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Long-term evolution of signs and symptoms in contact lens wearers

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Long-term evolution of signs and symptoms in contact lens wearers*

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Resumen

El propósito del estudio fue describir la evolución de las adaptaciones de los lentes de contacto (LC) durante un largo periodo de tiempo, y determinar los factores responsables de los cambios en las adaptaciones. Se recogieron datos (tipo de LC, tiempo de uso, agudeza visual, síntomas y signos) de los usuarios de LC que acudieron a una consulta española entre 2010 y 2020. El perfil de los sujetos fue comparado entre 2010 y 2020. Las características de las LC se compararon entre los tipos, reemplazos y diseños de las LC. Finalmente, se evaluaron los factores predisponentes al cambio de

* Artículo de investigación
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LC. Se incluyeron 74 usuarios de LC (28 hombres y 46 mujeres) de 39,0 ± 9,1 años. Las adaptaciones de hidrogel de silicona ($p = 0,01$) y reemplazo diario ($p < 0,001$) aumentaron durante el periodo de seguimiento. Las principales razones por las que se cambiaron las adaptaciones fueron la aparición o el aumento de signos clínicos o de síntomas. Hubo diferencias en el tiempo de uso de las LC y la agudeza visual entre los distintos tipos y reemplazos de LC ($p \leq 0,02$). Las LC rígidas y de reemplazo convencional se asociaron con una menor probabilidad de cambios en las adaptaciones ($p \leq 0,03$). En conclusión, la realización de exploraciones de seguimiento adecuadas de los usuarios de LC puede evitar la aparición de signos y síntomas a largo plazo. Los usuarios de LC de hidrogel y reemplazo frecuente tienen más probabilidad de requerir cambios en la adaptación de sus LC frente a los usuarios de LC rígidas y reemplazo convencional.

Palabras clave: lentes de contacto; signos; síntomas; uso prolongado.

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Abstract

The purposes of the study were to describe the evolution of contact lens (CL) prescription patterns during a long-term period in the same sample of CL wearers evaluated in a protocolized manner, and to determine the predisposing factors responsible for the changes observed in CL fittings. Data on clinical files (CL type, wearing time, visual acuity, symptoms, and clinical signs) of CL wearers who attended a Spanish eye setting between 2010 and 2020 were collected. The profile of CL wearers was compared between 2010 and 2020. The CL characteristics were compared between CL types, replacements, and designs. Finally, factors predicting a change in CL fitting were assessed. Seventy-four CL wearers (28 men and 46 women) aged 39.0 ± 9.1 years old were included. Silicone hydrogel ($p = 0.01$) and daily disposable ($p < 0.001$) CL fittings increased during the follow-up period. The main reasons for CL refitting were the appearance or increase of clinical signs and/or symptoms. CL wearing time and visual acuity differed between CL types and replacements ($p \leq 0.02$). Both, rigid and conventional replacement CL wear were associated with a lower probability of CL fitting changes ($p \leq 0.03$). In conclusion, this study provides useful clinical information about the profile of successful long-term CL wearers in the last decade. Adequate aftercare examinations of long-term CL wearers can avoid worsening of signs and symptoms. Hydrogel and frequent replacement CL wearers are more likely to undergo CL refitting when compared to rigid corneal and conventional CL wearers.

Keywords: contact lens; signs; symptoms; long-term.

Introduction

Over the last 30 years, more biocompatible contact lenses (CLs) have been released into the market (1). CL fittings have been improved due to better CL materials, designs, and manufacturing tools. As an example, several years ago, the fitting of

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hydrogel CLs with low oxygen permeability was very common. However, it is well-known that its long-term wear can affect the healthiness of the cornea due to a reduction in the epithelial oxygen uptake, leading to long-lasting epithelial microcysts and endothelial polymegathism (2). Later, silicone hydrogel CLs were developed to avoid hypoxic complications (3). Nevertheless, they could induce mechanical complications related to the high modulus of the materials such as corneal erosions, mucin balls, or CL-induced papillary conjunctivitis (4, 5). More recently, surface treatments have been developed to improve the wettability, lubricity, resistance to deposits, and biocompatibility of soft CLs (6). Finally, the use of daily disposable CLs has increased during the last years because of the elimination of CL cleaning procedures and care systems, and the decrease of CL surface deposits and complication rate (7-9).

