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Original Research Article

The Ocular Side Effects of Use of Contact Lens in Patients Presenting at Tertiary Care Centre

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Abstract

Introduction: Contact lenses have not only corrected refractive errors but have also improved people's appearance and provided greater freedom in daily activities, leading to an enhanced quality of life. However, contact lenses may also cause complications that can be disappointing for patients, compelling them to switch from contact lenses to other forms of vision correction if feasible. However, such transitions are not always easy and may also bring complications of their own.

Aim and Objectives: To provide a better concept of understanding contact lens related problems. Addressing contact lens problems properly can prevent contact lens dropout and lessen the consequences.

Material and Methods: A convenient sampling technique was used to collect data in a cross-sectional study conducted over a period of four months from April to August 2021. The study was conducted at Sarvodaya Hospital and Research Centre after ethical clearance from the ethical committee. The study included subjects aged 15 to 55 years who had been using contact lenses for more than one year. Participants were informed about the study's purpose, duration, and confidentiality, and their consent was obtained.

Result: The average years of contact lens use was 8.35 ± 5.81 years, with a range of 1.5 to 30 years. Most contact lens users (96%) had myopia and used contact lenses with minus power, ranging from -0.50 to -17.00 D, with a mean value of -4.46 D ± 3.69 D. A significant ($X2 = 31.636$; $p = .000$) association was found between corneal changes and years of contact lens use. Number of subjects with corneal changes increased with increase in number of years of contact lens use. It was determined that all of subjects those who used contact lenses for 26 – 30 years and half of subjects those used contact lenses for 21 – 25 years presented with corneal change.

Conclusions: It was concluded that long term use of contact lenses induced many corneal changes (neovascularization, staining, infiltrates, abrasions) among contact lens users. As the number of years of contact lens use and minus power of contact lens increased, more corneal changes were found.

Keywords: Contact Lens, Corneal Lesion, Neovascularisation, Vision.

Introduction

The market of contact lens is continuously surging. There are an estimated 140 million contact lens wearer worldwide with a year on year increase predicted, based on sales growth[1].

Contact lens are being widely used now a days both for cosmetic as well as therapeutic reasons. The demand for using cosmetic-coloured lenses have risen over the years. Contact lenses are advised for refractive errors, anisometropic errors of refraction, aphakia, keratoconus, epithelial defects, corneal opacities and dry eye cases.

Contact lenses have not only corrected refractive errors but have also improved people's appearance and provided greater freedom in daily activities, leading to an enhanced quality of life. However, contact lenses may also cause complications that can be disappointing for patients, compelling them to switch from contact lenses to other forms of vision correction if feasible. However, such transitions are not always easy and may also bring complications of their own[2]. Contact lens use can lead to complication like discomfort, neovascularization, superior epithelial arcuate lesion, acanthamoeba keratitis, fungal keratitis, giant papillary conjunctivitis, dry eyes, ptosis, pingecula, corneal staining and edema, stromal opacity and herpes reactivation[3].

According to the 2006 census, around 125 million people worldwide were using contact lenses, and the severity and frequency of complications associated with them vary greatly. These complications can be attributed to three main mechanisms: mechanical trauma to the conjunctiva and cornea, acute and chronic hypoxia caused by inadequate oxygen transmission, and allergic reactions from protein deposits on the contact lenses. Moreover, many patients with dry eyes or blepharitis may have compromised conjunctival and corneal surfaces, making them more susceptible to complications [4-7].

Corneal staining is a well-known potential complication associated with contact lens use, with a prevalence as high as 60%. However, it is generally not a significant clinical concern. Another complication is epithelial microcysts, which indicate chronic metabolic stress and can be easily observed using a slit-lamp biomicroscope. These microcysts are typically located in the central and paracentral cornea and appear as small opaque dots with focal illumination and transparent refractile inclusions with indirect retro illumination. While visual acuity is usually unaffected by microcysts, they are commonly seen with soft contact lenses, especially extended wear lenses. A small number of microcysts are not harmful, but a large number of microcysts can indicate a more serious issue[4].

With the above complication in mind we had conducted this study to provide a better concept of understanding contact lensrelated problems. Addressing contact lens related problems properly can prevent contact lens dropout and lessen the consequences.

