Approach to Pneumothorax in Emergency Department

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ABSTRACT

Pneumothorax is the collection of air in the pleural space. Most of these patients are admitted to emergency services first. If pneumothorax is left untreated, it can progress to a life-threatening clinical condition. All emergency physicians must have a detailed knowledge about it and its treatment.

Key words: Emergency department, pneumothorax, urgent treatment

INTRODUCTION

Since pneumothorax is a disease whose treatment should be begun when it is diagnosed, the stages of diagnosis and treatment are important for the management of pneumothorax.

DEFINITION AND CLASSIFICATION

The presence of air in the pleural cavity is called pneumothorax. It is divided into two groups: spontaneous and traumatic. Spontaneous pneumothorax (SP) is also divided into two subgroups: primary spontaneous pneumothorax (PSP) and secondary spontaneous pneumothorax (SSP). Traumatic pneumothorax (PT) may appear as a result of blunt or penetrating traumas. Traumatic pneumothorax cases due to diagnostic and/or therapeutic procedures are defined as iatrogenic pneumothorax (IP). Presence of both air and fluid in the pleural cavity is called hydropneumothorax (1-3).

Minimal collapse of the lung is called partial pneumothorax, whereas complete collapse is defined as total pneumothorax. Localized (loculated, encysted) pneumothorax is observed with existence of cohesion between the pleural leaves. However, diffuse pneumothorax can occur without cohesion. When the entrance and exit of air into the pleural space occur independently during respiration, it is called open pneumothorax. If there is no entrance and exit of air, closed pneumothorax is diagnosed. Tension pneumothorax develops when the air enters during inspirium and is trapped by the pleural space in turn that causes an increase in the intrapleural pressure. In other words, tension pneumothorax is due to the one-way entrance of air into the pleural space through a valve mechanism (3,4). American College of Chest Physicians classified pneumothorax as small (<3 cm) and large (>3 cm) based on a simple measurement of the distance between the apical side of the collapsed lung and the external margin of the pleural cavity (2).

ETIOLOGY AND INCIDENCE

The annual incidence of spontaneous pneumothorax is 7.4 per 100,000 and 1.2 per 100,000. Spontaneous pneumothorax is observed more in men than in women because of the smoking habit (5). PSP peaks during mid-twenties and is rare after 40 years of age. PSP is observed in individuals with tall and thin body structure – especially men – without an underlying pulmonary disease. Tall stature and long thorax structure thereby contribute to subpleural bleb formation.

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PSP generally appears as a result of the rupture of subpleural emphysematous blebs located on the apical side of the lung. It develops more during the days with wide-ranging atmospheric pressure. The bleb becomes strained by a decrease in atmospheric pressure, so that the inner pressure increases and consequently rupture occurs (6-8).

Air accumulation between the layers of the visceral pleura because of alveolar rupture is called bleb; appearance of air gaps inside the pulmonary parenchyma as a result of alveolar tissue damage is defined as bulla. Permanent dilatation due to tissue damage on the distal side of terminal bronchioles without fibrosis is called emphysema. Smoking was reported as an important risk factor for the appearance of bullous emphysema (9-16).

An underlying pulmonary disease exists in the cases with SSP. Chronic obstructive pulmonary disease (COPD) is specified in the literature as the most common underlying disease in SSP. Besides, tuberculosis, bullous lung, silicosis, granulamatous diseases, and metastatic conditions of the lung are also observed. Asthma attacks and coughing spells should be considered in the etiology of pneumothorax. Catamenial pneumothorax may be observed rarely in young women during their menstruation (2,17, 18).

Iatrogenic pneumothorax forms a significant part of traumatic pneumothorax. The most common causes for IP are transthoracic needle aspiration biopsy, thoracentesis, pleura biopsy, transbronchial lung biopsy, and catheterization of the subclavian vein. Pneumothorax may also develop due to procedures such as tracheostomy, bronchoscopy, and esophagoscopy (19-24).

Thoracic traumas are one of the most common causes of pneumothorax observed in emergency rooms (ERs). Pneumothorax may develop by penetrating and blunt traumas. Stabbing of osseous formations such as ribs and sternum into the pulmonary parenchyma or an increase in intrathoracic pressure without any fracture on osseous formations may cause pneumothorax as a result of blunt traumas. Lacerations of the pulmonary or bronchial system in gunshot or stabbing injuries may be associated with pneumothorax. Open pneumothorax cases generally appear by penetrating injuries (25).

