



ECHOGRAPHIE CONTEXTUELLE

Dyspnée

Thomas BOISHARDY

■ Rationnel

→ Définition de la dyspnée

- « une expérience subjective d'inconfort respiratoire faite de plusieurs sensations élémentaires qualitativement distinctes, variant en intensité »
American Thoracic Society

→ Présentation clinique atypique chez la personne âgée

Metlay JP. Influence of Age on Symptoms at Presentation in Patients With Community-Acquired Pneumonia. Arch Intern Med. 14 juill 1997;157(13):1453.
Lien CTC, Gillespie ND, Struthers AD, McMurdo MET. Heart failure in frail elderly patients: diagnostic difficulties, co-morbidities, polypharmacy and treatment dilemmas. European Journal of Heart Failure. janv 2002;4(1):91-8.

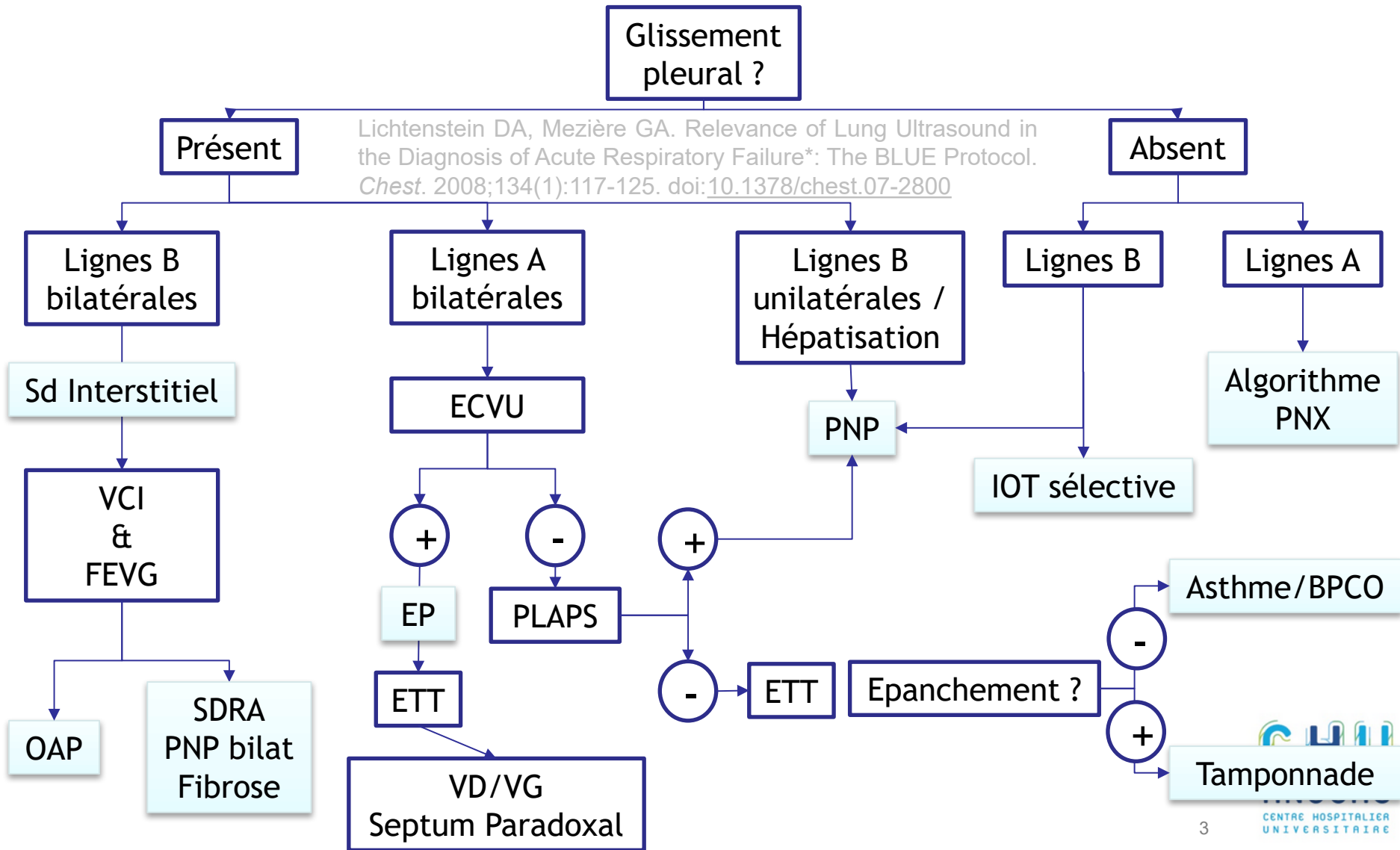
→ Etiologies intriquées

→ Les autres examens = délai d'initiation des thérapeutiques

- BNP : non spécifique
- Rx : ininterprétable
- TDM : disponibilité et irradiation

→ Patient instable non transportable

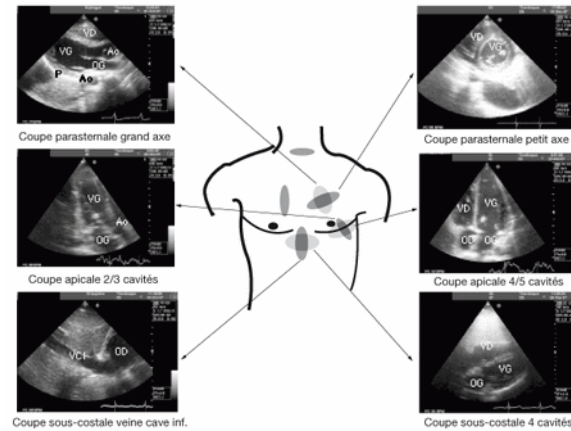
Stratégie diagnostique - Large



Introduction

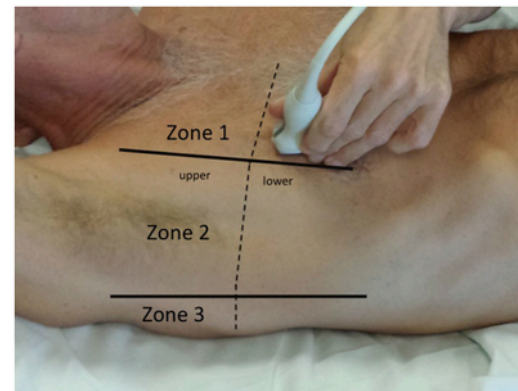
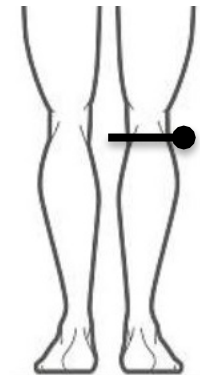
■ 3 sites anatomiques échographiés :

→ Echocardiographie



→ Echographie pleurale

→ Echographie 4 P



ECHOPLEUROGRAPHIE

■ Pleuro pulmonaire

- Acquisition dynamique
- Basée sur les artéfacts
- 4 sémiologies échographiques
 - Épanchement pleural
 - Syndrome interstitiel
 - Syndrome de consolidation alvéolaire
 - Pneumothorax
- US > Xray

Tierney DM, Huelster JS, Overgaard JD, Plunkett MB, Boland LL, St. Hill CA, et al. Comparative Performance of Pulmonary Ultrasound, Chest Radiograph, and CT Among Patients With Acute Respiratory Failure*: *Critical Care Medicine*. févr 2020;48(2):151-7.

- Apprentissage rapide (< 25 US)

Arbelot C, Dexheimer Neto FL, Gao Y, Brisson H, Chunyao W, Lv J, et al. Lung Ultrasound in Emergency and Critically Ill Patients: Number of Supervised Exams to Reach Basic Competence. *Anesthesiology*. janv 2020;1.

- Recommandations SFMU

Membres de la commission des référentiels de la SFMU, Duchenne J, Martinez M, Rothmann C, Claret P-G, Desclefs J-P, et al. Premier niveau de compétence pour l'échographie clinique en médecine d'urgence. Recommandations de la Société française de médecine d'urgence par consensus formalisé. *Ann Fr Med Urgence*. juill 2016;6(4):284-95.

Table 1. Published performance of lung ultrasound in the critically ill compared with CT

Ultrasound	Sensitivity	Specificity
Pleural effusion [9]	94%	97%
Alveolar consolidation [10]	90%	98%
Interstitial syndrome [11]	93%	93%
Pneumothorax [12]	95%	94%
Complete pneumothorax [13]	100%	96%
Occult pneumothorax [14]	79%	100%

CT, computed tomography.

Lichtenstein D. Lung ultrasound in the critically ill. *Current Opinion in Critical Care*. juin 2014;20(3):315-22.

Introduction

Lung

<https://doi.org/10.1007/s00408-019-00309-1>

STATE OF THE ART REVIEW



Lung Ultrasound for the Diagnosis and Management of Acute Respiratory Failure

Marjan Islam¹ · Matthew Levitus² · Lewis Eisen² · Ariel L. Shiloh² · Daniel Fein¹

Table 2 Integration of the foundational sonographic signs for the accuracy of lung ultrasound in the diagnosis of thoracic conditions

	Foundational Sonographic signs	Sensitivity	Specificity	Clinical notes
Pneumothorax [20–23]	(–) Lung sliding (–) B-lines (+) A-lines (+) Lung point	US: 78–90% CR: 39–52%	US: > 98% CR: > 98%	Differential also includes pleural adhesion, emphysema; lung point is diagnostic of pneumothorax
Interstitial syndrome [28–31]	<i>CPE</i> : (+) B-lines [diffuse] (+) Normal pleural line (+) Lung sliding	US: 85–94% CR: 73%	US: 90–92% CR: 90%	Accuracy increases if combined with high pre-test probability of <i>CPE</i>
Pneumonia [35, 36, 70]	(+) B-lines [focal] (+) B-lines with (–) lung sliding (+) Alveolar consolidation (+) Static/dynamic Air-bronchogram	US: 94–97% CR: 77%	US: 90–96% CR: 91%	Combination of dynamic air-bronchogram with subpleural consolidation yields highest specificity
Pulmonary embolism [8, 43]	(+) Subpleural consolidation (+) A-lines with (+) DVT	US: 60.9% US: 81%	US: 95.9% US: 99%	If Wells > 4 or (+) D-dimer Compared to helical CT scan
Endotracheal intubation [46]	–	US: 98.7%	US: 97.1%	Ultrasound allows direct real-time visualization of ETT passing through vocal cords
Diaphragm dysfunction [63, 64]	Diaphragm excursion < 10–15 mm Diaphragm Thickening Fraction < 30%	US: 75–85%	US: 74–75%	Studies were heterogeneous in timing of diaphragm scanning and definition of extubation failure

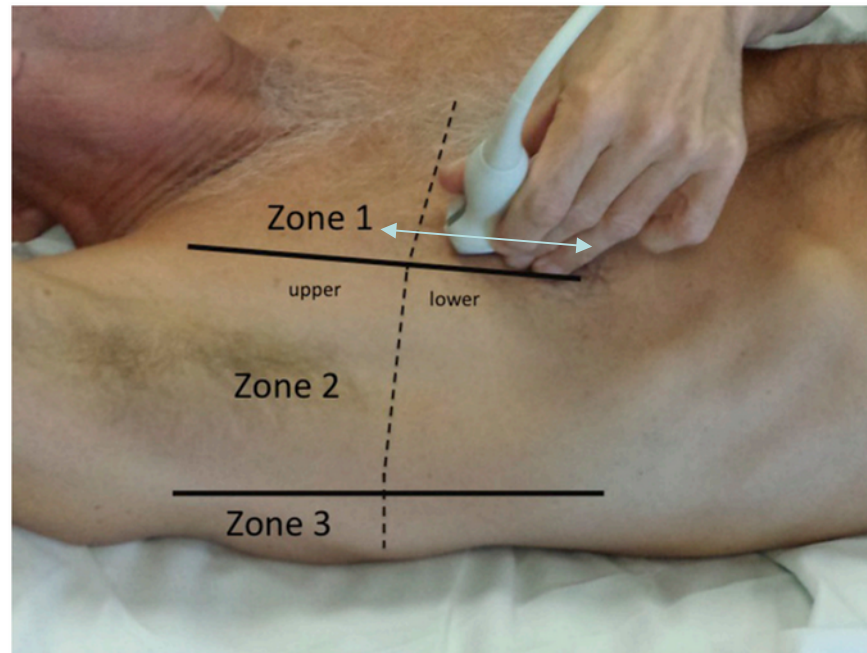
ARDS acute respiratory distress syndrome, *CPE* cardiogenic pulmonary edema, *NCPE* non-cardiogenic pulmonary edema, *US* ultrasound, *CR* chest radiography, *CT* computed tomography, *ETT* endotracheal tube

Echographie pleuro pulmonaire

■ Sonde

- Convexe
- Basse fréquence
- Image sans filtre
- Mode B / TM

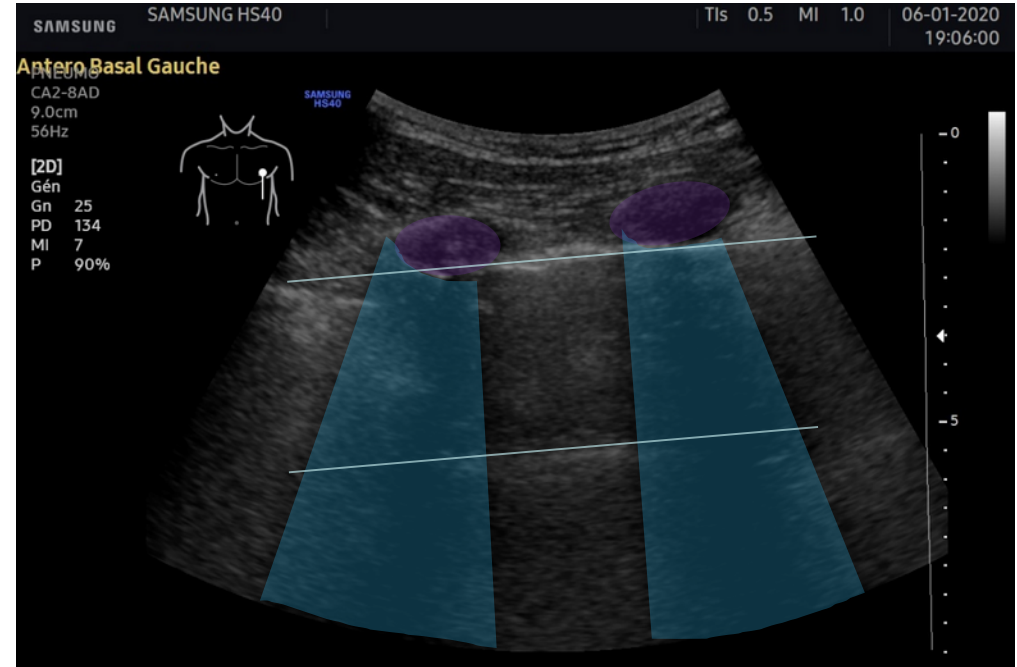
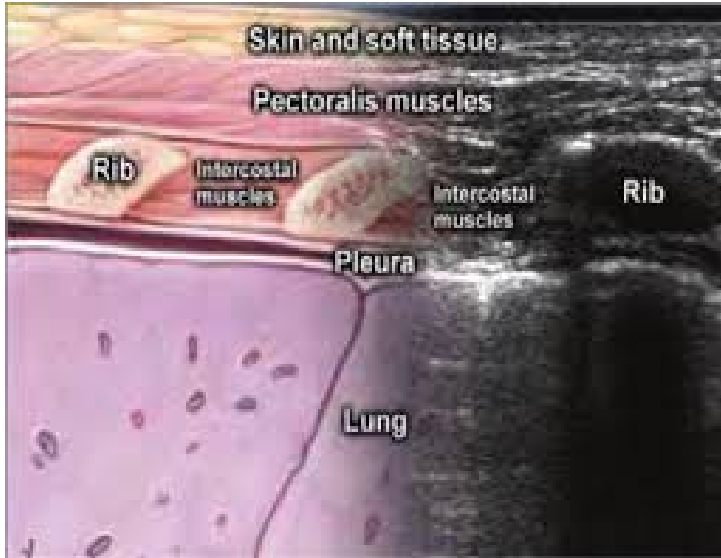
■ Fenêtres



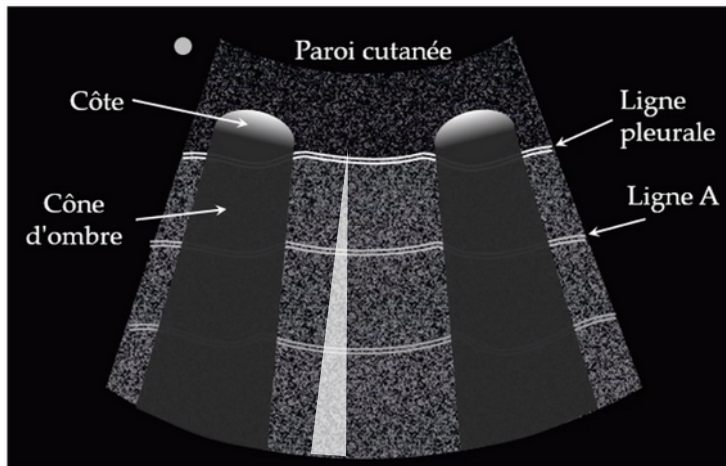
Doerschug KC, Schmidt GA. Intensive Care Ultrasound: III. Lung and Pleural Ultrasound for the Intensivist. Annals ATS. déc 2013;10(6):708-12.

