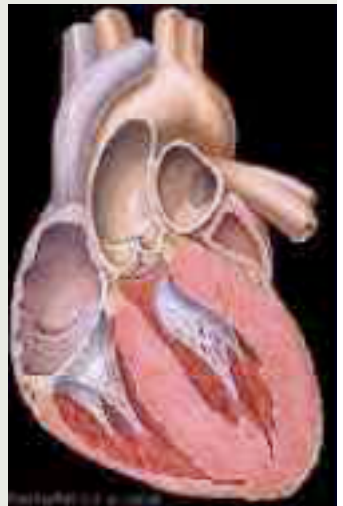


LES JEUDIS DE L'URGENCE

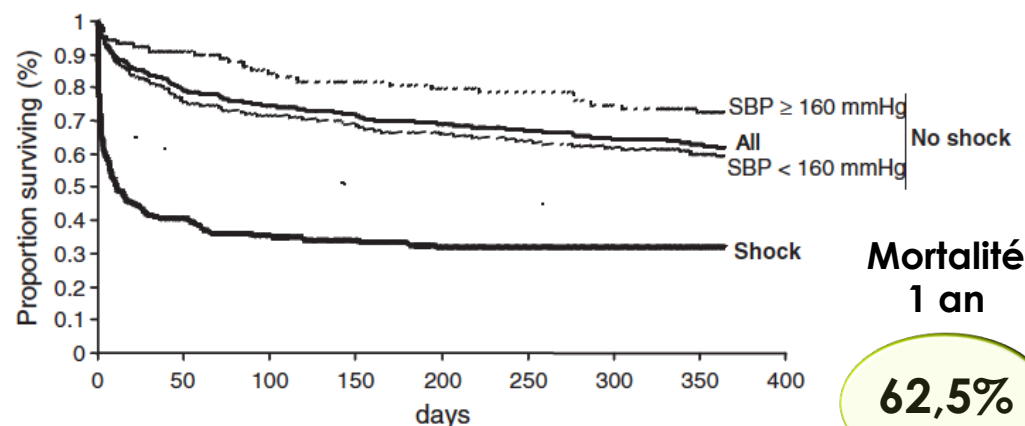
Choc cardiogénique

Dr C Roger



Epidémiologie: étude EFICA

- 60 centres, 599 patients
- 82% OAP, 29% choc cardiogénique



Facteurs protecteurs: HVG et HTA

	All patients (n=581)	Cardiogenic shock <i>p</i> ^a		
		Yes (n=166)	No (n=415)	
<i>Aetiology of ADHF (%)</i>				
IHD	61	64	59	0.31
Dilated cardiomyopathy	15	19	14	0.09
Hypertensive and/or hypertrophic cardiomyopathy	15	10	18	0.01
Valvular heart disease	21	17	23	0.17
Other aetiology	4	5	4	0.66
More than one aetiology	17	15	17	0.92
Unknown	0.2	0.6	0	0.29
<i>Precipitating factors (%)</i>				
Ischaemia	42	49	39	0.02
Arrhythmias	25	26	24	0.50
Infection	20	22	19	0.47
Hypertensive crisis	8	2	10	0.003
Drug compliance	7	5	8	0.21
Other [†]	25	35	21	0.001
None	8	4	9	0.04
<i>Symptoms on admission (%)</i>				
Cardiogenic shock	29	100	0	<0.0001
Pulmonary oedema	82	60	91	<0.0001
Peripheral oedema	27	20	30	0.02
Angina	14	17	13	0.29
Hepatomegaly	20	24	18	0.09
Syncope	4	9	2	0.0002
Arrhythmia	23	26	21	0.17
Stroke	1	1	1	1.00

Définition

- Insuffisance cardiaque aiguë:
 - Installation rapide de symptômes secondaires à des anomalies de la fonction cardiaque
 - Dysfonction systolique
 - Dysfonction diastolique
 - Troubles du rythme
 - Inadéquation précharge/postcharge
- Avec ou sans ATCD cardio

Définition

ESC Eur Heart J 2005

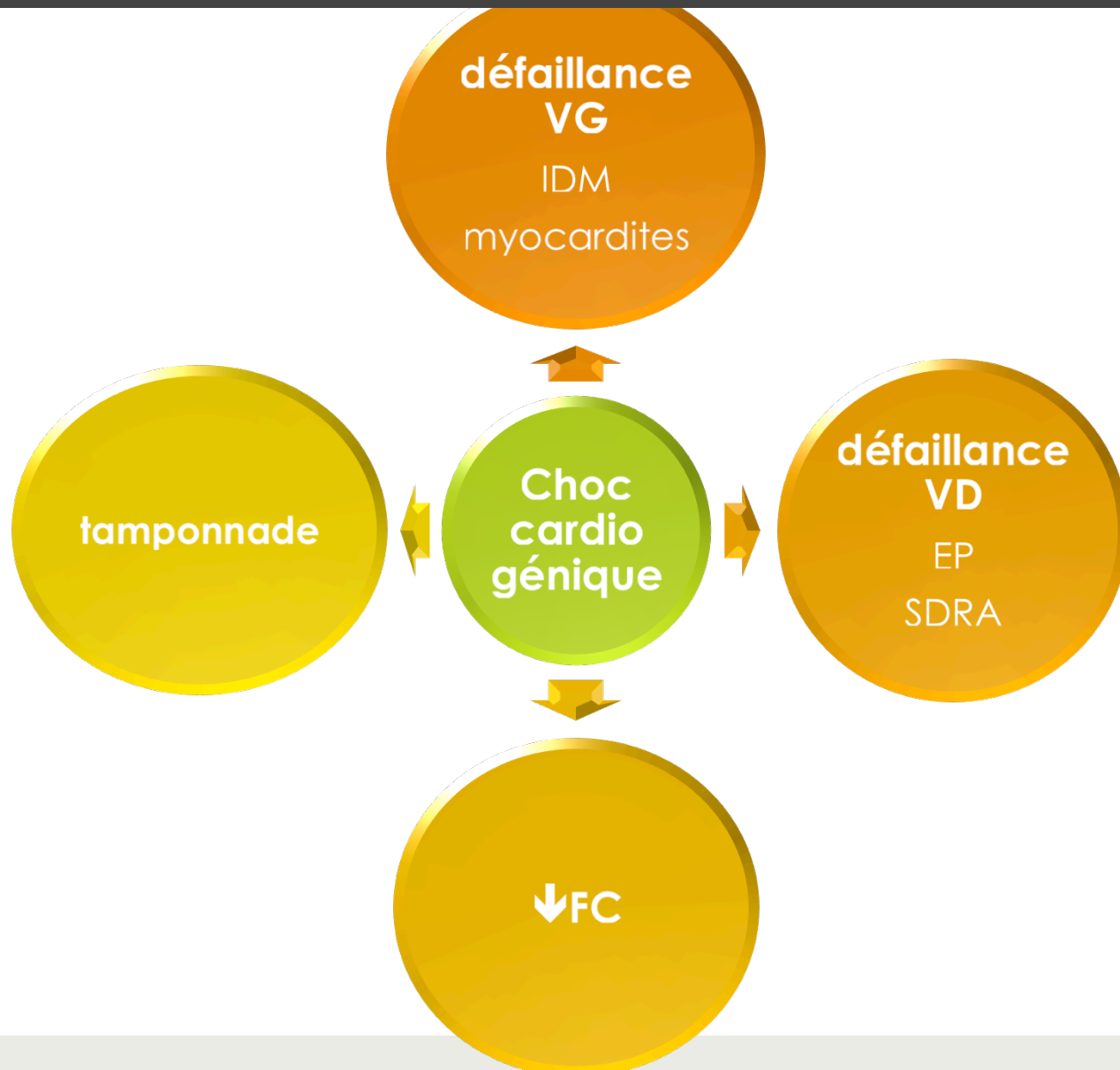
- Choc cardiogénique:
 - signes **d'hypoperfusion tissulaire** secondaire à une **défaillance cardiaque** après correction de la précharge.
- Caractérisé par
 - ↓ PAS < 90 mmHg pdt au moins 30 min + bas IC (< 2,2 l/min/m²) + Pcap > 16 mmHg
 - et/ou une oligurie (< 0,5 ml/kg/h)
 - Confusion
 - Marbrures, cyanose des extrémités
 - Avec ou sans congestion



Bas débit

Choc
cardiogénique

Altération d'un des composants du débit cardiaque



Etiologies

- Dysfonction aiguë du VG

- **IDM étendu +++**

- Intoxications médicamenteuses: AAR I, BB, IC, ADTC,
 - Myocardite aiguë
 - Post CEC
 - Cardiopathie dilatée
 - Contusion myocardiologique

- Dysfonction aiguë du VD

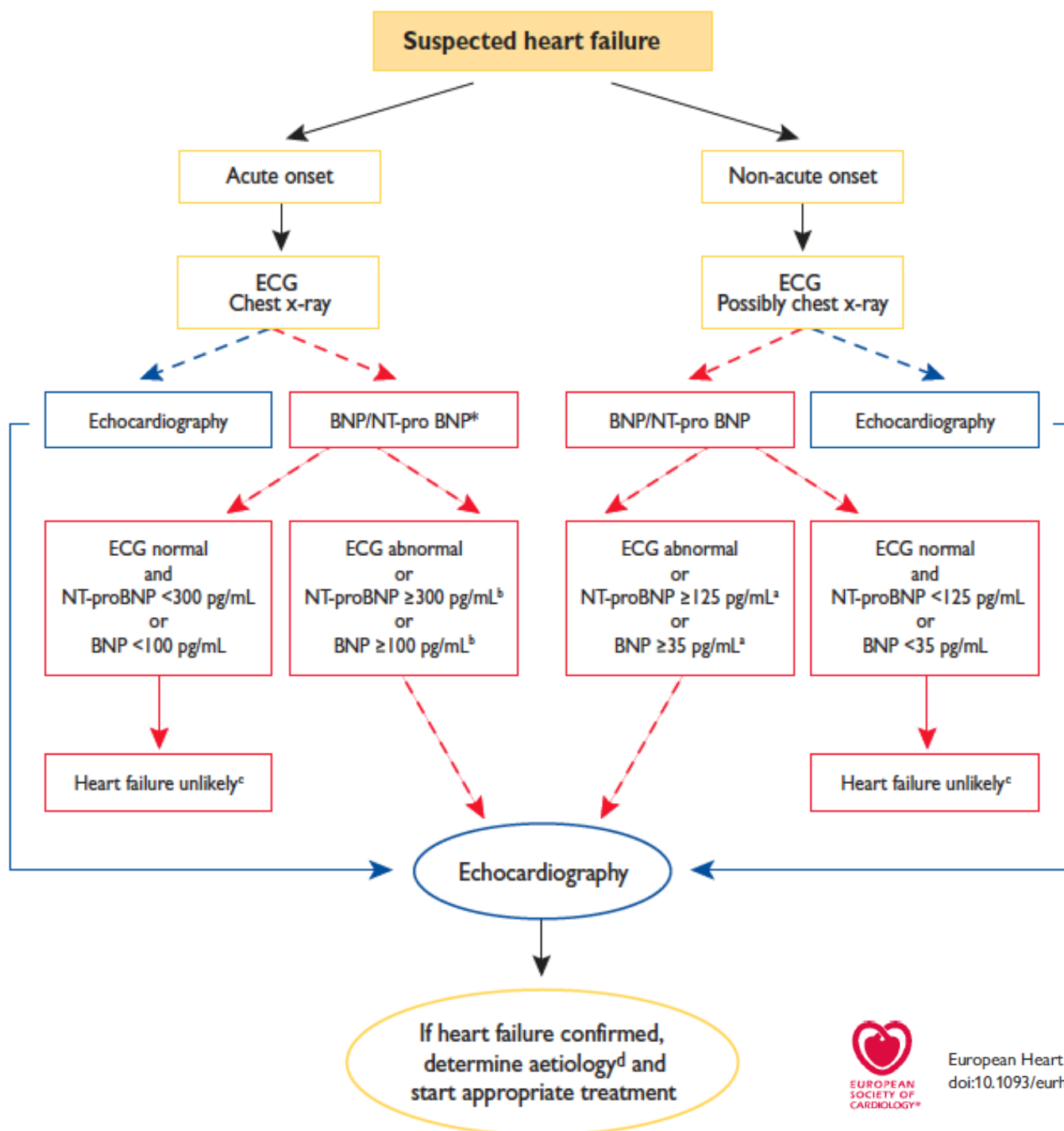
- Tamponnade
 - EP
 - SDRA
 - IDM VD

Etiologies

- Valvulopathies
 - RAo
 - Thromboses de prothèse
 - EI
- Troubles du rythme
 - BAV
 - TV, TSV

