Pearls for Adopting a New Laser Vision Correction Technique

One surgeon’s experience mastering the learning curve for ReLEx smile.

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Our center obtained the VisuMax femtosecond laser (Carl Zeiss Meditec) 5 years ago, and for nearly the first 2 years we used it only to create two-dimensional flaps for LASIK. This gave us invaluable knowledge and experience in optimizing patient positioning and docking. It also familiarized us with the appearance of air bubbles in different lamellar layers.

Three years ago, we started performing the ReLEx procedure, in which the VisuMax laser is used to cut a three-dimensional lenticule directly within the corneal stromal bed with micron-scale precision. The refractive error is corrected when the surgeon removes the lenticule.

The ReLEx procedure has two main variations, ReLEx flex and ReLEx smile. Initially, we performed ReLEx flex, in which a flap is formed and lifted before lenticule removal. We subsequently moved toward opening a smaller part of the flex flap—what might be called ReLEx pseudo-smile. This intensive early ReLEx experience gave us valuable knowledge about lenticule handling, laser energy settings, and different cutting patterns before we moved to ReLEx smile.

The fully developed ReLEx smile is a flapless corneal laser refractive procedure, employing a 2-mm pinhole that leaves the vast majority of the important superficial corneal stromal fibers intact and maintains corneal stability. ReLEx smile is our standard treatment for correcting myopia and astigmatism, and we also recently started using it to correct the mixed refractive errors of hyperopia and astigmatism.

We have gathered several pearls during our experience adopting ReLEx smile. This article details our approach to implementing this new laser vision correction technique and ensuring that patients achieve optimal results.

PATIENT POSITIONING AND DOCKING

Optimal patient cooperation is key to successful performance of ReLEx smile. We generally do not offer sedatives during the procedure in order to keep patients alert and cooperative.

Positioning of the patient’s head and docking the device to the eye are crucial steps. Patients must lie comfortably on the laser bed in the supine position, with the lower neck touching the lower edge of the head support. Normally this position ensures maximal working range during docking.

The bed is raised using a joystick, and the patient’s cornea approaches the laser head and treatment pack from below. Sometimes, a patient’s nose interferes with the protective shield surrounding the laser head. If this is the case, his or her head must be turned sideways. This is not a problem if eye rotation is evaluated simultaneously by, for instance, marks placed on the cornea.

ReLEx smile is performed under local anesthesia with oxybuprocaine after thorough cleaning of the area surrounding the eye. After the eyelid speculum is inserted, microscopic corneal surface particles are removed using a swab moistened in saline.

During docking, the cornea is supported and kept in a standard position relative to the laser head by light suction pressure applied via the cornea-shaped treatment pack. The pressure is kept low to avoid changes in the natural corneal shape; the use of low suction increases the risk that the cornea will loosen from the treatment pack due to suction loss. To reduce this risk and minimize eye movement during the laser treatment, the surgeon supports the position of the patient’s head using one or both hands.

LASER TREATMENT

During ReLEx laser treatment, air bubbles are formed in two separate corneal layers, below and above the lenticule being created. These are referred to as the lenticule layer (ie, the layer below) and the cap layer (ie, the layer above). With the formation of these bubble layers, the
patient’s vision becomes white or black. Many patients consider these approximately 30 seconds to be the most stressful part of the procedure, as they are unsure if their eyes are held steady in the right position and if failure will result in a poor outcome.

Before treatment, we inform patients thoroughly that their vision will be lost during the actual laser treatment and that suction loss is the worst-case scenario, which may postpone the final treatment by a couple of months. This information has a calming effect on most patients, and fortunately suction loss has become extremely rare with our increasing experience.

**Lenticule Extraction**

Lenticule extraction consists of breaking the remaining corneal stromal tissue bridges around the lenticule and physically removing the lenticule through the incision. Extraction is a delicate matter, and this is especially so in certain situations:

- Eyes with low refractive corrections, in which the lenticule can be less than 50 μm thick;
- When the optical zone (ie, the lenticule) is wide, as the number of stromal bridges that have to be broken correlates with the square of the optical zone radius; and
- In eyes with high astigmatism or mixed hyperopia and astigmatism, in which the edge thickness differs around the lenticule.

To protect a good surgical reputation, it is strongly recommended that surgeons start the learning curve using the VisuMax to create flaps for femtosecond LASIK. Subsequently, surgeons can confirm that they have reached the correct corneal layer, below or above the lenticule, and this can create problems if the lenticule layer is loosened before the cap layer. One efficient proactive escape precaution is to leave the right part of the cap layer untouched as a rescue zone until the correct position is ensured. If the lenticule layer is accidentally loosened first on the left side of the lenticule, the rescue zone can subsequently be used to identify the cap layer using the thin spatula from the right cap periphery.

Surgeons can confirm that they have reached the correct laser-cut layer by closely observing the tip of the spatula as it reaches the lenticule edge area. If a pronounced sidecut line is observed as the tip crosses the edge, the spatula is in the lenticule layer. The entire sidecut should be loosened before physical removal of the lenticule, and we use forceps for this step.

**SUMMARY**

The ReLEx smile procedure must be performed with focused, swift, and minimal movements to obtain optimal visual recovery and treatment results. ReLEx smile is not simply about corneal lenticule removal; more importantly, it is about obtaining optimal visual results and preserving corneal stability. These goals are achieved only with intensive practice and high patient volume.

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