



衛生福利部雙和醫院  
(委託臺北醫學大學興建經營)  
Taipei Medical University · Shuang Ho Hospital,  
Ministry of Health and Welfare



# 災難現場的外傷處置 不可或缺的第三隻眼

台灣外科醫學會

【重症醫學專科訓練】課程

社區急難事件到加護病房的照護



陳國智醫師

雙和醫院 急診醫學科

# 陳國智 醫師



醫用超音波學會指導醫師  
WINFOCUS director / instructor  
急救加護醫學會重症超音波負責人

**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



# 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

診 監 介 治  
斷 測 入 療

POINT OF CARE ULTRASOUND

~ 存在於臨床需求之所在 ~



現場 急診 加護 病房

POINT OF CARE ULTRASOUND

~ 存在於臨床需求之所在 ~

現場








急診

加護

病房

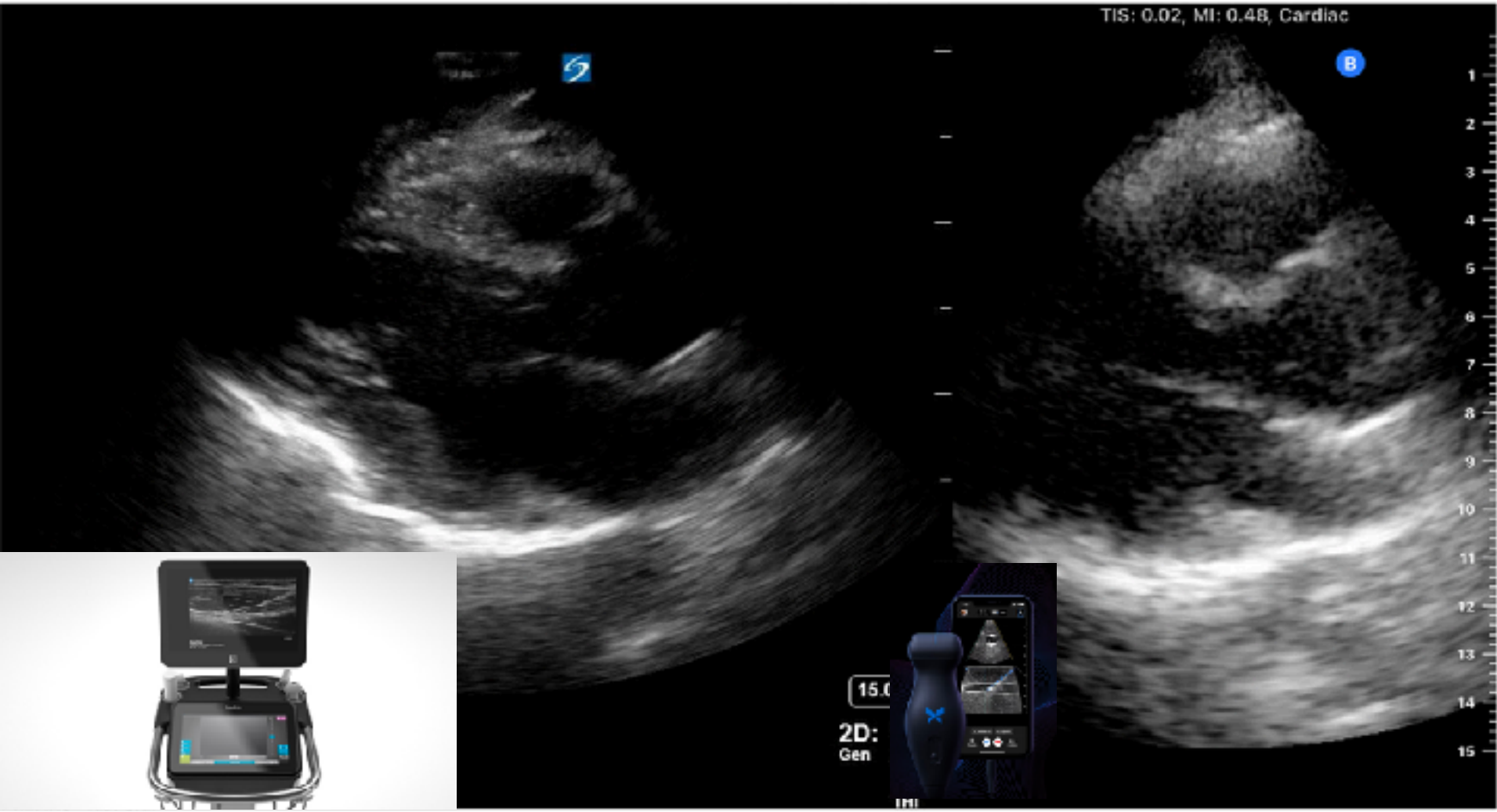
POINT OF CARE ULTRASOUND

~ 存在於臨床需求之所在 ~

|   | Name            | Probes  | Wireless                             | Display   | Storage                           | Cost   |
|---|-----------------|---|--------------------------------------|---|-----------------------------------|--|
|     | Clarius         | Linear, curvilinear, microconvex, & endocavitary              | Yes                                  | Personal iOS or Android smart device                                    | Cloud-based; DICOM capable        | \$4,900-\$6,900; no subscription   |
|    | SonoQue         | Linear & curvilinear; also dual-head probes                   | Yes                                  | Personal iOS smart device   | On smart device                   | \$999-\$4,400; no subscription   |
|    | Philips Lumify  | Linear, curvilinear, & phased array                           | No                                   | Personal Android smart device; iOS device with adapter                  | On device; DICOM capable          | \$6,000; no subscription   |
|    | EchoNous Kosmos | Phased array  | No                                   | Proprietary tablet or select Samsung devices                            | On device; DICOM capable          | \$5,000-\$8,500; no subscription   |
|    | Vave            | Phased array  | Yes                                  | Personal iOS or Android smart device                                    | On device or cloud; DICOM capable | \$99/month (billed annually)   |
|   | GE Vscan        | Sector, dual-head linear/sector, dual-head linear/curvilinear | No (Vscan Extend)<br>Yes (Vscan Air) | Extend: Proprietary tablet<br>Air: Personal iOS or Android smart device | On device or cloud; DICOM capable | \$2,995-\$4,995; no subscription   |
|  | Butterfly iQ+   | CMUT probe  | No                                   | Personal iOS or Android smart device                                    | Cloud-based; DICOM capable        | \$1,999 with \$420 annual subscription; \$2,999 with lifetime subscription |
|  | SonoSite iViz   | Linear, curvilinear, & phased array                           | No                                   | Proprietary tablet  | DICOM & cloud capable             | >\$10,000; no subscription   |

# The Use of Handheld Ultrasound Devices in Emergency Medicine

Adrienne N. Malik<sup>1</sup> • Jonathan Rowland<sup>2</sup> • Brian D. Haber<sup>3</sup> • Stephanie Thom<sup>1</sup> • Bradley Jackson<sup>1</sup> • Bryce Volk<sup>1</sup> • Robert R. Ehrman<sup>3</sup>  Current Emergency and Hospital Medicine Reports (2021) 9:73–81

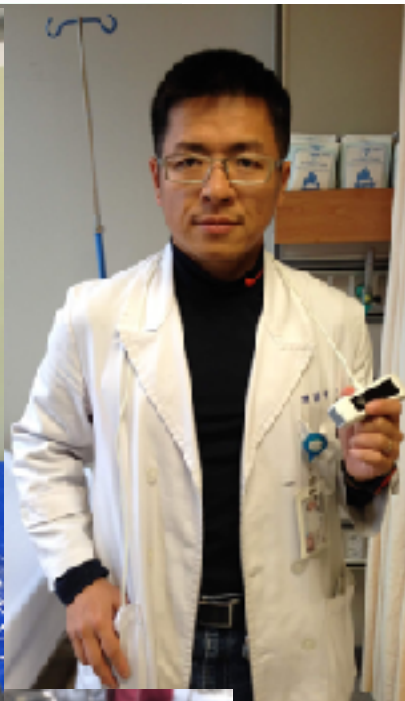


**Fig. 2** Side by side comparison of a parasternal long axis (PLAX) cardiac view obtained on the same patient using a SonoSite X-Porte (Fujifilm, SonoSite INC, Bothell, WA) on the left and the Butterfly iQ HHU

(Butterfly Network INC, Guilford, CT) on the right. Both images were obtained using the cardiac preset function on each machine



# Hand-Held Ultrasound



# 新冠肺炎流行期，該常規使用肺部超音波嗎？

## 安全的防護

陳國智

2020急加專刊





# 新冠肺炎流行期，該常規使用肺部超音波嗎？

陳國智

2020急加專刊

關鍵詞：新型冠狀病毒疾病，肺部超音波

## 臨床的必要

### 【結論】


以台灣目前的疫情而言，中小型醫院的急診部門，尤其是單線作業的急診，肺部超音波並不適合常規應用在COVID-19的診斷。然而，在完善的防護和有經驗的操作者手中，超音波在面對COVID-19的不同臨床情境中，無論是在到院前、急診、病房或是加護病房，應該能提供資源分配、疾病進展監測、治療成效評估和輔助醫療處置等決策的進行。

REVIEW

Open Access



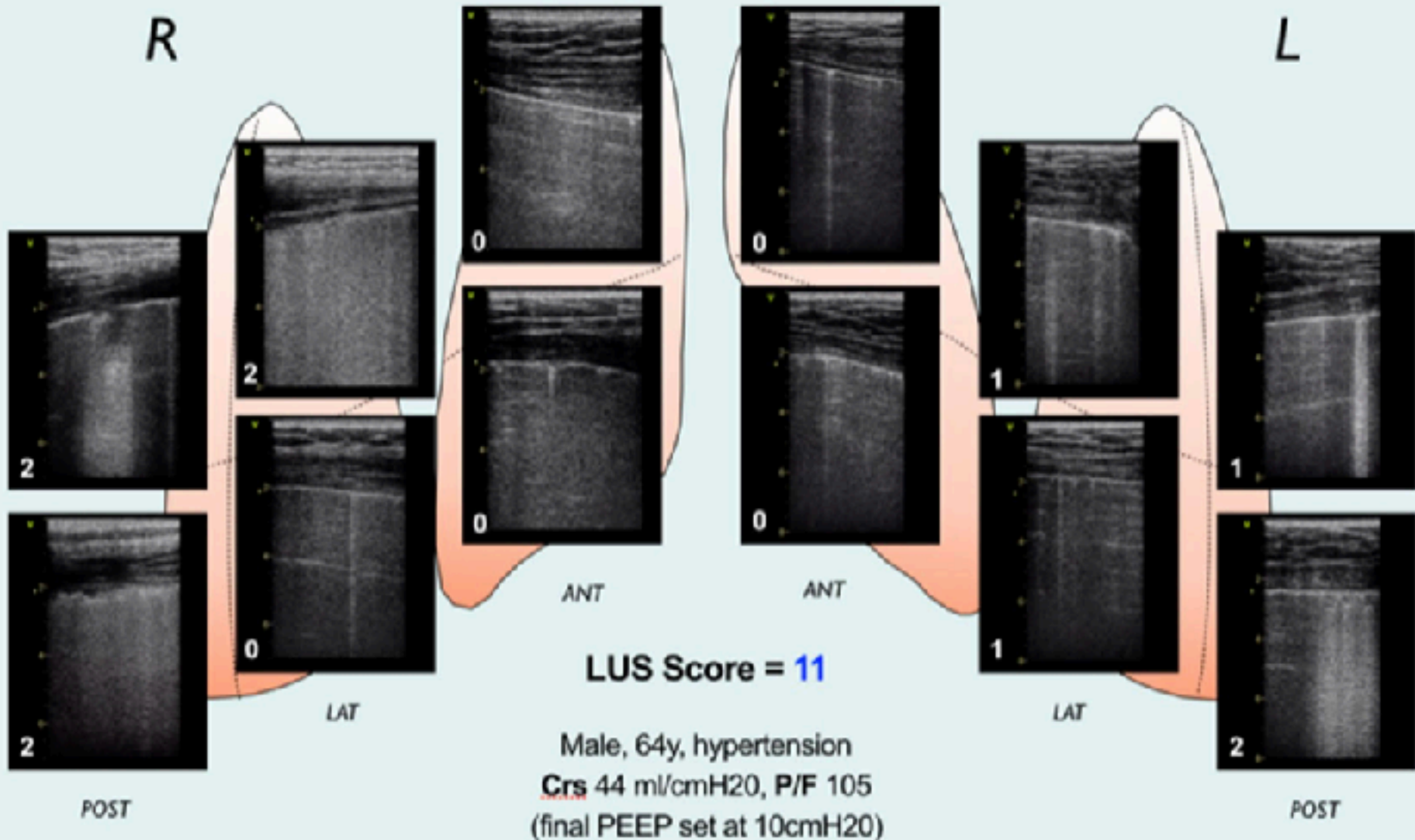
# Multi-organ point-of-care ultrasound for COVID-19 (PoCUS4COVID): international expert consensus

Arif Hussain<sup>1\*</sup> , Gabriele Via<sup>2†</sup>, Lawrence Melniker<sup>3</sup>, Alberto Goffi<sup>4</sup>, Guido Tavazzi<sup>5,6</sup>, Luca Neri<sup>7</sup>, Tomas Villen<sup>8</sup>, Richard Hoppmann<sup>9</sup>, Francesco Mojoli<sup>10</sup>, Vicki Noble<sup>11</sup>, Laurent Zieleskiewicz<sup>12</sup>, Pablo Blanco<sup>13</sup>, Irene W. Y. Ma<sup>14</sup>, Mahathar Abd. Wahab<sup>15</sup>, Abdulmohsen Alsaawi<sup>16</sup>, Majid Al Salamah<sup>17</sup>, Martin Balik<sup>18</sup>, Diego Barca<sup>19</sup>, Karim Bendjelid<sup>20</sup>, Belaid Bouhemad<sup>21</sup>, Pablo Bravo-Figueroa<sup>22</sup>, Raoul Breikreutz<sup>23</sup>, Juan Calderon<sup>24</sup>, Jim Connolly<sup>25</sup>, Roberto Copetti<sup>26</sup>, Francesco Corradi<sup>27</sup>, Anthony J. Dean<sup>28</sup>, André Denault<sup>29</sup>, Deepak Govil<sup>30</sup>, Carmela Graci<sup>31</sup>, Young-Rock Ha<sup>32</sup>, Laura Hurtado<sup>33</sup>, Toru Kameda<sup>34</sup>, Michael Lanspa<sup>35</sup>, Christian B. Laursen<sup>36</sup>, Francis Lee<sup>37</sup>, Rachel Liu<sup>38</sup>, Massimiliano Meineri<sup>39</sup>, Miguel Montorfano<sup>40</sup>, Peiman Nazerian<sup>41</sup>, Bret P. Nelson<sup>42</sup>, Aleksandar N. Neskovic<sup>43</sup>, Ramon Nogue<sup>44</sup>, Adi Osman<sup>45</sup>, José Pazeli<sup>46</sup>, Elmo Pereira-Junior<sup>47</sup>, Tomislav Petrovic<sup>48</sup>, Emanuele Pivetta<sup>49</sup>, Jan Poelaert<sup>50</sup>, Susanna Price<sup>51</sup>, Gregor Prosen<sup>52</sup>, Shalim Rodriguez<sup>53</sup>, Philippe Rola<sup>54</sup>, Colin Royse<sup>55,56</sup>, Yale Tung Chen<sup>57</sup>, Mike Wells<sup>58</sup>, Adrian Wong<sup>59</sup>, Wang Xiaoting<sup>60</sup>, Wang Zhen<sup>61</sup> and Yaseen Arabi<sup>62</sup>

# Low lung elastance, low ventilation/perfusion ratio



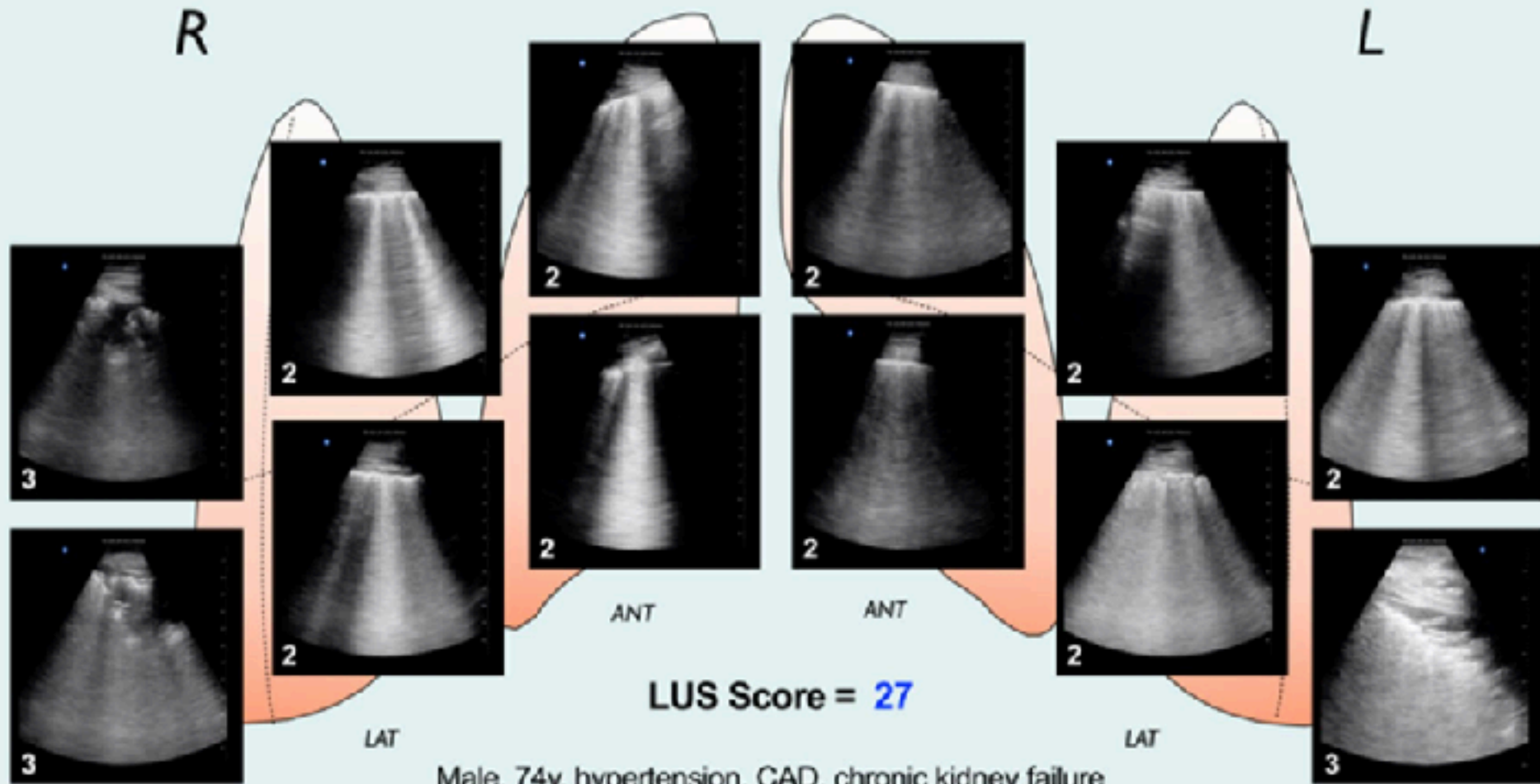
## COVID-19 PNEUMONIA LUS, consistent with "Phenotype L"



# High lung elastance, high R-L shunt



COVID-19 PNEUMONIA LUS, consistent with "Phenotype H"



Male, 74y, hypertension, CAD, chronic kidney failure

Crs 28 ml/cmH<sub>2</sub>O, P/F 82,  
(final PEEP set at 14cmH<sub>2</sub>O)





# POTENTIALLY USEFUL PoCUS APPLICATIONS in COVID-19 PATIENTS



**RESPIRATORY FAILURE  
DIAGNOSIS /  
TRIAGE AT ADMISSION**  
[LUS, FoCUS, DVT]

**COVID-19 PNEUMONIA  
PHENOTYPE IDENTIFICATION**  
[LUS], MONITORING [LUS, ECHO]

**MECHANICAL VENTILATION  
GUIDANCE**  
(RECRUITABILITY ASSESSMENT, PEEP  
TITRATION, PROMOTION RESPONSE  
PREDICTION) [LUS, ECHO]

**CARDIOVASCULAR ASSESSMENT**  
(SCREENING FOR PRE-EXISTING  
DISEASE, SEPSIS-RELATED  
MYOCARDIAL DYSFUNCTION,  
MYOCARDITIS DIAGNOSIS,  
RV DYSFUNCTION DIAGNOSIS,  
INCL ACP) [FOCUS, ECHO]

**MECHANICAL  
VENTILATION  
COMPLICATIONS  
SCREENING**  
(SUPERINFECTION,  
ATELECTASIS,  
PNEUMOTHORAX) [LUS]

**FLUID STATUS  
ASSESSMENT**  
(SCREENING FOR  
SEVERE HYPOVOLEMIA,  
VOLUME RESPONSIVENESS,  
FLUID OVERLOAD)  
[FOCUS, ECHO]

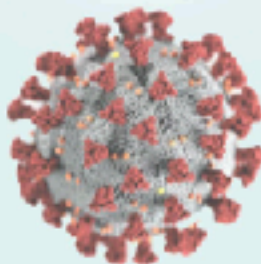
**VENTILATION WEANING**  
(READINESS, PREDICTION,  
FAILURE CAUSE DIAGNOSIS)  
[LUS, ECHO, DUS, MUS]

**DEEP VENOUS  
THROMBOSIS  
SCREENING  
& DIAGNOSIS**  
[DVT, FOCUS]

**SECONDARY  
ORGAN DYSFUNCTION  
DIAGNOSIS**  
(AKI, ABDOMINAL  
COMPLICATIONS),  
[FOCUS, ECHO, PORTAL /  
HEPATIC VEIN DOPPLER, ABD]

**STROKE DIAGNOSIS,  
NEURO-MONITORING**  
[TCD, ONSD ULTRASOUND]

**TELE-ULTRASOUND**  
[GUIDANCE, SECOND OPINION & REMOTE TRAINING]



# Safety





第四卷第四期

刊登日期：2021/08/30

Taiwan Emergency Medicine Bulletin 4(4) : e2021040409

## POCUS在COVID-19流行期的急診應用經驗分享!



**57F, Bilateral PN & ARDS**

**Rapid antigen: negative**

**PCR: positive (3d later)**

# Wireless probe

**Leltek**  
wireless handheld ultrasound device





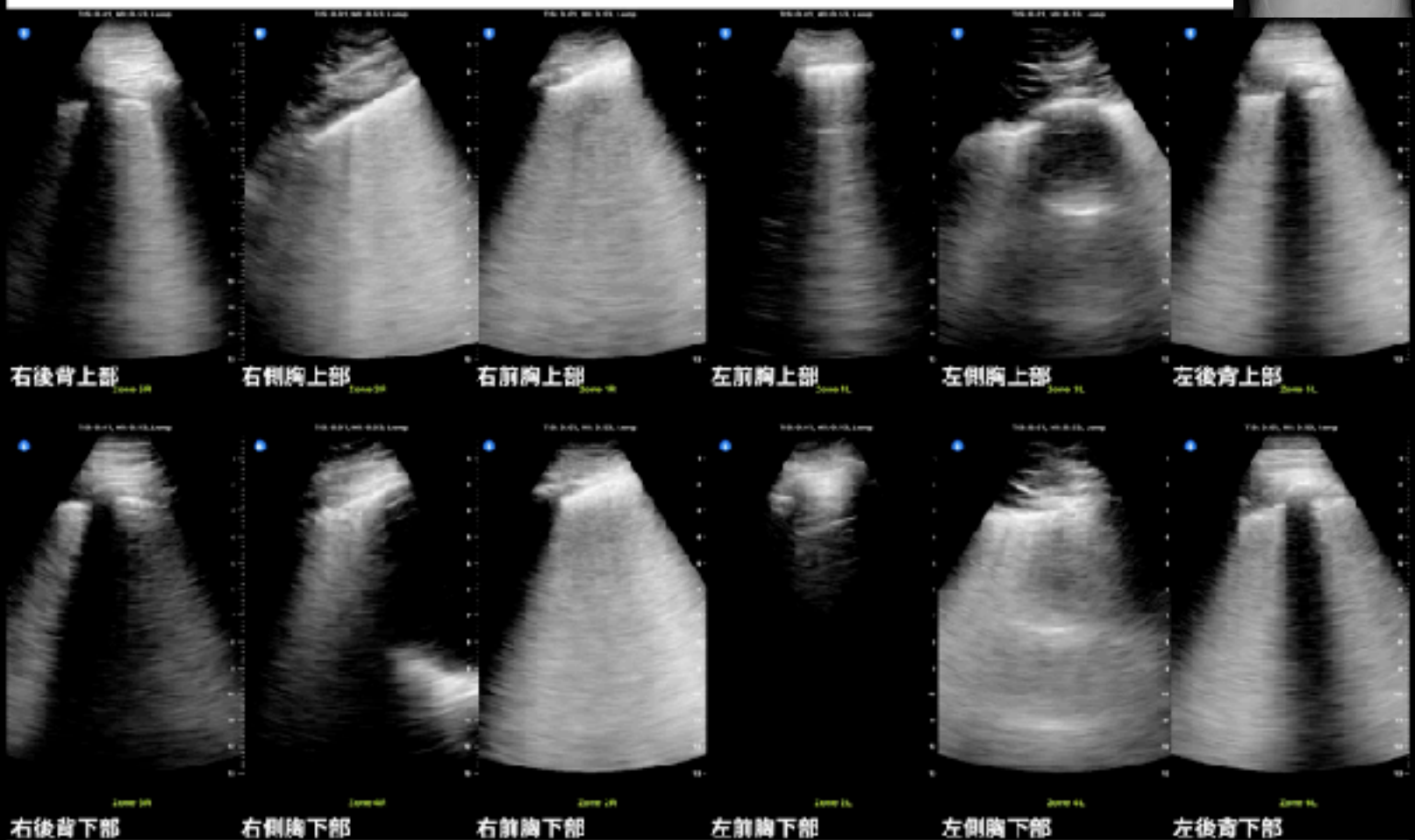
# Safety

(夾鍊袋)



