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Pneumothorax (Trapped air in the chest)

A pneumothorax is sometimes called a "collapsed lung" and it describes the condition in which air has become trapped next to a lung. Many cases occur without warning, particularly in healthy young men. Some develop as a complication of a chest injury or a lung disease.

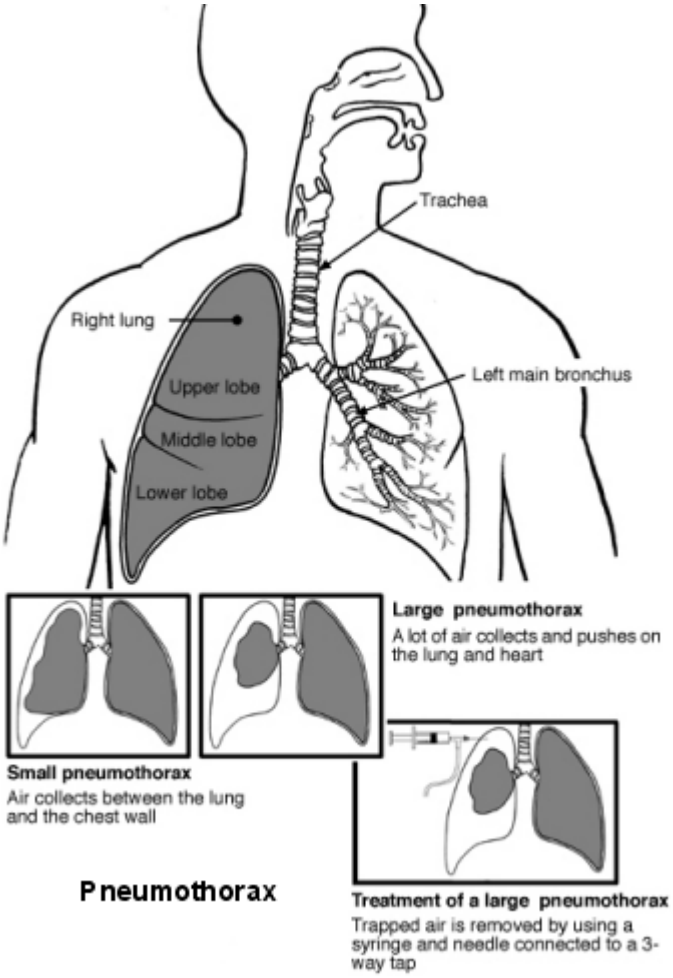
The most common symptom is a sudden sharp chest pain followed by pains on breathing in. Some people become breathless. In most cases, the pneumothorax clears without needing treatment. The trapped air of a large pneumothorax may need to be removed if it causes breathing difficulty. An operation is needed in some cases.

What is a pneumothorax?

A pneumothorax occurs when air becomes trapped between a lung and the chest wall.

Lungs are surrounded by a cavity called the pleural space. The pleural space is between the outside of the lungs and the inside of the chest wall. The pleural space normally contains a tiny amount of fluid (around 10mL) which helps the lung tissue to glide comfortably against the muscles as they inflate and deflate during breathing.

In a pneumothorax, air gets into this pleural space. Air in the pleural space can cause a fully or partially collapsed lung.



Types of pneumothorax

Spontaneous pneumothorax

A spontaneous pneumothorax happens suddenly without an obvious immediate cause. A spontaneous pneumothorax can be primary (occurring without any other lung condition) or secondary (occurring as a result of another lung condition).

Traumatic pneumothorax

A traumatic pneumothorax happens when the chest or lung is injured, allowing air to get into the pleural space. For example, a stab wound to the chest can cause a traumatic pneumothorax.

A traumatic pneumothorax can also happen as a complication of a medical procedure. For example, the procedure to insert a central venous catheter into the chest veins can sometimes accidentally cause a pneumothorax.

Tension pneumothorax

A tension pneumothorax is a severe and life-threatening type of pneumothorax. A tension pneumothorax can develop as a result of primary spontaneous, secondary spontaneous, or traumatic pneumothorax.

Tension pneumothorax causes shortness of breath that quickly becomes more and more severe. This occurs because the tear on the lung is acting like a one-way valve.

In effect, as each breath is taken in (inspiration), more air is pumped out of the lung and the valve action stops air coming back into the lung to equal the air pressure. The volume and pressure of the pneumothorax increases. This puts pressure on the lungs and heart. **Emergency treatment is needed to release the trapped air; without urgent treatment, it can be fatal.**

Pneumothorax symptoms

- The typical symptom is a sharp sudden stabbing pain on one side of the chest.
- The pain is usually made worse by breathing in (inspiration).
- Breathlessness may occur, particularly in a large pneumothorax.
- Other symptoms may exist if an injury or a lung disease is the cause - for example, cough or high temperature (fever).

A chest X-ray can confirm a pneumothorax. Other tests may be done if there is a suspicion of a lung disease being an underlying cause.

Pneumothorax causes

Primary spontaneous pneumothorax

This is where a pneumothorax develops for no apparent reason in an otherwise healthy person. This is a common type of pneumothorax. It is thought to be due to a tiny tear of an outer part of the lung - usually near the top of the lung.

It is not clear why this occurs but the tear often occurs at the site of a tiny bleb or bulla on the edge of a lung. A bleb or bulla is like a small balloon of tissue that may develop on the edge of a lung (a bulla is a larger version of a bleb). The wall of the bleb or bulla is not as strong as normal lung tissue and may tear. Air then escapes from the lung but gets trapped between the lung and chest wall.

Most primary spontaneous pneumothoraces occur in healthy young adults who do not have any lung disease. It is more common in tall thin people.

