



雙和急診POCUS訓練

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急診超音波臨床評核醫師
醫用超音波學會指導醫師
WINFOCUS director / instructor
Certified Interventional Pain Sonologist

急診 / 重症 / 介入 / 急性疼痛

經歷

新光急診超音波訓練中心主任
西園醫院急診醫學科主任
急診醫學會超音波委員會主委
台灣疼痛醫學會大體模擬手術講師
急救加護醫學會重症超音波負責人

EFAST



Resuscitative
急救復甦

Diagnostic
臨床診斷

Procedural
Guidance
處置導引

Symptom- or
Sign-Based
症狀導引

Therapeutic
輔助治療



Core Applications (2023 ACEP Emergency Ultrasound Guidelines)
15項急診超音波核心應用

陳國智醫師

Aorta

DVT

Trauma

Thoracic/Airway

Cardia/HD assessment

Procedural Guidance

US-guided NB

Testicular

Ocular

Skin & Soft tissue

Hepatobiliary

Urinary tract

Pregnancy

Bowel

MSK



Success rates ↑

Mechanical complications ↓

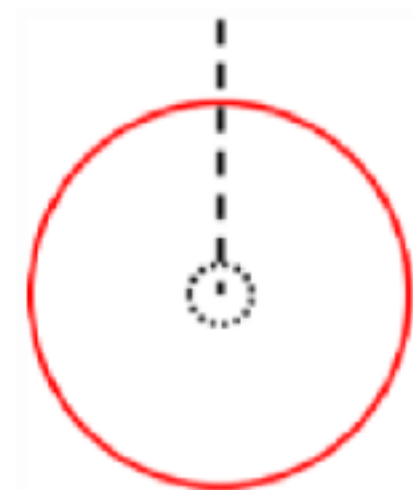
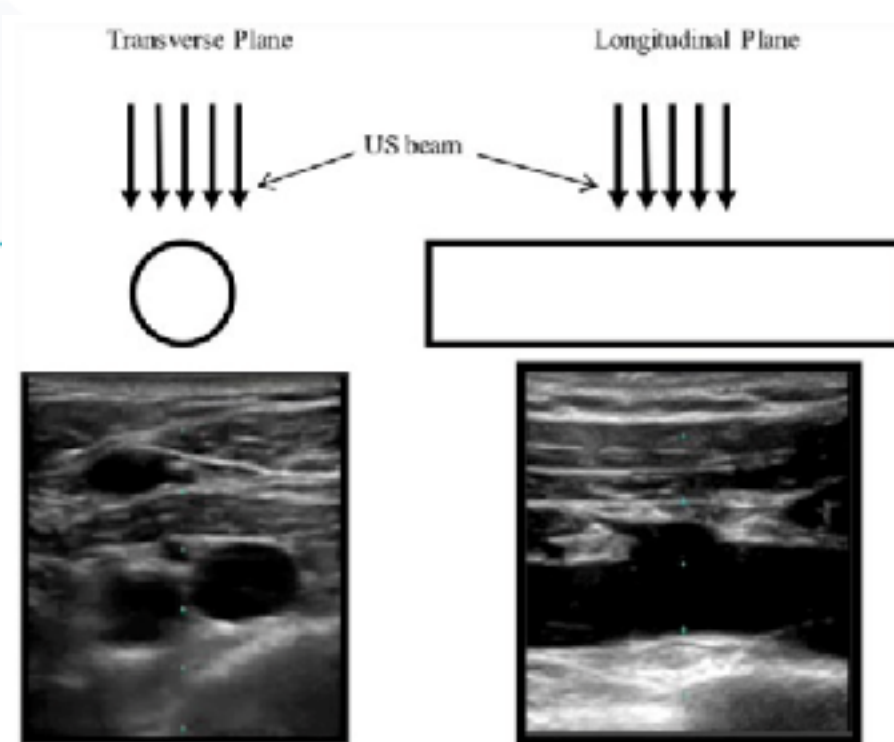
Safe ↑

Risk ↓

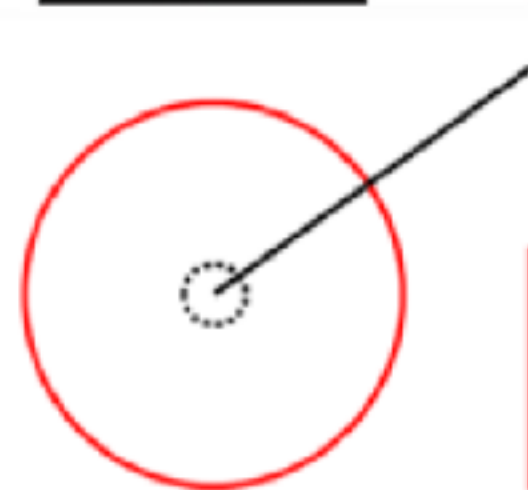
Time ↓

Cochrane 2011. US for **HD catheters**
Cochrane 2015. US v.s. landmarks for **IJVC**
2015 ELSO guideline

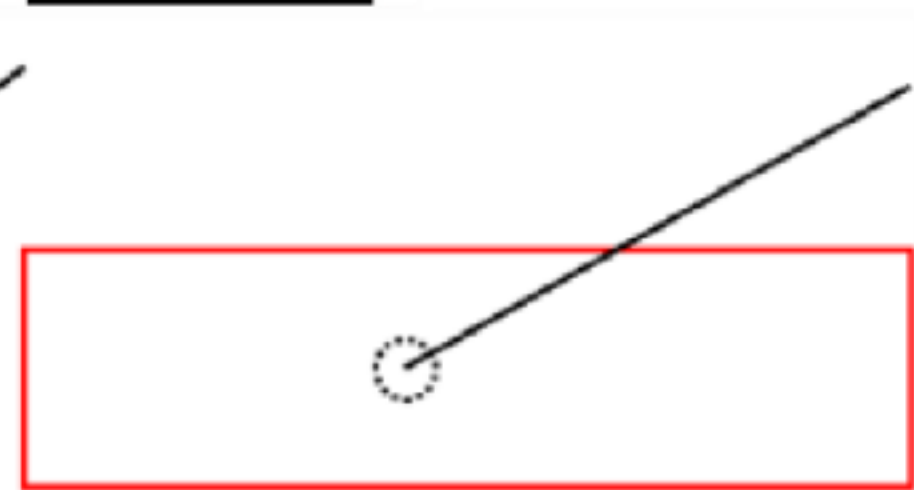




T-OOP



T-IP

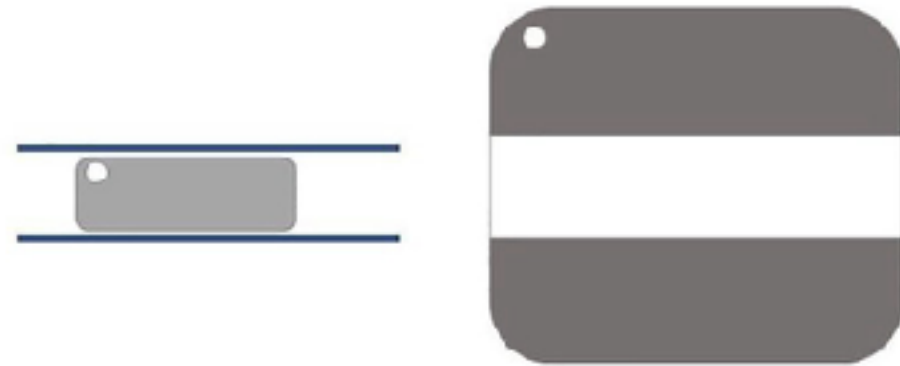


L-IP

SA - LA - OA view



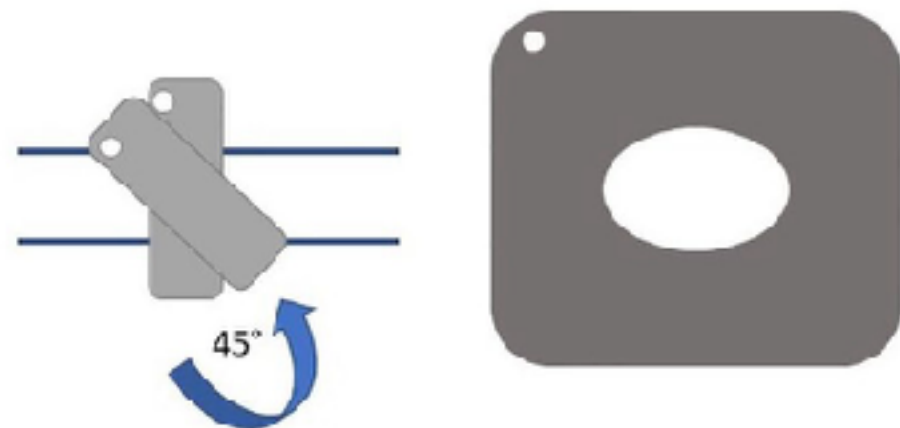
a) SA view



b) LA view

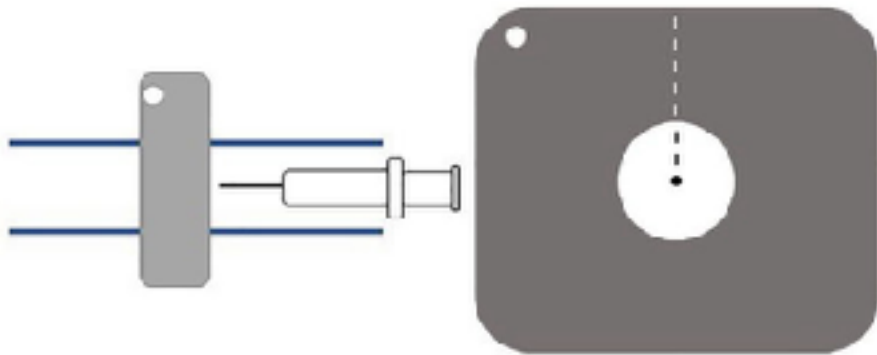


a) SA view

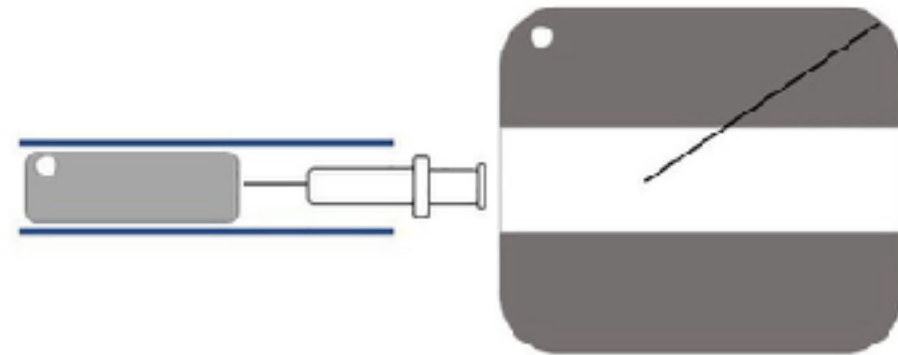


b) OA view

US guided cannulation



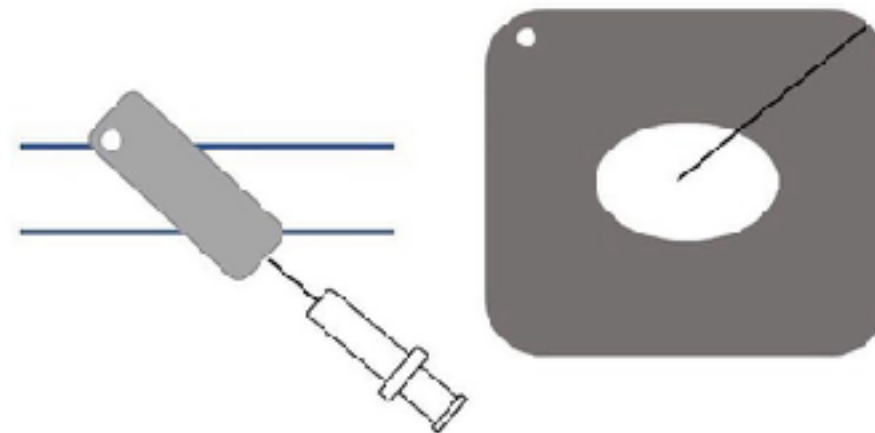
Short axis + out-of-plane technique - SA-OP



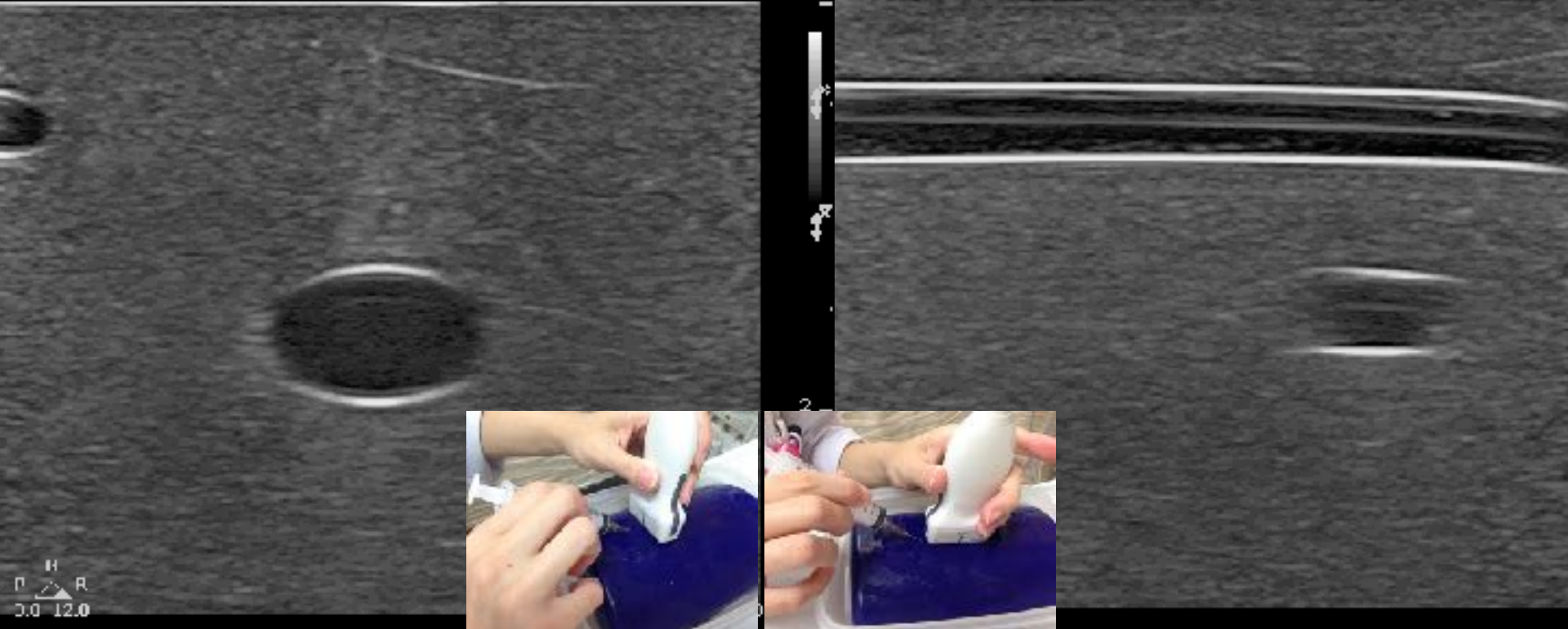
Long axis + in-plane technique - LA-IP



Short axis + in-plane technique - SA-IP



Oblique axis + in-plane technique - OA-IP



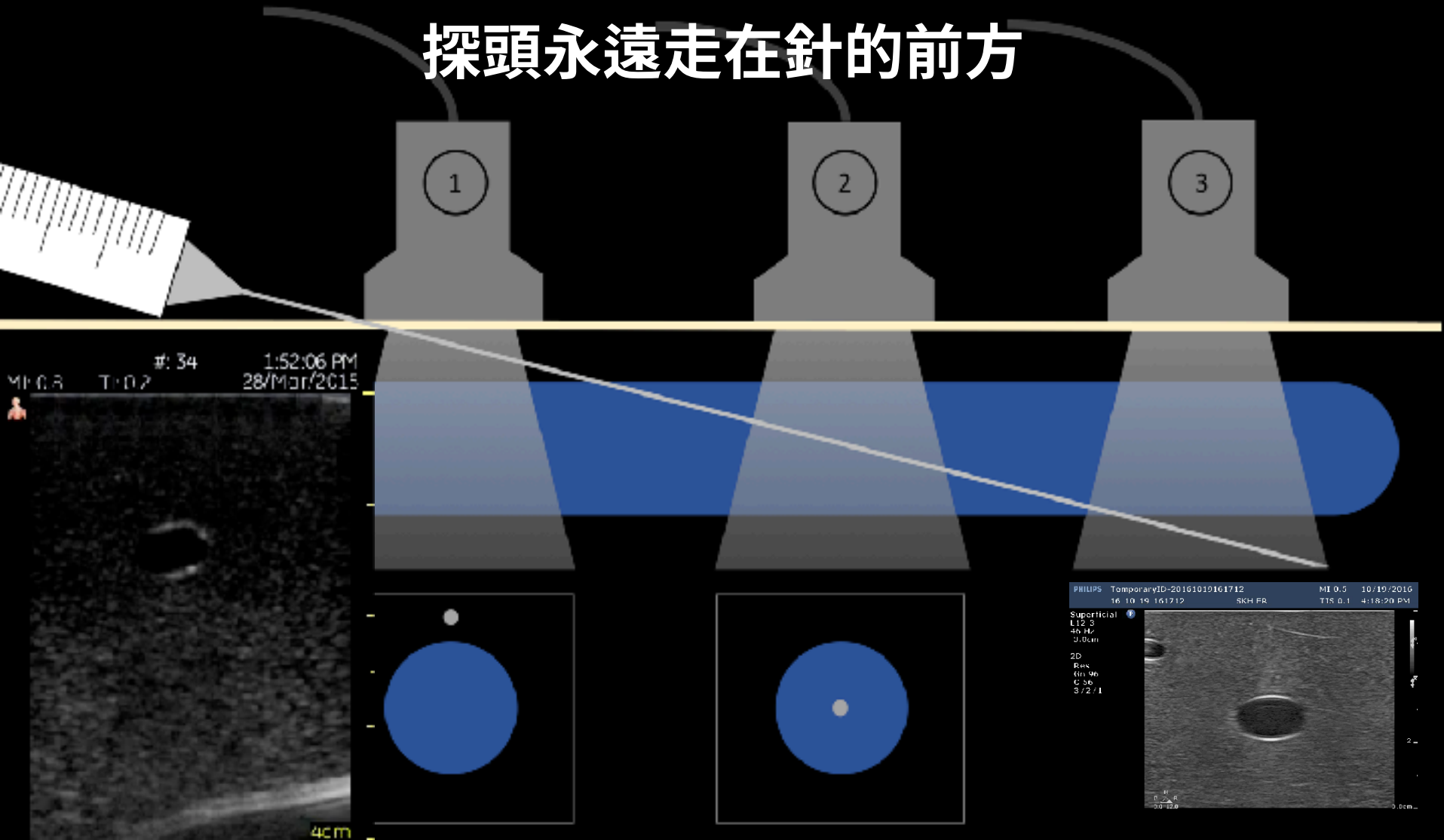
MASTER NEEDLING (基本功)

