Global LV Function

Jan Poelaert, MD, PhD

Department of Anesthesiology

Univ. Hospital Brussels

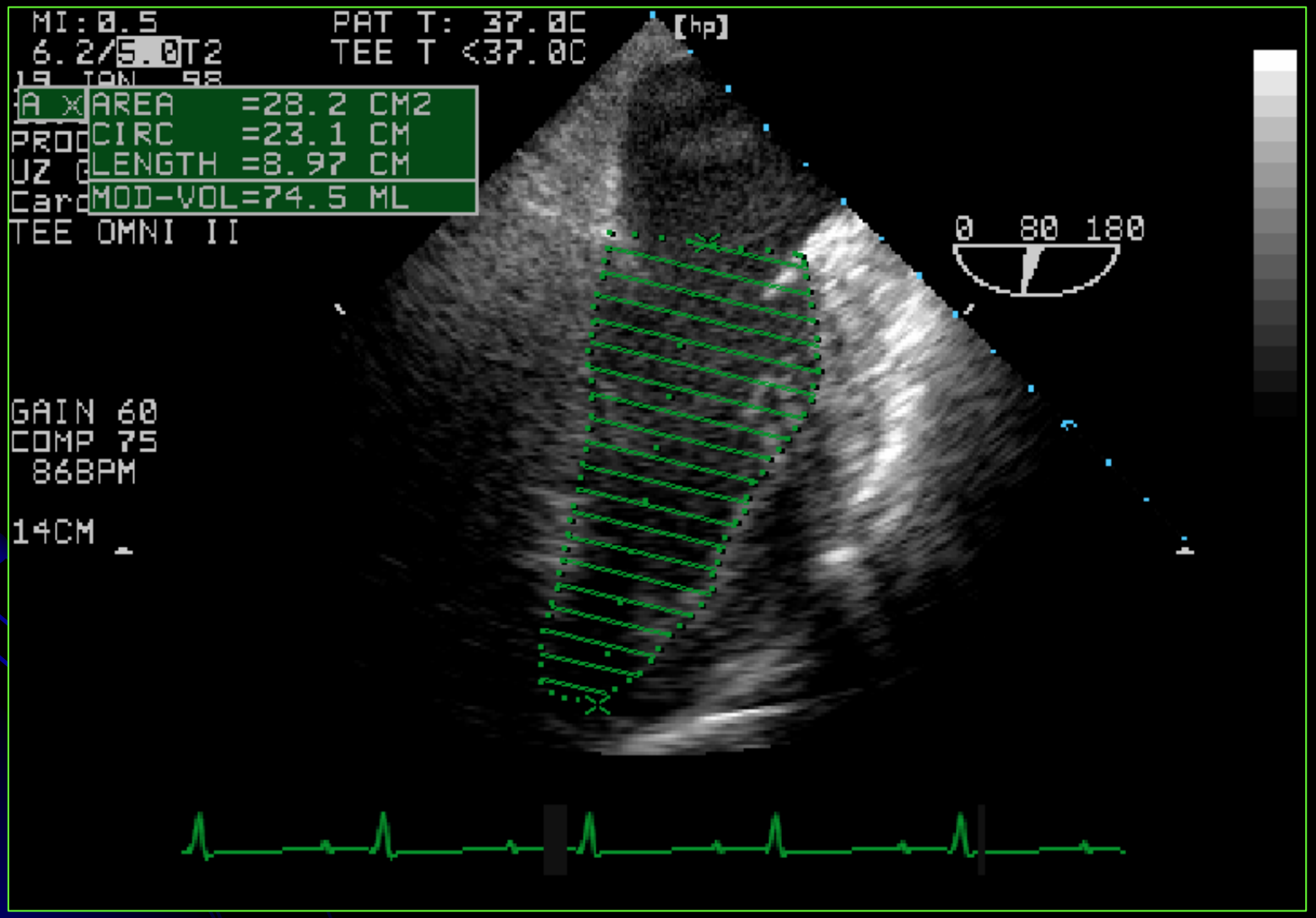
Belgium

Contents

1. How to estimate cardiac output ?
2. How to assess simple measures of systolic (and diastolic) function ?

Haemodynamic Monitoring

Estimation of Stroke Volume



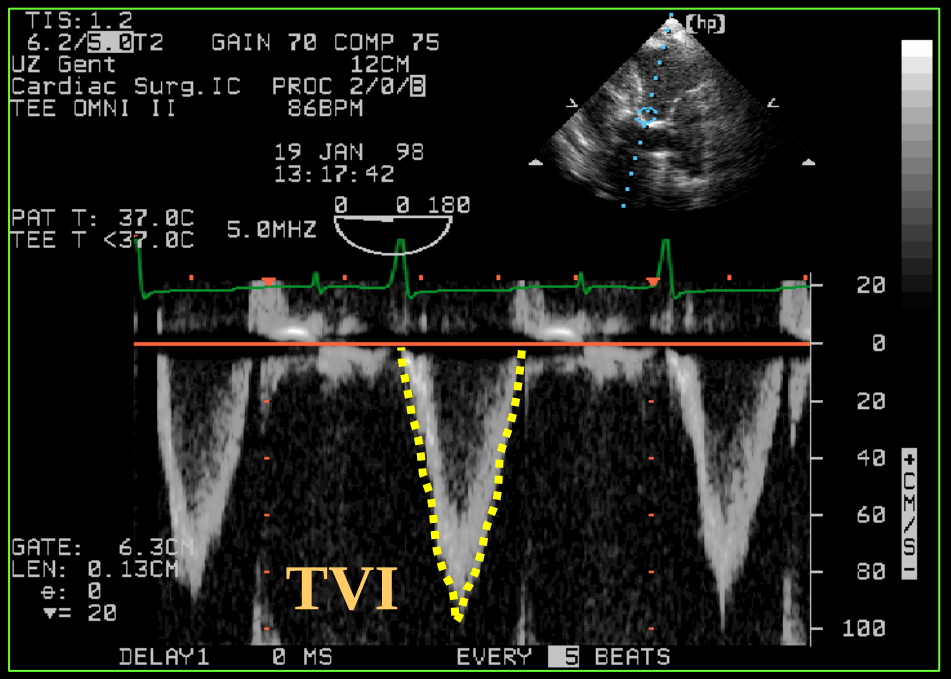
Haemodynamic Monitoring

Estimation of Cardiac Output

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

CO = SV * HR

CO = TVI * CSA * HR



Haemodynamic Monitoring

Estimation of Cardiac Output

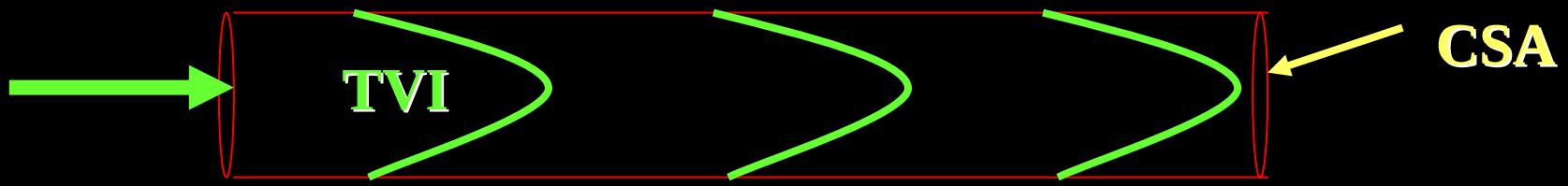
Site	author	n	failure	Doppler approach	r
PA	Savino	45	24	CW short axis	0,93
PA	Muhuideen	99	29	PW short axis	0,65
PA	Gorcsan III	15	13	PW short axis	0,83
PA	Izzat	19	10	PW short axis	0,95
MV	Shimamoto	65	NA	4-chamber view	NA
LVOT	Katz	57	12	CW transverse LA	0,91
LVOT	Darmon	109	2	CW transverse LA	0,98
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

