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Cross-linking technique uses contact lenses for patients with thin corneas

Corneal thickness is artificially increased to ensure safe UV absorption.

Contact lens-assisted cross-linking, a new technique for cross-linking in thin corneas, has shown encouraging early results, according to the surgeon who developed the technique.

Soosan Jacob, MS, FRCS, DNB, presented early results of contact lens-assisted cross-linking (CACXL) at the Indian Intraocular Implant and Refractive Surgery meeting in Chennai, India.



Soosan Jacob

“My technique of CACXL acts by artificially increasing the thickness of the ultraviolet (UV) absorption medium anterior to the endothelium by means of pre-corneal riboflavin film, a riboflavin-soaked contact lens and a pre-contact lens riboflavin film,” Jacob said in an interview with *Ocular Surgery News*.

With this technique, cross-linking can be performed on a larger number of patients and on patients with thinner corneas than those who undergo conventional corneal cross-linking, Jacob said.

CACXL is not dependent on swelling properties of the cornea, as in hypo-osmolar cross-linking, and produces a more stable riboflavin film, she said.

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Contact lens soaked in riboflavin

A daily disposable Bausch + Lomb SofLens made of hilafilcon is soaked in riboflavin 0.1% solution for 30 minutes, while the same solution of riboflavin is applied to the cornea every 3 minutes for 30 minutes. The riboflavin-soaked contact lens is then applied to the eye. Pre-corneal and pre-contact lens riboflavin films are also applied, thus sandwiching the contact lens in between these two layers.

“The pre-corneal riboflavin plus the contact lens gives the cornea an additional thickness of about 120 μm on average, increases UVA absorption and therefore brings down the UV radiance reaching the endothelium, thus making it much safer for the endothelium,” Jacob said at the meeting.

The pre-contact lens riboflavin film allows the maintenance of a riboflavin film above the attained 400 μm , which is in keeping with published works by Wollensak and colleagues, who consider the cornea and a pre-corneal riboflavin film together as a “composite two-compartment system.” In this system, the riboflavin film is an integral part of the cross-linking procedure and important in achieving the correct stromal and endothelial UVA irradiance, Jacob told OSN.

CACXL is indicated for patients with corneas less than 400 μm thick after epithelial removal. The thickness of the three layers — the pre-corneal riboflavin film, the riboflavin-soaked contact lens and the pre-contact lens riboflavin film — keeps the endothelium from toxicity, which occurs at about 0.3 mW/cm^2 .

“We applied Lambert’s law in this process — that is, each unit layer of a solution absorbs an equal fraction of light passing through it,” Jacob said at the meeting.

UVA is then applied to the eye with a 370 nm wavelength. After 30 minutes, the contact lens is removed, a balanced salt solution wash is performed, and a new contact lens is applied until the epithelium heals.

The contact lens used in this technique should be thin and must not have a built-in UV barrier or it will negate the effect. This information can be seen in the product literature or by checking the UV irradiance that passes through the contact lens with a UV meter, according to Jacob.

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Uniform thickness

A lens may buckle when placed on the eye and create an uneven pre-corneal riboflavin film, thus leading to hot or cold spots. This is “more common with a decentered lens, excessive eye movements by the patient or by squeezing the lids against a compressible eyelid speculum,” Jacob said.

This riboflavin film should be replenished as and when required, the lens centered, and a pre-contact lens film applied. The posterior portion of the pre-contact lens riboflavin film fills the troughs on the surface of the contact lens and makes the thickness uniform, whereas the anterior portion of the pre-contact lens riboflavin film creates the composite two-compartment system, as required by Wollensak and colleagues.

The procedure can be performed as an epithelium-on or epithelium-off technique. Jacob’s preferred modality is epi-off, and she has performed it on about 10 patients.

Anatomic and visual results are encouraging in early cases so far, Jacob said. A study is ongoing with early results to be published soon. – by Cheryl DiPietro and Matt Hasson

Reference:

Wollensak G, et al. *J Cataract Refract Surg.* 2010;doi:10.1016/j.jcrs.2009.07.044.

For more information:

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