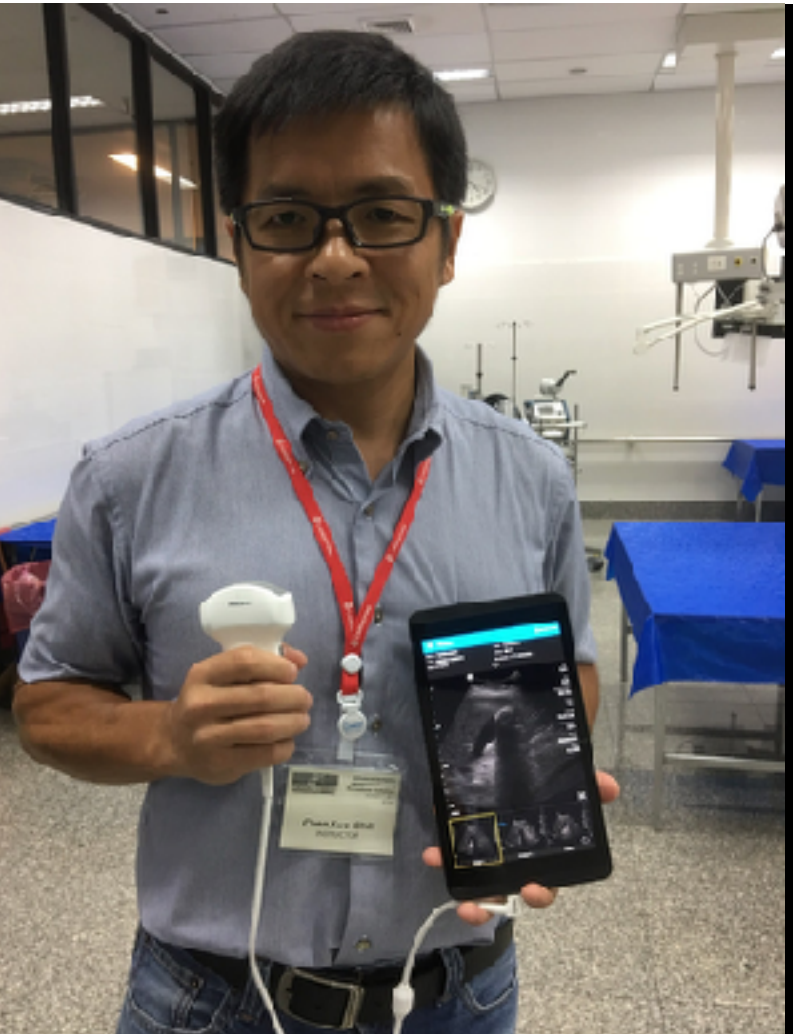
ULTRASOUND PROGRAM

POCUS：讓你【看透】人身
I-AIM & Current applications

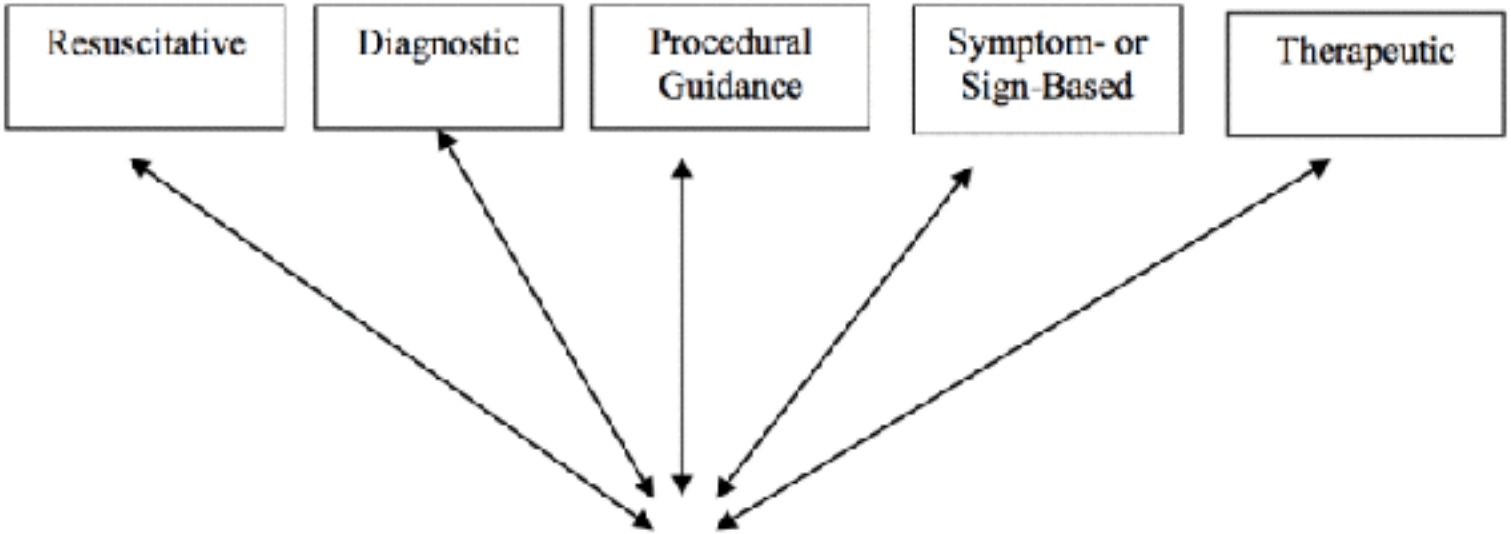


ULTRASOUND PROGRAM

POCUS-急診緣由

症狀問題	線索時間	診斷治療
雜	少	快

急診醫師要會的POCUS



Core Applications
Trauma
Intrauterine Pregnancy
AAA
Cardiac/HD Assessment
Biliary
Urinary Tract
DVT
Soft-tissue/Musculoskeletal
Thoracic/Airway
Ocular
Bowel
Procedural Guidance

ULTRASOUND PROGRAM

I-AIM掃描目標

Indication (point)適應症

Acquire
擷取影像

Interpret
判讀影像

Make decision
決定治療方向

Bahner DP, et al. J Ultrasound Med 2012

ULTRASOUND PROGRAM

Shock摸不到脈搏

PEA心臟有在跳嗎？

心臟

搏動

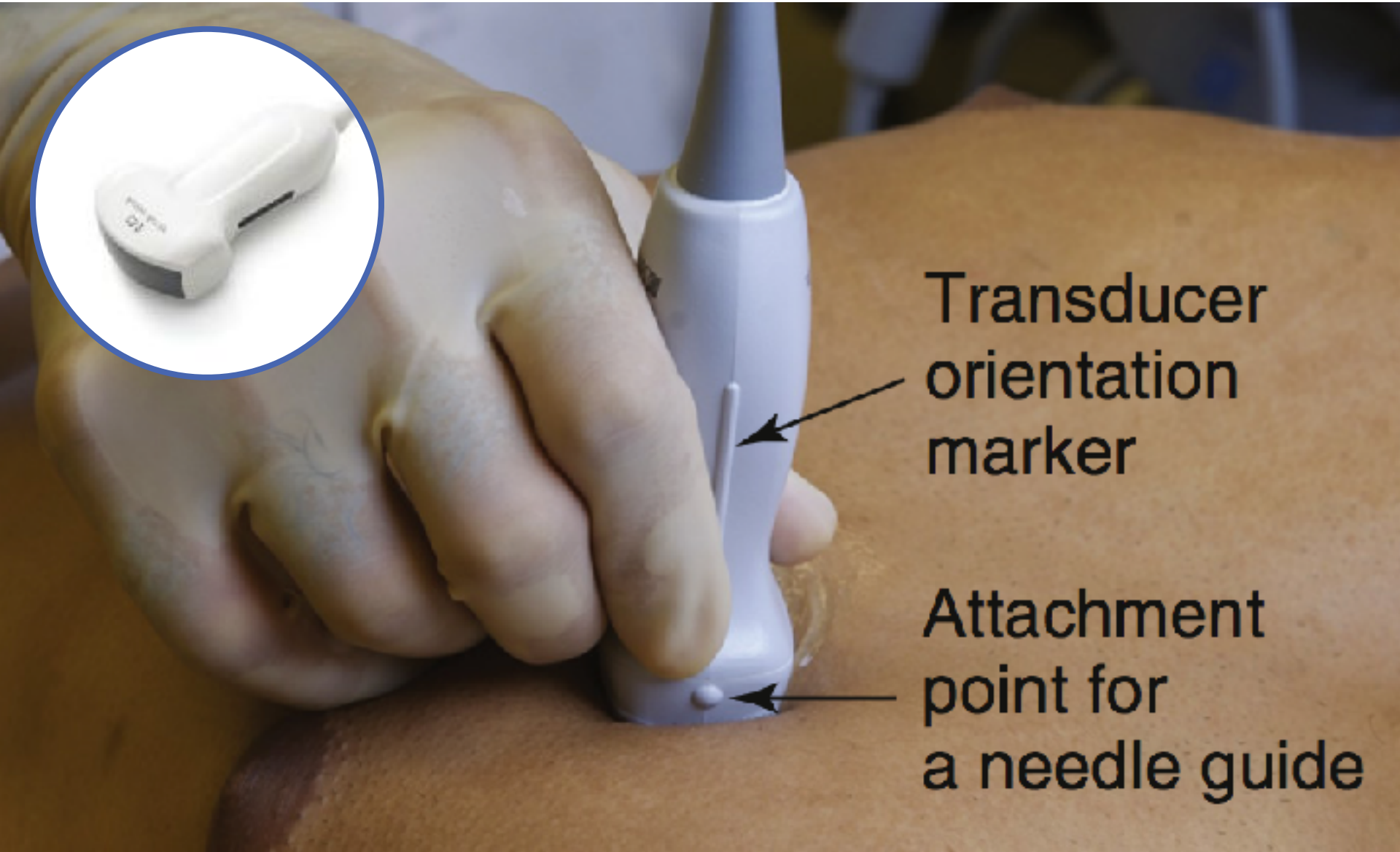
急救

Taipei

Bahner DP, et al. J Ultrasound Med 2012

ULTRASOUND PROGRAM

方向: 患者的右側和頭側



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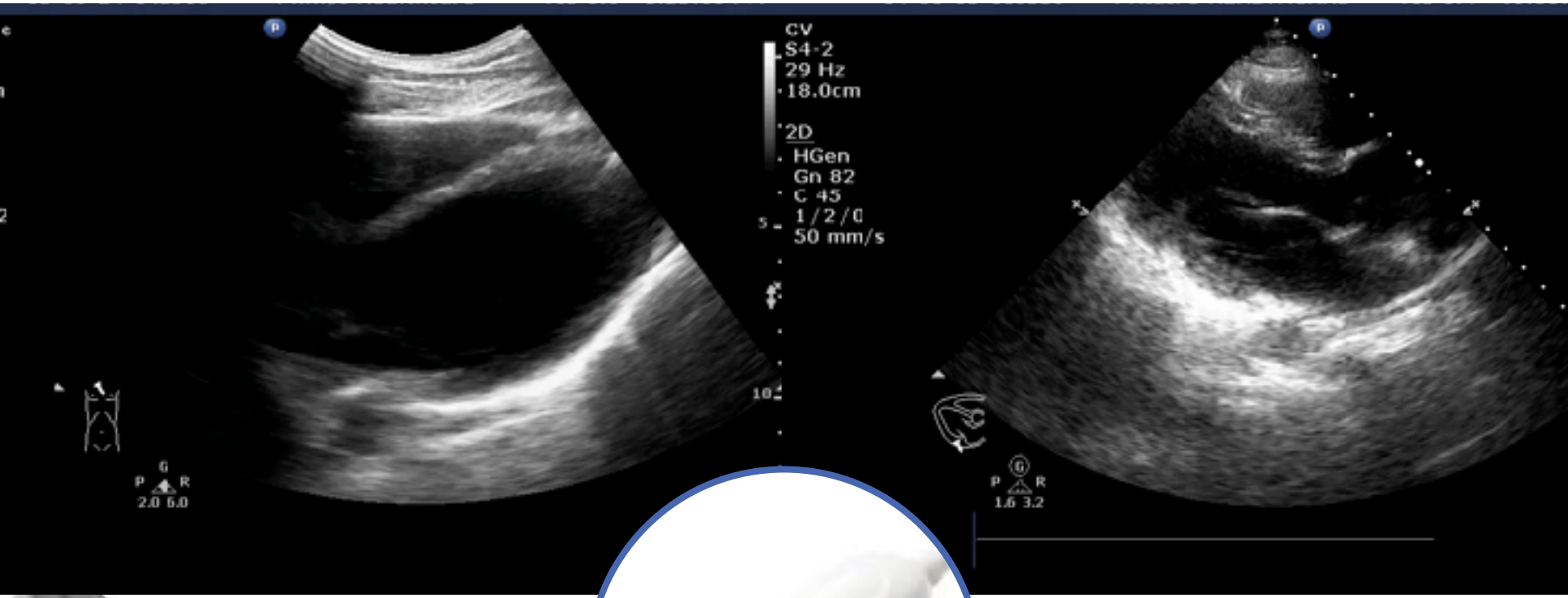
探頭的方向和螢幕的方向要一致



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到院前超音波建議探頭

頻率

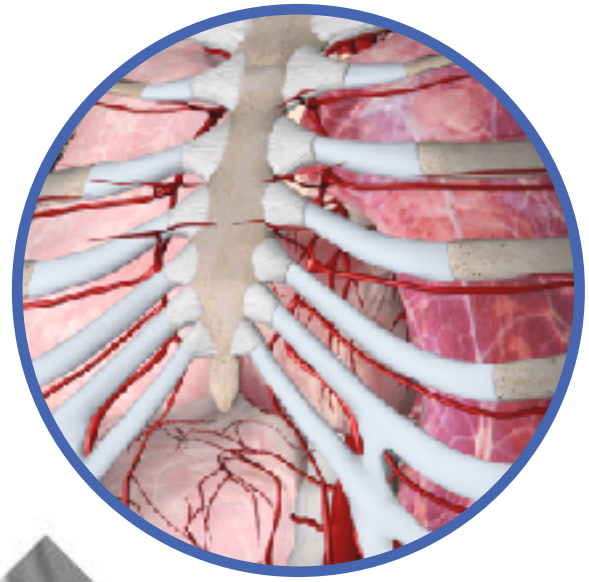
表面

弧

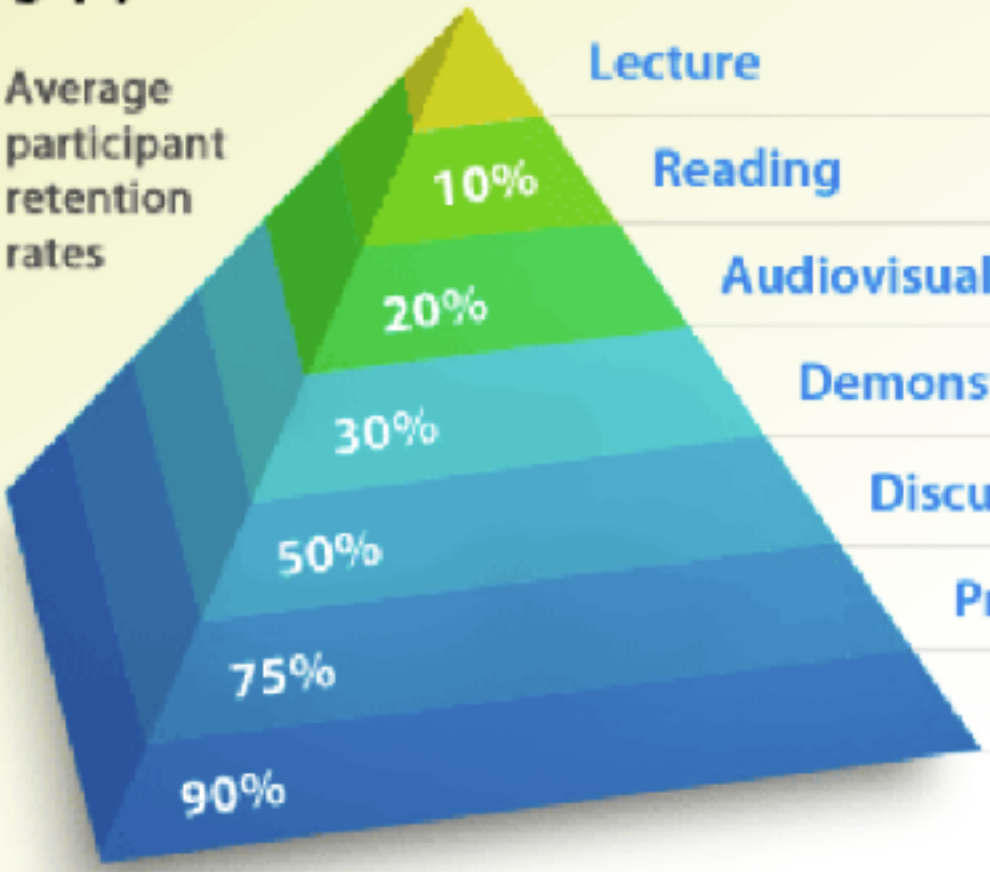
深度

ULTRASOUND
PROGRAM

今天的目標



Learning pyramid



We combine consultation with onsite, customized training and coaching. The results are optimal.

Source : National Training Laboratories, Arlington, Virginia

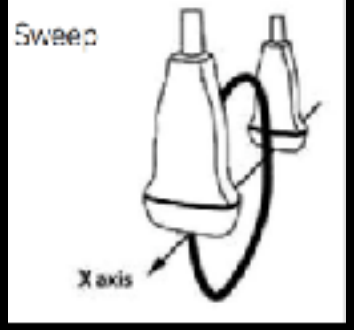
探頭操控 6 大技巧

X	Y	Z
Sweep	Slide	Rotate
Fan	Rock	Compress

探頭操控 6 大技巧

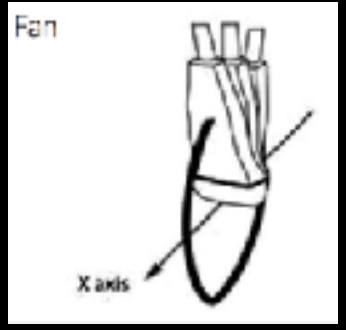
X	Y	Z
掃	滑	轉
扇	搖	壓

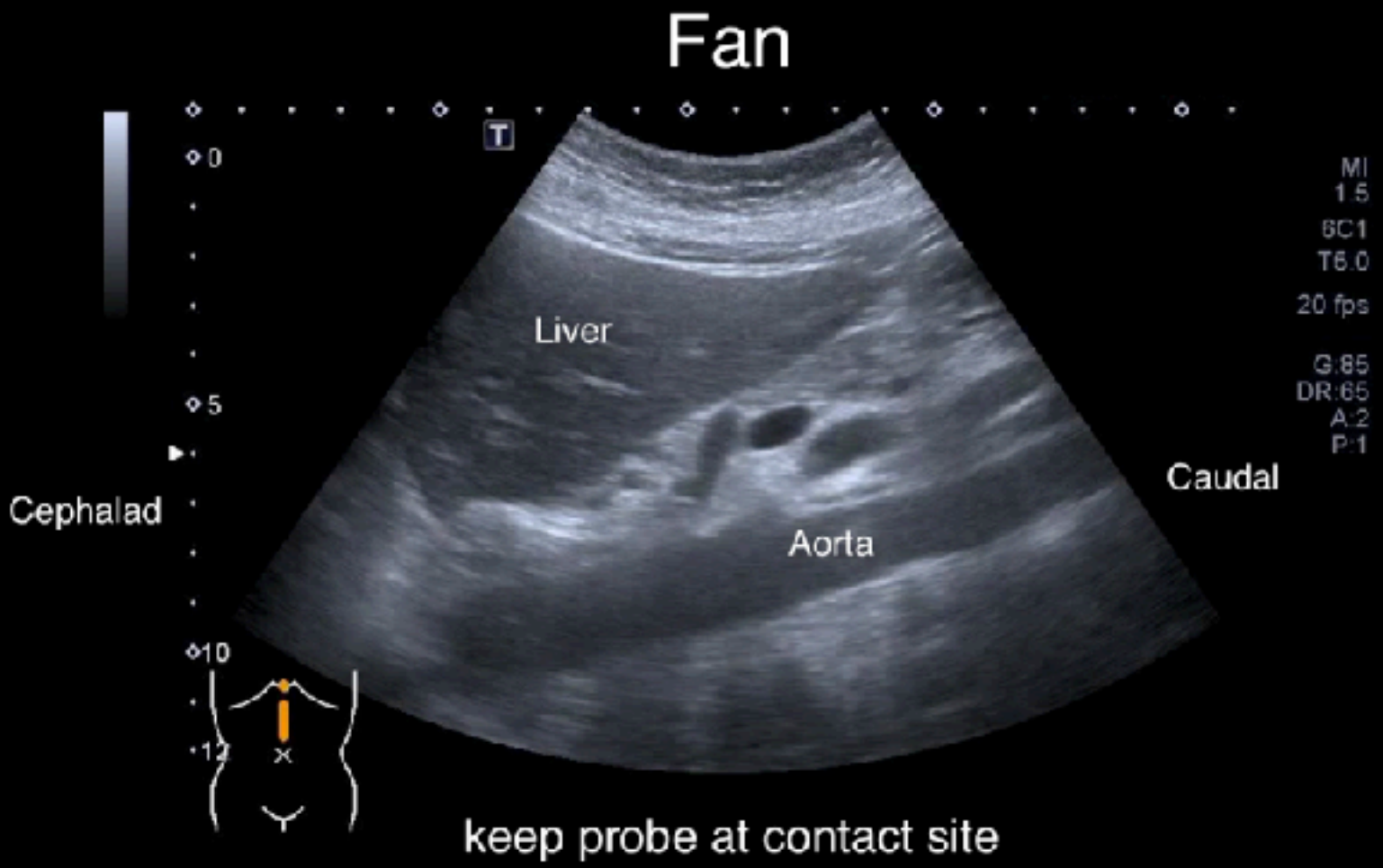
掃



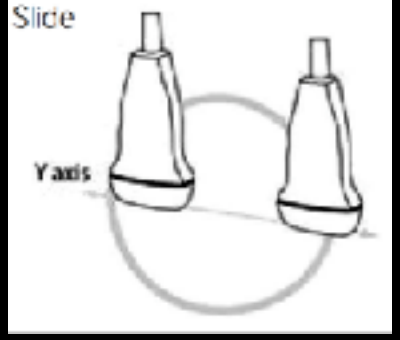
Sweep

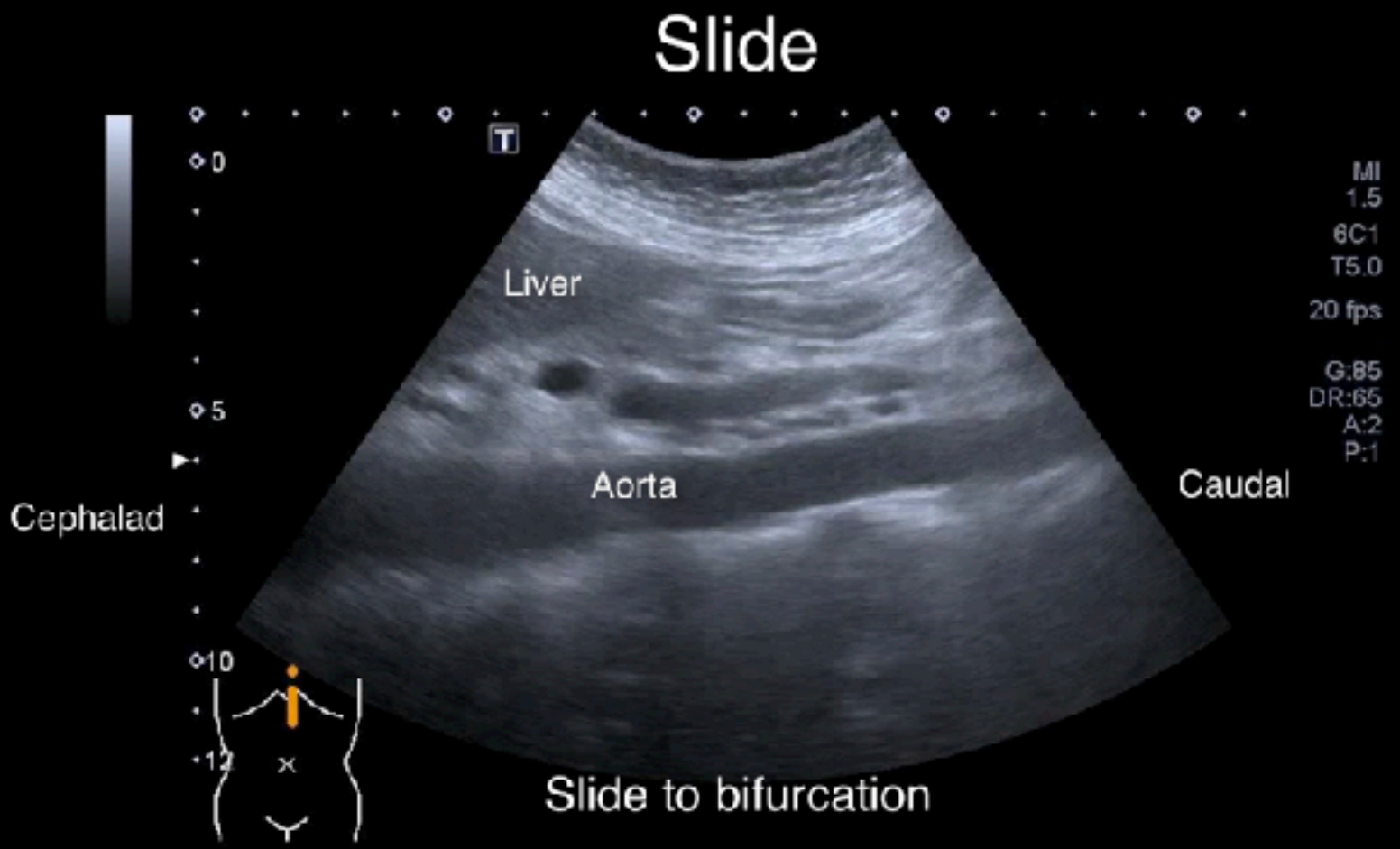
扇


Fan
X axis

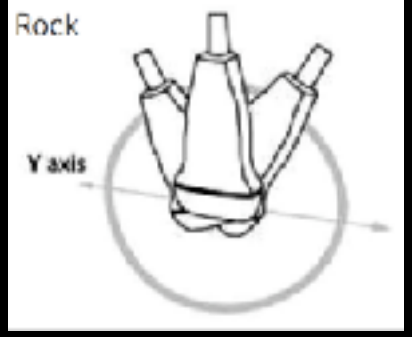

Fan
T
0
5
10
12
MI
1.5
6C1
T6.0
20 fps
G:85
DR:65
A:2
P:1
Liver
Aorta
Cephalad
Caudal
keep probe at contact site

