

# Videokeratography Findings in Children with Vernal Keratoconjunctivitis versus Those of Healthy Children

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**Purpose:** To determine videokeratographic topography of eyes with vernal keratoconjunctivitis (VKC) and to assess whether the severity of the VKC is related to the presence of changes compatible with keratoconus.

**Participants:** Seventy-six persons aged 6 to 21 years: 40 patients with VKC and 36 healthy controls.

**Design:** A comparative, observational case series.

**Methods:** We examined 76 persons, of whom 40 were patients with VKC and 36 were control subjects, and compared the outcomes of videokeratography (VKG) patterns (EyeSys Laboratories, Houston, TX), numerical corneal indices, and spherical equivalent refraction.

**Main Outcome Measures:** Corneal topographic patterns, corneal numeric indices, and corneal mirror imagery.

**Results:** We found many more abnormal patterns on VKG among the VKC patients than expected when compared with 'normal' eyes ( $P = 0.02$  for the right eye and  $P = 0.001$  for the left eye). Videokeratography allowed us to define a subgroup of patients with infraclinical keratoconus. A trend of superior corneal steepening ('superior keratoconus') was also found.

**Conclusions:** Vernal keratoconjunctivitis patients have more abnormal corneal topographic patterns than non VKC controls. Videokeratography may help decide how to follow-up and treat a presumed self-limiting disease. *Ophthalmology* 2002;109:2018–2023 © 2002 by the American Academy of Ophthalmology, Inc.

Vernal keratoconjunctivitis (VKC) is a seasonal or perennial allergic extraocular disease that affects mainly young males aged 6 to 21 years. Generally, the disease is considered self-limited, and carries good visual prognosis.

Keratoconus is a noninflammatory thinning disorder of the cornea that usually manifests after puberty and may cause progressive myopic astigmatism so severe as to warrant surgical intervention.

Gonzales,<sup>1</sup> who stated that keratoconus follows VKC, was the first to mention the association between VKC and keratoconus. Most reports of this association have been anecdotal,<sup>2–6</sup> but recently, several reports have used videokeratography (VKG) to quantify corneal topographic changes in patients with allergic eye diseases or have sur-

veyed the prevalence of allergic diseases in patients with overt and subclinical keratoconus by VKG.<sup>7,8</sup>

Jacq et al<sup>8</sup> studied the incidence and severity of allergic eyes and systemic diseases in patients with keratoconus on VKG, whereas Totan et al<sup>7</sup> showed that in a group of VKC patients, nearly 27% had abnormal patterns of VKG.

In our study, we compared VKG patterns in children with VKC versus healthy children. The comparison was done for the videokeratographic patterns and the numerical indices, modified from Rabinowitz et al,<sup>9</sup> Rasheed et al,<sup>10</sup> Maeda et al,<sup>11</sup> Wilson et al,<sup>12</sup> Sterker and Wiedemann.<sup>13</sup>

## Subjects and Methods

The study population consisted of consecutive patients visiting the primary care ophthalmology clinics of a large health maintenance organization (Clalit Health Services, Beer Sheba, Israel). All patients aged 6 to 21 years were examined after appropriate informed consent was obtained, according to the Institutional Review Board.

Subjects with a history of trauma, ocular foreign body, conjunctivitis other than VKC, previous ocular surgery, contact lens wear and anyone not able to cooperate with VKG were excluded. Vernal keratoconjunctivitis patients with shield ulcers or with previous ocular surgery, such as cryotherapy for papillae, cataract surgery, and filtering procedures, were also excluded.

The patients and their parents were interviewed. A complete ophthalmic examination was performed, including computerized VKG (EyeSys Laboratories, Houston, TX). All corneal topography was performed with the patient instructed to blink several times before the procedure without lubricants. Only the corneal topography at this visit was included in the study.

Originally received: October 4, 2001.

Manuscript no. 210839.

Accepted: March 12, 2002.

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Presented in part at the European Conference of Cataract and Refractive Surgery, Brussels, Belgium, September 2000.

Supported in part by the Goldman Foundation of the Faculty of Health Sciences, Ben Gurion University of the Negev, Beer Sheba, Israel.

