

Getting started in focused TTE: the questions the windows the basic anatomy

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Critical Care Ultrasound
Course



Reminder

Today

- Arrest/ resuscitation
- Simple questions
- Curved / sector probe
- Abdo / cardiac preset
- B mode only

Formal echocardiogram

- Stable patient
- Subtle questions
- Sector probe
- Cardiac preset (image 'round the wrong way')
- Doppler, M mode

Caveats

- Goldilocks: 'too big, too small, grossly OK'
- Very operator dependent
- Even experienced operators get it wrong
- Synthesise with clinical picture & other US findings eg old MI/LVF and new pneumonia
- **Don't be afraid to get help**

The questions

Today

1. Is the heart even beating?
2. Is there a tamponade?
3. Is the RV squashing the LV?
4. Is the LV too big, too small or grossly OK?
5. Is LV contraction too much, too little or grossly normal?

Formal echo

1. Regional wall motion?
2. LV diastolic function?
3. RV function?
4. Valves?

The questions

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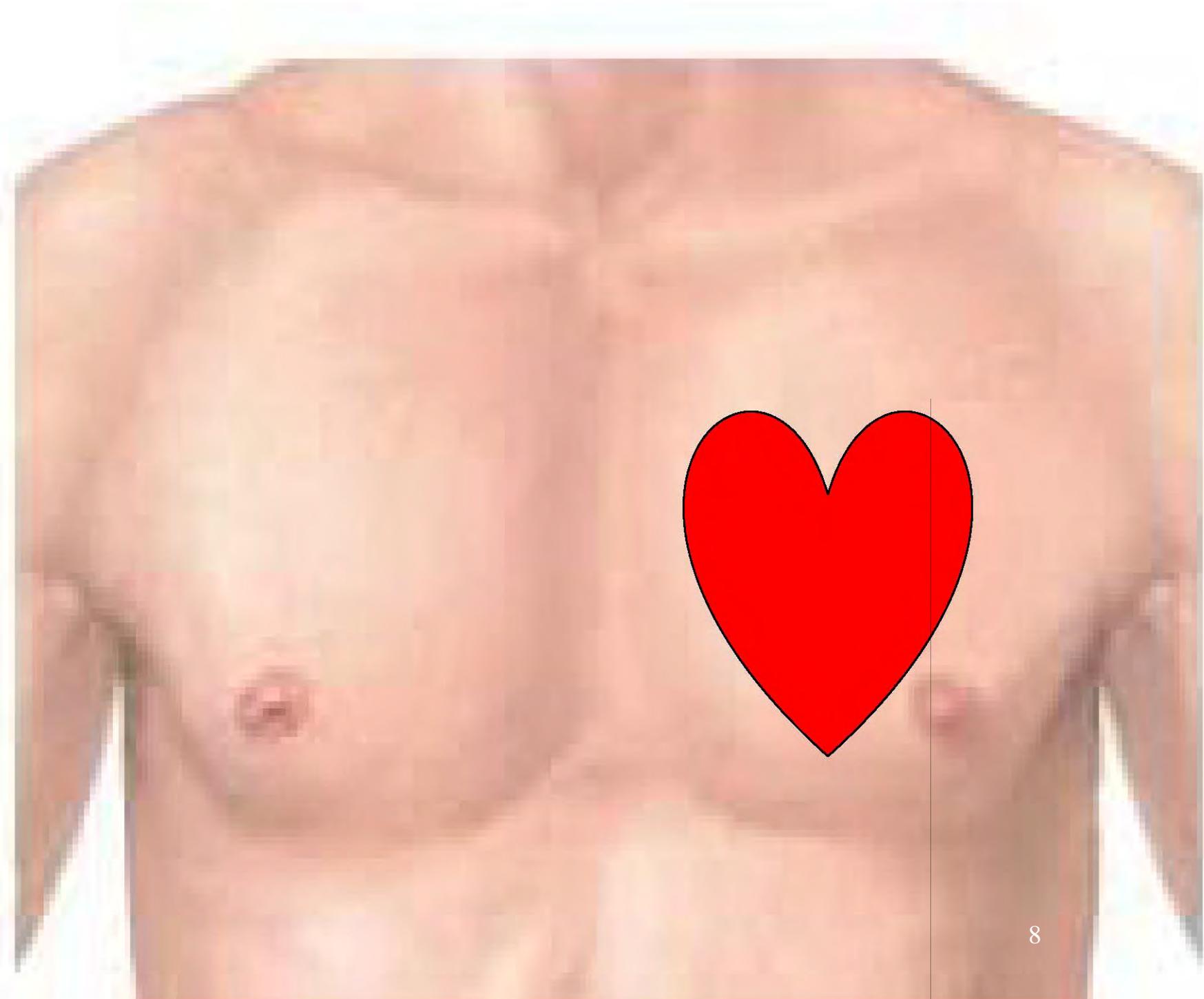
Tomorrow

1. Reg. LV motion?
2. LV dia. function?
3. RV function?
4. Valves?

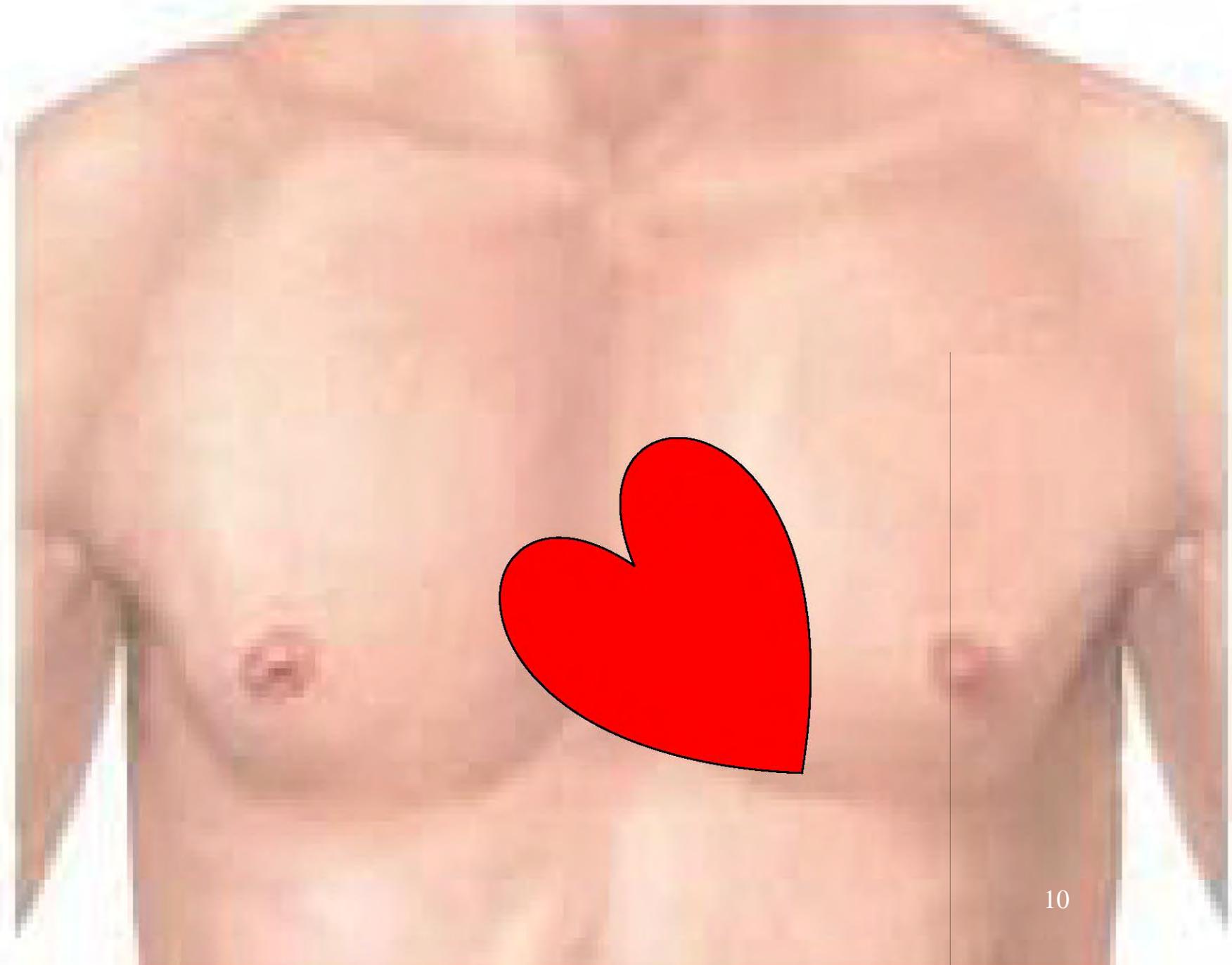
Ultrasound anatomy of the heart

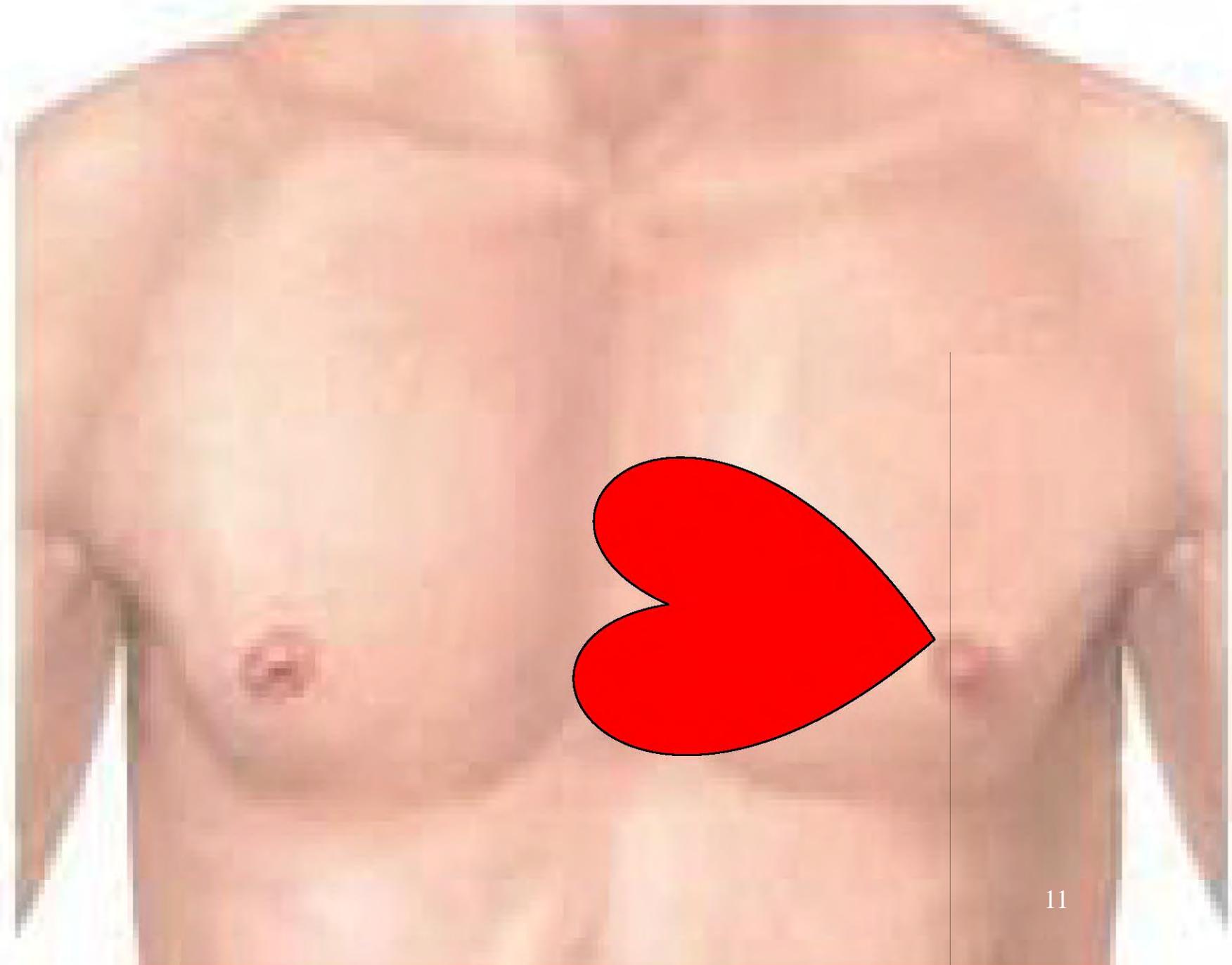
Where is the heart?

