Évaluation de la fonction cardiaque et instabilité hémodynamique: Partie II

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INSTITUT DE CARDIOLOGIE DE MONTRÉAL

CHUM

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Définition

Importance

The NEW ENGLAND JOURNAL of MEDICINE

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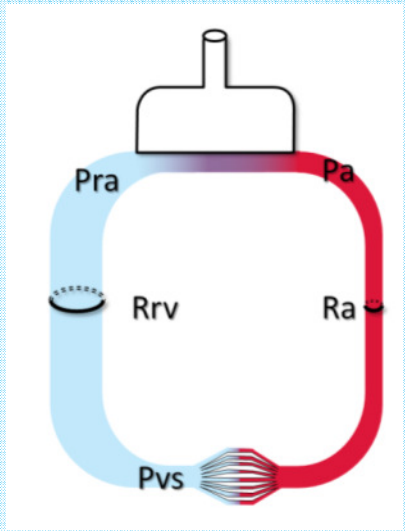
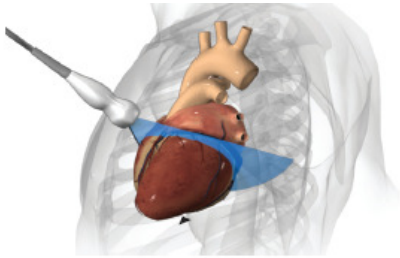
A Comparison of Aprotinin and Lysine Analogues in High-Risk Cardiac Surgery

Dean A. Fergusson, M.H.A., Ph.D., Paul C. Hébert, M.D., M.H.Sc., C. David Mazer, M.D., Stephen Fremes, M.D., Charles MacAdams, M.D., John M. Murkin, M.D., Kevin Teoh, M.D., M.Sc., Peter C. Duke, M.D., Ramiro Arellano, M.D., M.Sc., Morris A. Blajchman, M.D., Jean S. Bussières, M.D., Dany Côté, M.D., Jacek Karski, M.D., Raymond Martineau, M.D.,* James A. Robblee, M.D., M.B.A., Marc Rodger, M.D., M.Sc., George Wells, Ph.D., Jennifer Clinch, M.A., and Roanda Pretorius, M.Sc., for the BART Investigators†

Mécanisme



Approche



Most common condition associated with hemodynamic instability

1-↓ Pms: hypovolemia, vasodilatation

2-↑ Pra: Left and right systolic dysfunction

Left and right diastolic dysfunction

Left and right outflow tract obstruction

Pulmonary emboli

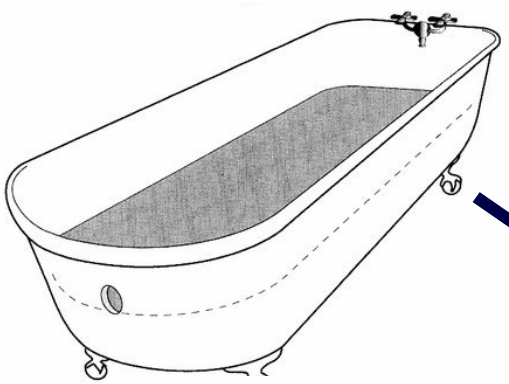
Hypoxia and hypercapnia

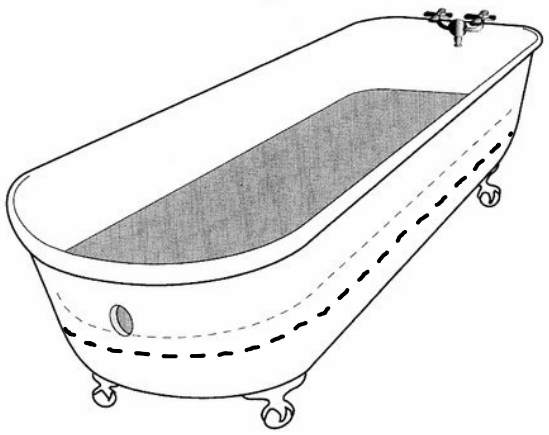
3-↑ Rrv: intrinsic obstruction and compartment syndrome (pericardial, mediastinal, thoracic, abdominal)

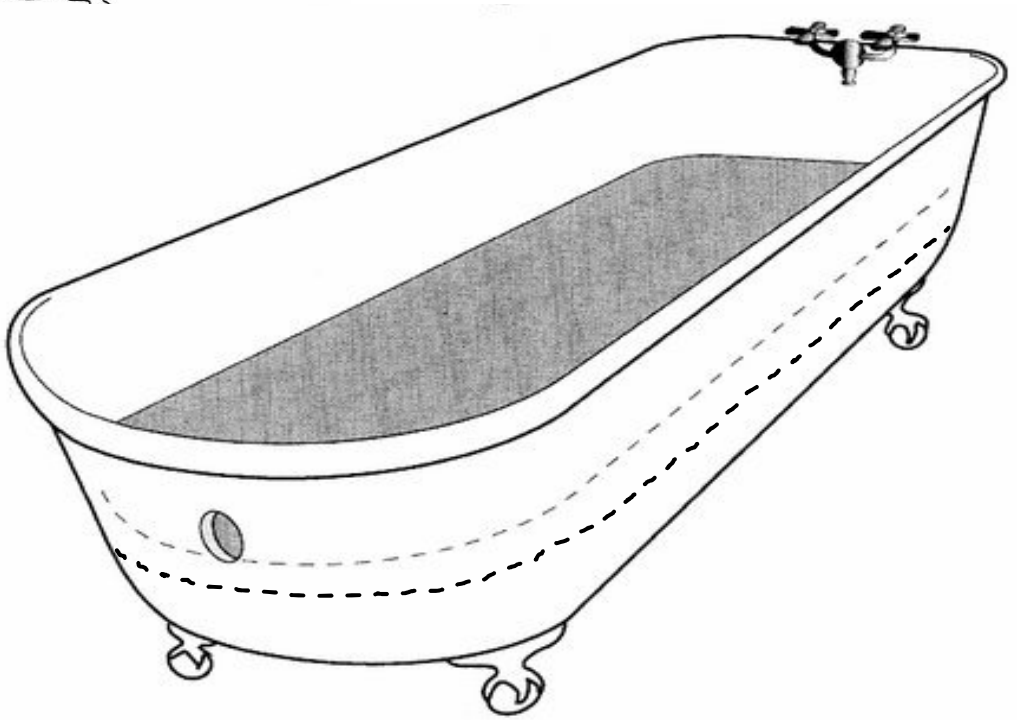
Pvs = $\frac{\text{Volume}}{\text{Compliance}}$

Augmentation de la compliance

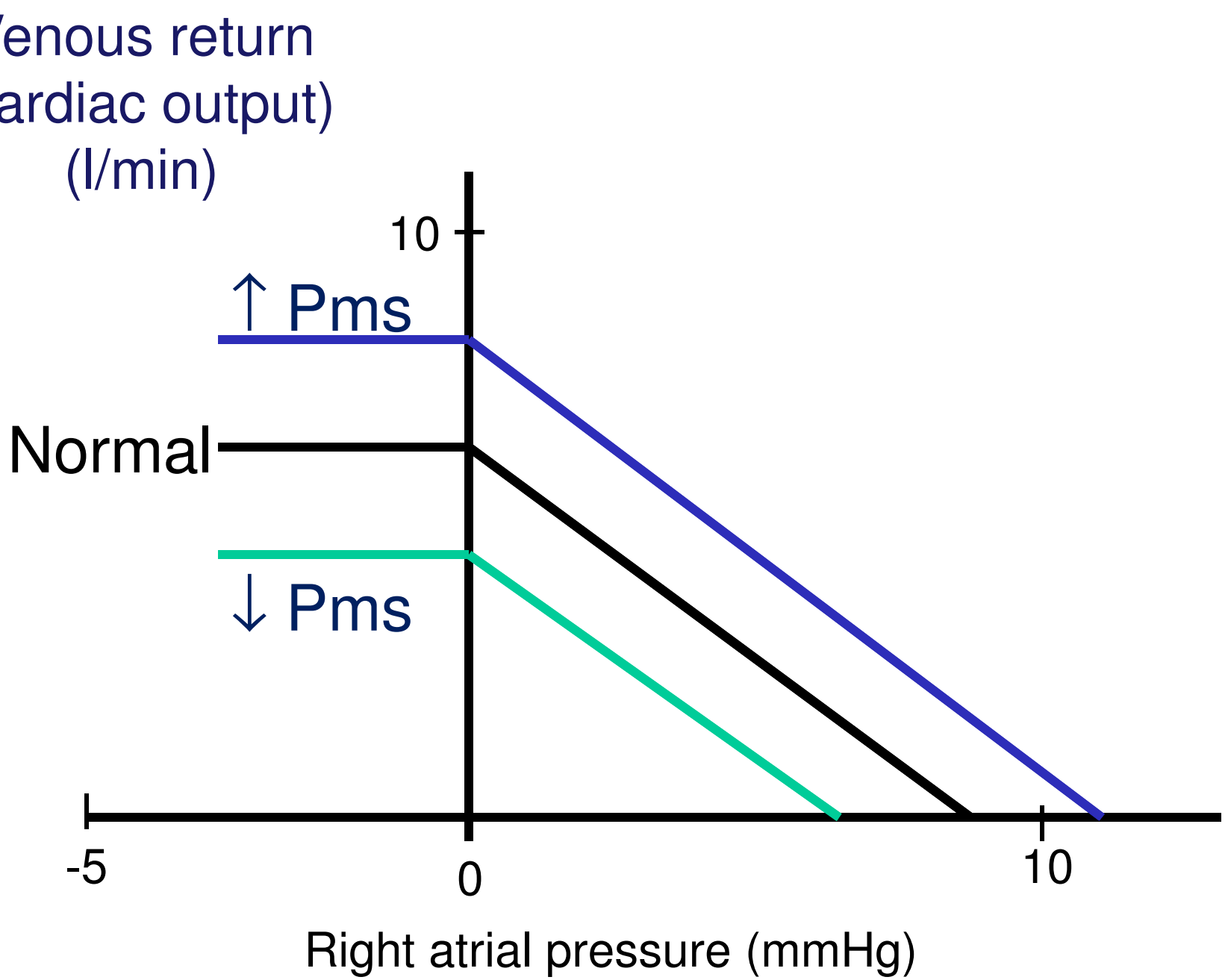
Perte de volume







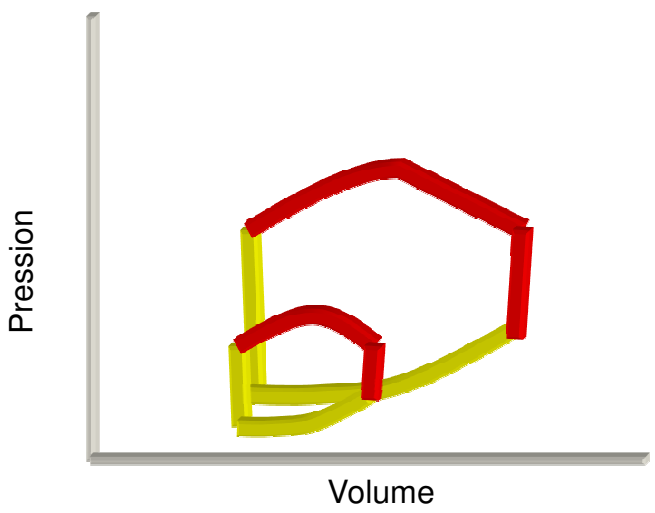
Adapated from: Jacobsohn et al Can J Anesth 1997 44:8 849-67



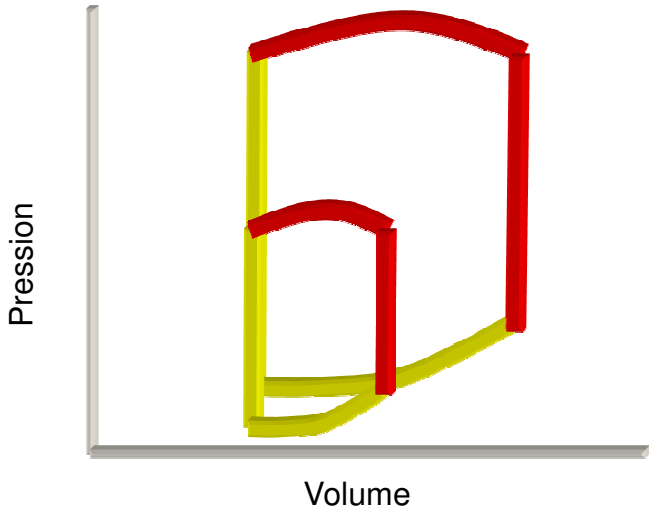
Adapated from: Jacobsohn et al Can J Anesth 1997 44:8 849-67

Baisse de la Pvs

Courbe pression-volume ventriculaire droite



Courbe pression-volume ventriculaire gauche



Congrès national d'anesthésie et de réanimation 2007. Les Essentiels, p. 497-520.

Évaluation de la volémie

D. Candela, L. Muller, J.-E. de La Coussaye, J.-Y. Lefrant *

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Évaluation de la volémie

- Réponse dépends: Pvs, Pra et Rvr
- En ventilation spontanée ou assistée?
- Réponse au volume = plus important
- Par ordre de fiabilité: réponse au volume
  - Wedge < TVC < aires échographiques < variation respiratoires artérielles < variations respiratoires veineuses < élévation des jambes

Passive leg raising predicts fluid responsiveness in the critically ill*

Xavier Monnet, MD, PhD; Mario Rienzo, MD; David Osman, MD; Nadia Anguel, MD; Christian Richard, MD; Michael R. Pinsky, MD, Dr hc; Jean-Louis Teboul, MD, PhD

Crit Care Med 2006 Vol. 34, No. 5

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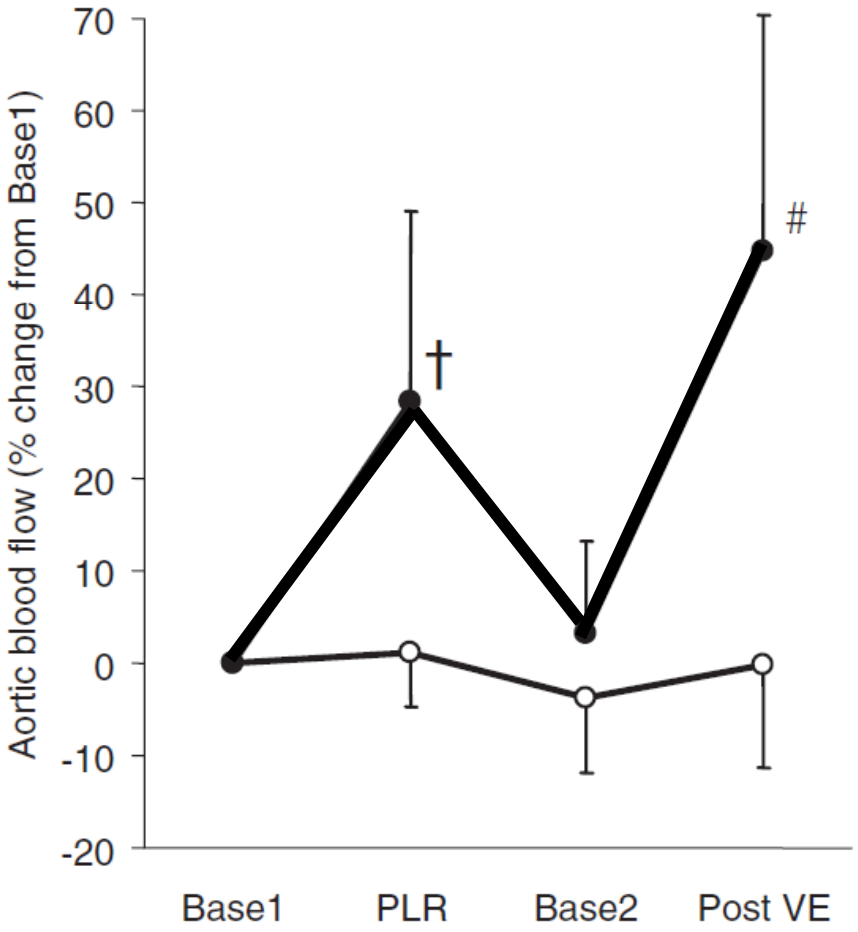
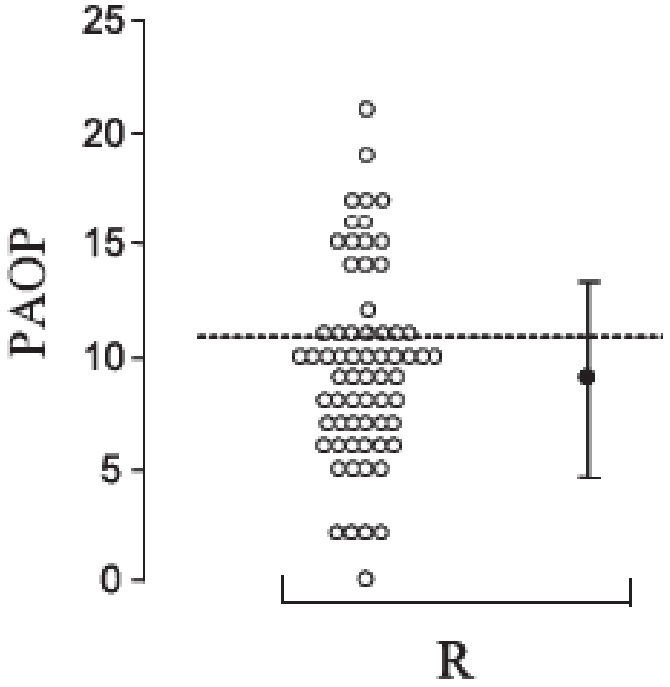


Crit Care Med 2006 Vol. 34, No. 5

Cardiac filling pressures are not appropriate to predict hemodynamic response to volume challenge*

David Osman, MD; Christophe Ridel, MD; Patrick Ray, MD; Xavier Monnet, MD, PhD; Nadia Anguel, MD; Christian Richard, MD; Jean-Louis Teboul, MD, PhD

150 fluid challenges were performed in 96 septic patients (73 men, 23 women; mean age, 62 14 yrs).
65/150 (43%) = positive response to fluid



CCM 2007

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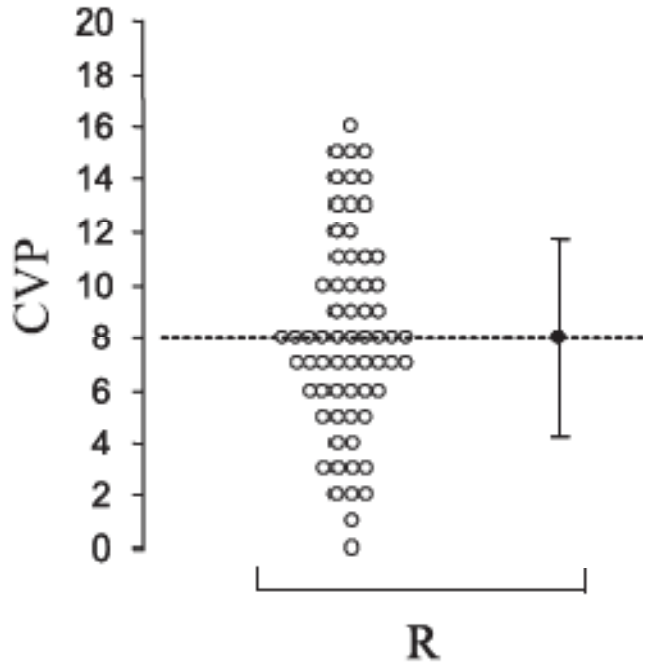


Crit Care Med 2007

ASE COMMITTEE RECOMMENDATIONS

2005

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

JOURNAL OF THE American Society of Echocardiography

Figure 4. Measurement of aortic root diameters at aortic valve annulus (AV ann) level, sinuses of Valsalva (Sinus Val), and sinotubular junction (ST Jxn) from midesophageal long-axis view of aortic valve, usually at angle of approximately 110 to 150 degrees. Annulus is measured by convention at base of aortic leaflets. Although leading edge to leading edge technique is demonstrated for the Sinus Val and ST Jxn, some prefer inner edge to inner edge method.

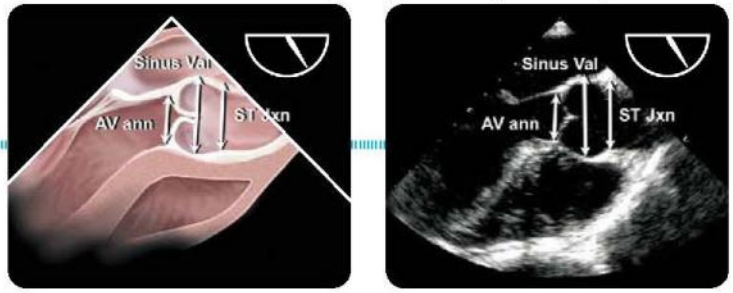


Figure 5. Transesophageal echocardiographic measurements of wall thickness of left ventricular (LV) septal wall (SWT) and posterior wall (PWT) from transgastric shortaxis view of LV, at papillary muscle level, usually best imaged at angle of approximately 0 to 30 degrees.

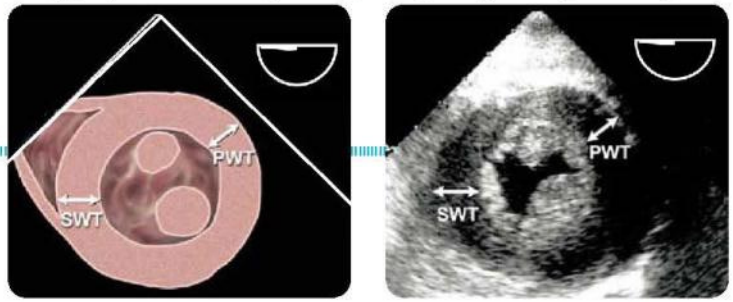


Figure 6. Transesophageal echocardiographic measurements of left ventricular (LV) minor-axis diameter (LVD) from transgastric 2-chamber view of LV, usually best imaged at angle of approximately 90 to 110 degrees after optimizing maximum obtainable LV size by adjustment of medial-lateral rotation.

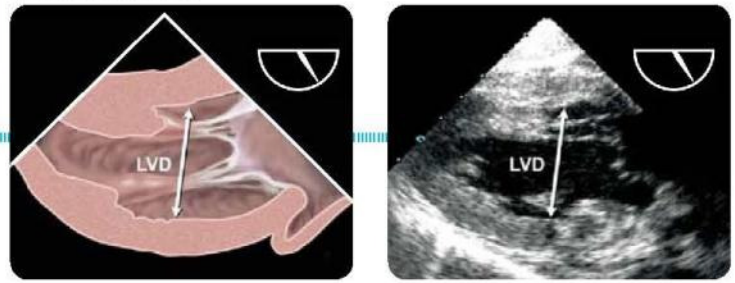


Figure 1. Transesophageal echocardiographic measurements of right ventricular (RV) diameters from midesophageal 4-chamber view, best imaged after optimizing maximum obtainable RV size by varying angles from approximately 0 to 20 degrees.

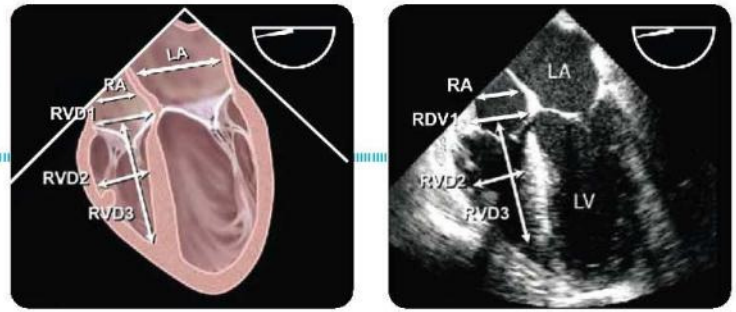


Figure 2. Transesophageal measurements of left ventricular length (L) and minor diameter (LVD) from midesophageal 2-chamber view, usually best imaged at multiplane angle of approximately 60 to 90 degrees.

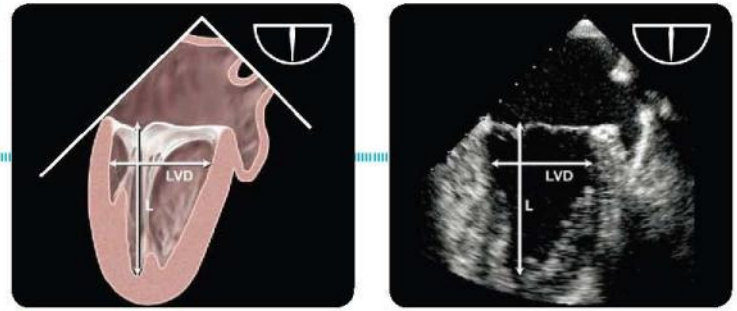
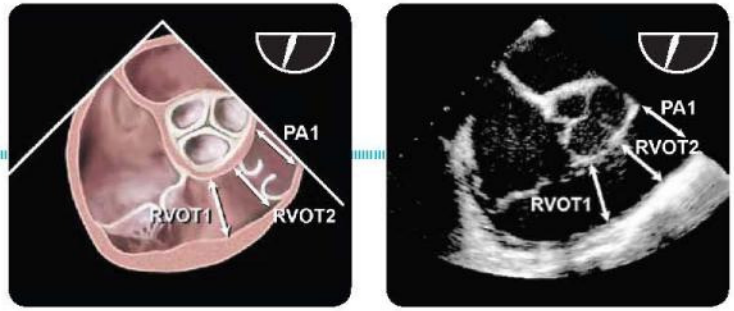


Figure 3. Measurement of right ventricular outflow tract (RVOT1) at pulmonic valve annulus (RVOT2) and main pulmonary artery (PA1) from mid-esophageal inflow-outflow view.



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ANESTHESIA REANIMATION

INSTITUT DE CARDIOLOGIE DE MONTRÉAL

Guidelines and Standards Committee and the Chamber Quantification Writing Group

WORKSHEET

Table 1. Reference limits and partition values of right ventricular and pulmonary artery size (Fig. 1, 3)

	Refer. range	Mildly abnormal	Moder. abnormal	Sever. abnormal
RV dimensions (DIASTOLE)				
Basal RV diameter (RVD 1), cm	2.0 - 2.8	2.9 - 3.3	3.4 - 3.8	≥ 3.9
Mid-RV diameter (RVD 2), cm	2.7 - 3.3	3.4 - 3.7	3.8 - 4.1	≥ 4.2
Base-to-apex length (RVD 3), cm	7.1 - 7.9	8.0 - 8.5	8.6 - 9.1	≥ 9.2
RVOT diameters (DIASTOLE)				
Below aortic valve (RVOT 1), cm	2.5 - 2.9	3.0 - 3.2	3.3 - 3.5	≥ 3.6
Below pulmonic valve (RVOT 2), cm	1.7 - 2.3	2.4 - 2.7	2.8 - 3.1	≥ 3.2
PA diameter (DIASTOLE)				
Above pulmonic valve (PA 1), cm	1.5 - 2.1	2.2 - 2.5	2.6 - 2.9	≥ 3.0

RV, Right ventricular; RVOT, right ventricular outflow tract; PA, pulmonary artery. Data from Foale et al.[76]

Table 2. Reference limits and partition values of right ventricular size and function as measured in the apical 4-chamber view (Fig. 1)

	Refer. range	Mildly abnormal	Moder. abnormal	Sever. abnormal
RV diastolic area, cm^2	11 - 28	29 - 32	33 - 37	≥ 38
RV systolic area, cm^2	7.5 - 16	17 - 19	20 - 22	≥ 23
RV fractional area change, %	32 - 60	25 - 31	18 - 24	≤ 17

RV, Right ventricular. Data from Weyman.[80]

Table 3. Reference limits and partition values for left atrial dimensions/volumes (Fig. 1)

	Women				Men			
	Refer. range	Mildly abnormal	Moder. abnormal	Sever. abnormal	Refer. range	Mildly abnormal	Moder. abnormal	Sever. abnormal
Atrial dimensions (SYSTOLE)								
LA diameter, cm (LA)	2.7-3.8	3.9-4.2	4.3-4.6	≥ 4.7	3.0-4.0	4.1-4.6	4.7-5.2	≥ 5.2
LA diameter/BSA, cm/m^2	1.5-2.3	2.4-2.6	2.7-2.9	≥ 3.0	1.5-2.3	2.4-2.6	2.7-2.9	≥ 3.0
RA minor-axis dimension, cm	2.9-4.5	4.6-4.9	5.0-5.4	≥ 5.5	2.9-4.5	4.6-4.9	5.0-5.4	≥ 5.5
RA minor-axis dimension/BSA,cm/m^2	1.7-2.5	2.6-2.8	2.9-3.1	≥ 3.2	1.7-2.5	2.6-2.8	2.9-3.1	≥ 3.2
Atrial area (SYSTOLE)								
LA area, cm^2	≤ 20	20-30	30-40	> 40	≤ 20	20-30	30-40	> 40
Atrial volumes (SYSTOLE)								
LA volume, mL	22-52	53-62	63-72	≥ 73	18-58	59-68	69-78	≥ 79
LA volume/BSA, mL/m^2	***22 ± 6***	***29-33***	***34-39***	***≥ 40***	***22 ± 6***	***29-33***	***34-39***	***≥ 40***

BSA, body surface area; LA, left atrial; RA, right atrial. ***Bold italic values:*** Recommended and best validated.

(See reverse side)

A

Table 4. Reference limits and partition values of left ventricular size (Fig. 2)

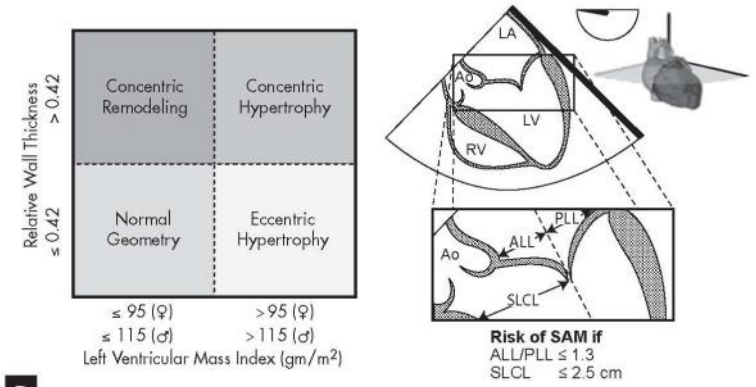
	Women				Men			
	Refer. range	Mildly abnormal	Moder. abnormal	Sever. abnormal	Refer. range	Mildly abnormal	Moder. abnormal	Sever. abnormal
LV dimension (DIASTOLE)								
LV diastolic diameter	3.9-5.3	5.4-5.7	5.8-6.1	≥ 6.2	4.2-5.9	6.0-6.3	6.4-6.8	≥ 6.9
LV diastolic diameter/BSA, cm/m^2	2.4-3.2	3.3-3.4	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 (DIASTOLE)								
LV diastolic volume, mL	56-104	105-117	118-130	≥ 131	67-155	156-178	179-201	≥ 201
LV diastolic volume/BSA, mL/m^2	***35-75***	***76-86***	***87-96***	***≥ 97***	***35-75***	***76-86***	***87-96***	***≥ 97***
LV systolic volume, mL	19-49	50-59	60-69	≥ 70	22-58	59-70	71-82	≥ 83
LV systolic volume/BSA, mL/m^2	***12-30***	***31-36***	***37-42***	***≥ 43***	***12-30***	***31-36***	***37-42***	***≥ 43***

BSA, body surface area; LV, left ventricular. ***Bold italic values:*** Recommended and best validated.

Table 5. Reference limits and values and partition values of left ventricular function (Fig. 1, 2)

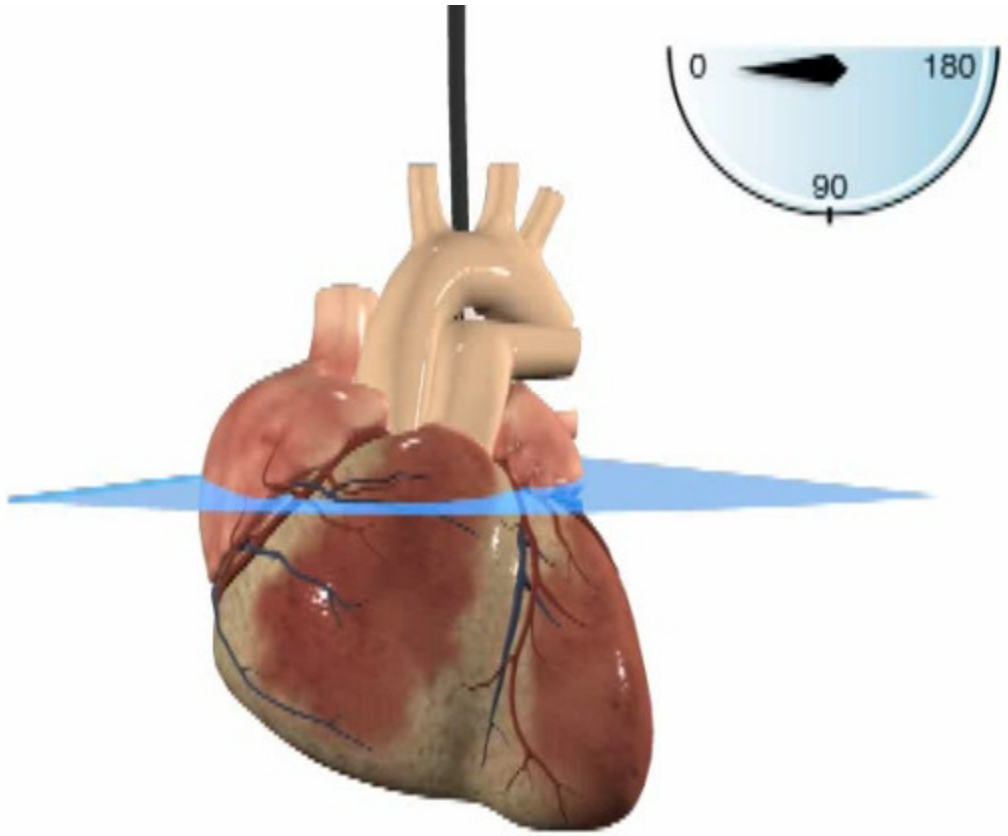
	Women				Men			
	Refer. range	Mildly abnormal	Moder. abnormal	Sever. abnormal	Refer. range	Mildly abnormal	Moder. abnormal	Sever. abnormal
Linear method								
Endocardial fractional shortening, %	27-45	22-26	17-21	≤ 16	25-43	20-24	15-19	≤ 14
Midwall fractional shortening, %	15-23	13-14	11-12	≤ 10	14-22	12-13	10-11	≤ 10
2D Method								
Ejection fraction, %	***≥ 55***	***45-54***	***30-44***	***< 30***	***≥ 55***	***45-54***	***30-44***	***< 30***

2D, Two-dimensional. ***Bold italic values:*** Recommended and best validated.

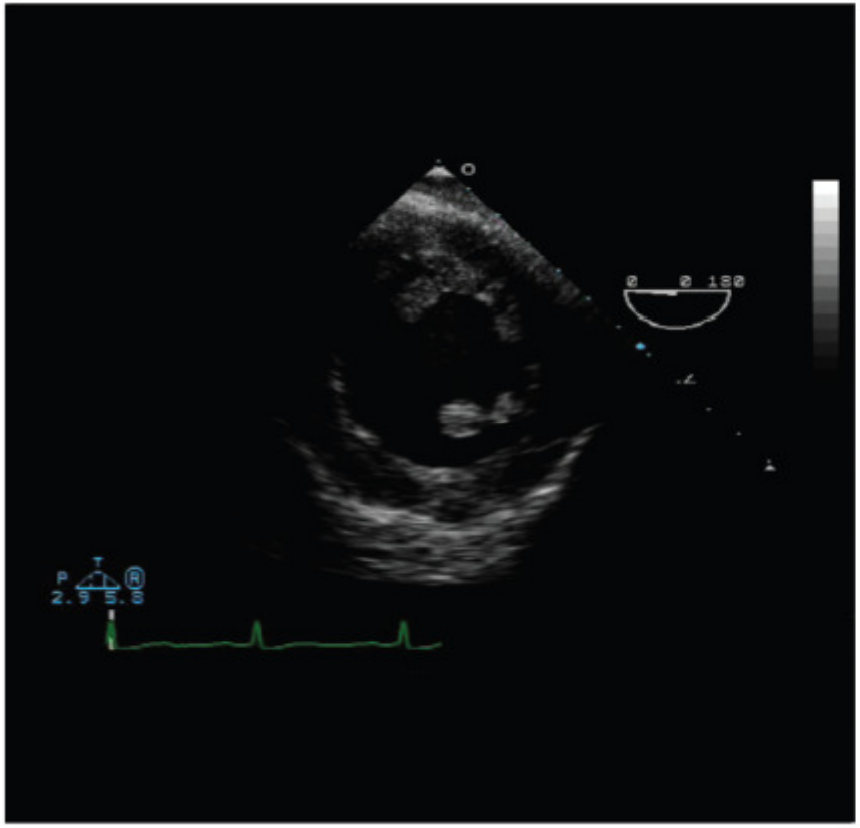


B

Transgastric mid-papillary view



A



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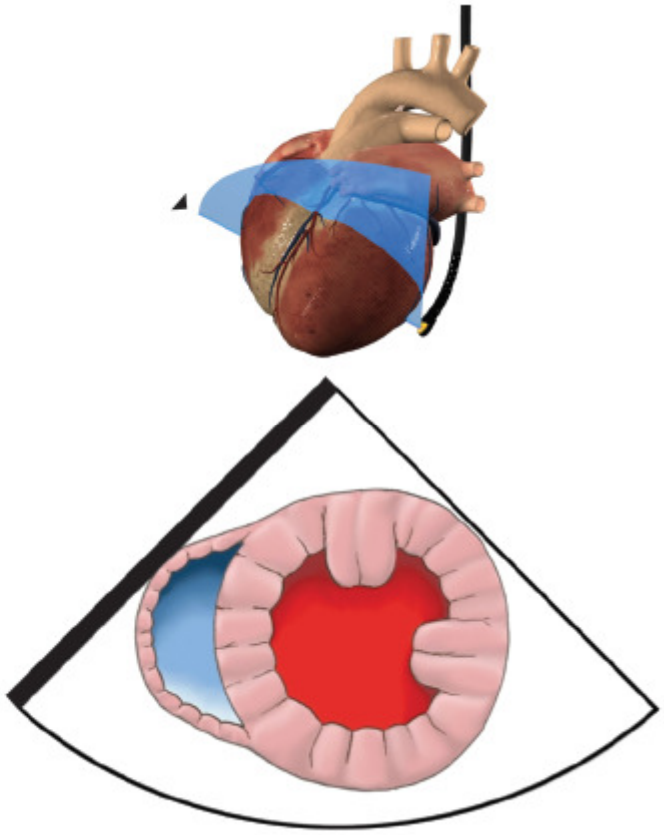
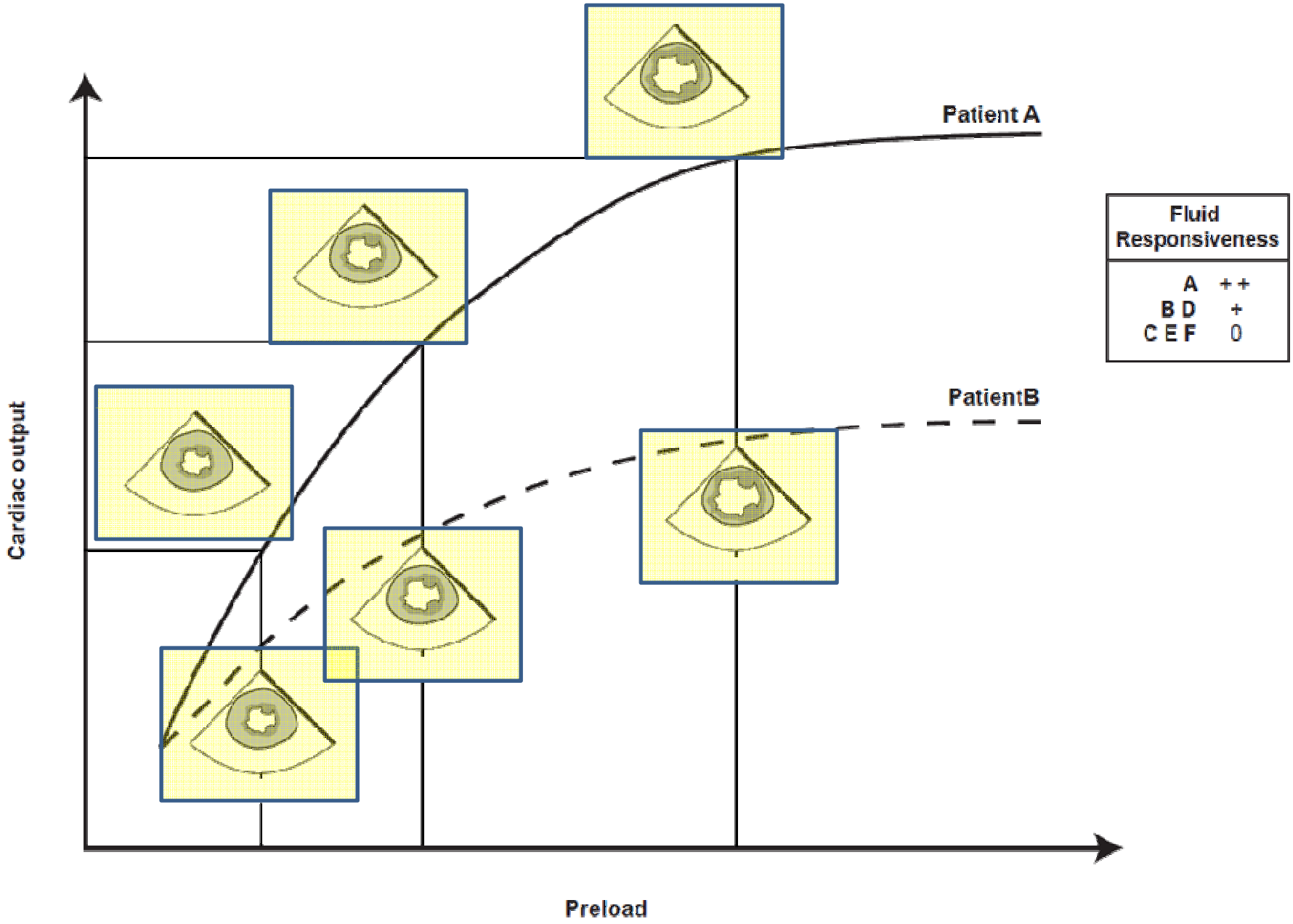
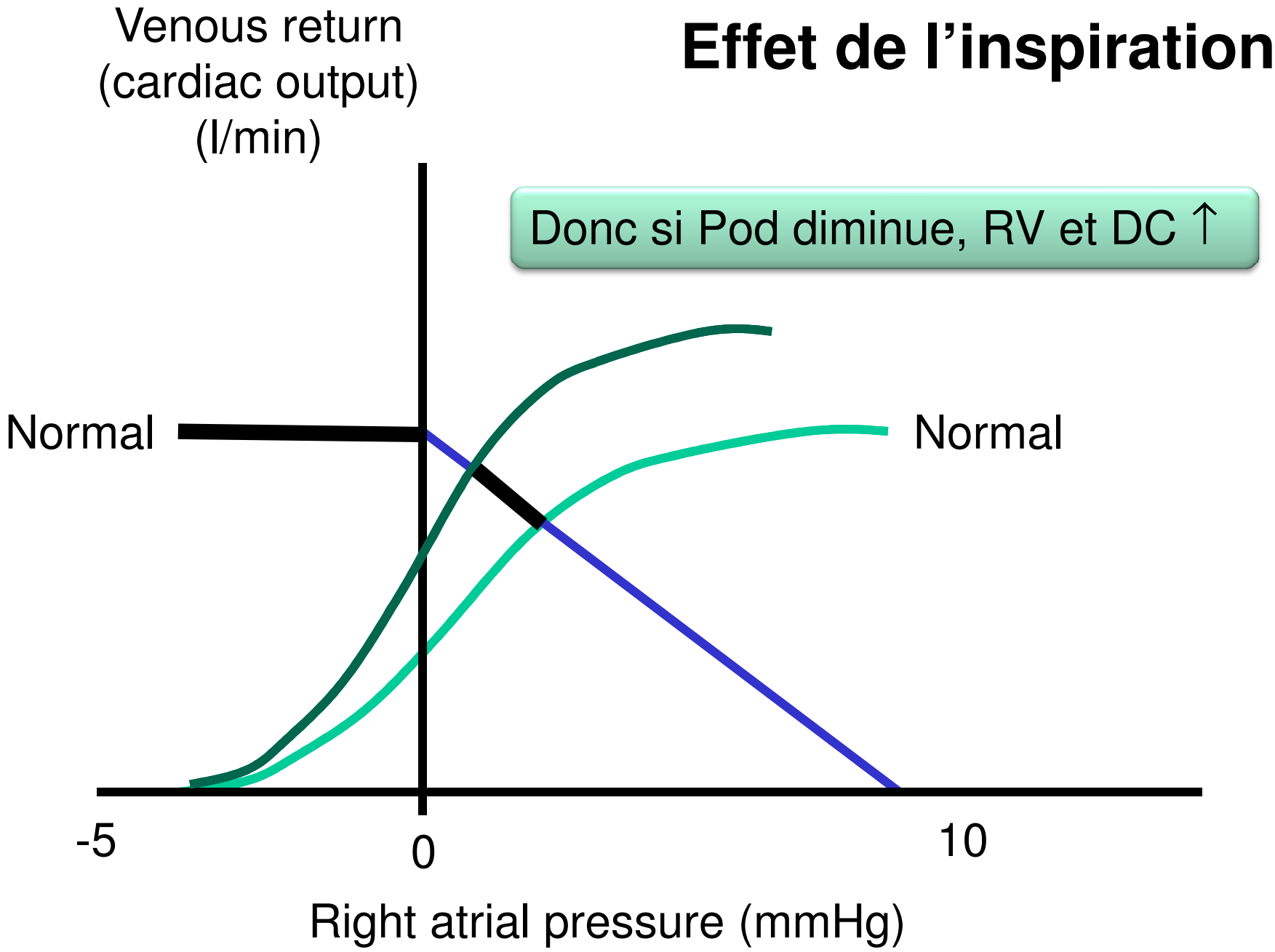


