

The Relationship Between Smoking And Complications In Patients Undergoing Pulmonary Rehabilitation After Chest Surgery

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ABSTRACT

The aim of this study was to investigate the relationship between postoperative complications and smoking in patients undergoing chest surgery. The data of 117 cases who were operated in our chest surgery clinic between January 2018 and December 2018 were evaluated retrospectively. 83 of our cases were male and 34 were female. The mean age of the patients was 50.97 ± 18.00 years and the length of hospital stay was 4.09 ± 2.96 days. 68 (58.10%) of the subjects were smokers. The number of non-smokers was 49 (41.90%). The mean amount of cigarettes consumed by smokers was 30.07 ± 20.85 pack-years. Pulmonary rehabilitation was started after the surgery and continued until discharge. There were 49 patients (41.90%) who non-smokers, 19 patients (16.20%) who smoked less than 20 pack*years, and 49 patients (41.90%) who smoked 20 pack*years or more. A total of 19 complications observed in smokers and 3 complications were observed in non-smokers. A positive correlation was found between smoking and postoperative complication ($p < 0.05$). Our results show that the amount of cigarette consumed is related to the rate of postoperative complications.

Keywords: chest surgery, complications, rehabilitation, smoking, therapy.

Göğüs Cerrahisi Sonrası Pulmoner Rehabilitasyon Uygulanan Hastalarda Sigara İçme ve Komplikasyonlar Arasındaki İlişki

ÖZ

Bu çalışmanın amacı, göğüs ameliyatı geçiren hastalarda postoperatif komplikasyonlar ile sigara içme arasındaki ilişkiyi araştırmaktır. Göğüs cerrahisi kliniğimizde Ocak 2018 ile Aralık 2018 tarihleri arasında opere edilen 117 olgunun verileri retrospektif olarak değerlendirildi. Olgularımızın 83'ü erkek, 34'ü kadındı. Hastaların yaş ortalaması 50.97 ± 18.00 yıldır ve hastanede kalış süresi 4.09 ± 2.96 gündür. Olguların 68'i (%58,10) sigara içicisi idi. Sigara içmeyenlerin sayısı 49 (%41.90) idi. Sigara içenler tarafından tüketilen ortalama sigara miktarı 30.07 ± 20.85 paket*yıldı. Ameliyat sonrası pulmoner rehabilitasyona başlandı ve taburcu oluncaya kadar devam etti. Sigara içmeyen 49 hasta, 20 paket*yıldan az içen 19 hasta (%16.20) ve 20 paket*yıl veya daha fazla içen 49 hasta (%41.90) vardı. Sigara içenlerde toplam 19, sigara içmeyenlerde 3 komplikasyon görüldü. Sigara içme ve postoperatif komplikasyon arasında pozitif bir ilişki bulundu ($p < 0.05$). Sonuçlarımız, tüketilen sigara miktarının postoperatif komplikasyon oranı ile ilişkili olduğunu göstermektedir.

Anahtar Kelimeler: göğüs cerrahisi, komplikasyonlar, rehabilitasyon, sigara, terapi.

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INTRODUCTION

Any abnormality occurring in the postoperative period which is clinically meaningful and has a definable disease or dysfunction is defined as a complication (Agostini, 2010). Smoking has been seen as a risk factor for postoperative complications in surgical operations (Thomsen, Villebro, and Møller, 2010). Postoperative pulmonary complications involved in the management of the patient undergoing surgery are important because they can lead to an increased hospital stay, cost of care, and increased morbidity and mortality (Rudra and Sudipta, 2006). The incidence of postoperative pulmonary complications has been reported to vary between 2% and 19% (Fisher, Majumdar, and McAlister, 2002). Patients undergoing chest surgery are usually high-risk patients. They are mostly elderly, have comorbidities, are physically bad due to malnutrition and pre-existing primary disease. Most of these patients are smokers, have occupational exposure and therefore have a higher risk of developing lung complications (Sengupta, 2015).

