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# Compliance among Soft Contact Lens Wearers

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## ABSTRACT

Contact lens compliance is proven to be crucial for preventing lens wear-related complications because of the interdependence of the steps in lens care regime and their influence on lens system microbial contamination. Awareness of the patients' lens handling compliance as well as correct recognition of non-compliant behaviours is the basis for creating more targeted strategies for patient education. The aim of this study was to investigate compliance among soft contact lens (SCL) wearers in different aspects of lens care handling and wearing habits. In our research 50 asymptomatic lens wearers filled out a questionnaire containing demographic data, lens type, hygiene and wearing habits, lenses and lens care system replacement schedule and self-evaluation of contact lens handling hygiene. We established criteria of compliance according to available manufacturer's recommendations, prior literature and our clinical experience. Only 2 (4%) of patients were fully compliant SCL wearers. The most common non-compliant behaviours were insufficient lens solution soaking time (62%), followed by failure to daily exchange lens case solution and showering while wearing lenses. 44% of patients reported storing lenses in saline solution. Mean lens storage case replacement was 3.6 months, with up to 78% of patients replacing lens case at least once in 3 months. Average grade in self-evaluating level of compliance was very good ( $4 \pm 0.78$ ) (from 1-poor level of hygiene to 5-great level of hygiene). Lens wearers who reported excessive daily lens wear and more than 10 years of lens wearing experience were also found to be less compliant with other lens system care procedures. ( $t = -2.99$ ,  $df = 47$ ,  $p < 0.0045$  and  $t = -2.33$ ,  $df = 48$ ,  $p < 0.024$ , respectively). Our study indicates that almost all patients had some degree of non-compliance in lens system maintenance steps. Most common non-compliant behaviours were the ones that are crucial for maintaining lens sterility and preventing infection. Despite the low objective compliance rate, self-grading was relatively high. Therefore, these results indicate the need for patient education and encouragement of better lens wearing habits and all of the lens maintenance steps at each patient visit.

**Keywords:** contact lens, compliance, non-compliance, case replacement, lens care.

## Introduction

Corneal infiltrative events, microbial keratitis and other complications have often been associated with soft contact lens (SCL) wear<sup>1–5</sup> and is the major cause of interrupted lens wear<sup>6</sup>. Lens system microbial contamination is directly associated with the level of compliance to lens system hygiene and wearing habits<sup>7–9</sup>. However, compliance rate is often way below the desired level, between 9 and 60%<sup>10,11</sup>. There are several reasons that may explain this issue: 1) inconsistent and incomplete manufacturers' recommendations confuse both medical professionals and patients<sup>12,13</sup>; 2) the insufficient compliance assessment of the lens wearers' behaviour as well as the insufficient education about the need to comply to recommendation of the lens manufacturer<sup>14,15</sup>; 3) patients' negligence of recommendations<sup>9</sup> and 4) lack of uniform compliance assessment instruments to follow up the lens wearers' wearing and maintenance habits<sup>12,13</sup>.

The aim of this study was to investigate compliance among SCL wearers in different aspects of lens care handling and wearing habits. With the lack of uniform compliance assessment instruments, we constructed a questionnaire focusing on the most important lens wearing habits, and the entire lens system hygiene.

## Subjects and Methods

### Subjects

Fifty asymptomatic randomly selected lens wearers from our outpatient clinic at the University Hospital Center Zagreb were asked to participate in the study by the researchers during regular control contact lens examina-

tion. After the researchers gave full explanation on the purpose of the study, all participants accepted to participate and filled out an anonymized questionnaire. Therapeutic lens wearers were not included in the study.

### Questionnaire

For the purpose of this study we have created a questionnaire containing 19 questions about demographic data, lens type, hygiene and wearing habits, lenses and lens care system replacement schedule and self-evaluation of contact lens handling compliance. We established 14 criteria of compliance according to the most common manufacturer’s recommendations and reported studies<sup>12–14,16</sup>. Criteria of compliance are summarised in Table 1. Patients were considered fully compliant only if they adhered to all of the proposed criteria. We examined whether excessive daily lens wear, number of years of lens wearing experience, age and gender were positively or negatively associated to number of non-compliant behaviours.

The survey protocol was approved by the Ethical Committee of the Zagreb University Hospital Centre.

