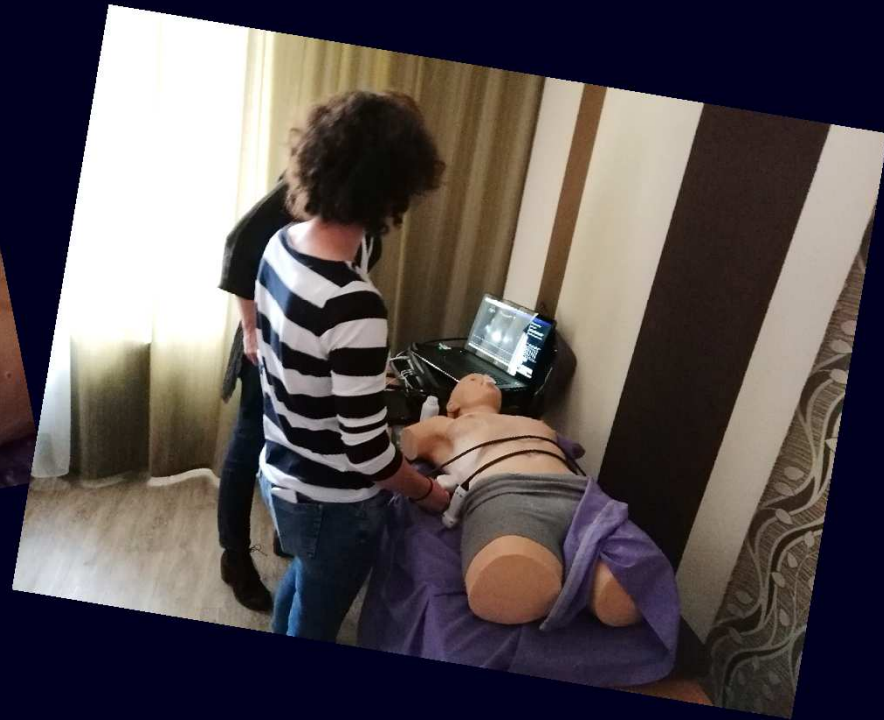


# LIMITY ULTRASONOGRAFICKÉ DIAGNOSTIKY PNEUMOTORAXU

*Roman Škulec*

- *Zdravotnická záchranná služba Středočeského kraje*
- *Klinika anesteziologie, perioperační a intenzivní medicíny, Masarykova nemocnice v Ústí nad Labem, Univerzita J. E. Purkyně v Ústí nad Labem*
- *Klinika anesteziologie, resuscitace a intenzivní medicíny, UK v Praze, LFHK, FN Hradec Králové*

# WS POCUS A ECHO



# POCUS A DG PNEUMOTORAXU

## Practical approach to lung ultrasound

A Miller MBChB FRCA FFICM\*

BJA Education, 16 (2): 39–45 (2016)

Consultant Intensivist, Anaesthetic Department, Royal Wolverhampton Hospitals, New Cross Hospital, Wolverhampton WV10 0QP, UK

## Pneumothorax

LU is nearly as good as CT for ruling a pneumothorax in or out. It takes less than a minute with US (Fig. 6).

- suverénní rychlá a jednoduchá metoda k vyhledání a potvrzení pneumotoraxu
- spolehlivější metoda než RTG S+H u pacientů vleže nebo v polosedě



# ***POCUS A DG PNEUMOTORAXU***

- **absence slidingu**
- **barcode sign v M-mode**
- **lung point**

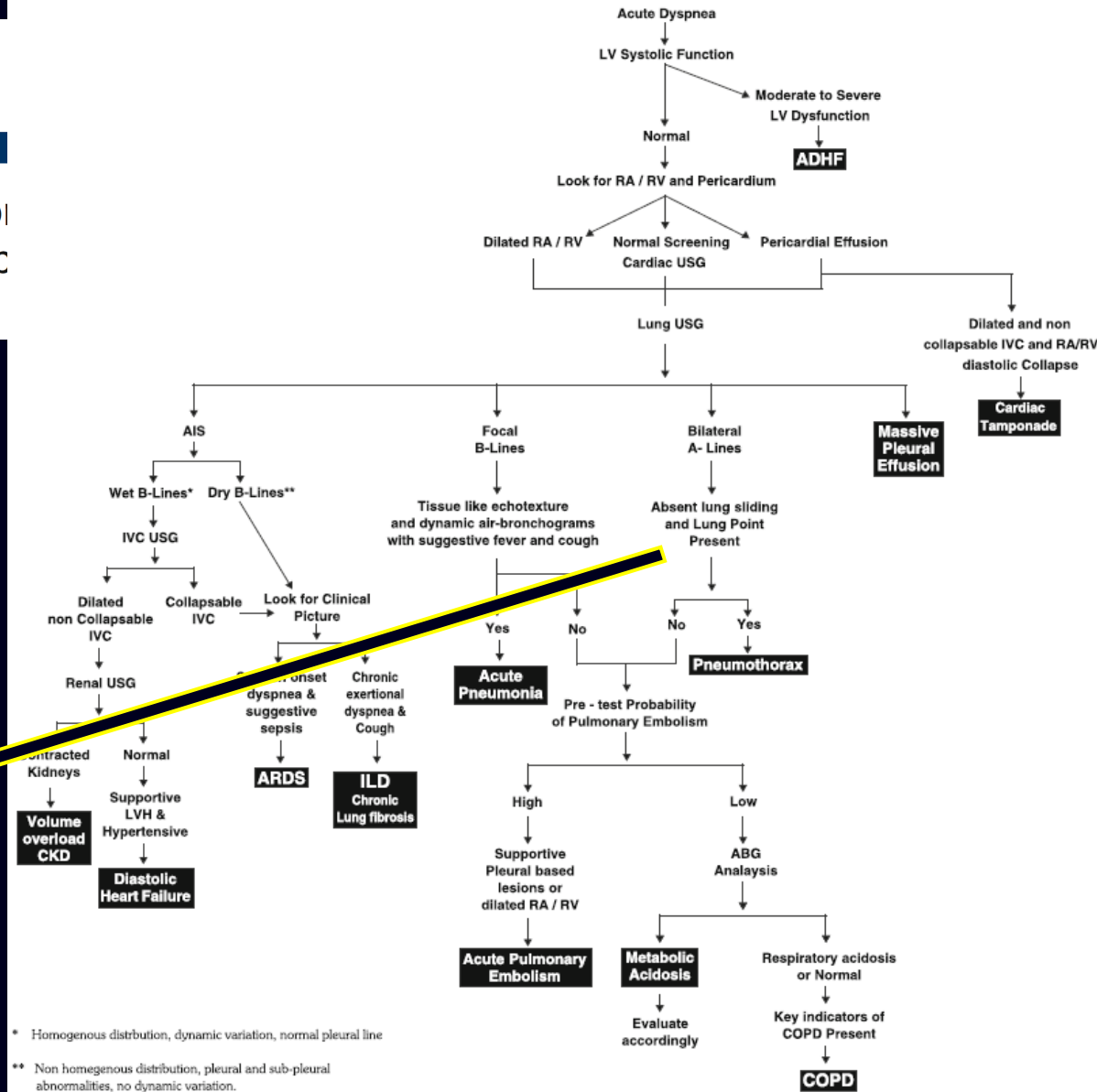
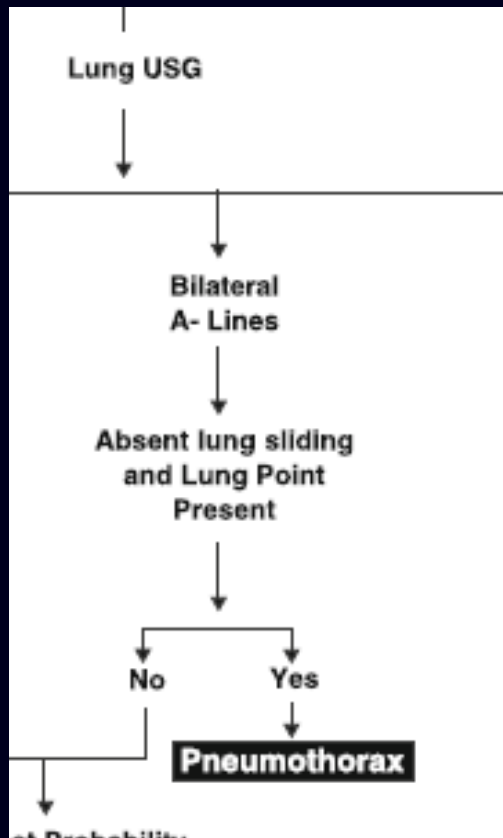
# POCUS A DG PNEUMOTORAXU

## DYSPNEA DIAGNOSTIC ALGORITHM

Guttikonda and Vadapalli *International Journal of Emergency Medicine* (2018) 11:21  
<https://doi.org/10.1186/s12245-018-0181-z>

### ORIGINAL RESEARCH

Approach to undifferentiated dyspnea in emergency department: aids in rapid clinical decision-making



\* Homogenous distribution, dynamic variation, normal pleural line

\*\* Non homogenous distribution, pleural and sub-pleural abnormalities, no dynamic variation.

