

Pitfalls in emergencies

I.M. Coman

MD, PhD, FESC

Pitfalls victims ?

WHO : all of us

WHEN : - Learning curve !
- When we hurry !

WHICH conditions :

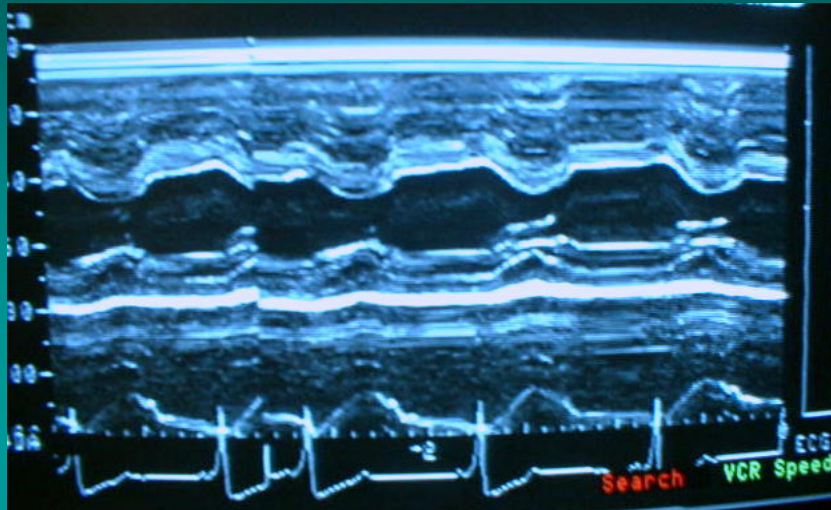
Poor devices /pts.windows

Arrhythmias

Extreme ages (children , old pts.)

Complex diseases/procedures

We love what we have...



WHY :

I. Technical errors during exam

I DON'T SEE !

II. Choice of irrelevant parameters

I LOOK IN THE WRONG DIRECTION !

III. Errors in interpreting results

‘ I DON'T UNDERSTAND !

EAE recommendations for training, competence, and quality improvement.

European Journal of Echocardiography (2009) 10, 893–905

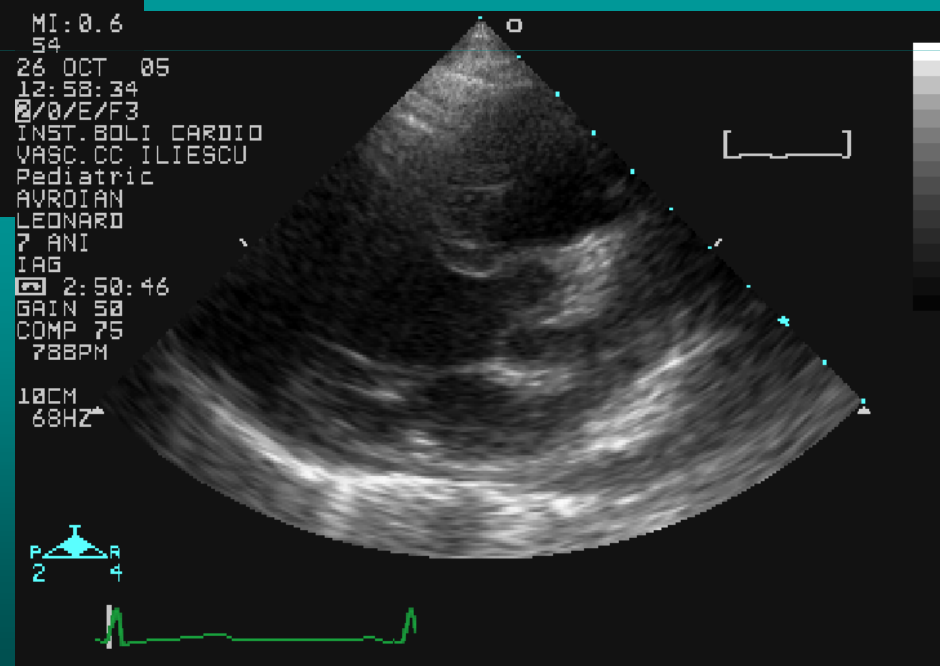
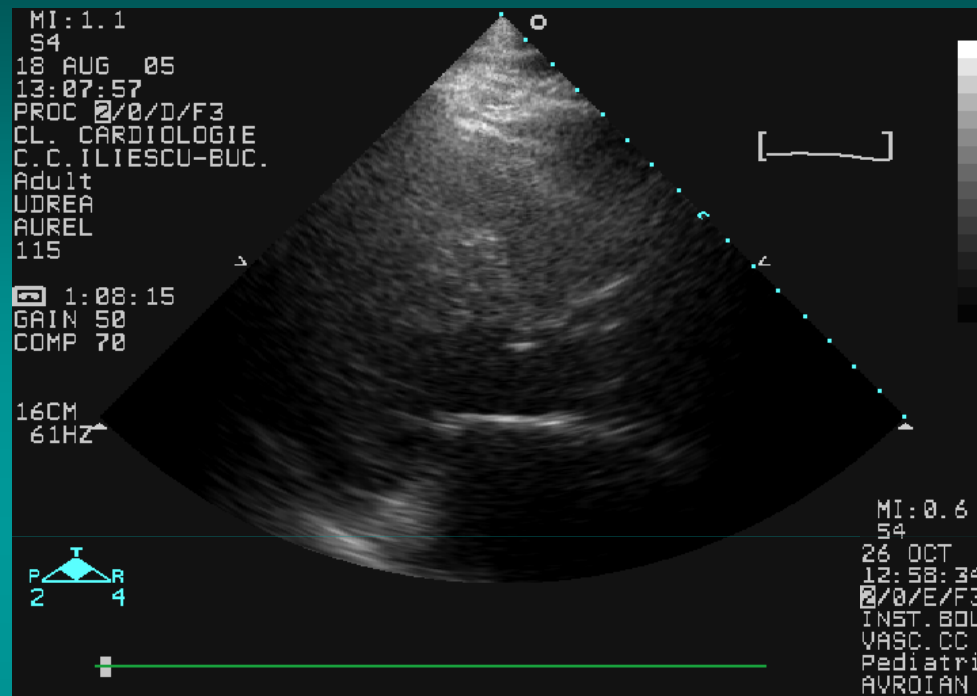


Let's look closer !

Technical errors

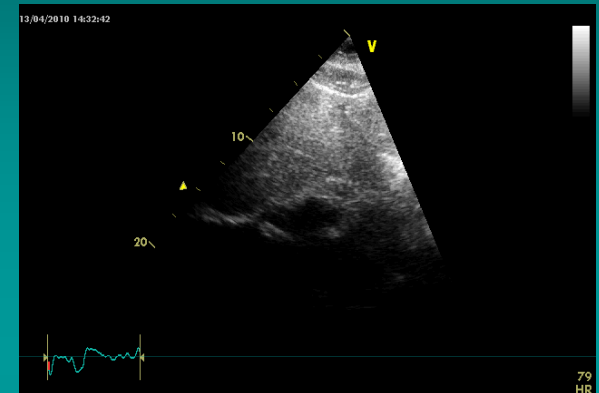
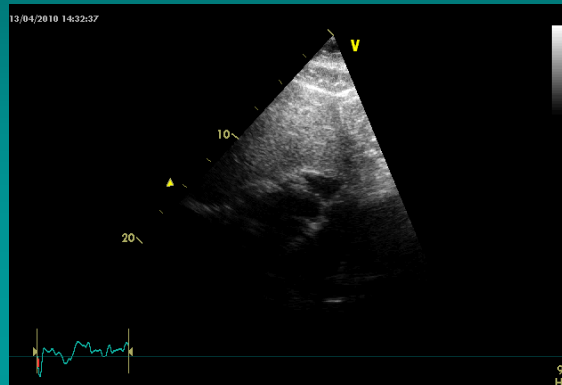
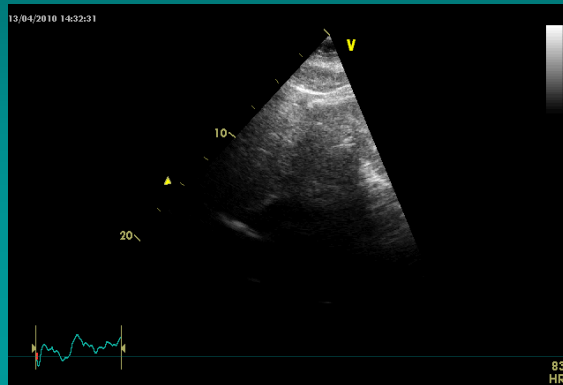


