

A Case of a Bilateral Giant Bullous Emphysema: Autologous Blood Application for Air Leak

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ABSTRACT

Surgery is a treatment choice in the presence of a giant emphysematous bulla (GBE) that covers at least one third of a hemithorax. In this article, a 53-year-old male patient who presented with complaints of progressive shortness of breath, sputum, and inability to perform his daily activities, diagnosed as bilateral GBE after radiological examinations, and post-operative problems were discussed. The right side GBE was operated on. In the postoperative period, there was an air leakage (AL), and the expansion of the lung was insufficient. As soon as respiratory distress and purulent secretion occurred, this important problem was resolved with autologous blood administration. In the presence of GBE, it is difficult to predict the surgical outcome about the lung tissue in the preoperative period. Very serious problems can be encountered in the postoperative period. In the postoperative period, the prolongation of HK and the inability of the lung to expand are very serious problems. Autologous blood application is safe, easy and effective in solving these problems.

INTRODUCTION

Giant bullous emphysema (GBE) is defined as the big bulla that covers at least one-third of a hemithorax.^[1] GBE is a space-occupying lesion that compresses the lung parenchyma around it, leading to impaired lung function. Surgically, bullectomy is the treatment of choice for GBE.^[2] In this presentation, we discussed a bilateral case of GBE operated in our clinic and the problems we experienced postoperatively.

CASE REPORT

A 53-year-old male patient, who was a chronic smoker, applied to our clinic due to progressive shortness of breath. In the history of the patient, who said that he had been receiving irregular drug treatment for a long time due to Chronic Obstructive Pulmonary Disease. In the physical examination tachypnea, dyspnea, ortopnea, and increase in the anteroposterior diameter of his chest were detected. According to the dyspnea index established by Laros et

al.,^[3] he described shortness of breath with walking, dressing and washing at home and his dyspnea index was five.

At auscultation, respiratory sounds were reduced in all lung areas, and the rhoncus was heard at the base of the lung. Brachial artery blood pressure was 90/60 mmHg, pulse rate, 115/min, fever: 36.8 °C, respiratory rate: 25/min, SpO₂: 75%. As demonstrated on chest radiography and thorax CT, GBE occupied both hemithorax almost completely and the collapsed lung did not manifest emphysematous areas (Fig. 1a, b). The results of laboratory analyzes were within normal limits. After applying pulmonary physiotherapy and walking exercises together with medical treatment for about four weeks, he was only able to reach the exercise capacity. He could walk only 100 m or go up to two floors (dyspnea index: 4). His best blood gas and pulmonary function test results were as follows: Ph: 7.39, Pco₂: 46.4 torrs, po₂: 72.1 torrs, SpO₂ 94%, FVC: 1.1 lt (28% of expected value), FEV₁: 0.8 lt (24% of expected value), and FEV₁/FVC: 77%

He was no longer desaturated during walking exercises. Perfusion scintigraphy, residual volume, carbon monoxide