Off-plane

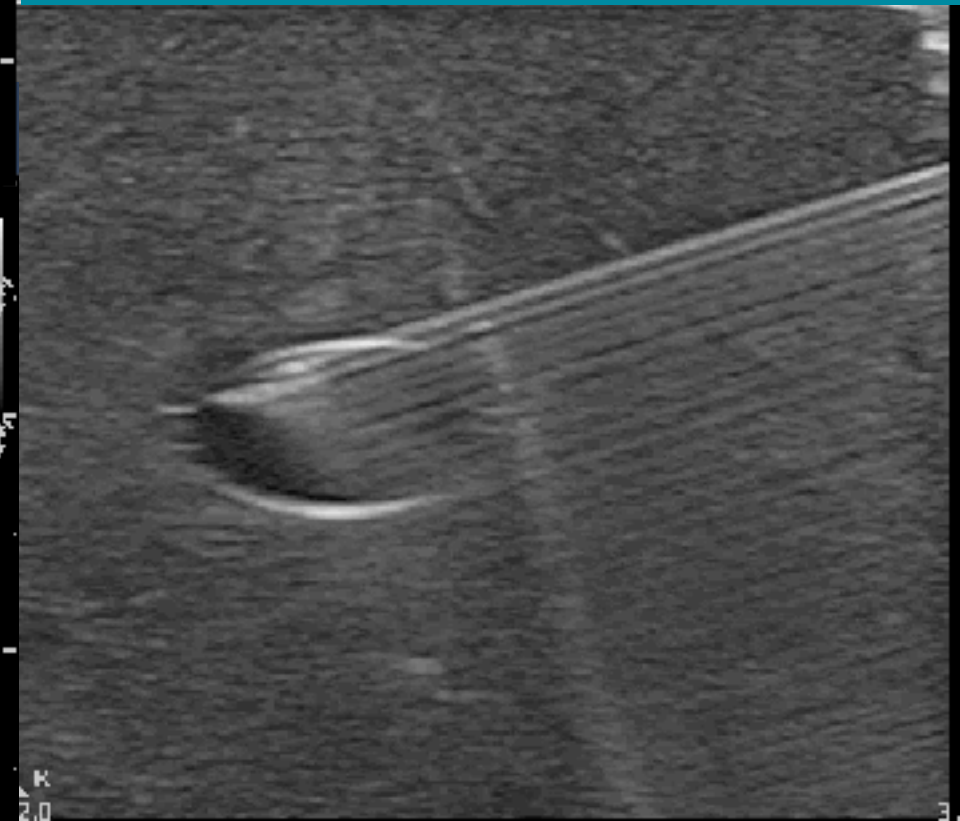
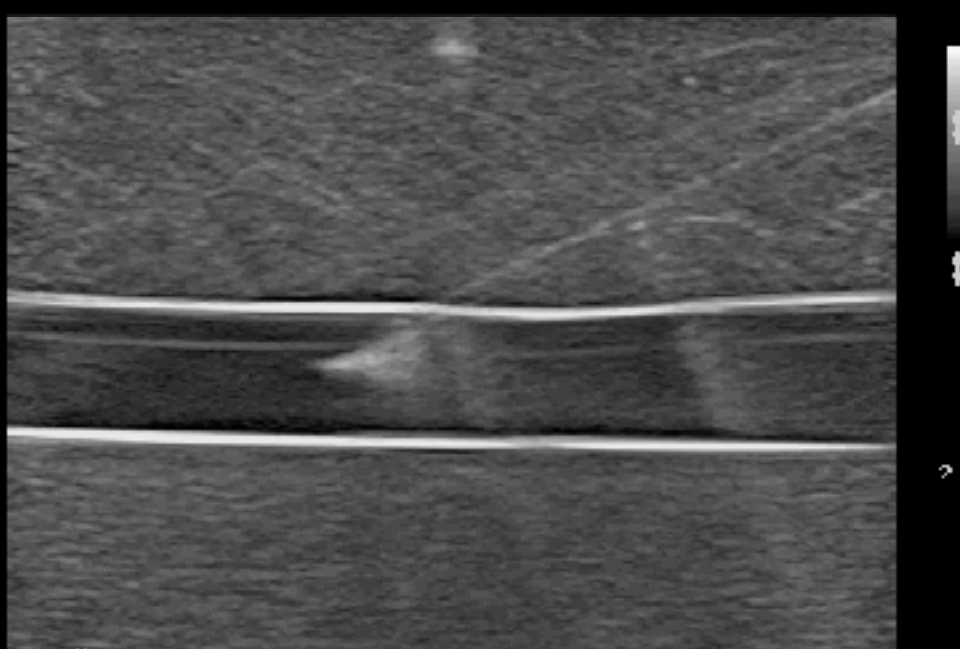
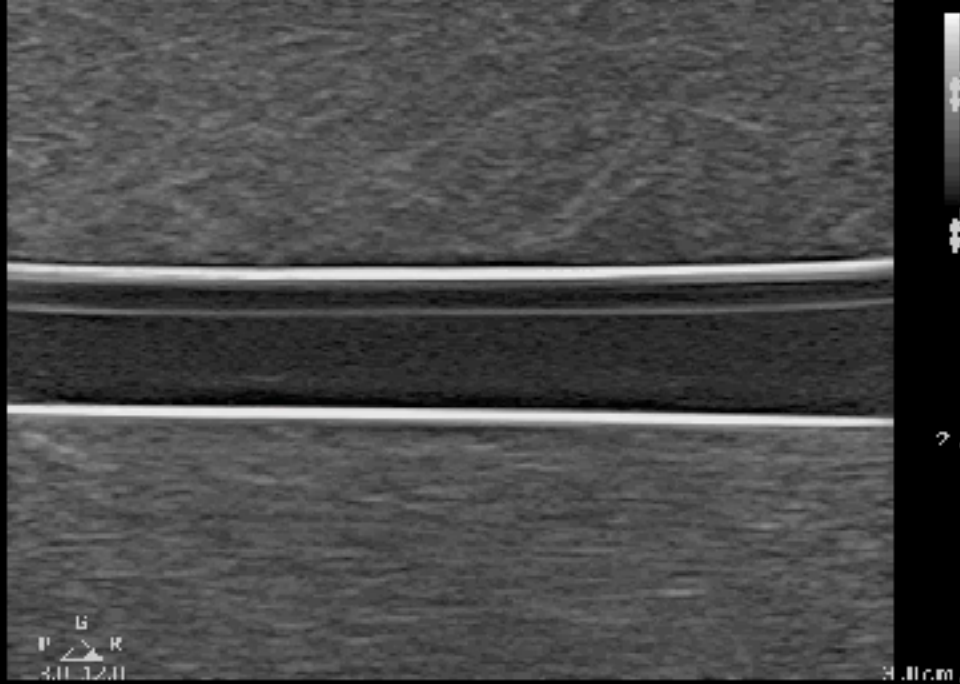
In-plane

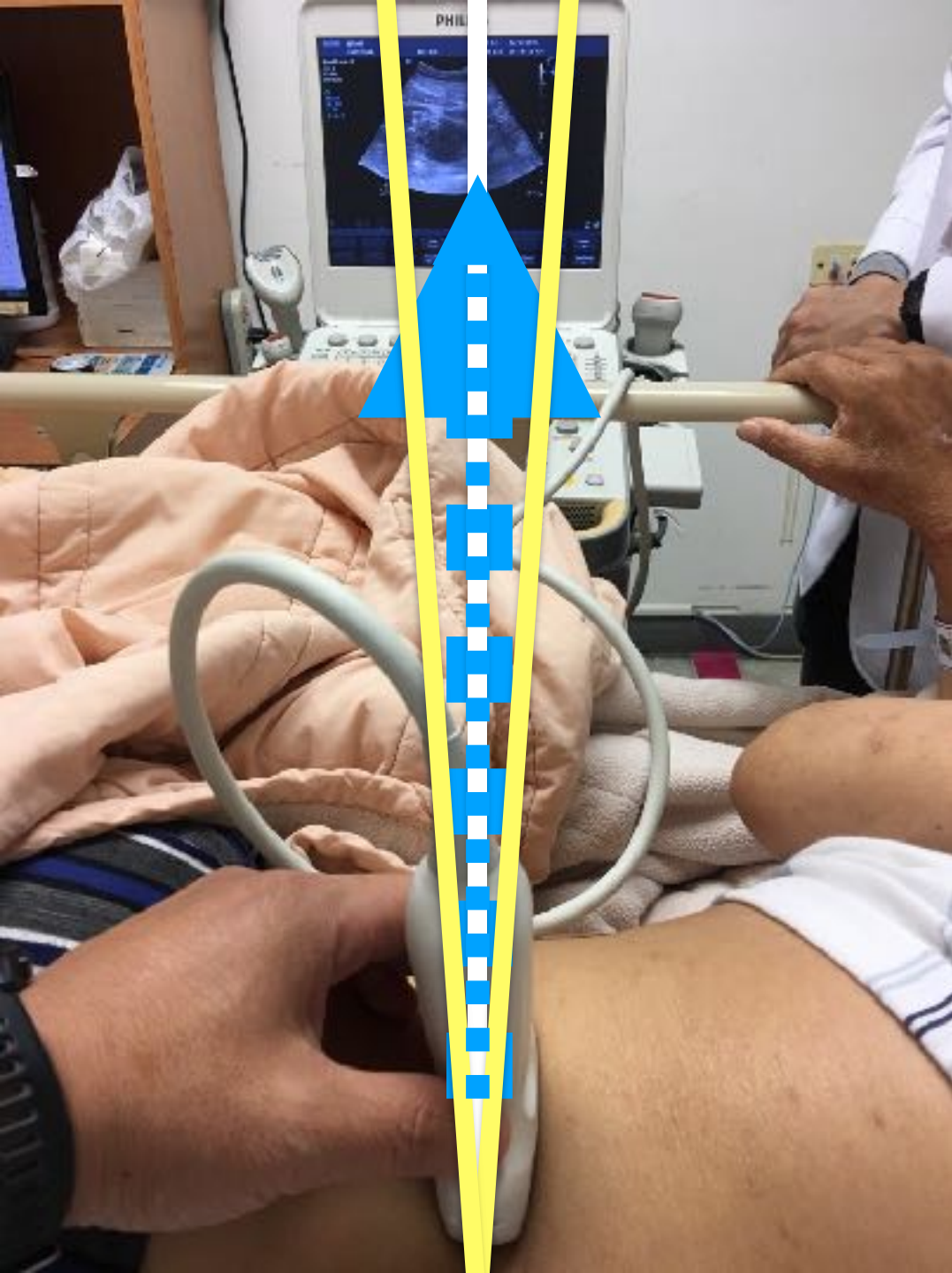
OFF-PLANE首重針尖

探頭永遠走在針的前方



NEEDLE OPTIMIZATION 探頭要垂直針身



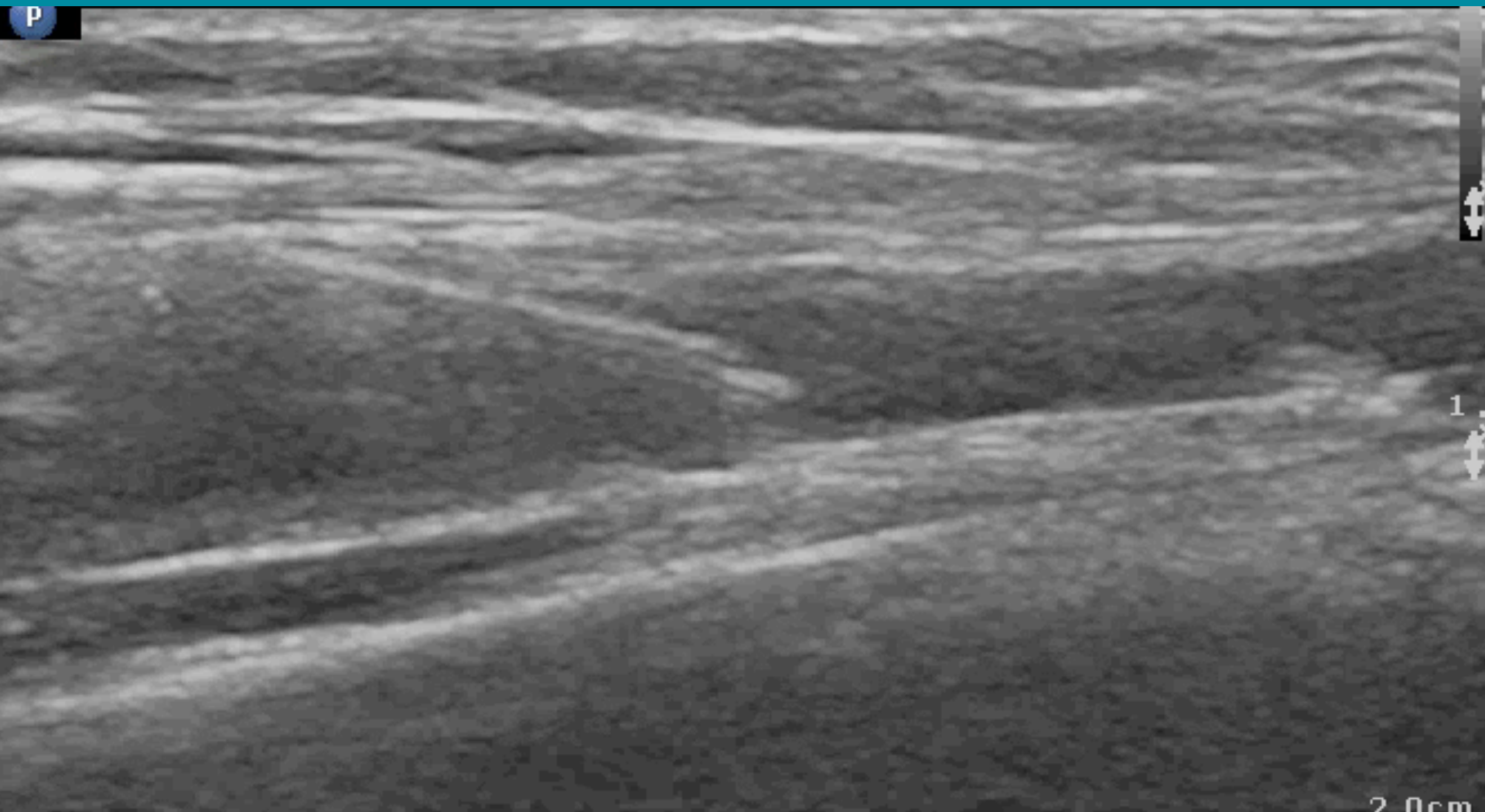


保持軸線

堅守切面

擬定路徑

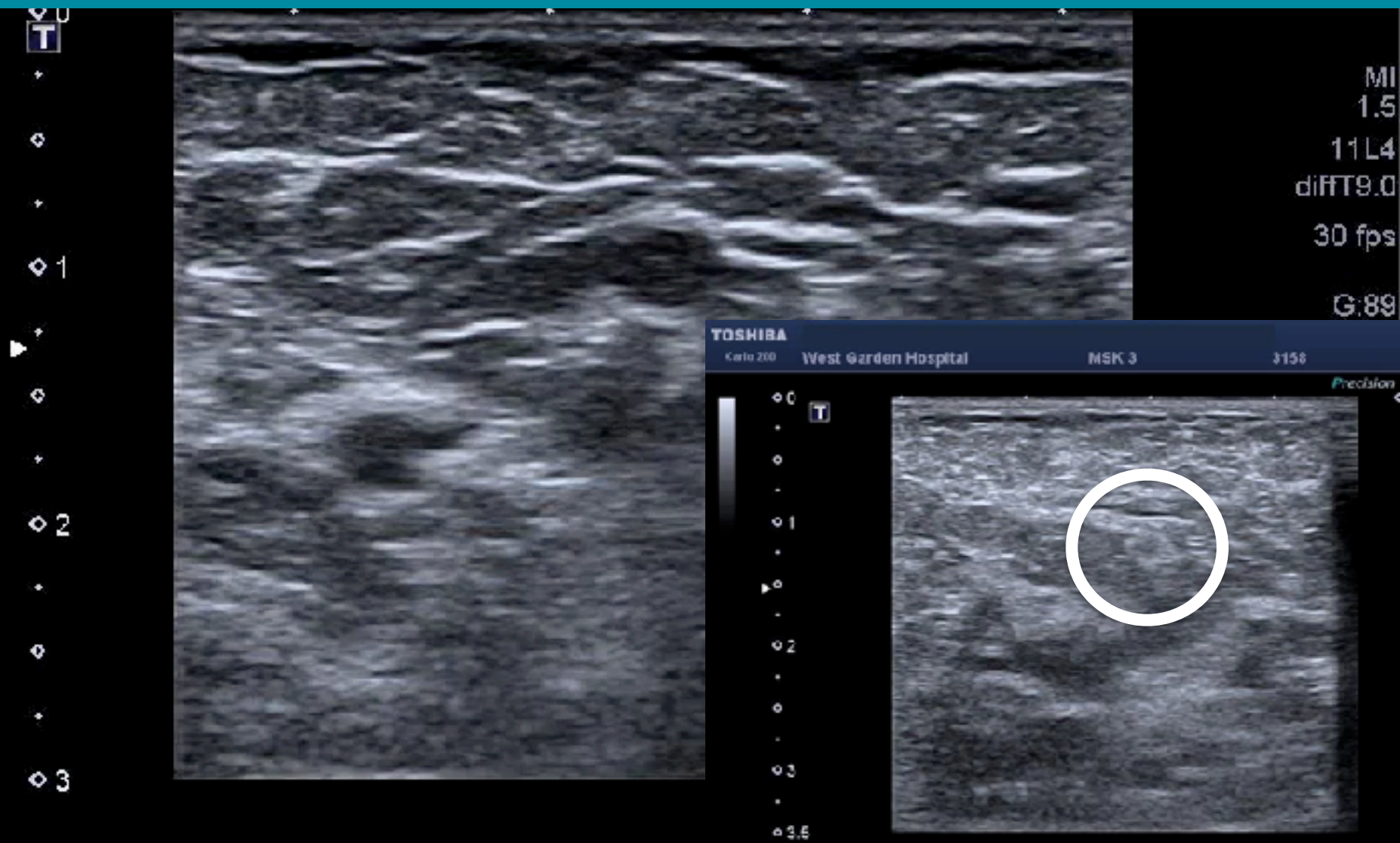
IN-PLANE APPROACH



P G R

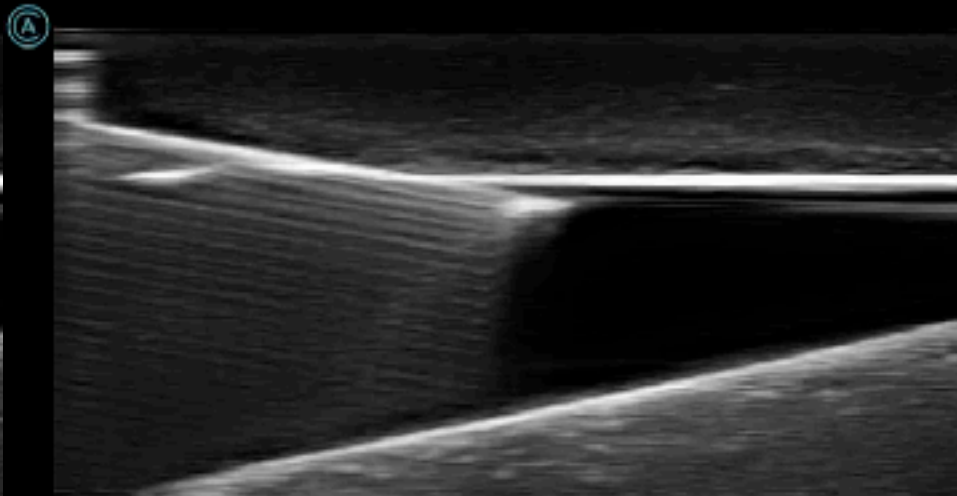
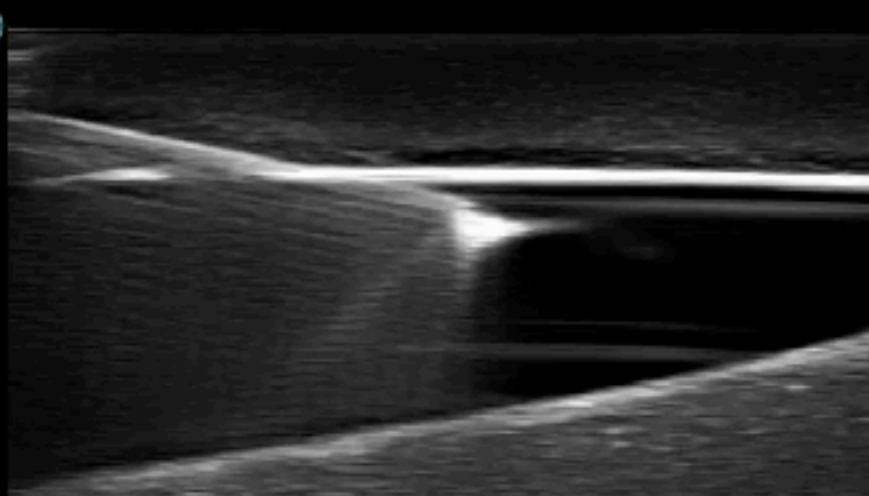
2.0cm

