ULTRASOUND
PROGRAM

如何準備 POCUS Game

陳國智 西園醫院急診醫學科

ULTRASOUND
PROGRAM

急重症超音波工作坊負責人

POCUS Academy
Emergency Ultrasound Training Center

Faculty
-WINFOCUS, PERCUSS, WFPICC
-Taiwan Pain Society

前急診超音波委員會主委

POCUS Academy

Point-of-care ultrasound is the visual stethoscope in the 21st century

CATEGORY

MOST VIEWED POSTS

RECENT POSTS

POCUS Academy

1,073 位訂閱者

訂閱

首頁 影片 播放清單 社群 頻道 簡介

上傳 全部播放 排序依據

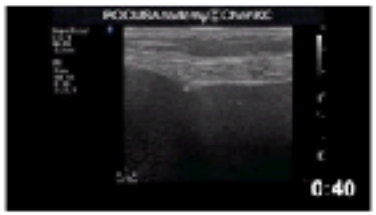
20181221@雙和急診基礎課程簡介(15分鐘精華)

觀看次數：365次・3 個月前

Ureteral stone 張閎世新醫師提供

觀看次數

Ureteral stone 張閎世新醫師提供

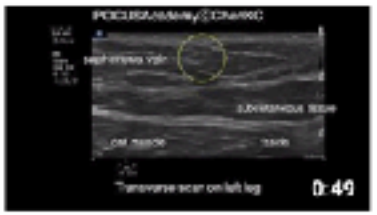


Paracentesis (off plane)

觀看次數：81次・7 個月前

Diverticulitis

觀看次數：247次・1 年前

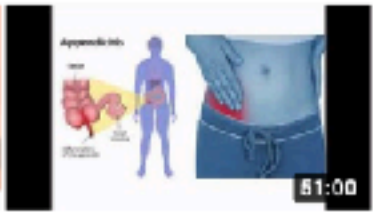


Saphenous thrombophlebitis

觀看次數：122次・1 年前

20191018_Focused Cardiac USG@SKHED

觀看次數：327次・1 年前



P-ABDOMEN for pediatric diseased abdomen @ SKH-...

觀看次數：174次・1 年前

POCUS for male genital emergency

觀看次數：159次・1 年前

64M, sudden onset of epigastric pain

觀看次數：212次・1 年前

Right adrenal gland tumor

觀看次數：318次・1 年前

Torsion解說

觀看次數：177次・1 年前

POCUS for acute dyspnea

觀看次數：336次・1 年前

20170322 新光急診教學實錄 RUSH

觀看次數：264次・1 年前

20161012 Basic EUS

觀看次數：950次・1 年前

POCUS for Acute dyspnea (CHEST)

觀看次數：340次・1 年前

台灣急診醫學通訊

第一卷第二期
刊登日期：2018/04/30
Taiwan Emergency Medicine Bulletin 1(2) : e2018010211

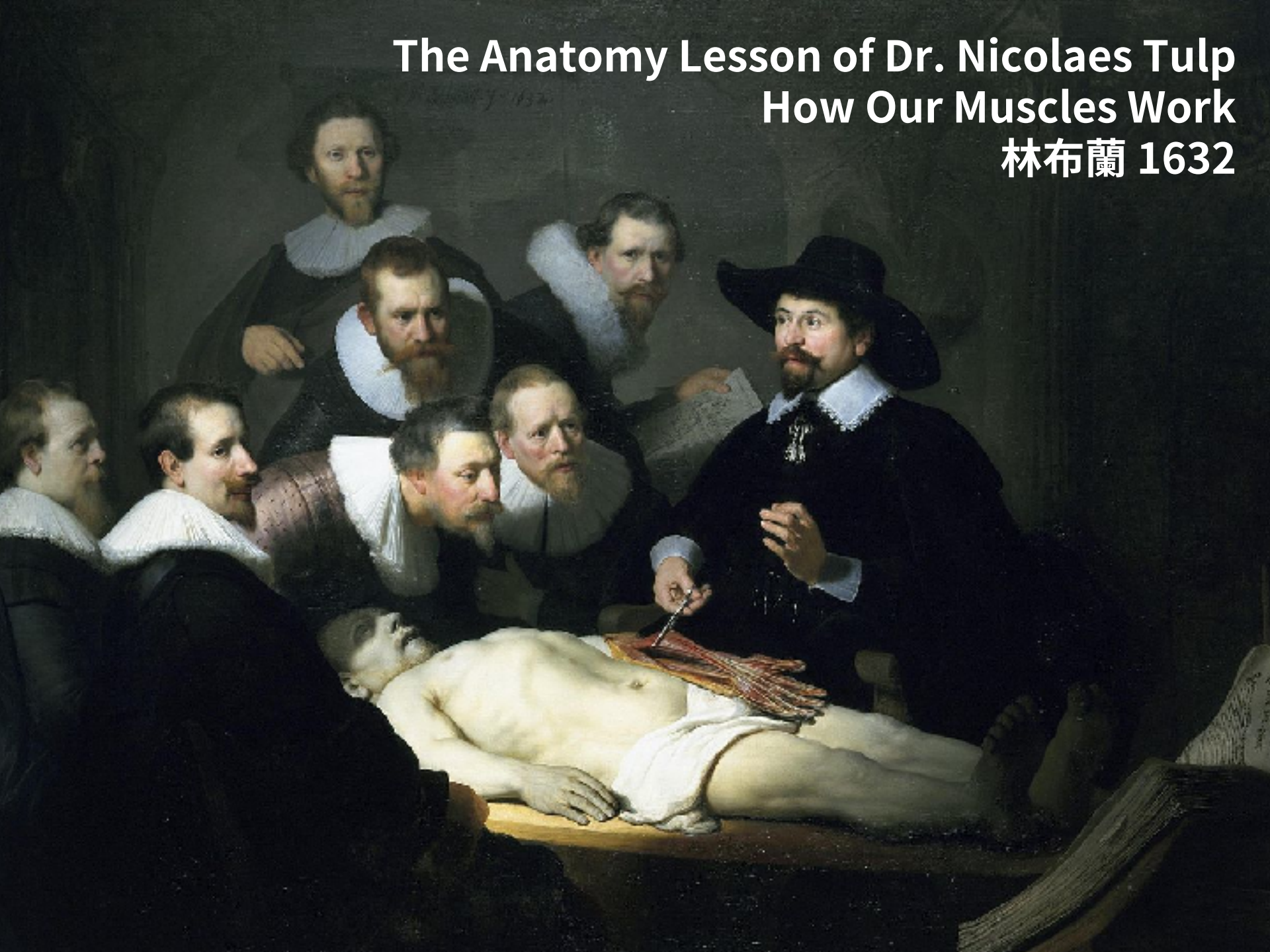
重點式超音波教學：活用手中探頭的6個技巧

第一卷第四期
刊登日期：2018/08/03
Taiwan Emergency Medicine Bulletin 1(4) : e2018010410

重點式超音波個案解析：中年女性胸痛

第一卷第六期
刊登日期：2018/12/07
Taiwan Emergency Medicine Bulletin 1(6) : e2018010610

台灣急診醫學里程碑中的重點式超音波


The Anatomy Lesson of Dr. Nicolaes Tulp
How Our Muscles Work
林布蘭 1632

現在你應該這麼做

Second Edition

Point-of-Care ULTRASOUND

Nilam J. Soni
Robert Arntfield
Pierre Kory

ELSEVIER


人員
設備
環境

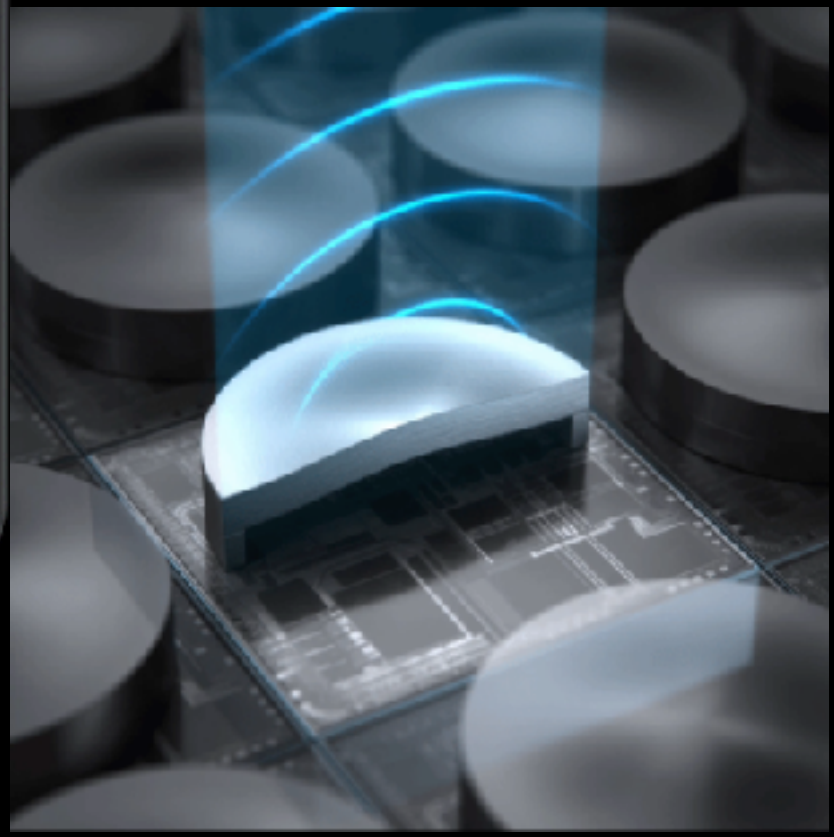
Victor Hugo

“There is one thing stronger than all the armies in the world, and that is an idea whose time has come”

POCUS’s time has come !!

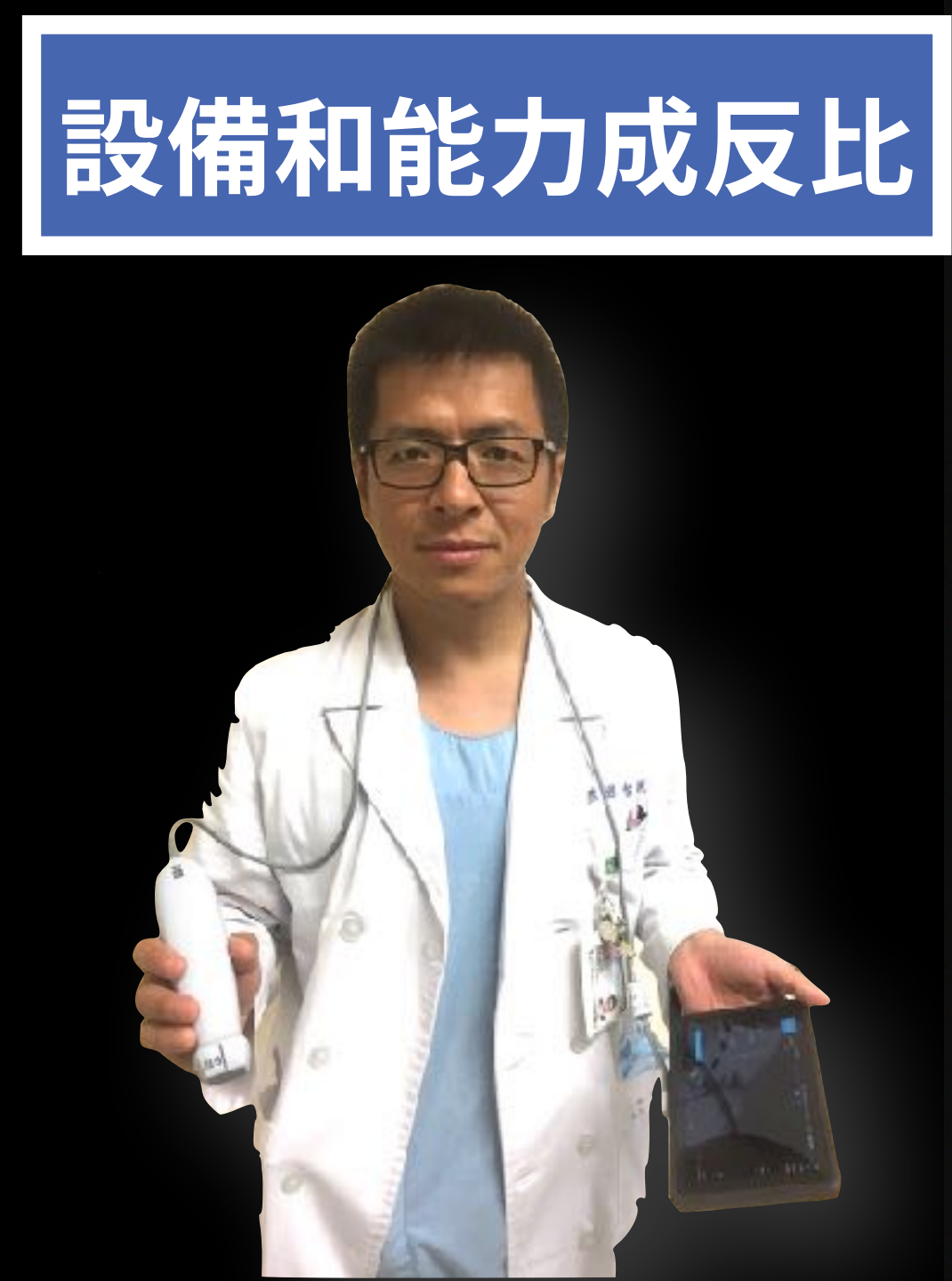
ChenKC@POCUSAcademy

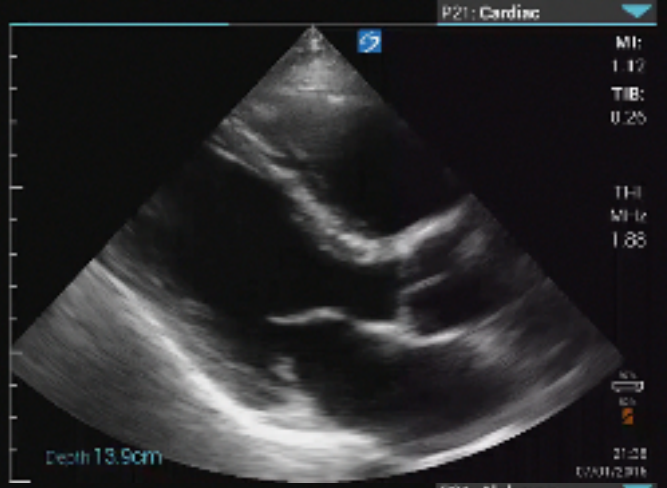
Butterfly iQ
$ 2000

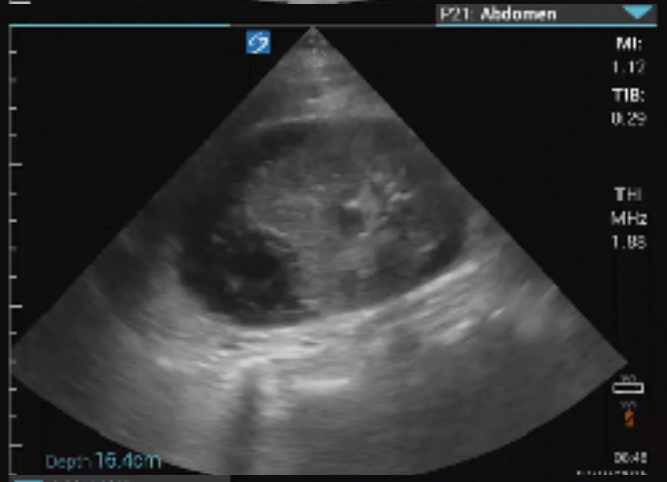


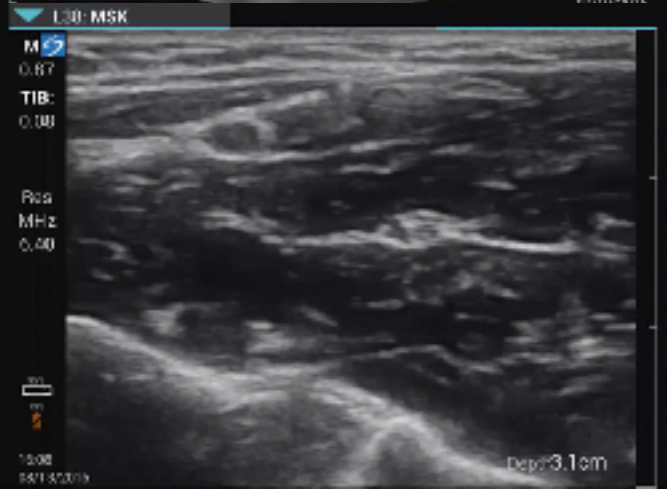

TIS: 0.02, MI: 0.48, Cardiac
10:26
Presets
Modes

設備和能力成反比




P21: Cardiac
Depth 13.9cm


P21: Abdomen
Depth 16.4cm


L38: MSK
Depth 3.1cm

ULTRASOUND PROGRAM

POCUS

Point-of-Care Ultrasound

"ultrasonography brought to the patient and performed by the provider in real time"

Moore, C. L., & Copel, J. A. NEJM 2011

ULTRASOUND
PROGRAM

POCUS

What's the point ?

ULTRASOUND PROGRAM

I-AIM

Indication (Point)

Acquire **Interpret** **Make decision**

Taipei A

Bahner DP, et al. J Ultrasound Med 2012

ULTRASOUND PROGRAM

Acute abdomen

Internal bleeding ?

FAST **Fluid** **CT/TAE/OP**

Taipei A

Bahner DP, et al. J Ultrasound Med 2012

必要 需要 想要

急診超音波－2012里程碑核心能力分級

第1級	第2級	第3級	第4級	第5級
描述急診超音波之適應症。	說明如何取得最佳化的超音波影像，能針對各類焦點式超音波的應用，選擇最適當的探頭。 執行創傷超音波(eFAST)檢查。	執行目標導向焦點式超音波檢查。 正確判讀所得影像。	執行焦點式超音波檢查至少150例。	能運用進階超音波: 如經食道超音波(TEE)、腸道、男女性生殖器、穿顱超音波(Transcranial Doppler) 等檢查。

必要	需要	想要		
描述和基本目標導向臨床超音波相關的解剖構造。	能針對目標導向臨床超音波，確認合適探頭、掃描設定值和掃描流程，以獲取和優化影像。	正確判讀取得的影像，並能完成目標導向臨床超音波的檢查和操作流程。	能展現正確記載目標導向臨床超音波報告的能力。	指導其他醫事人員目標導向臨床超音波。
描述目標導向臨床超音波的適應症為何，並能區別與傳統超音波不同之處。	能針對目標導向臨床超音波正確的取得影像。	描述目標導向臨床超音波檢查和操作流程的限制為何。	能持續在臨床處置中使用和整合適當的超音波應用。	擴展超音波技能至進階應用。
能展現掃描時所需的探頭操控手法。	能辨識出目標導向臨床超音波相關的解剖構造。	描述整合目標導向臨床超音波的臨床應用流程。	利用超音波來發覺醫療處置的成功和可能的併發症。	了解發展和維持成功急診超音波計畫的關鍵組成為何。
在監督下執行創傷超音波(eFAST)檢查。	在危急情境時能執行目標導向臨床超音波，如創傷超音波，心臟超音波和主動脈超音波。	執行和檢視包含各項核心適應症的目標導向臨床超音波檢查至少150例。		參與超音波相關的品質提升計畫。
		應用超音波來導引即時的臨床處置。		致力於目標導向臨床超音波領域的進展。

TSEM milestone

必要 **需要** **想要**

Has not Achieved Level 1	Level 1	Level 2	Level 3	Level 4	Level 5
	103.描述急診超音波(emergency ultrasound)之適應症。	104.說明如何取得最佳化的超音波影像，能針對各類重點式超音波的應用，選擇最適當的探頭。 105.具備基本超音波掃描能力(辨識各種器官組織)。 106.執行創傷超音波(eFAST)檢查。	107.執行目標導向重點式超音波檢查。 108.正確判讀所得影像。 109.執行急診超音波檢查至少 150 例。	110.熟練執行目標導向重點式超音波，在床邊進行緊急醫療狀況的評估和診斷、輔助急重症或外傷病人的急救以及協助臨床技術之執行。	111.進階使用急診超音波，發展新的應用模式。 112.教導急診超音波。
☐	☐	☐ ☐ ☐	☐ ☐	☐ ☐	☐ ☐

建　議：Case observation direct evaluation CODE/ case-based milestone direct observation/ direct observation with check list

ULTRASOUND PROGRAM

POCUS-目標

必要 MUST	需要 NEED	想要 WANT
R	EP	CME

ULTRASOUND PROGRAM

可以同步

病史詢問

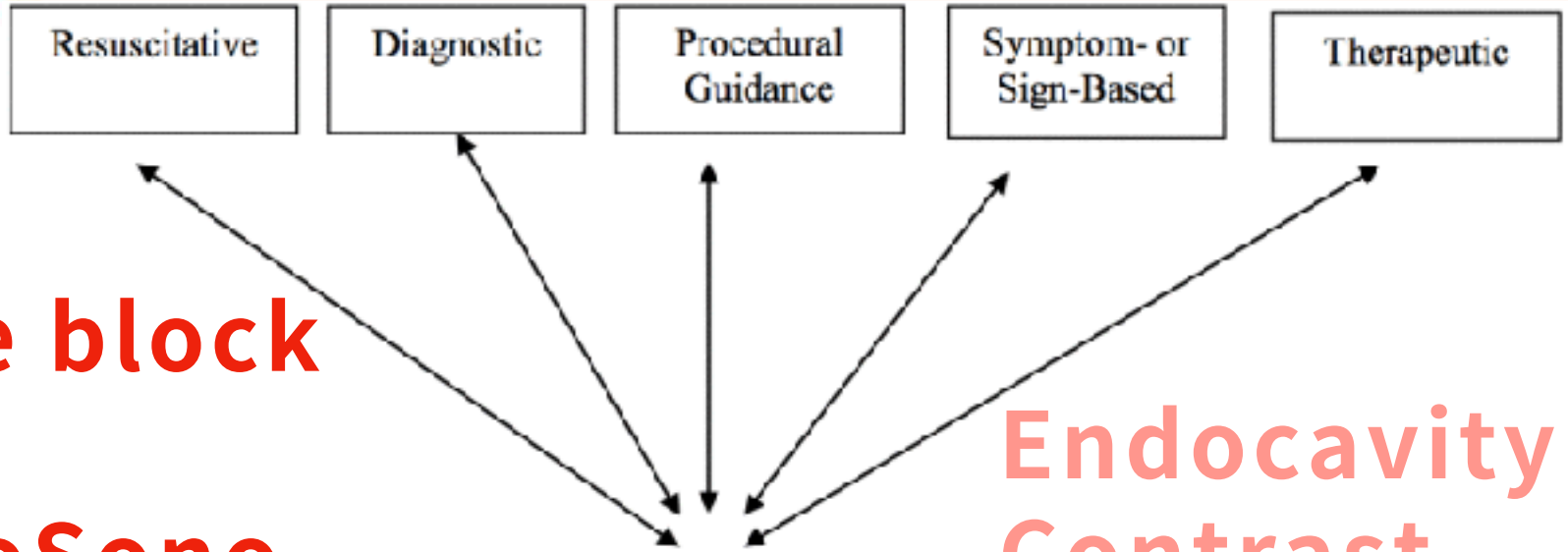
理學檢查

不可省略

Y POCUS N

Taipei Medical University Center for Education in Medical Simulation

ULTRASOUND PROGRAM



Nerve block
TEE
NeuroSono

Endocavity
Contrast

ACEP 2016

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

12 核心

5大應用

ULTRASOUND PROGRAM

POCUS for EP

診斷 **監測** **介入**

Diagnosis **Monitoring** **Intervention**


TE7 Ultrasound System
01-03-2018
20180301-131630-34EA
MSK1
12:44:40
L14-6Ns
AP 96.6%
MI 1.3
TIS 0.1
B
F H10
DR 110
FR 27
D 2.0
G 46
0
1
2


TE7 Ultrasound System
01-03-2018
180301-131630-34EA
Nerve
13:00:39
F 6.0~12.6
DR 100
FR 82
Anatomy
Nerve
Needle
Drug

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PROGRAM

POCUS-TSEM

基礎	進階	Game
4h	16h	R

Taipei Medical University Center for Education in Medical Simulation

ULTRASOUND
PROGRAM

POCUS-急診/Game

症狀 問題	線索 時間	診斷 治療
雜	少	快

58F, 左腰腹痛併發燒2天

20160726

20180603


02:05:23
02:06:44


Precision APure
0
5
10
15


Precision APure
0
5
10
15


Precision APure
0
5
0
15


Precision APure
0
5
10
15

2016 1st POCUS Game

2019 POCUS Game

ULTRASOUND
PROGRAM

POCUS Game-目標

會掃	會看	有趣
SCAN	READ	FUN
實作	影片	團隊

Knobology

Knobology

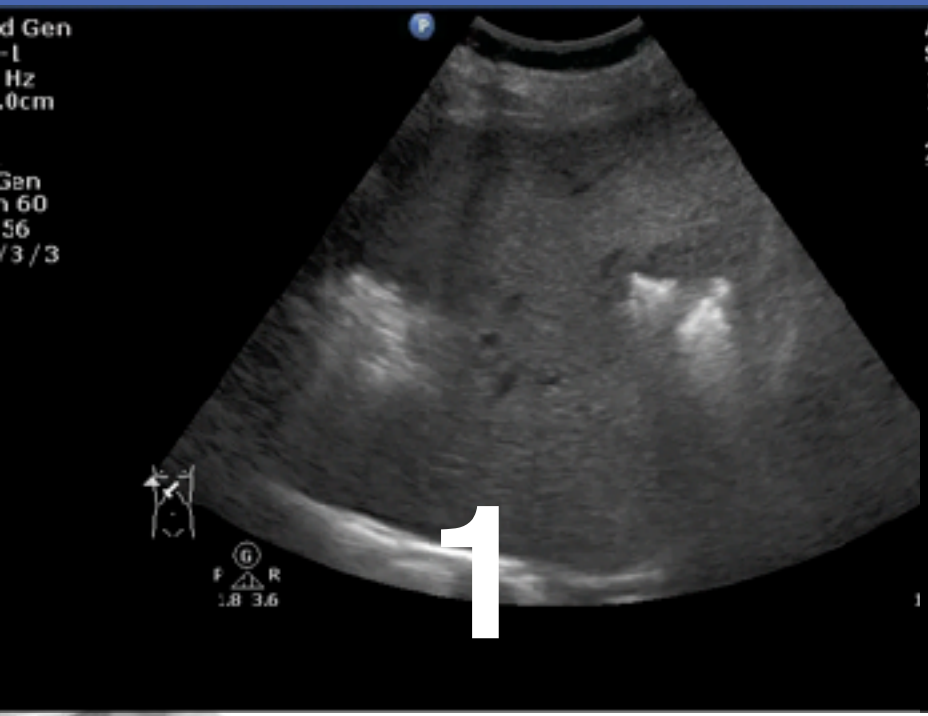
ULTRASOUND
PROGRAM

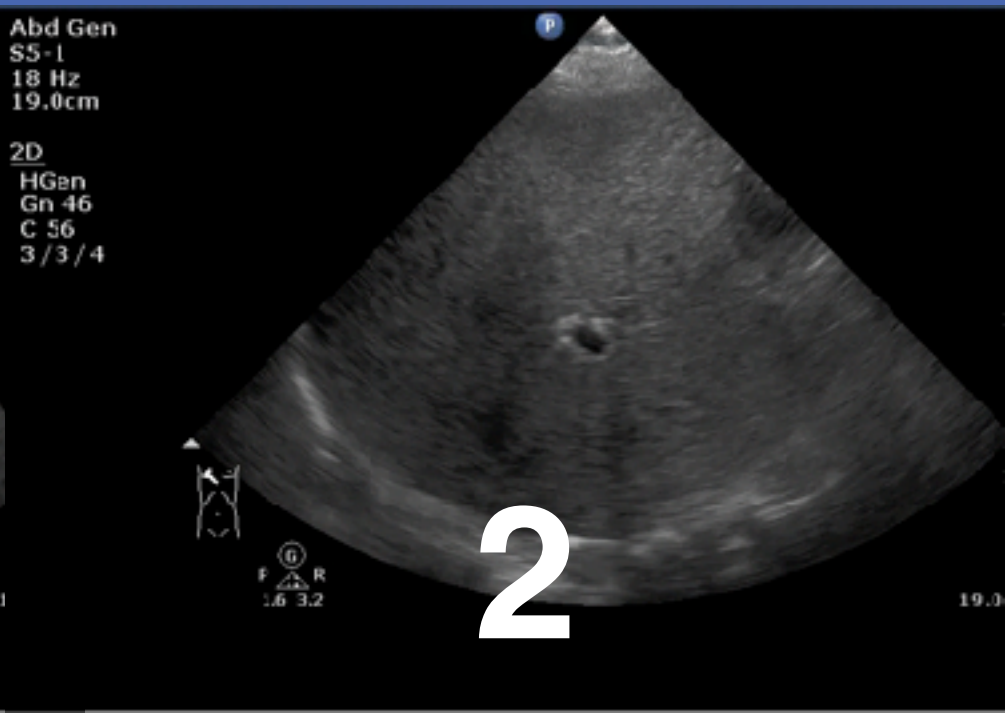
POCUS常用探頭

弧　　線　　扇

ULTRASOUND
PROGRAM

Which one is better ?





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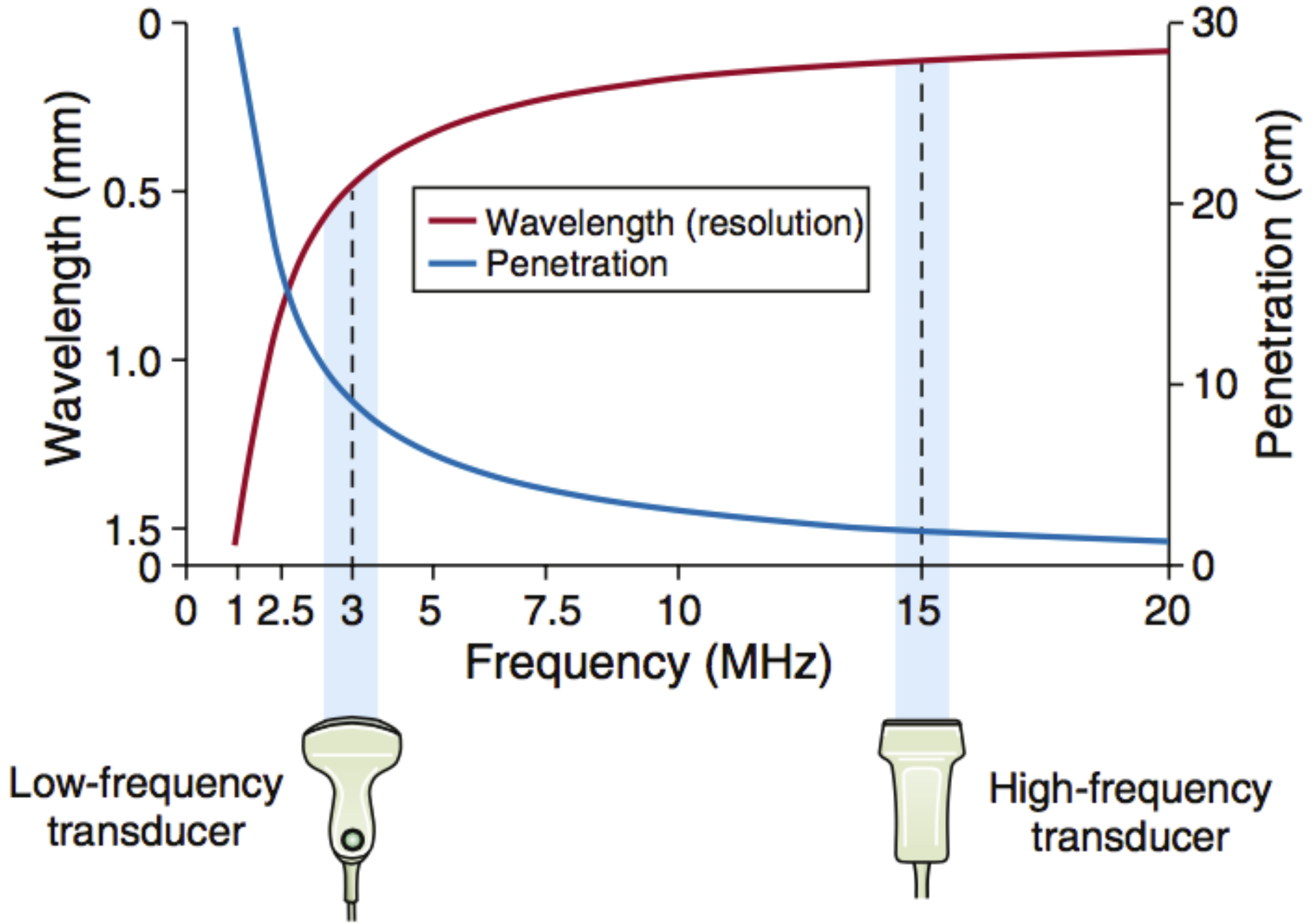
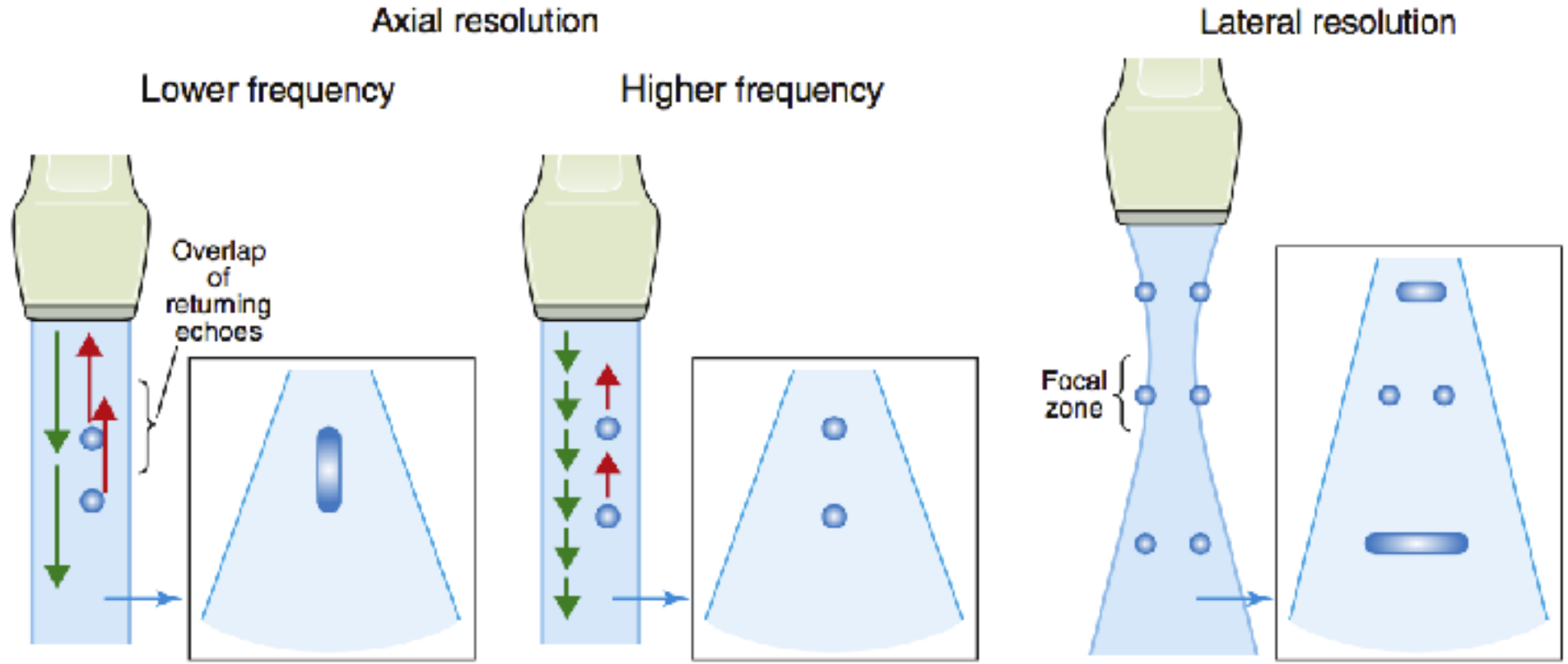
POCUS常用探頭

表面　　頻率　　深度


Wavelength (mm)
0
0.5
1.0
1.5
Penetration (cm)
30
20
10
0
Wavelength (resolution)
Penetration
0 1 2.5 3 5 7.5 10 15 20
Frequency (MHz)
Low-frequency transducer
High-frequency transducer

影像優化3大重點

置中　對焦　高頻



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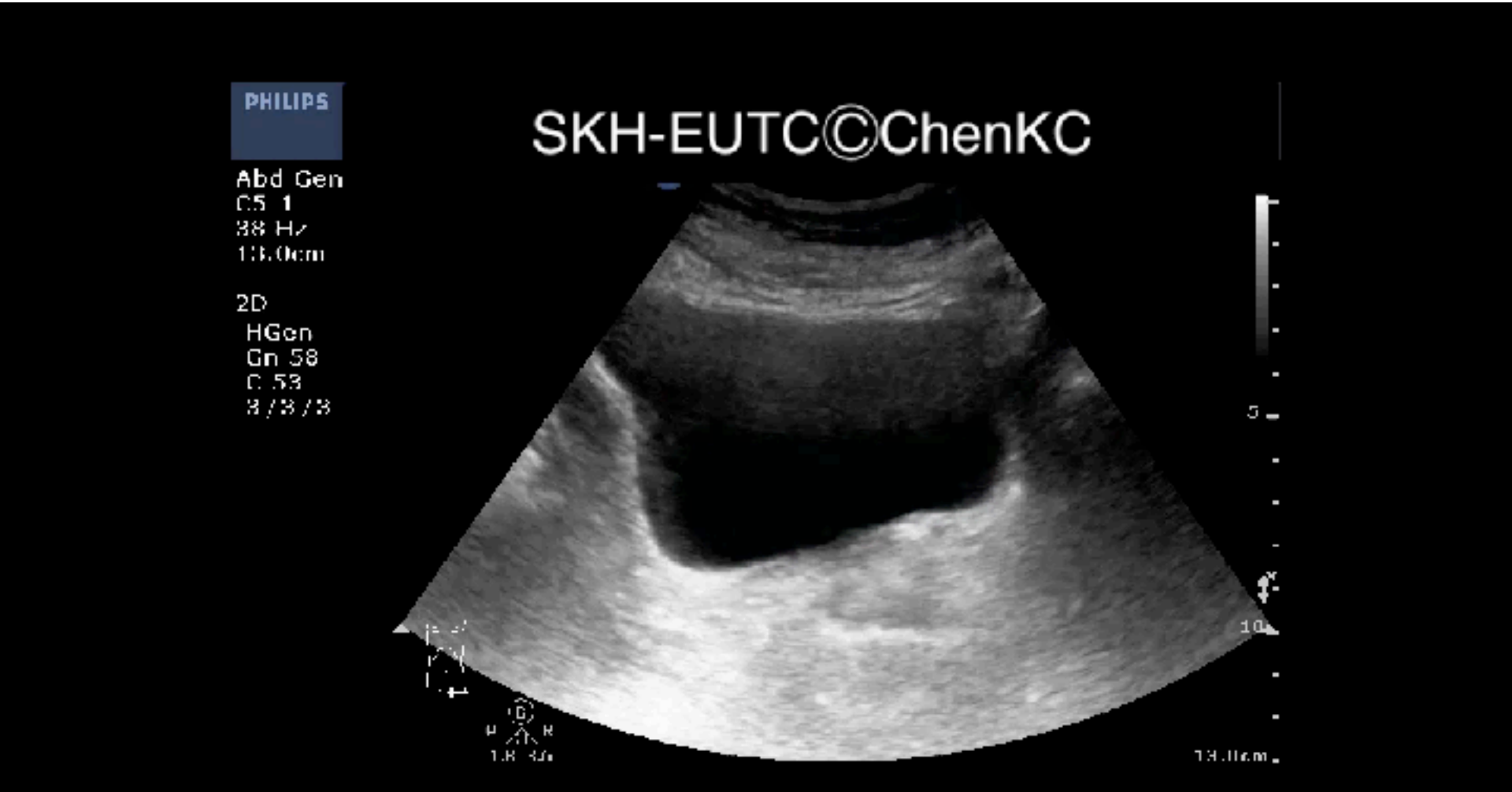
Operational skills ?



