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(委託臺北醫學大學興建經營)
Taipei Medical University - Shuang Ho Hospital,
Ministry of Health and Welfare



TTE vs TEE

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POCUSacademy.com

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

ASE practice guideline 2020



J Am Soc Echocardiogr. 2020 Apr;33(4):409–422.e4.

Table 1 Definitions of cardiac ultrasound categories

	UAPE	Cardiac POCUS	CCE	Limited echo	Comprehensive echo
Diagnostic expectations	"Routine" performance of a single imaging protocol to augment bedside examination	Focused exams with specific imaging protocols based upon suspicion of a specific disease (e.g., rule out tamponade)	Focused on a collection of specific views/findings pertinent to the care of the critically ill (e.g., cardiac output, fluid responsive)	Focused on previously delineated findings as a follow-up exam; limited imaging protocol applied to answer a specific question	Comprehensive, all findings, quantification; Increasingly use advanced techniques
Application frequency	Frequent, daily, multiple physicians	Usually once, per disease, but more frequently if change in clinical status	On admission or change in clinical status, potentially frequently	As follow up to comprehensive echo; potentially multiple times over weeks to months	Once (per admission, change in clinical status)
Interpretation of findings	Presence or absence of ultrasound "signs" indicative of cardiac abnormality	Findings related to the diagnosis sought in protocol	Primary and incidental findings recorded in views	All findings, primary and incidental, recorded in limited views	All findings, primary and incidental recorded in comprehensive imaging
Quantification	Usually Absent	Optional	Typically	Typically	Mandatory
Indication	Physical exam	Clinical suspicion	Medical necessity	Medical necessity	Medical necessity
Documentation	Images not recorded (except for QA), findings reported in physical exam	Image archiving and formal reporting controversial	Images archived, formal report	Images archived on PACS, formal report	Images archived on PACS, formal report
Teaching required	Introductory and modest (weeks)	Modest (weeks to months)	Advanced (months)	Advanced (years)	Advanced (years)
Notes	Used "in the manner and intent" of cardiac physical examination	Similar to UAPE, but disease specific	Imaging protocols specific to issues in the critically ill; comparison to available prior studies as indicated	Reading all findings increases training burden. Comparison to available prior studies is standard practice. Must be able to convert to comprehensive at bedside	Completely evaluates all findings, regardless of referral question or incidental nature. Comparison to available prior studies is standard practice.

CCE, critical care echocardiography; PACS, Picture Archival and Communication System; POCUS, point of care ultrasound; UAPE, ultrasound-assisted physical examination.

Adapted from: Kimura BJ. Point-of-care cardiac ultrasound techniques in the physical examination: better at the bedside. Heart 2017;103:987-994. <https://doi.org/10.1136/heartini-2016-309915>.

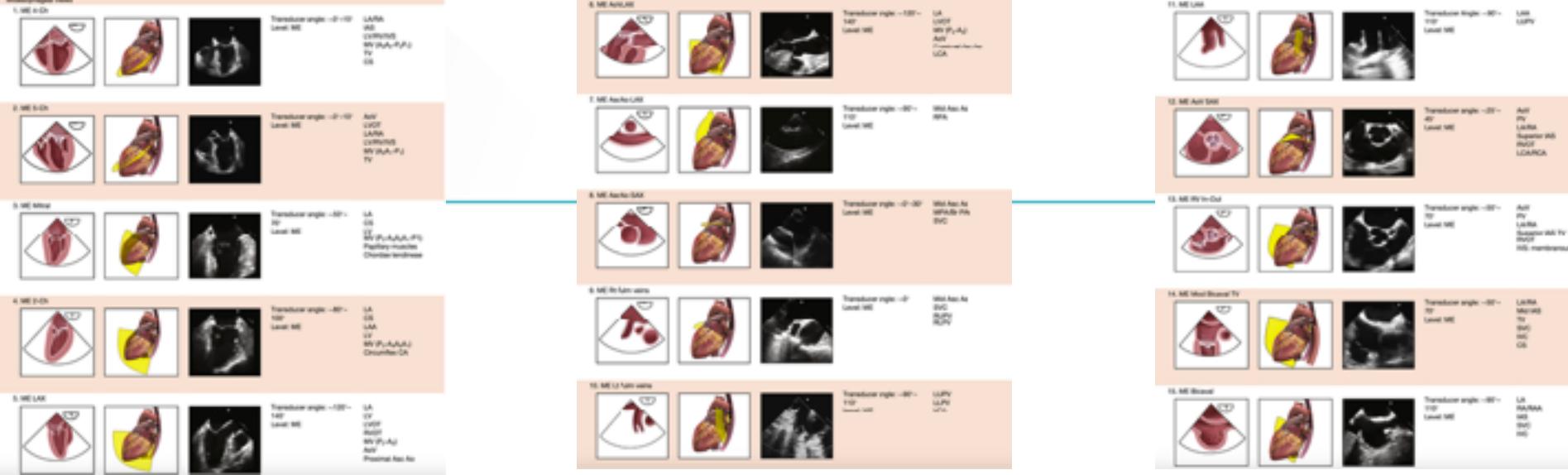
	UAPE	Cardiac POCUS	CCE
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急診心超三部曲

理學檢查
UAPE

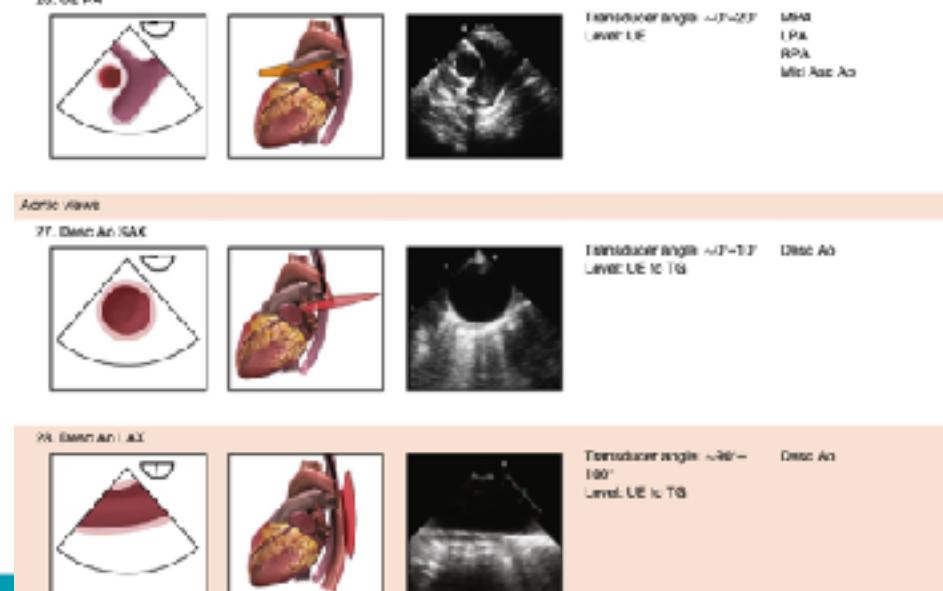
快速判定
Cardiac POCUS

進階測量
CCE



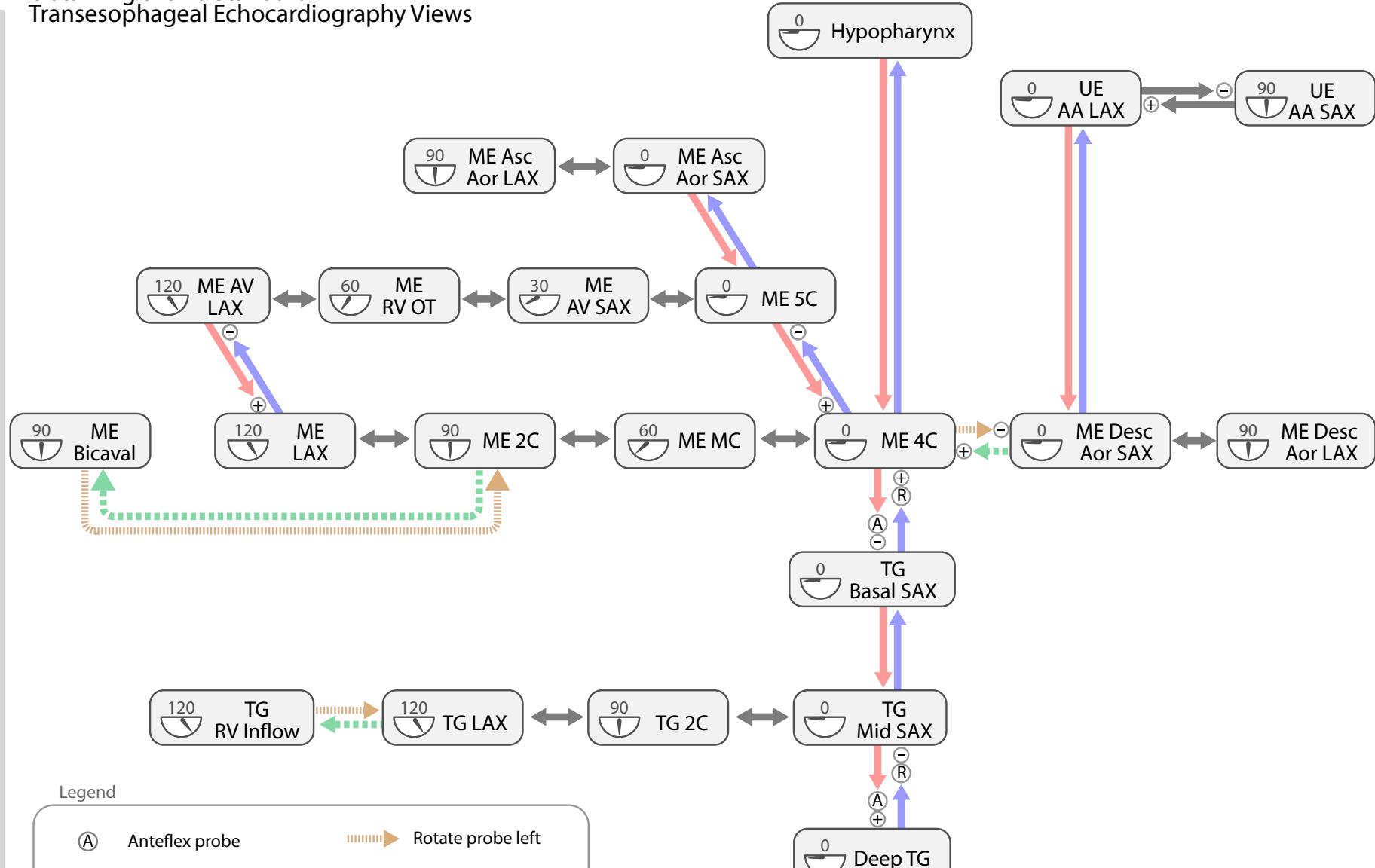
完整TEE 28 Views

ASE TEE guidelines 2019



Obtaining the 20 Standard Transesophageal Echocardiography Views

Probe Depth



Legend

- | | |
|-----|--|
| (A) | Anteflex probe |
| (R) | Retroflex probe |
| (-) | Decrease omniplane depth (display depth) |
| (+) | Increase omniplane depth (display depth) |
| ↔ | Change omniplane angle |
| 90 | Omniplane angle |

2C - Two Chamber
4C - Four Chamber
5C - Five Chamber
AA - Aortic Arch
AV - Aortic Valve

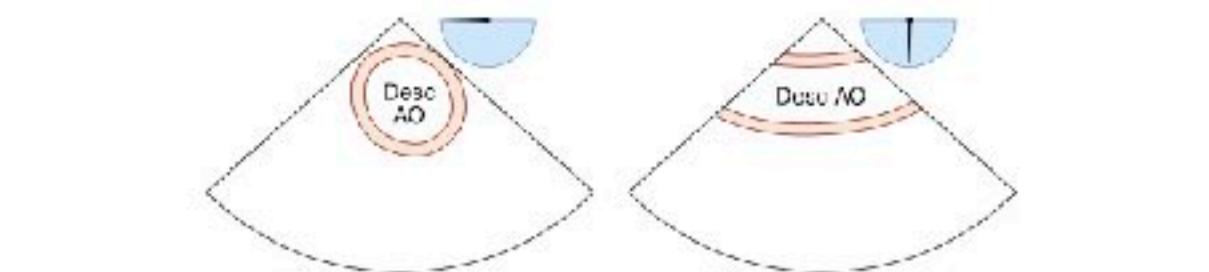
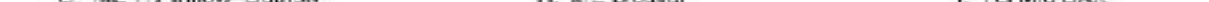
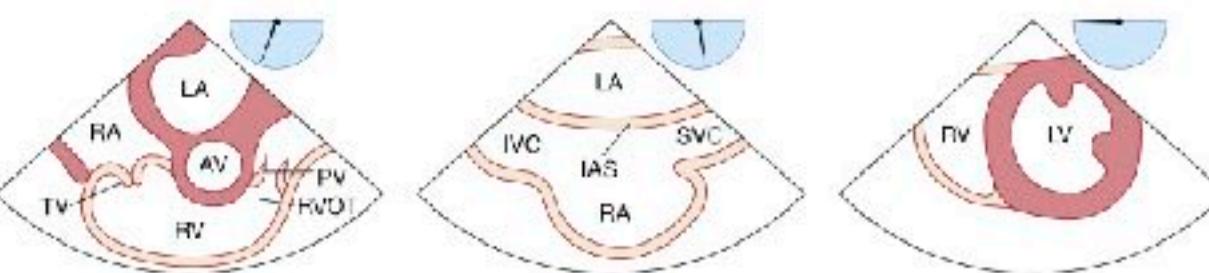
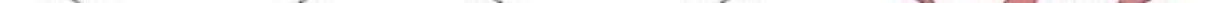
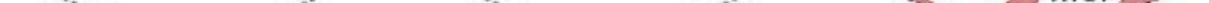
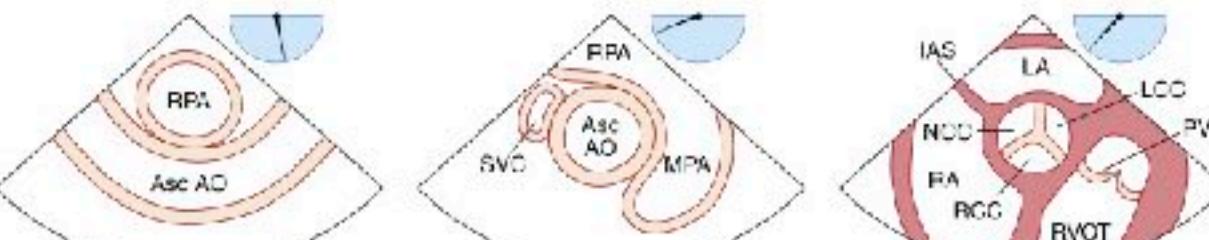
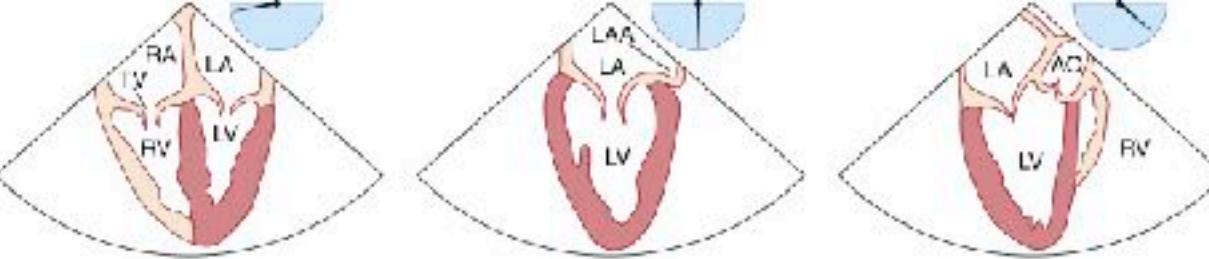
©Toronto General Hospital Department of Anesthesia and Pain Management 2008

Asc Aor - Ascending Aortic
Desc Aor - Descending Aortic
OT - Outflow Tract (Inflow-Outflow)
LAX - Long Axis
MC - Mitral Commissural

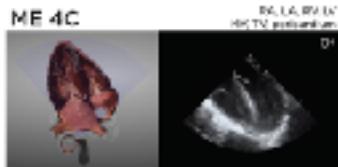
ME - Mid Esophageal
RV - Right Ventricle
SAX - Short Axis
TG - Transgastric
UE - Upper Esophageal