Echographie pleuro pulmonaire

■ Poumon normal

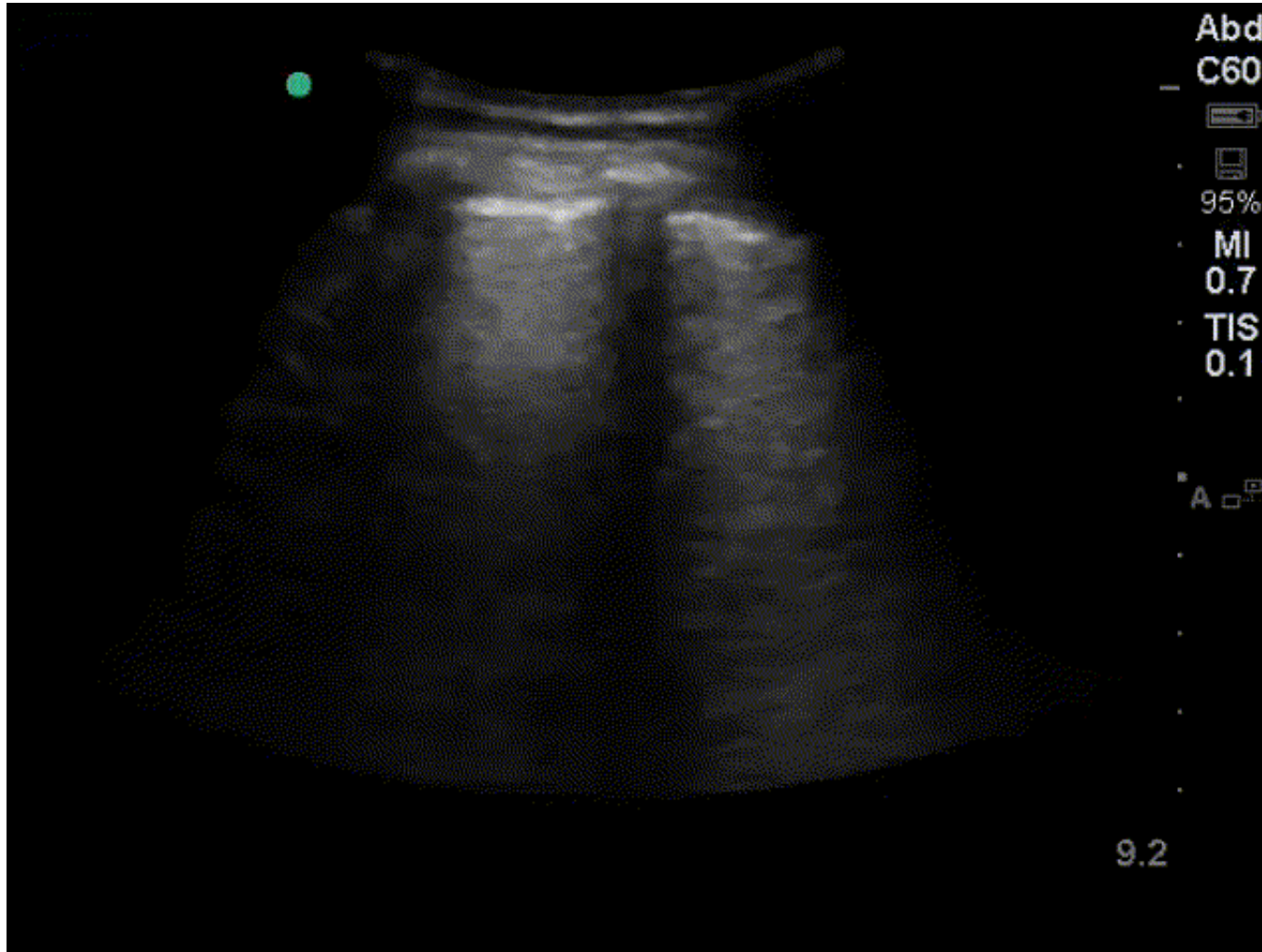


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Echographie pleuro pulmonaire

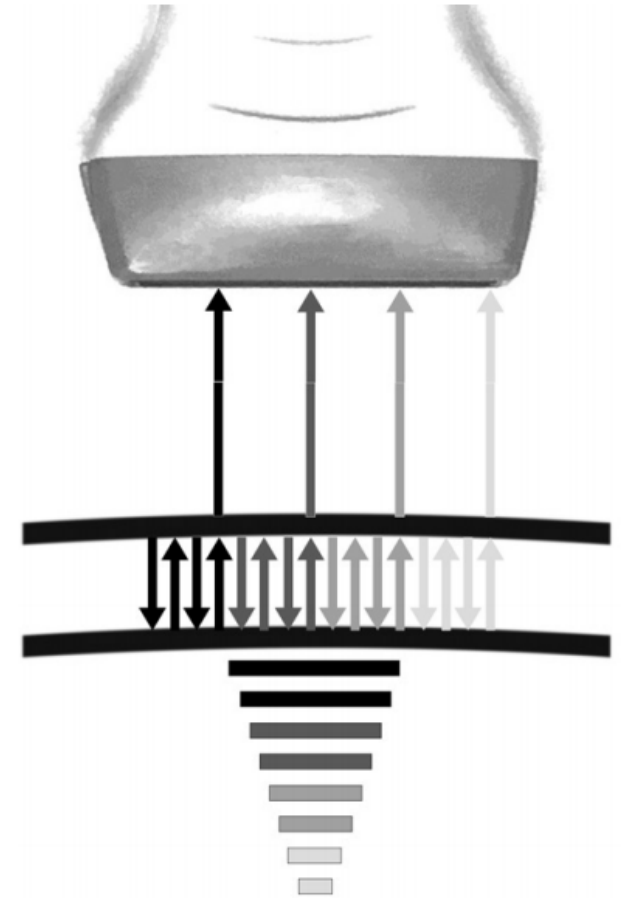
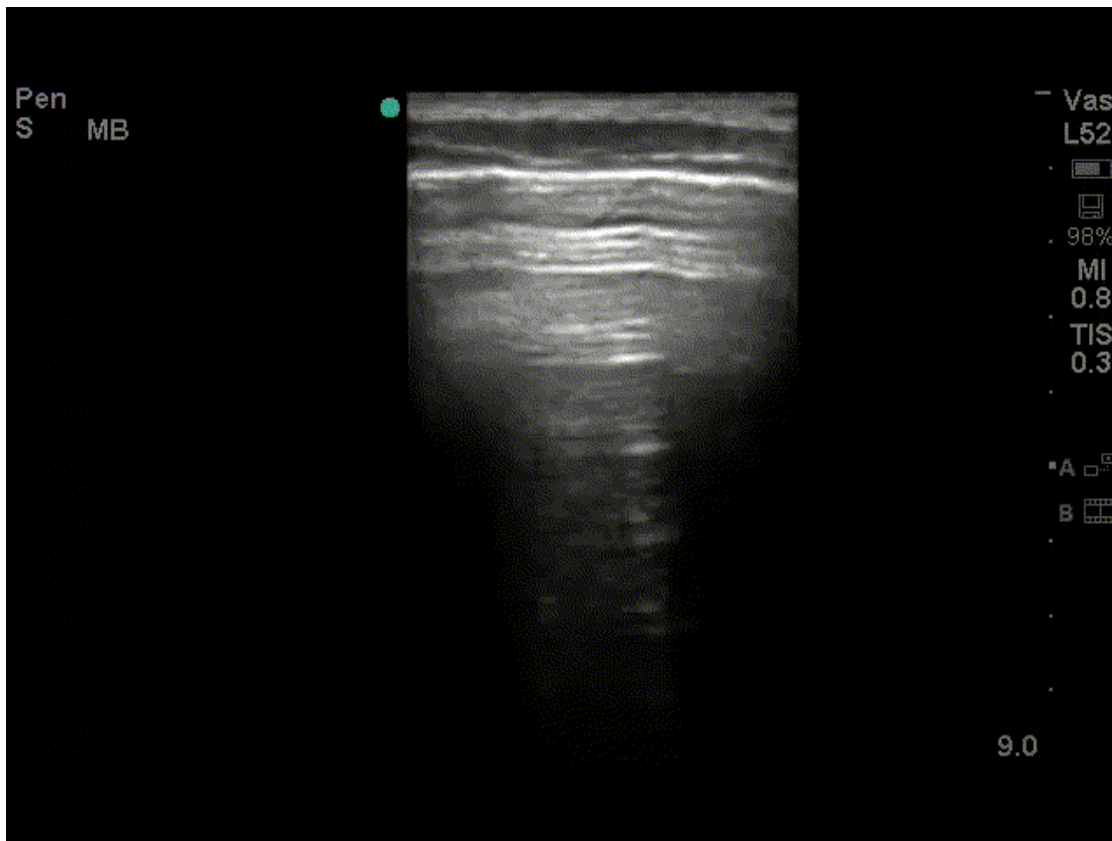
■ Image cible



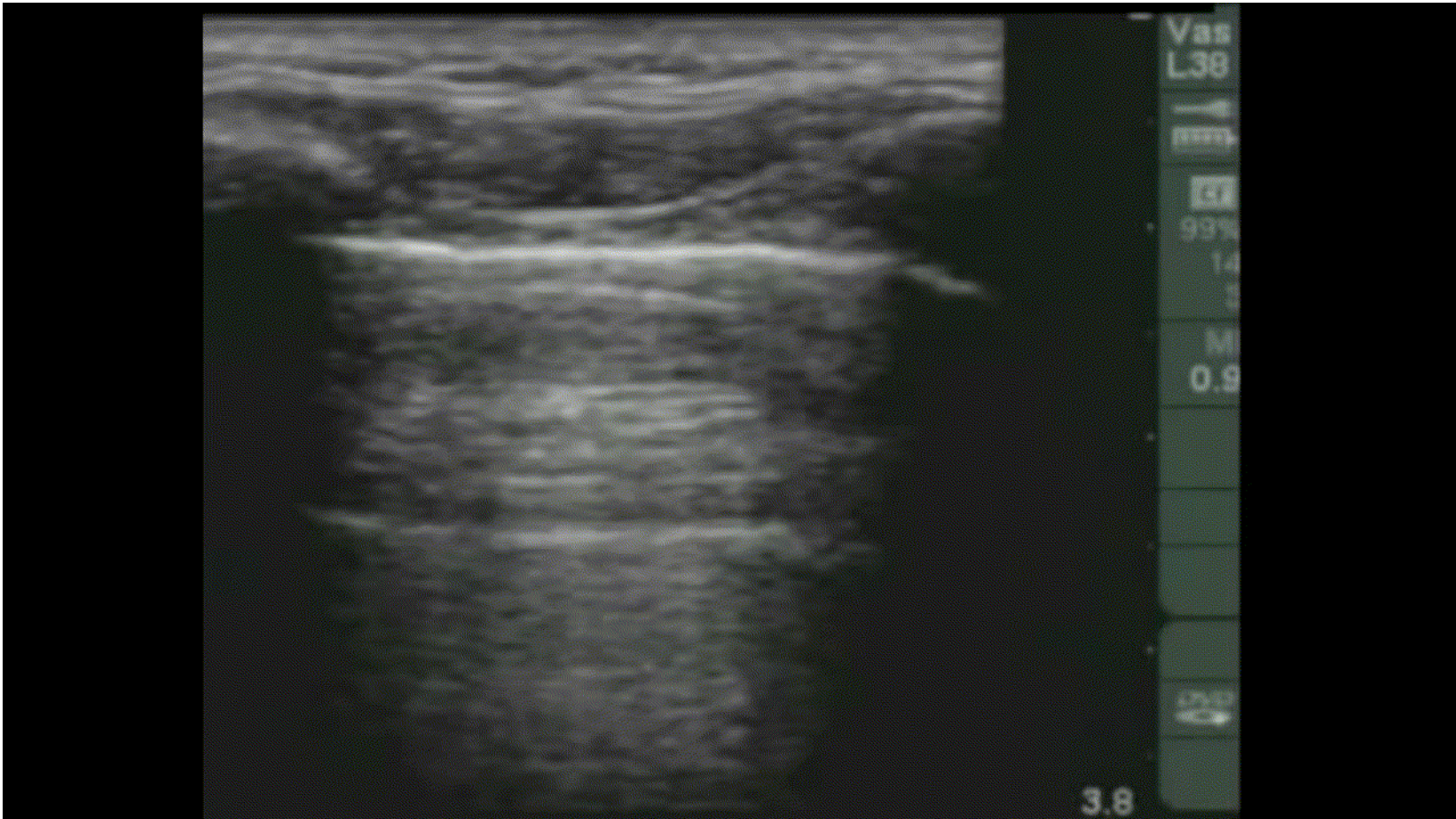
- Glissement pleural

■ Lignes A

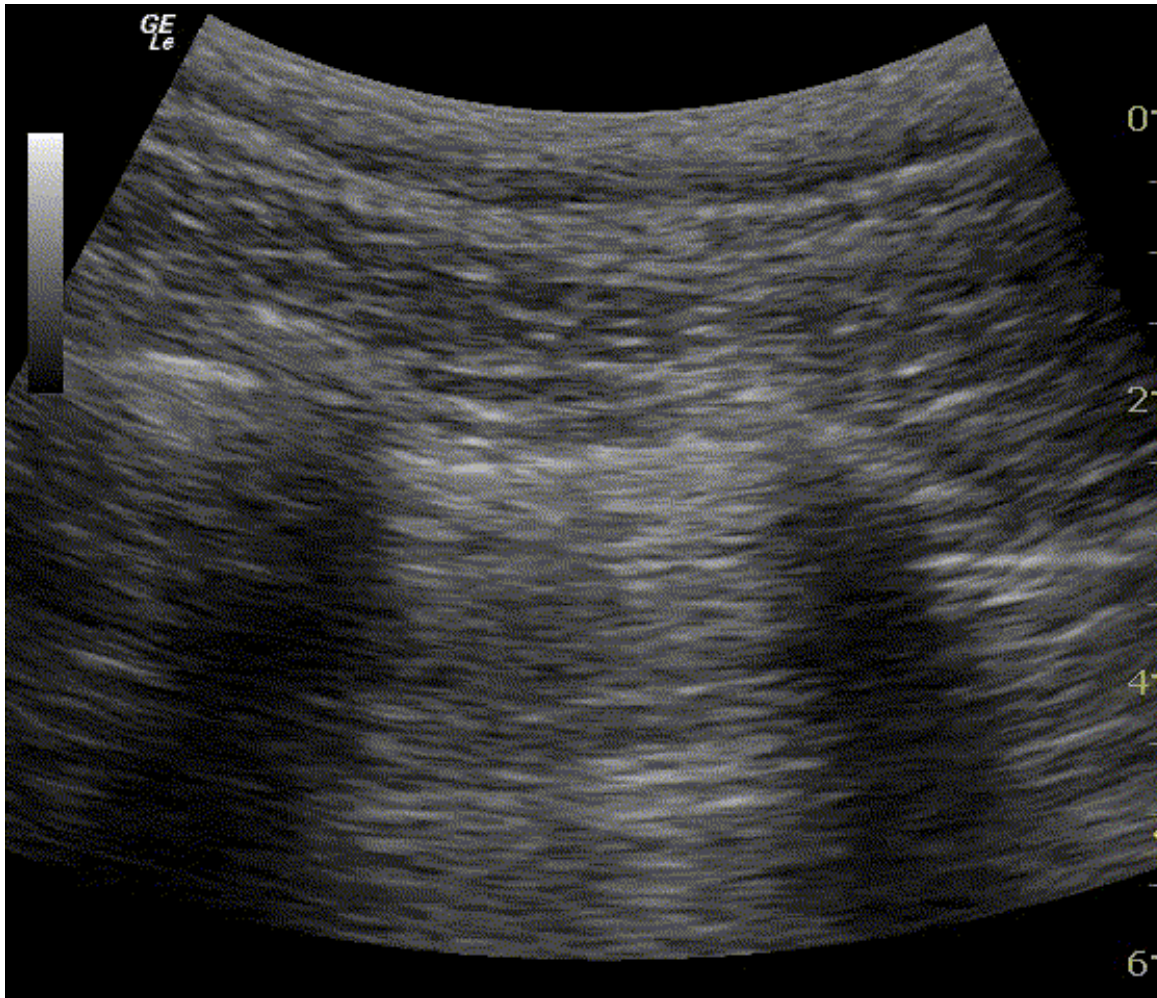
- Physiologiques
- Parallèles entre elles
- Critère de qualité



- Signe de la stratosphère

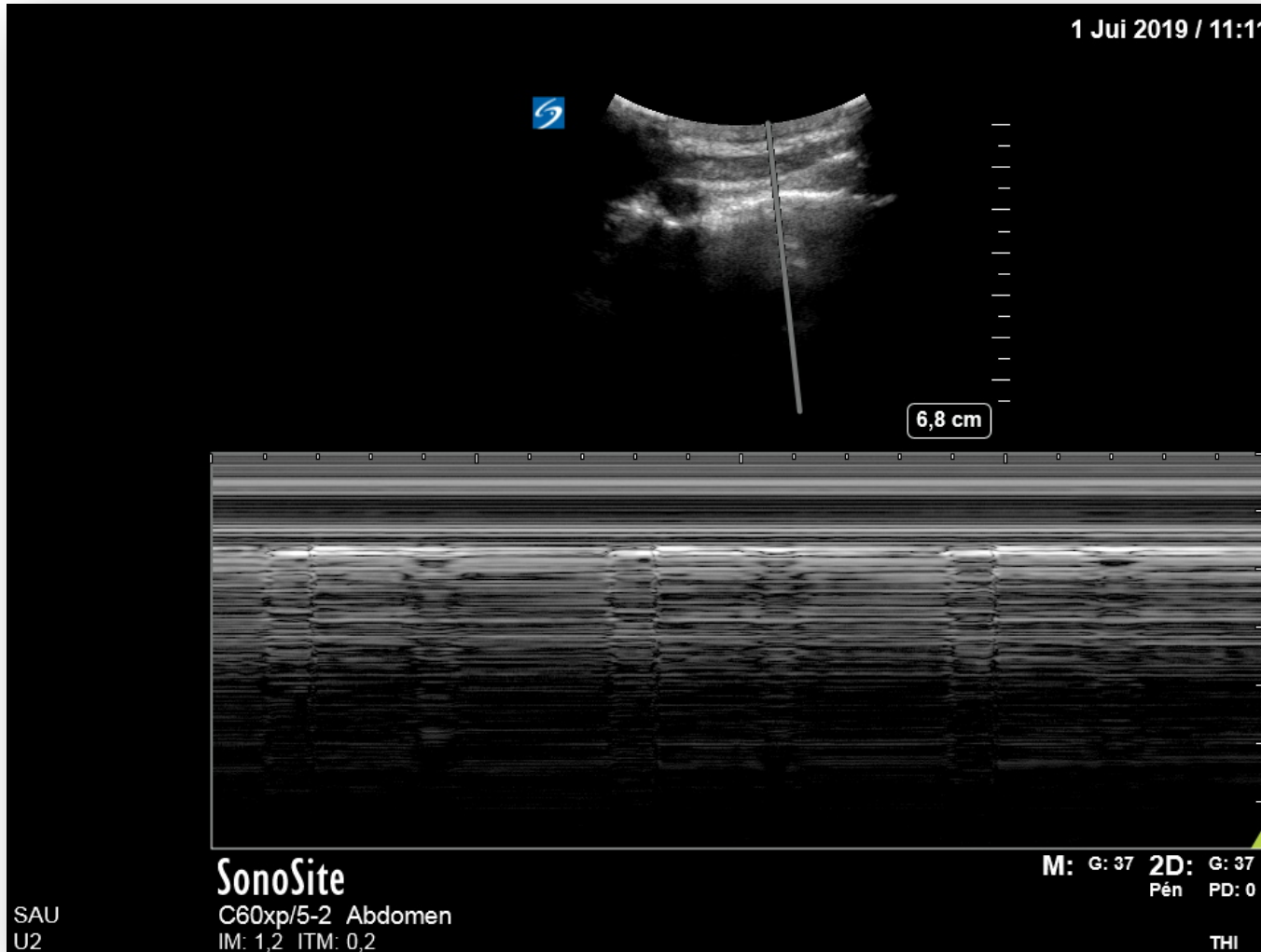


■ Pouls pleural



Echographie pleuro pulmonaire

■ Pouls pleural

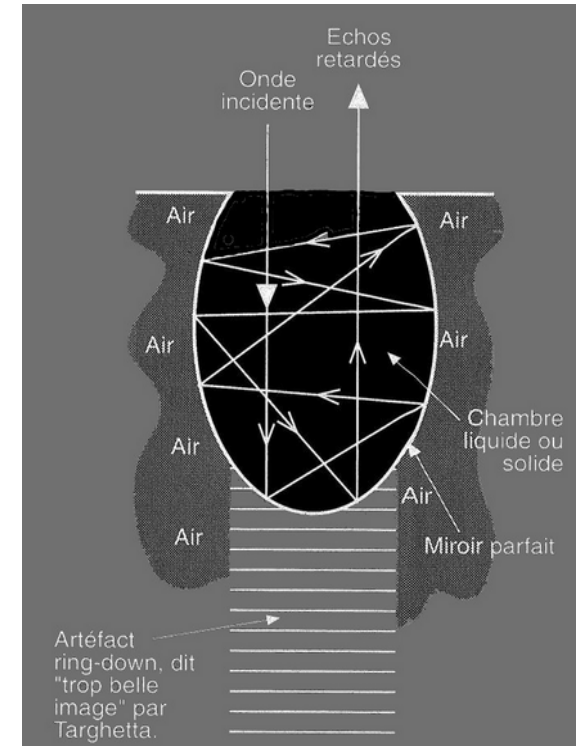


■ Lignes B

- Effacent les lignes A
- Synchrones avec le glissement pleural
- Hyperéchogènes
- Naissent de la plèvre et sont infinies

