International Journal of Multidisciplinary Trends

E-ISSN: 2709-9369
P-ISSN: 2709-9350
www.multisubjectjournal.com
IJMT 2024; 6(11): 79-81
Received: 05-08-2024
Accepted: 10-09-2024

Anusuya Das
Assistant Professor,
Department of Optometry
Swami Vivekananda
University, West Bengal, India

Corresponding Author:
Anusuya Das
Assistant Professor,
Department of Optometry
Swami Vivekananda
University, West Bengal, India

The impact of extended contact lens wear on corneal health

Anusuya Das

DOI: https://dx.doi.org/10.22271/multi.2024.v6.i11b.506

Abstract
Cornea is one of the most important component in our eye, which is transparent, avascular. It gets nutrition from Oxygen from air & aqueous humor. Commonly contact lens are used for correct refractive errors, cosmetic purposes [2], therapeutic uses. A perfect balance of oxygen, nutrition, and moisture is necessary for the cornea, a crucial component of the eye, to preserve its transparency and functionality.

Various types of contact lens present world-wide which are used to make spectacle free. Globally, approx. 140 million contact lens users are present. Actually, contact lens is foreign body respected of ocular surface, but a lot of benefits presents associated with disadvantages.

Extended using time of contact lens can feel discomfort on ocular surface, then there is a temporary solution of using topical lubricating eye drop. Some types of conjunctival complications [1] are present like giant papillary conjunctivitis (GPC), allergic conjunctivitis etc. For complications related of contact lens wear at cornea like epithelial oedema, bacterial keratitis [8, 9, 10], fungal keratitis [6, 7], microcysts, corneal neovascularization, peripheral corneal staining, corneal abrasions, superficial punctate keratitis etc [2, 3]. Long time of using contact lens can decreases the oxygen permeability of cornea, that is induces the hypoxia condition of cornea. The high risk of hypoxia is corneal oedema along with corneal infection.

But using contact lenses means that a foreign object is constantly pressed against the cornea, which can change the cornea's architecture and physiology [5]. Long-term lens use can lead to corneal hypoxia, which can collect fluid in the stroma. Several researchers have shown morphologic alterations in the corneal endothelium cells of people who wear a variety of contact lens types, including soft, hard, and extended wear soft lenses. These alterations might be a sign of persistent hypoxia-induced cell stress, which raises carbon dioxide levels, causes lactate to build up, and alters pH. Polymegathism may be a sign of abnormal cell function, and pleomorphism may be a sensitive measure of the condition of the corneal endothelium [4].

This article focused on corneal oxygenation, epithelial integrity, tear film stability, and the prevalence of corneal complications such as microbial keratitis and corneal neovascularization. Additionally, the study analysed the role of different contact lens materials, including silicone hydrogel and hydrogel lenses, in reducing hypoxic stress and promoting corneal health during extended wear. Wearing contact lenses for extended periods of time increases the risk of hypoxia and decreased oxygen delivery to the cornea. Even though silicone hydrogel contact lens technology has increased oxygen permeability and decreased the frequency of hypoxia-related problems, extended contact lens wear still carries a significant risk of neovascularisation and corneal infections. As a result, it's critical that both contact lens wearers and eye care specialists are aware of these hazards, stress the need of taking good care of your lenses, and weigh the advantages of wearing your lenses for shorter periods of time. Innovative lens designs and materials that can better maintain ocular health during prolonged usage require more investigation.

Keywords: Oxygen, epithelial oedema, bacterial keratitis, fungal keratitis, microcysts, corneal neovascularization, peripheral corneal staining, corneal abrasions, superficial punctate keratitis

1. Introduction
The cornea is critical for vision, requiring a constant supply of oxygen and nutrients to maintain transparency and function. Contact lenses have become a popular alternative to spectacles, with approximately 140 million users worldwide. While they offer numerous benefits, extended contact lens wear can adversely affect corneal health. This study aims to evaluate the impact of prolonged contact lens use on corneal oxygenation, epithelial integrity, and the prevalence of complications, providing essential insights for both users and eye care professionals.

2. Methods

2.1 Participants

A total of 150 participants aged 18-40 years who were regular contact lens users (daily wear and extended wear) were recruited from a university clinic. All participants provided informed consent, and the study adhered to the Declaration of Helsinki.

2.2 Study Design

This prospective cohort study lasted six months, involving baseline and follow-up assessments at three and six months.

2.3 Data Collection

2.3.1 Clinical Assessments

Corneal Oxygenation: Measured using a non-invasive oxygen transmissibility (Dk/t) assessment.

2.3.1.1 Epithelial Integrity: Evaluated via fluorescein staining and tear film break-up time (TBUT) tests.

2.3.1.2 Complications: Documented any cases of microbial keratitis, neovascularization, and other related complications through clinical examinations.

2.3.2 Survey

Participants completed a questionnaire assessing lens hygiene practices, wearing habits, and any experienced discomfort.

2.4 Statistical Analysis

Data were analyzed using SPSS version 26. Descriptive statistics were calculated, and comparative analyses employed Chi-square tests and ANOVA where appropriate, with a significance level set at $p<0.05$.

3. Results

3.1 Participant Demographics

Out of 150 participants, 65% were female, and the mean age was 25.3 years (SD ± 5.2). The majority (70%) used silicone hydrogel lenses, while 30% used traditional hydrogel lenses.

3.2 Corneal Oxygenation

Baseline Dk/t values showed that silicone hydrogel lenses significantly outperformed traditional lenses ($p<0.01$). However, at the three-month follow-up, 35% of users reported symptoms of discomfort attributed to hypoxia, regardless of lens type.

