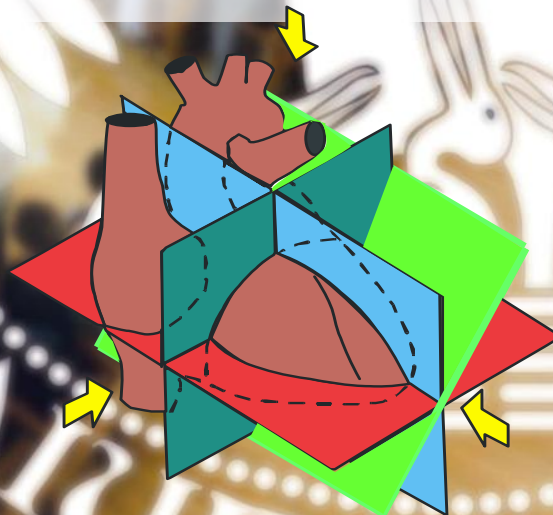
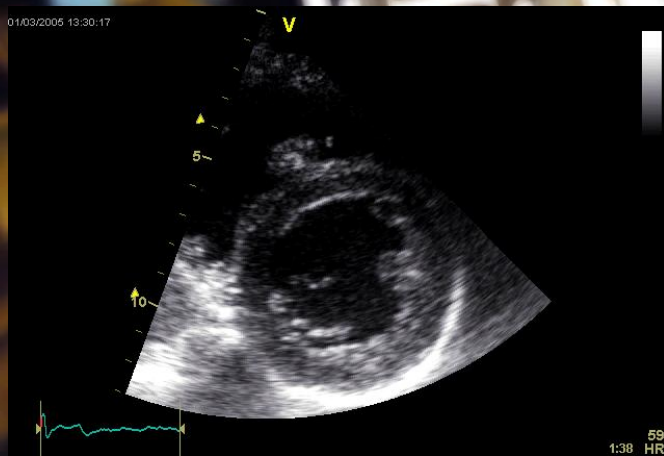


2D echokardiografie

Aleš Linhart

II. interní klinika kardiologie a angiologie

1. LF UK a VFN

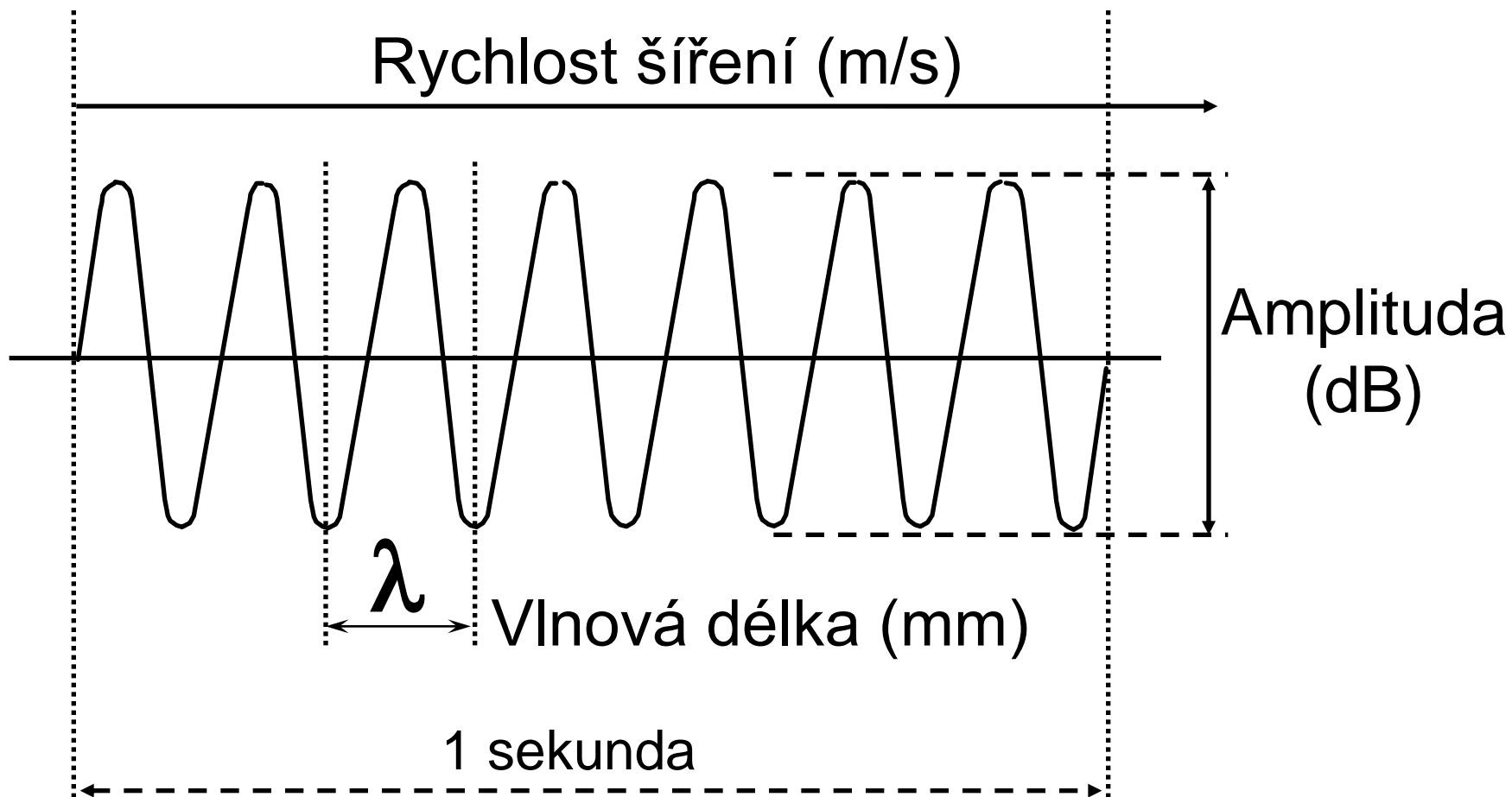


Co je třeba znát k atestaci z kardiologie ?

- Principy ultrazvuku
 - frekvence, využití harmonických frekvencí, rozlišovací schopnost
- Nastavení přístroje
 - gain, frekvence, fokusace
- Základní projekce
 - i méně často užívané!
- Základní normální hodnoty
- Interpretace patologických hodnot