## POCUS在COVID-19流行期的急診應用經驗分享!

57歲女性，就診時SpO2 64%，主訴咳和喘約5天  
BT 38.2°C; PR 86; RR 18; BP 122/70 mmHg  
Rapid test antigen: **negative**; RT-PCR on **3rd** day: **positive**



右後背上部

右側胸上部

右前胸上部

左前胸上部

左側胸上部

左後背上部

右後背下部

右側胸下部

右前胸下部

左前胸下部

左側胸下部

左後背下部

# Time to Add a Fifth Pillar to Bedside Physical Examination Inspection, Palpation, Percussion, Auscultation, and Insonation

Jagat Narula, MD, PhD; Y. Chandrashekar, MD; Eugene Braunwald, MD 2018

## 受傷機轉 POCUS 理學檢查

### 災難現場的外傷處置

~ 不可或缺的第三隻眼~

# 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



# Shock摸不到脈搏

PEA心臟有在跳嗎？



Acquire  
心臟介面



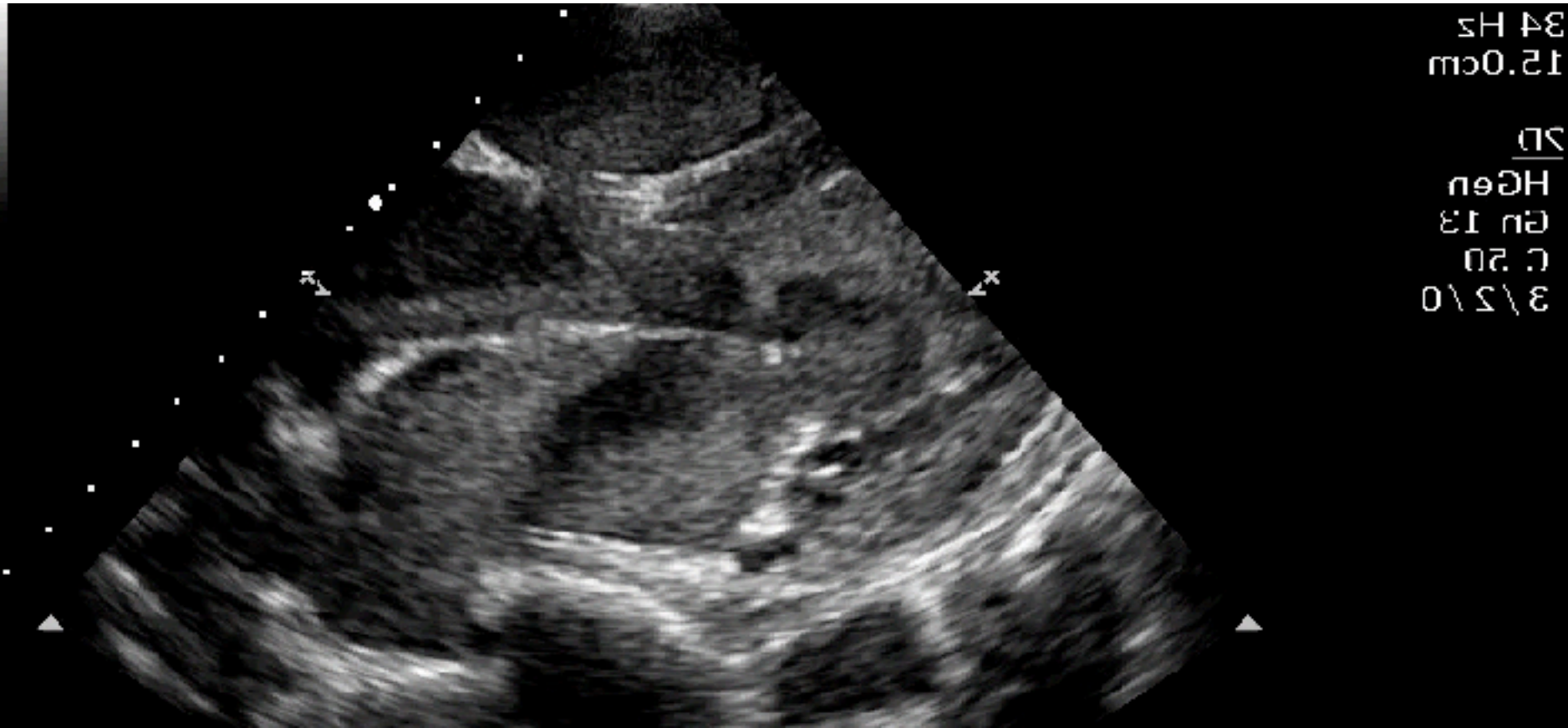
Interpret  
搏動有無



Make decision  
急救流程

# Shock摸不到脈搏

PEA心臟有在跳嗎？



# POCUS三劍客



**弧**

表面

目標



**線**

頻率

介面



**扇**

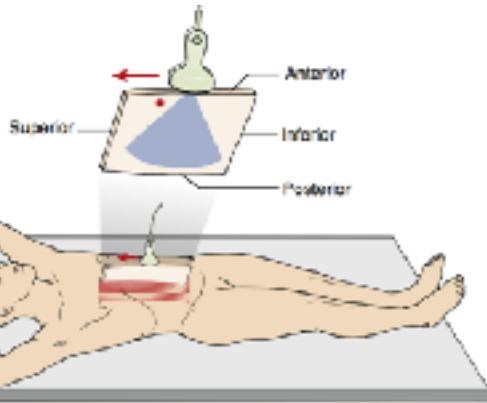
深度

視窗

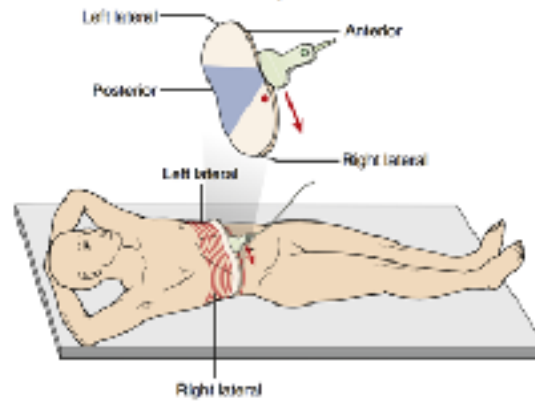
# 到院前超音波



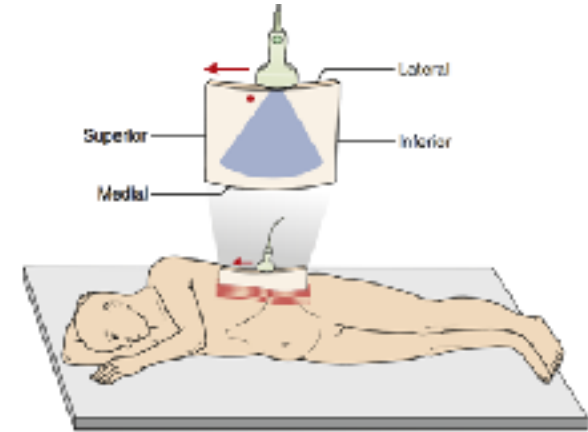
# 如何選擇最佳掃描介面？



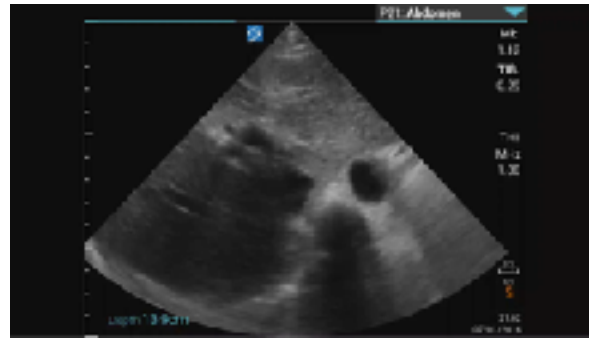
Sagittal 縱



Transverse 橫



Coronal 側



# 快狠準來自不斷的累積

WHEEL OFF ●

WHEEL ON ●

STOP ●

WHEEL OFF ●

WHEEL ON ●



