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Original Article

Effect of Vitamin a on Nasal Dryness

Ahmet Baki*

Department of Otolaryngology, Başakşehir Çam and Sakura City Hospital, İstanbul, Turkey

Abstract

Objective: To evaluate the effect of vitamin A on nasal dryness.

Materials and Methods: 40 patients with post-viral infection loss of smell were included in the study. Schirmer test papers were placed 10 minutes in each nasal cavity, and then the values obtained were measured and recorded. The patients have got treatment smell therapy together with intranasal vitamin A. Nasal Schirmer values before and after treatment were compared.

Results: There were a total of 40 patients in the study, 22 female and 18 male. Ages of patients ranged from 18 to 45 years, and the mean age of patients was 33.8±6.75 years. Before treatment, the means nasal Schirmer value was 13,1±5,4 but after treatment, 21,6±5,7. The comparison before and after the treatment for the nasal Schirmer test showed a statistically significant difference. Intranasal vitamin A treatment can prevent nasal dryness by increasing nasal secretion.

Conclusion: Vitamin A can improve nasal dryness by increasing nasal secretions.

Keywords: Nasal dryness; Nasal schirmer test; Vitamin A

Introduction

Olfactory dysfunction is common and estimated to affect about 21.6% of the general population [1]. Olfactory receptor neurons (ORN) are found within the neuroepithelium of the olfactory cleft, where they extend dendritic cilia to the surface mucous layer. For this reason, ORN is directly exposed to the external environment; they are prone to damage through contact with exogenous factors such as toxins, dust, orpathogens [2]. In adults, regeneration of mature neurons from stem cells is limited to the olfactory neuroepithelium (OE), which produces new ORN [3]. Retinoic acid (RA), a metabolite of vitamin A is a transcription regulator important in tissue development and regeneration [4]. RA signaling is vital during olfactory system embryogenesis and adult neuronal regeneration [5]. In a study by Duncan et al., high-dose vitamin A treatment was shown to improve olfactory functions [6]. In a study by Hummel et al., it was shown that intranasal vitamin A treatment provides improvements in olfactory functions [7]. Mucociliary clearance is an important protection mechanism of the upper and lower respiratory tract. The removal of foreign particles and pathogens from the inhaled air is achieved by the mucociliary function maintained by the collective work of the cilia, mucus cover, and mucus-producing glands [8]. Nasal secretion protects the airway epithelium from the harmful effects of the external environment and contributes to the maintenance of normal physiology by keeping the mucosa moist [9]. Vitamin A is believed to regulate cellular proliferation and differentiation of epithelial tissues. It has been shown that systemic vitamin A deficiency in experimental animals leads to the development of squamous metaplasia. The proliferation of basal cells and their subsequent transformation into squamous keratinizing cells instead of goblet and ciliary cells causes metaplasia in the airway epithelium [10]. In this study, the effect of vitamin A on nasal secretion was evaluated by nasal schirmer test.

Materials and Methods

This study was planned as a prospective study by the otorhinolaryngology clinic and started after the approval of the ethics committee. Participants were informed about the study, and informed consent was obtained. The study was carried out in accordance to the principles of the Helsinki Declaration. A total of 40 patients with smell disorder underwent detailed otorhinolaryngologic examination and nasal endoscopic examination.

Inclusion criteria for patients with smell disorder include the following: patients with impaired olfactory function as a result of viral infection, without previously medical treatment for smell disorder, any known nasal-paranasal sinus symptoms or nasal-paranasal sinus surgery, and normal nasal examination findings.

Exclusion criteria includes the following: patients with previous medical treatment for smell disease, nasal and paranasal disease symptoms such as allergic rhinitis and rhinosinusitis, nasal septal deviation, nasal polyps, nasal mucosal abnormalities and other structural nasal abnormalities, diabetes mellitus, hepatic impairment, chronic renal failure, hypo or hyperthyroidism, history of topical or systemic drug use affecting then as a physiology (topical or oral decongestant, antihypertensive, antidepressant, antipsychotic, etc.), smoking and alcohol consumption. In addition, patients with recent head trauma, psychiatric disorder, autoimmune disease, neurodegenerative disease, previous radiotherapy to the head and neck region, and with signs and symptoms of upper respiratory tract infection on the day of the test were also excluded. Smell therapy and intranasal vitamin A treatment were given simultaneously. Smell therapy was applied in sets of 4 for 3 minutes for three months. Nasal Schirmer test was performed before and after treatment. Forty patients were included in the study. A Nasal

***Corresponding author:** Ahmet Baki, Department of Otolaryngology, Başakşehir Çam and Sakura City Hospital, İstanbul, Turkey, Tel: +90 0216 632 18 18; Email: dr.ahmet170@gmail.com

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Schirmer test was performed before and after treatment. Smell function was evaluated by the CCCRC (Connecticut chemosensory clinical research center) test. The patients were tested before treatment and after three months of treatment.