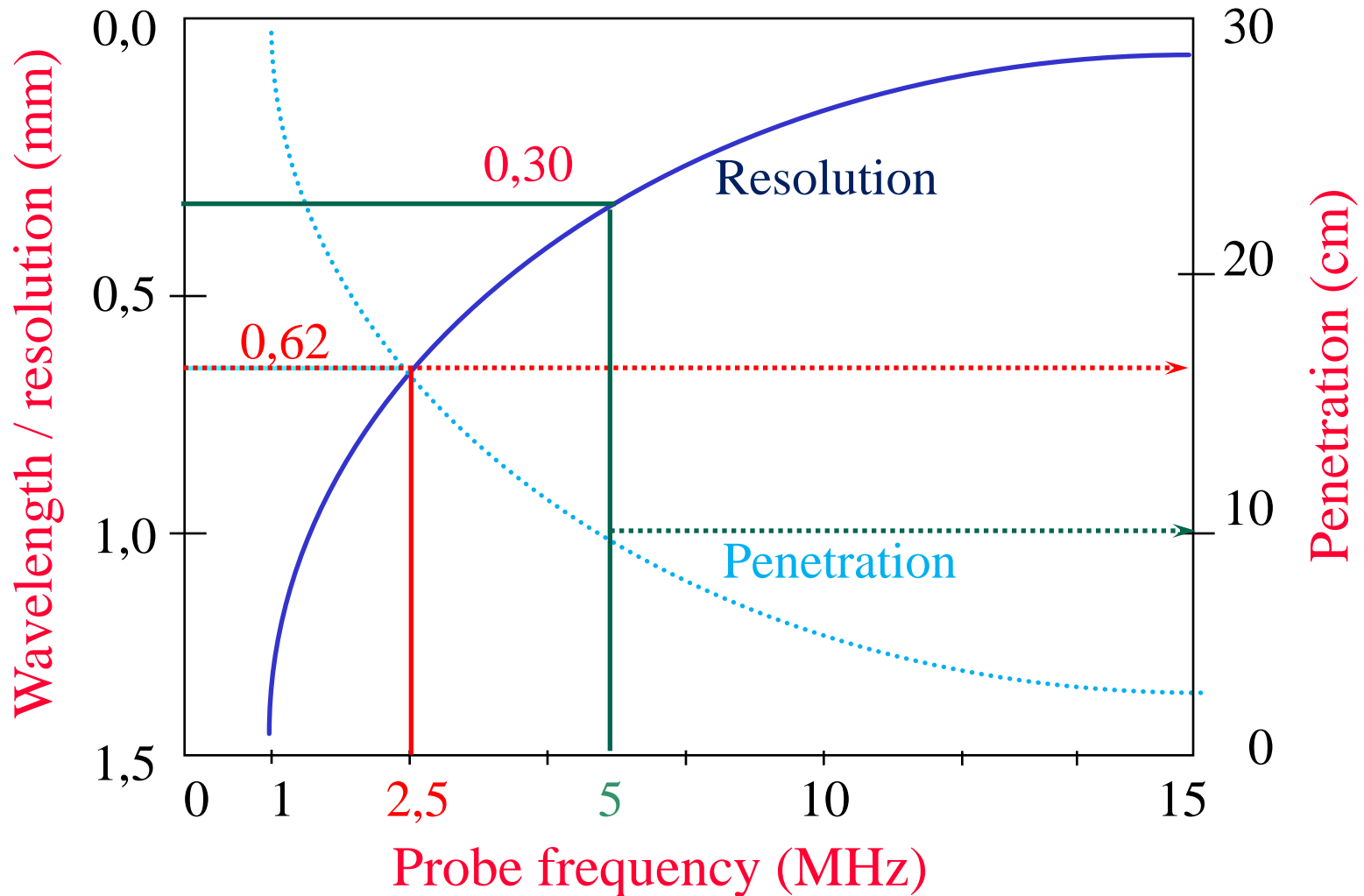
Principy ultrazvuku

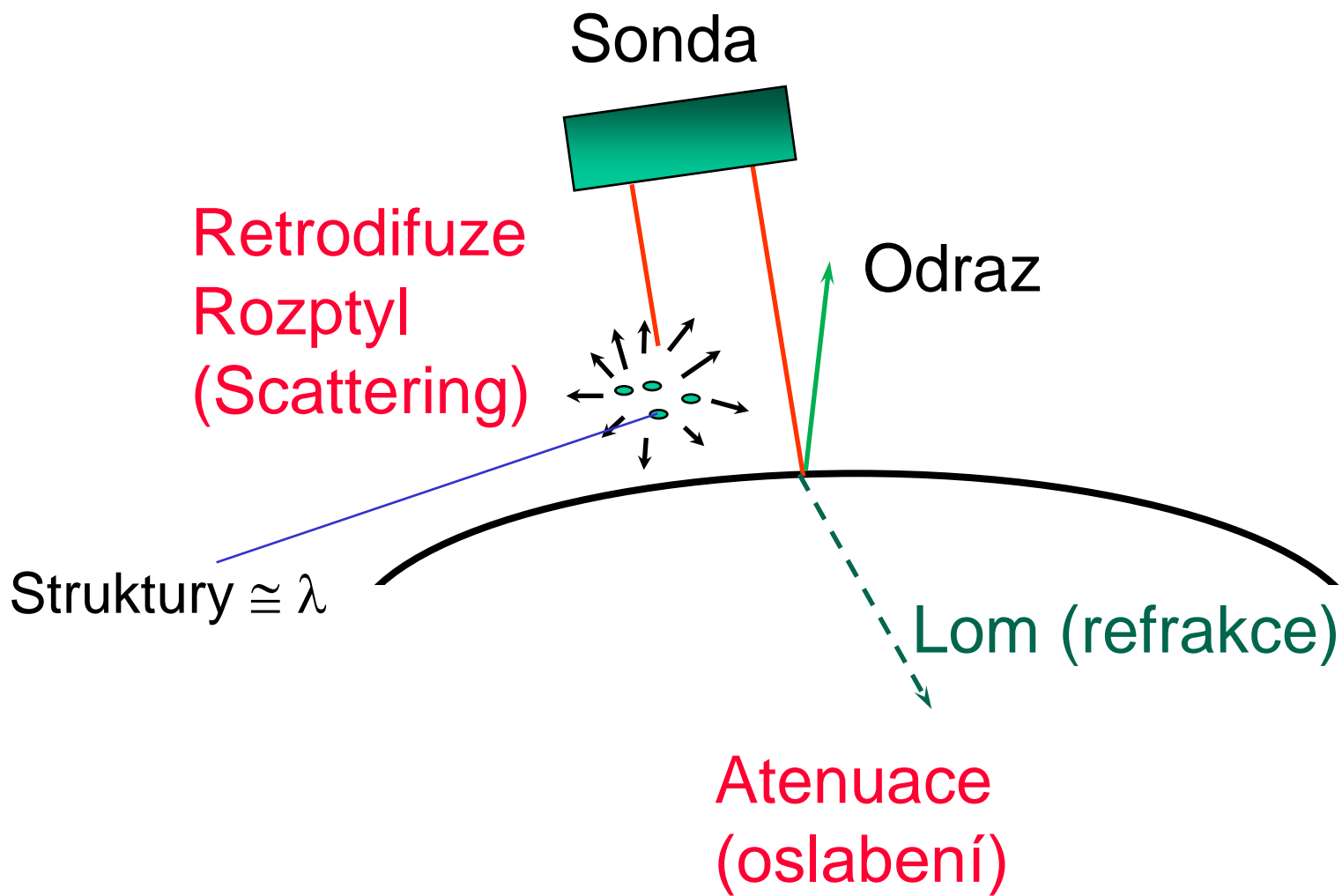
- Co je ultrazvuk a jak se šíří a chová ve tkáních
- Jak je tvořen echokardiografický obraz
- Jaké je rozlišení ultrazvuku
- Jaký je vztah mezi frekvencí a rozlišením
- Jak funguje harmonické zobrazení
- Co jsou fokální zóny



$$\text{Frekvence} = \frac{\text{Počet period}}{1 \text{ s}} \quad (\text{Hz})$$

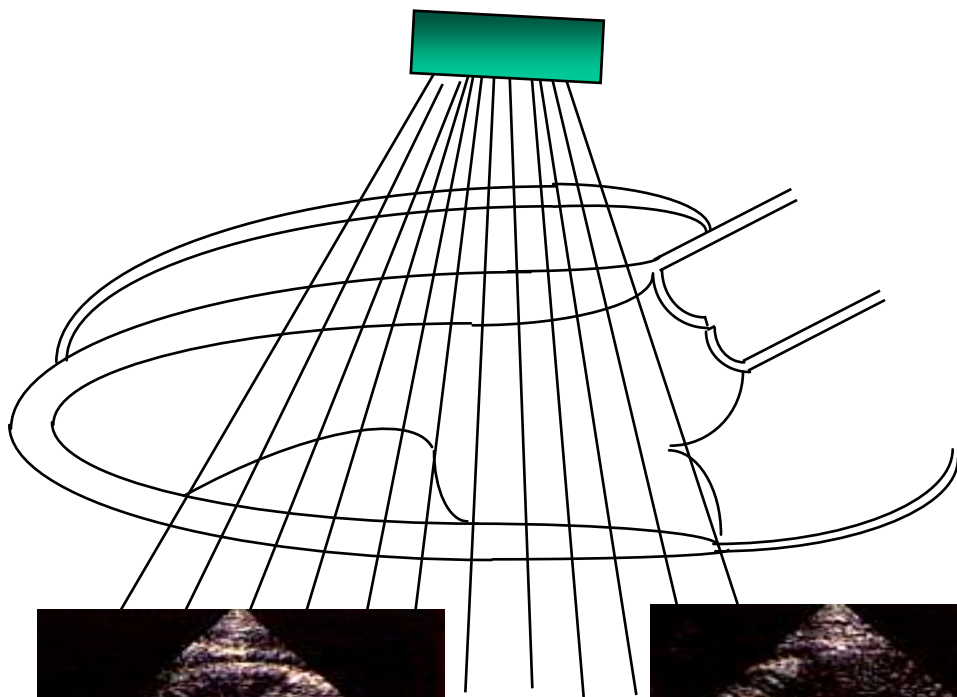
Relation between penetration and resolution according to probe frequency





Dvourozměrné zobrazení (2D)

Sonda



Sondy:

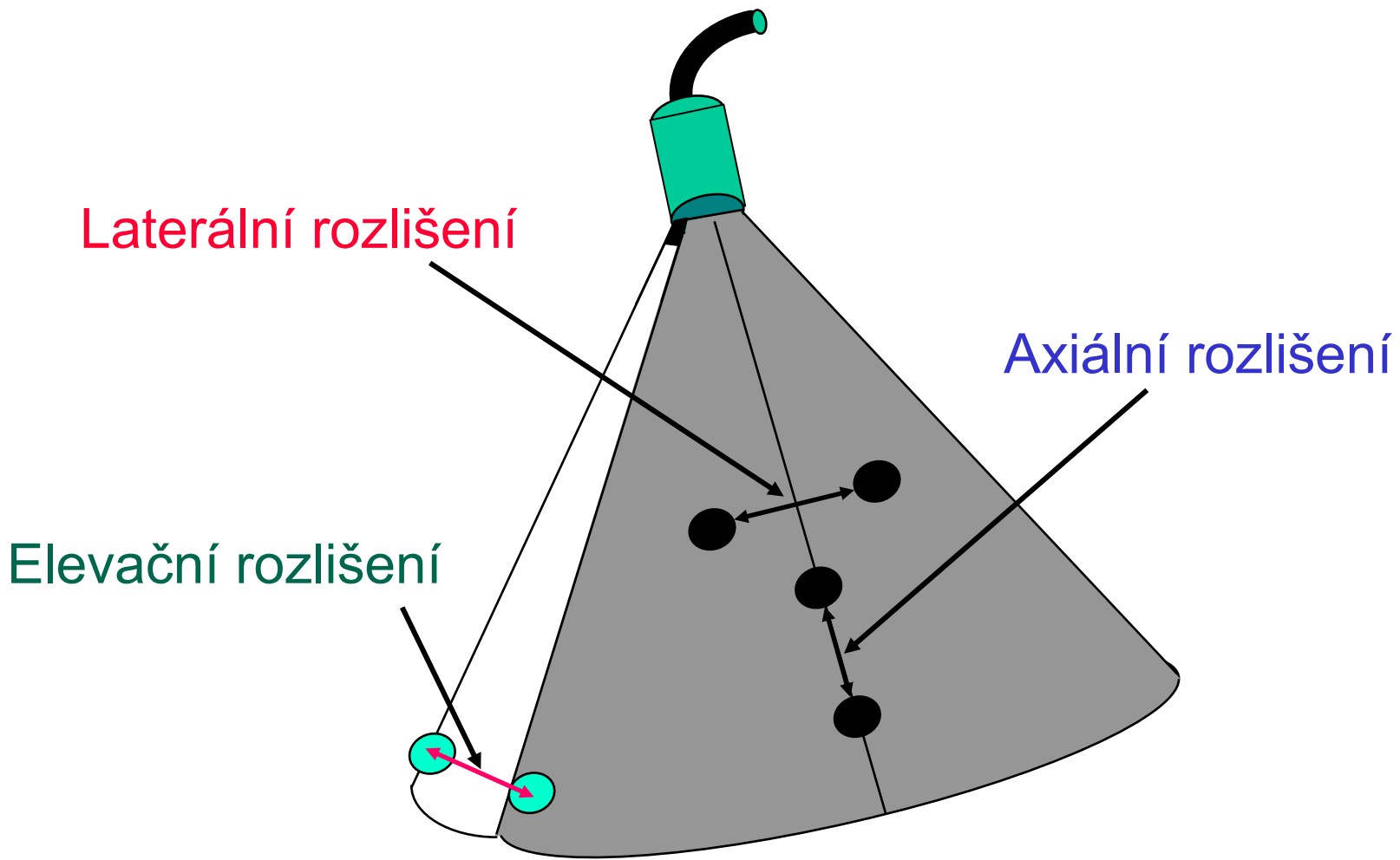
Mechanický pohyb krystalů

- Mechanical sector (1 krystal)
- Anular array (4 - 8 anulů)