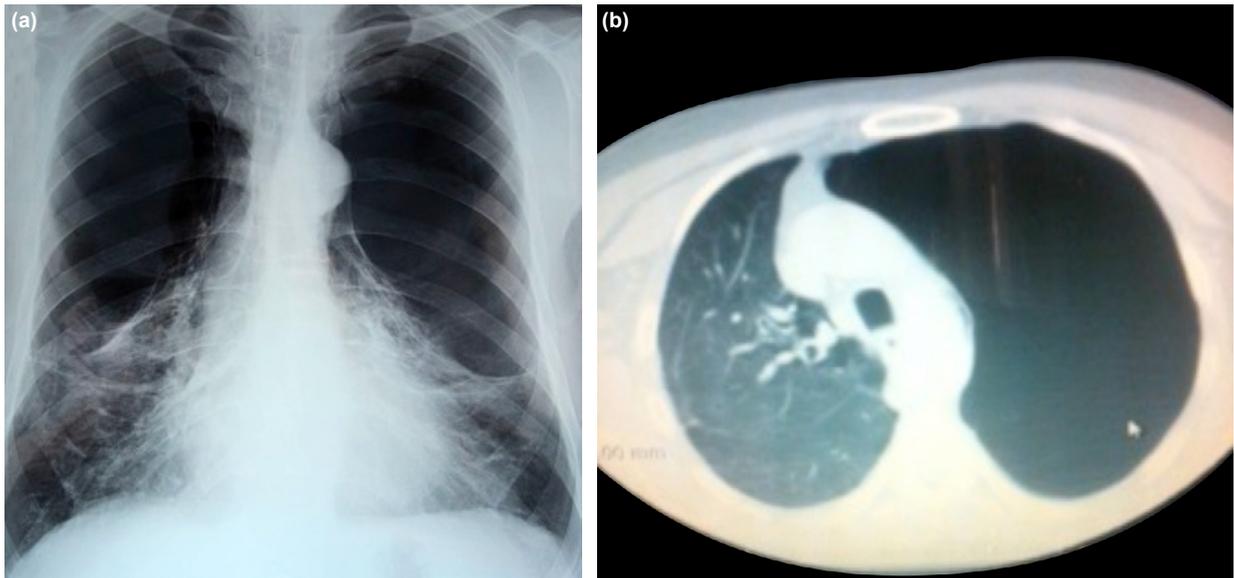


Figure 1. (a) On posteroanterior chest x-ray, a marked increase in aeration, including the upper and middle zones, especially in both lungs, is seen. (b) In thorax CT; a giant bulla is seen in the apical region on both sides, covering more than half of the hemithorax and causing atelectasis in the adjacent lung tissue. On the right, it is noteworthy that neighboring lung tissue is not emphysematous.

diffusion capacity and advanced spirometric tests such as DLCO/VA were not available in our hospital. Echocardiography findings were within normal limits. Bacterial growth was not observed in the sputum culture. Surgical intervention was planned for the patient. Muscle-preserving right lateral mini-thoracotomy was performed under general anesthesia. During the exploration, it was seen that the upper lobe was almost covered with bulla, which also occupied the two-thirds of the thorax. The middle and lower lung lobes were atelectatic but had normal parenchyma. After the incision area was supported with the wall of the bulla, bulla was excised with the help of a linear stapler. The remaining lung could expand and fill the thorax completely. Air leak was observed after postoperative day 1 and began to increase over time. Despite negative suction,

the lung could not be expanded (Fig. 2a). Additionally, 37.5 C fever, purulent secretion and respiratory distress developed on the 13th postoperative day. Streptococcus pneumoniae grew in sputum culture. Treatment with sensitive antibiotics was maintained.

Autologous blood pleurodesis was performed to stop air leak. The patient was placed in the Trendelenburg position during the application performed by delivering 100 cc of blood through the drain. The bottle of the chest drainage system was raised to chest level and the drain was not clamped. After application, air leak ceased and discharge of abundant purulent sputum was seen. At last, respiratory sounds were heard on auscultation. He was held in this position for about four hours. Then, negative

