

Is atopy a risk factor for the use of contact lenses?

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We studied the tolerance of soft contact lenses (CL) in 24 atopic (16 with hay fever) and 52 non-atopic subjects with a mean age of 20 years. They were examined when they first came to an ophthalmologist to have CL and re-examined after an average of 1.7 years. All subjects were allowed to use CL throughout the year, including the pollen season. Of the 76 subjects, 31 (41%) reported some kind of eye symptoms during the use of CL. Six subjects (8%) had stopped using CL because of symptoms. Altogether, in 29/76 subjects (38%) some objective sign was detected in the examination, confirming the subjective symptoms (conjunctivitis 16, keratoconjunctivitis 8, increased limbal blood vessels 4, and eczema palpebrae 1). Fourteen of the 24 atopics (58%) had experienced symptoms compared with 17 of the 52 non-atopics (33%) ($p = 0.034$). Eleven atopics had seasonal eye symptoms, and eight of them (73%) had problems with CL use. Eosinophils and neutrophils found in the conjunctival scrapings at the first examination appeared to predict poor CL tolerance when the occurrence of symptoms in different groups was first compared by bivariate analysis. The risk factors that could predict poor CL tolerance were also evaluated, with logistic regression analysis controlling potential confounders. History of an atopic condition increased 5-fold the risk of experiencing various external eye symptoms during the use of CL. We conclude that seasonal atopic allergy is a especially risk factor for wearing soft contact lenses, and their use should be restricted during the season.

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In Finland there were approximately 200 000–250 000 contact lens (CL) users in 1988, 75% of whom were 15–25 years old. The use of CL has increased, particularly in young people, among whom 20–30% have a predisposition to atopy and 10% suffer from hay fever (3). How do atopic subjects tolerate CL? Conjunctival and corneal irritation caused by CL is common. In the United States, 3–50% of soft contact lens users have symptoms of irritation (8). Carmichael (2) has reported that 65% of allergic subjects have problems with CL solutions. In Finland no data are available on the frequency of external eye symptoms among CL users.

A clinical examination made by an ophthalmologist is mandatory in Finland in order to get CL. The fitting of the lenses can also be done by an optician who has a license for this work. In the present study 76 subjects, of whom 24 were atopic and 52 non-atopic, were examined for the use of soft CL and followed up after 1.5 years to evaluate their CL tolerance.

Subjects and methods

The source material consisted of 250 consecutive subjects (75% women) who first came to an ophthalmologist (O.K.) to obtain CL. The definitive material included those 76 subjects, 64 women and 12 men (mean age 20 years, range 14–40 years), who took part in a follow-up examination after an average of 1.7 years (range 0.3–4.2 years). None had used CL previously. The subjects had mild or moderate myopia (mean -3.0 D, range from -0.75 to -7.0 D). If an astigmatism was present, it did not exceed 0.75 D. Twenty-four subjects (32%) gave a history of an atopic condition; 16 subjects had seasonal hay fever (11 with both nasal and eye symptoms), 2 had perennial rhinitis, 1 had urticaria with increased total IgE, and 5 had atopic eczema but not of the face. None of the subjects had experienced any serious eye infection or injury. At the first examination three atopics and one non-atopic complained of eye irritation or itching. Two atopics had an allergic and the third a bacterial blepharoconjunctivitis verified by culture. The non-atopic had

bacterial conjunctivitis. They were all adequately treated before fitting the CL.

In the slit lamp examination of the cornea and the upper and lower lid conjunctiva, special attention was paid to hyperaemia and to the surface morphology (papillae and follicles). The upper lid was everted and examined with a biomicroscope first with 16× magnification. A fluorescein strip was moistened in the lower cul-de-sac (without touching the cornea), and the diameter of papillae was measured with a micrometer which was installed in a Haag-Streit BQ 900 slit lamp using cobalt blue light and 10× magnification. Papillae were graded according to their diameter, and only those papillae with a diameter ≥ 0.3 mm and covering at least one-third of the tarsal area were considered to be significant and used in the analysis (5). The tear film was evaluated by measuring the so-called break-up time (BUT) and estimating the tear fluid secretion with Schirmer's test. If BUT was < 10 s or the Schirmer tear strip became moist < 10 mm in 5 min, the subject was not given CL. Ten subjects were excluded for that reason. If the lacrimal secretion is insufficient the lenses become dirty more quickly than usual and tear fluid does not rinse out allergens from the eye (1). Tear fluid also has antibacterial properties and influences corneal oxidation and metabolism.

