A very rare fatal complication: bilateral reexpansion pulmonary edema after treatment of single side total pneumothorax

Ahmet DUMANLI1,ID Ersin GÜNAY2,ID Gürhan ÖZ1,ID Suphi AYDIN1,ID Şule ÇILEKAR2,ID Adem GENCER3,ID İbrahim Güven ÇOŞĞUN2,ID Aydın BALCI2,ID

1 Department of Chest Surgery, Faculty of Medicine, Afyonkarahisar Health Sciences University, Afyonkarahisar, Turkey
2 Afyonkarahisar Sağlık Bilimleri Üniversitesi Tıp Fakültesi, Göğüs Cerrahisi Anabilim Dalı, Afyonkarahisar, Türkiye
3 Clinic of Chest Surgery, Afyonkarahisar State Hospital, Afyonkarahisar, Turkey

ABSTRACT
A very rare fatal complication: bilateral reexpansion pulmonary edema after treatment of single side total pneumothorax

Reexpansion pulmonary edema is a rare but fatal clinical condition that develops during the treatment of pneumothorax, pleural effusion and collapsed lung after atelectasis. A 31-year-old male patient was referred to our clinic with the complaint of stinging back pain that started 3 days ago and dyspnea developed during the last 24 hours. Physical examination and radiologic examinations revealed total pneumothorax in the right hemithorax. After tube thoracostomy, his general condition deteriorated and bilateral reexpansion edema developed in the lungs. The patient was admitted to the intensive care unit and was discharged on the 5th day after medical treatment. Our case is the first case of bilateral reexpansion pulmonary edema seen after unilateral spontaneous pneumothorax when literature review is performed. In order to emphasize the importance of rapid diagnosis and treatment, it is presented in the light of the literature.

Key words: Pneumothorax; reexpansion pulmonary edema; bilaterally; fatal complication

* Our case was presented as a e-poster at the 2018 TÜSAD congress.
Çok nadir görülen ölümcül bir komplikasyon: tek taraf pnömotoraks tedavisinden sonra gelişen bilateral reekspansiyon akciğer ödemi

Reekspansiyon akciğer ödemi; pnömotoraks, pleval efüzyon ve atelektaziye sekonder olarak, kollaba olmuş akciğerin tedavisi sırasında gelişen nadir görülen, ancak ölümcül olabilen bir klinik durumdur. Ötuş bir yarında erkek hasta hızla baslayan batıcı sirt ağrısı ve son 24 saatte gelişen nefes darlığı şikayeti ile klinik durumda görüldü. Yapılan inceleme sonucunda sağ hemitoraksta total pnömotoraks saptandı. Tüp torakostomi uygulandıktan hemen sonra genel durumu kötüleşti ve bilateral akciğerlerde reekspansiyon ödemi gelişti. Yoğun bakım alan hastanın medikal tedavi sonrası geçirdiği nadir görülen, ancak ölümcül olabilen klinik bir durumda, en iyiliği vurgulamak amacıyla literatür eşliğinde sunuldu.

Anahtar kelimeler: Pnömotoraks; reekspansiyon akciğer ödemi; bilateral; ölümcül komplikasyon

INTRODUCTION

Reexpansion pulmonary edema (RPE) is a complication that occurs during the treatment of longstanding collapsed lung. It usually occurs during the rapid treatment of total pneumothorax or massive pleural effusion. It is seen rare but can cause to death. Mortality rate is reported to be approximately 20%, especially in bilateral and sudden onset RPE. Its pathophysiology is not fully known. It has been blamed for a series of inflammatory reactions that lead to decreased surfactant production and increased endothelial permeability in the lung. These reactions are associated with increased cytotoxic oxygen metabolites as a result of neutrophil flux (1). Early diagnosis and treatment determines disease progression and is life-saving (2-5). Bilateral lung re-expansion pulmonary edema is, as would be expected, more severe and fatal than unilateral re-expansion pulmonary edema. According to our researches, although very rare, bilateral RPE can be seen after treatment of massive pleural effusion, hemothorax and decortication operation. Our case is the first case of bilateral RPE after spontaneous pneumothorax and is presented in the light of literature.

CASE REPORT

A 31-year-old male patient was admitted to the emergency department with complaints of stinging back pain and shortness of breath that developed over the last 24 hours. The arterial blood pressure was 115/75 mmHg, pulse 115/min, fever 36.9°C, respiratory rate was 24/min and O₂ saturation was 89%. In the physical examination, respiratory sounds decreased in the right hemothorax. Total pneumothorax was detected in the right hemothorax on computerized thorax tomography and was referred to our clinic (Figure 1). Patient's general condition deteriorated immediately after tube thoracostomy. Blood pressure arterial 95/55 mmHg, pulse 143/min, fever 37.1°C, respiratory rate 33 min, O₂ saturation was 86%. Blood gas; pH 7.33, PaCO₂ 29.1 mmHg, PaO₂ was 63.9 mmHg. Radiological imaging was performed again and the patient was admitted to the intensive care unit considering bilateral RPE (Figure 2). Corticosteroid, diuretic, oxygen (4 L/min) treatment was given and intravenous fluid restriction was performed. Vital signs improved 48 hours after treatment without intubation. The control chest X-ray was repeated five days after admission and he was discharged with healing.