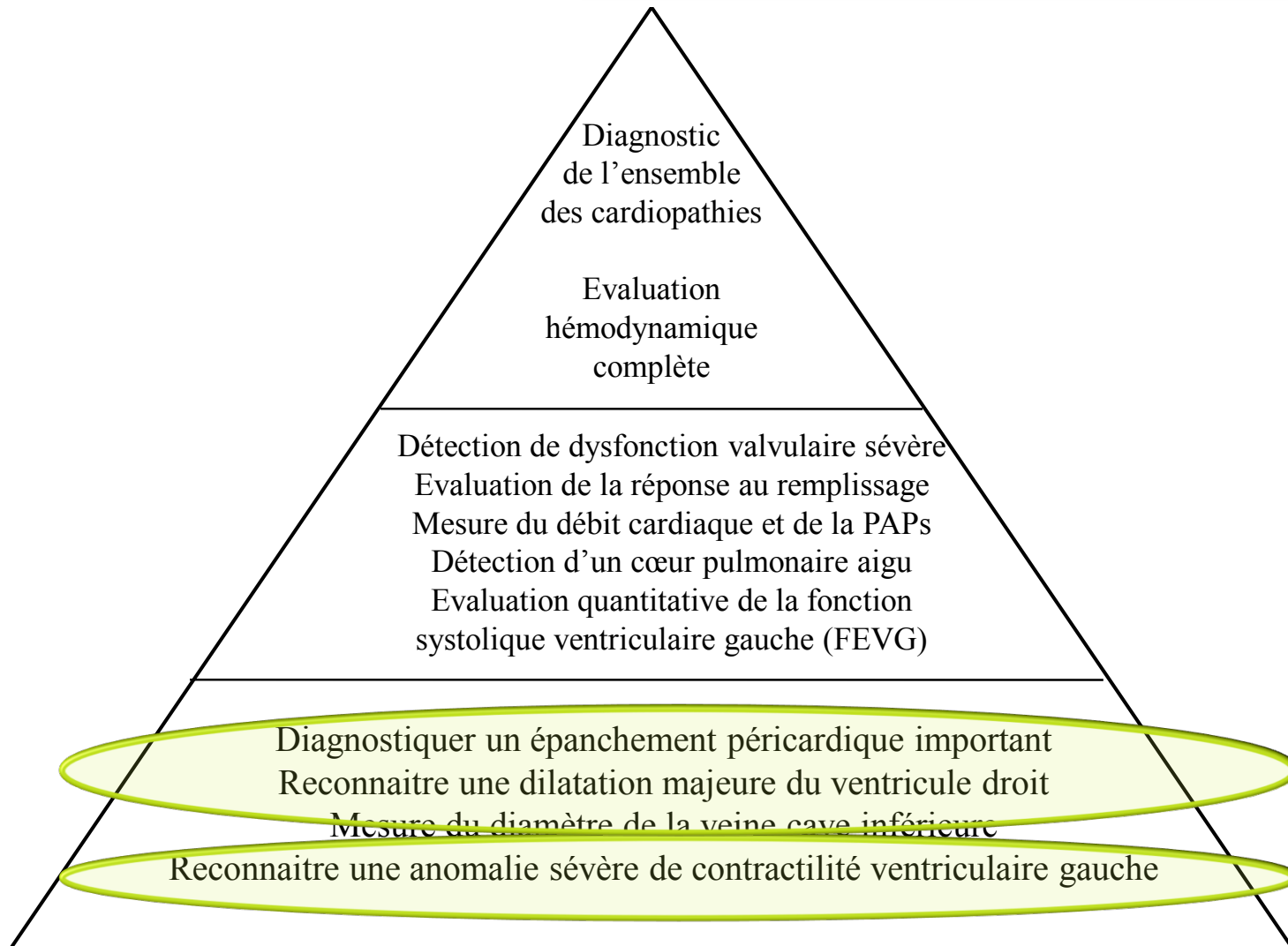
Choc cardiogénique post IDM

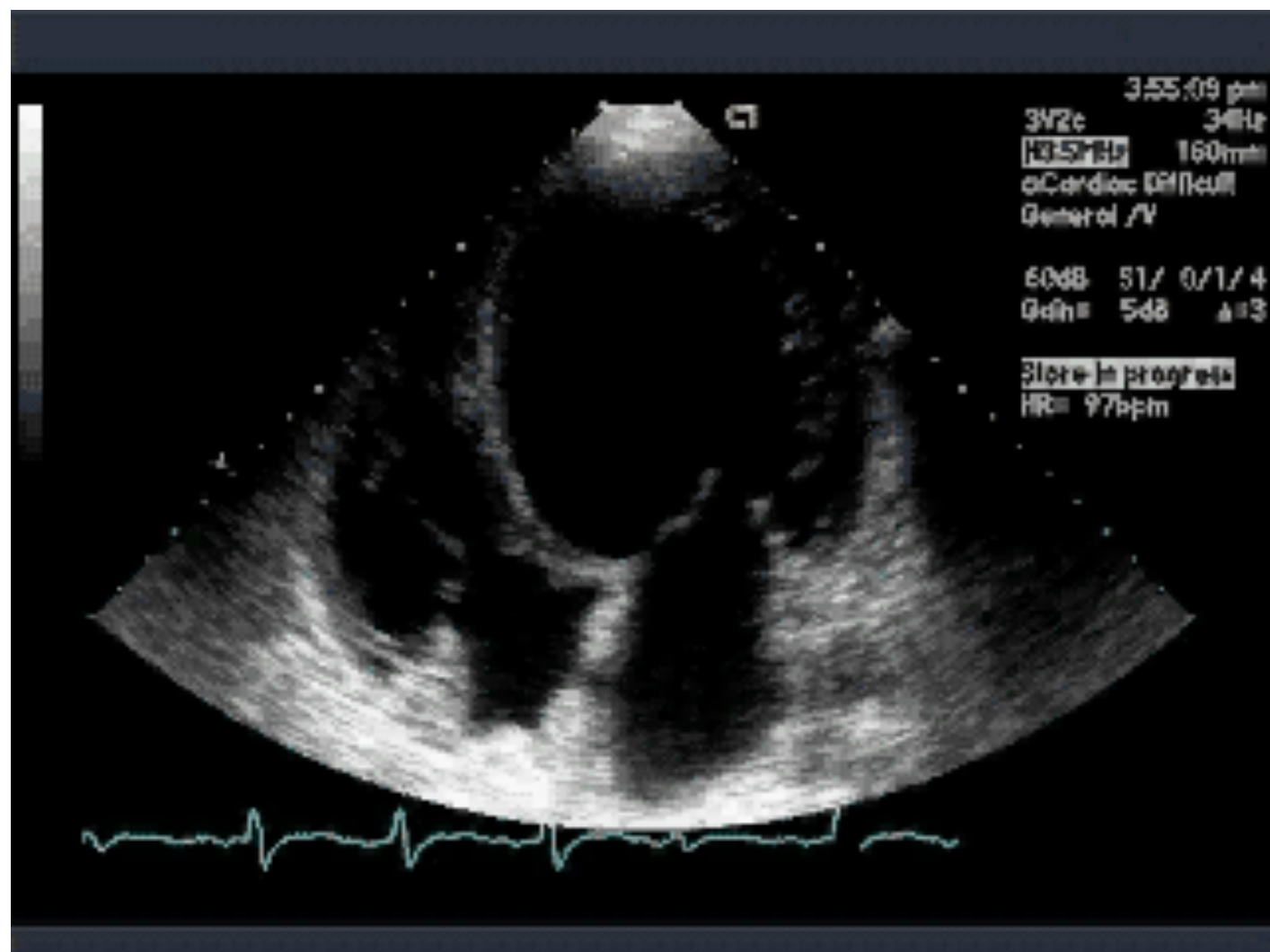
- 80% des cas de choc cardiogéniques, 10% des IDM
- Mortalité élevée: 50% *Goldberg NEJM 1999, Babaev JAMA 2005*
- FdR: patients âgés, diabétiques, IDM ant, ATCD d'IDM
- Peut être retardé dans les 24 à 72h post IDM
- Tjs rechercher une complication (IM aiguë, tamponnade, rupture septale)



Bernard P. Cholley
Antoine Vieillard-Baron
Alexandre Mebazaa

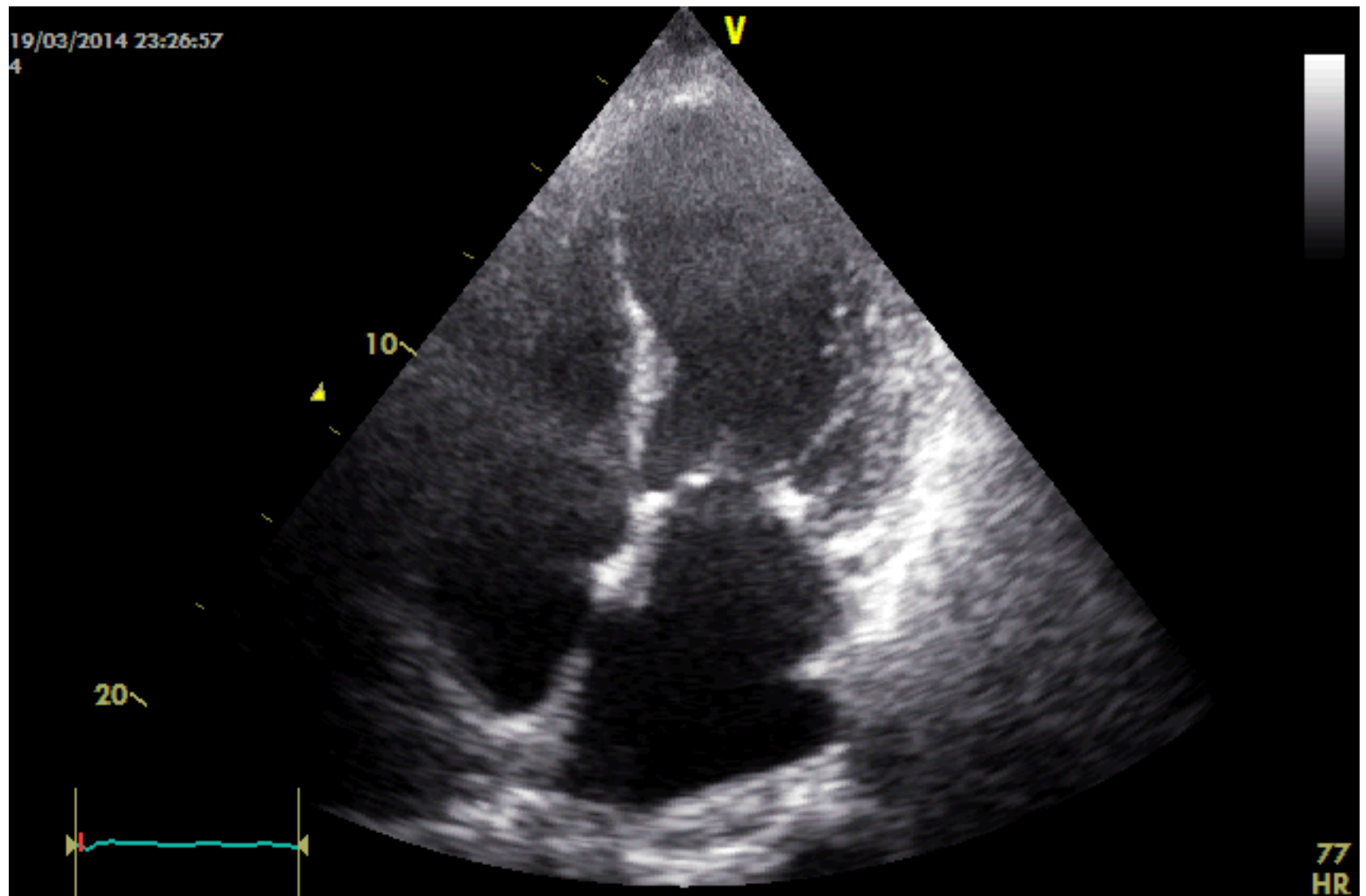
Echocardiography in the ICU: time for widespread use!





