

Different techniques for performing DALK: are they making a real difference?

Alireza Baradaran-Rafii, Hamidreza Hasani

Penetrating keratoplasty (PKP) is a highly successful procedure in which full thickness cornea is replaced. Recent advancements in surgical techniques and instrumentation have shifted away from conventional PKP to Deep Anterior Lamellar Keratoplasty (DALK) performed by several forms of manual, microkeratome/femtosecond laser-assisted lamellar procedures.

Deep anterior lamellar keratoplasty has been used as an alternative to PKP especially in keratoconus and corneal scarring¹⁻⁴ with some advantages compared with PKP including reduced risk of intraoperative complications, elimination the risk of endothelial graft rejection, and minimal endothelial cell loss.^{1 5 6} Therefore, it is the first choice for many surgeons that appreciate the advantages of an extraocular surgery, associated good visual outcome and the absence of endothelial rejection. However, technical difficulties, protracted operating times and the risk of corneal intraoperative perforation limit its general popularity.⁷ However, as perforation of Descemet's membrane may occur in a few cases of DALK, conversion to PKP may be inevitable.⁸

Different techniques for DALK have been introduced³ of them, the Anwar (big-bubble) and Melles techniques are the 2 most popular. Both techniques for keratoconus have comparable visual, refractive, aberrometric and biomechanical outcomes, except for contrast sensitivity, which is better with the Anwar technique.⁹

The femtosecond laser (FSL) as a surgical knife makes precise corneal incisions for both donor and recipient corneas, which leads to the better donor-host fit and increased donor-host junction surface area contact, which theoretically may result in faster wound healing, reduced astigmatism and rapid visual recovery.^{10 11} Femtosecond laser-assisted shaped wound configurations in DALK can combine the mechanical and wound healing

advantages. DALK can be performed in different configurations such as mushroom, top-hat, decagonal, conventional circular, Christmas tree and zigzag forms. Up to now, there is no randomized clinical trial to prove any priority among them.¹²⁻¹⁴ Also it seems that visual results, refractive outcomes and complications are comparable with conventional trephination techniques.¹⁵⁻¹⁷ Newer low-energy, high-frequency FSL machines can further minimize the FSL complications, but the high cost is now the most important limiting factor for widespread use of this technique.⁹

Larger anterior diameter cut provided by FSL mushroom configuration has been claimed to be superior to traditional straight cuts and might have an additive advantage in keratoconus cases and extensive corneal scars as it provides a larger anterior surface. In addition, mechanical stability may be better preserved in the mushroom configuration due to the step-form of its interface.¹¹

In keratoconus with irregular corneal thickness, the remaining undulating stromal bed achieved by Melles type dissection may cause decreased visual acuity and reduced contrast sensitivity.^{9,15} Also, femtosecond-assisted DALK (F-DALK) without big-bubble creation will lead to a remaining irregular stromal thickness that may also decrease the quality of vision. Thus, it would be better to complete F-DALK by injecting the air bubble into the residual stromal bed, thereby creating a big bubble to expose the Descemet's membrane.¹⁸

In the current valuable paper under the title of "Comparison between femtosecond laser mushroom configuration and manual trephine straight-edge configuration deep anterior lamellar keratoplasty" by Shehadeh-Mashor *et al*,¹⁹ two small series of patients (F-DALK versus manual trephination) with different etiologies (keratoconus, post-LASIK keratectasia, and corneal scarring) have been compared. The visual and refractive outcomes were similar but earlier visual recovery occurred with FSL mushroom configuration when compared to manual trephination straight edge DALK. Noticeably,

surgical techniques both in recipients and donors specially type of trephination (Mushroom versus conventional circular) and recipient dissections (Melles, Anwar, and pre-Descemet) are not the same. Also, suturing techniques and suture removal time points are different. Definite conclusions will certainly need to further randomized clinical trials with longer follow ups.

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