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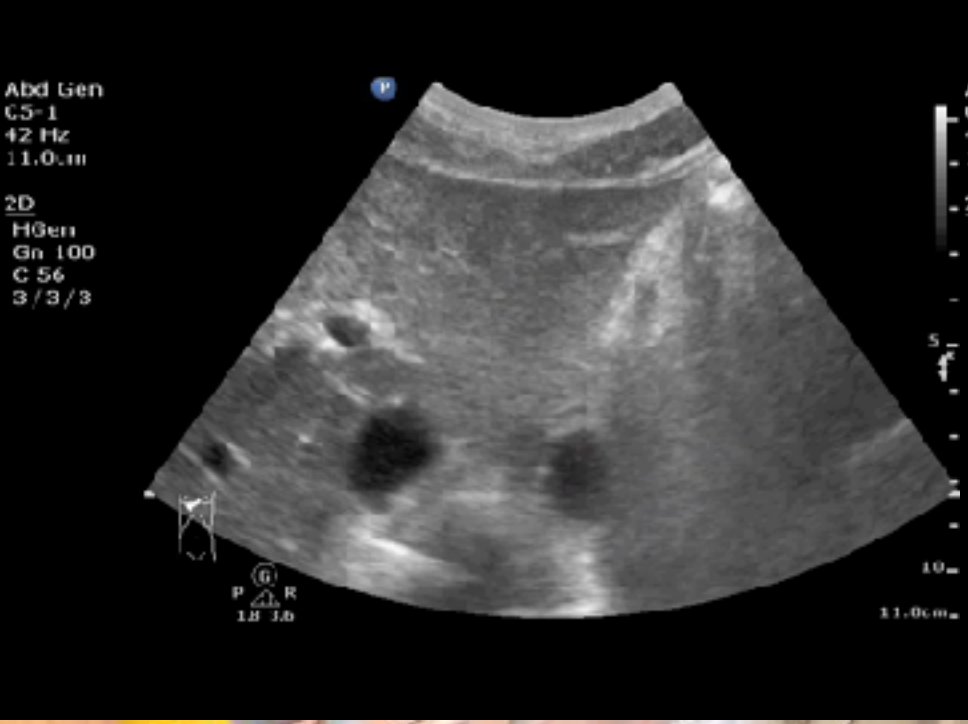
POCUS常用探頭

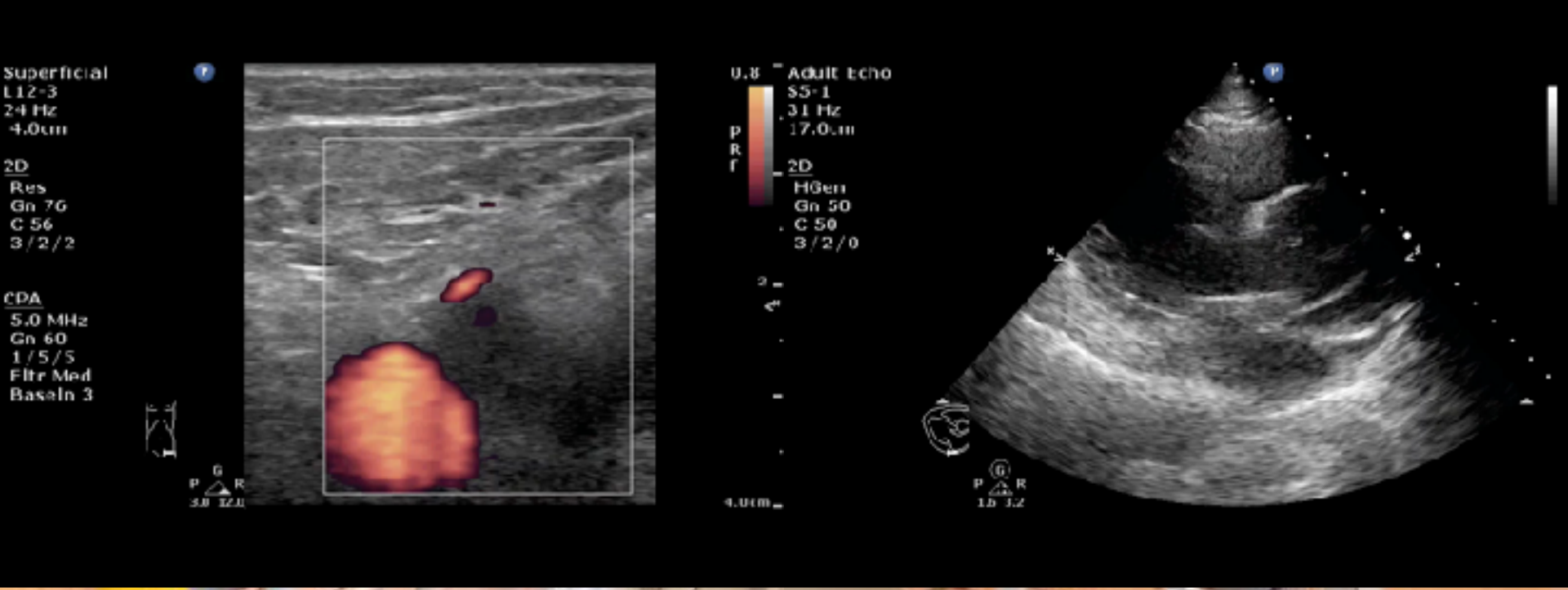
目標　　介面　　視窗


Abd Gen
C5-1
42 Hz
11.0cm
2D
HGen
Gn 100
C 56
3/3/3
11.0cm


Abd Gen
C5-1
42 Hz
11.0cm
2D
HGen
Gn 100
C 56
3/3/3
11.0cm


S5-1
PHILIPS
L12-3


C5-1
PHILIPS


Superficial
L12-3
24 Hz
4.0cm
2D
Res
Gn 76
C 56
3/2/2
CDA
5.0 MHz
Gn 60
1/5/5
Filtr Med
Baseln 3
Adult Echo
S5-1
31 Hz
17.0cm
2D
HGen
Gn 50
C 50
3/2/0


S5-1
PHILIPS
L12-3

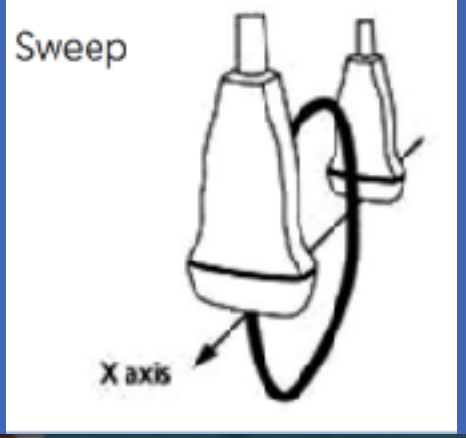

C5-1
PHILIPS

ULTRASOUND
PROGRAM

操控 6 大技巧

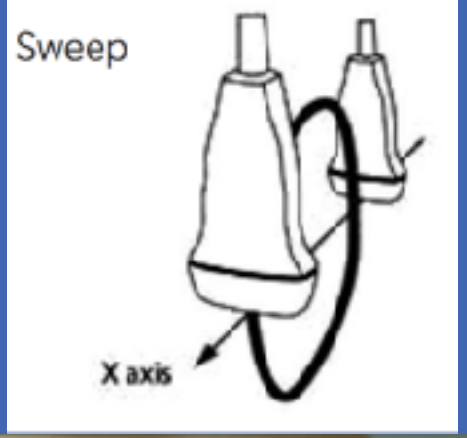
X	Y	Z
Sweep	Slide	Rotate
Fan/ Tilt	Rock	Compress

Sweep X



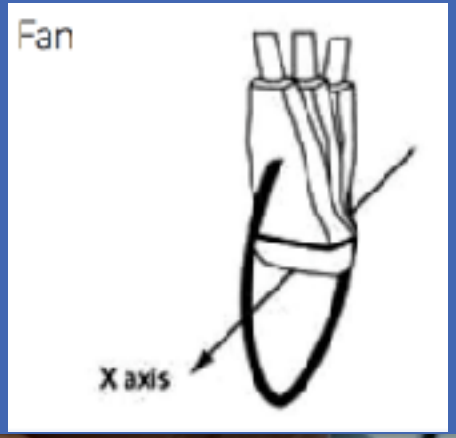
Bahner DP, et al. J Ultrasound Med 2016

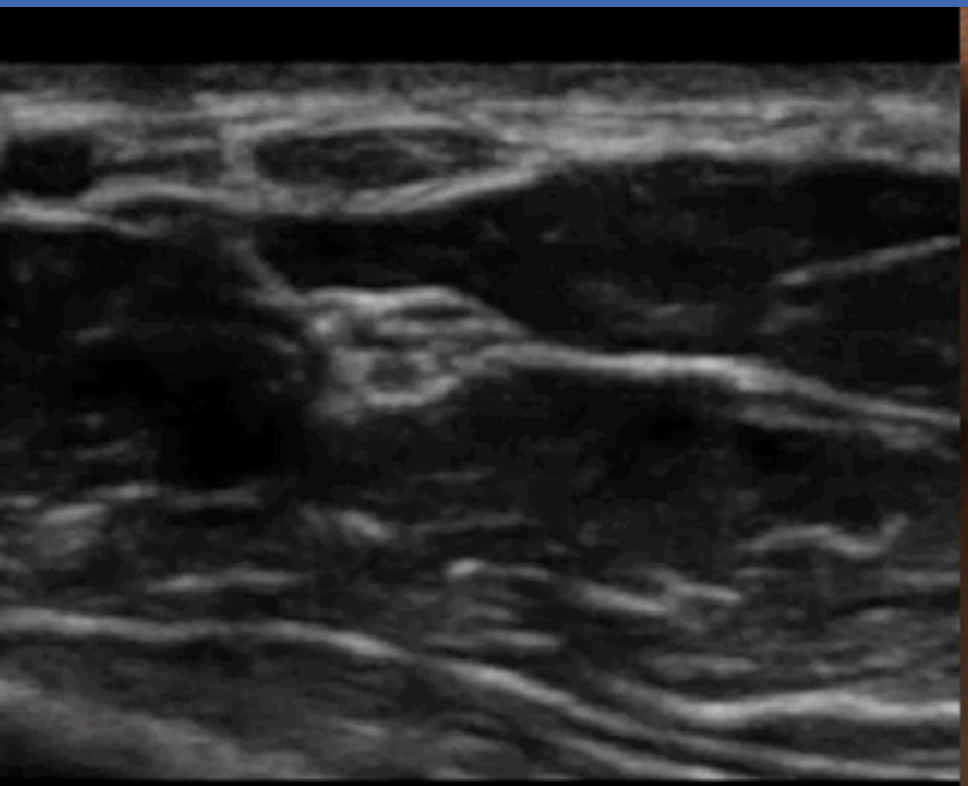
Sweep X

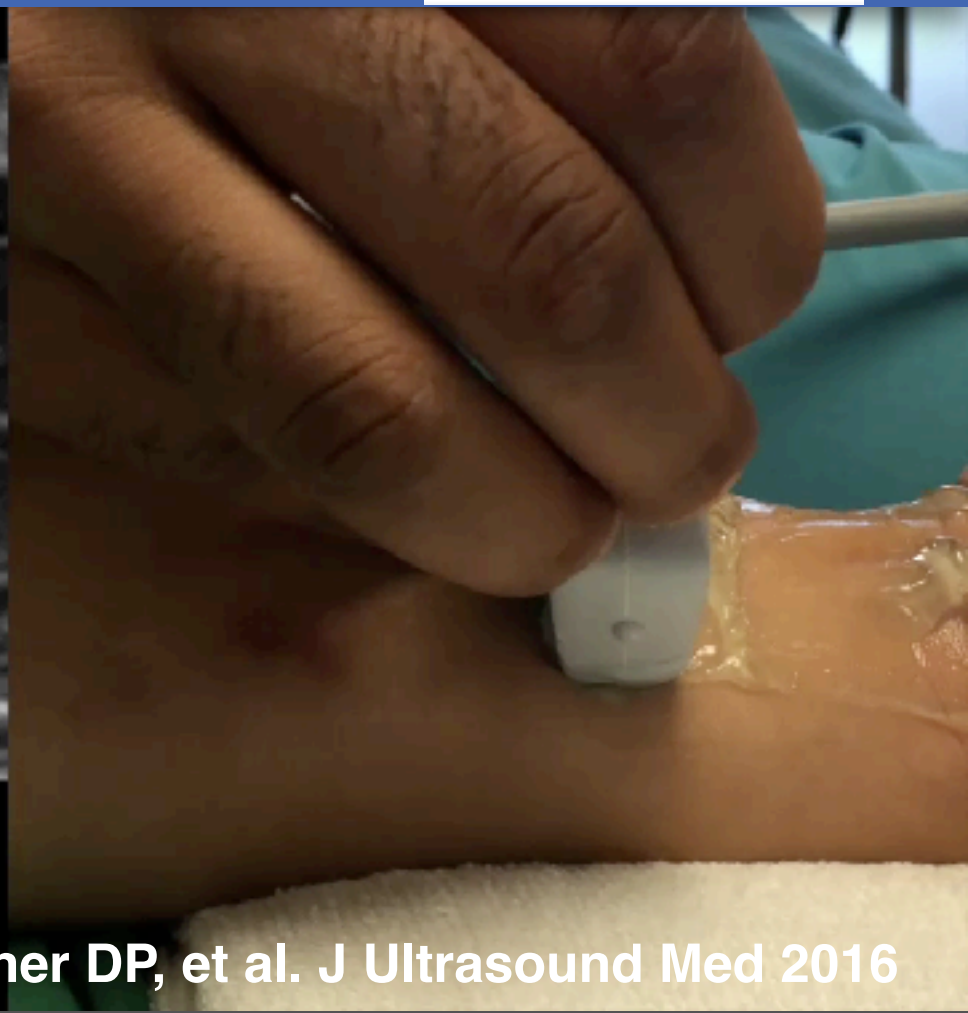


Bahner DP, et al. J Ultrasound Med 2016

Fan/Tilt X

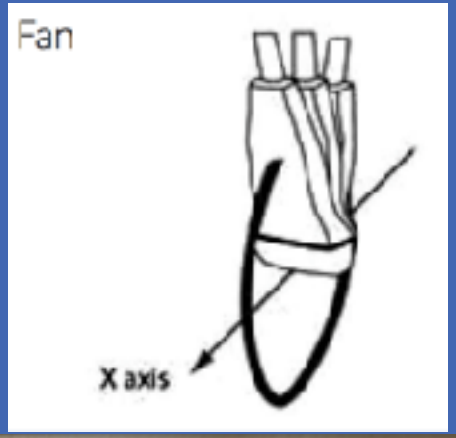






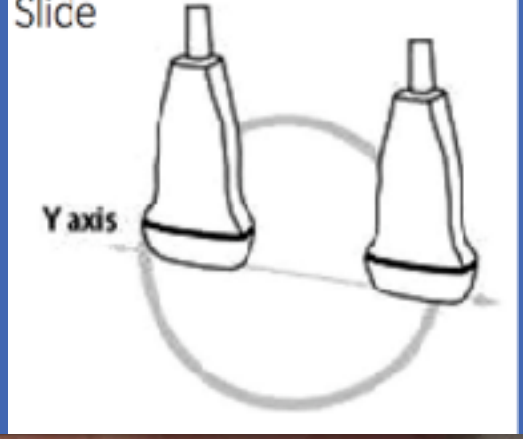
Bahner DP, et al. J Ultrasound Med 2016

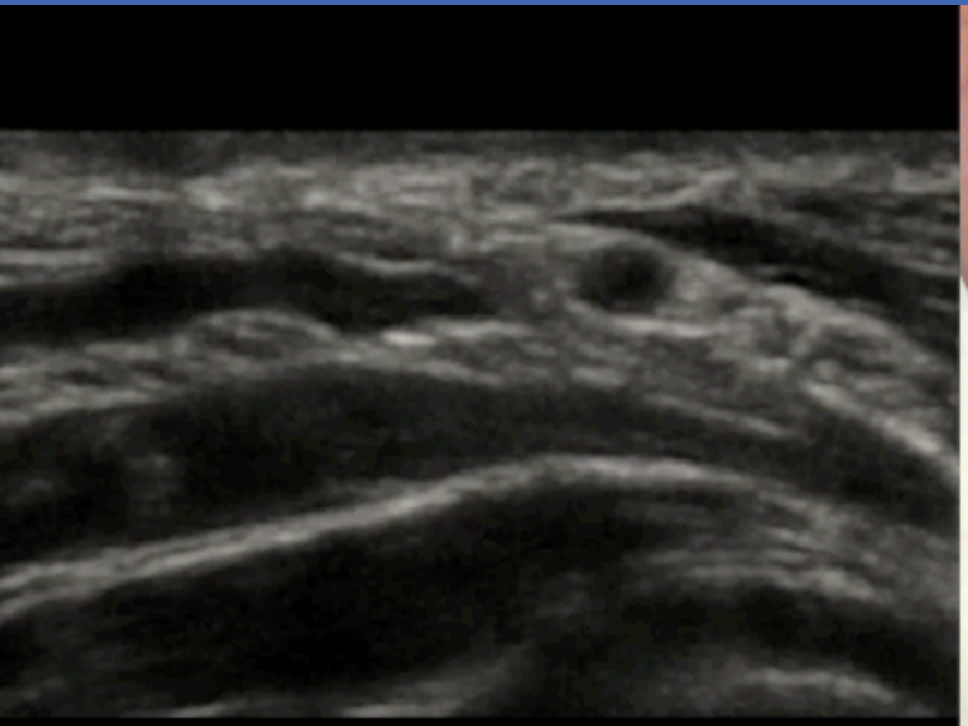
Fan/Tilt X



Bahner DP, et al. J Ultrasound Med 2016

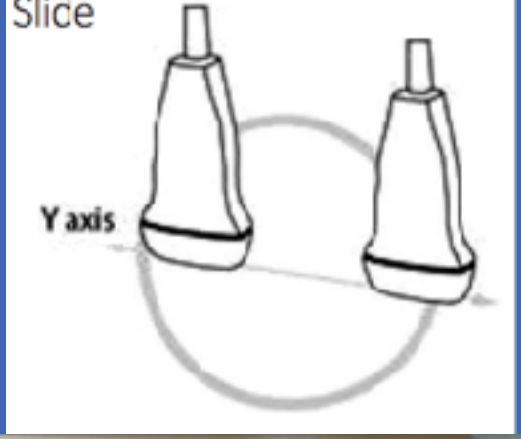
Slide Y





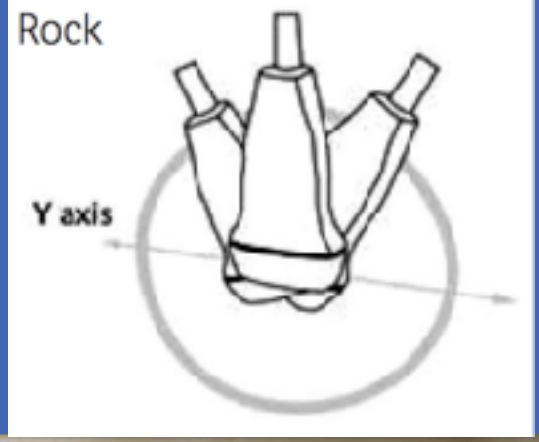
Bahner DP, et al. J Ultrasound Med 2016

Slide Y



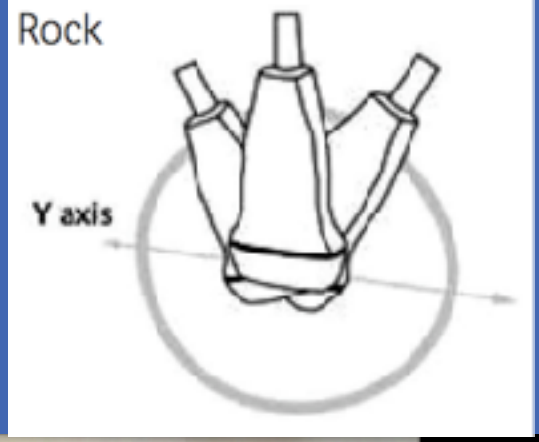
Bahner DP, et al. J Ultrasound Med 2016

Rock Y



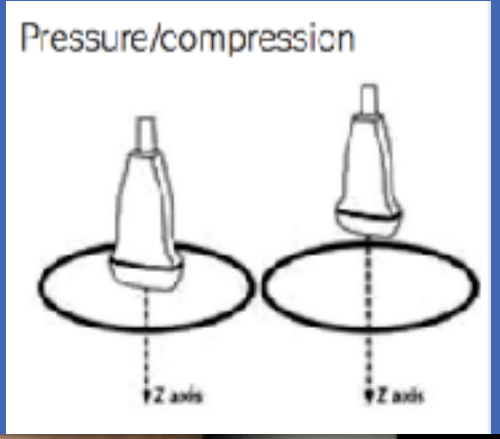
Bahner DP, et al. J Ultrasound Med 2016

Rock Y



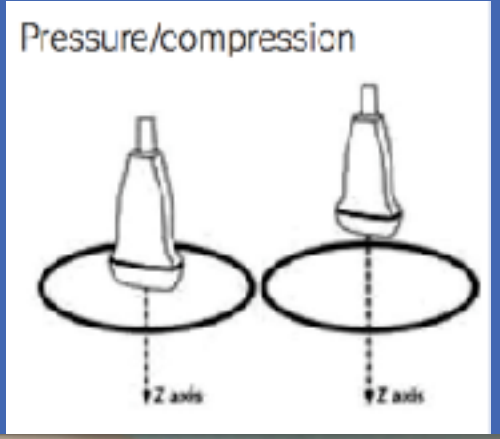
Bahner DP, et al. J Ultrasound Med 2016

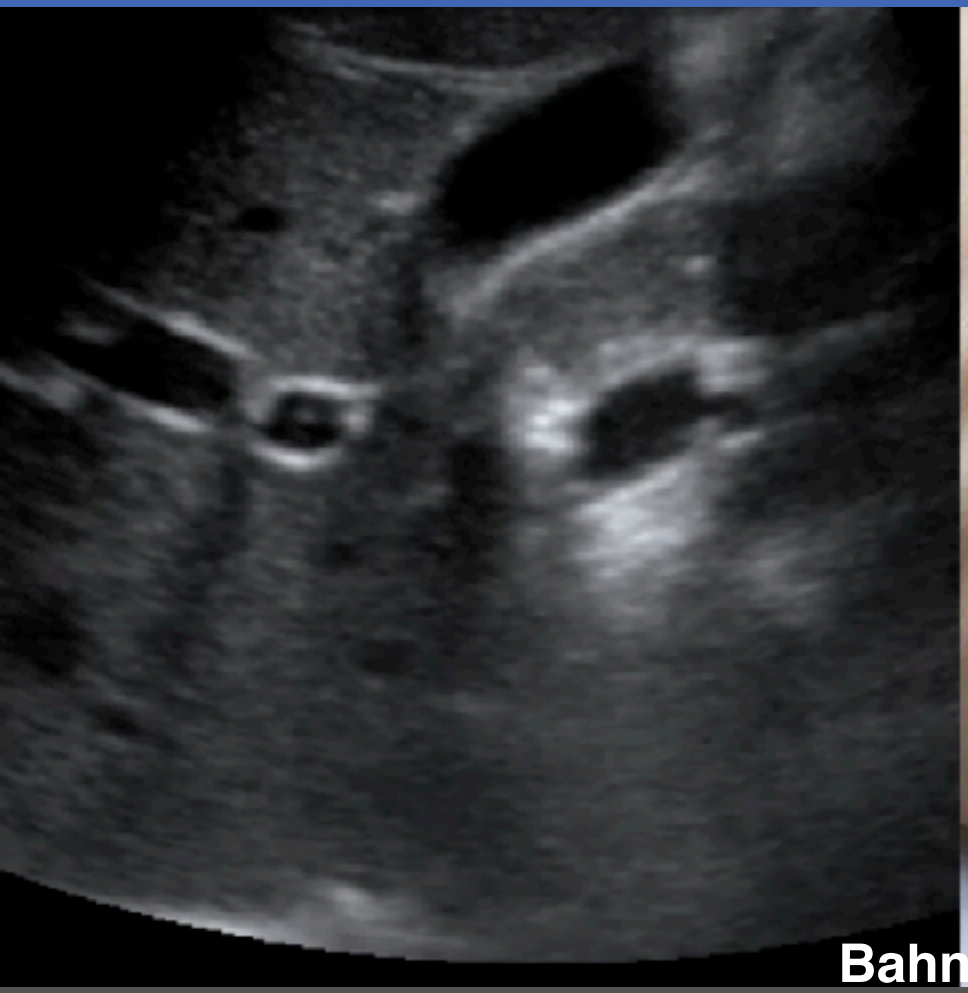
Compress Z



Bahner DP, et al. J Ultrasound Med 2016

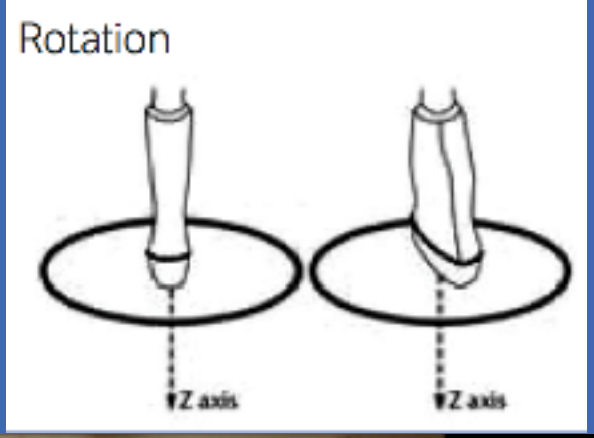
Compress Z

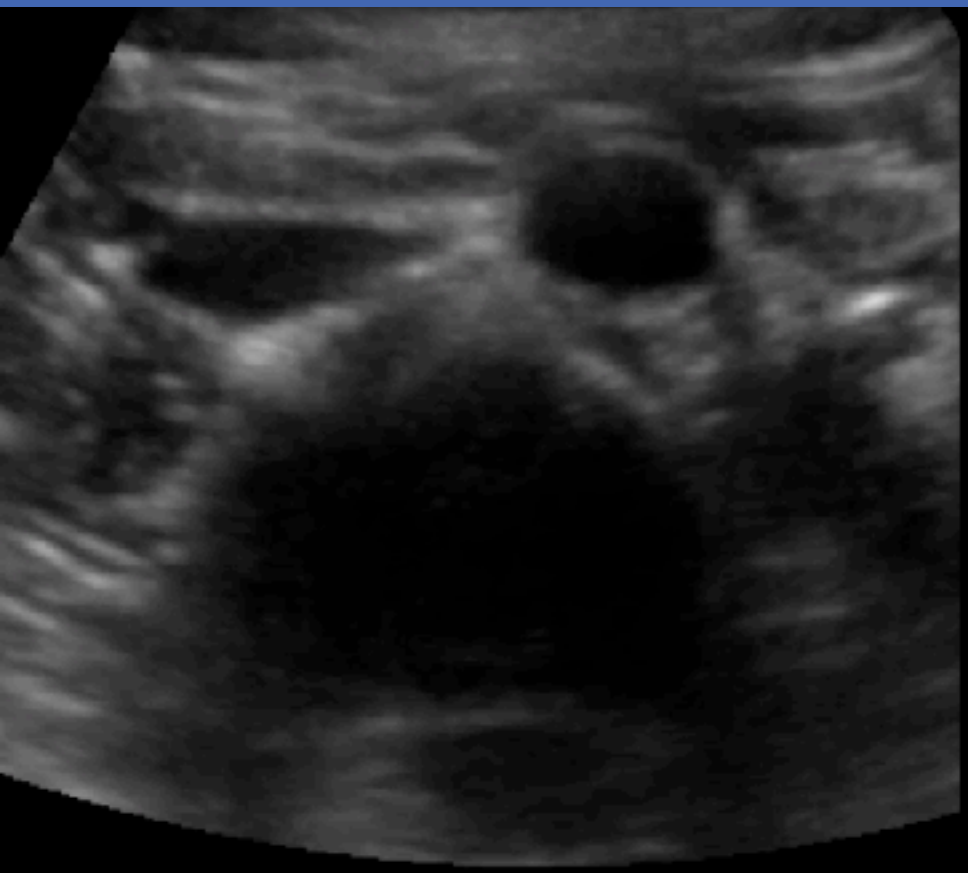




Bahner DP, et al. J Ultrasound Med 2016

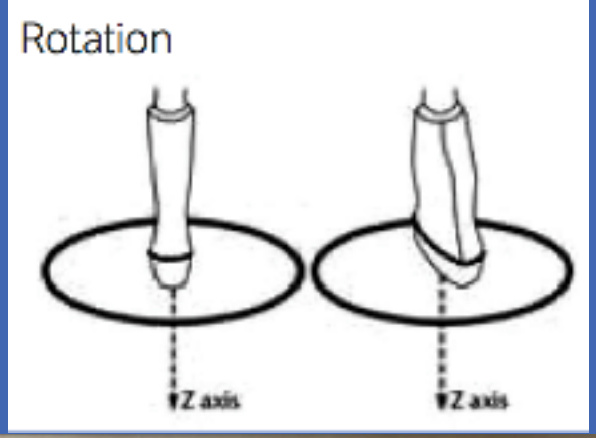
Rotate Z





Bahner DP, et al. J Ultrasound Med 2016

Rotate Z



Bahner DP, et al. J Ultrasound Med 2016

ULTRASOUND
PROGRAM

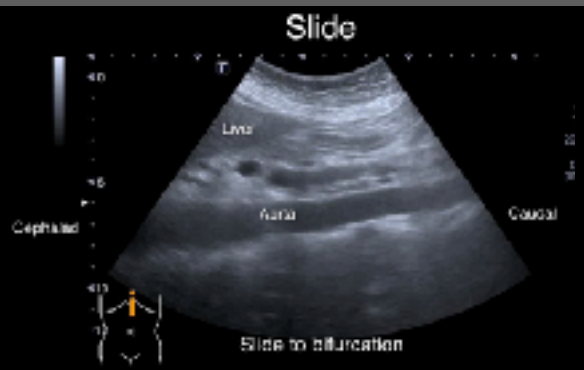
操控 6 大技巧

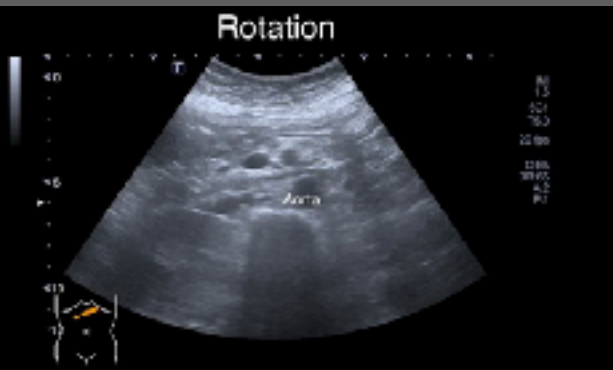
X	Y	Z
Sweep 掃	Slide 滑	Rotate 轉
Fan/Tilt 傾	Rock 搖	Compress 壓

