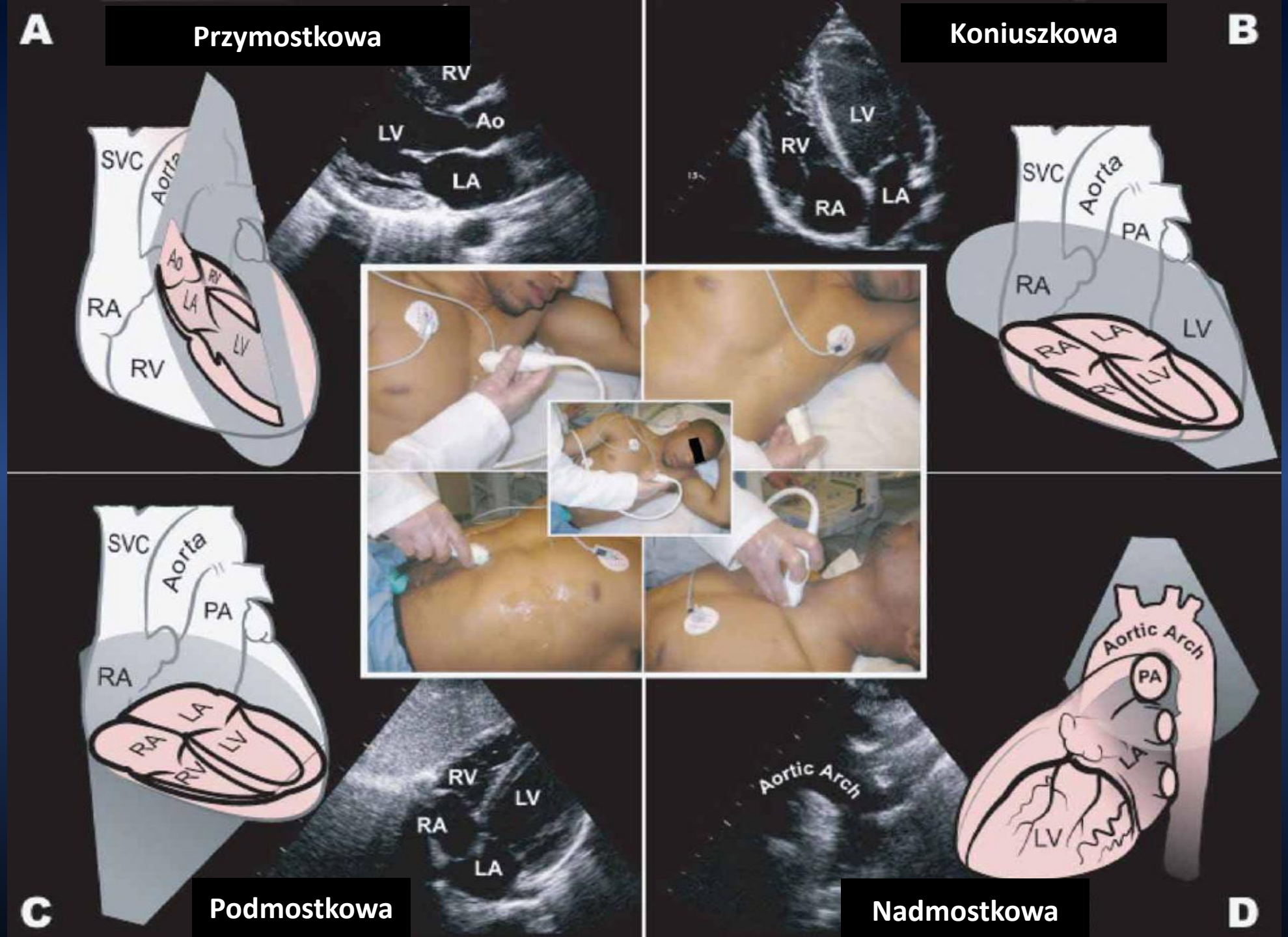
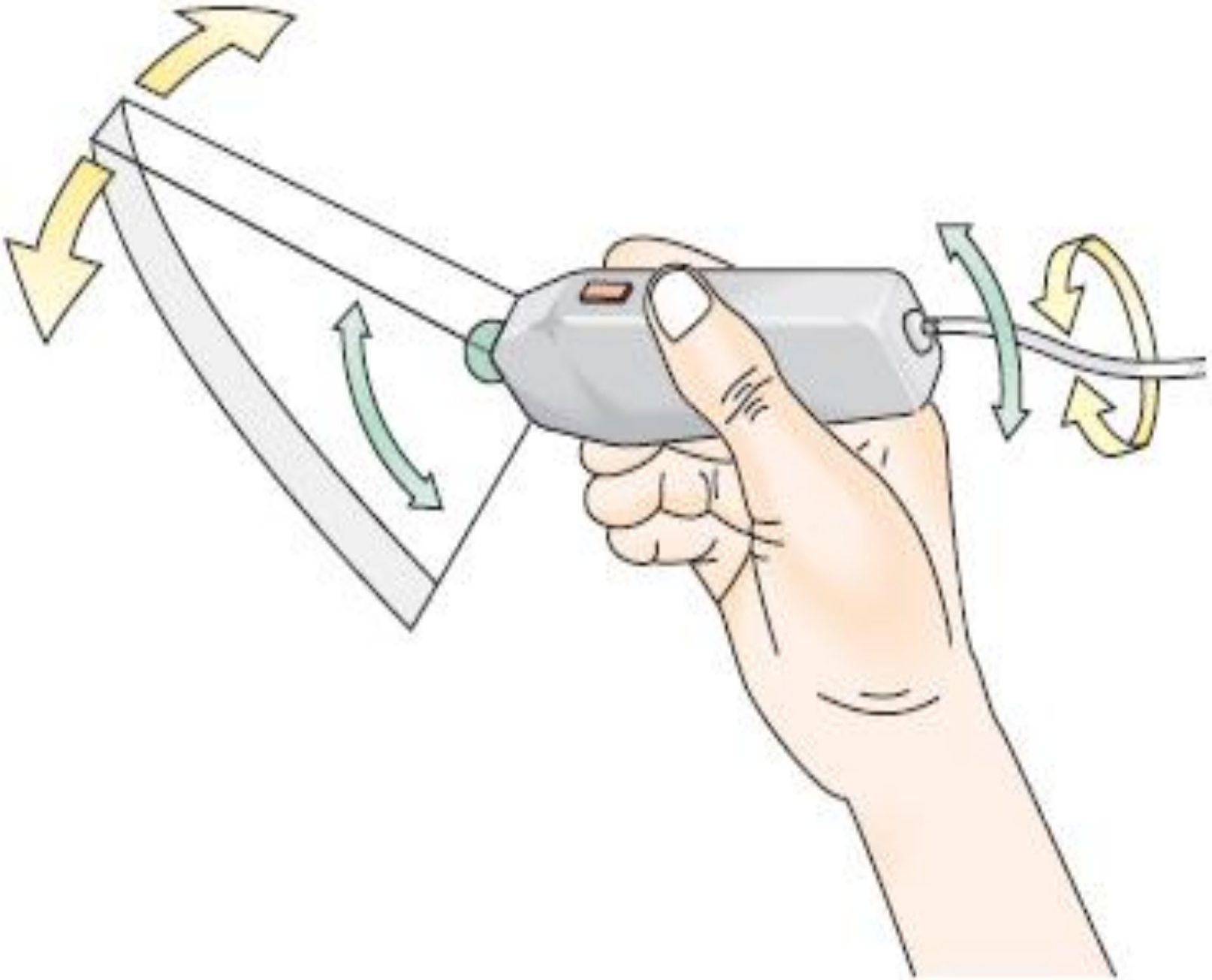
Echokardiografia na „OIOMie”

Wojciech Wróbel

I Klinika i Oddział Kardiologii GCM ŚUM Katowice

Katowice 25 03 2019


A
Przymostkowa
RV
Ao
LV
LA
SVC
Aorta
RA
RV
Ao
RV
LA
LV
B
Koniuszkowa
LV
RV
RA
LA
SVC
Aorta
PA
RA
LV
RA
LA
LV
RV
C
Podmostkowa
SVC
Aorta
PA
RA
LA
RA
LV
RV
RV
LV
RA
LA
D
Nadmostkowa
Aortic Arch
PA
LA
LV
Aortic Arch

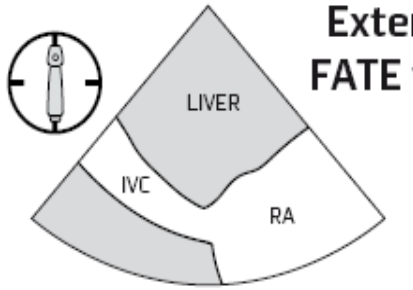


regionmidtjylland midt

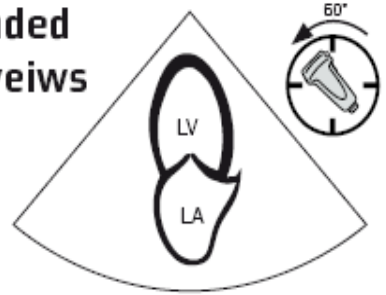
Focus Assessed Transthoracic Echo (FATE)

Scanning through position 1-4 in the most favourable sequence

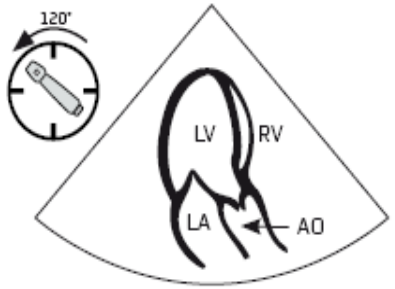
Extended FATE veiws



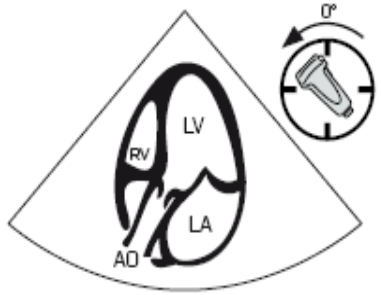
Pos 1: Subcostal Vena Cava



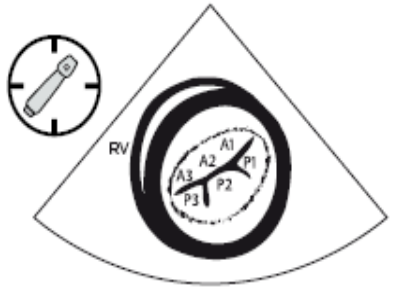
Pos 2: Apical 2 - Chamber



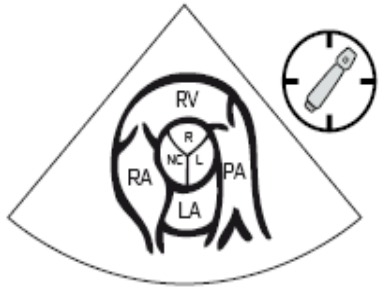
Pos 2: Apical Long - axis



Pos 2: Apical 5 - Chamber



Pos 3: Parasternal short axis mitral plane



Pos 3: Parasternal aorta short axis

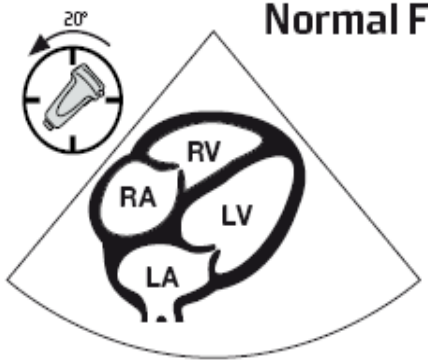
CW: Peak pressure: V²x 4; AO < 2 m/s; PA < 1 m/s; TI < 2.5 m/s
PW: Mitral Inflow desc. time 140 - 240 m/s; MAX E < 1.2 m/s; E/A >1
TVI: E/e´ < 12; IVC < 20 mm

Systolic Ventricular Function

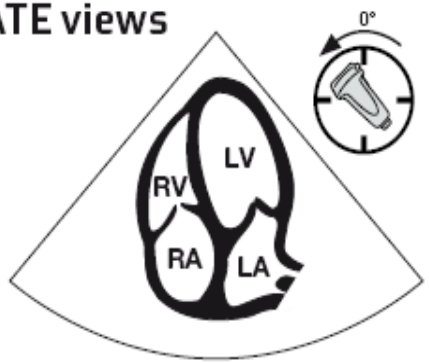
Ventricle	M-Mode	Normal	Mild ↓	Moderately ↓	Severely ↓
LV	EF (Teich) (%)	≥ 55	45 - 54	30 - 44	< 30
LV	FS (%)	≥ 25	20 - 24	15 - 19	< 15
LV	MSS (mm)	< 10	7 - 12	13 - 24	> 24
LV	Mapse (mm)	≥ 11	9 - 10	6 - 8	< 6
RV	Tapse (mm)	16 - 20	11 - 15	6 - 10	< 6

For additional information: www.usabcd.org

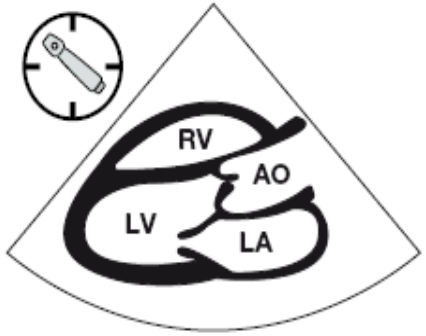
Normal FATE views



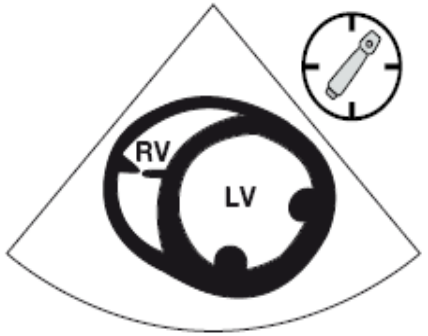
Pos 1: Subcostal 4-chamber



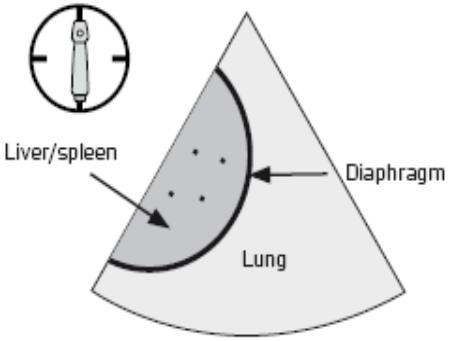
Pos 2: Apical 4-chamber



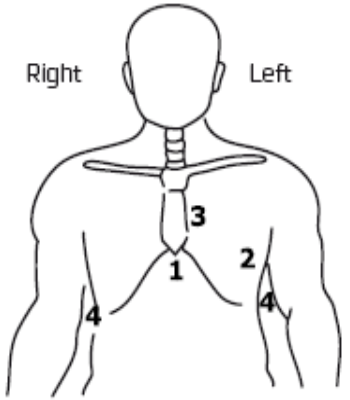
Pos 3: Parasternal long axis



Pos 3: Parasternal LV short axis



Pos 4: Pleural scanning



Protokół badania

A: aorta
B: both ventricles
C: contractility
D: dimensions
E: effusion
F: further structures

CRITICAL USG
Ultrasound in anesthesiology and intensive care
POLSKI ENGLISH

CRITICAL USG

FORMULARZ PRZYŁÓŻKOWEGO BADANIA ECHOKARDIOGRAFICZNEGO

Imię i nazwisko pacjenta			
Data urodzenia		**Oddział**	
Data badania		**Archiwizacja**	
Hr (u/min.)		**Ctk (mmHg)**	

Wskazania do badania:
☐ NZK ☐ niestabilność hemodynamiczna ☐ inne

Uzyskane projekcje:
☐ PLAX ☐ PSAX ☐ 4CH ☐ Subcostal ☐ Pleural ☐ inne

Jakość uzyskanych obrazów:
☐ dobra ☐ zła ☐ średnia ☐ nie do interpretacji

Rytm serca (EKG):
☐ rytm zatokowy ☐ AF ☐ SVT
☐ PEA ☐ asystolia ☐ VT ☐ VF

Lewa komora:
Wielkość: ☐ mała ☐ prawidłowa ☐ powiększona
Kurczliwość: ☐ brak czynności skurczowej (asystolia)
☐ prawidłowa ☐ hiperkinetyczna
☐ lekko/umiarkowanie upośledzona ☐ ciężko upośledzona
☐ zaburzenia kurczliwości odcinkowej

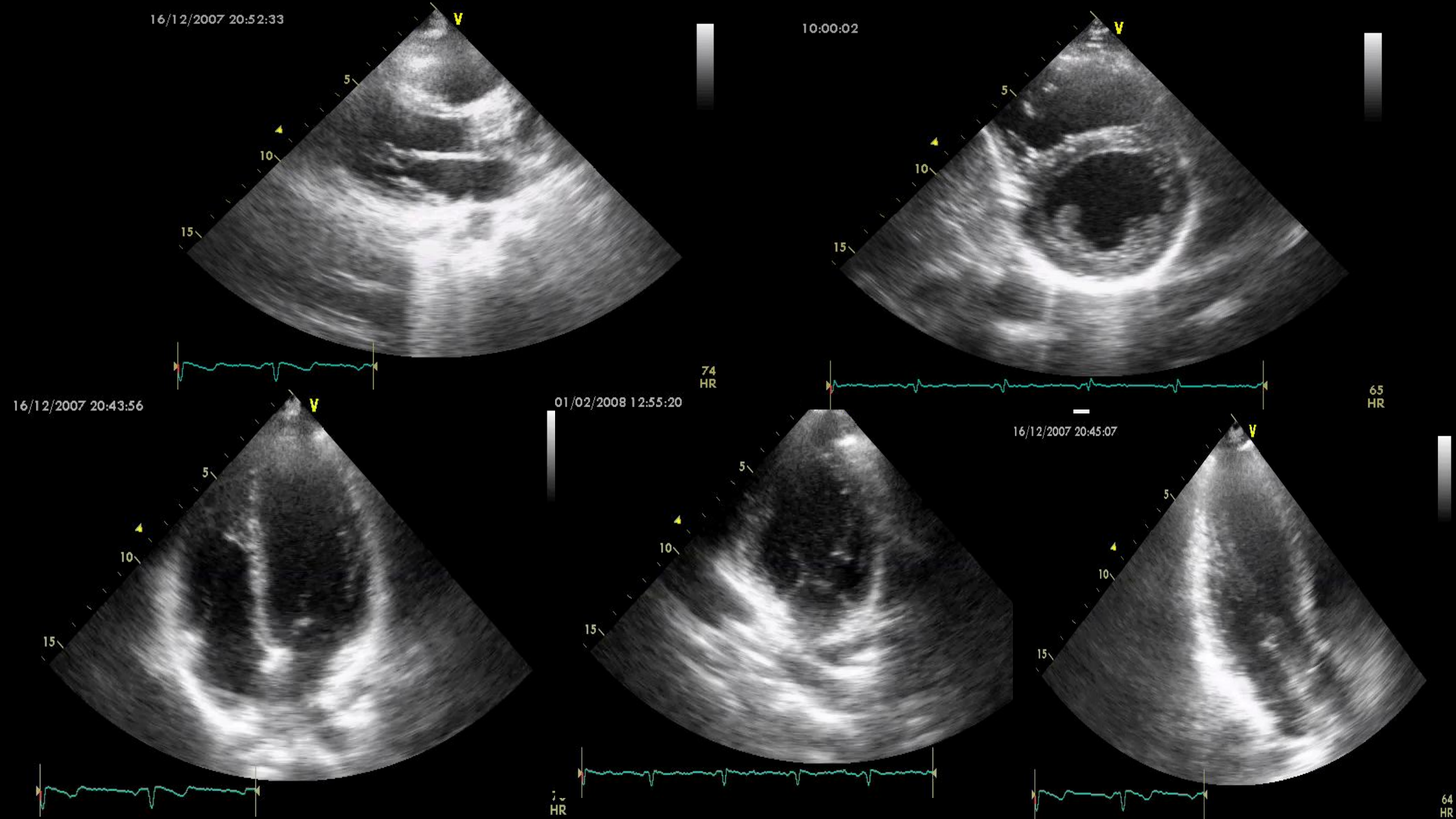
Prawa komora:
☐ mała ☐ prawidłowa ☐ powiększona ☐ PK/LK > 1
☐ cechy przeciążenia PK ☐ upośledzona kurczliwość wolnej ściany PK