ASE/SCA 11

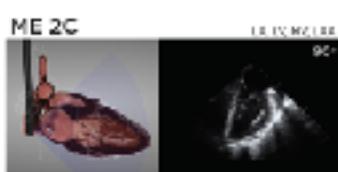
Basic Peri-OP Views



RESUSCITATIVE TEE VIEW GUIDE



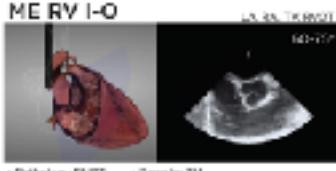
- Pathology: pericarditis
- UV: RV
- ECG: ST elevation
- ECG: PR interval
- ECG: AV



- Pathology: LV
- UV: ROBC
- ECG: ST depression
- ECG: T waves



- Pathology: aorta
- UV: RA
- ECG: PR interval



- Pathology: EMTT
- UV: TGA



- Pathology: EMTT
- UV: ROBC



- Pathology: MAMPS + LV dilation
- UV: RA
- ECG: PR interval



- Pathology: aortic stenosis
- UV: RA
- ECG: ST depression
- ECG: T waves



- Pathology: aorta
- UV: RA
- ECG: PR interval



- Pathology: EMTT
- UV: RA



- Pathology: EMTT

TEE-GUIDED CARDIAC ARREST RESUSCITATION

R. Rabinovitz & J. Wittenberg

NON-SHOCKABLE RHYTHM

- Epinephrine
- Pulseless Circulation Arrest (30 seconds)

SHOCKABLE RHYTHM

- DCCB / Cardiovert
- Continue ACLS

TEE

CPR IN PROGRESS - PRIMARY SURVEY

Pericardial Effusion / Tamponade

Pericardiocentesis

Inadequate LV compression / Obstruction LVOT

Dependent AMV

TEE

RHYTHM CHECK 1

Ventricular Fibrillation

Defibrillate

Pseudo-PEA

Hs and Ts
Consider resuscitating as compound shock

US

CPR IN PROGRESS - SECONDARY SURVEY

Free Fluid in Chest or Abdomen

Consider surgical pathology

AAA > 4 cm

Consider ruptured AAA

DVT

Greater hemimetry for PE

US TEE

RHYTHM CHECK 2

Pneumothorax

Thoracostomy

ROBC

Find Central Aorta Open

Mid Esophageal 4C

Cardiac Standstill &
 $\text{EtCO}_2 < 20 \text{ mmHg}$ after 30 minutes

Temporary Defibrillation

TEE

ADDITIONAL VIEW

Mid Esophageal Board

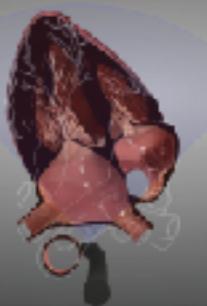
Procedural Guidance

RESUSCITATIVE TEE VIEW GUIDE

ME 4C

RA, LA, RV, LV
MV, TV, pericardium

0°

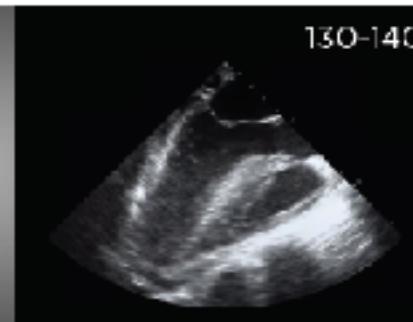
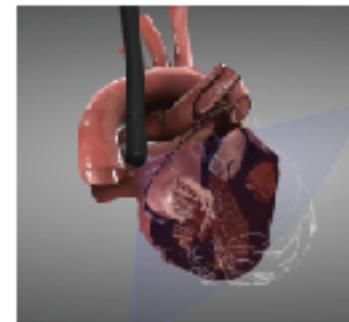