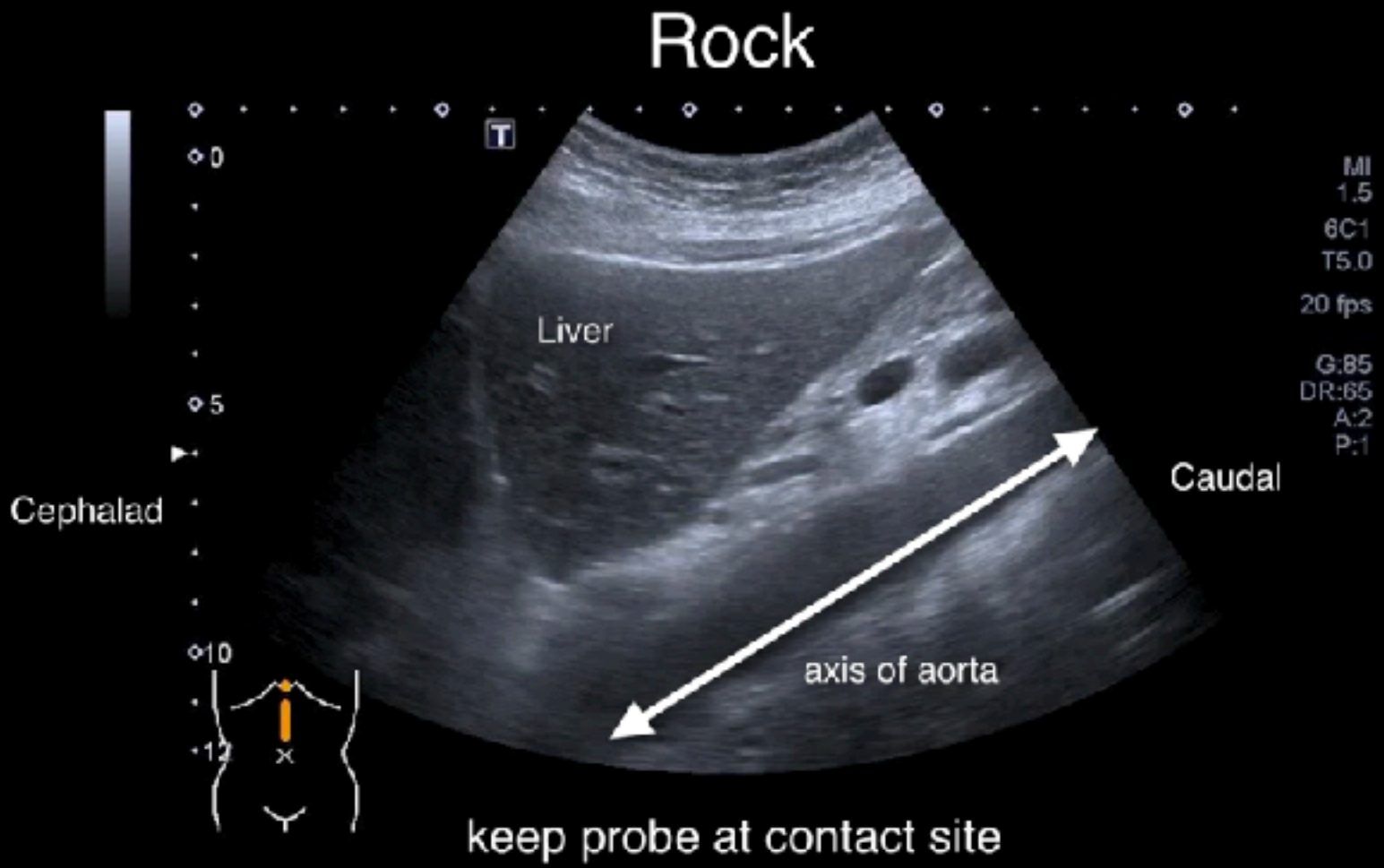
滑


Slide
Y axis

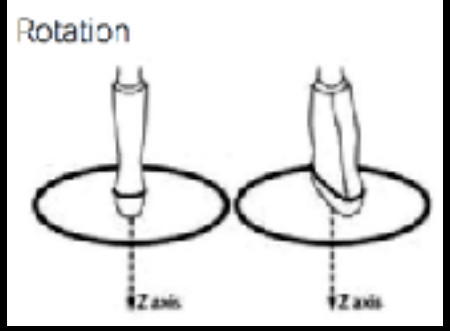

Slide
0
5
10
12
Liver
Aorta
Cephalad
Caudal
MI
1.5
6C1
T5.0
20 fps
G:85
DR:65
A:2
P:1
Slide to bifurcation

摇


Rock
Y axis


Rock
T
0
5
10
12
MI
1.5
6C1
T5.0
20 fps
G:85
DR:65
A:2
P:1
Liver
Cephalad
Caudal
axis of aorta
keep probe at contact site

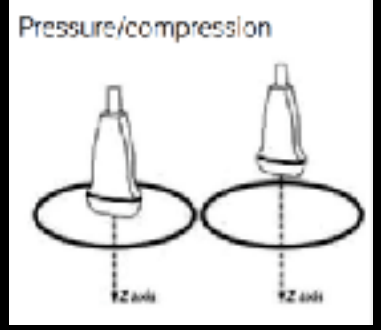
轉


Rotation
Z axis
Z axis

Rotation


0
5
10
12
Aorta
MI
1.5
6C1
T5.0
20 fps
G:85
DR:65
A:2
P:1

壓



Compression

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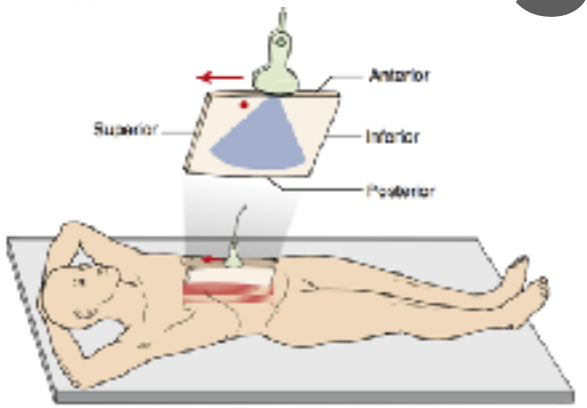
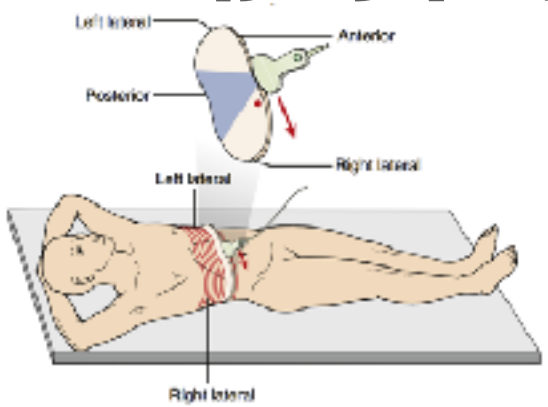
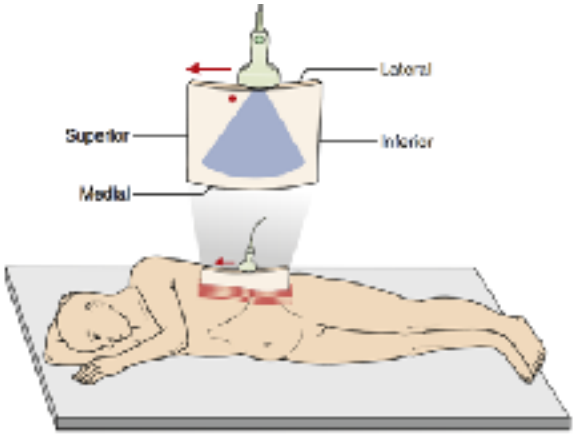
3D 立體掃描



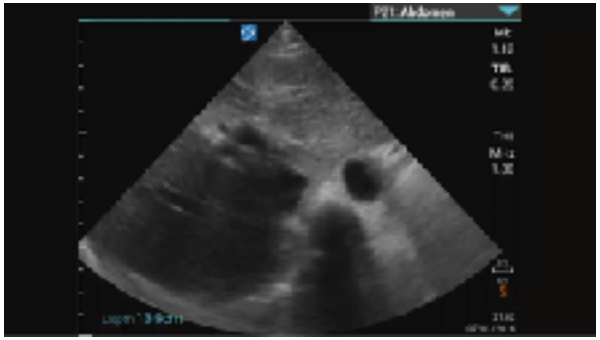


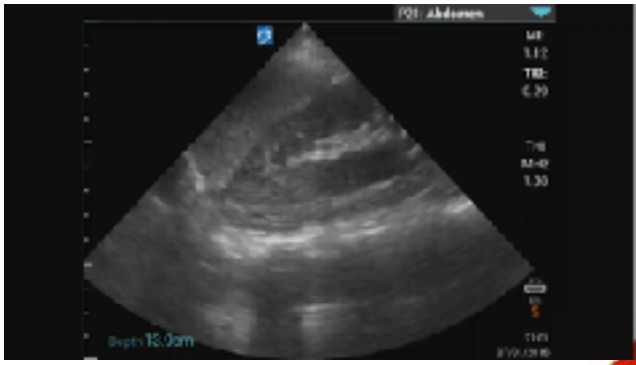


Sagittal 縱

Transverse 橫

Coronal 側





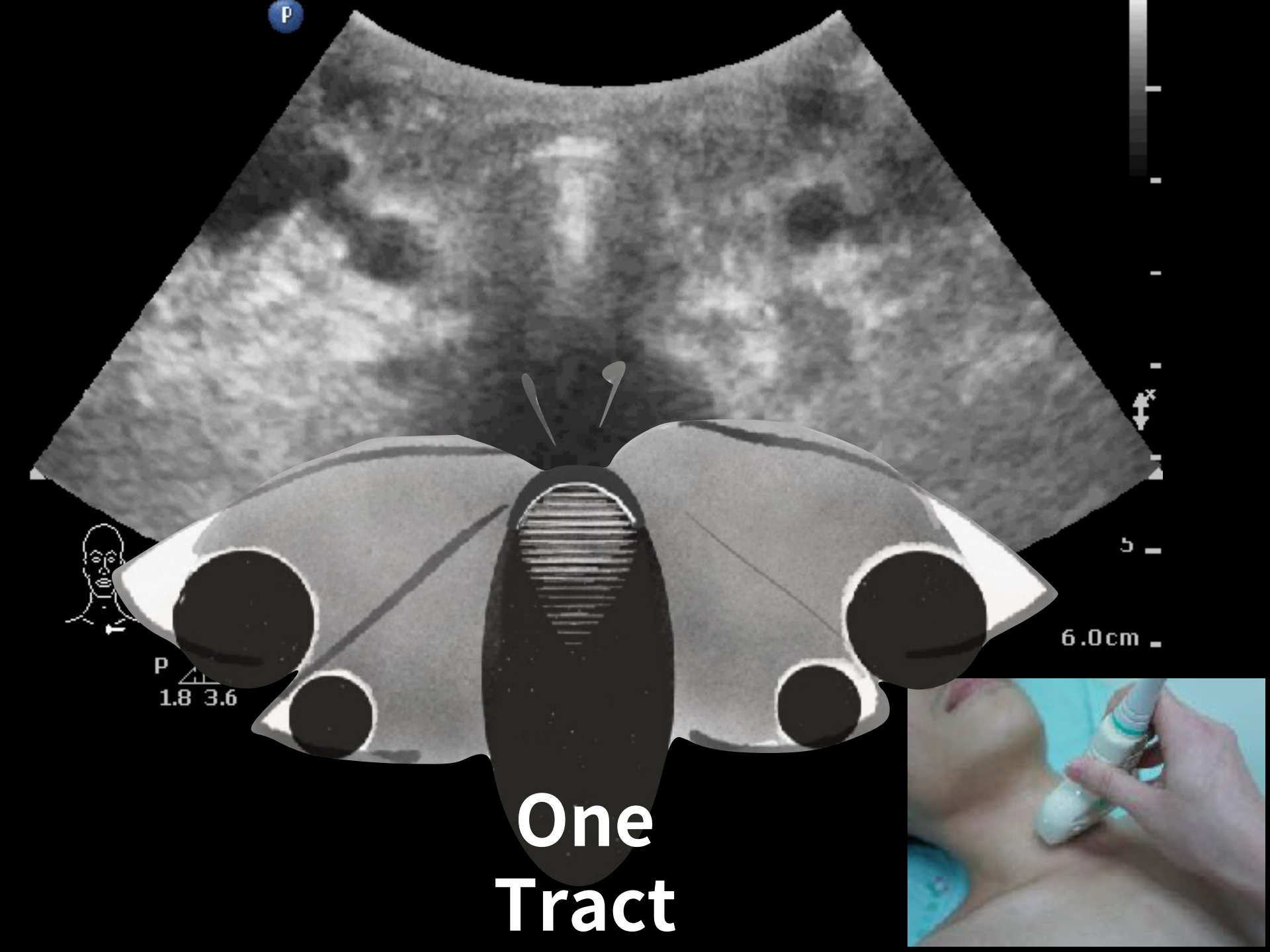
ULTRASOUND PROGRAM

Tracheal tube placement assessment
2015 CPR & ECC guidelines

Continuous waveform Capnography is recommended in addition to clinical assessment as the most reliable method of confirming and monitoring correct placement of an ETT.

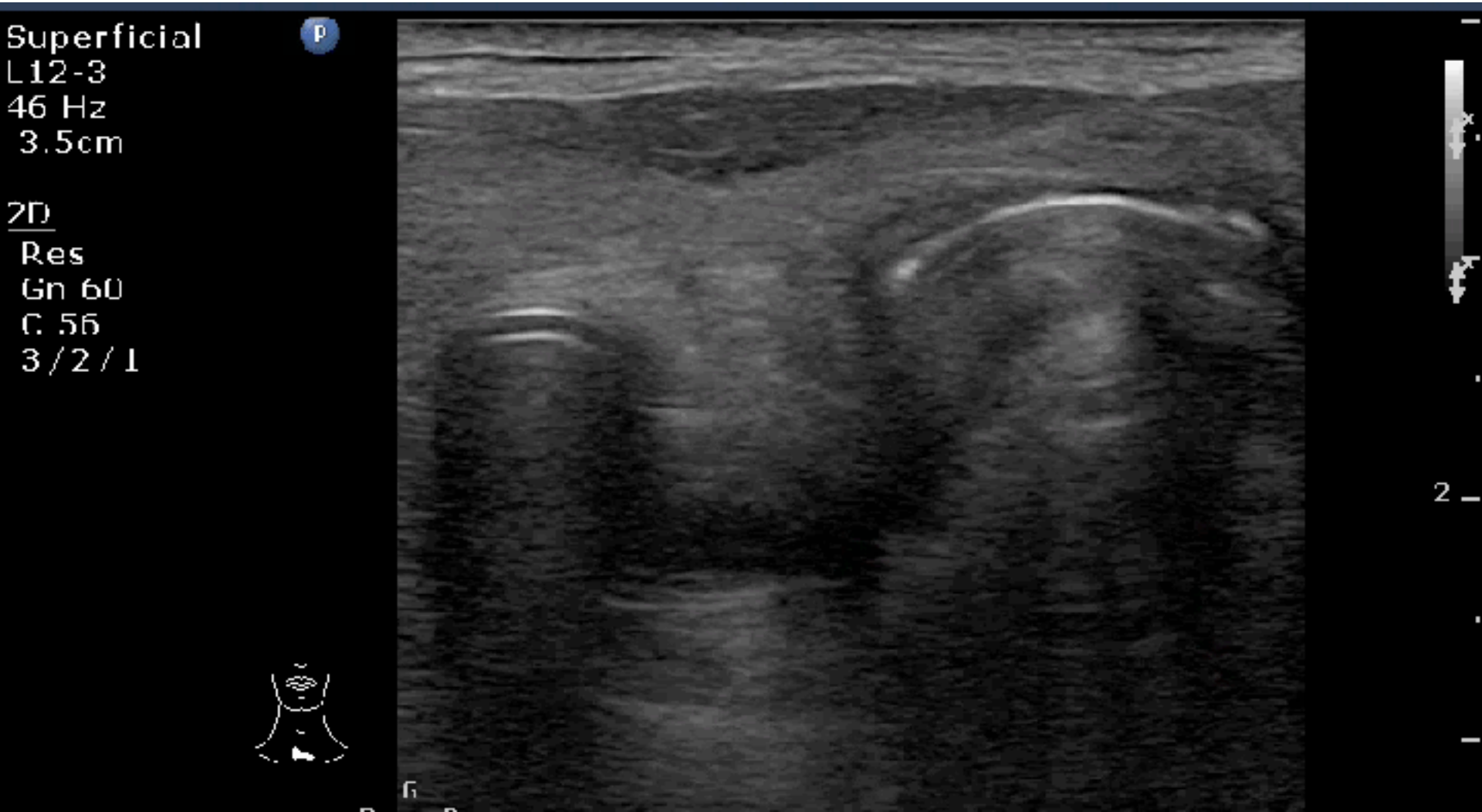
(Class I, LOE C-LD)

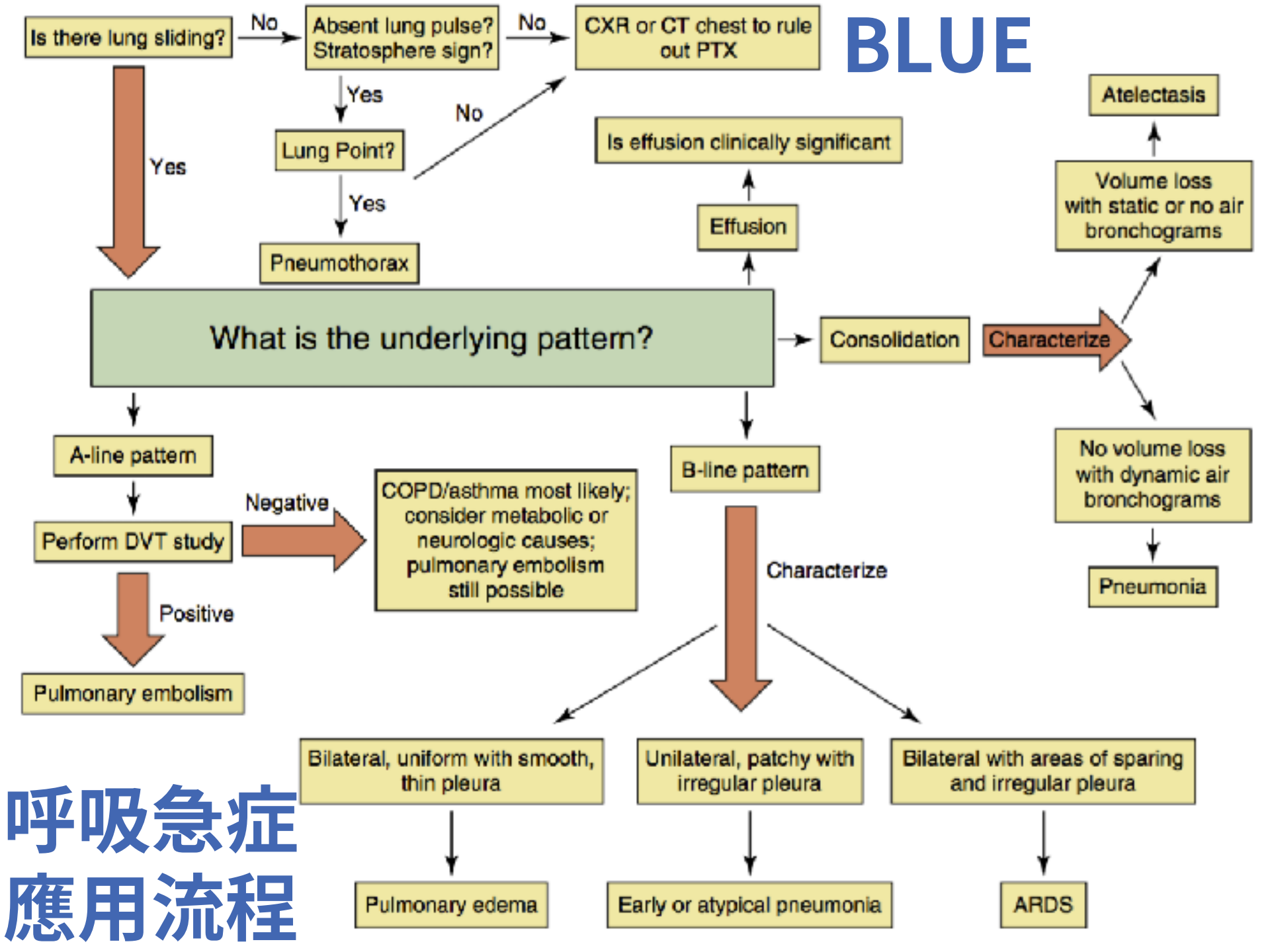
If continuous waveform capnometry is not available, a nonwaveform CO2 detector, esophageal detector device, or ULTRASOUND used by an experienced operator is a reasonable alternative.
(Class IIa, LOE C-LD)



One Tract

幾個氣柱(Air tract)？




BLUE
Is there lung sliding?
No
Absent lung pulse? Stratosphere sign?
No
CXR or CT chest to rule out PTX
Yes
Lung Point?
No
Yes
Pneumothorax
Yes
What is the underlying pattern?
Is effusion clinically significant
Effusion
Consolidation
Characterize
Atelectasis
Volume loss with static or no air bronchograms
No volume loss with dynamic air bronchograms
Pneumonia
A-line pattern
Perform DVT study
Negative
COPD/asthma most likely; consider metabolic or neurologic causes; pulmonary embolism still possible
Positive
Pulmonary embolism
B-line pattern
Characterize
Bilateral, uniform with smooth, thin pleura
Unilateral, patchy with irregular pleura
Bilateral with areas of sparing and irregular pleura
Pulmonary edema
Early or atypical pneumonia
ARDS
呼吸急症
應用流程

