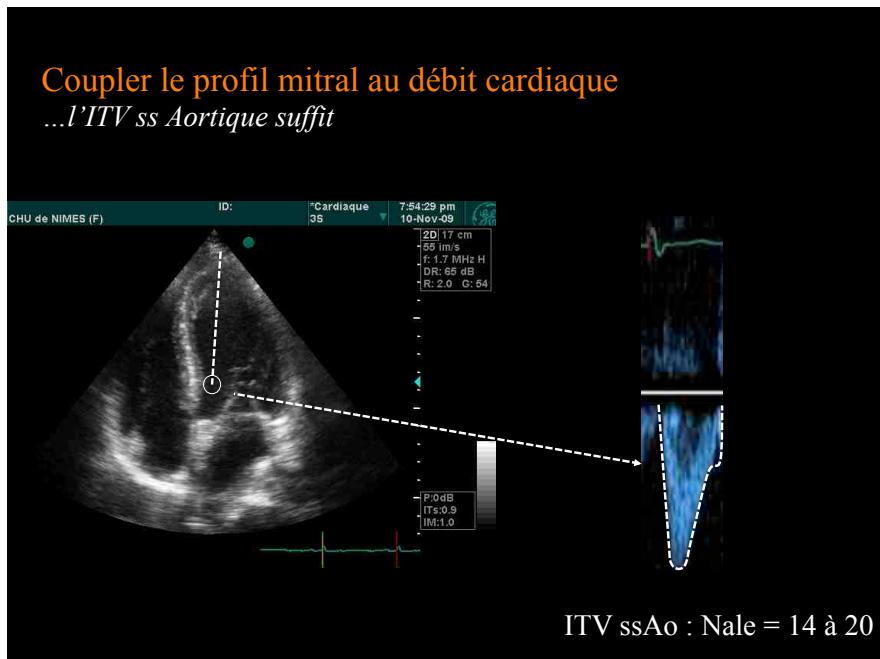


Réponse à l'expansion volémique : *définition « moderne »*

Recommandations d'experts de la SRLF
« Indicateurs du remplissage vasculaire
au cours de l'insuffisance circulatoire »

- L'efficacité d'un remplissage vasculaire se juge sur le volume d'éjection systolique (accord fort).
- L'augmentation de plus de 10–15 % du volume d'éjection systolique et/ou du débit cardiaque permet de différencier les patients répondeurs à un remplissage vasculaire (accord fort).

Teboul et al, Réanimation 2004



Fluid challenge : *What is the definition of fluid responsiveness*

- Fluid responsiveness is usually defined as a 10 to 15 % increase of cardiac output after a 250 to 500 mL of fluid infusion
- LVOT VTI recorded by echo is a valuable alternative to thermodilution cardiac output

Monnet et al Curr Op Crit Care 2007

Fluid challenge :

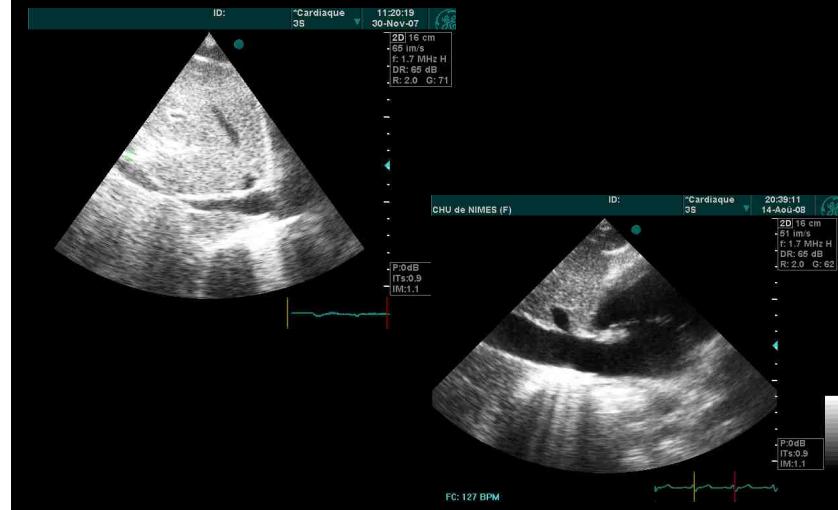
A risk of fluid overload – Avoid a 10% BW increase

- A fluid challenge is “let’s give some fluid and see what happens”
- Half of fluid challenges based on clinical data are negative
- The risk is fluid overload
- Safer maneuvers are necessary

Vincent JL - Anesthesiology 2011
Teboul Chest 2002

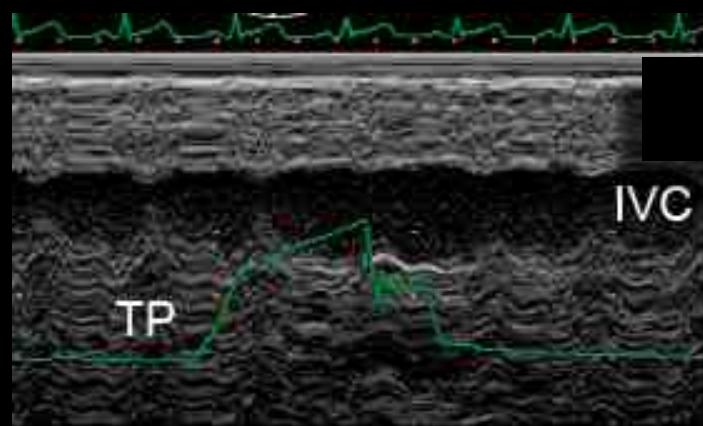
Variations respiratoires de la VCI:

Prédiction de la réponse au remplissage ?



Variations respiratoires de la VCI en ventilation contrôlée:

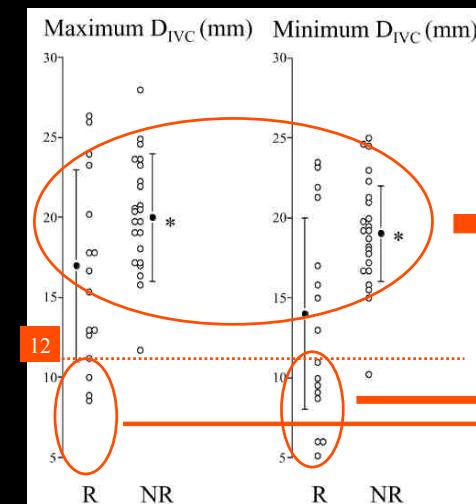
Distensibilité de la VCI : $\text{max-min} / (\text{max} + \text{min} / 2)$



Distensibilité de la veine cave inf en VAC

Vieillard Baron et al ICM 2004

Mesure du diamètre de la VCI : le diamètre est peu informatif



R = réponse + au remplissage

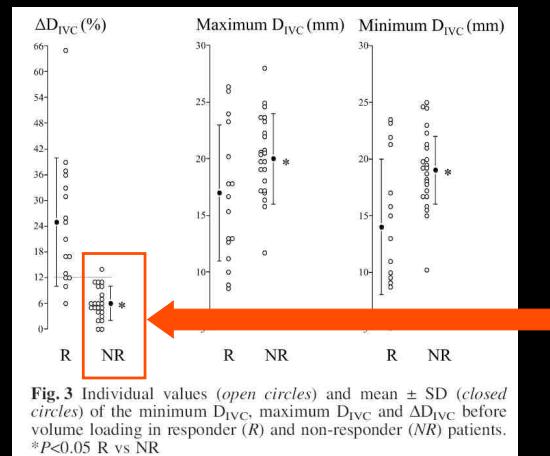
NR = réponse négative

Valeurs intermédiaires
Non informatives

Diamètre < 10 – 12 mm
Réponse au remplissage

Feissel et al Intensive Care Medicine 2004

Variations respiratoires de la VCI : indicateur de remplissage en ventilation mécanique contrôlée (max-min/max+min/2) Seuil = 12 %

