Commentary
Volume 11:05, 2024

Journal of Lasers, Optics & Photonics

ISSN: 2469-410X **Open Access**

Review of the Clinical Assessment of Corneal Endothelial Parameters after Laser Refractive Surgery in Myopic Eyes

Judei Jang*

Department of Ophthalmology, Military Institute of Medicine - National Research Institute in Warsaw, 04-141 Warsaw, Poland

Introduction

Laser refractive surgery, including procedures such as LASIK and PRK, has revolutionized the management of myopia (nearsightedness). While these surgeries are widely regarded as safe and effective, their impact on corneal endothelial cells has become a critical focus for ophthalmologists and researchers. The corneal endothelium, a single layer of cells on the inner surface of the cornea, plays a vital role in maintaining corneal clarity and homeostasis. This review aims to assess the clinical evaluation of corneal endothelial parameters after laser refractive surgery, highlighting how these procedures influence Endothelial Cell Density (ECD), morphology, and overall corneal health in myopic patients. The corneal endothelium is crucial for maintaining corneal transparency [1]. It regulates the hydration of the corneal stroma by controlling the movement of fluids between the aqueous humor and the corneal stroma. The endothelium consists of hexagonal cells that help maintain an optimal balance of hydration. Endothelial Cell Density (ECD) typically decreases with age, but significant losses can occur due to pathological conditions or surgical interventions. Laser refractive surgeries, particularly LASIK and PRK, involve alterations to the corneal structure, which can potentially lead to endothelial cell loss.

The creation of the corneal flap in LASIK can cause direct damage to the endothelium. Additionally, the excimer laser ablation process may also induce transient or permanent endothelial cell damage. Surgical procedures trigger an inflammatory response, which can affect endothelial cell viability. Post-operative inflammation can lead to apoptosis of endothelial cells. Alterations in the ocular surface post-surgery, such as dry eye syndrome, can impact endothelial health by affecting nutrient availability. One of the primary parameters assessed post-surgery is ECD, which is measured in cells per square millimeter. Studies have reported a decrease in ECD following laser refractive surgery, but the extent of this decrease varies widely among patients and depends on several factors, including the surgical technique, laser parameters, and individual patient characteristics [2,3]. Research comparing LASIK and PRK has shown that LASIK may result in a more significant initial decrease in ECD compared to PRK. However, the long-term outcomes may be similar between the two procedures, with both techniques typically resulting in ECD stabilizing over time. Reports indicate a reduction in ECD ranging from 5% to 20% immediately post-operatively, stabilizing within six months to one year. The loss of ECD is generally less pronounced, with studies showing decreases of around 3% to 10% post-operatively, stabilizing similarly over time.

Description

In addition to ECD, the morphology of endothelial cells is a significant parameter for assessing corneal health. This includes measurements of cell shape and size, typically evaluated through parameters such as the Coefficient of Variation (CV) in cell area and the percentage of hexagonal cells. A higher CV indicates a higher variability in cell size, which is associated with compromised endothelial function. Post-surgical assessments have shown that while ECD may decline, hexagonal cell percentage can remain stable or even improve, indicating a compensatory response of the remaining healthy cells.

An increase in the CV post-surgery can indicate an adverse effect on endothelial health, suggesting that the endothelium is undergoing stress and may not be functioning optimally. Long-term follow-up studies are essential to understand the sustainability of corneal endothelial health post-surgery. Most research indicates that while there is an initial decrease in ECD, the cells tend to stabilize and may even exhibit compensatory hyperplasia, particularly in younger patients with healthy pre-operative endothelial health. Specular microscopy is the gold standard for assessing ECD and cell morphology. This non-invasive imaging technique provides detailed information about endothelial cell density, morphology, and viability. Quick, reproducible, and allows for direct visualization of endothelial cells. Operator-dependent and accuracy can be affected by corneal edema or other surface irregularities.