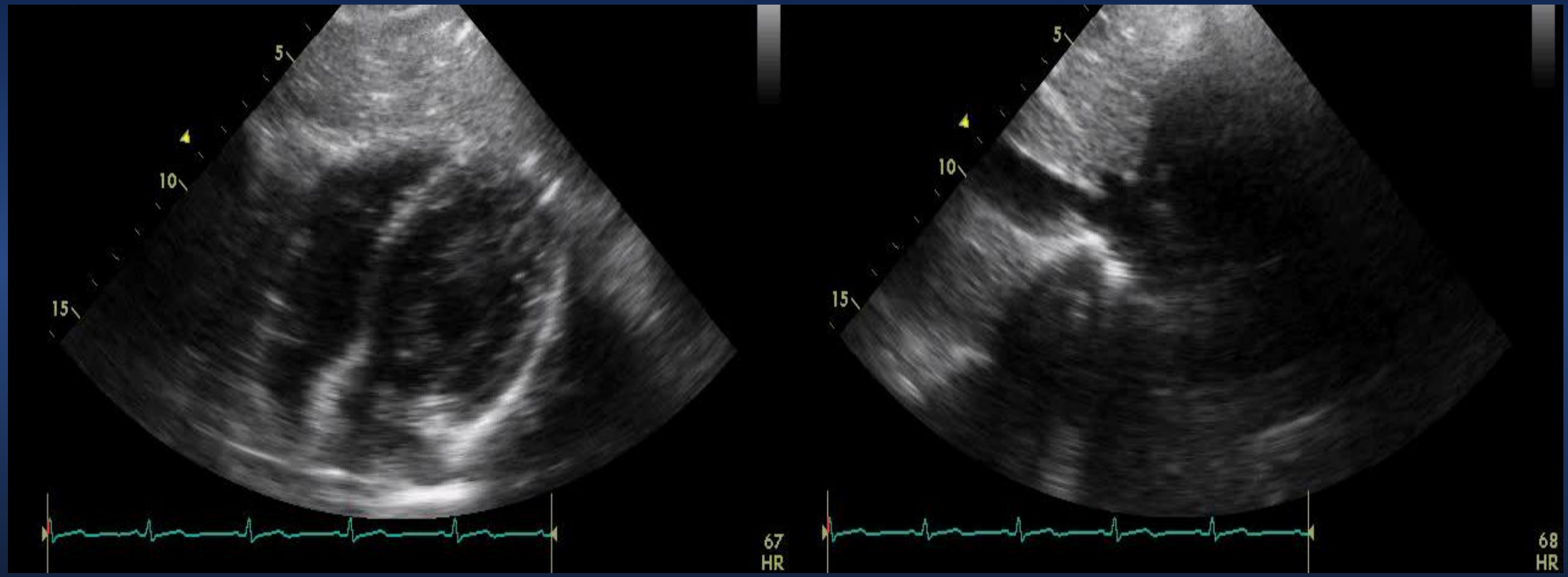
Aorta wstępująca:
☐ prawidłowej szerokości ☐ poszerzona ☐ rozwarstwienie

Osierdzie:
☐ wolne ☐ niewielka ilość płynu ☐ duża ilość płynu ☐ cechy tamponady

Płyn w jamach opłucnych:
☐ lewa ☐ prawa

Przedsionki	
Zastawki	
WNIOSKI	
Podpis	


16/12/2007 20:52:33
10:00:02
74
HR
65
HR
16/12/2007 20:43:56
01/02/2008 12:55:20
16/12/2007 20:45:07
64
HR

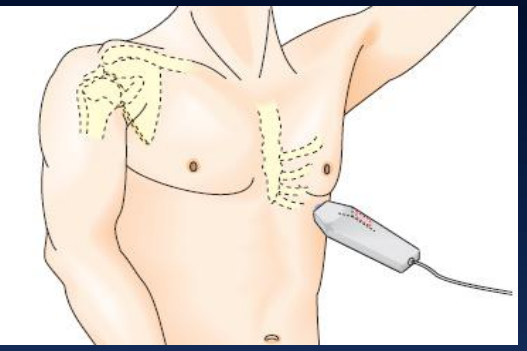

5
10
15
67
HR
5
10
15
68
HR

Szukanie przyczyn…

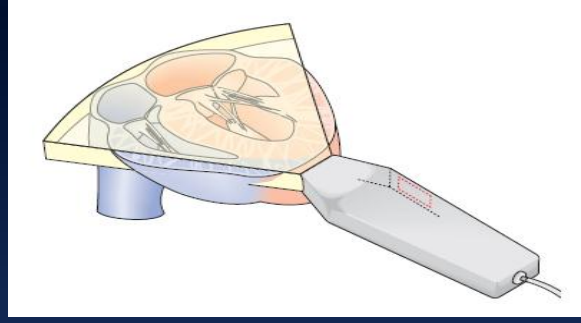
Przyczyna wstrząsu

Pacjent 1

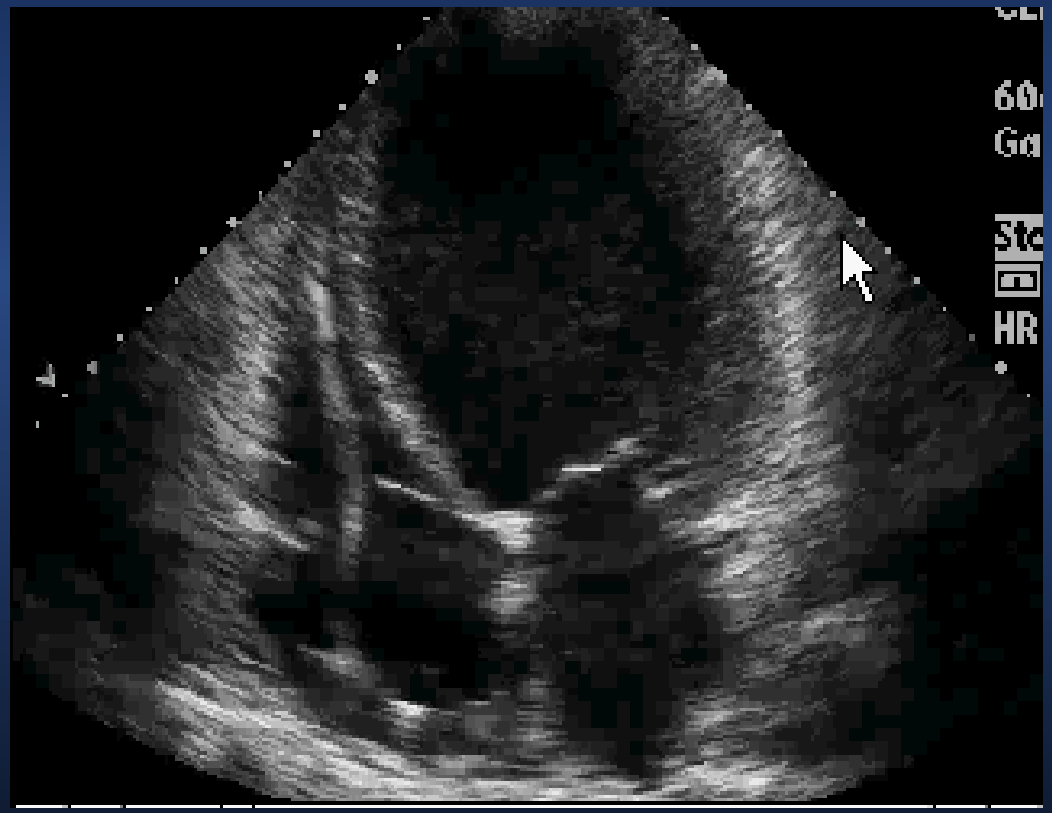
Najpewniej hypowolemiczna przyczyna wstrząsu



Możliwa przyczyna wstrząsu



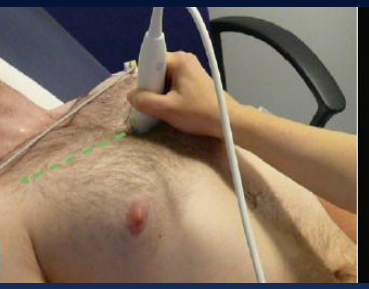
Pacjent 2

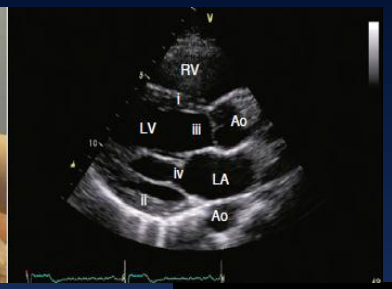


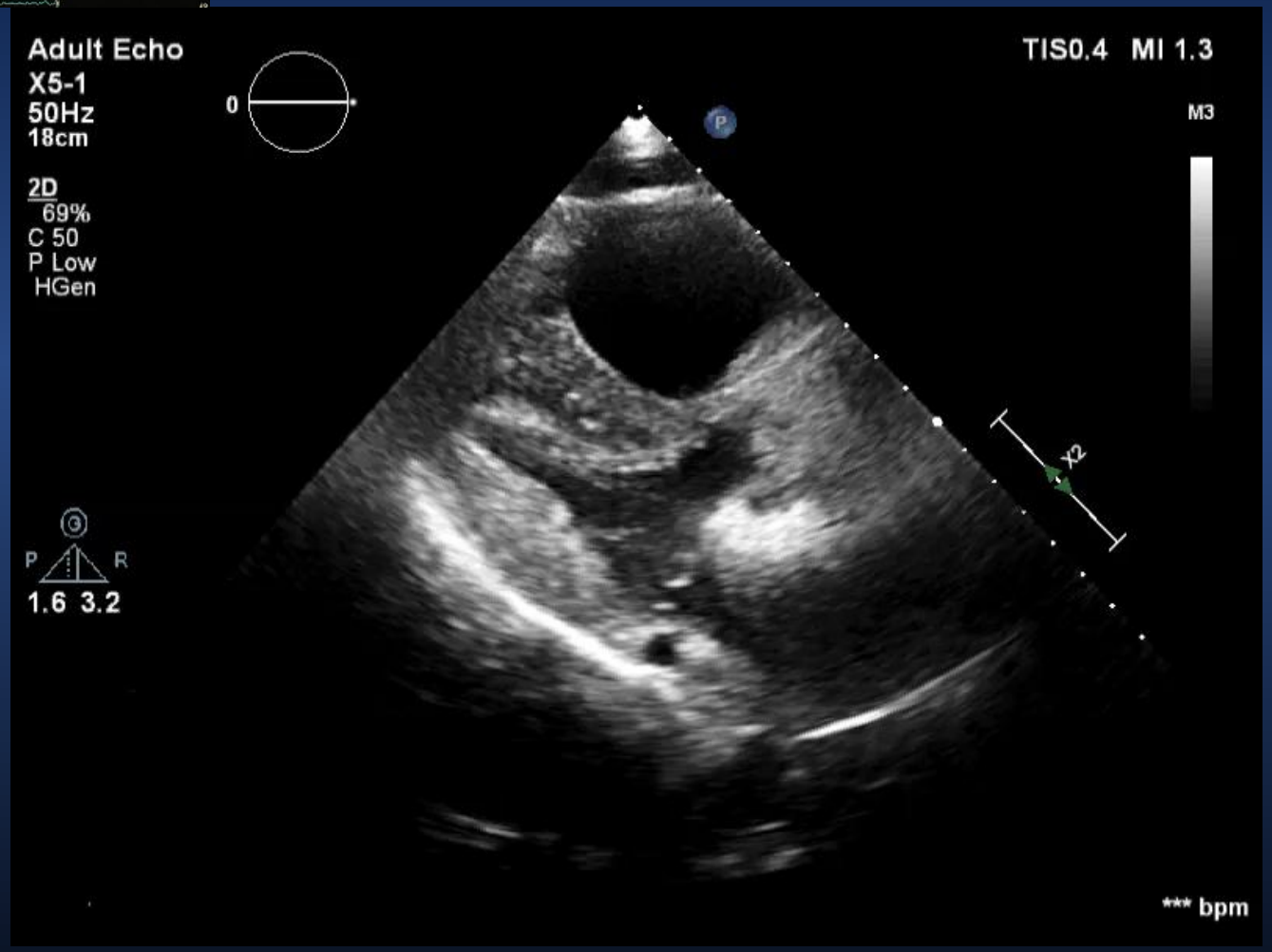
Najpewniej kardiogenna przyczyna wstrząsu

Możliwa przyczyna wstrząsu

Pacjent 3

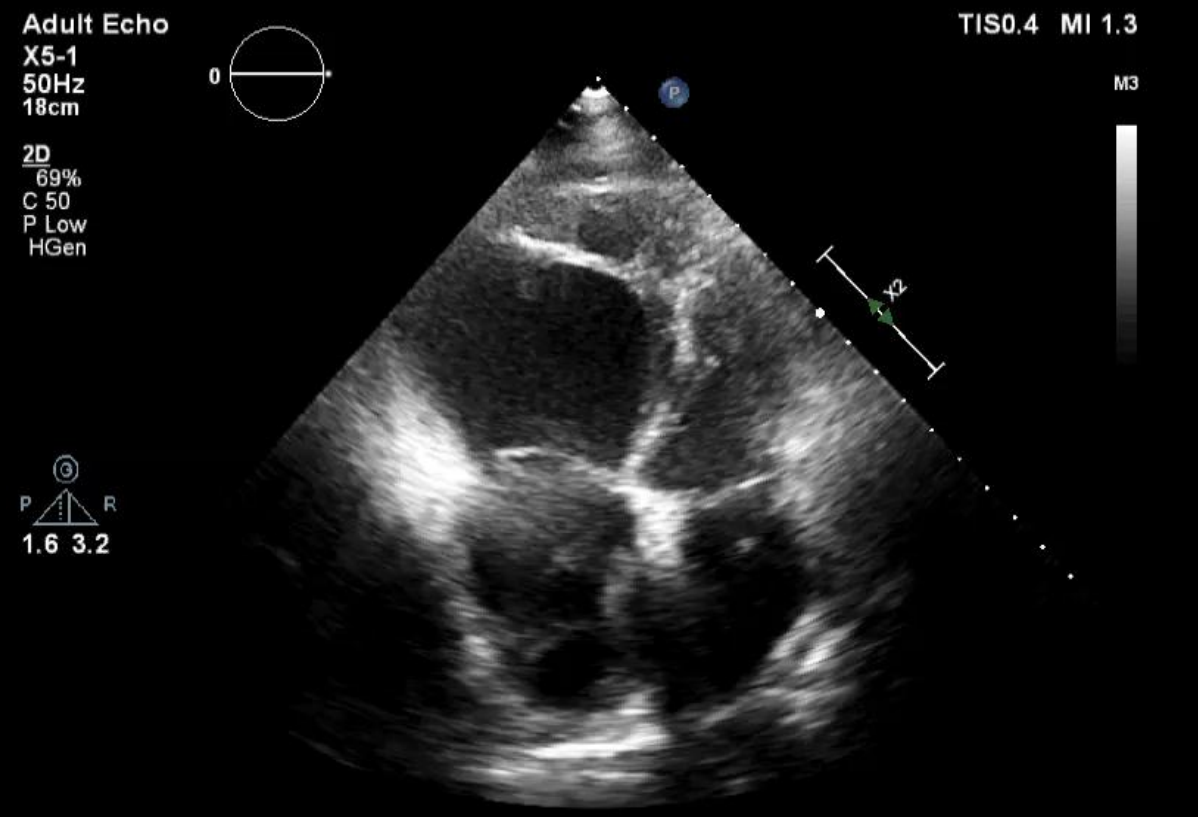







5
10

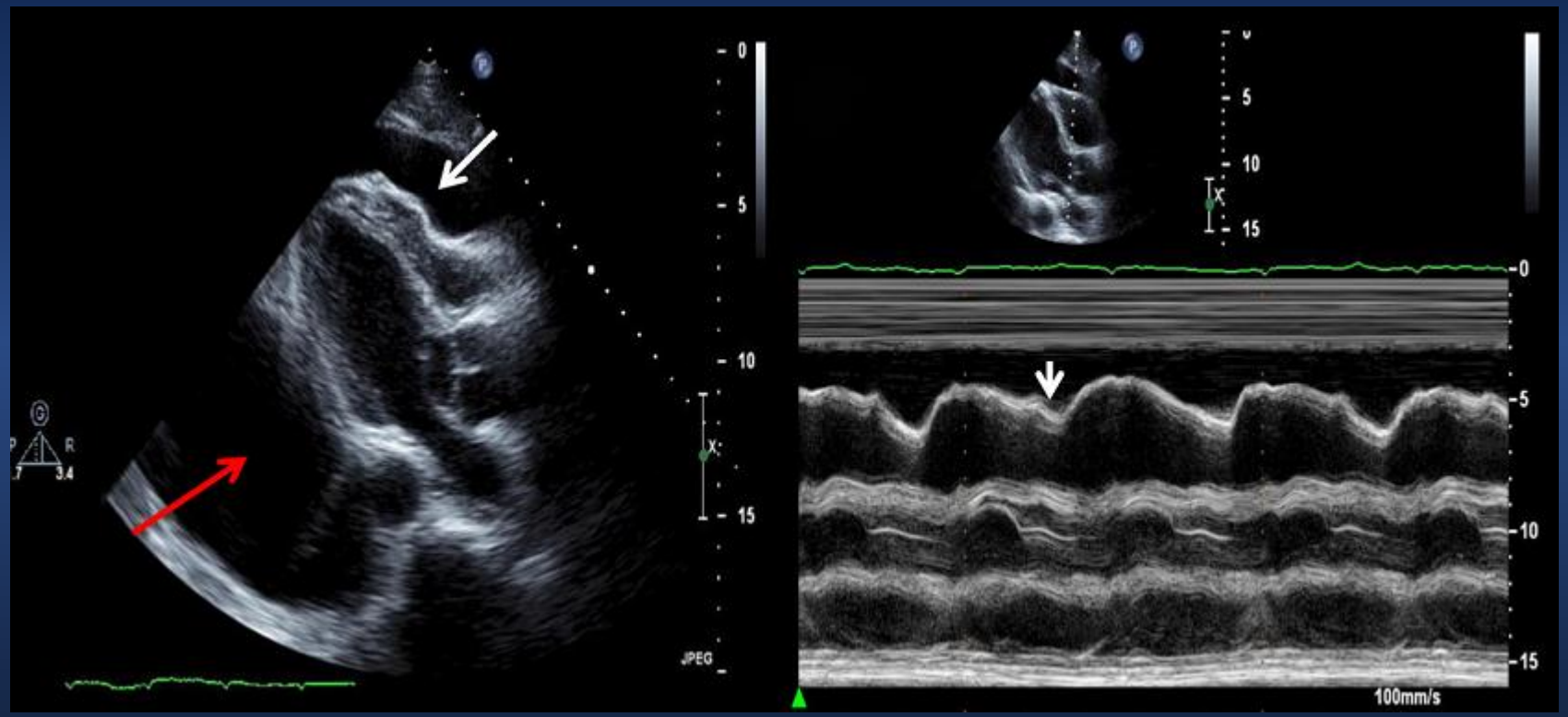

5
10


Adult Echo
X5-1
50Hz
18cm
2D
69%
C 50
P Low
HGen
0
TIS0.4 MI 1.3
M3
P
X2
P R
1.6 3.2
*** bpm

