The effect of wearing corneal reshaping lenses on refractive power and ocular surface recovery after FS-LASIK surgery

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Introduction. Exploring the effect of wearing corneal reshaping lenses on postoperative refractive power and ocular surface in femtosecond laser-assisted LASIK surgery (FS LASIK).

Methods. Retrospective research. Collect refractive error patients who underwent FS-LASIK surgery in the ophthalmology department of Suzhou Mingji Hospital from January 2020 to December 2023 and had a history of wearing corneal reshaping lenses before surgery as the wearing group for observation. According to the time taken for patients to stop wearing orthokeratology (Ortho K) lenses before surgery, they were divided into two groups: group 1 (stop wearing 3mo to 6mo) and group 2 (stop wearing more than 6mo). Follow up observation for 3 months after surgery and collect data. Patients who received FS-LASIK correction during the same period and had no history of wearing corneal reshaping lenses were selected as the control group. The observation indicators include: naked eye far vision (UDVA), computerized optometry, index of surface variation (ISV), and index of vertical asymmetry (IVA); Dry eye related indicators: ocular surface disease index (OSDI) questionnaire score and fluorescein sodium corneal staining (FL) score.

Results. (1)UDVA: There was a statistically significant difference in UDVA among the three groups of patients after 1 week of surgery (P=0.013), the UDVA of patients in the mirror wearing group was slightly higher than that of the control group after 1 week of surgery, but there was no difference in UDVA at 1 and 3 months after surgery (P>0.05).

(2)Computer optometry: There was no statistically significant difference in SE between the three groups of patients after 1 week and 1 month of surgery (P=0.490); at 3 months after surgery, there was a statistically significant difference in SE among the three groups of

patients (P=0.011); the SE of the group wearing glasses was higher than that of the control group (P<0.05), while there was no statistically significant difference between the group wearing glasses and the control group (P>0.05); the analysis of variance of repeated measurement data showed that there was a statistically significant difference in SE at different time points (1week, 1mo, 3mo) within the control group (P<0.05), while there was no statistically significant difference in SE between the wearing glasses group and the wearing glasses group at different postoperative time points (1week, 1mo, 3mo) (P>0.05).

(3) ISV and IVA: The control group showed no significant changes in ISV and IVA at 1w, 1mo, and 3mo after surgery, and there was no statistically significant difference compared to preoperative levels (P>0.05); the ISV and IVA of the mirror wearing group showed significant changes at 1w, 1mo, and 3mo after surgery, and the differences were statistically significant compared to preoperative levels (P<0.05); the ISV and IVA of group one and group two after wearing glasses were higher than those of the control group at 1w, 1mo, and 3mo postoperatively, and the difference was statistically significant (P<0.05); meanwhile, the ISV and IVA of the two groups wearing glasses were higher than those of the one group wearing glasses at 1w, 1mo, and 3mo after surgery, and the difference was statistically significant (P<0.05).

(4) OSDI score: The OSDI of the control group decreased significantly 3 months after surgery, and the difference was statistically significant compared to 1 week and 1 month after surgery (P<0.05); the OSDI index of the mirror wearing group showed a significant downward trend at 1w, 1mo, and 3mo after surgery, the OSDI score at 3mo after surgery was lower than that at 1w and 1w after surgery, and the difference was statistically significant (P<0.05), Meanwhile, at 1 week, 1 month, and 3 months after surgery, the OSDI score of the group wearing glasses was the highest, while the two group wearing glasses was comparable to the control group.

(5) FL score: The FL score of the control group decreased 3 months after surgery, and there was a statistically significant difference compared to 1 week after surgery (P<0.05); there was no difference in FL scores between the first and second groups after 1 week and 1 month of surgery, but the FL scores at 3 months after surgery were lower than those at 1 week, and the difference was statistically significant (P<0.05); the FL scores of the group wearing glasses at

1w, 1mo, and 3mo after surgery were higher than those of the control group (P<0.05), with the highest score, however, the scores of the group wearing glasses were comparable to those of the control group.