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Table 1. Clinical Classification of Vernal Keratoconjunctivitis

Palpebral	
Mild	Conjunctival papillae
Moderate	Mucus secretion
Severe	Mucous plugs, giant papillae (cobblestones), reticular scarring, or symblepharon formation
Limbal	
Mild	Thickening or opacification of the limbal conjunctiva
Moderate	Gelatinous lymphatic nodules that can coalesce (Horner-Trantas nodules)
Severe	Hyperemia, redness of the conjunctiva, with any of the above signs, and corneal panus formation
Combined	Limbal and palpebral, all with corneal involvement
Corneal	
Mild	Superficial punctate keratopathy at any stage
Moderate	Superficial punctate keratopathy
Severe	Nebulous keratopathy Shield ulcer

Vernal keratoconjunctivitis was graded according to site and severity (Fig 2) of the conjunctival and corneal involvement (Table 1).

Corneal topographic morphologic features were analyzed according to the definitions of Rabinowitz et al.<sup>9</sup> Minor simplifications were inserted that divide the topography patterns into 'normal' (round, oval, and symmetric bow tie) and 'abnormal' (asymmetric bow tie, with or without skewed axis, superior and inferior steepening, and irregular patterns; Fig 1).

Corneal topography was analyzed by two observers (RLG, TL) in a masked fashion, and interobserver reliability was tested.

Numeric EyeSys indices that were analyzed included the maximal corneal powers of both eyes, the inferior-superior (I-S) index, and the differential surface index. Mirror imagery was also tested. The I-S index, which calculates the difference in steepness between the upper and lower cornea, was calculated manually and served as a measure of corneal asymmetry. The differential surface index, which calculates the maximal dioptric difference at 3 mm from maximal corneal power, was calculated manually and served as a measure of surface irregularity.

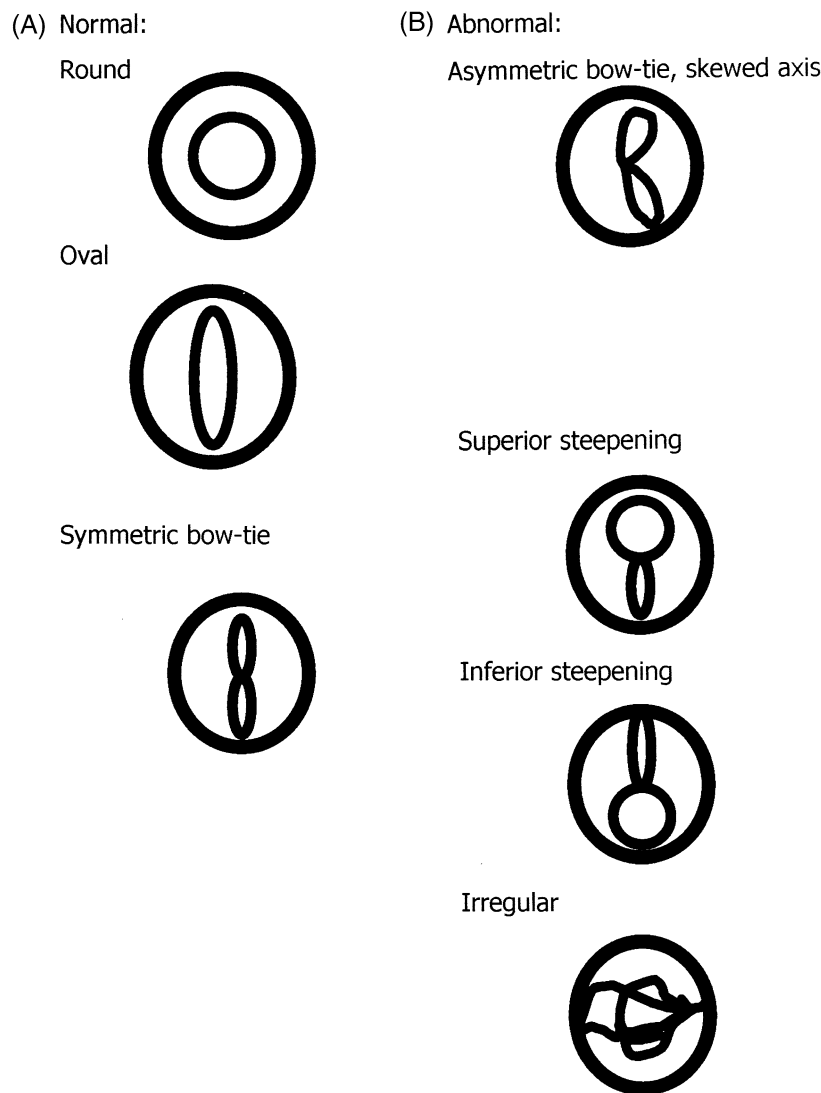


Figure 1. Definition of the corneal topography patterns. A, Normal. B, Abnormal.

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