

= Pneumothorax =

A pneumothorax ( pneumo- + thorax ; plural pneumothoraces ) is an abnormal collection of air or gas in the pleural space that causes an uncoupling of the lung from the chest wall . Like pleural effusion ( liquid buildup in that space ) , pneumothorax may interfere with normal breathing . It is often called collapsed lung , although that term may also refer to atelectasis . One or both lungs may be affected .

A primary pneumothorax is one that occurs spontaneously without an apparent cause and in the absence of significant lung disease , while a secondary pneumothorax occurs in the presence of existing lung pathology . Pneumothoraces can be caused by physical trauma to the chest ( including blast injury ) , or as a complication of medical or surgical intervention ; in this case it is referred to as a traumatic pneumothorax . In a minority of cases of both spontaneous or traumatic pneumothorax , the amount of air in the chest increases markedly when a one @-@ way valve is formed by an area of damaged tissue , leading to a tension pneumothorax . This condition is a medical emergency that can cause steadily worsening oxygen shortage and low blood pressure . Unless reversed by effective treatment , these sequelae can progress and cause death .

Symptoms typically include chest pain and shortness of breath . Diagnosis of a pneumothorax by physical examination alone can be difficult or inconclusive ( particularly in smaller pneumothoraces ) , so a chest radiograph or computed tomography ( CT ) scan is usually used to confirm its presence .

Small spontaneous pneumothoraces typically resolve without treatment and require only monitoring . This approach may be most appropriate in subjects who have no significant underlying lung disease . In larger pneumothoraces , or when there are marked symptoms , the air may be extracted with a syringe or a chest tube connected to a one @-@ way valve system . Occasionally , surgical interventions may be required when tube drainage is unsuccessful , or as a preventive measure , if there have been repeated episodes . The surgical treatments usually involve pleurodesis ( in which the layers of pleura are induced to stick together ) or pleurectomy ( the surgical removal of pleural membranes ) .

= = Signs and symptoms = =

A primary spontaneous pneumothorax ( PSP ) tends to occur in a young adult without underlying lung problems , and usually causes limited symptoms . Chest pain and sometimes mild breathlessness are the usual predominant presenting features . People who are affected by PSPs are often unaware of potential danger and may wait several days before seeking medical attention . PSPs more commonly occur during changes in atmospheric pressure , explaining to some extent why episodes of pneumothorax may happen in clusters . It is rare for PSPs to cause tension pneumothoraces .

Secondary spontaneous pneumothoraces ( SSPs ) , by definition , occur in individuals with significant underlying lung disease . Symptoms in SSPs tend to be more severe than in PSPs , as the unaffected lungs are generally unable to replace the loss of function in the affected lungs . Hypoxemia ( decreased blood @-@ oxygen levels ) is usually present and may be observed as cyanosis ( blue discoloration of the lips and skin ) . Hypercapnia ( accumulation of carbon dioxide in the blood ) is sometimes encountered ; this may cause confusion and - if very severe - may result in comas . The sudden onset of breathlessness in someone with chronic obstructive pulmonary disease ( COPD ) , cystic fibrosis , or other serious lung diseases should therefore prompt investigations to identify the possibility of a pneumothorax .

Traumatic pneumothorax most commonly occurs when the chest wall is pierced , such as when a stab wound or gunshot wound allows air to enter the pleural space , or because some other mechanical injury to the lung compromises the integrity of the involved structures . Traumatic pneumothoraces have been found to occur in up to half of all cases of chest trauma , with only rib fractures being more common in this group . The pneumothorax can be occult ( not readily apparent ) in half of these cases , but may enlarge - particularly if mechanical ventilation is required . They are

also encountered in patients already receiving mechanical ventilation for some other reason .