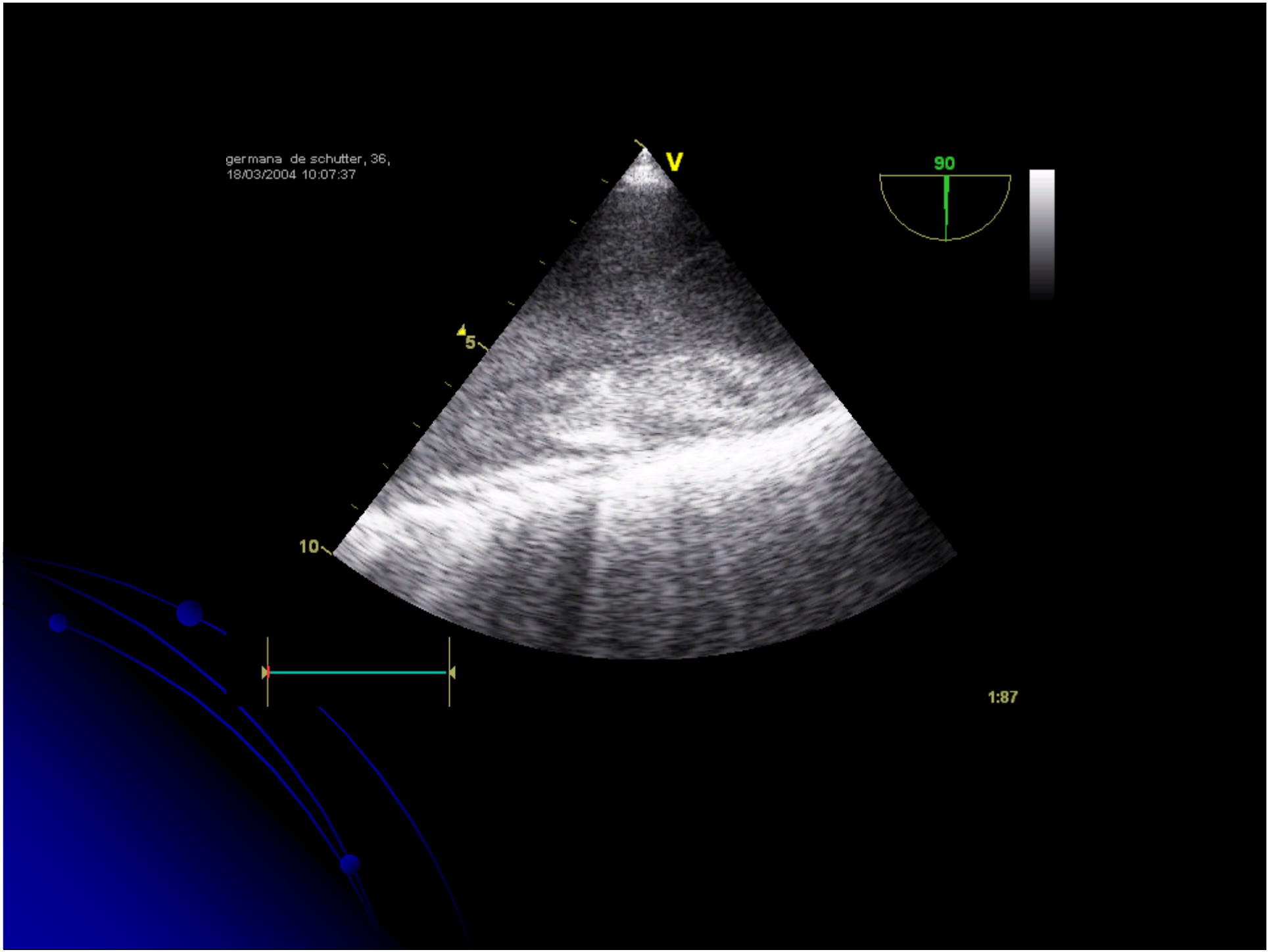
Haemodynamic Monitoring

Estimation of Cardiac Output

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



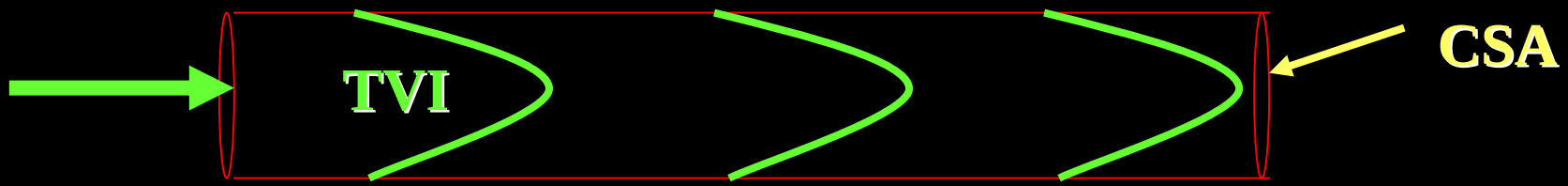
CO (l/min) = SV (ml) * HR (bpm)


germana de schutter, 36,
18/03/2004 10:07:37
V
90
5
10
1:87

Haemodynamic Monitoring

Estimation of Cardiac Output

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



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

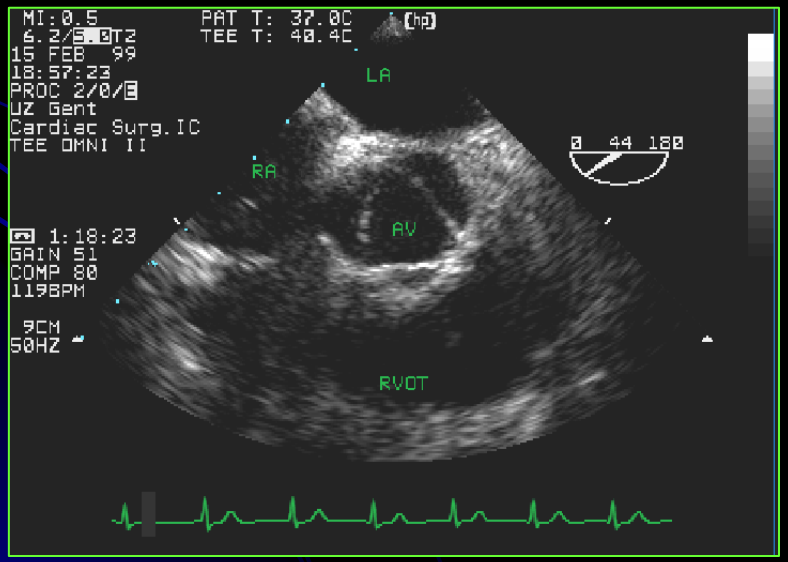
Pitfalls:

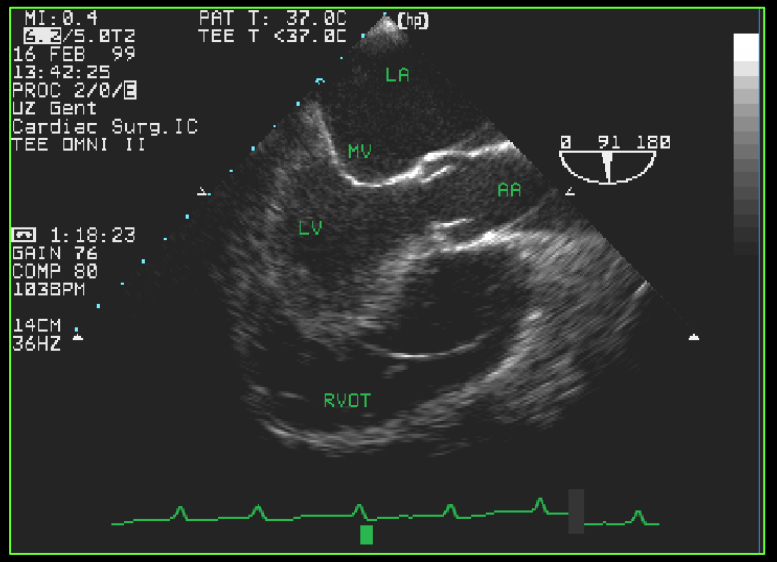
1. **Estimation of velocity(alignment, outline, not maximal velocity, number of beats)**
2. **Inappropriate velocity (stenosis, regurgitation)**
3. **Area measurement**

