

Pneumothorax

What is it?

The inside of the chest is divided into three basic parts: the right hemi thorax (right side), the left hemi thorax (left side), and the mediastinum (the center section.). The right and left sides do not communicate with each other. Therefore, what happens on one side of the chest does not necessarily occur on the other side.

Each lung completely fills its side of the chest. Under normal conditions, there should be no space between the lung and the chest wall. There is a potential space between the lung and the chest wall called the pleural space. If air is introduced into the pleural space, then the lung separates from the chest wall. This collection of air inside the chest, surrounding the lung, is called a pneumothorax. Some refer to this loss of lung volume as “a collapsed lung.” In fact, the lung is not like a balloon that pops when it is injured. The lung has substance inside it, and will usually remain partially inflated. However, if sufficient air continues to enter the pleural space, the lung can be nearly completely compressed by air under pressure, and a “tension pneumothorax” results.

What causes it?

There are many causes of pneumothorax. Any condition that can result in air entering the pleural space is a culprit. There are generally three sources of air: the lung, the atmosphere, and the abdomen.

The Lung

The lung is the most frequent source of air causing pneumothorax. There are a large number of conditions of the lung that can lead to this problem. They include:

- Congenital blebs
- Giant blebs
- Emphysema
- Trauma
- Lung cancer
- Granulomatous disease
- Iatrogenic (secondary to medical treatments)

Blebs are similar to large, air-filled blisters that exist on the surface of the lung. The most common form of blebs is congenital blebs; that is, the patient is born with them. These congenital blebs are typically located at the apex, or top of the lung, in tall thin individuals. Like any thin walled blister, the bleb can eventually rupture, leaking air into the chest. This air collects *outside* the lung, causing the lung to be pushed away from the chest wall, or “collapse”. The patient typically has a sharp pain in the chest, and becomes short of breath. The same events occur whether the disease process is due to congenital blebs, giant blebs, or emphysema.

The patient who presents with a pneumothorax for no apparent reason is said to have a spontaneous pneumothorax. Typically, at the time of the first pneumothorax, a chest tube is placed and the air leak allowed to heal. If the patient heals the leak, but the pneumothorax recurs, then the patient should usually undergo surgical therapy

In trauma, the lung leaks air into the chest due to an injury. The lung is injured by very high pressures from a blunt force, or is pierced by a sharp object or bullet. The mechanism of pneumothorax is the same as for blebs.

Occasionally, lung cancers and infections in the lung will create an air leak, and a pneumothorax occurs.

Finally, procedures such as lung biopsy or drainage of fluid with a needle will create a leak from the lung.

The Atmosphere

Air enters the chest from the atmosphere due to a defect or hole in the chest wall. The most common causes are trauma and drainage procedures. Trauma may result in a small or large defect in the chest wall through which air may enter the chest. In drainage or biopsy procedures, a needle is passed through the chest wall to drain fluid or to perform a biopsy. When this is done, there is always a chance that air will be introduced into the chest, and a pneumothorax result.

The Abdomen

Air enters the chest from the abdomen occasionally during laparoscopic surgery. Carbon dioxide is insufflated into the abdomen under pressure during laparoscopy. Occasionally, a patient will have a small defect in the diaphragm that allows the carbon dioxide to enter the chest, thereby causing a pneumothorax.

What is the treatment of pneumothorax?

The treatment depends upon the cause of the pneumothorax. In almost all cases, a chest tube is placed under local anesthesia to drain the air out of the chest and re-expand the lung. A chest tube is a small plastic catheter about the diameter of the small finger. While the patient is awake and lying flat, local anesthetic ("novacaine") is injected into a spot usually beneath the breast. A tiny incision is made in the skin, and the tube is introduced into the chest between the ribs. It is secured into place with sutures. The tube is connected to a device that aspirates the air from the chest, and re-expands the lung.

The tube will remain in place until one of two things happens. The first: the tube is removed when the air leak spontaneously heals. The second: the air leak fails to heal within a reasonable period of time (4-7 days), so the patient undergoes a surgical procedure to close the leak.

Fortunately, most patients heal their air leak within a short period of time. However, if the leak does not heal and surgery is required, thoracoscopy is usually sufficient to repair the problem. The procedure is called thoracoscopy, bleb resection, and talc pleurodesis.

At thoracoscopy, a small endoscope (camera) is introduced into the chest, and the bleb is identified. A special surgical device is used to remove the bleb and seal the lung. Then, a pleurodesis is performed. A pleurodesis is a procedure that "glues" the lung up to the chest wall, so that the lung is adherent to the chest wall, and cannot separate from the chest wall in the future. There are several techniques of pleurodesis, including pleurectomy, instillation of sterile talc, and instillation of bleomycin. The objective of each of these techniques is to create adhesion between the lung and chest wall to prevent a recurrent pneumothorax.

When something other than a bleb is the cause of the pneumothorax, thoracoscopy may be inadequate to repair the problem, and a thoracotomy may be required. At the time of thoracotomy, the cause is identified and treated appropriately.