Fig. 1 Dyspnea diagnostic algorithm

# ***POCUS A DG PNEUMOTORAXU***

- absence slidingu
- barcode sign v M-mode
- lung point
- absence B/Z linií
- ( ■ absence lung pulse)

# VALIDITA POCUS vs. PNEUMOTORAX

## Diagnostic Accuracy of Chest Ultrasonography versus Chest Radiography for Identification of Pneumothorax: A Systematic Review and Meta-Analysis

Covariate	Bivariate random-effect model			
	Sensitivity	Specificity	I2 statistics	P value
<b>Thoracic ultrasonography</b>				
<b>Patient enrollment</b>				
Consecutive	0.87 (0.81-0.94)	0.99 (0.98-1.0)	0	
Nonconsecutive	0.85 (0.77-0.93)	0.98 (0.97-1.0)	0	0.66
<b>Patient type</b>				
Trauma	0.85 (0.78-0.91)	0.99 (0.99-1.0)	76	<0.02
Non trauma	0.90 (0.83-0.98)	0.97 (0.95-0.99)	46	
<b>Operator</b>				
Emergency physician	0.88 (0.82-0.94)	0.99 (0.98-0.1.0)	86	<0.001
Non-emergency physician	0.81 (0.73-0.90)	0.98 (0.96-0.99)	71	
<b>Probe type</b>				
Linear	0.85 (0.78-0.92)	0.99 (0.98-1.0)	0	0.74
Nonlinear	0.88 (0.81-0.95)	0.98 (0.97-1.0)	0	
<b>Frequency</b>				
2-5 Mhz	0.87 (0.81-0.92)	0.98 (0.97-0.99)	0	0.4
5-10 Mhz	0.86 (0.75-0.97)	0.99 (0.98-1.0)	0	

# KLINICKÁ SITUACE

	SENZITIVITA	SPECIFICITA
■ po kanylaci v. subclavia	100 %	100 %
■ pacient s dušností*	85 %	95 %
■ tupé trauma hrudníku	48 – 98 %	≥88 %
■ novorozenec s ARS	≥87 %	≥96 %
■ 4H4T během KPR	?	?

Expert Agreement in the Interpretation of Lung Ultrasound Studies Performed on Mechanically Ventilated Patients

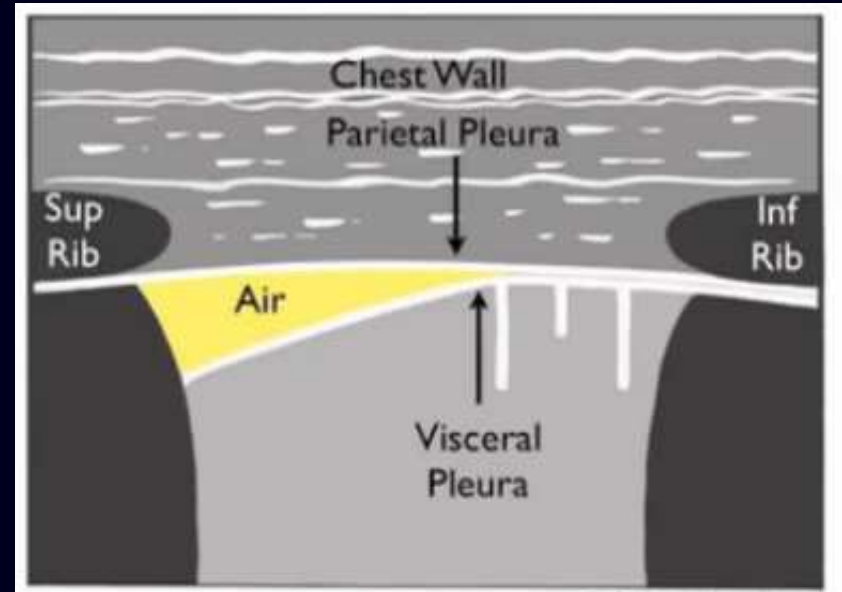
**Table 2.** Expert Confidence

Parameter	Normal	Pneumothorax	Interstitial Syndrome	Pleural Effusion	Consolidation	Atelectasis
Agreement, %	60	31	58	59	47	21
Confidence, %	73	72	82	80	78	77
Difference score	13	41	24	21	31	56



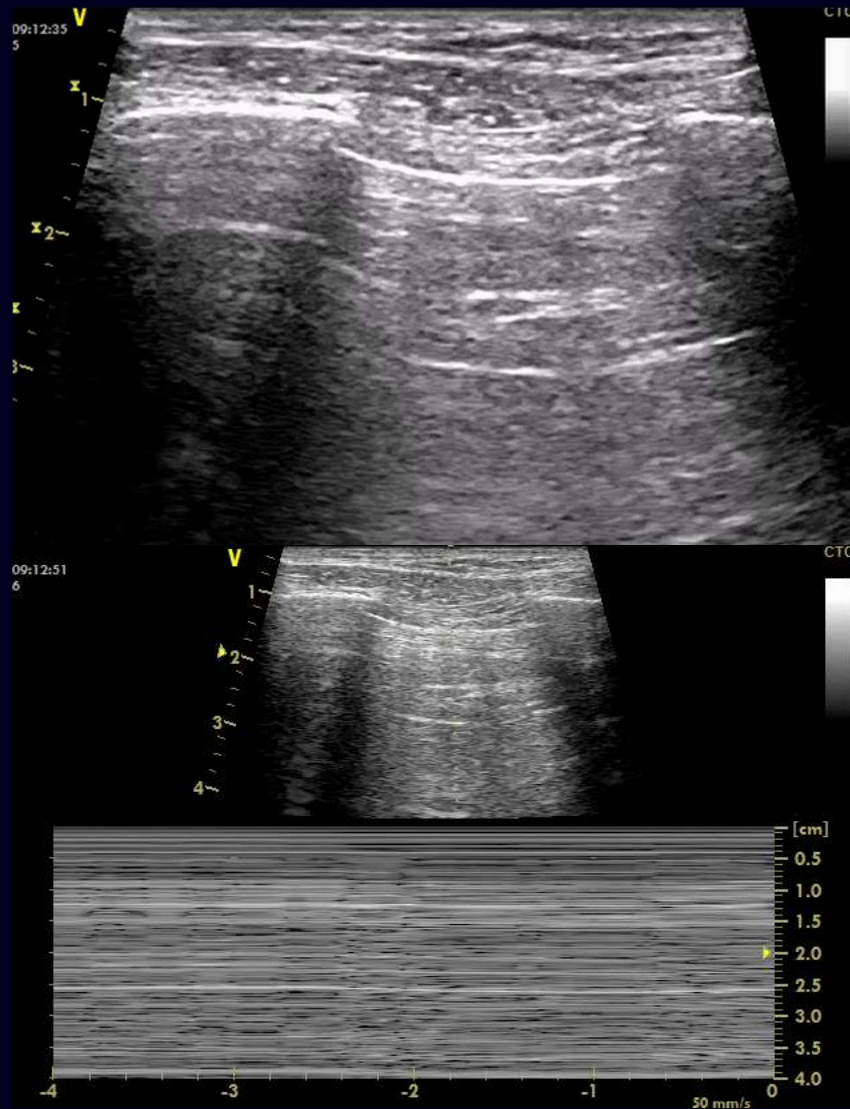
# ***POCUS A DG PNEUMOTORAXU***

- absence slidingu
- barcode sign v M-mode
- lung point
- absence B/Z linií
- ( ■ absence lung pulse)