Haemodynamic Monitoring

Load Dependent Indices: Cardiac Output

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

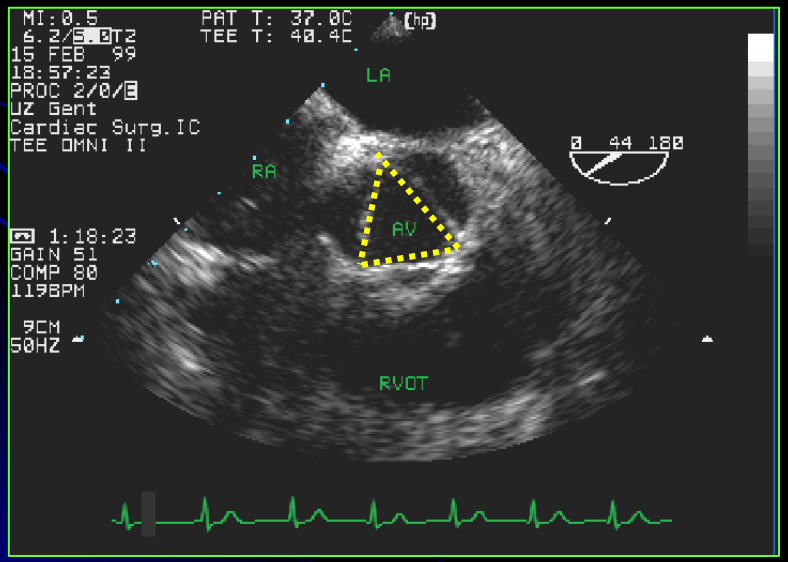


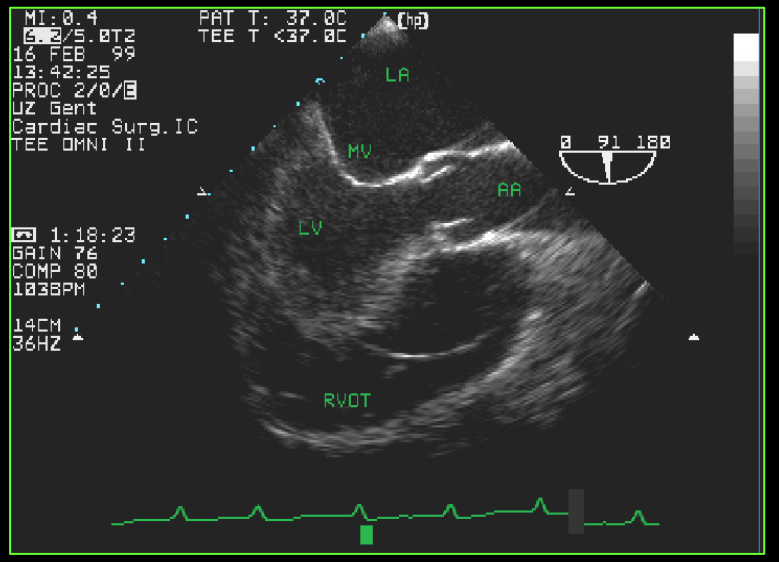


Haemodynamic Monitoring

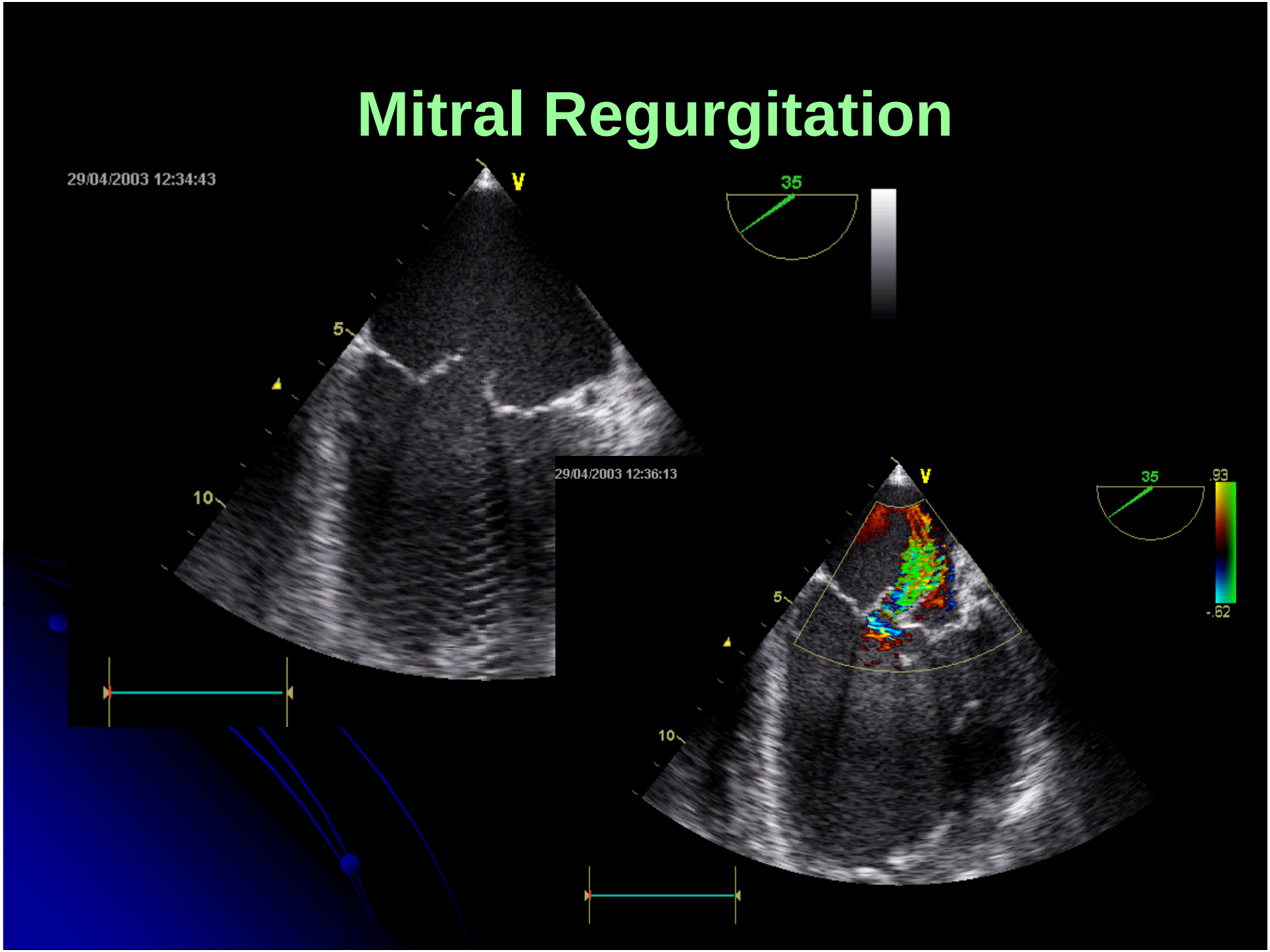
Load Dependent Indices: Cardiac Output

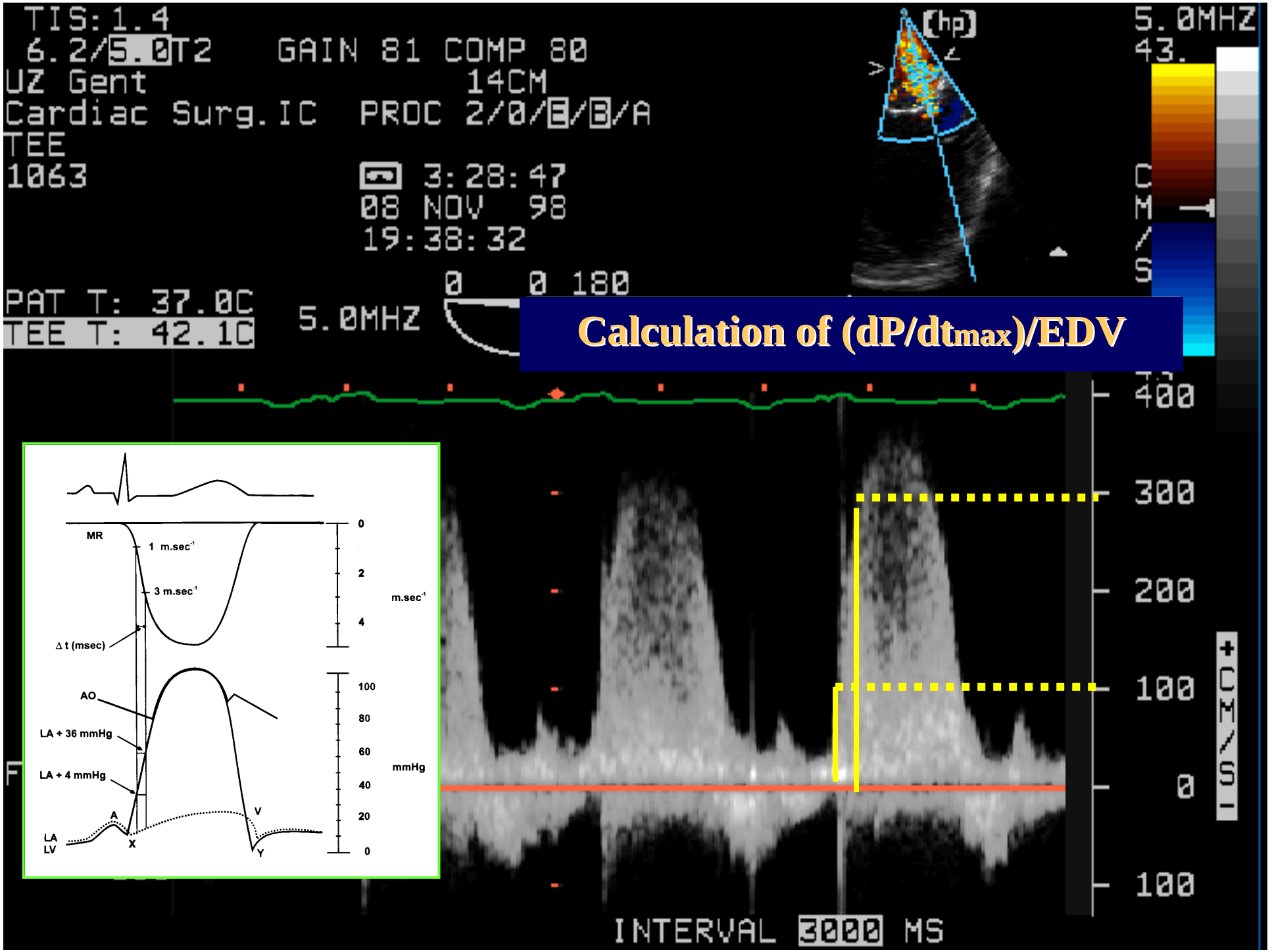
- **CSA**
  - **mean AVA**
  - **calculated: 0,785*d²**





