Assessment of LV Performance

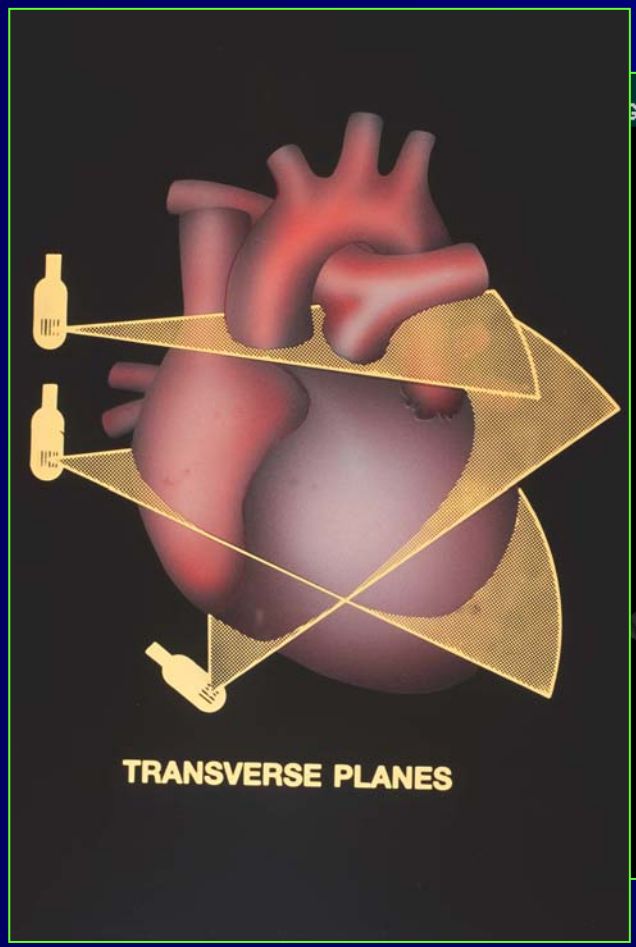
Jan Poelaert, MD, PhD

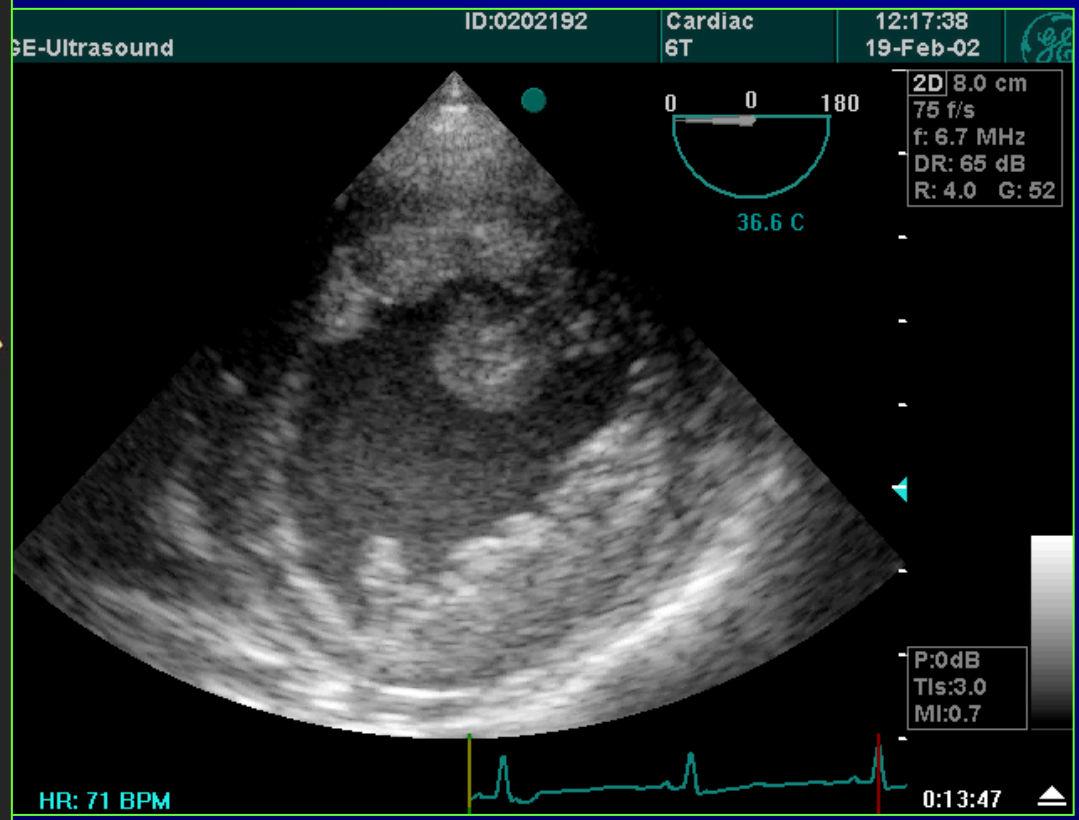
Cardiac Anaesthesia & Postoperative Cardiac Surgical ICU

Ghent University Hospital

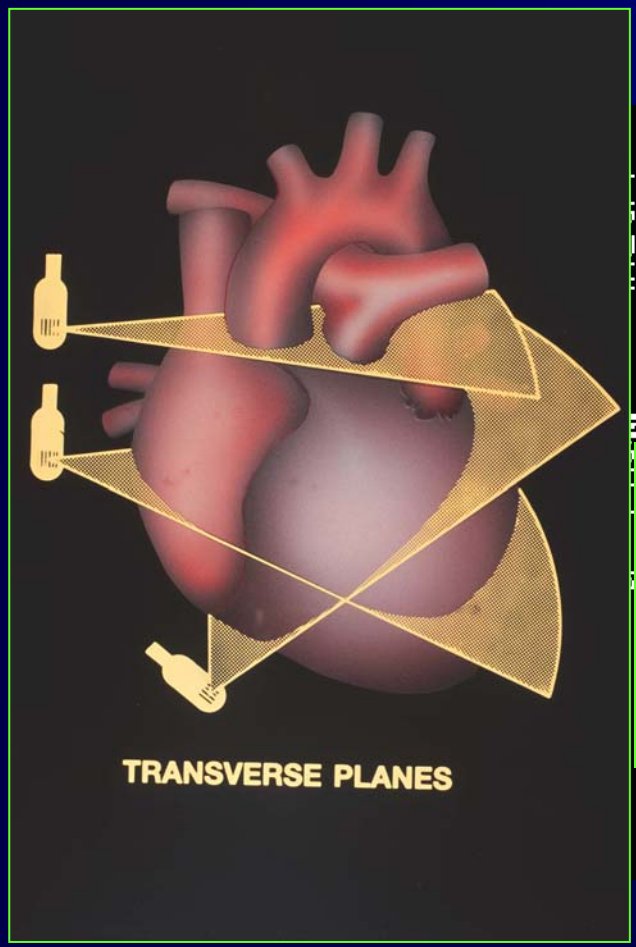
Gent, Belgium

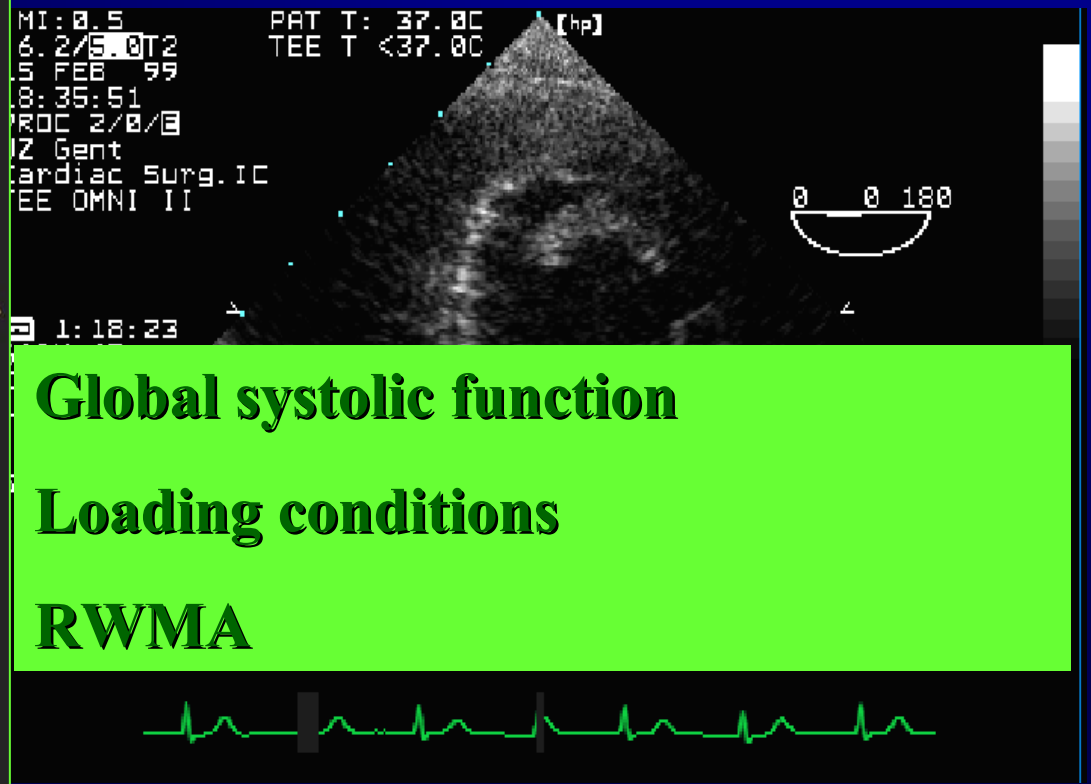
Assessment of LV Performance
Two-dimensional Imaging





