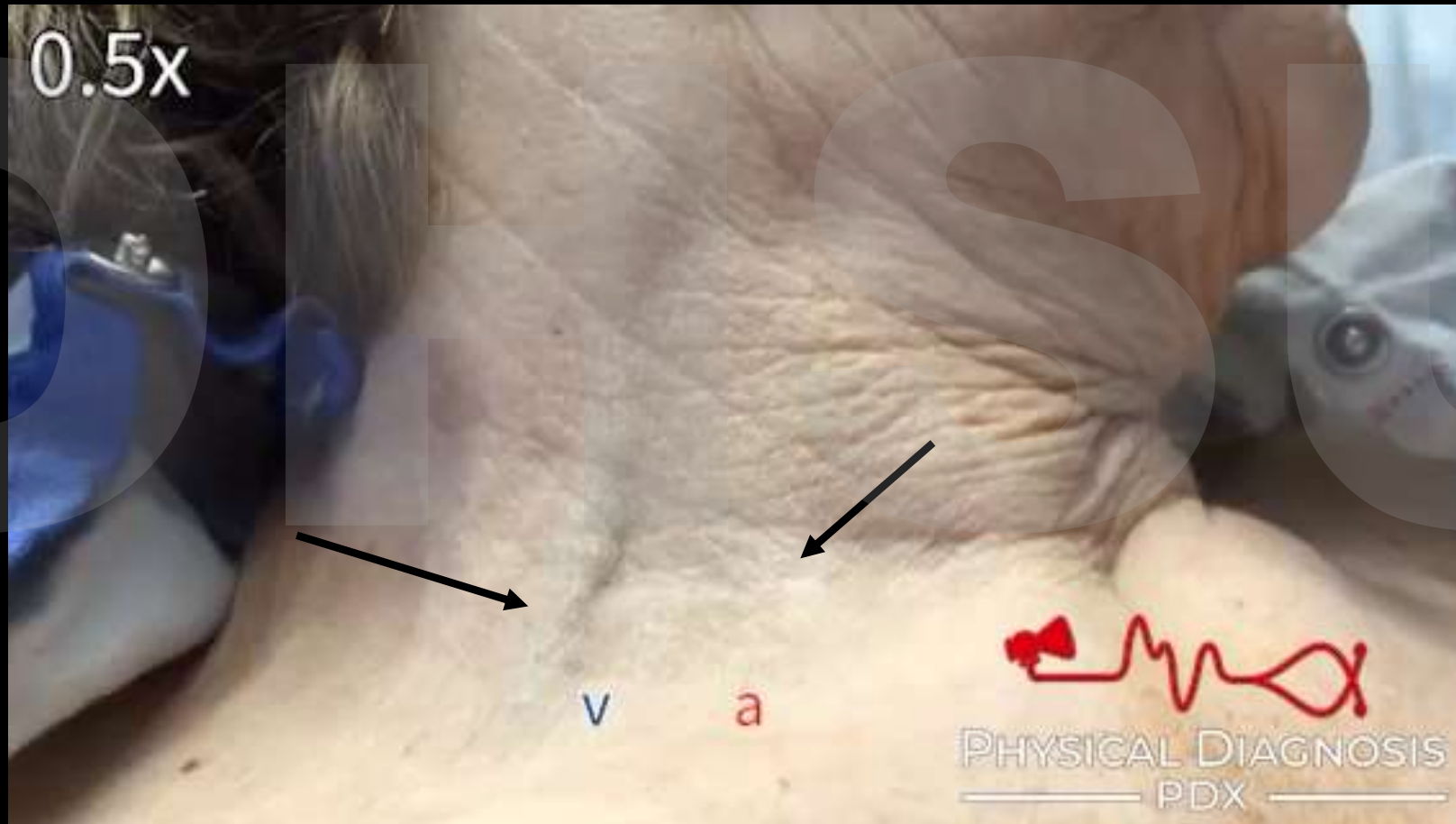
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# If Both Internal Jugulars are Unavailable...



# If Both Internal Jugulars are Unavailable...



# Can't Find the Jugular Venous Pulse?



# Can't Find the Jugular Venous Pulse?



OH SU

# Look Higher



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# Look Higher



# Section 2: Quantitative Assessment

- Most frequently applied component
- Used on a day-to-day basis

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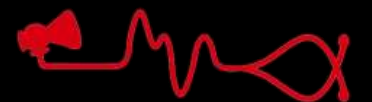
# Section 2: Quantitative Assessment

- What are we measuring?
  - Right atrial pressure
    - Normal RA pressure <6 mm Hg (via cath) or <8 cm H<sub>2</sub>O (via exam)
- Why are we measuring it?
  - To establish a diagnosis
  - Most often used to establish and follow volume status



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# Section 2: Quantitative Assessment

- How do we measure it?
  - We want to measure the height of the column of blood above the RA
  - But the RA is in the middle of the chest. . .
  - Must use landmarks to extrapolate to center of RA
    - Supine up to 30°: Angle of Louis is ~5 cm above middle of RA
    - At 30° or greater: Angle of Louis is ~8-10 cm above middle of RA
    - Upright position only: clavicles are ~12-16 cm above middle of RA
  - Tip: measure the width of your hand



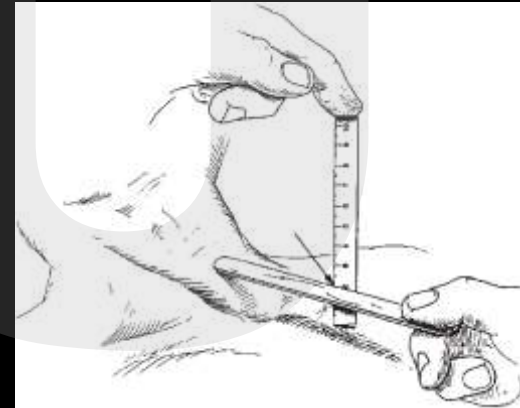
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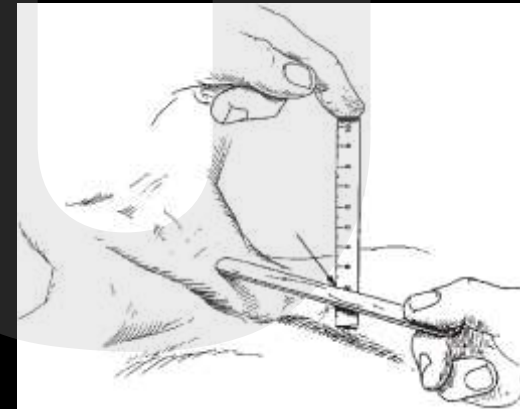


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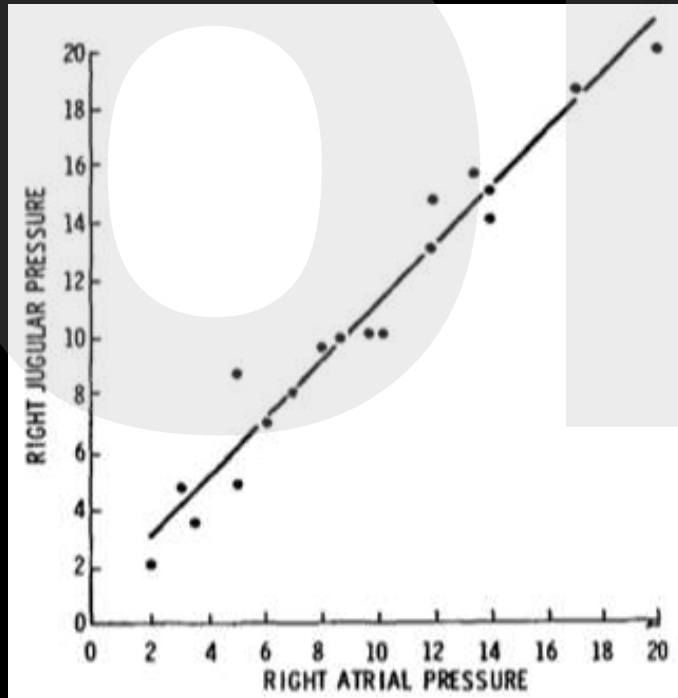
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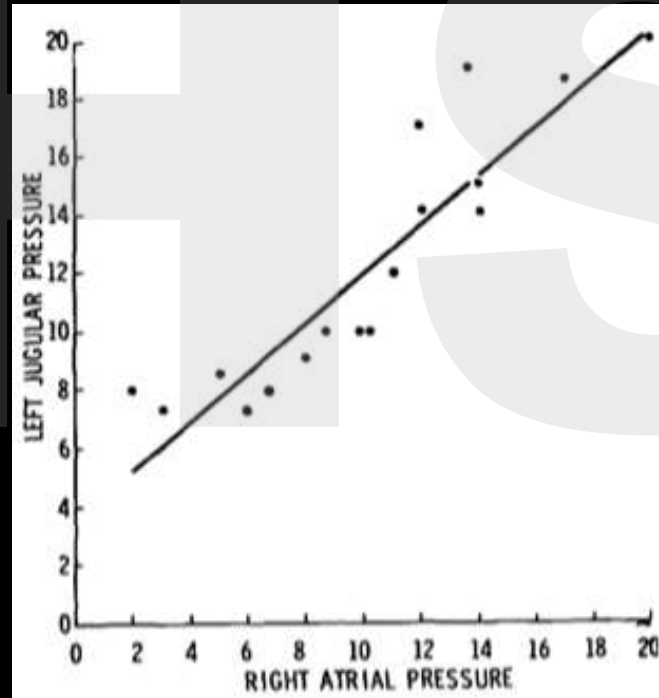


