



Comparative Analysis of Ocular Surface Disease in Patients Using Different Types of Contact Lenses: A Retrospective Cohort Study

Shalini Sinha¹, Anita Abastha², Gyan Bhaskar³

¹Senior Resident, Department of Ophthalmology, IGIMS, Patna

²Additional Professor, Department of Ophthalmology, IGIMS, Patna

³Professor, Department of Ophthalmology, IGIMS, Patna

Corresponding Author- Gyan Bhaskar

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ABSTRACT:

The present study experimentally investigated the analysis of ocular surface disease in patients using different types of lenses. The study has made several observations based on the sources available the chapters discuss the ocular surface disease and the prevalence of this disease in patients using different kinds of contact lenses. The study also explains several reasons for the occurrence of ocular surface disease. The impacts of contact lenses on the ocular surface. The study evaluated different kinds of contact lenses that are recently being used by people. Their effectiveness and therapeutic uses of these lenses. Further, the study made some conclusions based on the investigations. The chapter also provides knowledge about the types of lenses that are commonly used by people and their properties. The disadvantages and advantages of the lens are discussed their features and their uses. A piece of brief information about the compilation that patients undergo after the prolonged use of these lenses. The study also discussed the findings and graph of patients suffering from the ocular surface disease.

1. Introduction

1.1 Background of the study

The occurrence of “ocular surface disease (OSD)” is defined as the variety of factors that are affecting the ocular surface interaction with the external environment destructive changes in the ocular surface of the eye result in different types of symptoms which are mild to severe. These symptoms involve “visual disturbances, tear film instability, and a progressive nature”. The common cause of OSD is an increase in the osmotic property of the tear film and increased enhanced production of inflammatory mediators. The management of cornea disease is done by using the scleral lenses which are considered rigid gas-permeable lenses [1]. Dry eye is also an integral part of OSD it is a group of eye conditions. The primary causes of OSD are lack of adequate lubrication and moisture on the eye surface. This is not just due to inadequate humidity but also due to inflammation and damage to an area near the eye and sclera. The subtypes of contact lens of which can be therapeutic contact lenses, hydrogel, “rigid gas-permeable, and non-gas permeable” contact lenses. Therapeutic contact lenses are used in the treatment of ocular surface disease.

These play a vital role in relieving pain and improving “corneal healing, corneal sealing, corneal protection and drug delivery”. This is considered that there is a typical relation between OSD and antiglycan therapy. This condition is more common in patients who are going through a group of medications. There are different factors which impact OSD that as prolonged use of eye drops in old patients [2]. The utilization of lenses for the meditational purpose is not indicated in some conditions which are infective keratitis, corneal anaesthesia and important exposure to keratopathy with inadequate eyelid position or movement. The medically used lens is considered one of the most effective treatments for OSD however contraindications and complications should be considered. The subtypes of medically used contact lenses are soft lenses and scleral lenses. These lenses are considered to be therapeutic as they offer a barrier between the external environment and the cornea of the eye.

1.2 Problem Statement

There are several complications in delivering the drugs that are faced by ophthalmologists. The ophthalmic delivery of the drug has many limitations that should be considered anatomical and physiological barriers which



involve tear drainage epithelial transport limitations. Soft contact lenses are commonly used in treating a variety of eye symptoms and barriers. These barriers are excluded by “penetration of xenobiotics” which does not allow the active absorption of therapeutic agents. There is a necessity to tackle the ocular barriers that are achieved by gaining or designing an ideal delivery regimen that should include increased bioavailability and a controlled administration of the drug at the target site. The medicines that are used to treat various eye conditions are mainly in the form of eye drops or ointments which are now considered the traditional methods and have a low bioavailability. There is a need to analyze the OSD in patients using different types of contact lenses as they are widely used techniques in treating corneal and ocular surface disease.