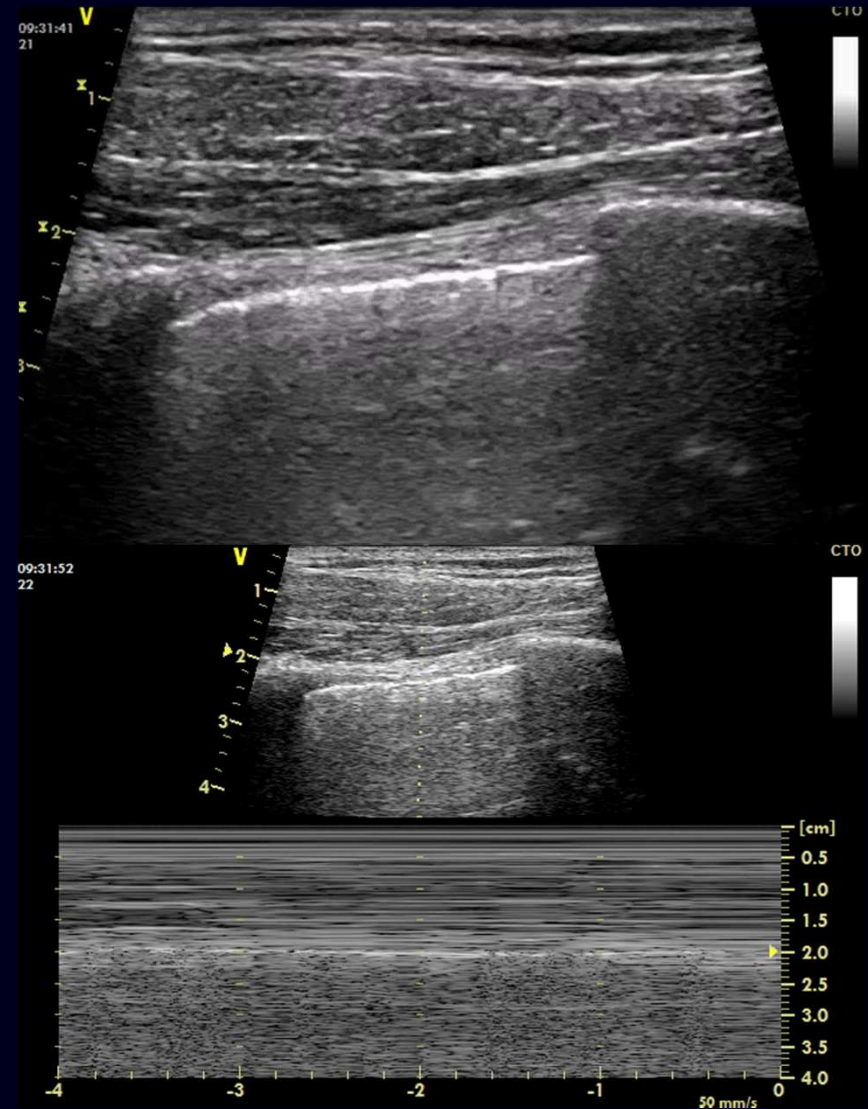


# ABSENCE SLIDINGU, BARCODE

## PNEUMOTORAX



## ZDRAVÁ PLÍCE



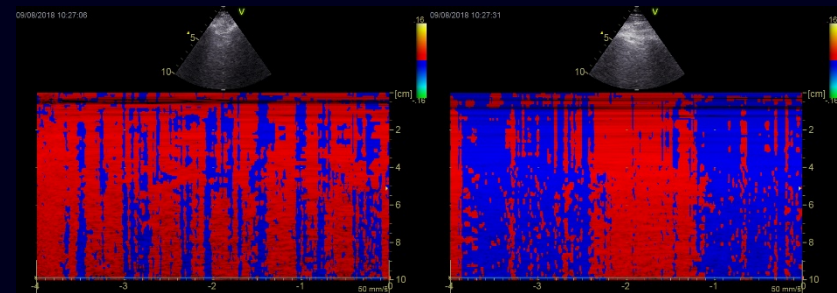
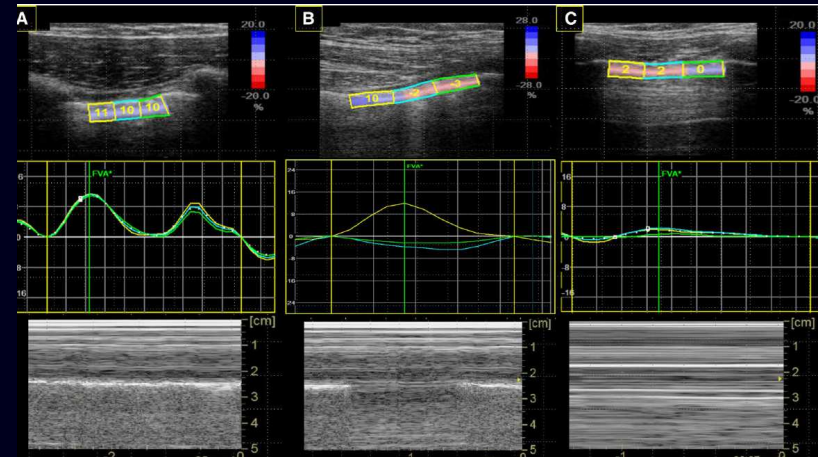
# ABSENCE SLIDINGU

■ neg. prediktivní hodnota 99%

■ specificita 60 – 99%

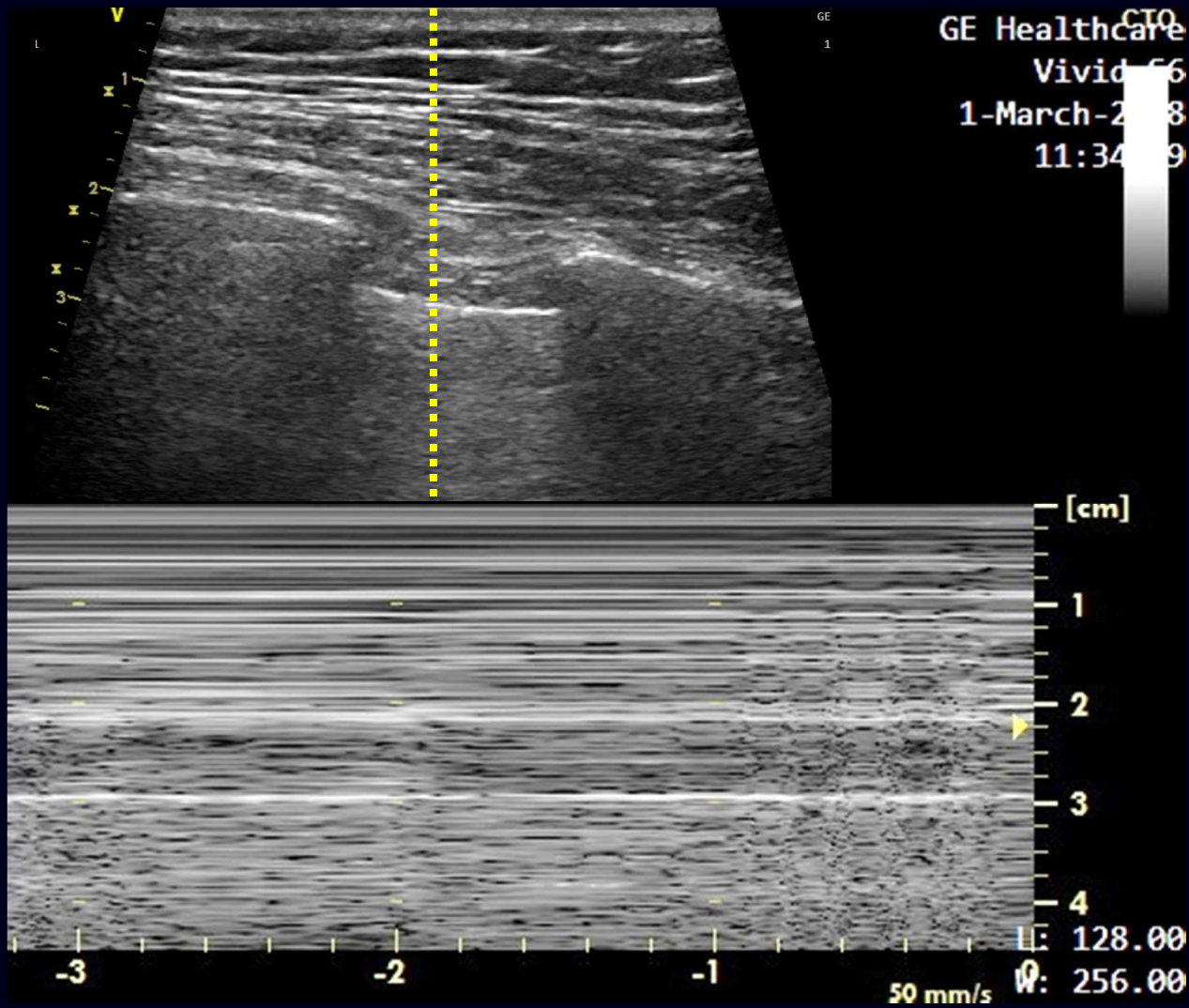
Oslabení / absence slidingu:

- pneumonie
- atelektáza
- bezdeší
- pleur. adheze
- intubace do bronchu
- ARDS
- plicní fibróza



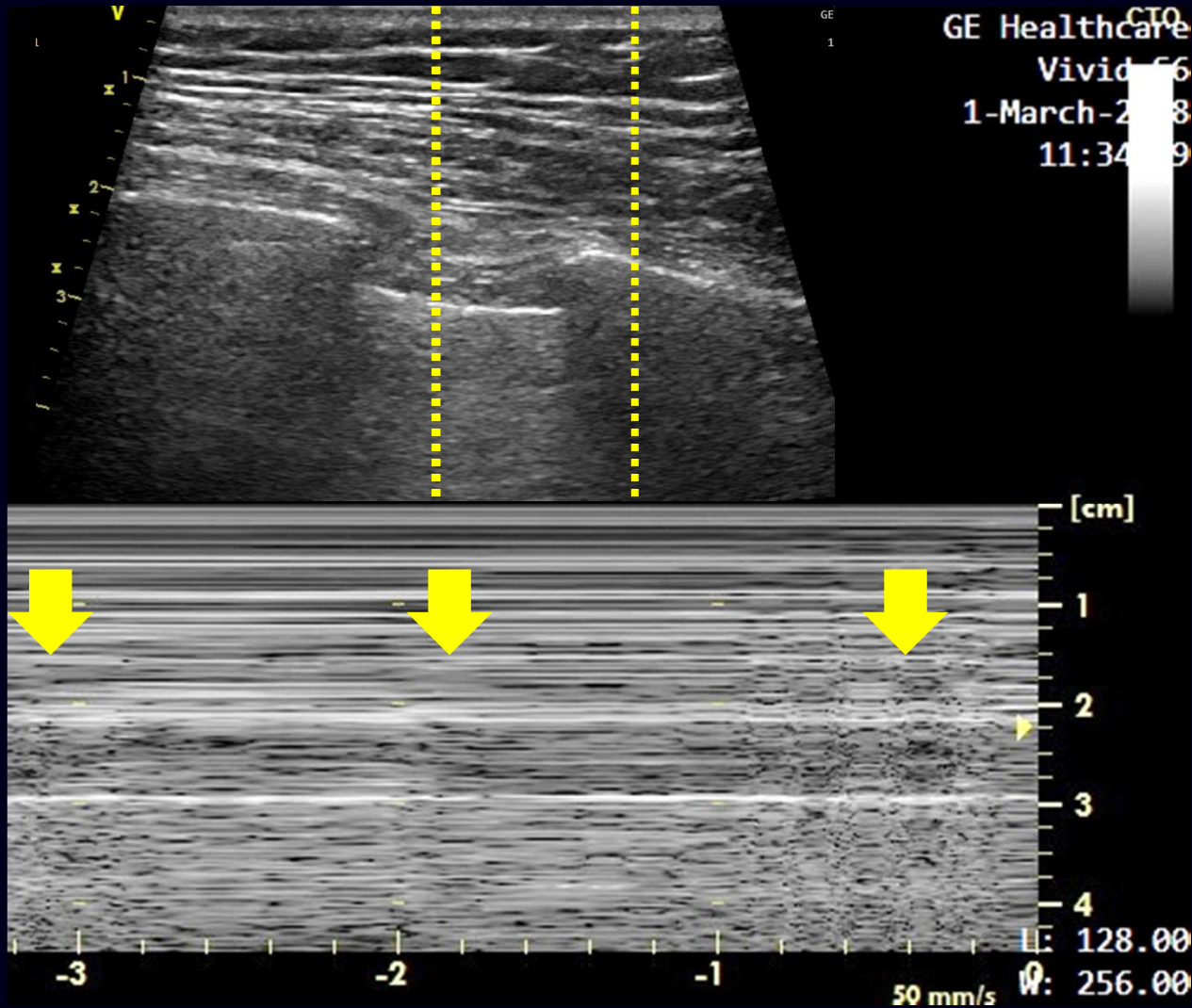
# TIP 1

■ pozor na pozici kurzoru M-mode!



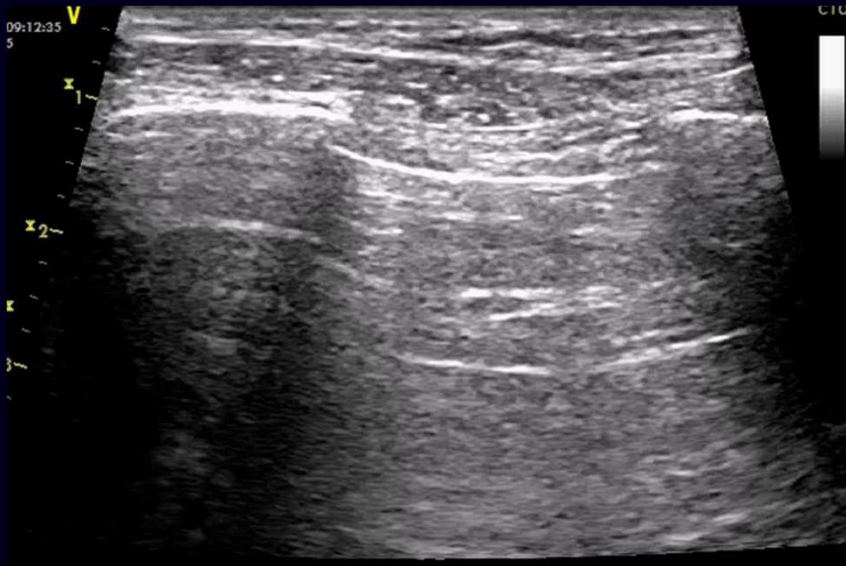
# ABSENCE SLIDINGU?

- pozor na pozici kurzoru M-mode!