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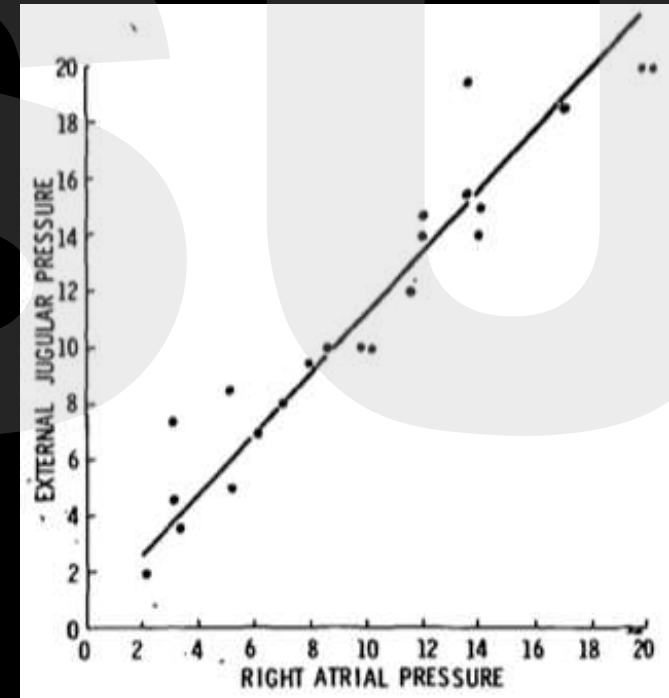
R IJ

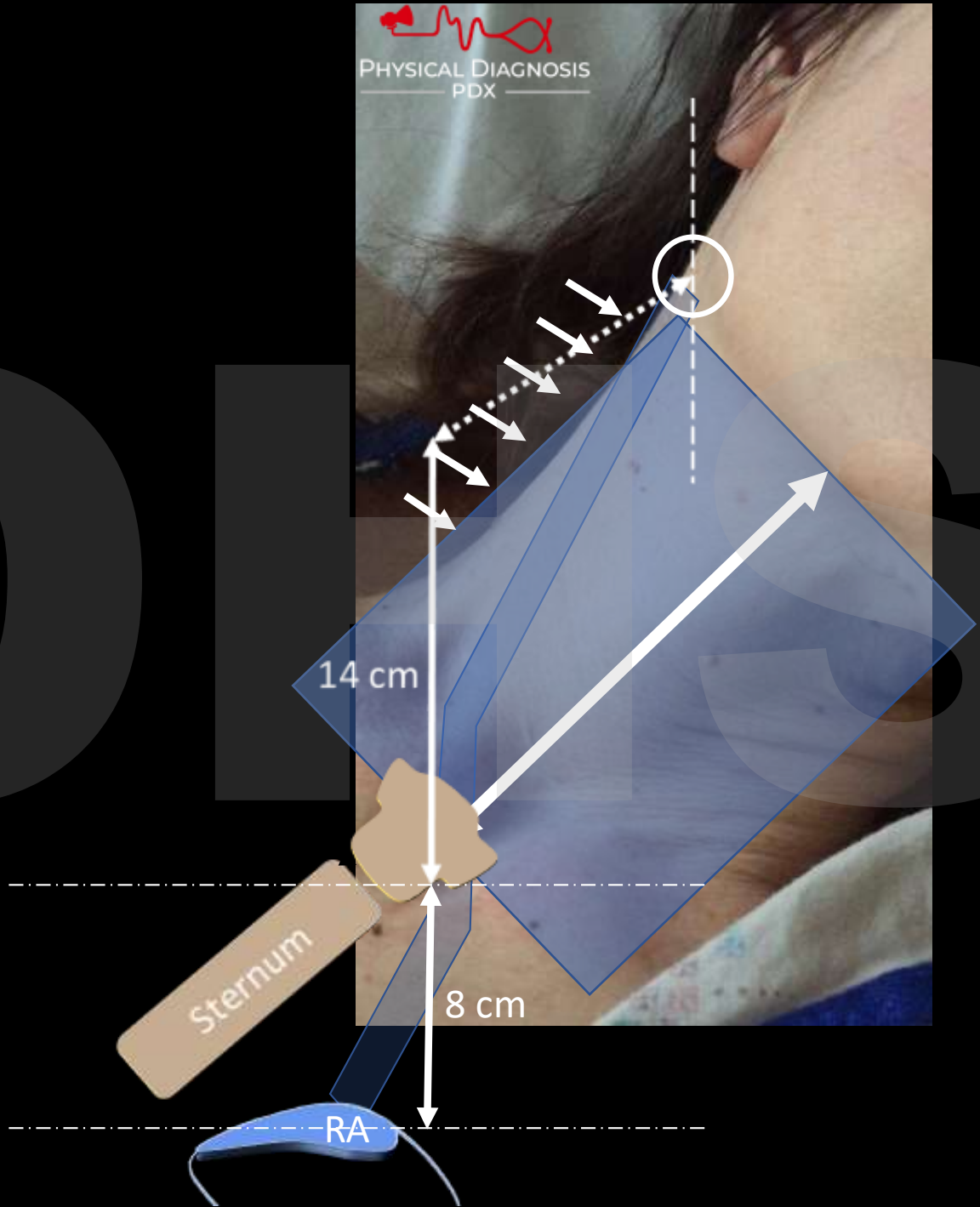


L IJ



EJ





OLDSU

# The Forehead Sign

- When you see indentations in the forehead, consider longstanding elevated CVP



# The Forehead Sign

- Same patient in a more reclined position



# The Forehead Sign



# The Forehead Sign



# OLDSU



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PDX

# One Last Place to Look...



# One Last Place to Look...



# Section 3: Qualitative Assessment

- Much can be learned about the heart by assessing the jugular venous waveform (beyond RA pressure)

OHSU



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- What is Mobitz I heart block?



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- Much can be learned about the heart by assessing the jugular venous waveform (beyond RA pressure)
- What is Mobitz I heart block?
- When was it described by Wenckebach?
  - Answer: 1893
- When was electrocardiography clinically available?
  - Answer: 1895

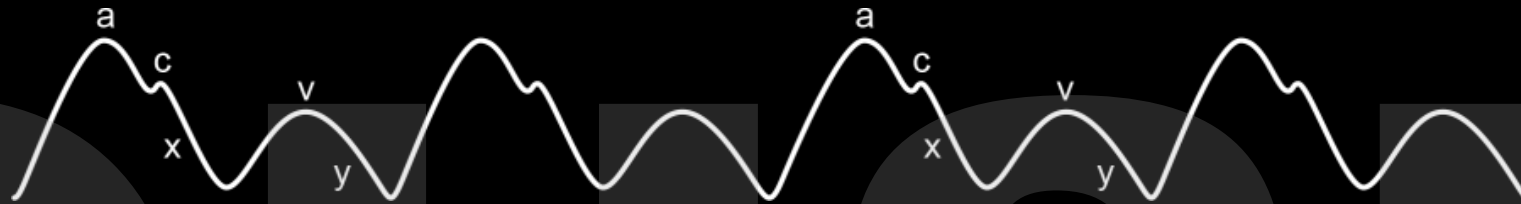


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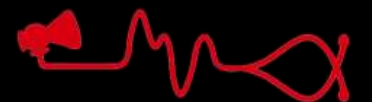
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- What is Mobitz I heart block?
- When was it described by Wenckebach?
  - Answer: 1893
- When was electrocardiography clinically available?
  - Answer: 1895
- What is the explanation for this seeming paradox?



