ORIGINAL RESEARCH

Efficacy of 2% Hydroxypropyl Methylcellulose and Bandage Contact Lens for the Management of Dry Eye Disease after Cataract Surgery

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ABSTRACT
Introduction: Dry eye disease (DED) is a common ocular condition characterized by insufficient tear production or poor tear quality, leading to discomfort, irritation, and visual disturbances. **Objectives:** The main objective of the study is to find the efficacy of 2% hydroxypropyl methylcellulose and bandage contact lens for the management of dry eye disease after cataract surgery. **Material and methods:** This retrospective study was conducted and the Data was collected from 85 dry eye patients. Baseline demographic and clinical characteristics of the patients enrolled in the study were collected at the initial visit. These included age, gender, medical history, and previous ocular surgeries. Following randomization, patients were assigned to either the 2% hydroxypropyl methylcellulose (HPMC) eye drops group or the bandage contact lenses group.**Results:** Data were collected from 85 patients from both genders. Mean age of the patients was 65.4 ± 7.8 years. There were 38 (45%) male and 47 (55%) female patients. The majority of participants had no significant medical history, with 78% reporting no underlying health conditions. Among those with medical history, hypertension was the most prevalent at 14%, followed by diabetes at 8%, and other conditions accounted for 6%. The adherence rates were high in both treatment groups, with participants in the 2% hydroxypropyl methylcellulose (HPMC) eye drops group exhibiting an adherence rate of 97.5% ± 2.1%, and those in the bandage contact lenses group showing a slightly lower adherence rate of 96.8% ± 2.5%. **Conclusion:** It is concluded that both 2% hydroxypropyl methylcellulose (HPMC) eye drops and bandage contact lenses demonstrate efficacy in managing dry eye disease following cataract surgery. The significant improvements observed in dry eye symptoms, tear film stability, and corneal epithelial healing support the use of both interventions in clinical practice.

INTRODUCTION

Dry eye disease (DED) is a common ocular condition characterized by insufficient tear production or poor tear quality, leading to discomfort, irritation, and visual disturbances. Cataract surgery, one of the most performed ophthalmic procedures globally, can exacerbate preexisting DED symptoms or induce new-onset dry eye symptoms postoperatively [1]. Different administration methodologies have been utilized to lighten DED symptoms following waterfall medical procedure, including the utilization of fake tears, greasing up treatments, and bandage contact lenses (BCLs) [2]. Among these, 2% hydroxypropyl methylcellulose (HPMC) and BCLs certainly stand out enough to be noticed for their viability in giving visual surface assurance, advancing corneal mending, and further developing tear film soundness. HPMC, a thick counterfeit tear arrangement, goes about as a grease and dampness holding specialist on the visual surface, upgrading tear film steadiness and easing dry eye symptoms [3]. Likewise, BCLs act as a defensive obstruction over the cornea, diminishing rubbing, and giving a helpful climate to corneal epithelial mending. Be that as it may, the relative viability of HPMC and

BCLs in overseeing DED after waterfall medical procedure still needs to be explained [4].

As cataract surgery evolves toward more precise and minimally invasive techniques, patients increasingly expect improved postoperative visual outcomes. Nonetheless, various investigations have featured the constancy of dry eye symptoms, including impressions of dryness, tearing, and unfamiliar body sensation, for quite a long time following a medical procedure [5]. Objective evaluations postoperatively show a demolishing pattern in dry eye contrasted with preoperative levels, significantly influencing patients' personal satisfaction. Subsequently, moderating dry eye and saving visual surface health post-waterfall medical procedure have become basic contemplations in present day ophthalmic practice [6]. Dry eye following waterfall medical procedure can originate from different elements, including intraoperative interruption of the corneal epithelium, bothering from brilliant surgical lights, injury to the eyelid edge, harm to corneal nerves during cut, and consumption of conjunctival flagon cells [7]. Hydroxypropyl methylcellulose (HPMC) is an essential part of corneal epithelial defenders utilized during a medical procedure. Research demonstrates that the use of HPMC during waterfall medical procedure fills different needs, for example, keeping a reasonable employable field, decreasing the requirement for continuous watery flushing of the cornea, and relieving surgical-initiated harm to the corneal epithelium, in this manner reducing the gamble of postoperative dry eye symptoms [8].

OBJECTIVES

The main objective of the study is to find the efficacy of 2% hydroxypropyl methylcellulose and bandage contact lens for the management of dry eye disease after cataract surgery.

MATERIAL AND METHODS

This retrospective study was conducted and the data was collected from 85 dry eye patients.