Pulmonary rehabilitation has been a standard component of postoperative care to prevent or reduce complications such as impaired pulmonary function, atelectasis, pneumonia, and secretion occlusion (Pasquina, 2006). Cessation of smoking prior to surgery may alleviate these risks and provide stronger benefits over longer periods while existing data do not provide clear advice on an optimal preoperative smoking cessation period (Theadom and Cropley, 2006). Cases of cardiovascular disease, chronic obstructive pulmonary disease, and cancer are the leading causes of death in smokers (Önen, 2011). Most patients who are candidates for chest surgery are past or present smokers. In this study, we investigated the relationship between smoking and post-operative complications in patients undergoing pulmonary rehabilitation after chest surgery. We hypothesized that pulmonary rehabilitation practices would have a beneficial effect on the rate of postoperative complications in patients who were smoking or not.

METHODS

January 2018 and December 2018, 117 patients who underwent surgical intervention in Bolu Abant İzzet Baysal University, Faculty of Medicine, Thoracic Surgery Clinic were evaluated retrospectively. All of the patients included in the study had routine pulmonary rehabilitation. In the postoperative period, the patients' were given training on the importance of pursed-lip breathing, diaphragmatic breathing, and deep breathing exercises, in addition, the use of an incentive spirometer in order to improve ventilation and to provide respiratory control within the pulmonary rehabilitation program. At the same time, the subjects were informed about bronchial hygiene techniques (percussion, vibration, coughing, huffing, forced expiration technique, active breathing cycle, autogenic drainage, humidification, etc.) and were applied once a day in the postoperative period. In the postoperative period, it was practiced how the cases would change position in the bed and how to mobilize with the drains and tubes. The history of lung disease, smoking habits and comorbidities of the patients who included in the study were recorded. Respiratory system symptoms, physical examination, and chest X-ray findings were evaluated. In addition, postoperative respiratory and non-respiratory complications were determined by face to face interviews with patients.

Clinical features, operative, and follow-up data were prospectively recorded in a computerized database. Mortality was defined as death within 30 days of operation or when admitted to the same hospital. The study was conducted in accordance with the principles of the Helsinki Declaration.

Statistical Analysis

As a result of the research, descriptive statistics were made primarily based on the qualitative and quantitative data collected. Qualitative variables were expressed as number (n) and percentage (%), and quantitative variables were expressed as mean, standard deviation (SD), and upper and lower values. The Kolmogorov-Smirnov test was used to determine whether the quantitative data were normally distributed. The correlation coefficient and statistical significance between the quantitative variables were calculated by Two-Way Pearson Correlation Analysis. Statistical Package for the Social Sciences (SPSS) version 20.0 (SPSS Inc. Chicago, IL, USA) was used for statistical evaluation of the data and significance level of $p < 0.05$ was evaluated in all hypothesis tests.

RESULTS

Our study was performed with 117 cases. 68 (58.10%) of our patients were smokers. The number of non-smokers was 49 (41.90%). The mean age of the patients was 50.97±18.00 years and the length of hospital stay was 4.09±2.96 days. The mean amount of cigarettes consumed by smokers was 30.07±20.85 pack-years. There were 49 patients (41.90%) who non-smokers, 19 patients (16.20%) who smoked less than 20 pack*years, and 49 patients (41.90%) who smoked 20 pack*years or more (Table 1).

Table 1. Demographic Information Of Patients Participating In The Study.

		Operated Patients in Chest Surgery Clinic n=117	
		Mean±SD	Min-Max
Age (years)		50.97±18.0	17-84
Hospital stay (day)		4.09±2.96	1-15
Pack*years cigarettes smoke		17.48±21.75	0-130
		n, (%)	
Gender			
	Female	34 (%28.8)	
	Male	83 (70.3)	
Pack*years cigarettes smoke			
	Any	49 (%41.9)	
	<20	19 (%16.2)	
	≥20	49 (%41.9)	
Diagnosis			
	Lung cancer	20 (%17.1)	
	Nodular lesion in the kung	20 (%17.1)	
	Pleural effusion	9 (%7.7)	
	Spontaneous pneumothorax	8 (%6.8)	
	Hyperhidrosis	8 (%6.8)	
	Mediastinal lap	6 (%5.1)	
	Idiopathic Pulmonary Fibrosis	5 (%4.3)	
	Mediastinal mass	4 (%3.4)	
	Prolonged air leak	4 (%3.4)	
	Pneumothorax	3 (%2.6)	

