April 2018 Critical Care Case of the Month

Clement U. Singarajah, MD

Phoenix VA Medical Center
Phoenix, AZ USA

History of Present Illness

A 70-year-old man was admitted for shortness of breath (SOB) secondary to a "COPD exacerbation/ILD". A pulmonary consult was placed for possible interstitial lung disease (ILD). A thoracic CT scan for pulmonary embolism showed no embolism and no obvious ILD. He was treated for a COPD exacerbation with the usual therapy of antibiotics, steroids, nebulized bronchodilators and oxygen. He started to improve.

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A few days later as he was preparing for discharge, the patient suddenly decompensated becoming more SOB (*once more proving that this a dangerous time for patients in hospital*). There were reports that this began after he choked and perhaps aspirated on some food and drink. His blood pressure remained stable, but he became tachycardic to 130 beats/min, hypoxic on 100% non-rebreathing mask with saturations of 92%. Obvious clinical acute respiratory failure was present. The patient was started on non-invasive ventilation but continued to deteriorate. He was deemed too unstable to obtain a CT scan. EKG showed sinus tachycardia. The patient was transferred to the ICU for respiratory failure. A chest x-ray was obtained (Figure 1).

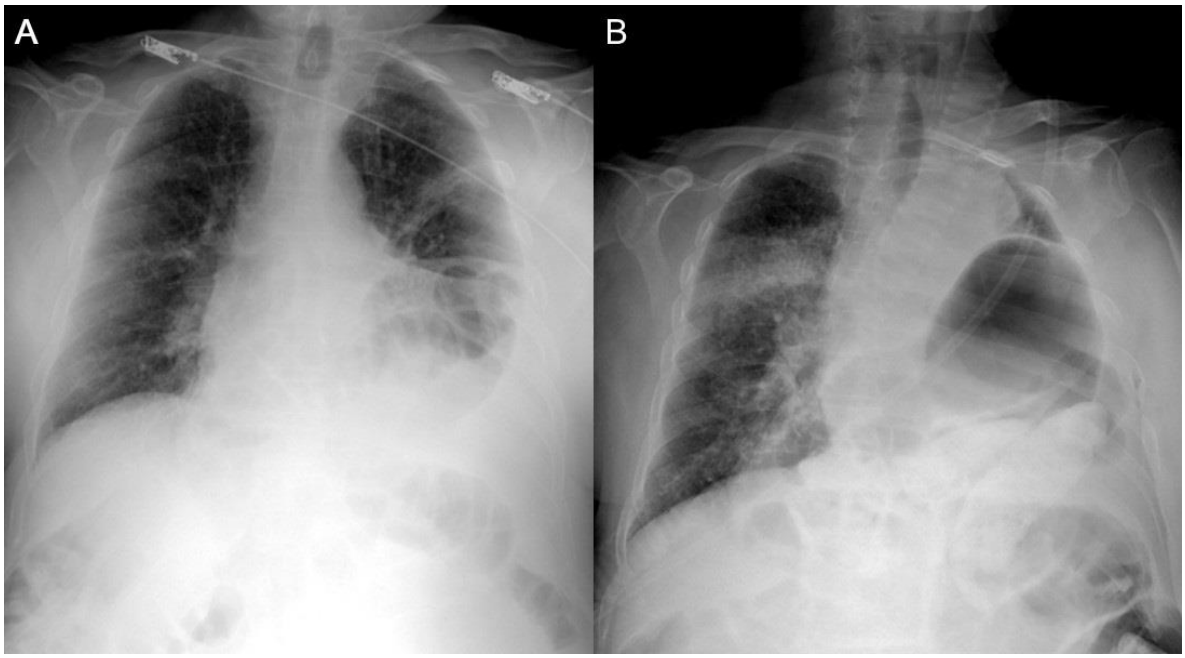

Figure 1. Panel A: Admission chest x-ray which was interpreted as not different from the patient's previous chest x-ray. Panel B: Portable chest x-ray taken shortly after initiation of non-invasive ventilation just after arrival in the intensive care unit.

The portable chest x-ray taken in the ICU shows a new right-sided consolidation and ***which of the following***?