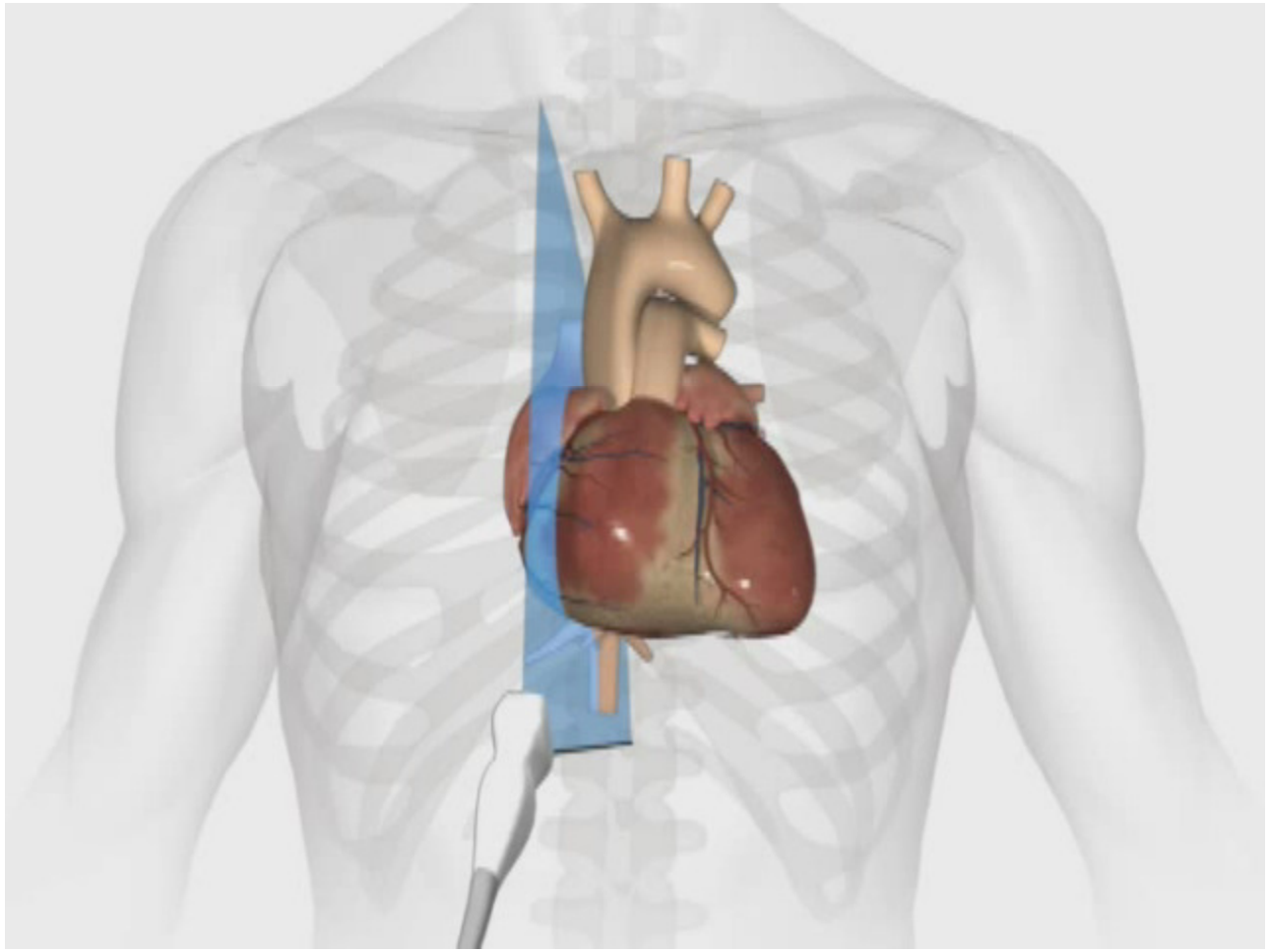
Limitation des mesures statiques d'aire ventriculaire



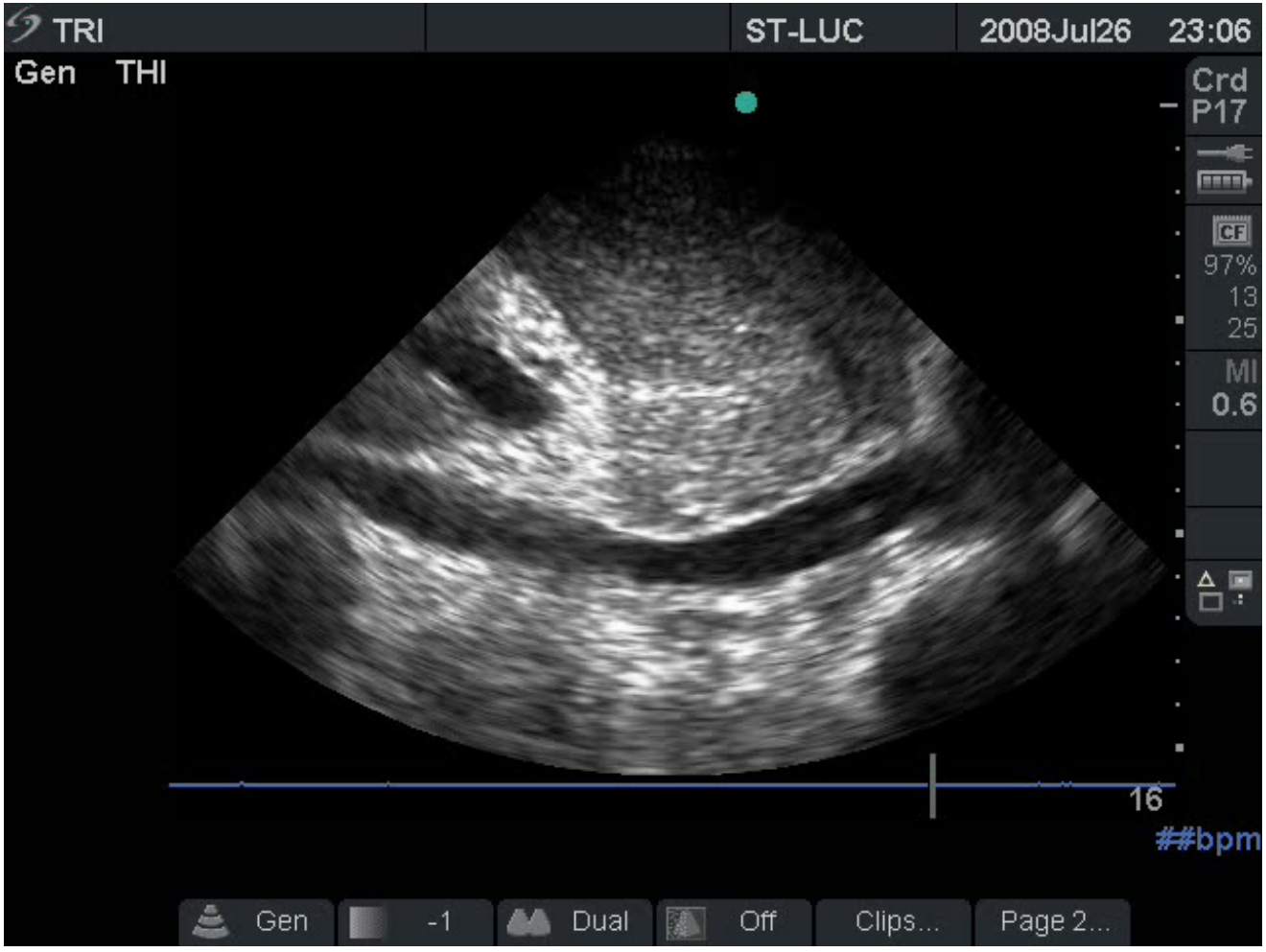
Effet de l'inspiration

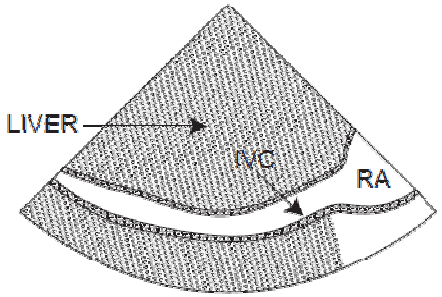


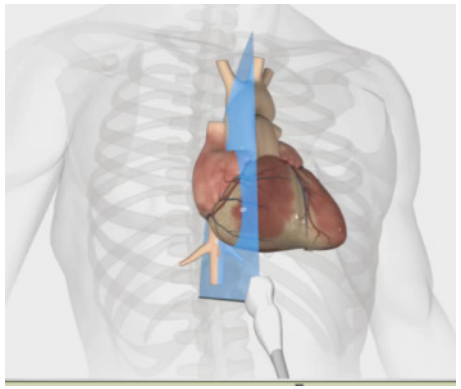
The 90°subcostal view



Normal or ↓ Pms



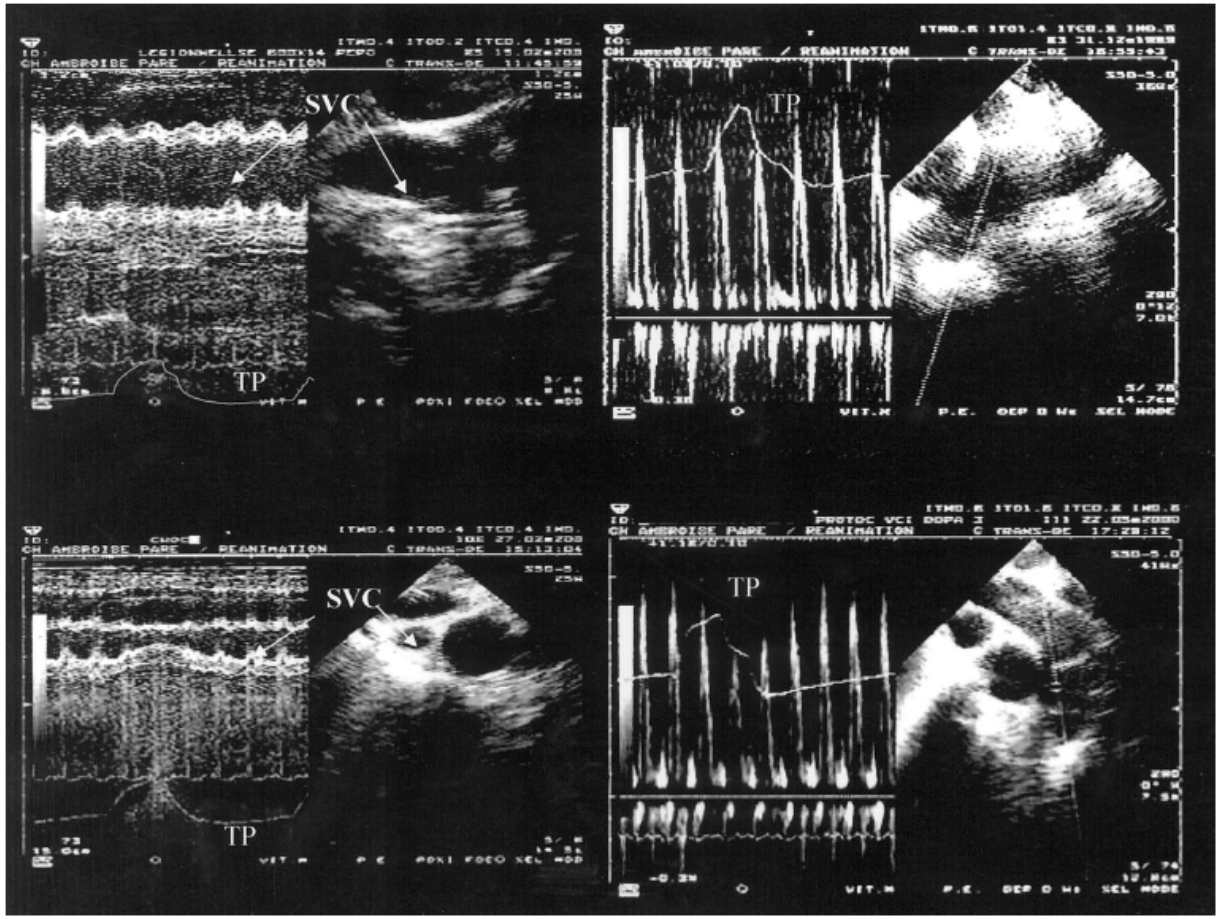


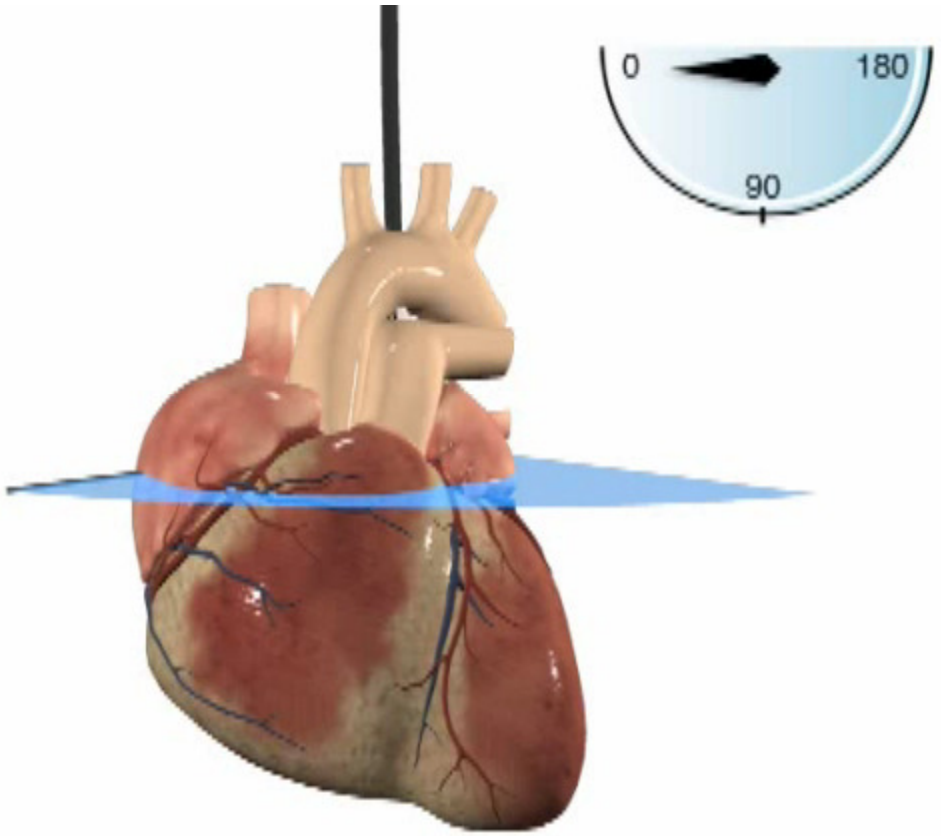


Anesthesiology 2001; 95:1083–8

Influence of Superior Vena Caval Zone Condition on Cyclic Changes in Right Ventricular Outflow during Respiratory Support

Antoine Vieillard-Baron, M.D., Roch Augarde, M.D.,† Sebastien Prin, M.D.,† Bernard Page, M.D.,‡ Alain Beauchet, M.D.,§ François Jardin, M.D.‖*

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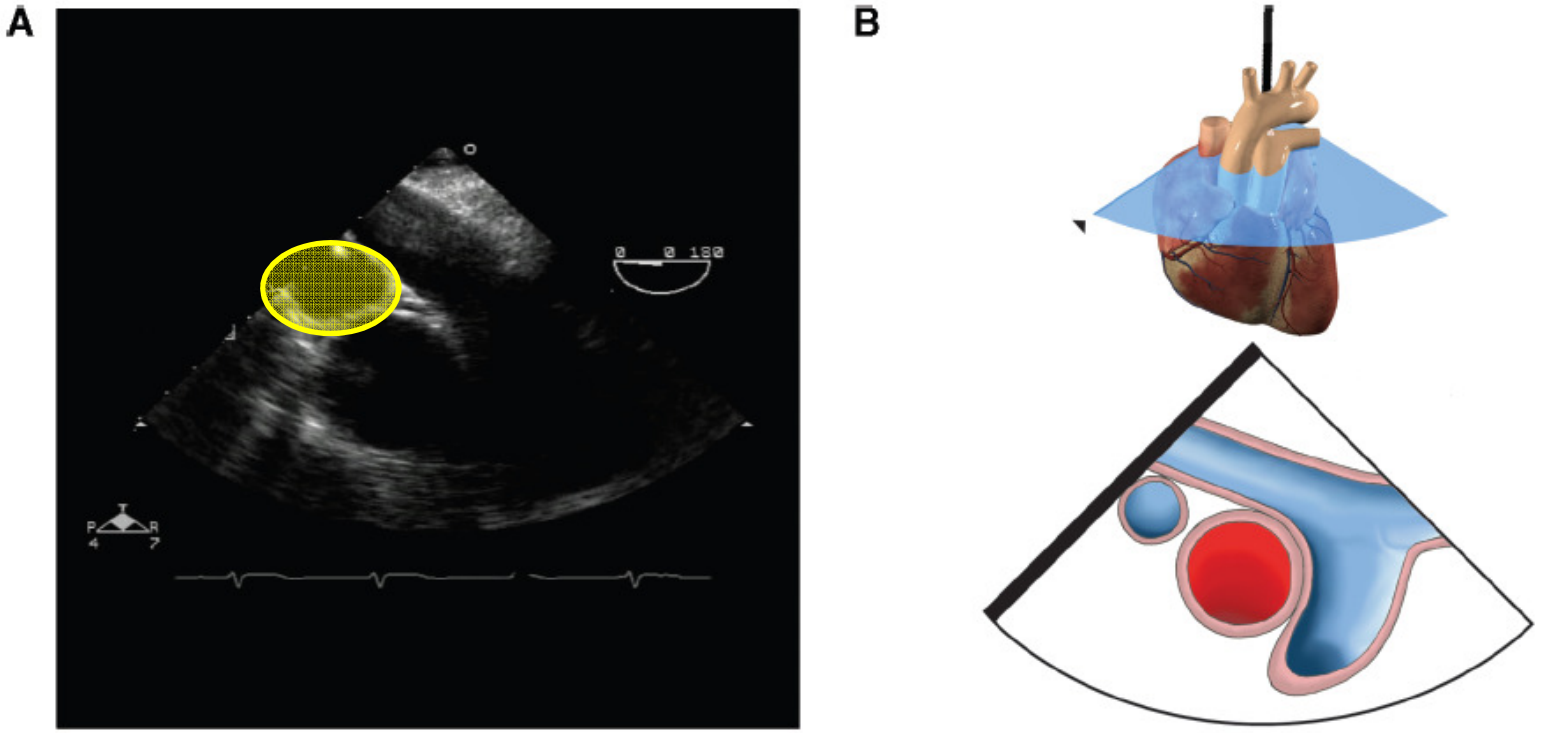
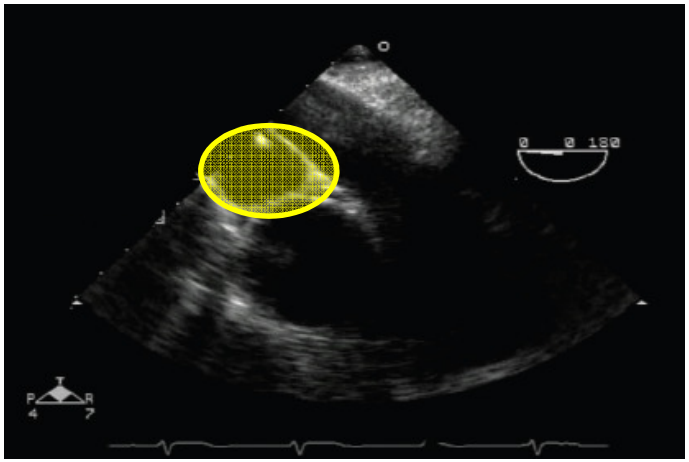
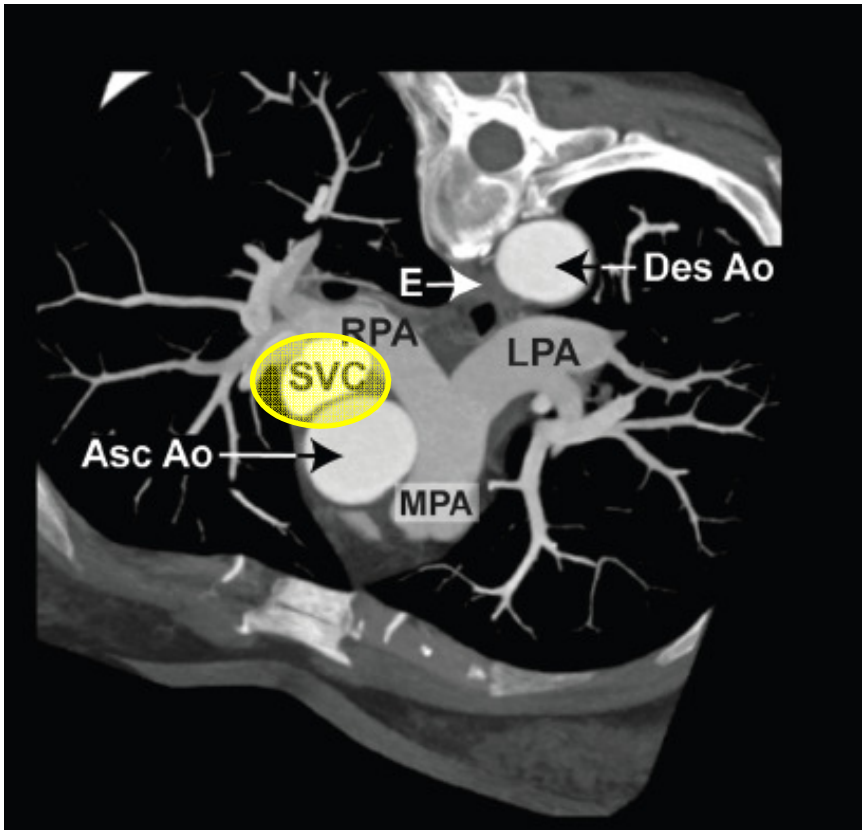
180
90

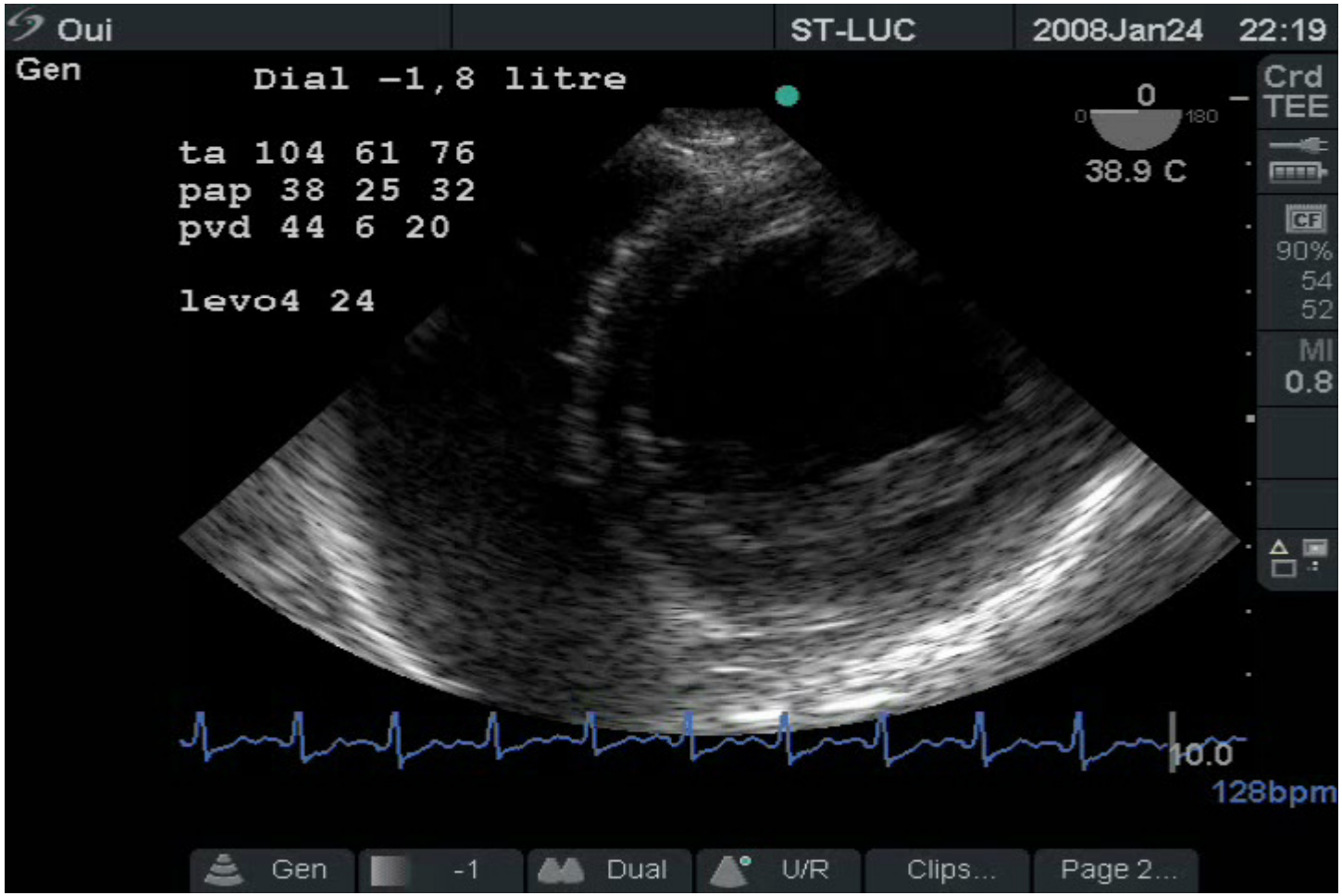
Mid-esophagienne aorte ascendante



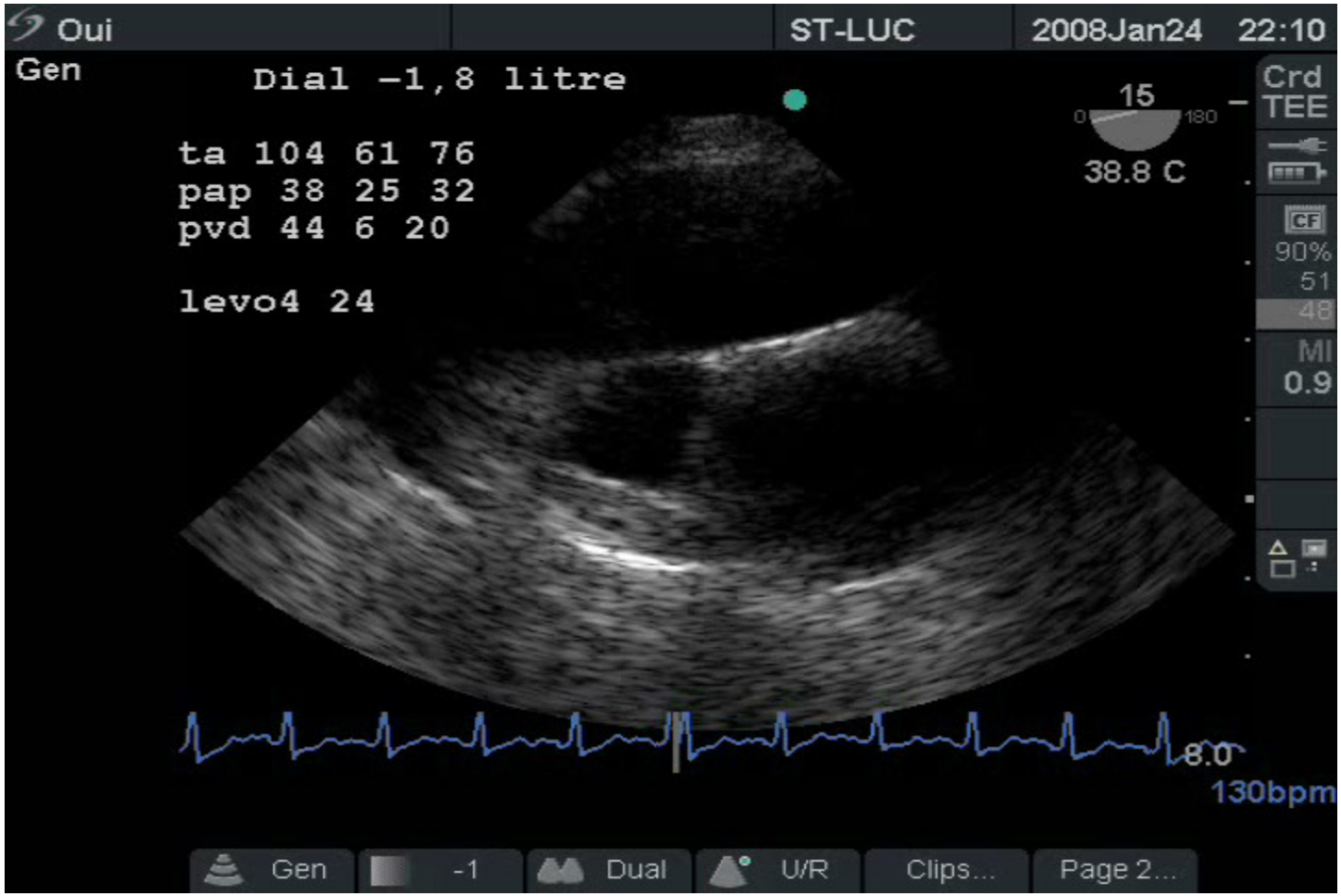


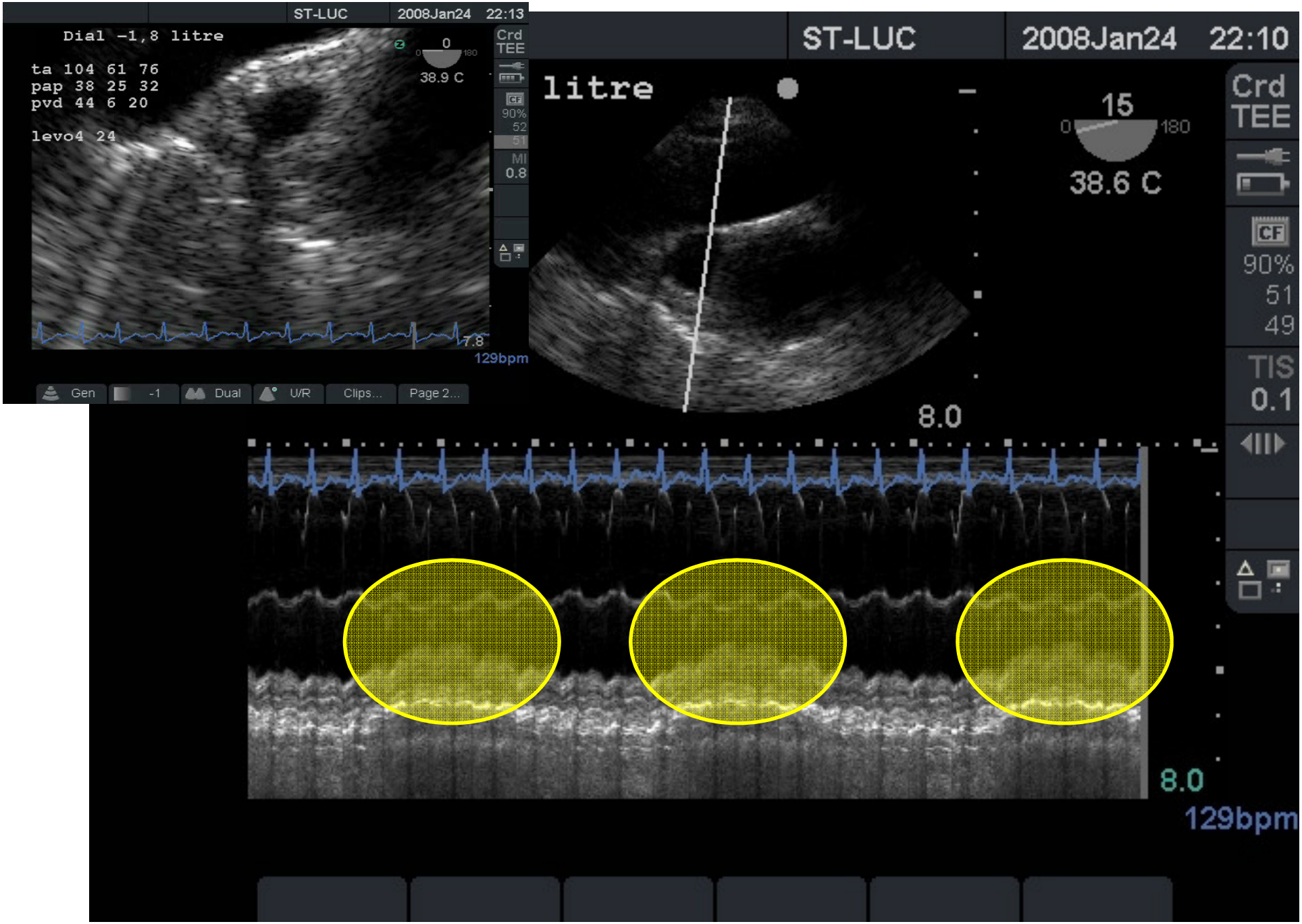

E
Des Ao
RPA
LPA
SVC
Asc Ao
MPA

Patient de 76 ans SI HSL: per-dialyse: coupe TG

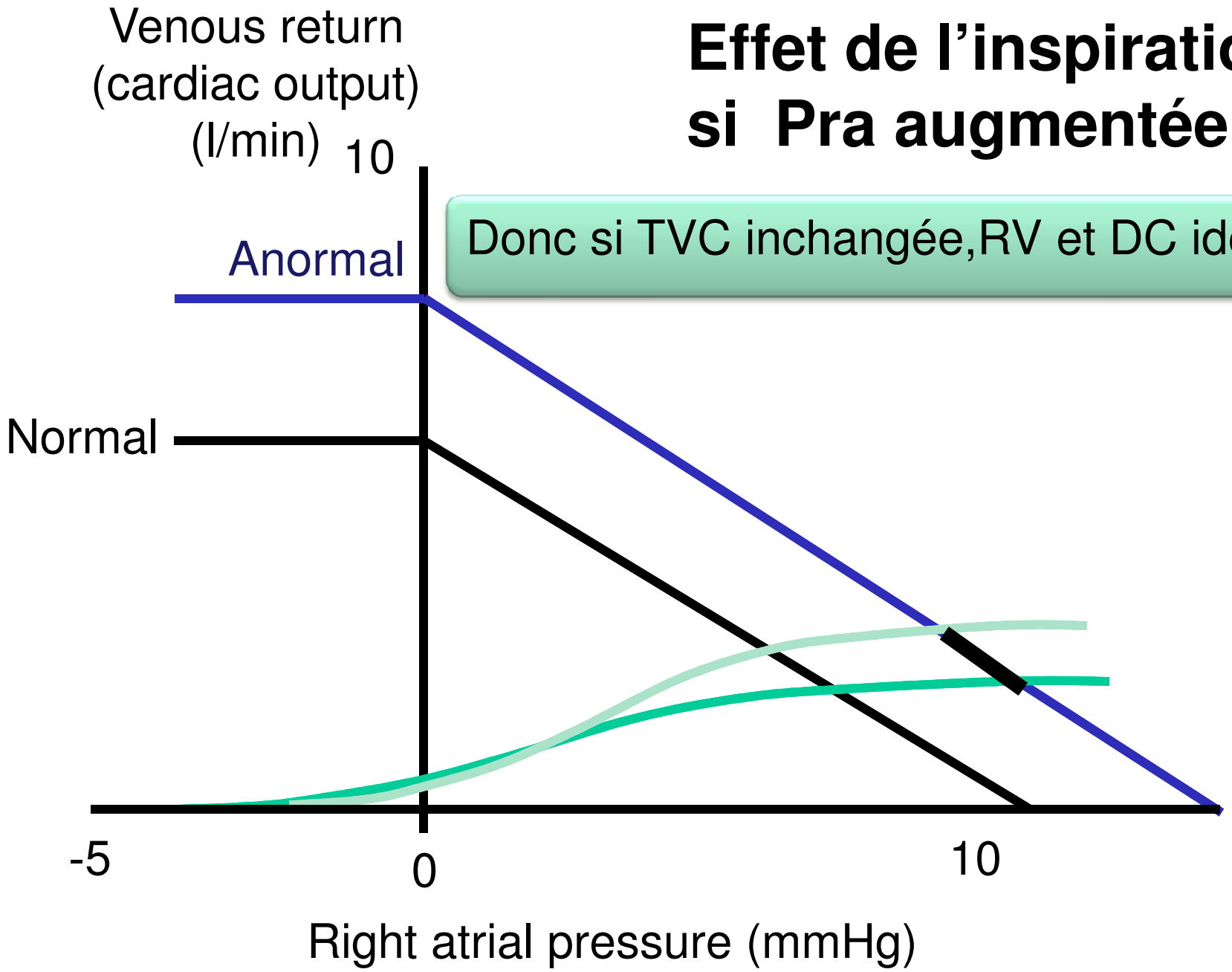


Patient de 76 ans SI HSL: per-dialyse: VCS




ST-LUC
2008Jan24
22:13
Dial -1,8 litre
ta 104 61 76
pap 38 25 32
pvd 44 6 20
levo4 24
38.9 C
Crd
TEE
90%
52
51
MI
0.8
7.8
129bpm
Gen
-1
Dual
U/R
Clips...
Page 2...
ST-LUC
2008Jan24
22:10
litre
15
38.6 C
Crd
TEE
CF
90%
51
49
TIS
0.1
8.0
8.0
129bpm

Effet de l'inspiration si Pra augmentée

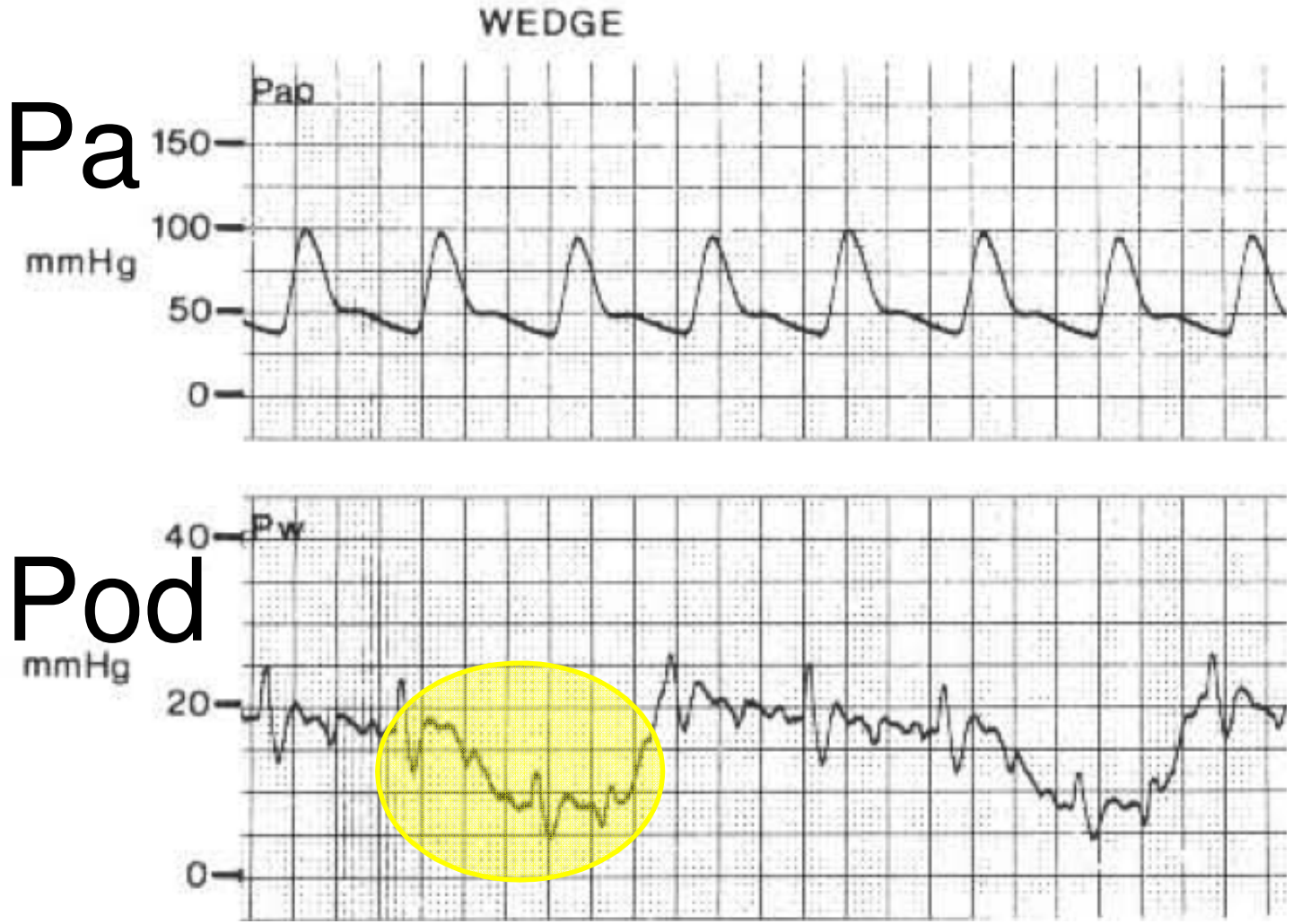


Donc si TVC inchangée,RV et DC idem

Adapated from: Jacobsohn et al Can J Anesth 1997 44:8 849-67

Respiratory Variations in Right Atrial Pressure Predict the Response to Fluid Challenge

