



Introduction à l'échographie cardiaque dirigée et l'échographie pulmonaire

André Denault MD PhD FRCPC, CSPQ, ABIM-CCM, FASE
 Président de la section CV de la SCA
 Professeur agrégé de clinique
 Département d'anesthésiologie
 Institut de Cardiologie de Montréal
 Service des soins intensifs
 Centre Hospitalier Universitaire de Montréal


Programme d'anesthésiologie
 Université Laval
 Québec 21 mars 2013





Ressources

<http://www.anesth.umontreal.ca/denault.html>



2010 Thèse de Doctorat : mécanisme de l'instabilité hémodynamique en chirurgie cardiaque


2011 Écho pulmonaire

2012 Instabilité hémodynamique et hypoxie: rôle de l'échographie ciblée


CHAPITRE 8

Évaluation de la détresse respiratoire et définition des concepts de base de son traitement

PAR ANDRÉ YVAN DENAULT ET FRANÇOIS MARTIN CARRIER




Guay, Martin, Plaud Précis d'anesthésiologie 2012



Basic concepts in the use of thoracic and lung ultrasound

Eric Piette^a, Raoul Daoust^b, and André Denault^c



Curr Opin Anesthesiol 2012

Core Review: Physician-Performed Ultrasound: The Time Has Come for Routine Use in Acute Care Medicine


Colin F. Roysse, MBBS, MD, FANZCA, *† David J. Canty, MBBS, FANZCA, PGDipEcho, *‡§||
 John Faris, MBChB, DAVMed, FAFOM, FFOM, FANZCA, BA, ASCeXAM, PGDipClinUs, ¶#**††
 Darsim L. Haji, MBChB, FACEM, PGDipEcho, †† Michael Veltman, MBBS, FANZCA, ASCExam,
 FASE, ¶#**§§ and Alistair Roysse, MBBS, MD, FRACS, FCSANZ|||



(Anesth Analg 2012;115:1007-28)

CCUS 2013 Symposium:

Challenging Dogma in Adult and Paediatric Acute Care




May 25 and 26th, 2013
 Sainte-Justine University Health center,
 Montréal

www.ccusinstitute.org

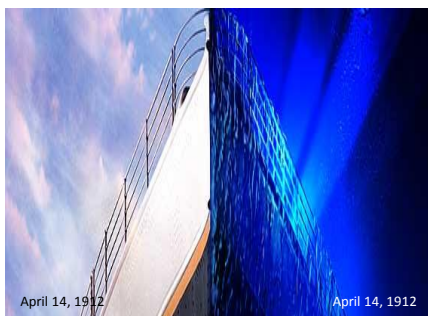
Objectifs

- “ Comprendre le rôle de l'échographie cardiaque et pulmonaire en salle d'opération, en salle de réveil et aux soins intensifs
- “ Développer une approche dans la prise en charge du patient instable et/ou hypoxique
- “ Reconnaître des images clés en échographie de surface

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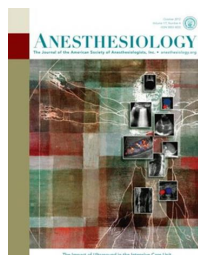
Monitoring vs diagnostique



Deep Impact of Ultrasound in the Intensive Care Unit

The "ICU-sound" Protocol

Emilpaolo Manno, M.D.,* Mauro Navarra, M.D.,† Luciana Faccio, M.D.,‡ Mohsen Motevallian, M.D.,† Luca Bertolaccini, M.D., Ph.D.,‡ Abdou Mfochivè, M.D.,† Marco Pesce, M.D.,† Andrea Evangelista, M.S.§



- “ Impact: Ultrasound examination
 - 85.6% abnormalities
 - modified it in 32/125 cases (25.6%)

Anesthesiology 2012

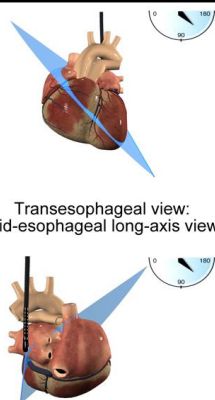
Focused Cardiac Ultrasound in the Emergent Setting: A Consensus Statement of the American Society of Echocardiography and American College of Emergency Physicians

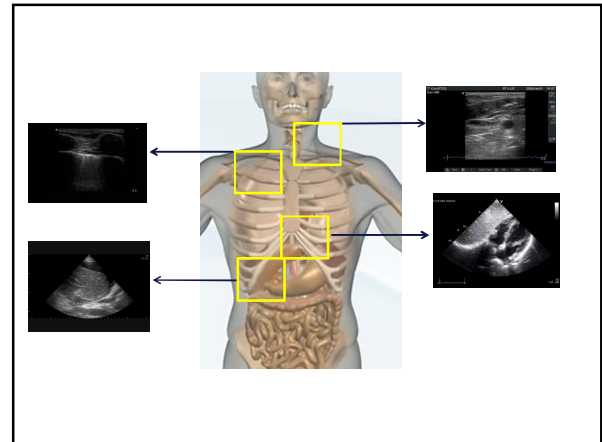
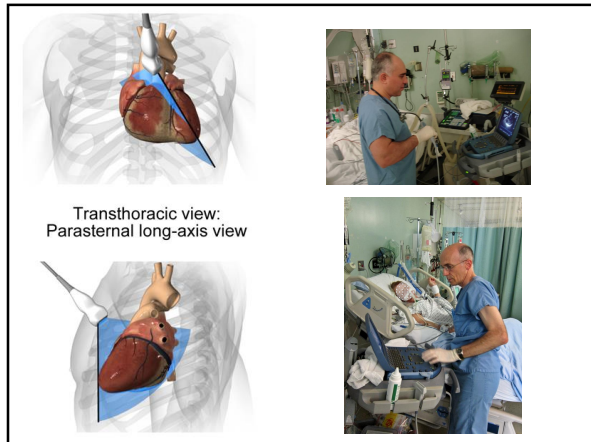
Arthur J. Labovitz, MD, FASE, Chair,* Vicki E. Noble, MD, FACEP,** Michelle Bierig, MPH, RDMS, FASE,* Steven A. Goldstein, MD,* Robert Jones, DO, FACEP,** Smadar Kori, MD, FASE,* Thomas R. Porter, MD, FASE,* Kirk T. Spencer, MD, FASE,* Vivek S. Taylor, MD, FACEP,** and Kevin Wei, MD,* St. Louis, Missouri; Boston, Massachusetts; Washington, District of Columbia; Cleveland, Ohio; Stony Brook, New York; Omaha, Nebraska; Chicago, Illinois; Charlotte, North Carolina; Portland, Oregon

Table 1 Goals of the focused cardiac ultrasound in the symptomatic emergency department patient

Assessment for the presence of pericardial effusion
Assessment of global cardiac systolic function
Identification of marked right ventricular and left ventricular enlargement
Intravascular volume assessment

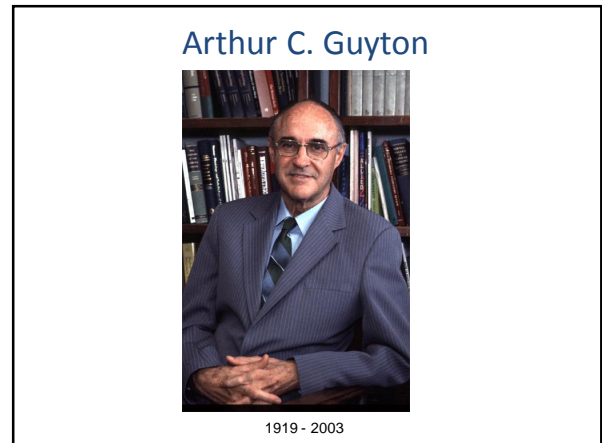
Journal of the American Society of Echocardiography December 2010