3.3 Epithelial Integrity

The mean TBUT decreased from 14.2 seconds (SD ± 3.5) at baseline to 10.4 seconds (SD ± 4.2) by the end of the study ($p<0.01$). Fluorescein staining revealed superficial punctate keratitis in 20% of participants at the six-month mark, primarily among those wearing traditional hydrogel lenses.

3.4 Complications

3.4.1 Microbial Keratitis: Documented in 5 participants (3.3%), with all cases occurring in those using traditional hydrogel lenses.

3.4.2 Corneal Neovascularization: Observed in 8 participants (5.3%), primarily in the extended wear group.

3.4.3 Giant Papillary Conjunctivitis (GPC): Reported in 6 participants (4%), associated with poor hygiene practices.

3.5 Lens Hygiene Practices

Participants using silicone hydrogel lenses [14] reported better hygiene practices, with 80% adhering to recommended cleaning protocols compared to only 50% in traditional lens users ($p<0.01$).

4. Discussion

This study highlights the significant risks [11, 12, 15] associated with extended contact lens wear, including corneal hypoxia and complications like microbial keratitis and neovascularization. Although silicone hydrogel lenses provide superior oxygen permeability, the potential for corneal complications remains, particularly with extended wear.

These findings align with previous research indicating that prolonged lens wear, even with advanced materials, can lead to adverse effects on corneal health. The deterioration of epithelial integrity and the increased prevalence of complications underscore the need for users to adhere to proper lens care practices and to limit extended wear.

5. Conclusion

While contact lenses, particularly silicone hydrogel varieties, offer advantages for vision correction, their extended use poses significant risks to corneal health. Eye care professionals must emphasize the importance of hygiene, proper wearing schedules, and regular check-ups to mitigate these risks. Future research should focus on developing innovative contact lens designs and materials that further enhance oxygen delivery and reduce complications.

6. References

1. Review of contact lens-related complications. Lim CH, Stapleton F, Mehta JS. Eye Contact Lens. 2018;44 Suppl 2:0. [PubMed] [Google Scholar]
2. A review of cosmetic contact lens infections. Lim CH, Stapleton F, Mehta JS. Eye (Lond) 2019;33:78-86. [PMC free article] [PubMed] [Google Scholar]
3. Ocular complications in contact lens wear and the risk factors: A retrospective analysis. Zainodin E, Najmee N, Hamzah F, Saliman N. Environ-Behav Proc J. 2021;15:105-110. [Google Scholar]
4. Prevalence of contact lens-related complications: UCLA contact lens study. Forister JF, Forister EF, Yeung KK, Ye P, Chung MY, Tsui A, Weissman BA. Eye Contact Lens. 2009;35:176-180. [PubMed] [Google Scholar]
5. Effects of rigid and soft contact lens daily wear on corneal epithelium, tear lactate dehydrogenase, and bacterial binding to exfoliated epithelial cells. Ladage PM, Yamamoto K, Ren DH, Li L, Jester JV, Petroll WM, Cavanagh HD. Ophthalmology. 2001;108:1279-1288. [PubMed] [Google Scholar]
6. The incidence of contact lens-related microbial keratitis in Australia. Stapleton F, Keay L, Edwards K, Naduvilath T, Dart JK, Brian G, Holden BA. Ophthalmology. 2008;115:1655-1662. [PubMed] [Google Scholar]
7. Risk factors for contact lens-related microbial keratitis

in Singapore. Lim CH, Carnt NA, Farook M, Lam J, Tan DT, Mehta JS, Stapleton F. Eye (Lond) 2016;30:447-455. [PMC free article] [PubMed] [Google Scholar]
8. Alamillo-Velazquez J, Ruiz-Lozano RE, Hernandez-Camarena JC, Rodriguez-Garcia A. IntechOpen. United Kingdom: 2021. Contact lens-associated infectious keratitis: Update on diagnosis and therapy; pp. 3-32. [Google Scholar]
9. Contact lens-related microbial keratitis: how have epidemiology and genetics helped us with pathogenesis and prophylaxis. Stapleton F, Carnt N. Eye (Lond) 2012;26:185-193. [PMC free article] [PubMed] [Google Scholar]
10. Recurrent bacterial keratitis. Kaye R, Kaye A, Sueke H, Neal T, Winstanley C, Horsburgh M, Kaye S. Invest Ophthalmol Vis Sci. 2013;54:4136-4139. [PubMed] [Google Scholar]
11. Characteristics of and risk factors for contact lens-related microbial keratitis in a tertiary referral hospital. Edwards K, Keay L, Naduvilath T, Snibson G, Taylor H, Stapleton F. Eye (Lond) 2009;23:153-160. [PubMed] [Google Scholar]
12. Personal hygiene risk factors for contact lens-related microbial keratitis. Stellwagen A, MacGregor C, Kung R, Konstantopoulos A, Hossain P. BMJ Open Ophthalmol. 2020;5:0. [PMC free article] [PubMed] [Google Scholar]
13. Nonulcerative complications of contact lens wear. Relative risks for different lens types. Stapleton F, Dart J, Minassian D. Arch Ophthalmol. 1992;110:1601-1606. [PubMed] [Google Scholar]
14. Have silicone hydrogel lenses eliminated hypoxia? Sweeney DF. Eye Contact Lens. 2013;39:53-60. [PubMed] [Google Scholar]
15. Age and other risk factors for corneal infiltrative and inflammatory events in young soft contact lens wearers from the Contact Lens Assessment in Youth (CLAY) study. Chalmers RL, Wagner H, Mitchell GL, et al. Invest Ophthalmol Vis Sci. 2011;52:6690-6696. [PubMed] [Google Scholar]