Assessment of LV Performance
Two-dimensional Imaging



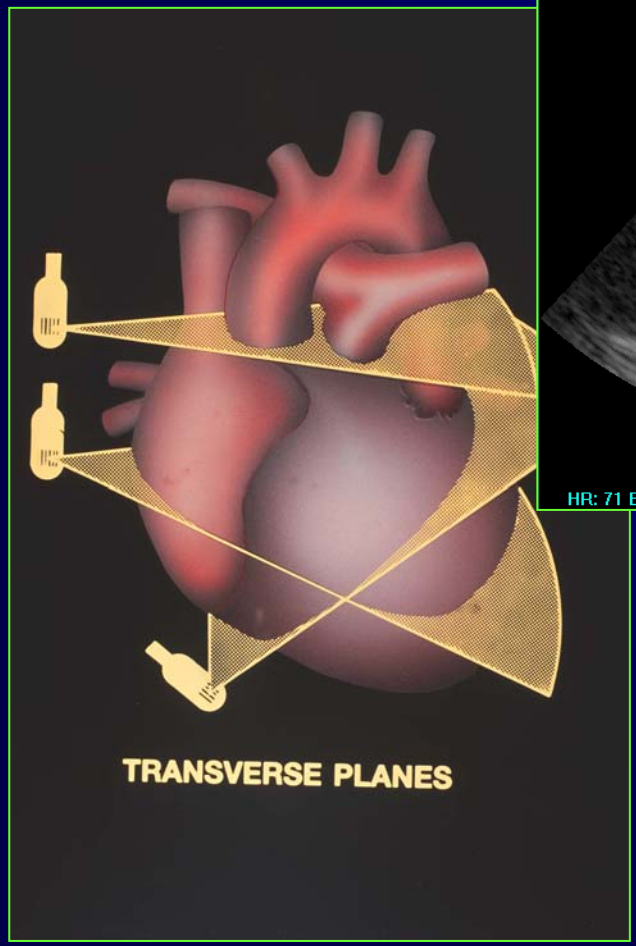


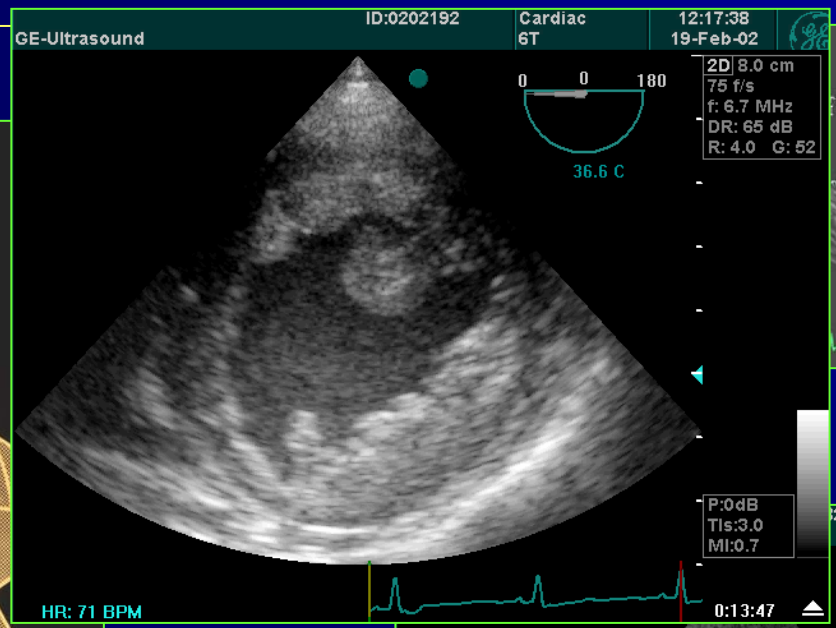
Global systolic function

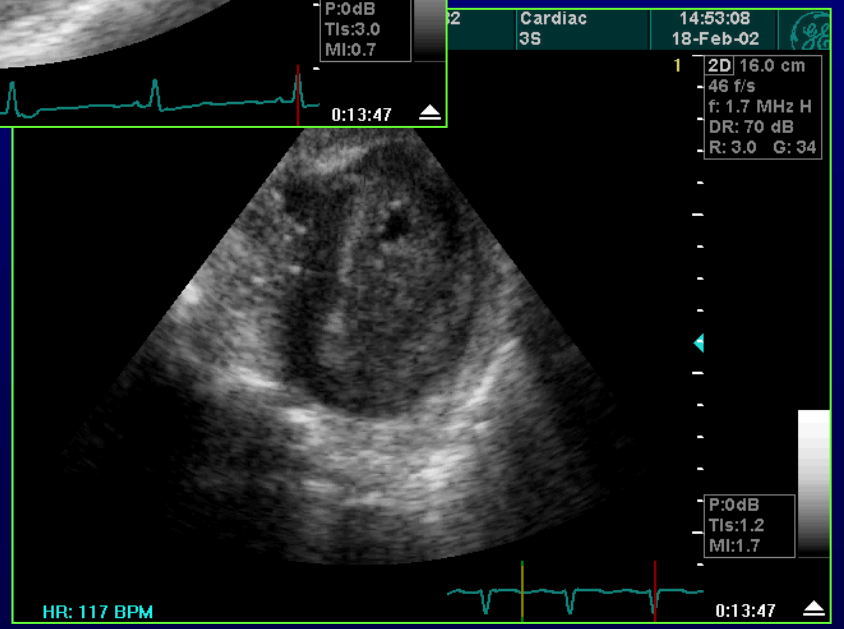
Loading conditions

RWMA

Assessment of LV Performance
Two-dimensional Imaging

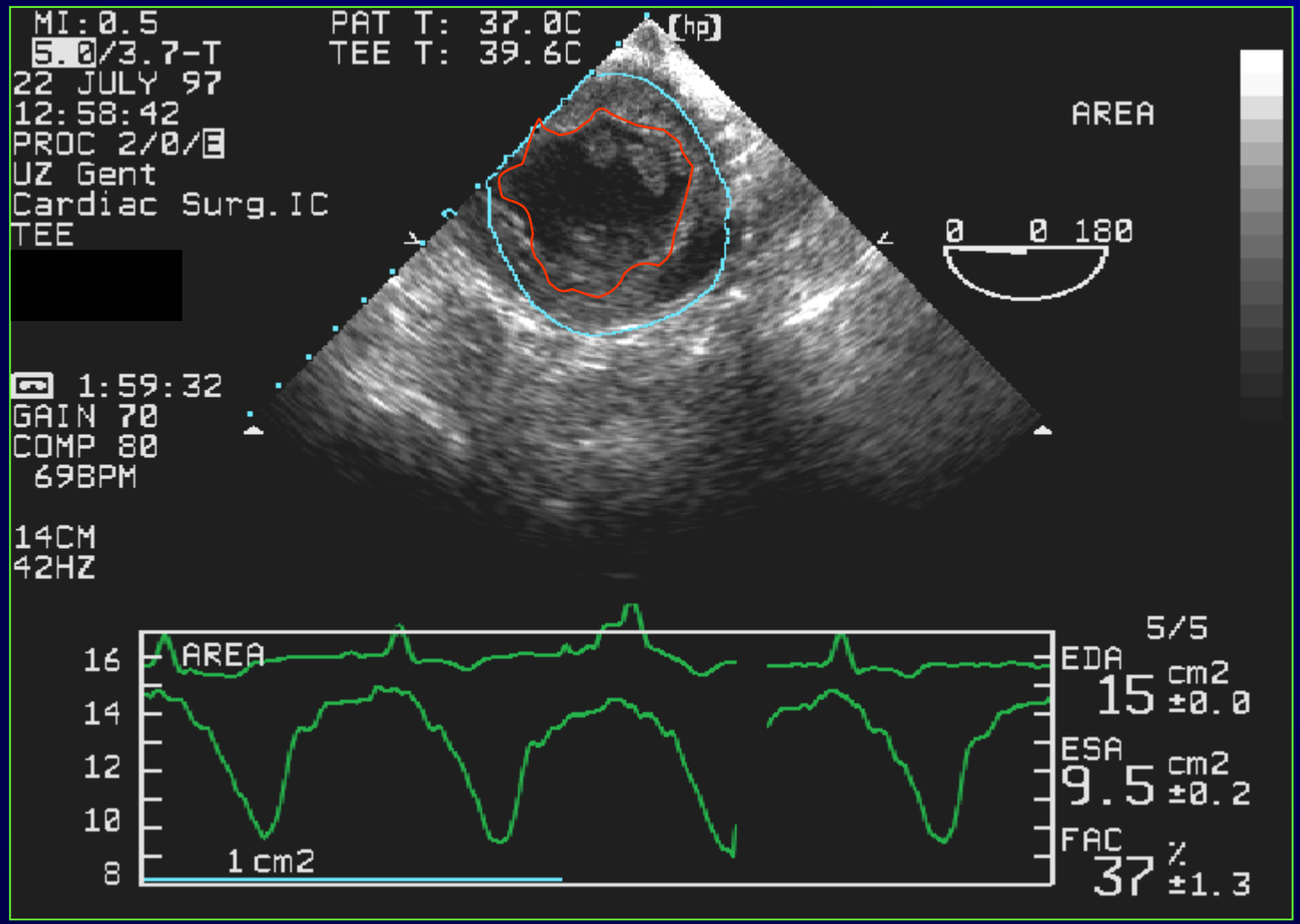






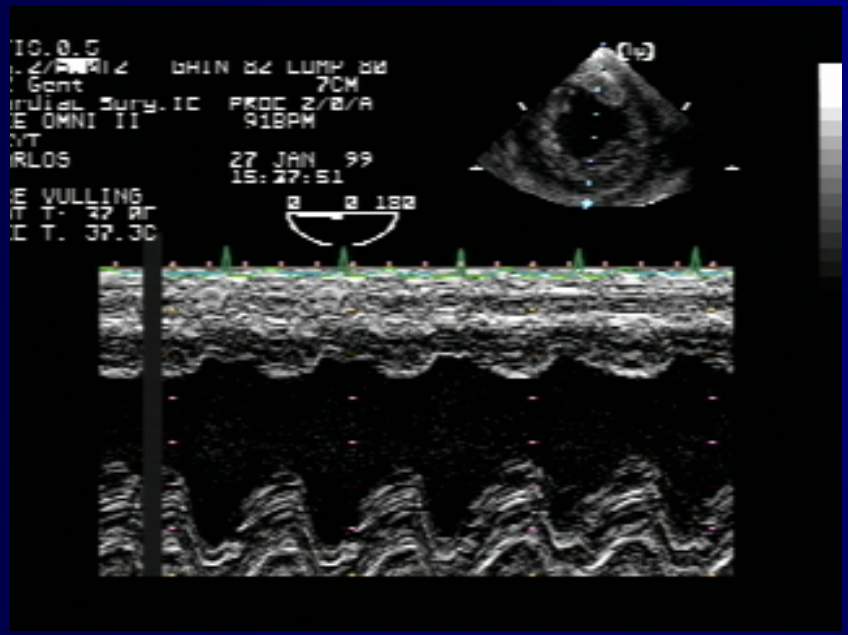
Assessment of LV Performance

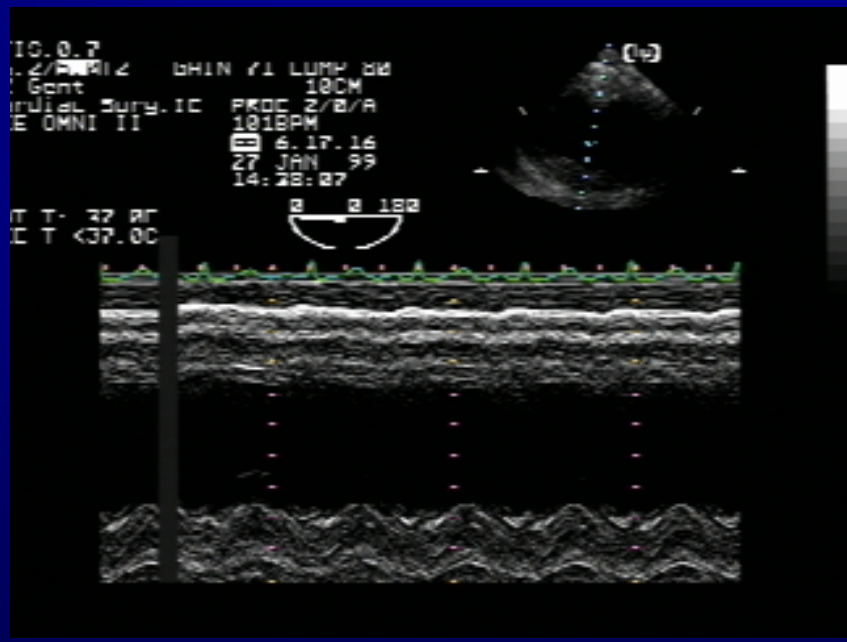
Measurement of Fractional Area Contraction



Assessment of LV Performance

Use of M mode





Fractional Shortening

Fractional area contraction

CO ?

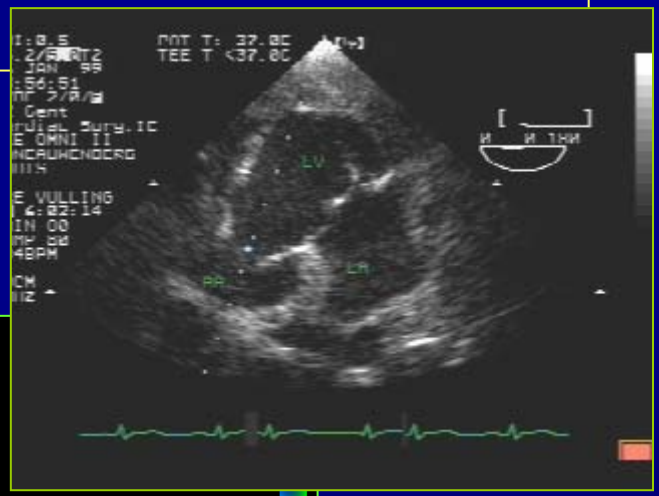
Assessment of LV Performance

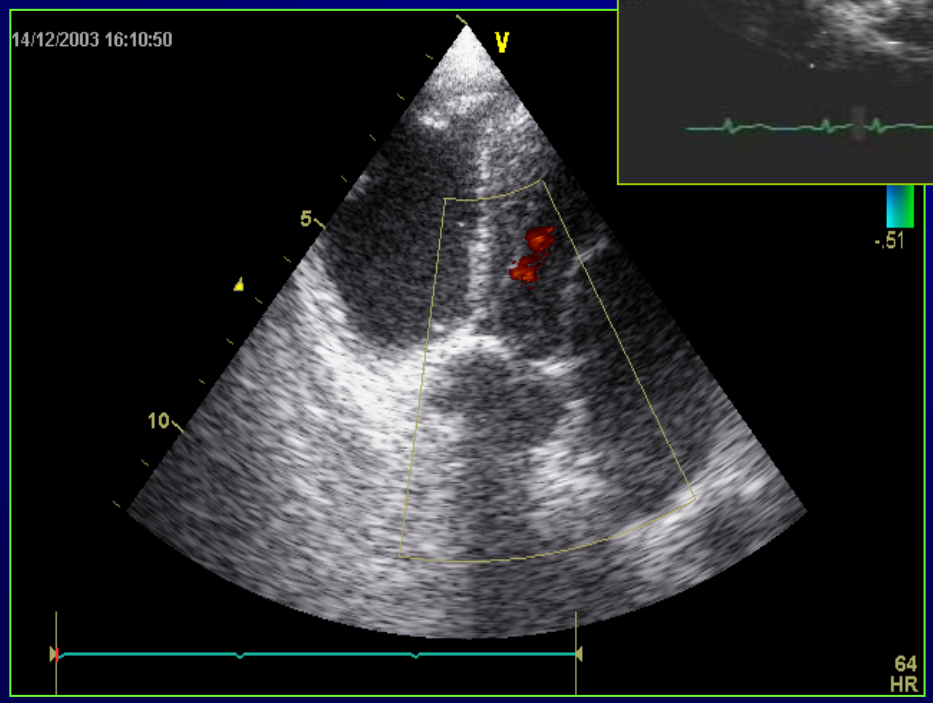
Estimation of Cardiac Output

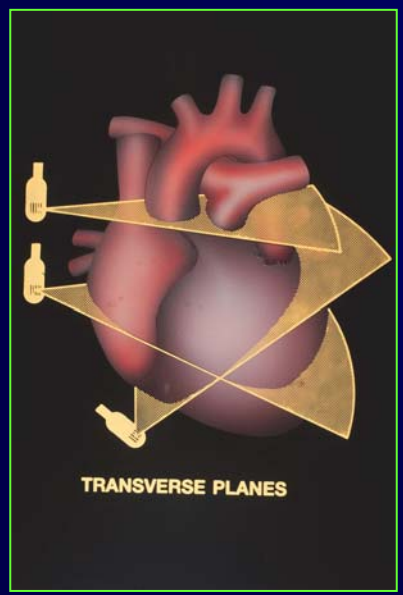
Site	author	n	failure	Doppler approach	r
PA	Savino	45	24	CW short axis	0,93
PA	Muhuideen	99	29	PW short axis	0,65
PA	Gorcsan III	15	13	PW short axis	0,83
PA	Izzat	19	10	PW short axis	0,95
MV	Shimamoto	65	NA	4-chamber view	NA
LVOT	Katz	57	12	CW transverse LA	0,91
LVOT	Darmon	109	2	CW transverse LA	0,98
LVOT	Feinberg	33	12	PW longitudinal LA	0,91
LVOT	Owen	64	9	PW transverse LA	0,95
LVOT	Poelaert	82	9	PW/CW transv./longitud. LA	0,87
AA	Descorps-Declère	28	7	PW transverse LA	0,98
RVOT	Maslow	45	16	PW longitudinal LA	0,98
LVOT	Perrino	33	3	CW multiplane LA	0,98