Sheldon Magder, George Georgiadis, and T. Cheong



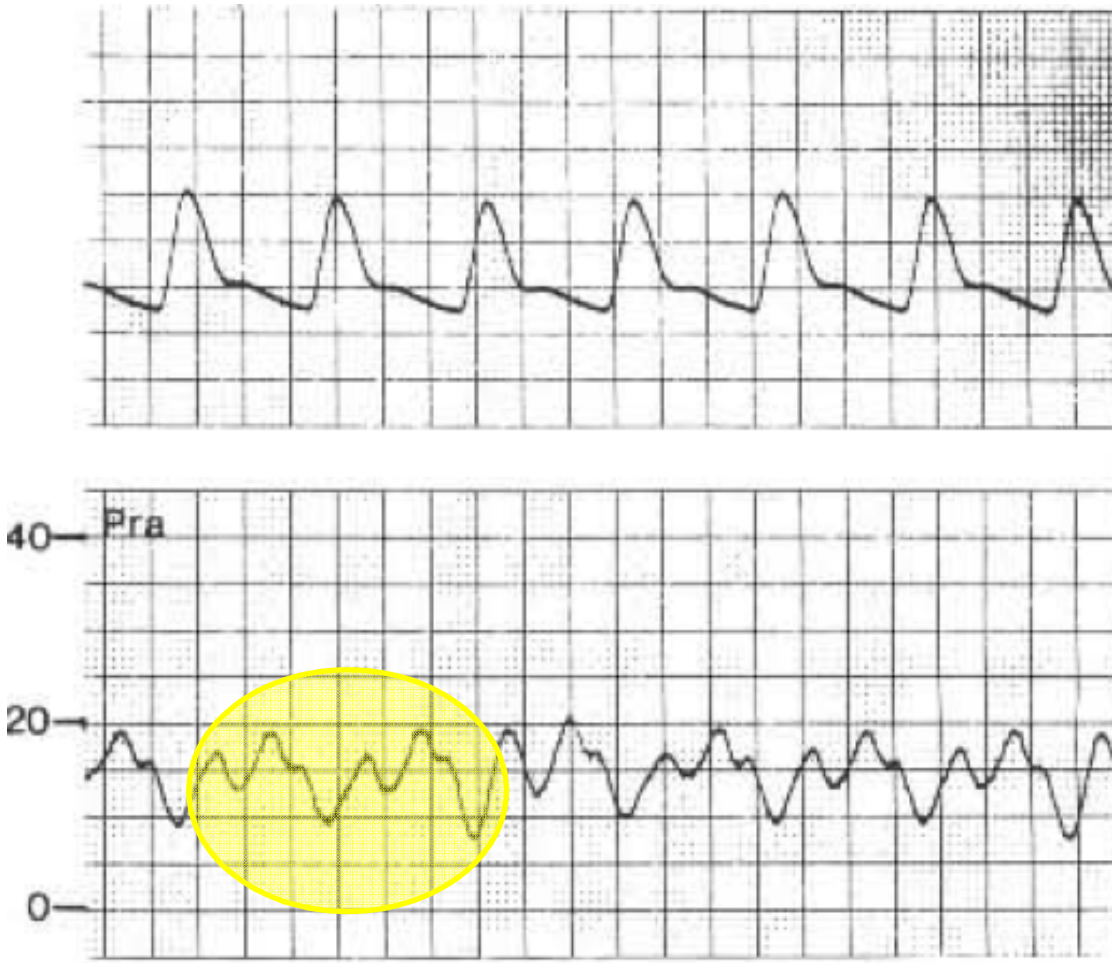
1982 JCCM

Respiratory Variations in Right Atrial Pressure Predict the Response to Fluid Challenge

Sheldon Magder, George Georgiadis, and T. Cheong

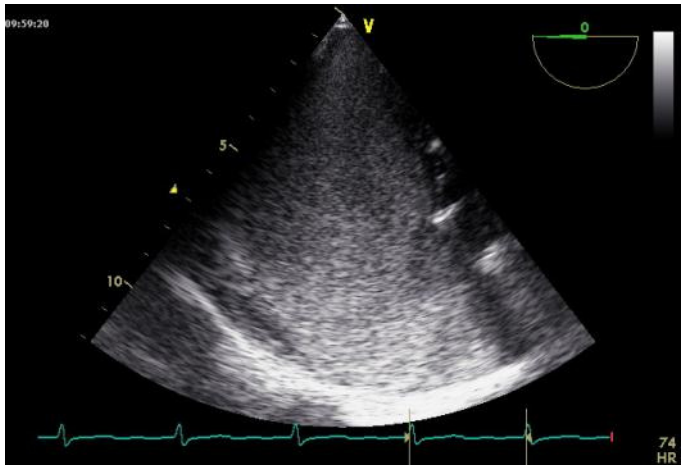
Pa

Pod

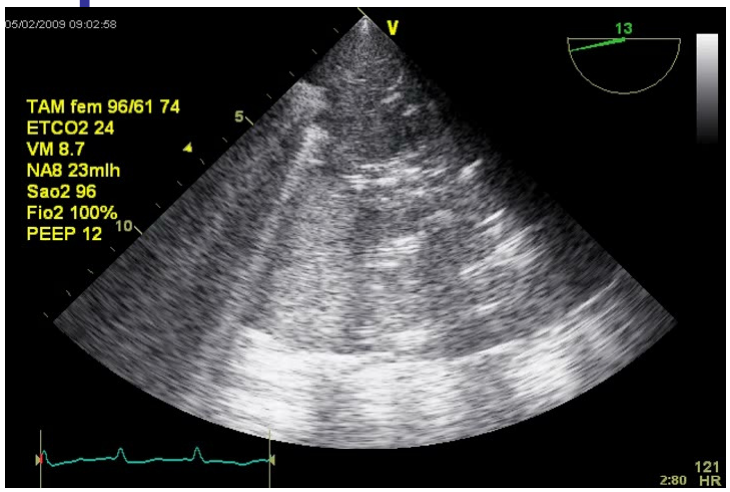


1982 JCCM

Si Pms réduit, et il réponds au volume: pourquoi?



Hémothorax

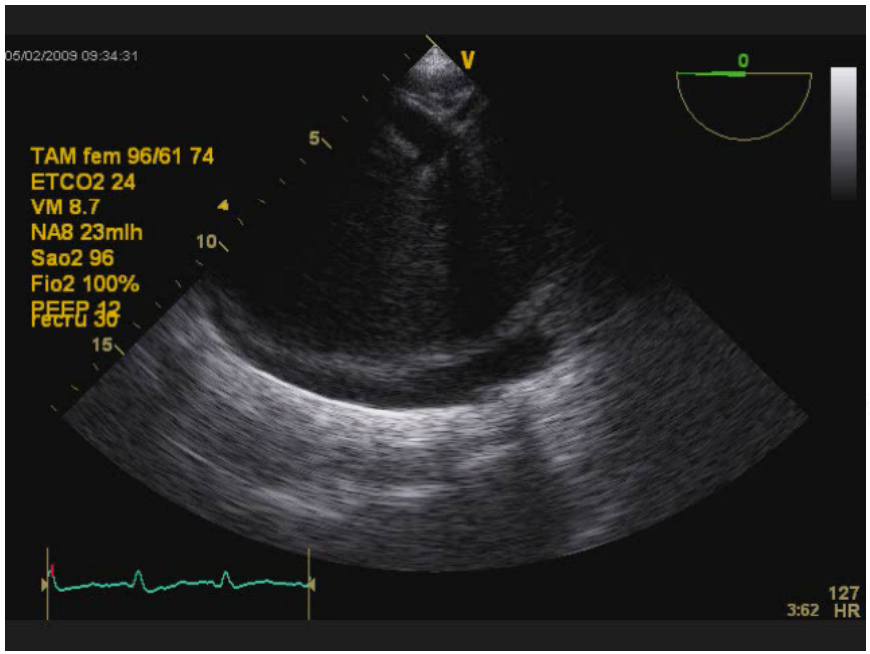


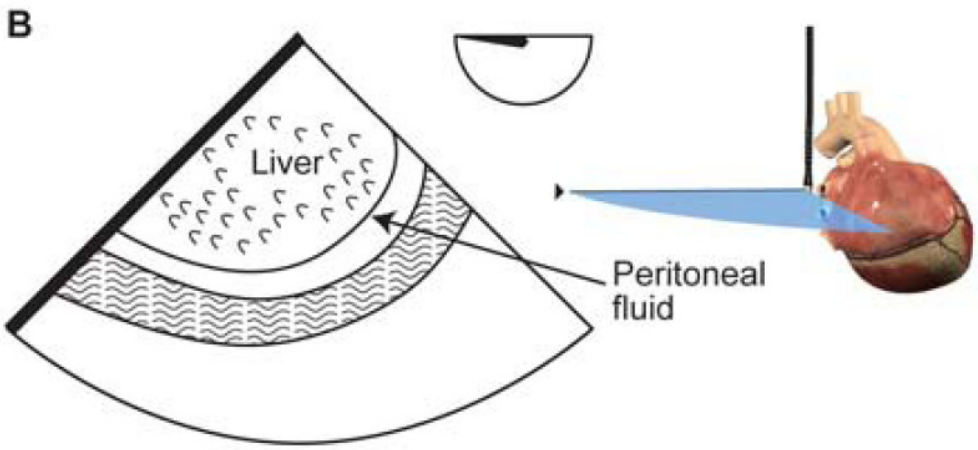
Pneumonie

Péritonite

Cholécystite aigue

Saignement abdominal





Most common condition associated with hemodynamic instability

1-↓ Pms: hypovolemia, vasodilatation

2-↑ Pra: Left and right systolic dysfunction

- Left and right diastolic dysfunction
- Left and right outflow tract obstruction
- Pulmonary emboli
- Hypoxia and hypercapnia

3-↑ Rrv: intrinsic obstruction and compartment syndrome (pericardial, mediastinal, thoracic, abdominal)

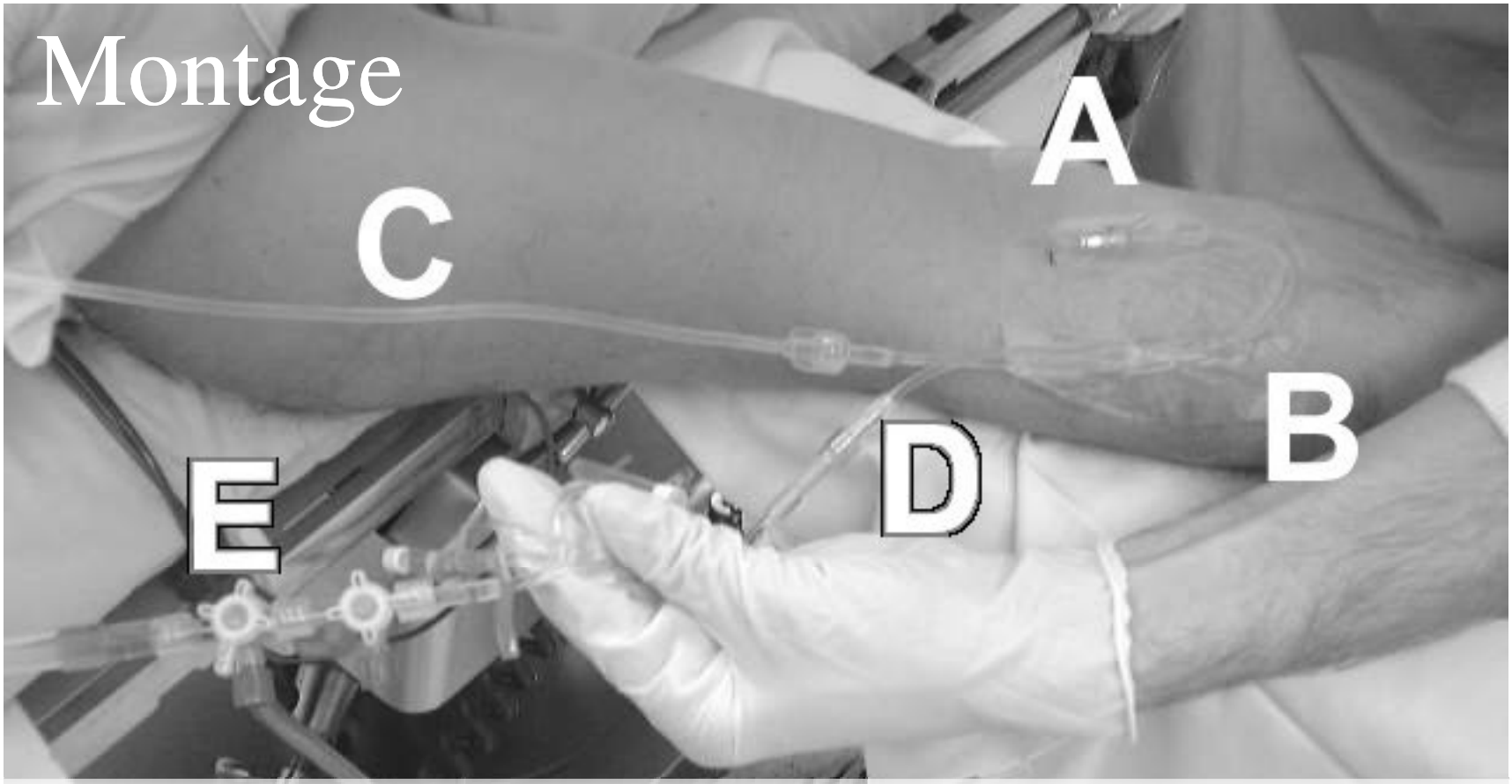
Intensive Care Med (2004) 30:627–632
DOI 10.1007/s00134-003-2052-0

ORIGINAL

Roger Desjardins
André Y. Denault
Sylvain Bélisle
Michel Carrier
Denis Babin
Sylvie Lévesque
Raymond Martineau

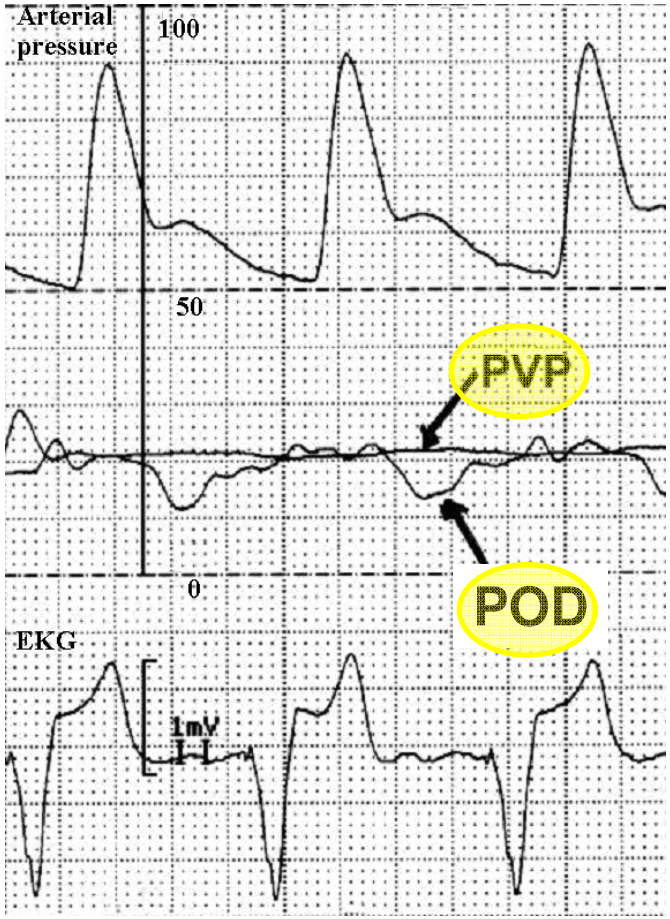
Can peripheral venous pressure be interchangeable with central venous pressure in patients undergoing cardiac surgery?

Montage



A-Intraveineuse
B-Connecteur en Y
C-Tubulure vers le capteur à pression où sera mesuré la PVP
D-Accès pour le soluté
E-Robinet pour alterner entre la mesure de PVP et le soluté

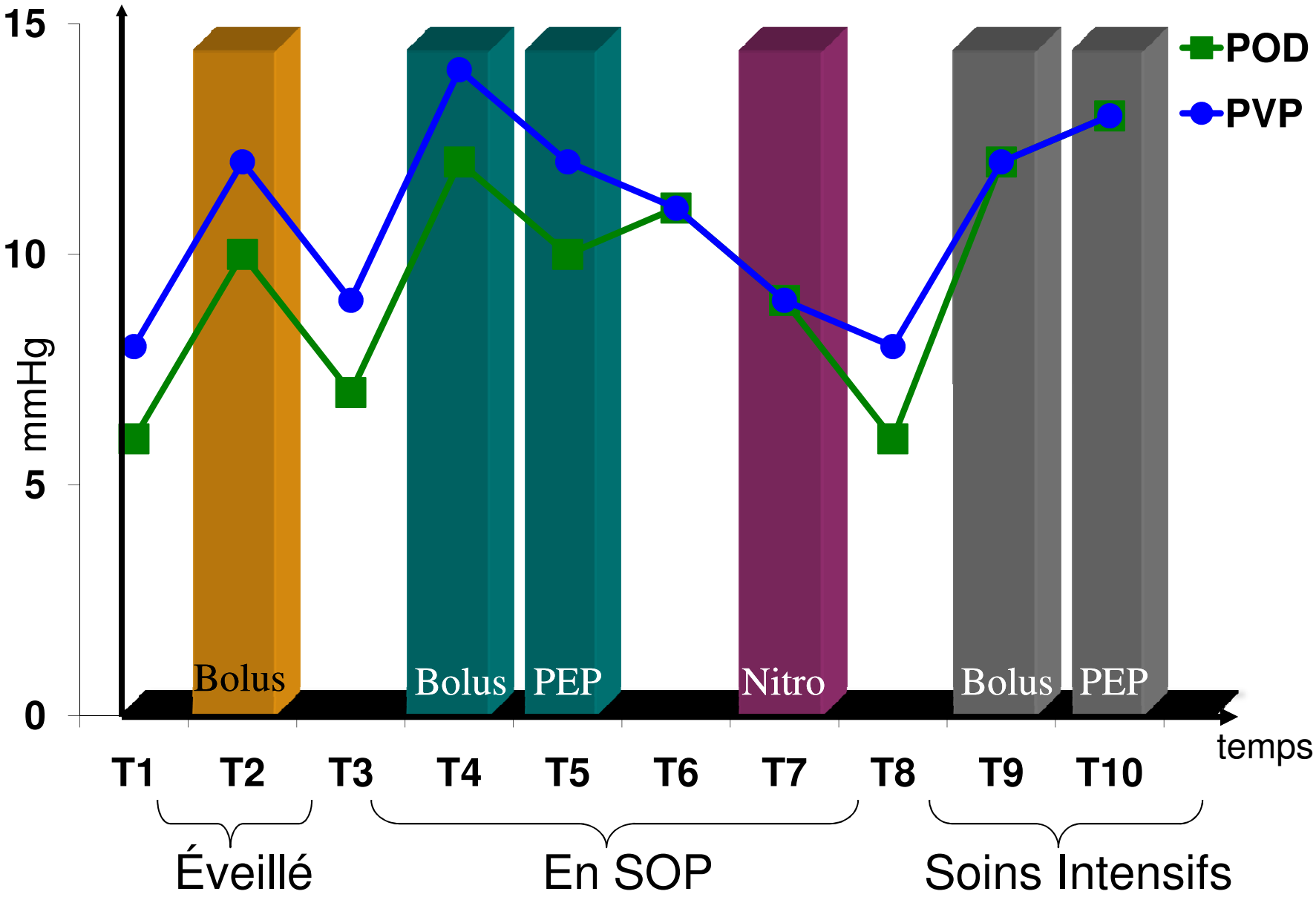
Exemple d'un tracé



Dans cet exemple, la valeur de la pression veineuse périphérique (PVP) en fin de diastole et en systole est similaire à la pression de l'oreillette droite (POD).

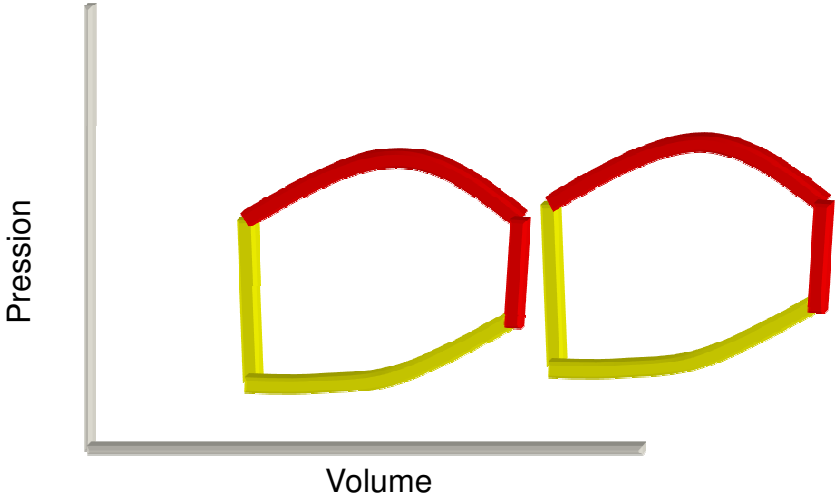
On observe un gradient en début de diastole entre les 2 valeurs.

Exemple d'un patient:

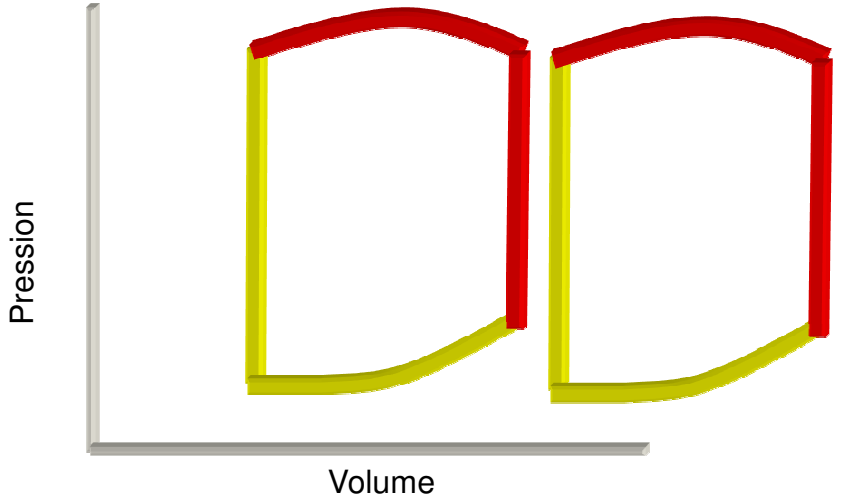


Dysfonction systolique

Courbe pression-volume ventriculaire droite

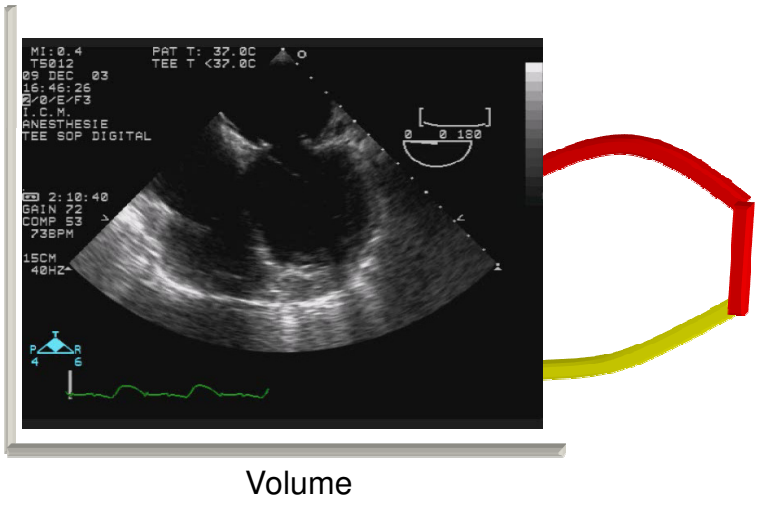


Courbe pression-volume ventriculaire gauche

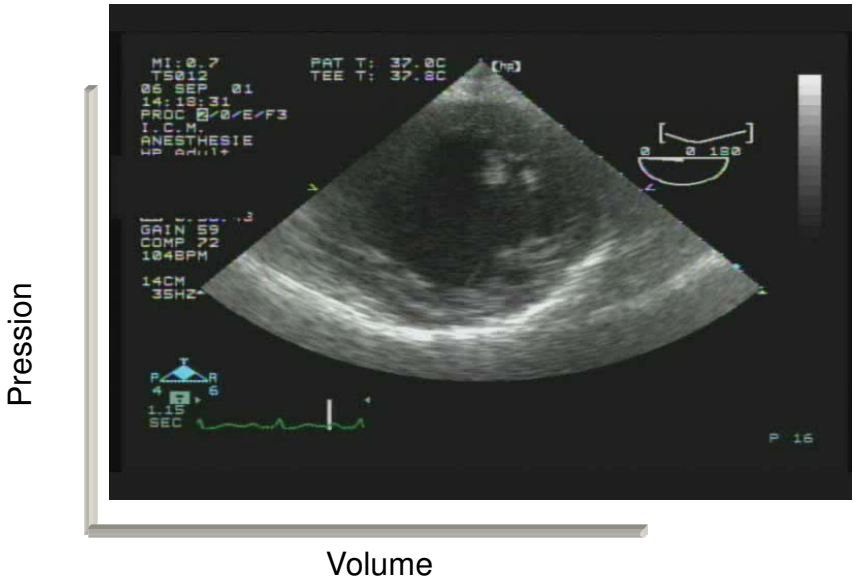


Dysfonction systolique

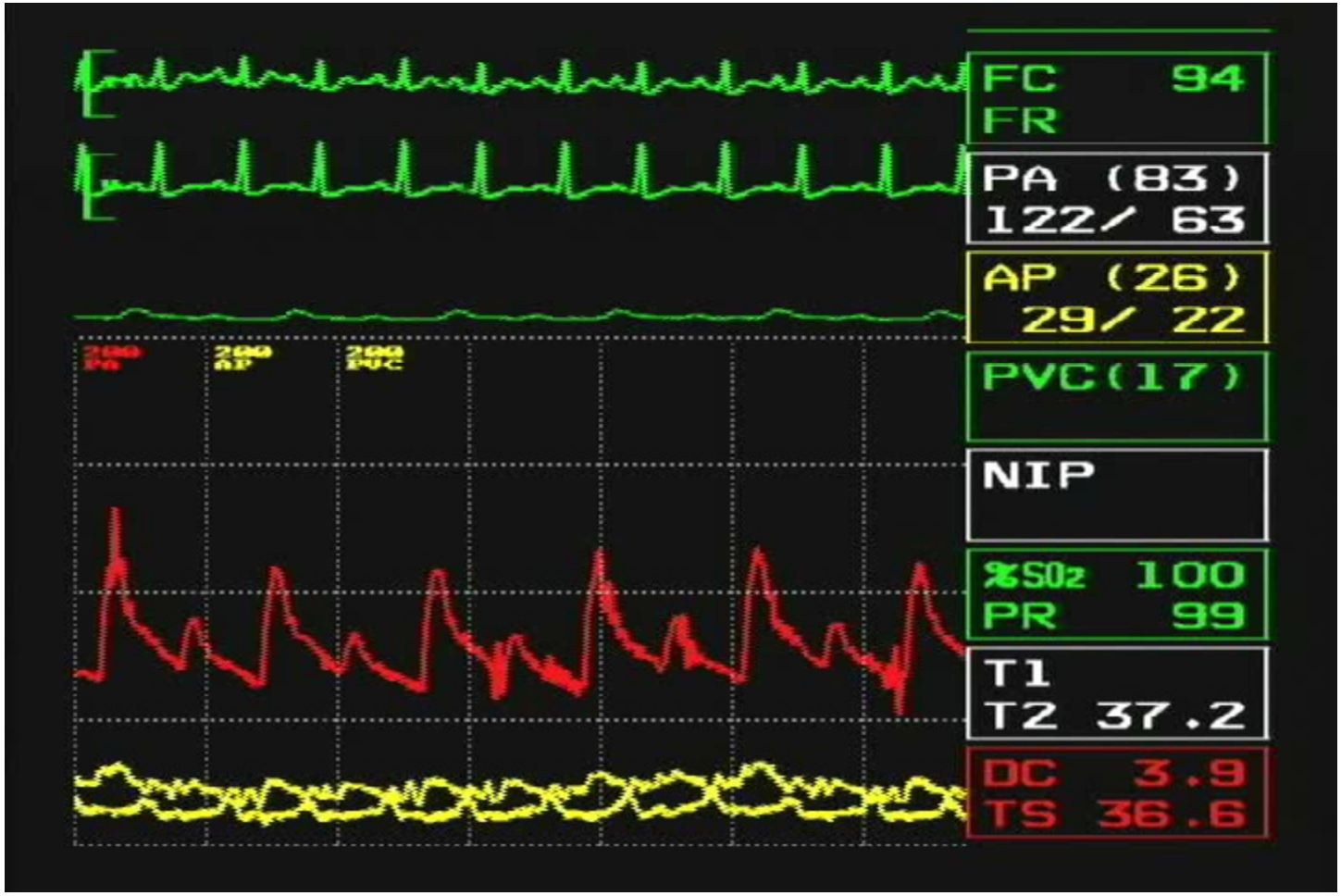
Courbe pression-volume ventriculaire droite

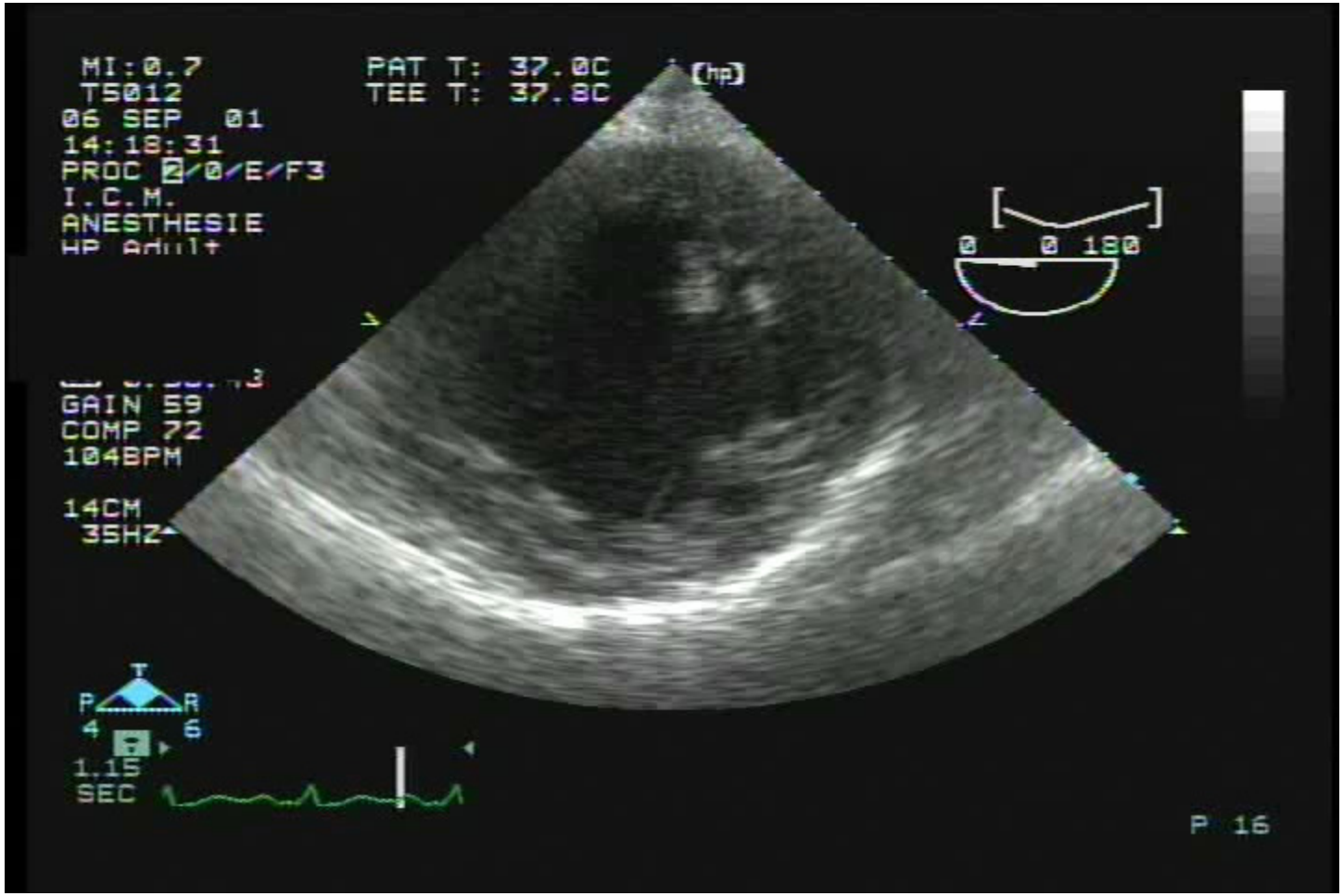


Courbe pression-volume ventriculaire gauche

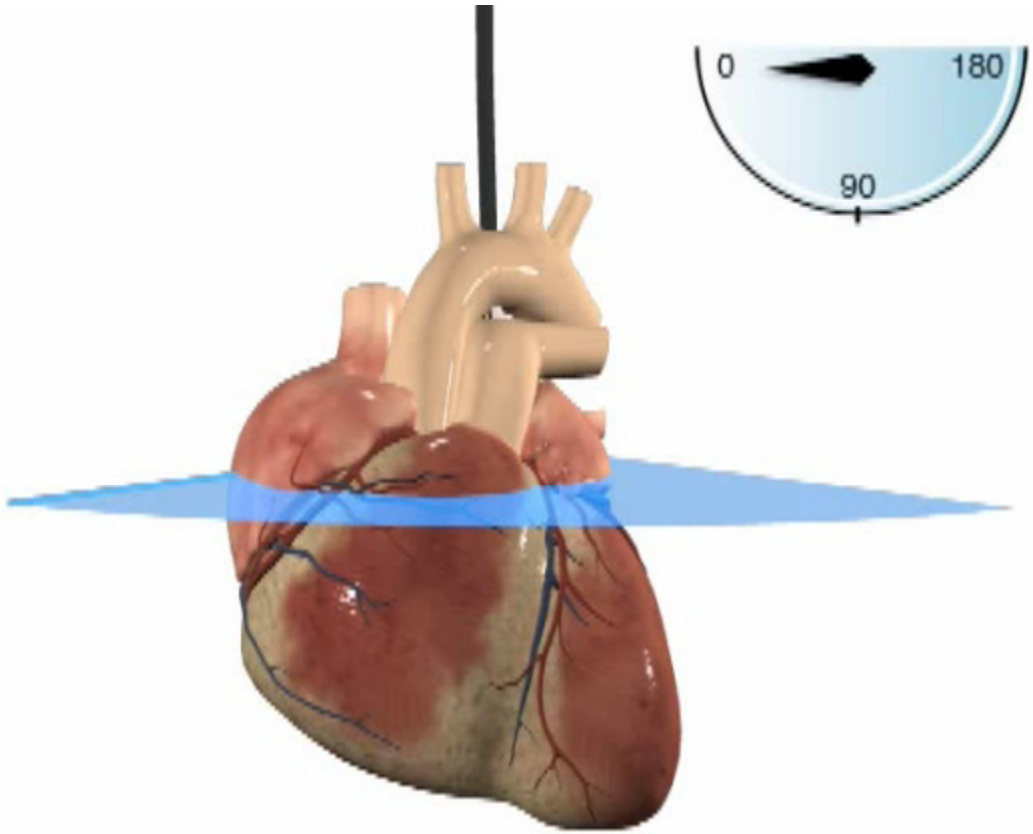


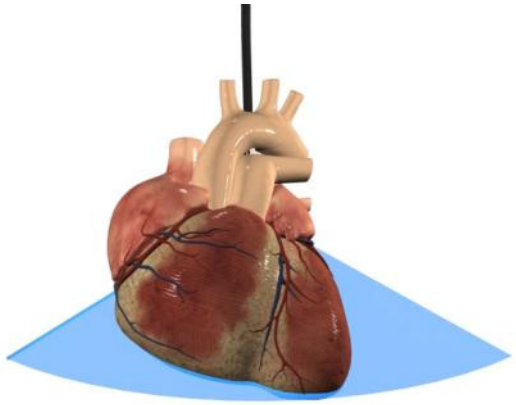
Patients instable: pourquoi?