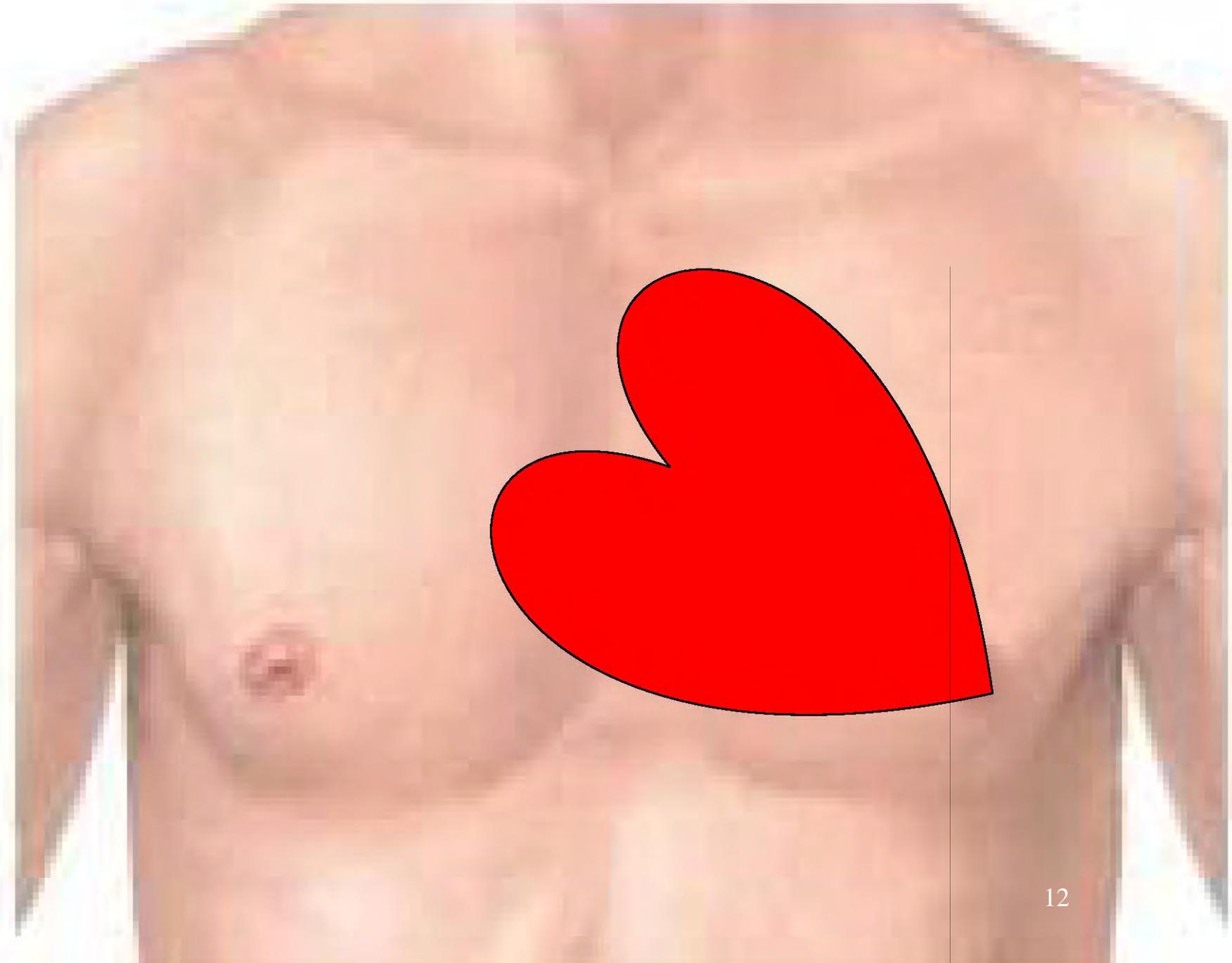
- Hiding behind the sternum (& left lung)
- Axis is complex:
- Oblique (not the same as the body!)
- Changes with patient position