### Statistical analysis

The statistical analysis was performed using The Statistical Package for the Social Sciences for Windows ver-

sion 13.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics was used to describe the subjects’ demographic and clinical data, using means and standard deviations for interval measures and frequencies and percentages for categorical variables. Kolmogorov–Smirnov goodness of fit test was used to test for the normality of data distribution ( $p < 0.05$  was considered as a significant departure from normality). To test differences in interval measures between the different compliance steps we used t-test for independent samples. A  $p$ -value of less than 0.05 was considered to denote statistical significance.

### Results

The majority of our 50 analysed lens wearers were females (78%). The mean patient age  $\pm$  SD was 32.72 $\pm$ 13.49, and mean number of lens wearing years of experience age  $\pm$  SD was 11.84 $\pm$ 9.39.

We found only two patients (4%) that fulfilled all of our 14 compliance behaviours criteria and were classified as fully compliant. All the other patients were non-compliant in at least some of the 14 evaluated behaviours, with mean number of non-compliant behaviours 3.71 $\pm$ 1.76.

10 SCL wearers (20%) reported using lenses longer than recommended, with mean lens replacement extension time  $\pm$  SD of 17.9 $\pm$ 8.61 days. 11 wearers (22%) reported using lens case longer than recommended, with mean lens case replacement extension time  $\pm$  SD of 10.91 $\pm$ 5.24 months. Mean compliance self-evaluating grade was 4 $\pm$ 0.78 (1-very poor lens hygiene, 5-excellent lens hygiene care) (Table 2). Table 2 summarizes the demographic, behavioural and self-assessment data.

**TABLE 1**

CRITERIA FOR COMPLIANCE AMONG SOFT LENS WEARERS

Criteria	Compliance value
<b>LENS</b>	
Daily lens wear	<12 hours per day
Regular soft lens replacement	Within manufacturers’ recommendations
Saline disinfection	None
Tap water for lens cleaning	None
<b>SOLUTION</b>	
Replacement of case solution	Daily
Topping up case solution	No
>4 h lens soaking	Yes
<b>LENS CASE</b>	
Regular case replacement	<3 months
Proper case hygiene (empty, wash with solution, air dry, pour new solution)	Yes
Tap water for case cleaning	No
<b>HYGIENE AND HABITS</b>	
Hand washing before lens system hygiene	Yes
Sleeping with lenses	None
Showering with lenses	None
Regular control examinations	Yes

**TABLE 2**

DEMOGRAPHIC, BEHAVIOURAL AND SELF ASSESSMENT DATA

Female gender	N=39 (78%)
Mean age (yrs $\pm$ SD)	32.72 $\pm$ 13.49
Mean No of years of contact lens wear	11.84 $\pm$ 9.39
Fully compliant patients	2 (4%)
Mean lens wearing time per day	12.46 $\pm$ 3.72
Mean No of non-compliant behaviours (N=14)	3.71 $\pm$ 1.76
Mean lens replacement extension time (days)	17.9 $\pm$ 8.61
Mean lens case replacement time (months)	3.62 $\pm$ 4.63
Mean lens case replacement extension time (months)	10.91 $\pm$ 5.24
Mean self-compliance assessment grade	4 $\pm$ 0.78

The most common non-compliant behaviours were insufficient lens soaking time, reported by 31 patient (62%), irregular lens solution replacement frequency, by 27 (54%), saline solution disinfection, by 22 (44%) and showering with contact lenses by 22 patients (44%). (Table 3).

Up to 40% of SCL wearers reported wearing lenses more than 12 hours daily, with mean lens wearing time

**TABLE 3**  
FREQUENCY OF LENS WEARERS' NON-COMPLIANT  
BEHAVIOURS

Lens wearing and hygienic habits reported by patients	N (percentage)
<4 h lens soaking	31 (62)
Irregular solution replacement frequency	27 (54)
Saline solution disinfection	22 (44)
Showering with contact lenses	22 (44)
Daily wear more than 12 hours	20 (40)
Tap water for case cleaning	17 (34)
Irregular lens case replacement	11 (22)
Lenses used beyond the recommended replacement period	10 (20)
Inadequate case hygiene	9 (18)
Irregular control examinations	4 (8)
Topping up case solution	3 (6)
Tap water for lens cleaning	2 (4)
Sleeping with lenses	2 (4)
No hand washing before lens system hygiene	0 (0)

per day  $\pm$  SD of 12.46 $\pm$ 3.72 hours. Patients who reported wearing lenses more than 12 h in a day and more than 10 years of lens wearing experience had statistically significant more non-compliant behaviours than those who adhered to recommended 12 hours wear ( $t = -2.99$ ,  $df = 47$ ,  $p < 0.0045$ ) and had up to 10 years of lens wearing experience ( $t = -2.33$ ,  $df = 48$ ,  $p < 0.024$ ). We found no statistical significance when comparing number of non-compliant behaviours and patient gender and age.

