

Ehokardiogrāfija bērniem

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BKUS Bērnu kardioloģijas klīnika

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GUIDELINES AND STANDARDS

Recommendations for Quantification Methods During the Performance of a Pediatric Echocardiogram: A Report From the Pediatric Measurements Writing Group of the American Society of Echocardiography Pediatric and Congenital Heart Disease Council

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(J Am Soc Echocardiogr 2010;23:465-95.)

Keywords: Pediatric quantification, Measurements, Z scores, Normative database

Ehokardiogrāfija bērniem - vēsturiski

- **1877 g. Pierre Curie (18 gadu vecumā) kopā ar vecāko brāli atklāj pjezoelektrisko efektu kristāliem**
- **1912 g. pēc Titānika bojāejas – meklē metodi aizbergu identifikācijai- izmantojot pjezoelektrisko efektu**
- **1953 g. Lundā, Zviedrijā izmanto kardioloģiskai diagnostikai**
- **1973 g. ASV izmanto VCC diagnostikai**

INDIKĀCIJAS EHOKARDIOGRĀFIJAI

- Kardiovaskulāras mazspējas simptomi
- Cianoze
- Respirators distress
- Troksnis
- Kardiomegālija
- Slodzes inducētas sāpes krūškurvī, sinkope

Indikācijas ehokardiogrāfijai

- Sirds ritma traucējumi
- Disembriogēnētiskas stigmatas
- Arteriāla hipertenzija
- VCC ģimenē
- Pēkšņa nāve ģimenē
- Kawasaki sindroms
- Sepsē
- Kardiotoksisku medikamentu lietošana
- u.c.

VCC-VITIUM CORDIS CONGENITUM

- Visbiežāk sastopamā iedzimtā anomālija
- 8-11‰ dzīvi dzimušo bērniem
(neskaitot PDA –priekšlaicīgi dzimušajiem) *
- 35 ‰ ieskaitot PDA –priekšlaicīgi dzimušajiem,
muskulārus VSD, divviru AoV**

- 1/3 nav nepieciešama ārstēšana
- 20% antenatāli mirušajiem
- 30% iemesls nāvei jaundzimušo vecumā

* A.Atzel et.all,2005

** J.Hofmann et all, 2006

2011. gadā

BKUS Bērnu kardioloģijas un kardiokirurģijas klīnikā
veiktas:

- 5724 ehokardiogrāfijas
- 984 augļa ehokardiogrāfijas

diagnosticētas:

- i/uterīni 78 patoloģijas
- postnatāli 168 patoloģijas

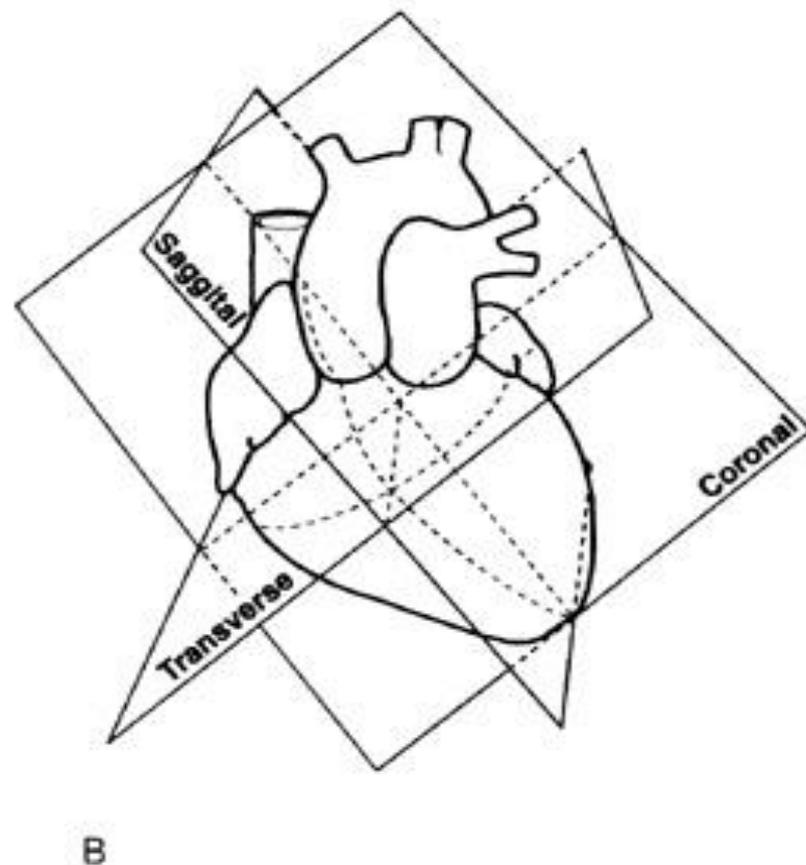
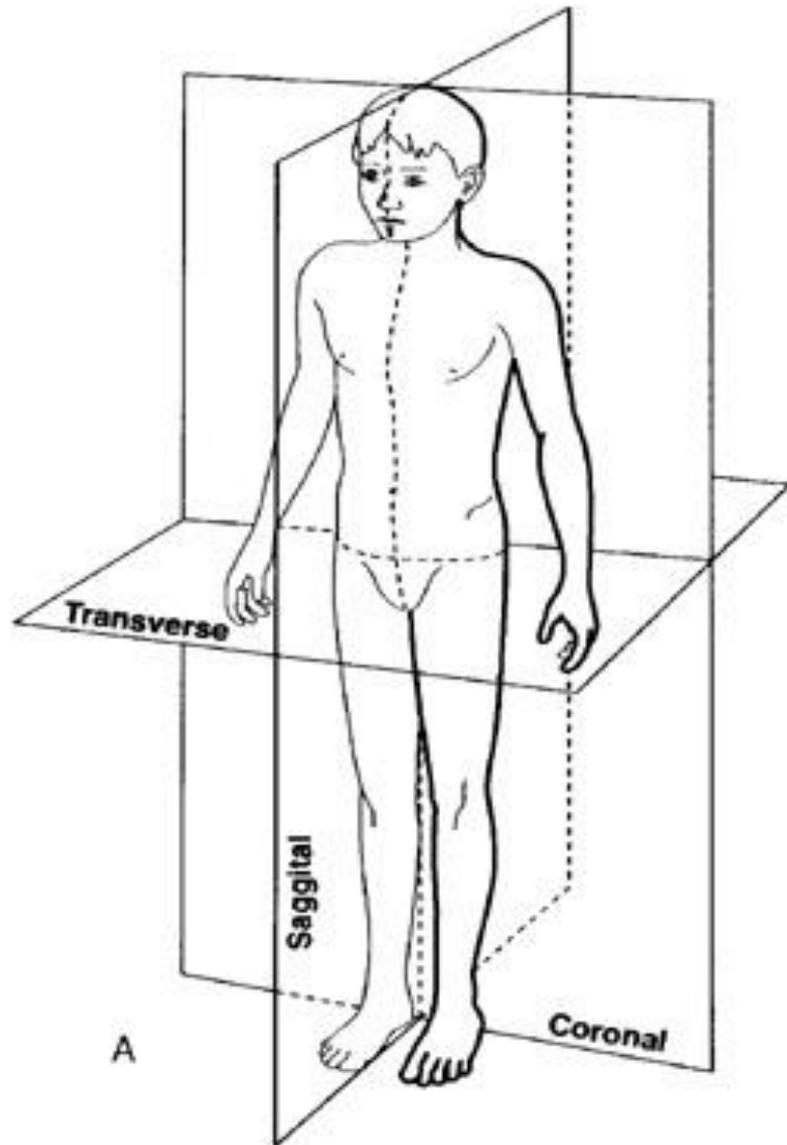
LV 18620 jaundzimušie

Ehokardiogrāfija bērniem

- 2D; M-režīms; PW, CW, krāsu *Doppler*
- Augstas frekvences transdžūseri neiznēsātiem un jaundzimušajiem
7,5- 12 MHz
- Zīdaiņiem –maziem bērniem 3-8 MHz
- Vide



Leonardo Da Vinci (15. gds.) 3 plaknes



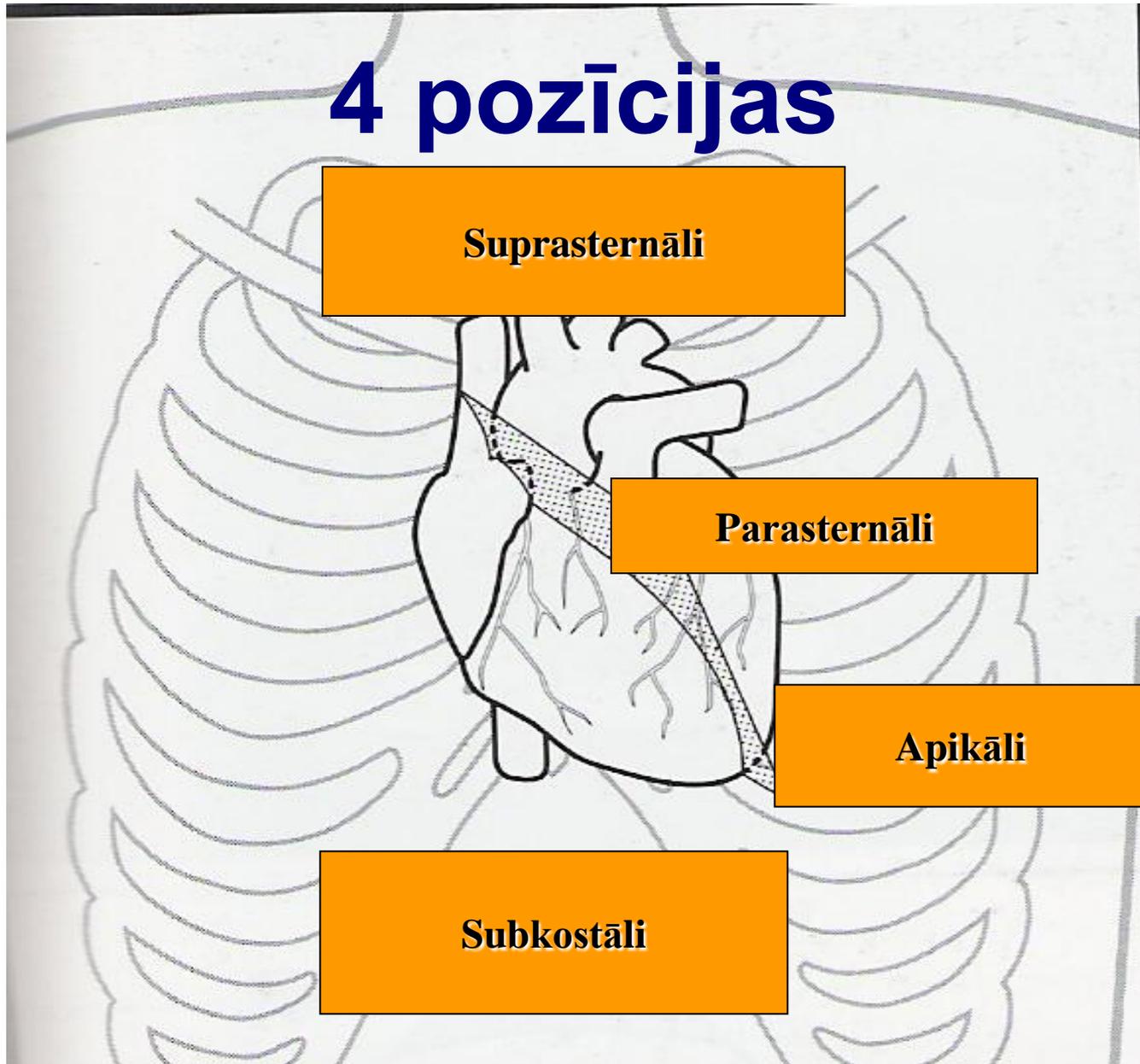
4 pozīcijas

Suprasternāli

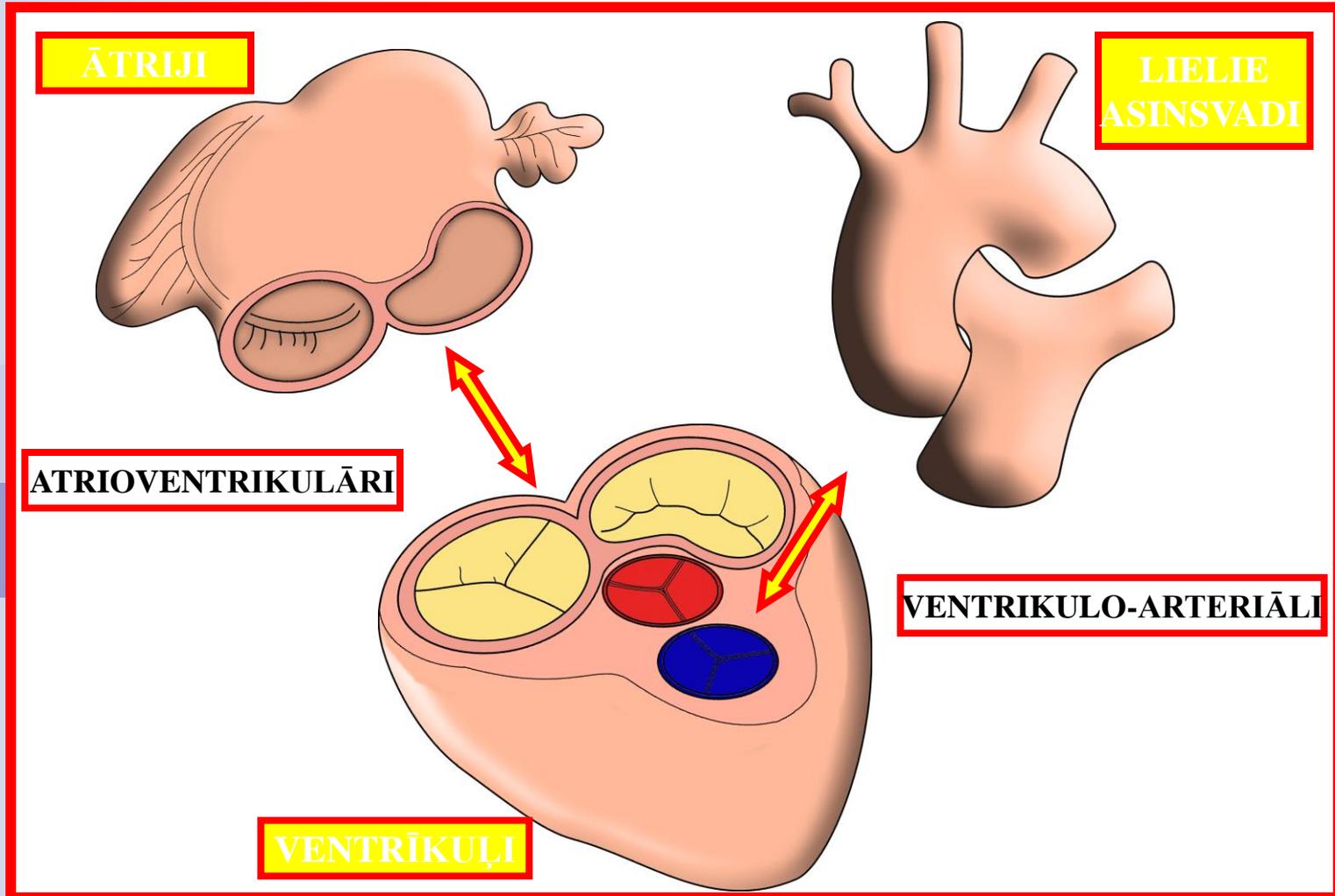
Parasternāli

Apikāli

Subkostāli



SECĪGA 3-SEGMENTU IZMEKLĒŠANA



SEGMENTU UN SAVIENOJUMU ANALĪZE

SECĪGA 3-SEGMENTU IZMEKLĒŠANA

■ SITUS

- SOLITUS

- INVERSUS

■ SIRDS NOVIETOJUMS

- LEVOKARDIJA

- MEZOKARDIJA

- DEKSTROKARDIJA

SECĪGA 3-SEGMENTU IZMEKLĒŠANA

ĀTRIJI

- SOLITUS
- INVERSUS
- BILATERĀLI LABAIS VAI KREISAIS

ATRIOVENTRIKULĀRS SAVIENOJUMS

- KONKORDANCE
- DISKORDANCE
- ATRĒZIJA
- DUBULTIEPLŪŠANA
- KOPĪGS

SECĪGA 3-SEGMENTU IZMEKLĒŠANA

VENTRIKUĻI

- Novietojums
- Trabēkulas
- AV vārstuļa piestiprinājums
- Izejas trakta virziens

VENTRIKULOARTERIĀLS SAVIENOJUMS

- Konkordance
- Diskordance
- Dubulta atiešana
- Vienīgās artērijas atiešana

SECĪGA 3-SEGMENTU IZMEKLĒŠANA

LIELIE ASINSVADI

- SOLITUS

- TRANSPONĒTI

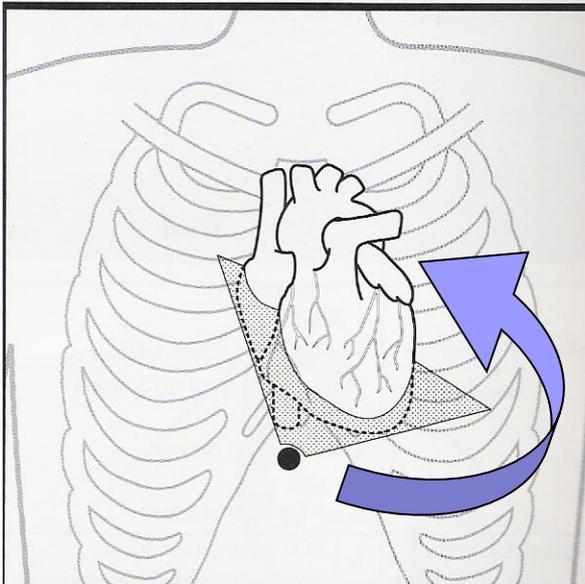
PA LABI UN PRIEKŠĀ
PA KREISI UN PRIEKŠĀ
TIEŠI PRIEKŠĀ
PARALĒLI

PĒC SECĪGAS SEGMENTU ANALĪZES

- Izvērtē starpsienu
- Vārstuļus
- Koronārās artērijas
- Endokardu
- Miokardu
- Perikardu
- **VEIC MĒRĪJUMUS:**

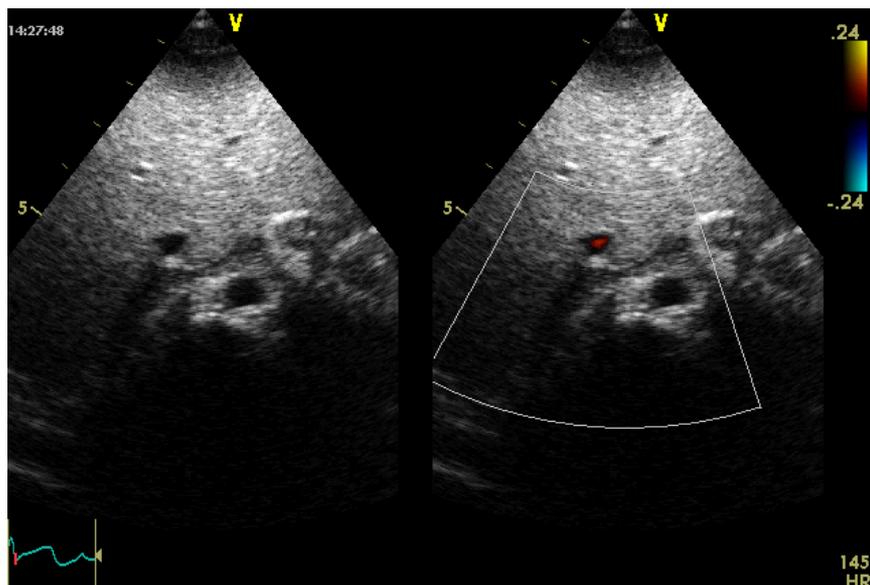
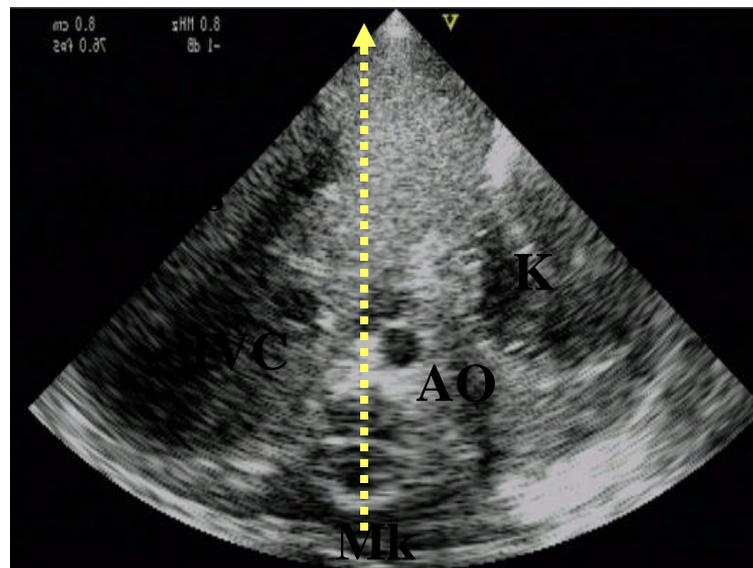
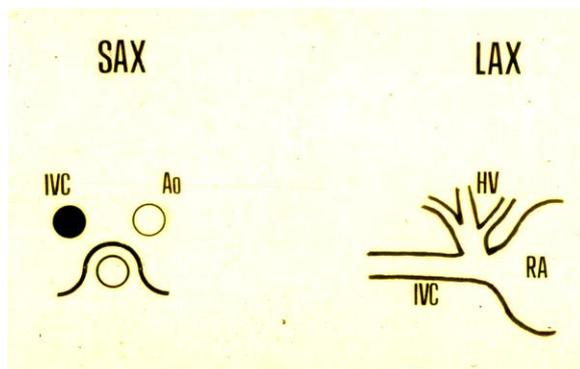
M-režīmā, PW, CW, krāsu Doppler režīmos

Subkostālā pozīcija

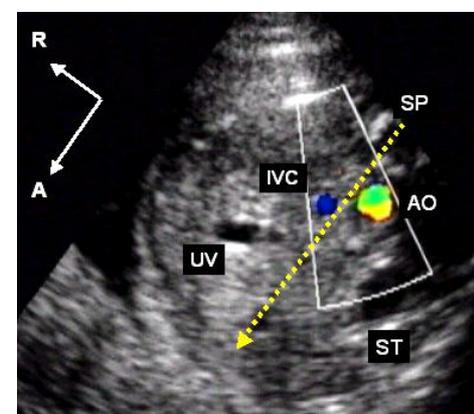


- Situs
- Novietojums
- Vēnu drenāža
- Ātriji
- AV savienojums
- Ventrīkuļi
- VA savienojums

