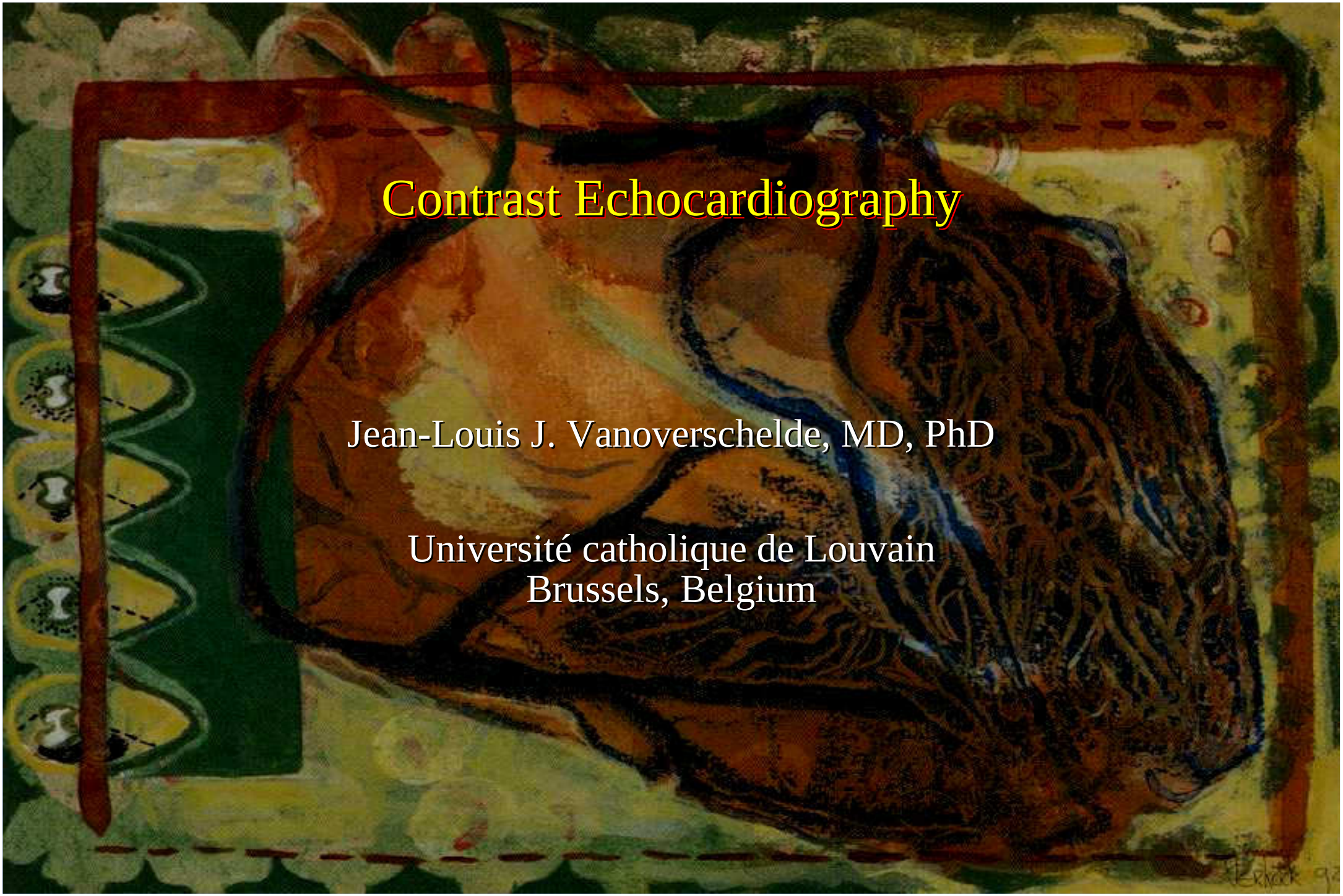


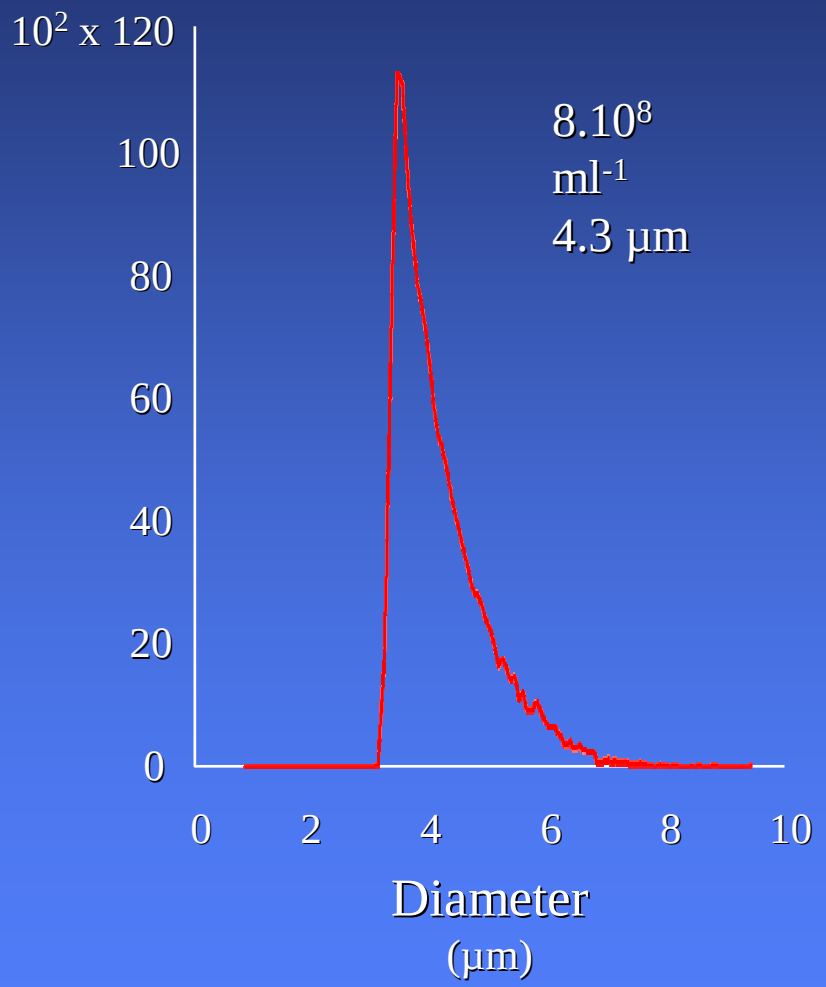
Contrast Echocardiography

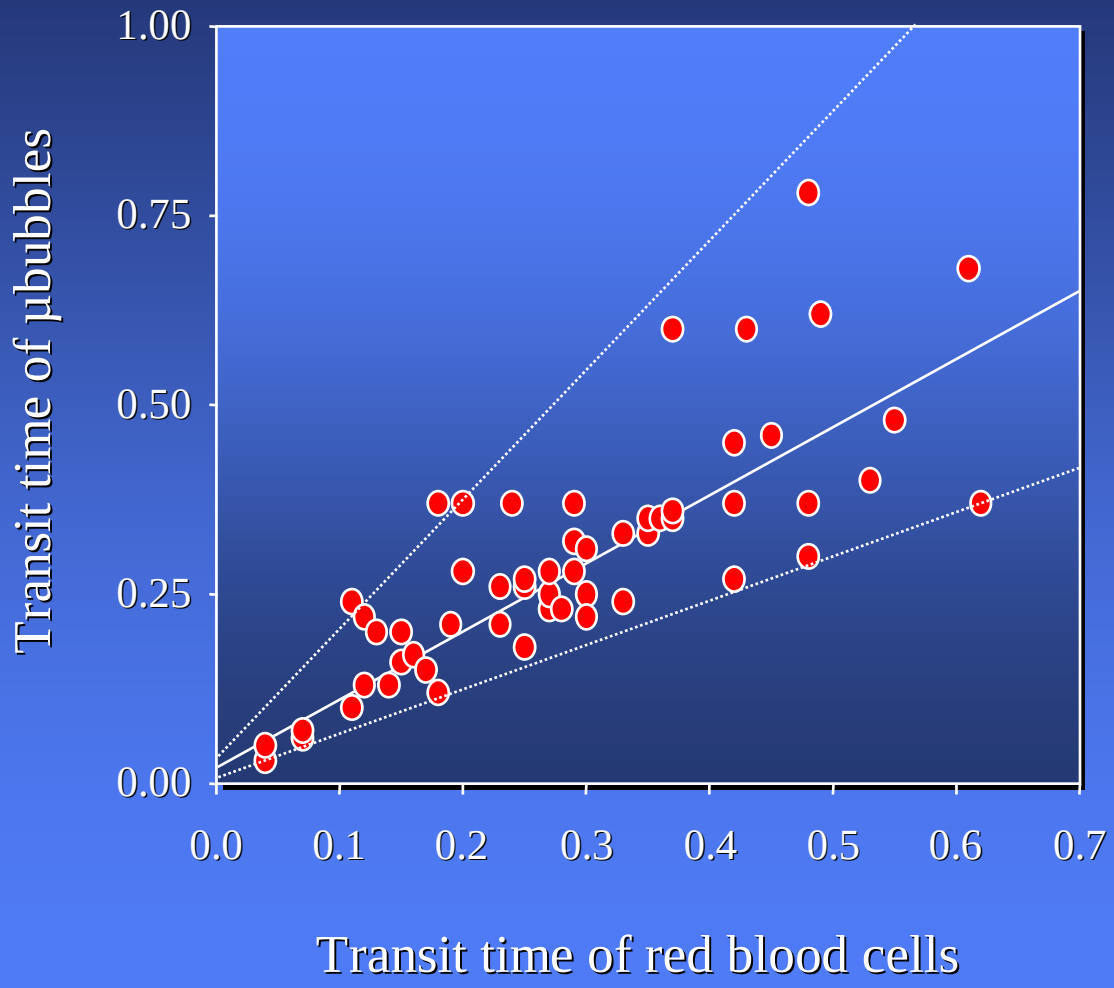
Jean-Louis J. Vanoverschelde, MD, PhD

Université catholique de Louvain
Brussels, Belgium

Contrast Echocardiography

Relation of µbubbles to red blood cells

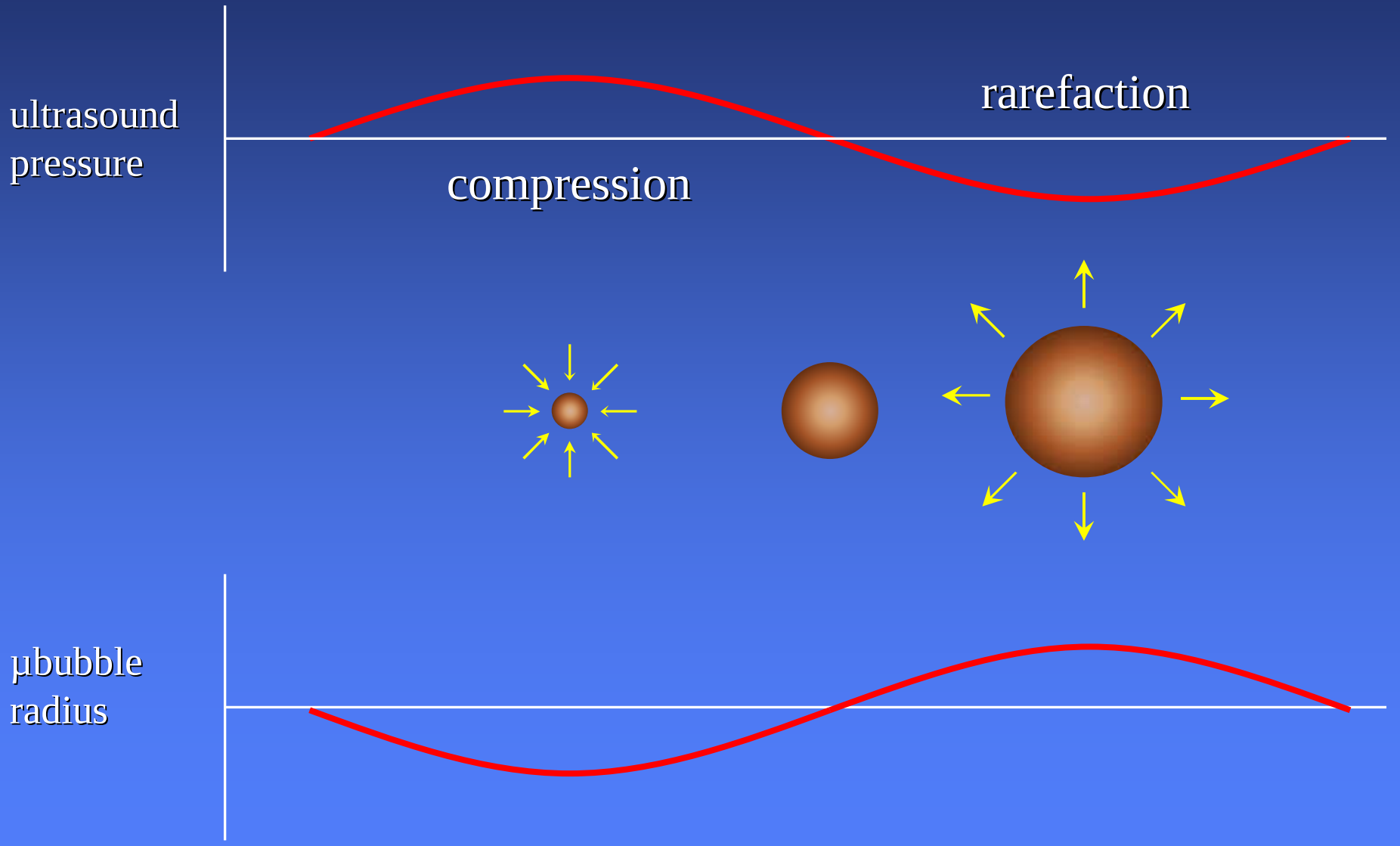




Jayaweera et al. ***Circ. Res.*** 1994

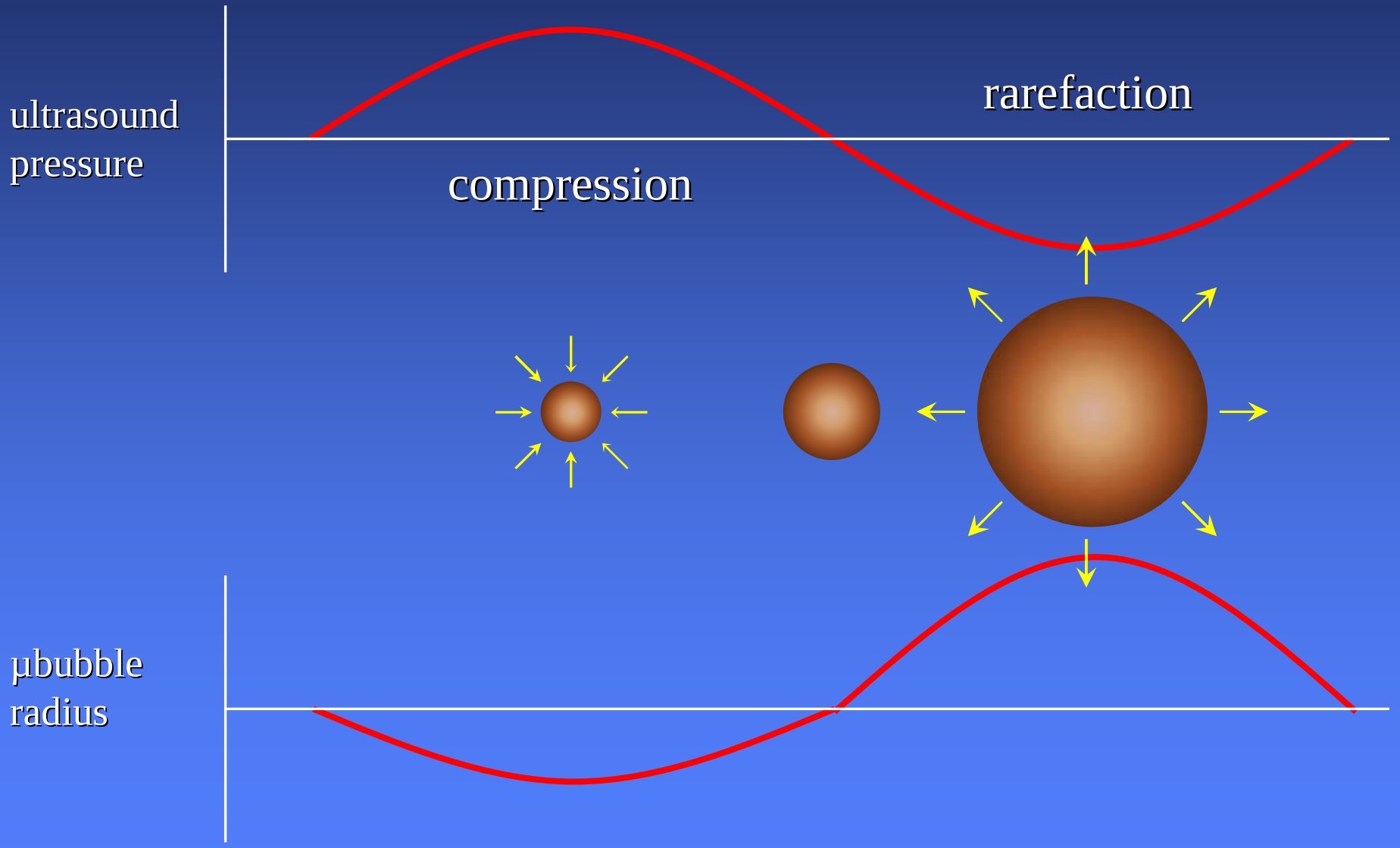
Contrast Echocardiography

Effect of low acoustic energy on µbubbles size



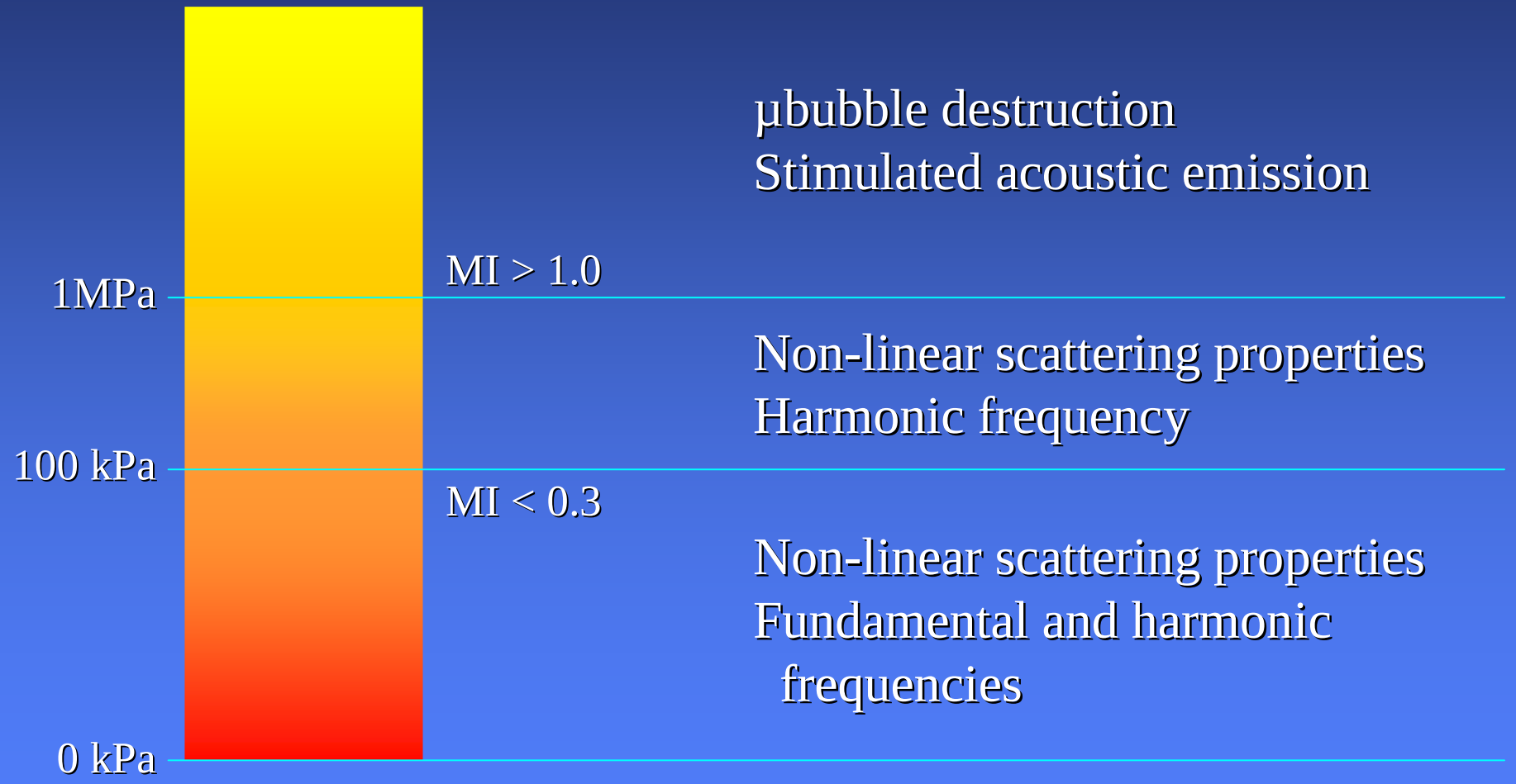
Contrast Echocardiography

Effect of high acoustic energy on µbubbles



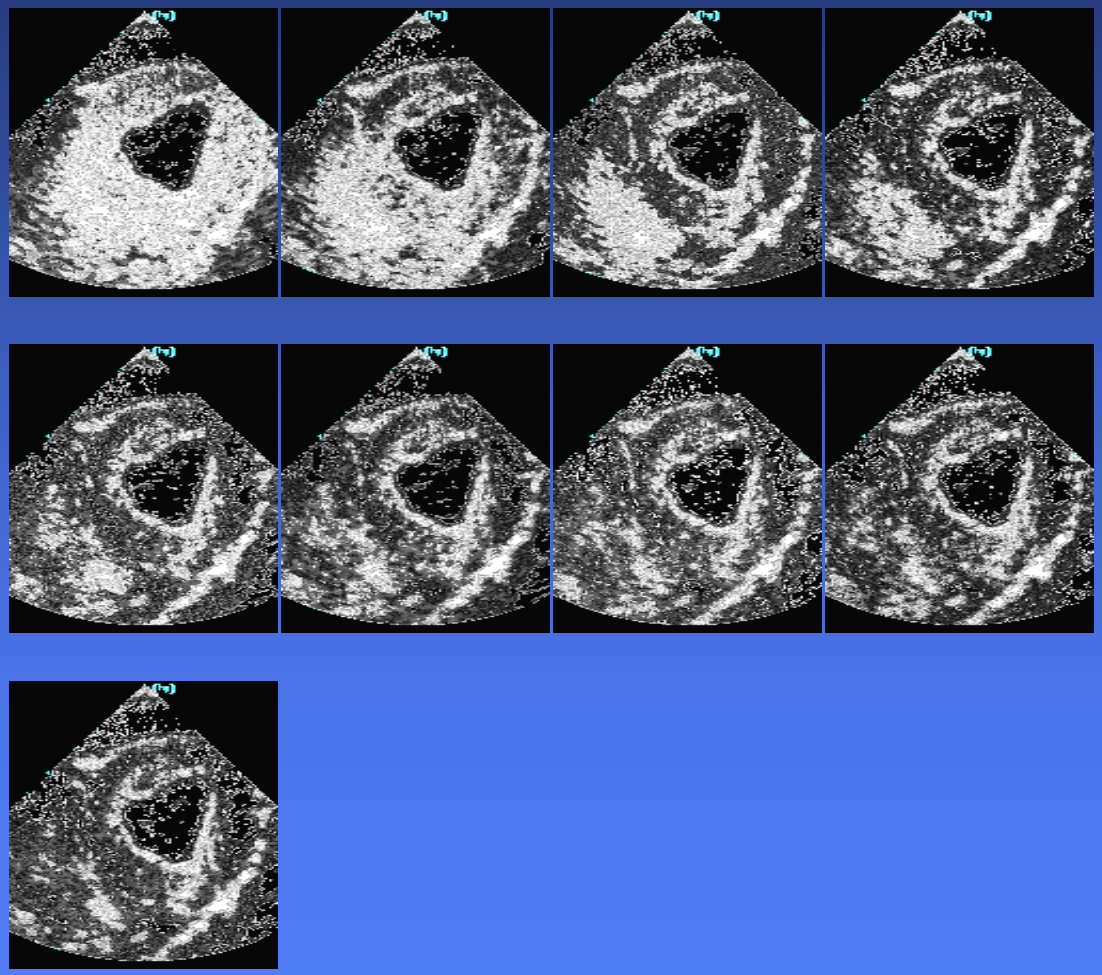
Contrast Echocardiography

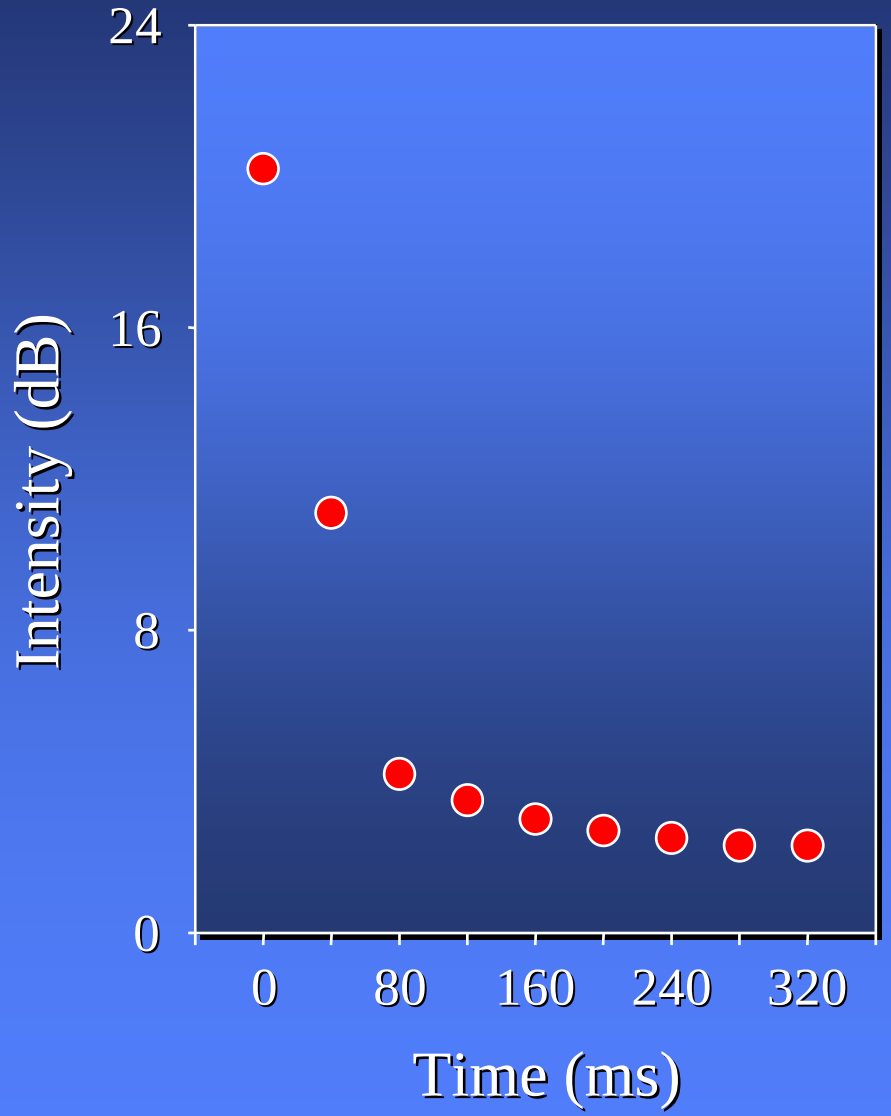
Effect of acoustic energy on µbubbles scattering properties

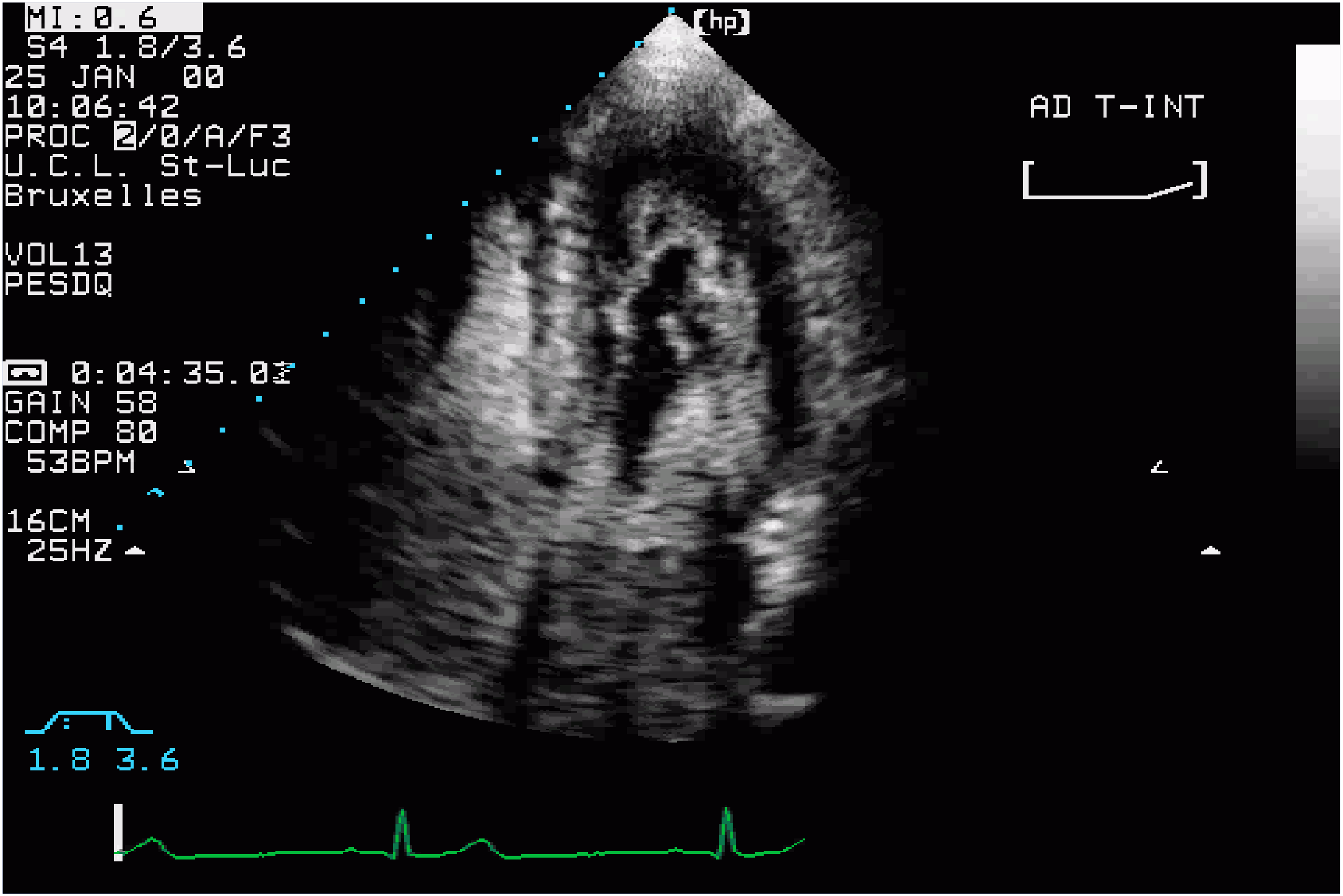


Contrast Echocardiography

Destruction of contrast by ultrasound



