

Keratometric Study of Cornea in Allergic Conjunctivitis Patients

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Abstract: Background: To explore corneal biomechanical changes, identify related factors and determine early indicators of keratoconus (KC) development risk in allergic conjunctivitis (AC) patients.

Methods: A total of 50 patients, including 20 eyes without AC and 30 eyes with AC were enrolled in this study. All patients underwent a complete ocular examination, including evaluations of clinical manifestations of AC, corneal tomography and densitometry by Pentacam, corneal biomechanics by Corvis ST, and corneal and epithelial thickness mapping by RTvue optical coherence tomography (OCT).

Results: The index of surface variance (ISV), index of vertical asymmetry (IVA), keratoconus index (KI), index of height decentration (IHD) and Belin/Ambrosio enhanced ectasia total deviation index (BAD-D) were significantly higher in the AC group than in the non-allergic conjunctivitis (NAC) group ($P < 0.05$). The tomography and biomechanical index (TBI) was also significantly higher in the AC group ($P = 0.04$). The average epithelial thickness in the 2–7 mm annulus was significantly thinner in the AC group than in the NAC group ($P < 0.05$). The average densitometry of the total cornea and the anterior layer were higher in the AC group than in the NAC group ($P < 0.001$). The ISV, IVA, KI, IHD and BAD-D were significantly correlated with the TBI and changes in corneal epithelial thickness in AC patients ($P < 0.05$). The changes in epithelial thickness were closely related to the eye rubbing frequency and allergic sign scores ($P < 0.05$).

CONCLUSIONS: AC patients should be advised to routinely undergo corneal tomographic and biochemical measurements and the TBI could be used an indicator of KC development risk in AC patients.

Keywords: Allergic conjunctivitis, central corneal thickness, Keratoconus.

1. INTRODUCTION

Allergic conjunctivitis is seen to be increasing in today's population. Allergic conjunctivitis includes a group of allergic reactions: acute reactions which include seasonal allergic conjunctivitis, perennial allergic conjunctivitis, chronic reactions which include vernal

keratoconjunctivitis and atopic keratoconjunctivitis. Giant papillary conjunctivitis due to contact lenses or any ocular prosthesis even though included in the same group occurs due to microtrauma.

Allergic conjunctivitis is characterized by myriad of signs and symptoms which is characterized by simple itching to more severe eye pruritus. Keratoconus is characterized by non-inflammatory corneal stromal thinning and protrusion inducing myopia and irregular astigmatism. There are studies which show close association between keratoconus and allergic conjunctivitis. Thus eye rubbing and itching are not just factors which lead to development of keratoconus but also leads to exacerbation of the condition. Keratoconus associated with allergic conjunctivitis is associated with rapid progression increasing the need for surgical intervention. Matrix metalloproteinases which are degradative enzymes released in response to corneal microtrauma have been considered as a main culprit for pathogenesis keratoconus.

Central corneal thickness gives information of overall health of the cornea. Central corneal thickness is the parameter being used in contact lens use and refractive surgery as well as being an early diagnostic tool to diagnose primary open angle glaucoma. Thus aim of our study is to study the effect of allergic conjunctivitis on central corneal thickness.

2. MATERIALS AND METHODS

A case control study was done at tertiary eye care centre during the month of January 2021 to June 2021. The study population included 35 eyes of 20 patients diagnosed with allergic conjunctivitis who were compared with 35 eyes of 35 age matched controls without any complaints. Informed consent was obtained from the participants before the study, which was conducted according to the guidelines and in accordance with the tenets of the Declaration of Helsinki. Participants in the study group included patients who presented with history of redness, itching, irritation, burning sensation, eyelid edema and slit-lamp on examination who had signs of papillae, micropapillary conjunctivitis, trichiasis, entropion, madarosis, symblepharon clinically and diagnosed as allergic conjunctivitis. Patients who were already on the medication for allergic conjunctivitis were also included in the group (patients were on olopatadine hydrochloride 0.1% topical medication). Exclusion criteria included patients who had epithelial defect, history of recent ocular trauma and patients who had undergone surgery recently and other ocular co morbidities and who did not give consent. Brief history which included medical, surgical, ophthalmic, family and drug history was taken. All participants underwent a detailed examination which included best corrected visual acuity, slit lamp examination of anterior segment, dilated funduscopy under mydriasis. Central corneal thickness was measured using ultrasound pachymeter. Cornea was anesthetized using topical proparacaine hydrochloride 0.5%. The probe was aimed perpendicularly to cornea at the centre of the pupil to measure the central corneal thickness. Goldmann's applanation tonometer was used to measure the intra ocular pressure.

All data were analyzed by a statistical software package (SPSS 18.0). Comparison of the parameters was done between the two groups using t- test. p value < than 0.05 was considered statistically significant. Quantitative variables were reported as mean and standard deviation.

3. RESULTS

Study group consisted of 35 eyes of 20 patients diagnosed with allergic conjunctivitis, mean age was found to be 25.23 ± 9.2 years, the youngest patient in the group was of 15 years and the eldest patient being 35 years. The control group consisted of 35 eyes of 35 patients with mean age of 27.23 ± 10 years, youngest patient of 15 years and eldest patient was of 37 years. Out of 35 eyes of the study group 12 patients were male (60%) and 8 patients were female (40%).

Control group had 35 patients which included 18 males (51.4%) and 17 females (48.5%). After all the patients underwent refraction and correction, best corrected visual acuity (BCVA) was found to be 6/9 in two of the patients in the study group who were found to have keratoconus whereas all other patients in the study population had BCVA of 6/6. BCVA did not show any statistically significant difference between the study group and control group ($p > 0.05$). Out of 20 patients in the study group one patient had atopic dermatitis (5%), history of bronchial asthma was present in five (25%) and eczema in six patients (30%), two patients were using contact lenses (10%). Anterior segment examination in the study group showed four patients with giant papillae (20%), two patients with keratoconus (10%), two with entropion (10%), cicatricial conjunctivitis was seen in two patients (5%).