實作 & 團隊

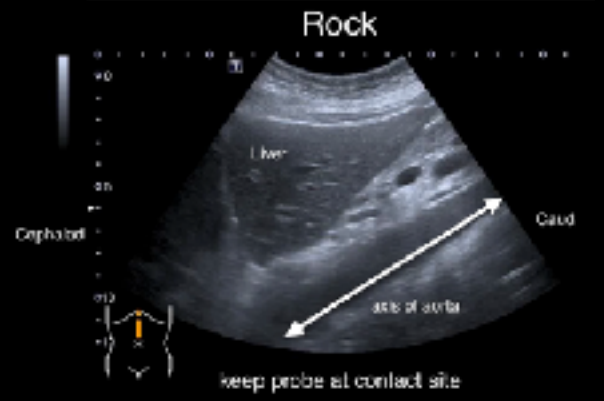
X Y Z


Sweep
Aorta


Slide
Liver
Aorta
Cephalad
Caudal
Slide to bifurcation


Rotation
Aorta

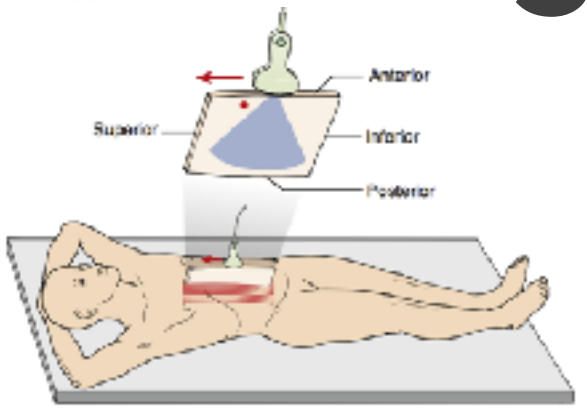

Fan
Liver
Aorta
Caudal
keep probe at contact site

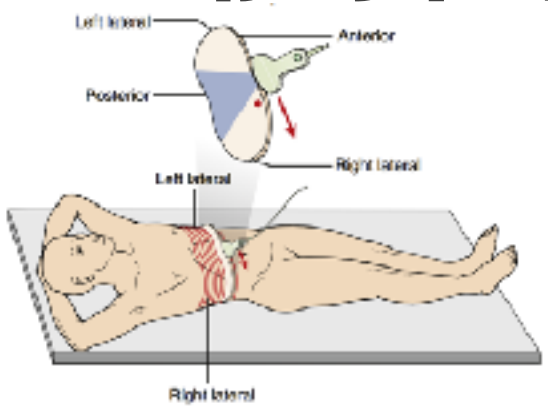

Rock
Liver
Cephalad
Caud
axis of aorta
keep probe at contact site

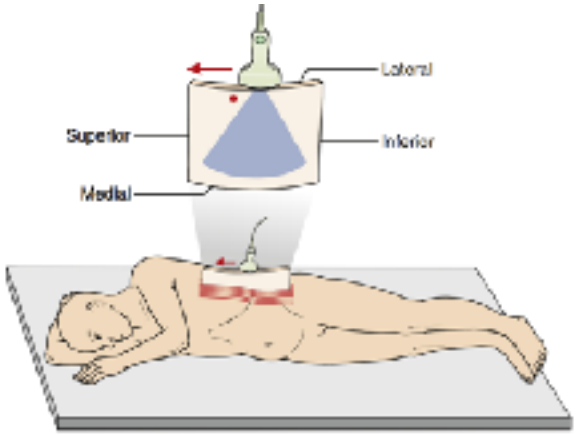

Compression
Aorta

ULTRASOUND
PROGRAM

3D 立體掃描



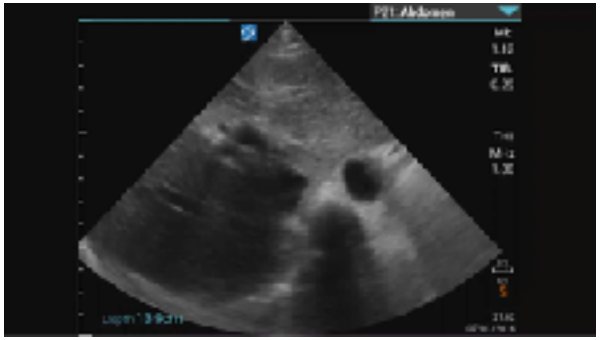


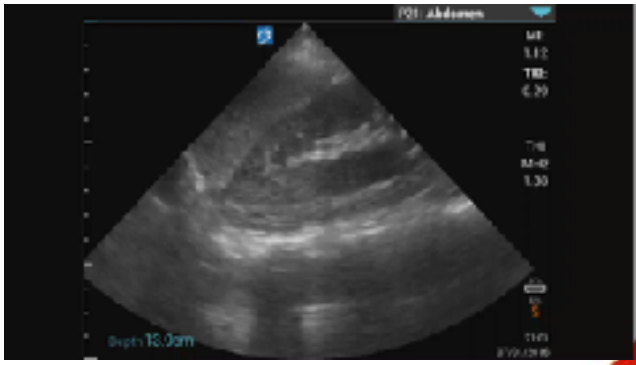


Sagittal 縱

Transverse 橫

Coronal 側

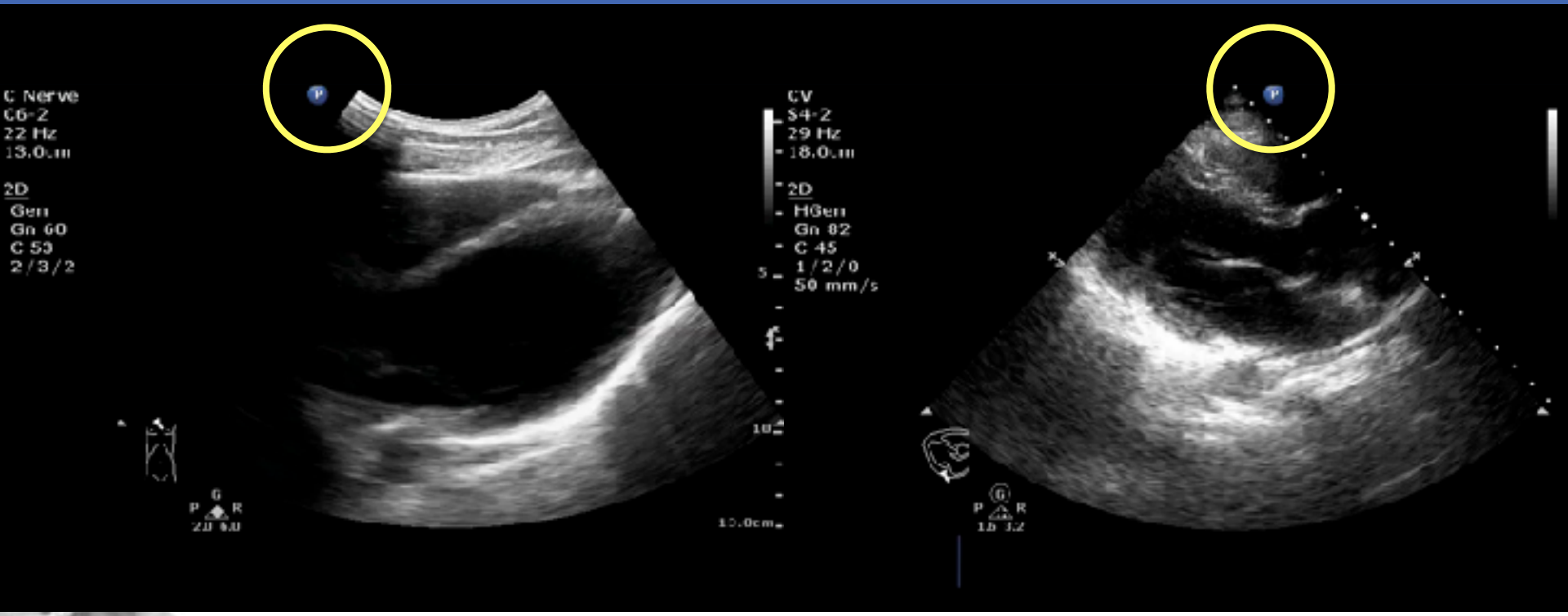




Indicator to right & head

ULTRASOUND
PROGRAM

General v.s. Cardiac



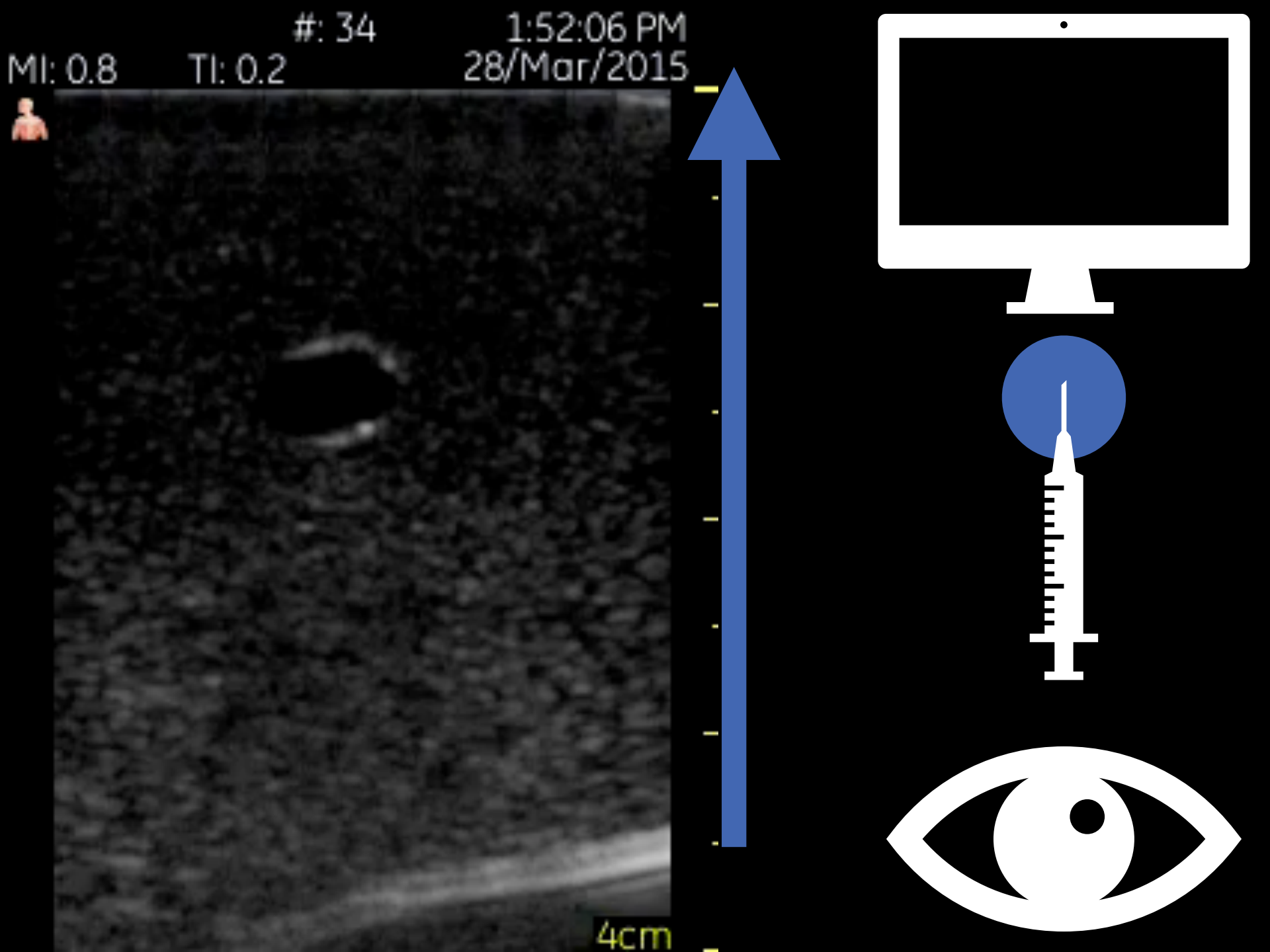
ULTRASOUND
PROGRAM

用針的藝術

Procedures

Success rates ↑

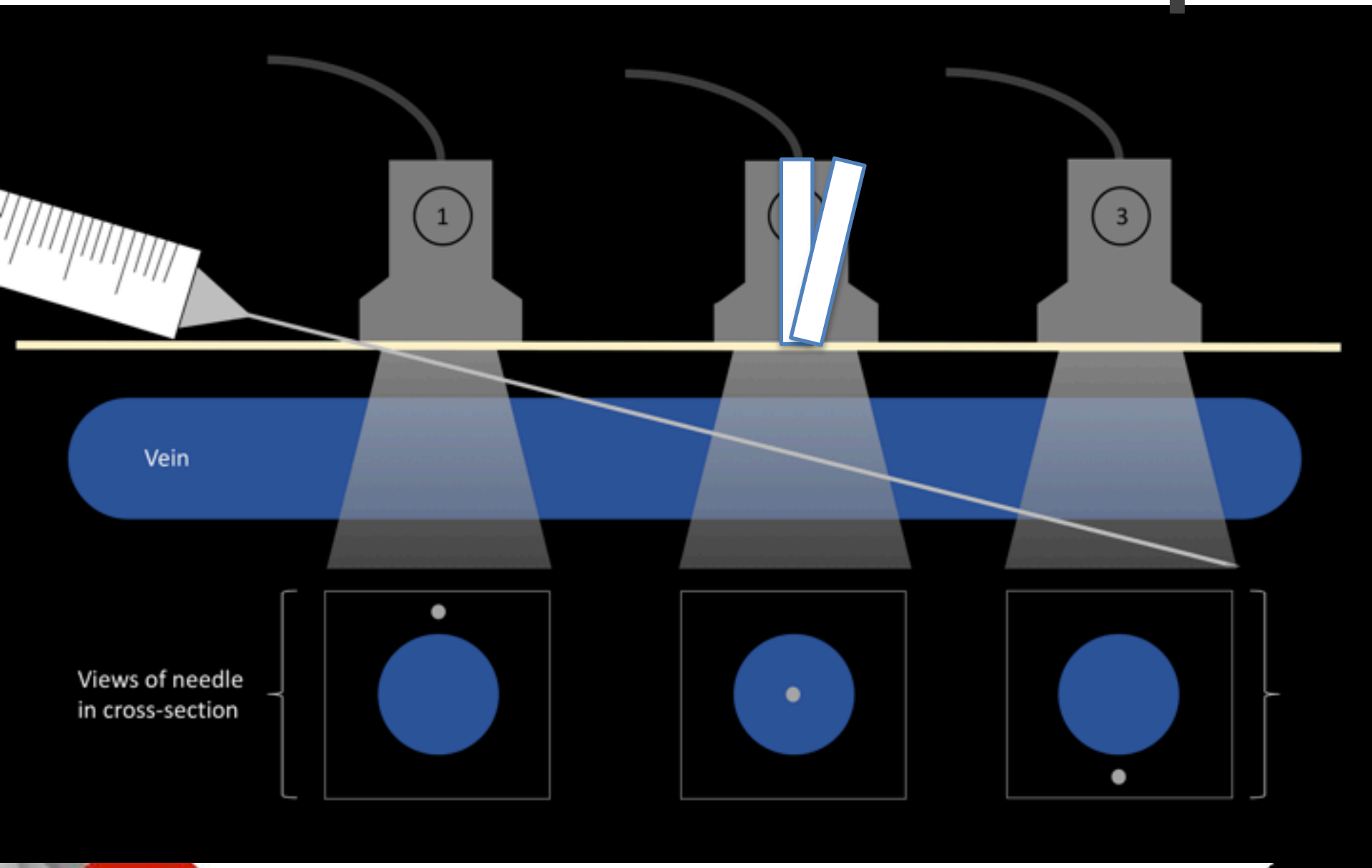
Mechanical complications ↓


#: 34
1:52:06 PM
MI: 0.8
TI: 0.2
28/Mar/2015
4cm


Off-plane
Trace the tip

ULTRASOUND PROGRAM

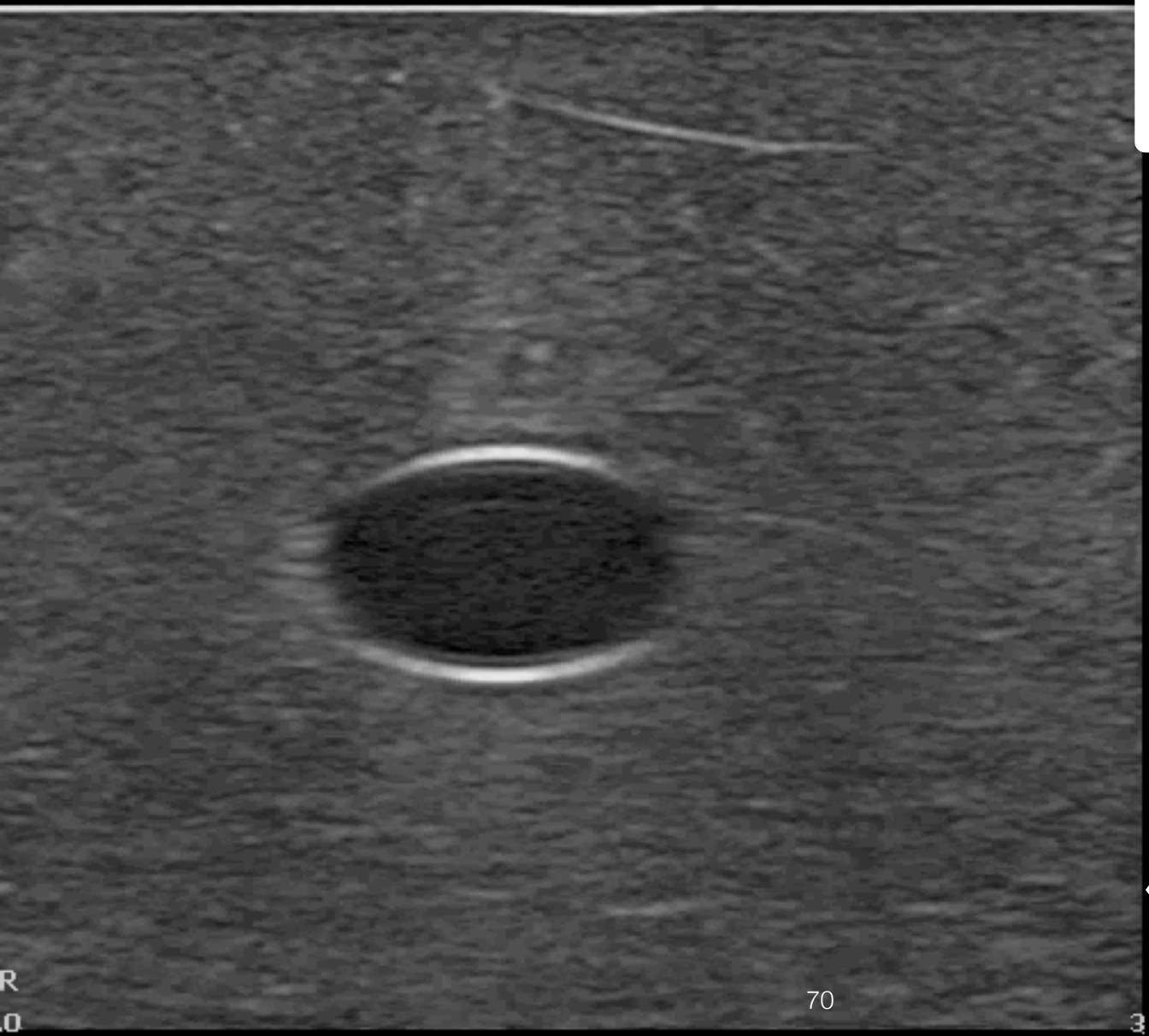
How to trace the tip ?

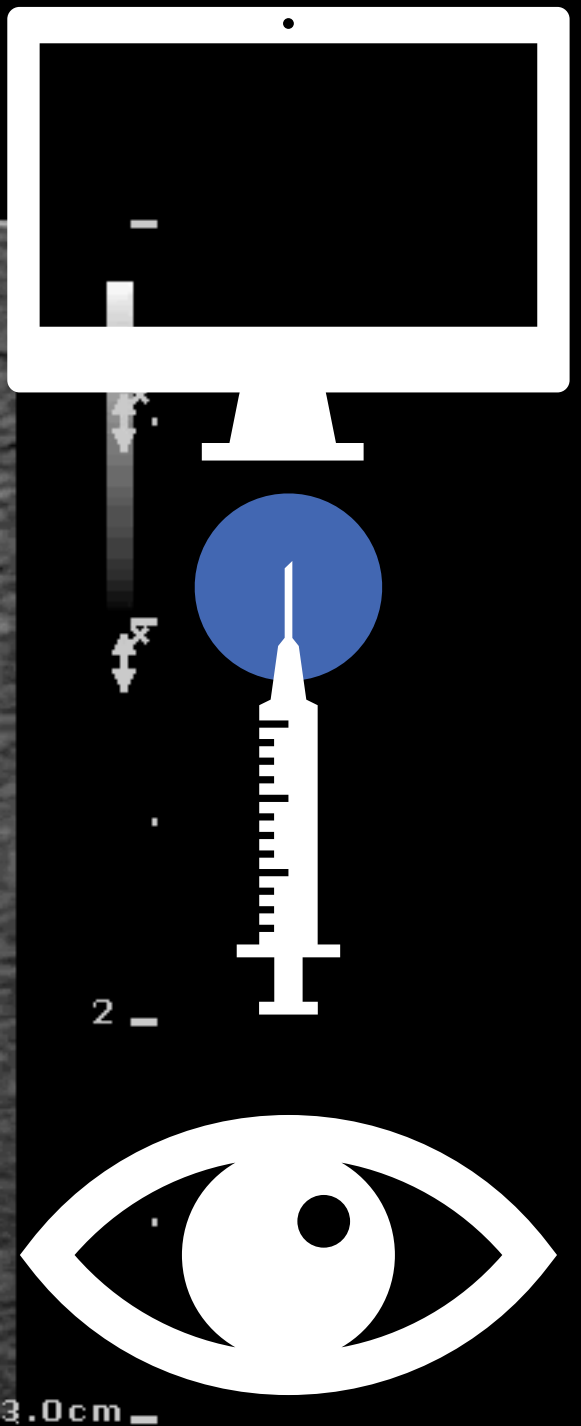


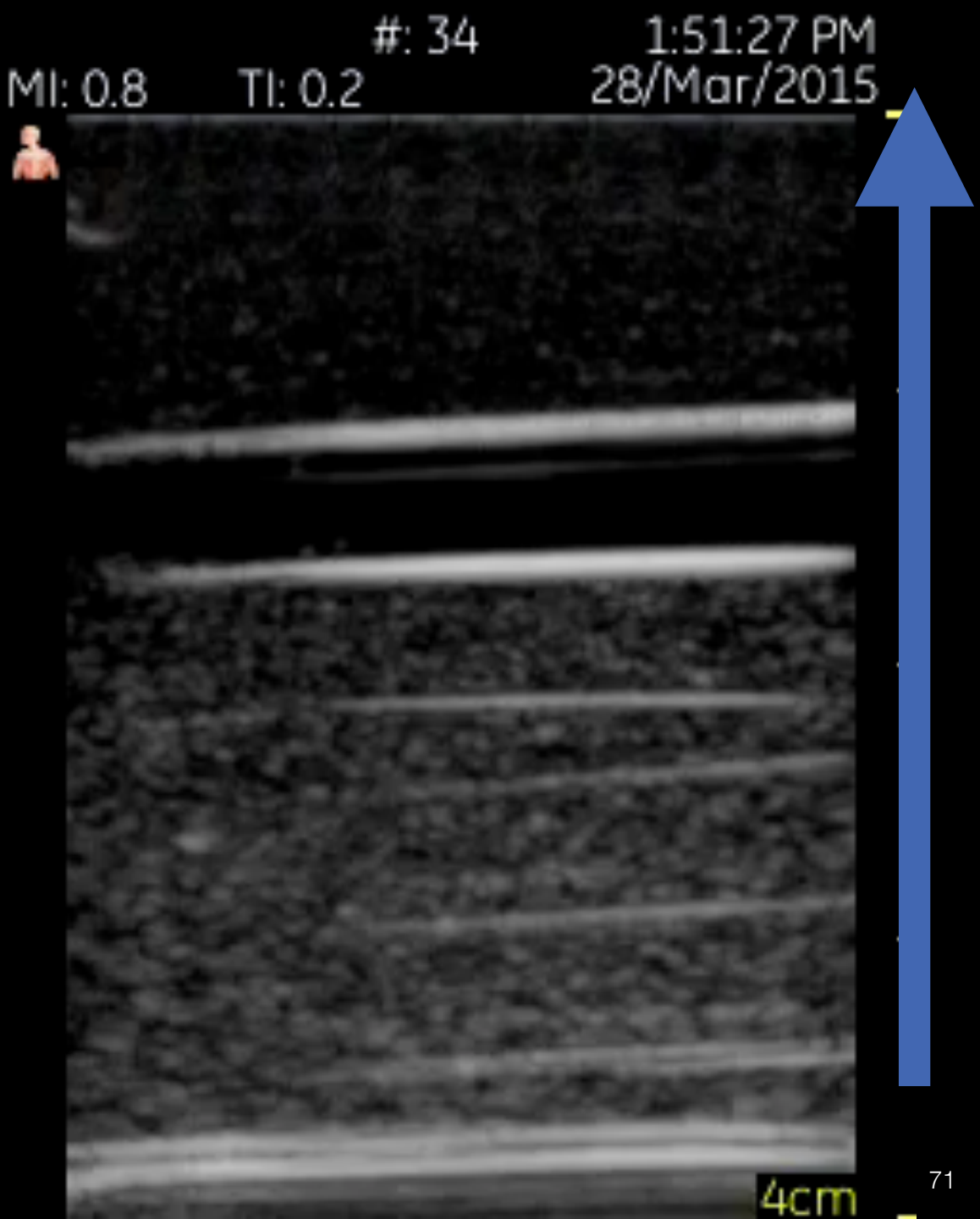
ULTRASOUND
PROGRAM

Tilt to trace the tip

Tilt & Sweep



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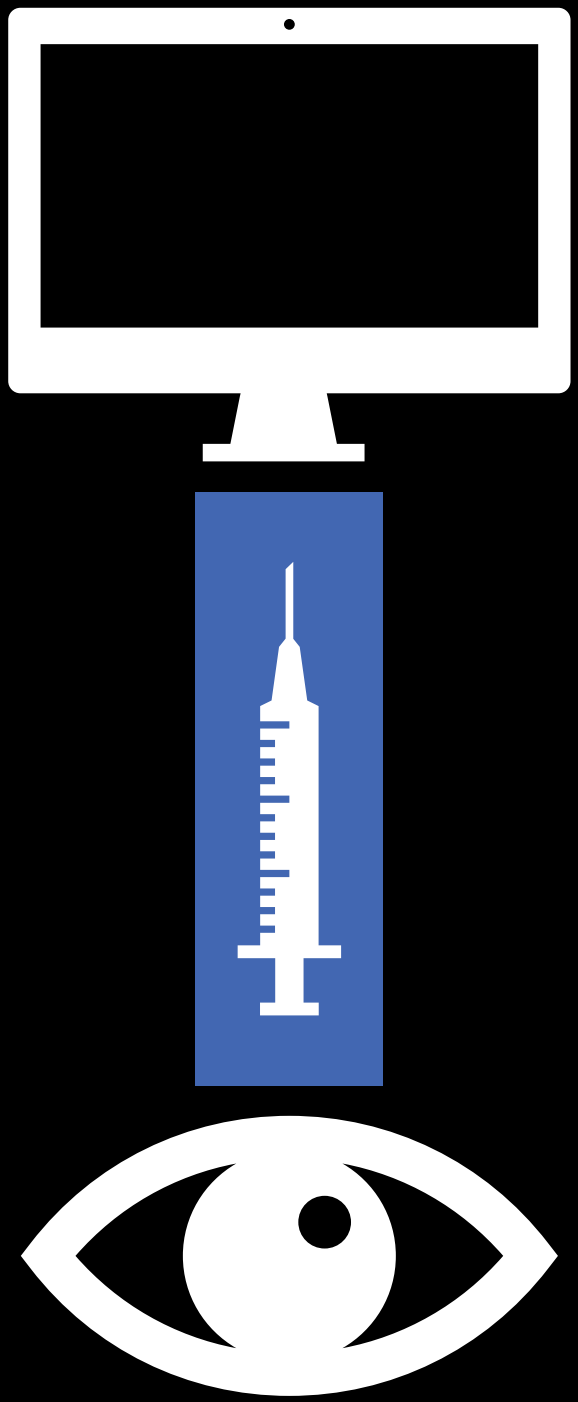
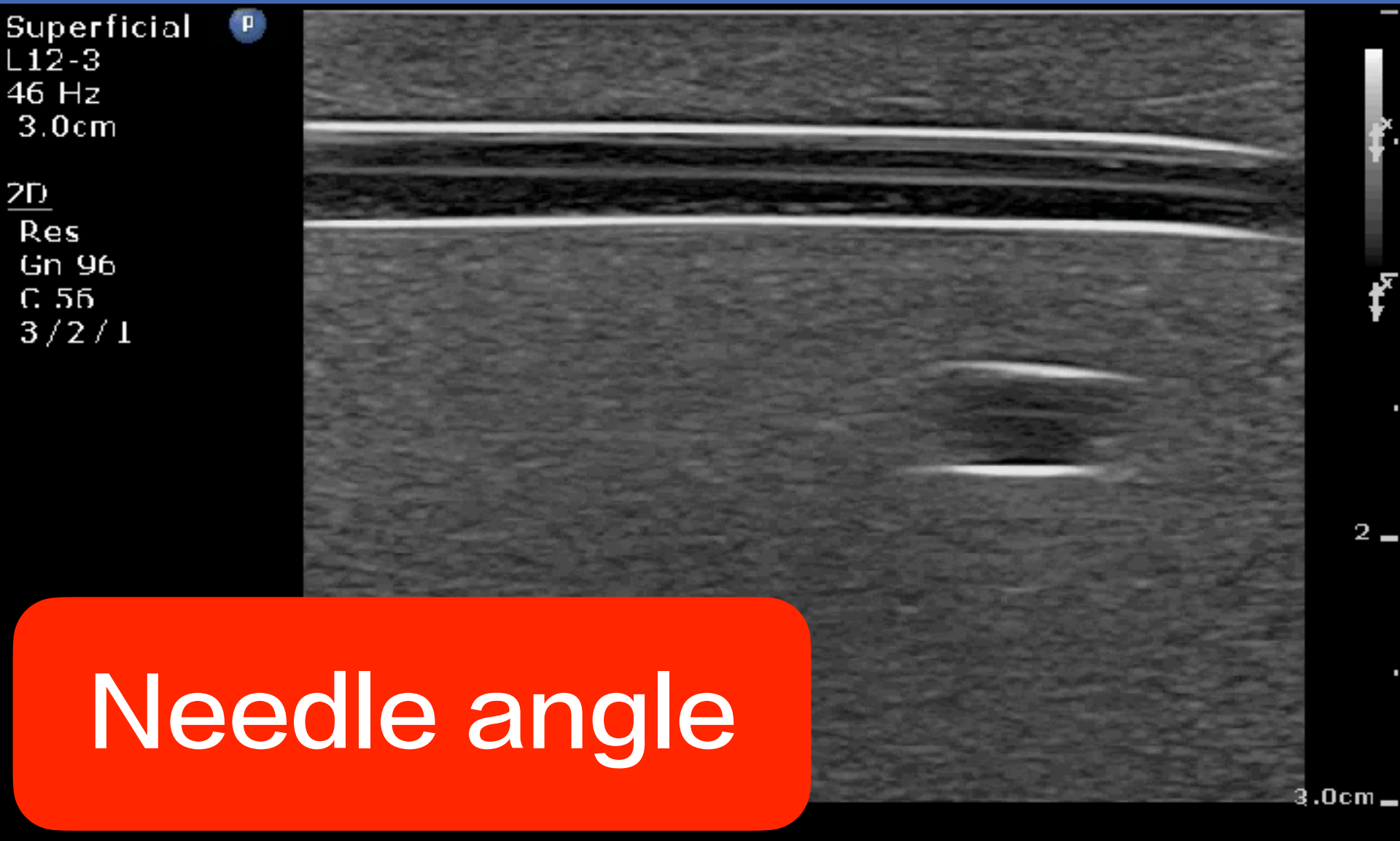
1:51:27 PM
MI: 0.8
TI: 0.2
28/Mar/2015
4cm



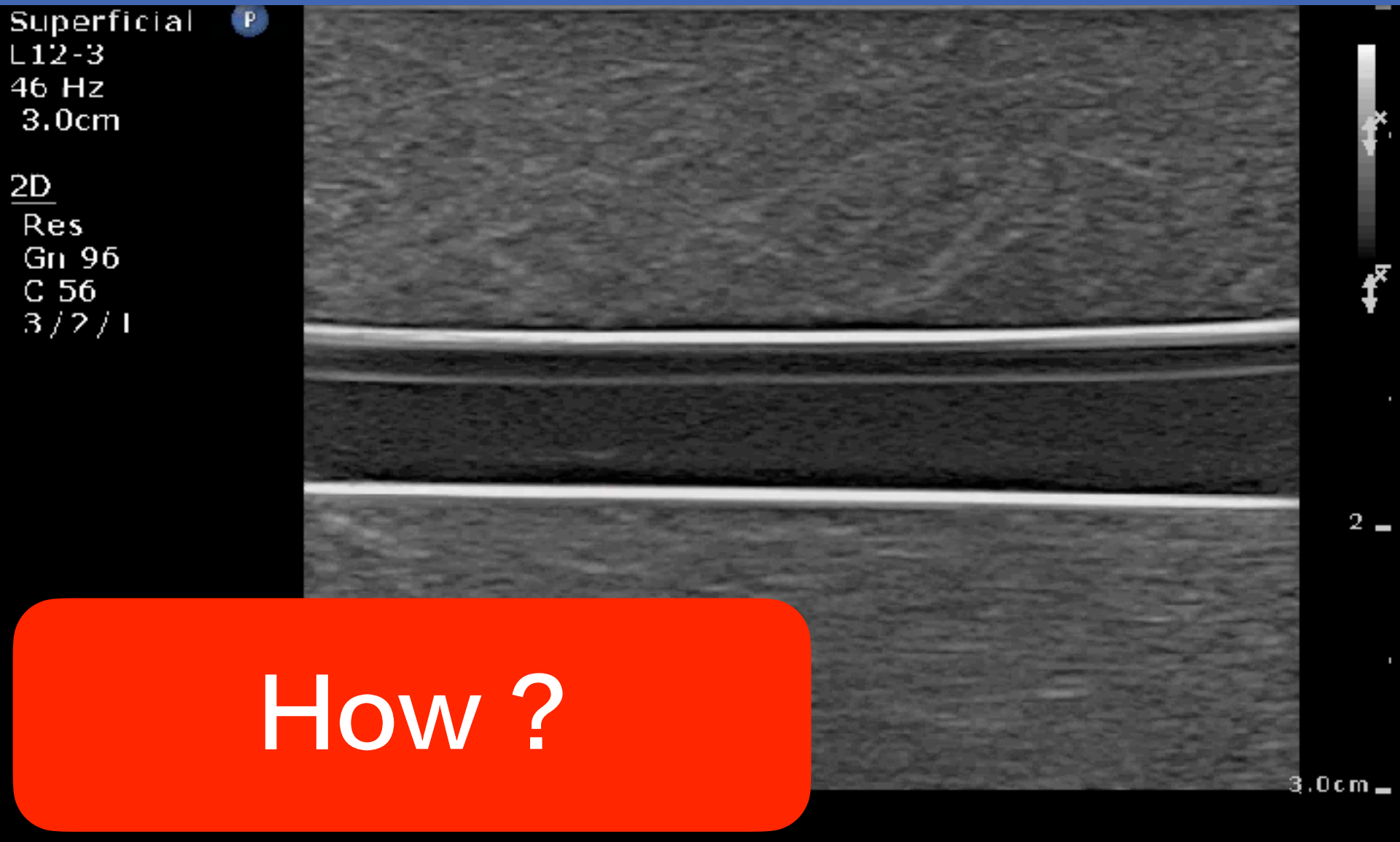

In-plane
See the needle shaft

Needle optimisation



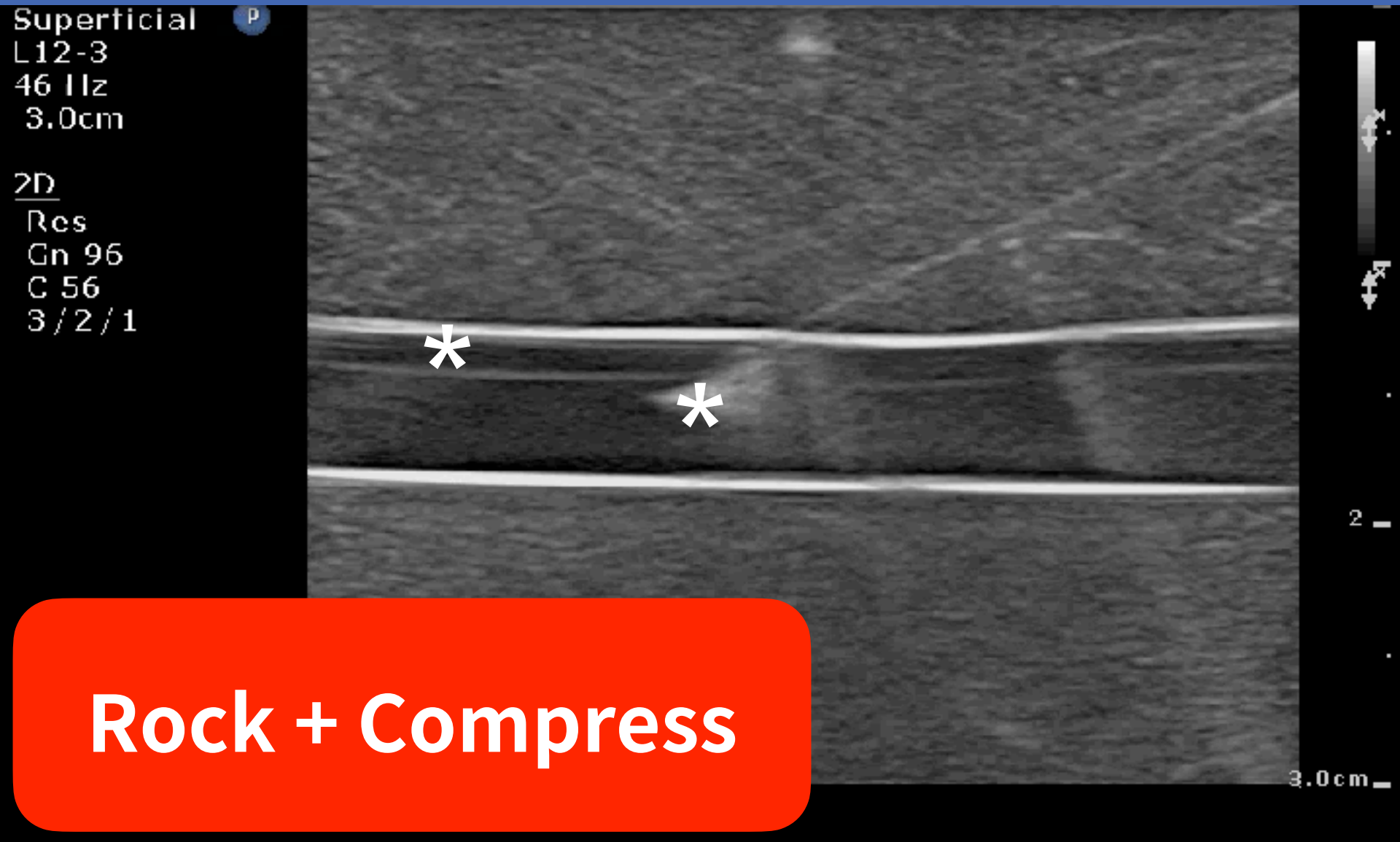
Needle angle

Needle optimisation



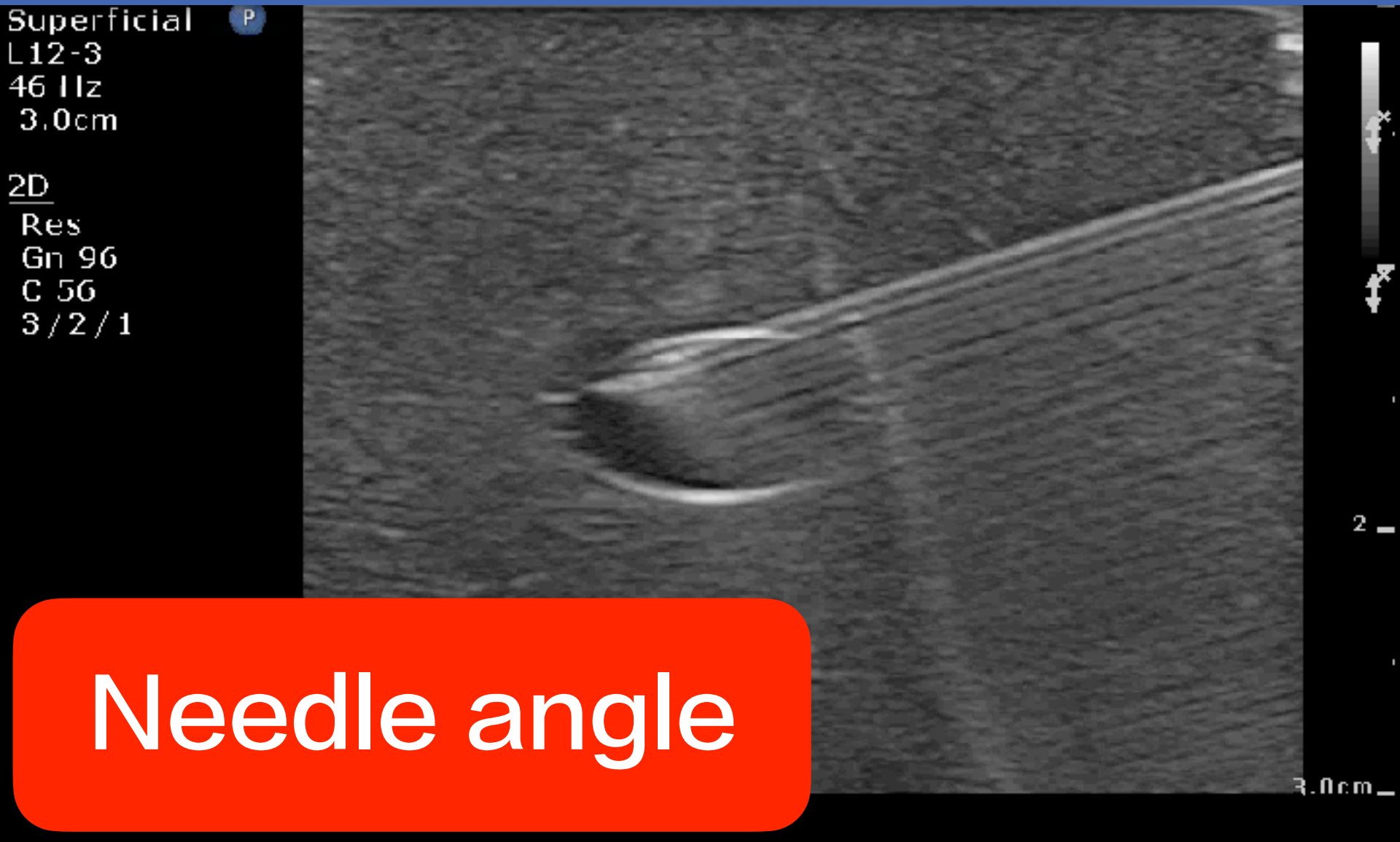
How ?

