

Protective efficacy of sunglasses on the conjunctival symptoms of seasonal rhinitis

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Background: Although allergen avoidance can lead to significant improvements in symptoms of allergic rhinitis, there are very few studies in this area. Sunglasses could be effective for protection of eyes from pollen as a cheap, comfortable, and simple avoidance option for allergens. The aim of this study is to determine if wearing sunglasses can decrease ocular symptoms.

Methods: Ocular symptomatic patients (39 total) who had a confirmed history of seasonal rhinitis by skin prick tests and negative skin prick tests for perennial allergens were included in the study. The duration of the study was 4 weeks with 3 required visits. At the onset of the 1-week run-in period, patients were randomized and divided into 2 groups. Group I (n = 18) received topical aqueous nasal budesonide regularly and loratadine once daily as a rescue medication. Group II (n = 21) wore sunglasses during daytime as an addition to this medication. Subjective data included a daily diary recording nasal and ocular symptom scores and antihistamine need during the study period.

Results: Sunglasses significantly reduced ocular symptoms ($p = 0.002$) and use of antihistamines ($p = 0.009$).

Conclusion: Sunglasses are an inexpensive and simple treatment for patients with allergic conjunctivitis. © 2013 The Authors. International Forum of Allergy & Rhinology, published by Wiley Periodicals, Inc., on behalf of ARS-AAOA, LLC.

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Key Words:

allergen avoidance; allergic rhinitis; conjunctivitis; pollen; sunglasses

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In many parts of the world, pollen allergy is very common, and the prevalence of seasonal allergic rhinitis (SR) ranges from 1% to 40%.¹ While conjunctivitis is the most common symptom, in seasonal allergic rhinitis patients, additional symptoms include ocular, respiratory, and oral allergy, plus skin symptoms, in addition to nasal symptoms. In some studies of pollen allergy, conjunctivitis was present in over 75% of patients suffering from allergic rhinitis.² In addition to associated eye problems, complaints of rhinorrhea, nasal congestion, and sneezing have an effect on

the patients' emotional well-being and social functioning. Intranasal corticosteroids are the first-line treatments for allergic rhinitis. They can also reduce ocular symptoms associated with allergic rhinitis.³ Other treatment options for conjunctivitis are second-generation antihistamines, topical H1 antihistamines, and cromones.

There is general consensus that recommends allergen avoidance in addition to medical treatment.¹ Although allergen avoidance can result in significant improvement in symptoms of allergic rhinitis, there have been very few allergen avoidance studies.^{4–6} Because it is more difficult to reduce exposure to pollen as an outdoor allergen, most investigated allergens are house dust mites and pets.^{3–5} Regarding outdoor exposure, it is possible that sunglasses can be effective for protection of eyes from pollens as a cheap, comfortable, and simple additional allergen avoidance option. The objective of the study was therefore to test the hypothesis that the addition of sunglasses to standard allergic rhinitis treatment would be an improvement over standard allergic rhinitis treatment alone.

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Patients and methods

Study patients

We identified adult patients (15–52 years of age) with a diagnosis of SR or both SR and asthma. These patients were admitted to our allergy clinic from March 15, 2010 to July, 15, 2010. A total of 170 patients had a clinical history of SR due to region-specific spring-season pollen allergens. They were additionally assessed by the skin prick test (SPT) to 16 common aeroallergens (Alyostal; Stallergenes, Paris, France), which included *Dermatophagoides pteronyssinus*, *Phleum pratense*, *Olea europea*, *Artemisia vulgaris*, *Parietaria officinalis*, *Corylus avellana*, *Betula verrucosa*, cat, dog, *Alternaria alternata*, *Cladosporium herbarum*, *aspergillus* mixture, *Blatella germanica*, *Tyrophagus putrescentiae*, *Acarus siro*, and *Lepidoglyphus destructor*. Ocular symptomatic patients who had a confirmed history of SR by SPT (wheal diameter >3 mm) were included in the study. Patients with asthma were also included. Inclusion and exclusion criteria for the study population are listed in Table 1, and the number of patients screened and enrolled in the study is listed in Figure 1. The study was approved by the ethics committee at Hacettepe University Hospital and informed consent was obtained from all participants.

