

## EFFECT OF CORTICOSTERIOD NASAL SPRAY ON TEAR FILM STABILITY IN ALLERGIC RHINITIS

<sup>1</sup>Mehroz shahid, <sup>2</sup>Ammara, <sup>3</sup>Sana maqsood, <sup>4</sup>Adila Qasim, <sup>5</sup>Shakila Abbas

### ABSTRACT

**Objective:** The aim of study is to check the effect of nasal steroid treatment on tear film stability in allergic rhinitis patients and compare the effect of fluticasone furoate 27.5mcg with momatesone furoate 50mcg nasal spray.

**Methodology:** A Quasi-Experimental study design was used. 60 participants of both genders diagnosed with Allergic rhinitis, age ranging from 15-30 years was included. Data was collected from Department of Ophthalmology at Madina Teaching Hospital, Faisalabad. Schirmer and tear breakup time was performed on each participant before prescribing the nasal spray. Then a patient was divided into 2 groups, 30 in each group. Fluticasone furoate was prescribed to group 1 and momatesone furoate to group 2 for 1 month. Follow up was taken on 2<sup>nd</sup> and 4<sup>th</sup> week of use. Schirmer test and TBUT was performed on both groups accordingly. Data analysis was done by repeated measure ANOVA and independent sample t test.

**Results:** Results showed that both test values was decreased at baseline which indicate that patients were having instability of tear film as  $p < 0.05$  ( $P=0.00$ ), while at 2<sup>nd</sup> and at 4<sup>th</sup> week  $p$  value was significant within groups as  $p < 0.05$  ( $P=0.00$ ). When comparing the both groups at base line the mean value of schirmer test in flucatisone furoate and momatesone was 7.666 and 7.33 respectively, at 2<sup>nd</sup> week was 10.544, 10.360, at 4<sup>th</sup> week was 15.266, 14.666 respectively. The mean value of (TBUT) in momatesone and flucatisone groups was 6.353, 6.293 at base line, 6.386, 7.080 at 2<sup>nd</sup> week and 8.900, 9.373 at 4<sup>th</sup> week respectively.

**Conclusion:** Both drugs momatesone furoate 50 mcg and flucatisone furate 27.5mcg improve tear film stability equally so any of the drugs can be used signally for treatment.

**Keywords:** Allergic rhinitis, Dry eye, Fluticasone furoate.

### INTRODUCTION

Allergic Rhinitis is a disease caused by the IgE mediated inflammation of the nasal membrane following the allergen reaction. It can be triggered by pollens, dust, mites, domestic animals, occupation triggers e.g tobacco smoke, nitrogen oxide, automobile exhaust and some other NASIDS (1). Allergic rhinitis patients also show ocular symptoms e.g. tearing, red eyes, sometimes eye swelling. Condition is diagnosed based on history and physical examination (9). The management of AR consists of avoidance of allergen, pharmacological treatment and immunotherapy. Intranasal corticosteroids are usually used for mild persistent or sever symptoms and can be prescribed alone or in combination with oral antihistamine. Intranasal corticosteroids are considered better because they also improve ocular symptoms (10). The anatomical link between both the eye with nose, as well as the lacrimal duct, has been shown to have a crucial part in blood vessel interaction, neurogenic network and lymphatic tissues all of which have numerous similar features (12). Allergic responses originating inside the nasal mucosa as a result of inhalant allergen exposure can impact the cornea, conjunctiva and other eye tissues through a variety of pathways. As a result of this link between the eye and the nose, allergy-related problems on the eye surface may develop (5). The most reasonable explanation for the allergic eye symptoms is that pollen accumulates on the conjunctiva, causing an allergic reaction identical to that seen in the nasal cavity following pollen contact.

