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Alterations in Intraocular Pressure in Myopic Patients Having Laser-Assisted In-Situ Keratomileusis and Photorefractive Keratectomy in Iraq

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Abstract

Introduction. Myopia is one of the most common refractive errors worldwide, primarily caused by an increase in axial length, resulting in blurred vision. Refractive surgery, including photorefractive keratectomy (PRK) and femtosecond laser-assisted in situ keratomileusis (FS-LASIK), provides effective correction for myopia. However, these procedures may influence intraocular pressure (IOP), a critical parameter in glaucoma risk assessment. This study investigates changes in IOP following PRK and FS-LASIK, aiming to evaluate differences between these two procedures.

Materials and methods. This prospective, comparative, clinically controlled study was conducted in Thi-Qar, Iraq, from January 2022 to January 2024. A total of 120 eyes from 60 patients with myopia were enrolled. Patients were randomized into two groups: PRK group (60 eyes) and FS-LASIK group (60 eyes). All procedures were performed by a single experienced surgeon. Preoperative and postoperative assessments included visual acuity, refraction, slit-lamp biomicroscopy, corneal topography, and IOP measurement using Goldmann applanation tonometry (GAT). Statistical analysis was conducted using SPSS version 23.0, and a p-value <0.05 was considered statistically significant.

Results. Baseline Characteristics: the mean age was 41.20±12.25 years (PRK group) and 41.80±14.12 years (FS-LASIK group) (p=0.898). Gender distribution was comparable (p>0.05).

Central Corneal Thickness (CCT): preoperatively, CCT was significantly higher in the PRK group (538.40±43.50 μm) compared to the FS-LASIK group (528.85±37.08 μm, p=0.027). Postoperatively, no significant difference was observed between the groups (p=0.761).

Intraocular Pressure (IOP) Changes: in the PRK group, IOP significantly decreased from 15.84±2.12 mmHg to 13.4±2.27 mmHg in the right eye (p=0.000) and from 15.58±2.56 mmHg to 13.3±2.62 mmHg in the left eye (p=0.000).

In the FS-LASIK group, IOP also significantly decreased from 14.3±2.69 mmHg to 13.2±2.23 mmHg in the right eye (p=0.000) and from 14.6±2.64 mmHg to 13.3±2.59 mmHg in the left eye (p=0.000).

However, when comparing postoperative IOP between groups, there was no statistically significant difference (p=0.727).
Conclusion. Both PRK and FS-LASIK resulted in a significant reduction in IOP, likely due to corneal biomechanical changes rather than true physiological reductions. While FS-LASIK showed a slightly greater decrease in IOP, the difference between procedures was not statistically significant. These findings suggest that IOP measurements post-refractive surgery should be interpreted cautiously, as traditional tonometry may underestimate actual values. Further studies with alternative tonometry methods and longer follow-up periods are recommended to improve glaucoma risk assessment in post-refractive surgery patients.
Keywords: intraocular pressure, laser-assisted in situ keratomileusis, myopia, photorefractive keratectomy

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Изменения внутриглазного давления у пациентов с миопией, перенесших лазерный кератомилез in situ и фоторефракционную кератэктомию, в Ираке

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Резюме

Введение. Миопия является одной из наиболее распространенных рефракционных аномалий во всем мире. Вызвана она в первую очередь увеличением осевой длины, что приводит к нечеткости зрения. Рефракционная хирургия, включая фоторефракционную кератэктомию (ФРК) и фемтосекундный лазерный кератомилез in situ (FS-LASIK), обеспечивает эффективную коррекцию миопии. Однако эти процедуры могут влиять на внутриглазное давление (ВГД), критический параметр в оценке риска глаукомы. В этом исследовании изучаются изменения ВГД после ФРК и FS-LASIK с целью оценки различий между этими двумя процедурами.
Материалы и методы. Данное проспективное сравнительное клинически контролируемое исследование проводилось в Ти-Каре, Ирак, с января 2022 г. по январь 2024 г. В исследование было включено 120 глаз 60 пациентов с миопией. Пациенты были рандомизированы в две группы: группа ФРК (60 глаз) и группа FS-LASIK (60 глаз). Все процедуры выполнял один опытный хирург. Предоперационные и послеоперационные оценки включали остроту зрения, рефракцию, биомикроскопию со щелевой лампой, топографию роговицы и измерение ВГД с помощью аппланационной тонометрии Гольдмана (GAT). Статистический анализ проводился с использованием SPSS версии 23.0, значение $p<0,05$ считалось статистически значимым.