OFF-PLANE APPROACH



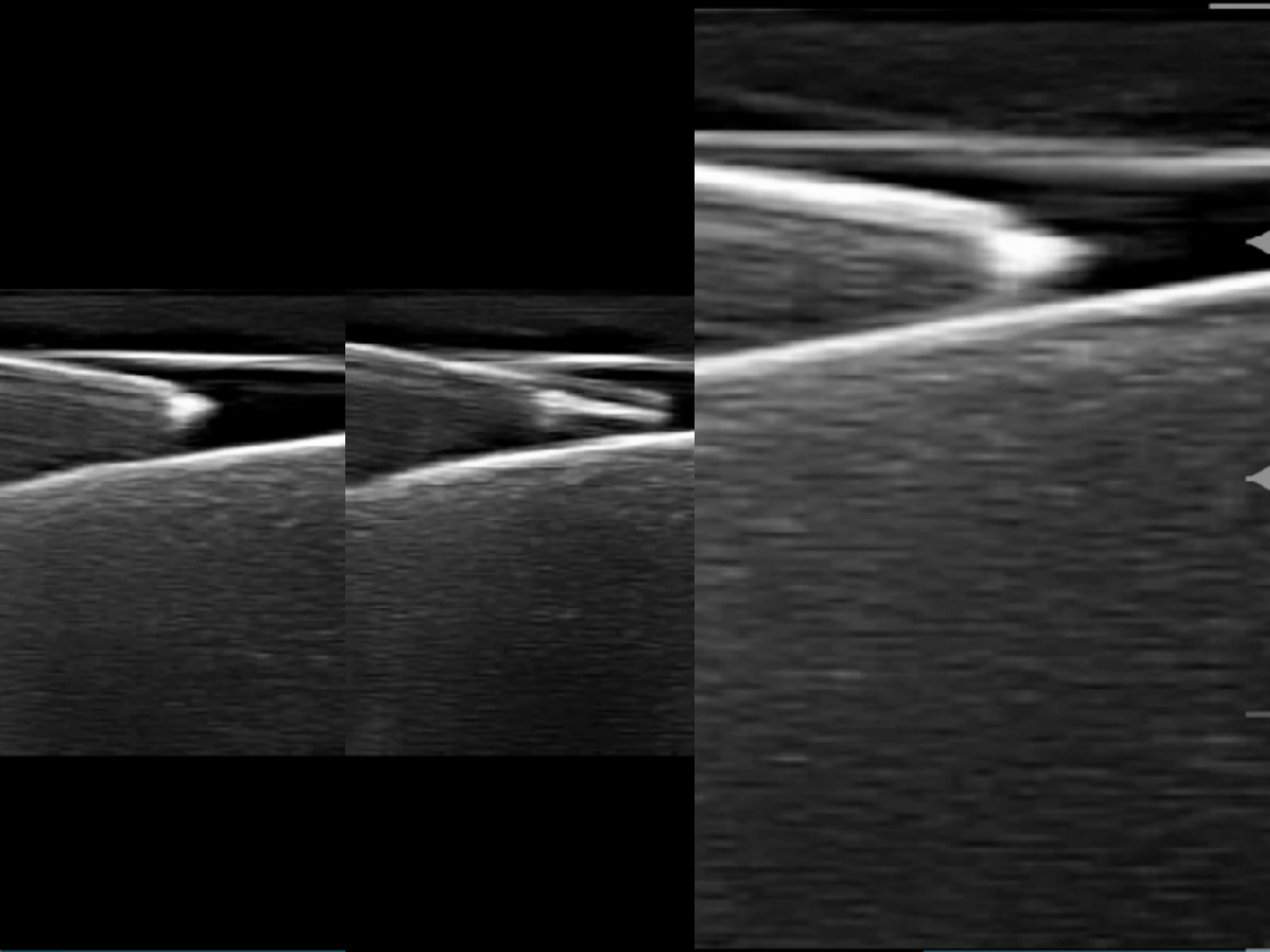
斜面由朝上轉朝下

斜面由朝下轉朝上



送Guidewire斜面朝下

送Catheter則斜面朝上



Rapid Central Vein Assessment (RaCeVA): A systematic, standardized approach for ultrasound assessment before central venous catheterization

Timothy R Spencer¹ and Mauro Pittiruti²

7 Steps

The Journal of Vascular Access
1–11

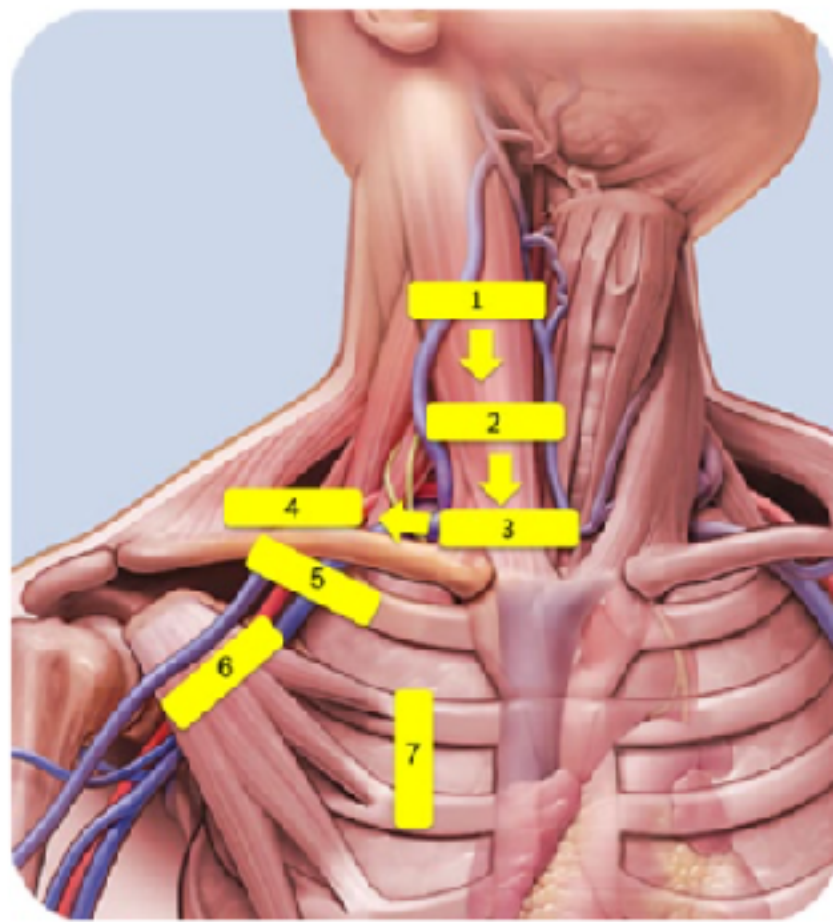
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RaCeVa protocol

Table 1. The seven steps of the Rapid Central Vein Assessment (RaCeVA).

	Transducer position	Structures to be assessed	Surrounding structures
Step 1	Mid-neck (transverse)	Internal jugular vein Carotid artery	Thyroid gland Trachea
Step 2	Base of neck (transverse)	Internal jugular vein Carotid artery Subclavian artery	Trachea Phrenic and vagus nerve
Step 3	Sternoclavicular (transverse)	Internal jugular vein Brachiocephalic vein	Pleura (mediastinum) Phrenic nerve
Step 4	Supraclavicular (longitudinal)	Subclavian vein Subclavian artery External jugular vein	Pleura (lung apex)
Step 5	Infraclavicular (transverse)	Axillary vein Axillary artery Cephalic vein	Pleura Ribs
Step 6	Infraclavicular (longitudinal)	Axillary vein Axillary artery	Pleura Ribs
Step 7	Sliding lung (longitudinal)	Pleura (anterior chest wall)	Ribs

如何挑選合適的CICC靜脈

Catheter/ Vein: 1:3 or less

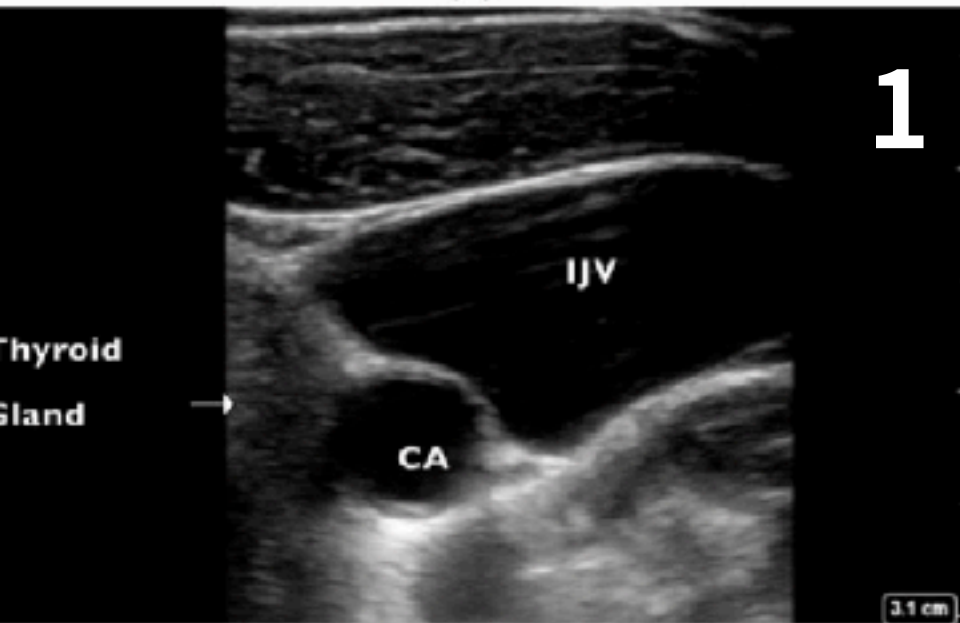
1. Size of the vein (internal diameter/caliber)
2. Depth of the vein (depth of target vessel from skin surface)
3. Respiratory variations (influence of respiratory cycle on vein diameter)
4. Compression by artery (influence of arterial pulsation on vein diameter)
5. Proximity to non-venous structures which must not be damaged (pleura, nerve, and artery)
6. Exit site location—convenience/appropriateness in terms for best care and maintenance



(a)



(a)



1



2

Carotid and
Subclavian artery
junction



(a)



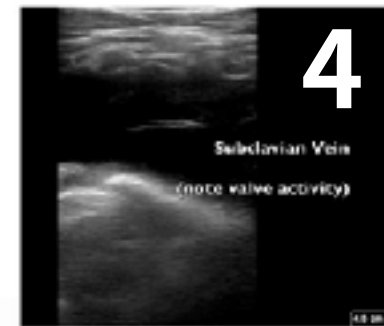
(a)



(b)



(b)



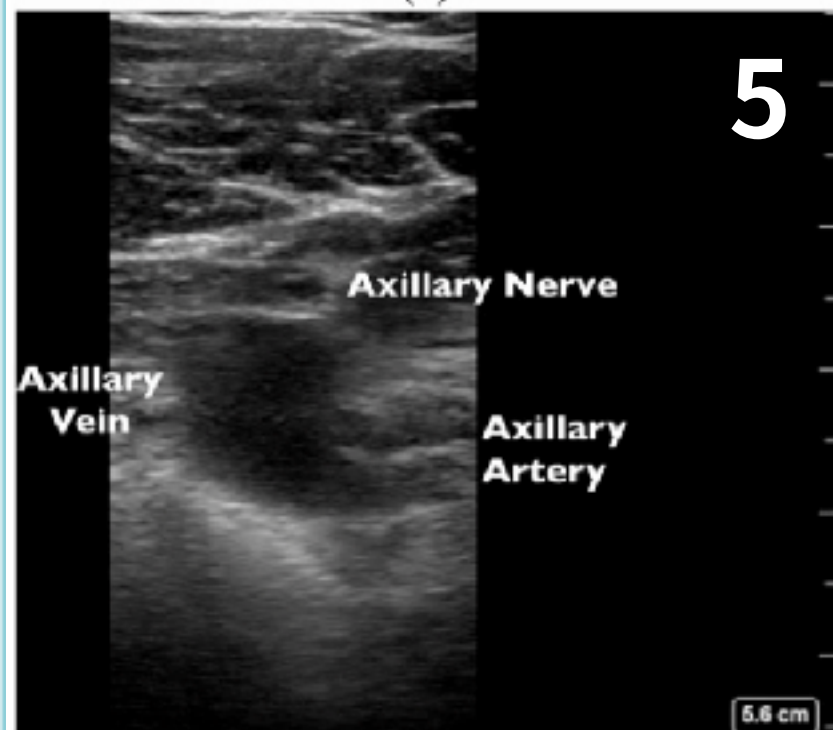
(c)



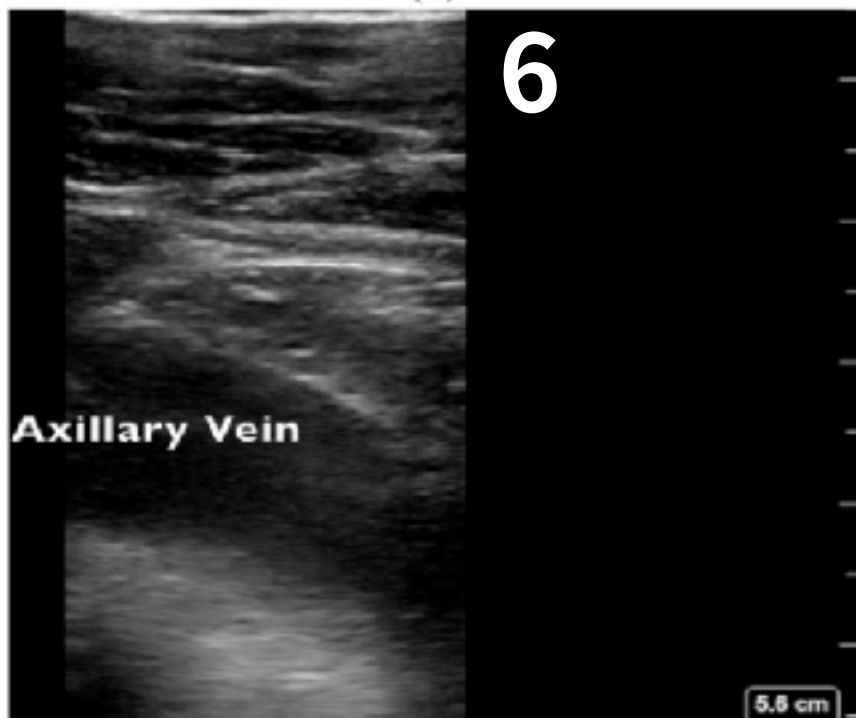
(a)



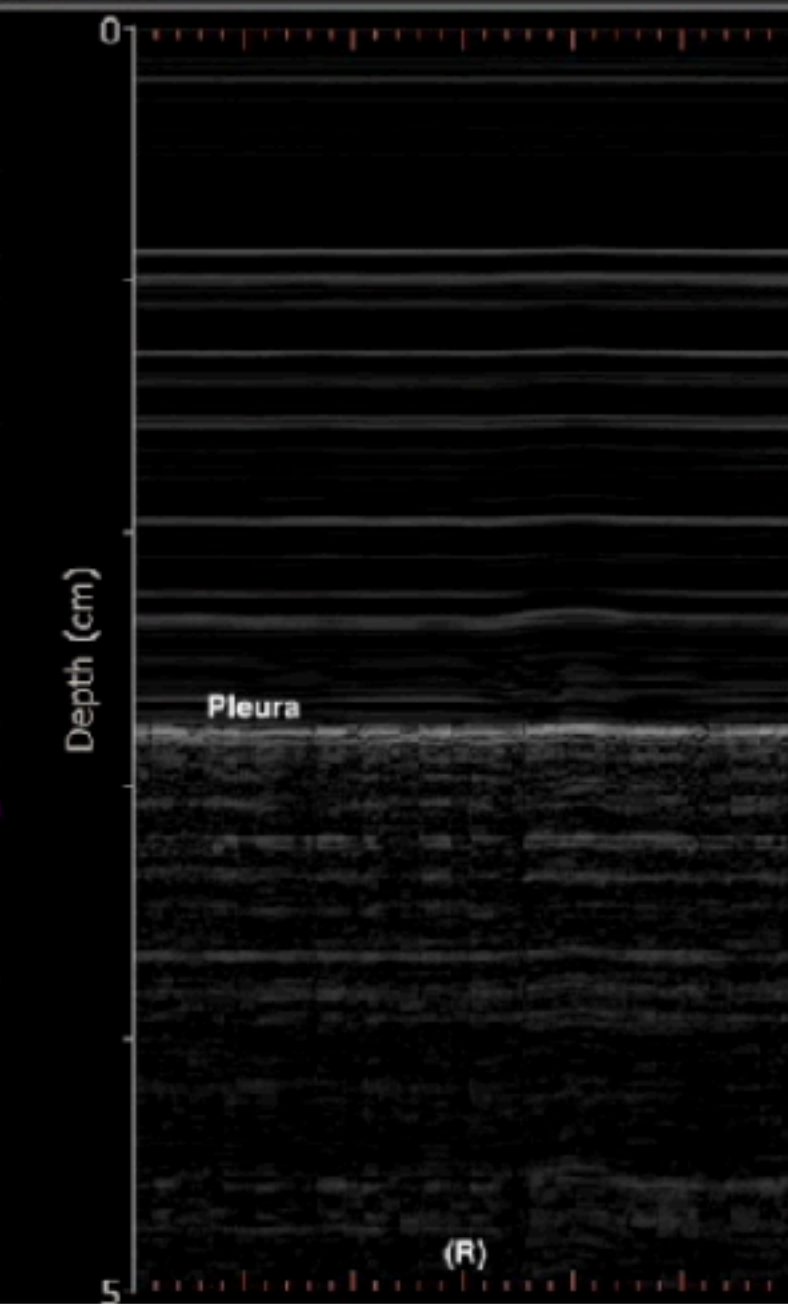
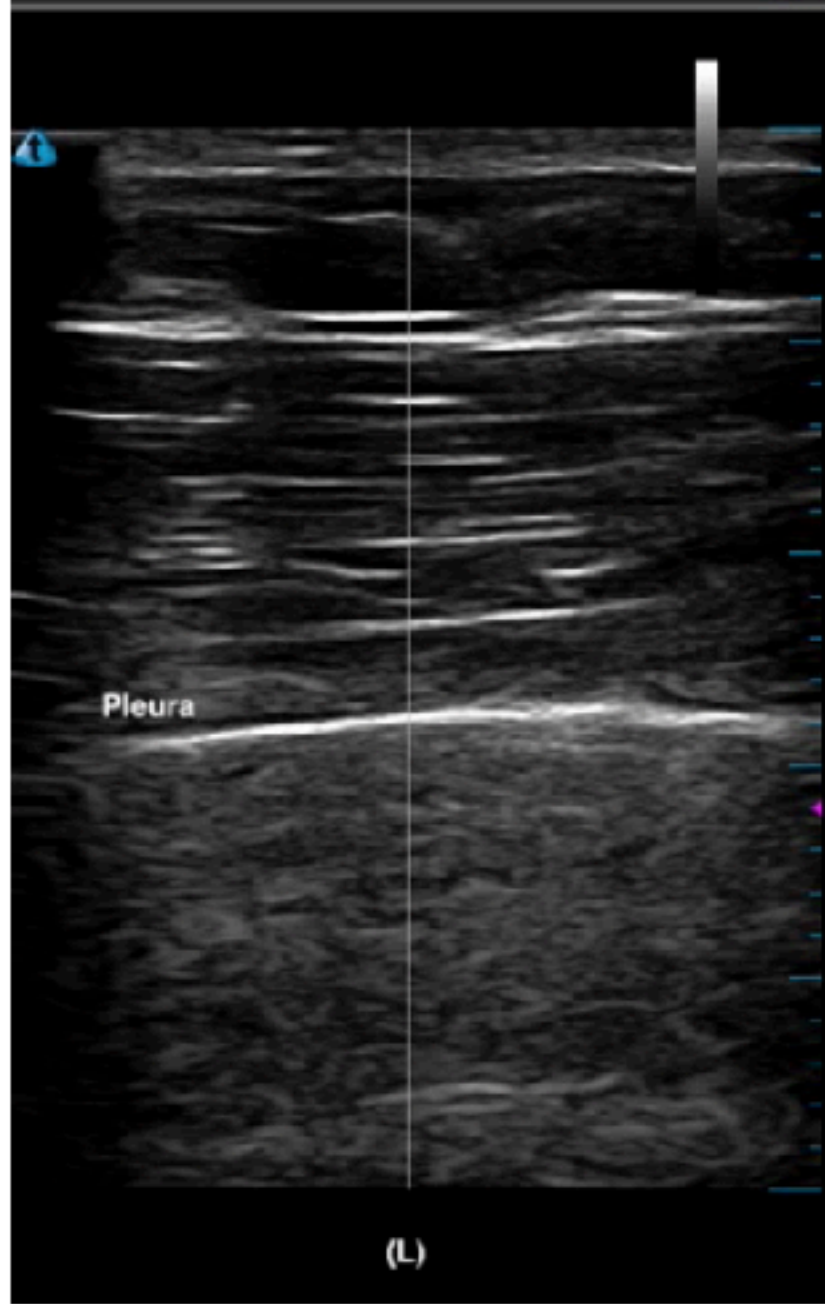
(a)



