**QUIZ 1st April 2020 (answers below)**

1. **What does a pneumothorax look like on lung ultrasound?**

2. **What are B lines on lung ultrasound?**

3. **What are A lines on lung ultrasound?**

4. **How do you detect a pleural effusion?**

5. **Describe and interpret the following blood gas.**

# RADIOMETER ABL800 FLEX

ABL827 Emergency
PATIENT REPORT  Syringe - S 250uL  Sample #  67543

## Identifications

| | |
|---|---|
| Patient ID | |
| Patient Last Name | |
| Patient First Name | |
| Sex | Female |
| Sample type | Venous |
| *T* | 37.0 °C |
| $FO_2(I)$ | 21.0 % |
| PEEP | cmH2O |
| Pressure Support | cmH2O |
| SIMV | Rate |
| Liter Flow | L/min |
| Note | |
| Operator | |
| Accession No. | |

## Blood Gas Values

| | | | | |
|---|---|---|---|---|
| ↑ pH | **7.605** | | [ 7.350 - 7.450 ] |
| $pCO_2$ | **43.6** | mmHg | [ 32.0 - 45.0 ] |
| ↓ $pO_2$ | **19.2** | mmHg | [ 75.0 - 105 ] |

## Oximetry Values

| | | | | |
|---|---|---|---|---|
| ↑ *c*tHb | **179** | g/L | [ 115 - 165 ] |
| ↓ $sO_2$ | **28.9** | % | [ 95.0 - 99.0 ] |
| *F*COHb | **1.2** | % | [ 0.0 - 1.5 ] |
| *F*MetHb | **0.5** | % | [ 0.0 - 1.5 ] |

## Electrolyte Values

| | | | | |
|---|---|---|---|---|
| ↓ $cNa^+$ | **118** | mmol/L | [ 137 - 146 ] |
| ↓ $cK^+$ | **2.6** | mmol/L | [ 3.5 - 5.0 ] |
| ↓ $cCa^{2+}$ | **0.91** | mmol/L | [ 1.15 - 1.30 ] |
| ↓ $cCl^-$ | **63** | mmol/L | [ 98 - 106 ] |

## Metabolite Values

| | | | | |
|---|---|---|---|---|
| *c*Glu | **7.5** | mmol/L | [ 3.0 - 7.8 ] |
| ↑ *c*Lac | **2.9** | mmol/L | [ 0.0 - 2.2 ] |
| *c*Crea | **49** | µmol/L | [ 40 - 90 ] |

## Calculated Values

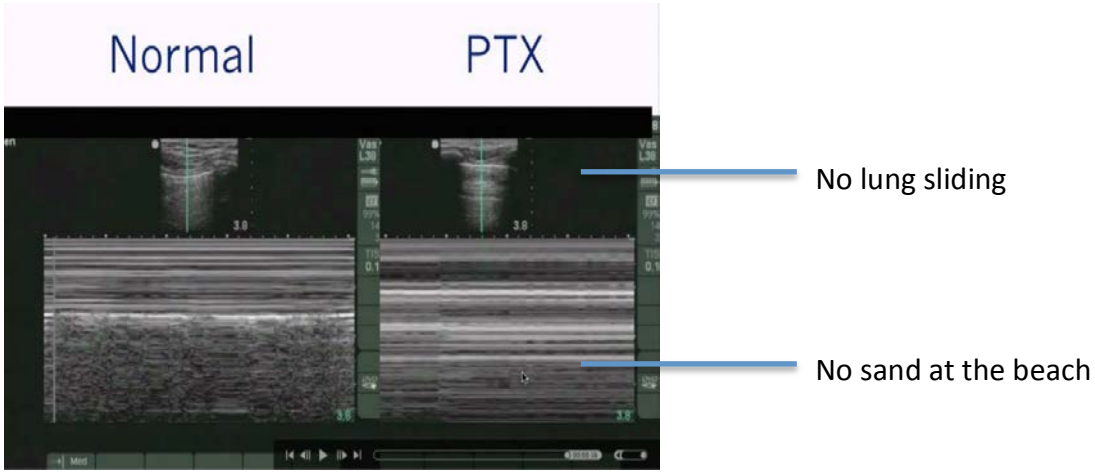
| | | | | |
|---|---|---|---|---|
| $ABE_C$ | **18.5** | mmol/L | [ - ] |
| $cHCO_3^-(P)_C$ | **43.7** | mmol/L | [ - ] |