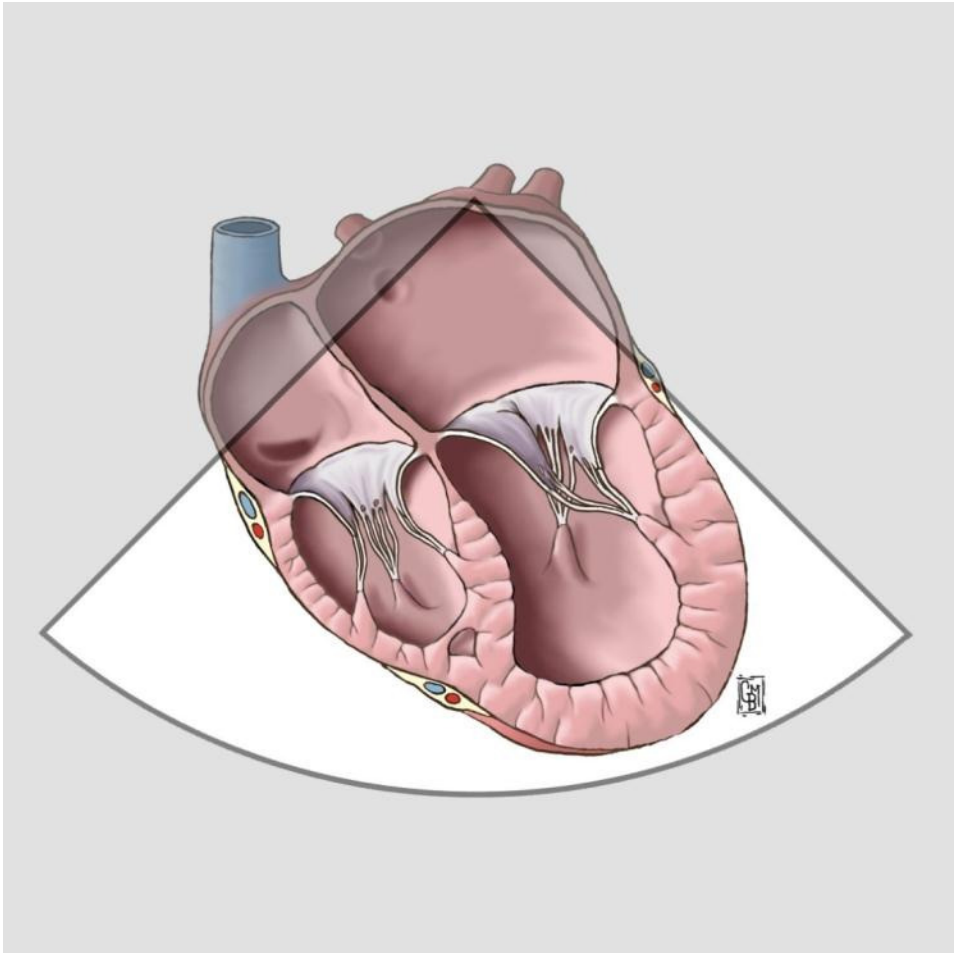


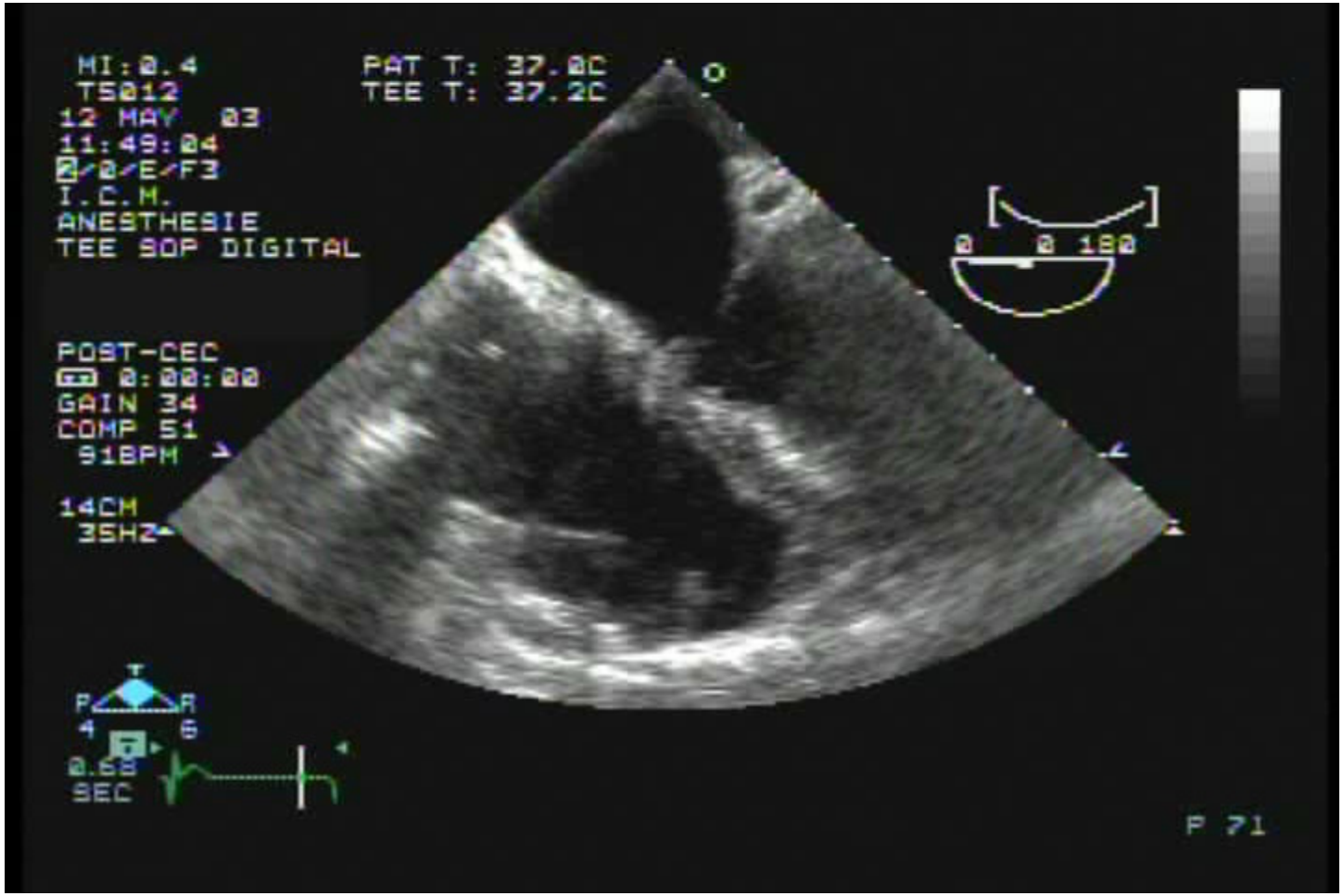

MI:0.7
T5012
06 SEP 01
14:18:31
PROC 2/0/E/F3
I.C.M.
ANESTHESIE
HP Adult
PAT T: 37.0C
TEE T: 37.8C
(hp)
0 0 180
GAIN 59
COMP 72
104BPM
14CM
35HZ
T
P R
4 6
1.15
SEC
P 16

Mid-esophageal four-chamber view








MI:0.4
T5012
12 MAY 03
11:49:04
I.C.M.
ANESTHESIE
TEE SOP DIGITAL
PAT T: 37.0C
TEE T: 37.2C
0 0 180
POST-CEC
0:00:00
GAIN 34
COMP 51
91BPM
14CM
35HZ
P 71

Most common condition associated with hemodynamic instability

1-↓ Pms: hypovolemia, vasodilatation

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Left and right diastolic dysfunction

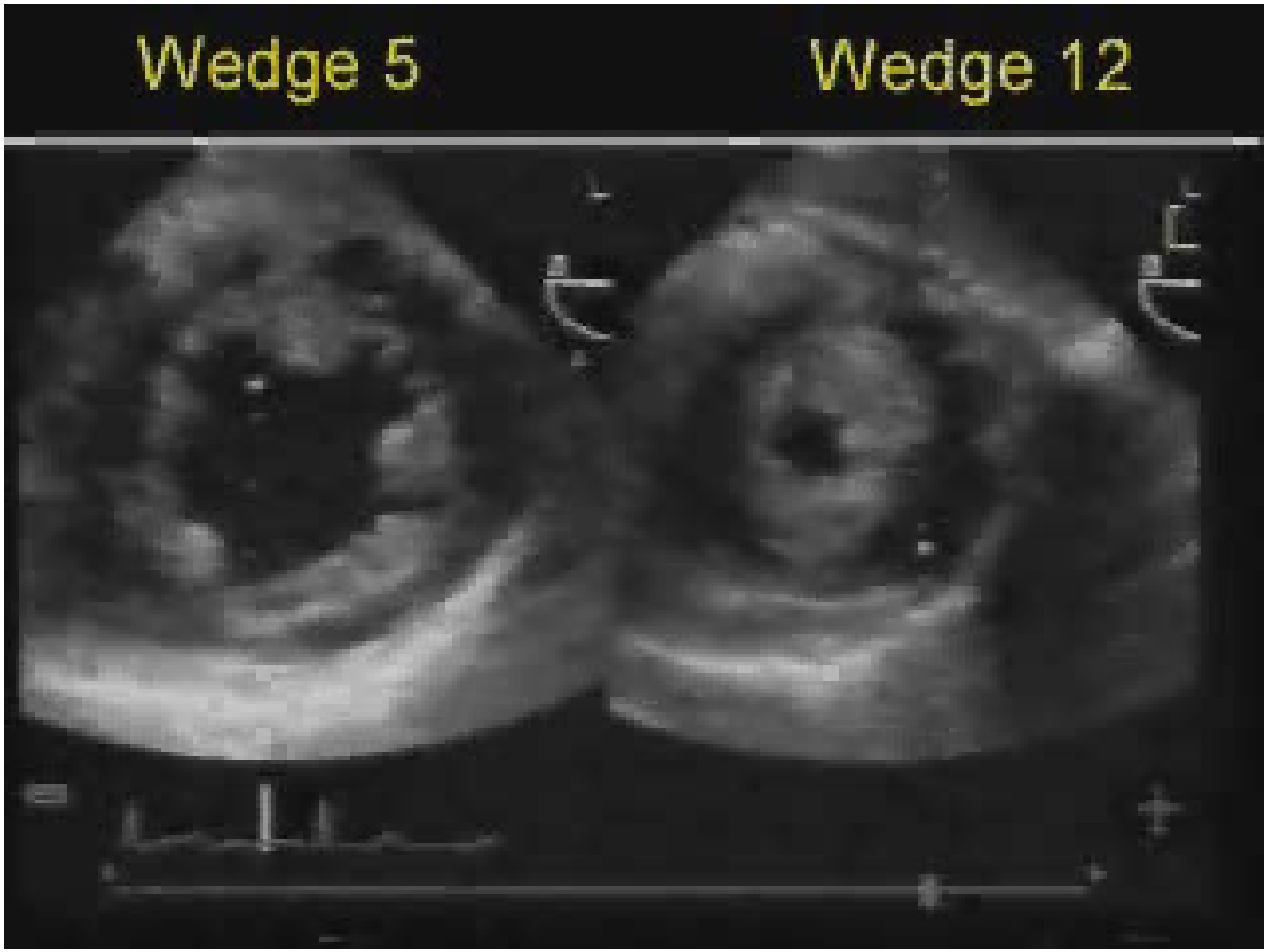
Left and right outflow tract obstruction

Pulmonary emboli

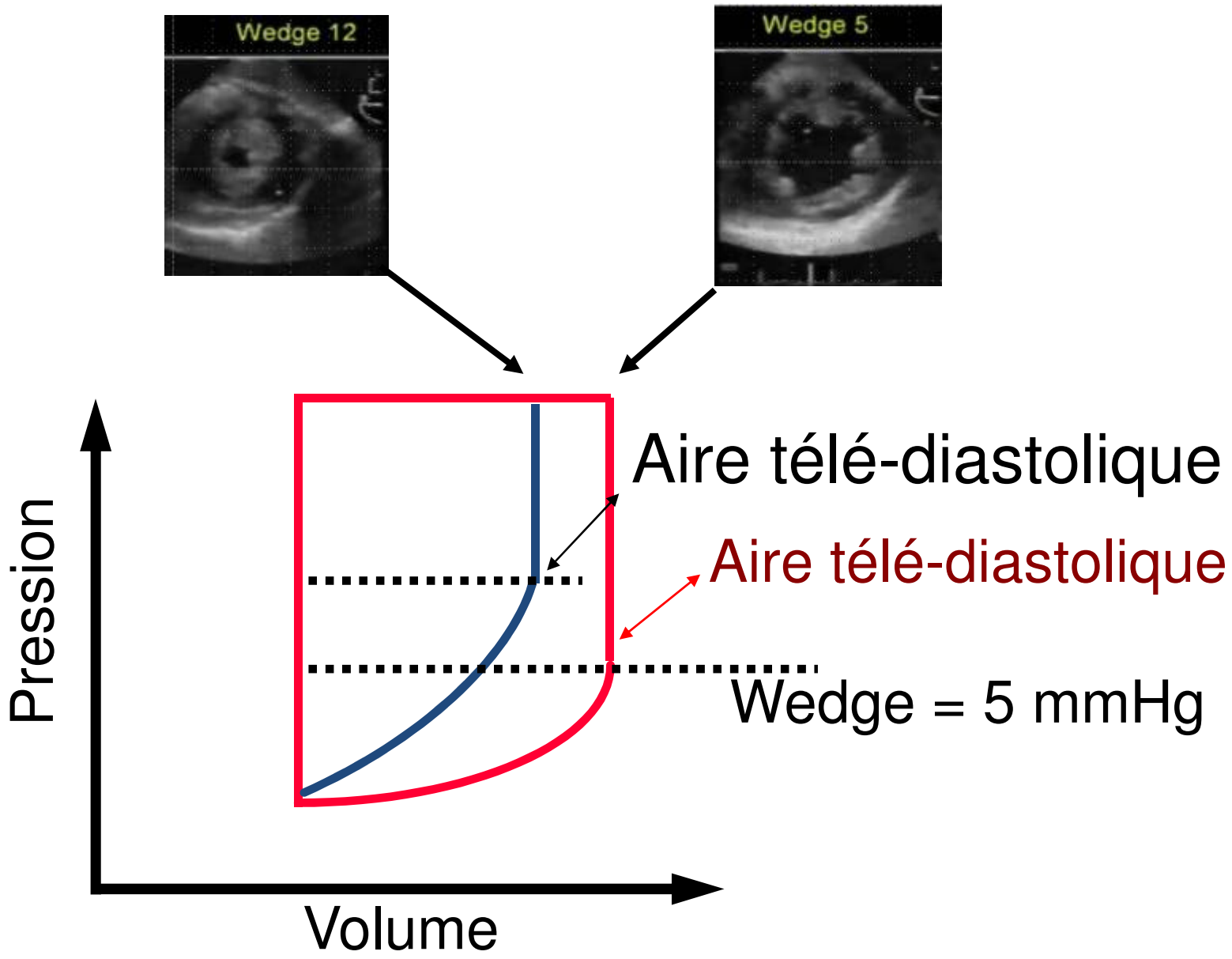
Hypoxia and hypercapnia

3-↑ Rrv: intrinsic obstruction and compartment syndrome (pericardial, mediastinal, thoracic, abdominal)

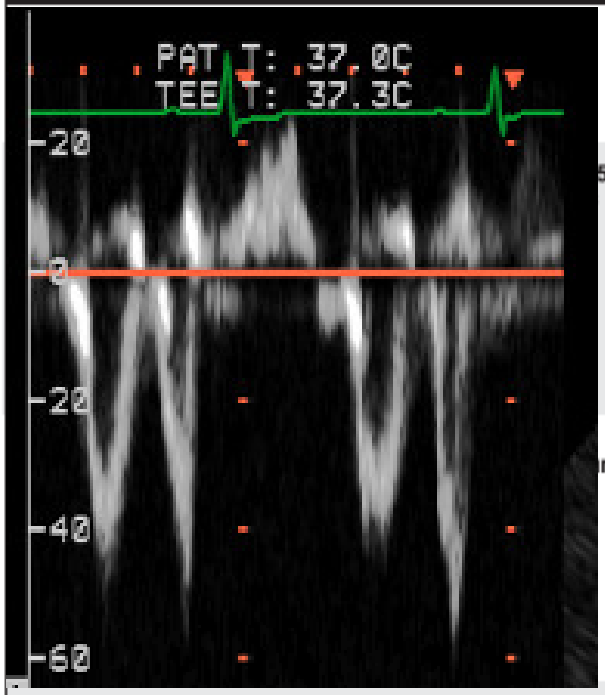
Dysfonction diastolique



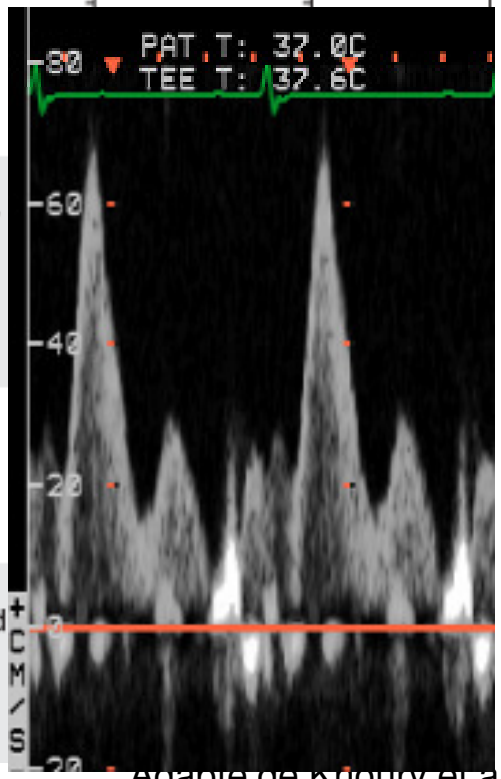
Dysfonction diastolique



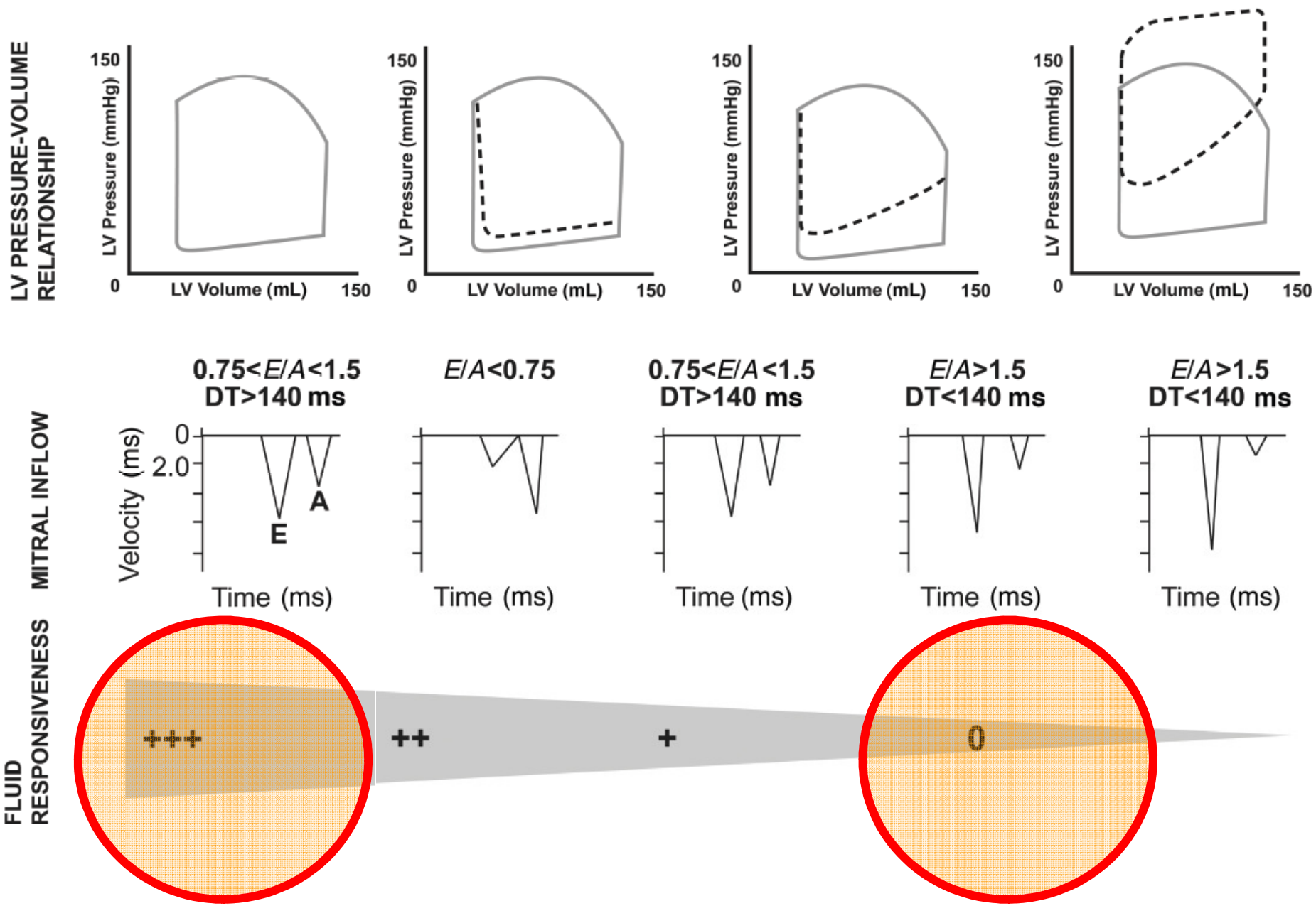
ECHOCARDOGRAPHIC CLASSIFICATION OF DIASTOLIC DYSFUNCTION



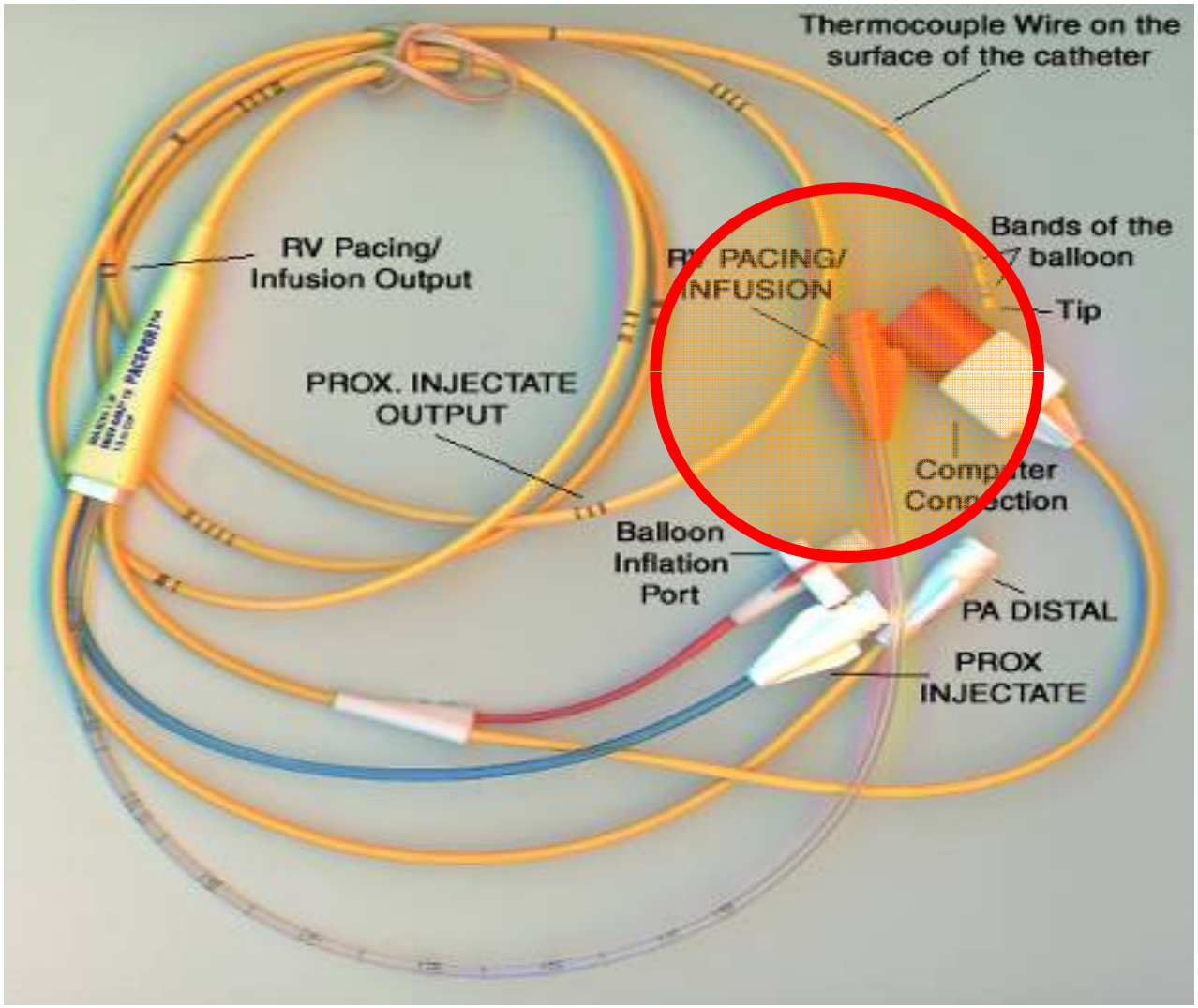
	Stage I Impaired relaxation	Stage II Pseudonormal	Stage III Reversible Restrictive	Stage IV Fixed Restrictive
	E/A<0.75	0.75<E/A<1.5 DT>140 ms	E/A>1.5 DT<140 ms	E/A>1.5 DT<140 ms
	Time (ms)	Time (ms)	Time (ms)	Time (ms)
	S>D AR dur<A dur	S<D or AR dur>A dur + 30 ms	S<D or AR dur>A dur + 30 ms	S<D or AR dur>A dur + 30 ms
	Time (ms)	Time (ms)		
COLOR M-MODE PROPOGATION VELOCITY	Vp>45 Velocity 0 Time (ms)	Vp<45 Time (ms)	Vp<45 Time (ms)	
DOPPLER TISSUE IMAGING OF MITRAL ANNULAR MOTION	E/Em<10 Velocity (ms) 0.15 0 Time (ms)	E/Em<10 Time (ms)	E/Em≥10 Time (ms)	
LV RELAXATION	Normal	Impaired	Impaired	
LV COMPLIANCE	Normal	Normal to ▼	▼▼	
ATRIAL PRESSURE	Normal	Normal	▲▲	

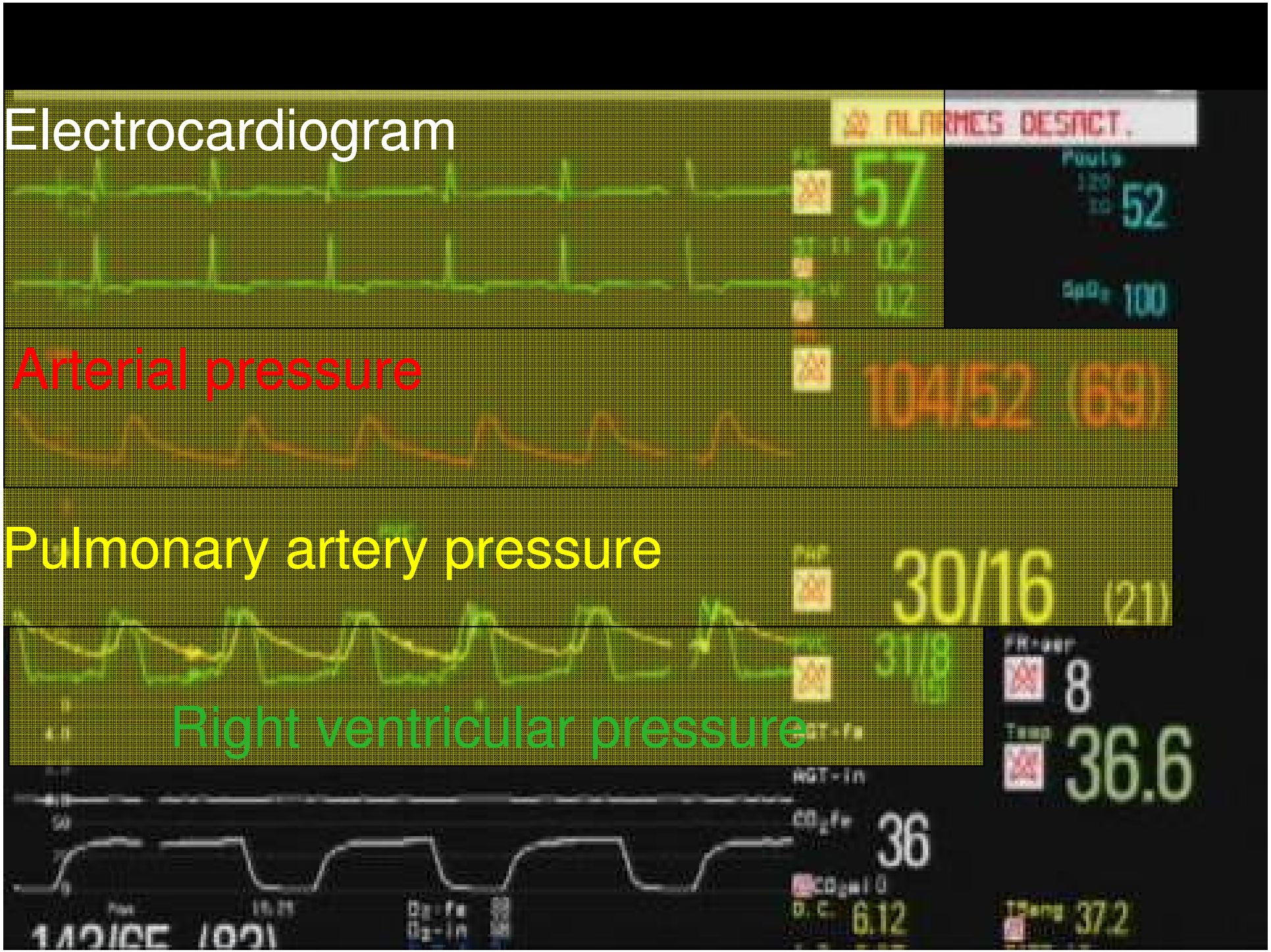


Adapté de Khoury et al JASE 2004


LV PRESSURE-VOLUME RELATIONSHIP
150
LV Pressure (mmHg)
0
LV Volume (mL)
150
MITRAL INFLOW
0.75<E/A<1.5
DT>140 ms
E/A<0.75
0.75<E/A<1.5
DT>140 ms
E/A>1.5
DT<140 ms
E/A>1.5
DT<140 ms
Velocity (ms)
2.0
E
A
Time (ms)
FLUID RESPONSIVENESS
+++
++
+
0

Diagnosis of RV dysfunction

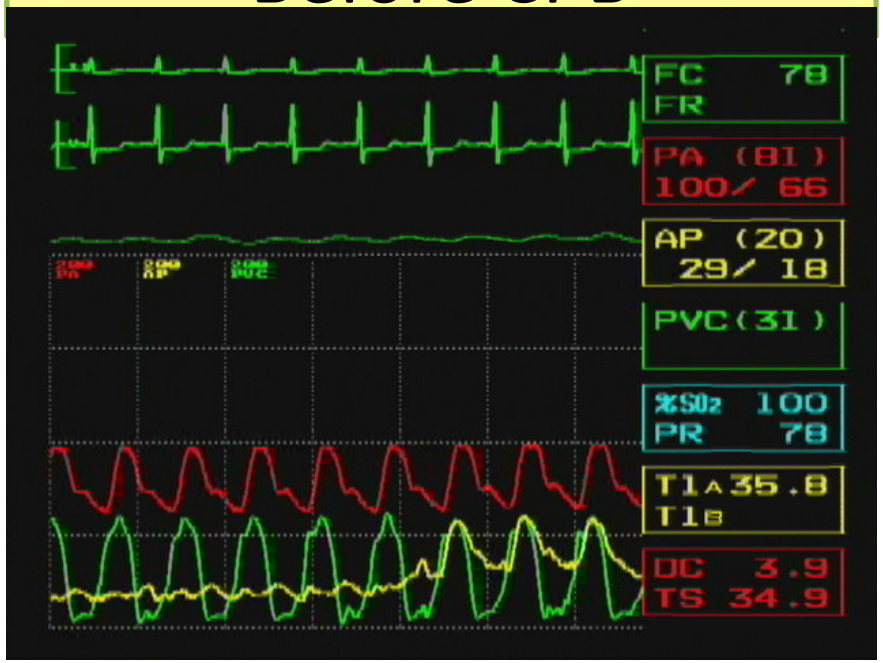


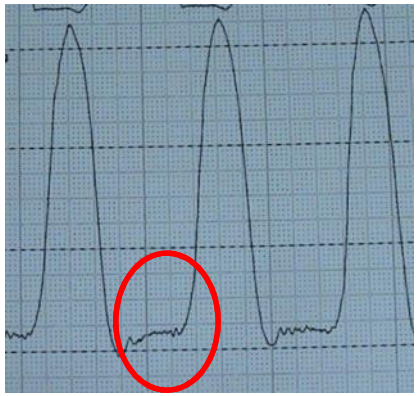

Electrocardiogram
ALARMES DESACT.
57
52
100
Arterial pressure
30/16 (21)
Pulmonary artery pressure
8
36.6
Right ventricular pressure
36
6.12
37.2

Visual and hemodynamic assessment

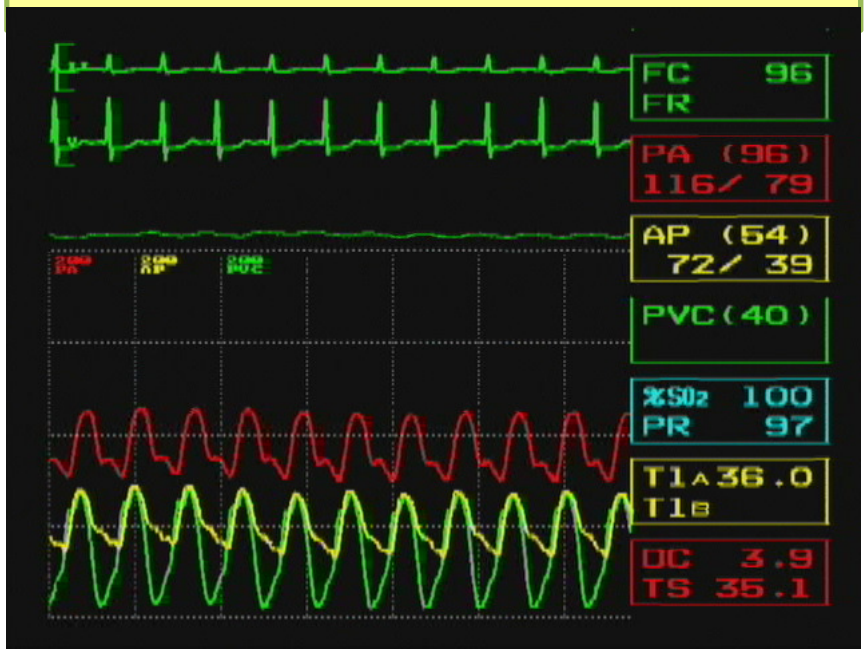
56 yo ♂ RV dysfunction after AVR

Before CPB

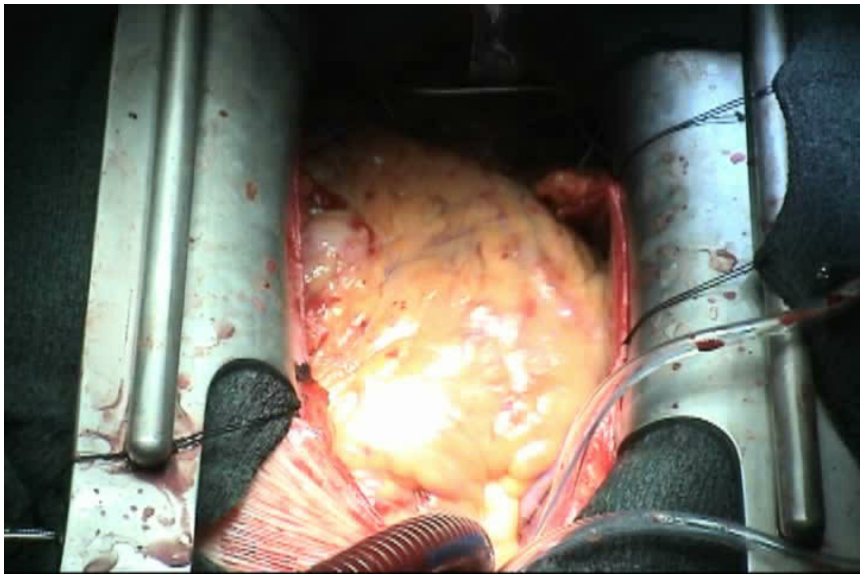


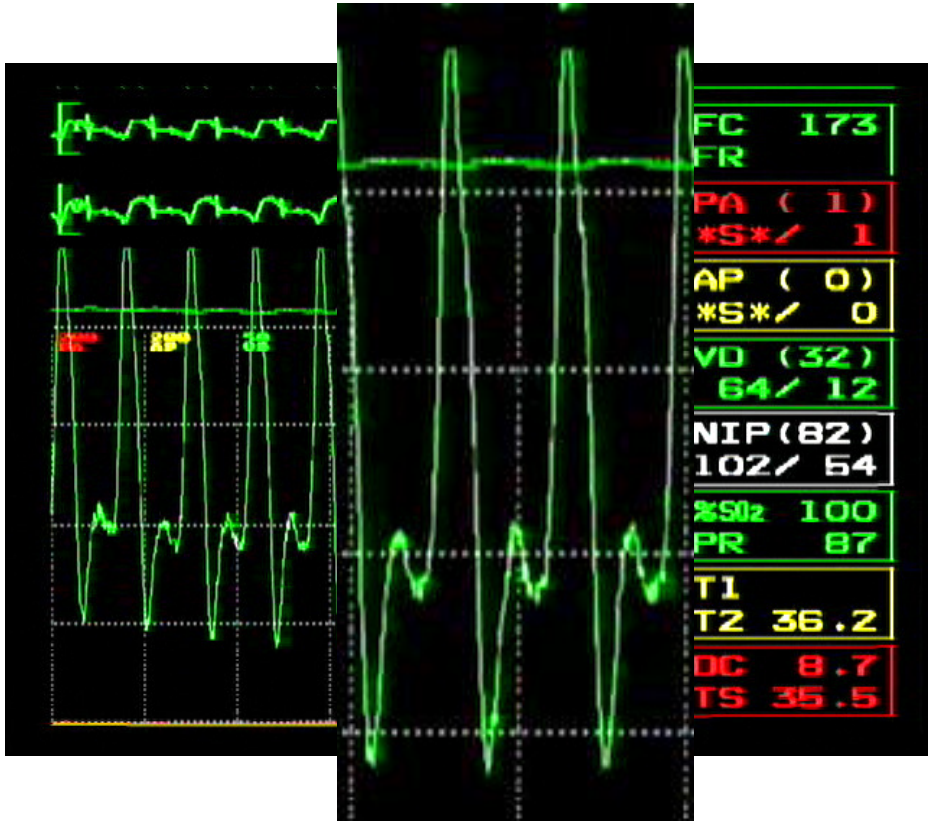


After CPB: unstable



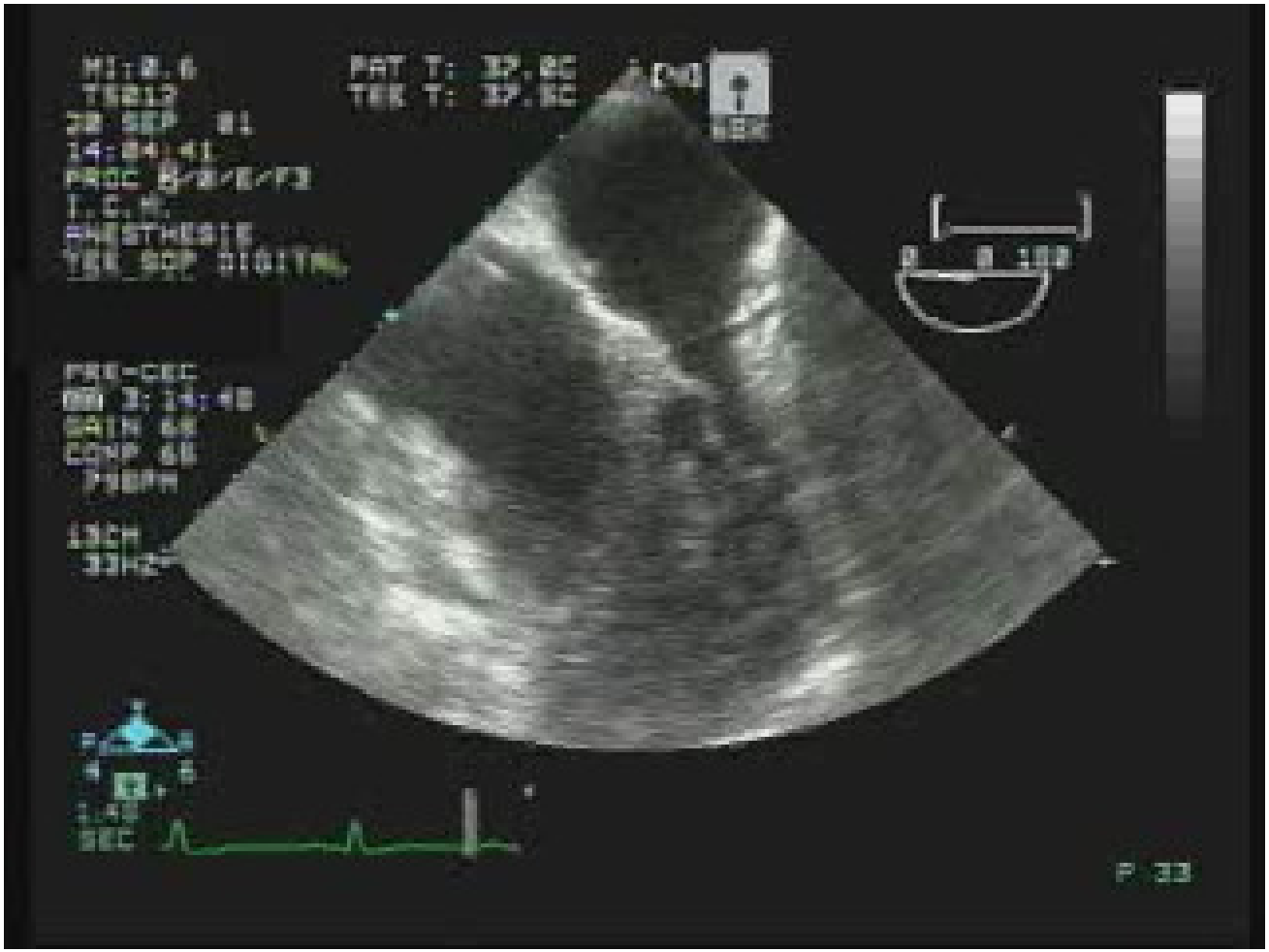
Severe RV dysfunction

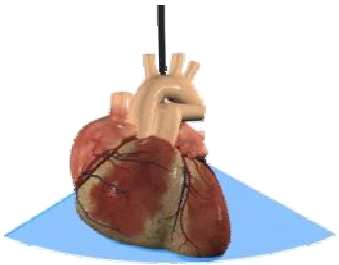




Hemodynamic instability

Septal interaction = consequence of RV dysfunction

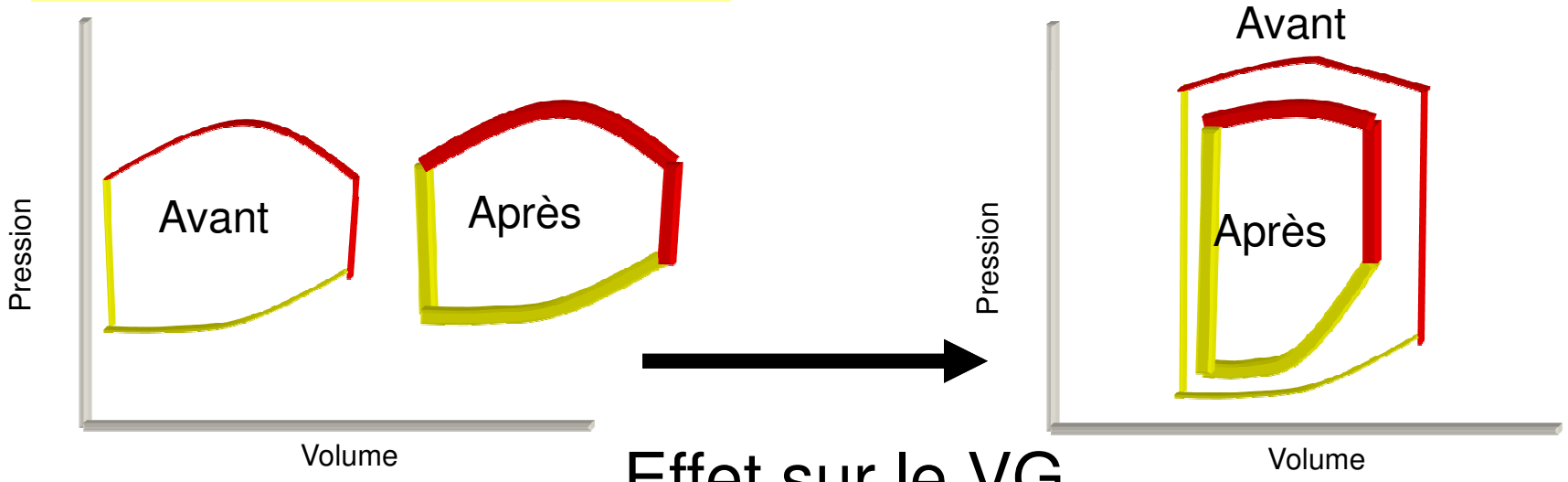




Interaction ventriculaire gauche-droite

Courbe pression-volume ventriculaire droite

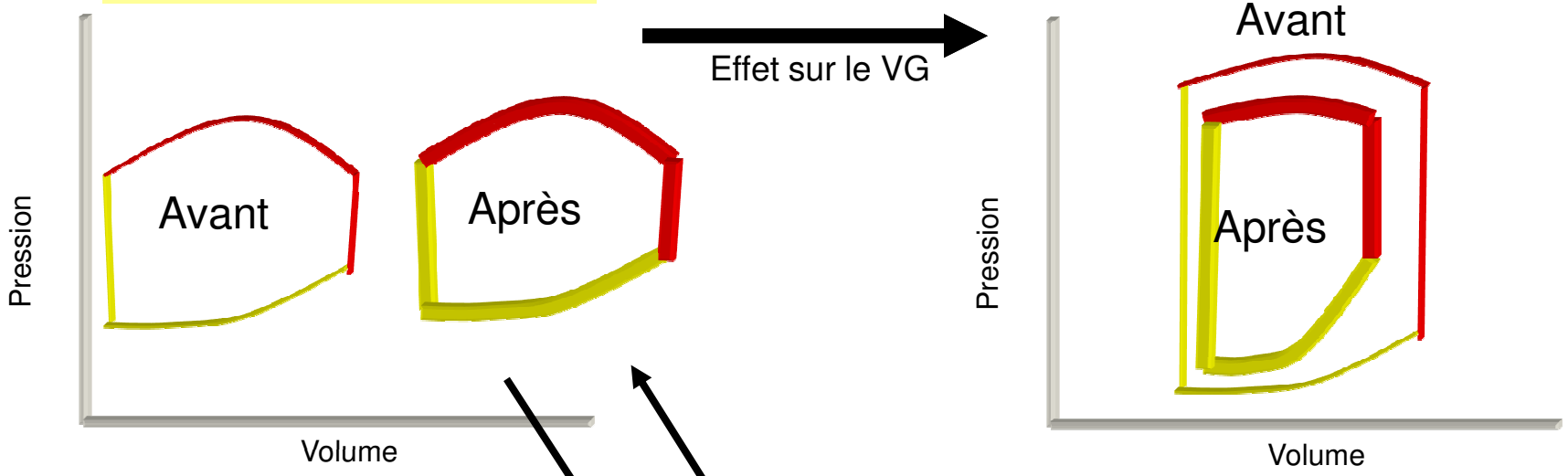
Courbe pression-volume ventriculaire gauche