Результаты. Исходные характеристики: средний возраст составил 41,20±12,25 года (группа ФРК) и 41,80±14,12 года (группа FS-LASIK) (p=0,898). Распределение по полу было сопоставимым (p>0,05).
Центральная толщина роговицы (ЦТР): до операции ЦТР была значительно выше в группе ФРК (538,40±43,50 мкм) по сравнению с группой FS-LASIK (528,85±37,08 мкм, p=0,027). После операции между группами не наблюдалось существенной разницы (p=0,761).
Изменения ВГД: в группе ФРК ВГД значительно снизилось с 15,84±2,12 мм рт. ст. до 13,4±2,27 мм рт. ст. в правом глазу (p=0,000) и с 15,58±2,56 мм рт. ст. до 13,3±2,62 мм рт. ст. в левом глазу (p=0,000). В группе FS-LASIK ВГД также значительно снизилось – с 14,3±2,69 мм рт. ст. до 13,2±2,23 мм рт. ст. в правом глазу (p=0,000) и с 14,6±2,64 мм рт. ст. до 13,3±2,59 мм рт. ст. в левом глазу (p=0,000). Однако при сравнении послеоперационного ВГД между группами статистически значимой разницы не было (p=0,727).
Заключение. Как ФРК, так и FS-LASIK привели к значительному снижению ВГД, вероятно, из-за биомеханических изменений роговицы, а не из-за истинного физиологического снижения. Хотя FS-LASIK показал немного большее снижение ВГД, разница между процедурами не была статистически значимой. Эти результаты показывают, что измерения ВГД после рефракционной операции следует интерпретировать осторожно, поскольку традиционная тонометрия может недооценивать фактические значения. Рекомендуются дальнейшие исследования с альтернативными методами тонометрии и более длительными периодами наблюдения для улучшения оценки риска глаукомы у пациентов после рефракционной операции.
Ключевые слова: внутриглазное давление, лазерный кератомилез in situ, миопия, фоторефракционная кератэктомия

■ INTRODUCTION

Myopia, one of the most prevalent refractive errors worldwide, arises primarily due to an increase in the axial length of the eyeball. This elongation causes light entering the eye to focus in front of the retina rather than directly on it, leading to blurred vision when viewing distant objects. Without proper correction, myopia can significantly impair visual acuity and overall quality of life [1]. Over recent decades, myopia has escalated into a major global public health concern, with projections estimating that by the year 2050, nearly half of the world's population – approximately 4.8 billion people – will be affected [2, 3].

Although myopia can be corrected using spectacles, contact lenses, or refractive surgery, it is not merely a benign condition. Higher degrees of myopia increase the risk of sight-threatening complications such as myopic macular degeneration, retinal detachment, cataract, and open-angle glaucoma, all of which can lead to irreversible vision loss later in life [4].

Refractive surgery has emerged as a widely used solution for myopia, with photorefractive keratectomy and femtosecond laser-assisted in situ keratomileusis being two of the most commonly performed procedures [5]. Photorefractive keratectomy, developed in the late 1980s, was the first laser-based surgical technique for myopia correction. It involves removing the corneal epithelium and reshaping the stromal bed using a 193-nanometer argon fluoride excimer laser. Photorefractive keratectomy is well-established as an effective, predictable, and safe procedure for treating mild-to-moderate myopia, astigmatism, and hyperopia [6].

Femtosecond laser-assisted in situ keratomileusis, on the other hand, has gained widespread popularity due to its faster visual recovery and reduced postoperative discomfort. In this procedure, a corneal flap is created to expose the stromal bed, which is then remodeled using an excimer laser to achieve the desired refractive correction [7]. Femtosecond laser-assisted in situ keratomileusis has demonstrated remarkable success, with patient satisfaction rates exceeding 95% [8]. However, while femtosecond laser-assisted in situ keratomileusis offers a more comfortable recovery compared to photorefractive keratectomy, photorefractive keratectomy remains a preferred option in certain cases, particularly for patients with thinner corneas or those at risk of flap-related complications. Nonetheless, photorefractive keratectomy is associated with drawbacks, including increased postoperative pain, delayed visual recovery, a higher risk of corneal haze, and greater likelihood of myopic regression, particularly in individuals requiring deeper stromal ablation [6].