Poelaert et al. Anaesthesia 1999;54:128-36

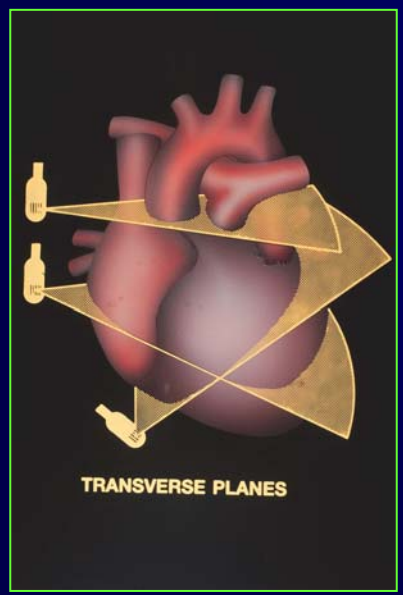
Assessment of LV Performance

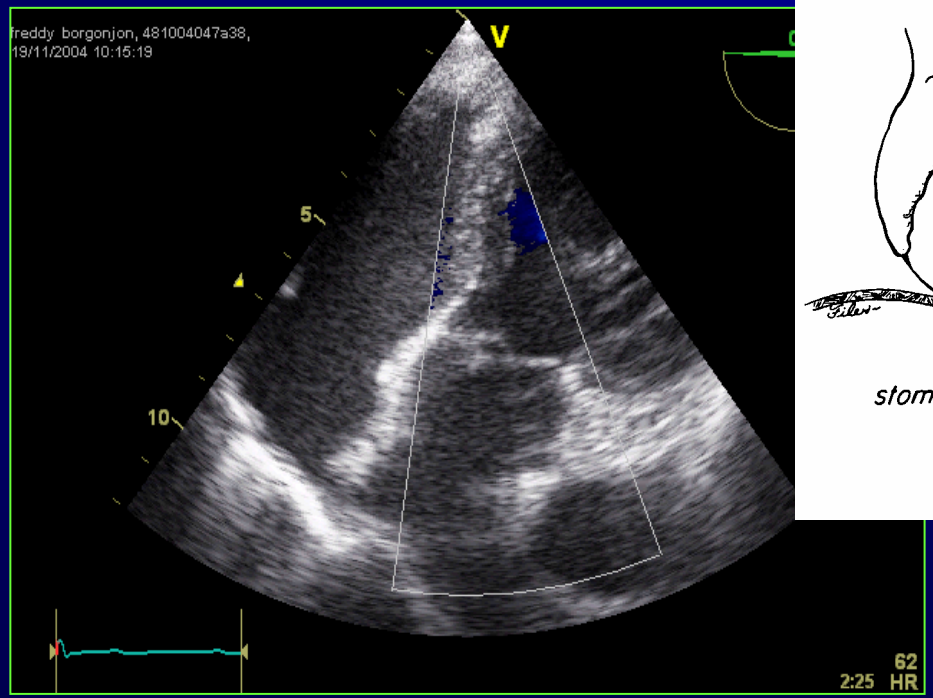


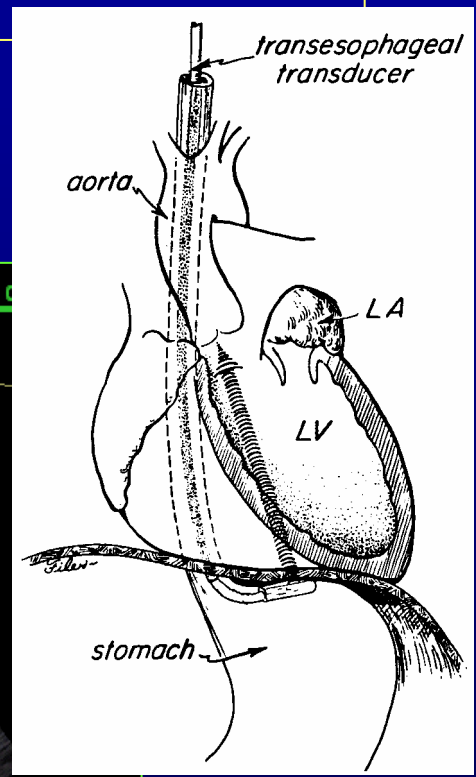




Assessment of LV Performance







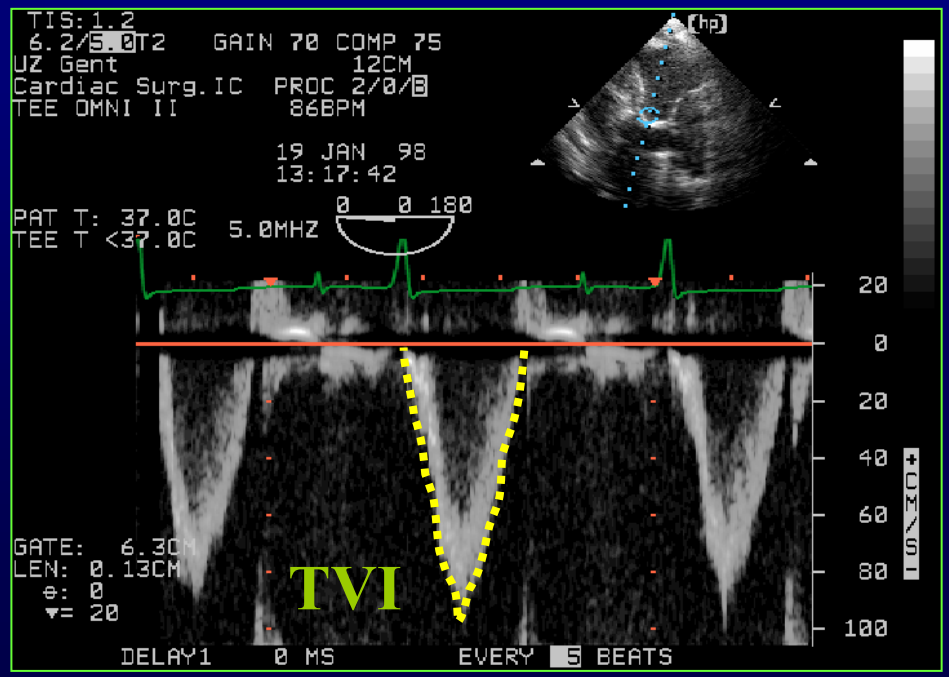
Assessment of LV Performance

Estimation of Cardiac Output

- **EF, FAC**
  - **preload and afterload dependent**
- **SV, CO**

CO = SV * HR

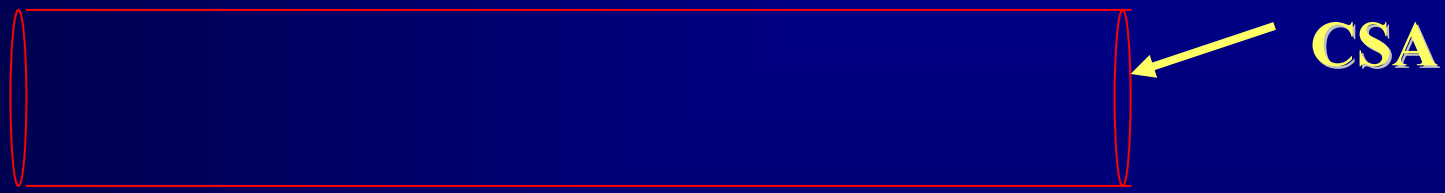
CO = TVI * CSA * HR



Assessment of LV Performance

Estimation of Cardiac Output

SV (ml) = TVI (cm) * CSA (cm^2)

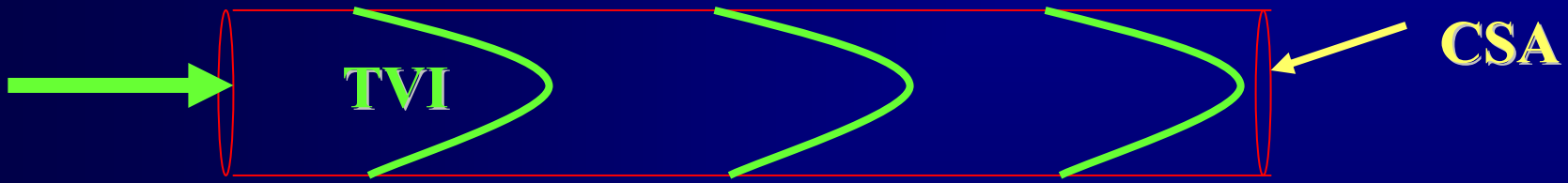


CO (l/min) = SV (ml) * HR (bpm)

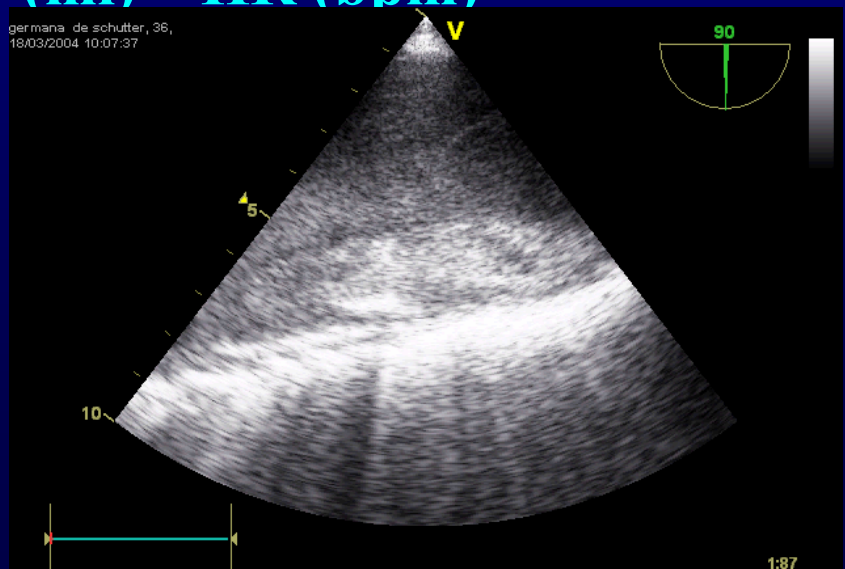
Assessment of LV Performance

Estimation of Cardiac Output

$$SV\ (ml) = TVI\ (cm) * CSA\ (cm^2)$$



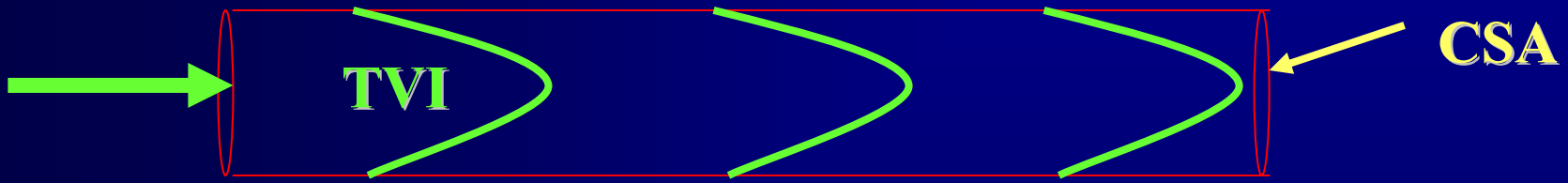
$$CO\ (l/min) = SV\ (ml) * HR\ (bpm)$$



Assessment of LV Performance

Estimation of Cardiac Output

SV (ml) = TVI (cm) * CSA (cm^2)



