Improvements in pain management aid surface ablation outcomes

Newer technologies and certain nonsteroidal anti-inflammatory drugs have allowed surgeons to offer superior results.

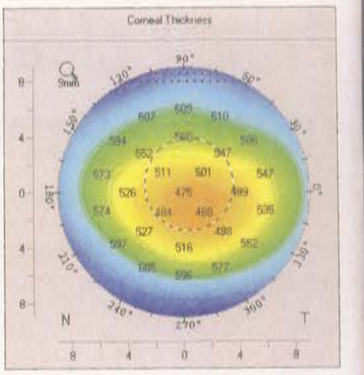
by Ming Wang, MD, PhD, and Tracy S. Swartz, OD, MS, FAAO

Special to OCULAR SURGERY NEWS

The field of vision correction has undergone significant enhancements since the 1990s introduction of photorefractive keratectomy. Changes include new imaging technologies such as wavefront and corneal imaging, new applications of such technologies and an increased understanding of the biomechanical effects of keratorefractive surgery.

Use of advanced wavefront technology in ablative procedures has resulted in a resurgence of surface ablation, including PRK, epi-LASIK and LASEK. LASIK with conventional microkeratomes covers the detailed ablation patterns with a relatively thick flap, essentially eliminating the benefit of wavefront ablation. Although this is lessened using a thin sub-Bowman's flap created with the femtosecond laser, surface ablation appears to lead to the best outcomes compared with LASIK.

Topography has also become more robust to assess more aberrant eyes. Originally used to demonstrate corneal curvature, new technologies address curvature and shape, as well as optical pachymetry. Highly detained pachymetry maps (Figure) may indicate early keratoconus in patients seeking LASIK, and such irregularities may result in increased surface ablations to avoid ectasia after elective surgery.



A pachymetry map revealing early keratoconus. *Image: Wang M, Swartz TS*

Increased understanding of biomechanics

These advancements in technology have increased our understanding of the posterior surface and corneal biomechanics after keratorefractive surgery. PRK was initially used with excimer lasers, and the associated pain and risk of corneal hazing are well-known. The haze results from damage to the epithelium and stroma simultaneously during the procedure, resulting in cross talk between the stromal keratocytes and epithelial cells.

Historically, LASIK was preferred because of the quick visual recovery, significantly less pain and patient convenience. Increased understanding of the biomechanics of flap creation and ectasia after LASIK, in addition to the dry eye and complications from manual microkeratomes, led to increased use of femtosecond lasers for flap creation and a resurgence of surface ablation.

Complications from LASIK, although rare, include dry eye, corneal weakness, ectasia and questionable corneal flap adhesion.

Dry eye continues to be the most common complication from LASIK. Up to 37% of patients without preexisting dry eye will be symptomatic 6 months after LASIK. Flap creation causes damage to corneal nerves, which may not regenerate to their preoperative level. Total disappearance of the subepthelial nerve layer at 1 month after LASIK has been reported.

Prolonged recovery of corneal subbasal nerve density after LASIK compared to PRK has also been reported. Three years after LASIK, a 34% reduction was found compared with a nearly unchanged subbasal nerve density after PRK. The reduction of corneal nerve regeneration and the actual number of fibers noted in post-LASIK patients were not found in patients post-LASEK.

Thus, many surgeons are increasing the amount of surface ablations to alleviate dry eye complaints postoperatively. In addition to the dry eye complications, LASIK has been found to be less stable long term because of the severance of collagen fibers. This is illustrated by the dislocation of flaps years after surgery. The National Institute for Health and Clinical Excellence reported the main problem with LASIK was long-term risk of corneal ectasia.

> **"Dry eye continues to be the most common complication from LASIK."**
> — Ming Wang, MD, PhD, and Tracy S. Swartz, OD, MS, FAAO

To avoid these complications, many surgeons have turned to laser-created flaps. Femtosecond laser planar flaps are clearly advantageous over meniscus flaps created by conventional microkeratomes. The creation of thin flaps less than 100 µm may produce less biomechanical changes and dry eye. The reliability of flap thickness makes them safer for those with thin corneas and prevention of ectasia. Wavefront ablations after laser-created flaps were found to lead to faster recovery, better uncorrected vision and better corneal sensitivity compared with treatments using conventional microkeratomes.