# Section 3: Qualitative Assessment



- “a” wave: right atrial contraction (late diastole)
- “c” wave: tricuspid valve closure (early systole)
- “x” descent: RA relaxation + ventricular contraction (mid systole)
- “v” wave: RA filling (late systole)
- “y” descent: passive RV filling (early diastole)

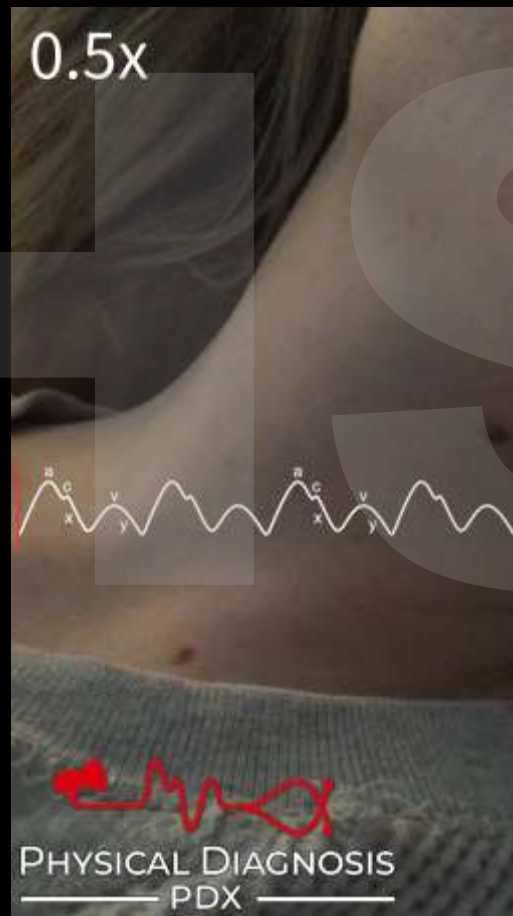


# Normal Jugular Venous Waveform

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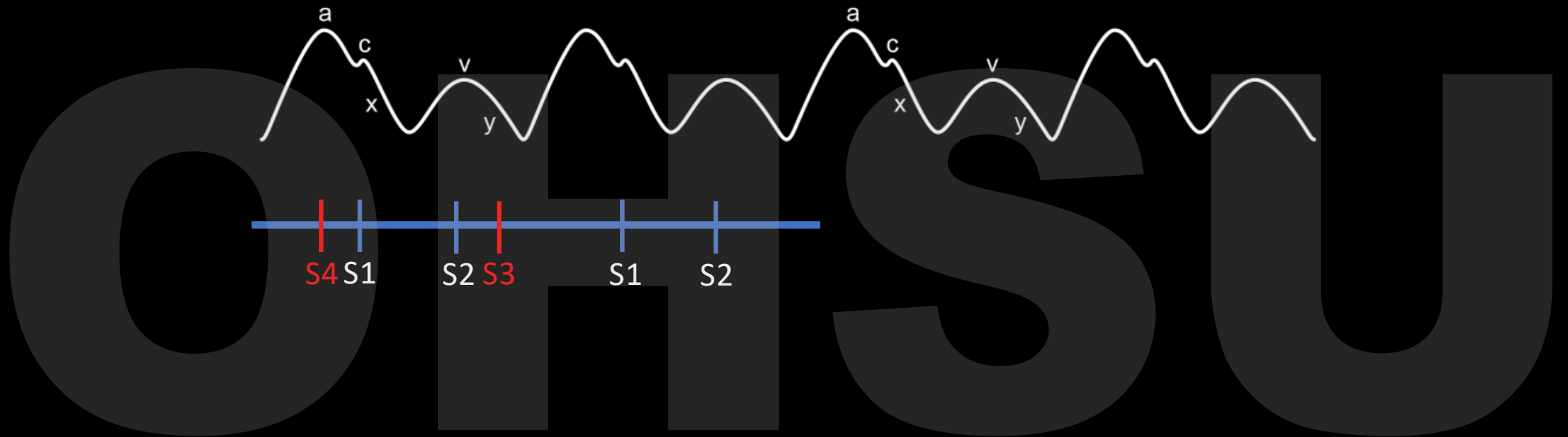
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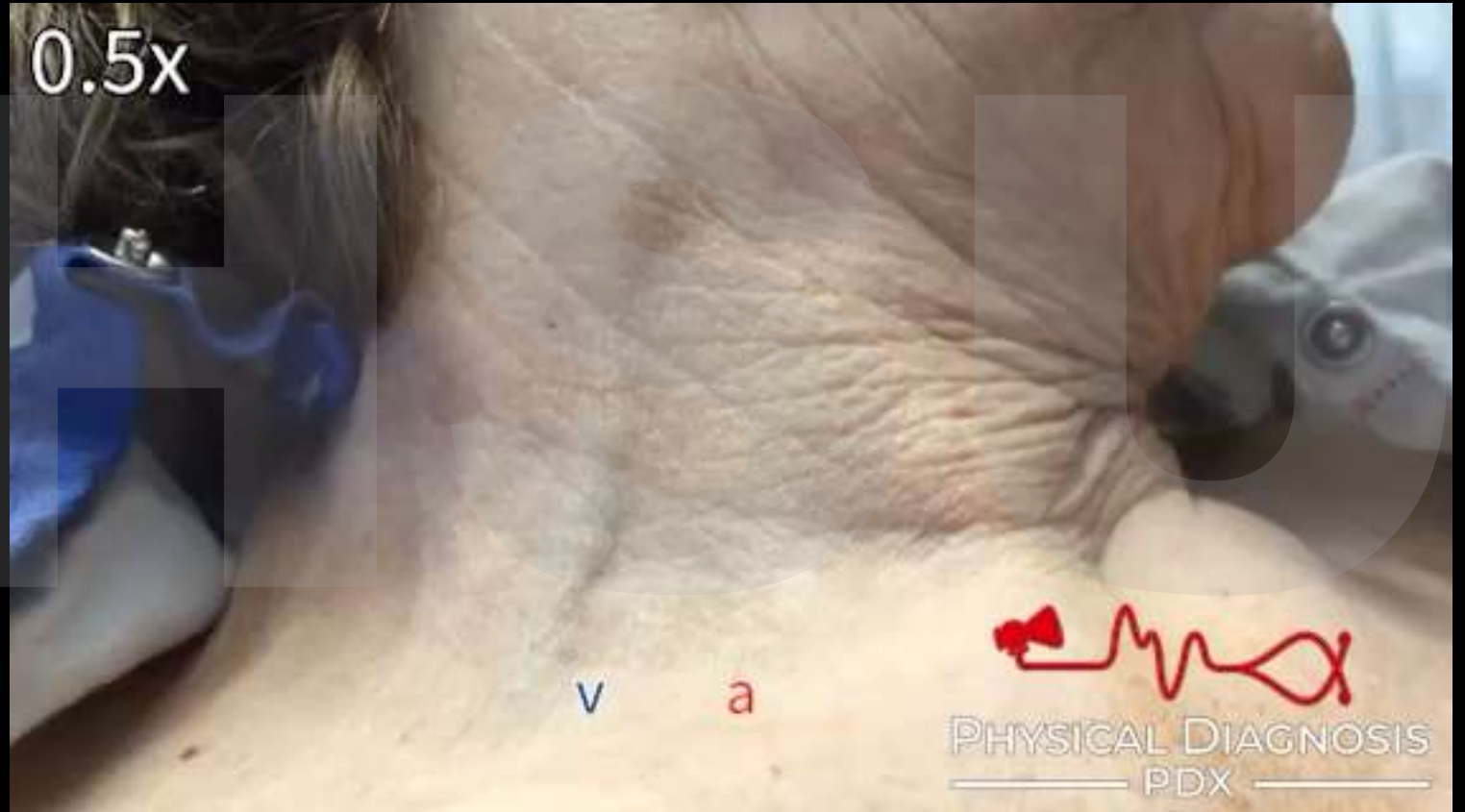
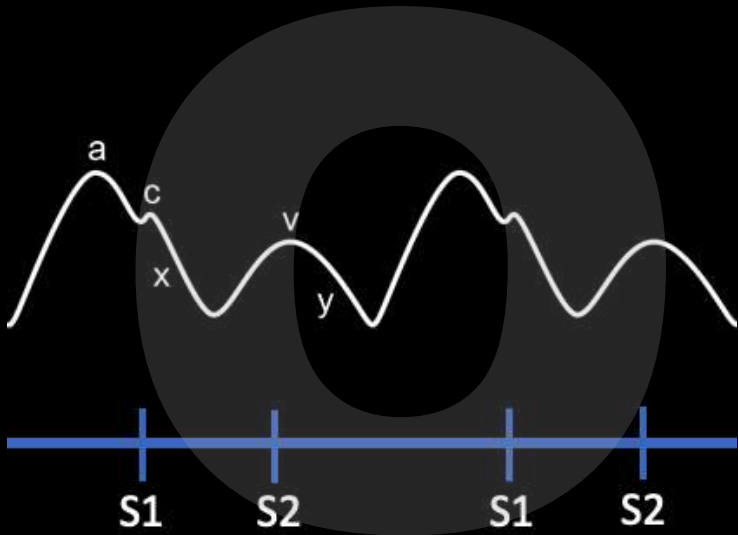
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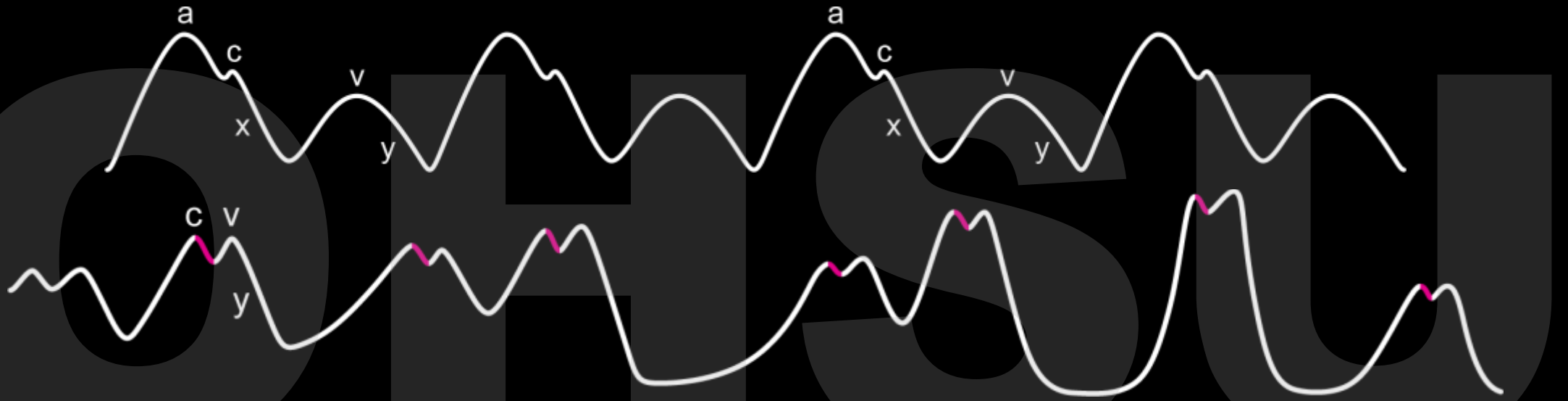
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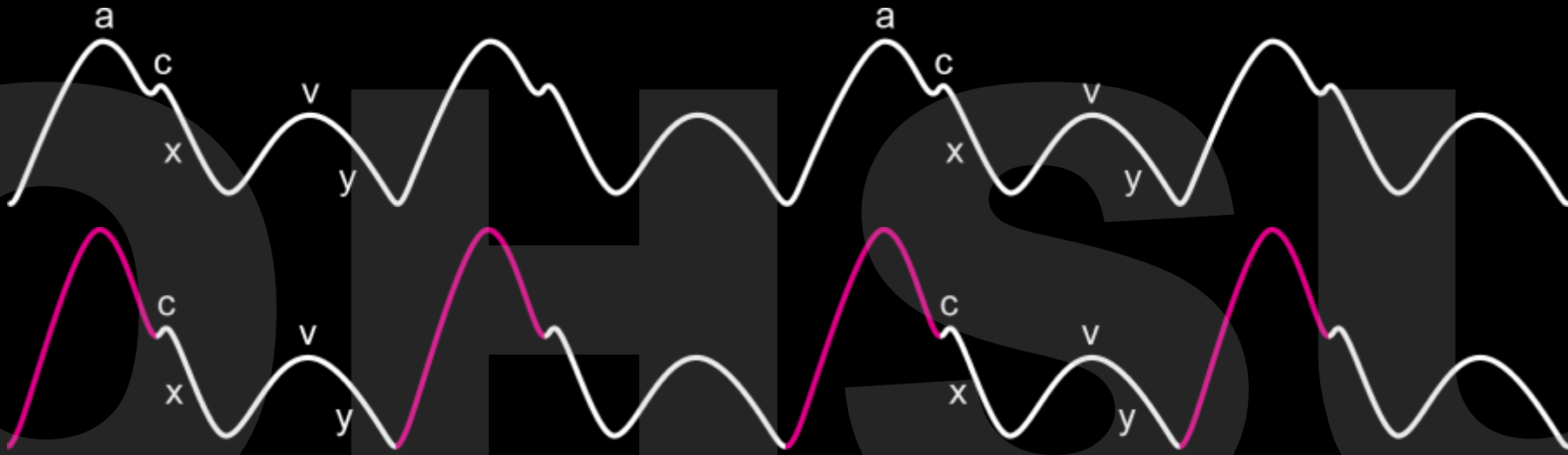
# Absent a wave, Small x descent