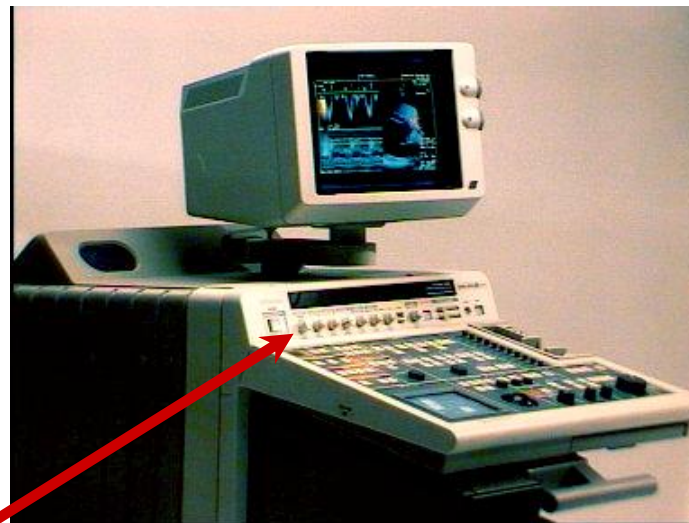
Plně elektronické

- Phased array (posun fáze)
- Linear array
- Curved array





Ovládací prvky echografu pro 2D zobrazení



Ultrasound power

Dynamic range



Focal zone

TGC

Frequency

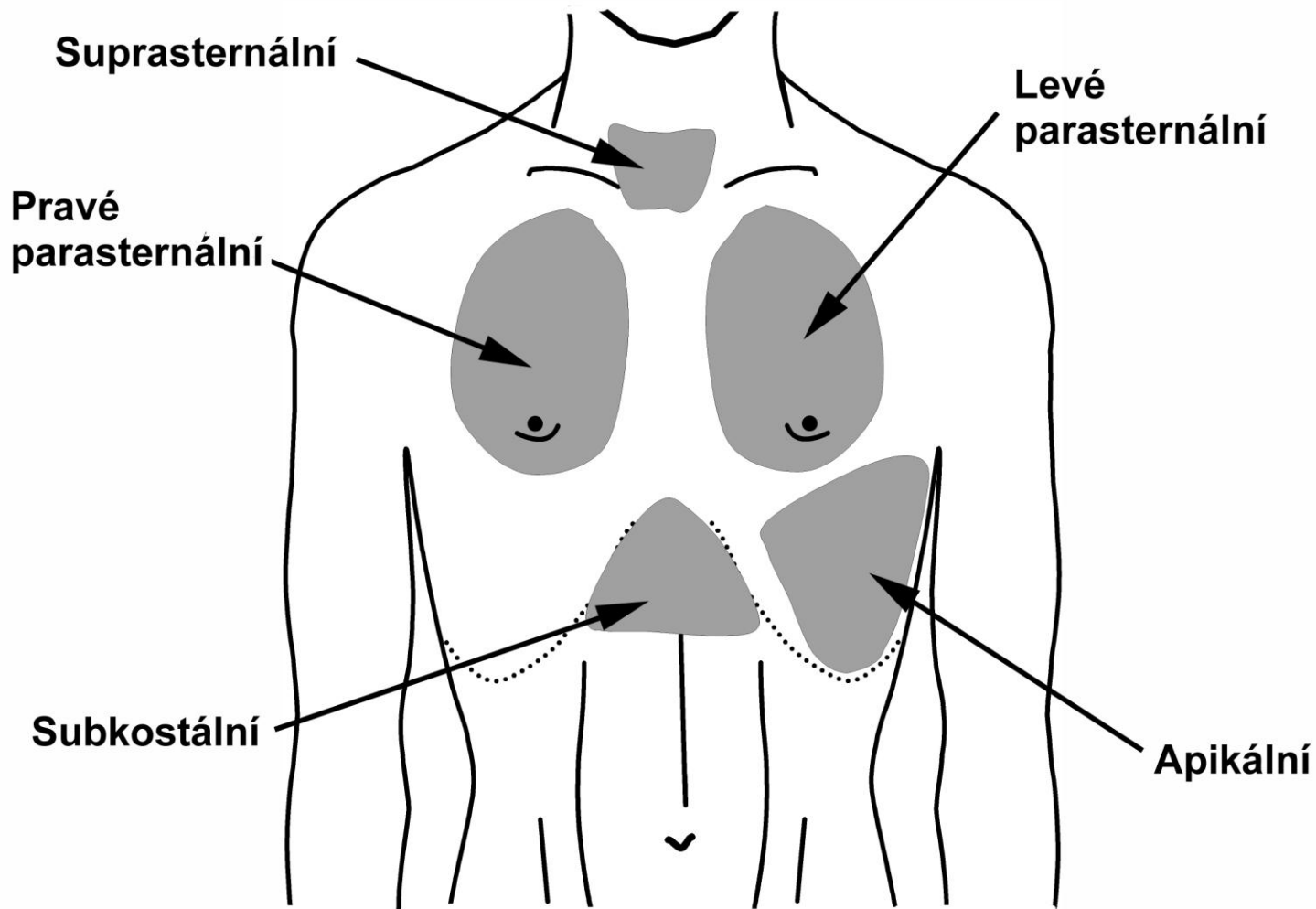
Gain

Sector width

Zoom

Depth

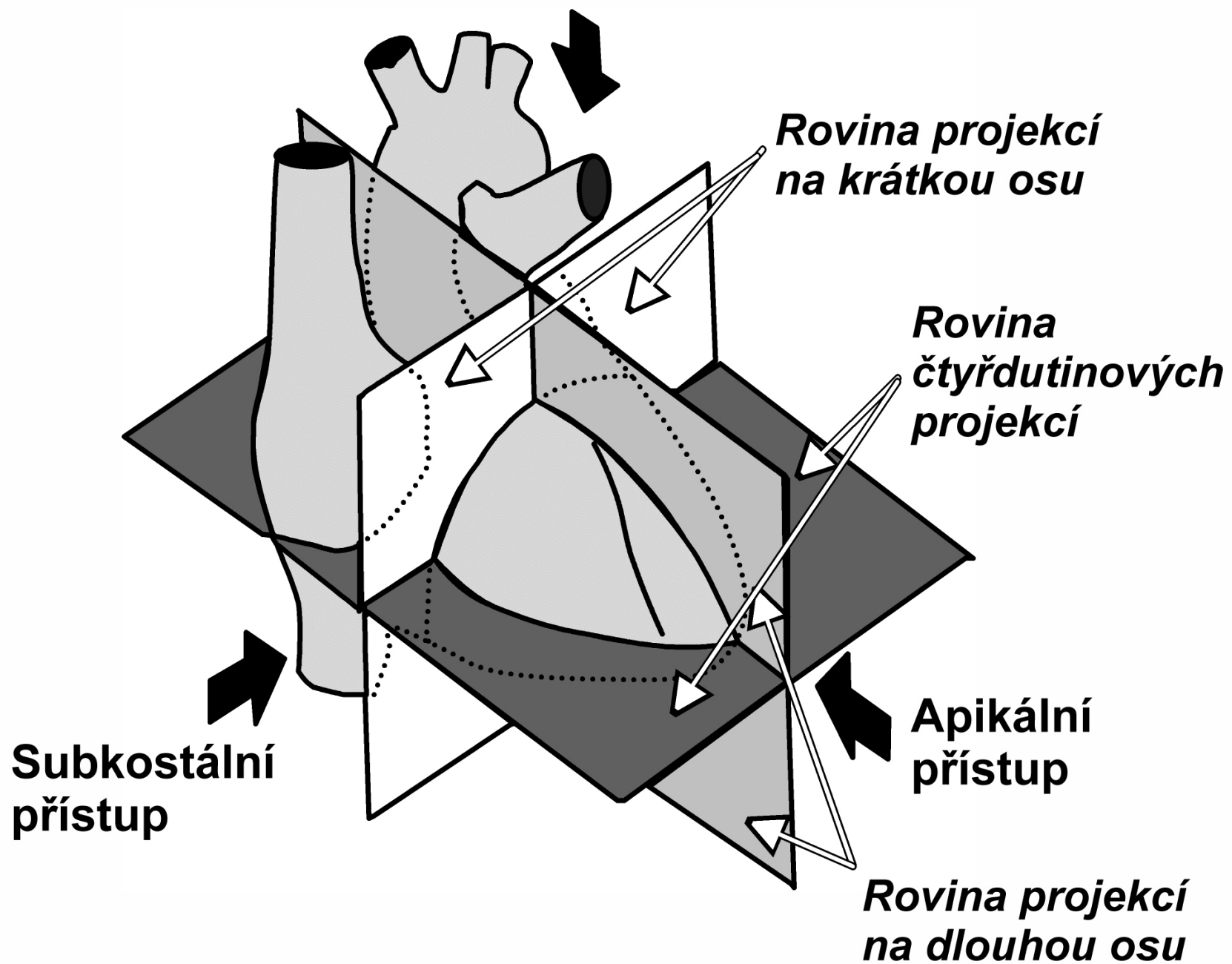
Základní echokardiografické projekce při transthorakálním vyšetření (TTE)