## Notes

| | |
|---|---|
| ↑ | Value(s) above reference range |
| ↓ | Value(s) below reference range |
| *c* | Calculated value(s) |
| | 0293: Warning: HbF detected and compensated for |

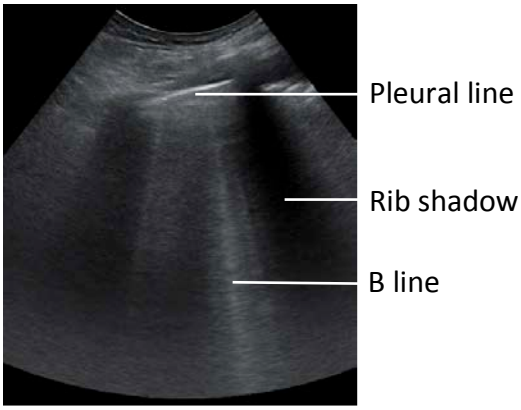
**QUIZ answers 1st April 2020**

1. **What does a pneumothorax look like on lung ultrasound?**

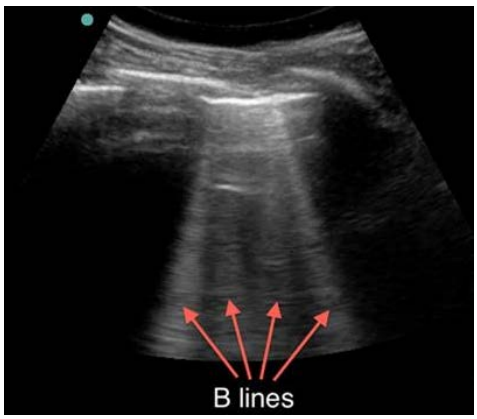



2. **What are B lines on lung ultrasound?**

*B lines are vertical hyperechoic lines that do not fade with increasing image depth.*
*B lines start at the pleural line and extend indefinitely. B lines move with lung sliding.*
*B lines represent an artifact generated by the juxtaposition of alveolar air and septal thickening (from fluid or fibrosis).*
*One or two B lines per field of view can be normal, especially in the elderly or the bases of the lungs. More frequent B lines can indicate pulmonary oedema, contusion, fibrosis or consolidation.*



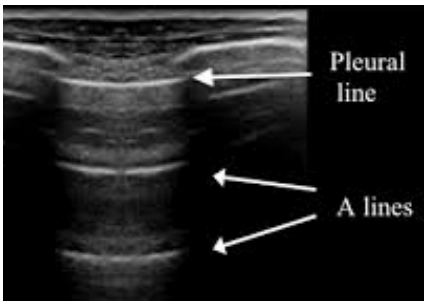

Normal




Not Normal

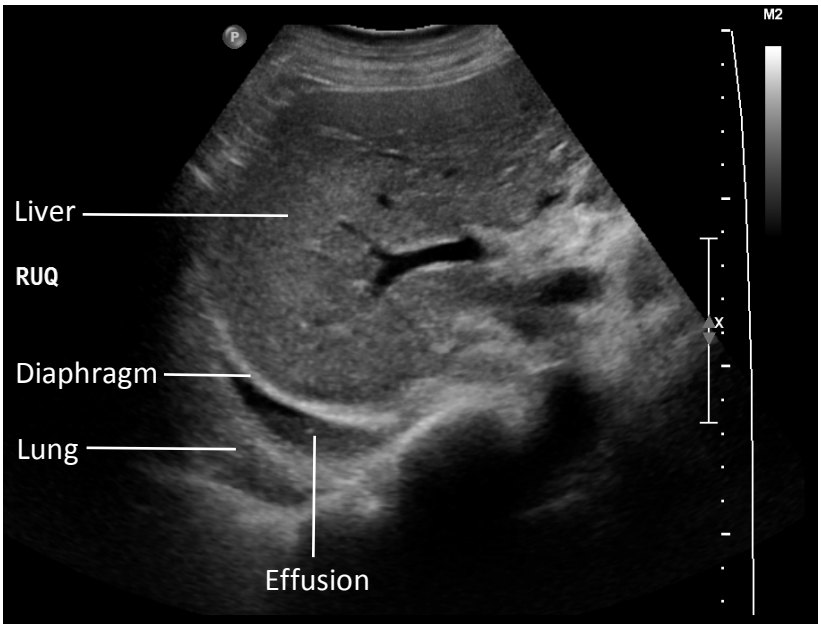
### 3. What are A lines on lung ultrasound