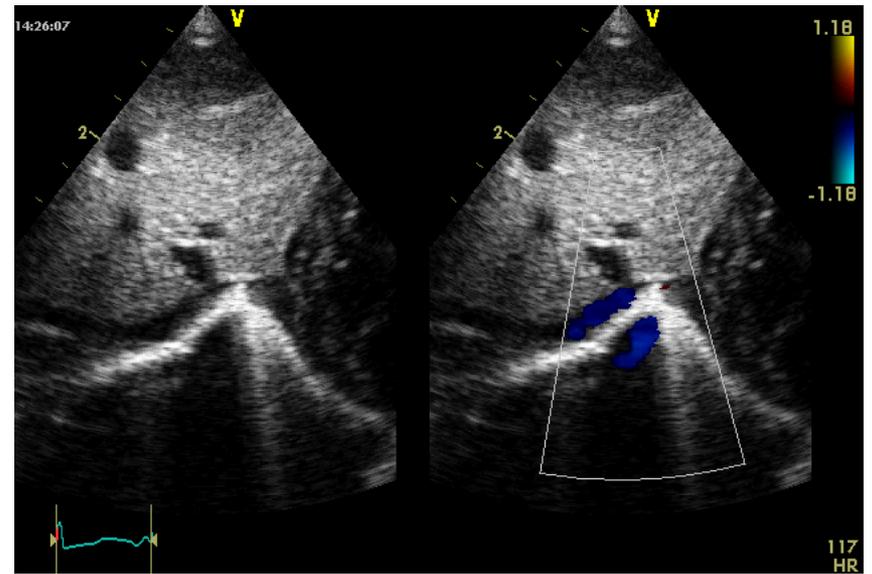
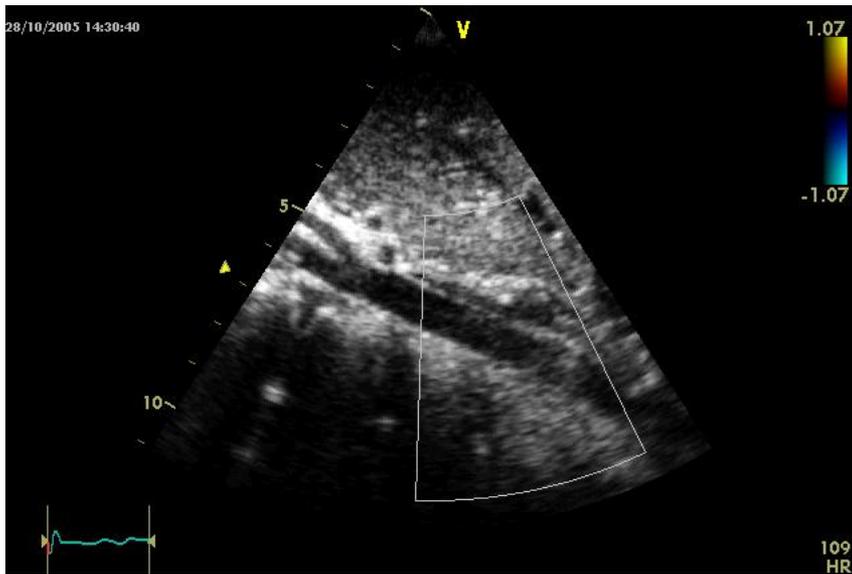
Subkostāla poz. abdomināli transverss skats



Auglis 21 g.ned



Subkostāla poz. abdomināli sagitāls skats



Sirds novietojums

Levokardija

galotne pa kreisi-Normas variants

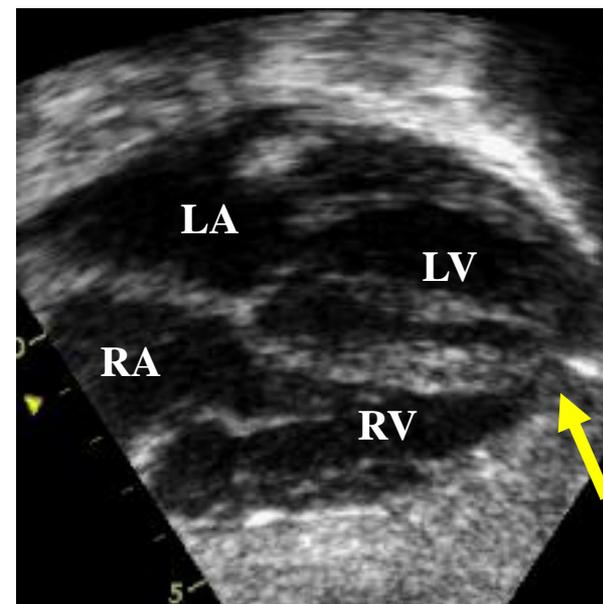
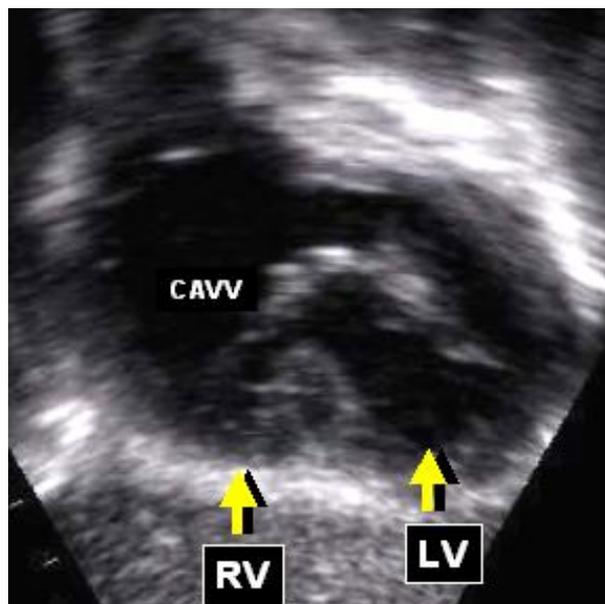
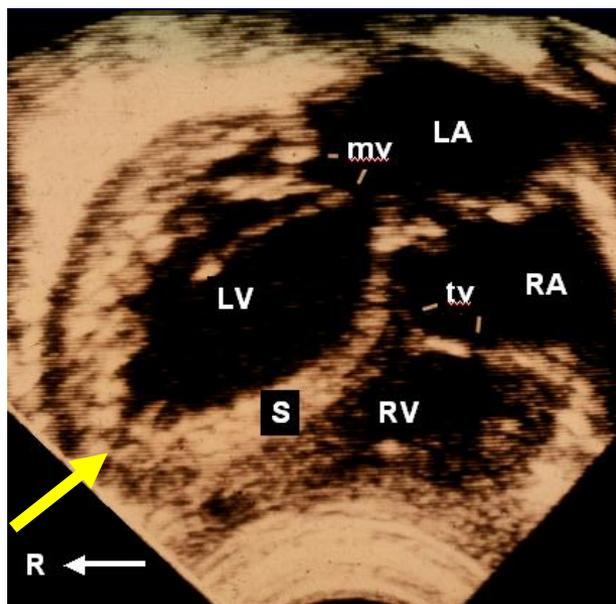
galotne pa labi- dekstroversija

Mezokardija

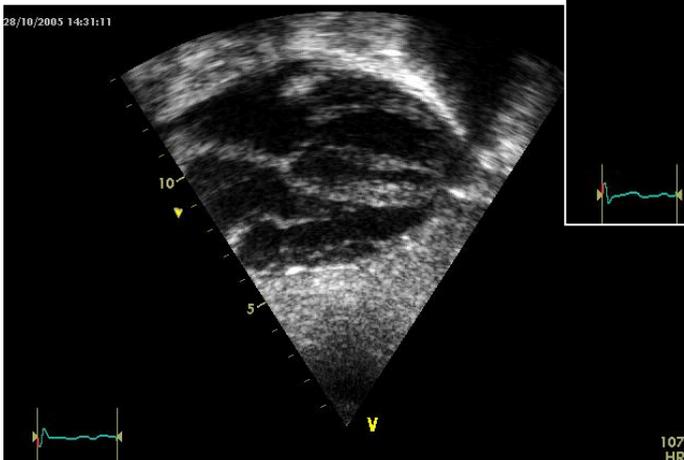
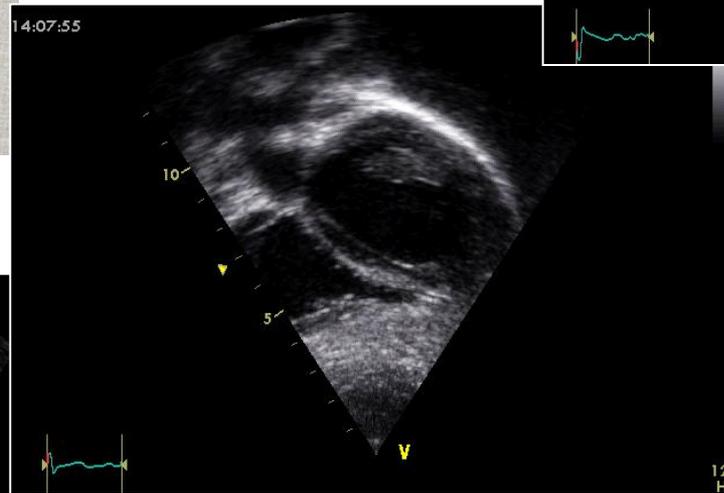
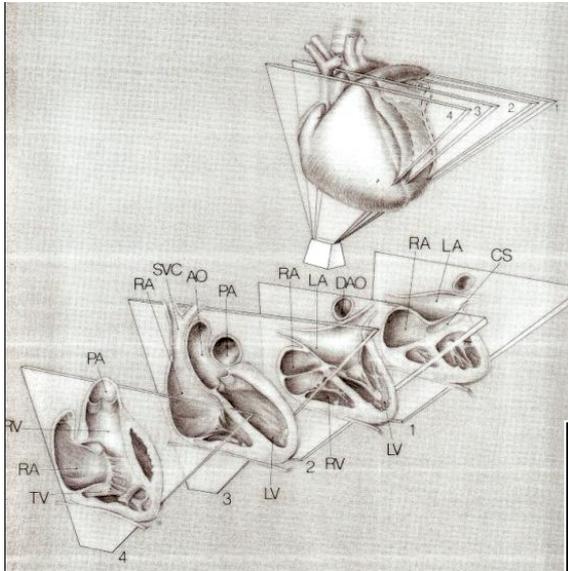
Dekstrokardija

galotne pa labi – spoguļattēls

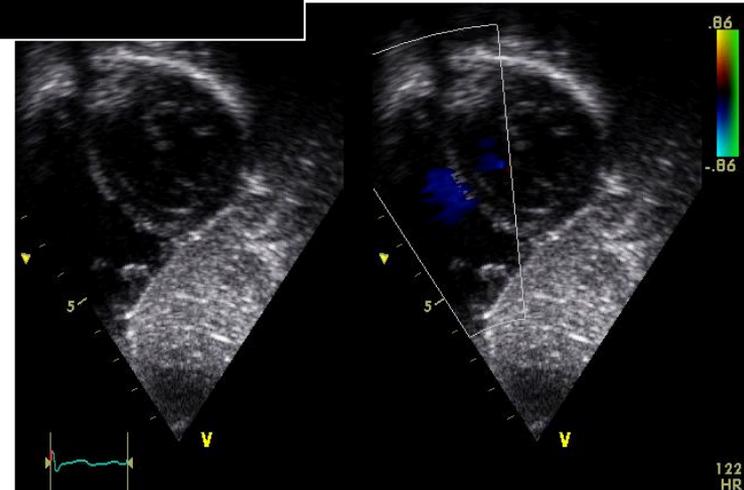
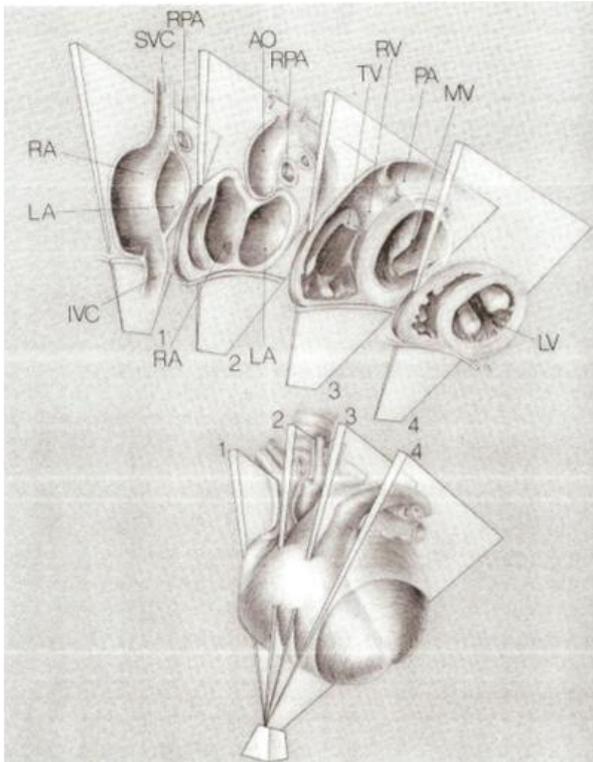
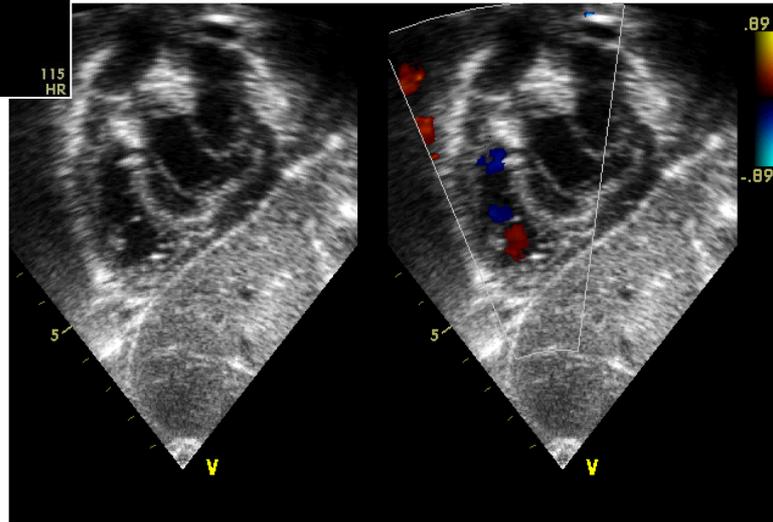
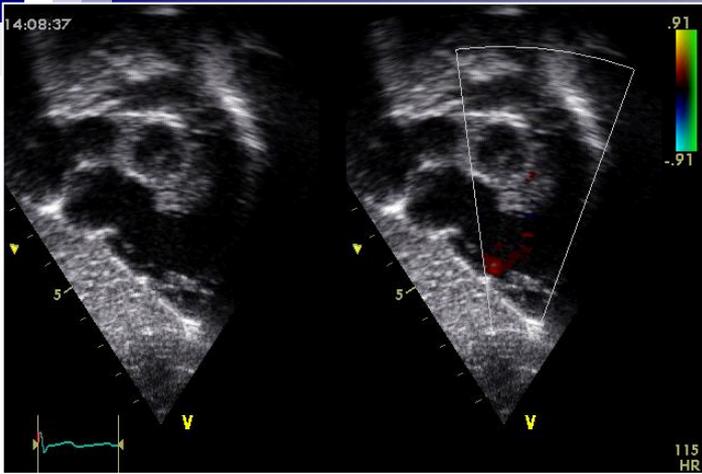
galotne pa kreisi-dekstropozīcija



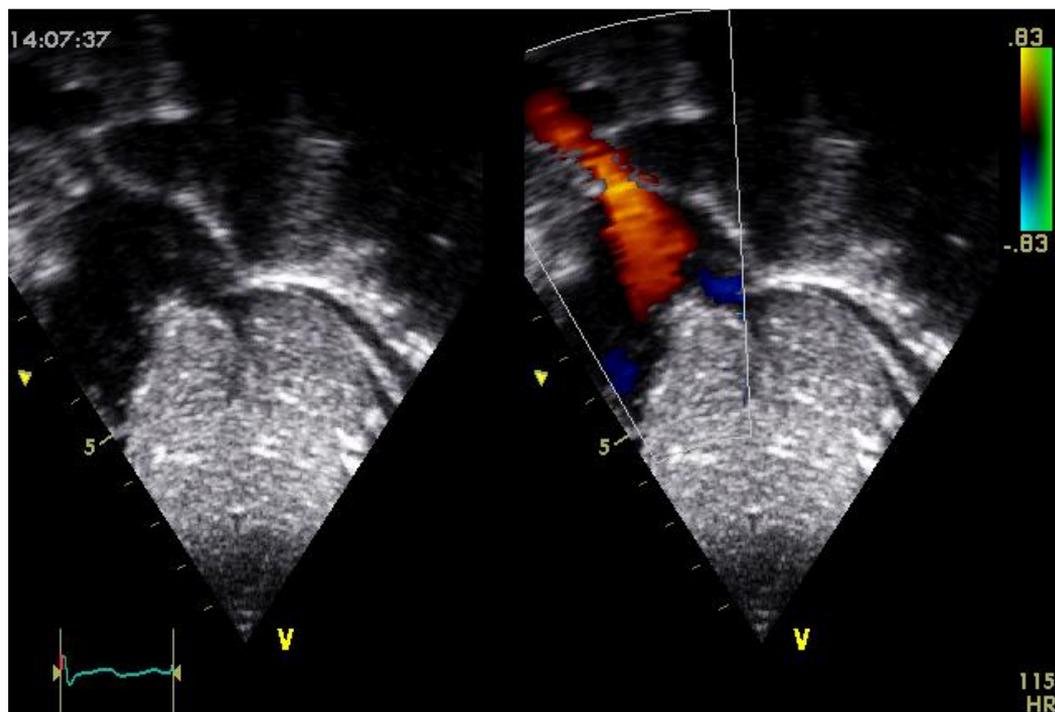
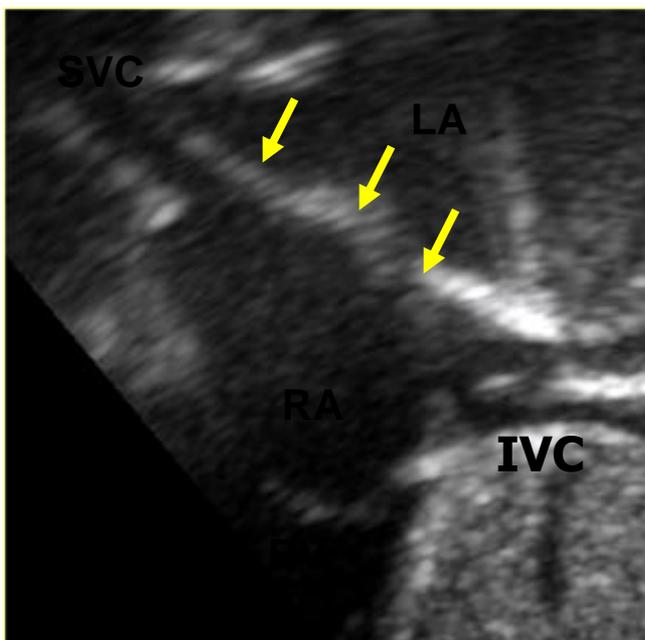
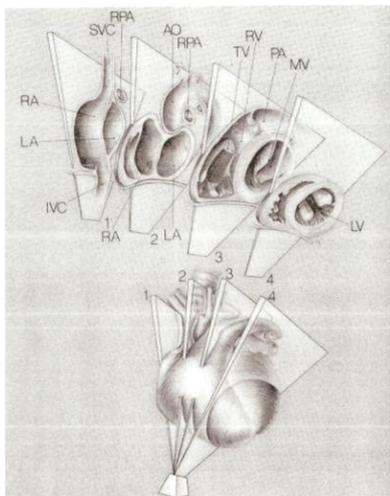
Subkostāla poz. 4-kameru skats



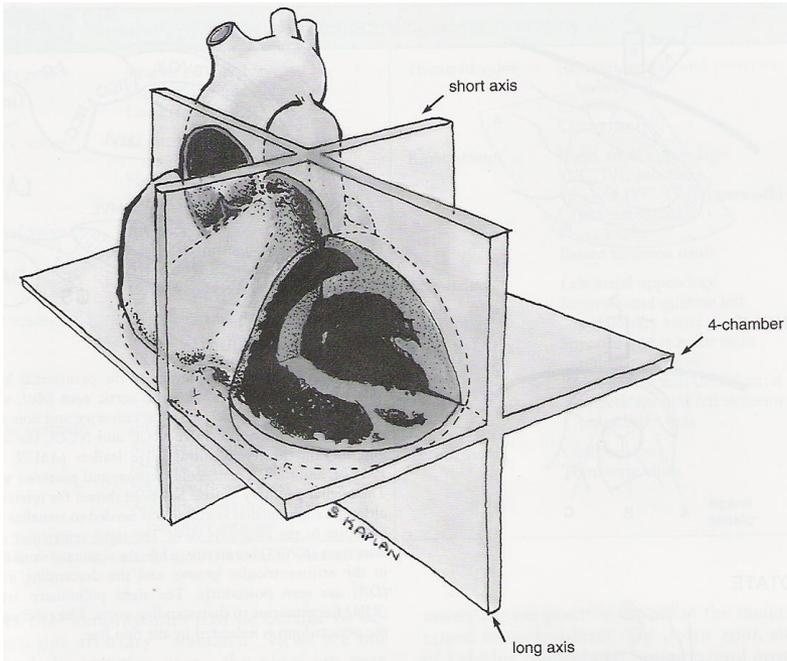
Subkostāla poz. sagitāls skats (īsās asis)



Subkostāla pozīcija sagitāls skats



Apikālā pozīcija



- 4- kameru skats
CS, 4 un 5 kameras

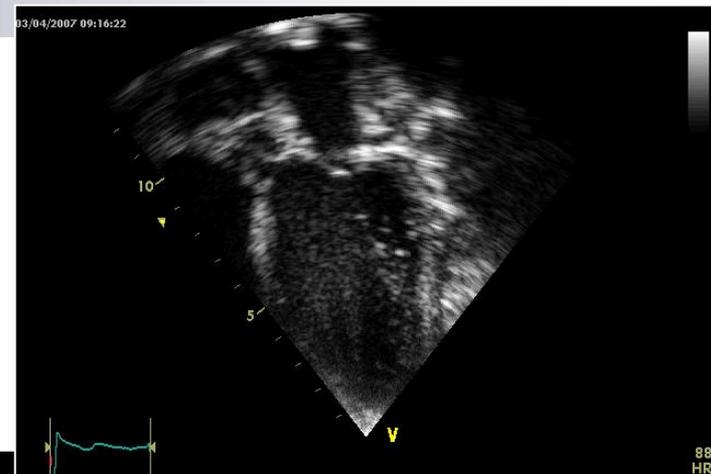
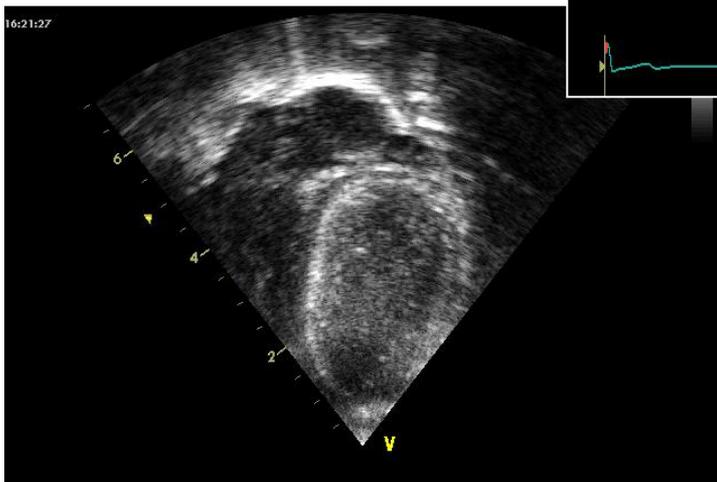
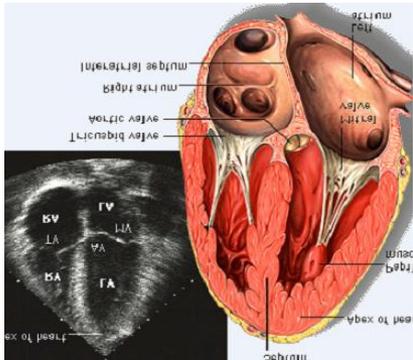
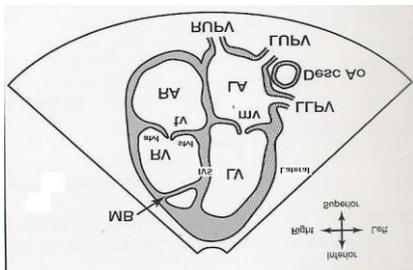
- Īsās ass skats

