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Comparison of Samfilcon A and Balafilcon A Bandage Contact Lenses in Reducing Postoperative Symptoms After Pterygium Surgery

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Objective: To compare differences in postoperative pain, foreign body sensation, photophobia, and lacrimation between balafilcon A and samfilcon A bandage contact lenses (BCLs) in the early stage following pterygium surgery.

Methods: A total of 66 eyes with pterygium conjunctival grafts fixed with sutures were included in this study, comprising 32 eyes fixed with samfilcon A and 34 eyes fixed with balafilcon A. Demographic data, postoperative corneal epithelialization time, and subjective discomfort, such as pain (using the visual analog scale [VAS]), were recorded and compared.

Results: Significant differences were noted in VAS scores between the first day ($P<0.01$) and the second day post-surgery ($P=0.03$), suggesting that patients experienced less pain after wearing samfilcon A. However, no significant differences were observed in corneal epithelialization time, VAS score before lens removal, foreign body sensation, photophobia, lacrimation, insomnia, and demographic data between the two groups. Finally, only two balafilcon A patients required nonsteroidal analgesics.

Conclusion: After pterygium surgery, samfilcon A BCL was associated with lower pain levels compared with balafilcon A BCL and could assist in reducing postoperative discomfort in patients and concurrently improving patient satisfaction.

Keywords: bandage contact lenses, pterygium, pain, visual analog scale, samfilcon A, balafilcon A

Pterygium is a prevalent degenerative condition of the conjunctiva that can result in decreased visual acuity due to astigmatism, induced by corneal involvement[1] and direct invasion of the visual axis.[2] At present, the gold-standard treatment for pterygium involves the excision of the pterygium followed by autologous conjunctival transplantation.[2–4] However, postoperative patients frequently express significant discomfort and foreign body sensation, likely attributable to factors such as the size of the pterygium, depth of invasion, surgical technique, and suture placement.[5] For instance, the use of Tenon-free autografts, which involves removing Tenon tissue, can accelerate epithelialization and concomitantly reduce discomfort.[6] On the other hand, while mitomycin C, 5 fluorouracil, cyclosporine, and β-ray irradiation have extensively been used as adjuvant treatments to minimize the risk of pterygium recurrence,[7–10] they typically elicit side effects, such as aggravation of pain.

In order to minimize postoperative pain, analgesics such as nonsteroidal anti-inflammatory drugs and pressure bandaging have been applied to accelerate corneal epithelialization and alleviate pain.[11] In 2007, Arenas et al introduced bandage contact lenses (BCLs) following pterygium surgery,[12] to reduce pain and protect surgical wounds. BCL has also been widely used in photorefractive keratectomy (PRK) surgeries.[13] At present, the primary component of marketed BCL is hydrophilic silicon hydrogel, with various product types available after years of research. Earlier studies have concluded that patients who wear samfilcon A experienced less pain compared to senofilcon A and lotrafilcon A after PRK.[14–16] Conversely, other studies have shown that pain, epiphora, and foreign body sensation were more pronounced with balafilcon A than with samfilcon A.[17,18] However, studies comparing the analgesic and protective effects of balafilcon A and samfilcon A after pterygium surgery are scarce.

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Thus, this study aimed to compare the effects of samfilcon A and balafilcon A BCLs on postoperative symptoms after pterygium surgery.

Methods

In this retrospective cohort study, the demographic data, postoperative observations, and follow-up information of patients diagnosed with primary pterygium between March 2023 and June 2023 were collected. This study was approved by the Independent Ethics Committee of the Union Hospital, Tongji Medical College, Huazhong University of Science and Technology (UHCT230149). Informed patient consent was waived by the ethics committee in view of the retrospective nature of the study and the anonymity of the study data. This study was performed in accordance with the guidelines outlined in the Declaration of Helsinki.

Study Design

A total of 66 eyes were included in this study, with 32 eyes fixed with samfilcon A (ULTRA, Bausch + Lomb, USA) and 34 eyes fixed with balafilcon A (PUREVISION 2, Bausch + Lomb, USA). The inclusion criteria were as follows: 1. Diagnosis of primary pterygium; 2. No other ocular surface diseases; 3. No history of ocular surgery; and 4. Patients aged at least 18 years and without severe medical conditions.

Surgical Technique

All surgical interventions were performed by the same ophthalmologist in the Department of Ophthalmology, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology.

Local anesthesia was administered via subconjunctival injection of 2% lidocaine. Briefly, the pterygium tissue was separated and excised. Next, the conjunctiva from the 12 o'clock position of the autologous corneal limbus was harvested and sutured with nylon sutures to the exposed sclera. Lastly, BCL was applied, and the eye was covered with gauze.