Mitral Regurgitation



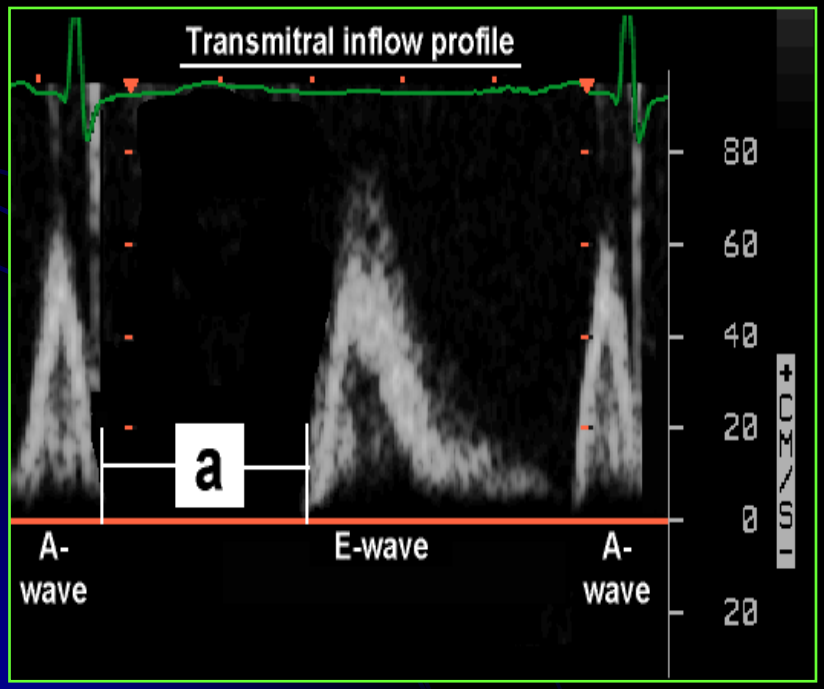

TIS: 1.4
6.2/5.0T2 GAIN 81 COMP 80
UZ Gent 14CM
Cardiac Surg.IC PROC 2/0/E/B/A
TEE
1063
3:28:47
08 NOV 98
19:38:32
PAT T: 37.0C
TEE T: 42.1C
5.0MHZ
0 0 180
5.0MHZ
43.
Calculation of (dP/dtmax)/EDV
MR
1 m.sec-1
3 m.sec-1
Δ t (msec)
AO
LA + 36 mmHg
LA + 4 mmHg
LA
LV
A
X
V
Y
0
2
4
m.sec-1
100
80
60
40
20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