Apex, MV, AO, PA

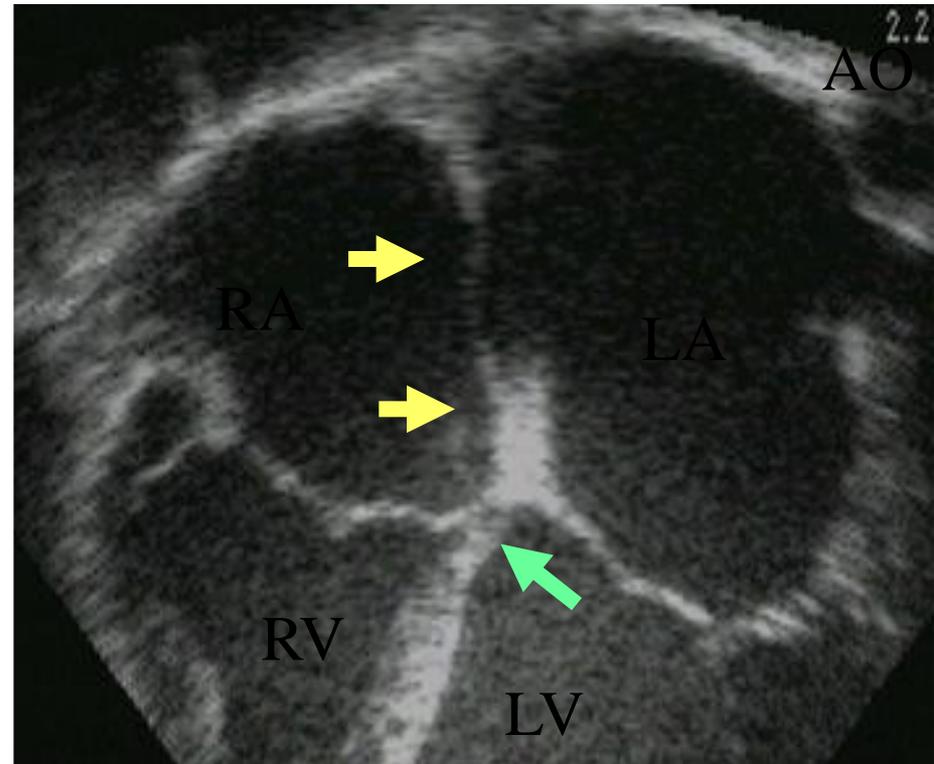
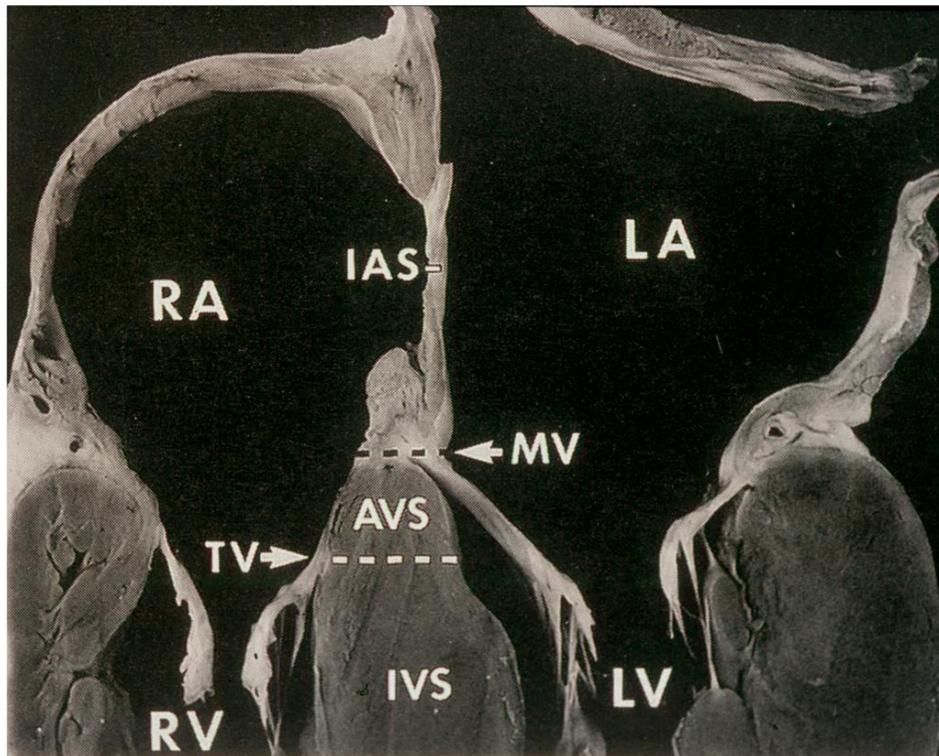
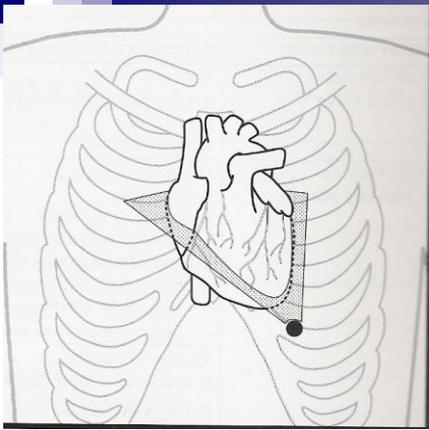
- Garās ass skats

labā un kreisā ventrikuļa
ieplūde un izplūde

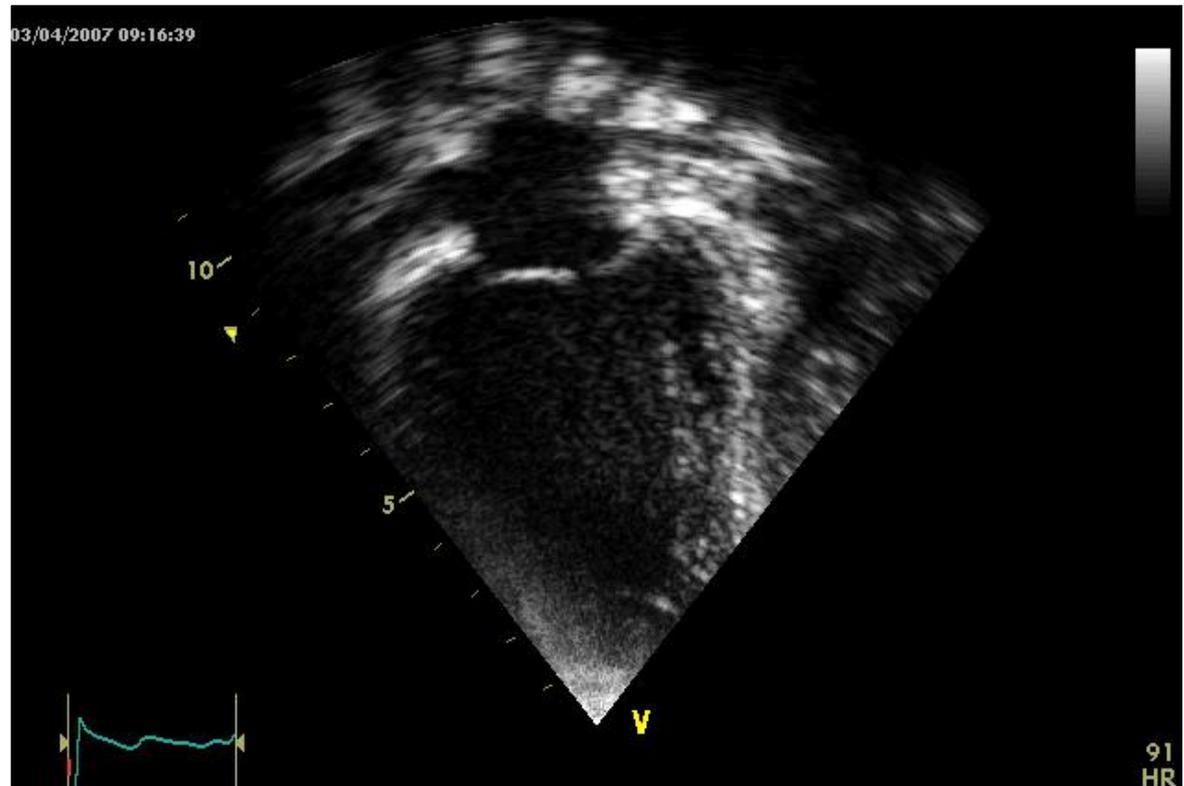
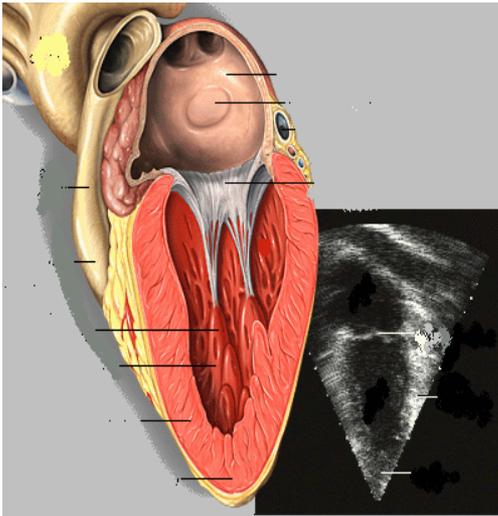
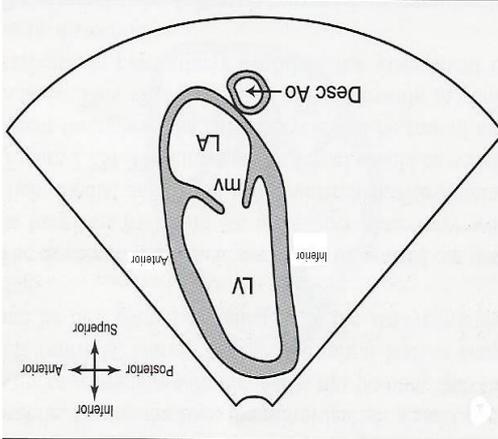
Apikālā pozīcija



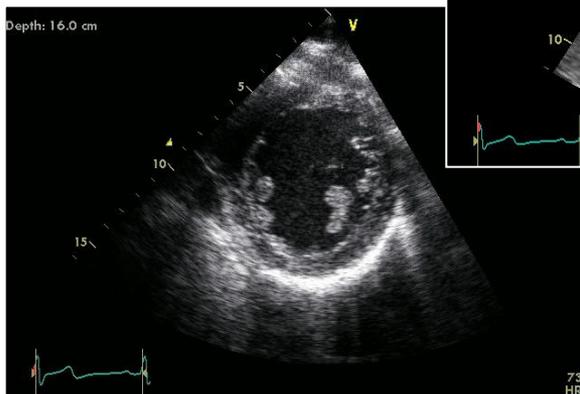
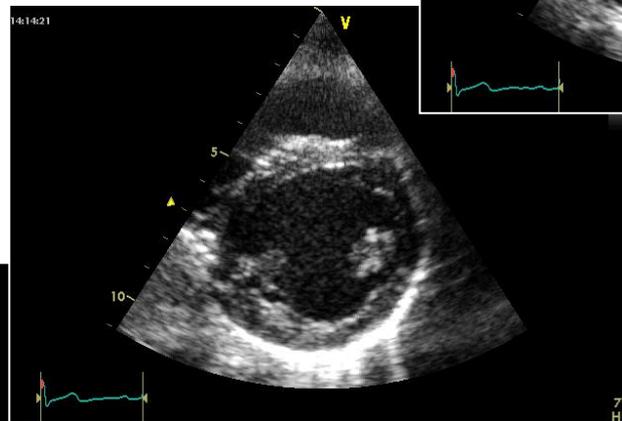
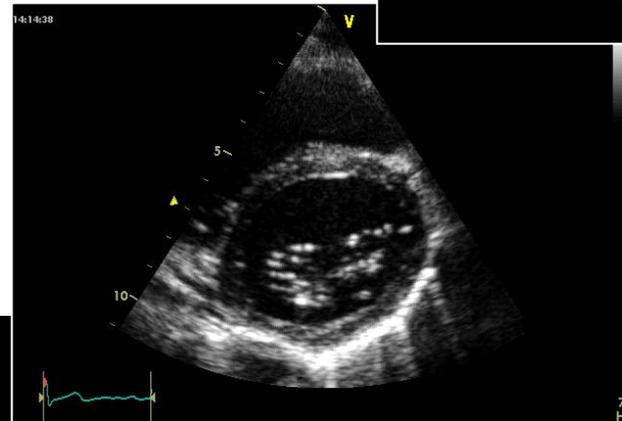
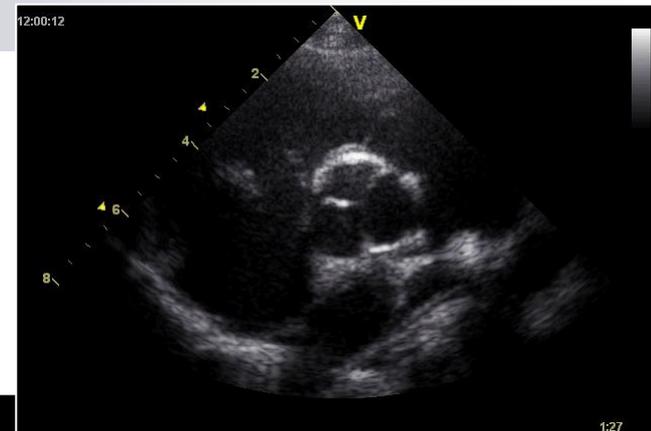
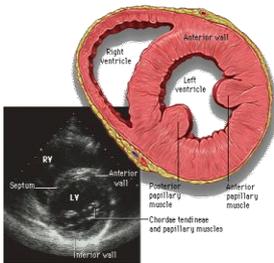
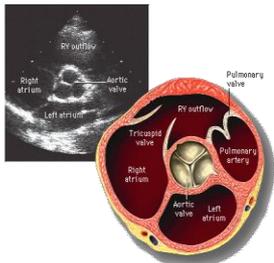
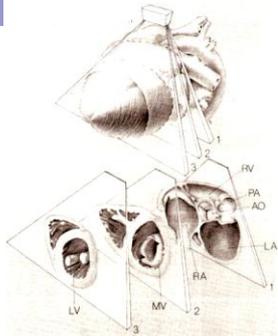
Apikālā pozīcija



Apikālā pozīcija Mitrālais vārstulis

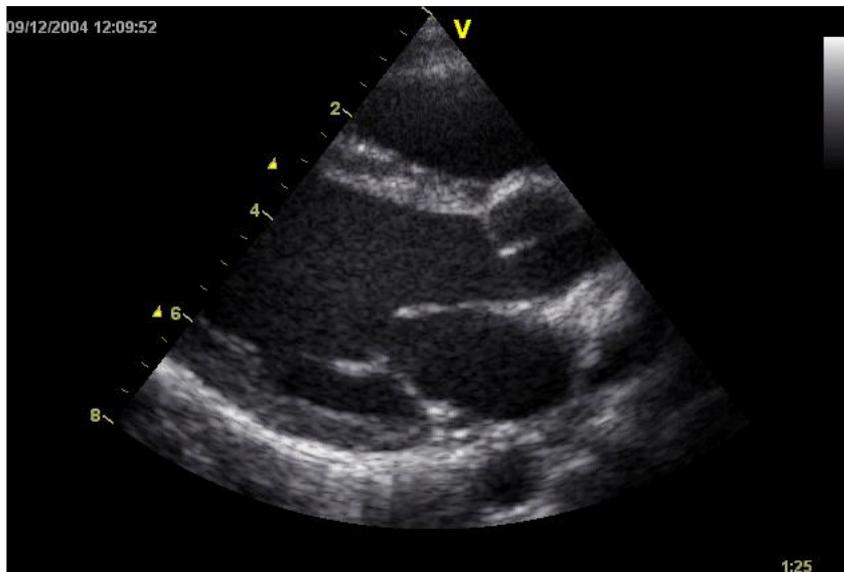
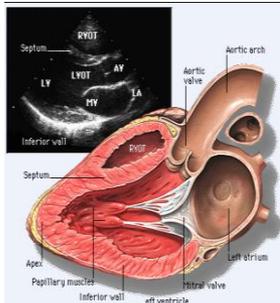
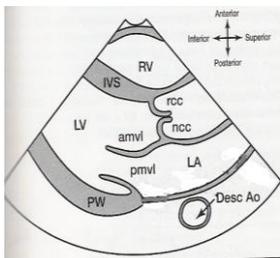
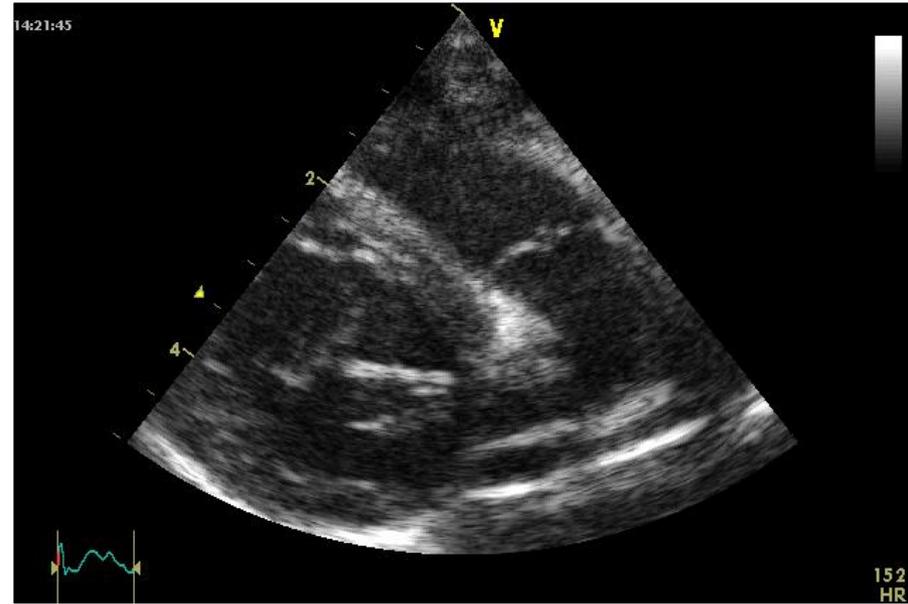
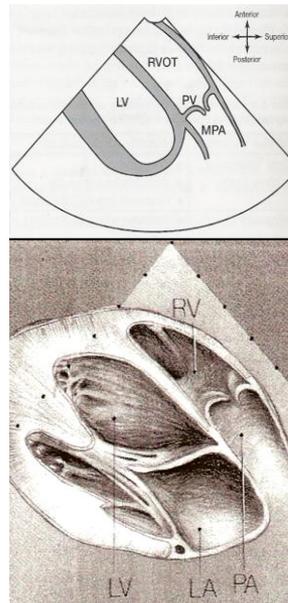


Parasternālā poz. Īsā ass



Parasternālā pozīcija Garā ass

Lb. ventr. izeja

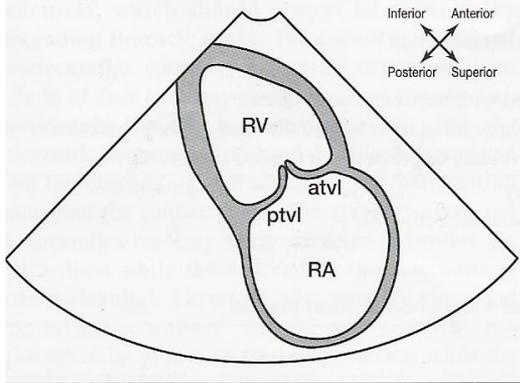
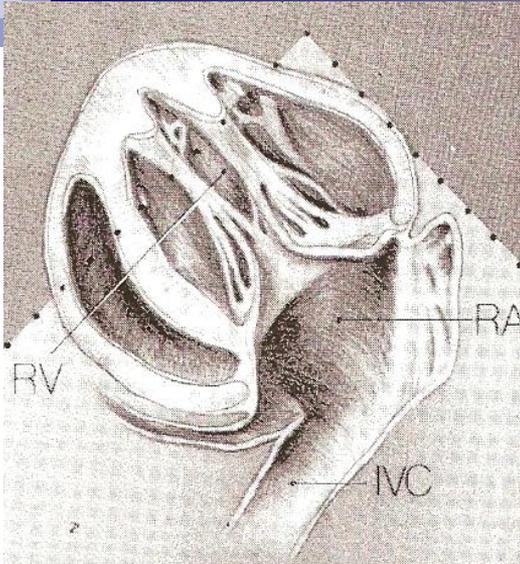


Kr. ventr. izeja

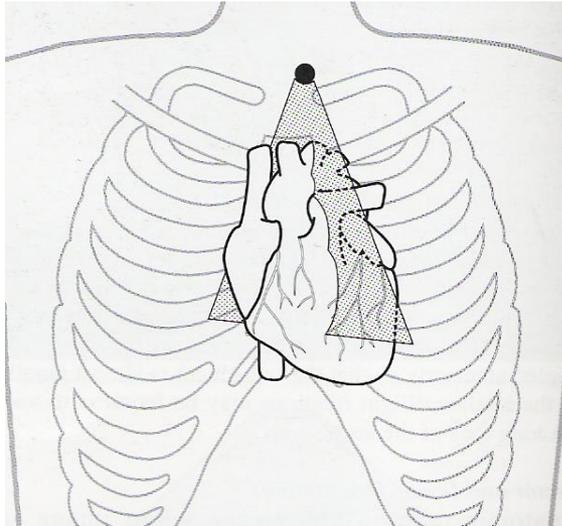


Parasternālā pozīcija

Trikuspidālais vārstulis



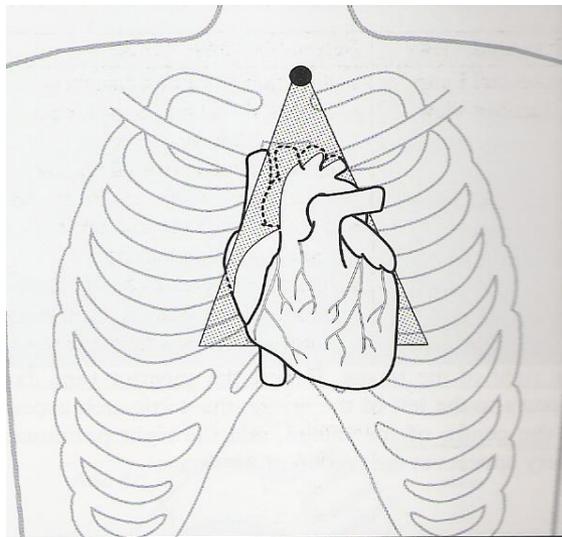
Suprasternāla pozīcija



• Koronārs skats (īsās ass)