Upon physical examination , breath sounds ( heard with a stethoscope ) may be diminished on the affected side , partly because air in the pleural space dampens the transmission of sound . Measures of the conduction of vocal vibrations to the surface of the chest may be altered . Percussion of the chest may be perceived as hyperresonant ( like a booming drum ) , and vocal resonance and tactile fremitus can both be noticeably decreased . Importantly , the volume of the pneumothorax can show limited correlation with the intensity of the symptoms experienced by the victim , and physical signs may not be apparent if the pneumothorax is relatively small .

== Tension pneumothorax ==

Although multiple definitions exist , a tension pneumothorax is generally considered to be present when a pneumothorax ( primary spontaneous , secondary spontaneous , or traumatic ) leads to significant impairment of respiration and / or blood circulation . Tension pneumothorax tends to occur in clinical situations such as ventilation , resuscitation , trauma , or in patients with lung disease . The most common findings in people with tension pneumothorax are chest pain and respiratory distress , often with an increased heart rate ( tachycardia ) and rapid breathing ( tachypnea ) in the initial stages . Other findings may include quieter breath sounds on one side of the chest , low oxygen levels and blood pressure , and displacement of the trachea away from the affected side . Rarely , there may be cyanosis ( bluish discoloration of the skin due to low oxygen levels ) , altered level of consciousness , a hyperresonant percussion note on examination of the affected side with reduced expansion and decreased movement , pain in the epigastrium ( upper abdomen ) , displacement of the apex beat ( heart impulse ) , and resonant sound when tapping the sternum . This is a medical emergency and may require immediate treatment without further investigations ( see below ) .

Tension pneumothorax may also occur in someone who is receiving mechanical ventilation , in which case it may be difficult to spot as the person is typically receiving sedation ; it is often noted because of a sudden deterioration in condition . Recent studies have shown that the development of tension features may not always be as rapid as previously thought . Deviation of the trachea to one side and the presence of raised jugular venous pressure ( distended neck veins ) are not reliable as clinical signs .

== Cause ==

== Primary spontaneous ==

Spontaneous pneumothoraces are divided into two types : primary , which occurs in the absence of known lung disease , and secondary , which occurs in someone with underlying lung disease . The cause of primary spontaneous pneumothorax is unknown , but established risk factors include male sex , smoking , and a family history of pneumothorax . The various suspected underlying mechanisms are discussed below .

== Secondary spontaneous ==

Secondary spontaneous pneumothorax occurs in the setting of a variety of lung diseases . The most common is chronic obstructive pulmonary disease ( COPD ) , which accounts for approximately 70 % of cases . Known lung diseases that may significantly increase the risk for pneumothorax are

In children , additional causes include measles , echinococcosis , inhalation of a foreign body , and certain congenital malformations ( congenital cystic adenomatoid malformation and congenital lobar emphysema ) .

11 @@ 5 % of people with a spontaneous pneumothorax have a family member who has

previously experienced a pneumothorax . The hereditary conditions ? Marfan syndrome , homocystinuria , Ehlers ? Danlos syndrome , alpha 1 @-@ antitrypsin deficiency ( which leads to emphysema ) , and Birt ? Hogg ? Dubé syndrome ? have all been linked to familial pneumothorax . Generally , these conditions cause other signs and symptoms as well , and pneumothorax is not usually the primary finding . Birt ? Hogg ? Dubé syndrome is caused by mutations in the FLCN gene ( located at chromosome 17p11.2 ) , which encodes a protein named folliculin . FLCN mutations and lung lesions have also been identified in familial cases of pneumothorax where other features of Birt ? Hogg ? Dubé syndrome are absent . In addition to the genetic associations , the HLA haplotype A2B40 is also a genetic predisposition to PSP .

= = = Traumatic = = =

A traumatic pneumothorax may result from either blunt trauma or penetrating injury to the chest wall . The most common mechanism is due to the penetration of sharp bony points at a new rib fracture , which damages lung tissue . Traumatic pneumothorax may also be observed in those exposed to blasts , even though there is no apparent injury to the chest .