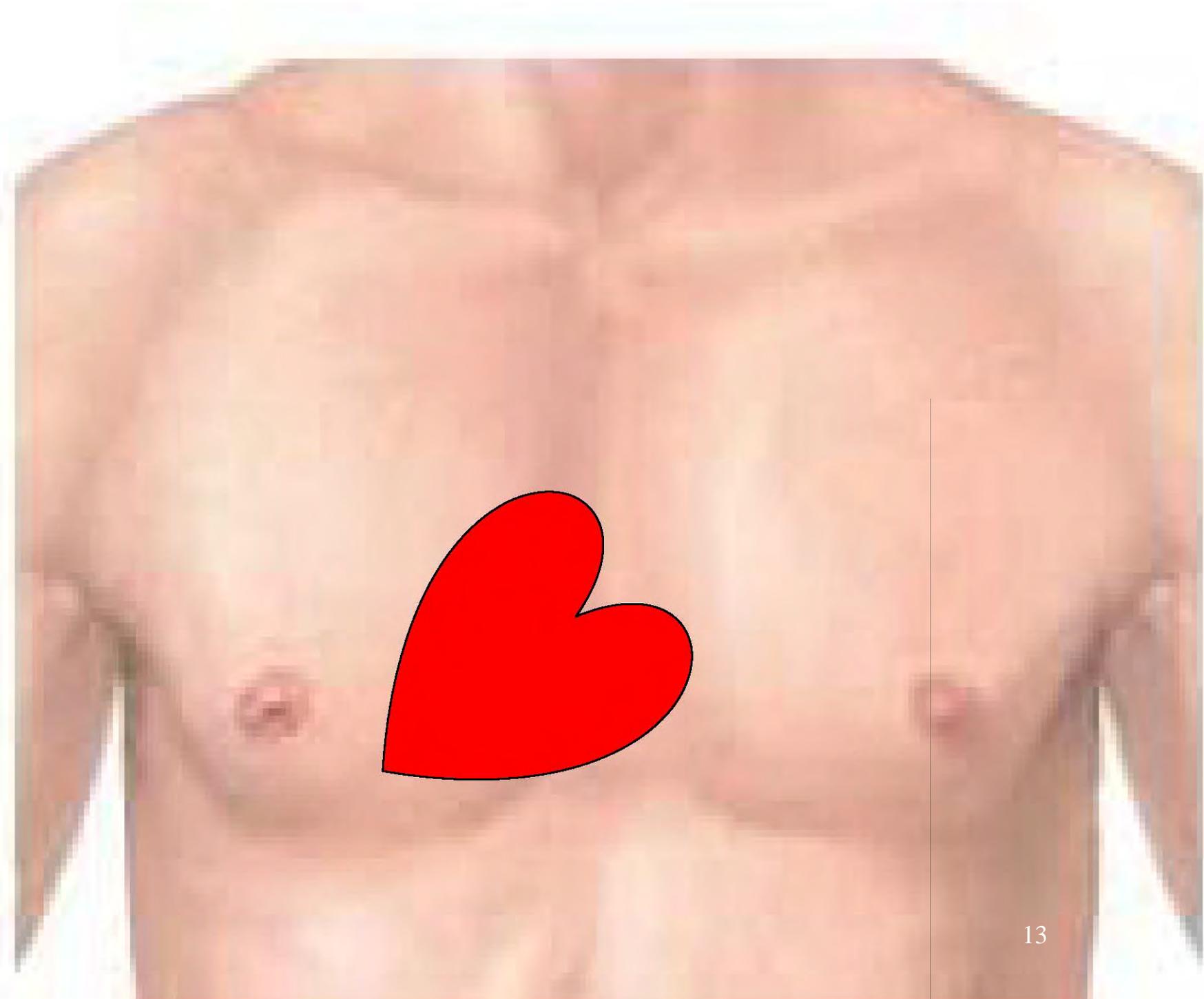












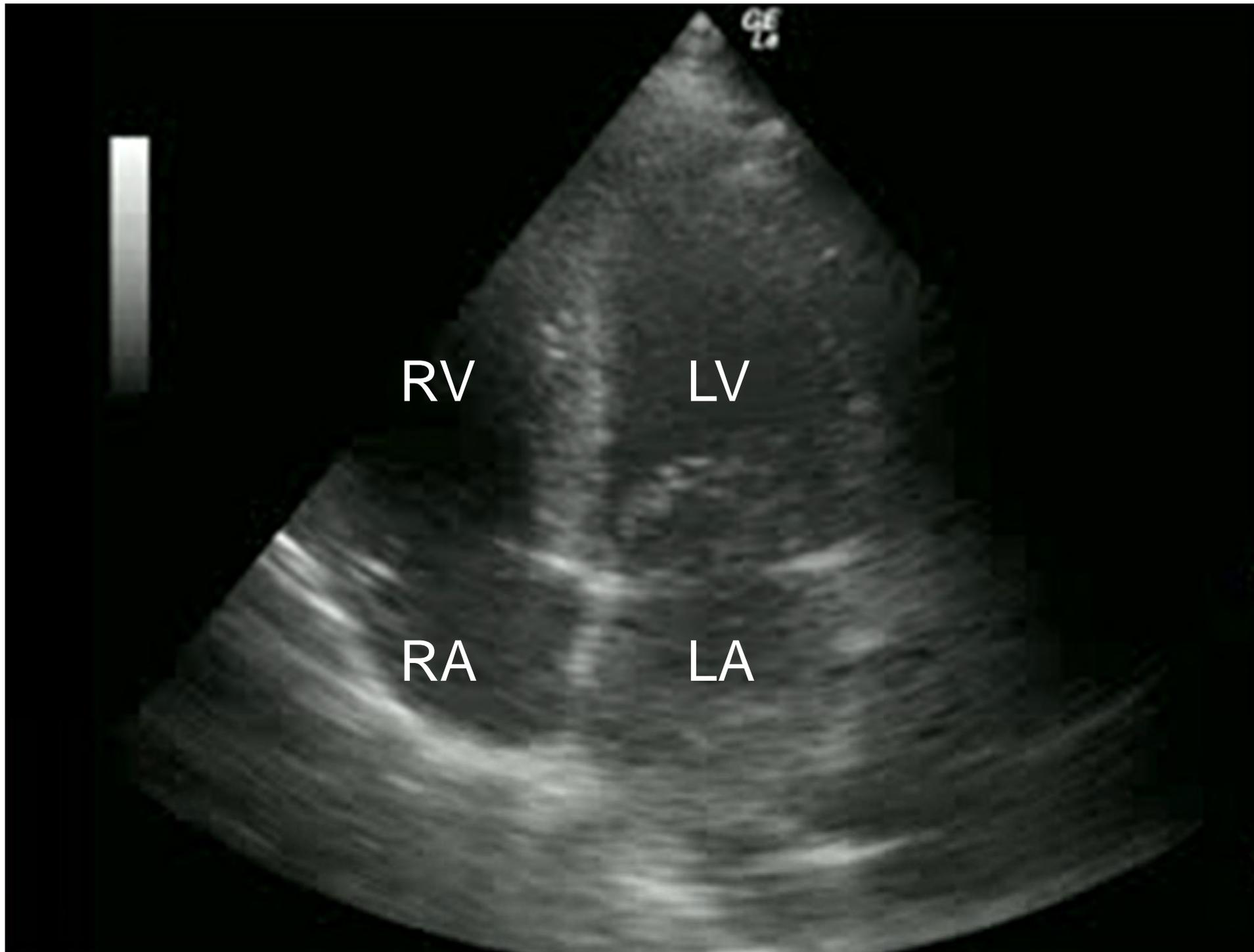
Atria versus ventricles

Atria

- Smaller
- Closer to the sternum

Ventricles

- Larger
- Closer to the apex



RV

LV

RA

LA

GE

LV versus RV

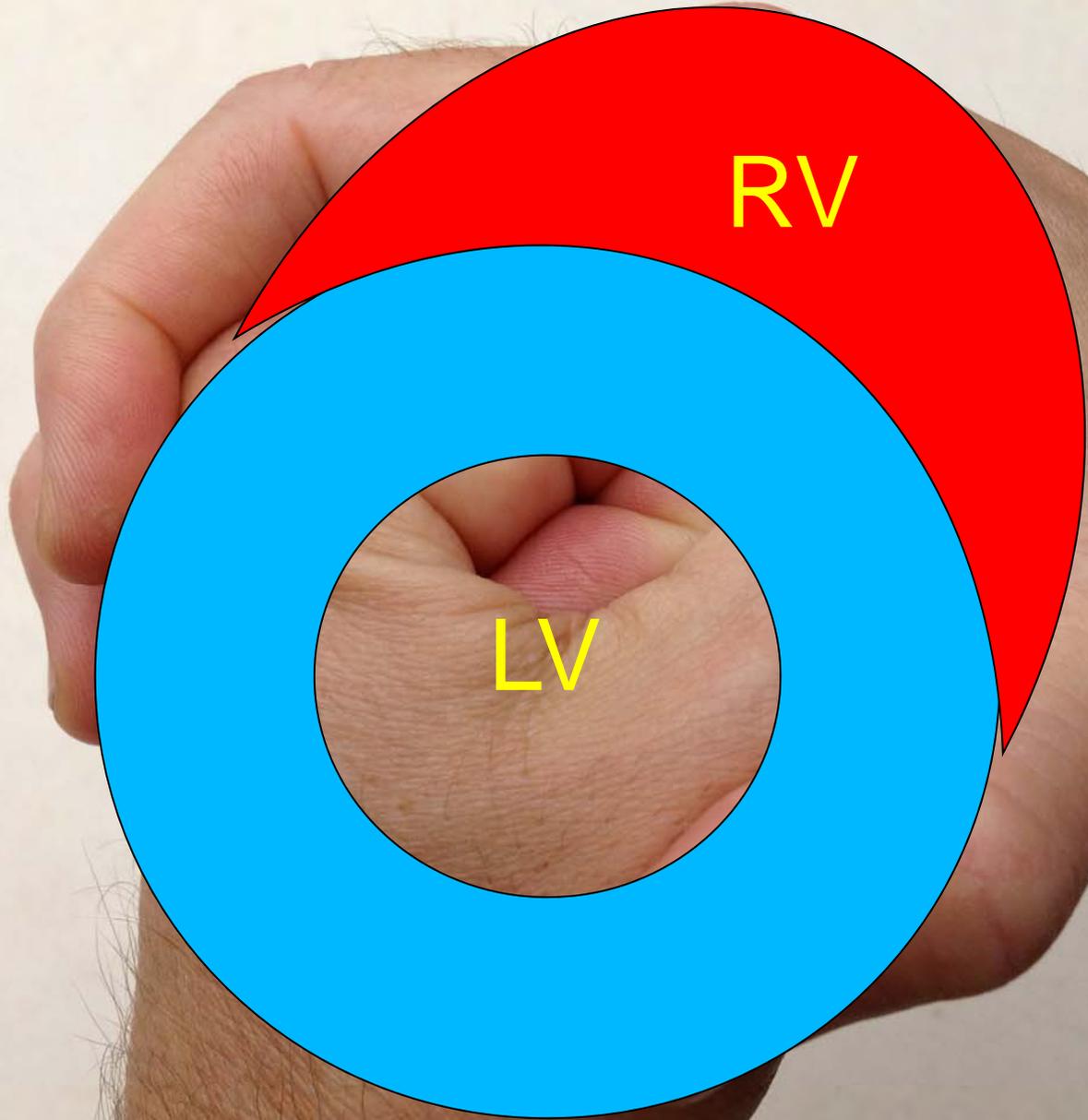
Left ventricle

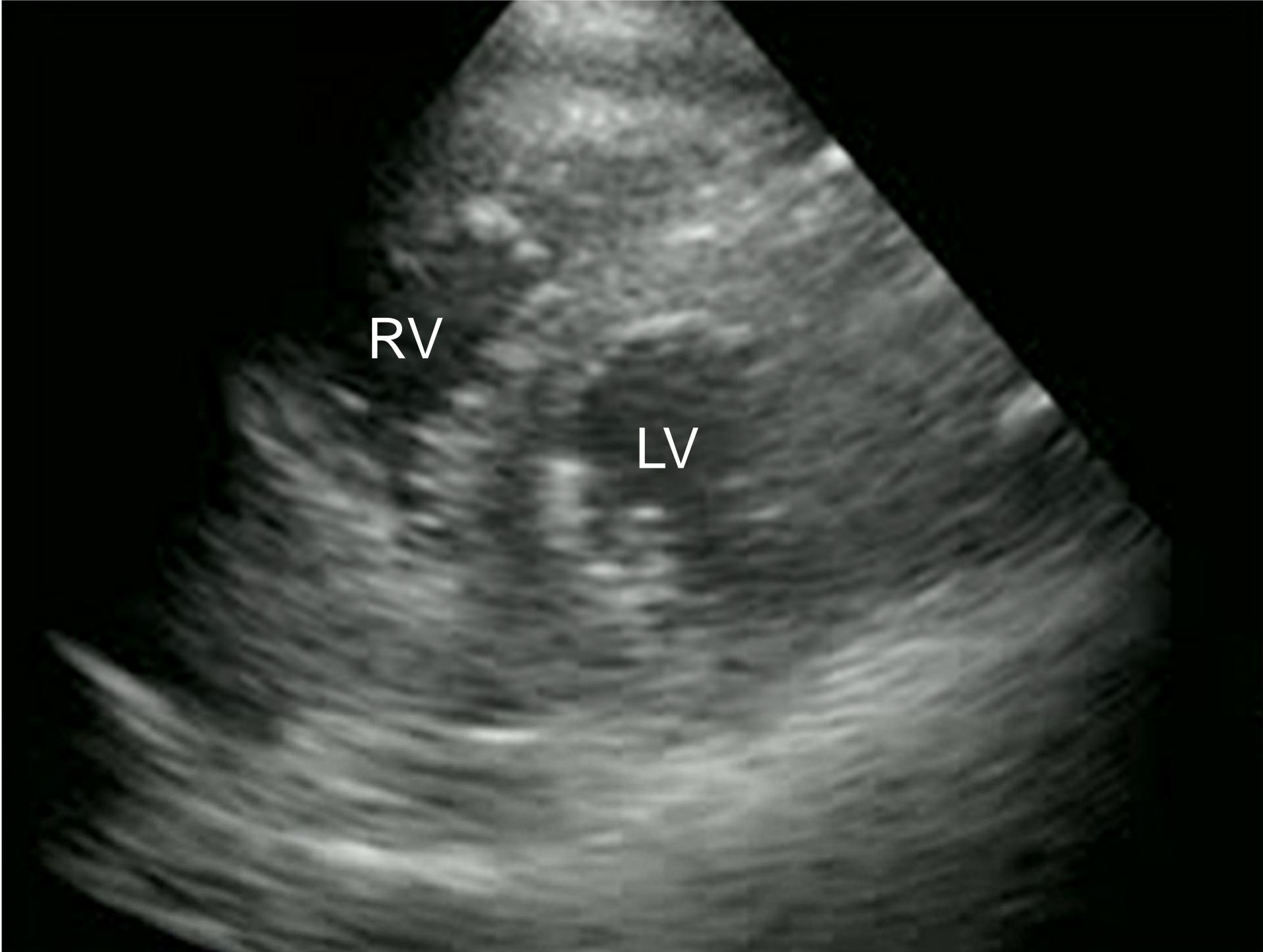
- Behind
- Simple shape / function
- Easy to see
- High pressure
- Thick & round
- Opens into the AV

Right ventricle

- In front
- Complex shape / function
- Hard to see
- Low pressure
- Thin & wussy





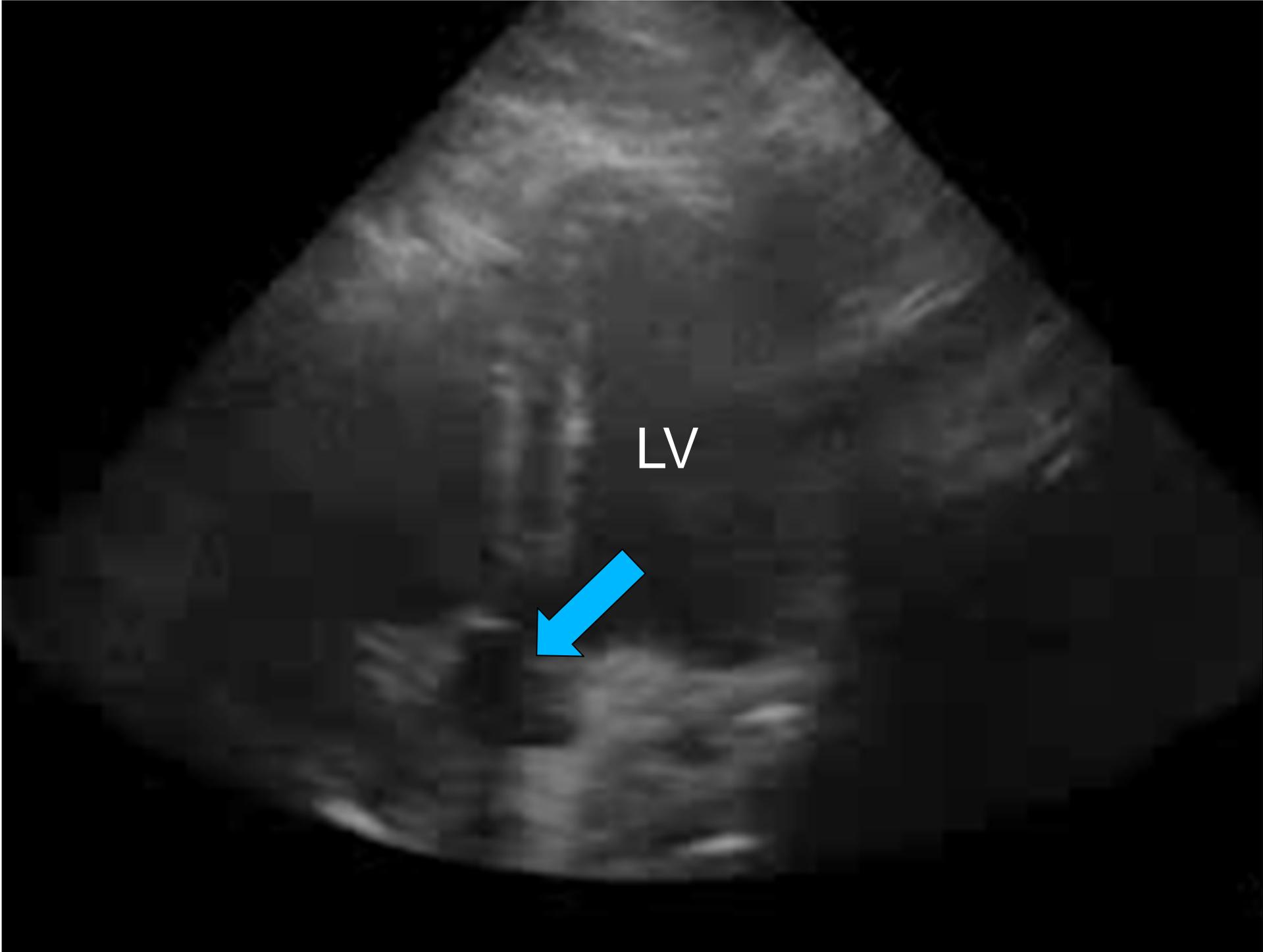


RV

LV









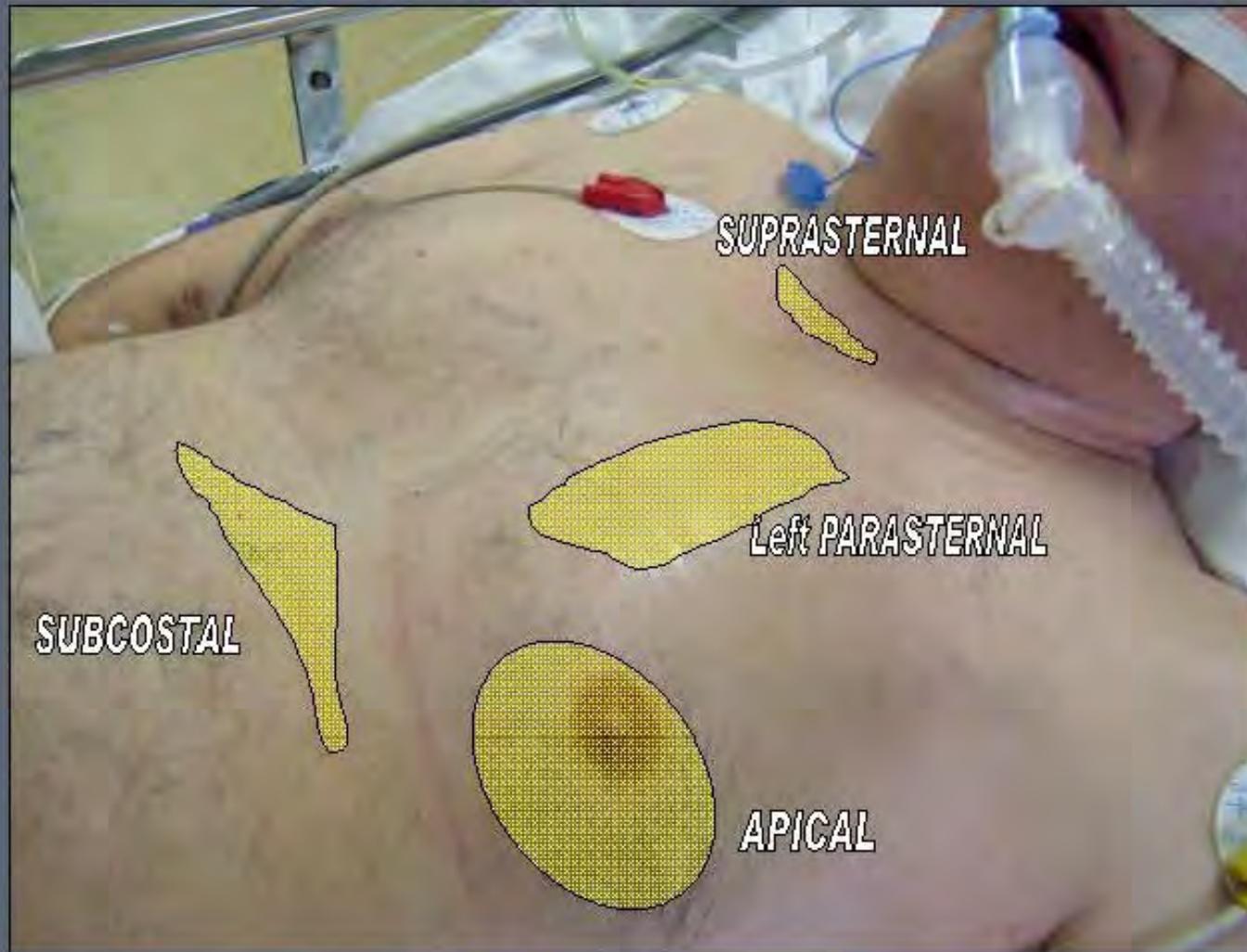


The windows

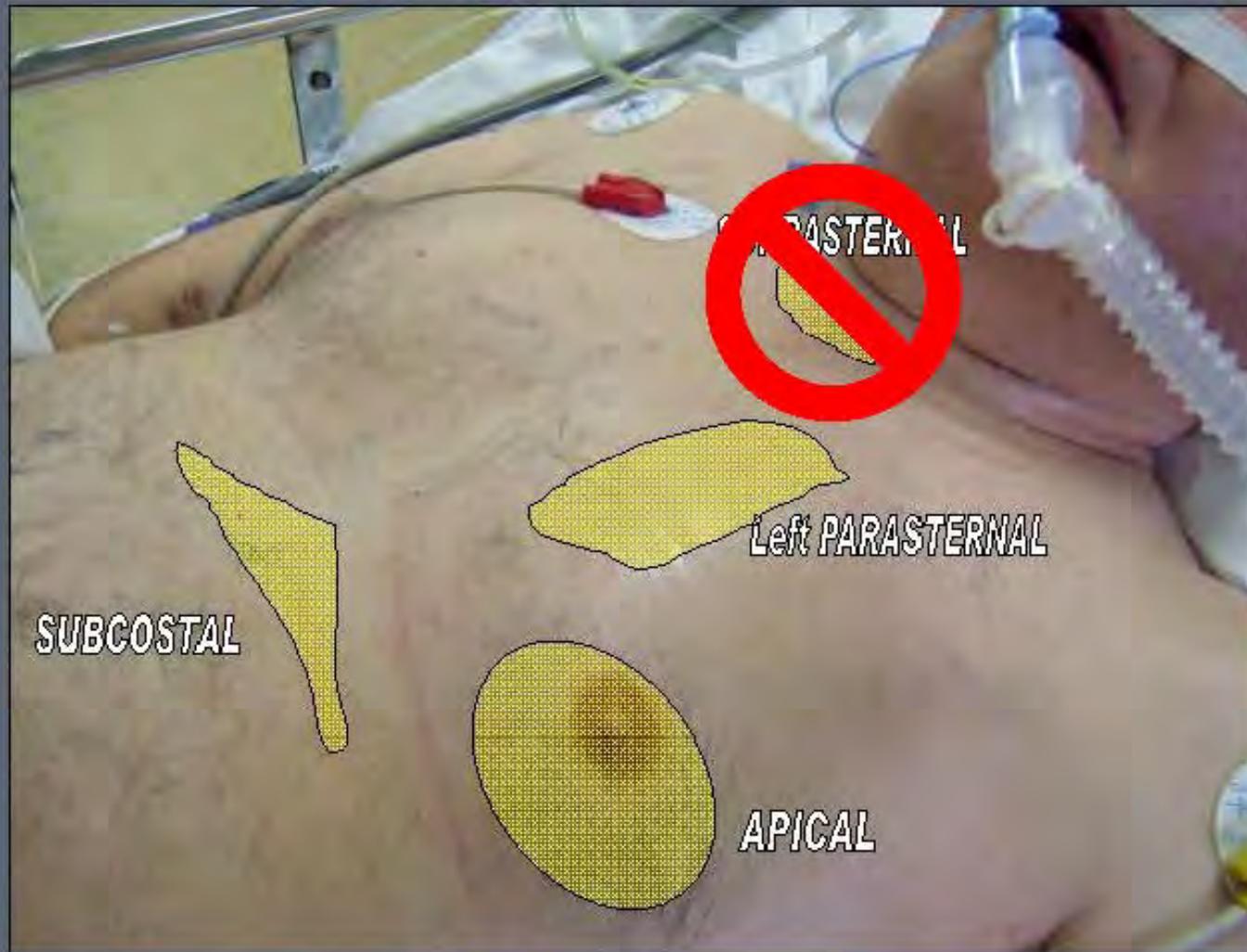
Why do we need so many windows?