- Caused by absent atrial contraction (a wave) & relaxation (x descent)
- Atrial fibrillation
- The waveform will occur with an irregular rhythm



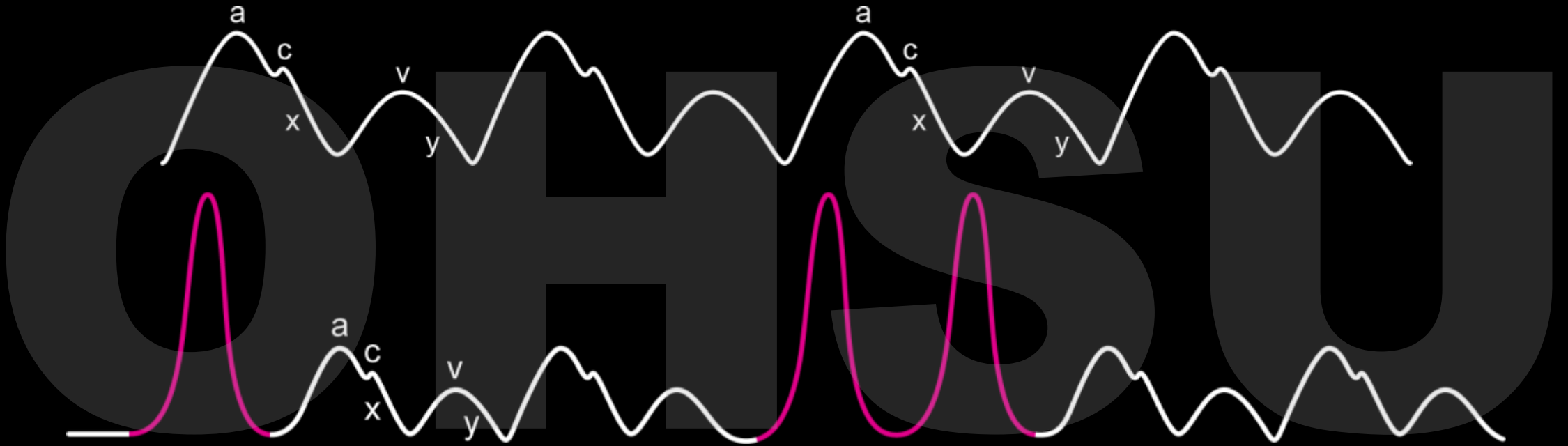
# Giant a Wave



- Caused by resistance to RV filling
- Tricuspid stenosis, increased RV end-diastolic pressure (e.g., pulmonary HTN)
- The giant a wave occurs with every beat