Needle optimisation



Rock + Compress

Needle optimisation



Needle angle

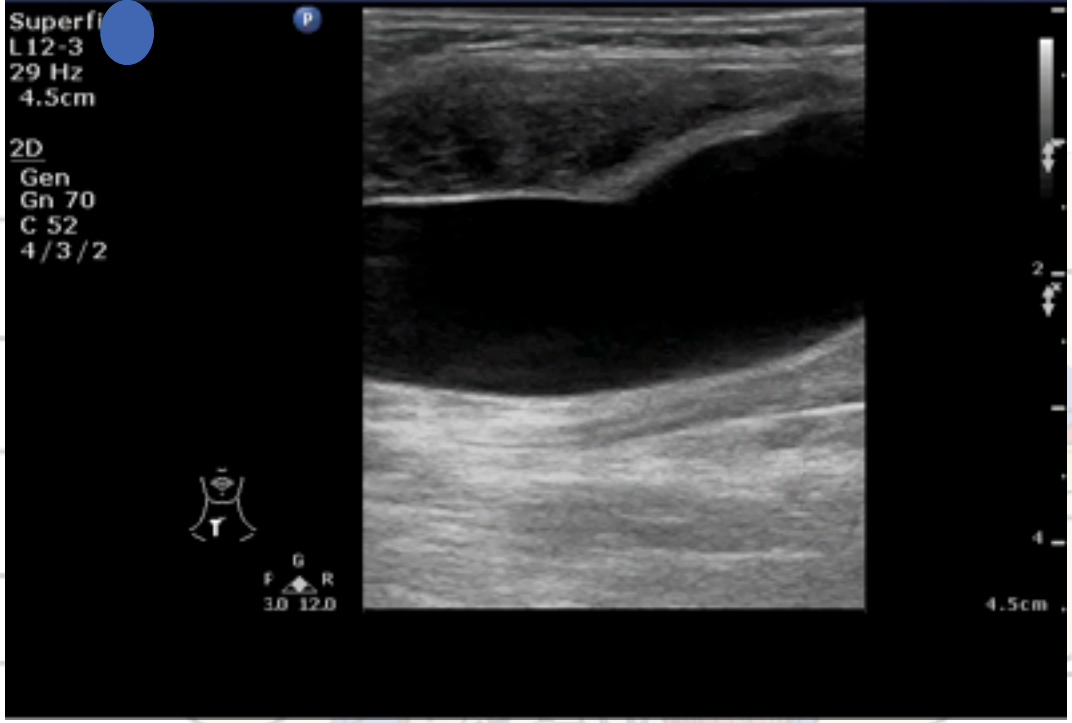

PHILIPS

ULTRASOUND
PROGRAM

ULTRASOUND
PROGRAM

常規

L
R
Arch of aorta
vein
Brachiocephalic
vein
Left subclavian
artery
Left subclavian
Trachea
Thyroid
veins
Inferior
Middle
Superior
Common
carotid artery
Internal
jugular vein
vena cava
Superior
vein
Right subclavian
artery
Right subclavian
Thyroid gland
Jugular vein
External
muscle
Sternocleidomastoid
Operator



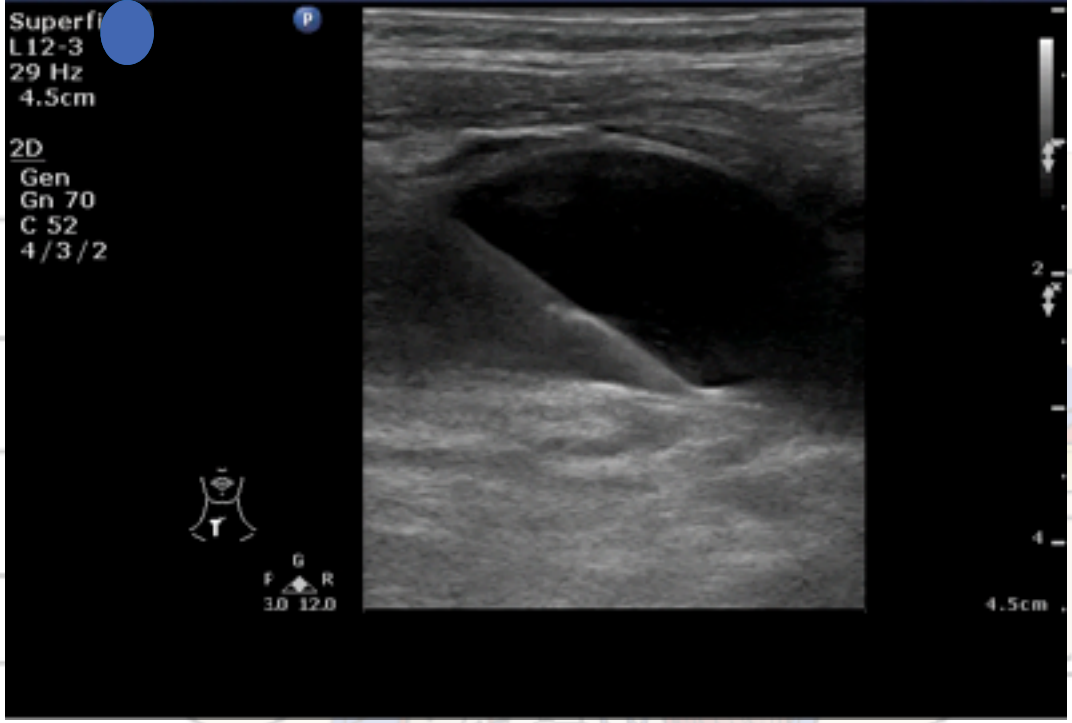
L

R

Arch of aorta
Brachiocephalic vein
Left subclavian vein
Left subclavian artery
Trachea
Thyroid veins
Inferior
Middle
Superior
Common carotid artery
Internal jugular vein
Superior vena cava
Right subclavian vein
Right subclavian artery
Thyroid gland
Jugular vein
External
Sternocleidomastoid muscle

!

Operator



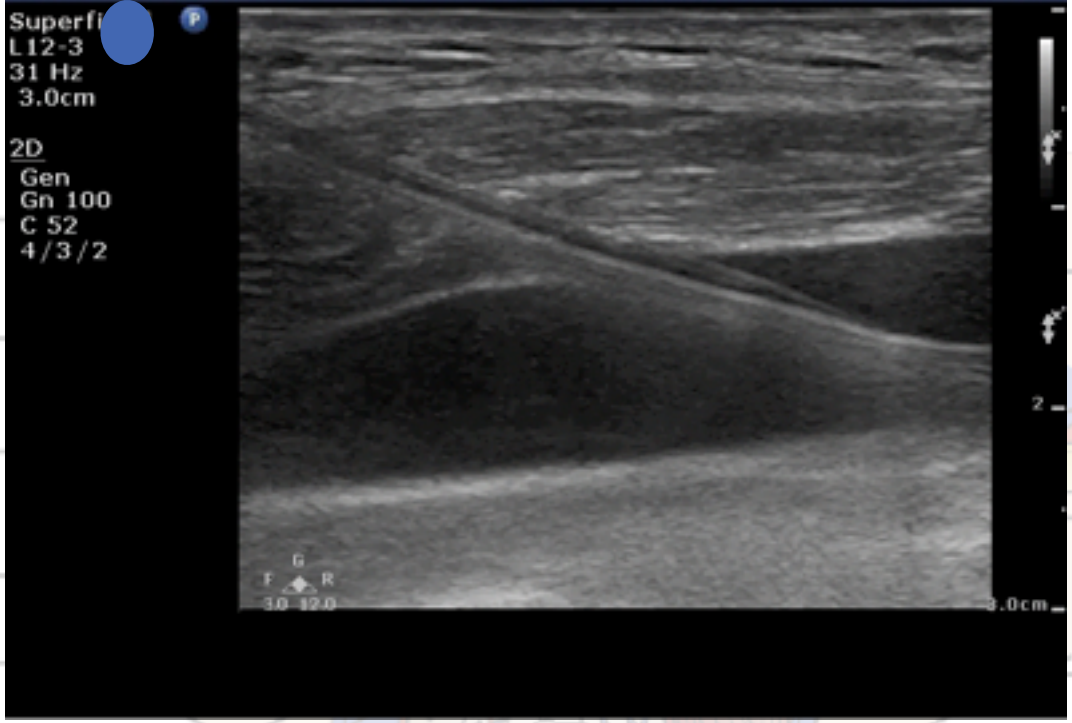
L

R

Arch of aorta
Brachiocephalic vein
Left subclavian vein
Left subclavian artery
Trachea
Thyroid veins
Inferior
Middle
Superior
Common carotid artery
Internal jugular vein
Superior vena cava
Right subclavian vein
Right subclavian artery
Thyroid gland
Jugular vein
External
Sternocleidomastoid muscle

!

Operator



L

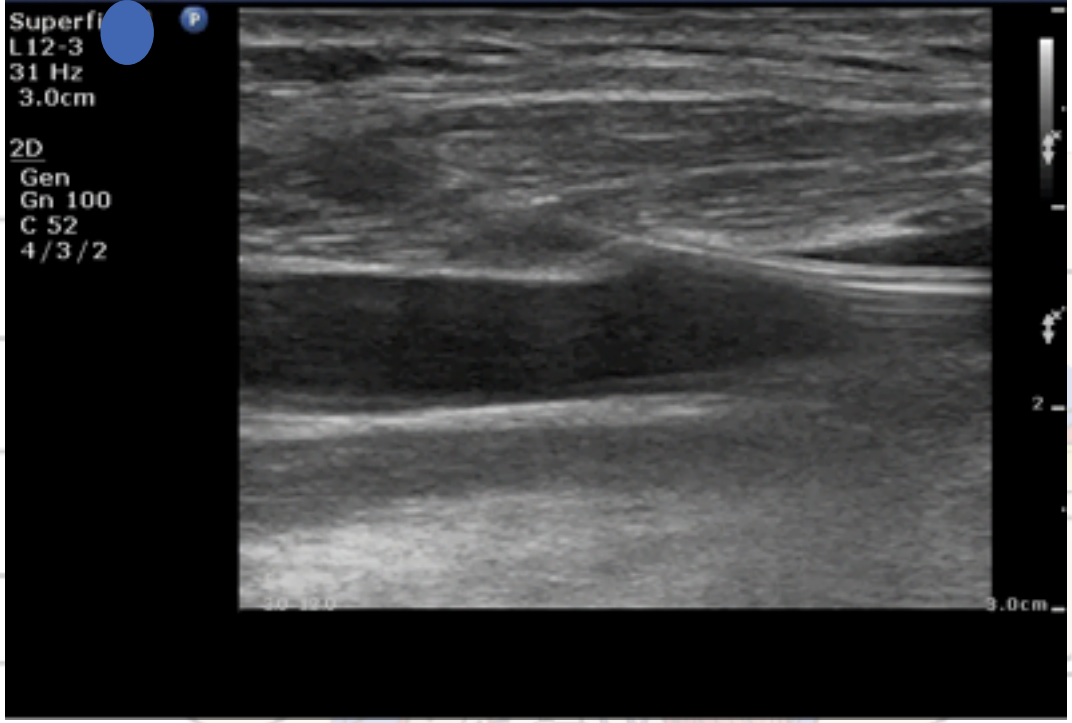
R

Arch of aorta
Brachiocephalic vein
Left subclavian vein
Left subclavian artery
Trachea
Thyroid veins
Inferior
Middle
Superior
Common carotid artery
Internal jugular vein
Sternocleidomastoid muscle
External jugular vein
Thyroid gland
Right subclavian artery
Right subclavian vein
Superior vena cava

!

Operator

L
R
Superfi
L12-3
31 Hz
3.0cm
2D
Gen
Gn 100
C 52
4/3/2
3.0cm
Arch of aorta
Brachiocephalic vein
Left subclavian vein
Left subclavian artery
Trachea
Thyroid veins
Inferior
Middle
Superior
Common carotid artery
Internal jugular vein
Superior vena cava
Right subclavian vein
Right subclavian artery
Thyroid gland
Jugular vein
External muscle
Sternocleidomastoid
!
Operator



L

R

Arch of aorta
Brachiocephalic vein
Left subclavian vein
Left subclavian artery
Trachea
Thyroid veins
Inferior
Middle
Superior
Common carotid artery
Internal jugular vein
Superior vena cava
Right subclavian vein
Right subclavian artery
Thyroid gland
Jugular vein
External muscle
Sternocleidomastoid

!

Operator

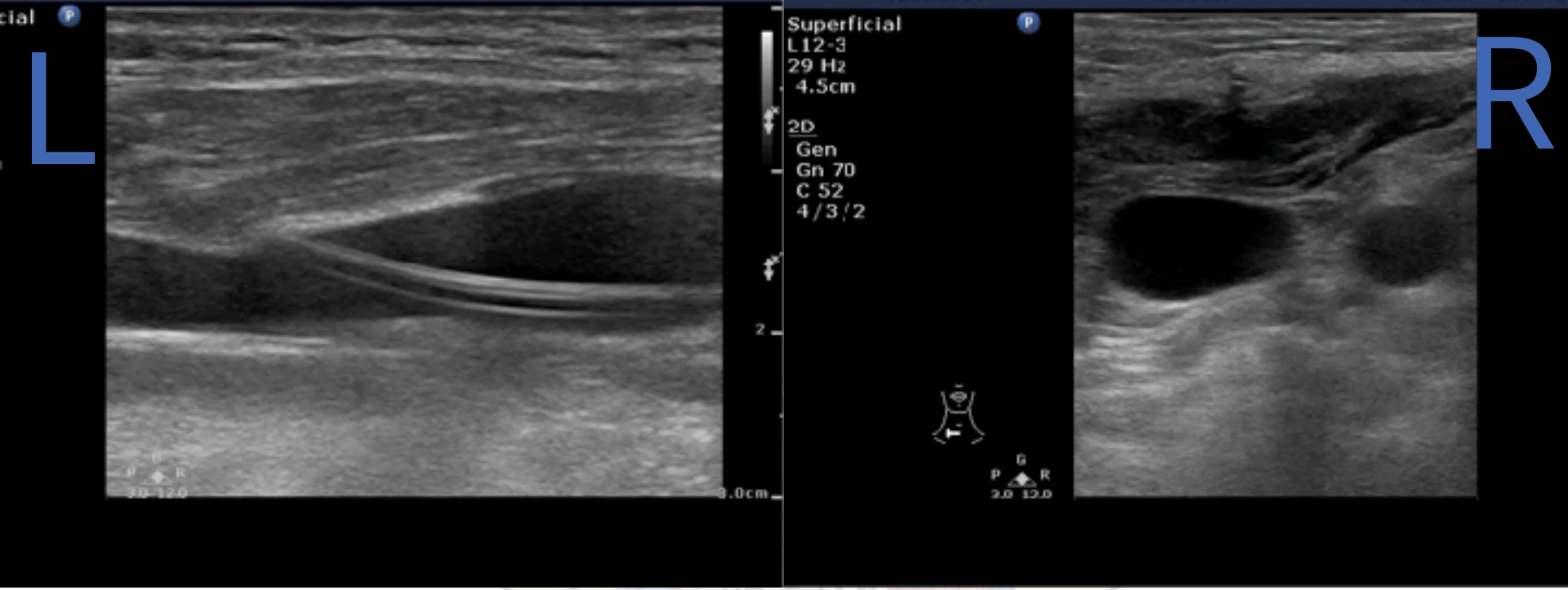
L

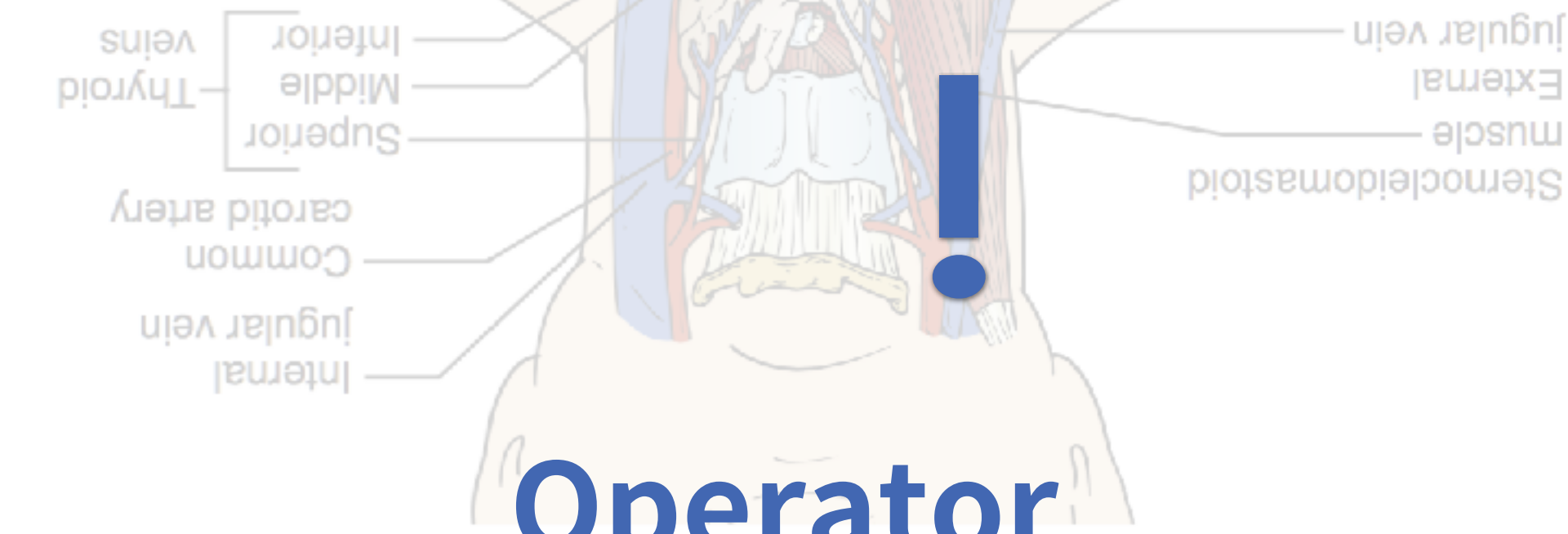
R

Arch of aorta
Brachiocephalic vein
Left subclavian vein
Left subclavian artery
Trachea
Thyroid veins
Inferior
Middle
Superior
Common carotid artery
Internal jugular vein
Sternocleidomastoid muscle
External jugular vein
Thyroid gland
Right subclavian artery
Right subclavian vein
Superior vena cava

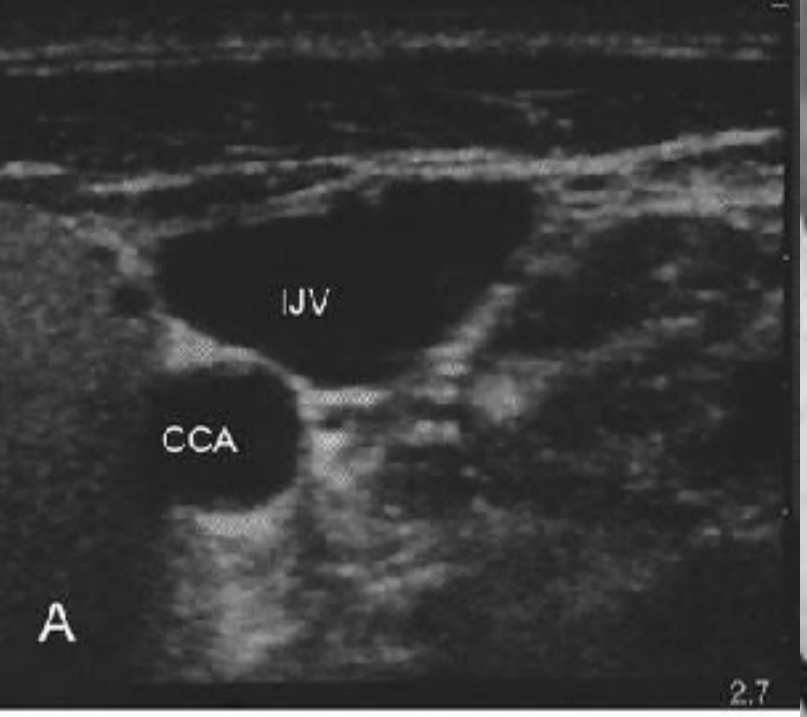
!

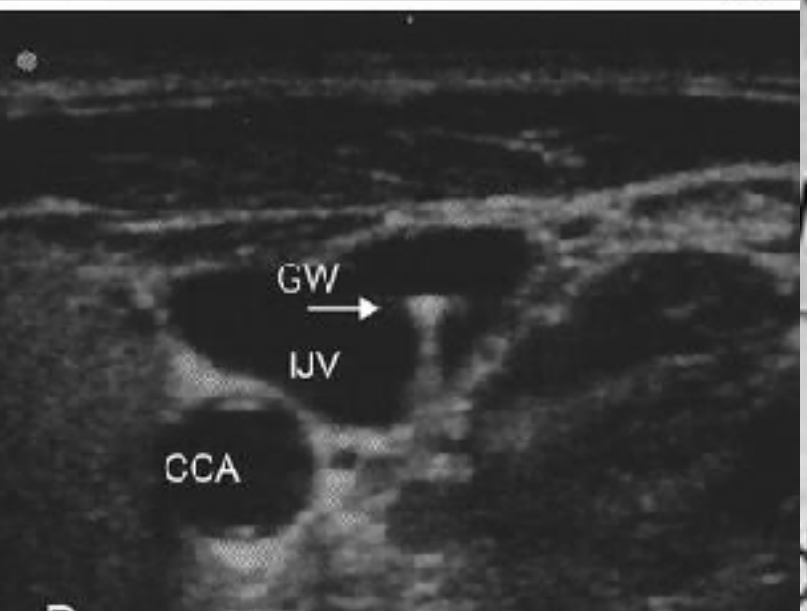
Operator


L
Superficial
L12-3
29 Hz
4.5cm
2D
Gen
Gn 70
C 52
4/3/2
R

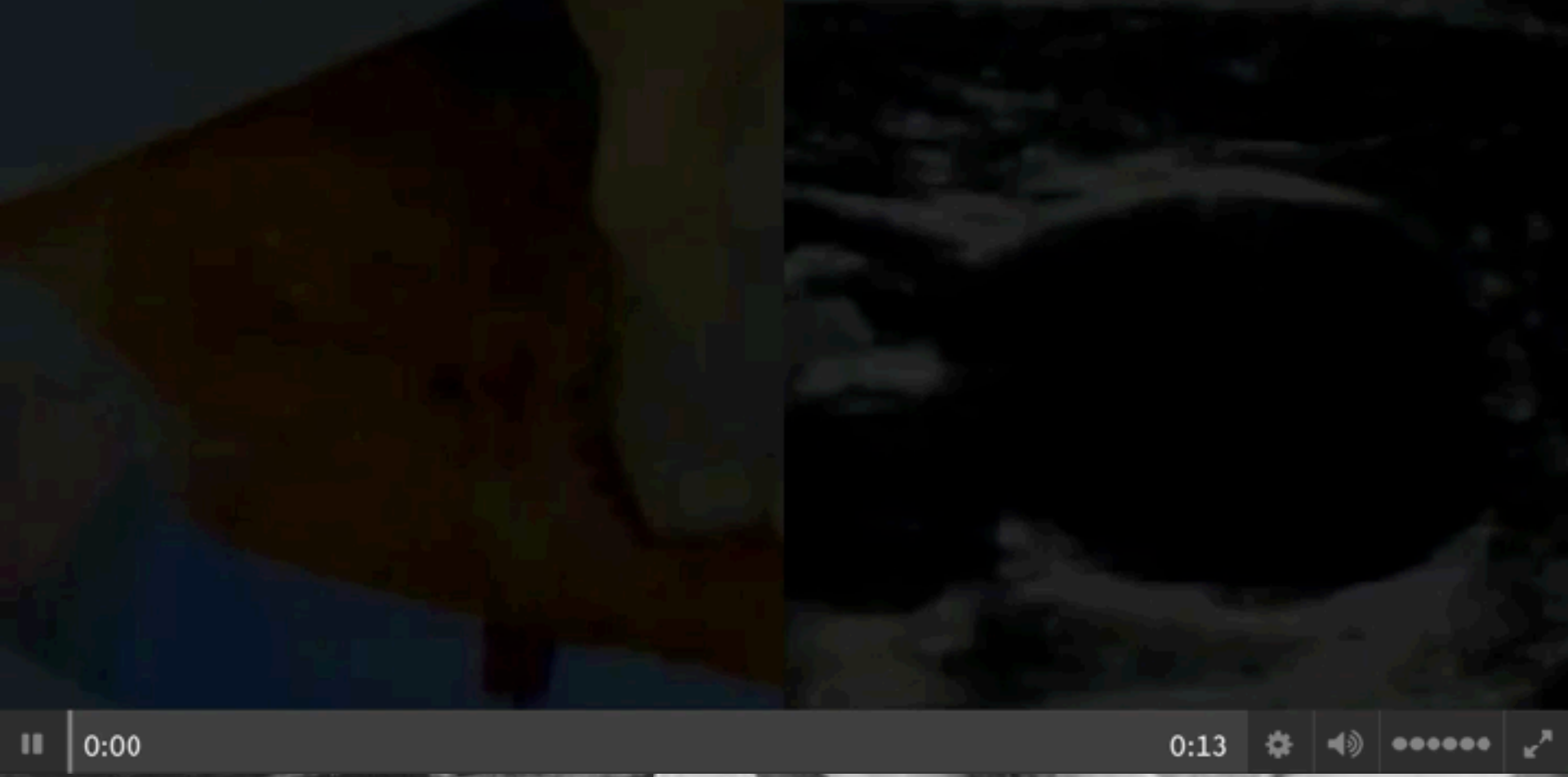

Thyroid veins
Inferior
Middle
Superior
Common carotid artery
Internal jugular vein
Jugular vein
External
muscle
Sternocleidomastoid

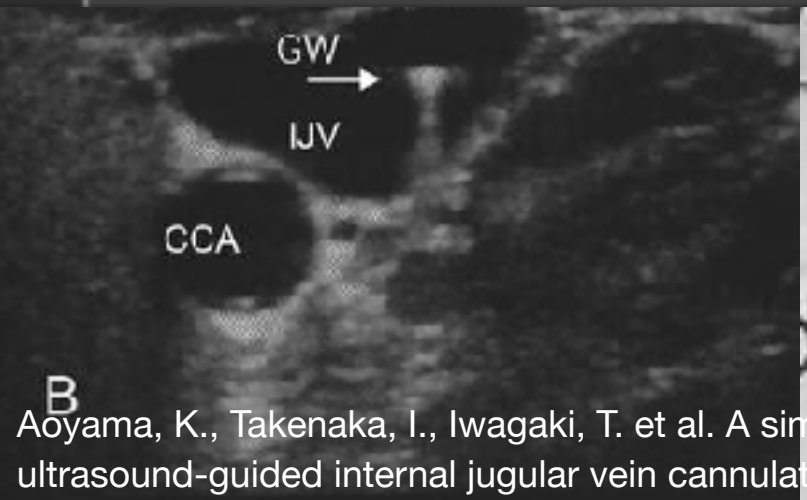
Operator





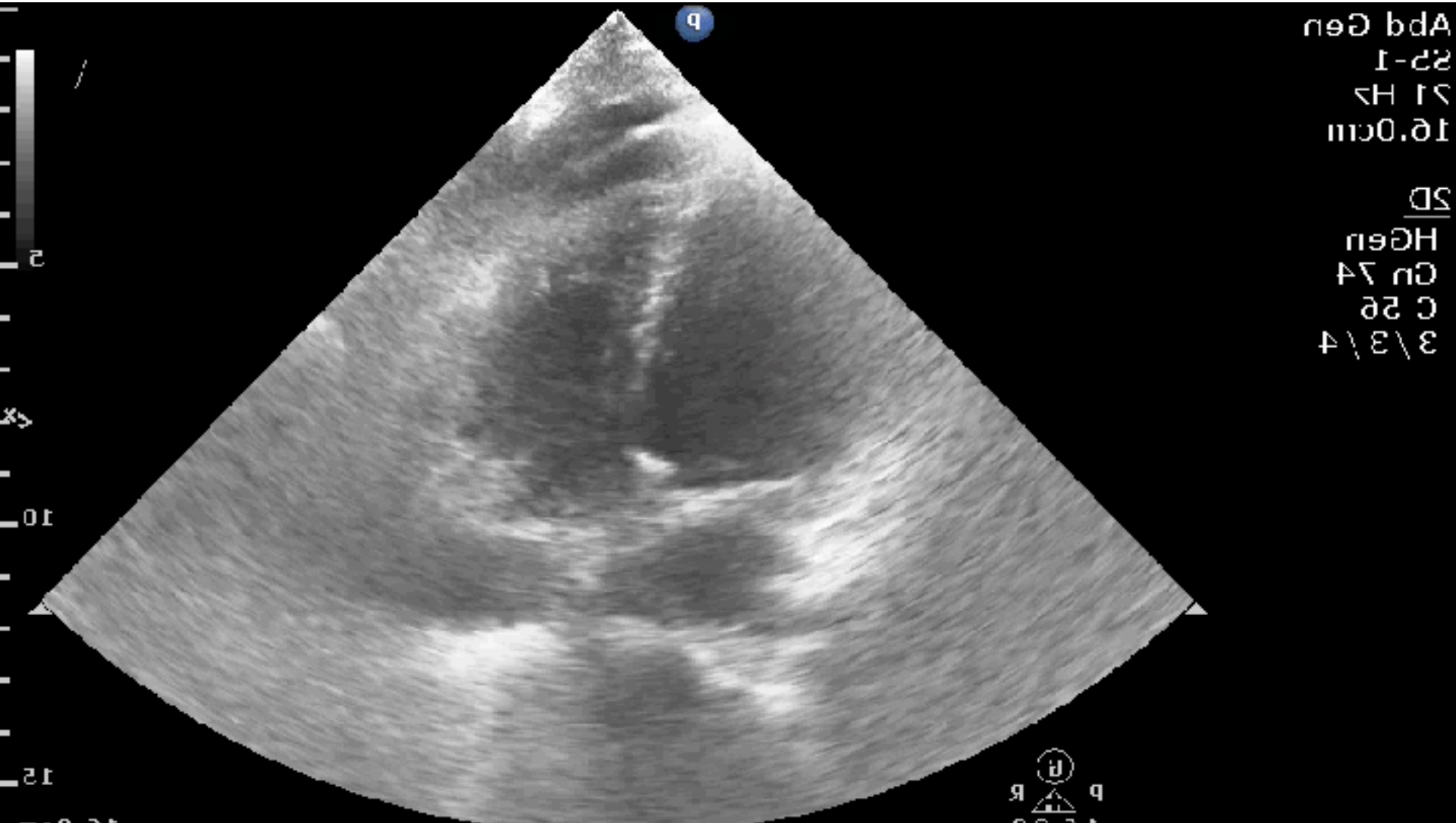
Aoyama, K., Takenaka, I., Iwagaki, T. et al. A simple maneuver for confirmation of the guidewire during ultrasound-guided internal jugular vein cannulation. Can J Anesth/J Can Anesth 62, 839–840 (2015)





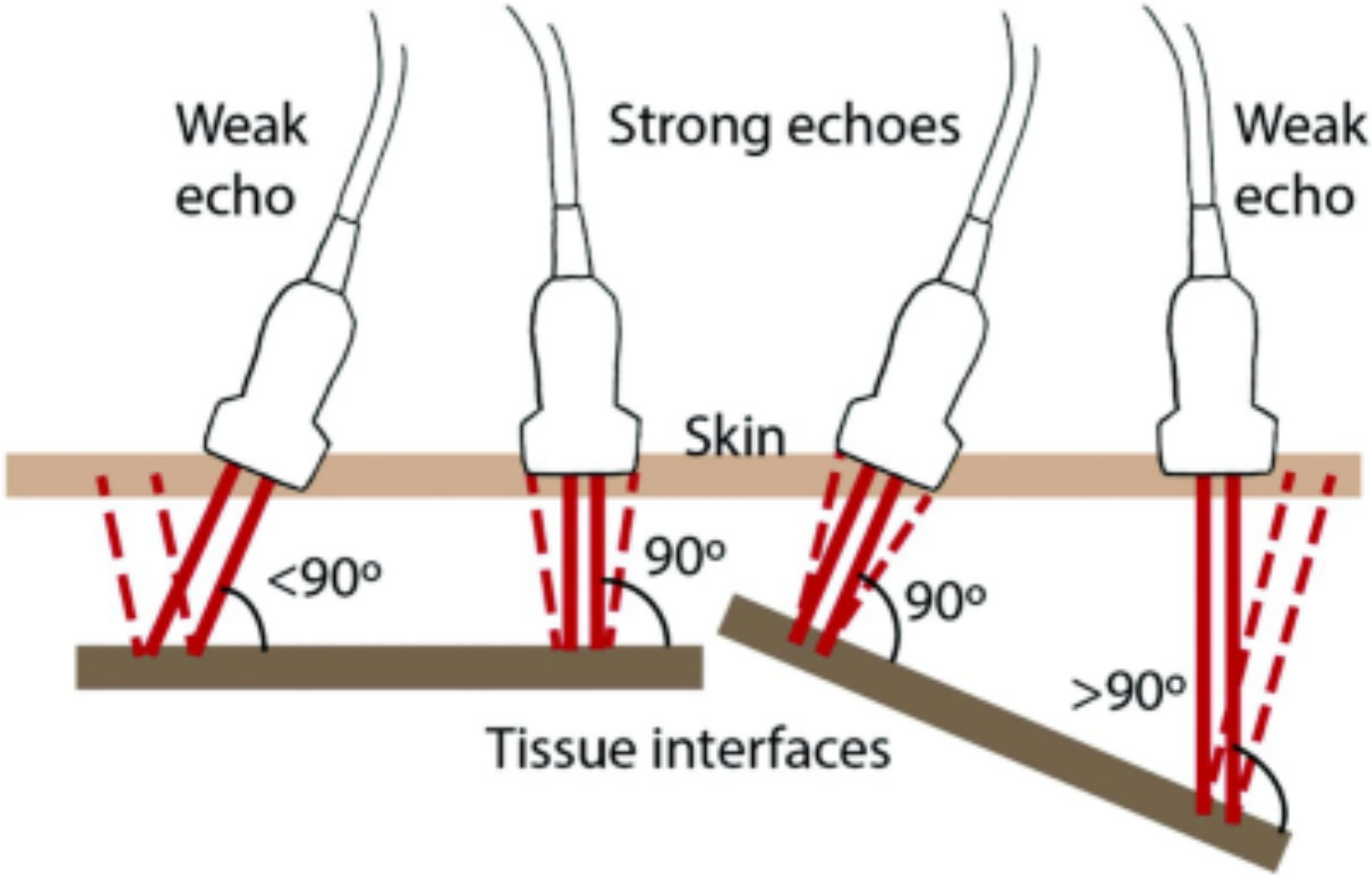
Aoyama, K., Takenaka, I., Iwagaki, T. et al. A simple maneuver for confirmation of the guidewire during ultrasound-guided internal jugular vein cannulation. Can J Anesth/J Can Anesth 62, 839–840 (2015)