Medical procedures , such as the insertion of a central venous catheter into one of the chest veins or the taking of biopsy samples from lung tissue , may lead to pneumothorax . The administration of positive pressure ventilation , either mechanical ventilation or non @-@ invasive ventilation , can result in barotrauma ( pressure @-@ related injury ) leading to a pneumothorax .

Divers who breathe from an underwater apparatus are supplied with breathing gas at ambient pressure , which results in their lungs containing gas at higher than atmospheric pressure . Divers breathing compressed air ( such as when scuba diving ) may suffer a pneumothorax as a result of barotrauma from ascending just 1 metre ( 3 ft ) while breath @-@ holding with their lungs fully inflated . An additional problem in these cases is that those with other features of decompression sickness are typically treated in a diving chamber with hyperbaric therapy ; this can lead to a small pneumothorax rapidly enlarging and causing features of tension .

= = Mechanism = =

The thoracic cavity is the space inside the chest that contains the lungs , heart , and numerous major blood vessels . On each side of the cavity , a pleural membrane covers the surface of lung ( visceral pleura ) and also lines the inside of the chest wall ( parietal pleura ) . Normally , the two layers are separated by a small amount of lubricating serous fluid . The lungs are fully inflated within the cavity because the pressure inside the airways is higher than the pressure inside the pleural space . Despite the low pressure in the pleural space , air does not enter it because there are no natural connections to an air @-@ containing passage , and the pressure of gases in the bloodstream is too low for them to be forced into the pleural space . Therefore , a pneumothorax can only develop if air is allowed to enter , through damage to the chest wall or damage to the lung itself , or occasionally because microorganisms in the pleural space produce gas .

Chest @-@ wall defects are usually evident in cases of injury to the chest wall , such as stab or bullet wounds ( " open pneumothorax " ) . In secondary spontaneous pneumothoraces , vulnerabilities in the lung tissue are caused by a variety of disease processes , particularly by rupturing of bullae ( large air @-@ containing lesions ) in cases of severe emphysema . Areas of necrosis ( tissue death ) may precipitate episodes of pneumothorax , although the exact mechanism is unclear . Primary spontaneous pneumothorax has for many years been thought to be caused by " blebs " ( small air @-@ filled lesions just under the pleural surface ) , which were presumed to be more common in those classically at risk of pneumothorax ( tall males ) due to mechanical factors . In PSP , blebs can be found in 77 % of cases , compared to 6 % in the general population without a history of PSP . As these healthy subjects do not all develop a pneumothorax later , the hypothesis may not be sufficient to explain all episodes ; furthermore , pneumothorax may recur even after surgical treatment of blebs . It has therefore been suggested that PSP may also be caused by areas of disruption ( porosity ) in the pleural layer , which are prone to rupture . Smoking may additionally

lead to inflammation and obstruction of small airways , which account for the markedly increased risk of PSPs in smokers . Once air has stopped entering the pleural cavity , it is gradually reabsorbed .

Tension pneumothorax occurs when the opening that allows air to enter the pleural space functions as a one @-@ way valve , allowing more air to enter with every breath but none to escape . The body compensates by increasing the respiratory rate and tidal volume ( size of each breath ) , worsening the problem . Unless corrected , hypoxia ( decreased oxygen levels ) and respiratory arrest eventually follow .

= = Diagnosis = =

The symptoms of pneumothorax can be vague and inconclusive , especially in those with a small PSP ; confirmation with medical imaging is usually required . In contrast , tension pneumothorax is a medical emergency and may be treated before imaging - especially if there is severe hypoxia , very low blood pressure , or an impaired level of consciousness . In tension pneumothorax , X @-@ rays are sometimes required if there is doubt about the anatomical location of the pneumothorax .

