

Corneal collagen cross-linking offers safe, simple approach for halting keratoconus progression

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in Anaheim

A CORNEAL collagen cross-linking procedure involving the topical application of riboflavin followed by ultraviolet irradiation appears to be effective in arresting the progression of keratoconus, according to Theo Seiler MD, PhD.

Initial clinical experience in a series of 26 eyes of 25 patients with moderate to advanced keratoconus followed for a minimum of one year showed that the cross-linking procedure halted the progression of keratoconus, improved visual function in some eyes, and caused no adverse effects.

"In addition to its promising efficacy and safety, this non-surgical approach to the treatment of keratoconus is simple and inexpensive, which makes it particularly attractive as a modality to use in third world countries," Dr Seiler noted.

Careful follow-up immediately after the procedure showed that the epithelium healed without any untoward sequelae in all eyes. Serial examinations performed at six-month intervals thereafter showed that in no eye did the maximum K reading increase by more than 0.5 D, while in two-thirds of the eyes, it decreased by an average of 2.0 D.

Furthermore, some 40% of eyes benefited with a BSCVA improvement of at least two lines, and mean BSCVA improved by 1.3 lines. No eyes had a loss of BSCVA.

"The overall improvement in BSCVA was statistically significant, although I am not sure whether it would be considered clinically significant," Dr. Seiler said.

The patients treated with the novel tech-

nique had confirmed progressive keratoconus based on history and corneal topography. They first underwent abrasion of the central cornea to improve penetration of the riboflavin, which was applied as a 0.1% solution. After a short waiting period of five minutes, the cornea was exposed to 365 nm UVA light for 30 minutes.

"The results achieved so far are very favourable, but this was only a small, feasibility study. Certainly, we need to continue follow-up of these patients to evaluate the durability of the effect as well as any long-term toxicity, and to perform a larger, controlled trial to better elucidate the indications and contraindications for cross-linking," said Dr.

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No adverse events have occurred during follow-up, including absence of any changes in endothelial cell counts, IOP, or clarity of the cornea or crystalline lens.

"Initial studies performed in animal models ruled out any toxic effects on the cornea or lens as a result of the 30-minute irradiation with the 365-nm wavelength of light.

However, we considered endothelial cell density a critical safety parameter since the endothelium is the closest structure sensitive to potential adverse effects of UV irradiation," Dr. Seiler noted.

He added that follow-up in rabbit models shows that the treatment benefit begins to decrease over time with eventual progression of keratectasia. However, it remains to be determined if and how those findings translate to humans.

Seiler.

Discussing the paper, M. Christina Kenney MD, PhD, pointed out that interpretation of the results of an uncontrolled study of keratoconus treatment is limited by the fact that progression and stabilisation are part of the natural history of the disease.

"Historical results from various studies report a range of progression rates, but importantly, in none of those investigations were decreased K readings observed as they were in this series. Therefore, this technique certainly seems to hold promise and is deserving of further study," she said.

The cross-linking procedure is designed to increase the cornea's biomechanical strength and thereby address the decreased corneal stiffness characterising keratoconus. It is

performed using topically applied riboflavin, a photosensitiser, followed by 30 minutes of irradiation with 365-nm ultraviolet A light to induce formation of additional bonds between molecules of corneal collagen (cross-linking).

Initial experiments performed ex vivo and in animal models evaluating various light-and chemical-based protocols for inducing cross-linking identified the riboflavin-UVA regimen as having the best risk/benefit profile in terms of producing the greatest increase in stiffness while being the least harmful.

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