- Pathology pericardium
- RWMA
- LV/RV size & function
- Valvular pathology

ME LAX

LV, LA, MV, AV

130-140°

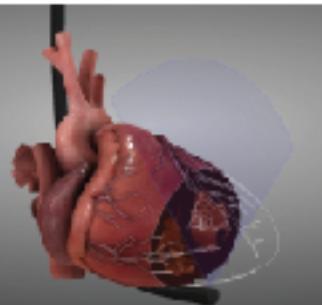


- Quality of CPR (AMC)
- LV function
- Pathology MV
- Pathology AV

TG SAX PAP

LV, RV

0°

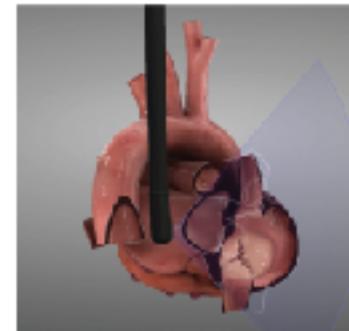


- LV function
- RWMA
- Pathology pericardium

ME Bicaval

IVC, RA, SVC

90°



- Procedure guidance
- Venous guidewire
- ECMO
- Volume responsiveness

I-AIM

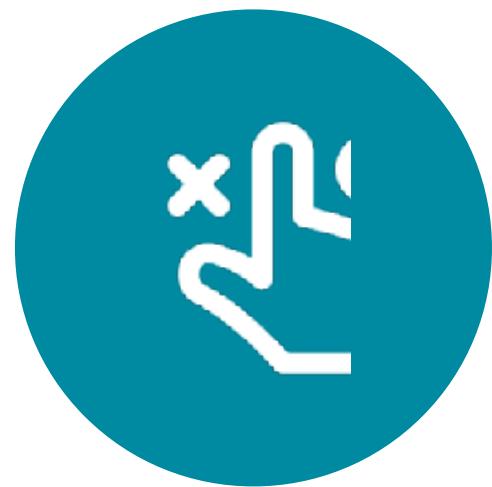
Indication



Acquire



Interpret



Make
decision

Transducers



Curve

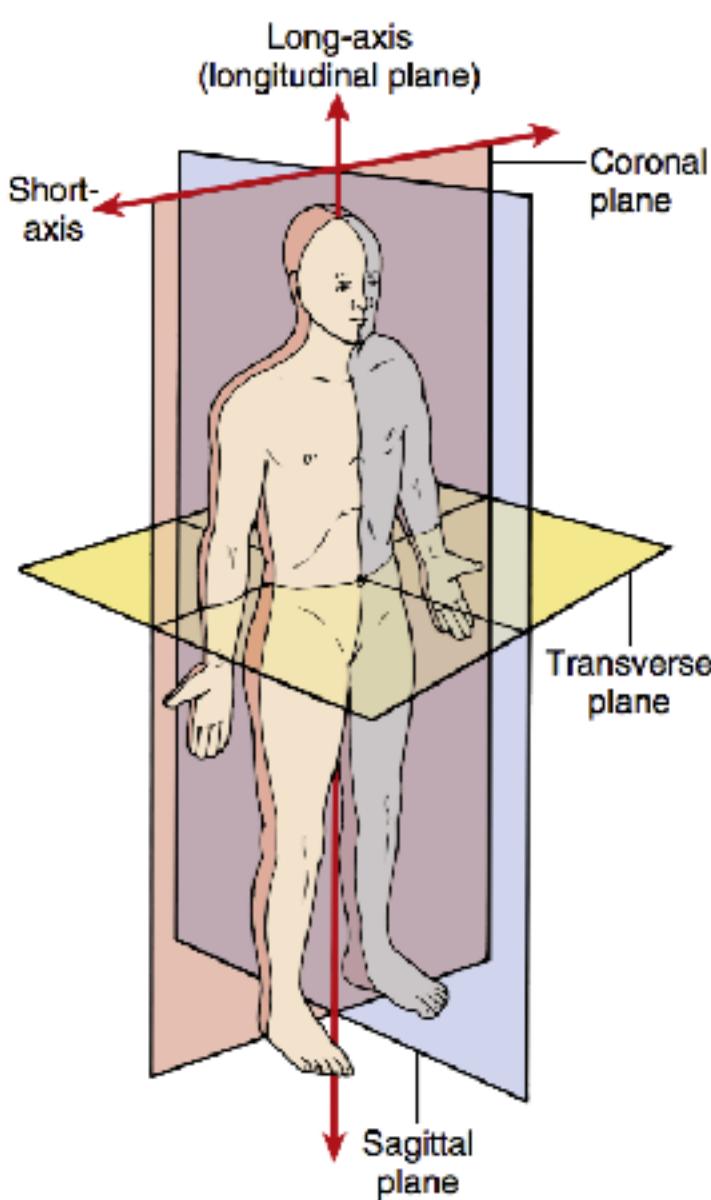


Sector

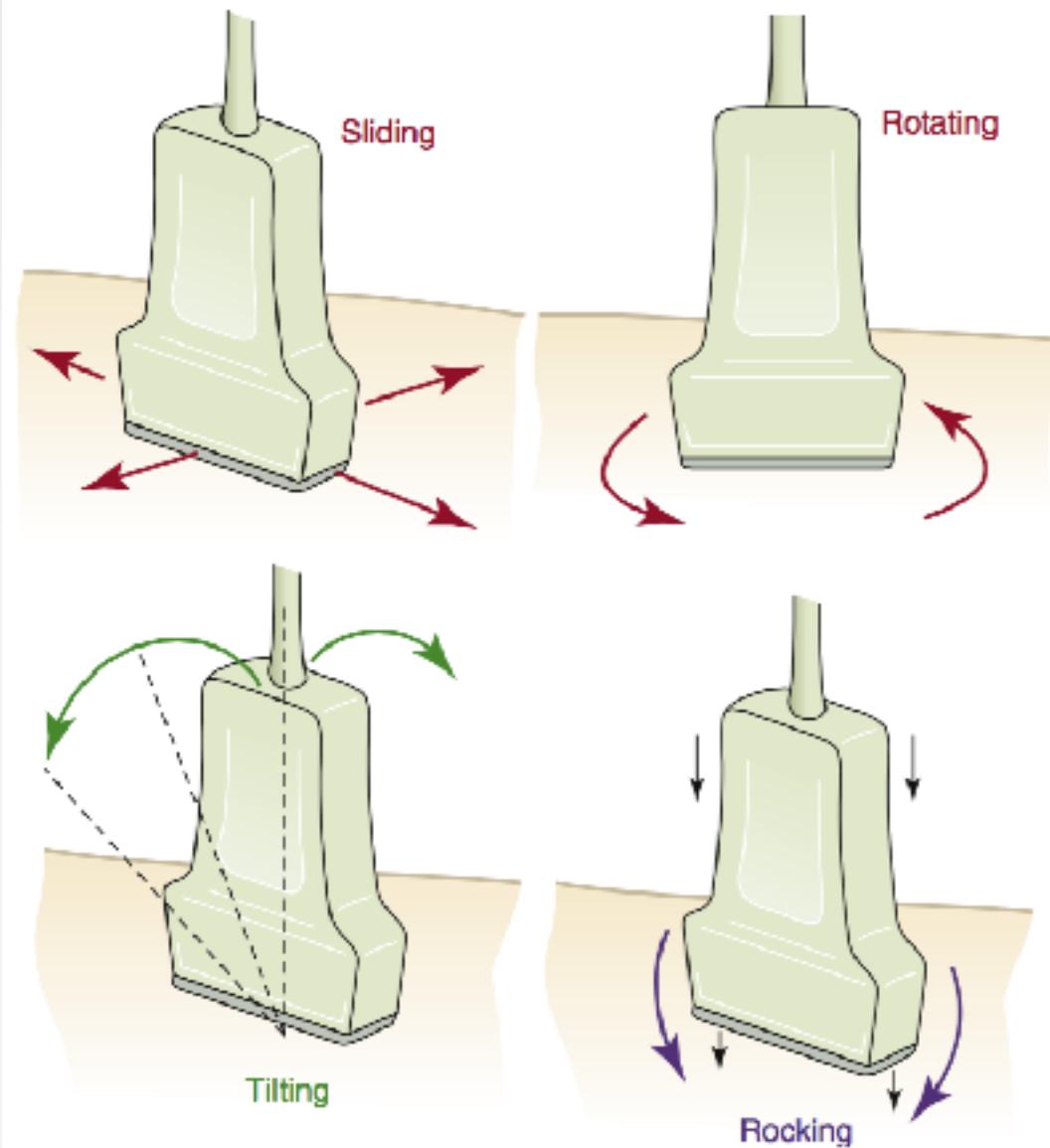


TEE

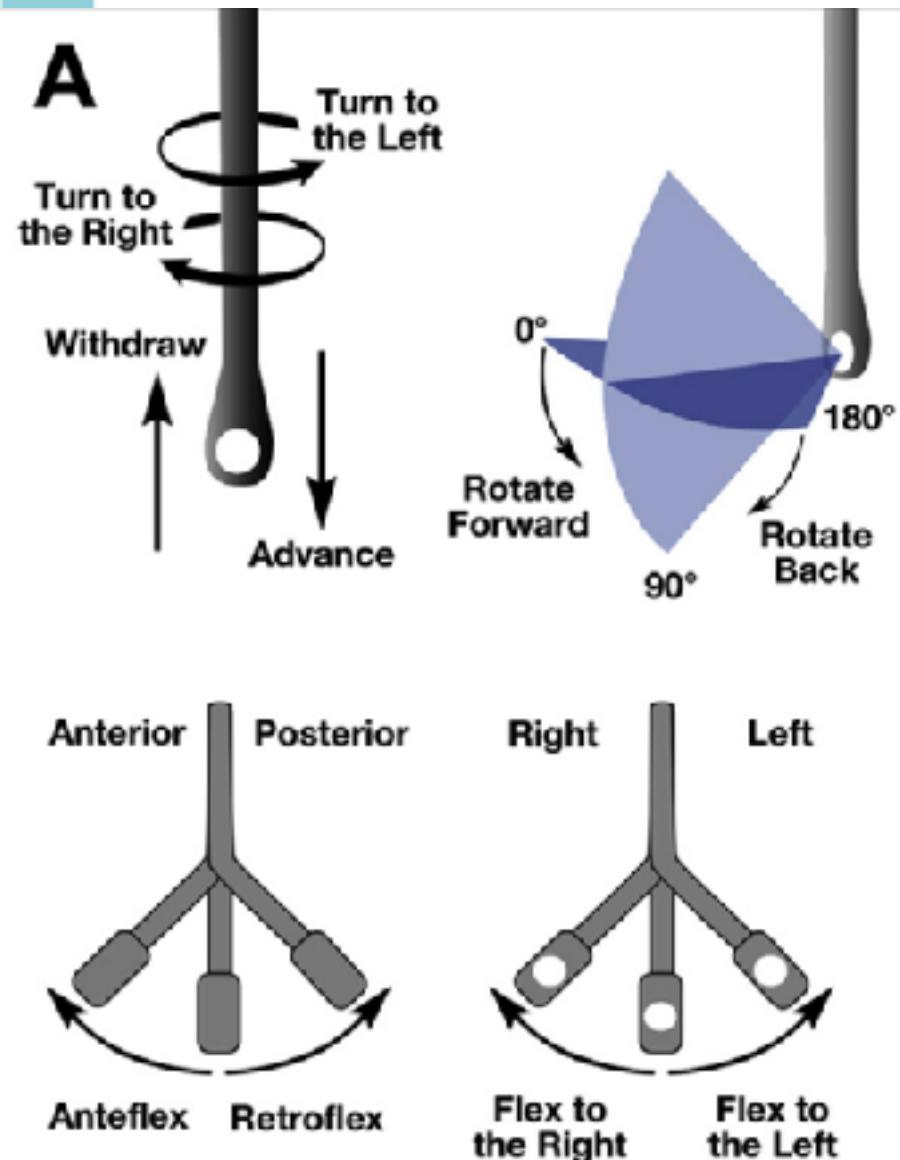
TTE掃描軸線和探頭操作



Transducer Movements

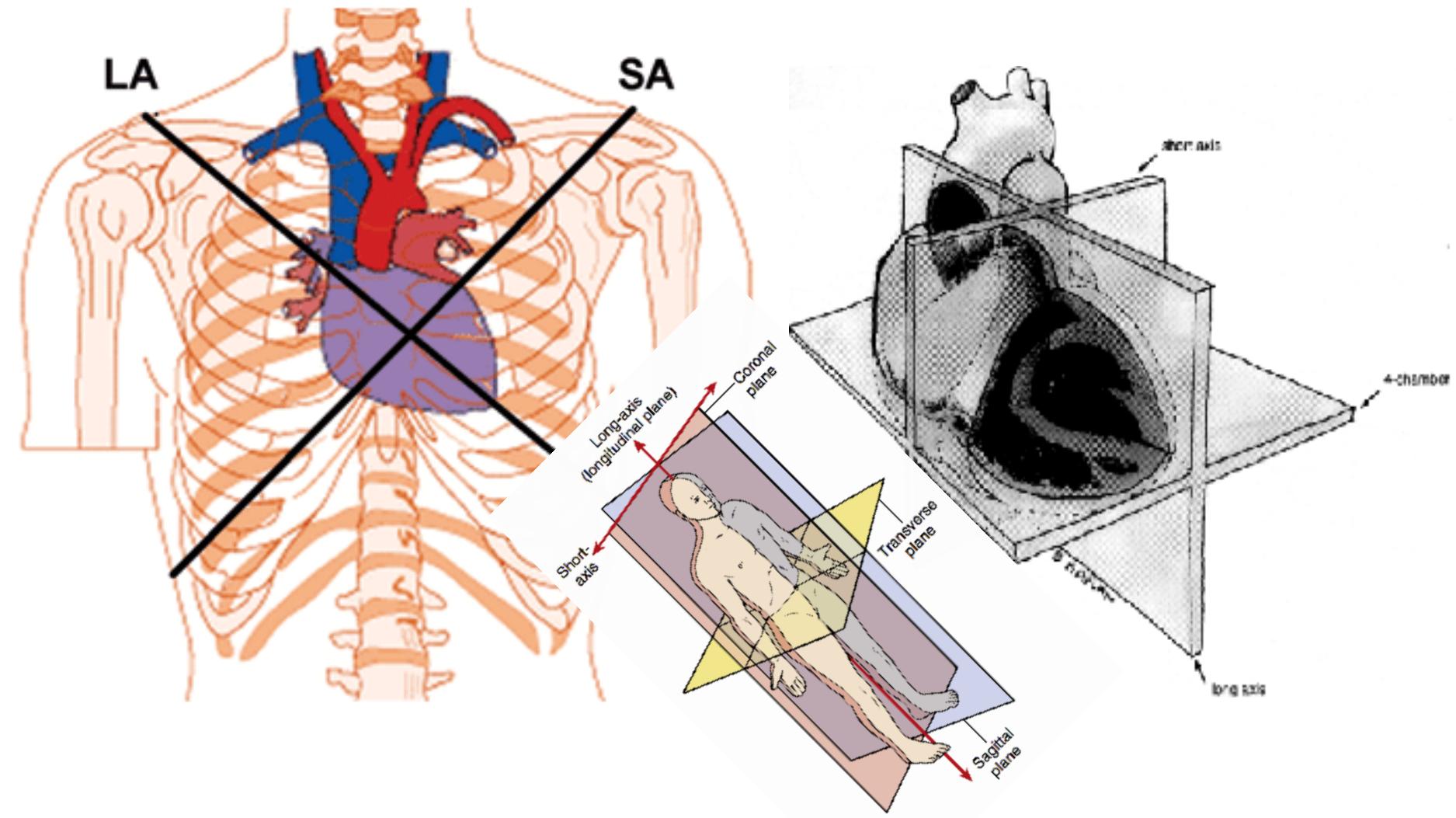


TEE掃描軸線和探頭操作



進和退
順逆轉
面朝前
晶體旋
前後彎
左右彎

心臟軸線界面



Parasternal



SPA

Subcostal

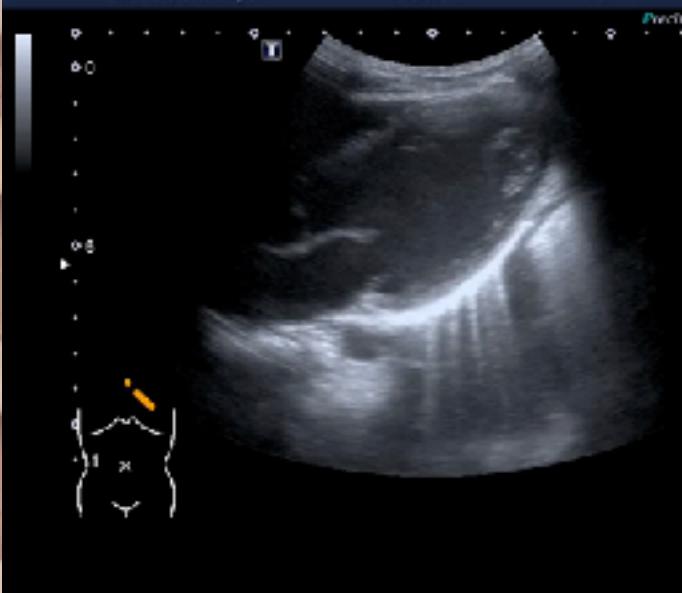
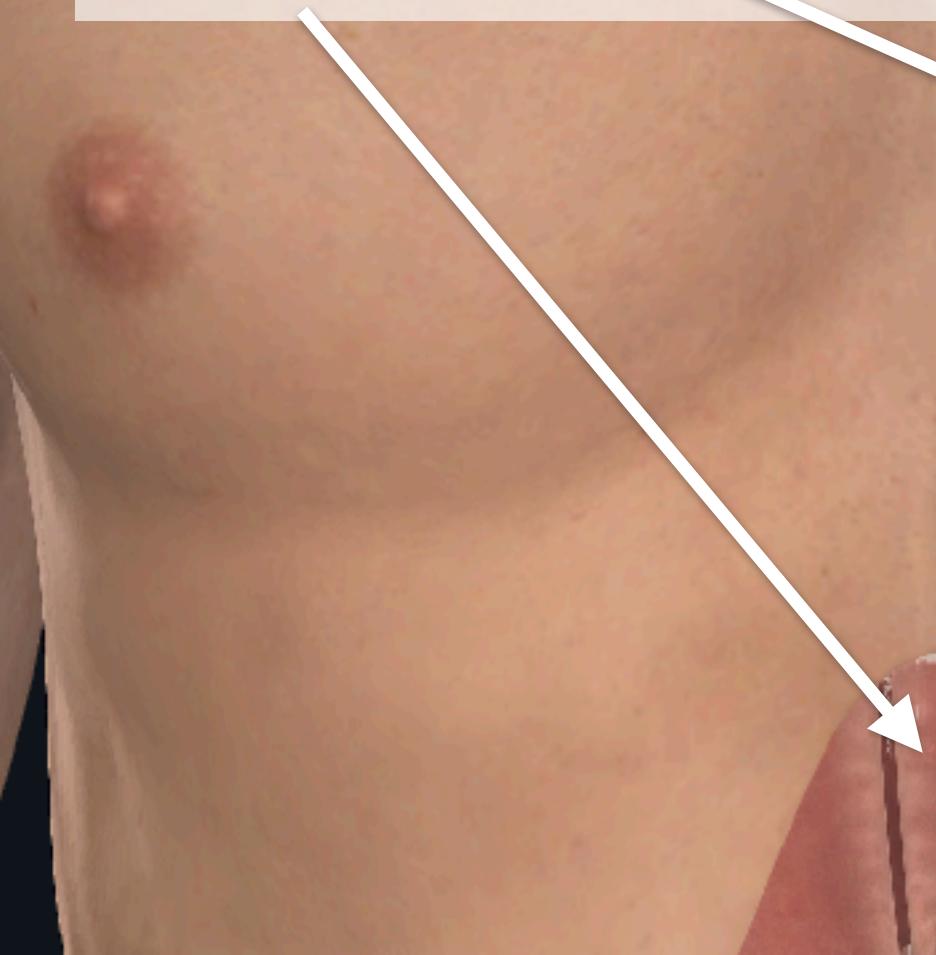


Apical

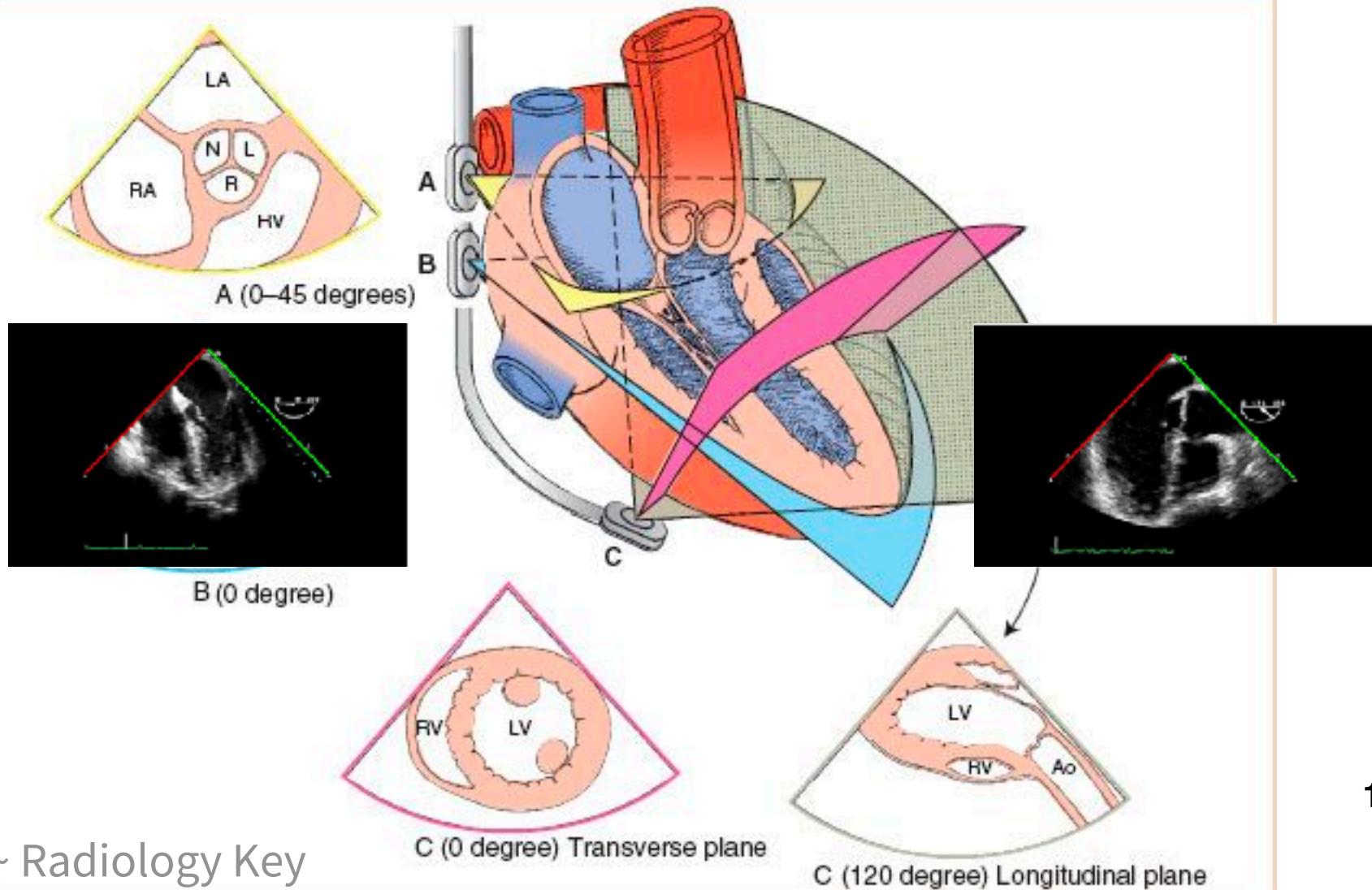
掃描介面 (探頭)

PSLA

S4C

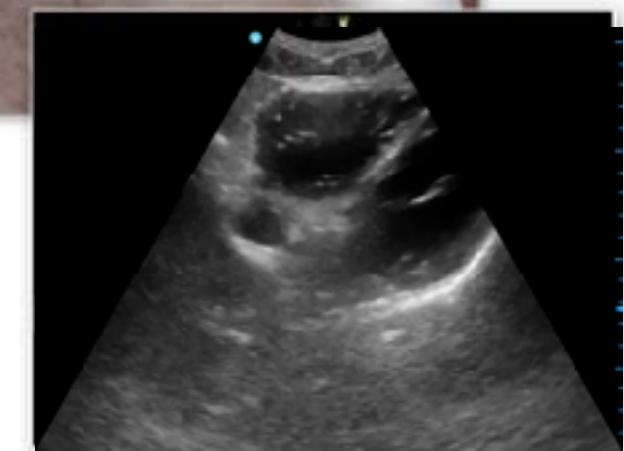
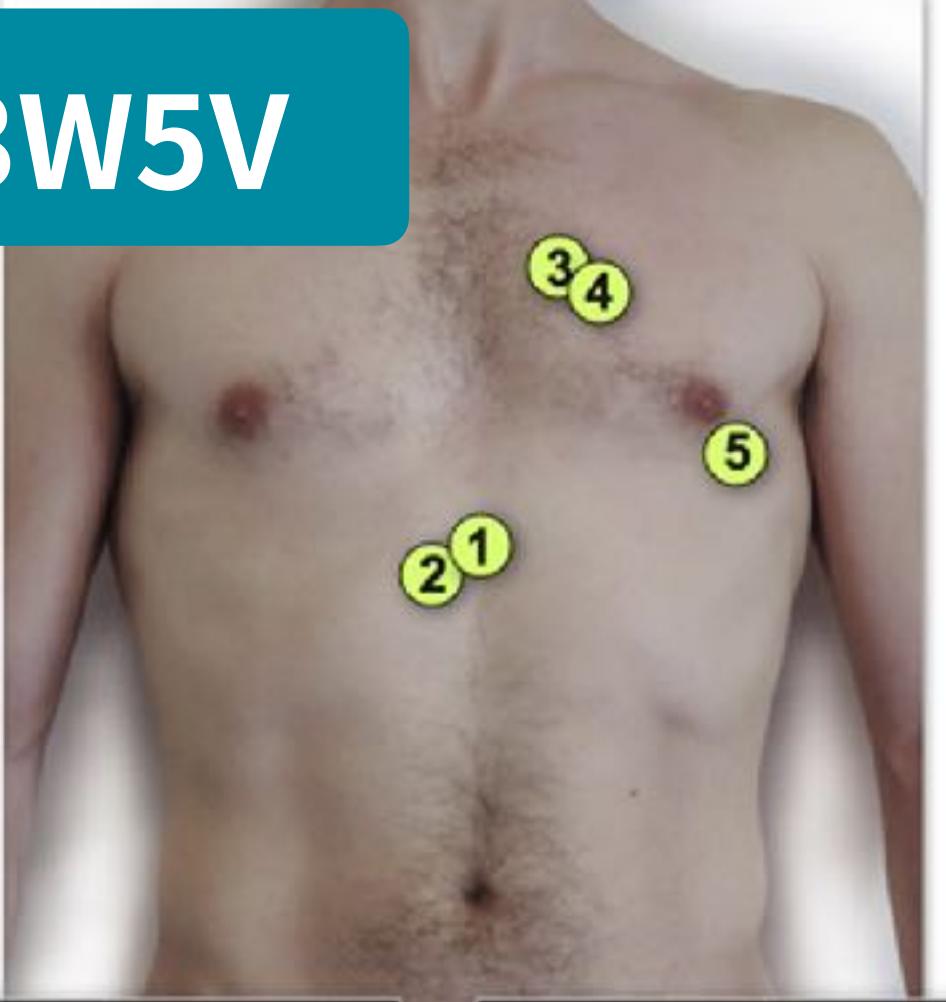