Bubble test/ Agitated saline



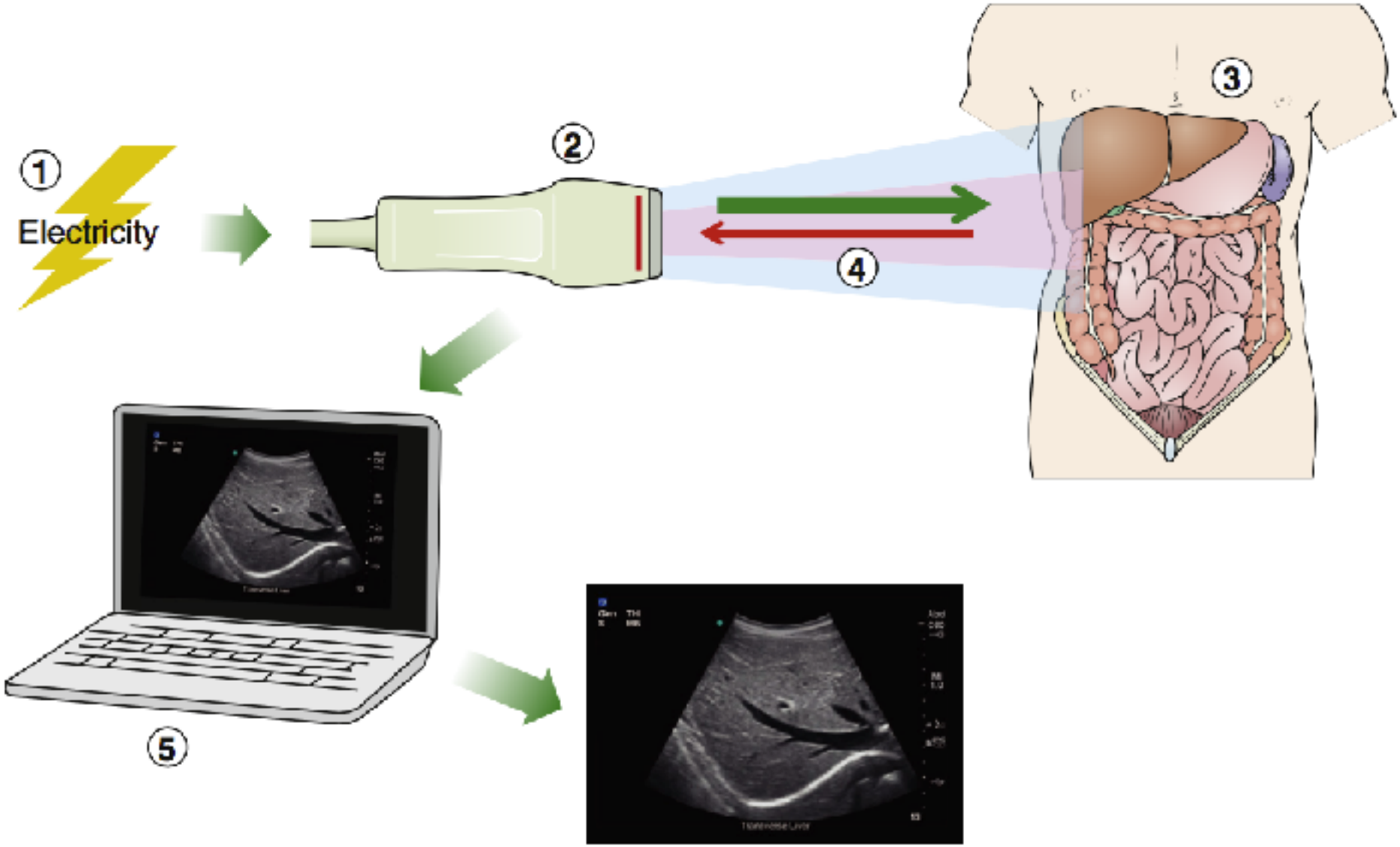
ULTRASOUND
PROGRAM

探頭垂直於掃描的目標物



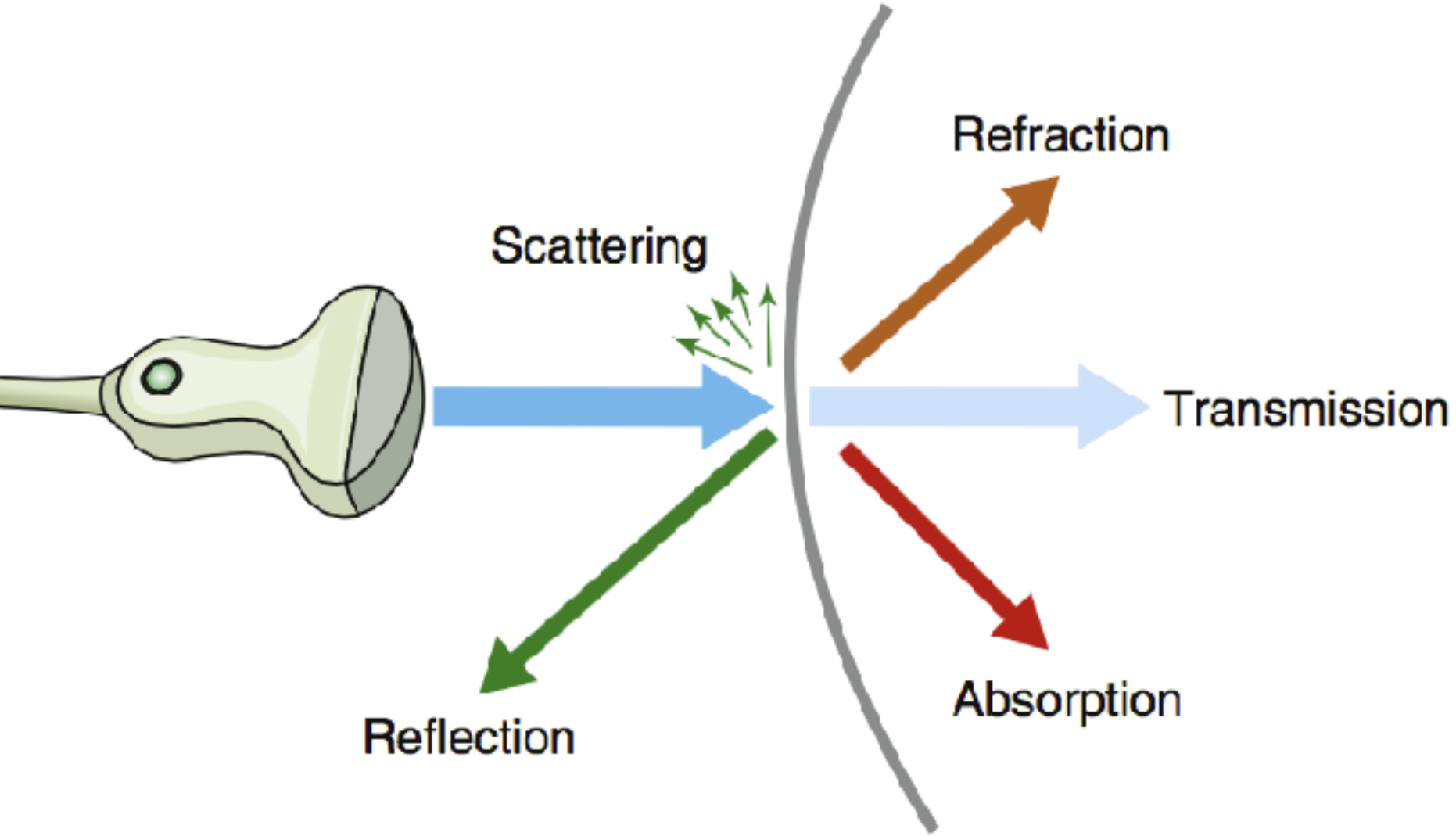
ULTRASOUND PROGRAM

超音波 > 20kHz



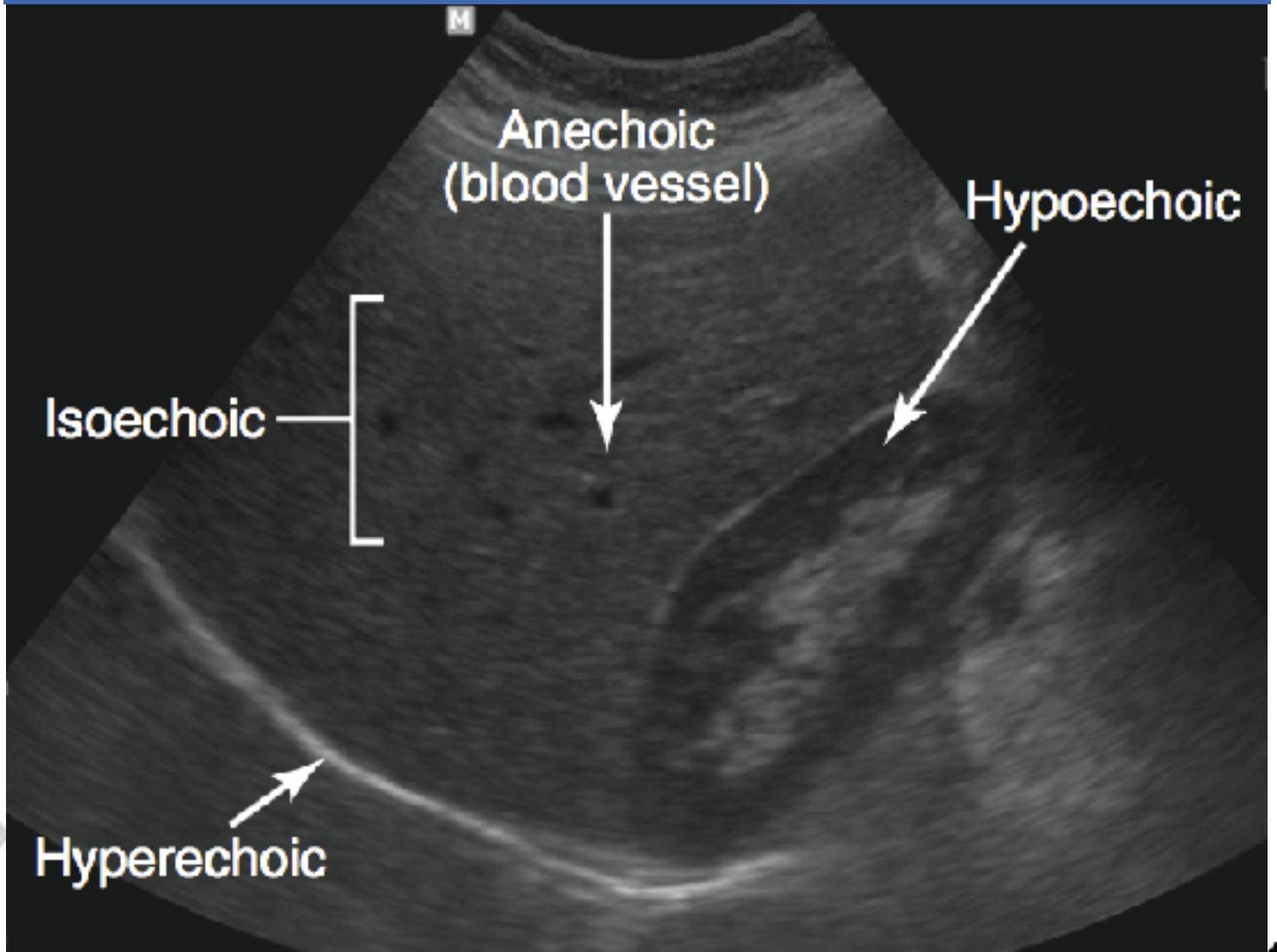
ULTRASOUND PROGRAM

如何克服掃描時的障礙？



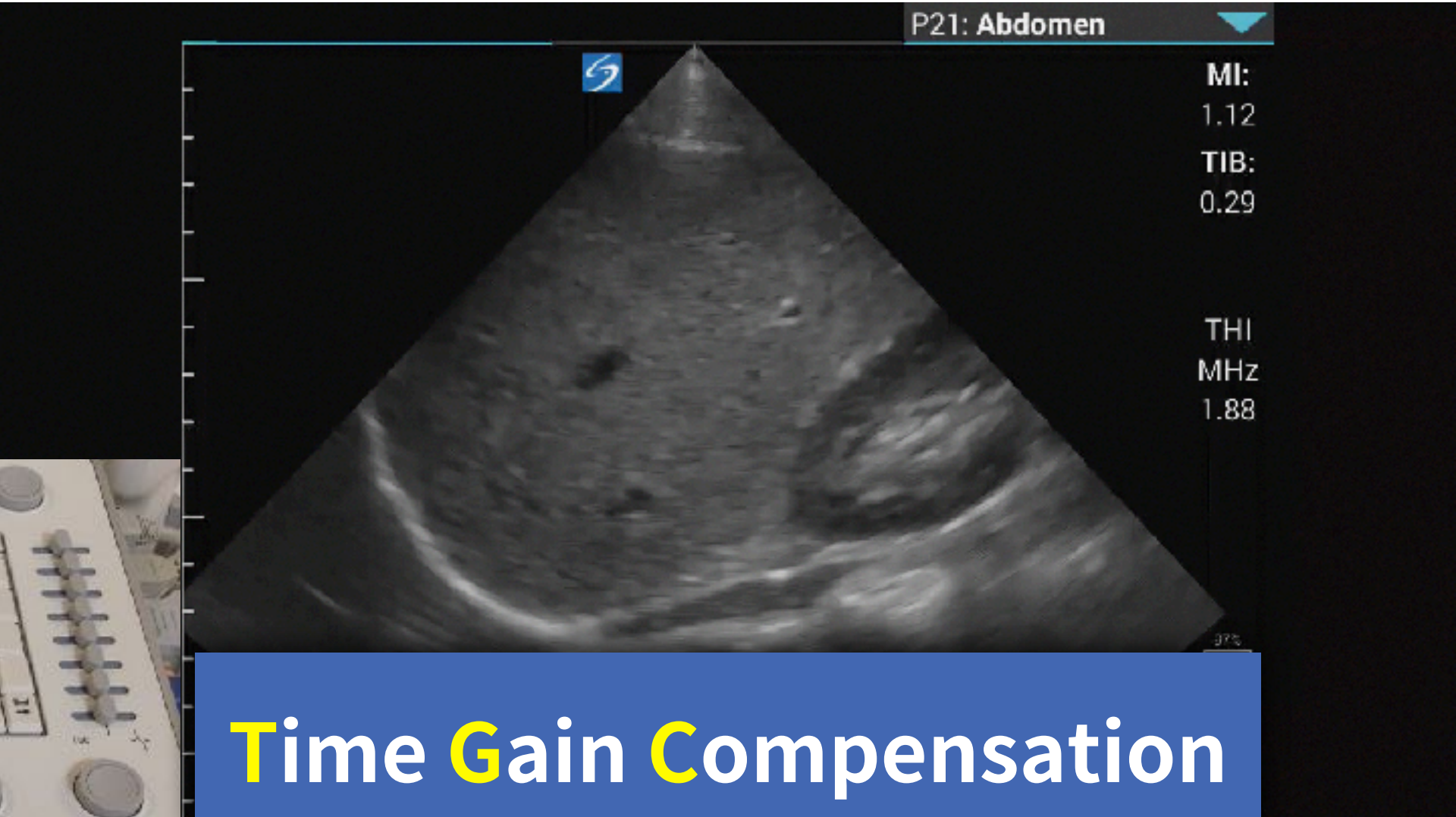
ULTRASOUND
PROGRAM

Brightness mode



ULTRASOUND PROGRAM

為什麼肝臟看起來會均質？



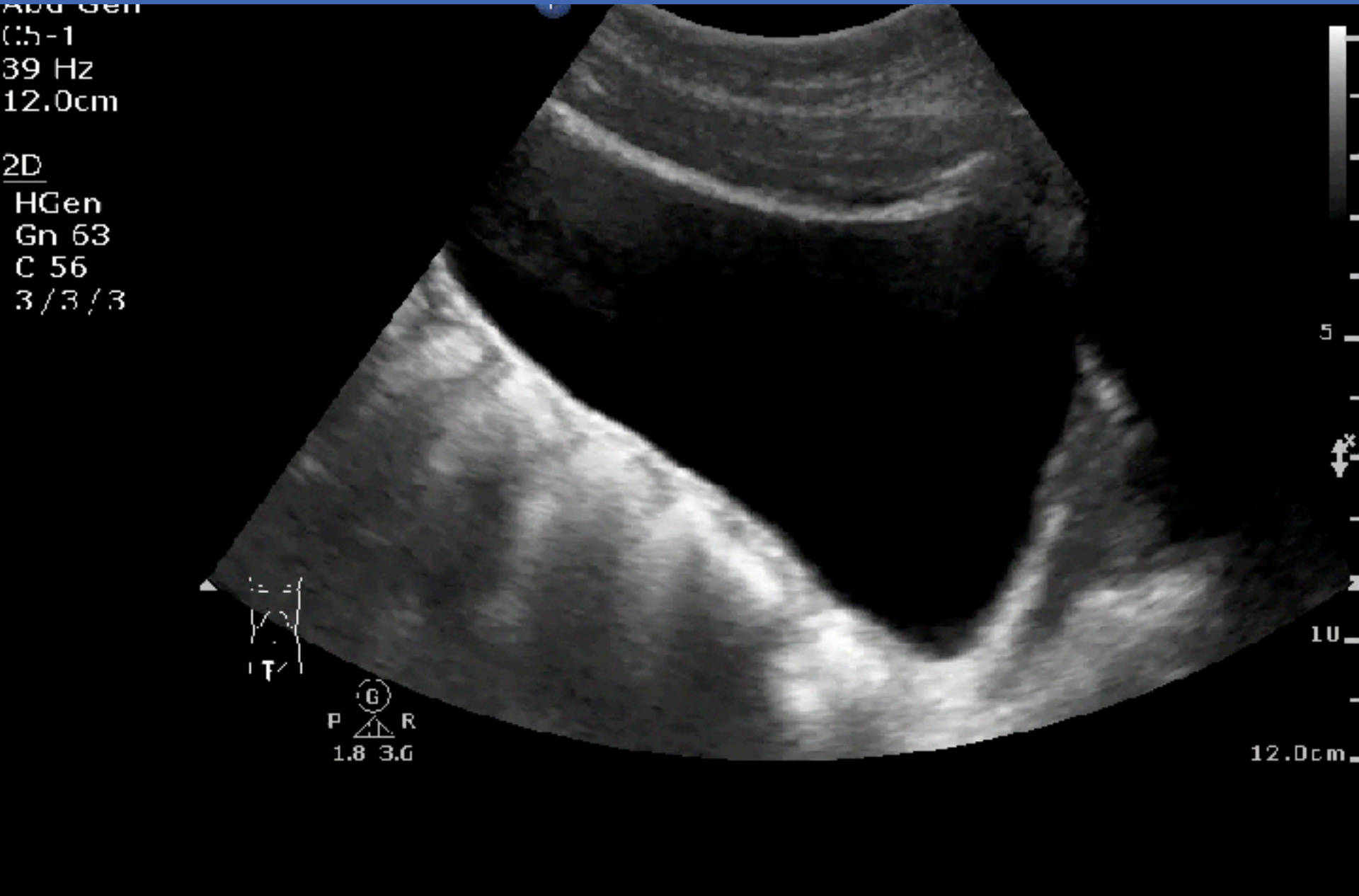
ULTRASOUND

水是最好的介質

TABLE 2.2 ■ Attenuation Coefficients of Different Materials

Tissue or Material	Attenuation (dB/cm/MHz)
Water	0.0022
Blood	0.15
Soft tissues	0.75
Air	7.50
Bone	15.00

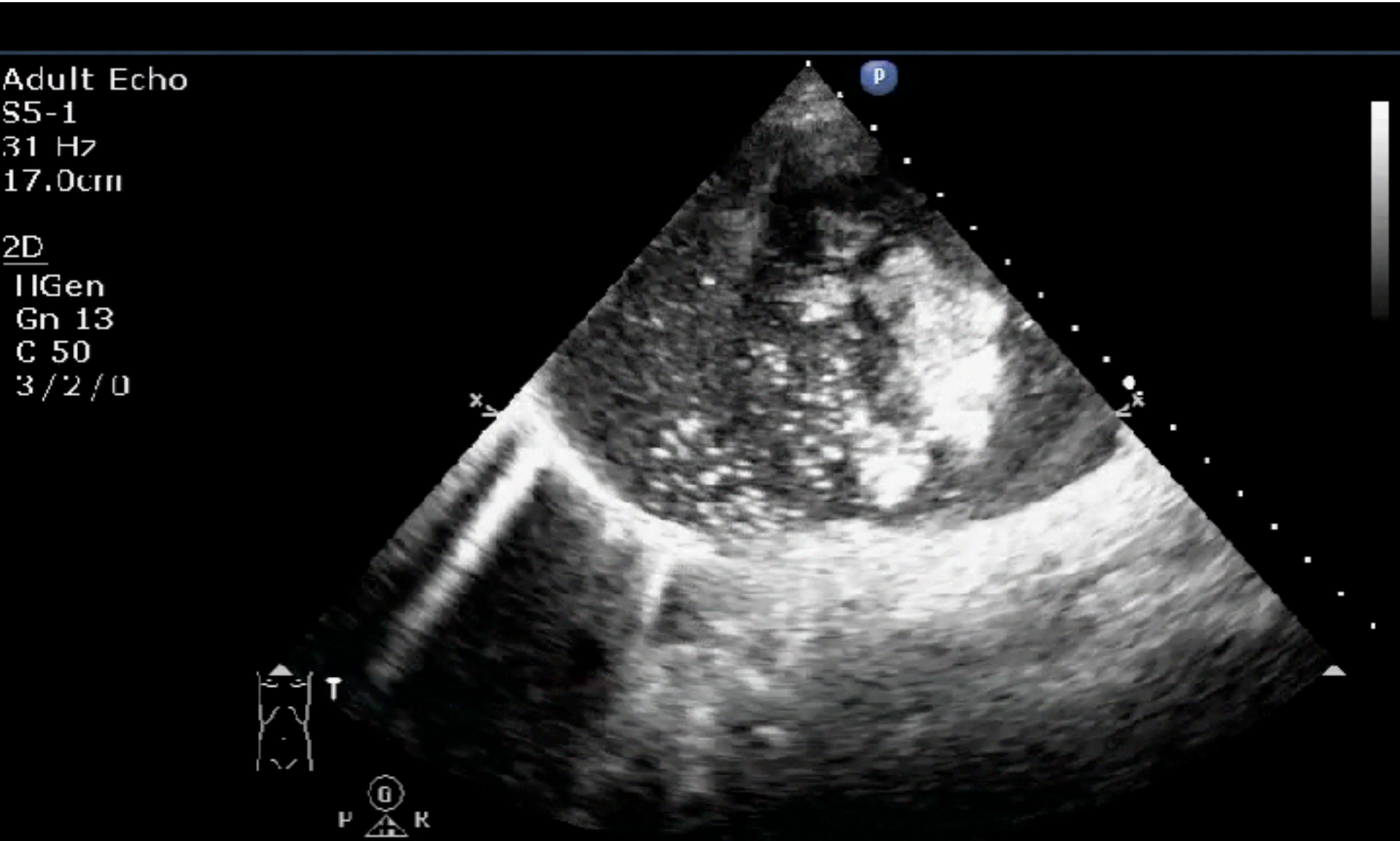
為什麼交界處這麼亮？



Impedance

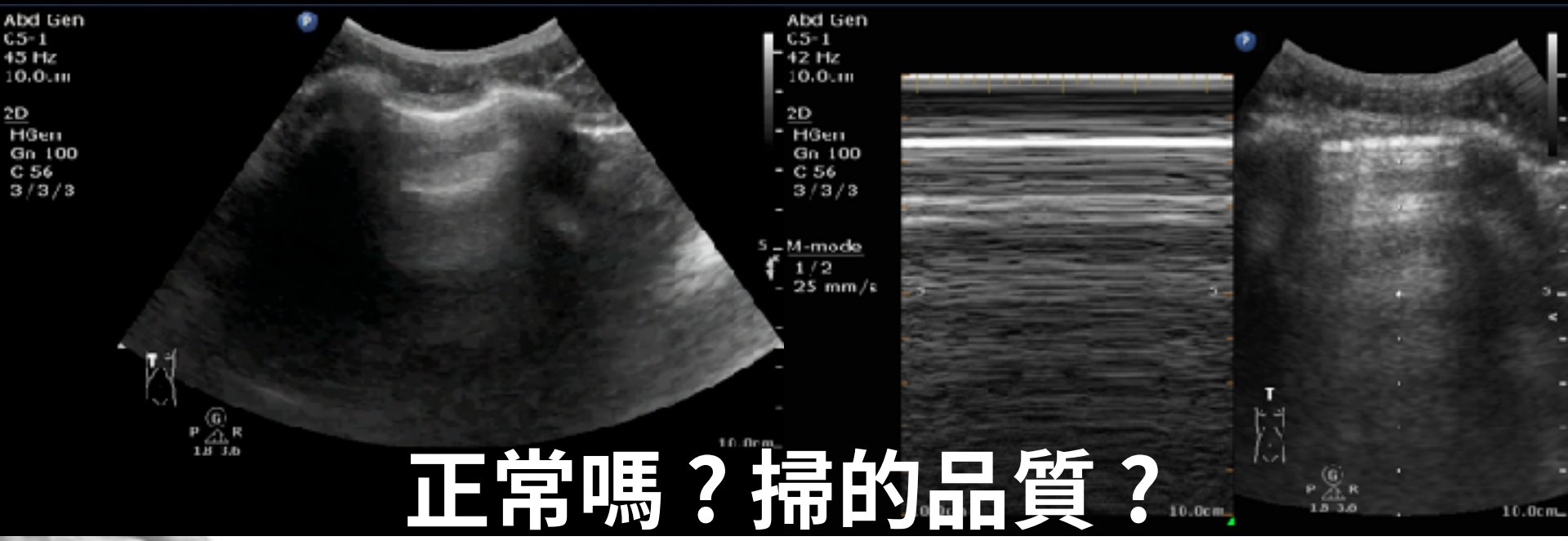
Tissue or Material	Density (g/cm^3)	Speed of Sound (m/s)	Acoustic Impedance (kg/(s m^2)) × 10^6
Air	0.001225	340	0.0004
Fat	0.95	1450	1.38
Blood	1.055	1575	1.66
Liver	1.06	1590	1.69
Bone	1.9	4080	7.75
Metal (e.g., titanium)	4.5	5090	22.9

使用BiPAP的患者，你看到什麼?

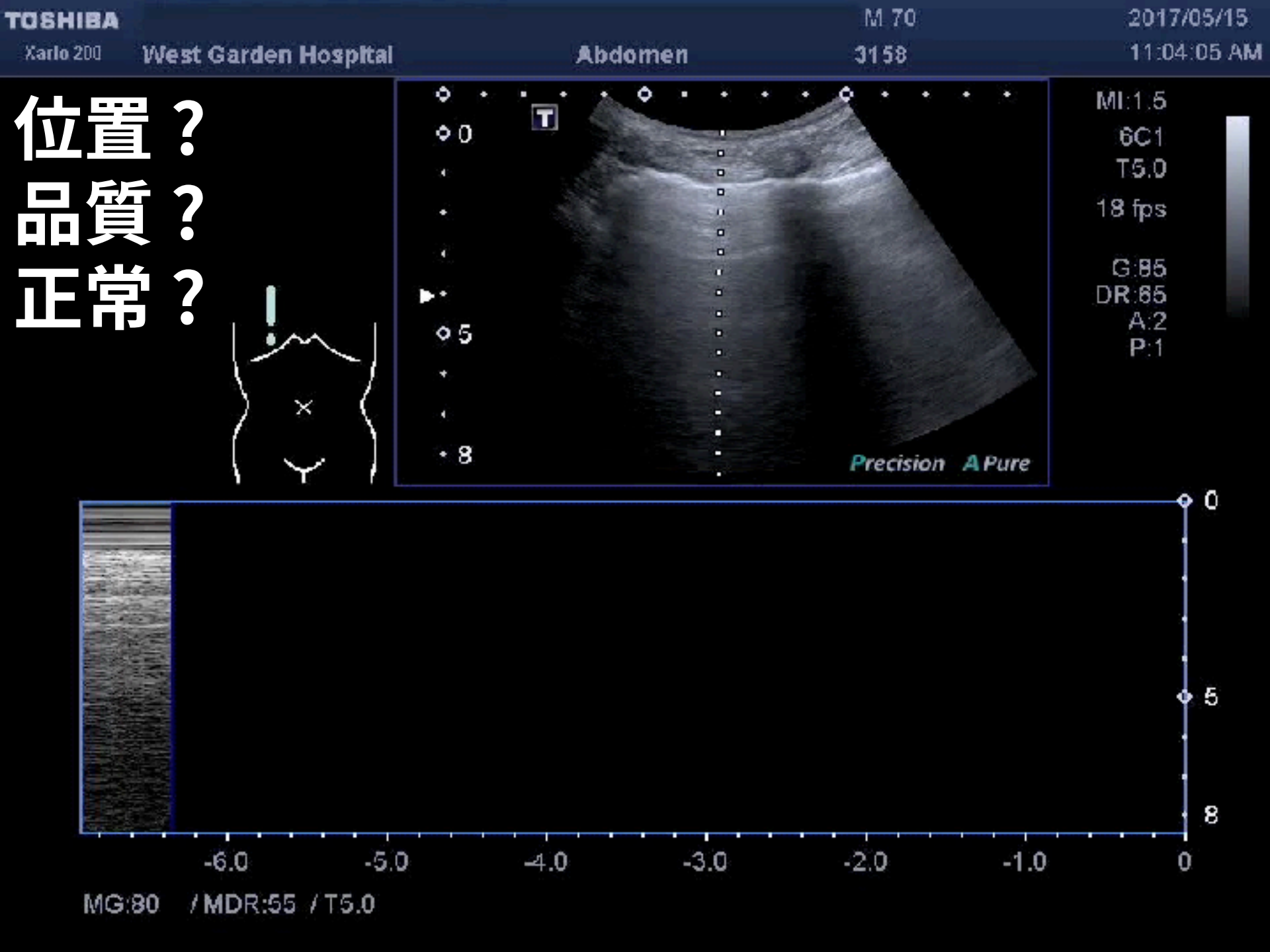


ULTRASOUND
PROGRAM

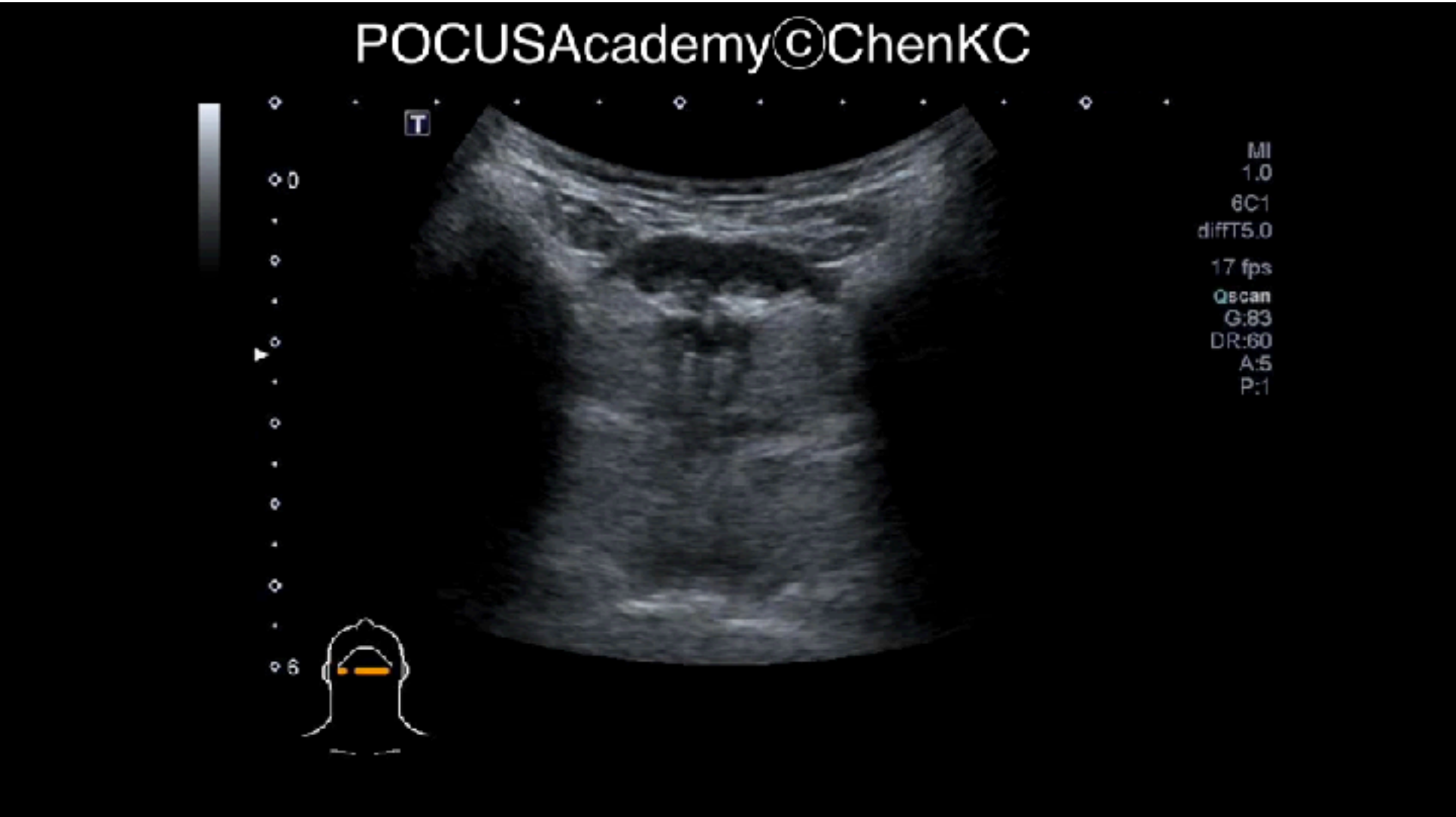
Motion mode



正常嗎？掃的品質？

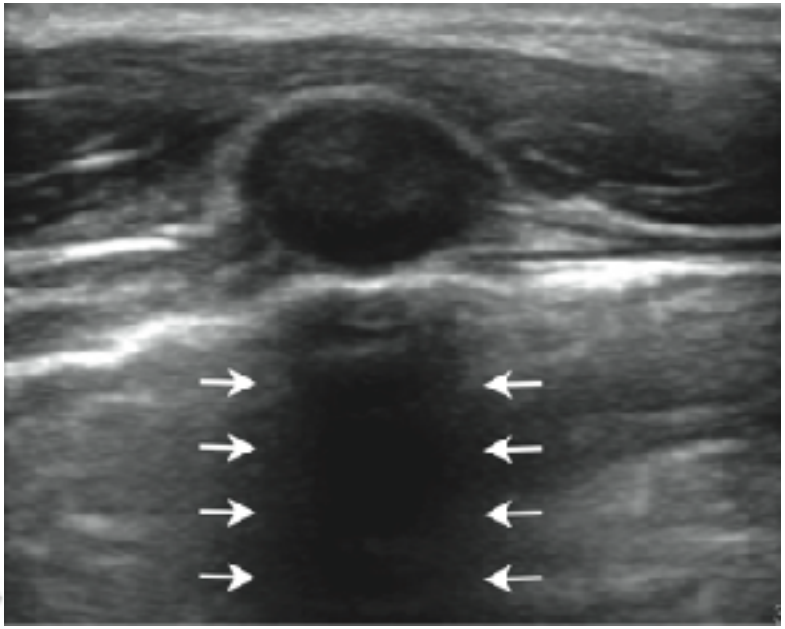

TOSHIBA
Xario 200
West Garden Hospital
M 70
Abdomen
3158
2017/05/15
11:04:05 AM
位置？
品質？
正常？
MI:1.5
6C1
T5.0
18 fps
G:85
DR:65
A:2
P:1
Precision
Pure
0
5
8
-6.0
-5.0
-4.0
-3.0
-2.0
-1.0
0
MG:80
/ MDR:55
/ T5.0

