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# The Role of Conservative Management in The Treatment of Large Primary Spontaneous Pneumothorax: Is Pleural Drainage Necessary?

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**ABSTRACT**

**Introduction**: There is no definite algorithm for the treatment of first episode primary spontaneous pneumothorax. Although interventional methods are recommended in patients with dyspnea or respiratory distress, conservative treatments are more prominent in patients with non-specific symptoms or asymptomatic patients. In this study we aimed to compare conservative treatment and chest tube application in patients with first-episode large spontaneous pneumothorax without respiratory distress.

**Methods:** The data of patients who were treated for primary spontaneous pneumothorax in our clinic between February 2022 and December 2022 was reviewed. Patients with first-episode large pneumothorax without respiratory distress were included in the study. Characteristics and follow-up results of the patients were recorded.

**Results:** A total of 28 patients who met the criteria were included in the study. The chest tube was applied to 20 of the patients included in the study, and 8 patients were followed up with O2 inhalation without surgical intervention. The mean hospital stay was longer in the chest tube group, while the mean time for lung expansion and the number of outpatient visits after discharge were found to be higher in the conservative group (p=0.014, p=0.00, p=0.015, respectively).

**Conclusion:** The conservative approach in the treatment of first-episode large primary spontaneous pneumothorax is an alternative to interventional procedures, with a shorter hospital stay and similar recurrence rates in patients without respiratory distress or low oxygen saturation.

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## Introduction

Primary spontaneous pneumothorax (PSP) is defined as the abnormal collection of air between the visceral and parietal pleura, without underlying lung disease and an obvious cause (1). It is a global health problem that frequently affects the adolescent and young adult age group. Subpleural blebs, which are found in approximately 90% of patients, were blamed for its etiology and smoking was stated as the most important preventable risk factor (2, 3).

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Generally, patients present with pleuritic sharp chest pain. Unlike secondary spontaneous pneumothorax that develops due to underlying lung disease, dyspnea and respiratory failure accompany the clinical picture less frequently (4).

Treatment options include clinical follow-up, oxygen inhalation, needle aspiration, pleural catheter, and chest tube applications. Advanced surgical interventions with VATS or thoracotomy may also be required in order to terminate active air leakage and/or reduce the risk of recurrence (4-6).

The amount of pneumothorax and the clinical condition of the patient are the two most important parameters in choosing the appropriate treatment method. Although there are several guidelines in the literature, there is no consensus on the treatment algorithm to be followed in this patient group (7, 8). Approaches applied especially in patients who do not have dyspnea and whose clinical condition is stable may differ between centers. In this retrospective study, it was planned to investigate the role of clinical follow-up without surgical intervention in the treatment of PSP by comparing the data of patients who underwent chest tubes.

## Methods and Material

### Patient selection

This study was designed as a retrospective cohort and approved by the Institutional Review Board of Kafkas University Medical Faculty. The data of patients treated with the diagnosis of primary spontaneous pneumothorax between February 2022 and December 2022 were retrospectively analyzed. Patients over 18 years of age with a first attack and large pneumothorax were included, while those with a history of past pneumothorax, trauma, and pre-existing lung disease were excluded. Patients with dyspnea, respiratory distress, or low saturation were not included in the study. The presence of a pneumothorax more than 2 cm from the lateral at the level of the pulmonary hilum on the chest X-ray was classified as a "large pneumothorax" (Figure 1). Chest tube insertion was planned for all patients with large pneumothorax regardless of the presence of any symptoms. Patients who did not accept surgical intervention were hospitalized with oxygen inhalation and followed up. Considering this difference in treatment, the patients were divided into two groups as "chest tube group" and the "conservative group". In the conservative group, 4-6 lt/min continuous oxygen was administered via a nasal cannula, and clinical and radiological (daily p/a chest radiogram) follow-up was planned. If there was no radiological progression in pneumothorax or worsening of symptoms during 24-hour follow-up in the conservative group, discharge was planned considering patient cooperation, proximity to the health center, and sociocultural factors. Oxygen inhalation therapy was continued throughout the hospitalization period.

