

Pinguecula and contact lenses

CLINICAL STUDY

Abstract

Purpose To assess the relationship between age and the incidence and severity (determined by a grading system) of pinguecula in contact lens (CL) wearers, and to compare the grade of pinguecula between CL wearers and non-wearers.

Methods A total of 600 CL wearers (94 wore hard CLs (HCLs) and 506 wore soft CLs (SCLs)) aged 11–60 years and 579 non-wearers aged 10–60 years were enrolled. The age, gender, medical history, ocular history, and grade of pinguecula at two locations (nasal and temporal) were determined in all subjects.

Results There was an age-related increase in the grade of pinguecula among both CL wearers and non-wearers. The grade of pinguecula at the temporal conjunctiva was higher in CL wearers than in non-wearers ($P=0.01907$), whereas it was higher in HCL wearers than SCL wearers at both the nasal and temporal conjunctiva ($P<0.00001$ and $P<0.00001$).

Conclusions This was the first assessment of the severity of pinguecula in a large consecutive series of CL wearers. Our results suggest that the use of CLs is an important risk factor for pinguecula.

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Keywords: pinguecula; grading; contact lens

Introduction

Pinguecula is one of the most common age-related eye diseases and is characterized by the appearance of yellowish to brown nodules on the bulbar conjunctiva near the sclerocorneal junction. The development of pinguecula is associated with aging.^{1–6}

We previously examined the incidence of conjunctivochalasis in a hospital-based population⁷ and in contact lens (CL) wearers.⁸ We found that the prevalence and severity of

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conjunctivochalasis were dependent on both the age⁷ of the subjects and the duration of wearing CLs.⁸ The grade of conjunctivochalasis was highest in hard CL (HCL) wearers, followed by soft CL (SCL) wearers, and then non-wearers.⁹ Wearing CLs can cause chronic conjunctival inflammation due to hypoxia, mechanical friction, dehydration, or incompatibility with the lens material.⁹ However, there have been no large-scale surveys that have investigated pinguecula in CL wearers. On the other hand, tear film instability because of CLs may be involved in the pathogenesis of pinguecula. It may be of benefit to CL wearers to know whether CLs are a risk factor for developing pinguecula. Accordingly, this study was performed to (1) assess the relationship between wearing CLs and pinguecula, (2) introduce a new pinguecula grading system, and (3) compare the severity of pinguecula between HCL wearers and SCL wearers by using our new grading system.

This report covers our recent work on the relationship between wearing CLs and the occurrence of conjunctivochalasis.⁹ Therefore, the study population consisted of the same subjects reported in a previous paper.⁹

Materials and methods

Subject

This was a prospective, cross-sectional, and consecutive case series. This study was performed in accordance with the Helsinki Declaration of 1975 and its 1983 revision. Institutional Review Board approval was obtained and informed consent was also obtained from each subject. Consecutive CL wearers attending our outpatient clinic for the periodic eye examinations between January and June 2007 were enrolled in the study. Almost all of the patients lived in Tokyo or Kanagawa in Japan. Patients with a history of ocular surgery or punctal occlusion, and those with infectious conjunctivitis, inflammatory conjunctivitis, proptosis, or eyelid abnormalities (such as

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entropion, ectropion, and trichiasis) were excluded. Moreover, patients using both HCLs and SCLs were excluded so that the differences between HCL and SCL wearers could be investigated. Consequently, the study population consisted of 506 SCL wearers and 94 HCL wearers, including 237 males and 363 females aged 28.9 ± 11.3 years (mean \pm SD), with an age range of 11–60 years (Table 1). The type of HCL was all rigid gas permeable lens, but not polymethylmethacrylate lens. The common reasons for the choice of HCL were the high myopia with astigmatism, a low cost of maintenance compared with SCL, and the parents' experience with HCLs. All CL wearers were under the age 60 years. First, 1034 patients were selected from among 1992 non-wearers, who attended our outpatient clinic for eye screening tests between January and June 2007 by excluding patients of 60 years of age and older in order to match for age with CL wearers. Next, we selected 564 age-matched controls in each age group from among 1034 control subjects by stratified random sampling using a random number table on the computer list. Thus, each decade age group was matched by using a

computer database. Controls lived in the same geographic area as the CL wearers.