BLUE 4 points

Point 1

Point 2

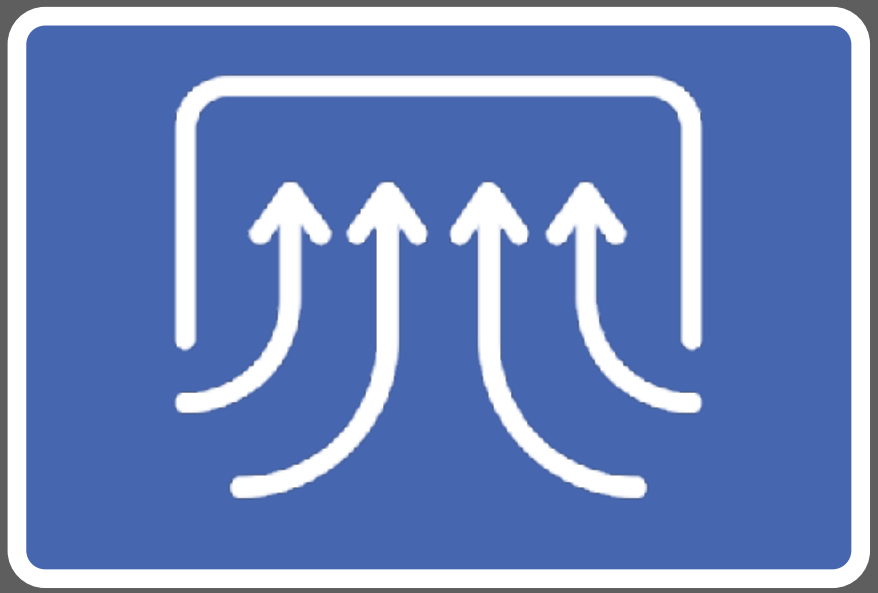
Head <<<<< Sagittal view >>>>> Toe

Point 3

Point 4

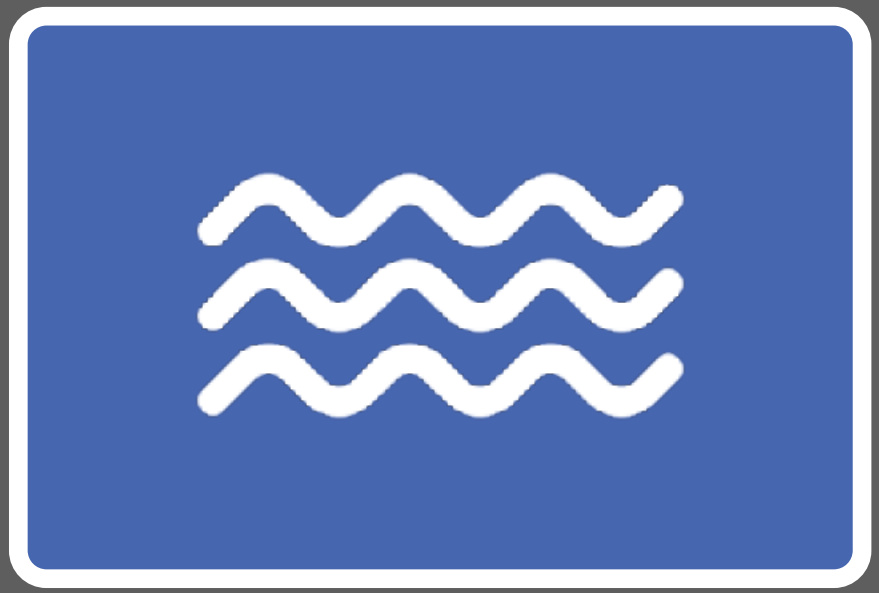
基本原則：　氣／水

Air 100%



Pneumothorax

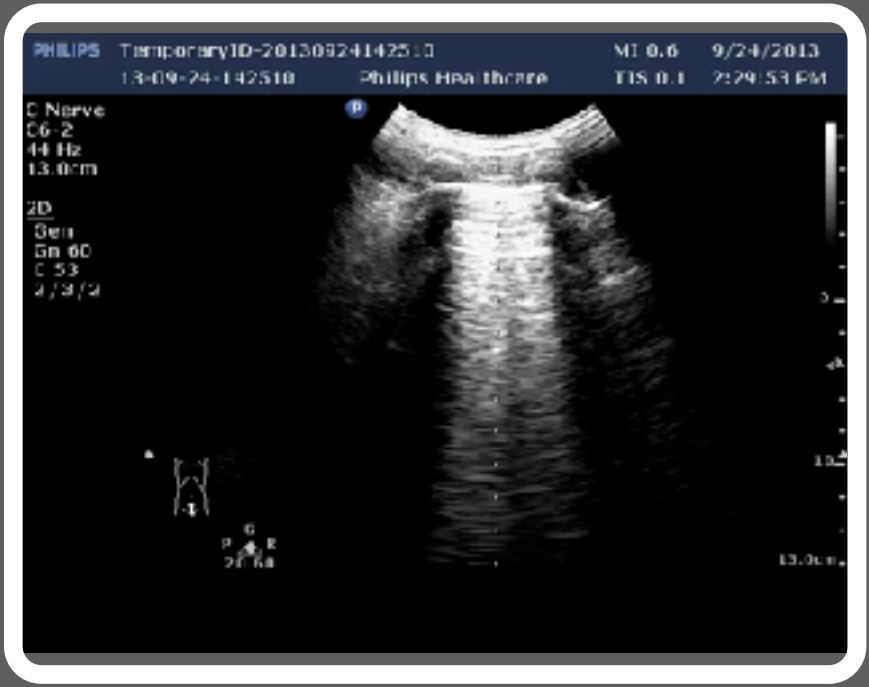
Fluid 100%



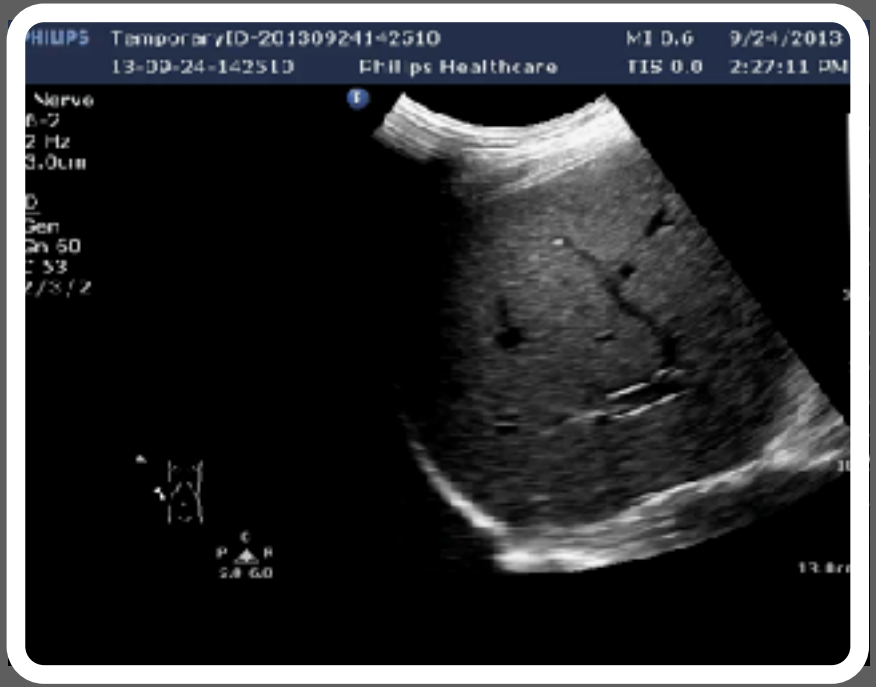
Pleural effusion

基本原則：　氣／水

Air



Fluid



基本原則：　真／假

True

Pneumonia
Pleural effusion
Pleural mass

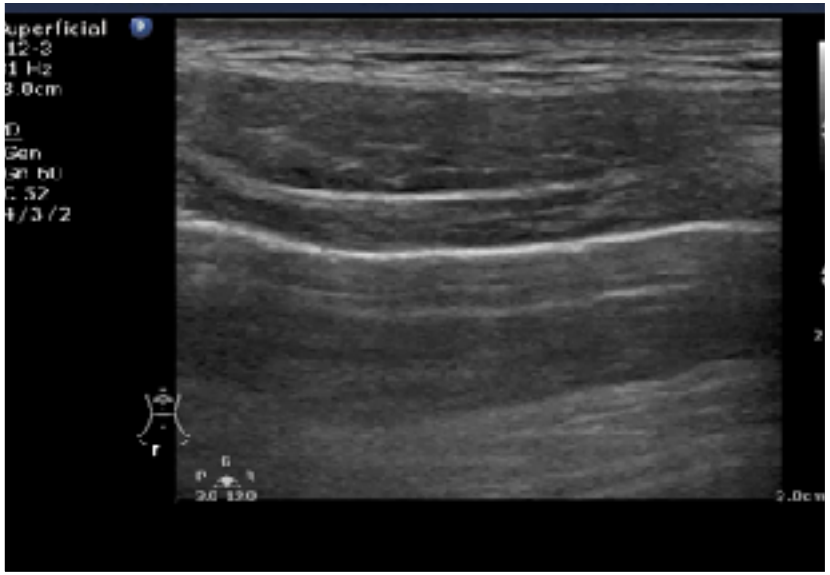
Artifact

Normal lung
Pneumothorax
AIS

基本原則：　真／假

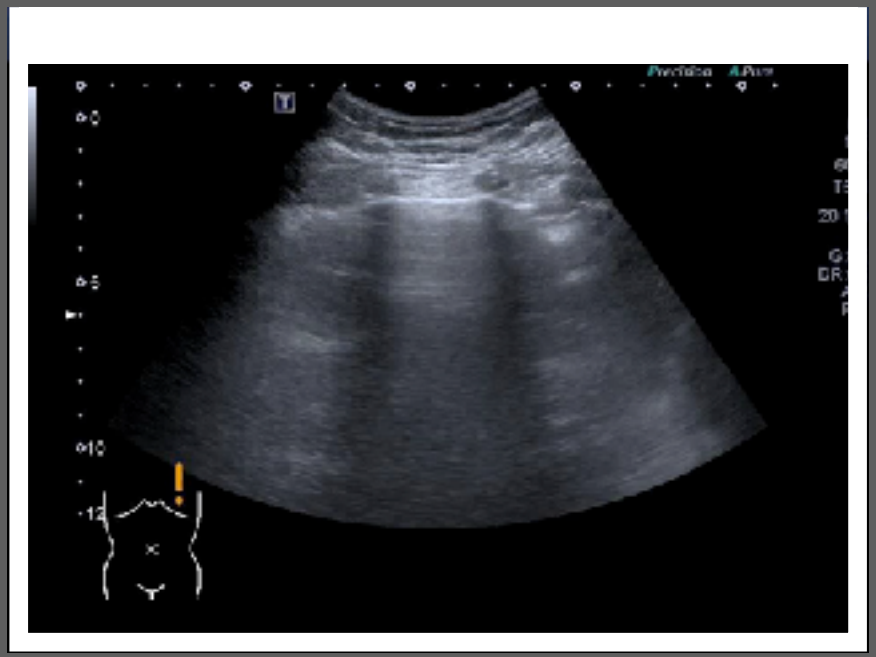
True

Artifact



基本假影：A lines

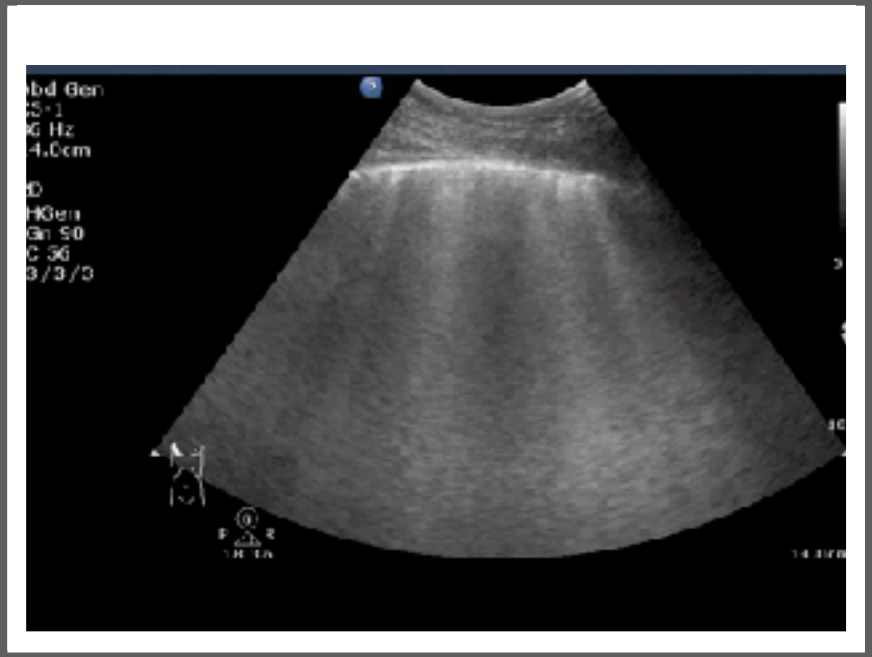
A lines



Pleural
Equal
Horizontal

基本假影：B lines

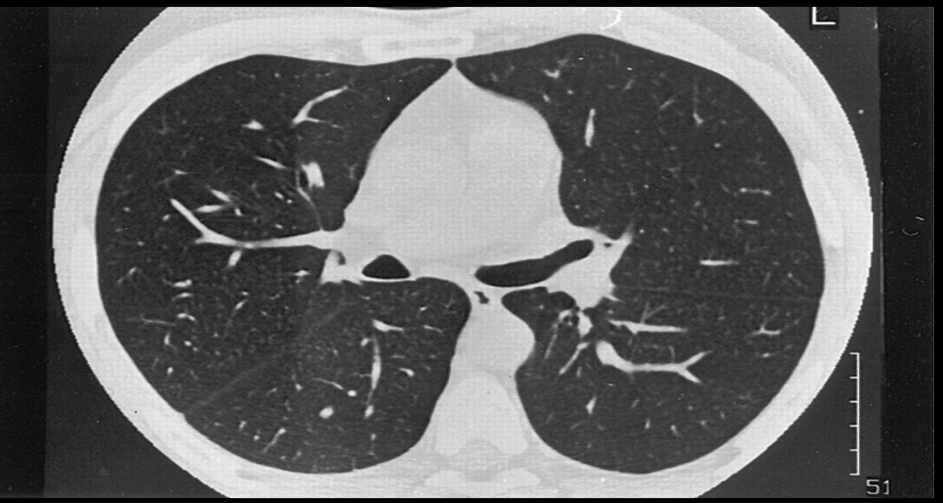
B lines

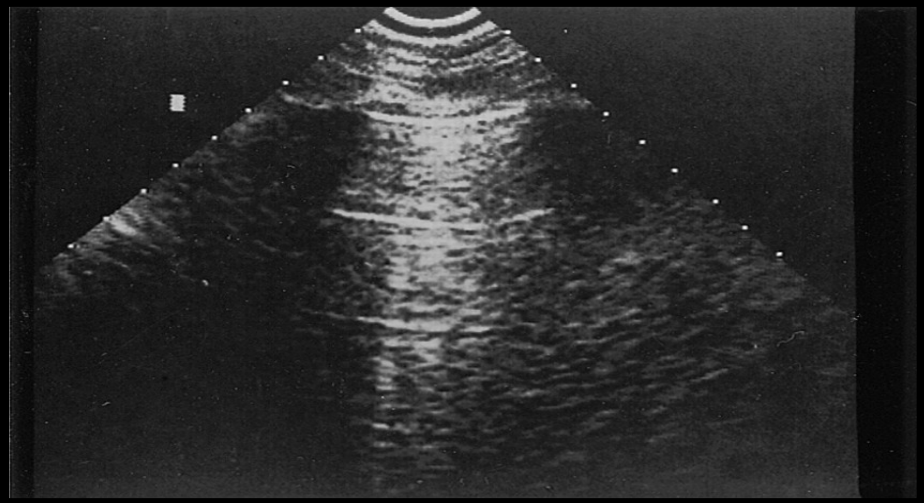


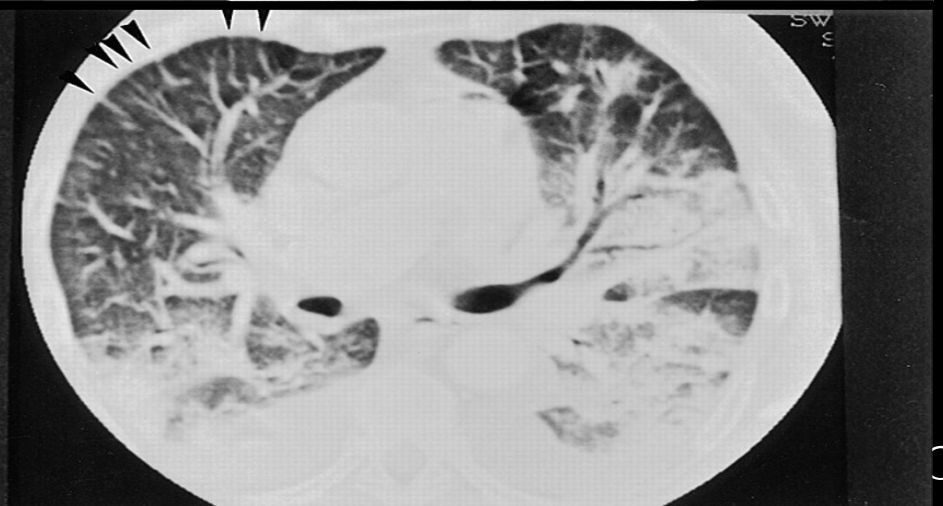
Pleural
Vertical
> 3 in ICS

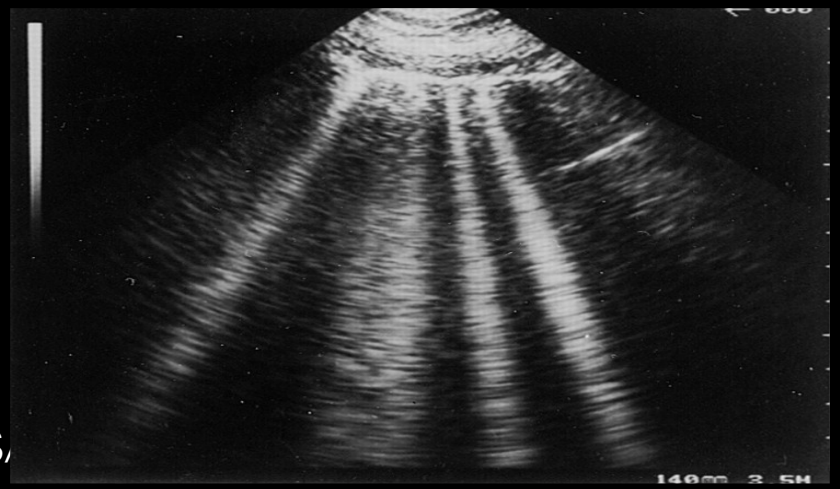
基本假影： A / B

US B lines ～ Kerley B lines







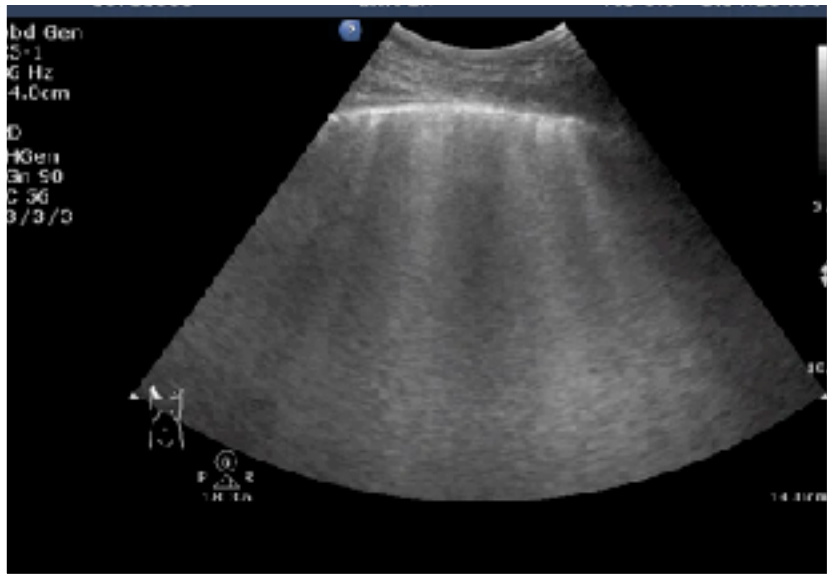


OCUS/

基本假影： A / B

A

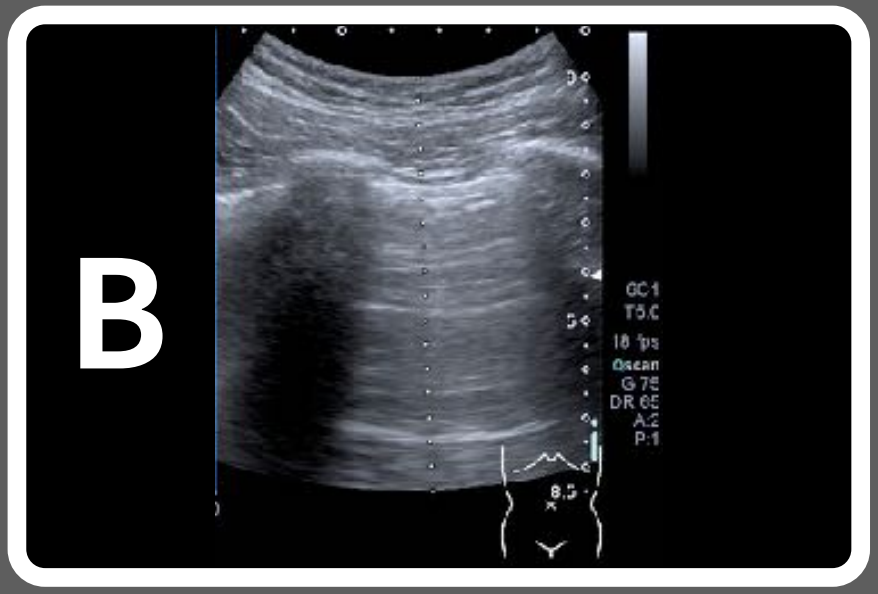
B



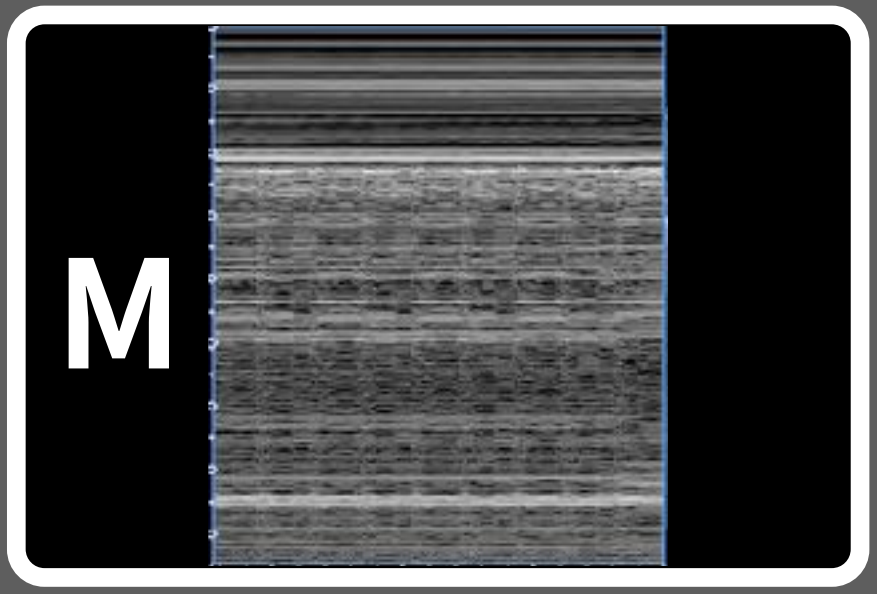
那一個影片有問題 ??

基本分析：　動／靜

Static

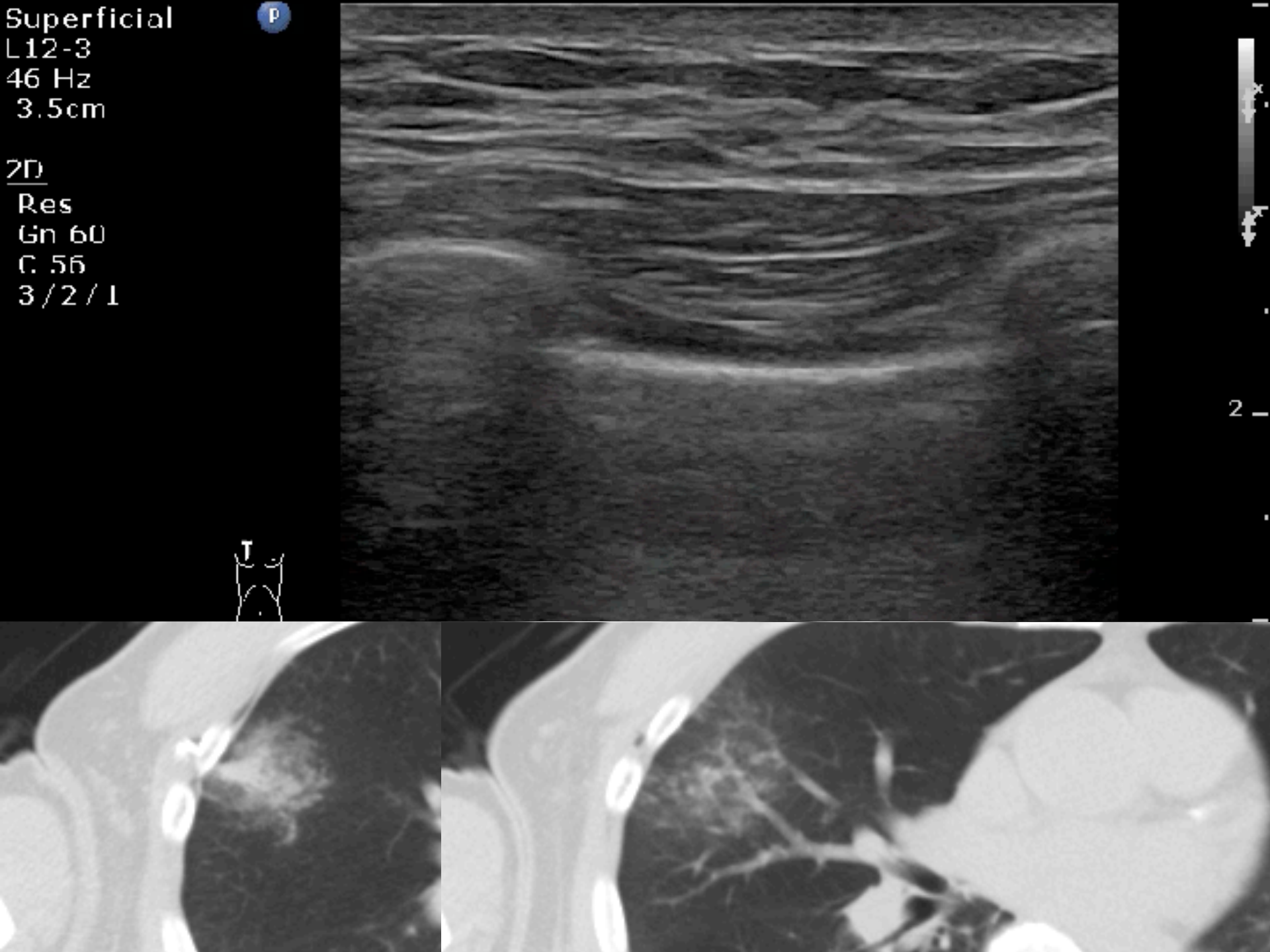


Dynamic

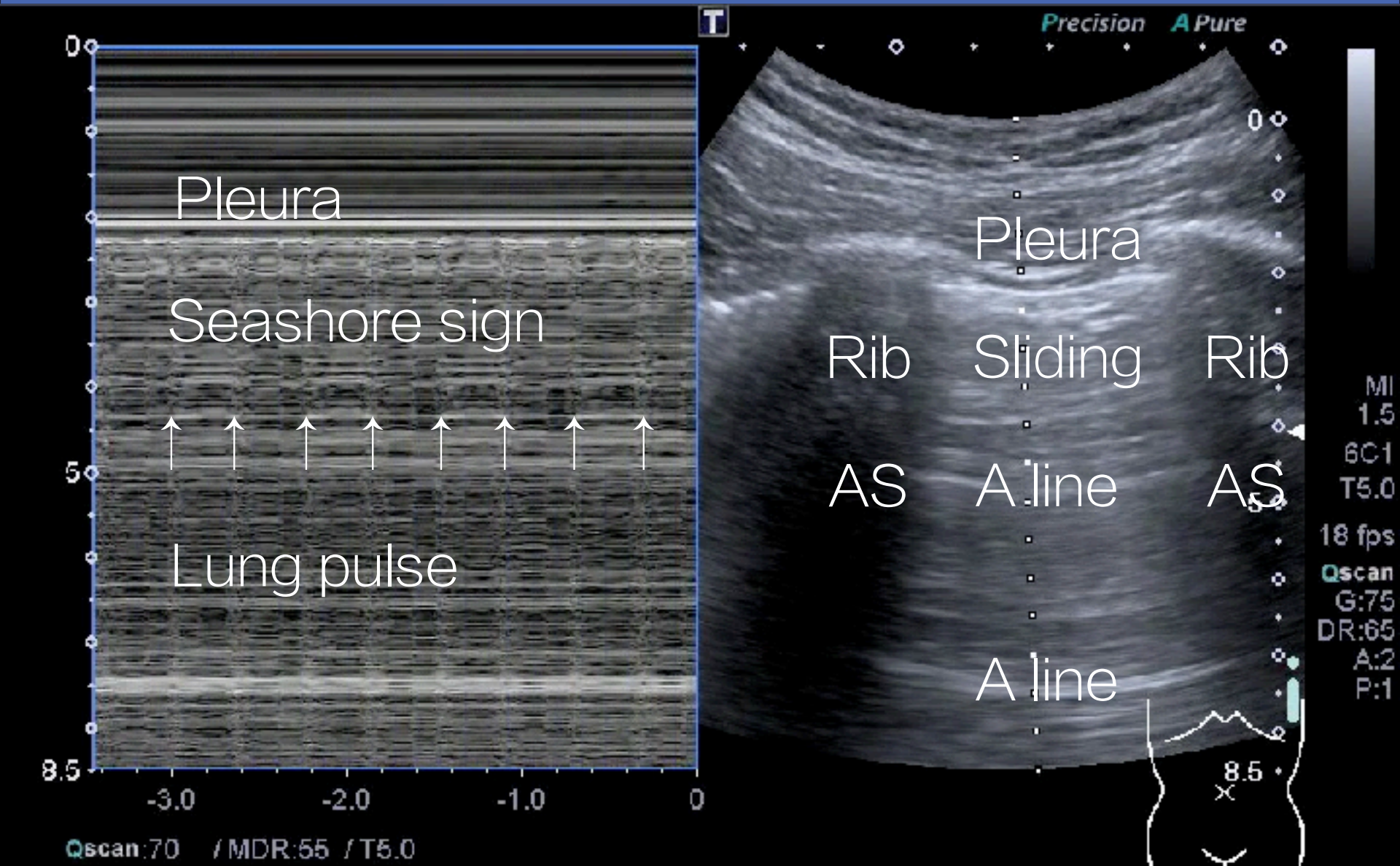


正常肺部的動與靜


Precision
A Pure
Bat sign
MI
1.5
6C1
T5.0
18 fps
Qscan
G:75
DR:65
A:2
P:1
0
5
8.5
-3.0
-2.0
-1.0
0
Qscan:70 / MDR:55 / T5.0


