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A Rare Complication of Spirometry: Pneumothorax

Spirometrinin Nadir Bir Komplikasyonu: Pnömotoraks

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Abstract

It is a known fact that the risk of iatrogenic pneumothorax is high after invasive procedures in patients with emphysema. However, pneumothorax is rarely seen as a complication of a non-invasive procedure such as spirometry, which is the key method for the diagnosis and follow-up of chronic obstructive pulmonary disease. Herein, we present a case of pneumothorax that developed as a complication of spirometry in a patient with emphysema.

Key words: *Chronic obstructive pulmonary disease, emphysema, spirometry, pneumothorax.*

Özet

Amfizemli hastalarda invazif prosedürlerden sonra iatrojenik pnömotoraks riskinin yüksek olduğu bilinen bir gerçektir. Hâlbuki kronik obstrüktif akciğer hastalığının erken tanısı ve takibi için anahtar yöntem olan spirometri gibi non-invazif bir prosedürün komplikasyonu olarak pnömotoraks nadiren görülmektedir. Biz burada amfizemli bir hastada spirometrinin komplikasyonu olarak gelişen pnömotoraks olgusunu sunduk.

Anahtar Sözcükler: *Kronik obstrüktif akciğer hastalığı, amfizem, spirometri, pnömotoraks.*

Chronic obstructive pulmonary disease (COPD) is characterized by the gradual progression of irreversible airflow obstruction (1). Pulmonary function tests (PFTs) provide objective and quantifiable measures of lung function (2). Spirometry, which is a part of PFTs, is the key for the diagnosis and management of COPD (3).

Pneumothorax is the presence of air in the pleural cavity (4). According to the etiology, pneumothoraces are classified as spontaneous, traumatic, and iatrogenic (5). Although iatrogenic pneumothorax commonly occurs due to invasive diagnostic and treatment methods, it can also occur as a possible sequel to an abrupt increase in transpulmonary pressure due to the spirometry (6,7).

Herein, we report a 71-year-old patient who was hospitalized for COPD exacerbation and developed pneumothorax after undergoing spirometry in the stable period.

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CASE

A 71-year old male patient was admitted to our emergency services with complaints of dyspnea. The postero-anterior (PA) chest x-ray was consistent with emphysema (Figure 1), so the patient was hospitalized with a pre-diagnosis of COPD exacerbation. Upon follow-up, the clinical condition of the patient improved and he underwent spirometry in the stable period. After spirometry he complained of sudden-onset left-sided chest pain. In the physical examination, breath sounds were diminished in the left lung. Electrocardiogram and cardiac enzymes were detected as normal. The PA chest x-ray showed pneumothorax in the left lung (Figure 2). Computed tomography (CT) of the thorax confirmed bilateral emphysema and left-sided pneumothorax; therefore, we performed a tube thoracostomy on the left lung (Figure 3). We observed the resolution of the pneumothorax and re-expansion of the left lung in the control PA chest x-ray (Figure 4) and thorax CT (Figure 5). The patient was discharged in good general condition after the removal of the chest tube.

DISCUSSION

Pulmonary emphysema is a component of COPD, which is defined as enlargement of airspaces distal to the terminal bronchiole, accompanied by destructive changes of alveolar walls (8,9). Air spaces may enlarge and bullae can develop in emphysema and the destruction of lung parenchyma results in expiratory airflow obstruction (10,11).

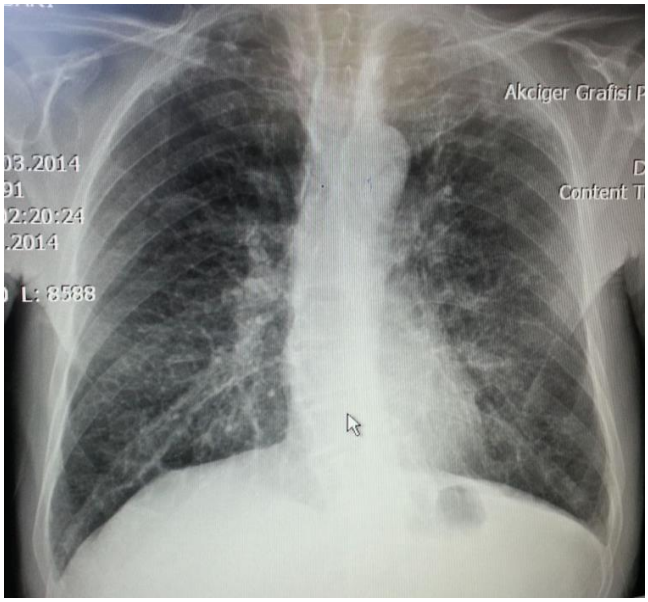

Figure 1: *Admission PA chest x-ray of the patient was consistent with emphysema*

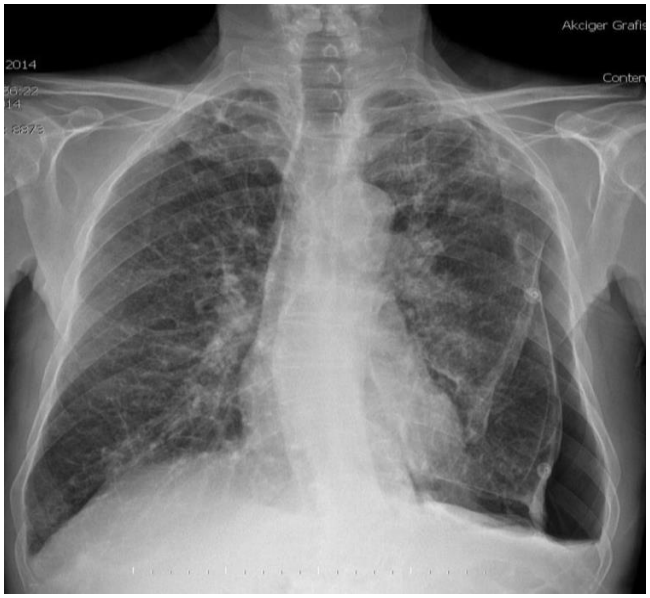

Figure 2: *After spirometry left-sided pneumothorax was detected in PA chest x-ray*