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16CM
25HZ
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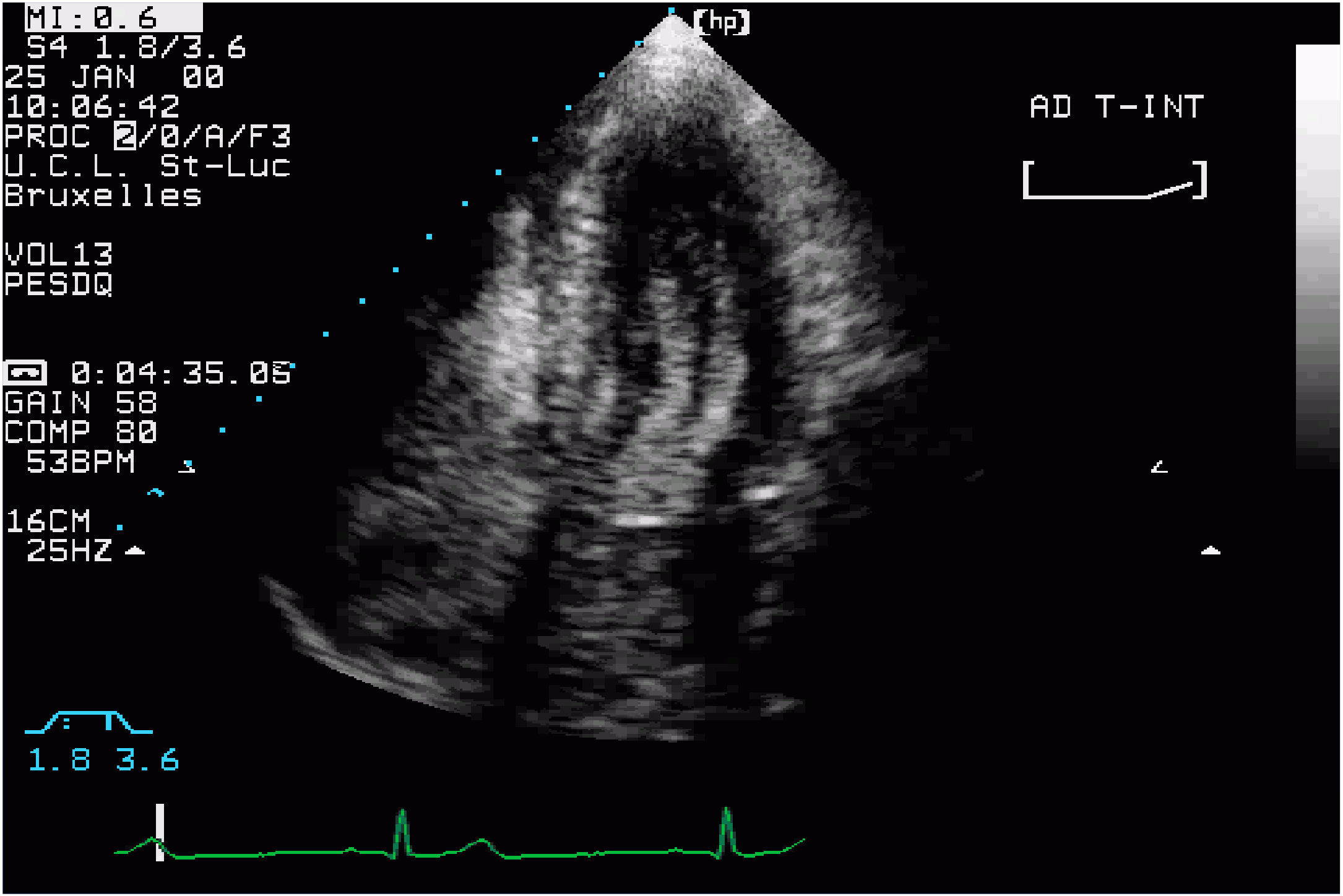
hp
AD T-INT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hp
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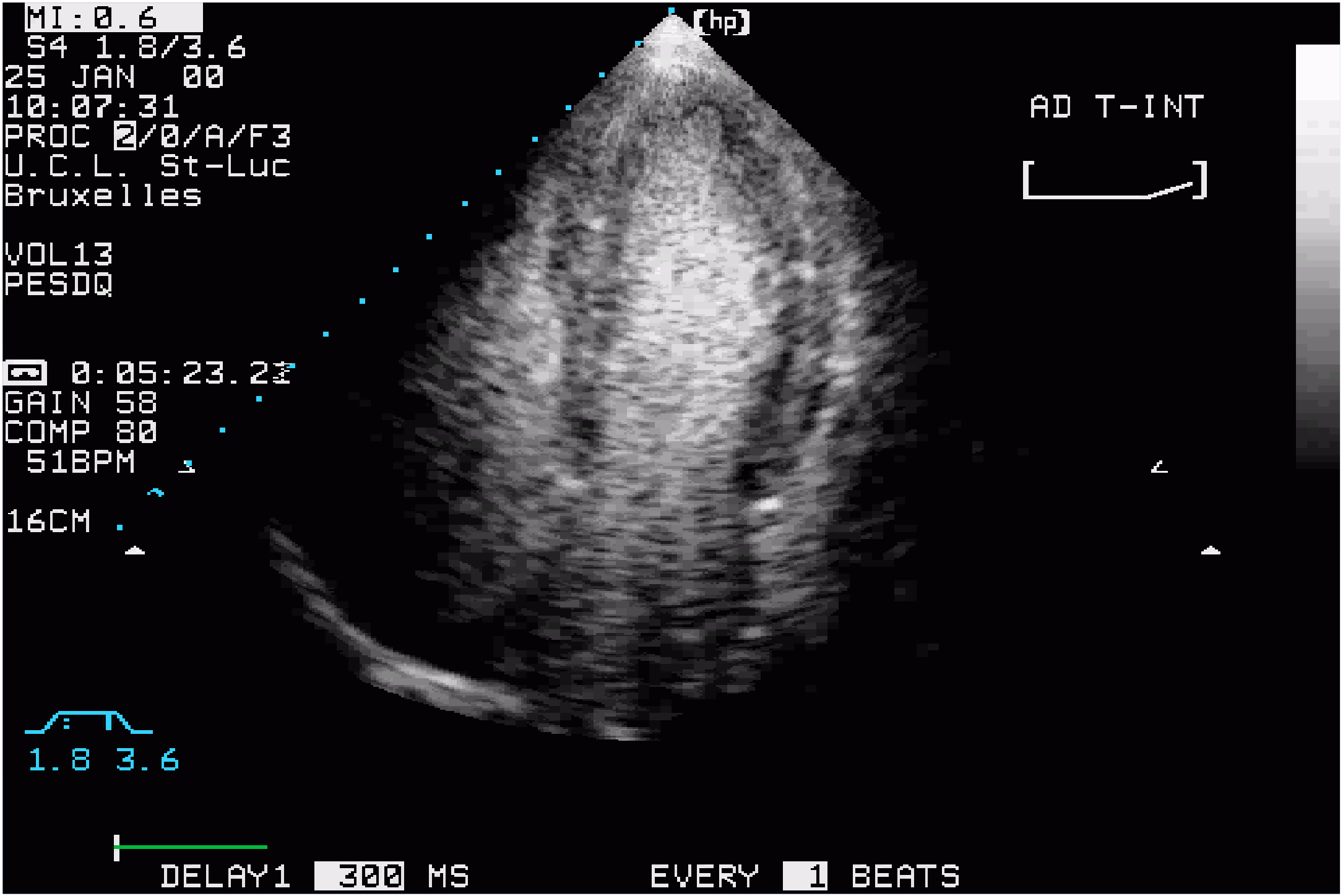
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Bruxelles
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PESDQ
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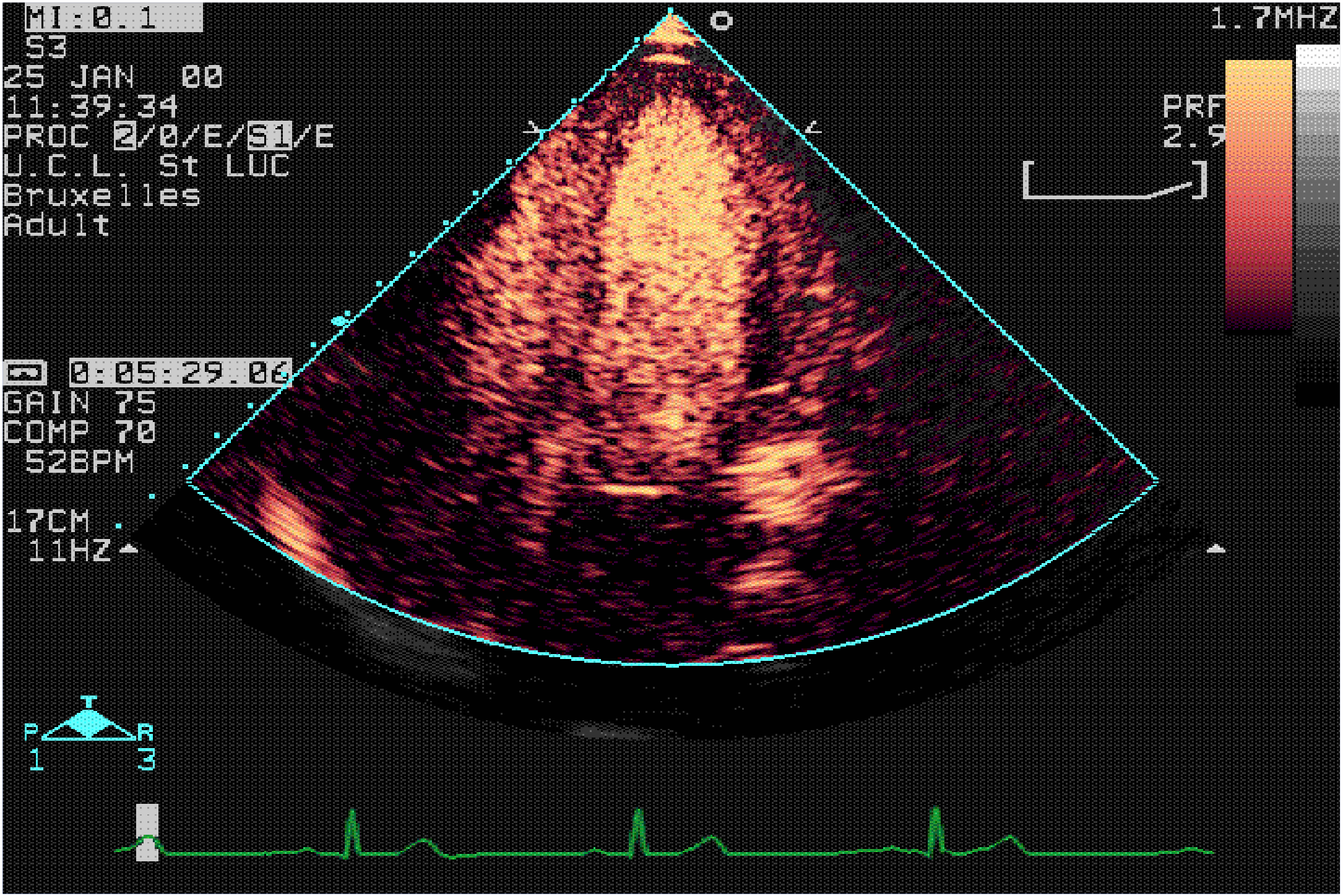
(hp)
AD T-INT
DELAY1 300 MS
EVERY 1 BEATS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Bruxelles
Adult
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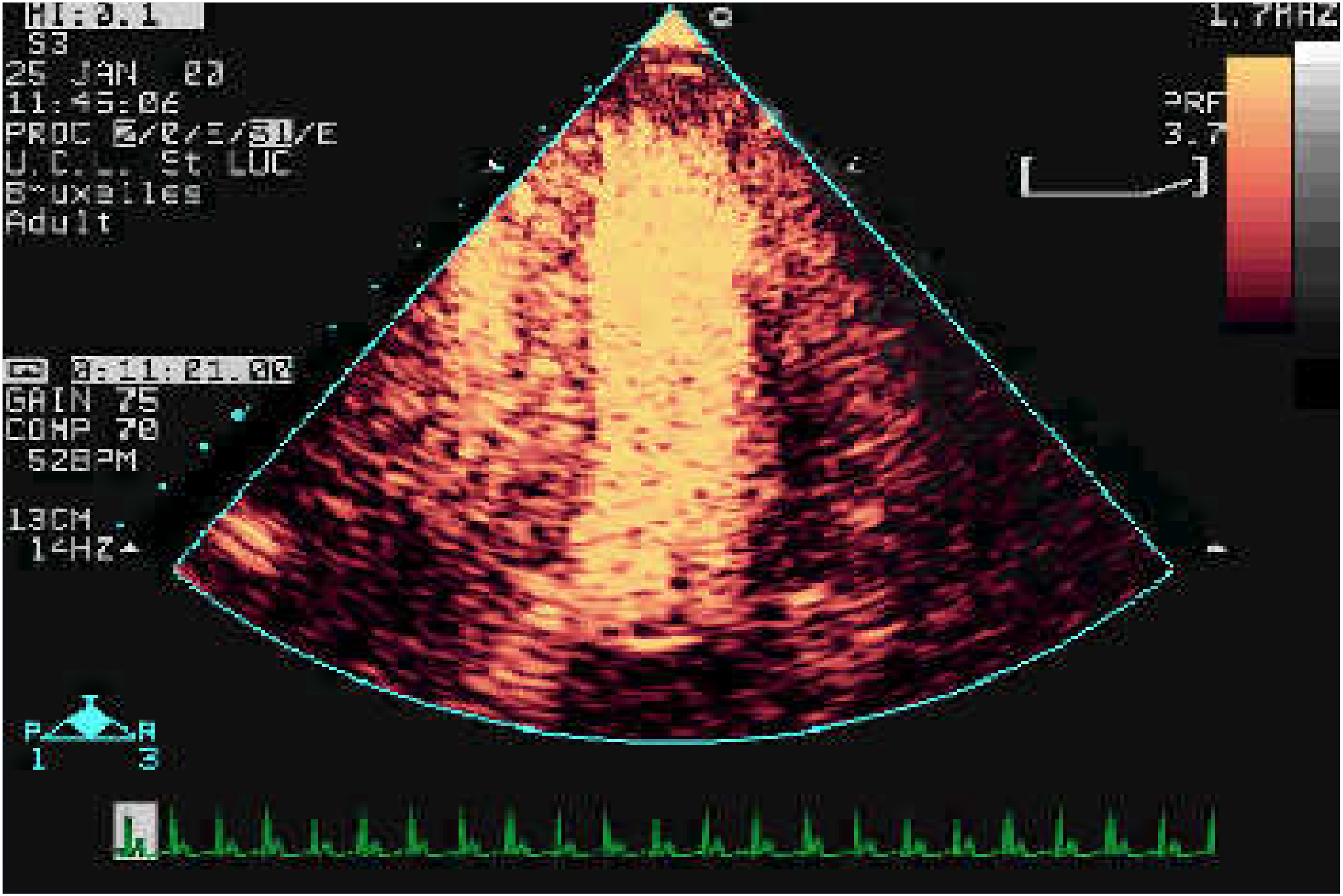
52BPM
17CM
11HZ
T
P
R
1
3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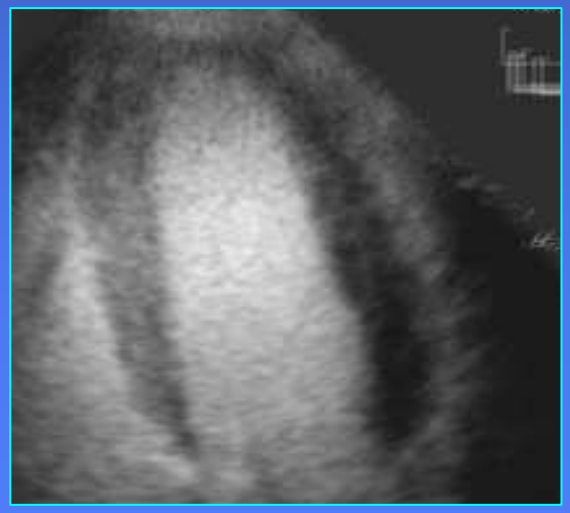
U.C.L. St LUC
Bruxelles
Adult
8:11:21.00
GAIN 75
COMP 70
528PM
13CM
14HZ
1.7MHZ
PRF
3.7
P
A
1
3