Material and Methods

A convenient sampling technique was used to collect data in a cross-sectional study conducted over a period of four months from April 2021to August 2021. The study was conducted at Sarvodaya hospital and Research centre after obtaining ethical approval from ethical review board, in accordance with the Declaration of Helsinki principles. The study included subjects aged

18 to 60 years who had been using contact lenses for more than one year. Total number of patients included in our study was 100. Participants were informed about the study's purpose, duration, and confidentiality, and their consent was obtained. The study focused on four corneal changes, namely corneal neovascularization, corneal infiltrates, corneal abrasions, and corneal staining. A gross slit lamp examination was performed, and different techniques were used to observe each of the corneal changes. SPSS version 20 was used for data analysis, and descriptive and inferential statistics were generated and reported for variables.

Result

The study included 100 contact lens users, of which 65% were female and 35% were male. The age of the users ranged from 18 to 60 years, with an average age of 31.18 ± 7.92 years. The subjects were using different types of contact lenses, including soft contact lenses (50%), soft cosmetic contact lenses (17%), RGP contact lenses (17%), soft toric contact lenses (12%), and silicone hydrogel contact lenses (4%).

The average daily wearing time of contact lenses was 9.82 ± 2.19 hours/day, with a range of 4 to 16 hours/day. The average years of contact lens use was 8.35 ± 5.81 years, with a range of 1.5 to 30 years. The majority of contact lens users (96%) had myopia and used contact lenses with minus power, ranging from -0.50 to -17.00 D, with a mean value of -4.46 D ± 3.69 D

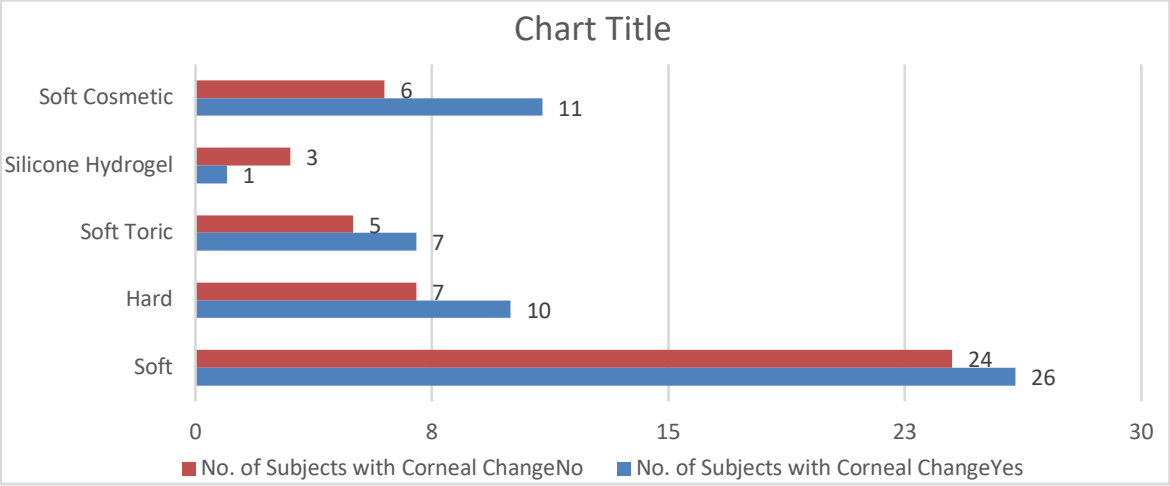

Figure 1: Association between corneal changes and types of contact lenses.

In this study various corneal changes were found among contact lens users. Results showed that 55 % (55 out of 100) of contact lens users presented with corneal changes while 45% (45 out of 100) of contact lens users had no corneal change. More than one corneal change was present among some subject. Neovascularization was found in 38% of contact lens users followed by corneal staining in 33%, corneal infiltrates in 17% and corneal abrasions in 12%.

A statistical analysis was performed to investigate the relationship between corneal changes and different types of contact lenses, and that the results did not show a significant association between the two. Specifically, the p-value, which indicates the probability of obtaining the observed results by chance, was greater than 0.05, which is the commonly used threshold for statistical significance.