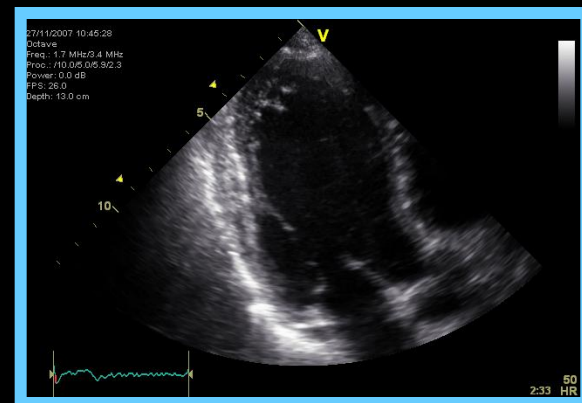
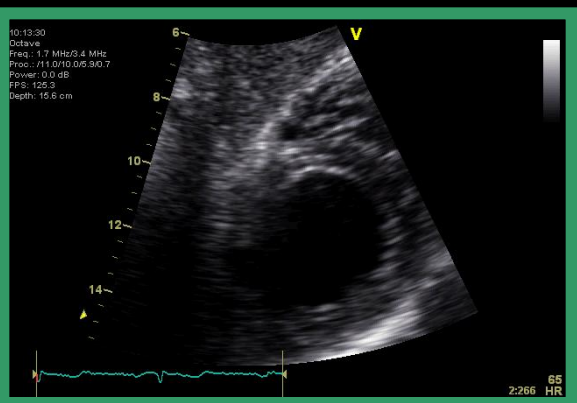
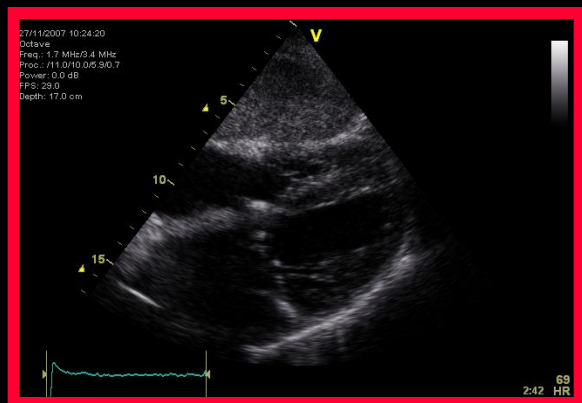
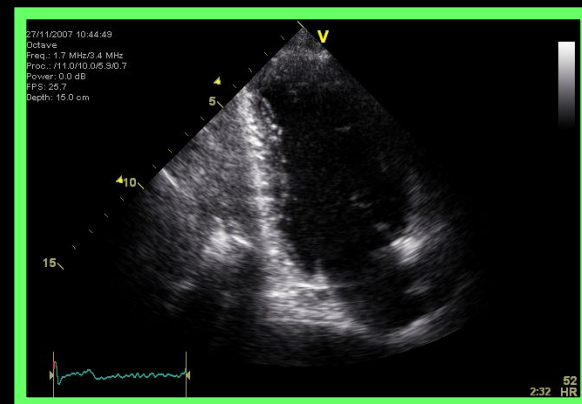
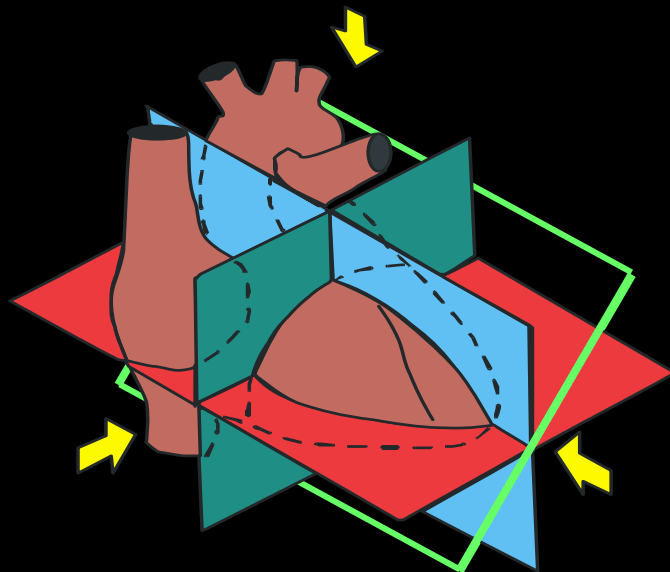
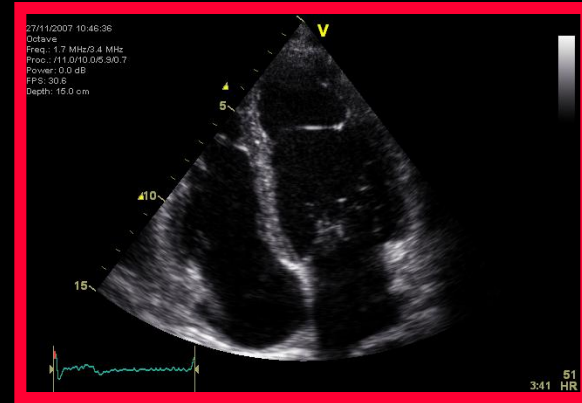
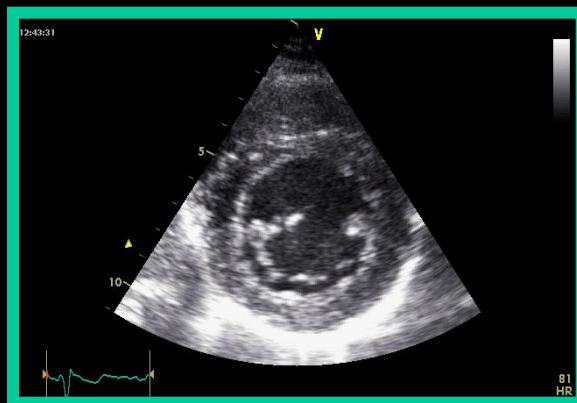
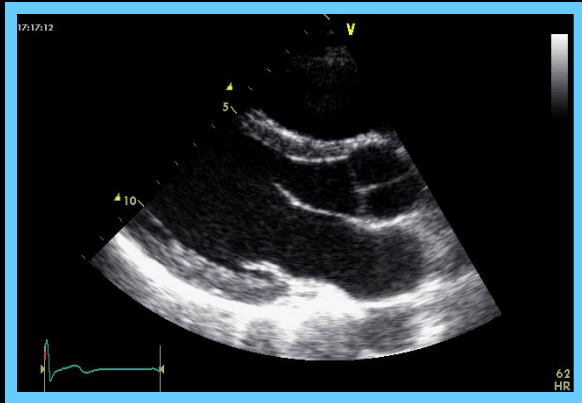