● WHEEL OFF

● WHEEL ON

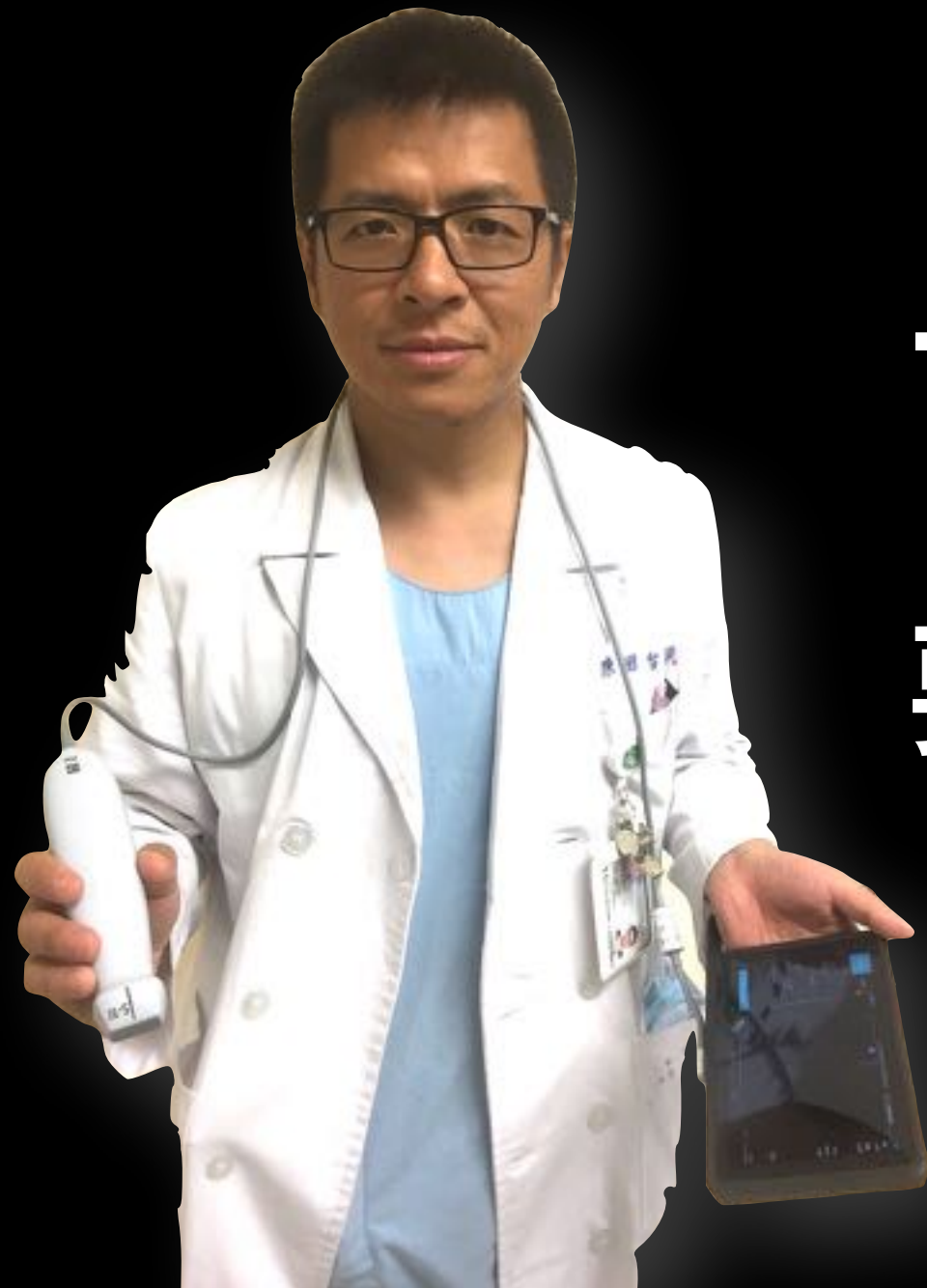
● GO

● WHEEL OFF

● WHEEL ON







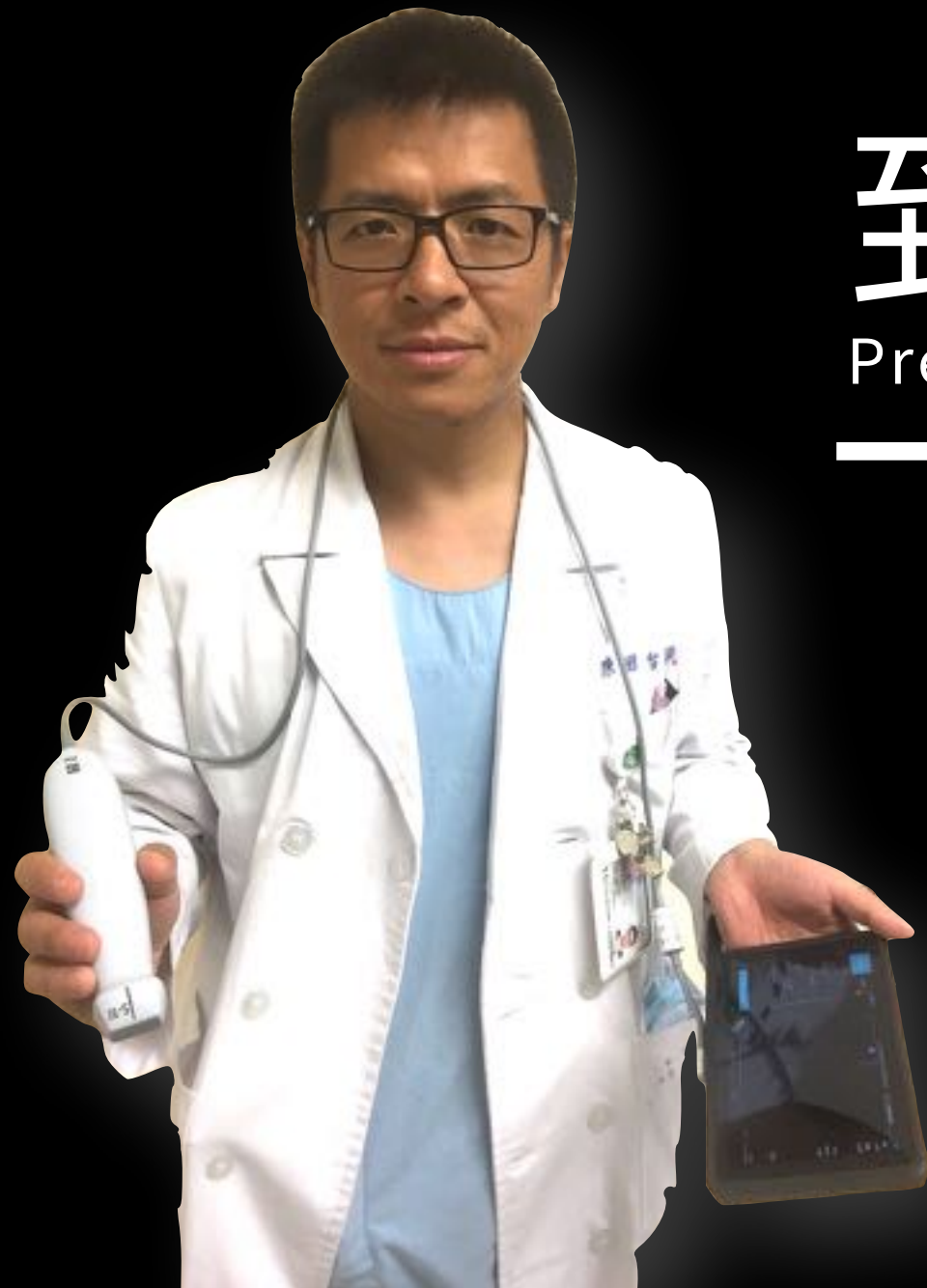
# 到院前超音波

Prehospital ultrasound

---

## 要做什麼？

臺北市政府消防局  
到院前超音波訓練



# 到院前超音波

Prehospital ultrasound

---

氣 (A) Airway

胸 (B) Breathing

心 (C) Circulation

血 (D) Diaphragm



# 到院前超音波

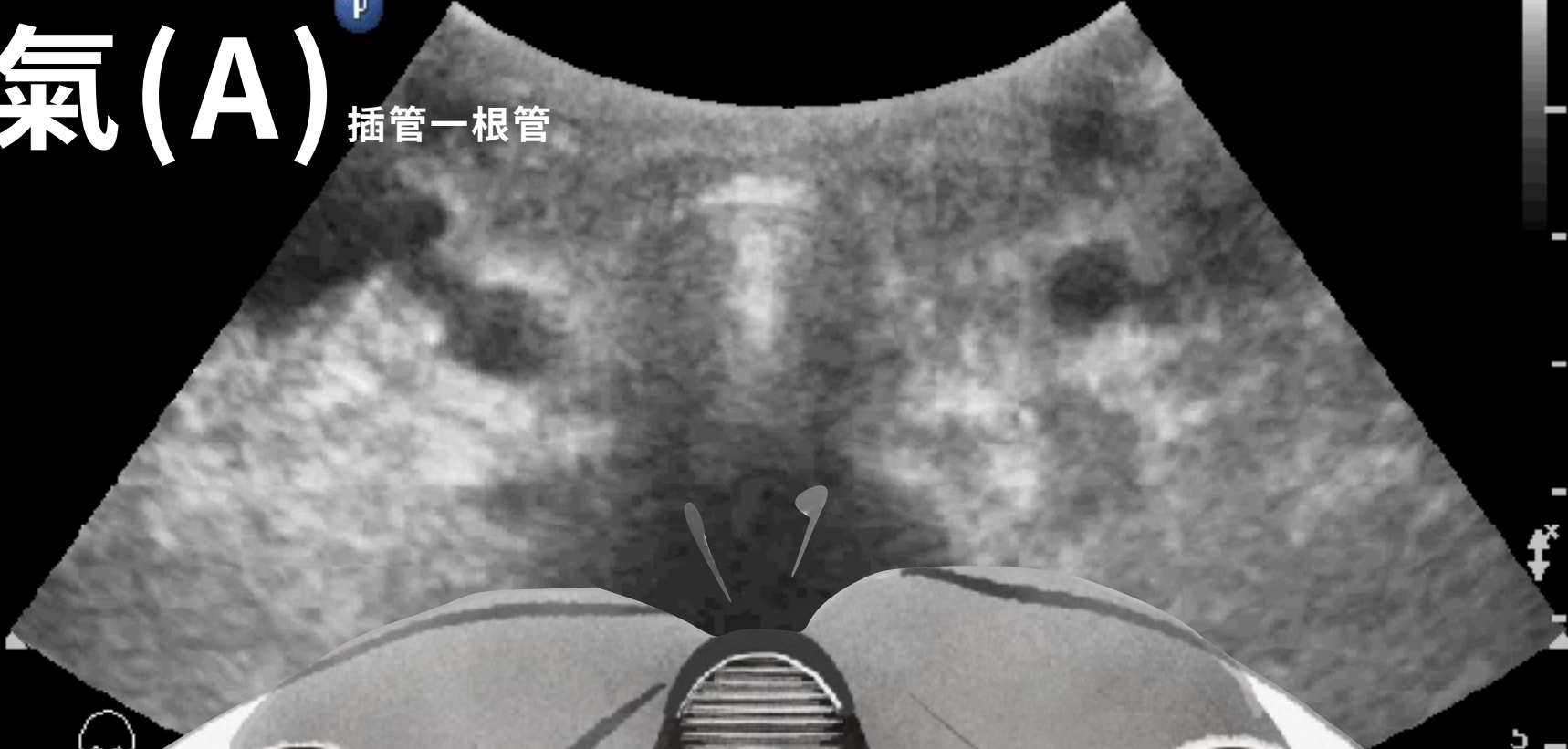
Prehospital ultrasound

---

- 氣 (A) 插管一根管
- 胸 (B) 滑動與氣胸
- 心 (C) 心搏與積液
- 血 (D) 肋膜與血胸

# 氣(A)

插管一根管



P  
1.8 3.6

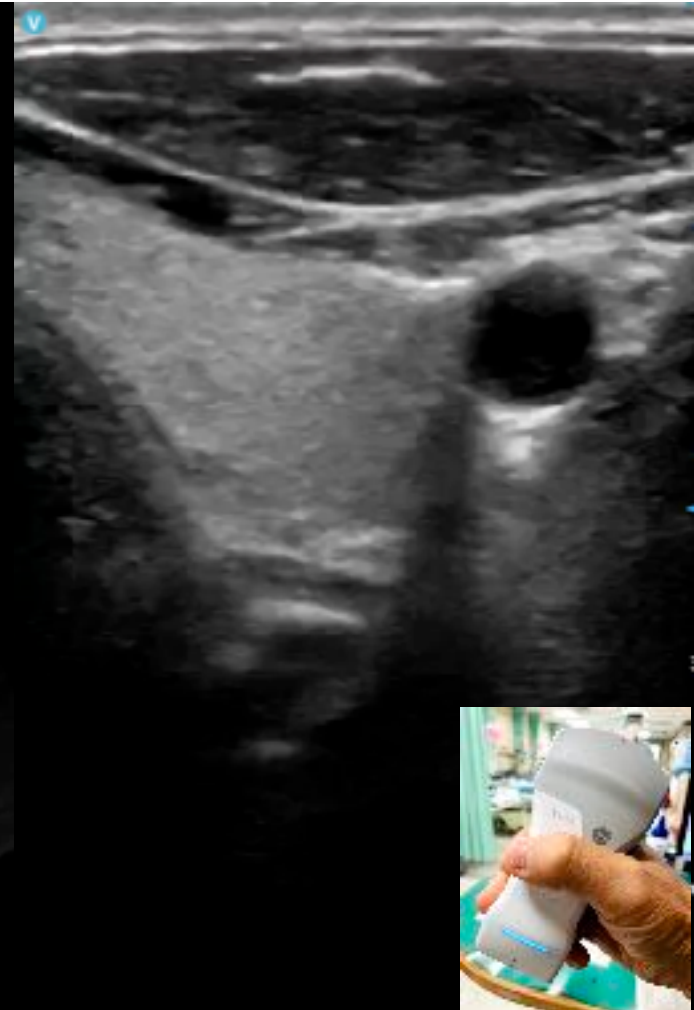
6.0cm

# One Tract





# Trachea & Eso for intubation



Exam12\_Abdominal

# 75F, shock & resuscitation



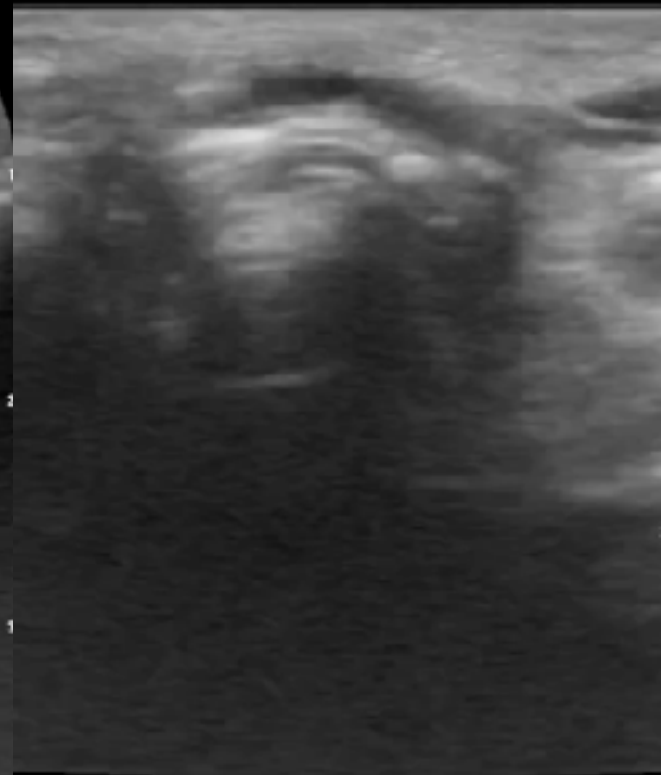
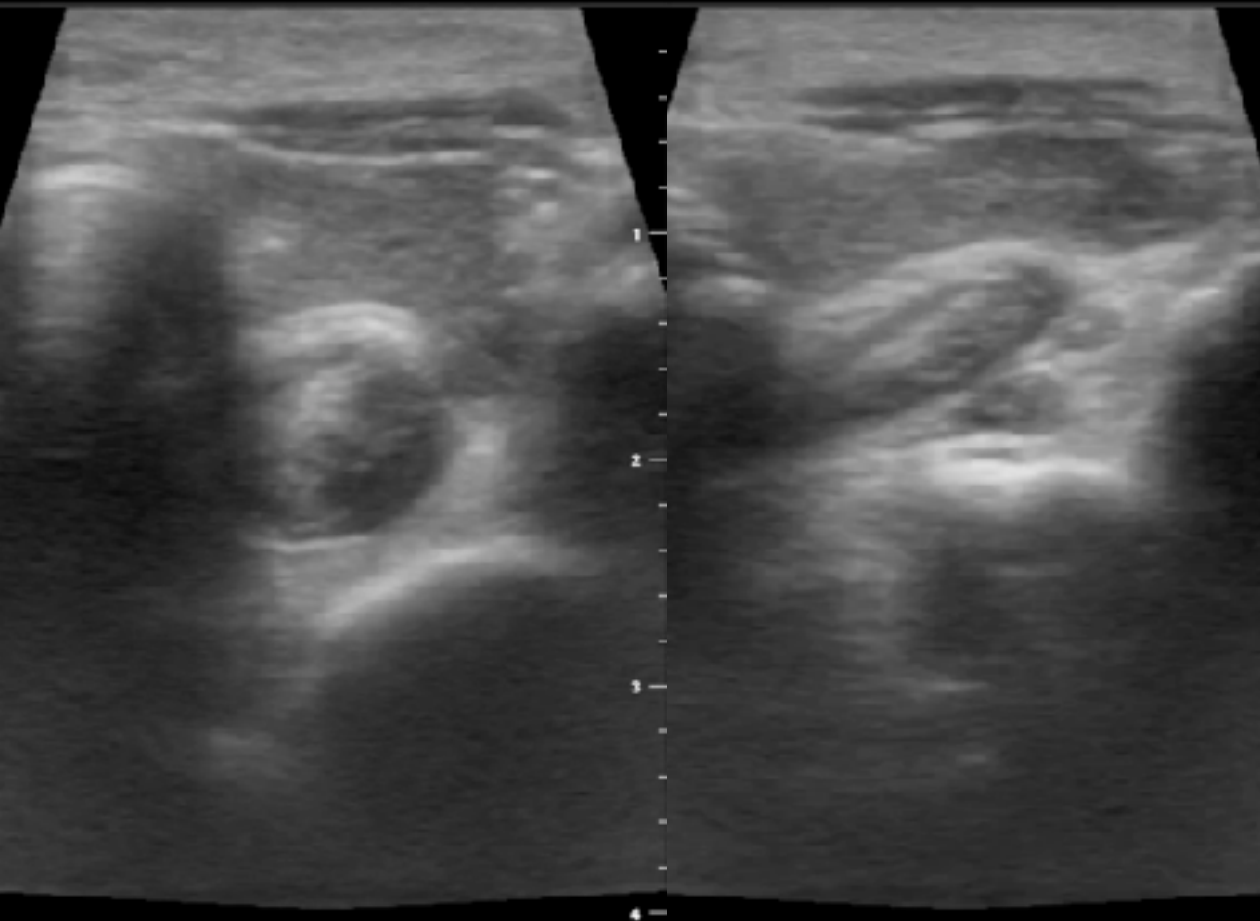
TIS: 0.01, MI: 0.35, MSK-Soft Tissue

TIS: 0.01, MI: 0.35, MSK-Soft Tissue

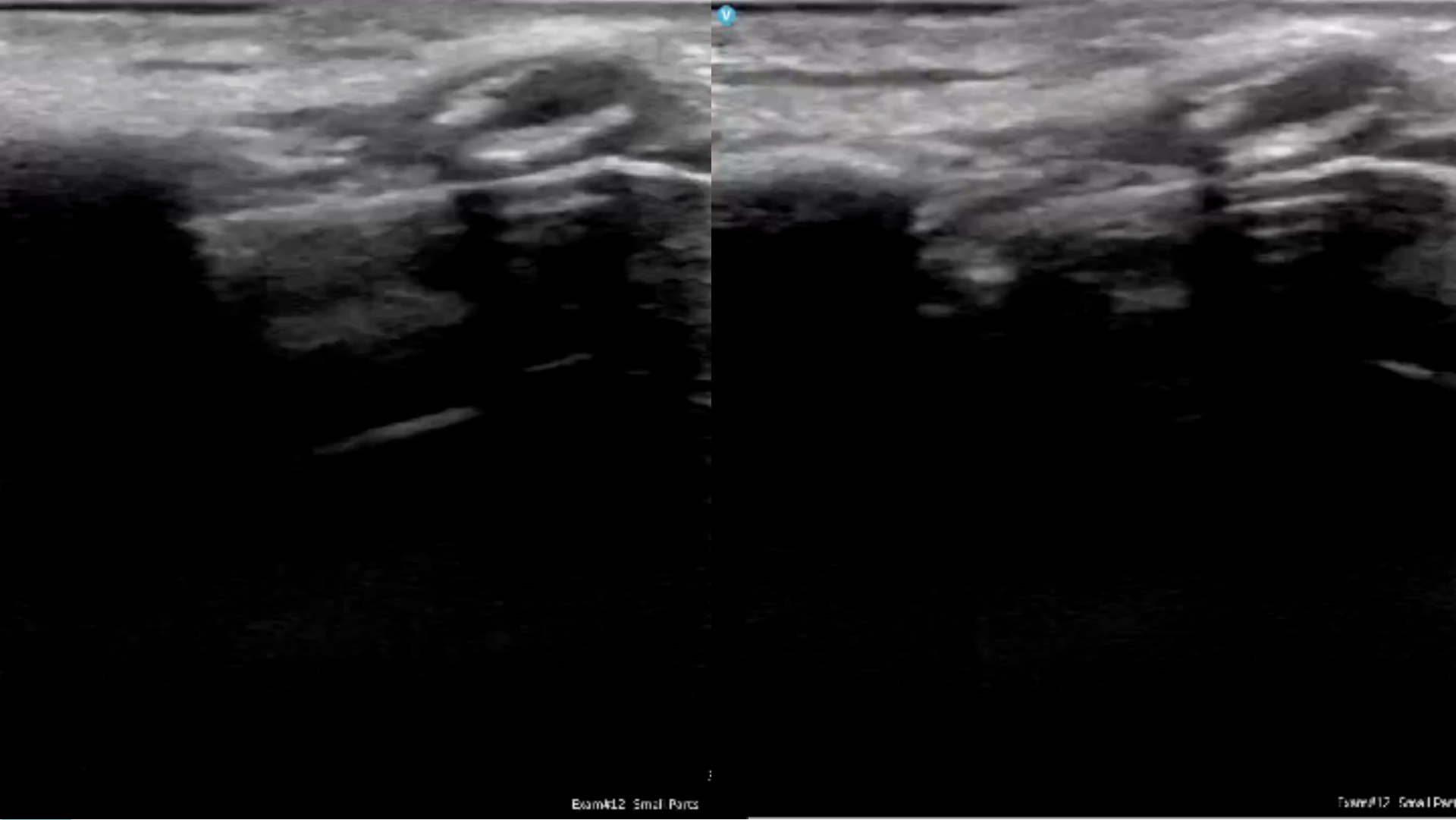
TIS: 0.01, MI: 0.26, MSK-Soft Tissue

B

B



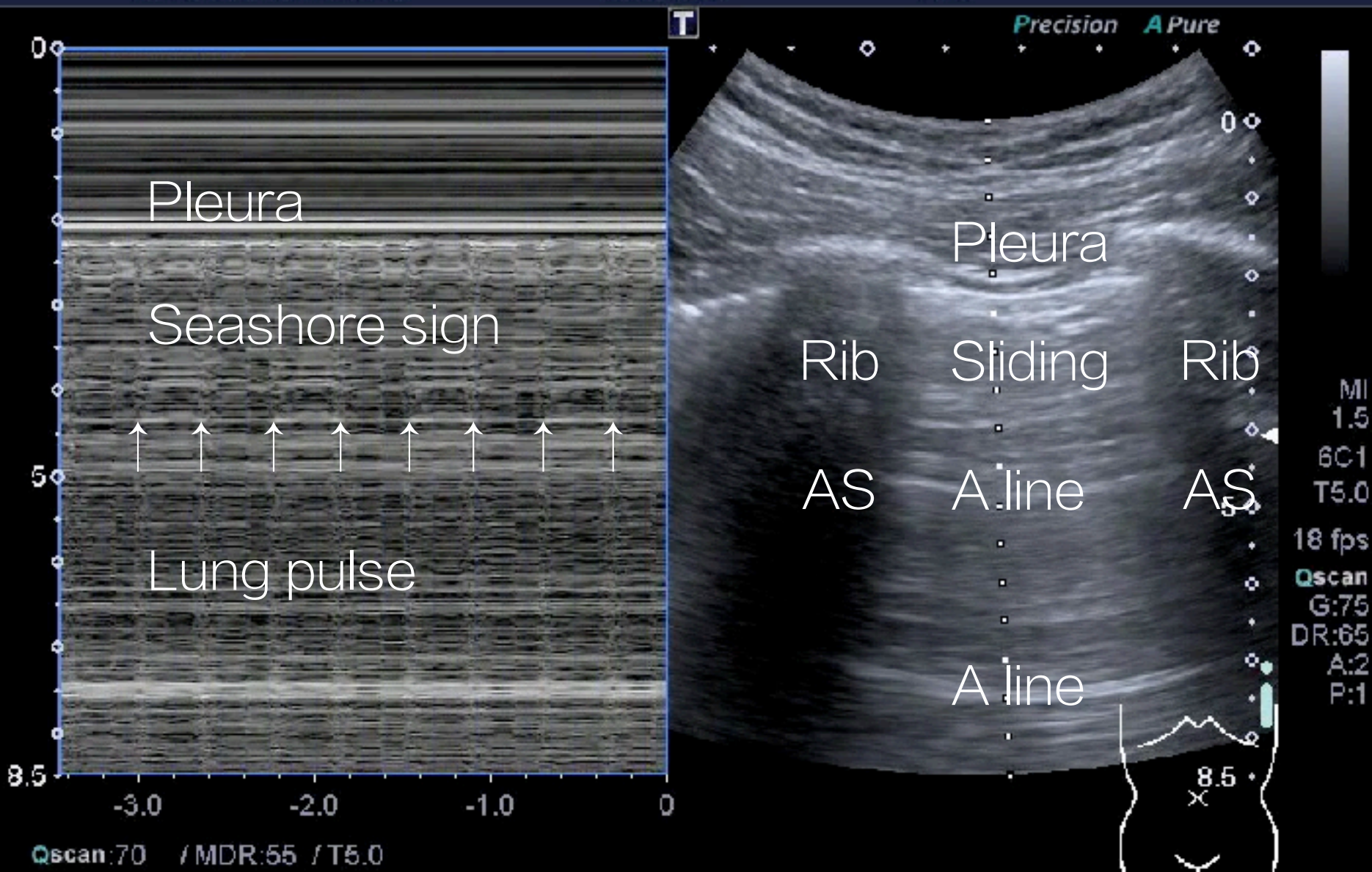
# Surgical airway: CTM & PDT



Exam#12 - Small Parts

Exam#12 - Small Parts

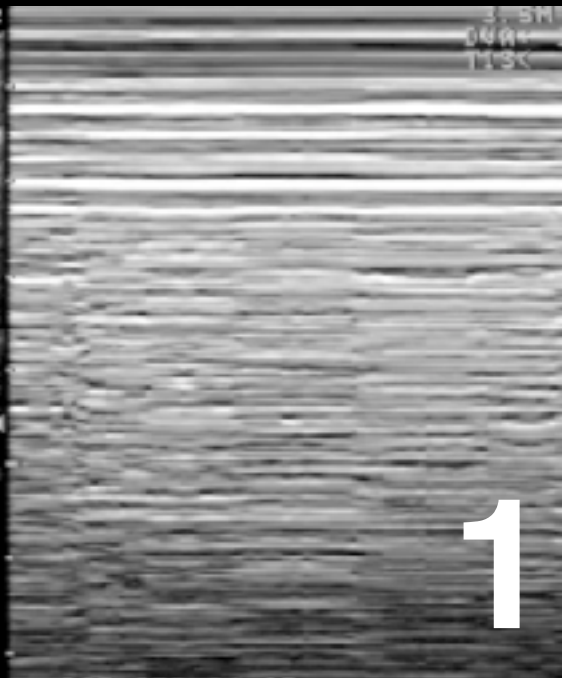
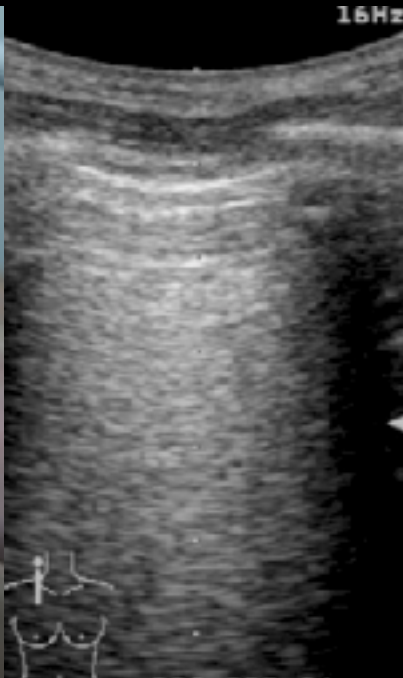
# 正常肋膜的B/M超音波影像