Conclusion. FS-LASIK was performed on patients who stopped wearing corneal reshaping lenses for three months or more, and there was no difference in visual acuity recovery and refractive power compared to the control group after surgery. However, patients in the mirror wearing group still show changes in corneal morphology after surgery and are related to the time of discontinuation. All three groups of patients had varying degrees of dry eye symptoms and chief complaints after surgery, which gradually recovered in the later stage, however, the time to stop wearing plastic lenses was short, and the ocular surface symptoms were relatively severe and the recovery was relatively slow.

Keywords. FS-LASIK technique; Corneal reshaping mirror; Eye surface recovery; Diopter

INTRODUCTION

Myopia is a global public health problem, and the myopia rate among children in East Asia is as high as 90%[1-2]. It is estimated that by the middle of this century, the global population affected by myopia and high myopia will reach 4.8 billion people and 940 million people[3]. At present, the methods to delay the progression of myopia mainly include low concentration atropine, orthokeratology (Ortho K) lenses, etc, in adulthood, corneal refractive surgery is chosen for correction. Ortho K lenses (orthokeratology; Ortho K lenses) are a type of lens that compress the cornea by closing the eyelids, changing the central curvature of the cornea to temporarily change the corneal refractive power and improve naked eye vision, at the same time, the corneal epithelium moves and thickens from the central area to the peripheral area, causing myopic defocus in the peripheral retina, thereby achieving the effect of controlling the development of myopia[4]. Long term wearing of corneal reshaping lenses in direct contact with ocular surface tissue may have an impact on tear film, cornea, and conjunctival tissue.

Lasik surgery assisted by femtosecond laser (FS LASIK) is still one of the mainstream surgical methods for refractive correction. The occurrence of postoperative dry eye is the most common complication of FS-LASIK surgery[5-6], and it is also the main cause of decreased patient satisfaction. The factors leading to postoperative dry eye include the history and duration of wearing contact lenses, the choice of surgical method and the degree of damage to the corneal nerve caused by the surgical procedure, postoperative medication, and corneal nerve repair. In recent years, the number of surgical patients with a history of wearing corneal reshaping lenses has been increasing year by year. This study aims to follow up patients with a history of wearing corneal reshaping lenses and receiving FS-LASIK correction for refractive errors, to observe the effects of corneal reshaping lens wearing history and cessation time on postoperative refractive power and ocular surface condition.

1 MATERIALS AND METHODS

1.1 General information and grouping

Collect data on refractive errors patients who underwent FS-LASIK surgery in the ophthalmology department of Suzhou Mingji Hospital from January 2020 to December 2023 and had a history of wearing corneal reshaping lenses before surgery, according to the time of preoperative cessation of wearing corneal reshaping lenses, they were divided into wearing group one (cessation of wearing 3mo to 6mo) and wearing group two (cessation of wearing more than 6mo). Follow up observation for 3 months after surgery and collect data. Patients who received FS-LASIK correction during the same period and had no history of wearing corneal reshaping lenses were selected as the control group. All patients have fully understood the surgical risks and signed informed consent forms before surgery.

1.2 Inclusion and exclusion criteria

1.2.1 Inclusion criteria (1) Over 18 years old but under 38 years old; (2) Within 2 years, the refractive index is stable, with a myopic spherical lens degree of ≤ 8.0D and a cylindrical lens degree of ≤2.0D, patients with hyperopia and mixed astigmatism are

excluded, and the eye parameters meet the surgical requirements; (3) Preoperative meibomian gland function was normal, and all dry eye parameters were normal; (4) Preoperative examination showed no other eye diseases except for refractive errors; (5) No history of wearing contact lenses other than corneal reshaping lenses before surgery.

1.2.2 Exclusion criteria (1) Eye accessory organ lesions such as eyelid defects, deformation, and incomplete closure; (2) Suspected cone or other corneal dilated diseases; (3) Uncontrolled glaucoma and cataracts that affect vision; (4) History of eye trauma and surgery; (5) Autoimmune system diseases, diabetes and other systemic diseases; (6) Depression, anxiety, and other psychological and mental illnesses, as well as hyperthyroidism and exophthalmos; (7) Patient data on postoperative DLK, interlayer hemorrhage, and corneal flap micro folds.