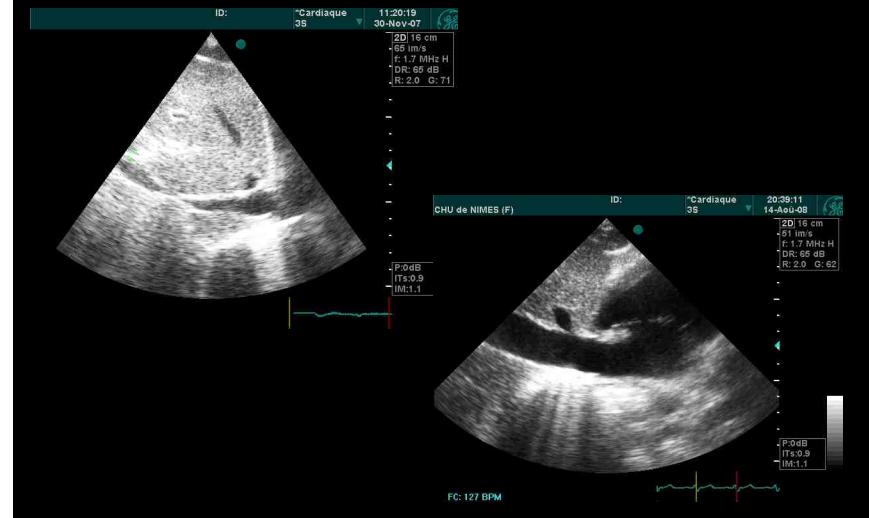


Feissel et al Intensive Care Medicine 2004

Non répondeurs
au remplissage

=
VCI non collapsible

Variations respiratoires de la VCI:
un faux ami en ventilation spontanée



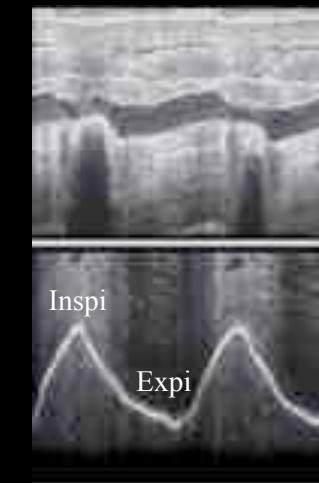
Diamètre et variations respiratoires de la VCI et PVC: recettes classiques en ventilation spontanée

Attention : évaluer la PVC n'est pas prédire la réponse au remplissage

Diamètre de la VCI (mm)	Variations respiratoires de la VCI (%)	Valeur de POD (mmHg)
Bas : < 15	Collapsus inspiratoire de 100 %	0-5
Normal : 15-25	> 50	6-10
	< 50	11-15
Elevé : > 25	< 50	16-20
	Absentes	> 20

Luthra A, Echo made easy Anshan eds 2007
Wong SP, Practice of clinical echocardiography 2002
Brennan JASE 2007

Variations respiratoires de la VCI en ventilation spontanée :
Un collapsus inspiratoire



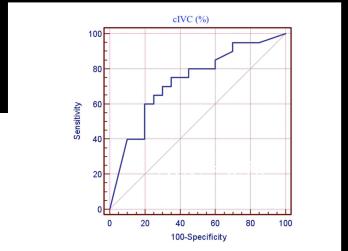
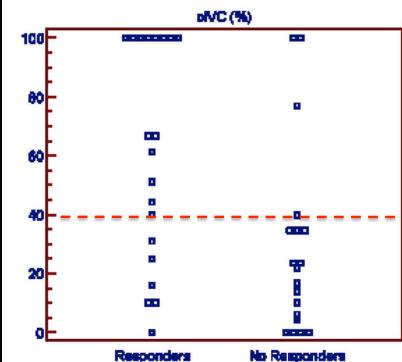
VCI

Diaphragme

Données personnelles

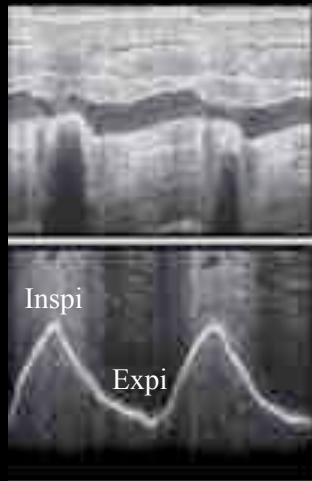
Variations respiratoires de la VCI en ventilation spontanée : utile que si $> 40\% \text{ (max-min/max)}$

Ici = collapsibilité =
compression en inspiration en VS



Muller et al Critical Care 2012

Variations respiratoires de la VCI et diaphragme:
Le course diaphragmatique peut elle influencer la cIVC indépendamment de la volémie



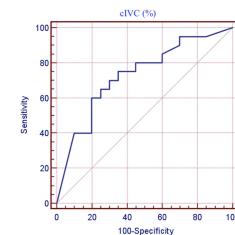
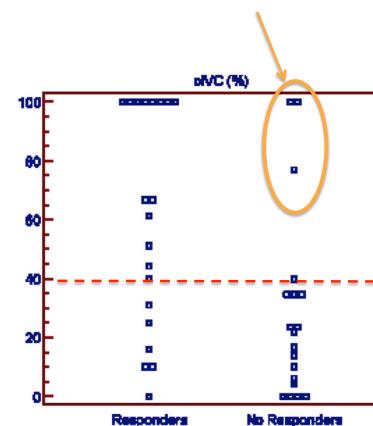
VCL

Diaphragme

Données personnelles In Review

Variations respiratoires de la VCI en ventilation spontanée :
utile que si > 40 % (max-min/max)

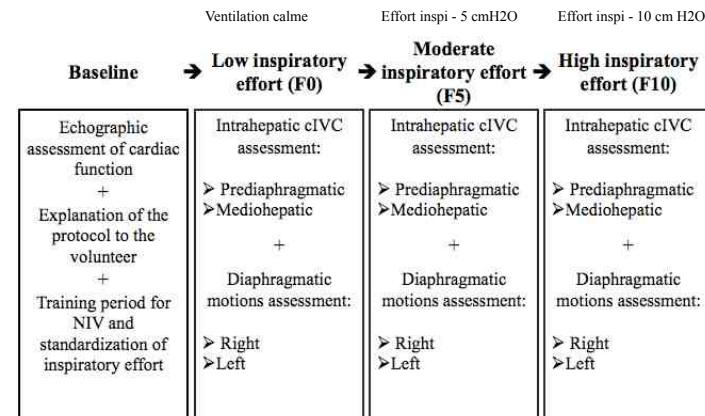
3 FAUX POSITIFS



Muller et al Critical Care 2012

Interactions diaphragme – Veine cave Inférieure

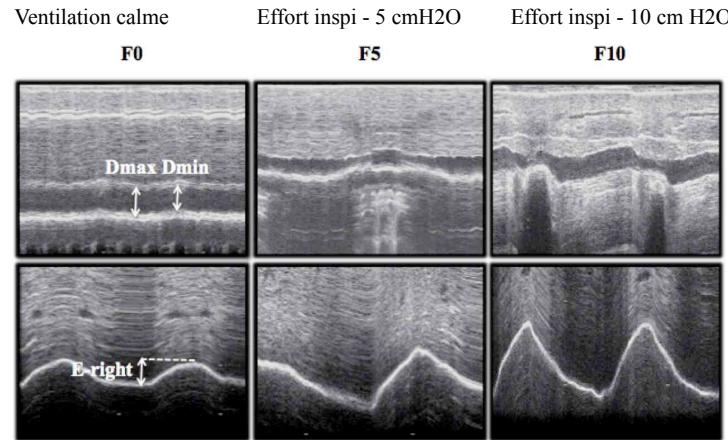
Etude sur 50 volontaires sains – efforts inspiratoires standardisés



Gignon et al - en reviewing 2015

Interactions diaphragme – veine cave inférieure

Etude sur 50 volontaires sains – efforts inspiratoires standardisés



Gignon et al - in review 2015

Interactions diaphragme – veine cave inférieure

Table 1: Diaphragmatic motions and cIVC of the healthy volunteers population (n=50)

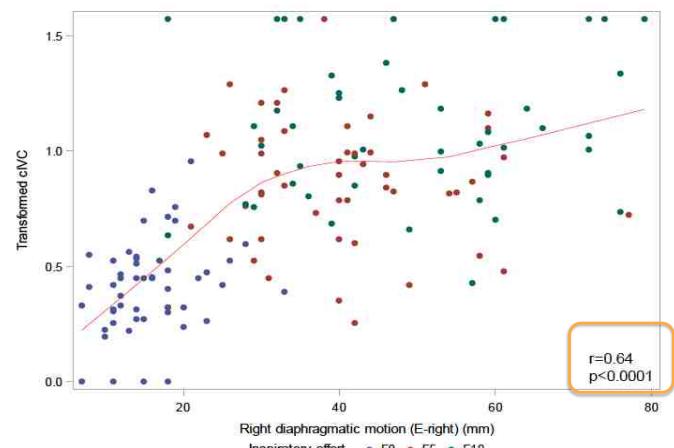
Inspiratory effort	Diaphragmatic Motion (mm)		Data are expressed as mean±SD. *number of missing data.
	E-right	E-left	
F0	16.5±7.9	11.4±5 (11)*	18±14
F5	40.1±12.3	27.6±10.1 (21)*	56±24
F10	48.9±16.2 (3)*	34.1±16.1 (29)*	75±22

F0: low inspiratory effort, F5: moderate inspiratory effort, F10: high inspiratory effort.
E-right: maximal excursion of the right diaphragm, E-left: maximal excursion of the left diaphragm.