Contrast Echocardiography

- Left ventricular opacification
- Myocardial perfusion
- Assessment of reperfusion and myocardial viability

Contrast Echocardiography
Left ventricular opacification

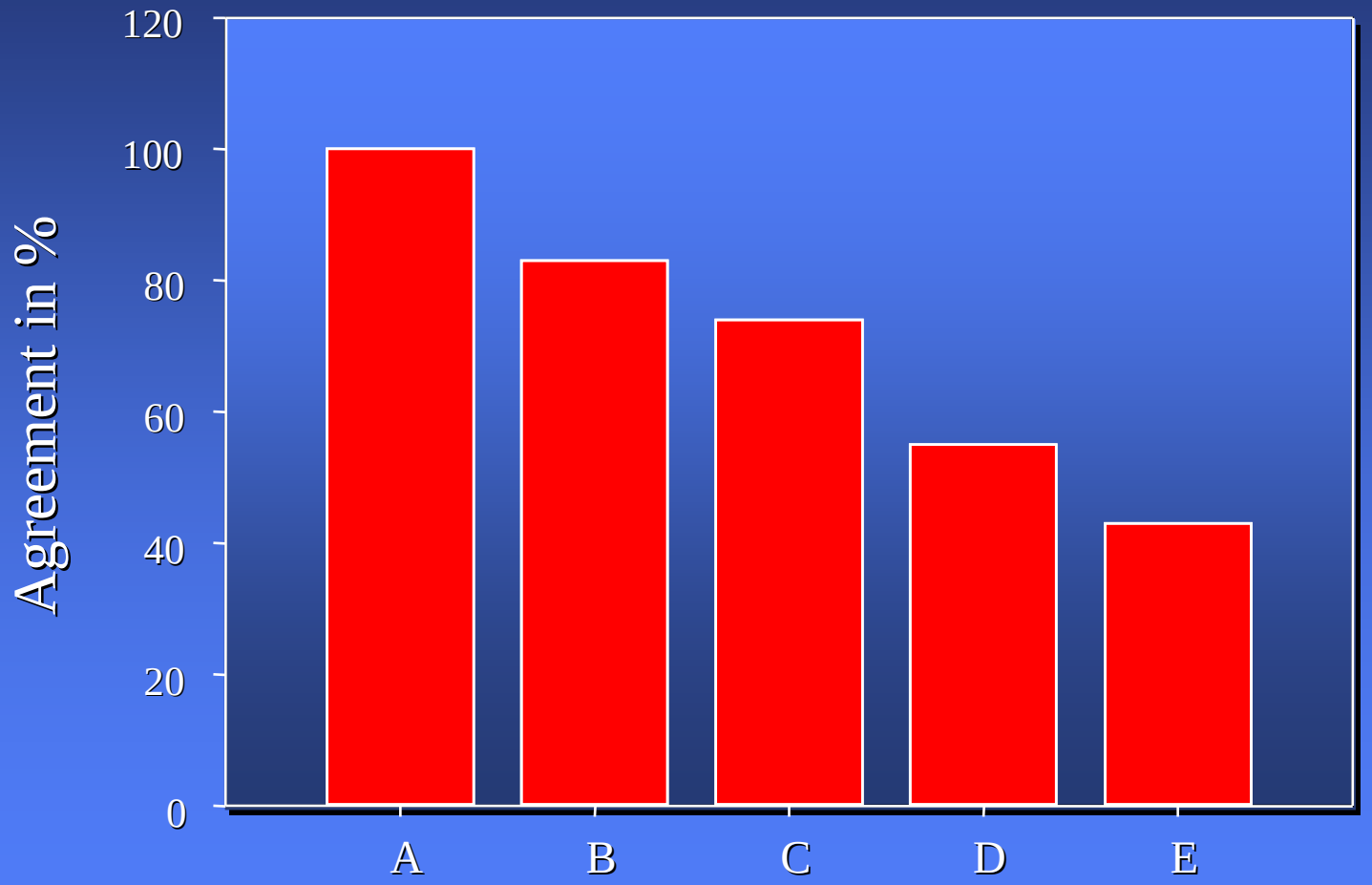


Improved endocardial border delineation

- reduced inter- and intra-observer variability
- improved detection of regional wall motion abnormalities
- improved calculation of LV volumes and ejection fraction