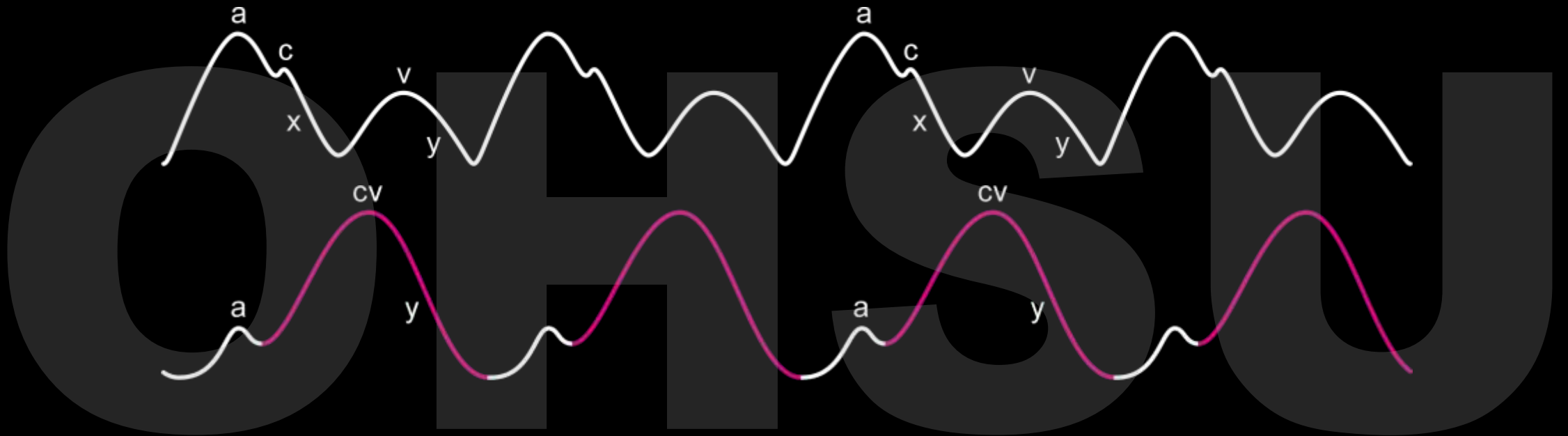


# Cannon a Wave



- Caused by atrial contracting against a closed tricuspid valve
- Atrioventricular dissociation
- The cannon a wave usually occurs intermittently
- When it occurs with every beat, it indicates AV dissociation + retrograde atrial activation from SVT (e.g., junctional rhythm)

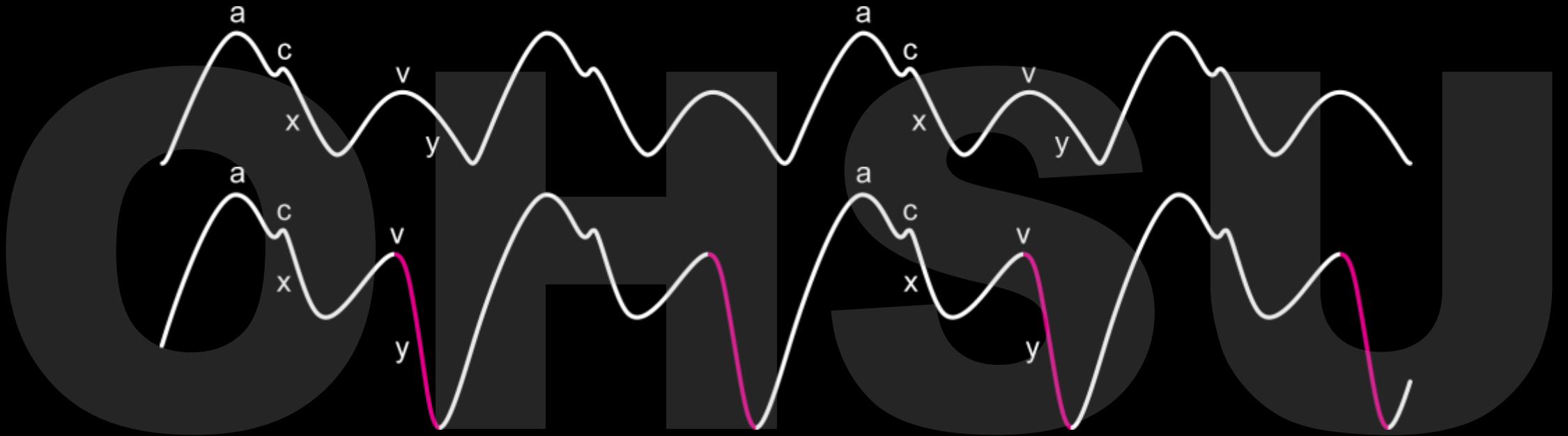
# CV Fusion Wave



- Also known as Lancisi's sign
- Tricuspid regurgitation
- Listen for the associated characteristic murmur

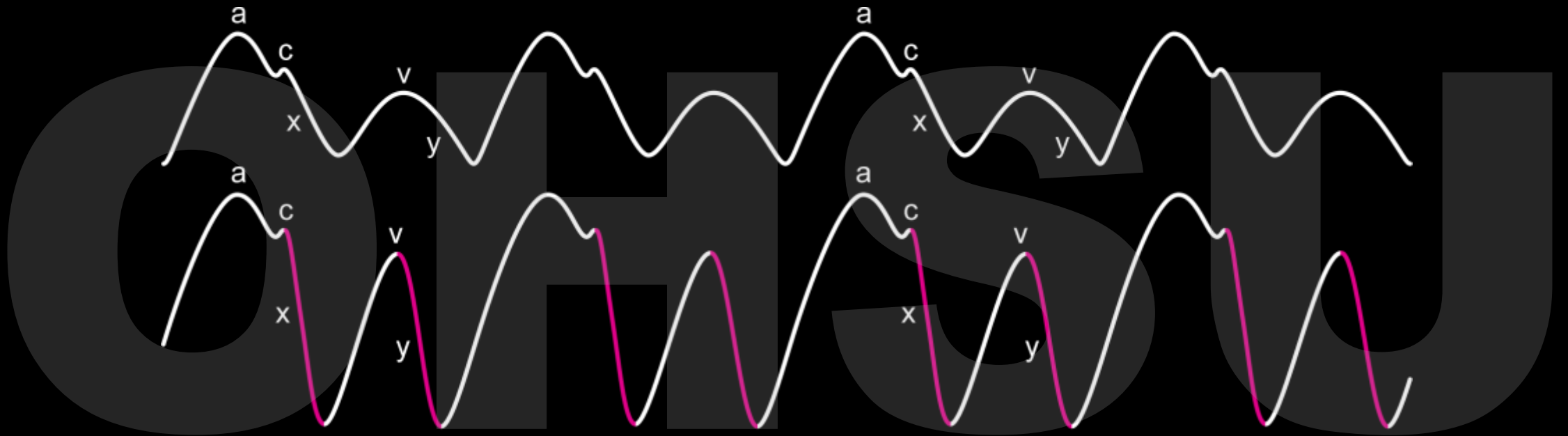


# Sharp and Deep Y Descent



- Also known as Friedreich's sign
- Constrictive pericarditis, restrictive cardiomyopathy
- Listen for the associated pericardial knock

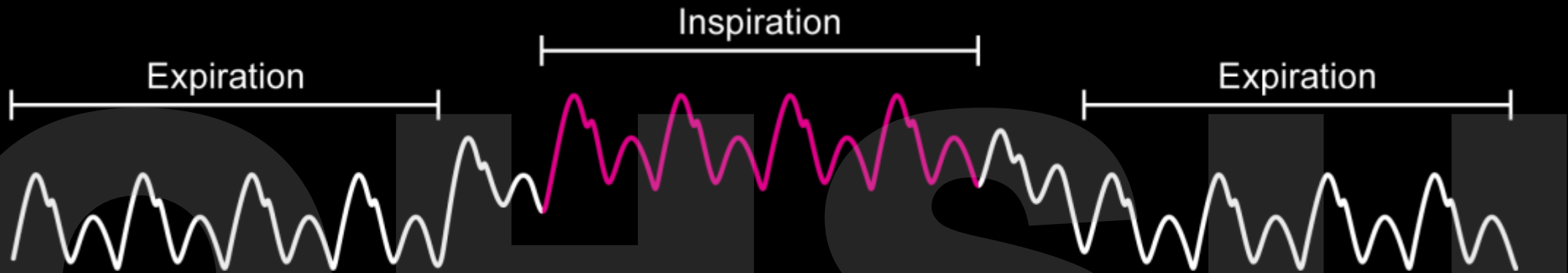
# Sharp and Deep X and Y Descents



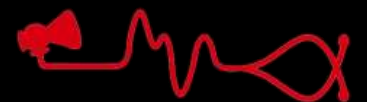
- Also known as the W sign
- Constrictive pericarditis



# Inspiratory Rise in JVP

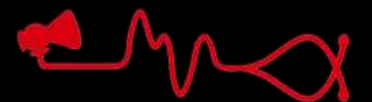


- Also known as Kussmaul's sign
- Caused by reduced RV compliance from any cause
  - RV failure
  - Tricuspid stenosis
  - Constrictive pericarditis
  - Restrictive cardiomyopathy