Gignon et al - in review 2015

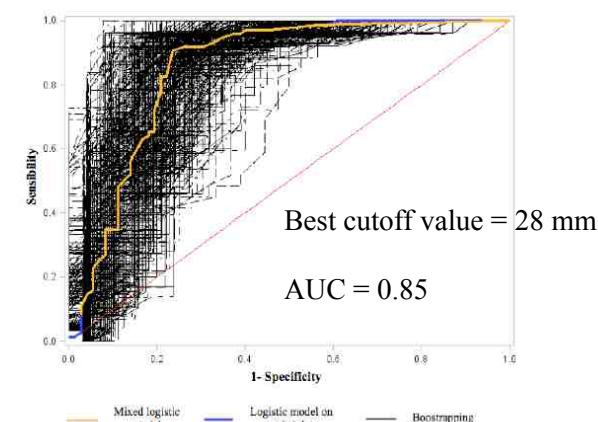
Corrélation course diaphragmatique et variabilité respiratoire du diamètre de la VCI (cIVC)

Figure 3: Evolution of cIVC in relation to the diaphragm motions for the three levels of breathing intensity (n=50).



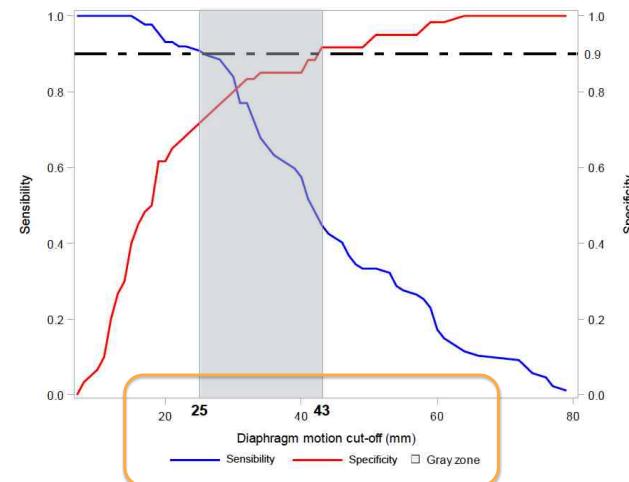
Gignon et al - in review 2015

Course diaphragmatique et prédictibilité d'un cIVC > 40 %



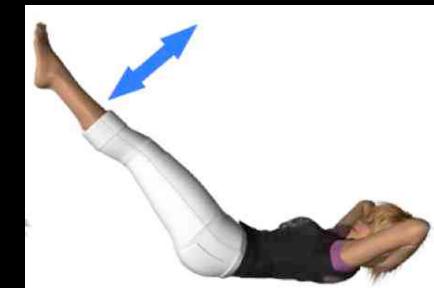
Gignon et al - in review 2015

Course diaphragmatique
et variabilité respiratoire du diamètre de la VCI (cIVC)



Gignon et al - in review 2015

Giving fluids without fluid infusion ?



Fluid responsiveness:
The passive leg rising test (PLR)

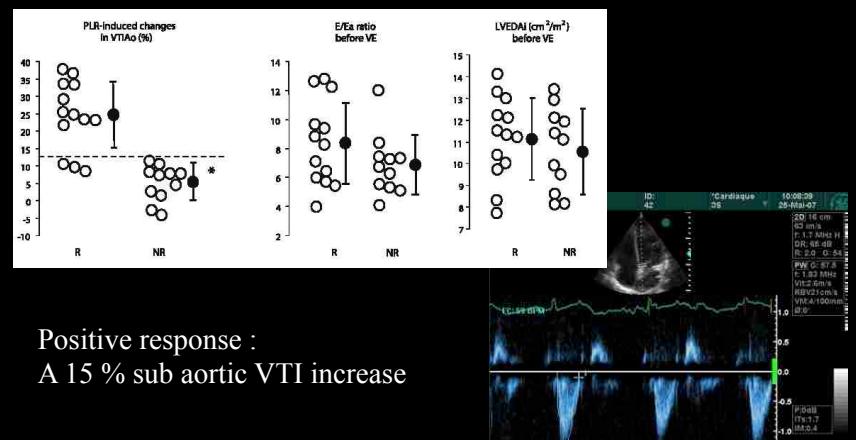
PLR = mimics a volume expansion of about 300 ml



Valuable both in
spontaneous or
mechanical ventilation

- Boulain et al Chest 2002
- Monnet et al Critical Care Med 2006
- Lafanechere et al Crit care 2006
- Lamia et al Intensive Care Med 2007
- Maizel et al Intensive Care Med 2007

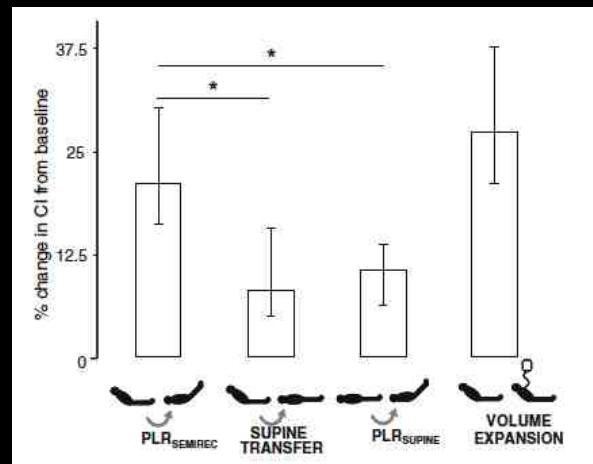
Fluid responsiveness:
The passive leg rising test (PLR) assessed by TTE



Positive response :
A 15 % sub aortic VTI increase

Lamia et al Intensive Care Med 2007

Lever passif de jambes :
La position compte...



Monnet et al Intensive Care Med 2009

Passive leg rising test :
...not always possible !



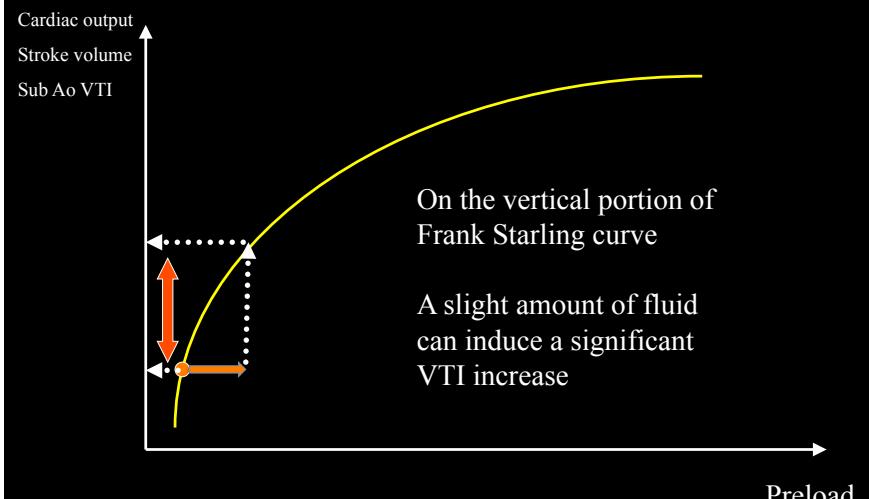
The mini fluid concept



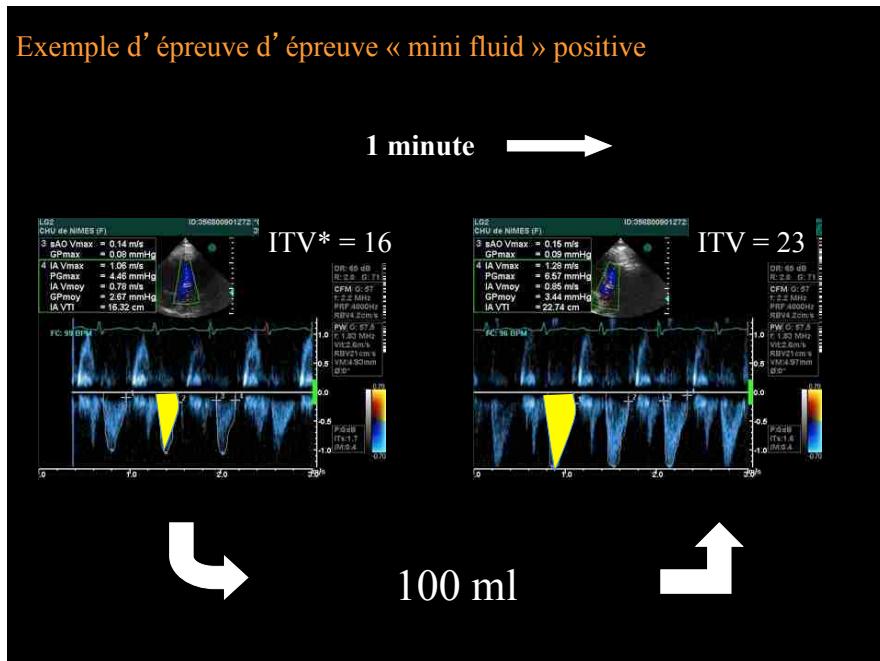
"The general concept is ... that the response to fluid challenge can be evaluated rapidly after a very limited amount of fluid..."