Unfortunately, the femtosecond lasers are expensive, enticing other surgeons to turn to advanced surface ablation techniques: PRK, LASEK and epi-LASIK. The application of wavefront to refractive surgery in conjunction with improved pain management alternatives has also

(Improvements, continued on page 54)

TASS prevention

(continued from page 51)

intraocular inflammation, occurring with implantation of a particular IOL after cataract extraction.

Antibiotic prophylaxis as a possible culprit

Another possible culprit in the development of TASS is the use of intracameral antibiotic prophylaxis, Dr. Kertes said. He noted that toxicity can result because of improper administration of antibiotics due to an error in drug concentration or the use of preservatives or solutions with which the antibiotics are mixed.

Ophthalmic surgeons must be informed when the hospital pharmacy or the medication supplier has made any changes to the medications or solutions, Dr. Kertes said.

"The doctors, the residents, the fellows, the nurses, staff who clean instruments, the hospital pharmacist and the pharmaceutical representatives all need to be aware of the complications that can occur with TASS and that changes to any processes are not trivial," he said.

As with endophthalmitis, the most effective means of minimizing the burden of TASS is through its prevention, Dr. Kertes said. OSN

For more information:

Peter J. Kertes, MD, CM, FRCS(C), can be reached at Sunnybrook Health Sciences Center, 2075 Bayview Ave., Toronto, Ontario, Canada, M4N 3M5; 416-480-5280; e-mail: peter.kertes@sunnybrook.ca.

Reference:
Jehan FS, Mamalis N, et al. Postoperative sterile endophthalmitis (TASS) associated with the memorylens. *J Cataract Refract Surg.* 2000;26:1773-1777.

Louise Gagnon is an OSN Correspondent based in Whitby, Ontario, Canada.

Improvements

(continued from page 52)

increased surgeons willingness to return to surface ablations.

Epi-LASIK, which uses an epikeratome to remove the epithelium along Bowman's membrane, has the advantages of LASIK and PRK without the disadvantages of either. Without a stromal flap, fewer higher-order aberrations are induced. Patients who underwent LASEK or other surface ablations report fewer night vision problems, including smaller starbursts, and have better contrast sensitivity than those after LASIK. Mild corneal opacities are easily treated using surface ablations as well.

Patients more compliant, comfortable

At our center, we have increased the number of surface ablations we perform because of our experience with Xibrom (bromfenac ophthalmic solution 0.09%, Ista Pharmaceuticals), which we use both intraoperatively and postoperatively to control pain.

Conductive keratoplasty procedures, which cause considerable discomfort, initially led us to investigate topical pain management. Use of Acular LS (ketorolac tromethamine ophthalmic solution 0.4%, Allergan) and Nevanac (nepafenac ophthalmic suspension 0.1%, Alcon) did not significantly reduce patients' discomfort, and we noted slower healing of the epithelial defects in patients using nepafenac.

Patients rarely complain of pain upon instillation using bromfenac, which was an additional benefit. Our experience was excellent when we used it postoperatively for pain after PRK. Patients were more comfortable the day after surgery, and our postop day 1 visual acuity improved.

Our patients started driving to the day 4 visit, which is when we typically remove the contacts, and the presence of keratoepithelial defects on the day 4 visit is rare.

Because of the twice-daily dosing schedule, our patients are more compliant and therefore more comfortable over the early postop course.

We were impressed with the effect on pain postop started soaking the bandage contacts in bromfenac before placing the lens on the eye after the surface ablation, which has dramatically decreased patients' discomfort during the first 24 hours. Many of our patients report not needing oral pain medications. We have found the postop day 1 visual acuities after PRK to be significantly better such that we now warn our patients that their vision may actually dip slightly due to healing on day 2 or 3. This has greatly reduced the amount of calls after-hours as well.