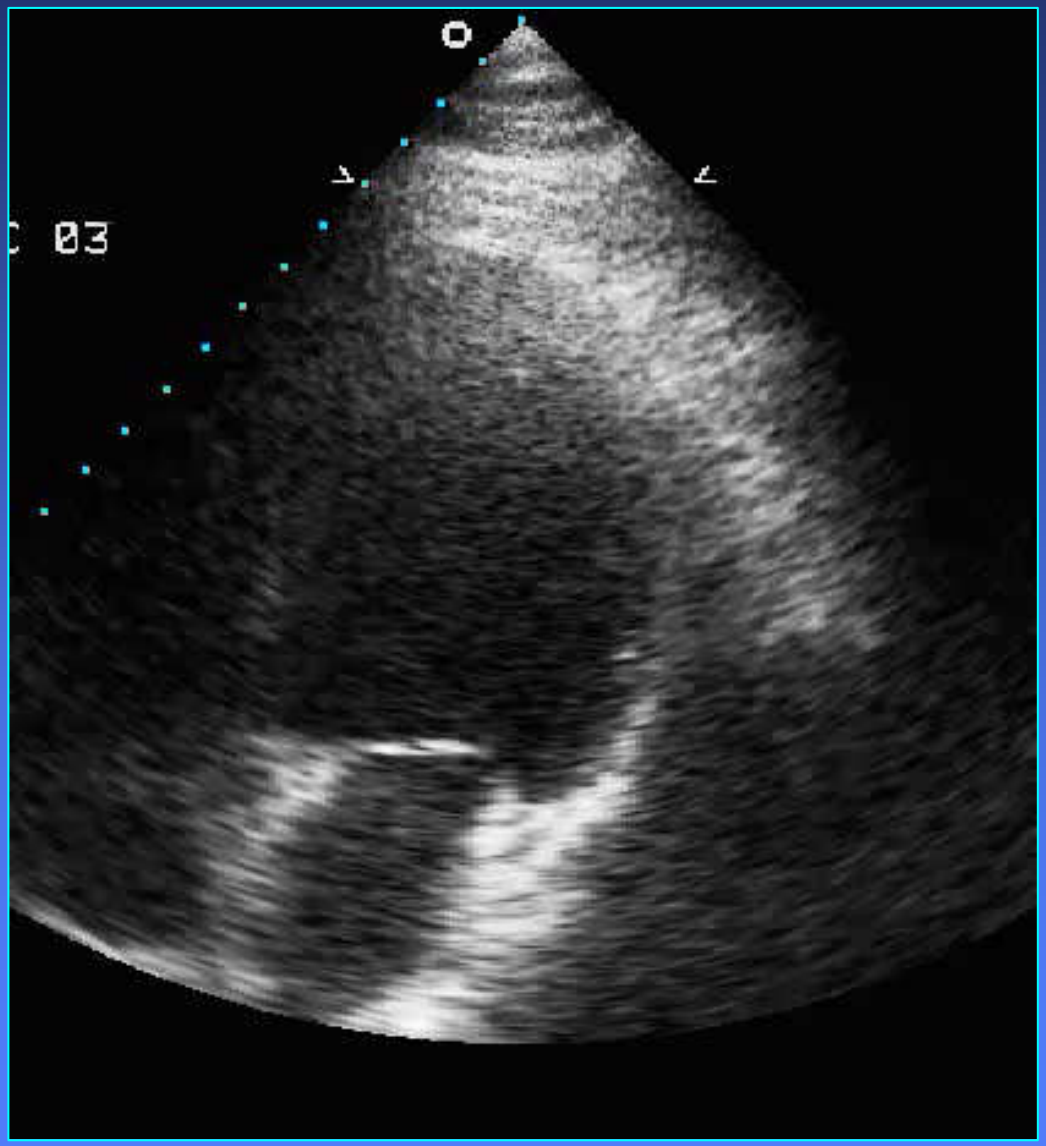
Contrast Echocardiography

Inter-institutional agreement according to image quality

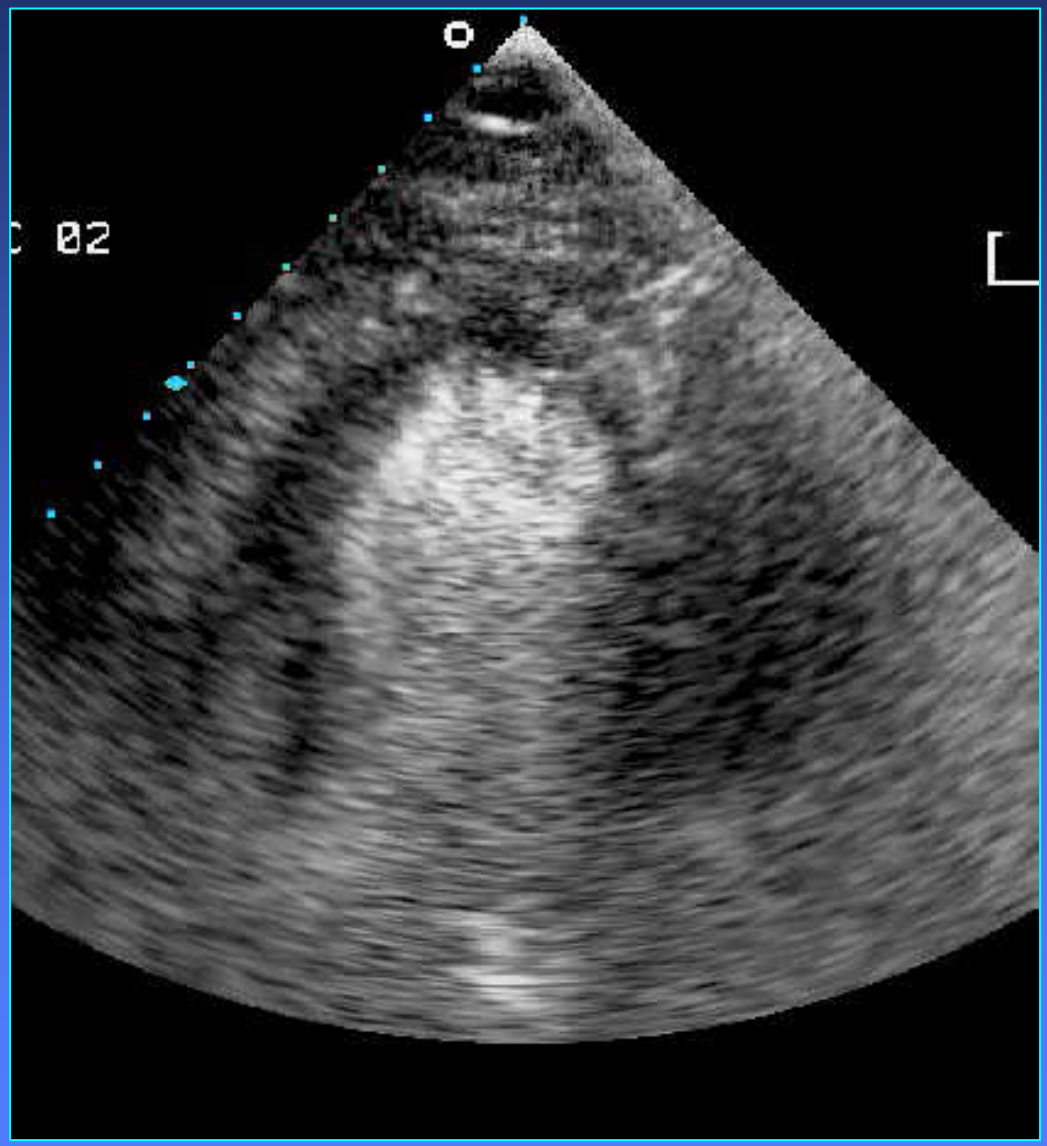


Hoffmann et al. ***J Am Coll Cardiol*** 1996;27:330

Contrast Echocardiography

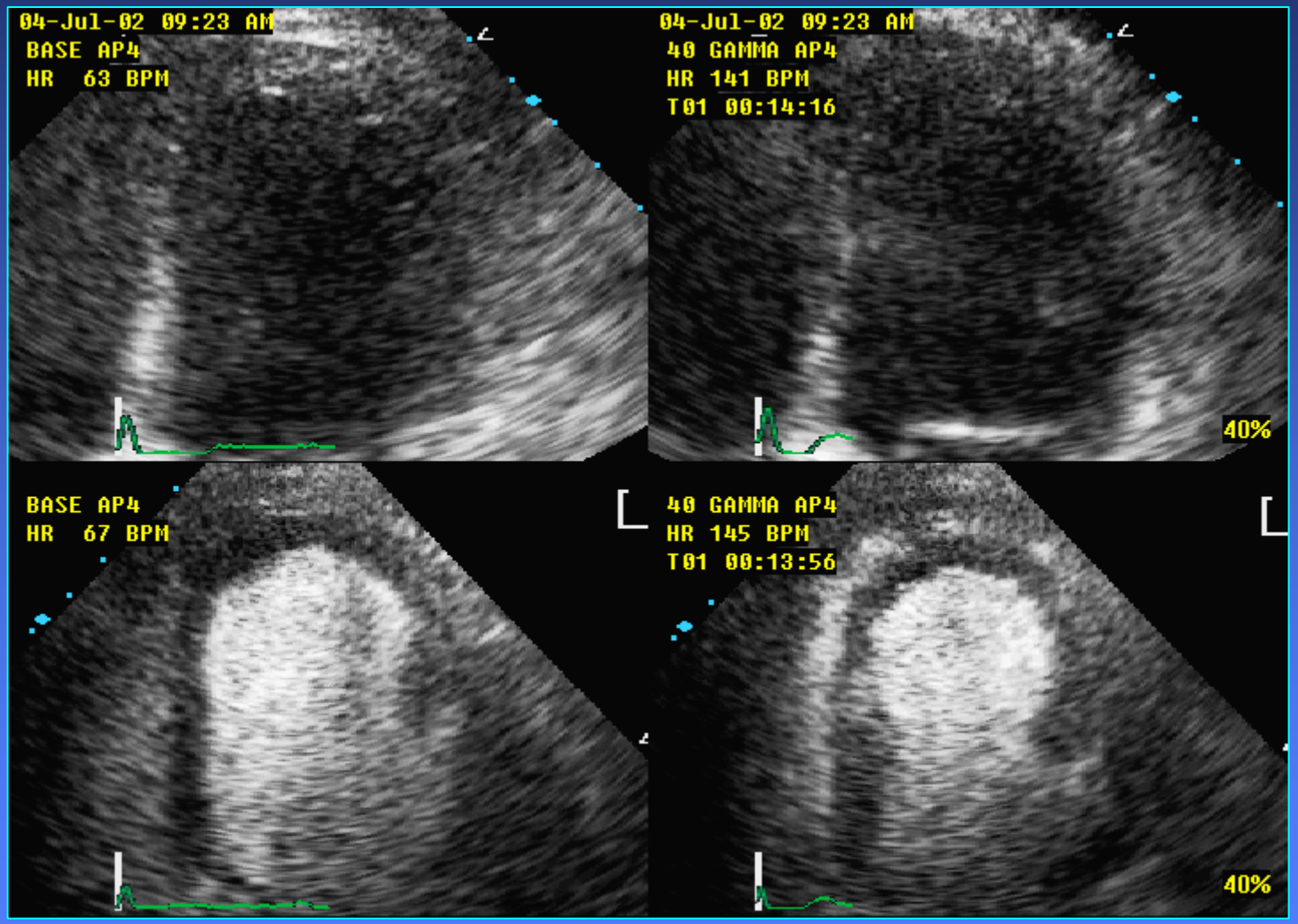


Contrast Echocardiography



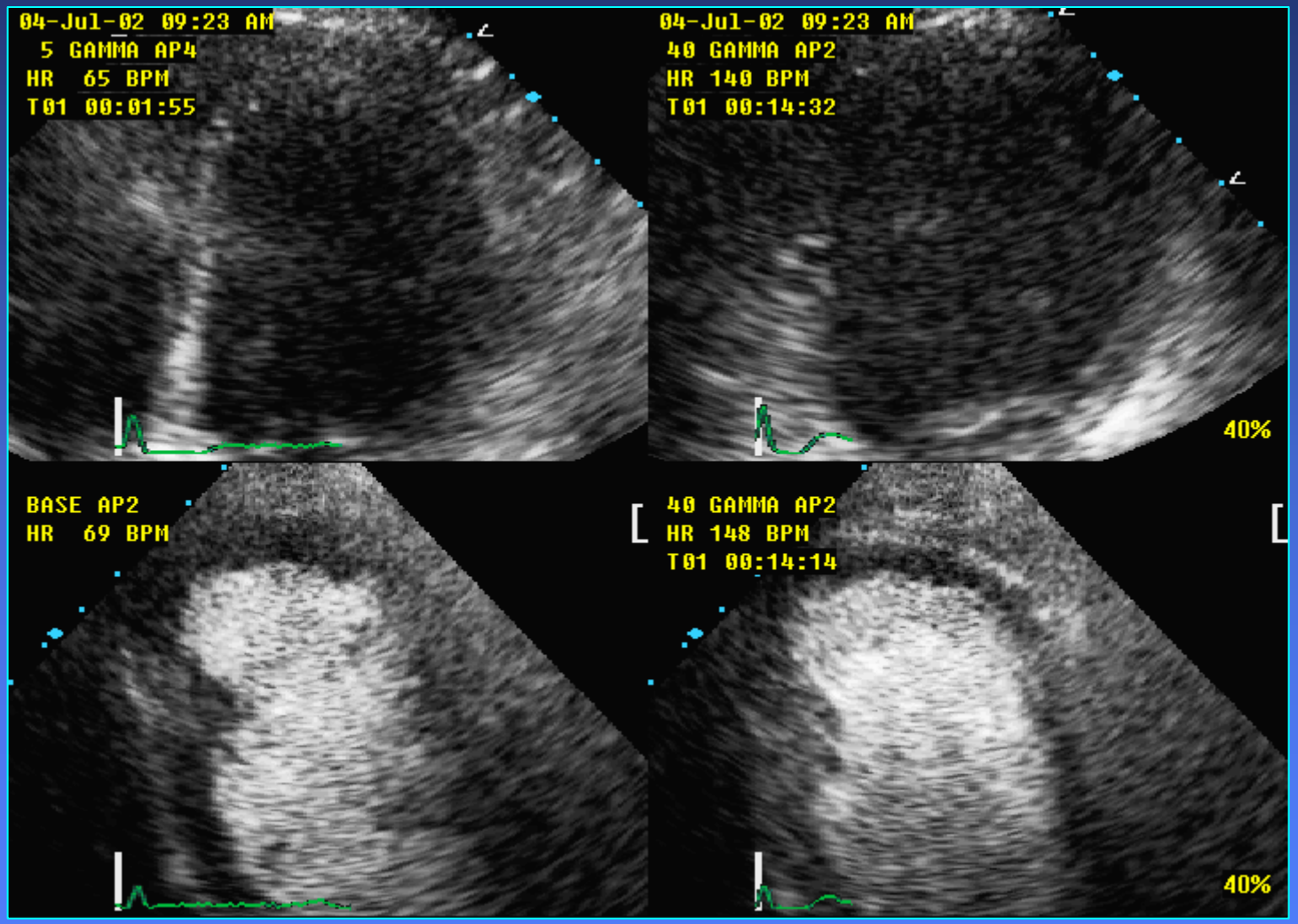
Contrast Echocardiography

NA, 67 y.o. male



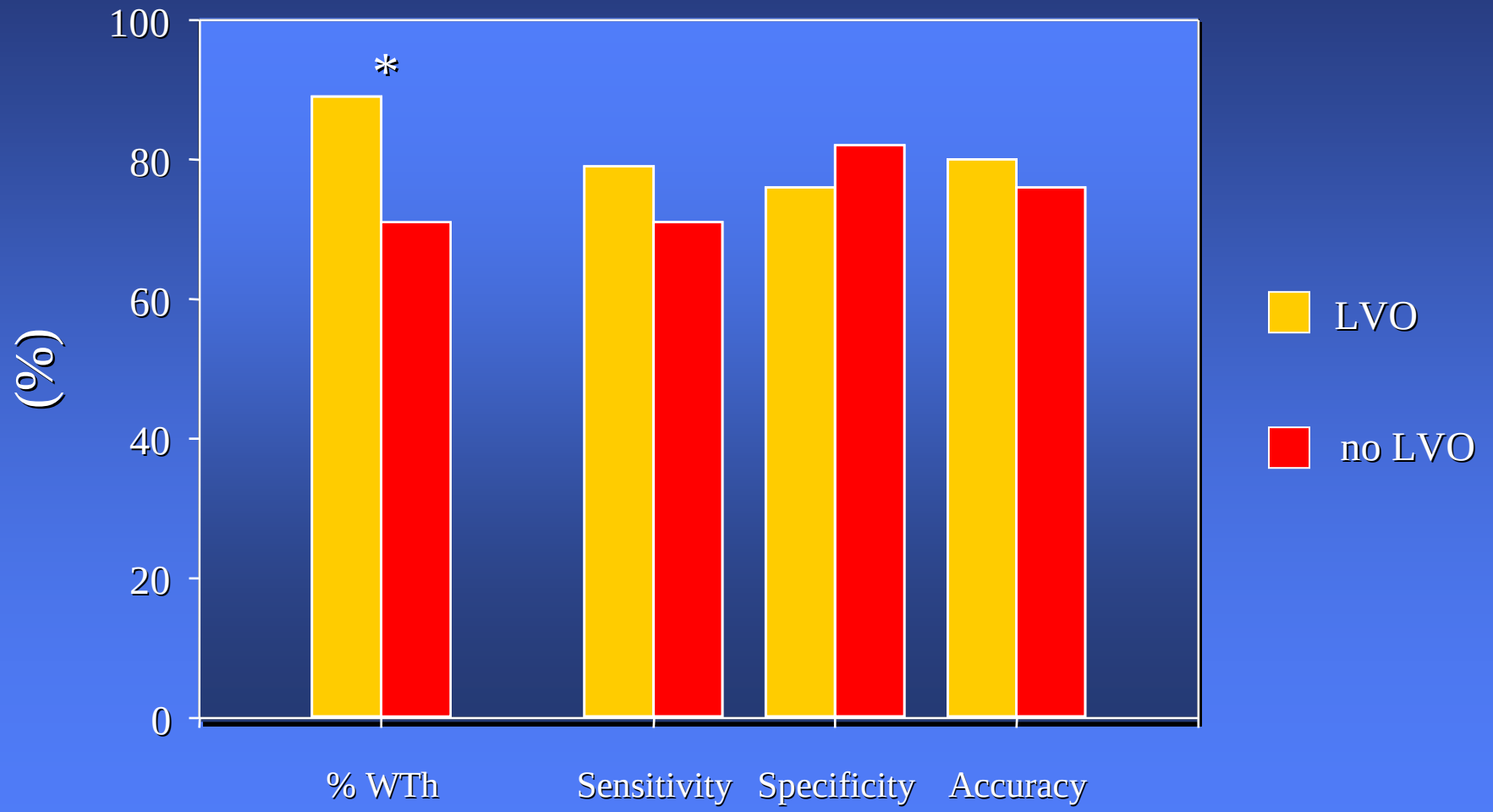
Contrast Echocardiography

NA, 67 y.o. male



Contrast Echocardiography

Effect of left ventricular opacification on accuracy of DbE



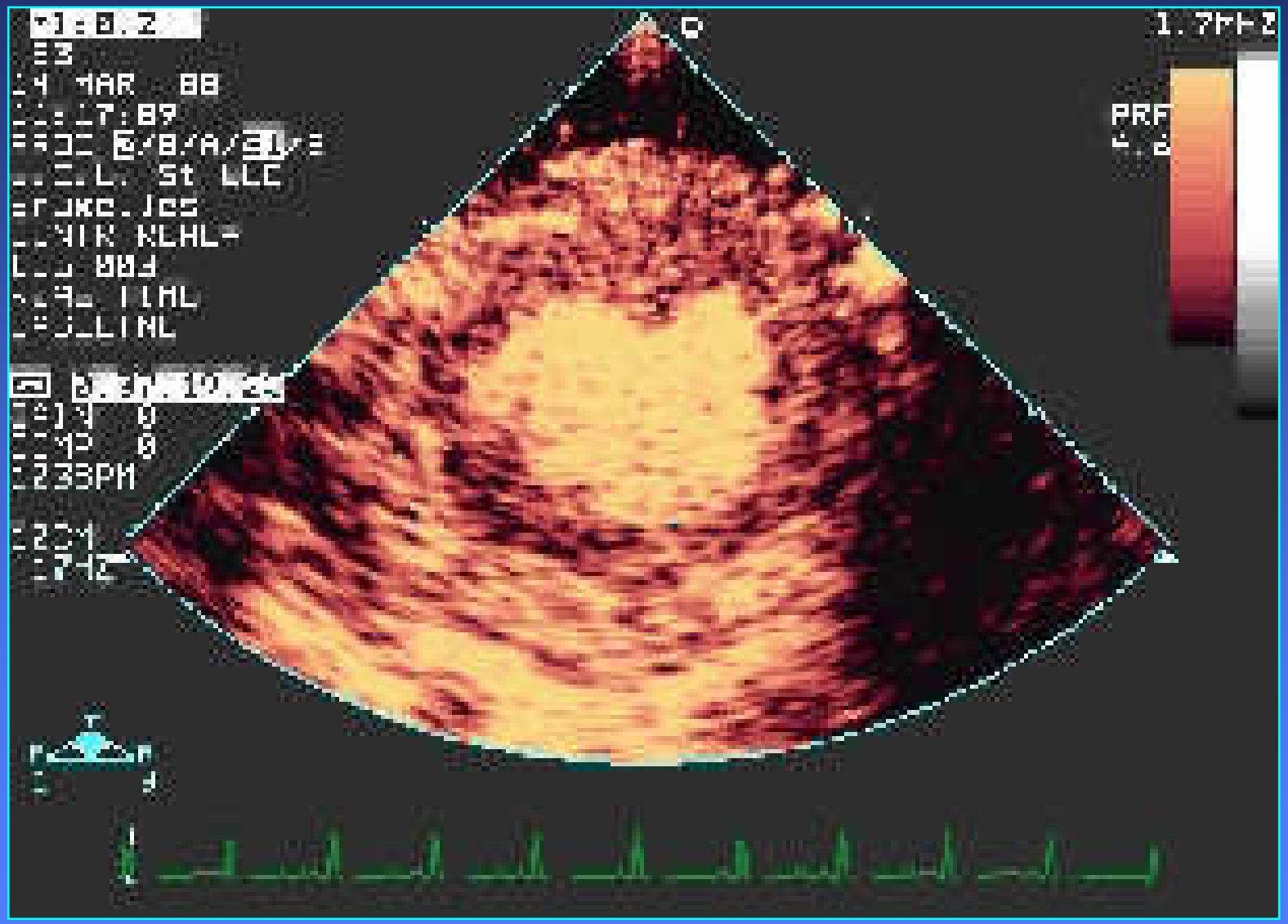
Dolan et al. ***Am Heart J*** 2001;142:908

Contrast Echocardiography

- Left ventricular opacification
- Myocardial perfusion
- Assessment of reperfusion and myocardial viability

Contrast Echocardiography

Real-time perfusion imaging using power modulation



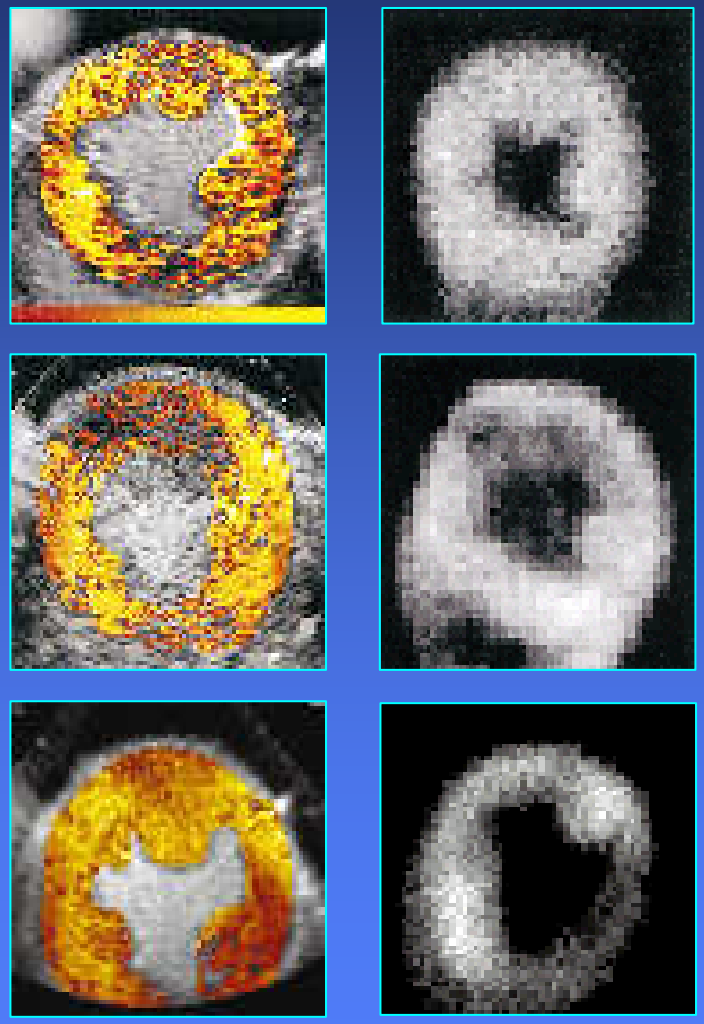
Contrast Echocardiography

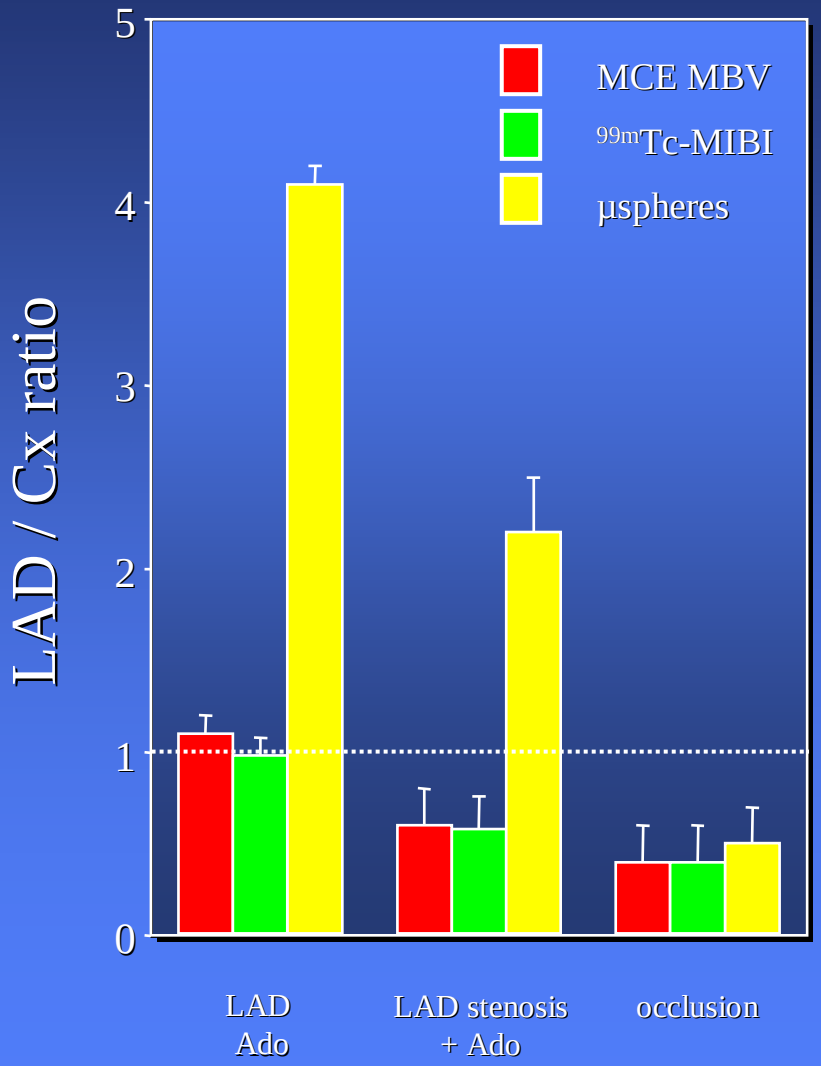
MCE versus MIBI for assessment of myocardial blood volume

LAD adenosine

LAD stenosis + adenosine

LAD occlusion





Wei et al. ***Am J Physiol*** 2001,280:H1896.

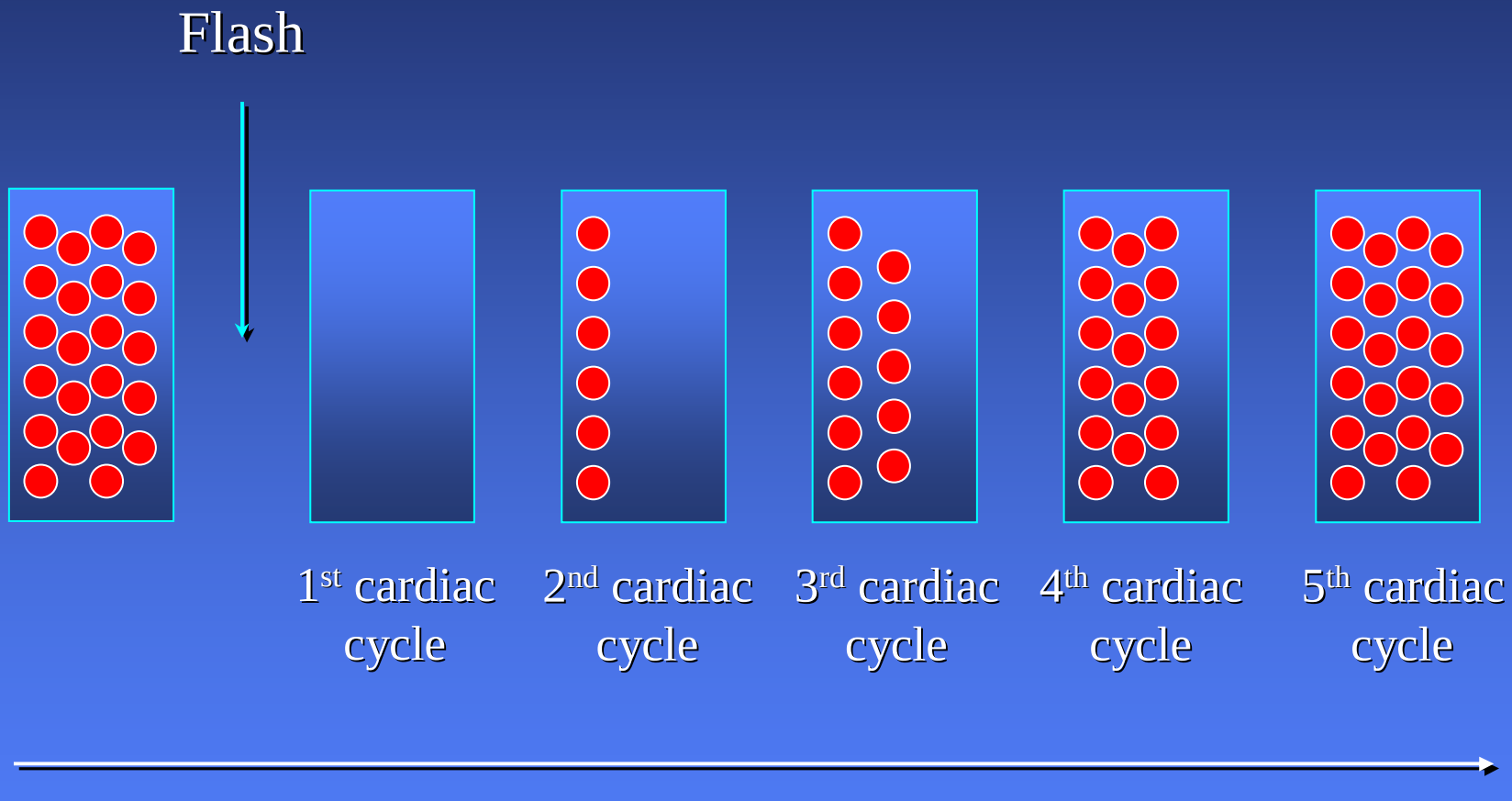
Contrast Echocardiography

How do we get from myocardial blood volume
to myocardial blood flow ?

DYNAMIC IMAGING

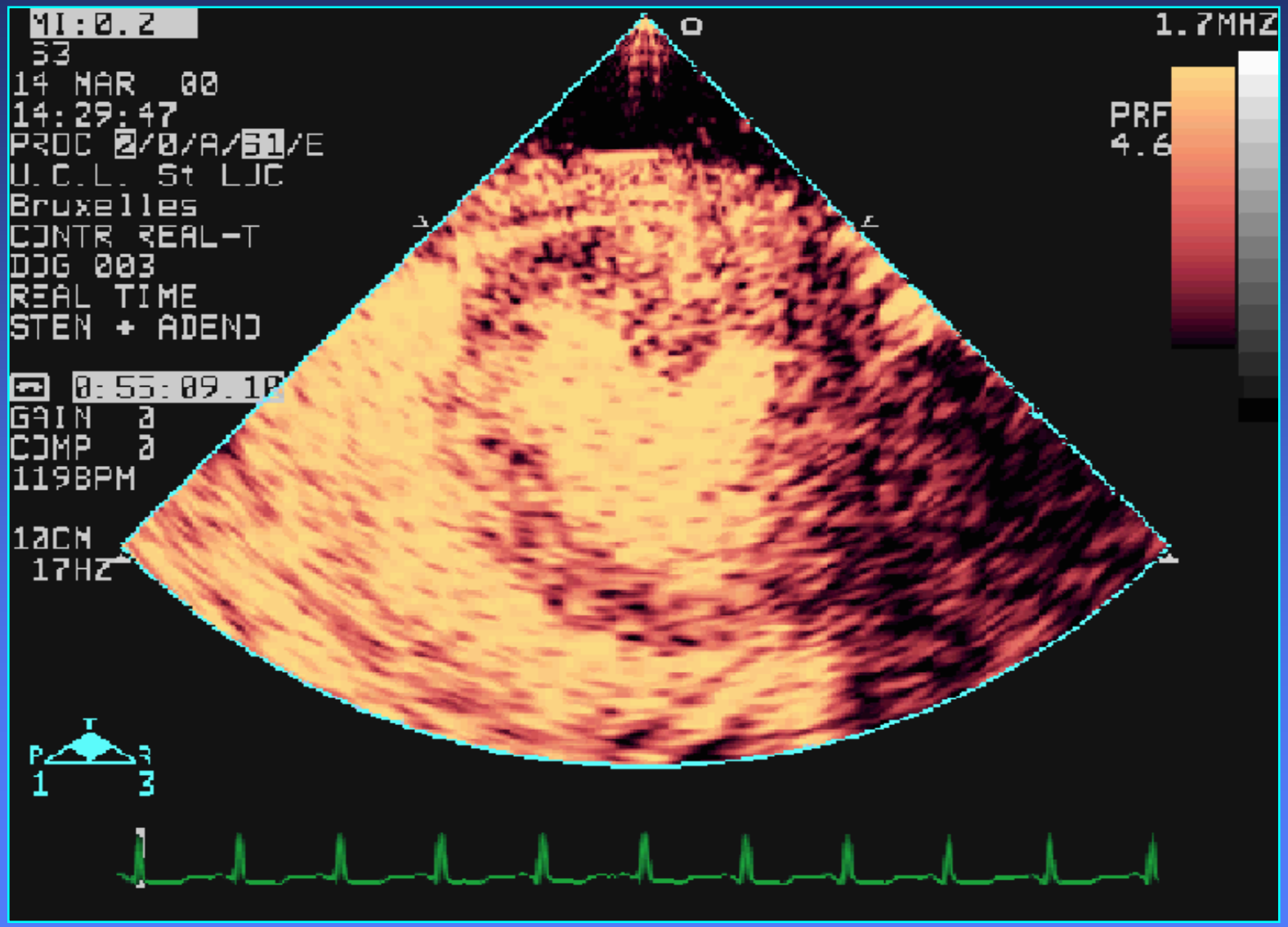
Contrast Echocardiography

Quantification of myocardial blood flow



Contrast Echocardiography

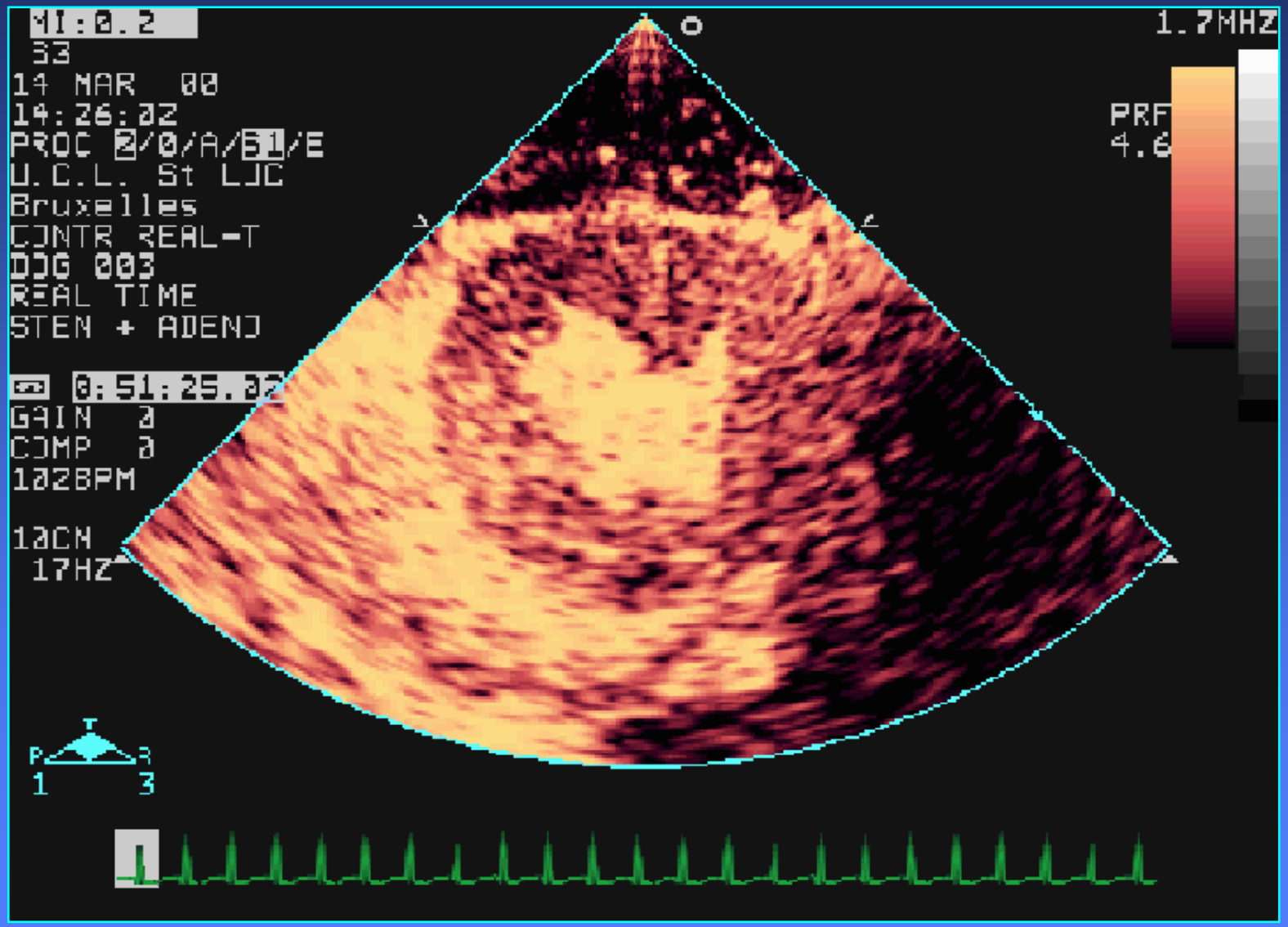
Real-time perfusion imaging using power modulation



Van Camp et al., ***JASE*** 2003;16:263

Contrast Echocardiography

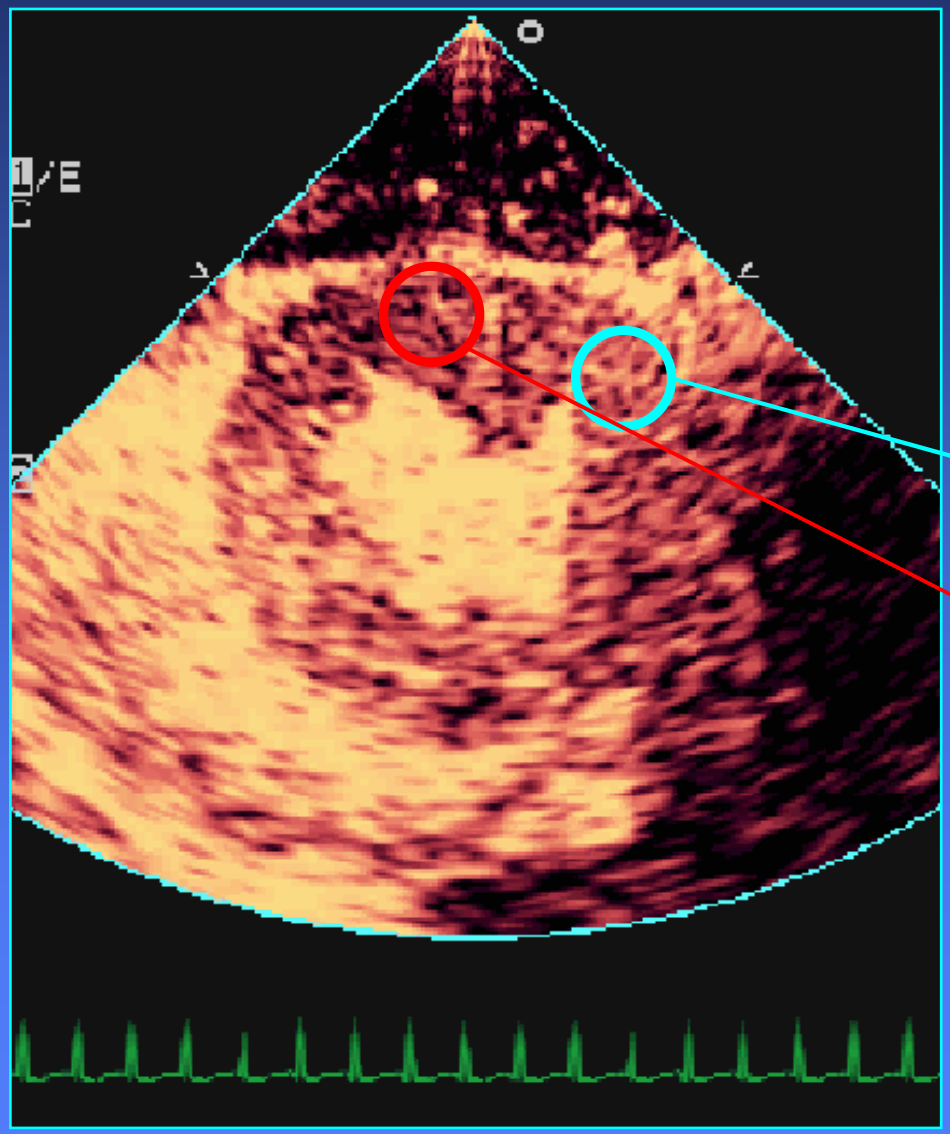
Real-time perfusion imaging using power modulation