(b)



(b)



MI 0.4
TIS <0.4
15L4
B/2/M/TV3
Gn 52 DR 59
Depth 5 cm
18 Hz

7

(L)

(R)

The Journal of Vascular Access
2023, Vol. 24(2) 185–190
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The SIC protocol: A seven-step strategy to minimize complications potentially related to the insertion of centrally inserted central catheters

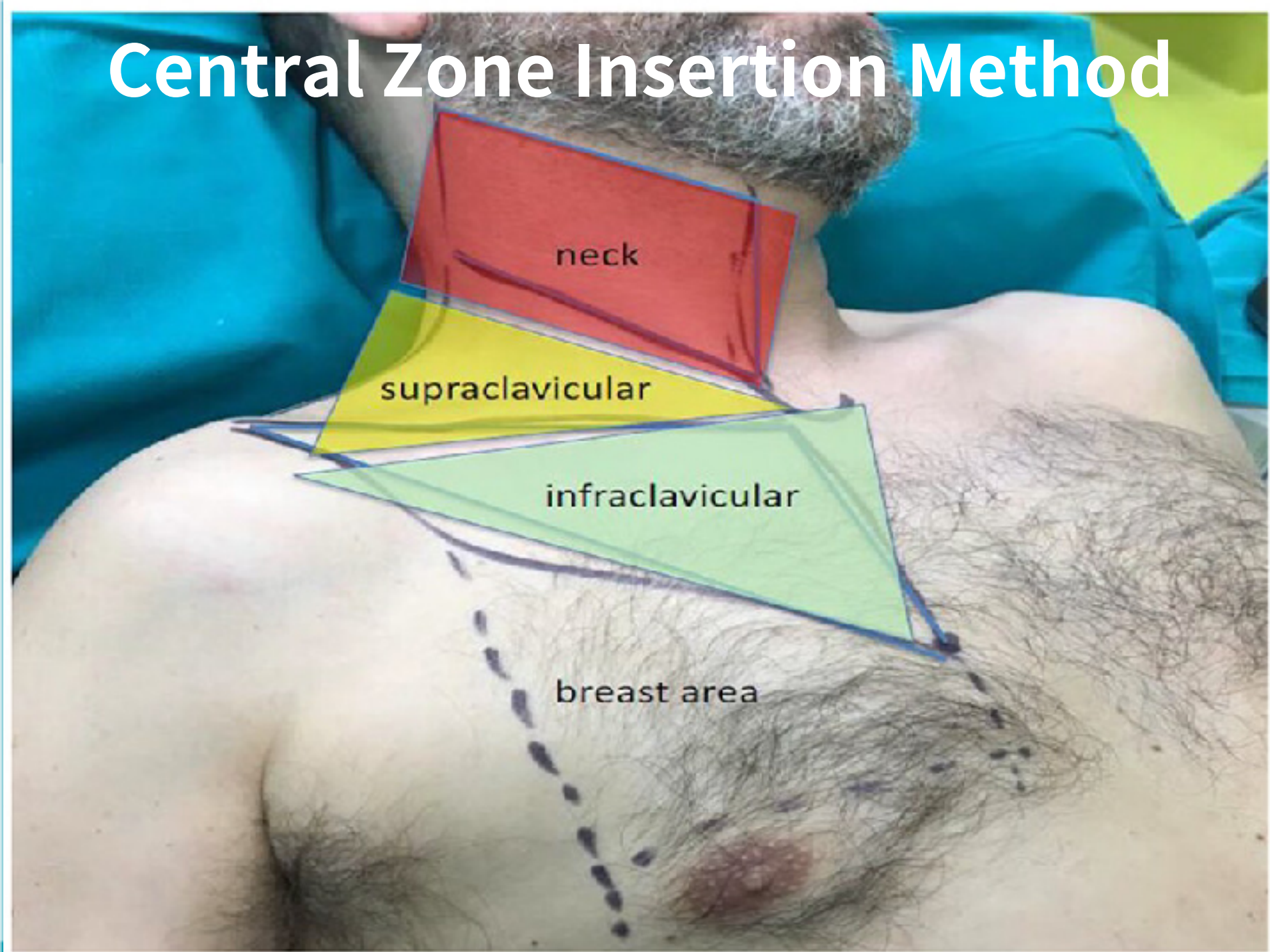
Safe Insertion of Centrally Inserted Central Catheters

Fabrizio Brescia¹ , Mauro Pittiruti² , Matthew Ostroff³ ,
Timothy R Spencer⁴  and Robert B Dawson⁵

Table 1. The seven steps of the SIC protocol.

Step 1	<i>Preprocedural evaluation</i> —choice of the vein by systematic ultrasound examination of the veins of the neck and of the supra/infraclavicular region (RaCeVA protocol) and choice of the ideal exit site (Central ZIM)
Step 2	<i>Appropriate aseptic technique</i> —hand hygiene, skin antisepsis with 2% chlorhexidine in 70% alcohol, maximal barrier precautions
Step 3	<i>Ultrasound-guided insertion</i> —ultrasound-guided venipuncture, ultrasound verification of the correct direction of the guidewire (tip navigation) and of the absence of pneumothorax (pleural scan)
Step 4	<i>Intra-procedural assessment of tip location</i> —verification of the central position of the tip by intracavitary ECG and/or by transthoracic echocardiography, using the “bubble test”
Step 5	<i>Adequate protection of the exit site</i> —reduction of the risk of bleeding and risk of contamination by sealing with cyanoacrylate glue
Step 6	<i>Proper securement of the catheter</i> —stabilization of the catheter using skin-adhesive sutureless devices, transparent dressing with integrated securement or subcutaneous anchorage
Step 7	<i>Appropriate coverage of the exit site</i> —use of semi-permeable transparent dressing, preferably with high breathability

Central Zone Insertion Method

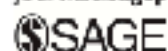




Rapid Femoral Vein Assessment (RaFeVA): A systematic protocol for ultrasound evaluation of the veins of the lower limb, so to optimize the insertion of femorally inserted central catheters

Fabrizio Brescia¹ , **Mauro Pittiruti²** , **Matthew Ostroff³** 
and **Daniele G Biasucci⁴**

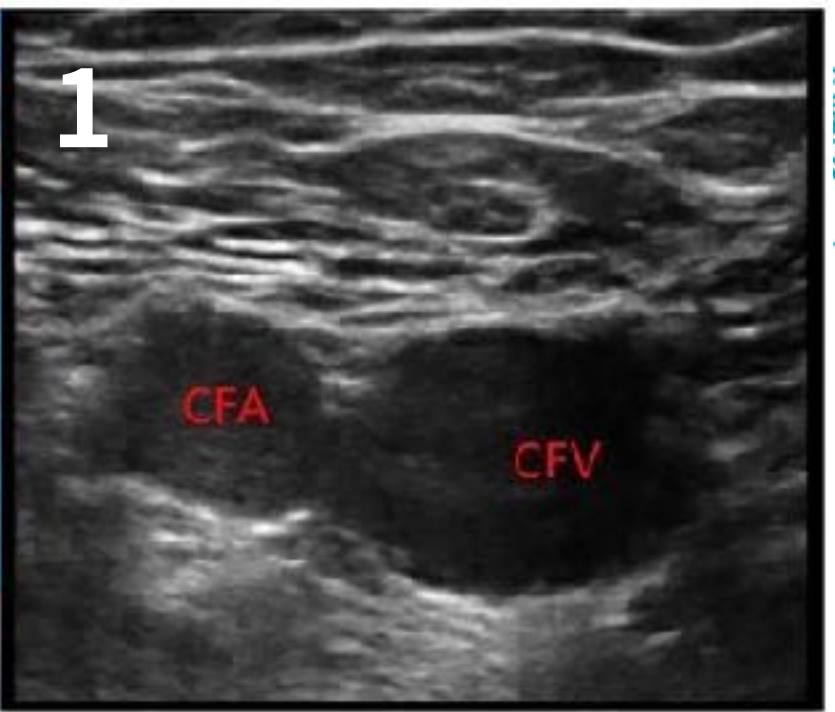
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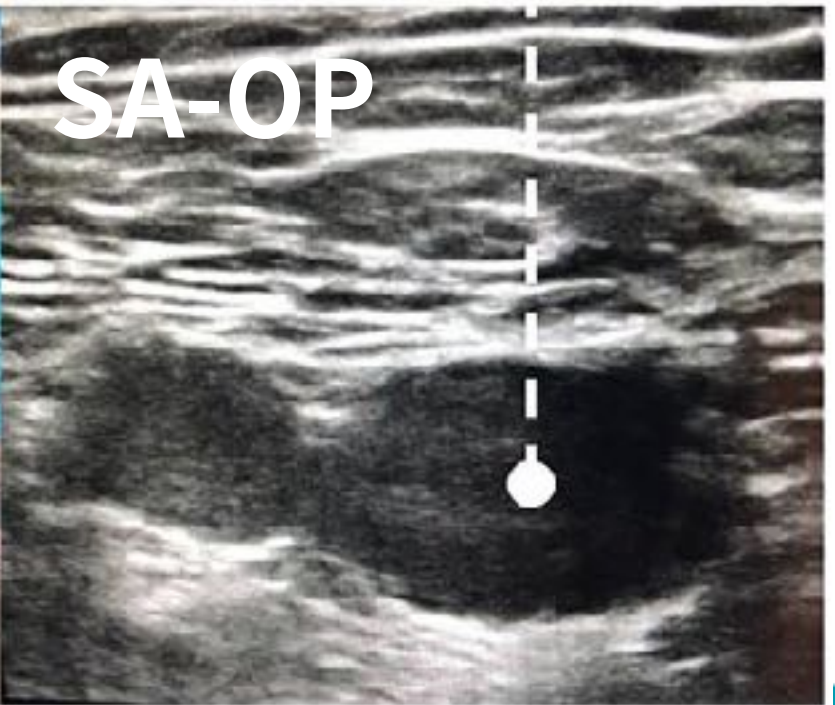
RaFeVa protocol

	Vascular structures to be assessed	Visualization of the vein
Step 1	Common femoral artery Common femoral vein	Short axis
Step 2	Common femoral vein External iliac vein	Long axis
Step 3	Common femoral artery Common femoral vein Saphenous vein	Short axis
Step 4	Superficial femoral artery Deep femoral artery Common femoral vein	Short axis
Step 5	Superficial femoral artery Deep femoral artery Superficial femoral vein Deep femoral vein	Short axis
Step 6	Superficial femoral artery Superficial femoral vein	Short axis
Step 7	Superficial femoral artery Superficial femoral vein	Oblique axis

(a)



(b)



(a)



2



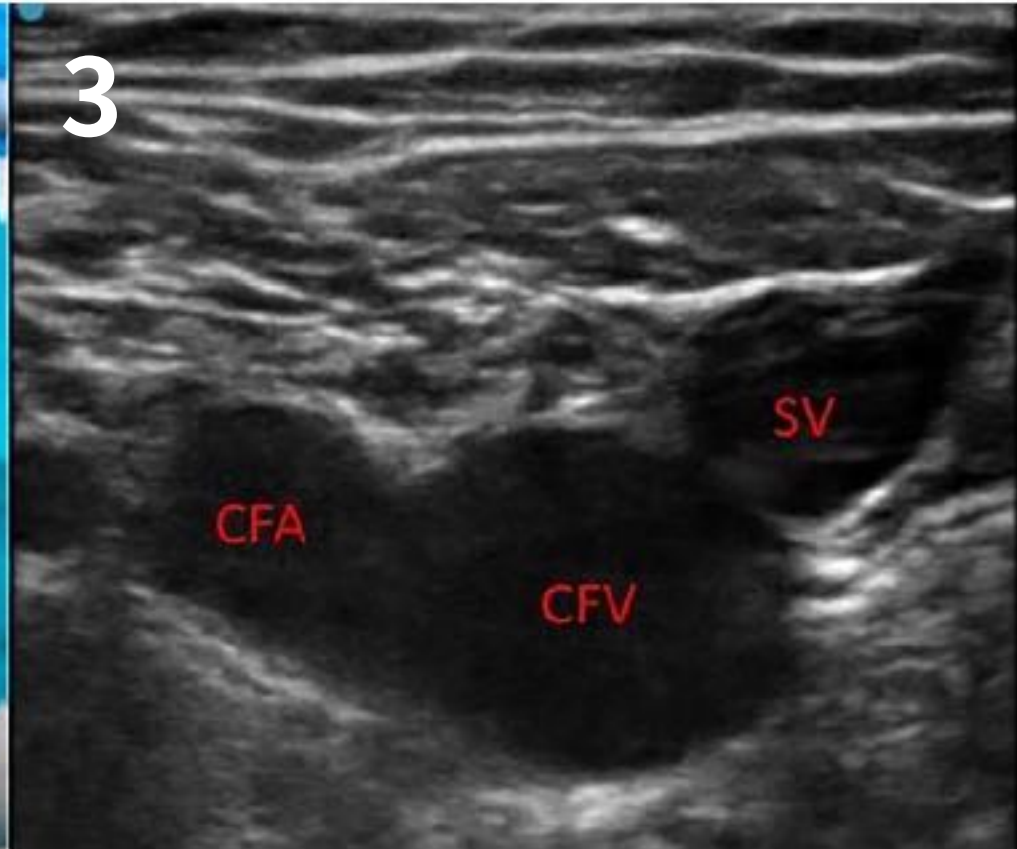
(b)