= = = Chest X @-@ ray = = =

Traditionally a plain radiograph of the chest , ideally with the X @-@ ray beams being projected from the back ( posteroanterior , or " PA " ) , has been the most appropriate first investigation . These are usually performed during maximal inspiration ( holding one 's breath ) ; no added information is gathered by obtaining a chest X @-@ ray in expiration ( after exhaling ) . If the PA X @-@ ray does not show a pneumothorax but there is a strong suspicion of one , lateral X @-@ rays ( with beams projecting from the side ) may be performed , but this is not routine practice . It is not unusual for the mediastinum ( the structure between the lungs that contains the heart , great blood vessels and large airways ) to be shifted away from the affected lung due to the pressure differences . This is not equivalent to a tension pneumothorax , which is determined mainly by the constellation of symptoms , hypoxia , and shock .

The size of the pneumothorax ( i.e. the volume of air in the pleural space ) can be determined with a reasonable degree of accuracy by measuring the distance between the chest wall and the lung . This is relevant to treatment , as smaller pneumothoraces may be managed differently . An air rim of 2 cm means that the pneumothorax occupies about 50 % of the hemithorax . British professional guidelines have traditionally stated that the measurement should be performed at the level of the hilum ( where blood vessels and airways enter the lung ) with 2 cm as the cutoff , while American guidelines state that the measurement should be done at the apex ( top ) of the lung with 3 cm differentiating between a " small " and a " large " pneumothorax . The latter method may overestimate the size of a pneumothorax if it is located mainly at the apex , which is a common occurrence . The various methods correlate poorly , but are the best easily available ways of estimating pneumothorax size . CT scanning ( see below ) can provide a more accurate determination of the size of the pneumothorax , but its routine use in this setting is not recommended .

Not all pneumothoraces are uniform ; some only form a pocket of air in a particular place in the chest . Small amounts of fluid may be noted on the chest X @-@ ray ( hydropneumothorax ) ; this may be blood ( hemopneumothorax ) . In some cases , the only significant abnormality may be the " deep sulcus sign " , in which the normally small space between the chest wall and the diaphragm appears enlarged due to the abnormal presence of fluid .

= = = Computed tomography = = =

Computed tomography ( CT , or " CAT scan " ) is not necessary for the diagnosis of pneumothorax , but it can be useful in particular situations . In some lung diseases , especially emphysema , it is possible for abnormal lung areas such as bullae ( large air @-@ filled sacs ) to have the same

appearance as a pneumothorax on chest X @-@ ray , and it may not be safe to apply any treatment before the distinction is made and before the exact location and size of the pneumothorax is determined . In trauma , where it may not be possible to perform an upright film , chest radiography may miss up to a third of pneumothoraces , while CT remains very sensitive .

A further use of CT is in the identification of underlying lung lesions . In presumed primary pneumothorax , it may help to identify blebs or cystic lesions ( in anticipation of treatment , see below ) , and in secondary pneumothorax it can help to identify most of the causes listed above .

= = = Ultrasound = = =

Ultrasound is commonly used in the evaluation of people who have sustained physical trauma , for example with the FAST protocol . Ultrasound may be more sensitive than chest X @-@ rays in the identification of pneumothorax after blunt trauma to the chest . Ultrasound may also provide a rapid diagnosis in other emergency situations , and allow the quantification of the size of the pneumothorax . Several particular features on ultrasonography of the chest can be used to confirm or exclude the diagnosis .

= = Management = =

The treatment of pneumothorax depends on a number of factors , and may vary from discharge with early follow @-@ up to immediate needle decompression or insertion of a chest tube . Treatment is determined by the severity of symptoms and indicators of acute illness , the presence of underlying lung disease , the estimated size of the pneumothorax on X @-@ ray , and - in some instances - on the personal preference of the person involved .

In traumatic pneumothorax , chest tubes are usually inserted . If mechanical ventilation is required , the risk of tension pneumothorax is greatly increased and the insertion of a chest tube is mandatory . Any open chest wound should be covered with an airtight seal , as it carries a high risk of leading to tension pneumothorax . Ideally , a dressing called the " Asherman seal " should be utilized , as it appears to be more effective than a standard " three @-@ sided " dressing . The Asherman seal is a specially designed device that adheres to the chest wall and , through a valve @-@ like mechanism , allows air to escape but not to enter the chest .

