

EAMS/ESA Copenhagen June 2018

The pearls of...

[Airwaymanagement.dk](http://airwaymanagement.dk)

Ultrasound evaluation of the airway

Workshop by **Zofia Piosik** and **Michael Kristensen**

Michael Seltz Kristensen,
Rigshospitalet,
Copenhagen, Denmark

airwaymanagement.dk

Conflict of interest declaration

WHAT	to this topic
Grants/research support/P.I.	
Employee	
Consultation fees	
Honoraria	
Speakers bureau	
Company sponsored	
Stock shareholder	
Spouse/partner	
Scientific Advisory Board	
Other	

None relevant to this topic

Suggested reading:

Insights into Imaging (2014) 5:253-279.



Insights Imaging
DOI 10.1007/s13244-014-0309-5

REVIEW

Ultrasonography for clinical decision-making and intervention in airway management: from the mouth to the lungs and pleurae

Michael S. Kristensen • Wendy H. Teoh • Ole Graumann •
Christian B. Laursen



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Insights
into Imaging

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A grayscale ultrasound image of a human airway, showing the internal structure of the trachea and bronchi. The text is overlaid on this image.

Ultrasound....

...Why 1?

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- Emergency Anterior-Neck oxygenation by anaesthetists:

Only 36% success !!





[Airwaymanagement.dk](http://www.Airwaymanagement.dk)

www.AirwayManagement.dk

Kristensen MS, Teoh WH et al: Anaesthesia 2016

The structured stepwise approach

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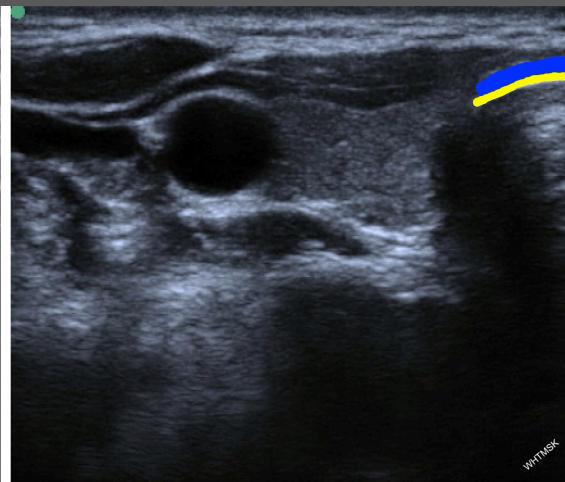


Teoh WH, Kristensen MS. *Anaesthesia* 2014
Kristensen MS. Teoh WH et al, *Anaesthesia* 2016
Kristensen MS. *Acta Anaesthesiol Scand* 2011



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Step 2

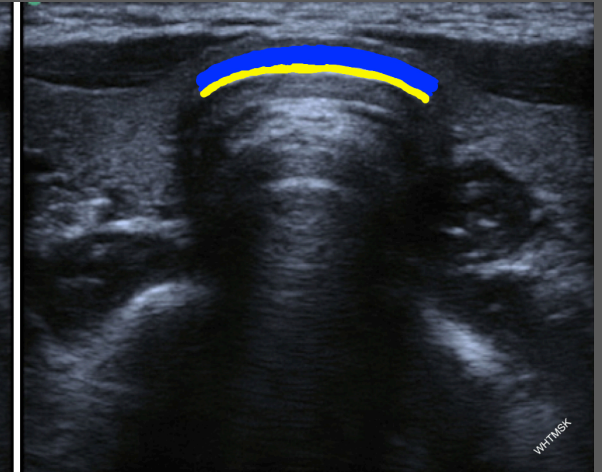


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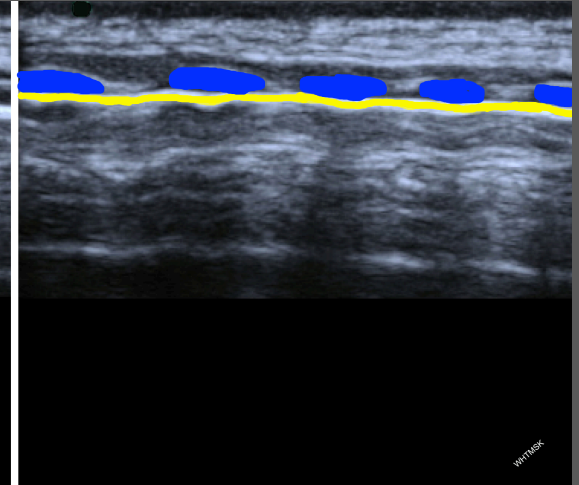
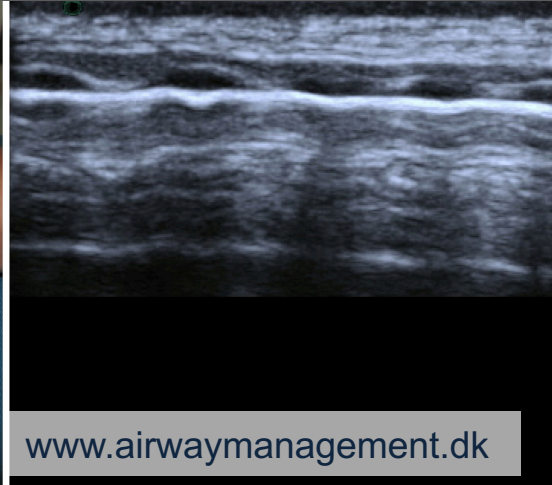
Step 1



Teoh WH, Kristensen MS. *Anaesthesia* 2014
Kristensen MS. Teoh WH et al, *Anaesthesia* 2016
Kristensen MS. *Acta Anaesthesiol Scand* 2011