1.3 Methods

1.3.1 Preoperative examination: All patients undergo routine corneal refractive surgery preoperative examination and record relevant information, including naked eye far vision (UDVA), best corrected visual acuity (BCVA), apparent refraction and post dilated refraction, intraocular pressure, slit lamp examination, Oculezer, ToPolyzer, corneal endothelial cell count, AL scan, and post dilated fundus examination.

1.3.2 Surgical method: Apply 5g/L levofloxacin eye drops (4 times/day) and 1g/L sodium hyaluronate eye drops (4 times/day) locally 3 days before surgery. On the day of the surgery, physiological saline was used to rinse the conjunctival sac and disinfect the skin around the eyes, prior to the surgery, obukaine hydrochloride eye drops were used for ocular surface anesthesia (a total of 3 times), and all surgeries were performed by the same physician. Routine disinfection and drape, use Alcon Wavelight platform FS-200 femtosecond laser machine to make corneal flap, set corneal flap diameter of 8.5mm, thickness of 115um, edge cutting angle of 110 °, and position of corneal flap pedicle at 12 o'clock position. Excimer laser cutting adopts

EX-500 excimer laser machine (Alcon) Q-value guidance mode, with physiological saline flushing and corneal flap repositioning, and antibiotic eye drops after surgery.

1.4 Postoperative management and follow-up

1.4.1 Postoperative medication: All patients were given 5g/L levofloxacin eye drops 4 times per day after surgery; 1g/L sodium hyaluronate eye drops 4 times per day, for a total of 4W; 1g/L fluorometholone eye drops 4 times per day, decreasing once a week for a total of 4 weeks.

1.4.2 Postoperative follow-up: The follow-up time is set at 1 day, 1 week, 1 month, and 3 months after surgery, follow up indicators include naked eye far vision (UDVA), computer optometry, intraocular pressure, slit lamp examination, computed tomography of corneal topography (Oculezer), and anterior corneal surface topography (ToPolyzer) to record the index of surface variation (ISV) and index of vertical asymmetry (IVA); dry eye related indicators include the Ocular Surface Disease Index (OSDI) questionnaire score and fluorescein sodium corneal staining, Luorescent (FL) score.

1.4.2.1 Equivalent spherical mirror (SE): Use a computer refractometer (brand and model) to check the spherical and cylindrical mirror degrees, and record the changes in SE according to the ratio of equivalent spherical mirror (SE)=spherical mirror degree+1/2 cylindrical mirror degree, and statistically analyze the changes in SE.

1.4.2.2 Corneal morphology examination: All patients use ToPolyzer to examine the anterior surface morphology of the cornea, recording the index of surface variation (ISV) and index of vertical asymmetry (IVA) parameters. ISV reflects the deviation between the curvature of the anterior surface of the cornea and the average curvature value, which can describe the smoothness of the cornea, the higher the value, the more irregular the corneal surface[z-x], IVA reflects the asymmetry of curvature in the vertical direction of the cornea with the horizontal meridian as the axis of symmetry.

1.4.2.3 Scoring of the Eye Surface Disease Index (OSDI) questionnaire: Patients are rated on a questionnaire by the same doctor, the questionnaire is divided into three parts: perceived discomfort in the eyes (photophobia, foreign body sensation, soreness,

blurred vision, and decreased vision), daily effects of eye discomfort (reading, nighttime driving, computer watching, and TV watching), and environmental factors that cause eye discomfort (wind, dryness, and air conditioning), each question and answer score is scored from 0 to 4 points based on the severity (from none, sometimes, half the time, always), and the final OSDI score is the sum of all scores × 100/(total number of evaluation questions) × 4), the total score is 0-100 points, and the higher the score, the poorer the patient's ocular surface health. Please ask the patient to carefully read the questionnaire content and truthfully answer the OSDI questionnaire based on their own situation.

1.4.2.4 Corneal fluorescein sodium corneal staining (FL) score: The same doctor performs corneal fluorescein staining on patients in a constant temperature and humidity examination room and scores them. After applying the test strip to the conjunctival sac for 3 seconds, the patient was instructed to blink several times and look straight ahead to evenly distribute sodium fluorescein on the surface of the cornea, cobalt blue light was used to observe the staining of the corneal epithelium under a slit lamp: the cornea was divided into four quadrants, and each quadrant was scored 0-3 points based on the degree of staining: 0 points for no staining, 1 point for 1 to 30 point staining, 2 points for more than 30 point staining but not fused, and 3 points for corneal point staining fusion and filamentous material.