Beyond visual correction, refractive surgery can influence intraocular pressure, a critical factor in ocular physiology. Intraocular pressure is primarily regulated by the production and drainage of aqueous humor in the anterior chamber. While the vitreous humor in the posterior segment remains relatively constant, intraocular pressure is maintained through a balance between aqueous humor production by the ciliary body and its outflow via the trabecular meshwork and uveoscleral pathways [9]. Goldmann's equation remains the standard reference for assessing aqueous humor dynamics in clinical practice [10].

Elevated intraocular pressure is a well-recognized risk factor for glaucomatous damage, and individuals with high myopia are at an increased risk of developing glaucoma [11]. Interestingly, studies suggest that myopic refractive surgery may lead to postoperative changes in intraocular pressure. A systematic review and meta-analysis [12] reported a significant reduction in intraocular pressure following myopic refractive procedures in the majority of patients. However, the extent and mechanisms underlying these changes remain a subject of ongoing investigation.

■ PURPOSE

Given these considerations, this study aims to evaluate differences in intraocular pressure changes among myopic patients undergoing femtosecond laser-assisted in situ keratomileusis or photorefractive keratectomy. Understanding these variations is crucial for optimizing surgical outcomes and minimizing long-term ocular risks in myopic individuals.

■ MATERIALS AND METHODS

This prospective, comparative, clinically controlled study was conducted between January 2022 and January 2024 in Thi-Qar, Iraq, involving 120 eyes from 60 patients diagnosed with myopia. Patients were eligible for participation if they had no ocular disease other than refractive error. To ensure voluntary participation, all patients received detailed information about the study's objectives, surgical techniques, potential risks, and benefits. Written informed consent was obtained from all participants before enrollment.

Inclusion and Exclusion Criteria

Patients included in the study were required to be at least 24 years old and have a diagnosis of myopia requiring surgical correction.

The exclusion criteria were as follows:

- Age below 24 years.
- Presence of cataracts or glaucoma.
- Diagnosis of diabetic macular edema.
- History of prior vitrectomy or intraocular surgery.
- Pregnancy at the time of enrollment.
- Uncooperative patients or those unable to provide written consent.

A comprehensive medical and ophthalmic history was recorded for each patient, including name, age, gender, place of residence, occupation, past medical history, history of ocular diseases, current refractive status, initial symptoms, and details regarding disease onset, duration, and progression.

Patient Groups and Surgical Procedures

The patients were randomly assigned to one of two equal groups:

- Group A (60 eyes): Underwent femtosecond laser-assisted in situ keratomileusis.
- Group B (60 eyes): Underwent photorefractive keratectomy.

All procedures were performed by a single experienced surgeon to minimize variability in surgical technique.

Preoperative Assessment

Before surgery, all patients underwent a comprehensive ophthalmologic evaluation, which included:

Visual acuity assessment:

- Refraction measurement: manifest and cycloplegic refraction using an auto keratorefractometer (MeCan Medical Co., Guangzhou, China).
- Slit-lamp biomicroscopy: performed using a slit lamp (Nidek Co., Aichi, Japan).
- Corneal topography: evaluated using Oculus Pentacam Corneal Topography (Ophthalmicmart Co., Singapore).
- Intraocular pressure measurement: assessed using the Goldmann applanation tonometer (Haag-Striet AT 900; Haag-Streit AC, Koeniz, Switzerland).

Surgical Techniques

Photorefractive Keratectomy Procedure: for the photorefractive keratectomy group, topical anesthesia was administered using 0.5% tetracaine hydrochloride eye drops. The corneal epithelial layer was marked using an 8/9-millimeter corneal marker and mechanically removed with a hockey blade to expose the corneal surface. The excimer laser (Alcon Wavelight® EX500, Alcon Laboratories) was then applied to reshape the stromal bed.

Following the laser ablation, a sponge soaked in 0.02% mitomycin C was placed on the stromal bed. The duration of mitomycin C application depended on the depth of corneal ablation. The stromal bed was then irrigated with 30 milliliters of chilled balanced salt solution. At the end of the procedure, a soft bandage contact lens was placed over the cornea, and a drop of combined moxifloxacin 0.5% and dexamethasone 0.1% was instilled.

Femtosecond Laser-Assisted in Situ Keratomileusis Procedure

For the femtosecond laser-assisted in situ keratomileusis group, a corneal flap was created using the Intralase® femtosecond laser (Abbott Laboratories, Lake Bluff, Illinois, USA) prior to laser ablation. The excimer laser was then applied to reshape the stromal bed according to each patient's refractive error. Key surgical parameters, including ablation depth, programmed flap thickness, and preoperative sphere and cylinder values, were recorded.