心臟軸線介面



~ Radiology Key

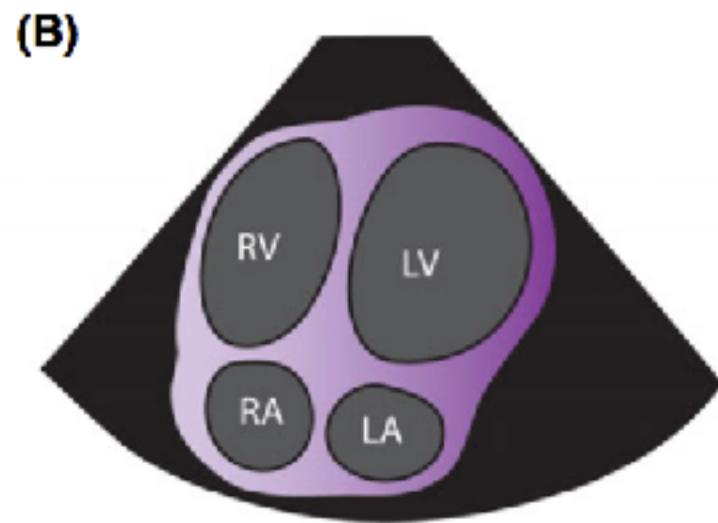
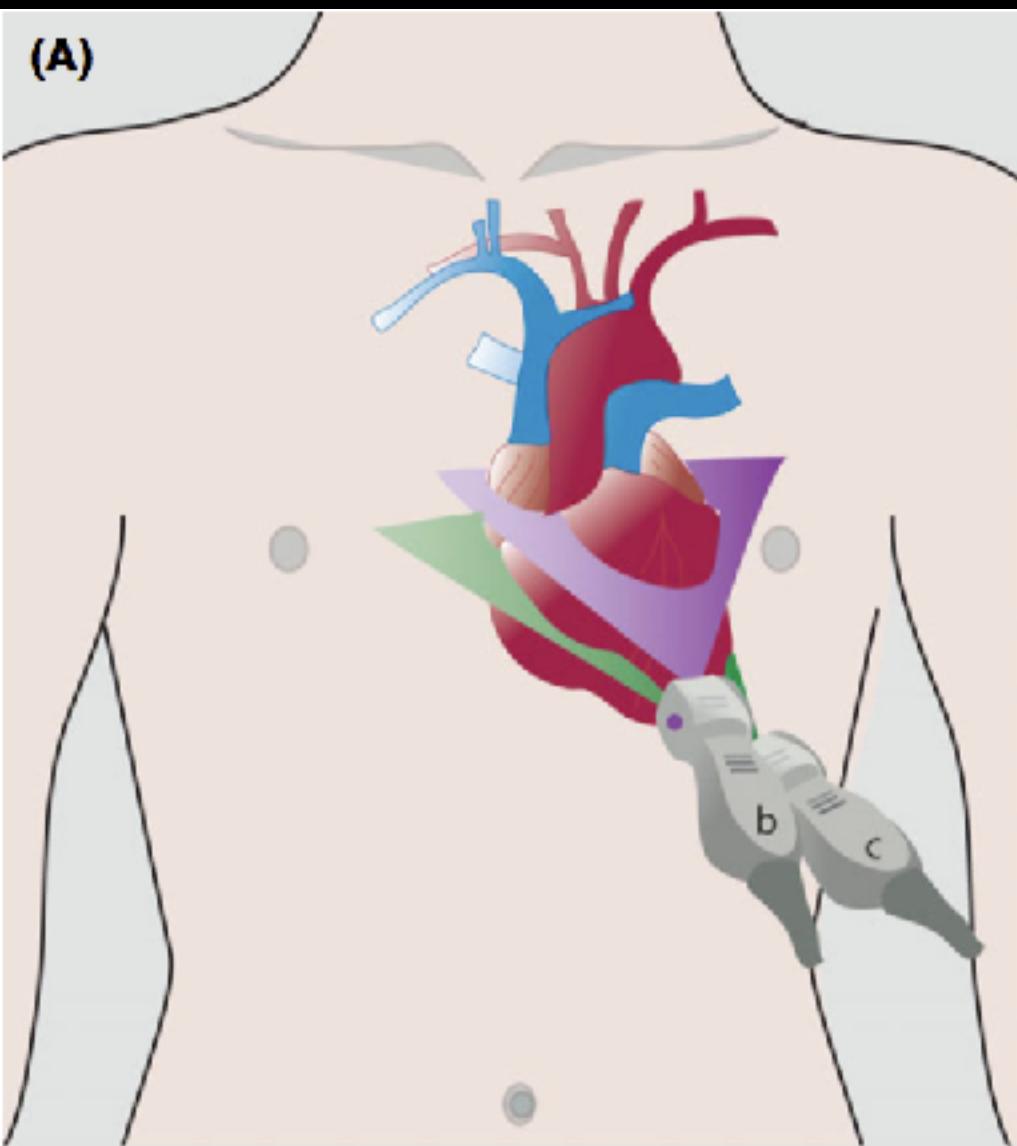
3W5V



HYPOPHARYNX



Underestimate



UAPE-Quick check

C nerve
C6-2
22 Hz
13.0cm

2D
Gen
Gn 60
C. 53
2/3/2

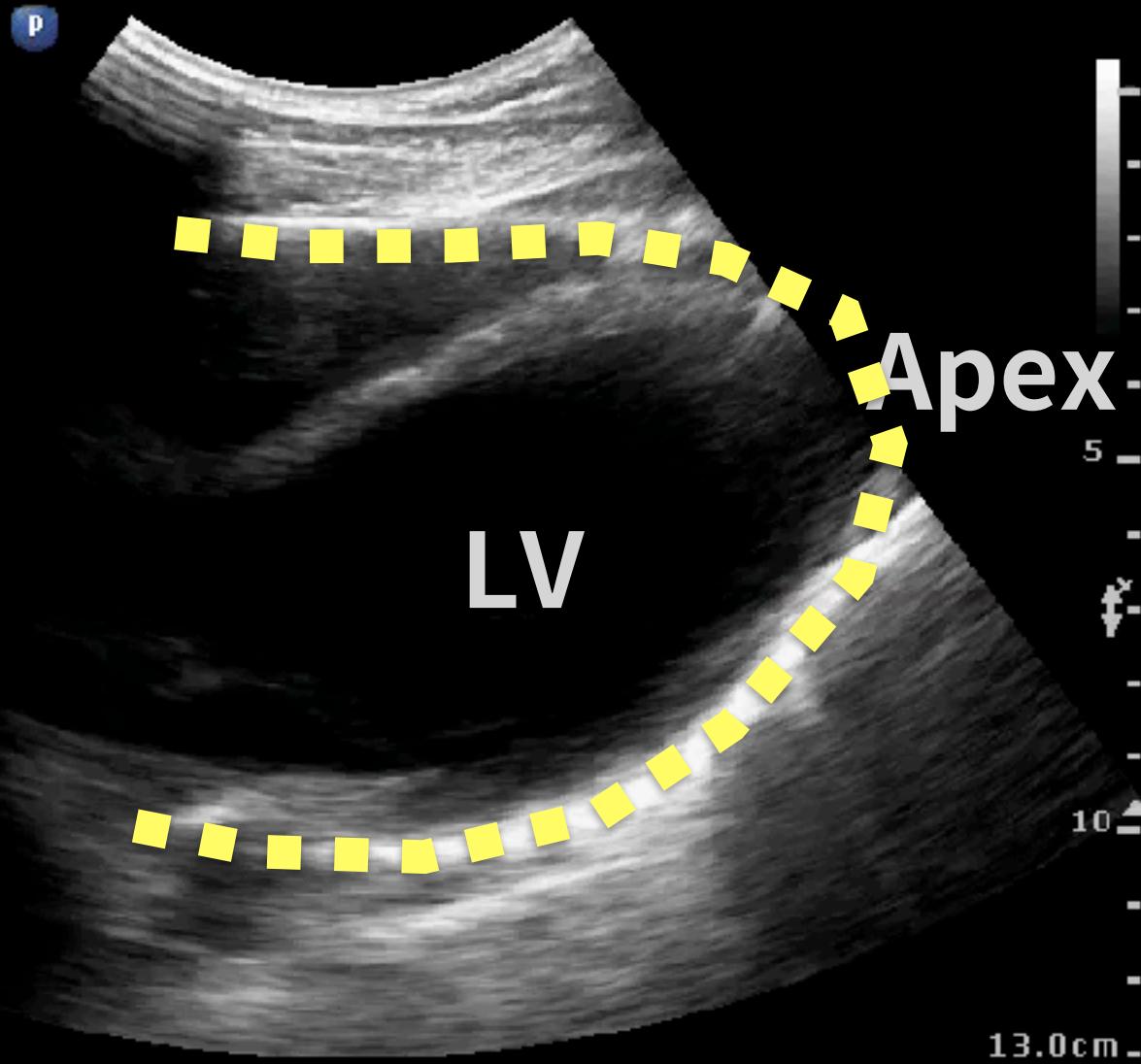
Base

LV

Apex



P R
2.0 6.0



13.0cm

UAPE-Quick check

Adult Echo
S4-1
77 Hz
15.0cm

2D
HGen
Gn 100
55
3/2/0
50 mm/s

Leg

Liver

Head

IVC

Diameter (1-2cm) / Variation (50%)

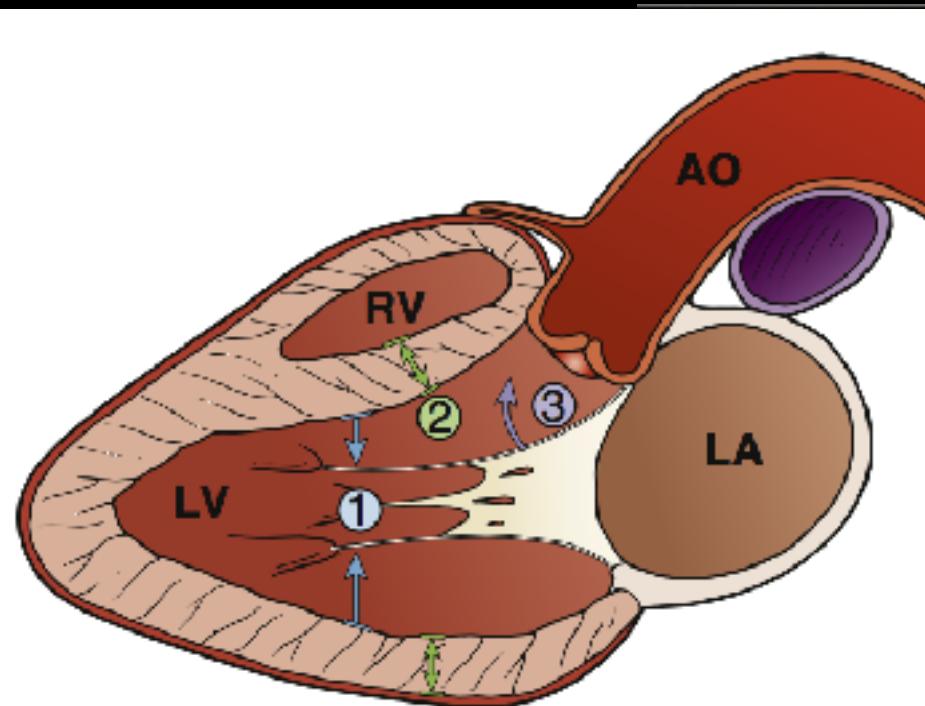
P R
R
1.7 3.1



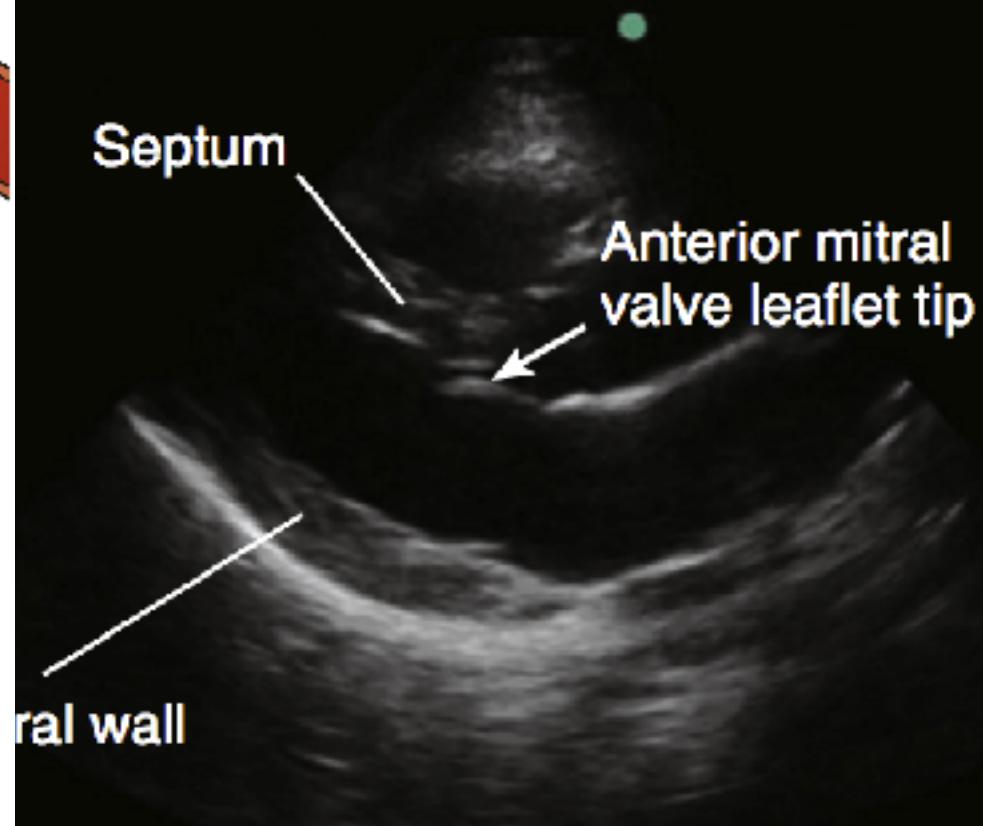
53
BPM

EPSS

E-point septal separation >7mm : LVEF < 30%



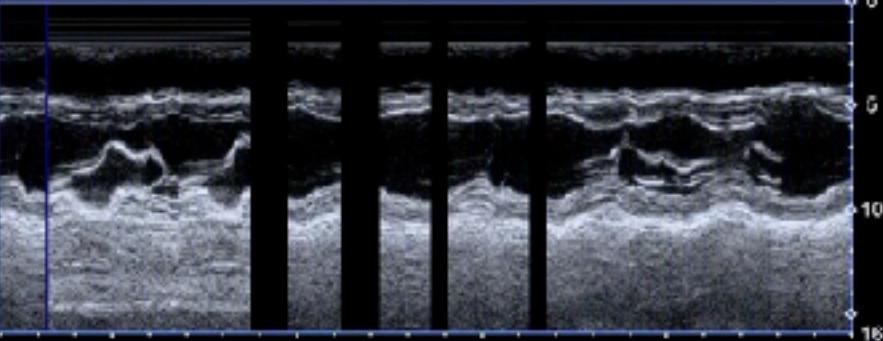
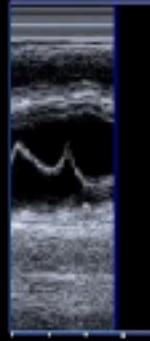
- 1 - Endocardial excursion
- 2 - Myocardial thickening
- 3 - Septal motion of anterior leaflet of mitral valve



EPSS

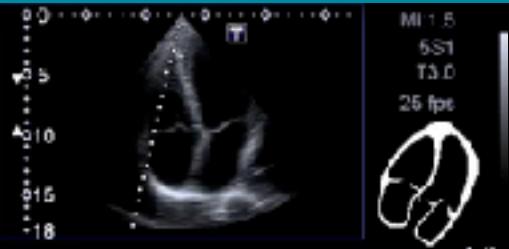


FS



Cardiac POCUS - CCE

TAPSE



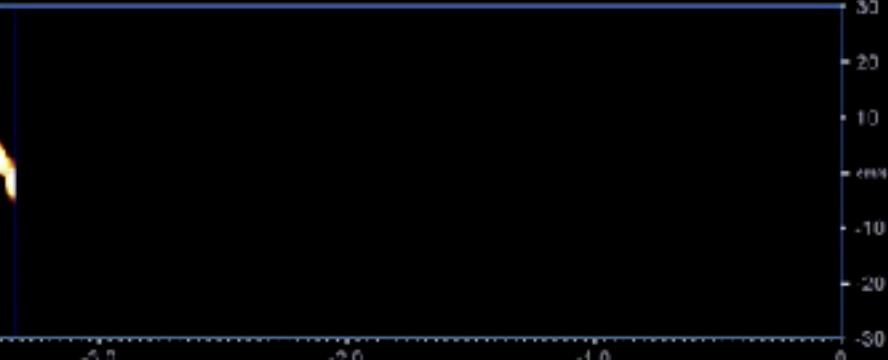
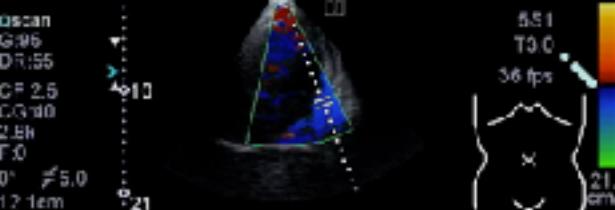
MAPSE