Możliwa przyczyna wstrząsu Pacjent 4

Tamponada serca

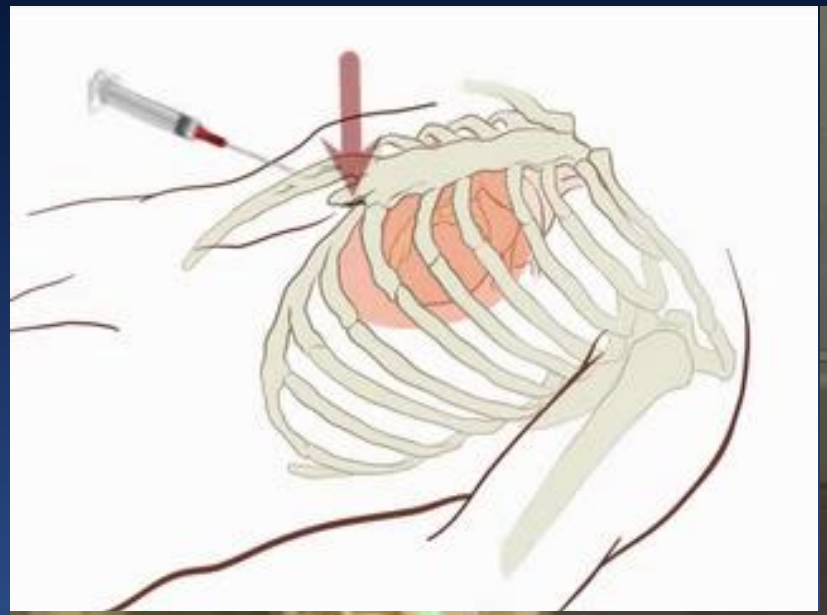
Płyn w worku osierdziowym - tamponada

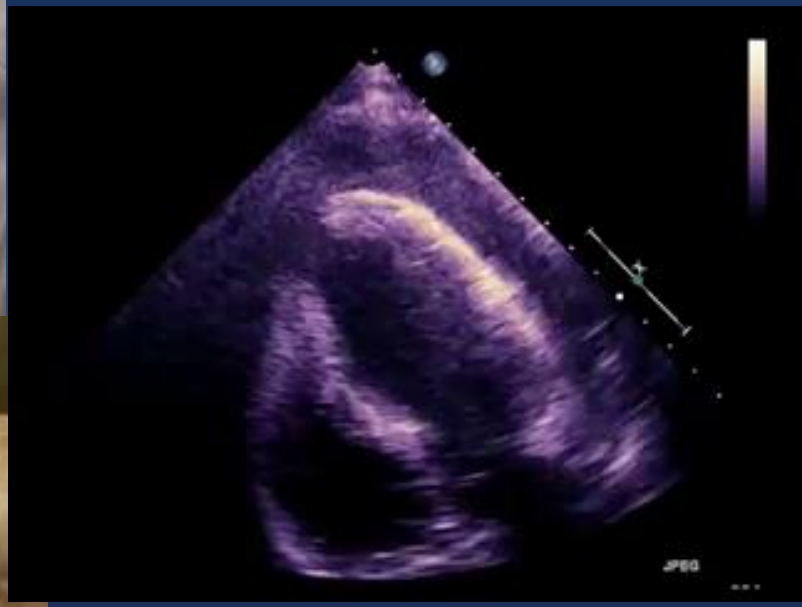


Płyn przed RV z jej supresją

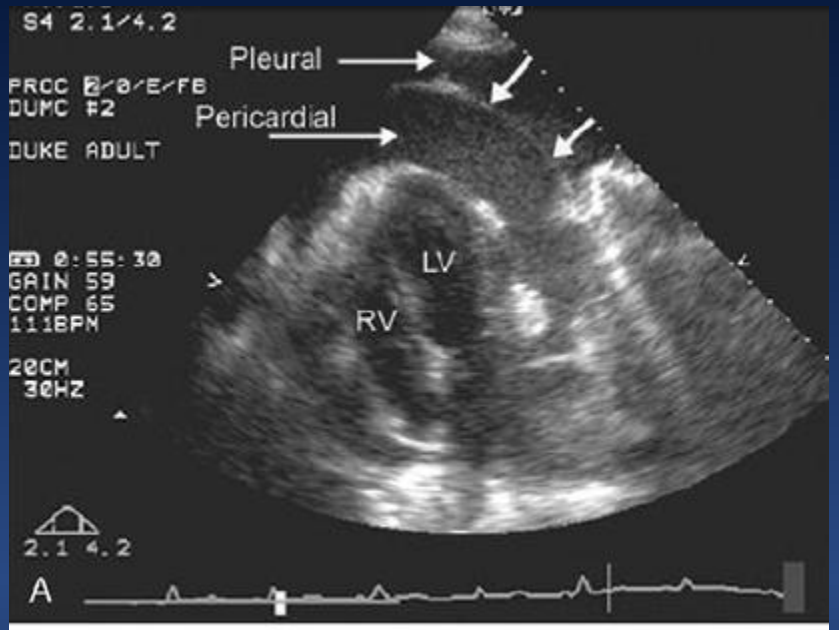
Rozkurczowe zapadanie się RV

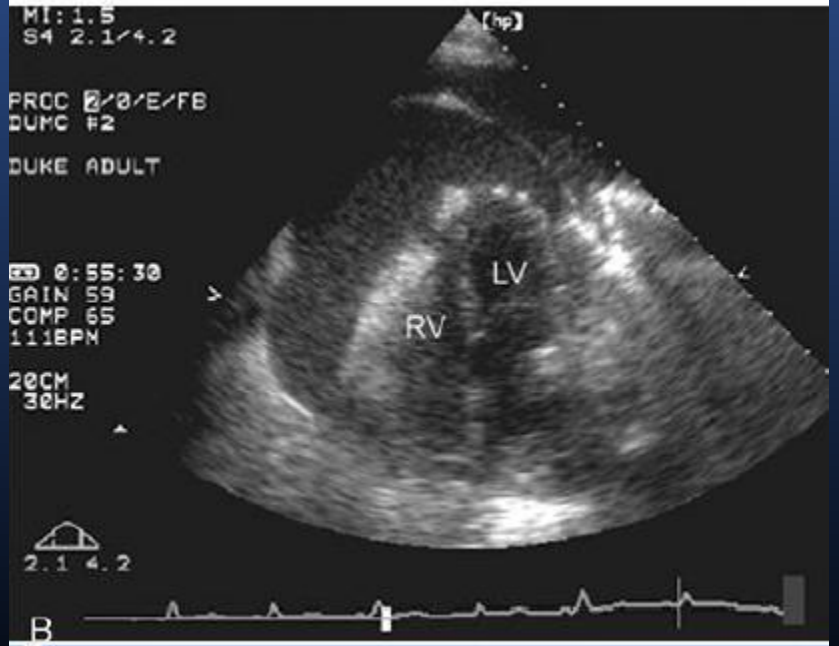
Tamponada serca/nakłucie osierdzia

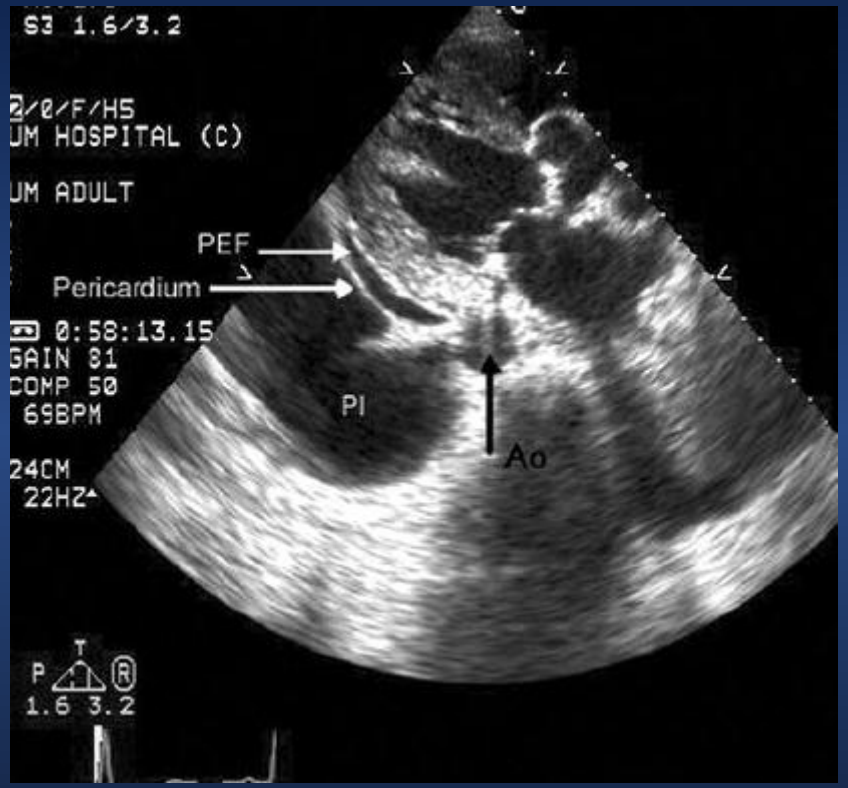




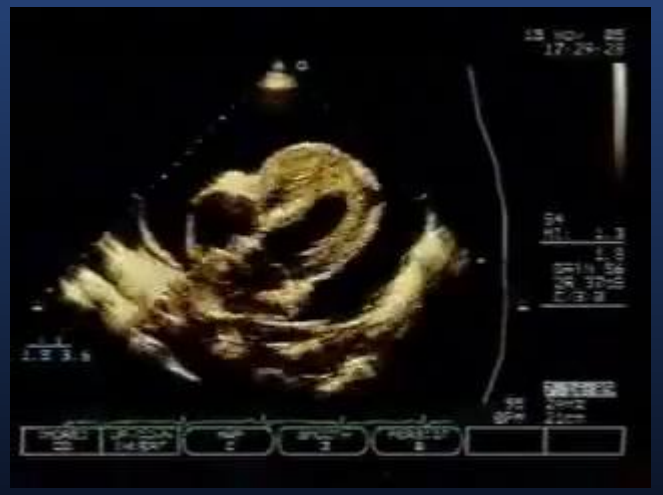
Płyn w opłucnej i osierdziu







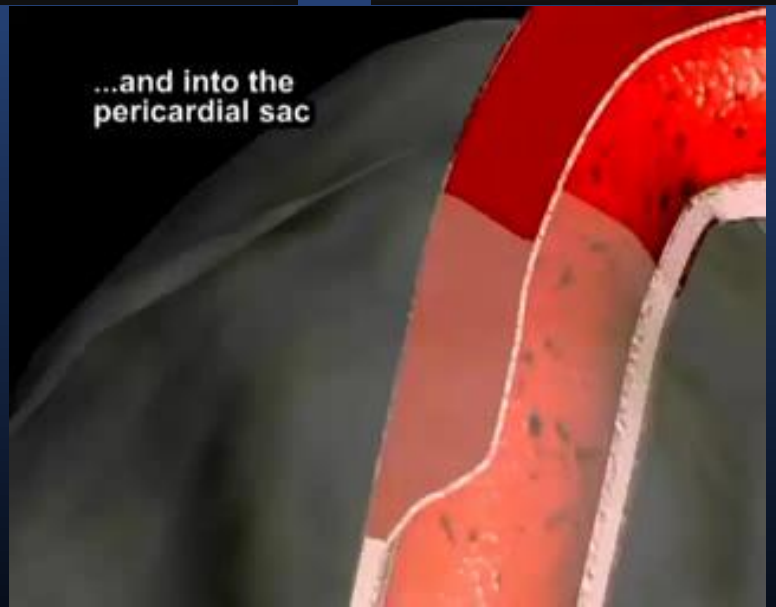
Przewlekły płyn, różnicowanie

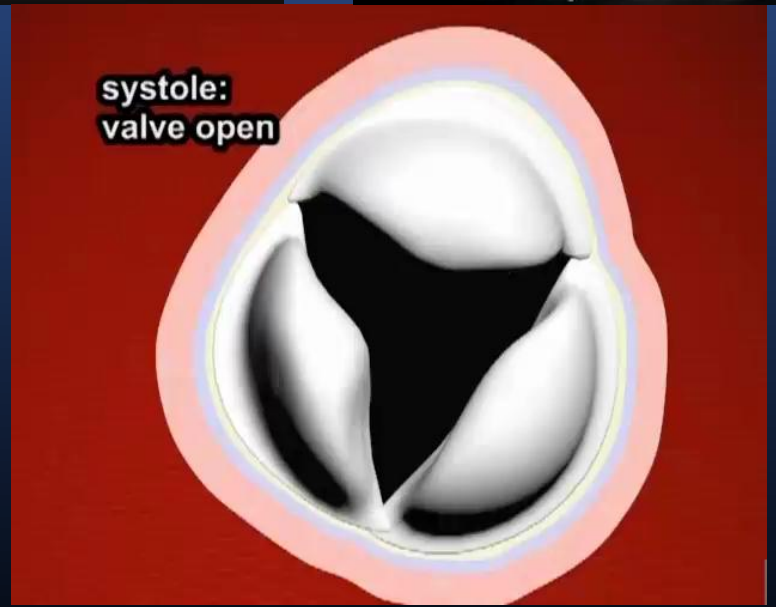


Możliwa przyczyna wstrząsu

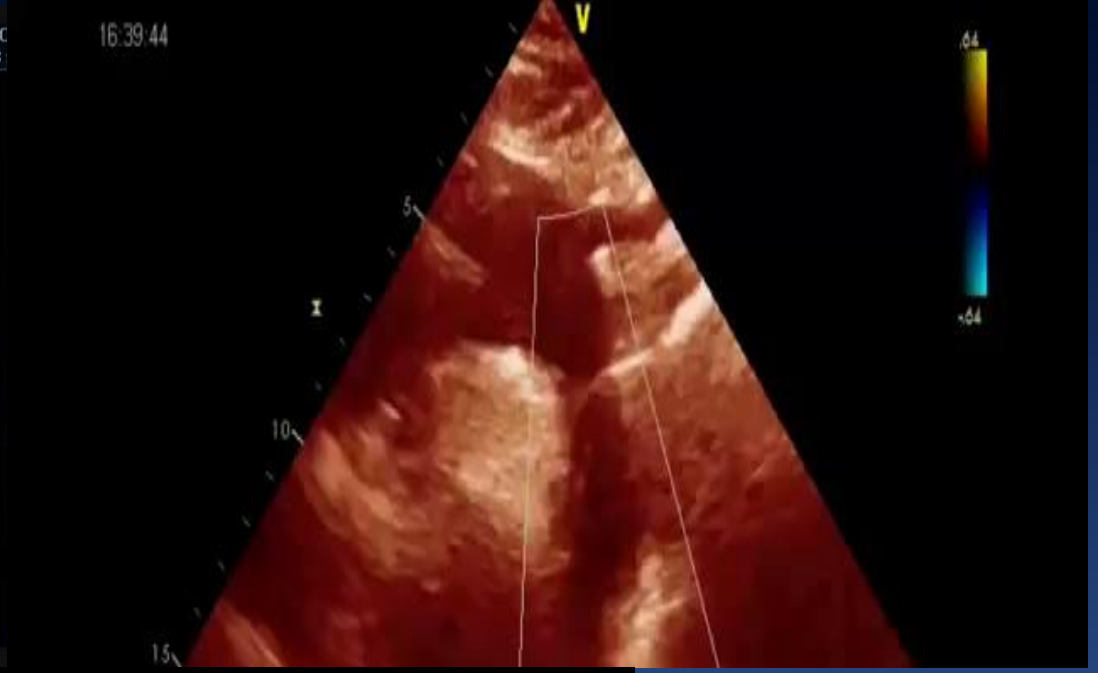
Pacjent 5

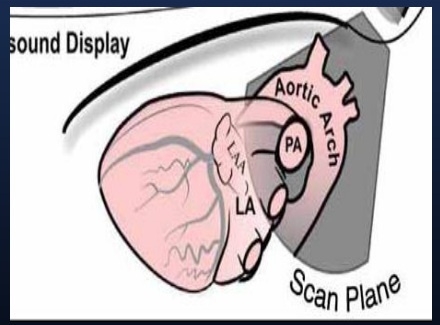
Rozwarstwienie aorty wstępującej



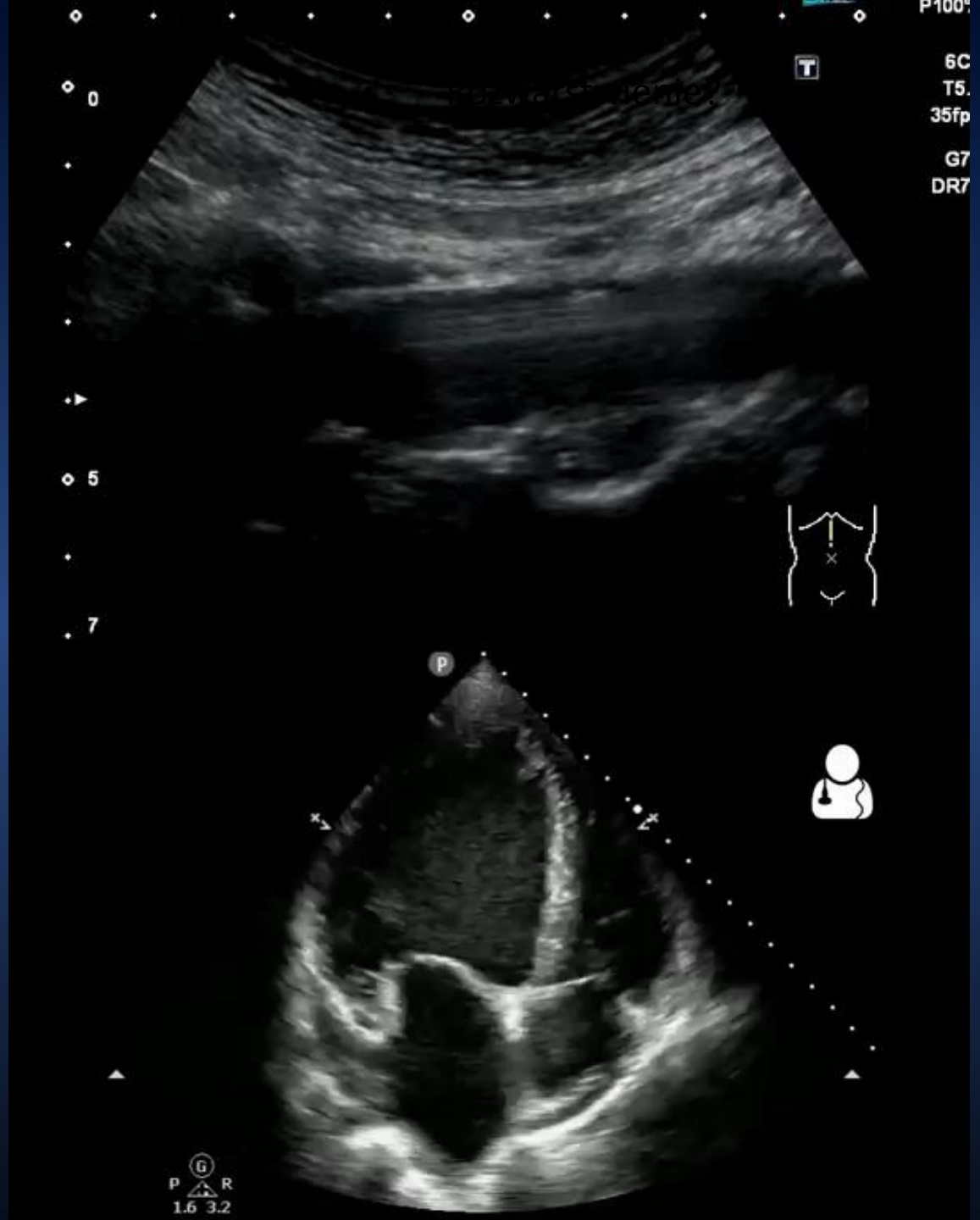



HD
1.9 3.8


16:39:44
V
5
10
15


sound Display
Aortic Arch
PA
LA
Scan Plane

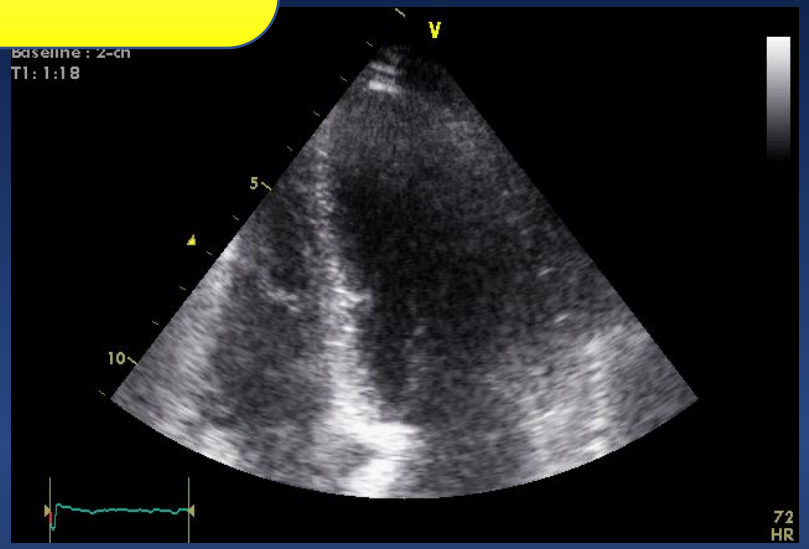

01/09/2015 03:31:19 AP 100% MI 0.9 TIS 0.7
P4-2 ADNAN
M
DC-7
B1
FH4.4 /D19.3 /G90
FR63 /IP5 /DR56
iTouch
47/217

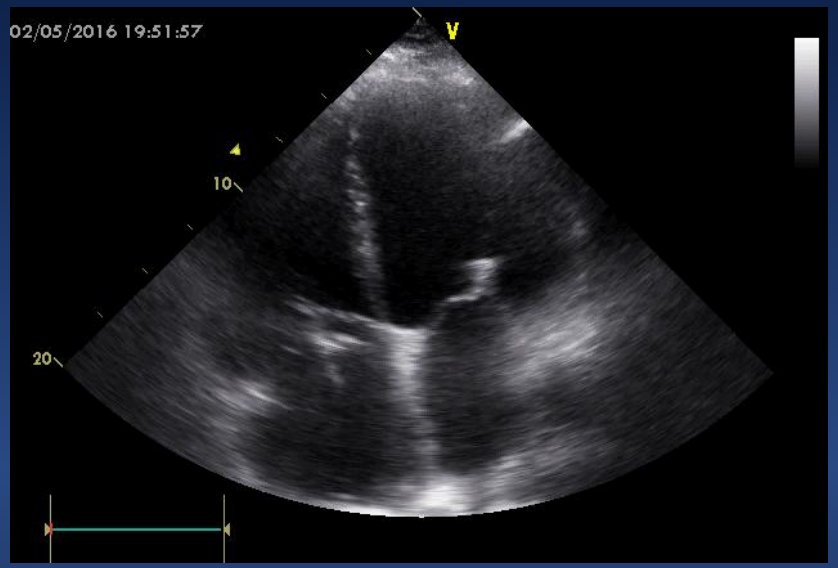