SYMPTOMS AND FINDINGS OF PHYSICAL EXAMINATION

Cases with PSP and SSP generally have sudden chest pain and dyspnea. Absence of chest pain and dyspnea is rare in pneumothorax. Chest pain generally appears at the beginning and is located on the pneumothorax side. When age, gender, body type, and smoking habits are evaluated, diagnosis of pneumothorax becomes closer (26).

Since perfusion of the collapsed lung continues notwithstanding with the decrease in ventilation, gas exchange deteriorates and hypoxemia appears. However, perfusion decreases by hypoxemic vasoconstriction in time and hypoxia is recovered by restoring the ventilation/perfusion rate (27).

Compared with the patients with PSP, dyspnea is usually prominent rather than chest pain in the patients with COPD. They have respiratory distress accompanied by hypoxia, hypercarbia, and acidosis. Limited pulmonary reserves of the patients with COPD may cause a difficulty in tolerating even small pneumothorax. Even though the rate of pneumothorax is less in these patients, severe respiratory distress may be observed due to the underlying disease. Physical examination findings of the primary disease may mask pneumothorax. Pneumothorax should be considered when there is an increase in respiratory distress and unilateral chest pain in a patient with COPD (26).

Detection of pneumothorax in the patients with penetrating injury is generally easier in ERs. Pneumothorax develops in a majority of the injuries preponderant to thorax. Accompanying subcutaneous emphysema should remind pneumothorax. Finger or any surgical tool should not be inserted into the thorax while exploring the laceration in the cases with penetrating injury. Examination should be carried out with inspection and auscultation first and then radiological imaging should be performed. Otherwise, IP may appear through insertion of a tool into the thorax for exploration (25,28).

Hemithorax with localized pain should be assessed well in the cases with blunt thorax trauma. The involvement of hemithorax in respiration, presence of flail chest, ecchymosis, scratches, and bruises, and traumatic deformity on the thoracic cage should be sought during inspection. Pain and crepitation due to rib fracture and subcutaneous emphysema should be examined by palpation. Auscultation may provide significant findings; however, it should be noted that shallow breathing of the patient prevents auscultation from displaying the findings. Therefore, radiological examination should not be disregarded (25,28).

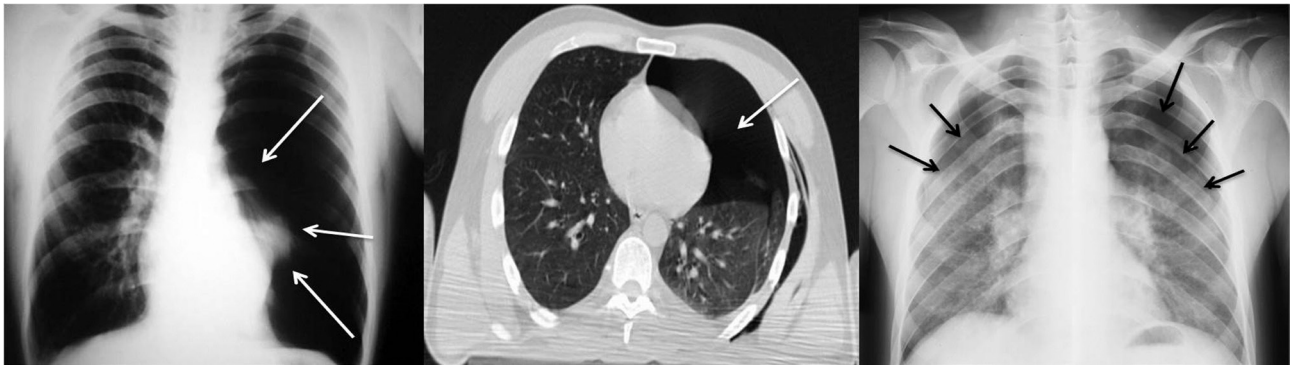

FIGURE 1: Radiographic views of pneumothorax. Arrows show pleural line in chest X-rays and pleural space in tomographic image.

