

## Contact lens care and disease characteristics in keratoconus

John Ching-Jen Hsiao<sup>1,2,\*</sup>, Shyan-Tarng Chen<sup>1,2</sup>

<sup>1</sup> School of Optometry, Chung Shan Medical University, Taichung City, Taiwan

<sup>2</sup> Department of Ophthalmology, Chung Shan Medical University Hospital, Taichung City, Taiwan

[johncjhsiao@yahoo.com.tw](mailto:johncjhsiao@yahoo.com.tw)

**Abstract:** Keratoconus is a noninflammatory, progressive corneal disorder characterized by localized conical protrusion, apical thinning, irregular astigmatism, and central corneal scarring. These changes in cornea often lead to some unique clinical symptoms and signs which usually can't be seen in normal eyes. Contact lens care of keratoconus is more challenging than care of normal eyes because the need for special diagnostic trial lenses, experienced clinician and more professional chair time. In this article, we will focus on how to diagnose Keratoconus based on its disease characteristics and the complexity of contact lens care for it. The model of 3 point touch lens fitting will also be discussed in detail. [John Ching-Jen Hsiao, Shyan-Tarng Chen. **Contact lens care and disease characteristics in keratoconus.** *Life Sci J.* 2013, 10(1):285-287] (ISSN:1097-8135). <http://www.lifesciencesite.com>. 44

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### 1. Introduction

Keratoconus is a progressive, often bilateral, non-inflammatory ocular disease characterized by steepening, apical thinning, and central scarring of the cornea. Patients' vision with keratoconus, usually deteriorate as the corneal protrusion worsen due to more irregular astigmatism and central corneal scar. The onset of Keratoconus typically begin at puberty and early adulthood and likely to progress until late in life and thus affects adults' visual quality in their daily activities. It is widely accepted that the corneal distortions induced by keratoconus increase the eye's optical aberrations and that the resultant degradation in retinal image quality reduced visual acuity and contrast sensitivity.<sup>1,2</sup> The classic clinical symptoms and signs of keratoconus include worsening of best corrected spectacle acuity, fluctuating visual acuity, increased regular and irregular corneal astigmatism, an inferiorly displaced, thinned protrusion of the cornea, Vogt's striae in the posterior corneal stroma, scars in Bowman's layer, and Fleischer's ring. These signs become more prevalent as the disease progresses.<sup>3,4</sup> In this paper, we will discuss some of the symptoms and signs mentioned above and the lens fitting philosophy of 3 point touch model for keratoconus.

### 2. Material and Methods

The following examinations were performed: Visual acuity with and without correction, manifest refraction, keratometry, corneal topography, complete slit lamp biomicroscopy examination and many trial rigid lens fittings with fluorescein dye.

Visual acuity was assessed for each eye with Snellen vision test chart viewed at 3 meter with mirror reflection set up. Corneal topography was performed using Dicon topographer (Paradigm Medical, USA) and keratometry reading using Topcon keratometer. Contact lenses used were Rose K rigid gas permeable lenses specially designed for keratoconic eyes.

### 3. Results and Discussion

At the early stage of keratoconus, patients will find a slowly but continuously decrease in both aided and unaided vision; this is because of the increase of irregular astigmatism and frequent changes in the refractive errors as the condition progresses. Often patients will complain seeing diplopia (double vision), mild photophobia, ghosting, flare from lights at night and mostly important of all, and the reduced vision with spectacles. The diagnosis of keratoconus is based on many clinical findings, and they include:

The early signs:

Distorted retinoscopy reflex, distorted and steeper keratometry mires, distorted photokeratometry rings, inferior steepening in corneal topography maps, apical corneal thinning and cone formation of the cornea.

The later signs:

Advanced Cone Formation: usually find on patients when his or her average keratometry reading falls between 50.00 to 60.00 diopters. The profile of the cone can take shape in Nipple cone, Oval cone, and Globus cone, with the last one being the most large in size and most difficult to fit contact lens.

**Munson's Sign of Lower Lid:** The lower lid is pushed downward when a patient with severe corneal ectasia looks down. This can be easily seen by comparing the both lids when patients with keratoconus look in a downward gaze (Fig.1).

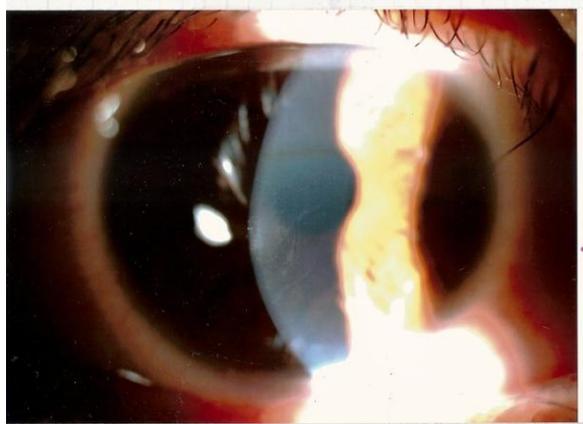
**Fleischer Iron Ring:** Iron deposition in the cornea, resulting in brown-colored rings or lines, are thought to be caused by the absorption of the metal into the basal epithelium layer from local stagnant tears.<sup>5</sup>This brown ring usually encircles the base of the ectatic cone of the keratoconus. One can easily see with slit lamp under cobalt blue light.