E/A

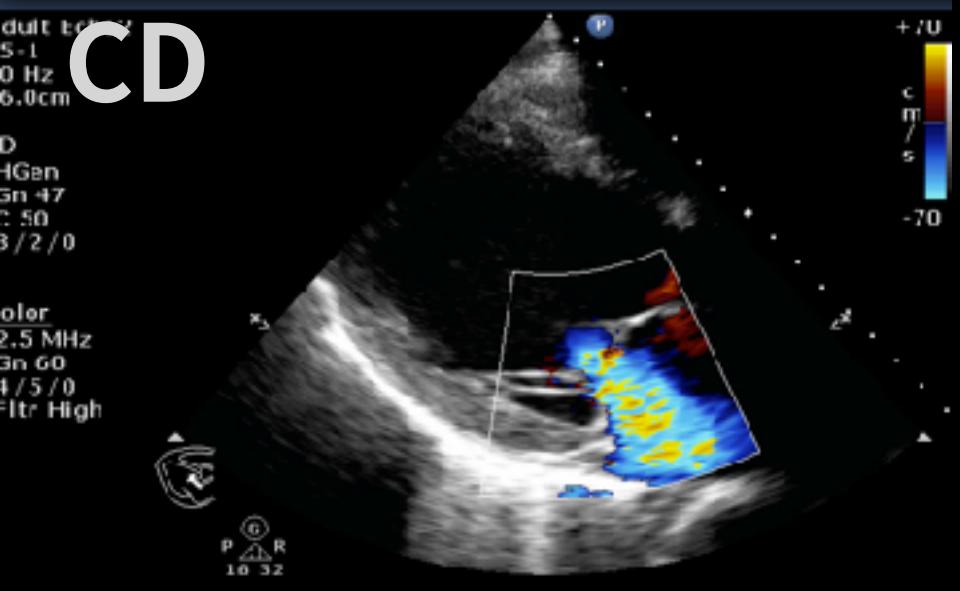


TDI



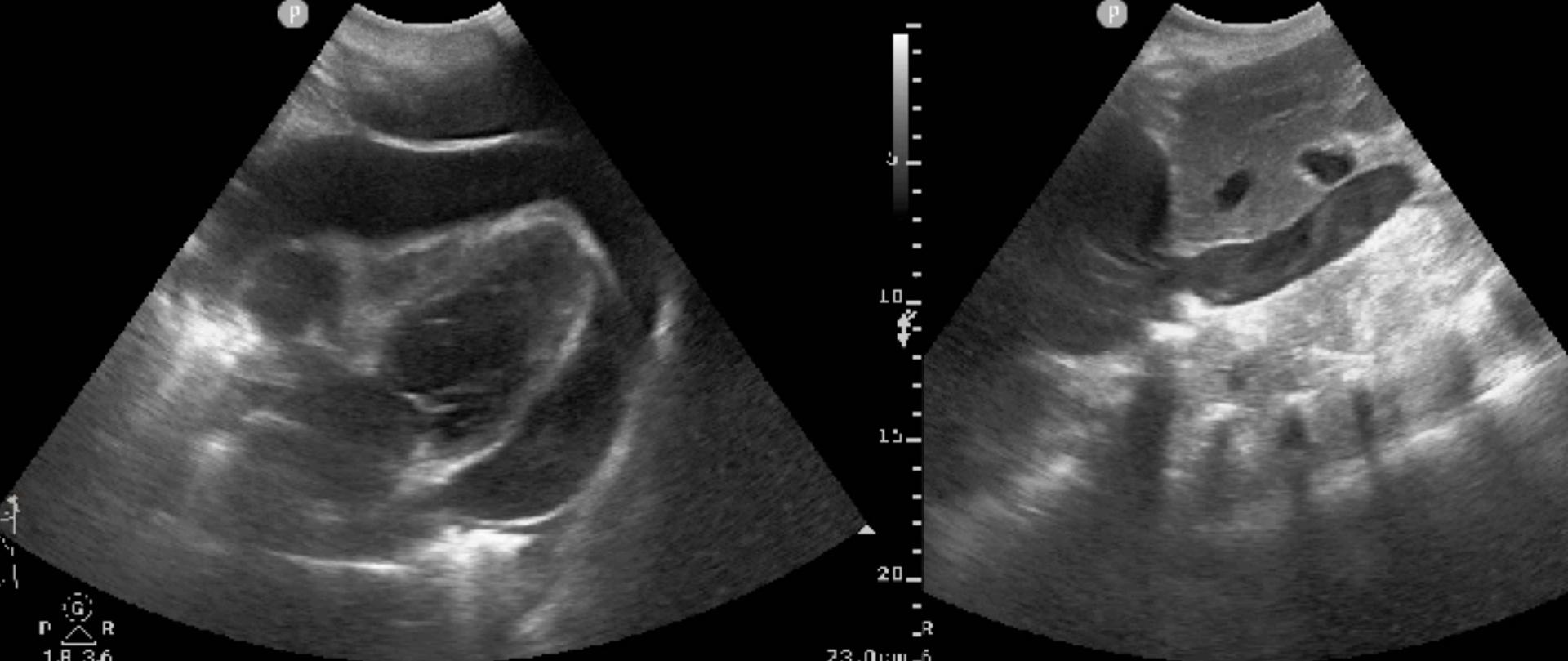
CCE

CD



VTI



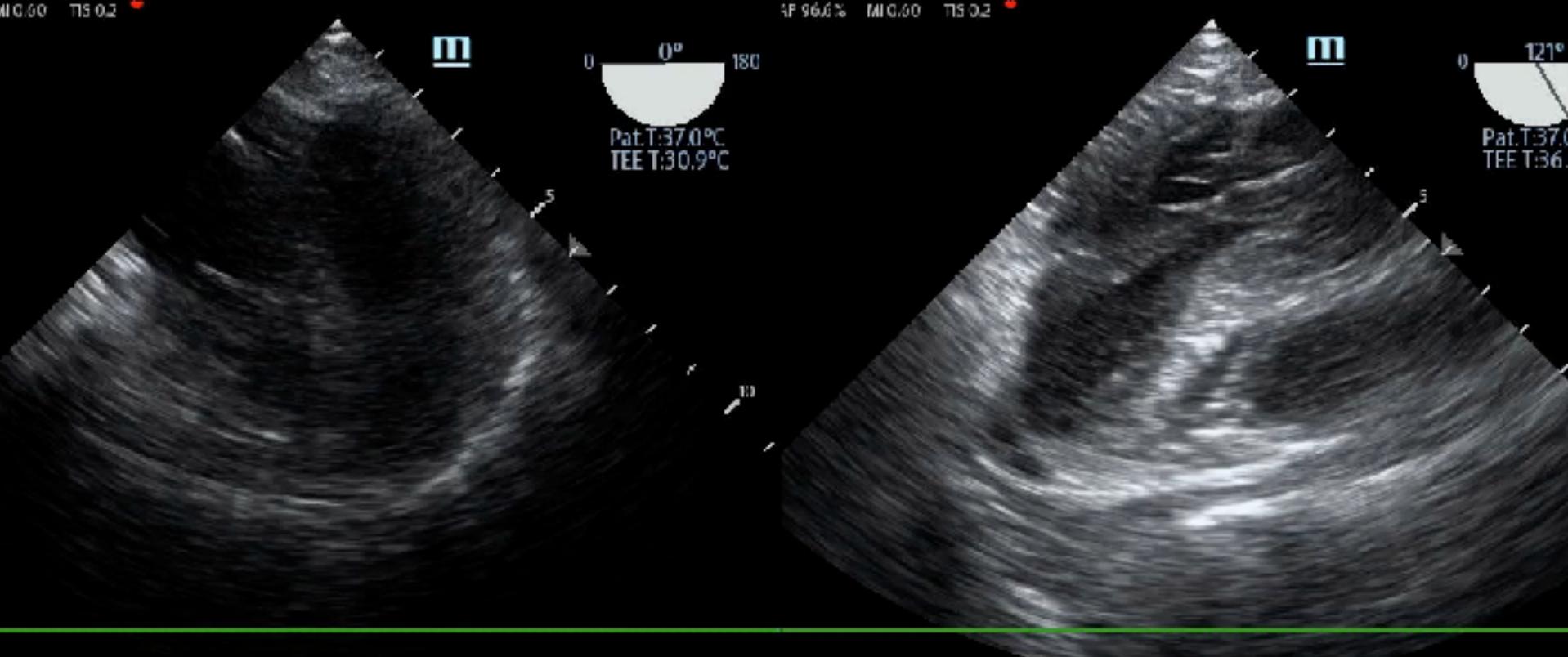


I-AIM



MC:00 TIS:0.2

AF:96.0% MIO:00 TIS:0.2

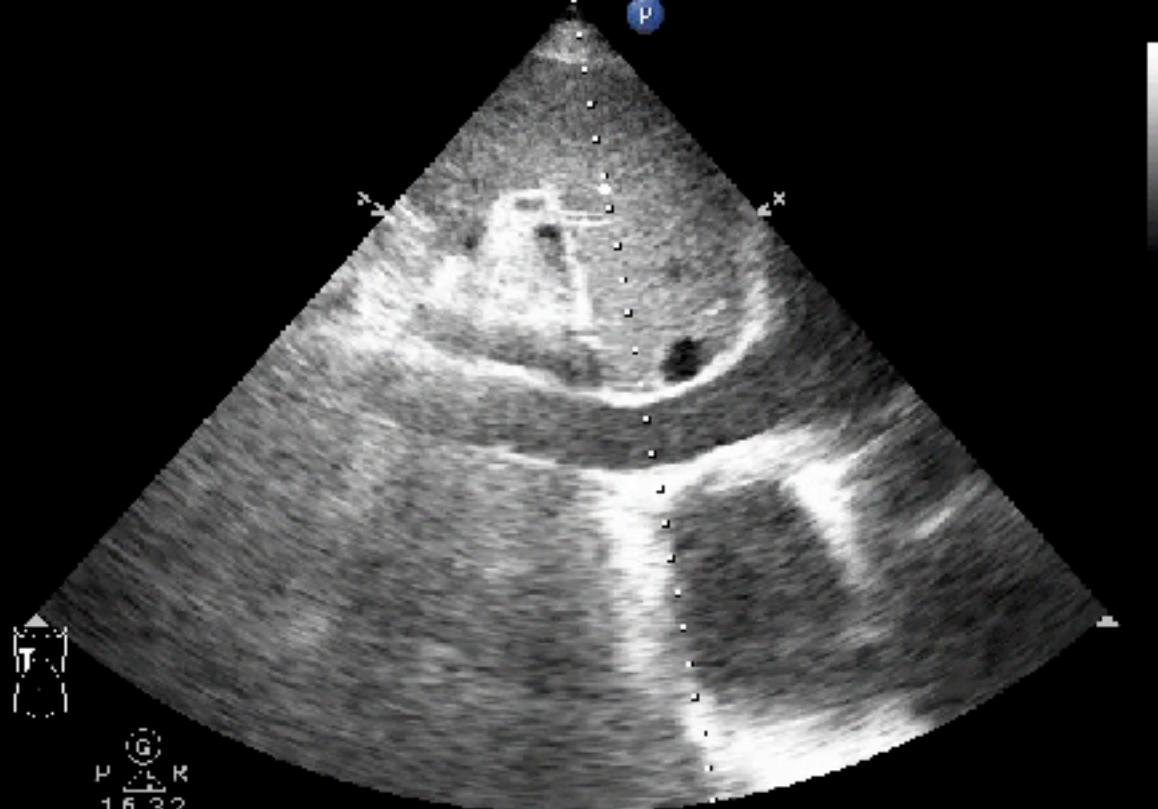


I-AIM



Adult Echo
SS 1
25 Hz
23.0cm

2D
HGen
Gn 100
C 50
3/2/0



I-AIM



B
F0.0-7.2
DR105
TR20
D15.0
G75



m

0 90° 180°
Pat T:37.0°C
TEE T:38.5°C



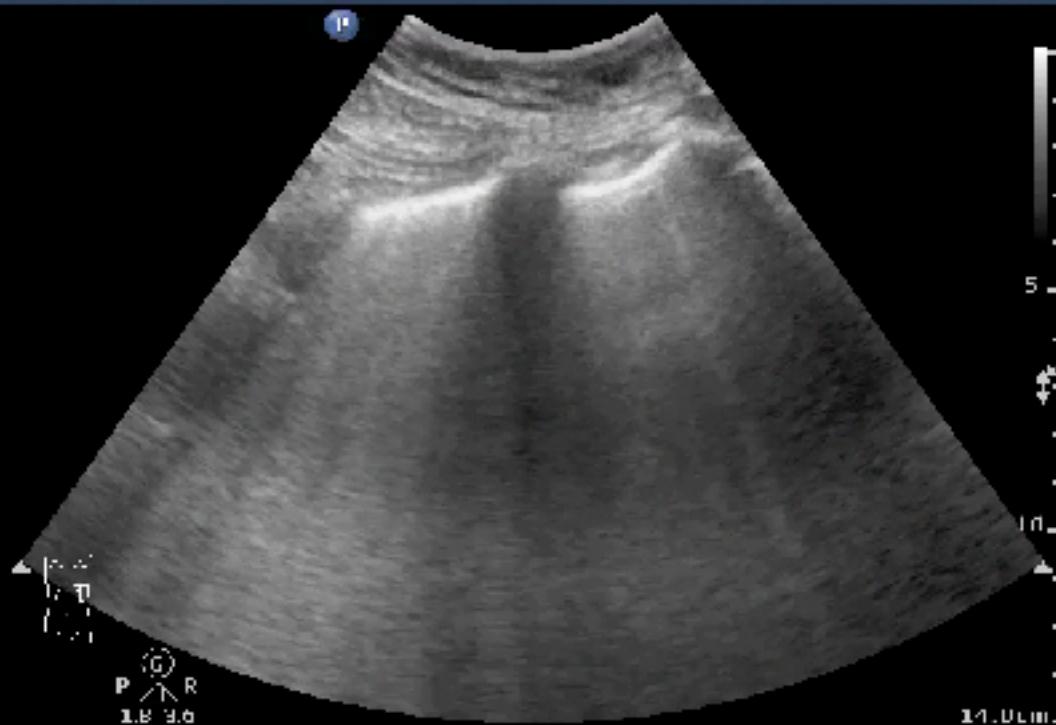
I-AIM



Abd Gen
C5 1
36 Hz
14.0 mm

2D

HGen
Gn 100
C 56
0/3/3