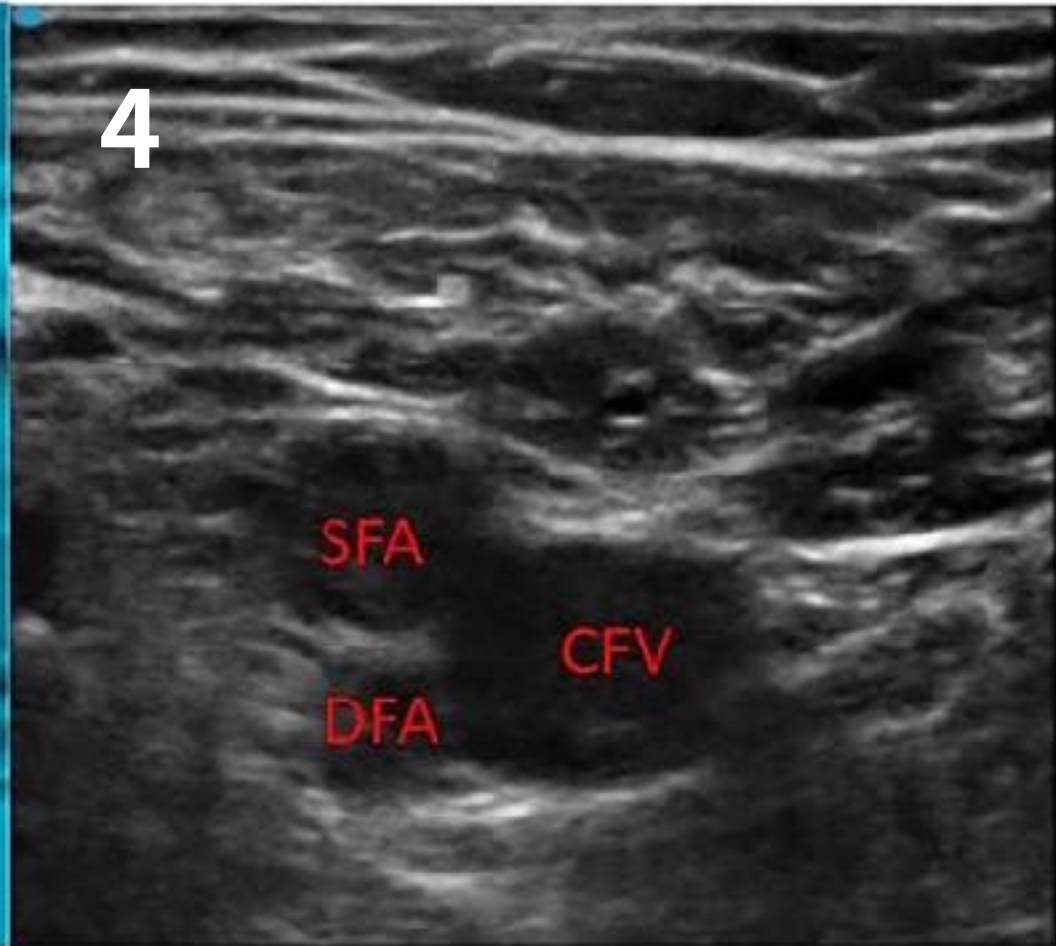
LA-IP



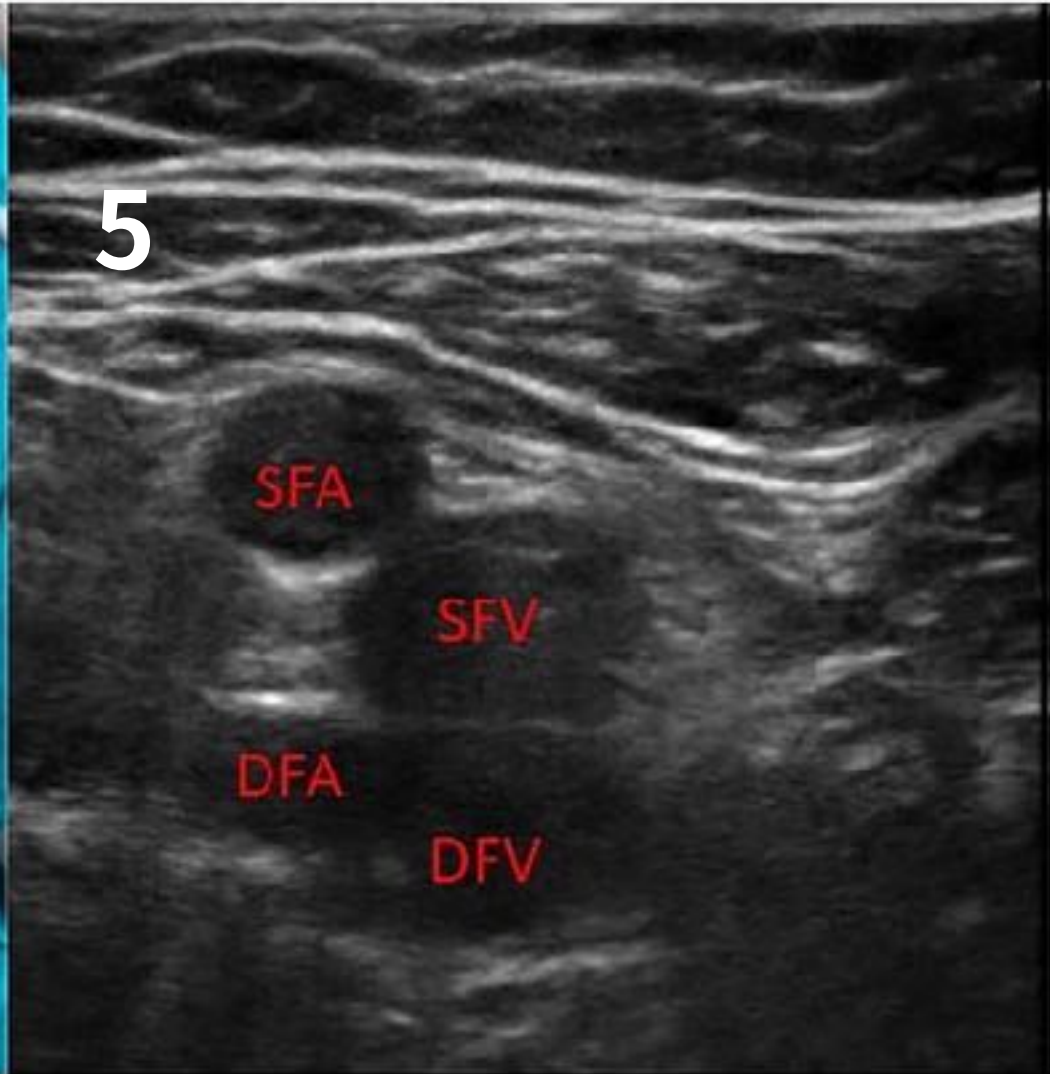
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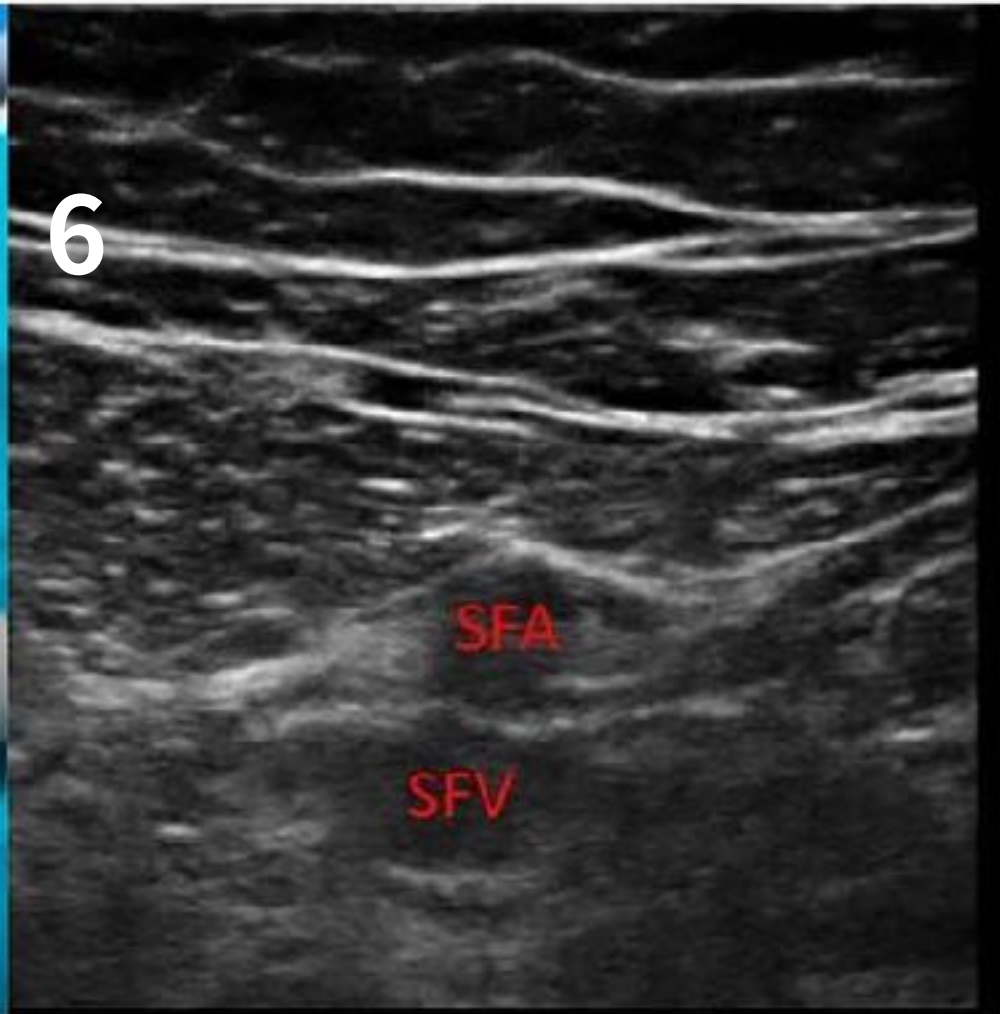


4



5





(a)



7



SFA

SFV

OA-IP

(b)



The Journal of Vascular Access
2023, Vol. 24(4) 535–544
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ECHOTIP: A structured protocol for ultrasound-based tip navigation and tip location during placement of central venous access devices in adult patients

**Antonio La Greca¹, Emanuele Iacobone² , Daniele Elisei²,
Daniele Guerino Biasucci³ , Vito D'Andrea⁴ ,
Giovanni Barone⁵, Geremia Zito Marinosci⁶
and Mauro Pittiruti¹ **

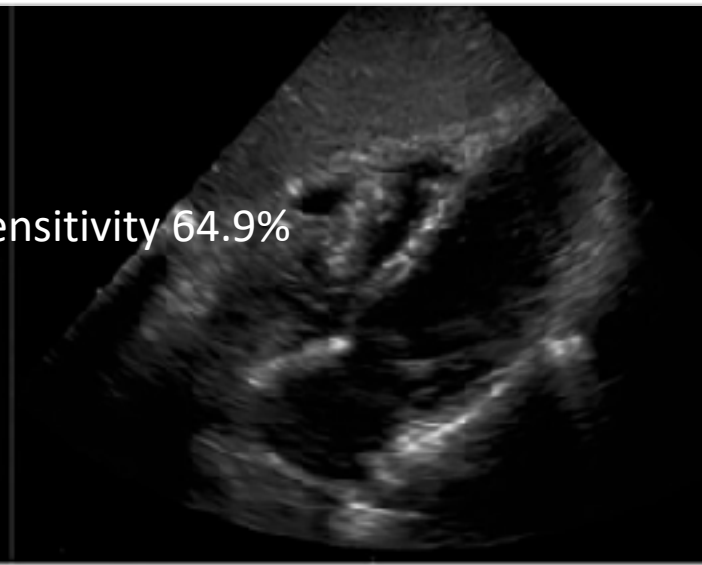
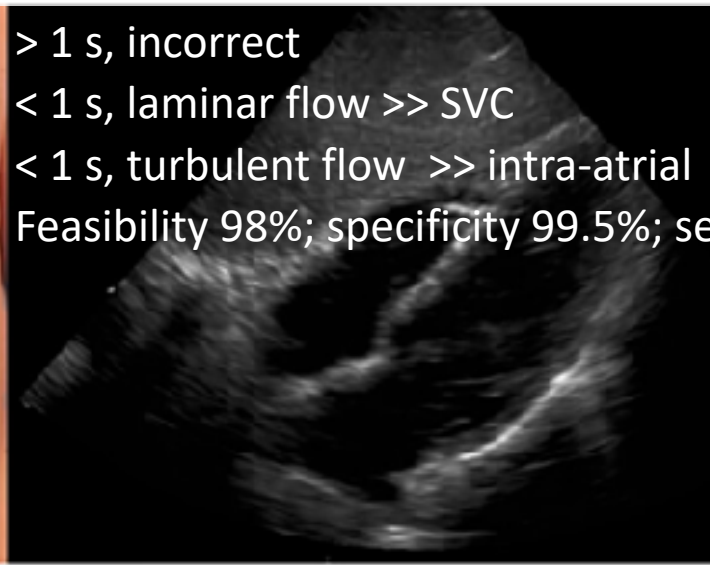
Bubble test: saline or 9:1 mixture of saline + air

> 1 s, incorrect

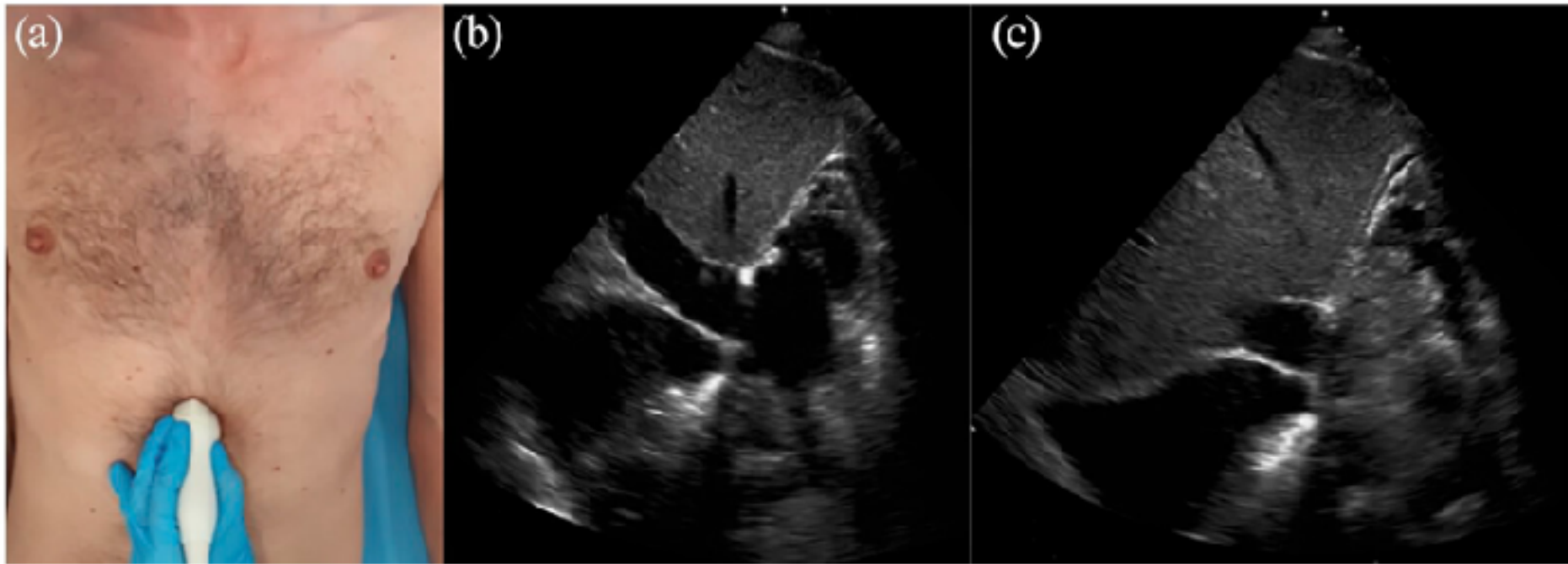
< 1 s, laminar flow >> SVC

< 1 s, turbulent flow >> intra-atrial

Feasibility 98%; specificity 99.5%; sensitivity 64.9%

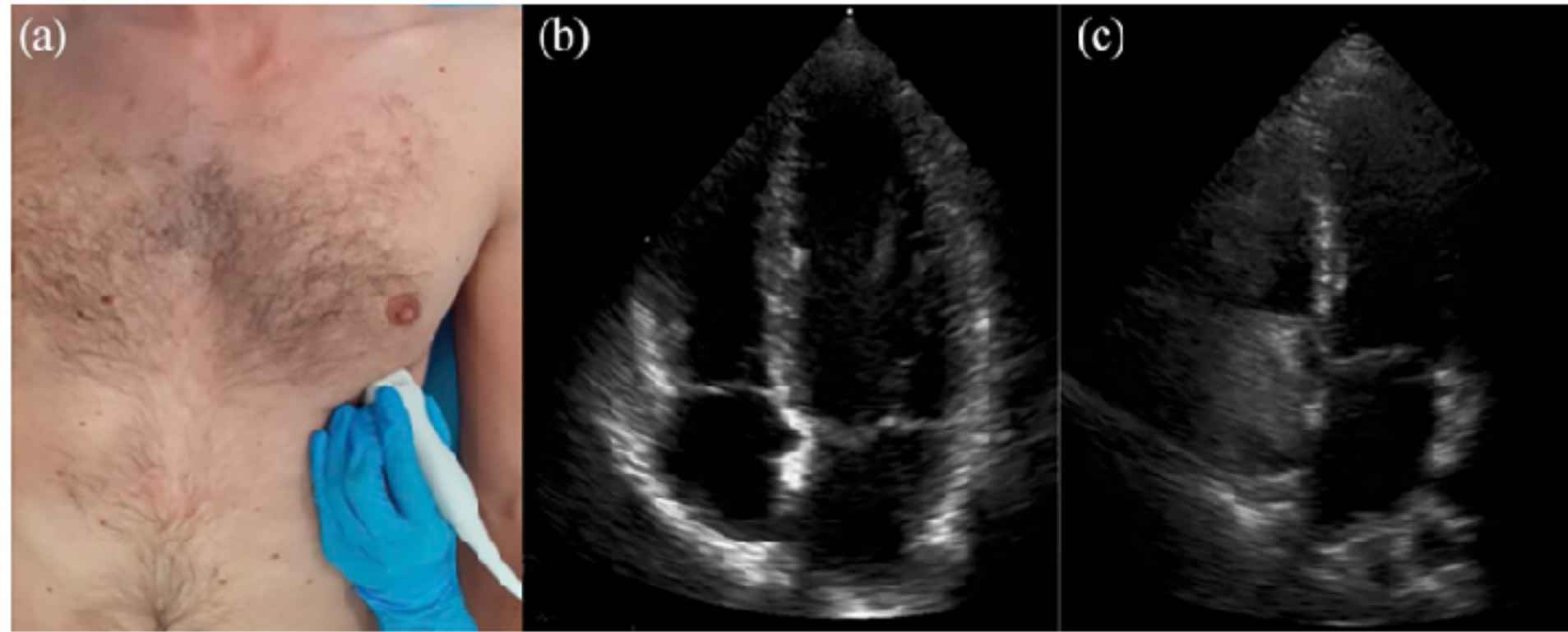


SUBCOSTAL OBLIQUE VIEW



Tip navigation >> Tip localization
CICC: bubble test < 1 s

APICAL 4 CHAMBER VIEW



Tip navigation >> Tip localization
PICC: bubble test < 2 s

Table 1. (a) ECHOTIP protocol for CICC.

	Probe	Technique
Tip navigation	7–12 MHz linear probe	Visualization of the cannulated vessel (wire/catheter inside the vein)
Tip location	2–6 MHz sectorial probe As alternative option: 3–8 MHz convex probe	Visualization of the deep vessels of neck and chest according to RaCeVA Immediate visualization (< 1 s) of bubbles in RA after flushing First option: subcostal views (four-chamber or bi-caval) Second option: four-chamber apical view

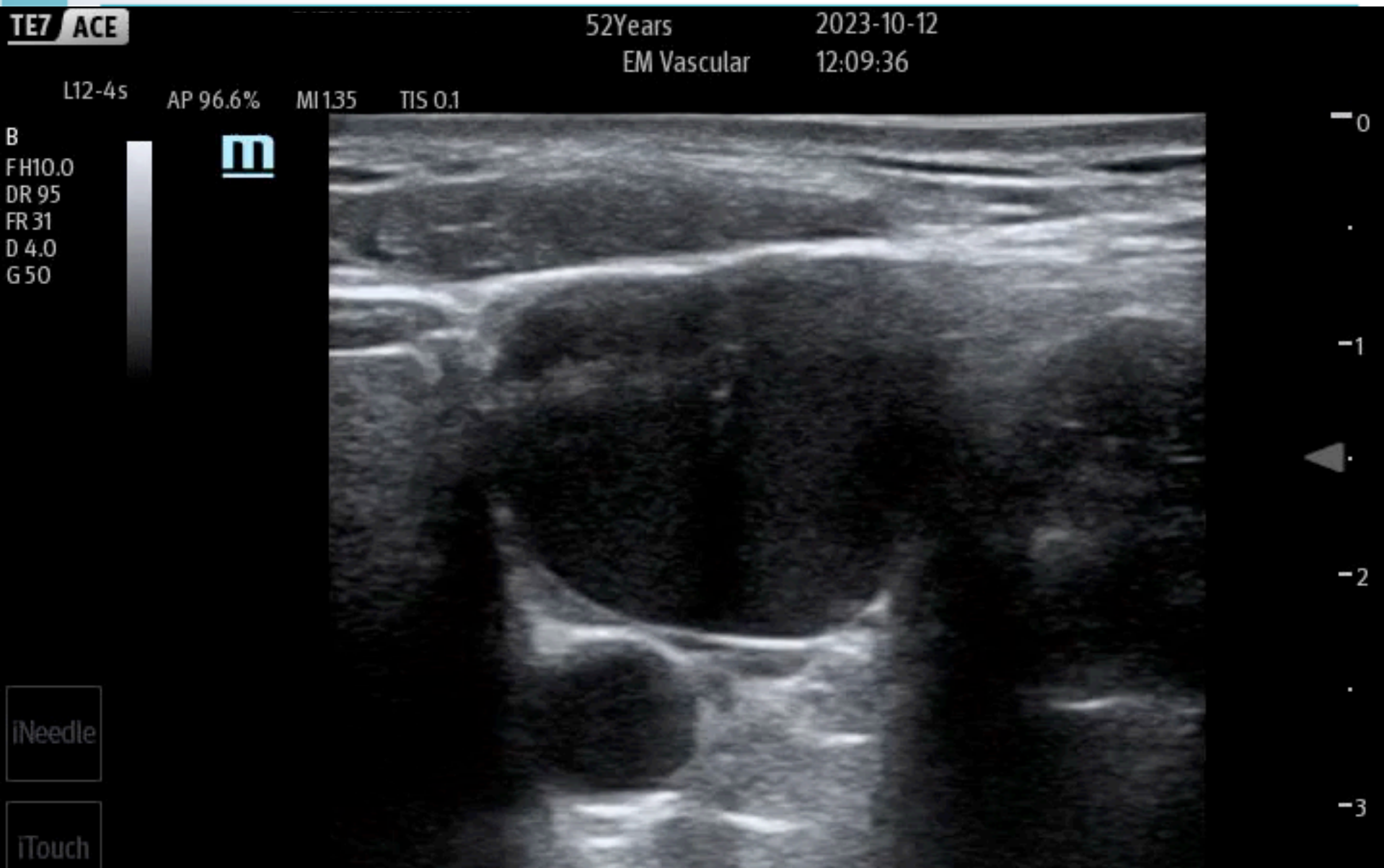
(b) ECHOTIP protocol for PICCs.

	Probe	Technique
Tip navigation	7–12 MHz linear probe	Visualization of the deep veins of the arm and of the infra/supraclavicular area according to RaPeVA and RaCeVA
Tip location	2–6 MHz sectorial probe As alternative option: 3–8 MHz convex probe	Immediate visualization (< 2 s) of bubbles in RA after flushing First option: subcostal views (four-chamber or bi-caval) Second option: four-chamber apical view

(c) ECHOTIP protocol for FICCs.

