



Optimising contact lens wear for a lifetime of use

Managing contact lens (CL) wearers to ensure long-term success with their lenses is a complex process; eye care practitioners (ECPs) balance the great lifestyle benefits of lens wear with risks of CL use, including the rare but extreme consequence of a severe infection. On a day-to-day basis, ECPs seek to optimise CL clinical performance: providing sufficient corneal oxygenation to prevent signs of hypoxia, monitoring for corneal infiltrative events, and providing comfortable CL wear. This article provides new information on current practice in managing initial lens adaptation and reflects on the available evidence on how ECPs can best advise their CL wearers for a lifetime of successful and safe wear.

One chance to create a first impression

With clinical data reporting improved quality of life and good acceptance of CLs in children as young as eight years old,¹ some contact lens wearers fitted in 2013 could be using lenses for decades ahead. As such, the first few days with contact lenses take on very great importance and it is important that this is carefully managed by ECPs.

Studies with first-time CL wearers suggest that there is an increased likelihood of ceasing lens wear early on, typically due to issues related to comfort, vision or lens handling.^{2,3} In fact, industry data indicate that 21 per cent of CL drop-outs stop using their lenses in the first month of wear.⁴ As such, managing the first few days and weeks of lens wear is very important. As part of their clinical training, ECPs are generally advised that new CL wearers should be eased into lens wear and given time to adapt to their new lenses. However, how this is typically done in modern practice is unknown, so a web-based survey was established to provide information about the advice which is typically provided to contact lens wearers. This survey was completed in January and February 2013 by 186 ECPs from 26 countries. Most ECPs were optometrists (154) or CL opticians (22) with the largest

Dr Philip Morgan reports on a new survey of practitioner recommendations on contact lens wearing times and reviews current information on the steps which can be taken for ongoing successful and safe lens wear

response rate from the UK (116).

Respondents were asked how they managed the first week of CL wear for new patients using daily disposable (DD) silicone hydrogels (SiH) and also planned replacement (two weekly or monthly) SiHs. For each day of wear, the respondents were given the options of a specified number of hours per day of lens wear (from two hours to 14 hours) and three non-time-specific options: as long as they found wear comfortable, as long as patient wishes, or all day except for a short period at the start and the end.

Figures 1 and 2 show the key findings. There are no significant differences between the management strategies for the two lens types. In each case, the advised wearing times over the first three days of wear were typically limited to eight hours or less. By day four and later, the specified wearing times become longer and in fact, the most commonly recommended strategy is to wear lenses 'as long as they are comfortable'. By the end of the week, over 40 per cent of ECPs offer this as their preferred recommended wearing time for their new patients. By six months of wear, half of ECPs use this as their guidance for patients, with only around 20 per cent of practitioners suggesting a specific duration of time as the recommended wearing period (Figure 3).

There is little or no evidence to determine the 'right' or 'wrong' approach here. However, as the first days of CL wear allow wearers to become accustomed to their new vision correction, a staged build up of lens use like this seems appropriate. There is a comfort adaptation for new wearers over the first month of use,² for multifocal CL wearers, evidence suggests that some time is needed for visual adaptation because initial performance is not representative of

that in the longer term.⁵

The application and removal of lenses is a new skill which needs to be mastered by first-time wearers. From a practical standpoint, limiting wear to a few hours for the first few days of CL use allows for removal to take place usually in the middle of the day which would allow for a patient to call their practice for advice if they have difficulties or problems.

In addition to becoming accustomed to lens handling, another key issue is optimising wearer comfort, and ensuring that the first few days of lens wear are comfortable may be particularly important to longer term success. A very recent study⁶ once again confirms that (a) the rate of CL discontinuation is significant with 40 per cent of a large sample of wearers reporting discontinuation at some stage and (b) the principal reasons for cessation of lens wear are discomfort and dryness (24 per cent and 20 per cent of discontinuing wearers, respectively). With many lens types being associated with reducing user comfort from mid afternoon onwards,⁷ it is logical to ease new wearers carefully into longer wearing days and to suggest to them that they should consider removing their lenses once they experience discomfort. Indeed, it is important that the ECP manages this situation proactively by alerting new wearers to the possibility of some end of day discomfort and giving 'permission' for lens removal in this eventuality. With discomfort and lens handling key factors in CL discontinuation, these areas should be specifically addressed throughout the fitting and aftercare process. Difficulties in this regard can be actively managed by considering comfort drops or by prescribing an alternative lens brand, material or replacement modality.