Objectifs

- ~ Comprendre le rôle de l'échographie cardiaque et pulmonaire en salle d'opération, en salle de réveil et aux soins intensifs
- ~ Développer une approche dans la prise en charge du patient instable et/ou hypoxique
- ~ Reconnaître des images clés en échographie de surface



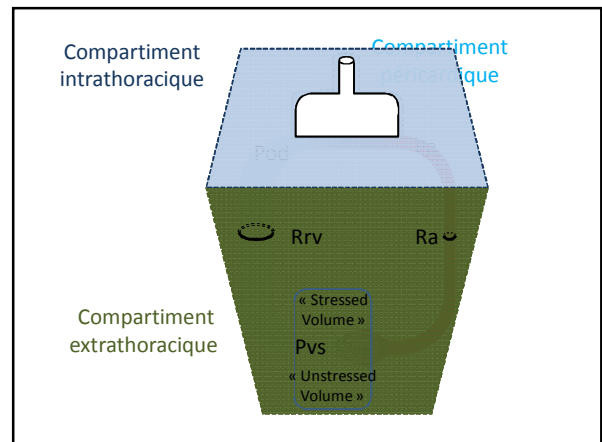
Eric Jacobsohn MB CHB FRCP(C),*
Robin Chorn BSc MB CHB FRCP(C),†
Michael O'Connor MD*

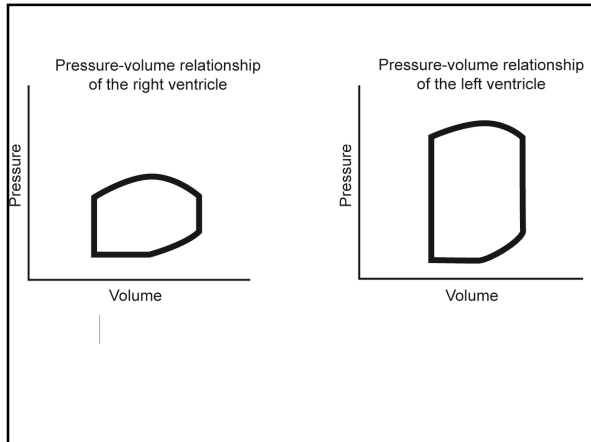
Review Article

The role of the vasculature in regulating venous return and cardiac output: historical and graphical approach

CAN J ANAESTH 1997 / 44: 8 / pp 849-867

This image block includes a small portrait of a man (Eric Jacobsohn) on the left. To the right, the title and authors of a review article are listed. At the bottom, the journal citation is provided.





Déterminants du retour veineux

$$RV = \frac{\text{Gradient de pression}}{\text{Résistance au RV}} = \frac{P_{vs} - P_{od}}{R_{rv}}$$

↓ Retour veineux si:

- 1- ↓ Pvs: hypovolémie, vasodilatation
- 2- ↑ Pod: dysfonction systolique ventriculaire gauche et droite
dysfonction diastolique ventriculaire gauche et droite
obstructions des valves et des chambres de chasse
embolies pulmonaires
hypoxie et hypercapnie
- 3- ↑ Rrv: obstruction intrinsèque ou extrinsèque (syndrome du compartiment)
(péricardique, médiastinal, thoracique, abdominal)

Déterminants du retour veineux

$$RV = \frac{\text{Gradient de pression}}{\text{Résistance au RV}} = \frac{P_{vs} - P_{od}}{R_{rv}}$$

↓ Retour veineux si:

- 1- ↓ Pvs: Choc hémorragique
Choc distributif
- 2- ↑ Pod: Choc cardiogénique
- 3- ↑ Rrv: Choc obstructif

Shock state

Hypotension
Oliguria
Cold extremities
Neurological alteration
Acidosis

Hypoxia and hemodynamic instability

Short history and physical exam

Simultaneous rapid diagnosis and treatment

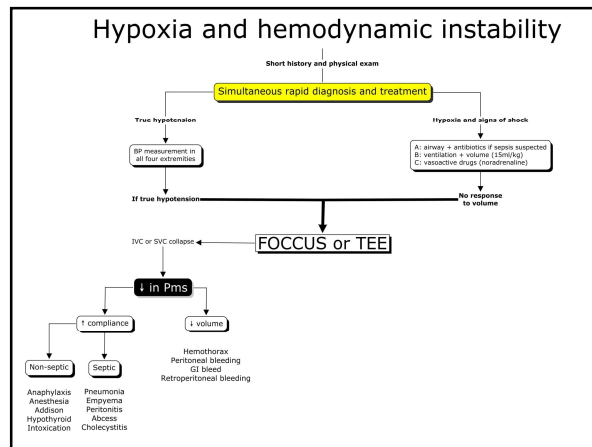
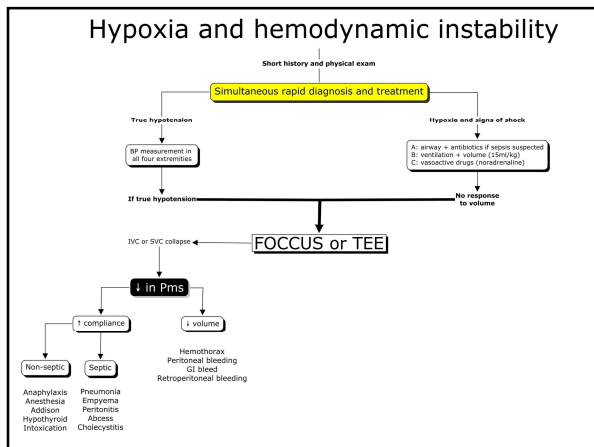
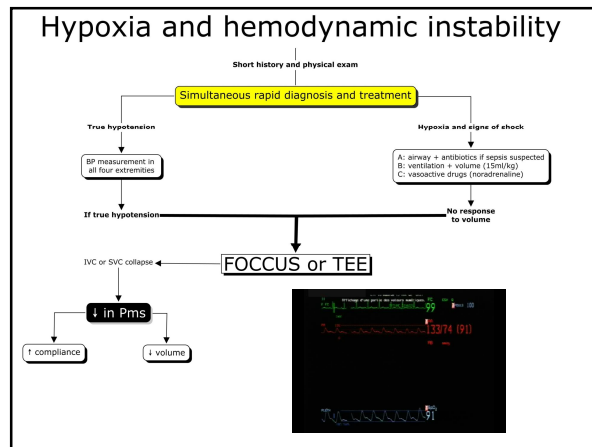
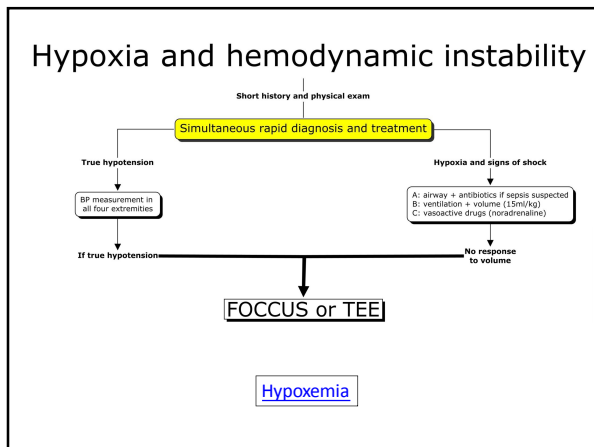
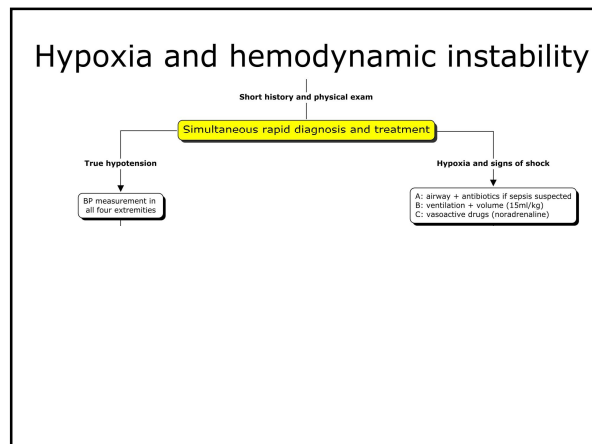
Hypoxia and hemodynamic instability

