

LOGIQ
E9

Volume Status And Fluid Responsiveness

蔡揚名

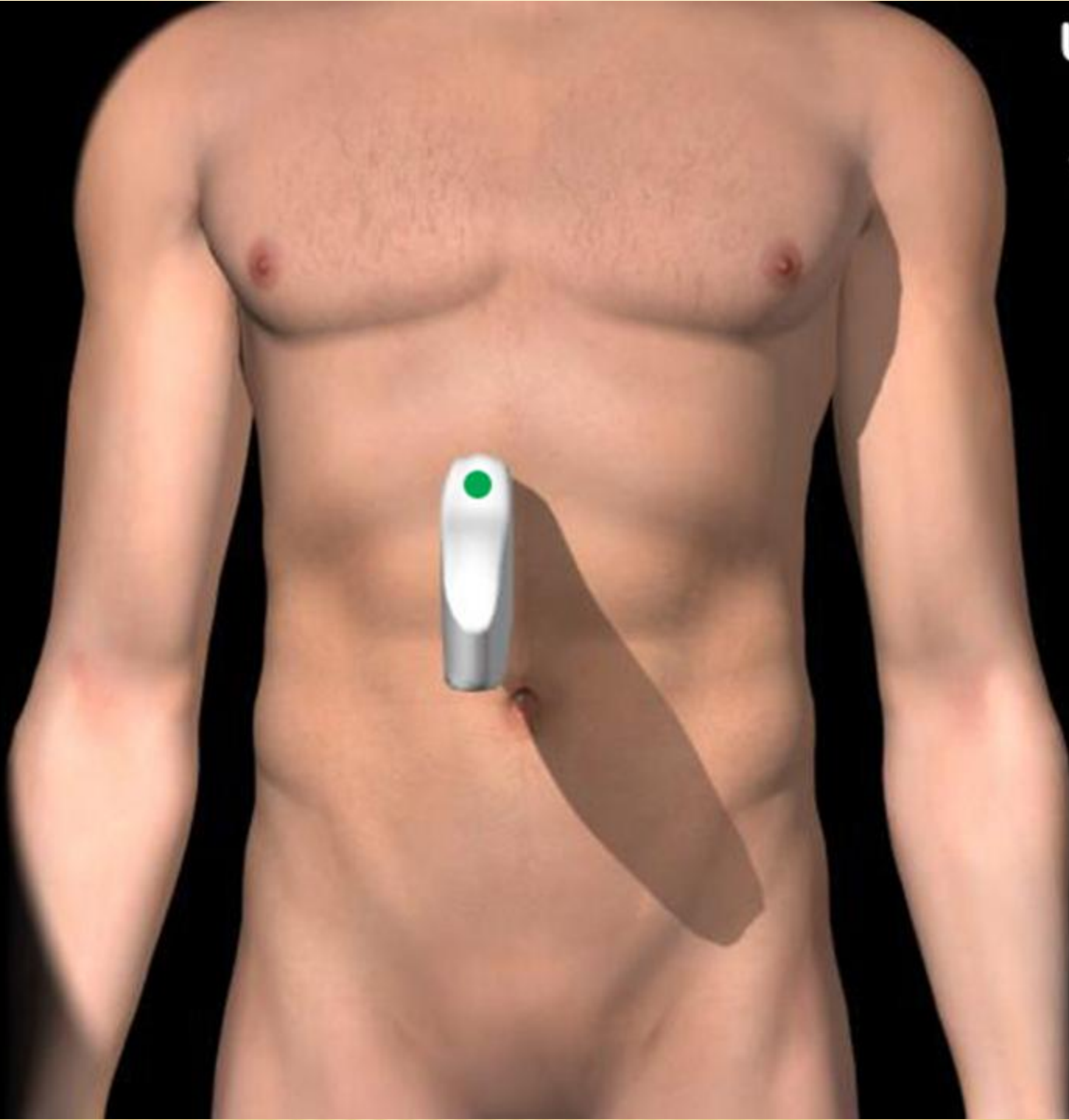
- ✘ 彰化基督教醫院
急診醫學部訓練
- ✘ 台大雲林分院
急診醫學部副主任
- ✘ 雲嘉區急診超音波
講師
- ✘ 醫用超音波學會
急診科專業醫師
- ✘ 急診醫學會超音波
委員/評核醫師





More IVC?