A. Poor image

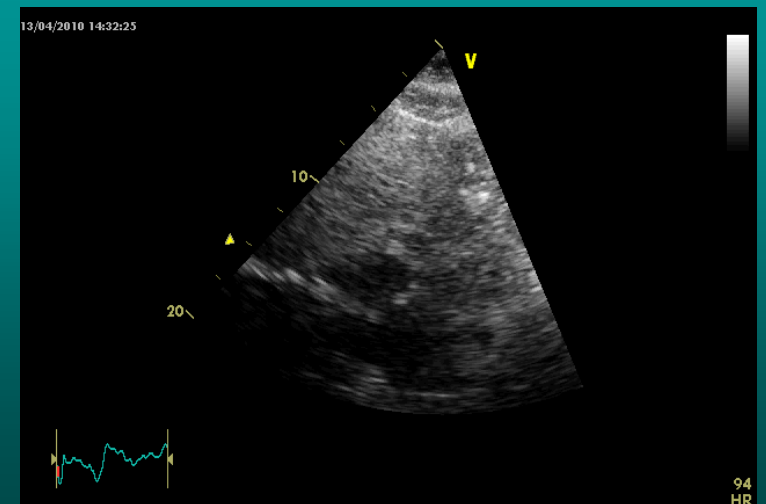
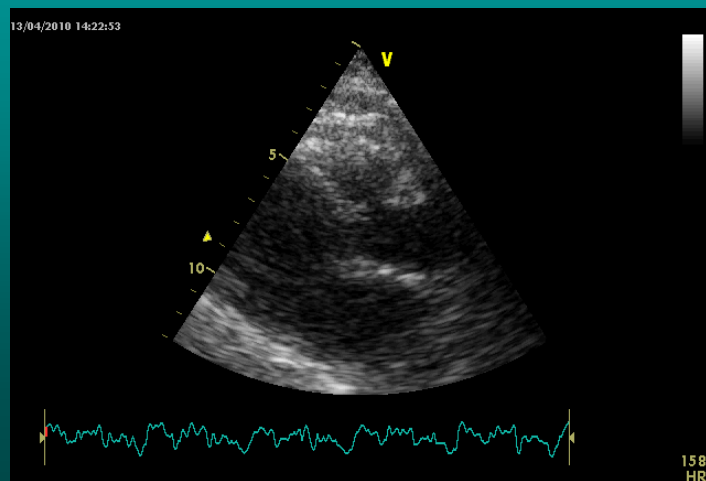


How to avoid

- Change frequency !

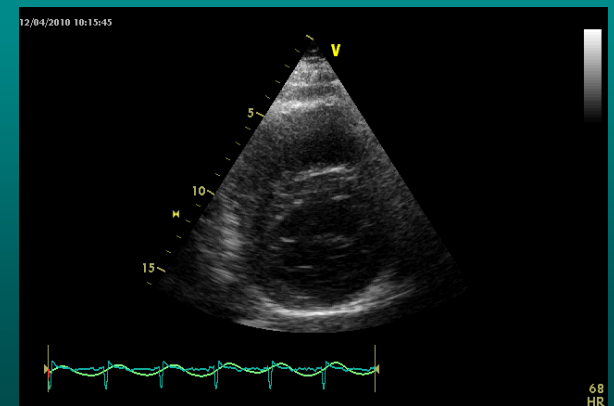
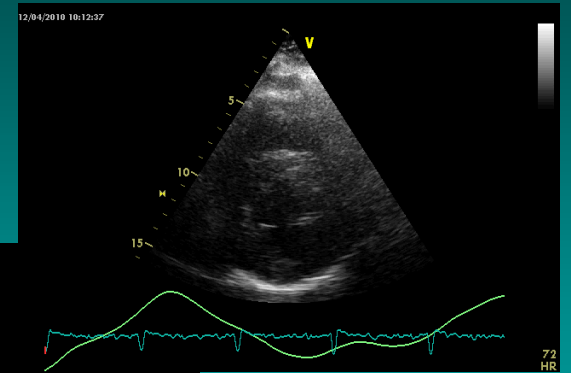
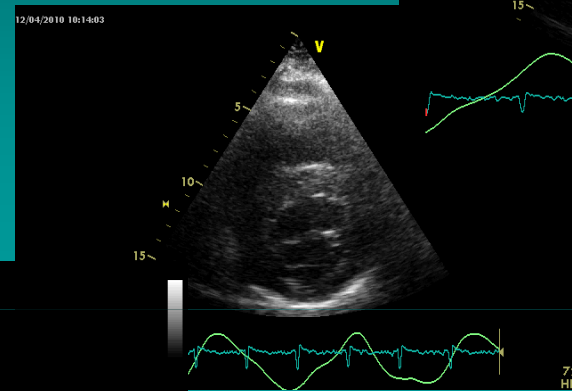
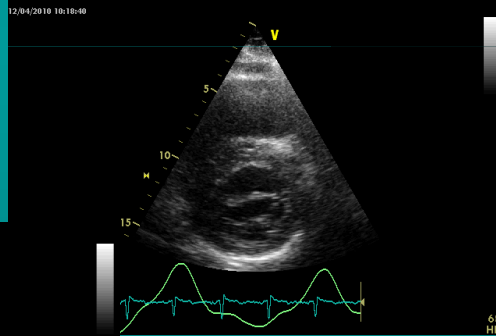
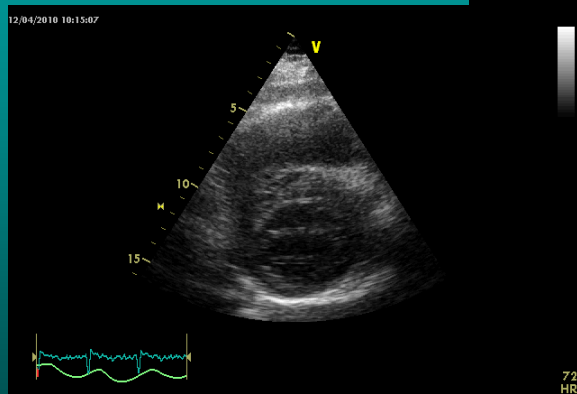


- Use harmonics !



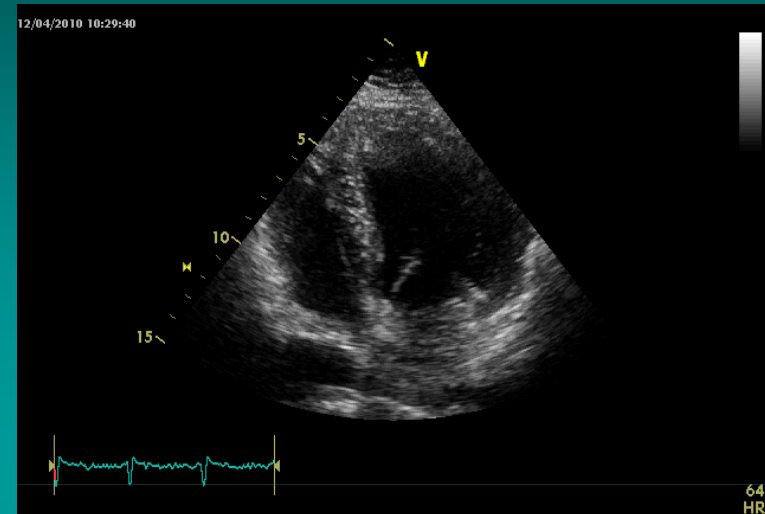
How to avoid

- Use respiratory cycle variations /apnea !
- Change patient's position !

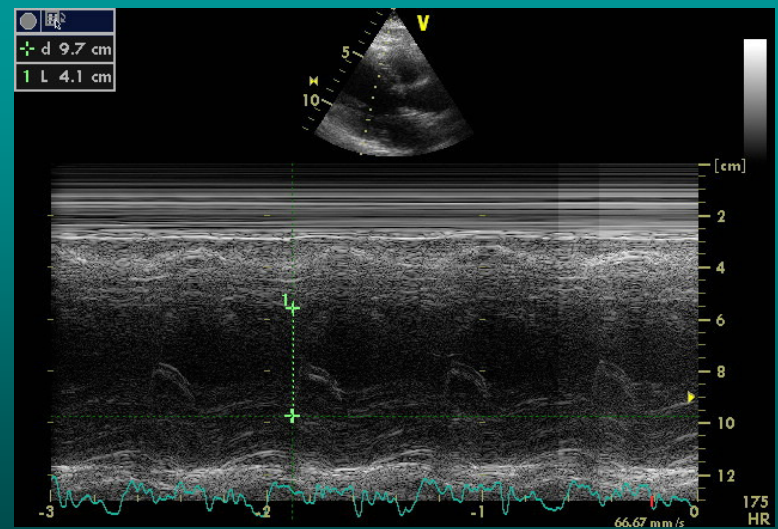


B. Inadequate imaging (2D)

A. Bad transducer position

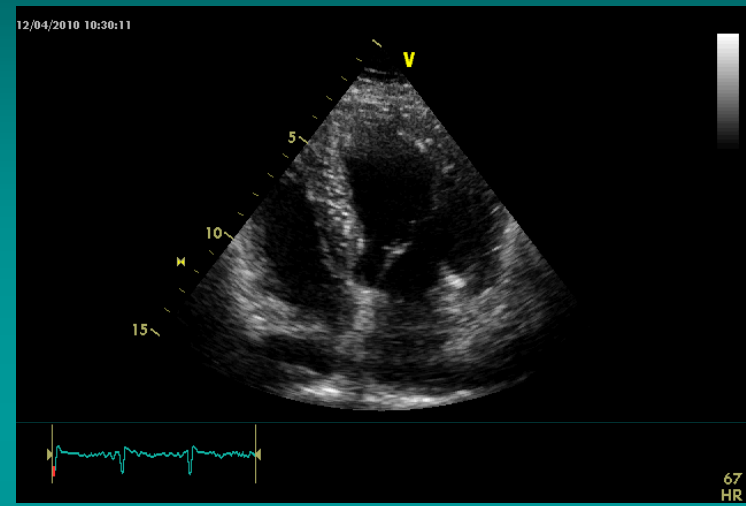
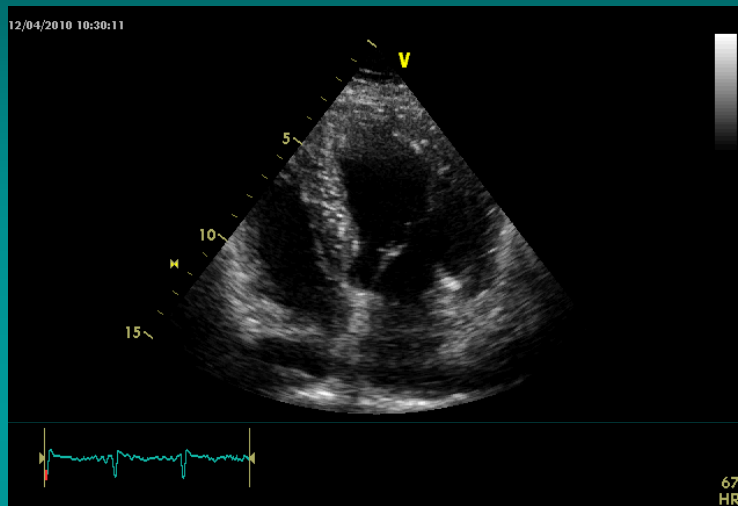