# 胸(B)

滑動與氣胸



1

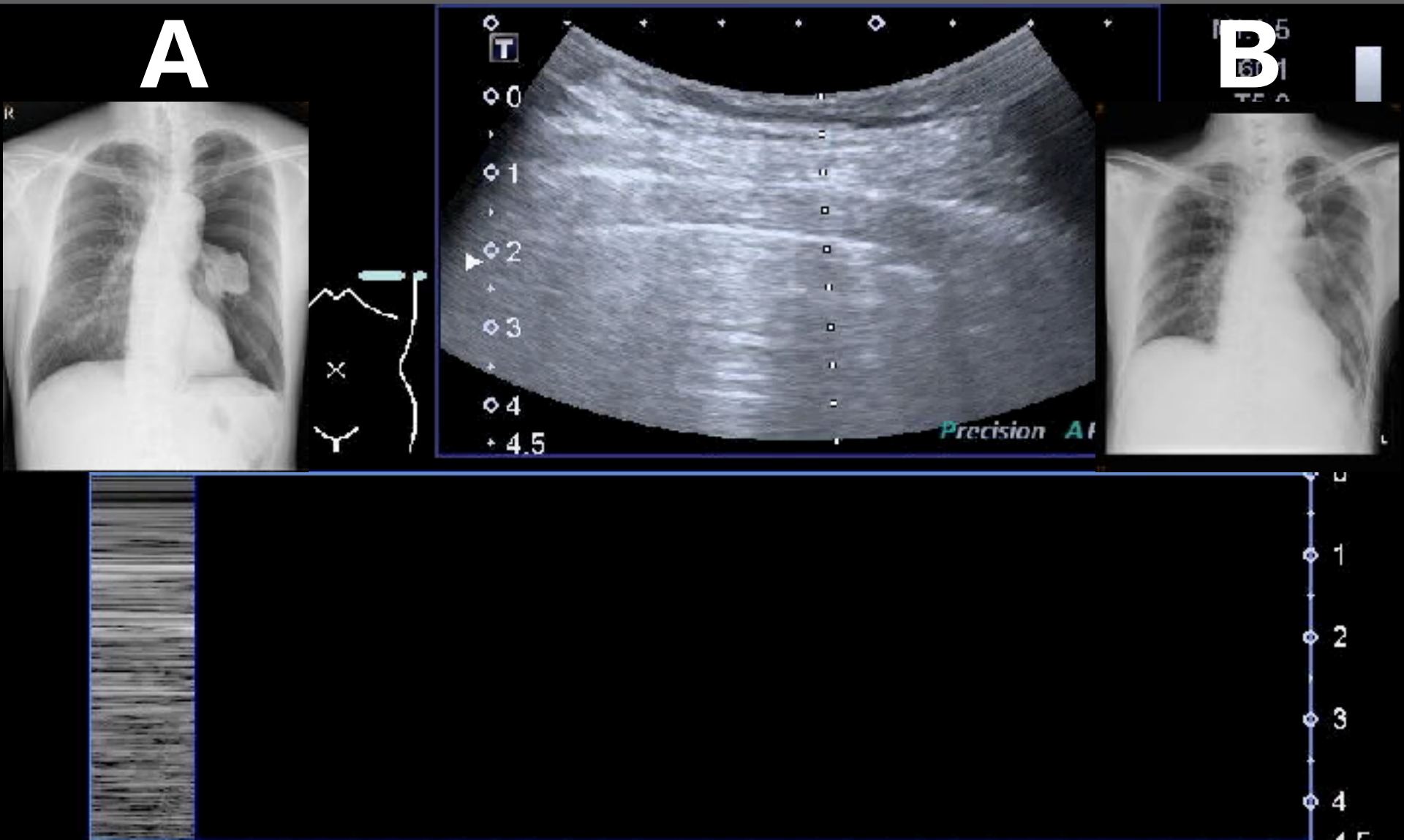
2

R08 055 C4

R08 055 C6 A3

# 胸(B) 滑動與氣胸

# Lung point



# 心(C) 心搏與積液

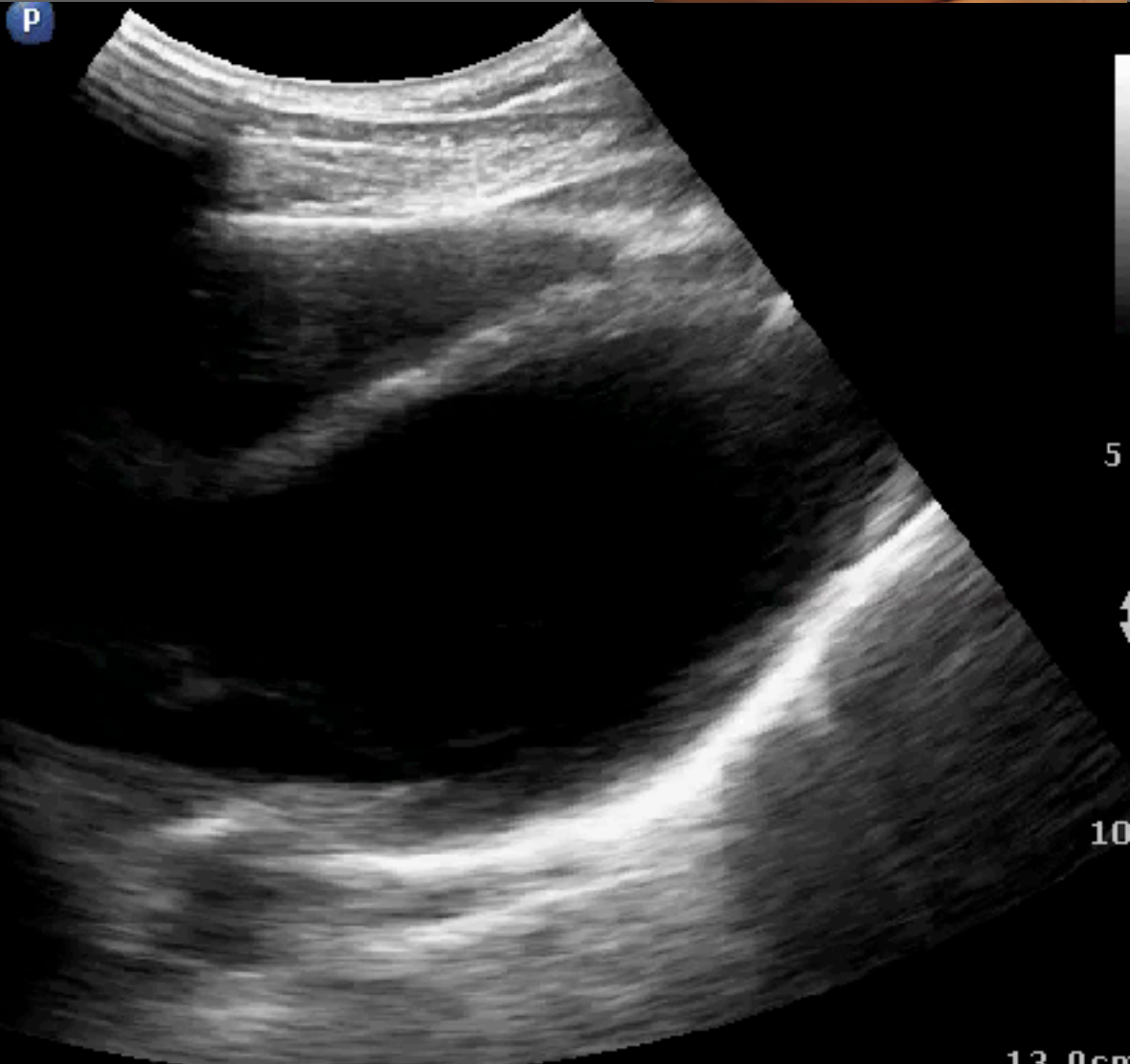


Nerve  
6-2  
2 Hz  
3.0cm

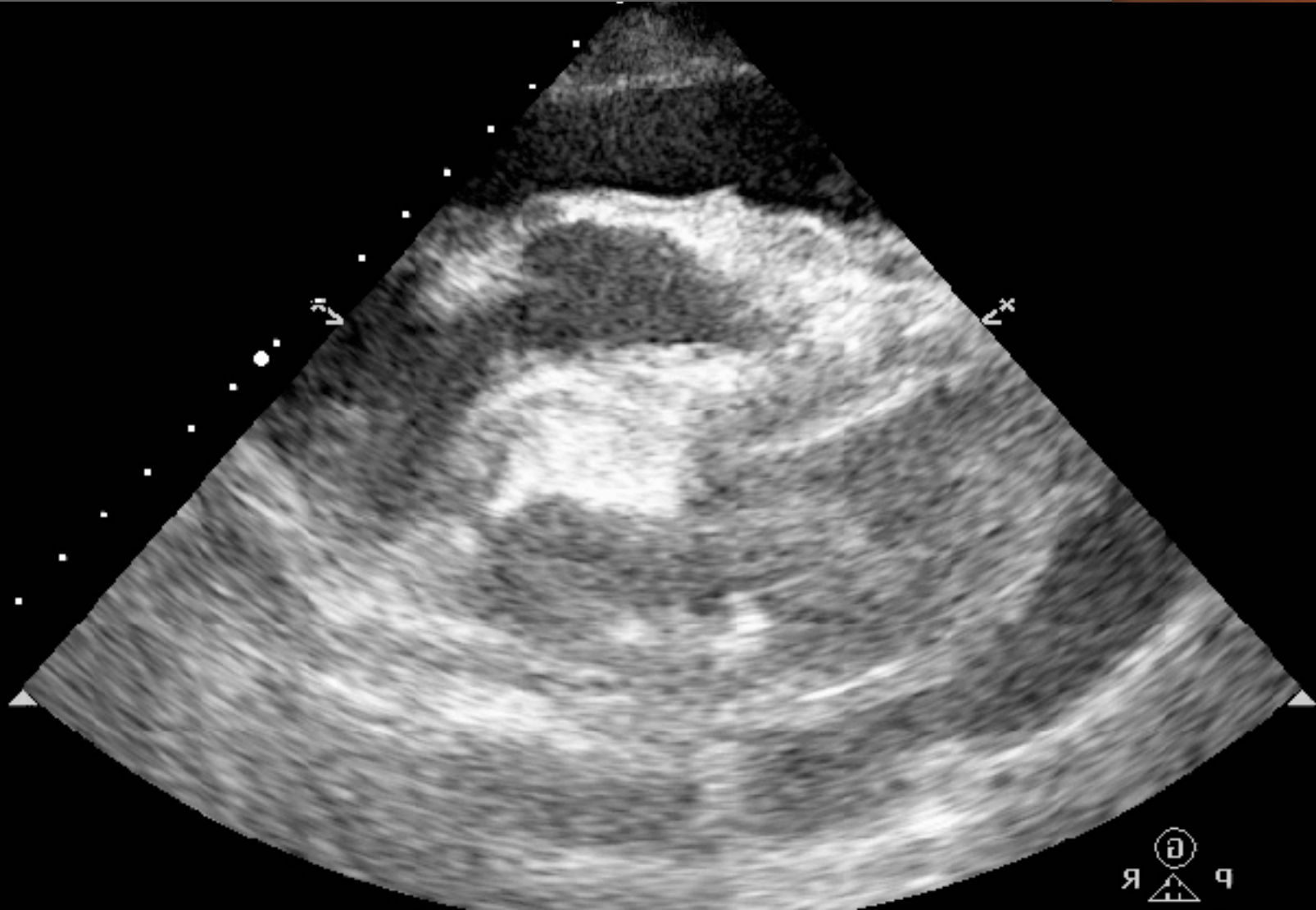
D  
Gen  
Gn 60  
C 53  
2/3/2



G  
P R

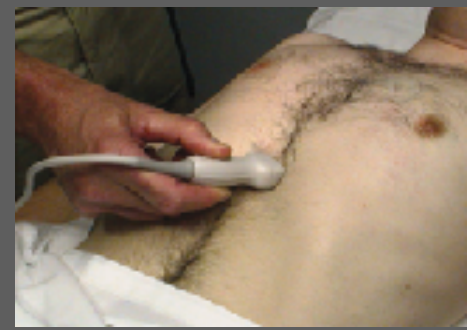


# 心(C) 心搏與積液





# 心(C) 心搏與積液



FAST  
C5 1  
26 Hz  
22.0cm

2D  
Gen  
Gn 76  
C 56  
1/3/3

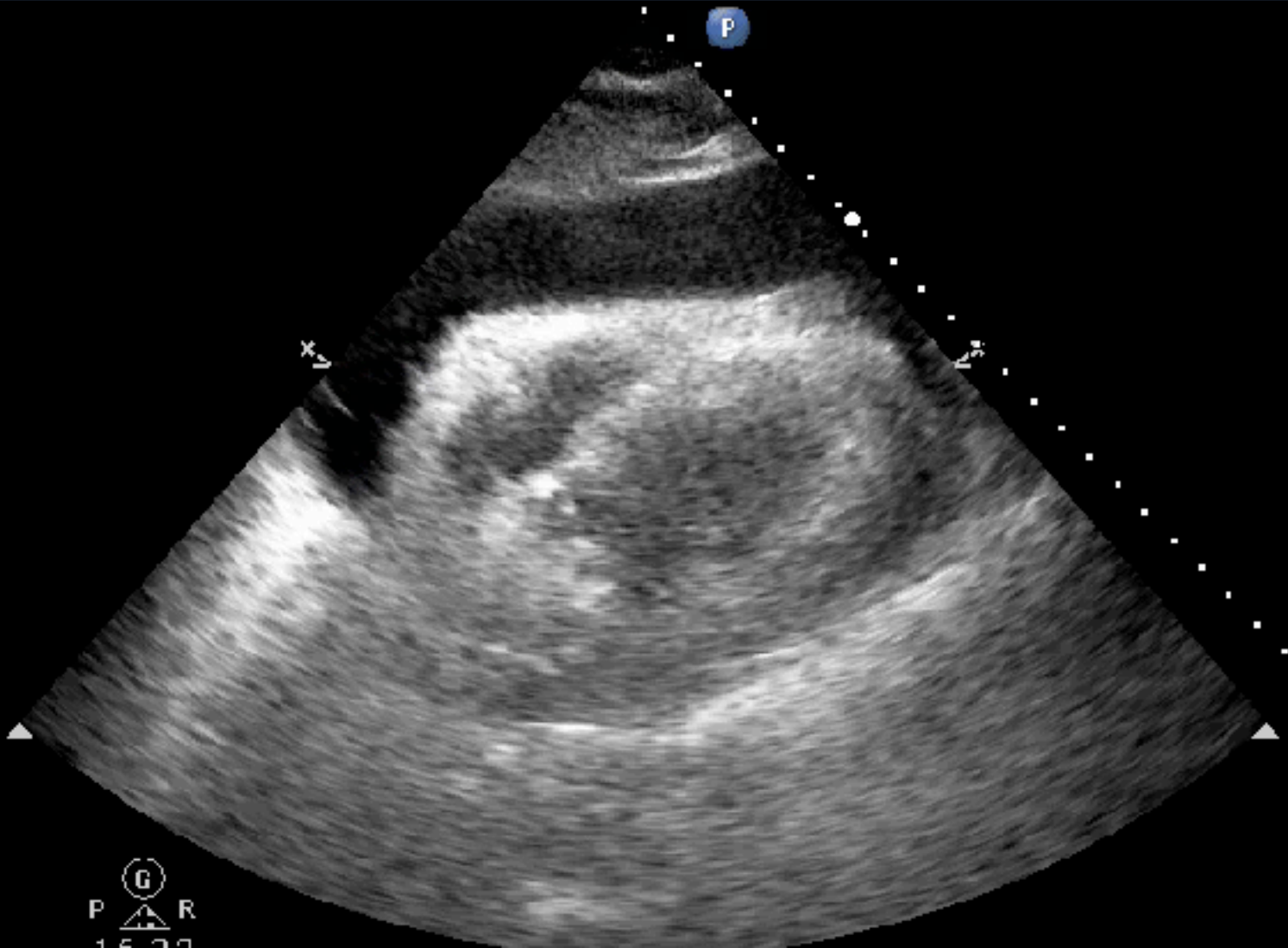


# 心(C) 心搏與積液

## 有心包膜積液嗎？

Adult Echo2  
S5-1  
21 Hz  
24.0cm

2D  
HGen  
Gn 50  
C 50  
3/2/0

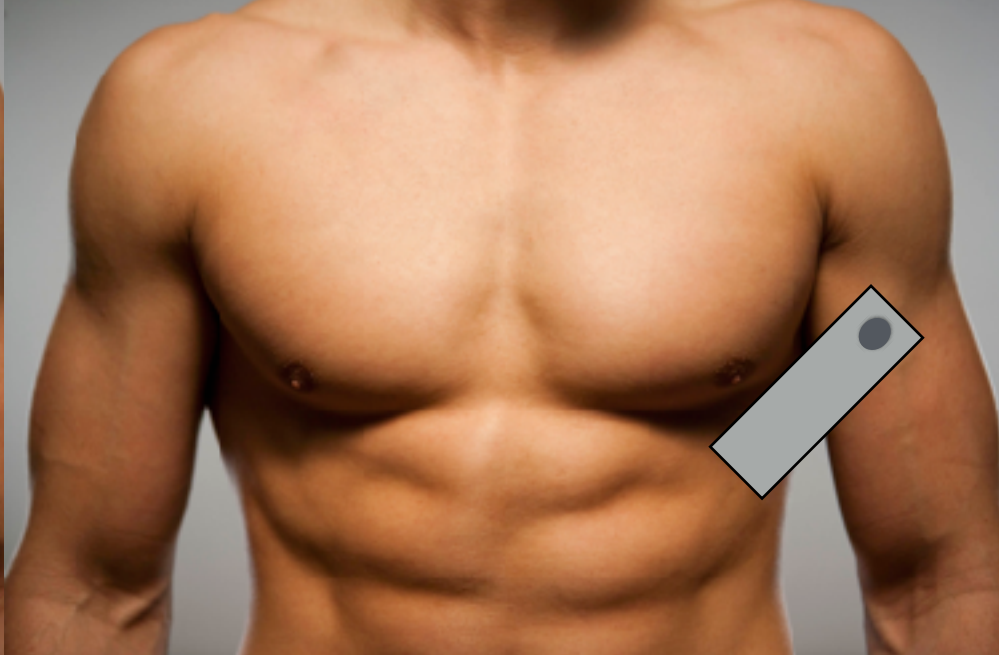


# 心(C) 心搏與積液

# 有心包膜積液嗎？ 災難時該怎麼辦？



# 血 (D) 肋膜與血胸





# 血(D) 肋膜與血胸

## 有大量血胸嗎？

Abd Gen  
2.5-1  
3.8 Hz  
13.0cm

2D  
HGen  
Gn 88  
C 56  
3/3/3



# 血(D) 肋膜與血胸

## 有大量血胸嗎？

Abd Gen  
C5-1  
31 Hz  
17.0cm

2D  
HGen  
Gn 90  
C. 56  
3/3/3





# 58M, dyspnea for 2 days (3級)

到院時間: 20220308 134801

檢傷級數: 3

意識狀態: E4\_V5\_M6

體重: 68Kg 體溫: 36°C

脈搏: 109 呼吸次數: 25

血壓: 139/107

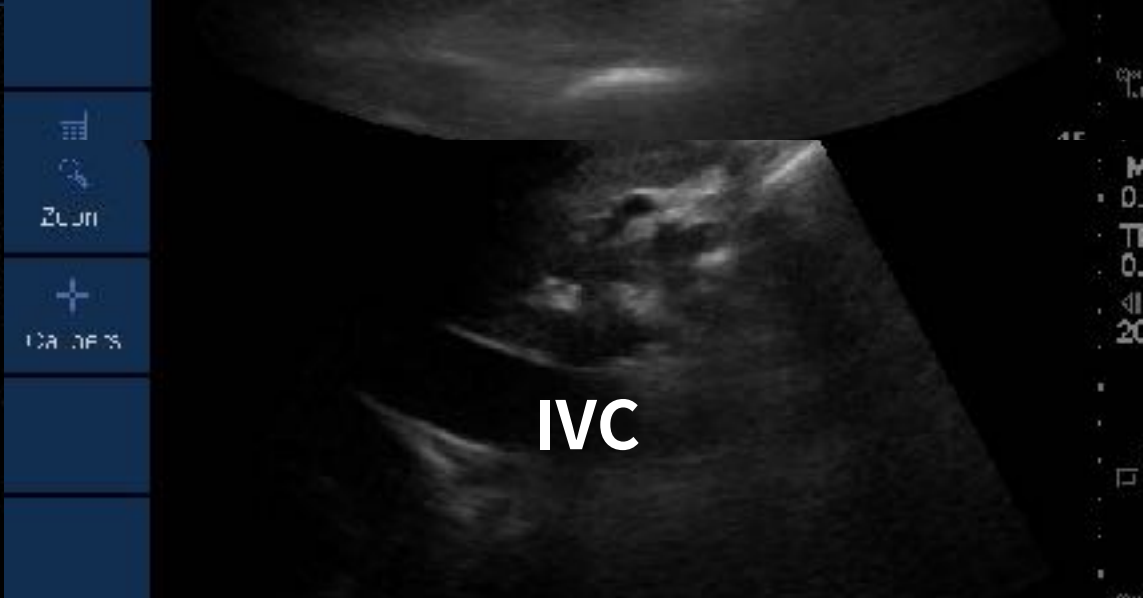
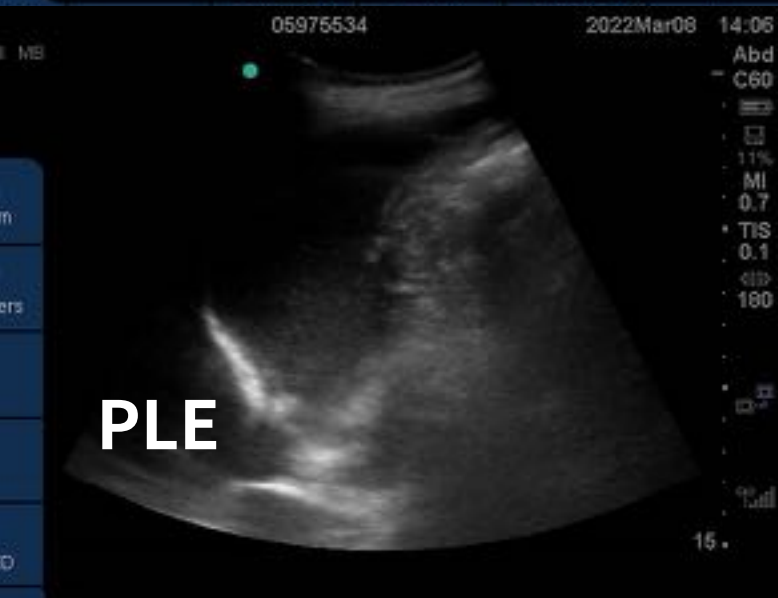
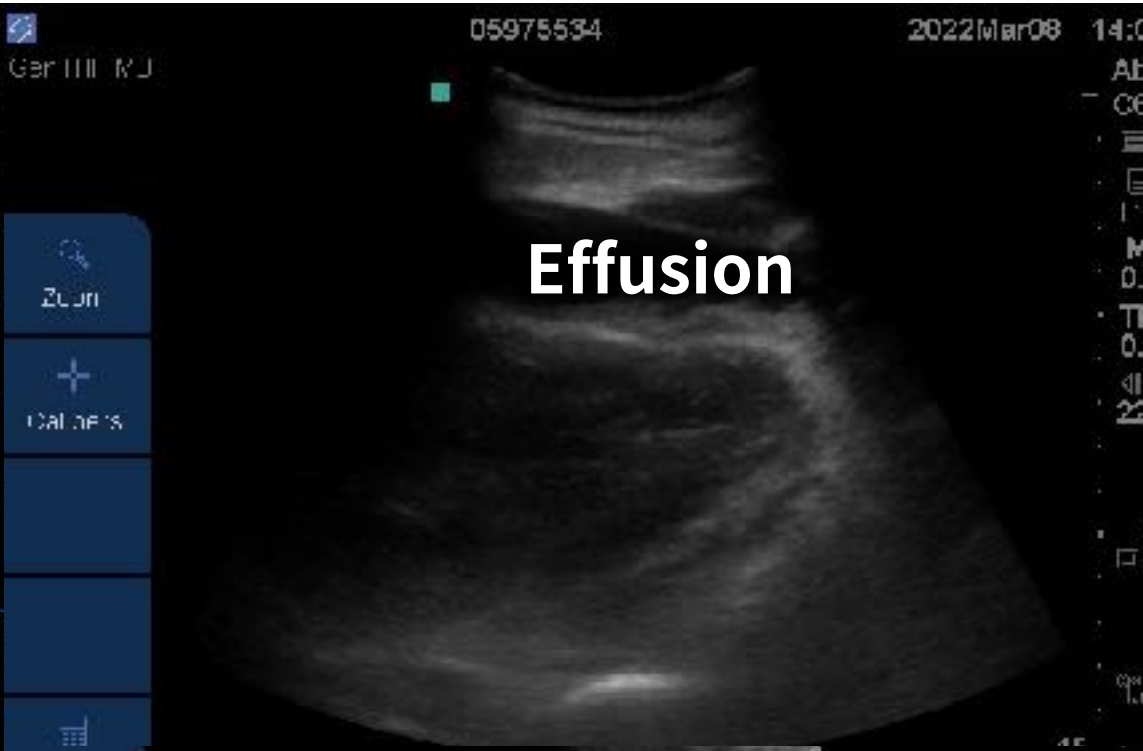
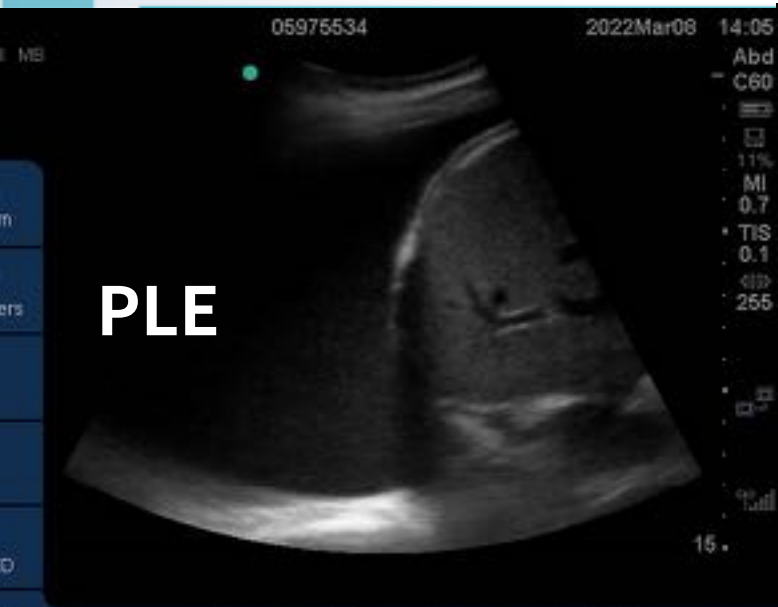
SP02: 92

過敏史: 無

過去病史: ;其他\_1:1;說明: B肝、肺腺癌

主述: 病患來診為呼吸短促, 喘2天

# Massive PLE & Tamponade







# Cardiac effusion, massive



# Pericardiocentesis, subcostal



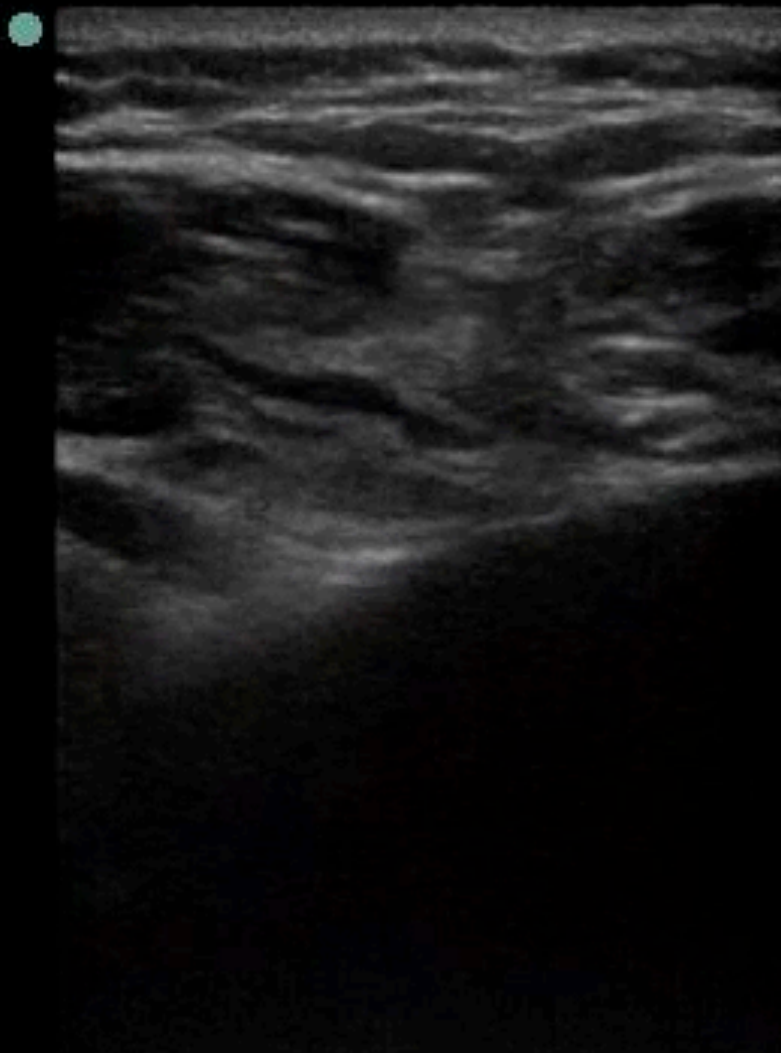
05975534

2022Mar08

14:27

Gen

MB



- Vas

HFL



11%

MI

0.6

TIS

0.1



Patient



Auto Gain



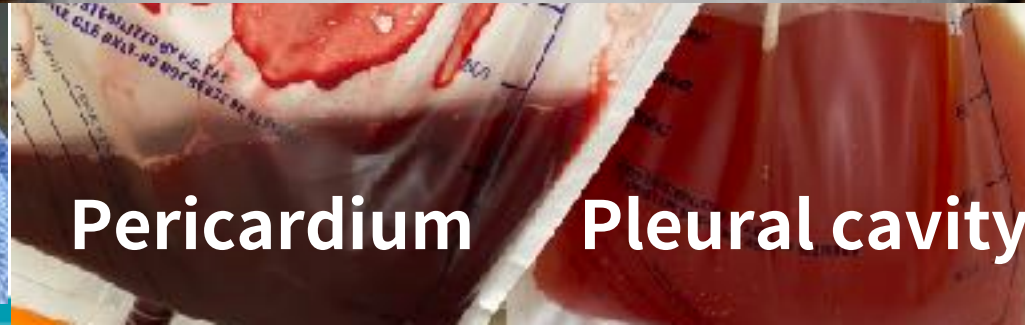
Gen



Clip



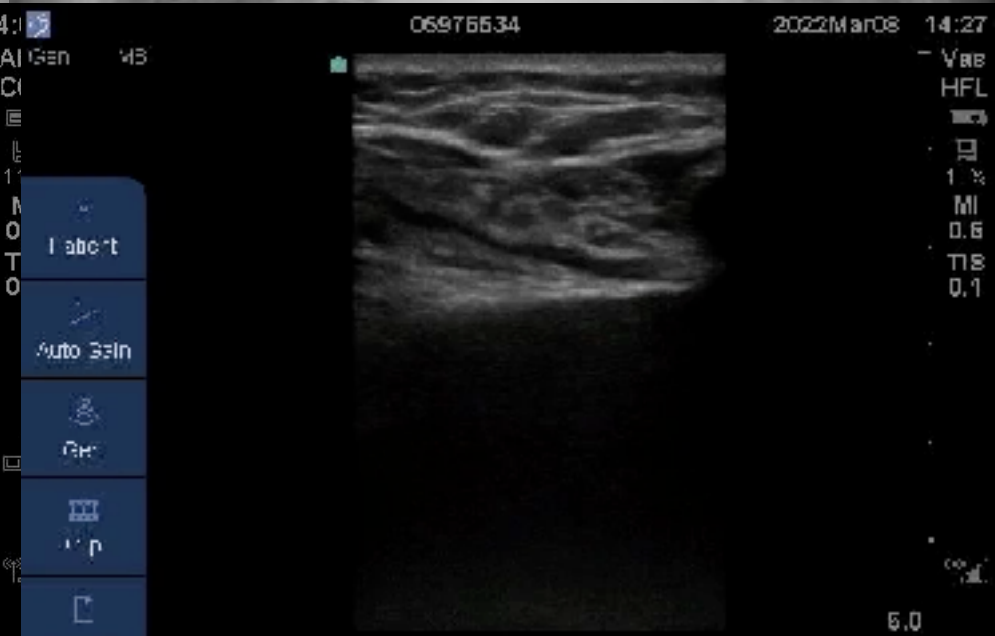
# 58M, dyspnea for 2 days (3級)



Pericardium

Pleural cavity

# Tamponade & PLE , improved

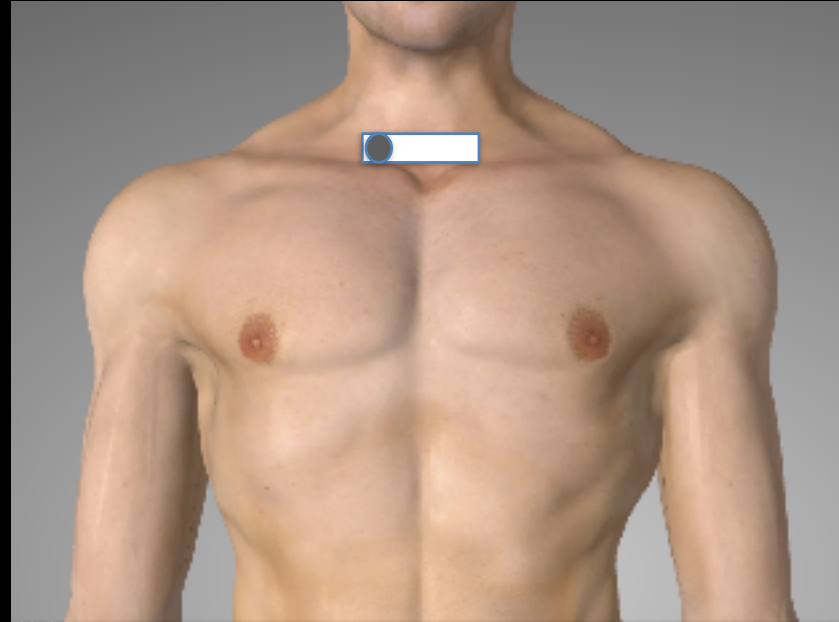




# 到院前超音波

Prehospital ultrasound

- 氣 (A) Airway / 插管一根管
- 胸 (B) Breathing / 滑動與氣胸
- 心 (C) Circulation / 心搏與積液
- 血 (D) Diaphragm / 肋膜與血胸