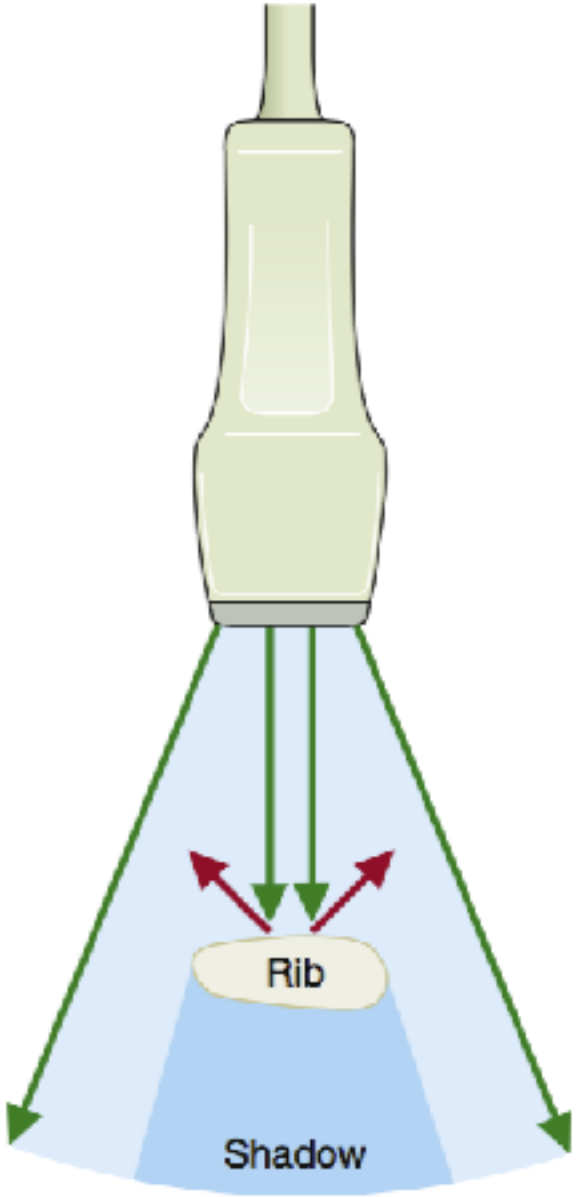
影片中最主要的Artifact為何？

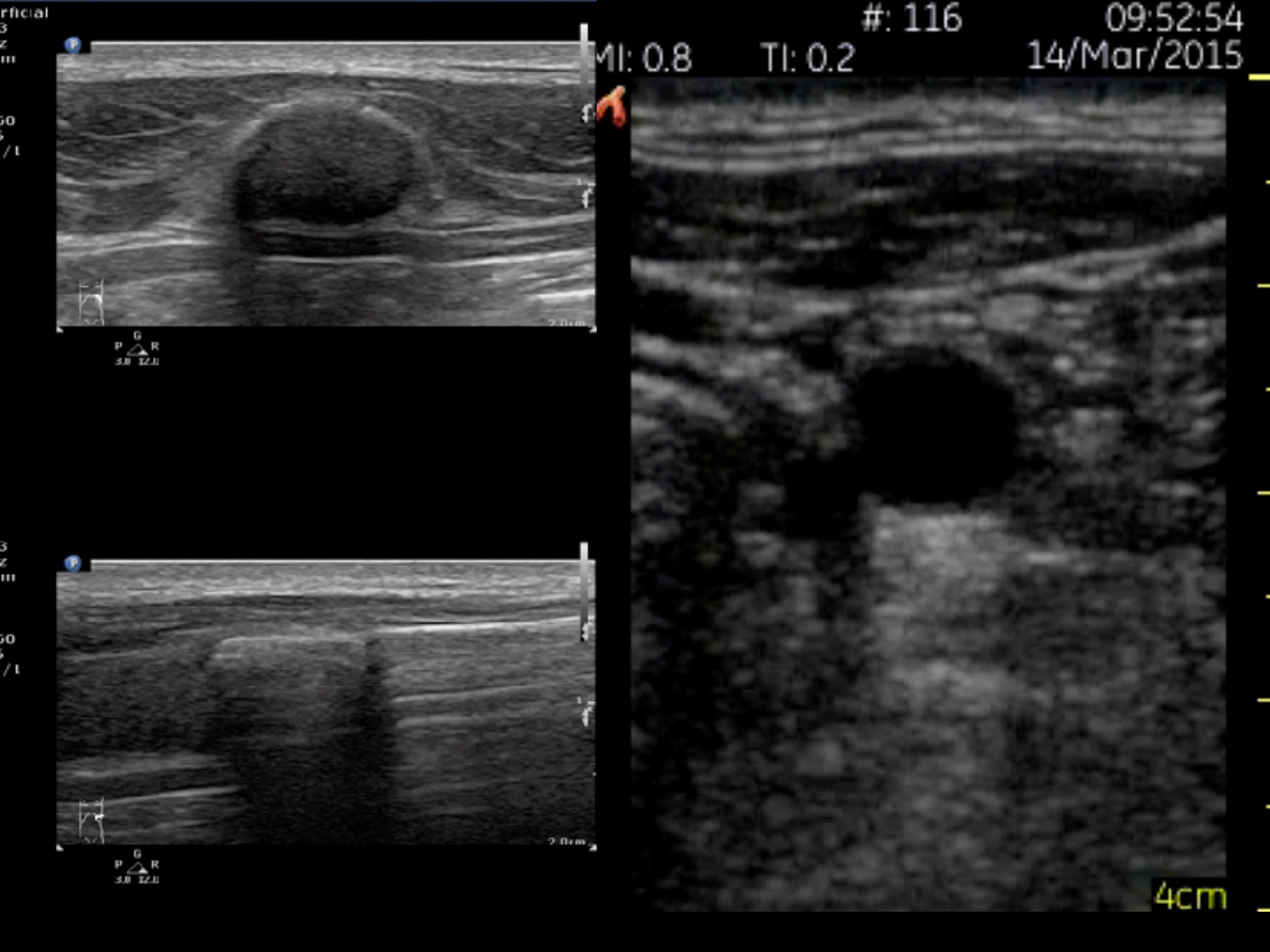


ULTRASOUND PROGRAM

Acoustic Shadowing

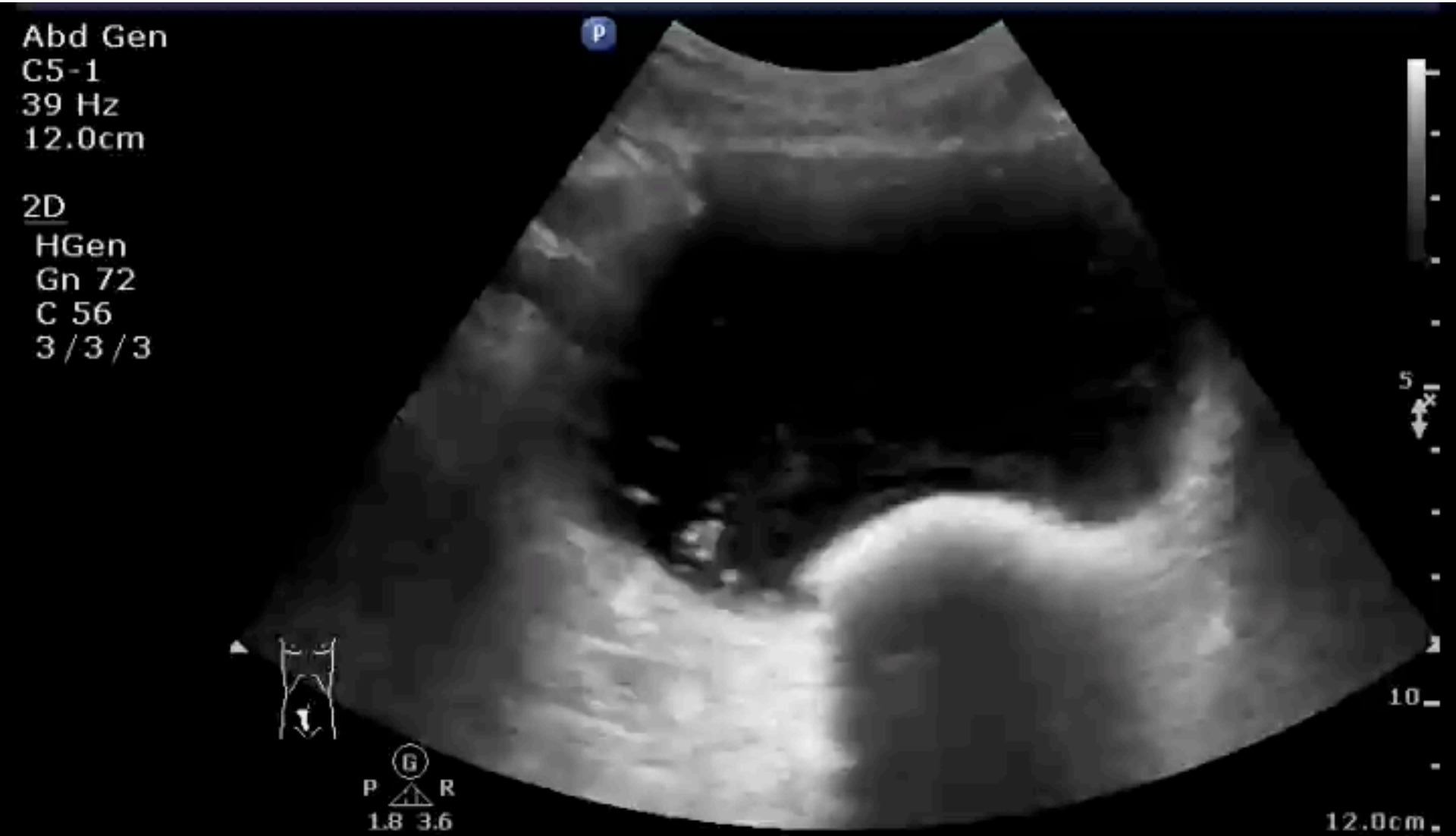





#: 116
09:52:54
MI: 0.8
TI: 0.2
14/Mar/2015
4cm

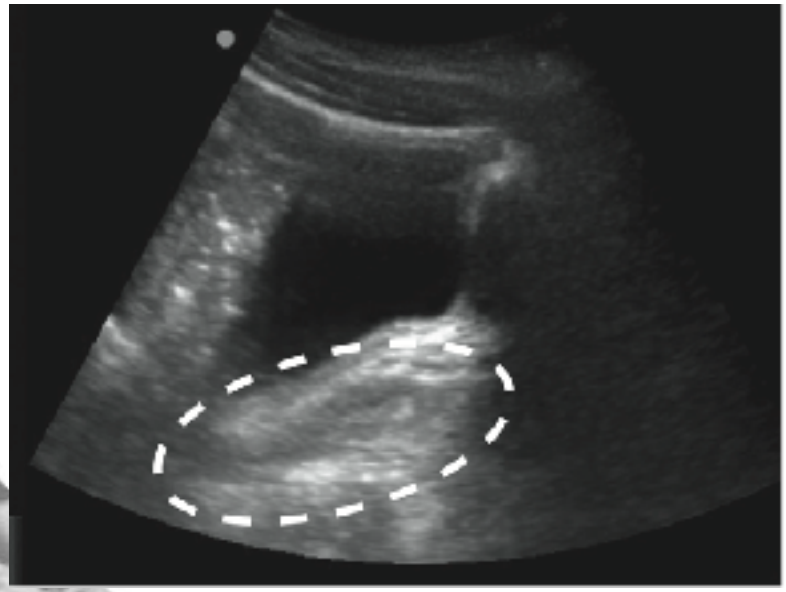
ULTRASOUND PROGRAM

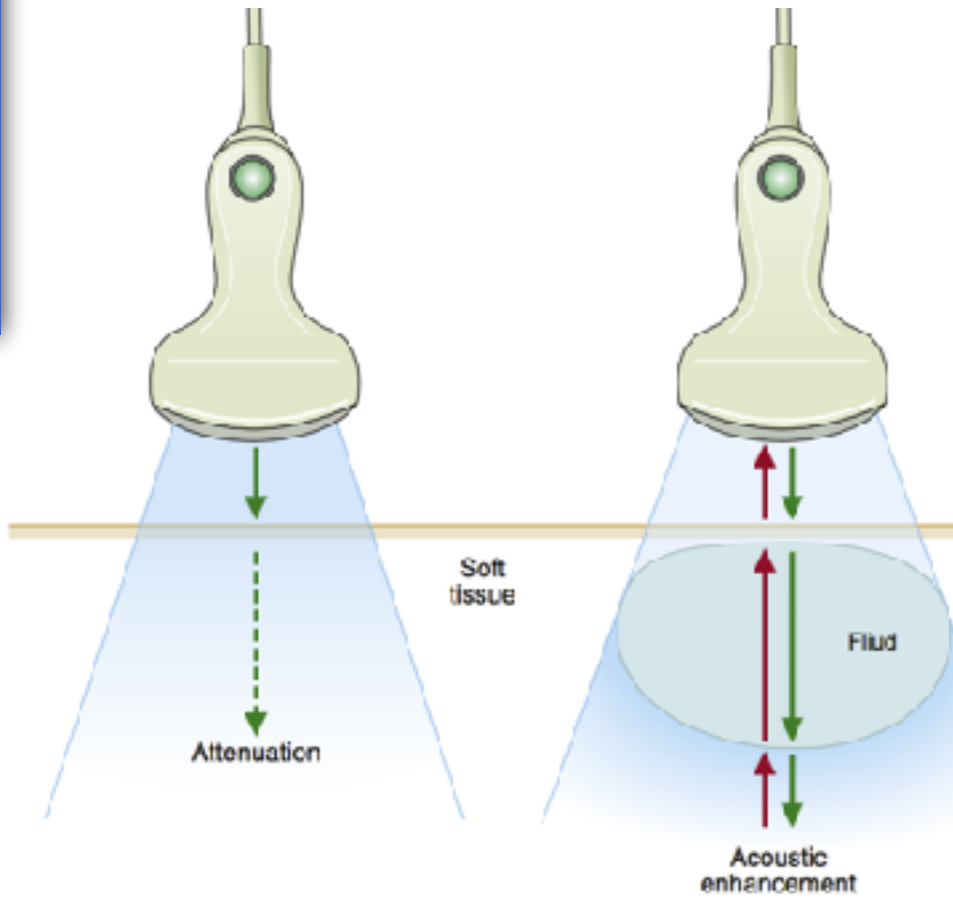
影片中有那些Artifacts?



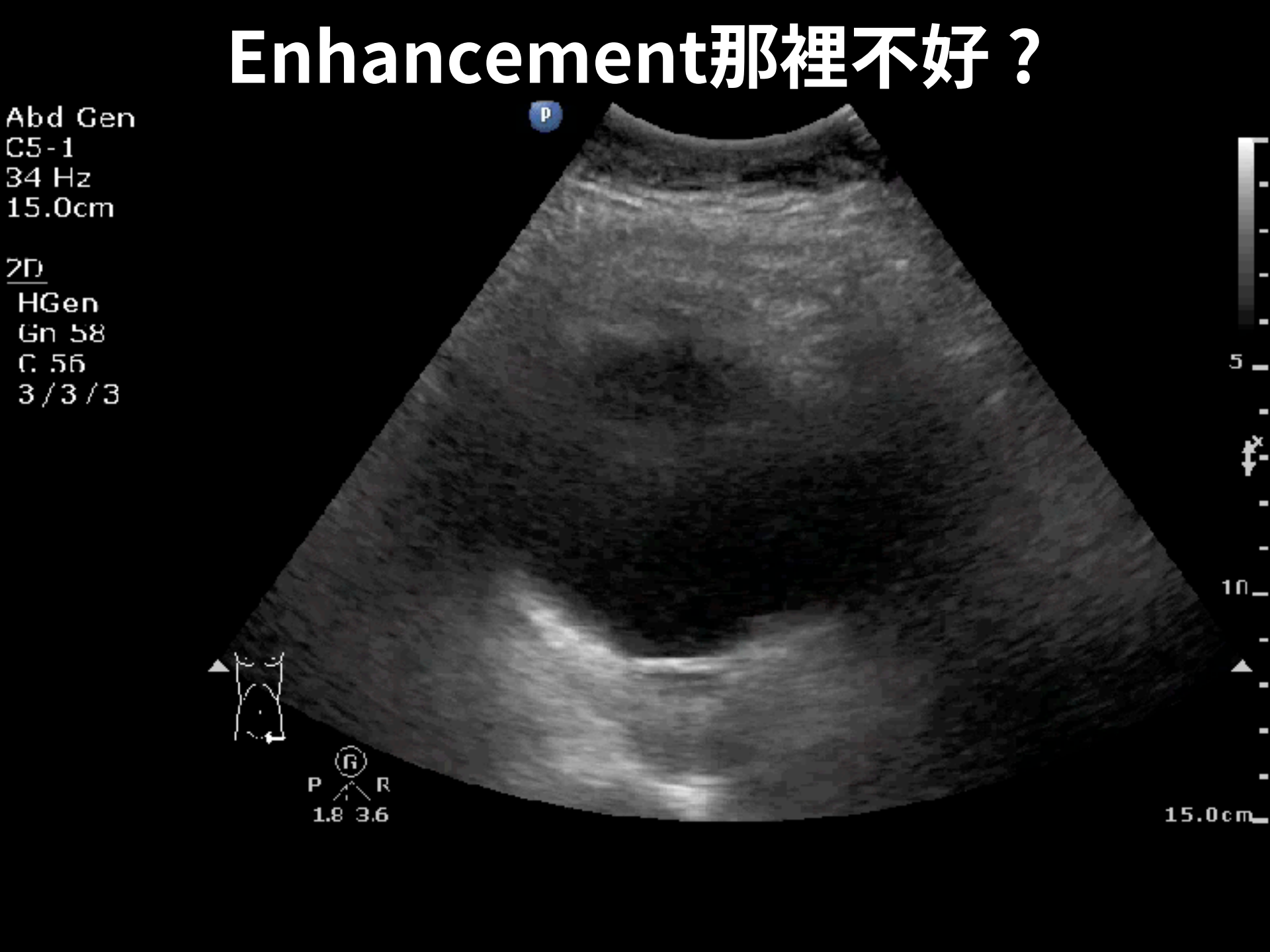
ULTRASOUND PROGRAM

Acoustic Enhancement





Enhancement那裡不好？



ULTRASOUND

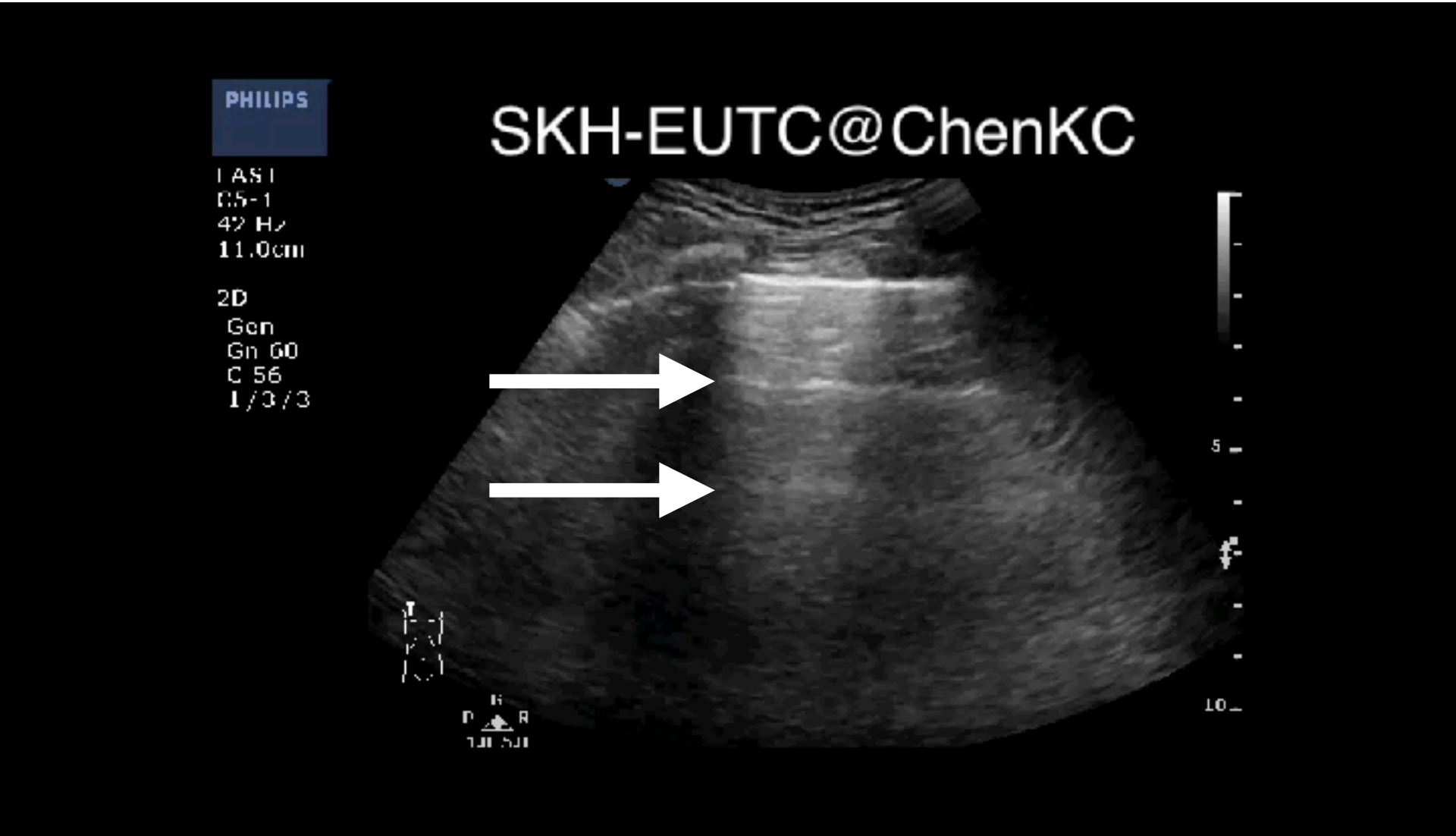
Shadow & Enhancement

TABLE 2.2 ■ Attenuation Coefficients of Different Materials

Tissue or Material	Attenuation (dB/cm/MHz)
Water	0.0022
Blood	0.15
Soft tissues	0.75
Air	7.50
Bone	15.00

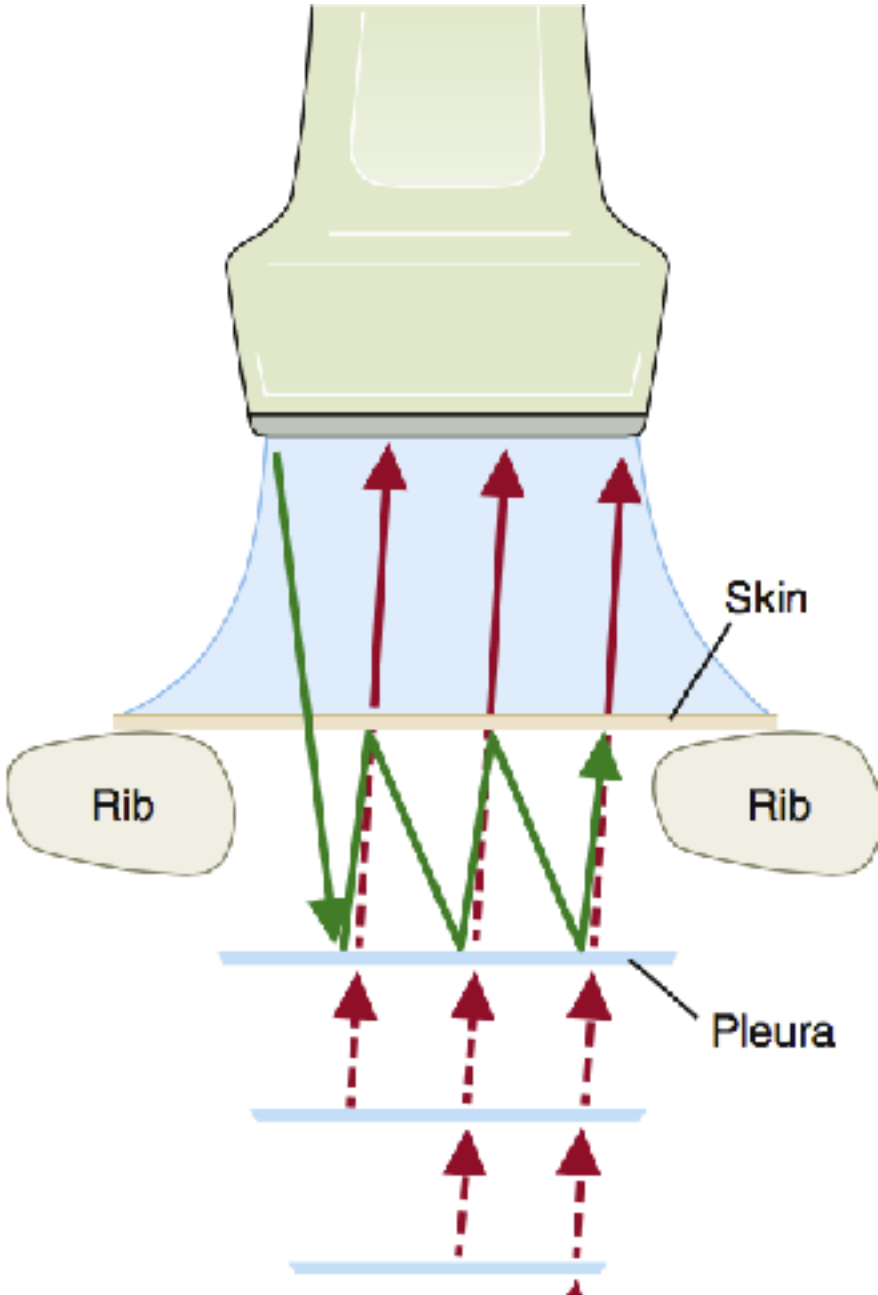
ULTRASOUND
PROGRAM

箭頭所指Artifacts? 成因為何？



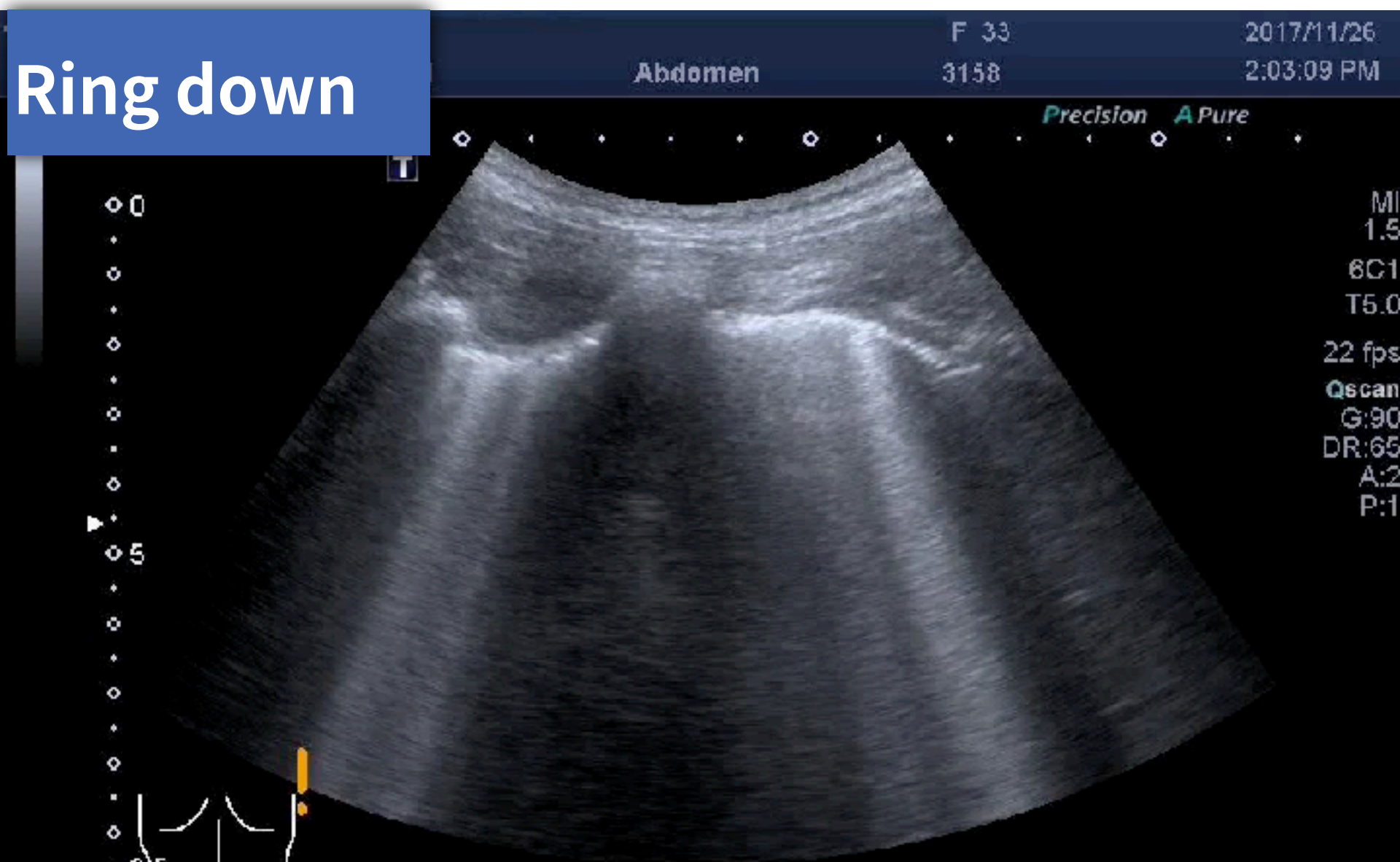
ULTRASOUND
PROGRAM

Reverberation



影片中的Artifact為何?

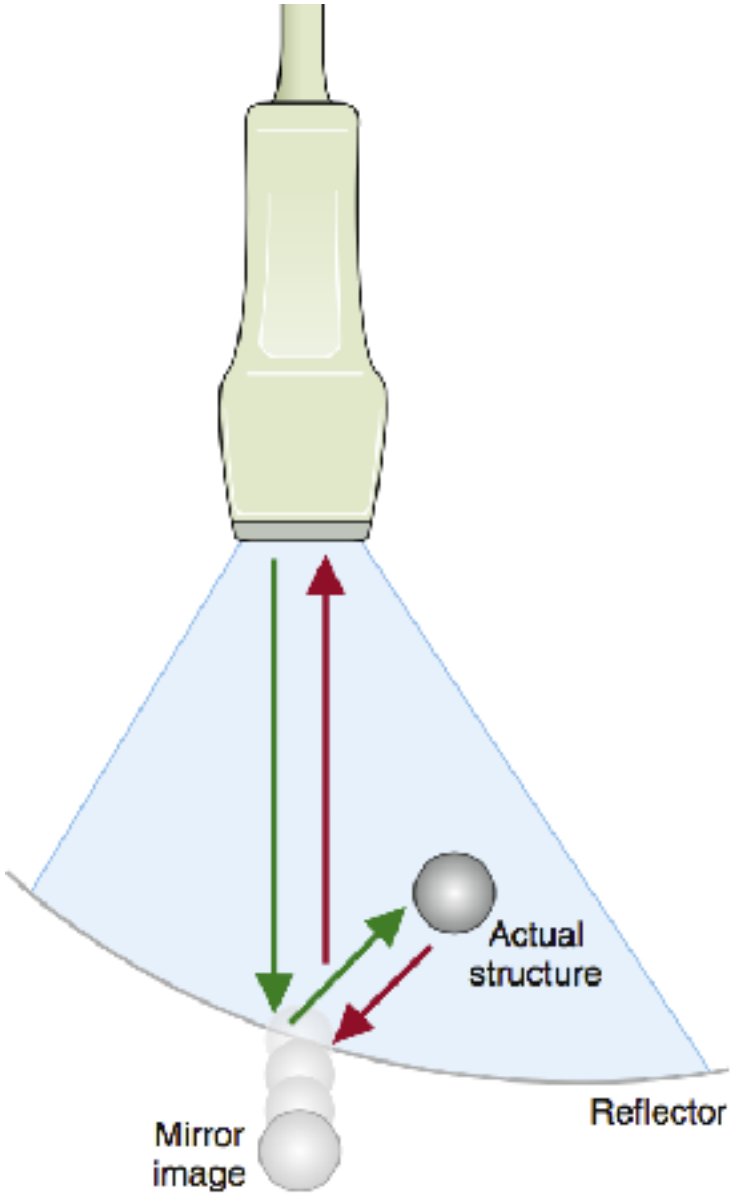
Ring down



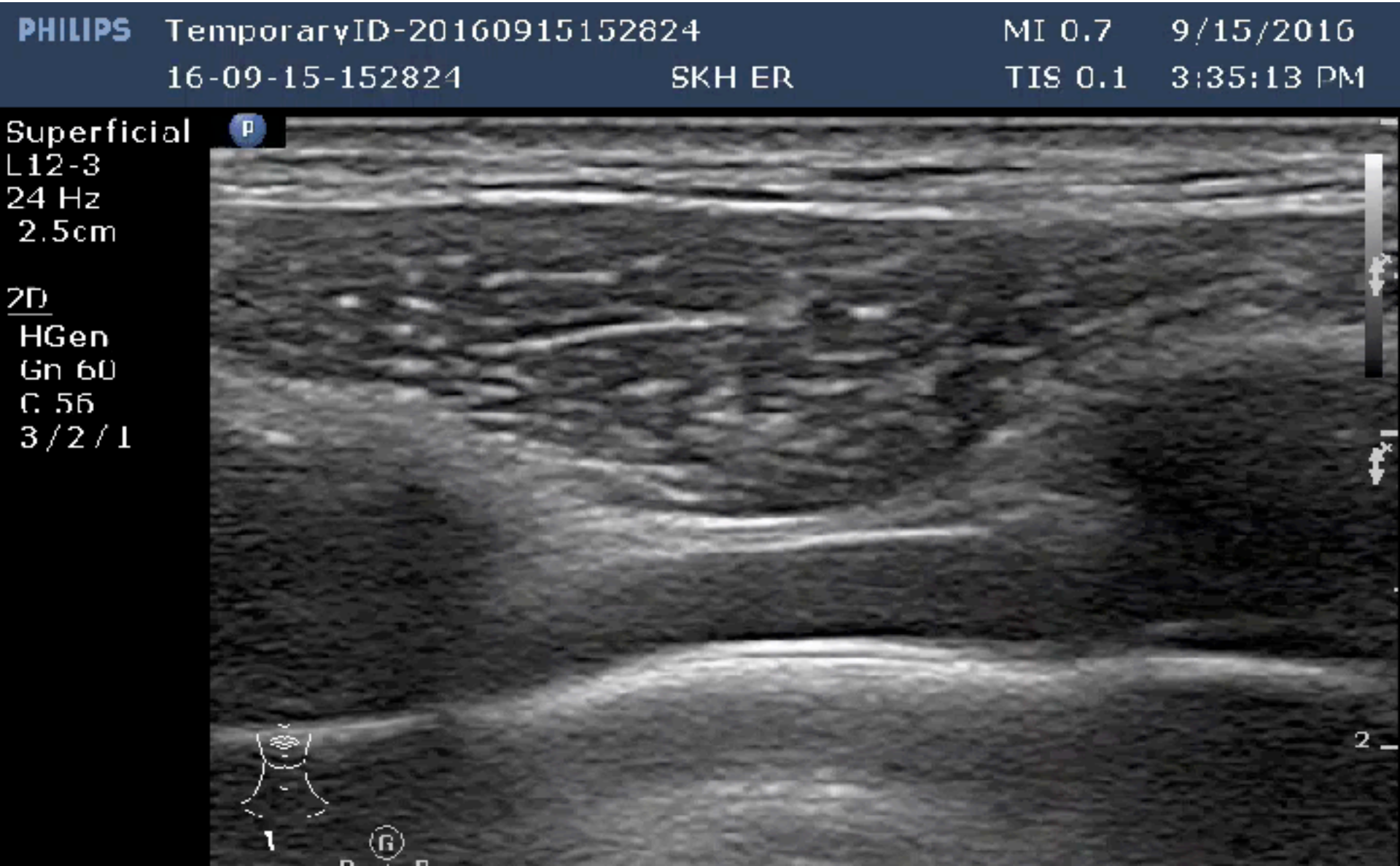
影片中的Artifact為何？成因？

ULTRASOUND PROGRAM

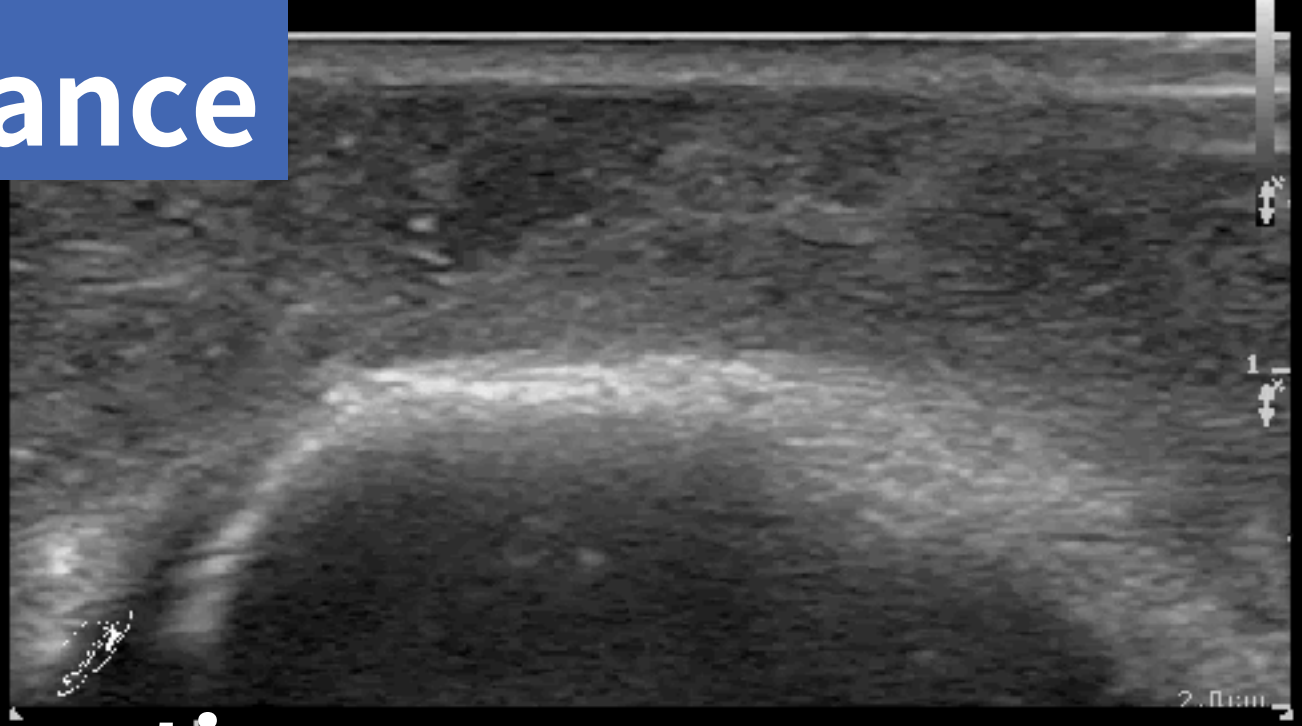
Mirror Image



Mirror image: Int thoracic a.