19/03/2014 23:26:57

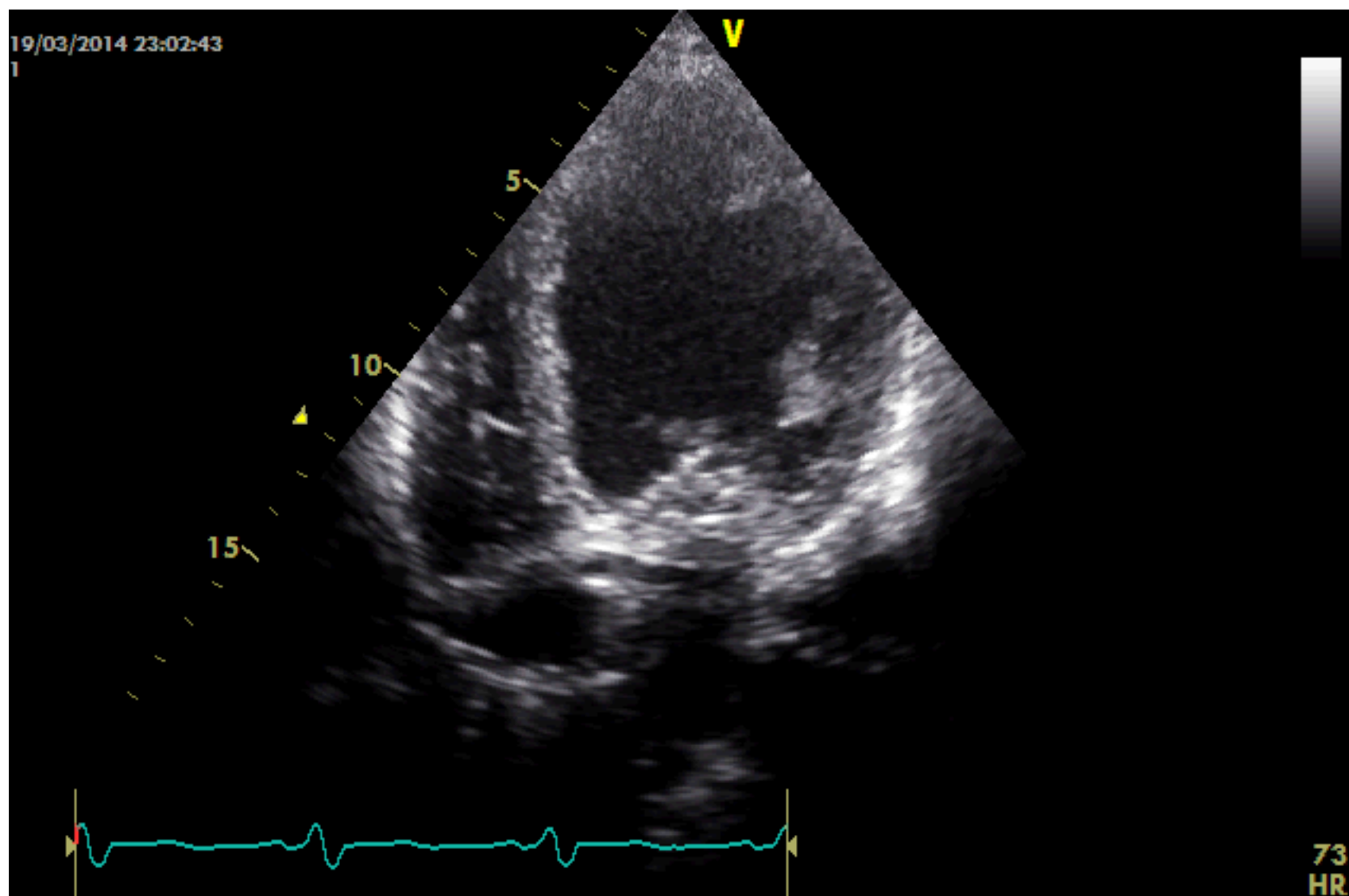
4



77
HR

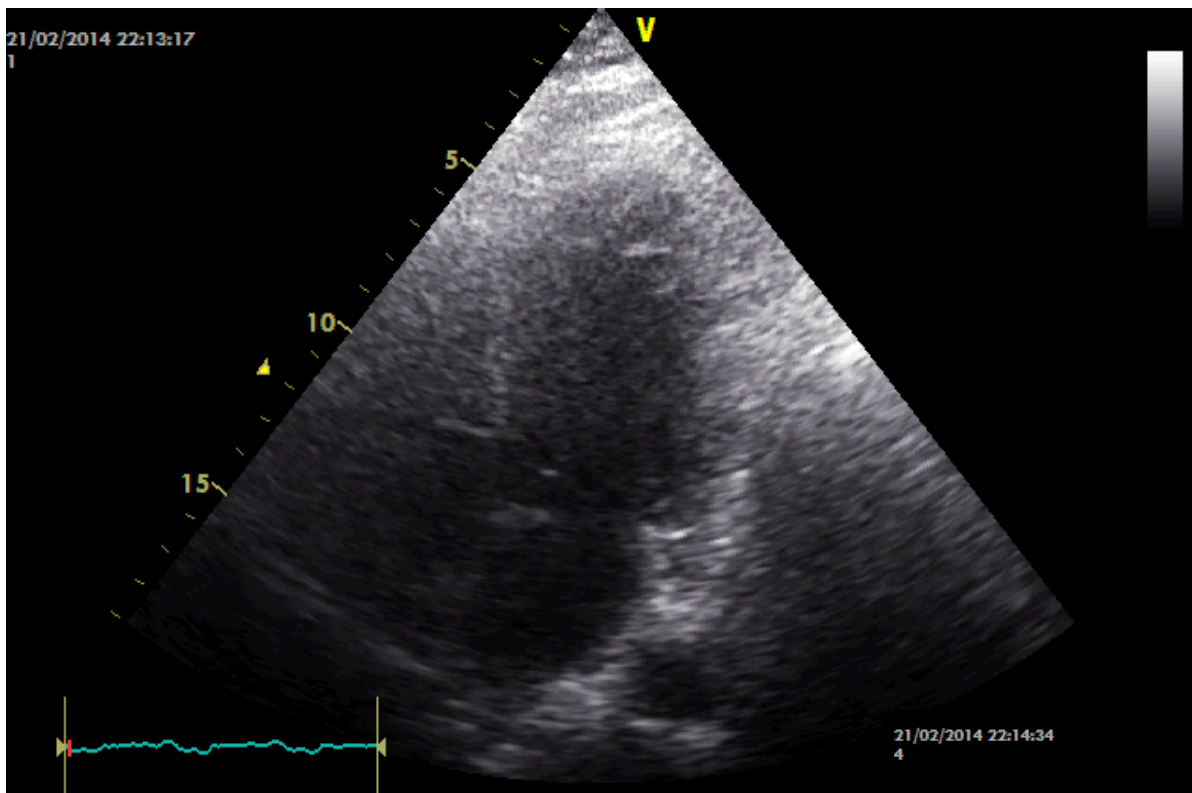
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1