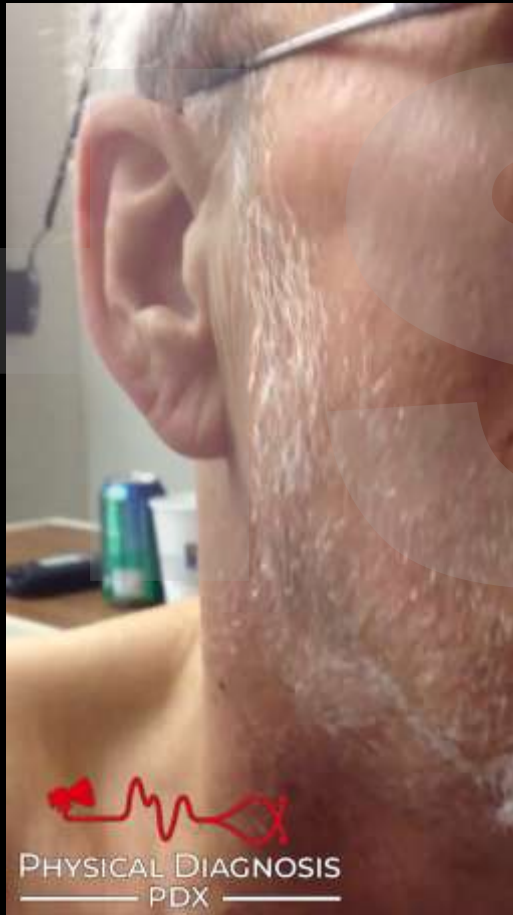


# Section 3: Qualitative Assessment

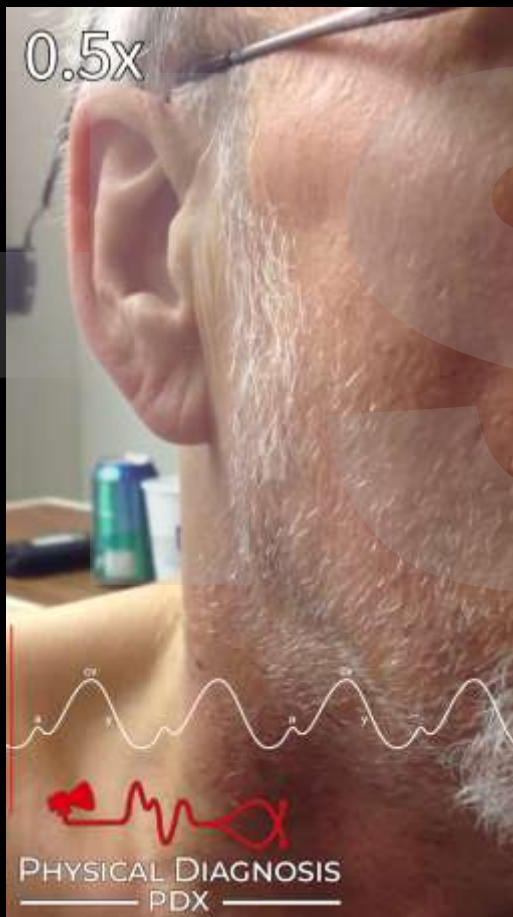
O H S U  
QUIZ MODE



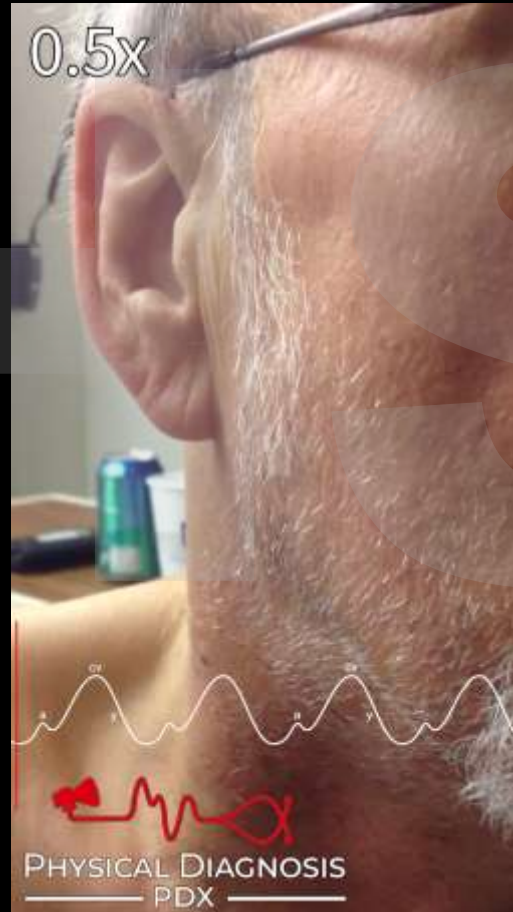
# OHSSU



# OHSSU



# Lancisi's Sign



# OHSSU



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PDX

OHSSU



# Kussmaul's Sign



# OHSSU



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— PDX —

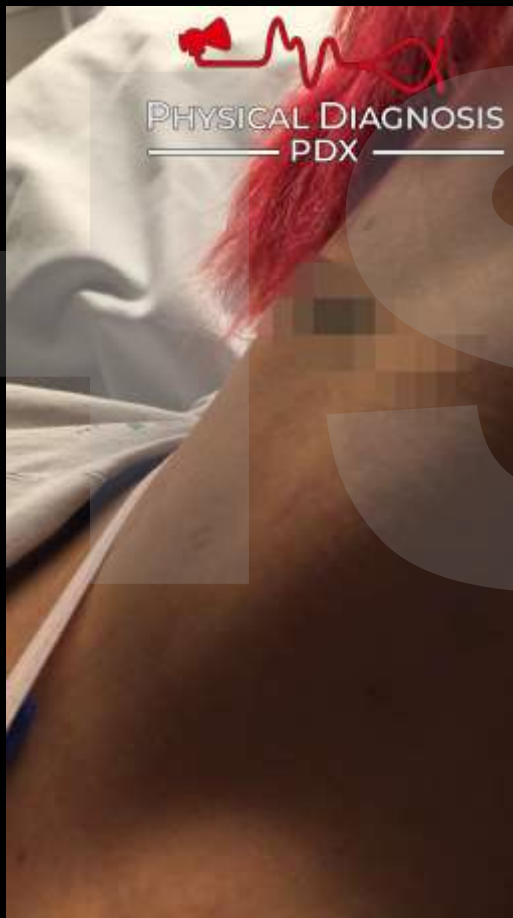
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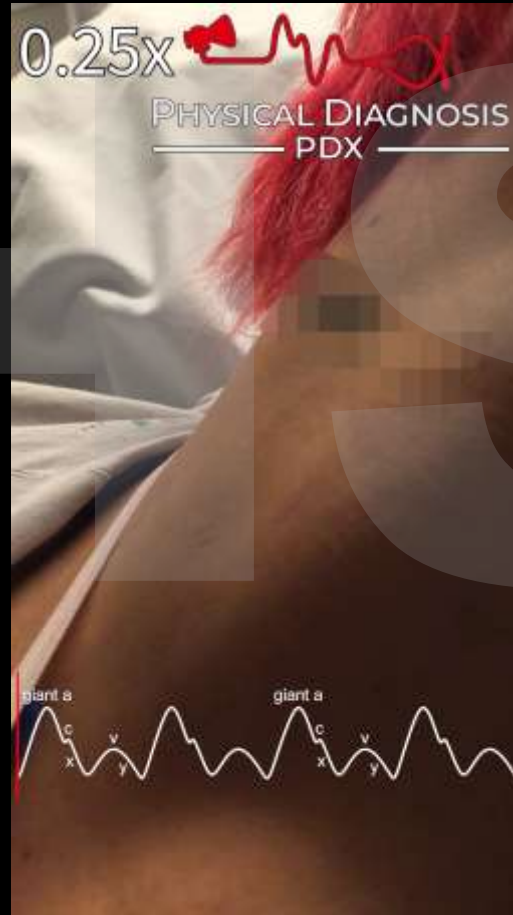
# Friedreich's Sign