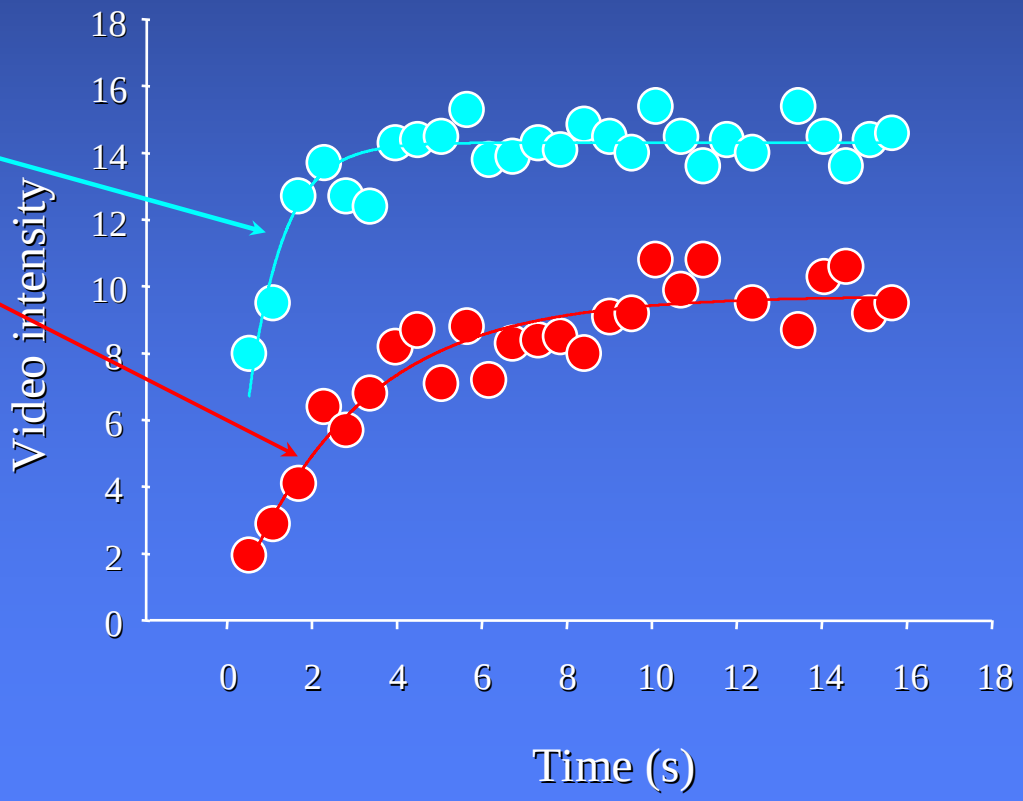
Van Camp et al., ***JASE*** 2003;16:263

Contrast Echocardiography

Real-time perfusion imaging using power modulation



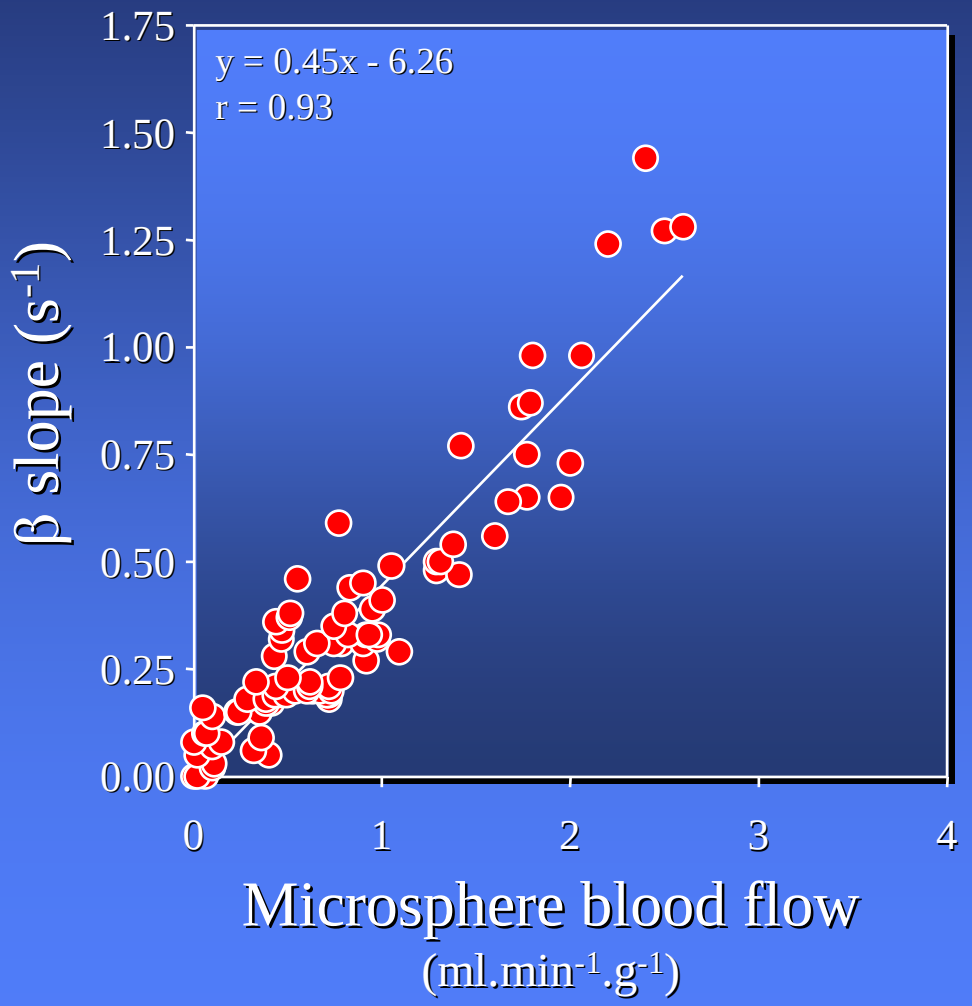
Stenosis + Adenosine

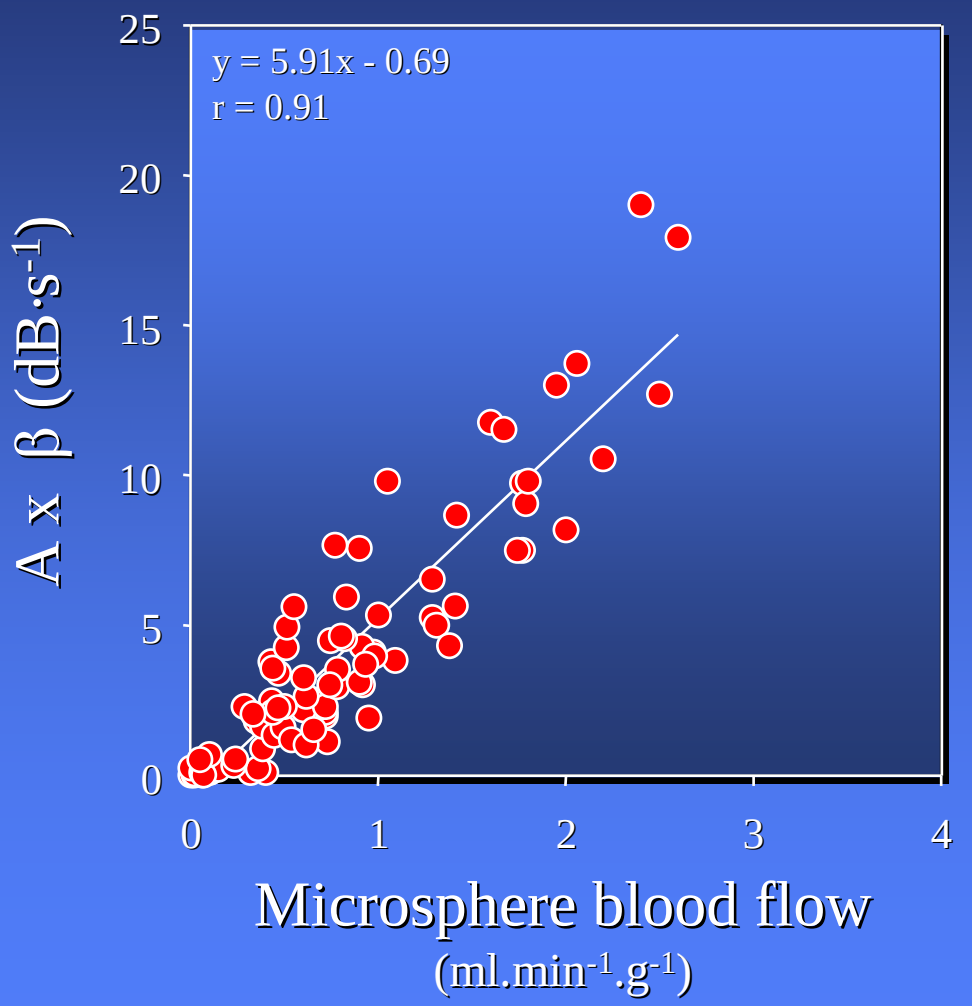


Van Camp et al., ***JASE*** 2003;16:263

Contrast Echocardiography

Real-time perfusion imaging using power modulation

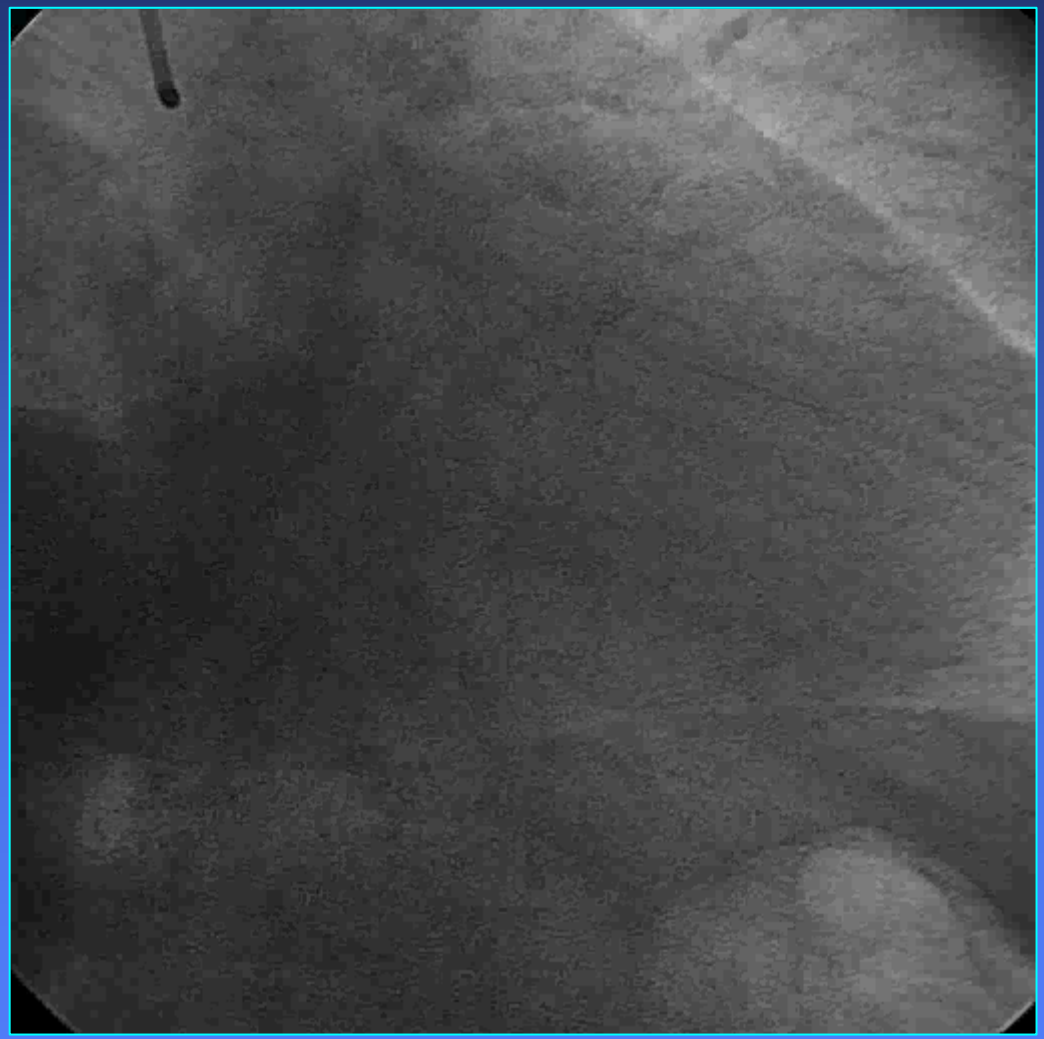




Van Camp et al., ***JASE*** 2003;16:263

Contrast Echocardiography

MN, 50 y.o. male



Peltier et al. ***JACC*** 2004;43:257

Contrast Echocardiography

MN, 50 y.o. male

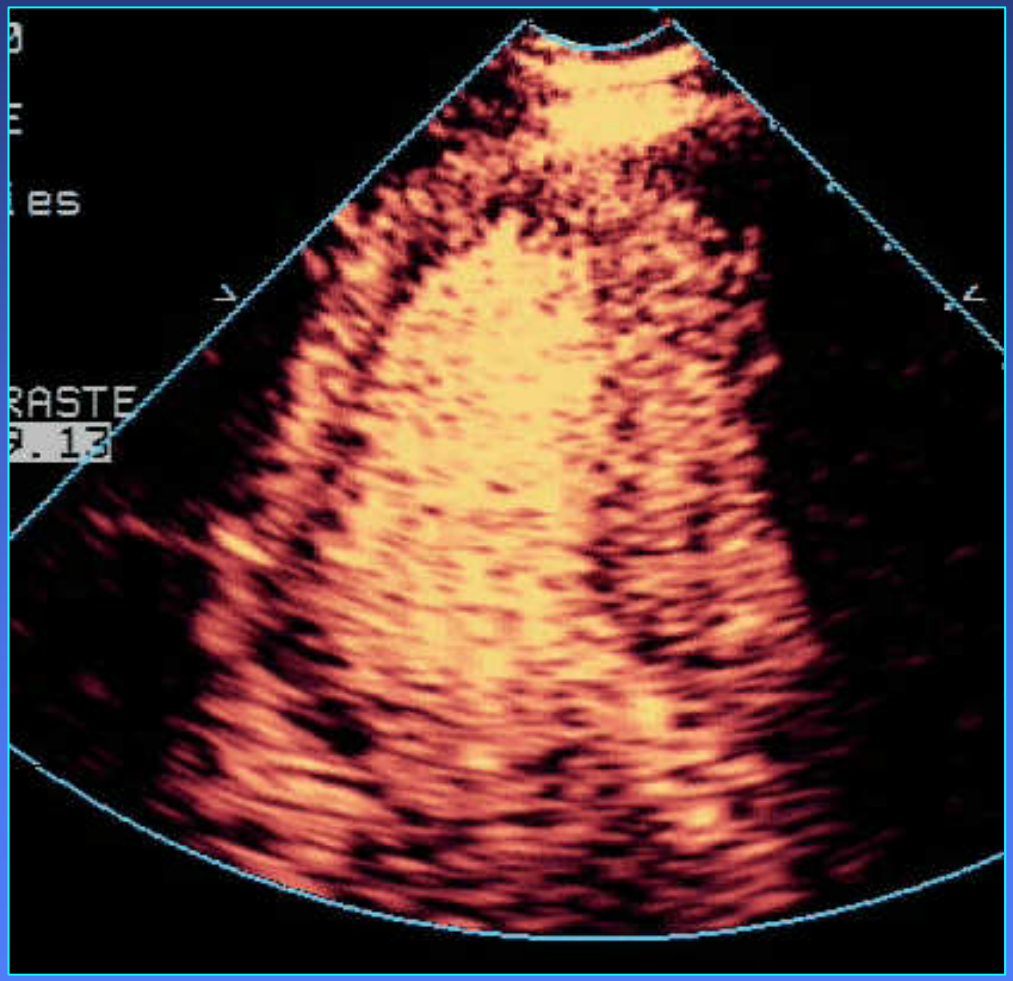
DIPYRIDAMOLE MCE

Peltier et al. ***JACC*** 2004;43:257

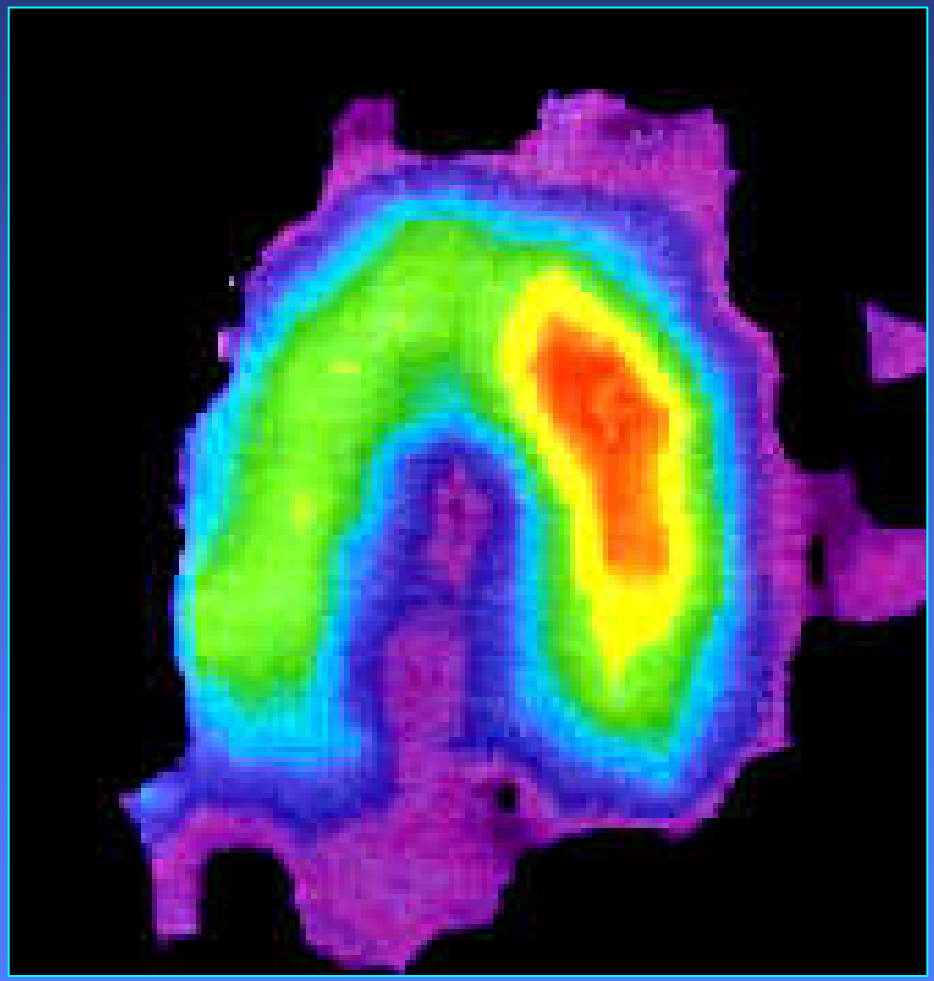
Contrast Echocardiography

MN, 50 y.o. male

DIPYRIDAMOLE MCE



DIPYRIDAMOLE SPECT

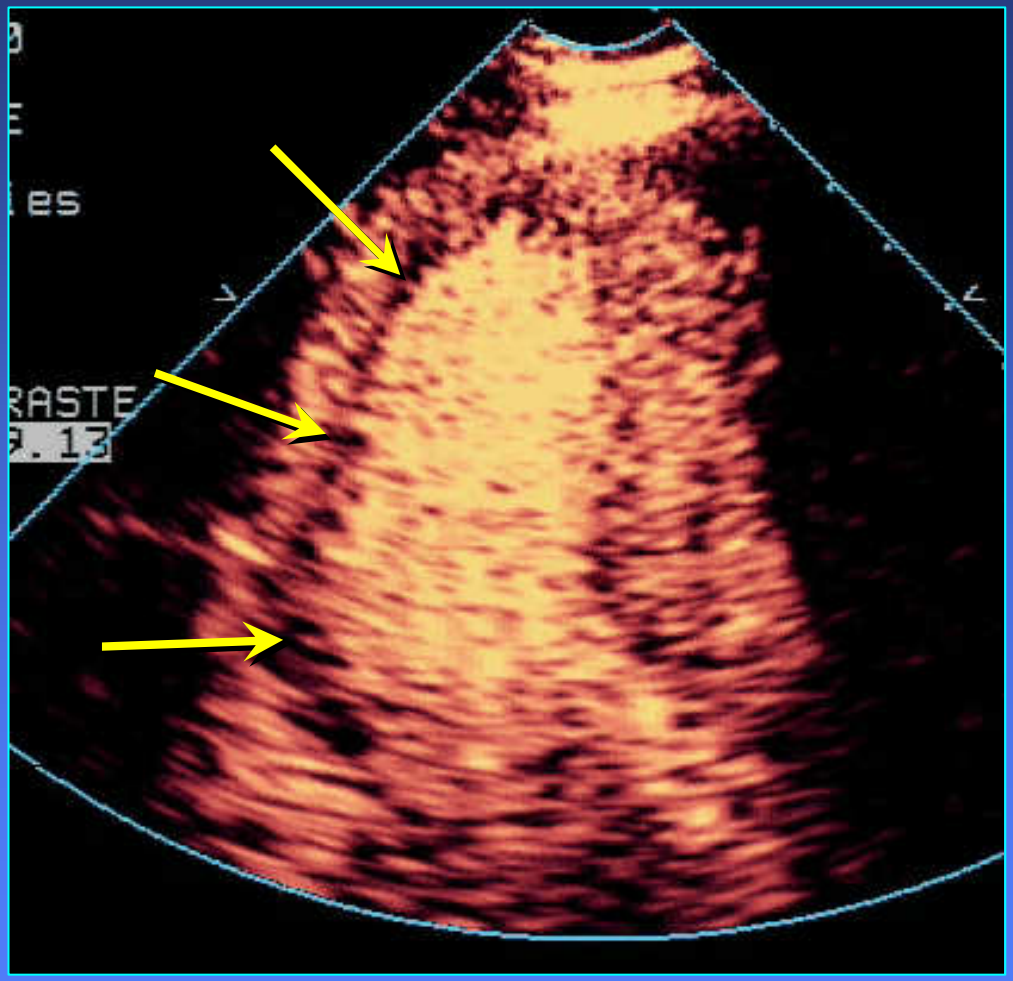


Peltier et al. ***JACC*** 2004;43:257

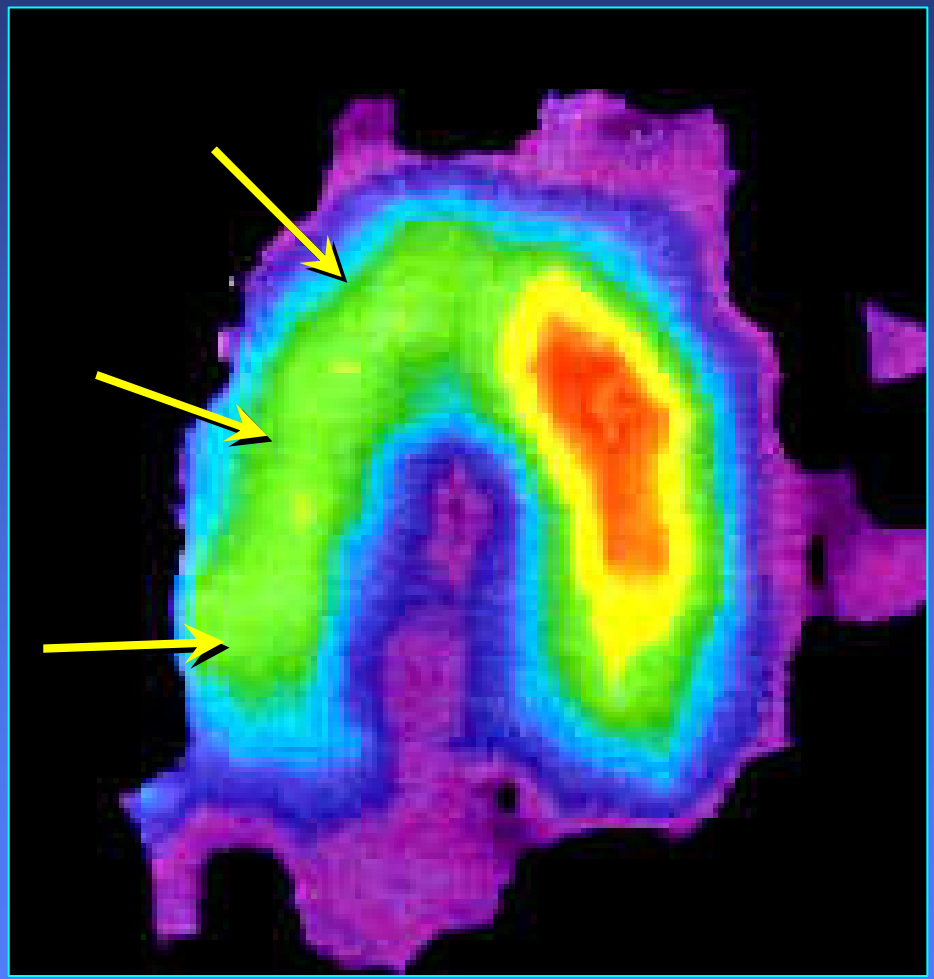
Contrast Echocardiography

MN, 50 y.o. male

DIPYRIDAMOLE MCE