There may have been some differences in the ratios of subjects with and without corneal changes across the different types of contact

lenses, these differences were not large enough to be considered statistically significant. In other words, the observed variations could have occurred by chance and do not provide strong evidence of a causal relationship between the type of contact lens and corneal changes.

The statement highlights the importance of interpreting statistical results in the context of the study design, sample size, and other relevant factors, and emphasizes the need for caution when making conclusions based solely on statistical significance. Pearson Chi-Square 2.492 p-value .646

Table 1: Association between corneal changes and daily wearing time of contact lenses.

Daily Wearing Time(hours/day)	No. of Subjects with Corneal Change		
	Yes	No	Total
4 – 8	18	18	36
9 – 12	34	25	59
13 – 16	3	2	5
Total	55	45	100

No significant association ($p > 0.05$) was found between corneal changes and daily wearing time of contact lenses. It was observed that overall ratios between subjects with corneal changes and subjects without corneal changes did not differ largely for different categories of daily wearing time of contact lens.

Table 2: Association between corneal changes and years of contact lens use.

	No. of Subjects with Corneal Change		Total
	Yes	No	
1 – 5	12	31	43
6 – 10	26	7	33
11 – 15	8	4	12
16 – 20	6	1	7
21 – 25	1	2	3
26 – 30	2	0	2
Total	55	45	100
Pearson Chi-Square 31.636 p-value 0.000			

A significant association ($X2 = 31.636$; $p = .000$) was found between corneal changes and years of contact lens use. Number of subjects with corneal changes increased with increase in number of years of contact lens use. It was determined that all of subjects those used contact lenses for 26 – 30 years and half of subjects those used contact lenses for 21 – 25 years presented with corneal change.

Table 3: Association between corneal changes and minus power of contact lenses

Minus Contact Lens Power (D)	No. of Subjects with Corneal Change		Total
	Yes	No	
-0.50 to -3.00	16	29	45
-3.25 to -6.00	20	11	31
-6.25 to -9.00	11	4	15
-9.25 to -12.00	1	1	2
-12.25 to -15.00	3	0	3
-15.25 to -18.00	4	0	4
Total	55	45	100

Pearson Chi-Square 14.325 p-value 0 .014

A significant (X2 = 14.325; p = .000) association was found between corneal changes and minus power of contact lens. Number of subjects with corneal changes increased with increase in minus power of contact lens. It was determined that all subjects those used contact lens power ranged from -15.25 to -18.00 D and -12.25 to -15.00 D had corneal changes and half of the subject those used contact lens power ranged from -9.25 to -12.00 D had corneal changes.

Table 4: Association between corneal changes and plus power of contact lenses.

Plus Contact Lens Power (D)	Corneal Changes		Total
	Yes	No	
+0.50 To +3.00	0	1	1
+3.25 To +6.00	1	2	3
Total	1	3	4
Pearson Chi-Square .444 P-Value .505			

No significant (p > 0.05) association was found between corneal changes and plus power of contact lens. In both categories of plus contact lens power similar ratio was found between subject with corneal changes and subjects without corneal changes

Table 5: Association of Corneal changes with different contact lens parameters.

Contact Lens Parameters	Pearson Chi Square	p value
Type of Contact Lens	2.492	0.646
Daily Wearing Time	1.986	0.370
Years of Contact Lens Use	31.636	0.000
Minus Power of Contact Lens	14.325	0.014
Plus Power of Contact Lens	0.444	0.505

The study found that among the 100 contact lens users, only 4% were hyperopic and used plus power contact lenses, with a mean power of +4.00 D ±1.35 D. 58% of the contact lens users presented with corneal changes, while the remaining 42% had no corneal changes. Among those with corneal changes, neovascularization was found in 38%, followed by corneal staining in 33%, corneal infiltrates in 17%, and corneal abrasions in 12%. There was no significant association (p > 0.05) found between corneal changes and the types of contact lenses used. The study also observed that the overall ratios between subjects with and without corneal changes did not differ significantly among the different types of contact lenses.

