

ORIGINAL INVESTIGATION

Analysis of Patients with Spontaneous Pneumomediastinum

Muharrem Çakmak¹, Melih Yüksel², Mehmet Nail Kandemir¹

¹Clinic of Chest Diseases, Gazi Yaşargil Training and Research Hospital, Diyarbakır, Turkey

²Emergency Medicine, Gazi Yaşargil Training and Research Hospital, Diyarbakır, Turkey

Abstract

OBJECTIVES: Spontaneous pneumomediastinum is characterized by the presence of air in the mediastinum without any reason. The objective of this study is to report our experience in the diagnosis and treatment of this clinical condition.

MATERIAL AND METHODS: 21 patients with spontaneous pneumomediastinum who were referred to our clinic between January 2010 and May 2015 were evaluated retrospectively. The presence of radiological pneumomediastinum and the absence a traumatic cause were taken as the basic criterion.

RESULTS: The mean age of the patients was 24.78 ± 4.37 years. Thirteen patients were male, eight patients were female. The main complaints of the patients were chest pain, dyspnea, neck pain, sore throat and cough. Thirteen patients were smokers. Seven patients had a prior history of asthma, five patient had chronic bronchitis and one patient had cronic obstructive lung diseases. No precipitating factor was identified in 9 patients. While initial complaints was associated with physical effort in 7 patients, three patients cough and two patients had a history of severe crying. Pneumomediastinum was diagnosed by chest radiography in 8 patients, and with chest CT in 13 patients. All the patients were performed bronchoscopy and radiograph of esophagus. Electrocardiogram was taken for all patients. Arrhythmia was detected in 4 of the patients. Treatment included analgesia, rest and oxygen therapy. Mortality and morbidity were not seen. The mean length of hospital stay was 4.4 ± 2.17 days.

CONCLUSION: Spontaneous pneumomediastinum is a benign process. Despite its low incidence, it should be considered in the differential diagnosis of acute chest pain.

KEYWORDS: Spontaneous pneumomediastinum, mediastinal emphysema, dyspnea, subcutaneous emphysema

Received: 28.08.2015

Accepted: 19.11.2015

INTRODUCTION

Pneumomediastinum is the presence of free air in the mediastinum due to traumatic or spontaneous reasons. Spontaneous pneumomediastinum is a subgroup of mediastinum, which does not cause any substantial complications or life-threatening symptoms and occur without an apparent cause and ameliorate on its own [1]. Its incidence is low. It has been reported that most of the patients are young males and that it is encountered approximately at the age of 20 [2].

The pressure between pulmonary interstitium and alveoli play an important role in the pathophysiology of spontaneous pneumomediastinum. The increase in pressure difference causes the alveoli to rupture and the air in the pulmonary interstitium accumulate by spreading to the hilus and mediastinum [2-4]. Asthma exacerbation, infections (pneumonia, small air way infections) and cough are among the most common reasons [1,5]. The most common clinical findings are chest pain, dyspnea and subcutaneous emphysema [6].

This study aimed to discuss the findings and results of the patients whose follow-up and treatment was carried out by our clinic due to spontaneous pneumomediastinum in light of the literature.

MATERIALS AND METHODS

Twenty-one patients treated for spontaneous pneumomediastinum between January 2010 and May 2015 were retrospectively evaluated. Patient charts were reviewed. Age, gender, radiologic findings, laboratory results, predisposing factors, precipitating causes, patient habits, treatments, hospitalization duration, mortality, and morbidity were studied.

1st International and Intercontinental Critical Care and Emergency Medicine Congress. 06-08 November 2013, Turkey.

Address for Correspondence: Muharrem Çakmak, Gazi Yaşargil Eğitim ve Araştırma Hastanesi, Göğüs Cerrahisi Kliniği, Diyarbakır, Türkiye Phone: +90 533 301 68 97 E-mail: drcakmak@gmail.com
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Inclusion criteria to the study were the presence of pneumomediastinum radiologically and non-existence of a traumatic cause (tracheobronchial tree or esophagus perforation, thoracic or cardiac surgeries, chest wall injuries, infections, and neck or abdominal surgeries).

Approval was obtained from the Ethics Committee of Dicle University, Medical Faculty (approval no/date: 314/02.09.2014).

Statistical Analysis

Continuous variables, mean \pm standard deviation and categorical variable were all expressed as number-rate in statistical analysis.