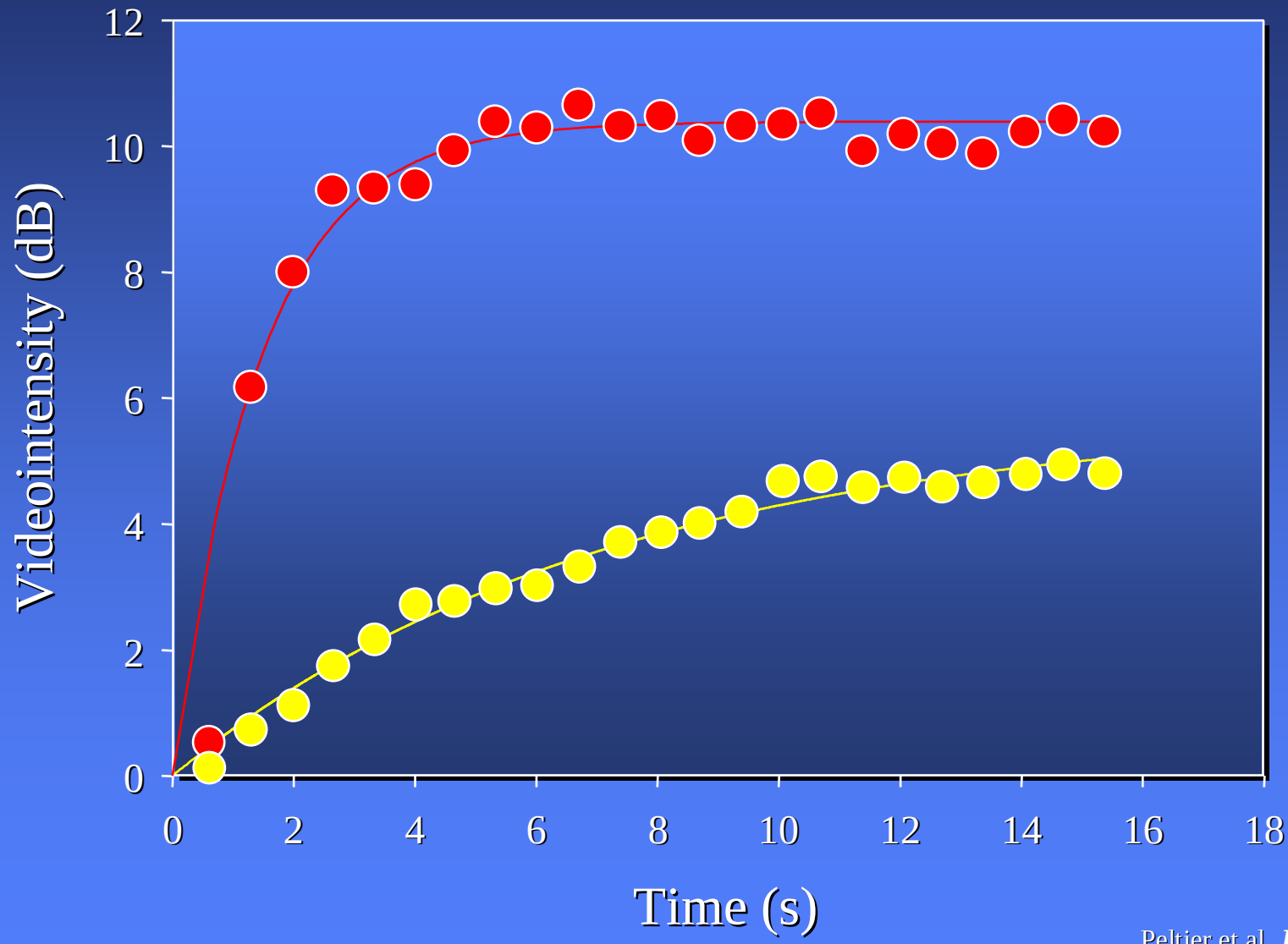
DIPYRIDAMOLE SPECT



Peltier et al. ***JACC*** 2004;43:257

Contrast Echocardiography

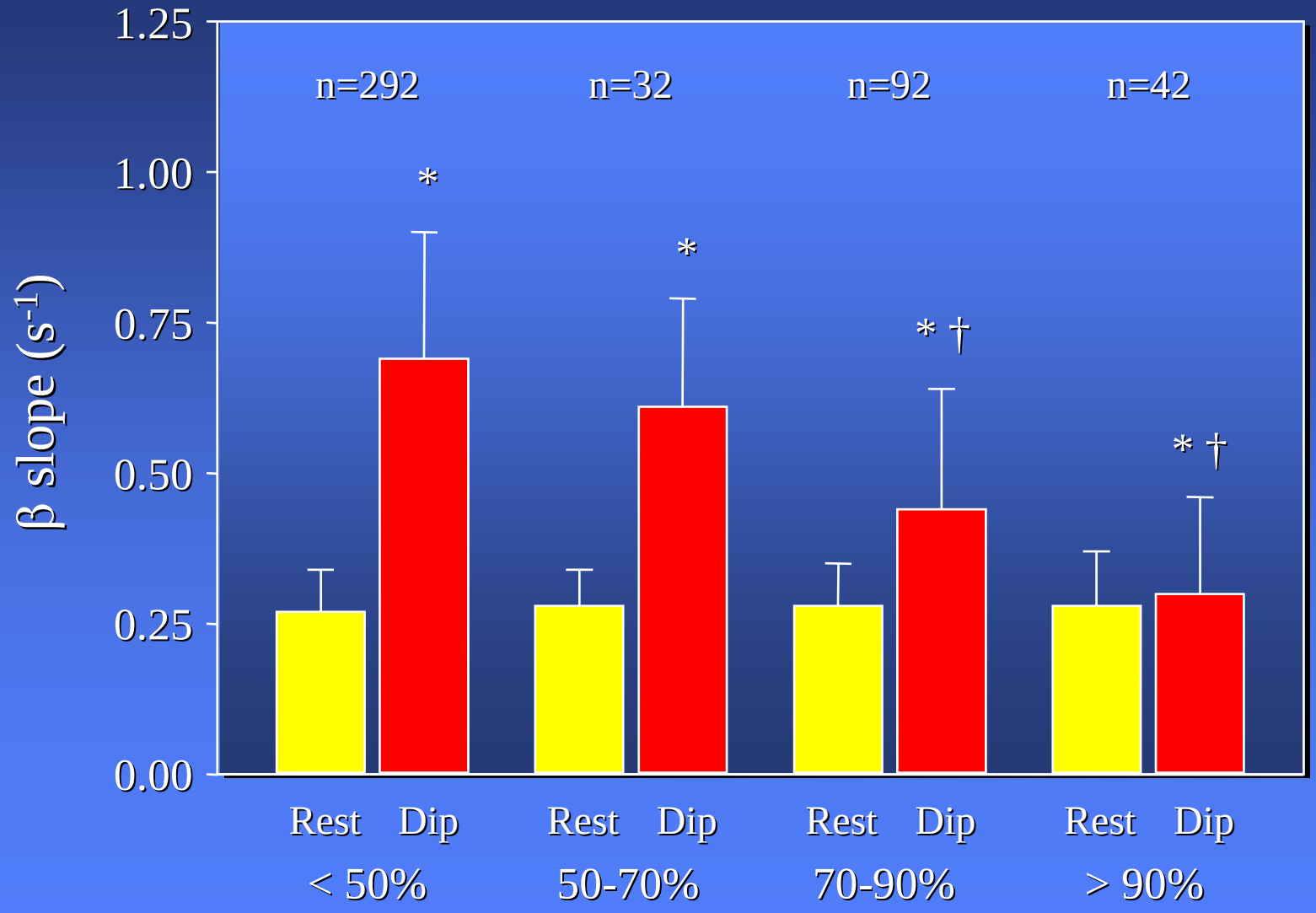
Dipyridamole real-time Power Modulation



Peltier et al. ***JACC*** 2004;43:257

Contrast Echocardiography

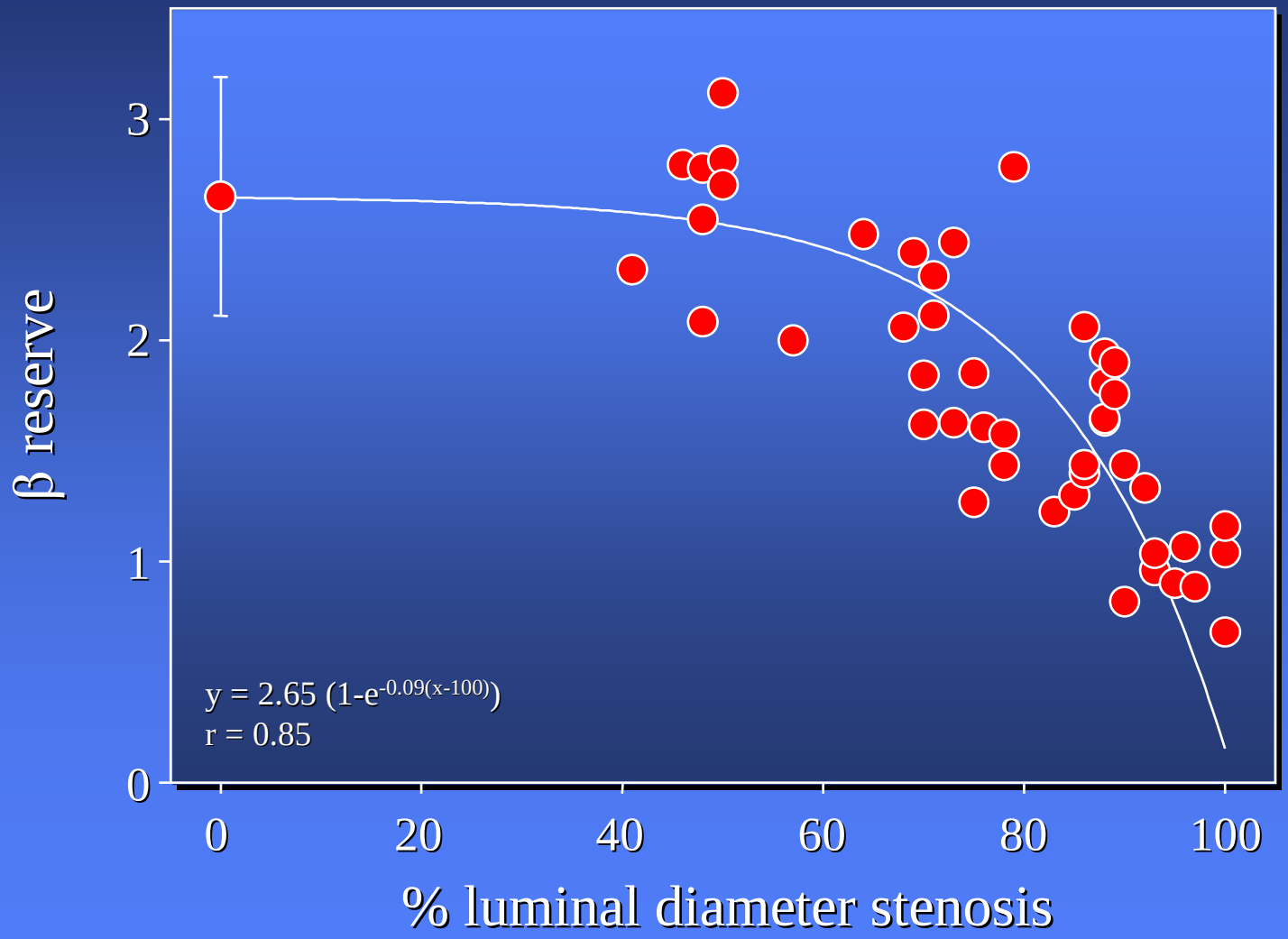
Dipyridamole real-time Power Modulation



Peltier et al. ***JACC*** 2004;43:257

Contrast Echocardiography

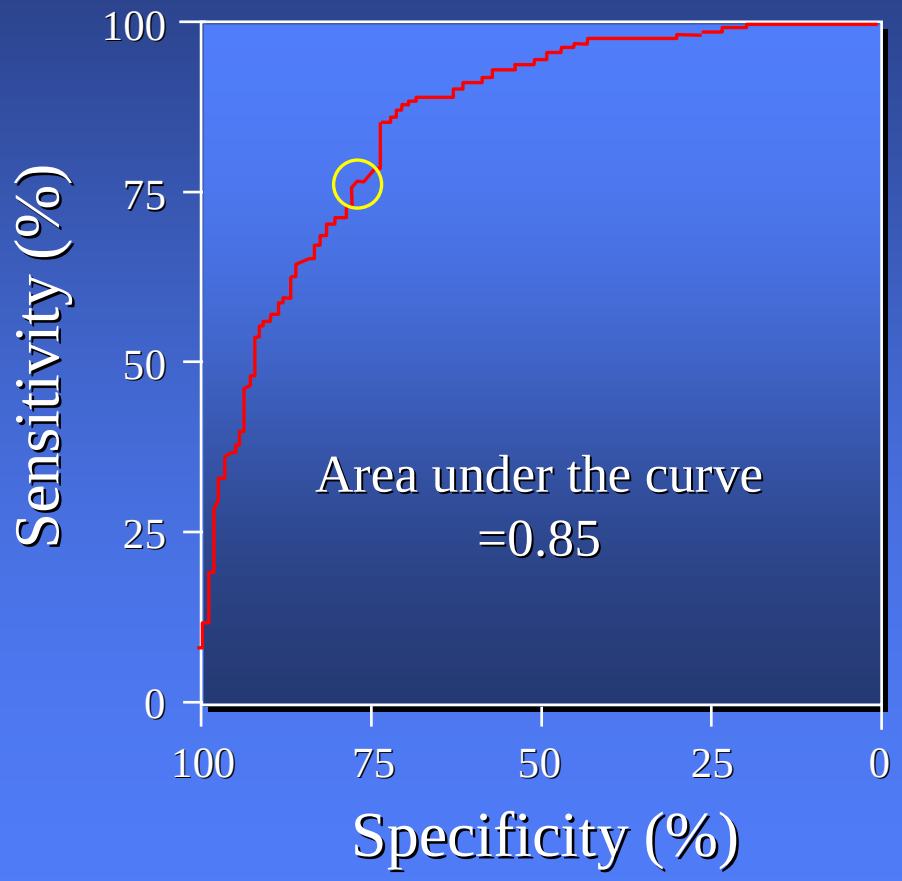
Dipyridamole real-time Power Modulation

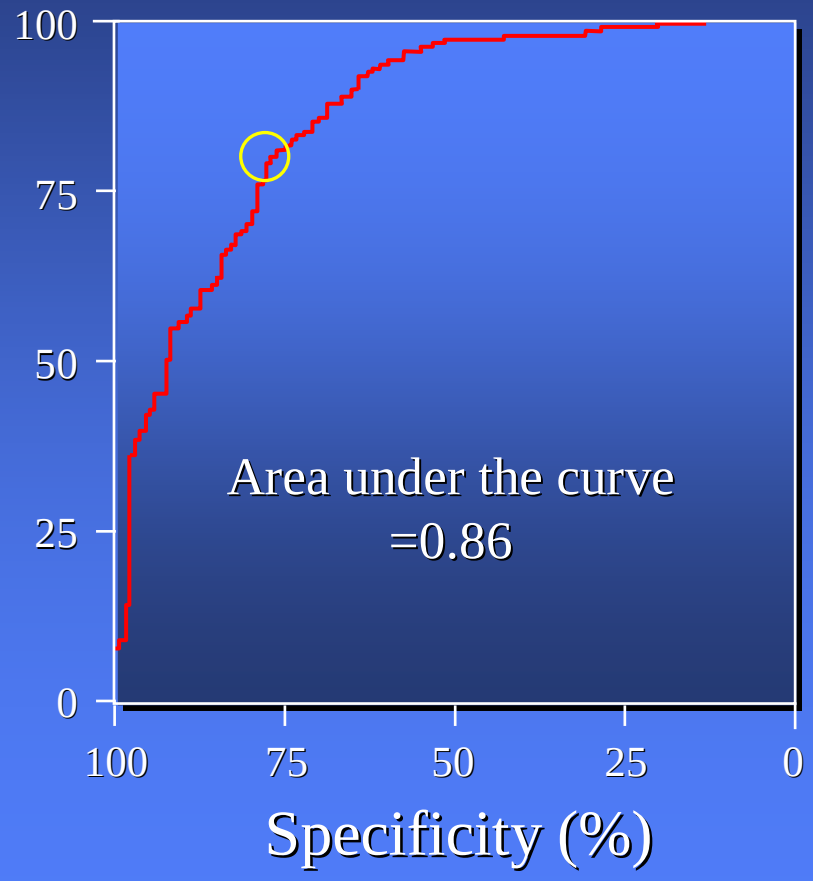


Peltier et al. ***JACC*** 2004;43:257

Contrast Echocardiography

Dipyridamole real-time Power Modulation

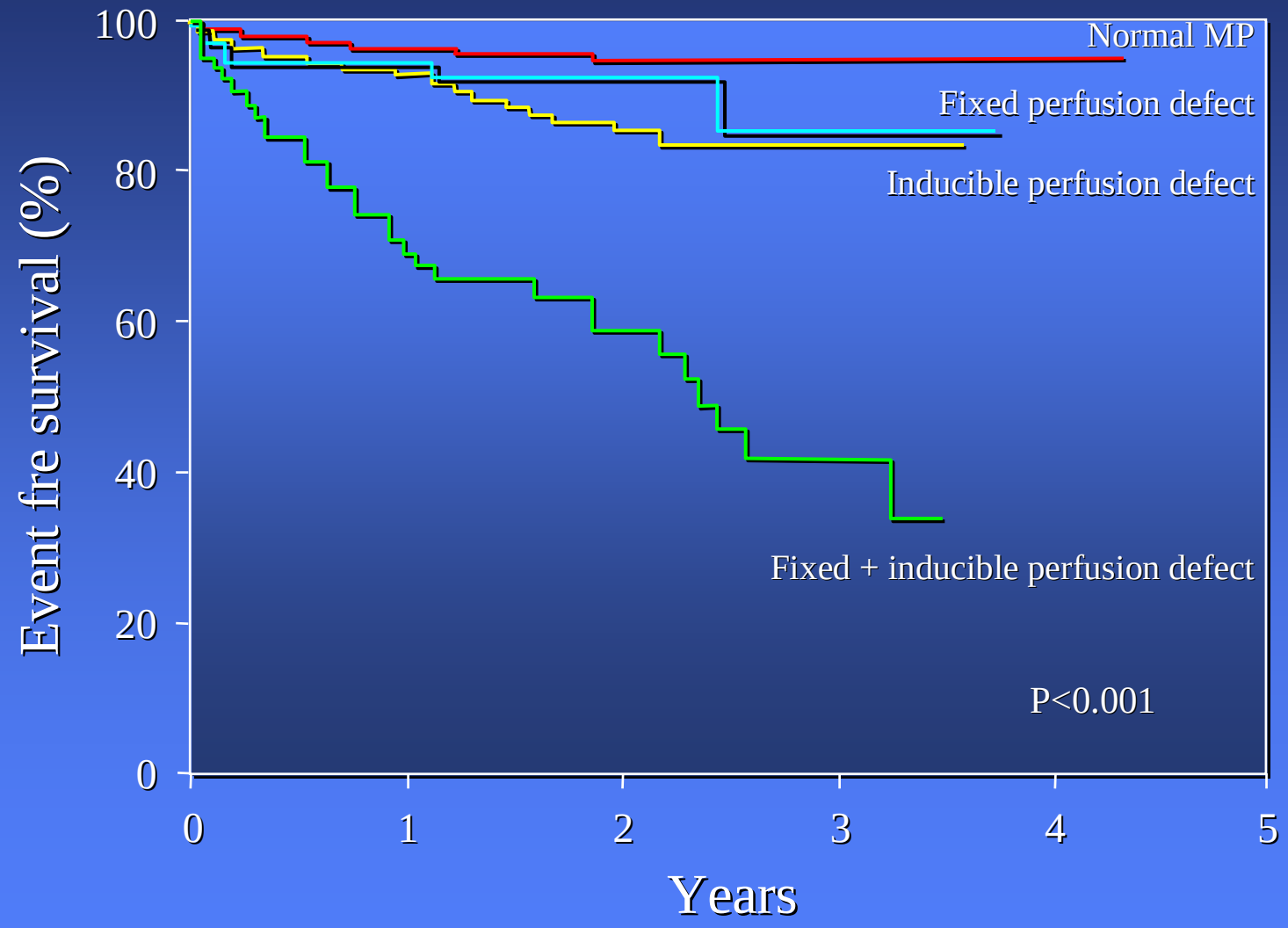




Peltier et al. ***JACC*** 2004;43:257

Contrast Echocardiography

Dipyridamole RTCE: Prognostic implications



Tsusui et al. ***JCirculation*** 2005;112:1444

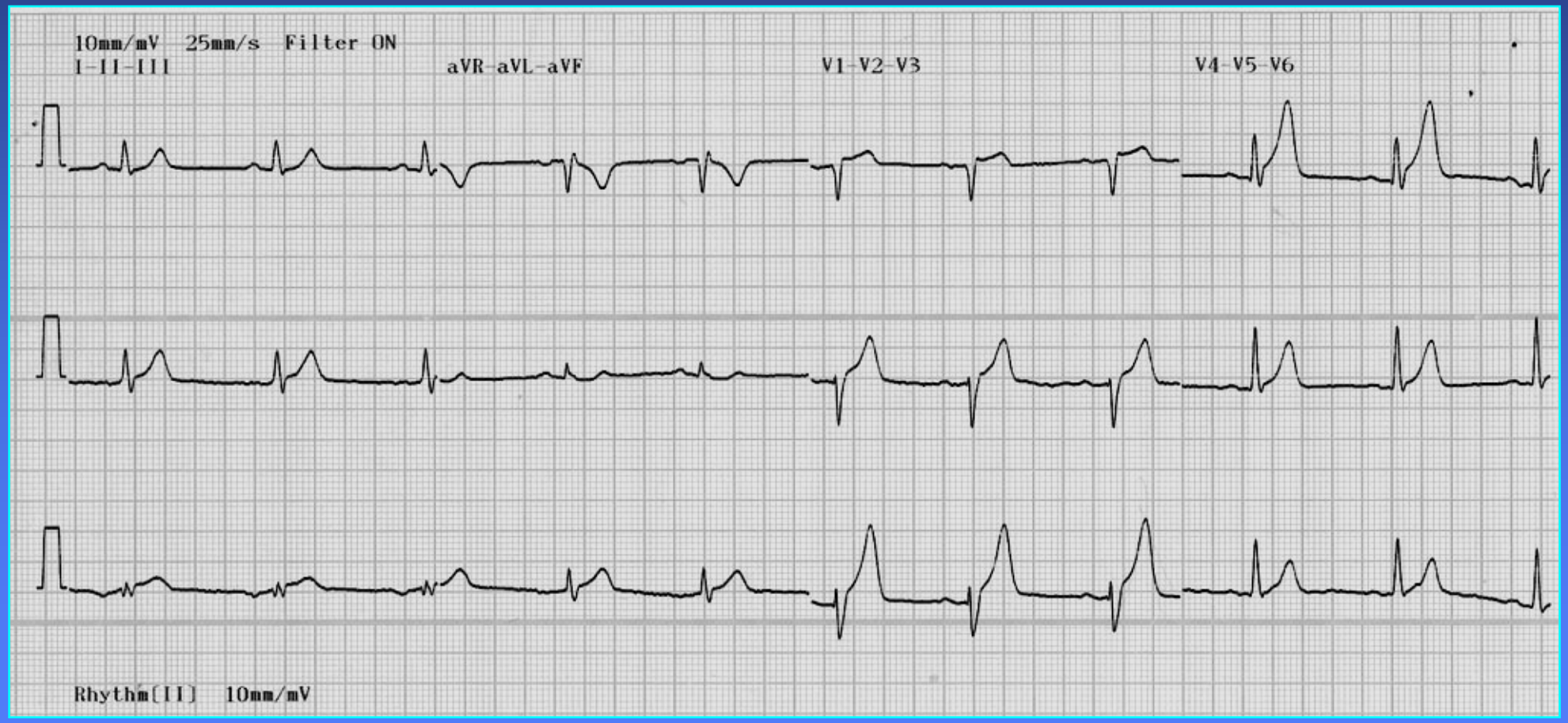
Contrast Echocardiography

- Left ventricular opacification
- Myocardial perfusion
- Assessment of reperfusion and myocardial viability

