began exploring femtosecond lasers for cataract surgery 2 years ago, visiting exhibitor booths while attending the major cataract meetings in Europe and the United States to learn as much as I could about the different technologies. As the machinery matured and the first prototypes were made available to surgeons around the world, I arranged to visit three ophthalmic centers to personally observe these amazing surgeries with different femtosecond laser platforms. I realized that the future of cataract surgery had arrived, and there was no turning back. This was the beginning of a paradigm shift, and I wanted to be a part of the evolution.

After initially observing cases done by Kasu Prasad Reddy, MD, at Maxivision Eye Hospital in Hyderabad, India, in 2011, I had the privilege of performing 18 laser cataract surgery procedures using the Technolas Perfect Vision GmbH prototype femtosecond laser. With data from these cases, I performed an observational pilot study looking at the circularity, size, and centration of the laser capsulotomy. My results convinced me that the capsulotomies were precise, predictable, and accurate.

After carefully comparing the various lasers that were available, in the first quarter of 2012 the Singapore National Eye Centre (SNEC) purchased the Victus Femtosecond Laser Platform (Technolas Perfect Vision GmbH). Below is a recap of my early experience with laser cataract surgery.

The laser suite must be equipped with positive pressure laminar airflow and high-efficiency particulate air filters to ensure patient safety and to keep an appropriately low room temperature.

SETTING UP THE LASER SUITE
With nine operating suites at SNEC, creating space for a laser suite within the sterile environment of the operating theater was challenging. The laser suite must be equipped with positive pressure laminar airflow and high-efficiency particulate air filters to ensure patient safety and to keep a consistent and appropriately low room temperature for optimal performance of the laser.

We chose to purchase only the module for cataract treatment, as two other femtosecond lasers for refractive surgery are positioned at a different location within the center. Approximately 50 SNEC cataract surgery faculty members use the Victus.

DOCKING AND TREATMENT
Once the patient is in the supine position, the suction clip of the Victus is gently centered on the eye
with the aid of the built-in operating microscope, and suction is applied. I do not use a wire speculum, as Asian palpebral apertures tend to be tight. Topical anesthesia is used, and no sedation is given. Four drops of sterile balanced saline solution are instilled in the shallow well of the suction clip, and the patient is swung under the laser and docked under low pressure. This is an important step, as the intervening liquid prevents direct contact between the cornea and the curved patient interface, thus preventing formation of corneal folds and avoiding incomplete capsulotomies. The interface clip is closed once the fluid meniscus disappears, which typically occurs as the fluid within the cup touches the cornea. The eye is then carefully moved upward until the intelligent pressure sensor displays a green light, indicating a safe and appropriate docking pressure. The optical coherence tomography (OCT) display shows real-time images of the cornea, iris, and lens within the capsular bag.

At this time in the procedure, either our applications specialist or nurse technician takes over to plan the treatment for capsulotomy and nucleus fragmentation. Corneal incisions are currently not available with our instrumentation. The treatment footpedal is kept depressed as beeping sounds are heard, indicating progress of the capsulotomy followed by nucleus fragmentation. This entire procedure is continuously imaged on the OCT display (Figure 1). Typically, the procedure is completed within 30 seconds, and the patient is then directly wheeled into the operating room for completion of the surgery.

**DIFFERENCES IN PHACO SURGERY AND COMPLICATIONS**

Phacoemulsification after laser capsulotomy and lens fragmentation may be different from conventional phacoemulsification in several respects.

**Difference No. 1: The dark irides of Asian patients are difficult to dilate.** To save time trying to get the pupil maximally dilated for femtosecond laser treatment, I prescribe Mydriacyl 1% (tropicamide; Alcon Laboratories, Inc.) minims, to be used by patients on the day of surgery so that the pupil will start to dilate as they leave home and head for SNEC.

**Difference No. 2: Pupils tend to constrict quickly after laser treatment if the pupil dilation was smaller than desired.** In these cases, posterior synechiae can develop rapidly. Injecting epinephrine into the anterior chamber at the start of surgery improves pupil dilation; however, synechiae may require viscodissection.

**Difference No. 3: Capsulotomy may be incomplete, especially if the patient moves during the procedure.** Trypan blue capsular dye is useful in these situations, especially if the cataract is intumescent or brunescent. Narrow capsular tags are best dealt with by pulling the capsule radially to snap them. In the event of a wider bridge of capsule, a circumferential motion is recommended to tear the capsulorrhexis, taking care to round off any dog-ear tears, which could subsequently contribute to an anterior capsular tear.

**Difference No. 4: Hydrodissection is performed by injecting small aliquots of balanced saline solution.** If big bubbles are seen within or posterior to the nucleus, these should immediately be released. The risk of performing excessively quick hydrodissection with large amounts of balanced saline solution is the occurrence of hydrorupture and a dropped nucleus. Interestingly, the quantity of bubbles created when using the Victus appears to be less than with other femtosecond laser systems, due to its short laser pulse duration, and I rarely feel the need to decompress the capsular bag before hydrodissection. Additionally, hydrodissection is further minimized by the pneumodissection.

**Difference No. 5: Using a nucleus separation technique, rather than phaco chop, takes advantage of nucleus fragmentation.** With laser cataract surgery, nucleus separation is quicker and safer than chopping, and I have altered my preferred technique accordingly (Figure 2).

**Difference No. 6: A bimanual technique for aspirating the cortex is preferred.** After laser segmentation, the tip of the aspirating instrument must extend beyond the capsulotomy rim to engage the cortical material. This makes aspirating the subincisional cortex a little more challenging. A bimanual technique is easier and safer in these cases.

Figure 1. Victus screen showing the capsulotomy completed and nucleus fragmentation in progress, as indicated by the horizontal green treatment bars. The six-cut pattern of the nucleus is seen on the left and the corresponding OCT on the right, both in real time. Note that the cut anterior capsule is lifted off the nucleus on the OCT image. The vertical green bar of the intelligent pressure sensor indicates that the appropriate and safe docking pressure is achieved.
After laser cataract surgery, corneas are invariably clear, even with extremely dense cataracts. Additionally, in my experience, more eyes achieve 20/20 UCVA on day 1 postoperatively than with conventional cataract surgery.

The postoperative prescriptions are the same after either surgical method, as there are no apparent differences in postoperative recovery between the two techniques. My patients continue to receive topical steroids, NSAIDs, and antibiotics for 1 month postoperatively. They are refracted at 1 month after laser cataract surgery.

As femtosecond laser treatment is an additional procedure, we feel that it is necessary to have patients sign a separate informed consent in addition to the one they sign for cataract surgery. This document provides information about the procedure, including the potential benefits and risks, and allows us to obtain consent for this additional step of treatment.

CONCLUSION

I have performed laser cataract surgery in more than 100 eyes since acquiring the femtosecond laser in April of this year. Thus far, my experience has been positive. We are currently analyzing the outcomes of our first 100 cases. Today, approximately 85% of my cataract patients opt for the laser procedure, which gives me the opportunity to keep up my manual capsulorrhexis creation skills and allows me to compare the outcomes between these and laser-created rhexes.

I am convinced that the laser cataract surgery cases outshine the manual ones in terms of predictability and precision of surgery. Furthermore, even after accounting for the time spent in the laser room, my laser cataract surgery procedures appear to be completed in a shorter time than manual ones.

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