1.5 Statistical Methods: All data were analyzed using SPSS 21.0 statistical software, and count data were described using case numbers (%), X^2 tests were used for inter group comparisons. Quantitative data that conform to a normal distribution are expressed as mean ± standard deviation. The comparison of repeated measurement data at different time points is conducted using analysis of variance of repeated measurement data for statistical analysis of inter group and intra group differences. If there is no difference between the groups, further analysis of variance will be performed on the repeated measurement data of the two groups wearing glasses. If there are differences between groups, LSD-t test will be further applied for pairwise comparison at different time points within the group. Apply independent sample t-test

to compare the differences between two groups at each time point. Inspection level: α= 0.05. Count data usage cases (%) description. The difference is statistically significant with $P<0.05$.

2 RESULTS

2.1 Comparison of General Information of Patients in Each Group: A total of 96 patients (187 eyes) were collected in this study. Wearing glasses in a group: 20 cases (37 eyes), including 13 males (23 eyes) and 7 females (14 eyes), with an age of 20.60±3.02 years old, an equivalent spherical mirror degree of 5.5 (4.5,6.25), and an average curvature K value of 42.93±1.37. Wearing glasses group 2: 19 cases (36 eyes), including 7 males (14 eyes) and 12 females (22 eyes), with an age of 20.95±5.48, an equivalent spherical lens degree of 4.63 (3.44,6.25), and an average curvature K value of 43.37±1.19. Control group: 57 cases with a total of 114 eyes, including 28 males with 56 eyes and 29 females with 58 eyes, the age was 25.25±4.44 years old, with an equivalent spherical mirror degree of 4.75 (4,5.5) and an average curvature K value of 43.50±1.76. There was no statistically significant difference in gender ratio, age, equivalent spherical mirror degree, and mean curvature K value among the three groups ($P>0.05$).

Table 1. Comparison of general characteristics before treatment among three groups of patients

variable	control group	Wearing a set of glasses	Wearing Mirror Group 2	$F/Z/\chi^2$	P
Age (years)	22.35±2.86	20.60±3.02	20.95±5.48	2.339	0.102
spherical equivalent	4.75(4,5.5)	5.5(4.5,6.25)	4.63(3.44,6.25)	3.663	0.160
Average curvature K value	43.50±1.76	42.93±1.37	43.37±1.19	1.794	0.169
Gender				3.133	0.209
masculine	28（49.12）	13（65.00）	7（36.84）		
woman	29（50.88）	7（35.00）	12（63.16）		

2.2 Complications: During the femtosecond valve making process, no negative pressure loss, anterior chamber bubbles, or opaque bubble layer (OBL) affecting

excimer laser ablation were observed in all patients. No pupil abnormalities affecting the tracking and positioning of the cutting center were observed during excimer laser ablation. All cases did not experience complications such as corneal subepithelial opacity, epithelial implantation, corneal flap displacement, infection, or steroid induced high intraocular pressure.

2.3 Refractive state

2.3.1 Comparison of naked eye far vision (UDVA)

One week after surgery, there was a statistically significant difference in UDVA among the three groups of patients (*P*=0.013), among them, the UDVA of the patients wearing glasses was slightly higher than that of the control group, at one and three months after surgery, there was no statistically significant difference in UDVA among the three groups of patients; the analysis of variance of repeated measurement data showed that there was a statistically significant difference in UDVA at different time points (1week, 1mo, 3mo) within the control group (*P*=0.001), at 3 months after surgery, UDVA was significantly higher than at 1 week after surgery, there was no statistically significant difference in UDVA at different time points (1week, 1mo, 3mo) between the wearing group and the two groups. See Table 2

Table 2 Comparison of naked eye far vision (UDVA) (logMAR) among three groups of patients

variable	control group	Wearing a set of glasses	Wearing Mirror Group 2	*Z*	*P*
Treatment for 1 week	0(-0.1,0)	-0.1(-0.1,0)	-0.1(-0.1,0) [a]	-2.479	0.013
Treatment for 1 month	0(-0.1,0)	-0.1(-0.1,0)	-0.1(-0.1,0)	-1.884	0.060
Treatment for 3 month	-0.1(-0.1,0) [b]	-0.1(-0.1,-0.1)	-0.1(-0.1,0)	-0.740	0.459
Z	13.478	1.524	0.095		
P	0.001	0.467	0.953		

Note: [a]*P*<0.05 compared to the control group, [b]*P*<0.05 compared to one week of treatment.