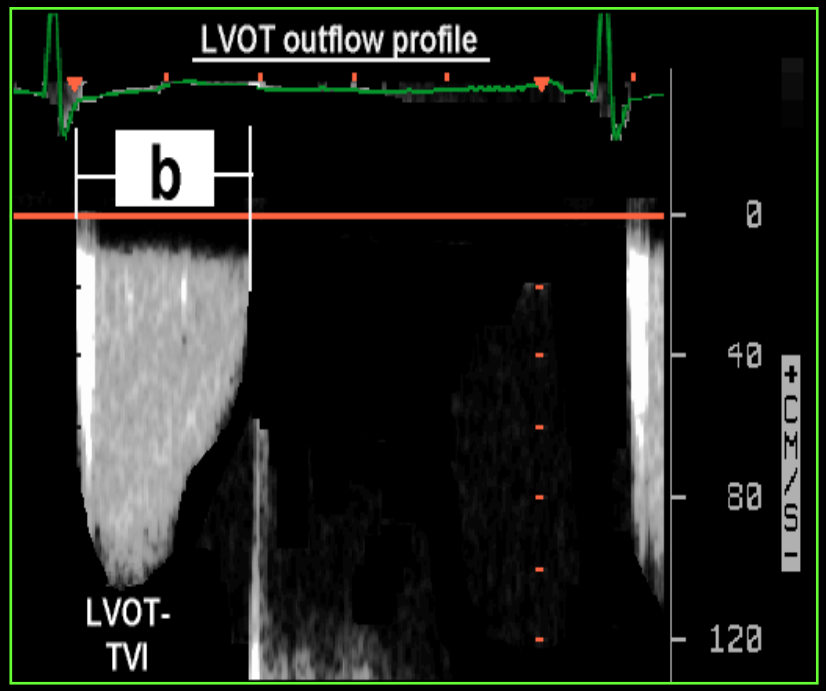
Haemodynamic Monitoring

Global Myocardial Performance

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

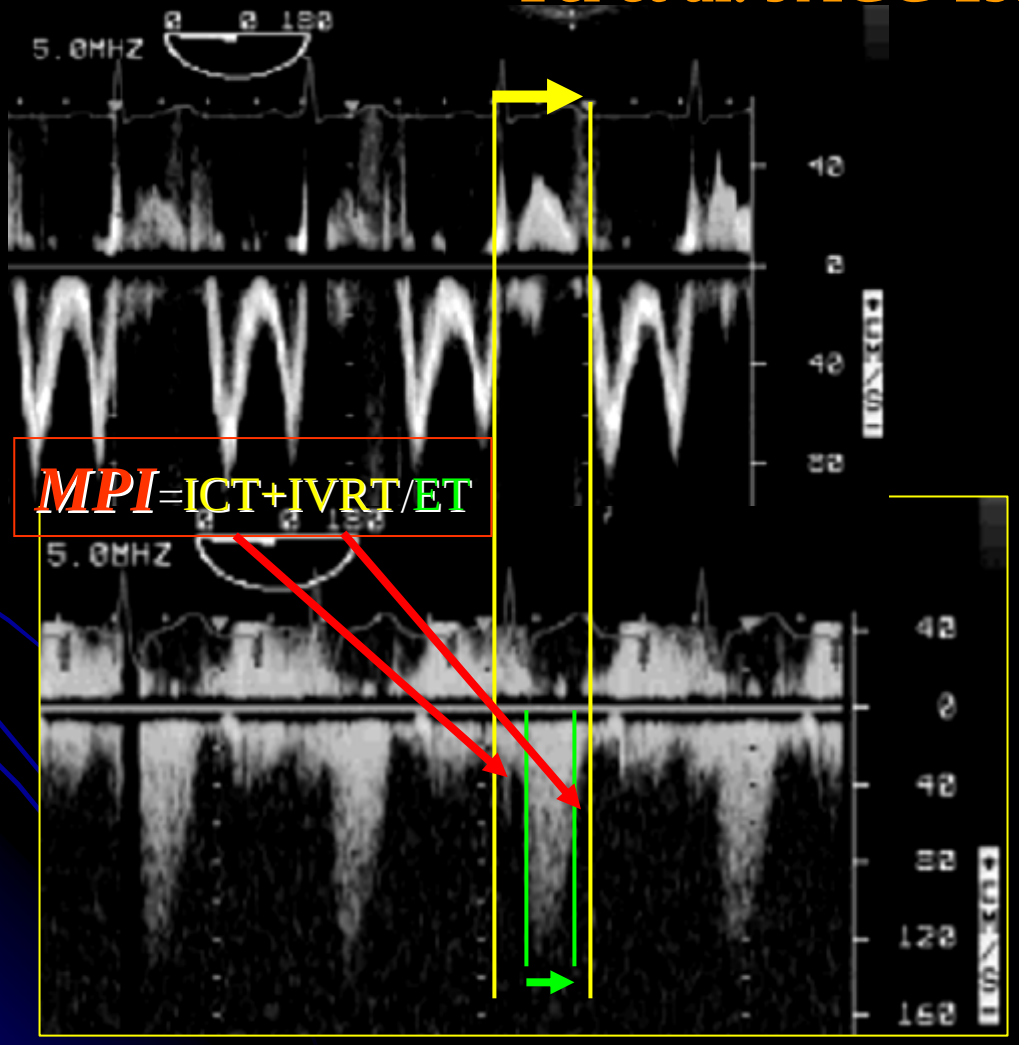
MPI systolic and diastolic parameters





Haemodynamic Monitoring
Global Myocardial Performance

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



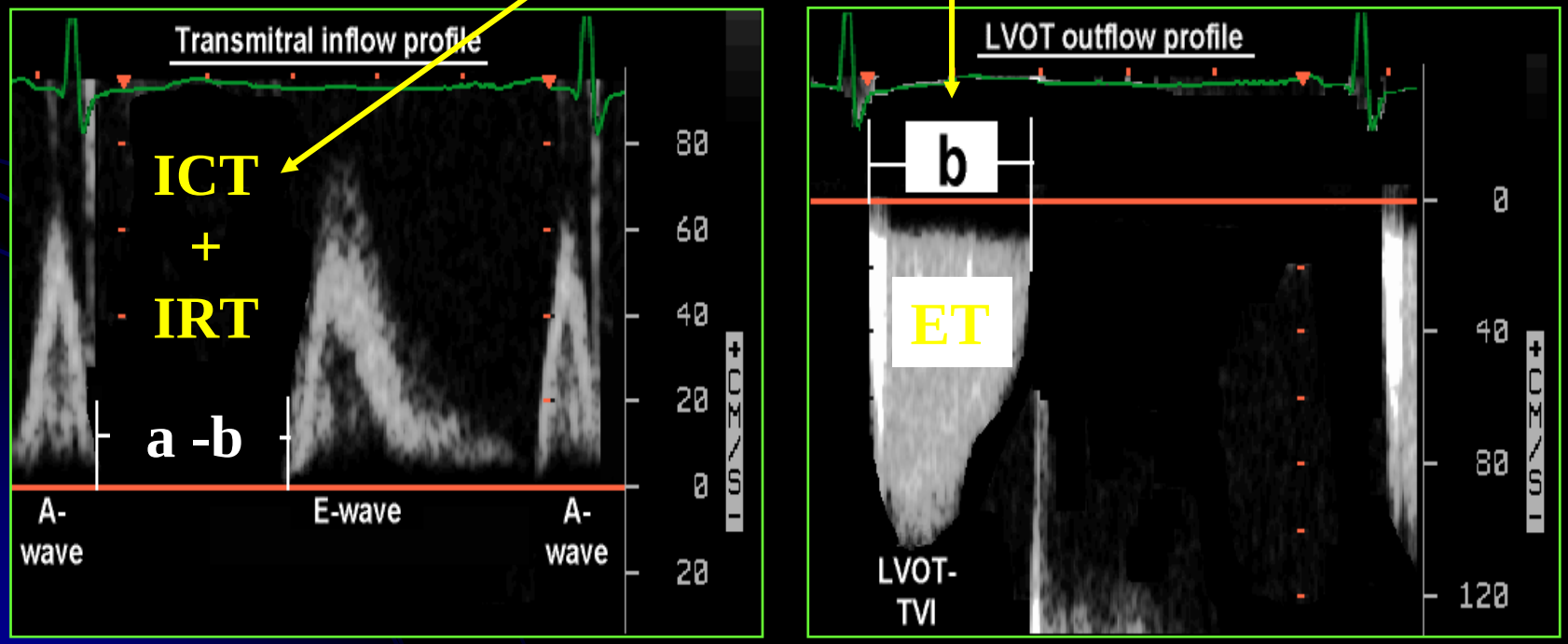
Haemodynamic Monitoring

Myocardial Performance Index

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

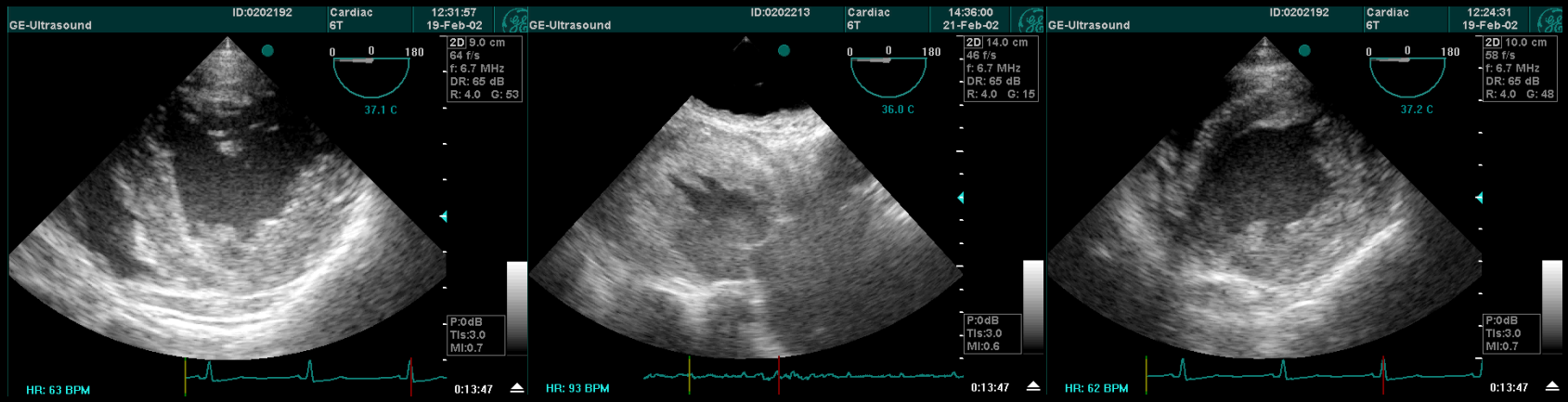
MPI systolic and diastolic parameters

MPI = (ICT + IRT) / ET



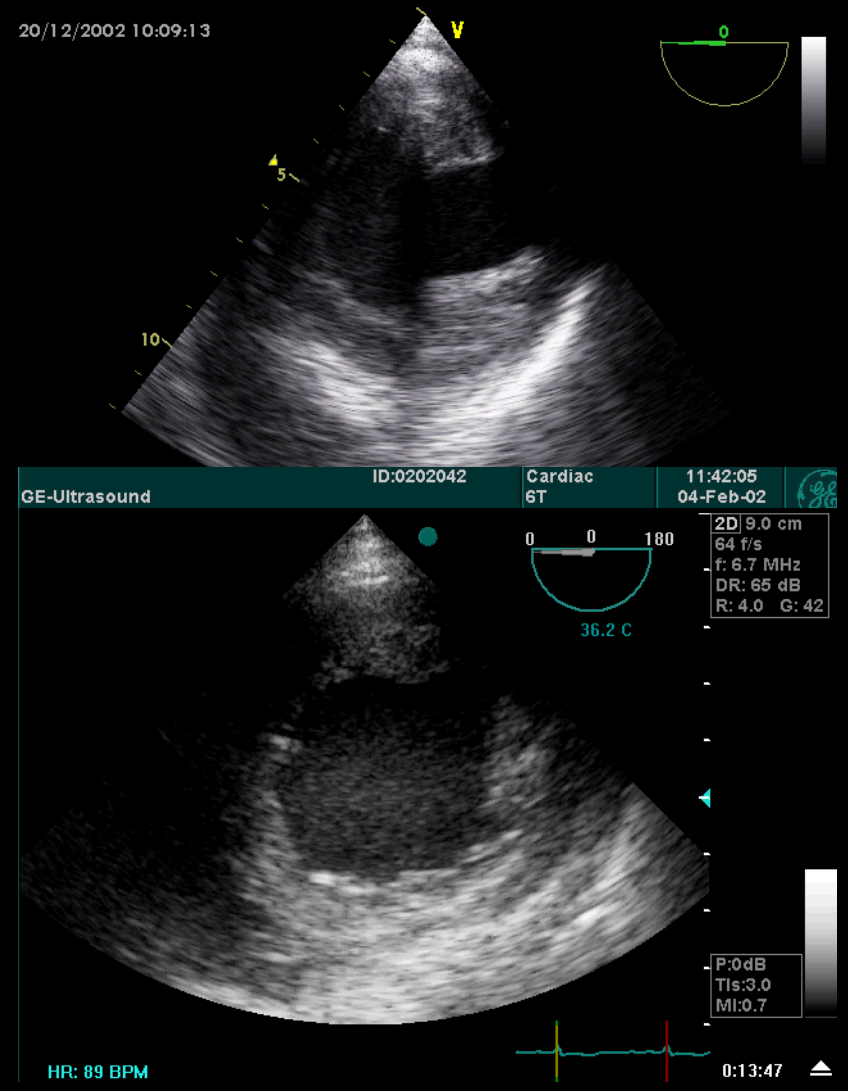
Perform TTE / TEE

SAX: normal ↗ function ↘ function



Perform TTE / TEE

SAX: normal ↗ function ↘ function