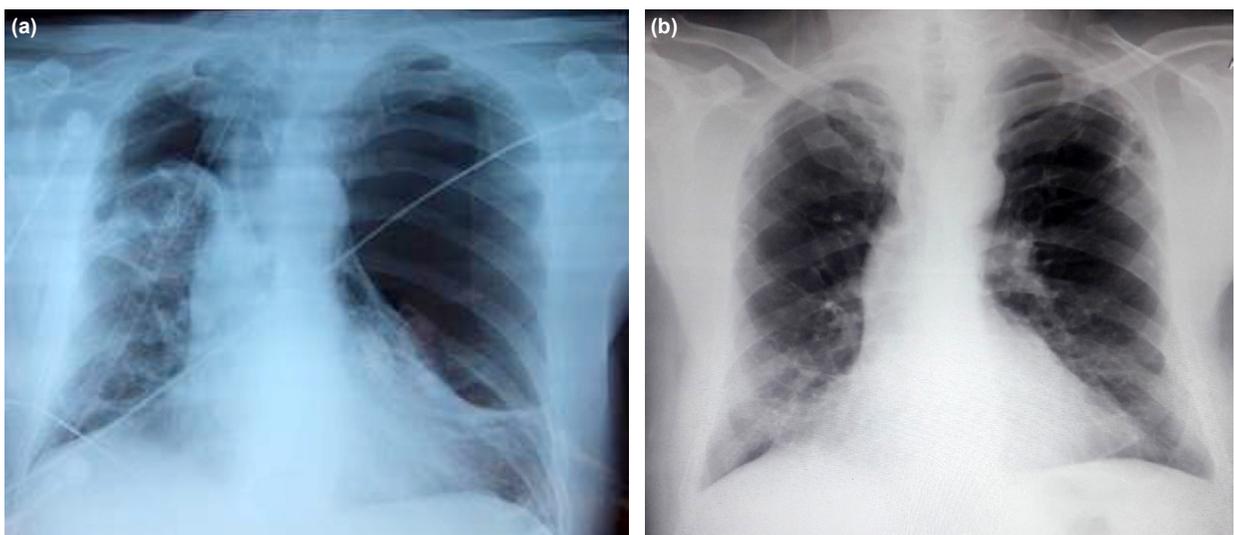


Figure 2. (a) PA Chest X-ray taken on postoperative 13th day; it appears that the right lung cannot be expanded. (b) PA chest X-ray taken after surgery performed on both sides.

suction was applied again. On the control chest radiogram, the lung was observed to be expanded. The patient was discharged on the 15th postoperative day after the removal of his chest tube. Surgical treatment was planned for the other side at another time.

In the first postoperative year, his respiratory function test results were as follows: FVC: 1.6 lt (35% of expected), FEV₁: 1.2 liters (37% of expected), FEV₁/FVC: 81% and the patient could perform his daily activities comfortably and walk without rest for one or two kilometers (dyspnea index 3).

DISCUSSION

The most common symptoms in bullous lung diseases (BLD) are shortness of breath and chest pain. Evaluation is usually started with plain chest radiography and a giant bulla is often confused with pneumothorax.

Surgical indication in GBE varies depending on the presence of dyspnea. Indications of surgery in non-dyspneic and pneumothorax are the presence of infected bulla, the possibility of malignancy, intense hemoptysis and severe chest pain. In GBE with dyspnea, the key point in deciding on surgical intervention is to determine how much the bulla contributes to pulmonary dysfunction. With surgery, it is intended to achieve reexpansion of the lung collapsed by the compression of the bulla, to restore the diaphragm to its normal position, to regulate the elastic recoil of the lung, to reduce airway resistance, and to eliminate breathing through dead space so as to relieve symptoms.^[2,4,5]

Lung tomography is the preferred imaging method. CT examination makes a significant contribution to the determination of the prevalence of the lesion. In GBE, the number, size and parenchymal pressures of the bulla can be displayed with CT. In addition, small bullae can be detected with this method that cannot be detected by standard chest radiograms.^[4] It is one of the parameters that show exactly the width of the bulla, its compression (if any) on the vascular or peripheral parenchyma and the nature of the lung in collapse. The bulla filling at least 1/3 of a hemithorax constitutes an ideal indication for resection.

The main criterion for evaluating pulmonary functions is spirometry. Obstruction in the airflow is a specific disorder in emphysema and definitive diagnosis can be made with difficult expiratory maneuvers. The 6-minute-walk test is often used to determine exercise capacity. PFT shows findings in favor of varying degrees of obstructive disease.

However, it is difficult to estimate the postoperative condition of the remaining lung in a collapse during the preoperative period.^[2] Patients with hypoxemia and hypercarbia and apparently low FVC, FEV₁ or decreased DLCO values are risky concerning postoperative complications. Patients with this feature may not benefit after surgery or even get worse.

Ideal patients for surgery included young patients, patients with normal heart function, slightly decreased pulmonary

function and patients who are very active and sufficient in their daily work despite breathlessness. There are publications reporting that patients with a single bulla with a preoperative dyspnea index of 3 or higher benefit more from surgical intervention.^[5] Our case had a strong muscular body with normal heart function without the additional disease, hypercarbia and desaturation during walking exercises. Besides, the remaining lung in the collapse was not emphysematous, as was seen on the CT. Presence of a huge bulla with a positive dyspnea index was an indication for surgery.

In surgical intervention, large resections should be avoided as much as possible, and it should be remembered that even in cases where the entire lobe is destructed, there may be some robust lung parenchyma in the hilus. In cases where the bullae are bilateral, in addition to cases suggesting the surgery on both sides at the same time with the median sternotomy, some authors also advocate the approach to the contralateral hemithorax according to the functional results obtained after the intervention to the other hemithorax.^[4] For this, VATS or thoracotomy can vary according to the preference of the surgeon. In our case, we preferred lateral mini-thoracotomy, which was performed without cutting the muscle as much as possible, and postponed the surgery of the contralateral side to another session.