Tension pneumothorax is usually treated with urgent needle decompression . This may be required before transport to the hospital , and can be performed by an emergency medical technician or other trained professional . The needle or cannula is left in place until a chest tube can be inserted . If tension pneumothorax leads to cardiac arrest , needle decompression is performed as part of resuscitation as it may restore cardiac output .

= = = Conservative = = =

Small spontaneous pneumothoraces do not always require treatment , as they are unlikely to proceed to respiratory failure or tension pneumothorax , and generally resolve spontaneously . This approach is most appropriate if the estimated size of the pneumothorax is small ( defined as < 50 % of the volume of the hemithorax ) , there is no breathlessness , and there is no underlying lung disease . It may be appropriate to treat a larger PSP conservatively if the symptoms are limited . Admission to hospital is often not required , as long as clear instructions are given to return to hospital if there are worsening symptoms . Further investigations may be performed as an outpatient , at which time X @-@ rays are repeated to confirm improvement , and advice given with regard to preventing recurrence ( see below ) . Estimated rates of resorption are between 1 @.@ 25 % and 2 @.@ 2 % the volume of the cavity per day . This would mean that even a complete pneumothorax would spontaneously resolve over a period of about 6 weeks . There ; however , is no high quality evidence comparing conservative to non conservative management .

Secondary pneumothoraces are only treated conservatively if the size is very small ( 1 cm or less air rim ) and there are limited symptoms . Admission to the hospital is usually recommended .

Oxygen given at a high flow rate may accelerate resorption as much as fourfold .

== Aspiration ==

In a large PSP ( > 50 % ) , or in a PSP associated with breathlessness , some professional guidelines recommend that reducing the size by aspiration is equally effective as the insertion of a chest tube . This involves the administration of local anesthetic and inserting a needle connected to a three @-@ way tap ; up to 2 @. @ 5 liters of air ( in adults ) are removed . If there has been significant reduction in the size of the pneumothorax on subsequent X @-@ ray , the remainder of the treatment can be conservative . This approach has been shown to be effective in over 50 % of cases . Compared to tube drainage , first @-@ line aspiration in PSP reduces the number of people requiring hospital admission significantly , without increasing the risk of complications .

Aspiration may also be considered in secondary pneumothorax of moderate size ( air rim 1 ? 2 cm ) without breathlessness , with the difference that ongoing observation in hospital is required even after a successful procedure . American professional guidelines state that all large pneumothoraces - even those due to PSP - should be treated with a chest tube . Moderately sized iatrogenic traumatic pneumothoraces ( due to medical procedures ) may initially be treated with aspiration .

== Chest tube ==

A chest tube ( or intercostal drain ) is the most definitive initial treatment of a pneumothorax . These are typically inserted in an area under the axilla ( armpit ) called the " safe triangle " , where damage to internal organs can be avoided ; this is delineated by a horizontal line at the level of the nipple and two muscles of the chest wall ( latissimus dorsi and pectoralis major ) . Local anesthetic is applied . Two types of tubes may be used . In spontaneous pneumothorax , small @-@ bore ( smaller than 14 F , 4 @. @ 7 mm diameter ) tubes may be inserted by the Seldinger technique , and larger tubes do not have an advantage . In traumatic pneumothorax , larger tubes ( 28 F , 9 @. @ 3 mm ) are used .

Chest tubes are required in PSPs that have not responded to needle aspiration , in large SSPs ( > 50 % ) , and in cases of tension pneumothorax . They are connected to a one @-@ way valve system that allows air to escape , but not to re @-@ enter , the chest . This may include a bottle with water that functions like a water seal , or a Heimlich valve . They are not normally connected to a negative pressure circuit , as this would result in rapid re @-@ expansion of the lung and a risk of pulmonary edema ( " re @-@ expansion pulmonary edema " ) . The tube is left in place until no air is seen to escape from it for a period of time , and X @-@ rays confirm re @-@ expansion of the lung .