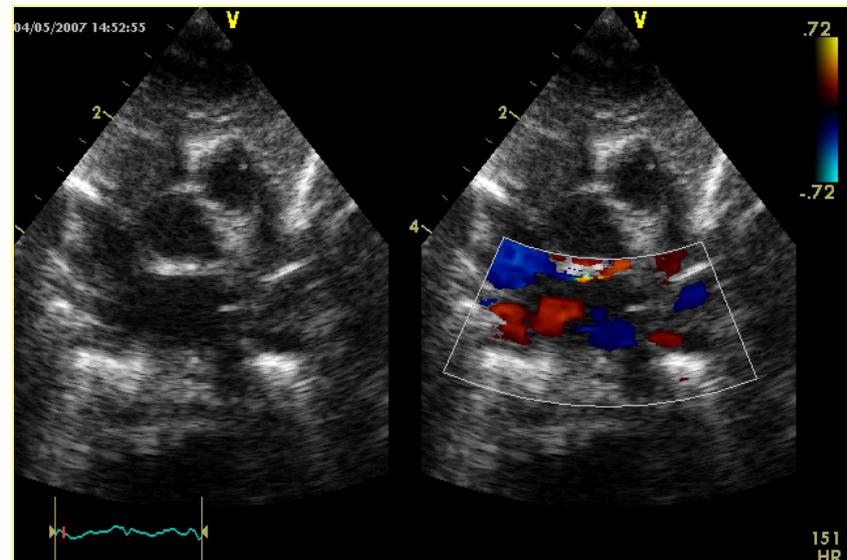
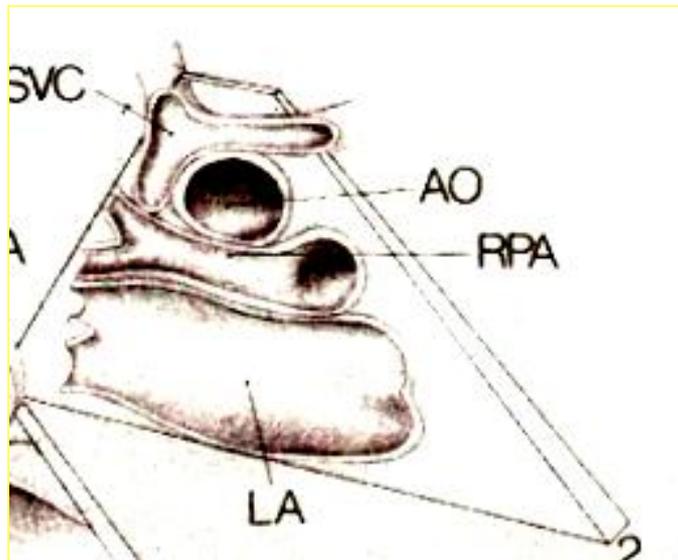
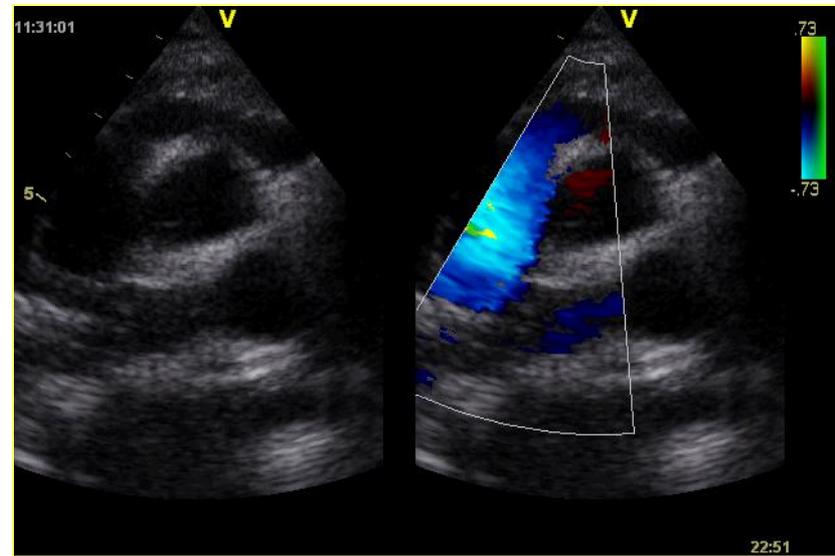
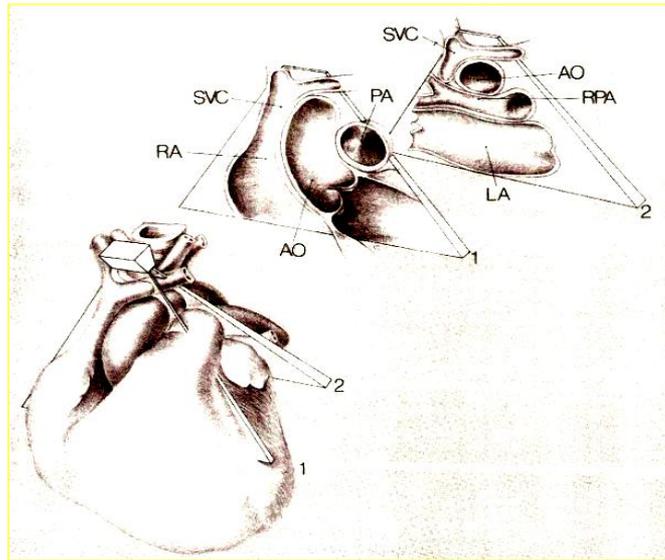
- lb. PA
- SVC
- plaušu vēnas

• Aortas loka skats (garā ass)

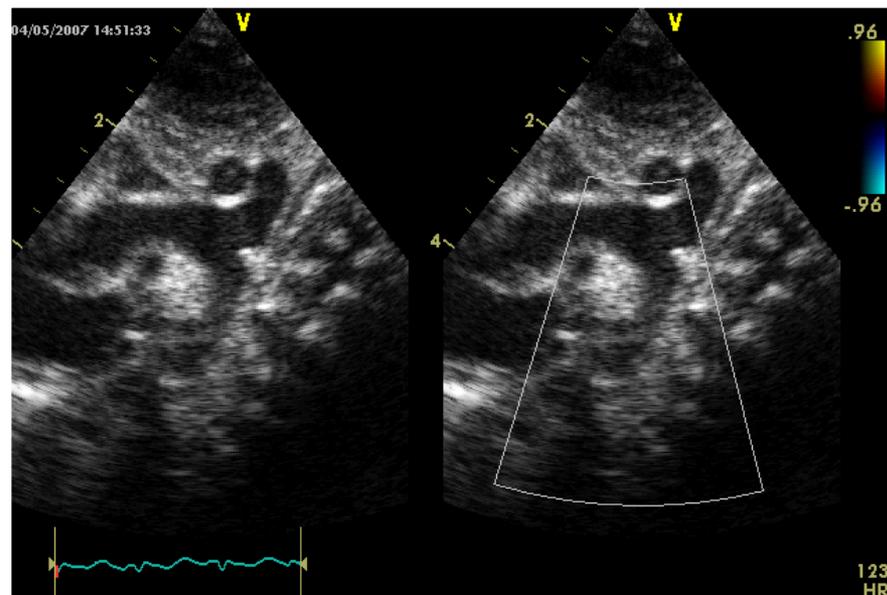
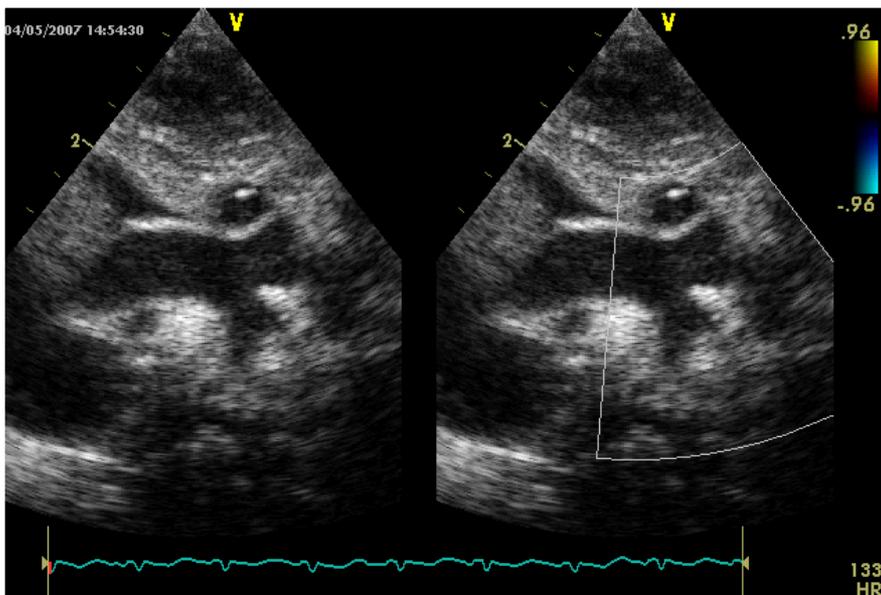
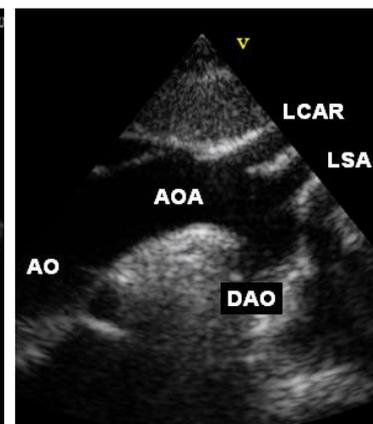
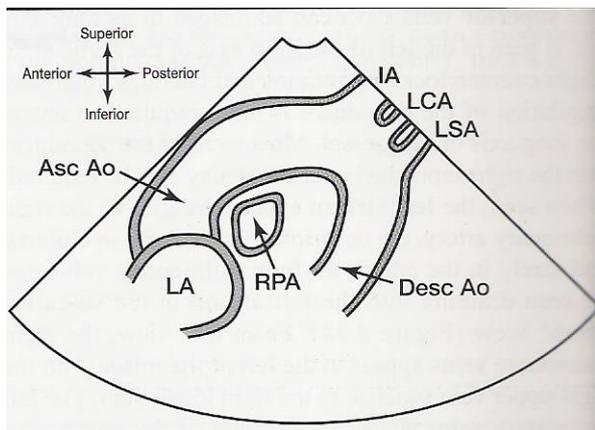


- AO loks
- kr. PA
- PDA

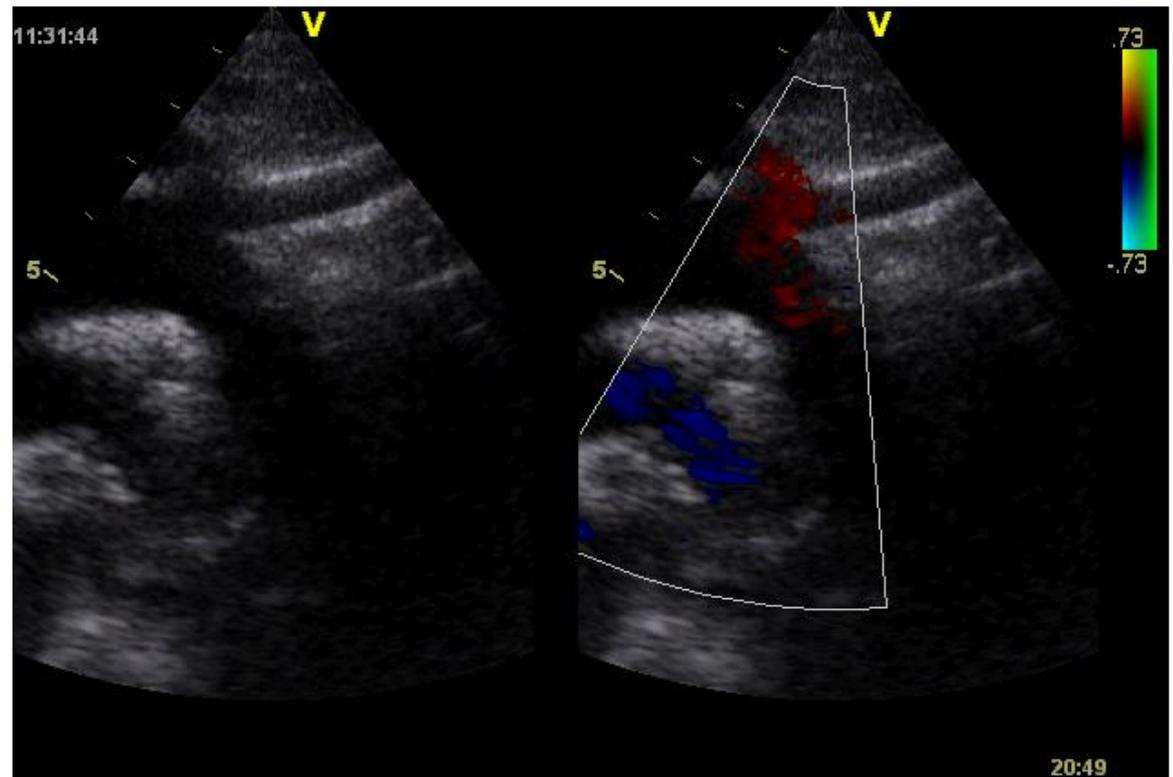
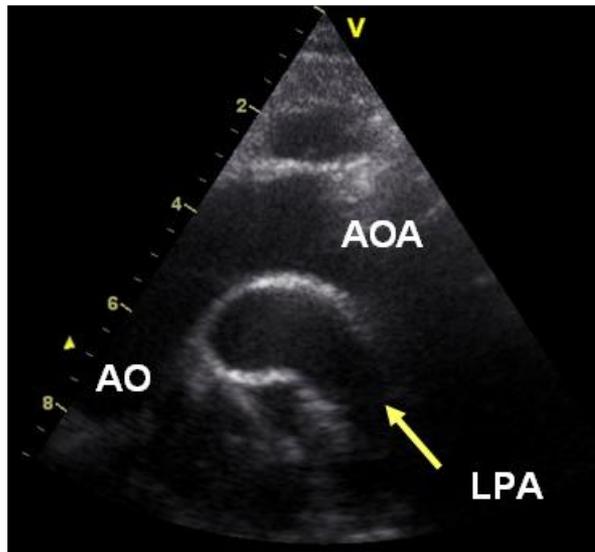
Suprasternāla poz. Koronārais skats



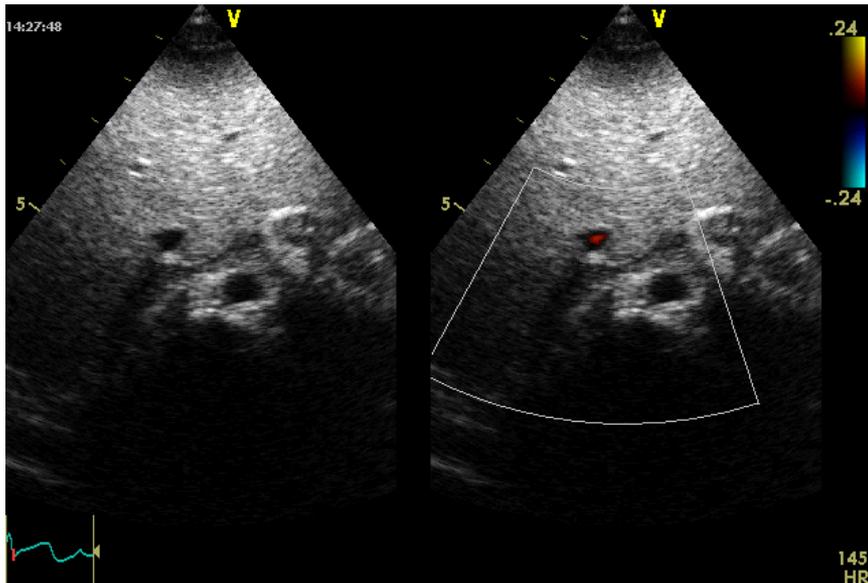
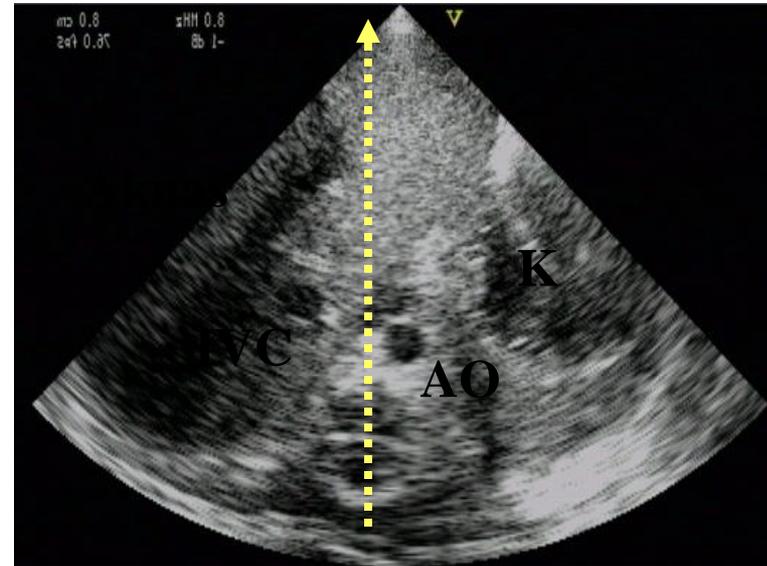
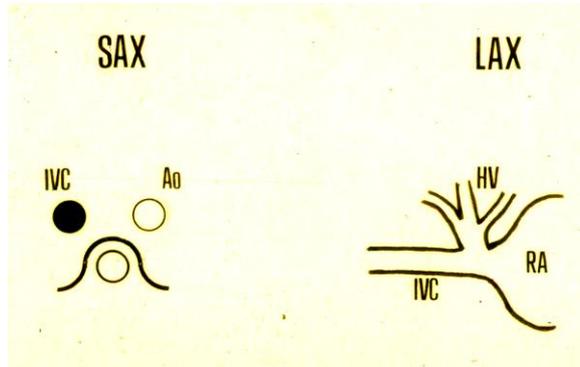
Suprasternāla poz. Ao loka skats



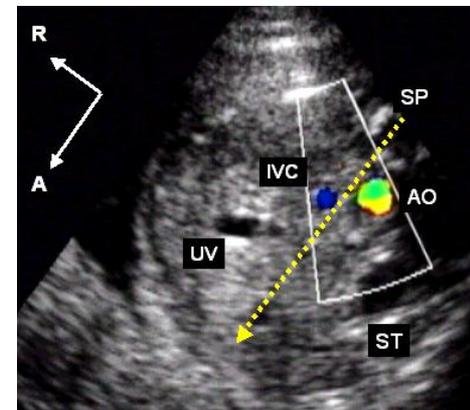
Suprasternāla poz. Ao loka skats



Situs solitus

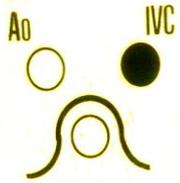


Auglis 21 gest.ned.

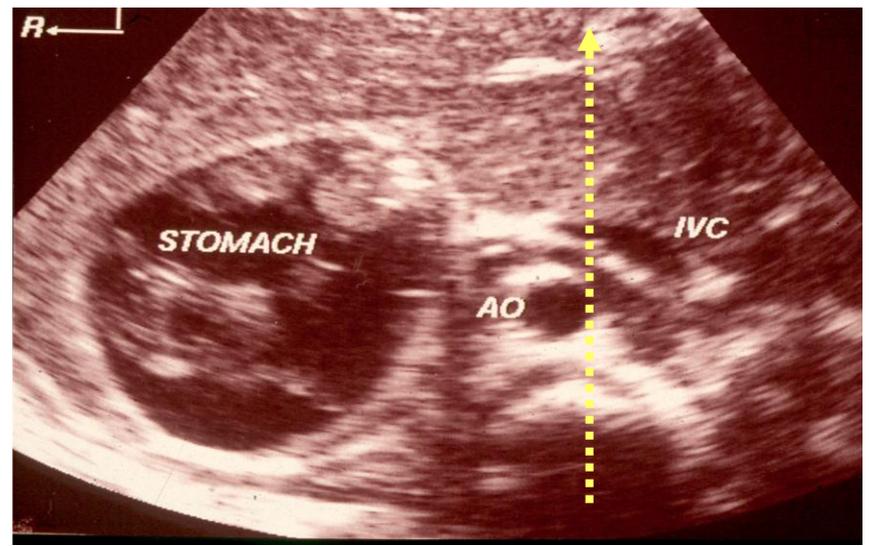
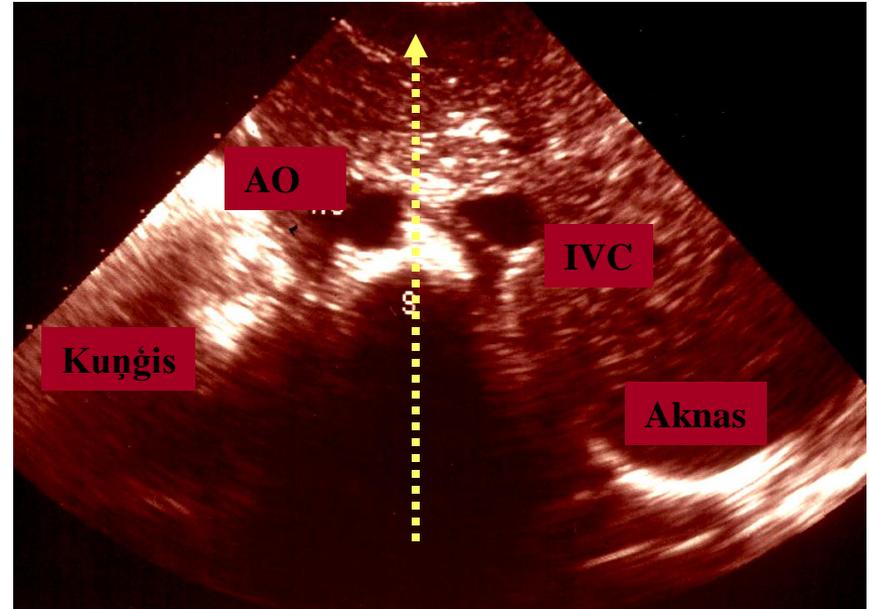
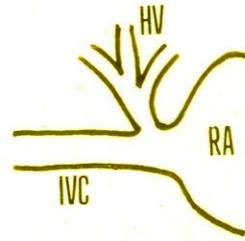