B. Wrong M-mode cut

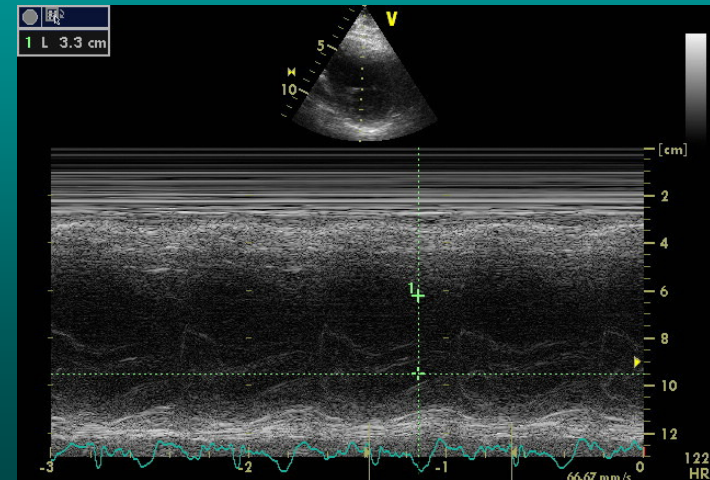
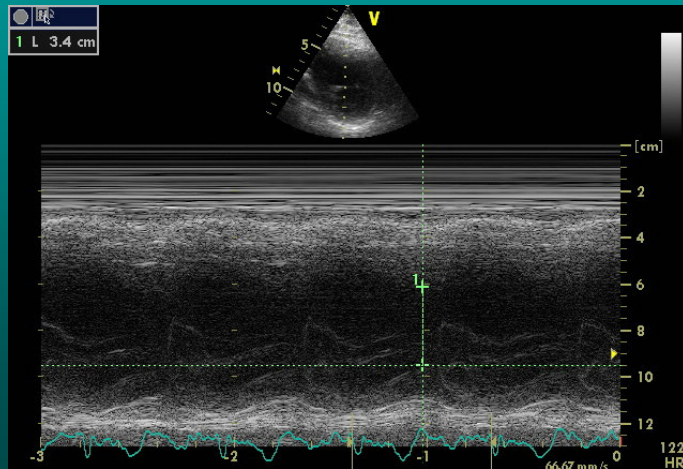


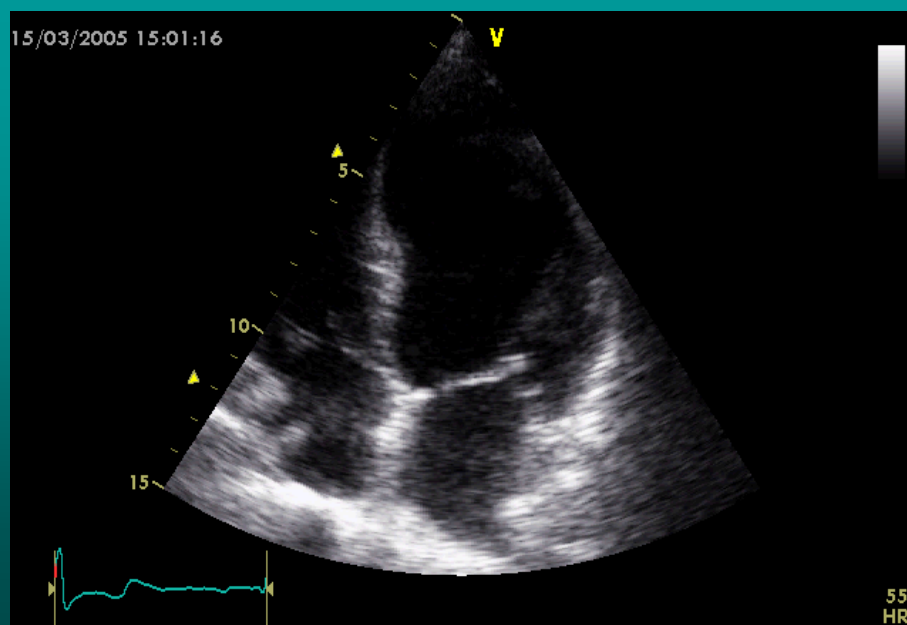
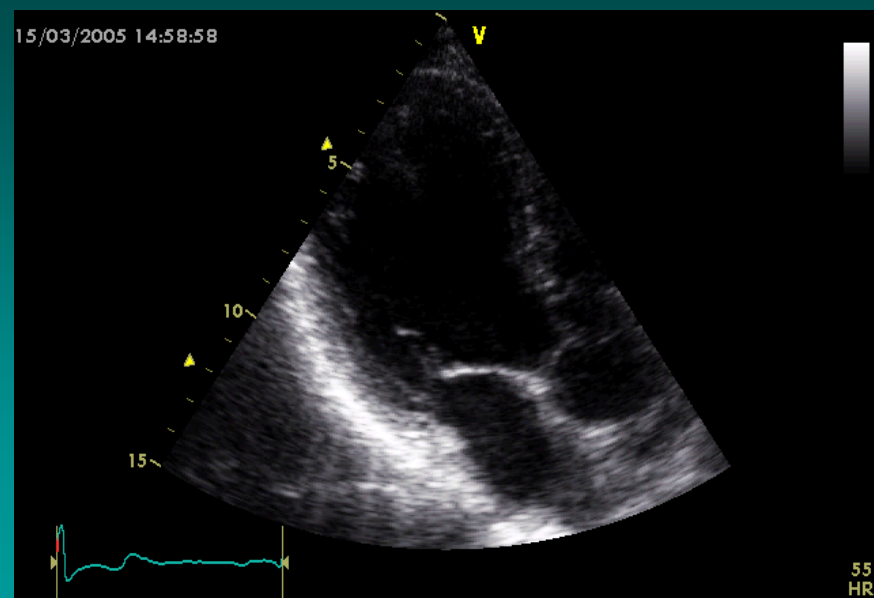
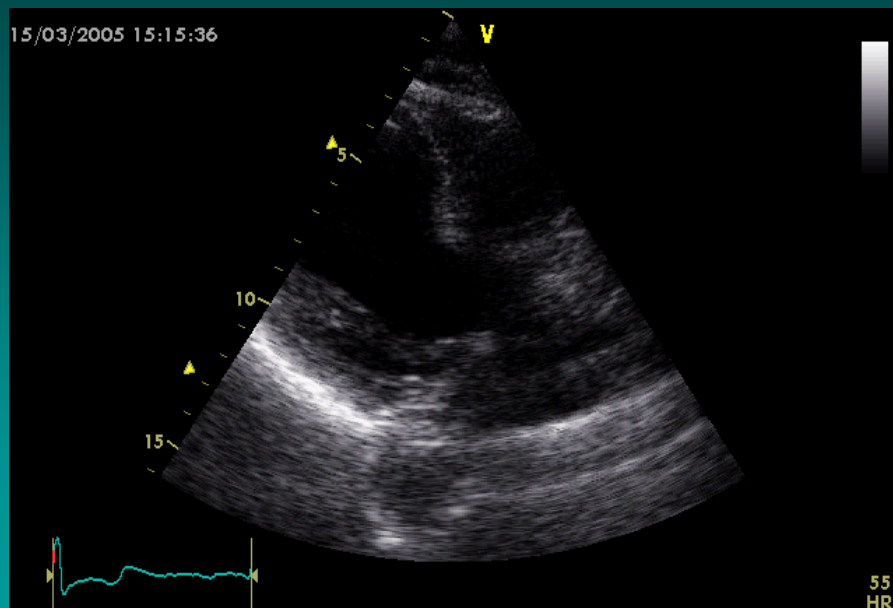
How to avoid

Go to the spine ! (“il appice di Pordenone “)