0
5
7
T
P
6C
35fp
G7
DR7
1.6 3.2

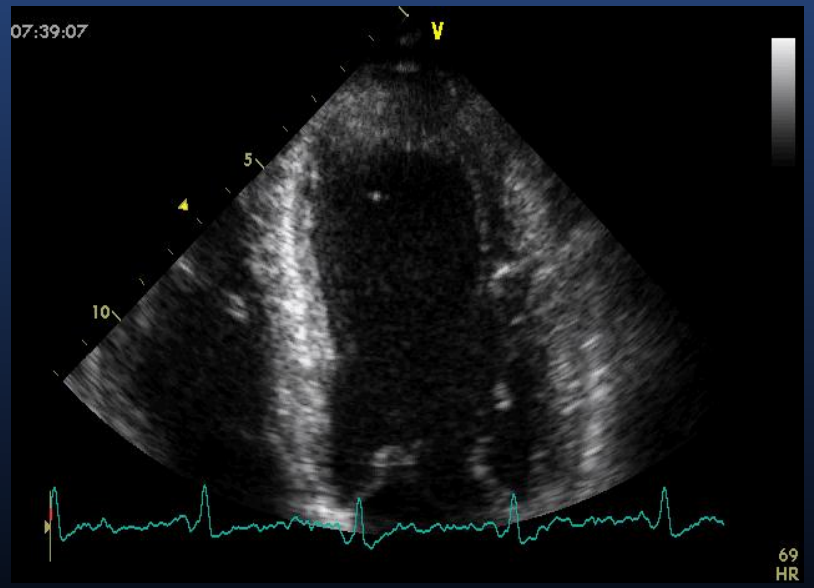
Montorowanie pacjenta

Ocena funkcji mechanicznej serca

Kurczliwość (dobra/zła)



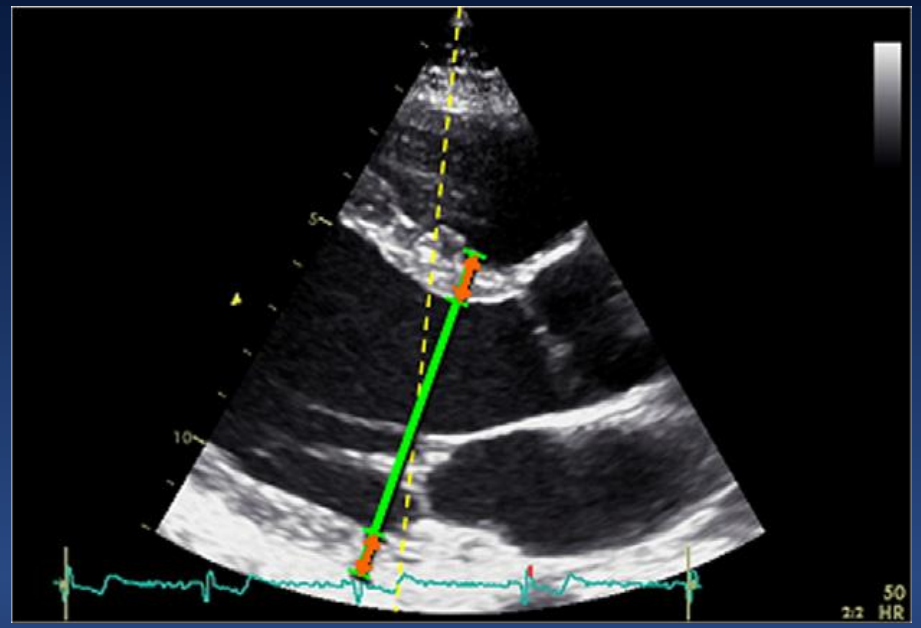




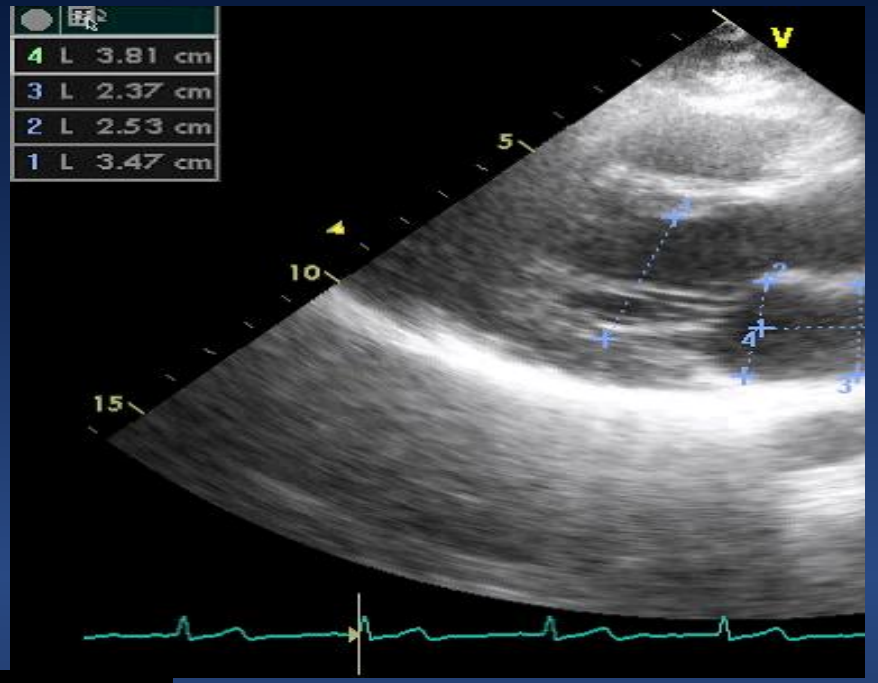
Zaburzenia kurczliwości odcinkowej (są/ nie ma)

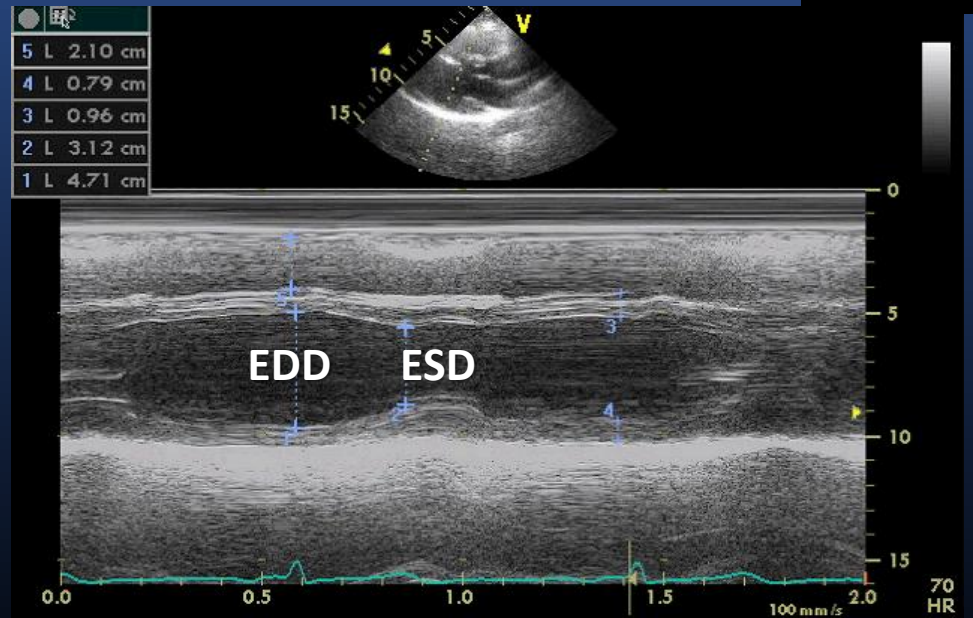
Frakcja skracania

Enddiastole



Endsystole



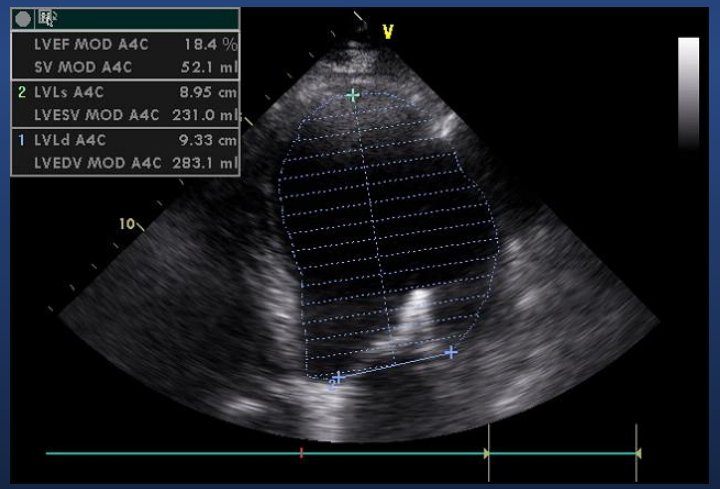


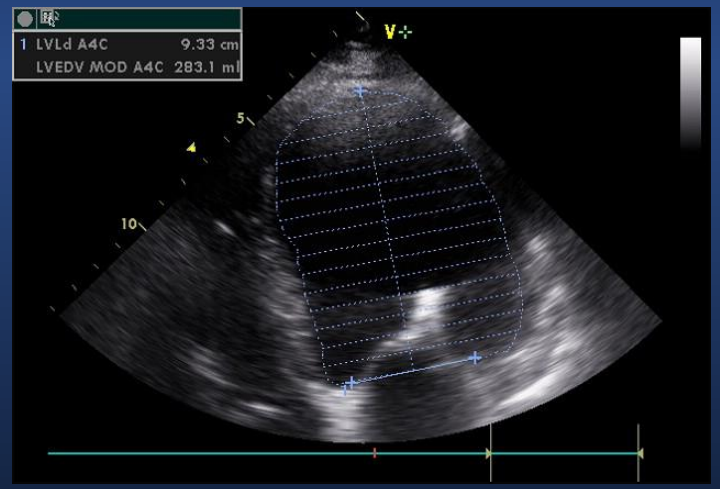
Ocena funkcji mechanicznej serca

Ocena funkcji lewej komory

Frakcja wyrzutowa (Ejection fraction- EF)

metodą Simpsona





Ocena funkcji mechanicznej serca

Ocena funkcji lewej komory

Ocena rzutu minutowego serca z VTI

Ocena rzutu serca przykład

$$SV = \pi * \left[\frac{LVOT}{2}\right]^2 * LVOT\ VTI$$

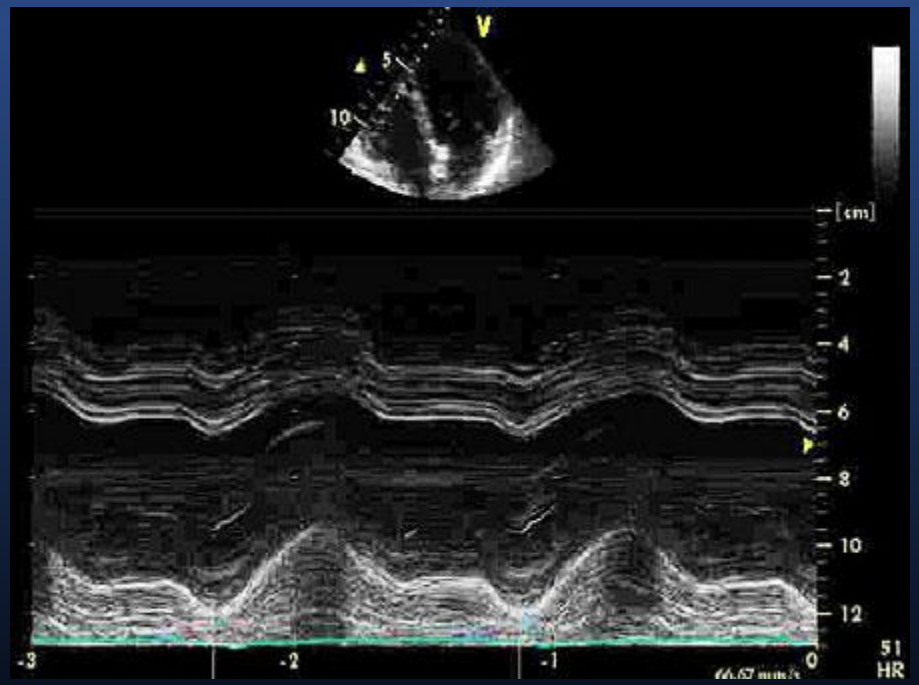
$$CO = \frac{SV * HR}{1000}$$

Ocena funkcji mechanicznej serca

Ocena funkcji prawej komory

TAPSE - tricuspid annular plane systolic excursion

(ruch pierścienia trójdzielnego oceniony w projekcji M-Mode)