Situs inversus

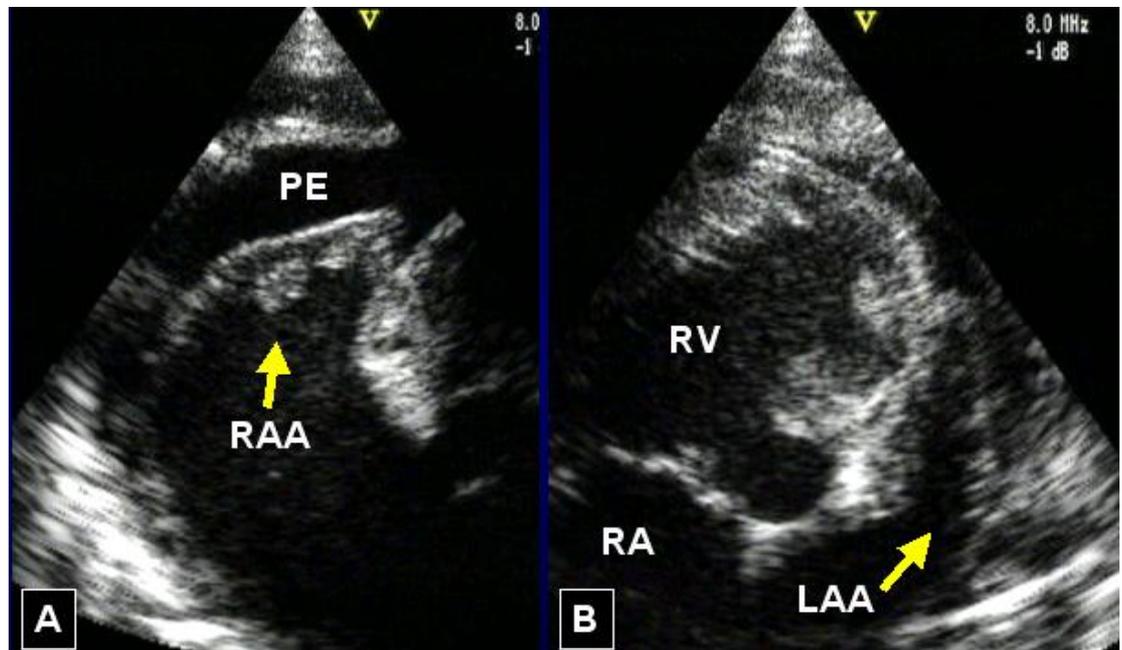
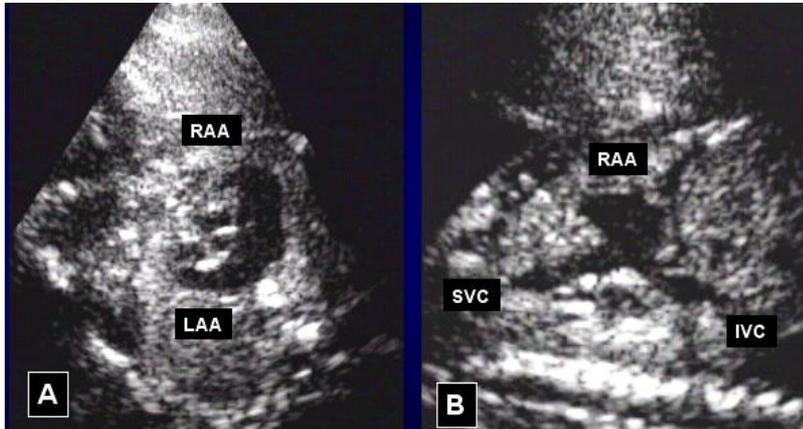
SAX



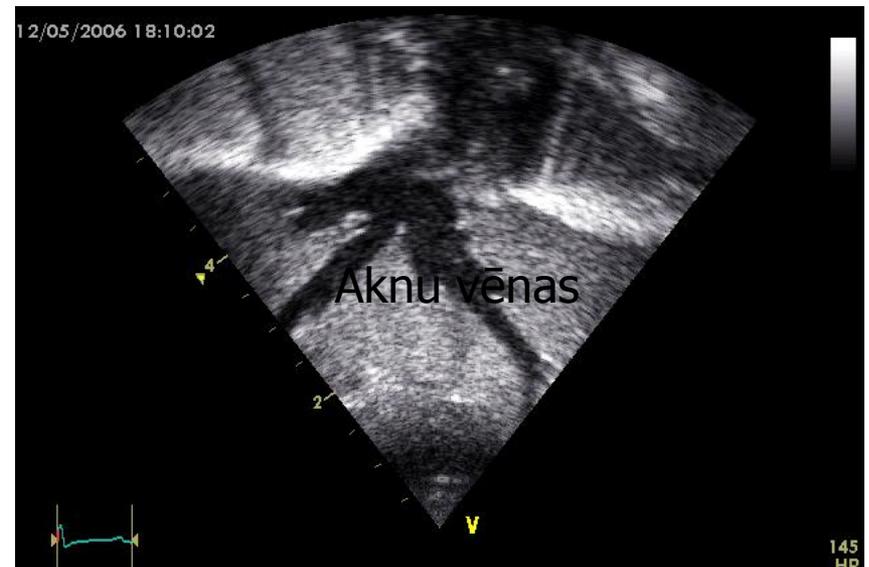
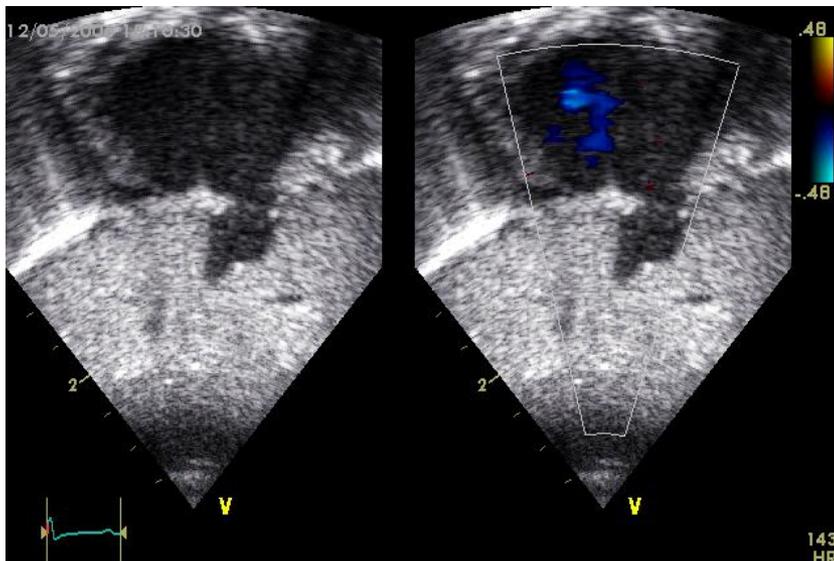
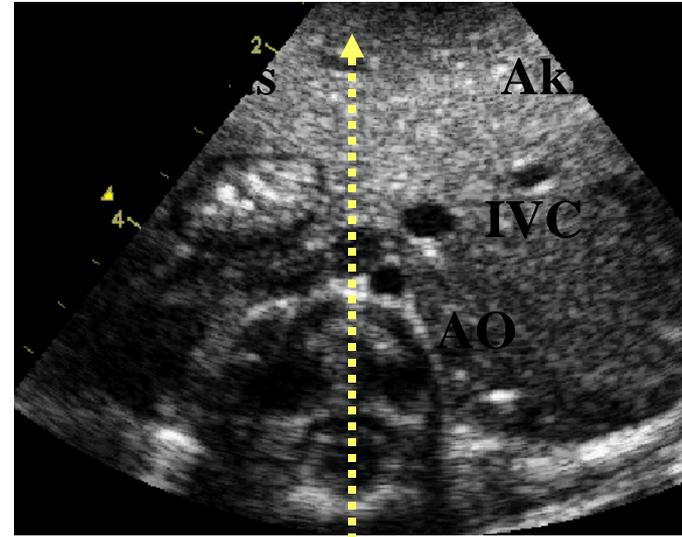
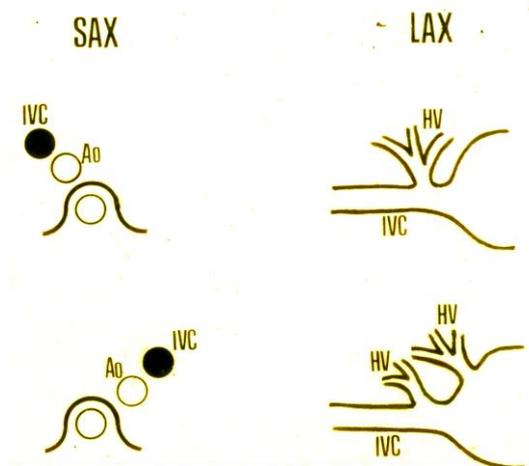
LAX



Situs Solitus Ātriju austiņas

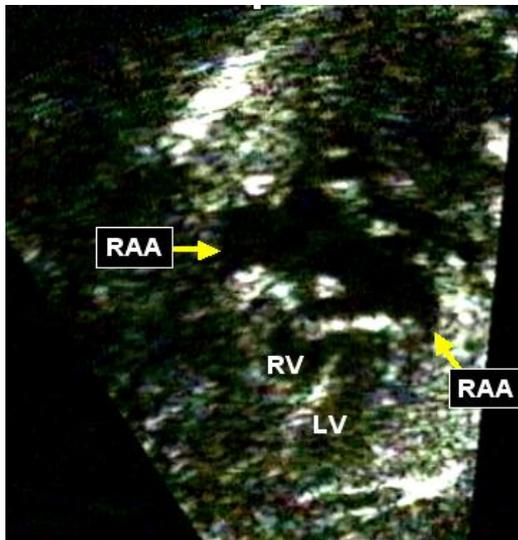
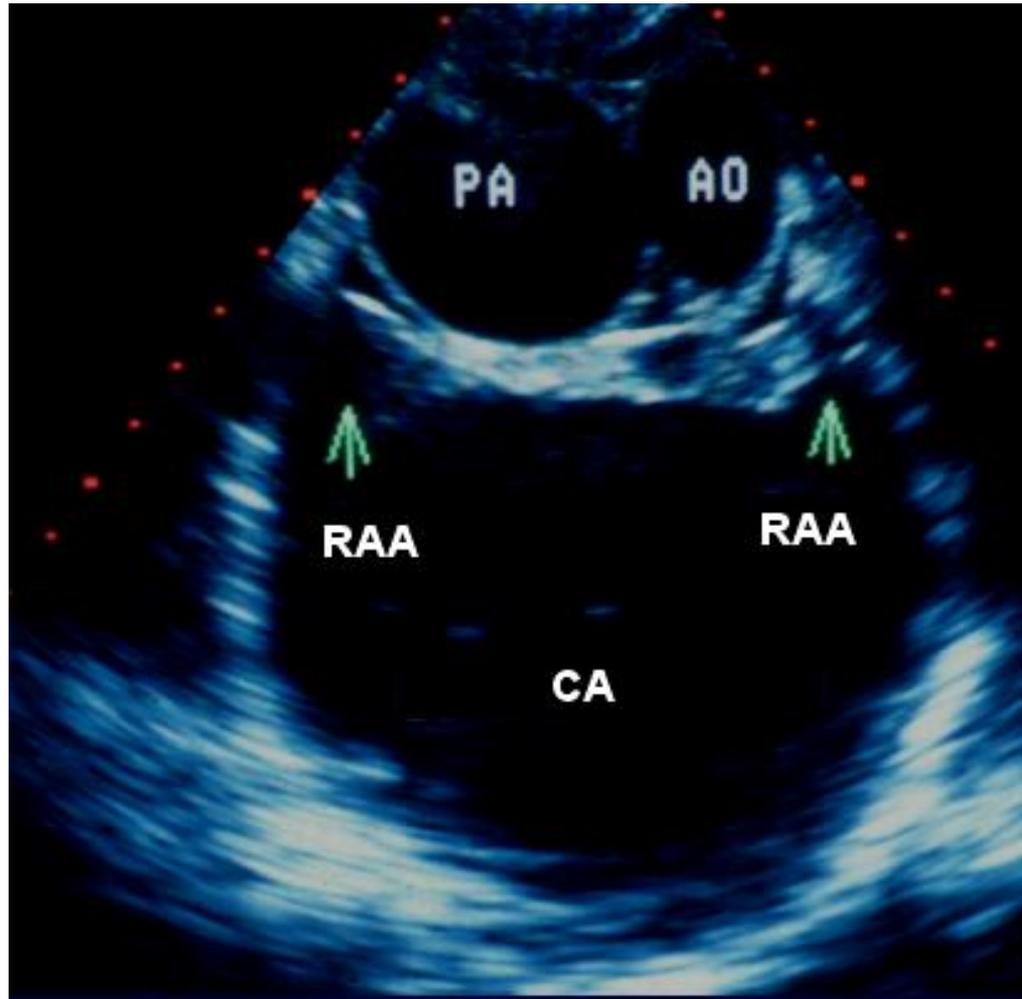
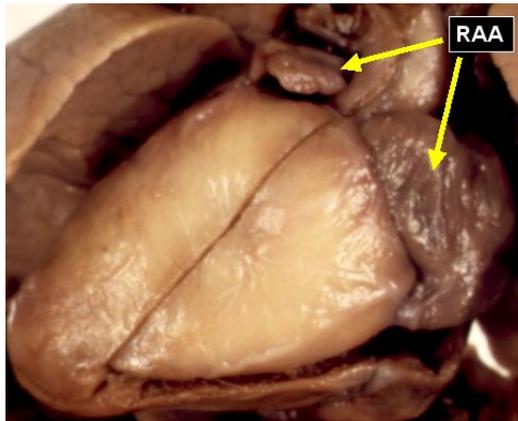


Labā ātrija Izomērisms (Asplēnija)

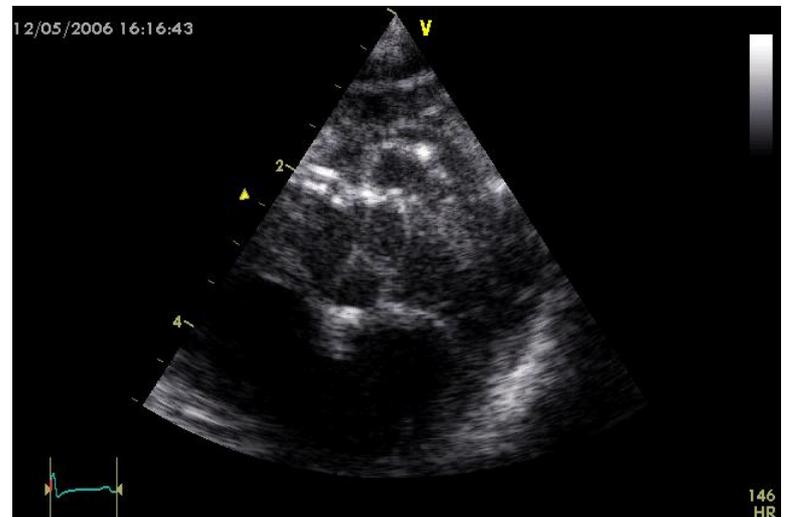
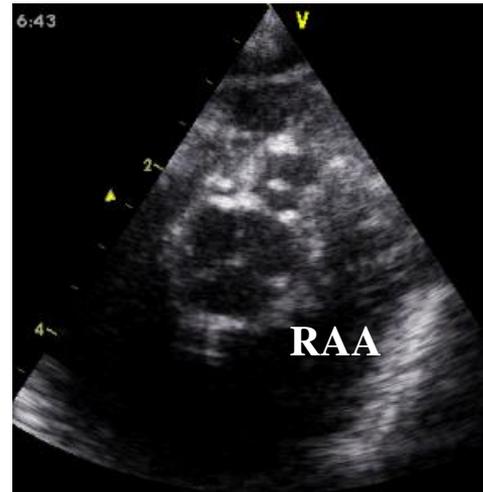


Labā ātrija izomērisms (Asplēnija)

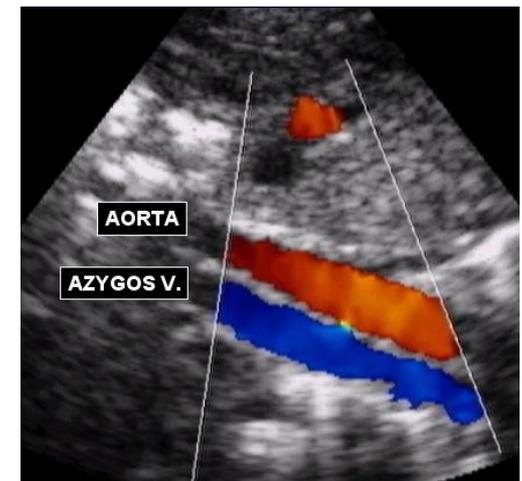
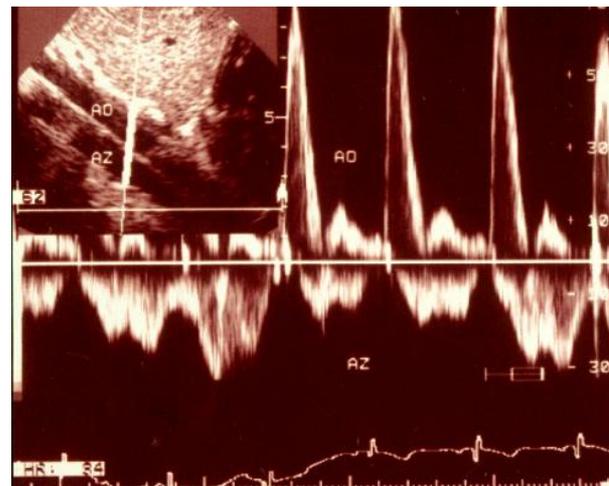
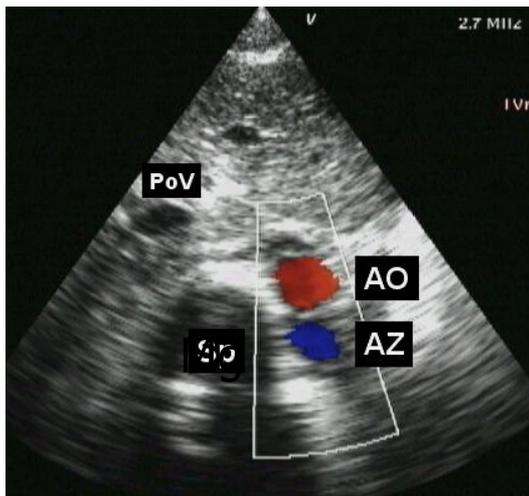
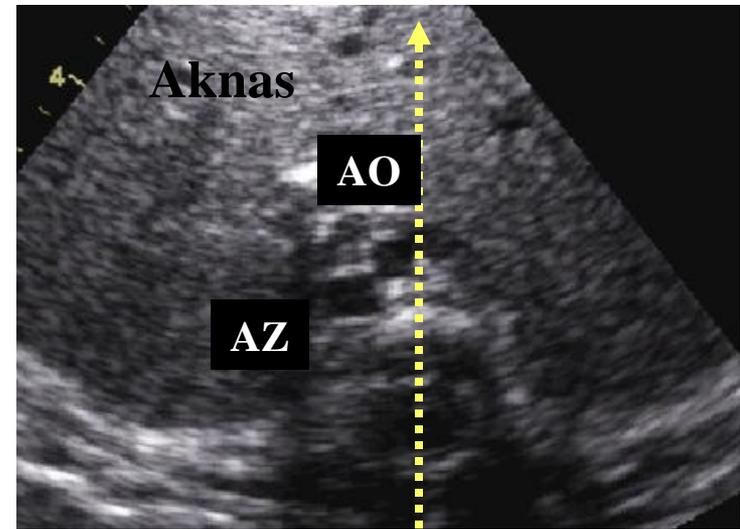
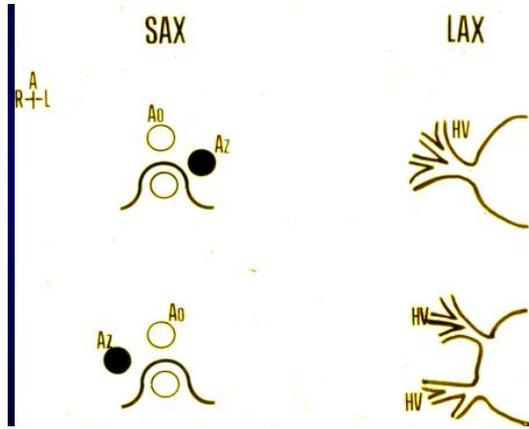
Abi ātriji - kā labais



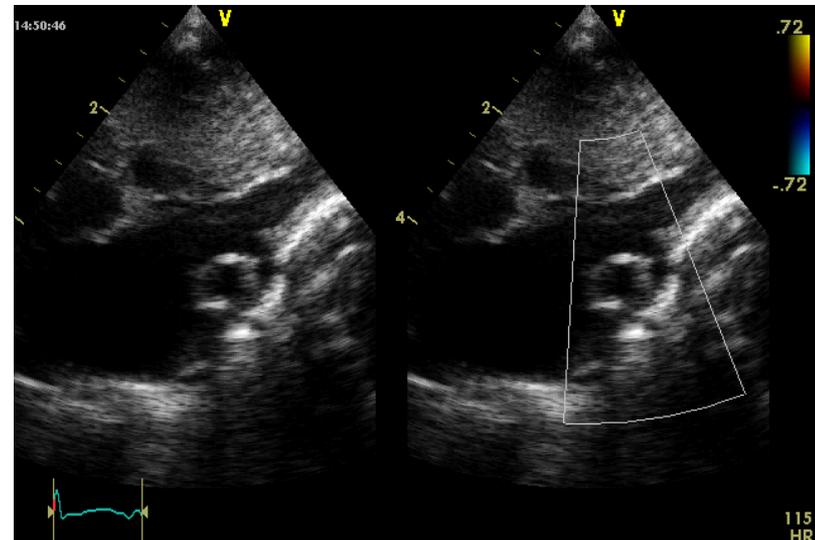
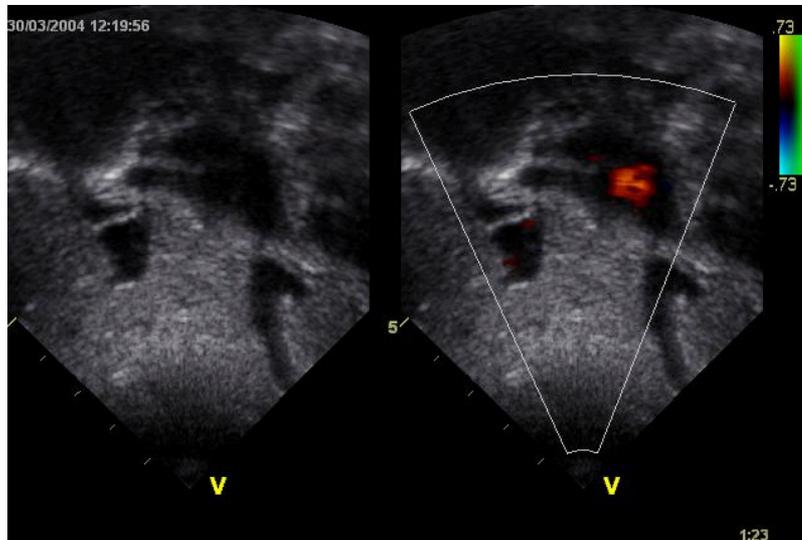
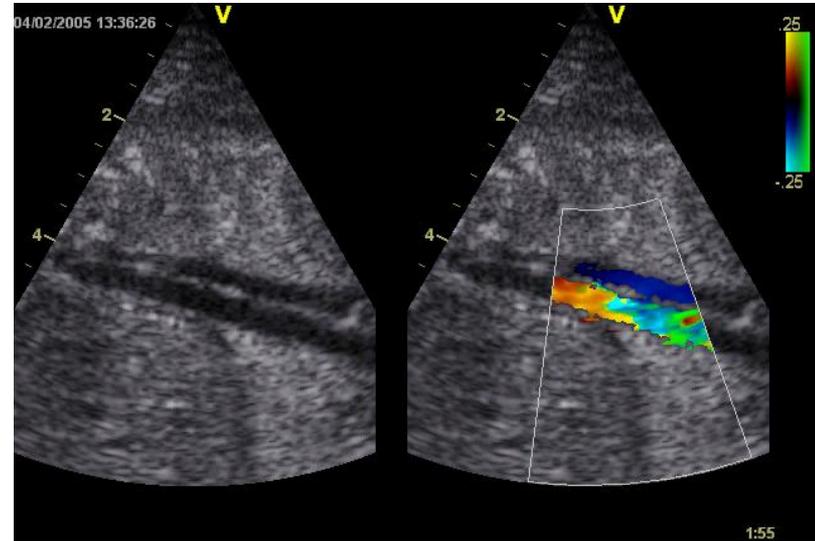
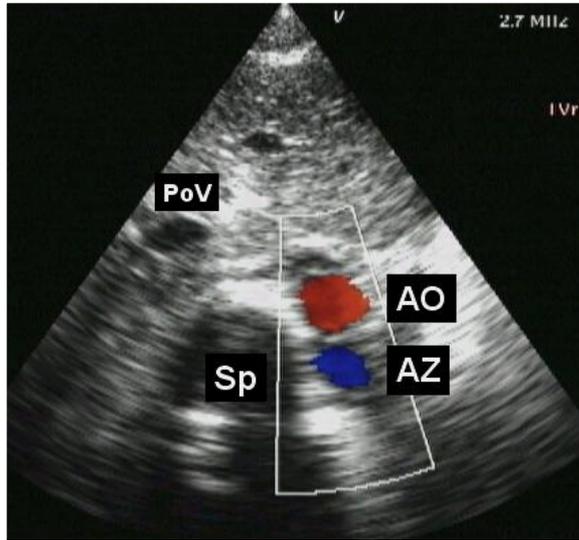
Labā ātrija izomērisms (Asplēnija)