CO (l/min) = SV (ml) * HR (bpm)

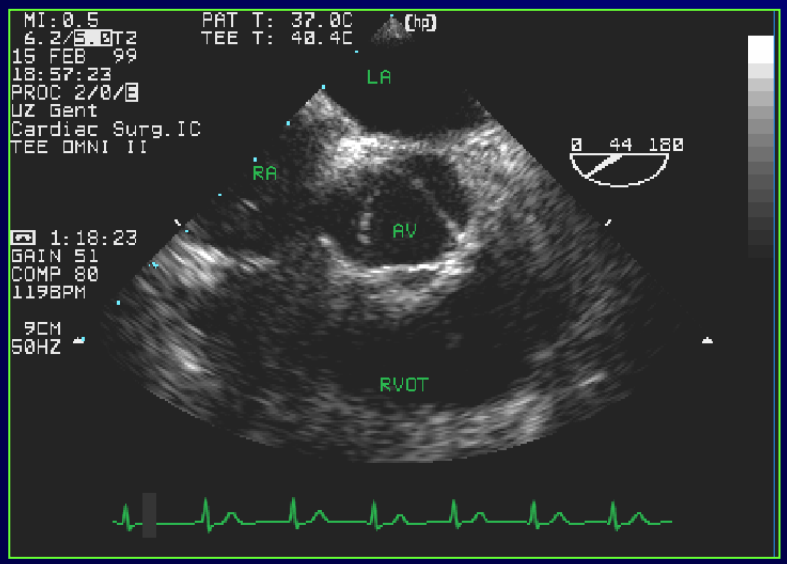
Pitfalls:

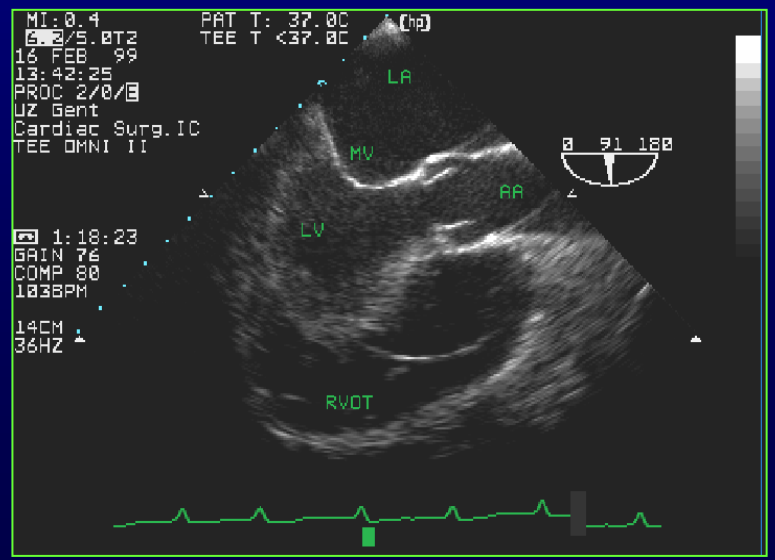
1. **Estimation of velocity(alignment, outline, not maximal velocity, number of beats)**
2. **Inappropriate velocity (stenosis, regurgitation)**
3. **Area measurement**

Assessment of LV Performance

Load Dependent Indices: Cardiac Output

- **CSA**
  - **mean AVA**
  - **calculated: 0,785*d²**

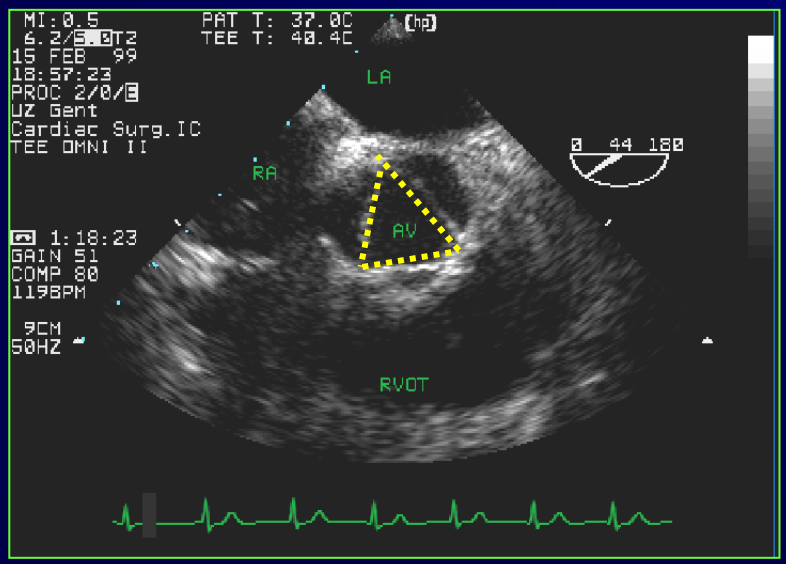


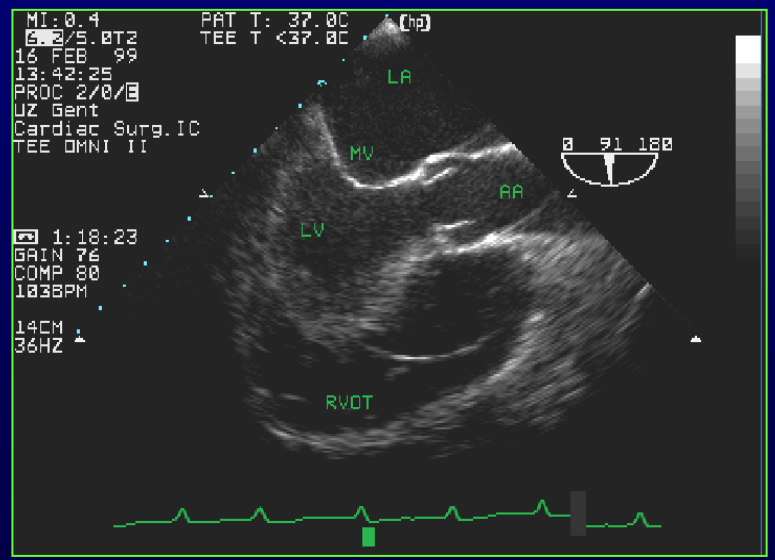


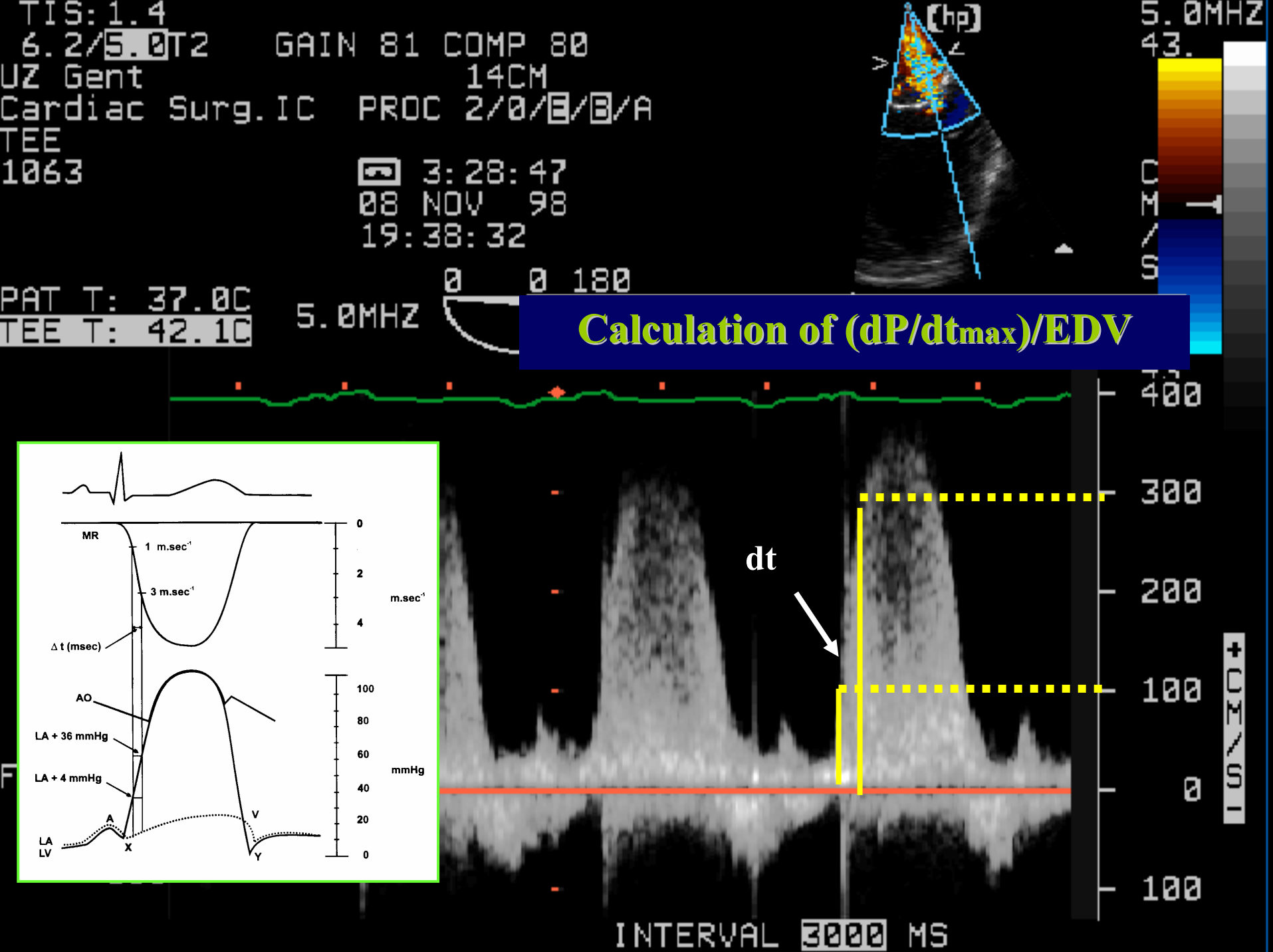
Assessment of LV Performance

Load Dependent Indices: Cardiac Output

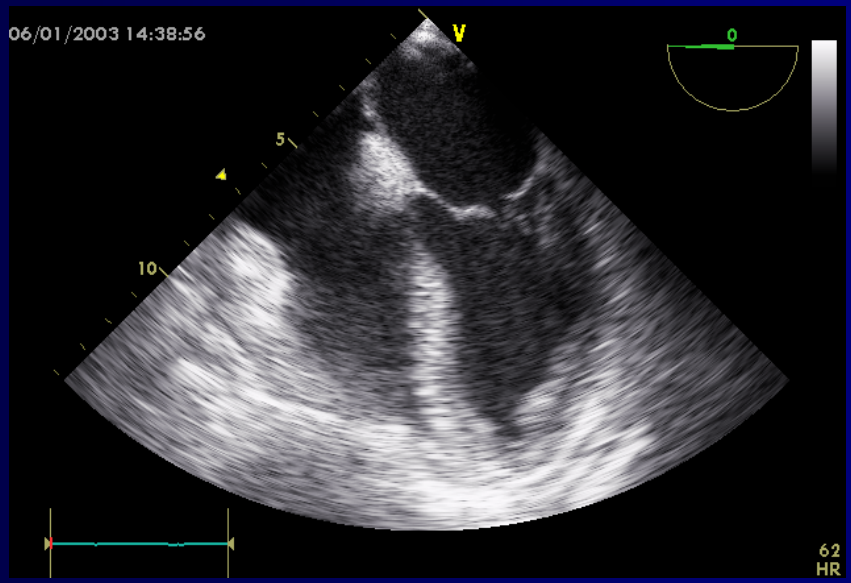
- **CSA**
  - **mean AVA**
  - **calculated: 0,785*d²**