2.3.2 Comparison of the effectiveness and stability of refractive power:

The target refractive index of all patients is 0, the proportion of equivalent spherical mirrors at±0.50D after 1 week in the wearing group and the control group were (74.6)% and (78.1)% respectively, there is no statistically significant difference between the two groups.

There was no statistically significant difference in SE between the three groups of patients after 1 week and 1 month of treatment (P=0.490); there was a statistically significant difference in SE among the three groups of patients 3 months after surgery (P=0.011), with the SE of the group wearing glasses being higher than that of the control group; the analysis of variance of repeated measurement data showed that there was a statistically significant difference in SE at different time points (1week, 1mo, 3mo) within the control group (P<0.05), while there was no statistically significant difference in SE at different time points (1week, 1mo, 3mo) between the group wearing glasses 1 and group wearing glasses 2 (P=0.733). See Table 3.

Table 3 Comparison of refractive power among three groups of patients

variable	control group	Wearing a set of glasses	Wearing Mirror Group 2	*Z*	*P*
Treatment for 1 week	0.25(0.00,0.50)	0.25(-0.13,0.50)	0.25(0.06,0.50)	2.707	0.258
Treatment for 1 month	0.25(-0.25,0.25)	0.25(-0.13,0.50)	0.25(0.25,0.50)	1.082	0.582
Treatment for 3 month	0.25(0.00,0.50) [bc]	0.50(0.25,0.50) [a]	0.25(0.06,0.50)	8.962	0.011
Z	18.931	6.000	0.620		
P	＜0.001	0.050	0.733		

Note: [a]P<0.05 compared to the control group, [b]P<0.05 compared to 1 week of treatment, [c]P<0.05 compared to 1 month of treatment.

2.4 Corneal morphological changes

Before surgery, there was no statistically significant difference in ISV and IVA among the three groups of patients (P>0.05), the ISV and IVA of the control group did not show significant changes at 1 week, 1 month, and 3 months after surgery, and there was no statistically significant difference compared to before surgery (P>0.05); the ISV and IVA of the mirror wearing group showed significant changes at 1 week, 1

month, and 3 months after surgery, and the differences were statistically significant compared to before surgery (P<0.05); the ISV and IVA of group one and group two after surgery were higher than those of the control group at 1 week, 1 month, and 3 months, and the difference was statistically significant (P<0.05); at the same time, the ISV and IVA of the two groups after 1 week, 1 month, and 3 months of surgery were higher than those of the one group, and the difference was statistically significant (P<0.05), as shown in Tables 4 and 5.

Table 4 Comparison of ISV among three groups of patients

variable	control group	Wearing a set of glasses	Wearing Mirror Group 2	*Z*	*P*
Preoperative	23(18.75,27.0)	19(16.5,25.0)	23(17.5,27.0)	4.071	0.131
Treatment for 1 week	24(19.0,32.0)	26(22.0,31.0)^{*a}	40(35,47.75)^{*ac}	42.370	＜0.001
Treatment for 1 month	24(19.0,30.0)	26(21.0,34.5)^{*a}	40.5(29.75,45.75)^{*abc}	33.149	＜0.001
Treatment for 3 month	24.5(19.0,30.0)	24.5(20.25,33.0)^{*ab}	38(26.0,44.0)^{*abc}	22.046	＜0.001
Z	5.640	57.447	72.182		
P	0.130	＜0.001	＜0.001		

Note: ^{a}P<0.05 compared to the control group, ^{c}P<0.05 compared to the group wearing glasses, ^{b}P<0.05 compared to one week of treatment, and $^{*}P$<0.05 compared to preoperative treatment.