Grading system for pinguecula

Pinguecula was graded into three categories as follows: grade P(0) = none, grade P(1) = mild or moderate pinguecula, and grade P(2) = severe pinguecula (Figure 1). Grading was carried out separately for lesions affecting the temporal and nasal halves of the conjunctiva. The diagnosis and grading of pingueculae was carried out by two skilled optometrists and an ophthalmologist (TM). The graders were trained by scoring 30 standardized sample photographs of the eyes. After training, the three graders recorded scores (3-point scale) of 120 pinguecula located on both the nasal and temporal conjunctiva in 60 eyes of 30 subjects, before the study started. A high degree of consistency among the scores of three graders was obtained (94.2%). They were aware of the CL status of all subjects. We evaluated the grade of pinguecula immediately after CL removal. Although data were obtained for both eyes, only data

Table 1 Clinical profile of the subjects

	Contact lens wearers	Non-wearers	P-value
Number of patients	600	564	—
Age (years)	28.9 ± 11.3	29.6 ± 13.4	NS
<i>Sex</i>			
Male	237 (39.5%)	276 (48.9%)	
Female	363 (60.5%)	288 (51.1%)	
<i>Refraction</i>			
Spherical equivalent (D)	-4.86 ± 2.47	-2.47 ± 2.61	<0.0001
Sphere (D)	-4.52 ± 2.41	-2.17 ± 2.55	<0.0001
Cylinder (D)	-0.78 ± 0.78	-0.70 ± 0.71	NS

Abbreviations: D, diopters; NS, not significant.

Values are expressed as mean \pm s.d. and were compared with unpaired Student's *t*-test.

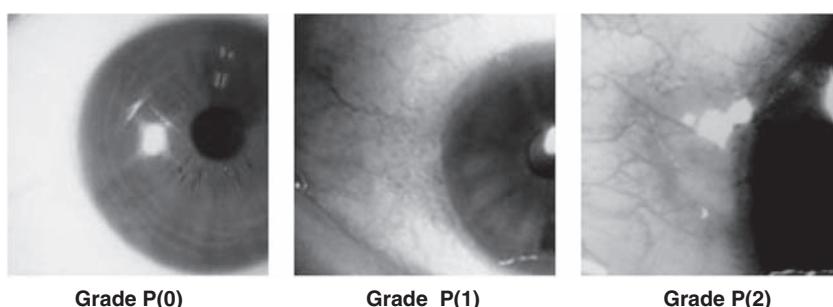


Figure 1 Pinguecula grading system. Pinguecula was graded into three categories as follows: grade P(0) = no pinguecula, grade P(1) = mild, or moderate pinguecula (yellowish-white and flat or slightly elevated lesion), and grade P(2) = severe pinguecula (highly vascular and elevated lesion).

from the right eye were used for analysis. Any discrepancies among the three graders were adjudicated by an independent senior doctor.

Statistical analysis

The paired or unpaired Student's *t*-test was used to compare the mean values between the two groups and the χ^2 -test was used to compare percentages. Relations among the variables were investigated by calculating Pearson's correlation coefficients and partial correlation coefficients. Correlations were also evaluated by Fisher's Z-transformation method and Bartlett's test. Grades of pinguecula were compared between the two groups by the two-tailed Mann-Whitney *U*-test. The level of significance was set at $P < 0.05$ for all analyses, which were carried out with the Stat View statistical software package (Abacus Concepts, Berkeley, CA, USA).

Results

Figure 2 shows the grade of pinguecula in each age group. As shown in Figure 2, the prevalence of pinguecula located on both the nasal and temporal

conjunctiva increased dramatically with age among both CL wearers (11–20 years, 2.6% (nasal) and 3.2% (temporal), 21–30 years; 15.6 and 18.0%, 31–40 years, 23.0 and 25.7%, 41–50 years, 46.2 and 50.8%, 51–60 years, 77.4 and 80.6%, and total subjects 11–60 years, 20.4 and 22.6%) and non-wearers (11–20 years, 0.0% (nasal) and 0.6% (temporal), 21–30 years; 5.2 and 5.7%, 31–40 years, 7.4 and 7.4%, 41–50 years, 49.3 and 47.8%, 51–60 years, 49.2 and 52.5%, and total subjects 11–60 years, 13.8 and 14.4%). There was no significant difference in the grade of pinguecula between the nasal and the temporal conjunctiva in each age group. However, the grade of pinguecula was significantly higher in CL wearers than in non-wearers (mean grade for the nasal conjunctiva: 0.27 ± 0.57 vs 0.18 ± 0.47 , $P = 0.00173$; temporal conjunctiva: 0.29 ± 0.56 vs 0.19 ± 0.48 , $P = 0.00100$, unpaired *t*-test), as was the prevalence of pinguecula (nasal conjunctiva: $P = 0.06203$; temporal conjunctiva: $P = 0.01907$, two-tailed Mann-Whitney *U*-test) (Figure 2).