The most common compliant behaviours were hand washing prior to lens system handling ( $N = 50$ , 100%), not sleeping with lenses ( $N = 48$ , 96%) and not using tap water for lens system cleaning ( $N = 48$ , 96%) (Table 3).

## Discussion

The importance of compliance for safe and uninterrupted lens wear is no matter of debate<sup>9, 14</sup>. Hence, low level of compliance is worrisome and need to be improved<sup>15, 17</sup>. Therefore, there is a need to re-evaluate every step of lens system care and wearing habits in order to create improved strategies for patient education and maintenance of the desired level of compliance.

### Aspects of compliance

Currently, there are no recommended and validated instruments for the assessment of compliance among SCL wearers. Thus, we created a list of 14 criteria for compliance, based on currently available scientific knowledge and the most common manufacturers' recommendations.

Based on this questionnaire, we found that only 4% of lens wearers were fully compliant. However, since we evaluated every aspect of lens system (lens, lens case and lens solution use) as well as hygiene and wearing habits, we expected lower compliance rate than reported in the literature<sup>10, 11</sup>.

Moreover, since mean number of non-compliant behaviours was 3.71 $\pm$ 1.76. The fact that almost one third of the recommended behaviours are neglected by lens wearers implies the need for urgent interventions to prevent timely lens wear-related complications in our asymptomatic group of patients.

Extended contact lenses and lens case use was reported in 20% and 22% of patients, respectively, which is in concordance with other researches<sup>18</sup>. However, while lens wear extension time was about 2 weeks, case use extension time was about 1 year, which significantly raises risks for lens system contamination due to the surface microbial biofilm development<sup>17</sup>. Some researchers pointed out the problem that particularly irregular lens case exchange is not considered as non-compliant by patients, due to the insufficient patient education and awareness of consequences<sup>10</sup>.

Microbial keratitis is quite common SCL wear complication<sup>1, 8</sup>. Special attention is on Acanthamoeba related keratitis, because of its serious consequences<sup>19, 20</sup>. There is a lot effort invested in improving lens solution quality<sup>21</sup>. While the lens solution have proved antibacterial effectiveness<sup>21</sup>, non-adhering to manufactures instructions works in the opposite direction. In our study, the majority of patients were non-compliant especially in this aspect of lens system use. 62% reported insufficient lens soaking time, 54% irregular lens solution replacement frequency, and 44% were not using lens solution for lens soaking, but only saline solution. 44% non-compliance to showering with contact lenses only contributes to the risk of Acanthamoeba keratitis.

Excessive daily lens wear is also a significant risk factor associated with microbial contamination<sup>18</sup>. Our results might explain such findings, since we found that patients who reported wearing lenses more than 12 h in a day had statistically significant more non-compliant behaviours than those who adhered to recommended 12 hours wear. More steps of non-compliance might be associated to greater contamination rate.

Interestingly, more than 10 years of lens wearing experience also shows positive statistically significant association to number of non-compliance behaviours in comparison to group of patient with less than 10 years wearing experience. This could be due to the lack of reinforcement of education for the long-time lens wearers with vast lens handling experience. However, it is also possible that these results reflect only a subgroup of those »experienced« lens wearers, who had experienced no problems while wearing lenses, even despite their non adherence to recommendation, thus continuing to disregard the manufacturer's instructions.

All participants washed hands prior to lens system handling and almost all avoided tap water for lens system cleaning. Thus, we may assume that these habits are regarded by the lens wearers as the most important aspects of lens hygiene and are well educated on them.

