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Eye 2018: High dose dietary Riboflavin and direct sunlight exposure in the treatment of keratoconus and post-refractive surgery ectasia

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Abstract

Cornea collagen crosslinking has emerged as a highly successful treatment for keratoconus and post-LASIK ectasia. The use of topical concerted riboflavin explanation, along with a calibrated ultraviolet light source has been shown to successfully cross-link and stiffen the cornea align storm and arrest and in most cases, reduce the effect of corn steepening in several degenerative cornea conditions including keratoconus and post-refractive surgery ectasia.
Cornea cross-linking with the Avedro profitable UV light source and focused topical riboflavin explanation produced in a standard dose is usually accepted and was FDA accepted in the USA in 2016 as a treatment for Keratoconus and post-refractive surgery ectasia. The high financial treatment cost, along with the high cost of the Avedro machine, has limited ophthalmologist's and patient's contact with this new effective treatment.

We report cases at three separate institutions where patients, either on the own or under the suggestion of their ophthalmologist ingested high doses of dietary riboflavin (Vitamin B2) and were bare to 15 minutes per day of direct sunlight and noted within 6 months to experience a significant amount of cornea flattening by both topographic and keratometric capacities. No adverse effects were observed or reported in patients taking up to 1500 mg of dietary riboflavin per day and spending 15 minutes daily outdoors walking briskly facing the sun without sunglasses.

Case 1:
In February of 2012, patient 1, a 63-year-old Caucasian woman, was seen at Evergreen Eye Center in Federal Way, Washington for blurred vision after undergoing successful cataract surgery with a premium IOL. Prior treatment with LASIK surgery in both eyes for myopia was reported preoperatively. Residual astigmatism in both eyes following her premium IOL surgery reduced uncorrected vision to less than 20/40 in each eye at her three months follow up exam. After informed consent, the patient underwent additional successful keratorefractive "touch-up" surgery (LASEK) six months following her cataract operations, and visual acuity improved to 20/25 uncorrected in both eyes. Twelve months later she was noted to have signs of cornea ectasia on topography in both eyes, including with the rule astigmatism and a characteristic early "lobster claw" appearance with best-corrected acuity decreasing to 20/40 OD and 20/30 OS.

The patient returned six months later noting that her vision had greatly improved, and she was noted to have 20/25 best-corrected visual acuity with keratometric and topographical flattening of 1.5 diopters on topography. When questioned about her treatment the patient remarked that she had followed her EyeMD's suggestion of taking dietary riboflavin but stated that she felt "if 50 mg was good, I thought 500 mg would be better." She continued to follow up for 48 months maintaining excellent vision with no progression or worsening of her post-refractive surgery cornea ectasia.

Case 2:
Because of the initial positive results of this first patient, several additional post-refractive and keratoconus patients were treated at Evergreen Eye Center, Federal Way, Washington, and most recently at University of Missouri Department of Ophthalmology, Columbia, Missouri as part of an IRB and FDA approved investigation.
After informed consent and in compliance with the patient rights found in the Declaration of Helsinki, 11 additional patients have been enrolled in a prospective randomized, controlled study at the Department of Ophthalmology, University of Missouri – Columbia School of Medicine, taking 100 mg or 400 mg dietary riboflavin and walking briskly outdoors facing the sun without sunglasses for 15 minutes daily.

Case 3:
A 35-year-old clinical dietician with a history of progressive keratoconus reported to her cornea specialist at the Department of the Ophthalmology University of Tennessee – Memphis, that she had taken "mega-doses" of riboflavin after examination about its high tolerability and low risk of side effects. When seen by her cornea specialist, (A.S.), the patient was found to have 2.17 diopters OD and 1.33 diopters OS of cornea flattening on topography compared to her pre-treatment K average findings.

Discussion:
In 2016, we submitted Institutional Review Board (IRB) application for a high dose dietary riboflavin and direct sunlight exposure study in the treatment of keratoconus and post-refractive surgery cornea ectasia, which was approved for patient enrollment in 2016 and has recruited 11 patients to date with a minimum of 6 months follow up at University of Missouri Department of Ophthalmology. Prior to initiating our IRB and FDA approved and NIH registered study, several patients with keratoconus, post radial keratotomy and post LASIK ectasia were treated at Evergreen Eye Center with a

minimum of 24 months follow up with our initial patient now at 60 months follow up.

Conclusion:

We conclude that high-dose dietary riboflavin may have a place in the conduct of keratoconus and post-refractive surgery kerectasia as an economical another or adjunctive form of action. It may be especially useful in pediatric and pregnant patients who are more likely to regress after commercial cross-linking-therapy.

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