Discussion

The types of contact lenses used by our subjects are similar to those reported by other studies, which include soft contact lenses, soft cosmetic contact lenses, RGP contact lenses, soft toric contact lenses, and silicone hydrogel contact lenses. However, the percentages of each type may vary depending on the sample characteristics and preferences.

There have been several published studies on the average daily wearing time of contact lenses. One such study is "Global Trends in Contact Lens Wear: A Survey" by Morgan et al. [5], which reported an average wearing time of 8.4 hours per day among contact lens wearers worldwide. Another study by Dumbleton et al. [6] reported an average wearing time of 8.9 hours per day among

daily disposable contact lens wearers. The average daily wearing time of contact lenses in our study group subjects was 9.82 ± 2.19 hours/day, with a range of 4 to 16 hours/day.

This study found that contact lens users exhibited various corneal changes, which could be attributed to long-term wear of contact lenses causing hypoxia and dryness in the eyes. These findings align with previous studies conducted by Efron et al. [7], Beljan et al. [8], These studies reported corneal neovascularization, corneal infiltrates, corneal staining, and corneal abrasions among contact lens users.

Our study did not identify any significant relationship between the types of contact lenses and the occurrence of corneal changes. This could be attributed to the fact that the majority of the participants wore soft contact lenses, while other types were used by a smaller number of individuals. These findings are consistent with the results of other studies such as Efron et al. [7], Nichols et al. [9], and Ishak et al. [10] However, they differ from the outcomes of studies conducted by Nichols et al.ix

Moreover, the study did not observe any significant association between the daily wearing time of contact lenses and corneal changes. These results were consistent with the findings of Nichols et al. [9] but contrasted with the results of studies by Beljan et al. [8] This difference in findings could be attributed to regional and racial variations, as well as differences in the type and quality of contact lens material used.

The study revealed a significant association between corneal changes and years of contact lens use, possibly due to prolonged hypoxia caused by long-term contact lens use. These findings were consistent with the results of Beljan et al. [8] study. Additionally, a significant association was found between corneal changes and minus power of contact lens, possibly because thicker high-power lenses reduced oxygen permeability, causing more damage to the cornea.

Nichols et al. [9] and Lee et al. [10] studies supported these results. However, no significant association was observed between corneal changes and plus power of contact lens, possibly due to the small number of hyperopic contact lens users in the study. No other studies were found that discussed these specific findings in detail.

In our study among those with corneal changes, neovascularization was found in 38%, followed by corneal staining in 33%, corneal infiltrates in 17%, and corneal abrasions in 12%. The findings of our study suggest that contact lens use can have significant effects on the cornea. According to another study by Rabia Ammer et al [11] 58% of contact lens users also presented with corneal changes, which is consistent with our result. Another study by Morgan et al. [5], found a significant association of corneal changes with the type of contact lens and the daily wearing time of contact lenses, which we did not find. These differences may be due to different sample sizes, methods, or criteria for diagnosing corneal changes.

Another study Dumbleton et al. [6] found a correlation between corneal changes and contact lens deformation with changes in intraocular pressure, which may be another factor affecting the corneal health of contact lens users. A review article summarized the effects of long-term contact lens wear on the cornea, such as alterations in corneal thickness, curvature, sensitivity, cell density, and epithelial oxygen uptake. It also mentioned the formation of epithelial vacuoles and microcysts as well as the emergence of polymegathism in the corneal endothelium. These effects may not be evident in short-term studies but may have long-term implications for corneal function and integrity.

Finally, a study highlighted the risk of contact lens-related corneal infection (microbial keratitis), which can have serious consequences such as permanent vision loss. It estimated an annualized incidence ranging from ~2 to ~20 cases per 10,000 wearers, depending on the type and modality of contact lens use. It also discussed the factors that influence the intrinsic resistance and susceptibility of the cornea to in [12,13] fection, such as tear film composition, epithelial barrier function, immune response, and microbiome diversity.

Conclusions

Through our study we would like to conclude that long term use of contact lenses induces many corneal changes (neovascularization, staining, infiltrates, abrasions) among contact lens users. Also, as the number of years of contact lens use increased and minus power of contact lens increased, more corneal changes were found in patients using contact lens.

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