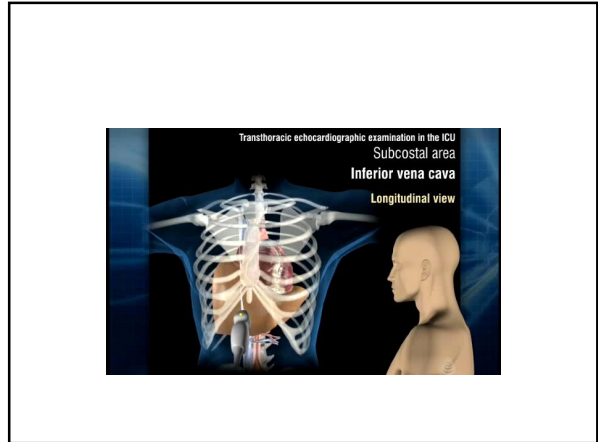
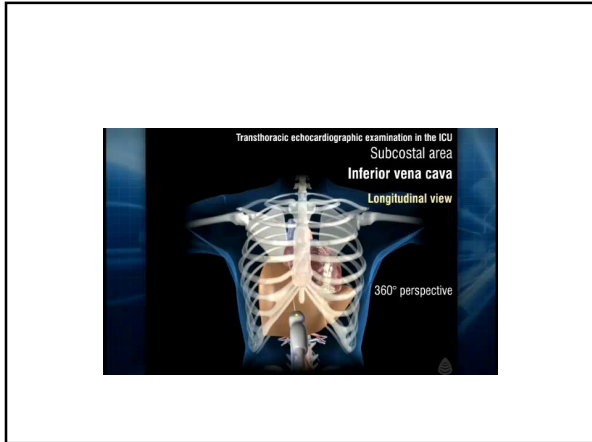
Short history and physical exam

Simultaneous rapid diagnosis and treatment

True hypotension

BP measurement in all four extremities





Subcostal area: Inferior vena cava (longitudinal view)

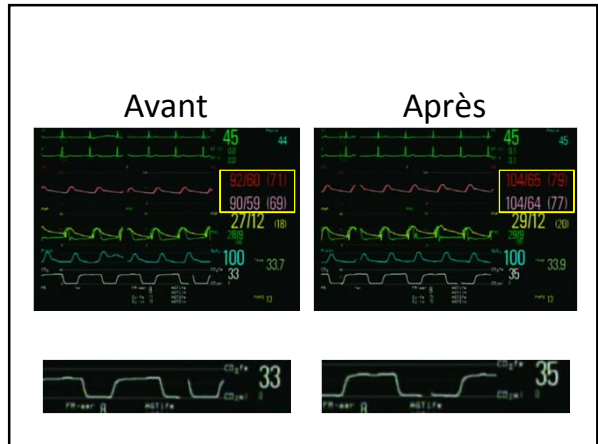
Identification of structures

- Inferior vena cava (IVC)
- Right atrium (RA)
- Liver

↑Pra

↓Pms ou ↑Rvr

↑Rvr



Intensive Care Med
DOI 10.1007/s00134-012-2693-y

ORIGINAL

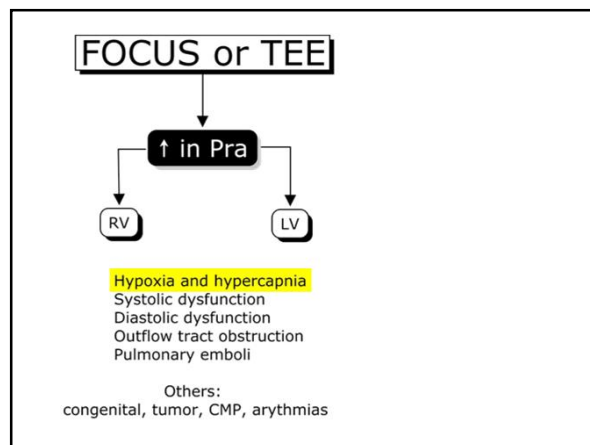
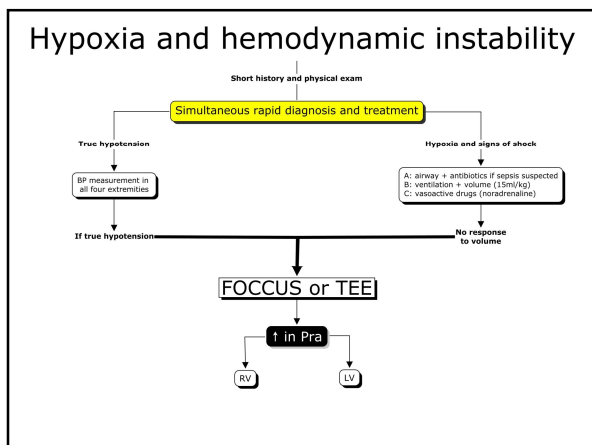
Xavier Monnet
Aurélien Bataille
Éric Magalhães
Jérôme Barrois
Marine Le Corre
Clément Gosset
Laurent Guérin
Christian Richard
Jean-Louis Teboul

End-tidal carbon dioxide is better than arterial pressure for predicting volume responsiveness by the passive leg raising test

Variable	AUC	p-Value versus 0.50
PLR-induced changes in cardiac index	0.98 (0.88–1.00)	<0.0001
PLR-induced changes in EtCO ₂	0.93 (0.81–0.99)	<0.0001
PLR-induced changes in arterial pulse pressure	0.65 (0.49–0.80)	0.07

Pms?

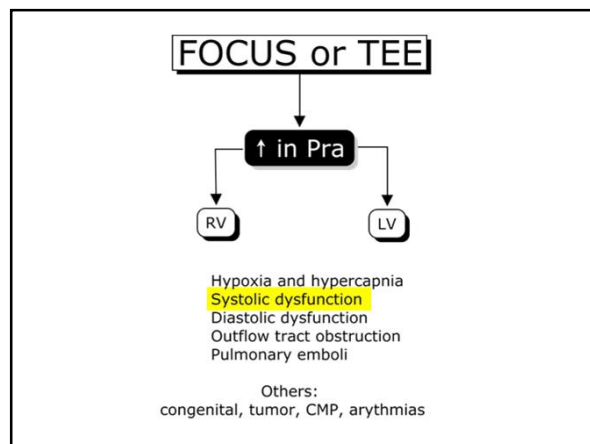
Hemothorax
Pneumonia
Peritonitis
Acute cholecystitis

