The Effect of Passive and Active Smoking on Nasal Mucociliary Clearance Time

Pasif ve Aktif Sigara Kullanımının Nazal Mukosiliyer Klirens Süresi Üzerine Etkisinin Değerlendirilmesi

Özet
Amaç: Bu çalışmanın amacı pasif ve aktif sigara kullanımının nazal mukosiliyer klirens süresi üzerine etkisini yaş ve cinsiyet bakımından benzer sağlıklı bireyler, pasif ve aktif sigara kullanıcılarının sonuçlarını karşılaştırarak araştırmaktır. Gereç ve Yöntem: Yetmiş beş hasta kriterleri karşıladı ve 3 gruba ayrıldı: 25 sağlıklı, aktif ya da pasif kullanımı olmayan olgu, 25 pasif sigara kullanıcı ve 25 aktif sigara kullanıcı çalışma grubunu oluşturmakta idi. Ayrintılı anamnez, kulak burun boğaz muayenesi ve nazal endoskopi sonrası nazal mukosiliyer klirens süresi ölçüldü ve karşılaştırıldı. Ayrıca, aktif sigara kullanıcısı grupunda sigara tüketim miktarı paket yıl olarak hesaplandı ve nazal mukosiliyer klirens süresi uzaması ile sigara tüketim miktarı arasındaki korelasyon değerlendirildi. Bulgular: Ortalama nazal mukosiliyer klirens süresi pasif ve aktif sigara kullanıcı olan gruplarda sağlıklı gruba göre anlamlı derecede daha uzamış olarak saptandı (p=0,0001). Pasif ve aktif sigara kullanıcı olan grupların ortalaması nazal mukosiliyer klirens süresi istatistiksel olarak farklı bulunmadı(p=0,05). Aktif sigara kullanımlı olan grupta sigara tüketim miktarı ile ortalaması nazal mukosiliyer klirens süresi uzama arasında pozitif korelasyon saptandı (r=0,433). Tartışma: Bu çalışmada, pasif ve aktif sigara kullanımların nazal mukosiliyer klirens süresini uzarttığını tespit edilmiştir. Tütün maruziyet atmosferinde kronik muayene ve alt solunum yol enfeksiyonları ve son derece riskli." 

Abstract
Aim: The aim of this study was to investigate the effect of passive and active smoking on NMC by comparing the results of age and sex matched healthy individuals, passive and active smokers. Material and Method: A total of 75 subjects met the criteria and were divided into three groups: control group (nonsmokers, group 1, n = 25), passive smokers group(group 2, n = 25), active smokers group (group 3, n = 25). NMC of these subjects were measured and compared. Moreover, the amount of cigarette consumption of active smokers group were calculated as package to year and the correlation between NMC and the amount of cigarette consumption in active smokers group were evaluated. Results: The mean NMC in passive smokers group and active smokers group were significantly longer than the control group (p=0,0001)! The comparison of NMC values between the passive smokers group and the active smokers group revealed no statistically significant differences (p=0,05). There was positive correlation between the increase in NMC and amount of cigarette consumption in the active smokers group (p=0,0001, r=0,433). Discussion: Both active and passive smoking prolonged nasal mucociliary clearance time when they were compared with healthy controls. Tobacco exposure is associated diseases such as asthma, chronic rhinosinusitis, and lower airway infections. It may be related to the direct effect of prolonged NMC.

Keywords
Passive Smoking; Active Smoking; Nasal Mucociliary Clearance Time (NMC)
Introduction

Mucociliary clearance of respiratory mucosa is the primary defense mechanism in the human airways. Mucociliary activity of the nose helps to remove foreign particles, pathogens, and toxins by transporting the mucus layer that covers the nasal epithelium towards the nasopharynx and it also helps to keep the mucosal surfaces moist by mucus gland secretions to obtain normal nasal physiology[1]. Nasal mucociliary clearance time (NMC) can be affected from some rhinological pathologies (allergic rhinitis, sinusitis, nasal polyposis), trauma, sinonasal surgery[2,3]. It has also been shown that NMC can be affected from toxins, drugs, environmental heat, smoking, pressure, pH, and so on.

