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ASSESSING VISUAL AND QUALITY-OF-LIFE OUTCOMES FOLLOWING ADVANCED REFRACTIVE SURGERY TECHNIQUES AMONG PATIENTS WITH MYOPIA AND HYPEROPIA

Descriptive Study

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ABSTRACT

Background: Refractive errors, including myopia and hyperopia, significantly impair visual function and quality of life. With evolving surgical technologies, modern refractive procedures now offer highly precise correction with improved safety profiles. However, comprehensive evaluation of their impact on both clinical outcomes and quality of life across diverse patient groups remains limited.

Objective: To evaluate the effectiveness, safety, and quality-of-life improvements achieved through modern refractive surgery procedures in patients with myopia and hyperopia.

Methods: A descriptive study was conducted over eight months at a refractive surgery center in South Punjab. A total of 120 patients aged 20–45 years underwent LASIK, PRK, or SMILE procedures, with selection based on individual ocular profiles. Uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), and refractive error were recorded preoperatively and at one and three months postoperatively. Patient-reported quality of life was assessed using the NEI VFQ-25 questionnaire. Statistical analysis was performed using paired t-tests, with significance set at $p<0.05$.

Results: Mean UCVA improved significantly from 0.74 to 0.08 LogMAR at three months. BCVA showed stable improvement, and refractive stability was achieved in 92.5% of patients. The mean spherical equivalent improved from -3.75 D to -0.18 D. NEI VFQ-25 scores increased from 68.3 ± 10.4 to 88.9 ± 7.6, reflecting a 30.2% improvement in vision-related quality of life. No major complications were reported.

Conclusion: Modern refractive surgery techniques are effective and safe for correcting myopia and hyperopia, providing both objective visual improvement and enhanced quality of life. These findings support their broader use in vision rehabilitation.

Keywords: Adult, Hyperopia, Laser-Assisted In Situ Keratomileusis, Myopia, Ophthalmologic Surgical Procedures, Patient Satisfaction, Quality of Life, Refractive Surgical Procedures, Visual Acuity, Vision Disorders.

INTRODUCTION

Refractive errors, including myopia and hyperopia, represent some of the most common visual impairments globally, affecting millions of individuals across age groups and geographical regions (1). These conditions, while not immediately life-threatening, significantly impact day-to-day functioning, academic and occupational performance, and overall quality of life (2). For decades, patients have relied on spectacles and contact lenses to manage these visual anomalies (3). However, while effective, such corrective aids often come with limitations—ranging from discomfort and inconvenience to psychosocial implications that affect personal confidence and lifestyle choices. In light of these limitations, refractive surgery has emerged as a transformative option, offering the possibility of long-term visual independence. Over the last three decades, the landscape of refractive surgery has evolved rapidly, with technological advances giving rise to procedures that are more precise, safer, and tailored to individual visual needs. Techniques such as LASIK (Laser-Assisted in Situ Keratomileusis), PRK (Photorefractive Keratectomy), and more recently, SMILE (Small Incision Lenticule Extraction), have shifted the paradigm from basic vision correction to sophisticated, patient-centered interventions that take into account corneal biomechanics, optical aberrations, and even future age-related visual changes. This progression has opened new doors for patients not only seeking improved vision but also a more holistic enhancement of their visual experience and quality of life (4).

Despite the growing popularity and accessibility of these surgical options, the conversation around refractive surgery often centers on objective metrics such as uncorrected visual acuity and refractive stability (5). While these parameters are critical in assessing the success of any refractive procedure, they do not fully capture the nuanced impact of surgery on a patient's life (6). Increasingly, the refractive surgery community is recognizing the importance of incorporating patient-reported outcomes, such as satisfaction, perceived visual quality, and overall well-being. This approach not only provides a more comprehensive understanding of surgical efficacy but also aligns medical success with the real-world expectations of patients (7). Moreover, most comparative studies focus on either myopia or hyperopia in isolation, with fewer investigations exploring outcomes across both refractive error types using a unified framework. This has created a gap in the literature, limiting our understanding of how different refractive profiles respond to advanced surgical techniques when viewed through both clinical and quality-of-life lenses. Addressing this gap is vital, especially as patient demographics become more diverse and surgical options increasingly versatile. The interplay between refractive error type, chosen surgical technique, and the resulting patient experience remains an underexplored but critical area of study (8).