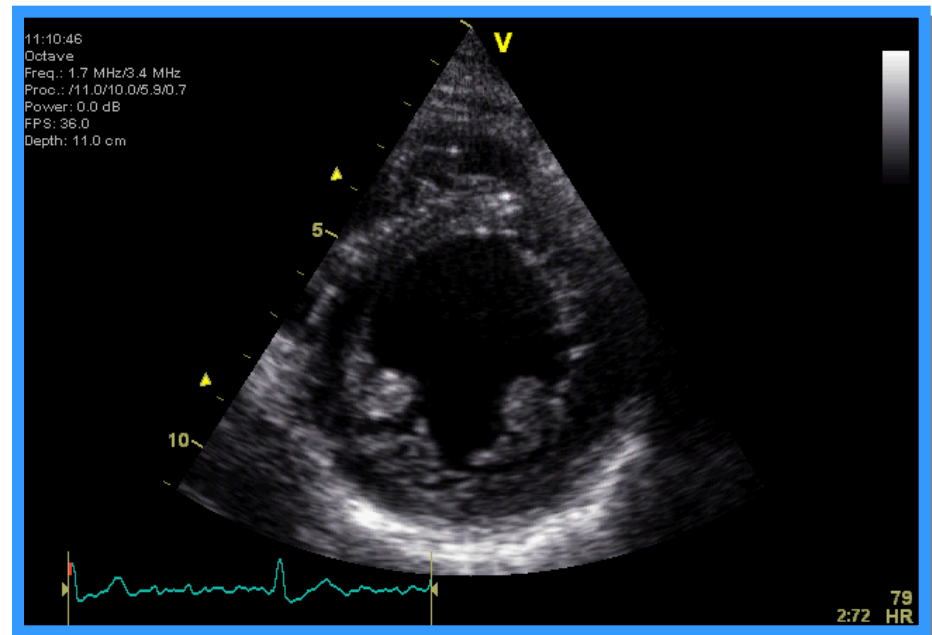
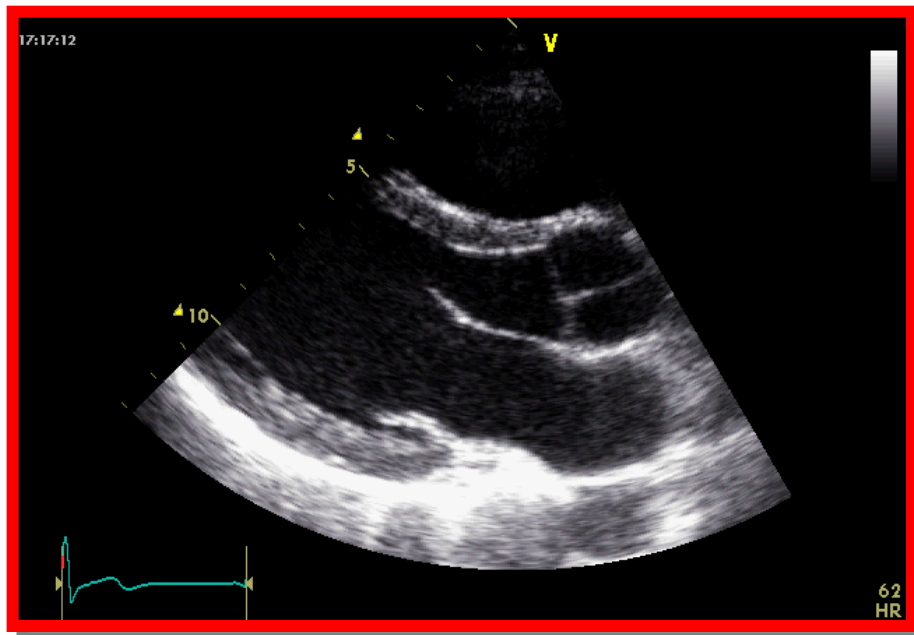
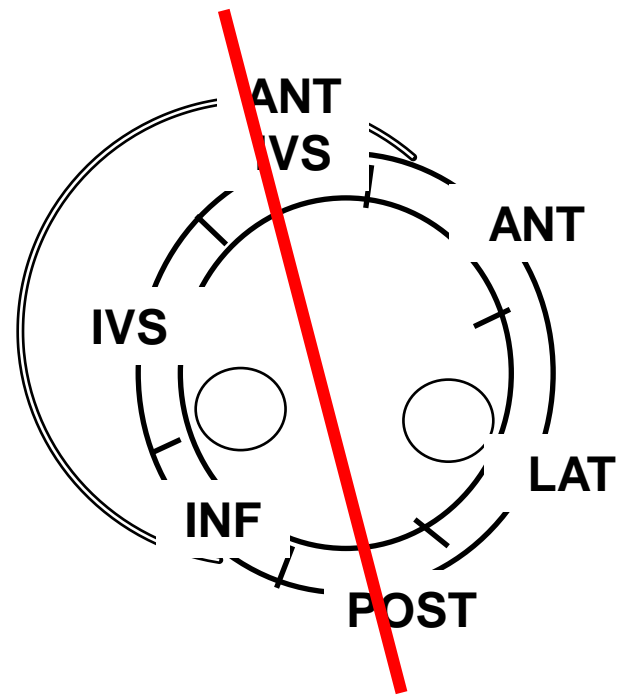
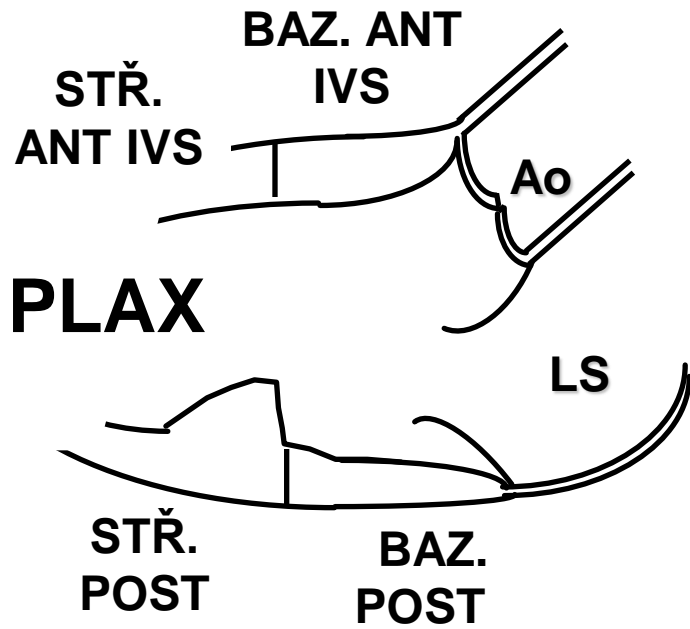
Základní echokardiografické projekce při transthorakálním vyšetření (TTE)

- Levá parasternální ⇒ Dlouhá osa
⇒ Krátká osa
- Apikální ⇒ 4 dutinová
⇒ 4 dutinová s aortou (5 dutinová)
⇒ 2 dutinová
⇒ 2 dutinová s aortou (3 dutinová)
- Subxiphoidální
- Suprasternální
- Pravá parasternální (Doppler !)

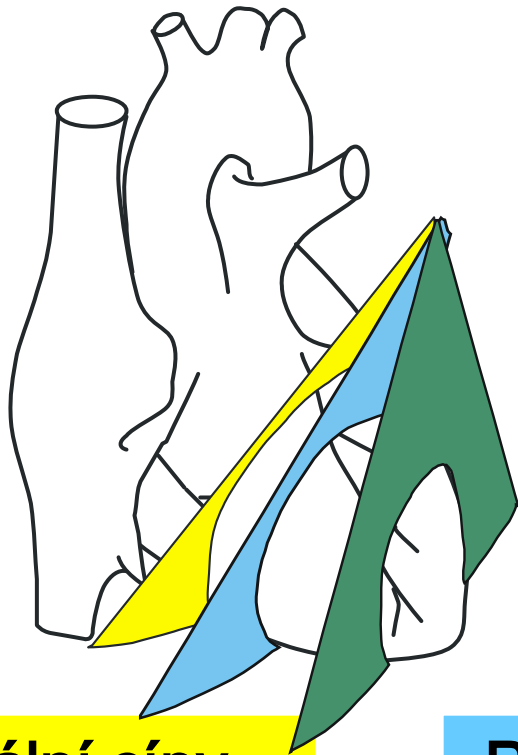
Parasternální přístup







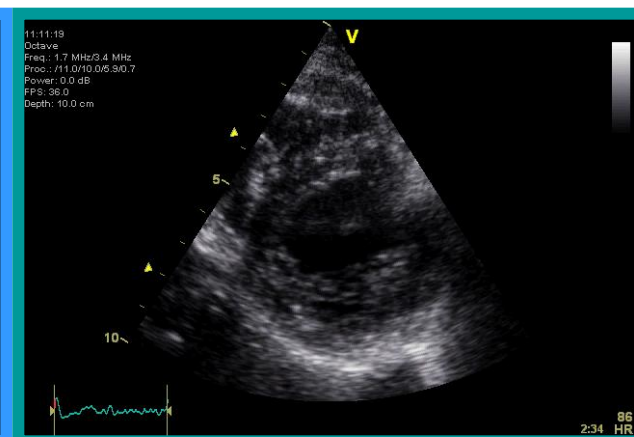
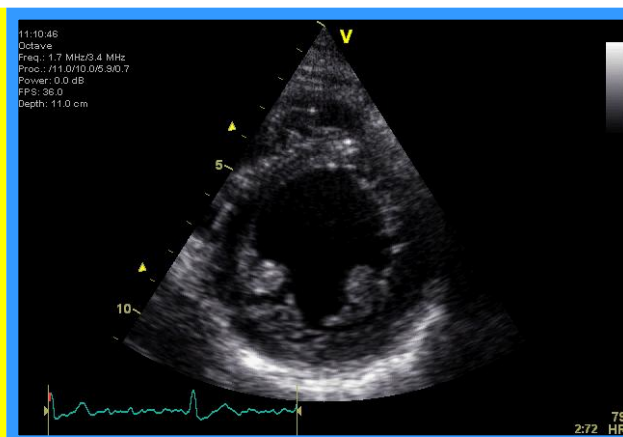
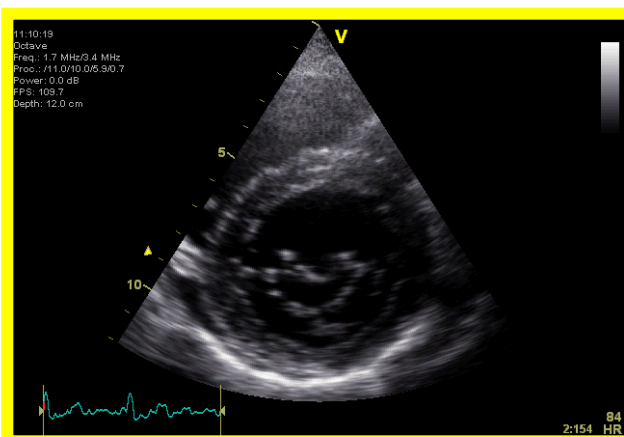
PSAX – levá komora