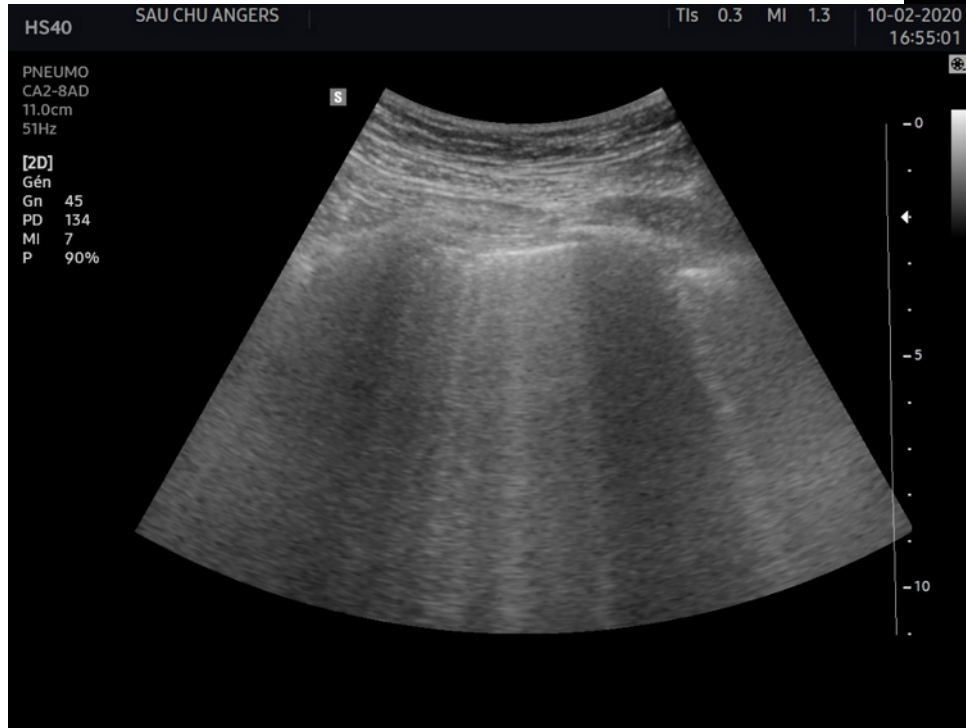
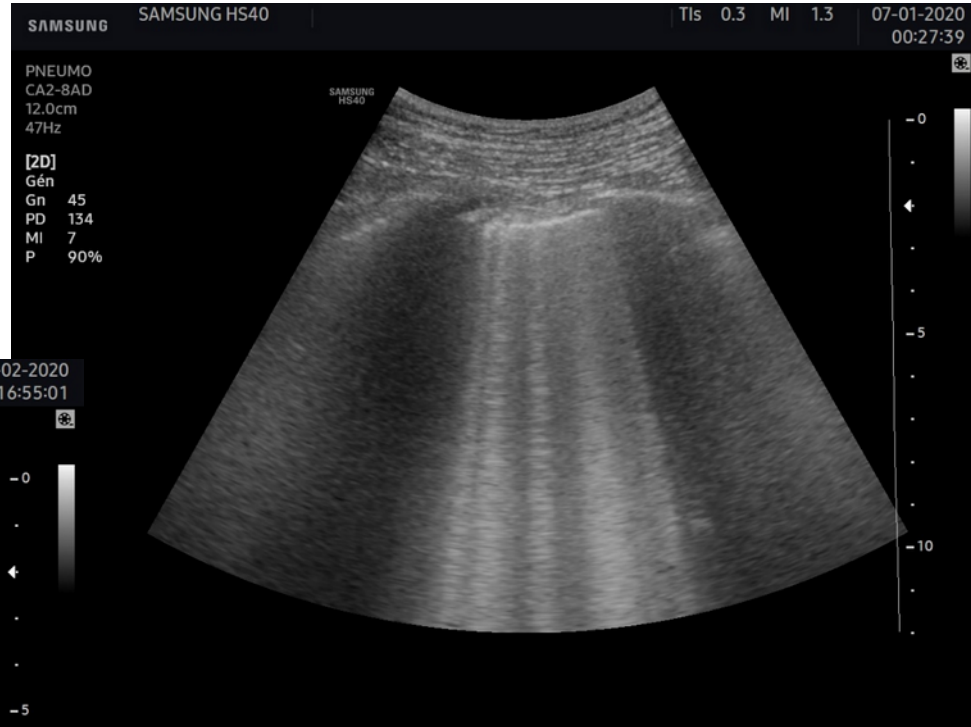
■ Pathologiques ?

- ≥ 3
- Simultanées
- Par champ pulmonaire



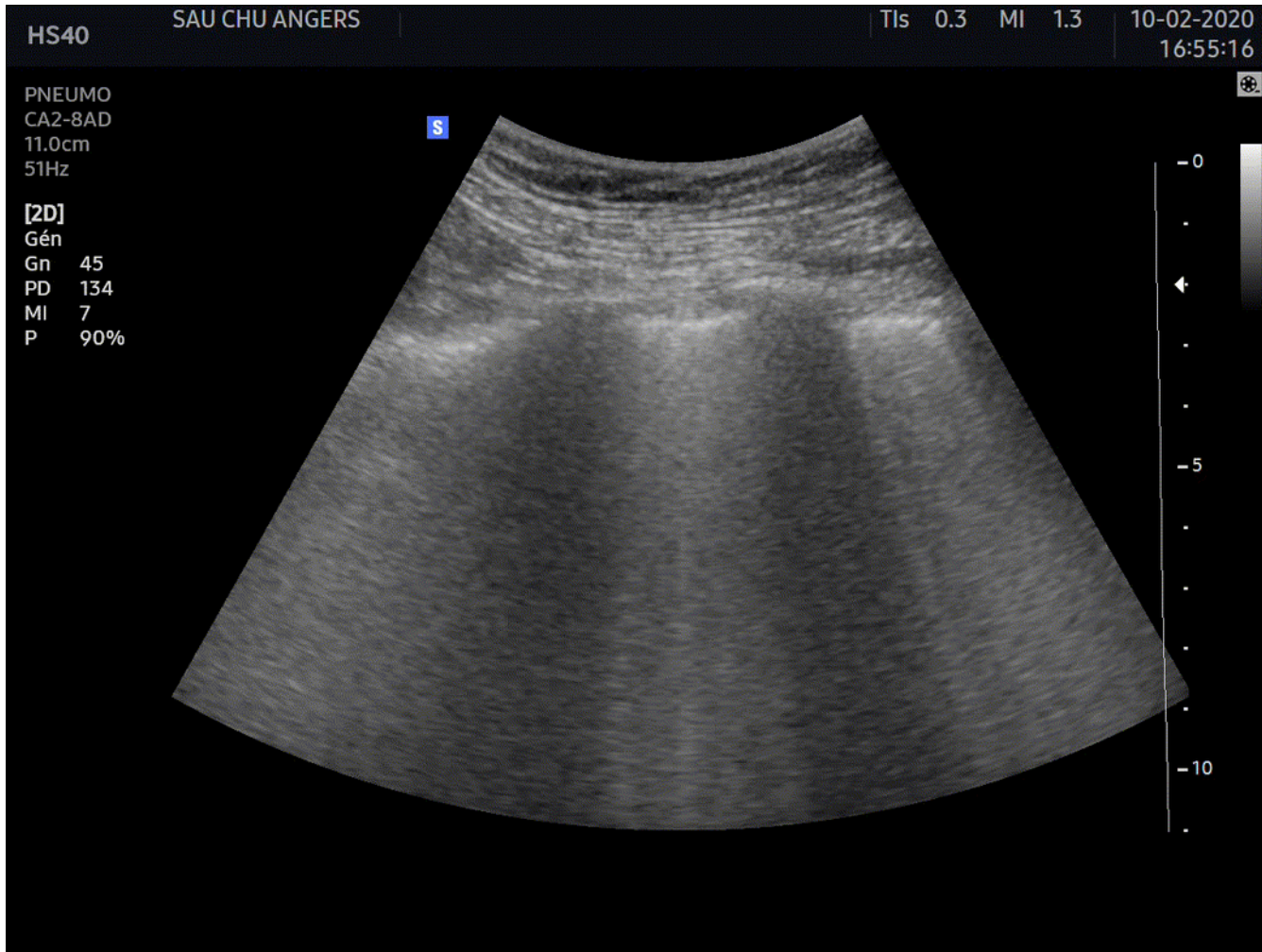
Echographie pleuro pulmonaire

■ Lignes B



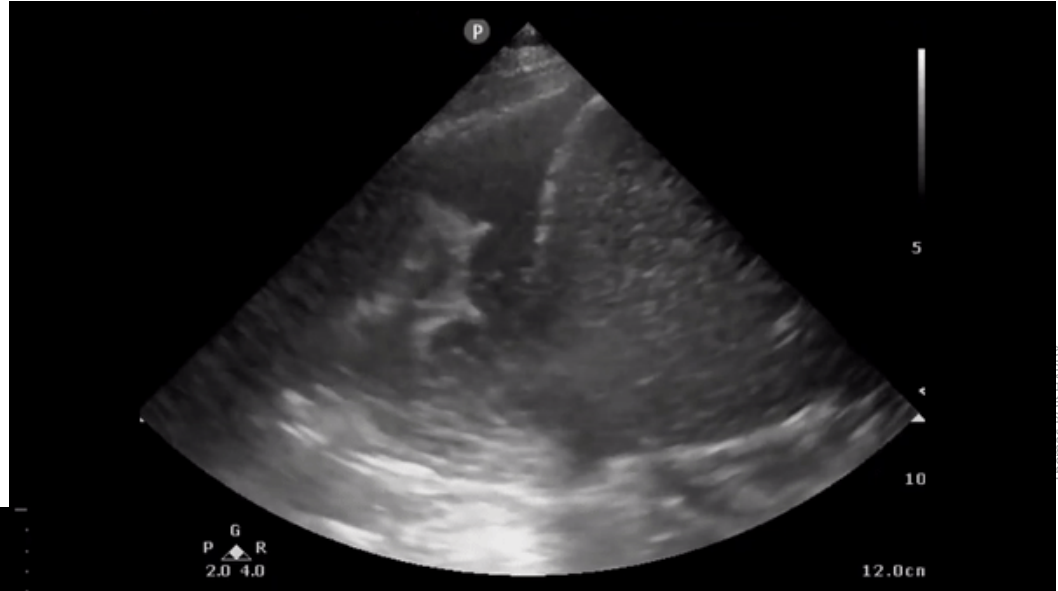
Echographie pleuro pulmonaire

■ Lignes B

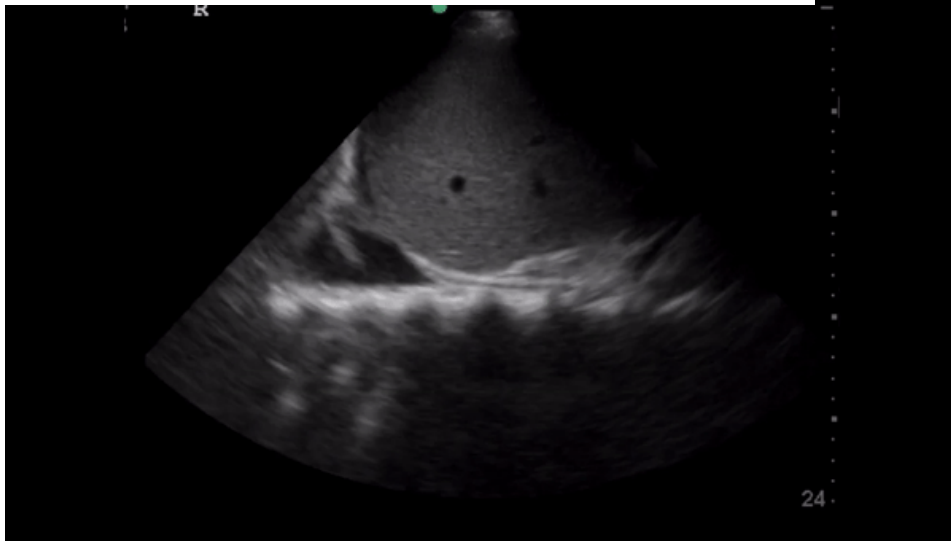


Echographie pleuro pulmonaire

■ Epanchement pleural



THOMAS BOUSTAROT



Echographie pleuro pulmonaire

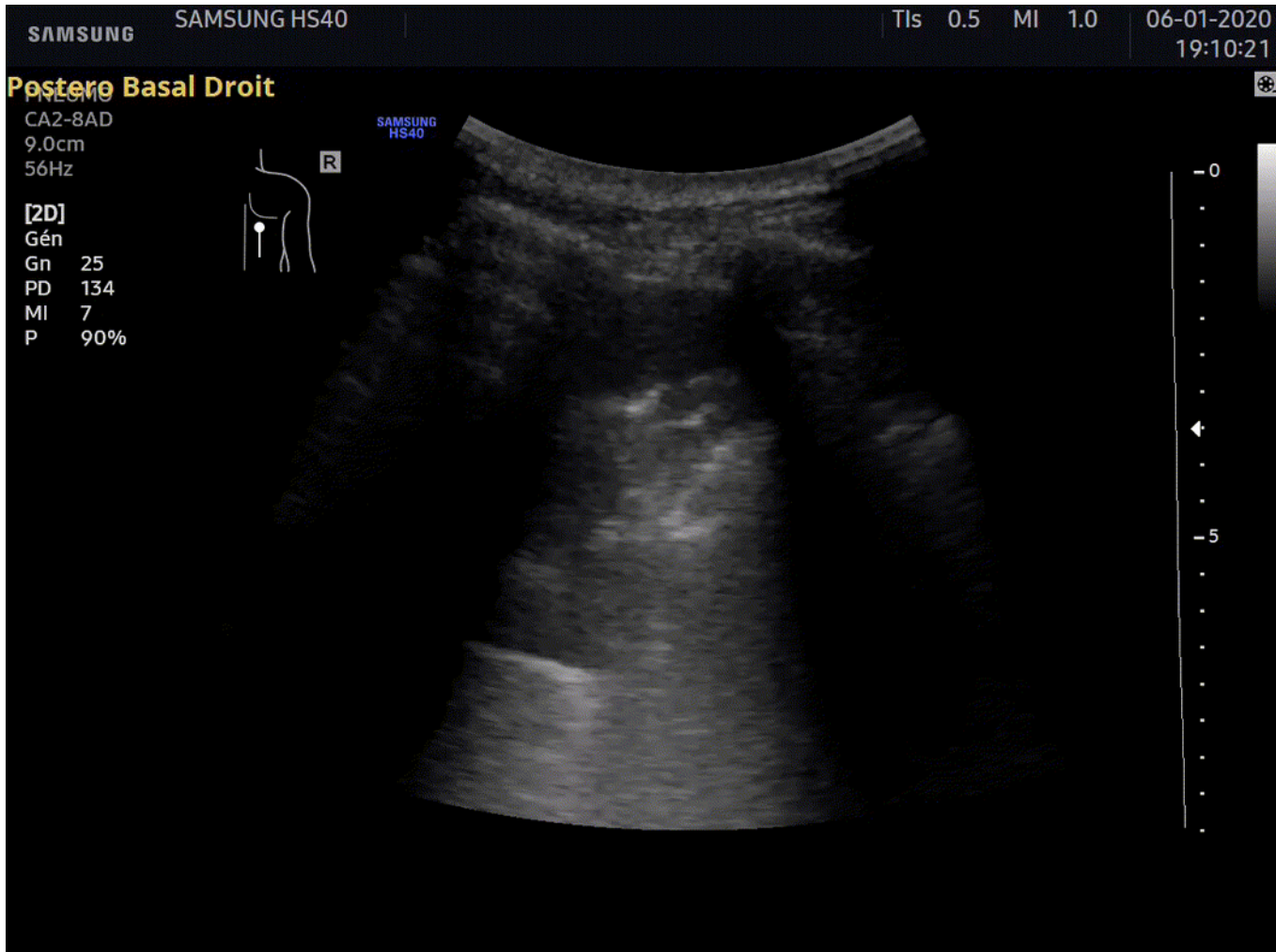
■ Point poumon



■ Hépatisation pulmonaire



■ Shred Sign



■ Pneumopathie

Table 5. Sensitivity and specificity rates of lung ultrasonography findings in patients with pneumonia

LUS findings	Sensitivity (%)	Specificity (%)	PPV	NPV	Accuracy (%)	Kappa
<i>Computed tomography was taken as the gold standard</i>						
Consolidation	87.8	91.7	97.7	64.7	88.5	0.686
Focal interstitial pattern	24.5	75.0	80	19.6	34.4	-0.002
Diffuse interstitial pattern	71.4	100	100	46.2	77	0.496
Subpleural lesion	87.8	58.3	89.6	53.8	81.9	0.447
Pleural line anomaly	81.6	66.7	90.9	47.1	78.6	0.417
B-3 line positivity	79.6	91.7	97.5	52.4	81.9	0.555
B-7 line positivity	16.3	83.3	80	19.6	29.5	-0.002
Pleural effusion	85.7	58.3	89.4	50	80	0.414

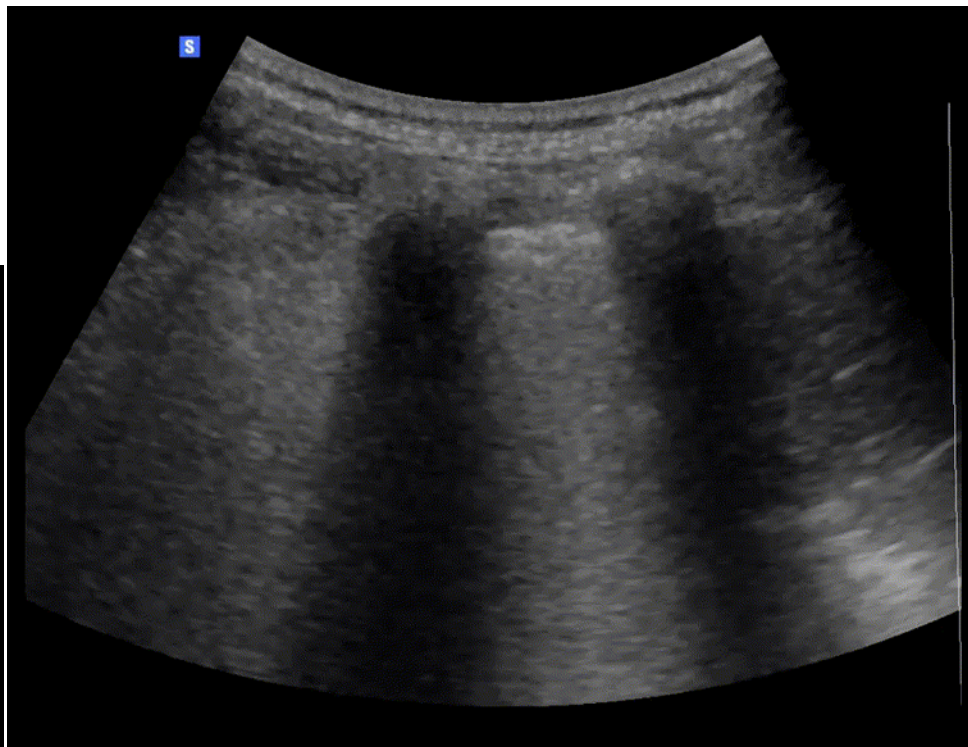
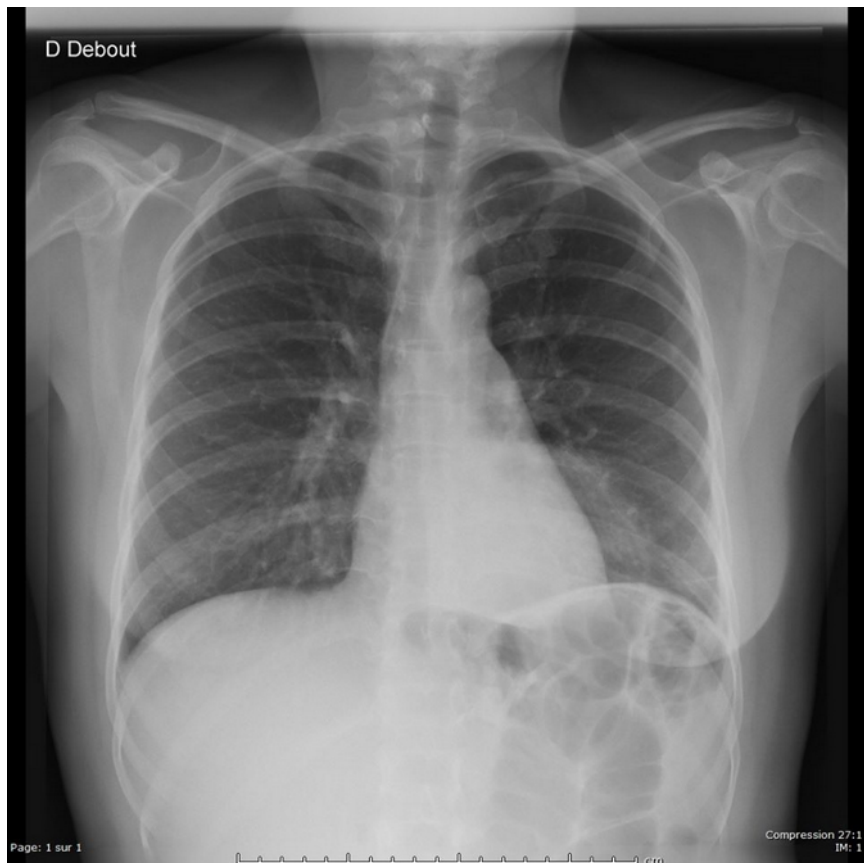
LUS = lung ultrasonography; NPV = negative predictive value; PPV = positive predictive value.