The location of pinguecula was compared between CL wearers and non-wearers in each age group (Figure 3). In both group, most of the patients with pinguecula had pinguecula in the both nasal and temporal conjunctiva.

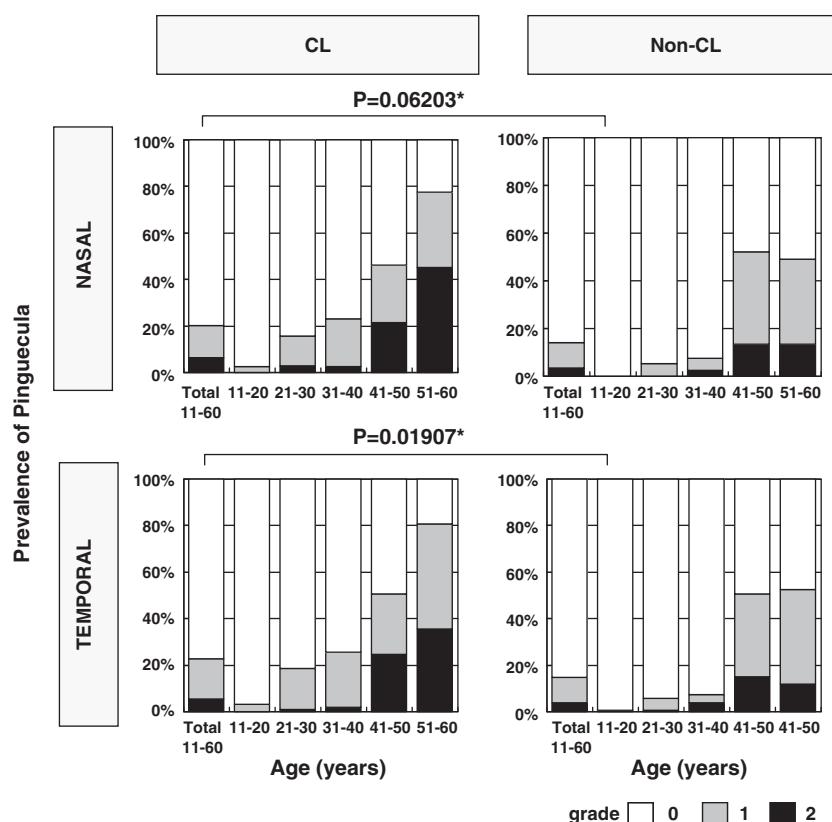


Figure 2 Comparison of the grade of pinguecula at the nasal and temporal areas of the conjunctiva in CL wearers and non-wearers. Pinguecula was graded according to the system indicated in Figure 1 and the Materials and methods. *Mann-Whitney *U*-test.