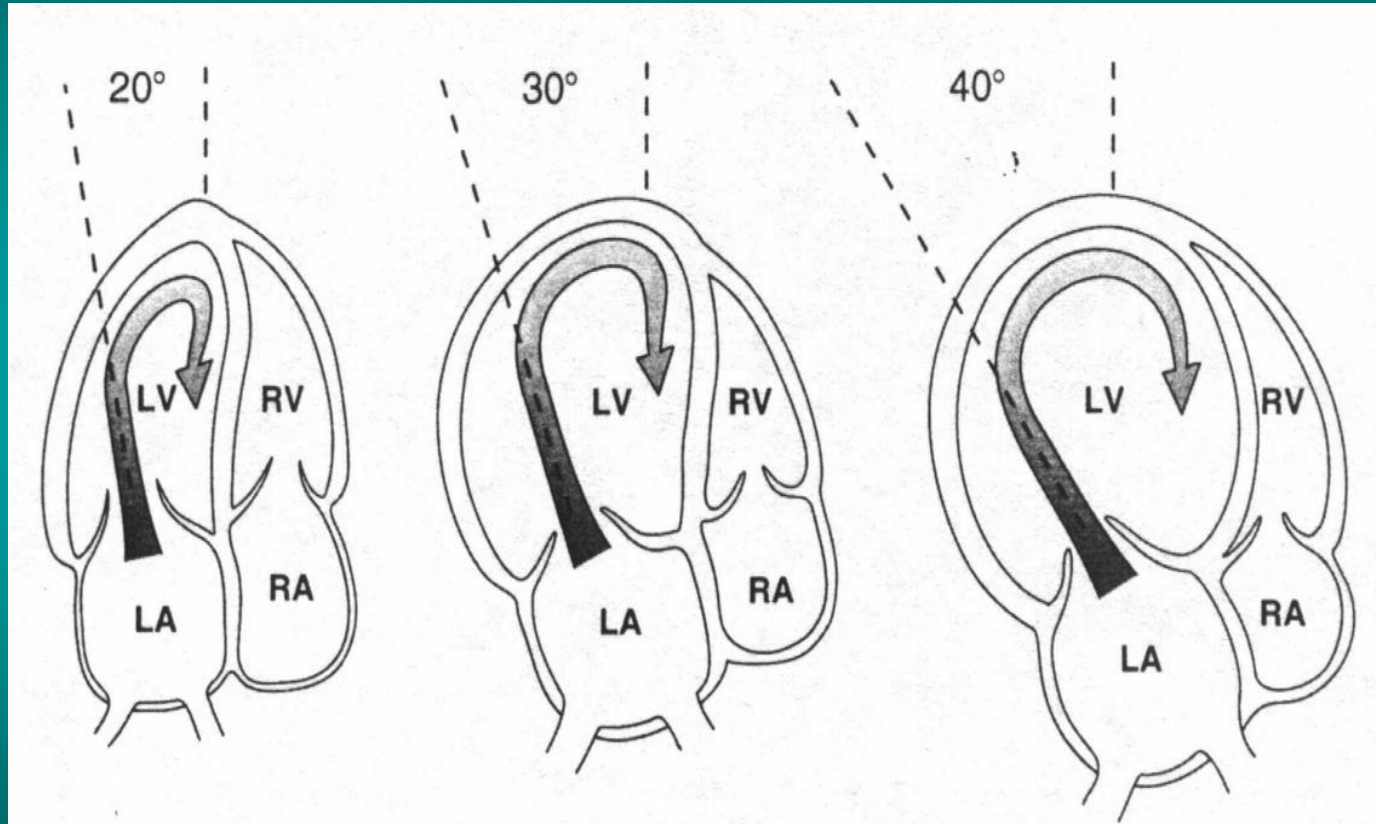
Short axis before M mode measurements !





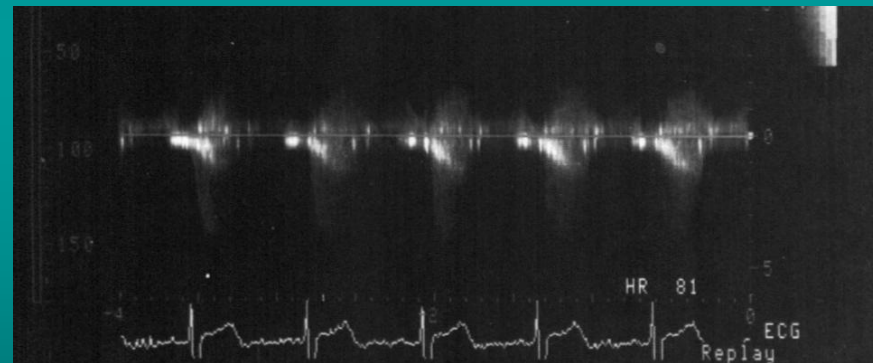
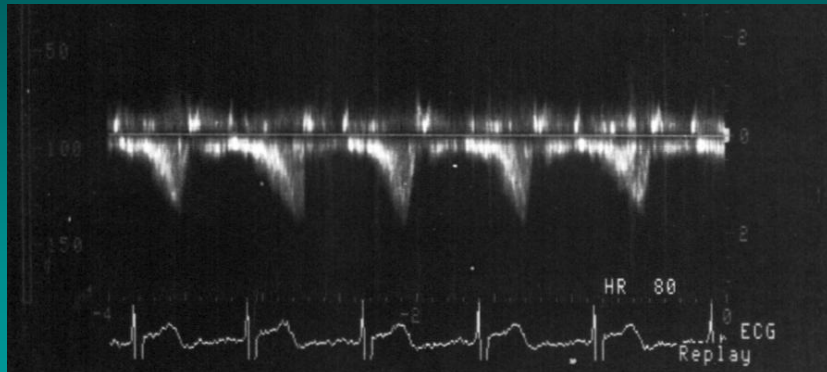
Inadequate imaging (Doppler)

Best Doppler signal ..



..NOT necessarily from the ideal 2D imaging point

The clearest signal ..



...could be not the good one..

Inadequate imaging (Doppler)

PW : mitral inflow

1. Bad sample volume position

- valve/annulus artifacts
- maximal velocity underevaluated (modified E/A)

2. Too large sample volume

- wide velocity spectrum

3. Gain excess

- may alter time and velocity measurements

4. Inadequate filters

- wall / valve artifacts
- falsely “reduced” durations

Inadequate imaging (Doppler)

5. Inadequate Doppler beam direction

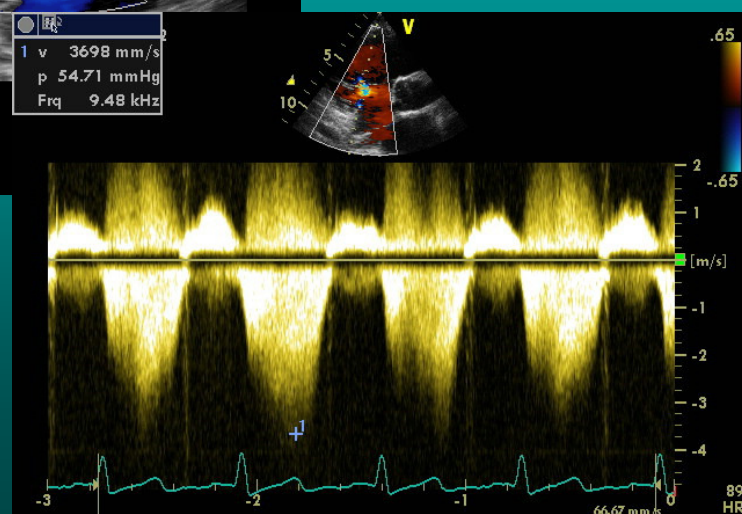
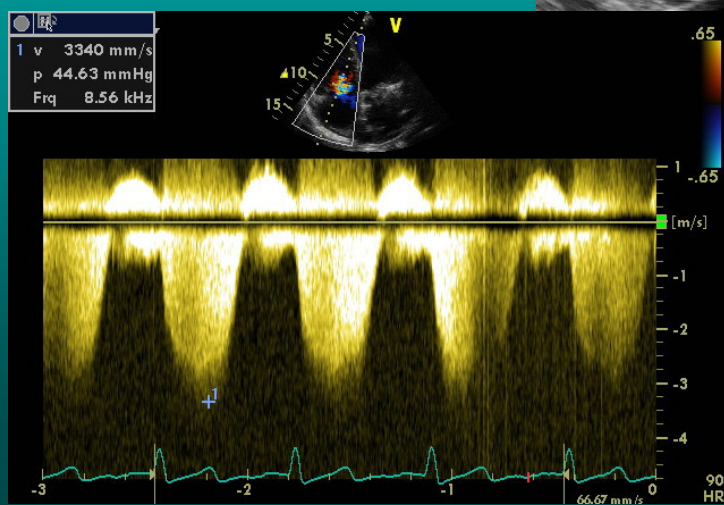
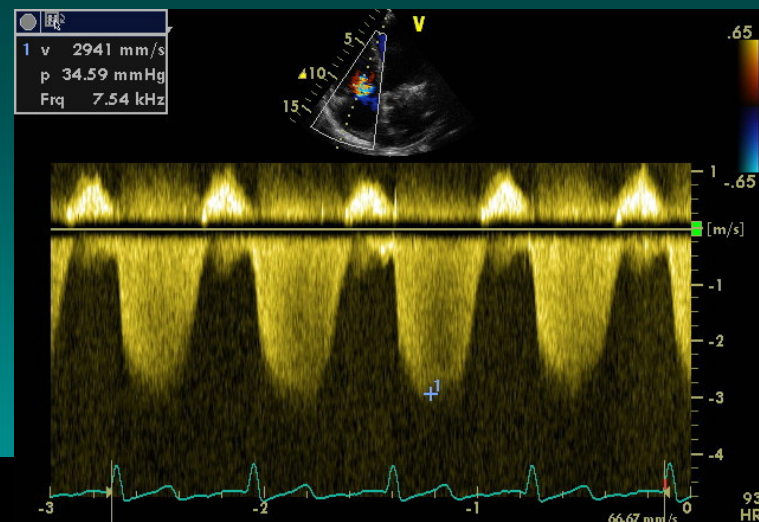
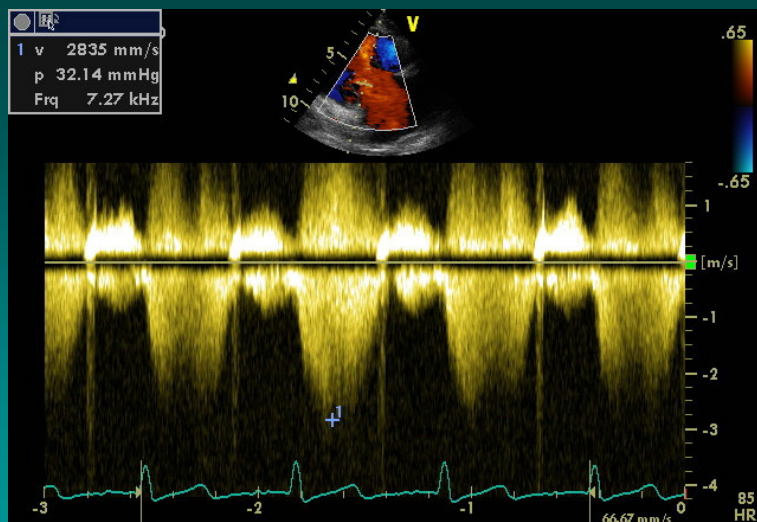
- maximal velocity underevaluated