Vincent JL - Anesthesiology 2011

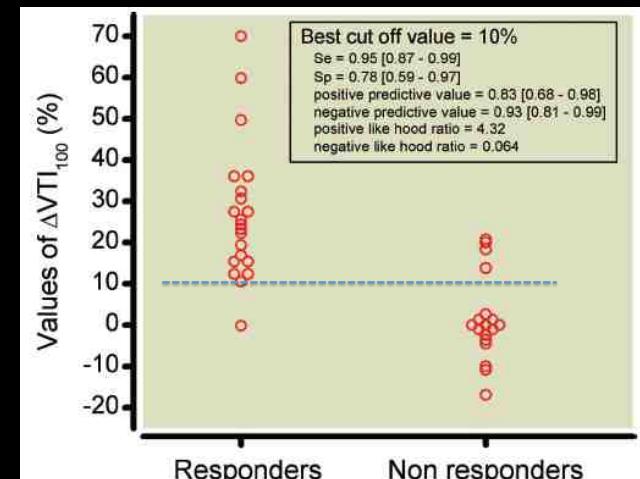
Mini fluid challenge : *the basics*



Exemple d' épreuve d' épreuve « mini fluid » positive

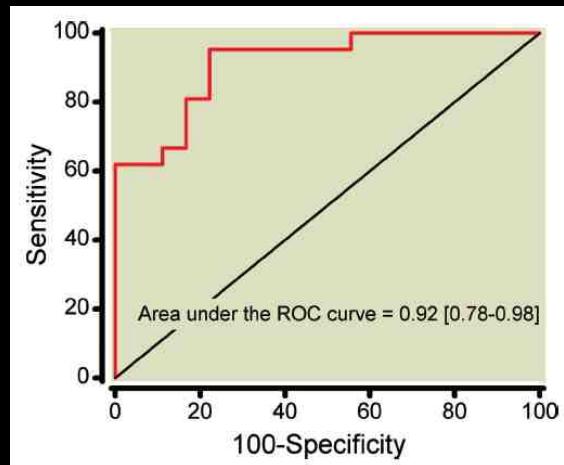


Mini fluid challenge



Muller et al Anesthesiology 2011

Mini fluid challenge



Muller et al Anesthesiology 2011

$VTI\ T_0$

↓
100 mL fluid infusion over 1 minute

↓
 $VTI\ T + 1\ minute$

↓
 VTI increase $> 10\%$

↓
Yes
(Responder)

↓
No
(Non responder)

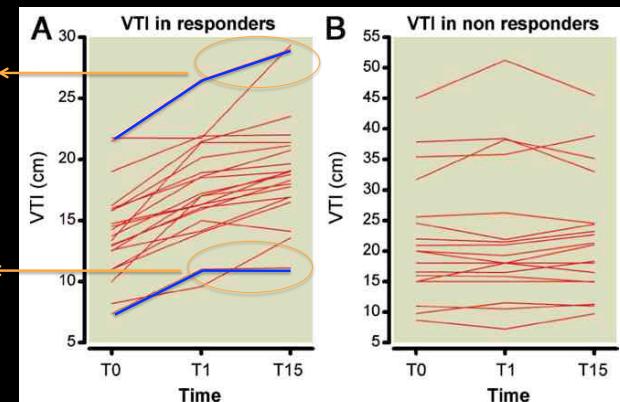
↓
Fluid 400 mL
over 15 minutes

↓
Stop fluid

Mini fluid challenge : reconstruction d'une courbe de Frank-Starling ?

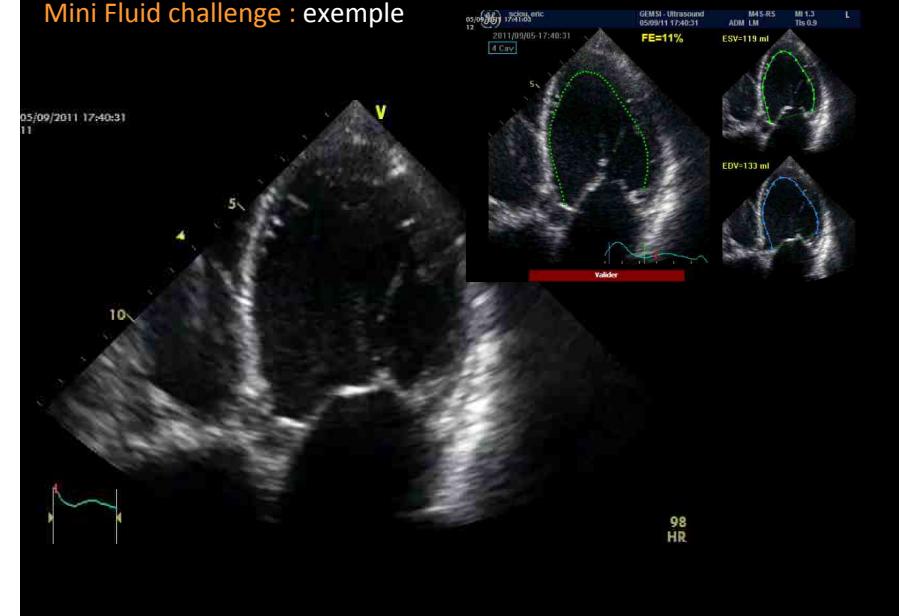
Nouvelle épreuve souhaitable ?

Nouvelle épreuve non souhaitable ?

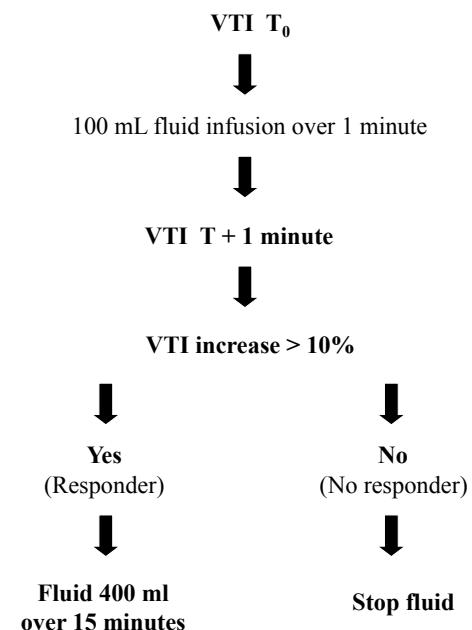
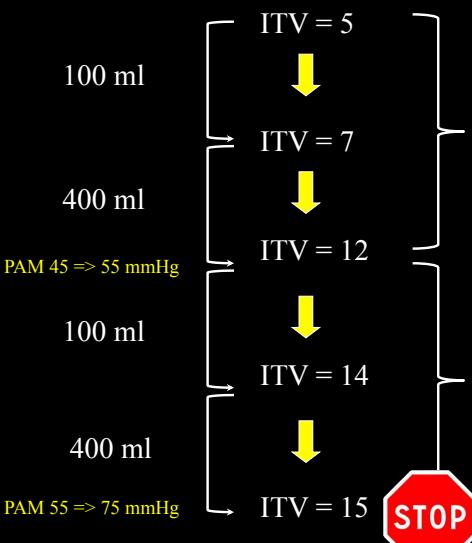