A cytological scraping was taken from the right lower lid conjunctiva with one sweeping movement of an iris spatula (A. Heiss, No. 2, Germany) from inner to outer canthus. A bacterial swab was taken from the conjunctiva of the left lower lid. No local anaesthetic was used. The sample was spread on a glass slide, air-dried and stained: 5 min Wright's solution, 15 min May-Gruenwald-Giemsa solution. The slide was examined under light microscope ($\times 1000$) using oil immersion. All the cells were counted with a method used in ophthalmic cytology (6, 7). The scale was as follows: 1–10 cells/slide = +, 11–40 cells/slide = ++, 41–60 cells/slide = +++, > 60 cells = ++++. For the analysis the cell counts were divided into two classes; 0 = 0–1 +; 1 = 2 +, 3 +, or 4 +.

After the examination the optician fitted the contact lenses. All of the subjects received soft hydrogel contact lenses, mostly made from hydroxethyl-methacrylate (HEMA) and meant for daily but not continuous wear. Instructions for cleaning, daily care, and hygiene of the lenses were given. The atopic subjects were allowed to use the lenses also during the pollen season. The subjects themselves chose how many hours/day and days/week they wore the lenses. They also chose the disinfection method: heat, hydrogen peroxide, or some other chemical. Enzymatic protein cleaning was recommended once a week. The lens wearers were recommended to change to new ones at least once a year. All the

subjects were asked to attend a re-examination after 6 to 12 months, irrespective of possible problems with the use of CL.

The subjects had a clinical and cytological re-examination after an average of 1.7 years (range 0.3–4.2 years). The time interval was the same for atopics and non-atopics. All the 16 pollen-sensitive subjects had used CL also during the pollen season. Four atopic subjects had used CL more than a year and only one of them with atopic eczema had not yet been through the pollen season. Ten of the 24 atopics had experienced at least two pollen seasons. Eighty percent of all subjects had used CL on 5–7 days/week. Sixty-nine subjects (91%) came to the control examination in order to renew their CL while 7 (9%) attended because of problems with their CL. Fifty percent of all subjects had used enzymatic cleaning once a week and the other half more seldom. Seventy-two percent of all subjects had used preserved CL solutions. The subjects attended the examination wearing their CL. The fitting and condition of the lenses were checked, especially that they were not too tight; i.e., the lenses could move 1–2 mm during blinking.

The occurrence of symptoms in different groups were first compared by bi- or trivariate analysis by chi-square test for statistical significances. To evaluate the effect of various potential determinants on CL tolerance, history of atopic conditions, presence of conjunctival papillae or conjunctival hyperemia, presence of neutrophils, eosinophils, or *Staphylococcus epidermidis* or *aureus*, were estimated odds ratios by logistic regression analysis. The model controlled potential confounders (sex, age at second examination, time between the examinations, degree of myopia, days of CL use/week, time interval of CL change, and method of disinfection).

Results

Of the 76 subjects, 7 (9%) came to the follow-up examination because of symptoms or signs during the use of soft contact lenses. Two of them were atopic. The rest of the group came for the control examination. Six subjects (8%) had stopped using CL because of symptoms. Two of them were atopic. Altogether 31 (41%) reported some kind of eye symptoms while using CL. The symptoms were mild in 19 (25%) and moderate to severe in 12 (16%) subjects. The most common complaints were sensation of a foreign body, redness, itching, pain, and lacrimation, in that order. Twenty-three of the 31 symptomatic and 6 of the 45 symptom-free subjects had also some objective sign at the follow-up examination. The diagnoses were based on the clinical findings: conjunctivitis (16), mild punctate epithelial keratoconjunctivitis (7), severe keratoconjunctivitis