Effet sur le VG

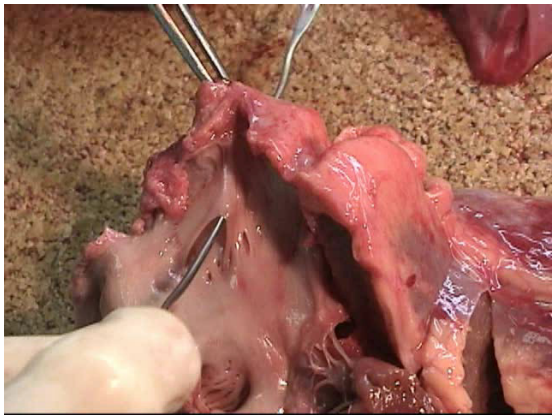
Courbe pression-volume ventriculaire droite

Courbe pression-volume ventriculaire gauche



Ouverture du foramen ovale

Hypoxémie & HTP via le shunt gauche-droit



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Left and right diastolic dysfunction

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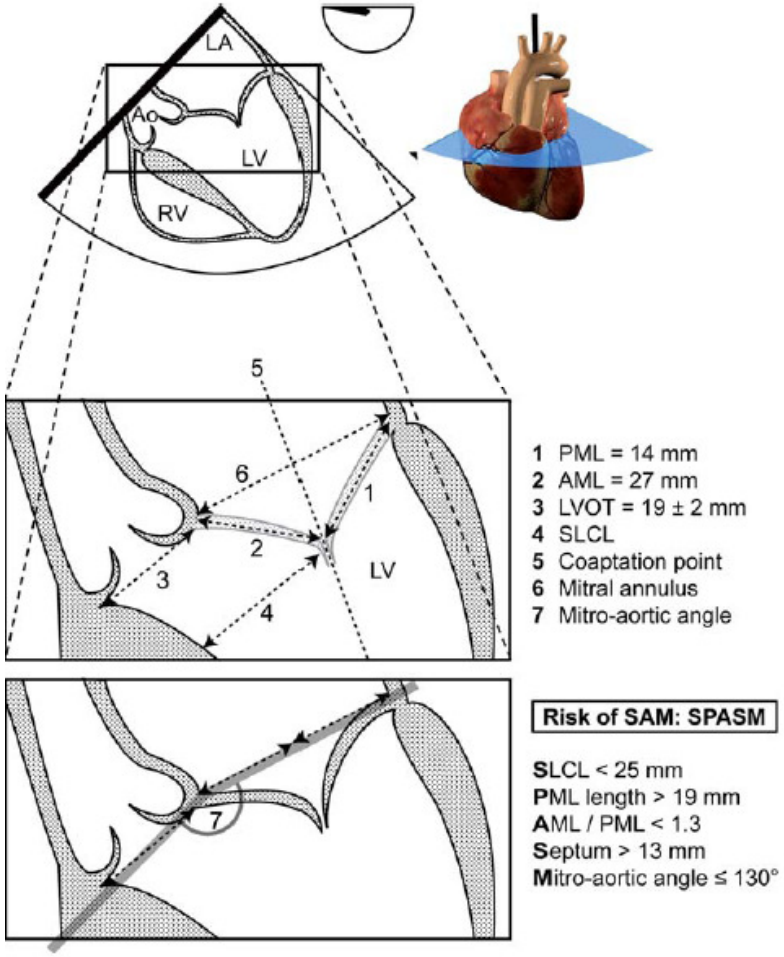
Pulmonary emboli

Hypoxia and hypercapnia

3-↑ Rrv: intrinsic obstruction and compartment syndrome (pericardial, mediastinal, thoracic, abdominal)

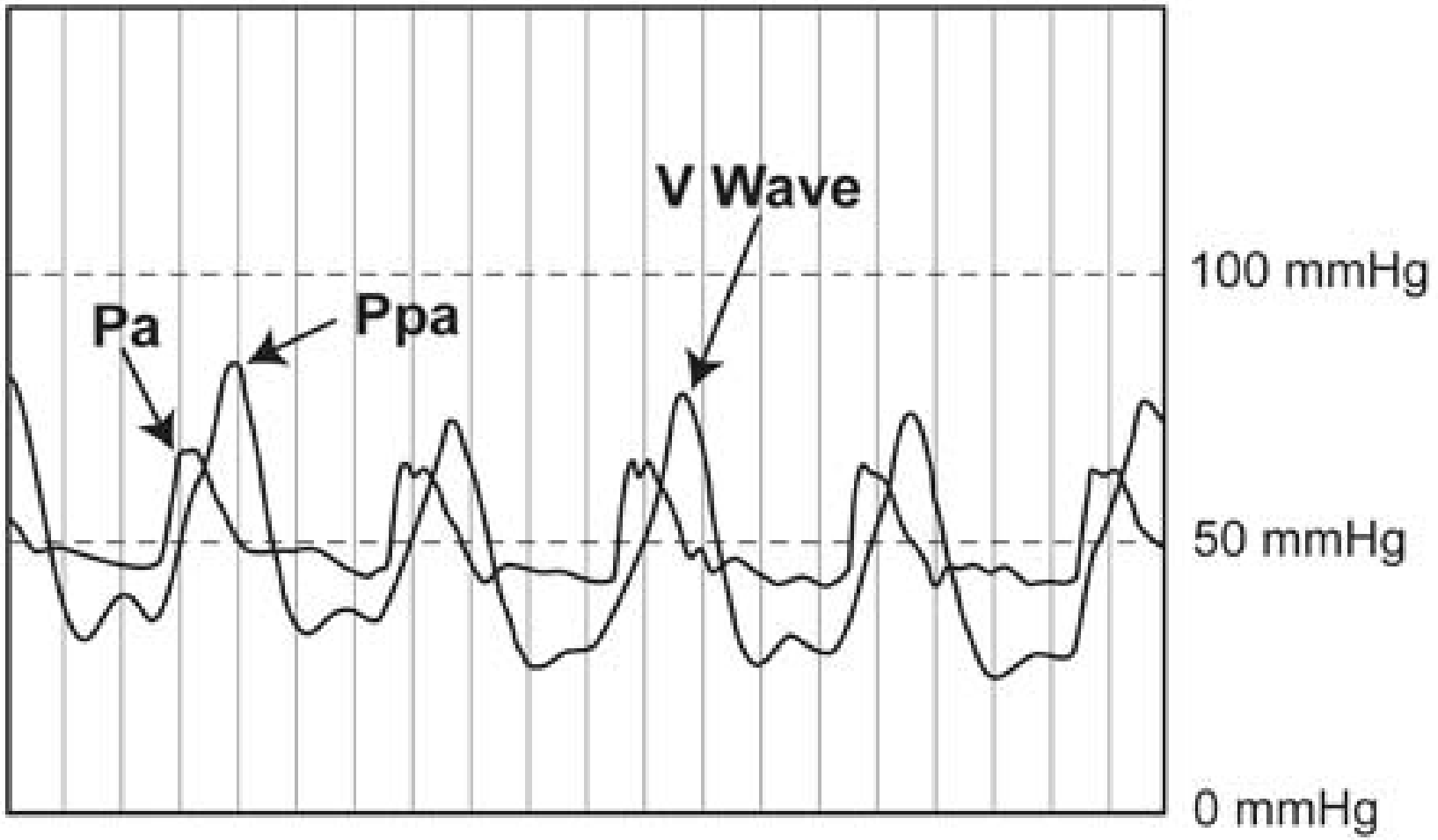
Always consider left ventricular outflow tract obstruction in hemodynamically unstable patients

Antoine G. Rochon, MD · Philippe L. L'Allier, MD · André Y. Denault, MD

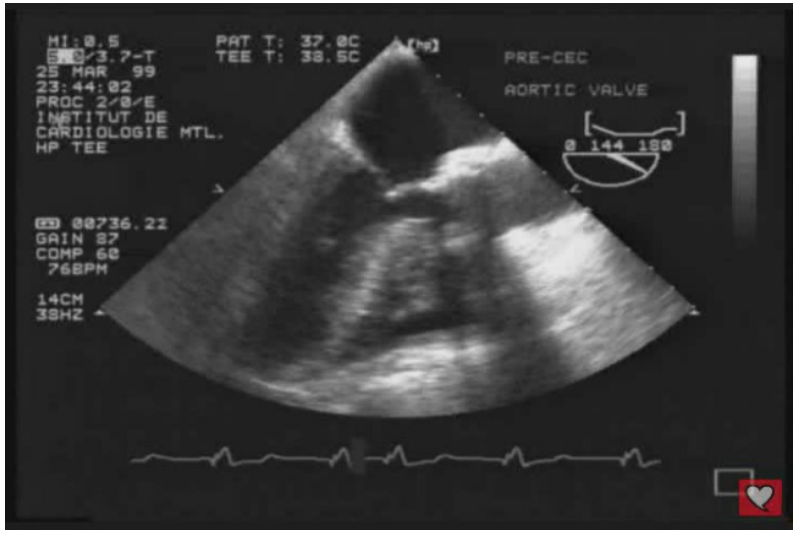


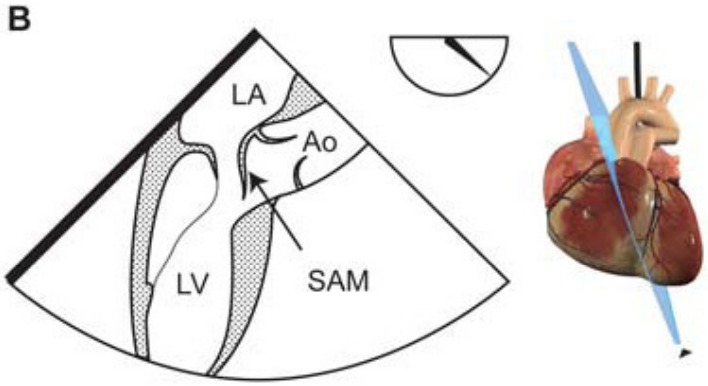
Can J Anesth/J Can Anesth (2009) 56:962–968

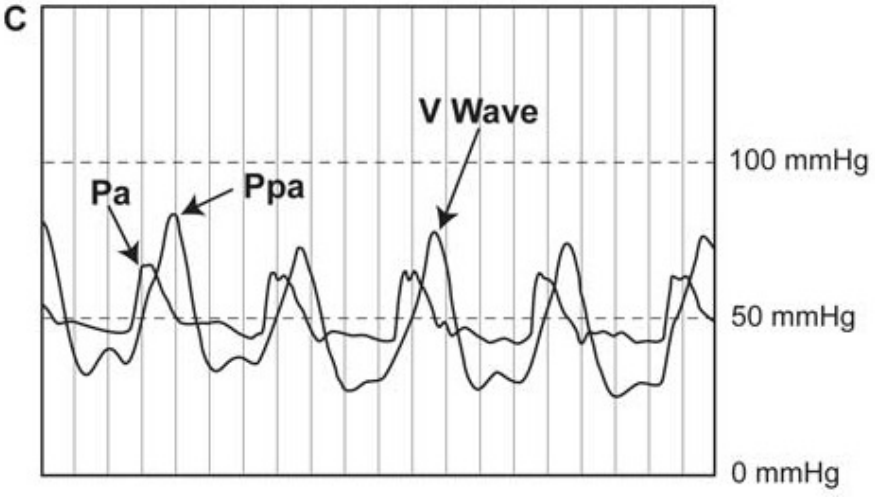
Régurgitation mitrale en sortie de CEC?



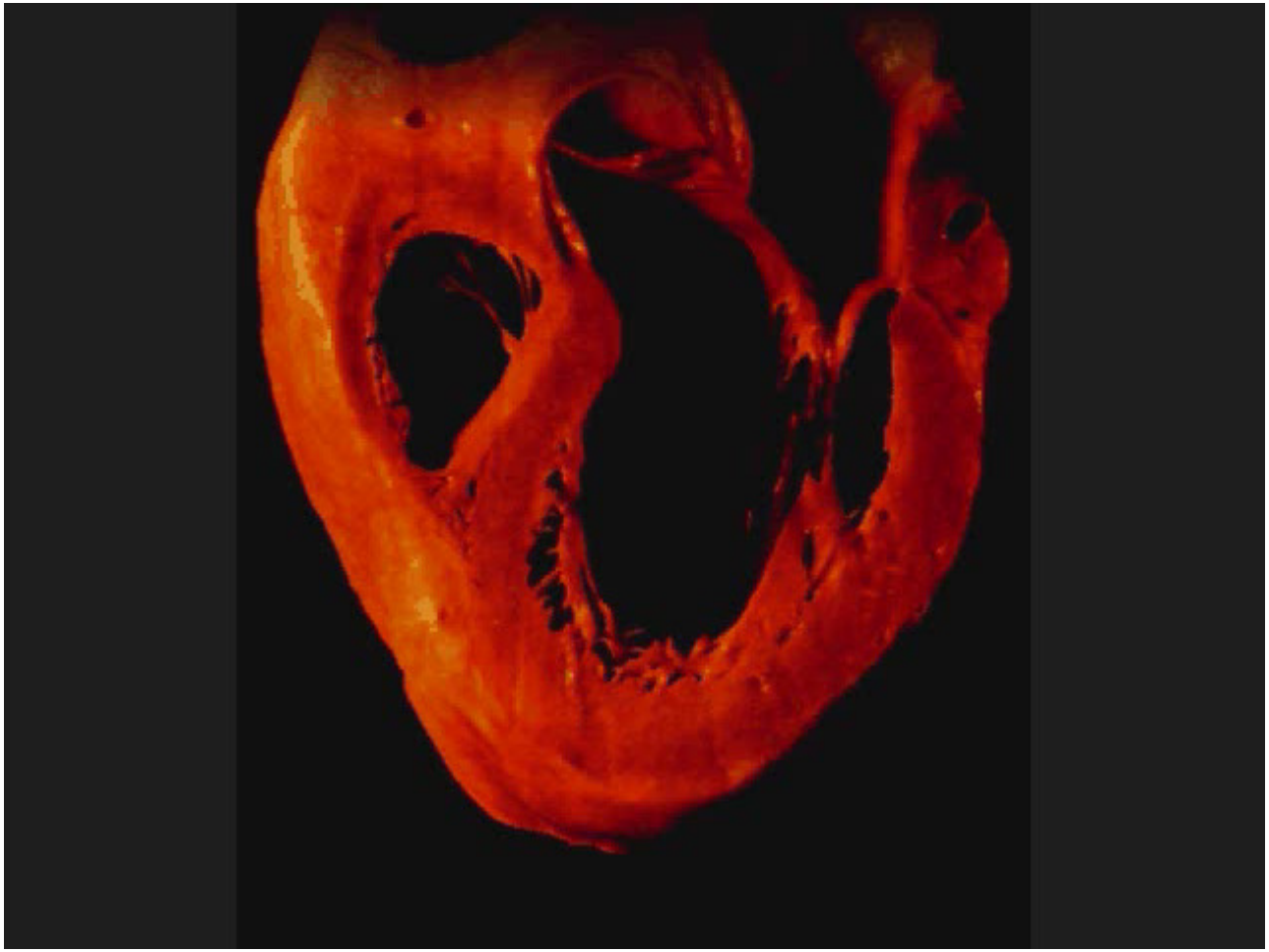
Mitral regurgitation after CPB?





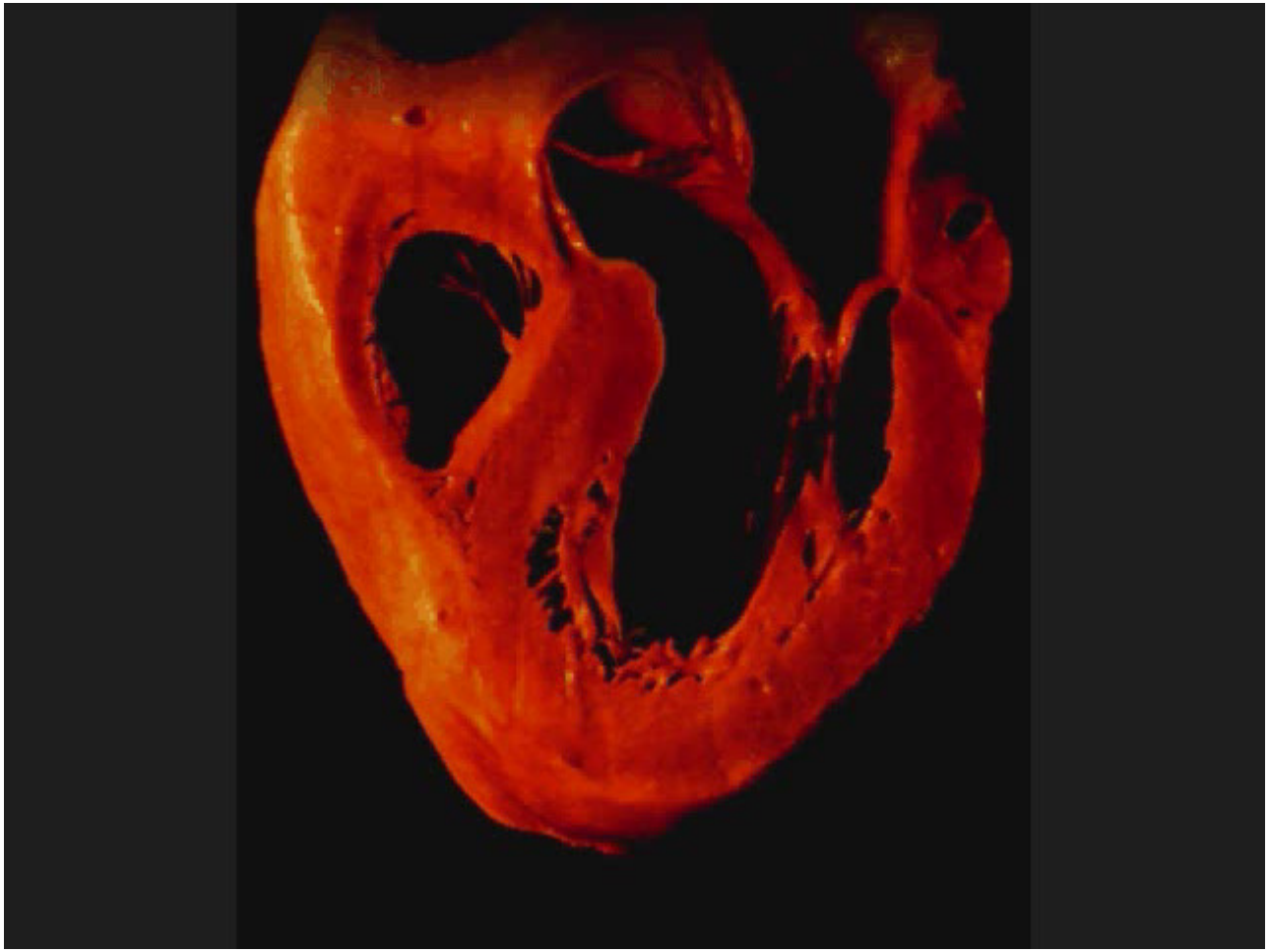


LVOT obstruction

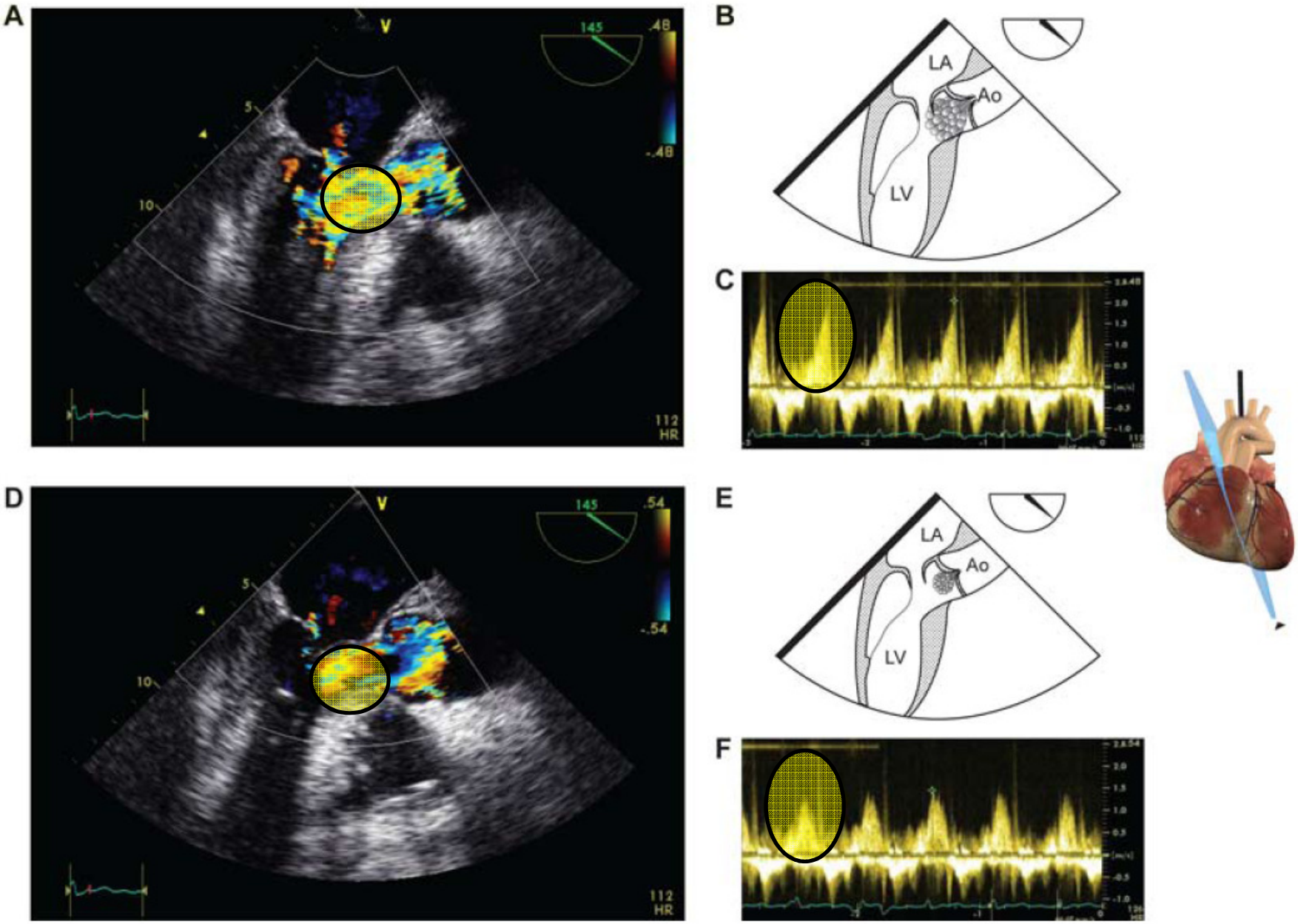


Courtoisie de Gaudiani

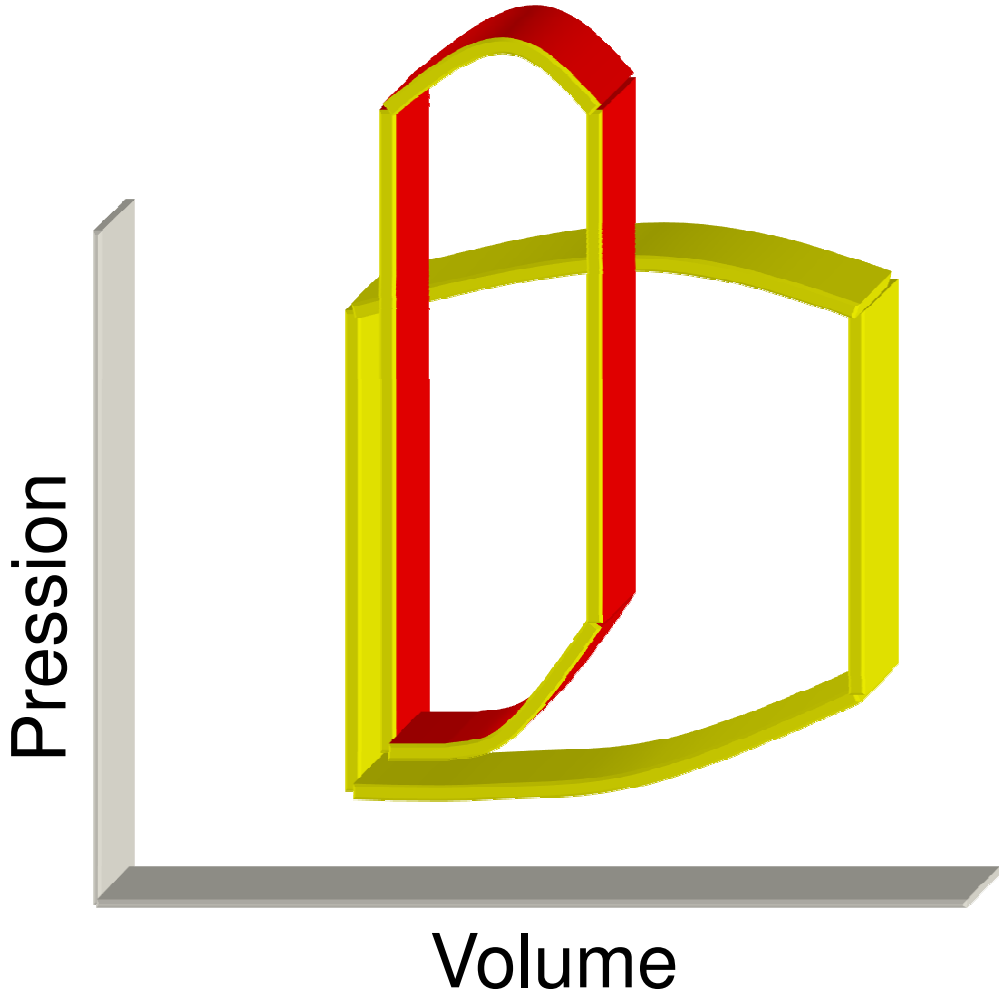
LVOT obstruction



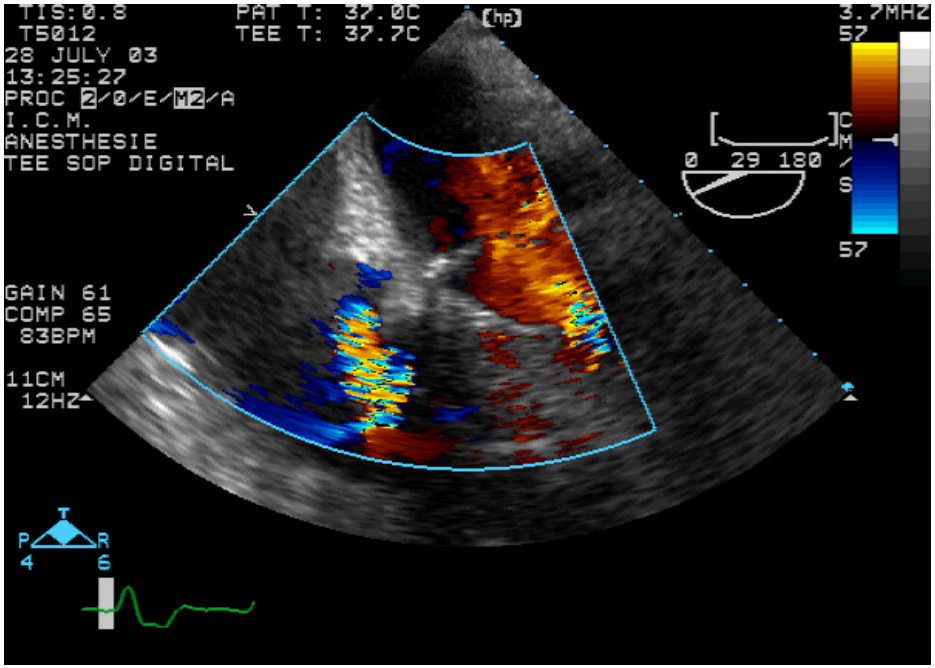
Courtoisie de Gaudiani


A
B
C
D
E
F
LA
Ao
LV
145
.48
-.48
.54
-.54
112
HR

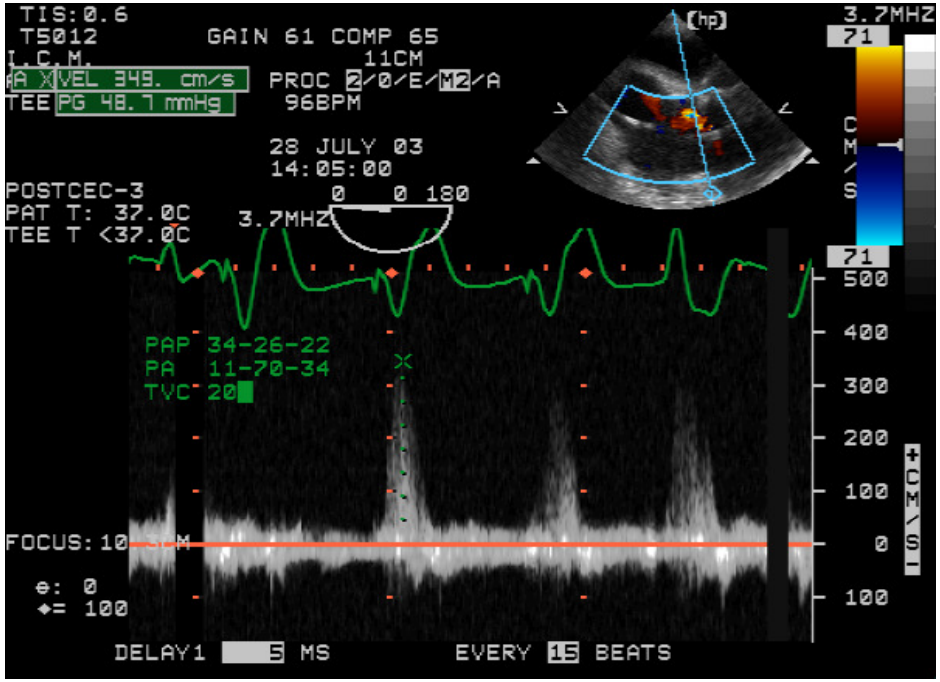
Obstruction de la chambre de chasse du ventricule gauche



Régurgitation tricuspidienne



Doppler continu

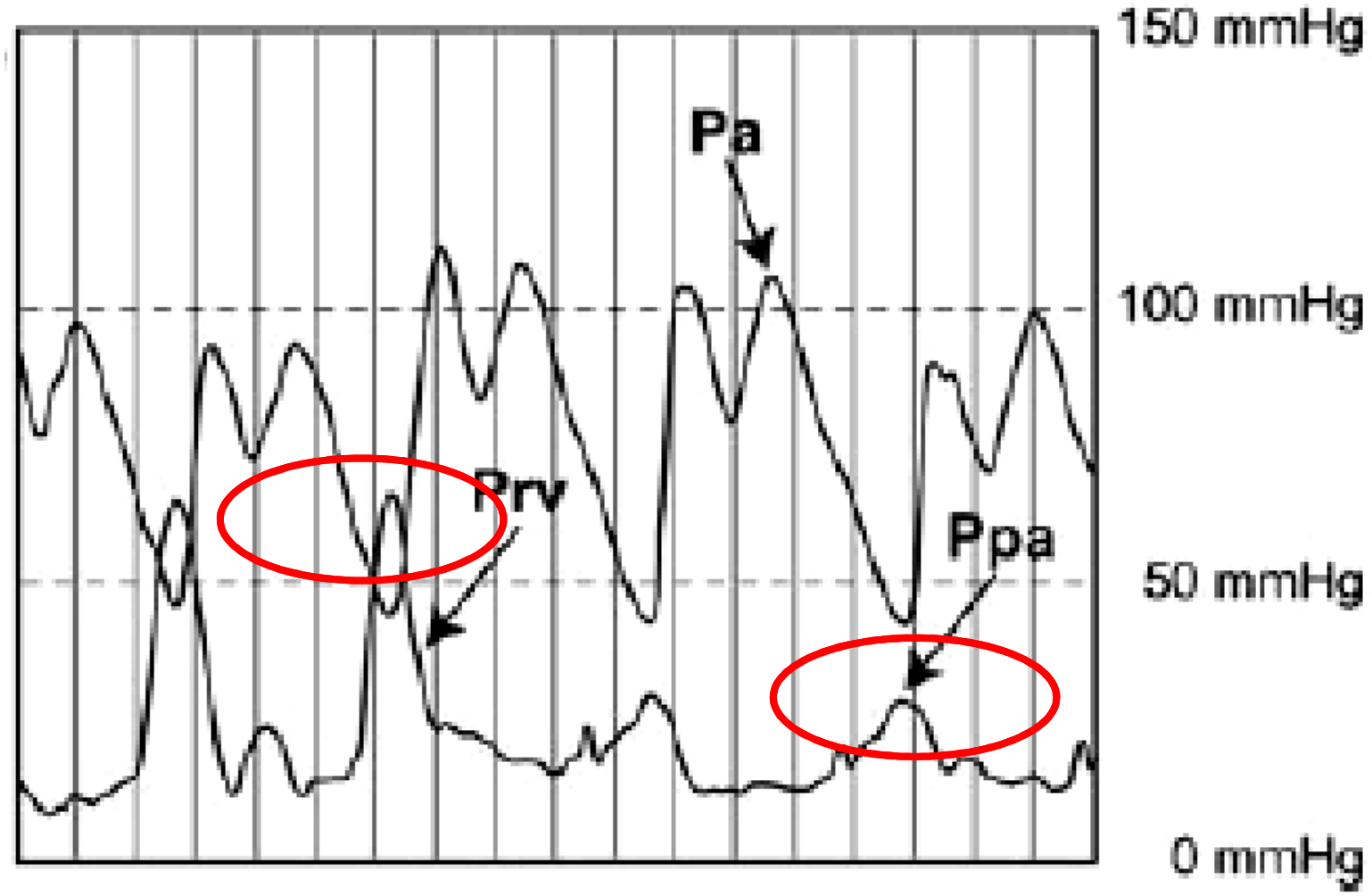


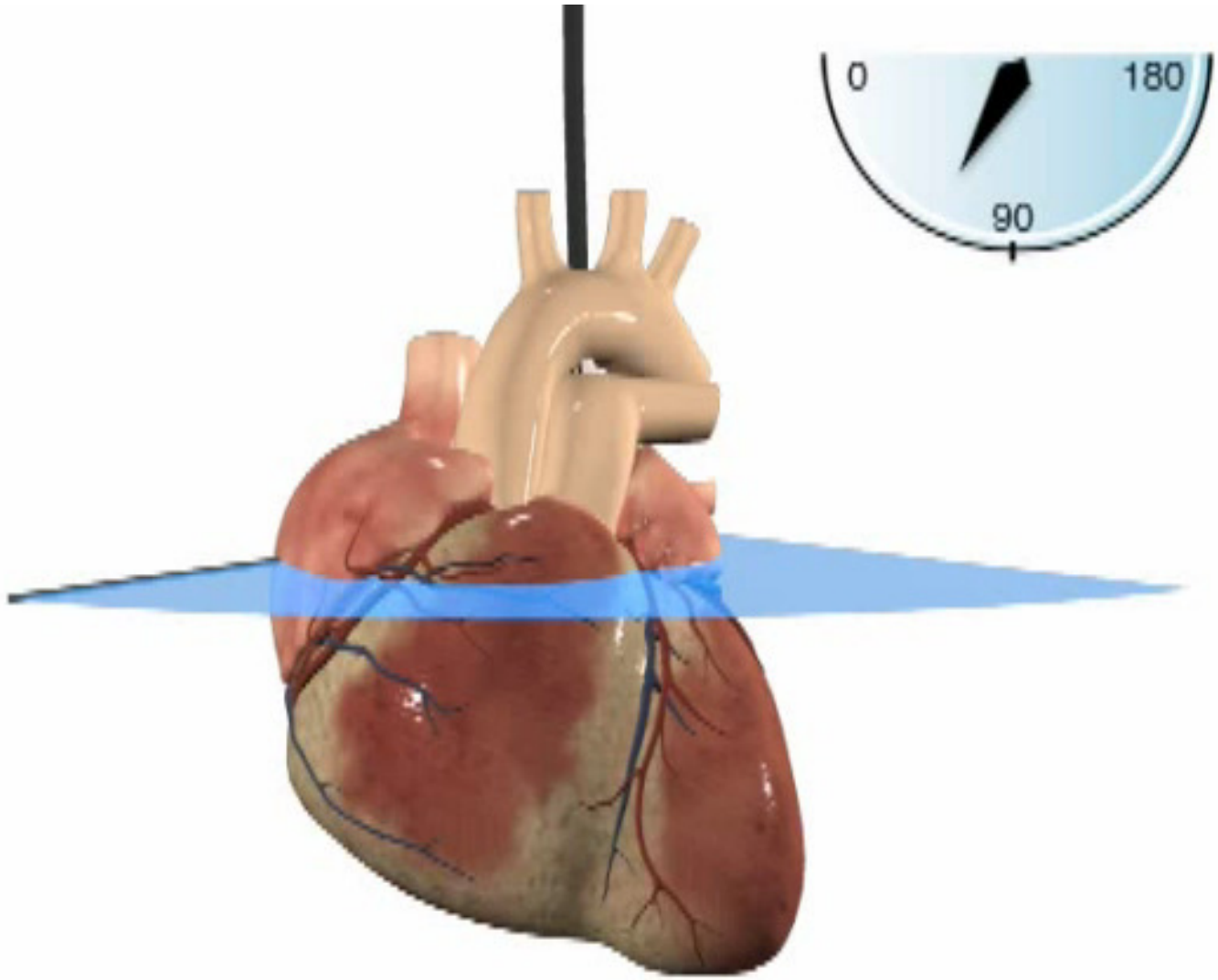
Gradient de 48 mmg avec une Pod de 20 mmHg

PAP systolique de 68 mmHg

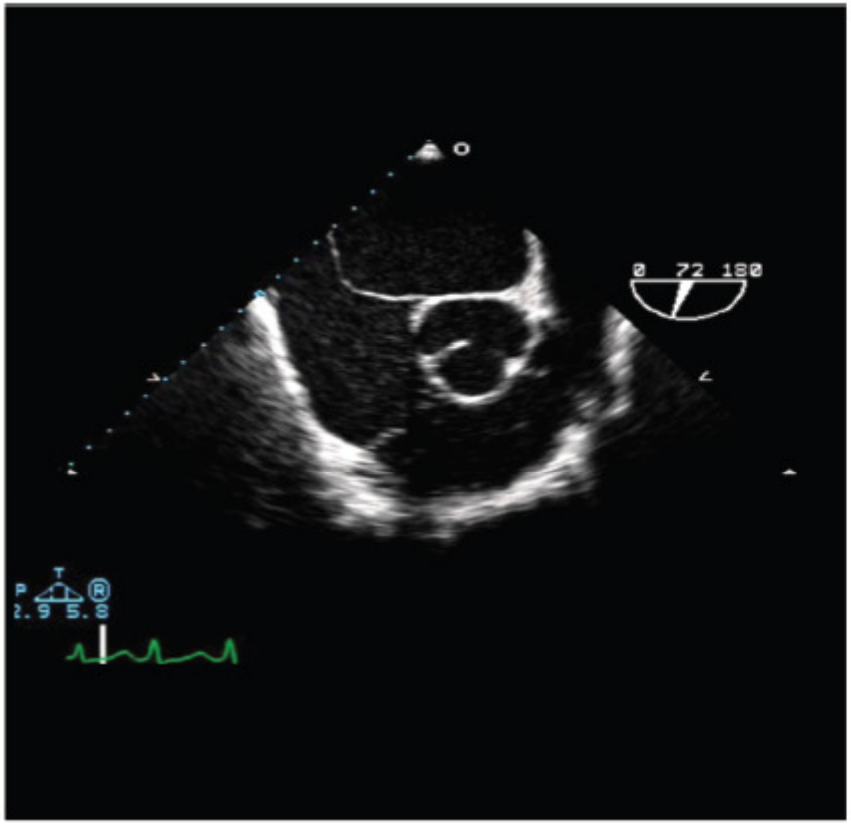
PAP systolique mesurée de 34 mmHg ???