If after 2 ? 4 days there is still evidence of an air leak , various options are available . Negative pressure suction ( at low pressures of ? 10 to ? 20 cmH<sub>2</sub>O ) at a high flow rate may be attempted , particularly in PSP ; it is thought that this may accelerate the healing of the leak . Failing this , surgery may be required , especially in SSP .

Chest tubes are used first @-@ line when pneumothorax occurs in people with AIDS , usually due to underlying pneumocystis pneumonia ( PCP ) , as this condition is associated with prolonged air leakage . Bilateral pneumothorax ( pneumothorax on both sides ) is relatively common in people with pneumocystis pneumonia , and surgery is often required .

It is possible for a patient with a chest tube to be managed in an ambulatory care setting by using a Heimlich valve , although research to demonstrate the equivalence to hospitalization has been of limited quality .

== Pleurodesis and surgery ==

Pleurodesis is a procedure that permanently eliminates the pleural space and attaches the lung to the chest wall . No long @-@ term study ( 20 years or more ) has been performed on its consequences . Good results in the short term are achieved with a thoracotomy ( surgical opening of

the chest ) with identification of any source of air leakage and stapling of blebs followed by pleurectomy ( stripping of the pleural lining ) of the outer pleural layer and pleural abrasion ( scraping of the pleura ) of the inner layer . During the healing process , the lung adheres to the chest wall , effectively obliterating the pleural space . Recurrence rates are approximately 1 % . Post @-@ thoracotomy pain is relatively common .

A less invasive approach is thoracoscopy , usually in the form of a procedure called video @-@ assisted thoracoscopic surgery ( VATS ) . The results from VATS @-@ based pleural abrasion are slightly worse than those achieved using thoracotomy in the short term , but produce smaller scars in the skin . Compared to open thoracotomy , VATS offers a shorter in @-@ hospital stays , less need for postoperative pain control , and a reduced risk of lung problems after surgery . VATS may also be used to achieve chemical pleurodesis ; this involves insufflation of talc , which activates an inflammatory reaction that causes the lung to adhere to the chest wall .

If a chest tube is already in place , various agents may be instilled through the tube to achieve chemical pleurodesis , such as talc , tetracycline , minocycline or doxycycline . Results of chemical pleurodesis tend to be worse than when using surgical approaches , but talc pleurodesis has been found to have few negative long @-@ term consequences in younger people .

= = = Aftercare = = =

If pneumothorax occurs in a smoker , this is considered an opportunity to emphasize the markedly increased risk of recurrence in those who continue to smoke , and the many benefits of smoking cessation . It may be advisable for someone to remain off work for up to a week after a spontaneous pneumothorax . If the person normally performs heavy manual labor , several weeks may be required . Those who have undergone pleurodesis may need two to three weeks off work to recover .

Air travel is discouraged for up to seven days after complete resolution of a pneumothorax if recurrence does not occur . Underwater diving is considered unsafe after an episode of pneumothorax unless a preventative procedure has been performed . Professional guidelines suggest that pleurectomy be performed on both lungs and that lung function tests and CT scan normalize before diving is resumed . Aircraft pilots may also require assessment for surgery .

= = Prevention = =

A preventative procedure ( thoracotomy or thoracoscopy with pleurodesis ) may be recommended after an episode of pneumothorax , with the intention to prevent recurrence . Evidence on the most effective treatment is still conflicting in some areas , and there is variation between treatments available in Europe and the US . Not all episodes of pneumothorax require such interventions ; the decision depends largely on estimation of the risk of recurrence . These procedures are often recommended after the occurrence of a second pneumothorax . Surgery may need to be considered if someone has experienced pneumothorax on both sides ( " bilateral " ) , sequential episodes that involve both sides , or if an episode was associated with pregnancy .