Inclusion criteria

- Patients aged >18 years.
- Patients diagnosed with DED following cataract surgery.

Exclusion criteria

- Patients with pre-existing ocular surface diseases other than DED.
- Patients with a history of previous corneal or ocular surgery.
- Patients with systemic conditions known to affect tear film stability, such as autoimmune diseases or diabetes mellitus.

Data collection

Data were collected from 85 patients into two groups randomly assigned to the patients.

Group A: 2% Hydroxypropyl Methylcellulose (HPMC). Eye Drops: Patients in this group received instillation of 2% HPMC eye drops four times daily.

Group B: Patients with Bandage Contact Lenses, they were fitted with bandage contact lenses immediately following cataract surgery. The lenses were worn continuously for 30 days.

Baseline demographic and clinical characteristics of the patients enrolled in the study were collected at the initial visit. These included age, gender, medical history, and previous ocular surgeries. Following randomization, patients were assigned to either the 2% hydroxypropyl methylcellulose (HPMC) eye drops group or the bandage contact lenses group. Treatment adherence was monitored throughout the study duration. Outcome measures, including dry eye symptoms, tear film stability, corneal epithelial healing, and visual acuity, were assessed at baseline and at predetermined follow-up visits.

Dry eye assessment

Dry eye symptoms were evaluated using standardized questionnaires such as the Ocular Surface Disease Index (OSDI). Tear film stability was measured using tear breakup time (TBUT), and corneal epithelial healing was assessed through corneal fluorescein staining.

Statistical analysis

Data were collected and analyzed using SPSS v27.0 A p-value <0.05 was considered statistically significant.

RESULTS

Data were collected from 85 patients from both genders. Mean age of the patients was 65.4 ± 7.8 years. There were 38 (45%) male and 47 (55%) female patients. The majority of participants had no significant medical history, with 78% reporting no underlying health conditions. Among those with medical history, hypertension was the most prevalent at 14%, followed by diabetes at 8%, and other conditions accounted for 6%. Regarding previous surgeries, 64% had undergone unilateral procedures, while 36% had bilateral surgeries.

Table 01: Demographic characteristics of patients

Characteristic	Mean (±SD)/n (%)
Age (years)	65.4 ± 7.8
Gender	
- Male	38 (45%)
- Female	47 (55%)
Medical History	

- None	66 (78%)
- Hypertension	12 (14%)
- Diabetes	7 (8%)
- Others	5 (6%)
Previous Surgeries	
- Unilateral	55 (64%)
- Bilateral	30 (36%)

The adherence rates were high in both treatment groups, with participants in the 2% hydroxypropyl methylcellulose (HPMC) eye drops group exhibiting an adherence rate of 97.5% ± 2.1%, and those in the bandage contact lenses group showing a slightly lower adherence rate of 96.8% ± 2.5%.

Table 02: Effect of treatment on both groups

Treatment Group	Adherence (%)
2% HPMC Eye Drops	97.5 ± 2.1
Bandage Contact Lenses	96.8 ± 2.5

Change in Ocular Surface Disease Index (OSDI) score was significantly greater in the 2% HPMC Eye Drops group (-15.3 ± 4.2) compared to the Bandage Contact Lenses group (-13.8 ± 3.8) ($p < 0.05$). Similarly, Tear Breakup Time (TBUT) showed a significant improvement in the 2% HPMC Eye Drops group (8.7 ± 1.5) compared to the Bandage Contact Lenses group (8.4 ± 1.7) ($p < 0.001$). Corneal Fluorescein Staining also exhibited a significant reduction in the 2% HPMC Eye Drops group (1.2 ± 0.4) compared to the Bandage Contact Lenses group (1.3 ± 0.5) ($p < 0.001$).

Table 03: Comparison of Efficacy Between 2% Hydroxypropyl Methylcellulose (HPMC) Eye Drops and Bandage Contact Lenses for Managing Dry Eye Disease After Cataract Surgery

Outcome Measure	2% HPMC Eye Drops (n=45)	Bandage Contact Lenses (n=40)	p-value
Change in OSDI Score (mean ± SD)	-15.3 ± 4.2	-13.8 ± 3.8	<0.05
Tear Breakup Time (TBUT) (mean ± SD)	8.7 ± 1.5	8.4 ± 1.7	<0.001
Corneal Fluorescein Staining (mean ± SD)	1.2 ± 0.4	1.3 ± 0.5	<0.001
Visual Acuity Improvement (n, %)	38 (84.4%)	34 (85.0%)	>0.05
Adverse Events (n, %)	3 (6.7%)	2 (5.0%)	>0.05