The soft gel lenses are considered as safe to an extent which means the soft gel lens does not affect the tear film and cornea until the individual wearing the lens uses them for a longer span of [3]. There is a need to understand the correctness and efficacy of the division of contact lenses used in ocular surface disease which prevents the endangering of the patient and prevents the affection of quality of life of the patient. There is a need to understand the correct usage of lenses as enormous ophthalmic diseases are the primary cause of visual impairment causing a disability in the patient. The lack of understanding of this study could prevent several visual impairments reported globally. Contact lens (CL) wearing them is a common etiologic factor which is responsible for forming OSD. These contact lenses are further responsible for causing inflammation. The reason behind the inflammation is incompatibility between the CL and the ocular surface [4]. There is a need to understand through the perspective of elderly patients who use the traditional methods of eye disease treatment such as eye drops which they are unable to install correctly. There is a necessity to develop innovative drug formulations which have a high bioavailability.

1.3 Research Aim and Objectives

The research aims to compare and analyze the OSD in patients using different types of “contact lenses”. The objectives are given below:

- To analyze the occurrence of OSD in patients

- To evaluate the use of different types of contact lenses
- To compare and analyze the OSD prevalence in patients using a variety of CL
- To assess drug delivery through different types of contact lenses
- To analyze the utilization of CL for the medication in patients with OSD
- To assess different types of lenses in optimal visual correction

1.4 Research Hypothesis

Hypothesis 1: Patients with OSD using several forms of CL can have a negative impact

Hypothesis 2: Factors that can determine the efficacy of disease in patients using in patients highlighting ocular surface disease.

2. Literature Review

2.1 Overview of Different Types of Contact Lenses (CL)

There variety of CL “soft contact lenses, rigid gas-permeable contact lenses, extended-wear contact lenses, and Disposable contact lenses these are replaceable”. These lenses provide a variety of benefits however the continuous use of the lenses may result in a variety of eye-related diseases one of them being dry eye disease and OSD which commonly causes eye discomfort and pain affecting the patient’s condition.

Conventional contact lenses are used to correct vision in the same manner as eyeglasses do. Wearing CL is a common prevalent factor for “dry eye conditions”. The occurrence of dry eye or OSD restricts the wearing of lenses. The various workshops conducted by the Ocular Surface Society address the issue of wearing contact lenses associated with discomfort in the eye causing the tear of the film [5]. The contact lens discomfort is associated with dry eye condition. The application of the contact lens on the ocular surface divides the tear film into two parts. These are pre- and post-tear films. The mechanism of this is addressed by the occurrence of contact rubbing of the lens and ocular surface which plays a role of the foreign body causing OSD associated with dry eye.

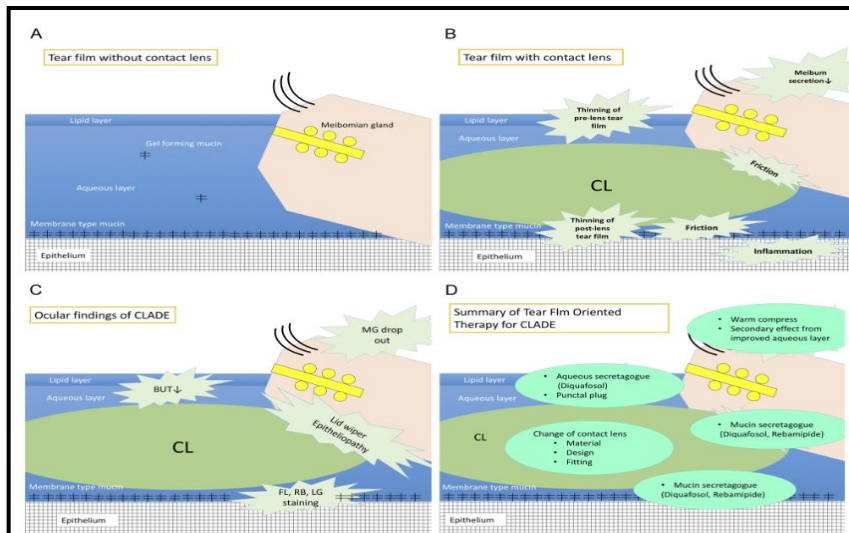


Figure 2.1: Changes In Tear Film After Inserting Contact Lens

(Source: Vidal-Rohr *et al.* 2018)

The term “contact lens discomfort (CLD)” gained importance after the high reports of the OSD. The term is defined as episodic and persistent ocular sensations that are commonly using lens. This condition can be in association with either with or without visual impairment. The most common cause of contact lens discomfort is because of the inefficient interaction of the lens and the ocular environment. This further leads to a decrease in the time wearing of the lens and discontinuation of the CL wear.