	Probe	Technique
Tip navigation	7–12 MHz linear probe (femoral vein and external iliac vein)	Visualization of the deep vessels of the lower limb according to RaFeVA
Tip location	3–8 MHz convex probe (common iliac vein and IVC) 2–6 MHz sectorial probe As alternative option: 3–8 MHz convex probe	Visualization of IVC in short and long axis views Visualization of bubbles after flushing Tip in IVC: immediate visualization of bubbles in IVC Tip in RA or at the junction RA/IVC: immediate visualization of bubbles in RA

CVC IN SEPTIC SHOCK PATIENT



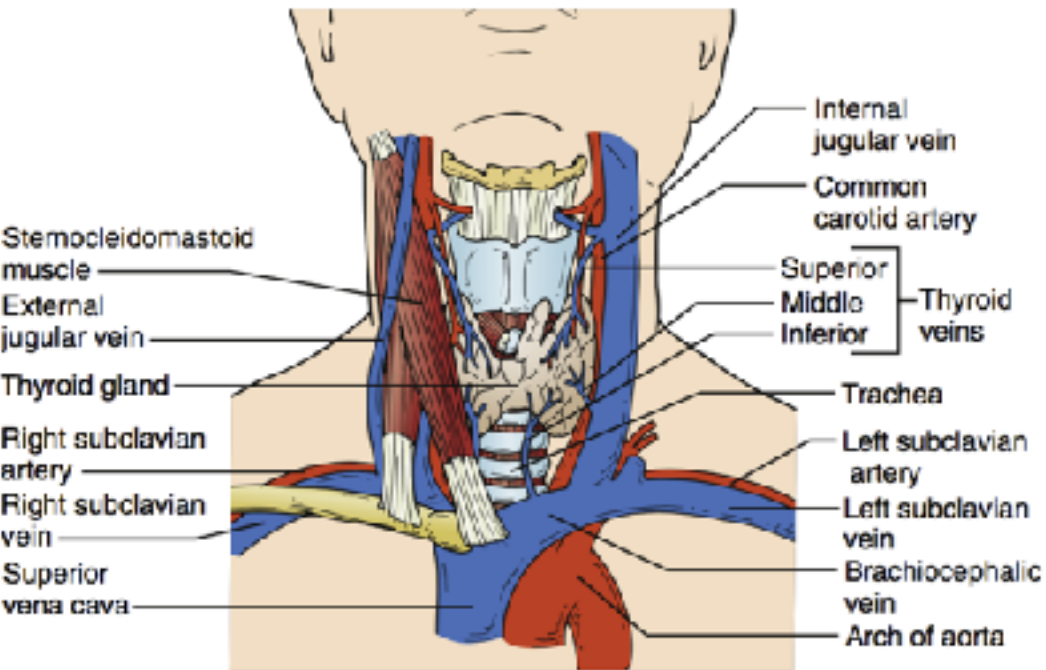
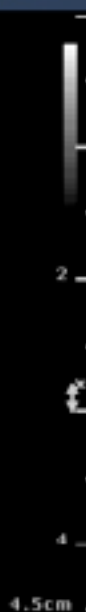
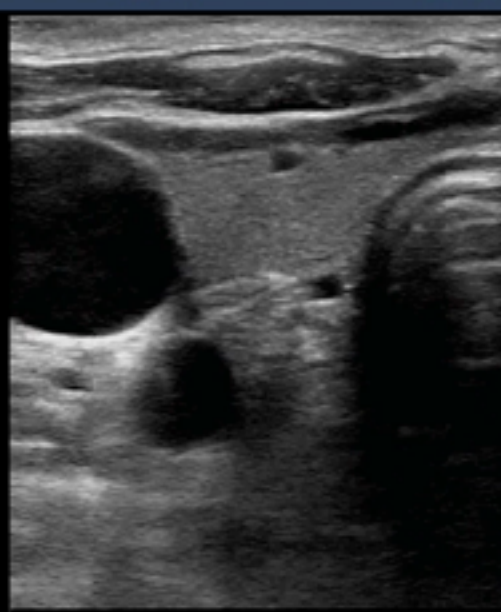


US-GUIDED CVC

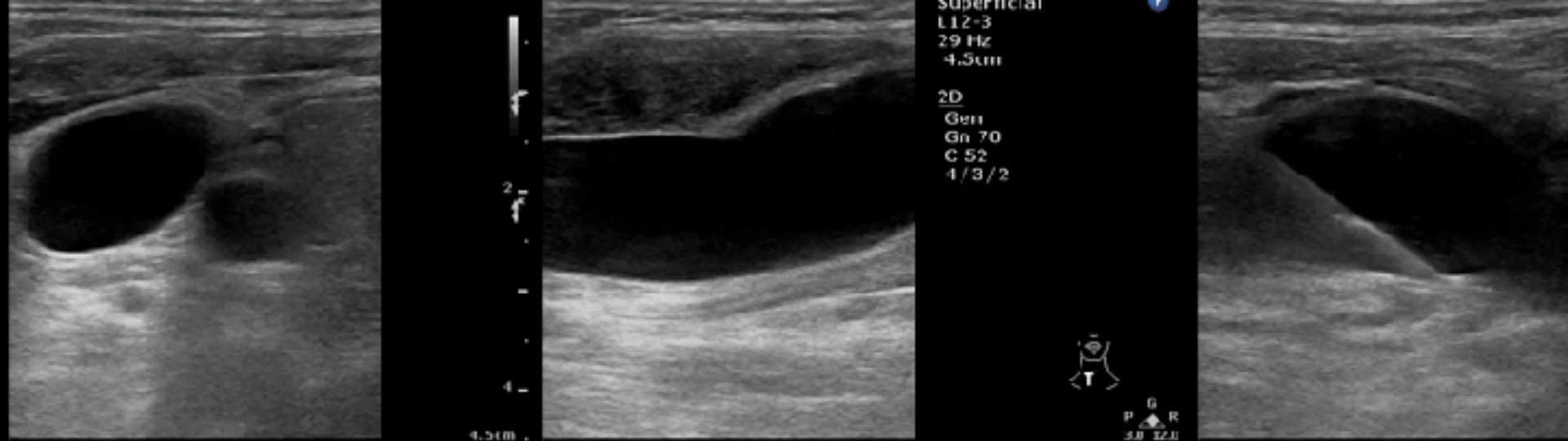


Arterial
L12-3
37 Hz
4.5cm

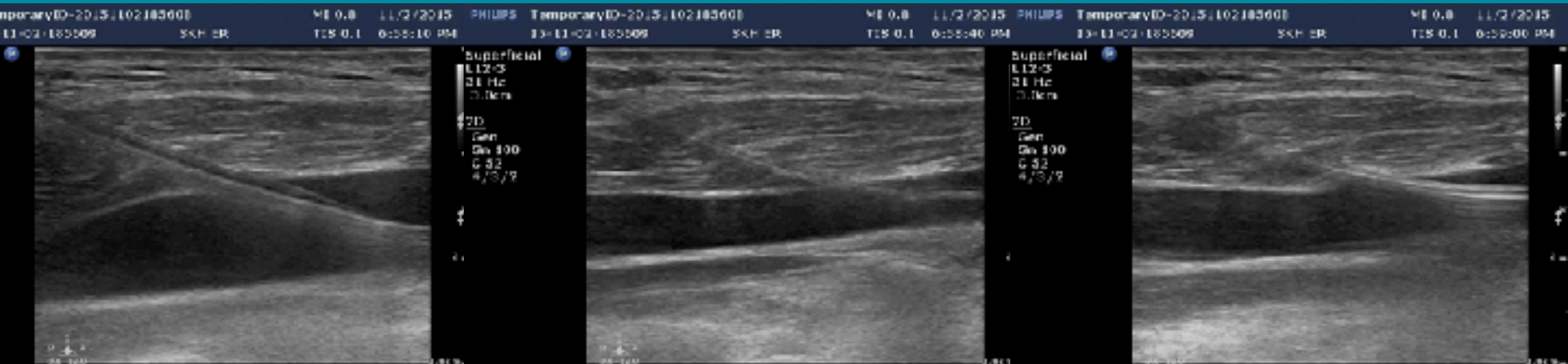
2D
HGen
Gn 50
C 41
3/3/2

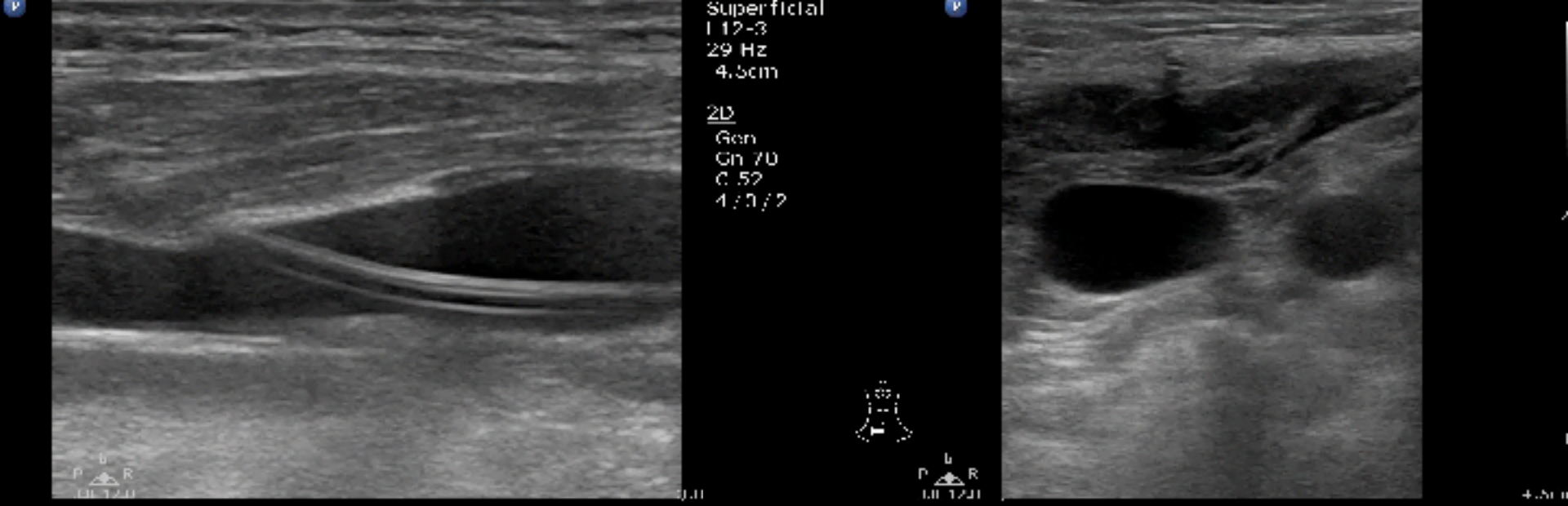


- Size
- Shape
- Depth
- Compressibility**
- Proximity to CCA
- Distal anastomosis with SCV
- Respiratory variation