Nasal schirmer test

After the patients were adapted to the hospital environment for 15-30 min, they were taken to the Schirmer test room. Environmental temperature was recorded as 20.25°C ± 0.87°C (18.3°C-21.9°C) and humidity as 45.34±14.26 (23%-68%). For eye and nasal Schirmer test, standard Schirmer test paper of 35 mm length and 5 mm width was used (ERC SCHIRMER Tear Test Strip, Turkey). The nasal Schirmer test paper was folded at an angle of 45 degrees from an area of approximately 5 mm from one end, and then placed bilaterally with the help of a speculum and bayonet in parallel with the nasal dorsum and anterior nasal septum after an anterior rhinoscopic examination. The 5 mm portion of the test paper was placed in contact with the anterior nasal mucosa and the rest of the test paper overflowing from the nostril. During this period, care was taken not to touch the turbinate on the lateral nasal wall. After waiting for 10 minutes, the amount of wetting of the paper was recorded in mm.

Statistical analysis

Statistical Package for the Social Sciences 22 program was used for statistical analysis. The suitability of parameters to normal distribution was evaluated by Shapiro-Wilks test. Descriptive statistical methods (mean and standard deviation) were determined when evaluating the study data. Wilcoxon Signed Rank test was used to evaluate the dependent non-parametric data. P<0.05 was considered statistically significant.

Results

Ages of patients ranged from 18 to 45 years, and the mean age of patients was 33.8±6.75 years. 50% of patients were female and 50% were male. Pre-treatment nasal Schirmer values ranged from 5 to 22 and the mean value was13,1±5,4. Post-treatment nasal Schirmer values ranged from 13to 32 and the mean value was 21, 6±5,7. Comparison of nasal schirmer test before and after treatment, there is a statistically significant increase in nasal schirmer values after treatment. (p=0.001) (Table 1) This study showed that intranasal vitamin A treatment can prevent nasal dryness by increasing nasal secretion.

	N	Min-Max	Mean±SD	P
Pre-treatment	40	5-22	13,1±5,4	0,001
Post-treatment	40	13-32	21,6±5,7	
Wilcoxon test, N: patient number, Min: Minimum, Max: Maximum, SD: Standard deviation, p≤0.05				

Table 1: Schirmer test before and after treatment.

Discussion

The nasal mucosa is rich in vascular and glandular structures plays an essential role in the mucus layer and mucociliary movement. Any factor affecting the mucus layer also affects mucociliary clearance. Nasal glandular secretion is essential for nasal mucociliary clearance [11]. Changes in the amount and content of nasal secretion affect mucociliary clearance [12].

Schirmer test is frequently used in cases where lacrimal function provides information and decreases the amount of tears for various reasons [13]. Modified intraoral Schirmer test is used to determine the amount of saliva in cases of salivary gland hypofunction [14]. The nasal Schirmer test is an inexpensive and easy to use method that has recently been used and does not caused is comfort to determine the amount of nasal secretion. In a study showed that intranasal Schirmer test is a simple and practical method that can be used to determine the amount of nasal secretion in the Turkish population [15]. Lindemann et al. performed a nasal Schirmer test for the quantitative assessment of the amount of nasal secretion on non-smokers and smokers. The nasal Schirmer test results that smoked were significantly lower than the control group. In our study, patients who are smoking were excluded from the study to avoid confusing factors [16]. Ciliary transport is dependent on a series of complex interactions between the cilia and the sinonasal environment. Conditions such as nasal air flow, intranasal PO2, humidity, temperature, mucus viscosity, and mucociliary structure and clearance rate can affect ciliary transport [17]. Mucociliary clearance can be impaired by both infection and surgical trauma [18]. Mucous membrane healing occurs by migration of cells from normal adjacent epithelium, followed by reproduction and differentiation of progenitor cells [19]. Sinus mucosa basal cells are multipotent to differentiate into squamous, ciliated, and goblet cells [20]. It has been determined that the main source of new progenitor cells in the paranasal sinus mucosa is undifferentiated basal cells [21]. Systemic administration of vitamin A has been shown to regenerate normal ciliated tracheal epithelium in hamsters. Vitamin A regulates the replication of basal cells and, therefore, ciliated progenitor cells. It also modulates the replication of mucous cells, which are essential for the generation of the mucus layer necessary for proper mucociliary transport function. In a study, it was shown that ciliary cells did not form in the group that was not given vitamin A [22]. After the improvement of systemic vitamin A levels, ciliated progenitor cells rapidly developed cilia and further matured into the functional ciliated epithelium. Another study showed that systemic vitamin A deprivation in hamsters resulted in squamous metaplasia of pseudostratified ciliated tracheal epithelium with loss of goblet cells, resulting in loss of mucus-secreting capability and an overall disruption of the mucociliary microenvironment [23]. One study showed that Topical vitamin A (retinoic acid) may help to restore ciliated paranasal sinus epithelium [24].

Based on these results, the effect of vitamin A on nasal secretions was investigated in this study. Nasal Schirmer test results were obtained before and after intranasal vitamin A treatment. It was observed that there was a significant increase in nasal secretions of the patients.

Conclusion

Intranasal vitamin A treatment can prevent nasal dryness by increasing nasal secretion.

Conflict of Interest

None

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