In the "chest tube" group, the chest tube was terminated 24 hours after the air leak cessation and full lung expansion attainment. The characteristics of the patients, their symptoms at presentation, the amount of pneumothorax, the preferred treatment method, the drainage time, and the length of hospital stay were recorded.

### Follow-up after discharge

Patients in the "chest tube" group were called for outpatient control 10 days after discharge. Early follow-up after discharge was often planned for patients in the "conservative group".

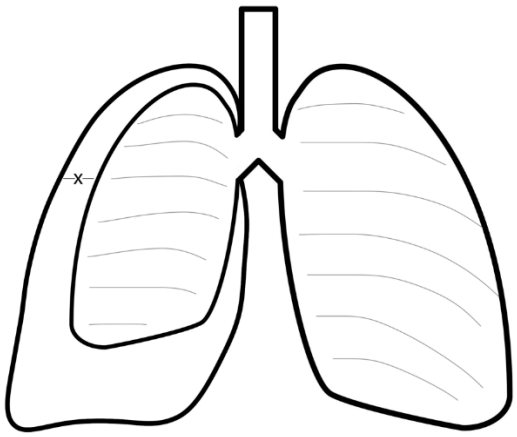


**Figure 1.** The presence of separation greater than 2 cm from the lateral chest wall (X) at the level of the hilum was classified as "large pneumothorax".

### Statistical Methods

Statistical analysis was performed using SPSS 28.0 (SPSS Inc., Chicago, IL, USA). Continuous variables were expressed as mean value ± standard deviation (SD) while categorical variables were presented as counts and percentages. Chi-squared test or Fisher's exact test was used to compare frequencies while the independent two-sample t-test or Mann-Whitney U test was used to compare the continuous variables.

## Results

A total of 28 patients who met the criteria were included in the study. There were 20 males and 8 females. The mean age was 25.9±6.5, the median age was 29 years (range: 18-41). The most common symptom was sharp chest pain (75 %). The chest tube was applied to 20 of the patients included in the study, and 8 patients were followed up with O2 inhalation without surgical intervention. The characteristics of the patients are presented in Table 1. No complications related to chest tube placement were observed. Successful pain management was achieved with non-steroid anti-inflammatory drugs. Full lung expansion was achieved in 7 of 8 patients in the conservation group however, chest tube application was required in one patient due to the progression of pneumothorax. In the chest tube group, VATS was performed in one patient due to persistent air leakage. The mean follow-up time was 5.2±2.8 months and in long-term follow-up, VATS was performed in one patient from each group because of pneumothorax recurrence. When the results of the two groups were compared, the mean hospital stay was longer in the chest tube group, while the mean time for lung to expand and the number of outpatient visits after discharge were found to be higher in the conservative group (p=0.014, p=0.00, p=0.015, respectively) (Figure 2).

## Discussion

The results of our study are important in terms of showing that even large pneumothorax completely regresses over time without any intervention. However, the critical point is that none of the patients included in the study had respiratory difficulties or oxygen desaturation as the presence of respiratory distress or low oxygen saturation is an agreed indication of interventional therapy like needle aspiration or chest tube (7-10).

**Table 1.** Characteristics of patients

| Variables | Conservative treatment (n=8) | Chest tube (n=20) | P value |
|---|---|---|---|
| **Age (mean±SD)** | 25.6±5.9 | 25.9±6.9 | 0.90 |
| **Sex (male) (%)** | 6 (75) | 14 (70) | 1.0 |
| **Pneumothorax side (right) (%)** | 4 (50) | 9 (45) | 1.0 |
| **Hospital stay (day) (mean±SD)** | 2.5±1.3 | 4.8±2.3 | 0.014 |
| **Lung expansion time (day) (mean±SD)** | 13.4±4.9 | 3.1±2.4 | 0.00 |
| **Recurrence (yes) (%)** | 1 (12.5) | 2 (10) | 1.0 |
| **Follow-up time (months) (mean±SD)** | 4.5±2.4 | 5.5±2.9 | 0.41 |
| **The number of outpatient visits (mean±SD)** | 2.9±0.8 | 2.3±0.4 | 0.015 |
| **Application to the outpatient clinic earlier than the scheduled date (yes) (%)** | 4 (50) | 3 (15) | 0.077 |