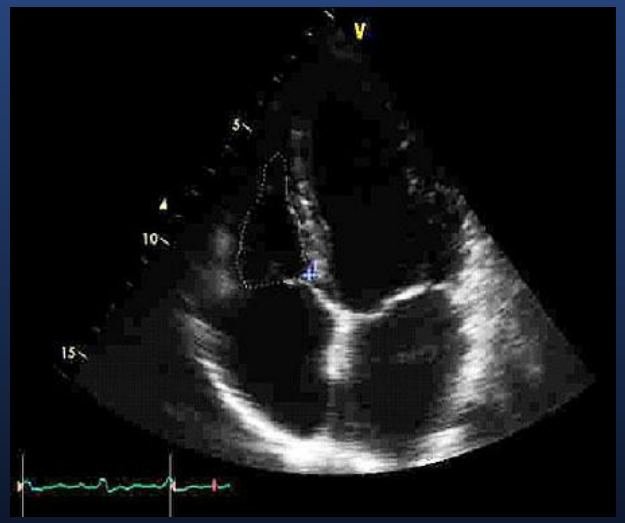
N ≥ 16mm

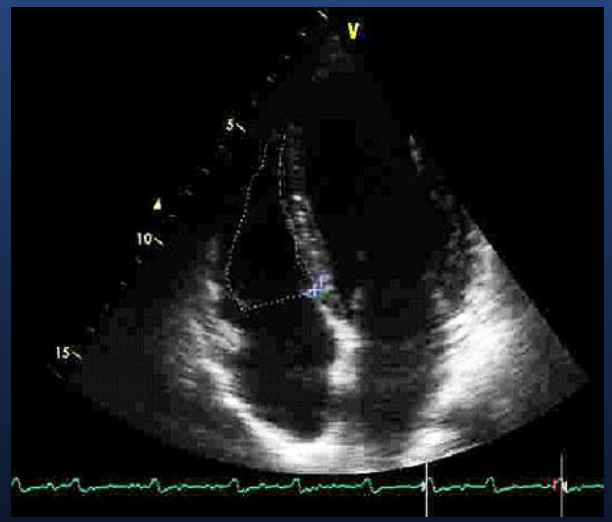
Ocena funkcji mechanicznej serca

Ocena funkcji prawej komory

FAC = right ventricular fractional area change
(odsetkowa zmiana pola powierzchni prawej komory)

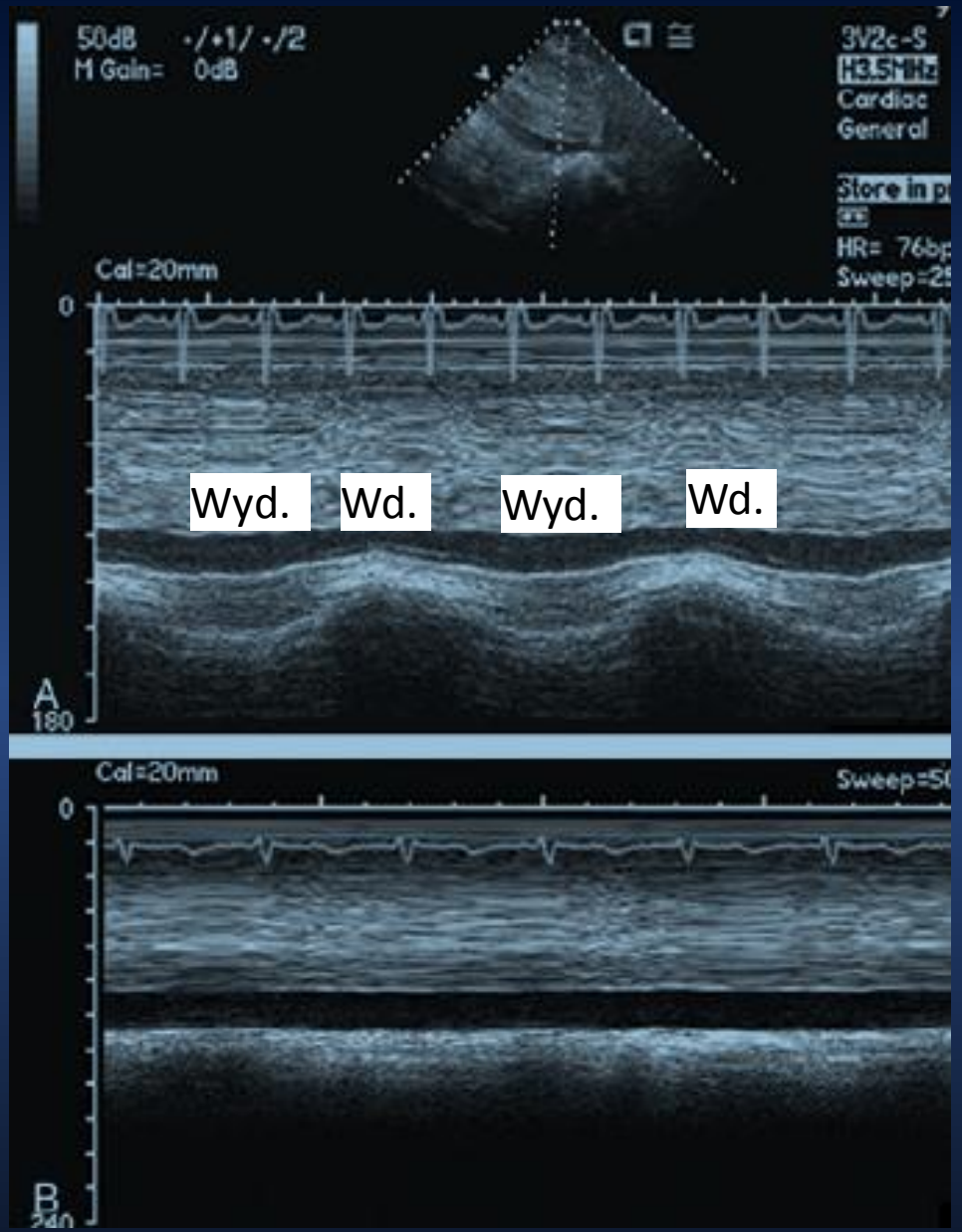
RV FAC = RVEDA - RVESA / RVEDA x 100%
RVEDA - right ventricular end-diastolic area
RVESA - right ventricular end-systolic area





N >35%; Ciężka dysfunkcja prawej komory ≤ 17%

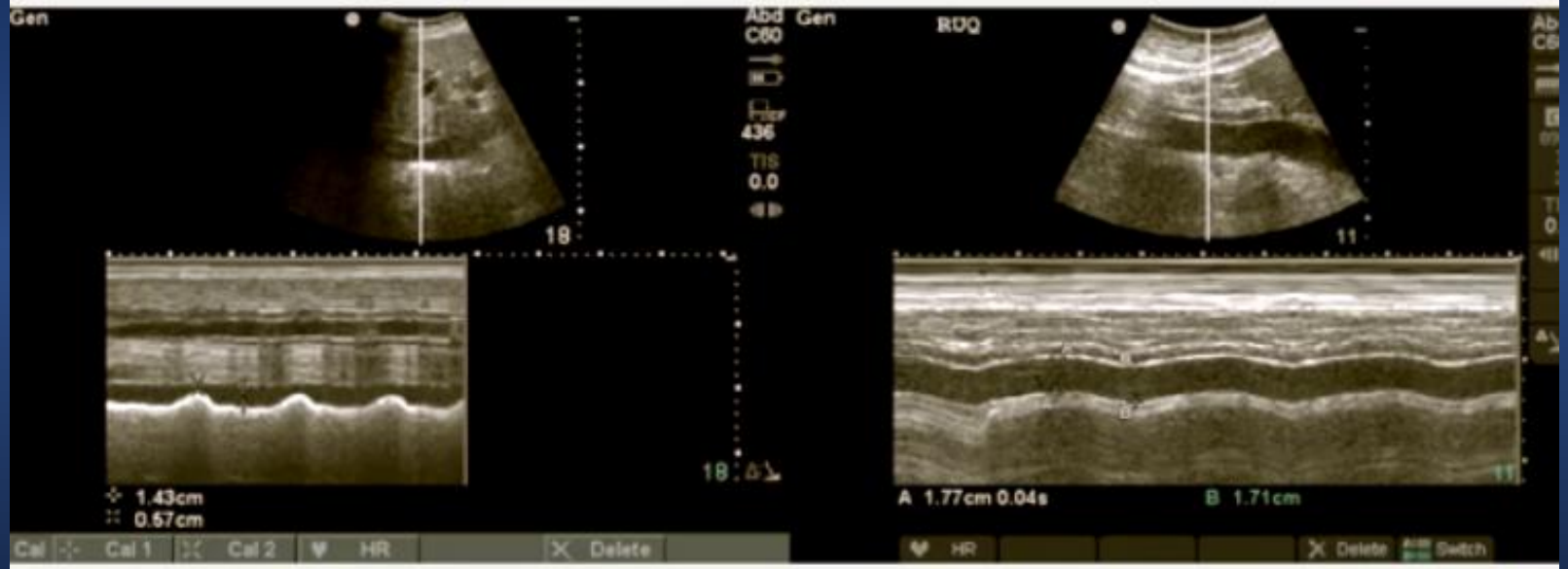
Ocena wolemii …żyły głównej dolnej



CCI= (Maks.- Min.)/Maks. (%)

