Contact Lens-Assisted Collagen Cross-linking: Is it the Working Solution?

To the Editor:

I read with interest the article entitled “Contact Lens-Assisted Collagen Cross-Linking (CACXL): A New Technique for Cross-Linking Thin Corneas” in the June 2013 issue of the Journal of Refractive Surgery. The method described seems to be an innovative solution for a demanding group of patients with keratoconus who are at increased risk for progression of the disease. The authors used a soft lens that is not expected to absorb ultraviolet by itself in normal conditions, but they did soak the contact lens in riboflavin before placement and applied the ultraviolet absorber drop above and under the contact lens during treatment. The riboflavin is an absorber of ultraviolet light and would be present above soft lenses, in the lens body, and under contact lenses all through the irradiation time. The role of the contact lens in this study seems to be an ultraviolet filter to decrease the amount of actual irradiation to the corneal stroma. It is obvious that ultraviolet absorption at the level of the contact lens is not helpful in strengthening the cornea for halting the progression of keratoconus. Similar results might be achieved by decreasing only the power of irradiance, which would be a trade-off between the safety and efficacy of the treatment.

REFERENCE


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The author has no financial or proprietary interest in the materials presented herein.

Reply:

We thank Dr. Peyman for her correspondence on our article. We agree with Dr. Peyman that the riboflavin solution coats the contact lens; however, we have also noted that there is absorption of riboflavin into the contact lens. Soft contact lenses are made of pliable hydrophilic plastics called hydrogels that aid in diffusion of riboflavin solution into the contact lens. The soft contact lens we used is made of hifafilcon B with 59% water content, nonionic with a Dk value of approximately 24. In a small experimental demonstration, we observed that there is persistence of the riboflavin pigment or color on the contact lens even after repeated washing of the soaked contact lens in saline solution, and also measured the difference in the ultraviolet (UV) transmission between the contact lens soaked in riboflavin and the contact lens after washing in saline (Figure 1). The percentage of UV transmission before and after the washing of the riboflavin-soaked contact lens was nearly 60% and 70%, respectively. To an extent this proves that the riboflavin has diffused into the contact lens.

In contact lens-assisted collagen cross-linking (CACXL), UV-A transmission through the soaked contact lens at the level of cornea is 1.5 to 1.7 mW/cm². This is less than the conventional CXL, where nearly 3 mW/cm² reaches the corneal surface. Hence, in CACXL, the amount of UV transmission is already reduced to a level where there is no or less endothelial damage. With this amount of transmission, in our study it was possible for us to obtain a demarcation at 252.9 µm, which lies within the range of values that have been reported in previous studies for CXL. This also shows that there has been, until now, no standardized threshold level for UV transmission to be reduced to or to be maintained at in thin corneas. In CACXL, by placing the contact lens, we are able to minimize the UV exposure to the endothelium and, at the same time, gain the potential...
effect of cross-linking. Therefore, CACXL provides an easy and efficient means to reproduce conditions simulating conventional CXL by increasing the functional corneal thickness. We are also in the process of analyzing the absorption coefficient of riboflavin in soft contact lenses in vitro and performing studies to determine the minimum effective UV irradiance for effective cross-linking in thin corneas.

REFERENCES


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