Abd Gen  
C5-1  
58 Hz  
6.0cm

2D  
HGen  
Gn 100  
C 56  
3 / 3 / 3



P  
G  
R  
1.8 3.6

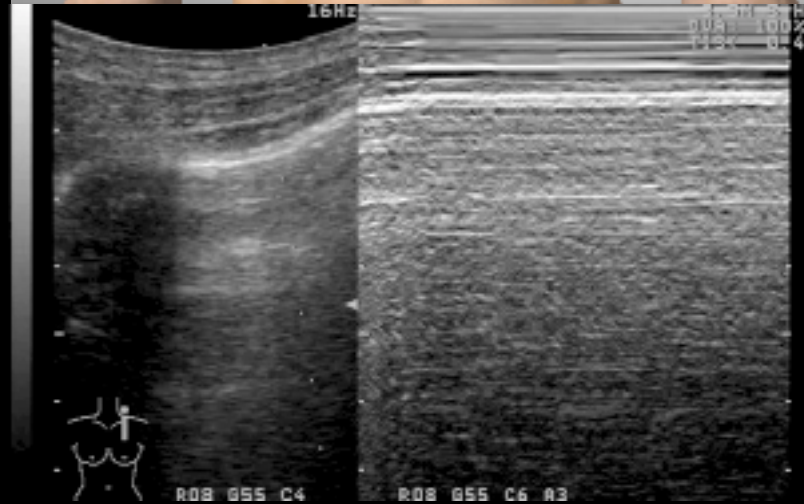
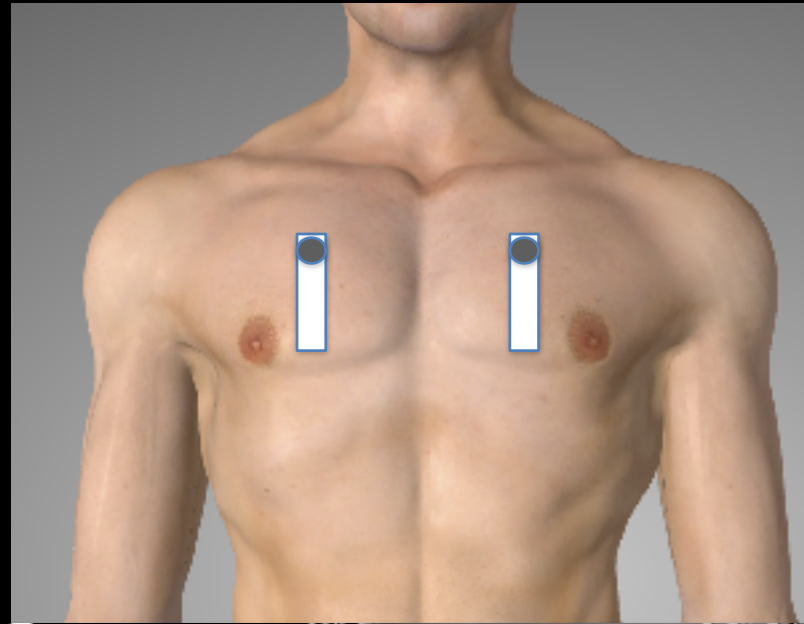
6.0cm

# 到院前超音波

Prehospital ultrasound

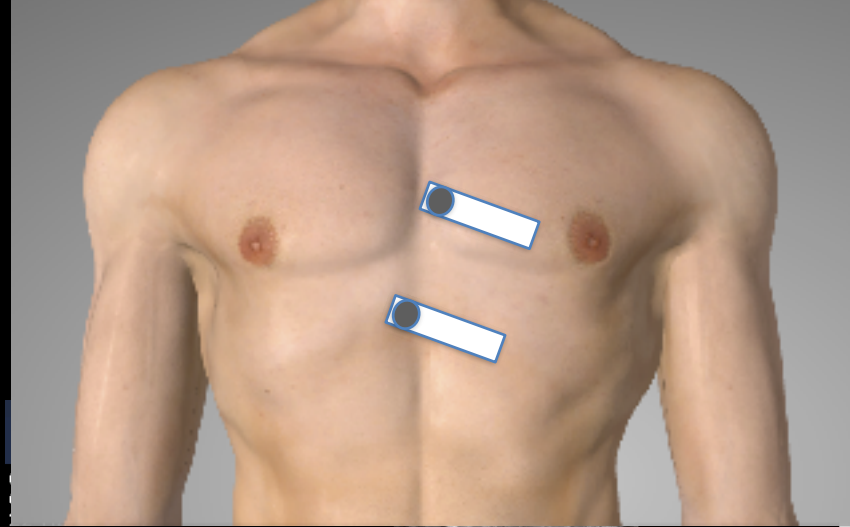
---

- 氣 (A) Airway / 插管一根管
- 胸 (B) Breathing / 滑動與氣胸
- 心 (C) Circulation / 心搏與積液
- 血 (D) Diaphragm / 肋膜與血胸

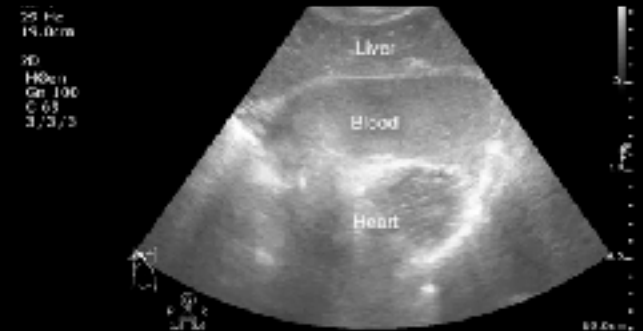


# 到院前超音波

Prehospital ultrasound

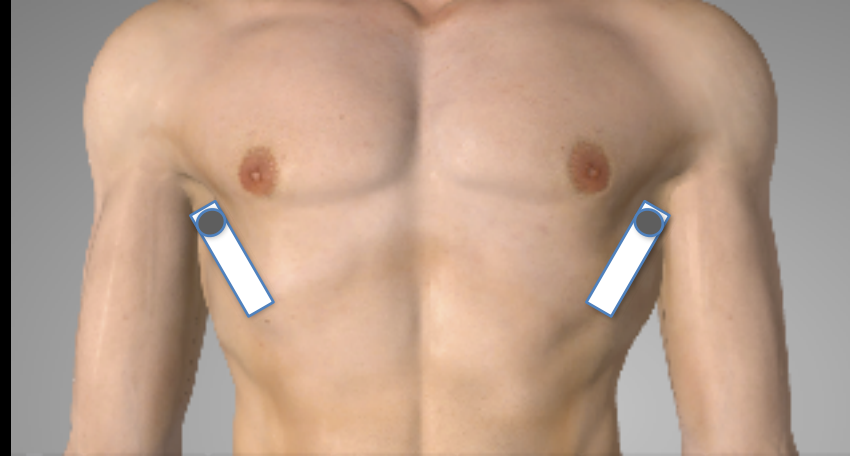


- 氣 (A) Airway / 插管一根管
- 胸 (B) Breathing / 滑動與氣胸
- 心 (C) Circulation / 心搏與積液
- 血 (D) Diaphragm / 肋膜與血胸

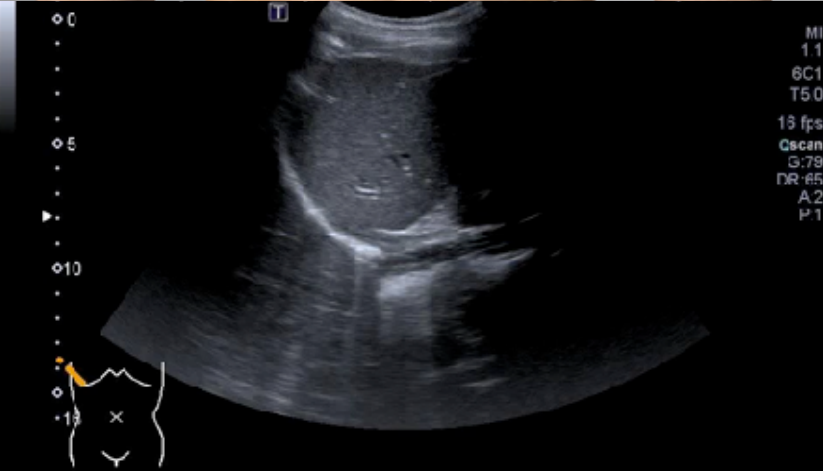


# 到院前超音波

Prehospital ultrasound



- 氣 (A) Airway / 插管一根管
- 胸 (B) Breathing / 滑動與氣胸
- 心 (C) Circulation / 心搏與積液
- 血 (D) Diaphragm / 肋膜與血胸



C5-1  
38 Hz  
13.0cm

2D  
11Gen  
Gn 88  
C 56  
3/3/3







W J O

World Journal of  
Orthopedics

Online Submissions: <http://www.wjgnet.com/2218-5836office>  
wjo@wjgnet.com  
doi:10.5312/wjo.v1.i1.10

World J Orthop 2010 November 18; 1(1): 10-19  
ISSN 2218-5836 (online)  
© 2010 Baishideng. All rights reserved.

TOPIC HIGHLIGHT

Stanislaw Peter Stawicki, MD, *Series Editor*

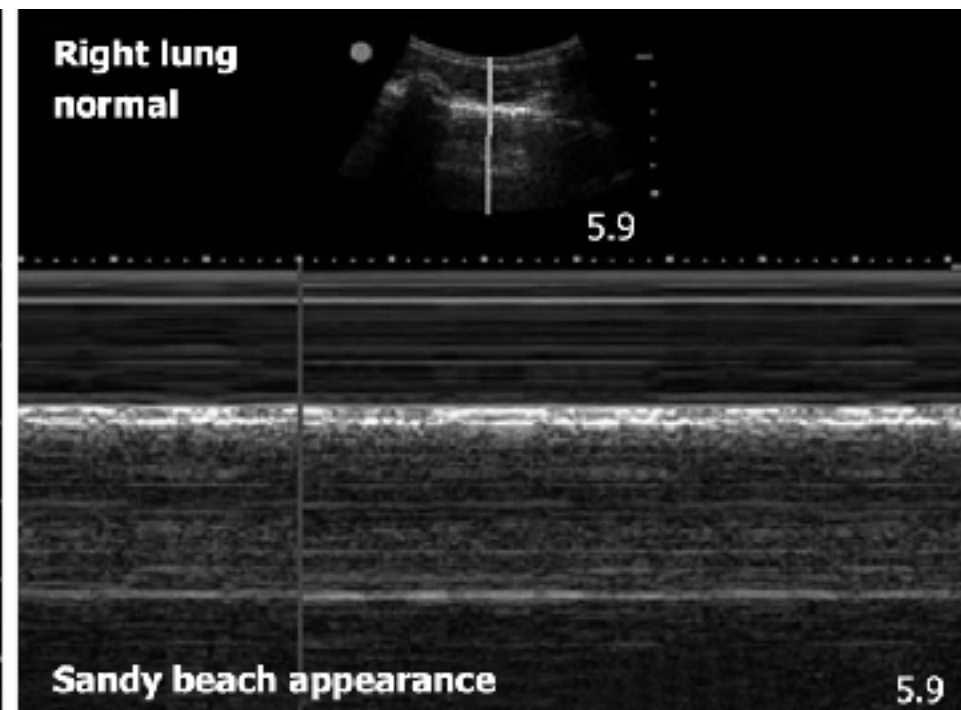
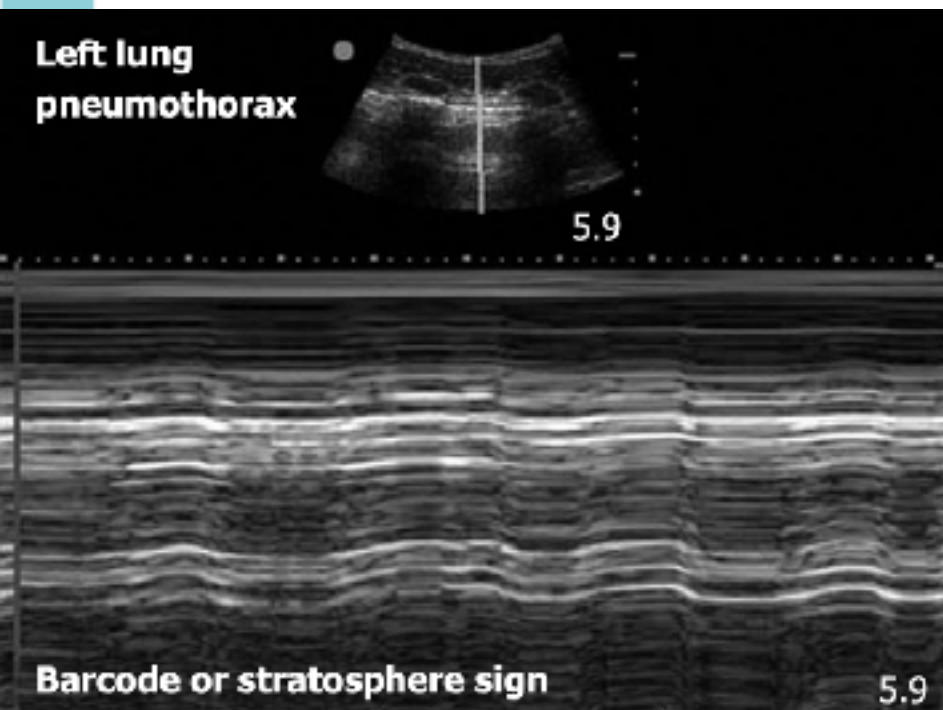
## Portable ultrasonography in mass casualty incidents: The CAVEAT examination

Stanislaw Peter Stawicki, James M Howard, John P Pryor, David P Bahner, Melissa L Whitmill, Anthony J Dean

Stanislaw Peter Stawicki, MD, *Series Editor*

## Portable ultrasonography in mass casualty incidents: The CAVEAT examination

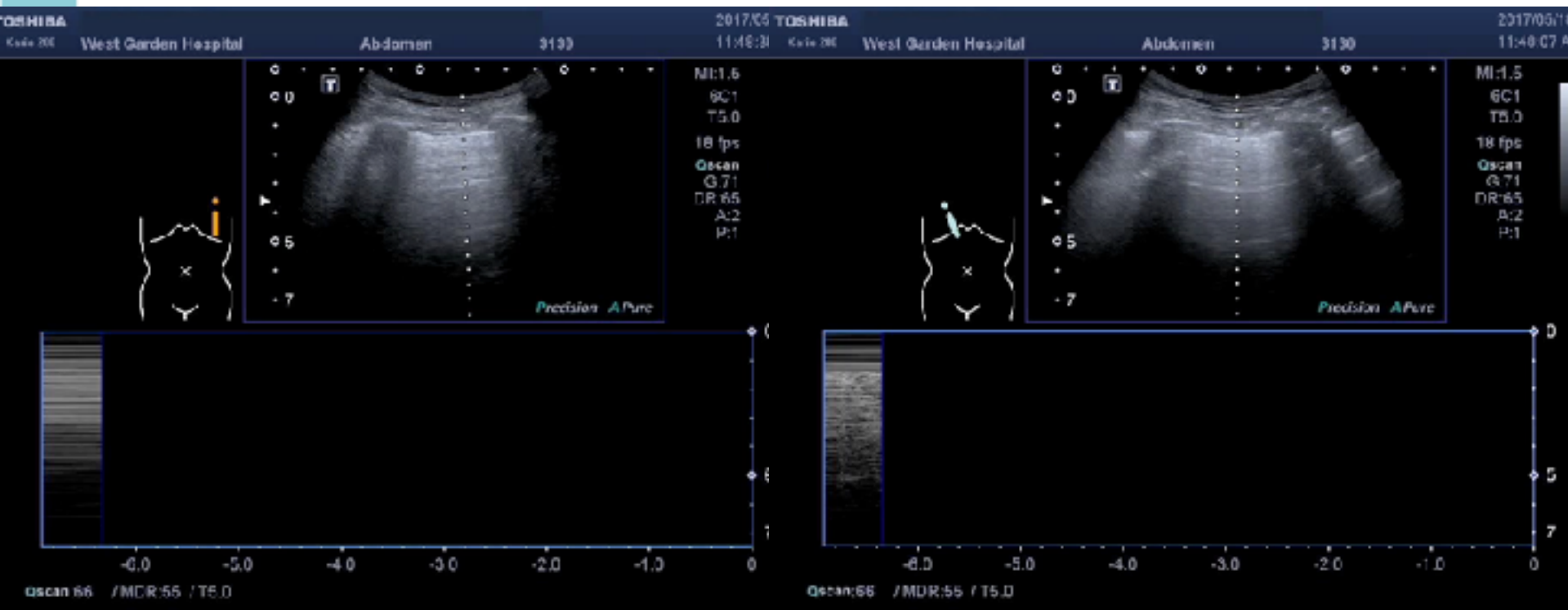
Stanislaw Peter Stawicki, James M Howard, John P Pryor, David P Bahner, Melissa L Whitmill, Anthony J Dean



Stanislaw Peter Stawicki, MD, *Series Editor*

# Portable ultrasonography in mass casualty incidents: The CAVEAT examination

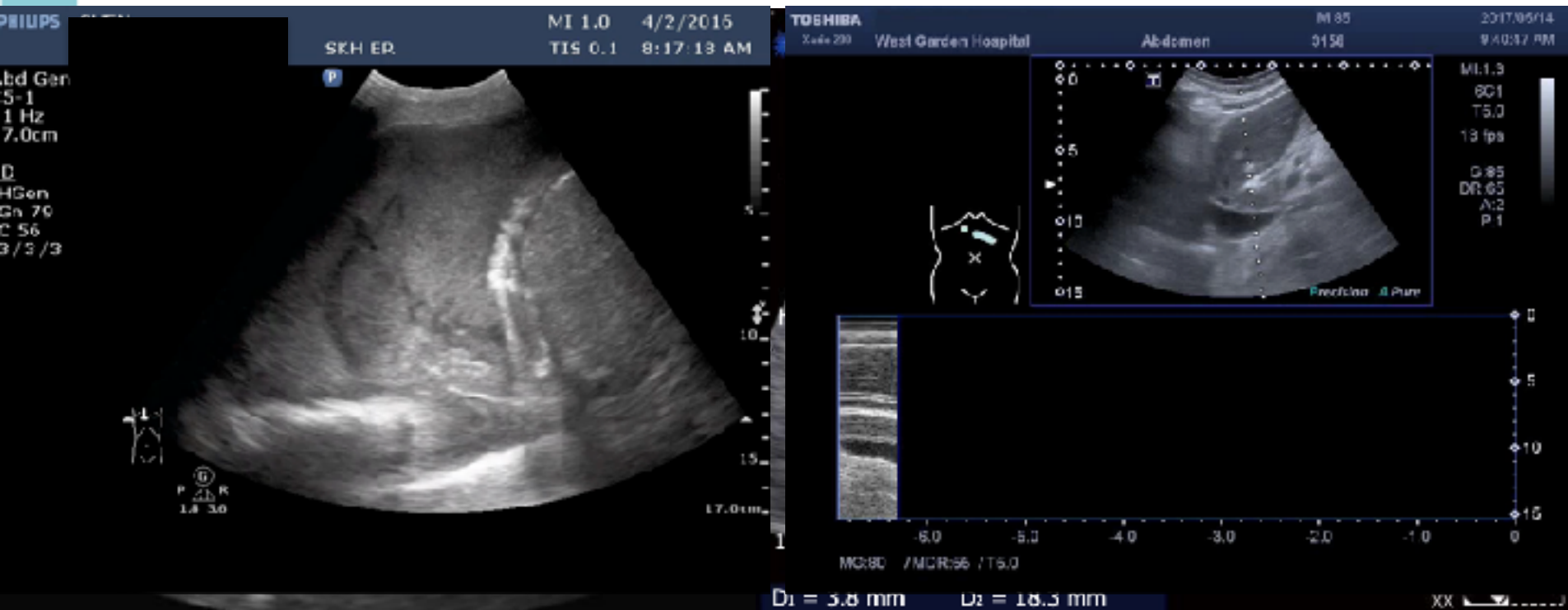
Stanislaw Peter Stawicki, James M Howard, John P Pryor, David P Bahner, Melissa L Whitmill, Anthony J Dean



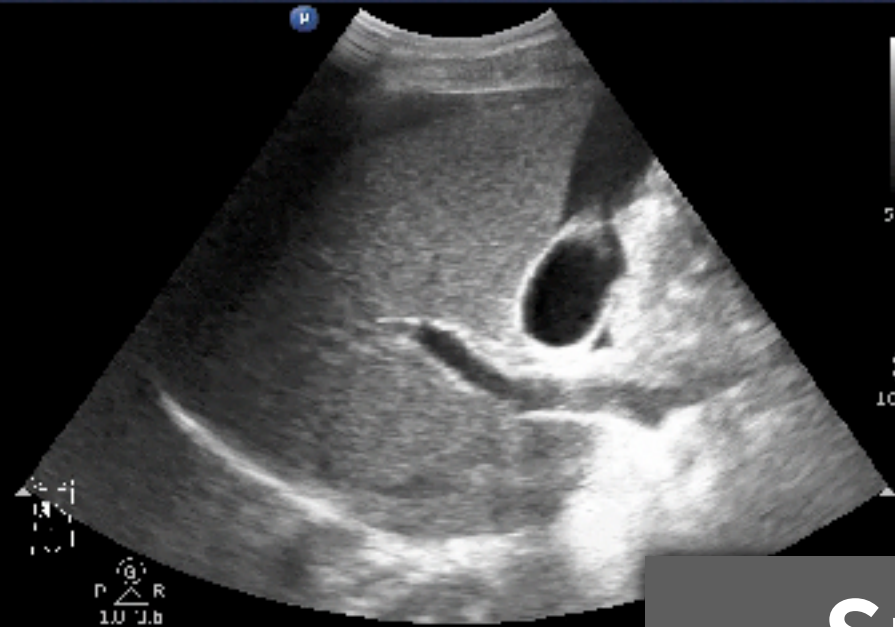
Stanislaw Peter Stawicki, MD, Series Editor

# Portable ultrasonography in mass casualty incidents: The CAVEAT examination

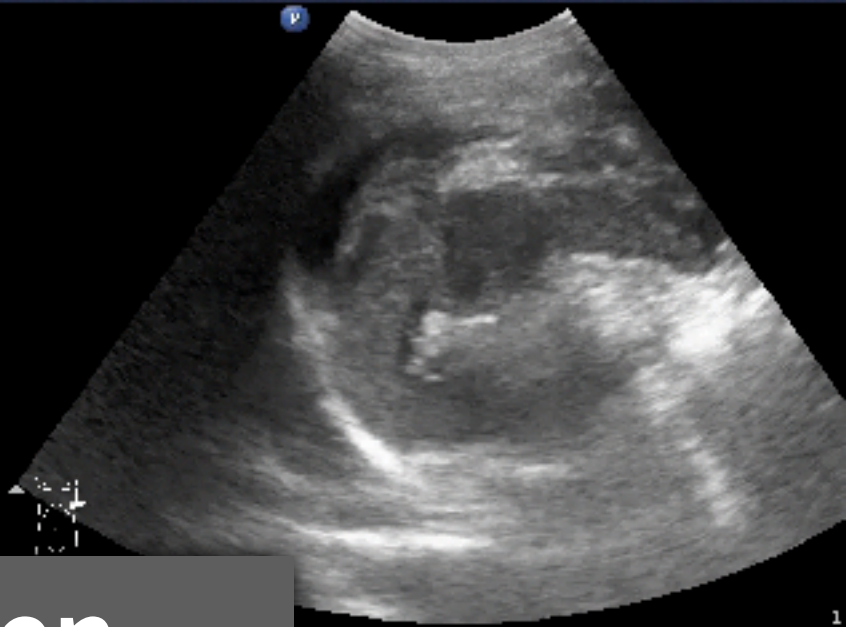
Stanislaw Peter Stawicki, James M Howard, John P Pryor, David P Bahner, Melissa L Whitmill, Anthony J Dean