Postoperatively, topical antibiotics and corticosteroids were prescribed for both groups. In the femtosecond laser-assisted in situ keratomileusis group, these medications were discontinued two weeks after surgery.

Statistical Analysis

All collected data were analyzed using the Statistical Package for the Social Sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative variables were presented as mean±standard deviation and range, while qualitative variables were expressed as numbers and percentages. Statistical significance was determined using a p-value threshold of $p<0.05$ which is considered statistically significant.

■ RESULTS

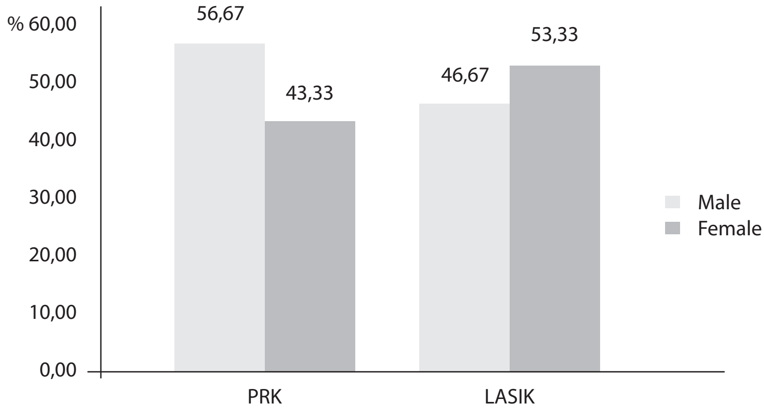
The study included a total of 120 eyes from 60 patients, with 60 eyes (50%) undergoing photorefractive keratectomy and 60 eyes (50%) undergoing femtosecond laser-assisted in situ keratomileusis. The mean age of patients in the photorefractive keratectomy group was 41.20±12.25 years, with 34 male patients (56.67%). In the femtosecond laser-assisted in situ keratomileusis group, the mean age was 41.80±14.12 years, with 28 male patients (46.67%) (Figure and Table 1).

Preoperatively, central corneal thickness was significantly higher in the photorefractive keratectomy group (538.40±43.50 µm) compared to the femtosecond laser-assisted in situ keratomileusis group (528.85±37.08 µm), with a statistically significant p-value of 0.027. However, postoperatively, central corneal thickness showed no significant difference between the groups (photorefractive keratectomy: 390.45±47.98 µm, femtosecond laser-assisted in situ keratomileusis: 389.8±49.80 µm, p=0.761). This suggests that while there was a slight preoperative variation in corneal thickness, both procedures resulted in comparable postoperative corneal thinning. These findings highlight the importance of preoperative corneal assessment in surgical planning and reinforce the overall similarity in corneal tissue removal between the two techniques.

In the photorefractive keratectomy group, intraocular pressure showed a statistically highly significant reduction postoperatively in both eyes. The mean intraocular pressure in the right eye decreased from 15.84±2.12 mmHg preoperatively to 13.4±2.27 mmHg

Table 1
Comparison between PRK group and LASIK group regarding demographic data (n=120)

	PRK (n=60)	LASIK (n=60)	P-value
Age (years)	41.20±12.25	41.80±14.12	0.898
Gender Male Female	 34 (56.67%) 26 (43.33%)	 28 (46.67%) 32 (53.33%)	



Gender distribution in the study groups

postoperatively (p=0.000), while the left eye showed a similar reduction from 15.58±2.56 mmHg to 13.3±2.62 mmHg (p=0.000).

This significant decrease in intraocular pressure may be attributed to corneal biomechanical changes following photorefractive keratectomy, which can affect intraocular pressure measurements rather than true intraocular pressure reduction. These findings emphasize the need for cautious interpretation of intraocular pressure changes post-surgery and consideration of alternative intraocular pressure assessment methods for long-term glaucoma risk evaluation.

In the femtosecond laser-assisted in situ keratomileusis group, intraocular pressure significantly decreased postoperatively in both eyes. The right eye showed a reduction from 14.3±2.69 mmHg preoperatively to 13.2±2.23 mmHg postoperatively (p=0.000), while the left eye decreased from 14.6±2.64 mmHg to 13.3±2.59 mmHg (p=0.000).