Superficial
L12-3
46 Hz
3.5cm
2D
Res
Gn 60
C 56
3/2/1
T
2

正常肺部的動與靜


Pleura
Seashore sign
Lung pulse
0
5
8.5
-3.0
-2.0
-1.0
0
Qscan:70 / MDR:55 / T5.0
Precision A Pure
Pleura
Rib Sliding Rib
AS A line AS
A line
MI 1.5
6C1
T5.0
18 fps
Qscan
G:75
DR:65
A:2
P:1

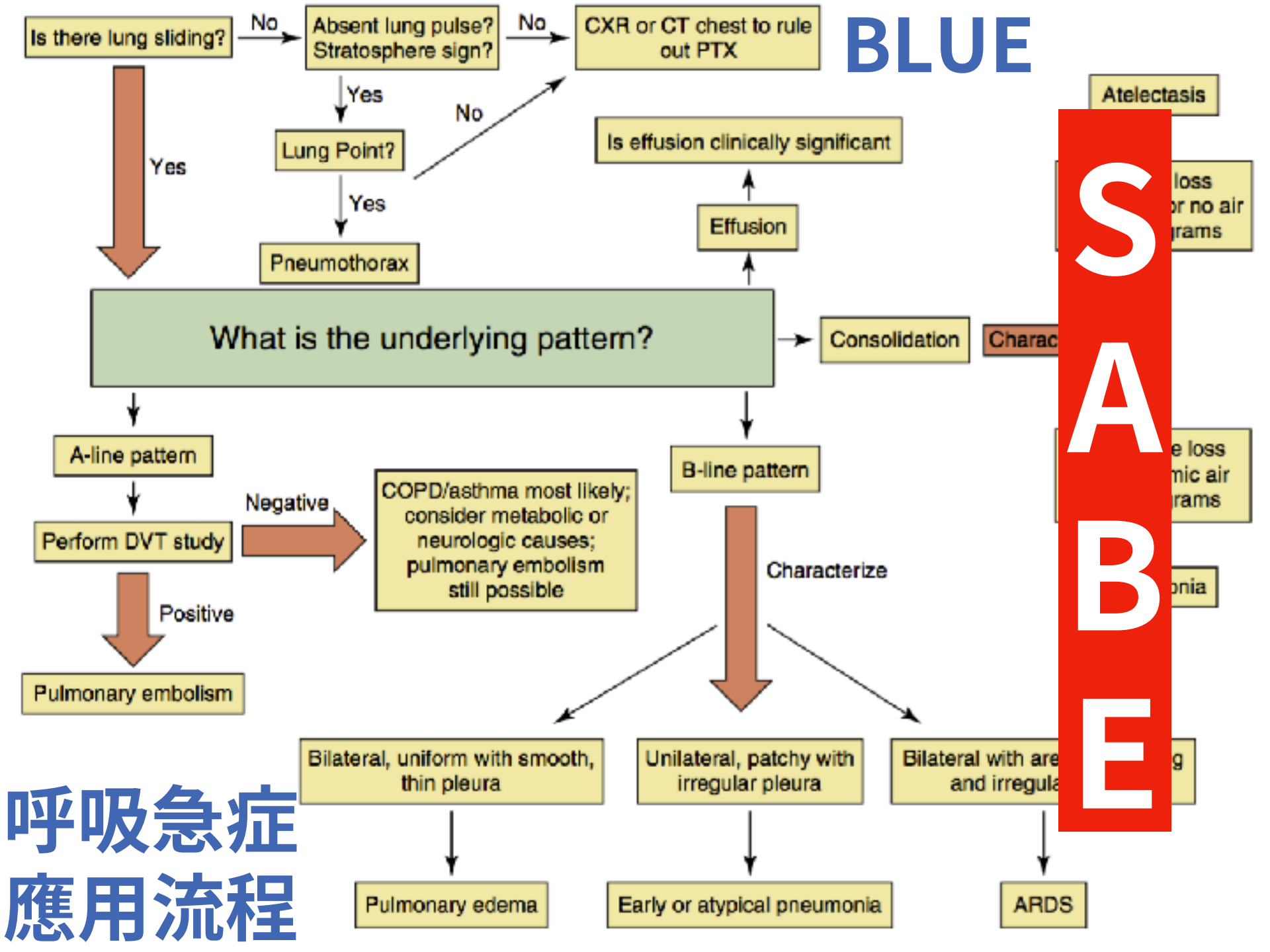
LUS的建議：四原則

氣
水

真
假

A
B

動
靜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Lung Point?
No
Yes
Pneumothorax
Yes
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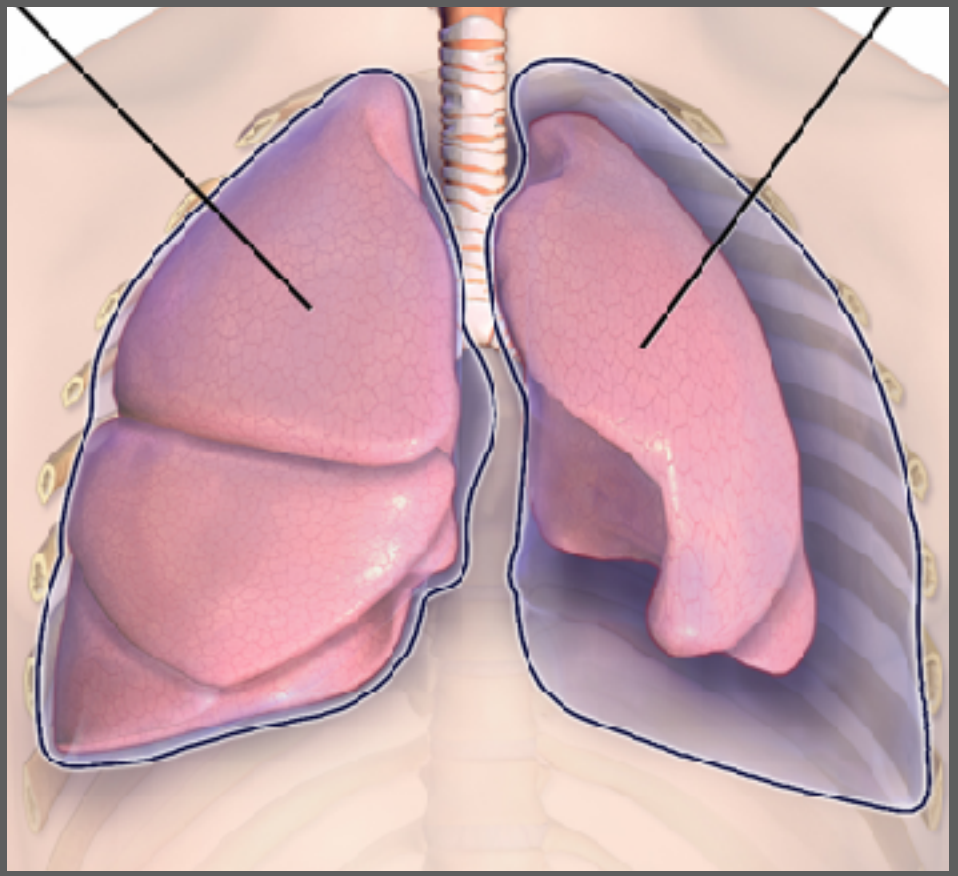
Is effusion clinically significant
Effusion
Consolidation
Atelectasis
A-line pattern
Perform DVT study
Negative
COPD/asthma most likely; consider metabolic or neurologic causes; pulmonary embolism still possible
Positive
Pulmonary embolism
B-line pattern
Characterize
Bilateral, uniform with smooth, thin pleura
Unilateral, patchy with irregular pleura
Bilateral with are and irregula
Pulmonary edema
Early or atypical pneumonia
ARDS
SABE
呼吸急症
應用流程

LUS for PAP

PTX

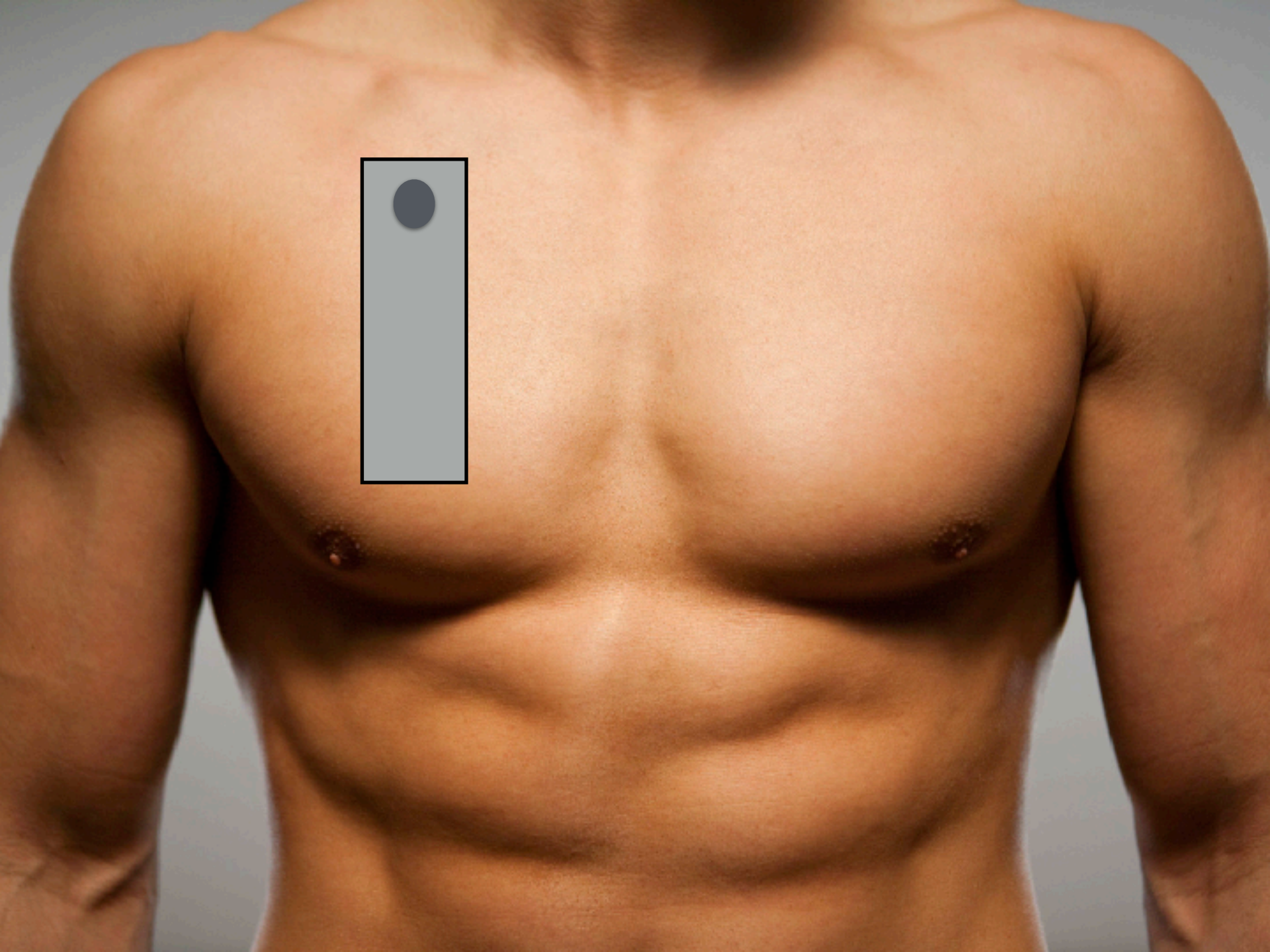


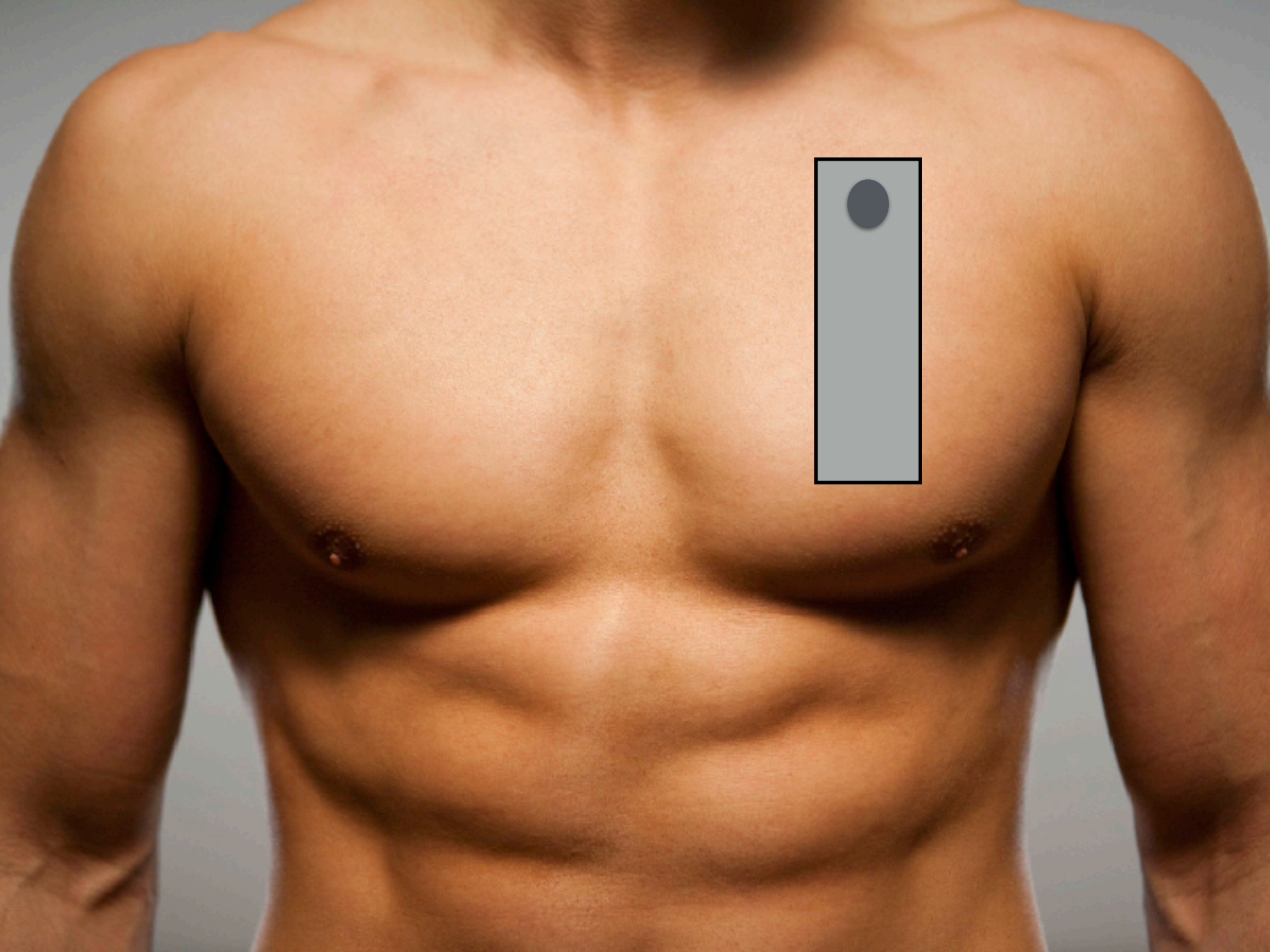
ChenKC@POCUSAcademy

LUS for PTX

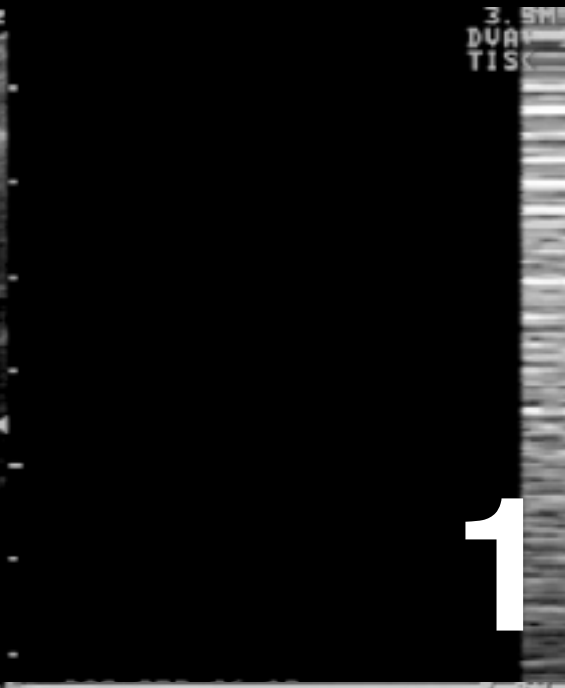
Table 2 Lung ultrasound in the diagnosis of pneumothorax

Study (first author)	n	Sensitivity (%)	Specificity (%)	Ultrasound LR+/LR−	Gold standard	Sonographer type
Kirkpatrick[54]	225	US 49 CXR 21	US 100 CXR 99	Undefined/0.51	CT	Novice trauma surgeons
Knudtson[65]	328	US 92	US 99	92/0.081	CXR	Trauma surgeons
Chung[23]	97	US 80 CXR 47	US 94 CXR 94	13/0.21	CT	Experienced radiologists
Lichtenstein[66]	200	US 95	US 94	16/0.053	CT	Intensivists
Zhang[10]	135	US 86 CXR 27	US 97 CXR 100	29/0.14	CT and chest drain	EP
Sartori[67]	285	US 100 CXR 87	US 100 CXR 100	Undefined/0	CT	Experienced physicians not otherwise specified
Lichtenstein[6]	260	US 81	US 100	Undefined/0.19	Final clinical diagnosis	Experienced intensivists
Nagarsheth[34]	79	US 81 CXR 31	US 100 CXR 100	Undefined/0.19	CT	Novice surgeon
Ding[68]	7569	US 88 CR 52	US 99 CR 100	88/0.12	CT or air escape (meta-analysis)	Meta-analysis varied
Alrajhi[69]	1048	US 91 CXR 50	US 98 CXR 99	46/0.092	CT or air escape (meta-analysis)	Meta-analysis varied
Xirouchaki[22]	84	US 75 CXR 0	US 93 CXR 99	11/0.27	CT	Experienced intensivist

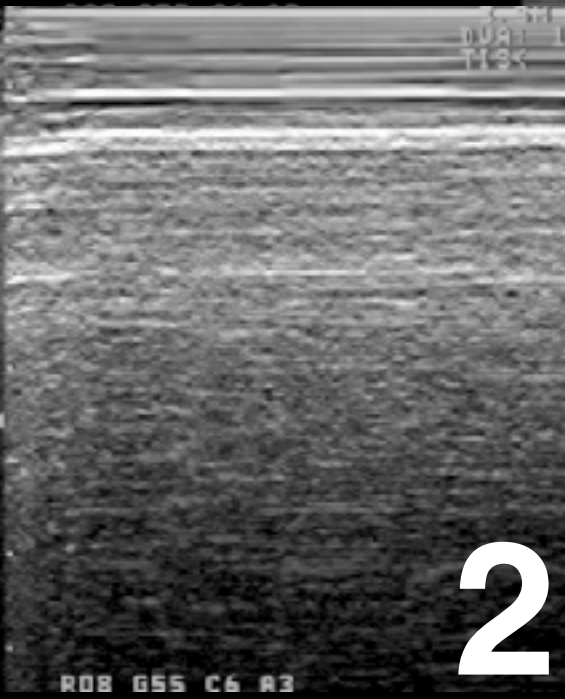





17Hz

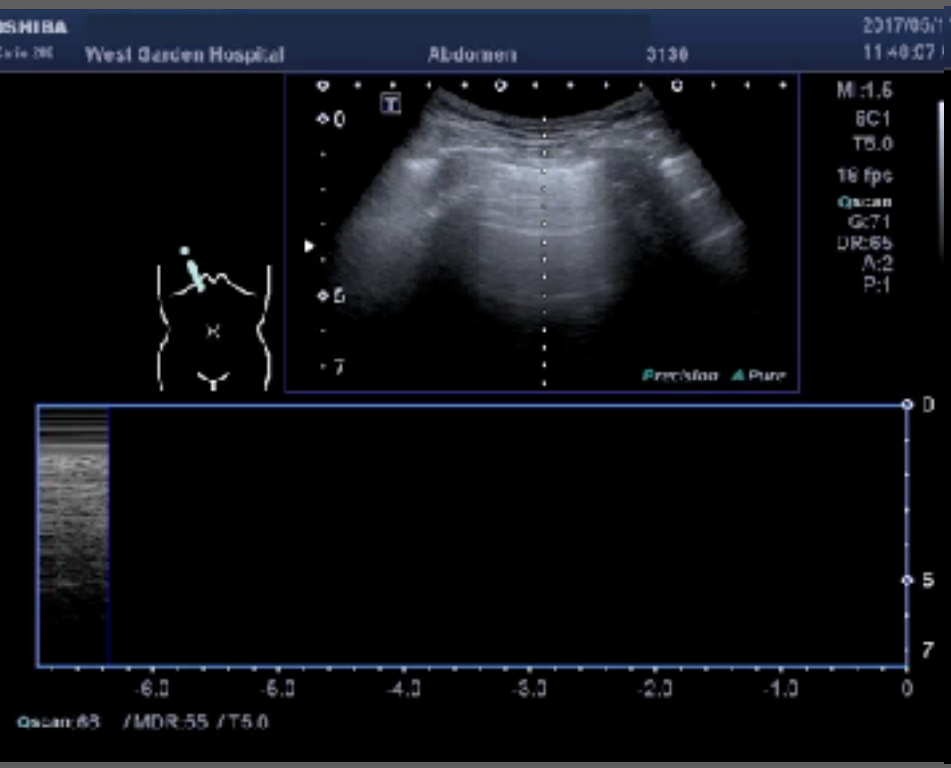

1


16Hz
R08 G55 C4

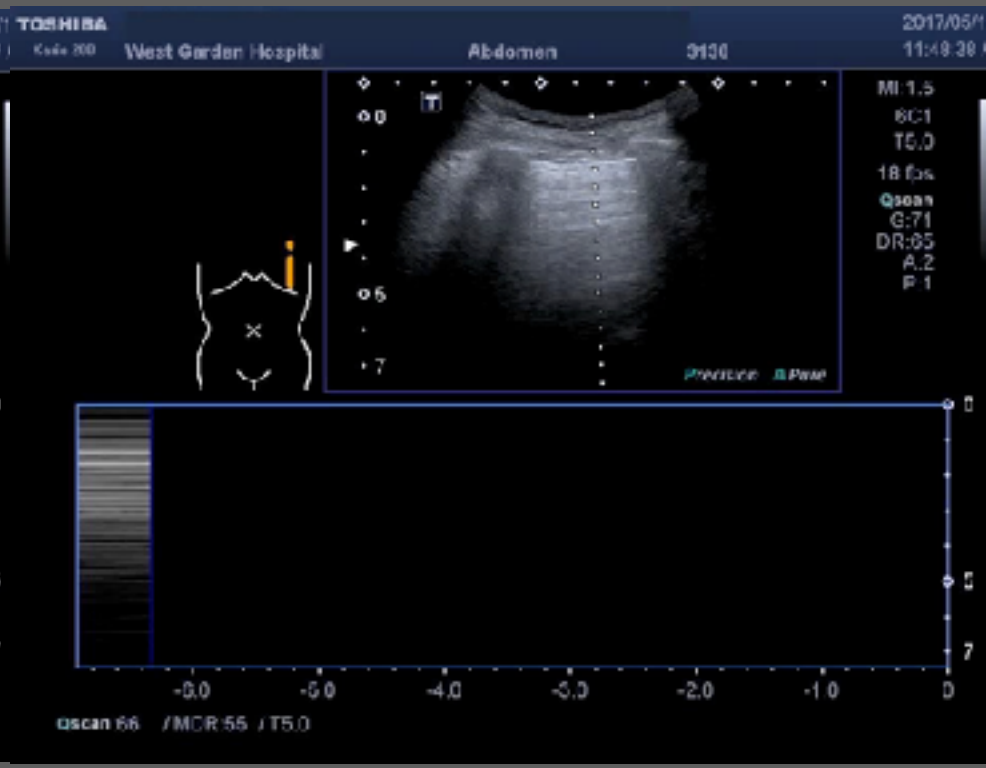

R08 G55 C6 A3
2

氣胸影像

正常


TOSHIBA
West Garden Hospital
Abdomen
3130
MI 1.5
6C1
T5.0
18 fps
Qscan
G:71
DR:65
A:2
P:1
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0

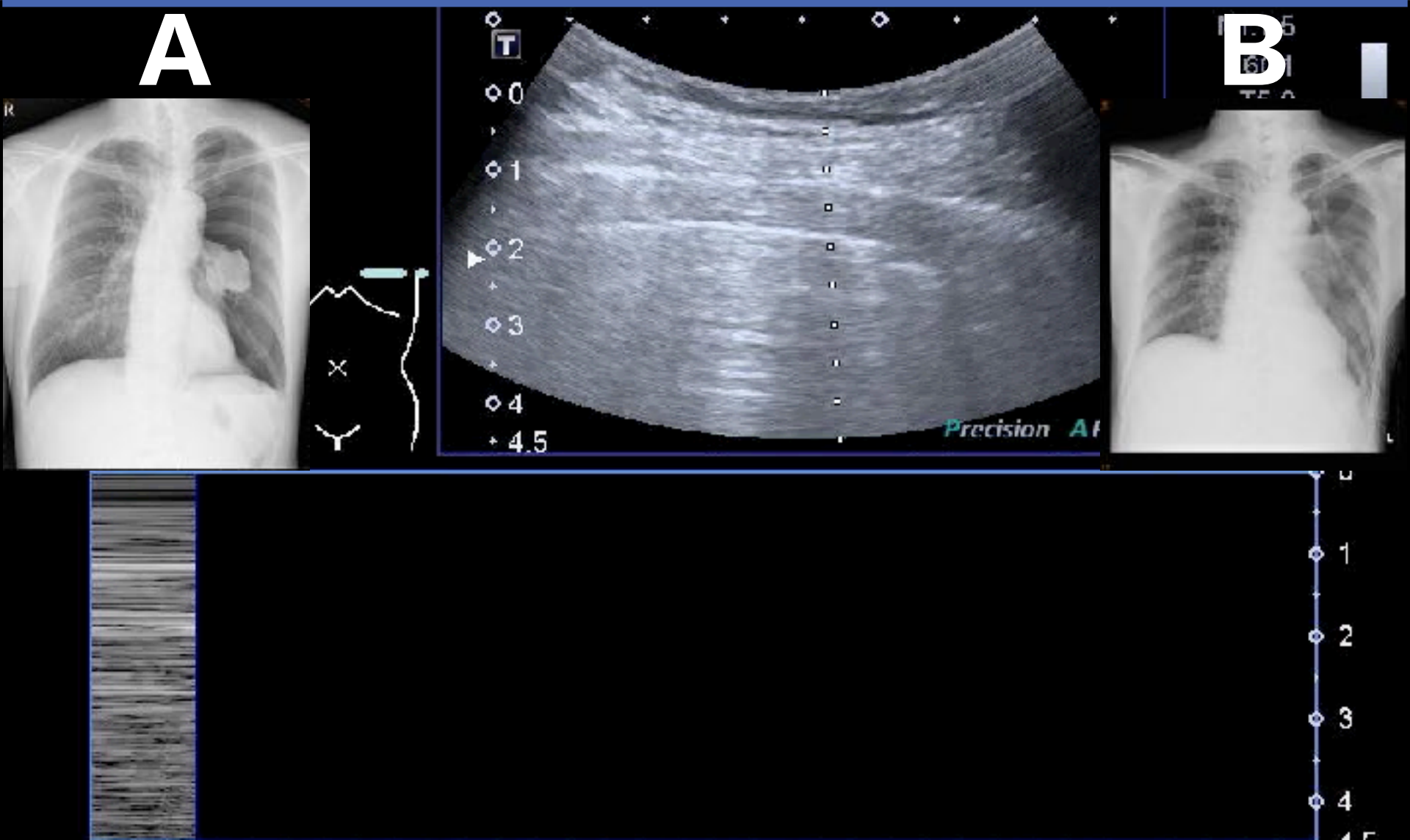
氣胸


TOSHIBA
West Garden Hospital
Abdomen
3130
MI 1.5
6C1
T5.0
18 fps
Qscan
G:71
DR:65
A:2
P:1
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0