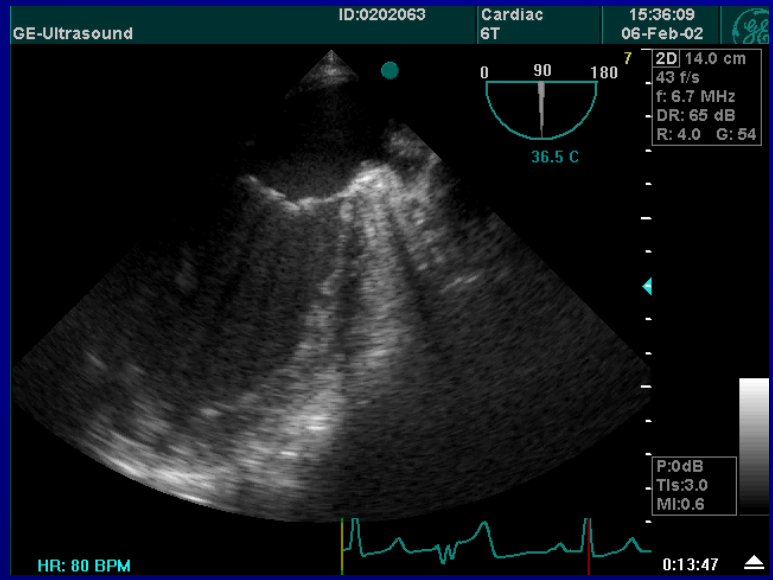


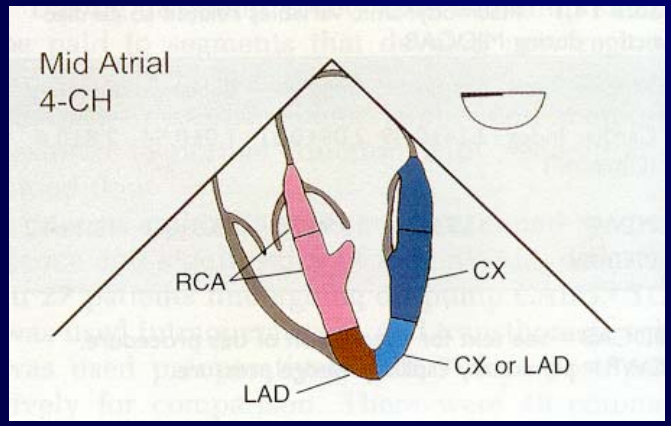


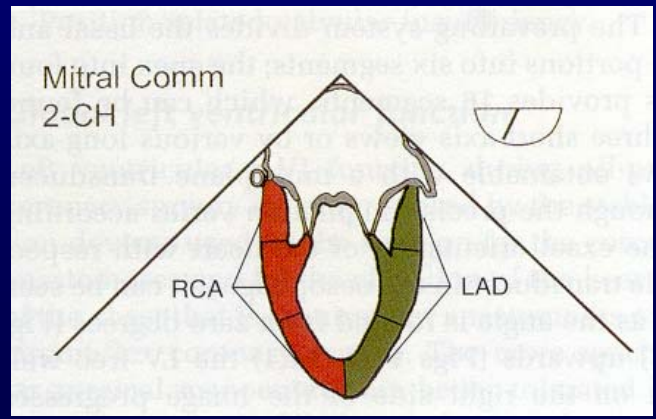

TIS: 1.4
6.2/5.0T2 GAIN 81 COMP 80
UZ Gent 14CM
Cardiac Surg.IC PROC 2/0/E/B/A
TEE
1063
3:28:47
08 NOV 98
19:38:32
PAT T: 37.0C
TEE T: 42.1C
5.0MHZ
0 0 180
(hp)
5.0MHZ
43.
Calculation of (dP/dtmax)/EDV
dt
MR
1 m.sec-1
3 m.sec-1
Δ t (msec)
AO
LA + 36 mmHg
LA + 4 mmHg
LA
LV
A
X
V
Y
0
2
4
m.sec-1
100
80
60
40
20
0
mmHg
400
300
200
100
0
100
+CM/S-
INTERVAL 3000 MS

Assessment of LV Performance









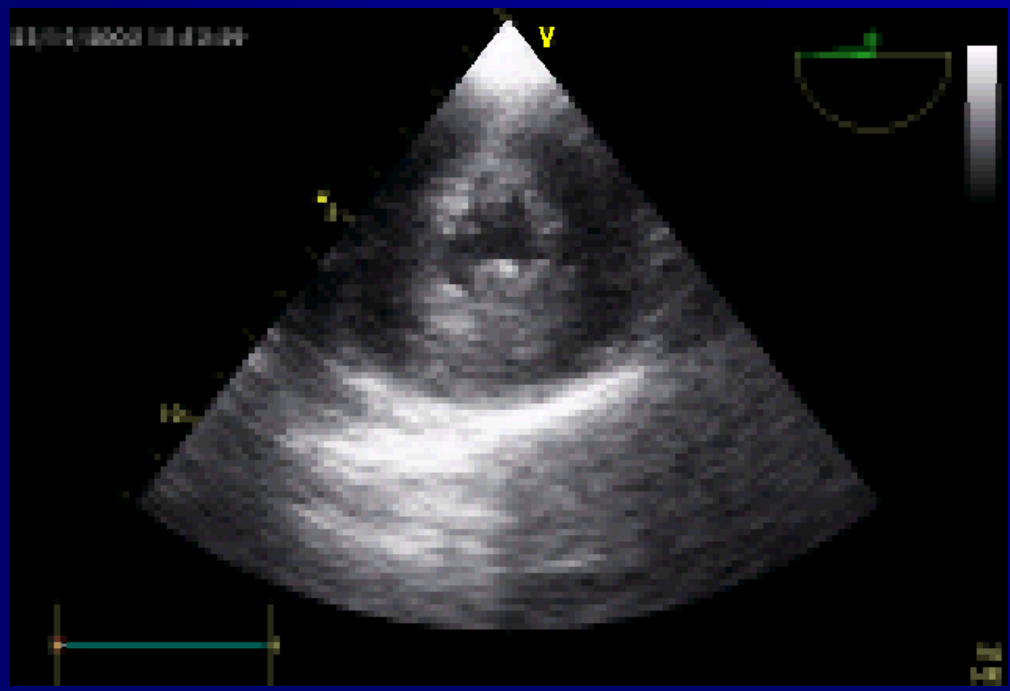
Assessment of LV Performance

LVH ?

Mitral regurgitation ?

RV function ?

Preload ?



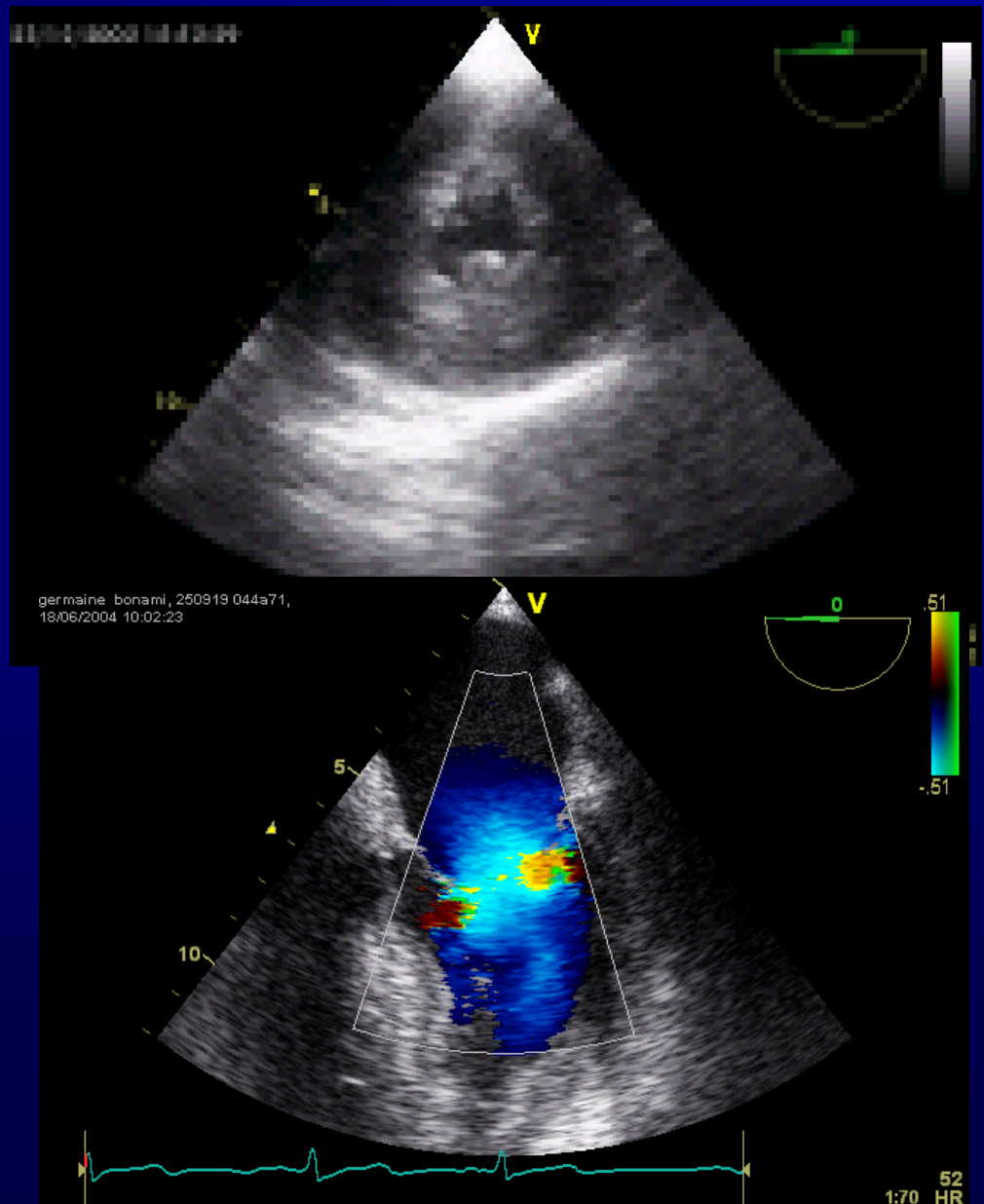
Assessment of LV Performance

LVH ?

Mitral regurgitation ?

RV function ?

Preload ?



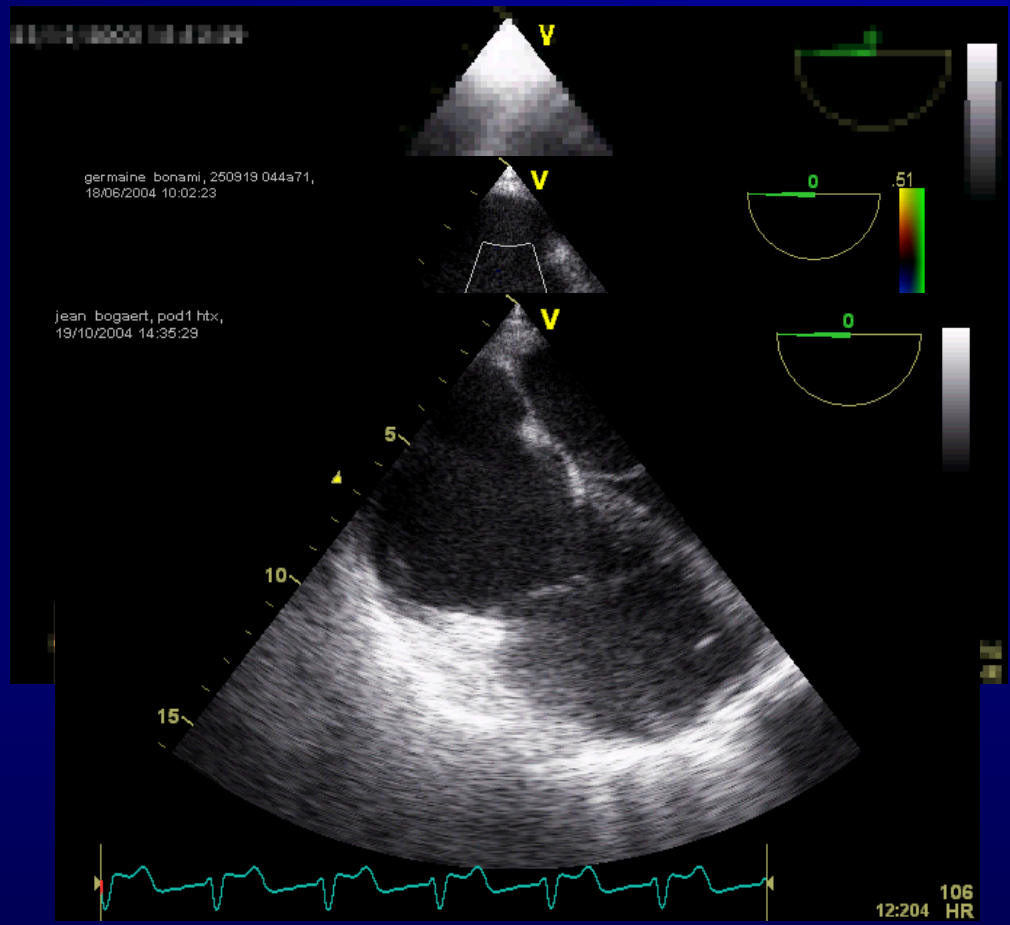
Assessment of LV Performance

LVH ?

Mitral regurgitation ?

RV function ?

Preload ?