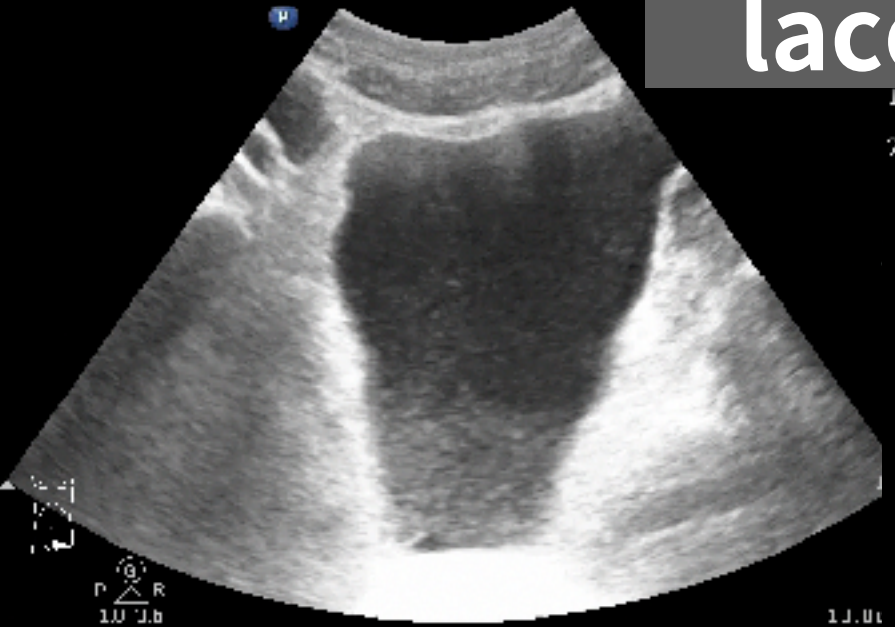




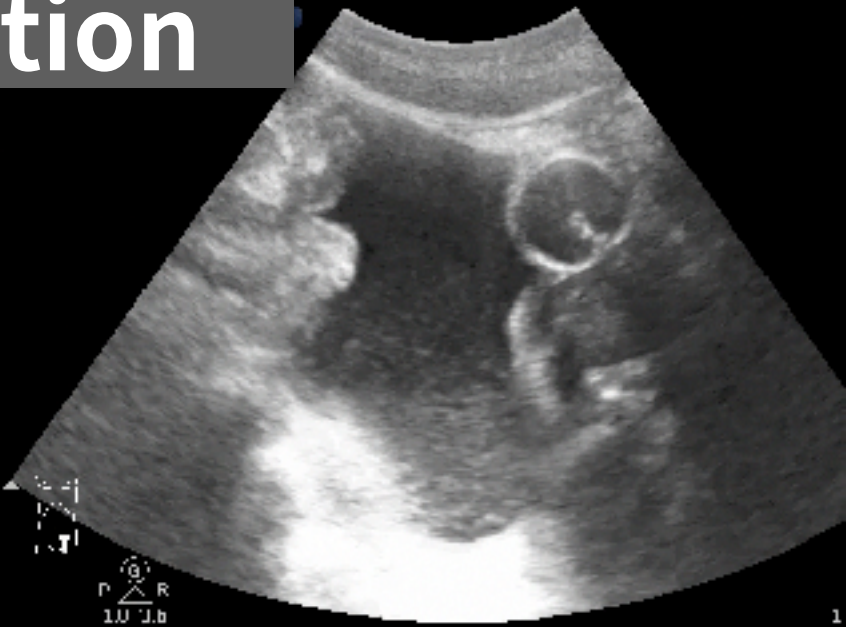
11.0cm  
11Gen  
Ch 90  
C 56  
3/3/0



# Spleen laceration

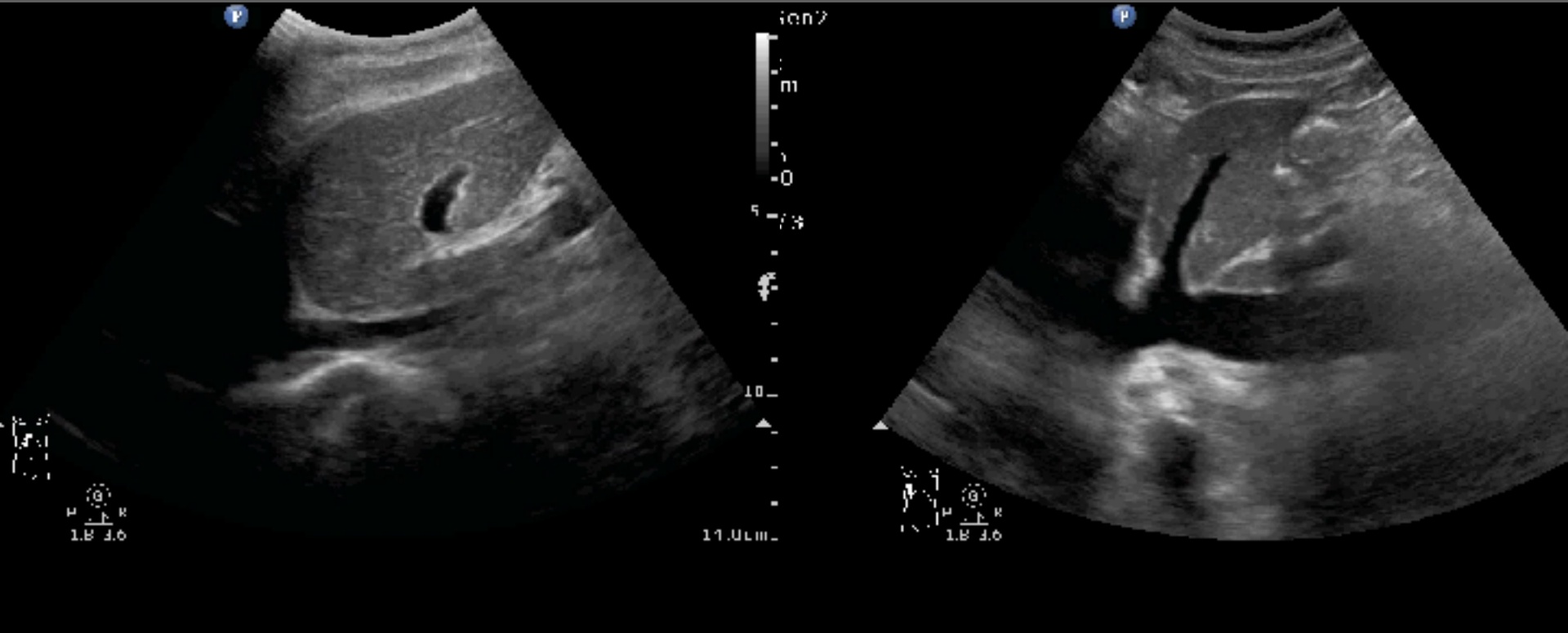


11.0cm  
11Gen  
Ch 90  
C 56  
3/3/0



11.0cm  
11Gen  
Ch 90  
C 56  
3/3/0

# 那一個為Fluid responder ?



**Diameter  $< 1\text{cm}$  / CI  $> 50\%$**

Stanislaw Peter Stawicki, MD, Series Editor

# Portable ultrasonography in mass casualty incidents: The CAVEAT examination

TE7 Ultrasound System

07-02-2018

20180207-164506-34EA

Adult ABD

10:33:19

C5-2s  
MI 0.9  
TIS 0.7

AP 96.6%

B  
FH5.0  
DR 120  
FR 24  
D 13.0  
G 57

Table 3 The chest, abdomen, vena cava, and extremities for acute triage protocol summary

| Description | Identification of immediately and potentially life-threatening injuries (FAST + pneumothorax) | Intravascular status evaluation (IVCCI) | Hemothorax assessment                    | Extremity assessment (lower → upper extremity sonography) |
|-------------|---|---|--|---|
| Skill level | Easy  | Intermediate                            |  | Difficult   |
| Urgency     | Primary triage & assessment (Mandatory)   |   | Secondary triage & assessment (Optional) |   |



# 臺鐵太魯閣意外 慈濟協助救災啟動關懷

2021-04-02 | 慈濟基金會



慈濟醫療志業執行長林俊龍趕至現場搶救傷患。（攝影者：慈濟基金會提供）

清明連假第一天，臺鐵驚傳死傷事故。4月2日上午九點半左右，臺鐵從臺北樹林開往臺東的太魯閣號408次列車，行經北迴線大清水隧道時，疑似工程車停車不當從臺九線滑落撞擊列車，導致列車出軌變形，死傷嚴重。慈濟基金會聞訊即成立「0402臺鐵太魯閣火車事故－慈濟緊急協助機制」，花蓮慈院亦啟動大量傷患應變。





花蓮慈濟醫院

2021年4月5日 · 📍

#我在的地方不能有疼痛出現

#最陌生的溫暖

# PAIN control

| <b>Nerve</b>                 | <b>Motor</b>  | <b>Sensory</b>  | <b>Injuries Treated</b>   |
|------------------------------|---|---|---|
| Radial                       | Wrist extension   | Dorsal aspect of hand from thumb to radial half of ring finger                    | Hand injuries to affected area  |
| Median                       | Wrist and finger flexion  | Volar aspect of hand from thumb to radial half of ring finger                     | Hand injuries to affected area  |
| Ulnar                        | Intrinsic muscles of hand   | Sensation to 5th digit, and ulnar half of ring finger                             | Hand injuries to affected area  |
| Interscalene brachial plexus | Superior and middle trunks of the brachial plexus (C5–C7), shoulder and upper arm | Superior and middle trunks of the brachial plexus (C5–C7), shoulder and upper arm | Shoulder, humerus, and elbow injuries; does not reliably block forearm or hand injuries |
| Sciatic (popliteal)          | All movements of foot and toes (via tibial and peroneal nerves)                   | Foot and most of leg, excludes most medial aspect (innervated by saphenous)       | Injuries to lower leg, ankle, and foot  |
| Femoral                      | Flexion at hip and extension at knee  | Medial aspect of distal thigh and leg   | Hip fractures, proximal femur, and knee injuries  |

# FN block for femoral fracture

PHILIP

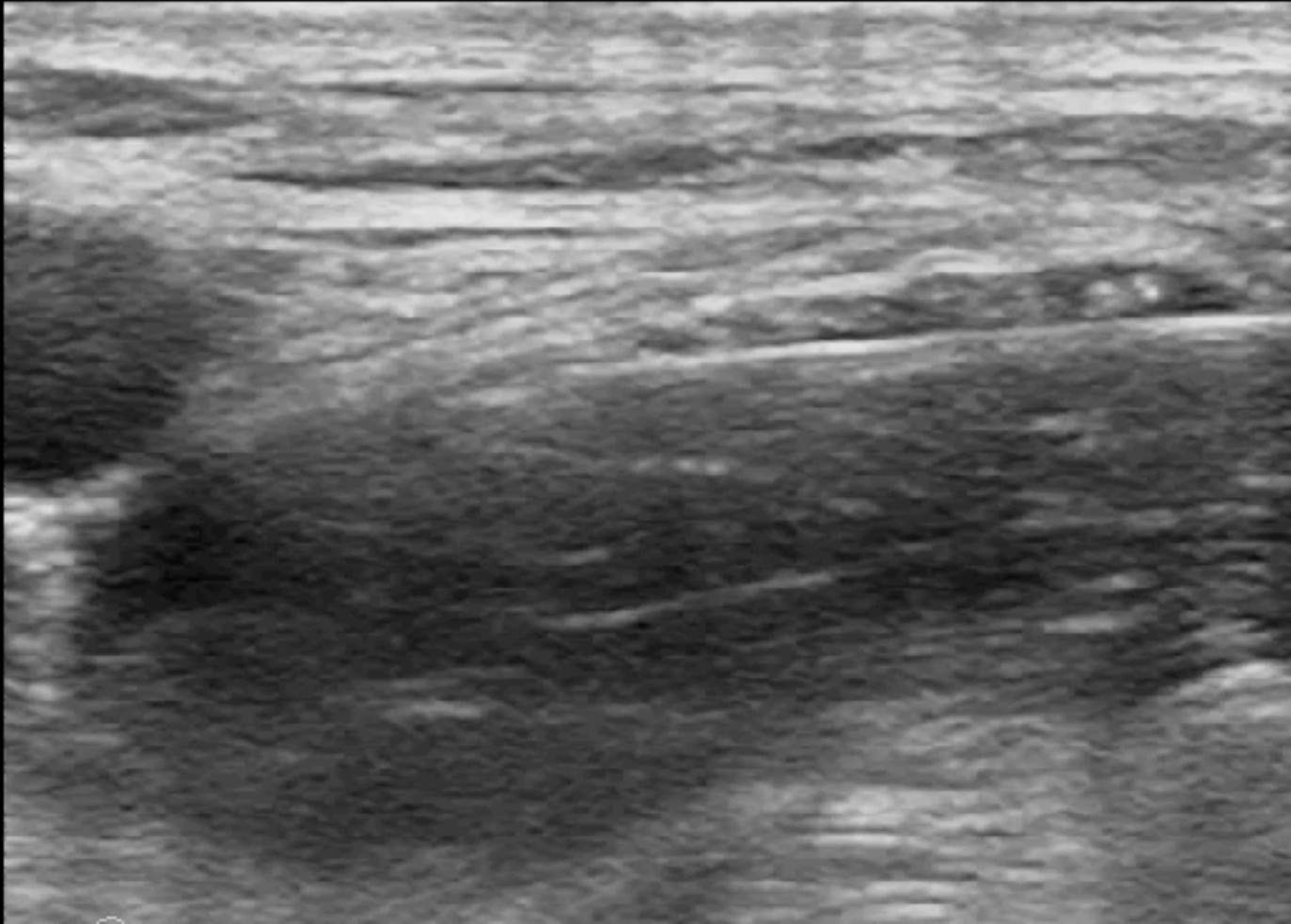
MI 0.8 2/21/2022

SKH ER

TIS 0.1 10:44:33 AM

Arterial  
L12-3  
42 Hz  
3.0cm

P



2D  
HGen  
Gn 62  
C. 40  
3/3/2



# Ultrasonographic Applications After Mass Casualty Incident Caused by Wenchuan Earthquake

J Trauma. 2010;68: 1417–1420

*Deng Dan, MD, Liao Mingsong, MM, Tao Jie, MM, Wu Xiaobo, MM, Chen Zhong, MM, Liang Yan, MM,  
Lai Xiaojin, MM, and Chang Ming, MM*

BBC中文網

2008年5月12日14時28分，  
四川汶川縣發生8.0級地震，  
成為1978年唐山大地震後，  
中國大陸傷亡最慘重的震災。

512的官方傷亡人數，停駐在2008年9月：  
全國69227人遇難，  
374643人受傷，  
17923人失蹤。

此後十年，數字未曾更新。



# Ultrasonographic Applications After Mass Casualty Incident Caused by Wenchuan Earthquake

J Trauma. 2010;68: 1417–1420

*Deng Dan, MD, Liao Mingsong, MM, Tao Jie, MM, Wu Xiaobo, MM, Chen Zhong, MM, Liang Yan, MM,  
Lai Xiaojin, MM, and Chang Ming, MM*

## Major examination: FAST

-outdoor, for safety concern

## 3207 wounded patient

-37.6% had US (1207/3207)

-9.53% had US assisted intervention (115/1207)

## Detection rate of trauma related disease

-6.96% (84/1207)

-false negative rate 5.6% (5/89)

-US intervention 100% (drainage)

# Streamlined focused assessment with sonography for mass casualty prehospital triage of blunt torso trauma patients

2013年蘆山地震, 芮氏 7.0; 11826 injured

Hu H, et al. Am J Emerg Med 2014;32:803-6

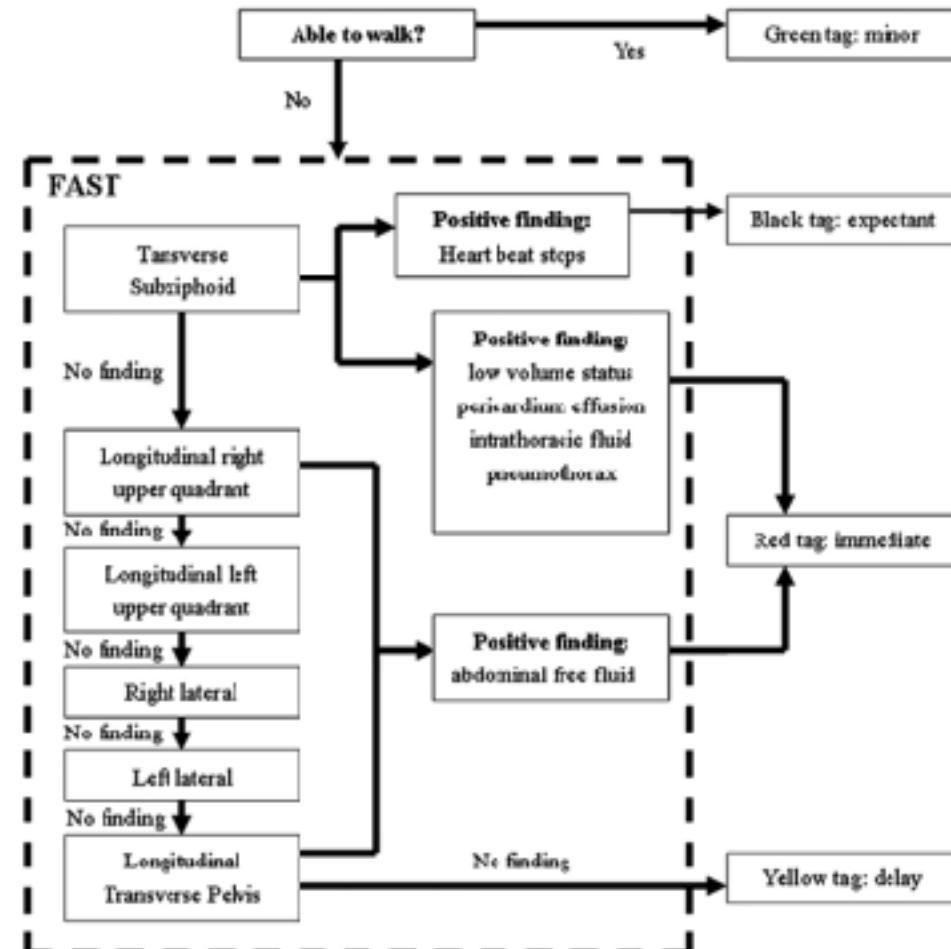
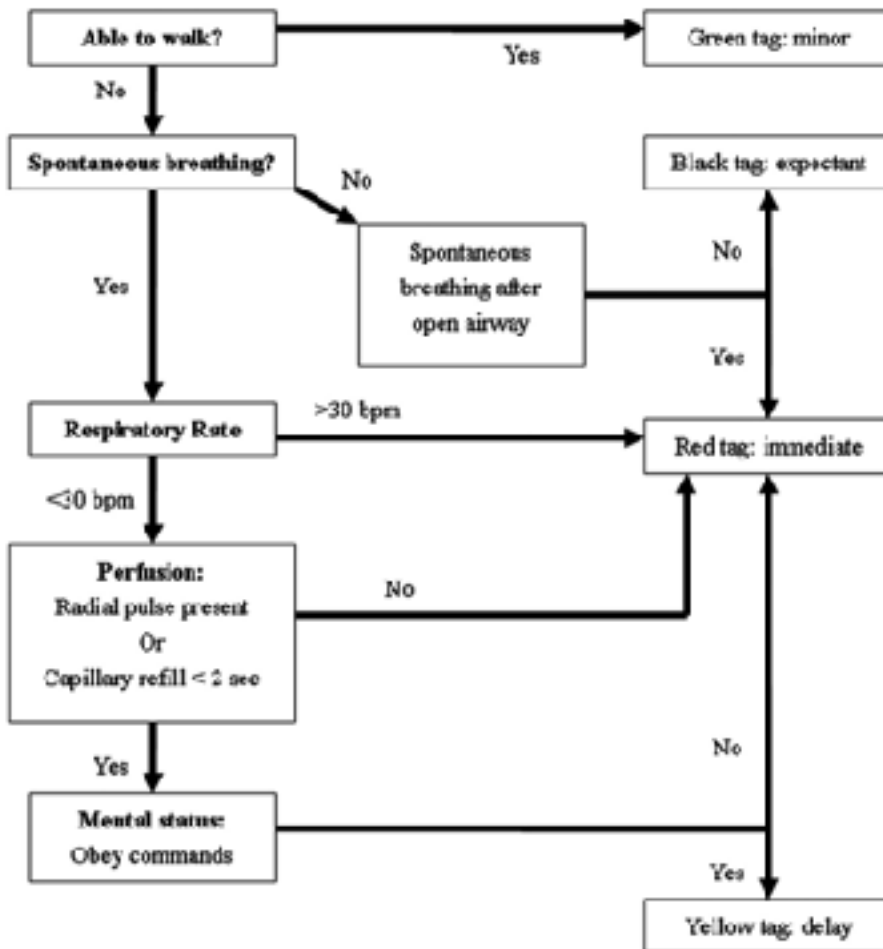
## START

2.3min versus 2.9min

## SFAST

Simple Triage and Rapid Treatment

Streamlined FAST



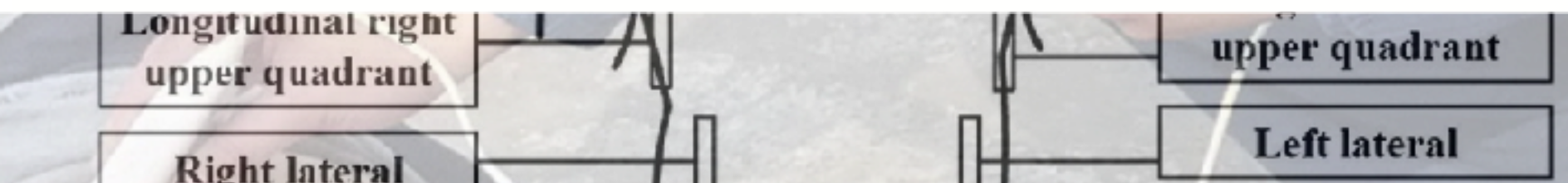
# Streamlined focused assessment with sonography for mass casualty prehospital triage of blunt torso trauma patients

45 patients in 24 hours after earthquake (on site) [Hu H, et al. Am J Emerg Med 2014;32:803-6](#)

## FAST examination views

### Statistical comparison of START and SFAST against benchmark standard ISS scale

|       | Accuracy rate (%) | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) |
|-------|-------------------|-----------------|-----------------|---------|---------|
| START | 80.0              | 77.3            | 82.6            | 81.0    | 79.2    |
| SFAST | 91.1              | 90.9            | 91.3            | 90.9    | 91.3    |



### Statistical comparison of START and SFAST in determining whether patient needed emergent surgery

|       | Accuracy rate (%) | Sensitivity (%) | Specificity (%) | PPV (%) | NPV (%) |
|-------|-------------------|-----------------|-----------------|---------|---------|
| START | 55.6              | 51.9            | 61.1            | 66.7    | 45.8    |
| SFAST | 62.2              | 59.3            | 66.7            | 72.7    | 52.2    |



# ABCDE of prehospital ultrasonography: a narrative review

Ketelaars et al. Crit Ultrasound J (2018) 10:17

Rein Ketelaars<sup>1,2\*</sup> , Gabby Reijnders<sup>3</sup>, Geert-Jan van Geffen<sup>1,2</sup>, Gert Jan Scheffer<sup>1</sup> and Nico Hoogerwerf<sup>1,2</sup>

# Point-of-Care Ultrasound in Austere Environments



## A Complete Review of Its Utilization, Pitfalls, and Technique for Common Applications in Austere Settings

Emerg Med Clin N Am 35 (2017) 409–441

Laleh Gharahbaghian, MD<sup>a,\*</sup>, Kenton L. Anderson, MD<sup>b</sup>, Viveta Lobo, MD<sup>a</sup>,  
Rwo-Wen Huang, MD<sup>a</sup>, Cori McClure Poffenberger, MD<sup>a</sup>, Phi D. Nguyen, MD<sup>c</sup>



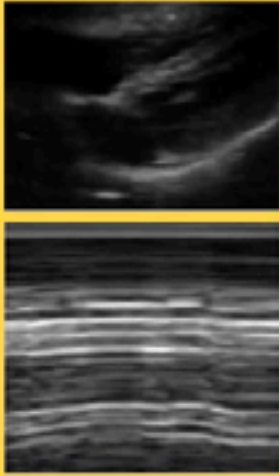
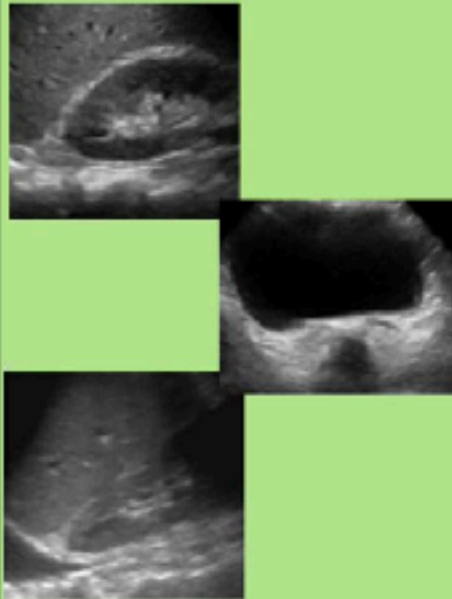
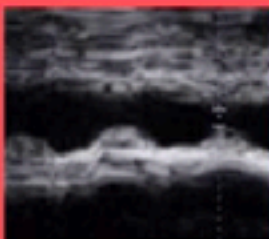
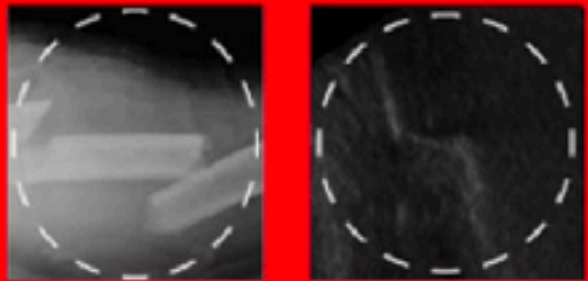
# Portable ultrasound in disaster triage: a focused review