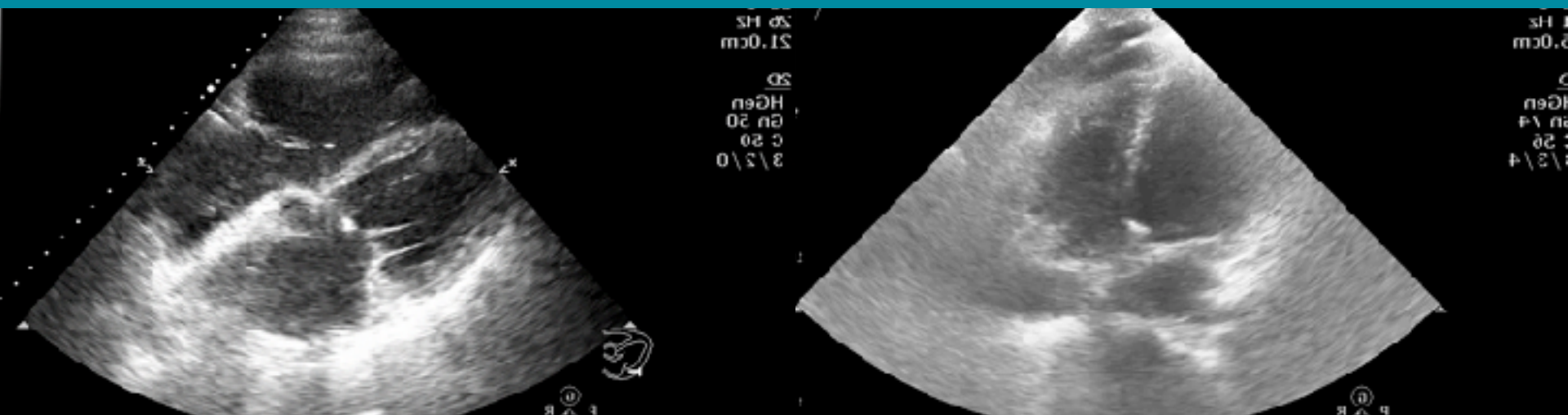


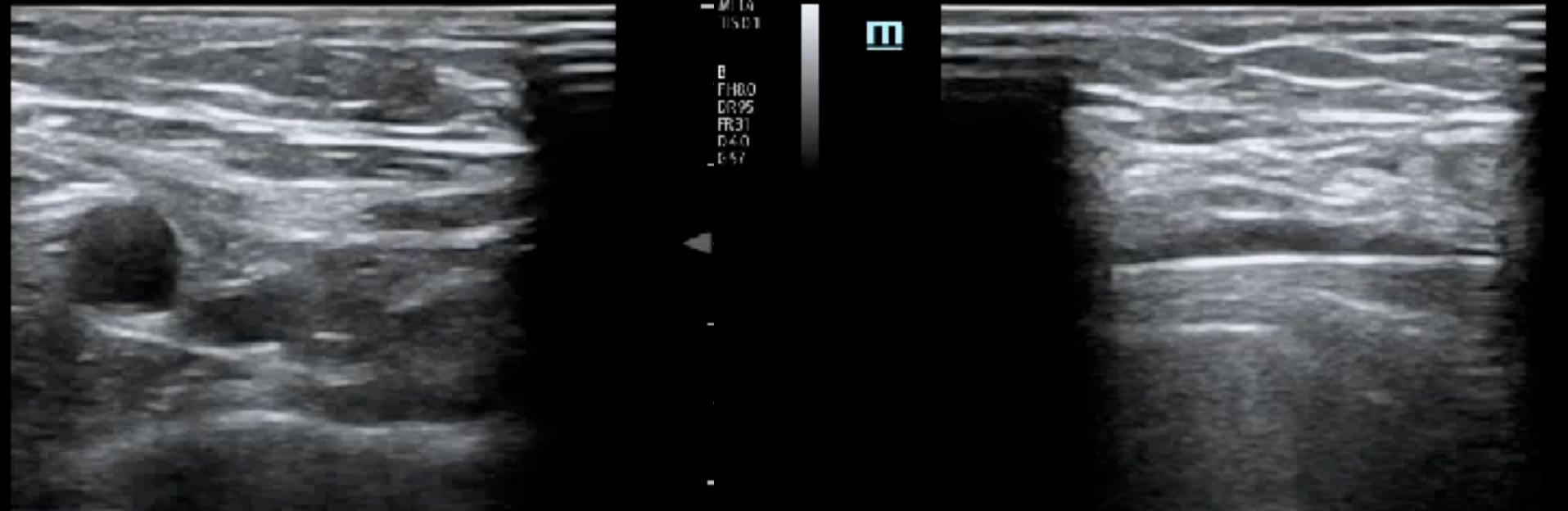
US-GUIDED CVC STEPS





CVC CONFIRMATION

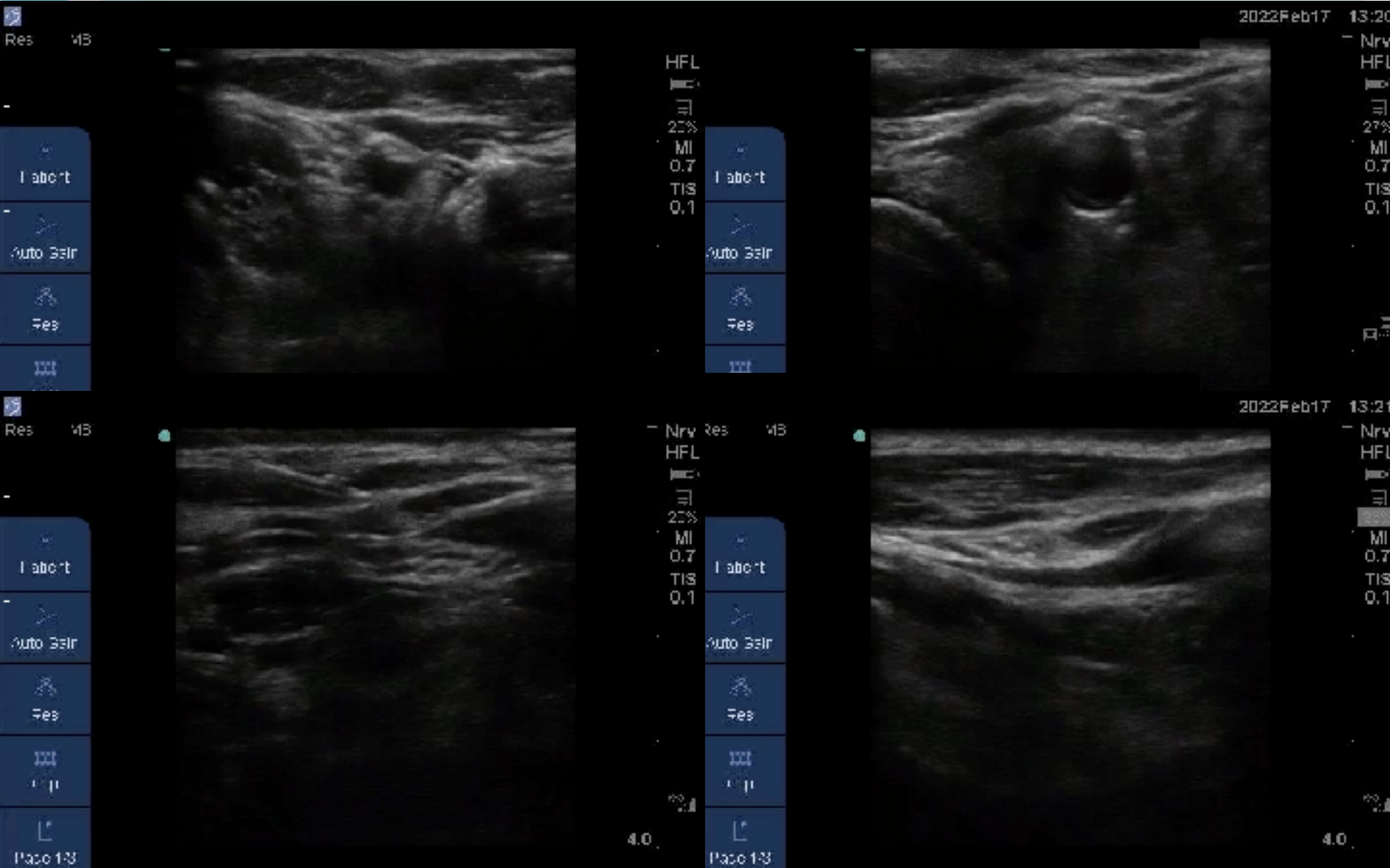




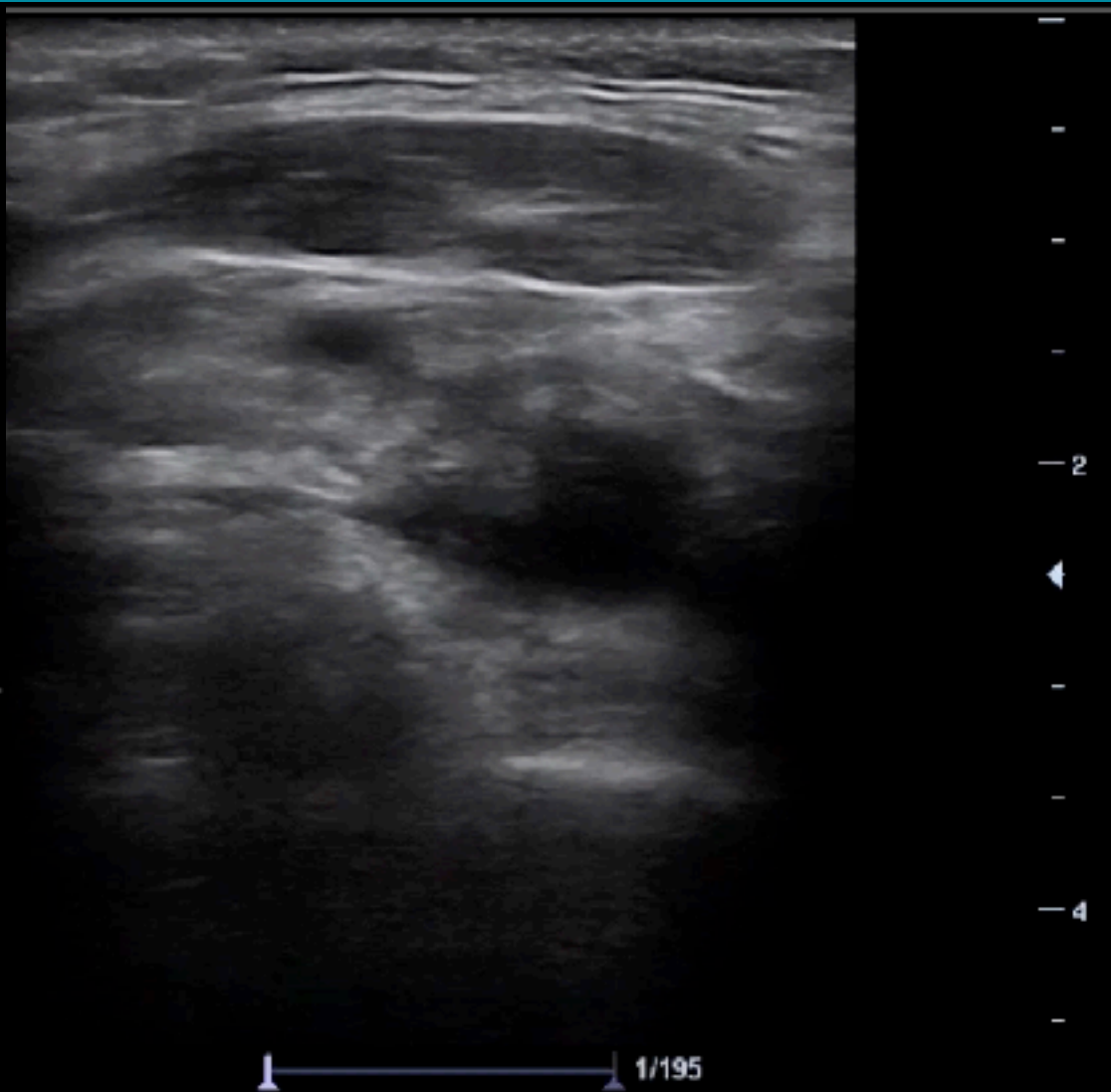
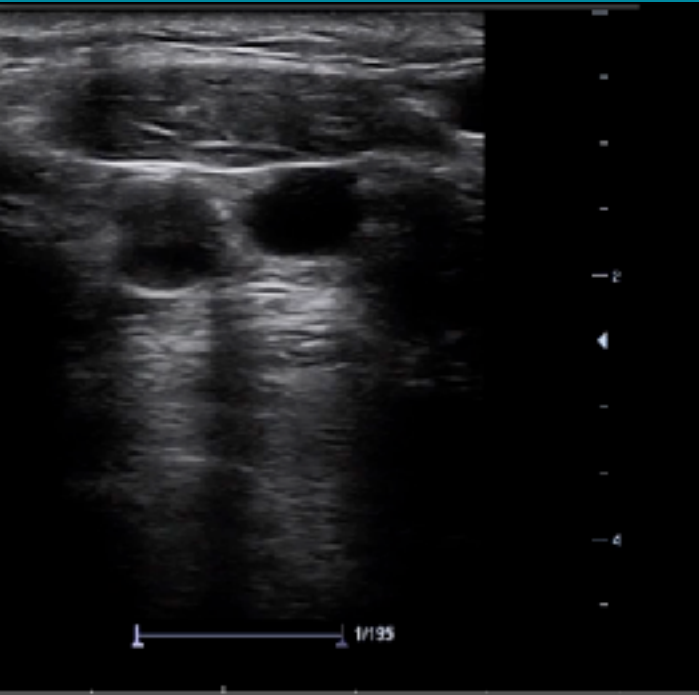
CVC CONFIRMATION



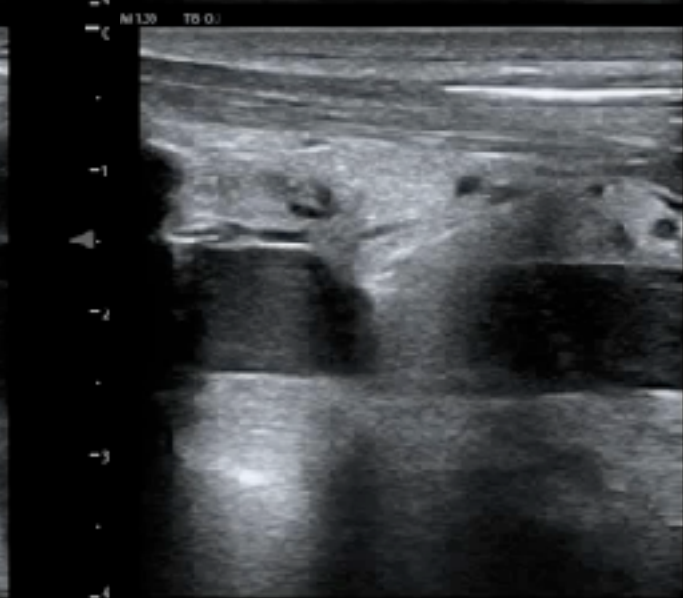
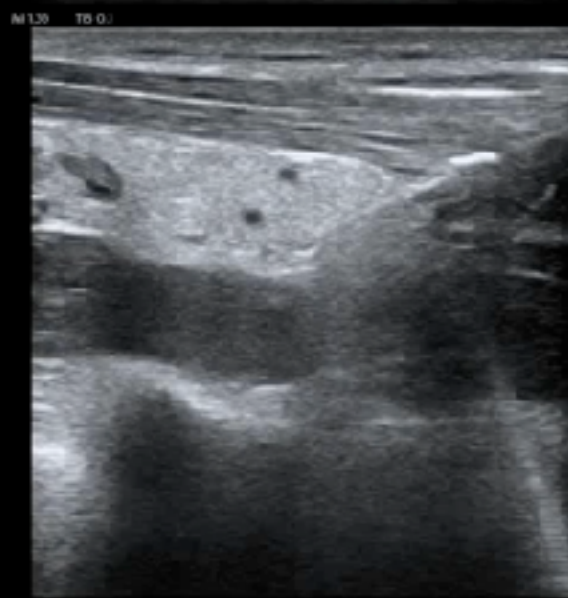
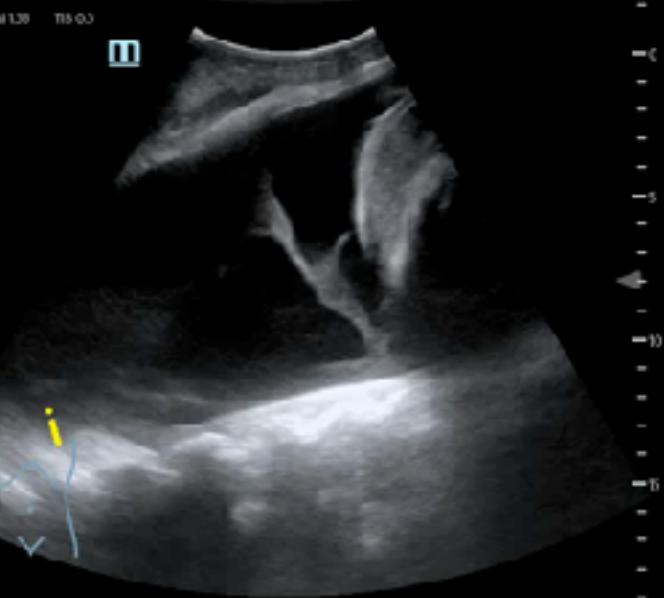
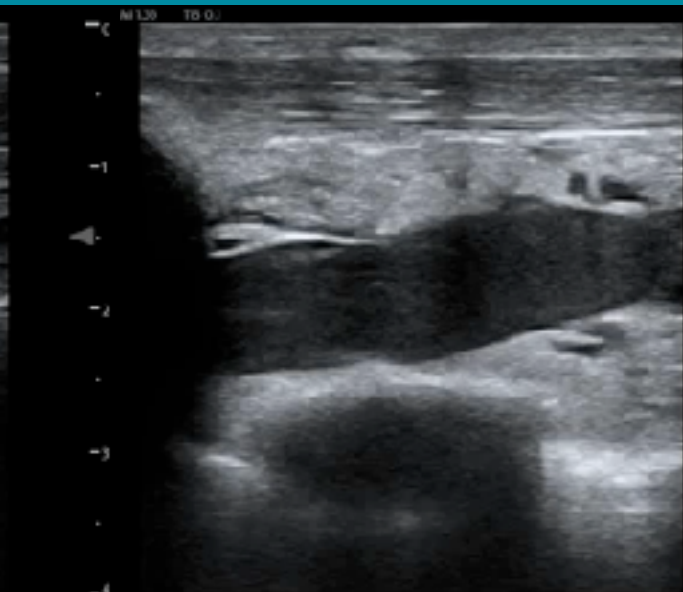
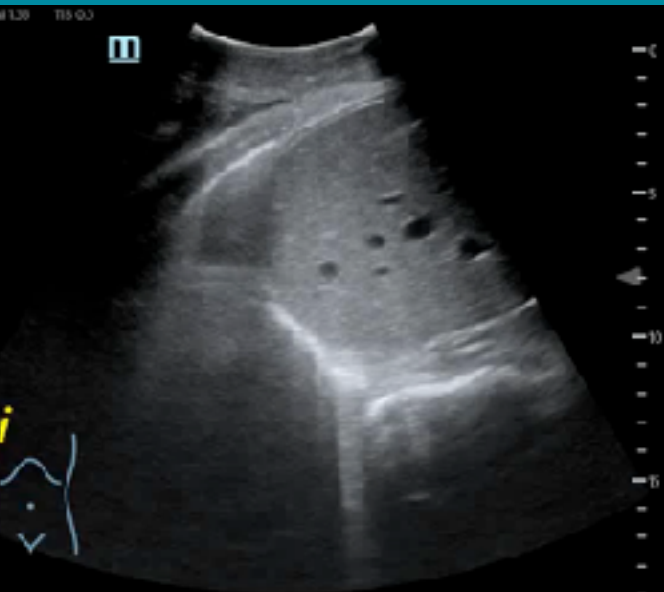
Echo guided CVC on left IJV (頭側)

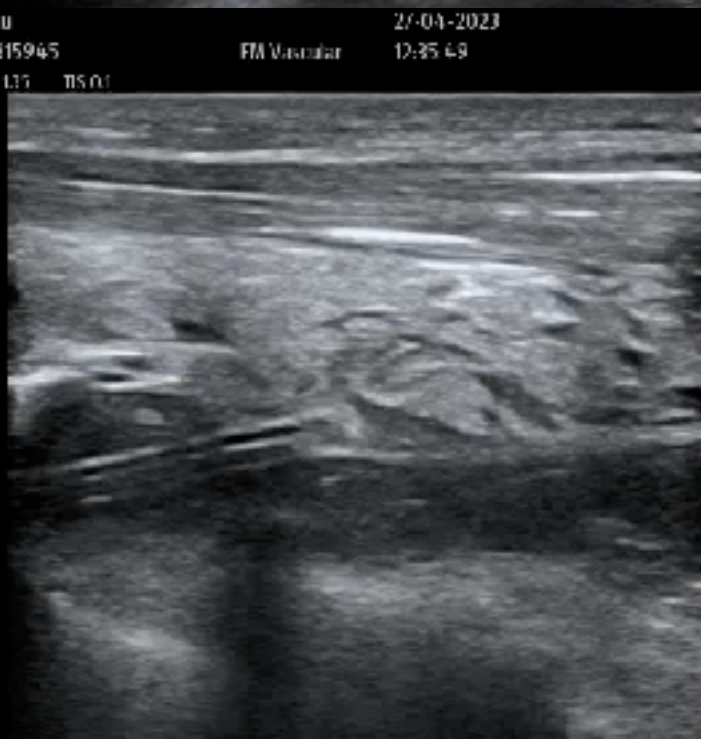


穿刺前的三思: 合適? 安全? 容易?



64M, 安中轉入，Shock & AMS





Septic shock, renal abscess, AKI

mindray

sha ng 01498867

17/08/2022

10:15:20

AP 92.5% MI 1.4 TIS 0.1

112 4a

Carotid



M7

B1

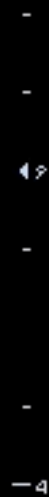
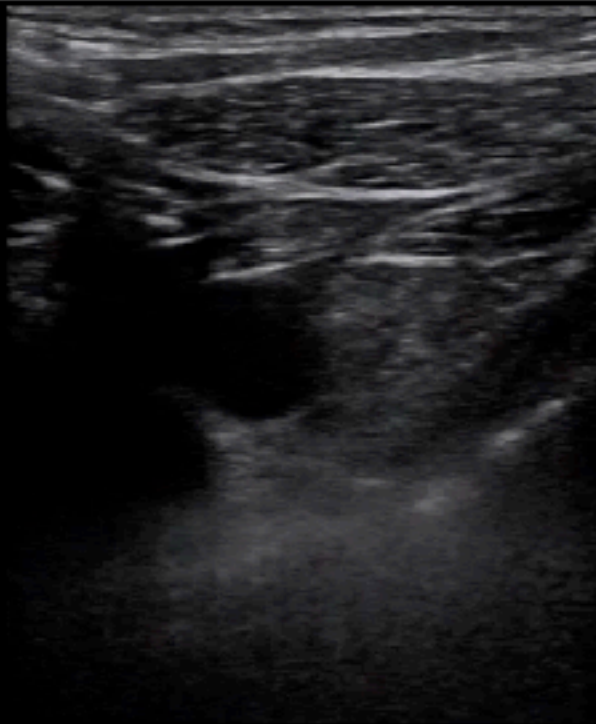
FH 11.0 / D4.6