Cases with tension pneumothorax may refer ER with an apparent clinical presentation whereas it may appear during the evaluation process in ER. In tension pneumothorax, the lung is completely collapsed first, then diaphragm and mediastinum start to be pushed downward and toward the opposite side. The mediastinal impulsion forces the trachea to displace to the opposite side and superior and inferior vena cava to bend, which in turn causes a decrease in venous return to the heart. Hypotension, tachycardia, cyanosis, and bulging cervical veins appear in the patient. Examination findings similar to cardiac tamponade may be observed. The most prominent complaint is dyspnea that appears suddenly and increases rapidly. Differential diagnosis is provided by a loss of respiratory sounds on the concerning side and deviation of the trachea to the opposite side (28).

Physical examination of the patients with PSP is generally normal except moderate tachycardia. A decrease in respiratory sounds is observed during the auscultation of the concerning side. If a heart rate of more than 140 pulse/min, hypotension, cyanosis, or electromechanical dissociation exists, pneumothorax should be suspected. The side with pneumothorax is larger than the opposite side in tension pneumothorax but its motion is less prominent during respiration. No tactile fremitus exists. Hyperresonance is present in percussion. Respiratory sounds are absent or decreased on the pneumothorax side. Trachea is shifted to the opposite side. The lower edge of the liver slides down on the right side with pneumothorax (28,29).

DIAGNOSIS

Radiological Imaging

Radiological imaging is essential for the diagnosis of pneumothorax. Pneumothorax is identified by separate imaging of the pleural line in the chest X-ray in standing position. No signs of pulmonary parenchyma are observed on the distal side of this line. Pneumothorax usually appears on the apex and the lateral side of the lung. Expulsion from the apex to the hilus may be observed. Moreover, air may be located on the medial or subpulmonary side. The X-rays taken during expirium facilitate the diagnosis, since the volume of the air in the pleural space remains stable with a decrease in the pulmonary volume during expirium, so that pneumothorax seems larger (3,4) (Figure 1).

Concomitant pulmonary parenchyma disease is likely if an increase in the density in the lung and a decrease in the pulmonary volume exist together with pneumothorax. If any pulmonary consolidation exists, an individual pleural line may not be observed. The diagnosis of pneumothorax with typical apical location may even be difficult because signs for pulmonary parenchyma beyond the pleural line may be observed due to over-expansion of intact lobes in the parenchymal disease (3,4).

Since the air is not located on the apical side when imaging is taken in lying position for the patients with poor general condition, the diagnosis of pneumothorax is more difficult. In consideration of the gravity effect, pleural air is expected to be collected in the anteromedial pleural recess, which is the outermost area in this position. In this case, the image of deep anterior costophyrenic sinus, observation of the medial side of the diaphragm below the cardiac shadow, more prominent edges of the cardiac margin, pericardial fatty pad, or vascular structure should remind anteromedial pneumothorax. Pneumothorax of subpulmonary space is detected when the sharper diaphragm line is observed despite the parenchymal disease. Deep lateral costophyrenic image, visible anterior costophyrenic sulcus, or hyperlucent image of the quadrants of the abdomen are other

supporting findings. Posteromedial upper pneumothorax appears as a lucent triangle on the medial side of the pulmonary base and usually accompanies lower lobe pathologies. In the newborn period, an increase in radiolucency on single hemithorax or clear imaging of mediastinal edge is the suggestive finding for ipsilateral pneumothorax. Pneumothorax without rib fracture may be detected on the patients with blunt thoracic trauma. Pleural effusion exists in about 10%–20% of the patients. This is observed as a small air-fluid level in the radiograph (3,4).

Although the use of ultrasonography scan (USG) is a new concept for the diagnosis of pneumothorax, it is easy to learn. Pneumothorax is missed in over half of the chest x-rays taken in supine position (30). Bedside USG was shown to be equally or more sensitive to detect this injury compared with X-ray (30-33). Scanning is performed from intercostal spaces along mid-clavicular line with a high-frequency vascular probe placed onto the anterior chest wall. In the "B-mode scan," pneumothorax is diagnosed with disappearance of the sliding move of the visceral pleura over the parietal pleura (ant walking), absence of the comet finding, and the "stratosphere image" in "M-mode scan" are diagnostic (34).

