Epithelial-on crosslinking shows promise
by Michelle Dalton, EyeWorld Contributing Editor

Early results are similar to epi-off techniques and may be beneficial for older patients as well

FOR MORE THAN A DECADE, corneal crosslinking has been discussed, described, and used worldwide as a means of treating keratoconus. In Europe, patients as young as 9 years are undergoing the procedure, but it remains under investigation in the United States. The procedure has been shown in various studies to stop the progression of keratoconus, improve or reduce corneal steepness, and improve best corrected visual acuity. Once thought to be limited to younger patients in whom keratoconus is still developing and progressing, some studies have shown older adults can benefit as well. Corneal crosslinking with riboflavin and ultraviolet (UV) light is being performed at roughly 400 centers worldwide, including several in the United States under the CXL-USA Study Group. Preliminary results from one of the study centers were presented earlier this year, with more results expected sometime in the third or fourth quarter, said Roy S. Rubinfeld, M.D., Washington Eye Physicians & Surgeons, Chevy Chase, Md. In the CXL-USA Study, which began in October 2009, subjects initially underwent the original, epithelial-off technique. Jodi Luchs, M.D., F.A.C.S., co-director, Department of Refractive Surgery, North Shore/Long Island Jewish Health System, N.Y., and one of the study investigators, explained that the epi-off technique involves anesthetic drops, epithelial debridement, riboflavin drops for 30 minutes (after which the physician checks the cornea for riboflavin saturation), exposure to UV light for 30 minutes, placement of a bandage contact lens, and post-op treatment “similar to PRK,” he said. In the most common crosslinking procedures, the UV irradiance is about 3 milliwatts per square centimeter, and the uncorrected visual acuity is between 360 and 370 nanometers, depending on which device is being used. The CXL-USA Study Group is using a medical UV light source used off-label under an Investigational Review Board approval, said Dr. Rubinfeld, who helped design the study. In epi-off, the epithelium is debrided “so the riboflavin can penetrate fully through the corneal stroma,” he said. “The epithelium was originally thought to be the primary barrier to penetration of the riboflavin into the corneal stroma.”

Patients undergoing the epi-off procedures are “uncomfortable for the first few days as the epithelial defect is healing,” Dr. Luchs said. “I think the pain with epi-off is even a little more intense than the pain from a simple PRK procedure.” Other variables may dissuade some potential candidates from the procedure as well, he said. In most published studies, corneal curvature can increase after the epi-off procedures, and vision can worsen for months post-op before improving, he added.

“The CXL-USA group postulated that an epi-on procedure might allow faster visual recovery, a much more comfortable procedure, reduce the risk of infection, and reduce the risk of late onset corneal haze,” he said. Late haze after crosslinking may occur because “as the cornea starts to

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had improved B
improvement in visual function.
[best corrected visual acuity] these patients will experience.”

maps show the improvement in corneal shape, and that’s what correlates best with the improvements in visual functioning and the B
from one of the centers involved in the study; this particular center evaluated 36 patients who underwent the epi-on procedure and 20

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