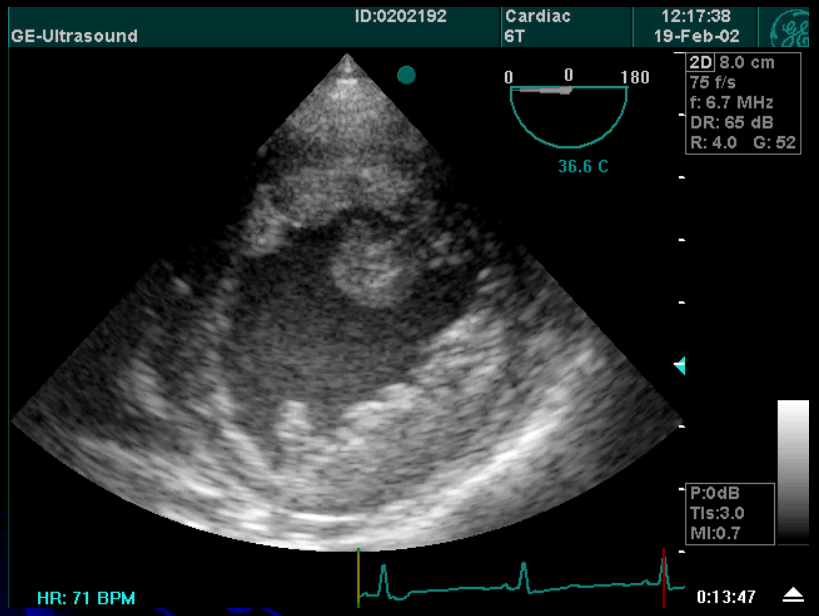


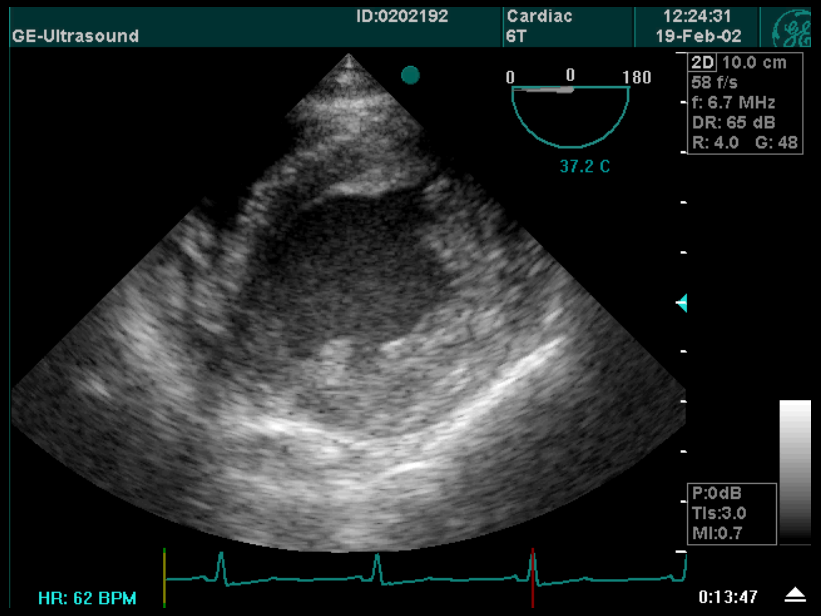
Correct measurement ?

Clinical Status

Perform TTE / TEE

SAX: normal **↗ function** **↘ function**





Correct measurement ?

Clinical Status

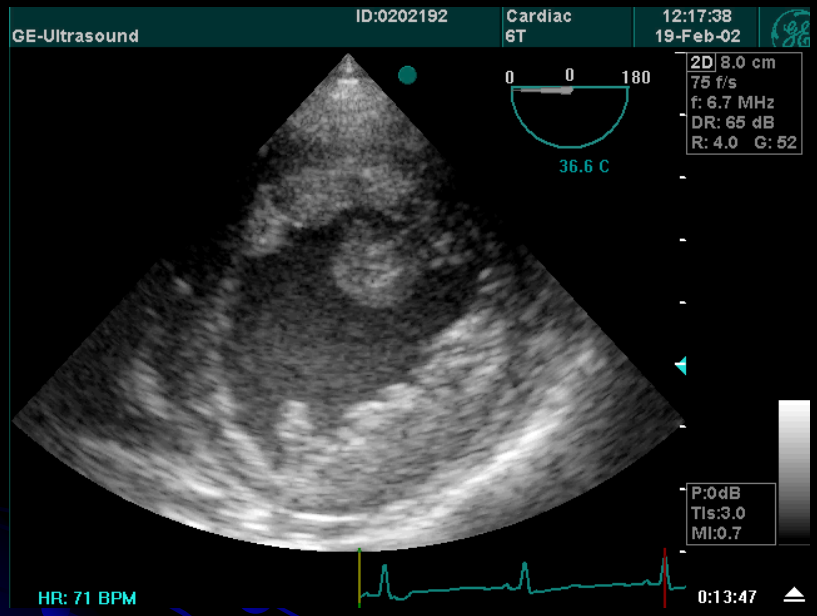
Arterial pressure monitoring

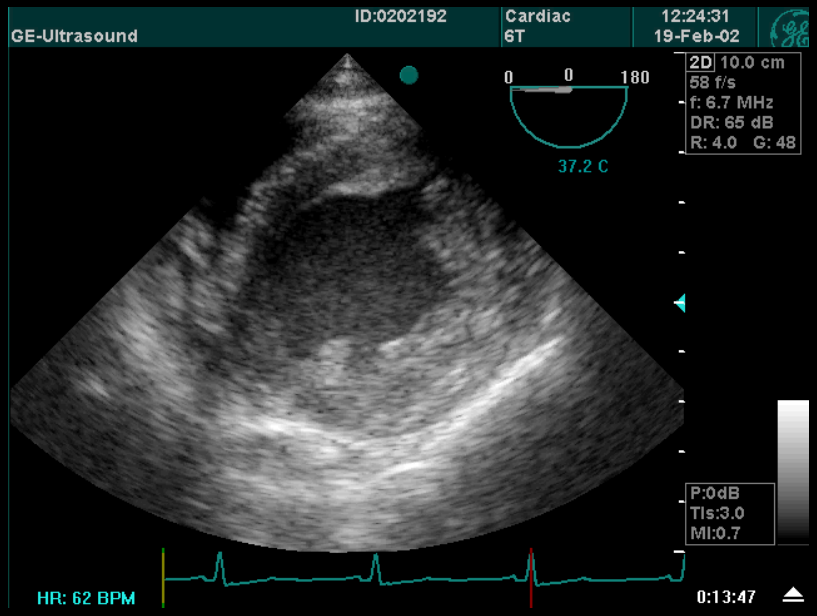
Confirmation ?

Pressure waveform ?

Perform TTE / TEE

SAX: normal ↗ function ↘ function





SPV

Fluid challenge ?

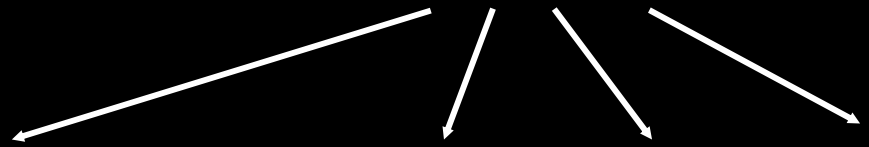
Arterial pressure monitoring

Confirmation ?

Pressure waveform ?

Haemodynamic Monitoring

SAX: normal **↗ function** **↘ function**



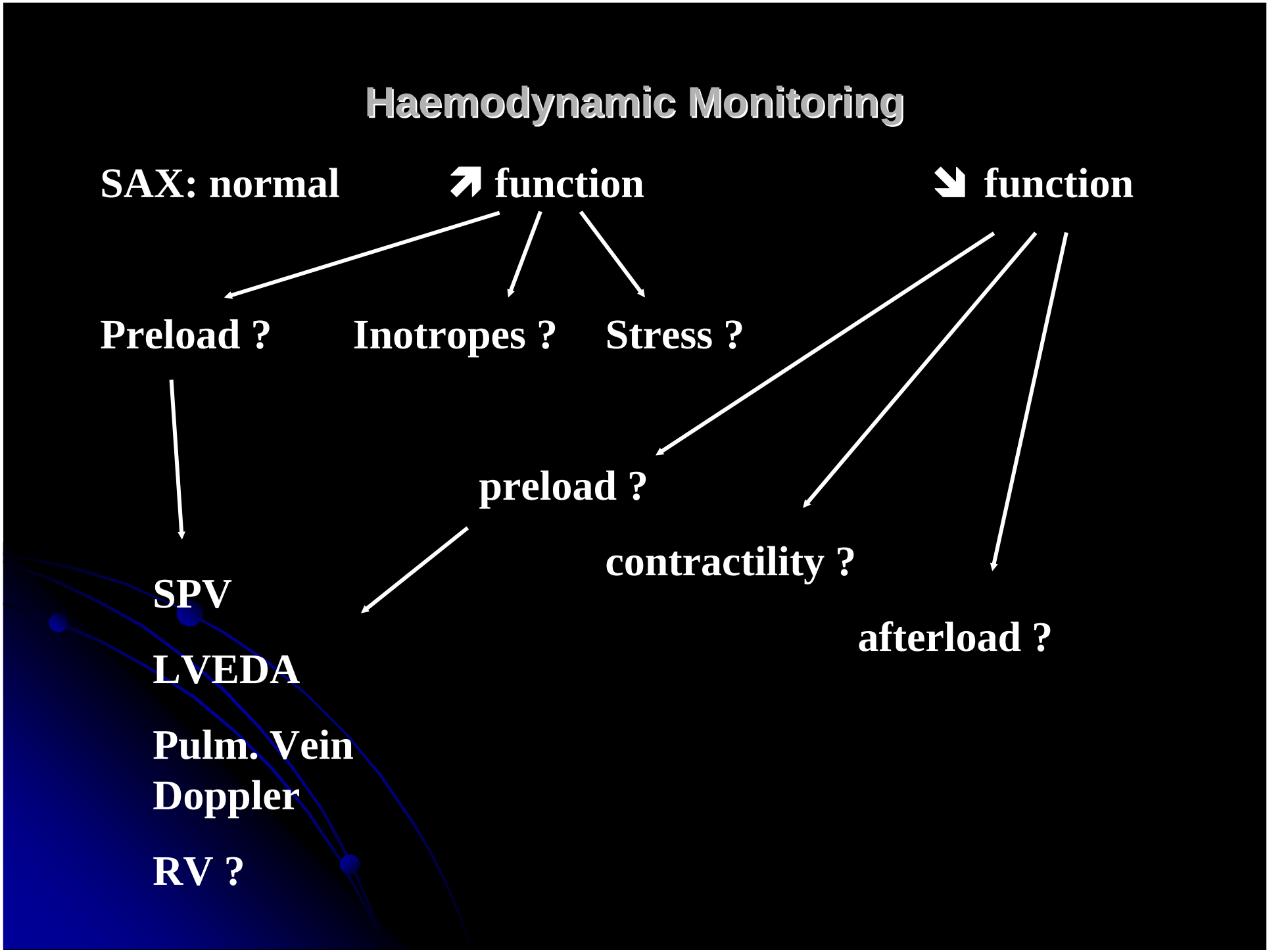
Preload ? **Inotropes ?** **Stress ?** **Sepsis ?**