Sezgin C, Gunalp M, Genc S, Acar N, Ustuner E, Oguz AB, et al. Diagnostic Value of Bedside Lung Ultrasonography in Pneumonia. *Ultrasound in Medicine & Biology*. févr 2020;S0301562920300405.

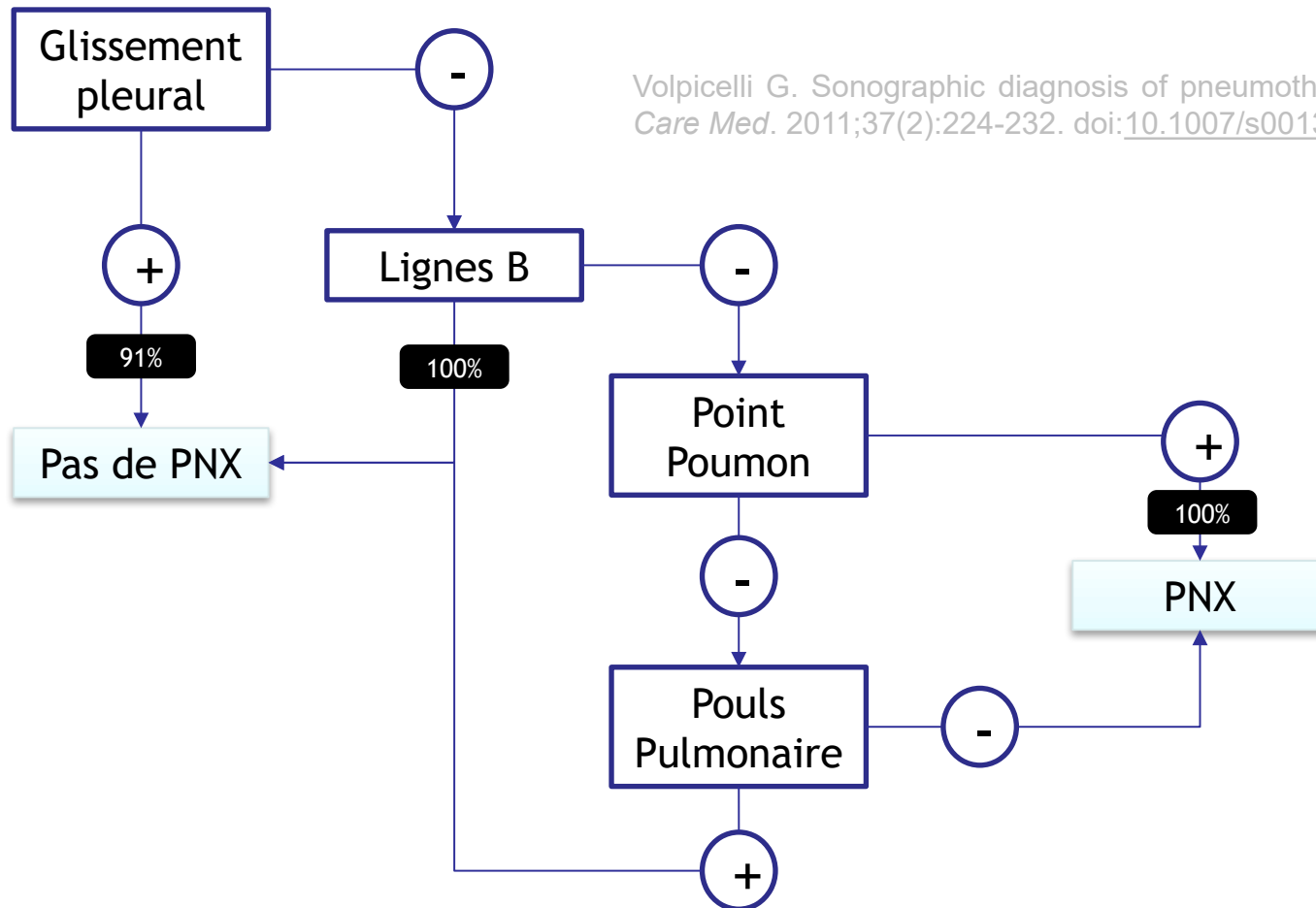
→ EPP : Se : 85%, Sp 93%

Alzahrani SA, Al-Salamah MA, Al-Madani WH, Elbarbary MA. Systematic review and meta-analysis for the use of ultrasound versus radiology in diagnosing of pneumonia. *Crit Ultrasound J*. 2017;9(1):6. doi:10.1186/s13089-017-0059-y

Stratégie diagnostique



■ Pneumothorax (PNX)



Volpicelli G. Sonographic diagnosis of pneumothorax. *Intensive Care Med.* 2011;37(2):224-232. doi:[10.1007/s00134-010-2079-y](https://doi.org/10.1007/s00134-010-2079-y)

ECHOCARDIOGRAPHIE

■ Echocardiographie

- Acquisition dynamique
- Evaluation échographique ciblée
- 5 analyses
 - FEVG
 - Visuelle
 - MAPSE
 - Onde S'
 - Fonction ventriculaire droite
 - Dilatation VD, septum paradoxal
 - Mesure IT
 - Epanchement péricardique et signes de tamponnade
 - Veine cave inférieure
 - Pression de remplissage
 - Doppler mitral
 - Doppler tissulaire

■ Sonde

- Phased Array
- Basse fréquence
- Mode B, Mode M et mode Dopple

■ Fenêtres



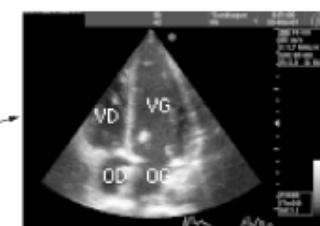
Coupe parasternale grand axe



Coupe parasternale petit axe



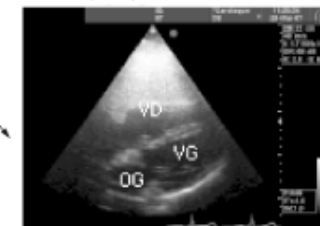
Coupe apicale 2/3 cavités



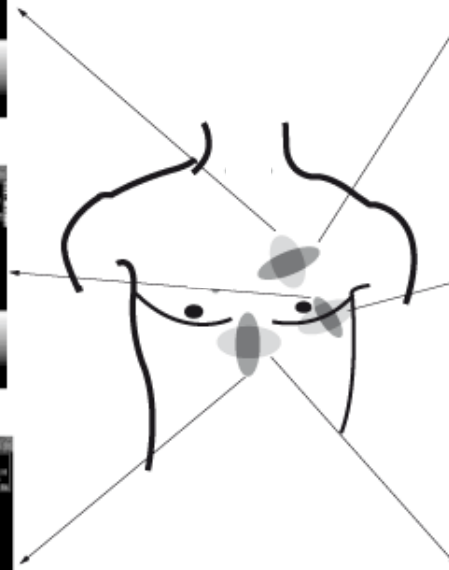
Coupe apicale 4/5 cavités



Coupe sous-costale veine cave inf.



Coupe sous-costale 4 cavités



Echocardiographie

■ FEVG visuelle / MAPSE / onde S'

Table 3 Correlations (*r*) of systolic parameters and level of significance (*P*)

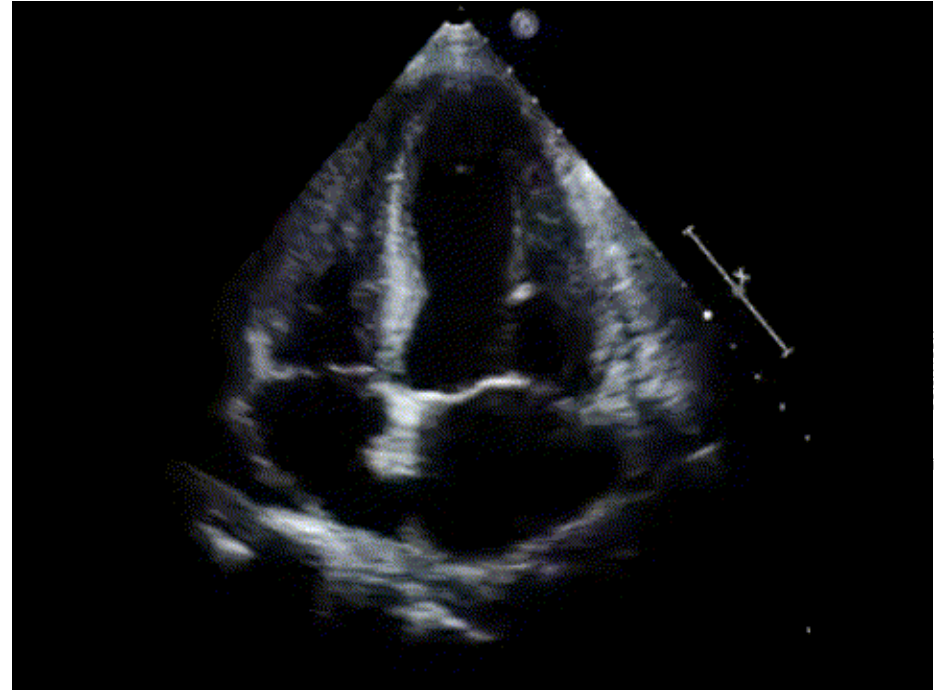
	Day 1 <i>n</i> = 47		Day 2 <i>n</i> = 44		Day 3 <i>n</i> = 34		Day 4 <i>n</i> = 31		Day 5 <i>n</i> = 28		Day 6 <i>n</i> = 26		Day 7 <i>n</i> = 21		All measurements <i>n</i> = 253	
	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>
Simpson vs. EBEF	0.896	^a	0.949	^a	0.910	^a	0.859	^a	0.855	^a	0.794	^a	0.942	^a	0.905	^a
Simpson vs. AVPDm	0.495	^a	0.346	^b	0.281		0.392	^b	0.322		0.101		0.577	^a	0.404	^a
Simpson vs. TDIs	0.609	^a	0.559	^a	0.530	^a	0.413	^b	0.152		0.123		0.310		0.473	^a
Simpson vs. LVOT VTI	0.616	^a	0.408	^a	0.288		0.499	^b	0.570	^a	0.450	^b	0.742	^a	0.513	^a
AVPD vs. TDIs	0.427	^a	0.264		0.456	^a	0.356		0.535	^a	0.635	^a	0.630	^a	0.439	^a
^a	Corr sign at the 0.01 level.															
^b	Corr sign at the 0.05 level.															

Simpson single-plane method of the four-chamber view. AVPDm, atrioventricular plane displacement, mean value of septal, lateral, anterior, inferior measurements; EBEF, eyeball ejection fraction; LVOT VTI, velocity time integral in the left ventricular outflow tract; TDIs, pulsed tissue Doppler imaging, systolic velocity of the septal portion of the mitral annulus; Spearman rank correlation was used, and for differences between two groups, Mann-Whitney *U* test was used. *P* values have been corrected by the Bonferroni method.

Bergenzaun L, Gudmundsson P, Öhlin H, Düring J, Ersson A, Ihrman L, et al. Assessing left ventricular systolic function in shock: evaluation of echocardiographic parameters in intensive care. Crit Care. 2011;15(4):R200.

■ FEVG visuelle

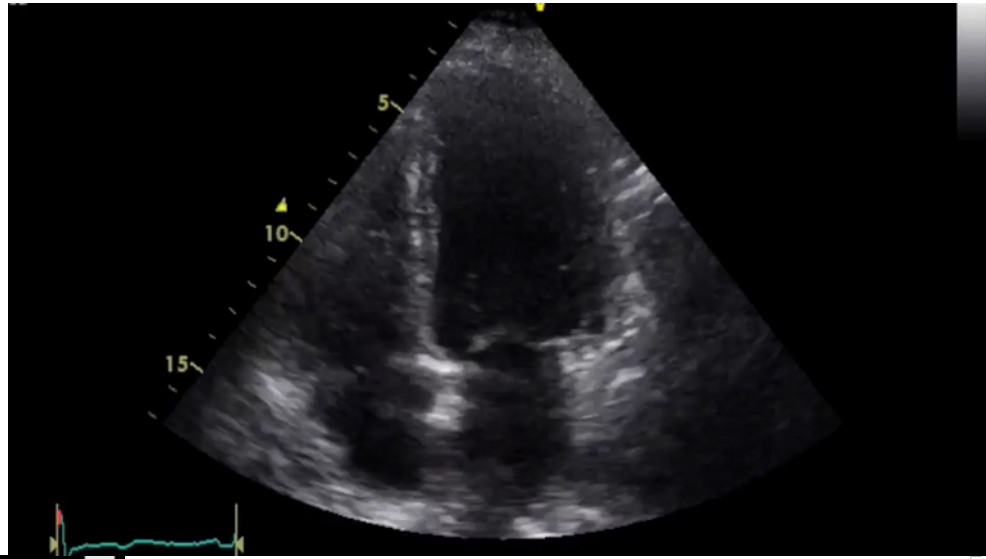
- Normal ($> 50\%$)
- Altérée ($35 - 50\%$)
- Effondrée ($< 35\%$)



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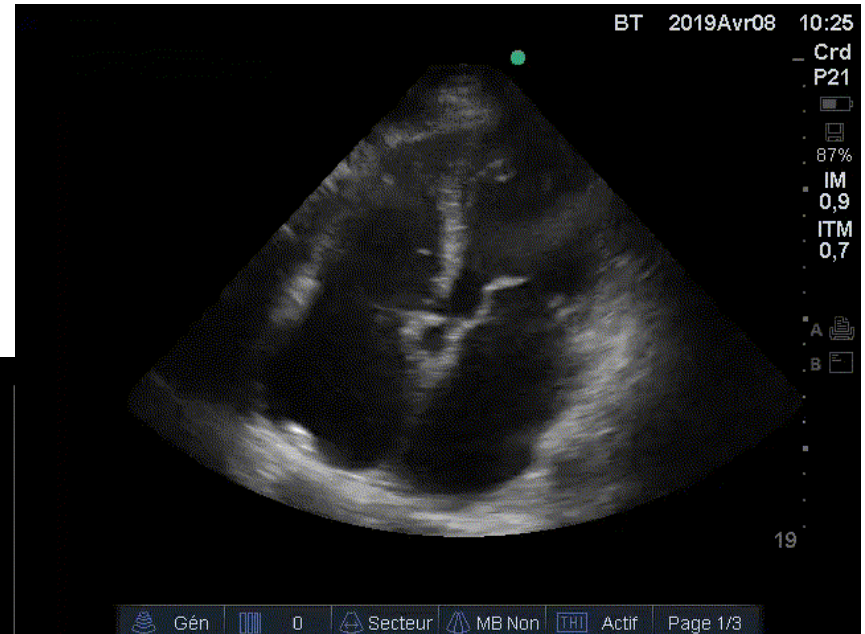
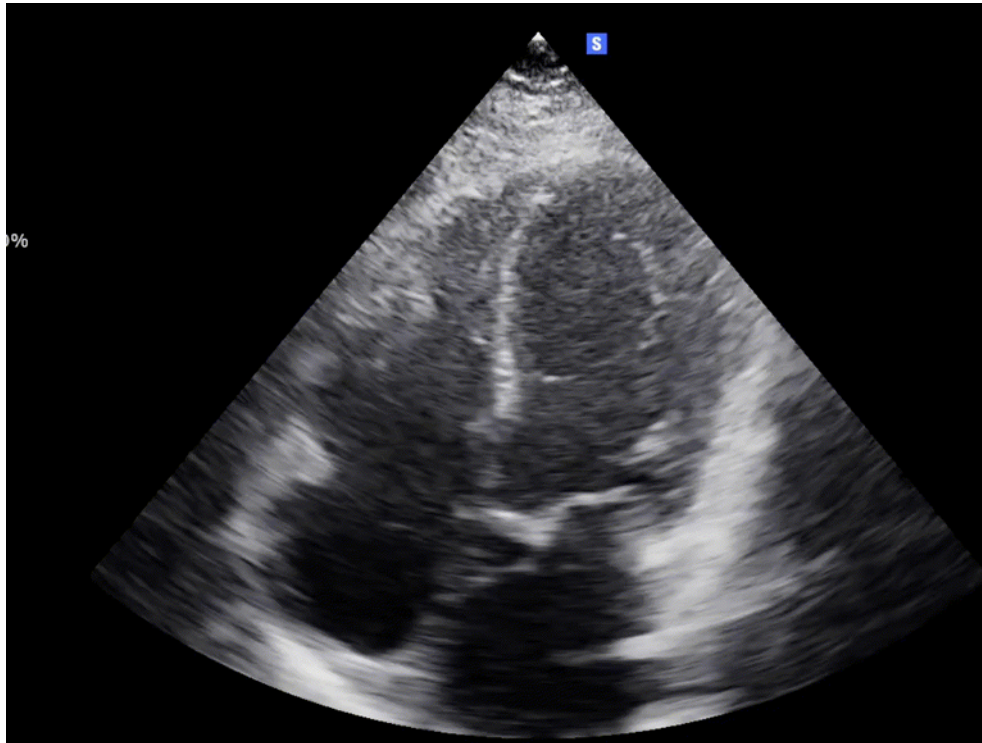
■ FEVG visuelle

- Normal ($> 50\%$)
- Altérée ($35 - 50\%$)
- Effondrée ($< 35\%$)



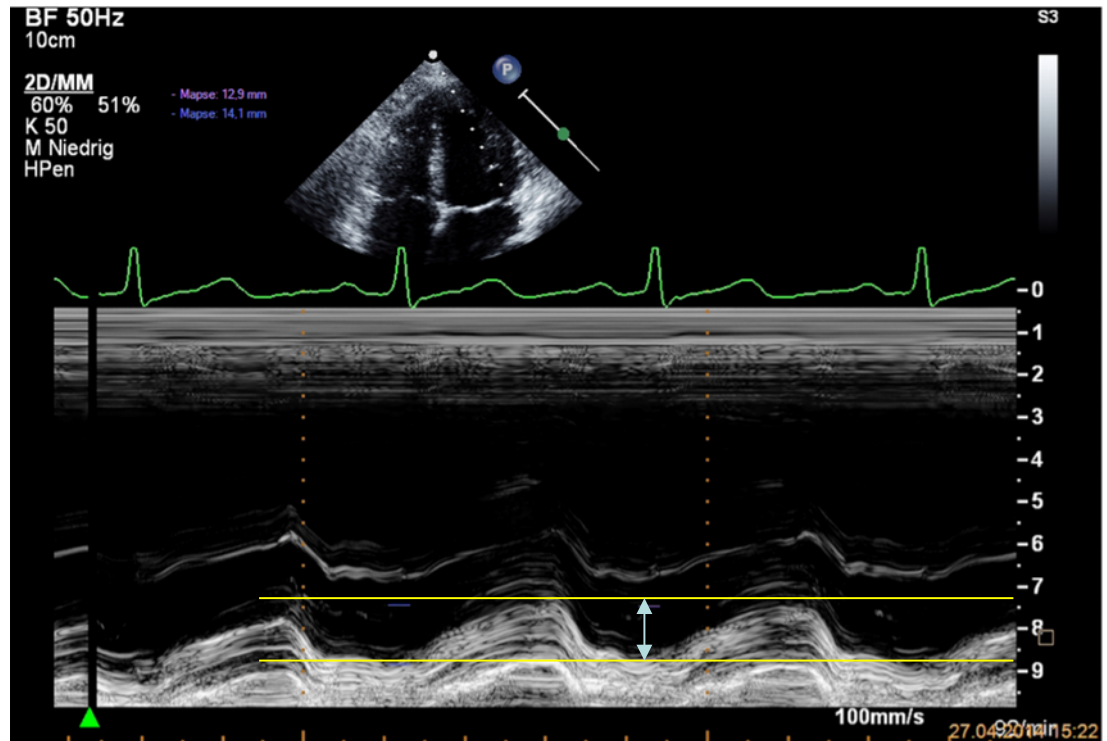
■ FEVG visuelle

- Normal (> 50%)
- Altérée (35 - 50%)
- Effondrée (< 35%)