TABLE 1. Inclusion and exclusion criteria for the study population

Inclusion criteria
Age >18 years
History of allergic rhinitis at least 1 year
Ocular symptomatic (having conjunctivitis)
Not treated with nasal corticosteroids in the previous 2 weeks or antihistamines in the previous 10 days
Signed informed consent
Exclusion criteria
Sensitization to perennial allergens
Having nasal polyps
Having significant deviation of nasal septum or nasal tract malformation
Having chronic sinusitis
Having uveitis or other eye problems
Wearing contact lenses
Pregnancy
Having received immunotherapy in past 2 years
Not living in the city where the study was conducted

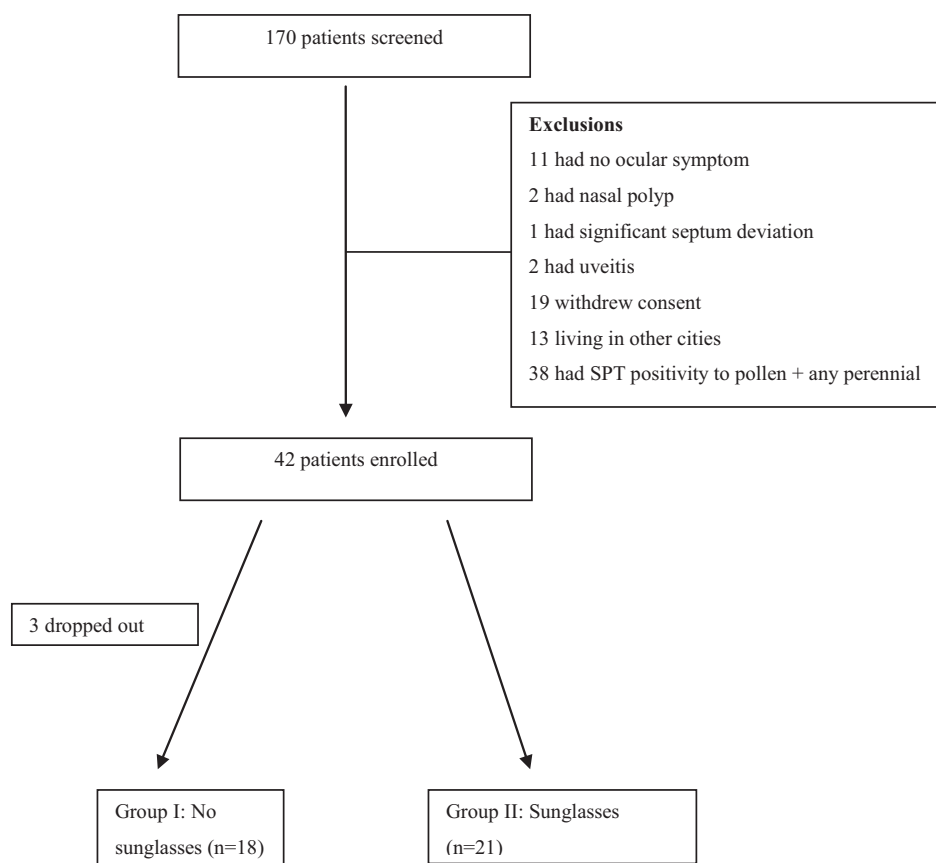


FIGURE 1. Number of patients screened and enrolled in the study.

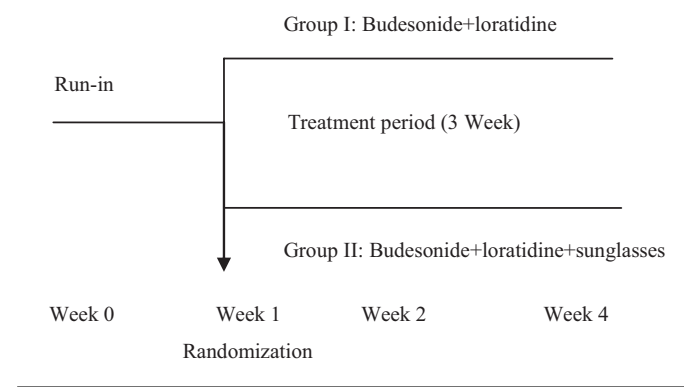


FIGURE 2. Study design.