Obstruction de la chambre de chasse du VD

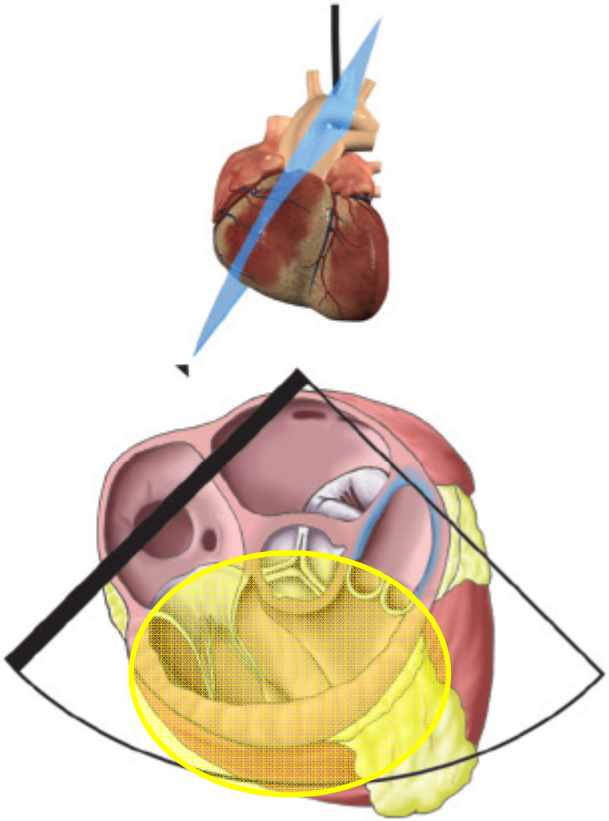


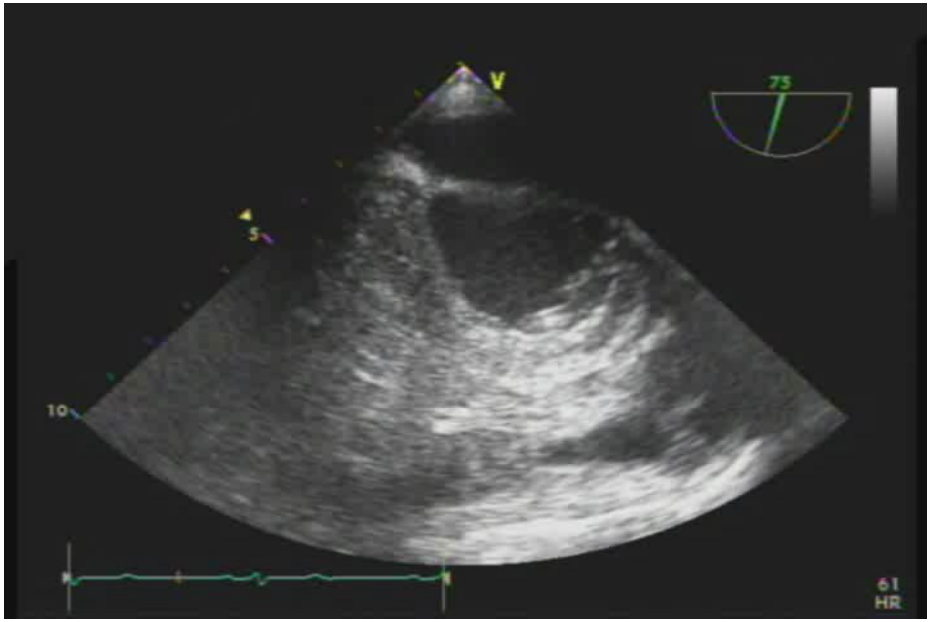

0
180
90

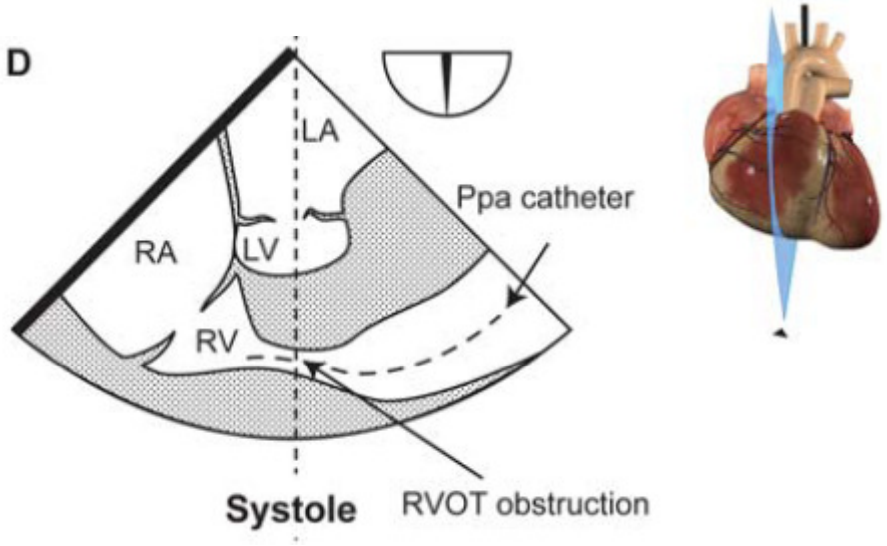
A

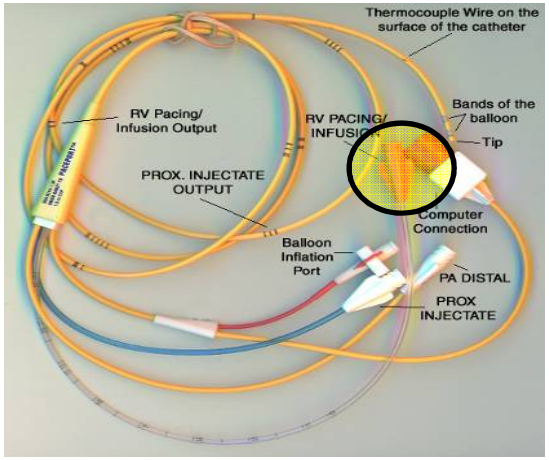


B




75
5
10
61
HR


D
LA
Ppa catheter
RA
LV
RV
Systole
RVOT obstruction


Thermocouple Wire on the surface of the catheter
RV Pacing/ Infusion Output
RV PACING/ INFUSION
Bands of the balloon
Tip
PROX. INJECTATE OUTPUT
Computer Connection
Balloon Inflation Port
PA DISTAL
PROX INJECTATE


ST-II
-0.7
ST-V
1.0
SpO2 100
P
180
PA
74/47 (57)
90
P
84/48 (60)
0
PVC
40
PAP
23/16 (19)
PVC
38/7 (15)
FR-aer
10
0
AGT-fe
Temp
36.3
AGT-in
CO2fe
28

Dynamic right ventricular outflow tract obstruction in cardiac surgery

André Y. Denault, MD, FRCPC,[a] Miguel Chaput, MD,[b] Pierre Couture, MD, FRCPC,[a] Yves Hébert, MD, FRCSC,[b] François Haddad, MD, FRCPC,[c] Jean-Claude Tardif, MD, FRCPC[c]

- Systolic RV to Pap > 6 mmHg (18%)
- Systolic RV to Pap > 25 mmHg (4%)
  - N = 11 patients
  - 50% with AVR
  - 73% on milrinone
  - 91% with hemodynamic instability

(n = 800)

JTCVS 2006

Most common condition associated with hemodynamic instability

1-↓ Pms: hypovolemia, vasodilatation

2-↑ Pra: Left and right systolic dysfunction

Left and right diastolic dysfunction

Left and right outflow tract obstruction

Pulmonary emboli

Hypoxia and hypercapnia

3-↑ Rrv: intrinsic obstruction and compartment syndrome (pericardial, mediastinal, thoracic, abdominal)

68 yo ♀ hypotensive at the ER
3 weeks after removal of a meningioma

Noradrenalin at 0.15 µg/kg/min
(40 ml/h de 4mg/250ml)

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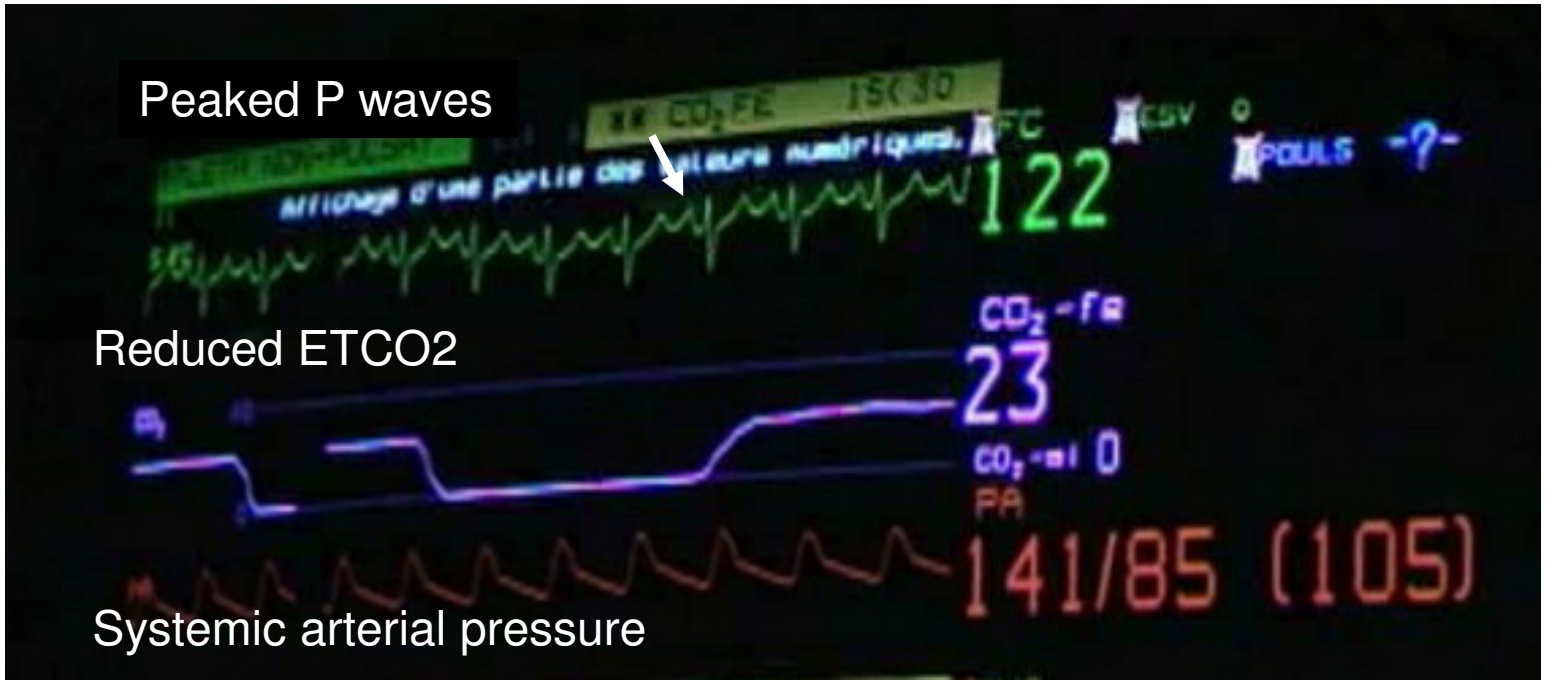
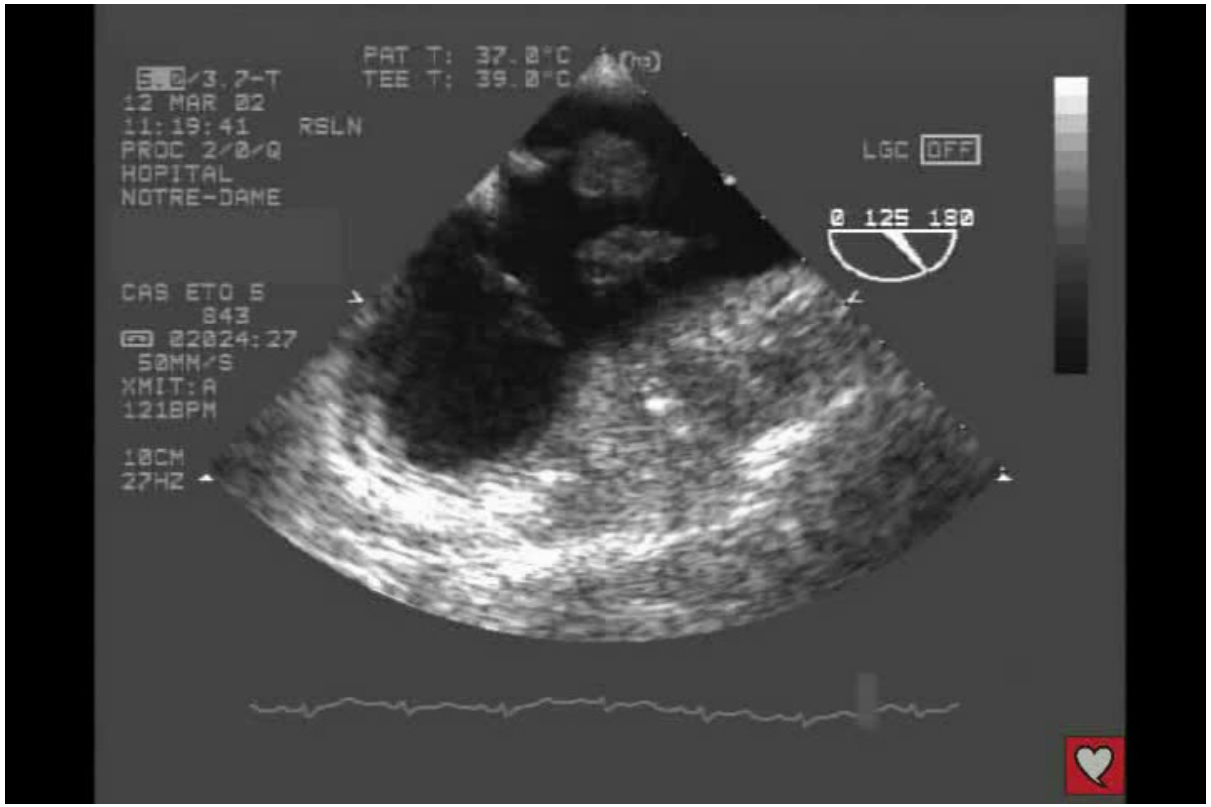
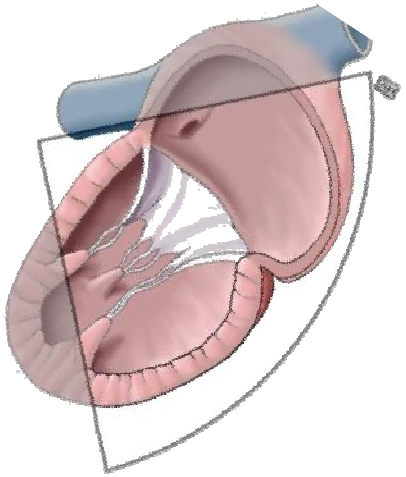
3 weeks after removal of a meningioma

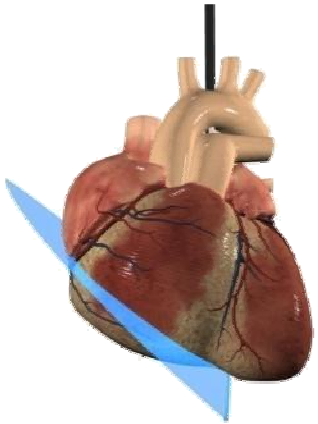


Noradrenalin at 0.15 µg/kg/min
(40 ml/h of 4mg/250ml)

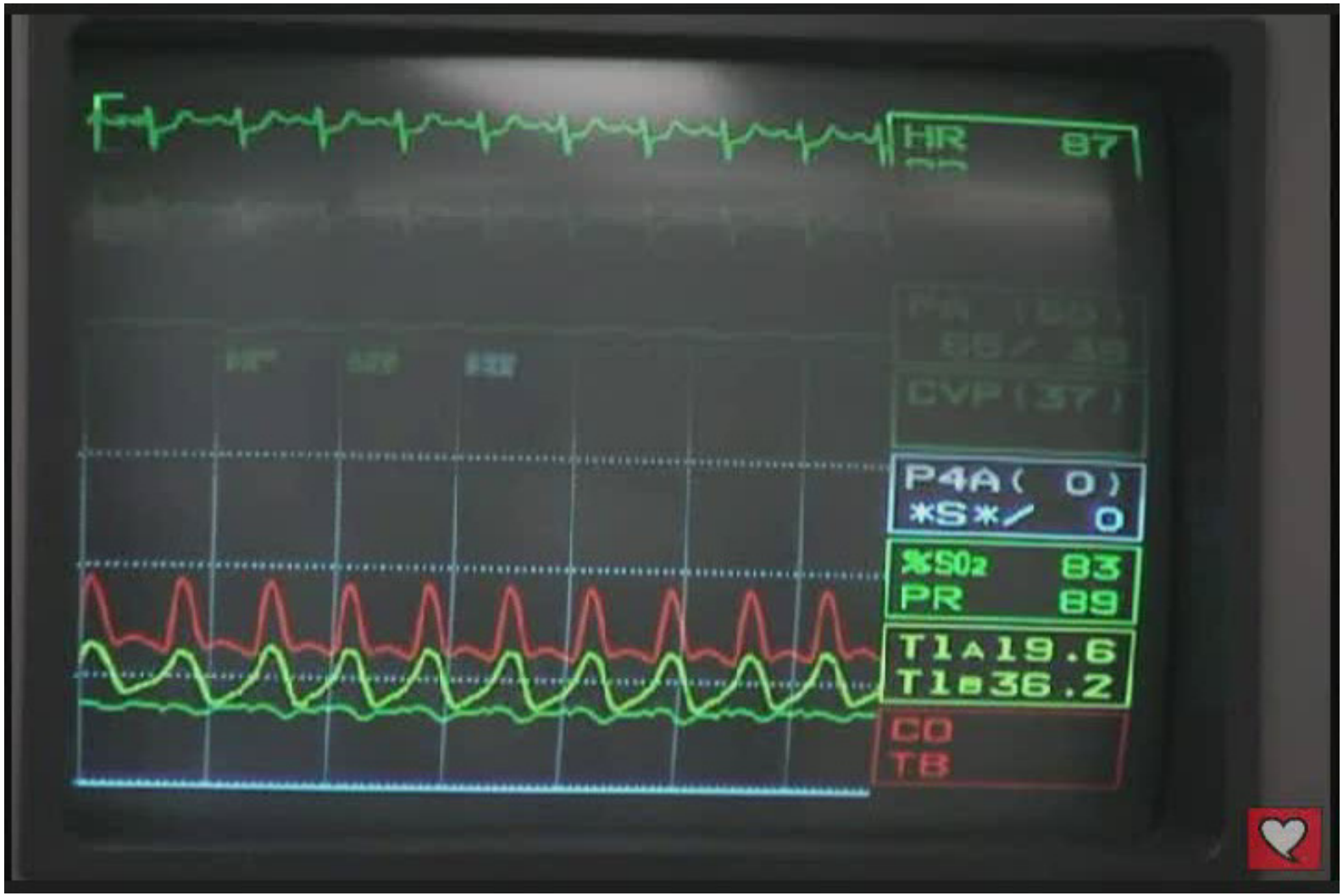
68 yo ♀ hypotensive at the ER
3 weeks after removal of a meningioma

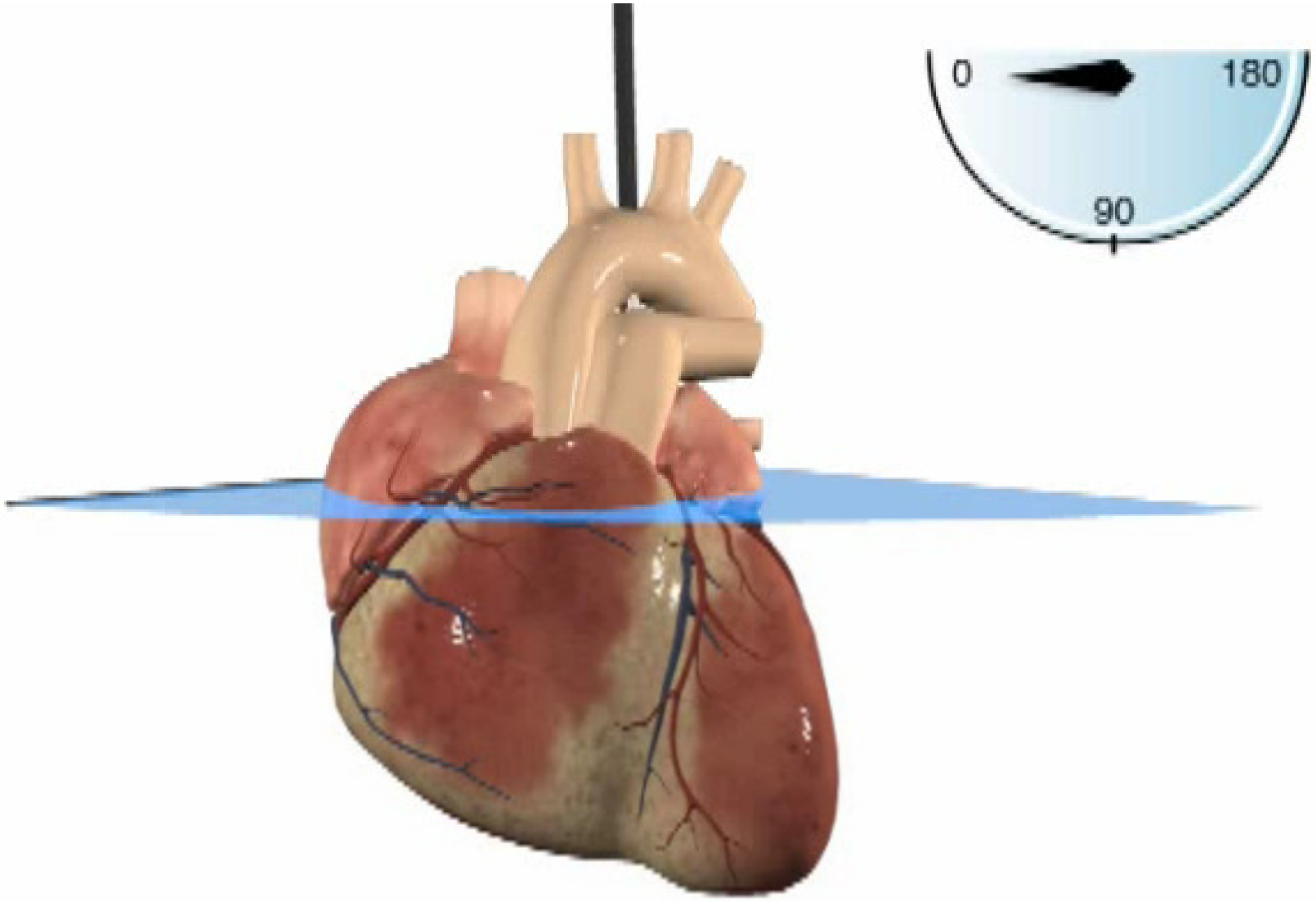




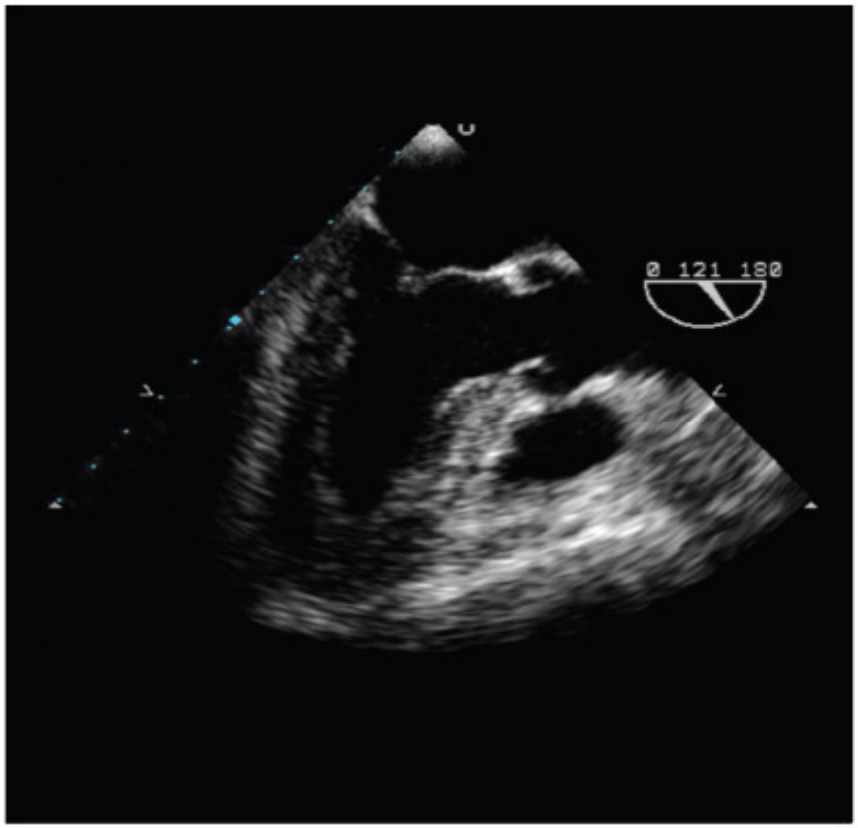


Patient instable après remplacement valve aortique

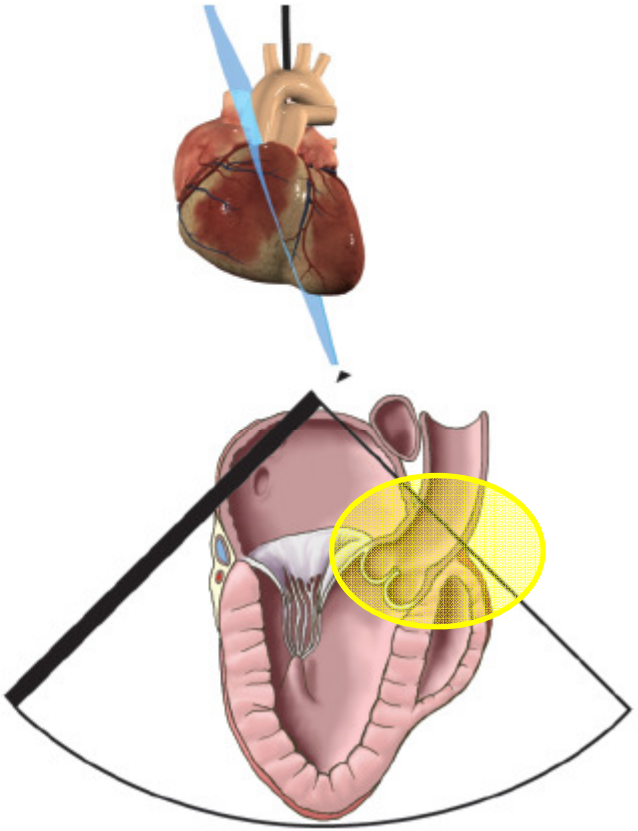


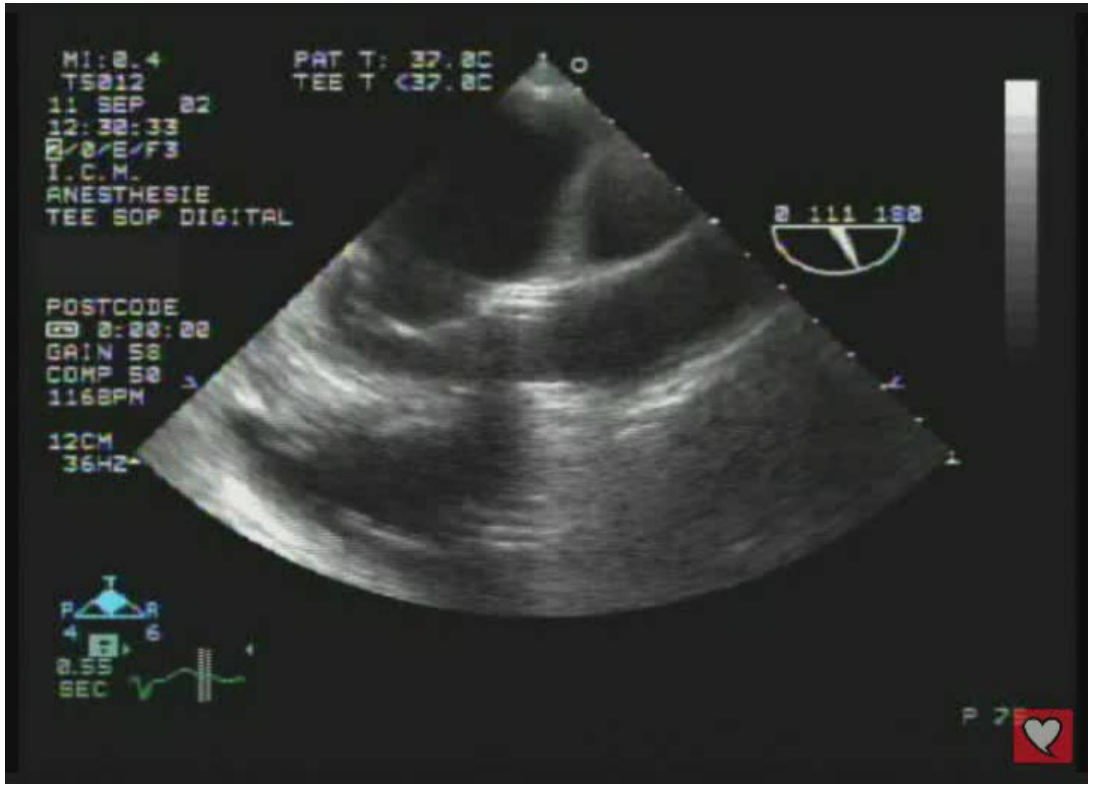

0
180
90

A

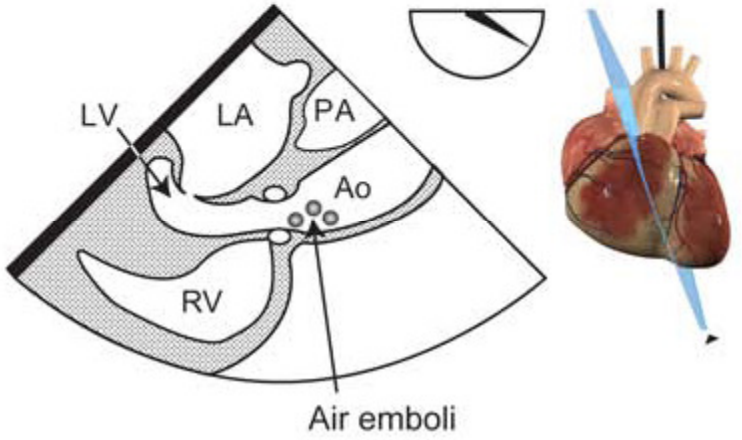


B




MI:0.4
TS012
11 SEP 02
12:30:33
I.C.M.
ANESTHESIE
TEE SOP DIGITAL
PAT T: 37.0C
TEE T 37.0C
POSTCODE
GAIN 58
COMP 50
116BPM
12CM
36HZ
0.55
SEC

C


LV
LA
PA
Ao
RV
Air emboli

Most common condition associated with hemodynamic instability

1-↓ Pms: hypovolemia, vasodilatation

2-↑ Pra: Left and right systolic dysfunction

Left and right diastolic dysfunction

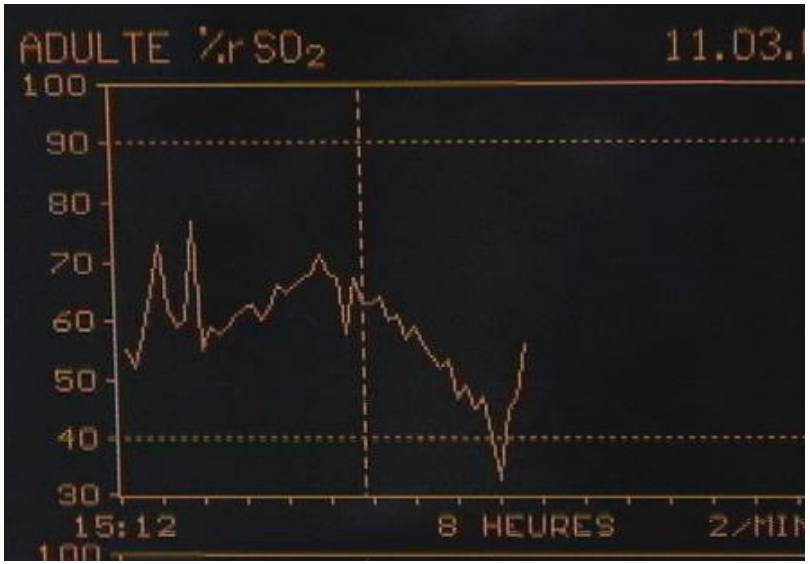
Left and right outflow tract obstruction

Pulmonary emboli

Hypoxia and hypercapnia

3-↑ Rrv: intrinsic obstruction and compartment syndrome (pericardial, mediastinal, thoracic, abdominal)

Hemodynamic effect of hypoxia



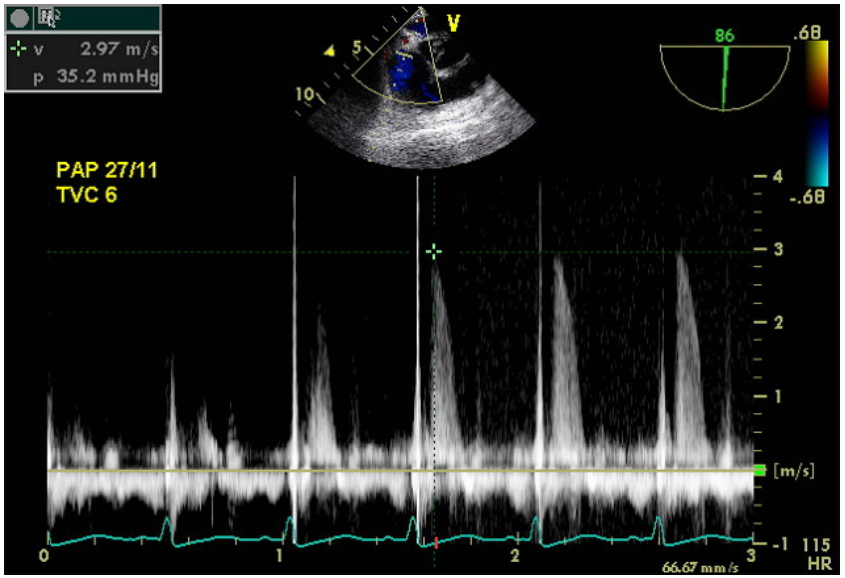
NIRS brain oximetry

- 48 yo ♂ with ischemic cardiomyopathy
- Systemic desaturation post-CPB with pulmonary hypertension
- Rx: PEEP and nitroglycerine

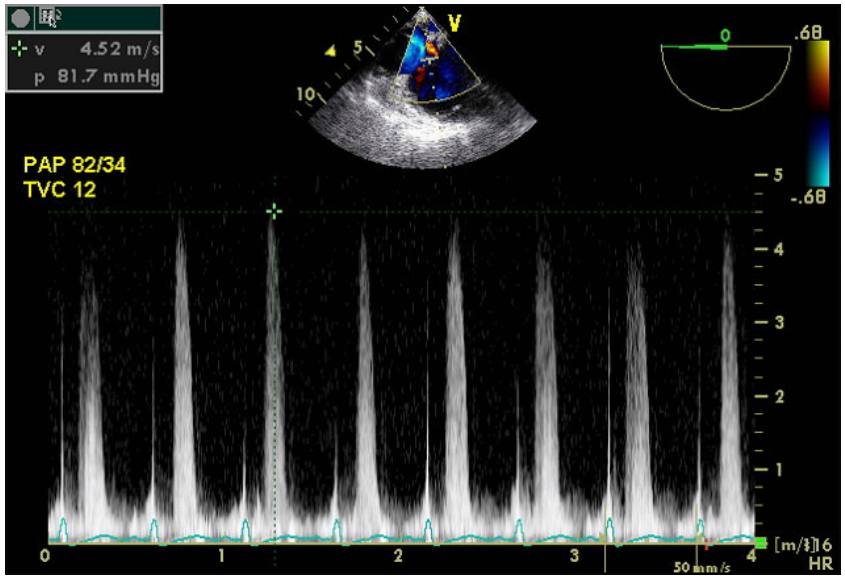
During hypoxia

After hypoxia

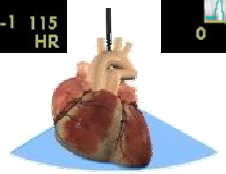
Beginning of apnea



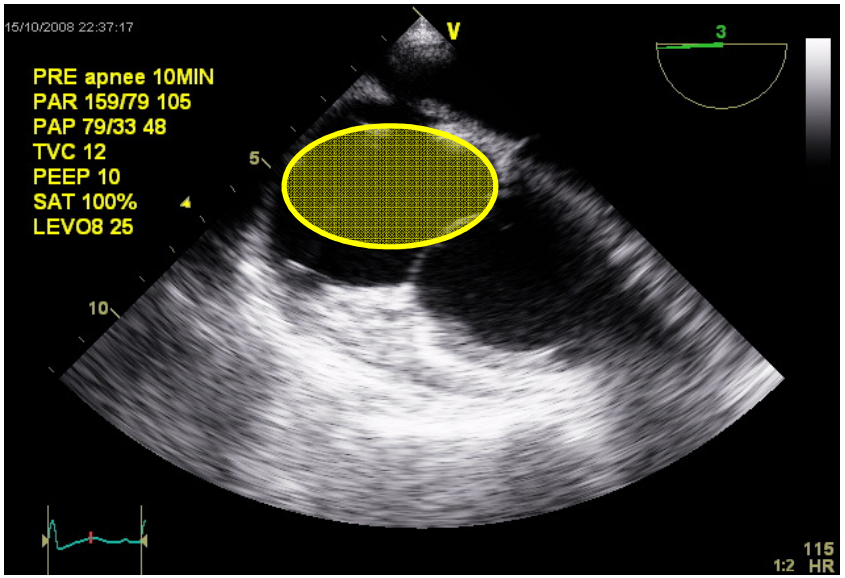
10 minutes after

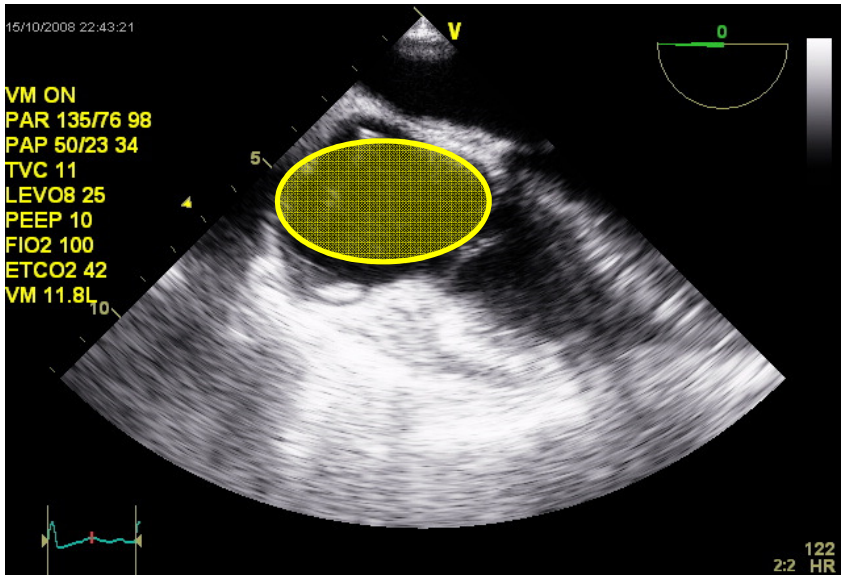


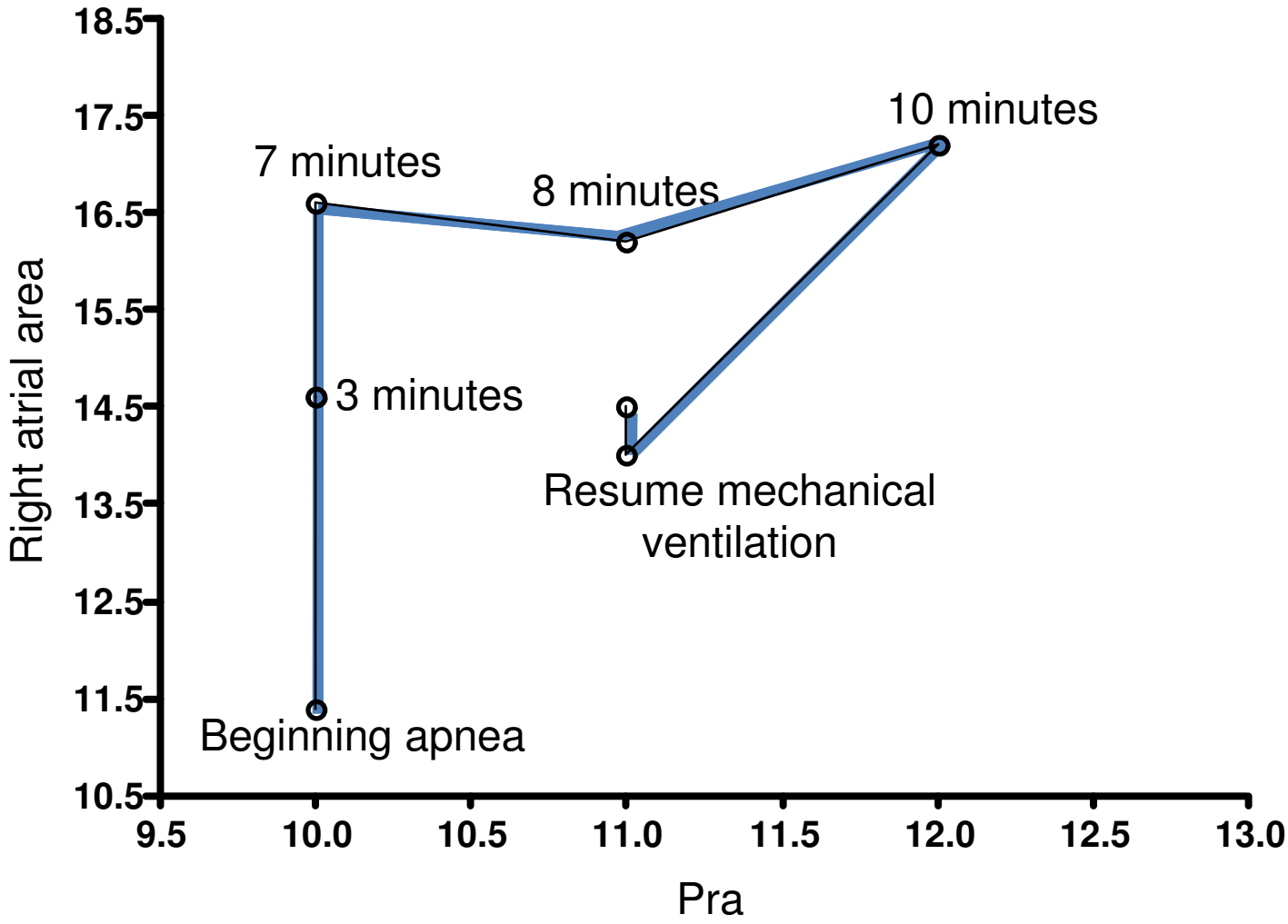
10 minutes after



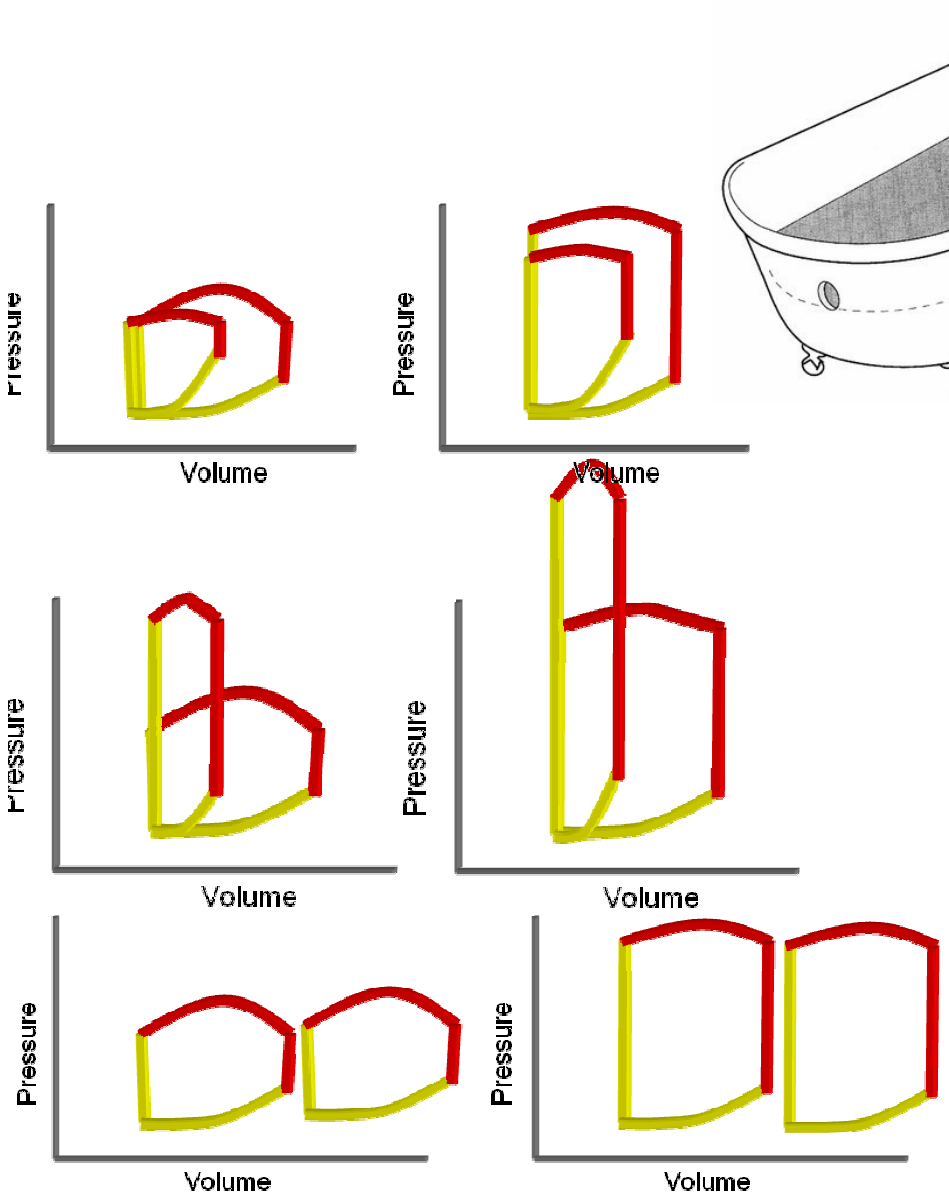
Ventilation restarted

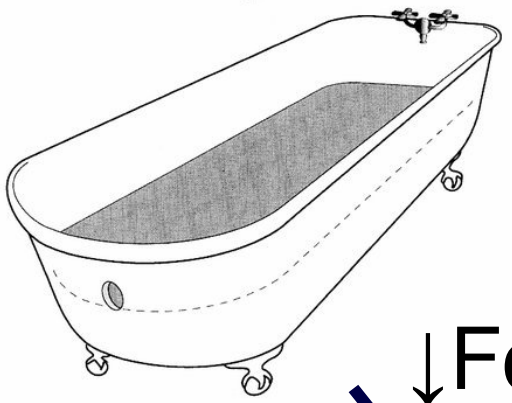




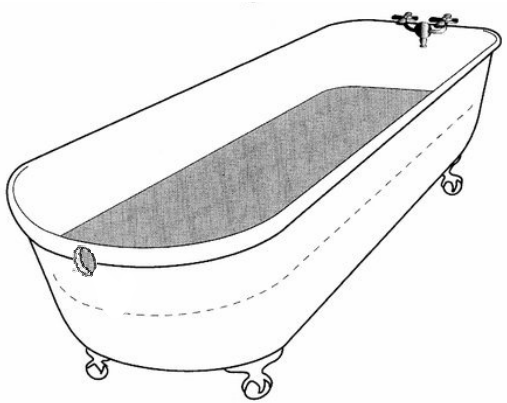

18.5
17.5
16.5
15.5
14.5
13.5
12.5
11.5
10.5
Right atrial area
9.5
10.0
10.5
11.0
11.5
12.0
12.5
13.0
Pra
7 minutes
8 minutes
10 minutes
3 minutes
Resume mechanical ventilation
Beginning apnea