■ MAPSE (Mitral Annulus Plane Systolic Excursion)

- Mode M
- Mesure en cm
- Corrélé à la FEVG
 - > 10 cm : normale
 - 8-10 : altérée
 - < 7 cm : effondrée

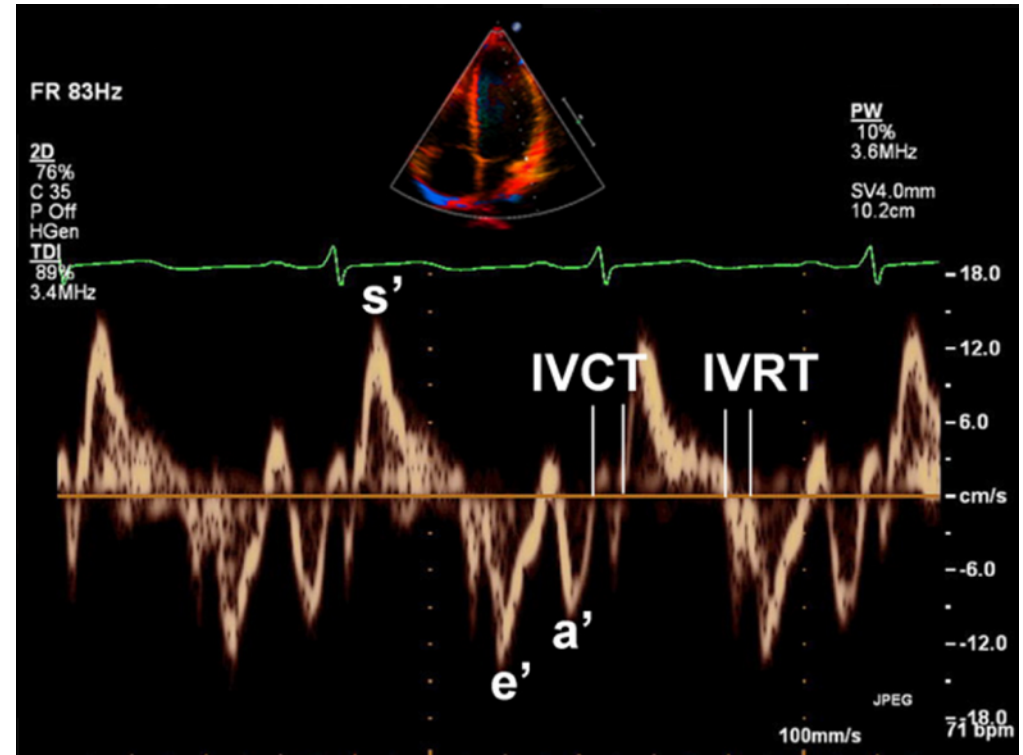


Hu K et al. Clinical implication of mitral annular plane systolic excursion for patients with cardiovascular disease. *European Heart Journal - Cardiovascular Imaging*. 1 mars 2013;14(3):205-12.

Huang SJ et al. Longitudinal wall fractional shortening: an M-mode index based on mitral annular plane systolic excursion (MAPSE) that correlates and predicts left ventricular longitudinal strain (LVLS) in intensive care patients. *Crit Care*. déc 2017;21(1):292.

■ Onde S'

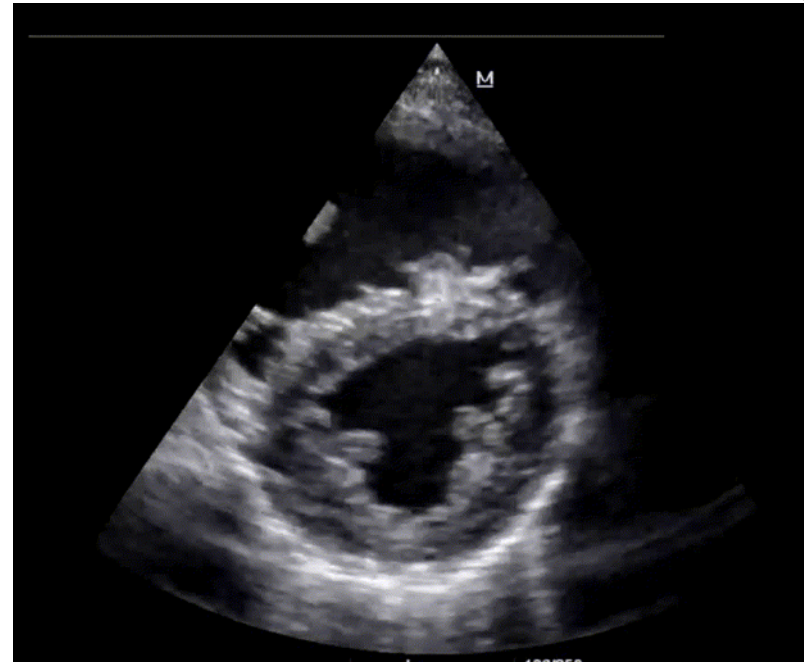
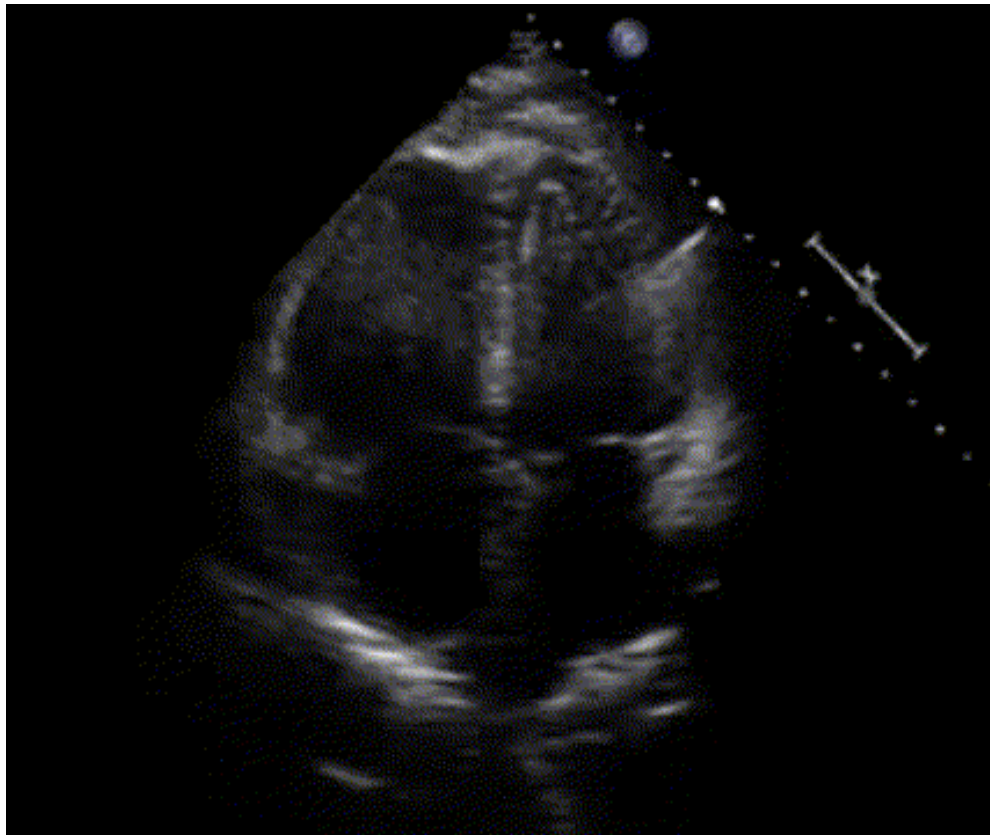
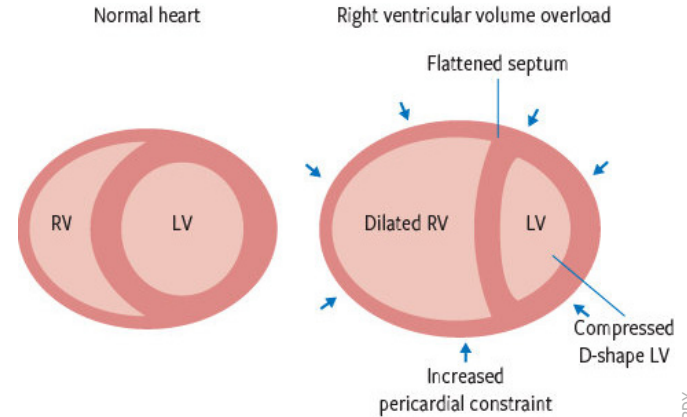
- Doppler tissulaire
- Basse vitesse : $\text{cm}\cdot\text{s}^{-1}$
- Valeur
 - FEVG normale : $> 8 \text{ cm}\cdot\text{s}^{-1}$
 - FEVG altérée : $6 - 8 \text{ cm}\cdot\text{s}^{-1}$
 - FEVG effondrée : $< 6 \text{ cm}\cdot\text{s}^{-1}$



Duzenli MA, Ozdemir K, Aygul N, Altunkeser BB, Zengin K, Sizer M. Relationship between Systolic Myocardial Velocity Obtained by Tissue Doppler Imaging and Left Ventricular Ejection Fraction: Systolic Myocardial Velocity Predicts the Degree of Left Ventricular Dysfunction in Heart Failure. *Echocardiography*. 2008;25(8):856-863. doi:10.1111/j.1540-8175.2008.00694.x

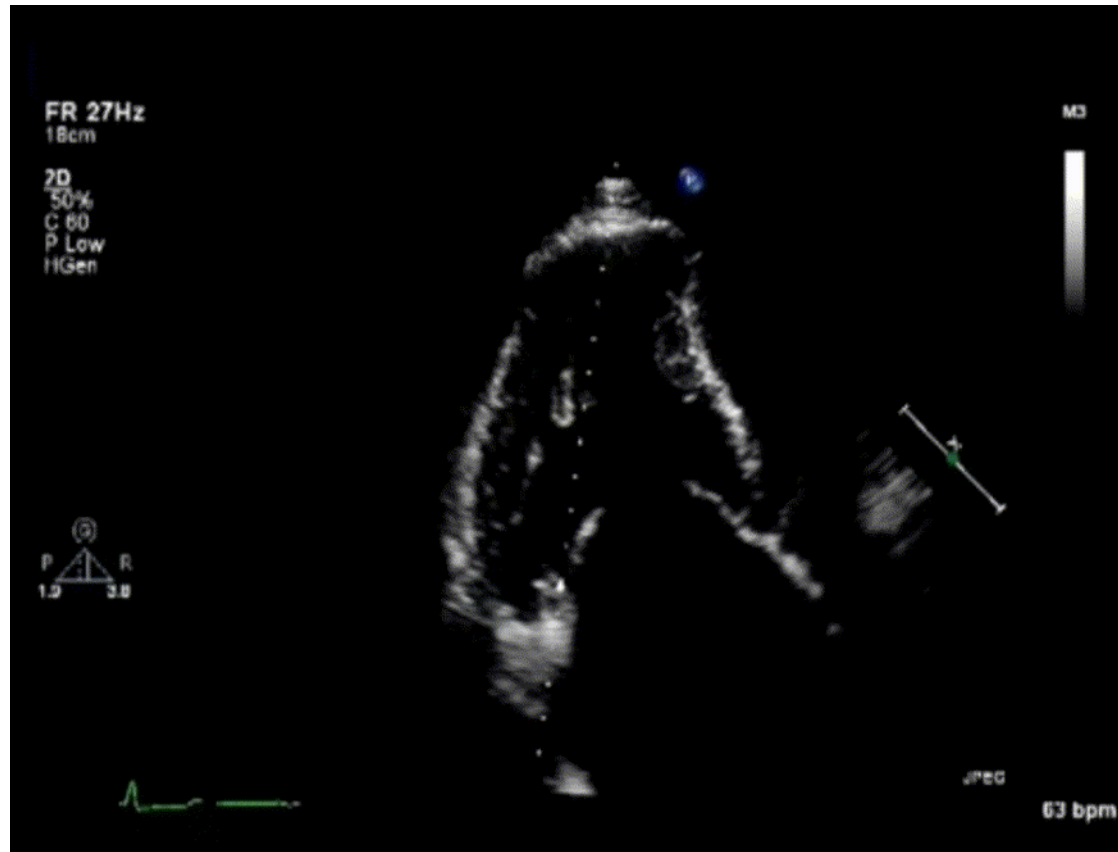
■ Evaluation du VD

- Dilatation Ventricule Droit ($VD/VG > 1$)
- Septum Paradoxal



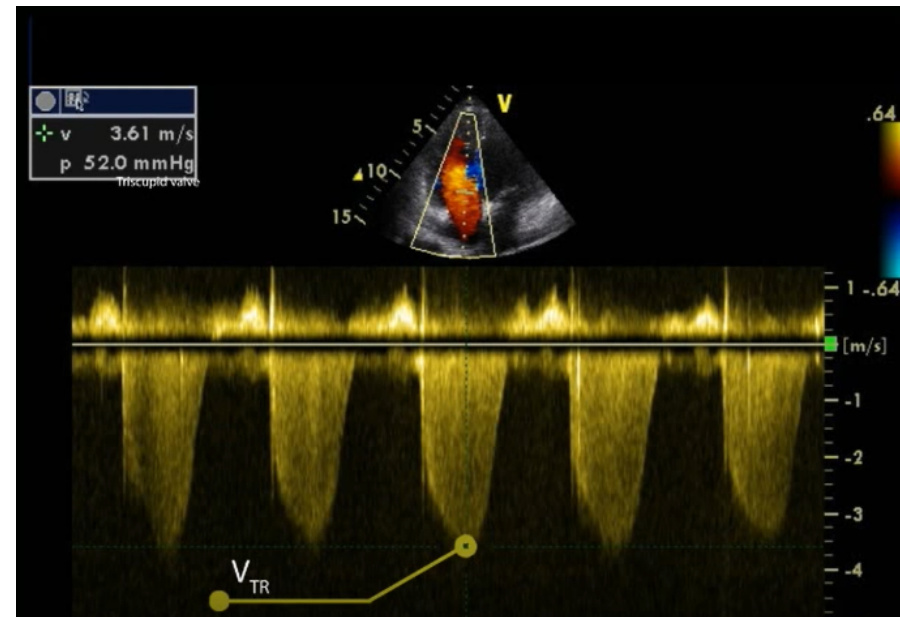
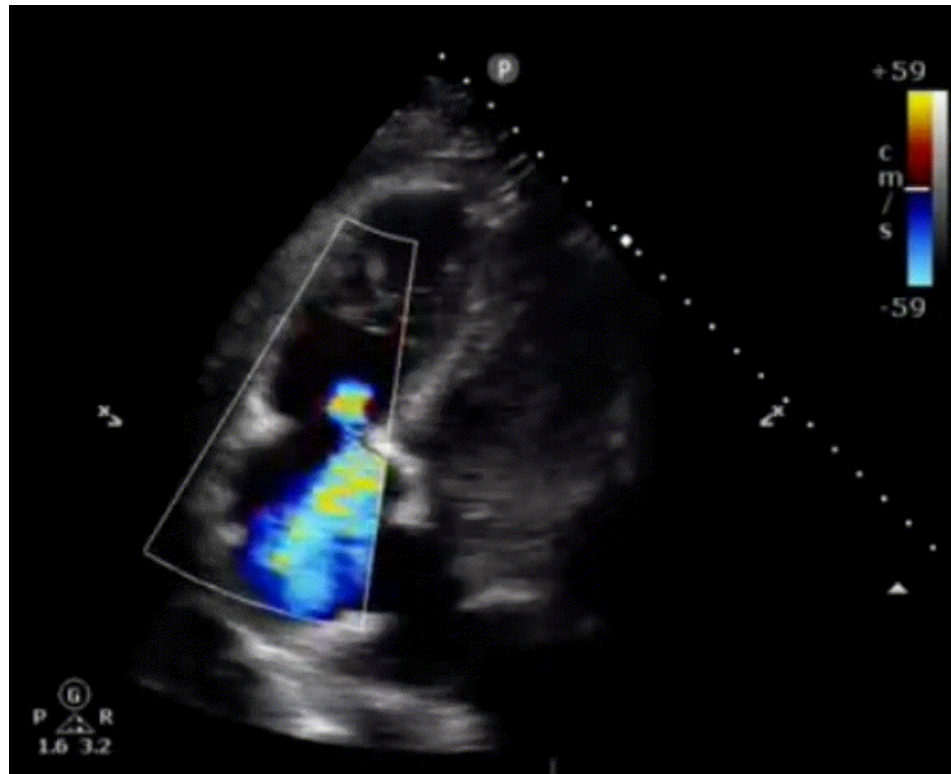
■ Evaluation du VD

- FEVD (TAPSE)
- N > 16 mm



■ Evaluation du VD

- Insuffisance Tricuspidienne -> mmHg
- Physiologique chez 50% de la population



$$\Delta P = 4 \times (V_{\max})^2$$

■ Evaluation du VD

- Insuffisance tricuspидienne
- FEVD (TAPSE)
- PAPs ?

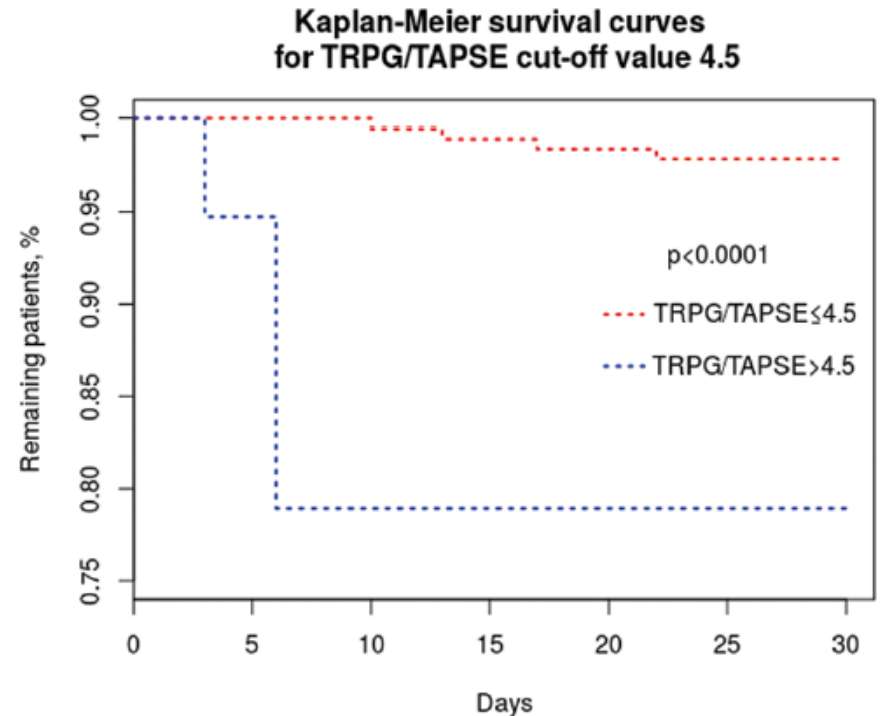
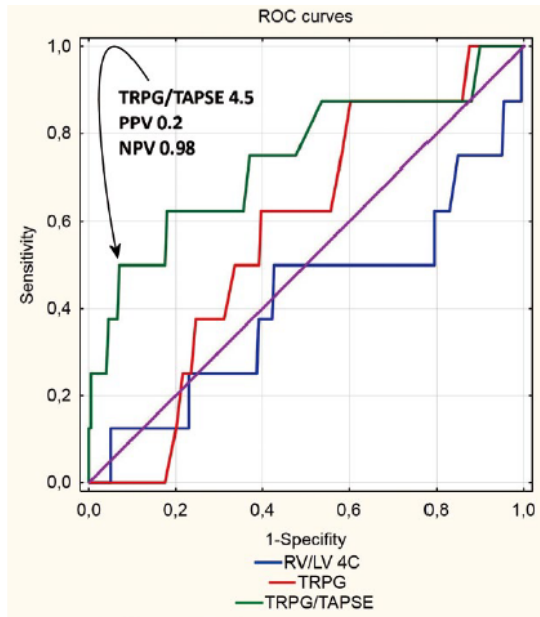


Figure 3. Kaplan-Meier curves according to TRPG/TAPSE in 207 patients with TAPSE ≤ 20 mm. Abbreviations as in Figure 1.