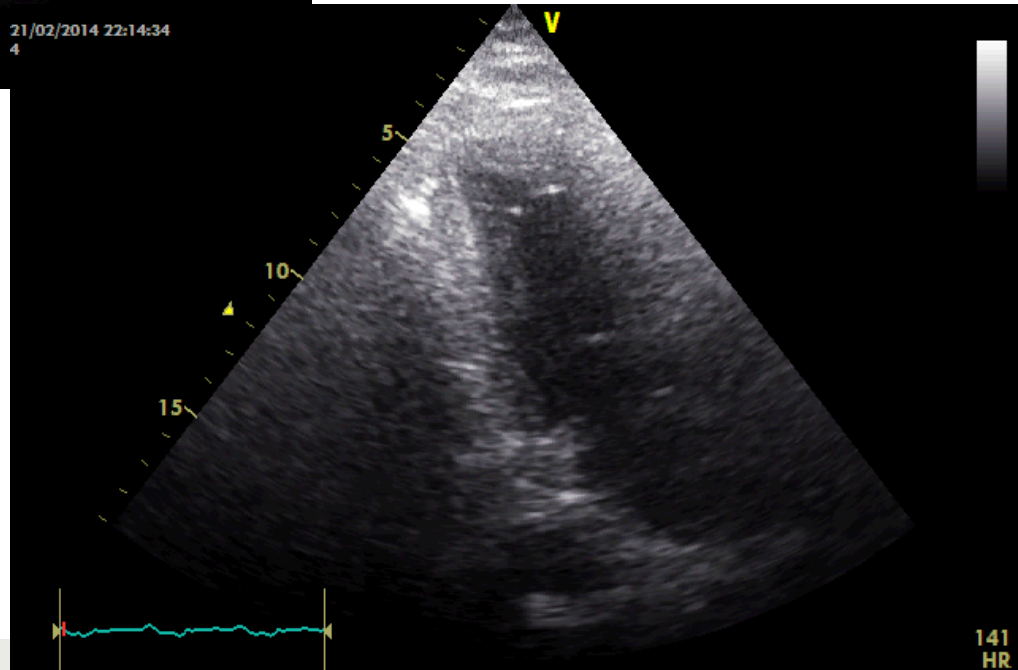
21/02/2014 22:13:17

1



21/02/2014 22:14:34

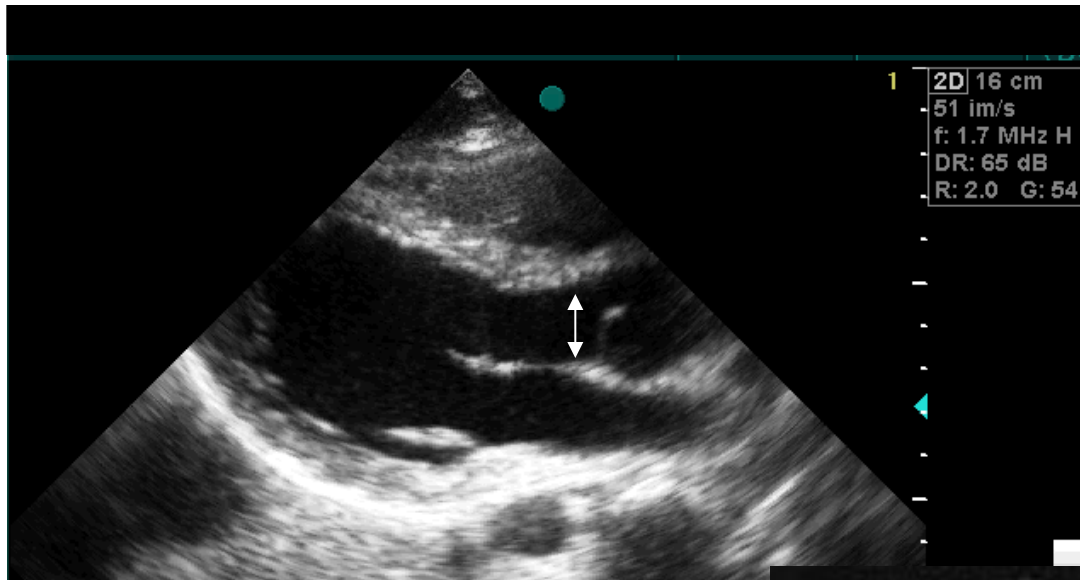
4



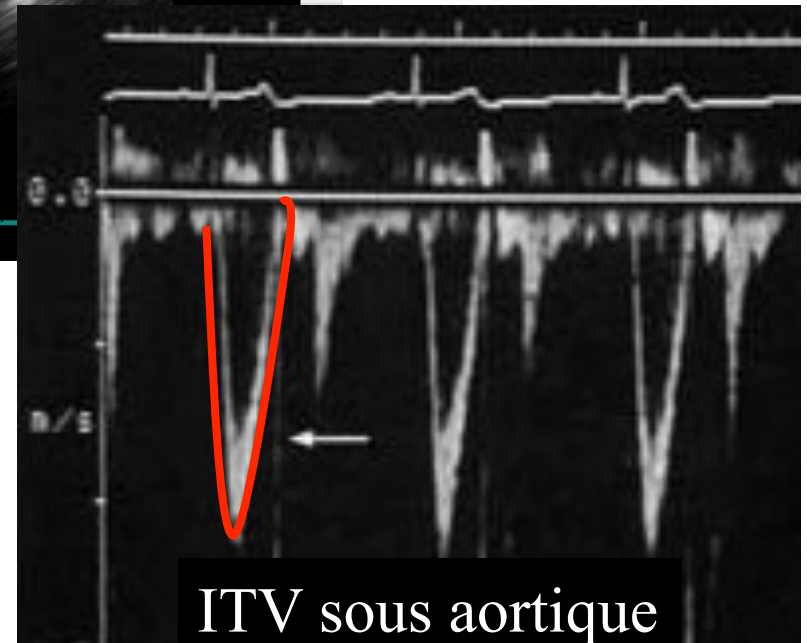
141

HR

Débit cardiaque : $F_c \times ITV \times S_{ao} (\pi D^2/4)$

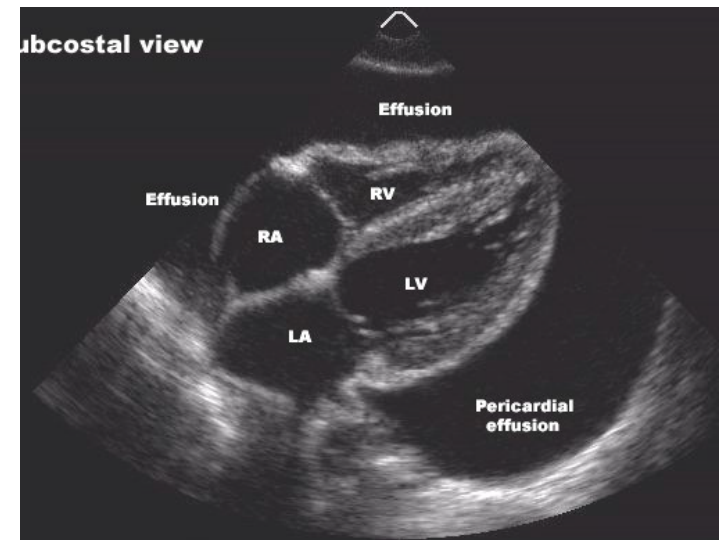
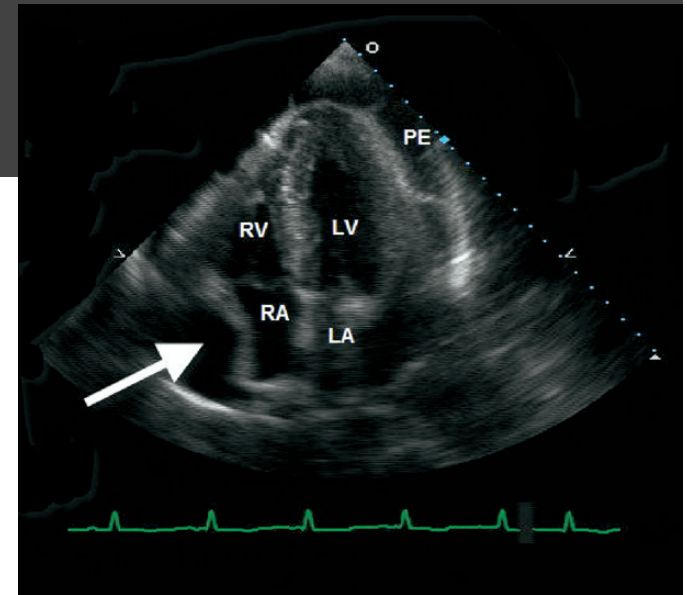
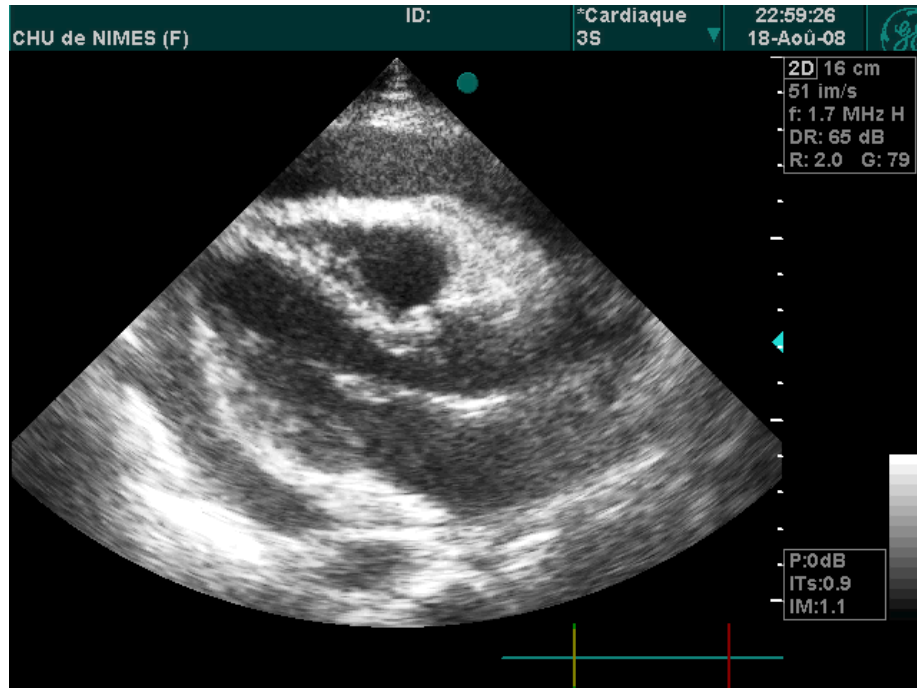


$ITV_{ssAo} = 14 \text{ à } 20 \text{ cm}$



ITV sous aortique

Tamponnade

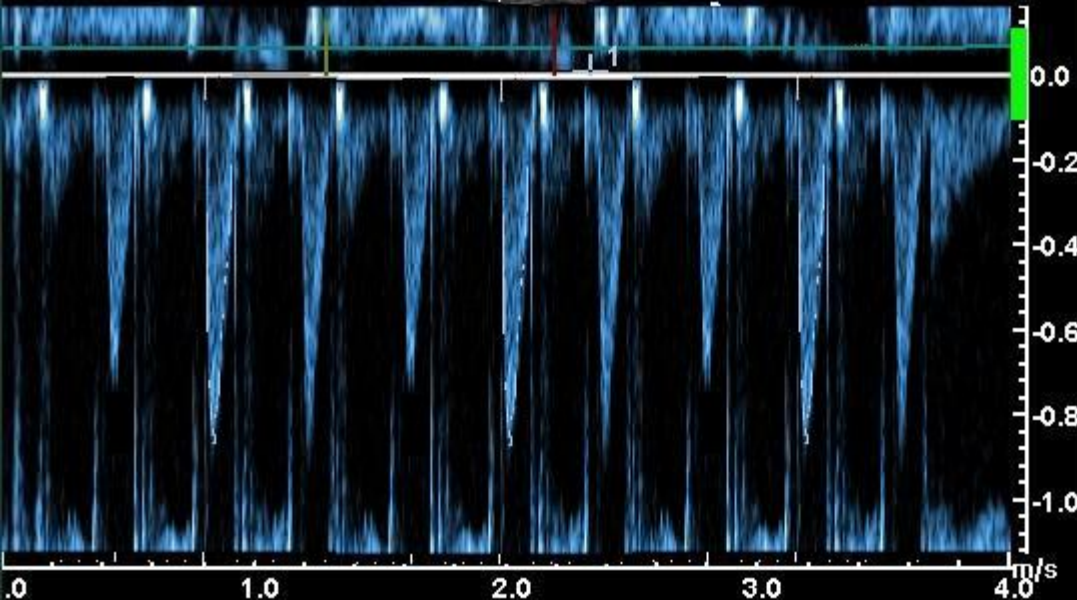


Tamponnade : principes du diagnostic échographique

Tamponnade =

1. Epanchement péricardique
2. Associé à des signes de compression :
 - Pouls paradoxal échographique en VS
 - Compression OD, VD, plus rarement OG, VG
 - Dilatation majeure de la VCI
 - Septum paradoxal inspiratoire en VS
 - Swinging heart

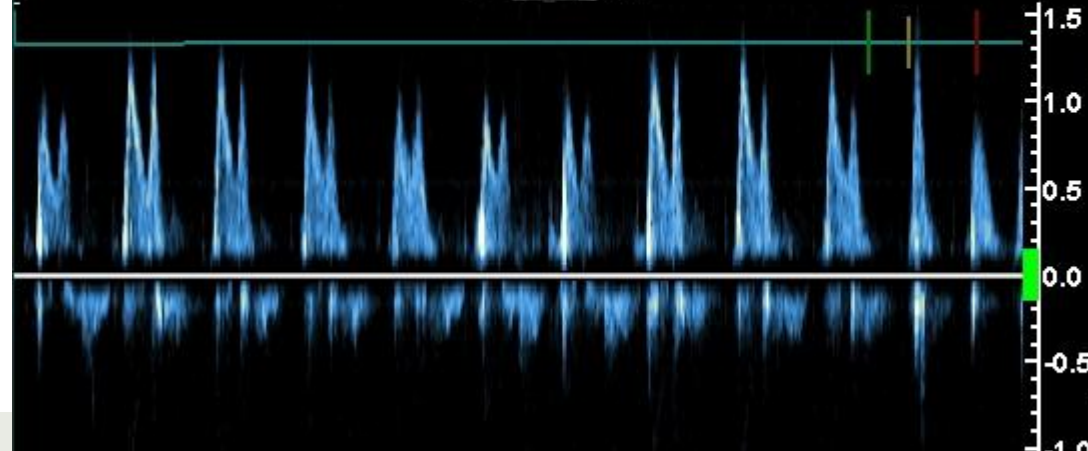
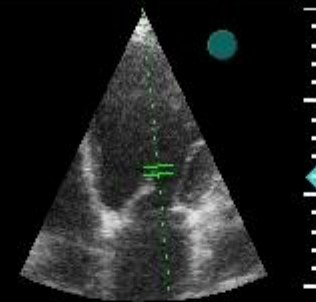
1 sAO Vmax = 0.86 m/s
GPmax = 2.93 mmHg
sAO GPmoy = 1.52 mmHg
sAO VTI = 17.91 cm



Pouls paradoxal échocardiographique

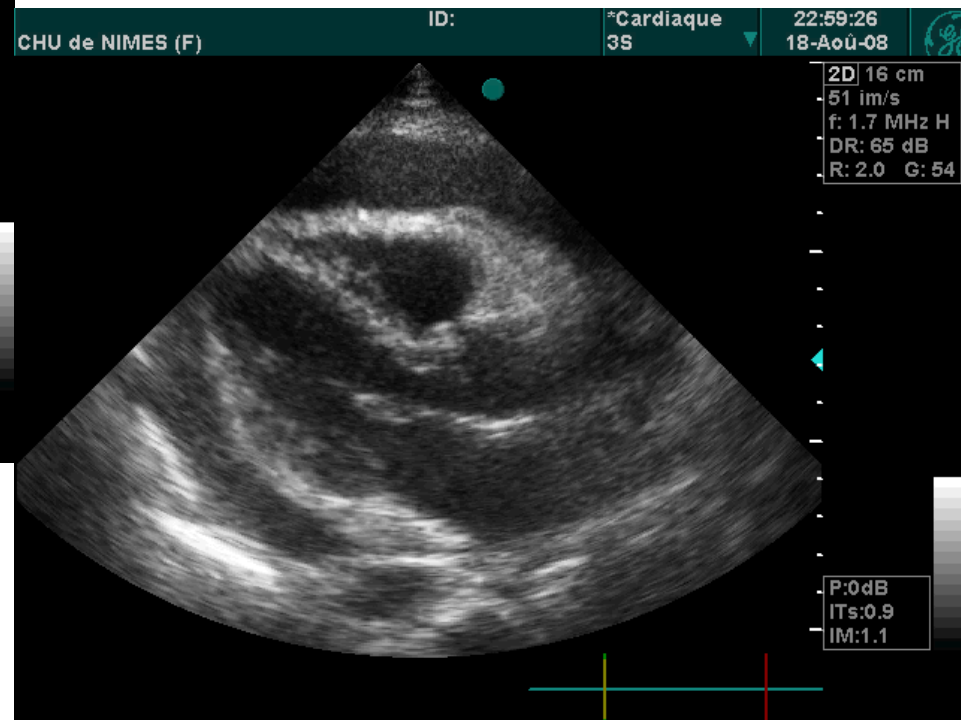
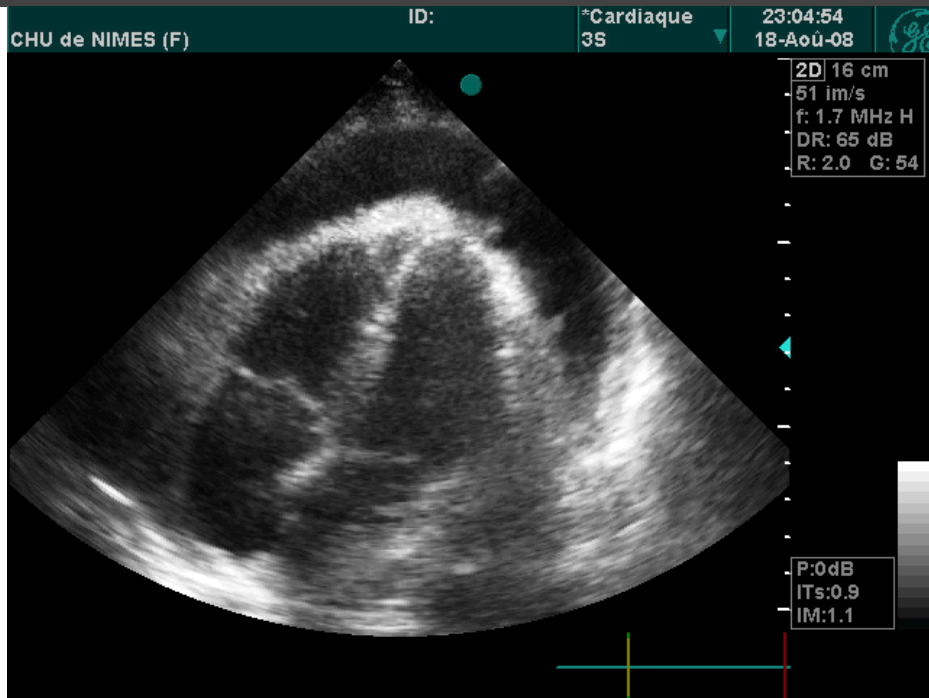
diminution inspiratoire et augmentation expiratoire de:

- **Vmax** de l'**onde E** avec inversion du rapport E/A
- **ITV ssAo**



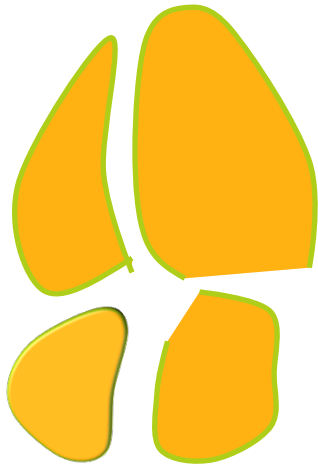
Respiratory changes in transvalvular flow velocities versus two-dimensional echocardiographic findings in the diagnosis of cardiac tamponade.
Ital Heart J. 2003 Mar;4(3):186-92.