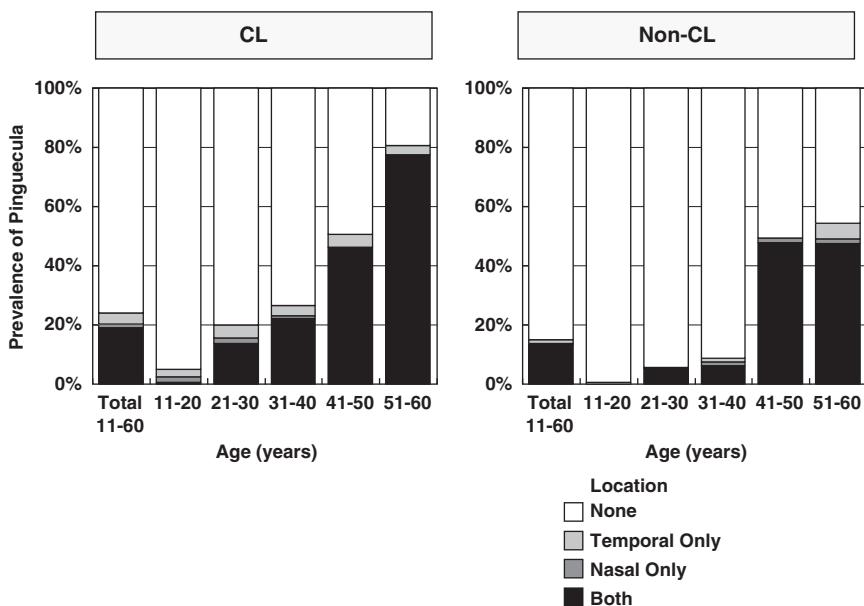


Figure 3 Comparison of the location of pinguecula in each age group between CL wearers and non-wearers. The location of pinguecula was classified into four categories: (1) no pinguecula, (2) temporal pinguecula only, (3) nasal pinguecula only, and (4) both temporal and nasal pinguecula.

There was no significant difference in the location of pinguecula between CL wearers and non-wearers in each age group (two-tailed Mann–Whitney *U*-test).

The grade of pinguecula was higher in HCL wearers than in SCL wearers at both the nasal and temporal conjunctiva ($P < 0.00001$ and $P < 0.00001$, respectively, two-tailed Mann–Whitney *U*-test) (Figures 4a and b). There were significant differences in the prevalence and location of pinguecula between HCL and SCL wearers in some age groups ($P < 0.05$, two-tailed Mann–Whitney *U*-test, Figure 5).

The grade of pinguecula was significantly correlated with the duration of CL wear in SCL (nasal; $r = 0.222$, $P < 0.00001$, and temporal; $r = 0.237$, $P < 0.00001$) and HCL wearers (nasal; $r = 0.554$, $P < 0.00001$, and temporal; $r = 0.506$, $P < 0.00001$).

Discussion

This study showed that both the prevalence and grade of pinguecula were higher in CL wearers than in non-wearers, and that the grade of pinguecula was higher in HCL wearers than SCL wearers. Although the prevalence of pinguecula is well known to increase with age, no previous attempt has made to assess the influence of wearing CLs on pinguecula. This study provides the first data about the grade of pinguecula in CL wearers.

The prevalence of pinguecula was very low during the first three decades of life and steadily increased after the

fourth decade in non-wearers (Figure 2), indicating that pinguecula increases with age. Among CL wearers, however, pinguecula was even seen in younger patients, and its prevalence at both the nasal and temporal areas was significantly higher than in non-wearers (Figure 2). Constant friction and inflammation of the conjunctiva caused by the CL edge may be responsible for the younger onset of pinguecula in CL wearers.

Next, we compared the grade of pinguecula between HCL and SCL wearers, and showed that the grade was higher in HCL wearers than SCL wearers (Figures 4a and b). The duration of CL wearing was correlated with the patient's age, so the findings in Figure 4a resemble those displayed in Figure 4b.

Regarding the pathogenesis of pinguecula, its grade was higher in SCL and HCL wearers than in non-wearers, suggesting that pinguecula related to SCLs and HCLs may share a common pathogenesis. CLs have an adverse influence on tear film stability, causing break-up and thinning of the film, and increasing evaporative tear loss, probably by a disruptive effect on the tear lipid layer.^{10,11} Although the possibility exists that conjunctival stimulations including CL-related dryness of the eyes and the mechanical friction between CL and conjunctiva may induce pinguecula in CL wearers, the relation between CL and pinguecula is still unclear. Further investigation will be required to assess the relationship between wearing CLs and the pathogenesis of pinguecula.