**Apical scar formation:** When the severity of the cone reaches to a certain level that may cause the integrity of cornea to disrupt and induce scar. This is may also associated with rigid lens fitting if patients had been wearing the lens as the treatment of keratoconus.

**Increased visibility of corneal nerve fibres:** This is also due to the stress on cornea associated with the progression of corneal ectasia.

**Vogt's striae:** Vertical lines that occur in the posterior stroma, also induced by the stress of the cone. The striae can disappear upon induced pressure, either via examiner's finger or Q-tip on patients' eyelid (Fig.1).

All these clinical signs would be more obvious and easier to detect as the condition of keratoconus progresses.

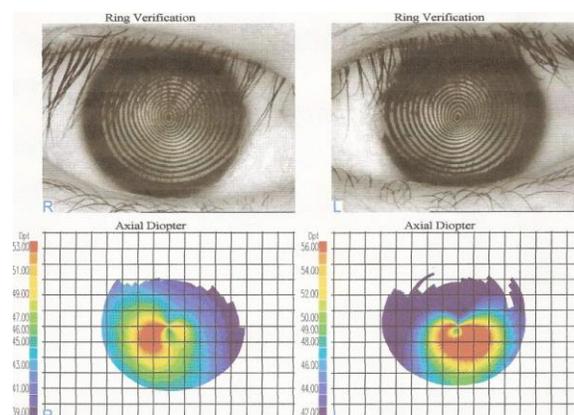


**Fig. 1. Spherical orthokeratology lens fitted on a cornea with high astigmatism.**

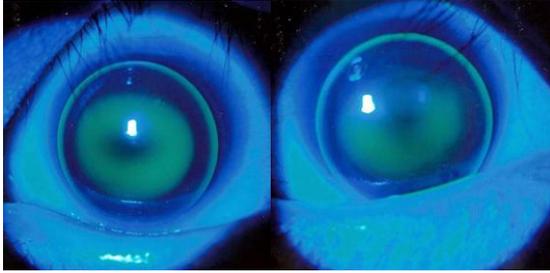
The treatment of keratoconus includes correction with spectacles at early stages, the use of contact lens at the moderate stage, and finally cross-linking or keratoplasty at severe cases. Although corneal transplantation has been successful in the surgical management of keratoconus, most of the patients with this condition are still managed with contact lenses for visual rehabilitation.<sup>6,7</sup>In general,

soft contact lens and spectacle have no effect on the distorted surface of the keratoconic cornea and hence preserving the majority of aberration induced by irregular astigmatism. In contrast, rigid contact lens improves vision in eyes with keratoconus is that tears fill the gap between the irregular corneal surface, allowing the smooth inner surface of the lens to act as the new smooth surface of the cornea, thereby reduces the majority of the irregular astigmatism.

It is widely accepted that the three point touch method is the most suitable philosophy for keratoconus rigid lens fitting. The three point of touch refer to the positions on the lens found at the 3 o'clock position, the 9 o'clock position, and the central part of the lens. This can be easily analyzed by looking the corneal topography (Fig. 2) and the corresponding rigid lens fitted photography using 3 point touch method and Rose K rigid lens (Fig.3) of our example patient with keratoconus. The red, steeper regions at the middle of topography of both eyes match with the central light touch bearing area in the photos. The fitting philosophy emphasize on the lens must rest lightly against the cone apex and the majority of lens weight is supported by the nasal and temporal zone by the mid-periphery of the back surface. The objectives of the lens fitting are to provide best possible visual acuity, minimal interference to corneal physiology and to optimize lens comfort. Some case studies have led to hypothesis that apical clearance fitting accelerate ectatic progression, whereas some other opposing studies suggest that via apical support, the cornea may acquire more central scar. To balance the 2 above hypotheses, one must be careful not to impose excessive mechanical pressure on the cone when the fitting technique of 3 point touch method of lens is used.



**Fig. 2. Topography of Keratoconus OU.**



**Fig. 3. “3 point touch” rigid lens fitted photography in corresponding to the corneal topography above, using and Rose K rigid lens.**

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#### 4. Conclusion

Due to the significant impact of keratoconus to patients' quality of lives, it is important to diagnosis the disease and to deal with it with appropriate treatment whenever suitable. Rigid Gas Permeable contact lens remains the choice of treatment for keratoconus because of its ability to reduces irregular astigmatism, to improve visual acuity and its' non-surgical in nature. Although contact lens care of keratoconus possess more challenges than that of the normal eyes, the benefit patients received from enhanced visual acuity is priceless.

#### Corresponding Author:

John Ching-Jen Hsiao, OD, FIACLE.  
School of Optometry, College of Medical Sciences and Technology, Chung Shan Medical University, No. 110, Jianguo N. Rd., Taichung City 402, Taiwan.  
E-mail: [johncjhsiao@yahoo.com.tw](mailto:johncjhsiao@yahoo.com.tw)

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