Computed tomography (CT) of thorax provides perfect results in the assessment of pneumothorax. Therefore, CT may be required to define the size and location of the pneumothorax better, to make a differential diagnosis between the pneumothorax and a large bulla by better evaluation of the pulmonary parenchyma (35-37) (Figure 1).

Electrocardiographic changes

Right deviation in frontal QRS axis and a decrease in precardiac R and QRS wave amplitude appear in the patients with left-side pneumothorax. Inversion occurs in precardial T wave. Such changes may be confused with acute myocardial infarction of submyocardium (35).

TREATMENT

The purpose of the treatment of pneumothorax is to discharge the accumulated air and prevent recurrence. Treatment options include observation, oxygen therapy, aspiration of air using a thin catheter and removal of the catheter, closed underwater drainage by tube tracheostomy, pleurodesis, and parenchymal repair by video thoracoscopy or open surgery.

Treatment is planned according to the degree of pneumothorax, clinical status of the patient, prolonged air leakage, and pneumothorax being primary or secondary, first or relapsed. It should be noted that pneumothorax is a challenging and rarely life-threatening disease. Despite all therapeutic options, incomplete re-expansion of the lung and early recurrence may reach up to 25% (34, 28-40).

In the patients with secondary spontaneous pneumothorax and especially patients who have COPD, observation, needle aspiration, and drainage using a thin catheter do not take place except very rare cases. Such cases should be admitted to the hospital and treated immediately. Tube tracheostomy should be preferred as a first-line therapy, so that pulmonary re-expansion is provided rapidly and clinical presentation recovers in this manner. Polyethylene 24- to 28-F chest tubes may be preferred. Even though air leakage lasts longer, although pulmonary re-expansion is provided in the patients with COPD, clinician should not be in a hurry to make a decision about surgery (41).

Observation

If the PSP is below 20%, the patient either is asymptomatic or has minimal complaint. These patients are just followed up. If the relation between the alveolus and the pleural space is interrupted, the air in the pleural space is absorbed. Spontaneous absorption is slow. Studies have shown that 1.25% of hemithorax is absorbed within 24 h. In this way, the pneumothorax consisting of 15% of the hemithorax is completely resorbed within 12 days. This treatment may be considered for pneumothorax cases that consist of less than 15% of the hemithorax. If the patient is admitted, the rate of pleural air absorption is increased by addition of oxygen therapy (42,43).

Oxygen Therapy

In experimental and clinical trials, the ratio of pleural air absorption increases with oxygen therapy. Chernix and Avery reported that the experimental pneumothorax in rabbits could be treated using 100% oxygen and the air absorption increased six times. Northfielt calculated that high-flow oxygen therapy using a face mask increased the air absorption four times. The patients with pneumothorax who cannot have tube tracheostomy or aspiration should be treated with oxygen in high concentrations in the hospital (7).