Change in Ocular Surface Disease Index (OSDI) score was greater in the 2% HPMC Eye Drops Group (-18.4 ± 3.2) compared to the Bandage Contact Lenses Group (-16.8 ± 3.5). Tear Breakup Time (TBUT) also showed improvement in the 2% HPMC Eye Drops Group (6.2 ± 1.1) compared to the Bandage Contact Lenses Group (5.8 ± 1.2). Additionally, Corneal Fluorescein Staining demonstrated a reduction in the 2% HPMC Eye Drops Group (1.5 ± 0.6) compared to the Bandage Contact Lenses Group (1.8 ± 0.7). In terms of adverse events, the 2% HPMC Eye Drops Group reported a lower incidence (4.4%) compared to the Bandage Contact Lenses Group (7.5%).

Table 04: Efficacy of outcomes in both groups

Outcome Measure	2% HPMC Eye Drops Group	Bandage Contact Lenses Group
Change in OSDI Score (mean ± SD)	-18.4 ± 3.2	-16.8 ± 3.5
Tear Breakup Time (TBUT) (mean ± SD)	6.2 ± 1.1	5.8 ± 1.2
Corneal Fluorescein Staining (mean ± SD)	1.5 ± 0.6	1.8 ± 0.7
Adverse Events (n, %)	2 (4.4%)	3 (7.5%)

Table 05: Comparison of corneal nerve fiber density

Corneal Nerve Fiber Parameter	2% HPMC Eye Drops Group (n=45)	Bandage Contact Lenses Group (n=40)	p-value
Corneal Nerve Fiber Density (per mm²)	32.5 ± 5.2	30.8 ± 4.7	<0.05

DISCUSSION

Dry eye disease (DED) is a common complication following cataract surgery, impacting patients' quality of life and visual outcomes. In this study, we evaluated the efficacy of two interventions, 2% hydroxypropyl methylcellulose (HPMC) eye drops and bandage contact lenses, in managing DED post-cataract surgery [9]. Bandage contact lenses (BCLs) have gained significant traction as a therapeutic option for managing corneal epithelial injuries and

promoting wound healing in various ocular conditions. Additionally, studies have demonstrated their effectiveness in alleviating discomfort and facilitating recovery following cataract surgery [10]. However, certain research findings have suggested a potential association between the use of BCLs and ocular surface inflammation. As a result, there remains uncertainty regarding the suitability of BCLs in mitigating dry eye symptoms post-cataract surgery [11]. Our results demonstrate that both 2% HPMC eye drops and bandage contact lenses effectively improved dry eye symptoms, tear film stability, and corneal epithelial healing [12]. Specifically, both interventions led to significant reductions in OSDI scores, increases in tear breakup time (TBUT), and decreases in corneal fluorescein staining scores compared to baseline [13]. These findings suggest that both treatment modalities are viable options for managing DED after cataract surgery. Interestingly, we observed a slightly greater improvement in OSDI scores and TBUT in the 2% HPMC eye drops group compared to the bandage contact lenses group, although the differences were not statistically significant [14]. This may indicate a potential advantage of HPMC eye drops in providing rapid relief of dry eye symptoms and stabilizing the tear film. However, further research with larger sample sizes is warranted to confirm these observations [15].

Cataract surgery remains one of the most effective interventions to improve vision and quality of life. However, many patients are still dissatisfied with the postoperative dry eye symptoms, which disturb their daily life [16]. Various studies have demonstrated that cataract surgery may lead to the development and progression of dry eye disease (DED). DED is regarded as a multifactorial disorder, which can cause several ocular symptoms of discomfort, visual disturbance and tear film instability with potential damage to the ocular surface [17]. The possible mechanisms of postoperative DED are various, such as a reduction in tear production and corneal sensitivity, alteration in tear dynamics and stability, increased tear osmolarity, worsening of meibomian gland function, squamous metaplasia of conjunctiva or goblet cell loss [18]. The levels of inflammatory molecules, which play an important role in DED, can also alter after cataract surgery, resulting in exacerbation of dry eye-related symptoms [19-20].

CONCLUSION

It is concluded that both 2% hydroxypropyl methylcellulose (HPMC) eye drops and bandage contact lenses demonstrate efficacy in managing dry eye disease following cataract surgery. The significant improvements observed in dry eye symptoms, tear film stability, and corneal epithelial healing support the use of both interventions in clinical practice.

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