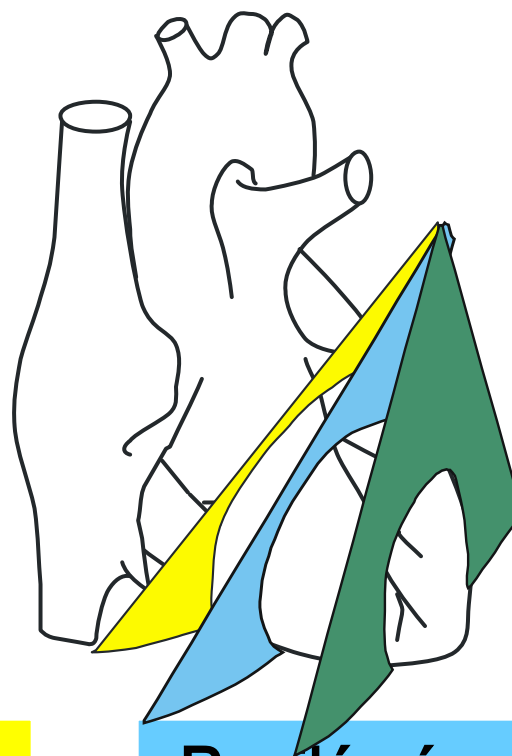


Mitrální cípy

Papilární svaly

Apex

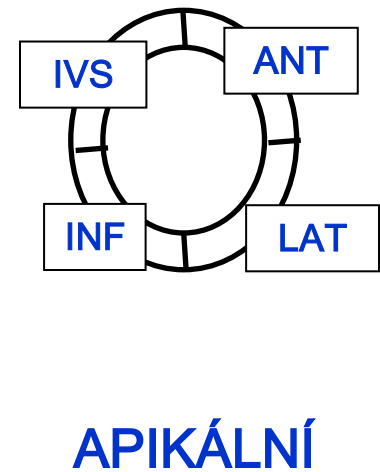
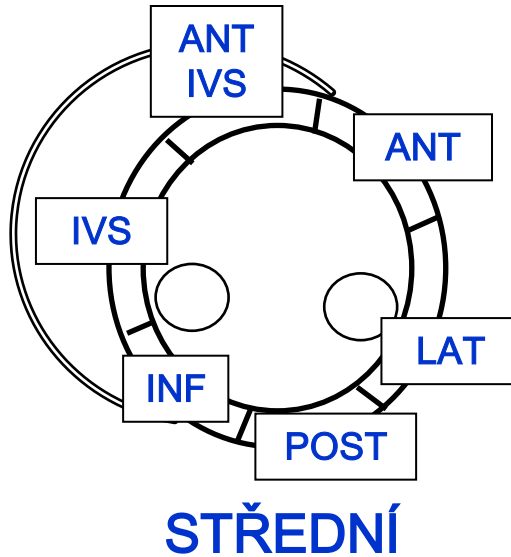
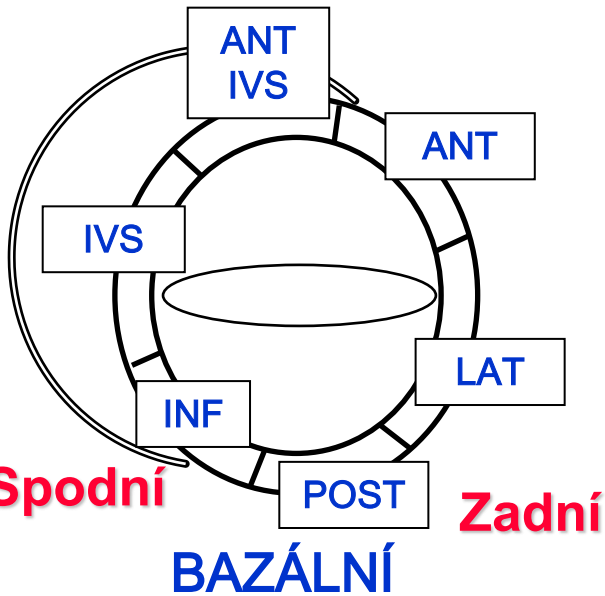


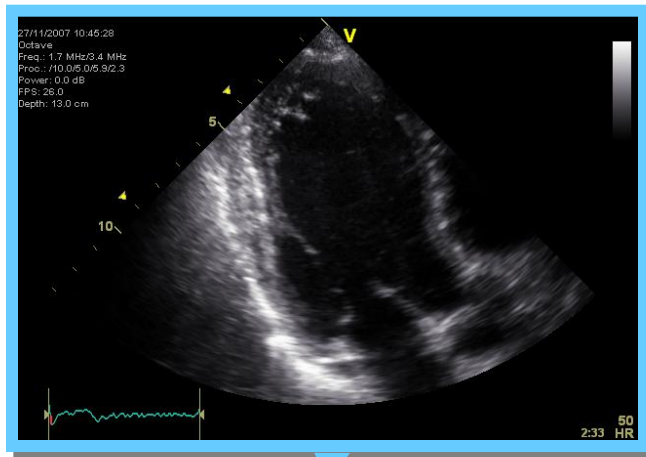
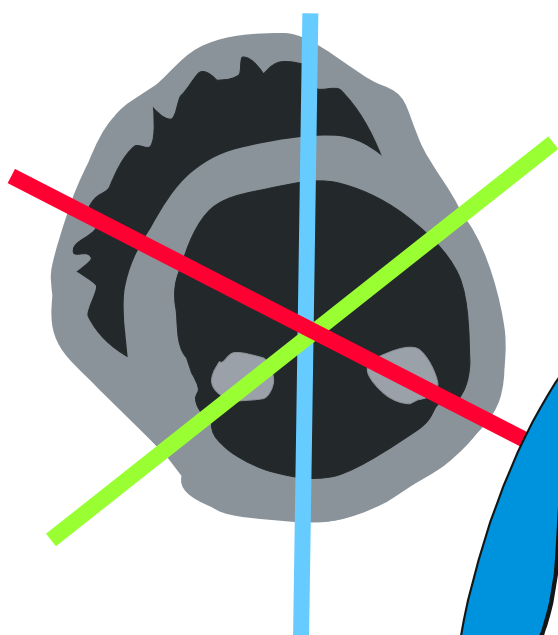


Mitrální cípy

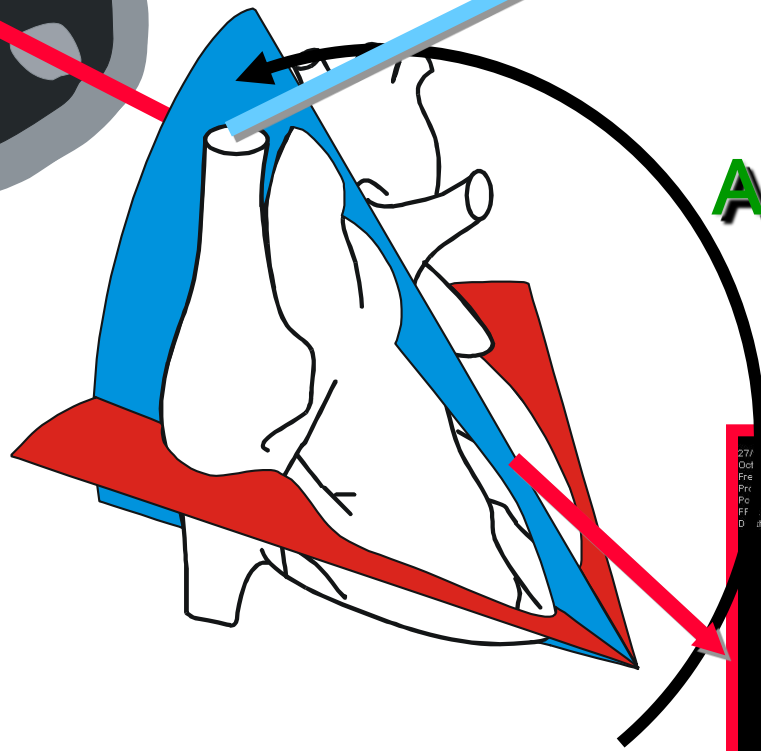
Papilární svaly

Apex

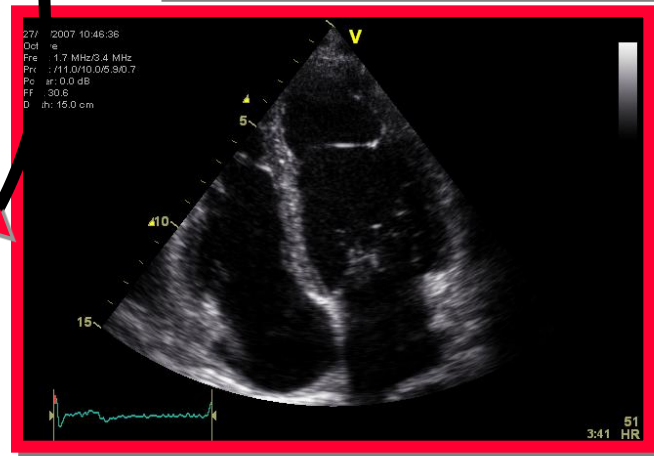
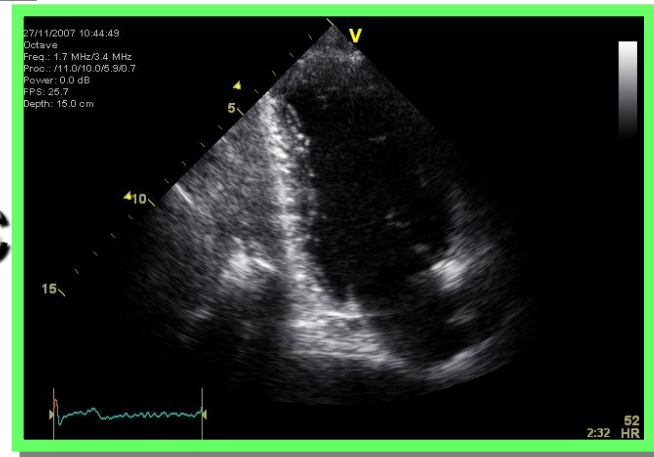