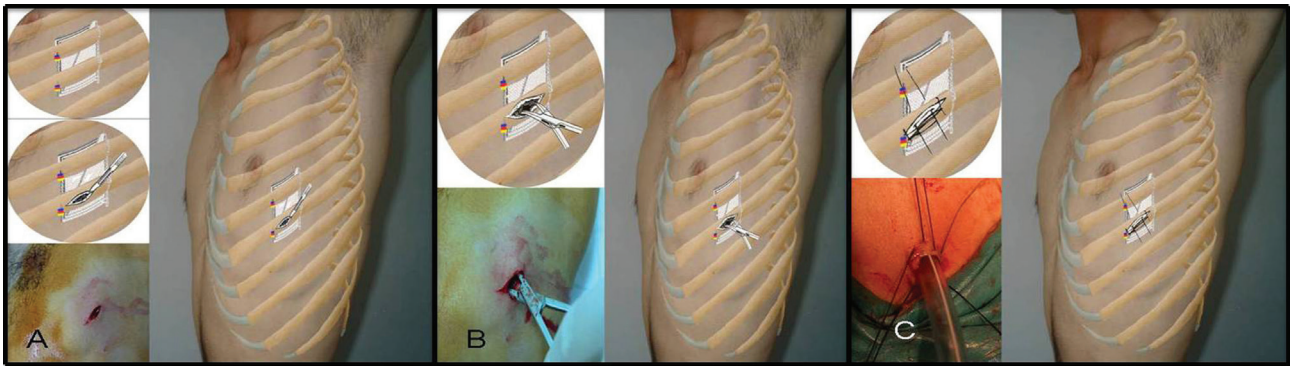

FIGURE 2: Schematic presentation of tube thoracostomy. **A)** While the patient is in straight sitting/lying position, the arm where the drain will be inserted is raised above the head. Following disinfection and local anesthesia, the tube is inserted from a safe triangular area. A skin incision parallel to intercostal space/ground on the rib is applied using a scalpel according to the thickness of the drain to be placed. **B)** The subcutaneous tissue is dissected till the muscle layer using tissue scissors. The dissection should be performed on the back of the rib. The insertion site of the drain into the thorax should be just above the rib. The muscular tissue was passed without dissecting much using a clamp and the parietal pleura is punctured. **C)** The drain is placed into the thorax along the intercostal space via a clamp. The drain may be placed on any depth according to the measure written on it. As soon as the intercostal space is passed, the tip of the drain is manipulated backward–upward (along the apical site). Two fixation sutures passing near the incision with 0 or 1/0 silk sutures fix the drain. A closing suture in "U" or "mattress" form is placed on the middle of the incision. Suture depth should cover all layers of the skin and subcutaneous tissue.

Aspiration

The first-line therapy for many of the patients with PSP consisting of more than 15% of the hemithorax may be aspiration. In this procedure, a 16-gauge needle polyethylene catheter is inserted from the second intercostal space and at the mid-clavicular line under local anesthesia. If pneumothorax is loculated or cohesions exist, other eligible locations are preferred. The needle is removed from the cannula after inserting into the thorax. Alternatively, Arrov-Clark thoracentesis kit may be used. An outer cannula with a needle is provided with the kit. If this kit is used, sufficient dermal incision should be done to prevent catheter bending. Three-way cock and 60-mL injector are connected with the catheter. Aspiration is applied until no air is aspirated. If no pressure is sensed after 4 L of air is aspirated, no further expansion is considered and tube tracheostomy should be performed. If no air is aspired, stopcock should be closed and the catheter should be fixed onto the chest wall. When expansion persists in the chest x-ray taken after 4 h, the catheter should be removed and the patient should be observed for 2 h. However, the patient should be discharged with suggestion for immediate referral in case of repetition of the symptoms. In three case series including 62 cases, 42 patients were treated successfully using this method. The advantage of this method is simplicity and less trauma compared with a large tube. If the patient does not want to be admitted, she/he is treated with less cost. There are no data suggesting that this method causes more recurrence than tube thoracostomy (44).

Invasive procedure is necessary in the cases with a pneumothorax more than 20% or progressing pneumothorax. The intravenous cannula can aspirate moderate pneumothorax and has a success rate of about 75%. If the patient is more than 50 years and the volume of air discharged is more than 2.5 L, the success rate diminishes. The success rate of simple aspiration in the cases with secondary pneumothorax is just 37% (2,45).

Tube Tracheostomy (Closed Underwater Drainage)

If simple aspiration is not achieved, tube thoracostomy should be performed. This procedure provides rapid discharge of air from the pleural space. The chest tube should be placed on the top part of the pleural space as much as possible to prevent residual air. Air is discharged easily if the tube is placed properly. While placing the chest tube, it should be considered that pleura may be irritated and partial pleurodesis may appear at least. This reduces the possibility of recurrent pneumothorax. The accepted treatment strategy for the first episode is tube tracheostomy. Observation may be a suitable method for asymptomatic patients with a pneumothorax less than 20% (43,44) (Figure 2).

Primary spontaneous pneumothorax can be treated efficiently with tube tracheostomy. A thin catheter with a 14 F diameter is reported to be sufficient. A success rate of 90% for primary pneumothorax, 52% for first recurrence, and 15% for the second recurrence is reported in tube tracheostomy (2,46).

Tokur et al developed a newly designed thorax drainage catheter. An experimental study about this catheter reported promising results compared with classical tube thoracostomy in case of hemopneumothorax (47).