Secondary spontaneous pneumothorax

This means that a pneumothorax develops as a complication of an existing lung disease.

This is more likely to occur if the lung disease weakens the edge of the lung in some way as this may make the edge of the lung more liable to tear and allow air to escape from the lung.

For example, a pneumothorax may develop as a complication of chronic obstructive pulmonary disease (COPD) - especially where lung bullae have developed in this disease.

Other lung diseases that may be complicated by a pneumothorax include:

- Pneumonia.
- Tuberculosis.
- Sarcoidosis.
- Cystic fibrosis.
- Lung cancer.
- Idiopathic pulmonary fibrosis.

Other causes of pneumothorax

- An injury to the chest - for example, a car crash or a stab wound.

- Surgical operations.
- Endometriosis - rarely, this can cause something called a catamenial pneumothorax.

How common is a pneumothorax?

About 2 in 10,000 young adults in the UK develop a spontaneous pneumothorax each year. Men are affected about three times more often than women and are affected at a younger age. Men are more likely to be affected around the age of 20 years and women in their early 30s.

It is more common in men who smoke than in men who don't smoke and nine times more common in women who smoke than in women who don't smoke. Cigarette smoke seems to make the wall of any bleb even weaker and more likely to tear.

Up to 5 in 10 people who have a primary spontaneous pneumothorax have another one or more at some time in the future. If it does occur again it is usually on the same side and it usually occurs within three years of the first one.

Complications of a pneumothorax

A pneumothorax can cause complications, such as:

- Repeated episodes of pneumothorax in the future.
- Infection in the pleural space (empyema, or pyopneumothorax).
- Fluid inside the lung itself if it re-expands too quickly (re-expansion pulmonary oedema).
- Bleeding into the pleural space (haemothorax, or haemopneumothorax).

- In a tension pneumothorax, high-pressure air inside the pleural space can cause respiratory failure (inability to breathe) and ultimately a cardiac arrest (the heart stopping beating). A tension pneumothorax can be lethal if not treated urgently.

Diagnosing a pneumothorax

A pneumothorax can often be diagnosed by a doctor listening to the lungs. A chest x-ray will often confirm the diagnosis. Occasionally, other tests might be needed but this is unusual.

Pneumothorax treatment

No treatment

No treatment may be needed for a small pneumothorax. The small tear that caused the leak usually heals within a few days (sometimes as little as 1-3 days), especially in cases of primary spontaneous pneumothorax. Air then stops leaking in and out of the lung. The trapped air of the pneumothorax is gradually absorbed into the body.

A repeat chest x-ray may be needed in 7-10 days to check that it has gone. Simple painkillers might be needed for a few days if the pain is bad.

Removing the trapped air

This may be needed if there is a larger pneumothorax or if there are underlying lung or breathing problems. As a rule, a pneumothorax causing breathlessness is best removed.

The commonest method of removing the air is to insert a very thin tube through the chest wall with the aid of a needle. (Some local anaesthetic is injected into the skin first to make the procedure relatively painless.)

A large syringe with a three-way tap is attached to the thin tube that is inserted through the chest. The syringe sucks out some air and the three-way tap is turned. The air in the syringe is then expelled into the atmosphere. This is repeated until most of the air of the pneumothorax is removed.

Sometimes a larger chest tube is inserted to remove a large pneumothorax. This is more commonly needed for cases of secondary spontaneous pneumothorax when there is underlying lung disease. The tube is then left there for a few days to allow the lung tissue that has torn to heal.

Treating repeated episodes of pneumothorax

Some people have repeated episodes of spontaneous pneumothorax. If this occurs, a procedure may be advised with the aim of preventing the condition from coming back. For example, an operation may be an option to remove a bleb on the lung surface that repeatedly tears.

Another procedure that may be advised is for an irritant powder (usually a kind of talcum powder) to be put on the lung surface. This causes inflammation which then makes the lung surface stick to the inside of the chest wall.

A lung specialist will be able to give the pros and cons of the different procedures. The procedure advised may depend on the general health and on whether there is an underlying lung disease.

Preventing a pneumothorax

A smoker who has had a primary spontaneous pneumothorax can reduce the risk of its happening again by stopping smoking. Smoking tobacco, smoking cannabis, and vaping all increase the risk of a pneumothorax.

Flying, travel, and diving advice

It can be dangerous to fly with a pneumothorax. It is very important not to fly until a specialist has confirmed that it is safe to do so following a pneumothorax. This is usually around 7 days after a repeat X-ray has confirmed that the pneumothorax has disappeared completely.

Scuba diving increases the risk of developing a tension pneumothorax which can be fatal. People who have had a pneumothorax in the past are usually advised not to go scuba diving; they need a full evaluation by a private specialist in diving medicine if they still want to do so.

Further reading

- British Thoracic Society Guideline for pleural disease; British Thoracic Society - BMJ (2023).
- Schnell J, Koryllos A, Lopez-Pastorini A, et al; Spontaneous Pneumothorax. Dtsch Arztebl Int. 2017 Nov 3;114(44):739-744. doi: 10.3238/arztebl.2017.0739.
- Goldman RD; Spontaneous pneumothorax in children. Can Fam Physician. 2020 Oct;66(10):737-738.
- Carson-Chahhoud KV, Wakai A, van Agteren JE, et al; Simple aspiration versus intercostal tube drainage for primary spontaneous pneumothorax in adults. Cochrane Database Syst Rev. 2017 Sep 7;9:CD004479. doi: 10.1002/14651858.CD004479.pub3.

Last updated by: Dr Philippa Vincent, MRCGP 13/01/2025	
Peer reviewed by: Dr Toni Hazell, MRCGP 13/01/2025	**Next review date:** 12/01/2028

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