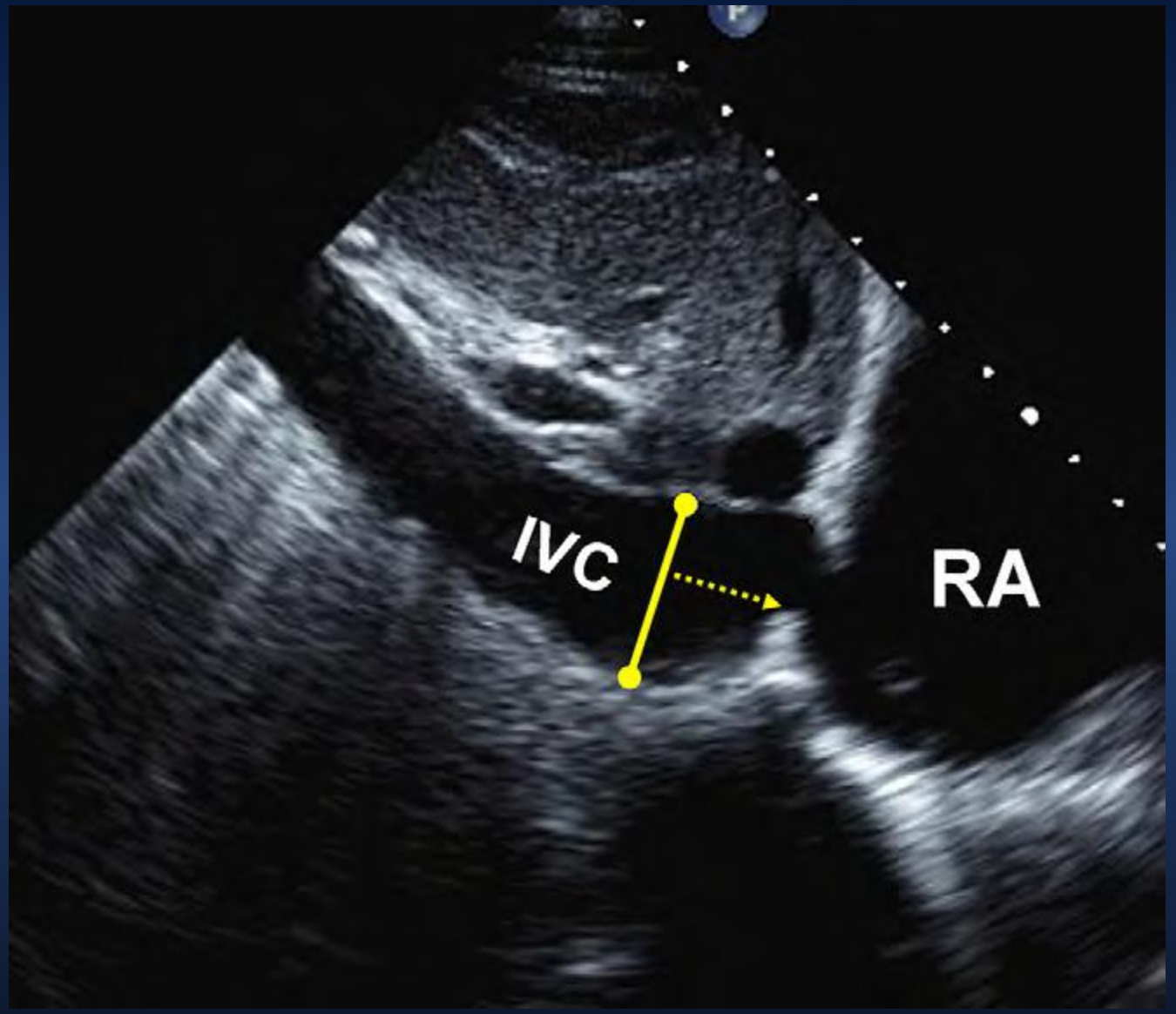
N> 50%

M-mode



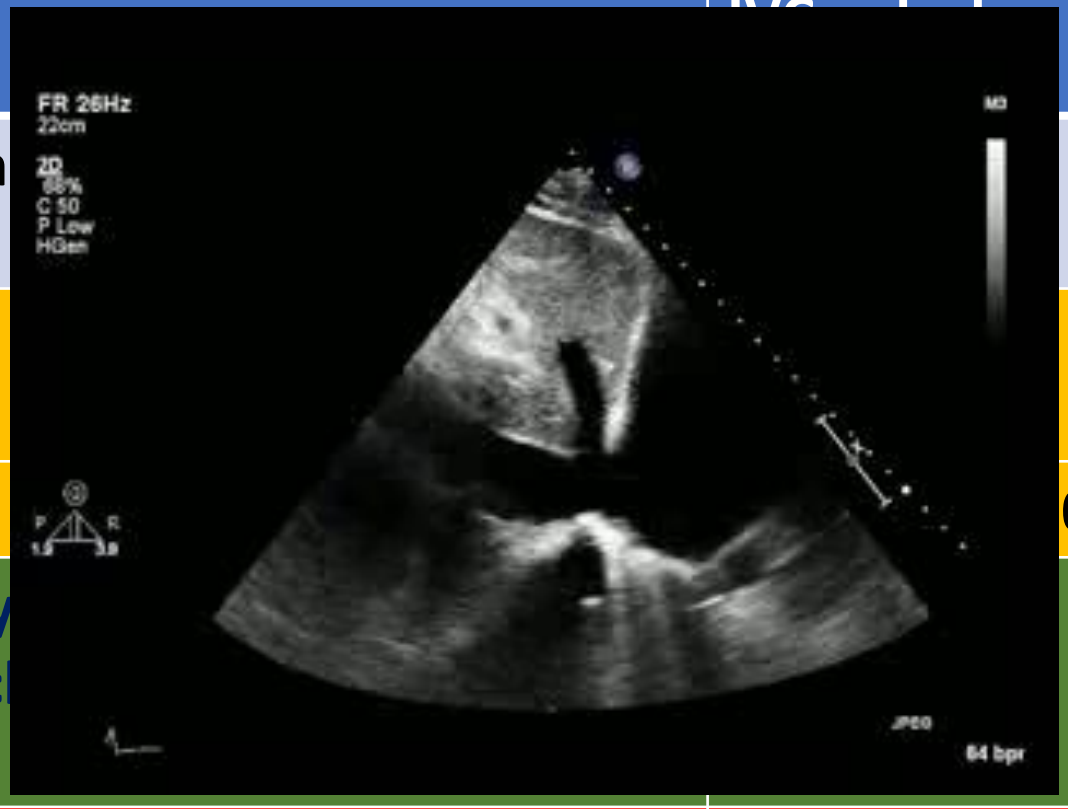
CI=(1.43-0.57)/1.43 = 60%

CI=(1.77-1.71)/1.77 = 3%

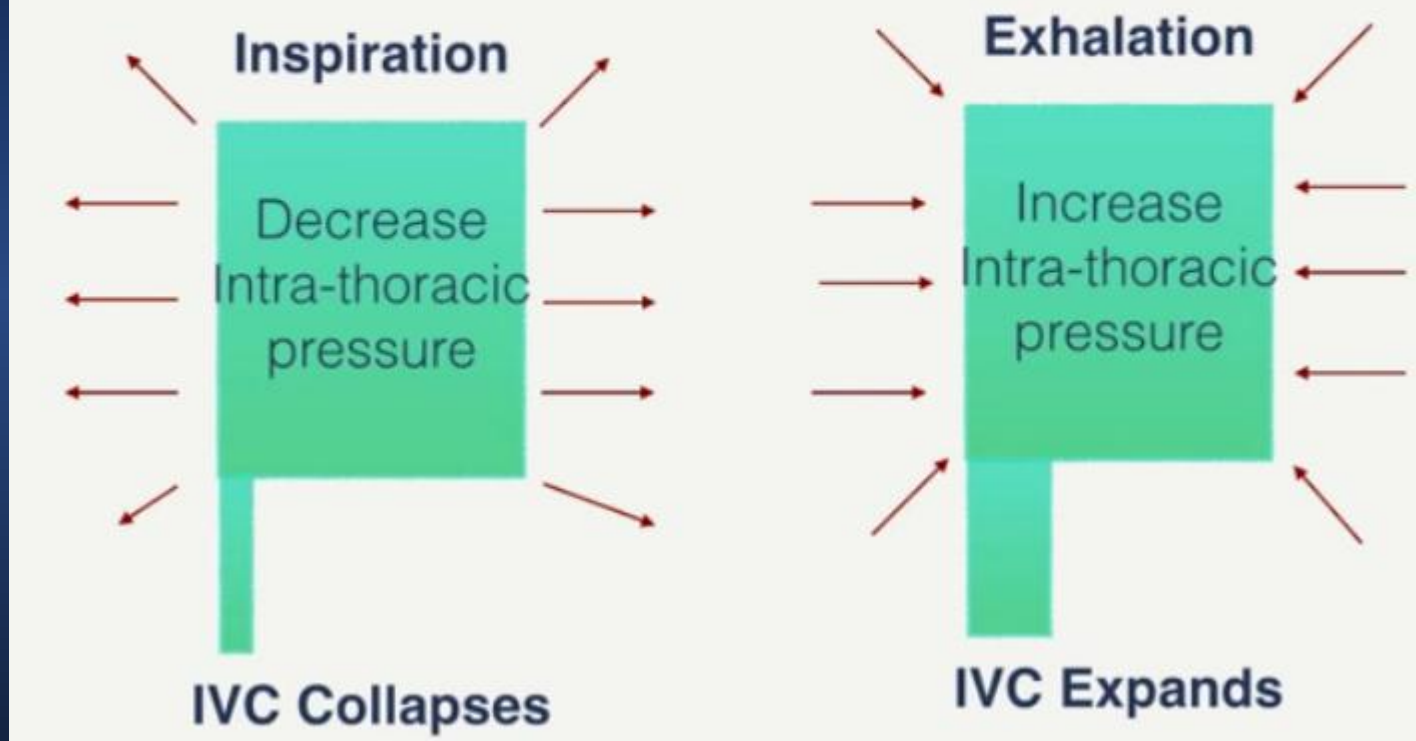

IVC
RA

Oszacowanie ciśnienia w prawym przedsionku RAP

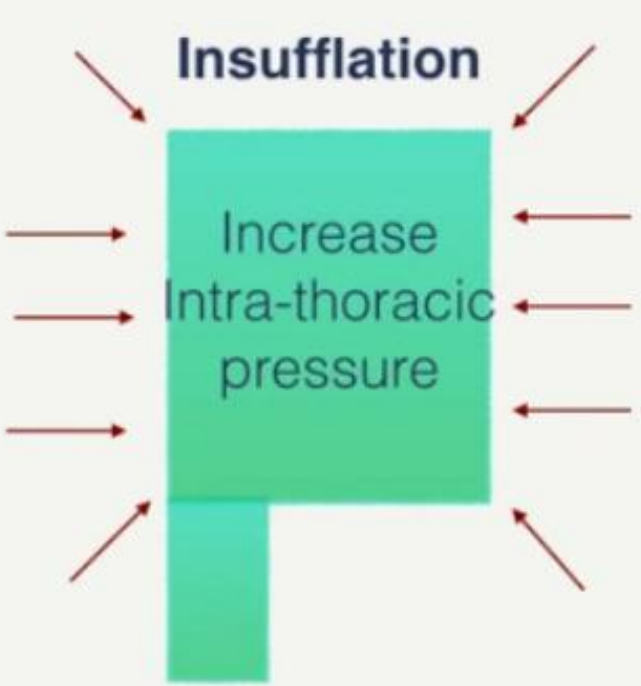
IVC (mm)		RAP (mmHg)
Wąska (≤ 21mm		3 (0-5)
Wąska		8
Szeroka	0%	8
Jw.+dominujący żż. wątrobowych napełnianie RV		**15 (10-20)**
Szeroka	**Zapadanie <50%**	**15 (10-20)**



IVC Physiology - Spontaneous Breathing

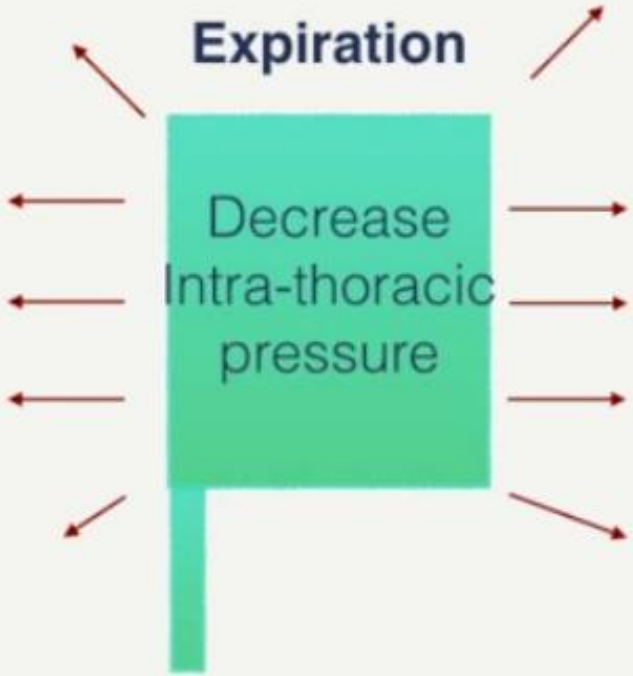


IVC Physiology - Mechanical Ventilation



Decrease Venous Return

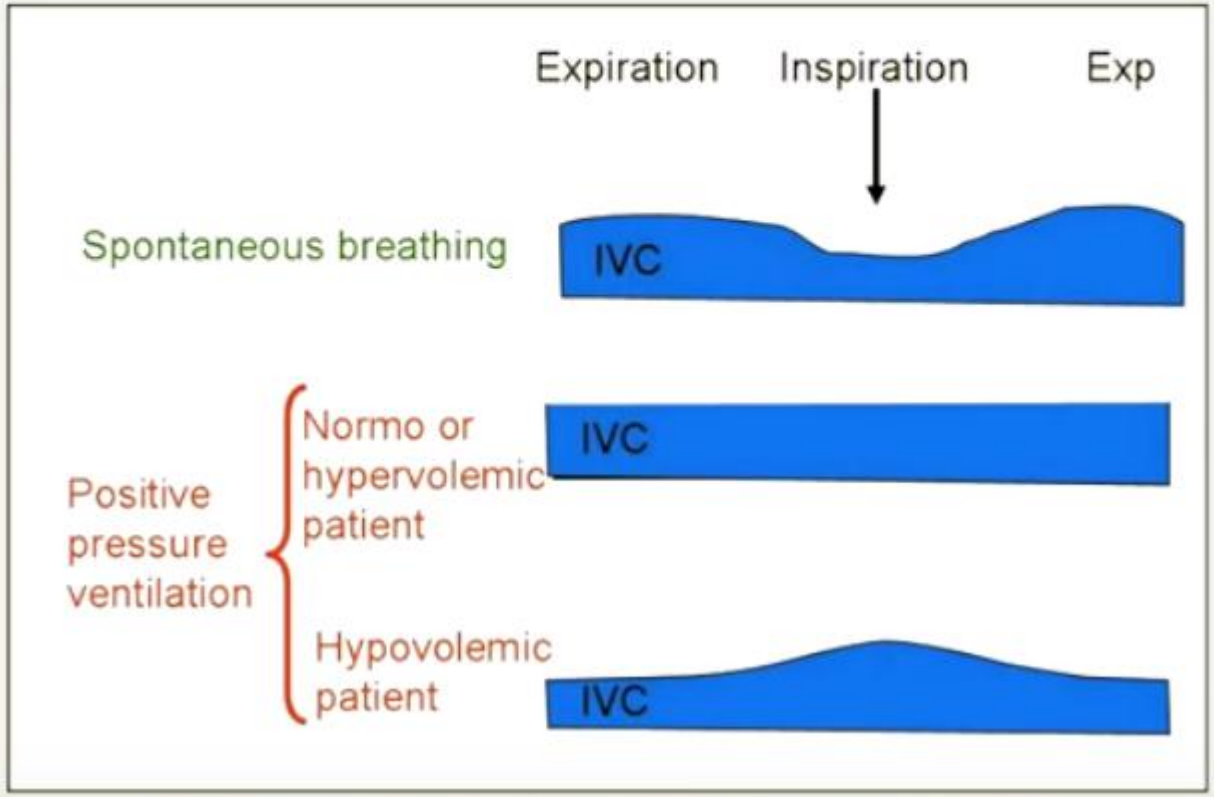
IVC Expands



Increase Venous Return

IVC Collapses

IVC physiology



Echocardiography in ICU, Stanford University https://web.stanford.edu

Hypowolemia

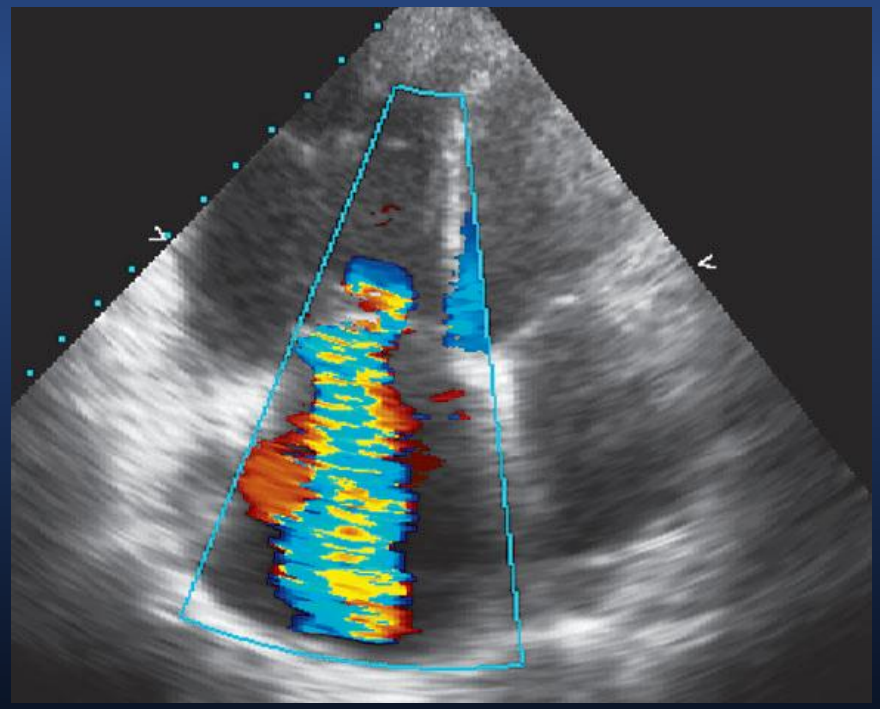

V
107
HR

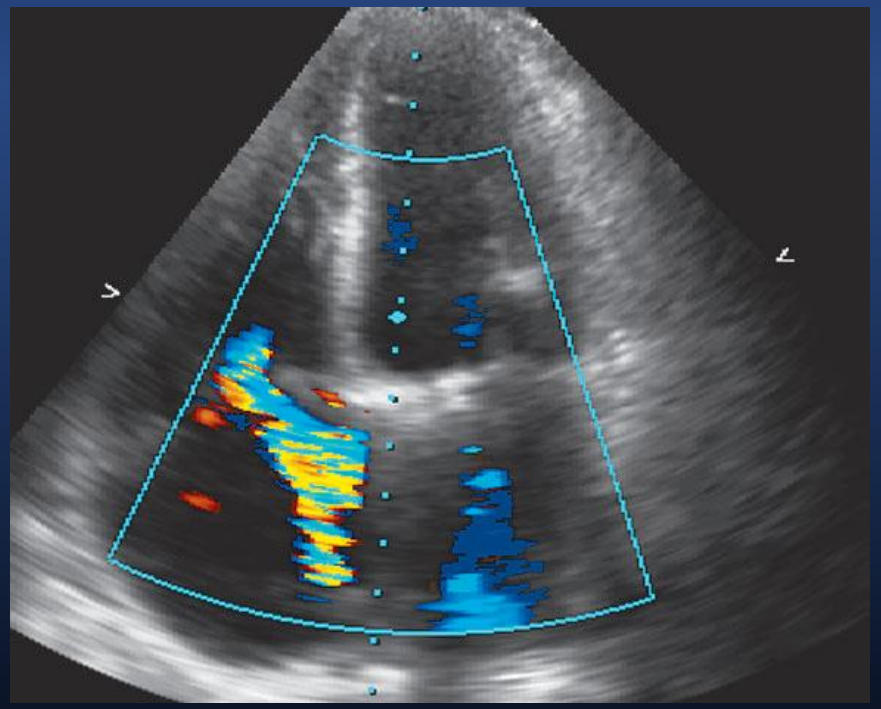

V
93
HR

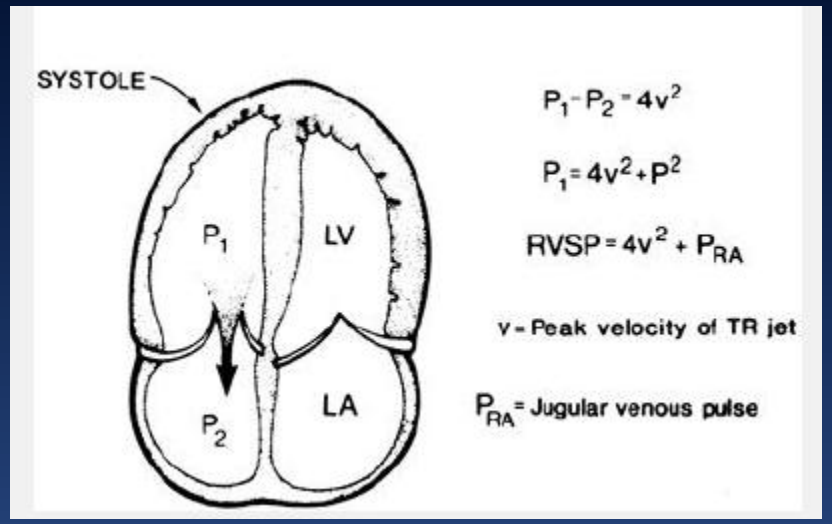
Pułapki

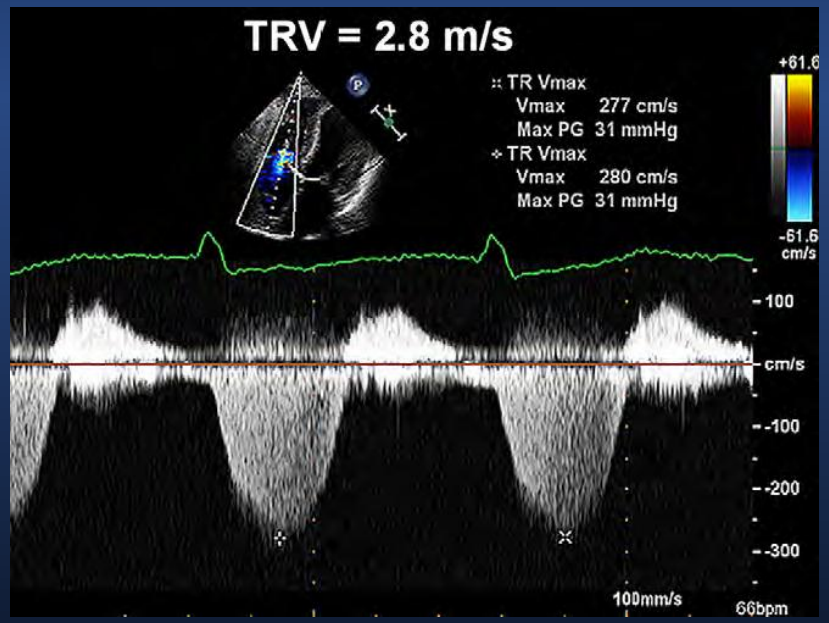
IVC vs Ao

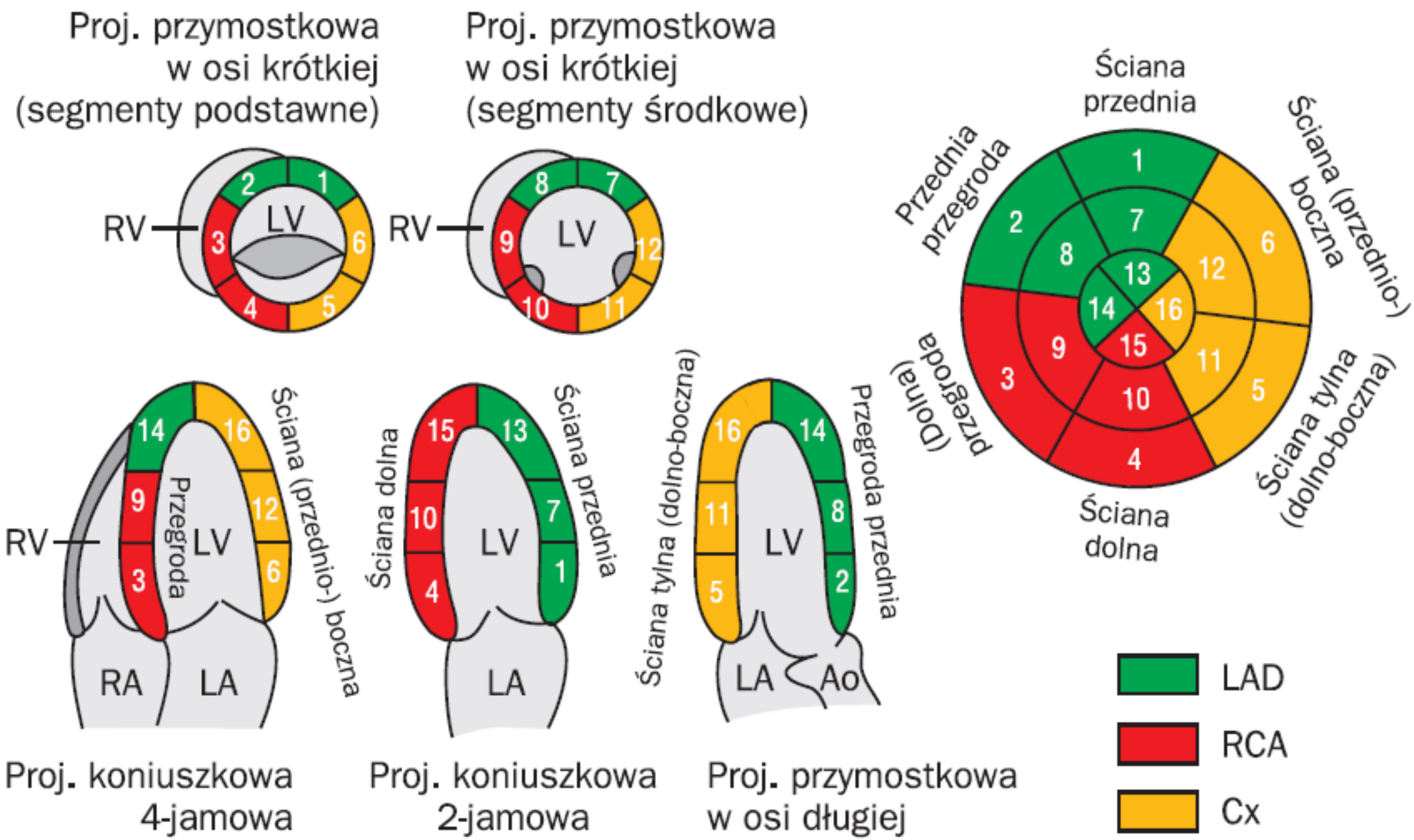
Skurczowe ciśnienie w prawej komorze
(RVSP- *Right ventricular systolic pressure/*
˜SPAP – systolic pulmonary arterial pressure)