Bandage Contact Lenses

Both BCLs used in the present study are hydrophilic silicon hydrogel products. Samfilcon A has higher water content and oxygen permeability coefficient, whereas balafilcon A allows for a wider dioptric range. There were no significant differences in diameter, base curve, and center thickness between the two groups (Table 1).

Statistical Analysis

Data on age, gender, follow-up period, postoperative corneal epithelialization time, pain (the first day after surgery, the second day after surgery, and before lens removal), and other subjective feelings were collected, included foreign body sensation, photophobia, lacrimation, pain relief needs, and insomnia. A visual analog scale (VAS) was employed for pain assessment.

IBM SPSS Statistics 27 software and Microsoft Excel 2021 software were utilized for statistical analysis. The *t*-test was used for statistical analysis of corneal epithelialization time, VAS scores, and age, and P value less than 0.05 was considered statistically significant. Foreign body sensation, photophobia, lacrimation, pain relief needs, and insomnia were compared using the chi-square test, with P values less than 0.05 indicating significant differences.

Table 1 Specifications of Two Bandage Contact Lenses

	Water Content	Oxygen Permeability	Diameter	Base Curve	Center Thickness	Refractive Index	Dioptric Range
Samfilcon A	46±2%	85.5×10^{-11}	14.2±0.20 mm	8.5±0.20 mm	0.070 mm	1.411±0.005	0~-12.0D
Balafilcon A	36±2%	68.3×10^{-11}	14.0±0.20 mm	8.6±0.20 mm	0.070 mm (0~-12.0D) 0.175 mm (+5.25~+6.0D)	1.426±0.005	+6.0~-12.0D

Results

Demographics

All 66 patients had unilateral involvement (Table 2). The average follow-up duration for the samfilcon A group and balafilcon A group was 6.59±1.79 and 6.12±1.80 days, respectively. The average age of patients in the samfilcon A group was 57.66±6.74 years, including 11 right eyes and 21 left eyes, and 10 males and 22 females. In contrast, patients in the balafilcon A group had a mean age of 60.03±5.65 years, including 19 right eyes and 15 left eyes, 17 males and 17 females. Data on pterygium size were missing. The average depth for the samfilcon A group (n=17) and the balafilcon A group (n=15) was 3.43±0.55mm and 3.41±0.64mm, respectively. There were no significant differences in follow-up duration, age, eye side, gender and depth of corneal invasion.

Postoperative Outcomes

The results revealed that compared with patients in the balafilcon A group, the VAS scores of those in the samfilcon A group after pterygium surgery were lower on the first day after surgery, the second day after surgery, and prior to lens removal (Table 3). An independent sample *t*-test revealed significant differences in mean VAS scores between the first day after surgery and the second day after surgery ($P<0.01$), as well as before lens removal ($P<0.05$). Only two patients in the balafilcon A group and no patients in the samfilcon A group required nonsteroidal anti-inflammatory analgesics.

Patients were followed up daily and underwent slit-lamp examination from the first postoperative day. During the assessment, the BCL was shifted to the temporal side to expose the pterygium excision wound. A positive fluorescein sodium staining results indicated incomplete epithelialization, whereas a negative result reflected successful epithelialization. BCLs were removed after the observation of completed epithelialization. Patients were followed up daily and underwent slit-lamp examination from the first postoperative day. During the assessment, the BCL was shifted to the temporal side to expose the pterygium excision wound. A positive fluorescein sodium staining results indicated incomplete epithelialization, whereas a negative result reflected successful epithelialization. BCLs were removed after the observation of completed epithelialization. Notably, while the mean time to epithelization was marginally shorter in the samfilcon A (4.16±0.92 days) group compared to the balafilcon A (4.21±0.64 days) group, the difference was not

Table 2 Demographics Characteristics

	Samfilcon A (n=32)	Balafilcon A (n=34)	P value
Age (year)	57.66±6.74	60.03±5.65	0.19
Gender (male:female)	10:22	17:17	0.12
Eyes (right:left)	11:21	19:15	0.08
Follow-up (Days)	6.59±1.79	6.12±1.80	0.28
Pterygium Size (mm)	3.43±0.55 (n=17)	3.42±0.64 (n=15)	0.94

Table 3 Postoperative Outcomes

	Samfilcon A (n=32)	Balafilcon A (n=34)	P value
Visual analog scale			
First day after surgery	1.41±0.71	2.65±0.98	<0.01
Second day after surgery	0.28±0.46	0.65±0.85	0.03
Prior to removal	0	0.09±0.51	0.34
Corneal epithelialization days	4.16±0.92	4.21±0.64	0.80
Photophobia	16 (50.0%)	21 (61.8%)	0.34
Lacrimation	20 (62.5%)	23 (67.7%)	0.66
Foreign body sensation	21 (65.6%)	28 (82.4%)	0.12
Insomnia	3 (9.4%)	4 (11.8%)	0.75

statistically significant (P=0.799). Thus, these results collectively indicated that corneal epithelialization time was comparable between the samfilcon A and balafilcon A groups. In all patients, the bandages were removed when epithelialization was observed. Among the subjective postoperative symptoms of patients, while a lower proportion of patients in the samfilcon A group reported significant photophobia, lacrimation, foreign body sensation, and insomnia, the differences were not statistically significant.