Despite all these improvements in the CL market, CL dropout rate has remained stable in the last 30 years (10-12). It is estimated that around 50% of CL wearers suffer from CL discomfort, a condition that causes annoying symptoms that are usually perceived as ocular dryness (13). This issue is currently a tremendous concern for eye care practitioners and industry because discomfort is the top cited reason for CL dropout in established CL wearers (14). Relationships between discomfort symptoms and ocular surface signs, such as meibomian gland dysfunction or lid wiper epitheliopathy, have been reported (15, 16). However, the association between signs and symptoms in CL wearers is not frequent (17), being advisable to monitor both signs and symptoms when evaluating CL fittings (18).

Therefore, it is important to report and analyse the CL prescribing patterns throughout the time to evaluate the behaviour of the market, giving an essential information for CL practitioners, researchers, and manufacturers. There are recent studies addressing CL prescribing patterns over the last years that provide valuable insights into the evolution of the CL market over time (7, 8). However, reports providing clinical data, like symptoms reported during CL wear or the health status of

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the ocular surface, are scarce (19). Therefore, the purpose of this study was to describe how CL prescription patterns have changed during a long-term period in the same sample of CL wearers and specially, to determine the predisposing factors responsible for the changes observed in CL fittings.

Materials and methods

Study design

A retrospective study was performed at a tertiary referral center. The study was approved by the Ethics Committee of the city where it was performed.

Data collected

Data of the follow-up visits of established CL wearers that visited the same CL practitioner (MJG-G) between 2010 and 2020 were recorded. The schedule of follow-up visits was established to each CL wearer between 3 to 12 months according to the evaluator's criteria. Additionally, CL wearers were instructed to attend the clinic if needed. All CL wearers ≥ 18 years old who attended the clinic were included in the study, except orthokeratology and scleral CL wearers.

The parameters evaluated during the visits were: habitual CL wearing time (hours per day), type of CL used (hydrogel, silicone hydrogel, or rigid corneal), CL replacement (conventional –annual or biannual–, frequent –quarterly, monthly, or biweekly–, or daily), CL design (spherical, toric, or multifocal), use of a CL discomfort management strategy (artificial tears or eyelid hygiene), visual acuity with CLs (decimal scale), subjective ocular symptoms while wearing the CLs, and ocular signs. Symptoms were recorded as presence or absence of ocular redness, itchiness, stinging, dryness, grittiness, tearing, secretions, and vision variations. Ocular signs evaluated were the following: degree of bulbar and limbal hyperemia, corneal neovascularization,

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and anterior and posterior blepharitis with the Efron scale; degree of tarsal hyperemia, tarsal papillae, and corneal fluorescein staining with the Cornea and Contact Lens Research Unit (CCLRU) scale; and presence or absence of sties, chalazion, and eyelid oedema.

To analyze the symptoms and signs recorded, two scores were obtained, one for symptoms and one for ocular signs. Both scores were calculated as the total sum of symptoms or signs, respectively, observed for each CL wearer during each visit. When CL wearers visited the eye clinic more than once a year, the data recorded for that year were the ones corresponding to the longer period within that year (e. g., when a patient completed a follow-up visit in October and another one in December of the same year, the data recorded for that year were those of the October follow-up visit because they represented 10 months of that year).

Statistical analysis

Statistical analysis was performed using the R statistical package version 4.2.1. Data are presented as mean ± standard deviation for quantitative variables, and percentage for nominal variables. $P \leq 0.05$ was considered statistically significant.

To assess differences in clinical parameters related to CL characteristics, the data of the time of CL wear, visual acuity, symptoms, and clinical signs were compared between CL types, replacements, and designs in the first and last study visits separately using either an Analysis of Variance (ANOVA) or Kruskal-Wallis H test for parametric or non-parametric variables, respectively. When statistically significant differences were found, post-hoc analysis (post-hoc Tukey test for parametric variables, and Nemenyi test with Tukey correction for non-parametric variables) were performed to obtain two-by-two comparisons.

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To evaluate the change of the CL wearers profile, the data corresponding to the first and last visits of the study period were compared using the Student's t test or the Wilcoxon test in parametric or non-parametric quantitative variables, respectively; or the McNemar test in qualitative variables.

After considering the data recorded during the first study visit, factors predisposing to changes in CL fitting were assessed using a logistic regression model.