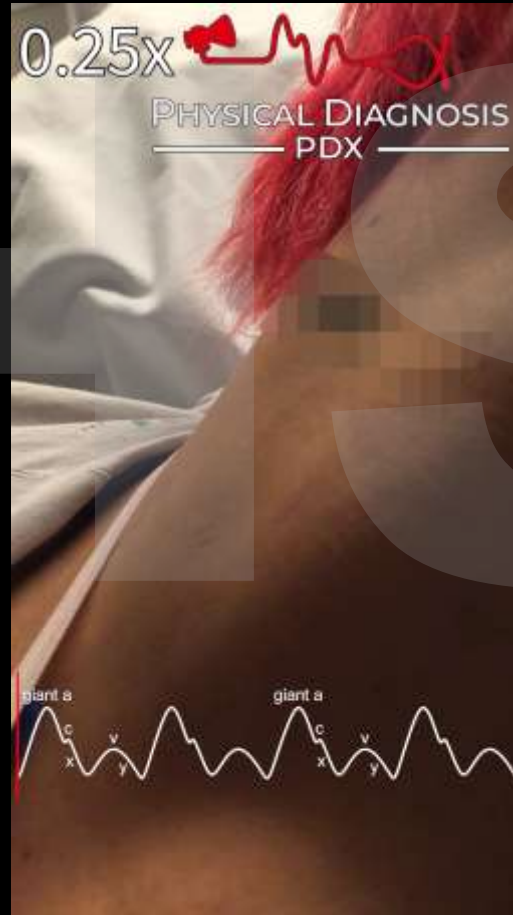
# OHSSU



# Giant A Wave



# Giant A Wave



# OHSSU



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PDX

# OHIO STATE



# Kussmaul's Sign



# OHIO STATE



OHIO STATE



# Lancisi's Sign



# OH SU



O H S U



# Lung Disease



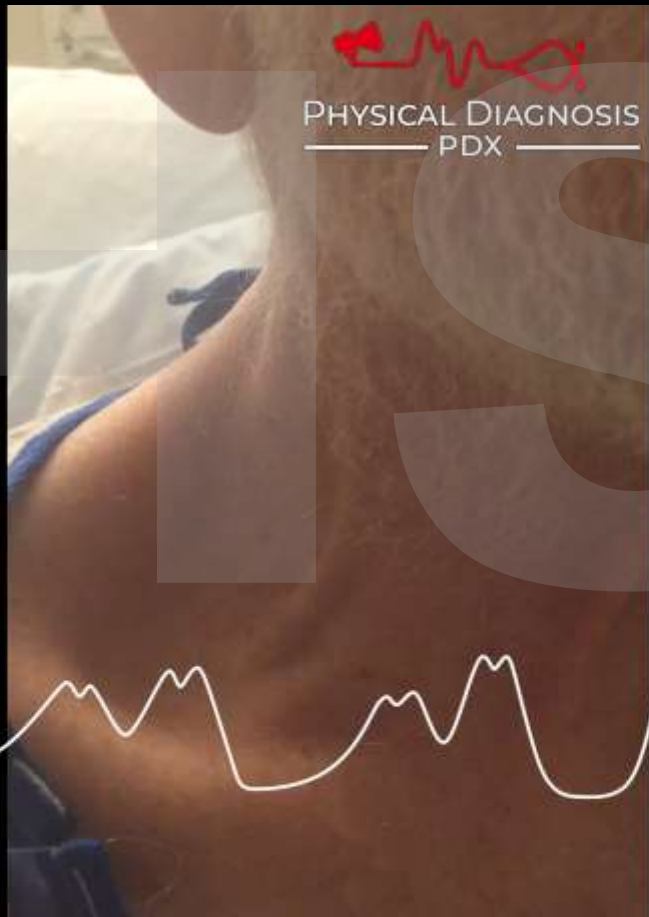
# OHIO STATE



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PDX

# OHSSU

0.5x



PHYSICAL DIAGNOSIS  
PDX



# Atrial Fibrillation

0.25x





PHYSICAL DIAGNOSIS  
PDX

# Kussmaul's Sign

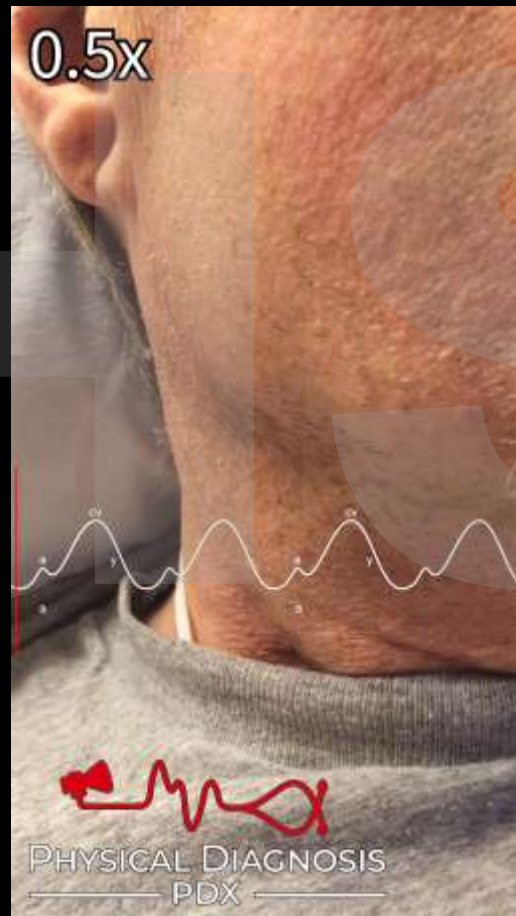


# OHIO STATE

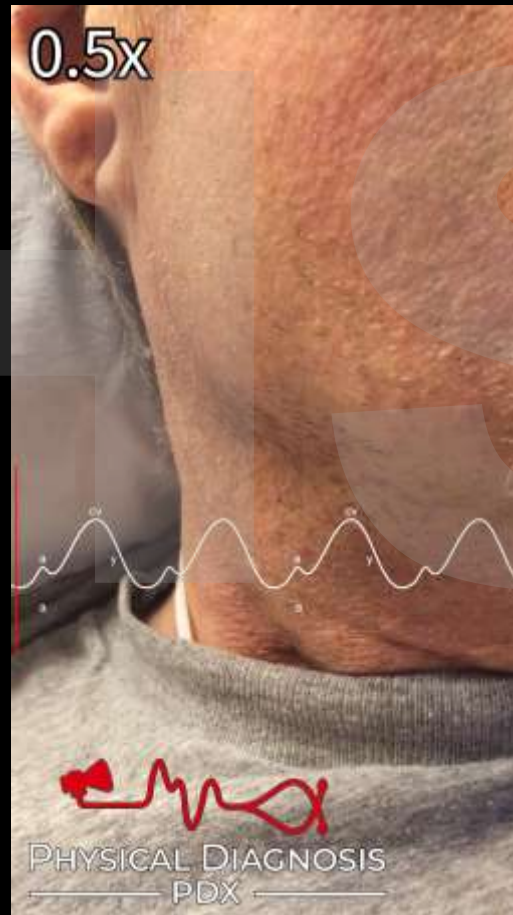


PHYSICAL DIAGNOSIS  
PDX

# OHSSU



# Lancisi's Sign



# OHSSU



  
PHYSICAL DIAGNOSIS  
— PDX —