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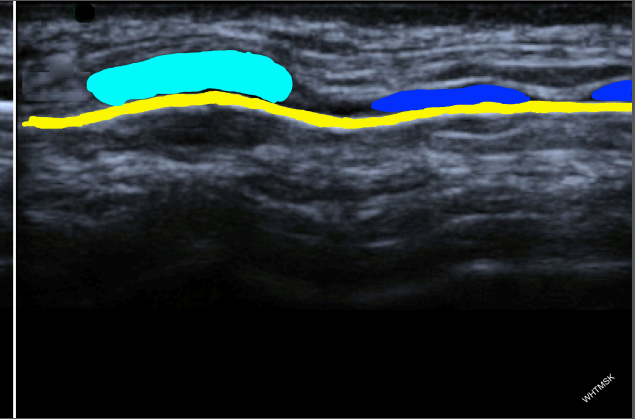
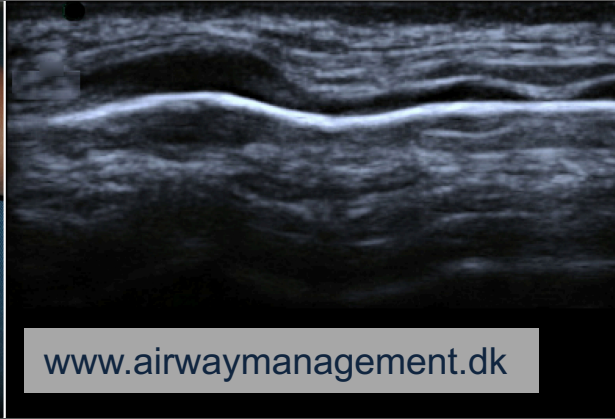
String Of Pearls Step 3



Teoh WH, Kristensen MS. *Anaesthesia* 2014
Kristensen MS. Teoh WH et al, *Anaesthesia* 2016
Kristensen MS. *Acta Anaesthesiol Scand* 2011

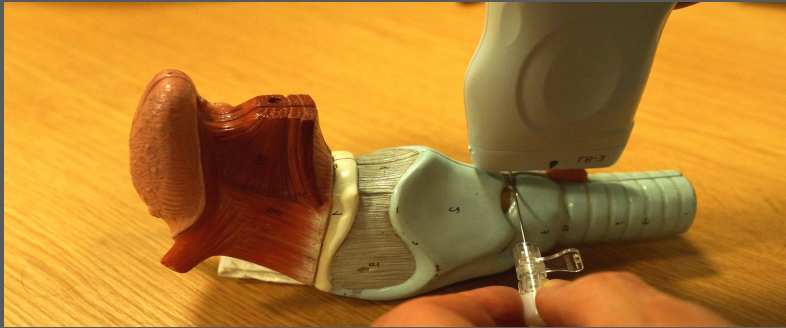
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String Of Pearls Step 4



Teoh WH, Kristensen MS. *Anaesthesia* 2014
Kristensen MS. Teoh WH et al, *Anaesthesia* 2016
Kristensen MS. *Acta Anaesthesiol Scand* 2011

Step 5



Teoh WH, Kristensen MS. *Anaesthesia* 2014
Kristensen MS. Teoh WH et al, *Anaesthesia* 2016
Kristensen MS. *Acta Anaesthesiol Scand* 2011

Step 6



Teoh WH, Kristensen MS. *Anaesthesia* 2014
Kristensen MS. Teoh WH et al, *Anaesthesia* 2016
Kristensen MS. *Acta Anaesthesiol Scand* 2011

Structured approach to ultrasound-guided identification of the cricothyroid membrane: a randomized comparison with the palpation method in the morbidly obese



M. S. Kristensen*, W. H. Teoh, S. S. Rudolph, M. F. Tvede, R. Hesselfeldt, J. Børglum, T. Lohse,

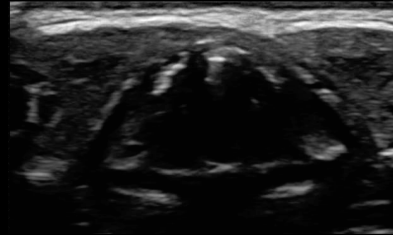
	Palpation method	ultrasound-guided	P-value
Success	13/35 = 37% (95% CI 21-55%)	29/35 = 83% (95% CI 66-93%)	0.0008
Time (s)	18 (5-45)	48 (26-112)	

Kristensen MS, Teoh WH, Rudolph S, et al. *BJA*, 2015

Ultrasound Improves Cricothyrotomy Success in Cadavers with Poorly Defined Neck Anatomy

A Randomized Control Trial

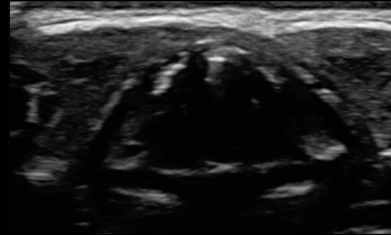
Naveed Siddiqui, M.D., M.Sc., Cristian Arzola, M.D., M.Sc., Zeev Friedman, M.D., Laarni Guerina, M.D., Kong Eric You-Ten, M.D., F.R.C.P.C.