2.2 Impact of Different Types of Contact Lenses in Causing OSD

The use of conventional lenses which a used to correct the refractive errors causes OSD after the prolonged use of it. This is addressed by improving the wettability of the lens. The enhanced wettability property in the lens must be associated with increasing coating and surface moisturizing agents. Different types of lenses provide therapeutic effects and also the effect on the ocular surface causing discomfort of the eye of the patient using them. These lenses bring various changes in the ocular surface that result in eye discomfort and also affect vision in threatening cases of OSD [5].

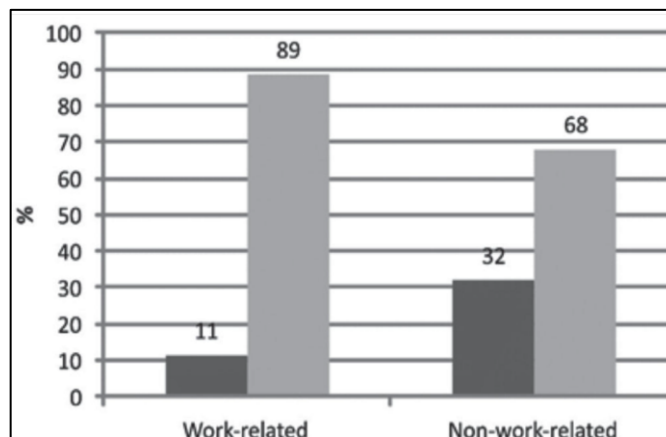


Figure 2.2: Distribution of the disease according to gender and working approach

(Source: Milanez *et al.* 2017)



The graph shows that almost 89% of male patients with working ability have been mostly affected by Ocular surface disease, whereas 11% of females suffer from this disease considering their work approach [6]. The conventional use of lenses is to correct myopia however results in eye discomfort due to prolonged use. There are several impacts of contact lenses such as inefficient blinking of the eye, and ptosis. The contact lenses offer the advantage of correcting the refractive however affecting the physiology of the eye. Blinking of the eye is a common ocular surface physiological mechanism.

This involves the usage of both the upper eyelid and lower eyelid however prolonged wearing of contact lenses affects this function by not providing good optics. Hyperemia is another impact of using common CL that is poor in quality. This occurs due to factors causing some of the other irritation and inflammation of the eye. The dilation of conjunctival blood vessels leads to changes in the sclera color that is it converts white to red color. This colour change is visible along with irritative or inflammatory agents. The contact lens creates an impact on the axial length of the eye.

2.3 Clinical Complications of Using the Different Types of Contact Lens

There could be clear signs of “corneal hypoxia, involving epithelial microcysts, stromal neovascularization, and endothelium polymathic”. The ocular surface inflammation is in direct relation with severe inflammation. Although the conventional lens provides a significant effect in correcting vision however this effect is temporary. There are a variety of complications that are directly linked to the usage of contact lenses. These complications mainly arise due to the incompatible interaction of the CL and tear film, “ocular surface, endogenous and environmental microorganism” [7]. The prolonged use of these lenses causes hypersensitivity disorders. The common signs are papillary conjunctivitis and microbial keratitis”.

The inappropriate use of contact lenses results in allergic eye disease and blepharitis. These signs are considered as severe symptoms which commonly affect the diagnosis process and management of the condition. These signs are further divided into “corneal infection, corneal inflammation, and metabolic conditions”. This is observed that soft gel lenses provide a good level of comfort as compared to hard materials. Corneal inflammation arises as a severe sign and could also lead

to visual loss. The metabolic complications arise due to metabolic stress between the CL and tear film of the eye and due to lack of oxygen trans permeability between the two structures [8]. The CL directly interacts with external environmental conditions and also with the cornea of the eye. The imbalance in the homeostasis of this interaction results in dry eye and meibomian dysfunction.