Confocal microscopy provides a more in-depth view of corneal structures, including the endothelium. It allows for the visualization of individual cell layers and the assessment of cell morphology at a cellular level. OCT has emerged as a complementary tool for evaluating corneal structures, including the endothelium. Although traditionally used for imaging retinal structures, advancements have allowed for its application in corneal imaging. Younger patients generally exhibit better endothelial cell recovery and health post-surgery compared to older individuals. This can be attributed to the greater regenerative potential of younger corneas. Patients with a higher pre-operative ECD may experience less significant declines post-surgery. Conversely, those with lower initial ECD may be at higher risk for complications and greater loss of endothelial cells. Conditions such as diabetes, ocular surface diseases, or previous ocular surgeries can negatively impact endothelial health post-refractive surgery. The choice of surgical technique can significantly influence post-operative endothelial outcomes. Additionally, advancements in laser technology, such as femtosecond lasers, may reduce the risk of endothelial damage.

Given the potential for endothelial cell loss and morphological changes post-surgery, routine monitoring of endothelial parameters is essential. This is particularly crucial for patients with pre-existing risk factors or those undergoing more extensive corrections. Surgeons should counsel patients about the potential risks to endothelial health associated with laser refractive surgery. Providing detailed information on expected outcomes, potential complications, and the importance of post-operative follow-up can help manage patient expectations. Surgeons should consider individual patient factors, such as age, pre-operative endothelial cell density, and existing ocular conditions, when planning surgical interventions. Tailoring surgical approaches to minimize risks can enhance overall outcomes [4,5].

Conclusion

The clinical assessment of corneal endothelial parameters after laser refractive surgery in myopic eyes is a crucial aspect of ensuring patient safety and optimal visual outcomes. While laser refractive surgery has proven effective in correcting myopia, careful evaluation of endothelial cell density, morphology, and long-term health is essential. Further research is needed

***Address for Correspondence:** Judei Jang, Department of Ophthalmology, Military Institute of Medicine - National Research Institute in Warsaw, 04-141 Warsaw, Poland; E-mail: judeijang@gmail.com*

Received: 02 September, 2024, Manuscript No. JLOP-24-152156; **Editor Assigned:** 04 September, 2024, PreQC No. P-152156 **Reviewed:** 16 September, 2024; QC No. Q-152156; **Revised:** 23 September, 2024; Manuscript No. R-152156; **Published:** 30 September, 2024, DOI: 11.37421/2469-411X.2024.11.161

to explore the underlying mechanisms of endothelial changes post-surgery, identify risk factors for significant endothelial loss, and develop strategies to mitigate these risks. Ongoing advancements in imaging technology will continue to improve our understanding of corneal endothelial health and refine surgical techniques to ensure the best possible outcomes for patients seeking refractive surgery. In conclusion, while laser refractive surgery offers significant benefits for myopic patients, vigilance in monitoring corneal endothelial parameters is vital to preserve corneal integrity and maintain long-term visual health.

Acknowledgement

None.

Conflict of Interest

None.

References

1. Gambato, Catia, Evelyn Longhin, Anton Giulio Catania and Daniela Lazzarini, et al. "Aging and corneal layers: An *in vivo* corneal confocal microscopy study." *Graefes Arch Clin Exp Ophthalmol* 253 (2015): 267-275.
2. Duman, Rahmi, Mediha Tok Çevik, Sadık Görkem Çevik and Reşat Duman, et al. "Corneal endothelial cell density in healthy Caucasian population." *Saudi J Ophthalmol* 30 (2016): 236-239.
3. Feizi, Sepehr. "Corneal endothelial cell dysfunction: Etiologies and management." *Ther Adv Ophthalmol* 10 (2018): 2515841418815802.
4. Seiler, T. "Current evaluation of myopia correction with the excimer laser." *Ophthalmologe* 92 (1995): 379-384.
5. Lubatschowski, Holger, G. Maatz, A. Heisterkamp and U. Hetzel, et al. "Application of ultrashort laser pulses for intrastromal refractive surgery." *Graefes Arch Clin Exp Ophthalmol* 238 (2000): 33-39.

How to cite this article: Jang, Judei. “Review of the Clinical Assessment of Corneal Endothelial Parameters after Laser Refractive Surgery in Myopic Eyes.” *J Laser Opt Photonics* 11 (2024): 161.