6. Sweep

- greater error probability (duration/ PHT)

7. Number of cardiac cycles measured

- > errors : pts in atrial fibrillation



Inadequate imaging (Doppler)

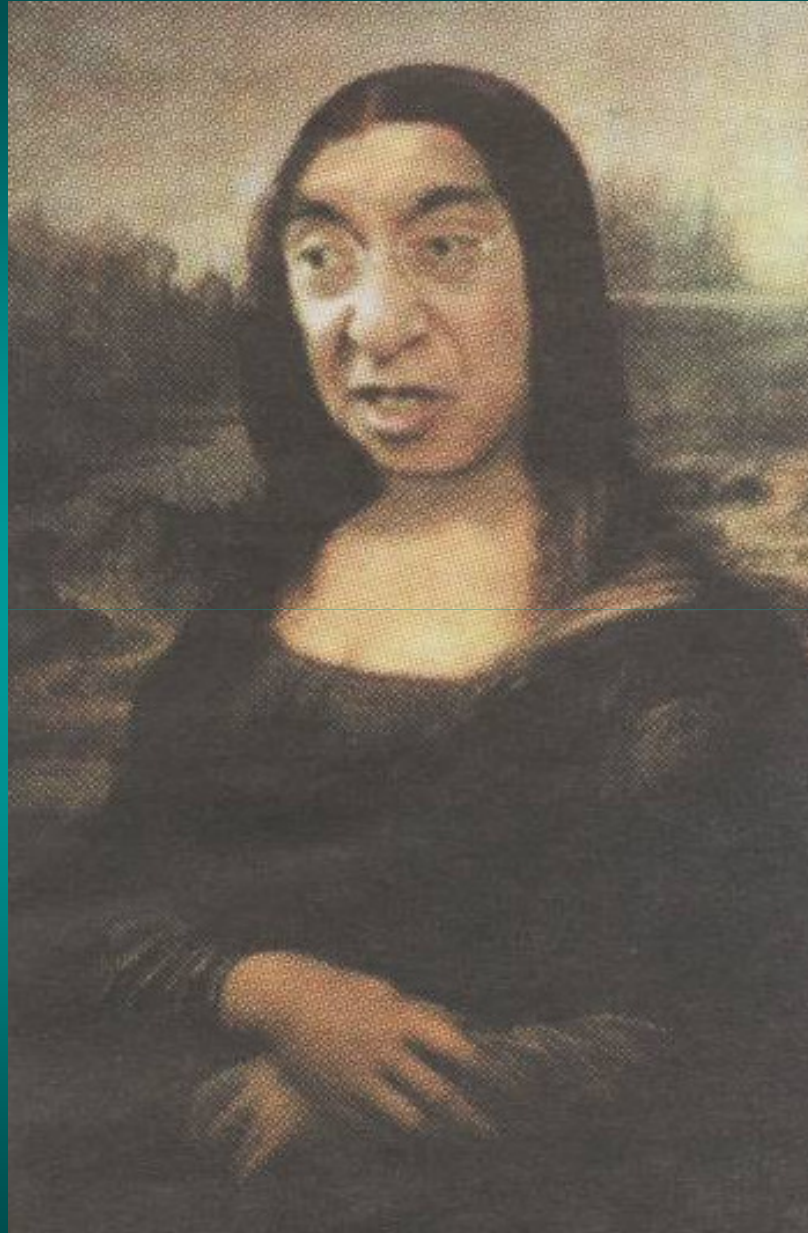
8. Not using provocative maneuvers

- Valsalva
- respiratory

9. Ignoring audio signal

10. Lack of recording measurements

**Inadequate
choice..**

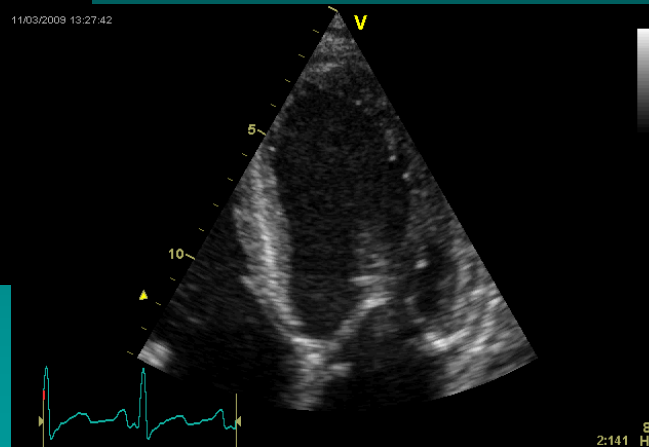
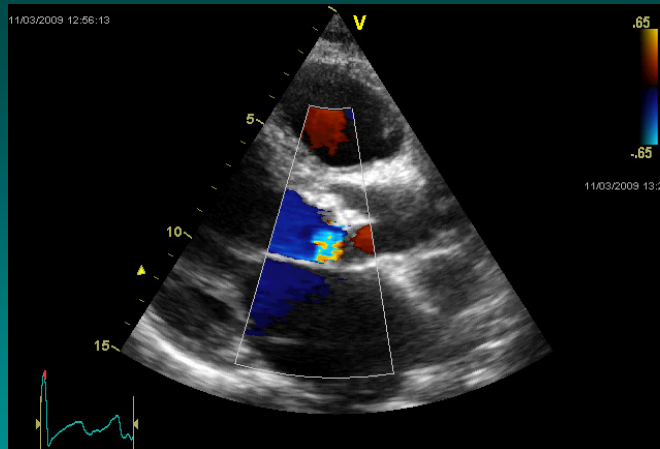


**...of
relevant
parameters**

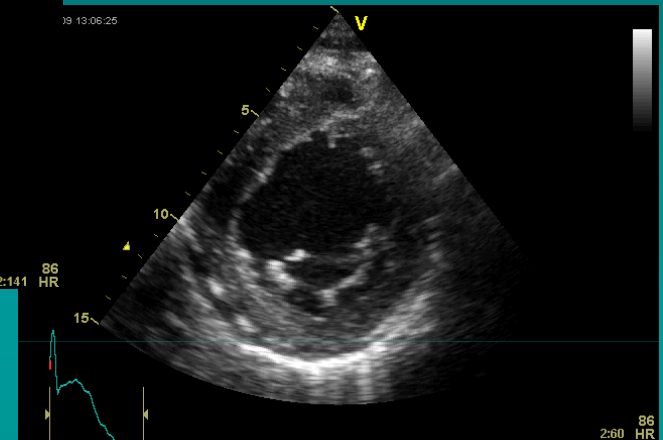
The chosen parameter - correctly calculated – does not really express , in that context , the severity of the condition

-- *LV/Ao gradient in aortic stenosis with low LV EF*

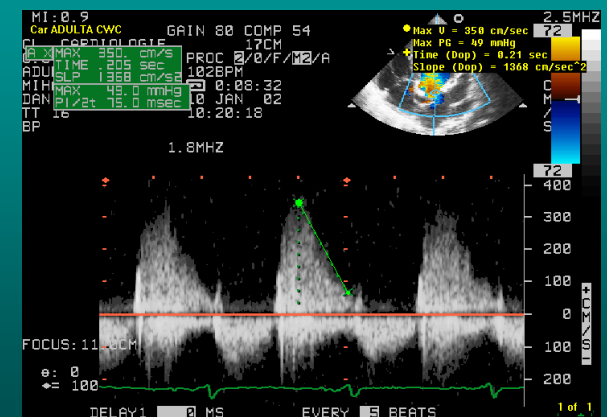
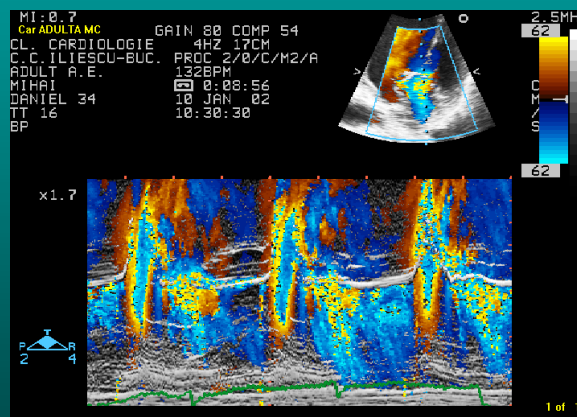
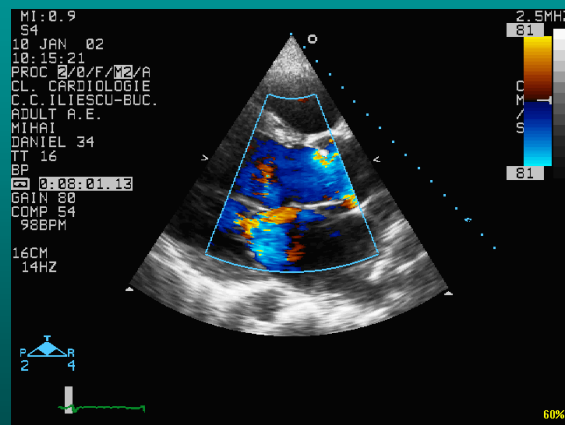
-- *color (semi quantitative) assessment of AR in acute AR*



low LV EF



No endd. aortic turbulence ..