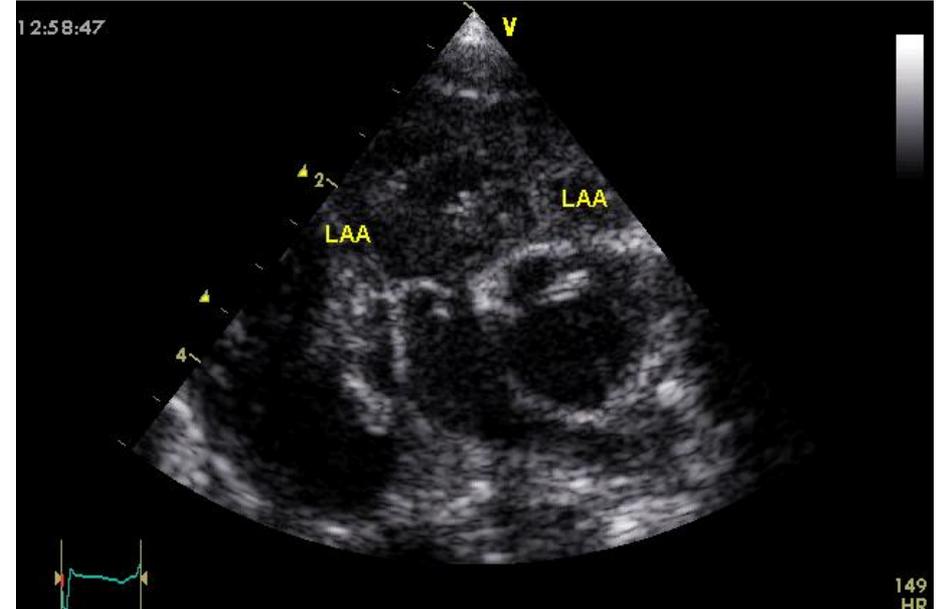
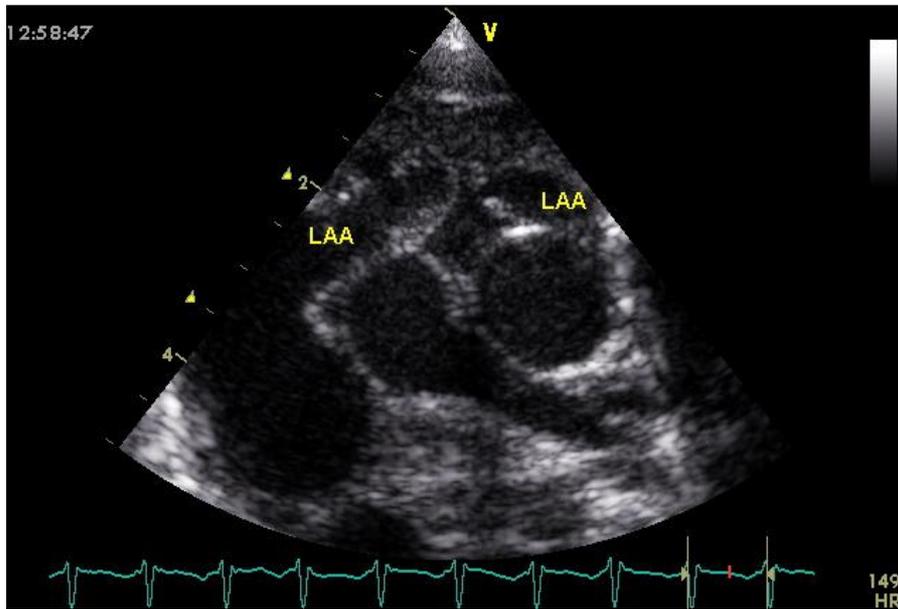
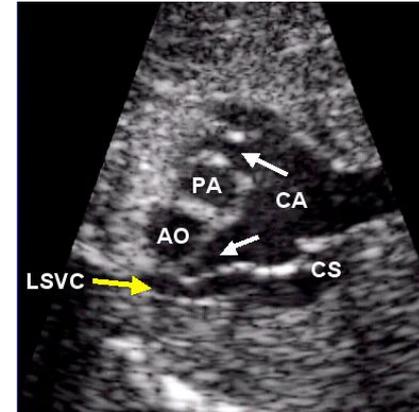
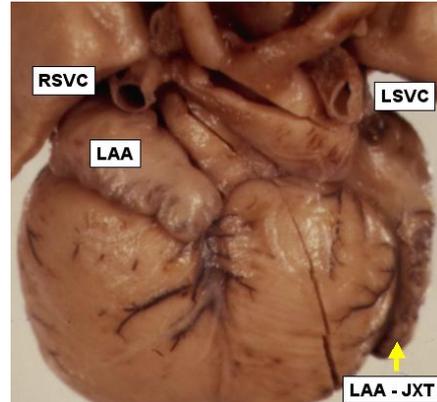
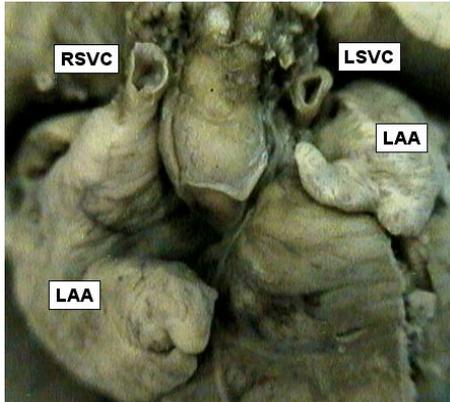
Kreisā ātrija izomērisms (Polisplēnija)



Kreisā ātrija izomērisms (Polisplēnija)



Kreisā ātrija izomērisms -Polisplēnija



Secīga izmeklēšana pa segmentiem

- Svarīgi lai izprastu novietojumu (solitus)
- Sniedz pilnīgu informāciju par sirds anatomiju
- Samazina kļūdu iespējamību
- Atvieglo izpratni un analīzi

Mērījumi

■ IEPLŪDES mērījumi - DIASTOLĒ

TV (apikāli -4 k),

MV, LA (parast. garā ass)

■ IZPLŪDES mērījumi – SISTOLE

PV, PA, RPA (parast. garā vai īsā ass),

LPA, Ao, Ao aSC (parast. garā ass),

Ao loks, istmus (suprastenāli)

Mērījumi

Doppler

- PA < 1 m/sec
- Ao asc, Ao desc līdz 1,8 m/sec
- TV un MV A > E i/utero → pirmās 3 nedēļas

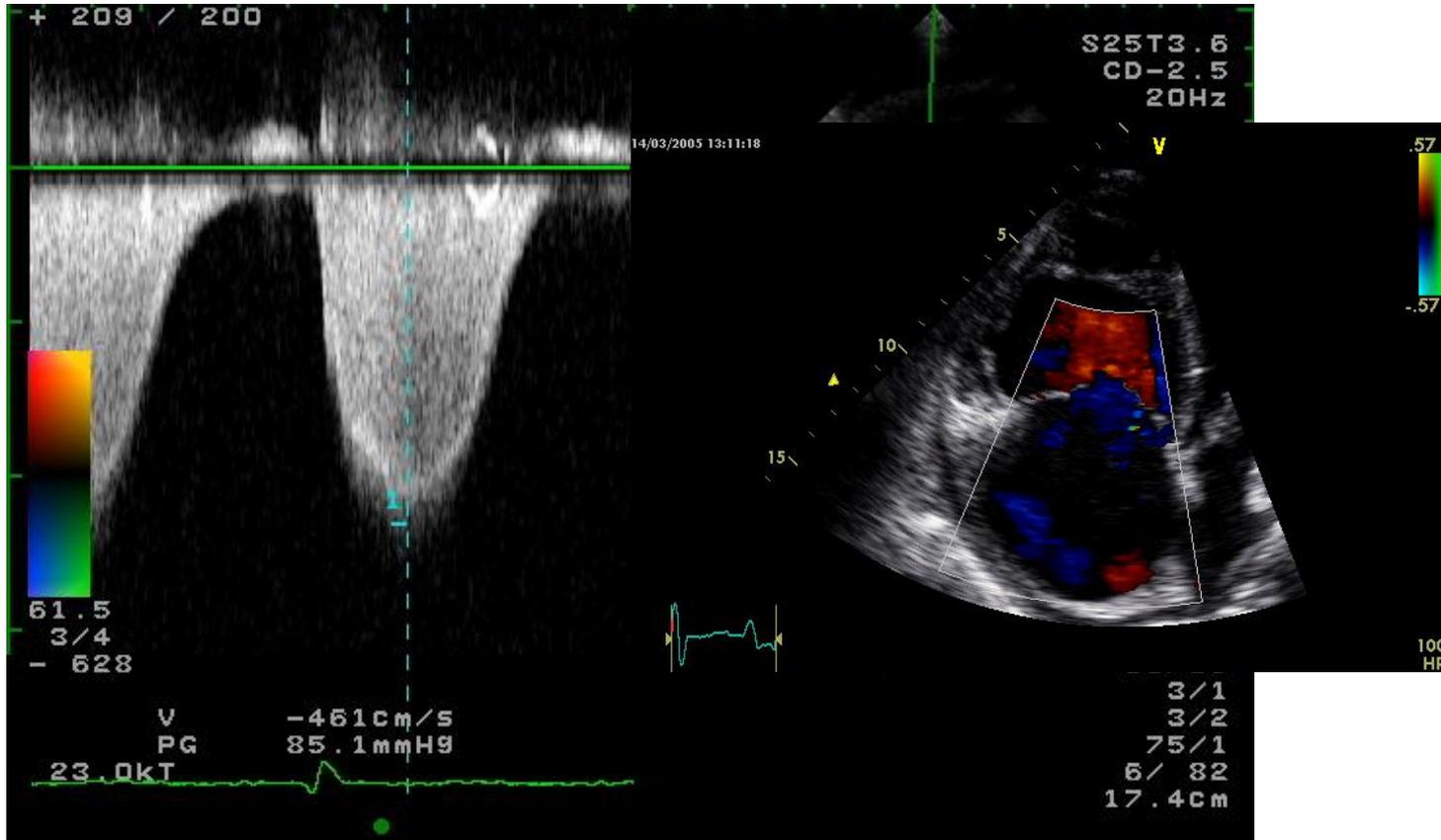
Guidelines and standards for performance of a pediatric echocardiogram. Wyman W et.al J Am Soc Echocardiogr 2006; 19:1413-1430

Mērījumi

- LV masa bērniem līdz 17 gadiem
 $60,8 \pm 12 \text{ g/m}^2$
- LV hipertrofija bērniem līdz 23 gadiem
zēniem $> 103 \text{ g/m}^2$
meitenēm $> 84,2 \text{ g/m}^2$
- FS = 28-44 % EF = 56- 78%

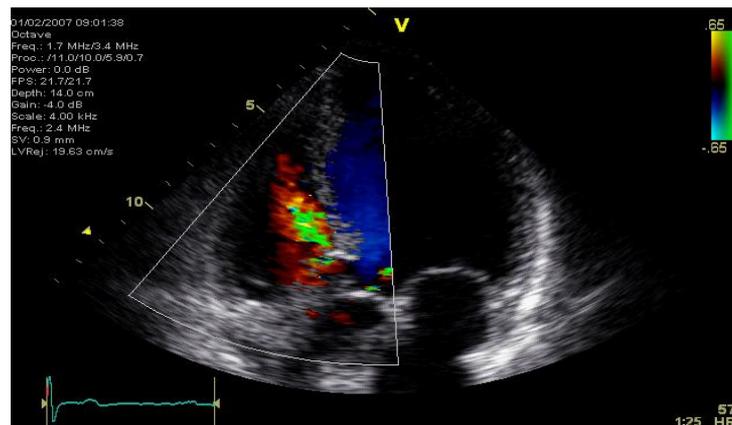
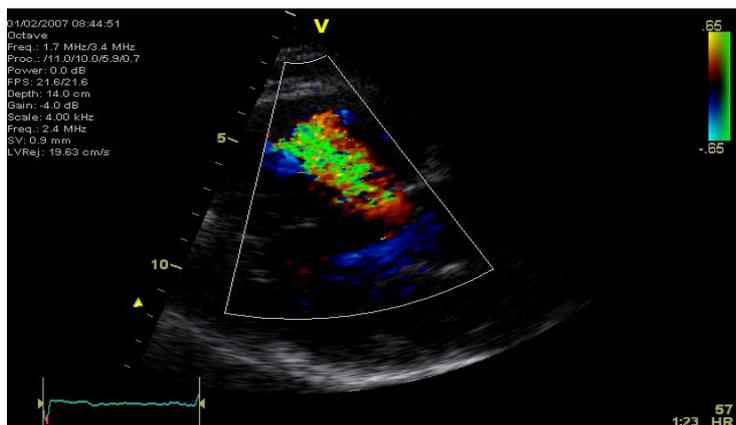
Pediatric cardiology for practitioners, Park M 2008- 5 th ed. :91-97

Plaušu artērijas sistoliskais spiediens



max TVR gradients+ RAP

Plaušu artērijas sistoliskā spiediena kalkulācija, ja ir VSD

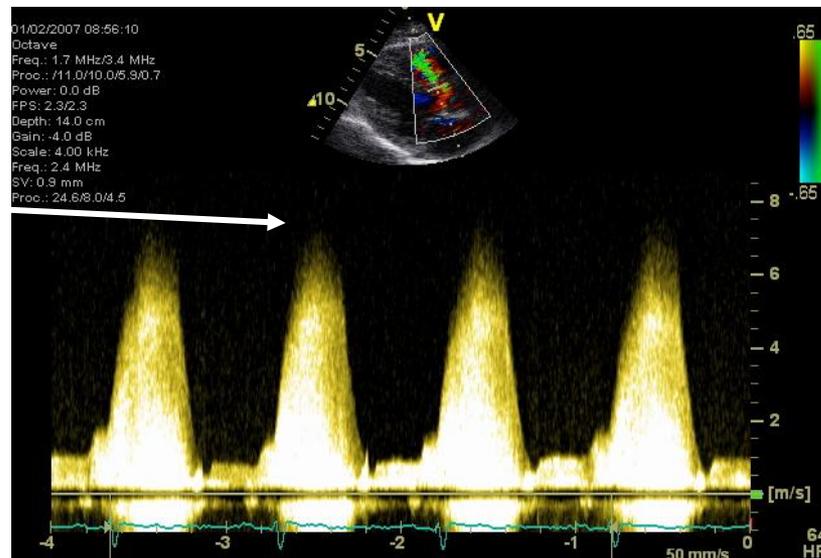


TA sist. - PG VSDšunts =

PA sist. spiediens

(RV spiediens)

(ja nav RV / LV izejas obstrukcija)



Qp:Qs

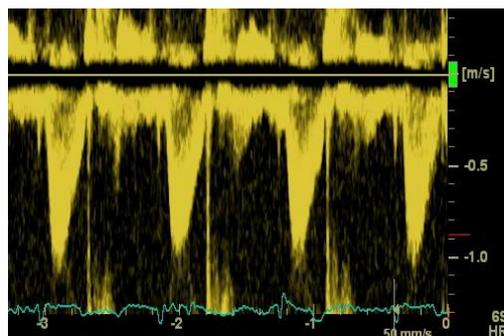
Qs



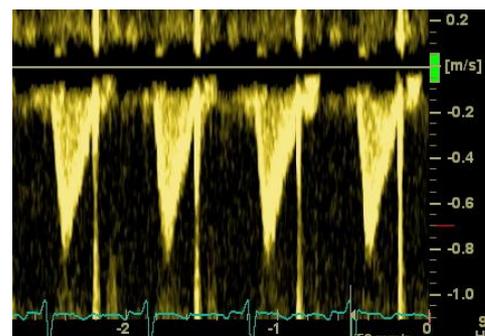
Qp



LVOT-VTI



RVOT-VTI



$Qp : Qs > 1,5 : 1 \Rightarrow$ nozīmīgs L-R šunts

Pediatric and Fetal Echo Z-Score Calculators

Using the medical literature and published data to generate z-scores and reference values (normal values) for pediatric and fetal echocardiography

[Aortic Root Z-Scores](#)

Calculate BSA-adjusted z-scores of the aortic annulus and sinuses of Valsalva using data published by Boston Children's Hospital. (Updated 11/2008: added percentiles)

[Ascending Aorta Z-Scores](#)

Z-Scores of the ascending aorta (AAO) and aortic root. Data from the Children's Heart Center, Halifax, Nova Scotia, published in 2006.

[Cardiac Valve Z-Scores](#)

Calculate BSA-adjusted z-scores of the mitral valve, tricuspid valve, aortic valve, and pulmonary valve using data published by Cincinnati Children's Hospital. This data is also used to create [dynamic z-score tables](#).

[Coronary Artery Z-Scores](#)

Calculate BSA-adjusted z-scores of the proximal coronary arteries (for patients with Kawasaki disease) using data published by [Boston Children's Hospital](#) and [Children's National Medical Center, Washington, DC](#).

[Fetal Echo Z-Scores](#)

Calculate gestational age-adjusted z-scores for fetal echo (left ventricle, mitral valve, aortic valve, aortic arch, etc.) using data published by The Royal Brompton Hospital, London, UK.

[LV Mass Z-Scores](#)

Calculate height-adjusted z-scores of left ventricular mass (m-mode derived calculation) using data published by Montreal Children's Hospital.

[M-Mode Z-Scores](#)

Calculate BSA-adjusted z-scores for common M-Mode measurements (LVEDD, LVESD, IVS, LVPW, LA) using data published by Johannes Gutenberg University, Germany.

[Z-Scores of Cardiac Structures: Detroit Data](#)

Calculate BSA-adjusted z-scores of 21 common pediatric echo measurements (m-mode, mitral valve, aortic valve, pulmonary arteries, etc.) using data published by Detroit Children's Hospital. (Updated 11/2008: added percentiles)

[Z-Scores of Cardiac Structures: Wessex Data](#)

Calculate BSA-adjusted z-scores of 15 cardiac structures (mitral valve, aortic valve, pulmonary arteries, etc.) using data published by the Wessex Cardiothoracic Unit, Southampton UK.