Similar to the findings in the photorefractive keratectomy group, this highly significant decrease in intraocular pressure may be due to postoperative corneal thinning rather than an actual reduction in intraocular pressure. Since intraocular pressure measurements rely

Table 2
Comparison between PRK group and LASIK group regarding central corneal thickness (CCT) (μm)

CCT (μm)	PRK (n=60)	LASIK(n=60)	P-value
Pre-operative	538.40±43.50	528.85±37.08	0.027 (S)
Post-operative	390.45±47.98	389.8±49.80	0.761 (NS)

Notes: S – significant; NS – none significant.

Table 3
Intraocular pressure (IOP) changes in PRK group during the course of the study

IOP (mmHg)	Pre-operative	Post-operative	P-value
Right eye	15.84±2.12	13.4±2.27	0.000(HS)
Left eye	15.58±2.56	13.3±2.62	0.000(HS)

Note: HS – highly significant.

Table 4
Intraocular pressure (IOP) changes in LASIK group during the course of the study

IOP (mmHg)	Pre-operative	Post-operative	P-value
Right eye	14.3±2.69	13.2±2.23	0.000 (HS)
Left eye	14.6±2.64	13.3±2.59	0.000 (HS)

Note: HS – highly significant.

Table 5
Comparison between PRK group and LASIK group regarding IOP alterations

IOP (mmHg)	PRK (n=60)	LASIK(n=60)	P-value
Pre-operative	15.66±2.3	14.4±2.7	0.338 (NS)
Post-operative	13.6±2.50	13.4±2.82	0.727 (NS)
P-value	0.000 (HS)	0.000 (HS)	

Notes: S – significant; NS – none significant; HS – highly significant.

on corneal resistance, alterations in corneal biomechanics following femtosecond laser-assisted in situ keratomileusis can lead to underestimated intraocular pressure readings. These results highlight the importance of considering alternative intraocular pressure measurement techniques, such as corneal-compensated intraocular pressure or anterior chamber manometry, for more accurate long-term intraocular pressure assessment in post-refractive surgery patients.

Preoperatively, intraocular pressure was slightly higher in the photorefractive keratectomy group (15.66±2.3 mmHg) compared to the femtosecond laser-assisted in situ keratomileusis group (14.4±2.7 mmHg), but this difference was not statistically significant (p=0.338). Postoperatively, intraocular pressure levels in both groups became even more similar, with 13.6±2.50 mmHg in the photorefractive keratectomy group and 13.4±2.82 mmHg in the femtosecond laser-assisted in situ keratomileusis group (p=0.727), again showing no significant difference.

However, within each group, intraocular pressure significantly decreased postoperatively (p=0.000), indicating that both procedures led to a measurable reduction in intraocular pressure readings. This decline is likely due to changes in corneal thickness and biomechanics rather than a true reduction in intraocular pressure. These findings reinforce the importance of using alternative intraocular pressure assessment methods, such as corneal-compensated intraocular pressure, in post-refractive surgery patients to avoid underestimation of intraocular pressure and potential misdiagnosis of ocular hypertension or glaucoma.

■ DISCUSSION

In the present study, the mean age of patients undergoing photorefractive keratectomy was 41.20±12.25 years, while those in the femtosecond laser-assisted in situ keratomileusis group had a mean age of 41.80±14.12 years. The photorefractive keratectomy group had a higher proportion of male patients (56.67%) compared to the femtosecond laser-assisted in situ keratomileusis group (46.67%). These demographic characteristics differ from previous studies, such as Ang et al. (2022), who reported a younger study population with a mean age of approximately 29 years in both groups [13]. Similarly, Humayun et al. (2023)

reported an even younger cohort, with a mean age of 23.6 years in the photorefractive keratectomy group and 24.4 years in the femtosecond laser-assisted in situ keratomileusis group [14]. The observed age difference in our study may be attributed to variations in patient selection criteria, regional differences in surgical candidacy, or evolving trends in refractive surgery timing. Furthermore, gender distribution in our study varied from previous reports, where male representation ranged from 33.9% to 66.6% [13, 14]. These variations highlight the need for further research to determine whether demographic factors, such as age and gender, influence surgical outcomes and long-term corneal stability.

Preoperatively, the photorefractive keratectomy group exhibited a significantly greater central corneal thickness than the femtosecond laser-assisted in situ keratomileusis group (p=0.027). However, after surgery, this difference was no longer statistically significant (p=0.761). These findings align with the work of Nassar et al. (2018), who similarly reported no significant preoperative difference in central corneal thickness (p=0.09) but found a significant reduction postoperatively within both surgical groups. Given that central corneal thickness plays a crucial role in intraocular pressure measurement and corneal biomechanics, the observed thinning after refractive surgery is expected [15]. The degree of stromal ablation required in each procedure likely accounts for the observed changes, emphasizing the importance of preoperative corneal thickness evaluation when determining surgical candidacy and predicting long-term corneal integrity.