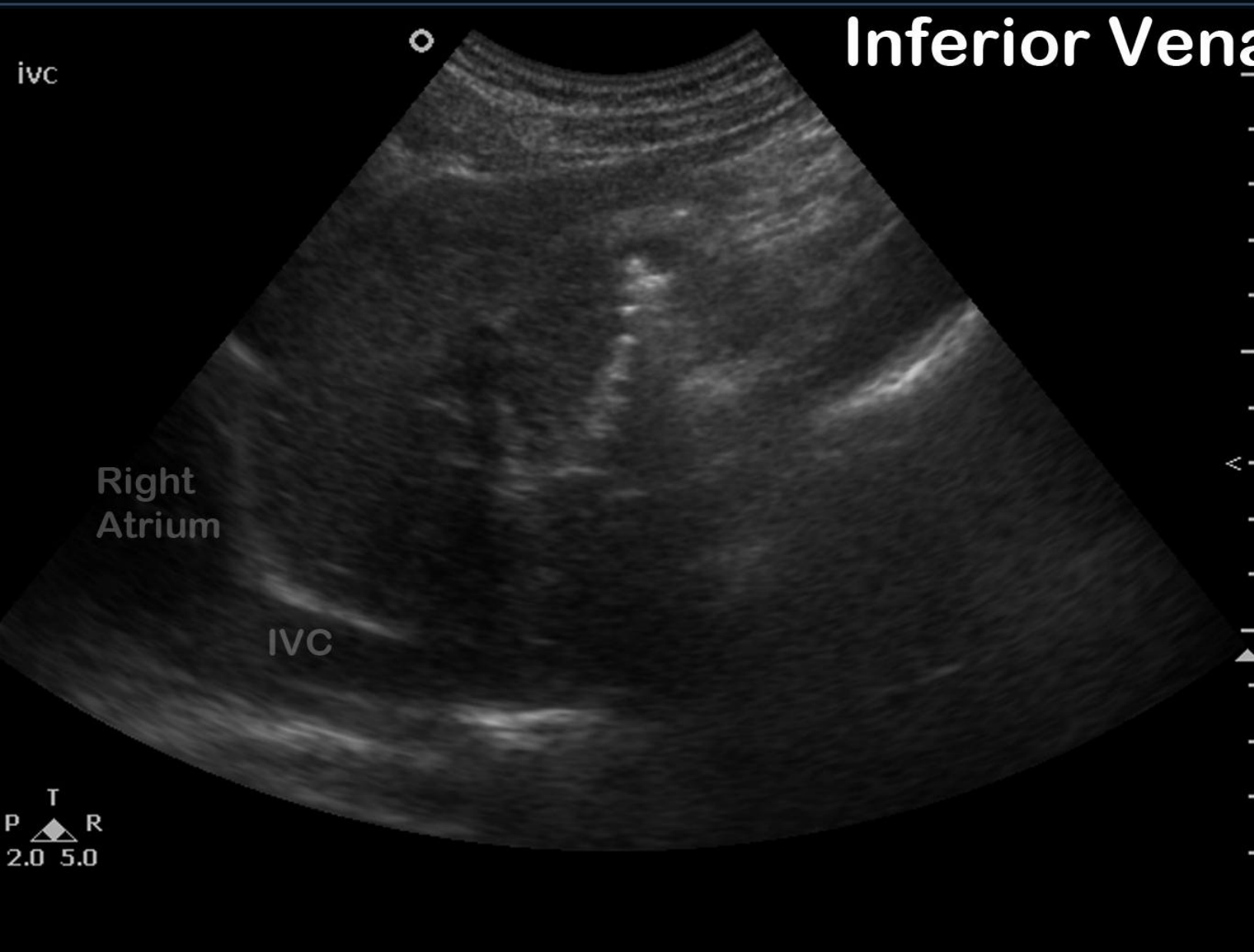
**Ultrasound
Inferior
Vena Cava
Long Axis**



TRANSDUCER ORIENTATION

- ✘ Placed right lateral to sub-xiphoid
- ✘ Indicator pointed towards 12:00
- ✘ Landmark
 - Inferior Vena Cava
 - Right Atrium

Ultrasound Inferior Vena Cava



ivc

Right
Atrium

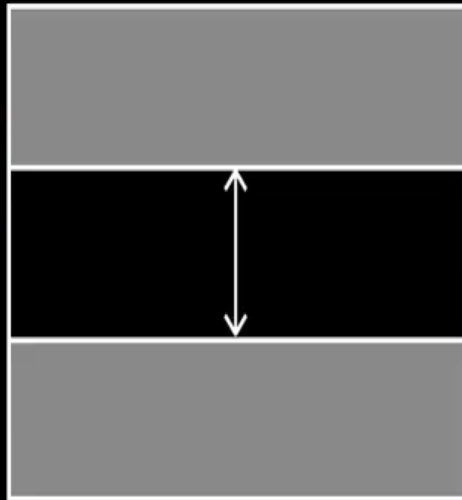
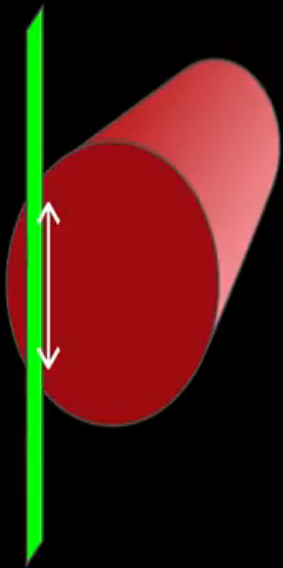
IVC

T
P R
2.0 5.0

CYLINDER EFFECT

BEAM

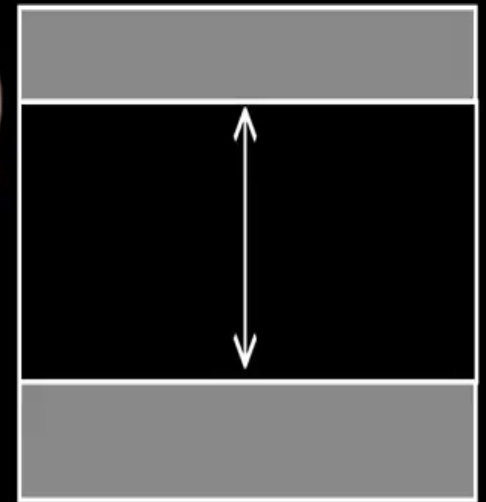
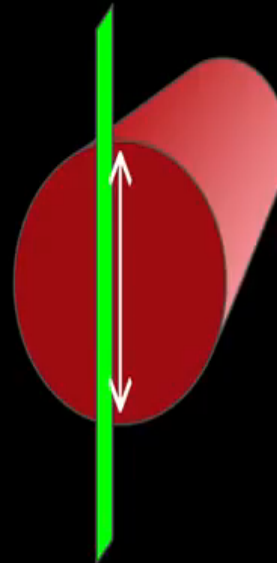
SCREEN