Administration of Sclerosing Agent into the Pleural Space (Pleurodesis)

If the patients with PSP were treated by observation or tube tracheostomy, a recurrence of 40% was reported. Injecting different agents into the pleural space creates an intense inflammatory reaction and the possibility of recurrence can be reduced. This procedure is performed on the patients with obliterated pleural space. Pleurodesis is performed to prevent the recurrence by administering quinacrine, talk, talk blowing, slurry olive oil, or tetracycline through the tube in the first pneumothorax attack. The agent chosen most often for pleurodesis of the patients with pneumothorax is tetracycline derivatives. In a study randomizing 229 patients treated with tube thoracostomy into two groups, 1500 mg tetracycline was administered to one of the groups. A recurrence rate of 25% and 41% was observed in the tetracycline group and the other group, respectively, during a 5-year survey. An agent via a tube may be administered to the cases treated with tube thoracostomy because of primary or secondary pneumothorax. Intrapleural tetracycline is administered when the lung is expanded and movements are recommended to the patient to provide contact with all pleura, especially the apex. Although it is not contraindicated when bronchopleural fistula exists, it is not useful for early closure of the fistula (42,48). Chemical pleurodesis should be considered to prevent relapses and reduce air leakages for COPD cases with SSP. Diluted talk may be preferred as a chemical agent (35).

RECURRENT PNEUMOTHORAX

The rate of recurrence risk of pneumothorax was found to be different in different studies based on the age groups, gender, size, smoking status, underlying lung disease, and treatment methods (5–60%). The risk is higher during first months and more frequent in SSP (27,49,50).

In a meta-analysis of 11 series including the patients who were observed, treated by needle aspiration or tube tracheostomy because of primary spontaneous pneumothorax, the recurrence ratio was reported between 6% and 52%. A majority of the recurrences appear within the first 6–24 months. The risk is higher for the cases with pulmonary fibrosis, which is detected radiologically, smoking, asthenic type, and younger age. The predictive value of bullae detected radiologically during first pneumothorax over the risk of recurrence was not proven (51).

DIFFERENTIAL DIAGNOSIS

Differential diagnosis is very important for pneumothorax, since a tube thoracostomy procedure that is performed before final diagnosis may result in severe complications. A pseudo-air image above the diaphragm may appear in the cases with thoracoabdominal trauma. Gastrothorax, giant bullae, and giant bronchogenic cysts, which mimic clinical presentation of tension pneumothorax, are important for differential diagnosis. History taking and a careful physical examination should be performed. Thoracic CT should be considered for differential diagnosis (52-54).

MANAGAMENT OF PNEUMOTHORAX IN ER

Although pneumothorax is treated within the frame of general treatment principles mentioned earlier, actual treatment of these patients starts in the ER. Immediate oxygen therapy should be begun first for a patient diagnosed with spontaneous pneumothorax. Then, intravenous access should be provided and the fluid should be administered. Arterial blood gas analysis is very important for the patients with a concomitant disease such as COPD in particular. Oxygen concentration should be adjusted according to the blood gas level and clinical presentation of the patient. Facilitating the respiration by relieving the pain and anxiety of the patient is essential. After the diagnosis is confirmed, the most suitable treatment should be selected and performed within the above-mentioned principles.

Thoracic surgeons in our country usually carry out the treatment of pneumothorax. Furthermore, when the cases such as the failure to access the concerning specialist or provide urgent treatment are considered, emergency medicine specialists should perform air aspiration from pleural space or tube tracheostomy. Such procedures will be life saving especially for the cases with tension pneumothorax and trauma. Surgical materials required for these procedures should be kept ready in all emergency rooms (41,43,45).

Thin catheters may be used for air aspiration; when these are not available, a branule with a wider diameter (i.e., gray) is inserted into the thorax through one of the second, third, or fourth intercostal spaces and the plastic side of the branule is left inside. Air up to 1000 mL may be aspired using a 50-mL injector placed into the tip after removal of the metal part. Then, adopting a serum set into the posterior end of the branule and placing the other end under water in a serous fluid bottle may create a closed underwater drainage system. A similar system may be established in tension pneumothorax, or the branule may be inserted into the thorax and left as fixed with open end by removing the metal part. Closed pneumothorax thereby is converted into open type, and progression of tension pneumothorax may be reduced. In this way, time is saved for intervention (55-58).