Tamponnade, VD



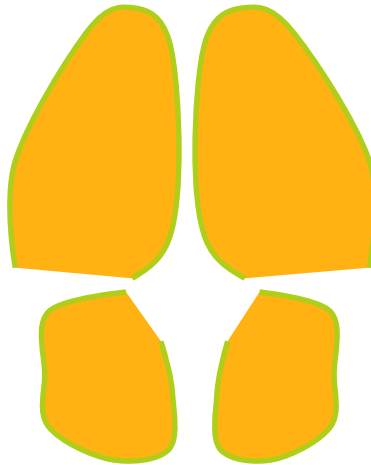
Défaillance ventriculaire droite : échographie

Normal



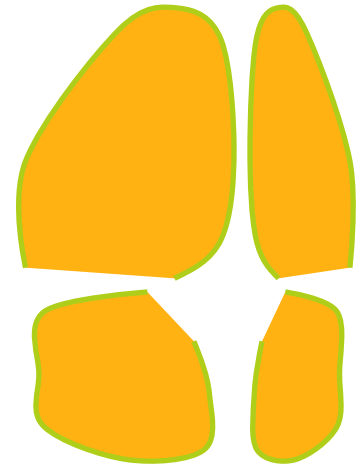
$$\text{STDVD}/\text{STDVG} < 0,6$$

Dilatation modérée



$$0,6 < \text{STDVD}/\text{STDVG} < 1$$

Dilatation majeure

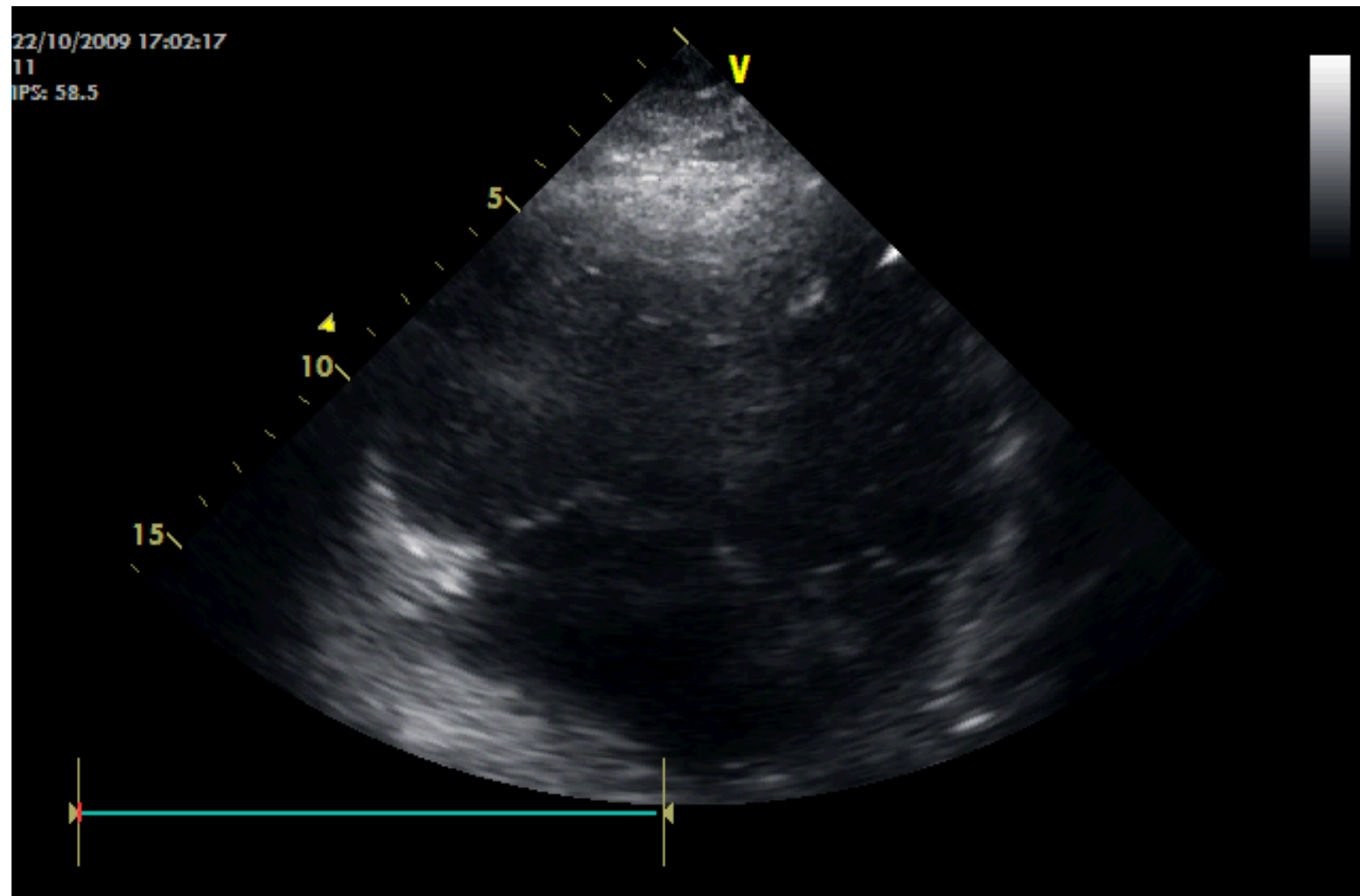


$$\text{STDVD}/\text{STDVG} > 1$$

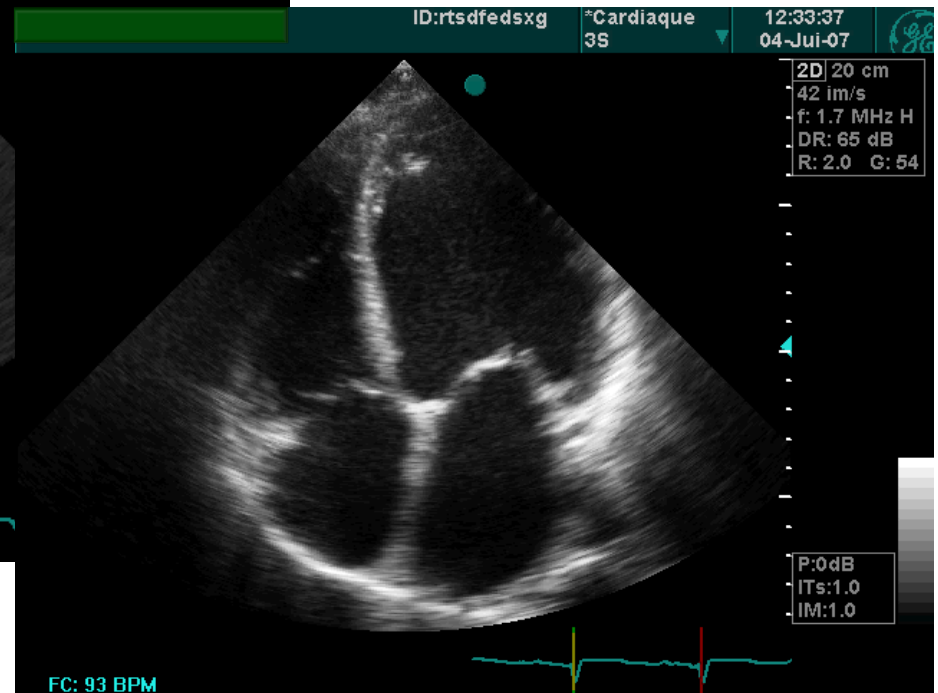
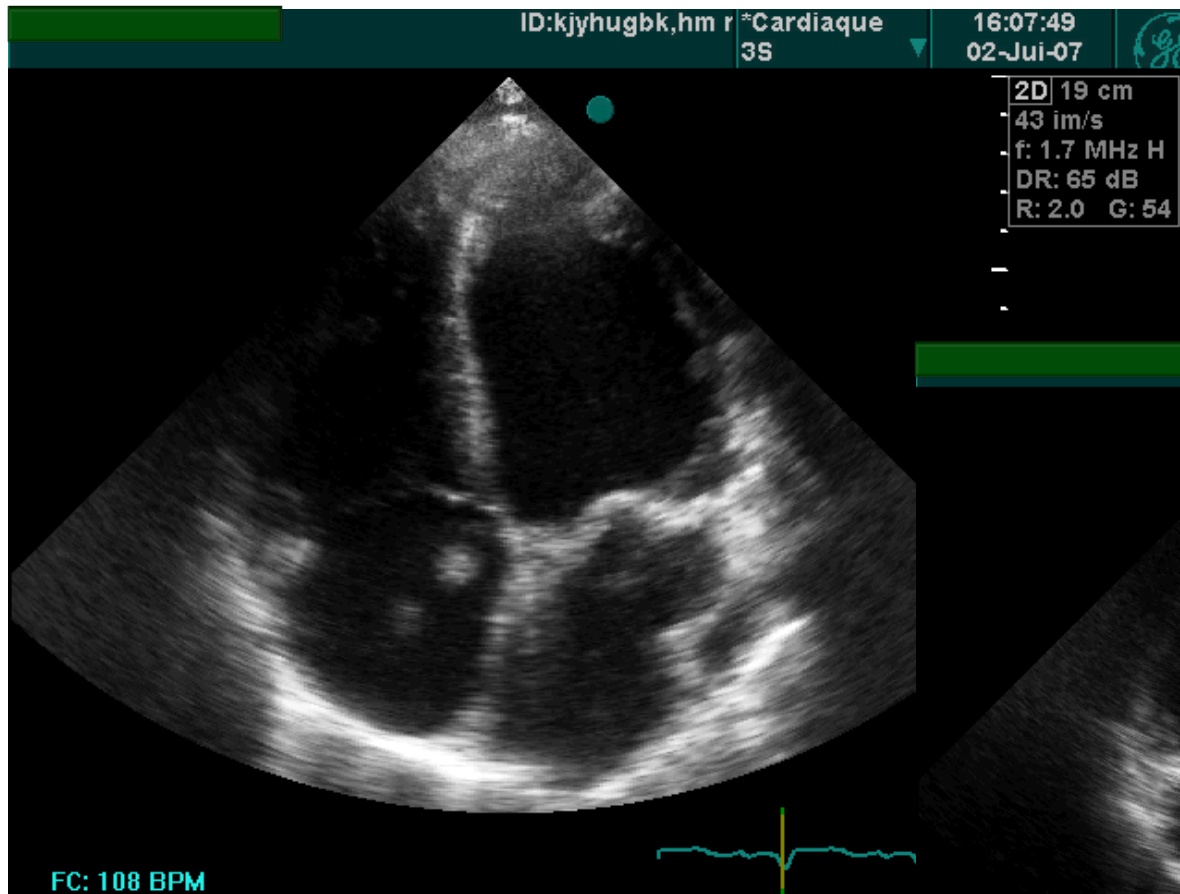
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11

