

Aerospace Medicine Clinic

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You are the USAF flight surgeon on call for your medical treatment facility at an Air Base in the Pacific which boasts a high operations tempo. This particular call week has been uneventful with regard to in-flight emergencies, but it is only Wednesday. You get home to your apartment after a busy clinic day and you are ready to relax for the evening. You are about to sit down to enjoy a nice, juicy steak fresh off the grill when the call phone rings.

On the other end of the line, the caller identifies himself as the aircraft commander of an AWACS who is currently midflight during a training mission. As you start to wonder how he is able to call your phone from that altitude, he brings your attention immediately back into focus as he says, "I've got a troop up here who's having trouble breathing." You immediately ask if the patient is conscious and able to speak. The commander gives you an affirmative and then hands the satellite phone to the patient.

Your patient is a 28-yr-old male airborne mission systems operator with no previous medical history. He reports having mild shortness of breath just prior to takeoff about 6 h ago, but states, "I thought I might be starting to get a cold or something." He states that the shortness of breath became progressively worse as they gained altitude and now says, "I feel like my breath is leaving me." As he is speaking, you can hear that he is having an increased work of breathing, as well as difficulty speaking in full sentences. He goes on to tell you that he is having sharp left-sided chest pain with deep inspiration and his dyspnea worsens if he attempts to lay down or exerts himself.

He is 5'6" tall, a nonsmoker, and denies having any fevers, chills, headache, cough, abdominal pain, leg swelling, or neurological symptoms. In addition to no significant past medical history, he also has no family history of cardiopulmonary disease. There has been no rapid decompression and no other crewmembers are experiencing symptoms.

1. What do you think is going on?

- A. Pneumonia
- B. Spontaneous pneumothorax
- C. Pulmonary embolism
- D. Musculoskeletal chest wall pain
- E. Pleurisy

ANSWER/DISCUSSION

1. B. Spontaneous pneumothorax is an uncommon disease, affecting between 1.2 and 6 individuals per 100,000, men more commonly than women.^{2,6,7} It occurs more frequently in young men who are tall and thin and often results from the rupture of a subpleural bleb which was previously asymptomatic.^{4,6,8,12} Risk of spontaneous pneumothorax is also significantly increased in smokers.² Though the patient had no risk factors for spontaneous pneumothorax other than gender and age, his clinical presentation is most consistent with this diagnosis. This condition is known to occur in USAF aviators, with a total of 153 spontaneous pneumothoraces occurring in 95 patients between 2002 and 2014, several of which occurred in flight.¹¹

2. What is your next course of action?

- A. Tell the patient to hold the phone to his chest so you can attempt to hear breath sounds.
- B. Give the phone to another crewmember and walk them through a telemedicine physical exam.
- C. Tell the patient to put his oxygen mask on 100% flow, but not to gang load.
- D. Tell the patient to put on his oxygen mask and to gang load emergency oxygen.

ANSWER/DISCUSSION

2. C. Given the fact you are conducting telemedicine and unable to examine the patient yourself, you must attempt to narrow the differential diagnosis based on the history alone. Attempting to conduct auscultation of the chest via telephone will not be adequate and a fellow crewmember (in most cases) will have neither the equipment nor the training to perform an adequate physical exam. Additionally, the ambient noise from the airplane could potentially obscure the physical exam even if adequately equipped and trained personnel were aboard.

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Based on your assessment of the information you were able to obtain via telephone, the most likely diagnosis for this patient is a primary spontaneous pneumothorax. The initial treatment for spontaneous primary pneumothorax is 100% oxygen, as it increases the rate of absorption due to decreasing the partial pressure of nitrogen in the pleural capillaries.⁹ The patient can obtain this from placing his oxygen mask on and breathing normally. You instruct the patient to use 100% oxygen only, but not to gang load. The additional positive pressure could worsen the disease and progress to tension pneumothorax.³

He does as you instruct him and then hands the phone back to the pilot, who asks you what their next course of action should be. You inquire about their location. He tells you they are flying over an allied Asian country and are approximately 90 min from home station. Your home station has access to a nearby naval hospital with a full complement of emergency and inpatient services. There is an airbase within 30 min of their present location which has an emergency department, but no inpatient services or surgical specialties.

