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New Lenticule Extraction Platforms

An overview of two procedures currently available outside the United States.

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CLEAR for Advanced Refractive Correction

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Refractive lenticule extraction was introduced almost a decade ago. Since then, much has been learned about its clinical efficacy, safety, complications and their management, and short- to medium-term outcomes. The next evolution in refractive lenticule extraction will take many forms. One example is corneal lenticule extraction for advanced refractive correction (CLEAR), which is performed with the Femto LDV Z8 laser (Ziemer Ophthalmic Systems).

The CLEAR procedure is an optional software upgrade to the Z8 multipurpose laser, which may also be used for cataract surgery, corneal transplantation, pterygium surgery, tunnel and pocket creation for inlays, and LASIK flap creation. The CLEAR procedure received the CE Mark in April 2020 for the correction of -0.50 to -10.00 D sphere and up to -5.00 D cylinder.

ADVANTAGES

Treatment centration. One advantage of CLEAR is that it offers a wide range of centration options (Figure 1).^{1,2} The Femto LDV Z8 allows repositioning of the planned lenticule with the touchscreen after suction is activated. Currently, the lenticule may be centered on the pupil, the internal fixation light, or any position on the corneal surface that has been previously marked. The lenticule can also be rotated (Figure 2) to compensate for cyclotorsion when the patient is supine, which should improve treatment accuracy in patients with astigmatism.



Figure 1. Different centration options with the CLEAR procedure.

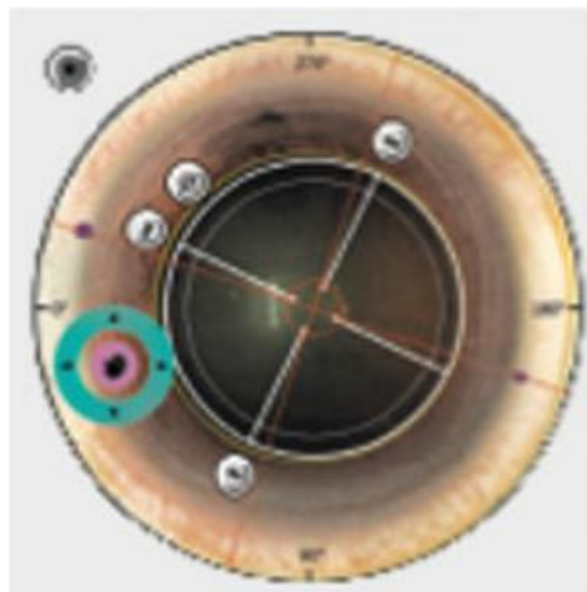


Figure 2. Compensation for cyclotorsion.

Guidance. Several incisions can be made during refractive lenticule extraction. Most surgeons either create a single 2- to 5-mm incision or two smaller incisions.

During the CLEAR procedure, two guiding tunnels (Figure 3) are created at any angle required, depending on corneal anatomy and how deep-set the eye is. These tunnels guide the surgeon to dissect directly into the anticipated plane (anterior and posterior) of the lenticule and ensures that the surgeon is in the correct plane. I expect this application to shorten the learning curve for surgeons new to refractive lenticule extraction. Those with more experience can transition to a single incision.

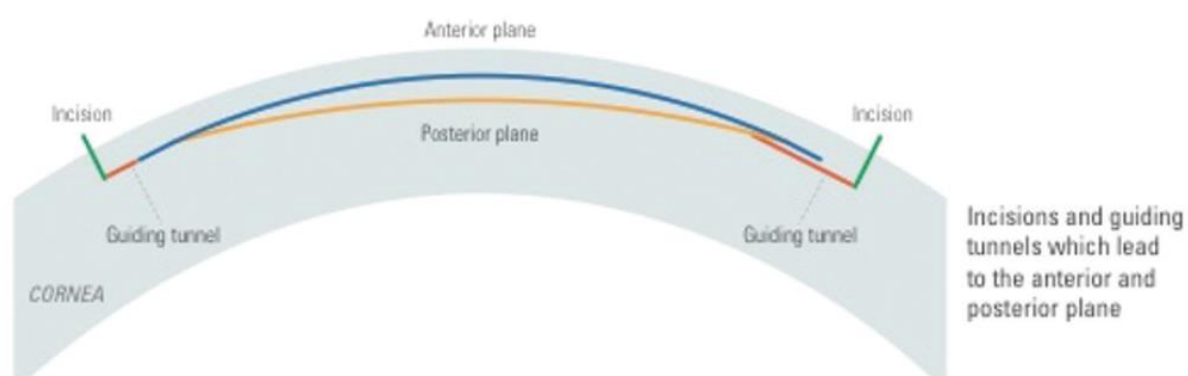


Figure 3. Incisions and guiding tunnels leading to the anterior and posterior planes.