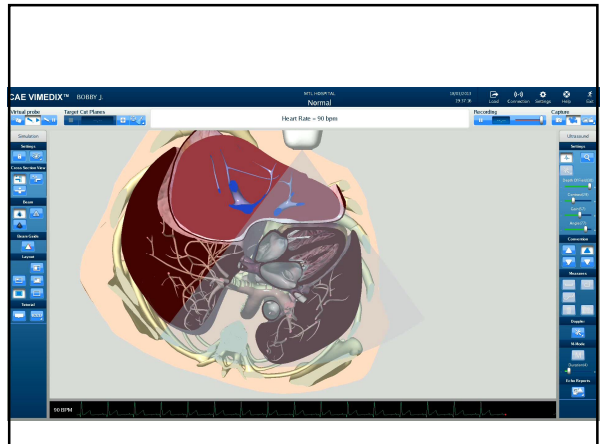
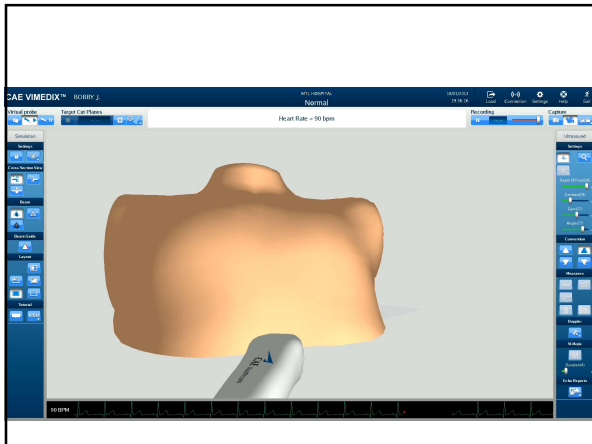
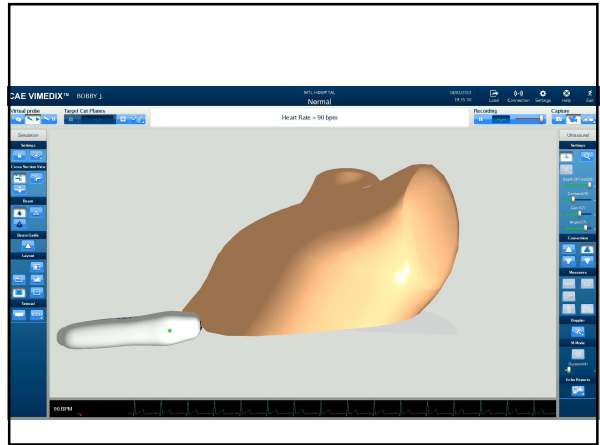
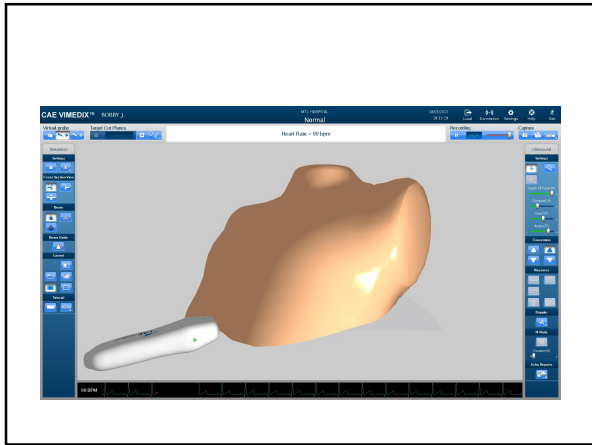
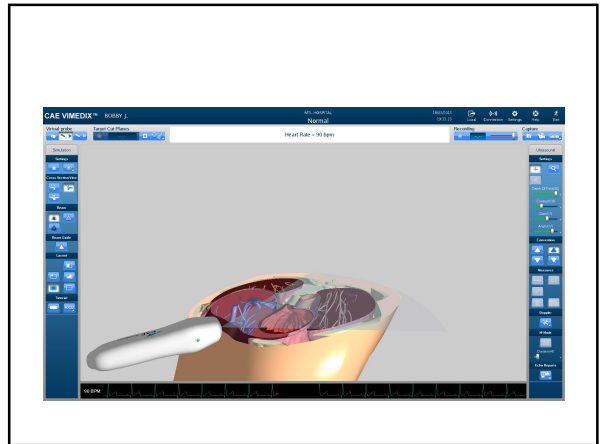
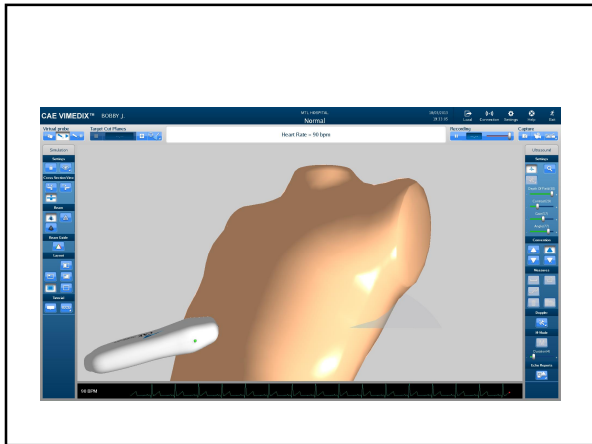


Basic concepts in the use of thoracic and lung ultrasound

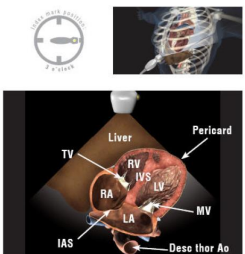
Eric Plette^a, Raoul Daoust^b, and André Denault^a

Cur Opin Anesthesiol 2012.



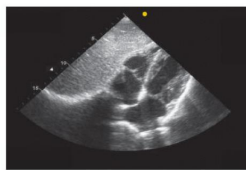
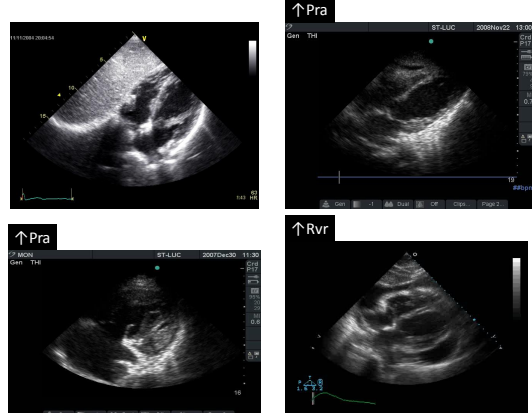


Subcostal area: Four-chamber view




Identification of structures

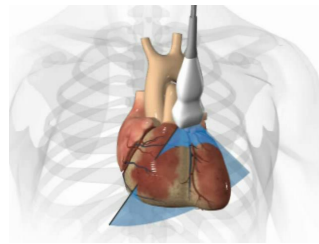
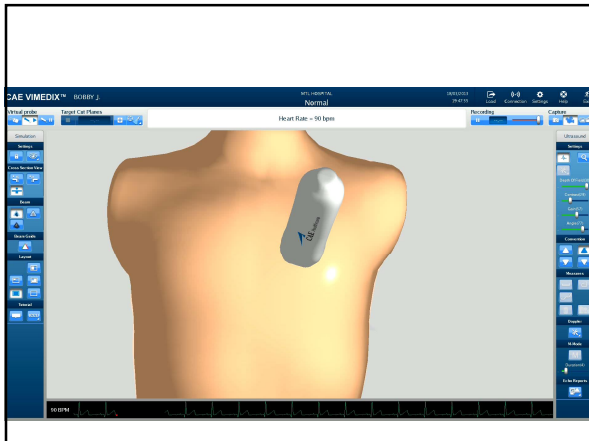
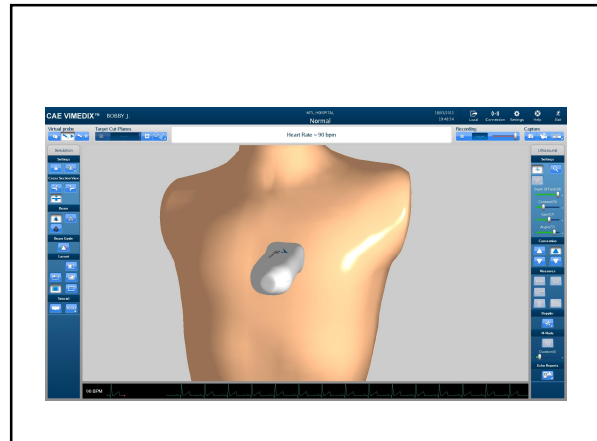
- Left atrium (LA)
- Right atrium (RA)
- Left ventricle (LV)
- Right ventricle (RV)
- Mitral valve (MV)
- Tricuspid valve (TV)
- Pericardium (Pericard)
- Descending thoracic aorta (Desc thor Ao)
- Interatrial septum (IAS)
- Interventricular septum (IVS)
- Liver