1. Left pleural effusion and a loculated pneumothorax with tension physiology
2. Left pneumothorax with tension physiology
3. Left pneumothorax without tension physiology
4. Left sided tension hydropneumothorax
5. None of the above

Correct!
5. None of the above

There is a density with air in the left chest. It could potentially be a loculated pneumothorax but is unusual in appearance. The patient did not improve on non-invasive ventilation and continued to have a SpO2 in the upper 80's.

Which of the following should be ***done at this time***?

1. Bronchoscopy
2. Intubation
3. Nasogastric tube
4. 1 and 3
5. All of the above

Correct!
5. All of the above

The patient is clinically in respiratory failure and needs a secure airway. The patient was left on non-invasive ventilation until intubation could be performed using a rapid sequence intubation sequence. Only one attempt was required. A nasogastric tube was placed immediately after intubation and revealed greenish stomach contents and about 400 mL of contents which was rapidly removed.

A portable chest x-ray was performed about 5 minutes after intubation (Figure 2).

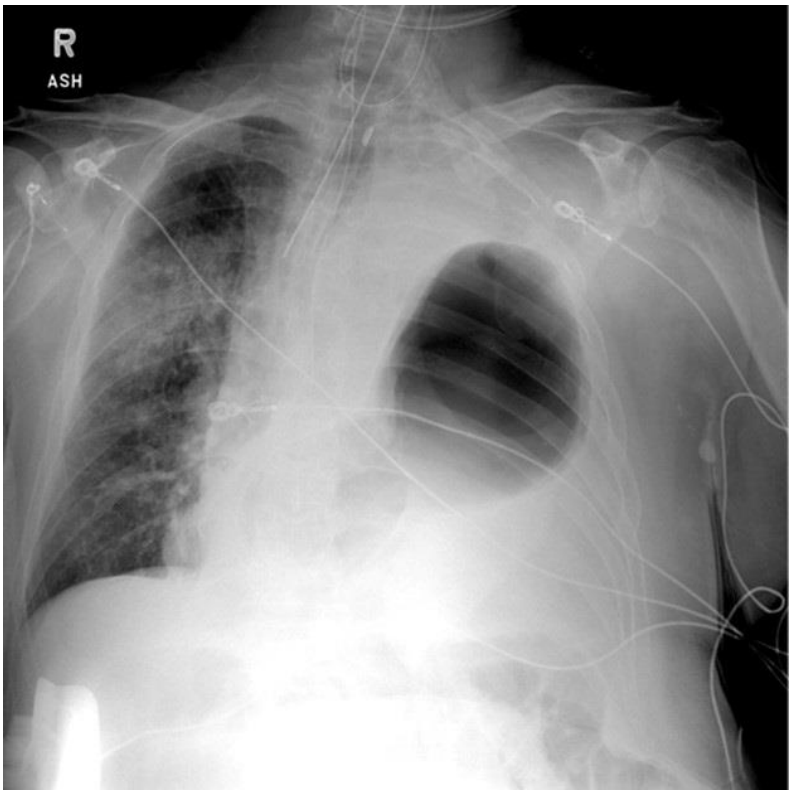

Figure 2. Portable chest x-ray t taken 5 minutes after intubation.

A bronchoscopy was performed which showed significant external compression of the left main stem and shift of the main carina to the patient's right side. The compression of the left main stem was about 90% but it was possible to flush saline and pass the bronchoscope through into the left lung. All segments on left side were visualized but all segments showed distorted architecture and signs of external compression. Moderate secretions were aspirated from the left side after the bronchoscope was passed deeper, but there was no obvious mucous plugging anywhere in the left lung. The right lung showed some green tinged aspirate and had thicker secretions, again without mucous plugging. This was most marked in the RUL. The patient tolerated the procedure well.

A portable chest x-ray was taken after the bronchoscopy (Figure 3).