Results

Seventy-four CL wearers (28 men and 46 women) with a mean age of 39.0 ± 9.1 years old (range: 24.0-74.0 years) in the first study visit were included in the study. Patients attended a follow-up visit 6.6 ± 2.6 times (range: 2-15 times) throughout the study period. The average time interval between visits was 22.8 months. Patients were advised to attend a follow-up visit at least annually, but on average, only 6 (8.1 %) patients attended the follow-up visits within a year. Forty (54.0 %) patients attended visits within 2 years, 21 (28.4 %) patients within 3 years, and the remaining 7 (9.5 %) within more than 4 years. The first follow-up visit included in the study was in 2010, and the last follow-up visit included was between 2018 and 2020. Thus, the follow-up period for each patient ranged from 9 to 11 years. The different types of CL used by the study patients are shown in Table 1S of Supplementary Material.

Study patients started wearing CLs at a mean age of 20.4 ± 6.6 years old (range: 6.0-42.0 years) and had been using CLs for 11.5 ± 8.7 years (range: 1.0-36.0 years) in the first study visit. The mean spherical refraction was -5.50 ± 5.50 diopters (D) (range: -21.25 / +10.50 D) and the mean visual acuity was 0.97 ± 0.29 units in decimal scale. Fifteen (20.3 %) CL wearers of the whole sample had keratoconus, and 21 (28.4 %) suffered from allergy.

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CL type, soft CL replacement, CL design, and CL wearing time, as well as symptoms and clinical signs scores observed along the whole follow-up period are shown in Figure 1. Differences in clinical parameters between CL types, replacements, and designs for the first and last study visits are shown in Table 1.