PHILIPS

NORMA

02/03/2012

08:24:52

TIS1.8 MI 1.0

38240820120302

S8-3/Ped-CHD

FR 61Hz

7.0cm

M3

2D

58%

C 50

P Off

Pen



JPEG

115 bpm

PHILIPS

NORMA

02/03/2012

08:25:14

TIS1.8 MI 1.0

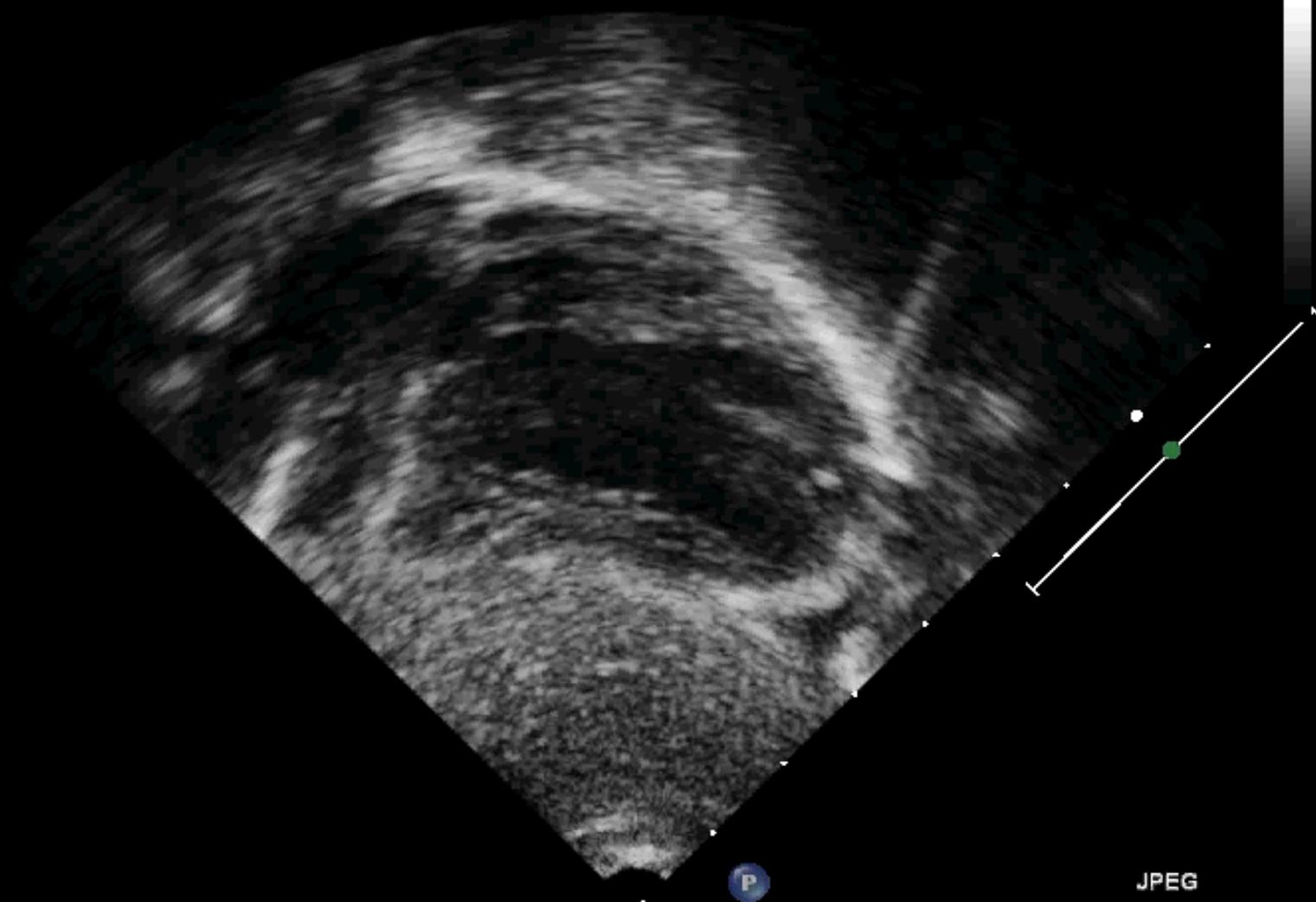
38240820120302

S8-3/Ped-CHD

FR 61Hz
9.0cm

M3

2D
61%
C 50
P Off
Pen



P

JPEG

128 bpm

PHILIPS

NORMA

02/03/2012

08:25:43

TIS1.8 MI 1.0

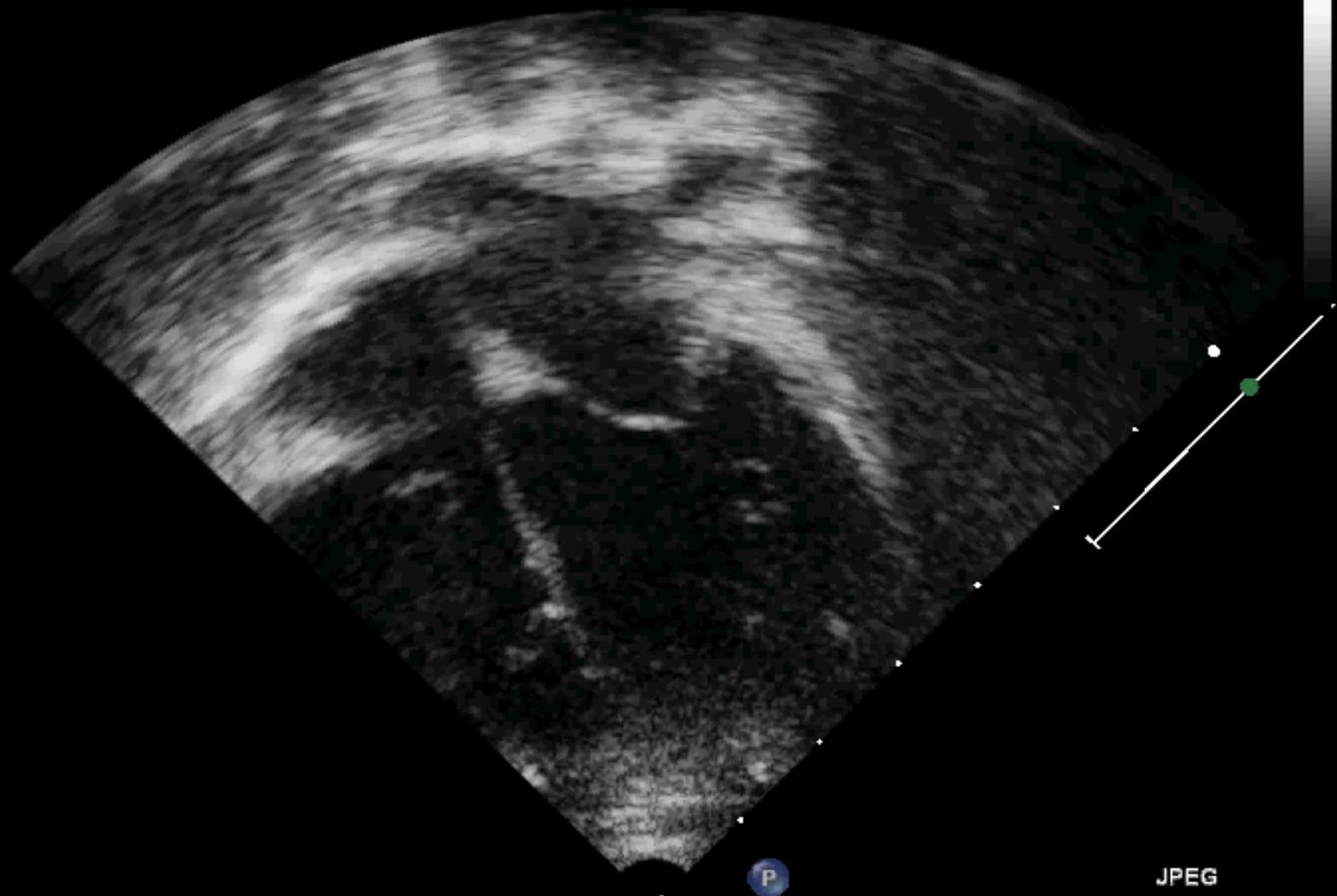
38240820120302

S8-3/Ped-CHD

FR 61Hz
8.1cm

2D
60%
C 50
P Off
Pen

M3



P

JPEG

138 bpm

PHILIPS

NORMA

02/03/2012

08:26:22

TIS1.8 MI 1.0

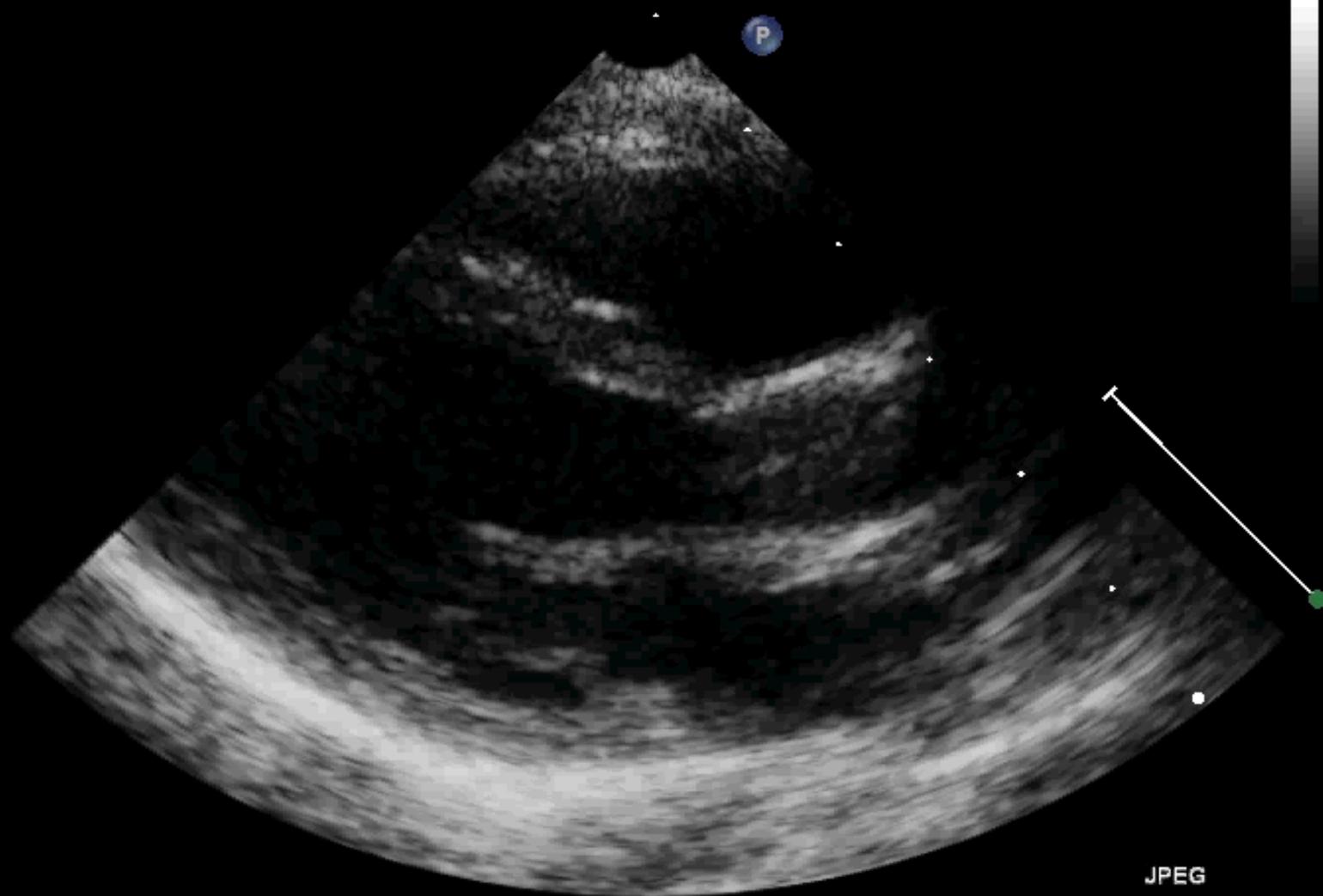
38240820120302

S8-3/Ped-CHD

FR 61Hz
6.0cm

M3

2D
56%
C 50
P Off
Pen



JPEG

131 bpm

PHILIPS

NORMA

02/03/2012

08:26:31

TIS1.8 MI 1.0

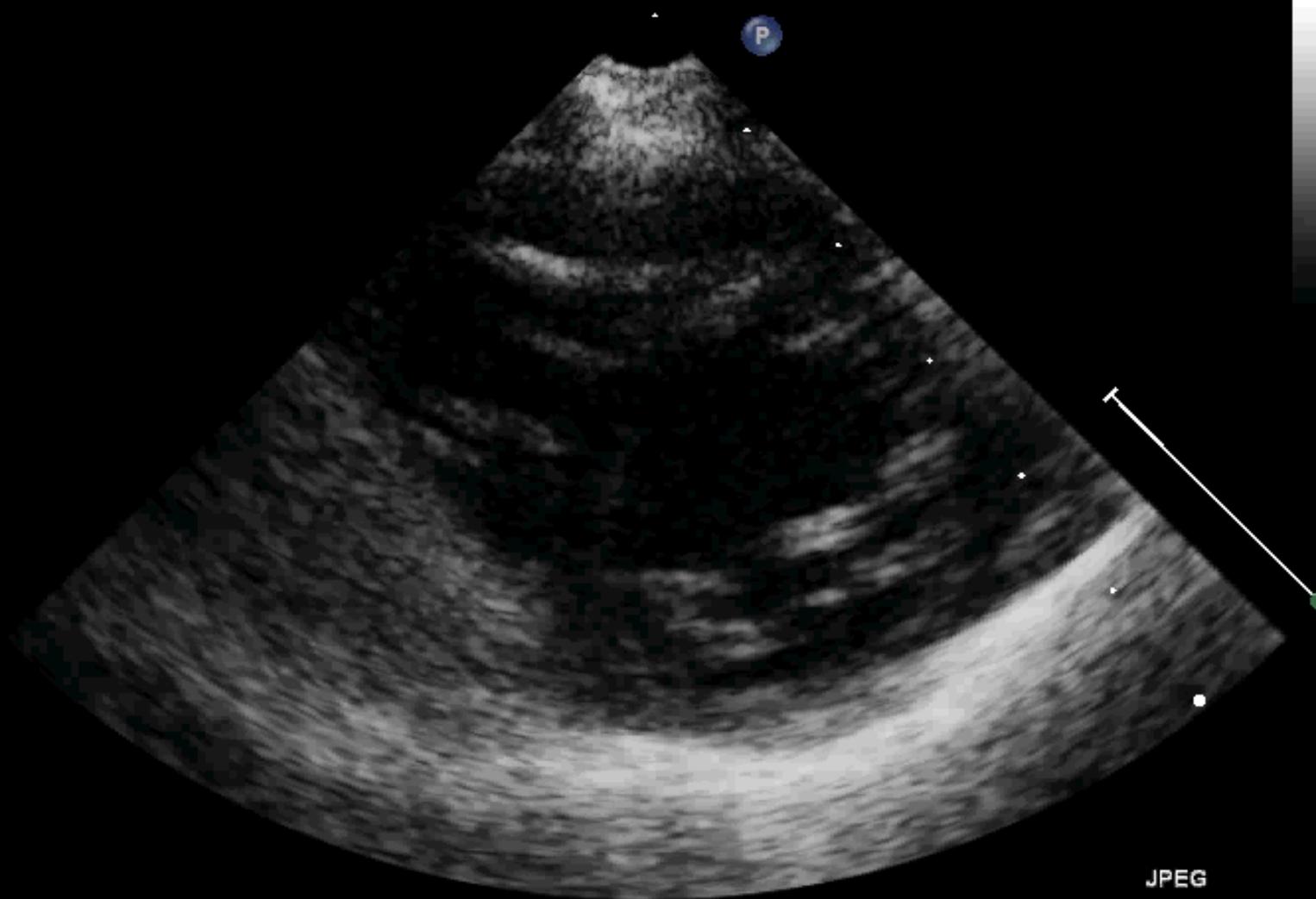
38240820120302

S8-3/Ped-CHD

FR 61Hz
6.0cm

M3

2D
56%
C 50
P Off
Pen



JPEG

137 bpm

PHILIPS

NORMA

02/03/2012

08:26:42

TIS1.8 MI 1.0

38240820120302

S8-3/Ped-CHD

FR 61Hz

6.0cm

M3

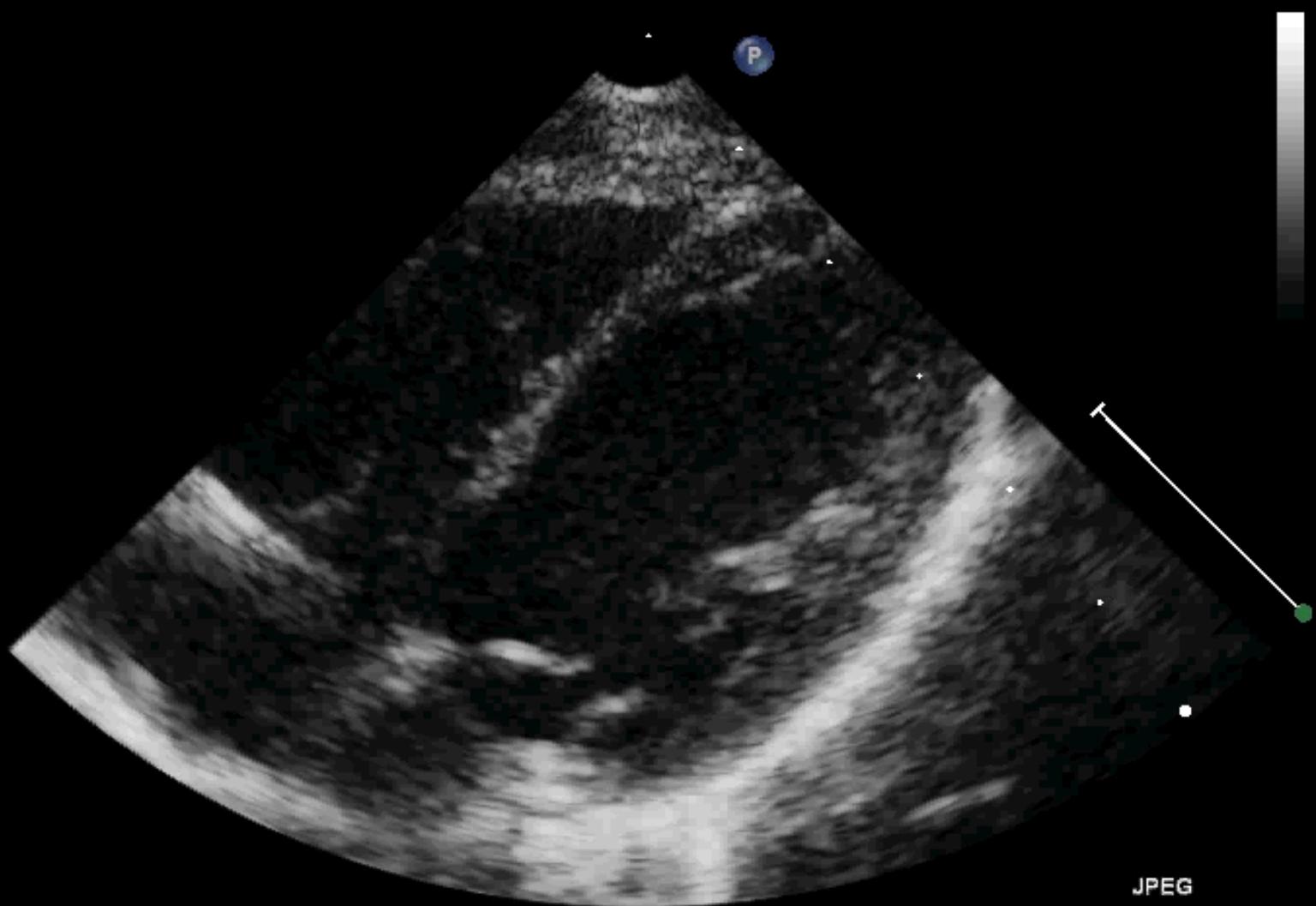
2D

56%

C 50

P Off

Pen



JPEG

122 bpm

PHILIPS

NORMA

02/03/2012

08:26:42

TIS1.8 MI 1.0

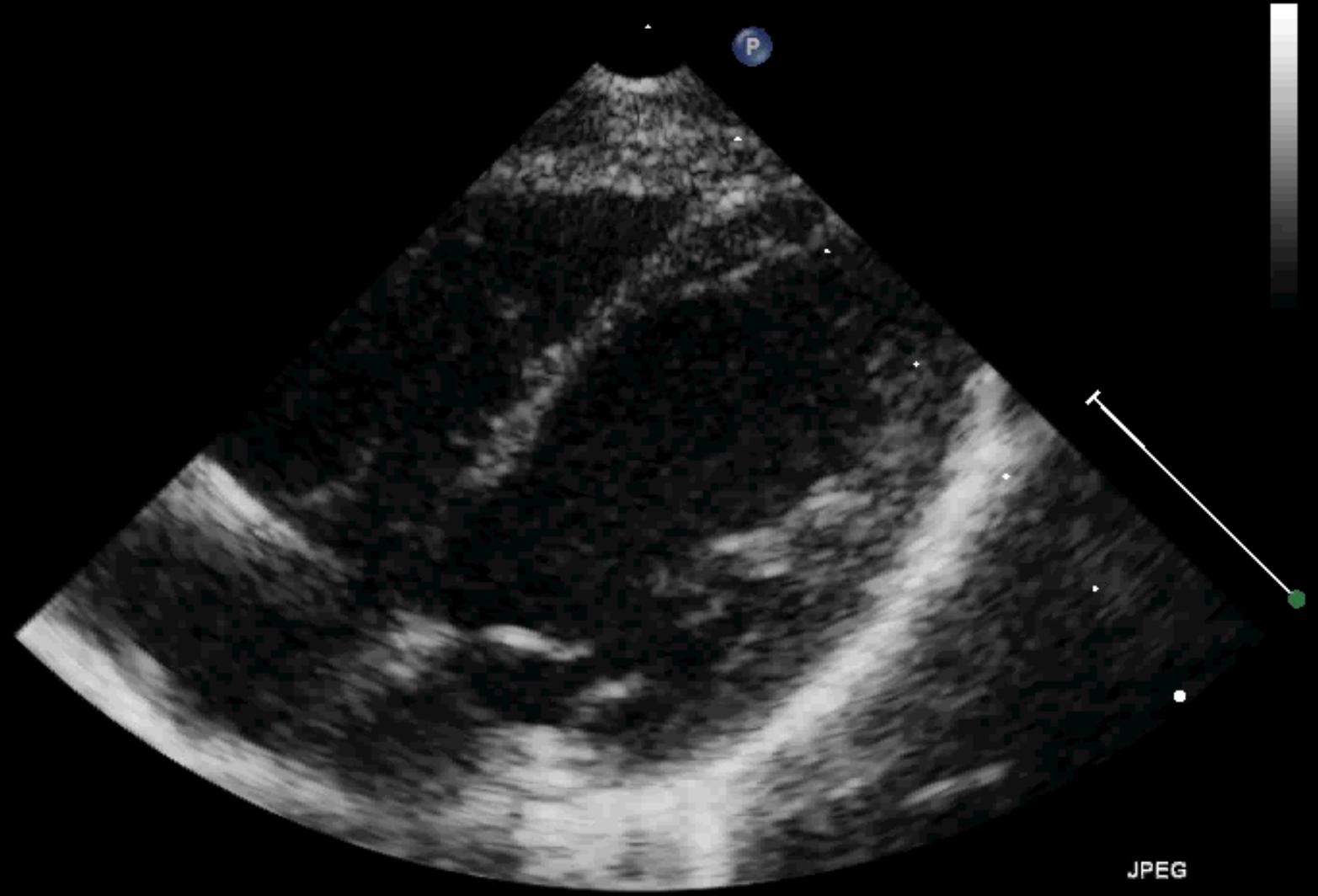
38240820120302

S8-3/Ped-CHD

FR 61Hz
6.0cm

M3

2D
56%
C 50
P Off
Pen



JPEG

122 bpm

PHILIPS

NORMA

02/03/2012

08:30:43

TIS1.4 MI 1.2

38240820120302

S8-3/Ped-CHD

FR 14Hz
9.0cm

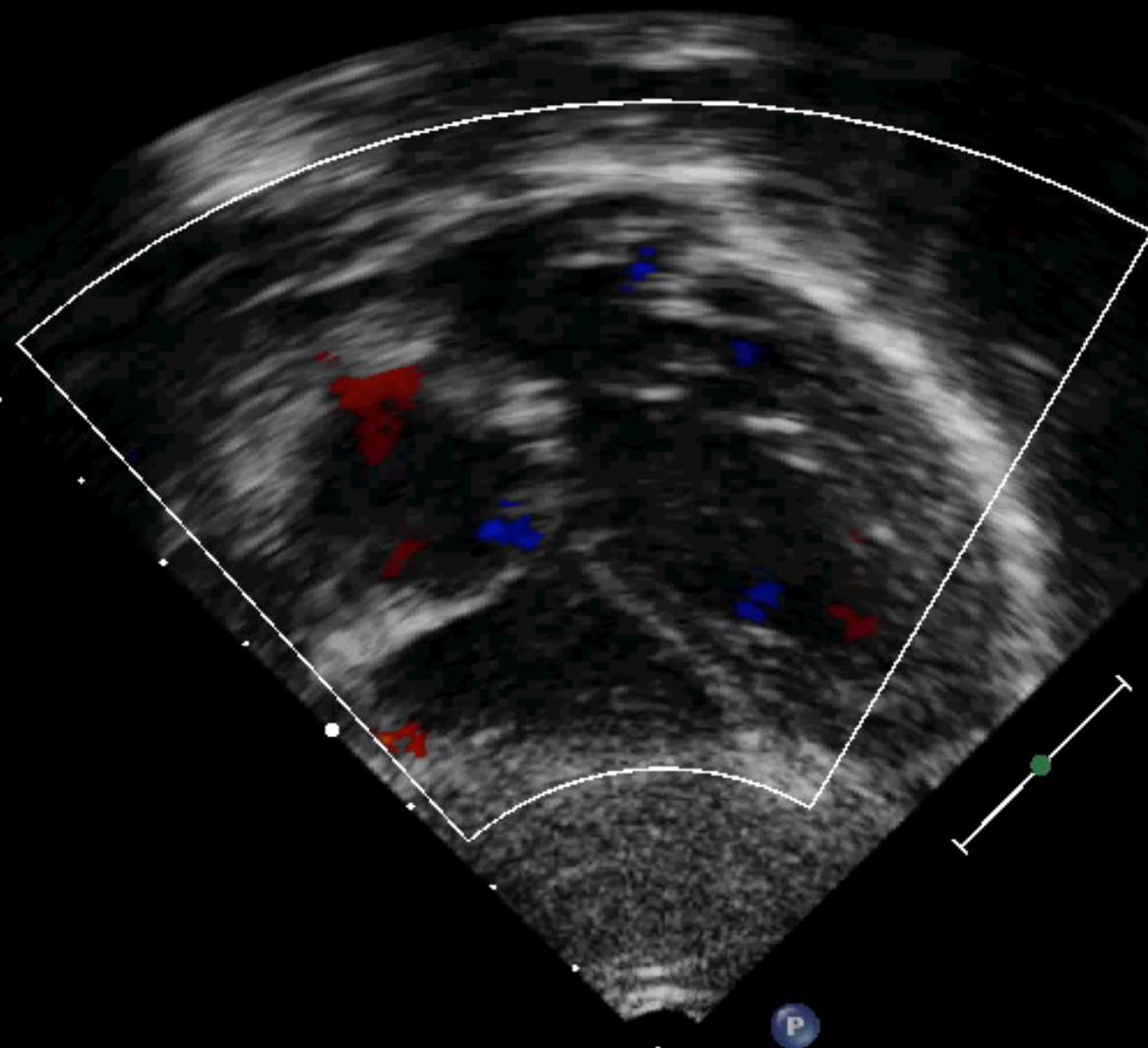
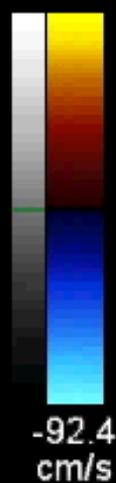
2D