特異性 100%


Superficial
L12-3
31 Hz
3.0cm
2D
Gen
Gn 60
C 52
4/3/2
P
R
3.0 12.0
2
3.0cm

Lung point

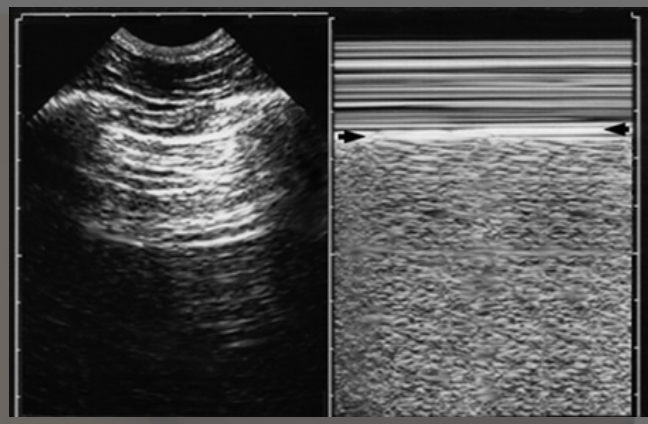


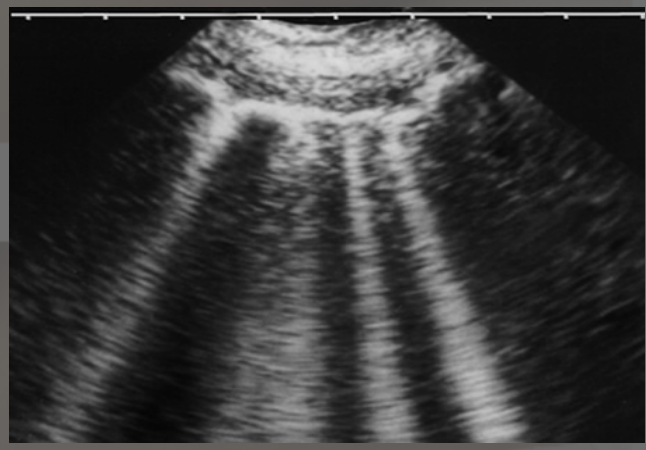
Point 1

PTX

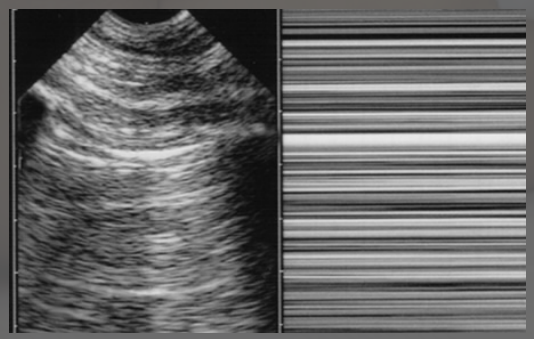
BLUE 4 points

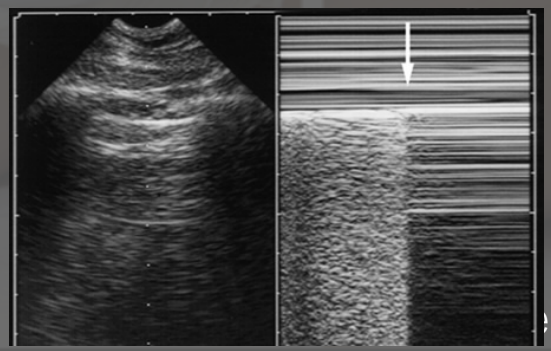
Point 2

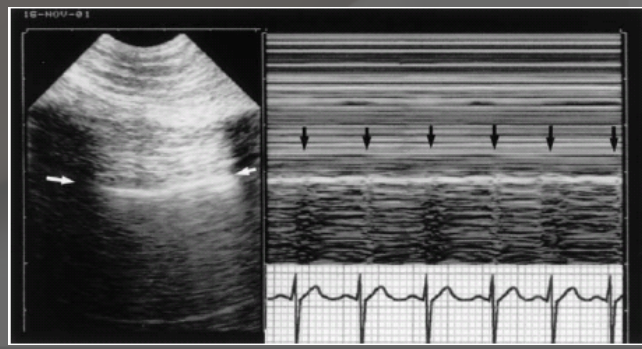




Highest







PTX

4

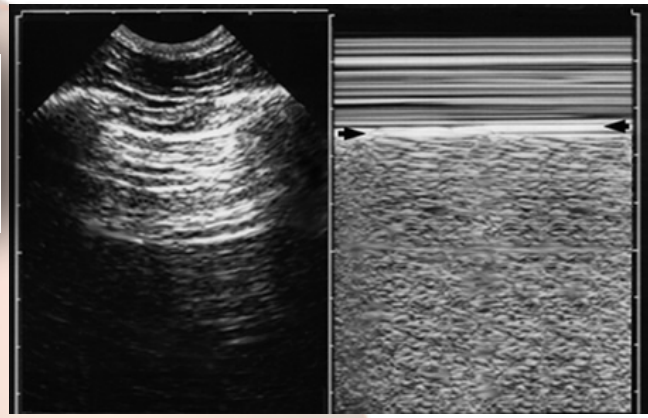
SBP Point

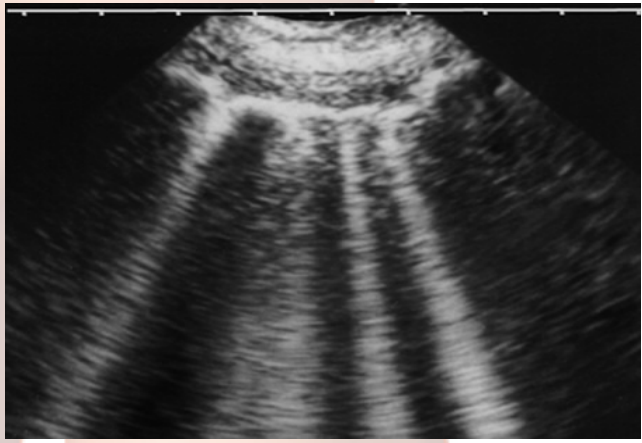
No sliding

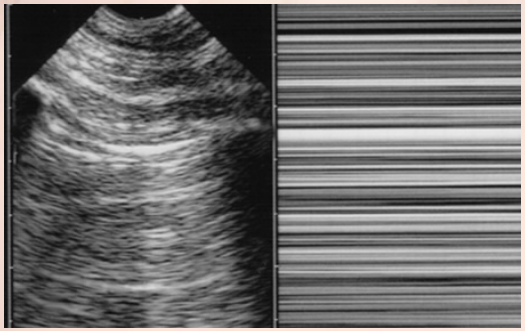
No B lines

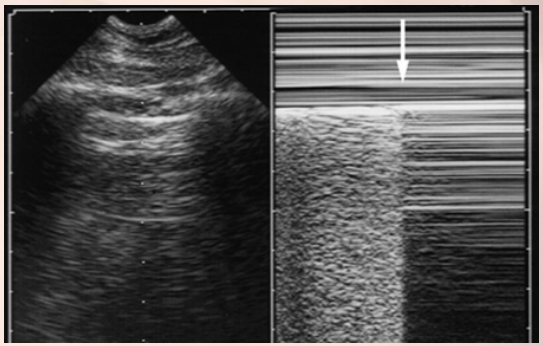
No pulse

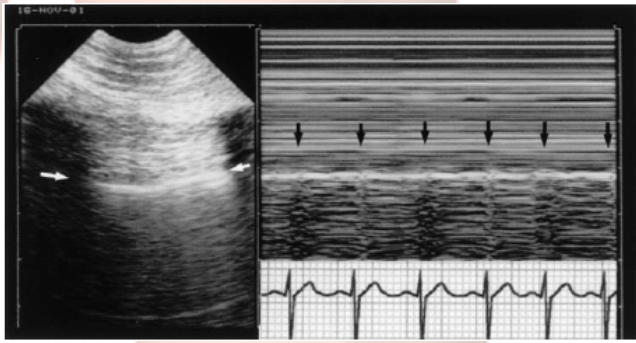
Lung point











PLE

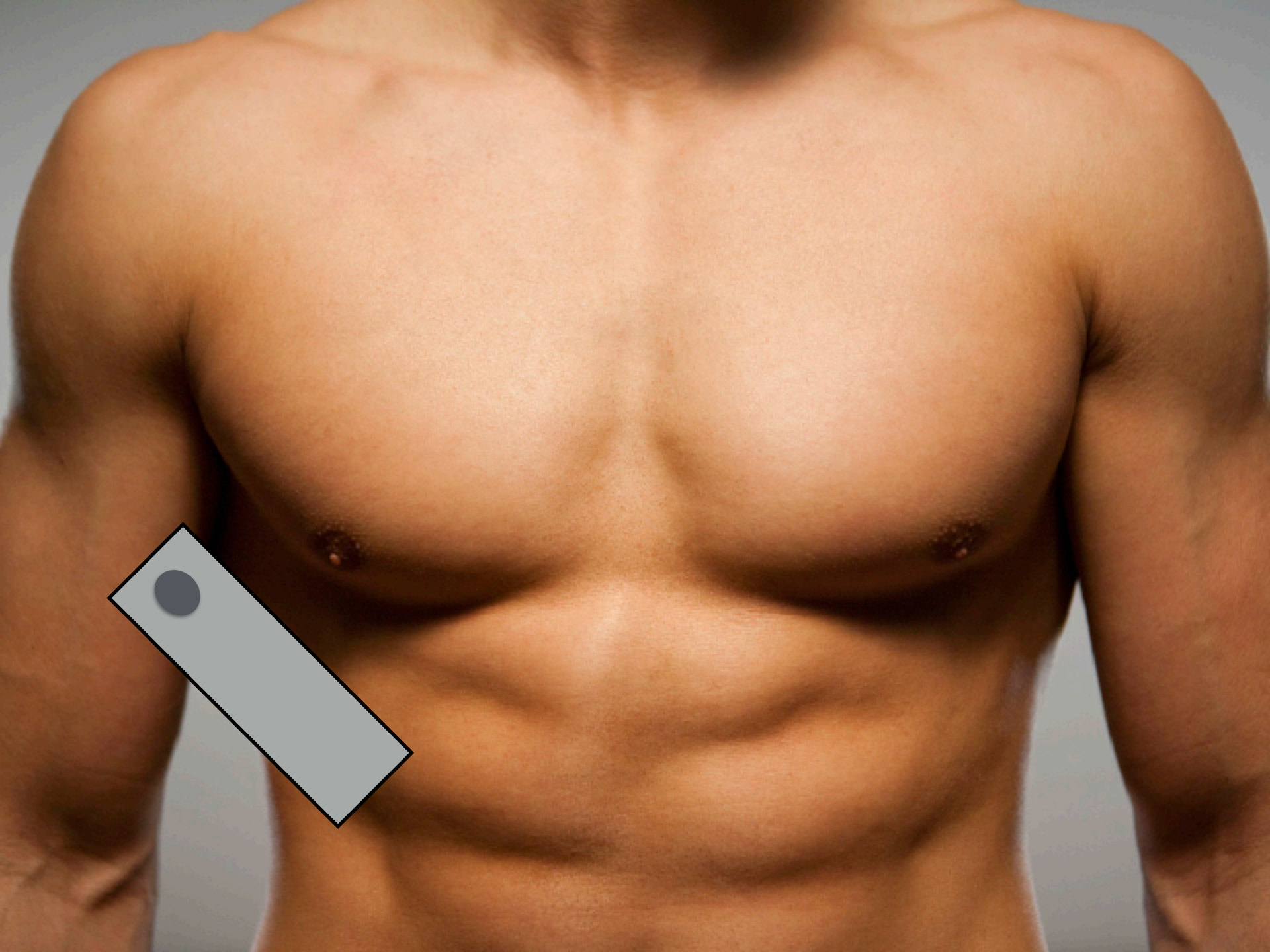
Point 3

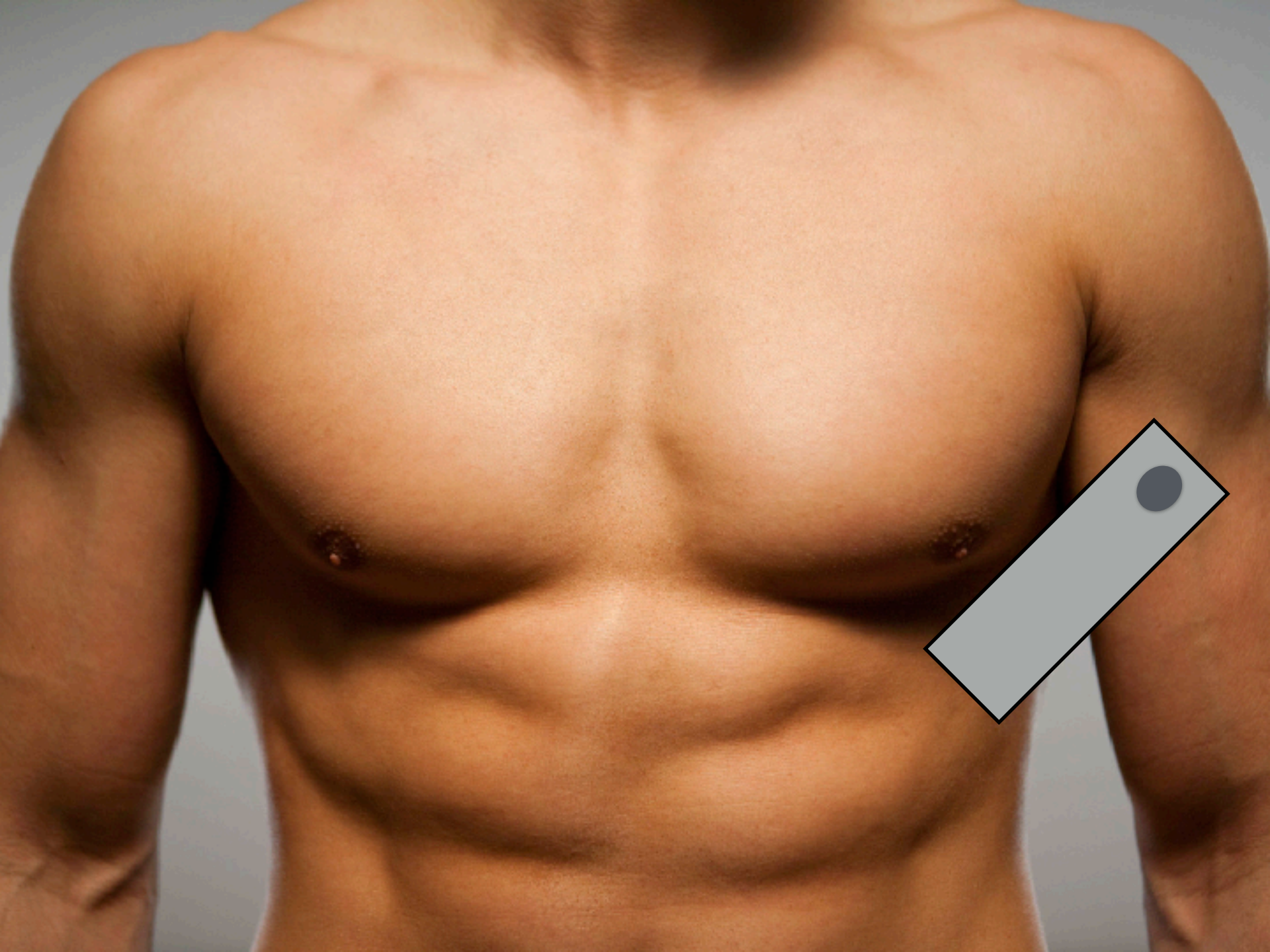
BLUE points

Diaphragm

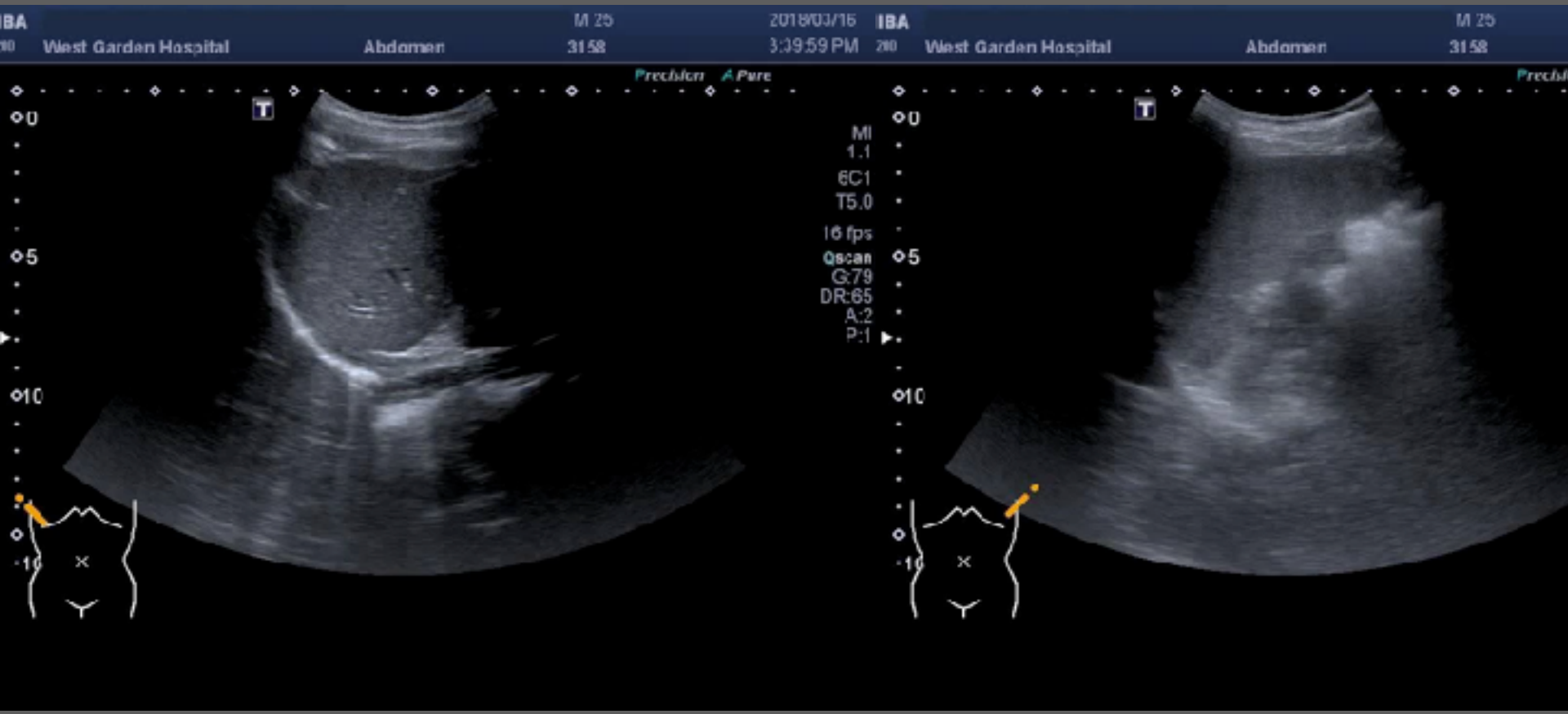
Table 4 Lung ultrasound in the diagnosis of pleural effusion

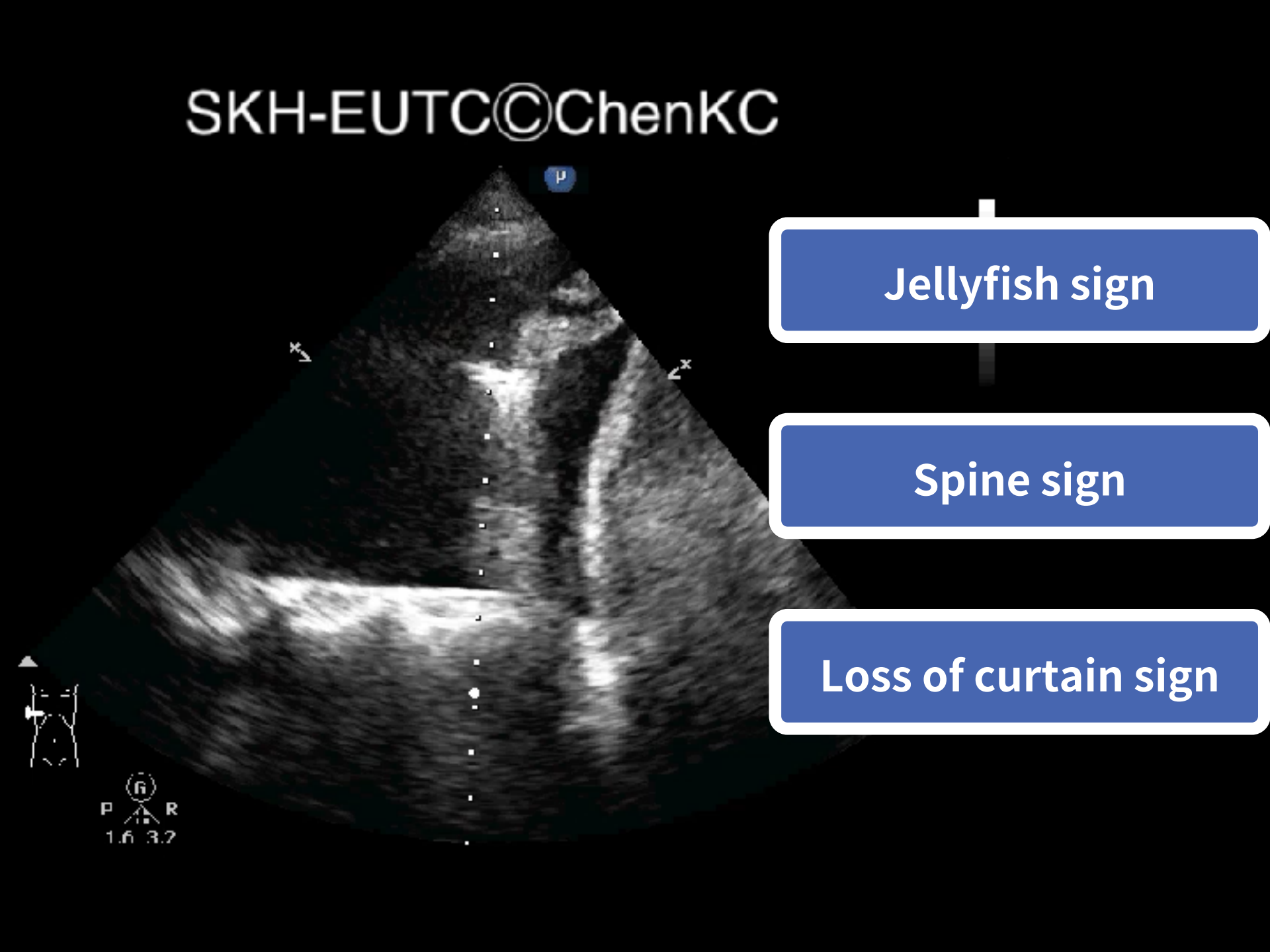
Study (first author)	n	Sensitivity (%)	Specificity (%)	Ultrasound LR+/LR−	Gold standard	Sonographer type
Ma[72]	240	US 96	US 100	Undefined/0.04	CT	EP
Rozycki[73]	47	US 84	US 100	Undefined/0.16	CT	Surgeons
Abboud[74]	142	US 12	US 98	6/0.9	CT	Experienced EP
Lichenstein[3]	32	US 92	US 93	13/0.086	CT	Experienced intensivist
Brooks[75]	61	US 92	US 100	Undefined/0.08	Composite gold standard	Experienced EP or surgeon
Xirouchaki[77]	42	US 100 CXR 65	US 100 CXR 81	Undefined/0	CT	Experienced intensivist
Schleder[76]	24	Hand US 91 CXR 74	Hand US 100 CXR 31	Undefined/0.09	High-end US	Intensivist