Treatment in Cases with Hemopneumothorax

The hemopneumothorax, which is a rare complication, is observed in 10–12% of the cases with spontaneous pneumothorax. It was reported 30 times more in male cases. It is a result of rupture of new vascularization areas that appear secondary to the cohesions between the visceral and the parietal pleura. Clinical presentation depends on the amount of bleeding. Complaints such as chest pain and shortness of breath increase. Bleeding may stop due to the tamponade when pulmonary expansion is provided. In some cases, sudden hypotension may require urgent surgery (59,60).

Treatment in Cases with Hydropneumothorax

Hydropneumothorax may develop spontaneously due to underlying diseases such as bronchial carcinoma, malign mesothelioma, rheumatoid arthritis, Wegener's granulomatosis, tuberculosis, as well as iatrogenic causes such as complication of feeding tube where esophageal integrity is deformed or infectious diseases such as rupture of hydatid cyst. Symptoms such as dyspnea and chest pain develop in these patients. In the ER, hemithorax, which is under pressure, may be relieved through fluid discharge by thoracentesis as well as general precautions such as recovery of oxygenation. The most rationalistic treatment approach is tube tracheostomy and further treatment of the underlying disease (61,62).

Treatment of Pulmonary Edema Dependent on Re-expansion

It is a rare complication seen after rapid discharge of air or fluid filling hemithorax in the collapsed lung. Pulmonary edema develops within the first hour following tube tracheostomy in over half of the cases. Edema may be either unilateral or bilateral. Mortality may reach up to 20% especially for the cases with bilateral and sudden onset. Persistent cough develops after tube tracheostomy or negative pressure implementation; hypoxemia and hypotension may appear in the patient. Although the mechanism is unclear, an increase in endothelial permeability is considered etiology. This process depends on deformation of alveolocapillary membrane and ischemia–reperfusion damage. It is likely to start as a result of an increase in pulmonary flow; tension and distention appear during pulmonary re-expansion. The mechanism of pulmonary edema is similar to that of adult respiratory distress syndrome and post-pneumonectomy pulmonary edema.

Oxygen support, mechanical ventilation with end-expirium positive pressure, diuresis, and hemodynamic support are basic parts of the management. The patient was positioned at lateral decubitus to keep the affected side upward in order to decrease edema and intrapulmonary shunts. Misoprostil, a prostaglandin analogue, and ibuprofen or iIndocin as anti-inflammatory agent are recommended in the early term. For the same purpose, interleukin-8 antibodies are suggested to be used as a preliminary treatment for the lungs collapsed for a long period as well as patients at a high risk. Re-expansion pulmonary edema recovers within 24–72 hours in general. Tube thoracostomy is performed to prevent edema formation; the tube should be clamped and opened intermittently to allow gradual expansion of the lung and negative pressure should not be applied to a collapsed lung (63,64).

Horner's Syndrome

It is a rare complication of spontaneous pneumothorax and appears because of sympathetic ganglion traction as a result of mediastinal displacement (65).

Subcutaneous Emphysema

If the parietal pleura is also damaged in case of pneumothorax, air passes along the gap and endothoracic fascia accumulates under the skin and diffuses by dissecting the chest wall.

Subcutaneous emphysema may develop without pneumothorax if the patient has a previous pleural or pulmonary inflammatory disease. When a subcutaneous emphysema appears on the neck just after trauma, trachea or esophageal injury should be considered first. Subcutaneous emphysema may also develop due to tube thoracostomy. If the diameter of the thoracostomy tube is inadequate, it means that the amount of air passing into the intrapleural space is much more than the amount of air discharged. The air passes around the drain and progresses to subcutaneous area. The air trapped here diffuses by dissecting the subcutaneous tissue. In this case, a secondary tube with a wider diameter would be appropriate. The path to be followed is treatment of the primary disease. Subcutaneous emphysema is not treated specifically; however, air discharge may be provided through a small incision parallel to skin folds or puncturing thin needles to create decompression under the skin if emphysema causes a severe disorder such as tracheal compression (57,59)

Patients with pneumothorax mostly refer to ER first and stay in ER until referral to the concerning clinic to follow treatment. The emergency service intervention is required when the condition is life threatening. However, in consideration that critical care is provided to the patients in ER of many hospitals, pneumothorax reveals as a disease group that should be recognized by an emergency medicine specialist with all aspects.

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