DISCUSSION

RPE was first described in 1958 by Carlson et al. (6,7). RPE is an important complication to keep in mind in patients requiring tube thoracostomy. The incidence of RPE is reported to be between 1-14% (5). The etiology is not fully known (2,7). However, it is thought that the cause is a destructive pathological process that develops as a result of increased endothelial permeability (2). In this process, the alveolo-capillary membrane is damaged and the ischemia-reperfusion injury cycle begins (6). Prolonged collapse (> 72 hours) leads to hypoxemia in the lungs, damage to the capillary wall, and consequent-
A very rare fatal complication: bilateral reexpansion pulmonary edema after treatment of single side total pneumothorax

Ly reduced surfactant production. Rapid opening of the collaps causes sudden and rapid blood flow to this area and sudden distension of the alveoli (3). In this process, which results in increased capillary permeability and hydrostatic pressure, fluid flows into the alveoli and interstitium with high protein content and edema develops (5).

Although RPE usually occurs in the collapsing lung, it can rarely be seen in bilateral lungs (5,8-10). Therefore, vasoactive substances such as histamine, prostaglandin or neurogenic factors are thought to be effective in the development of RPE (11). Wolf et al. after unilateral hemothorax treatment and Paksu et al. also after empyema treatment has reported bilateral RPE (9,10). Our case is the first RPE developed after single-sided total pneumothorax treatment.

Collapses lasting more than three days and rapid drainage of excess pleural fluid (> 1500 mL) are risk factors for the development of RPE (3). Other risk factors for RPE include pulmonary hypertension that changes alveolar dynamics and impaired gas exchange hypoxemic conditions (12). Although RPE causes fatal respiratory failure, it may also spontaneously regress. Cobanoglu et al. has reported in their study that 11 (21%) of 53 cases died (5). Our patient was discharged five days after hospitalization due to early diagnosis and treatment.

Monitoring of the patient, invasive or noninvasive hemodynamic support, oxygen supply, diuresis, discontinuation or reduction of fluid intake and the use of inotropic agents are vital in the treatment of RPE. Prevention of RPE depends on carefully pleural evacuation procedures.

CONFLICT of INTEREST
The authors reported no conflict of interest related to this article.

AUTHORSHIP CONTRIBUTIONS
Concept/Design: AD
Analysis/Interpretation: EG, AG
Data Acquisition: EG, GÖ
Writting: AD, SA
Critical Revision: ŞÇ, AB
Final Approval: İGC, AB

REFERENCES
1. Yucel O, Kunak Zl, Macit E, Gunal A, Gozubuyuk A, Gul H, et al. Protective efficacy of taurine against pulmonary edema progression: experimental study. J Cardiothorac Surg 2008;3:57.
2. Altınok T, Salman S, Yazıcı U, Yıldız D, Topçu S. Pnömotoraks tedavisi sonrası gelişen reekspansiyon akiğer ödemi (olgu sunumu). Solunum Hastalıkları 2003;14:288-90.
3. Yücel O, Erdoğu V, Kavuk K, Genç O, Turhan K. Reexpansion pulmonary edema: a case report. Turkish J Thorac Cardiovasc Surg 2009;17(3):218-20.
4. Mahfood S, Hix WR, Aaron BL, Blaes P, Watson DC. Reexpansion pulmonary edema. Ann Thorac Surg 1988;45:340-5.
5. Çobanoğlu U, Sayr F, Mergan D. Reekspansiyon akiğer ödemi: 8 olgunun analizi. Solunum 2011;13(3):176-81.
6. Trachiotis GD, Vricella LA, Aaron BL, Hix WR. Reexpansion pulmonary edema. Ann Thorac Surg 1997;63:1206-7.
7. Kuzucuoğlu T, Caygusuz EA, Alatl İ, Dal EM. Tüp torakostomi sonrası gelişen reekspansiyonel akiğer ödemi: olgu sunumu. J Kartal TR 2010;XXI(1):41-4.
8. Ragozzino MW, Green R. Bilateral reexpansion pulmonary edema following unilateral pleurocentesis. Chest 1991;99:506-8.

9. Paksu MS, Paksu S, Akgün M, Kalayıcı AG, Baysal K. Bilateral reexpansion pulmonary edema associated with pleural empyema: a case report. Eur J Pediatr 2011;170:1205-7.

10. Wolf SP, Deunk J, Cornet AD, Elbers PWG. Bilateral reexpansion pulmonary edema following treatment of a unilateral hemothorax. F1000Research 2014;3:318.

11. Matsuura Y, Nomimura T, Murakami H, Matsushima T, Kakehashi M, Kajihara H. Clinical analysis of reexpansion pulmonary edema. Chest 1991;100:1562-6.