Pression de l'oreillette droite





↓Fonction cardiaque
↑ Pod



Adapated from: Jacobsohn et al Can J Anesth 1997 44:8 849-67

Most common condition associated with hemodynamic instability

1-↓ Pms: hypovolemia, vasodilatation

2-↑ Pra: Left and right systolic dysfunction

Left and right diastolic dysfunction

Left and right outflow tract obstruction

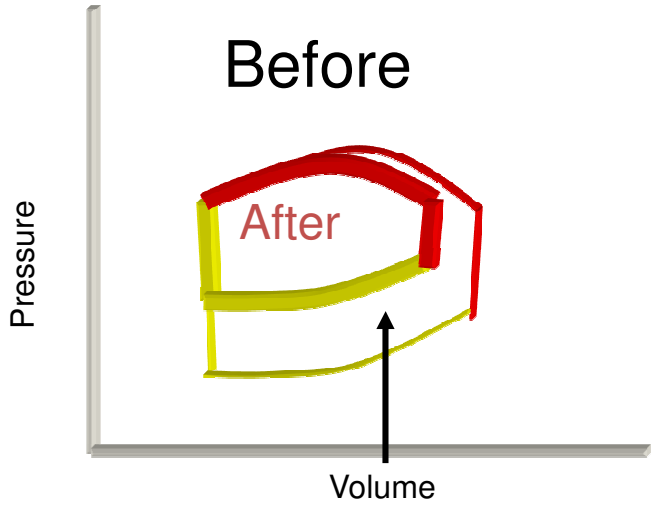
Pulmonary emboli

Hypoxia and hypercapnia

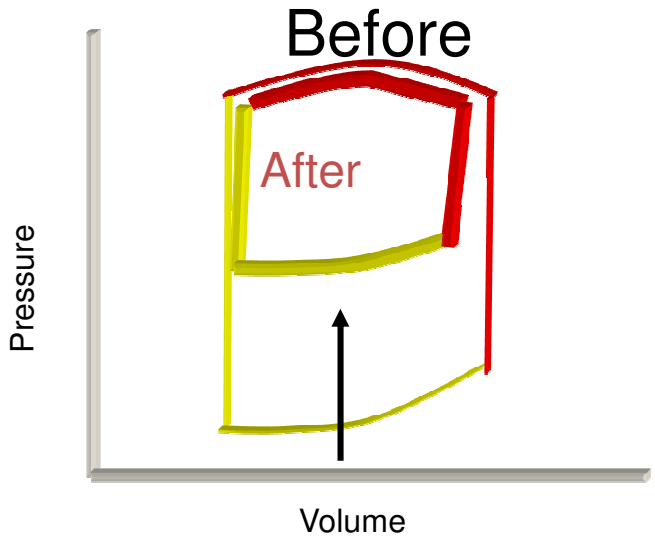
3-↑ Rrv: intrinsic obstruction and compartment syndrome (pericardial, mediastinal, thoracic, abdominal)

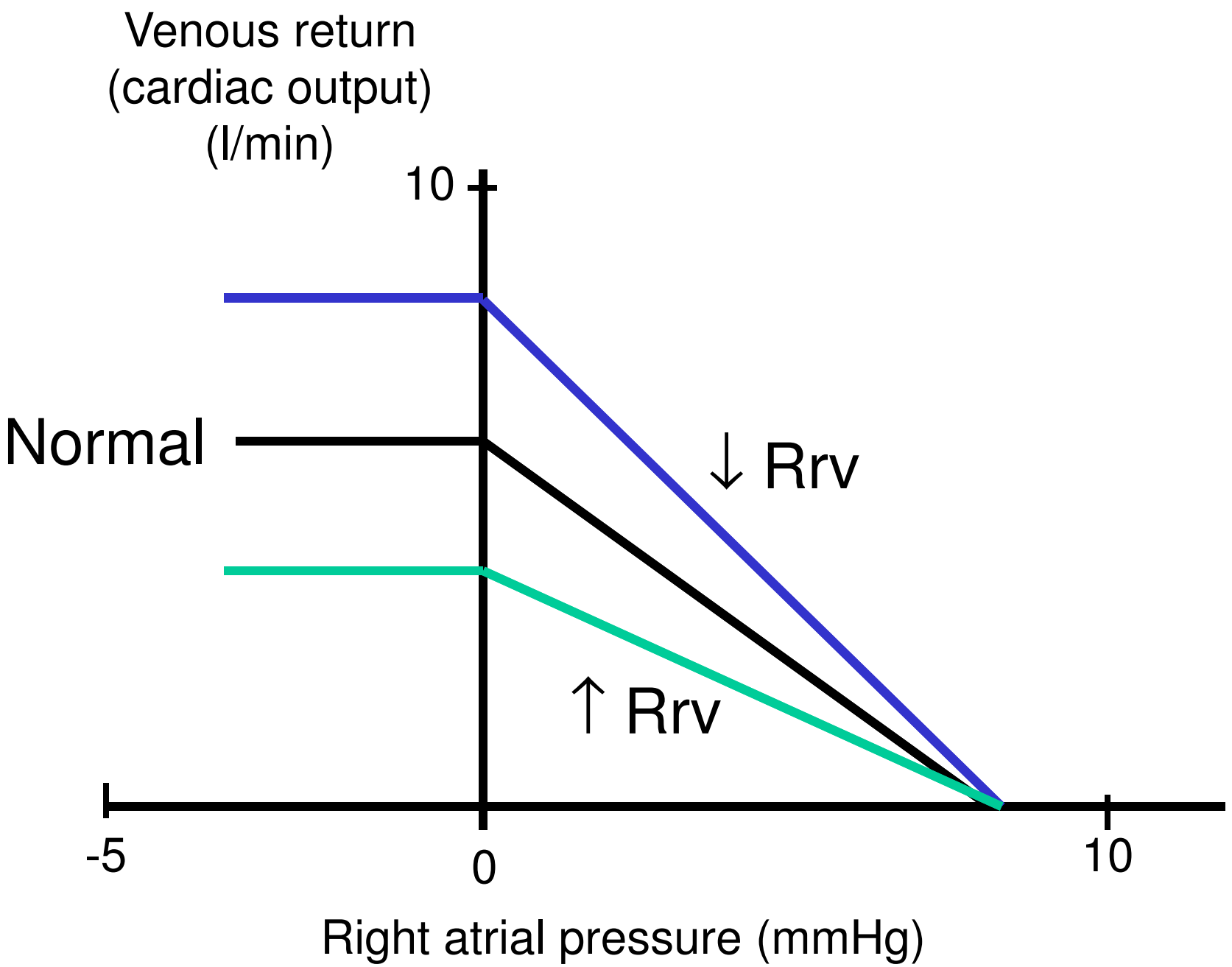
Effect of ↑ mediastinal, thoracic and abdominal pressures

Right ventricular pression-volume relationship



Left ventricular pression-volume relationship





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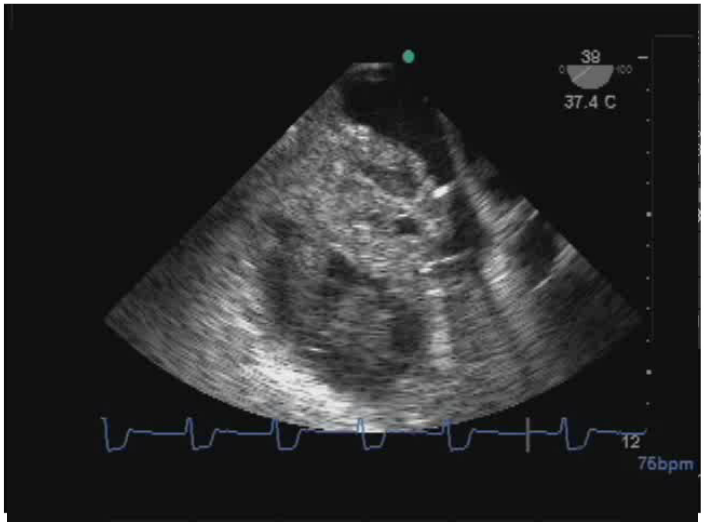
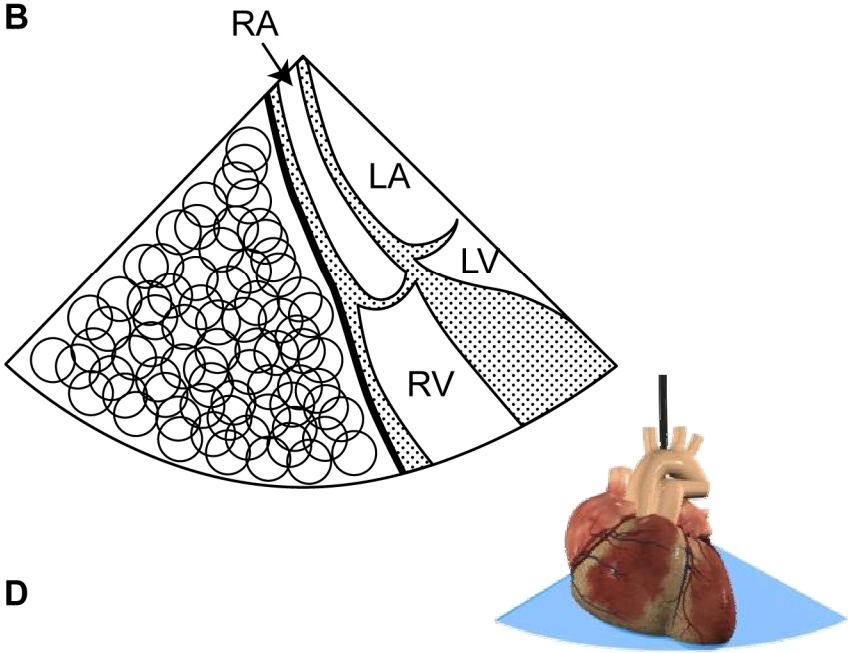
Unstable patient after CABG

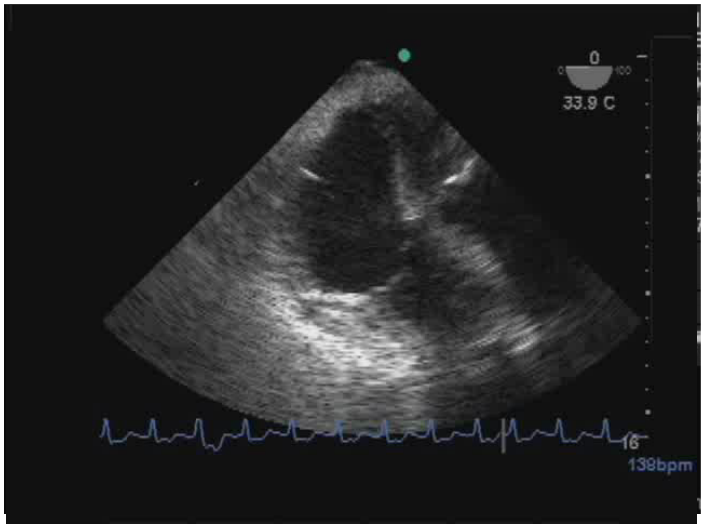
A



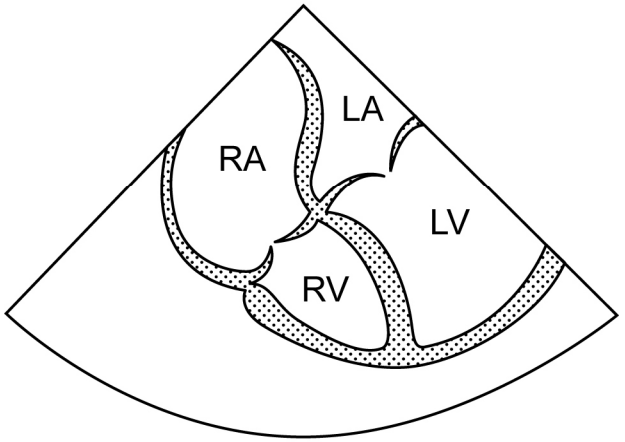
B



C



D



After drainage

Most common condition associated with hemodynamic instability

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Pulmonary emboli

Hypoxia and hypercapnia

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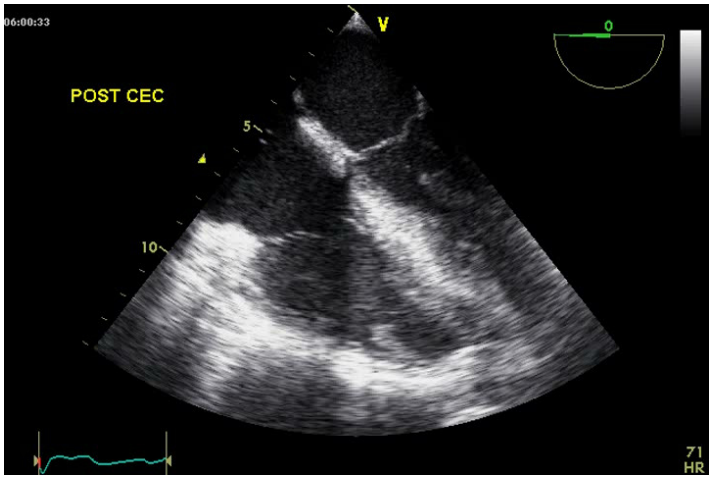
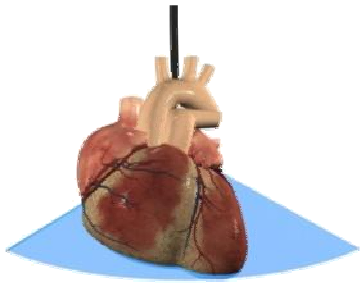
RV failure post-CPB

Before CPB

After CPB



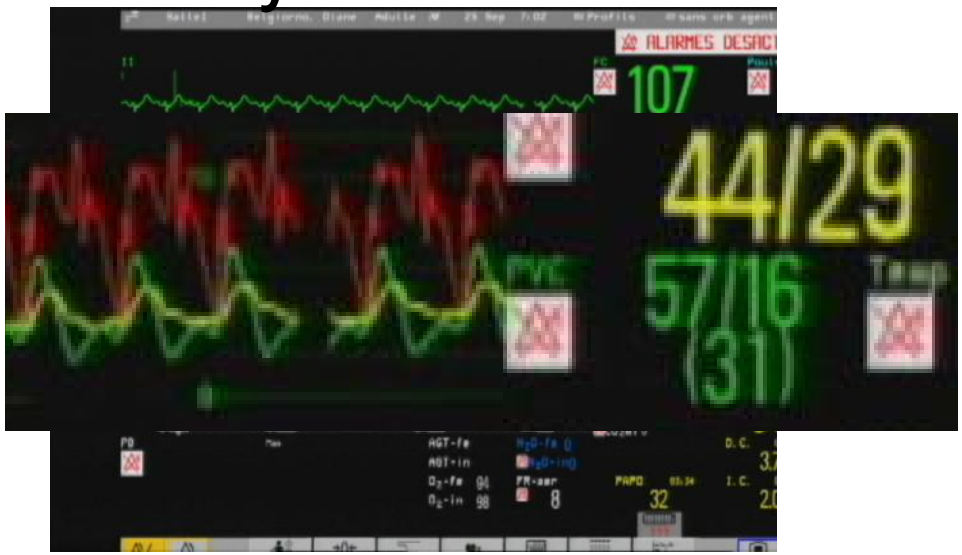


↑ Peak pressure upon chest closure

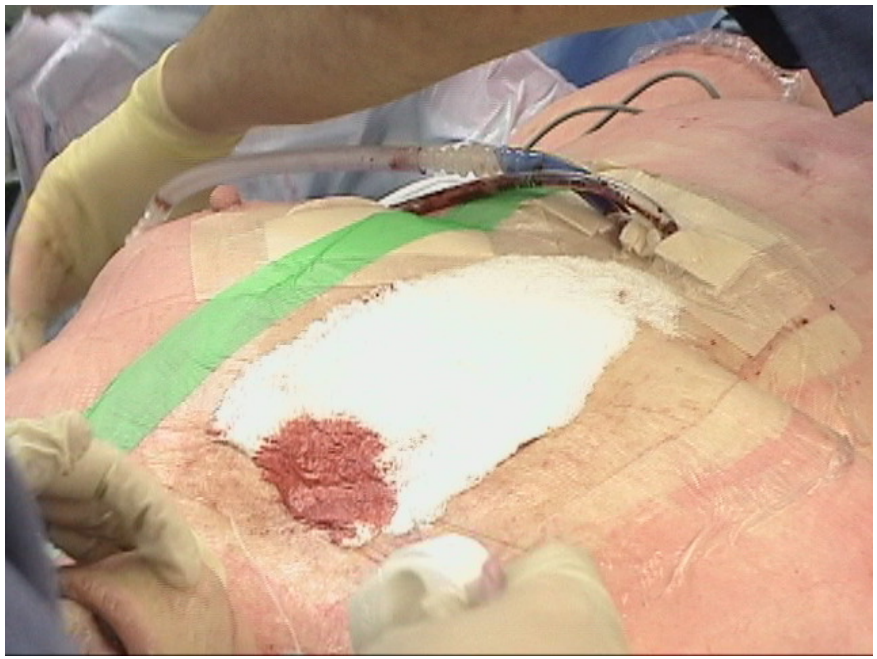
Before CPB

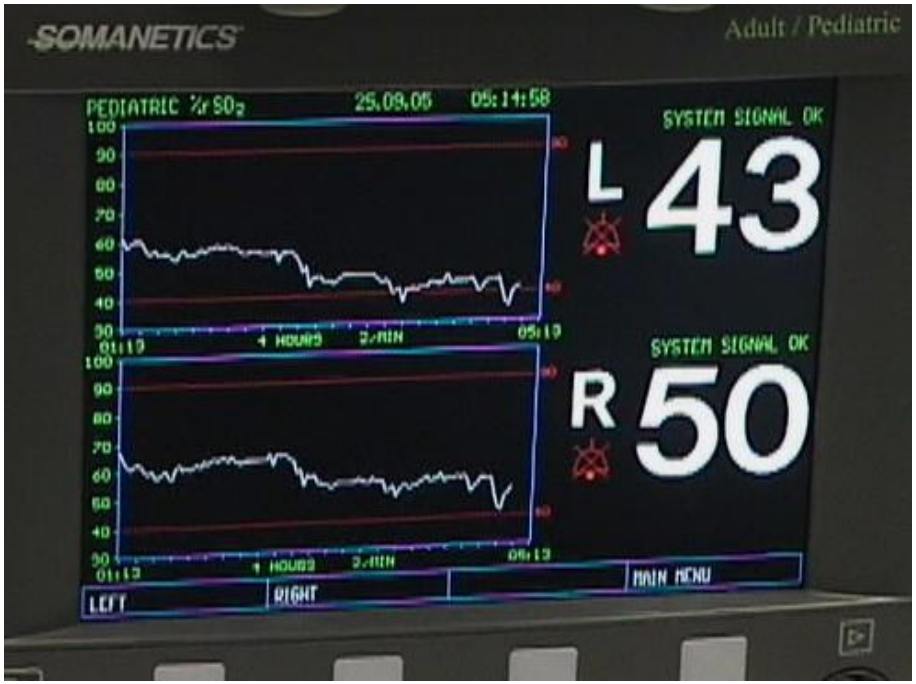
After CPB

Simultaneously



Chest reopened and sent to ICU





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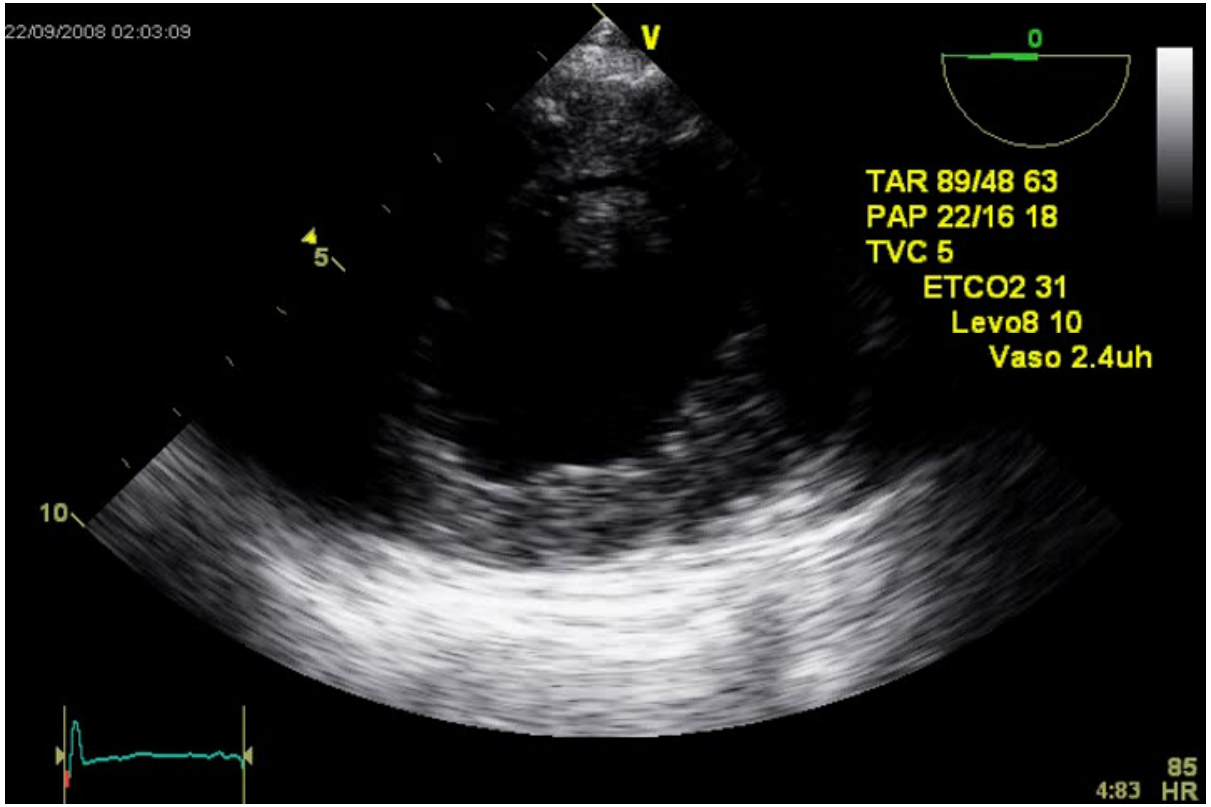
19 yo ♂ polytrauma transferred to our ICU: organ donation

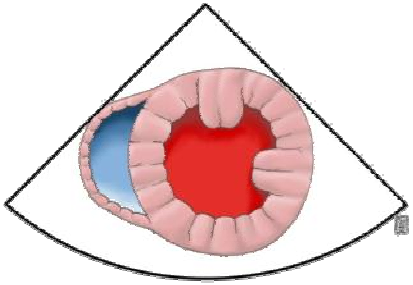
HR	84 beats/min
Pa (radial)	89/48 63 mmHg
PAP	22/16 18 mmHg
Pra	5 mmHg
$ETCO_2$	31 mmHg

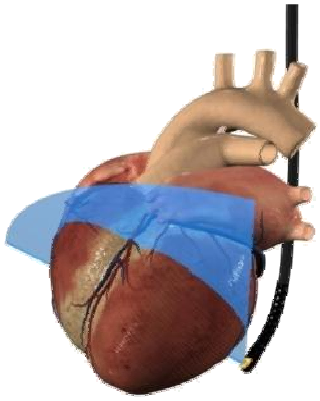
Noradrenaline 5.3 ug/min +

vaso 2.4 units/h unchanged since transfer

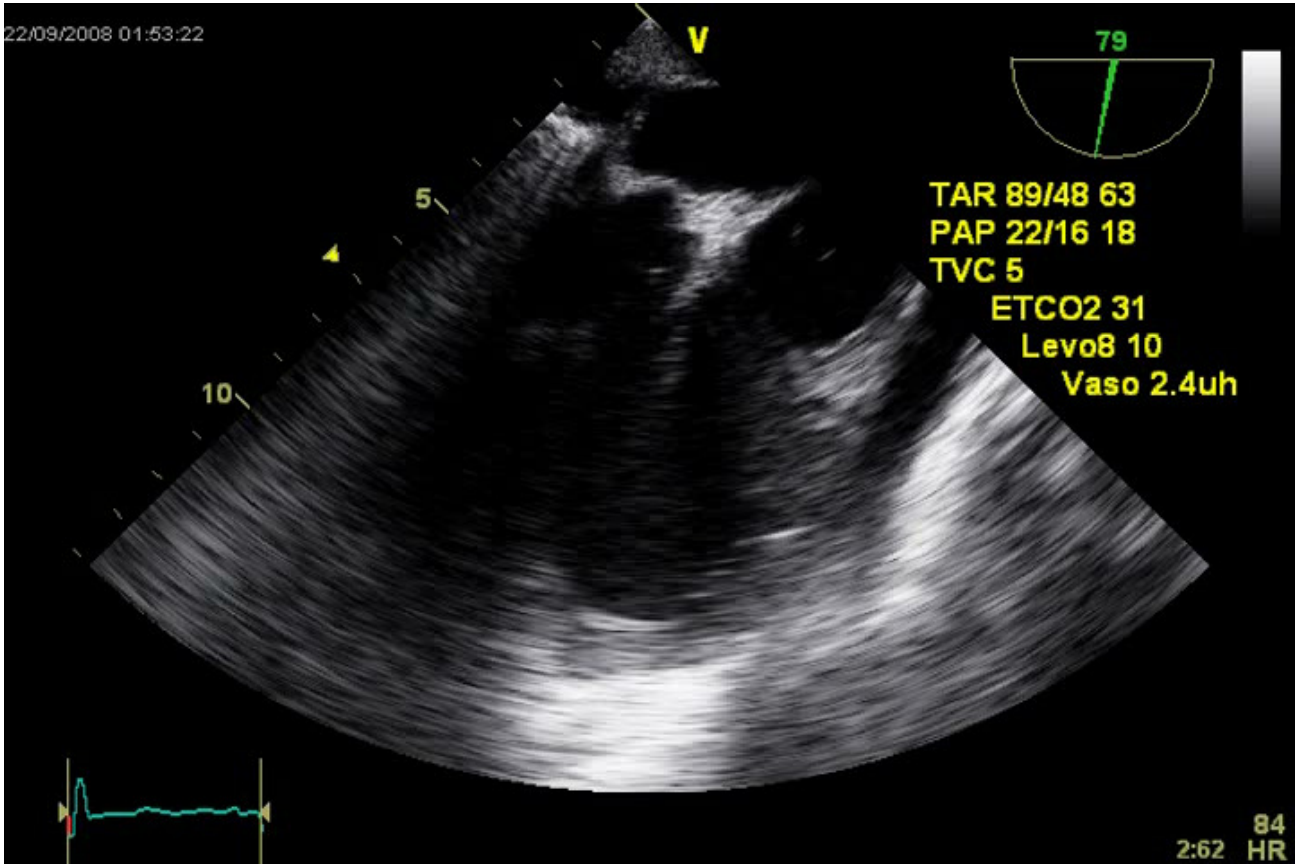
Cardiac donor candidate?

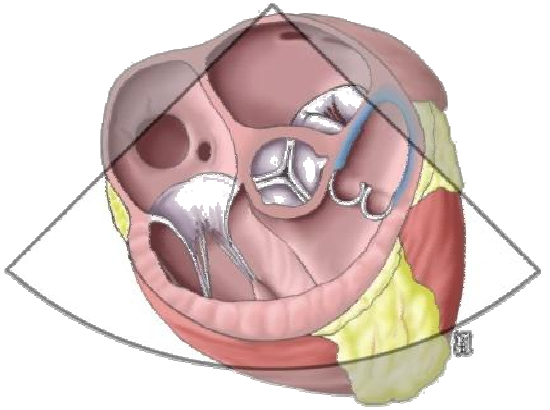


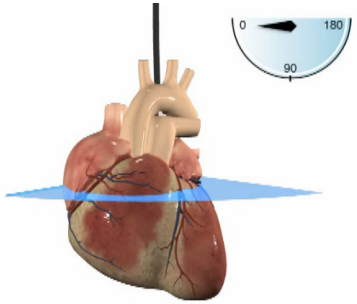




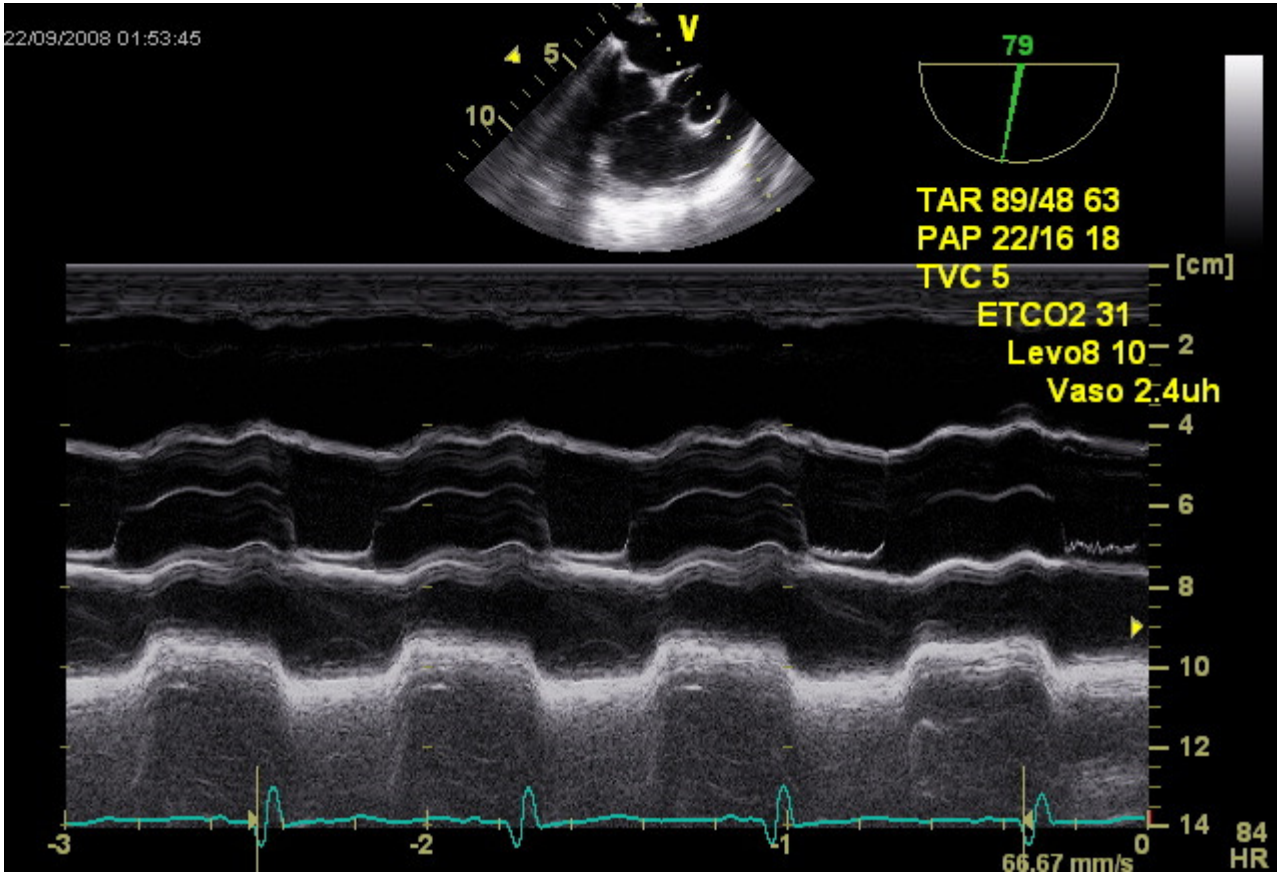
ME inflow-outflow view





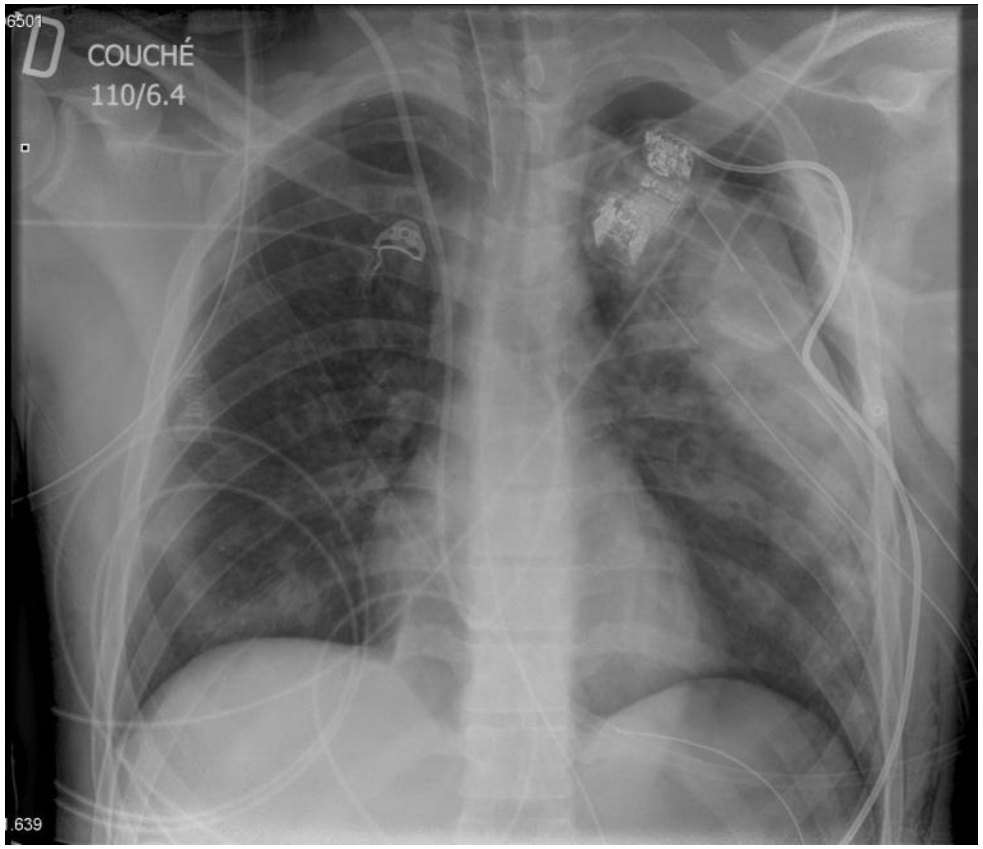


M-Mode: **diastolic** right ventricular outflow tract obstruction

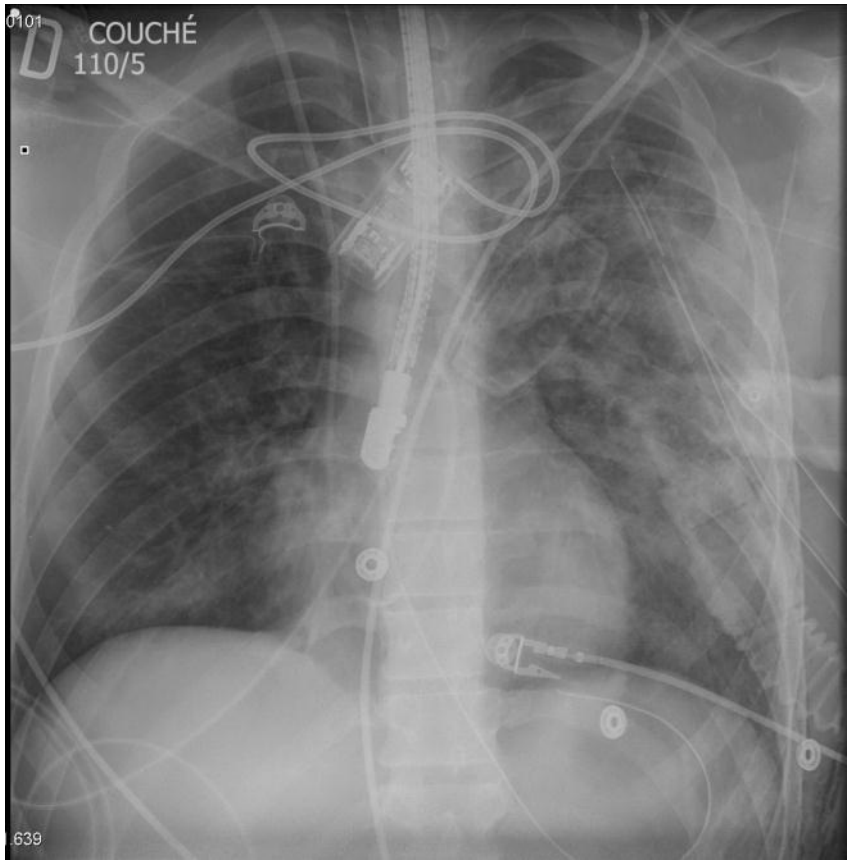


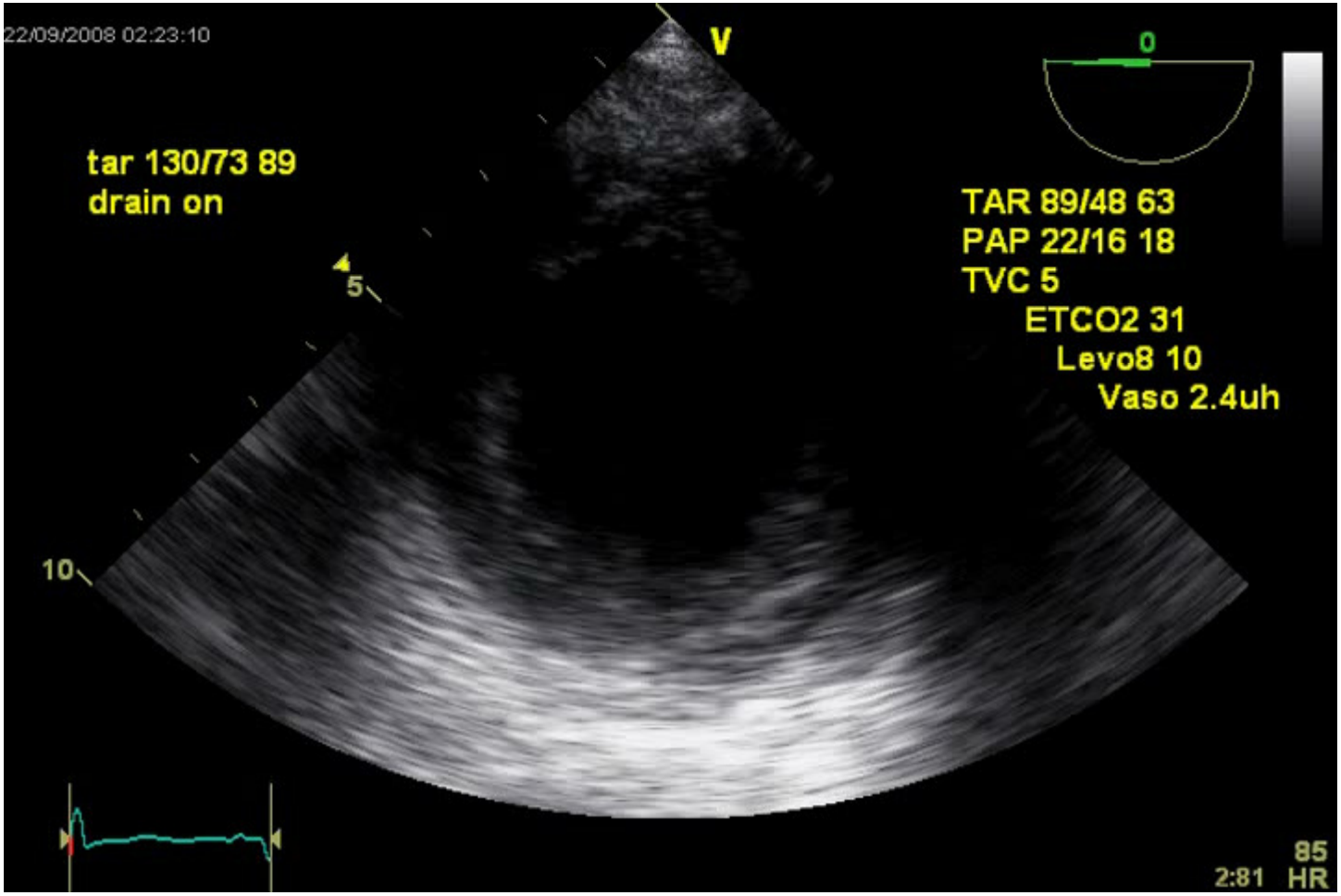
Chest radiograph

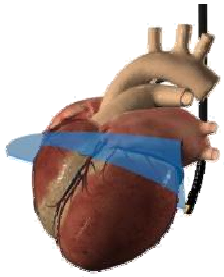
Before chest tube



After chest tube on




22/09/2008 02:23:10
V
0
tar 130/73 89
drain on
TAR 89/48 63
PAP 22/16 18
TVC 5
ETCO2 31
Levo8 10
Vaso 2.4uh
5
10
85
2:81 HR