...but diastolic mitral regurge

and brisk aortic PHT

**In spite of correctly applying the technique ,
there are major (nonavoidable) disturbing factors**

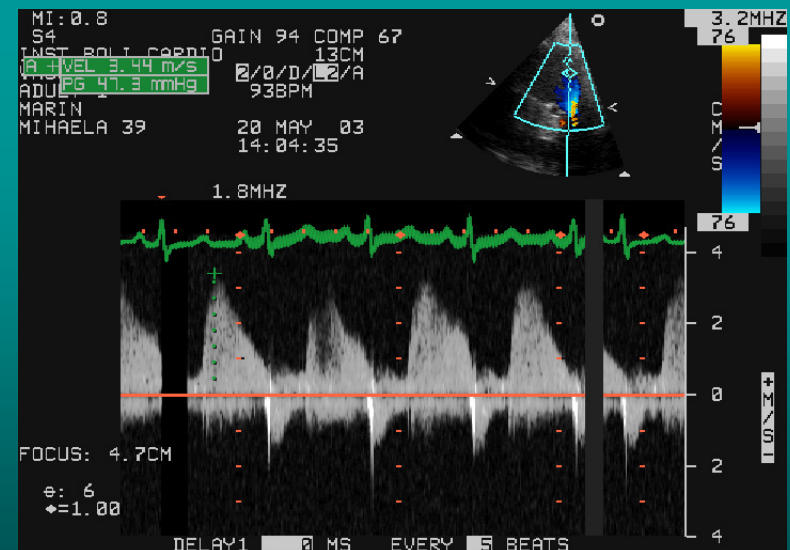
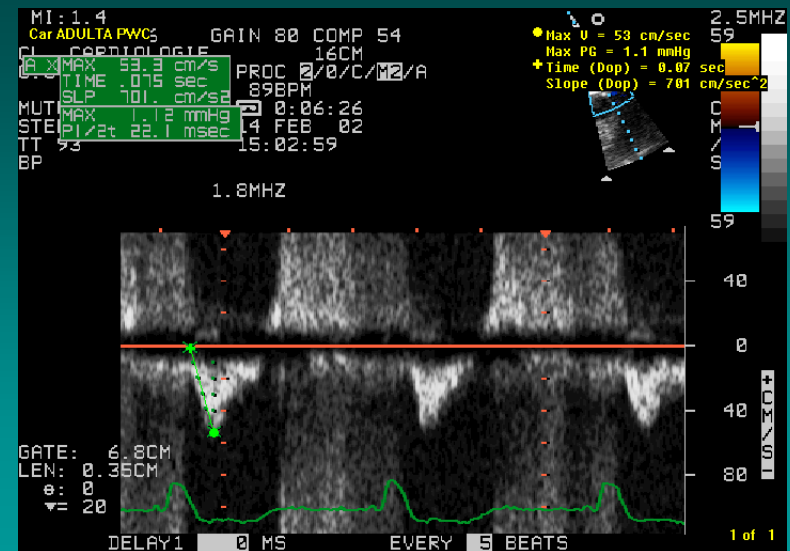
*Using **PAT formula** in proximal pulmonary emboli*

Eur Respir J 1999; 13: 616 – 21

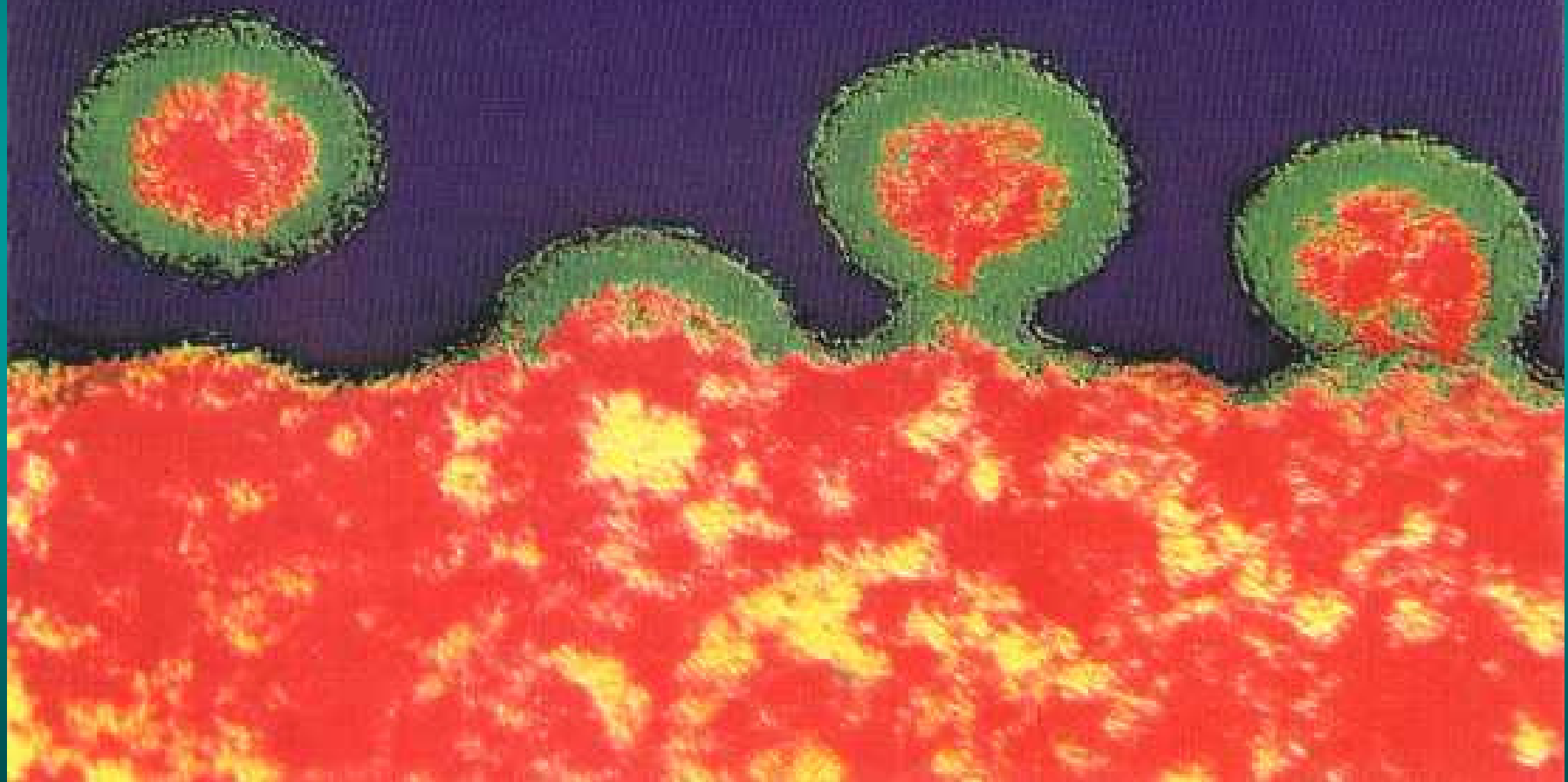
- early return of the reflected pressure wave interfering with RV ejection.
- severely impaired RV function

Using *PAT* formula for PAP assessment in *very severe PHT*

Presiune medie cateterism	TAP (met.A)	Gradient diastolic max AP/VD (met B.)	
40-45 mm (n:6)	- 3,6 mm (- 14 , + 8)	-12,3 mm (-21 -8)	
45-50 mm (n:10)	-4,7 mm (- 16, +3)	-11,9 mm (- 22 , -3)	
>50 mm (n:6)	- 9,9 mm (- 21, - 5)	-16,4 mm (-29 ,-8)	



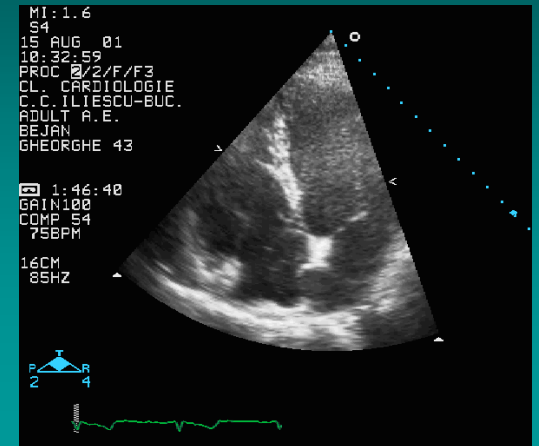
III. Errors in interpreting results



Misunderstanding results

1. Incorrect recognition of structures / waves / flows

- right heart structures
- right heart flows
- left heart structures
- left heart flows