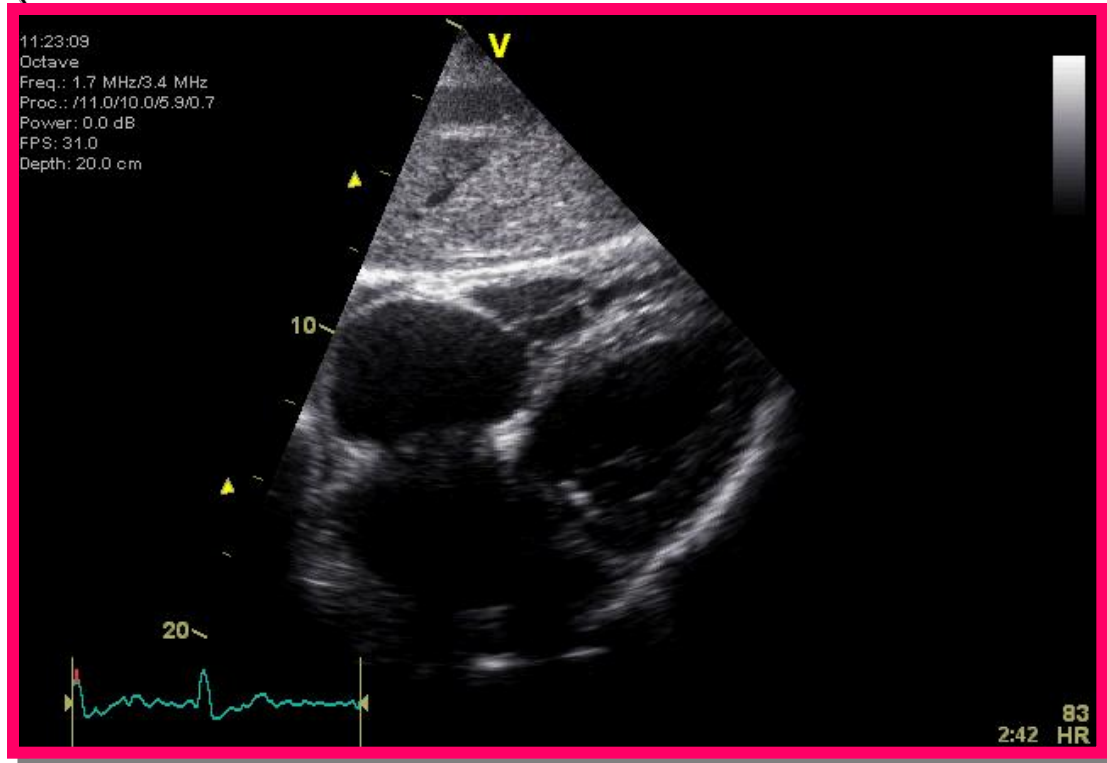
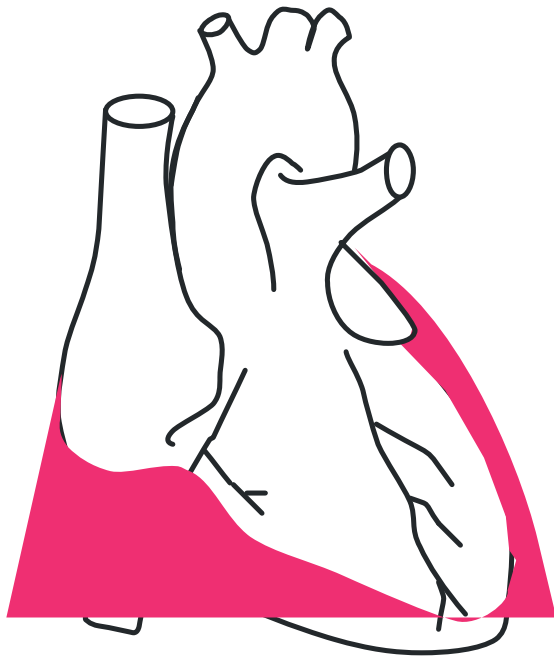
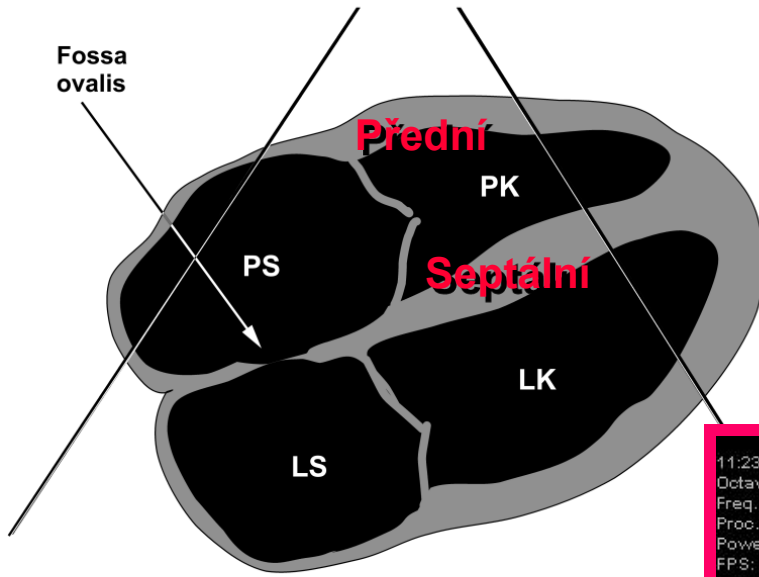
ALAX



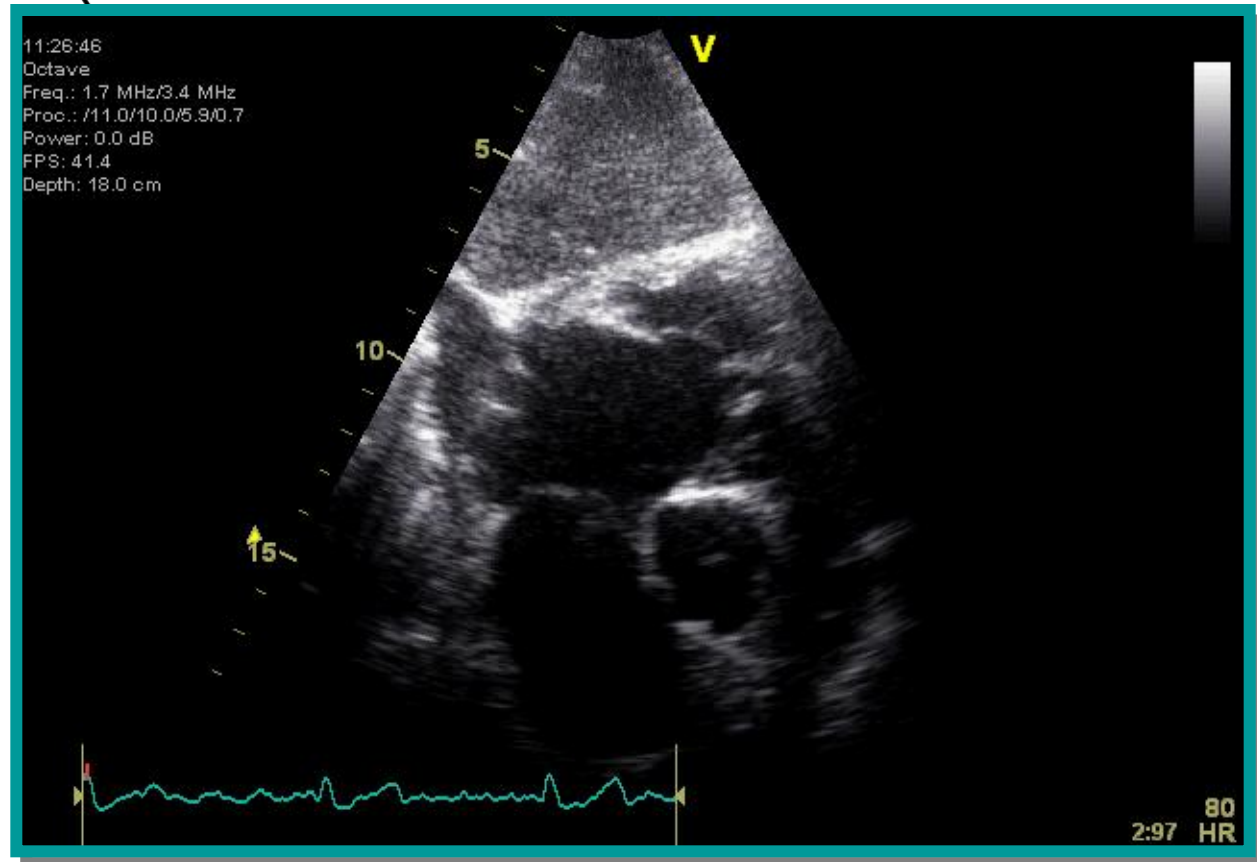
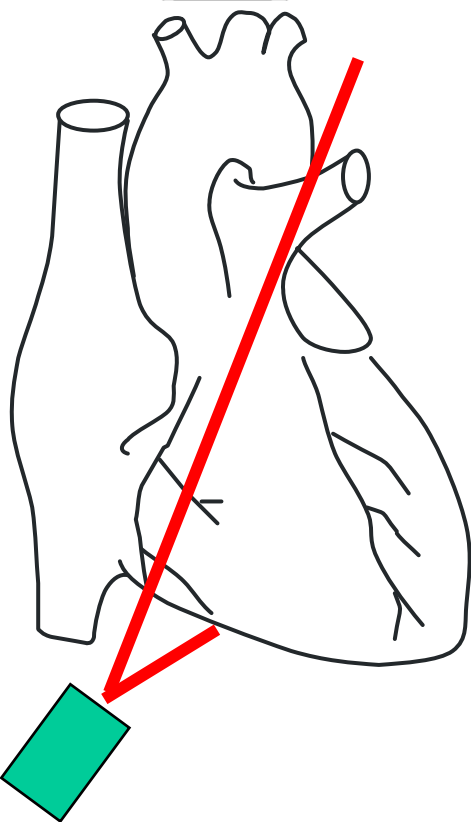
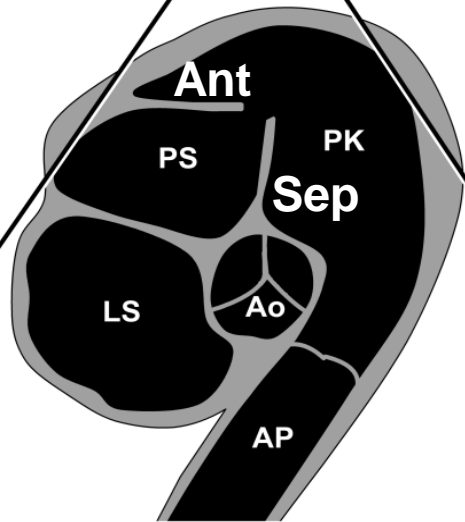
A2C