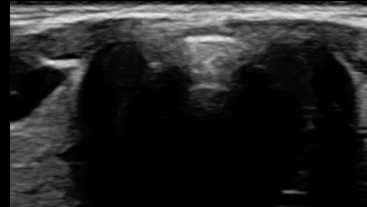
Thyroid cartilage

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Kristensen MS, Teoh WH, Rudolph SS et al. Anaesthesia 2016



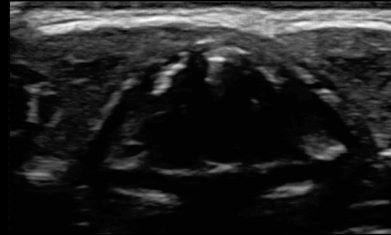
Thyroid cartilage



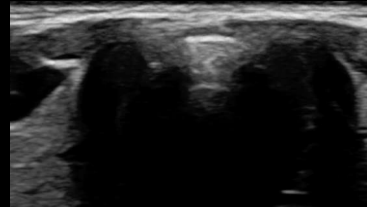
Airline (= CTM)

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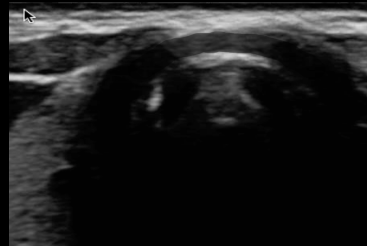
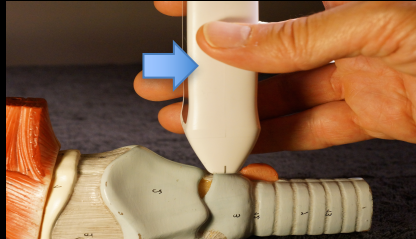
Kristensen MS, Teoh WH, Rudolph SS et al. Anaesthesia 2016



Thyroid cartilage



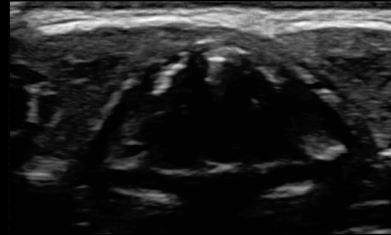
Airline (= CTM)



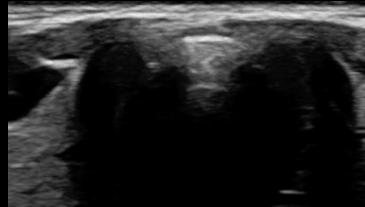
Cricoid cartilage

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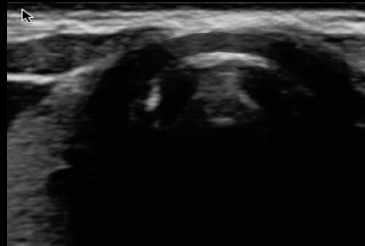
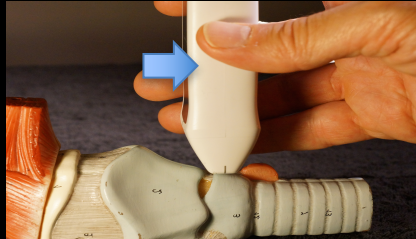
Kristensen MS, Teoh WH, Rudolph SS et al. Anaesthesia 2016



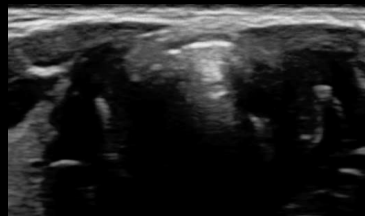
Thyroid cartilage



Airline (= CTM)



Cricoid cartilage



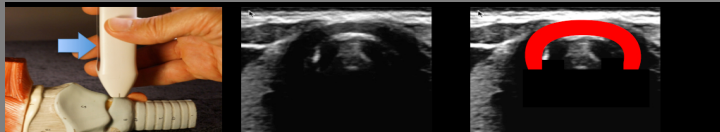
Airline (= CTM)

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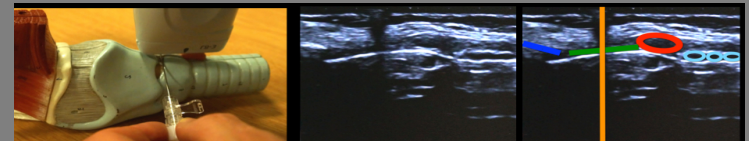
Kristensen MS, Teoh WH, Rudolph SS et al. Anaesthesia 2016

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Successful identification of the Cricothyroid membrane in the morbidly obese:



- 90 % (CI 77-97 %)

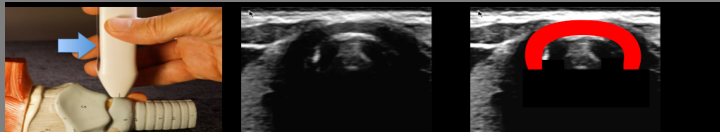


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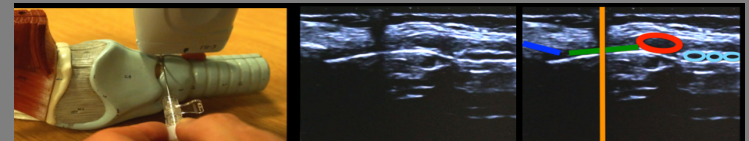
Kristensen MS, Teoh WH, Rudolph SS et al. Anaesthesia 2016

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The time to correct identification of the Cricothyroid Membrane:



- 24 s [9-69]

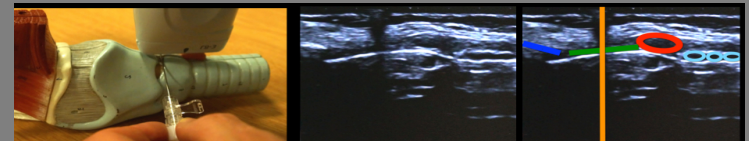
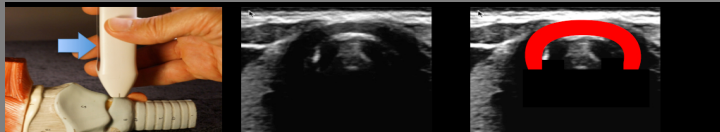