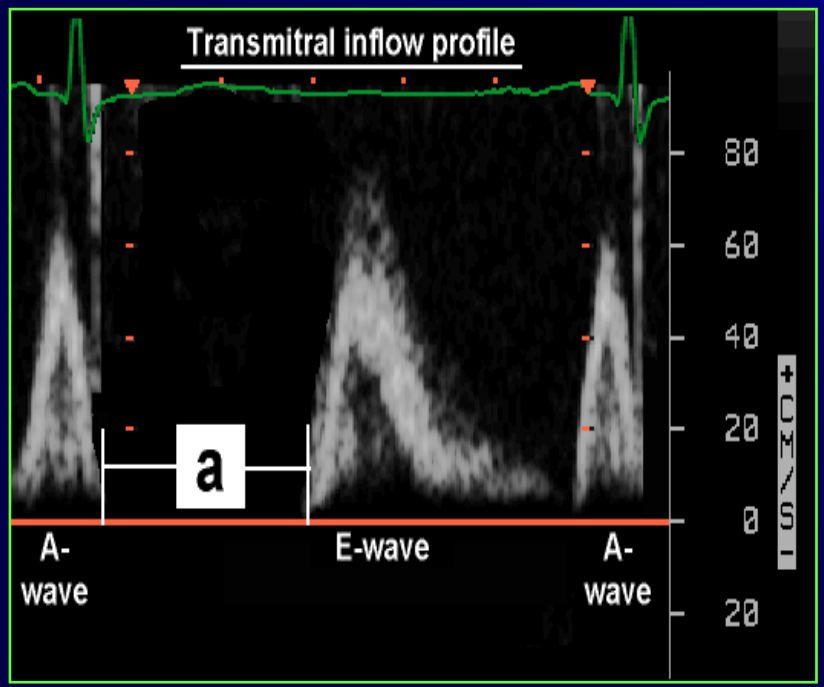


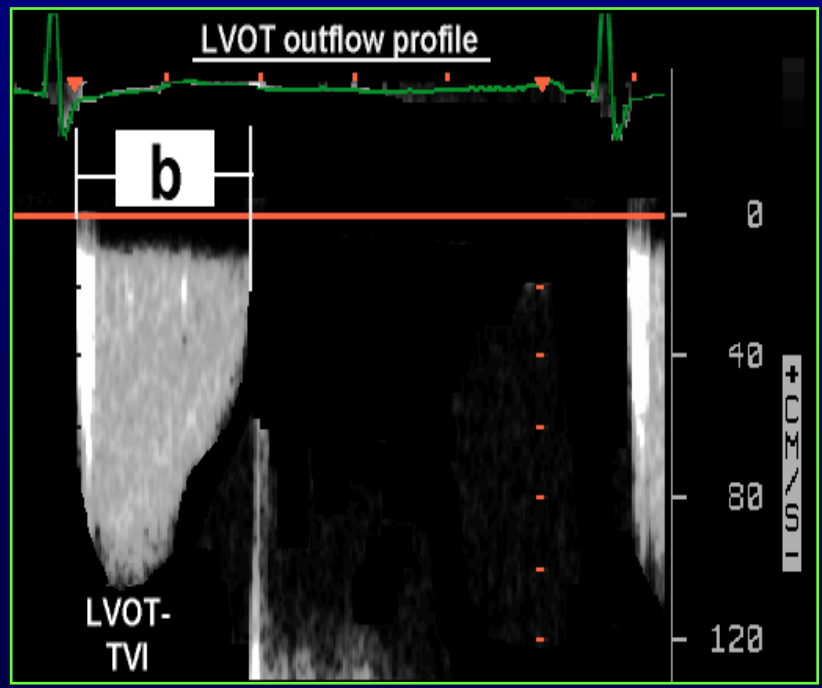
Assessment of LV Performance

Global Myocardial Performance

Tei et al. JACC 1996; 27:658-64

MPI systolic and diastolic parameters





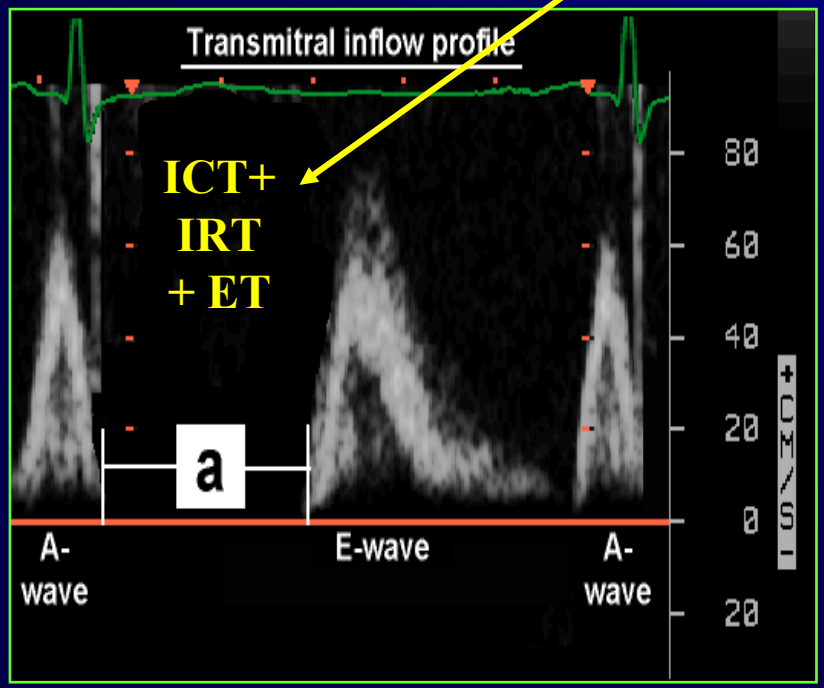
Assessment of LV Performance

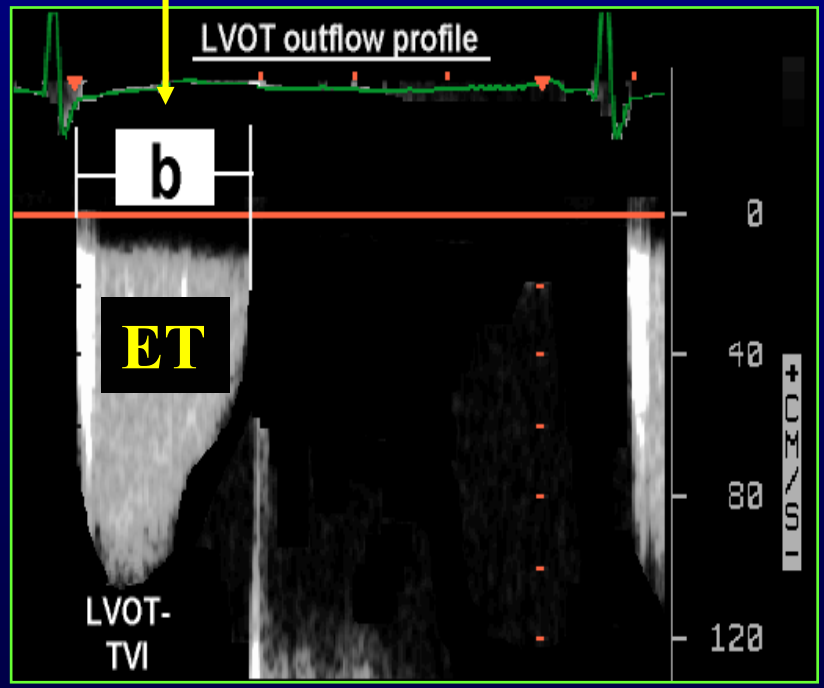
Global Myocardial Performance

Tei et al. JACC 1996; 27:658-64

MPI systolic and diastolic parameters

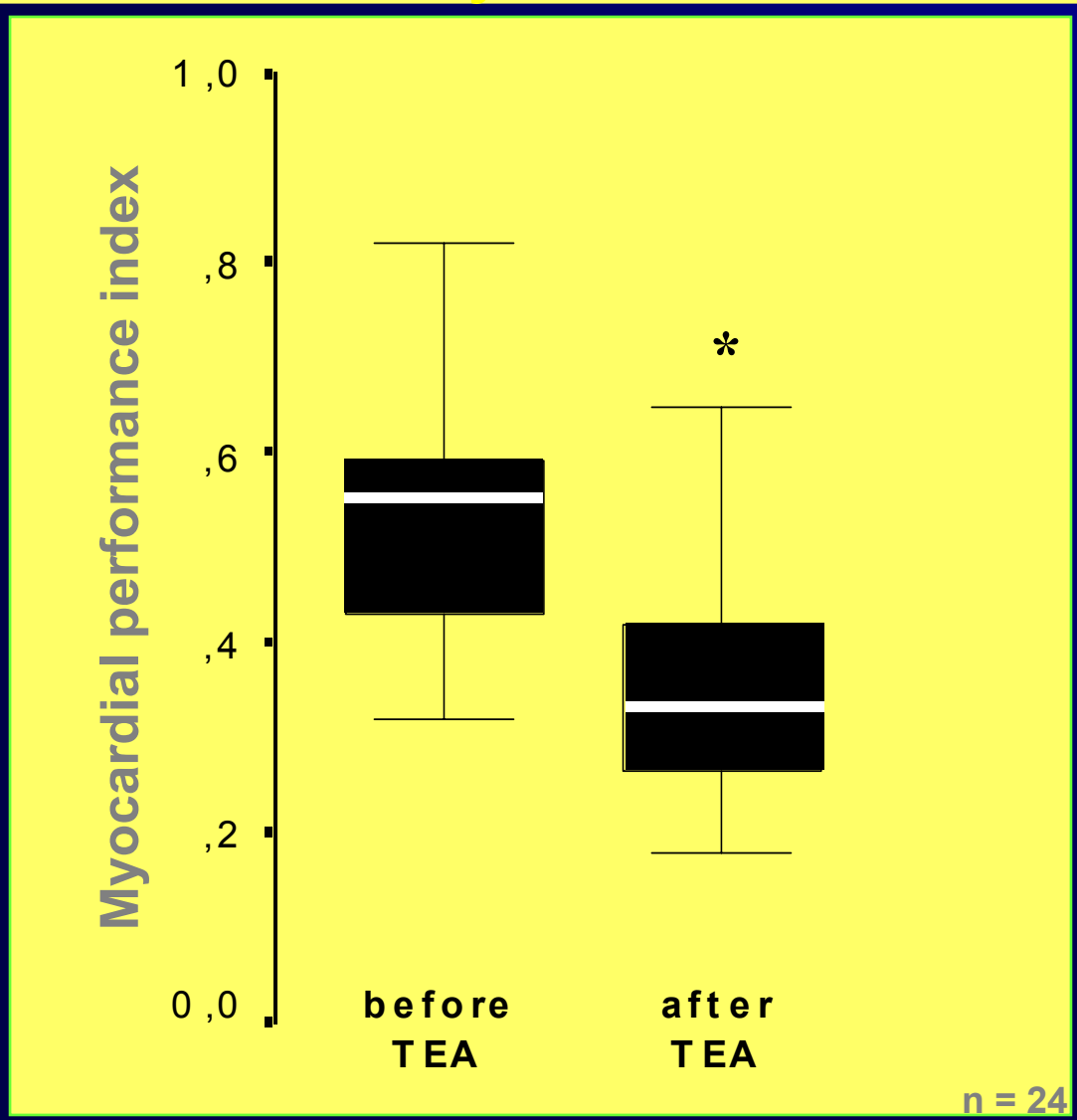
$$MPI = (ICT + IRT) / ET$$





Assessment of LV Performance

Myocardial Performance



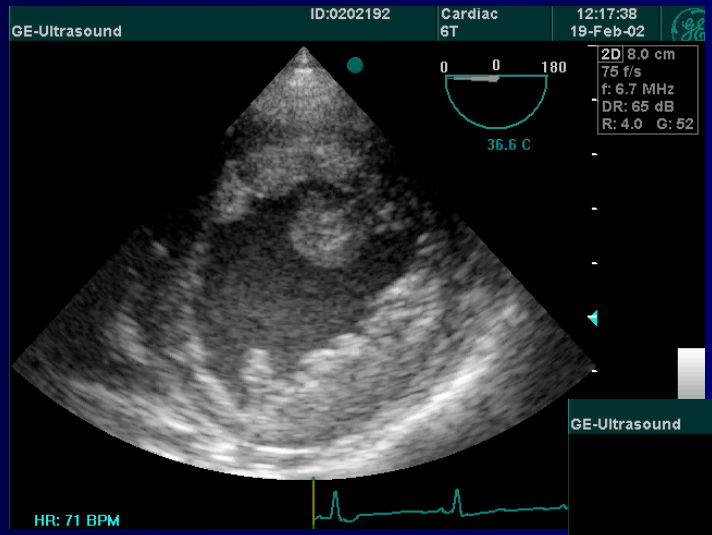
TEA induced a significant decrease in MPI compared with baseline. The mean change in MPI from baseline was 0,173, corresponding to a mean percent change of 32,5%.