---

**Corresponding Arthur: Mehroz shahid**

<sup>1,2,3,4,5</sup> Department of Optometry, The University of Faisalabad (TUF)

The fact that ocular allergen challenge causes watery and itchy eyes supports the theory of direct allergen accumulation causing symptoms that are linked to the production of inflammatory mediators in ocular secretions, including histamine (63). There is nasolacrimal reflex also responsible for eye symptoms describe as afferent reflexes triggers when allergen start depositing on nasal mucosa which then travel centrally. Efferent reflex might therefore propagate to both conjunctival as well as contra-lateral side of nasal cavity. The nasal-ocular reflex idea is based on the notion that released histamine stimulates nasal afferent neurons, causing an efferent parasympathetic reaction, not only does this generate the well-known nasolacrimal reflex, but it also triggers a nasal ocular reflex. In the favor of this notion, lacrimal gland is abundantly having parasympathetic innervations which penetrate the orbit in tandem with parasympathetic nasal cavity input (13).

Tear film instability has long been thought to be a factor in the development of Dry eye syndrome (DES) (14). Dry eye is a multifaceted ocular surface condition characterized by a lack of tear film homeostasis (15). Dry eye is commonly manifested as persistent, low-grade inflammatory condition. The inflammation of any ocular tissue e.g conjunctiva, cornea leads to increase in production of immunological activation and inflammatory cells are attracted to and retain in conjunctiva by adhesion molecules. Then apoptosis start due to these inflammatory cells and tear production reduced or diminished (21). When severe dry eye disease is left untreated, recurrent damage can lead to keratoconjunctivitis, which compromises deeper layers of cornea and prolong healing time while also increasing the discomfort, blurring of vision and photophobia. Unmanaged dry eye disease, recurrent corneal abrasion, corneal scarring and deep tears lead to impairment of vision (25).

Corticosteroid has been used widely as anti-inflammatory drug (43). Corticosteroids have shown great results in dry eye treatments as they reduce the inflammation in ocular tissue that ultimately leads to increase in goblet cell density and improvement of dry eye (41). The aim of study was to access the effect of corticosteroid nasal spray on the tear film stability in allergic rhinitis and compare the effect of fluticasone furoate 27.5mcg and mometasone 50 mcg nasal sprays on tear film stability in allergic rhinitis

## MATERIAL AND METHODS

Quasi Experimental study design was used. Study was conducted at Madina Teaching Hospital, Faisalabad (MTH). The duration of study was from September 2021 to June 2022. Sample was collected by using non-probability convenient sampling technique. 60 patients (by using Raosoft calculator) was included in the study and divided into two groups. Group-1 (30) and Group-2 (30). The inclusion criteria included both genders with age limit 15-30 years. Only those patients were included in the study that was already diagnosed with allergic rhinitis. Patient with Systemic and ocular diseases other than Allergic rhinitis e.g. asthma, upper respiratory tract infection, gastritis, chronic sinusitis, glaucoma, cataract, subcapsular cataract, high intraocular pressure, computer users, patients having PCOS and pregnant ladies, patients diagnosed for dry eye and having previous history of dry eye disease or taking treatment for dry eye, patients using anti-allergic drops or any anti-histamine and who were using steroids since last 6 months either systemic or topical all were excluded from the study. Self-design proforma was used to collect data. The informed oral consent was taken from each person. Demographic data, history was taken by self-design proforma to fulfill the inclusion and exclusion criteria. Tear film stability is checked by both tests Schirmer and tear break up time. First of all entire procedure was explained to patient and minor side effects of alkane was told to patients like stinging, irritation and photophobia. Then asked to patient sit comfortably. Put an alkane drop into each eye and wait for few minutes. Schirmer strips are 35mm long strips, bend 5mm of each strip. Asked patient to look up, gently pull the lower lid and insert the folded end of the strip at temporal side of eye lid. Ask patient to gently close the eye and not squeeze the eye. Wait for 5 minutes. Ask patient to open both eyes and look up. Remove the both strips and measurement was noted. Below the 10mm wet strip was considered low tear production rate.