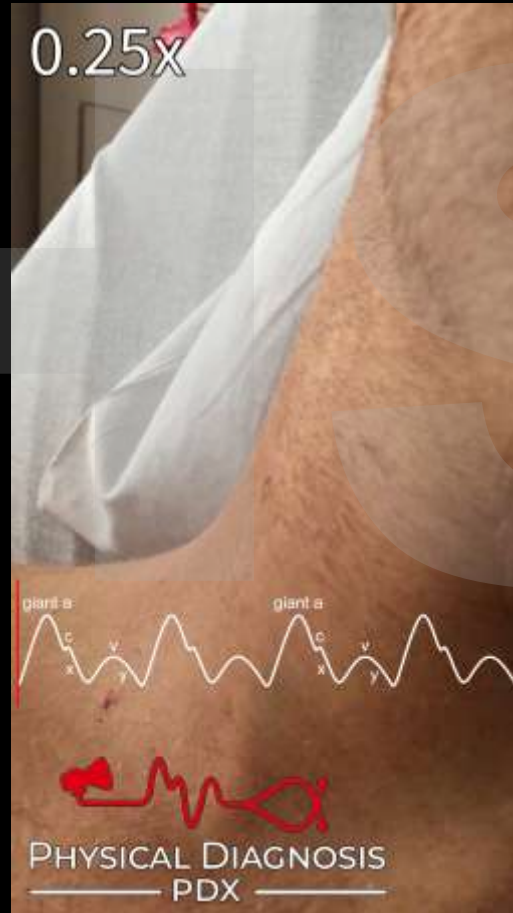
# OHSSU



# OHSSU



# Giant A Wave





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— PDX —

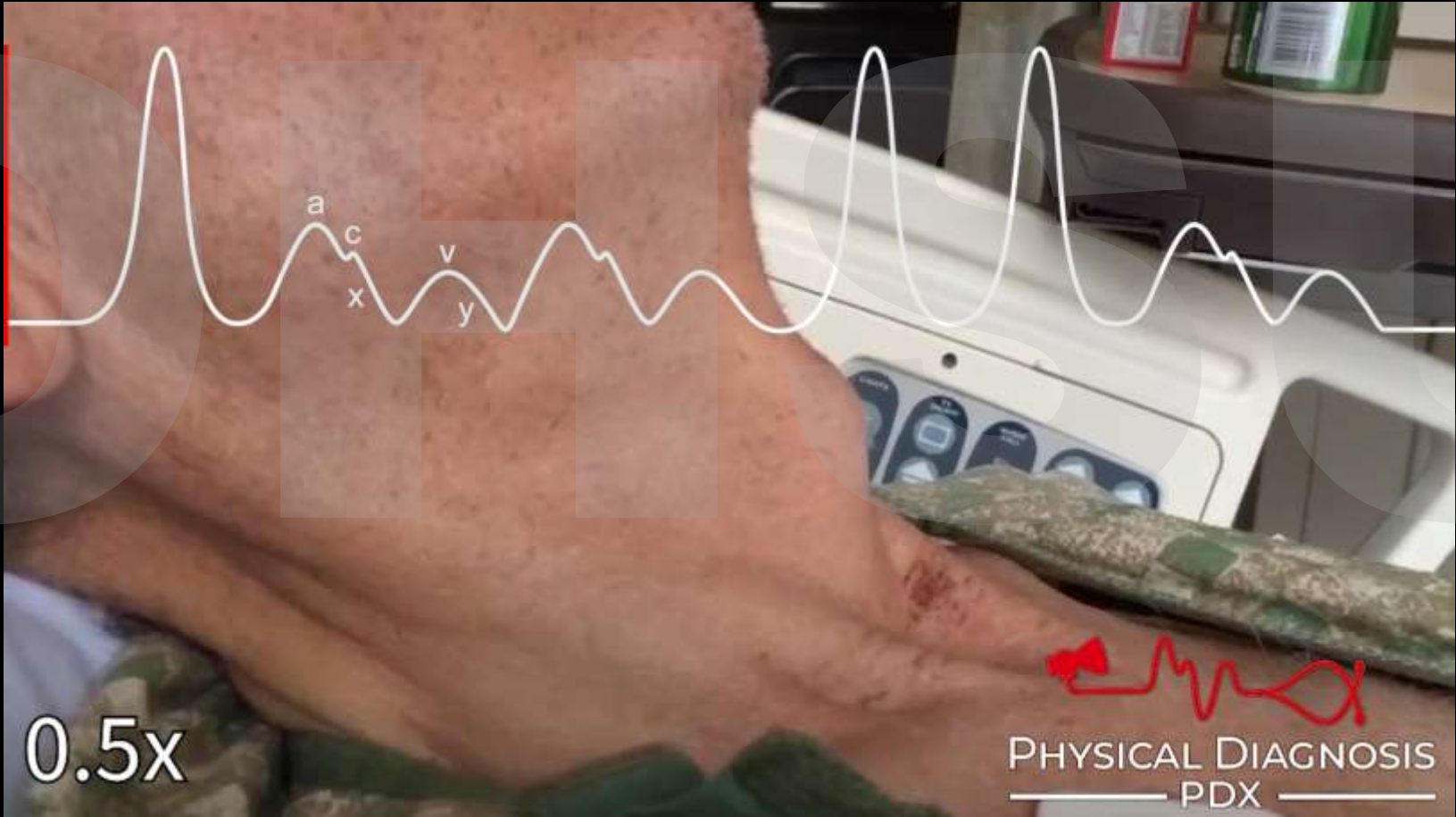
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PHYSICAL DIAGNOSIS  
— PDX —



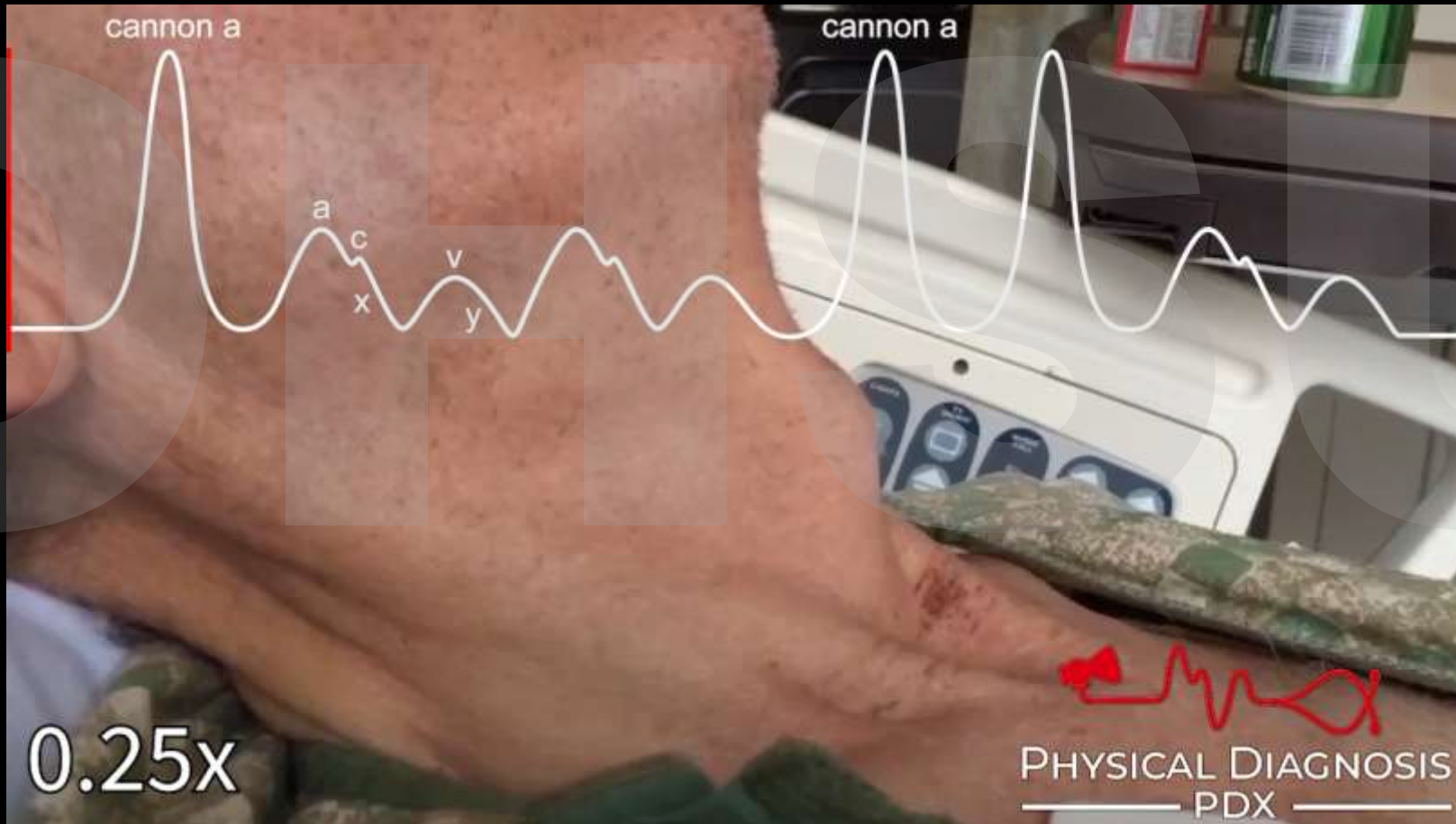
  
PHYSICAL DIAGNOSIS  
— PDX —



0.5x

PHYSICAL DIAGNOSIS  
PDX

# Cannon A Wave



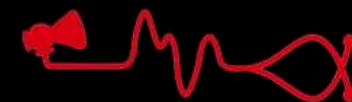
# Venous or Arterial?



# Back to Wenckebach



OHSU



OHSU  
THANK YOU



PHYSICAL DIAGNOSIS  
PDX

# Acknowledgements

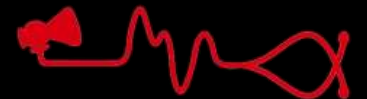
- Joseph Nugent
- Maniraj Jeyaraju
- Peter Sullivan
- Lynn Loriaux
- Our patients

OHSU



# References

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