Impedance

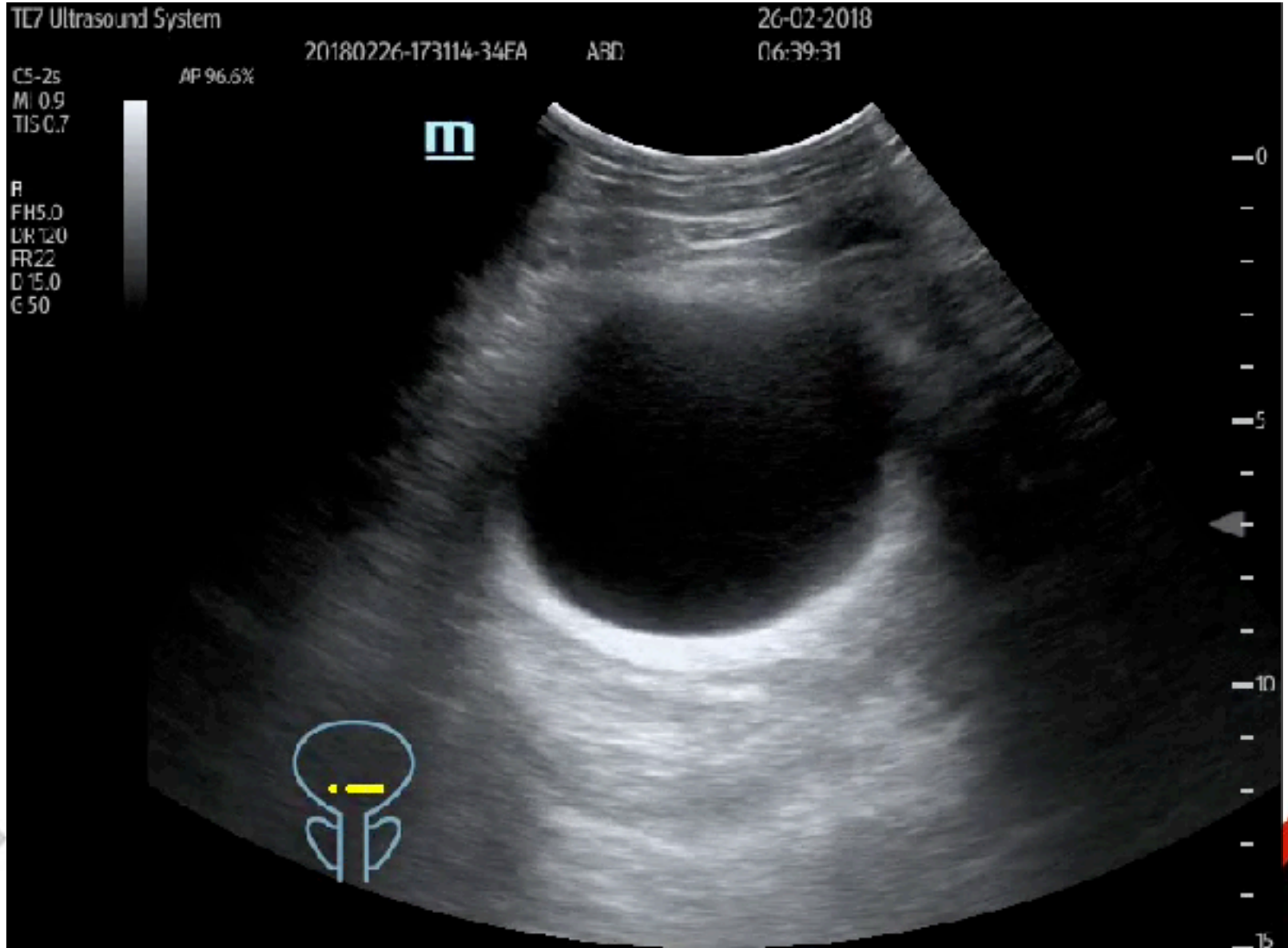


Reverberation
Mirror image

Tissue or Material	Density (g/cm^3)	Speed of Sound (m/s)	Acoustic Impedance (kg/(s m^2)) × 10^6
Air	0.001225	340	0.0004
Fat	0.95	1450	1.38
Blood	1.055	1575	1.66
Liver	1.06	1590	1.69
Bone	1.9	4080	7.75
Metal (e.g., titanium)	4.5	5090	22.9

ULTRASOUND
PROGRAM

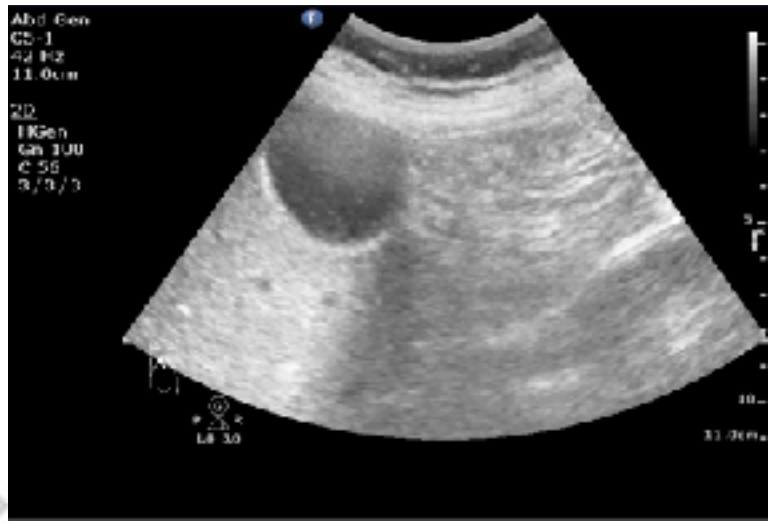
影片中有那兩種artifacts?

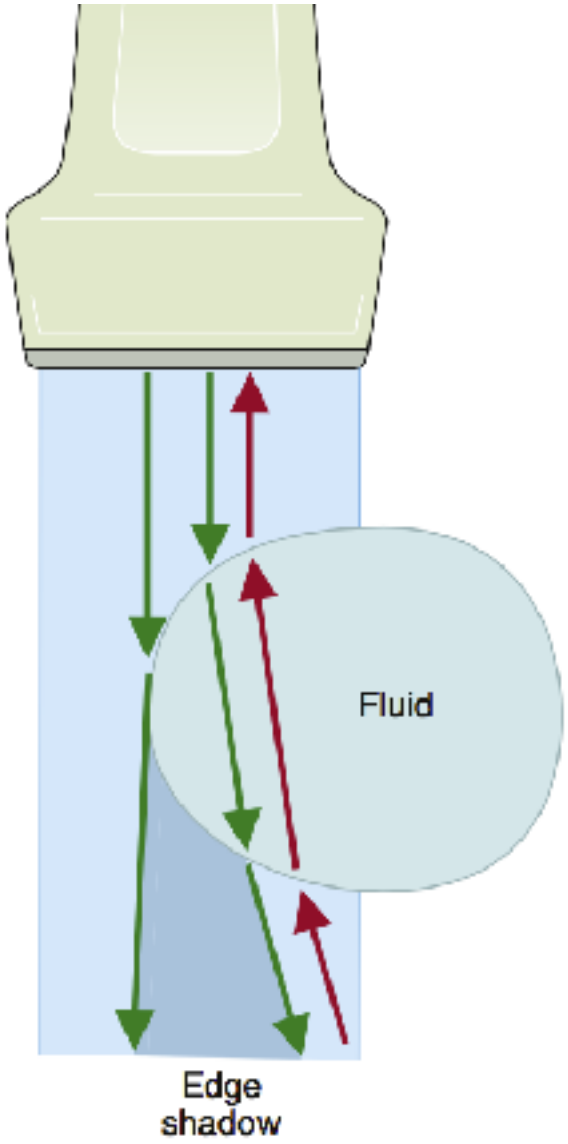


ULTRASOUND
PROGRAM

Edge shadow
Side lobe

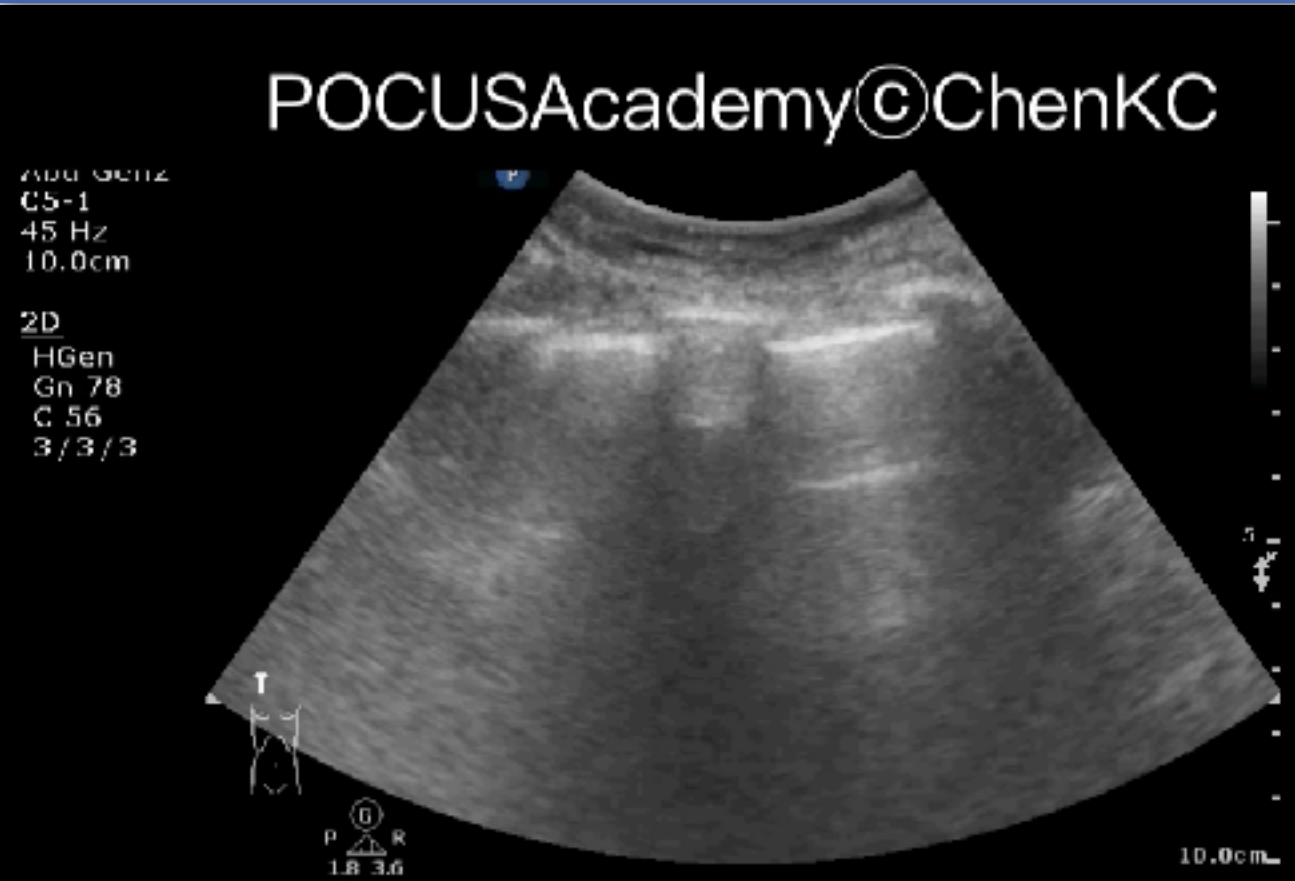
Refraction





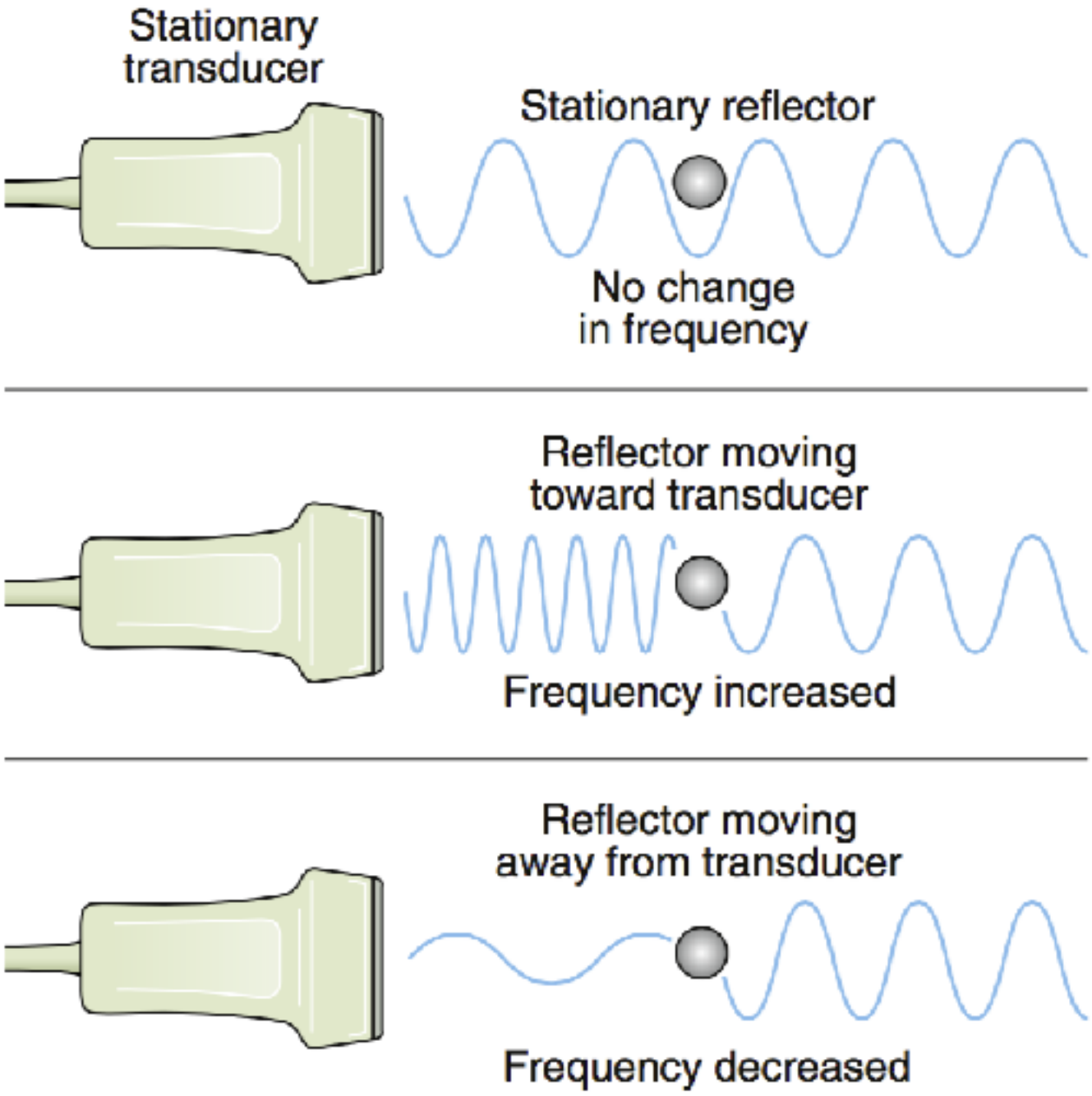
ULTRASOUND PROGRAM

Noise Reduction (THI)

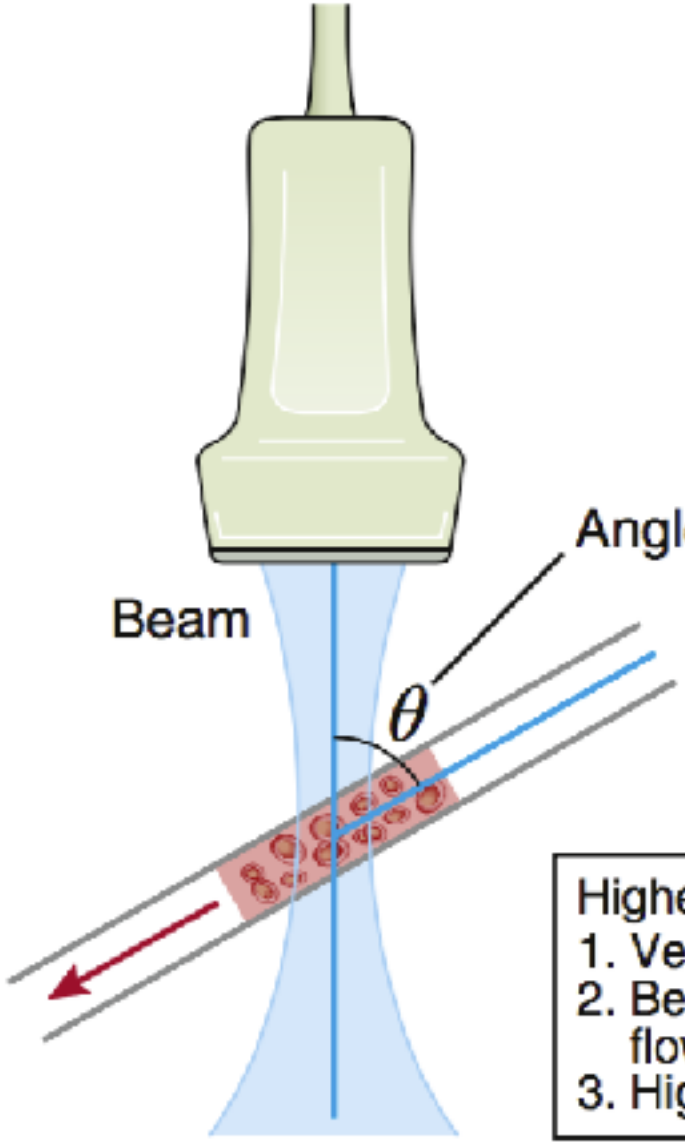


1

ULTRASOUND
PROGRAM

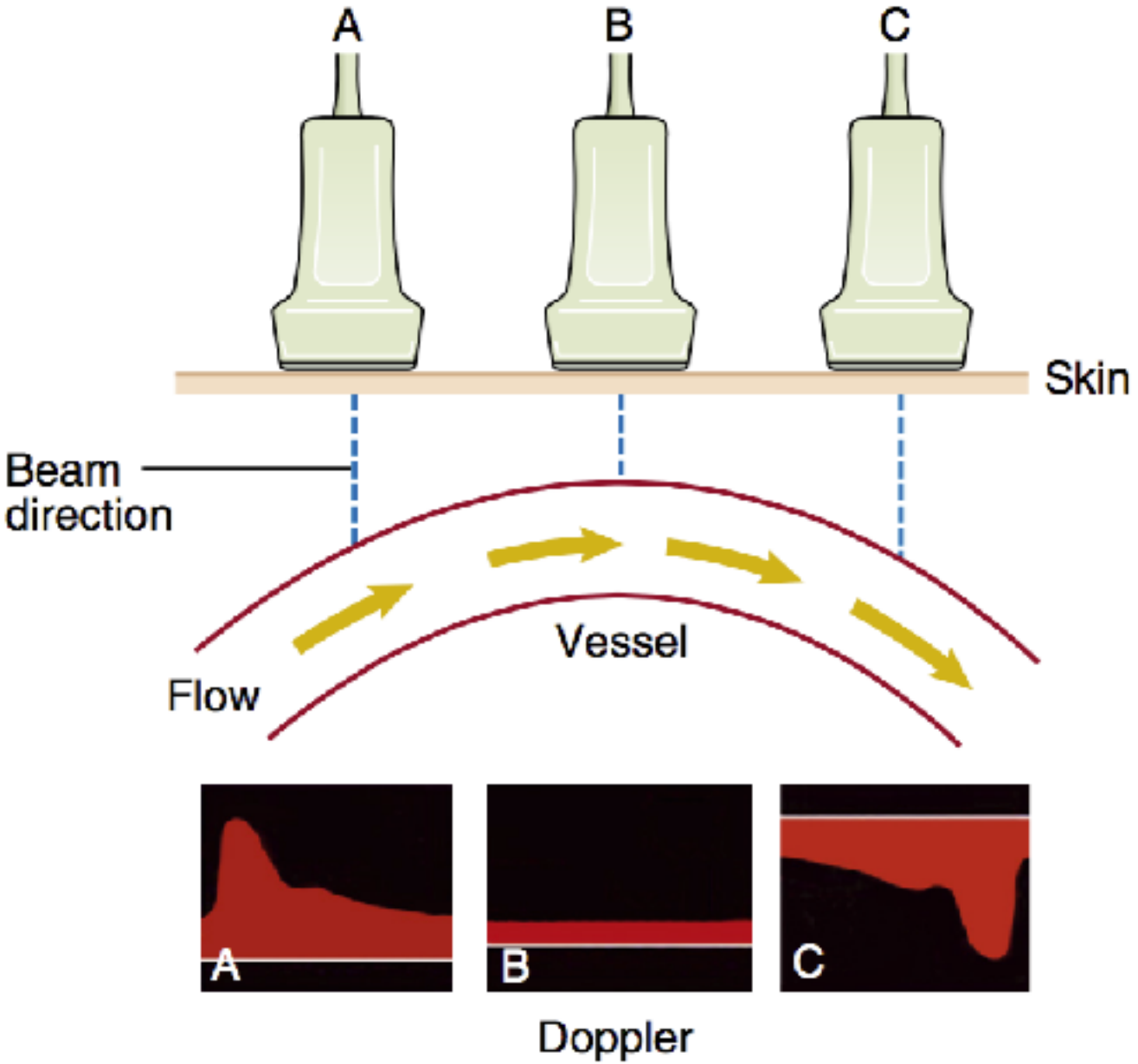


ULTRASOUND
PROGRAM



Higher Doppler frequency obtained if:
1. Velocity is increased
2. Beam is aligned parallel to flow direction
3. Higher frequency is used

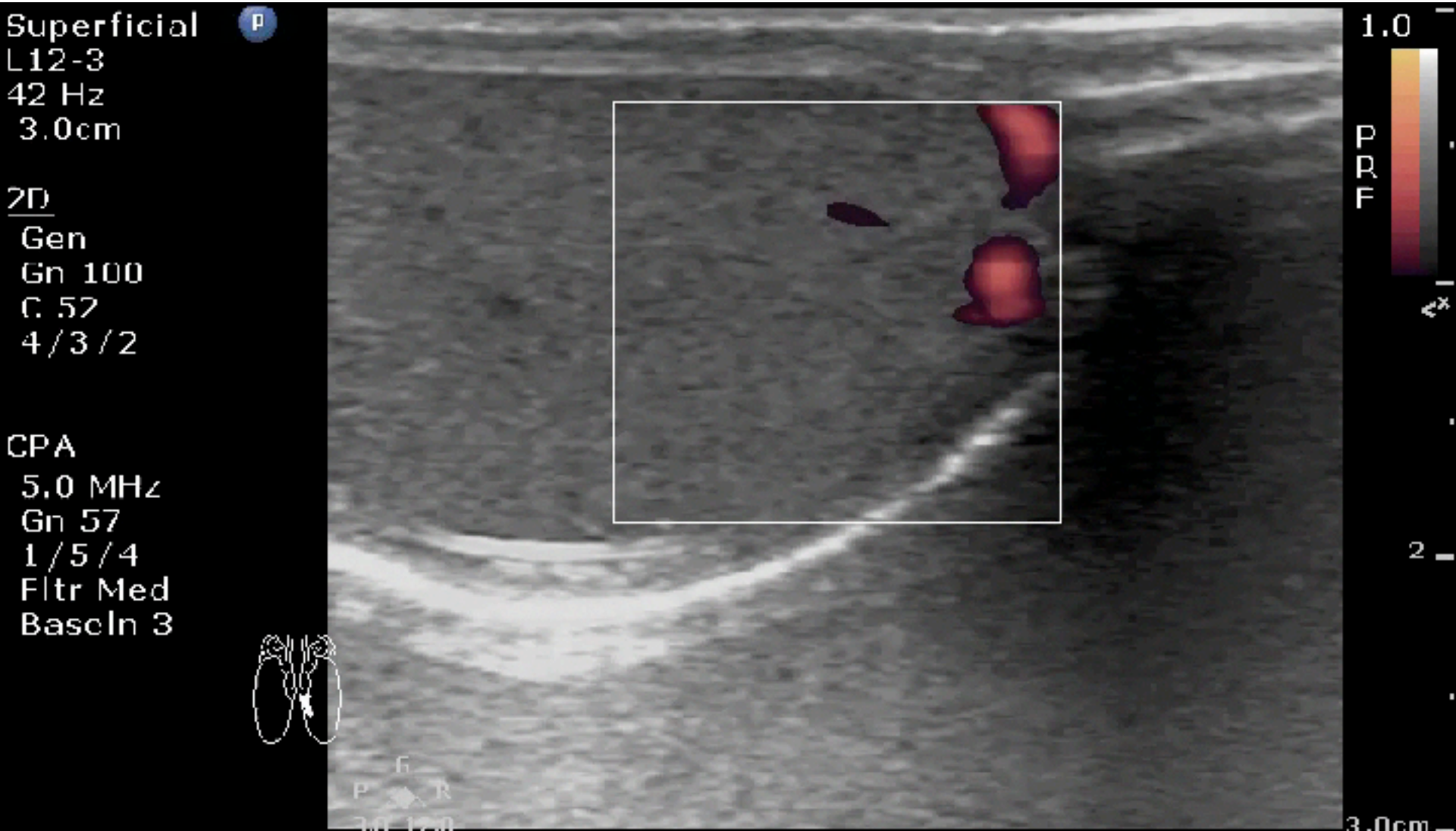
ULTRASOUND
PROGRAM



Tai

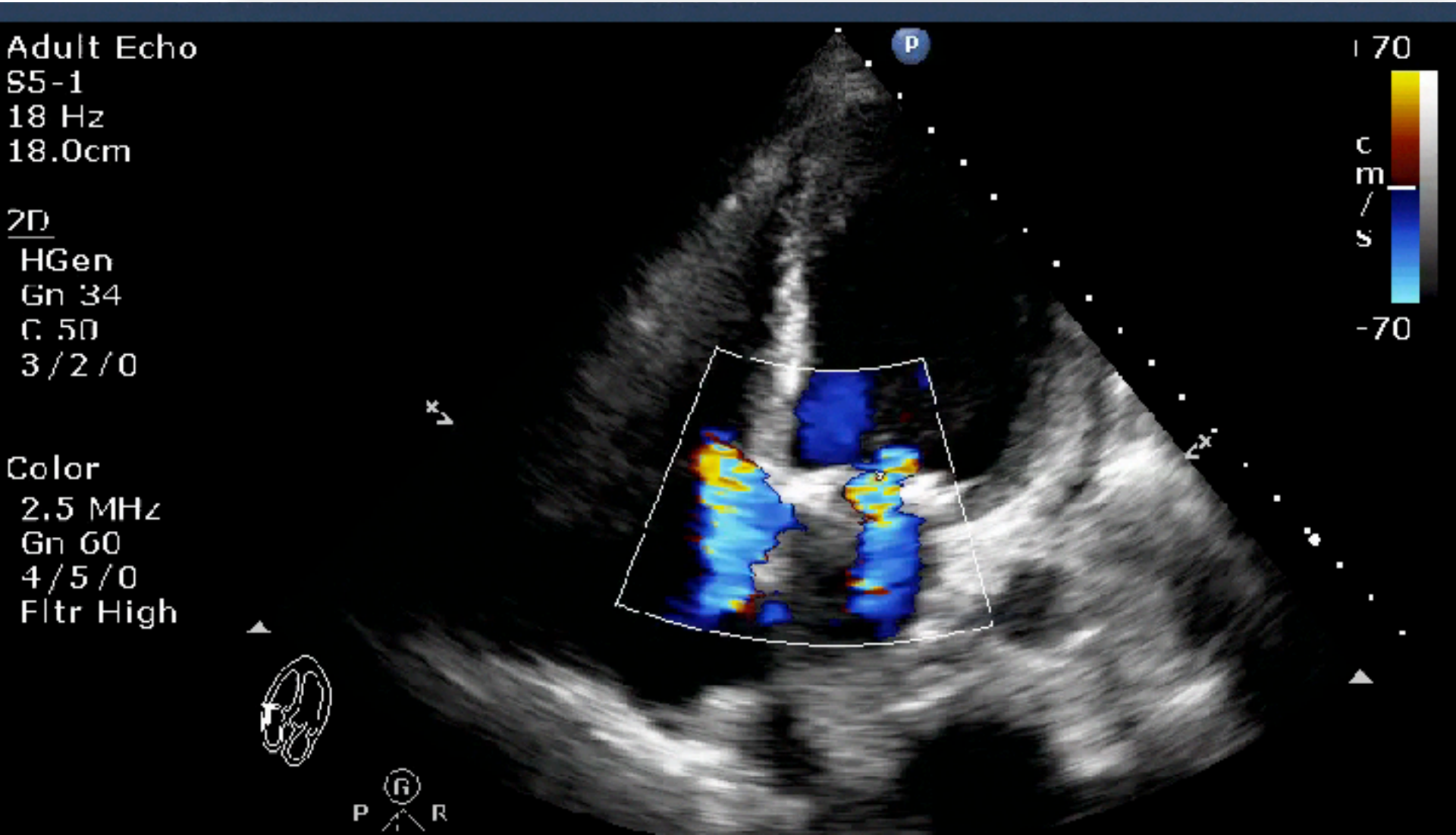
ULTRASOUND PROGRAM

Power Doppler for Low Flow



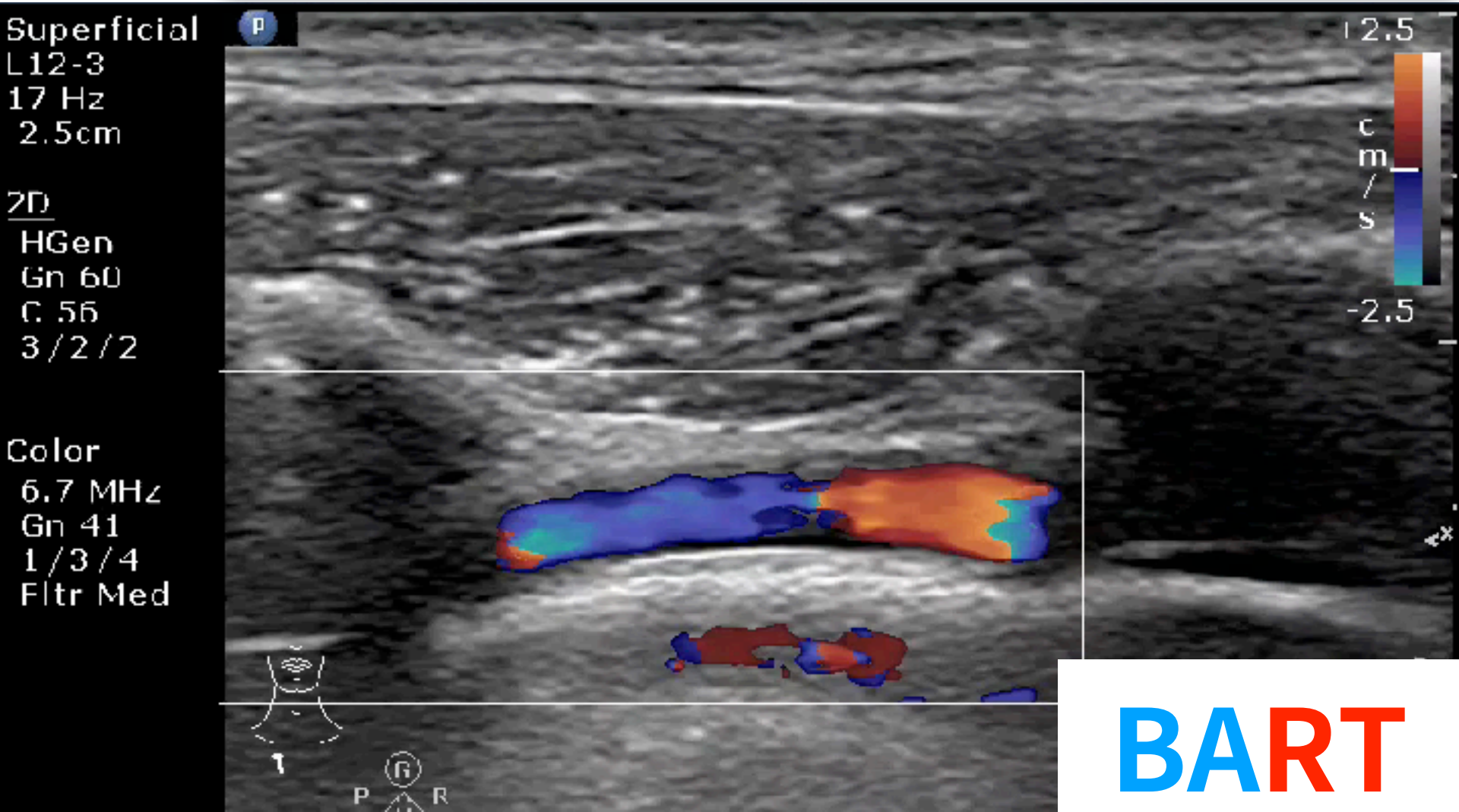
ULTRASOUND PROGRAM

Color Doppler for Directions



ULTRASOUND
PROGRAM

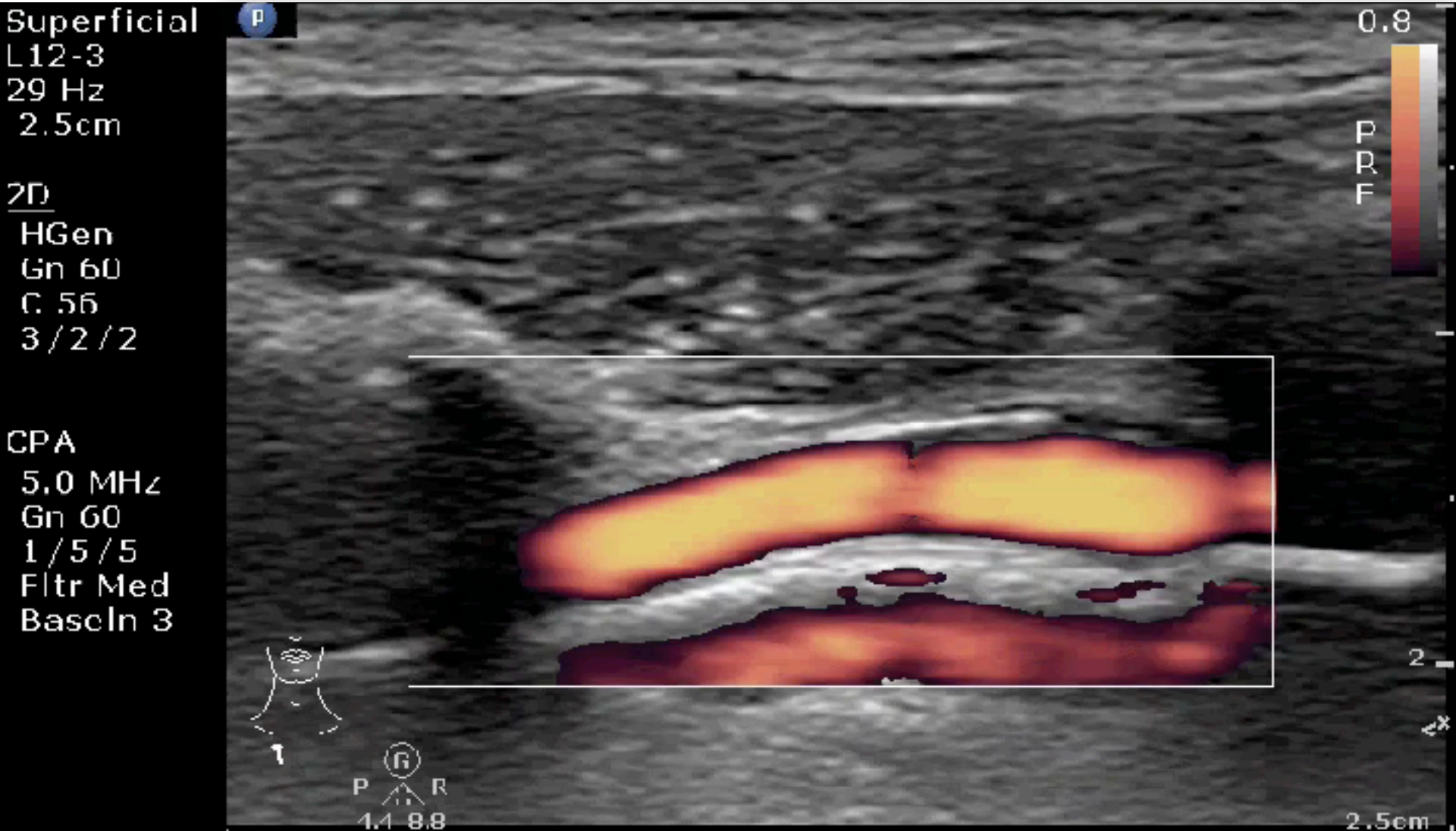
Blue Away Red Toward



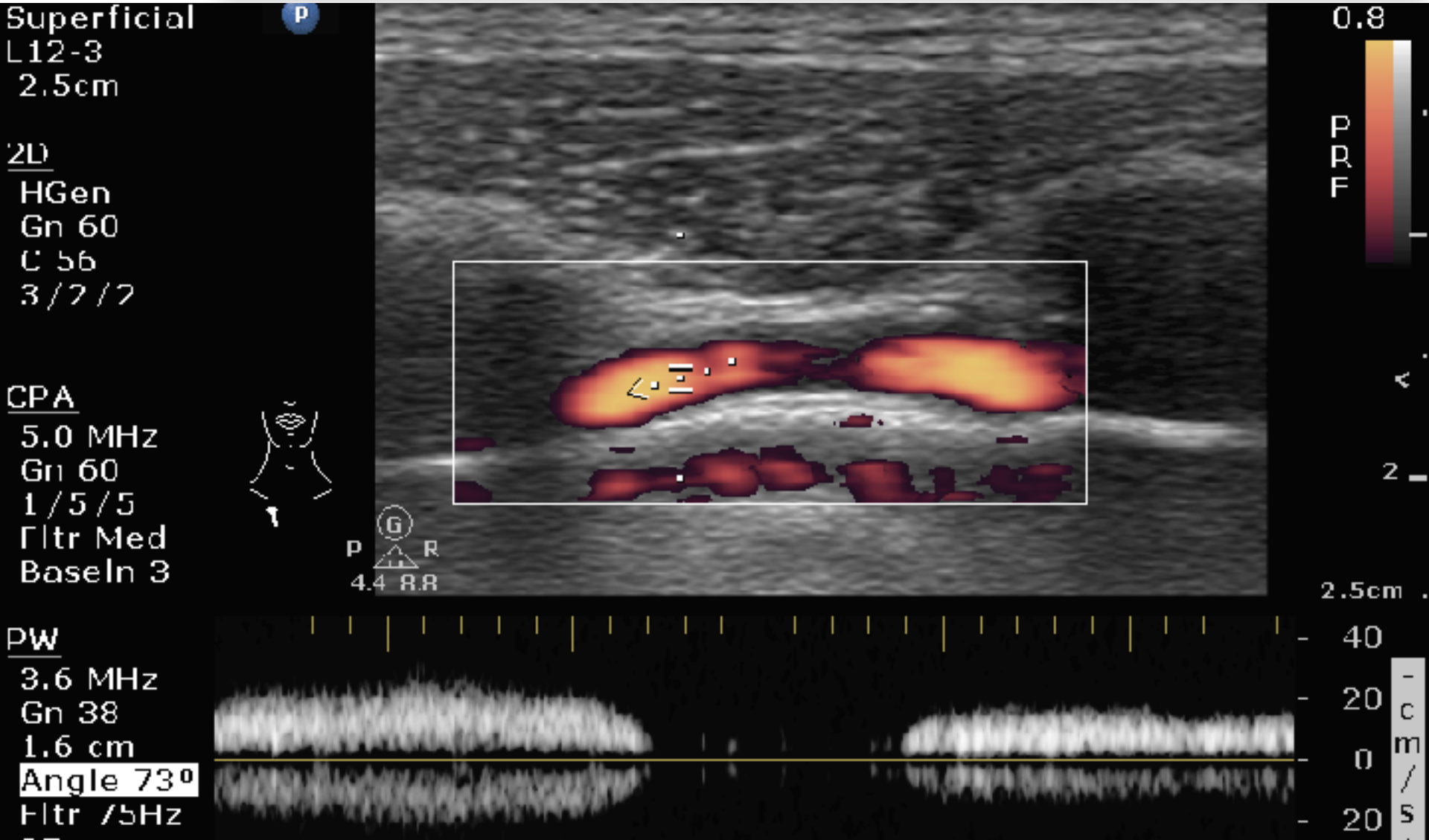
BART

ULTRASOUND
PROGRAM

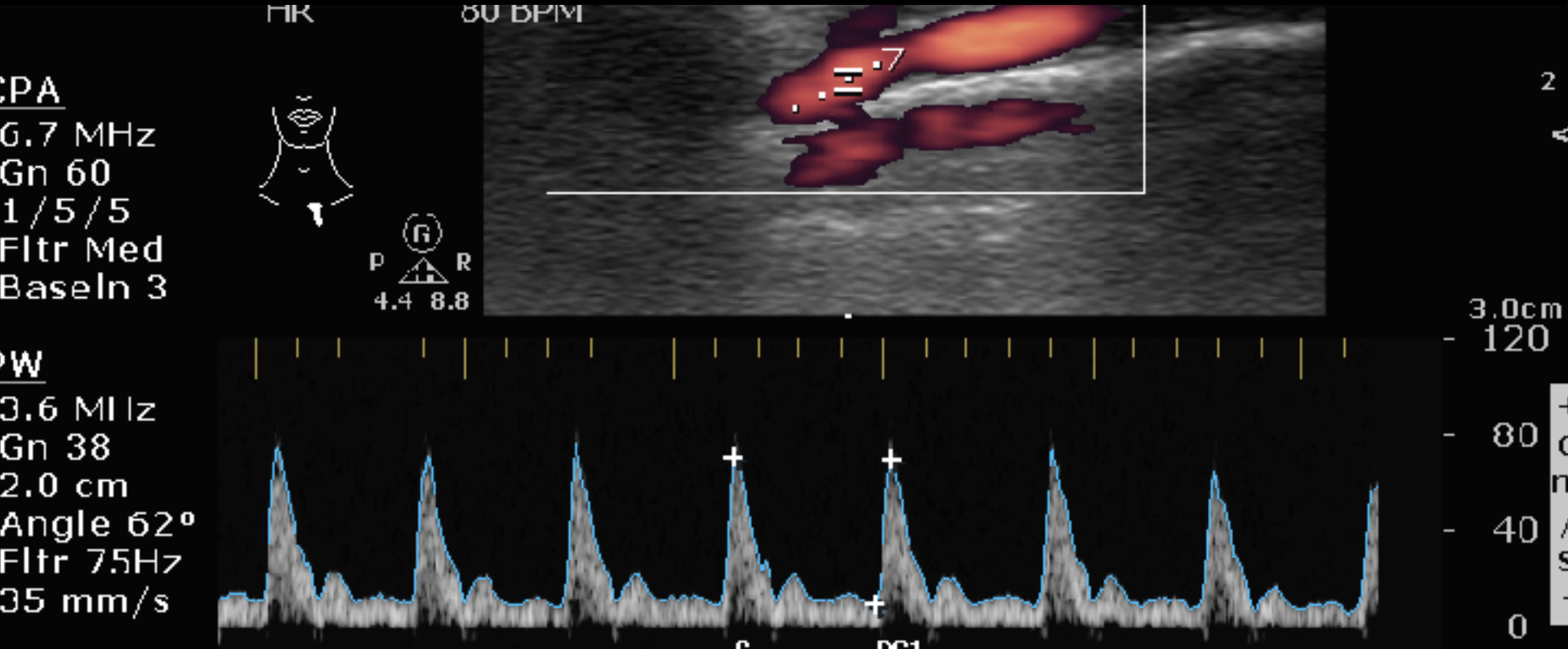
Artery or Vein ?