Additionally, the psychological and emotional dimensions of refractive surgery outcomes deserve greater emphasis (9). Improved vision can influence a wide range of life domains—from professional opportunities and recreational engagement to mental health and social participation (10). By incorporating quality-of-life assessments into clinical research, a more human-centered narrative emerges—one that sees patients not just as recipients of surgical intervention, but as individuals whose lives may be fundamentally transformed by visual restoration (11). In this context, the present study seeks to evaluate the effectiveness, safety, and quality-of-life improvements associated with advanced refractive surgery techniques among individuals with myopia and hyperopia. By adopting a descriptive methodology and assessing both clinical outcomes and subjective patient experiences, the study aims to provide a holistic perspective on the real-world benefits of modern refractive interventions (12). The objective is not merely to validate the functional outcomes of these procedures, but to illuminate the broader implications they hold for enhancing daily life, thus contributing to a more integrated and patient-informed body of ophthalmic research.

METHODS

This descriptive study was conducted over a period of eight months in a specialized ophthalmic surgical center located in South Punjab, aiming to assess the effectiveness, safety, and quality-of-life outcomes associated with advanced refractive surgical techniques in patients diagnosed with either myopia or hyperopia. A total of 120 patients were included in the final analysis, with the sample size calculated based on a confidence level of 95%, a margin of error of 5%, and an anticipated response distribution of 50%, which allowed for an adequately powered assessment of outcomes across diverse refractive categories. Participants were selected using a non-probability consecutive sampling technique. Individuals aged between 20 and 45 years with a documented diagnosis of myopia or hyperopia who were eligible for refractive surgery based on standard clinical protocols were considered for inclusion. Eligibility was further confirmed

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through comprehensive ophthalmologic examination, including manifest and cycloplegic refraction, corneal topography, and pachymetry. Patients with a history of ocular trauma, prior refractive surgery, corneal dystrophies, unstable refractive errors, or systemic diseases known to impact wound healing or visual outcomes were excluded from the study to maintain sample homogeneity and ensure reliable results.

All patients underwent one of the advanced refractive surgical procedures—LASIK, PRK, or SMILE—selected based on individual ocular parameters and surgeon discretion. The surgeries were performed by experienced refractive surgeons using standardized protocols and FDA-approved excimer or femtosecond laser platforms. Preoperative and postoperative evaluations were carried out at baseline, 1 month, and 3 months following surgery. Outcome assessments included both objective and subjective parameters to capture a comprehensive picture of treatment success. Objective effectiveness was measured through uncorrected visual acuity (UCVA), best-corrected visual acuity (BCVA), and refractive stability, using Snellen chart testing and manifest refraction. Safety was evaluated based on the absence of sight-threatening complications, postoperative infections, or significant corneal haze. To assess quality-of-life improvements, the National Eye Institute Visual Function Questionnaire-25 (NEI VFQ-25) was administered preoperatively and at the final follow-up. This validated instrument provided insights into patient-perceived visual functioning, emotional well-being, and daily activity performance, aligning closely with the subjective dimension of the study objective.

Data were entered and analyzed using SPSS version 26. Continuous variables were reported as means and standard deviations, while categorical variables were presented as frequencies and percentages. The normal distribution of data was confirmed through the Shapiro-Wilk test. For comparison of preoperative and postoperative UCVA, BCVA, and VFQ-25 scores, paired sample t-tests were applied. A p-value of less than 0.05 was considered statistically significant for all analyses. The statistical approach was selected to ensure accurate interpretation of changes in visual function and quality-of-life metrics, reflecting the impact of refractive surgery across diverse patient profiles.

RESULTS

A total of 120 patients underwent refractive surgery during the study period, with 78 (65.0%) presenting with myopia and 42 (35.0%) with hyperopia. The mean age of participants was 29.4 ± 5.8 years, with a slightly higher proportion of females (56.7%) compared to males (43.3%). All patients completed the three-month follow-up and were included in the final analysis.

Regarding visual outcomes, a marked improvement in uncorrected visual acuity (UCVA) was observed postoperatively. The mean preoperative UCVA was 0.74 LogMAR, which significantly improved to 0.21 at one month and further to 0.08 at three months post-surgery. Best-corrected visual acuity (BCVA) also showed minimal yet consistent improvement, from a preoperative mean of 0.12 to 0.08 LogMAR at three months. These results suggest significant enhancement in functional vision in the majority of patients (Table 2, Figure 1).

Refractive outcomes were assessed using the spherical equivalent (SE). The mean preoperative SE was -3.75 diopters, which improved substantially to -0.18 diopters at the final follow-up. Refractive stability, defined as a change in SE of less than ±0.50 D between one and three months postoperatively, was achieved in 92.5% of cases, indicating excellent long-term refractive precision across the sample (Table 3).