3. What do you advise him to do?

- A. Declare an in-flight emergency and land at the nearest base.
- B. Land at the nearest base without calling an in-flight emergency.
- C. Declare an in-flight emergency and land at the nearest civilian airport.
- D. Land at the nearest civilian airport without declaring an in-flight emergency.
- E. Declare an in-flight emergency, land at home station, and meet the patient on the flight line.
- F. Return to home station without declaring an in-flight emergency and meet the patient at the clinic.

ANSWER/DISCUSSION

3. **A.** This is a medical emergency. The patient has been worsening since the beginning of the mission and has the potential to progress from a spontaneous pneumothorax to a tension pneumothorax, which could result in his death. You direct the pilot to declare an in-flight emergency and land at the nearest base, which can coordinate an ambulance to meet the patient on the flight line and transport him to the emergency department.

He arrives at the emergency room for additional evaluation. He continues to complain of dyspnea and sharp, left-sided chest pain. He is mildly tachycardic to 100 bpm, but his vitals are otherwise within normal limits and his S_pO_2 is 99% on room air. His exam is remarkable for decreased breath sounds and some crackles on the left.

4. What is the next step in the patient's care?

- A. Immediate needle decompression of the left chest.
- B. Obtain electrocardiogram (EKG) and chest X-ray (CXR).
- C. Obtain CXR alone.
- D. Obtain computed tomography angiography of the chest.
- E. Place a thoracostomy in the left chest.

ANSWER/DISCUSSION

4. **B.** The patient is clinically stable and though spontaneous pneumothorax appears to be the most likely cause, a definitive diagnosis has not yet been made, so no treatment should yet be administered (A and E). EKG was significant only for sinus tachycardia and CXR confirmed a large pneumothorax on the left. Left thoracostomy was placed and connected to suction at 20 cm H_2O . He was then transferred to a nearby host-nation inpatient facility for additional evaluation and stabilization. Computed tomography was performed at this facility and demonstrated small blebs and apical scarring on the left. Once stabilized, he was transported back to his home station via critical care airborne transport team and directly admitted to the nearby U.S. naval hospital.

5. What is the patient's disposition now?

- A. Discharge home following removal of the thoracostomy tube after CXR demonstrates resolution of the pneumothorax, then consider for a waiver for return to flying status.
- B. Discharge home following removal of the thoracostomy tube after CXR demonstrates resolution of the pneumothorax, then permanently disqualify from flying status.
- C. Obtain surgical consult for video-assisted thoracoscopic surgery (VATS) pleuradesis during the same hospital admission and permanently disqualify from flying status.
- D. Obtain surgical consult for VATS pleuradesis during the same hospital admission and consider for a waiver to return to flying status after recovery.
- E. Obtain surgical consult for VATS pleuradesis as an outpatient and consider for a waiver to return to flying status after recovery.

ANSWER/DISCUSSION

5. **D.** A history of spontaneous pneumothorax due to demonstrable pathology that would predispose the member to recurrence (such as blebs) is disqualifying for all flying classes in the U.S. Air Force in accordance with the medical standards directory.¹⁴ This change was made to policy in 2016 due to a high rate of recurrence.¹¹ This can range from 20 to 50% in patients who do not undergo definitive treatment.^{1,5,13} Aircrew are considered a high-risk group for increased morbidity and mortality in the setting of recurrence of spontaneous primary pneumothorax. This is due to the effects of Boyle's Law, in which gas expansion at altitude can worsen the degree of pneumothorax and thus the subsequent physiological sequelae.¹⁰ A waiver may be considered for patients who undergo thoracoscopic abrasive pleuradesis to decrease the likelihood of recurrence.

The patient was seen by general surgery during the same hospital admission and taken to the operating room, where he underwent a left-sided VATS mechanical pleuradesis and apical wedge resection to remove the blebs. His postoperative course

was uneventful and he was discharged home. He resumed full activity within 30 d of discharge and demonstrated stability on follow-up X-rays. He was granted a waiver and returned to flying duty 3 mo after the incident.

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