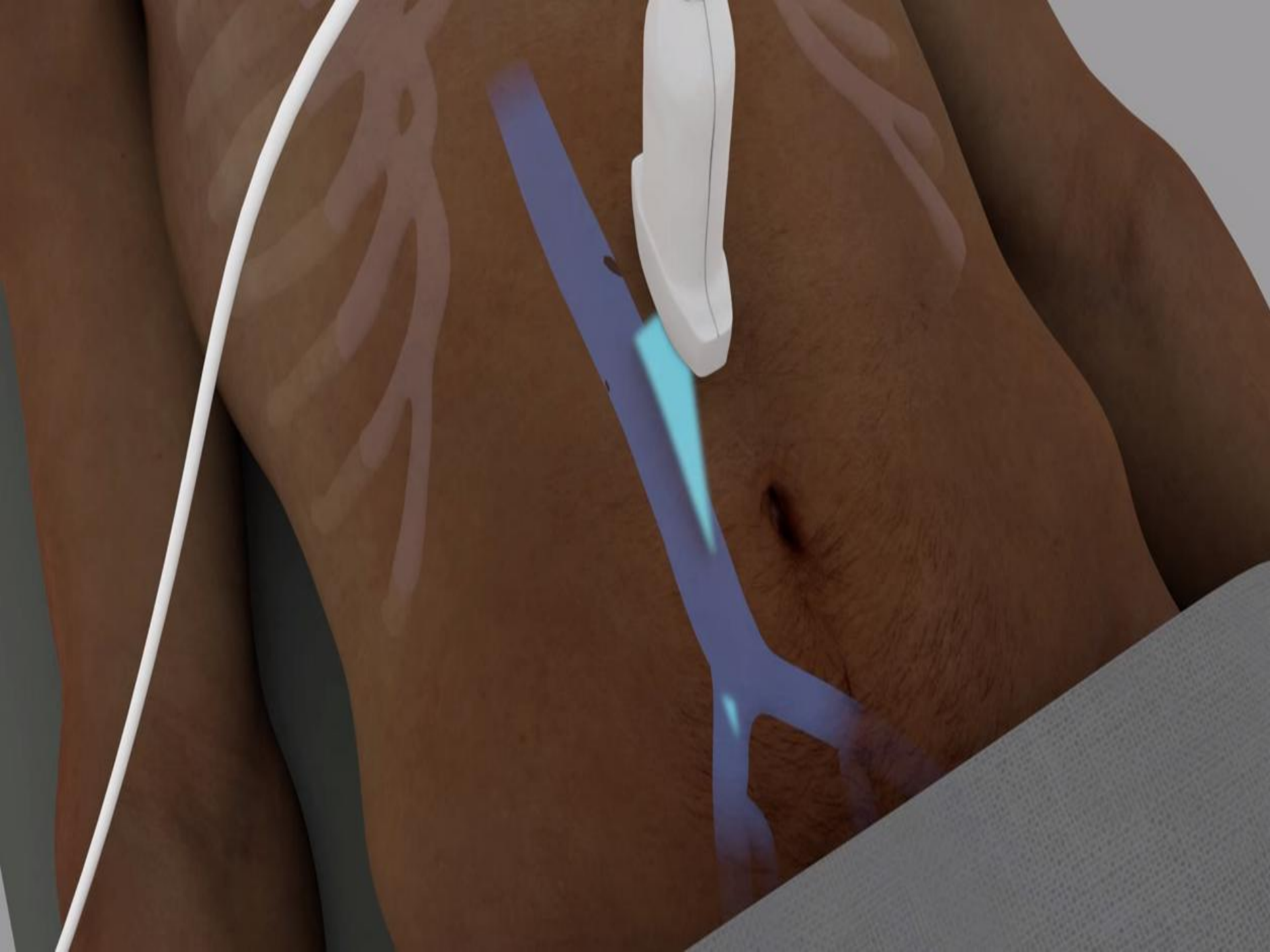
FALSE DIAMETER

BEAM

SCREEN

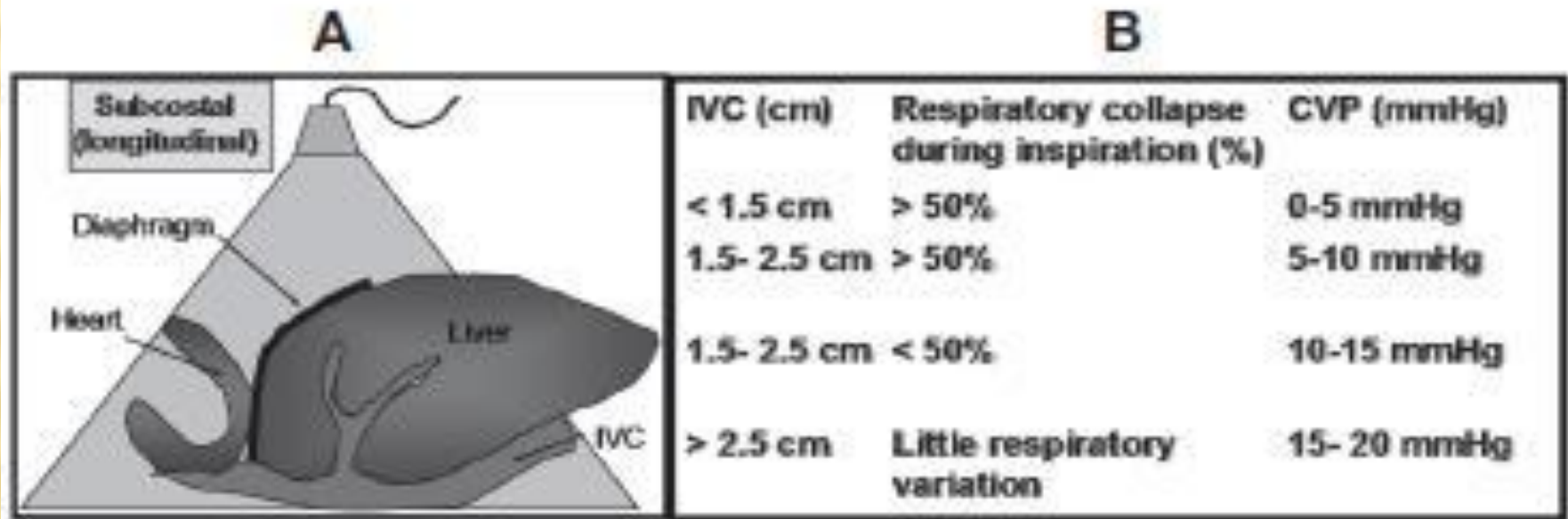


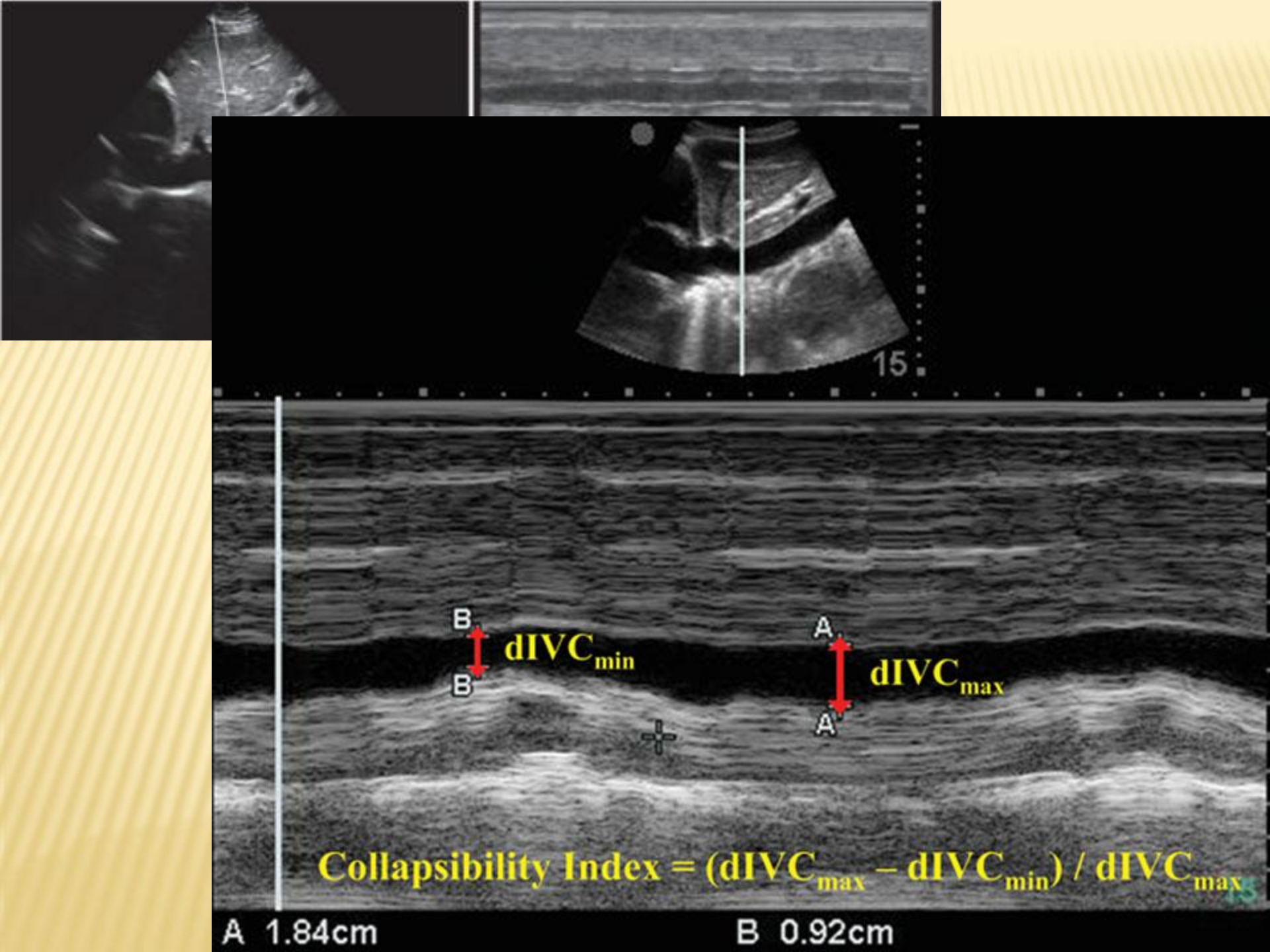
TRUE DIAMETER



VOLUME STATUS BASED ON IVC ALONE

Figure 2. (A) Schematic Of Subcostal Longitudinal View Of Inferior Vena Cava. (B) IVC Size And Respiratory Variation Correlation To Central Venous Pressure Measurements





A 1.84cm

B 0.92cm

$$Collapsibility\ Index = (dIVC_{max} - dIVC_{min}) / dIVC_{max}$$

$dIVC_{min}$

$dIVC_{max}$

VOLUME STATUS BY CAVALAORTA INDEX

- ✘ Step 1: Measure maximal internal IVC anteroposterior diameter (in M Mode)
→ Measure just caudal to confluence of hepatic veins (~**3 cm from right atrium**)
- ✘ Step 2: Measure maximal internal aorta anteroposterior diameter (in M Mode)

✘ Step 3: Calculate the Caval Aorta Index as
 IVC/Ao

CVP <7 cm H₂O: Caval Aorta Index of **0.72** (+/-
0.09)