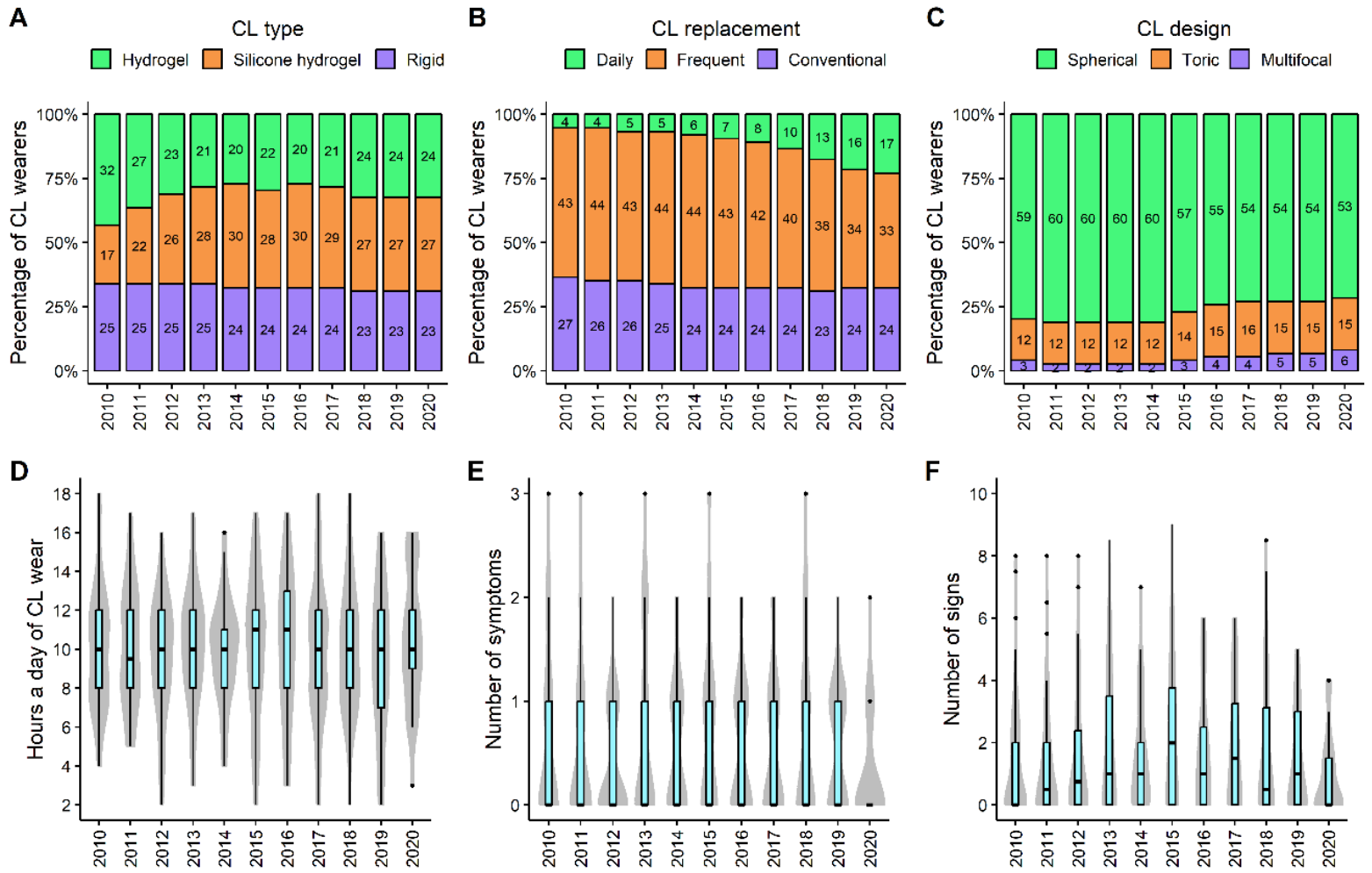

Figure 1. Contact lens (CL) type (A), soft CL replacement (B), CL design (C), CL wearing time (D), number of symptoms (E), and number of clinical signs (F) observed along the follow-up period. Bar diagrams show the percentage of patients that wore the

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different CL characteristics, while the shadows of the violin graphs (D, E, F) show the patients density.

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Table 1. Differences in clinical parameters between contact lens (CL) types, replacements, and designs for the first and last study visits.

CL type		**Hydrogel**	**Silicone hydrogel**	**Rigid**	**p-value**
Number of CL wearers	First visit	32 (43.2 %)	17 (23.0 %)	25 (33.8 %)	
	Last visit	24 (32.4 %)	27 (36.5 %)	23 (31.1 %)	
CL wearing time (hours a day)	First visit	8.78 ± 2.45†	9.65 ± 3.39	11.12 ± 3.10†	***0.01***
	Last visit	7.58 ± 2.65†	9.41 ± 3.38	11.39 ± 3.30†	***< 0.001***
Visual acuity	First visit	1.00 ± 0.27	1.11 ± 0.17‡	0.91 ± 0.27‡	***0.02***
	Last visit	1.02 ± 0.26†	1.05 ± 0.30‡	0.83 ± 0.29†‡	***0.01***
Symptoms	First visit	0.59 ± 0.76	0.24 ± 0.44	1.00 ± 1.19	*0.09*
	Last visit	0.63 ± 0.88	0.48 ± 0.58	0.57 ± 0.79	0.97
Clinical signs	First visit	1.97 ± 2.02*	0.77 ± 1.33*	1.36 ± 2.06	***0.03***
	Last visit	1.21 ± 1.55	1.06 ± 1.65	1.46 ± 1.69	0.64

CL replacement		**Daily**	**Frequent**	**Conventional**	**p-value**
Number of CL wearers	First visit	4 (5.4 %)	43 (58.1 %)	27 (36.5 %)	
	Last visit	17 (23.0 %)	33 (44.6 %)	24 (32.4 %)	
CL wearing time (hours a day)	First visit	5.75 ± 1.26*†	9.47 ± 2.75*	10.85 ± 3.13†	***0.01***
	Last visit	8.18 ± 3.30†	8.79 ± 3.16‡	11.21 ± 3.35†‡	***0.01***
Visual acuity	First visit	1.08 ± 0.12	1.03 ± 0.26	0.93 ± 0.27	0.16
	Last visit	1.06 ± 0.24†	1.02 ± 0.30‡	0.85 ± 0.29†‡	***0.01***
Symptoms	First visit	0.75 ± 0.96	0.44 ± 0.67	0.96 ± 1.16	0.23
	Last visit	0.65 ± 0.61	0.49 ± 0.80	0.58 ± 0.78	0.44

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Clinical signs	First visit	1.50 ± 1.73	1.61 ± 1.95	1.30 ± 2.00	0.64
	Last visit	1.09 ± 1.75	1.18 ± 1.54	1.40 ± 1.68	0.70