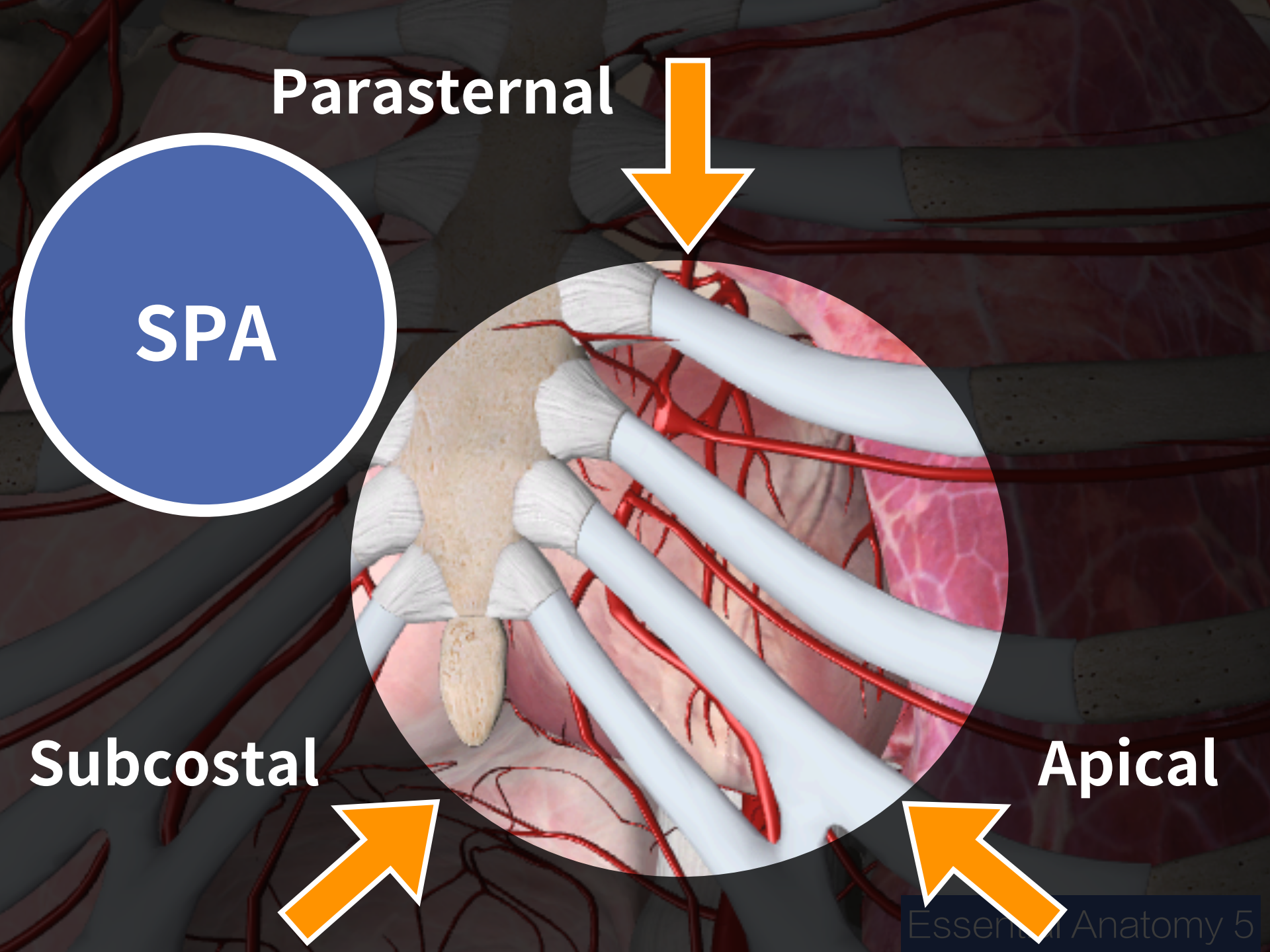
Diaphragm


West Garden Hospital
Abdomen
3158
3:39:59 PM
MI
1.1
6C1
T5.0
16 fps
Qscan
G:79
DR:65
A:2
P:1
West Garden Hospital
Abdomen
3158