Ciurzyński M, Kurnicka K, Lichodziejewska B, et al. Tricuspid Regurgitation Peak Gradient (TRPG)/Tricuspid Annulus Plane Systolic Excursion (TAPSE) — A Novel Parameter for Stepwise Echocardiographic Risk Stratification in Normotensive Patients With Acute Pulmonary Embolism —. *Circ J.* 2018;82(4):1179-1185. doi:10.1253/circj.CJ-17-0940

■ Cœur pulmonaire aigu vs chronique ?

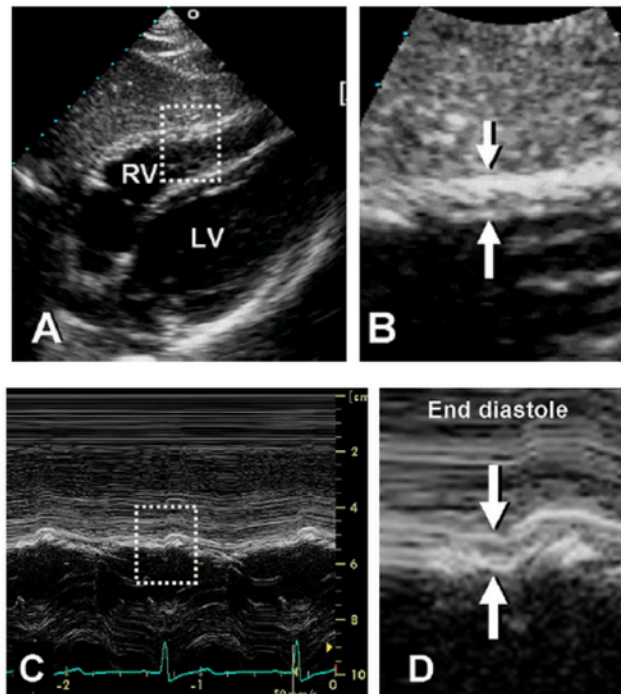
→ PAPs

- PAPs = ΔP + POD
- < 40 - 50 mmHg => aigu

Martinez M, Duchenne J, Bobbia X, et al. Deuxième niveau de compétence pour l'échographie clinique en médecine d'urgence. Recommandations de la Société française de médecine d'urgence par consensus formalisé. Ann Fr Med Urgence. 2018;8(3):193-202. doi:10.3166/afmu-2018-0047

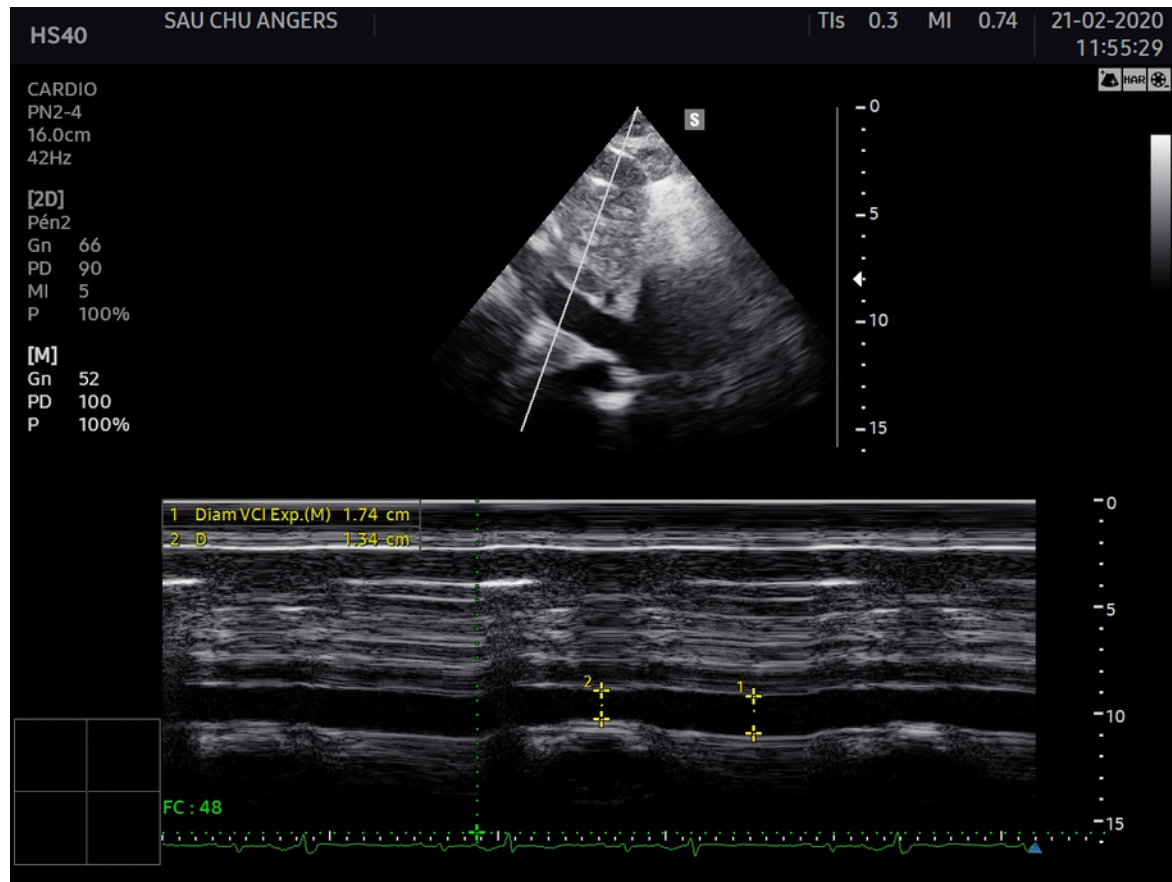
→ Epaisseur VD

- Fenêtre sous xiphoïdienne
- Mode B ou TM
- $N \leq 5\text{mm}$



■ Veine cave inférieure

- Mode B
- Fenêtre Sous Xiphoïdienne



■ Veine cave inférieure

→ Se mesure à ~2cm de l'oreillette

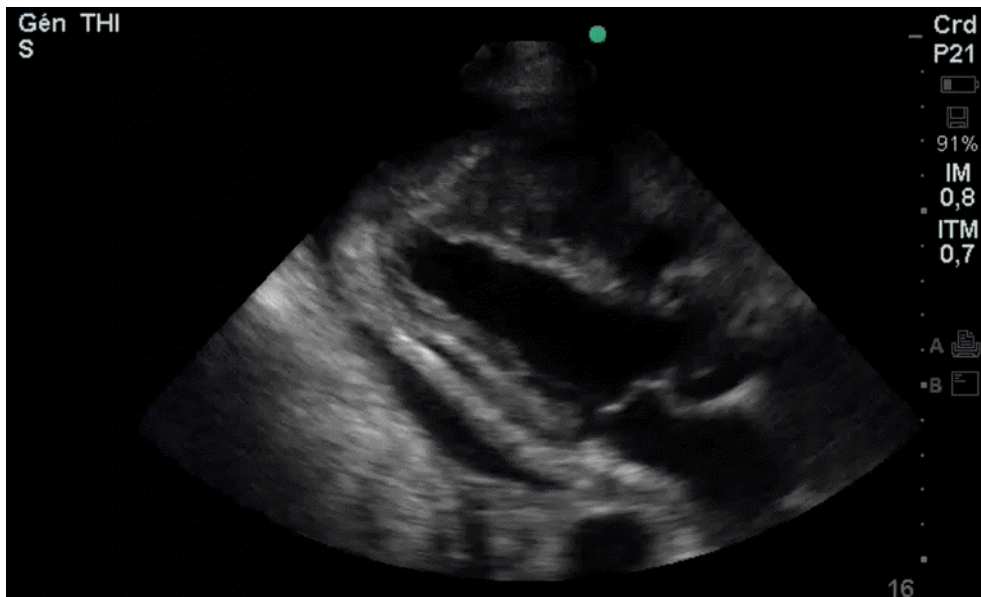
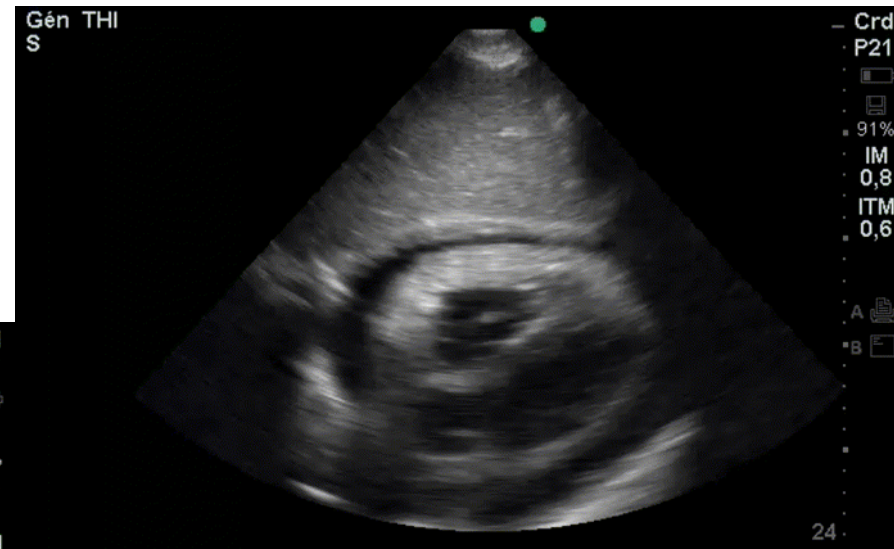
Diamètre VCI (mm)	DVCI (%)	POD (mmHg)
Bas (< 15)	100	0-5
Normal (15-25)	> 50	6-10
	< 50	11-15
Haut (> 25)	< 50	16-20
	Absente	> 20

Wong SP OC. Echocardiographic findings in acute and chronic pulmonary disease. In : The practice of clinical echocardiography. Philadelphia : WB Saunders Company ; 2002. p.739-60

■ Epanchement péricardique

- Rare, ~2% des patients consultant pour dyspnée
- Intérêt pronostic
- Diagnostic US facile (mode B)

Zanobetti M, Scorpiniti M, Gigli C, et al. Point-of-Care Ultrasonography for Evaluation of Acute Dyspnea in the ED. *Chest*. 2017;151(6):1295-1301. doi:[10.1016/j.chest.2017.02.003](https://doi.org/10.1016/j.chest.2017.02.003)



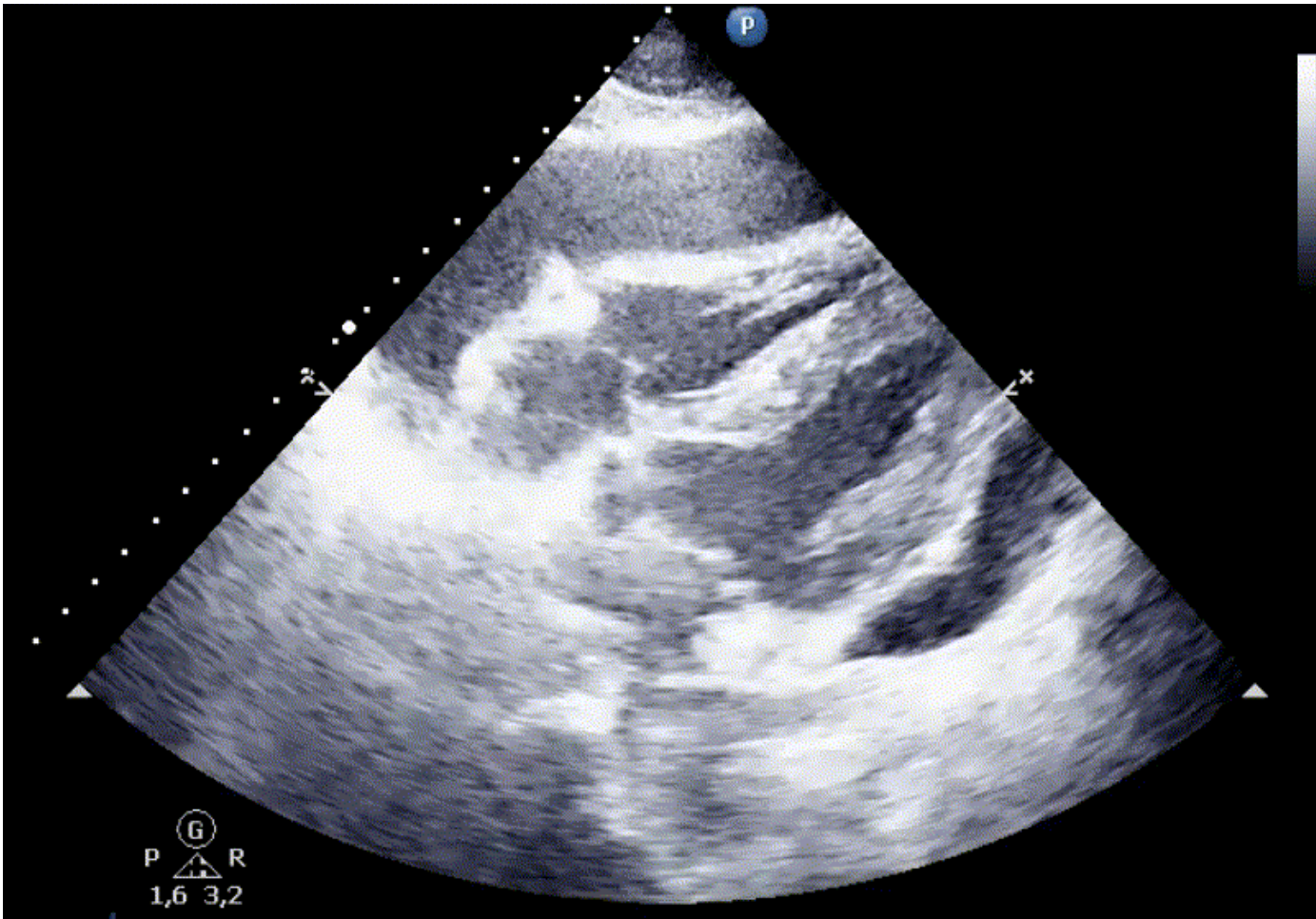
■ Epanchement péricardique

- Significatif en diastole uniquement
- < 100cc : en systole uniquement, postérieur
- 100-300cc : systolo diastolique, postérieur
- > 300cc : systolo diastolique, antéro postérieur
- 300-500cc : 1 à 2cm antéro-postérieur
- > 500cc : > 2cm en antérieur

■ Tamponnade

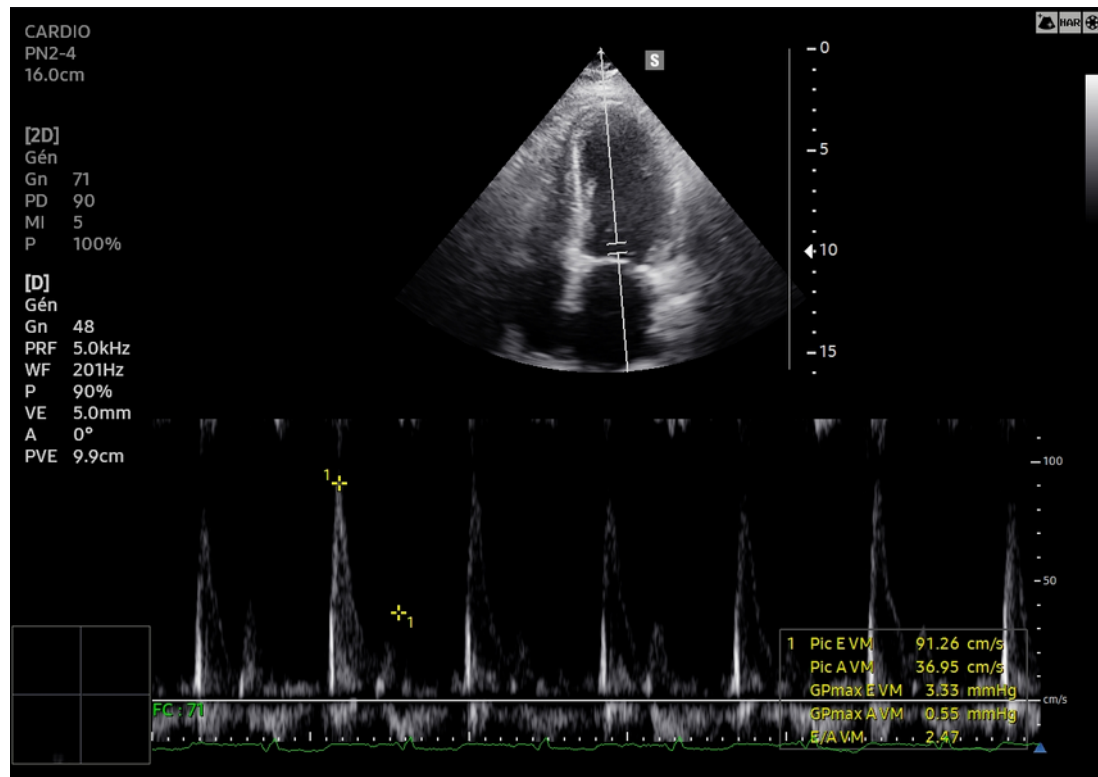
- Epanchement péricardique circonférentiel
- Collapsus télédiastolique de l'oreillette droite (Pré Tamponnade)
- Collapsus télédiastolique du ventricule droit
- VCI dilaté, non « respirante »

■ Tamponnade



■ Doppler mitral

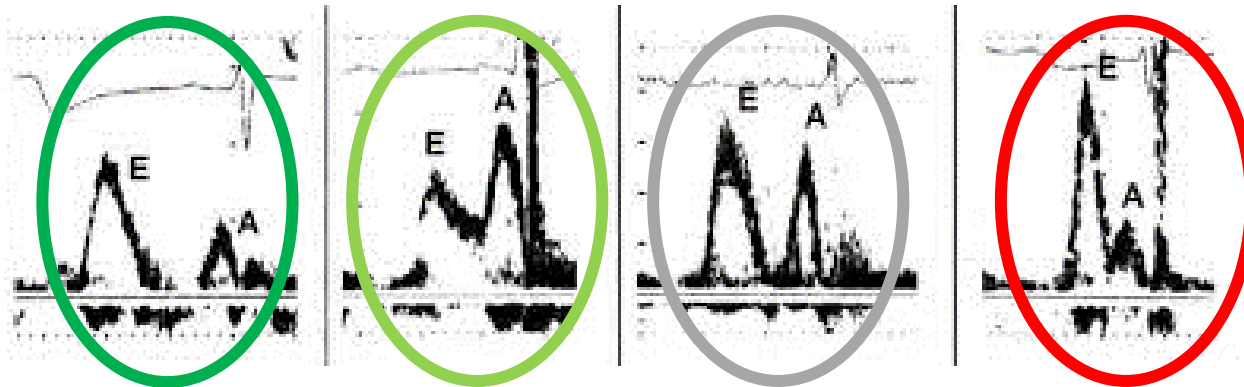
- Evaluation des pressions de remplissage du VG
- Fenêtre apicale, Coupe 4 cavités
- Doppler pulsé (fenêtre : extrémité des valves ouvertes)



■ Doppler mitral

→ Profil mitral (varie avec l'âge) :

- Onde E : remplissage passif VG
- Onde A : remplissage actif VG (contraction oreillette)



$E/A > 2$
 $\Rightarrow \nearrow P^{\circ}$ gauches

Tableau 1 : Valeurs normales du flux mitral. TDE = temps de décélération de l'onde E

Âge	2-20 ans	21-40 ans	41-60 ans	> 60 ans
Onde E (cm/s)	88 ± 14	75 ± 13	71 ± 14	71 ± 11
Onde A (cm/s)	49 ± 12	51 ± 11	57 ± 13	75 ± 12
Rapport E/A	1,88 ± 0,45	1,53 ± 0,40	1,28 ± 0,25	0,96 ± 0,18
TDE (ms)	142 ± 19	166 ± 14	181 ± 19	200 ± 29

■ Doppler mitral

Diastolic Function in Patients With Heart Failure and a Normal Ejection Fraction

	Average \pm SD	Range	Abnormal, %
LV pressure			
EDP, mm Hg	27 \pm 7	7–48	92 (>16)
τ , ms	59 \pm 15	32–110	79 (>48)
Echocardiography			
IVRT, ms	96 \pm 22	55–153	38 (>105)
E, mm/s	74 \pm 22	32–131	40 (<70)
DT, ms	349 \pm 140	101–604	64 (>280)
A, mm/s	76 \pm 23	36–139	50 (>70)
E/A ratio	1.0 \pm 0.4	0.4–2.4	48 (<1.0)

τ indicates relaxation time constant; E, peak E velocity; DT, deceleration time; and A, peak A velocity.