CL design		**Spherical**	**Toric**	**Multifocal**	**p-value**
Number of CL wearers	First visit	59 (79.7 %)	12 (16.2 %)	3 (4.1 %)	
	Last visit	53 (71.6 %)	15 (20.3 %)	6 (8.1 %)	
CL wearing time (hours a day)	First visit	9.93 ± 3.22	8.67 ± 2.15	11.00 ± 1.73	0.21
	Last visit	9.55 ± 3.56	8.27 ± 2.82	11.33 ± 3.33	0.17
Visual acuity	First visit	1.00 ± 0.28	0.94 ± 0.17	1.07 ± 0.12	0.31
	Last visit	0.96 ± 0.33	1.02 ± 0.17	0.96 ± 0.20	0.83
Symptoms	First visit	0.61 ± 0.97	0.75 ± 0.62	1.00 ± 1.00	0.28
	Last visit	0.57 ± 0.72	0.73 ± 0.88	0.00 ± 0.00	0.09
Clinical signs	First visit	1.49 ± 1.89	1.42 ± 2.39	1.67 ± 1.53	0.81
	Last visit	1.43 ± 1.69	0.93 ± 1.47	0.17 ± 0.41	0.10

Data are presented as mean ± standard deviation. P-values correspond to the Analysis of Variance or Kruskal-Wallis H test results. *Significant differences between hydrogel and silicone hydrogel CL type, or daily and frequent CL replacement. †Significant differences between hydrogel and rigid CL type, or daily and conventional CL replacement. ‡Significant differences between silicone hydrogel and rigid CL type, or frequent and conventional CL replacement.

The most frequent symptom observed was ocular dryness, and it was reported between 4 (16.0 %) and 16 (36.4 %) CL wearers along the whole follow-up period (Table 2S of Supplementary Material). The most frequent clinical sign observed was conjunctival hyperemia. Bulbar hyperemia was observed in 5 (20.0 %) to 14 (35.0 %) CL wearers along the follow-up period, and limbal hyperemia was present in 1 (4.0 %)

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to 17 (39.5 %) CL wearers. Posterior blepharitis ranged from 4 (16.0 %) to 14 (31.8 %) CL wearers, and corneal staining was detected in 3 (12.0 %) to 9 (23.1 %) CL wearers depending on the year. All symptoms and clinical signs detected along the whole follow-up period are detailed in Table 2S of Supplementary Material.

Change of the CL wearers profile

Regarding CL type, the percentage of silicone hydrogel CL wearers significantly increased during the follow-up period (17 (23.0 %) to 27 (36.5 %); p = 0.02), while hydrogel CL wearers showed a tendency to decrease (32 (43.2 %) to 24 (32.4 %); p = 0.06). In contrast, rigid corneal CL fittings remained stable (25 (33.8 %) to 23 (31.1 %); p = 0.16). Regarding CL replacement, daily CL fittings increased (4 (5.4 %) to 17 (23.0 %); p < 0.001) during the study period, while frequent CL replacements –quarterly, monthly, and biweekly– decreased (43 (58.1 %) to 33 (44.6 %); p = 0.01), and conventional CL replacements remained stable (27 (36.5 %) to 24 (32.4 %); p = 0.08). Regarding CL design, spherical fittings decreased (59 (79.7 %) to 53 (71.6 %); p = 0.03), toric CL fittings showed a tendency to increase (12 (16.2 %) to 15 (20.3 %); p = 0.08), and multifocal designs did not significantly change (3 (4.1%) to 6 (8.1 %); p = 0.18). The percentage of CL wearers following a discomfort management strategy (artificial tears or eyelid hygiene) significantly increased (5 (6.7 %) to 15 (20.3 %); p = 0.01) during the follow-up period. There were no significant differences in the CL wearing time (9.77 ± 3.05 to 9.43 ± 3.45 hours a day; p = 0.36), number of symptoms (0.65 ± 0.91 to 0.55 ± 0.74; p = 0.33), or clinical signs (1.49 ± 1.94 to 1.23 ± 1.62; p = 0.47) during the study period.

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Factors predisposing to changes in CL fitting

Thirty-two (43.2 %) CL wearers changed the CL (type, replacement, and/or design) along the follow-up period; 17 (53.1 %) of these 32 CL wearers changed once, 13 (40.6 %) twice, and 2 (6.3 %) three times. The reasons for the changes were mainly the presence of alterations of the ocular surface and/or the report of symptoms (29 (59.2 %) cases). Other reasons were convenience (8 (16.3 %) cases), visual requirements (6 (12.2 %) cases), or fitting improvement (6 (12.2 %) cases). Of all the CL changes, 29 (52.7 %) corresponded to a change in CL type, 17 (30.9 %) corresponded to a change in CL replacement, and 9 (16.4 %) corresponded to a change in CL design. In 6 of these CL changes, more than one of the aspects evaluated (type, replacement, and design) was changed. The specific CL fitting changes, as well as the year of change, are detailed in Figure 1.