- 38 s [15-83] ($p=0.00026$)

Kristensen MS, Teoh WH, Rudolph SS et al. Anaesthesia 2016

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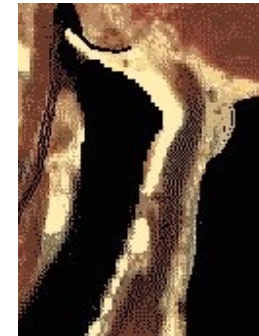
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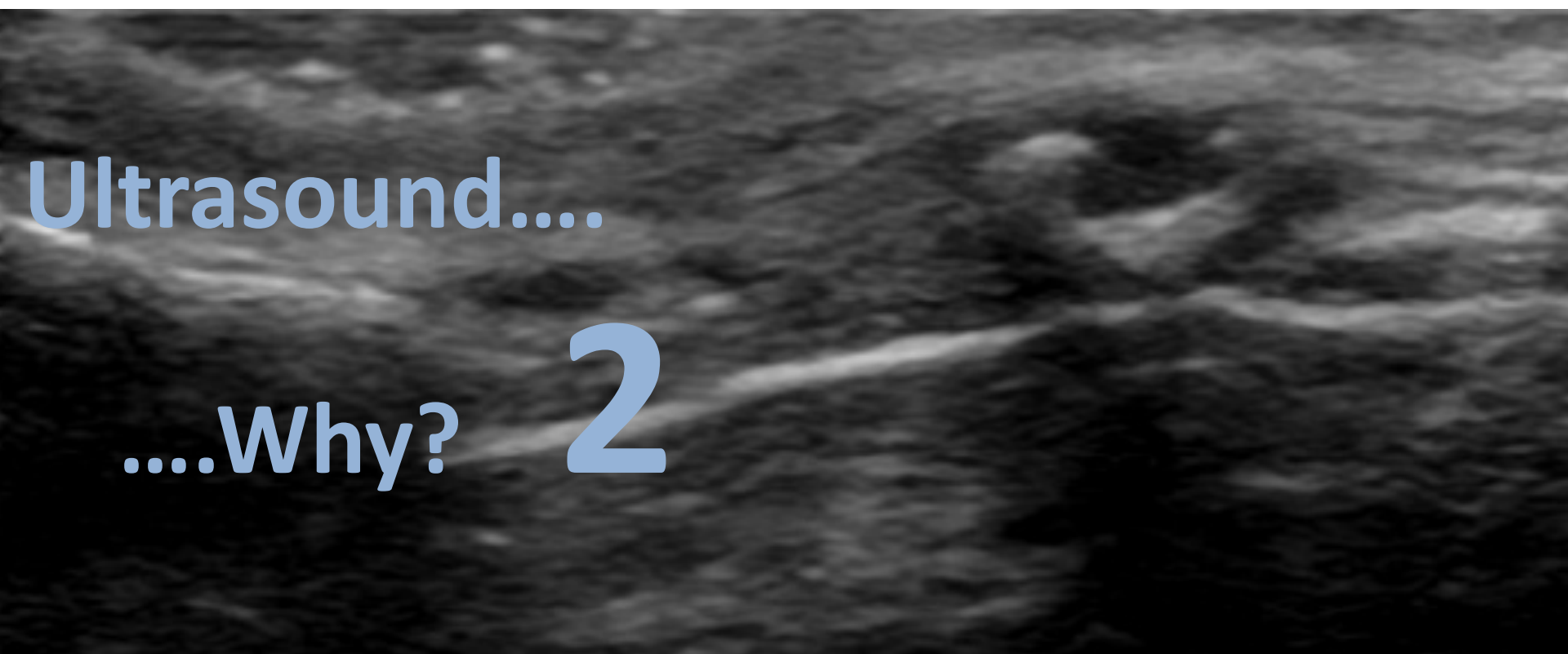


Success with at least one of the techniques in
100 % (CI 92-100 %)

Kristensen MS, Teoh WH, Rudolph SS et al. Anaesthesia 2016

- Identify the cricothyroid membrane **before** induction in all patients
 - Look! - Will often be sufficient
 - Palpate if necessary
 - If still in doubt: Supplement with ultrasonography