SD: Standard deviation

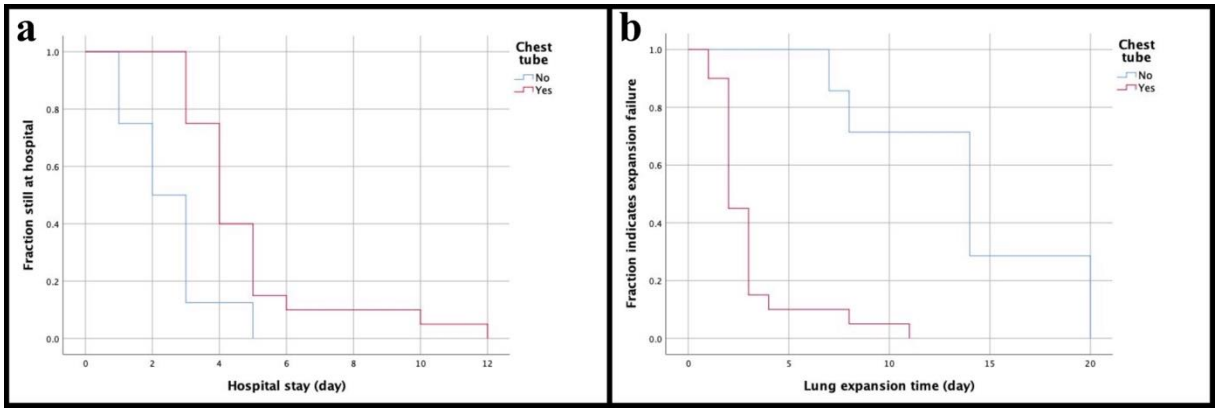


**Figure 2.** The mean hospital stay was longer in the chest tube group (Figure 2a), while the mean time for the lung expansion was longer in conservative group (Figure 2b).

While there is no consensus in the treatment of primary spontaneous pneumothorax, the treatment principles have turned to conservative or less invasive approaches over time. British Thoracic Society (BTS) does not recommend intervention in cases of primary spontaneous pneumothorax smaller than 2 cm and they recommend needle aspiration first in large pneumothorax (7). However, The American College of Chest Physicians (ACCP) adopted a more aggressive approach to the treatment of first-episode spontaneous pneumothorax and recommended chest tubes for that all pneumothorax greater than 20% [8]. However, current literature provides data supporting less aggressive treatment modalities (9-13). Thelle et al (11), compared needle aspiration and chest tube in the treatment of spontaneous pneumothorax and shows shorter hospital stays and higher immediate success rates for needle aspiration chest tube drainage. In the study of Simon et al (9), in which they included 316 patients with large pneumothorax, they presented more advantageous results in the patient group that preferred conservative treatment with a lower complication rate and shorter hospital stay compared to the interventional management.

In our study, although the mean hospital stay was shorter in the conservative treatment group, outpatient visits were more frequent after discharge. We think that the fear of pneumothorax progression and anxious behavior have an effect on frequent outpatient visits in the conservative group. While the patients in the chest tube group attributed the chest pain they frequently experienced after discharge to the surgical procedure, the patients in the conservative group attributed the nonspecific symptoms they experienced to possible pneumothorax progression.

## Conclusion

The conservative approach in the treatment of first-episode large primary spontaneous pneumothorax is an alternative to interventional procedures, with a shorter hospital stay and similar recurrence rates in patients without respiratory distress or low oxygen saturation.

### Ethical approval

The study was approved by the Kafkas University Health Sciences Institutional Review Board and designed as a retrospective observational analysis.

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