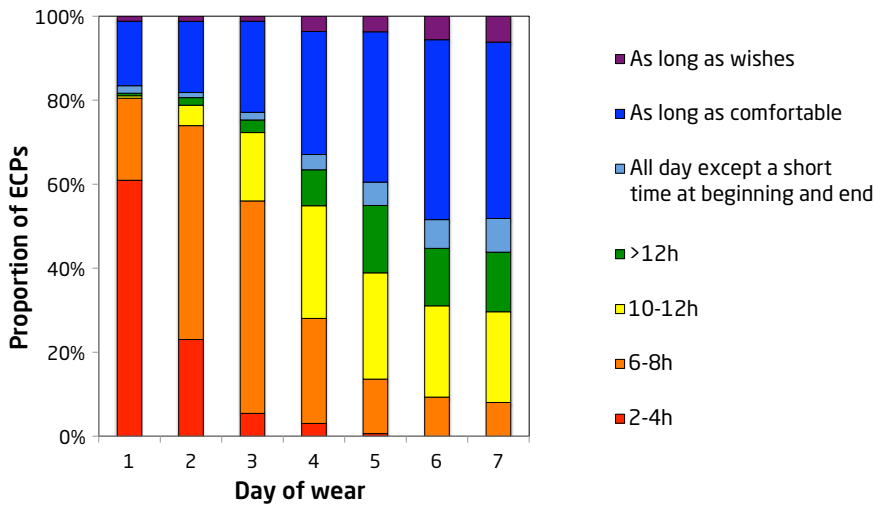


Figure 1 Recommended first week wearing time for daily disposable SiHs

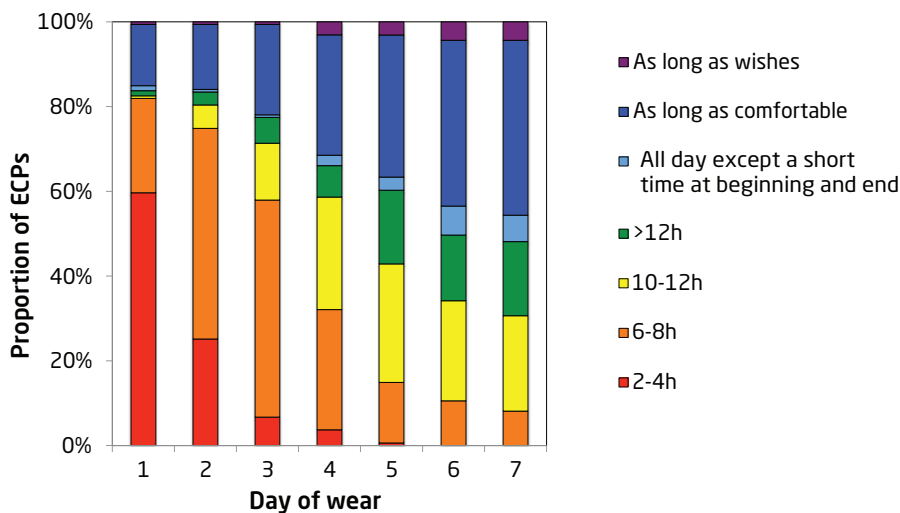


Figure 2 Recommended first week wearing time for planned replacement SiHs

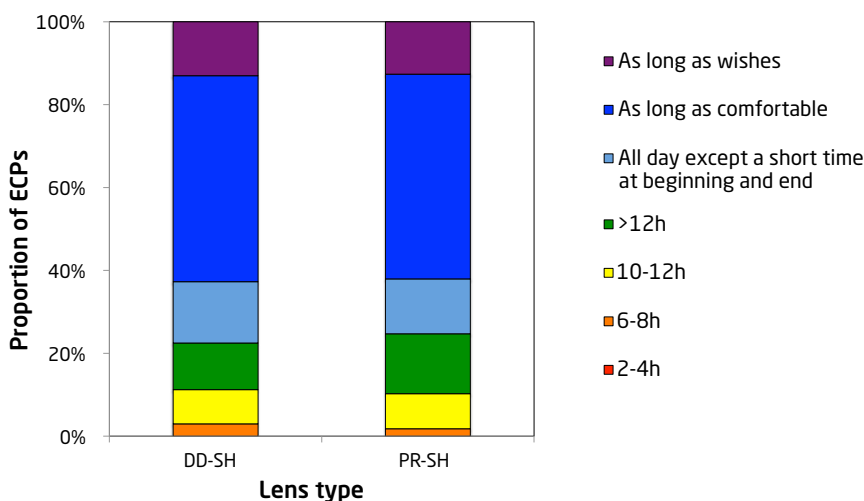


Figure 3 Recommended wearing times after six months of lens wear

Understanding and optimising comfort

Given the above, optimising lens comfort remains a major issue for manufacturers, ECPs and patients alike, due to the potential for reduced comfort leading to the cessation of lens wear. Currently, however, the precise mechanisms which determine lens comfort are poorly understood. Differences in overall lens design characteristics may play a role in wearer comfort, although reports are contradictory with evidence of thicker soft lenses being both less comfortable⁸ and more comfortable⁹ than thinner lenses. Similarly, the evidence for a link between on-eye dehydration and wearer comfort is mixed with some research finding a possible link,^{6,10} but most authors reporting a lack of a relationship.^{7,11-13}

Another factor which is sometimes associated with improved comfort is greater oxygenation; however, there is little evidence for this. While there are some reports of good comfort with lenses which offer high levels of oxygen transmissibility,^{8,14,15} such studies are not able to prove a causal link between the good comfort and the high oxygenation.¹⁶ In fact, exploration of this area is problematic because of the great variation in available lens types. As for any experiment, an ideal study design would be to explore two or more CLs whose only difference is a single parameter: for example, a range of lenses which are identical except their oxygen transmissibility. However, this is near impossible because of the inter-dependency of lens parameters. Increasing oxygenation can be achieved by increasing the proportion of silicone content in the lens material but of course this increases lens stiffness and might also affect surface characteristics, so it is not possible to pinpoint differences in comfort to a single parameter. At the present time therefore, while SiH lenses offer improvements for corneal hypoxia and ocular surface redness, there is no good evidence that improved corneal oxygenation leads to a more comfortable CL experience.