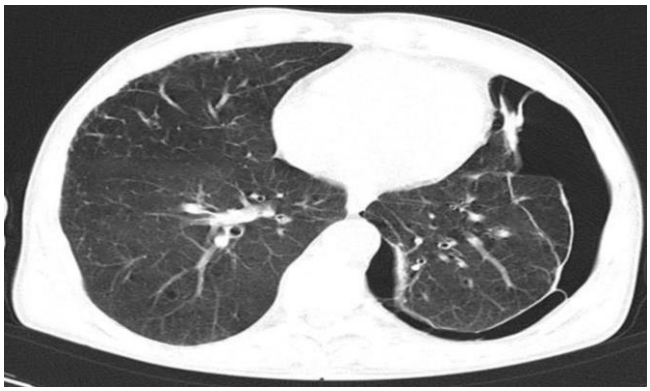

Figure 3: *Thorax CT confirmed pneumothorax in the left lung*

Figure 4: *Resolution of pneumothorax was observed in control PA chest x-ray*

The airflow obstruction in patients with suspected emphysema can be assessed by spirometry, which is the best diagnostic test to evaluate lung function in COPD (1). To date, spirometry remains the most effective means of identification and assessment of the course of COPD and responses to therapy (3). In our case, the patient was hospitalized with a pre-diagnosis of COPD exacerbation. After medical treatment, in the stable period of the patient, we aimed to assess his response to therapy and measure the degree of airflow obstruction by spirometry.

Pneumothorax, which is the presence of air in the pleural cavity, may be traumatic, spontaneous with or without underlying lung disease, or iatrogenic (4). Spontaneous pneumothoraces that occur without recognized lung disease are called primary spontaneous pneumothoraces (PSP), whereas secondary spontaneous pneumothorax (SSP) occurs as a complication of an underlying lung disease like COPD (4,5,12). It was reported that emphysema and bullae formation in COPD may lead to the occurrence of SSP (13,14).

The clinical diagnosis of pneumothorax is based on the anamnesis, physical examination, and radiological investigations (13,15,16). The clinical results are dependent on the degree of collapse on the affected lung (17). Although 10% of pneumothoraces are asymptomatic, the symptoms due to the symptomatic pneumothorax consist of acute chest pain, breathlessness, tachypnea, and tachycardia (18). Additionally, a shift of the mediastinum and haemodynamic instability may occur if the pneumothorax is significant (17).

Figure 5: *Control Thorax CT showed re-expansion of the left lung after tube thoracostomy*

Iatrogenic pneumothorax commonly occurs due to the invasive diagnostic and treatment methods such as transthoracic needle aspiration, subclavian vein catheterization, thoracentesis, transbronchial lung biopsy, pleural biopsy, and mechanical ventilation (6). Additionally, iatrogenic pneumothorax may occur due to non-invasive diagnostic methods, such as spirometry. Breathing maneuvers with a spirometer decreases pleural pressure, increases transpulmonary pressure, and produces large negative swings in intrathoracic pressures, which is similar to the Müller maneuver (19,20). A possible complication of an abrupt increase in transpulmonary pressure is pneumothorax secondary to the barotrauma (7). The clinical profile of iatrogenic pneumothorax is affected by any underlying diseases, the health conditions of the patient, and the etiology of pneumothorax. For instance, a patient in poor general condition or with an underlying disease may experience severe symptoms, even from a small volume of pneumothorax (6). In our case, the patient underwent spirometry and after the procedure he complained of acute left-sided chest pain. With the sudden onset of chest pain, we performed PA chest x-ray and thorax CT, and detected left-sided pneumothorax. Although there was partial pneumothorax in the left lung, he became symptomatic immediately due to the underlying emphysema. We were aware that there was an underlying disease like emphysema, but pneumothorax did not occur spontaneously. Therefore, we explained the etiology of pneumothorax as iatrogenic, which is a complication of spirometry. To our knowledge, the number of case reports presenting pneumothorax as a complication of spirometry is very limited in the literature.

Depending on the clinical profile or underlying disease of the patient, non-invasive treatment methods including observation, simple aspiration, or chest tube placement using a small catheter are recommended (6). However, underwater seal drainage is the classical treatment method that is used for the treatment of pneumothorax; in particular there is a 99 % rate of success reported in iatrogenic pneumothorax by tube thoracostomy (21). In the current case, we performed tube thoracostomy on our patient and achieved a good clinical response.

As a conclusion, the sudden occurrence of respiratory symptoms after spirometry, especially in patients with underlying COPD, should be evaluated carefully in terms of pneumothorax.

CONFLICTS OF INTEREST

None declared.

AUTHOR CONTRIBUTIONS

Concept - Ü.T., M.S.İ., M.S.P., T.V.; Planning and Design - Ü.T., M.S.İ., M.S.P., T.V.; Supervision - Ü.T., M.S.İ., M.S.P., T.V.; Funding - Ü.T., M.S.İ., M.S.P., T.V.; Materi-

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