Mean CCT in the study group was $521.77 \pm 5.9 \mu\text{m}$ whereas in the control group was $542.62 \pm 5.42 \mu\text{m}$. Analysis by t test showed that the difference in the mean CCT between the study and control group was statistically significant ($t = 15.396$, $p < 0.0001$). The mean IOP in the study group was 17.08 ± 1.8 mm of hg and the in the control group was found to be 11.79 ± 1.79 mm of hg. IOP in the study group was on higher side when compared to the control group but there was no statistically significant difference found between the two groups ($p = 0.04$, $p > 0.05$).



SHOWING THE AGE DISTRIBUTION IN THE PARTICIPANTS OF BOTH THE GROUPS

	age	SD
study	25.25	9.4
control	27.23	10

SHOWING THE GENDER DISTRIBUTION IN THE PARTICIPANTS IN BOTH THE GROUPS

	males(numbers)	females(numbers)
study	60%(12)	40%(8)
control	51.40%(18)	48.50%(17)

SHOWING DISTRIBUTION OF SYSTEMIC ASSOCIATION IN THE STUDY GROUP

Systemic association	Percentage of study group	Number of participants
atopic dermatitis	5%	1
bronchial asthma	25%	5
eczema	30%	6
contact lenses	10%	2
nothing significant	10%	2

SHOWING DISTRIBUTION OF CLINICAL SIGNS IN STUDY GROUP

clinical signs	percentage	number of participants
giant papillae	20%	4
keratoconus	10%	2
entropion	10%	2
cicatrival	5%	1

SHOWING DISTRIBUTION OF MEAN IN TGE STUDY AND CONTROL GROUP

	study	control
mean CCT (µm)	521.77	542.62

SHOWING COMPARISON OF DIFFERENT PARAMETERS BETWEEN THE GROUPS

	study	control	
parameters	mean + sd	mean±sd	p value
age	25.23+9.2	27.23±10	NS
male/female	12/8	18/7	NS
BCVA in snellens	6/24-6/6	6/24-6/6	NS
CCT (µm)	521.77+5.9	542.62±5.42	t=15.396<0.0001
IOP(mm hg)	17.08+1.8	11.79±1.79	NS

4. DISCUSSION

In our study we analyzed that the age group of 16 to 35 years was the most susceptible age group for allergic conjunctivitis with mean age of 25.23± 9.2 years with male preponderance, whereas in the previous studies mean age was 37.05± 5.7 years with female preponderance which showed slightly higher age group of susceptibility. This can be attributed to multiple factors which include increasing air pollution, household pets, genetic predisposition, exposure to multiple allergens. Systemic association with eczema was most commonly seen in the study population which accounted to 30% of the study group, 25% study group had history of bronchial asthma, 10% of patients gave history of contact lens usage and 5% of the study group had association with atopic dermatitis. Previous study done by Bencharki Y et al.⁵ shows systemic association with allergic conjunctivitis which included rhinitis in 80%, asthma is 18%, 2% of the cases showed urticaria and eczema. This shows that systemic associations with allergic conjunctivitis are not uncommon.

Mean CCT in the study group of our population was 521.77 ±5.9 µm and the control group showed mean CCT of 542.62±5.42 µm which showed statistically significant decrease in the central corneal thickness in the allergic conjunctivitis group. Previous studies done by Ondas O6 showed similar decrease in the central corneal thickness in the allergic conjunctivitis study group with mean CCT being 523.45±18.03µm in the study population and 540.30 ± 38.91 µm in the control group which corresponded well with the results of our study. Whereas in the study conducted by Dogan et al showed even though decrease in the CCT was seen in the study group compared to the control group but there was no statistically significant difference between the two groups. This can be attributed to the etiology of eye rubbing which leads to release of matrix metalloproteinases (MMP) which leads to corneal tissue damage leading to development of keratoconus. This correlates to keratoconus seen in one of our patient in the study group.

These MMP s actually play in a role in the normal turn over of the corneal epithelium but when present in excess amounts they lead to corneal destruction. In a study done by Kumagai et al⁹ it has been found that active forms of MMP -2 and MMP – 9 were found in the tears of the VKC patients compared to healthy controls. Thus eye rubbing

and release of MMP play a major role in thinning of the corneal stroma which might end up the patient in severe complications like keratoconus.

Alterations in the CCT will also affect the measurement of IOP and might delay the diagnosis of glaucoma. Therefore measuring the central corneal thickness plays an important role in the diagnosis of glaucoma, keratoconus, dry eye, corneal refractive surgery, atopic keratoconjunctivitis.

IOP was found to be higher in the study group when compared to control group but did not show any statistically significant difference as patients included in the study were on olapatidine hydrochloride 0.1% TID and not on steroids.

Thus measuring central corneal thickness in the patients with allergic conjunctivitis plays an important role from the first visit as well as in the follow up visits as patients ending up with complications like keratoconus can be easily detected at the earliest stages and treated appropriately. Similarly, even IOP plays important role in allergic conjunctivitis patients who have chronic history of eye rubbing as there are high chances of them landing up in steroid induced glaucoma especially in vernal and atopic conjunctivitis which due to their chronic nature need steroids in the management. Thus, this study enlightens the need of measuring CCT and IOP in the regular evaluation of patients with allergic conjunctivitis.

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DOI: <https://doi.org/10.15379/ijmst.v10i1.2678>

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