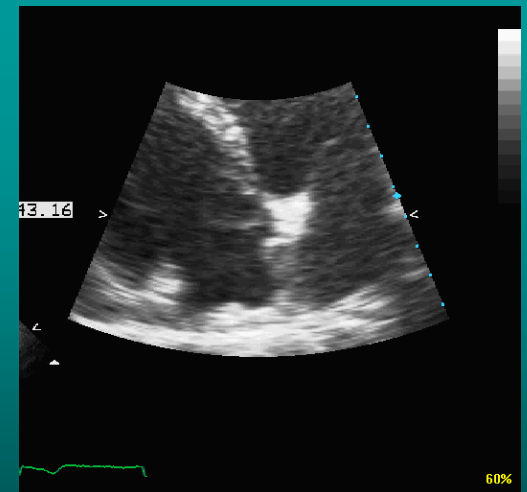


2. Ignoring normal values range

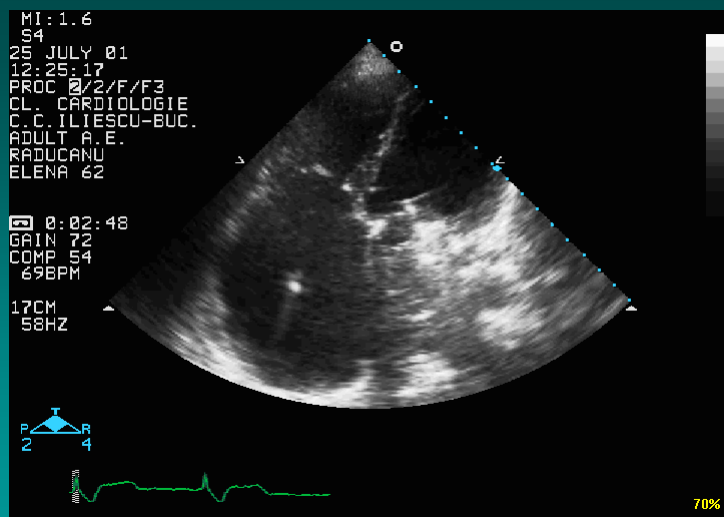
Don't be ashamed to look in a manual !

3. Not using correction for:

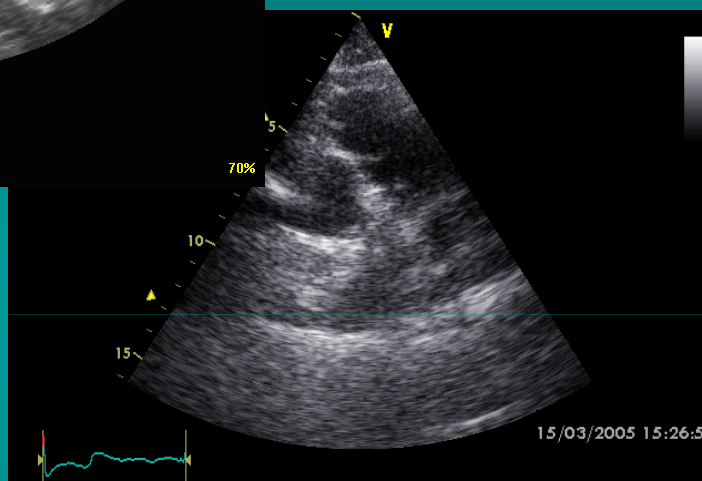
- BMI
- cardiac frequency
- position : - Coanda effect



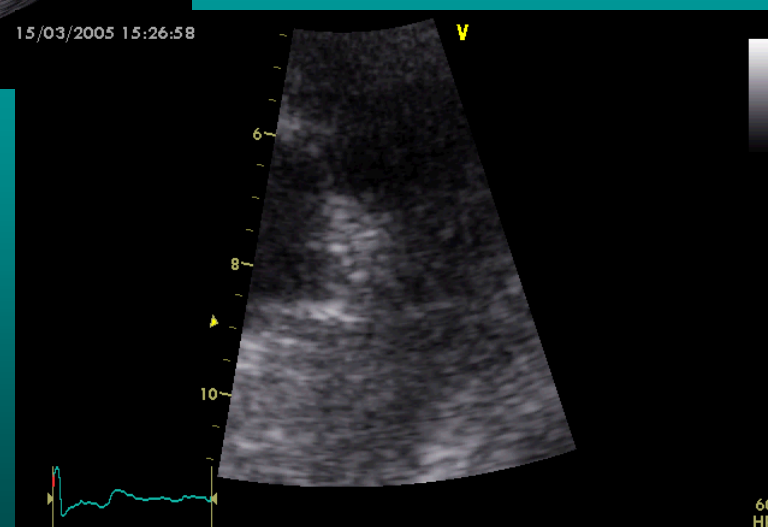
ASIA and Chiari network
(no clots !)