Regarding the factors predisposing to changes in CL fitting, the initial use of hydrogel and frequent replacement CLs was associated with a higher probability of CL change. In contrast, the initial use of rigid corneal and conventional replacement CLs was associated with a lower probability of CL change (Table 2). The remaining variables were not predisposing factors for a change of CL fitting in the study population.

Table 2. The likelihood of each factor observed in the first study visit to change the contact lens (CL).

	Odds-ratio (95% CI)	**p-value**
Age	0.99 (0.94-1.04)	0.72
Female gender	1.30 (0.50-3.43)	0.59
Starting age of CL wear	1.00 (0.93-1.08)	0.93
CL wearing time (hours a day)	0.90 (0.77-1.05)	0.20

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Hydrogel CL wear	5.38 (2.03-15.23)	***0.01***
Silicone hydrogel CL wear	0.46 (0.13-1.43)	0.20
Rigid corneal CL wear	0.28 (0.09-0.79)	***0.02***
Daily replacement CL wear	0.12 (0.01-2.40)	0.17
Frequent replacement CL wear	4.76 (1.75-14.22)	***0.01***
Conventional replacement CL wear	0.31 (0.10-0.84)	***0.03***
Spherical design CL wear	0.43 (0.13-1.34)	0.15
Toric design CL wear	3.17 (0.90-12.95)	*0.08*
Multifocal design CL wear	0.65 (0.03-7.03)	0.73
Corneal ectasia	0.68 (0.19-2.21)	0.53
Discomfort management strategy	0.87 (0.11-5.55)	0.88
Visual acuity	0.30 (0.04-1.83)	0.21
Symptoms	0.77 (0.44-1.29)	0.34
Clinical signs	1.04 (0.82-1.33)	0.72

CI: confidence interval.

Discussion

This study aimed to evaluate the long-term fitting changes made in CL wearers who attended an eye clinic and were evaluated following the same protocol. Silicone hydrogel and daily disposable CL fittings increased throughout the study. However, no significant changes were observed in the presence of symptoms, clinical signs, or CL wearing time. In addition, the predisposing factors responsible for CL fitting changes were the initial use of hydrogels and frequent replacements. The presence of alterations in the ocular surface and/or the report of symptoms were the main reasons that led to the changes. Although patients were advised to attend the clinic at least annually, half

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of the sample attended the clinic every two years, and almost the remaining patients had longer intervals between follow-up visits.

The mean age of the patients in the first study visit and the percentage of women were similar to the values reported worldwide, but the proportion of rigid corneal CL fittings was higher (33 % vs 12 %) (20). This fact might be the consequence of the high number of CL wearers included in the study sample who suffered from keratoconus. This study was performed gathering data from CL wearers who attended a university eye clinic that is considered a tertiary referral center. Most of the patients of this study who presented keratoconus were fitted with a rigid CL to improve their visual acuity, because it is the first choice of correction in moderate to severe ectasias (21).

Most of the CL wearers included in this study did not attend the aftercare visits in the fashion recommended by the CL practitioner. This aspect might be conditioned because a reminder was not sent to the patients to return within the recommended time. However, in a previous prospective study, no differences were found in the percentage of follow-up visits attended by subjects who were reminded of the visits by phone and those who were not (22). Additionally, most of the optometrists (97 %) surveyed in another study reported to give only verbally advices on the follow-up visits to patients, and not in a written format (23). Hence, to optimize the compliance with follow-up visits, it would be beneficial to incorporate a written reminder of follow-up visits, to advise subjects on the importance to attend them, and to repeat key information (24).

Regarding the CL prescribing changes along the study period, only the data collected in the first and last study visits were statistically compared to ensure adequate statistical power. The results obtained agree with previous studies where silicone hydrogel and daily disposable CL fittings have gradually increased since their introduction in the market (7, 8). On the one hand, it is well known that, to reduce problems derived from CL wear, it is advisable that practitioners increase CL

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replacement schedules, oxygen transmissibility, the compatibility between the CL and the ocular surface through a change of CL material, or recommend eyelid hygiene when there is meibomian gland disfunction (3, 13, 25). The symptoms and clinical signs observed in this study were not plentiful. The most frequent reported symptom in the present study was dryness. This is not surprising since CL discomfort is an extended condition, suffered by approximately one in two CL wearers (13), and is reported as one of the most common reasons for CL dropout (11, 12). The most frequently observed clinical signs in this study were ocular redness and posterior blepharitis. And again, both were previously associated with CL wear and a high probability of CL dropout (11, 12, 26).