Study protocol

The duration of the study was 4 weeks with 3 required visits. The first week was a run-in period when all subjects received only nasal and ocular saline solutions. At the onset of the 1-week run-in period, patients were randomized and divided into 2 groups. Group I (n = 18) received topical aqueous nasal budesonide, 2 sprays to each nostril once or twice daily according to the rhinitis severity, and loratadine once daily as a rescue medication (200–400 µg/day; Inflacort®, Bilim, Turkey; Rhinocort®; Astra-Zeneca, Wilmington, DE; 10 mg/day loratadine, Claritin®; Schering-Plough, Kenilworth, NJ). The Allergic Rhinitis and Its Impact on Asthma (ARIA) classification was used to determine SR severity. Group II (n = 21) wore sunglasses as a daytime addition to the above medications (Fig. 2). The type of sunglasses was standard for all patients, which covered the eyes like a mask as shown in Figure 3. A baseline questionnaire was collected at the end of the run-in period. It consisted of data on demographic details (age, sex, and employment), clinical features (predominant symptoms, age of onset, duration of disease), accompanying disorders

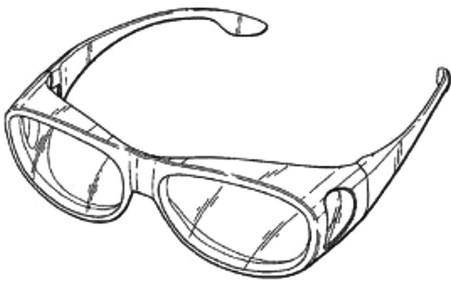


FIGURE 3. Sunglasses used during the study period.

(perennial rhinitis, asthma, and other disorders), smoking status, and familial atopy history. Subjects were evaluated at weeks 0, 1, 2, and 4. The diary card contained questions related to symptoms (stuffy, itchy, and runny nose; sneezing; teary and itchy eyes) and antihistamine need during the study period. Compliance with treatment and wearing sunglasses were also recorded on the diary card. Patients rated the severity of their nasal and ocular symptoms on a 7-point categorical severity scale⁷ for the daytime (completed in the evening). Scoring ranged from 1 to 7 as shown in Figure 4.⁷ The total daily symptom score was the sum of the individual symptom scores for a given day, resulting in a rhinoconjunctivitis total symptom score that ranged between 0 and 42, when 6 symptoms were evaluated. Mean antihistamine need was also measured for a 3-week treatment period. At each visit, diaries were collected and compliances of medication usage and wearing sunglasses were checked by direct questioning of authors according to the diary card review. Pollen counts were obtained from the Turkish National Allergy and Clinical Immunology society website (<http://www.aid.org.tr/pollen.ankara>). They were classified as few (1–4 pollen grains per cubic meter), moderate (5–19 pollen grains per cubic meter), high (20–199

	1	2	3	4	5	6	7
Sneezing							
Runny nose							
Itchy nose							
Stuffy nose							
Teary eyes							
Itchy eyes							
Total nasal symptom: Sum of 4 nasal symptom scores (1-28)							
Total ocular symptom= Sum of 2 ocular symptom scores (1-14)							
Total daily symptom score= Total nasal symptom score+ Total ocular symptom score (1-42)							
1-2= none to an occasional limited symptom							
3-4= mild-steady symptoms but easily tolerable							
4-5= moderately bothersome –symptoms hard to tolerate, may interfere with activities of daily living and/or sleep							
6-7= unbearably severe- symptoms are so bad, person can't function all the time							

FIGURE 4. Assessment of nasal and ocular symptom severity (7-item).

TABLE 2. Baseline characteristics of the 39 SR patients

Characteristics	Group I (n = 18)	Group II (n = 21)	p ^a
Age	30.2 ± 11.8	31.1 ± 9.1	0.2
Females, n (%)	10 (56)	13 (62)	0.2
Smoking status, n (%)			
Nonsmokers	15 (83)	15 (71)	0.6
Smokers (current or ex-smoker)	3 (17)	6 (29)	0.2
Age onset of SR, years	25.6 ± 10.8	21.9 ± 7.8	0.03
SR duration, years	5.3 ± 4.1	9.1 ± 7.7	
Allergic rhinitis classification, n (%)			
Mild	5 (28)	9 (43)	0.8
Moderate-severe	13 (72)	12 (57)	
Asthma	9 (50)	5(24)	0.01

^aSignificant values are in bold.
SR = seasonal allergic rhinitis.

