

Pneumothorax

A **pneumothorax** is defined as air in the pleural space which can cause complete or partial lung collapse. Remember that the pleural space is normally under negative pressure, which helps keep the lungs expanded. When air gets into this area, the pressure is no longer negative and so the lung might collapse. Generally, we think of a pneumothorax in the context of trauma to the chest wall, like a gunshot, stab wound, or broken rib, however, there are several different causes for pneumothorax:

- A **primary spontaneous pneumothorax** can happen suddenly with no warning even in young and healthy people with no underlying lung disease. This type of pneumothorax is usually associated with a bleb on the surface (visceral pleura) of the lung. A bleb is a little out-pocketing of air that is bigger than an alveolus. If it ruptures, it can allow air to flow from within the lung alveoli into the pleural space and a lung collapse will occur. Blebs are more common in smokers and in tall and slender adolescent males, but they can be found in females too. Sometimes if the blebs are small they will close and heal on their own after rupturing, but other times surgery is required to close them.
- A **secondary spontaneous pneumothorax** may occur in individuals who have an underlying lung disease that causes structural changes of the lung tissue. These changes can result in an opening to the pleural space from overdistended, damaged, or compromised alveoli. Alveolar damage is most common with chronic conditions like COPD (which accounts for nearly three quarters of the cases of secondary spontaneous pneumothorax in adults). In children this type of pneumothorax may occur because of the effects of measles, foreign body aspiration, and certain congenital malformations of the lung such as Marfan syndrome, Ehlers-Danlos syndrome, and alpha 1-antitrypsin deficiency.
- An **open pneumothorax** involves an opening to the pleural space that remains unsealed with both inspiration and expiration. This means that during inspiration when the pleural space volume increases, the negative pressure pulls air into the pleural space. Then during expiration as the pleural space volume decreases, the resulting positive pressure pushes air back out of the pleural space.
- A **tension pneumothorax** is characterized by an injury to the visceral pleura that allows air to enter the pleural space with inhalation, but not leave it upon exhalation. This situation is usually because of a flap of visceral pleura tissue that closes over the opening into the pleural space as exhalation begins and prevents the exit of that inhaled air. Over time, the accumulation of air in the pleural space increases pressure in the thoracic cavity and causes compression of the affected lung. As this pressure becomes greater than the pressure on the opposite side of the thoracic cavity, it can cause the mediastinum (the area between the lungs that contains the heart, part of the trachea, the esophagus, and blood vessels) to shift to the side of lower pressure. In addition to the collapsed lung, the danger of this mediastinum shift is compression of the vena cava (decreased venous return, cardiac output, and BP with increased HR). In X-rays, the base of the trachea can be seen shifted towards the area of lower pressure, a condition called tracheal shift. Treatment to aid in lung expansion is done by inserting a large bore needle or chest tube into the affected side of the chest along with one-way valve drainage or continuous chest suction to remove the air.

This video may help to visualize a tension pneumothorax: <https://books.byui.edu/-kcMv>



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