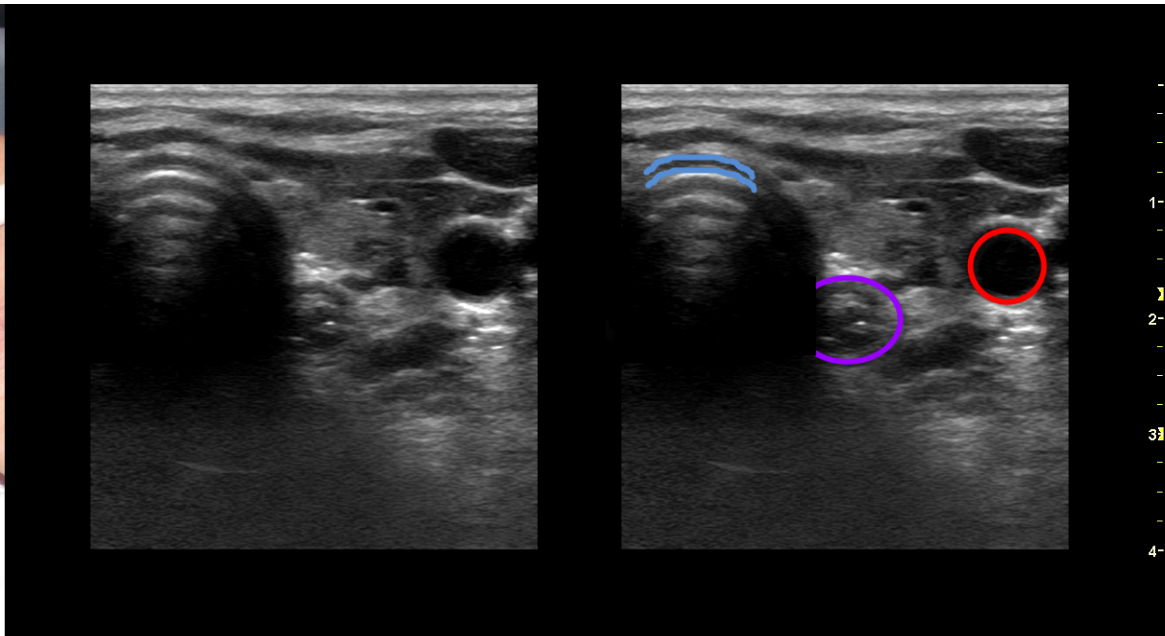




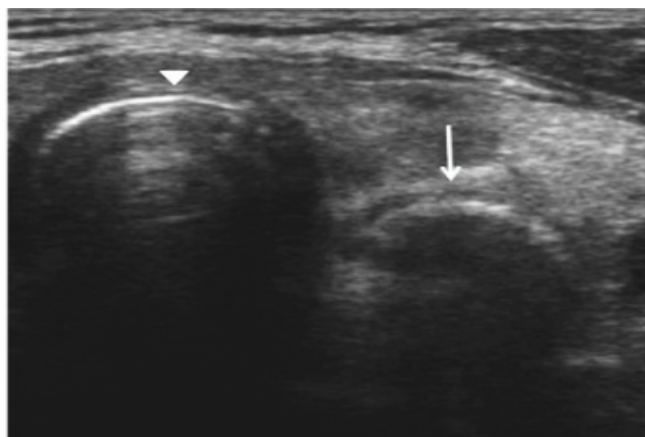
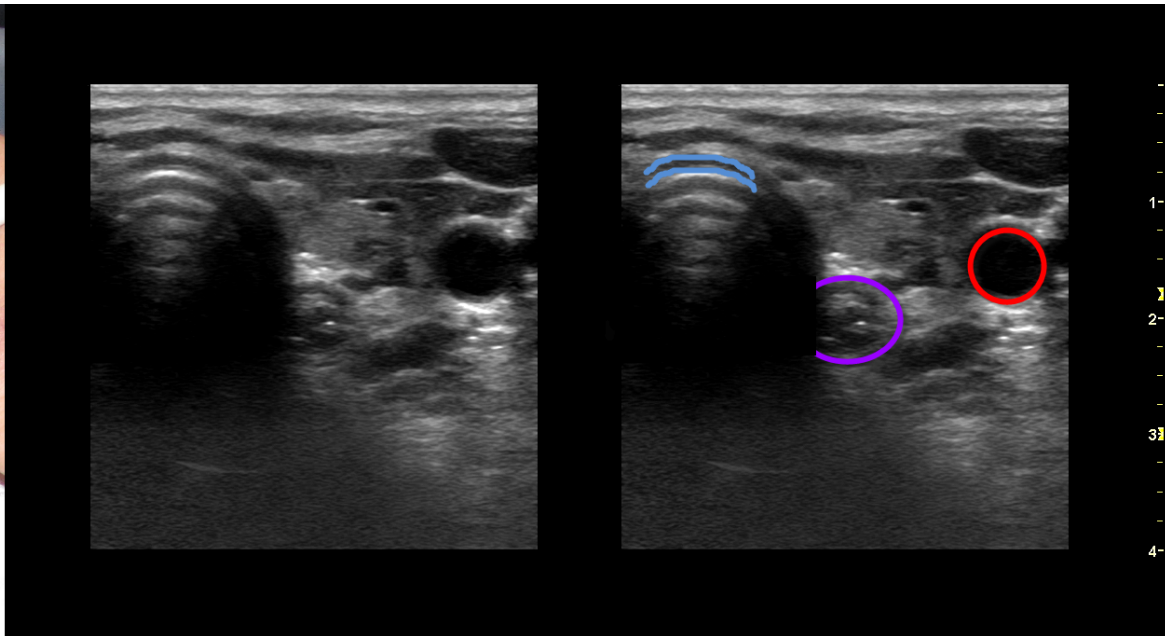
Ultrasound....

....Why? 2

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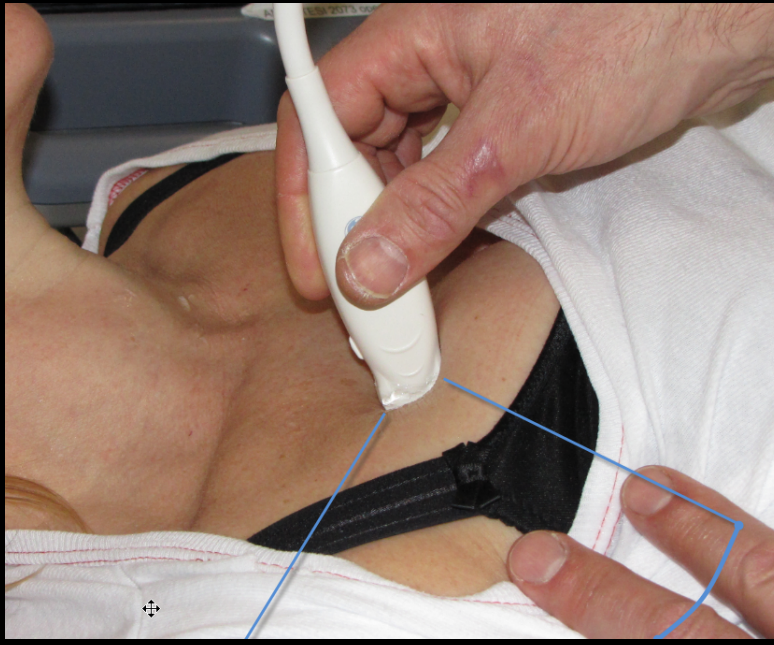


Ultrasound....