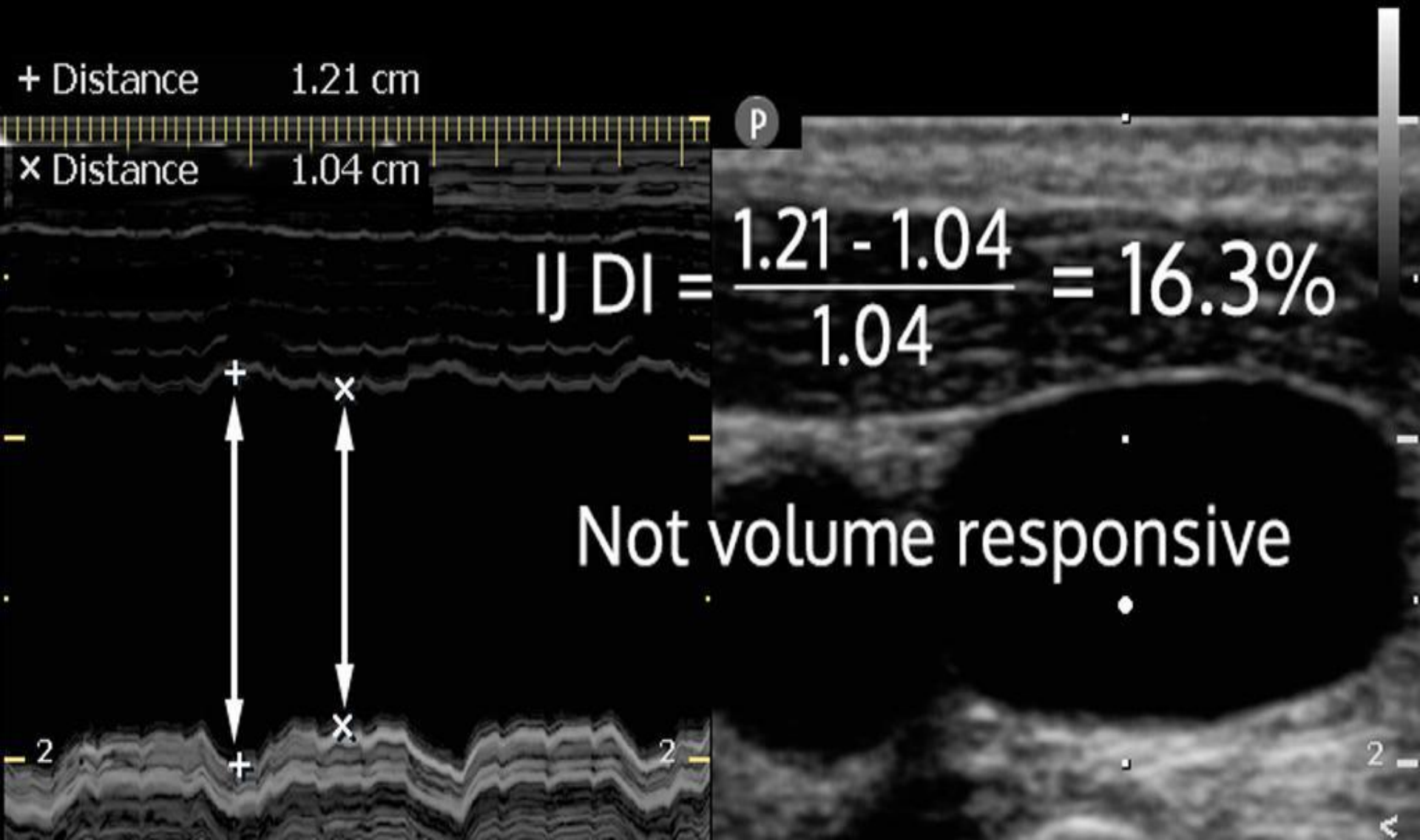
CVP 8-12 cm H₂O: Caval Aorta Index of **1.23** (+/-
0.12)

CVP >13 cm H₂O: Caval Aorta Index of **1.59** (+/-
0.05)

DISTENSIBILITY INDEX(DI)

- ✘ In a mechanically ventilated patient
- ✘ Contraindications
 - Spontaneous respirations during Mechanical Ventilation
 - Tidal Volume **<7 ml/kg** Ideal Body Weight (based on gender and height)
 - Non-sinus rhythm
 - Right ventricular dysfunction