The first 5 diagnoses among our patients were 20 patients (17.10%) with lung cancer, 20 patients (17.10%) with lung nodular lesions, 9 patients (7.70%) with pleural effusion, 8 patients (6.80%) with spontaneous pneumothorax, and 8 patients (6.80%) with hyperhidrosis (Table 1). There was a relationship between smoking rate and postoperative complications (r=0.369, p=0.001) (Table 2).

Table 2. The relationship between post-operative complications and smoking status.

		The presence of complications	Smoking status	Smoking amount (Pack*Years)
The presence of complications	r	1	.292	.369
	p		.003*	.001*
Smoking status	r		1	.685
	p			.001*
Smoking amount (Pack*Years)	r			1
	p			

*p<0.05.

Postoperative complications were observed in 19 (27.90%) of the smokers and 3 (6.10%) of the non-smokers group had postoperative complications (Table 3).

Table 3. Distribution of complications according to smoking status.

Complications	Smokers n=19	Non-smokers n=3
Prolonged air leak	4 (%21.1)	-
Atrial Fibrillation	3 (%15.8)	-
Hematoma	2 (%10.5)	-
Hemorrhage	2 (%10.5)	-
Tachycardia	2 (%10.5)	-
Empyema	1 (%5.3)	-
Apical bull perforation	1 (%5.3)	-
Arytenoid dislocation	1 (%5.3)	-
Atelectasis	1 (%5.3)	-
Delirium	1 (%5.3)	-
Diaphragm elevation	1 (%5.3)	-
Dyspnea	1 (%5.3)	-
Embolism	1 (%5.3)	-
Secretion retention	1 (%5.3)	-
Hoarseness	1 (%5.3)	-
Chylothorax	1 (%5.3)	-
Pericardial effusion	-	1 (%33.3)
Hypertension	-	1 (%33.3)
Constipation	-	1 (%33.3)

There was a significant relationship between postoperative complications according to smoking status between two groups ($p<0.05$). The most common postoperative complications in smokers: prolonged air leak 4 (21.10%), atrial fibrillation 3 (15.80%), empyema 2 (10.50%), hematoma 2 (10.50%), hemorrhage 2 (10.50%), and tachycardia 2 (10.50%) while in non-smoking group had pericardial effusion 1 (33.00%), hypertension 1 (33.00%), and constipation 1 (33.00%).

DISCUSSION

In our study, we investigated the relationship between smoking and postoperative complication in patients undergoing pulmonary rehabilitation after chest surgery. In our cases, postoperative complications were more frequent in the smoking group.

Pulmonary rehabilitation practices are recommended to limit the development of postoperative pulmonary complications with significant and economic effects and to prevent shoulder dysfunction after a commonly reported thoracotomy (Agostoni, 2013). Agostoni (2013) investigated the physiotherapy applications to the cases operated in chest surgery clinics in the United Kingdom and reported that deep breathing exercises, early mobilization, and shoulder exercises were widely recommended. In our study, the pulmonary rehabilitation program we applied to our cases was similar to the literature. However, the mean length of hospital stay in our hospital was 4.09 ± 2.96 days and physiotherapy was applied once a day. There are studies that suggest the different frequency physiotherapy sessions on days 1st and 2nd, three times a day on the 3rd and 4th days, two times a day, and once a day until independently mobile (Mackay, Ellis, and Johnston, 2005). However, the frequency of pulmonary complications is not mentioned when physiotherapy is applied at this frequency.