*Air below the pleural line reflects most US back to the transducer. This is itself a reflector, meaning some of the US waves will bounce back and forth between the pleura and transducer generating artifacts called A lines. A lines are horizontal lines below the pleura with the same spacing as the distance between the probe and the pleural line. Because they demonstrate the presence of air below the pleura, they are present both in normal lungs and in pneumothorax.*




### 4. How do you detect a pleural effusion?

*Up to 500mL pleural fluid is easily missed on CXR but can be detected with ultrasound! Effusions are dependent due to gravity, so the fluid collects inferoposteriorly in a supine patient. The fluid can be seen between the diaphragm and the lung posterolaterally where the lung floats on top of the effusion.*



**5. Describe and interpret the following blood gas.**

| | | | |
|---|---|---|---|
| *pH* | *7.605* | | *Alkalosis* |
| *$pCO_2$* | *43.6* | *mmHg* | *Hypercarbia - compensation for a metabolic alkalosis*<br>*$pCO_2$ rises 0.5 - 0.7mmHg for 1mmol/L rise in $HCO_3$*<br>*In this case rise in bicarbonate is 43.7 – 24 = 19.7*<br>*$pCO_2$ should be 40 + (19.7 x 0.5) = 49.9 mmHg*<br>*Here $pCO_2$ 43.6 mmHg so compensation is partial* |
| *$pO_2$* | *19.2* | *mmHg* | *Venous sample* |
| *Hb* | *179* | *g/L* | *Increased* |
| *Na* | *118* | *mmol/L* | *Hyponatraemia* |
| *K* | *2.6* | *mmol/L* | *Hypokalaemia* |
| *iCa* | *0.91* | *mmol/L* | *Hypocalcaemia* |
| *Cl* | *63* | *mmol/L* | *Hypochloraemia* |
| *Glu* | *7.5* | *mmol/L* | *Normal* |
| *Lact* | *2.9* | *mmol/L* | *Slightly elevated* |
| *Creat* | *49* | *umol/L* | *Normal* |
| *ABE* | *18.5* | *mmol/L* | *Base is very much in excess* |
| *$HCO^3$* | *43.7* | *mmol/L* | *Consistent with metabolic alkalosis* |

➔ *Metabolic alkalosis*

*The blood gas belongs to a patient with an eating disorder*
*Metabolic acidosis initiated by chronic diuretic misuse +/- vomiting*
*Hypokalaemia maintains the alkalosis*

Metabolic requires an initiation factor. Then, because the kidneys are usually excellent at excreting excess bicarbonate, there needs to be something that impairs kidney function in order to maintain the alkalosis.

| | | |
|---|---|---|
| Initiation factors | Bicarbonate gain | Endogenous - ketone metabolism |
| | | Exogenous – antacids, sodium bicarb, citrate |
| | Acid loss | Renal – diuretics, mineralocorticoid, hypercalcaemia |
| | | GIT – vomiting gastric acids, NG suction |
| | | Hyperventilation in compensated hypercapnia |
| Maintenance factors | Chloride depletion | |
| | Hypokalaemia | |
| | Decreased GFR | |
| | Mineralocorticoids | |