Newer technologies and better medical management of postop discomfort have allowed us to offer superior results with patient safety in mind. Surface ablation is often the preferred method of elective visual correction in cases of mild dry eye, corneal irregularities or mild astigmatism asymmetry, and corneal scaring secondary to contact lens wear.

Using an effective nonsteroidal anti-inflammatory drug such as bromfenac to control pain enables us to do what we feel is in our patients' best interest without disrupting their daily lives and decreasing the "wow factor" of elective surgical vision correction. OSN

> **"Newer technologies and better medical management of postop discomfort have allowed us to offer superior results with patient safety in mind."**
> — Ming Wang, MD, PhD, and Tracy S. Swartz, OD, MS, FAAO

For more information:

Ming Wang, MD, can be reached at the Wang Vision Institute, 1801 W. End Ave., Suite 1150, Nashville, TN 37203; 615-321-8881; fax: 615-321-8874; e-mail: drwang@wangvisioninstitute.com. Dr. Wang has no direct financial interest in the products discussed in this article, nor is he a paid consultant for any companies mentioned. **Tracy S. Swartz, OD, MS, FAAO,** can be reached at Wang Vision Institute, 1801 W. End Ave., Suite 1150, Nashville, TN 37203; 615-321-8881; fax: 615-321-8874; e-mail: drswartz@wangvisioninstitute.com. Dr. Swartz has no direct financial interest in the products discussed in this article, nor is she a paid consultant for any companies mentioned.

■ References:

DePaiva CS, Chen Z, et al. The incidence and risk factors for developing dry eye after LASIK. *Am J Ophthalmol.* 2006;141:438-445.

Erie JC, McLaren JW, Hodge DO, Bourne WM. Recovery of corneal subbasal nerve density after LASIK. *Am J Ophthalmol.* 2005;140:1059-1064.

Lee SJ, Kim KJ, et al. Comparison of corneal nerve regeneration and sensitivity between LASIK and laser epithelial keratomileusis (LASEK). *Am J Ophthalmol.* 2006;141:1009-1015.

Marshall J. Wound healing and biomechanics of corneal flap creation. Paper presented at the XXIV Congress of the ESCRS, Sept. 10, 2006; London, United Kingdom.

Nifouroushan MR, Speaker MG, Latkany R. Traumatic flap dislocation 4 years after laser in situ. *J Cataract Refract Surg.* 2005;31:1664-1665.

Perez-Gomez I, Efron N. Change to corneal morphology after refractive surgery (myopic laser in situ keratomileusis.) as viewed with confocal microscope. *Optom Vis Sci.* 2003;80:690-697.

Schallhorn S. Tanzer D. Comparison of visual outcomes with femtosecond and mechanical microkeratomes following LASIK. Paper presented at the XXIV Congress of the ESCRS; September 2006, United Kingdom.

Sher NA, Golben M, et al. Randomized trial of topical bromfenac 0.09% versus keroralac 0.4% for control of post-PRK pain and discomfort. Podium presentation, ASCRS; April 2007, San Diego.

Sugar A, Rapuano CJ, et al. Laser in situ keratomileusis for myopia and astigmatism: Safety and efficacy: a report by the American Academy of Ophthalmology. *Ophthalmology.* 2002;1922-1928.

Slade S. Sub-Bowmans' keratomileusis with the Intralase laser. Paper presented at: The Fifth International Congress on epi-LASIK, LASEK, and Advanced Surface Ablation; Sept. 8, 2006; London, United Kingdom.

Wang XJ, Givergis R, Younesi P, Chynn E. Evaluation of the efficacy and safety of Xibrom (bromfenac ophthalmic solution) vs. Acular (ketorolac tromethamine ophthalmic solution) as post-operative analgesia following refractive surgery (LASEK, & Epi-LASIK). Poster, ASCRS, April 2007.