Smoking is an independent risk factor for pulmonary complications after chest surgery (Agostini, 2010). In a study evaluating the risk of smoking and the risk of surgical outcomes, it has been reported that smokers who have smoked more than 20 pack*years have significantly increased the risk for respiratory complications in smokers compared to non-smokers (Hawn, 2011). Mills (2011) reported that the rate of postoperative complications also decreased in the case of smoking cessation earlier. The degree of smoking cessation benefit will depend on three factors: the amount of cigarette smoking per life (package*year), how long the patient has been smoking, and the age at which they quit smoking. Smoking cessation for more than 4 weeks has been reported to benefit at least in wound healing (Sorensen, Karlsmark, and Gottrup, 2003). On the other hand Şenel et al. reported that cigarette smoking causes respiratory symptoms, but it has been observed that there is no effect on the level of physical activity in middle-aged male subjects (Şenel, Yağcı, and Atalay, 2018).

Our study has some limitations. The majority of our patients are upper-middle-aged men, so our results may not be applied directly to young patients and women. Pulmonary rehabilitation during our hospital stay may have reduced the effectiveness of physiotherapy. As a result of this study, we found that smoking increases the risk of postoperative complications in our patients undergoing chest surgery.

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REFERENCES

- Agostini P, Cieslik H, Rathinam S, Bishay E, Kalkat MS, Rajesh PB, et al. Postoperative pulmonary complications following thoracic surgery: are there any modifiable risk factors? *Thorax*. 2010;65(9):815-8.
- Agostini P, Reeve J, Dromard S, Singh S, Steyn RS, Naidu B. A survey of physiotherapeutic provision for patients undergoing thoracic surgery in the UK. *Physiotherapy*. 2013;99(1):56-62.
- Fisher BW, Majumdar SR, McAlister FA. Predicting pulmonary complications after nonthoracic surgery: a systematic review of blinded studies. *Am J Med*. 2002;112(3):219-25.
- Hawn MT, Houston TK, Campagna EJ, Graham LA, Singh J, Bishop M, et al. The attributable risk of smoking on surgical complications. *Ann Surg*. 2011;254(6):914-20.
- Mackay MR, Ellis E, Johnston C. Randomised clinical trial of physiotherapy after open abdominal surgery in high risk patients. *Aust J Physiother*. 2005;51(3):151-9.
- Mills E, Eyawo O, Lockhart I, Kelly S, Wu P, Ebbert JO. Smoking Cessation Reduces Postoperative Complications: A Systematic Review and Meta-analysis. *Am J Med*. 2011;124(2):144-54.e8.
- Önen ZP, Şen E, Gülbay BE, Öztürk A, Yıldız ÖA, Acıcan T, et al. Kardiyopulmoner hastalığı olanlarda sigaranın bırakılması. *Anatol J Cardiol*. 2011;11(3).
- Pasquina P, Tramèr MR, Granier J-M, Walder B. Respiratory physiotherapy to prevent pulmonary complications after abdominal surgery: a systematic review. *Chest*. 2006;130(6):1887-99.
- Rudra A, Sudipta D. Postoperative pulmonary complications. *Indian J Anaesth*. 2006;50(2):89-98.
- Sengupta S. Post-operative pulmonary complications after thoracotomy. *Indian J Anaesth*. 2015;59(9):618.
- Sorensen LT, Karlsmark T, Gottrup F. Abstinence from smoking reduces incisional wound infection: a randomized controlled trial. *Ann Surg*. 2003;238(1):1-5.
- Şenel A, Yağcı N, Atalay TO. Examination of the effect of smoking on physical activity in middleaged males. XVII. Fizyoterapi Ve Rehabilitasyonda Gelişmeler Kongresi .April 25-28, 2018, Antalya. *Turk J Physiother Rehabil*. 2018;29(Suppl 2):P092.
- Theadom A, Cropley M. Effects of preoperative smoking cessation on the incidence and risk of intraoperative and postoperative complications in adult smokers: a systematic review. *Tob Control*. 2006;15(5):352-8.
- Thomsen T, Villebro N, Møller AM. Interventions for preoperative smoking cessation. *Cochrane Database Syst Rev*. 2010;7(7).