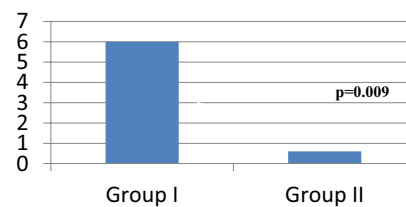
pollen grains per cubic meter), and very high (>200 pollen grains per cubic meter).⁸

Statistical analysis

The primary endpoint was daytime ocular symptom scores and antihistamine needs. Other endpoints were nasal symptom scores and total symptom scores. The analysis included all patients with at least 1 baseline measurement and 1 measurement during the treatment period. Baseline values were the average values during run-in periods for symptom scores. Efficiency endpoints were analyzed over the 3-week treatment period as the average change from baseline. Repeated measure analyses of variance were used to measure the differences between the baseline symptom scores and after treatment symptom scores. Mean antihistamine need was measured by the Mann-Whitney U test. Chi-square testing and Student *t* test were used for categorical and continuous variables, respectively. Statistical significance was defined for *p* values <0.05. SPSS MS Windows Release 10.0 software (IBM, SPSS, Armonk, NY) was used for statistical analysis.

Results

Baseline characteristics of the 39 SR patients are listed in Table 2. Of the study patients, 59% were women. The mean age was 30.7 ± 10.3 years. Fourteen patients (35.9%) had mild persistent allergic rhinitis, and 25 (64.1%) patients had moderate to severe persistent allergic rhinitis. Fourteen patients also had asthma. The major symptoms were due to rhinitis in 66.7%, rhinoconjunctivitis in 17.9%, conjunctivitis in 12.8%, and asthma in 2.6% of the patients. There were no significant differences between the 2 groups according to age, sex, smoking status, onset of allergic rhinitis, and severity of disease. Only the duration of the disease

AH total**FIGURE 5.** Effect of sunglasses on total antihistamine need. AH total = total antihistamine need (mean value); Group I = without sunglasses; Group II = with sunglasses.**TABLE 3.** Effect of sunglasses on symptom scores and total antihistamine need

Variable	Groups	n	Mean	Standard deviation
NSS on 1st day	I	18	4.6	3.6
	II	21	5.7	4.1
NSS on 7th day	I	18	3.5	3.9
	II	21	6.4	3.8
NSS on 28th day	I	18	4.1	6.2
	II	21	2.8	3.7
OSS on 1st day	I	18	8.7	6.2
	II	21	3.8	5.9
OSS on 7th day*	I	18	9.2	6.2
	II	21	6.4	3.8
OSS on 28th day*	I	18	4.1	6.2
	II	21	2.8	3.7
AH total*	I	18	6.0	7.8
	II	21	0.6	1.6

**p* < 0.05.

AH total = total antihistamine need; Group I = without sunglasses; Group II = with sunglasses; NSS = nasal symptom score; OSS = ocular symptom score.

was longer in Group II patients (*p* = 0.027). Of the patients, 82% were sensitized to mono-pollen. The most sensitized pollen allergen was *Phleum pratense* in 37 of 39 patients. Other allergens for the study population included *Olea europaea*, *Artemisia vulgaris*, and *Betula verrucosa*. Regarding nasal symptom scores, there was no significant difference between the 2 groups (*p* = 0.256), but there was a significant decrease between the measurements at the beginning and at the end of the treatment for both groups (*p* = 0.001). There was a significant difference between Group I and II with respect to mean ocular symptom scores (*p* = 0.002). A lower score was observed in Group II, but was not significant (*p* = 0.071). Regarding total symptom scores, there was no significant difference between the 2 groups (*p* = 0.245). Antihistamine need was significantly reduced by wearing sunglasses (*p* = 0.009) (Figure 5, Table 3). Grass pollen counts for Ankara ranged from 5 to

>200 pollen grains per cubic meter at the study period, and there was no correlation between pollen counts and efficacy of sunglasses. No one in Group II felt discomfort wearing sunglasses. Three of the patients in Group I discontinued their medication. One was lost to follow-up, 1 discontinued because of adverse events, and 1 discontinued because of lack of improvement.

