

September 2016 Digital Edition

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The news magazine of the American Society of Cataract & Refractive Surgery

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Featuring:
Corneal collagen crosslinking

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into practice — P. 78***

Epi-off vs. epi-on debate continues — P. 80

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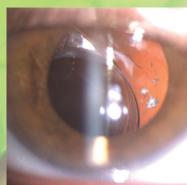
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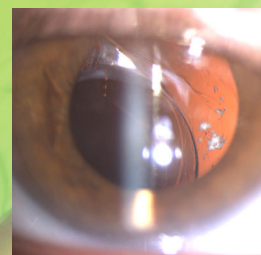
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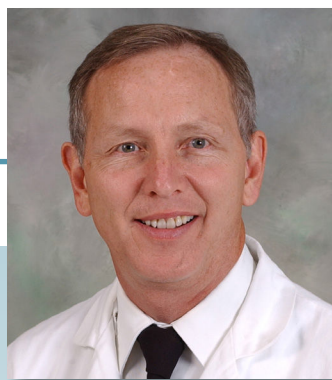


Fixing a toric IOL that has dislocated into vitreous cavity after retina surgery — P. 40

Refractive editor's corner of the world

Predictable refractive outcomes: The future of keratoconus treatment

by Liz Hillman EyeWorld Staff Writer



Experts say PiXL procedure is promising but still has "a long way to go"

“Exremely interesting and positive.” That’s how **Roberto Pinelli, MD**, founder of the Switzerland Eye Research Institute, Lugano, Switzerland, described the current state of crosslinking in ophthalmology.

While excitement certainly continues after the U.S. Food and Drug Administration (FDA) approval of Photrexa and Photrexa Viscous (Avedro, Waltham, Massachusetts) as well as the company’s KXL System for treatment of progressive keratoconus earlier this year, the riboflavin-UV light procedure—first described decades ago and available internationally for years—is not remaining stagnant in its technology or technique. There have been modifications as well as new indications for the procedure in recent years.

Conventional crosslinking stabilizes and strengthens the cornea for progressive keratoconus and ectasia patients, but some physicians have been working with the technology and refining the technique to obtain predictable refractive outcomes as well.

“We know that crosslinking for keratoconus is a very good treatment,” **Anders Behndig, MD**, Umeå University, Sweden, said at the 2016 ASCRS•ASOA Symposium & Congress. “We do the same treatment protocol in all cases of keratoconus though, which from a refractive standpoint might not be so good.

“Of course, the main purpose of the treatment is to halt the disease, which [crosslinking] does, but it would be nice to control the refractive effects of the treatments, too,” Dr. Behndig continued.

For both refractive effects and corneal stability, crosslinking is now regularly coupled with topography-guided photorefractive keratectomy (PRK), intrastromal rings, and even LASIK. Dr. Behndig thinks there could be another option for predictable refractive outcomes in keratoconus treatment: photorefractive intrastromal crosslinking (PiXL, Avedro).

This topography-guided crosslinking, which has been available internationally for the last few years, is marketed by Avedro as the “next revolution in refractive correction” in low myopic or post-cataract patients. Dr. Behndig spoke at the ASCRS•ASOA Symposium & Congress about PiXL in the context of providing customized, refractive keratoconus treatment.

PiXL, which Avedro describes as using “precise, patterned, topography-guided accelerated crosslinking,” involves real-time eye tracking and a higher UVA power. The UV light is customized and directed in a specific pattern based on the patient’s topography to flatten the cornea where most needed.

According to his own research involving 12 months worth of data on 25+25 eyes, Dr. Behndig said he found that PiXL offered a significant refractive advantage over conventional crosslinking in keratoconus. He admitted, however, that the difference was not huge.

“The effects are promising so far. Of course, the method will need further fine tuning, but my impression is that this procedure has the potential to become valuable in treating keratoconus in the future.”

Dr. Pinelli, who patented the transepithelial riboflavin solution ParaCel, now owned by Avedro, has had a similar experience with the technology.

“Obviously the customization based on topography is theoretically interesting, but we have no difference in our cases between the groups with and without controlled procedures in terms of stability of results,” Dr. Pinelli said, explaining that he has used PiXL for about 3 months in about 100 cases.

A. John Kanellopoulos, MD, medical director, LaserVision.gr Eye Institute, Athens, who pioneered research with numerous crosslinking techniques, said PiXL has shown some “remarkable excimer-like effects ... without tissue removal, making it a promising treatment for progressive keratoconus, corneal ectasia, and even refractive correction in low myopes, but it has a long way to go.”

“PiXL offers a new indication of not only stabilizing the cornea with crosslinking but also being able to,

through the predetermined variable pattern and variable fluence, result in a predictable refractive effect,” Dr. Kanellopoulos said.

Dr. Kanellopoulos said eventually he thinks this individualized, topography-based crosslinking technique will replace conventional corneal collagen crosslinking as the keratoconus treatment of choice.

“If one has in his armamentarium the availability of PiXL, it automatically becomes the treatment of choice because not only can it stabilize ectasia through its efficacy and safety and introduction of higher corneal rigidity, but it can also through its variable pattern help improve the refractive effect,” he said, noting that correction of irregular myopic astigmatism, which is especially linked to keratoconus and post-LASIK ectasia, would be an extreme benefit to patients.

PiXL compared to crosslinking combo procedures

PiXL is not the only procedure that seeks to address refractive error while ensuring a stable cornea. Conventional crosslinking has also been combined with topography-guided PRK, intrastromal rings, and LASIK.

Dr. Kanellopoulos said that while traditional crosslinking in and of itself can result in a 1.5–2 D correction of irregular astigmatism and flattening, when performed after PRK—the Athens protocol—physicians can achieve up to 15 D of correction.

Dr. Pinelli said that when refractive error of up to 2 D remains after transepithelial crosslinking (also known as epi-on crosslinking where the epithelium is not removed prior to soaking the cornea with riboflavin as it would be in epi-off procedures), he usually corrects it with an advanced surface ablation technique. For higher diopters of refractive error, Dr. Pinelli said he usually performs intraocular surgery, such as a lensectomy or phakic IOL implant, 3 months post-crosslinking.

Dr. Behndig told *EyeWorld* that the fact that PiXL doesn’t remove any tissue might be an advantage, but he acknowledged that PRK may have better refractive precision.

“We don’t know which factors make one treatment—PiXL or crosslinking and PRK—better than

We are in an era of rapid innovation in corneal refractive surgery, and the last 12 months have given us a wide range of technologies that provide more options to improve the outcomes for our patients. One particularly exciting technology is corneal crosslinking, and specifically its use in therapeutic cases. According to the 2016 ASCRS Clinical Survey, almost 20% of ASCRS members plan on performing crosslinking procedures in the next 12 months.

In this month’s “Refractive editor’s corner of the world,” **Roberto Pinelli, MD**, **Anders Behndig, MD**, and **A. John Kanellopoulos, MD**, provide an excellent overview of how this new technology may fit into our practices, in terms of patient selection, protocols, and potential combination treatments. Corneal crosslinking, though available outside of the U.S. for many years now, is a new option for many surgeons. As with any new product, we should continue to review studies and the literature, as well as seek out additional educational resources to ensure we are well versed and equipped to provide the best options for our patients.

Steven Schallhorn, MD,
Refractive editor