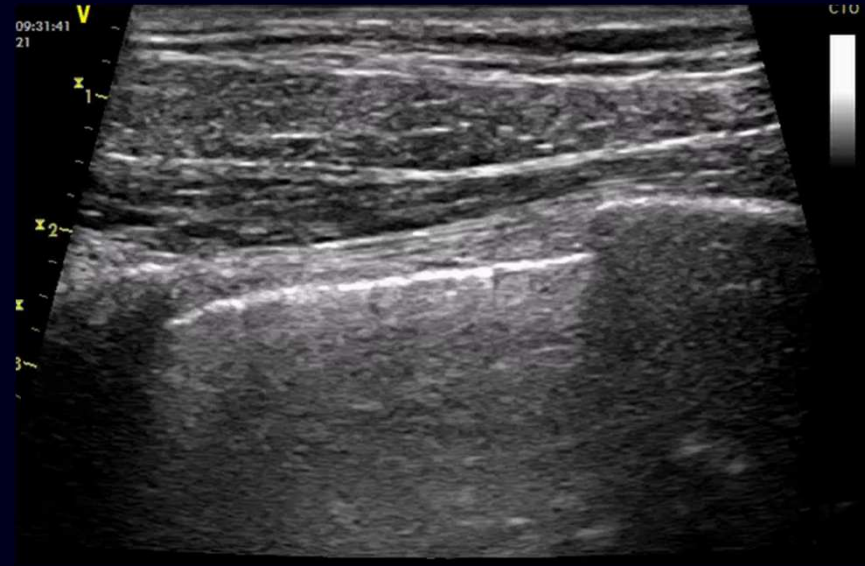


# ***ABSENCE B/Z LINIÍ***

## **PNEUMOTORAX**



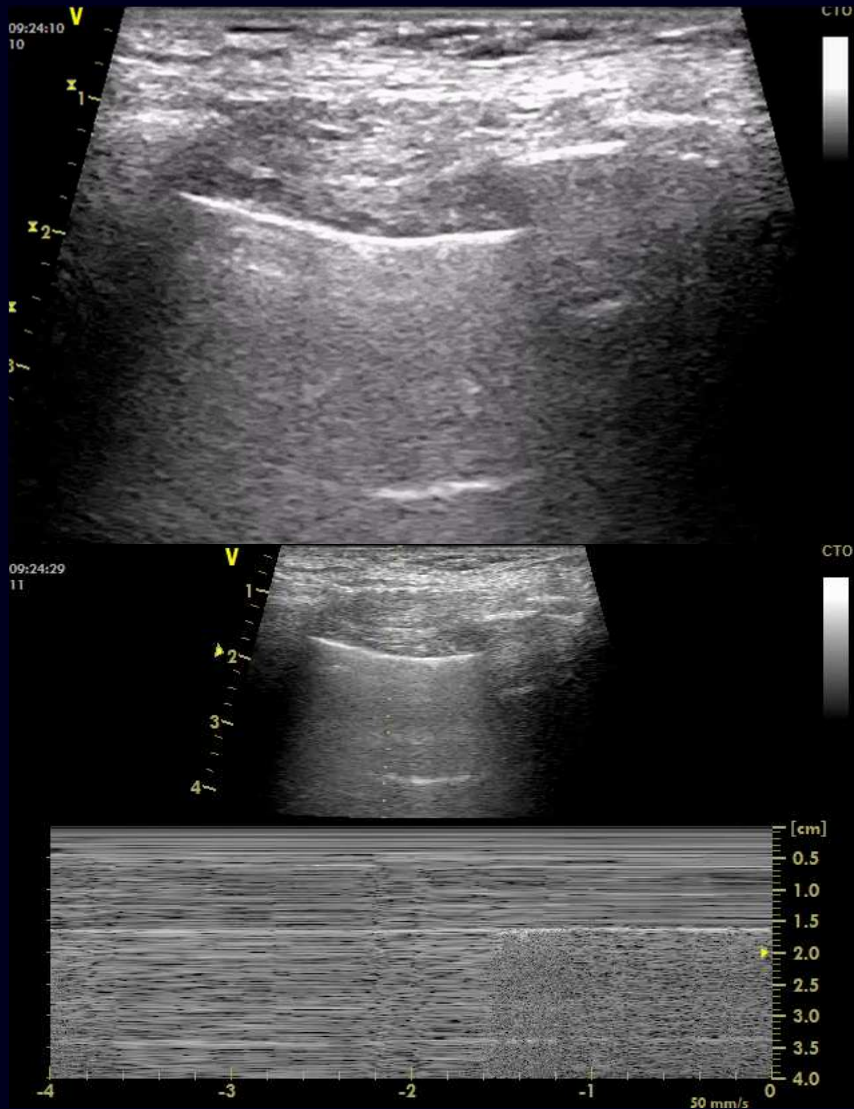
## **ZDRAVÁ PLÍCE**



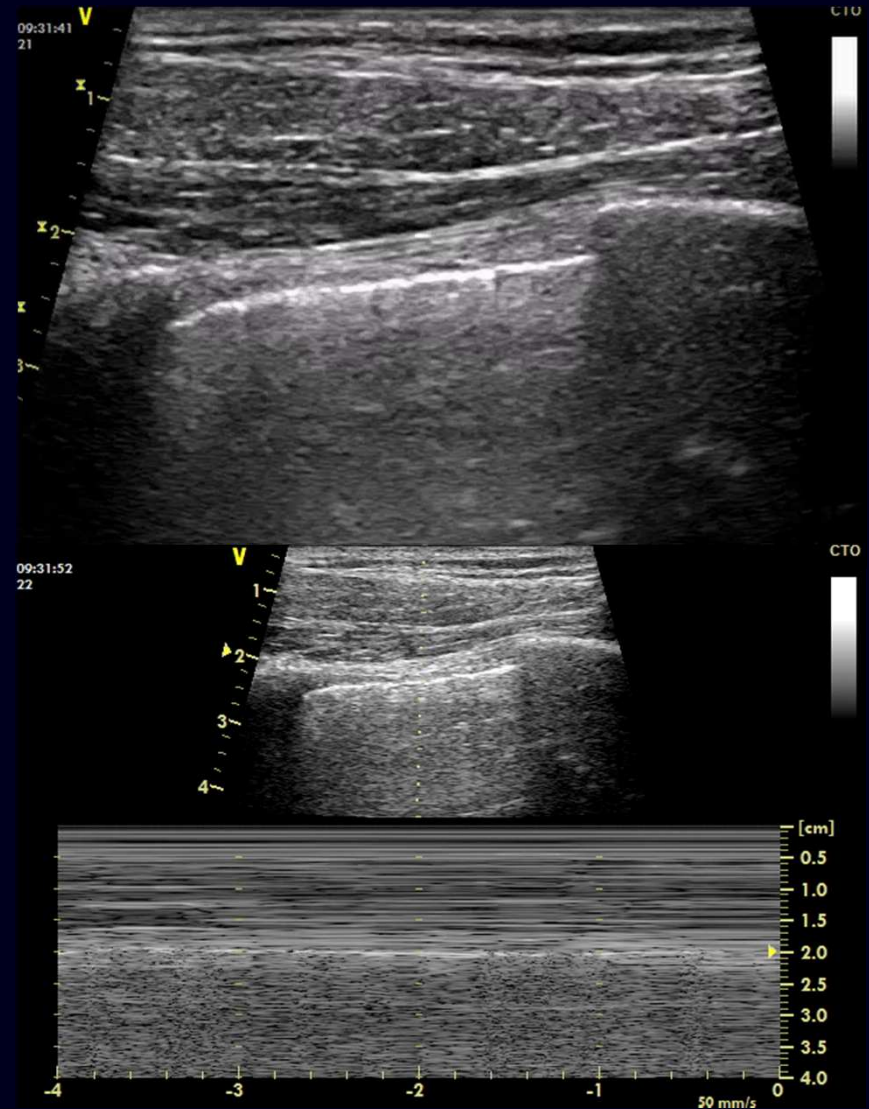
- negativní prediktivní hodnota 98-100%
- ...ale pozitivní prediktivní hodnota irelevantní

# LUNG POINT

## PNEUMOTORAX

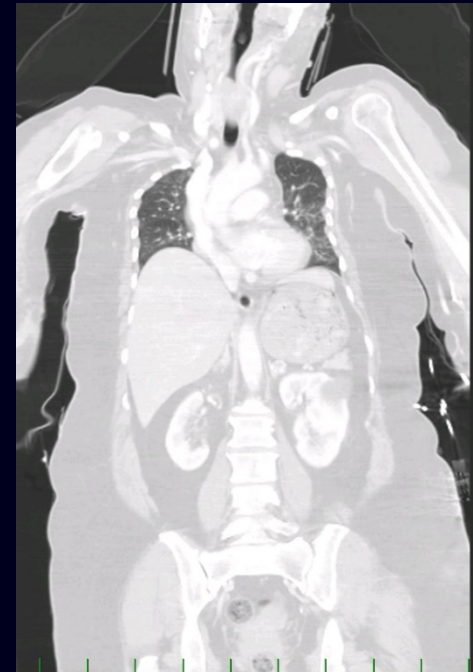


## ZDRAVÁ PLÍCE



# CASE 1

- 53letá žena, spolujezdec vpředu, DN – náraz do pravého boku
- polytrauma (fraktura femuru dx, fraktura lopatky dx, fraktura 7. žebra dx, sériová fraktura žeber sin)