- Tableau d'insuffisance cardiaque
 - 45% dysfonction diastolique
 - En augmentation
 - Absence de thérapeutique spécifique

WRITING GROUP MEMBERS, Lloyd-Jones D, Adams RJ, et al. Heart Disease and Stroke Statistics —2010 Update: A Report From the American Heart Association. *Circulation*. 2010;121(7). doi:[10.1161/CIRCULATIONAHA.109.192667](https://doi.org/10.1161/CIRCULATIONAHA.109.192667)

Zile MR, Gaasch WH, Carroll JD, et al. Heart Failure With a Normal Ejection Fraction: Is Measurement of Diastolic Function Necessary to Make the Diagnosis of Diastolic Heart Failure? *Circulation*. 2001;104(7):779-782. doi:[10.1161/hc3201.094226](https://doi.org/10.1161/hc3201.094226)

■ Doppler tissulaire

→ Intérêt

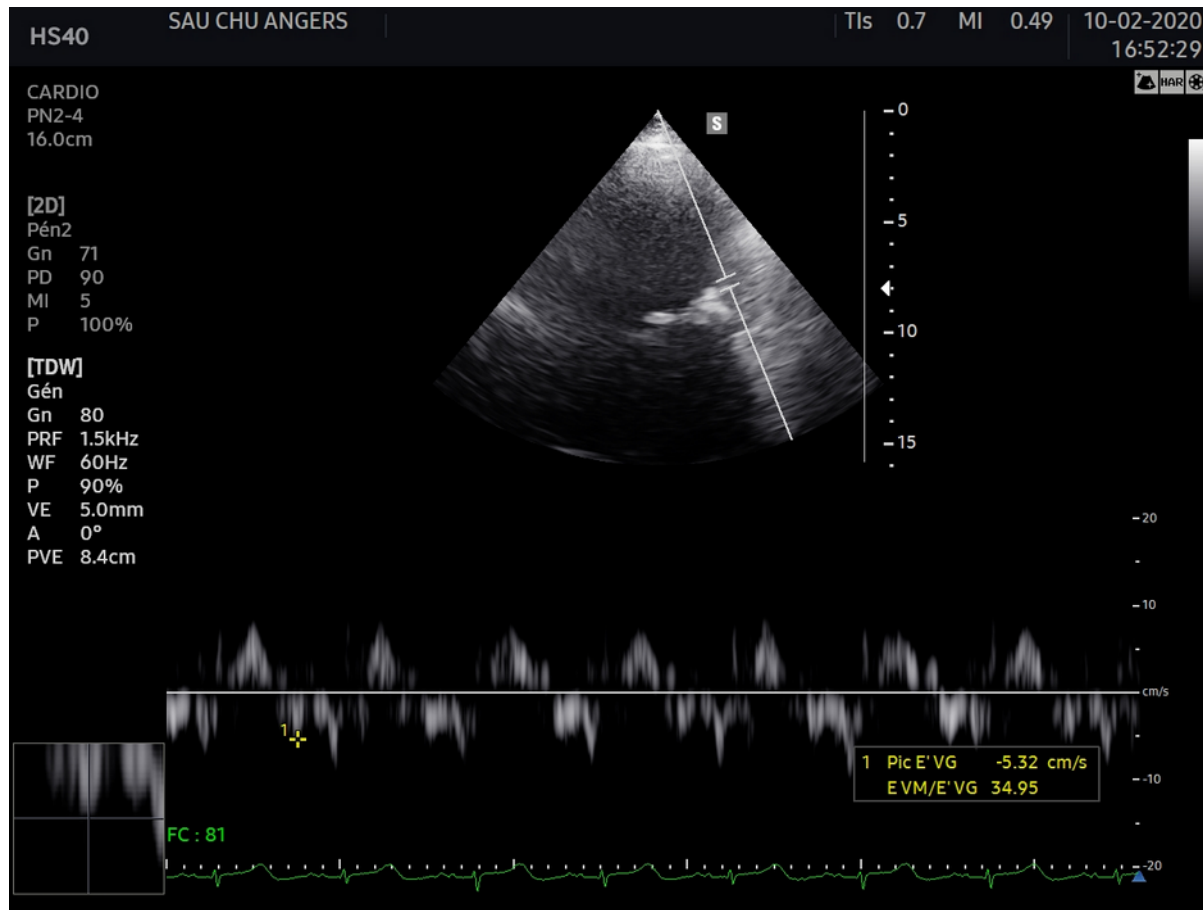
- Ne pas méconnaître une insuffisance cardiaque à FEVG préservée
- Evaluation des pressions de remplissages dans la FA

→ Valeur

- E : dépend de la précharge gauche & de la relaxation
- E'(Ea) : dépend de la relaxation VG, indépendant de la précharge
 - Normal $> 10\text{cm.s}^{-1}$
 - $< 10\text{cm.s}^{-1}$: insuffisance cardiaque diastolique
- E/E' : dépend uniquement de la précharge
 - > 15 : augmentation des pressions gauches
 - < 9 : normal
 - 8 - 15 : zone grise

■ Doppler tissulaire

- Vitesse de déplacement du tissu myocardique
- Filtre basses fréquence



ECHOVEINOGRAPHIE

■ Rationnel

- Phlébite : présentation clinique hétérogènes
- Aucun signe clinique sensible, ni spécifique
- Disponibilité Echo-Doppler veineux aléatoire

■ Echographie 4 points

- Se : 70-100% ; Sp : 78-100%
- Sonde linéaire, haute fréquence
- Mode B
- Fenêtre
 - Inguinale Dte et Gche
 - Poplitée Dte et Gche

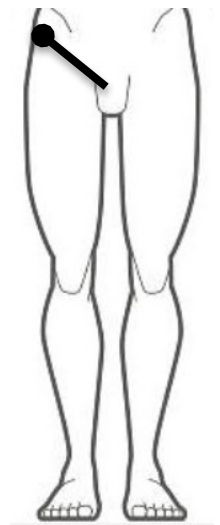
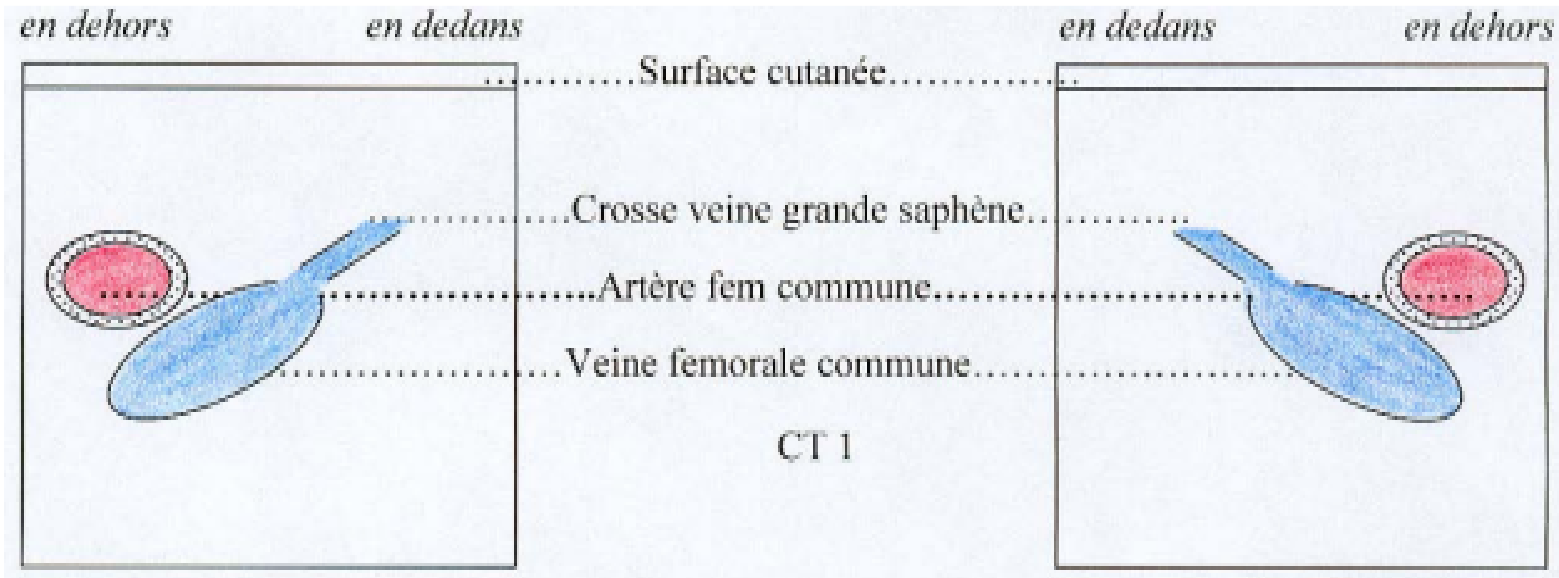
■ Veine normale

- Vide d'écho
- Paroi fine et souple
- Elle se laisse déprimer, jusqu'à s'effacer complètement

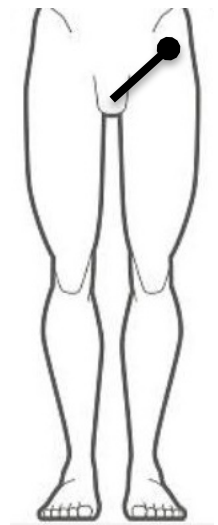
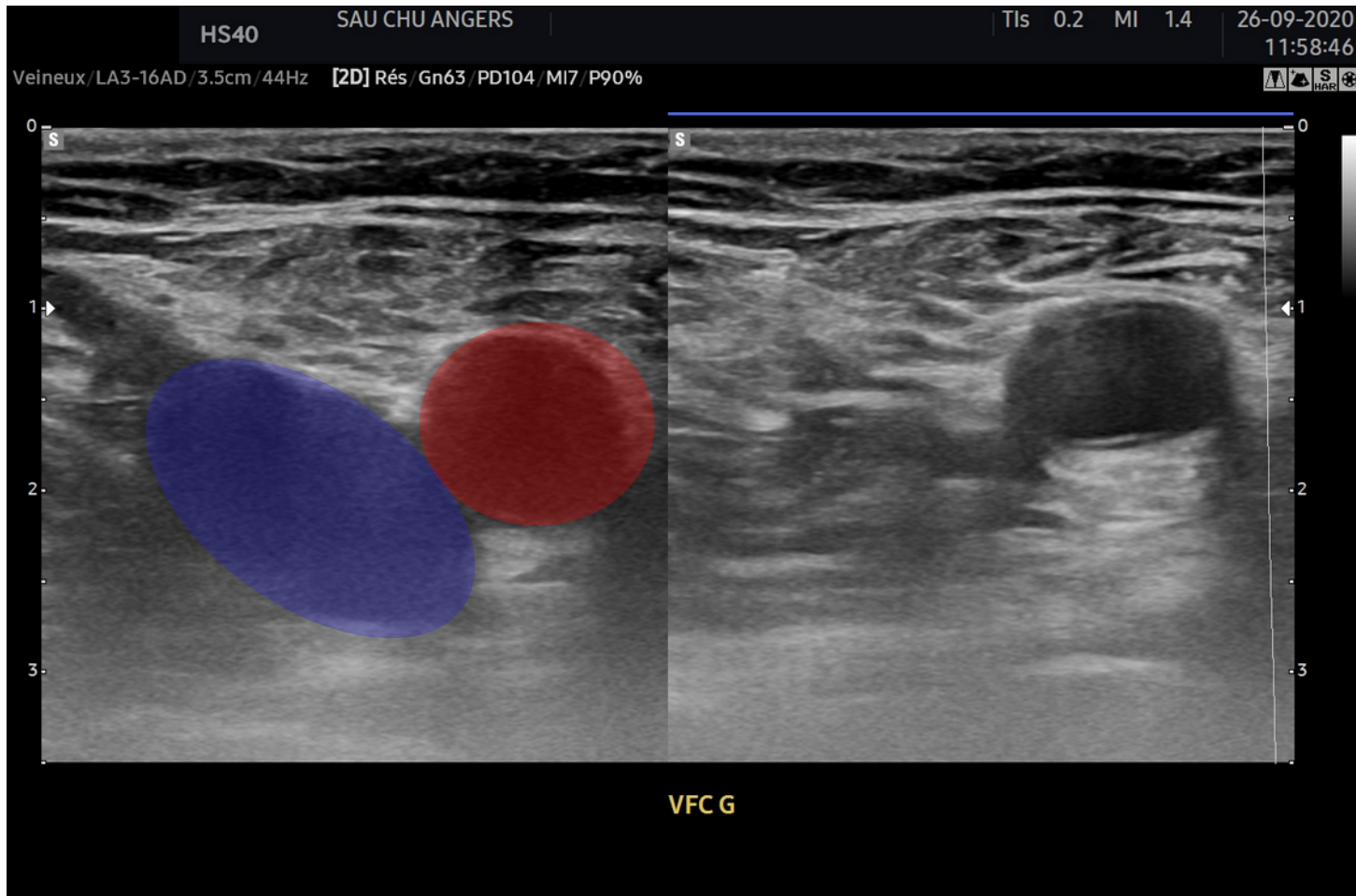
■ Veine thrombosée

- PERTE DE COMPRESSIBILITE

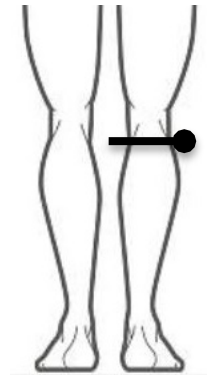
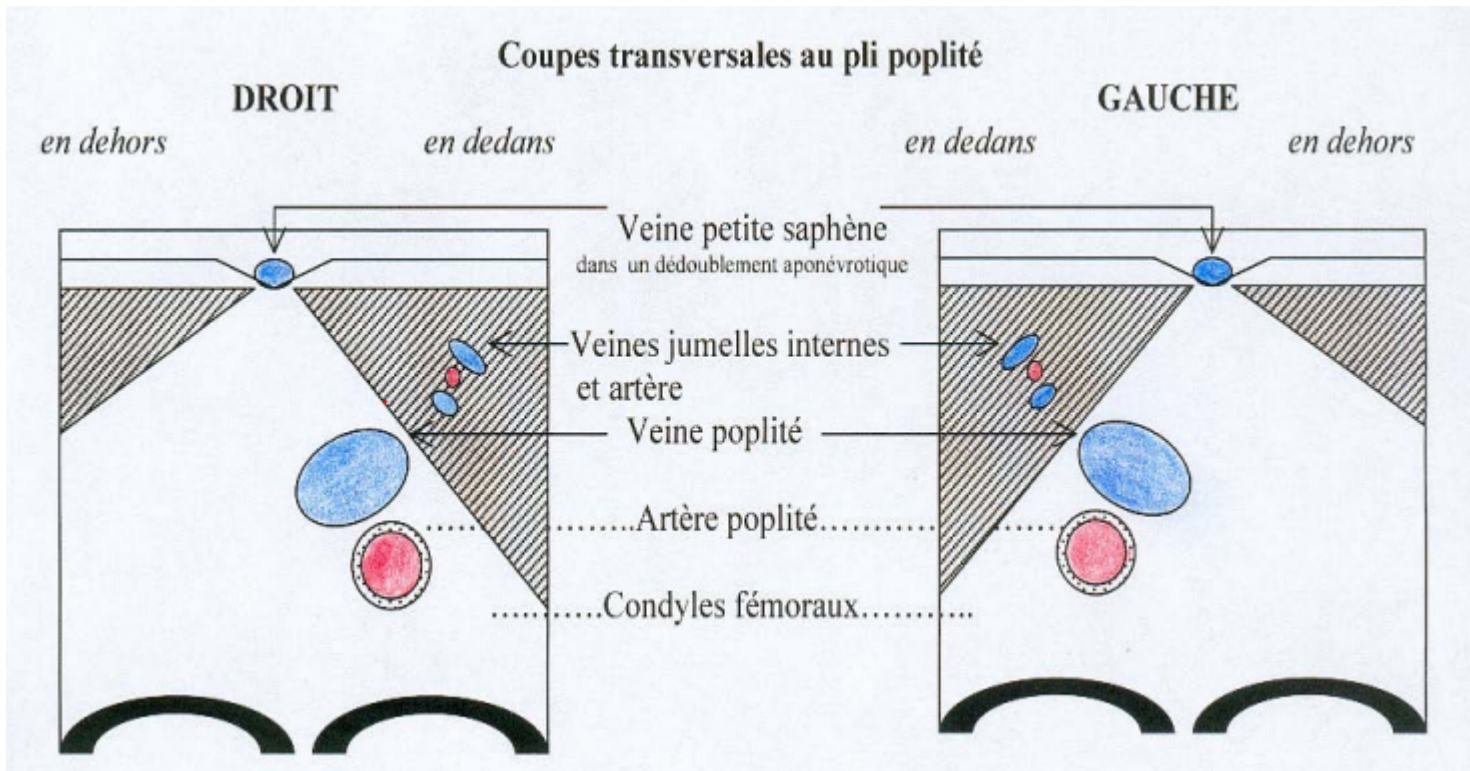
■ Fenêtres inguinales