IPS: 58.5



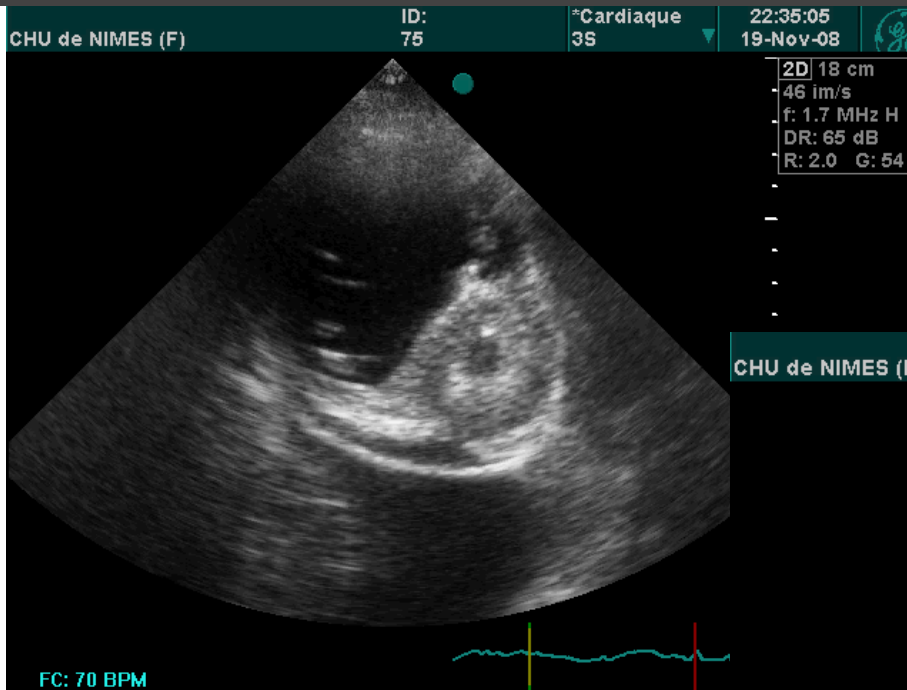
Défaillance VD: EP



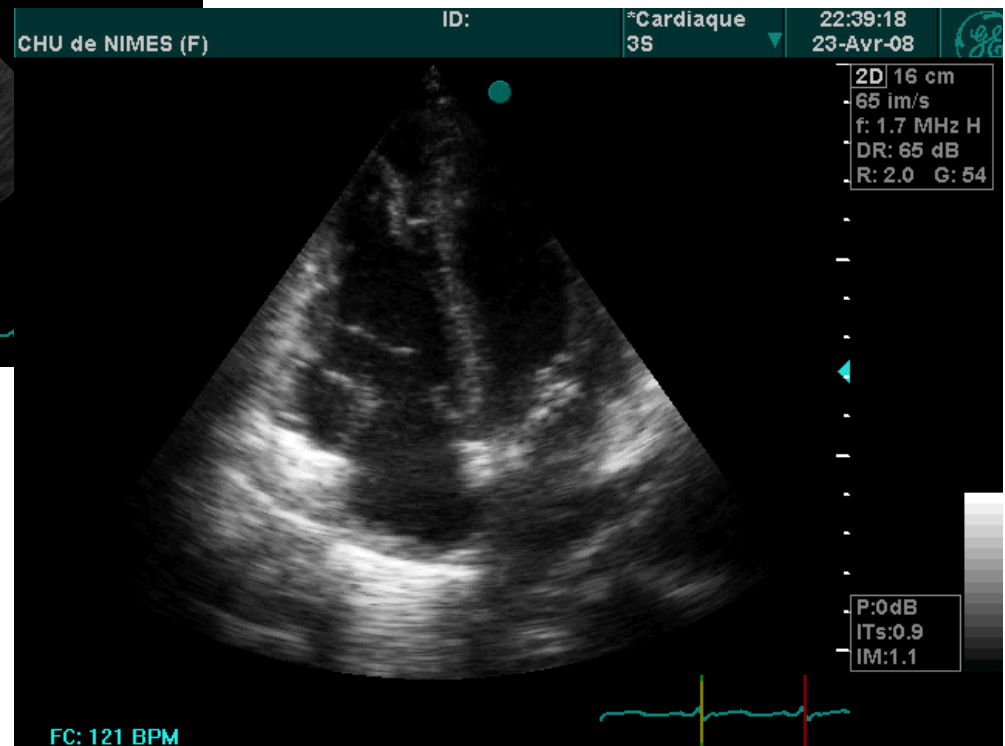
Score de Wells et probabilité diagnostique

Éléments	Points
Antécédents de TVP ou EP	+1.5
Pouls > 100 / min	+1.5
Chirurgie/immobilisation récente	+1.5
Signes de TVP	+3
Diagnostic alternatif moins probable que l'EP	+3
Hémoptysie	+1
Cancer	+1
<i>Probabilité clinique</i>	
Faible	0-1
Moyenne	2-6
Forte	≥7

Défaillance VD: SDRA



Dyspnée, hypoxémie
T=38°C
Foyer basal gauche à l'ausc



Reco 2012: thérapeutiques du choc cardiogénique

Patients with hypotension, hypoperfusion or shock			
Electrical cardioversion is recommended if an atrial or ventricular arrhythmia is thought to be contributing to the patient's haemodynamic compromise in order to restore sinus rhythm and improve the patient's clinical condition.	I	C	–
An i.v. infusion of an inotrope (e.g. dobutamine) should be considered in patients with hypotension (systolic blood pressure <85 mmHg) and/or hypoperfusion to increase cardiac output, increase blood pressure, and improve peripheral perfusion. The ECG should be monitored continuously because inotropic agents can cause arrhythmias and myocardial ischaemia.	IIa	C	–
Short-term mechanical circulatory support should be considered (as a 'bridge to recovery') in patients remaining severely hypoperfused despite inotropic therapy and with a potentially reversible cause (e.g. viral myocarditis) or a potentially surgically correctable cause (e.g. acute interventricular septal rupture).	IIa	C	–
An i.v. infusion of levosimendan (or a phosphodiesterase inhibitor) may be considered to reverse the effect of beta-blockade if beta-blockade is thought to be contributing to hypoperfusion. The ECG should be monitored continuously because inotropic agents can cause arrhythmias and myocardial ischaemia, and, as these agents are also vasodilators, blood pressure should be monitored carefully.	IIb	C	–
A vasopressor (e.g. dopamine or norepinephrine) may be considered in patients who have cardiogenic shock, despite treatment with an inotrope, to increase blood pressure and vital organ perfusion. The ECG should be monitored as these agents can cause arrhythmias and/or myocardial ischaemia. Intra-arterial blood pressure measurement should be considered.	IIb	C	–
Short-term mechanical circulatory support may be considered (as a 'bridge to decision') in patients deteriorating rapidly before a full diagnostic and clinical evaluation can be made.	IIb	C	–

Reco 2012: thérapeutiques du choc cardiogénique

Treatment of cardiogenic shock (Killip class IV)		
Oxygen/mechanical respiratory support is indicated according to blood gasses.	I	C
Urgent echocardiography/Doppler must be performed to detect mechanical complications, assess systolic function and loading conditions.	I	C
High-risk patients must be transferred early to tertiary centres.	I	C
Emergency revascularization with either PCI or CABG in suitable patients must be considered.	I	B
Fibrinolysis should be considered if revascularization is unavailable.	IIa	C
Intra-aortic balloon pumping may be considered.	IIb	B
LV assist devices may be considered for circulatory support in patients in refractory shock.	IIb	C
Haemodynamic assessment with balloon floating catheter may be considered.	IIb	B
Inotropic/vasopressor agents should be considered:	IIa	C
• Dopamine		
• Dobutamine	IIa	C
• Norepinephrine (preferred over dopamine when blood pressure is low).	IIb	B

PEC du choc cardiogénique

▣ Traitement étiologique

- ▣ Revascularisation myocardique
- ▣ Autres:
 - ▣ Drainage péricardique
 - ▣ Thrombolyse
 - ▣ Chirurgie valvulaire

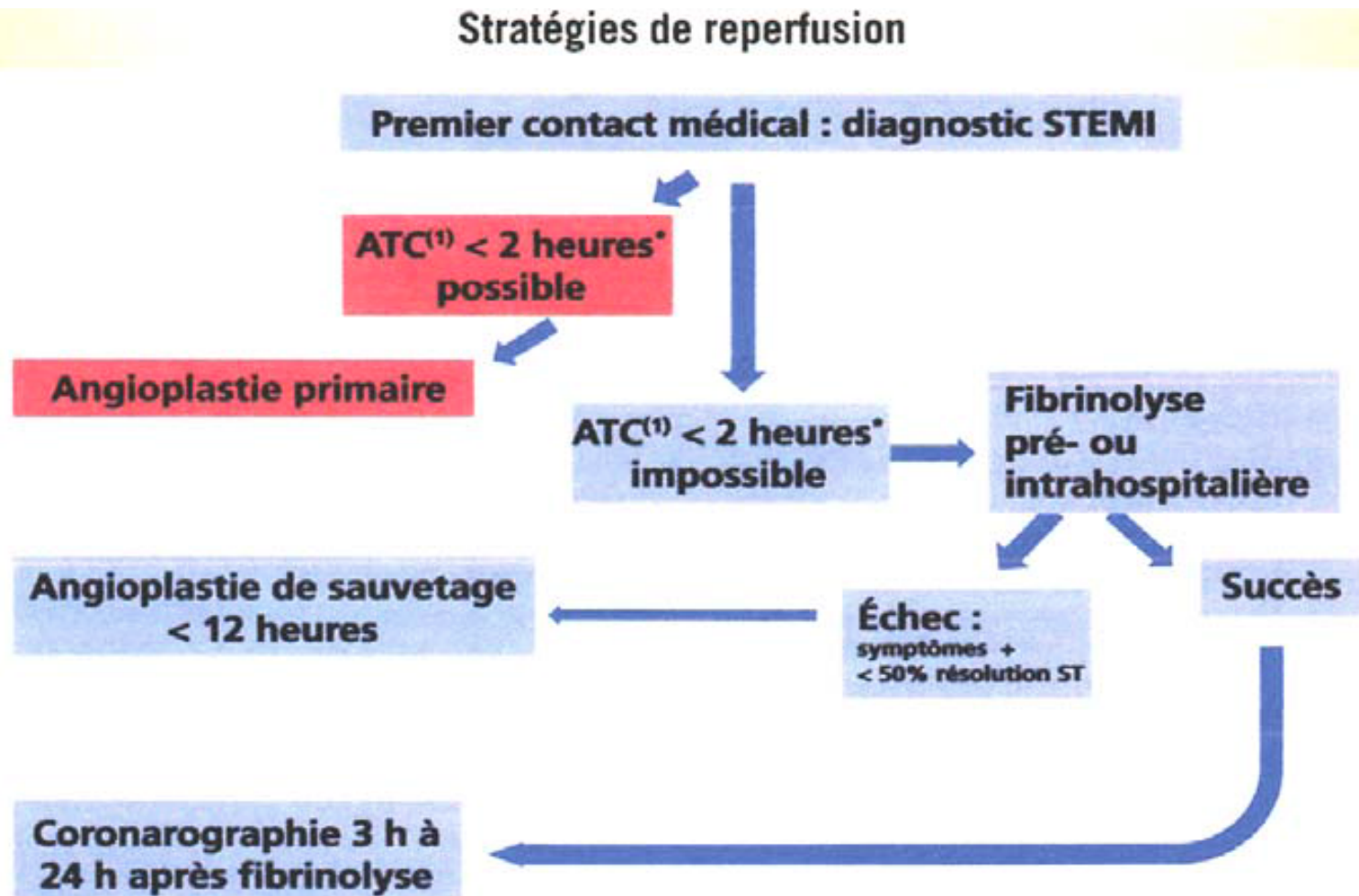
▣ Réanimation

- ▣ catécholamines
- ▣ ventilation
- ▣ Diurétiques, EER

▣ Assistance circulatoire

- ▣ CPBIA
- ▣ Impella
- ▣ ECMO

Traitement étiologique: quelle stratégie de reperfusion?



* Le délai de 2 heures est réduit à 90 minutes si le patient est vu dans les 2 premières heures
1. ATC : angioplastie.

■ Situation optimale

ESC reco 2008

fibrinolyse

- Si revascularisation non disponible dans les 90 minutes
- Le plus tôt possible, 3 premières heures, non recommandée au delà de 12h
- Respect des CI absolues: AVC ischémique ds les 6 mois, AVC hémorragique, chir lourde récente (< 3 sem), saignement digestif récent (>1 mois), dissection aortique
- Moins efficace si choc constitué



TRANSFERT LE PLUS RAPIDEMENT POSSIBLE VERS
CENTRE DE CARDIO INTERVENTIONNELLE

Revascularisation

- En urgence+++ *Hochman NEJM 1999*
- Par angioplastie +++
- Par chirurgie de pontage si angioplastie impossible

TABLE 4. MORTALITY AMONG STUDY PATIENTS.*

ETUDE
SHOCK

OUTCOME AND SUBGROUP	REVASCULARIZATION	MEDICAL THERAPY	DIFFERENCE BETWEEN GROUPS (95% CI)	RELATIVE RISK (95% CI)	P VALUE
	percent (number in subgroup)		percent		
30-day mortality					
Total	46.7 (152)	56.0 (150)	-9.3 (-20.5 to 1.9)	0.83 (0.67 to 1.04)	0.11
Age <75 yr	41.4 (128)	56.8 (118)	-15.4 (-27.8 to -3.0)	0.73 (0.56 to 0.95)	
Age ≥75 yr	75.0 (24)	53.1 (32)	+21.9 (-2.6 to 46.4)	1.41 (0.95 to 2.11)	0.01†
6-mo mortality‡					
Total	50.3 (151)	63.1 (149)	-12.8 (-23.2 to -0.9)	0.80 (0.65 to 0.98)	0.027
Age <75 yr	44.9 (127)	65.0 (117)	-20.1 (-31.6 to -7.1)	0.70 (0.56 to 0.89)	
Age ≥75 yr	79.2 (24)	56.3 (32)	+22.9 (0.7 to 46.6)	1.41 (0.97 to 2.03)	0.003†

Quelles catécholamines dans le choc cardiogénique?