= = Epidemiology = =

The annual age @-@ adjusted incidence rate ( AAIR ) of PSP is thought to be three to six times as high in males as in females . Fishman cites AAIR 's of 7 @-@ 4 and 1 @-@ 2 cases per 100 @-@ 000 person @-@ years in males and females , respectively . Significantly above @-@ average height is also associated with increased risk of PSP ? in people who are at least 76 inches ( 1 @-@ 93 meters ) tall , the AAIR is about 200 cases per 100 @-@ 000 person @-@ years . Slim build also seems to increase the risk of PSP .

The risk of contracting a first spontaneous pneumothorax is elevated among male and female smokers by factors of approximately 22 and 9 , respectively , compared to matched non @-@ smokers of the same sex . Individuals who smoke at higher intensity are at higher risk , with a "

greater @-@ than @-@ linear " effect ; men who smoke 10 cigarettes per day have an approximate 20 @-@ fold increased risk over comparable non @-@ smokers , while smokers consuming 20 cigarettes per day show an estimated 100 @-@ fold increase in risk .

In secondary spontaneous pneumothorax , the estimated annual AAIR is 6 @. @ 3 and 2 @. @ 0 cases per 100 @, @ 000 person @-@ years for males and females , respectively , with the risk of recurrence depending on the presence and severity of any underlying lung disease . Once a second episode has occurred , there is a high likelihood of subsequent further episodes . The incidence in children has not been well studied , but is estimated to be between 5 and 10 cases per 100 @, @ 000 person @-@ years .

Death from pneumothorax is very uncommon ( except in tension pneumothoraces ) . British statistics show an annual mortality rate of 1 @. @ 26 and 0 @. @ 62 deaths per million person @-@ years in men and women , respectively . A significantly increased risk of death is seen in older victims and in those with secondary pneumothoraces .

= = History = =

An early description of traumatic pneumothorax secondary to rib fractures appears in Imperial Surgery by Turkish surgeon ?erafeddin Sabuncuo?lu ( 1385 ? 1468 ) , which also recommends a method of simple aspiration .

Pneumothorax was described in 1803 by Jean Marc Gaspard Itard , a student of René Laennec , who provided an extensive description of the clinical picture in 1819 . While Itard and Laennec recognized that some cases were not due to tuberculosis ( then the most common cause ) , the concept of spontaneous pneumothorax in the absence of tuberculosis ( primary pneumothorax ) was reintroduced by the Danish physician Hans Kjærgaard in 1932 . In 1941 , the surgeons Tyson and Crandall introduced pleural abrasion for the treatment of pneumothorax .

Prior to the advent of anti @-@ tuberculous medications , iatrogenic pneumothoraces were intentionally given to people with tuberculosis in an effort to collapse a lobe , or entire lung , around a cavitating lesion . This was known as " resting the lung " . It was introduced by the Italian surgeon Carlo Forlanini in 1888 , and publicized by the American surgeon John Benjamin Murphy in the early 20th century ( after discovering the same procedure independently ) . Murphy used the ( then ) recently discovered X @-@ ray technology to create pneumothoraces of the correct size .

= = Other animals = =

Non @-@ human animals may experience both spontaneous and traumatic pneumothorax . Spontaneous pneumothorax is , as in humans , classified as primary or secondary , while traumatic pneumothorax is divided into open and closed ( with or without chest wall damage ) . The diagnosis may be apparent to the veterinary physician because the animal exhibits difficulty breathing in , or has shallow breathing . Pneumothoraces may arise from lung lesions ( such as bullae ) or from trauma to the chest wall . In horses , traumatic pneumothorax may involve both hemithoraces , as the mediastinum is incomplete and there is a direct connection between the two halves of the chest . Tension pneumothorax ? the presence of which may be suspected due to rapidly deteriorating heart function , absent lung sounds throughout the thorax , and a barrel @-@ shaped chest ? is treated with an incision in the animal 's chest to relieve the pressure , followed by insertion of a chest tube .