Muller et al Anesthesiology 2011

Mini Fluid challenge : exemple

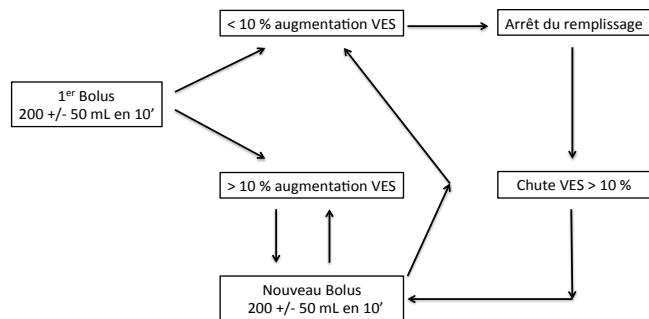


Mini Fluid challenge : exemple

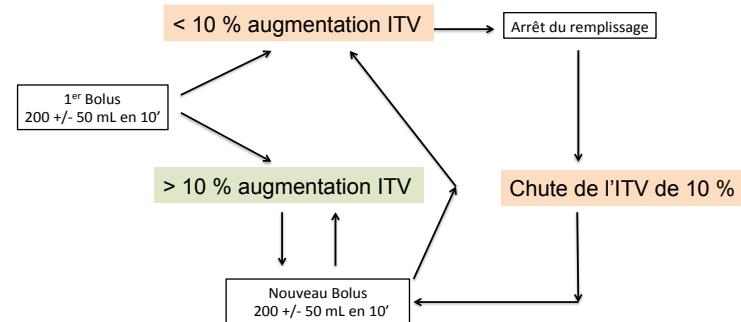


Stratégie du remplissage vasculaire pér opératoire

Guidelines for perioperative haemodynamic optimization

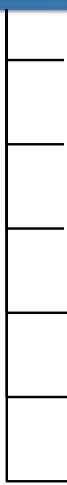


Recommandations SFAR 2

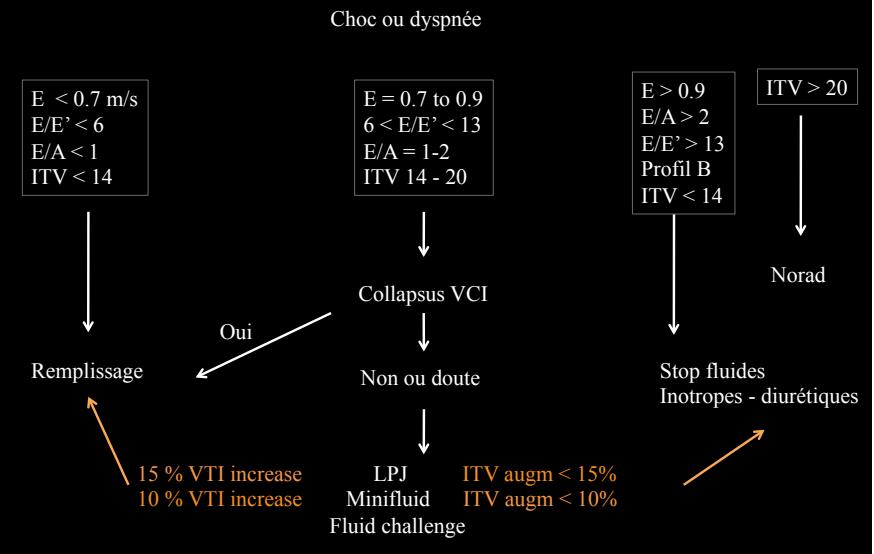


Recommandations SFAR 2012

Utilisation du débit cardiaque : principe



Evaluation de la volémie par échographie :
Proposition d'algorithme



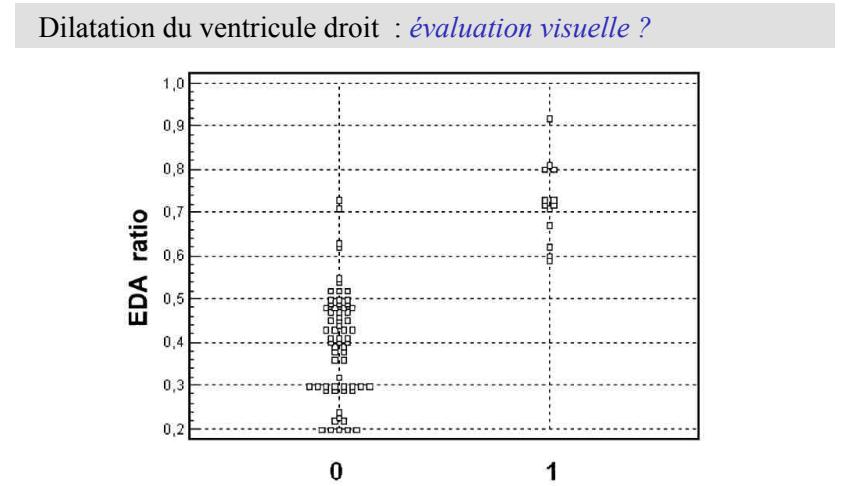
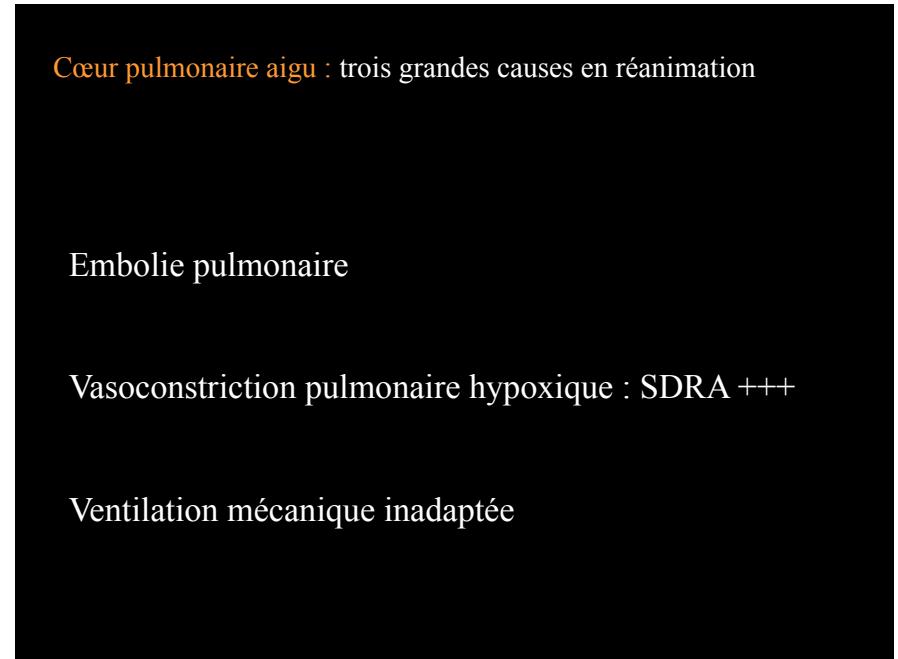
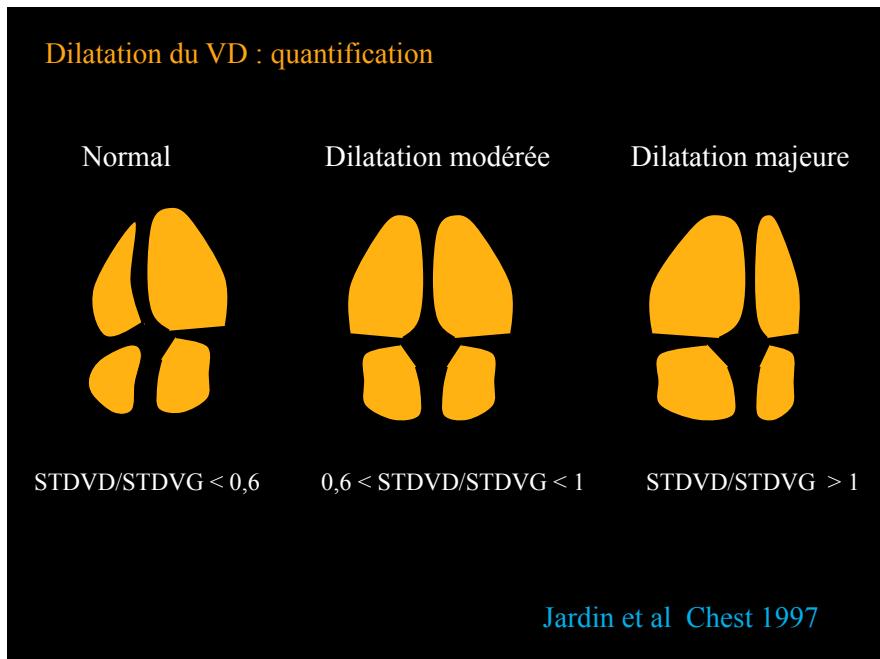
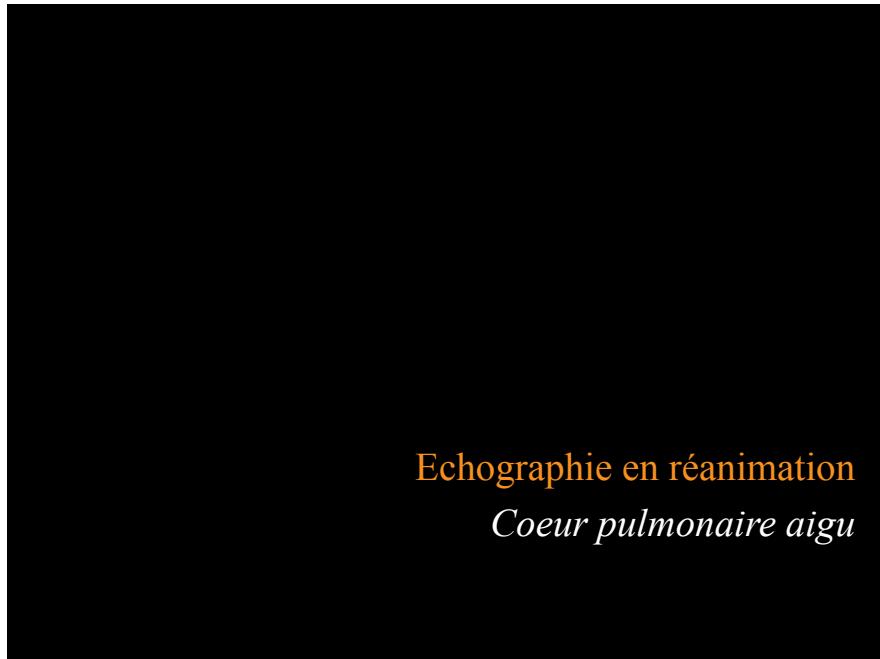
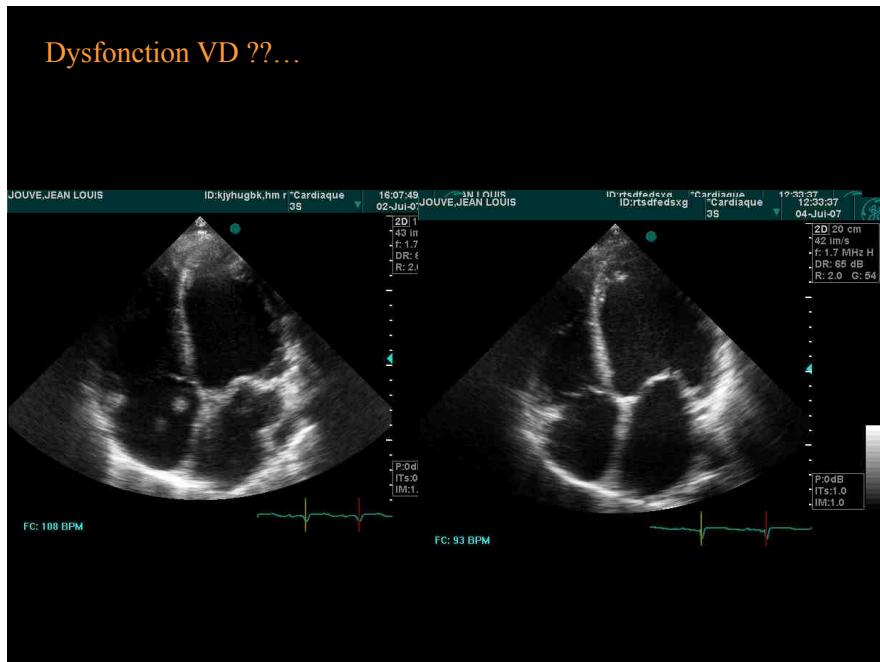