Then tear break up time TBUT was performed. Ask patient to place head on head rest and chin on chin rest. Align the temporal canthus with slip lamp for adjustment of patient. Then made adjustment at examiner side, adjust the eye pieces according to your refractive error and rotate eye pieces until patient eye is in clear focus. Turn on the diffuse illumination. Then asked to patient to look up and rub a fluorescein strip. Asked patient to blink the eye as fluorescein spread evenly on eye. Turn on the cobalt blue filter to observe

the tear film. Then asked to patient not to blink the eye. Time should be noted until the first dry spot appear on tear film. Less than 5 seconds is considered instability of tear film and high evaporative rate. All the findings were noted on the proforma. These tests were performed at baseline on 60 patients. Then they divided randomly into 2 groups. Each group included 30 patients. Flucatisone furoate 27.5 mcg nasal sprays was prescribed to group 1 and momatesone furoate 50mcg nasal spray was prescribed to group 2 for a 1 month. Patients were asked on follow up at 2<sup>nd</sup> week and at 4<sup>th</sup> week after using the nasal sprays. After 2 weeks of using the steroid nasal spray patients were asked to come on follow up Schirmer test and tear break up time both were performed again on both groups. Readings were noted on the proforma. Then at 4<sup>th</sup> week patients were again came on follow up. Tear film stability was again checked by both tests schirmer test and TBUT. Readings were noted. Analysis was done on the Statistical package for the social sciences (SPSS) Version 20.0 by using the Repeated Measure ANOVA and Independent sample t test.

## RESULTS

A total of 60 patients were selected with age ranging from 15 to 30 years. Out of this age range, minimum and maximum age with which patients presents were 16 years and 28 years respectively. The mean and standard deviation of the age were found to be 20.67±3.497. Out of which 56.7% were male (N=34) and 43.3% were female (N=26).

**Table 1: Tear film stability (Schirmer test) in momatesone furoate Group.**

	Mean	Std. Deviation	N	sig
Schirmer test value before using momatesone furoate	7.666	4.273	30	0.00
Schirmer test value after using momatesone furoate at 2 <sup>nd</sup> week	10.454	4.485	30	
Schirmer test value after using momatesone furoate at 4 <sup>th</sup> week	15.226	8.199	30	

*N: sample size, std: standard, sig: significant.*

**Table 2: Tear film stability (TBUT) in of momatesone furoate Group.**

	Mean	Std. Deviation	N	Sig
TBUT value before using momatesone furoate	6.353	2.711	30	0.00
TBUT value after using momatesone furoate at 2 <sup>nd</sup> week	6.386	2.922	30	
TBUT value after using momatesone furoate at 4 <sup>th</sup> week	8.900	1.893	30	

**Table 3: Tear film stability (Schirmer test) in flucatisone furoate Group.**

	Mean	Std. Deviation	N	sig
--	------	----------------	---	-----

Schirmer test value before using flucatisone furoate	7.366	4.014	30	0.00
Schirmer test value after using flucatisone furoate at 2 <sup>nd</sup> week	10.360	4.757	30	
Schirmer test value after using flucatisone furoate at 4 <sup>th</sup> week	14.666	8.631	30	

**Table 4: Tear film stability (TBUT) in flucatisone furoate Group.**

	Mean	Std. Deviation	N	sig
TBUT value before using flucatisone furoate	6.293	2.272	30	0.00
TBUT value after using flucatisone furoate at 2 <sup>nd</sup> week	7.080	2.334	30	
TBUT value after using flucatisone furoate at 4 <sup>th</sup> week	9.373	2.885	30	

Comparing the both groups by applying independent t test, at base line P= 0.780 and mean value of tear film stability checked with schirmer test in flucatisone furoate group was 7.666 and 7.33 in momatesone which indicated both groups were having instability of tear film. The mean value (Schirmer) in momatesone and flucatisone group at 2<sup>nd</sup> week was 10.544, 10.360 while at 4<sup>th</sup> week was 15.266, 14.666 respectively, while p value was 0.938 and 0.784 which indicate that tear film stability was improved by both drugs equally. The mean value (TBUT) in momatesone and flucatisone groups was 6.353, 6.293 at base line, 6.386, 7.080 at 2<sup>nd</sup> week and 8.900, 9.373 at 4<sup>th</sup> week respectively. The p value was 0.926 at baseline, 0.314 at 2<sup>nd</sup> week, and 0.456 at 4<sup>th</sup> week which indicate that no improvement was shown at 2<sup>nd</sup> week in momatesone group while minor improvement was shown in flucatisone furoate group. Tear film stability was improved by both groups at 4<sup>th</sup> week equally so any of the drug can be used signally.