3. Methods

The research design is considered as a development of the strategy or a framework that will be used to research so that analysis becomes simplified. The research design that has been used is *Cross-sectional and conducted at IGIMS Patna between march 2018 to February 2019*. The methods that have been incorporated to conduct the study are *Secondary Qualitative Analysis*. The sources of data have been journal articles and peer-reviewed articles which are published between 2017 and 2018. This data analysis method is used as the sources obtained from this method are easy to gather.

This is time efficient method of data collection and gives accurate information. The information gathered from this source is of high quality as it also includes government reports [9]. The research philosophy is defined as the belief in providing information about the mechanism of gathering data. The research philosophy that has been used is the *Interpretivism philosophy* which is based on the assumption that could be made for the study these assumptions are made based on analysis and events that have been practically conducted [10]. The *Inductive Research Approach* has been used in this study. A research approach indicates the procedure that will be used by the researcher to gather, analyze, and interpret the data [11]. The data analysis method that has been used is *Thematic data analysis*. This data analysis method gives accurate outcomes from the research.

4. Data Analysis and Discussion

4.1 Comparative Analysis of “Ocular Surface Disease” in Patients Using Different Types of Contact Lenses

The OSD is linked with dry eye disease which is a chronic condition that affects most of the population this results in various abnormalities for instance the abnormal quantity of tears and poor or unstable quality of the “tear film”. The inflammation in the ocular surface is associated with irritative symptoms. There is an unclear relation between ocular surface inflammation with ocular surface



microbiome. This is due to less flow of “microflora diversity” with the OSD.

The occurrence of OSD also depends on the gender of the patient and also on the exposure of the eye to environmental conditions [12]. However, it is important to evaluate the “ocular surface assessment”. The OS is clearly in the exposure of air or dust particles therefore there is a high rate of contamination with microbes. The homeostatic imbalance that occurs due to contact lenses leads to ocular surface damage [13]. The prolonged use and irresponsible use of lenses lead to disruption in the microbiota of the normal eye. The use of probiotics and prebiotics helps in treating the symptoms of OSD by modulating eye inflammation and eye homeostasis.

4.2 Evaluating the Effects of Using Different Types of Contact Lenses on Ocular Surface

Contact lens discomfort (CLD) is common in individuals who are not habitual to contact lenses. This is a considerable cause of eye-related disease and the use of them is decreasing. Soft lenses are one of the most commonly used types of lenses. However, these lenses result in different effects which are alterations in the cornea. The reason behind these corneal alterations is that the soft lenses cover the whole diameter of the cornea. Although these contact lenses are effectively used by patients to correct refractive errors.

The adequate maintenance of these lenses leads to a reduction in complications. The contact lenses are of different types which have hard and soft materials. However, contact lenses act as foreign bodies for the eye. The prolonged application of hard or soft material contact lenses is considered to destroy the biophysical properties of tear film [14]. The multifocal lens has a large diameter which is considered a disrupting factor for the ocular surface. These lenses have a negative impact on the eye. These effects of the multifocal lens are conjunctival redness and a reduction in the blink frequency there is a significant decline in non-invasive tear breakup time [15]. There is a significant effect after the application of a multifocal lens which is a decline in the lipid layer thickness of the eye. The removal of the lens provides a scope for improvement in the lipid layer thickness.

4.3 Discussion

The analysis of OSD in patients who use different contact lenses results in a variety of signs and symptoms. These symptoms are due to the reason that contact lenses are

considered the foreign body of the eye which directly stays in contact with the ocular surface eye and more commonly the tear film and cornea. The insufficiency or lack of oxygen reaches the tear film results in harming the eye in different manners [16]. The continuous exposure of the ocular surface to the external environment leads to the dispersion of various properties of the eye as in this case, the eye will fail to recognize between transient microorganisms and the core microbiome. This is an important factor to be considered as it further may cause visual impairments.

5. Conclusion

The conclusion is drawn from the analysis of OSD in patients who use different types of contact lenses. The study reveals inadequate and irresponsible use of contact lenses could result in ocular surface disease. The prolonged and continuous use of these lenses results in damage to tear film and cornea. Although these lenses are commonly used to provide therapeutic effects also such as the correction of refractive index. However, these are also considered convenient techniques for drug delivery in the eye as the therapeutic lenses are capable of replacing the traditional methods of eye drug delivery such as eye drops or ointments.

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