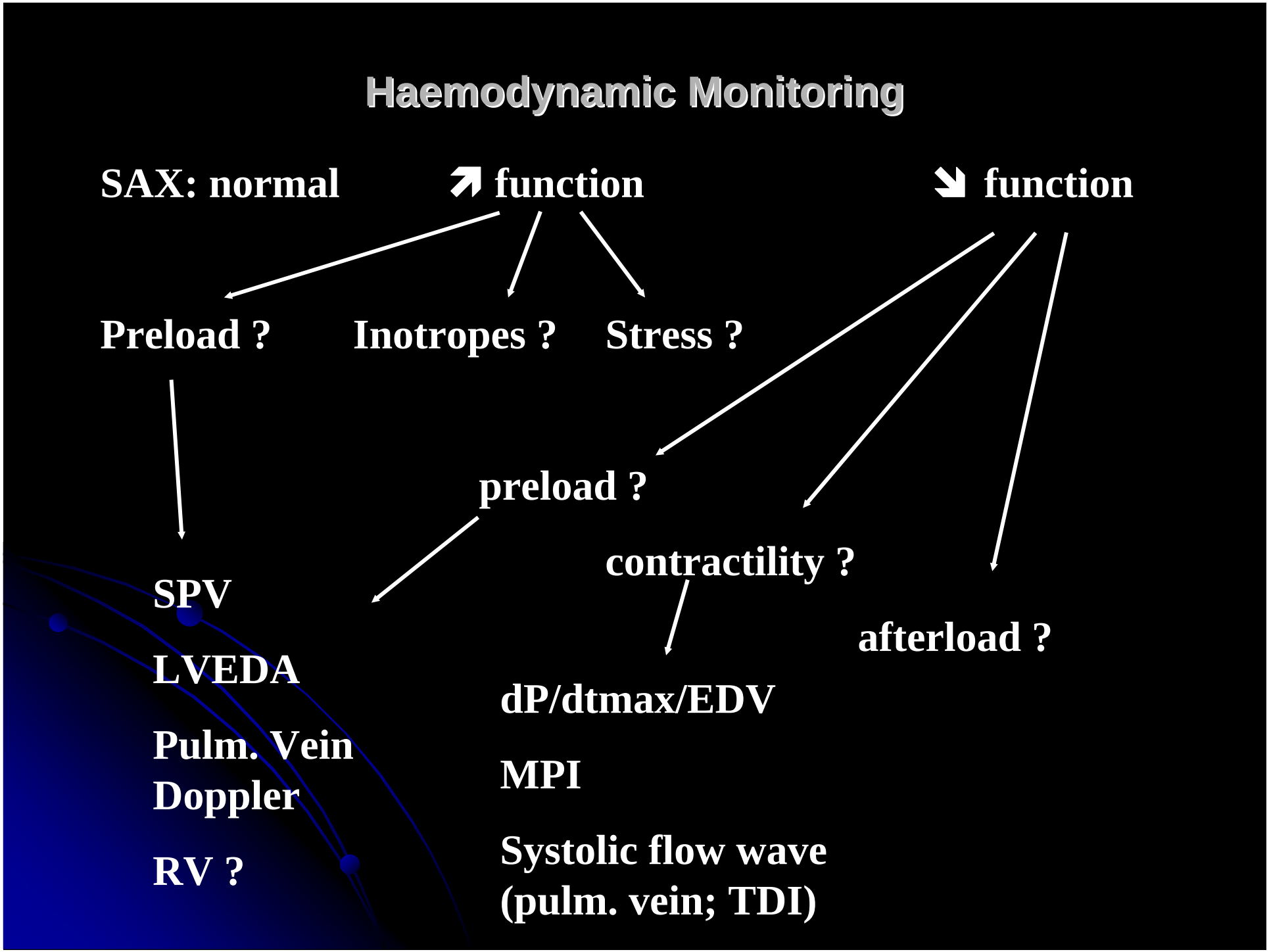
Haemodynamic Monitoring

SAX: normal **↗ function** **↘ function**

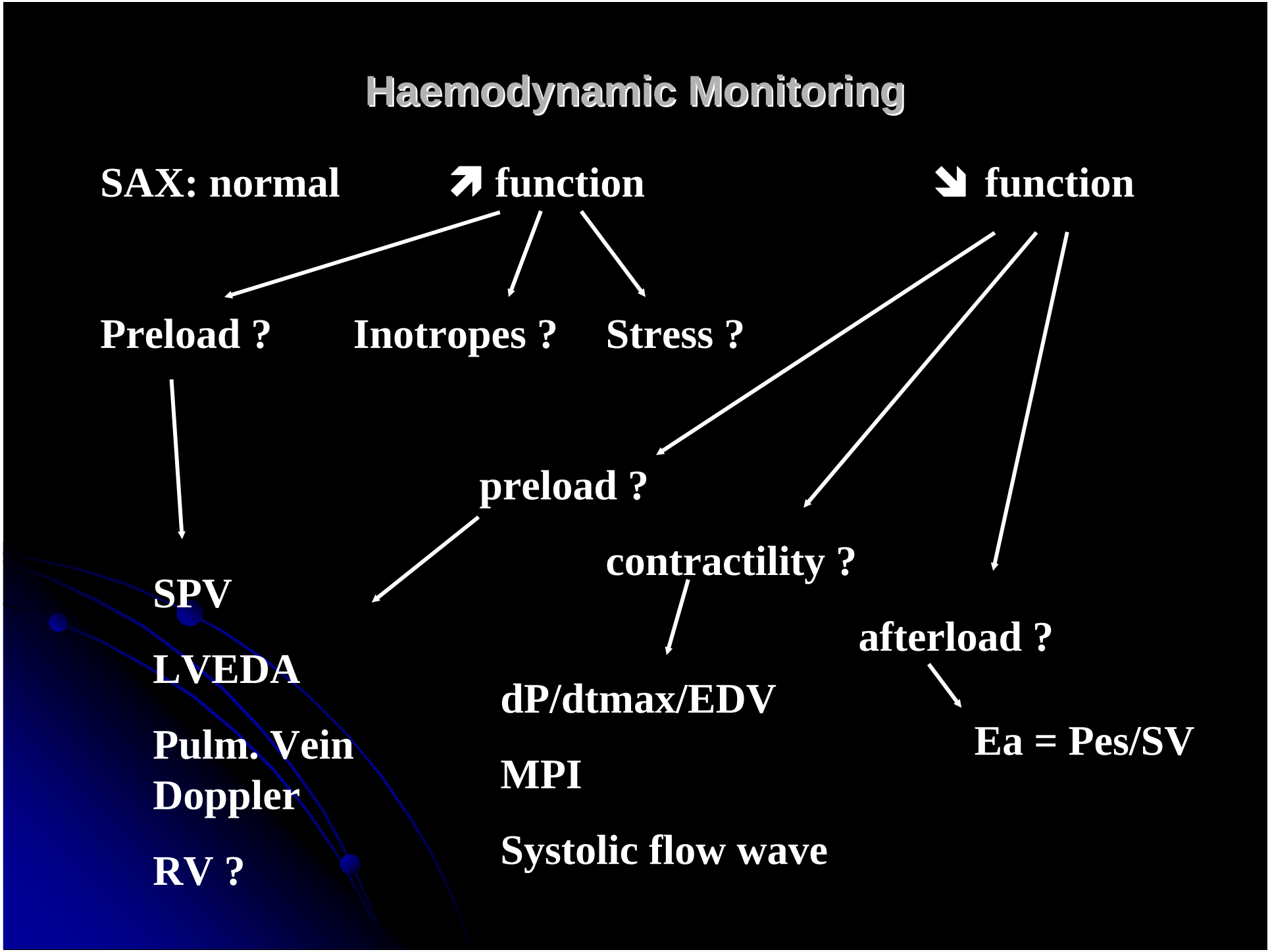
Preload ? **Inotropes ?** **Stress ?** **Sepsis ?**