S. M. Wydo · M. J. Seamon · S. W. Melanson ·  
P. Thomas · D. P. Bahner · S. P. Stawicki

Eur J Trauma Emerg Surg

DOI 10.1007/s00068-015-0498-8

2015

| Intermediate  | Easy  | Difficult   | Difficult   |
|---|---|---|---|
| <p>Chest</p>  | <p>Abdomen</p>  | <p>Venous Assessment</p>  | <p>Extremity Assessment</p>  |



# ABCDE of prehospital ultrasonography: a narrative review

Ketelaars et al. Crit Ultrasound J (2018) 10:17

Rein Ketelaars<sup>1,2\*</sup> , Gabby Reijnders<sup>3</sup>, Geert-Jan van Geffen<sup>1,2</sup>, Gert Jan Scheffer<sup>1</sup> and Nico Hoogerwerf<sup>1,2</sup>

**Table 2 The CAVEAT protocol. Stawicki et al. [135]**

| Urgency                         | Step | Examination                   | Focus on  | Looking for   |
|---------------------------------|------|-------------------------------|---|---|
| CAVEAT protocol                 |      |                               |   |   |
| Primary assessment (mandatory)  | 1    | Evaluation of the pleura      | Chest   | Pneumothorax  |
|                                 | 2    | Complete FAST examination     | Abdomen<br>Costophrenic recesses                      | Hemoperitoneum<br>Hemothorax  |
|                                 | 3    | Inferior Vena Cava assessment | Collapsibility index                                  | Volume depletion  |
| Secondary assessment (optional) | 4    | Upper- and lower extremities  | Long bones; regions of pain, tenderness, or deformity | Major fractures eligible for more accurate reduction and stabilization<br>Fractures to prioritize utilization of radiographic resources, or achieve even more accurate triage |

CAVEAT sonographic evaluation of the chest, abdomen, vena cava, extremities for acute triage, FAST focused assessment with sonography for trauma

This table shows the suggested order of examinations in the CAVEAT protocol. Specific components may depend on the operators' skill level and on the individual patient's injuries

# 62F, Breast ca hx with dyspnea & shock



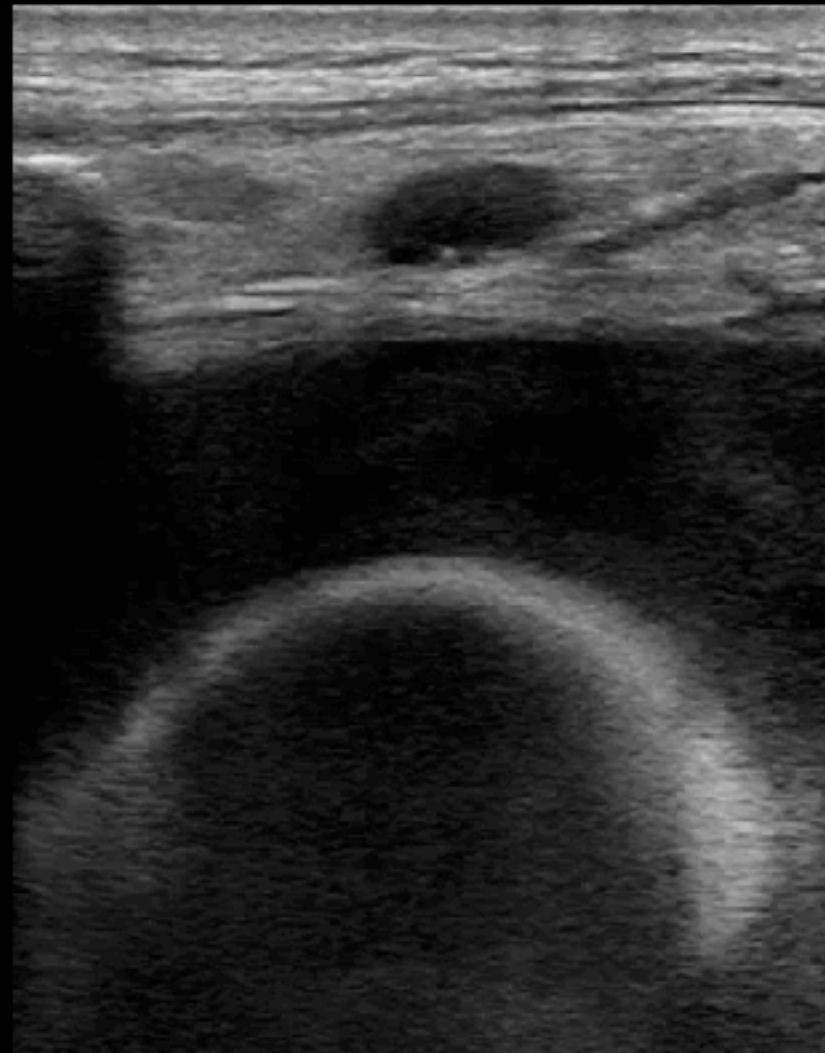
PHILIPS

MI 1.2 1/18/2021  
TIS 0.2 3:47:10 PM

Arterial  
L12-3  
34 Hz  
5.0cm

2D  
HGen  
Gn 66  
C. 41  
3/3/2

P



P R

2

1

# Parasternal approach pericardiocentesis



PHILIPS

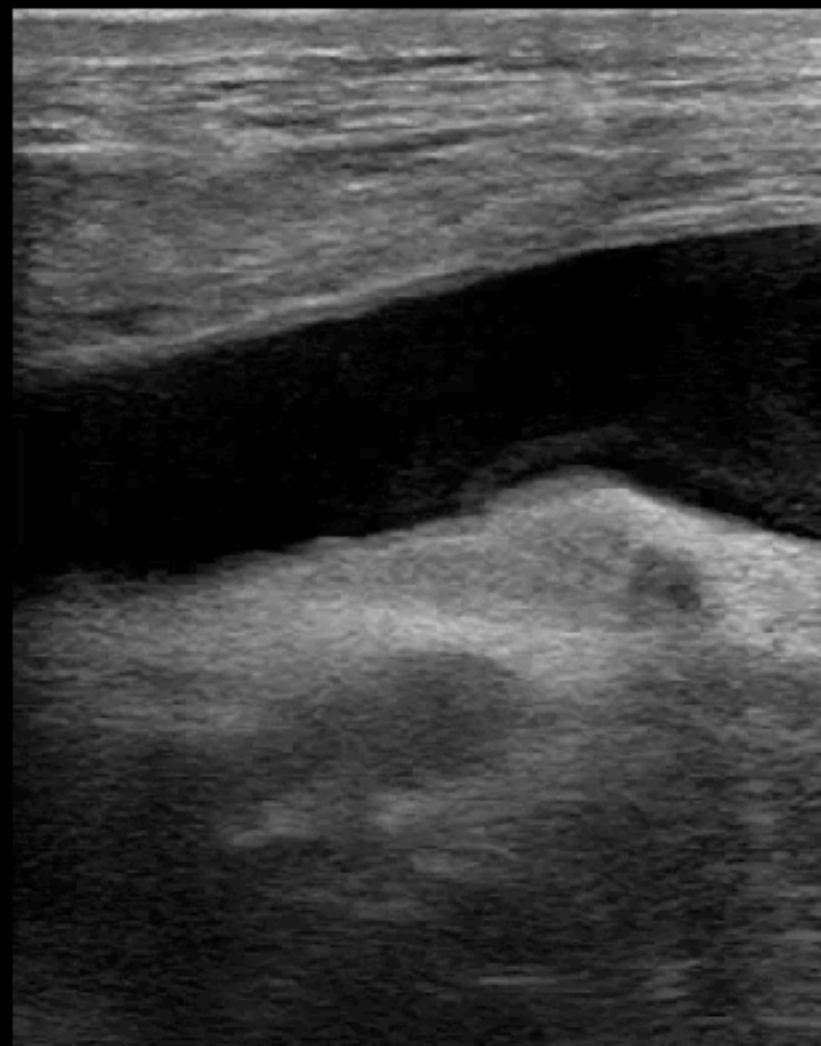
MI 1.2 1/18/2021

TIS 0.2 3:54:32 PM

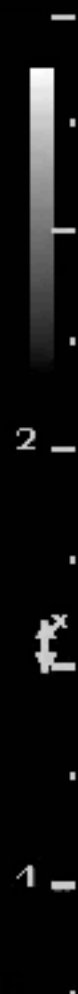
Arterial  
L12-3  
34 Hz  
5.0cm

P

2D  
HGen  
Gn 66  
C. 41  
3/3/2

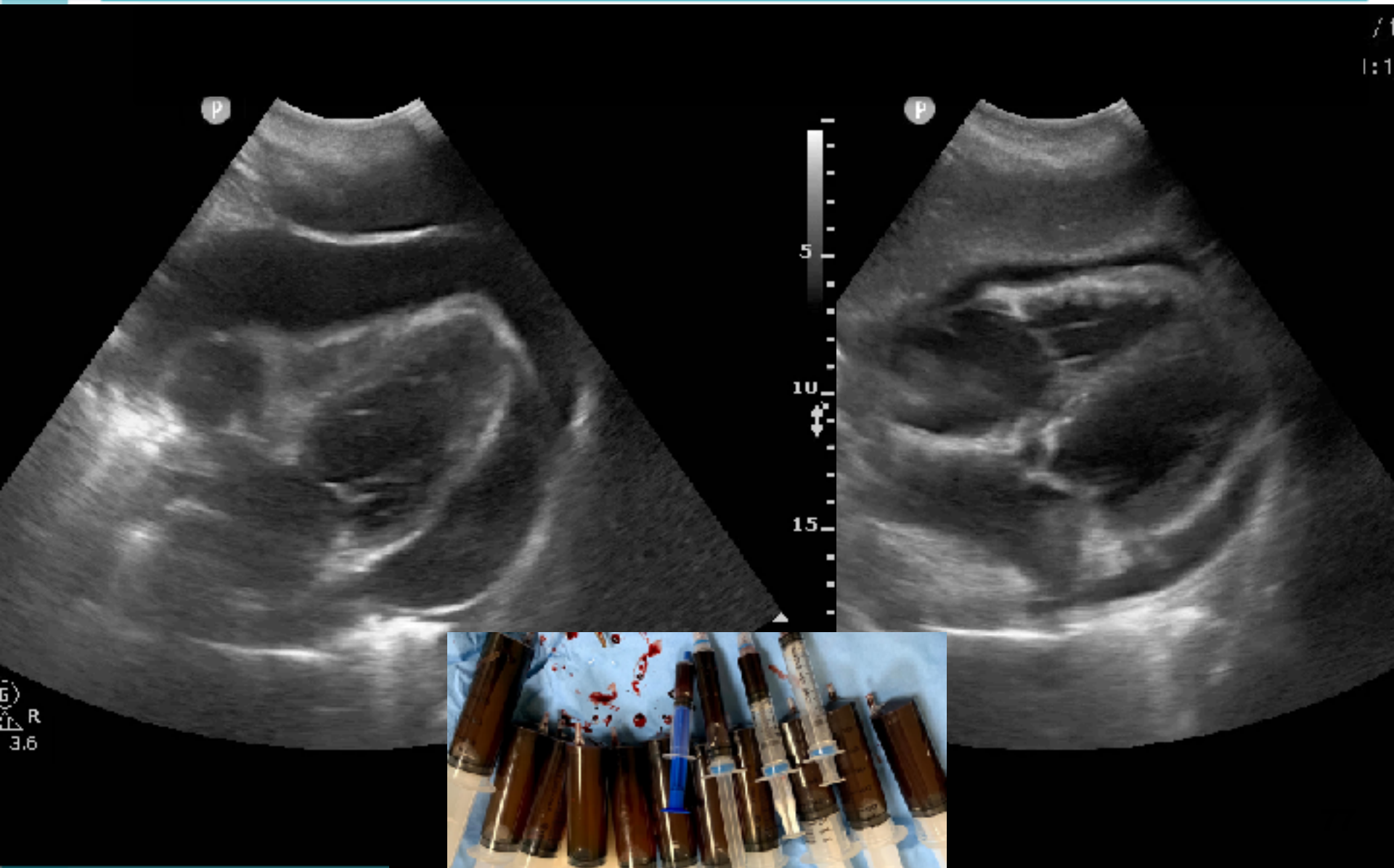


P  
G  
R



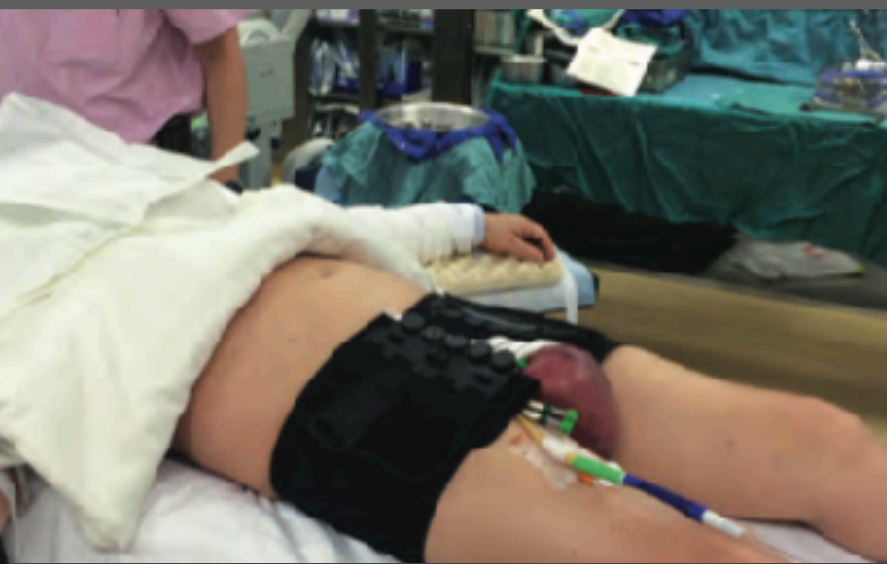


# Monitor response



6) R  
3.6

/1  
1:1

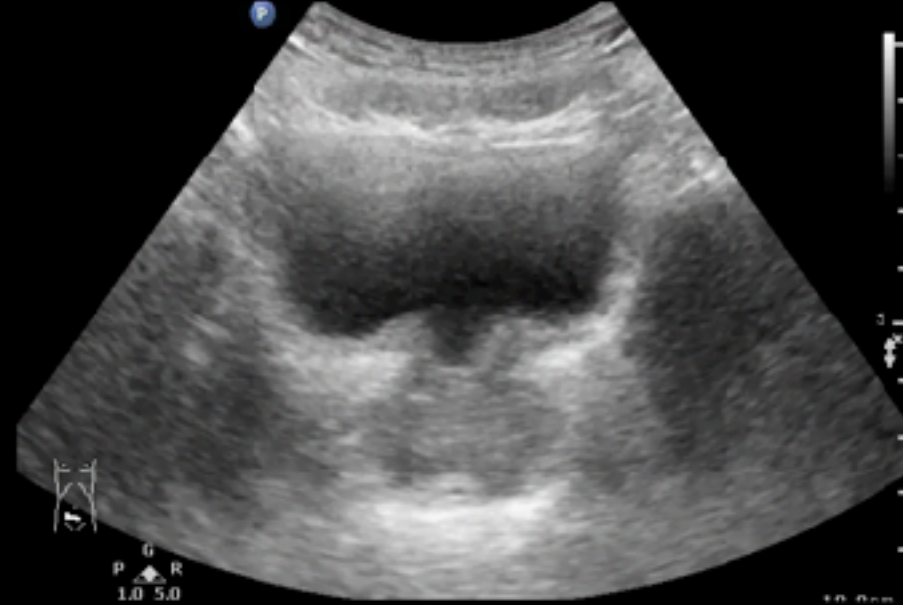


# Open Book Fx

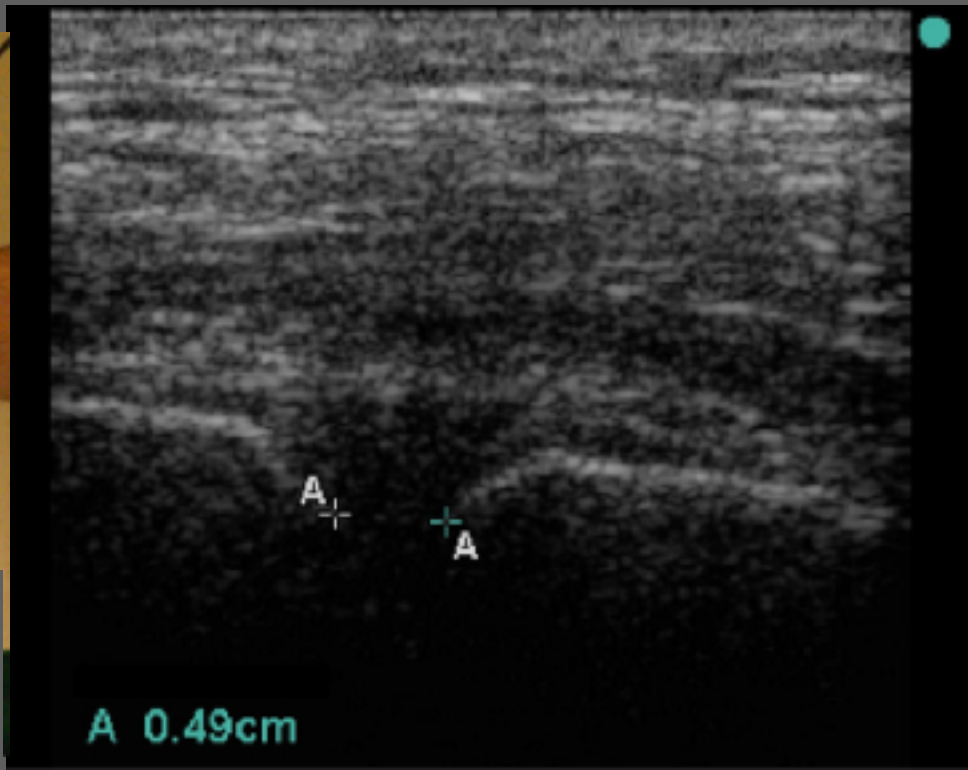


FAST  
CS-1  
45 Hz  
10.0cm

2D  
Gen  
Gn 84  
C 56  
1/3/3







# FAST-PS study

Cutoff :  $> 25\text{mm}$

Sensitivity: 100% Specificity: 100%





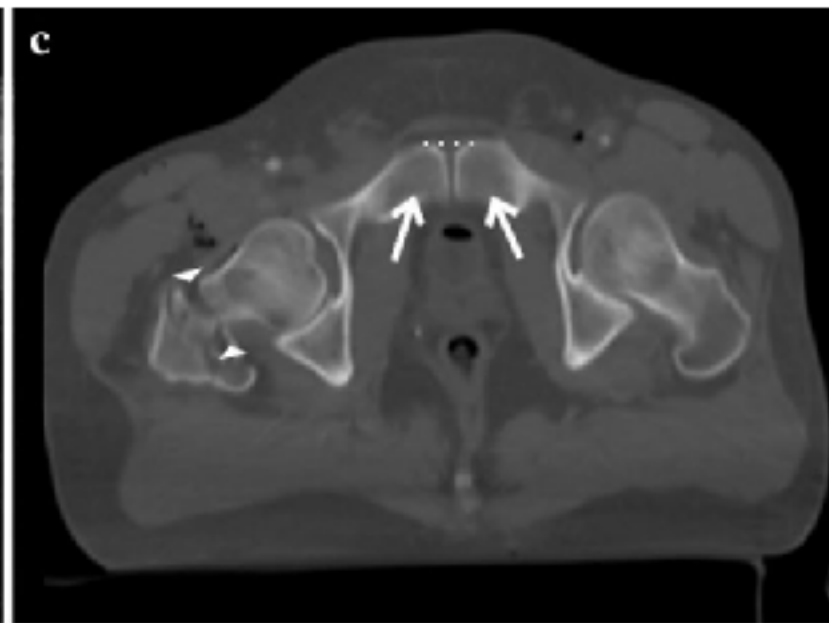
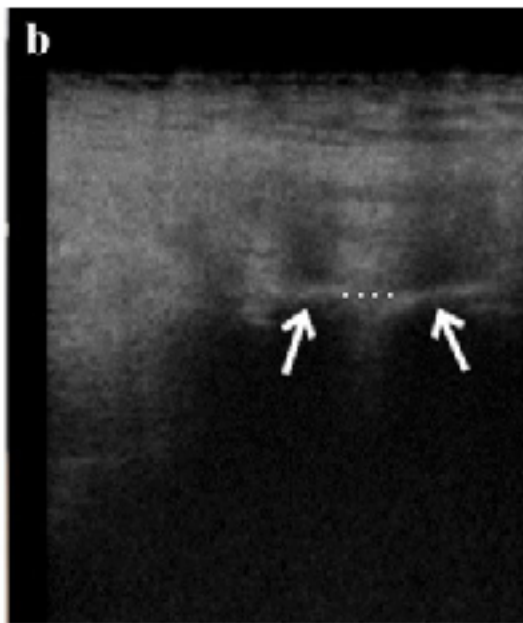
# Diagnostic accuracy of pubic symphysis ultrasound in the detection of unstable pelvis in polytrauma patients during e-FAST: the value of FAST-PLUS protocol. A preliminary experience

Stefania Ianniello<sup>1</sup> · Paola Conte<sup>1</sup> · Marco Di Serafino<sup>2</sup> · Vittorio Miele<sup>3</sup> · Margherita Trinci<sup>1</sup> · Gianfranco Vallone<sup>4</sup> · Michele Galluzzo<sup>1</sup>

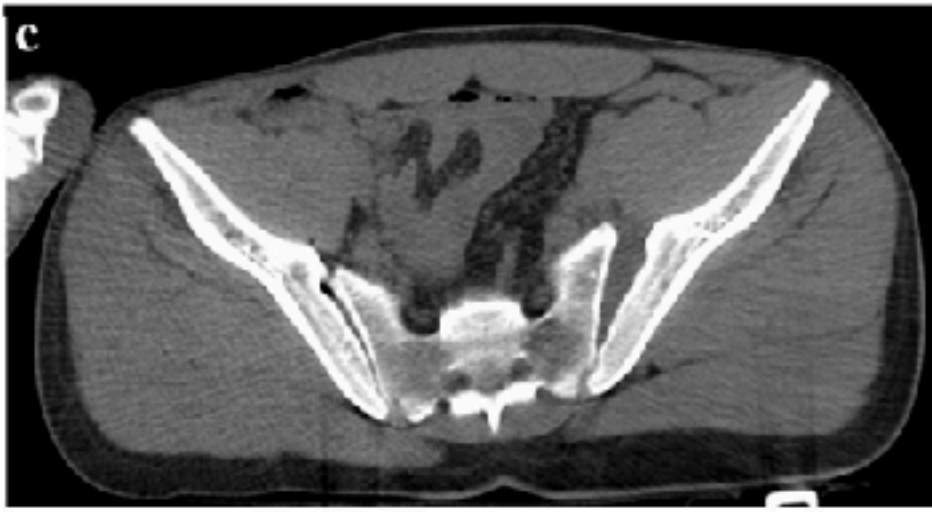
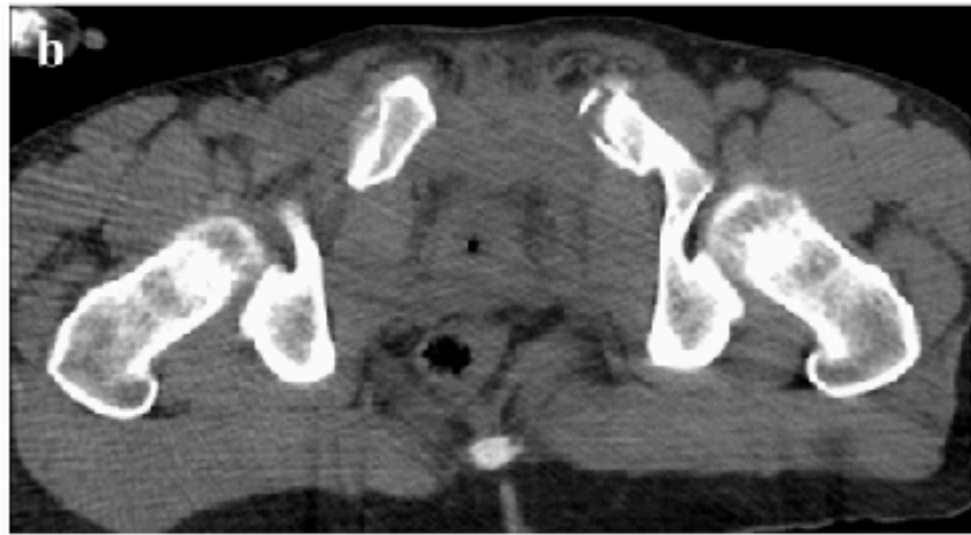
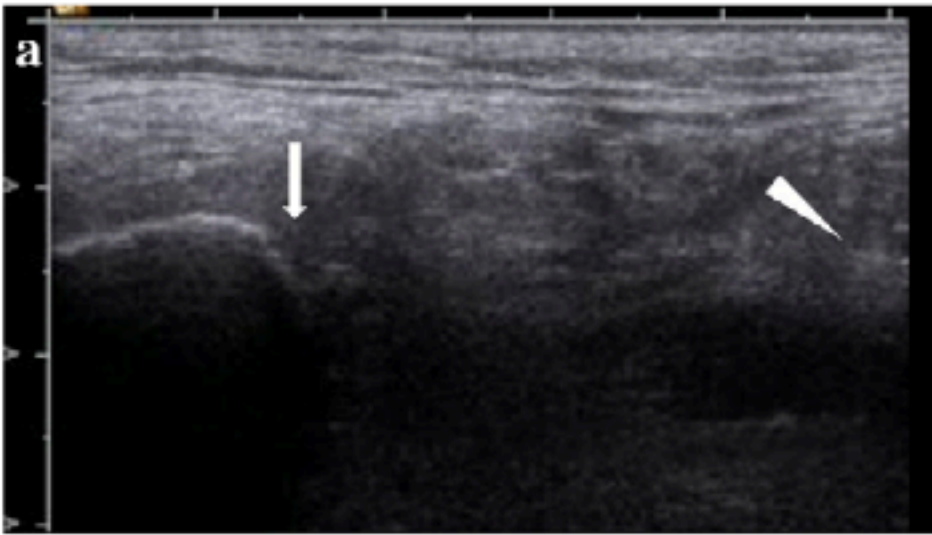
Retrospective  
5 OB fracture in 67 suspect pelvic instability