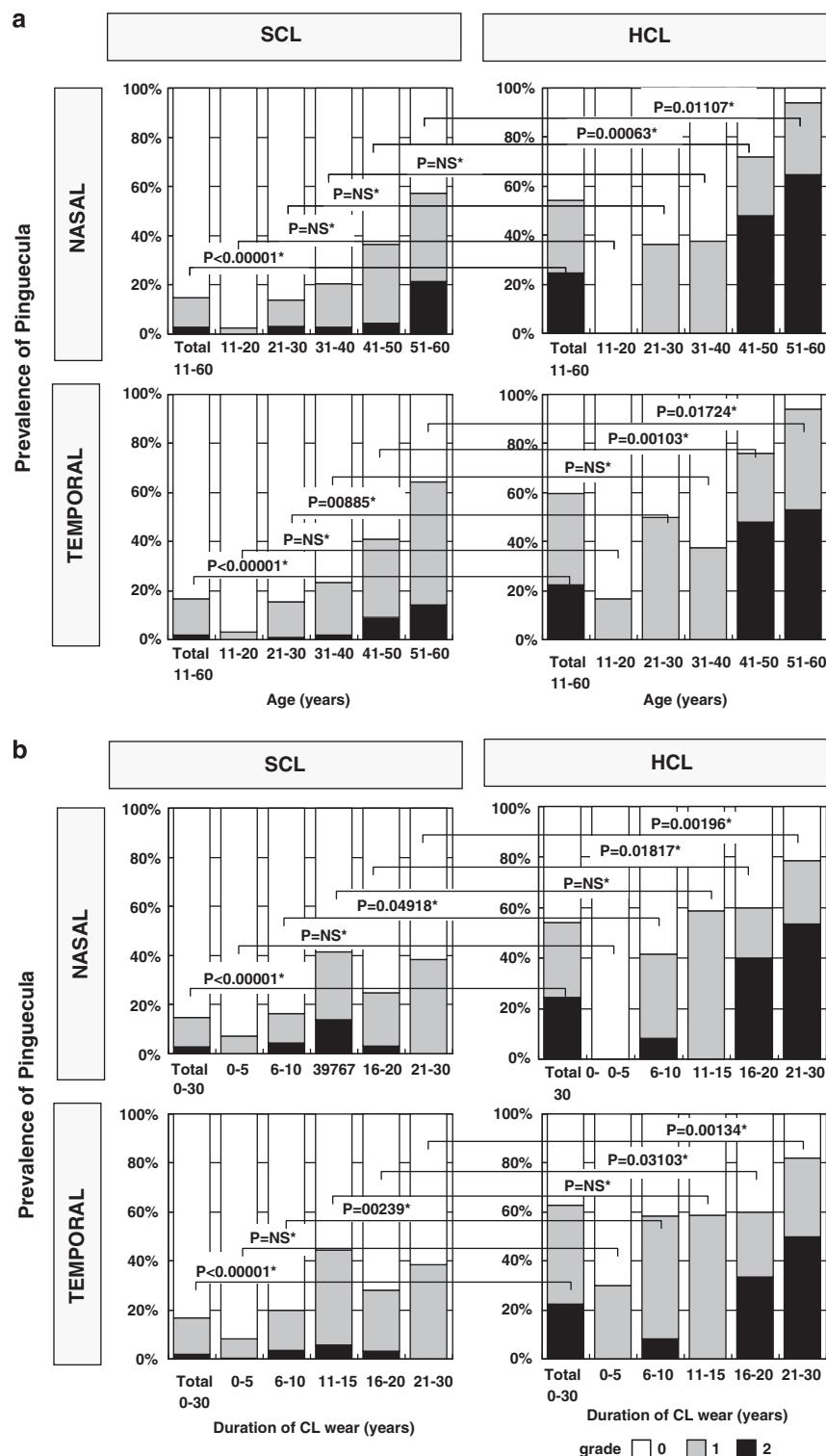


Figure 4 Comparison of the grade of pinguecula in each age group (a) and duration of CL wear (b) between SCL and HCL wearers.
*Mann–Whitney *U*-test. Abbreviation: NS = not significant.

Despite the larger size of SCLs, the grade of pinguecula in SCL wearers was lower than in HCL wearers (Figures 4a and b). There may be several reasons for this.

First, other features of a CL, such as its edge, curvature, elasticity, thickness, and fit, may be more important for inducing conjunctival stimulation than its size.