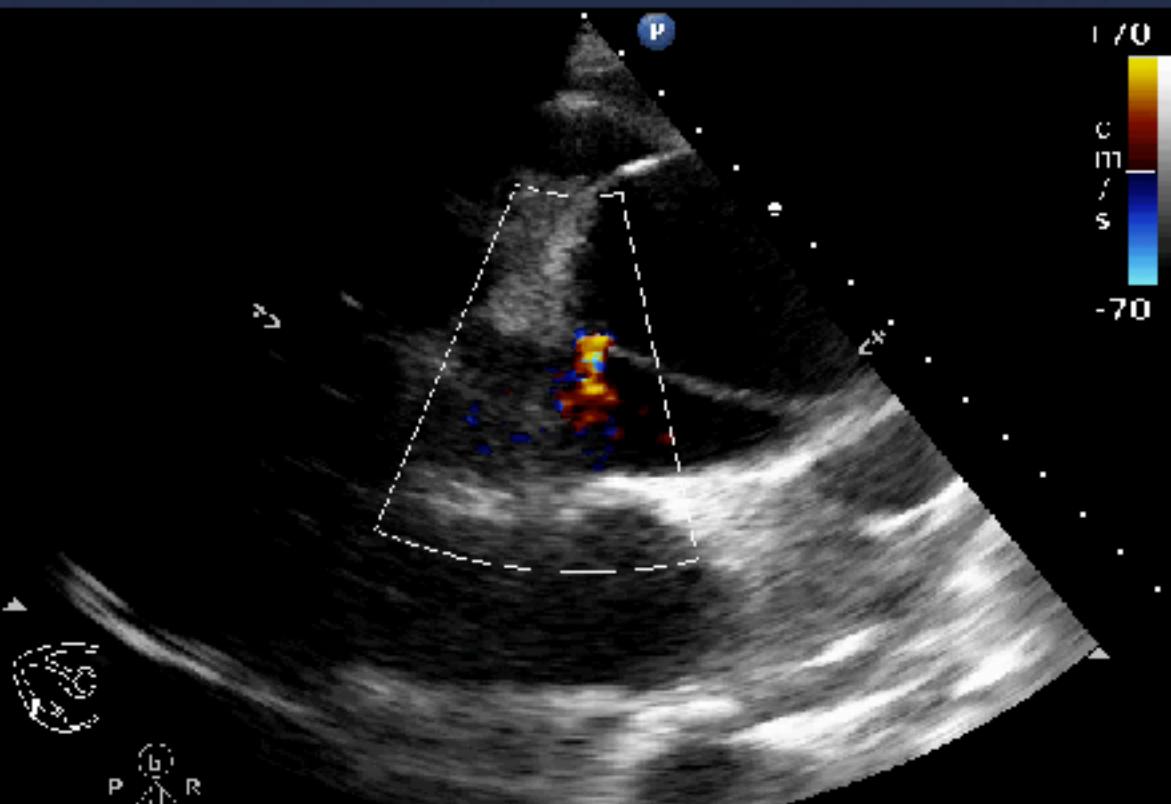
I-AIM



Adult Echo
S5-1
20 Hz
15.0cm

2D
II Gen
Gn 11
C 50
3/2/0

Color
2.5 MHz
Gn 45
4/5/0
Fltr High

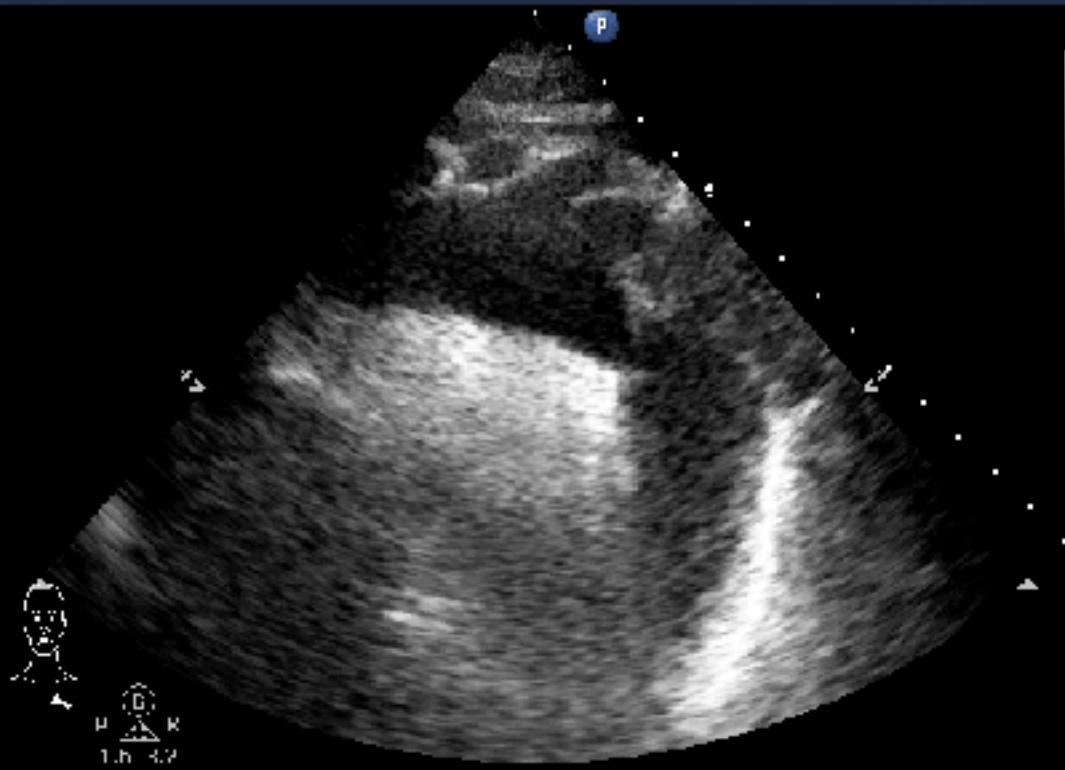


I-AIM



Adult Echo
S5 1
34 Hz
15.0cm

2D
IGen
Gn 43
C 50
3/2/0

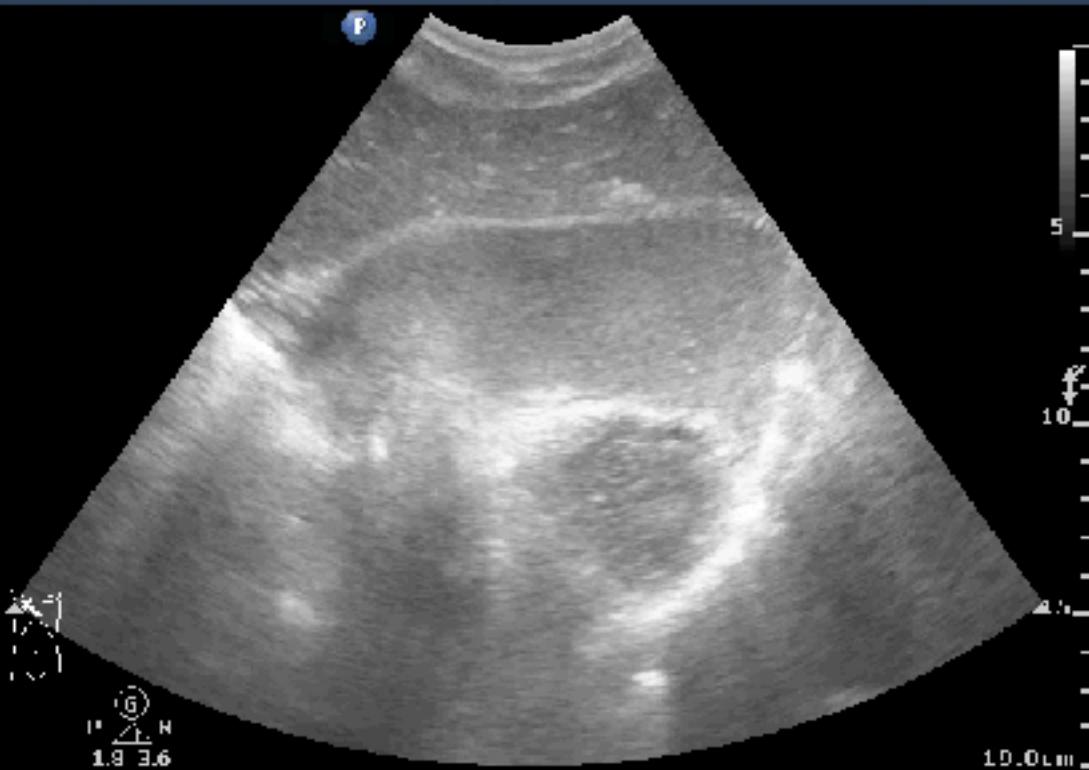


I-AIM

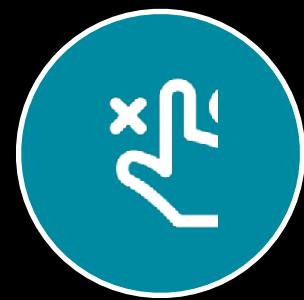


Abd Gen
C5 1
29 Hz
19.0cm

2D
HGen
Gn 100
C 69
3/3/3



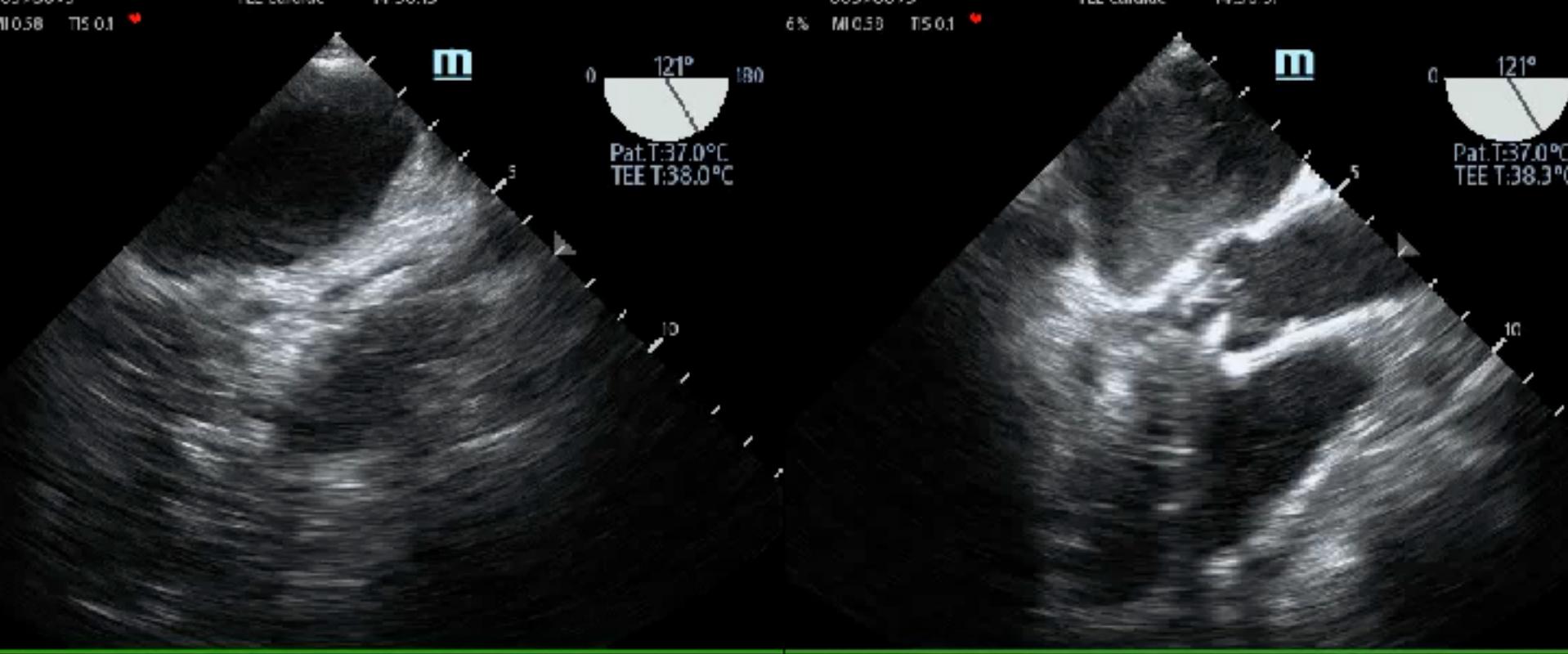
I-AIM





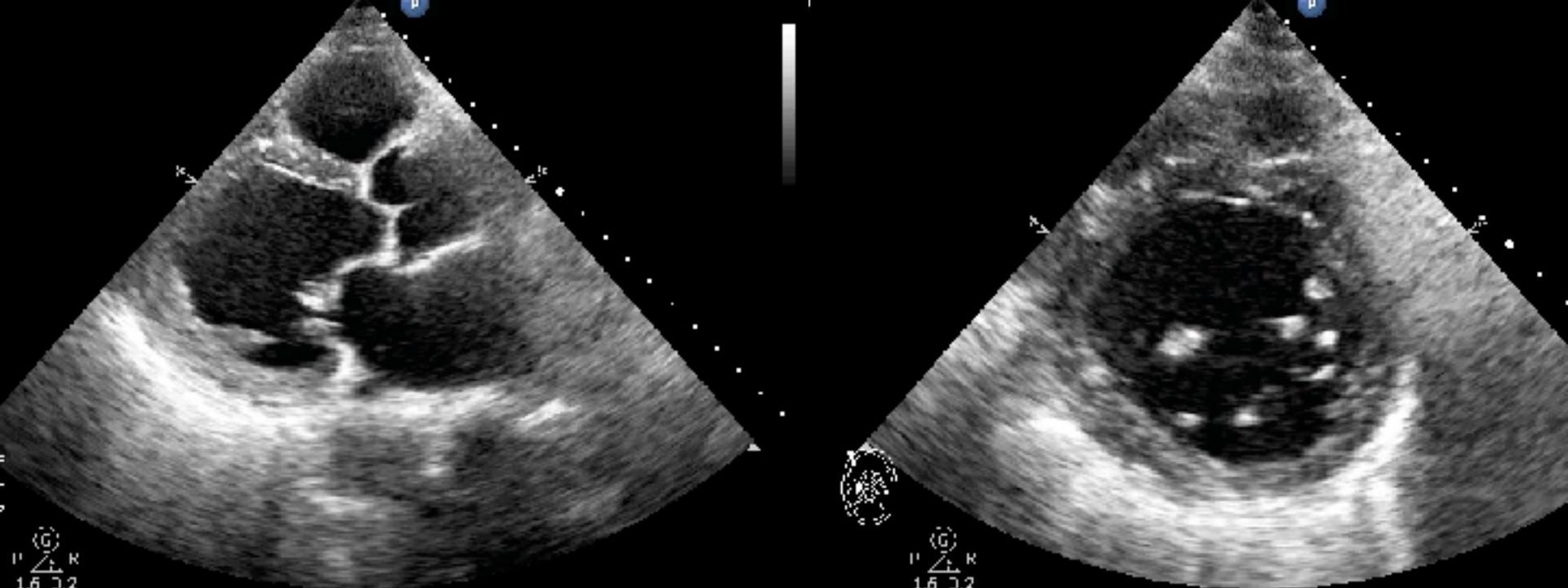
I-AIM