RESULTS

Mean age was 24.78 ± 4.37 years. Thirteen patients were males (62%) and 8 were females (38%). Two of the male patients were children at the ages of 6 and 9. The mother of one of the children had received inpatient treatment in our clinic due to spontaneous pneumomediastinum twice. Blood samples belonging to the mother and the child were taken under genetic analysis. No chromosomal anomalies were detected.

The most common symptom among the patients was centrally located chest pain (n: 19 patients, 90%). Seventeen patients (81%) had dyspnea, 15 (71%) had cough, 11 (52%) had neck pain, 5 (24%) had aphonia, 4 (19%) had subcutaneous emphysema located in the neck, and 4 (19%) had difficulty in swallowing (Table 1).

Predisposing factors of the disease were smoking in thirteen patients (62%), asthma in 7 (33%), chronic bronchitis in 5 (24%), and chronic obstructive pulmonary disease in 1 (5%) (Table 1).

While precipitating factors of the disease were physical effort in seven patients (33%), cough in 3 (14%) and severe crying in 2 (10%) (pediatric patients), there were no distinct precipitating factors in nine patients (43%) (Table 1).

The duration between the diagnosis of the disease and setting of the complaints was between 1 hour and 3 days. Most complaints of the patients were nonspecific except for subcutaneous emphysema (n: 4). Hamman's sign, which is accepted pathognomic for pneumomediastinum, was present in 4 patients (19%).

All patients underwent chest radiography and 13 had additional computed thoracic tomography, and it was realized that diagnosis was made with chest radiography in 8 (38%) and computed thoracic tomography in 13 patients (62%). Main findings on chest radiography were subcutaneous emphysema and air column in the mediastinum, and on computed tomography, it was extensive air image in the mediastinum (Figures 1,2).

There was no abnormal finding in laboratory tests (complete blood count, routine biochemistry, coagulation tests, arterial blood gases) apart from eosinophil and leucocyte elevation. Arrhythmia was detected on the electrocardiography of four (19%) patients.

It was seen that oral intake of the patients diagnosed with spontaneous pneumomediastinum was stopped until having eliminated esophagus injuries and that bronchoscopy was performed and esophagus passage graphy was taken to exclude trachea or esophagus rupture.

Primary treatment of the patients included analgesia, bed rest and oxygen therapy. It was established that response to

Table 1. Distribution of symptoms, predisposing and precipitating factors in patients with spontaneous pneumomediastinum

	Number of patients (n)	Percentage (%)
Symptoms		
Chest pain	19	90
Dyspnea	17	81
Cough	15	71
Neck pain	11	52
Aphonia	5	24
Subcutaneous emphysema	4	19
Difficulty in swallowing	4	19
Predisposing factors		
Smoking	13	62
Asthma	7	33
Chronic bronchitis	5	24
Chronic obstructive pulmonary disease	1	5
Precipitating factors		
None	9	43
Physical effort	7	33
Cough	3	14
Severe crying	2	10



Figure 1. Chest radiography of a patient with pneumomediastinum.

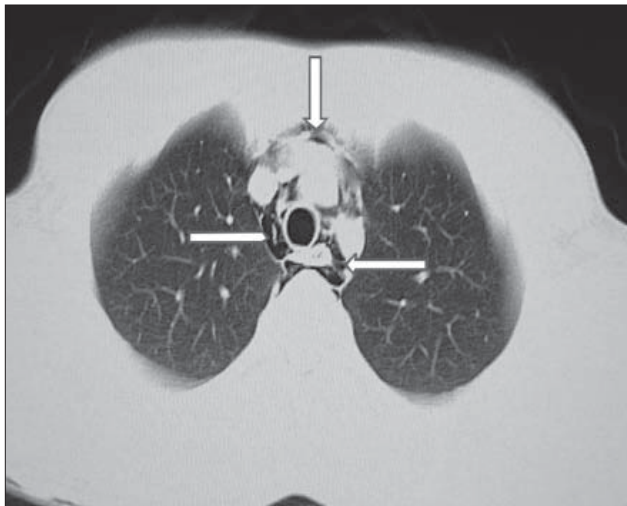


Figure 2. Computed thoracic tomography of a patient with pneumomediastinum.

treatment was achieved from the 2-3 L/15-20 min of oxygen therapy and in 3-4 days with additional treatments with bronchodilator, antibiotics and antitussive.