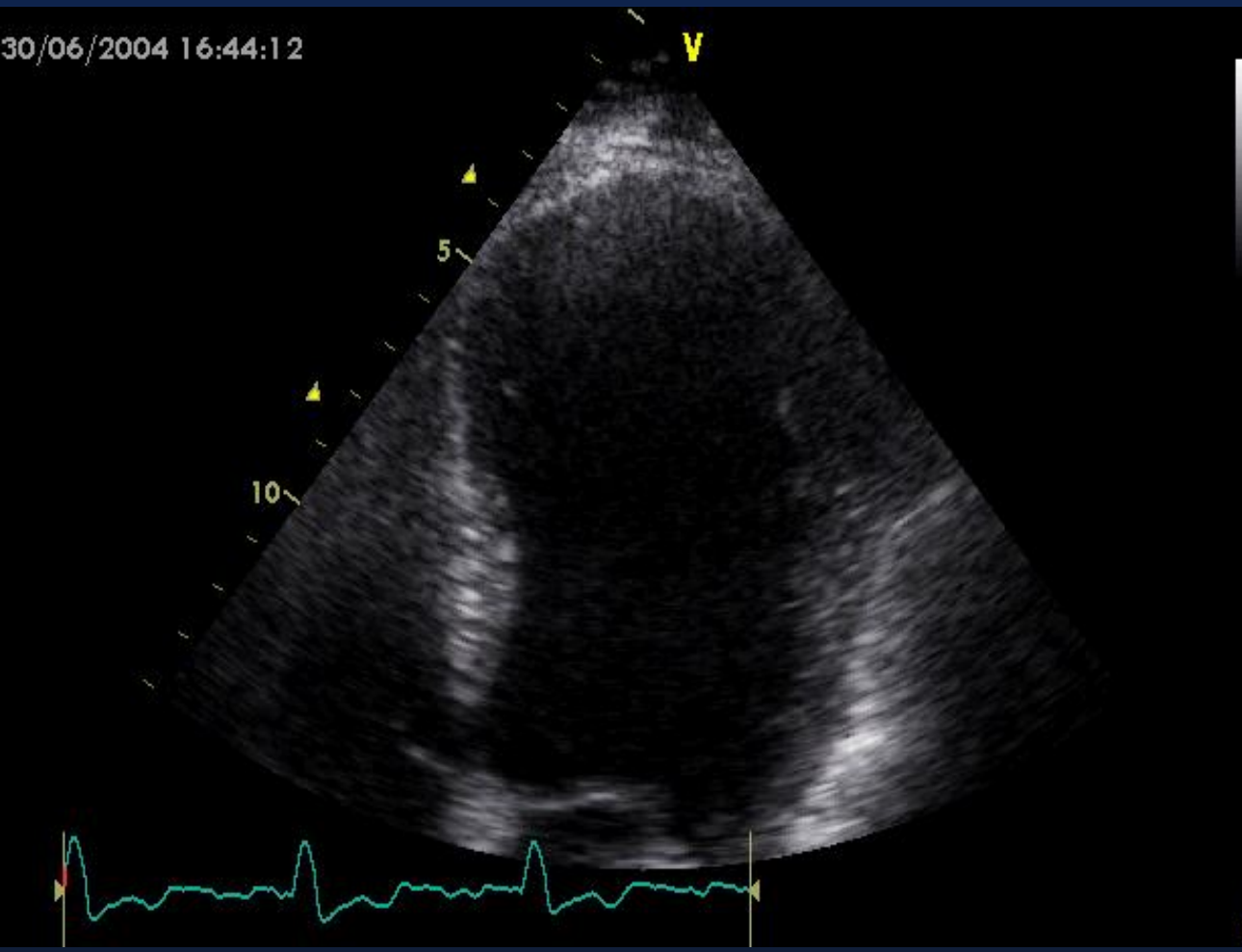

SYSTOLE
P1
LV
P2
LA
P1 - P2 = 4v2
P1 = 4v2 + P2
RVSP = 4v2 + PRA
v - Peak velocity of TR jet
PRA = Jugular venous pulse

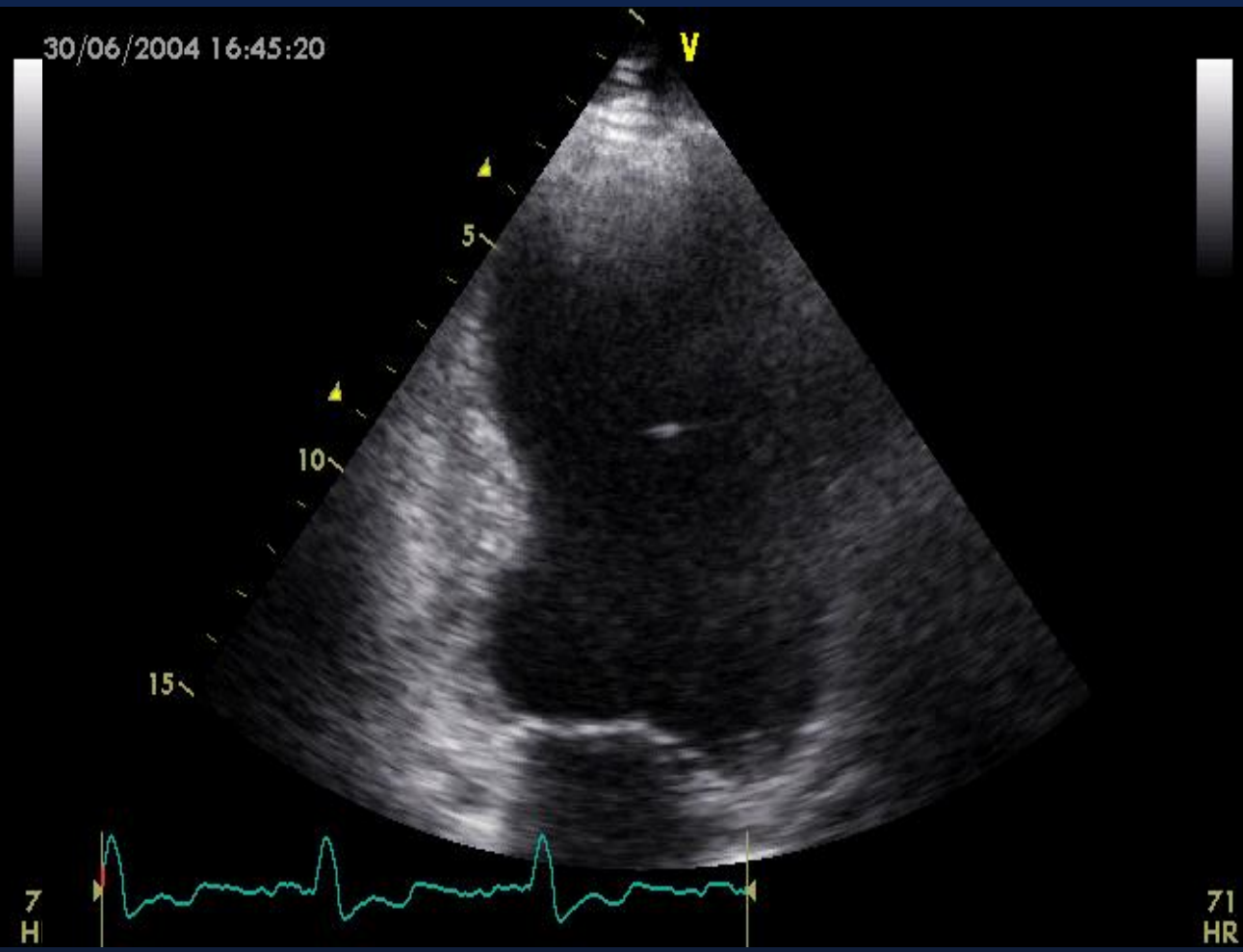

TRV = 2.8 m/s
TR Vmax
Vmax 277 cm/s
Max PG 31 mmHg
TR Vmax
Vmax 280 cm/s
Max PG 31 mmHg
+61.6
-61.6
cm/s
100
cm/s
-100
-200
-300
100mm/s
66bpm


Proj. przymostkowa w osi krótkiej (segmenty podstawne)
Proj. przymostkowa w osi krótkiej (segmenty środkowe)
RV
LV
1
2
3
4
5
6
7
8
9
10
11
12
Ściana przednia
Przednia przegroda
Ściana (przednio-) boczna
Przegroda (dolna)
Ściana tylna (dolno-boczna)
Ściana dolna
13
14
15
16
RA
LA
Ao
Przegroda
Ściana dolna
Ściana przednia
Ściana tylna (dolno-boczna)
Przegroda przednia
Proj. koniuszkowa 4-jamowa
Proj. koniuszkowa 2-jamowa
Proj. przymostkowa w osi długiej
LAD
RCA
Cx