1. Sometimes you can't see what you want from your 'usual' window: obesity, emphysema, positioning
2. The heart is a complex shape ... with complex structures inside (valves)
3. Standardised views allow everyone to compare their images: apples with apples

Transthoracic Windows



Transthoracic Windows



TTE windows

Subcostal:

Long // Short IVC & RA/ basal LV (MV) / mid LV (papillary) /
apex

Parasternal:

Long LV / RV (TV) / RV (PV)
Short aortic valve / basal LV (MV) / mid LV (papillary) /
apex

Apical: 4 chamber, 5 chamber, 2 chamber, long ('3
chamber')

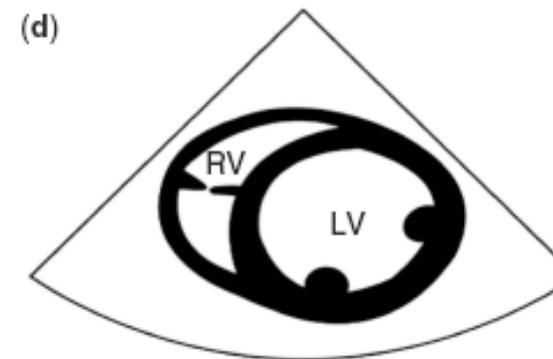
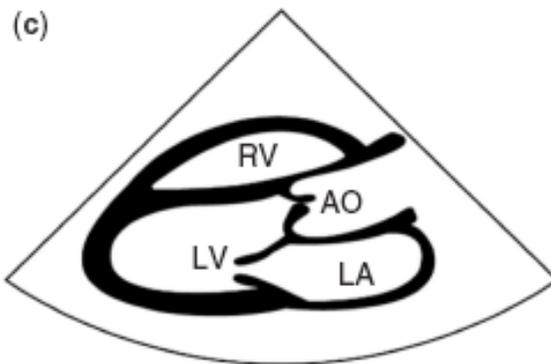
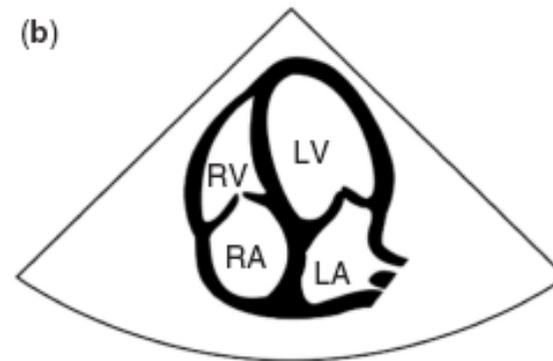
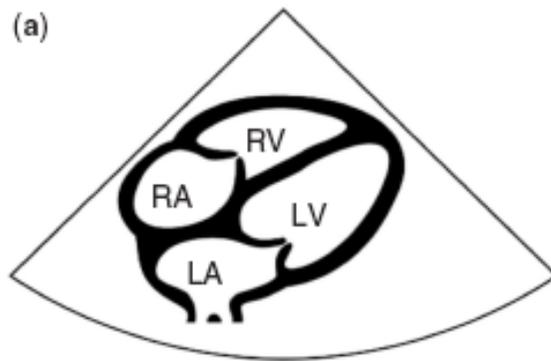
The TTE windows for **focused echo**

Subcostal long axis ('FAST' window)

Parasternal: long LV, short mid-LV

Apical: 4 chamber (& 2 chamber)

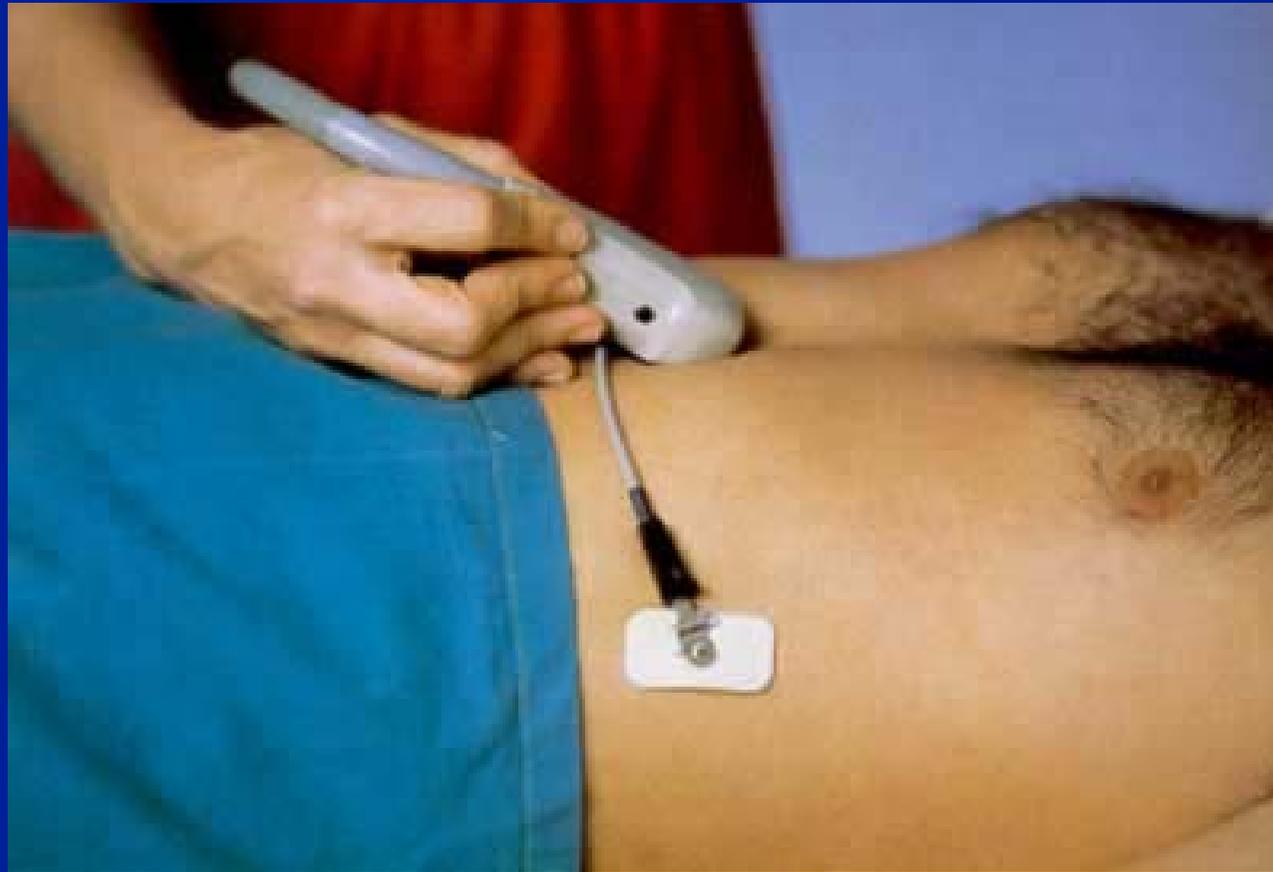
Standard views



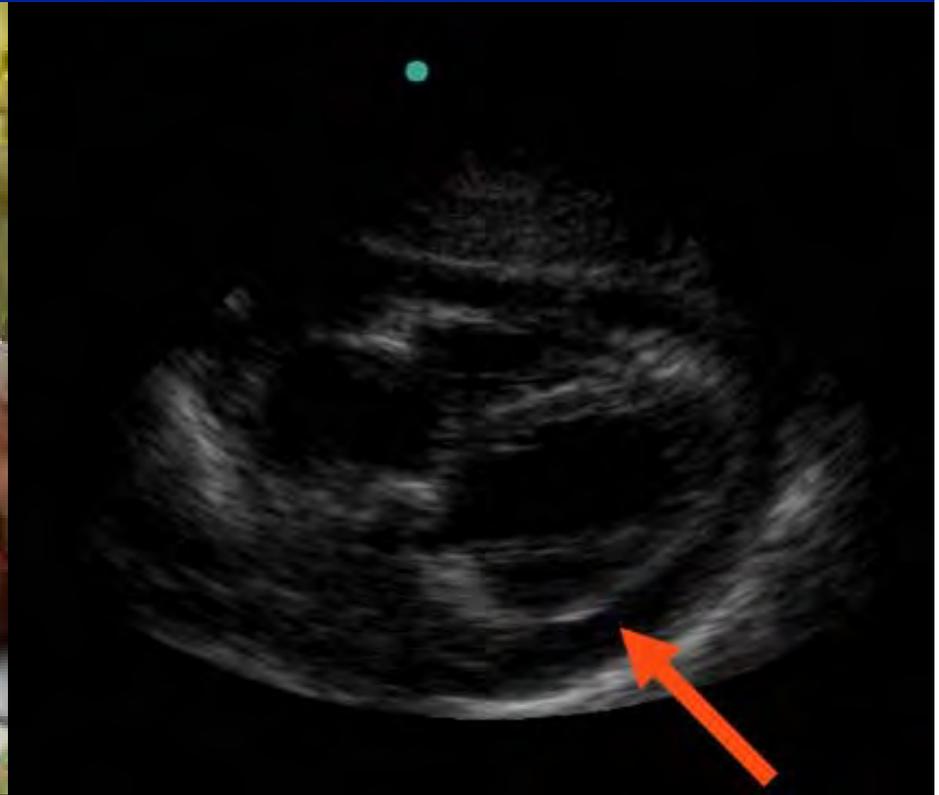
Subcostal long axis:

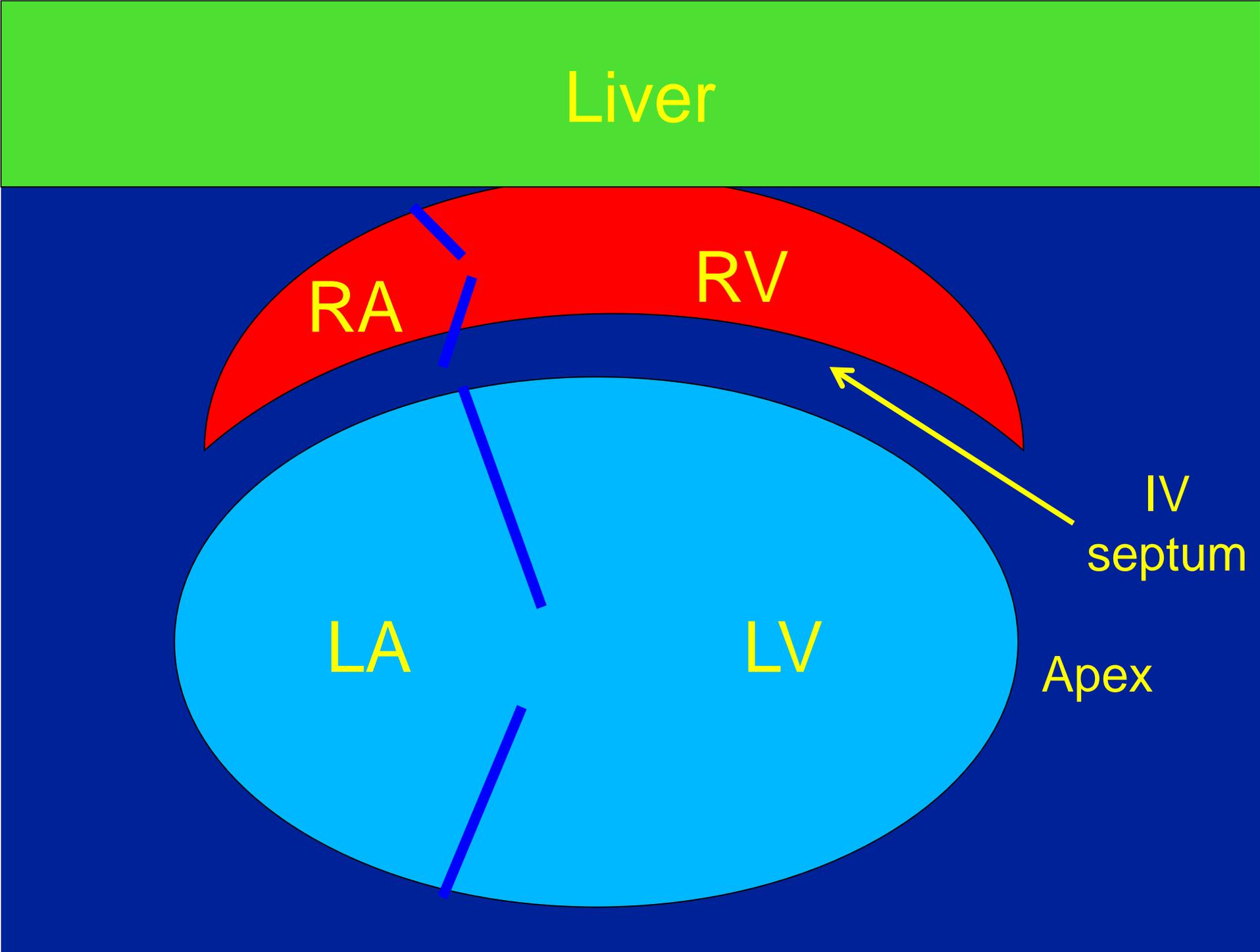
probe is transverse
angled **up** into thorax

Subcostal abdo preset: marker to patient's right



Subcostal cardiac preset: marker to patient's left





liver is window
right heart is above left heart
apex points to right of screen

Pen TH
S MB

Cr
P2



96
M
1.0
A
B
C



Parasternal long axis (PLAX):