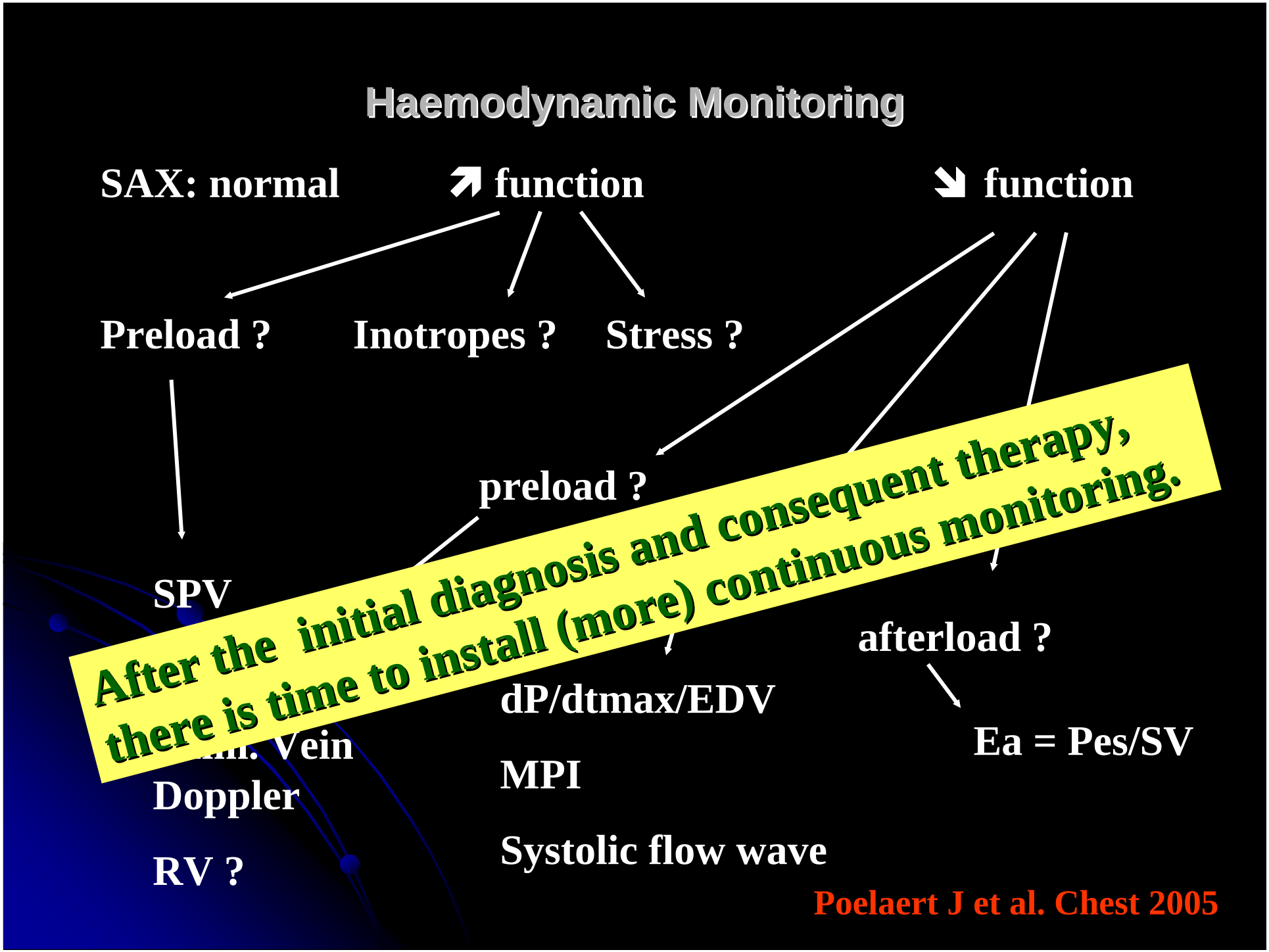
- **SPV**
- **LVEDA**
- **Pulm. Vein Doppler**
- **RV ?**

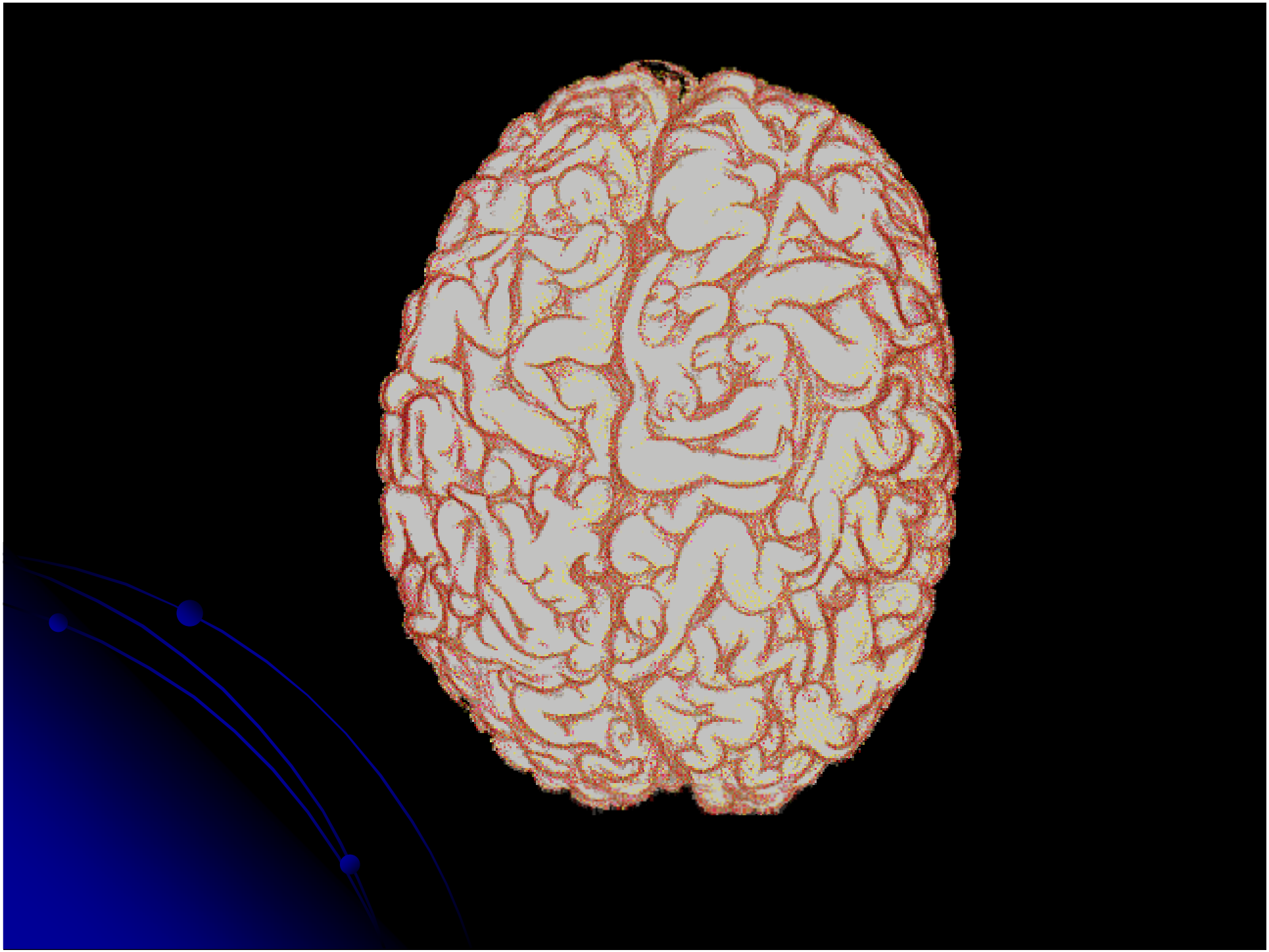

Haemodynamic Monitoring
SAX: normal
↗ function
↘ function
Preload ?
Inotropes ?
Stress ?
preload ?
contractility ?
afterload ?
SPV
LVEDA
Pulm. Vein Doppler
RV ?


Haemodynamic Monitoring
SAX: normal
↗ function
↘ function
Preload ?
Inotropes ?
Stress ?
preload ?
contractility ?
afterload ?
SPV
LVEDA
Pulm. Vein Doppler
RV ?
dP/dtmax/EDV
MPI
Systolic flow wave (pulm. vein; TDI)

Haemodynamic Monitoring




Haemodynamic Monitoring
SAX: normal
↗ function
↘ function
Preload ?
Inotropes ?
Stress ?
preload ?
SPV
Vein
Doppler
RV ?
dP/dtmax/EDV
MPI
Systolic flow wave
afterload ?
Ea = Pes/SV
After the initial diagnosis and consequent therapy, there is time to install (more) continuous monitoring.
Poelaert J et al. Chest 2005



Thank You !

jan.poelaert@uzbrussel.be