Contrast Echocardiography

T.V.H. - ♂ - 46 year old

10.43 am : ECG

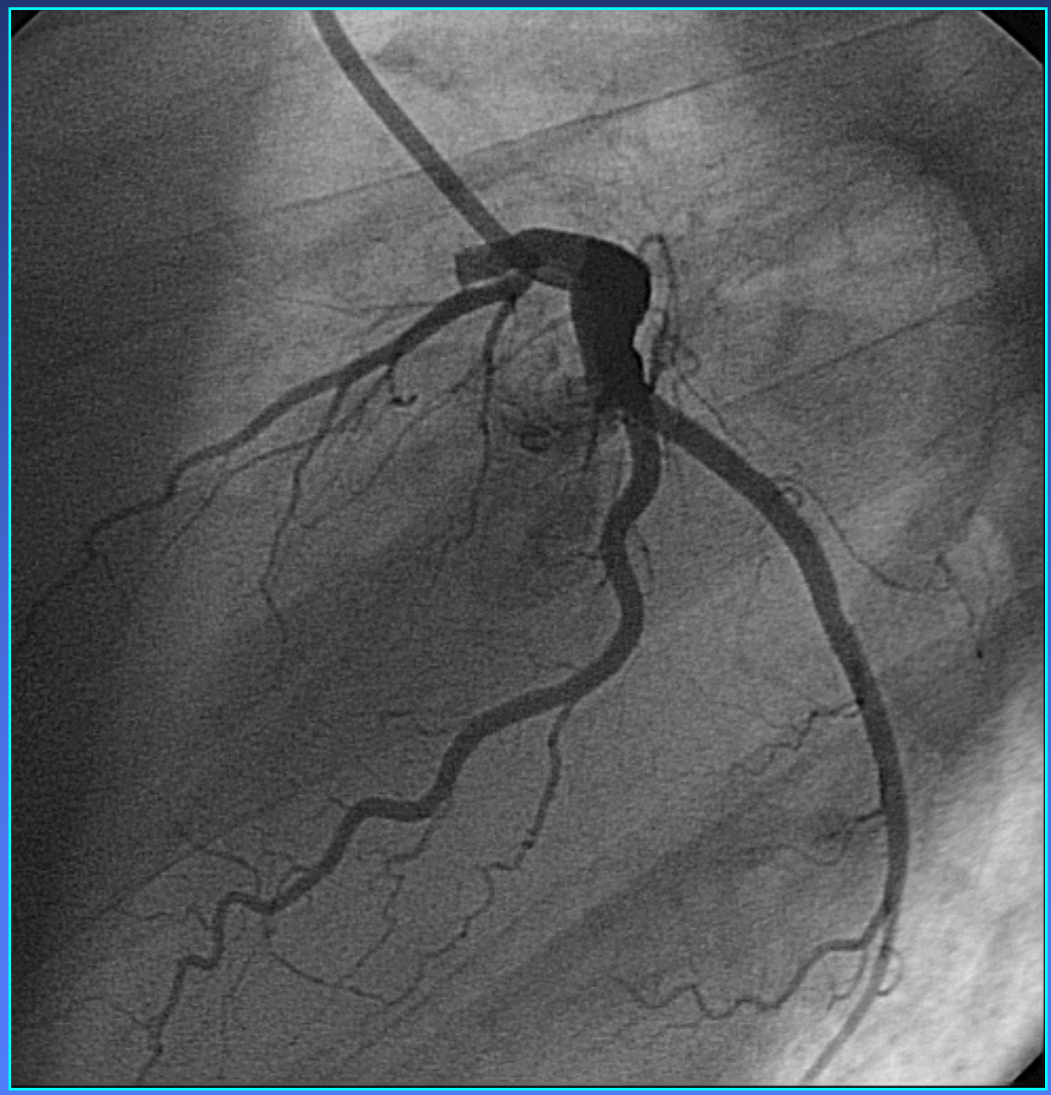


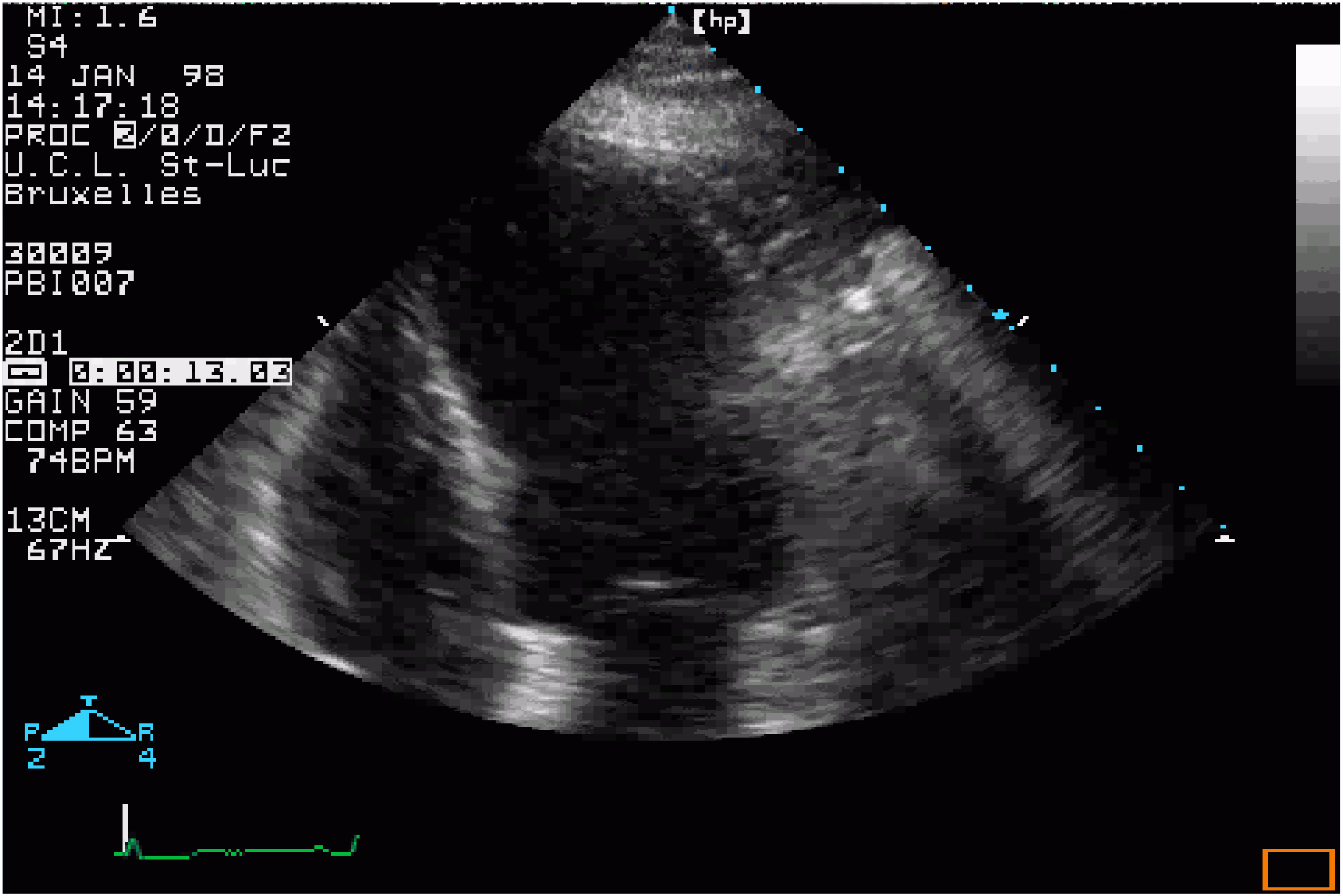
Contrast Echocardiography

T.V.H. - ♂ - 46 year old

11.43 am

Coronary angiography

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Bruxelles
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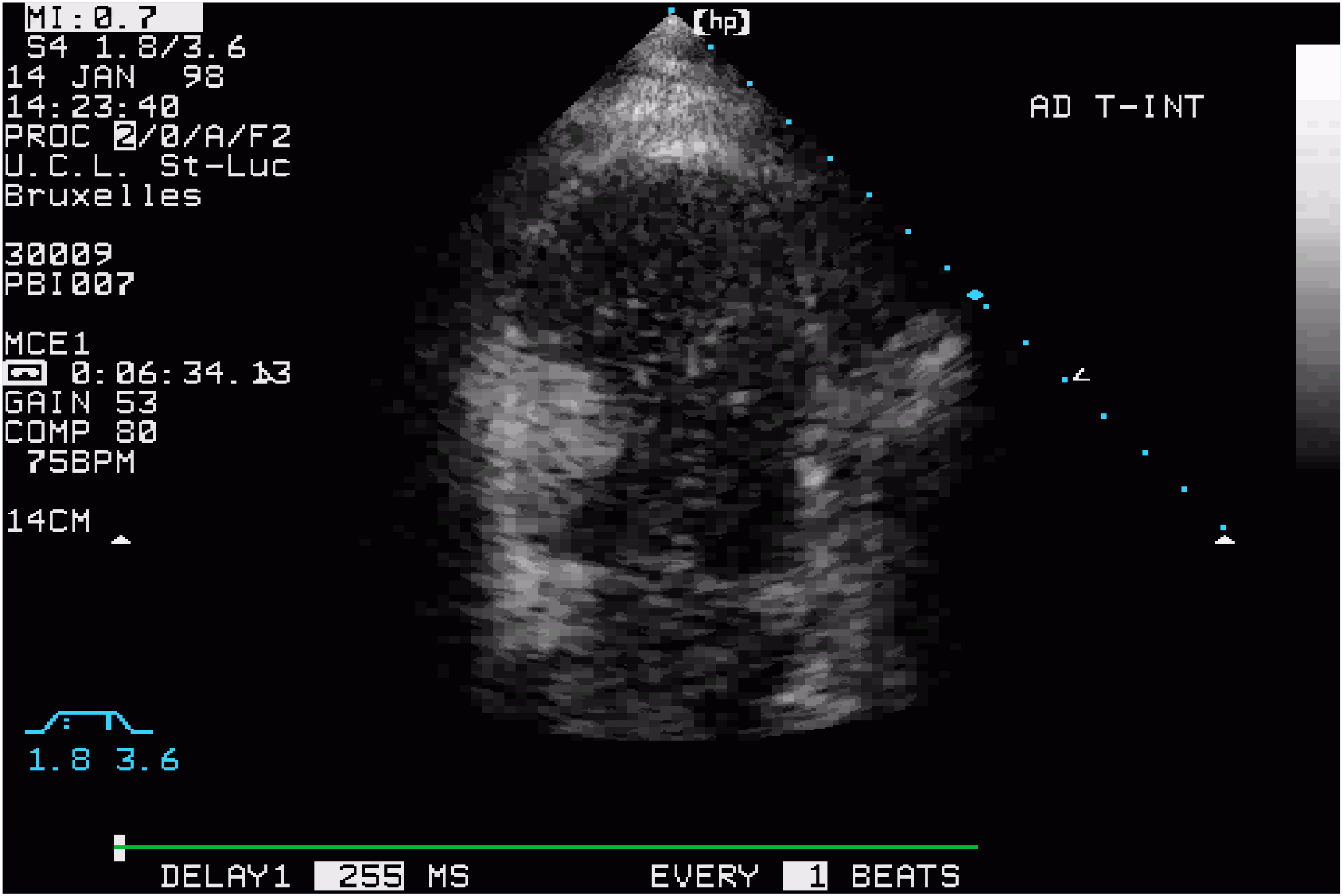
67HZ
[hp]
T
P
R
2
4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14:23:40
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Bruxelles
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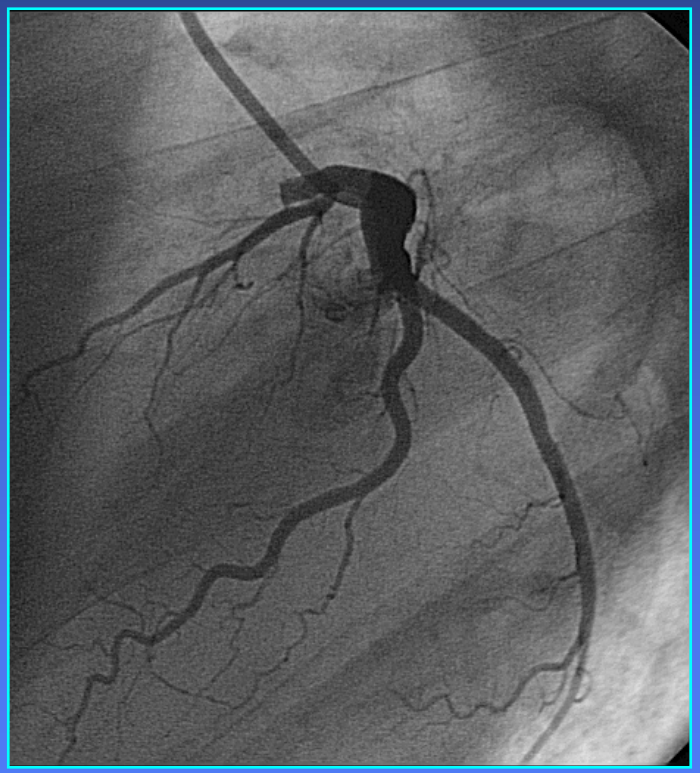
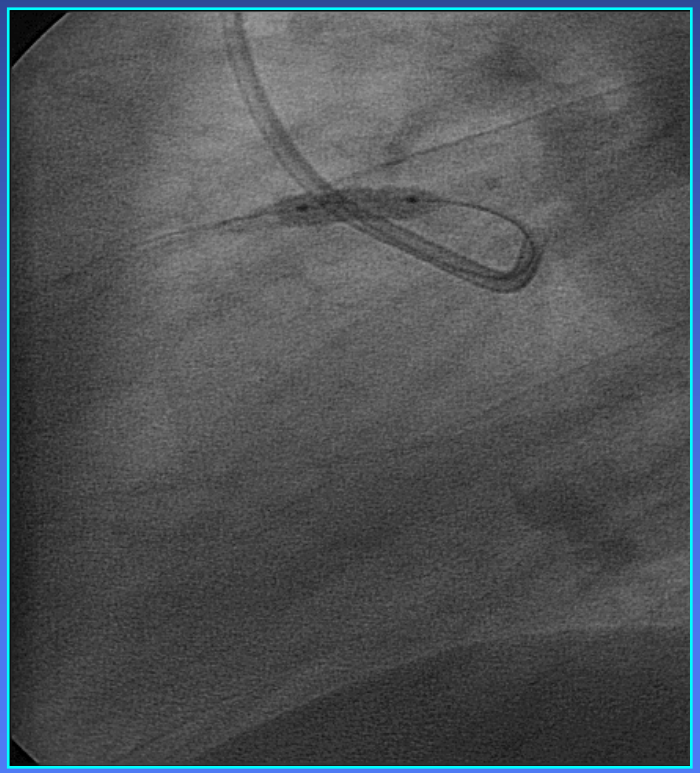
PBI007
MCE1
0:06:34.13
GAIN 53
COMP 80
75BPM
14CM
1.8 3.6
(hp)
AD T-INT
DELAY1 255 MS
EVERY 1 BEATS

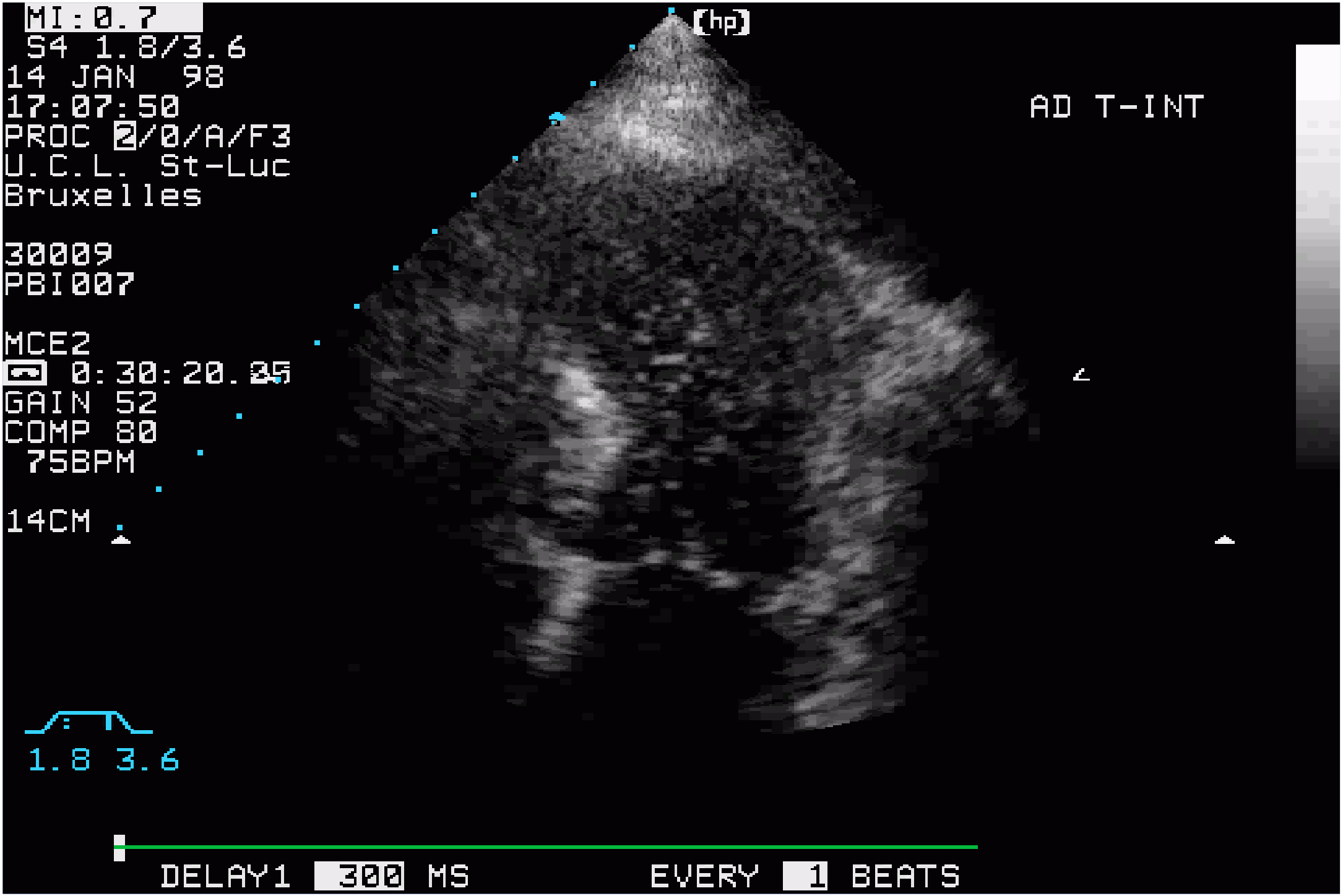
Contrast Echocardiography

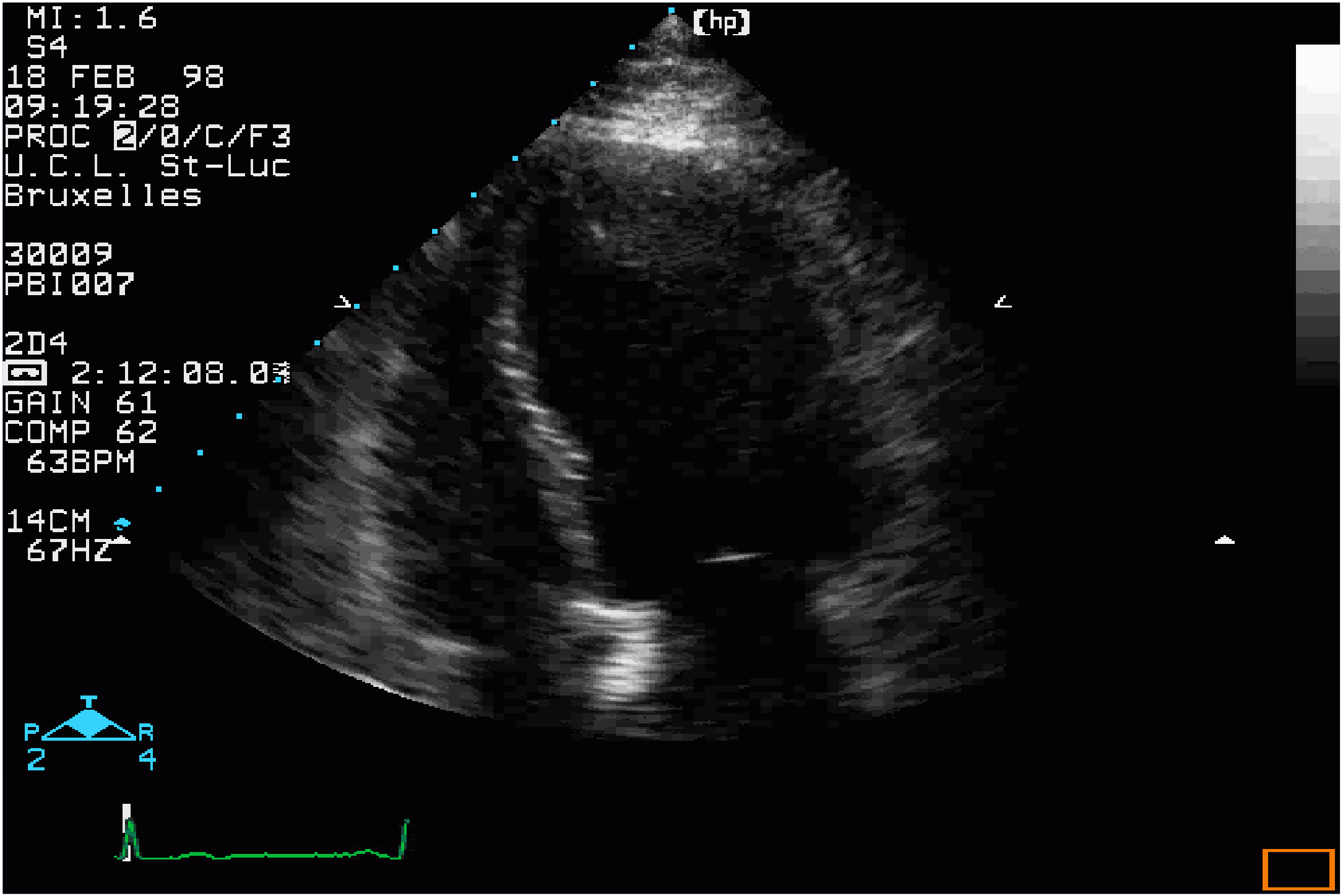
T.V.H. - ♂ - 46 year old

11.53 am : direct angioplasty and stenting






MI:0.7
S4 1.8/3.6
14 JAN 98
17:07:50
PROC 2/0/A/F3
U.C.L. St-Luc
Bruxelles
30009
PBI007
MCE2
0:30:20.25
GAIN 52
COMP 80
75BPM
14CM
(hp)
AD T-INT
1.8 3.6
DELAY1 300 MS
EVERY 1 BEATS