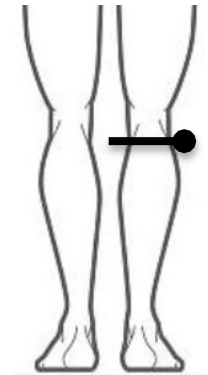
■ Fenêtres inguinales



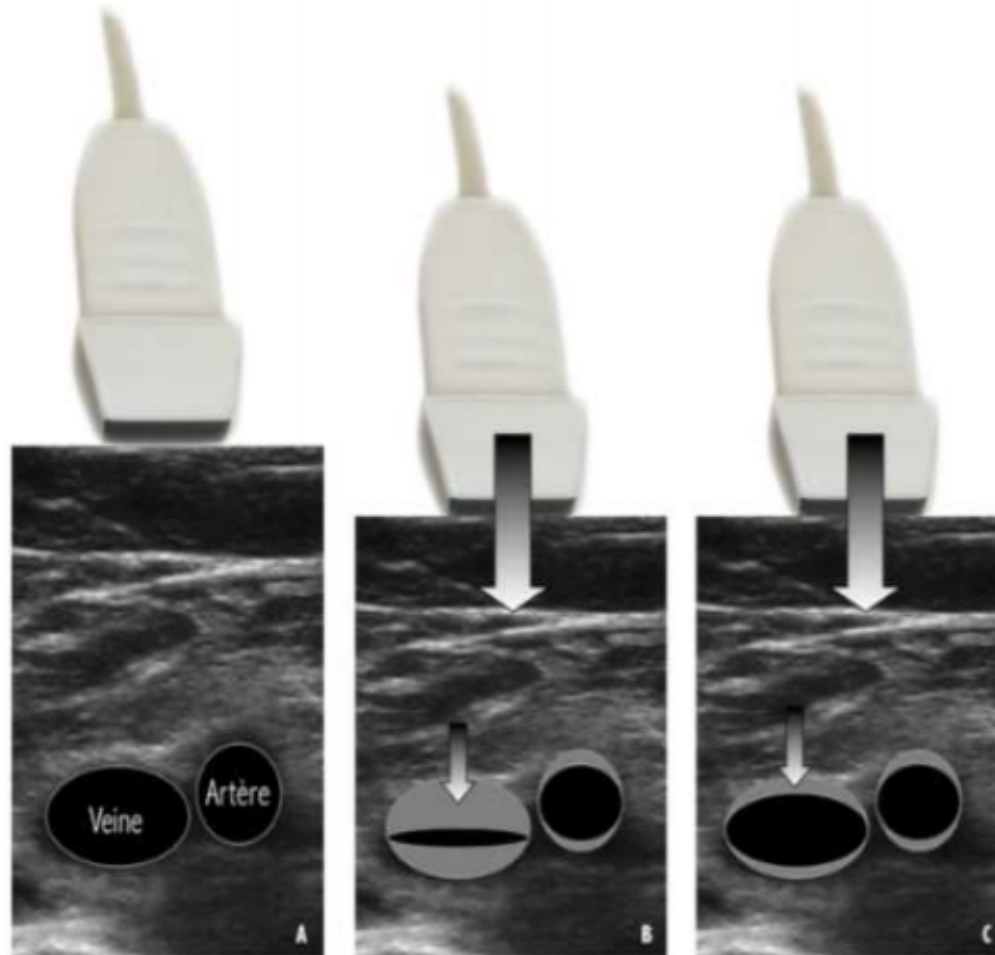
■ Fenêtre poplitée



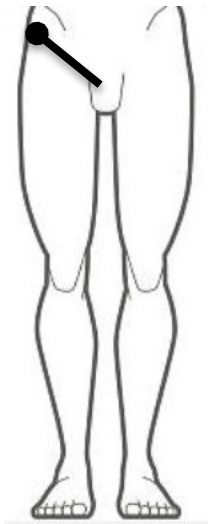
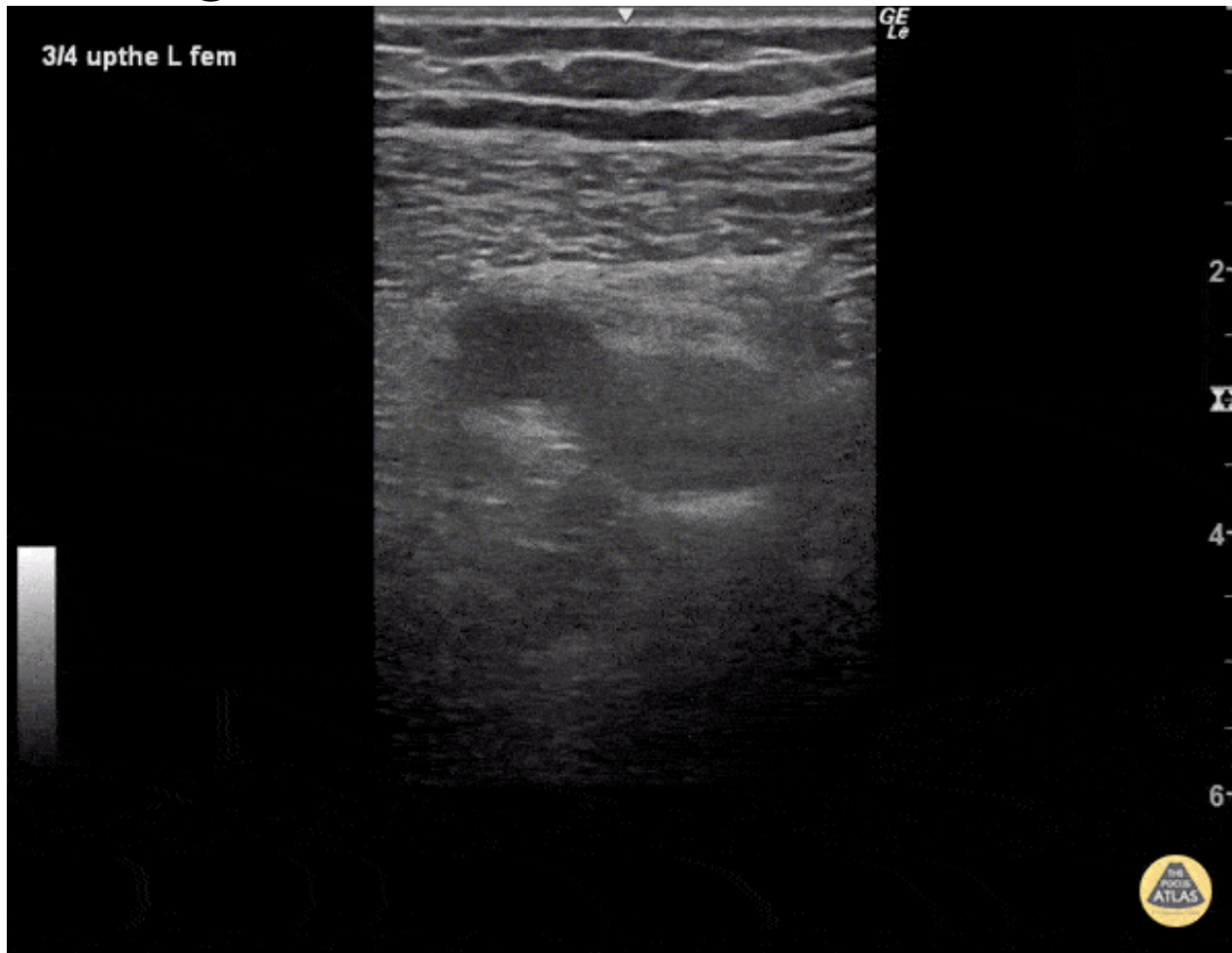
■ Fenêtre poplitée



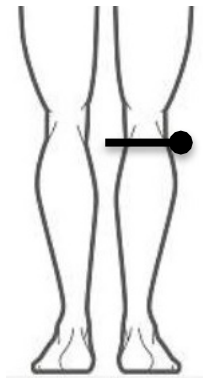
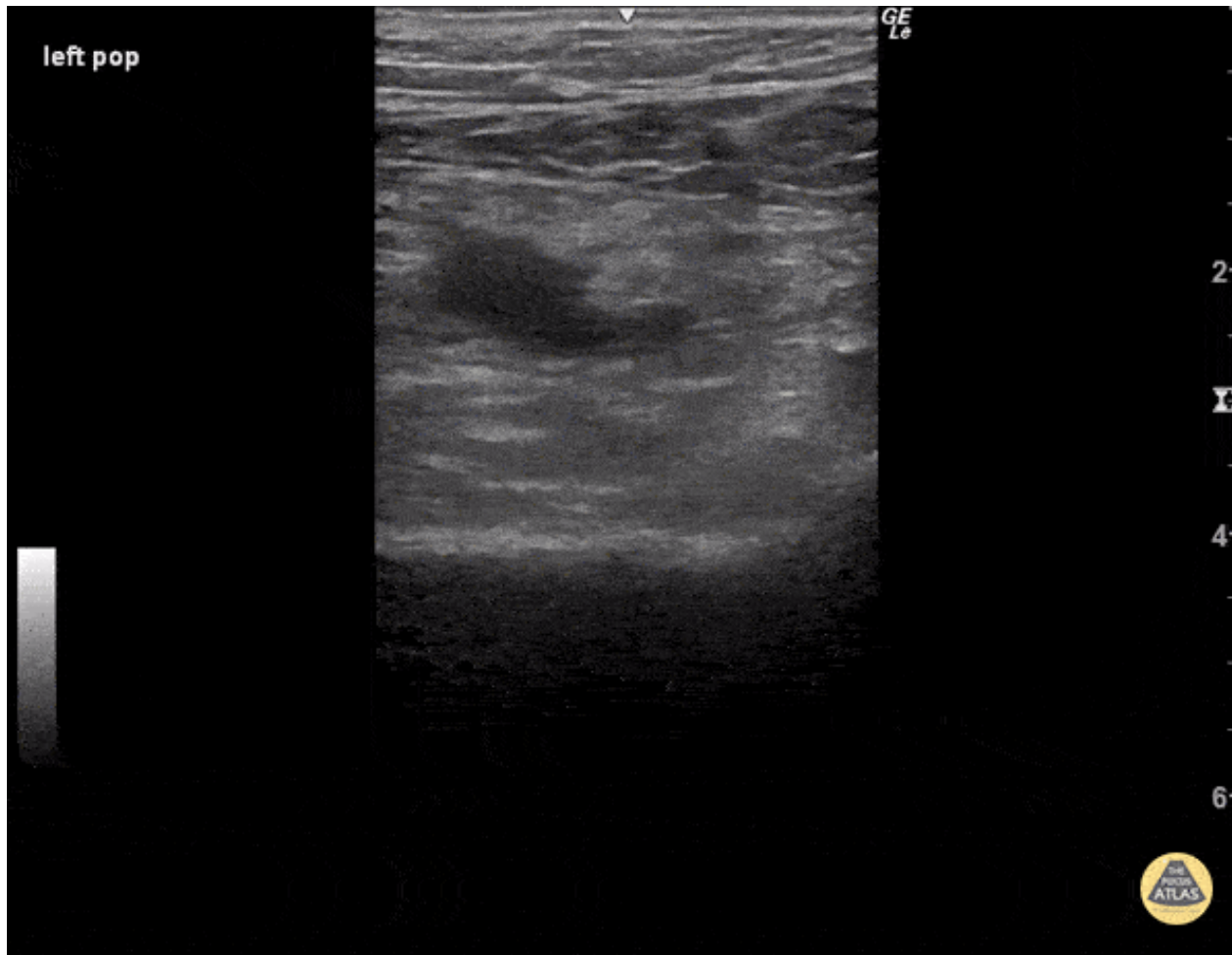
■ Technique



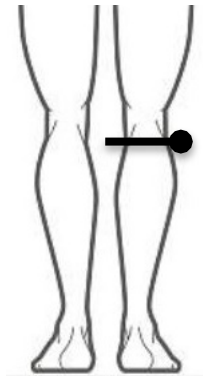
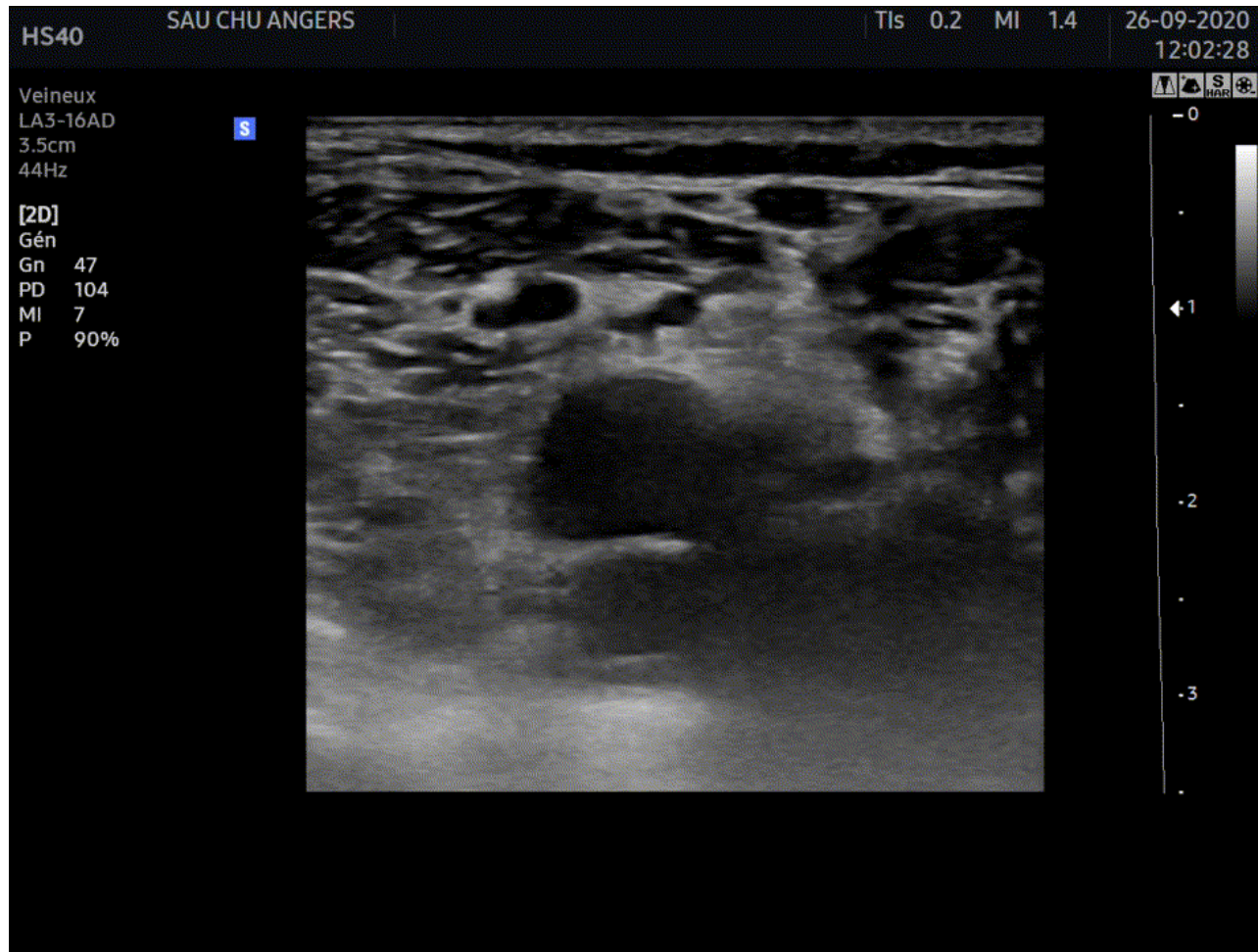
■ Fenêtre inguinal



■ Fenêtre poplitée



■ Fenêtres poplitée



■ Limites

→ Difficulté de réalisation

- Variations anatomiques
- Obésité
- Défaut de compressibilité
 - Femme enceinte (stase)
 - Masse musculaire / Tendon

Wakai A. Emergency department compression ultrasound to diagnose proximal deep vein thrombosis. The Journal of Emergency Medicine. 2001;21(4):444. doi:[10.1016/S0736-4679\(01\)00414-0](https://doi.org/10.1016/S0736-4679(01)00414-0)

→ Patient avec antécédent de TVP

- À un an d'une TVP, seul 1/3 des EDMI sont normaux
 - Risque de faux positif
- ⇒ Echo de spécialiste

→ Thrombose superficielle

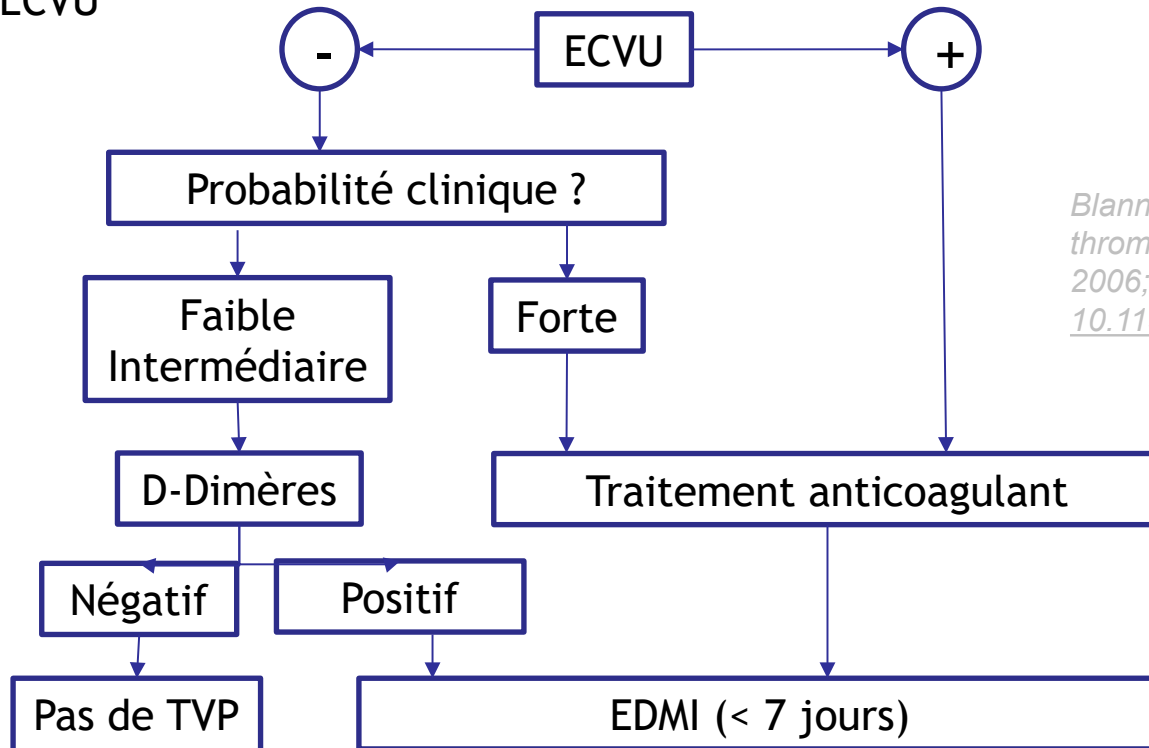
- Echo de spécialiste : spécificité 36%
 - Pas de risque emboligène
- ⇒ Prévoir Echo de spécialiste à dans la semaine

Kearon C, Akl EA, Ornelas J, et al. Antithrombotic Therapy for VTE Disease. Chest. 2016;149(2):315-352. doi:[10.1016/j.chest.2015.11.026](https://doi.org/10.1016/j.chest.2015.11.026)

■ Stratégie (TVP)

→ 3 éléments clefs (VPN dépend de la prévalence de la maladie)

- Probabilité clinique (Wells)
- D-dimères
- ECVU



Blann AD, Lip GYH. Venous thromboembolism. BMJ. 2006;332(7535):215-219. doi: 10.1136/bmj.332.7535.215

■ Stratégie (EP)

→ Rapport de Vraisemblance Positif : 42

Le Gal G, Righini M, Sanchez O, et al. A positive compression ultrasonography of the lower limb veins is highly predictive of pulmonary embolism on computed tomography in suspected patients. Thromb Haemost. 2006;95(06):963-966. doi:10.1160/TH06-03-0158

⇒ Suspicion d'EP & ECVU positive : EP confirmée

Lower-limb CUS

It is recommended to accept the diagnosis of VTE (and PE) if a CUS shows a proximal DVT in a patient with clinical suspicion of PE.^{164,165}

I

A

Konstantinides SV, Meyer G, Becattini C, et al. 2019 ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS). European Heart Journal. 2020;41(4):543-603. doi:10.1093/eurheartj/ehz405

→ Par contre Rapport de Vraisemblance négatif : 0,6

- ECVU normale n'exclue pas le diagnostic