The association of smoking and NMC has been studied; however, the correlation of passive smoking and NMC has not been clearly documented yet. Although many studies have investigated the association of smoking and NMC[4-6], there is only one study investigating the relationship between passive smoking and NMC[7].

Because of insufficient data about the relationship between passive smoking and NMC, we aimed to investigate the effect of passive and active smoking on NMC by comparing the results of age and sex matched healthy individuals, passive and active smokers.

Material and Method

Study Design

This study was conducted between January 2014 and April 2014 in the otorhinolaryngology Department of Mustafa Kemal University. Ethics committee approval was obtained and the study was conducted adhering to the Declaration of Helsinki. Informed consent was obtained from all subjects.

Study Population

One hundred ten voluntary subjects who referred to our clinic for symptoms other than rhinological diseases were enrolled in the study. The evaluation of subjects revealed detailed history, ear, nose and throat examinations and nasal endoscopic evaluations in every patient. At least 3 years of smoking history or passive smoke exposure time was required in order to be included to our study. Subjects those having a history of allergy or asthma; upper respiratory tract infection during the previous 2 months; a nasal pathology causing nasal obstruction such as sinusitis, septum deviation, nasal polyposis or bullous concha; having a history of nasal or paranasal operation; history of any medication; history of any systemic disease were excluded from the study. A total of 75 subjects met the criteria and were divided into three groups: control group (nonsmokers, Group 1, n =25), passive smokers group (Group 2, n =25), active smokers group (Group 3, n =25). NMC of these subjects were measured and compared. Moreover the amounts of cigarette consumption of active smokers group were calculated as package to year and the correlation between NMC and the amount of cigarette consumption in active smokers group were evaluated.

Measurement of NMC

Nasal mucociliary clearance times were evaluated with the saccharin tests performed by the same clinician at otorhino-
that the saccharin test is a simple, inexpensive technique to measure NMC with a chance of repeatability[10]. Normal mucociliary transit time in humans has been reported to be 12 to 15 min. Prolonged transit times are considered to be impaired mucociliary clearance that may lead to long-term respiratory tract diseases, sinonasal and middle ear infections[11].

There are various factors effecting mucociliary clearance time such as temperature, moisture, partial oxygen pressure, pH, cigarette and various inhalation agents; anatomic barriers as septum deviation, adenoid hypertrophy and systemic diseases such as viral infections, chronic sinusitis, chronic and allergic rhinitis, cystic fibrosis, bronchiectasis, chronic bronchitis and diabetes mellitus[2,3,12]. Smoking is also a well-known factor that could have an effect on NMC. It has been shown that cigarette smoke inhibits ciliary beat frequency[13,14]. Also NMC has been shown to be slower in regular smokers up to the ciliostatic effect of tobacco smoke, decrease in cilia number and changes in the viscoelastic properties of mucus[4,15,16]. However, Quinlan et al. did not observe any such difference in NMC in smokers[17].

However, in the literature, the relationship between nasal MCC and exposure to passive smoking has been neglected. In an animal study by Zayas et al, tissue disruption was shown by scanning electron microscope and mucus transport was significantly reduced, even after exposure to the smoke of one cigarette[18]. There is only one study about the relationship between passive smoking and NMC in the literature. In this study conducted by Habesoglu et al., they found that both active and passive smoking increased nasal MCC time when compared with healthy controls[7].

In our study, we found that MMC in passive smoking group and active smoking group were significantly longer than the healthy controls. The comparison of NMC values between the passive smoking group and the active smoking group revealed no statistically significant differences. In addition, there was positive correlation between the increase in NMC and amount of cigarette consumption.

Limitations of our study were the small sample size and that we did not measure the amount of tobacco exposure in passive smoking group. Finally, further studies with a larger group of participants will be beneficial.

Conclusion

Both active and passive smoking prolonged NMC when they were compared with healthy controls. According to the literature, tobacco exposure is associated with diseases such as asthma, chronic rhinosinusitis, and lower airway infections[19].

It may be hypothesized that it could be related to the direct effect of prolonged NMC.

Competing interests

The authors declare that they have no competing interests.

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