However, some lens factors have been shown to relate to wearer comfort. The nature of the lens edge appears to be important, and research in this area is becoming more interesting with the ability of ocular coherence tomographers to image the lens edge on eye.¹⁷ At least one study has demonstrated that while a 'knife-edge' design can give rise to increased conjunctival staining, such an edge



is generally more comfortable than a round-edge design.¹⁸

There is also increasing interest in the relationship between surface deposition and comfort. While the overall quantity of protein on a lens surface might not influence comfort,^{19,20} the state of the protein might be important. Subbaraman and co-workers recently reported that lenses which maintained proteins in a native (non-denatured) state were more comfortable.²¹ For lipids, Panaser and Tighe have argued that the build up of non-polar lipids at the lens surface leads to reduced comfort.²² Of course, any effects due to the presence of surface deposition are minimised when lenses are replaced on a DD basis.

There has been increasing interest in the frictional relationship between the eyelid and the CL surface since the description of the lid wiper by Korb and colleagues over the past 10 years.^{23,24} This phenomenon is especially interesting when laboratory measures of surface friction of CLs shows a large variation between current lens brands.²⁵ Lid wiper epitheliopathy and conjunctival folds (clinical signs which may be related to lens surface frictional properties) have been reported to be more marked in symptomatic CL wearers (vs asymptomatic wearers).^{26,27} However, while some important conference presentations have been delivered which suggest a link between lens surface frictional characteristics and wearer comfort,^{28,29} there are as yet no reports in the peer reviewed literature.

While we await important breakthroughs in our understanding of the determinants of CL comfort, some modern lens types are able to offer comfort levels comparable to the 'no lens' situation. For example, Morgan and colleagues recently reported on a one year study of a DD SiH lens in neophyte wearers which offered high