with over 2 mm vascular invasion of the cornea and subepithelial cloudiness (1), micropannus (superficial limbal blood vessels involving the cornea 1–2 mm) (4), and eczema palpebrae (1). Lid eczema was probably caused by thiomersal because it disappeared after the disinfection liquid was changed to one without preservatives. Of the 29 objectively symptomatic subjects, 12 (41%) were atopic, while in the symptom-free group 12 of 47 (26%) were atopic. The difference is not significant (chi-square, $p = 0.149$). Fourteen of the 24 atopics (58%) had symptoms during the use of CL, as compared with 17 of 52 non-atopics (33%). The difference is significant ($p = 0.034$).

Of the 11 atopics who had seasonal conjunctivitis, 8 (73%) had either objective or subjective symptoms during CL use. Eosinophils and neutrophils found in the conjunctival cytology at the first examination also appeared to predict poor CL tolerance (Table 1). At the follow-up examination only conjunctival hyperaemia was significantly related to reported symptoms during the use of CL (Table 1).

Table 1. Clinical and cytological findings at the first and second examination and their association with subjective symptoms during the follow up-period ($n = 76$)

		Reported symptoms at follow-up examination	
	Number	<i>N</i>	<i>P</i>
First examination			
Atopy	24	14	0.034
No atopy	52	17	
Hyperemia	4	3	0.153
No hyperemia	72	28	
Papillae	21	11	0.204
No papillae	55	20	
Neutrophils	28	16	0.027
No neutrophils	48	15	
Eosinophils	5	5	0.005
No eosinophils	71	26	
<i>Staphylococci</i>	29*	14	0.268
No <i>Staphylococci</i>	40*	14	
Second examination			
Hyperemia	23	16	0.001
No hyperemia	53	15	
Papillae	51	24	0.112
No papillae	25	7	
Neutrophils	48	22	0.241
No neutrophils	28	9	
Eosinophils	9	6	0.092
No eosinophils	67	25	
<i>Staphylococci</i>	32**	15	0.481
No <i>Staphylococci</i>	29**	11	

* 69 subjects studied; ** 61 subjects studied.

The duration of CL use and habits of use, frequency of enzymatic cleaning, methods for daily care and disinfection, interval of CL change, and degree of myopia, did not affect the CL tolerance when estimated in the bi- or trivariate analysis (Table 2).

The risk factors which could predict poor CL tolerance were evaluated by logistic regression analysis (for the variables tested, see Methods). History of an atopic condition increased five-fold the risk of having various symptoms during use of CL (odds ratio 5.05, 95% confidence limit 1.49–17.14, $p = 0.009$). Hyperemia (OR 6.55, CL 1.98–21.63, $p = 0.002$) or papillae (OR 3.94, CL 1.06–14.63, $p = 0.040$) observed at the second examination were significantly associated with symptoms reported by the subjects. Two atopics had at both the first and the follow-up examination marked conjunctival eosinophilia and poor tolerance to contact lenses. Three other atopics with hay-fever, who developed problems during the use of CL, had eosinophilia before the use of lenses but not at the follow-up examination; this could be explained by the seasonal variation.

The presence of *Staphylococcus epidermidis* or *aureus* at the first or second examination was not associated with symptoms during CL use.

Table 2. Association of habits in use and care of contact lenses as well as degree of refraction with subjective symptoms during the follow-up period ($n = 76$)

		Reported symptoms at follow-up examination	
	Number	<i>N</i>	<i>P</i>
Use of CL			
< 1.5 years	37	15	0.966
> 1.5 years	39	16	
Use of CL*			
5–7 days/week	58	23	0.623
Less frequently	15	7	
Enzymatic cleaning*			
Once/1–2 weeks	34	12	0.638
Once a month	9	4	
Less frequently	30	14	
Care solutions*			
Preservatives	52	23	0.392
No preservatives	21	7	
Disinfection			
H ₂ O ₂	39	16	0.981
Heat	24	10	
Other chemical	13	5	
Interval of CL change*			
< a year	38	13	0.213
> a year	35	17	
Refraction*			
< -3D	38	12	0.085
> -3D	35	18	

* Missing information from three subjects.