- Dobutamine en 1^{ère} intention en l'abs d'hypoTA
 - Dose: 5 à 20 μ g/kg/min
 - Dilution 3 x poids dans 50 ml
 - Vitesse 1 ml/h = 1 μ g/kg/min
- Adrénaline si hypoTA réfractaire et PAD basse (alternative dobu+ norad)
 - Dose: 0,2 à 2 μ g/kg/min
 - Effets métaboliques importants
 - Pro arythmogène
- Pas de supériorité du levosimendan

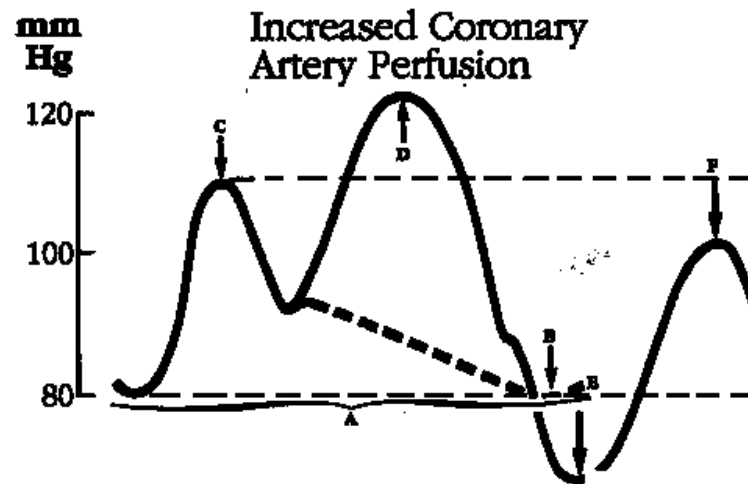
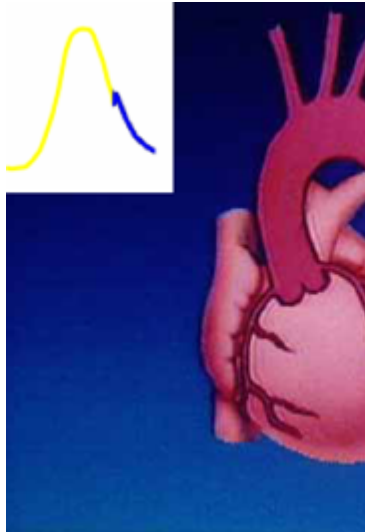
Assistance circulatoire

■ Indications

Table 24 Terms describing various uses of mechanical circulatory support (MCS)

Bridge to decision (BTD):	Use of MCS in patients with drug-refractory acute circulatory collapse and at immediate risk of death to sustain life until a full clinical evaluation can be completed and additional therapeutic options can be evaluated.
Bridge to candidacy (BTC):	Use of MCS to improve end-organ function in order to make an ineligible patient eligible for transplantation.
Bridge to transplantation (BTT):	Use of MCS to keep a patient at high risk of death before transplantation alive until a donor organ becomes available.
Bridge to recovery (BTR):	Use of MCS to keep patient alive until intrinsic cardiac function recovers sufficiently to remove MCS.
Destination therapy (DT):	Long-term use of MCS as an alternative to transplantation in patients with end-stage heart failure ineligible for transplantation.

CPBIA



DIASTOLE: IN

- augmente
- augmente
- augmente

- A. One Complete Cardiac Cycle
- B. Unassisted Aortic End Diastolic Pressure
- C. Unassisted Systolic Pressure
- D. Diastolic Augmentation
- E. Assisted Aortic End Diastolic Pressure
- F. Reduced Systolic Pressure

TION

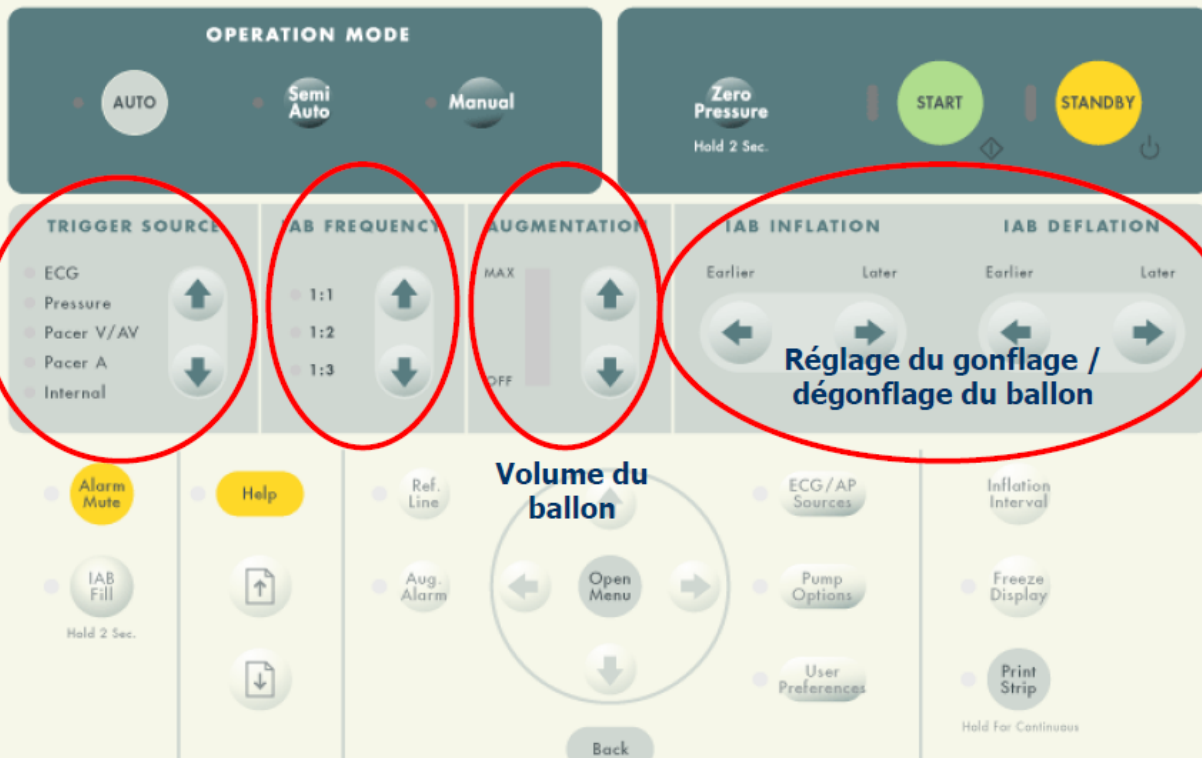
рге

unimproved conservation en O₂

CPBIA



Mode de
déclenchement
du ballon



Réglage du gonflage /
dégonflage du ballon

Volume du
ballon

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812

OCTOBER 4, 2012

VOL. 367 NO. 14

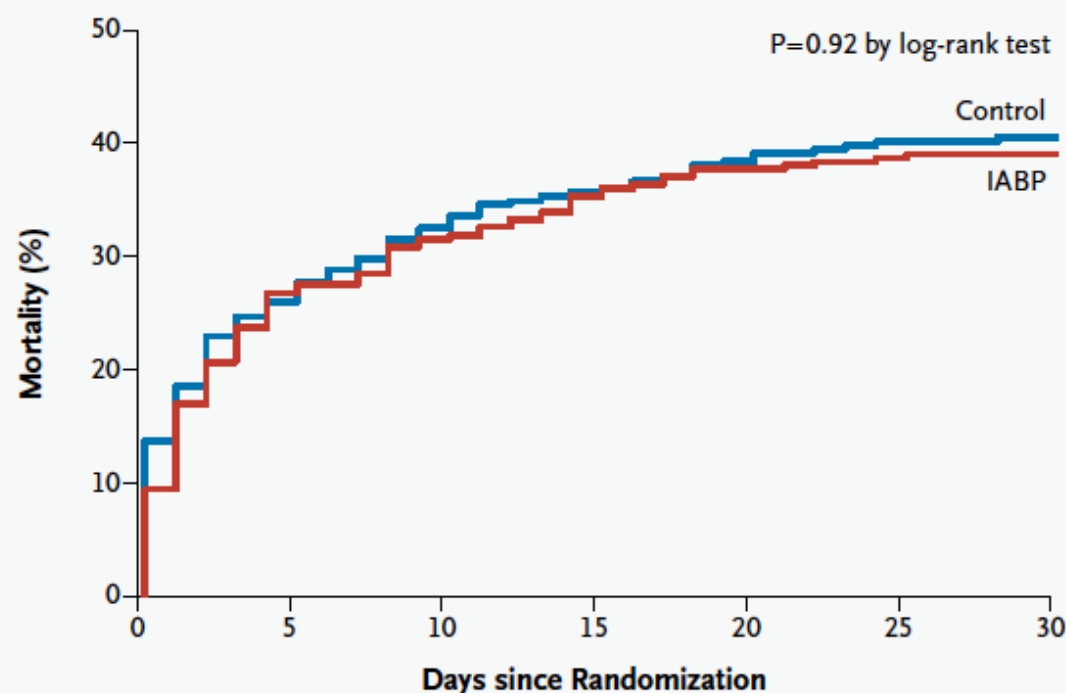


Figure 1. Time-to-Event Curves for the Primary End Point.

Time-to-event curves are shown through 30 days after randomization for the primary end point of all-cause mortality. Event rates represent Kaplan-Meier estimates.

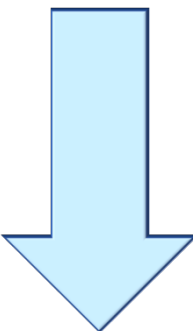
Myocardial Infarction

Mirosław Ferenc, M.D.,
Hans-Gert Geiger, M.D., Klaus Empen, M.D.,
Georgios D. Kitas, M.D., Jörg Fuhrmann, M.D.,
Michael Müller, M.D., and Karl Werdan, M.D.,

ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation



European Heart Journal (2012) **33**, 2569–2619

2010

2012

IABP insertion is recommended in patients with haemodynamic instability (particularly those in cardiogenic shock and with mechanical complications).

I

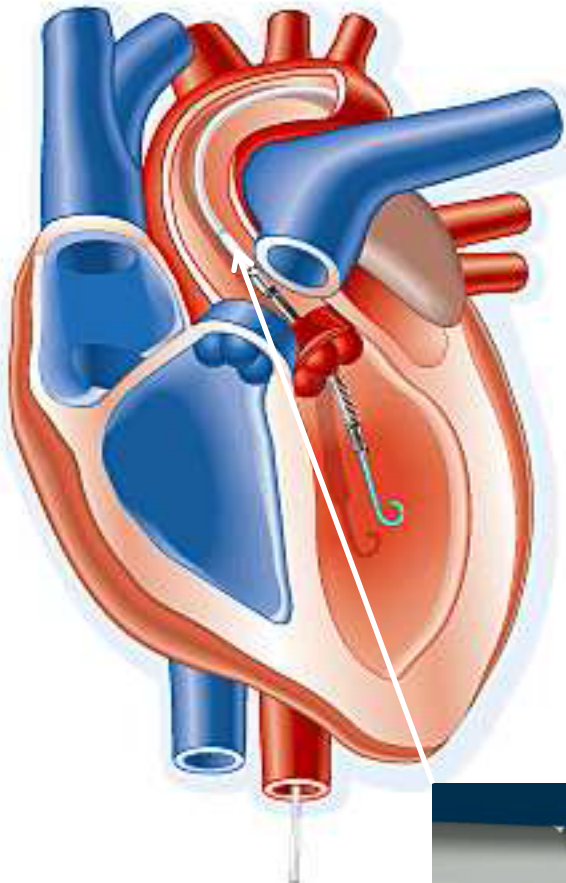
C

Intra-aortic balloon pumping may be considered.