DI < 18% → NOT VOLUME RESPONSIVE

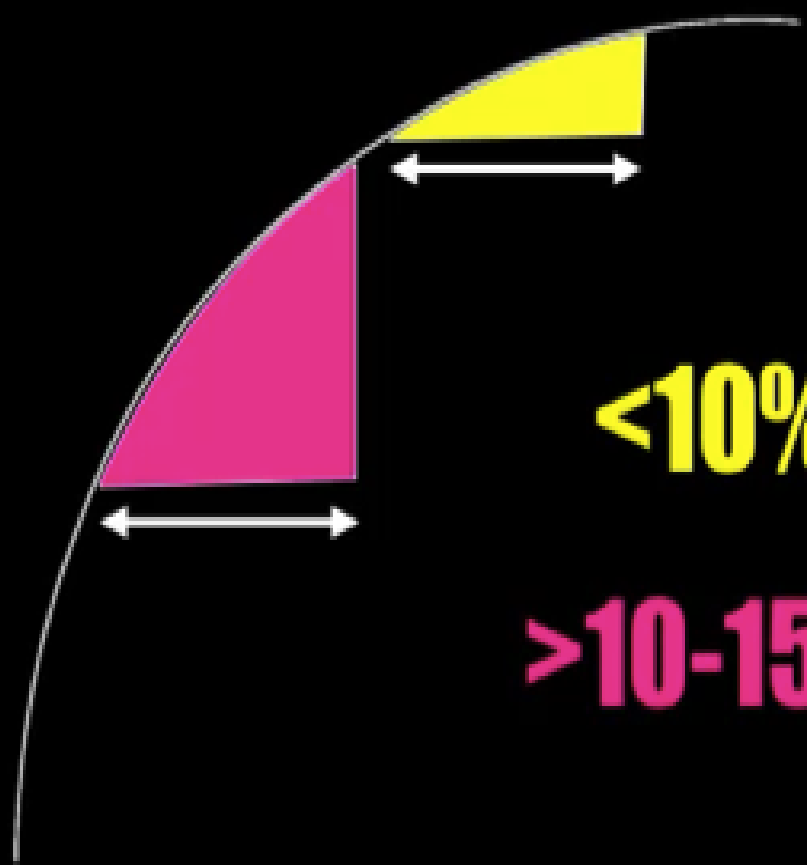




Fluid

**Responsiveness...will
your Echo help??!**

SV



<10%

Not responsive

>10-15%

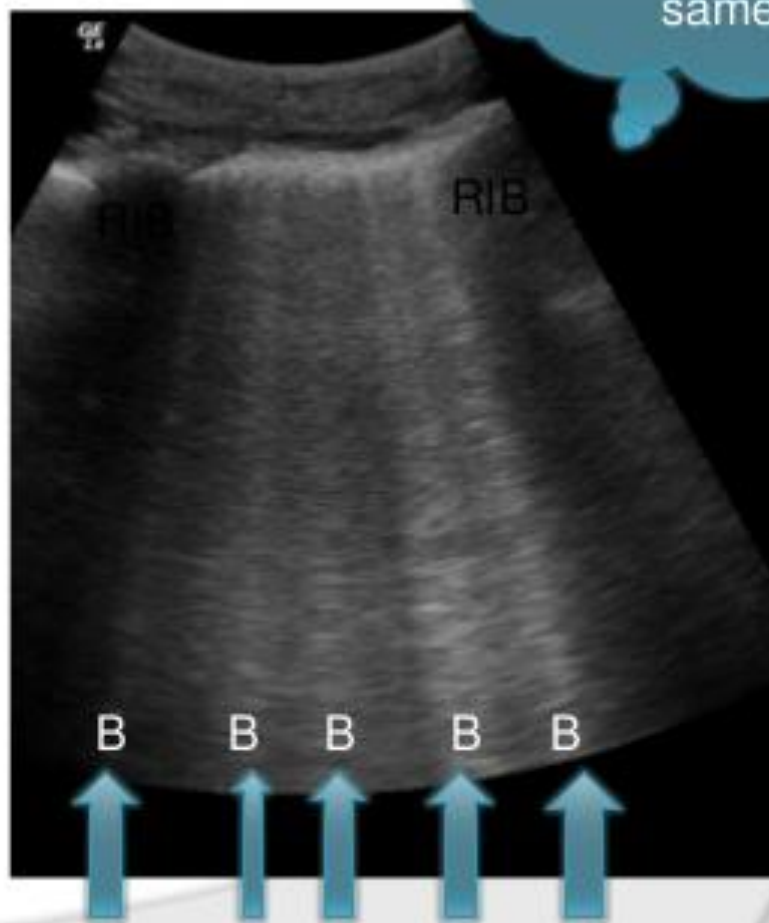
Responsive

Preload

B lines = fluid in alveolus or interstitium

- ⦿ Originates from pleural line
- ⦿ Reaches base of screen OR ALMOST
- ⦿ MORE THAN 2 at once is abnormal

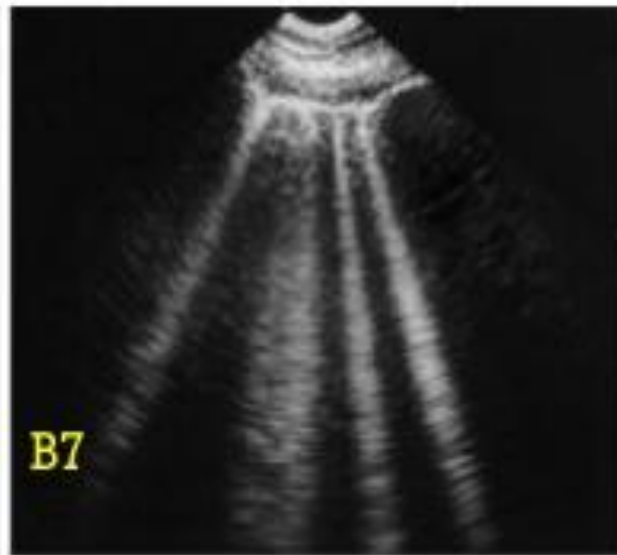
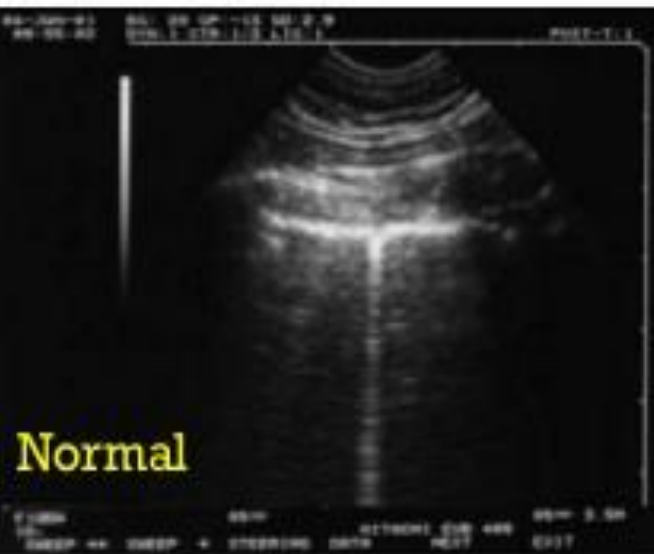
EXCEPT in lung base