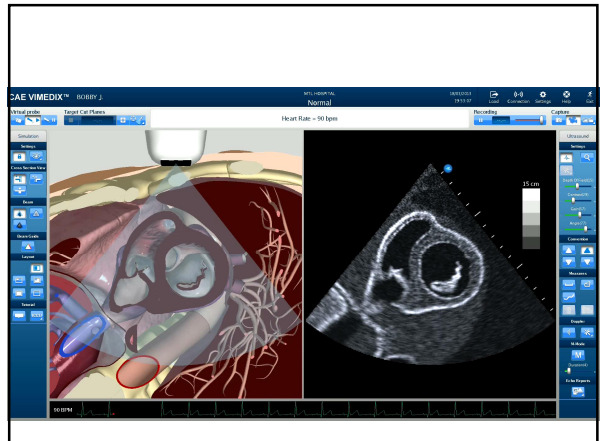
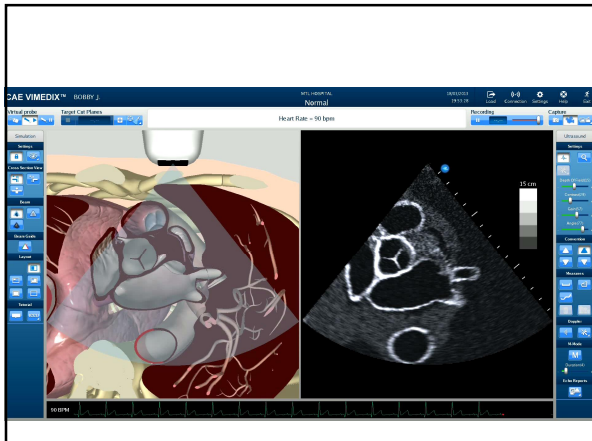
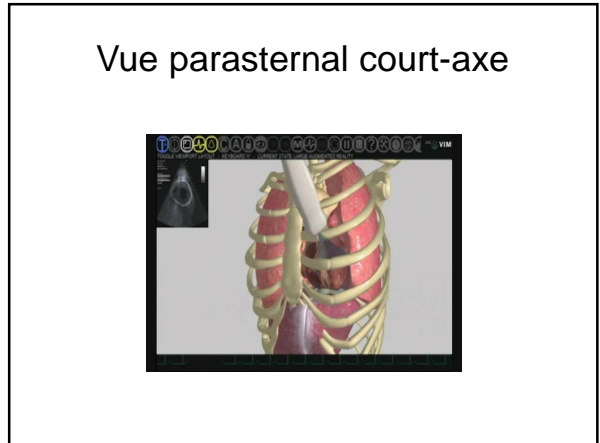
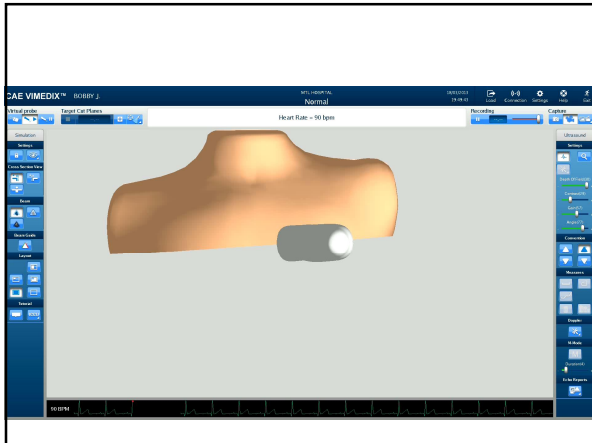
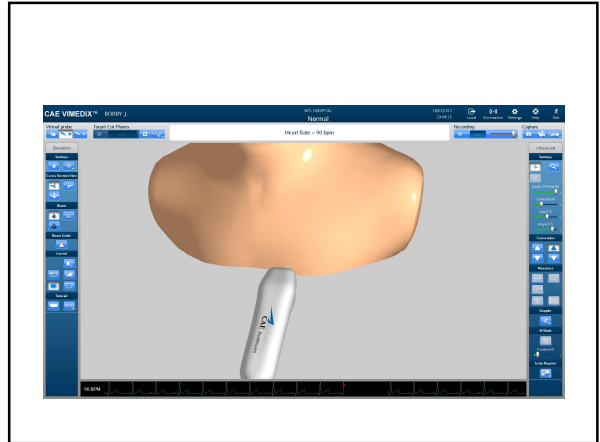
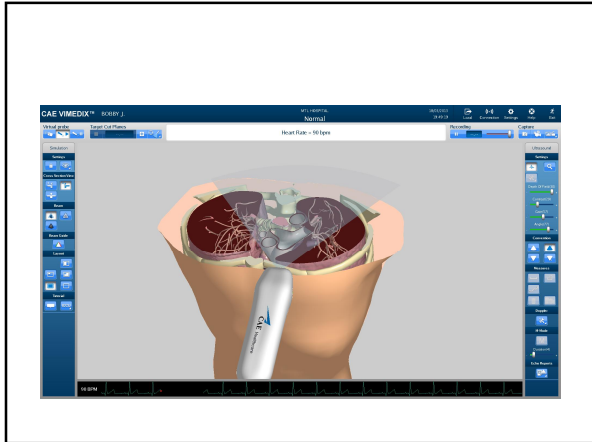



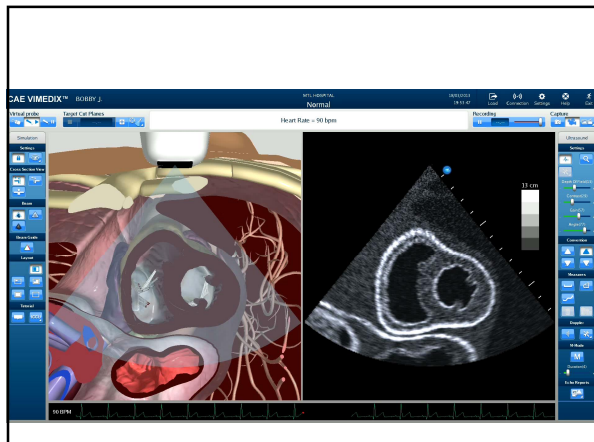
Homme de 24 ans avec cirrhose congénitale: code bleu



Vue parasternal court-axe





27 ans instable post laparotomie urgente

FOCUS or TEE

↑ in Pra

RV

LV

Hypoxia and hypercapnia
Systolic dysfunction
Diastolic dysfunction
Outflow tract obstruction
Pulmonary emboli

Others:
congenital, tumor, CMP, arrhythmias

Always consider left ventricular outflow tract obstruction in hemodynamically unstable patients