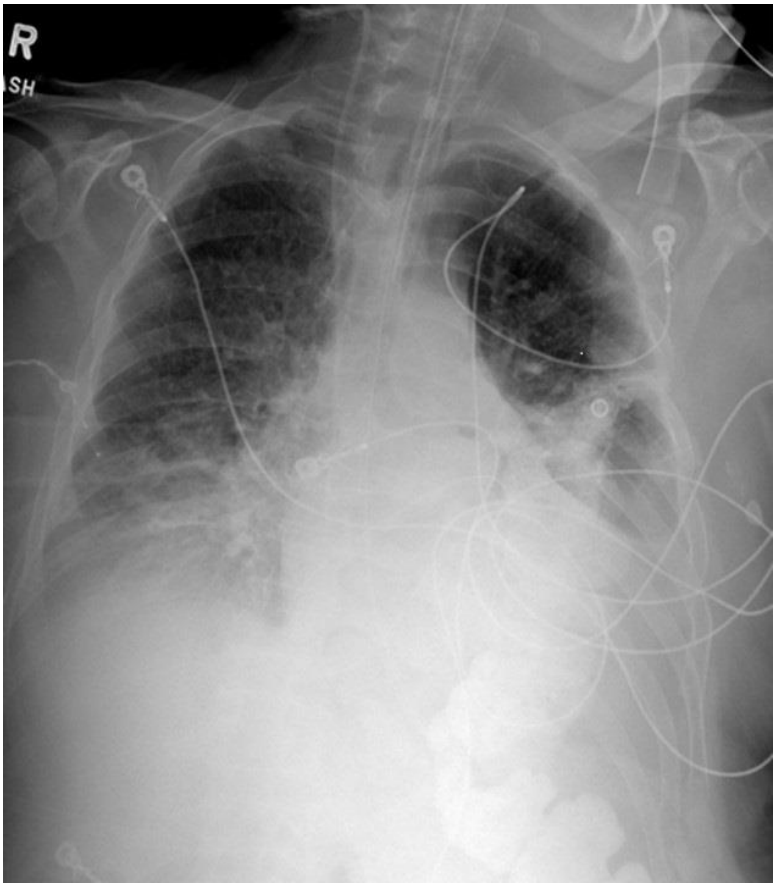

Figure 3. Portable chest x-ray taken after bronchoscopy.

What is the most likely ***explanation for the air*** in the patient's chest seen in Figures 1B and 2?

1. Diaphragmatic hernia
2. Pneumothorax with movement of air into the peritoneal space
3. Rapidly resolving pneumothorax
4. Ruptured pneumatocele
5. Skin fold with air trapping

Correct!
1. Diaphragmatic hernia

There is air in the left lung which spontaneously resolved. Of the choices listed, only a diaphragmatic hernia is reasonable. Based on the sequence of events it seems likely that the non-invasive ventilation may have inflated the gut which slid through a hernia into the chest. Nasogastric tube placement and intubation allowed decompression of bowel and air entry into lung. The bronchoscopy confirmed that the left lung was externally compressed and distorted.

Which of the following would ***confirm the presence of a diaphragmatic hernia***?

1. Esophagogastroduodenoscopy (EGD)
2. Point of contact ultrasound
3. Thoracic CT scan
4. 1 or 3
5. Any of the above

Correct!
3. Thoracic CT scan

A thoracic CT scan was performed (Figure 4).

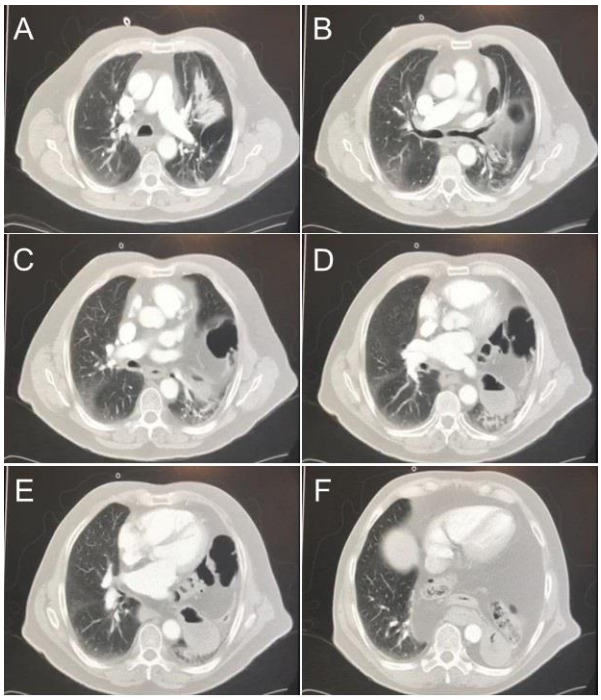

Figure 4. Representative images from the thoracic CT scan showing abdominal contents in the left chest.