## DISCUSSION

Tear film stability has been improved by using corticosteroid nasal spray. Corticosteroid has been considered most effective drug in decreasing inflammatory process and importantly in dry eye as due to their potent anti-inflammatory effect (14). Ophthalmic anti-inflammatory medications like dexamethasone, methylprednisolone have been shown to be useful in treating dry eye (15). Corticosteroid intra nasal sprays are being utilized more frequently in the treatment of allergic rhinitis (16). Inhaler and nasal corticosteroids are known to have very minimal potential for side effects in comparison to ophthalmic corticosteroids (17). Nasal and oropharyngeal mucosa allow inhaler and nasal sprays to be absorbed. Then they meet the targeted tissue without going to systemic circulation and degradation done by the liver and kidney (18). Corticosteroids either systemic or ophthalmic both can cause cataract and glaucoma but that depends upon the duration and dose being used (19). A research was conducted in 2021 to investigate the effect of intranasal steroid treatment in dry eye of geriatric patients having rhinitis. 31 patient's age greater than 65 years were included in the study. Beclomethasone dipropionate 50 microgram, 2 puff in each nostril two times a day given. Treatment was given for 4 weeks. Patients who were having a rhinitis of both types allergic and non-allergic both were included in study. Result of study reveal schirmer test 1, tear break up time TBUT, total nasal symptoms score TNSS, all were improved significantly after using the intranasal steroid P<0.001 (20). Total 60 patients with age was ranging from 18 to 30 years were included in present study. They were divided into two groups. Flucatisone furoate was given to group 1 and momatesone to group 2 for 1 month. Tear film stability was checked at 2<sup>nd</sup> week and 4<sup>th</sup> week. Results of study revealed

that tear film stability was improved by both drugs at 2<sup>nd</sup> week but great results showed at 4<sup>th</sup> week (P=0.00).

A study was done by ozturk and his colleague twenty-six patients used beclomethasone or budesonide after the surgery of endoscopic sinus for 3 to 19 months. They observed during this months no discernible increase in intraocular pressure was found in these cases (21). For this reason we would use nasal steroid drugs for dry eye treatment in AR patients with less side effect. Results of this study revealed schirmer and tear break up times values was improved which indicates that tear film stability was improved by using steroid nasal spray . We recommend a nasal steroid treatment should be used in treating tear film stability in AR patients. Clinician should pay attention to patient symptoms as they mimic as allergic but they should check the dry eye in allergic rhinitis patients. Future study should perform to check the long term effect of steroid nasal spray on retinal thickness. The limitation of study was this lacks the control group, a placebo effect to justify the post treatment improvement and patient hardly use same drug for 1 month it can affect our study.

### CONCLUSION

This study concluded that tear film stability was improved by using the steroid nasal spray and tear film stability was improved by both drugs momatesone furoste 50 mcg and flucatisone fuorate 27.5mcg equally so any of the drug can be used signally for treatment.