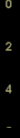
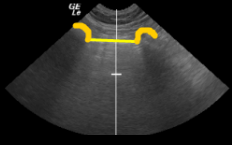
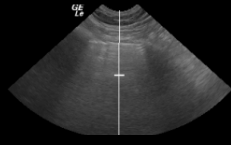
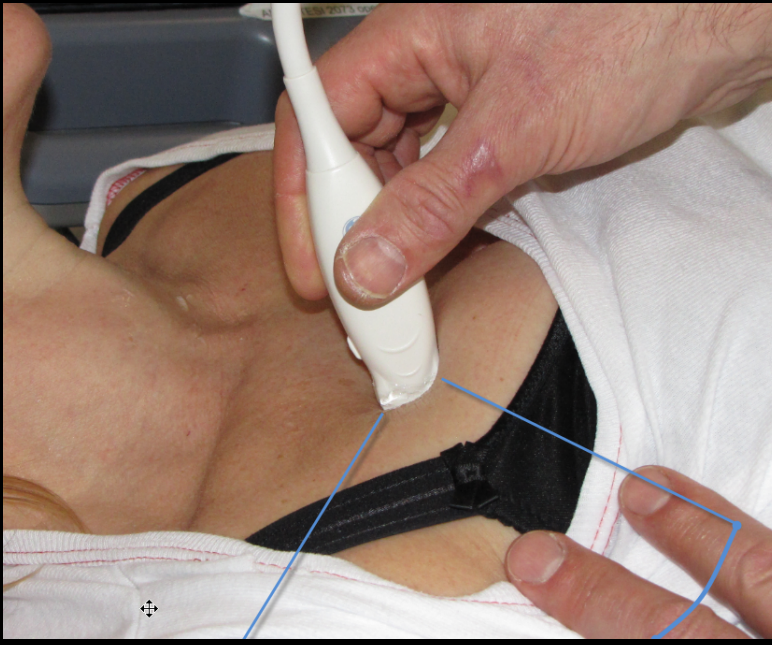
....Why? 3

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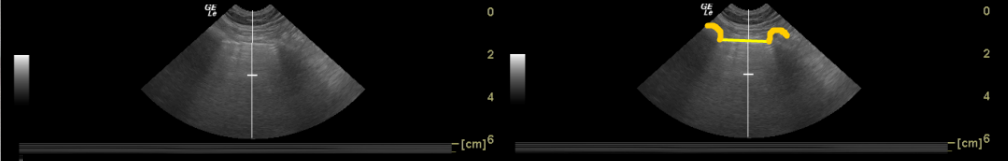
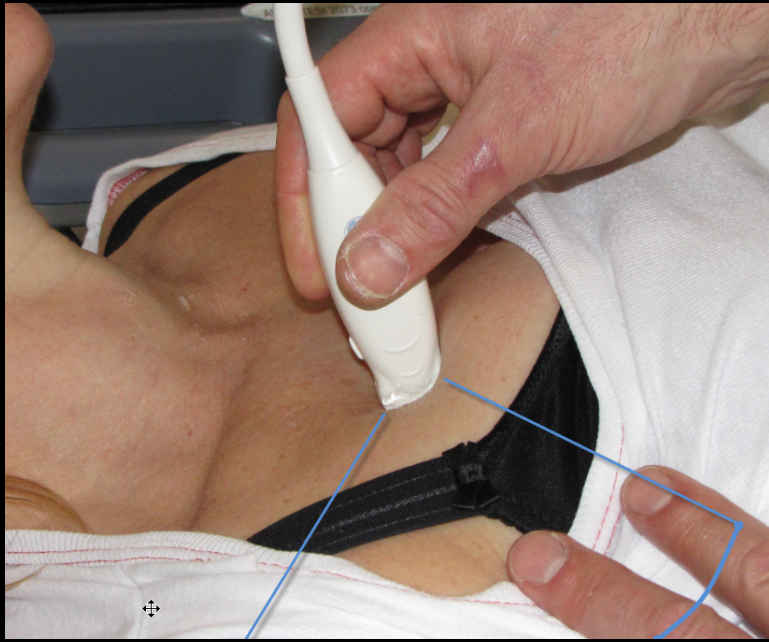


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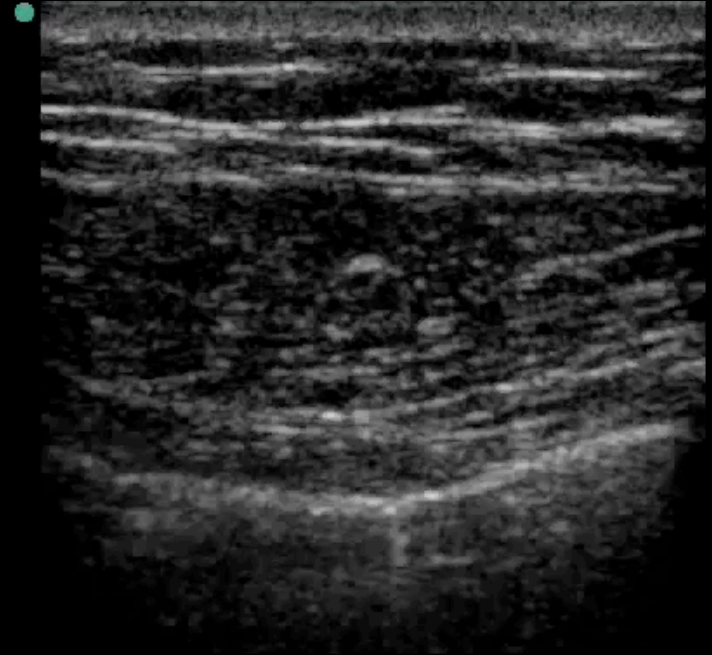