Discussion

Allergic conjunctivitis is induced by allergic reactions originating primarily in the nasal mucosa. However, the allergic response in conjunctiva typically occurs by ocular exposure to allergens that trigger mast cell degranulation, releasing a cascade of allergic and inflammatory mediators.⁹ Nasal steroids can suppress the inflammation in nasal mucosa and also control ocular symptoms.³ In addition, sunglasses can easily block the entrance of allergens to conjunctiva. In this randomized non-blinded study of allergy symptoms with and without sunglasses that provided a wraparound barrier to pollen, our findings suggested that sunglasses significantly decreased symptoms and the amount of medication required. In a study by Gotoh et al.,¹⁰ face mask and eyeglasses with side-guard frames for pollen avoidance were used to examine the preventive effect of masks and eyeglasses for pollen invasion to the nose and eye. In this study, pollen particles preexisting in the nose and eye were removed by washing the nasal cavity and eyes with saline solution, followed by counting the particles using a microscope. The number of pollen particles in the nasal cavity and on the conjunctiva was unchanged by wearing a face-mask and eyeglasses. In addition, a mini-pump was used to collect nearby airborne particles floating at nose level. They then evaluated the results according to the pollen invasion rate, which was determined by dividing the number of pollen particles in the nasal cavity and/or conjunctiva by the amount of airborne pollen particles measured with the mini-pump. This pollen invasion rate was significantly lower in patients with a facemask. However, the difference was not significant between patients with or without eyeglasses. In the study by O'Meara et al.,¹¹ in which a randomized double-blind design was used, subjects wearing active nasal filters had significantly reduced scores, at all time-points compared with placebo group. Half of the individuals wearing nasal filters had significantly reduced number of sneezes, runny nose, itchy nose, sniffles, itchy throat; itchy eyes, and watery eyes. The nasal filters also enabled the resolution of existing symptoms.¹¹ Sunglasses can vary a great deal between models. Some were wraparound, while others offered less coverage. Some have large lenses, while others had small lenses. We did not use any nasal mask or nasal filter, we used a standard model with big lenses with similar coverage to a mask. This model seems to be similar to those used in the study by Gotoh et al.¹⁰ Sunglasses could be more protective, causing different re-

sults compared with the eyeglasses used in that study. This could be due to the protective effect of reduced ultraviolet (UV) rays by the sunglasses, and/or due to the barrier effect of the wraparound glasses.

UV protection by sunglasses depends on several factors, including shape and fit, lens color, and UV filtering and reflecting abilities. They provide photoprotection by decreasing photochemical injury to the eye.^{12,13} All types of glasses block the majority of UV. However, standardized sunglasses for UV transmission provide the best protection.¹³ In the present study, we did not use standard lenses for UV transmission. The results showed that standard treatment including sunglasses led to effective prevention for conjunctival symptoms during the pollen season by decreasing allergen load of conjunctiva or by decreasing UV damage. Patients who wore sunglasses rubbed their eyes less. We used sunglasses, and no one in the study or control group wore eyeglasses. However, protective clear glasses could work as well as sunglasses for prevention of pollen to the conjunctiva. Exposure to natural pollen or UV is not standardized in this study. One group received sunglasses blocking conjunctival allergen deposition, whereas the other group did not use any glasses, allowing allergen passage or UV along the sides, which is a limitation for this study. Prospective studies with better control groups are needed to more completely characterize the protective efficacy of sunglasses for the conjunctival symptoms of seasonal rhinitis.

The mean cost of seasonal allergic rhinitis per person without comorbid disorders during the grass pollen season is approximately \$80. It can increase to \$140 in the presence of asthma and/or conjunctivitis in Ankara, Turkey.¹⁴ Sunglasses are cheap, simple, and preferable devices for patients. The cost-effectiveness of sunglasses was not directly shown, but it is probable that sunglasses can reduce the cost of treatment by decreasing the need for antihistamines.

SR lasts approximately 3.5 months, and the main cause is grass pollen sensitivity in Ankara, Turkey.^{2,14} The study was conducted from March 15 to July 15. During the first 14 weeks of the 16-week study period, the grass pollen count was either at high and or very high levels. A correlation between this variable and sunglass efficiency was not identified. However, wearing sunglasses provided a positive effect on ocular symptoms. Although health-related quality of life would be more appropriate to assess the impact of sunglasses, we did not use more objective data such as the Rhinoconjunctivitis Quality of Life Questionnaire¹⁵ in this study, which is another limitation.

Conclusion

In spite of these limitations, based upon our findings, sunglasses appear to be an inexpensive and simple treatment option for patients with allergic conjunctivitis.

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