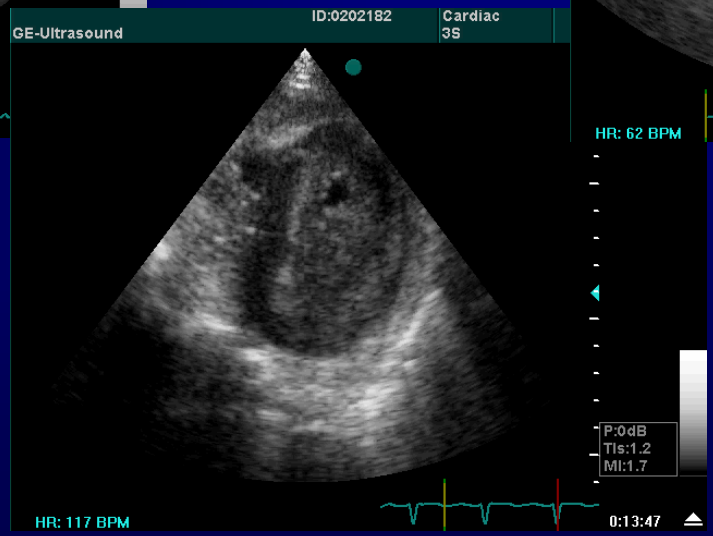
Schmidt et al. Anesthesiology 2000; 93:A656

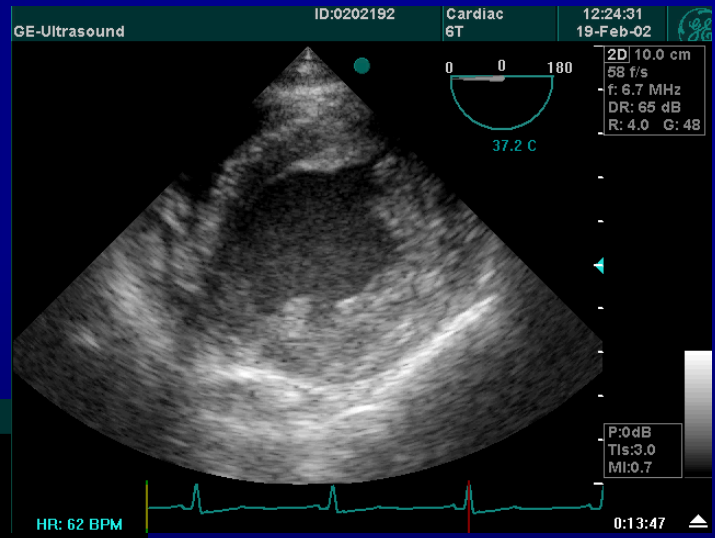
Assessment of LV Performance

Perform TTE / TEE

SAX: normal ↗ function ↘ function







Poelaert et al. Chest 2005

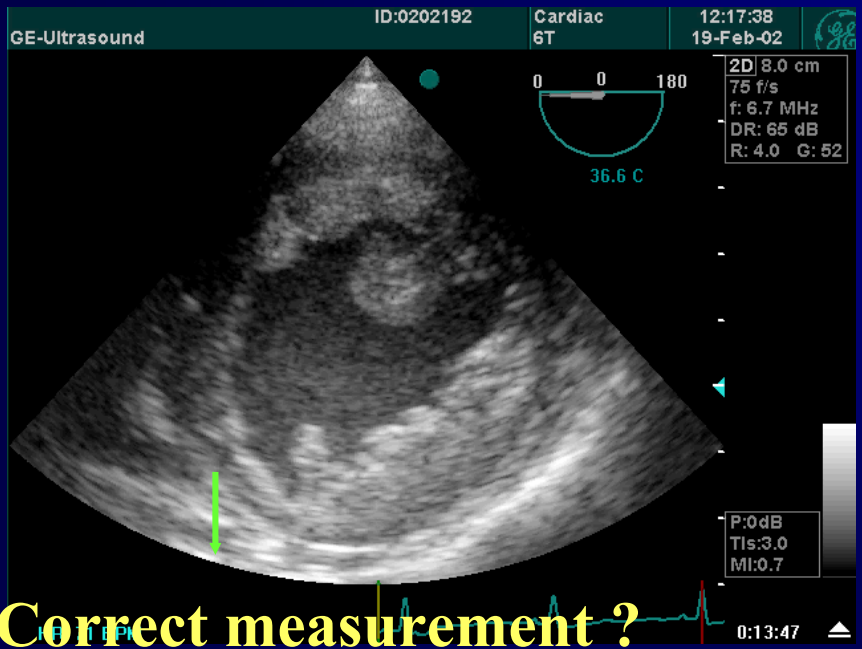
Assessment of LV Performance

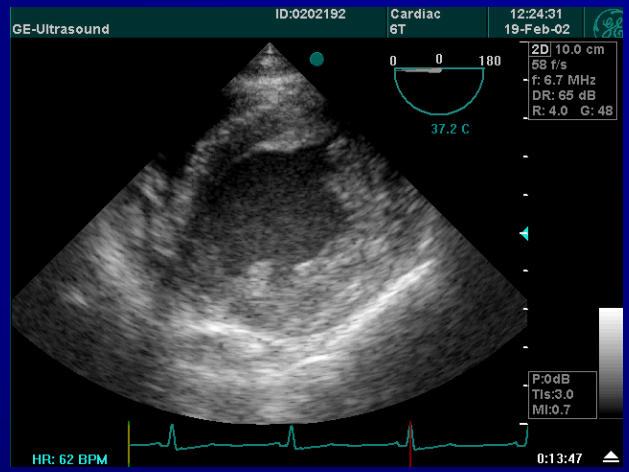
Perform TTE / TEE

SAX: normal

↗ function

↘ function





Correct measurement ?

Clinical Status

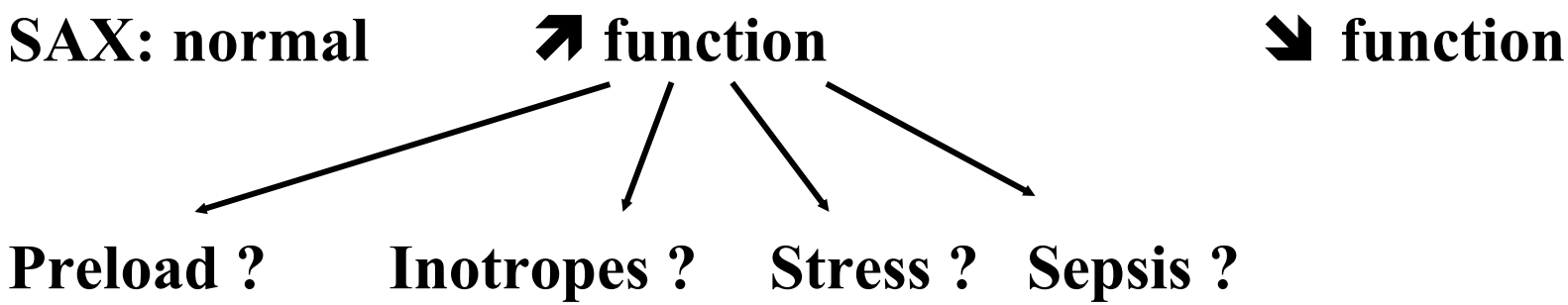
Arterial pressure monitoring

Confirmation ?

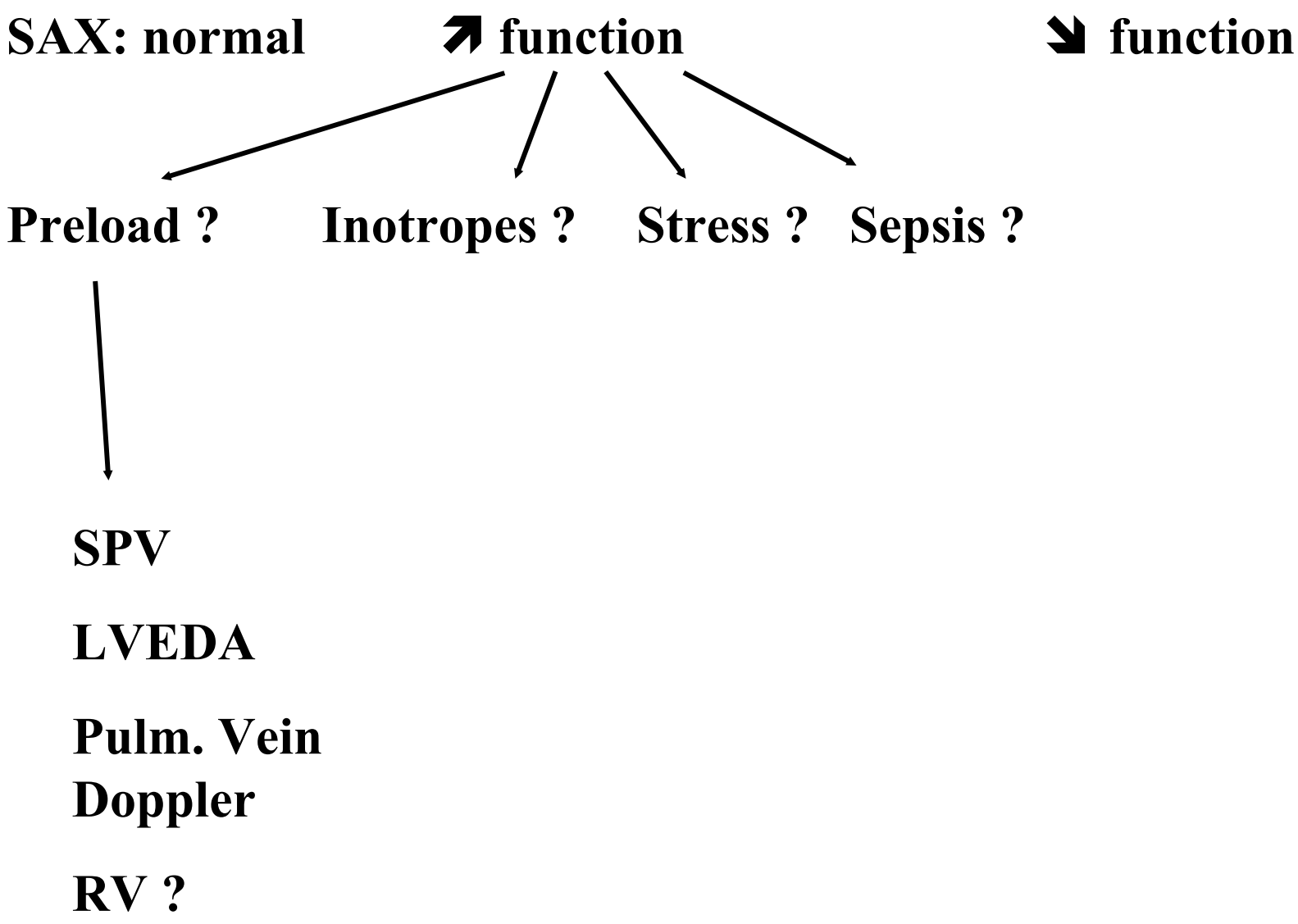
Pressure waveform ?