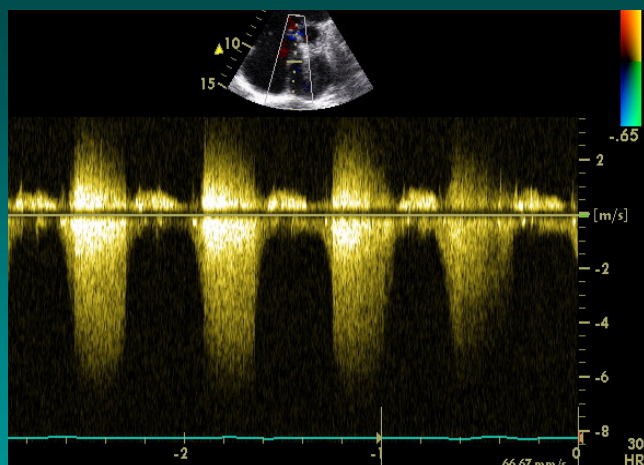


**Catheters ,
electrodes**

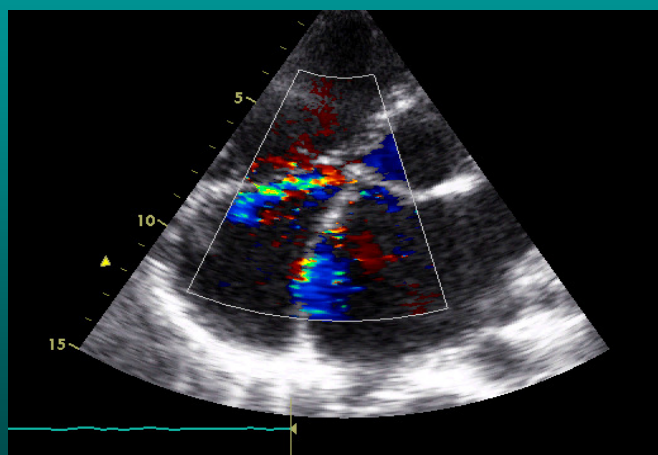


Left main stent

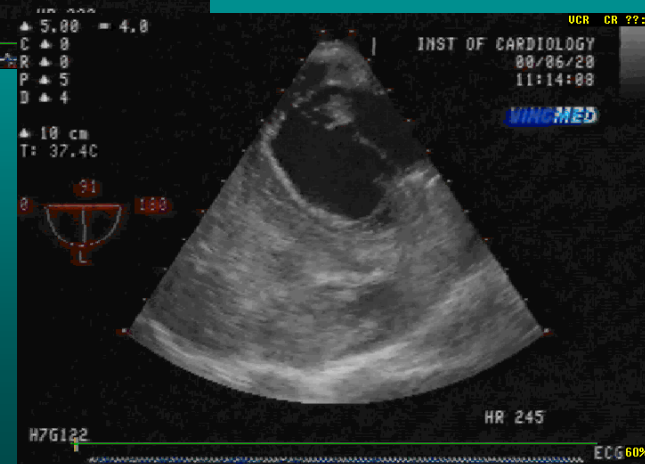




**Not tricuspid
regurgitation !
(but LV-RA shunt !)**

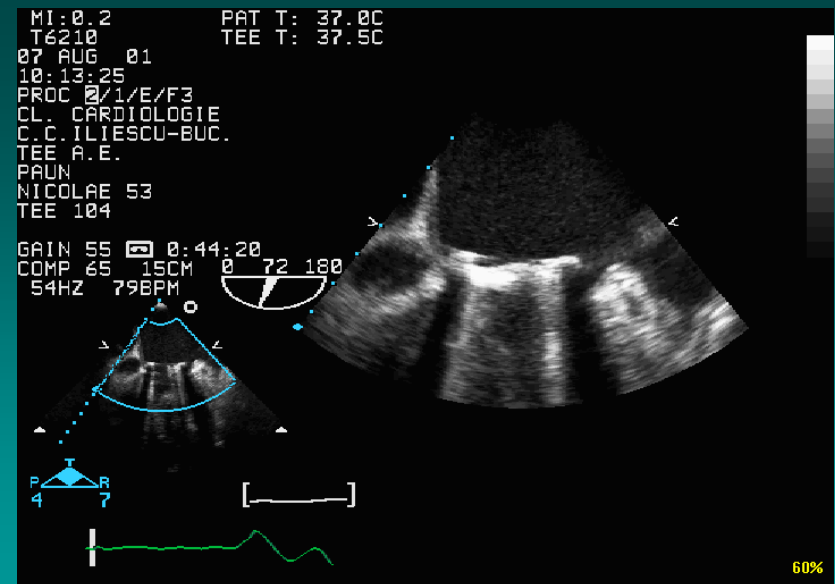


**No trombus !
(RV tumor)**

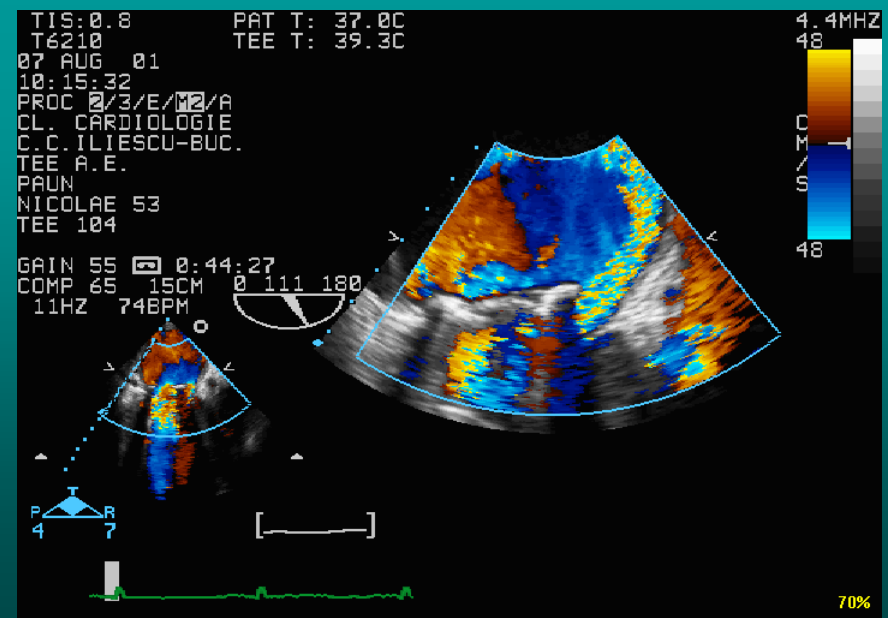




No vegetation !
Ruptured papillary muscle !



Coanda effect :
color underestimation of regurge



Misunderstanding results

4. Ignoring the haemodynamic context :

LV dysfunction :

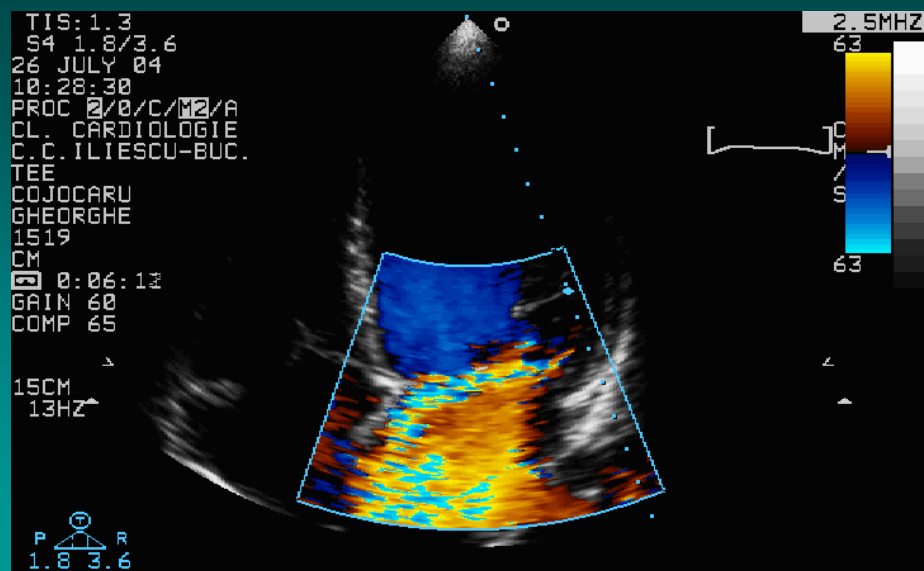
- E/A pseudonormalisation
- different significance of EF in severe mitral regurge

Intracavitary / arterial pressures

- HT : increased color area of mitral regurge

Associated Lesions :

- transmitral gradient in associated regurge
- gradient in multiple stenosis (initial velocity high ! : extended Bernoulli)



MI: 1.6
 S4
 05 OCT 01
 12:31:48
 PROC 2/2/F/F3
 CL. CARDIOLOGIE
 C.C. ILIESCU-BUC.

MARICESCU
 NICOLAE 51

1:28:50
 GAIN 97
 COMP 54
 79BPM

19CM
 54HZ

P 2 R 4

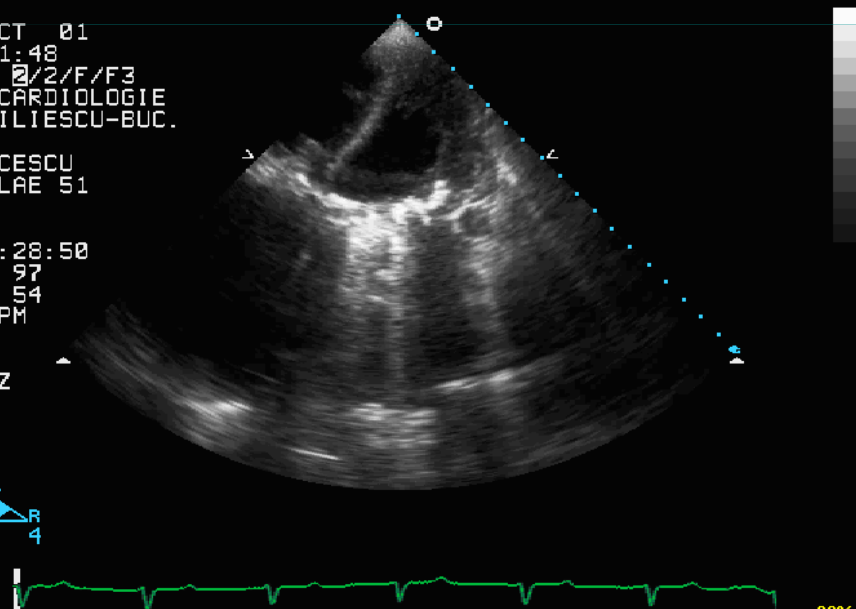


Table 38-1. Normal Values of Doppler Parameters in Apparently Normal Prosthetic Valves

Parameter	Velocity (m/sec)	Gradient (mm Hg)	
	V _{max}	delta P _{max}	delta P _{mean}
<i>Mitral Position</i>			
Starr-Edwards (ball-in-cage)	1.9 ± 0.4	14.6 ± 5.5	4.6 ± 2.4
St. Jude Medical (bileaflet)	1.6 ± 0.3	10.0 ± 3.6	3.5 ± 1.3
Bjork-Shiley (tilting disc)	1.6 ± 0.3	10.7 ± 2.7	2.9 ± 1.6
Carpentier-Edwards (porcine bioprosthesis)	1.8 ± 0.2	12.5 ± 3.6?	6.5 ± 2.1?
Hancock (porcine bioprosthesis)	1.5 ± 0.3	9.7 ± 3.2	4.3 ± 2.1
<i>Aortic Position</i>			
Starr-Edwards (ball-in-cage)	3.2 ± 0.6	38.6 ± 11.7	23.0 ± 8.8
St. Jude Medical (bileaflet)	2.4 ± 0.3	25.5 ± 5.1	12.5 ± 6.4
Bjork-Shiley (tilting disc)	2.5 ± 0.6	23.8 ± 8.8	14.3 ± 5.3
Carpentier-Edwards (porcine bioprosthesis)	2.5 ± 0.5	23.2 ± 8.7	14.4 ± 5.7
Hancock (porcine bioprosthesis)	2.4 ± 0.4	23.0 ± 6.7	11.0 ± 2.3
<i>Tricuspid Position (Case Reports)</i>			
Bjork-Shiley (tilting disc)	1.6	10.2	5
Porcine bioprosthesis	1.3 ± 0.3	7 ± 2	3 ± 2

(Data summarized from refs. 18, 55, 111, and 112.)

Ignoring normal values range

Misunderstanding results

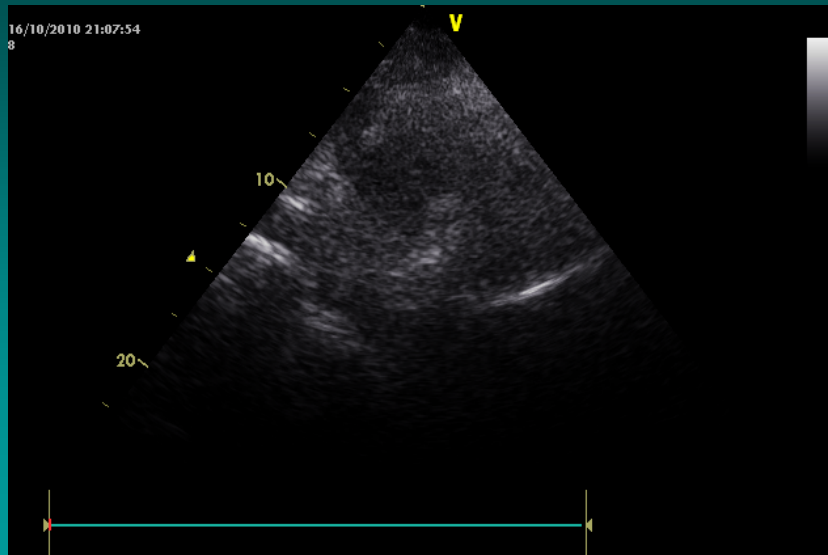
5. Ignoring general biological context

Age Elder pts : impaired relaxation

Hyperkinetic Syndrome - Pregnancy
- Anemia
- Hyperthyroidia

6. Recent therapeutic procedures

- Diuretics
- SR post electric conversion : absent or < “a”
- Coronarography / stenting



Searching for ...



CONCLUSIONS

TO AVOID PITFALLS we need :

- **Good theoretical knowledge of US physics**
- **Solid practical training**
- **Clinical integration of data**
- **Patience**