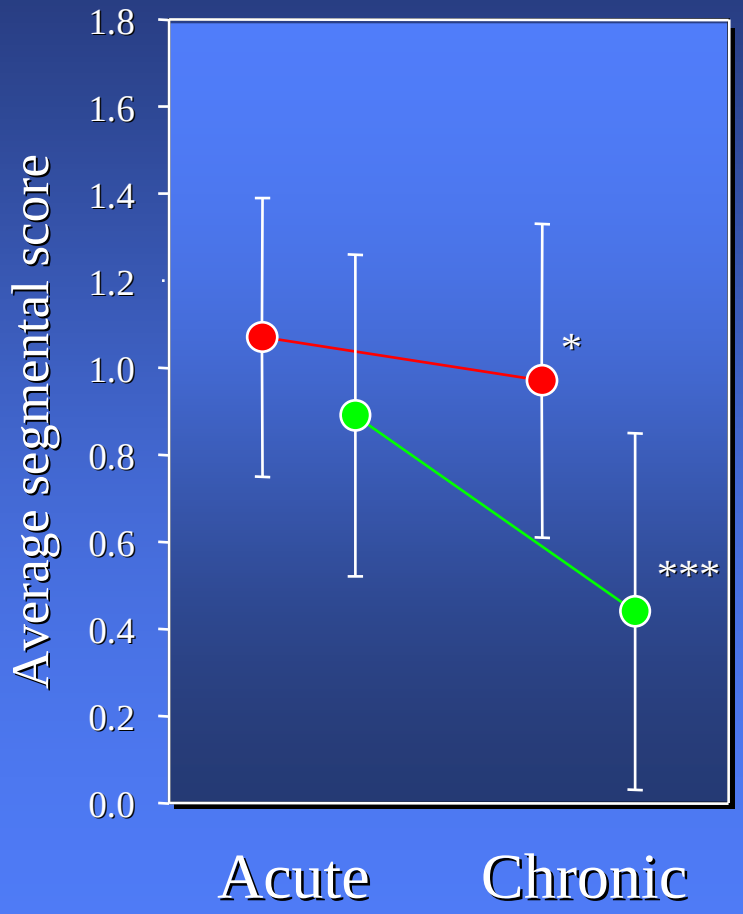

MI:1.6
S4
18 FEB 98
09:19:28
PROC 2/0/C/F3
U.C.L. St-Luc
Bruxelles
30009
PBI007
2D4
2:12:08.0
GAIN 61
COMP 62
63BPM
14CM
67HZ
[hp]
T
P
R
2
4

Contrast Echocardiography

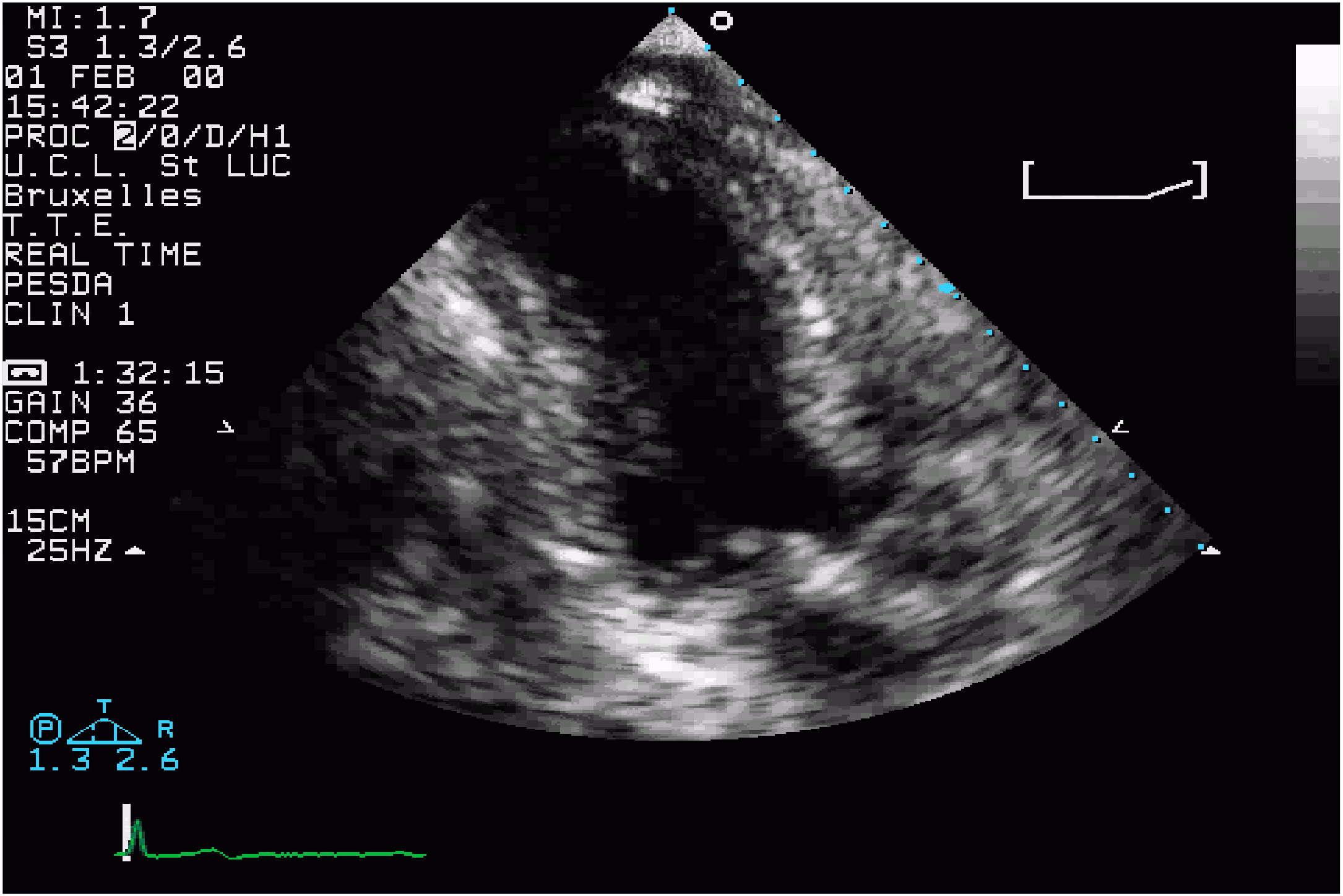
Assessment of the « no-reflow » phenomenon by i.c. MCE

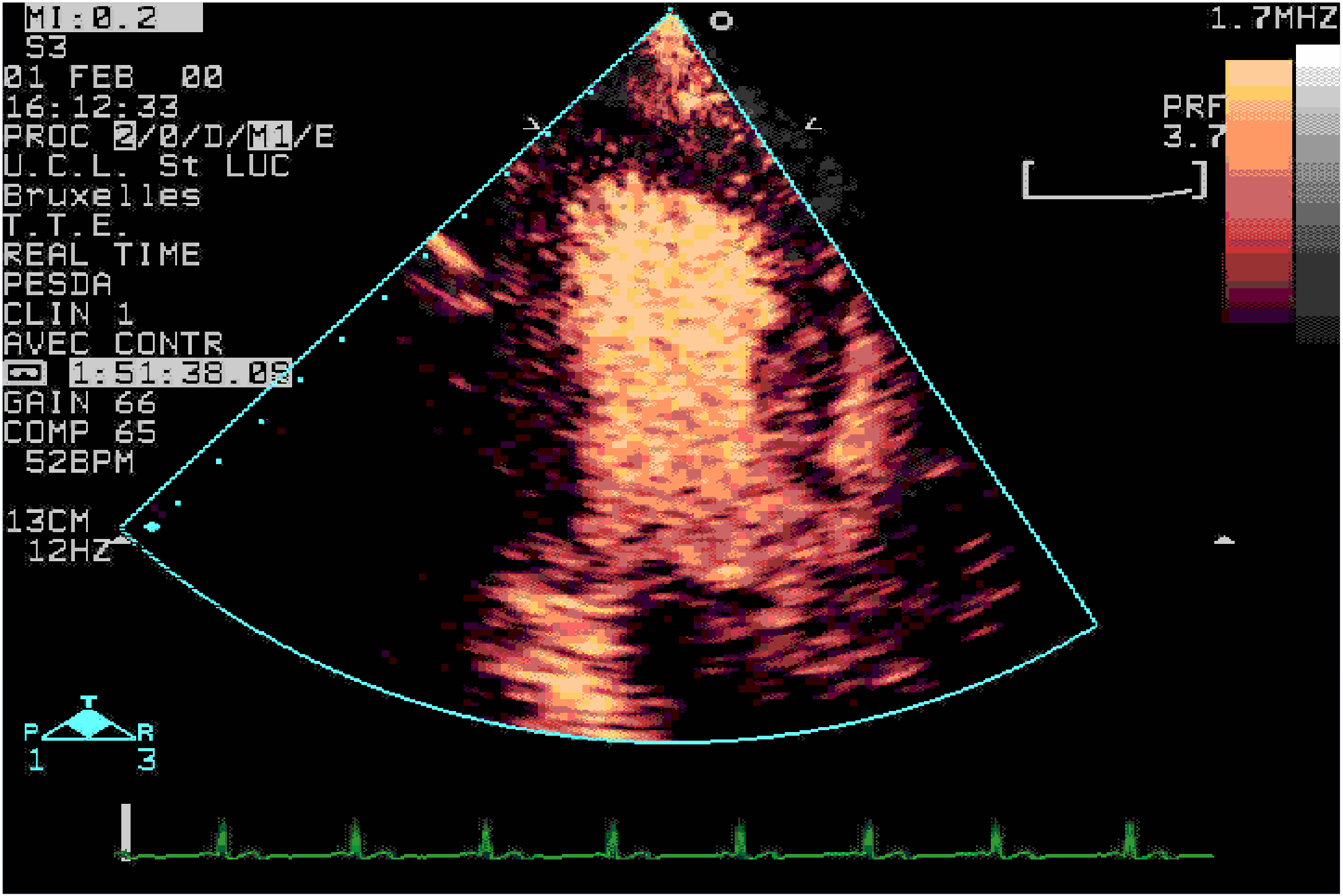
Before PTCA

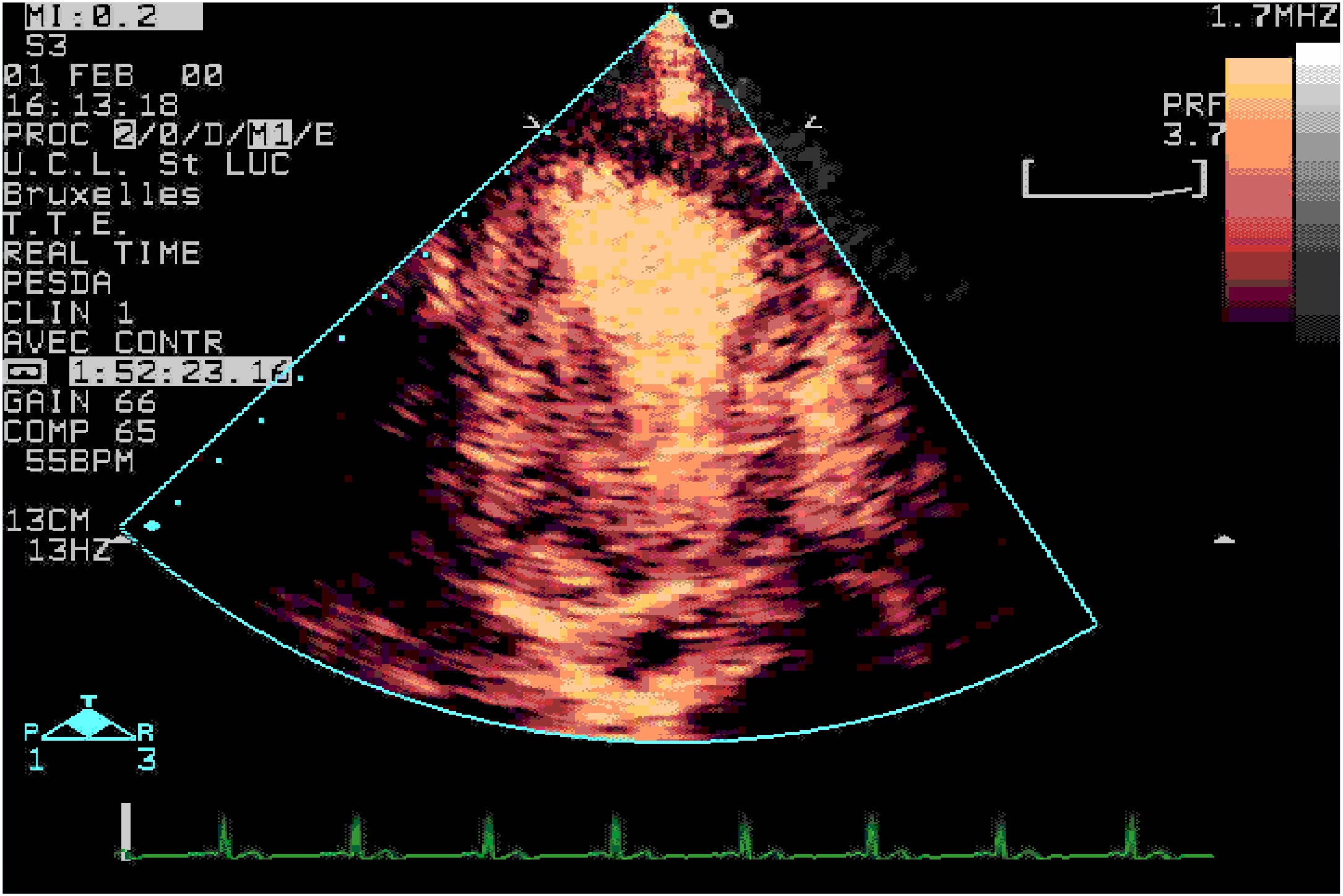
After PTCA

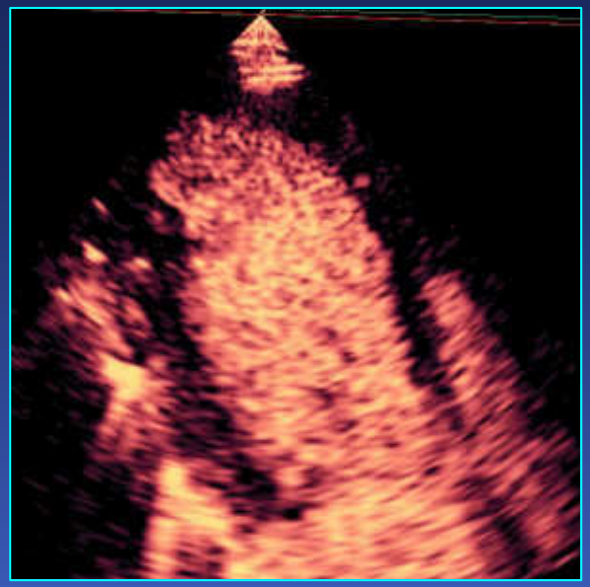


Ito et al. ***Circulation*** 1992;85:1699.

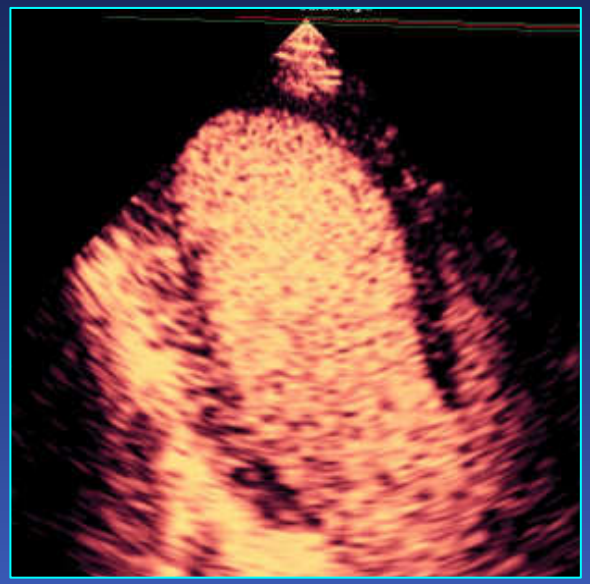

MI:1.7
S3 1.3/2.6
01 FEB 00
15:42:22
PROC 2/0/D/H1
U.C.L. St LUC
Bruxelles
T.T.E.
REAL TIME
PESDA
CLIN 1
1:32:15
GAIN 36
COMP 65
57BPM
15CM
25HZ
T
R
1.3 2.6


MI:0.2
S3
01 FEB 00
16:12:33
PROC 2/0/D/M1/E
U.C.L. St LUC
Bruxelles
T.T.E.
REAL TIME
PESDA
CLIN 1
AVEC CONTR
1:51:38.0
GAIN 66
COMP 65
52BPM
13CM
12HZ
1.7MHZ
PRF
3.7
T
P
R
1
3

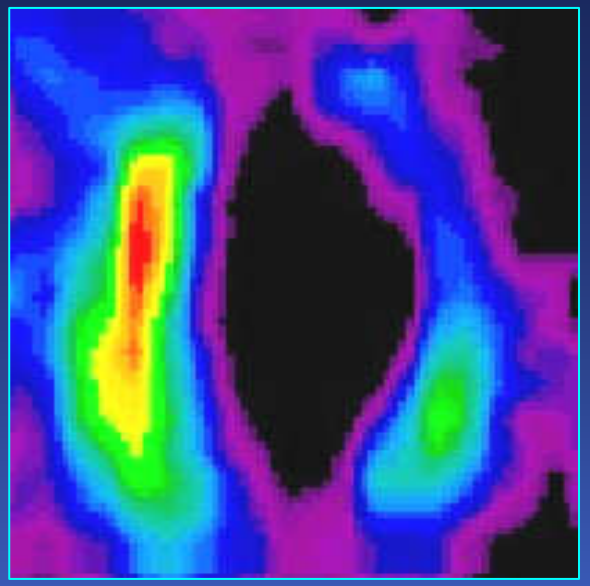

MI:0.2
S3
01 FEB 00
16:13:18
PROC 2/0/D/M1/E
U.C.L. St LUC
Bruxelles
T.T.E.
REAL TIME
PESDA
CLIN 1
AVEC CONTR
1:52:23.10
GAIN 66
COMP 65
55BPM
13CM
13HZ
1.7MHZ
PRF
3.7
T
P
R
1
3



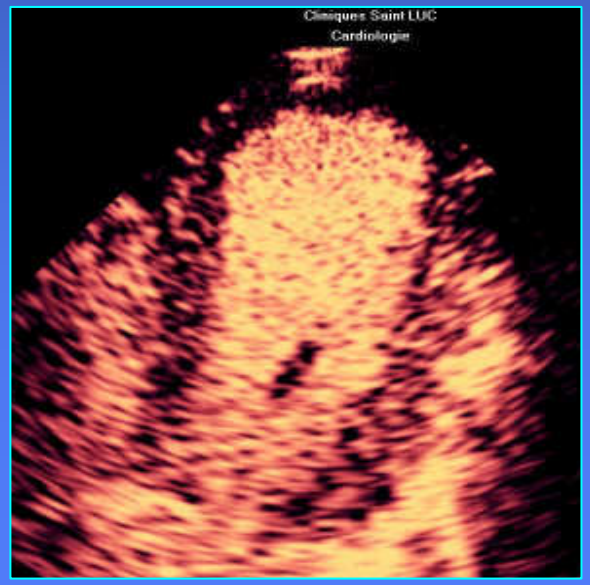
After FLASH

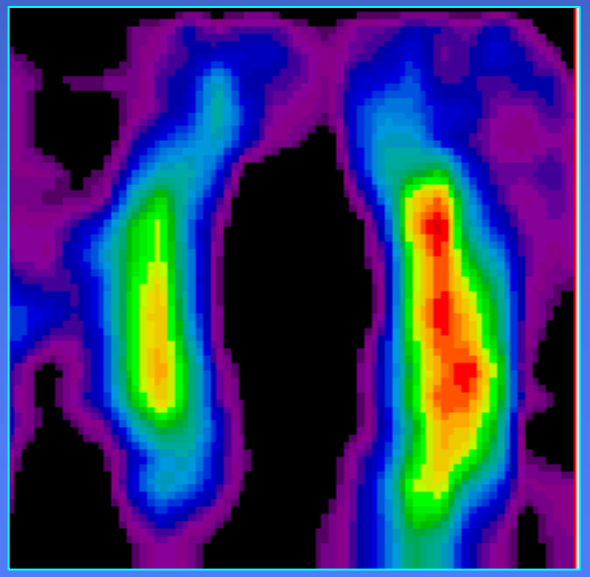


After refill



MIBI SPECT





Contrast Echocardiography

Detection of myocardial viability with intravenous MCE

	Early MCE	Late MCE
Sensitivity	21%	62%
Specificity	89%	85%
PPV	63%	78%
NPV	57%	72%

Swinburn et al. ***J Am Coll Cardiol*** 2001;38:19.

Contrast Echocardiography

- Left ventricular opacification
- Myocardial perfusion
- Assessment of reperfusion and myocardial viability