

## Pneumothorax from diagnosis to treatment, hands on course: Part II

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**Abstract:** Pneumothorax is a situation where air is inserted in the pleural space that separates the lung from the chest wall. Pneumothorax can be primary or secondary. There is also a third type called; tensioned. Based on the concentration of air and type of pneumothorax the proper treatment has to be selected. There are cases where the concentration is minimal and observation is enough and more severe cases where surgery is required. Currently there are many techniques used for the biopsy of lung lesions. The bronchoscope (forceps, fine needle aspiration), fine needle aspiration under computed tomography scan and endobronchial ultrasound (EBUS) are commonly used. However, all these techniques have in common a possible side effect; pneumothorax. In our current issue we will focus on the different minimally invasive techniques of pneumothorax management. Moreover, a presentation will be made for several systems that are being used for air or fluid aspiration.

**Keywords:** Pneumothorax; VATS; Heimlich

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Pneumothorax can be divided to primary, secondary and tensioned. In the current special issue we will focus on the anatomy of the pleural space and the underlying mechanism of pneumothorax. Moreover, we will present pneumothorax due to pacemaker device insertion and barotraumas. Furthermore, devices that are being used for fluid drainage will be presented. On each side of the thoracic cavity there is a pleural membrane which covers the surface of lung (visceral pleura) and also lines the inside of the chest wall (parietal pleura). Under normal circumstances the two layers are separated by a small amount of lubricating serous fluid. Air does not enter this cavity 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. Pneumothorax can only developed if air is allowed to enter this cavity, through damage to the chest wall or damage to the lung itself, or due to infection in the pleural space that produce gas.

Chest-wall defects are usually evident in cases of injury to the chest wall, such as stab or bullet wounds. On the other hand, in secondary spontaneous pneumothoraces, vulnerabilities in the lung tissue are caused by a variety of diseases. Lung parenchyma lesions particularly rupturing of bullae (large air-containing lesions) in cases of severe emphysema is a common etiology for pneumothorax. There is the case where areas of necrosis may induce pneumothorax, although the exact mechanism is unclear. Primary spontaneous pneumothorax (PSP) has for many

years been thought to be caused by “blebs”. These lesions 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 (1-10). Smoking may additionally lead to inflammation and obstruction of small airways, which account for the markedly increased risk of PSPs in smokers. Smoking habit has been suggested that disrupts the pleural layer, which is then prone to rupture. Usually, 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, however, not to escape. If this situation is not handled, respiratory arrest eventually will follow.

Prevention might be proposed in some patients. A preventative procedure (thoracotomy or medical thoracoscopy with pleurodesis) may be recommended after an episode of pneumothorax, with the intention to prevent recurrence. Several agents have been investigated for pleurodesis, however, talc has presented the best results until now. 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; prevention depends on estimation of the risk of recurrence. These procedures are often recommended after the occurrence of a second pneumothorax. There is the case where surgery might be considered if someone has experienced pneumothorax on both sides, sequential episodes that involve both sides, or if an episode was associated with pregnancy (11-20).

Pneumothorax is a serious situation that has to be treated. The method of treatment 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 approach is determined by a number of factors: (I) severity of symptoms; (II) indicators of acute illness; (III) presence of underlying lung disease; (IV) estimated size of the pneumothorax on X-ray; (V) personal preference of the person involved.

In the case of traumatic pneumothorax, chest tubes are usually inserted. There is the case where mechanical ventilation is required, and in this case 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. The “Asherman seal” which a dressing 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 (21-30).

In the case of tension pneumothorax treatment is urgent with urgent needle decompression. This action 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 this situation is not treated then cardiac arrest might occur and needle decompression is performed as part of resuscitation as it may restore cardiac output (28,31-44).

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