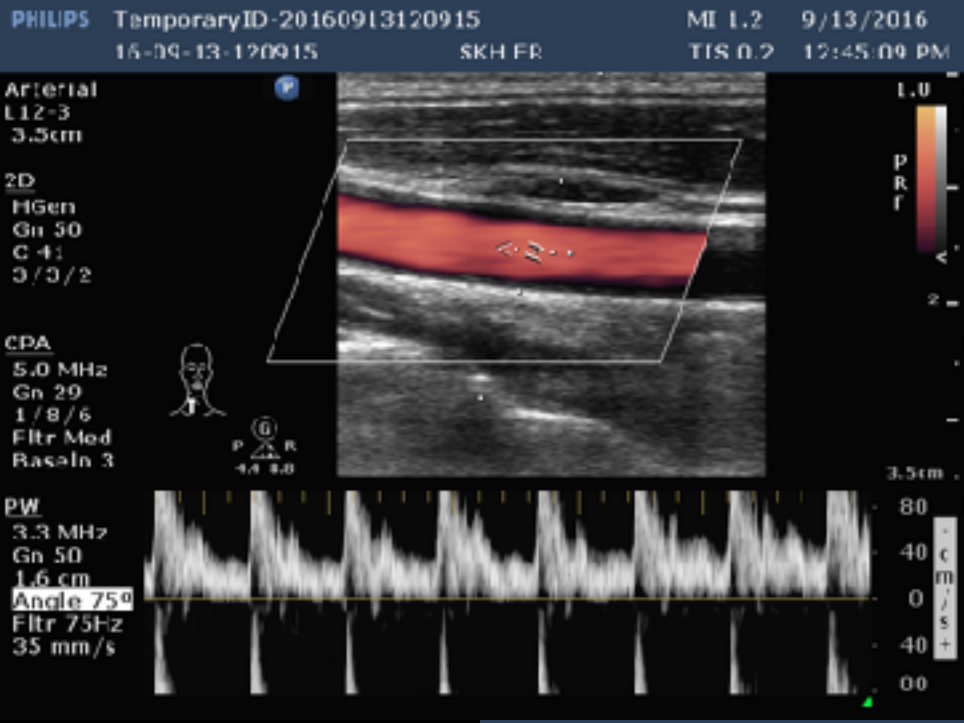


Spectral analysis

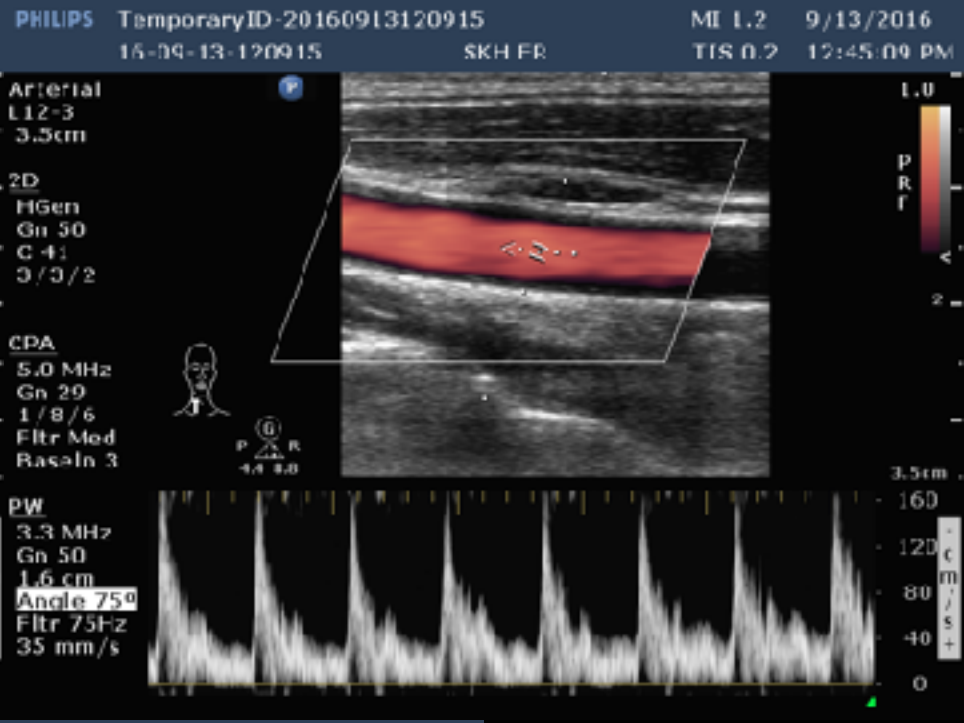



L12-3
28 Hz
3.0cm
2D
HGen
Gn 60
C 56
3/2/2
CPA
6.7 MHz
Gn 60
1/5/5
Fltr Med
Baseln 3
P R
4.4 8.8

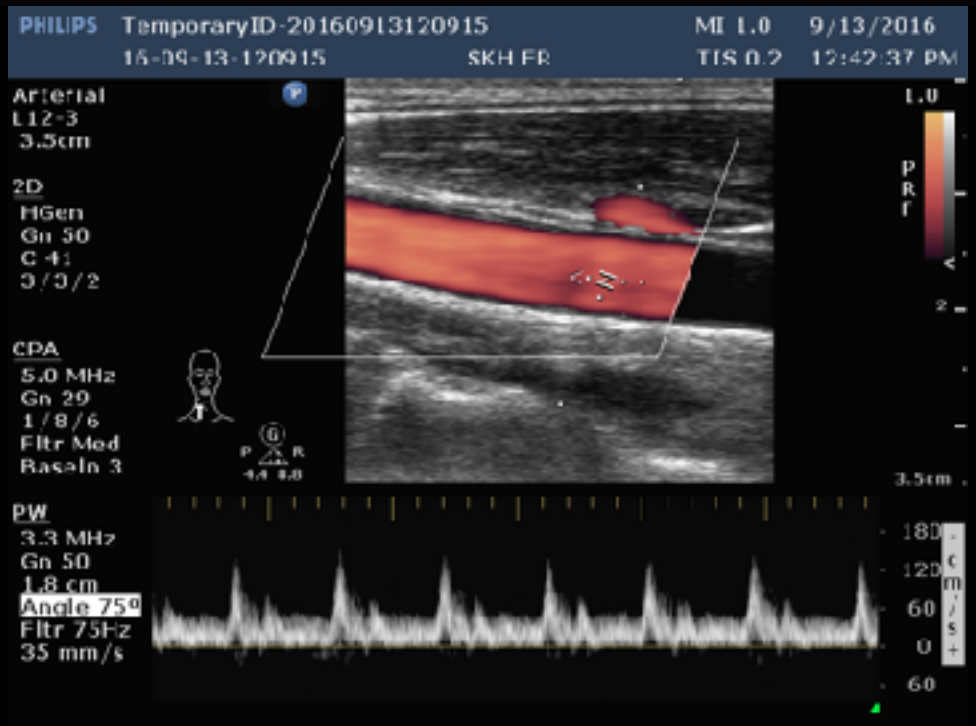

HR
80 BPM
CPA
6.7 MHz
Gn 60
1/5/5
Fltr Med
Baseln 3
P R
4.4 8.8
PW
3.6 MHz
Gn 38
2.0 cm
Angle 62°
Fltr 75Hz
35 mm/s
3.0cm
120
80
40
0



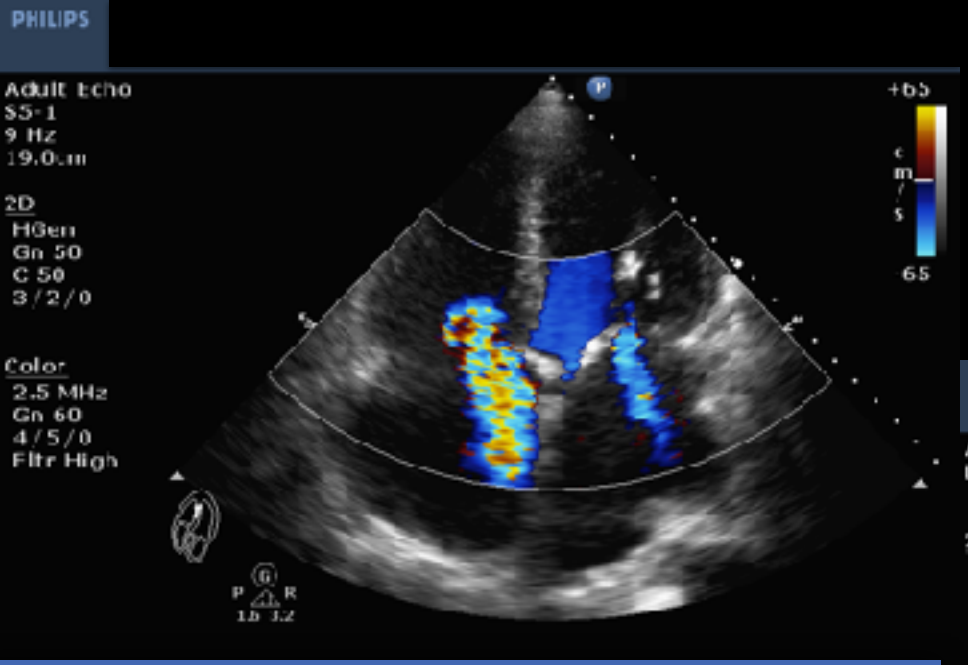
Aliasing



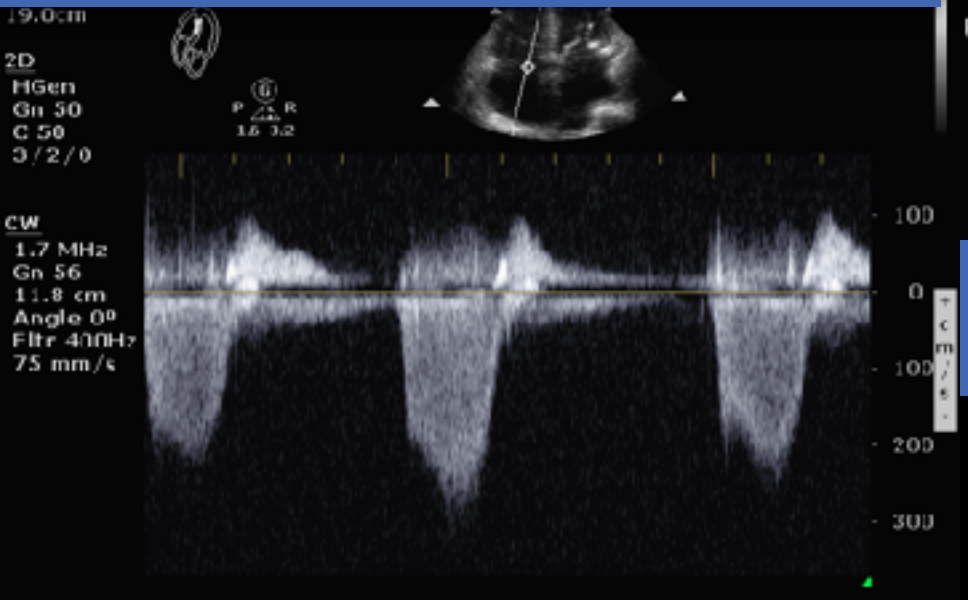
Scale

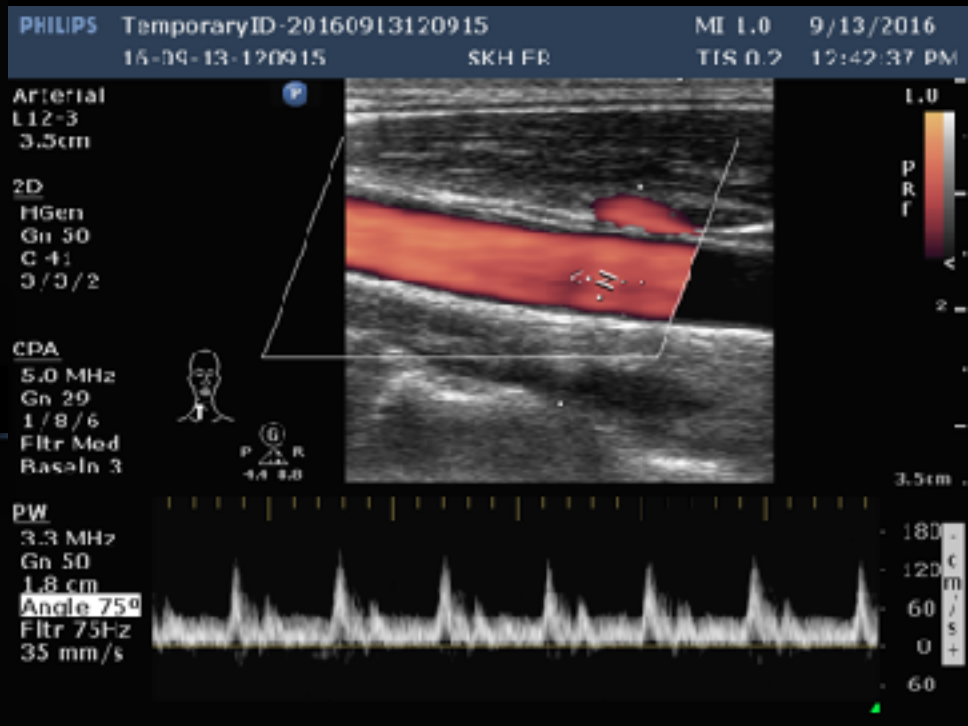


Baseline



Continuous-Wave



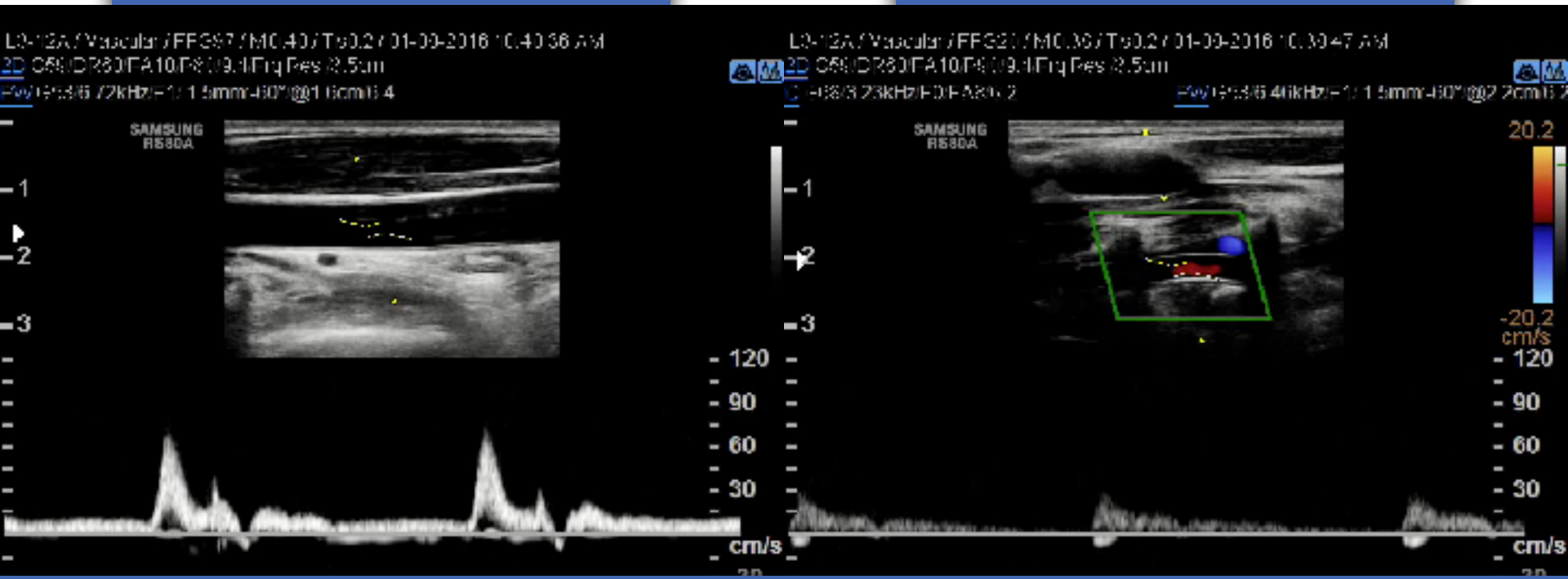


Pulsed-Wave

ULTRASOUND PROGRAM

CCA

VA

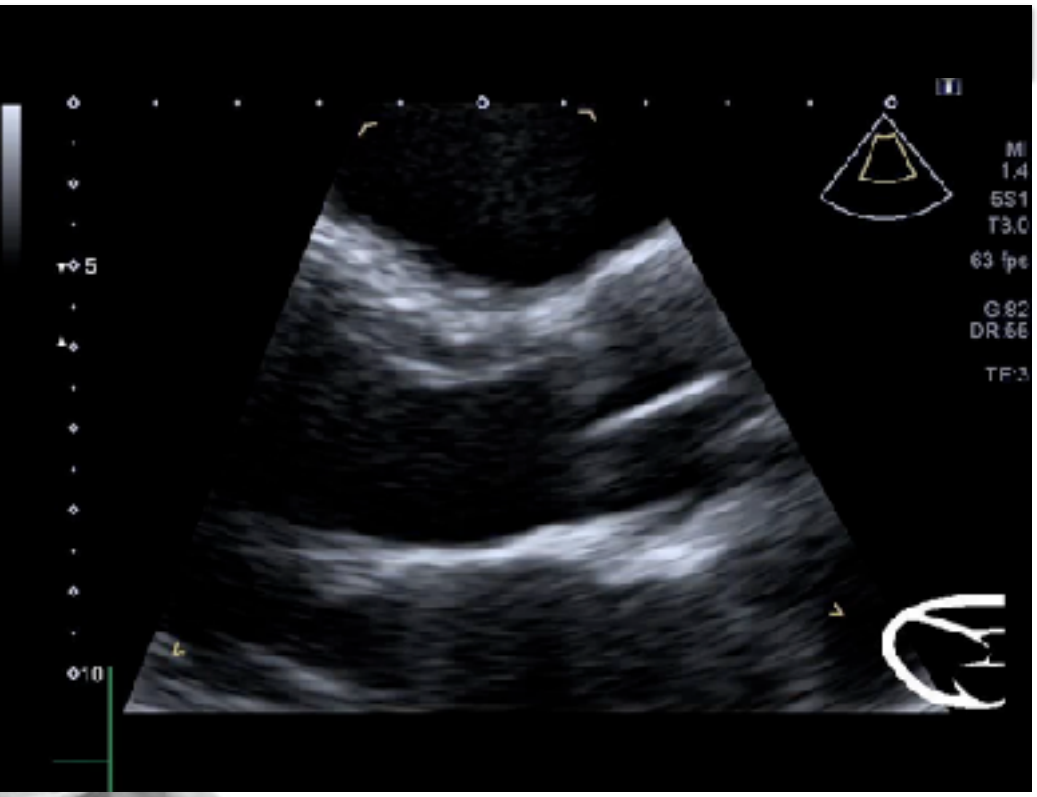


Duplex

B mode & Doppler spectral display

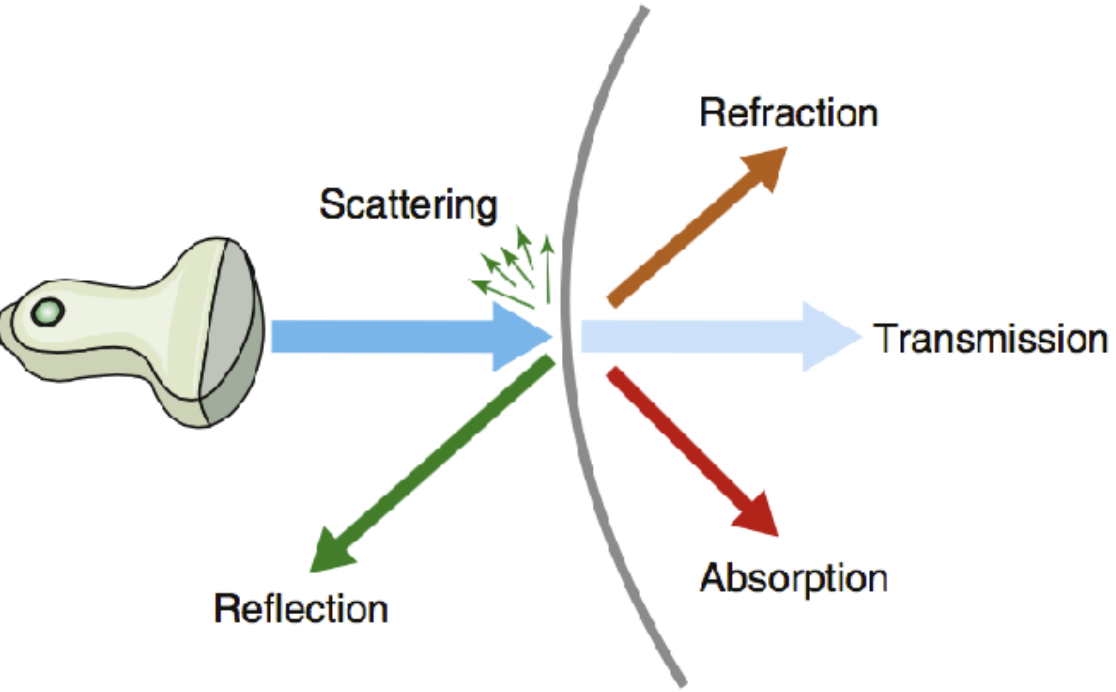
ULTRASOUND
PROGRAM

Zoom



ULTRASOUND PROGRAM

Physics



Resolution
Attenuation
Impedance
Refraction
Doppler

Scattering

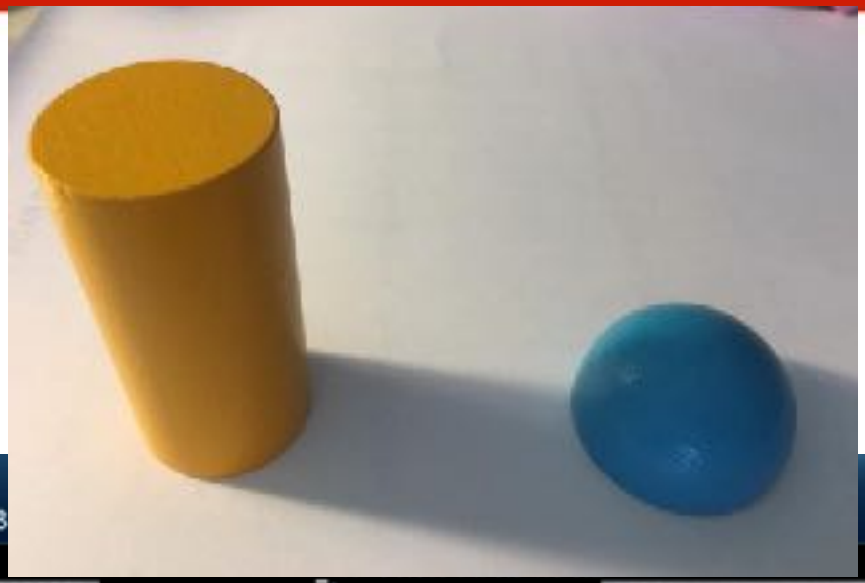
ULTRASOUND

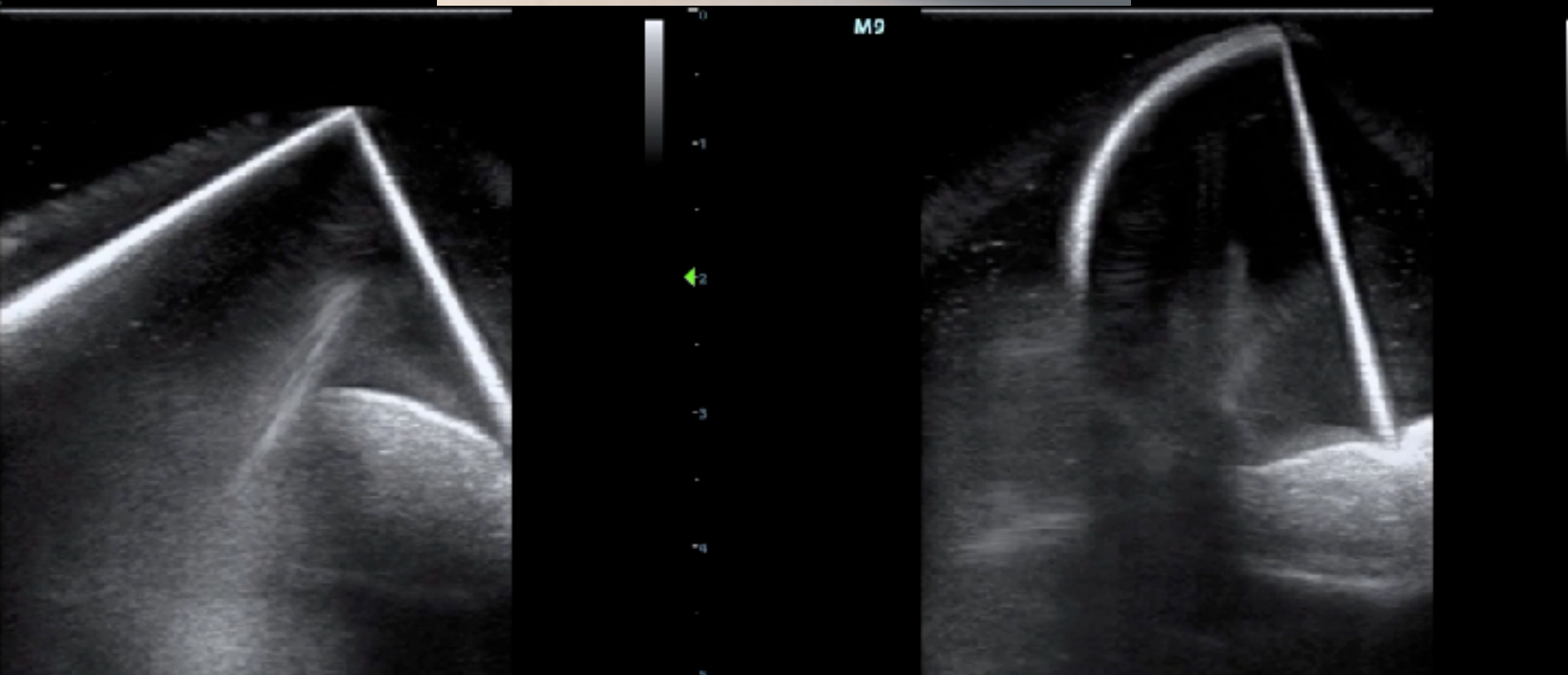
Water Bath

ULTRASOUND

Water Bath

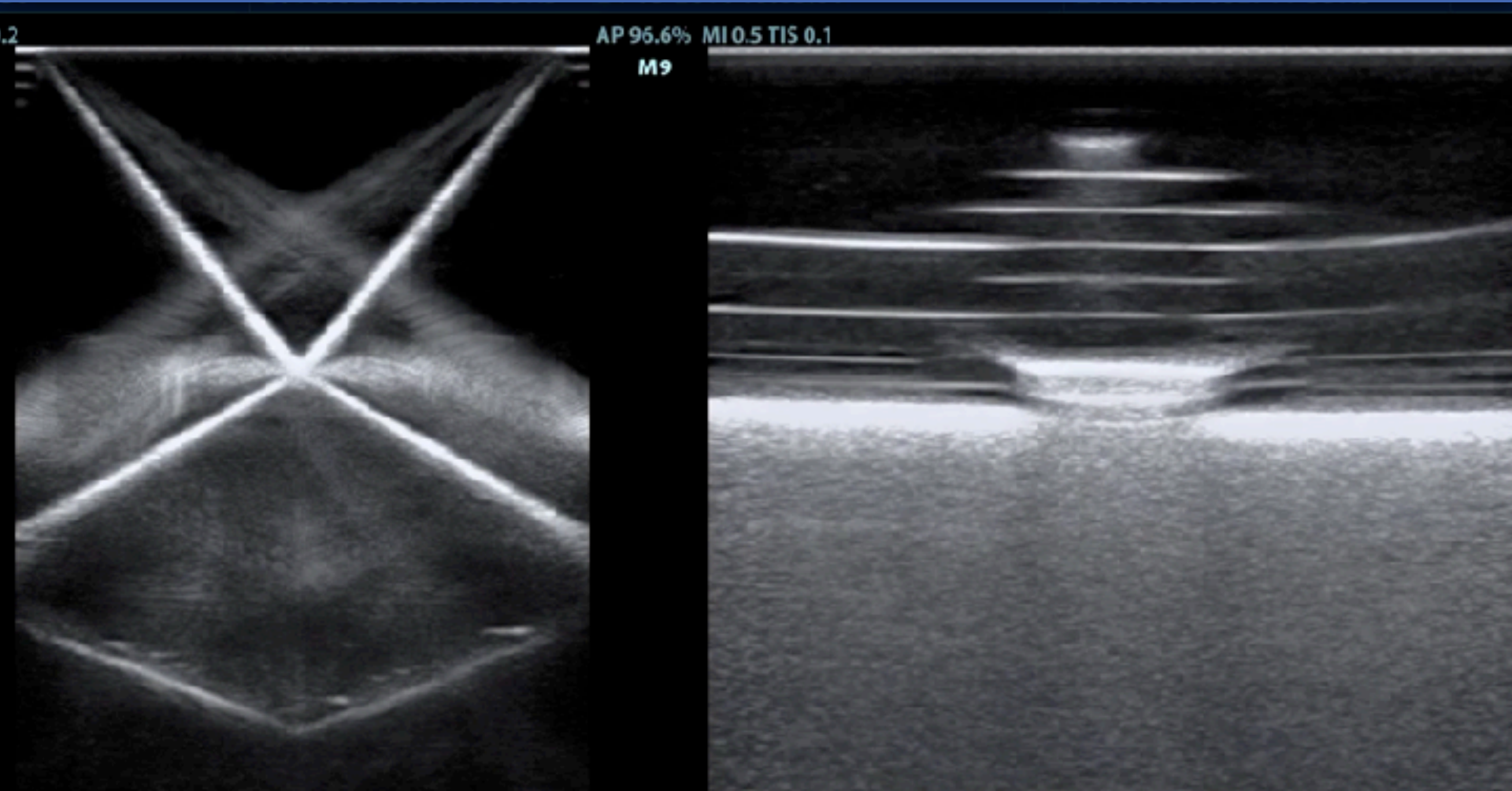
ULTRASOUND
PROGRAM



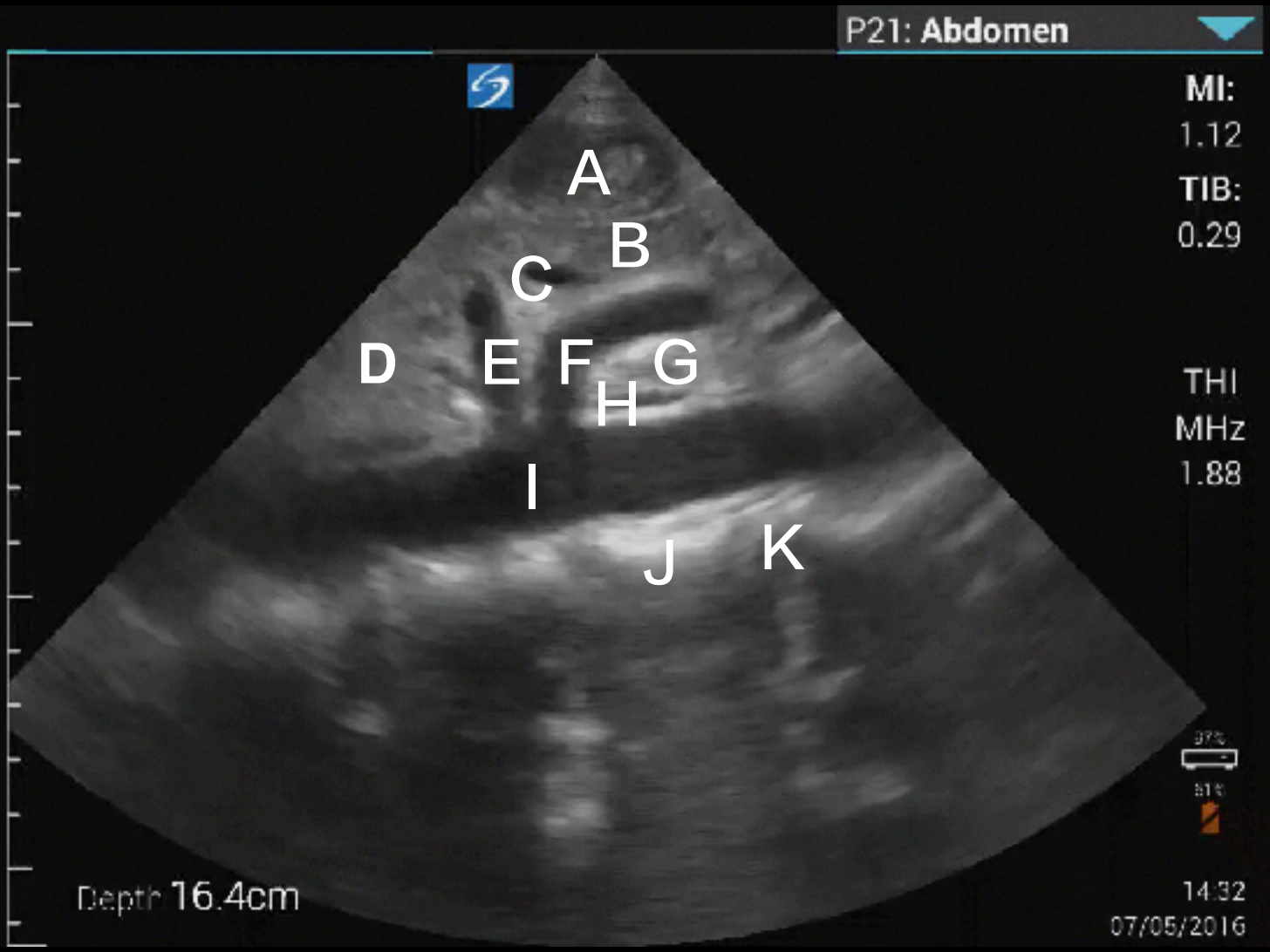


ULTRASOUND

Water Bath



Name the structures ?



THE VISUALIST