There were no complications apart from a temperature of 38-39°C in 4 patients (%19). It was determined that relapse (5%), which responded to conservative treatment, developed in a female patient three months later and no mortality occurred. Mean hospitalization duration of the patients was 4.4 ± 2.17 days.

DISCUSSION

Even though the incidence of spontaneous pneumomediastinum is low, it is not accurately known. Newcomb et al. [2] have reported this rate as 1 in 29.670 and Maravelli et al. [7] have reported it between 1/7.000-1/32.000. The disease primarily affects young males and is seen around the age of 20 [2]. The number of males was 1.62 times more than females and mean age was 24.78 ± 4.37 in our study.

Spontaneous pneumomediastinum may occur with three mechanisms: 1) gas production and air accumulation due to

mediastinal infections; 2) air accumulation in the mediastinum owing to the rupture in the cutaneous or mucosal membranes; 3) pressure difference between pulmonary interstitium and alveoli. Rupture occurs in the alveoli due to pressure difference and the air accumulated in the interstitium spreadsthrugh the hilus and to the mediastinum, which has lower pressure, from the lung periphery (Macklin effect). As the air pressure in the mediastinum increases, air leak to the cervical region, within soft tissues and to the retroperitoneal space is seen. These three mechanisms make up the basic pathophysiology of spontaneous pneumomediastinum [1,8].

Both predisposing and precipitating factors have been reported in spontaneous pneumomediastinum. Asthma is the most common predisposing factor [9]. Narcotic drug use has also been reported among predisposing factors. Primary precipitating factors are cough, sneeze, defecation, childbirth and vomiting [1,2,10]. The most common predisposing factors in our study were smoking with a rate of 62% and asthma with a rate of 33%. Precipitating factors were physical effort with a rate of 33% and cough with a rate of 14%. However, there were no precipitating factors in 43% of the patients. The most common symptoms in spontaneous pneumomediastinum are chest pain, dyspnea, neck pain, and discomfort. The most commonly reported symptom is chest pain. Other symptoms include painful swallowing, cough, dysphonia (difficulty in speaking), back pain, and stomachache. The most commonly reported sign on physical examination is subcutaneous emphysema located in the neck with a rate of 10%-100% [1,2,6,10,11]. The prevalence of Hamman's sign, which is described as a crunching, rasping sound, synchronous with the heartbeat, during osculation of the anterior chest area, has been reported in various rates, changing between 0%-100%. In recent studies, this rate has been reported lower [12]. Hamman's sign was present in four patients in our study. The most common symptom, which was centrally located chest pain, was followed by dyspnea, cough, neck pain and saphonia.

Diagnosis is usually made with posteroanterior chest radiography and lateral radiography. Sakai et al [13]. have recommended the evaluation of the mediastinum with tomography since chest radiography is generally normal in patients with spontaneous pneumomediastinum. Computed thoracic tomography is among the gold standard of imaging techniques in patients that have a low amount of pneumomediastinum. In our study, eight patients were diagnosed with chest radiography and thirteen with tomography.

Main approach in the treatment of spontaneous pneumomediastinum is bed rest, oxygen therapy and analgesia. Patients respond well to this treatment. Similarly in many studies, treatment duration has been reported between 2 to 5 days [1,2,3,12]. Mean hospitalization duration in our study was 4.4 ± 2.17 days.

Complication development that could cause life-threatening situations is very rare in spontaneous pneumomediastinum. Gerazounis et al [14]. have reported relapse occurring in late periods. In our study, one female patient suffered a relapse that developed in the late period. Spontaneous pneumomediastinum also developed in the child of the same

patient. Pathology was not detected in the genetic analysis performed on both the mother and the child.

In conclusion, primary spontaneous pneumomediastinum is an uncommon pathology of thoracic surgery, which does not have adverse results. Despite encountered in low numbers, differential diagnosis should be considered in patients with acute chest pain since it has a very different treatment protocol when compared to other clinically similar diseases.

Consent could not be obtained from the patients since this was a retrospective study (5-yearfile scanning).

Conflict of Interest: Concept - M.Ç.; Design - M.Ç.; Supervision - M.Y.; Resources - M.Ç., M.N.K., M.Y.; Materials - M.Ç., M.N.K., M.Y.; Data Collection and/or Processing - M.Ç.; Analysis and/or Interpretation - M.Ç., M.N.K.; Literature Search - M.Ç., M.N.K., M.Y.; Writing - M.Ç.; Critical Review - M.Ç., M.N.K., M.Y.; Other - M.Ç., M.N.K., M.Y.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

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