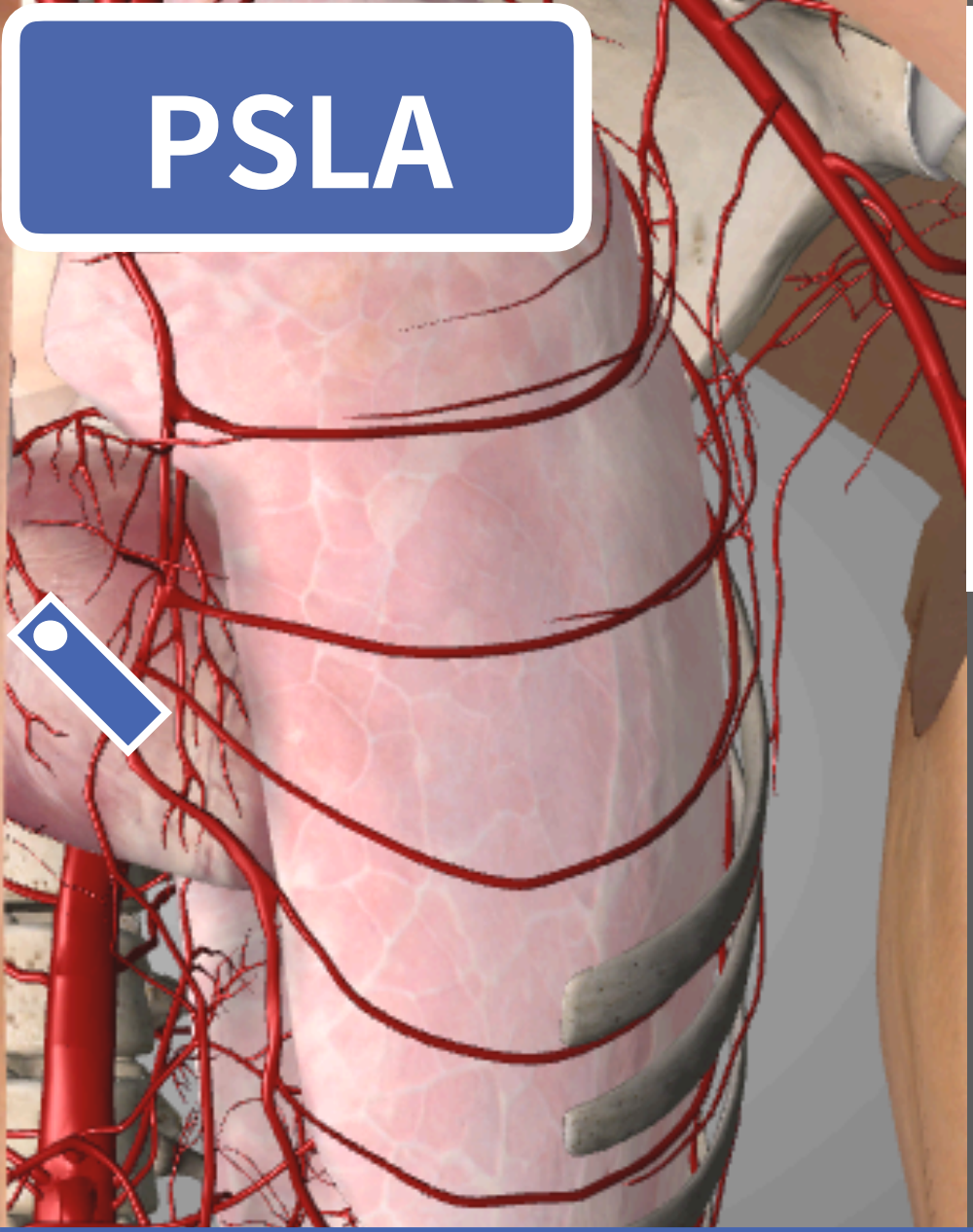

SKH-EUTC©ChenKC
Jellyfish sign
Spine sign
Loss of curtain sign

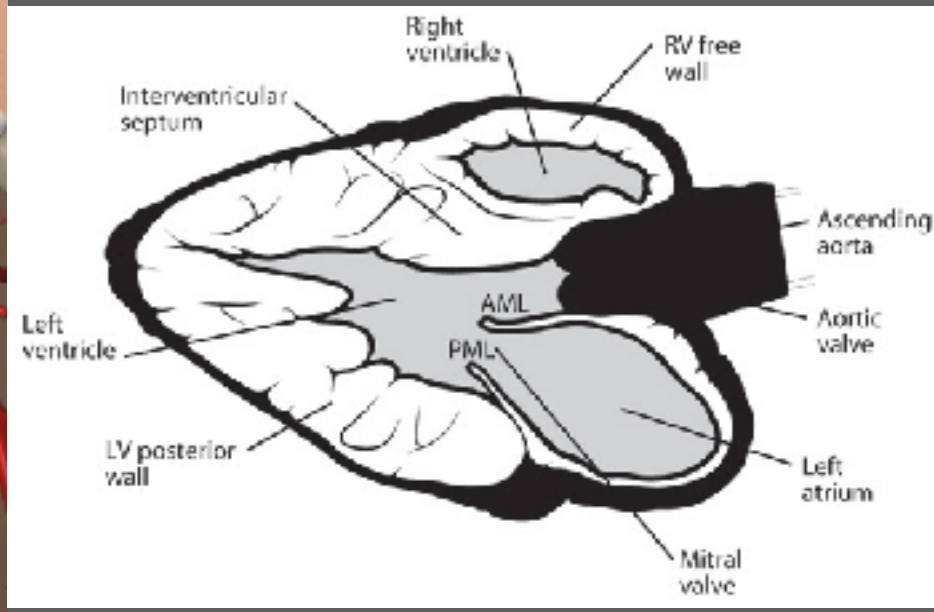
大量血胸

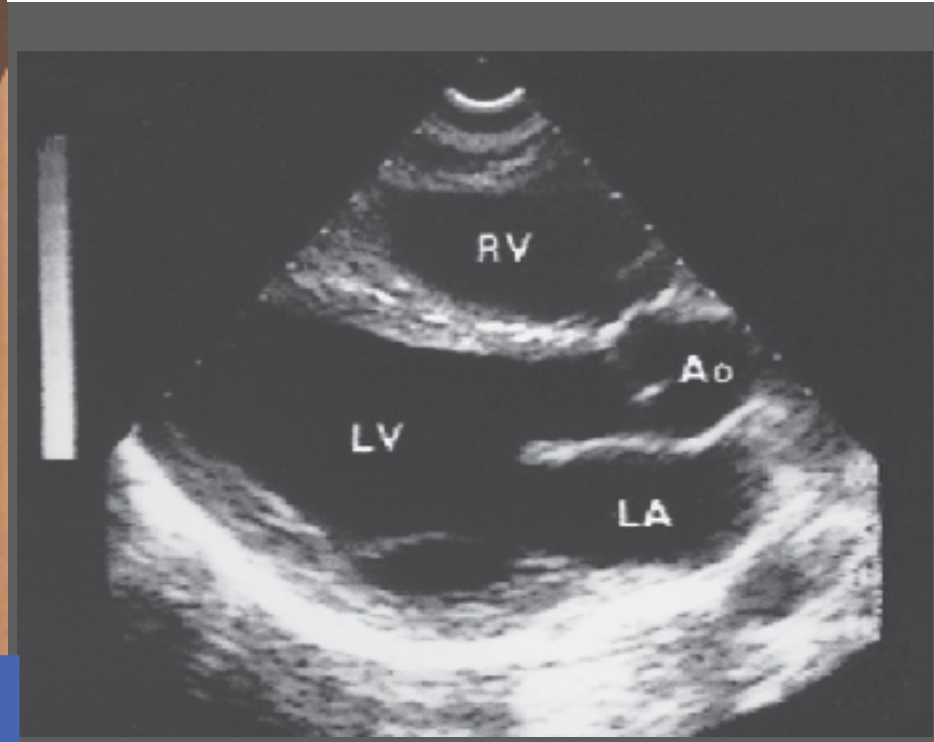

Abd Gen
C5-1
31 Hz
17.0cm
2D
HGen
Gn 90
C 56
3/3/3
P
R
1.8 3.6
5
10
15
17.0cm


Parasternal
SPA
Subcostal
Apical

PSLA

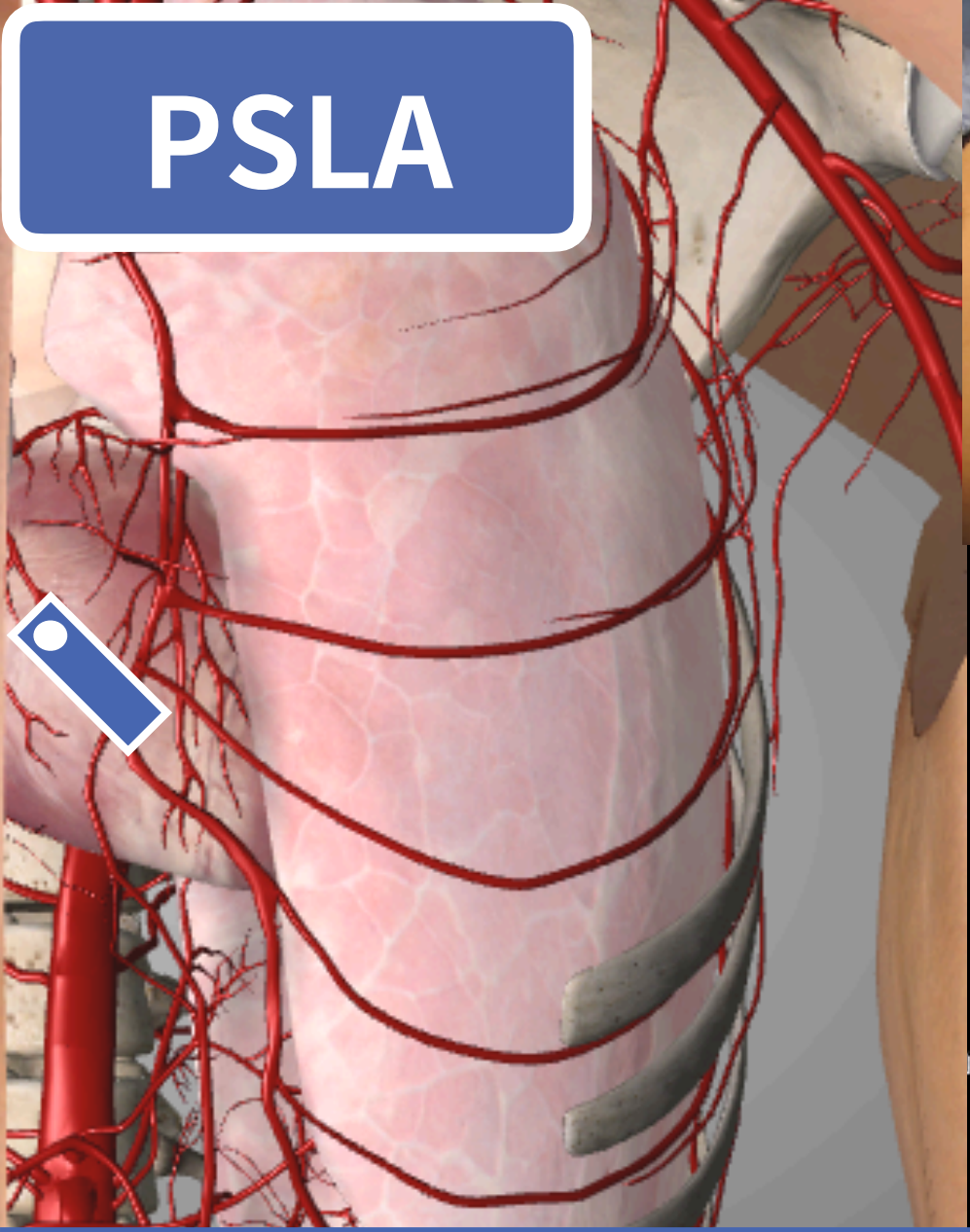


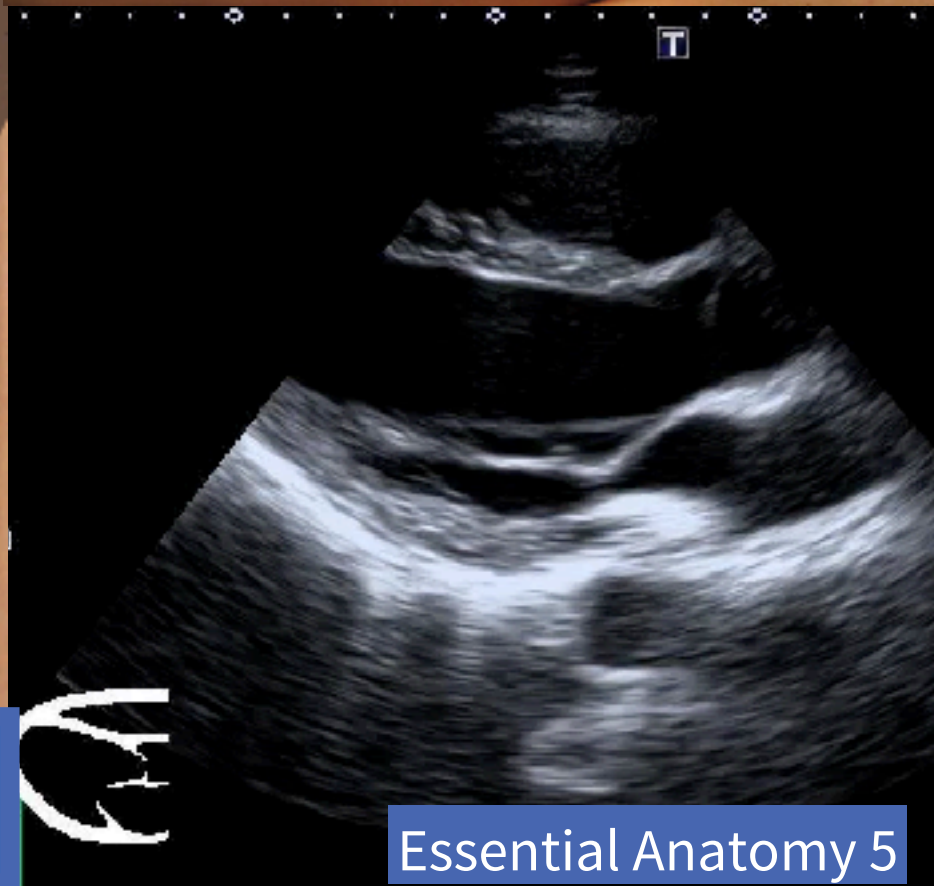




Parasternal long axis

PSLA

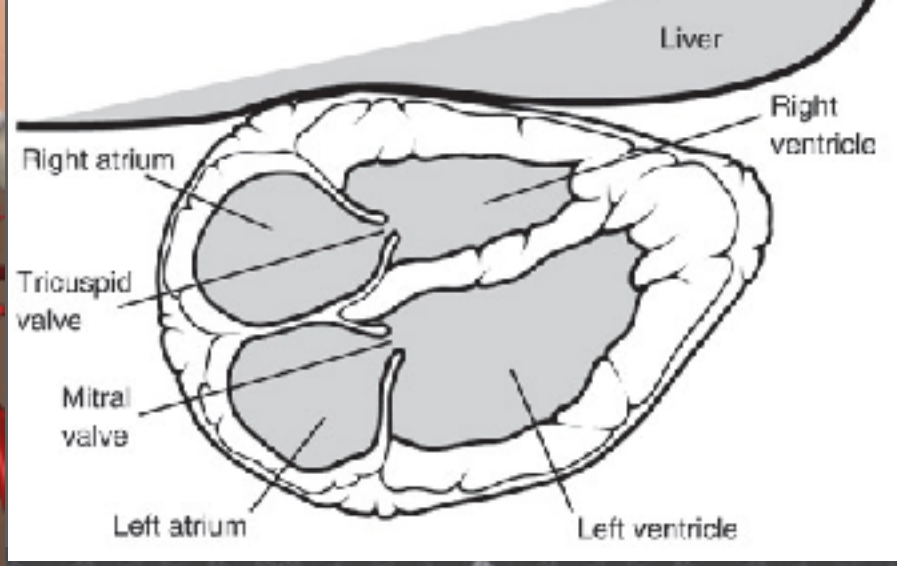


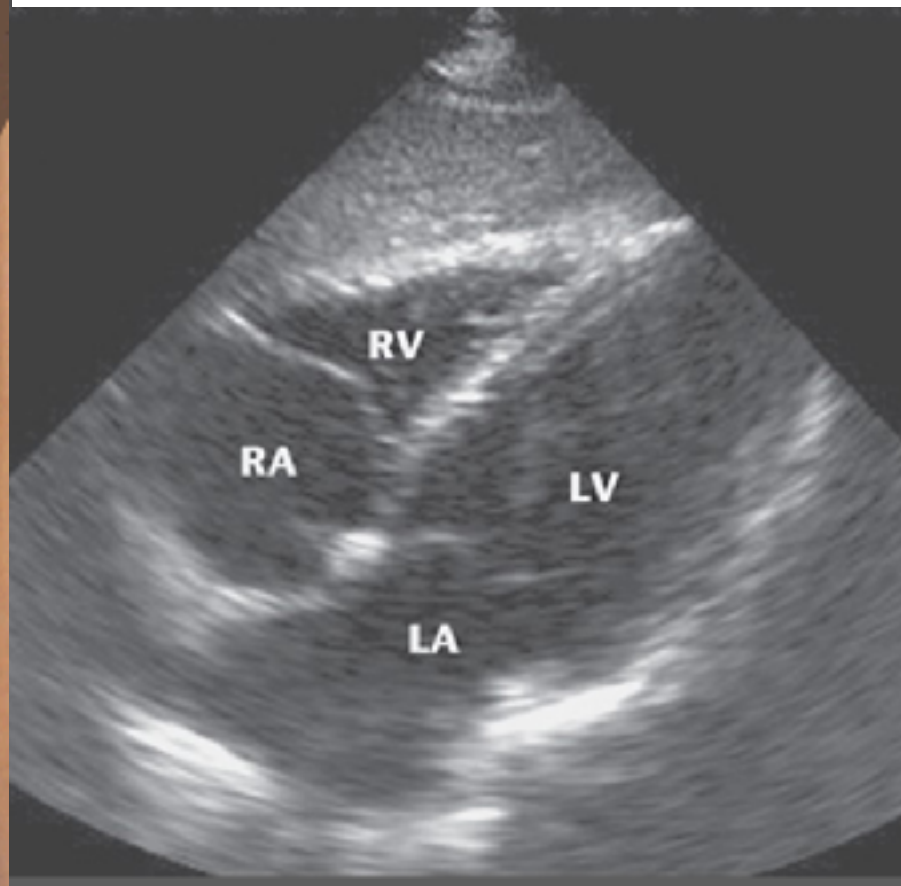


Parasternal long axis

Essential Anatomy 5

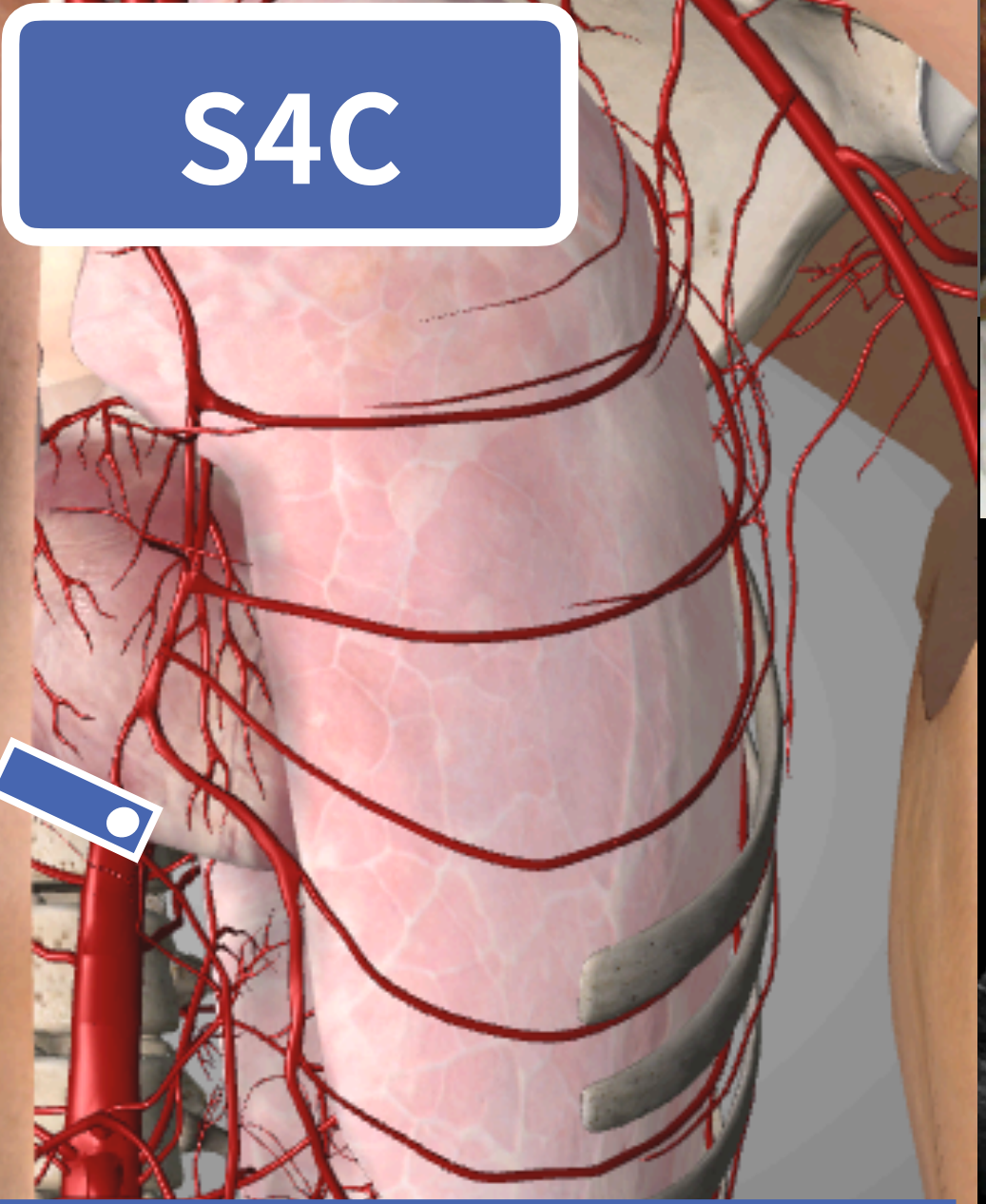
S4C





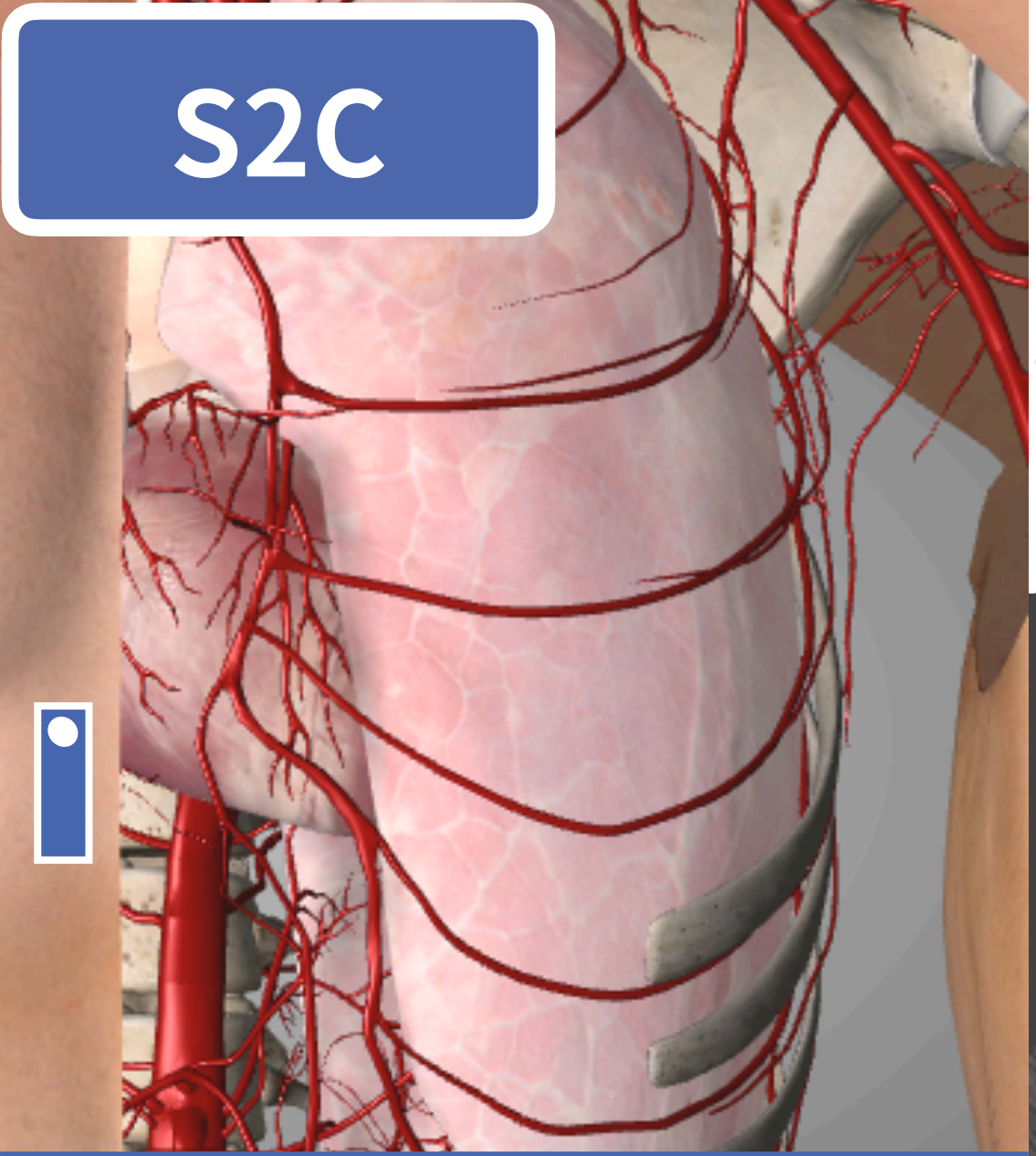
Subcostal 4 Chambers

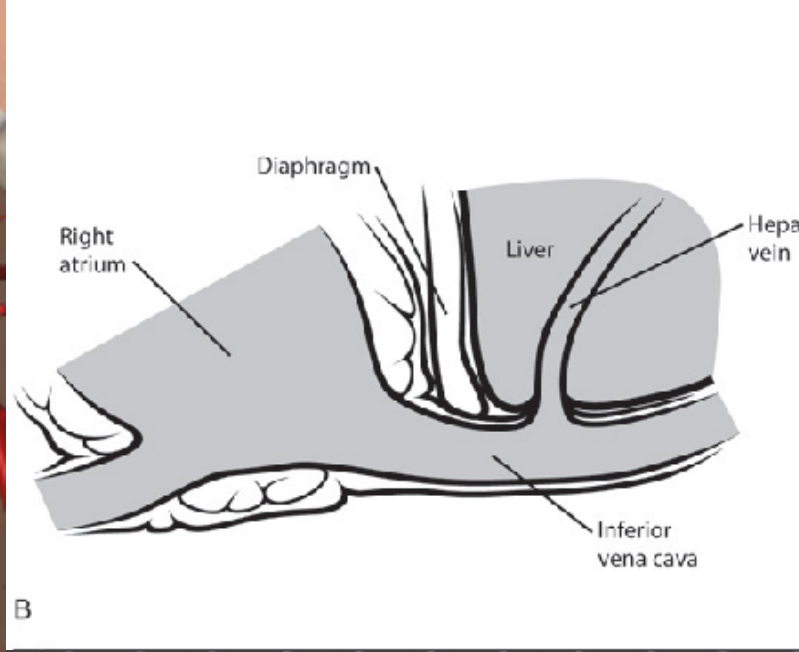
S4C

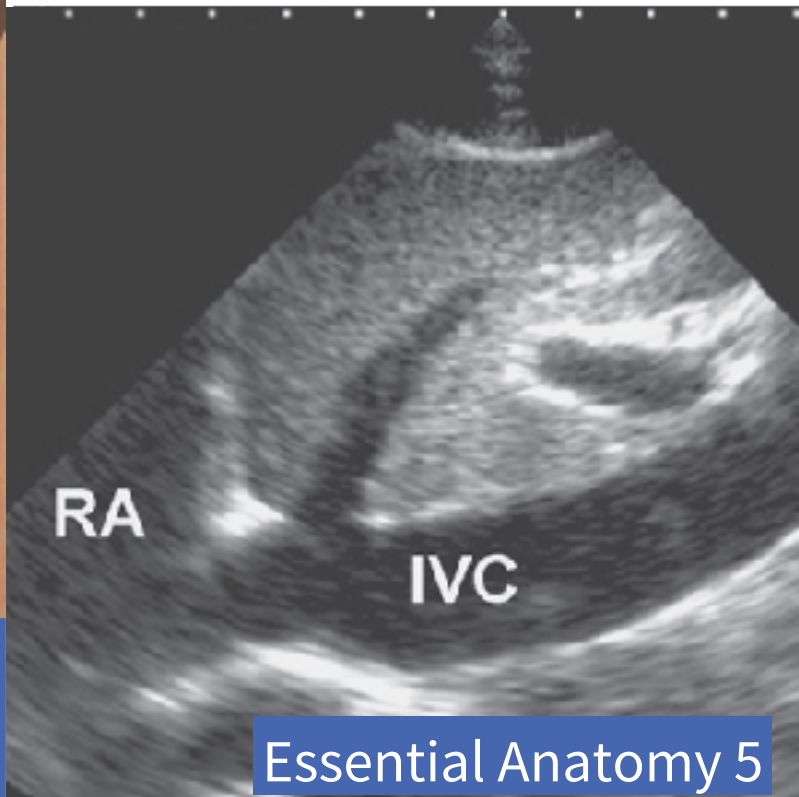


Subcostal 4 Chambers

S2C



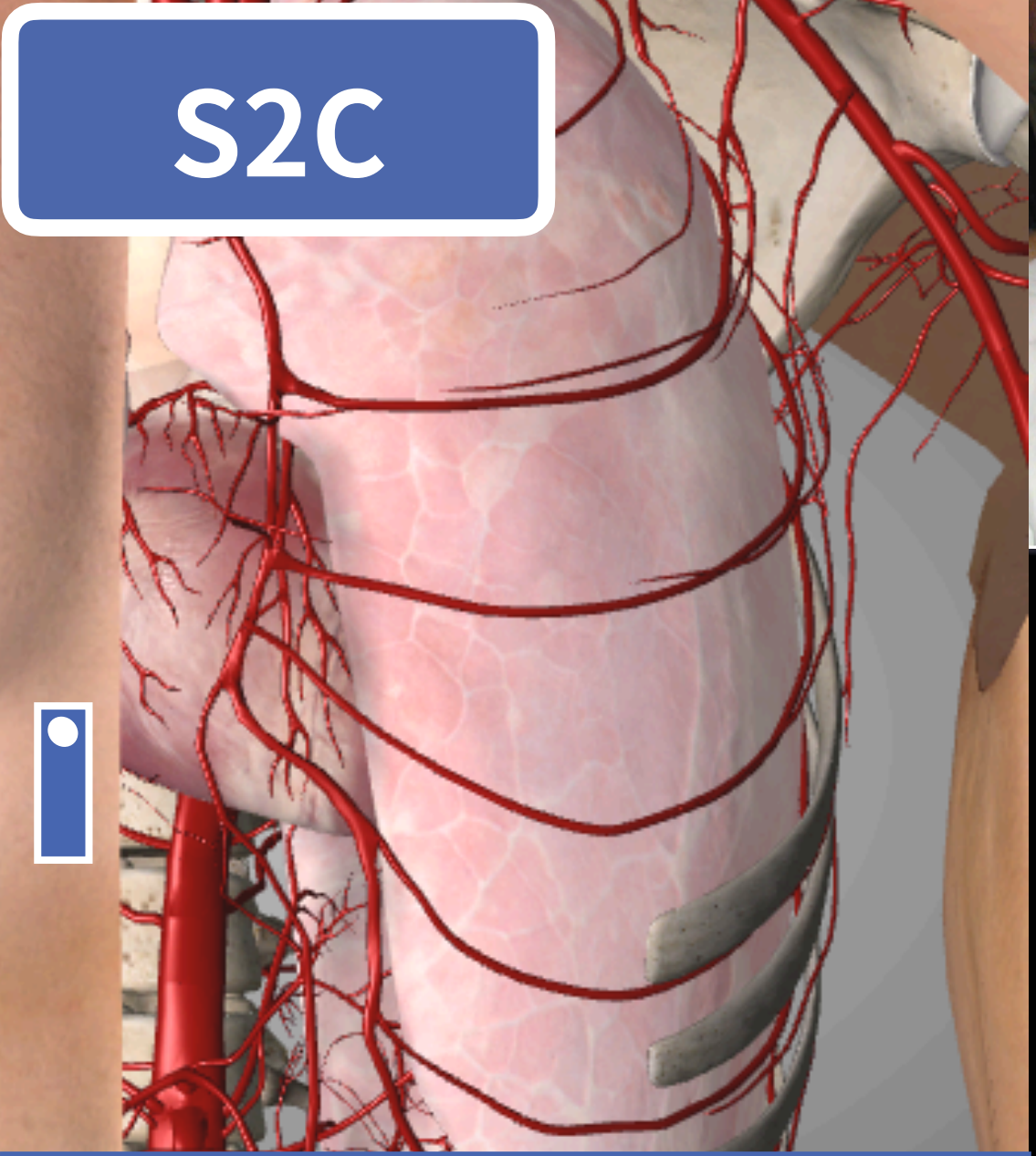


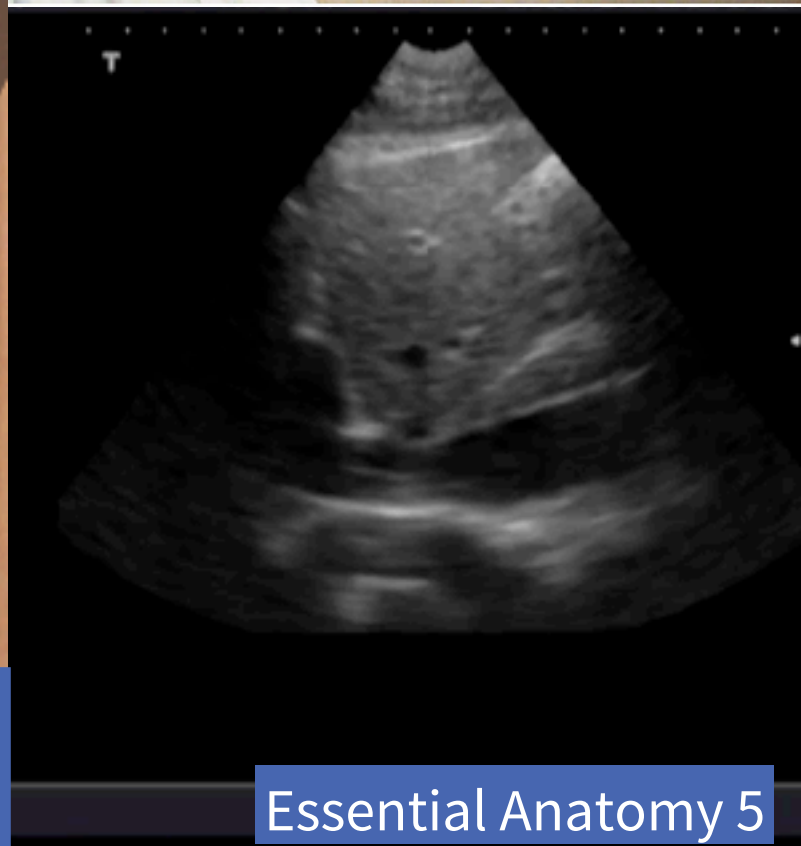


Subcostal 2 Chambers

Essential Anatomy 5

S2C

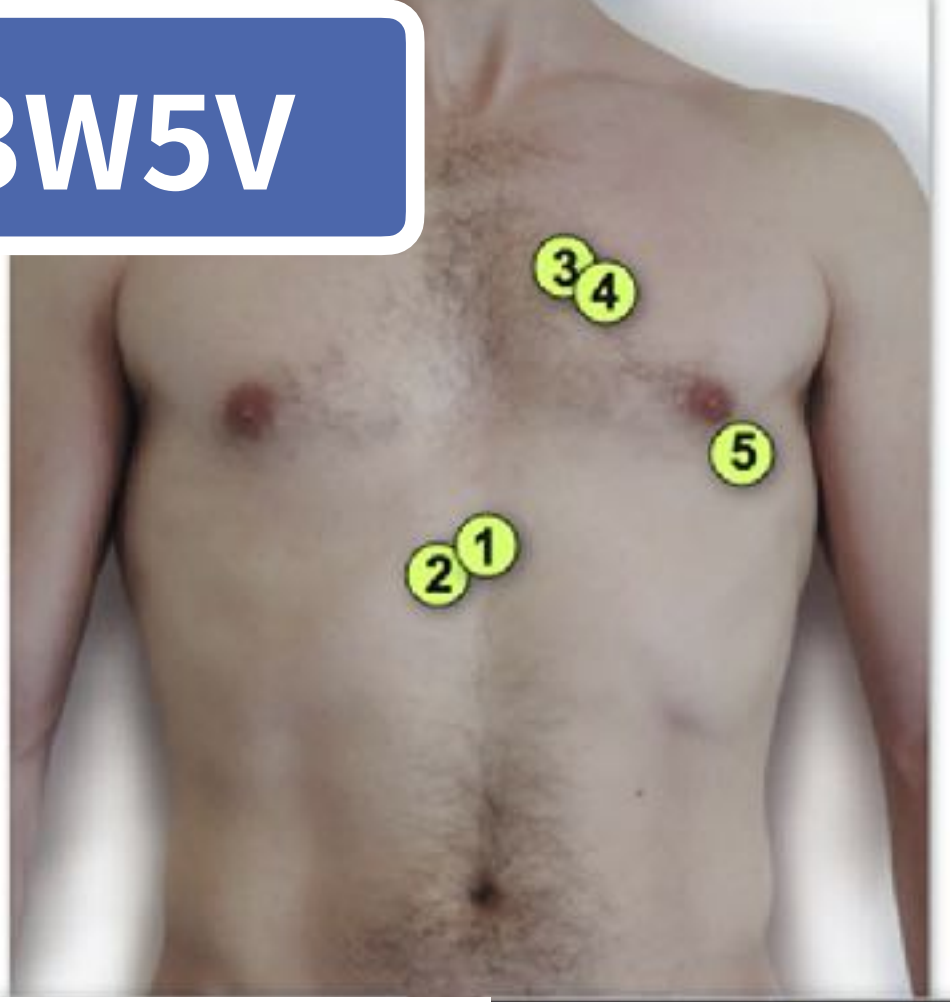




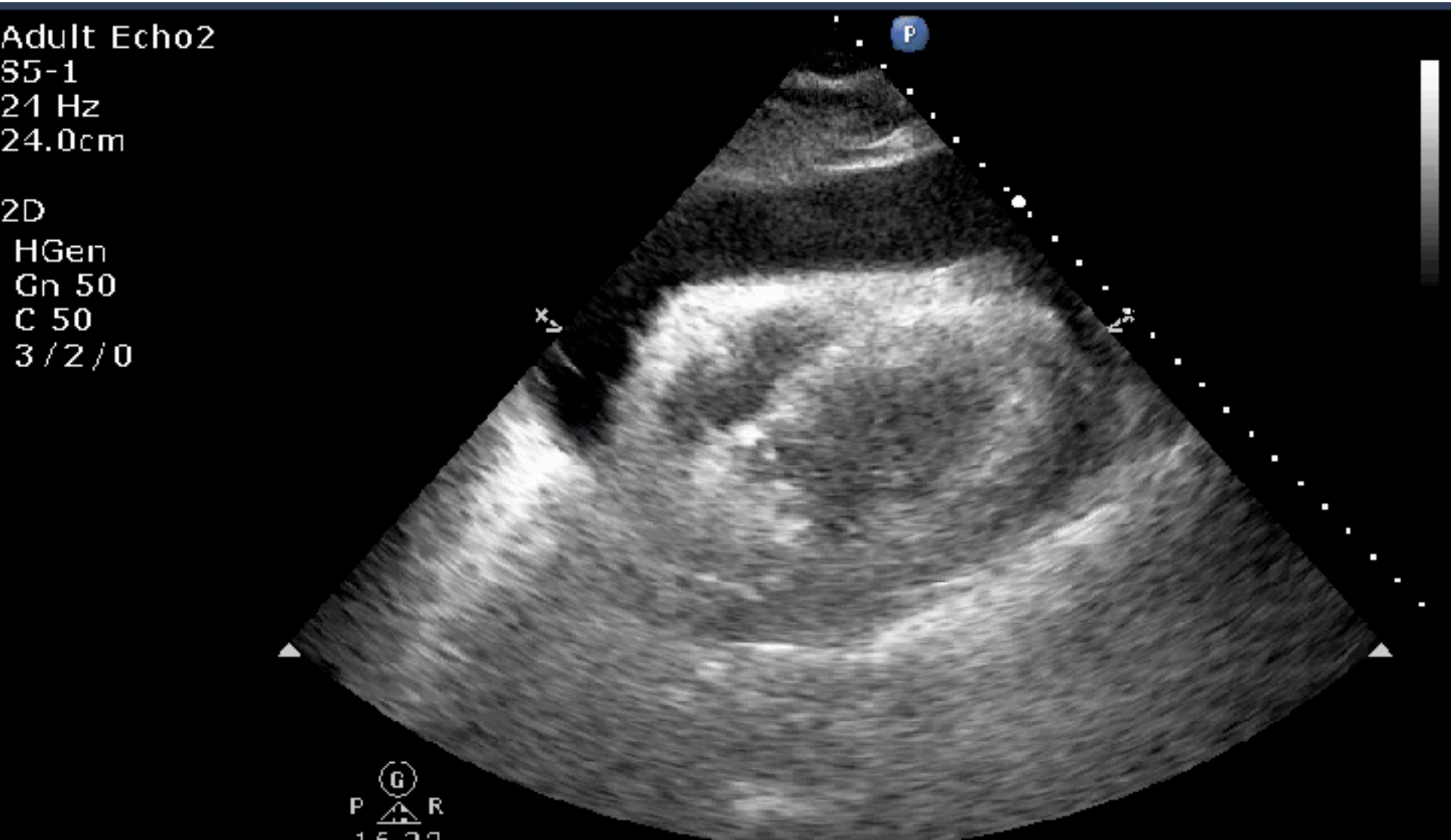
Subcostal 2 Chambers

Essential Anatomy 5

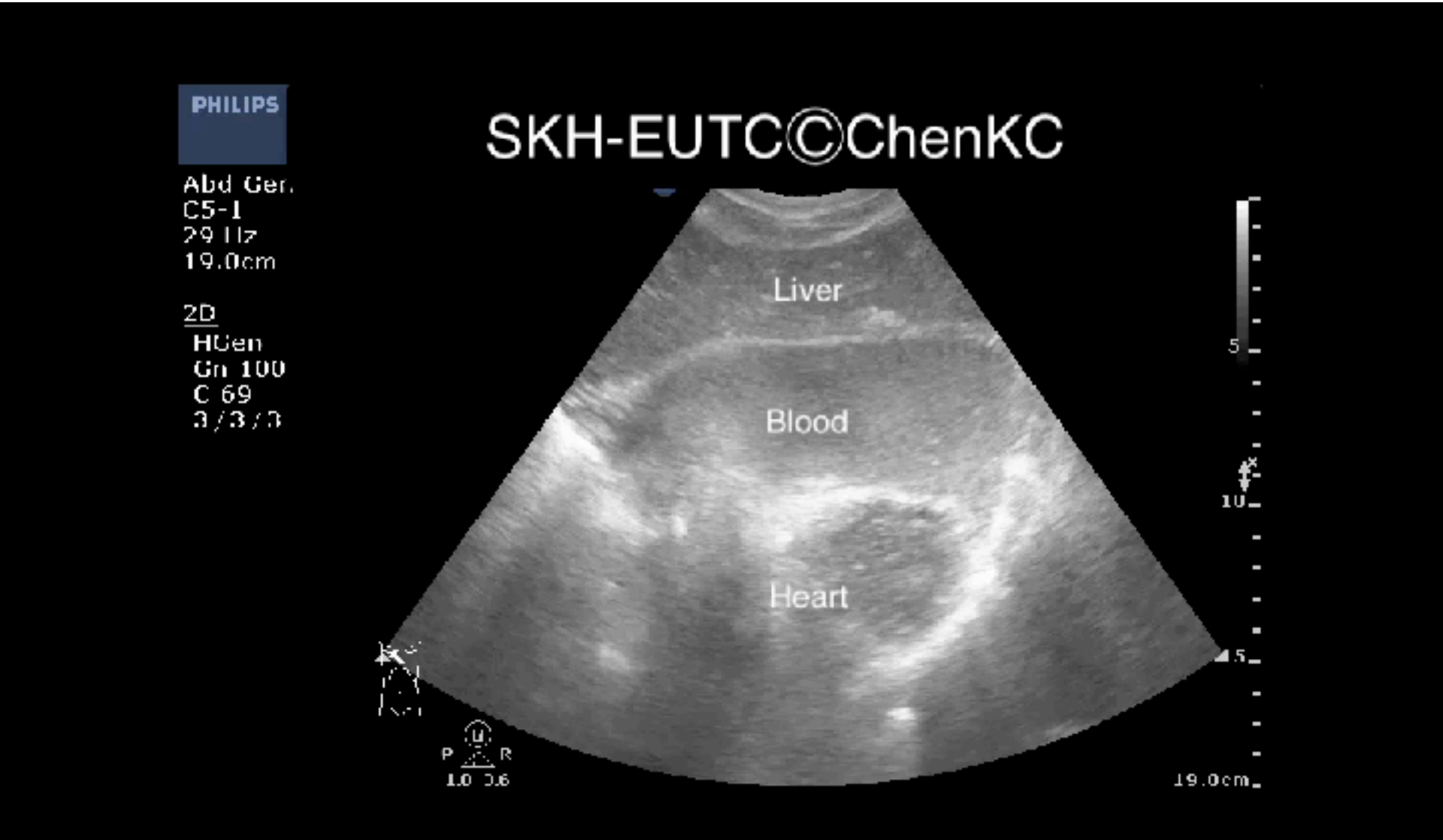
3W5V



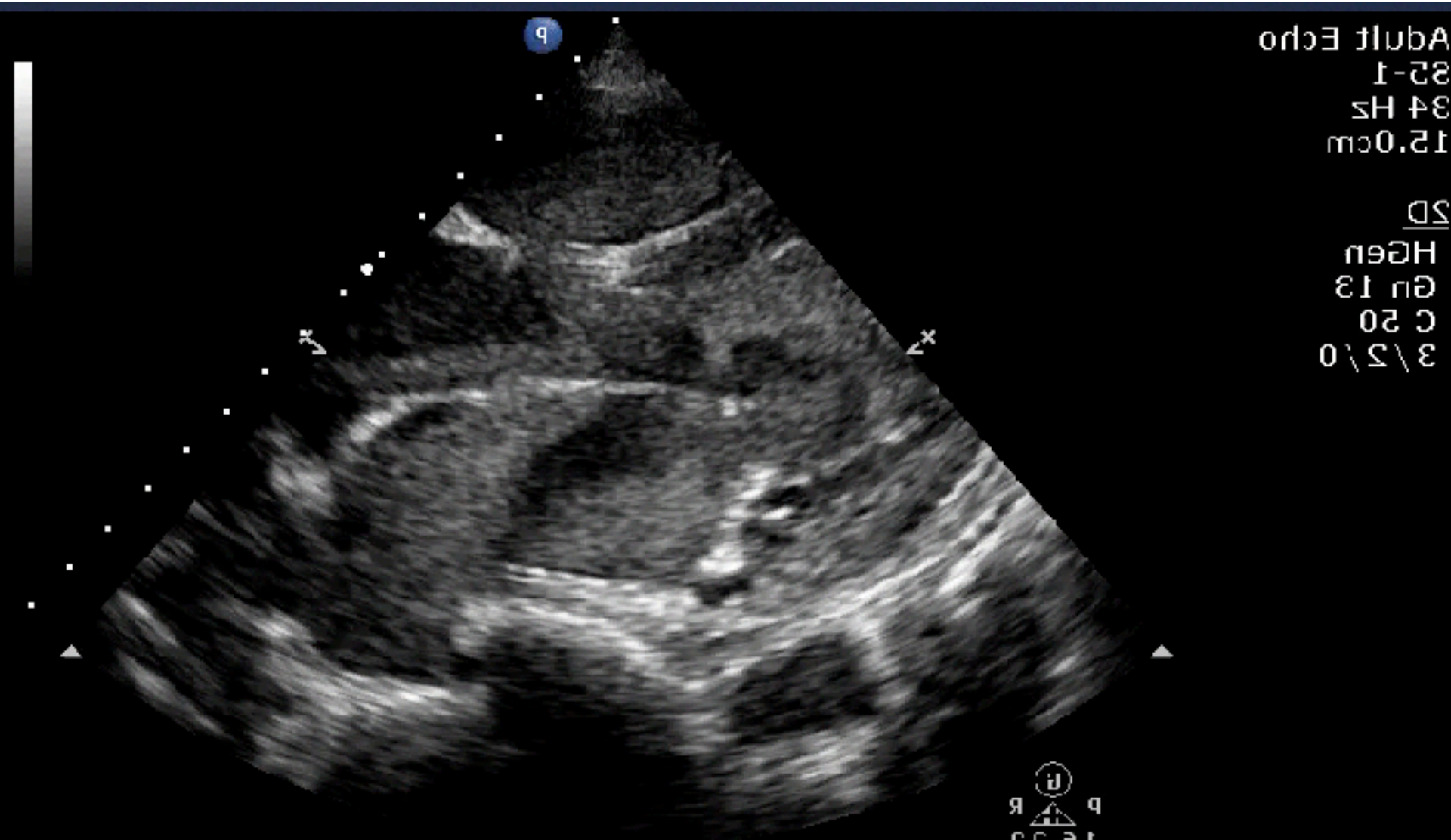
有心包膜積液嗎？



有心包膜積液嗎？

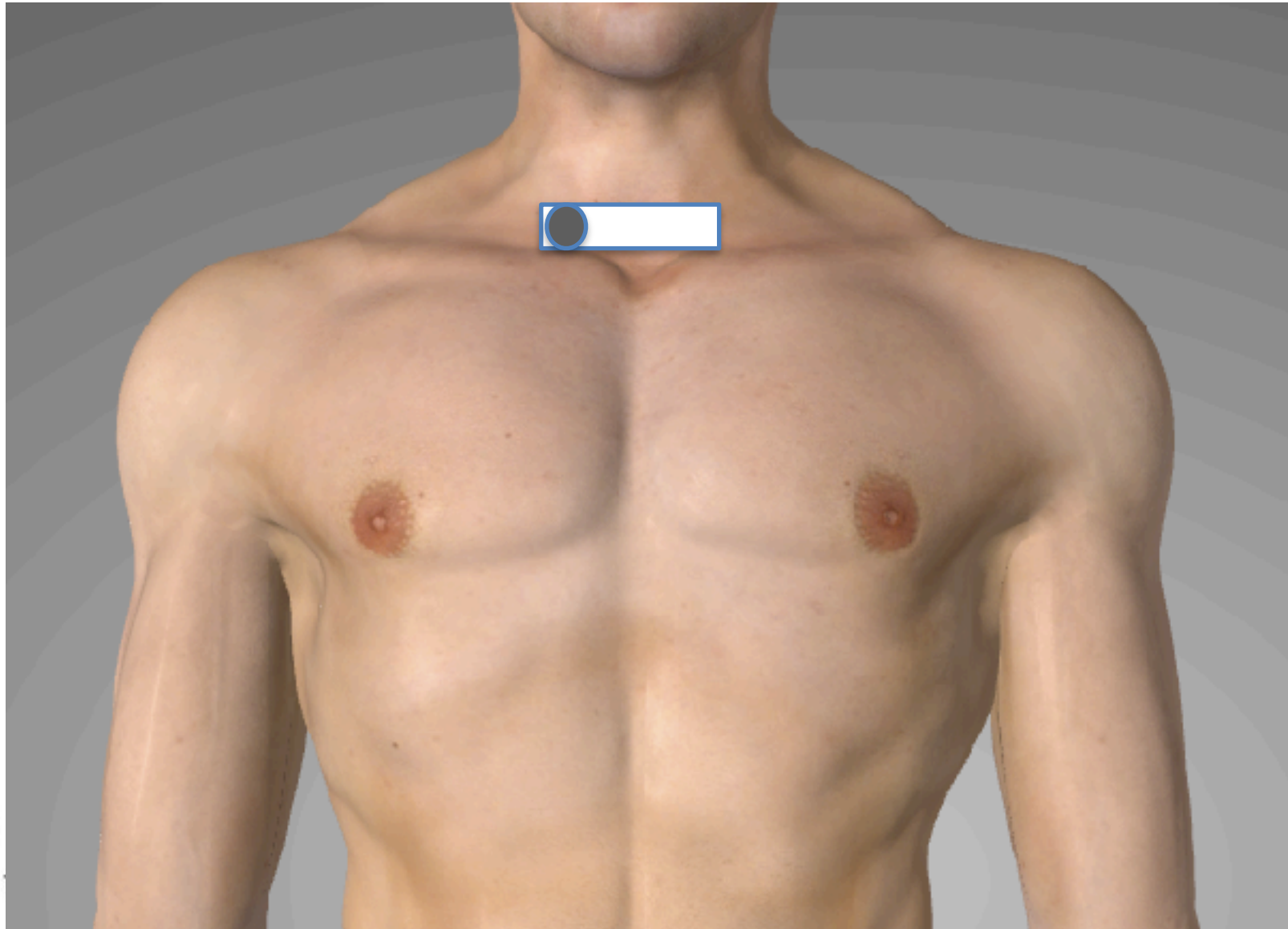

PHILIPS
SKH-EUTC©ChenKC
Abd Gen
C5-1
29 Hz
19.0cm
2D
HGen
Gn 100
C 69
Liver
Blood
Heart
19.0cm