Table 5 Comparison of IVA among three groups of patients

variable	control group	Wearing a set of glasses	Wearing Mirror Group 2	*Z*	*P*
Preoperative	0.13(0.1,0.18)	0.1(0.08,0.15)	0.13(0.09,0.16)	6.409	0.051
Treatment for 1 week	0.14(0.09,0.19)	0.14(0.11,0.23)^{*a}	0.23(0.18,0.25)^{*ac}	25.777	＜0.001
Treatment for 1 month	0.14(0.1,0.2)	0.14(0.1,0.21)^{*a}	0.22(0.16,0.24)^{*abc}	17.163	＜0.001
Treatment for 3 month	0.15(0.1,0.2)	0.14(0.1,0.2)^{*ab}	0.21(0.16,0.24)^{*abc}	11.121	0.004
Z	4.781	37.843	52.481		
P	0.189	＜0.001	＜0.001		

Note: ^{a}P<0.05 compared to the control group, ^{c}P<0.05 compared to the group wearing glasses, ^{b}P<0.05 compared to one week of treatment, and $^{*}P$<0.05 compared to preoperative treatment.

2.5 Eye surface recovery situation

2.5.1 Eye Surface Disease Index (OSDI) questionnaire score:

The OSDI score of the control group showed no significant change at 1 week and 1 month after surgery, and the difference was not statistically significant (P>0.05), However, at 3 months after surgery, the OSDI score decreased significantly, and there was a statistically significant difference compared to 1w and 1mo (P<0.05); at 1w, 1mo, and 3mo after surgery, the OSDI score of the group wearing glasses was significantly higher than that of the group wearing glasses, and the OSDI score of the group wearing glasses was higher than that of the control group; the OSDI scores of the wearing glasses group showed a significant downward trend at 1 week, 1 month, and 3 months after surgery. At 3 months after surgery, there was no statistically significant difference in OSDI scores between the two groups wearing glasses and the control group (P>0.05), but there was a statistically significant difference between the two groups wearing glasses and the control group (P<0.05). As shown in Table 6.

Table 6 Comparison of Eye Surface Disease Index (OSDI) among Three Groups of Patients

variable	control group	Wearing a set of glasses	Wearing Mirror Group 2	Z	P
Treatment for 1 week	16(8,33.5)	52(25.5,62.75)*	30(15,45)$^{\#}$	16.242	＜0.001
Treatment for 1 month	16(8,28)	36.5(19.25,45)^{*b}	20(9,32)$^{\#b}$	14.394	0.001
Treatment for 3 month	8(0,23)^{bc}	24.5(14.25,39.75)^{*bc}	9(5,17)$^{\#bc}$	14.634	0.001
Z	28.413	40.00	38.00		
P	＜0.001	＜0.001	＜0.001		

Note: Compared with the control group, $^{*}P$<0.05, compared with the group wearing glasses $^{\#}P$<0.05, compared with 1 week of treatment ^{b}P<0.05, compared with 1 month of treatment ^{c}P<0.05.

2.5.2 Corneal fluorescein sodium corneal staining (FL) score:

The change in FL score was not significant in the control group at 1 week and 1 month after surgery, and the difference was not statistically significant (P>0.05), however, at 3 months after surgery, the FL score decreased significantly, and the

difference between FL at 1w was statistically significant (P<0.05); there was no significant difference in FL scores between the group wearing glasses at 1w and 1mo postoperatively, and it was not until 3mo postoperatively that the FL score was lower than one week postoperatively, and the comparison was statistically significant. The scores of the group wearing glasses were higher than those of the control group at 1w, 1mo, and 3mo after surgery (P<0.05), while there was no statistically significant difference in scores between the group wearing glasses and the control group at 1w, 1mo, and 3mo after surgery (P>0.05). As shown in Table 7.

Table 7 Comparison of corneal fluorescein sodium staining (FL) among three groups of patients

variable	control group	Wearing a set of glasses	Wearing Mirror Group 2	*Z*	*P*
Treatment for 1 week	1(0,1)	2(1,2)*	1(1,1)	12.149	0.002
Treatment for 1 month	0(0,1)	1(0,1)*	0(0,1)	9.019	0.011
Treatment for 3 month	0(0,0)b	1(0,1)*b	0(0,0)b	13.604	0.001
Z	11.952	19.846	14.857		
P	0.003	＜0.001	0.001		

Note: *P<0.05 compared to the control group, #P<0.05 compared to the group wearing glasses, bP<0.05 compared to 1 week of treatment, and cP<0.05 compared to 1 month of treatment.