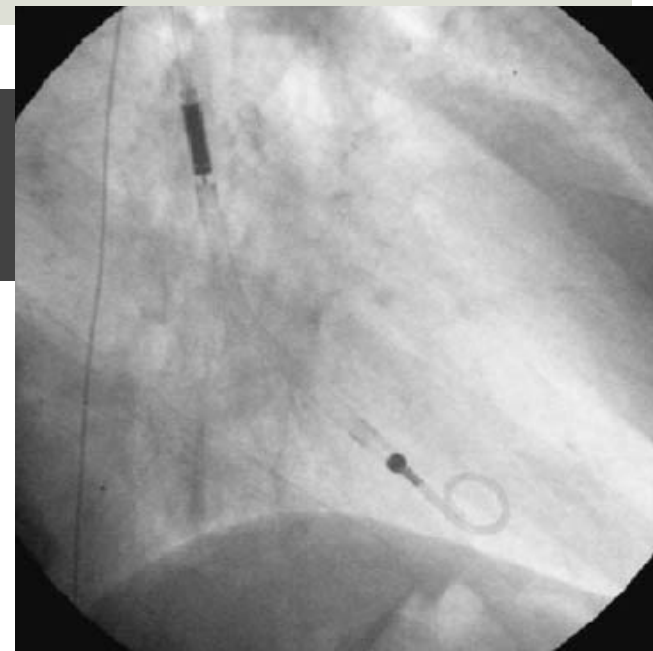
IIb

B

Impella® (Abiomed®)



Pompe axiale rotative qui
aspire le sang du VG et
l'éjecte dans l'aorte
Débit généré: 2,5 à 5 l/min

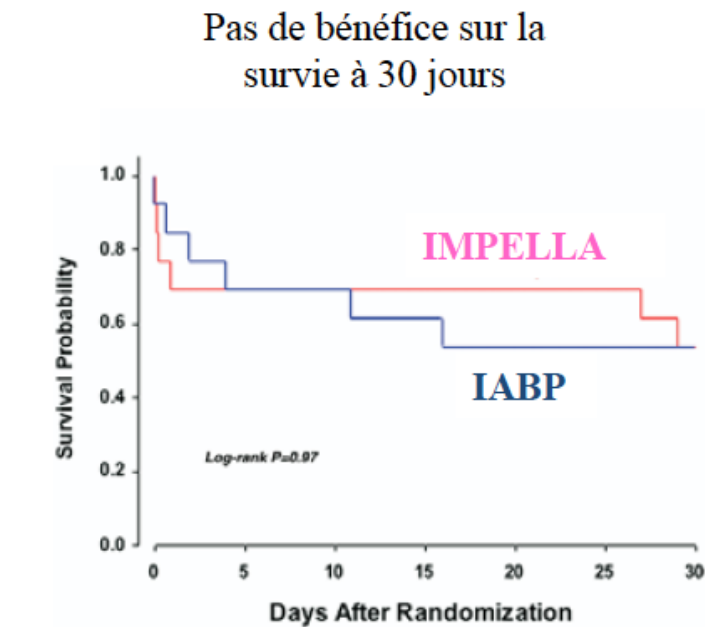
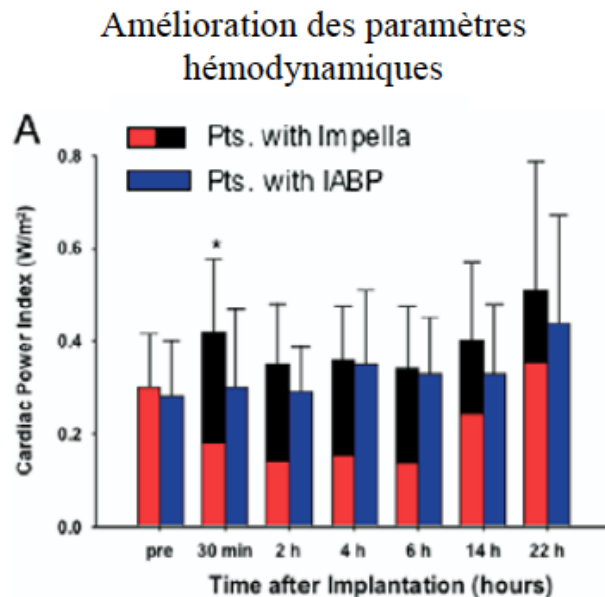


Impella®: décharge VG

- Par voie percutanée (Impella 2.5) ou abord chirurgical (Impella 5)
- Indications:
 - IDM avec choc cardiogénique réfractaire
 - Echec de sevrage CPBIA
 - OAP post implantation d'ECMO
- Nécessite une fonction VD peu altérée
- Avantages: insertion facile, peu invasif, pas d'anticoagulation

Impella®

- Une étude randomisée (25 patients) comparant Impella® et CPBIA dans le choc cardiogénique



ECMO: *extra-corporeal membrane oxygenation*

- Orientation des patients vers un centre de référence d'assistance circulatoire si choc cardiogénique réfractaire ou appel de l'UMAC

- Indications de choix

- Cardiopathie de stress
- Myocardite fulminante
- Intox β -bloquants

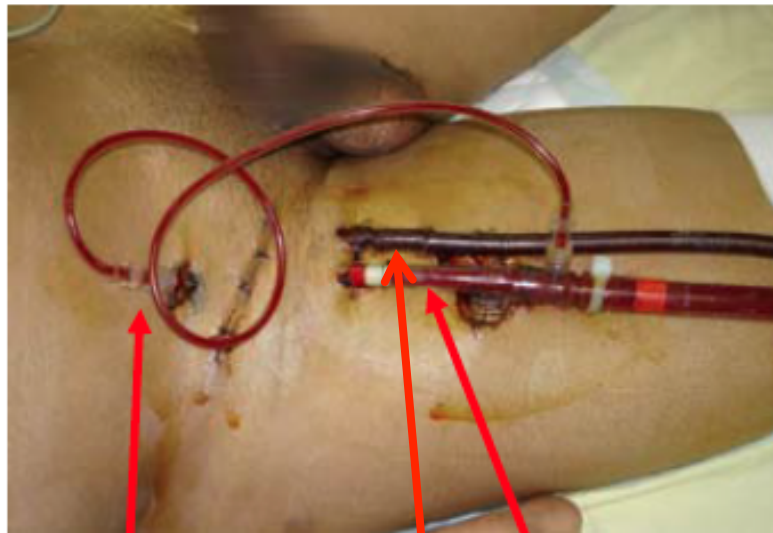


POTENTIEL DE RECUPERATION

- Autres indications:

- IDM en phase aiguë
- Insuffisance cardiaque sur cardiomyopathie dilatée
- Rejet aigu de greffe

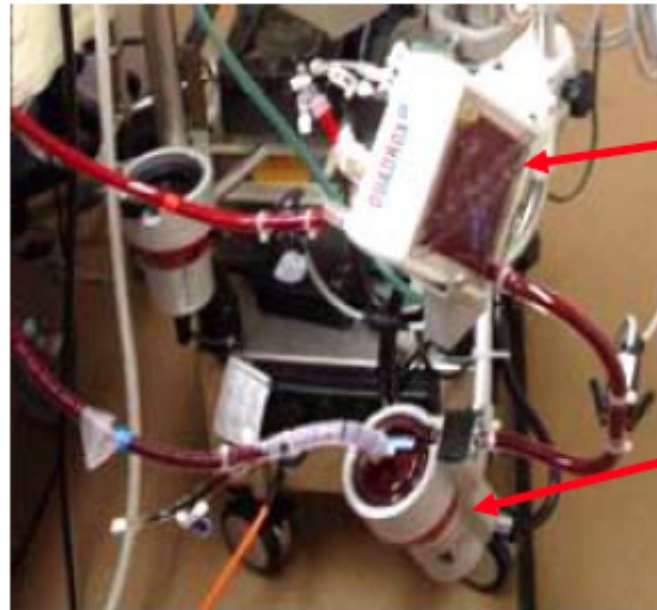
ECMO



+ KT de
reperfusion de
l'Art. fém. Sup.

Ligne de réinjection
artérielle : injection
RETROGRADE

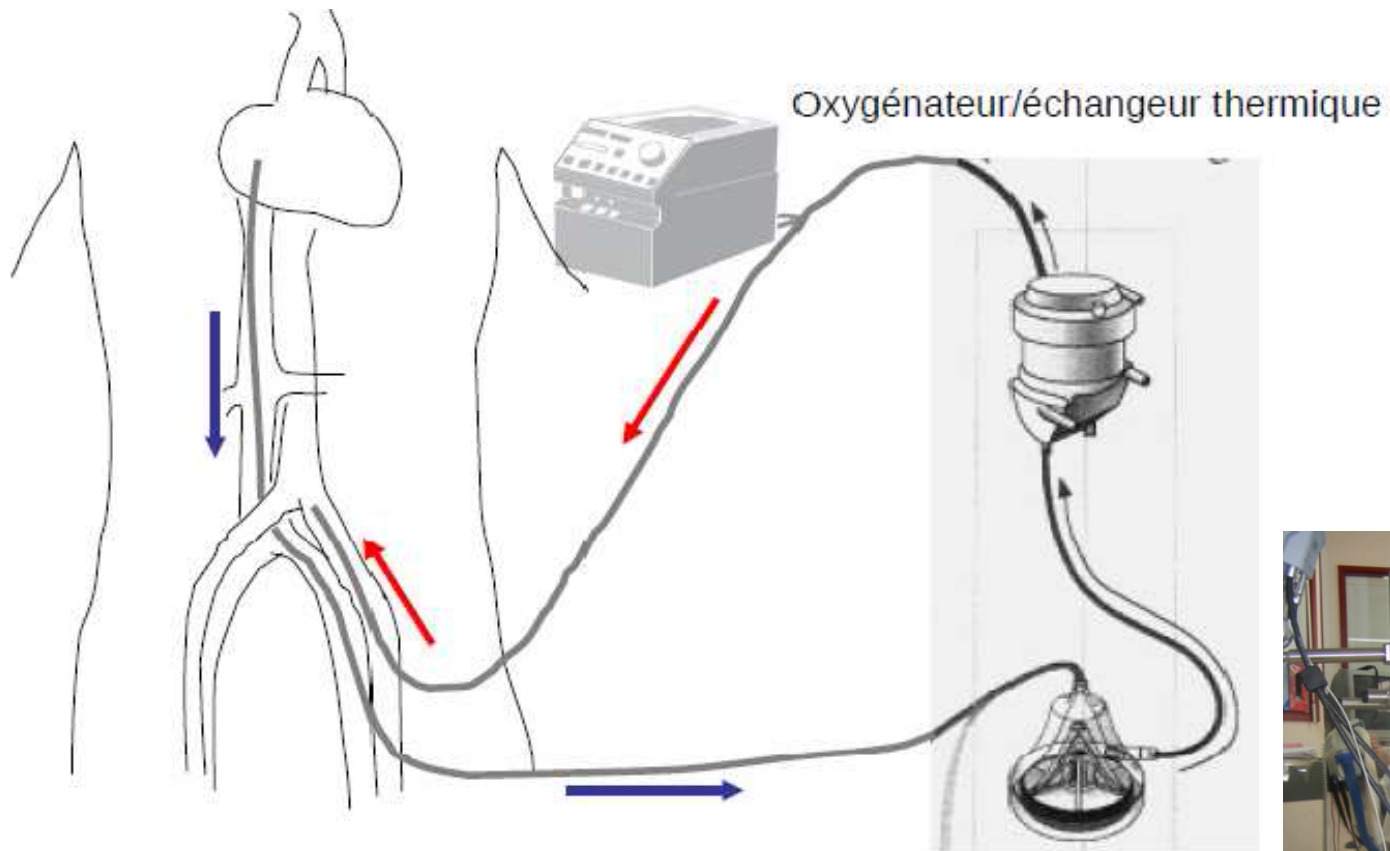
Ligne veineuse
remontant ds l'OD



OXYGENATEUR

POMPE à débit
laminaire





ECMO: quand décider de la mettre en place?

- A l'heure actuelle, aucun consensus sur le « timing » de l'assistance circulatoire
- Pas de critère formel
 - Étiologie
 - Choc réfractaire aux traitements
 - Evolutivité+++ des symptômes
 - Rechercher des signes de détérioration rapide de la fonction cardiaque: nausées, dlrs abdo, tachycardie
 - Défaillance hépatique, rénale++
 - ETT: FEVG <20%, ITVssAo < 8 cm

Assistances circulatoires percutanées

	Type de flux	↗ débit	Type assistance	Décharge VG	facilité	Abord vasc	Durée max	Prix consommable en €
CPBIA	pulsatile	0 à +	VG	+	+++	A: 7 à 7.5 Fr	10	700
IMPELLA LP 2.5	Non pulsatile (pompe axiale)	++ (2,5 l/min)	VG	++ Fonction VD OK	++	A: 13 Fr	10	2500
ECMO	Non pulsatile (centrifuge)	+++ (5 à 7 l/min)	Bi V	0	++	A : 17-21 F V : 19-29 F (OD)	14	1800

Quelle orientation des patients en choc cardiogénique?

Suspicion de choc cardiogénique
ATCD
S.cliniques
ECG
ETT+++



ETIOLOGIE ?
PEC spécifique:
Drainage péricardique
Fibrinolyse
Revascularisation

Cardiologie
interventionnelle



EVOLUTIVITE+++
Si détérioration rapide fonction systolique

Centre de référence
assistance circulatoire

UMAC si patient
intransportable

