Combined Partial Topo-guided PRK and Corneal Collagen Cross-linking
Case report

ZIAD M. T. ABUELEM, MD, Jordanian Board of Ophthalmology (J.B.Ophth), Member of the Jordanian Ophthalmic Society (JOS), American Academy of Ophthalmology (AAO) and the International Society of Refractive Surgery (ISRS).
Amman, Jordan.
E-mail: ziad09@gmail.com.
Tel.: 00962-79-9573081.
Abstract

Purpose: To describe a case of Keratoconus in which the right eye was managed using the Athens protocol.
Methods: Single patient case report.
Results: After the patient received partial topo-guided PRK with CXL simultaneously (Athens protocol), the UCVA, BSCVA improved and K-max reduced at 5 months follow up.
Conclusions: Using the Athens protocol in suitable candidates helps to improve the quality and quantity of vision and provides corneal stability.

Introduction

Throughout my practice in my private clinic, a significant number of the cases are diagnosed as Keratoconus. As a member of the ISRS this gave me the chance to apply for this externship. My goal was to learn more about early detection of these cases using advanced diagnostics given how crucial early diagnosis is to enable the application of a wider variety of options in the management of these cases thereby decreasing the financial burden and expected morbidities suffered by patients in cases of delayed diagnoses. Therefore exploring management options will maximize patients' potential for improving their quality of life in the face of this preventable cause of blindness which is very common in our region.

The externship lasted 3 weeks and was conducted in The Laser Vision Ambulatory Eye Surgery Unit, which is a Clinic and Research Eye Institute founded in 2001 and situated in Athens, Greece. The mentor of this Externship was Dr. A. J. Kanellopoulos. Activities during the externship focused on building advanced skills in anterior segment diagnostics, evaluation of refractive patients for cornea and lens based surgery, attending a multitude of procedures and learning about keratoconus advanced diagnostics.

The topic I was most interested in during the externship was the management of keratoconus using the partial PRK and CXL (Athens protocol) technique, which provided me with better understanding of the concept of this approach in relation to indications, expected benefits, follow up criteria, limitations and ways to minimize complications. Learning this equipped me with more options for treating patients suffering from this disease.

Case discussion:

Keratoconus is a common disease, and its prevalence increases day by day due to the huge development in diagnostic and screening tools. Management of Keratoconus has also developed; new approaches have raised either to halt the progression of the disease or to rehabilitate the cornea or to achieve both [1].

In this case report I will discuss the management of the right eye of a 38 year old male patient with a history of bilateral keratoconus, his initial UCVA was 3/10. BSCVA 7/10 with refraction of -1.50/-7.50*30, K-readings 52.87/44.5 @116. Pentacam shows keratoconus with irregular bowtie pattern, K-max 57.2D, thinnest location of 489 um. (Fig.1). Corneal OCT shows epithelial thinning over the cone and minimum thickness of 492 um (OCT RTVue 100). (Fig.2).
Because the vision was not functionally further correctable with spectacles or contact lenses, the option of partial topo-guided PRK to normalize the corneal surface followed by corneal CXL in the same setting was adopted.

The clinician should take special consideration in treating these cases. By no means can the excimer laser be considered an instrument for emmetropia in these patients in a fashion similar to routine LASIK or PRK refractive cases. The treatment should be directed towards normalizing the corneal surface and allowing for improvement BSCVA. There is an obvious danger in thinning these corneas too much by giving in to the temptation to correct the refractive error.

Putting in mind this important principle, the treatment using the the Alcon/WaveLight EX500 laser topography-guided customized ablation treatment (T-CAT) software was done, correcting -2.75D of myopia and -4.00D of astigmatism, respecting the topographical axis of 25, on an optical zone of 5.50 mm. The excimer laser ablation resembles that employed in a hyperopic treatment, with the goal of steepening of the area adjacent to the cone in an attempt to normalize the corneal surface. This treatment left 445 um of residual stroma, which is a safe thickness for the subsequent step of CXL. The protocol used was 5mW/cm² for 18 minutes of UV light, using VibeX Rapid riboflavin (1 drop every 1min for the first 9min, 1 drop every 2min for the rest 9min).

Follow up of the case at 5 months showed an improvement of the UCVA to 6/10, BSCVA to 10/10-, with a refraction of -1.00/-2.25*20, flattening of steep K by 4.7D (from 50.8 to 46.1), reduction of K-max by about 9D (from 57.2 to 47.9). OCT cornea showed deep cross-linking line.

This shows that applying this technique of performing the two procedures together offers the advantages of normalizing the corneal surface and provides a better penetration of riboflavin and UVA to achieve a wider and deeper CXL effect with greater corneal flattening.

References:
Fig. 1: Preoperative pentacam of the right eye, showing keratoconus with irregular bowtie pattern, TL of 489 um, K-max of 57.2D.
Fig. 2: Preoperative OCT RTVue 100 of the right eye, showing epithelial thinning over the cone.
Fig. 3: Alcon/WaveLight EX500 laser-topography-guided customized ablation treatment (T-CAT) of the right eye, showing the plan to treat -2.75D of myopia and -4.00D of astigmatism, using the topographic axis of 25, the ablation done over an optical zone of 5.50 mm.
Fig. 4: Pre and postoperative pentacam 5 months apart showing flattening of the cone and the changes in steep k and K-max.
**Fig. 5:** Postoperative OCT RTVue 100 of the right eye, showing a more uniform epithelial thickness mapping and the deep cross-linking line.