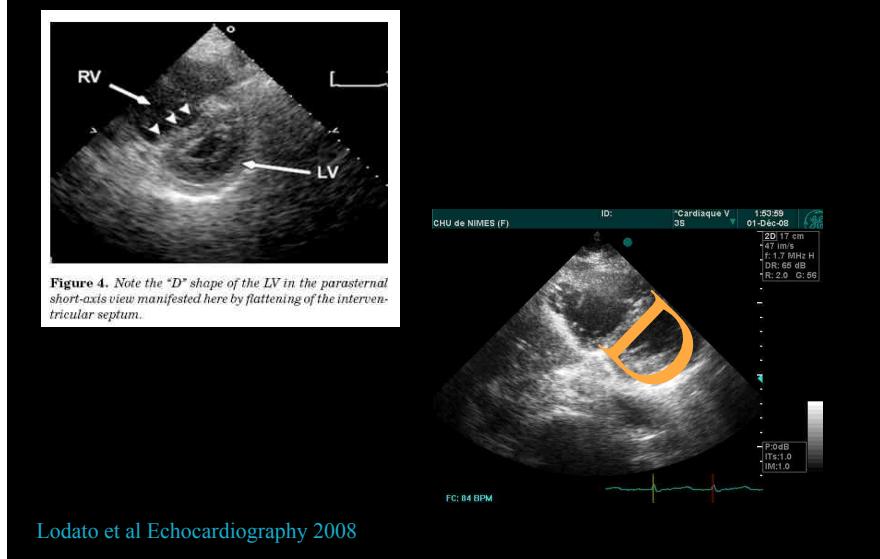
Fig. 3 Individual values of RV size, assessed on a long-axis view as the ratio of the end-diastolic area of the right ventricle over the end-diastolic area of the left ventricle (EDA ratio), in the two qualitative groups: *grade 0* normal RV size; *grade 1* moderately enlarged right ventricle

Vieillard Baron et al Intensive Care Med 2006

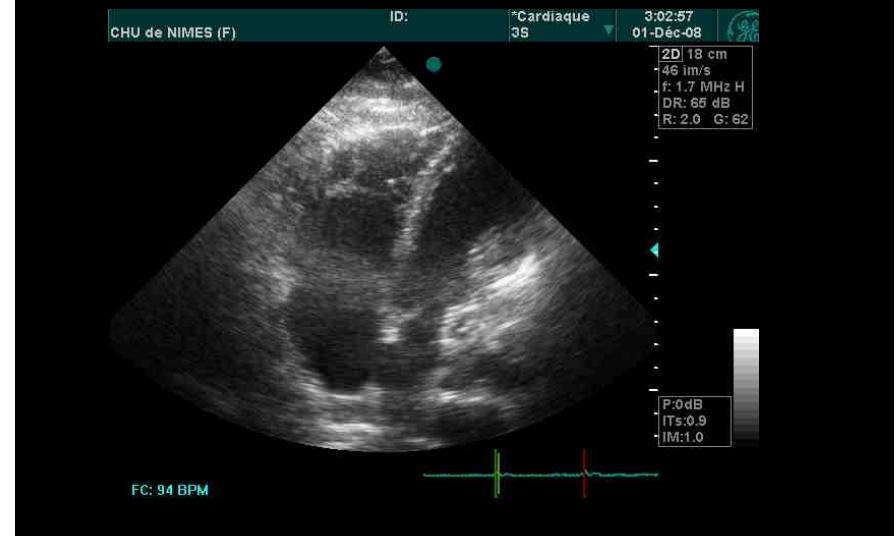
Dysfonction VD ??...