Discussion

The objective of this study was to compare the efficacy of samfilcon A and balafilcon A BCLs in the management of pain and other discomforts after pterygium surgery. On the one hand, the results uncovered that VAS scores were lower in the samfilcon A group compared to the balafilcon A group on the first and second postoperative days. On the other hand, no significant differences were identified in other subjective indicators and objective corneal epithelization time between the two groups. While the preoperative depth of pterygium corneal invasion was similar between the two groups, the reliability of these findings was limited due to the incomplete sample data.

In previous studies, BCL has been applied as an adjuvant therapy after pterygium surgery to relieve pain and protect conjunctival incisions and grafts.[2] In a study involving 20 patients wearing BCL after pterygium surgery and 19 controls, Chen et al reported that the use of BCL significantly reduced pain and promoted epithelial healing.[19] According to a prospective study, patients who wore BCL experienced high pain levels and decreased sleep quality compared to those using tight bandage patching.[20] In contrast, the results of another 30-eye study showed that wearing BCL for the first three days after pterygium surgery reduced pain and promoted epithelial regeneration compared to patching.[21] Another study identified no significant differences between the use of BCL and patching in reducing postoperative pain or other symptoms, and recommended BCL for patients with visual needs.[22] BCL could also be applied to complex conditions such as pterygium with conjunctivochalasis.[23] In addition, the use of larger diameter scleral BCLs alleviated symptoms after pterygium surgery compared to those who did not wear scleral BCL.[12]

Furthermore, BCL has also been demonstrated to protect the self-repair process of the corneal epithelium during postoperative recovery of PRK surgery, and studies concluded that high oxygen permeability promotes the rapid repair of the corneal epithelium.[24] Herein, BCLs were worn for less than 1 week after pterygium surgery, with all patients achieving complete corneal epithelization. However, it is worthwhile emphasizing that the higher oxygen transmission rate of samfilcon A did not significantly accelerate corneal epithelization. On the other hand, balafilcon A, a BCL with higher water content, has been reported to provide superior comfort for long-term wear,[16,17] which might have accounted for the relatively high postoperative VAS scores in the balafilcon A group.

Duru et al compared the effect of samfilcon A and balafilcon A after PRK,[17] and described that wearing silicone hydrogel lenses after refractive surgery can reduce clinical symptoms, and samfilcon A has a better effect of reducing postoperative discomfort than balafilcon A. In another study undertaken by Reindel et al, the use of samfilcon A was associated with a more comfortable experience compared to balafilcon A when wore for seven days or more.[18]

Samfilcon A contains polyvinylpyrrolidone, which interacts with the wetting agent in the polymer matrix to maintain a high water content even after long-term wearing.[16] The maintenance of water content makes the lens surface moist for a longer time, improves the stability of the tear film, and helps to reduce the difference caused by the refractive index between the dry and wet areas on the surface, thereby improving visual quality.[25,26]

The removal of Tenon tissue and the use of tissue adhesives may alleviate the pain and discomfort of patients after pterygium surgery,[6,27] Therefore, its combination with BCL might be more effective. Although current studies identified no significant difference in complication rates between suture and tissue adhesives,[28] Hall et al reported eight cases of retraction of grafts resulting from the use of tissue adhesives.[29] Therefore, taking into account graft stability, suture techniques were selected instead of tissue adhesives in this study. If alternative techniques are adopted, measures should be implemented to avoid graft movement, including limiting BCL movements during corneal epithelialization, and ensuring a close fit between the graft and the conjunctival wound. Nonetheless, the effectiveness of the combination of BCL with no-suture techniques warrants further experimental validation.

Nevertheless, several limitations of this study cannot be overlooked. To begin, this was a retrospective study with a relatively small sample size for subjective indicators of corneal epithelization time and postoperative discomfort.

Secondly, changes in BCL properties during wear were not recorded and analyzed. Therefore, additional prospective, double-blind, large-sample studies are necessitated to compare a broader range of BCL and yield more significantly different and clinically meaningful results.

Conclusion

Overall, this study uncovered that in the postoperative adjuvant treatment of patients with primary pterygium, samfilcon A BCL outperformed balafilcon A BCLs in alleviating postoperative symptoms, thereby reducing the postoperative discomfort of patients and improving patient satisfaction.

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Disclosure

The authors report no conflicts with the reported in this manuscript.

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