Femto-assisted penetrating kearoplasty and suction trephination conventional penetrating keratoplasty (types, techniques, advantages and disadvantages)

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ABSTRACT
In order to enhance donor-to-host alignment, boost wound stability, maintain more healthy endothelium, and enhance final best spectacle-corrected visual acuity, numerous donor and host corneal cutting procedures have been developed over time (BSCVA). The traditional method of corneal transplantation in most countries is still done manually, using a cylindrical blade trephine and punch to make donor and host corneal buttons. This is because it is relatively inexpensive and accessible. The vacuum trephine is commonly employed in the United States for conventional penetrating keratoplasty (PKP). The blade trephine produces a wound with a vertical, straight edge. It requires numerous somewhat tight sutures to support the demands of intraocular pressure since it is relatively unstable and sluggish to heal. In addition to uneven suture tension, donor and host corneal tissue's vertical and rotational misalignment causes optical distortion, which increases postoperative astigmatism and decreases BSCVA. It was suggested that stepped corneal incisions with horizontal lamellar donor-host contact surfaces might enhance incisional alignment and wound stability. The typical method for making these incision patterns has proved to be technically difficult, which has limited their broad adoption. BCVA and postoperative astigmatism have been found in numerous trials using the FSL for PKP to be superior to or on par with traditional PKP. Postoperative endothelial cell counts associated with FSL-assisted PKP are similar to or superior to those associated with traditional PKP, according to the literature.

Keywords: Femto-assisted, kearoplasty, trephination.

Since Edward Zirm conducted the first successful human corneal transplant more than a century ago, corneal transplantation methods have advanced quickly (1). In order to enhance donor-to-host alignment, boost wound stability, maintain more healthy endothelium, and enhance final best spectacle-corrected visual acuity, numerous donor and host corneal cutting procedures have been developed over time (BSCVA)(2).

These procedures have progressed from using manual methods (such as hand-held trephination, suction trephines, etc.) and motorised devices to presently utilising laser-enabled systems. The traditional method of corneal transplantation in most countries is still done manually, using a cylindrical blade trephine and punch to make donor and host corneal buttons. This is because it is relatively inexpensive and accessible. The vacuum trephine is commonly employed in the United States for conventional penetrating keratoplasty (PKP).

The blade trephine produces a wound with a vertical, straight edge. It requires numerous somewhat tight sutures to support the demands of intraocular pressure since it is relatively unstable and sluggish to heal. In addition to uneven suture tension, donor and host corneal tissue's vertical and rotational misalignment causes optical distortion, which increases postoperative astigmatism and decreases BSCVA. The use of mechanical motor trephination, which was intended to address some of these problems, has mostly been discontinued for PKP because it was linked to greater rates of graft decentration(7). It was suggested that stepped corneal incisions with horizontal lamellar donor-host contact surfaces might enhance incisional alignment and wound stability (2). Unfortunately, the typical method for making these incision patterns has proved to be technically difficult, which has limited their broad adoption. With the development of laser technology, a range of precise corneal trephination patterns have been made possible that were not possible with manual and mechanical technologies. With encouraging outcomes, keratoplasty has been performed on people using both excimer and femtosecond lasers (FSLs). Since the 1980s, the excimer laser has been used for corneal trephination, and studies have shown that it provides superior refractive results than manual trephination, including decreased postoperative keratometric astigmatism and increased visual acuity (5). However, because surgeons may use the FSL for laser in situ keratomileusis, it has grown in popularity for corneal transplantation over time (LASIK). In patients with corneal disease, reports of the first successful FSL-assisted keratoplasty procedures were published in 2007(6) .and FSL has accrued the greatest number of treated eyes compared with excimer laser. For this reason, we focus on the use of the FSL for keratoplasty in this article.

Femtosecond laser-assisted penetrating keratoplasty

BCVA and postoperative astigmatism have been found in numerous trials using the FSL for PKP to be superior to or on par with traditional PKP (7). When compared to standard PKP, some studies show an improvement in BSCVA and astigmatism up to 6 months after surgery.(36). With comparable long-term visual outcomes to traditional PKP, this translates to a quicker period to visual recovery for patients. Faster wound healing due to better tissue alignment may be the cause of the quicker visual recovery.

These studies have also shown that early suture removal is possible when wounds heal more quickly(7). Moreover, postoperative endothelial cell counts associated with FSL-assisted PKP are similar to or superior to those associated with traditional PKP, according to the literature (7). Some studies have found no better visual and refractive results with FLEK compared to traditional keratoplasty at any time period, which is troubling given that the FSL is substantially more expensive to employ than vacuum trephination(8). Particularly in patients with keratoconus, it is hypothesised that the applanation utilised by the FSL may cause oval trephination of the host cornea, which may disrupt graft-host tissue alignment and lead to severe postoperative corneal astigmatism (5). It has been suggested that noncontact laser trephination techniques, including those utilising the excimer laser, could resolve these problems.(39). To further study this matter, a prospective randomised trial contrasting FSL-assisted penetrating keratoplasties with conventional trephination and maybe excimer-laser trephination has to be conducted.

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