

The Effectiveness of the Use of Phakic Intraocular Lenses to Correct Myopia

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Annotation: Myopia, or nearsightedness, is one of the most prevalent refractive errors worldwide and is increasing in incidence, particularly among young adults. While spectacles and contact lenses offer temporary correction, surgical approaches such as phakic intraocular lens (pIOL) implantation have emerged as long-term solutions for patients with high degrees of myopia who are not candidates for corneal refractive surgeries like LASIK due to thin corneas or other contraindications. This study aimed to evaluate the clinical efficacy, safety, and visual outcomes of posterior chamber phakic intraocular lens implantation in patients with moderate to high myopia. A prospective clinical investigation was conducted on 80 patients (160 eyes) aged 21–45 years with myopic refractive errors ranging from -6.0 D to -20.0 D. Patients were selected based on anterior chamber depth, endothelial cell density, and general ocular health. Visual acuity, refractive stability, intraocular pressure (IOP), endothelial cell count, and patient satisfaction were assessed preoperatively and postoperatively at regular intervals over a 12-month follow-up. The study demonstrated significant improvement in uncorrected visual acuity (UCVA), with 92% of eyes achieving 20/25 vision or better. There were no cases of significant endothelial cell loss, lens dislocation, or secondary glaucoma. These findings support the effectiveness of phakic intraocular lenses as a viable, reversible, and stable method of correcting myopia, particularly

in cases where corneal refractive surgery is contraindicated.

Keywords: myopia, phakic intraocular lens, refractive surgery, visual acuity, implantable collamer lens, posterior chamber lens, high myopia, intraocular pressure.

Introduction: Myopia is a major global health concern, with projections indicating that nearly half of the world's population will be affected by 2050. In cases of moderate to high myopia, traditional corrective methods such as glasses and contact lenses often fall short in providing adequate visual quality and may be associated with limitations in lifestyle, professional performance, or long-term compliance. Laser-based corneal refractive surgeries, while effective, are not suitable for all patients due to anatomical limitations such as insufficient corneal thickness, irregular corneal topography, or pre-existing dry eye syndrome. In such scenarios, phakic intraocular lenses (pIOLs) provide an alternative, offering high-quality vision without altering the corneal structure. Phakic IOLs are implanted into the eye without removing the natural crystalline lens, thus maintaining accommodation and preserving natural vision dynamics. The most commonly used models include iris-fixated, angle-supported, and posterior chamber implantable collamer lenses (ICLs). Among these, the posterior chamber ICL has gained popularity due to its favorable safety profile and optical performance. This study evaluates the visual and refractive outcomes following posterior chamber pIOL implantation in myopic patients and aims to establish its role in modern refractive surgery practice.

Materials and Methods: This prospective clinical study was conducted at the Department of Ophthalmology, Samarkand State Medical University, involving 80 patients (160 eyes) between the ages of 21 and 45 with stable myopia for at least one year and refractive errors ranging from -6.0 D to -20.0 D. Patients were selected based on comprehensive ocular assessments including slit-lamp examination, manifest and cycloplegic refraction, keratometry, pachymetry, endothelial cell count using specular microscopy, anterior chamber depth (ACD) measurement via anterior segment OCT, and fundus examination to rule out retinal pathology. Only patients with an ACD ≥ 2.8 mm and endothelial cell count > 2200 cells/mm² were included. Patients with history of uveitis, cataract, glaucoma, retinal disease, or systemic autoimmune conditions were excluded. All procedures were performed under local anesthesia using Visian Implantable Collamer Lenses (ICLs) implanted in the posterior chamber. A peripheral iridotomy was created preoperatively to prevent pupillary block. Postoperative treatment included topical antibiotics, corticosteroids, and intraocular pressure-lowering agents as needed. Patients were evaluated on postoperative day 1, week 1, and months 1, 3, 6, and 12. Outcome measures included uncorrected and best-corrected visual acuity (UCVA, BCVA), spherical equivalent refraction, IOP, endothelial cell density, and subjective patient satisfaction scores. Statistical analysis was performed using SPSS 25.0 with paired t-tests for comparison of pre- and post-operative values. A p-value < 0.05 was considered statistically significant.

Results: The mean age of patients was 29.7 ± 6.2 years, with an average preoperative spherical equivalent of -11.4 ± 3.2 D. The mean preoperative UCVA was 0.12 ± 0.08 (Snellen equivalent), while the mean postoperative UCVA at 12 months improved to 0.85 ± 0.10 , with 92% of eyes achieving 20/25 vision or better. The mean BCVA remained stable or improved in all cases. Postoperative refractive error ranged from -0.50 D to +0.25 D, indicating high refractive accuracy. IOP remained within normal limits throughout the follow-up period in all patients. The mean endothelial cell loss was 2.1% at 12 months, which is within acceptable safety thresholds. No significant complications such as cataract formation, pigment dispersion, lens rotation, or angle closure were noted. One case of mild postoperative inflammation resolved with

corticosteroid therapy. Subjective patient satisfaction was high, with 94% reporting improved quality of life, independence from glasses or contact lenses, and visual comfort.

Discussion: The results of this study confirm the high efficacy and safety of posterior chamber phakic intraocular lenses in the correction of moderate to high myopia, especially in patients unsuitable for LASIK or PRK. The rapid visual recovery, stability of refractive outcomes, and preservation of the corneal architecture make pIOLs a desirable option. The low rate of complications and minimal endothelial cell loss reinforce the safety of modern ICL designs when proper patient selection and surgical technique are employed. Compared to laser refractive surgery, pIOL implantation offers reversibility and predictability in high refractive errors, with a lower risk of inducing higher-order aberrations or corneal ectasia. Furthermore, the maintenance of natural lens function allows for continued accommodation, which is particularly beneficial for young patients. However, careful preoperative evaluation is essential to identify suitable candidates and prevent potential postoperative issues such as angle narrowing or pupillary block. Future advancements in ICL materials and customization may further expand its indications and improve long-term outcomes.

Conclusion: Phakic intraocular lenses represent an effective, safe, and reversible solution for correcting moderate to high myopia in patients contraindicated for corneal refractive surgery. The posterior chamber ICL provides excellent visual outcomes, high patient satisfaction, and minimal complications when appropriate surgical protocols and patient selection criteria are followed. Given the increasing prevalence of myopia globally, pIOLs should be considered a key component of refractive surgical options in modern ophthalmic practice.

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