### REFERENCES

- (1). Varshney J, Varshney H. Allergic rhinitis: an overview. Indian Journal of Otolaryngology and Head and Neck Surgery. 2015 Jun; 67(2): 143-9.
- (2). Jeans T, Ziyar A. Allergic rhinitis clinical presentation: History, physical, causes [Internet]. Allergic Rhinitis Clinical Presentation: History, Physical, causes. Medscape 2021; <https://emedicine.medscape.com/article/134-825-clinical>.
- (3). Small P, Kim H. Allergic rhinitis. Allergy, Asthma and Clinical Immunology. 2011 Dec; 7(1): 1-8.
- (4). Dogru M, Gunay M, Celik G, Aktas A. Evaluation of the tear film instability in children with allergic diseases. Cutaneous and ocular toxicology. 2016 Jan 2; 35(1): 49-52.
- (5). Small P, Keith PK, Kim H. Allergic rhinitis. Allergy, asthma & clinical immunology. 2018 Sep; 14(2): 1-1.
- (6). Yenigun A, Elbay A, Dogan R, Ozturan O, Ozdemir MH. A pilot study investigating the impact of topical nasal steroid spray in allergic rhinitis patients with dry eye. International archives of allergy and immunology. 2018; 176(2): 157-62.
- (7). Baroody FM. How nasal function influences the eyes, ears, sinuses, and lungs. Proceedings of the American Thoracic Society. 2011 Mar 1; 8(1): 53-61.
- (8). Dogru M, Gunay M, Celik G, Aktas A. Evaluation of the tear film instability in children with allergic diseases. Cutaneous and Ocular Toxicology. 2016 Jan 2; 35(1): 49-52.
- (9). Winebrake J, Drinkwater O, Brissette A, Starr C. The TFOS Dry Eye Workshop II: Key Updates [Internet]. American Academy of Ophthalmology.2022 <https://www.aaopt.org/eyenet/article/the-tfos-dry-eye-workshop-ii>
- (10). Yang CQ, Sun W, Gu YS. A clinical study of the efficacy of topical corticosteroids on dry eye. Journal of Zhejiang University SCIENCE B. 2006 Aug; 7(8): 675-8.
- (11). Rouen PA, White ML. Dry eye disease: prevalence, assessment, and management. Home healthcare now. 2018 Mar 1; 36(2): 74-83.
- (12). Cutolo CA, Barabino S, Bonzano C, Traverso CE. The use of topical corticosteroids for treatment of dry eye syndrome. Ocular Immunology and Inflammation. 2019 Feb 17; 27(2): 266-75.
- (13). Yang CQ, Sun W, Gu YS. A clinical study of the efficacy of topical corticosteroids on dry eye. Journal of Zhejiang University SCIENCE B. 2006 Aug; 7(8): 675-8.
- (14). Nagelhout TJ, Gamache DA, Roberts L, Brady MT, Yanni JM. Preservation of tear film integrity and inhibition of corneal injury by dexamethasone in a rabbit model of lacrimal gland

- inflammation–induced dry eye. *Journal of Ocular Pharmacology & Therapeutics*. 2005 Apr 1; 21(2): 139-48.
- (15). Hong S, Kim T, Chung SH, Kim EK, Seo KY. Recurrence after topical nonpreserved methylprednisolone therapy for keratoconjunctivitis sicca in Sjögren's syndrome. *Journal of ocular pharmacology and therapeutics*. 2007 Feb 1; 23(1): 78-82.
- (16). Nathan RA. The burden of allergic rhinitis. In *Allergy & Asthma Proceedings 2007 Jan 1* 28( 1): 1.
- (17). Jeppesen P, Krag S. Steroid treatment and risk of glaucoma. *Ugeskrift for Laeger*. 2015 Aug 1; 177(34): 1620-3.
- (18). Coleman AL, Miglior S. Risk factors for glaucoma onset and progression. *Survey of ophthalmology*. 2008 Nov 1; 53(6): 3-10.
- (19). Busool Y, Mimouni M, Vainer I, Levartovsky S, Sela T, Munzer G, Kaiserman I. Risk factors predicting steroid-induced ocular hypertension after photorefractive keratectomy. *Journal of Cataract & Refractive Surgery*. 2017 Mar 1; 43(3): 389-93.
- (20). KIRIKKAYA E, BAŞER E. Effect of Nasal Steroid Treatment on Dry Eye in Geriatric Population with Rhinitis: Case Control Study. *Türkiye Klinikleri Oftalmoloji Dergisi*. 2021; 30(4): 218-26.
- (21). Choi EY, Walton DS. Goniotomy for steroid-induced glaucoma: clinical and tonographic evidence to support therapeutic goniotomy. *Journal of Pediatric Ophthalmology & Strabismus*. 2015 May 1; 52(3): 183-8.