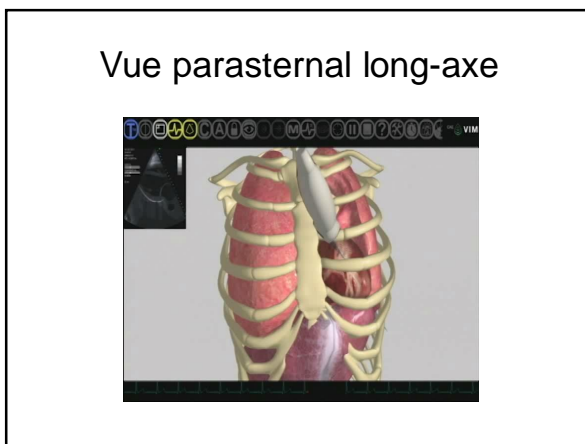
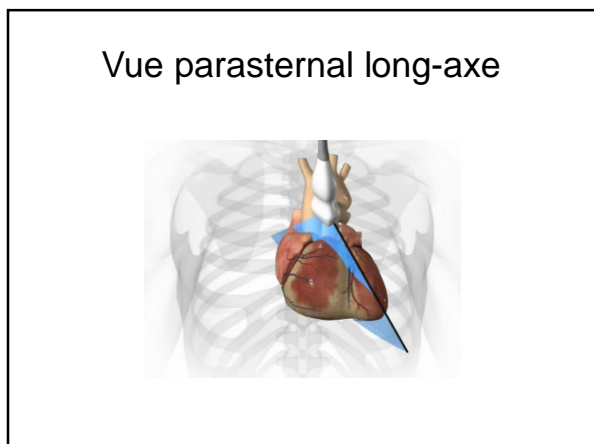
Antoine G. Rochon, MD · Philippe L. L'Allier, MD ·
André Y. Denault, MD

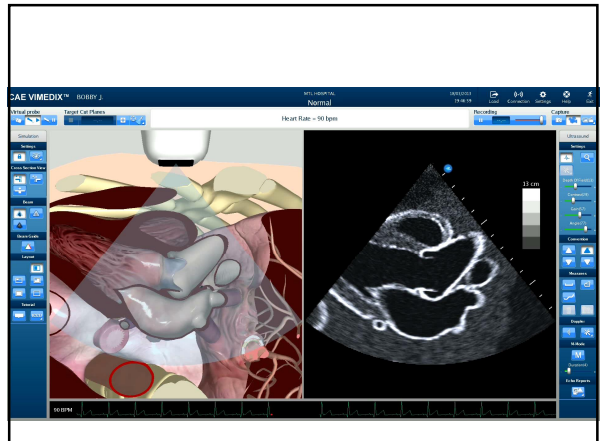
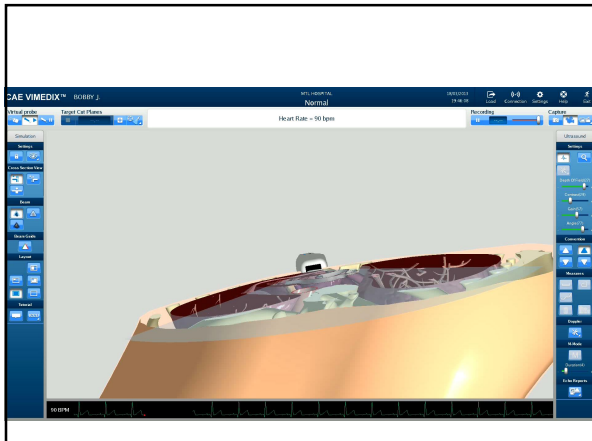
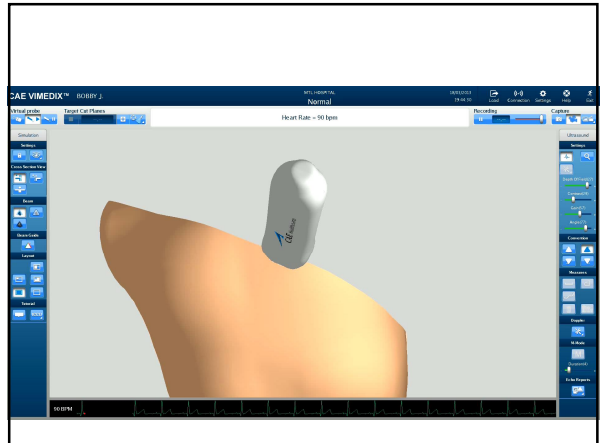
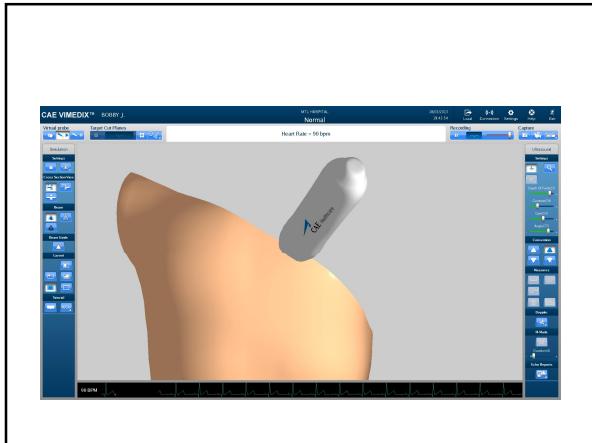
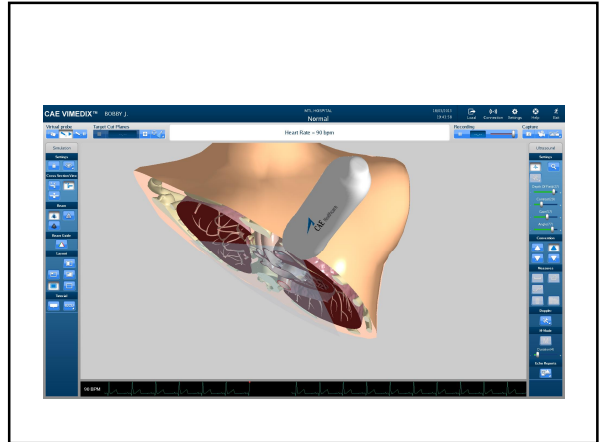
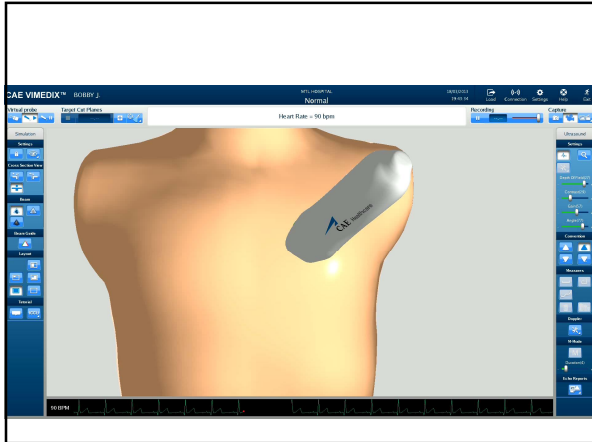
- 1 PML = 14 mm
- 2 AML = 27 mm
- 3 LVOT = 19 ± 2 mm
- 4 SCL
- 5 Coaptation point
- 6 Mitral annulus
- 7 Mitro-aortic angle