Poelaert et al. Chest 2005

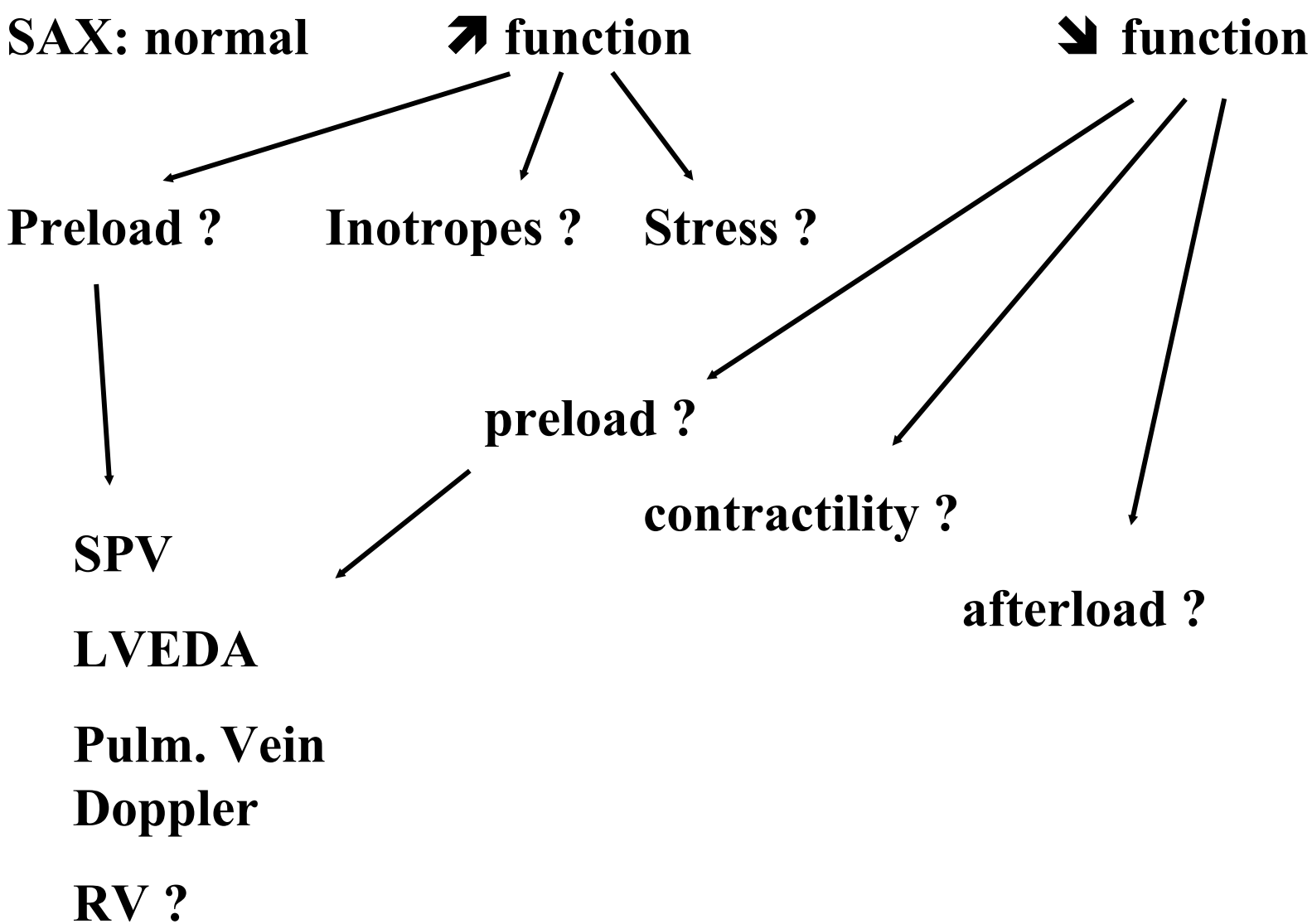
Haemodynamic Monitoring



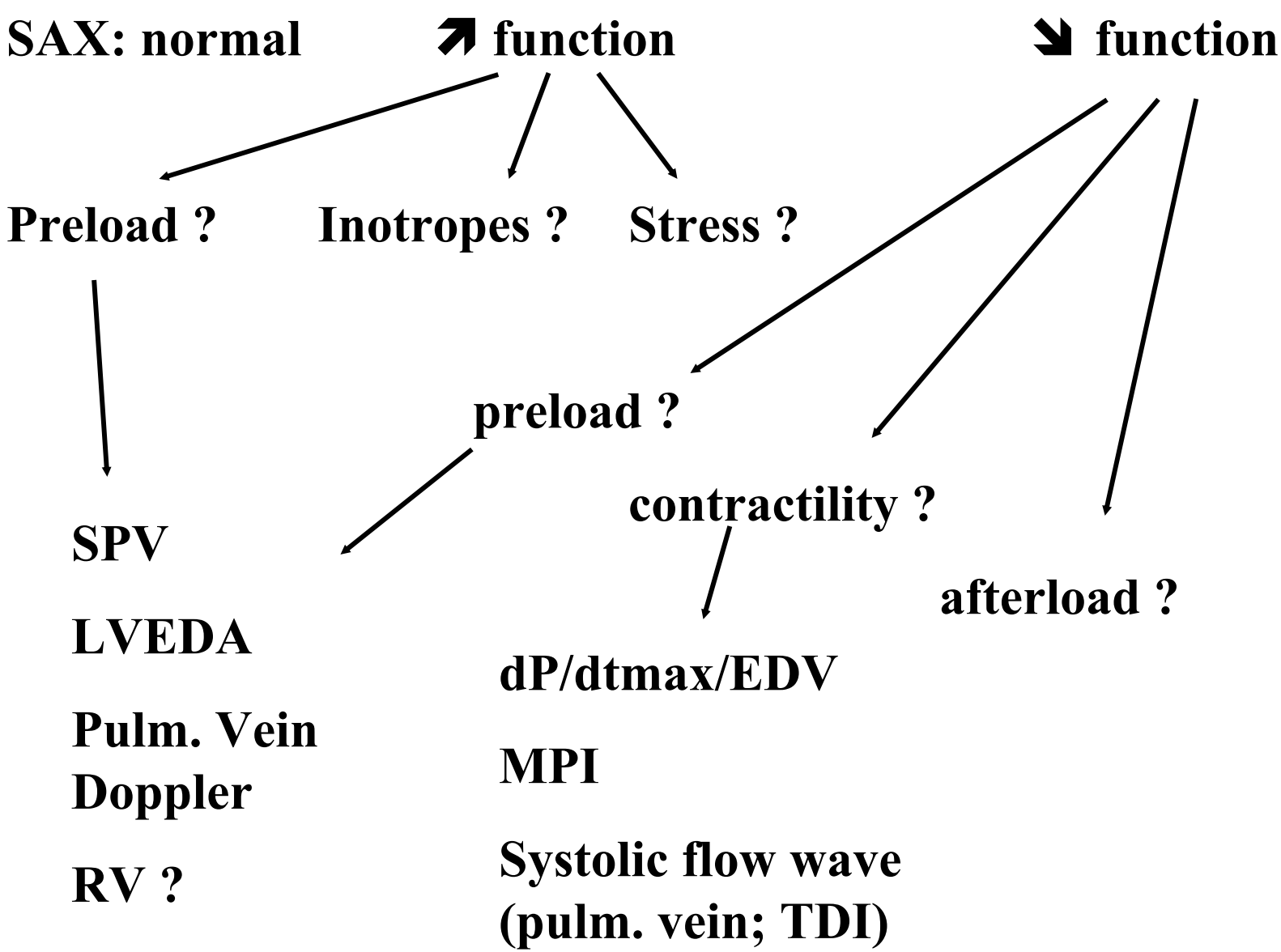
Haemodynamic Monitoring



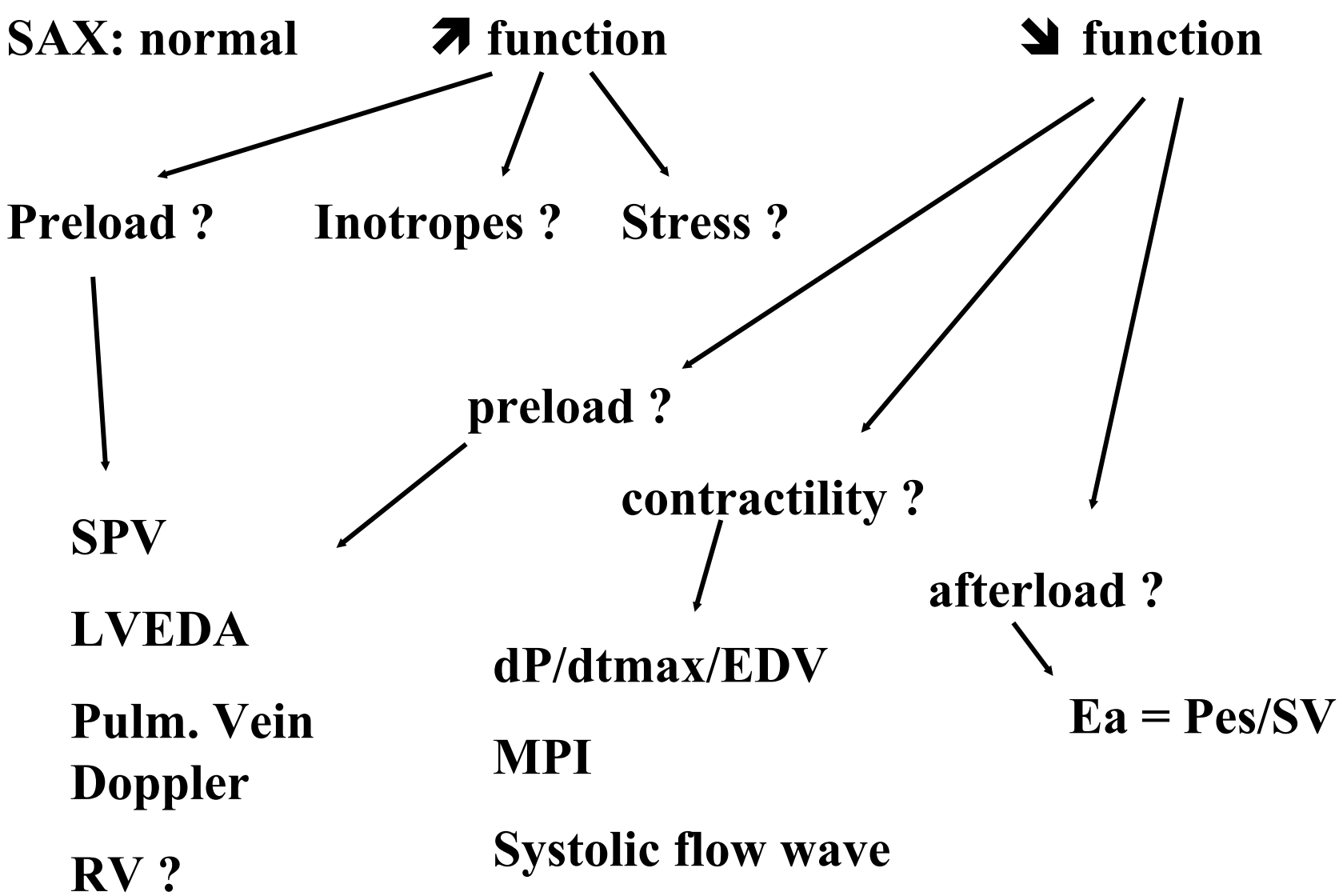
Haemodynamic Monitoring



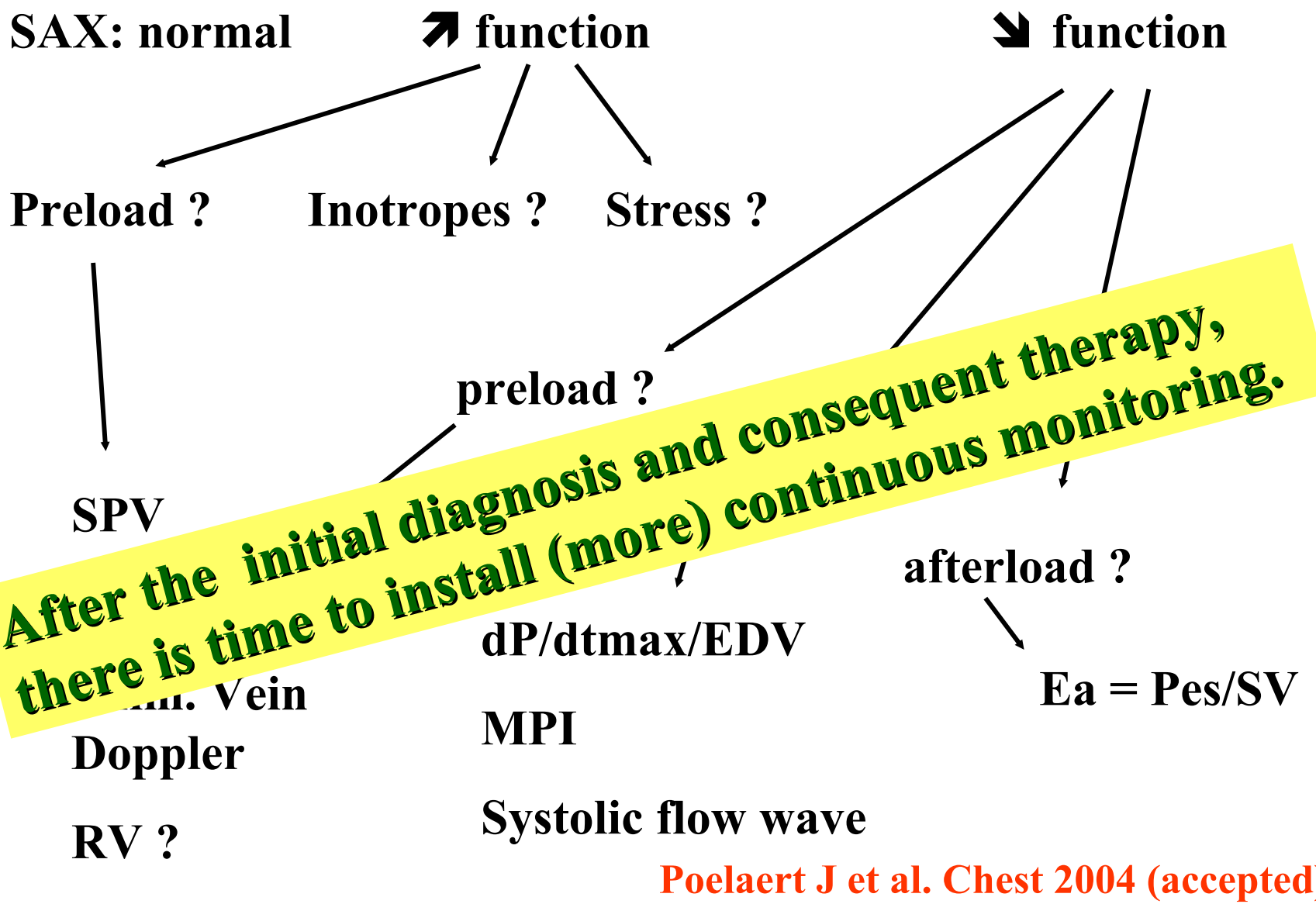
Haemodynamic Monitoring



Haemodynamic Monitoring



Haemodynamic Monitoring



Poelaert J et al. Chest 2004 (accepted)

Thank You !