Imaging capability. Intraoperative OCT may be performed with the Femto LDV Z8 (Figure 4). This feature is frequently used during cataract, pterygium, and transplant surgery, but it can also be useful during complex CLEAR cases such as in eyes that have a history of corneal transplantation.

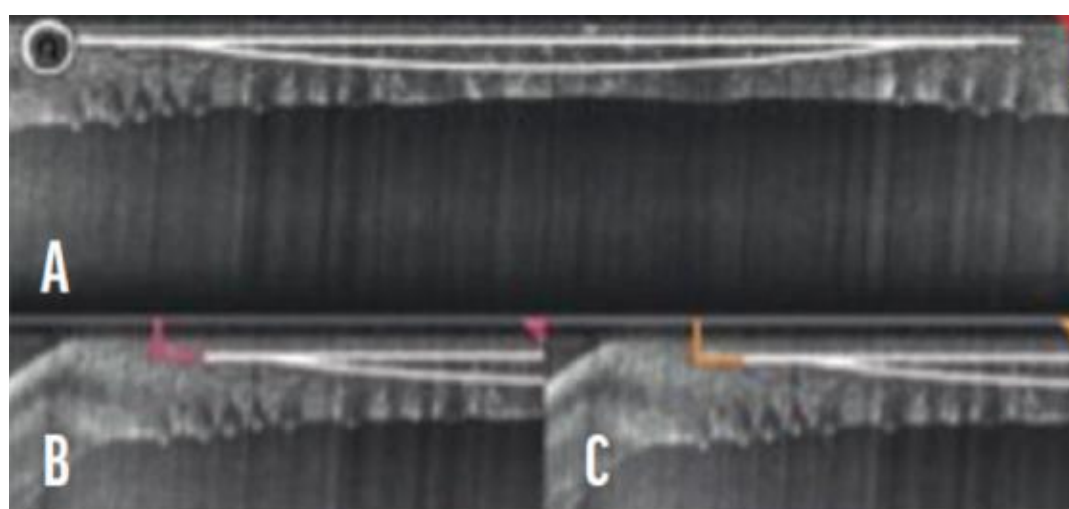


Figure 4. Intraoperative OCT scan showing planned lenticule (A), incisions (B), and guiding tunnels (C).

Figures 1–4 courtesy of Jodhbir S. Mehta, BSc (Hons), MBBS, PhD, FRCOphth, FRCS(Ed), FAMS

MY EXPERIENCE

My experience with CLEAR includes the six cases I performed before the procedure received the CE Mark. At that time, the software could create only a myopic spherical lenticule. Now, the software may be used for astigmatism correction as well. The laser head is docked in a fashion similar to when performing LASIK. Vacuum occurs after appplanation, and docking should ensure that the risk of suction loss is low. After docking, the lenticule position can be adjusted and rotated, as described earlier, to ensure it is on the corneal vertex. I marked the 0° to 180° axis and the corneal vertex at the slit lamp. Lenticule creation took approximately 30 seconds.

The footprint of the laser system means that the same bed can be used under a microscope for lenticule extraction. Although there was no sidecut, I found delineating the anterior and posterior planes with a SMILE dissector (ASICO) to be straightforward. It was important to use a smooth dissector to separate residual tissue bridges, but I observed few bridges during my cases. Lenticule extraction was uncomplicated.

Postoperatively, UCVA was 20/30 or better on day 1, the interface was clear, and the incisions were well healed. An analysis of postoperative tomography showed the minimal induction of spherical aberration and vertical coma.

CONCLUSION

My initial experience with the CLEAR procedure was encouraging. Clinical results were excellent with respect to refractive outcomes and higher-order aberrations. I look forward to gaining more experience with the new software upgrade now available.

1. Kang DSY, Lee H, Reinstein DZ, et al. Comparison of the distribution of lenticule decentration following SMILE by subjective patient fixation or triple marking centration. *J Refract Surg.* 2018;34(7):446-452.

2. Wong JX, Wong EP, Htoon HM, Mehta JS. Intraoperative centration during small incision lenticule extraction (SMILE). *Medicine.* 2017;96(16):e6076.