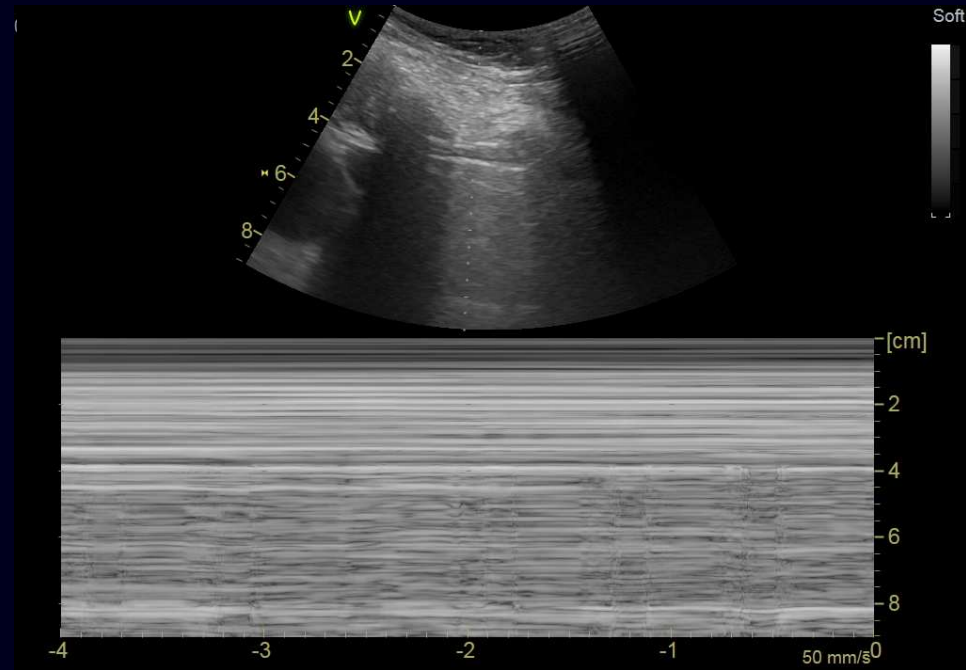
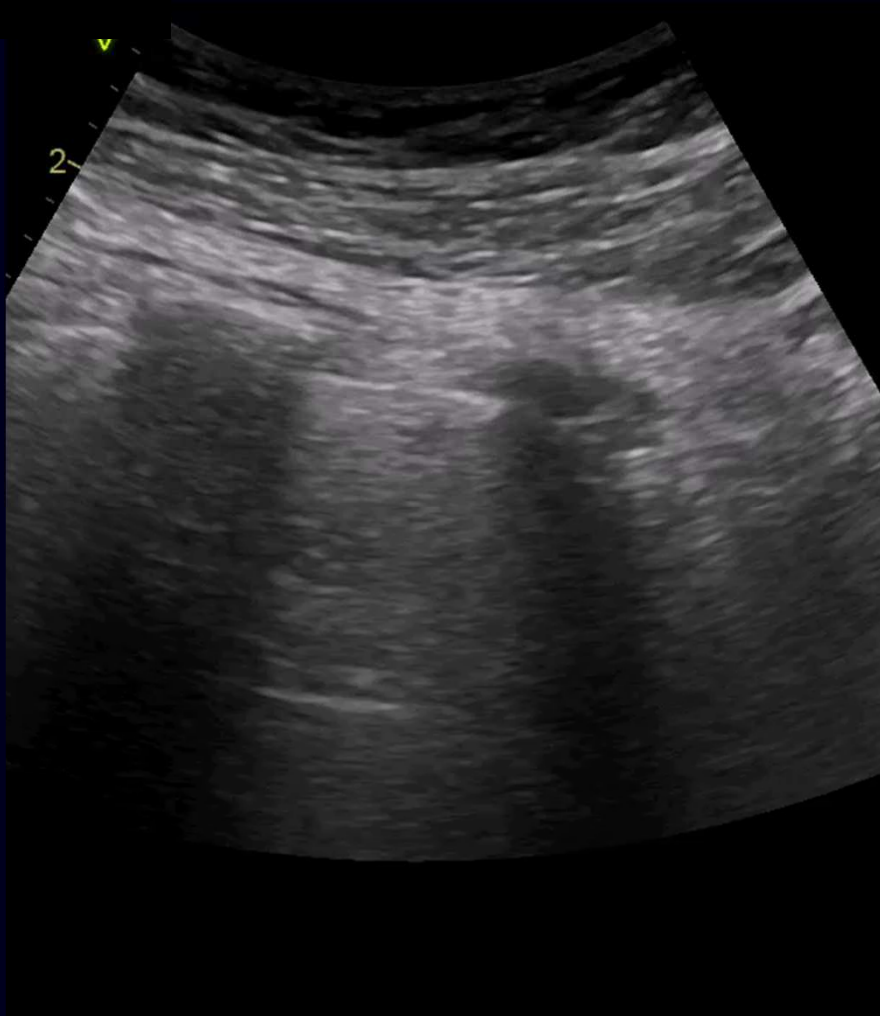




# ***CASE 1***

- **urgentní osteosyntéza humeru, ponechána na UPV, za několik hodin selfextubace**
- **záhy poté rozvoj akutního respiračního selhání**
- **kontuze plíce?**
- **aspirace?**
- **poranění DC při selfextubaci?**
- **hemotorax?**
- **pneumotorax?**

# CASE 1



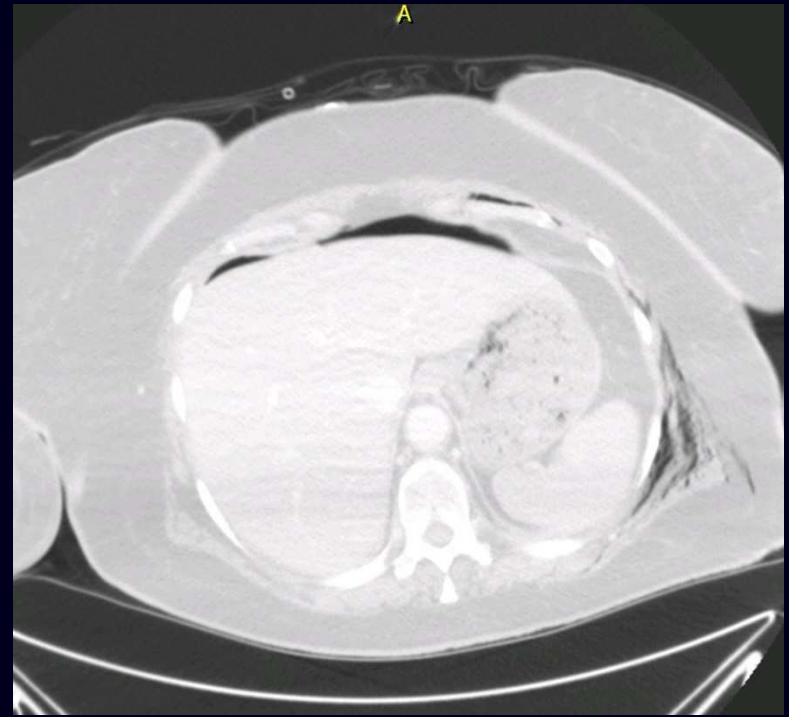
■ pneumothorax?