A highly significant reduction in intraocular pressure was observed postoperatively in both groups (p=0.000). In the photorefractive keratectomy group, intraocular pressure decreased significantly in both eyes, mirroring findings from Nassar et al. (2018), who also reported a marked intraocular pressure reduction at three months postoperatively in both groups (p=0.000) [15]. Similarly, Ang et al. (2022) demonstrated intraocular pressure decreases following both procedures, with intraocular pressure reductions from 15.1±3 mmHg to 11.3±2.1 mmHg in the femtosecond laser-assisted in situ keratomileusis group and from 14.4±2.6 mmHg to 12.1±3 mmHg in the photorefractive keratectomy group [13].

Despite the apparent intraocular pressure reduction, it is widely recognized that these changes may not reflect a true physiological decrease in intraocular pressure but rather an alteration in measurement due to corneal structural changes. As demonstrated in previous research [16, 17] intraocular pressure readings following refractive surgery may be underestimated due to changes in corneal thickness and rigidity, particularly when measured using Goldmann applanation tonometry. Helmy and Hashem (2020) found that in myopic patients undergoing femtosecond laser-assisted in situ keratomileusis, intraocular pressure decreased significantly from 15.72±2.37 mmHg preoperatively to 11.71±2.24 mmHg postoperatively (p<0.001), highlighting the impact of corneal modifications on intraocular pressure assessment [17].

Furthermore, Kilavuzoglu et al. (2017) reported a strong correlation between preoperative intraocular pressure and the magnitude of intraocular pressure reduction following surgery, suggesting that higher baseline intraocular pressure values were associated with greater postoperative intraocular pressure reductions. This phenomenon underscores the importance of interpreting intraocular pressure changes cautiously in post-refractive surgery patients, as standard intraocular pressure measurement techniques may underestimate true intraocular pressure values [18].

Preoperatively, there was no statistically significant difference in intraocular pressure between the photorefractive keratectomy and femtosecond laser-assisted in situ keratomileusis groups (p=0.338), and this remained unchanged three months postoperatively (p=0.727). However, both groups exhibited a highly significant intraocular pressure reduction from baseline (p=0.000). These results are consistent with Nassar et al. (2018), who reported similar postoperative intraocular pressure reductions in both procedures without significant intergroup differences [15].

Interestingly, some studies have suggested that the magnitude of intraocular pressure reduction may vary between procedures. Humayun et al. (2023) found that intraocular pressure initially increased immediately after surgery but subsequently decreased between three and six months postoperatively, with femtosecond laser-assisted in situ keratomileusis demonstrating a greater reduction in intraocular pressure than photorefractive keratectomy. This discrepancy may be attributed to differences in corneal healing dynamics, epithelial remodeling, and the extent of stromal tissue removal in each technique [14].

The observed intraocular pressure reduction following refractive surgery, although statistically significant, may not represent a true physiological decrease. Instead, it likely reflects changes in corneal biomechanics that influence intraocular pressure measurement. Given that intraocular pressure is a key factor in glaucoma risk assessment, these findings emphasize the need for alternative intraocular pressure measurement techniques, such as corneal-compensated intraocular pressure or anterior chamber manometry, to improve accuracy in post-refractive surgery patients.

Additionally, while both photorefractive keratectomy and femtosecond laser-assisted in situ keratomileusis demonstrated comparable intraocular pressure changes postoperatively, subtle variations between techniques warrant further investigation. Longitudinal studies with extended follow-up periods and alternative intraocular pressure measurement methods could provide greater insight into the long-term implications of refractive surgery on intraocular pressure dynamics and glaucoma risk assessment.

■ CONCLUSION

The findings of this study demonstrate that corneal refractive surgery leads to a significant reduction in intraocular pressure, with a greater decrease observed following femtosecond laser-assisted in situ keratomileusis compared to photorefractive keratectomy. These results contribute valuable insight into intraocular pressure changes following refractive surgery within the Iraqi population and align with global research on this subject. Given the clinical implications of altered intraocular pressure measurements in post-refractive surgery patients, particularly in glaucoma risk assessment, further research is warranted to validate these findings. Future studies with larger sample sizes, longer follow-up periods, and alternative intraocular pressure measurement techniques will be essential to refining our understanding of intraocular pressure dynamics and improving patient care in both medical and surgical.

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