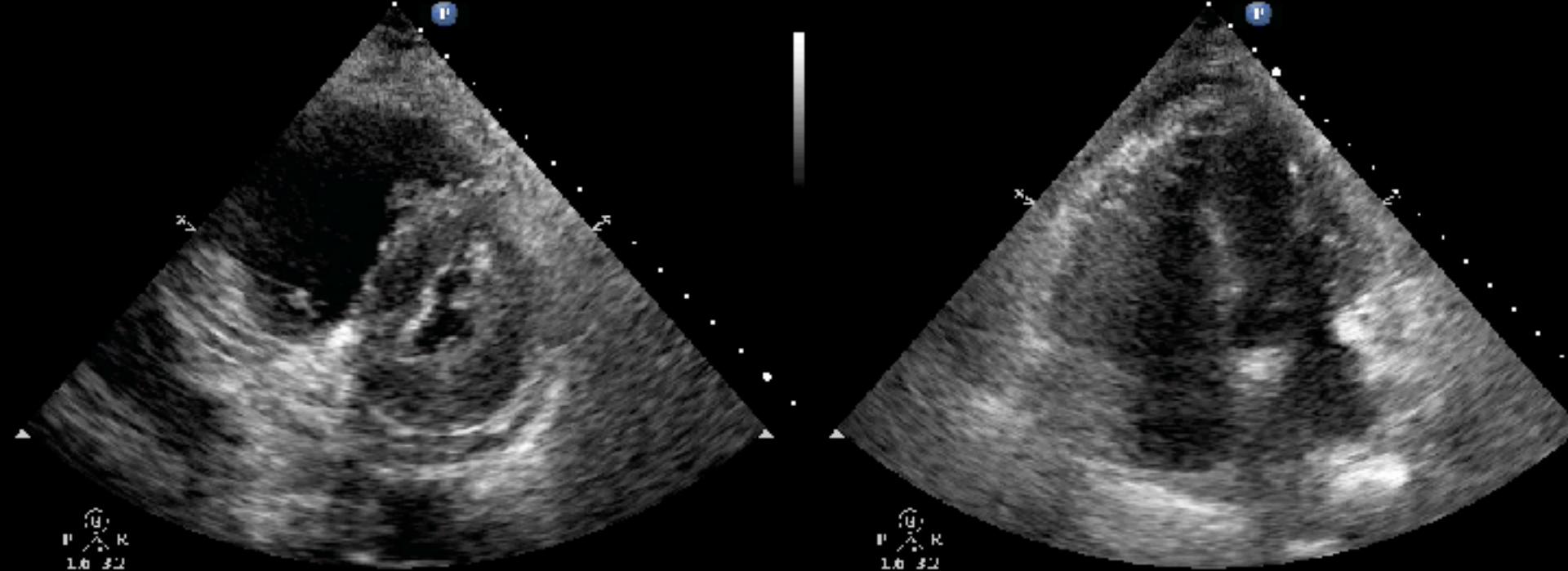
I-AIM



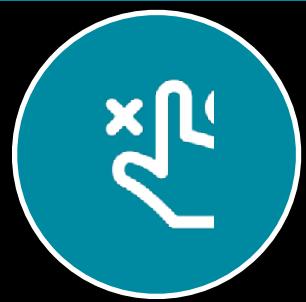


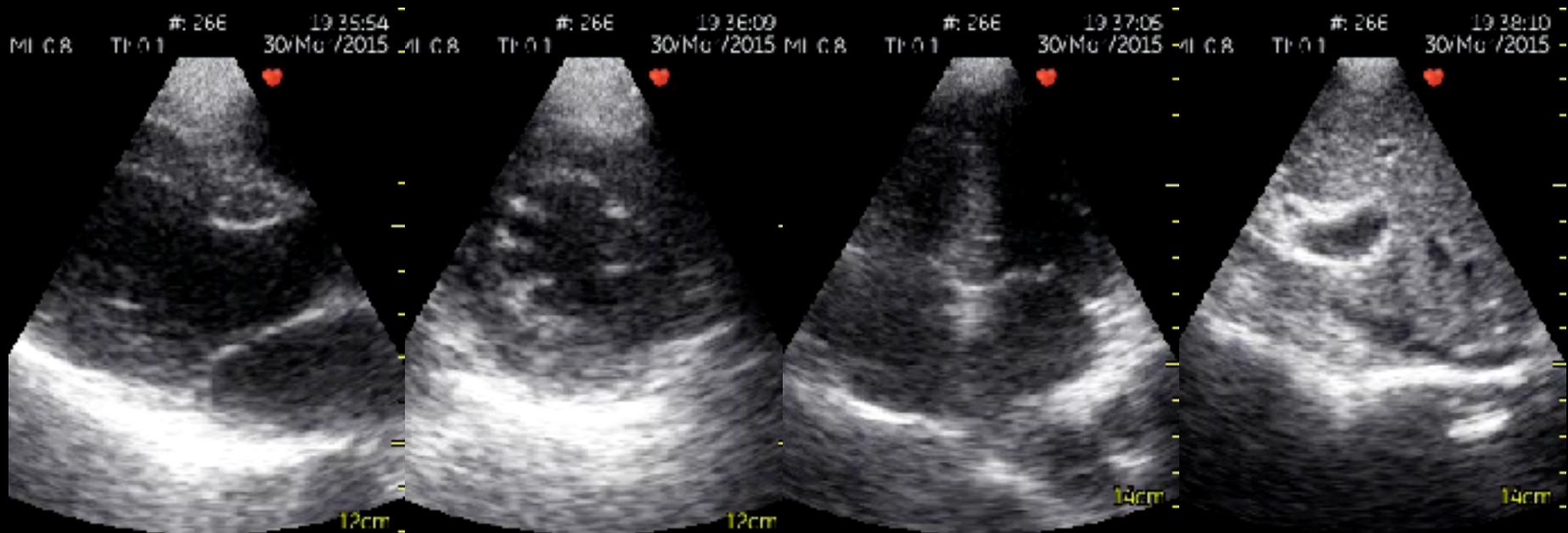
I-AIM





I-AIM



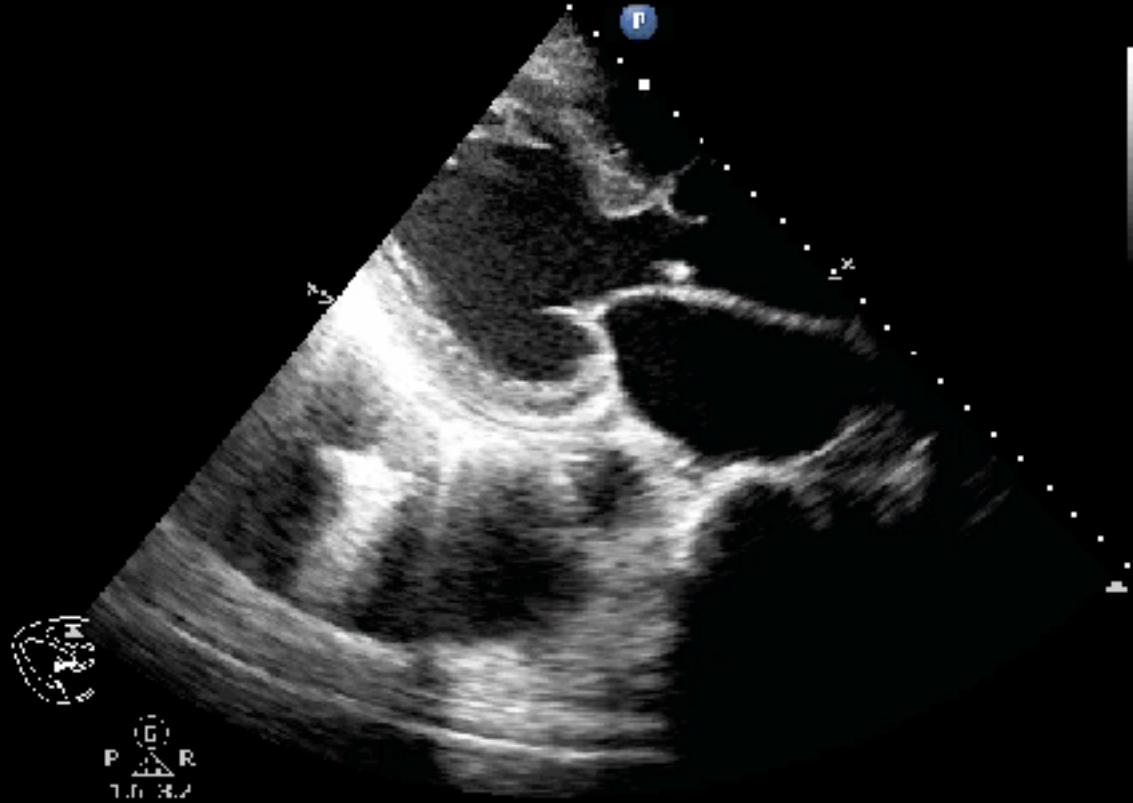


I-AIM



Adult Echo2
SS 1
25 Hz
21.0cm

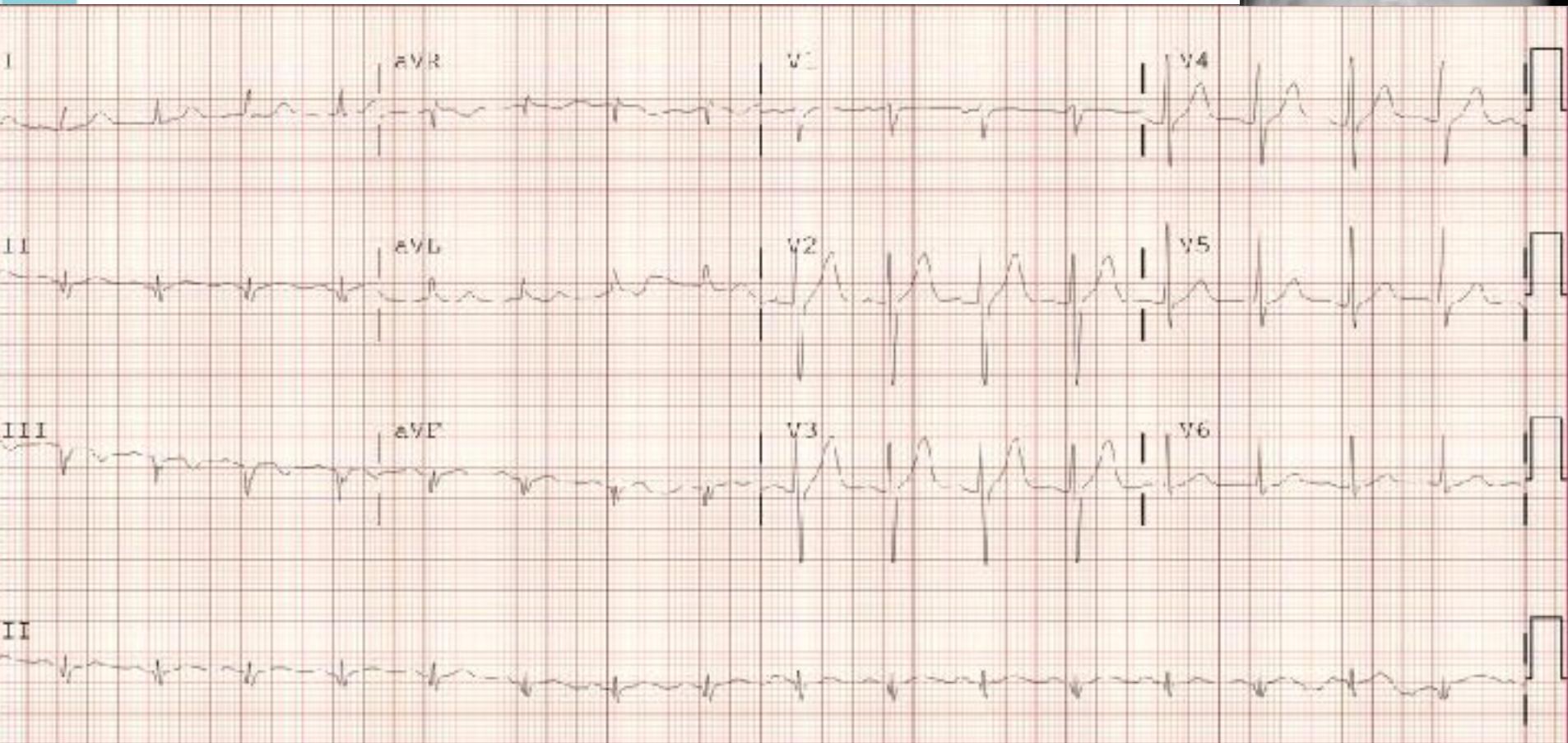
2D
HGen
Gn 31
C 50
3/2/0

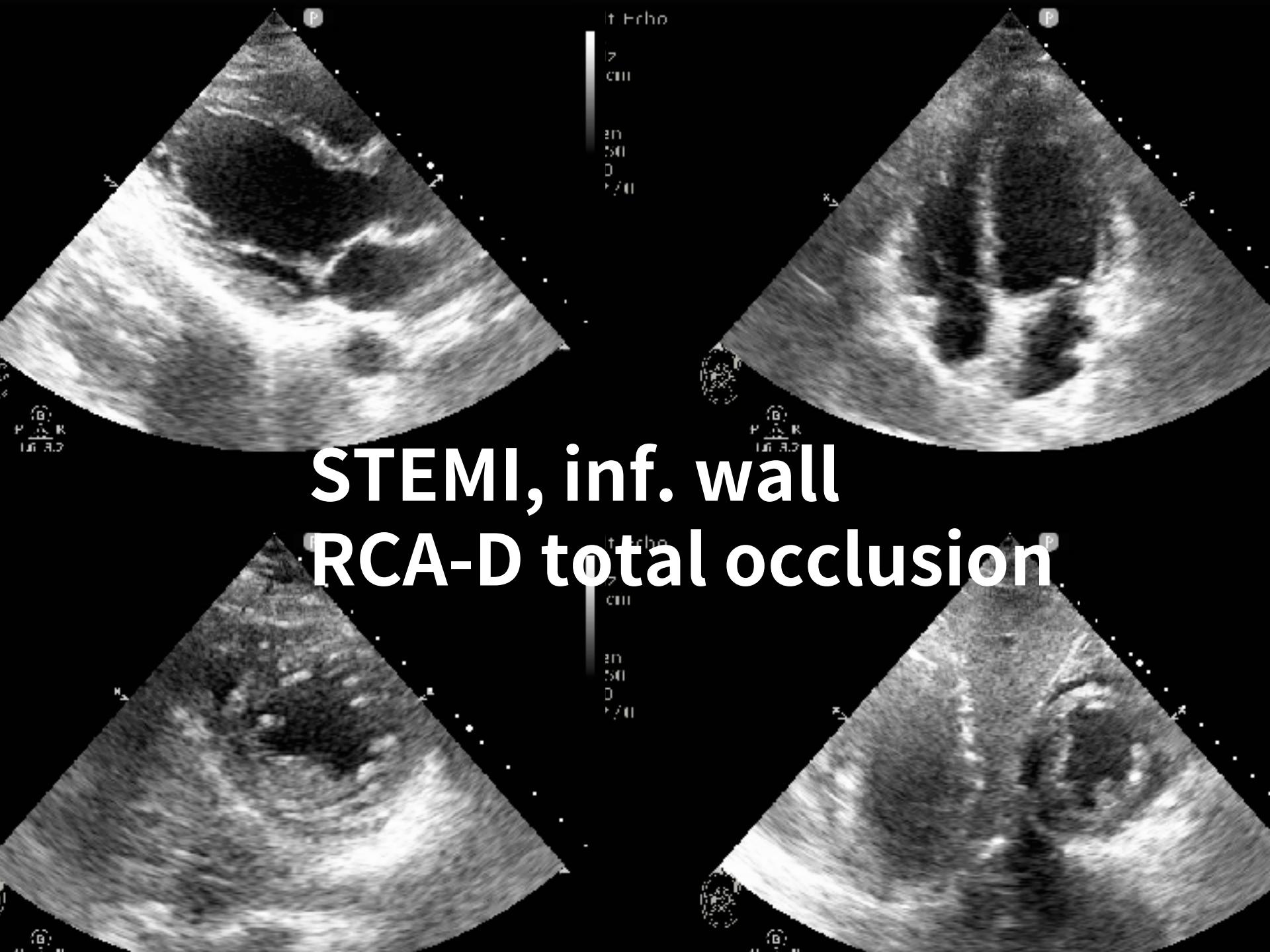


I-AIM



39M, epigastric pain & cold sweating

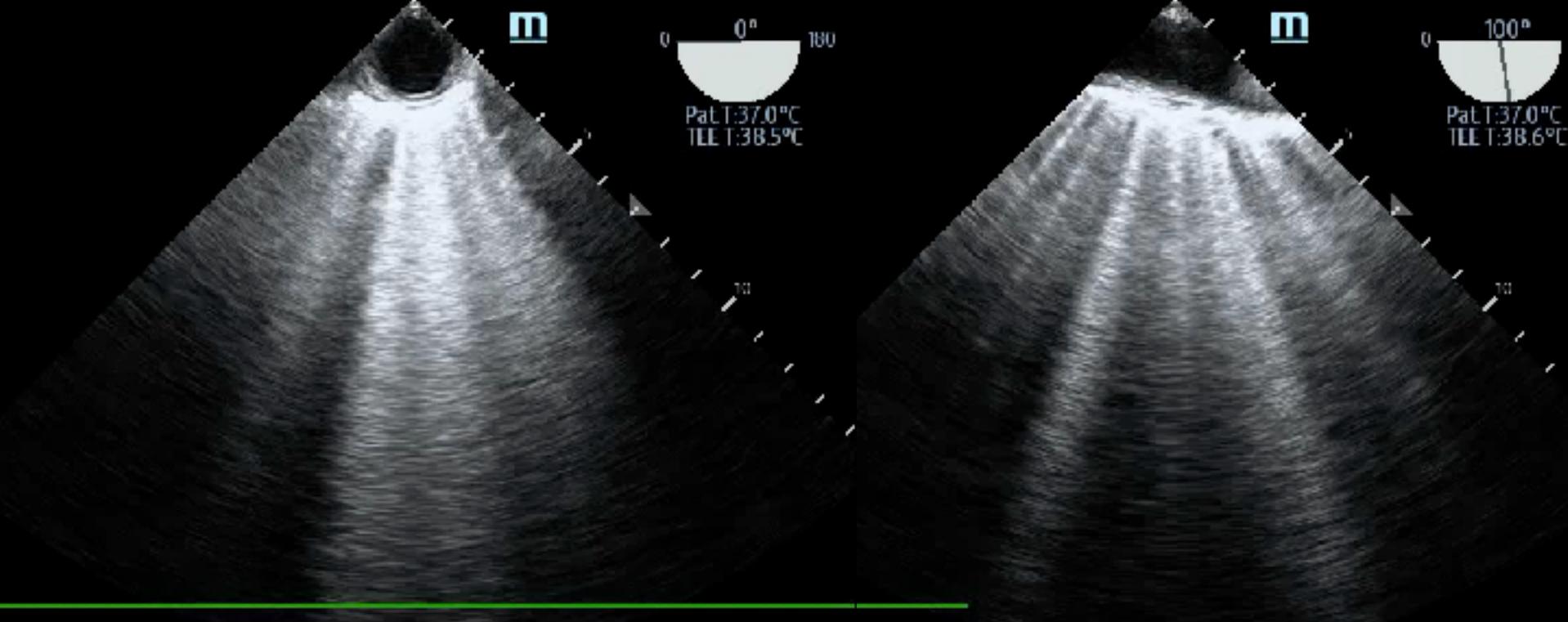




**STEMI, inf. wall
RCA-D total occlusion**

96.6% 08:08 08:02

08:08 08:02