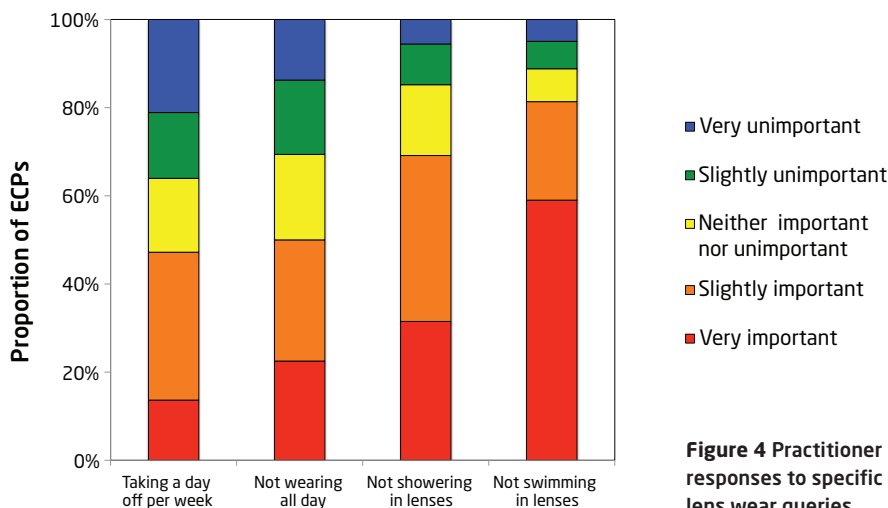


Figure 4 Practitioner responses to specific lens wear queries

levels of comfort which were similar to those reported by non-wearers.²

Recommended wearing patterns: minimising risks

The survey conducted for this paper also asked ECPs about their attitudes to the best duration of lens wear, and CL use in more challenging situations (Figure 4). About half of the respondents felt it important to not wear lenses for all waking hours and also to have a day off per week from lens wear.

Not using lenses for a full day (perhaps modifying this to 'all comfortable hours') may be appropriate if wearers are aware of end of day discomfort. In terms of oxygenation, however, SiH lens wearers are able to use lenses for all waking hours without compromising ocular surface physiology (Figure 5). For daily wear, a lens with a Dk/t of 20 units or greater across all the lens offers near-natural levels of oxygen flux (ie the amount of oxygen reaching the corneal surface during lens wear)³⁰ and corneal oxygen consumption.³¹ While most

conventional hydrogel lenses do not reach this threshold for the entire lens (albeit that Dk/t might reach this value in certain lens regions), all currently marketed SiH lenses meet this criterion for daily wear.³² As such, from a physiological standpoint, a CL wearer with good comfort should be able to use lenses all day.

The requirement of time off from CL wear during the week is more contentious. In terms of the impact of this approach to reduce CL-associated infections, epidemiological data suggest an approximately linear relationship between the number of days of CL wear per week and the risk of microbial keratitis.³³ So, while not using lenses one day per week will reduce the risk of an infection to about 6/7 that of someone using lenses every day, there is no 'protective' effect beyond this simple relationship. Given that all CL wear should be considered as a risk/benefit proposition, having one or more days off per week is of course appropriate if the patient is not interested in full time CL wear, but if they enjoy using lenses each day and their lifestyle is enhanced as a consequence, then full time wear of CLs is quite clinically justifiable.

Managing the CL wearer's exposure to water is a long established conundrum for ECPs. Despite the inherent difficulties of establishing specific risk factors in epidemiological studies of CL-related infections (due to their low incidence), swimming has been identified as being associated with about a six fold increased risk for *Acanthamoeba* keratitis³⁴ and for microbial keratitis generally.³⁵ At the same time, there is resistance by CL wearers to desist from wearing CLs during swimming. Tu and Joslin recently reported that swimming in



Figure 5 After eight hours wear SiH daily disposable lens (narafilcon A, right image) versus the same non-lens wearing eye prior to fitting (left image) demonstrating no signs of conjunctival or limbal hyperaemia (images courtesy of David Ruston)



CLs was the 'negative contact lens wearing behaviour' most commonly undertaken despite many wearers being aware of the risk of doing so.³⁶ The same authors advocate avoiding other exposure to water such as showering and hot tubs. The survey respondents to the current work support this view: a clear majority report not showering or swimming in lenses as being important for their patients.

This situation presents a problem for eye care practitioners. For swimming in particular, there are clear benefits to wearing CLs versus spectacles or using no correction at all. It is not therefore surprising that many CL wearers opt to ignore the advice of their practitioner and use their lenses. In this situation it might be advisable to address the issue proactively by suggesting that if the wearer chooses to wear lenses for swimming, having been advised of the risks, that they should use DD lenses under well-fitting goggles, with the lenses being discarded immediately after finishing swimming. This advice is particularly useful as the holiday season approaches to ensure that CL wearers can be refitted with DD lenses if necessary. Use of DD lenses in this way seems to be a sensible compromise between offering the benefits of CLs in an environment which is unsuitable for spectacles and which might be unsafe if no correction is employed, and minimising the likelihood of lens contamination.