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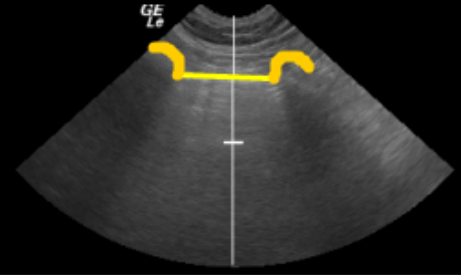
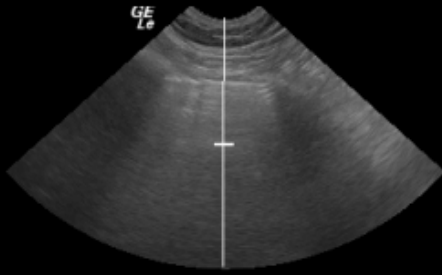
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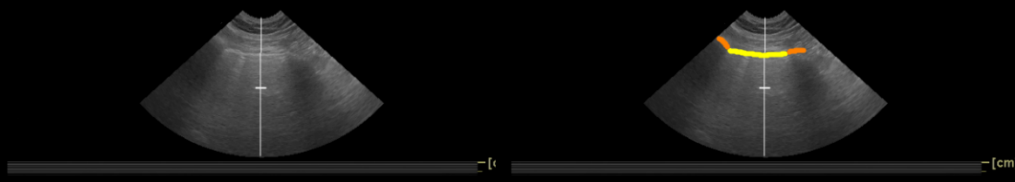
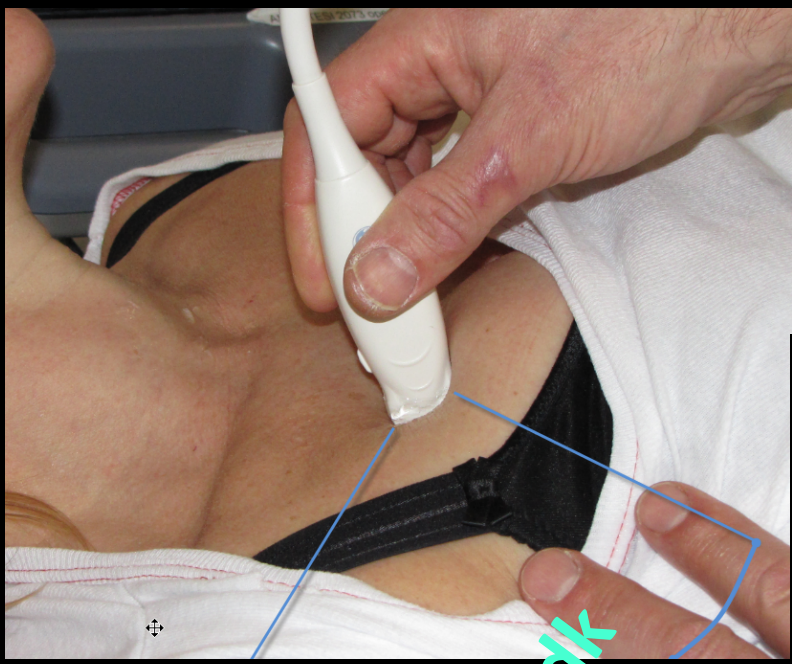


Normal breathing/ventilation

"Sliding lung"