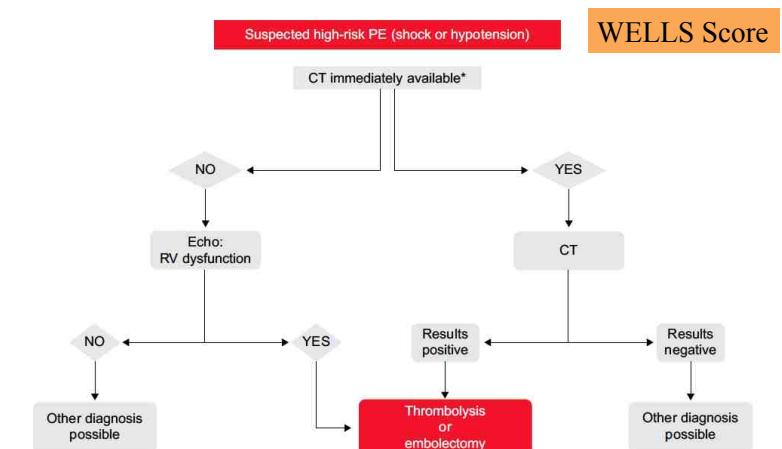
Septum paradoxal : « the D sign »



Dilatation aigue du VD :
état de choc, fracture bilatérale des fémurs

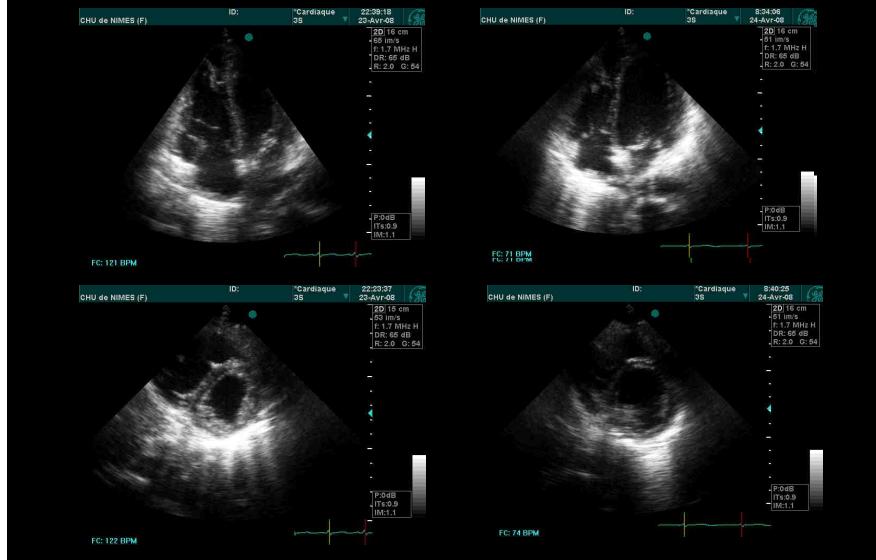


Embolie pulmonaire et echo : *intérêt que si choc*



Konstantinides et al NEJM 2008
Konstantinides et al Hellenic J Cardiol 2010

Cœur pulmonaire aigu :
patiente 40 ans péritonite, SDRA, PEP 12, Norad 2 mcg/Kg/min



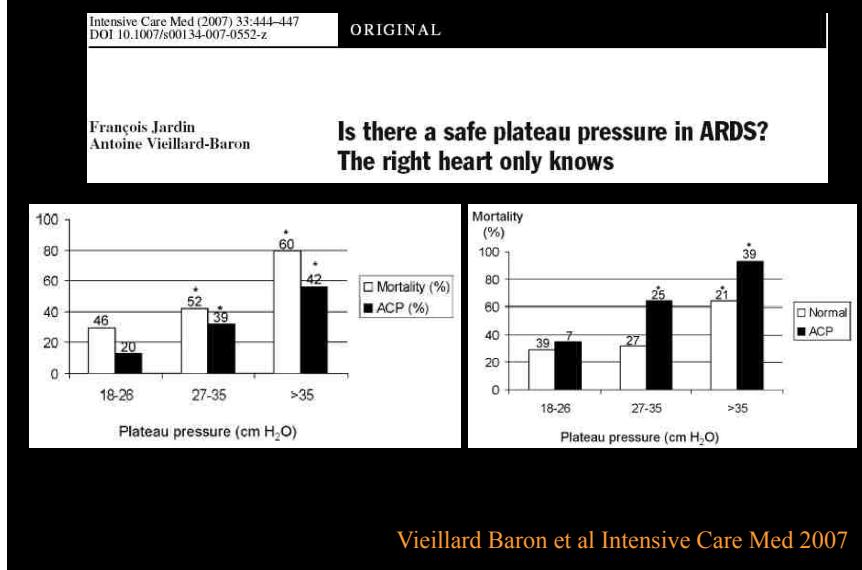
Cœur pulmonaire aigu en réanimation:
Jusqu'à 25 % des patients en SDRA

Table 3 Independent factors associated with acute cor pulmonale (ACP) and patent foramen ovale (PFO)

ACP	OR ^a	95 % CI	p value
Plateau pressure, cmH ₂ O	1.07	0.98–1.17	0.13
PaO ₂ /FiO ₂ ≤ 100	1.41	0.70–2.82	0.33
PaCO ₂ ≥ 60 mmHg	3.09	1.31–7.30	0.01
PFO	OR ^b	95 % CI	p value
Age >60 years	2.07	0.91–4.72	0.08
Respiratory-system compliance <25 mL/cmH ₂ O ^c	2.06	0.82–5.17	0.12
Tidal volume, mL/kg of predicted body weight	1.24	0.89–1.74	0.20

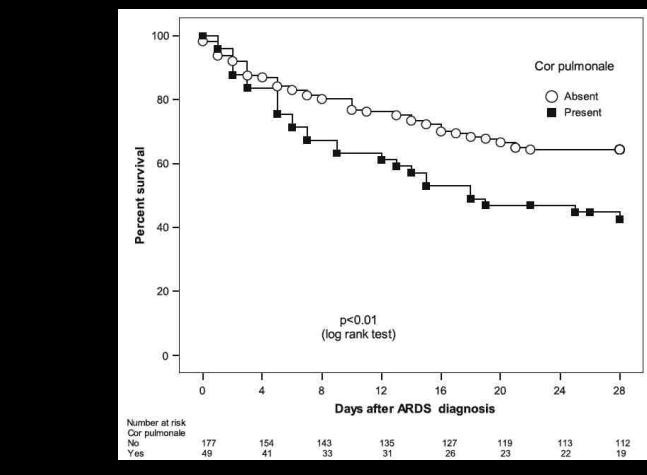
Lhéritier et al Intensive Care Med 2013

Défaillance ventriculaire droite et pressions de ventilation



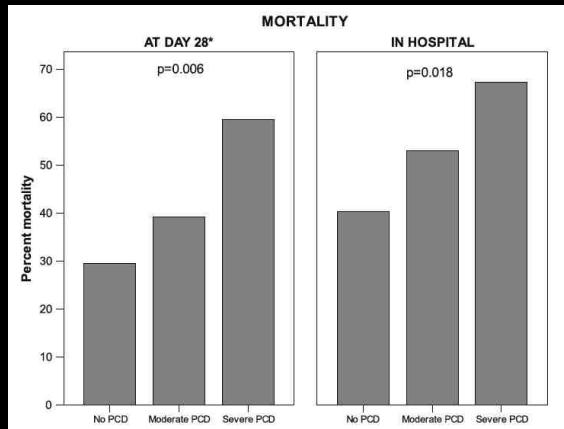
Vieillard Baron et al Intensive Care Med 2007