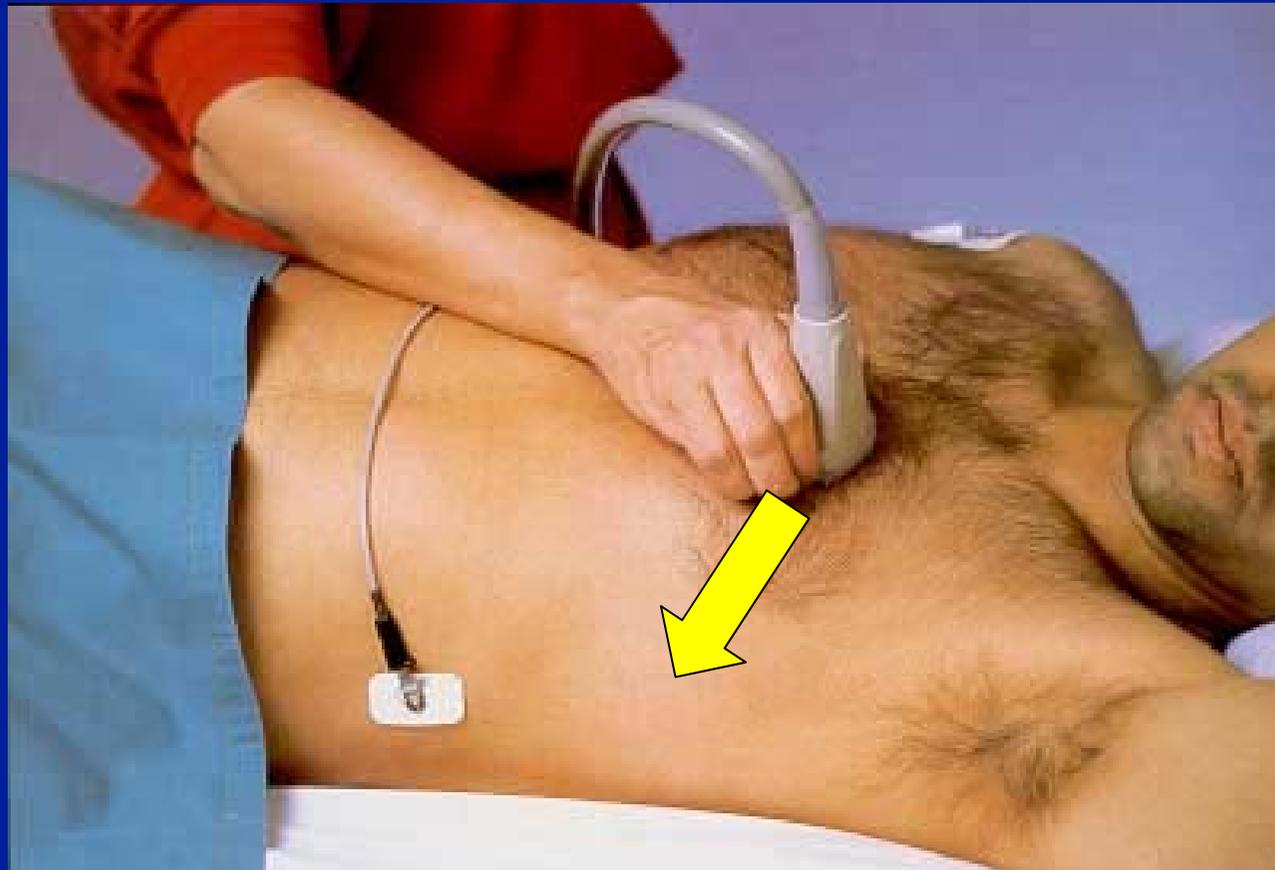
Draw an imaginary line...

from right shoulder to left elbow

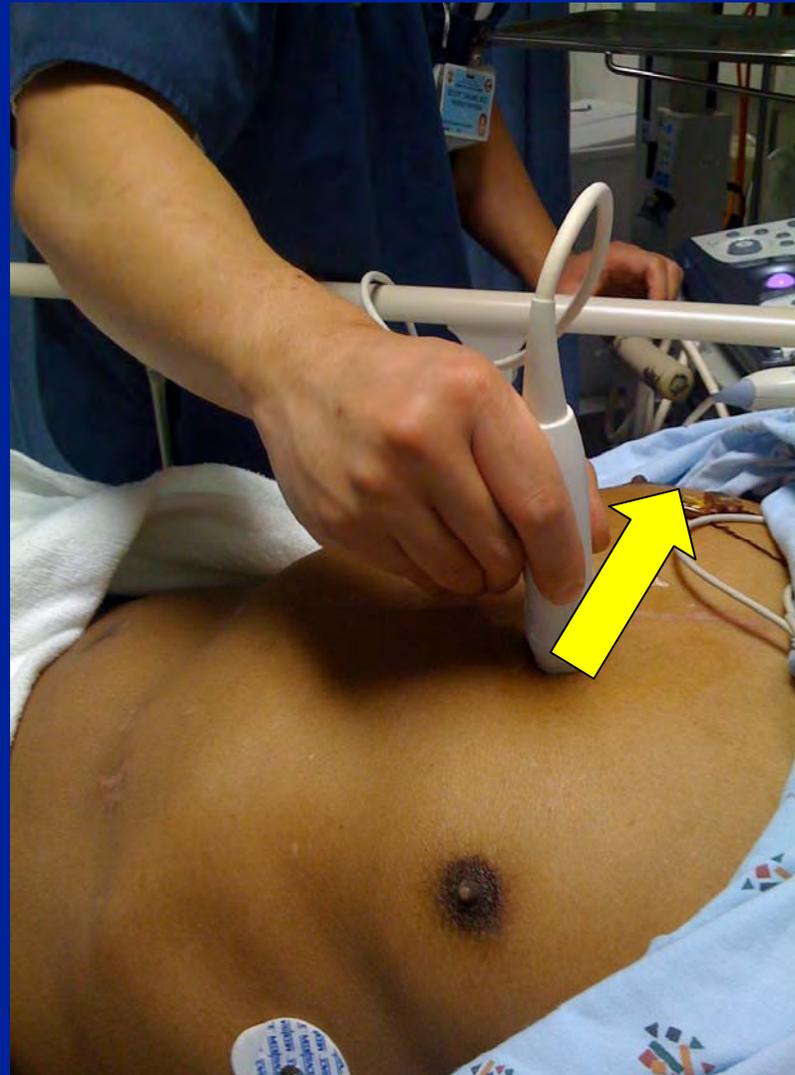
Abdo preset: marker to left elbow

Cardiac preset: marker to right shoulder

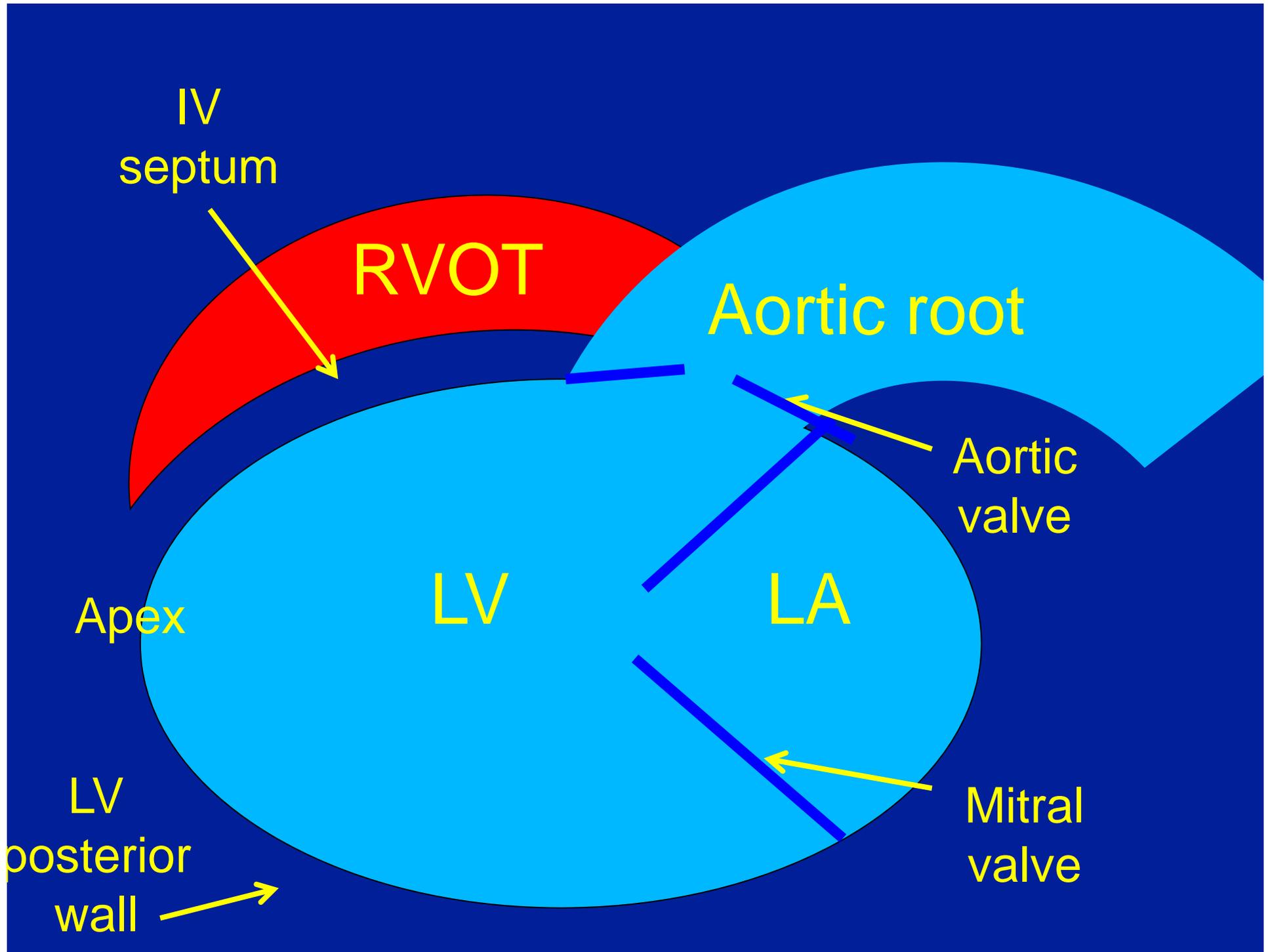
PLAX abdo preset: marker points to left elbow