Which of the following is (are) a ***type(s) of diaphragmatic hernia***?

1. Bochdaelek hernia
2. Morgagni hernia
3. Paraesophageal hernia
4. 1 and 3
5. All of the above

Correct!
5. All of the above

A diaphragmatic hernia can be congenital or acquired and can be through diaphragmatic foramina – those of Morgagni and Bochdaelek or along the esophageal hiatus (Figure 5).

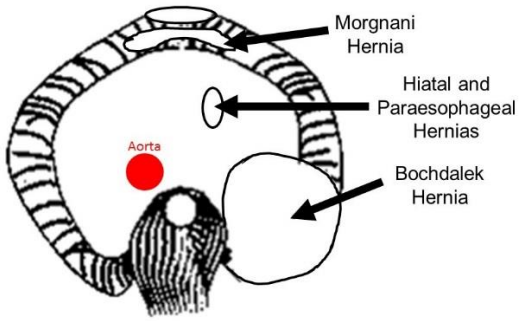

Figure 5. Schematic of the diaphragm showing the locations of diaphragmatic hernias.

Hernias via the foramen of Morgagni are smaller and usually present later in life at the sternocostal angles, whereas the Bochdalek variety are larger and tend to occur posterolaterally.

A hiatal hernia is also a herniation of bowel contents through the diaphragm but are obviously more central and via the esophageal hiatus of the diaphragm. Two types are noted, sliding and paraoesophageal. Hiatal hernias are not usually described as diaphragmatic hernias, but semantically they would seem to fit the definition – a hernia being classically defined as an abnormal protrusion of bowel contents from one body cavity into another.

The literature notes that complications of the paraoesophageal hiatal hernias include strangulation or incarceration as is the case with all hernias. They tend to enlarge with time, age and acquired obesity and surgeons may choose to close them with mesh procedures either laparoscopically or by laparotomy.

It is not inconceivable (*but not in the usage of this word from the famous film, The Princess Bride*), that the external collapse of the left lung helped protect that side from an aspiration. In most cases aspiration is on the right side due to angulation of the left main stem compared to the right.

Non-invasive ventilation can often push air into the stomach which can usually be of little concern. In this case it created significant problems. Placing a chest tube by any methodology would be a problem as that will likely enter his bowel and perforate it which creates obvious problems and would have made the situation

far more fraught for the residents and fellows treating this patient and earned the ire of the surgical or ICU attendings involved in the case.

The Chiladitis sign/syndrome should not be confused with this discussion which is usually a right-sided phenomenon wherein bowel is interposed between liver and diaphragm but can also be seen on the left between spleen and diaphragm.

As far as the author can tell, there are no clear cases of a similar case reported wherein use of non-invasive ventilation caused an acute enlargement of a paraesophageal hernia leading to tension physiology, midline shift, respiratory distress, etc.

The exact terminology to describe is open to discussion – tension hiatal hernia seems reasonable but the term *status aerophagia iatrogenicus* is more melliflous, leaving aside the correct Latin conjugations. The term *status* is used in medicine to implying ongoing uncontrolled issues, as in *status asthmaticus* or *status epilepticus*. *Aerophagia* is self-explanatory, *iatrogenicus* is perhaps the correct Latin conjugation (iatrogenica, vs iatrogenicum etc.?) to imply that this was caused by a well-intentioned medical intervention. Any reader well versed in Latin grammar is invited to correct this or use the last reference to provide input.

The patient is discussing pros/cons of surgical repair with the surgical team since there is a concern for complications such as strangulation or incarceration with ischemia.

References

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