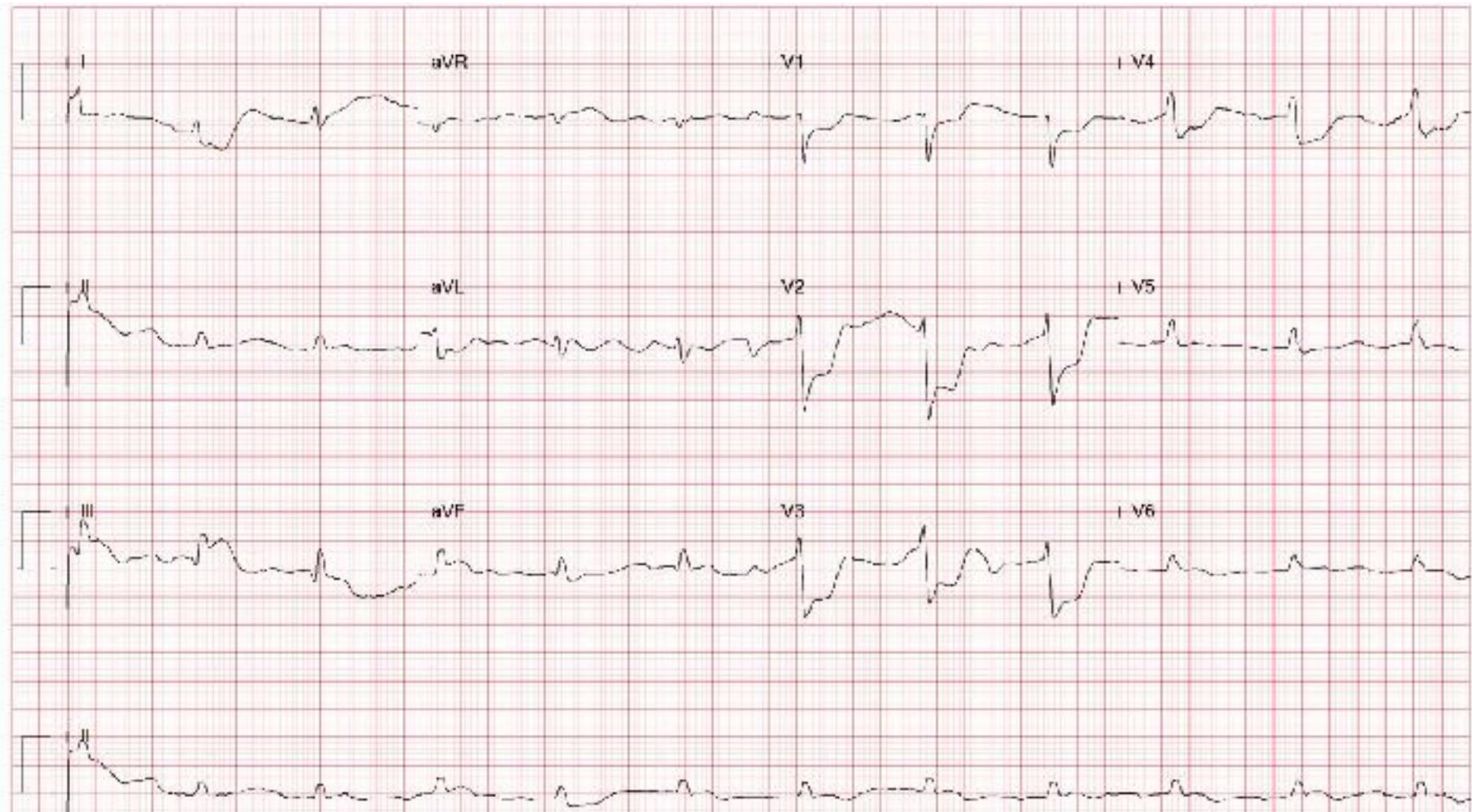


I-AIM



個案

55M, Chest pain 2H, 119
BT 36; RR 18
SpO₂ 95% ; BP 80/59

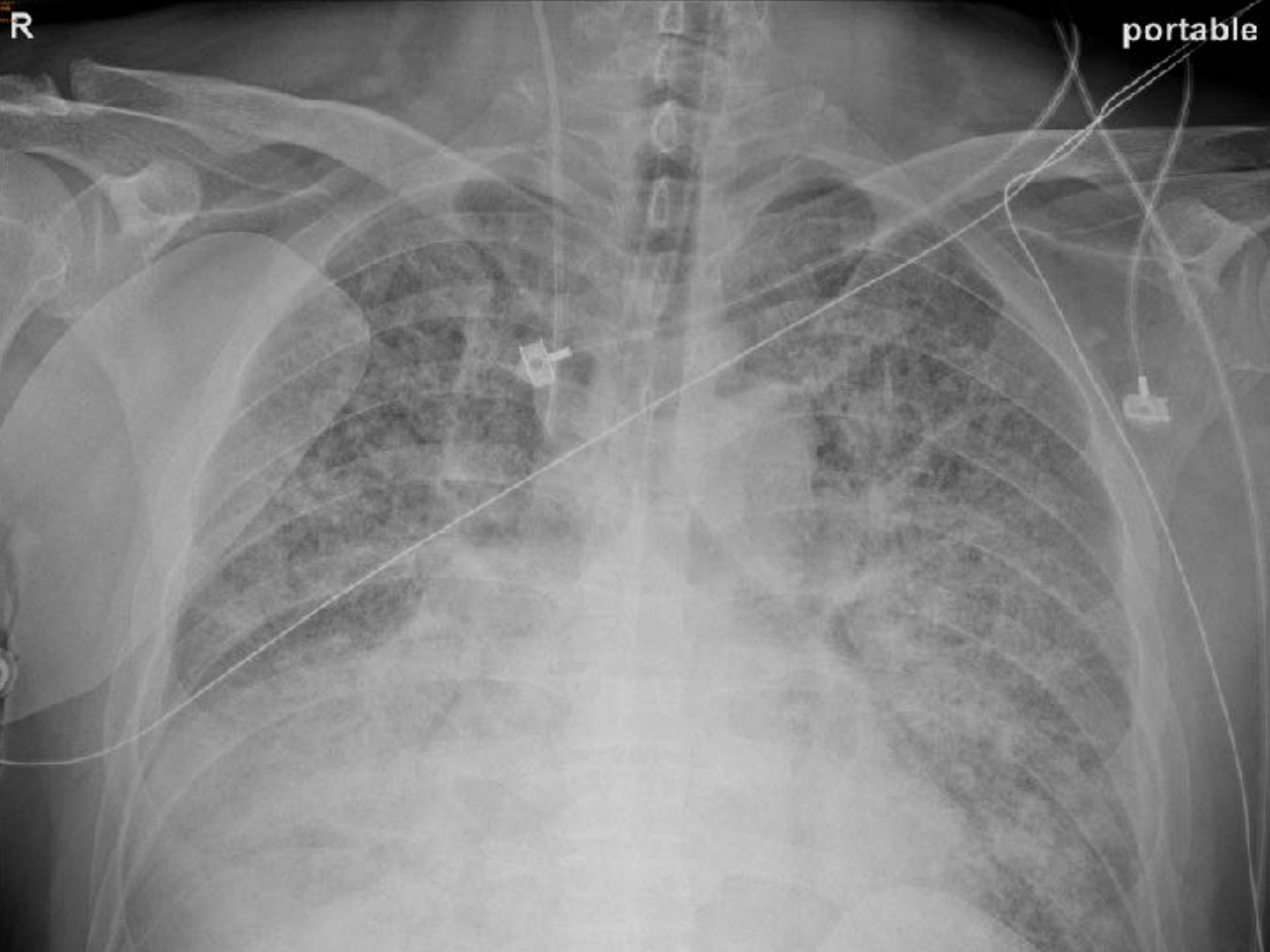


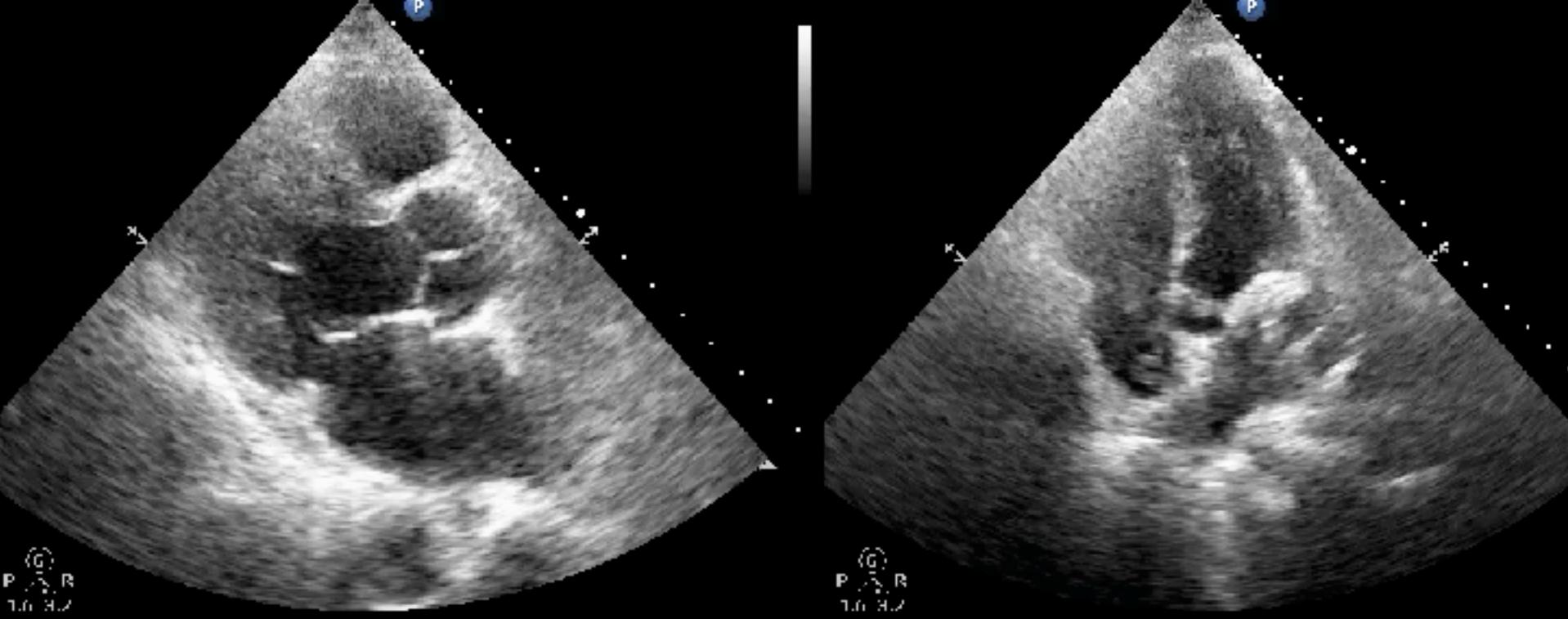


16

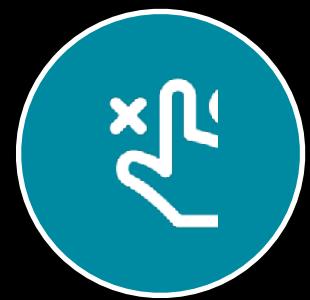
R

portable





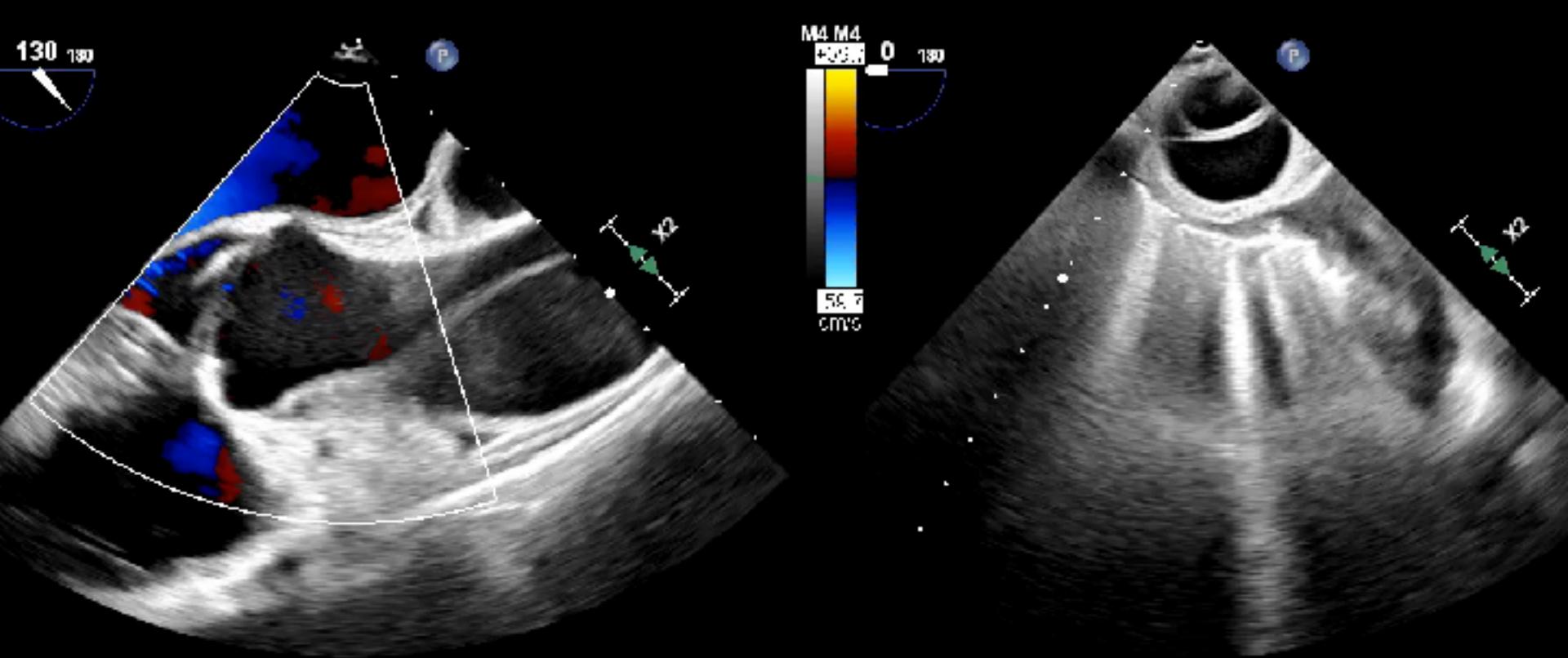
I-AIM





I-AIM





I-AIM

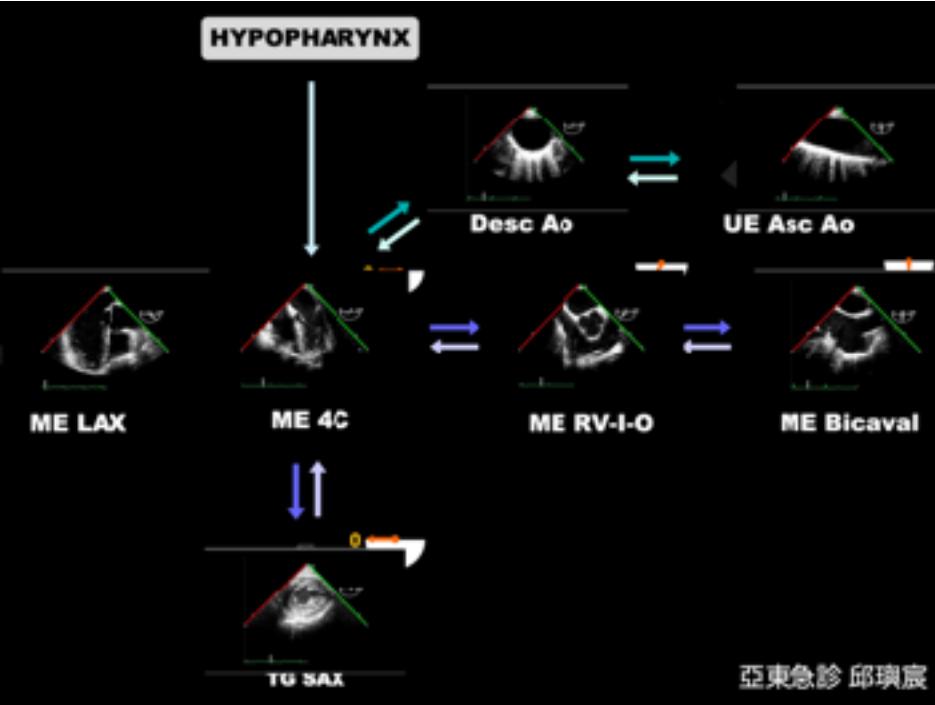
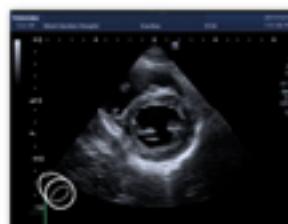
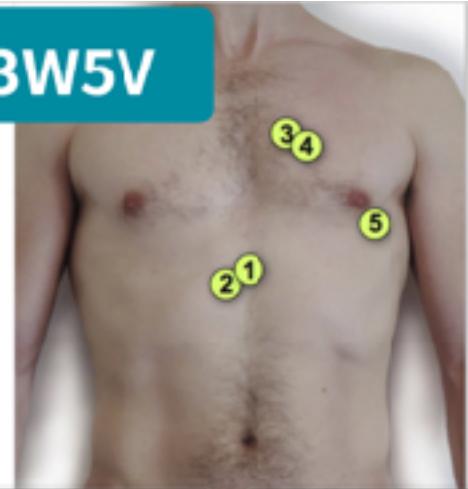




I-AIM



3W5V



急診心超三部曲

理學檢查
UAPE

快速判定
Cardiac POCUS

進階測量
CCE