Advances in Corneal Transplantation: Techniques and Outcomes.

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Introduction

Corneal transplantation, also known as keratoplasty, has seen significant advancements over the past few decades. These innovations have improved surgical outcomes, reduced recovery times, and enhanced the quality of life for patients suffering from corneal diseases. This article delves into the latest techniques in corneal transplantation and their outcomes, highlighting the evolution of this critical surgical procedure [1].

Corneal transplantation involves replacing a damaged or diseased cornea with a healthy donor cornea. The procedure is often necessary for patients with conditions such as keratoconus, corneal dystrophies, corneal scars, or corneal edema. Traditionally, penetrating keratoplasty (PK) was the standard method, but recent advancements have introduced various lamellar keratoplasty techniques that target specific layers of the cornea, offering several benefits over traditional methods [2].

PK involves the full-thickness transplantation of the cornea. The damaged cornea is completely removed and replaced with a donor cornea. Suitable for extensive corneal damage involving multiple layers. Long track record of successful outcomes. Higher risk of complications such as rejection and infection. Greater likelihood of postoperative astigmatism. Lamellar keratoplasty techniques have revolutionized corneal transplantation by allowing partial-thickness transplants, which involve only specific layers of the cornea [3,4].

DALK involves replacing only the anterior (front) layers of the cornea, preserving the patient's healthy endothelium (the innermost layer). Lower risk of rejection compared to PK since the endothelium is preserved. Better visual outcomes due to less induced astigmatism. Technically more challenging than PK. Potential for interface haze between donor and recipient tissues. Studies have shown that DALK provides excellent visual outcomes and long-term graft survival [5].

DSEK/DSAEK involves replacing the damaged endothelium and Descemet's membrane with donor tissue. This technique is often used for conditions like Fuchs' dystrophy and other endothelial disorders. Faster visual recovery compared to PK. Smaller incision, reducing the risk of complications and promoting quicker healing. Potential for graft dislocation requiring repositioning. Limited applicability for conditions involving anterior corneal layers [6].

DSEK/DSAEK has shown high success rates with rapid visual recovery and long-term graft survival. DMEK is a more refined version of endothelial keratoplasty, involving the transplantation of only Descemet's membrane and the endothelium. Excellent visual outcomes due to closer anatomical restoration. Lower rejection rates compared to DSEK/DSAEK. Highly technically demanding with a steep learning curve. Higher risk of graft detachment compared to other techniques [7].

DMEK is associated with superior visual outcomes and lower long-term complication rates. PDEK is a newer technique that involves transplanting the Descemet's membrane, endothelium, and a thin layer of the pre-Descemet's layer. Enhanced visual outcomes due to improved anatomical match. Limited long-term data compared to more established techniques. Early studies suggest promising visual and clinical outcomes [8].

The use of femtosecond lasers in corneal transplantation allows for precise, bladeless cuts, improving the accuracy and consistency of the procedure. Enhanced precision and control during surgery. Reduced risk of human error. Improved wound healing and graft alignment. Requires access to advanced laser technology, which can be costly. Limited availability in some regions. Femtosecond laser-assisted keratoplasty has demonstrated improved graft stability, reduced astigmatism, and faster visual recovery [9].

Research into bioengineered corneas aims to develop synthetic or lab-grown corneal tissues to address donor tissue shortages. Still in experimental stages with ongoing research required. Long-term outcomes not yet fully understood. Initial studies are promising, indicating the potential for effective and safe bioengineered corneas. Stem cell therapy involves using stem cells to regenerate damaged corneal tissue, offering a potential treatment for various corneal disorders. Potential to restore vision without the need for donor tissue. May provide solutions for currently untreatable corneal conditions [10].

Conclusion

Advances in corneal transplantation techniques have significantly improved the outcomes for patients with corneal diseases. From the traditional full-thickness PK to the more sophisticated lamellar techniques like DALK, DSEK/DSAEK, and DMEK, each method offers specific advantages and challenges. Innovative approaches such as femtosecond

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laser-assisted keratoplasty, bioengineered corneas, and stem cell therapy promise to further enhance the field, offering hope for even better visual outcomes and broader accessibility in the future. As research continues to evolve, the future of corneal transplantation looks bright, with the potential to restore vision for countless individuals worldwide.

References

1. Zhou Y, Wang T, Tuli SS. Overview of corneal transplantation for the nonophthalmologist. Transplant Direct. 2023;9(2):e1434.
2. Romano V, Iovieno A, Parente G. Long-term clinical outcomes of deep anterior lamellar keratoplasty in patients with keratoconus. Am J Ophthalmol. 2015;159(3):505-11.
3. Melles GR. Landmark study on Descemet stripping with endothelial keratoplasty: Where has it led us?. J Refract Surg. 2021;47(5):561-2.
4. Veldman PB, Terry MA, Straiko MD. Evolving indications for Descemet's stripping automated endothelial keratoplasty. Curr Opin Ophthalmol. 2014;25(4):306-11.
5. Price Jr FW, Price MO. Evolution of endothelial keratoplasty. Cornea. 2013;32:S28-32.
6. Green M, Wilkins MR. Comparison of early surgical experience and visual outcomes of DSAEK and DMEK. Cornea. 2015;34(11):1341-4.
7. Agarwal A, Dua HS, Narang P, et al. Pre-Descemet's endothelial keratoplasty (PDEK). Br J Ophthalmol. 2014;98(9):1181-5.
8. Moshirfar M, Jehangir N, Fenzl CR. LASIK enhancement: clinical and surgical management. J Refract Surg. 2017;33(2):116-27.
9. Abou Shousha M, Yoo SH, Kymionis GD, et al. Long-term results of femtosecond laser-assisted sutureless anterior lamellar keratoplasty. Ophthalmol. 2011;118(2):315-23.
10. Alió del Barrio JL, De la Mata A, De Miguel MP, et al. Corneal regeneration using adipose-derived mesenchymal stem cells. Cells. 2022;11(16):2549.

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