急救中檢查脈搏時心臟，怎麼了



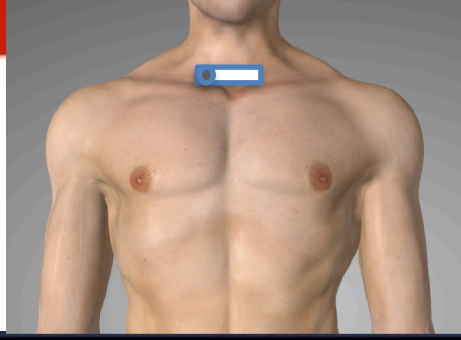
ULTRASOUND
PROGRAM

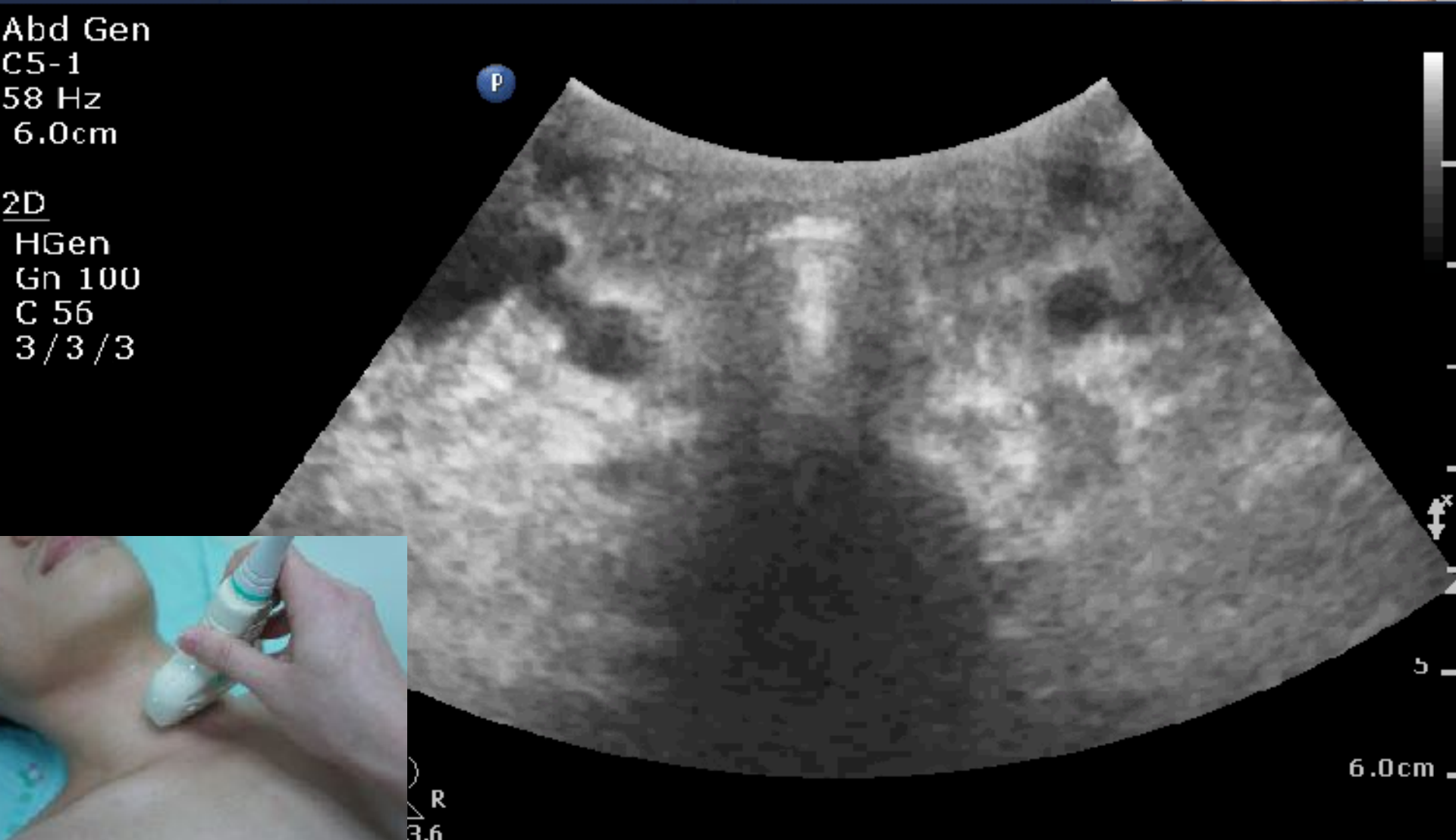
Airway (氣管插管)



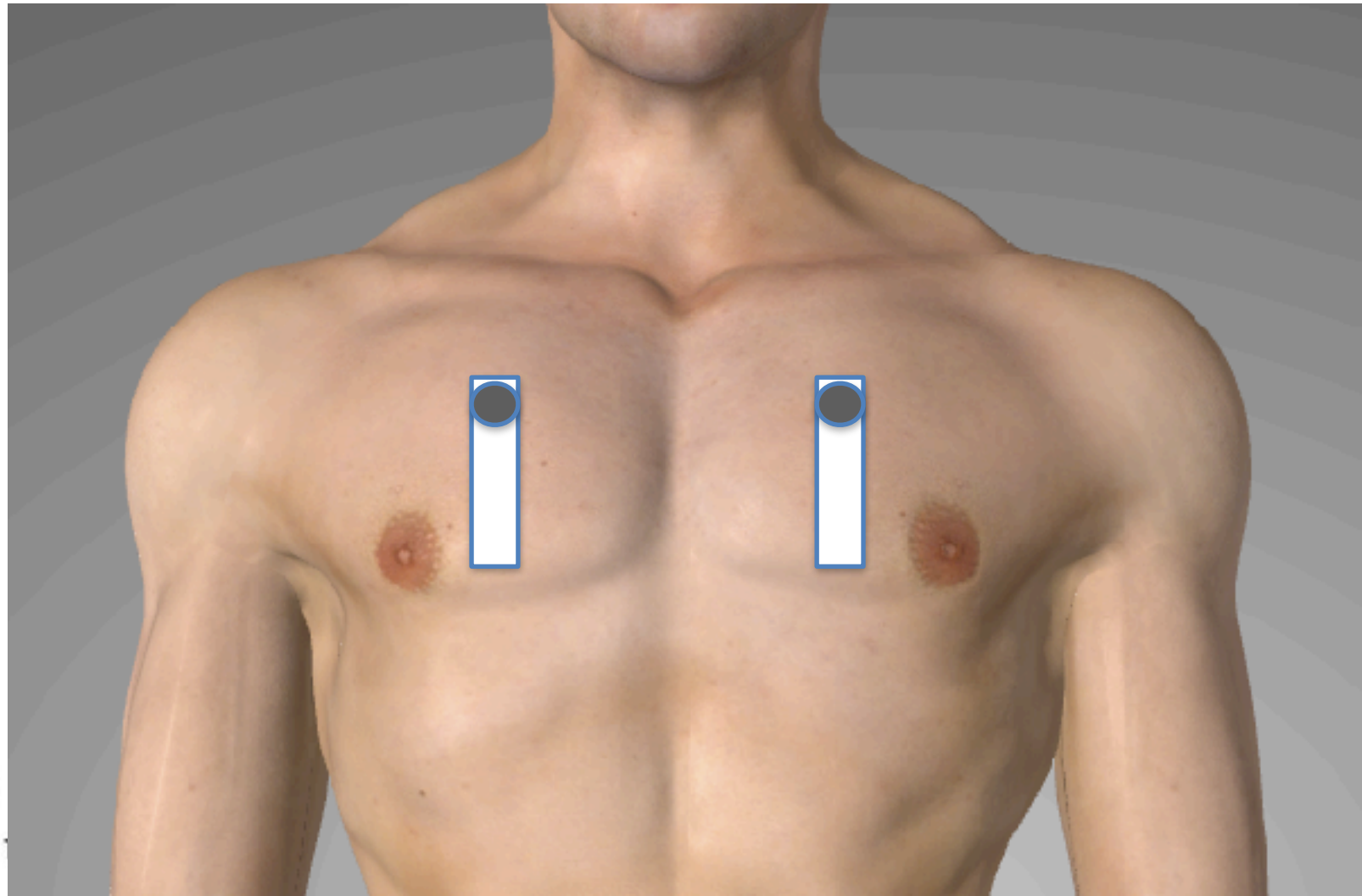
ULTRASOUND PROGRAM

Airway (氣管插管)



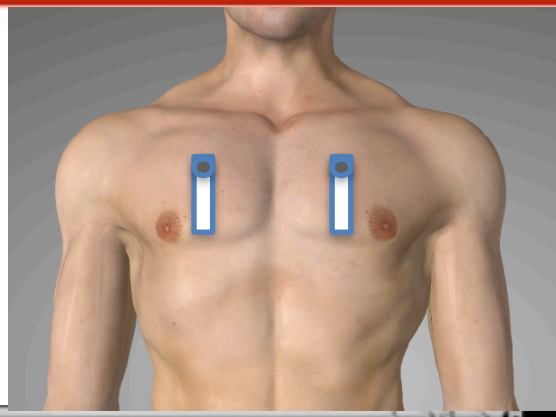


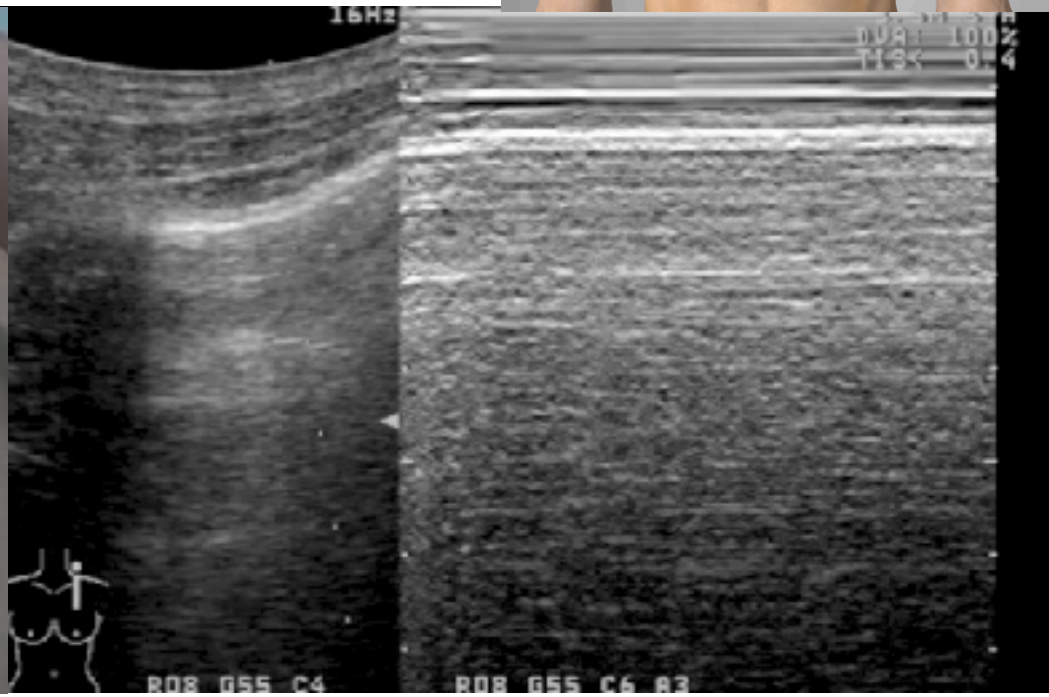
Breathing
(大量氣胸)



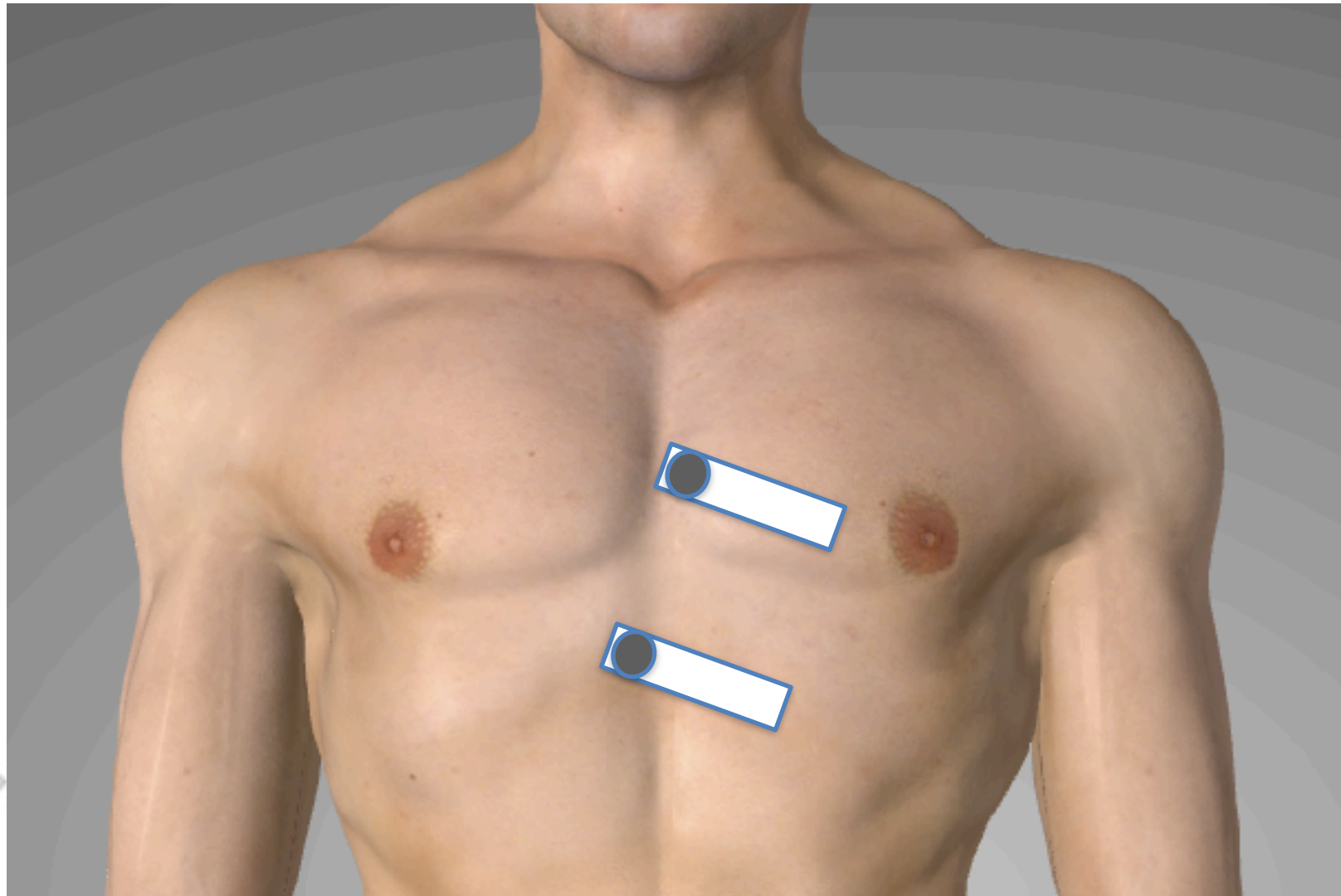
ULTRASOUND
PROGRAM

Breathing
(大量氣胸)

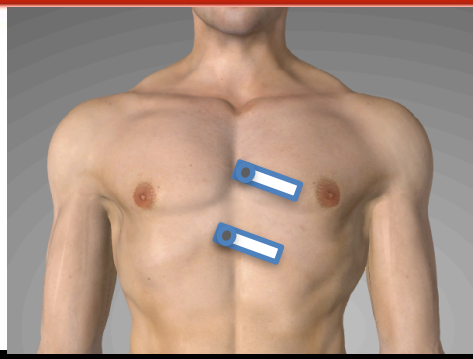


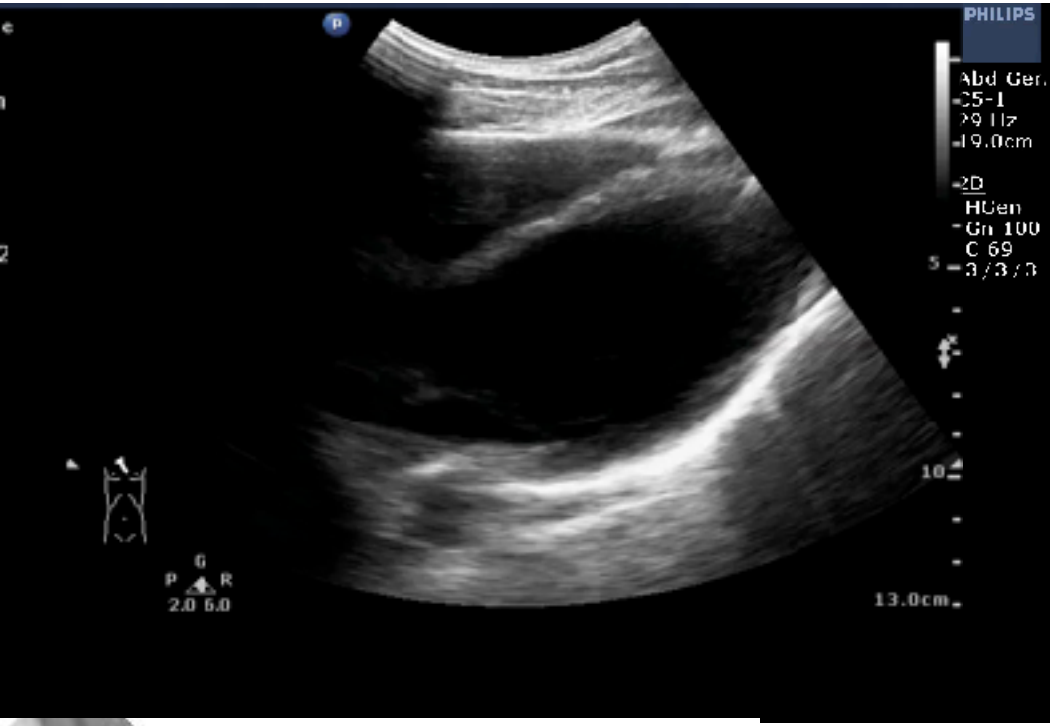


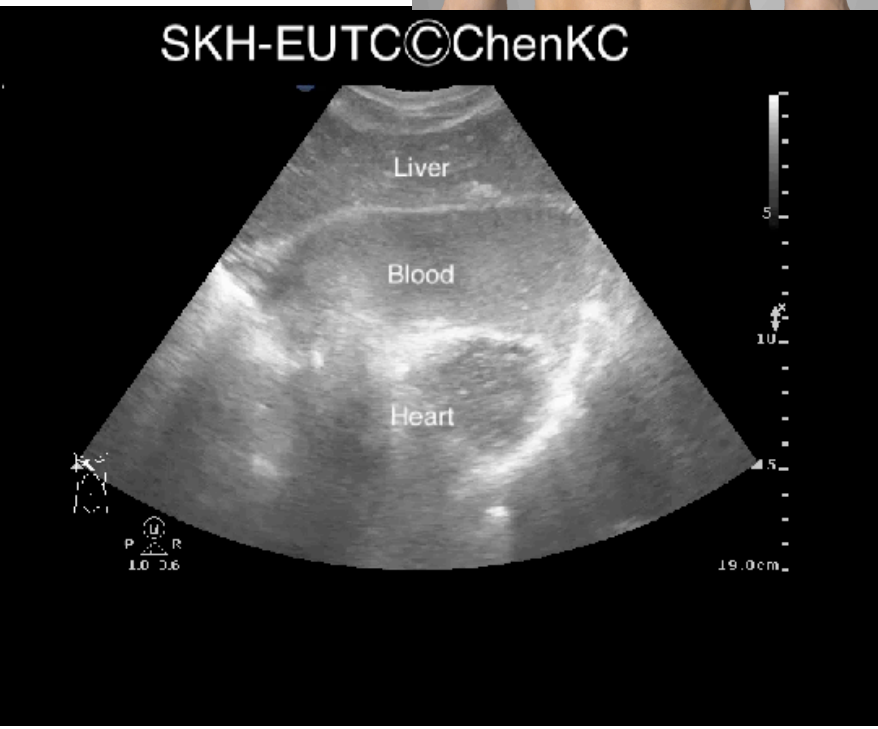
Cardiac
(心搏及心包膜積液)



Cardiac
(心搏及心包膜積液)

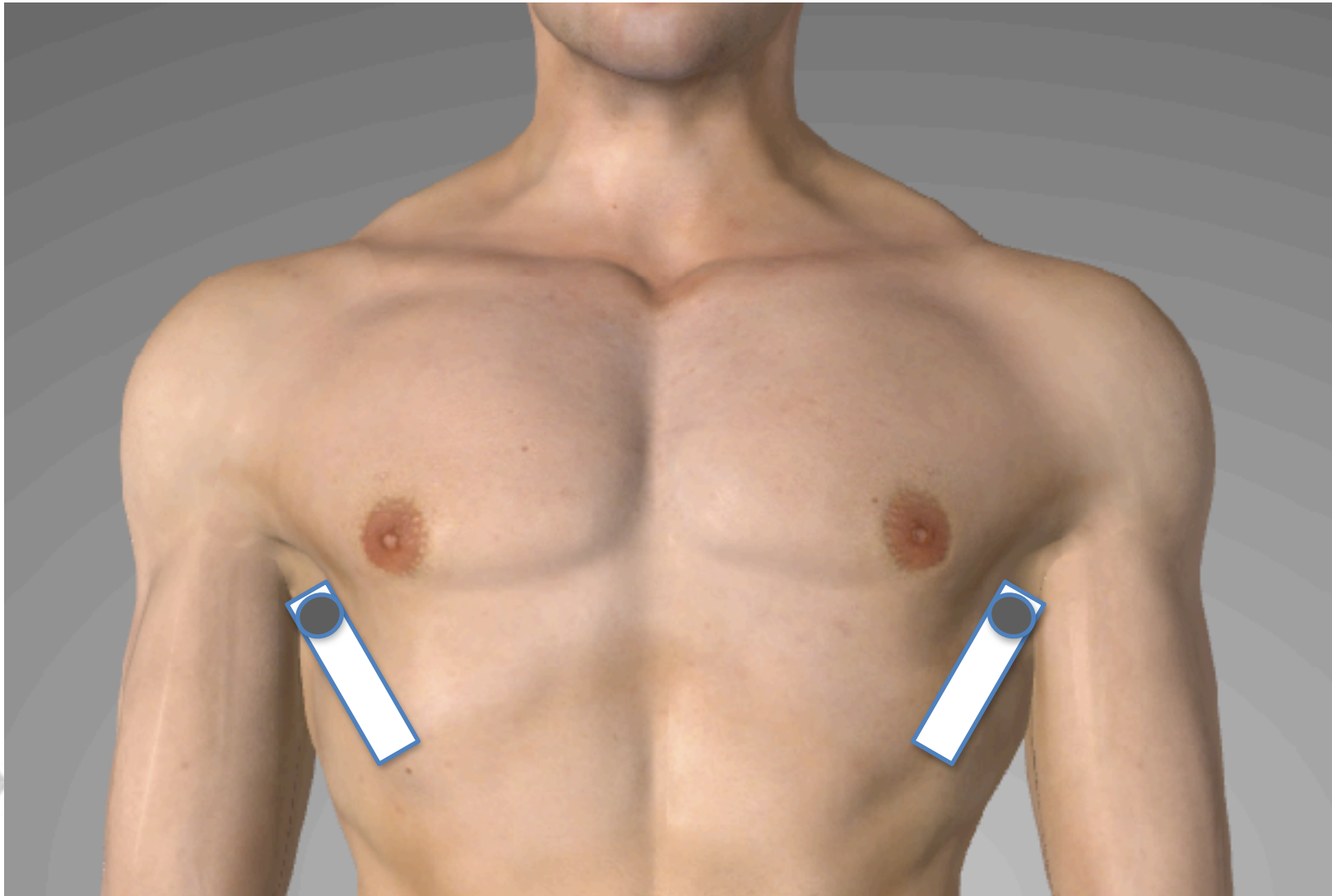






ULTRASOUND PROGRAM

Diaphragm (大量血胸)



ULTRASOUND
PROGRAM

Diaphragm (大量血胸)