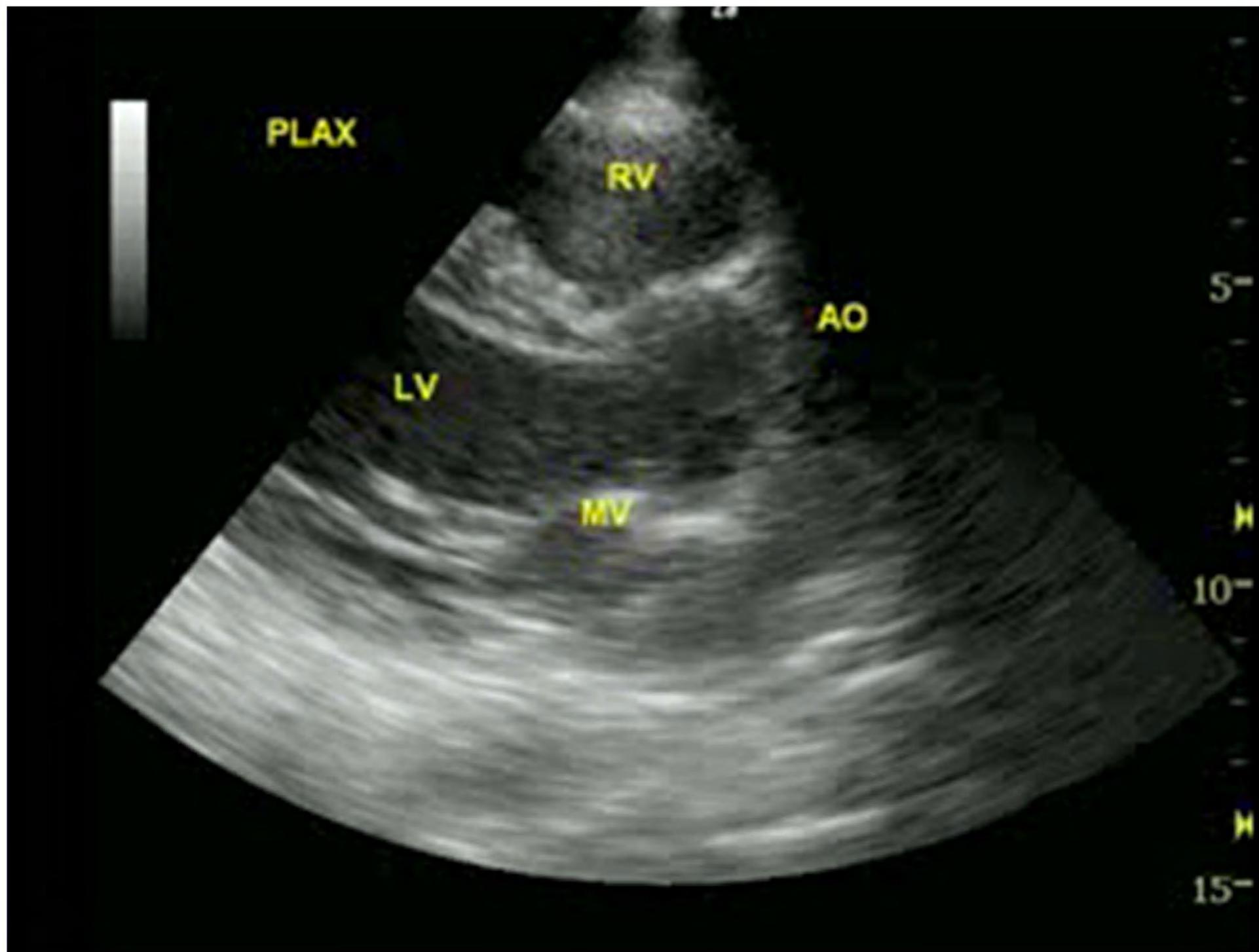


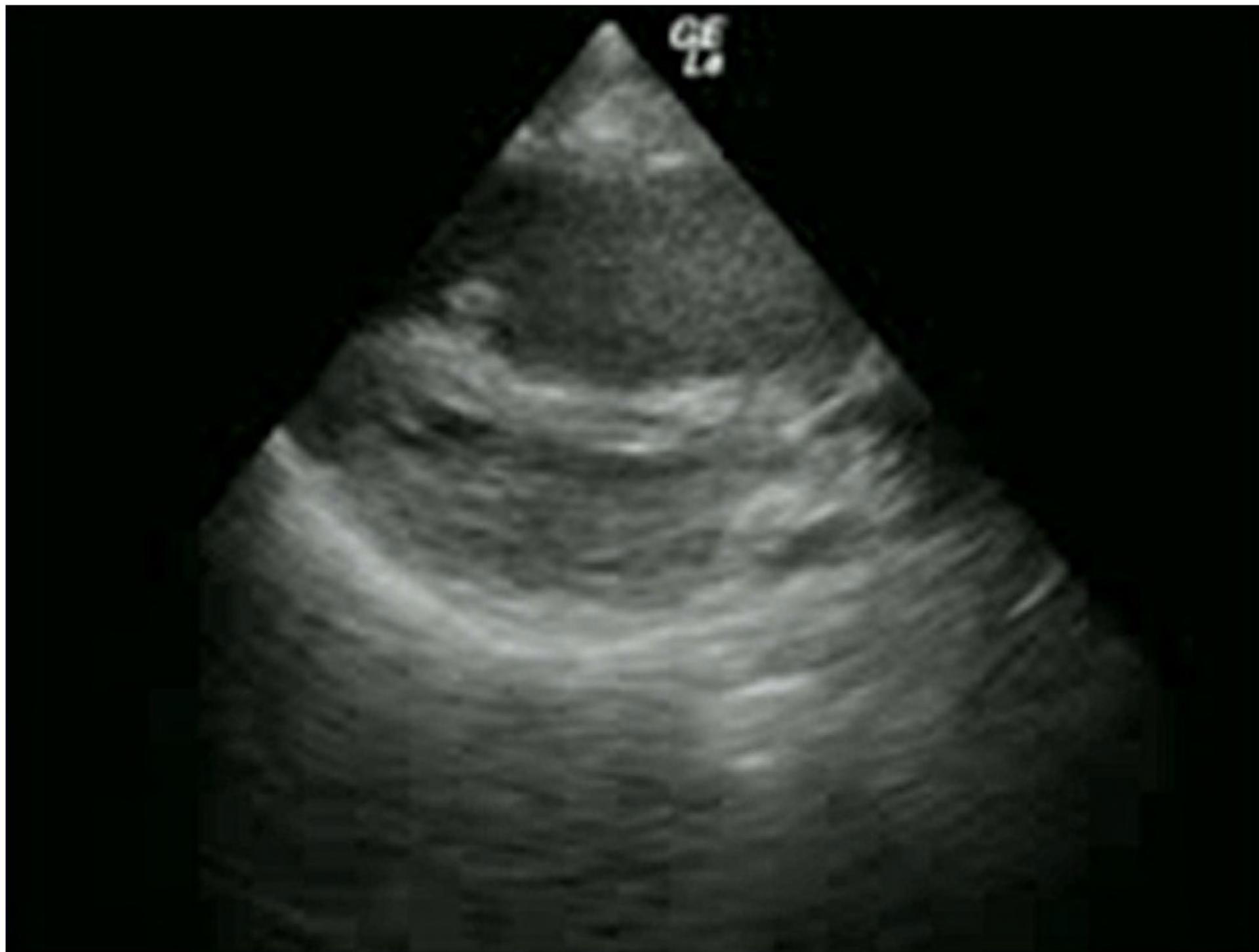
PLAX cardiac preset: marker points to right shoulder



Now the apex is to left of screen
Aortic root is to right of screen
RV is still above the LV







Parasternal short axis (PSAX):

probe rotated 90 degrees to PLAX
cardiac preset: marker to L shoulder
abdo preset: marker to R hip

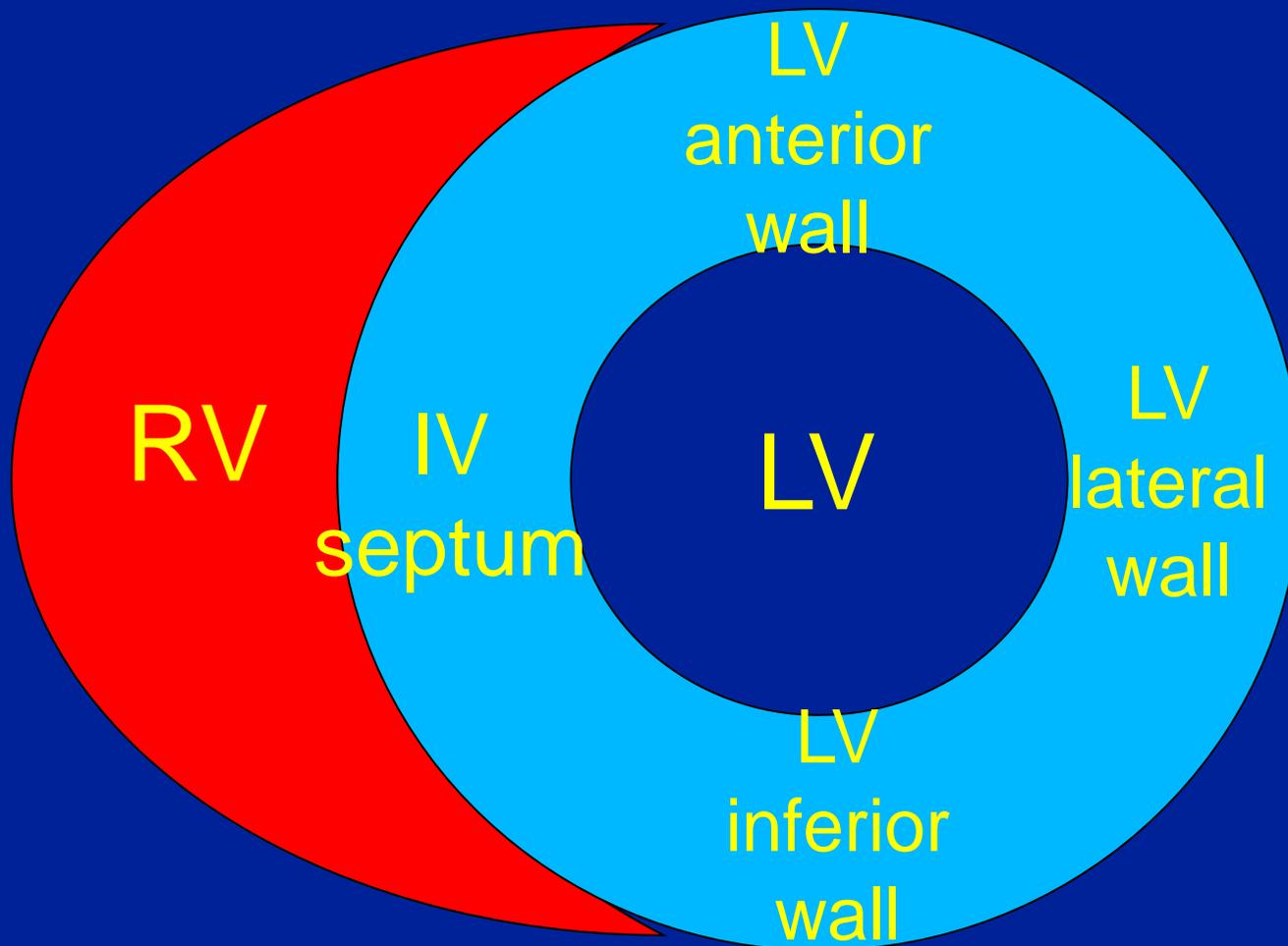
PSAX: sector probe

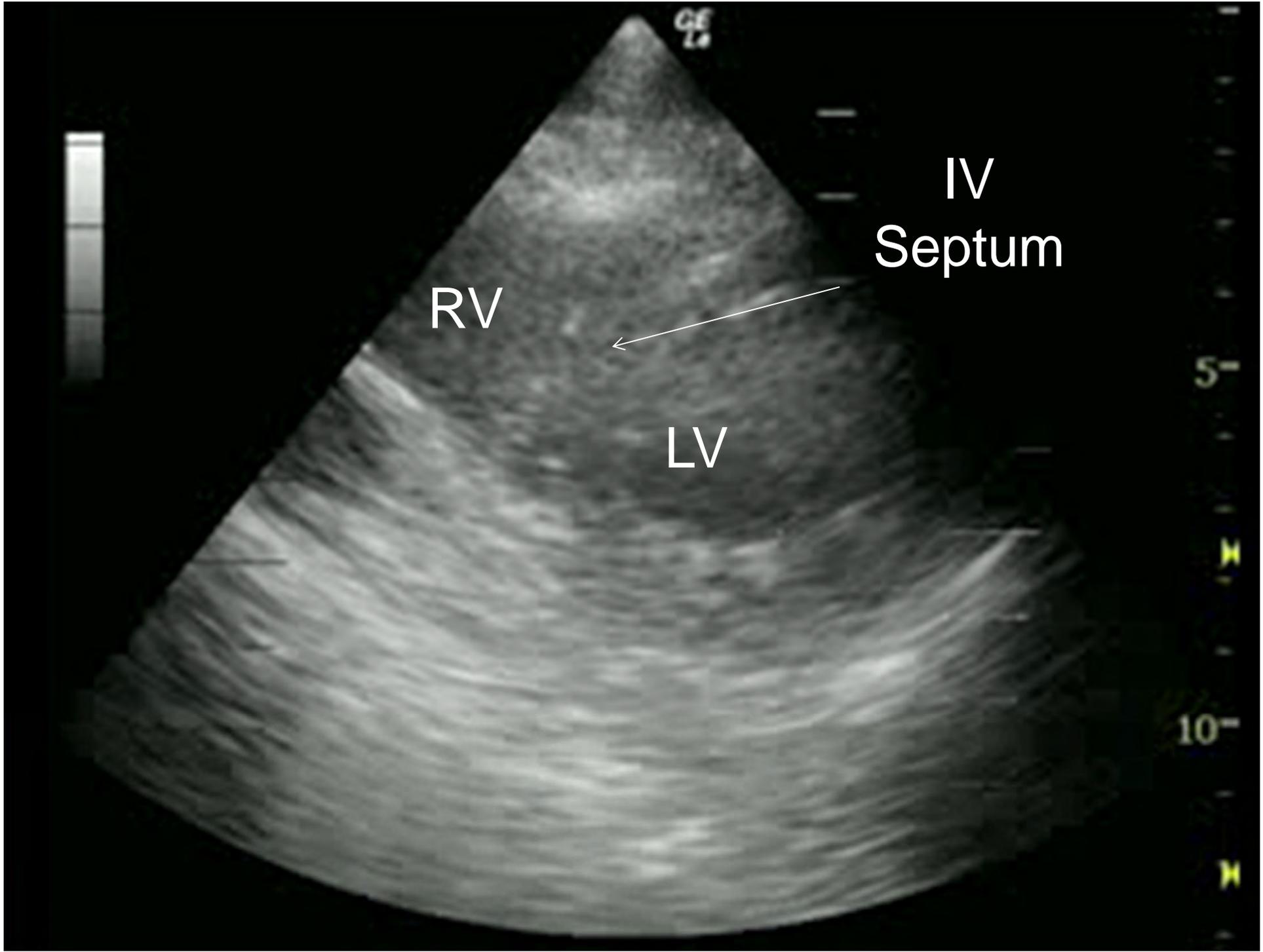


Onscreen:

LV is usually round (high pressure)

RV is usually hard to see (hiding)





CF
LA

IV

Septum

RV



LV

5

M

10

M



en THI



Cro
P21
66%
MI
1.0
TIS
0.7

13

Apical 4 chamber (A4C)

Find the apex beat...

...or just slide the probe down from PSAX

Don't use the curved probe- too tricky

Sector probe: marker to 3 o'clock (patient's
left side)

