Available online at www.medicinescience.org

ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2021;10(2):529-31

The effect of smoking on the duration of drain and hospital stay in patients with primary spontaneous pneumothorax

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Received 30 March 2021; Accepted 11 April 2021
Available online 25.04.2021 with doi: 10.5455/medscience.2021.03.105

Abstract

Primary spontaneous pneumothorax is the presence of free air in the pleural space without any underlying lung disease or trauma. It usually occurs in thin young males. Smoking is an important factor in its etiology. Treatment is follow-up, needle aspiration or tube thoracostomy. Our aim in conducting this study is to examine the demographic data of patients who underwent tube thoracostomy due to primary spontaneous pneumothorax and the effect of smoking on the duration of drain and hospital stay. This is a retrospective observational cohort study conducted in a Training and Research Hospital Thoracic Surgery clinic between February 2015 and February 2020. All patients who underwent tube thoracostomy for primary spontaneous pneumothorax were included in the study. Patients were divided into two groups according to smoking status as: Group 1 (smoking group), Group 2 (non-smoker group). Age, gender, body mass index, duration of drain and hospital stay was compared between the groups. Group 1 included 48 patients (mean age: 22.7±2.92 years, 79.2% male) and group 2 included 23 patients (mean age: 22.5±2.37 years, 73.9% male). There was no statistically significant difference between the groups in terms of gender, age, body mass index ($p > 0.05$). However, the duration of drain and hospital stay of the patients in group 2 was statistically significantly lower than group 1 ($p < 0.001$). Three patients in group 1 were operated on due to prolonged air leak. Our study supports that smoking is a major factor prolonging the treatment process in addition to the primary spontaneous pneumothorax etiology.

Keywords: Primary spontaneous pneumothorax, smoking, tube duration time, hospital stay

Introduction

Pneumothorax (PX) occurs when free air accumulates between the parietal and visceral pleura and separates the lung from the chest wall [1.2]. PX is divided into two groups according to how it is formed; spontaneous andtraumatic. Spontaneous pneumothorax (SP) is divided into two groups according to the underlying lung disease; primary and secondary. Primary spontaneous pneumothorax (PSP) has no underlying lung disease and is common in young male patients. Secondary spontaneous pneumothorax (SSP) is usually seen in adults with underlying chronic obstructive pulmonary disease. [3.4]. If the PX develops due to blunt or penetrating trauma, it is called traumatic pneumothorax. Iatrogenic pneumothorax constitutes an important part of traumatic pneumothorax [1.5].

The annual incidence of PSP is 0.227 per 100 and 3.3 times higher in men than in women. Typically, it occurs in tall, thin men between the ages of 15 and 30 [3.6]. PSP diagnosis, it may be suspected based on history and physical examination, but diagnosis is usually made by radiography (x-ray). If required, CT is the gold standard [2.7]. The most common symptoms are chest pain and dyspnea [1.2.8]. In the literature, bed rest, oxygen therapy, needle aspiration or tube thoracostomy (TT) are the most recommended treatments for PSP [3.7.9]. TT, which can be performed with local or sedo analgesia, is the placement of a polyvinyl chloride (PVC) tube placed between parietal and visceral pleura for air or fluid drainage. The closed water bottom drainage system allows the evacuation of air or fluid from the pleural cavity via a one-way valve system [10.11]. PSP recurrence, increasing from 40% in past-smokers to 70% in active smokers [12.13].

In our study, we aimed to determine the effects of demographic data, body mass index (BMI) and smoking on the duration of drain and hospital stay of patients who underwent tube thoracostomy for PSP and were hospitalized.

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Material and Methods

Study Design and Study Population

This retrospective clinical study was conducted in the Thoracic Surgery Clinic between February 2015 and February 2020. The data of 71 patients who underwent TT for PSP were analyzed and included in the study. Patients were divided into two groups according to smoking status as: Group 1 (smoking group), Group 2 (non-smoker group). Group 1 consisted of 48 patients; group 2 consisted of 23 patients. Pneumothorax was diagnosed with chest X-ray and / or thorax CT. Inclusion criteria were: patients who underwent TT for PSP. The exclusion criteria are as follows: patients who received oxygen therapy, bed rest or needle aspiration without TT, recurrent PSP, SSP, traumatic PX, mental retardation, having any disease that prevents the patient from walking, having a history of lung surgery, having a chronic lung disease such as asthma.

Due to the retrospective nature of this study, all treatments and medications were administered during the hospital procedure after informed consent of the patients was obtained. The study protocol was approved by the Local Ethics Committee (19/12/2019 54132726-000-26644). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Outcome Measurements

Demographic characteristics, BMI, duration of drain stay and hospital stay of group 1 and group 2 patients who underwent TT for PSP were examined.