3 DISCUSSION

The pathogenesis of myopia is not yet clear, and at present, fundamental treatment cannot be carried out from the perspective of etiology, Currently, optical correction is mainly used in clinical practice, which can be divided into two categories: non-surgical correction and surgical correction. Non surgical correction methods mainly include wearing frame glasses or corneal contact lenses. Among them, Ortho-K is a rigid oxygen permeable corneal contact lens with anti geometric design, which adopts a multi arc design, the middle basal arc area acts on the center of the cornea to reduce corneal curvature, correct myopic refractive errors, and improve naked eye vision, at the same time, the reverse arc area in the middle and periphery makes the peripheral corneal membrane steep, forming myopic defocus around the

macula, delaying axial growth, and achieving the goal of controlling the development of myopia[11]. It has been widely used in clinical practice, but wearing it can also increase the irregularity of the cornea and the possibility of ocular surface damage. The biggest advantage of Ortho-K is its reversibility, which is also the fundamental difference from corneal refractive surgery. FS-LASIK in corneal refractive surgery is still one of the mainstream refractive surgeries, which uses femtosecond laser to accurately create corneal flaps and irreversible ablation of corneal stroma using excimer laser to change the central curvature of the cornea and achieve the goal of treating myopia.

In order to accurately implement the surgical plan of FS-LASIK, the true and stable shape of the cornea is crucial. The temporary changes caused by the wearing of Ortho-K lenses can affect the measurement and mapping of corneal morphology, it is usually recommended that patients wearing Ortho-K lenses stop using them for a period of time before undergoing FS-LASIK surgery. This period may vary, usually from a few weeks to several months. The exact time depends on the speed at which the wearer's cornea returns to its original shape. If FS-LASIK surgery is performed without sufficient waiting time after discontinuing Ortho-K lenses, there is a risk of inaccurate correction. This may result in unsatisfactory visual outcomes or require additional corrective procedures. This study found that there was no statistically significant difference in postoperative naked eye vision and SE among the three groups of patients at different times after surgery. There was no statistically significant difference in postoperative naked eye vision and SE between the Ortho-K mirror discontinuation group and the control group for three months or longer.

This study found that the postoperative ISV and IVA values of the three groups increased compared to before surgery, in addition, the differences in the wearing group at various time points (1week, 1mo, 3mo) after surgery were statistically significant, indicating that the wearing of Ortho-K lenses still changes the anterior corneal surface over time.

The ocular surface injury and dry eye after FS-LASIK surgery have always been

a hot topic of clinical concern, the preoperative ocular surface condition, surgical method, and intraoperative procedures are related to the postoperative ocular surface recovery and dry eye condition. Studies have shown that rigid corneal contact lenses can cause an increase in tear osmotic pressure, possibly due to the rapid evaporation of tears caused by the movement of the lens, which damages the tear film[c]. There are also studies showing that corneal epithelial injury, changes in corneal anterior surface morphology, and irregular changes after wearing glasses can promote a decrease in tear film stability, thereby affecting the quality of tears[D-E]. This study found that at different postoperative time points (1week, 1mo, 3mo), the corneal fluorescein sodium staining (FL) index was higher in the group wearing glasses than in the group wearing glasses and the control group, in other words, the shorter the time to stop wearing Ortho-K lenses, the longer the duration of corneal epithelial damage after surgery. Similarly, in terms of the Eye Surface Disease Index (OSDI), at different postoperative time points (1week, 1mo, 3mo), the wearing of glasses in Group 1 was higher than that in Group 2 and the control group, indicating that the shorter the time to stop wearing Ortho-K glasses, the more severe the postoperative eye surface discomfort symptoms in patients.

In summary, the impact of the use of Ortho-K mirrors on FS-LASIK varies from person to person. The duration of continuous use of Ortho-K lenses, the degree of corneal shaping, and personal healing patterns can all affect the results. Before performing FS-LASIK, stop wearing Ortho-K lenses for a certain period of time, your eye care professionals will monitor the stability of your cornea and they will repeat measurements over time to ensure that the cornea returns to its natural shape, which can to some extent ensure the accuracy of postoperative treatment.

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