Discussion

Subjects with some kind of atopic disorder (hay fever with more or less pronounced conjunctival symptoms, perennial rhinitis, asthma, atopic eczema) who want or need contact lenses make up a large part of an ophthalmologist's daily practice. In the present study we tried to evaluate CL tolerance in atopics, suffering mainly from hay fever, by comparing them with non-atopics during a follow-up of about 1.7 years. Consecutive subjects applying for CL were included without selection, and the final material consisted of those who also came to the follow-up examination. Because the number of subjects taking part in the first examination was about three times that of those attending the second clinical and cytological examination, bias is unavoidable: subjects who experienced problems during the use of CL may be overrepresented in the follow-up material. In fact, seven (two atopics) came to the control because of problems with CL. Nevertheless, the potential bias does not invalidate the main observation: a known atopic condition is an independent risk factor for problems during the use of contact lenses. The risk is increased particularly in those with a history of external eye symptoms during the pollen season. After controlling the potential confounding factors in logistic regression analysis, there was a five-fold higher risk for various external ocular symptoms or signs in the atopic than in the non-atopic group. At the first examination the subjects were not told to avoid using CL during the pollen season, and indeed they had used CL more or less all the year round. Outside the season most atopics appeared to tolerate CL as well as the non-atopic users. We conclude that subjects with hay fever should restrict the use of CL during the pollen season, at least during the high pollination period.

The presence of even one eosinophil or plasma cell in the conjunctival scraping has been suggested to increase the risk for symptoms during CL use (4). In the present study there were only five subjects (all were atopic) who had eosinophilia at the first examination, and all of them had problems with CL. The number of subjects having eosinophilia at the follow-up examination increased from five to nine, but three of the nine were asymptomatic. Nevertheless, presence of eosinophilia is, in most cases associated with atopic conditions and is a risk factor. Also the presence of neutrophils seems predictive of poor CL tolerance, although they can be found in almost one-third of perfectly normal-looking eyes.

Presence of *Staphylococci* was not associated with symptoms during CL use.

Habits in the use and care of contact lenses did not appear to have much influence on CL tolerance. However, those who renewed their CL less frequently than once a year had more problems, just as did those who cleaned with enzymatics less frequently than once a week.

Cleaning solutions may also cause hypersensitivity reactions, which could be minimized with disposable CL. Solutions free from preservatives (thiomersal) seemed to be safer. The effect of different habits in the use and care of contact lenses may have reached significance with more subjects and a longer follow-up time.

The value of clinical and cytological examination for predicting problems during the use of contact lenses is modest. However, an atopic history may present an increased risk for various external eye symptoms, which in some subjects prevents further use of CL. Conjunctival hyperemia at the second examination as well as marked eosinophilia or neutrophilia in the conjunctival scrapings at the first examination are warning signs; precautions and good control are mandatory if the use of CL is necessary.

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References

1. BUTRUS SI, ABELSON MB. Contact lenses and the allergic patient. *Int Ophthalmol Clin* 1986; 26: 73-81.
2. CARMICHAEL CA. Heat or chemical disinfection: does it really matter? *Rev Optometry* 1983; 120: 71-4.
3. HAAHTELA T, HEISKALA M, SUONIEMI I. Allergic disorders and immediate skin test reactivity in Finnish adolescents. *Allergy* 1980; 45: 433-41.
4. HANNA HL. Cytological contraindications in contact lens wear. *Contacto* 1979; 23: 15-23.
5. KORB DR, GREINER JV, FINNEMORE VM, ALLANSMITH MR. Biomicroscopy of papillae associated with wearing of soft contact lenses. *Br J Ophthalmol* 1983; 67: 733-6.
6. NORN MS. Conjunctivo-cytologic studies. In: *External eye. Methods of examination*. Copenhagen: Scriptor, 1974: 142-54.
7. LIOTET S, BONNIN P. Étude cytologique et clinique de l'allergie conjonctivale. *Arch Opht (Paris)* 1966; 26: 287-94.
8. SENDELE DD. Chemical hypersensitivity reactions. *Int Ophthalmol Clin* 1986; 26: 25-43.

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