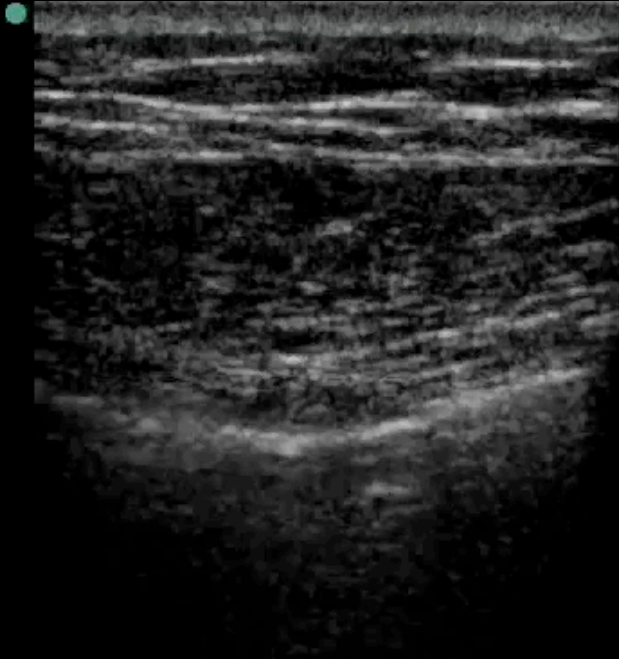
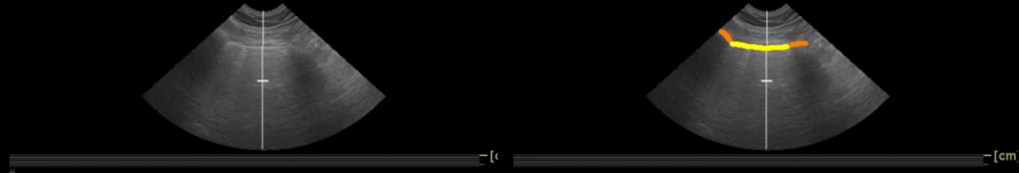
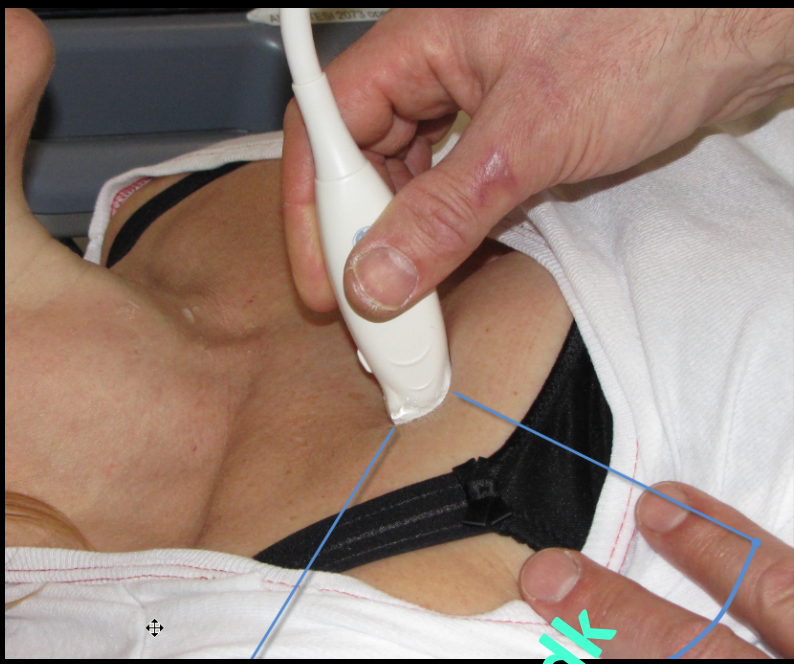
"Seashore sign"

"Sandy beach sign"



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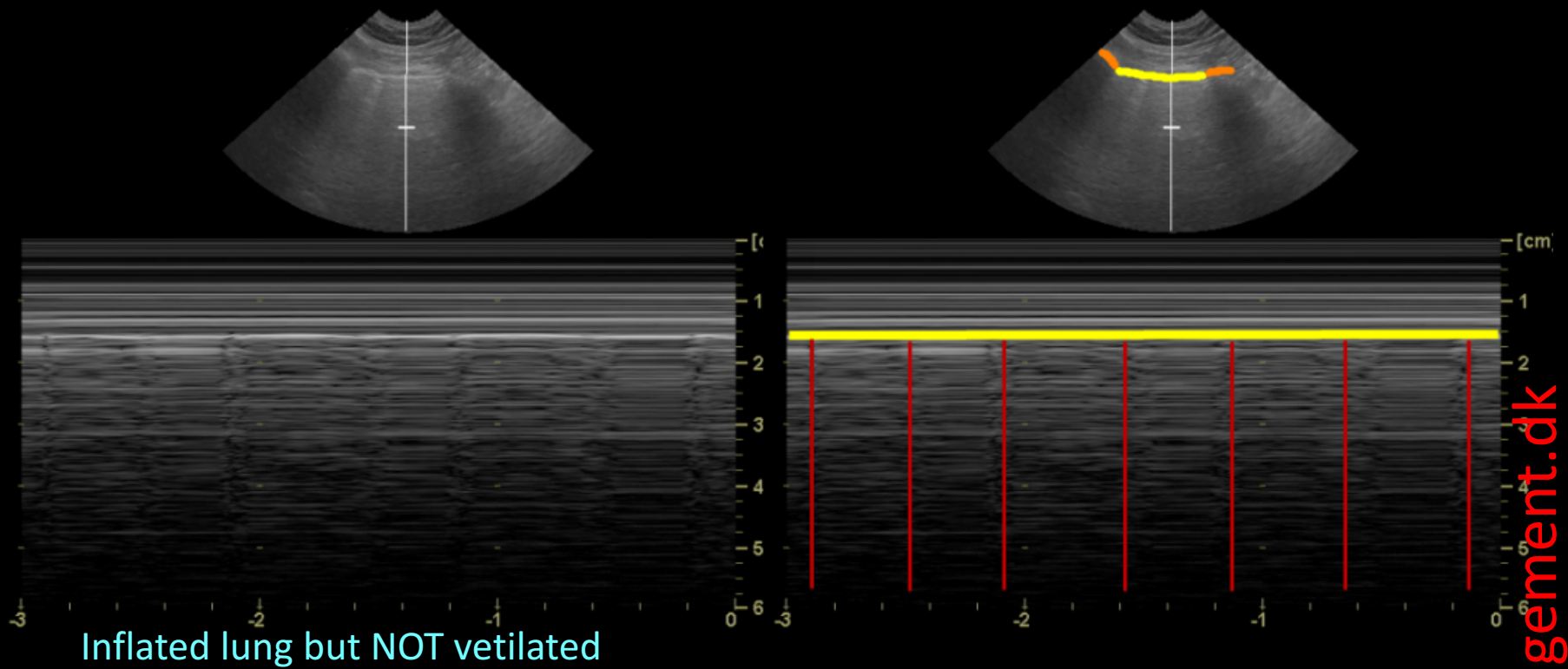
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Now: Hands on....

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