1

Strassen Diagnose



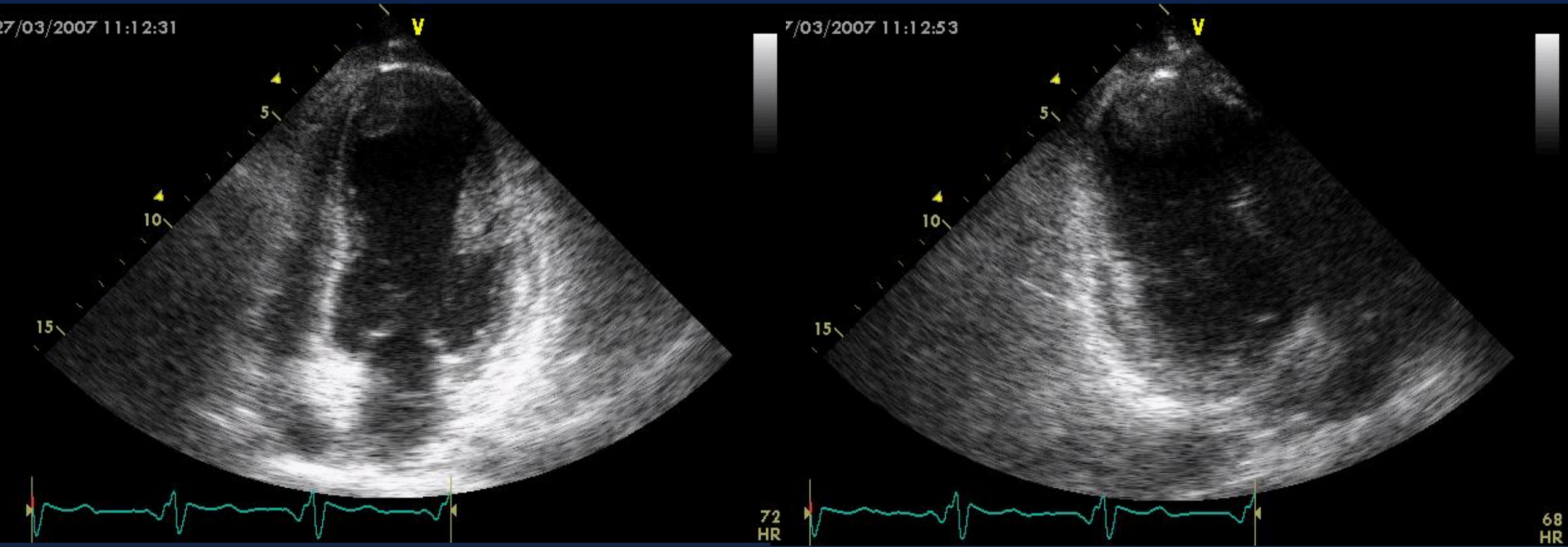


Zawał serca ściany przedniej

2

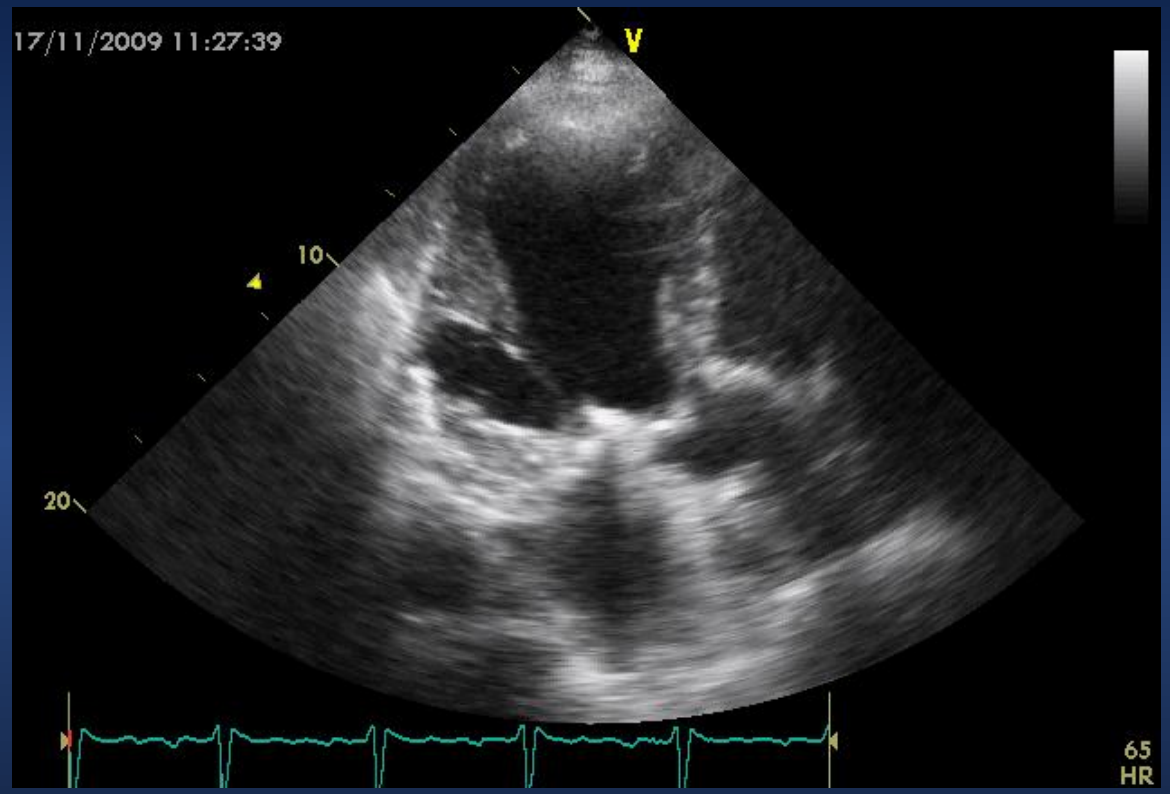
Zawał serca ściany dolnej

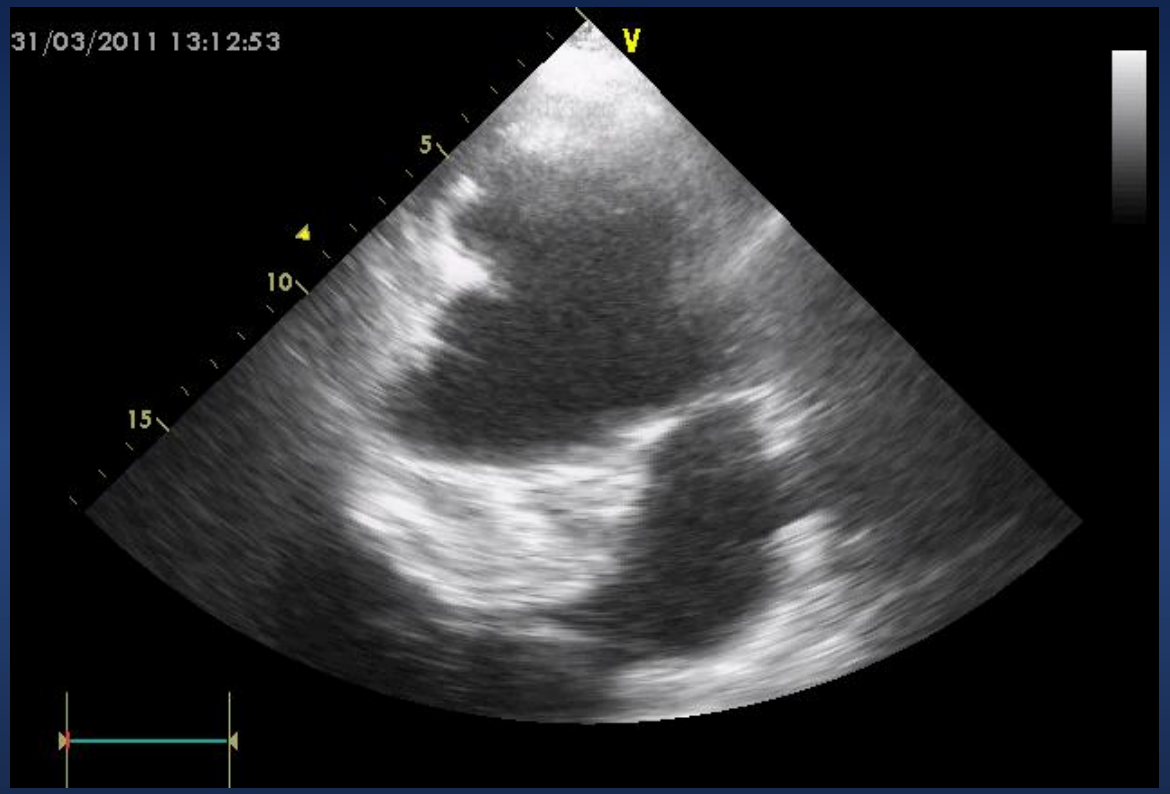
3



Skrzeplina w tętniaku koniuszka

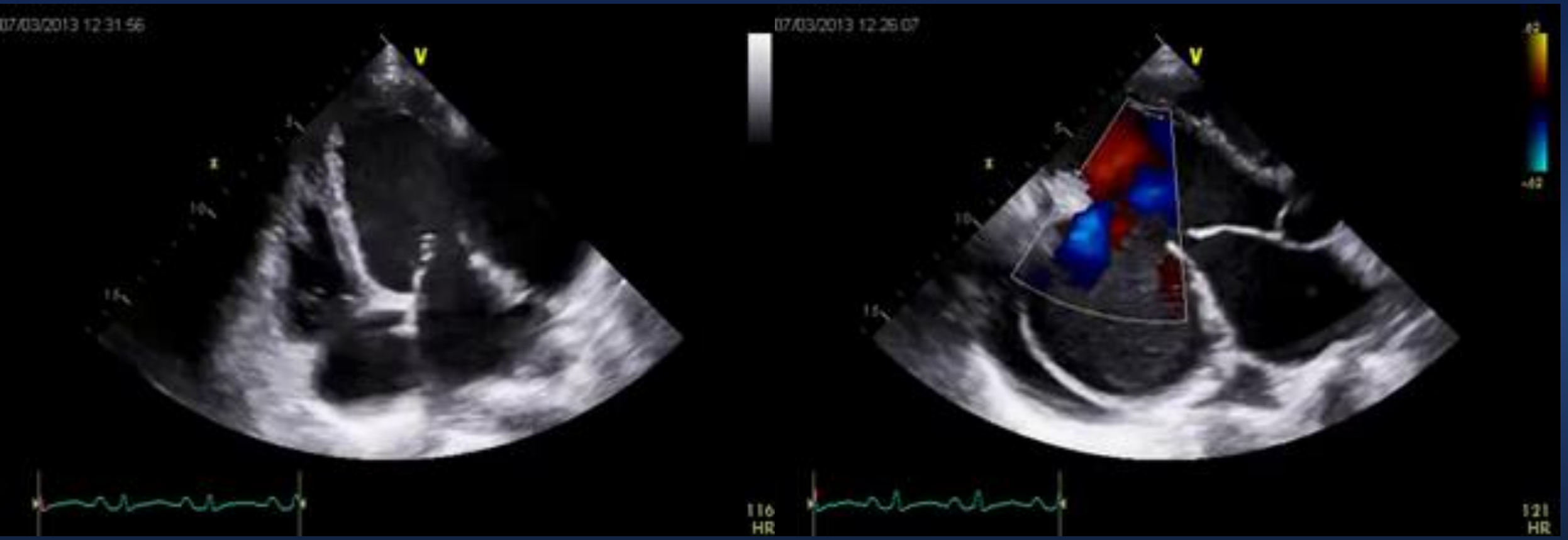
4





Skrzeplina w tętniaku segmentu podstawnego ściany tylnej

5



Tętniak rzekomy lewej komory

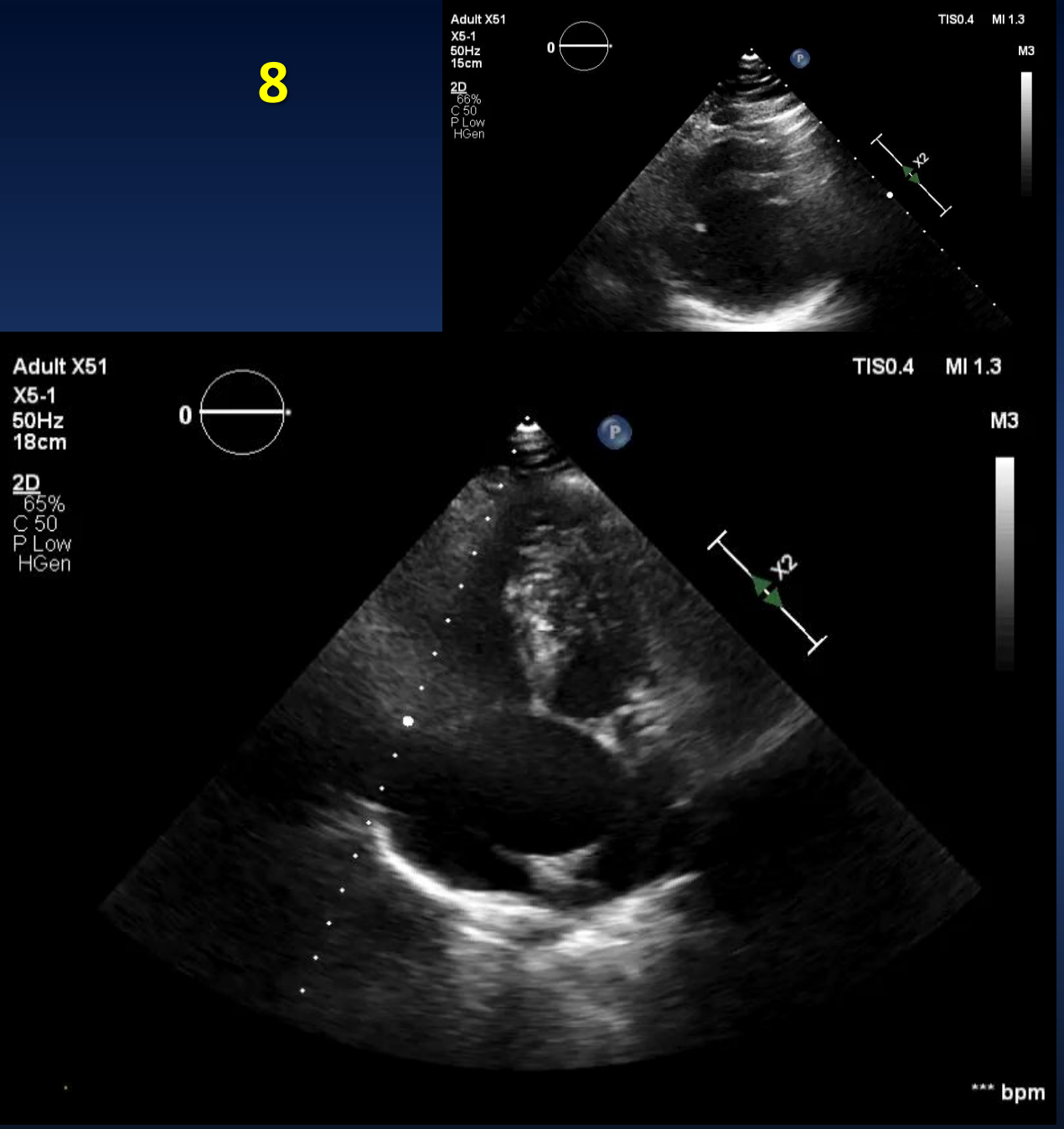
6

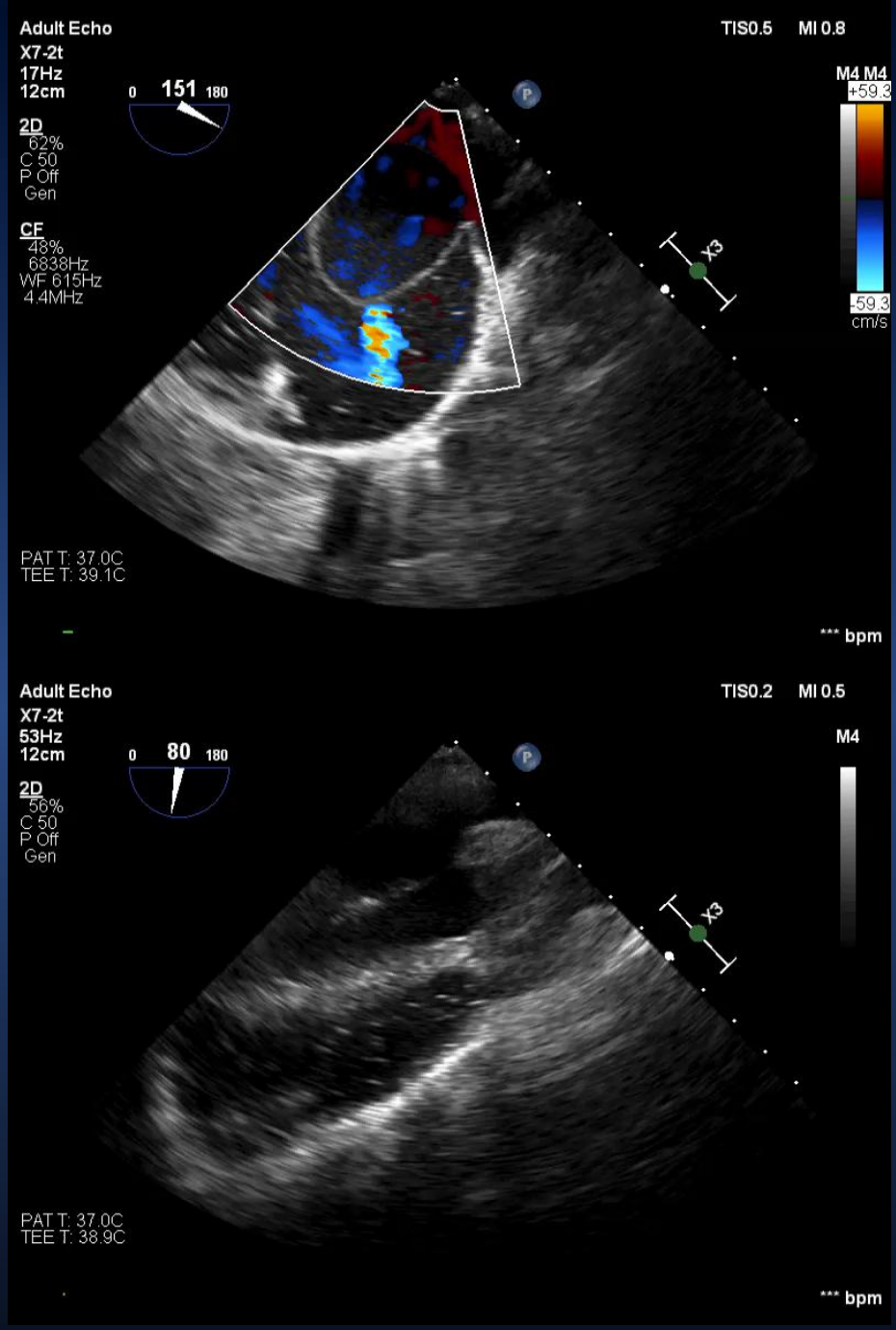
Ubytek w przegrodzie międzykomorowej

7

IZW

8

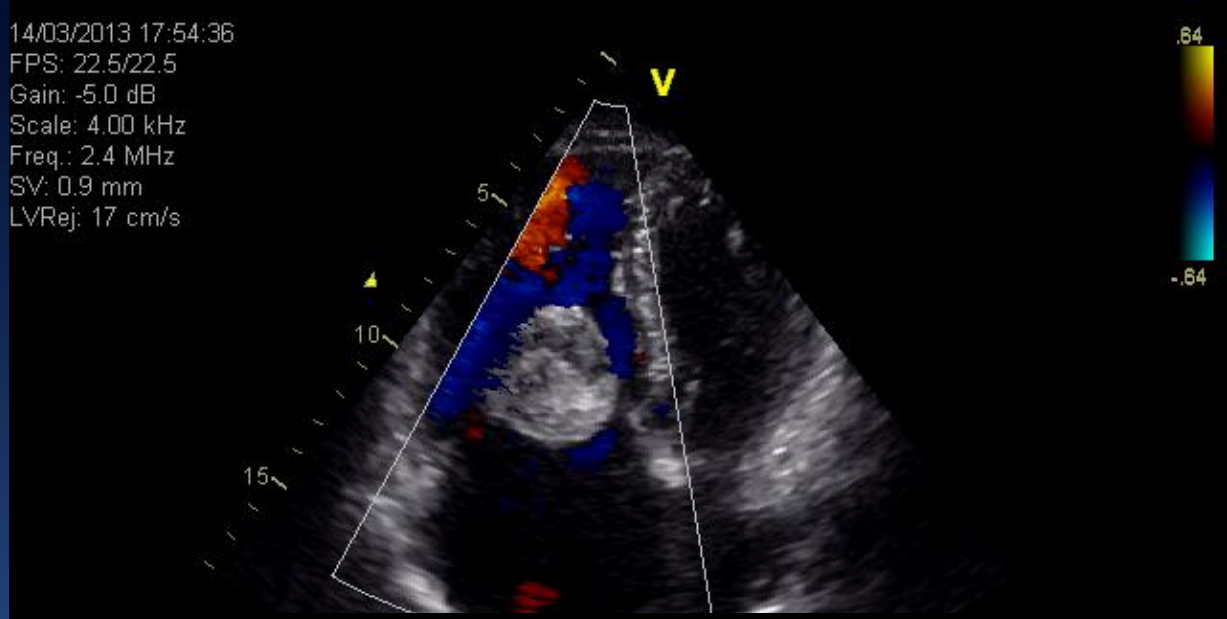


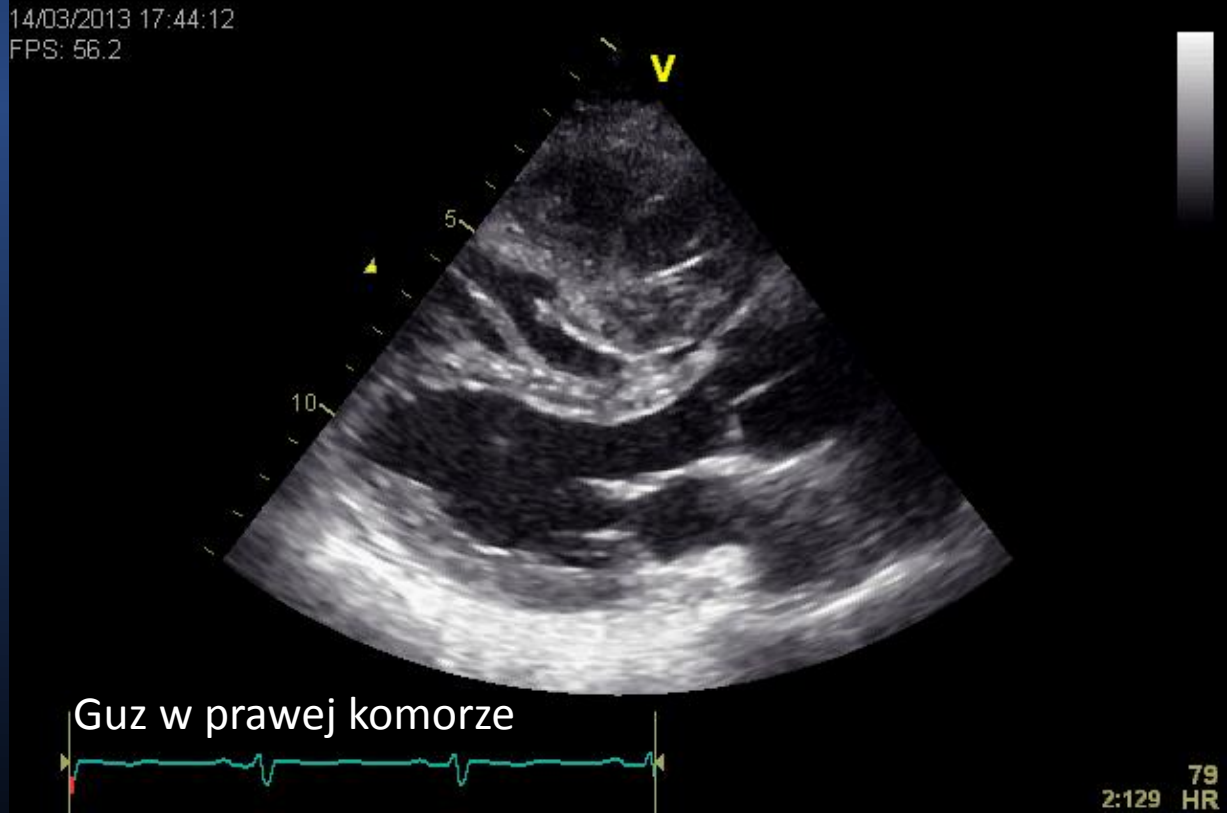


Pękający tętniak opuszki aorty

9,10

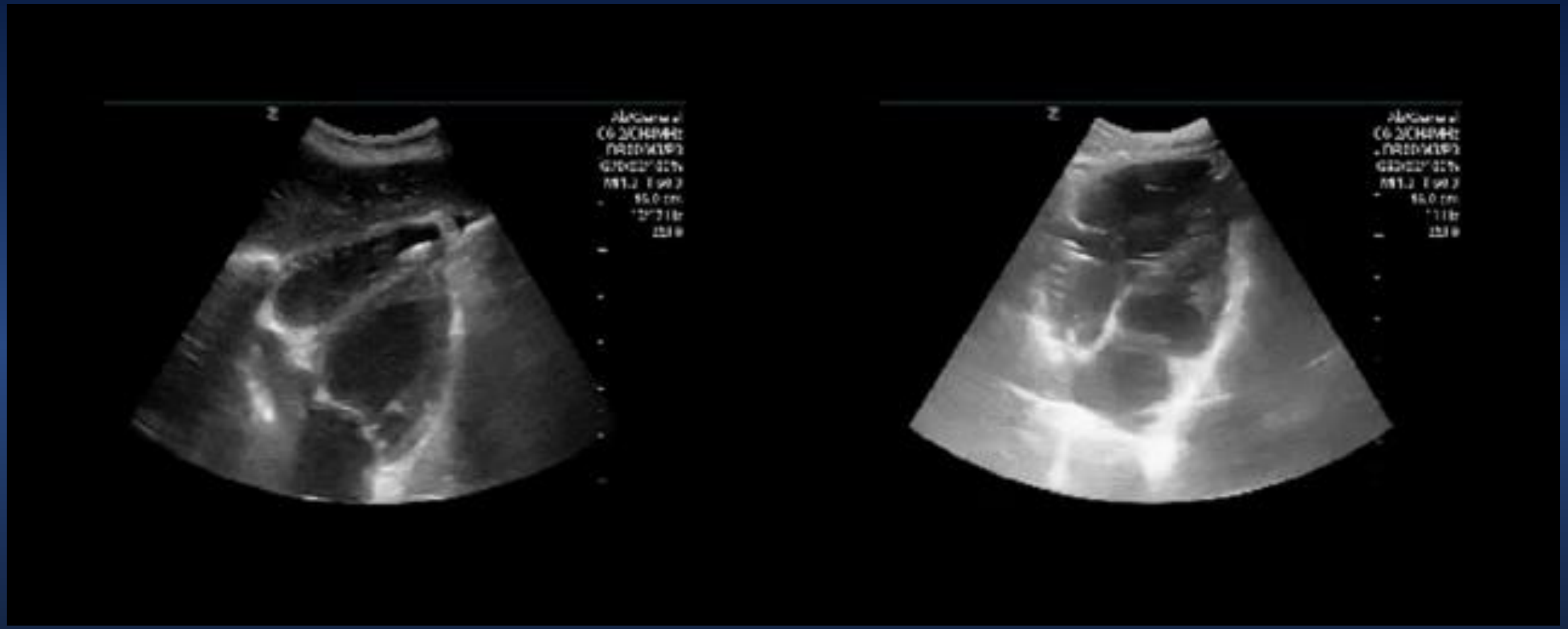
Guz w lewym przedsionku





Guz w prawej komorze

11



VT/Masaż pośredni

VF

12

„umierające serce”

Goya Francisco
Autoportret z doktorem Arrietą,
1820, olej na płótnie,117 x 79 cm
Institute of Arts, Minneapolis