Received: 15 April 2020 / Accepted: 19 May 2020

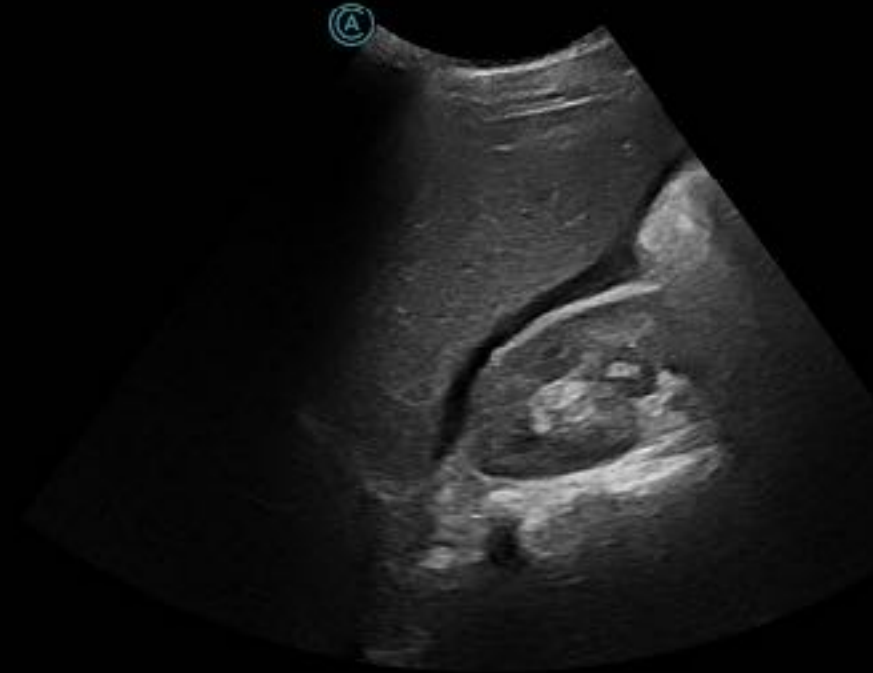
© Società Italiana di Ultrasonologia in Medicina e Biologia (SIUMB) 2020

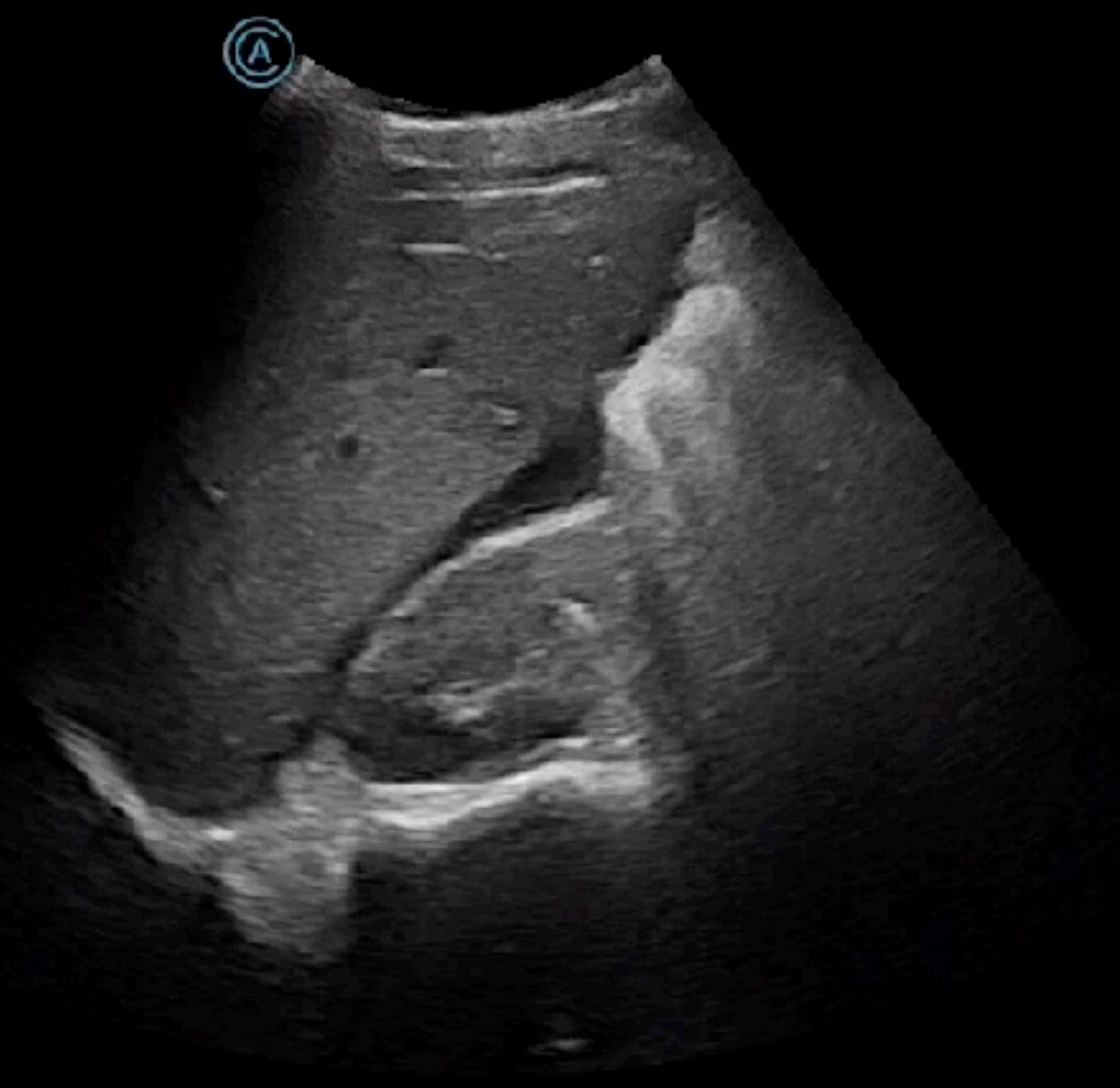


# Diagnostic accuracy of pubic symphysis ultrasound in the detection of unstable pelvis in polytrauma patients during e-FAST: the value of FAST-PLUS protocol. A preliminary experience



# 23M, trauma with abdominal pain



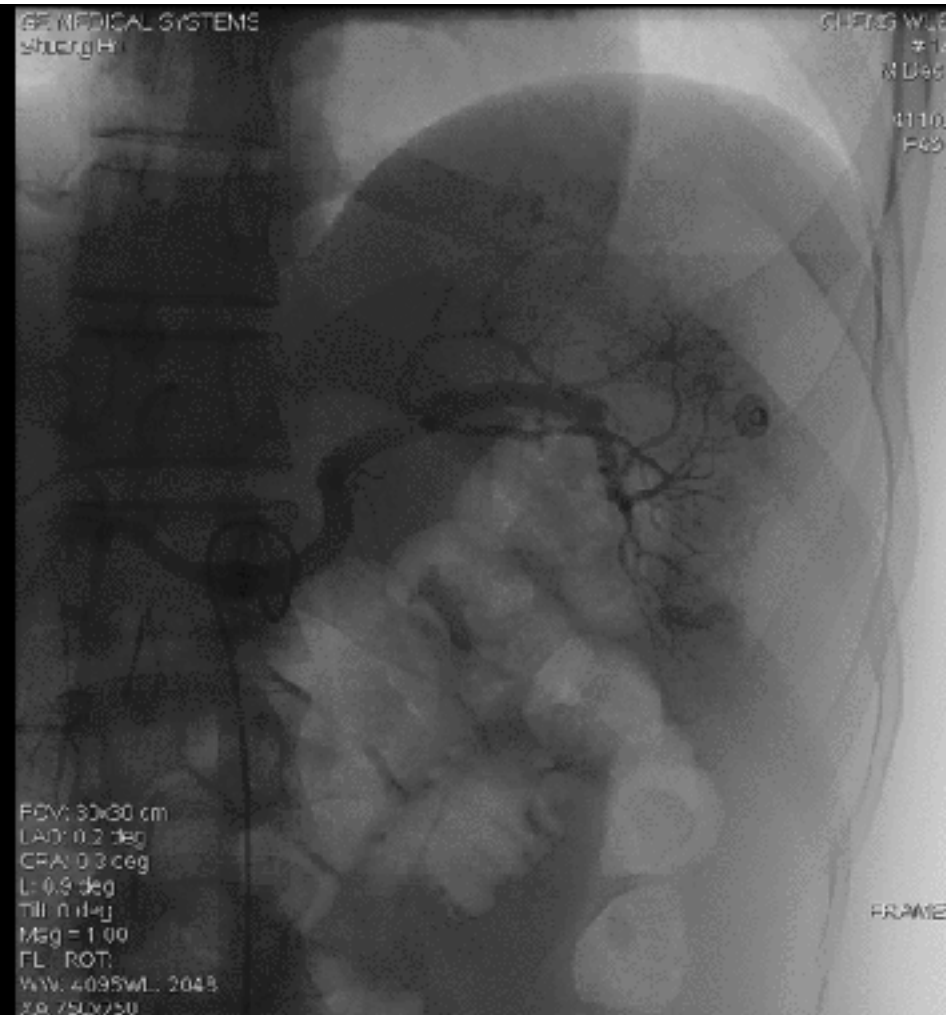
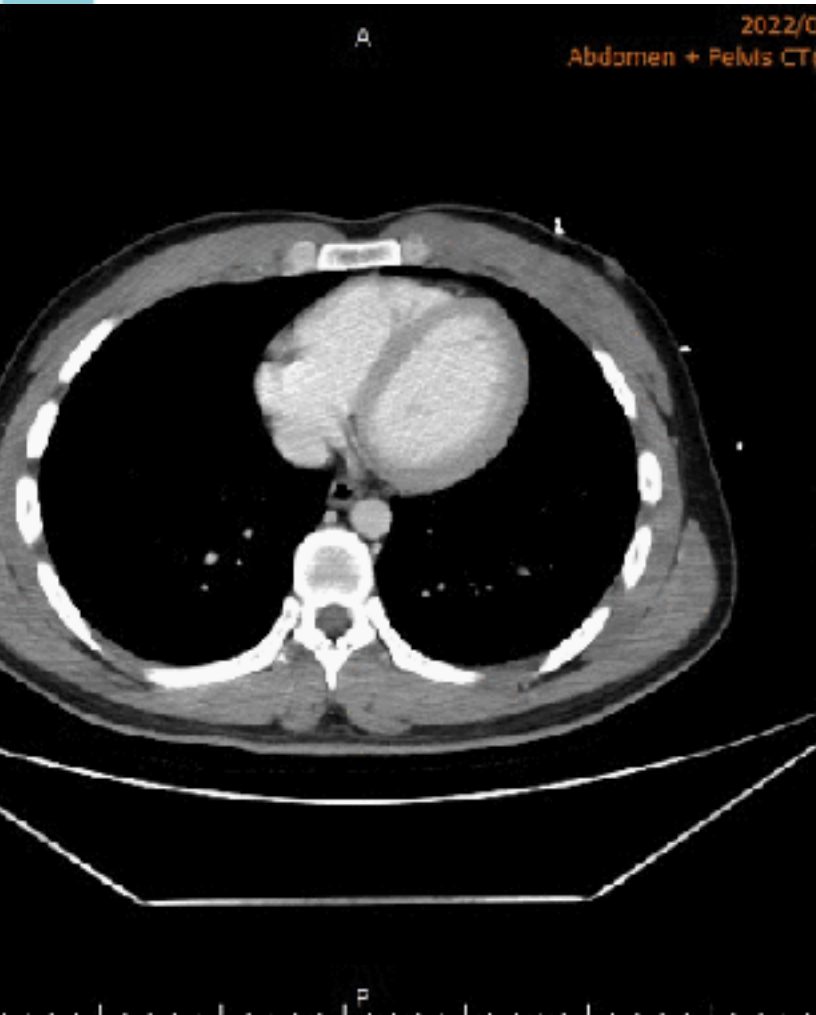


0.4  
Prese  
èß  
FP  
60.0  
Dept  
16.0  
Gai  
50.0  
Powe  
M  
PR  
0.0

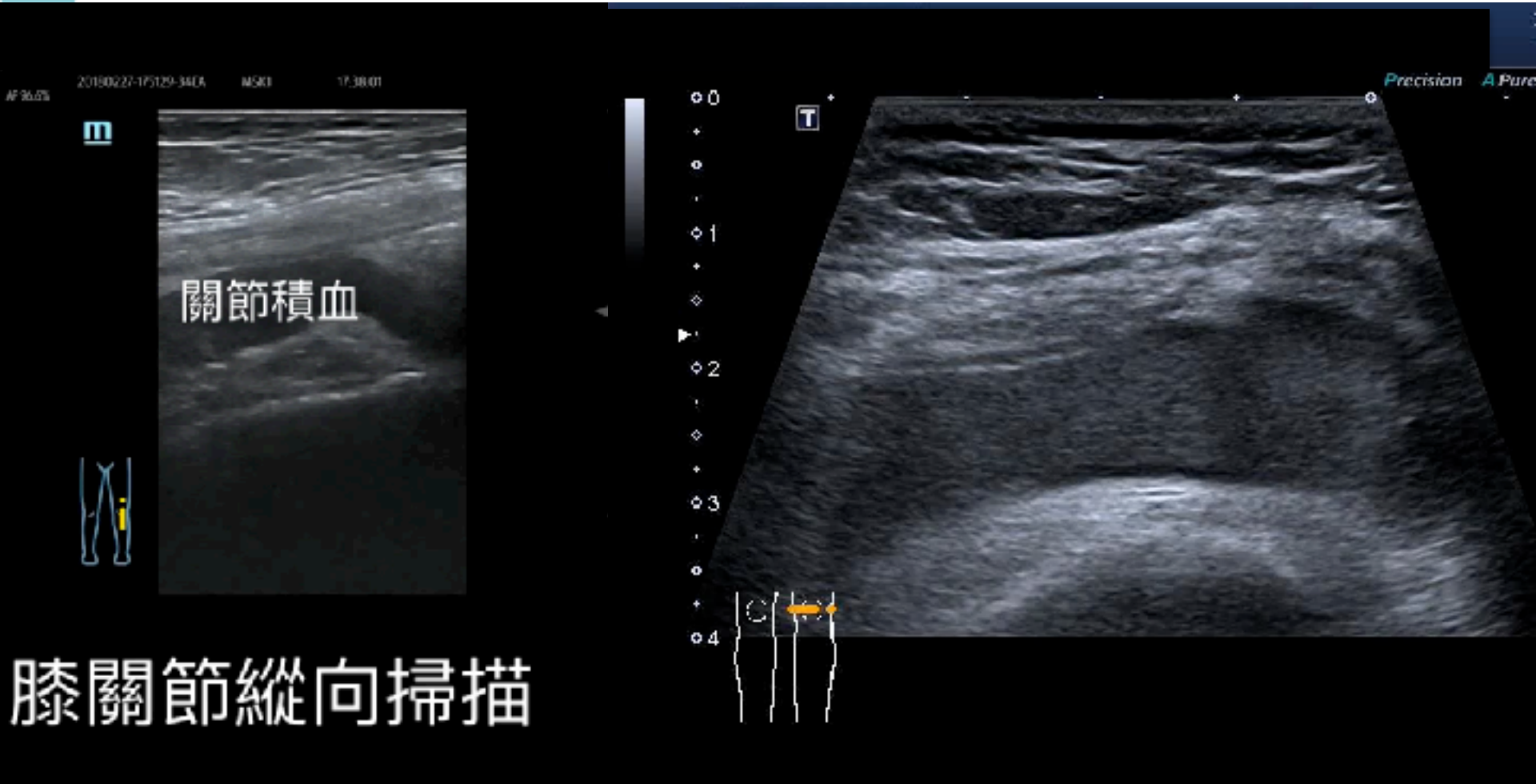




# Splenic laceration & TAE



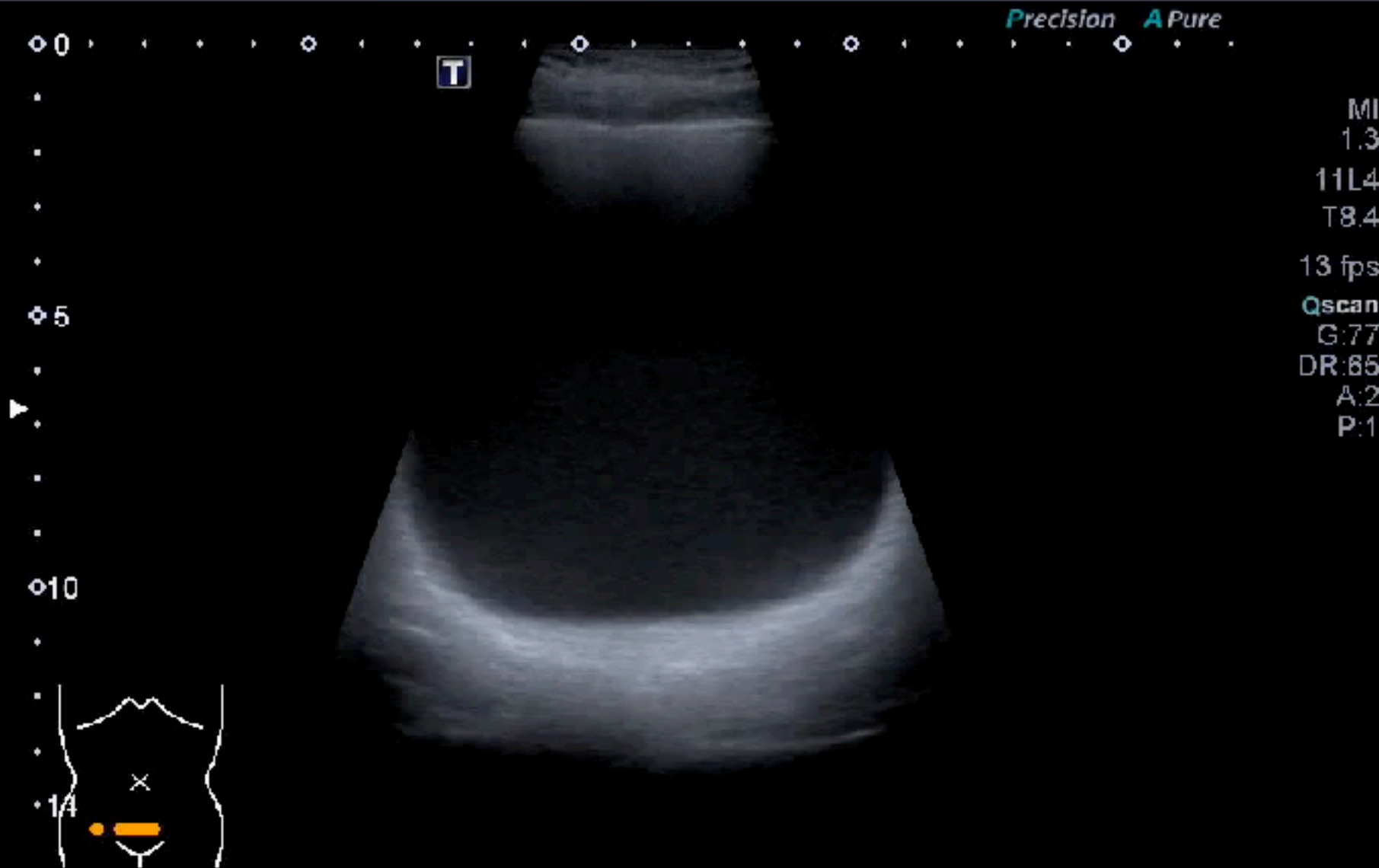
# Joint effusion & aspiration



關節積血

膝關節縱向掃描

# 76M, AUR & urethral stricture



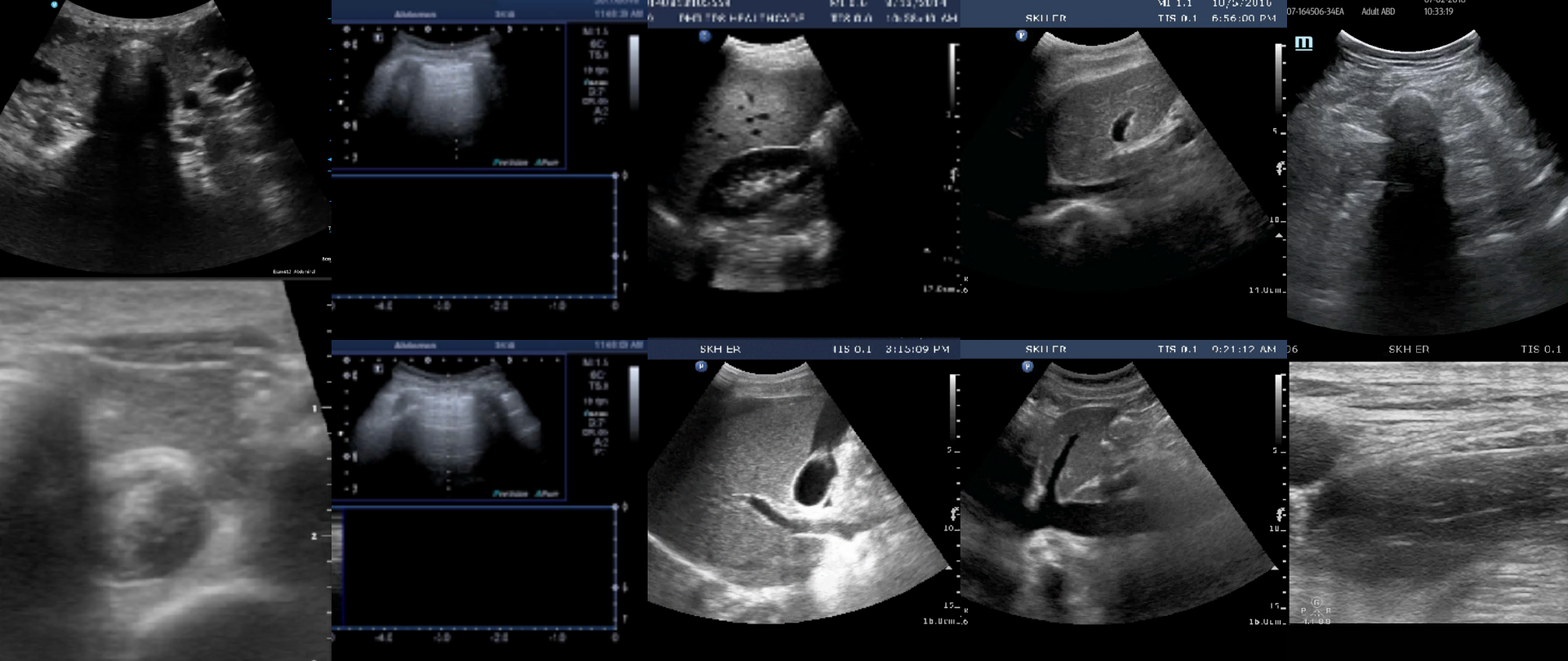
# 安全 決策 電力

受傷機轉 POCUS 理學檢查

災難現場的外傷處置

~ 不可或缺的第三隻眼~





# 災難現場的外傷處置

~ 不可或缺的第三隻眼 ~

[juice119@gmail.com](mailto:juice119@gmail.com) / [POCUSacademy.com](http://POCUSacademy.com)