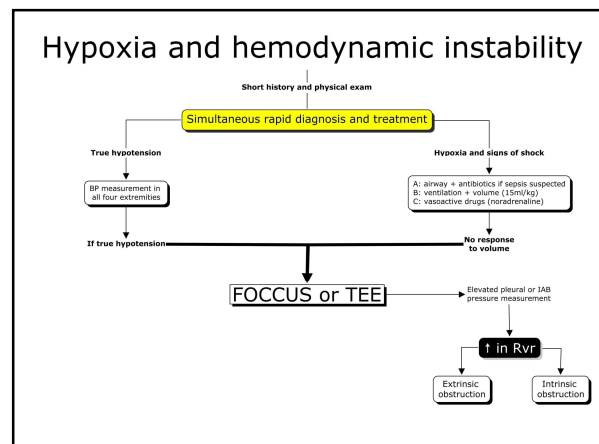
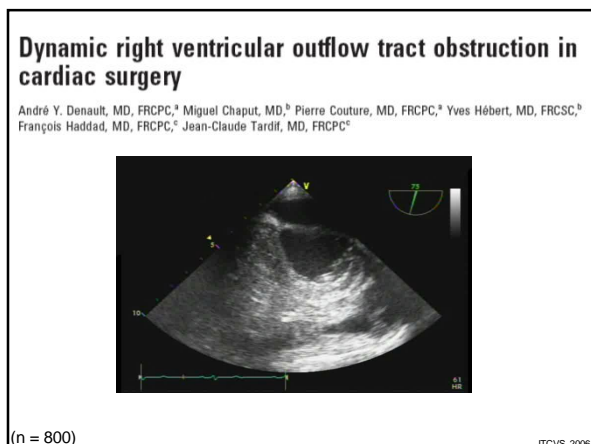
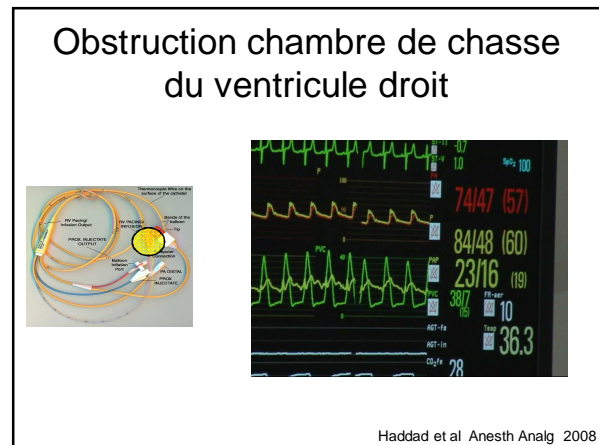
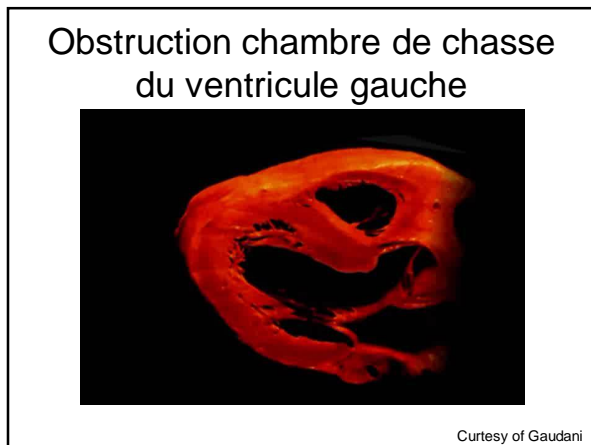
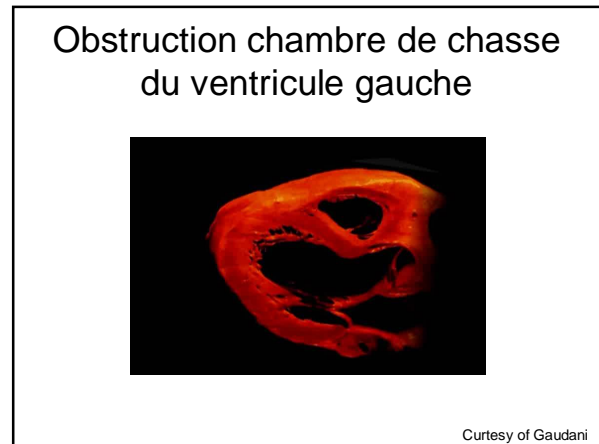
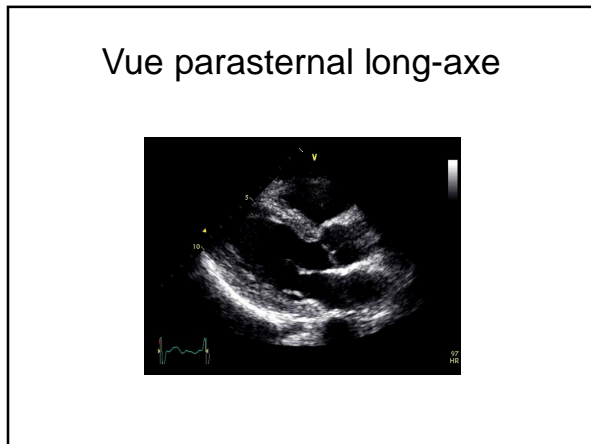
[Risk of SAM: SPASM]

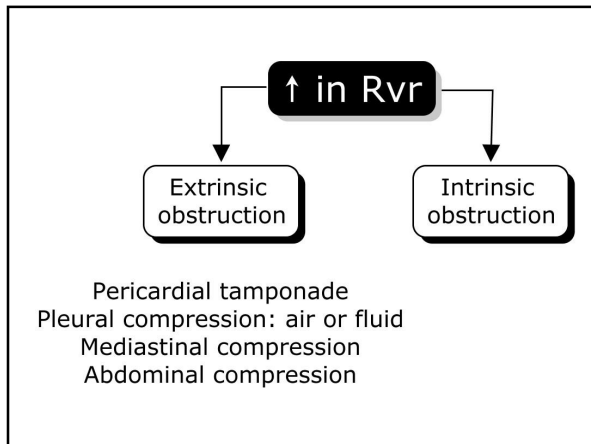
SCL < 26 mm
PML length > 15 mm
AML / PML < 1.3
Septum > 10 mm
Mitro-aortic angle < 130°

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

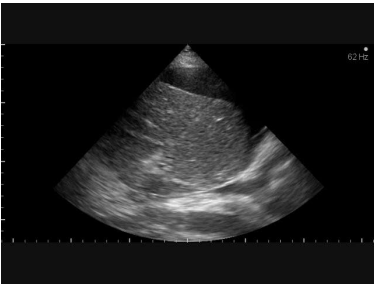
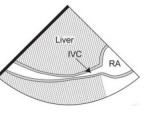