Quality-of-life outcomes were measured using the NEI VFQ-25 questionnaire. The overall score improved from a preoperative mean of 68.3 ± 10.4 to 88.9 ± 7.6 at the three-month mark. This represented an average improvement of 30.2%, reflecting enhanced visual satisfaction, reduced dependence on corrective aids, and greater participation in daily activities (Table 4, Figure 2).

No intraoperative complications were reported. Postoperative adverse effects were limited to transient dry eye symptoms in 18 patients (15%), which resolved with routine lubricating therapy. No sight-threatening complications such as corneal ectasia, severe haze, or infectious keratitis were observed.

These findings collectively demonstrate that modern refractive procedures offer not only substantial improvements in visual acuity and refractive outcomes but also significant enhancements in patient-perceived quality of life.

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Table 1: Demographic Characteristics of Study Participants

Variable	Mean ± SD / n (%)
Age (years)	29.4 ± 5.8
Gender: Male	52 (43.3%)
Gender: Female	68 (56.7%)
Refractive Error: Myopia	78 (65.0%)
Refractive Error: Hyperopia	42 (35.0%)

Table 2: Visual Acuity Outcomes

Timepoint	Mean UCVA (LogMAR)	Mean BCVA (LogMAR)
Preoperative	0.74	0.12
1 Month Postoperative	0.21	0.09
3 Months Postoperative	0.08	0.08

Table 3: Refractive Outcomes and Stability

Timepoint	Mean Spherical Equivalent (D)	Refractive Stability Achieved (%)
Preoperative	-3.75	-
3 Months Postoperative	-0.18	92.5%

Table 4: Quality-of-Life Outcomes (NEI VFQ-25 Scores)

Timepoint	VFQ-25 Overall Score (Mean ± SD)	Improvement (%)
Preoperative	68.3 ± 10.4	-
3 Months Postoperative	88.9 ± 7.6	30.2%