Cœur pulmonaire aigu en réanimation:
Pronostic du SDRA



Boissier et al Intensive Care Med 2013

Cœur pulmonaire aigu en réanimation:
Pronostic du SDRA

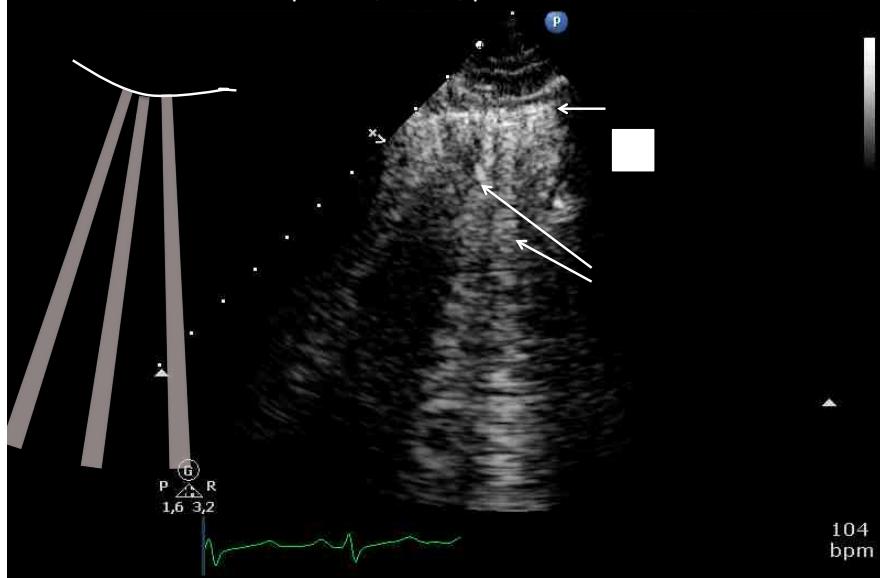


Boissier et al Intensive Care Med 2013

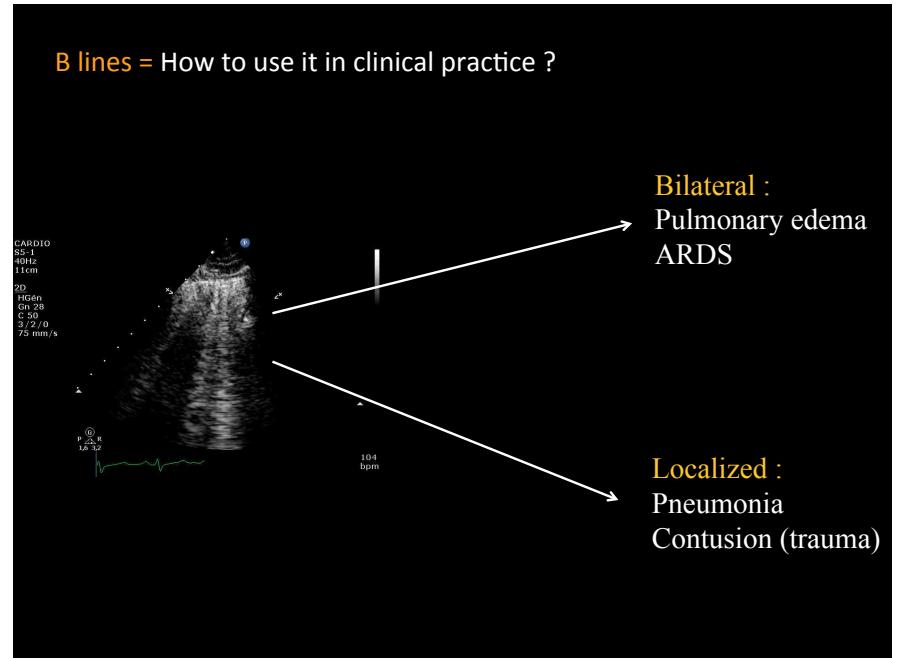
Actualités en échographie

Coupler écho cardio et écho pleuro pulmonaire

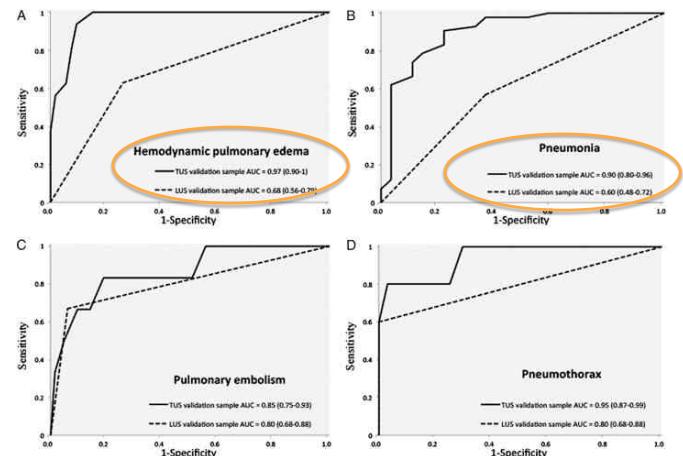
Alveolo-interstitial syndrome = multiple B lines
= intra alveoli fluid : plasma, blood, pus...



B lines = How to use it in clinical practice ?



Association échocardiographie et pleuro pulmonaire au cours des dyspnées:
Supérieur à l'écho pleuro pulm seule



Bataille et al Chest 2014

Actualités en échographie

Quelques nouveautés sur les machines...

Les dispositifs ultra portables pour les débutants ?:
Attention

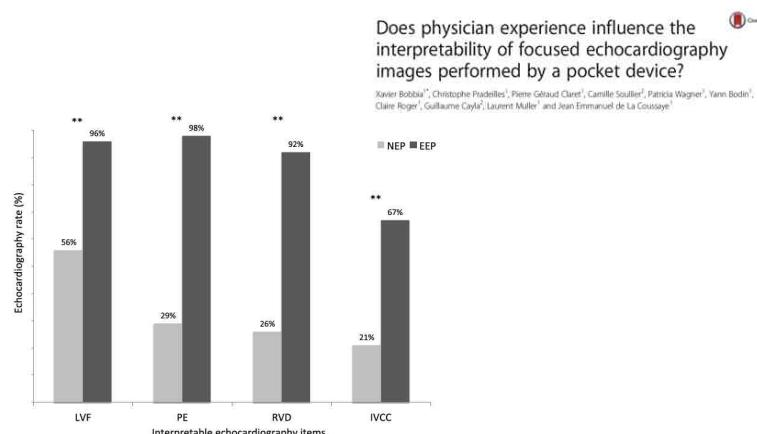


Fig. 2 Interpretable echocardiography items according to physician experience. EEP: experienced emergency physician; NEP: novice emergency physician (almost 50 echocardiographies after initial training); "Echography rate" is the number of examinations in which the item is interpretable; LVF: qualitative left ventricular function; PE: pericardial effusion; RVD: right ventricular dilation; IVCC: inferior vena cava compliance. ** p <.05

Bobbia et al Scand J Trauma Resusc Emerg Med 2015

ETO miniaturisés?
Aussi efficaces,

Emmanuelle Begot
François Dalmary
Carine Chatecopar
Marc Clavel
Nicolas Picton
Bruno François
Roberto Lang
Philippe Vignon

Hemodynamic assessment of ventilated ICU patients with cardiorespiratory failure using a miniaturized multiplane transesophageal echocardiography probe



Begot et al Intensive Care Med 2015

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Hemodynamic assessment of ventilated ICU patients with cardiorespiratory failure using a miniaturized multiplane transesophageal echocardiography probe

Table 2 Proposed therapeutic changes directly resulting from hemodynamic assessment using the standard and miniaturized TEE probes

Therapeutic changes	Standard TEE probe (n)	Miniaturized TEE probe (n)	Kappa (95 % CI)
Fluid loading	14 (40 %)	12 (35 %)	0.80 (0.62–0.99)
Vasopressor support (initiation or increasing dose)	5 (14 %)	4 (12 %)	0.90 (0.65–1.0)
Inotropes (initiation or increasing dose)	8 (23 %)	9 (26 %)	0.90 (0.40–1.0)
Diuretics/negativation of fluid balance	2 (6 %)	3 (9 %)	0.80 (0.40–1.0)
Protective mechanical ventilation	3 (9 %)	3 (9 %)	1 (1.0–1.0)
Inhaled NO	2 (6 %)	2 (6 %)	1 (1.0–1.0)
Pericardiocentesis	0	0	1 (1.0–1.0)
Emergency cardiac valve surgery	4 (11 %)	3 (9 %)	0.80 (0.56–1.0)

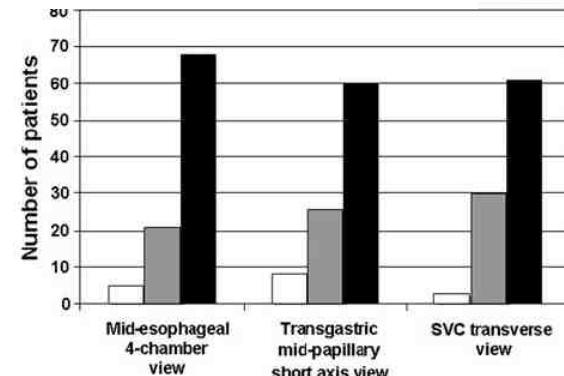
Begot et al Intensive Care Med 2015

ETO miniaturisés?
Aussi efficaces, utilisables plus longtemps

Antoine Vieillard-Baron
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Paul Mayo
Cyril Charron
Jean-Bernard Amiel
Cédric Esterez
François Leleu
Xavier Repesse
Philippe Vignon

A pilot study on safety and clinical utility of a single-use 72-hour indwelling transesophageal echocardiography probe

timal quality

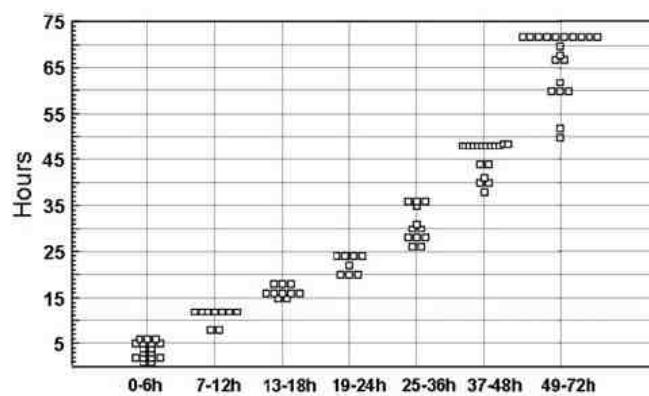


Intensive Care Med 2013

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Intensive Care Med 2013