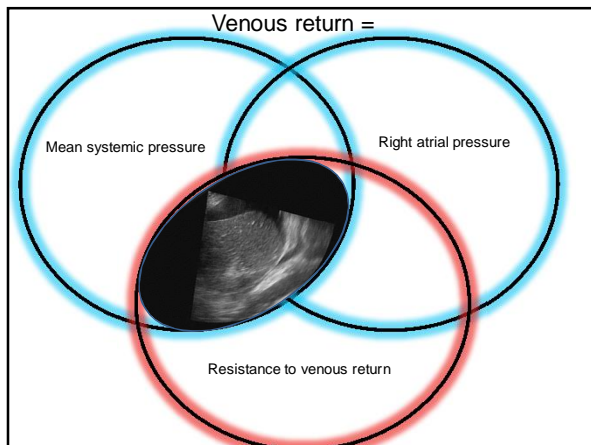


Mécanismes mixtes



Courtoisie Dr Philippe Rola



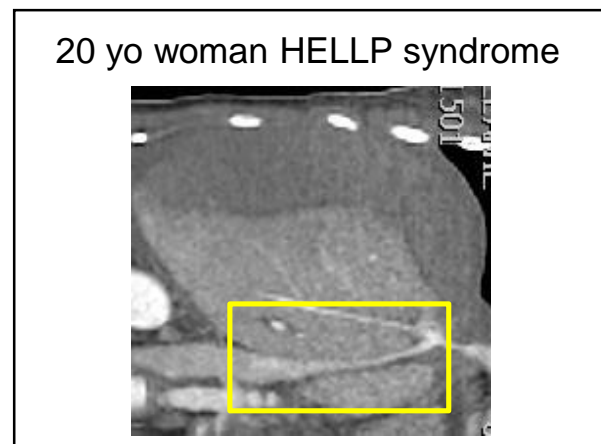
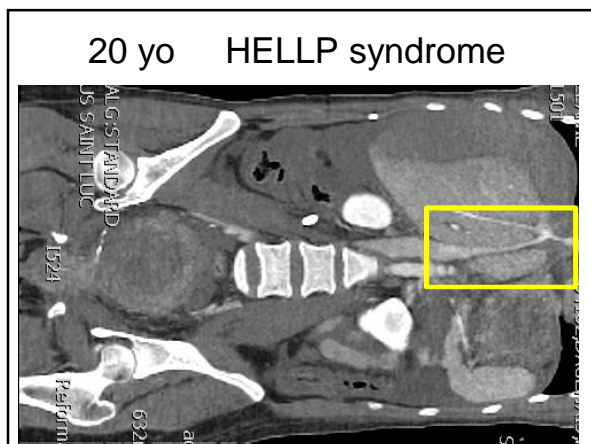
Monitoring de la pression abdominale



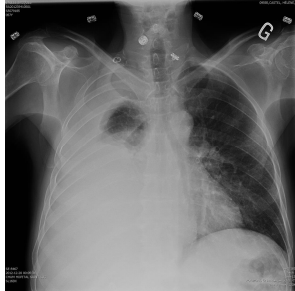



**WORLD SOCIETY OF THE
ABDOMINAL COMPARTMENT SYNDROME**

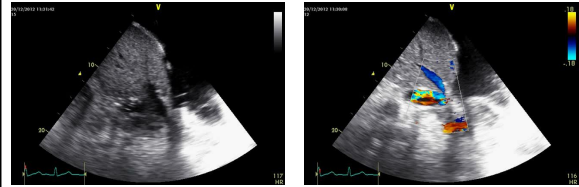
Home Education Join WSACS Discussion Research For Patients Me



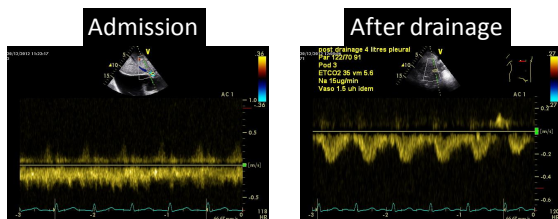
de 54 ans avant
une greffe hépatique



Instable à son arrivée aux SI



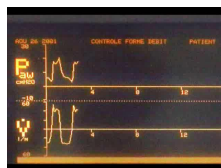
Doppler veines hépatiques



Limitations de l'échographie
transthoracique

- “ Équipement nécessaire et rapidement accessible
- “ Nécessite une formation de base ou avancée
- “ L'examen est dépendant de l'opérateur
- “ L'échographie n'est pas un bon moniteur mais un complément
- “ L'échographie n'est pas utile pour toutes les causes d'instabilité hémodynamique

Patient instable aux soins intensifs
Pressions de pointe
Hypotension sévère

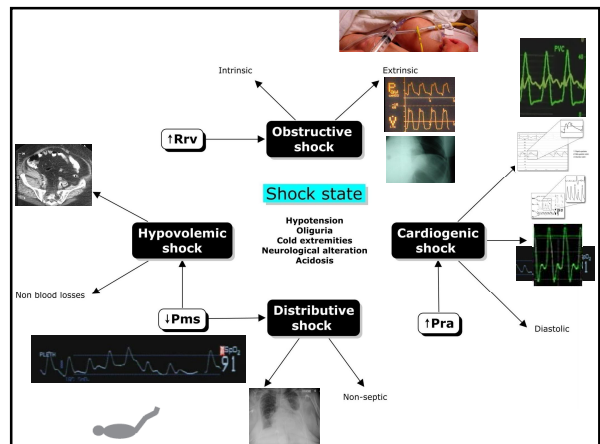
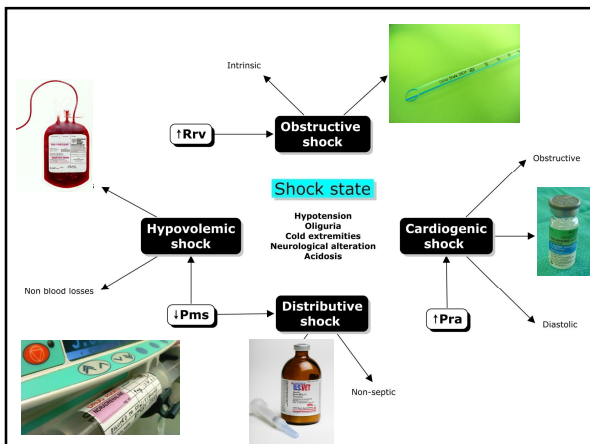
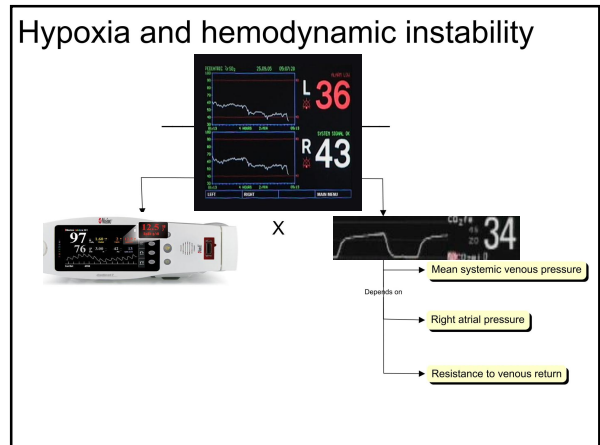


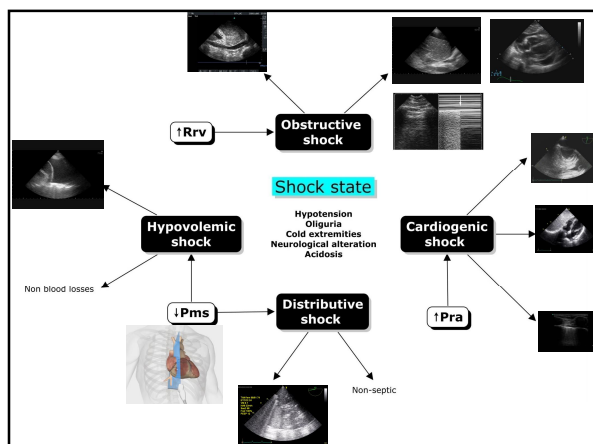
Où est l'erreur?





En résumé





Stéthoscope

Stethos = thorax

Scopein = observer



Échographie = "Body-scope"

En résumé

- " L'échographie transthoracique (ETT) est la modalité de choix dans la prise en charge d'un patient hypotendu ou hypoxique
- " Dans certains cas l'accès au thorax ne sera pas possible
- " La formation des anesthésiologistes en échographie transthoracique et transesophagienne ciblée est pertinente et nécessaire

Merci



Denis Babin
MSc Env. Inh, RT
Assistant de recherche