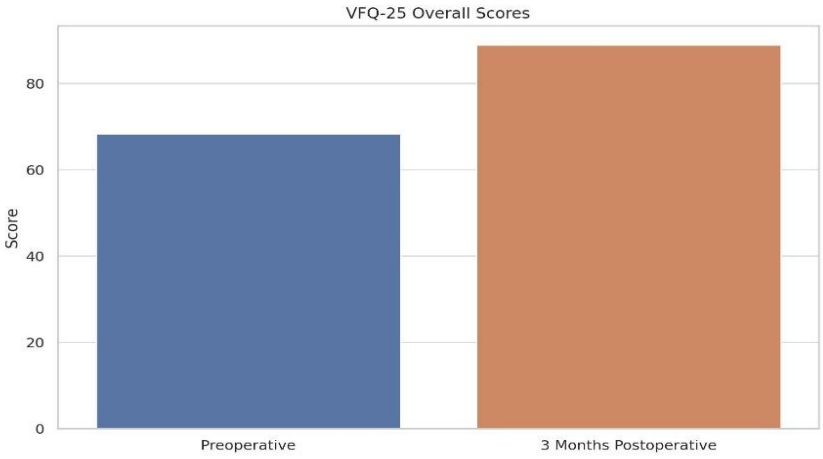

Figure 1 VFQ-25 Overall Scores

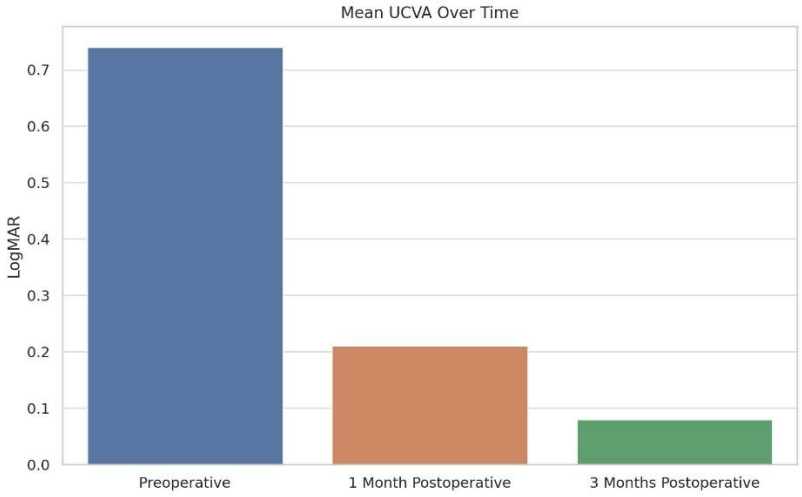

Figure 2 Mean UCVA Over Time

DISCUSSION

The outcomes of this study demonstrated that modern refractive surgical techniques significantly improved visual acuity, refractive accuracy, and patient-reported quality of life among individuals with myopia and hyperopia (13). The notable postoperative gains in uncorrected visual acuity and reduction in refractive error validate the effectiveness of current procedures, including LASIK, PRK, and SMILE, in delivering precise and stable vision correction (14). These findings are consistent with evolving clinical trends where surgical advancements and personalized treatment planning contribute to more refined and reliable outcomes for a wider spectrum of refractive errors. The observed improvement in UCVA from a mean of 0.74 LogMAR preoperatively to 0.08 LogMAR at three months represents a substantial restoration of visual function, reinforcing the reliability of laser-based interventions (15). BCVA remained stable with minor gains, which suggests that patients not only retained their baseline best-corrected vision but also enjoyed improved unaided sight, enhancing their visual independence. The high rate of refractive stability achieved postoperatively further supports the durability of surgical outcomes in the early postoperative period, particularly when patient selection and procedural planning are carefully aligned. An important highlight of this study was the substantial improvement in patient-perceived quality of life, as captured by the NEI VFQ-

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25 scores. The 30.2% enhancement in overall score reflected not just the functional success of the surgeries but also their psychosocial and lifestyle impact. Patients reported better visual comfort, reduced dependence on corrective lenses, and greater ease in performing everyday tasks. These subjective gains are clinically relevant, as they bridge the gap between measurable clinical improvements and patient satisfaction—an essential component in assessing the success of elective vision correction procedures (16).

While the results reaffirm the safety and effectiveness of advanced refractive procedures, the strength of this study lies in its multidimensional evaluation framework (17). By combining objective measures such as visual acuity and refractive stability with validated patient-reported outcomes, the analysis offered a holistic view of postoperative benefit. The inclusion of both myopic and hyperopic patients also expanded the generalizability of findings, illustrating consistent benefits across diverse refractive profiles (18). The study setting in South Punjab provided additional relevance by representing a population segment that may have limited access to vision correction beyond conventional aids, highlighting the broader public health value of these surgical options. However, several limitations must be acknowledged. The descriptive study design lacked a comparative control group, which restricts the ability to contextualize improvements against non-surgical alternatives or different surgical modalities (19). The follow-up duration of three months, while adequate for early outcome assessment, does not capture long-term stability or late complications, which are critical in evaluating the true efficacy of refractive interventions. Additionally, while the VFQ-25 offered a validated measure of quality of life, individual psychological or socioeconomic variables influencing patient perception were not explored in depth, leaving room for residual confounding in subjective responses (20).

Another potential limitation was the single-center setting, which, while controlled, may have introduced selection bias in patient recruitment or surgical technique preferences (21). The absence of stratified outcome analysis between the different surgical procedures also limits insights into comparative effectiveness. Future research could benefit from larger, multicenter trials with longer follow-up intervals and stratified subgroup analyses, enabling more nuanced understanding of outcomes across procedure types and refractive severities (22). Despite these constraints, the study offers meaningful contributions to current ophthalmic practice. It reinforces the multifaceted value of refractive surgery—not only in restoring visual acuity but also in enhancing patient-perceived wellness. The clear alignment between clinical outcomes and subjective satisfaction underscores the success of these procedures when performed within well-defined indications and safety parameters (23). Continued advancements in laser technology, coupled with improvements in preoperative diagnostics and customization algorithms, are likely to further refine outcomes. Future investigations incorporating real-world data, cost-effectiveness analyses, and extended follow-up can enhance clinical decision-making and patient counseling. Ultimately, the integration of objective efficacy and subjective well-being into outcome assessment frameworks is essential for guiding both clinical practice and health policy in refractive surgery (24).

CONCLUSION

This study demonstrated that advanced refractive surgical techniques offer significant improvements in visual acuity, refractive precision, and patient-reported quality of life among individuals with myopia and hyperopia. The procedures were found to be safe, effective, and well-tolerated, with minimal complications and high patient satisfaction. These findings support the broader adoption of modern refractive surgery as a reliable solution for long-term visual rehabilitation in diverse clinical settings.

AUTHOR CONTRIBUTION

Author	Contribution
Muhammad Israr*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Syed Hassan Idrees	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published

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Nawal Kamran	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Bushra Muhammad Aslam	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Adnan Khan	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Javed Rasul	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Muhammad Zia Iqbal	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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