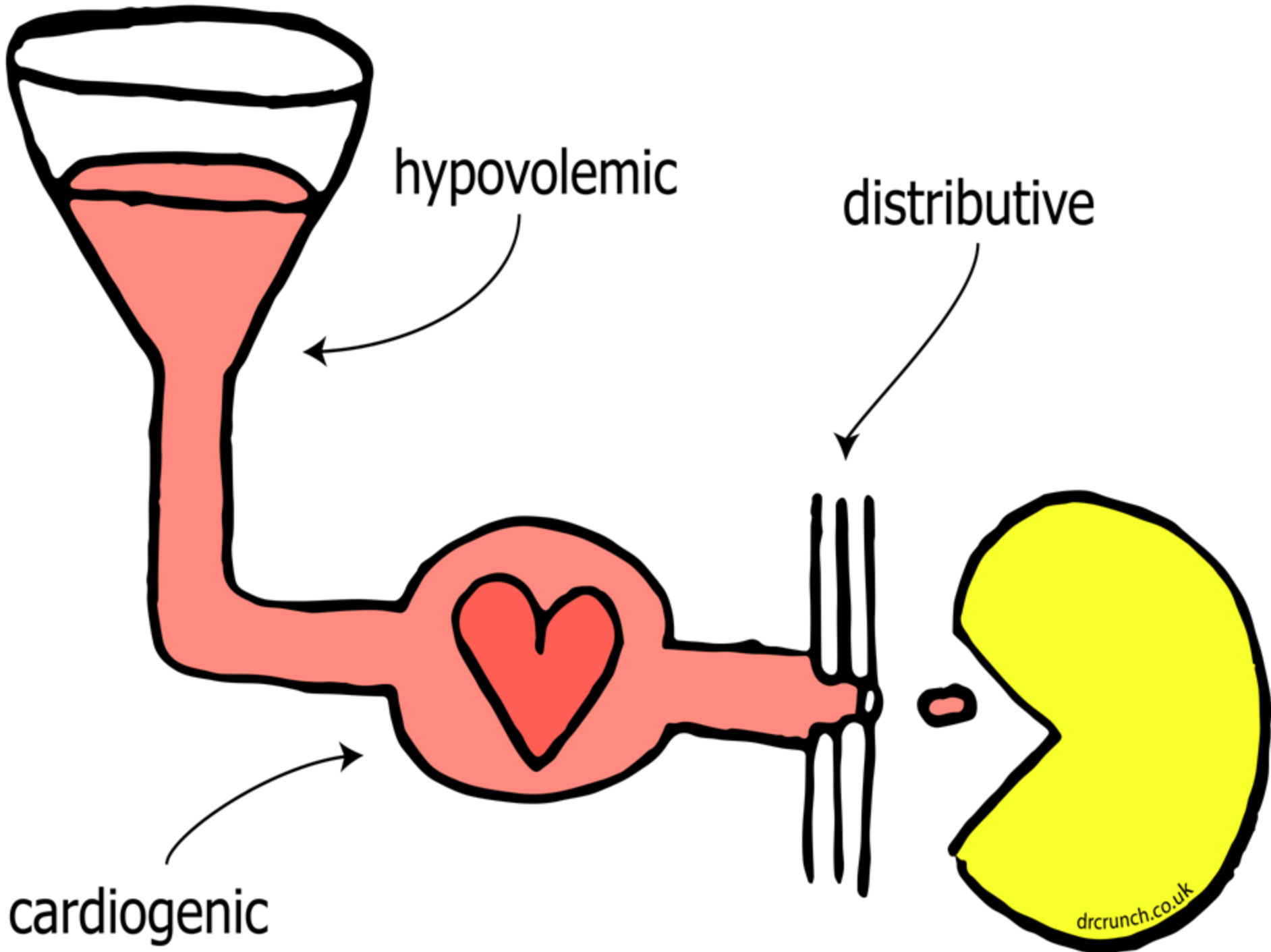


Remember as
'Kerley Bs'
Not exactly the
same.

HYPOTENSION AND B LINE → FLUID INTOLERERENCE

- Interlobular septal thickening/oedema
 - > 3 lung rockets spaced around 7mm apart (B7 lines)
- Alveolar filling/oedema
 - > 3 lung rockets spaced around 3mm apart (B3 lines)