A4C: sector probe

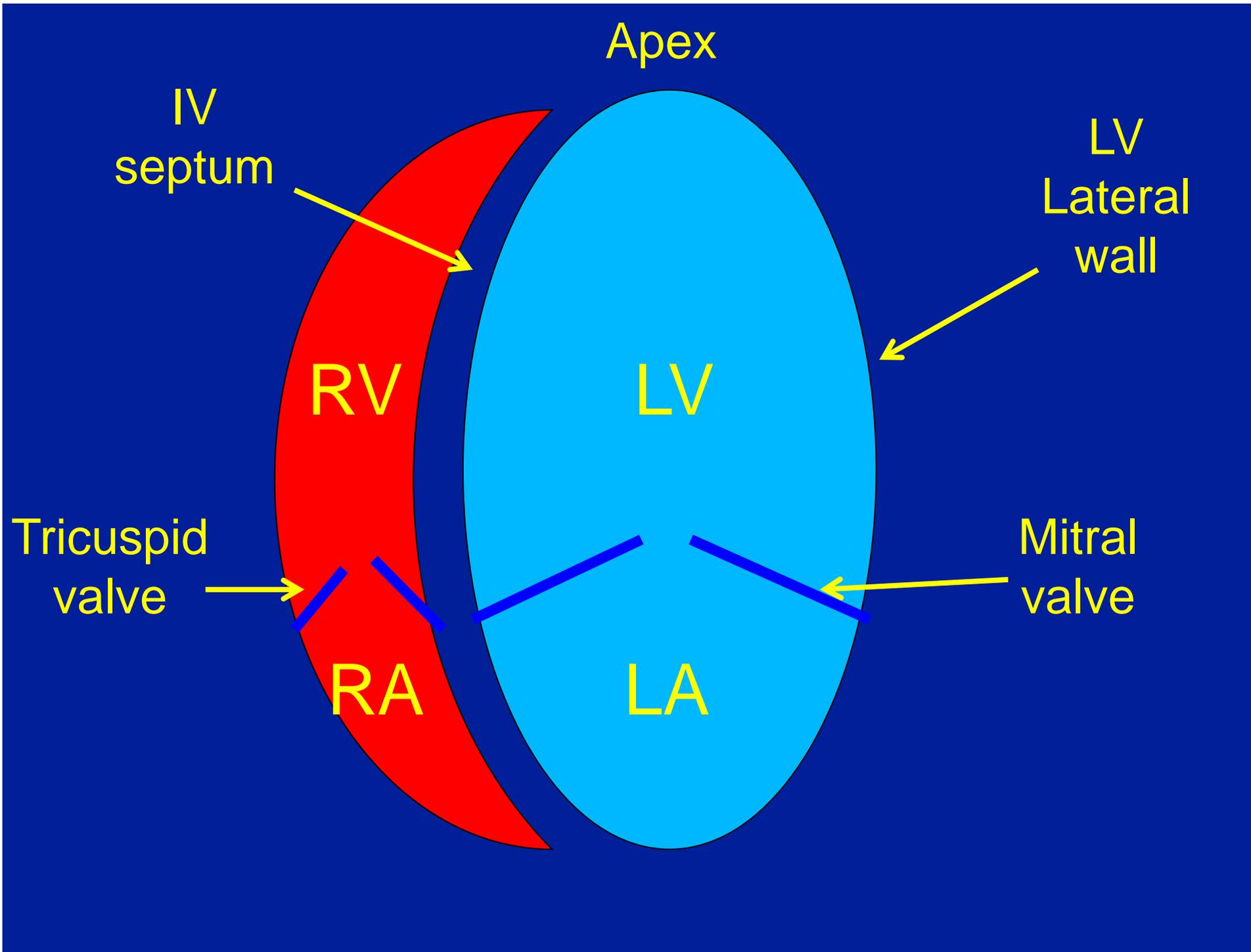


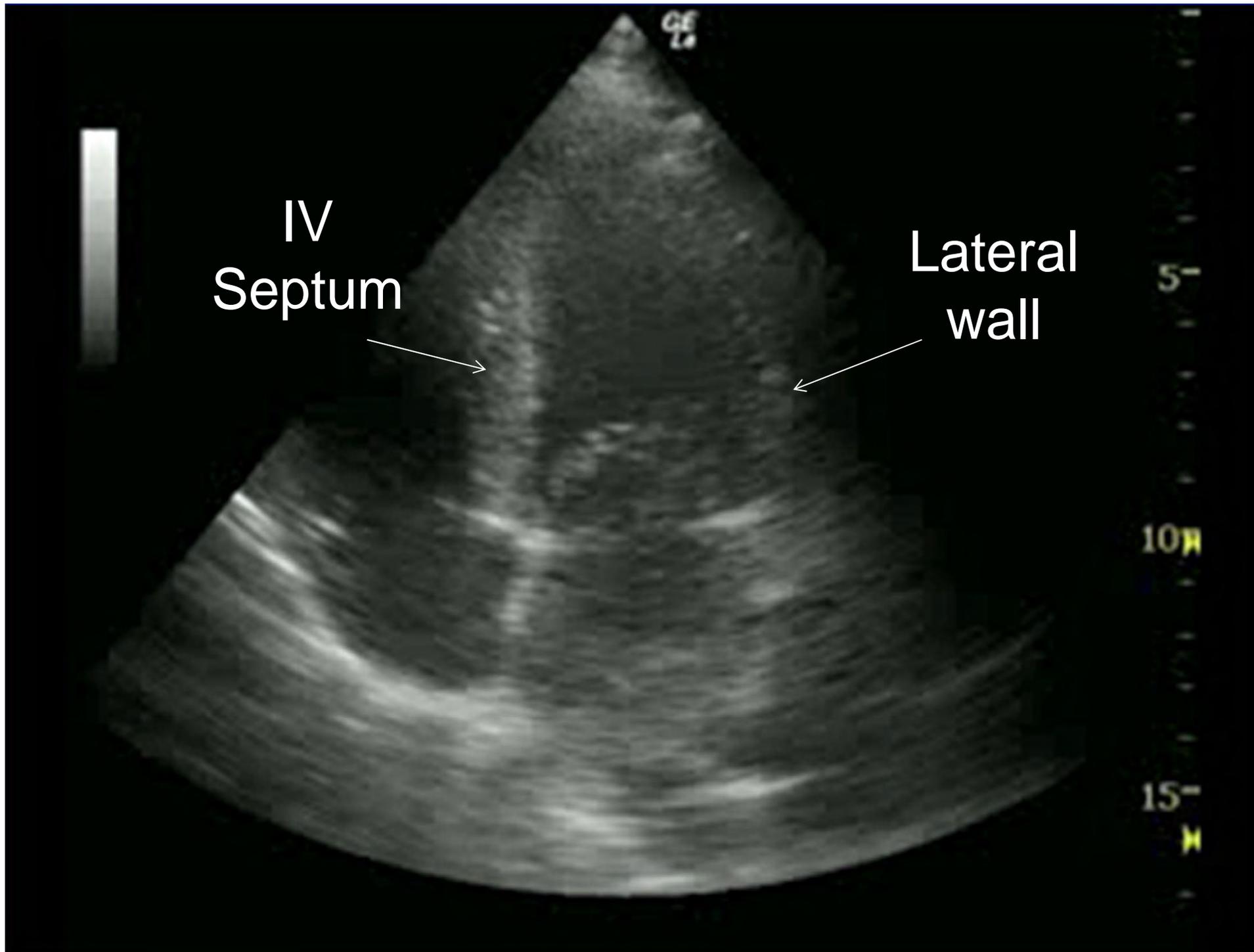
Onscreen:

RV is on the **left**, LV is on the right

Atria below

Ventricles above





- Crd
P21



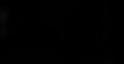
66%

MI

0.9

TIS

0.7

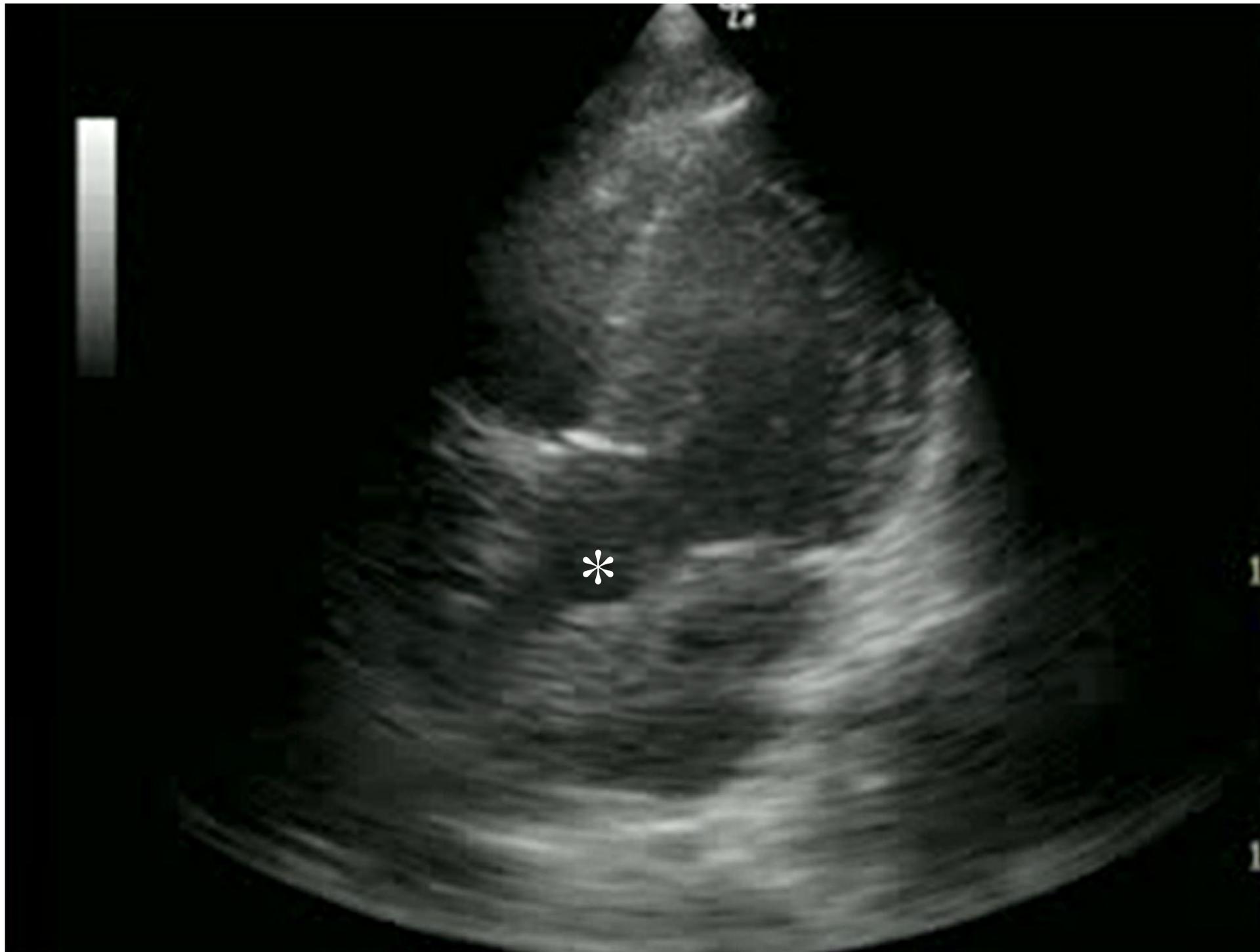


Apical 5 chamber (A5C)

Same position

Just flatten out the probe

Aortic root comes into view



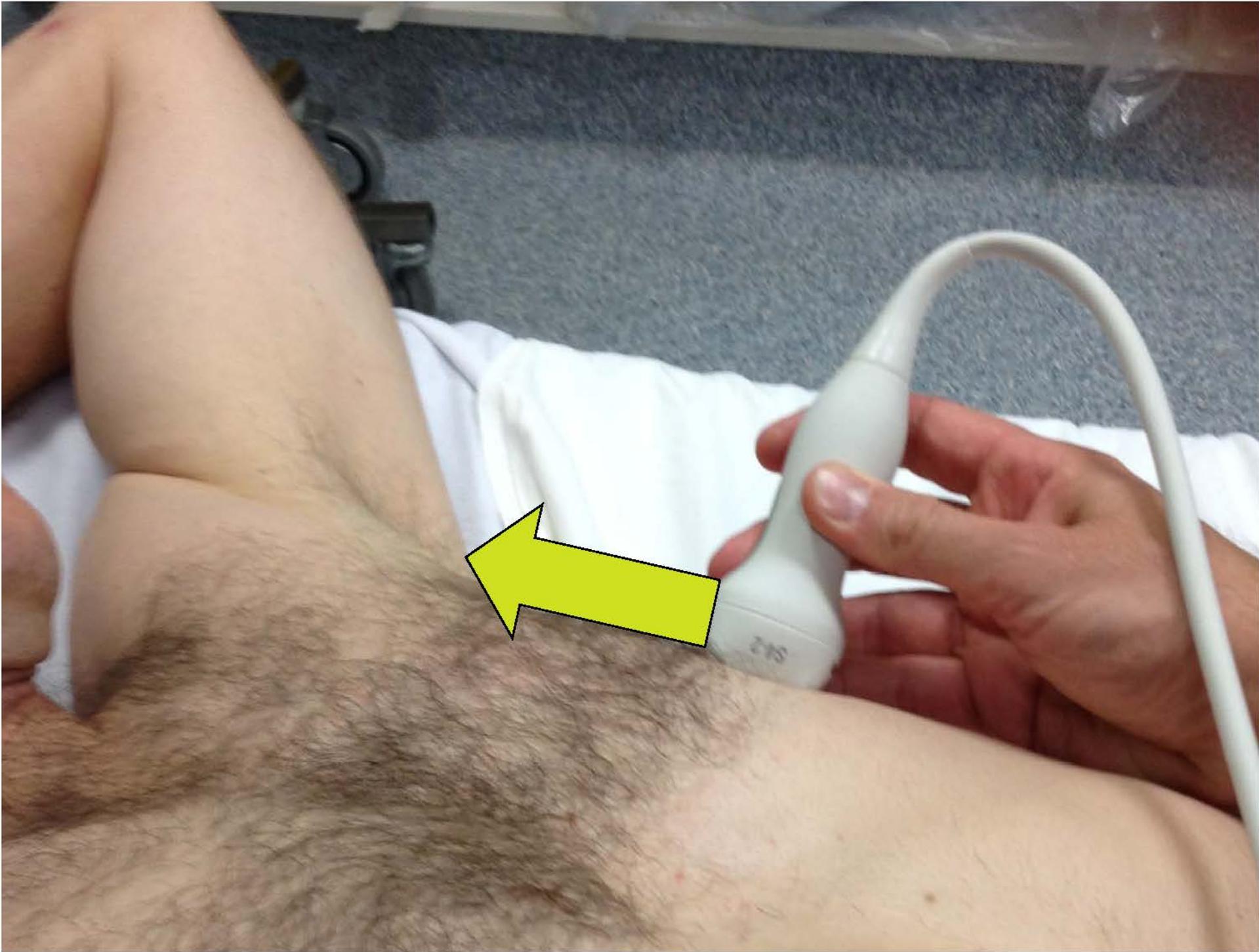
Apical 2 chamber (A2C)

Keep your eyes on the screen

Hold probe with one hand

Turn it with the other

Probe marker points to 11 o'clock (patient's head)

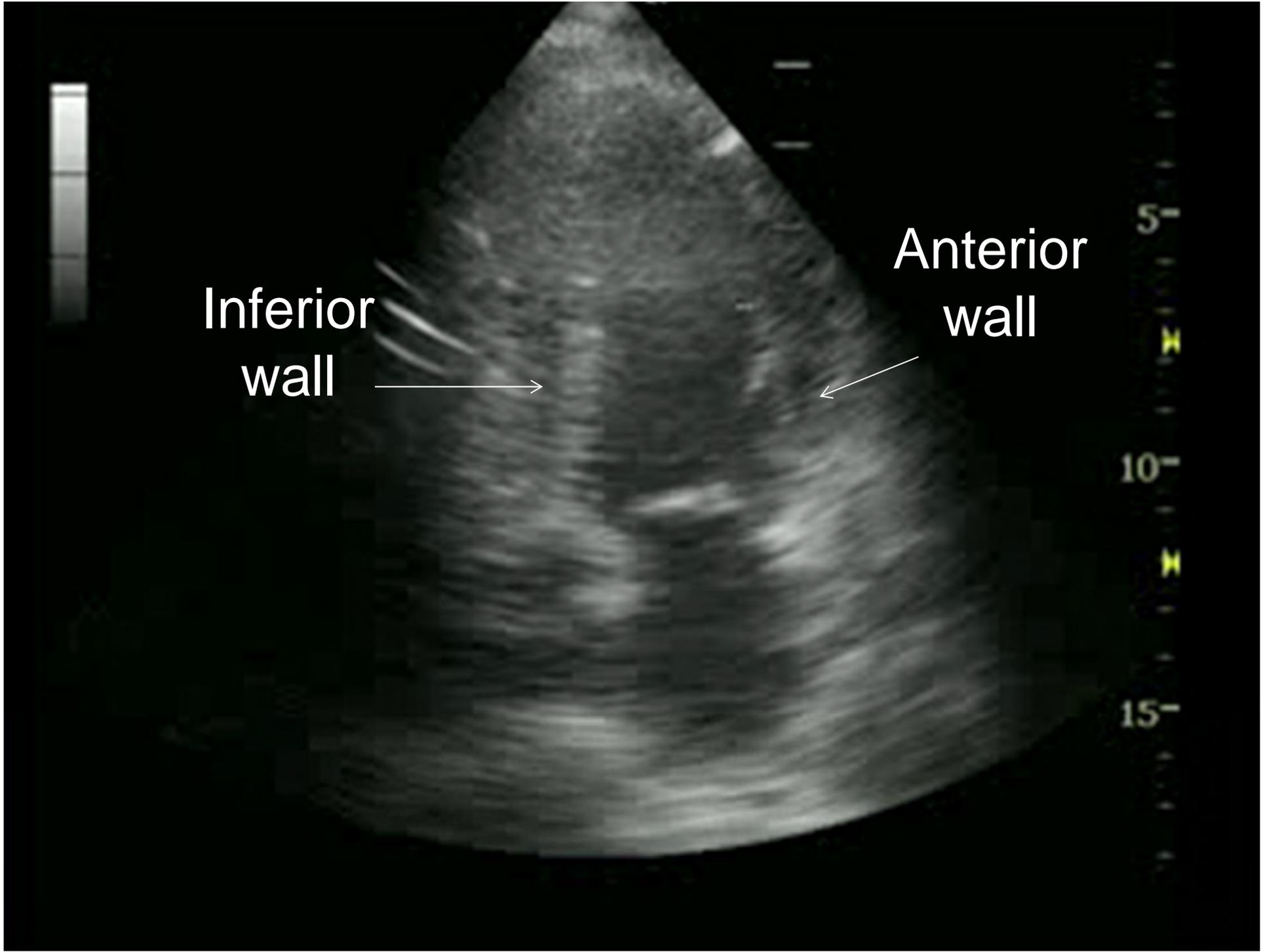


Onscreen: just see the LV & LA

Atrium below ventricle

LV anterior wall on the right

LV inferior wall on the left



Inferior
wall



Anterior
wall



5-

10-

15-

Windows & LV walls

LV SEGMENTS: THE PSAX 'COMPASS'