Despite the changes performed in the CL fittings and the increased use of discomfort management strategies (i. e., artificial tears or eyelid hygiene), symptoms and clinical signs did not statistically improve. Another management strategy adopted by CL wearers suffering from discomfort consists of decreasing the amount of time they wear their CLs (13). The habitual CL wearing time of the patients included in this study was similar in the first and last study visits, suggesting that CL fittings in this sample of patients were successful. However, there is no available data of those patients that abandoned CL wear during the same period of time; therefore, the results could be biased by this fact. CL dropout remains a challenge for CL practitioners. The estimated CL dropout rate is around 22 % of CL wearers (14). The main reported reasons for CL abandonment are discomfort and dryness, but other reasons include vision, cost, and convenience (11, 12). Although the association between CL types (hydrogel vs silicone hydrogel) and CL dropout still remains unclear (12, 15), some clinical signs have been associated with CL dropout, such as low tear break-up times, low Schirmer test values, a high corneal staining, or posterior blepharitis (15, 26). Therefore, it is advised that the reported reasons for abandonment may be monitored at the CL consultations.

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There were differences in clinical parameters according to the CL type and replacement. Rigid CL wearers, and consequently, conventional replacement wearers (as both factors were associated because, as seen in Figure 1B, only a maximum of 2 (4 %) patients wore a conventional replacement soft CL) used the CLs more hours a day and achieved a lower visual acuity. These results might be caused by the high proportion of patients presenting keratoconus, because their visual acuity might not be as high as in healthy individuals (27, 28). Healthy individuals might be expected to achieve a similar visual acuity with their spectacles (29); therefore, they might not require using CLs as much as individuals with ectasia to maintain a good vision. In addition, there were slight differences in clinical signs between the different CL types, but only at the beginning of the follow-up period. Clinical signs were significantly higher in hydrogel CL wearers and lower in silicone hydrogel wearers. However, at the end of the study, these differences disappeared, which might mean that the CL fitting changes performed along the aftercare visits were successful. Finally, no differences in the clinical parameters evaluated were found between the different CL designs, although this result does not agree with previous studies where toric and multifocal designs were associated with higher discomfort and dryness rates (30, 31).

Regarding the predisposing factors to change CL fittings, the use of hydrogel and frequent replacement CLs was associated with a higher probability of CL changes. These results seem reasonable because, as mentioned before, they comprise the factors reported to improve CL fittings by increasing the oxygen transmissibility and reducing the CL replacement schedule (3, 13, 25).

One of the limitations of this study was that no validated questionnaires were administered to the patients to know whether they had or not CL discomfort, because data was obtained from the registers of a CL consulting room during a long follow-up period. Some of the validated questionnaires used in the scientific literature to evaluate CL discomfort are the Contact Lens Dry Eye Questionnaire-8 (32) or the Contact Lens

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Discomfort Index (33). Both questionnaires allow classifying CL wearers as symptomatic or asymptomatic based the scores obtained. Moreover, given that this was a retrospective study, each patient included in the study had a different number of follow-up visits because they did not attend the eye clinic every year. Thus, the time interval between visits was different for each patient, but the follow-up period always ranged between 9 and 11 years. Besides, the number of patients who attended a follow-up visit in the last year (2020) was slightly lower, possibly due to the SARS-CoV-2 coronavirus disease (COVID-19 pandemic) (Table 2S of Supplementary Material). Further prospective studies associating the scores obtained in validated symptom questionnaires with long-term CL fitting changes would be of use to confirm these results. Besides, the sample selection did not consider those individuals who abandoned CL wear or did not attend the clinic where the study was performed during the analyzed period. Therefore, the present results only comprise information for those successful CL wearers that continued attending the clinic for the whole follow-up period.

Conclusions

The CL fitting changes performed in CL wearers who continued attending the same clinic along the whole follow-up period were consistent to the advances in the CL technology currently available in the market. These changes were successful to maintain a healthy ocular surface status and to control CL symptoms for a decade in the study sample. Finally, the initial use of rigid corneal and conventional replacement CLs might be associated with a lower probability of CL changes.

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