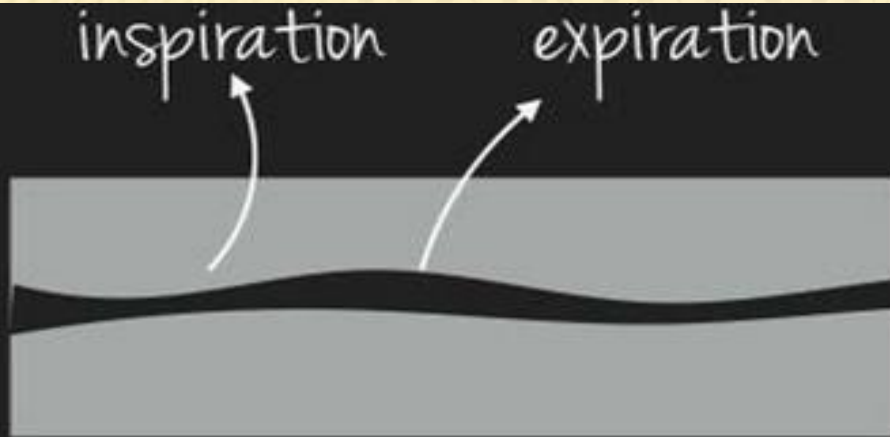


hypovolemic

distributive

cardiogenic

HYPOVOLAEMIC SHOCK



Small IVC

Collapse > 50%



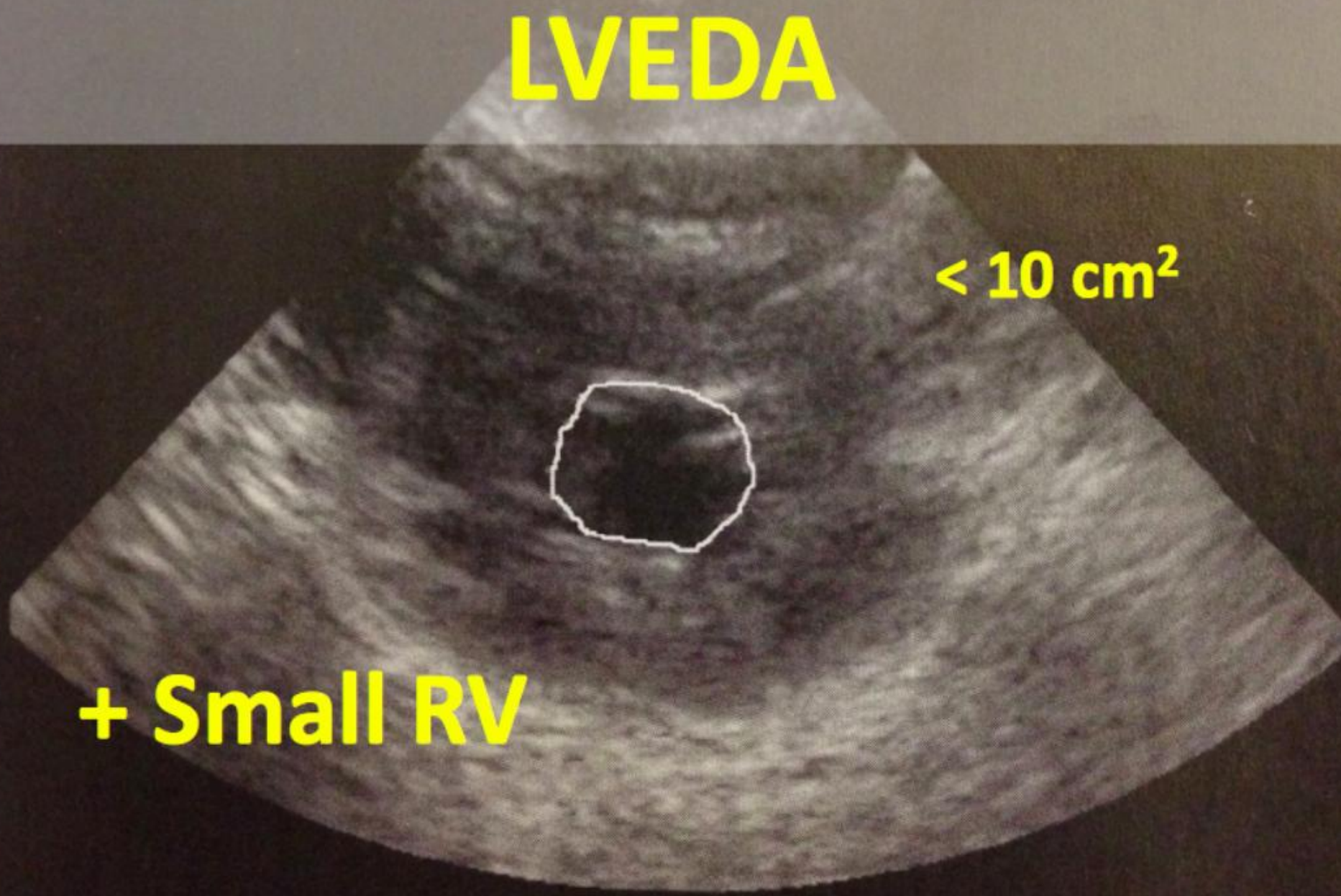
LVEDA

< 10 cm²

+ Small RV

Diastole

AV 3.30cm²



CARDIOGENIC SHOCK

inspiration

expiration



Large IVC (>2.5cm)

Collapse < 50%



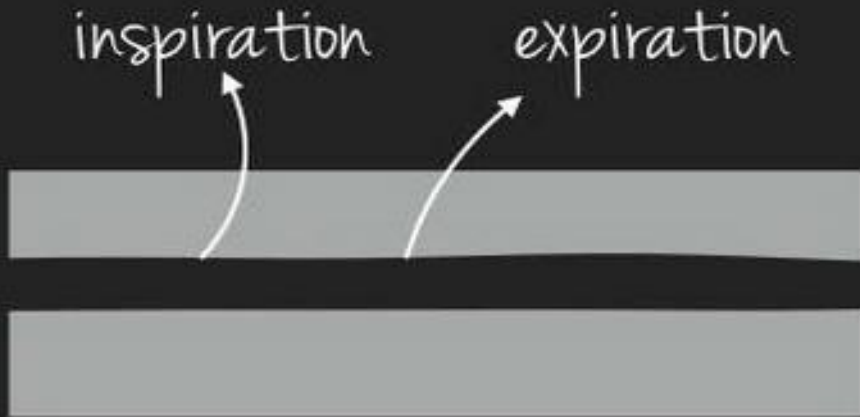
Diastolic



Systolic



OBSTRUCTIVE SHOCK



Large IVC(>2.5cm)

Collapse < 50%



D shape W



Tamponade



Stratosphere
sign

TAKE HOME MESSAGE

- ✘ Heart
 - LEVDA
 - Obstructive

- ✘ IVC
 - CI < 50%
 - DI < 18%

- ✘ Lung → B line