However, according to our results, subjective experience and self-awareness may be misleading. As stated above, we found that only 4% of lens wearers were fully compliant. However, when asked about the self-evaluation of compliance, our results point a relatively high mean self-assessment grade, which implies great difference between objective and subjective understanding of compliance and indicates need for more targeted strategies for patient education. In example, many patients reported saline solution soaking, which might be due to the similarity of terms like sterile saline solution and lens solution disinfection. These terms have to be clarified to the patient.

A potential limitation of our study is small sample and limited comparison to other studies, since we created our own compliance evaluation form. This latter limitation is usual in similar studies, since there is still no uniform validated compliance assessment instruments.

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## Conclusion

We have evaluated the compliance to the manufacturers' recommendation among the SCL wearers. Using our assessment instrument, we showed a high rate of non-compliant behaviour among asymptomatic lens wearers. Our research provides a comprehensive insight in lens wearer non-compliance from different aspect of lens system care and wearing habits. Furthermore, it highlights the fact that patients don't associate some of their behaviours with non-compliance, which reinforces the importance of introducing better strategies for patient education. Careful analysis of the user's compliance behaviour should be performed in order to improve overall compliance and to prevent lens wear related complications and lens wear interruptions during many years of lens wear.

The lack of official, detailed compliance evaluating form and grading system limits the comparison of compliance rate among researches and also compliance evaluation in daily clinical practice. Such questionnaire would give the practitioner valuable information on the patients' level of compliance, and serve as a step to step guide for treating patients on the focus of educational interventions directed toward specific areas of proper lens care through many years of lens wear.

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## **SURADLJIVOST NOSIOCA MEKIH KONTAKTNIH LEĆA**

### **SAŽETAK**

Suradljivost nosioca kontaktnih leća najvažniji je faktor prevencije komplikacija povezanih s nošenjem leća. Razlog tome je međusobna povezanost pojedini koraka prilikom održavanja leća i njihov utjecaj na bakterijsku kontaminaciju. Svijest o ispravnom održavanju leća i prepoznavanje neodgovarajućih ponašanja prilikom njege leća temelj je prevencije komplikacija. Cilj ovog istraživanja je utvrditi razne aspekte suradljivosti prilikom održavanja mekih kontaktnih leća. 50 asimptomatskih nosioca leća ispunilo je upitnik, koji je sadržavao demografske podatke, vrstu leća, navike nošenja i održavanja leća, učestalost izmjene leća i kutijica za leće te ocjenu vlastite razine suradljivosti prilikom održavanja leća. Utvrdili smo vlastite kriterije za suradljivost prema uputama proizvođača leća i otopina za leće, dostupnoj literaturi i našim kliničkim iskustvima. Potpunu suradljivost našli smo kod samo 2 pacijenta (4%). Najčešća nesuradljiva ponašanja bila su prekratko držanje leća u posudici s tekućinom za leće (62%), nadolijevanje tekućine za leće u već postojeću u kutijici te tuširanje s kontaktnim lećama. 44% pacijenata čuvalo je leće u fiziološkoj otopini. Prosječna učestalost zamjene posudica za leće bila je 3,6 mjeseci, a čak 78% pacijenata zamijeni kutijicu za leće barem jedanput u 3 mjeseca. Prosječna ocjena prilikom procjene vlastite razine suradljivosti bila je vrlo dobar ( $4 \pm 0,78$ ) (1-vrlo loša suradljivost, 5-odlična suradljivost). Pacijenti koji su nosileće više od 12 sati dnevno te oni koji imaju više od 10 godina iskustva nošenja leća bili su slabije suradljivi i u raznim drugim aspektima održavanja leća ( $t = -2,99$ ,  $df = 47$ ,  $p < 0,0045$  i  $t = -2,33$ ,  $df = 48$ ,  $p < 0,024$ , pojedinačno). Naše istraživanje pokazuje da su gotovo svi pacijenti bili nesuradljivi u barem nekom aspektu prilikom održavanja leća. Većina nesuradljivosti bila je upravo kod onih ponašanja koja su inače važna za održavanje sterilnosti i prevenciju infekcija. Unatoč niskoj objektivnoj suradljivosti, vlastita ocjena suradljivosti bila je relativno visoka. Naši rezultati ukazuju na potrebu bolje edukacije pacijenata te poticanja ispravnijih navika i pridržavanja pojedinih koraka prilikom održavanja leća na svakoj redovnoj kontroli.