Interventions

TT was performed in all patients. While the patient is in a semi-sitting position, the arm on the side where the tube will be attached is raised overhead. Aseptic technique is used to prevent site infection or secondary empyema; Use of sterile gloves, gowns and equipment is sufficient. After effective skin cleansing using chlorhexidine or iodine, thoracentesis is performed from the mid axillary line, which is ideal for TT, and the intercostal space where the tube will be inserted is determined. Local anesthesia is applied to the skin, subcutaneous, intercostal muscles and pleural surface with the needle. After the tube size (16-36Fr) is determined, the tube is inserted by entering the thorax with blunt dissection. After the tube is fixed with two sutures, it is connected to the closed underwater drainage system [14]. A control chest radiograph was seen after TT. Complications such as kinking of the tube were checked. There were no complications. The patients were hospitalized and followed up. Patients were mobilized and pulmonary rehabilitation was performed. Daily drainage and air leakage control was done. When the air leak was cut from the thoracic drain, a chest radiograph was taken to evaluate whether the lung was expanded. If the lung was expanded, the thorax drain was removed and the patient was discharged the next day after a control chest radiograph. Patients whose air leak did not stop after 14 days was diagnosed with prolonged air leak. Three patients from group 1 underwent Video Assisted Thoracoscopic Surgery (VATS) wedge resection and pleurectomy due to prolonged air leak.

Statistical analysis

Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 20.0 software (IBM SPSS Inc., Chicago, USA). Continuous variables shown to have abnormal distribution were log-transformed before deeper statistical analysis. Qualitative variables were expressed in numerical and percentage values. Continuous variables were expressed as mean and standard deviation values. The one-way ANOVA test was used when comparing the mean and standard deviation values of the continuous variables of the patients in all three groups. Mutual comparisons between groups were made using Tukey's post hoc analysis method. A significant P value was considered as <0.05.

Results

Seventy-one patients with a diagnosis of PSP who underwent TT were included in the study. Patients were divided into two groups according to smoking status as: Group 1 (smoking group), Group 2 (non-smoker group). 48 (67.60%) of the patients were in group 1 and 23 (32.40%) were in group 2. There was no statistically significant difference between the groups in terms of age, gender and BMI ($p> 0.05$). However, the duration of drain and hospital stay of the patients in group 2 was statistically significantly lower than group 1 ($p <0.001$).

The demographic characteristics of the patients, BMI, day of drain and hospital stay are shown in the Table. Three patients from group 1 underwent VATS wedge resection and pleurectomy due to prolonged air leak.

Table. Demographic characteristics of patients

		Group 1 (Smoker)	Group 2 (Non-smoker)	
		N:48	N: 23	(inter-group) p
Sex	**Male**	38 (%79.2)	17 (%73.9)	0.736
	Female	10 (%20.8)	6(%26.1)	
Age (year) (mean±SD)		22.7±2.92	22.5±2.27	0.789
BMI (kg/m2) (mean±SD)		20.5±1.15	20.7±1.06	0.430
Tube Duration Time (day) (mean±SD)		7.69±2.45	4.26±0.92	0.000
Hospital stay (day) (mean±SD)		8.69±2.45	5.26±0.92	0.001

Discussion

Many studies have been conducted on the diagnosis, etiology, treatment, and recurrence of PSP. There are not many studies in terms of patient-related risk factors that will affect the treatment process of PSP patients in the hospital.

Cigarette smoke drives small-airway remodeling by induction of growth factors in the airway wall via increased release of active transforming growth factor-beta [15]. Scramel et al. reported that the air caused the distal airways to overstretch and rupture the alveoli due to the bronchiolar inflammation caused by smoking [16]. Cottin et al. stated that respiratory bronchiolitis has a high prevalence in patients with spontaneous pneumothorax [17]. Bense et al. stated that smoking increased the risk of PSP 9 times in women and 22 times in men [18]. Plojoux et al. and Walker et al. emphasized that smoking is an important factor in PSP recurrence [12.19]. Smoking has also been identified as an important risk factor for prolonged air leak after resection along with poor pulmonary function [20.21]. Pan et al. demonstrated the effects of smoking, age, FEV1 / FVC ratio and stapler length on prolonged air leak [22].

According to our study results; Smoking prolongs the duration of drain and hospital stay of PSP patients treated with TT.

Unfortunately, there were some limitations in our article. The study was conducted retrospectively in a limited patient population. It can increase the power of the research with a multicenter prospective evaluation in a larger patient population.

Conclusion

As a result, although there was no difference in terms of age, gender and BMI of patients who were applied TT, the duration of drain and hospital stay of patients who smoked were found to be long.

Conflict of interests
The author does not declare any conflict of interest regarding the publication of this article.
Financial Disclosure
All authors declare no financial support.

Ethical approval
The study protocol was approved by the Local Ethics Committee (19/12/2019 54132726-000-26644). The study was conducted in accordance with the principles of the Declaration of Helsinki.

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