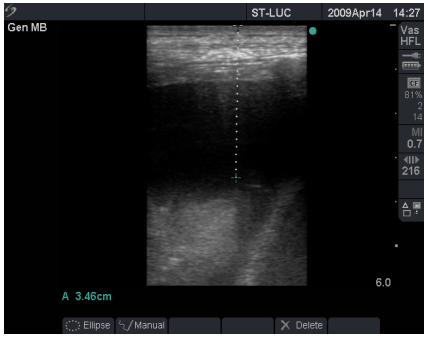


Lung ultrasound: Content of the lung

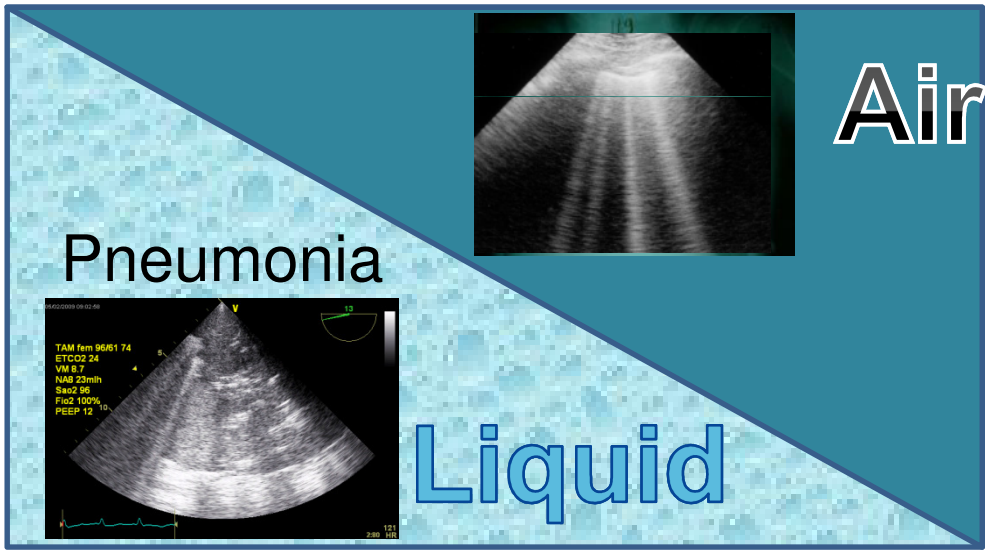
Interstitial oedema

Sen/Spe: 100% 100%

Pleural effusion

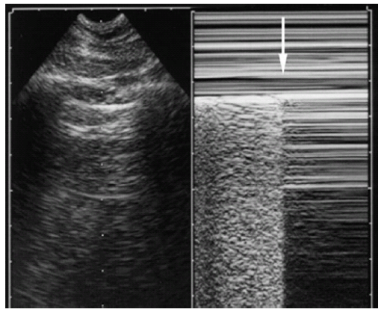


Sen/Spe: 97% 94%



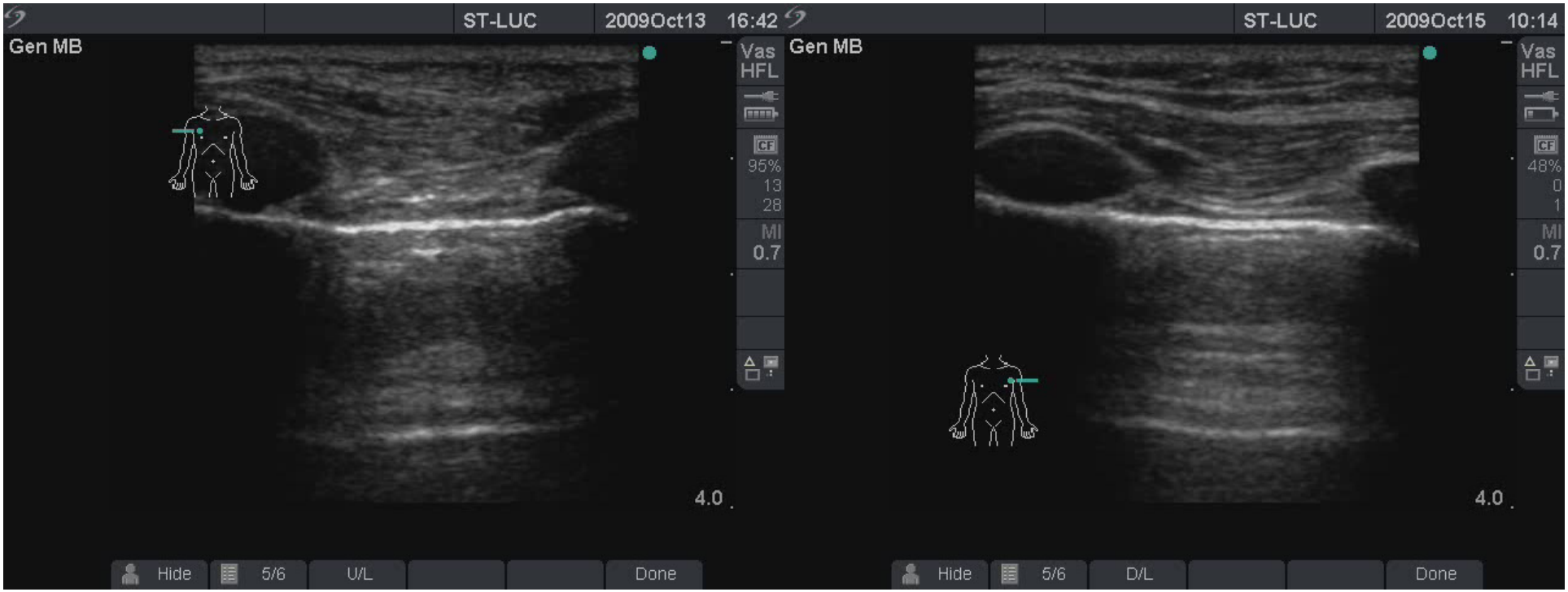
Sen/Spe: 90% 98%

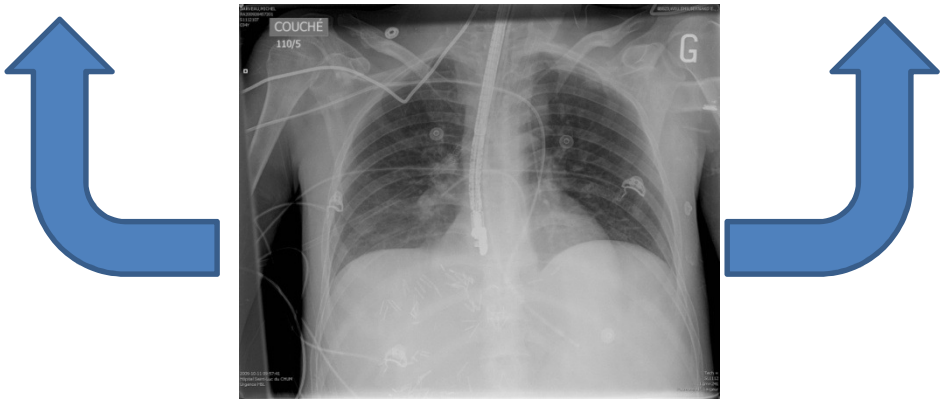
Pneumothorax



Sen/Spe: 79% 100%

♂ de 42 ans post-greffe de foie: désaturation





Most common condition associated with hemodynamic instability

1-↓ Pms: hypovolemia, vasodilatation

2-↑ Pra: Left and right systolic dysfunction

Left and right diastolic dysfunction

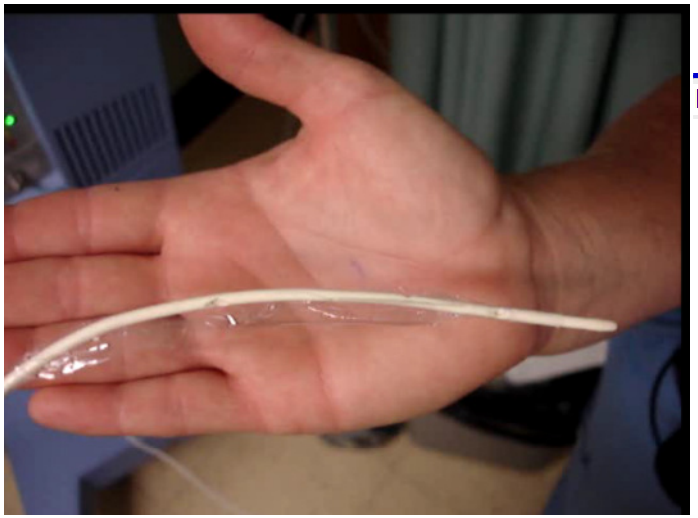
Left and right outflow tract obstruction

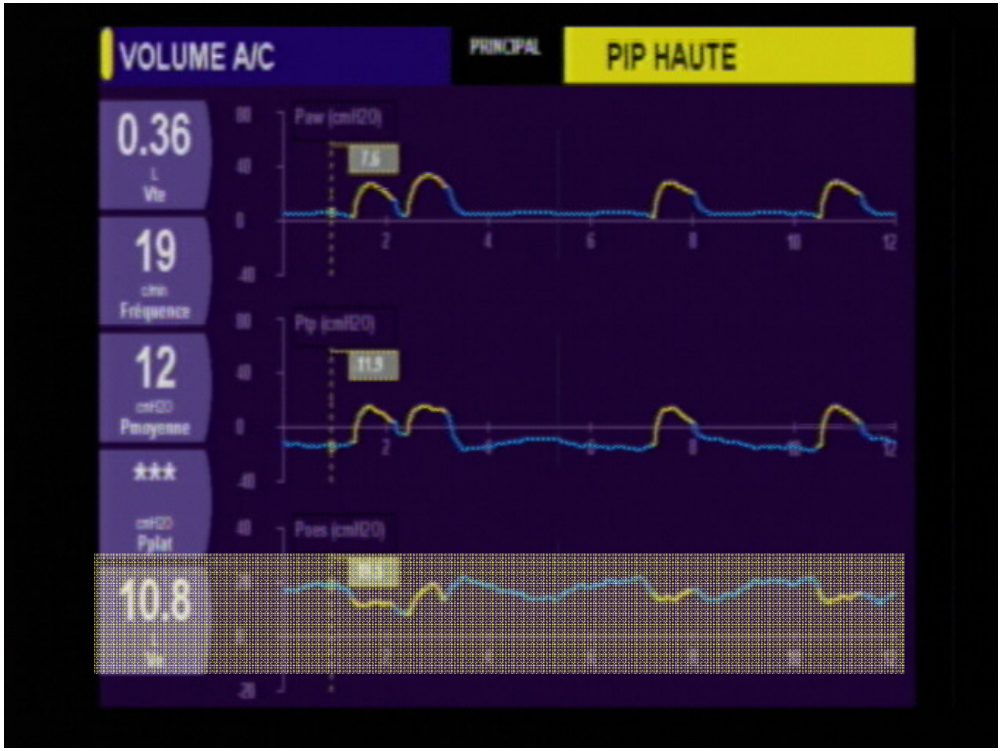
Pulmonary emboli

Hypoxia and hypercapnia

3-↑ Rrv: intrinsic obstruction and compartment syndrome (pericardial, mediastinal, thoracic, abdominal)

65 yo ♀ unstable after induction: difficult intubation. Treatment?





World Society of the Abdominal Compartment Syndrome

WORLD SOCIETY OF THE
ABDOMINAL COMPARTMENT SYNDROME

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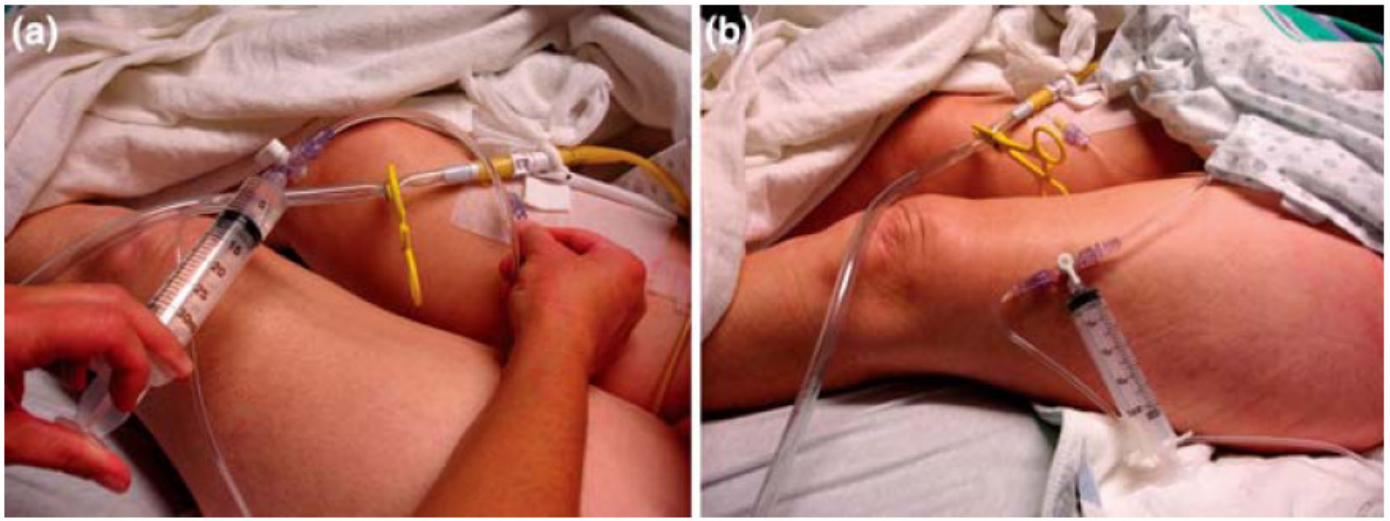
Can J Anesth/J Can Anesth (2009) 56:678–682
DOI 10.1007/s12630-009-9140-8

PERIOPERATIVE CARDIOVASCULAR ROUNDS

Acute abdominal compartment syndrome

Nancy Deslauriers, MD · Renée Déry, MD · André Denault, MD



63 yo ♂ ans with cirrhosis in shock after UGI endoscopy

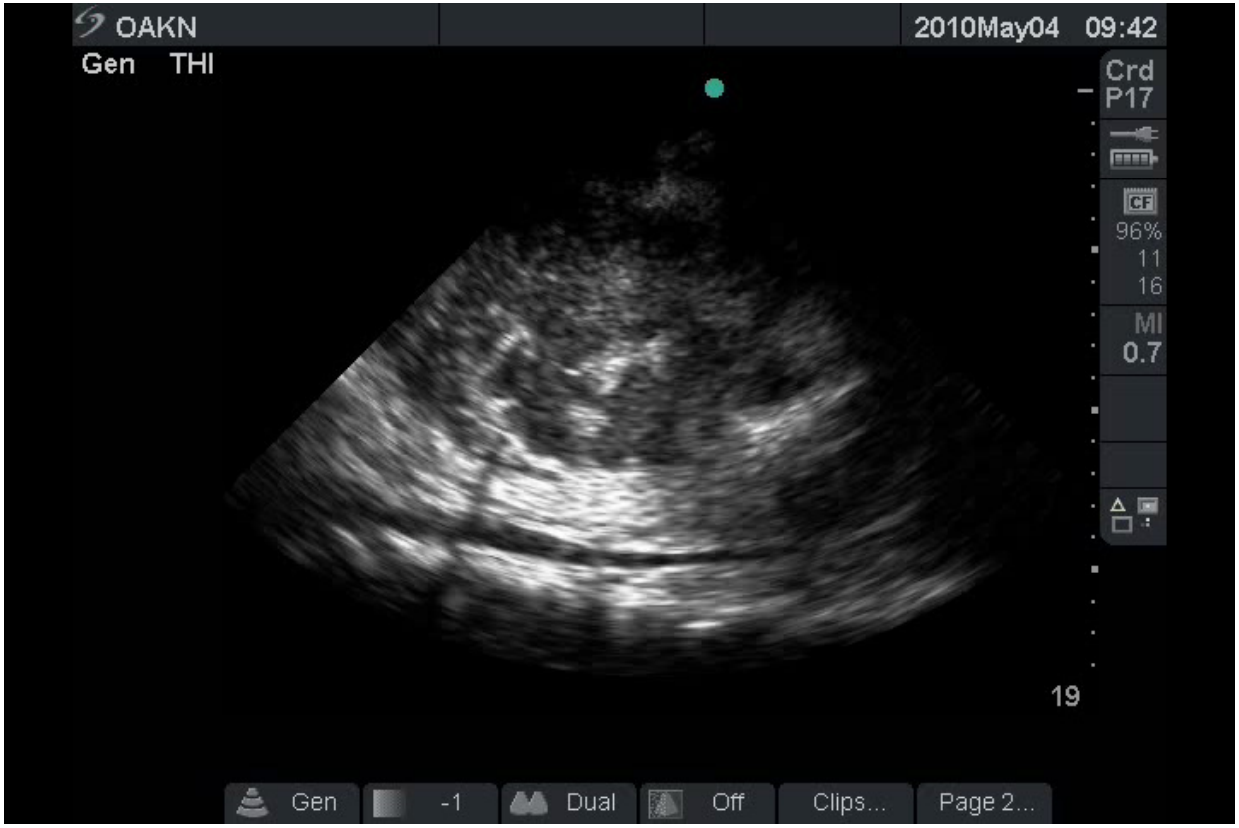
Noradrenaline (8 mg/250 at 100 ml/h) = 53 µg/min

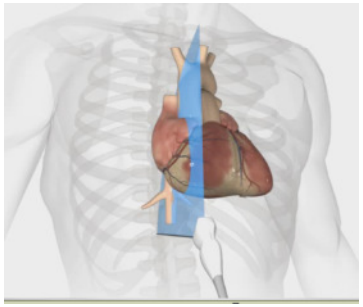
Noradrenalin (8mg/250 at 10 ml/h) = ↓5.3 µg/min


S1537
S1053


S1537
S1053

42 yo ♀ HR 155, acidosis, hypoxic and abdominal pressure of 31 mmHg: removal of 2.5 L





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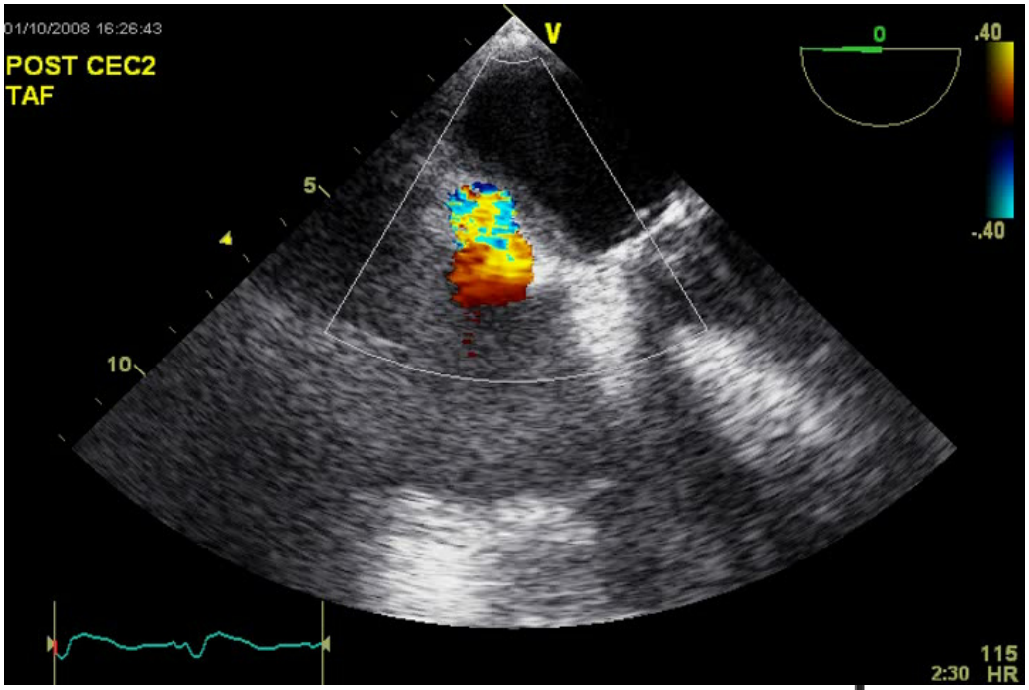
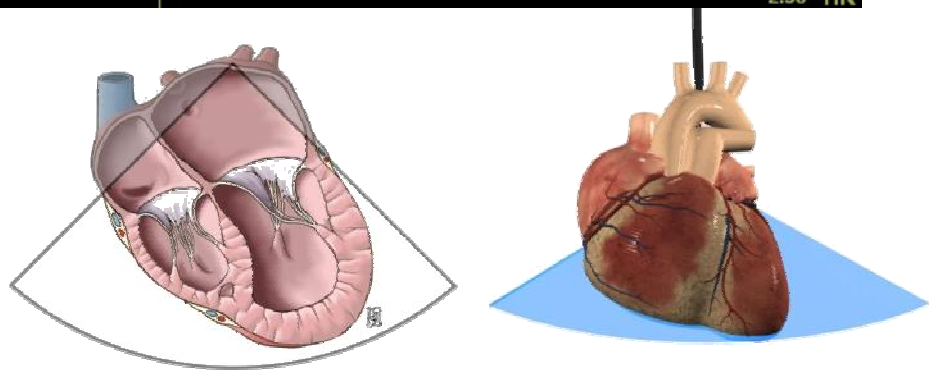
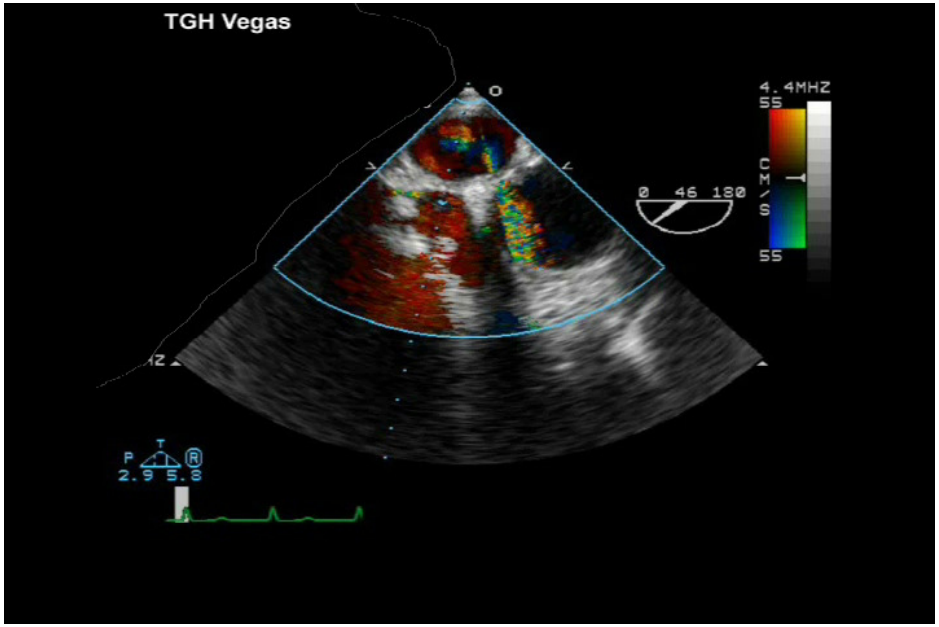
75 yo ♂ complex re-operation (AVR, MVR): unstable +++++

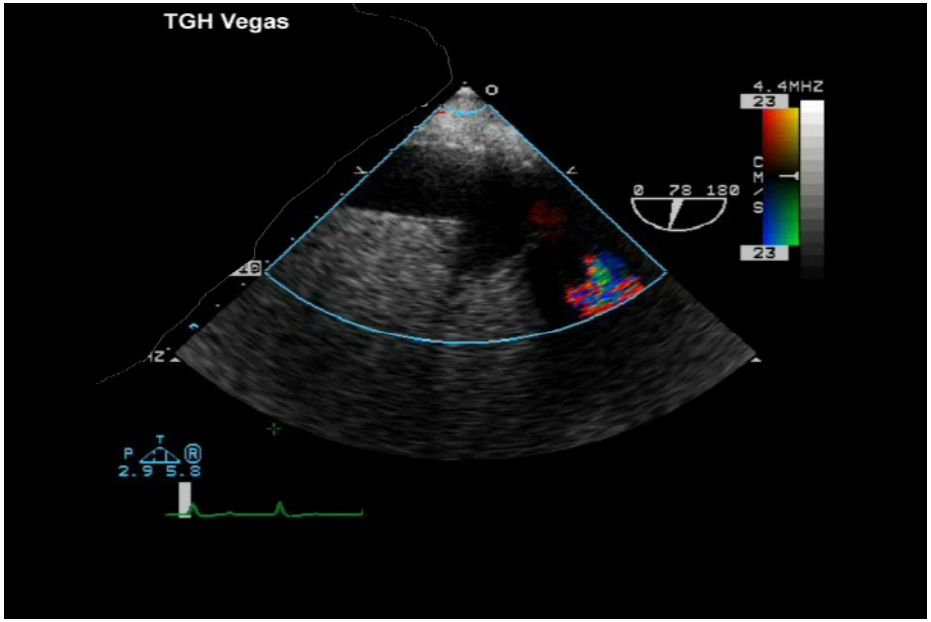


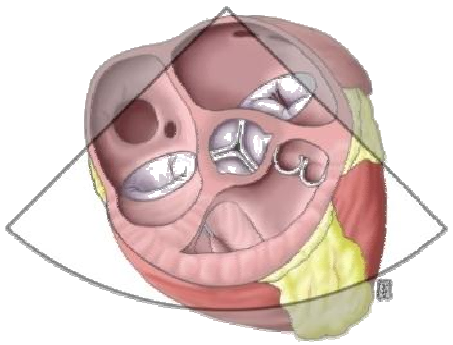
Hepatic venous flow

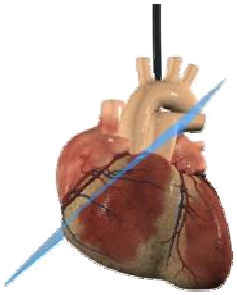


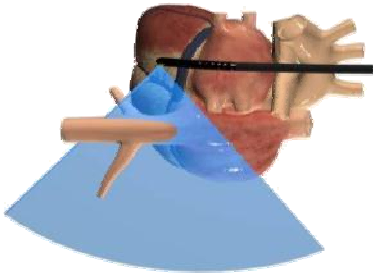
Similar case in Toronto General Hospital





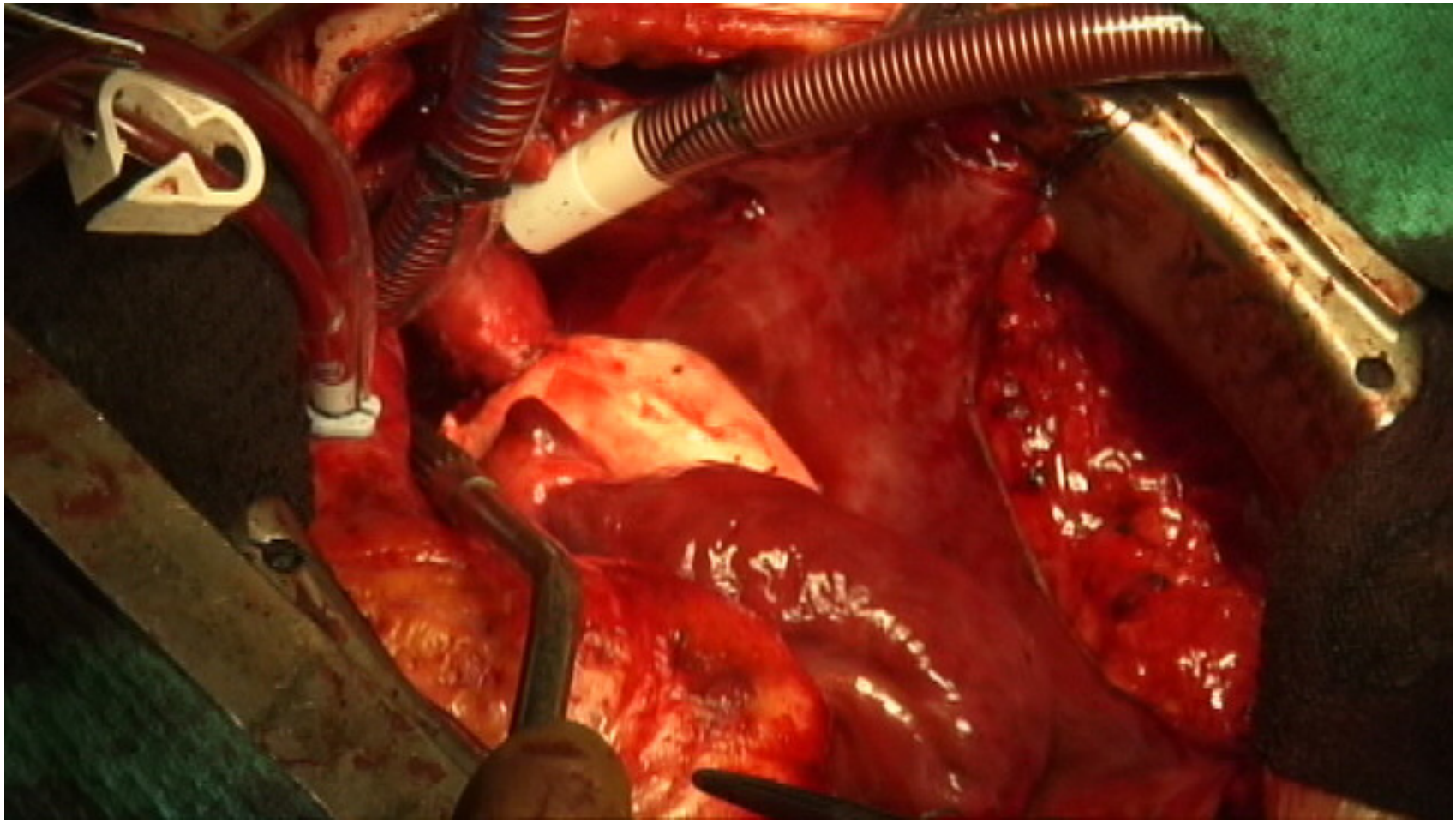






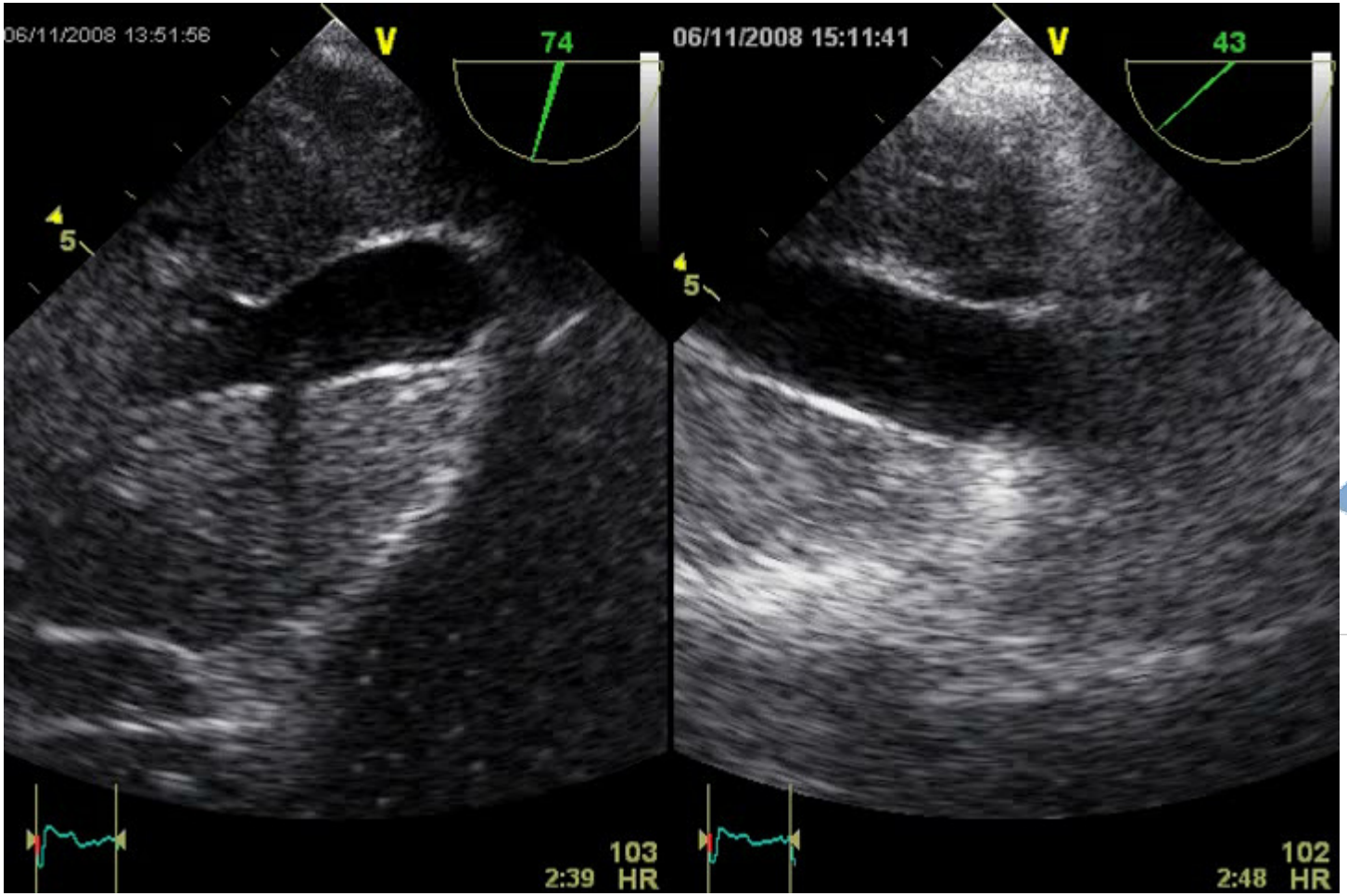
Courtesy Dr. A. Vegas

Fontan surgery: IVC to LPA anastomosis

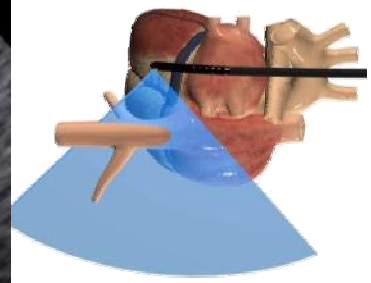


Hemodynamically unstable from iatrogenic IVC stenosis

Before

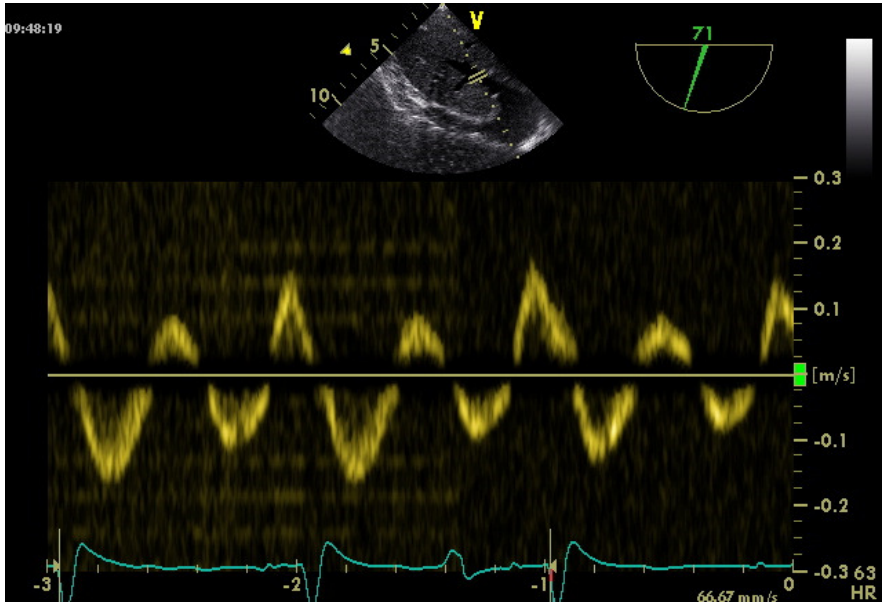


After correction

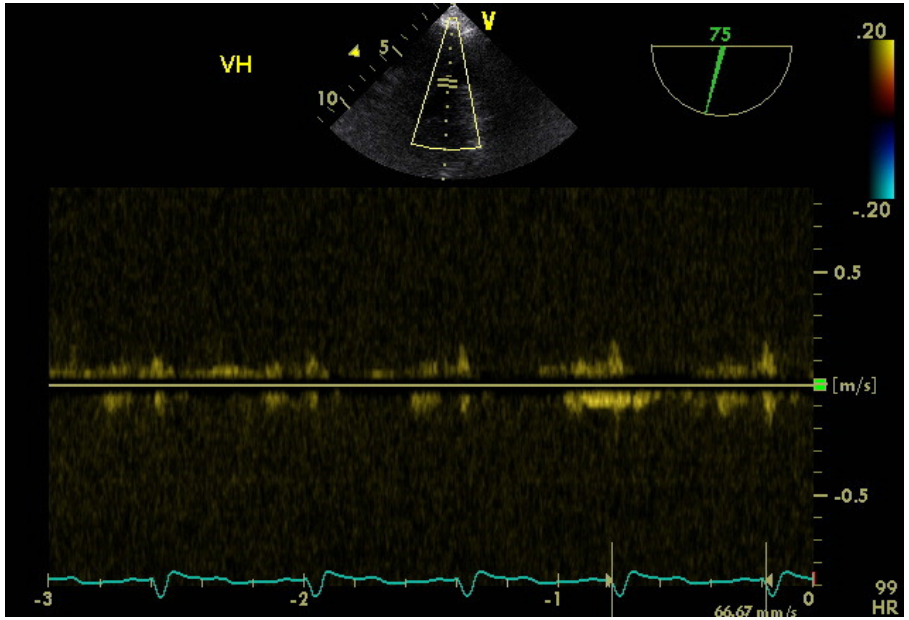


Hemodynamically unstable from iatrogenic IVC stenosis

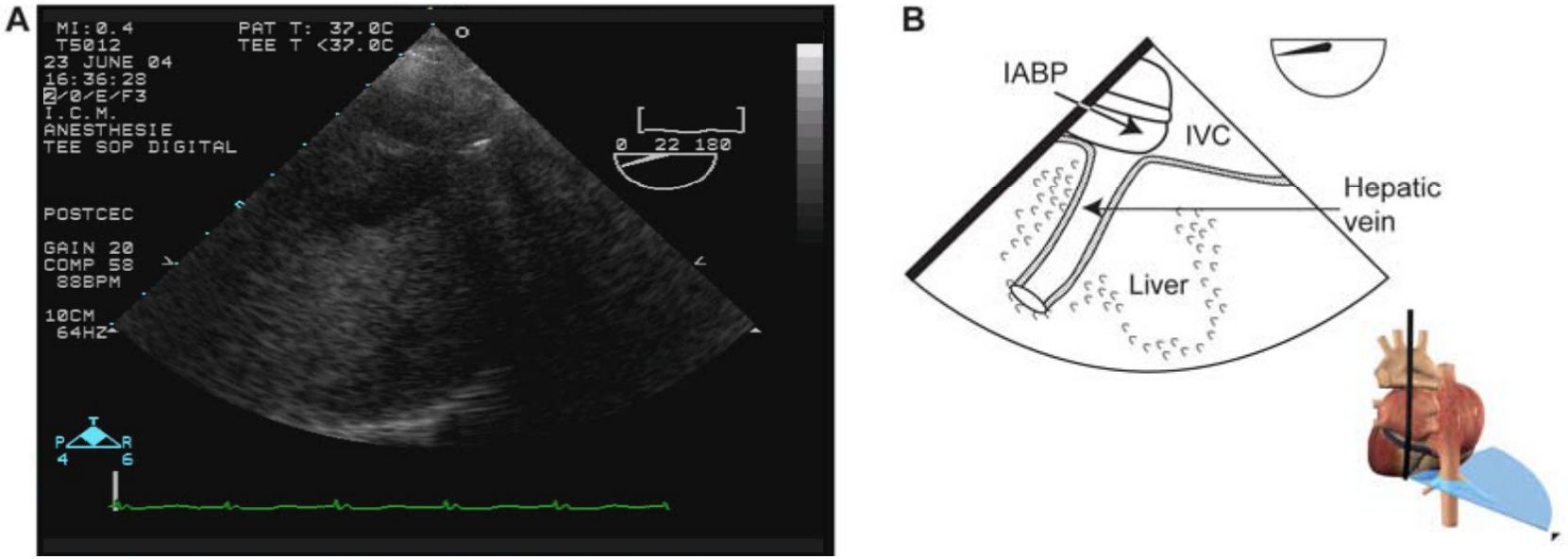
HVF before CPB



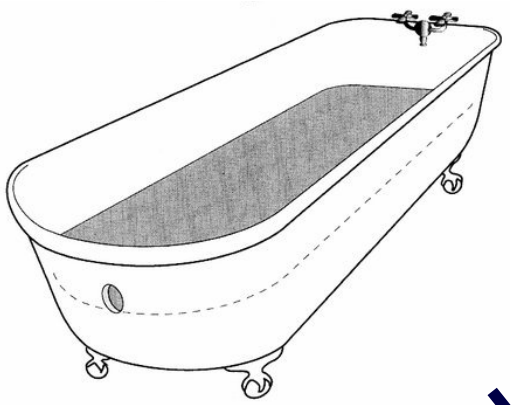
HVF after CPB



Résistance au retour veineux

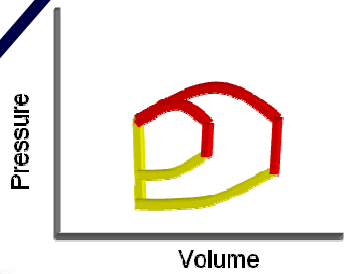


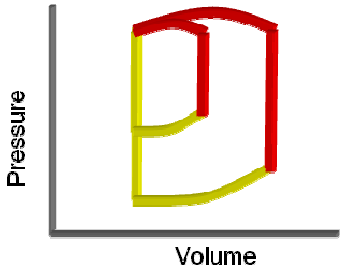
Résistance au RV

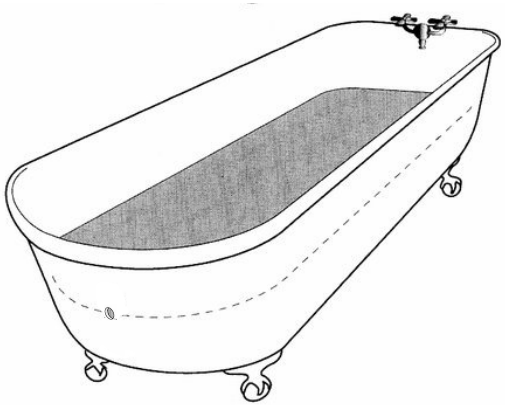


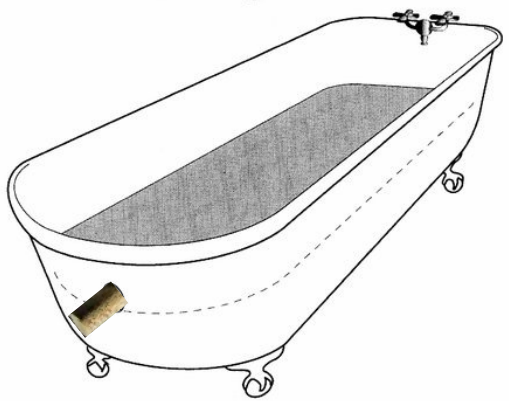
↓ taille de l'ouverture

Obstruction de l'ouverture









Adapté de: Jacobsohn et al Can J Anesth 1997 44:8 849-67