# CASE 1



- pneumotorax vlevo
- hrudní drenáž, úprava stavu

# CASE 1

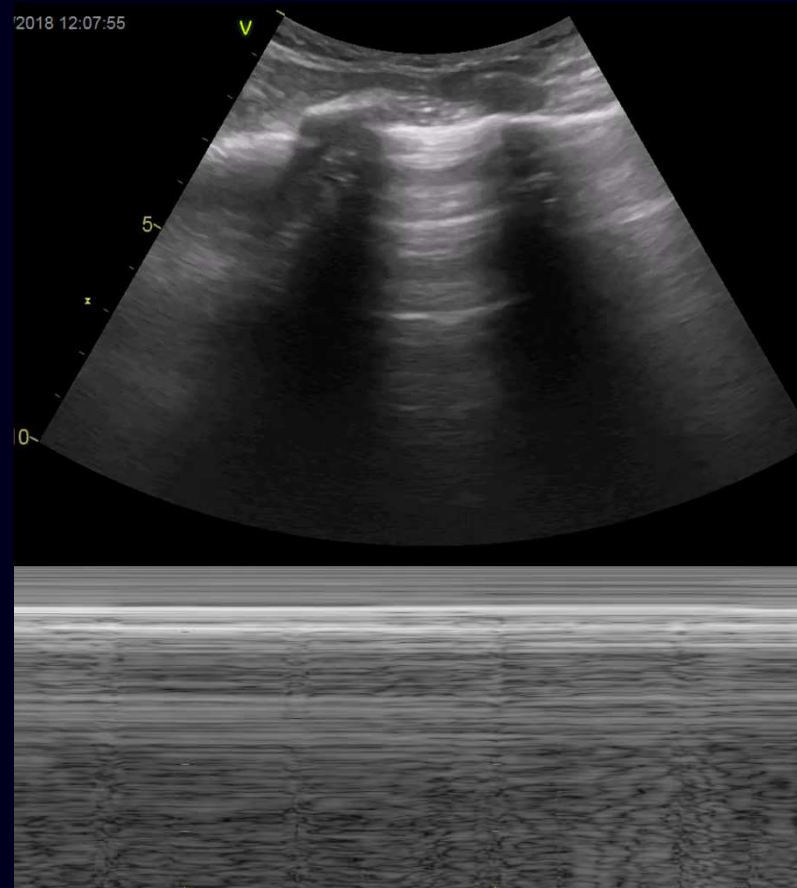
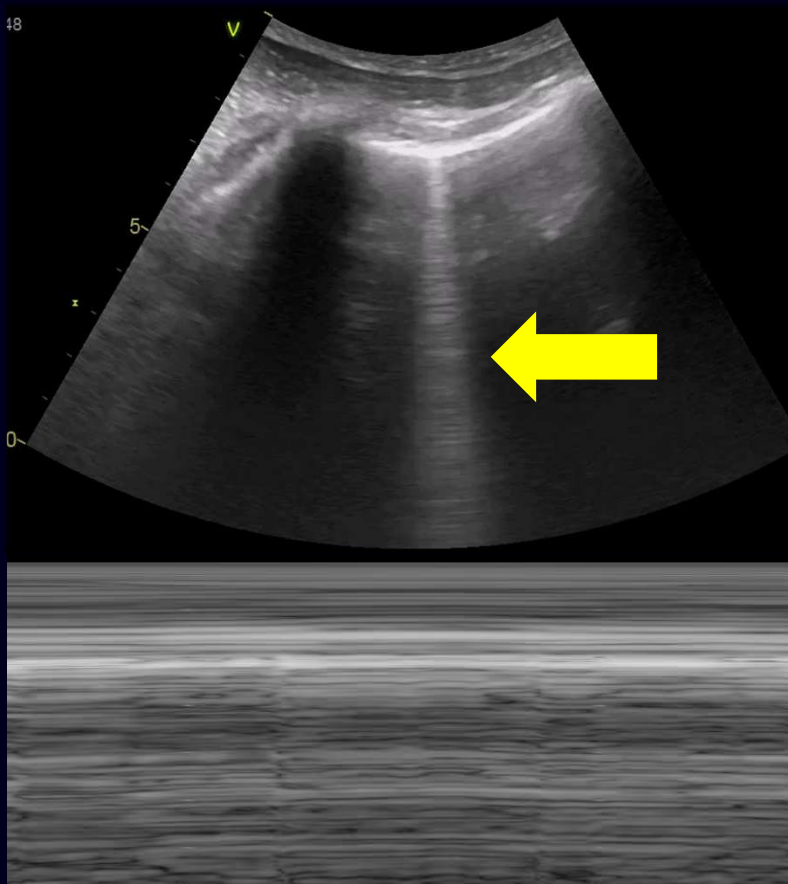