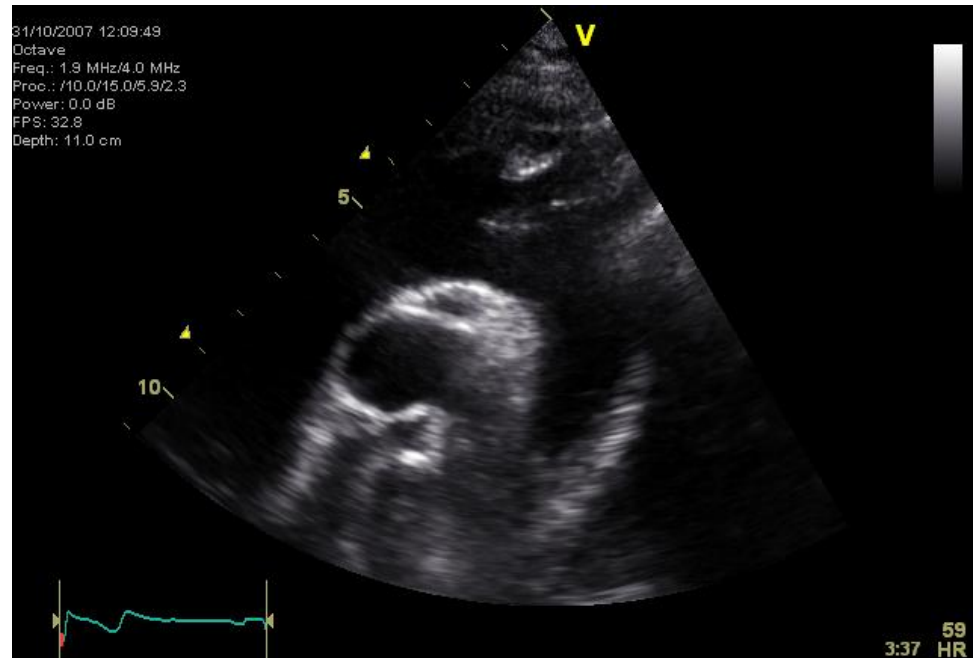
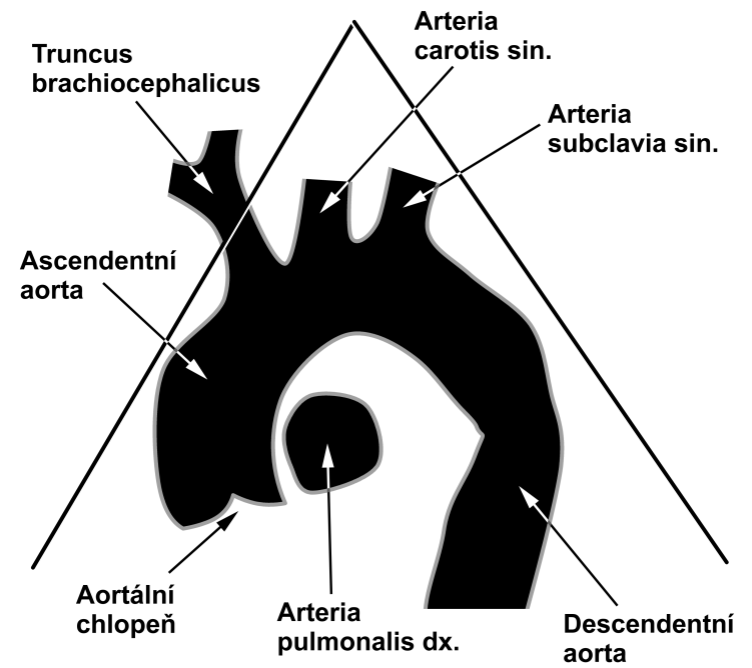
Subkostální 4dutinová projekce



Subxiphoidální projekce - krátká osa – úroveň velkých cév



Oblouk aorty



NORMÁLNÍ HODNOTY

Recommendations for Chamber
Quantification: A Report from the American
Society of Echocardiography's Guidelines and
Standards Committee and the Chamber
Quantification Writing Group, Developed in
Conjunction with the European Association
of Echocardiography, a Branch of the
European Society of Cardiology

Members of the Chamber Quantification Writing Group are: Roberto M. Lang, MD, FASE, Michelle Bierig, MPH, RDCS, FASE, Richard B. Devereux, MD, Frank A. Flachskampf, MD, Elyse Foster, MD, Patricia A. Pellikka, MD, Michael H. Picard, MD, Mary J. Roman, MD, James Seward, MD, Jack S. Shanewise, MD, FASE, Scott D. Solomon, MD, Kirk T. Spencer, MD, FASE, Martin St John Sutton, MD, FASE, and William J. Stewart, MD

Normativní data dle ASE /EAE

	Women				Men			
	Reference range	Mildly abnormal	Moderately abnormal	Severely abnormal	Reference range	Mildly abnormal	Moderately abnormal	Severely abnormal
LV dimension								
LV diastolic diameter	3.9-5.3	5.4-5.7	5.8-6.1	≥6.2	4.2-5.9	6.0-6.3	6.4-6.8	≥6.9
LV diastolic diameter/BSA, cm/m ²	2.4-3.2	3.3-3.4	3.5-3.7	≥3.8	2.2-3.1	3.2-3.4	3.5-3.6	≥3.7
LV diastolic diameter/height, cm/m	2.5-3.2	3.3-3.4	3.5-3.6	≥3.7	2.4-3.3	3.4-3.5	3.6-3.7	≥3.8
LV volume								
LV diastolic volume, mL	56-104	105-117	118-130	≥131	67-155	156-178	179-201	≥201
<i>LV diastolic volume/BSA, mL/m²</i>	<i>35-75</i>	<i>76-86</i>	<i>87-96</i>	<i>≥97</i>	<i>35-75</i>	<i>76-86</i>	<i>87-96</i>	<i>≥97</i>
LV systolic volume, mL	19-49	50-59	60-69	≥70	22-58	59-70	71-82	≥83
<i>LV systolic volume/BSA, mL/m²</i>	<i>12-30</i>	<i>31-36</i>	<i>37-42</i>	<i>≥43</i>	<i>12-30</i>	<i>31-36</i>	<i>37-42</i>	<i>≥43</i>

BSA, body surface area; LV, left ventricular.

Bold italic values: Recommended and best validated.

Normální hodnoty LK v M-mode

Parametr	Dolní mez	Horní mez
• IVS	6 mm	12 mm
• ZSd	6 mm	12 mm
• LKd		
– Ženy		32 mm/m ²
– Muži		31 mm/m ²

GUIDELINES AND STANDARDS

Guidelines for the Echocardiographic Assessment of the Right Heart in Adults: A Report from the American Society of Echocardiography

Endorsed by the European Association of Echocardiography, a registered
branch of the European Society of Cardiology, and the Canadian Society of
Echocardiography

Lawrence G. Rudski, MD, FASE, Chair, Wyman W. Lai, MD, MPH, FASE, Jonathan Afilalo, MD, Msc,
Lanqi Hua, RDCS, FASE, Mark D. Handschumacher, BSc, Krishnaswamy Chandrasekaran, MD, FASE,
Scott D. Solomon, MD, Eric K. Louie, MD, and Nelson B. Schiller, MD, *Montreal, Quebec, Canada; New York,
New York; Boston, Massachusetts; Phoenix, Arizona; London, United Kingdom; San Francisco, California*

(J Am Soc Echocardiogr 2010;23:685-713.)

Co by měl obsahovat každý echo nálezn

- **Levá komora**
 - velikost, struktura (hypertrofie, remodelace)
 - systolická funkce regionální a globální (EF)
 - plnění (diastolická funkce, odhad plicních tlaků – E/E´)
- **Levá síň**
 - velikost a objemy
- **Pravá komora a síň**
 - velikost
 - systolická funkce (TAPSE, FAC) a plicí tlaky (VCI)
- Chlopenní vady
- Zkratky, patologické útvary
- Tlaky v plicnici (odhad z TR /PR)
- Perikard
- Aortální oblouk

Děkuji za pozornost

II. interní klinika kardiologie a angiologie

1. LF UK a VFN

U nemocnice 2, 128 08 Praha 2

web: <http://int2.lf1.cuni.cz/>