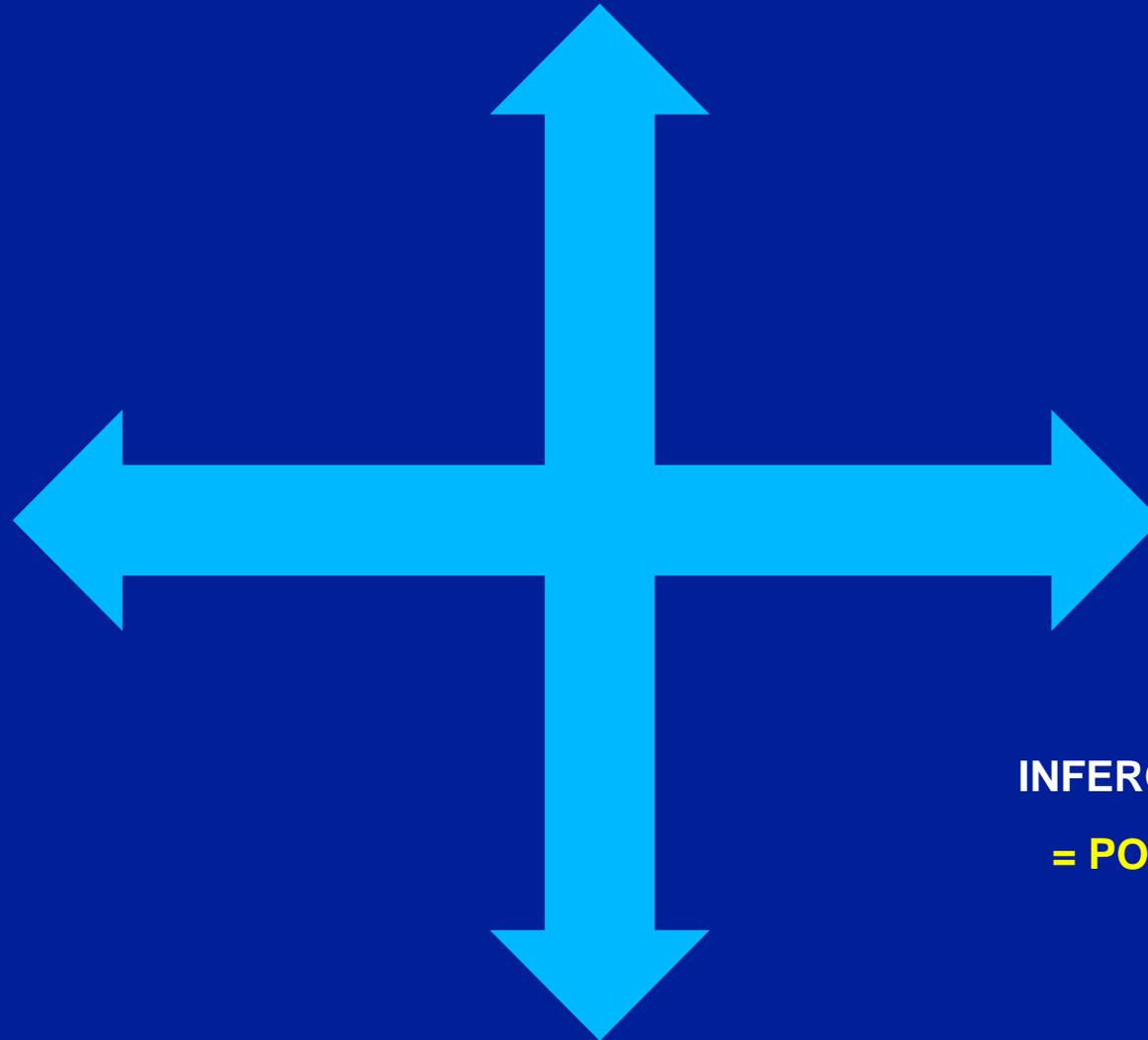
NORTH = ANTERIOR

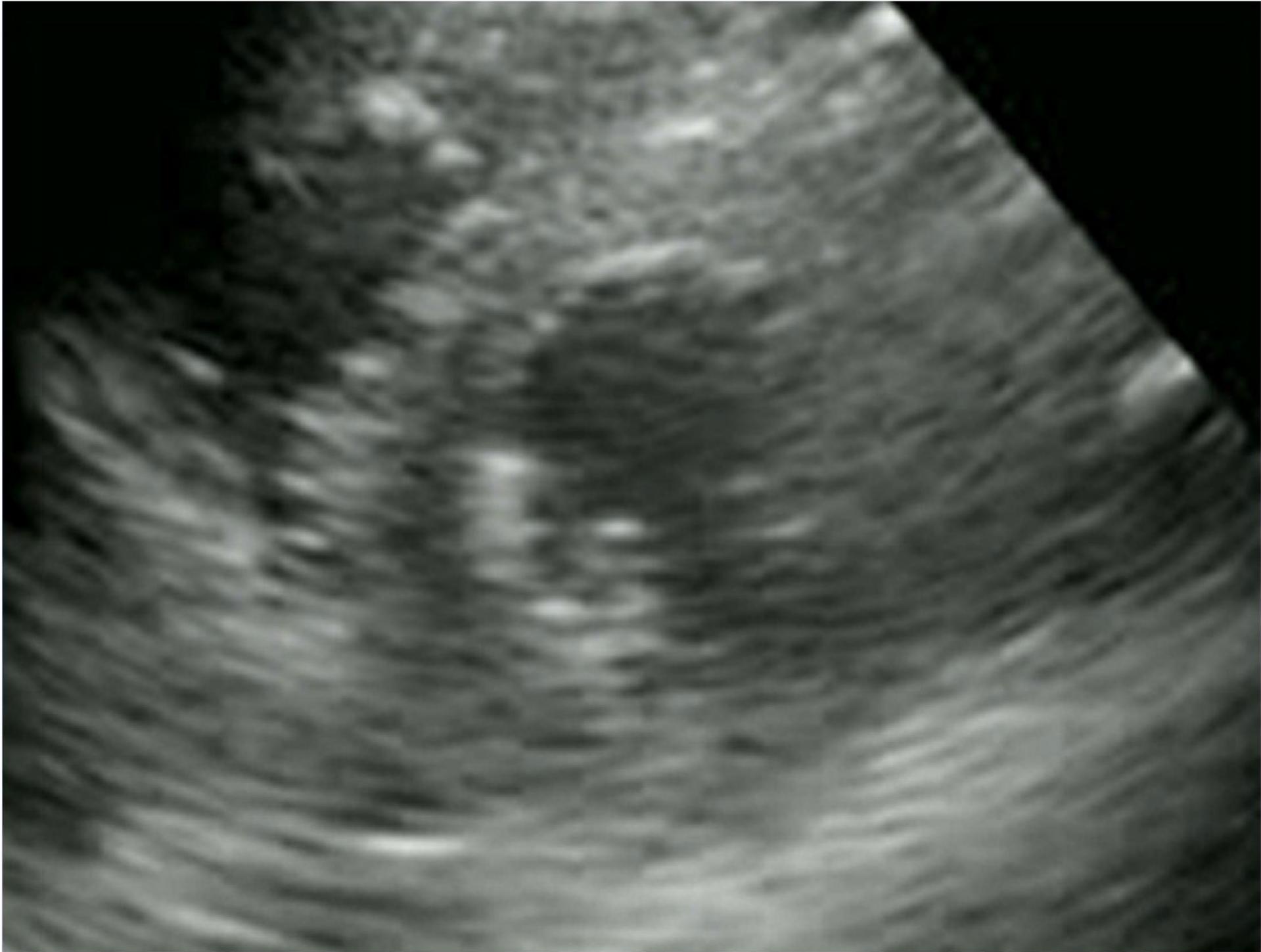
WEST =
SEPTAL

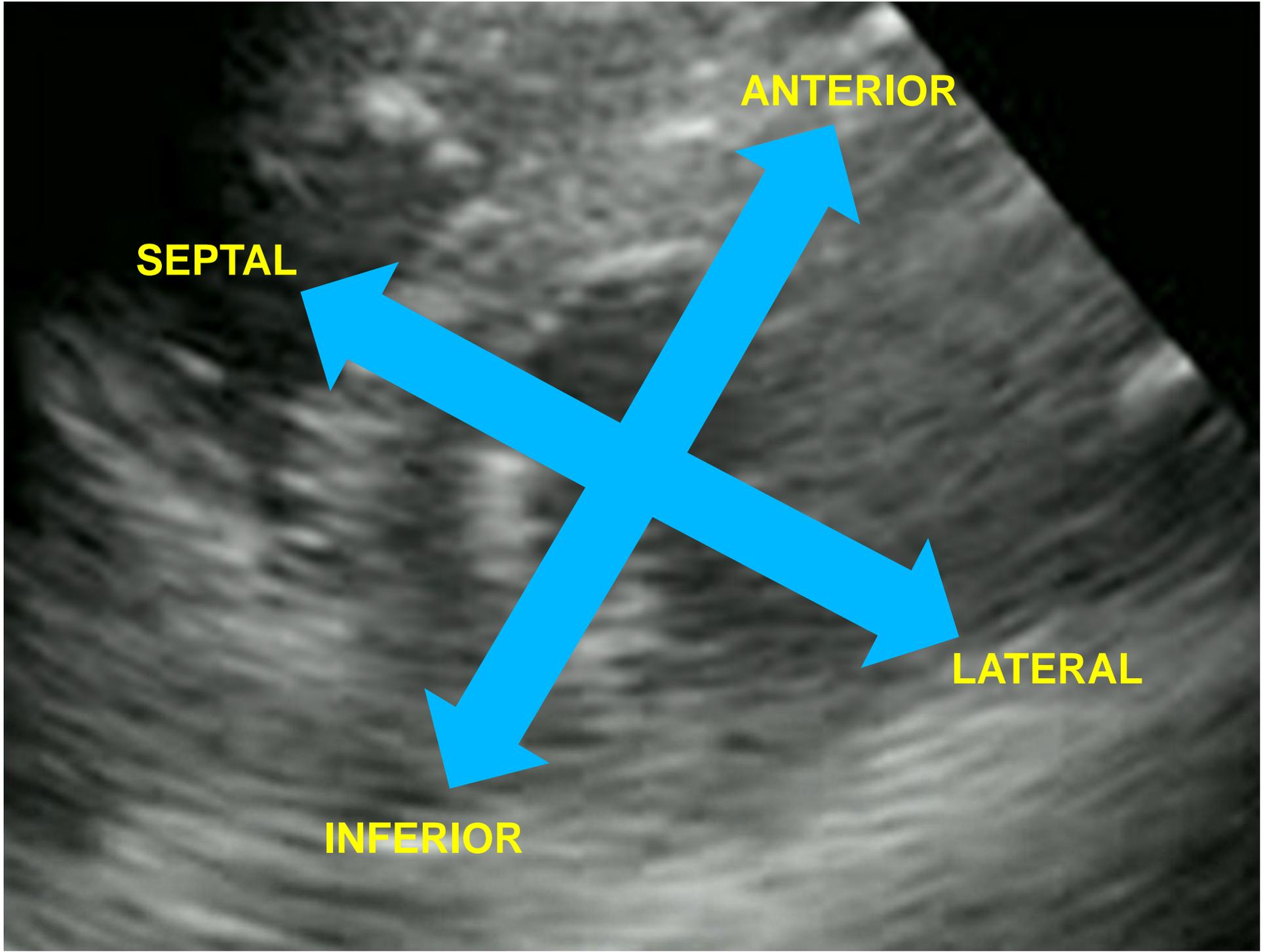
EAST =
LATERAL

INFEROLATERAL
= POSTERIOR

SOUTH = INFERIOR







ANTERIOR

SEPTAL

LATERAL

INFERIOR

Windows & LV walls

Subcostal long: posterior below, septal above

PLAX: posterior below, anteroseptal above

PSAX: all the LV segments, of course!

A4C: lateral on the right, septal on the left

A2C: anterior on right, inferior on left

Summary

- Arrest/ resuscitation
- Curved / sector probe
- Abdo / cardiac preset
- B mode only
- Subcostal, parasternal, apical
- What are the 5 questions?

5 questions

1. Is the heart beating?
2. Is there a tamponade?
3. Is the RV squashing the LV?
4. Is the LV too big / too small / grossly normal?
5. Is LV beating too well / not enough / grossly OK?

Thanks to

Gian Cibinel (Milan)

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