G50 / FR42

H'5 / DR127



M



1/204



14:28

Septic shock, renal abscess, AKI

mindray

shang 01199867

17/08/2022

11:16:00

AP 92.5% MI 1.4 TIS 0.1

112 4a Coratid



M7

B1

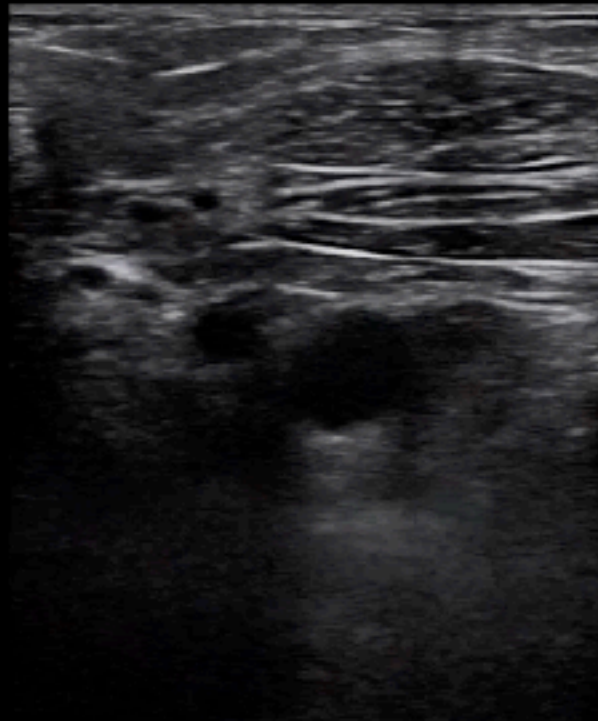
FR11.0 / D4.6

G50 / FR42

115 / DR127



M



-
-
-4
-
-
-4

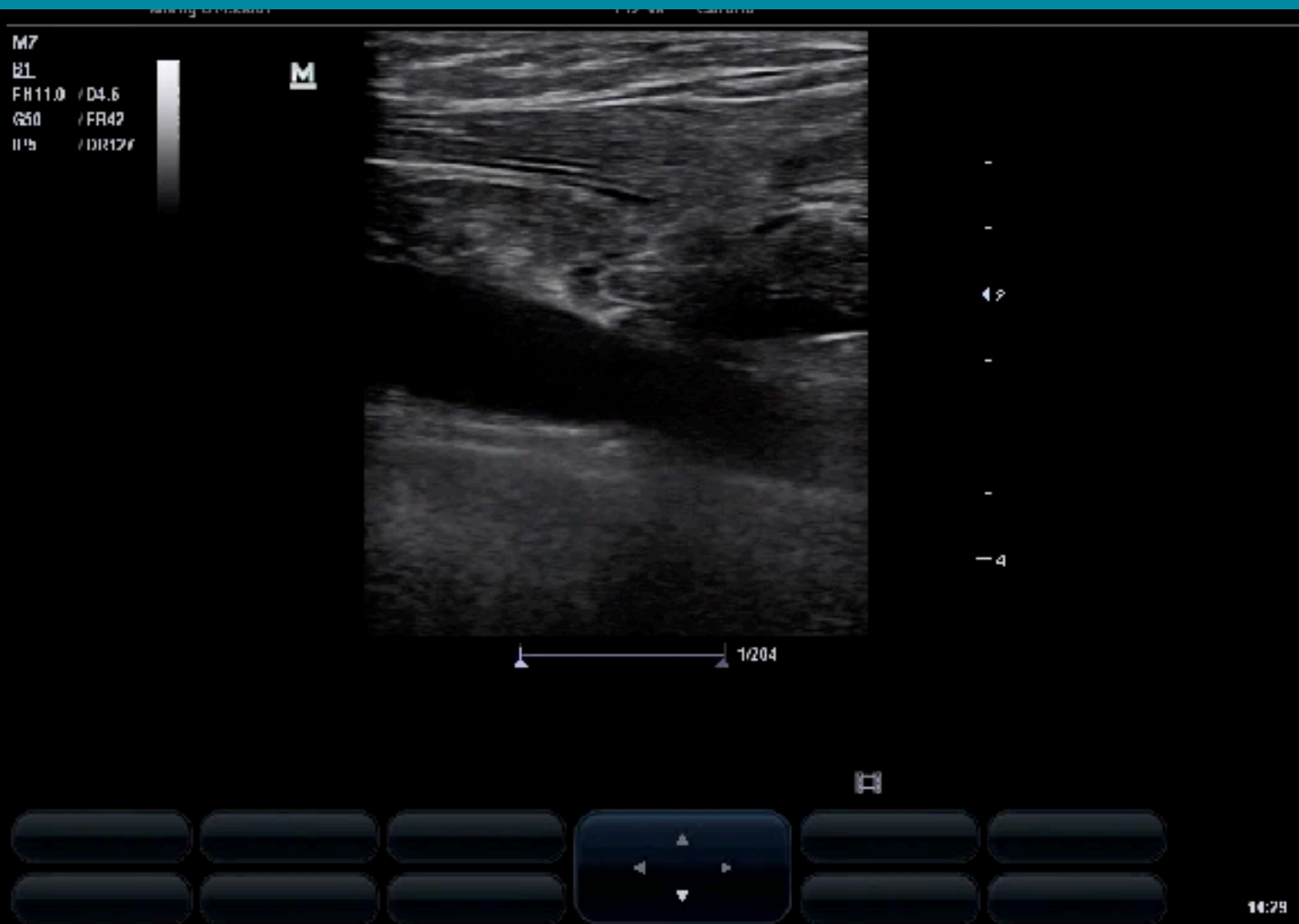
1/204



Septic shock, renal abscess, AKI



Septic shock, renal abscess, AKI



Septic shock, renal abscess, AKI

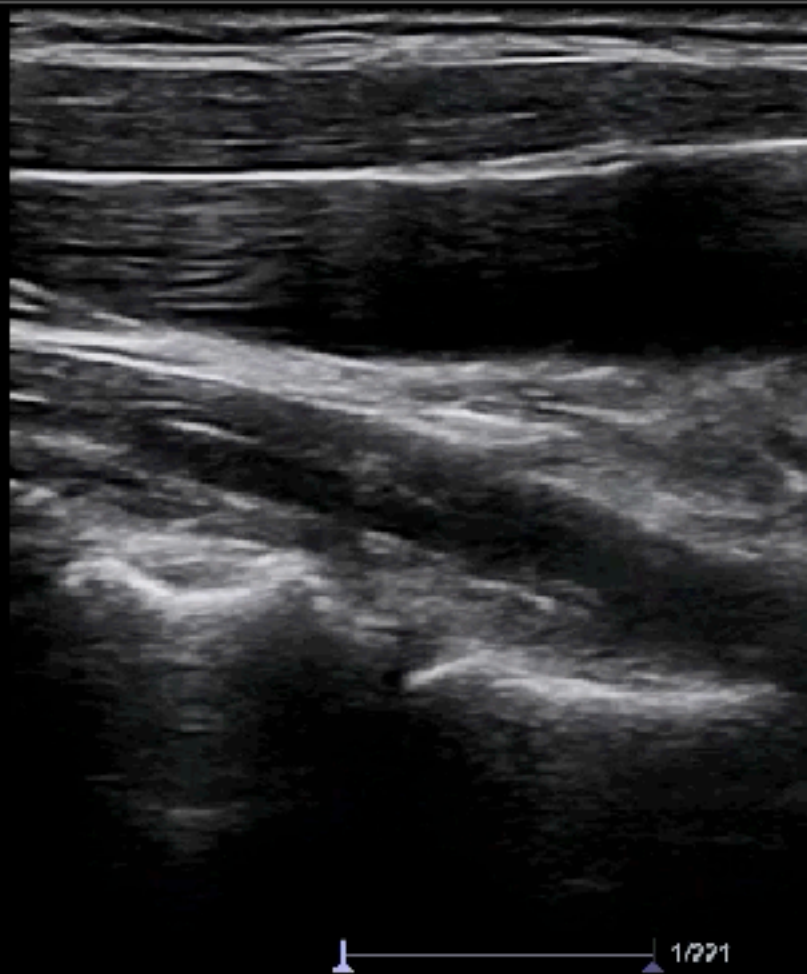
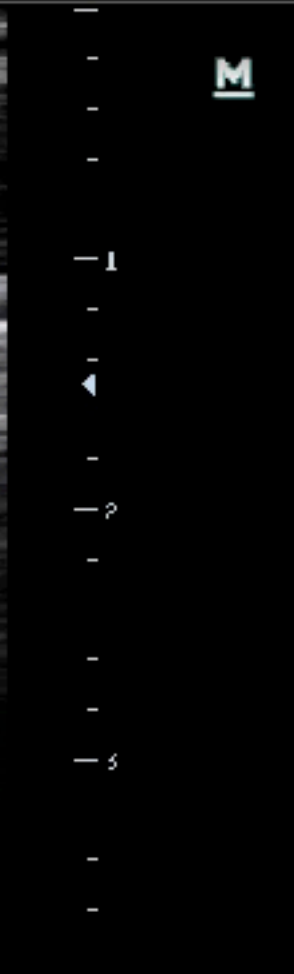


CVC for septic shock

09/08/2022 08:27:15 AP 91.2% MI 1.0 TIS 0.1
L12 4s CVC

09/08/2022 08:27:55 AP 91.2% MI 1.0 TIS 0.1
L12 4s CVC

SHD CHLN 14951190



CVC for septic shock

mindray

YIAN SHU CHEN 14951190

09/08/2022

08:36:30

AP 91.2% MI 1.0 TIS 0.1

L12.4s

CVC

M7

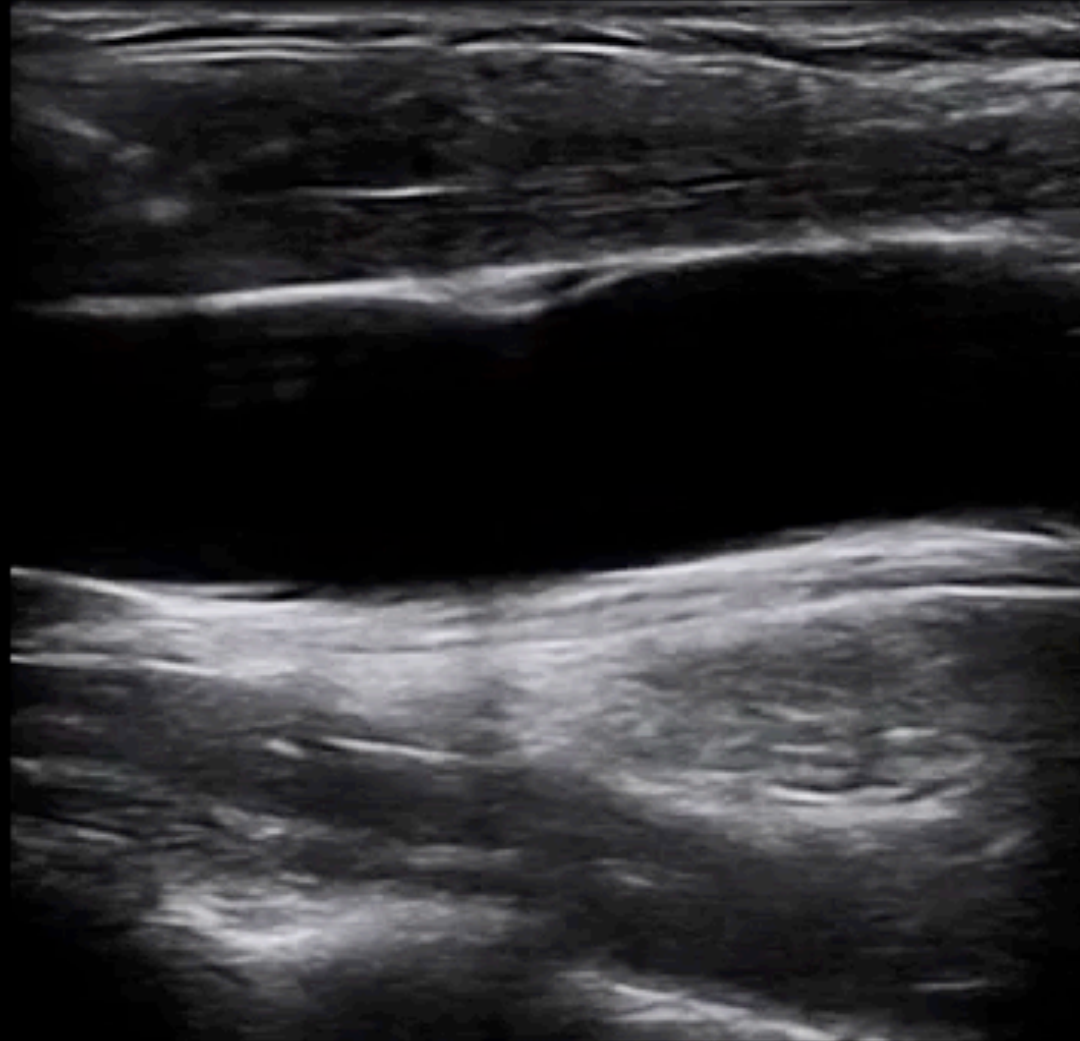
B1

F10 /D3.7

G52 /FR43

IP5 /DR95

M



1

2

3

CVC for septic shock

M7

B1

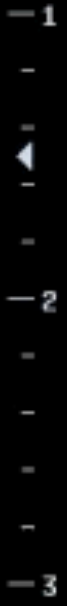
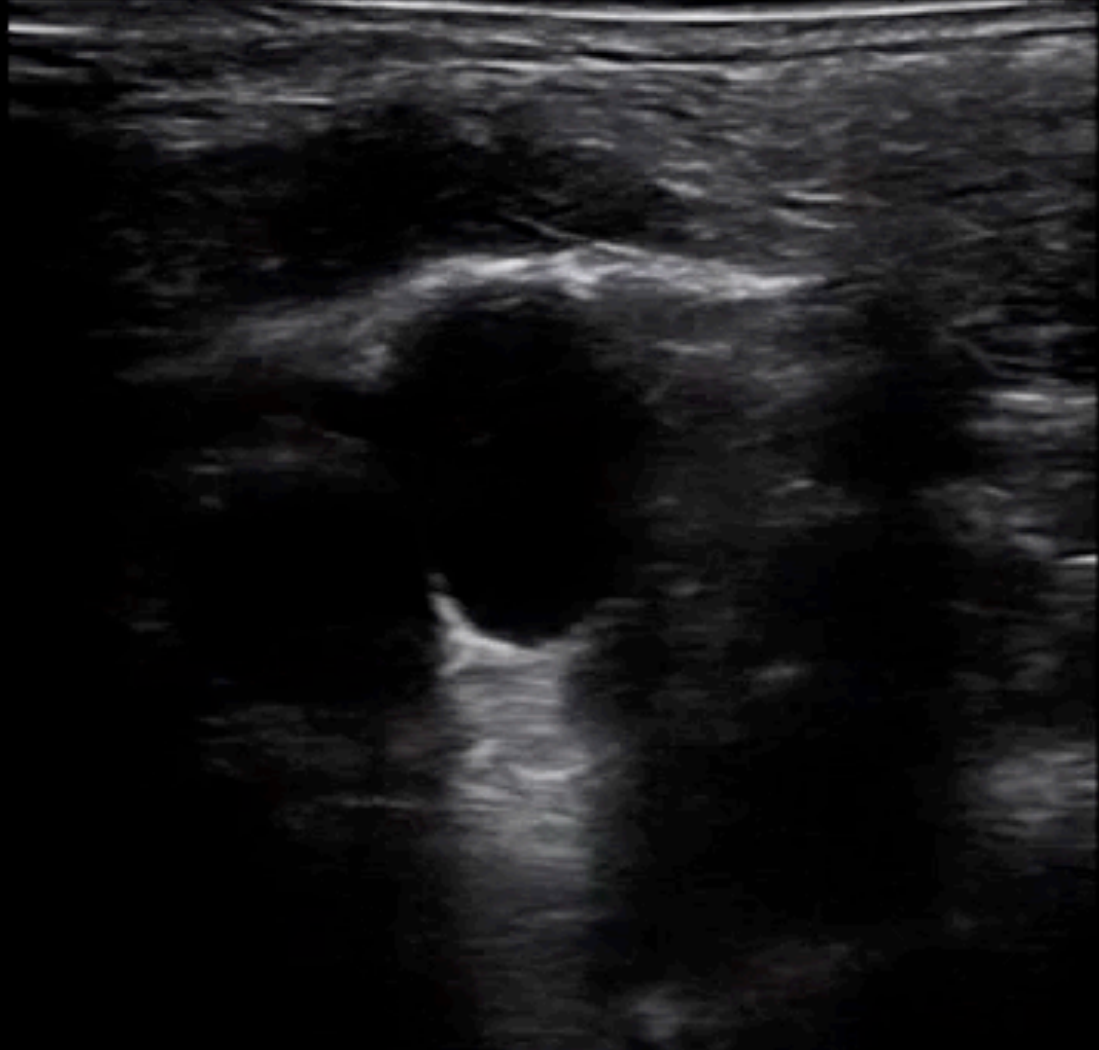
F10 /D3.7

G52 /FR43

IP5 /DR95



M

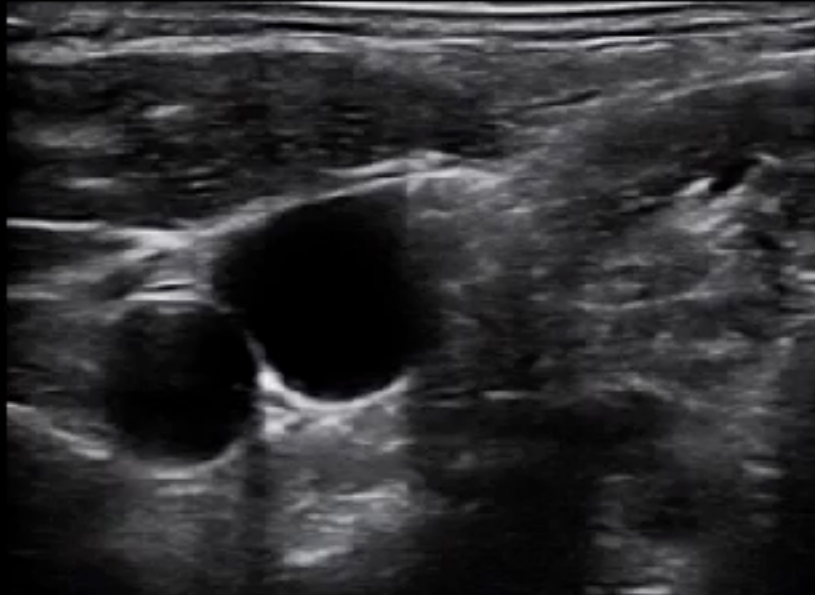


1/639

CVC for septic shock

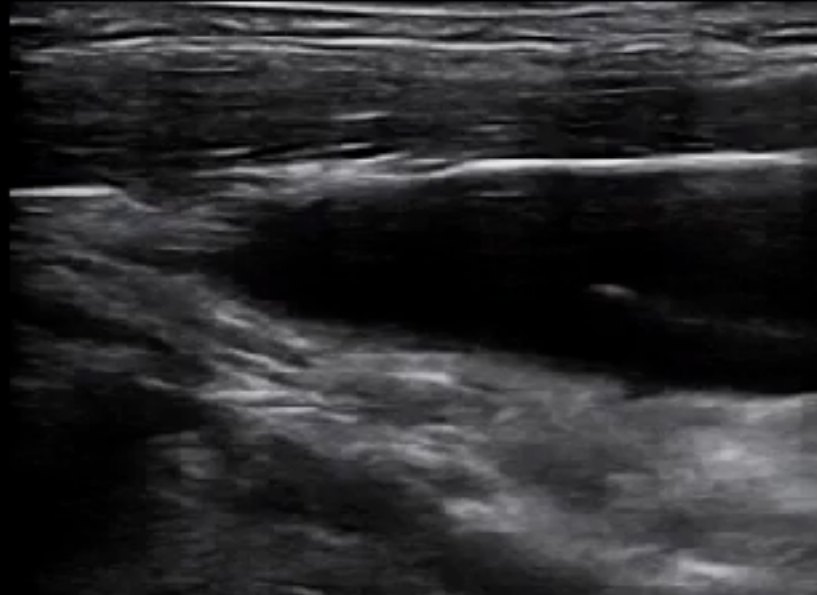
14951190

L12.4s CVC



EN 14951190

L12.4s CVC



mindray

YUAN SHI CF-FN 14951190

09/09/2022

10:11:35

AF 51.2% MI 1.3 TIS 0.1

L12.4s CVC

MF

BL

F10

G52

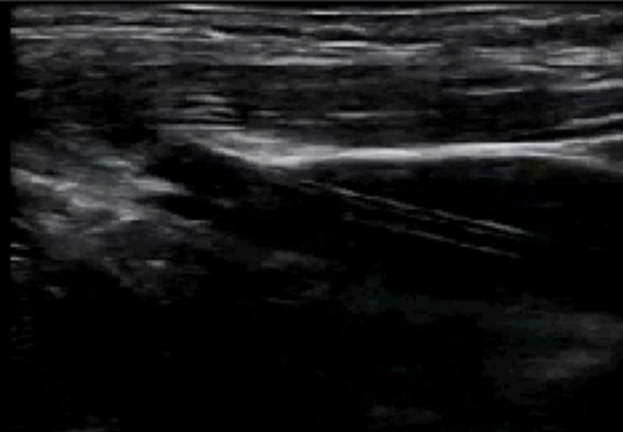
IPS

103.7

1.000

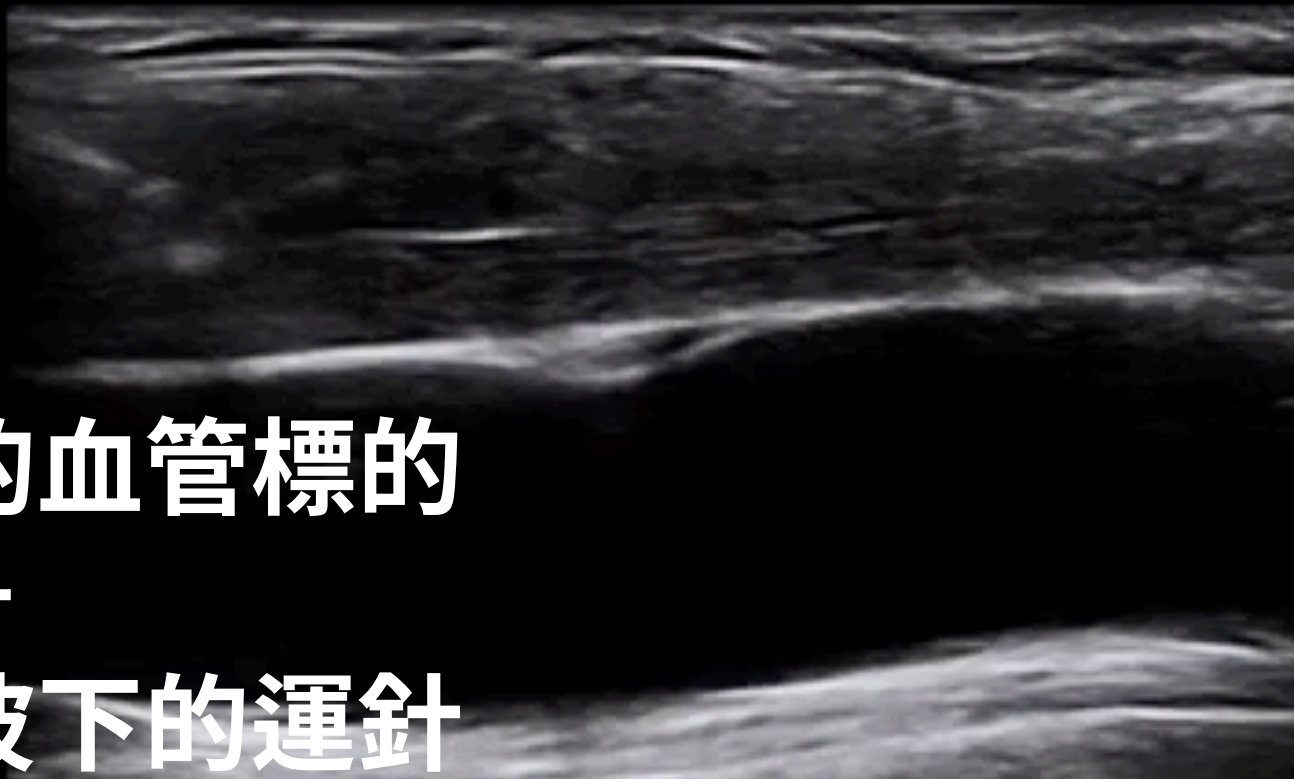
1.000

M



/D3.7
/FR43
/DR95

M



選擇合適的血管標的 + 熟練超音波下的運針

GOAL