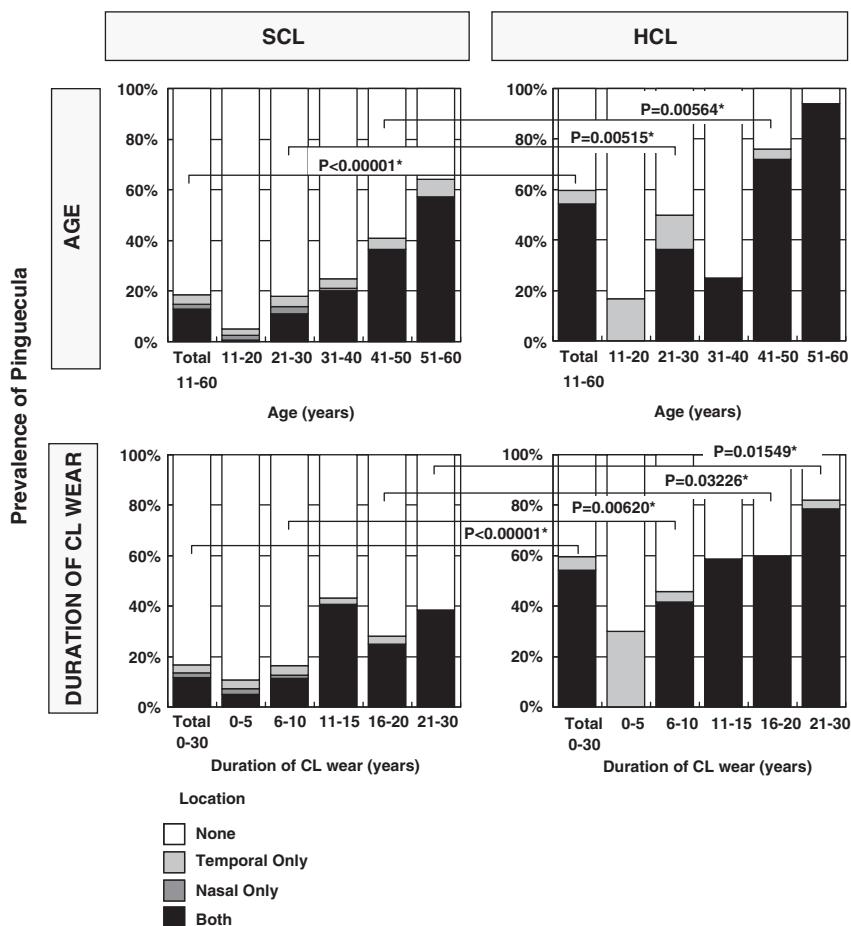


Figure 5 Comparison of the location of pinguecula in each age group and duration of CL wear between SCL and HCL wearers. The location of pinguecula was classified into four categories: (1) no pinguecula, (2) temporal pinguecula only, (3) nasal pinguecula only, and (4) both temporal and nasal pinguecula. *Mann-Whitney *U*-test.

HCLs may cause more severe chronic stimulation of the conjunctiva than SCLs because of their greater stiffness and larger elastic modulus. Second, SCLs have a larger diameter than HCLs and thus provide limbal protection against ultraviolet radiation (UVR), whereas HCLs with a smaller diameter provide less protection for the limbal cornea and leave the limbal conjunctiva exposed to UVR.^{12,13} The newer silicone hydrogel SCLs with greater oxygen permeability than conventional SCLs are thought to reduce the risk of hypoxia affecting the limbal epithelium and conjunctiva.¹⁴ Furthermore, SCLs are larger and softer, so that these lenses can cover pinguecula without causing rubbing, whereas the firm edge of HCLs stimulates both the conjunctiva and any pinguecula that exists.

This study had several limitations. One major drawback is that hospital-based studies tend to assess a selected sample of the population with different risk

factors. Second, the cross-sectional sample is also influenced by selection and cannot indicate the CL-induced changes of pinguecula. Long-term follow-up of the same patients will be needed to achieve this. Third, although keratoconjunctivitis sicca may be responsible for pinguecula, we did not evaluate dry eye symptoms. Despite these limitations, this study demonstrated the relationship between CL wearing and the severity of pinguecula. CL physicians need to inform the patients of the longer term cosmetic from an increased risk of pinguecula.

In summary, we reported the first assessment of the grade of pinguecula in CL wearers. We found that the prevalence and severity of pinguecula were dependent on the age and the duration of wearing CLs. The grade of pinguecula was highest in HCL wearers, followed SCL wearers, and non-wearers. These results indicate that pinguecula could be one of the complications related to wearing CLs.

Summary

What was known before

- Pinguecula is a relatively frequent disease; however, there have been no reports about the grade of pinguecula in contact lens (CL) wearers.

What this study adds

- The grade of pinguecula was higher in CL wearers than in the non-wearers, whereas it was higher in hard CL wearers than soft CL wearers. Our results suggest that the use of CLs is an important risk factor for pinguecula.

Conflict of interest

The authors declare no conflict of interest.

Acknowledgements

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