The most common complications in patients operated for GBE include failure to clear and remove secretions and expansion defects of the lung.^[6] Also, pleural effusion, empyema, pneumonia, arrhythmia, deep vein thrombosis, and lung embolism can be seen. Dwell time of the chest tube is important as it increases the likelihood of developing empyema. The chest tube is removed in the earliest postoperative period, during which drainage is reduced and air leak ceased. Reinforced suturing materials or the technique of not touching the parenchyma areas that will not be resected may be useful in reducing the amount and duration of air leak. In our case, the parenchyma on the stapler, the incision line, was supported by the bulla wall to prevent the development of air leak.

The postoperative care of these patients is similar to the care provided to patients with poor pulmonary functions. Postoperative care starts especially in the preoperative period with patients' quitting smoking and being included in the pulmonary rehabilitation program. However, drastic problems may be experienced during the postoperative period. There is still something to be done when these problems are encountered. In our case, autologous blood application prevented the emergence of drastic problems on the postoperative 13th day in which air leak and expansion defect continued.

Autologous blood application and pleurodesis are safe, easy, cheap and effective methods.^[7,8] It should be considered in cases where the full expansion of the lung cannot be achieved.^[8] Indeed, bronchial air leakage can be corrected by creating a fibrin plug within minutes with autologous blood. The patch effect with this fibrin plug also

showed its vital effect in our case and enabled the lung to be expanded in a short time. While the part of the air leak with the patch effect of autologous blood is closed, it is thought to trigger inflammation in the long term and cause fibrinous pleuritis.^[9] In addition to its being cheap and easily available, this method has the advantage that it does not have any side effects compared to other sclerosing agents.

The articles indicating that mortality varies between 1.5–11% and most of the deaths occur with respiratory failure, pleuropulmonary infection or contralateral pneumothorax show how important patient selection is in these cases.^[10]

In conclusion, patient selection, preoperative and postoperative care are very important in the presence of GBE. There may be different approaches for surgical removal of the bulla. Prolonged air leak and expansion defect after surgery is a serious problem. Autologous blood application is a safe method that can be life-saving in eliminating these problems.

Informed Consent

Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

Peer-review

Internally peer-reviewed.

Authorship Contributions

Concept: T.Ö.; Design: T.Ö.; Supervision: T.Ö.; Fundings: T.Ö.; Materials: T.Ö.; Data: T.Ö.; Analysis: T.Ö.; Literature search: T.Ö.; Writing: T.Ö.; Critical revision: T.Ö.

Conflict of Interest

None declared.

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Bir İki Taraflı Dev Bül Olgusu: Uzamış Hava Kaçağında Otolog Kan Uygulaması

Bir hemitoraksın en az üçte birini kaplayan dev amfizematöz bül (DAB) varlığında cerrahi bir tedavi seçimidir. Bu yazıda, ilerleyen nefes darlığı, balgam, günlük aktivitelerini yerine getirememe şikayetleriyle müracaat eden, radyolojik incelemeler sonrası iki taraflı DAB tanısı alan, 53 yaşında erkek bir olgu sunuldu, ameliyat sonrası yaşanan sorunlar tartışıldı. Sağ taraftaki DAB ameliyat edildi. Ameliyat sonrası dönemde hava kaçağı (HK) oldu ve akciğerin genişlemesi yetersizdi. Solunum sıkıntısı ve pürülan sekresyon olduğu anda otolog kan uygulamasıyla bu önemli sorun çözüldü. DAB varlığında, ameliyat öncesi dönemdeki kalan akciğer hakkındaki cerrahi sonucu tahmin etmek zordur. Ameliyat sonrası dönemde çok ciddi sorunlarla karşılaşılabilir. Ameliyat sonrası dönemde HK'nın uzaması ve akciğerin genişlememesi çok ciddi bir sorundur. Otolog kan uygulaması; bu sorunların çözülmesinde güvenli, kolay ve etkilidir.

Anahtar Sözcükler: Cerrahi; iki taraflı dev bül; otolog kan; uzamış hava kaçağı.