More generally, recent evidence suggests that DDs are a good option to minimise the inflammatory response seen in CL wear. While DDs are not associated with a reduction of the risk of CL associated infections,^{33,37,38} the number of overall inflammatory events does appear to be significantly reduced with this lens type.³⁹

The role of compliance: informing and empowering patients

In addition to ECPs keeping updated about the most appropriate CL materials, designs and modalities for optimum wear, ongoing success with CLs clearly requires significant input from the lens wearer. Lenses are complex medical devices, worn on the surface of the organ providing our most important sense, and need to be respected as such by both practitioner and patient. Over the past 20 years, many researchers have explored the compliance of CL wearers – the level to which patients adhere to the rules and guidelines provided by their practitioner and

lens manufacturer. While many stages have been identified as being required for full CL care (Young recently described 49 steps of a daily lens care regime⁴⁰), a sub-set of these have been specifically linked to CL associated-infections. Morgan and colleagues undertook a survey of over 4,000 CL wearers in 14 countries and identified three major areas which should be specifically addressed at CL aftercare examinations due to their association with both increased infections and generally low compliance (as such, time spent in the clinic discussing these topics is likely to deliver the most benefit to patients). In general, DD wearers exhibited better compliance, due to the fewer steps needed to care to these lenses.⁴¹

In wearers using CL solutions, care of the lens case was a particular cause for concern in this survey. Absence of case cleaning has been associated with a four-fold increase in microbial keratitis in lens wearers⁴² and microbiological analysis has demonstrated that three quarters of lens cases are contaminated with bacteria and 8 per cent with *Acanthamoeba*.⁴³ At the same time, only 4 per cent of lens wearers manage their lens case correctly: cases should be subjected to daily rubbing and rinsing with CL solution (or wiped with a tissue)⁴⁴ and then left to air-dry, face down on a tissue.⁴⁵

Daily 'rubbing and rinsing' of lens surfaces is performed by only 20 per cent of wearers,⁴¹ yet when not undertaken, has been associated with a threefold increase in the likelihood of a CL-related infection.⁴⁶ This simple process has been shown to reduce the bacterial load on a lens surface by three log units⁴⁷ and means that the overnight soaking solution is presented with a much easier task in terms of disinfection. The third key area to reiterate with wearers is hand-washing. Again, this is done routinely by a minority of lens wearers,⁴¹ yet is known to significantly diminish the risk of keratitis in CL wearers.³⁵

The method by which information about case care, rubbing and rinsing, and hand-washing is communicated to CL wearers is also important. In fact, various research efforts have demonstrated that repeated provision of lens care instructions may not lead to improvements in patient behaviour.⁴⁸ However, the above three components of lens care can be improved when reviewed at regular aftercare examinations,⁴⁹ so a short time spent discussing these three lens care areas (perhaps in addition to more specific

deficiencies identified for individual lens wearers) seems warranted.

Conclusions

All CL practitioners are aware of the great benefits which lenses offer their patients, and modern materials and designs are increasingly able to offer many years of successful vision correction. Current best practice, supported by most practitioners, is for the recommendation of shorter hours of wear for the first few days for new CL patients, quickly moving to wearing schedules which allow for use as long as the wearer is comfortable. This is logical with the close relationship between cessation of lens wear and end of day discomfort in soft lens wearers; while there is an increasing understanding of the underlying factors for CL comfort, modern lenses can offer high levels of comfort. Wearer satisfaction with comfort should be discussed at each aftercare visit, and reports of discomfort should be appropriately and quickly managed to ensure ongoing satisfaction.

Contact lens wear is associated with a small but non-zero risk of an ocular infection. Practitioners know of the risks of showering and swimming in lenses and generally recommend against these practices (or offer appropriate alternative strategies). However, careful aftercare and specifically targeting areas of known non-compliance can act to mitigate against problems of inflammation and infection; in non-DD lens wearers, case care and rubbing and rinsing should be discussed to ensure these steps are undertaken correctly. In all wearers, the importance of hand-washing should be stressed.

Overall, the various advances in lens materials and designs, coupled with improving understanding of wearer comfort and physiology now allow for long-term ocular health and patient satisfaction during contact lens wear. ●

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