■ pneumoperitoneum

# CASE 2

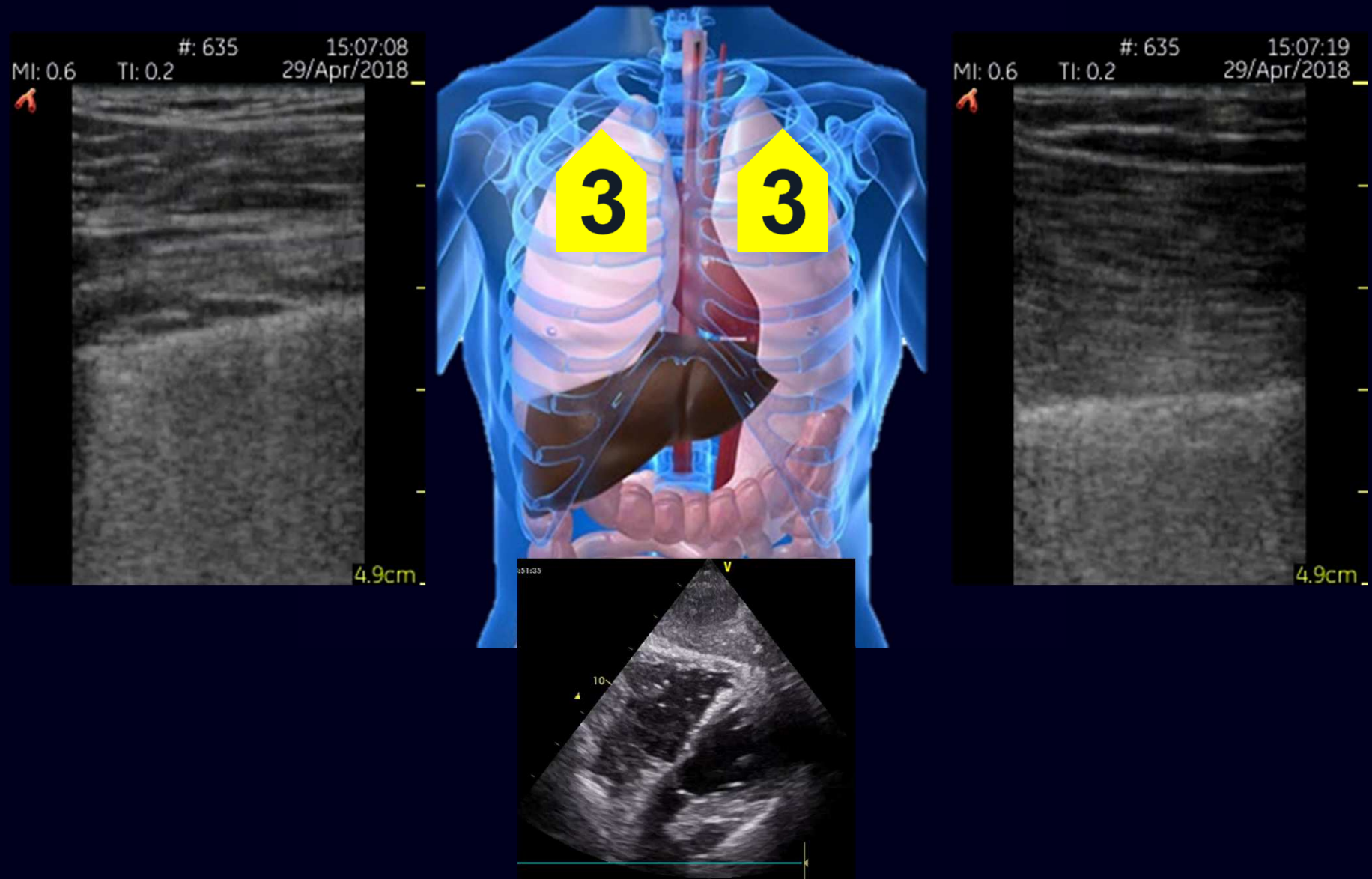
■ 60letý muž, polytrauma, st.p. UPV

■ dušnost na JIP



■ pneumotorax? **...ne** ...kontuze plíce, atelektáza

# TIP 2 (TRACE U KPR)

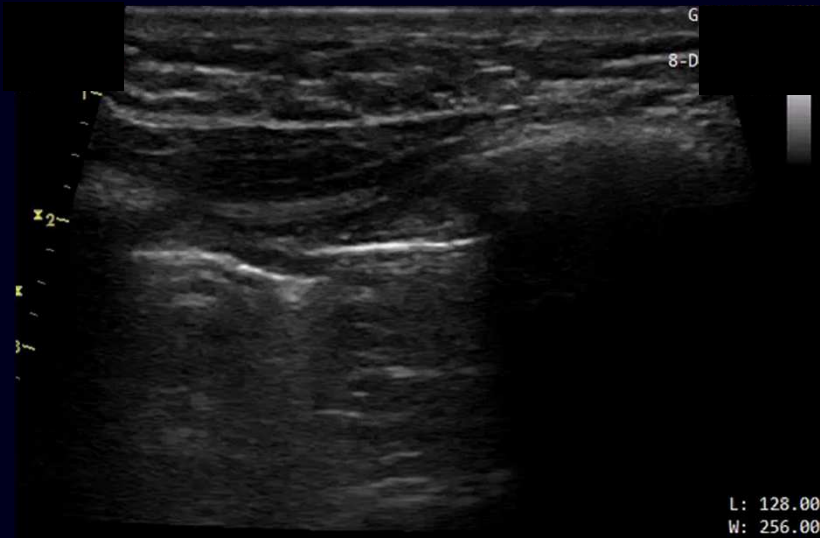


# ***CASE 3***

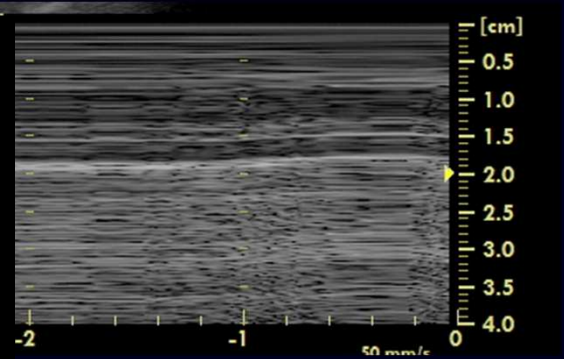
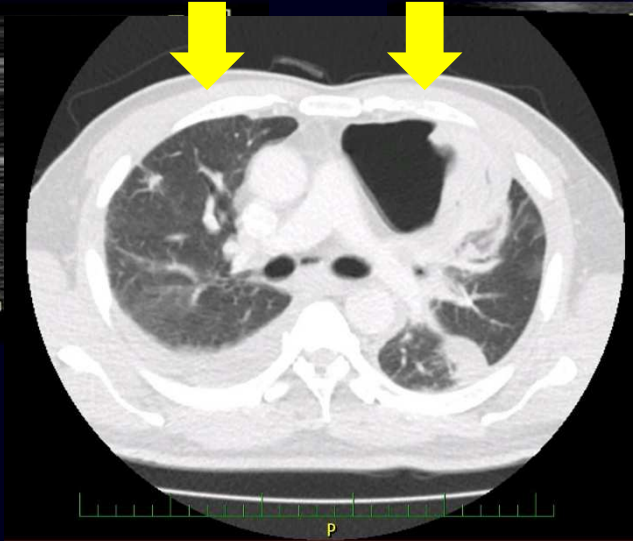
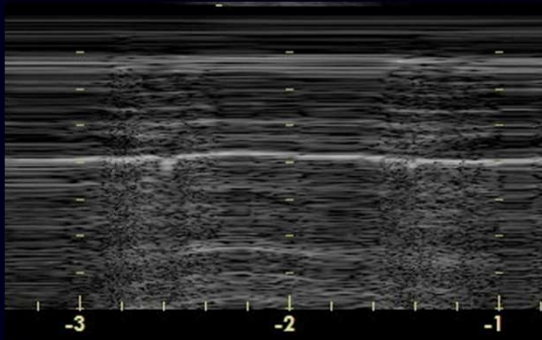
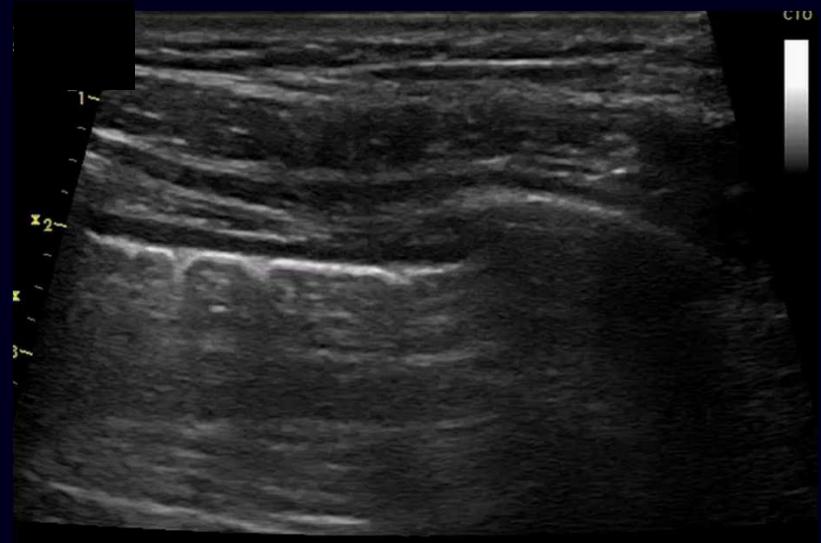
- 58 let, muž
- rozpadová pneumonie bilat.
- komplikováno STEMI apikálně

# CASE 3

**PRAVÁ PLÍCE**



**LEVÁ PLÍCE**



■ žádný  
pneumotorax

■ pneumotorax

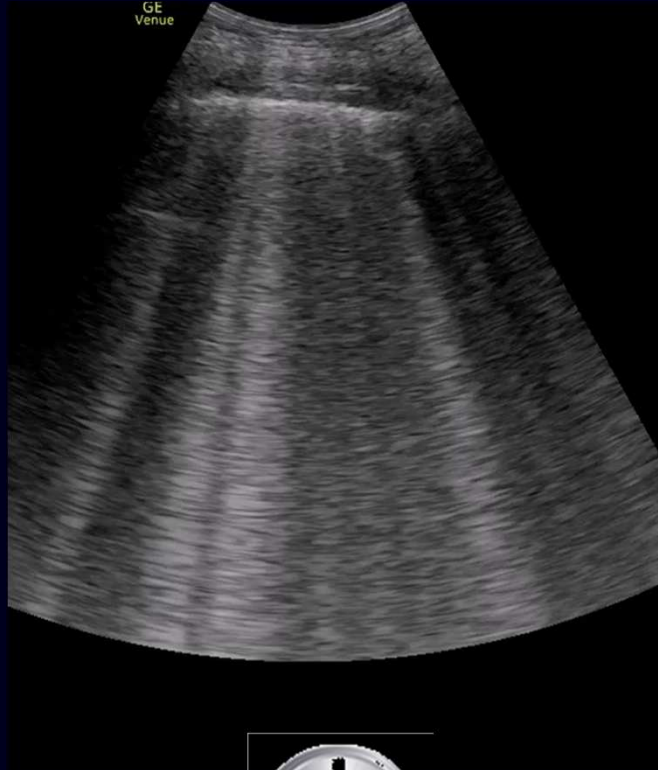


# TIP 3

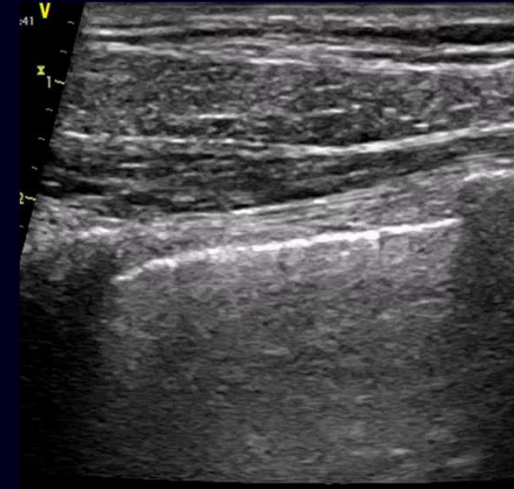
**KARDIOLOGICKÁ**



**KONVEXNÍ**



**LINEÁRNÍ**



# ***POCUS PLEURY A PLIC***

- není zlatý standard diagnostiky pneumotoraxu, tím je CT
- senzitivita < specificita, a záleží na klinické situaci
- nutné hodnotit všechny známky pneumotoraxu
- absence slidingu a přítomnost B/Z linií mají pouze negativní prediktivní hodnotu (téměř 100%), ale jsou velmi užitečné
- u traumat nenahrazuje RTG metody
- **zůstává ale silným diagnostickým nástrojem, který zrychluje dg a omezuje RTG diagnostiku**

***Děkuji za pozornost***

***skulec@email.cz***