64%
C 50
P Off
Pen

CF

77%
3.0MHz
WF High
Med

M3 M4
+92.4



P

JPEG

115 bpm

PHILIPS

NORMA

02/03/2012

08:31:01

TIS1.3 MI 1.2

38240820120302

S8-3/Ped-CHD

FR 14Hz
7.0cm

2D

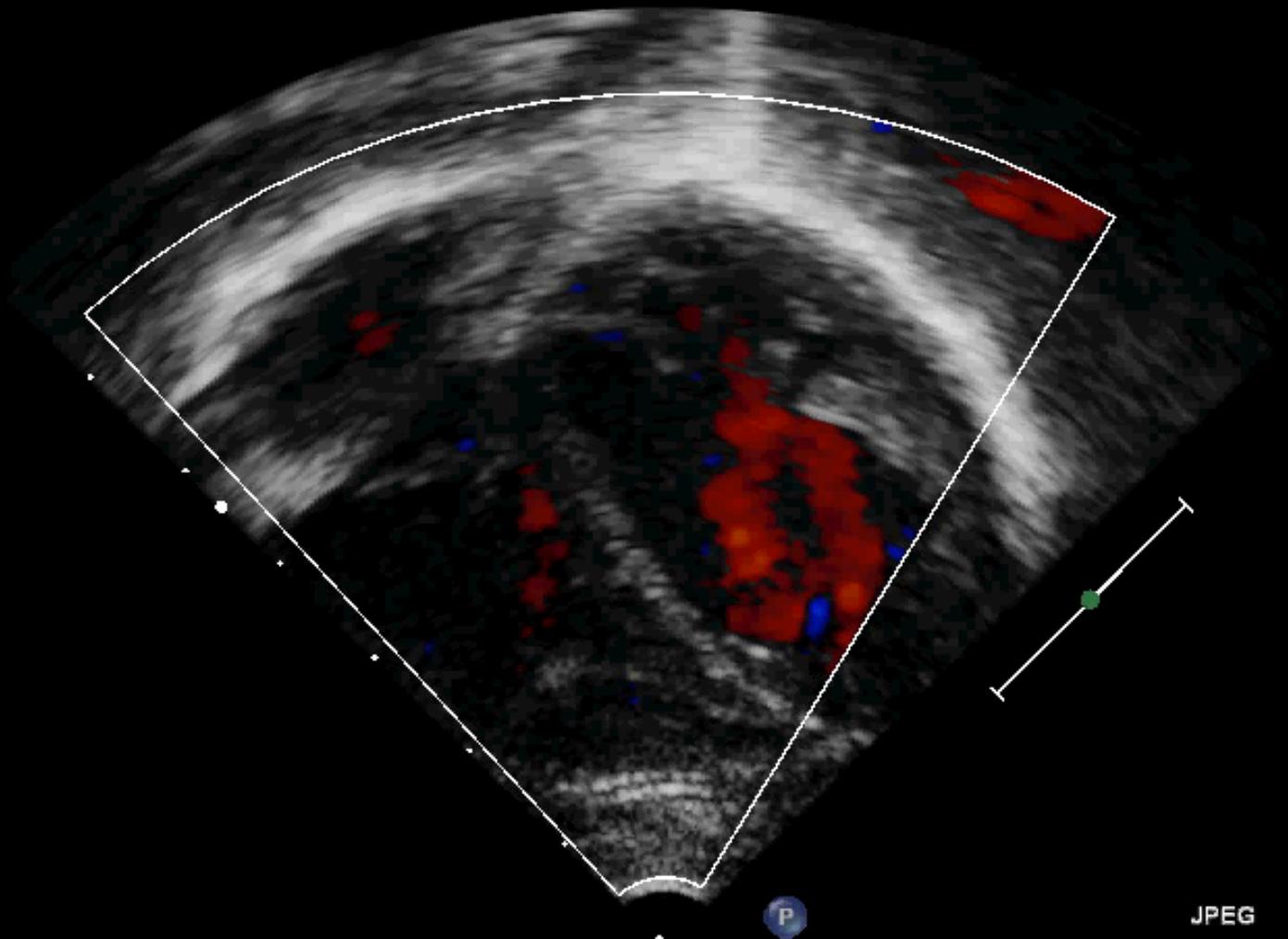
61%
C 50
P Off

Pen

CF

77%
3.0MHz
WF High
Med

M3 M4
+92.4



P

JPEG

114 bpm

PHILIPS

NORMA

02/03/2012

08:31:34

TIS1.4 MI 1.2

38240820120302

S8-3/Ped-CHD

FR 15Hz
6.0cm

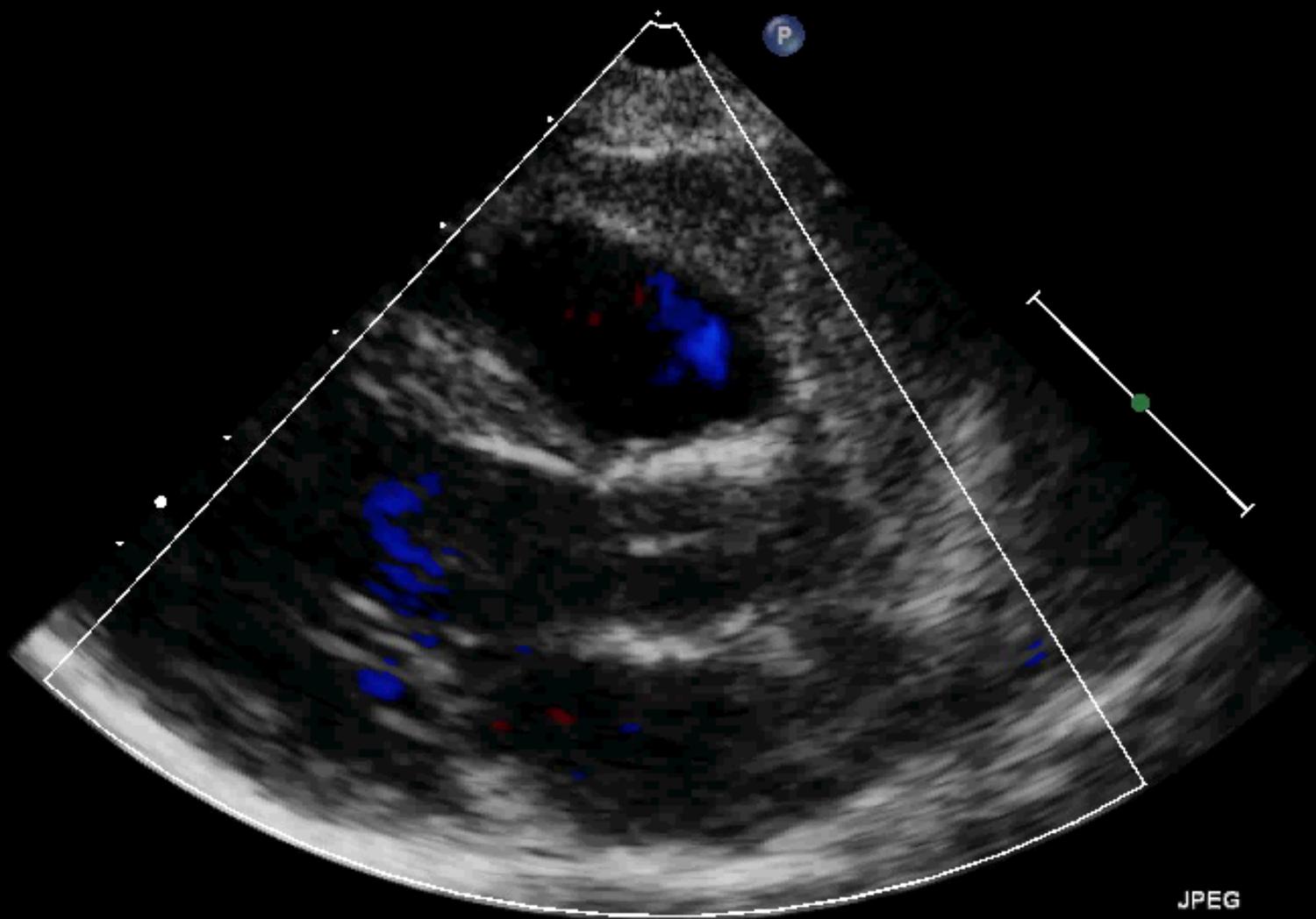
2D

58%
C 50
P Off
Pen

CF

77%
3.0MHz
WF High
Med

M3 M4
+92.4



JPEG

132 bpm

PHILIPS

NORMA

02/03/2012

08:29:32

TIS1.7 MI 1.2

38240820120302

S8-3/Ped-CHD

FR 61Hz

7.0cm

M3

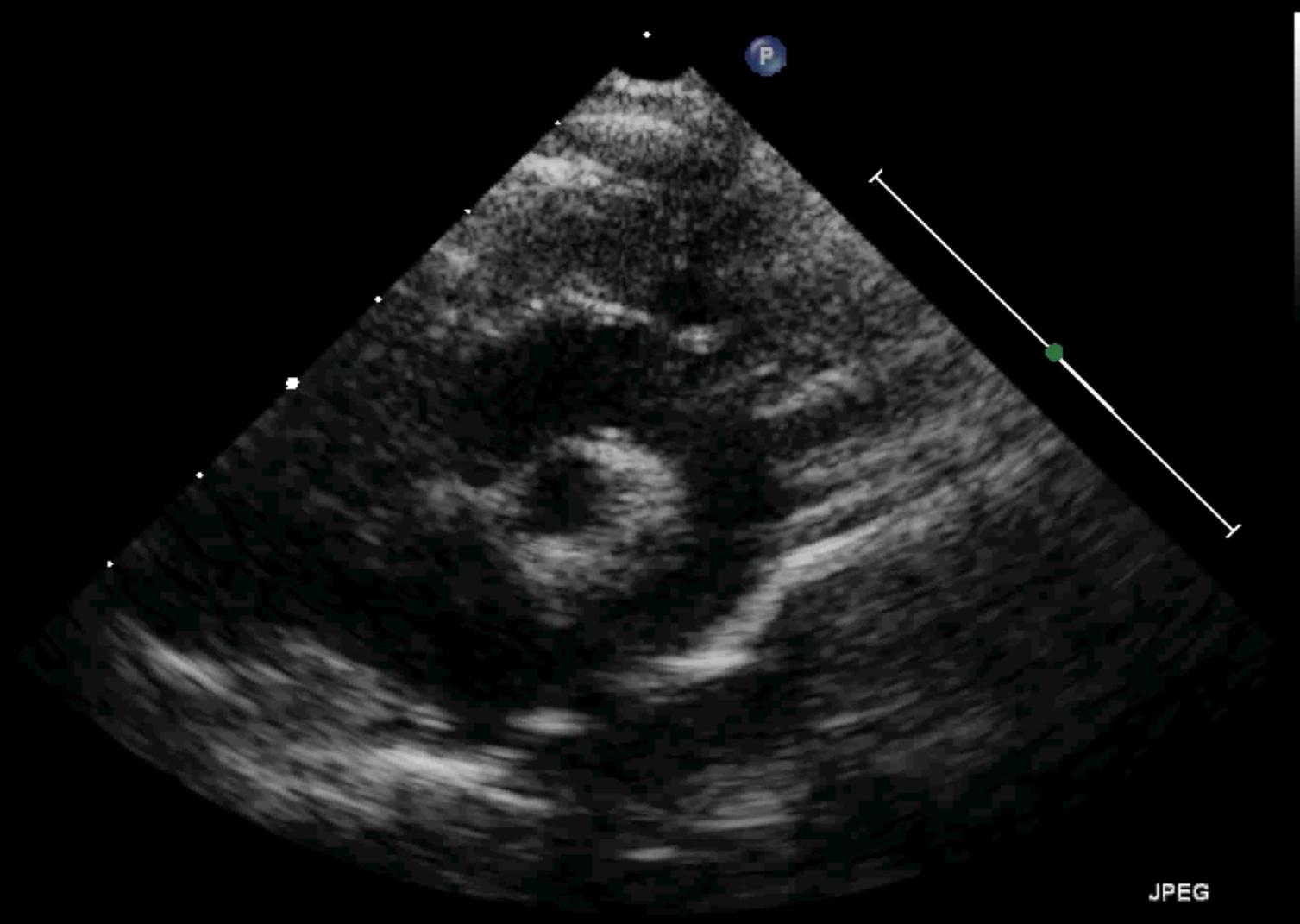
2D

58%

C 50

P Off

Pen



JPEG

129 bpm

PHILIPS

NORMA

23/02/2009

12:39:31

TIS1.2 MI 0.7

32351220090223

BKUS BERNU KARD

S8-3/Ped-CHD

FR 25Hz

10cm

2D / MM

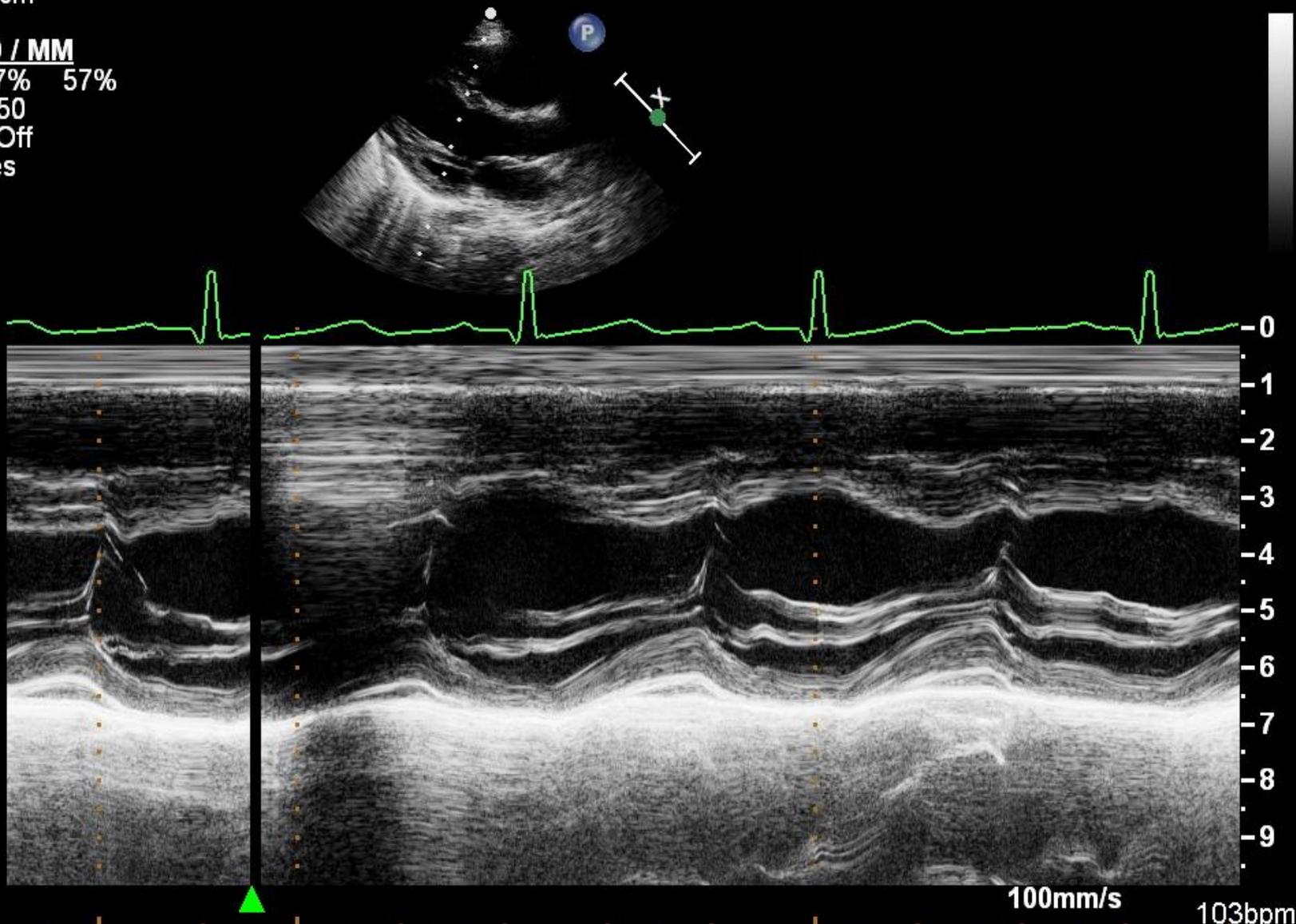
57% 57%

C 50

P Off

Res

M3



Slēdziens

Situs solitus.

Normāla plaušu un sistēmas vēnu drenāža.

Atrioventrikulāra un ventrikuloarteriāla konkordance.

Starpsiena intakta.

Vārstuļi intakti.

Ao loks bez patoloģijas.

Arteriālais vads slēgts.

Doplerogrāfiskie mērījumi

LVDd - LVDs - FS % EF % LV masa -

Ao PA

Slēdziens. Anatomiski normāla sirds.

PHILIPS

28/02/2012

12:02:21

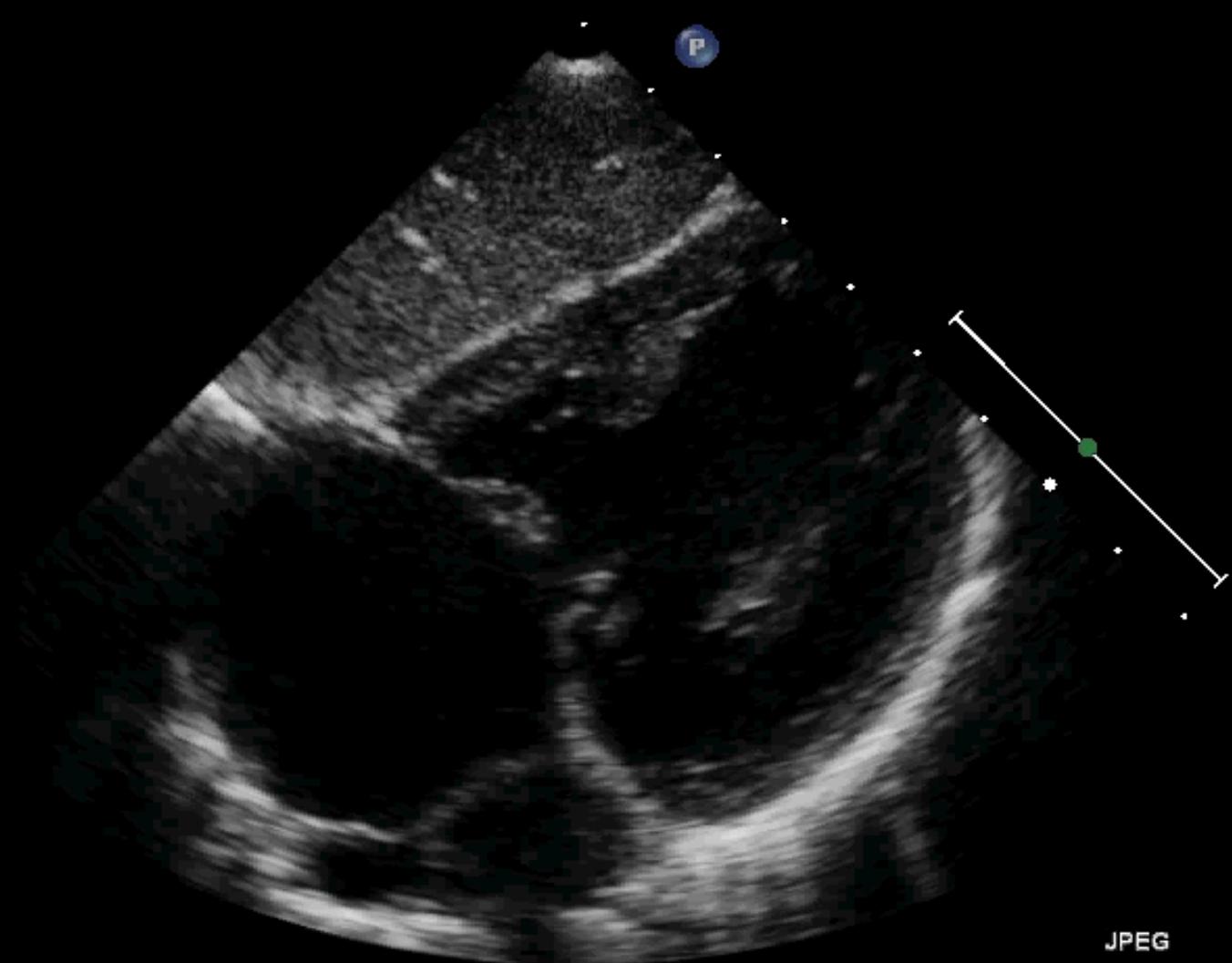
TIS1.8 MI 1.0

S8-3/Ped-CHD

FR 61Hz
10cm

M3

2D
62%
C 50
P Off
Pen



JPEG

136 bpm

Paldies par uzmanību😊

