



New findings on contact lenses for children and teens

Do you know your CLIP from your CLAMP and can younger patients really achieve successful contact lens wear? **Jeff Walline** reveals the findings of the latest studies on kids and contact lenses

It may be intuitive that the many benefits of contact lenses apply to younger patients as well as to adults, but it would be unwise to assume that this is the case without evidence.

In the past, few studies investigated paediatric contact lens wear but fitting contact lenses to children and teens is now a major focus for current contact lens research, with several studies generating many publications in this area (Table 1).

In fact growing evidence is now emerging to support fitting kids with contact lenses, addressing some of the key questions and issues surrounding paediatric contact lens fitting and the considerations required. As research continues in the area of controlling the progression of myopia with contact lenses, it is likely to focus even more attention in this area.

In this article we look at some of the most recent publications to answer commonly asked questions about contact lenses for children and teens, and suggest how the findings can be applied in everyday clinical practice.

How successful are children with contact lenses?

Many of the major studies have demonstrated high success rates and satisfaction levels with contact lenses among this age group. In the CLIP Study in Singapore, children aged 8-11 years were fitted with 1-Day Acuvue or 1-Day Acuvue for Astigmatism daily disposable lenses, and 90 per cent completed the study successfully.¹ Overall vision quality, overall comfort, and end-of-day comfort were graded significantly better for contact lens wearers than spectacle wearers at each of the follow-up visits over three months.

Most children and parents preferred contact lenses to spectacles across a wide variety of aspects including vision, comfort, handling, and appearance, and 95 per cent were either 'very satisfied' or 'satisfied' with contact lens wear at the end of the study. These findings

TABLE 1
Recent large-scale studies on contact lenses for children and teens

ACHIEVE	Adolescent and Child Health Initiative to Encourage Vision Empowerment
CLAMP	Contact Lens and Myopia Progression
CLAY	Contact Lenses and Youth
CLESG	Contact Lens Evolution Study Group
CLIP	Contact Lenses in Paediatrics
COOKI	Children's Overnight Orthokeratology Investigation
CRAYON	Corneal Reshaping and Yearly Observation of Nearsightedness
LORIC	Longitudinal Orthokeratology Research in Children

support those of the CLIP Study in the US, using a similar protocol and comparing contact lens fitting and follow-up between 8-12 year-old children and 13-17 year-old teens.^{2,3} The lenses used were two-weekly silicone hydrogel lenses, Acuvue Advance with Hydraclear or Acuvue Advance for Astigmatism.

This study also surveyed participants three months after the final visit to determine the percentage of participants who continued to wear contact lenses.⁴ Eighty per cent of teens' parents and 63 per cent of children's parents purchased lenses after the study. Satisfaction with contact lenses was high among both those purchasing additional contact lenses and those who did not. Children and teens reported similar contact lens comfort and low frequencies of most symptoms.

The most recent publication from the ACHIEVE Study compared wearing times between 1-Day Acuvue or Acuvue 2 contact lenses and spectacles in myopic children and teenagers.⁵ Approximately 93 per cent of the subjects randomly assigned to wear contact lenses continued to wear them for the entire three-year study, so adaptation rates for soft contact lenses are very high in this age group.

Younger contact lens wearers wore their lenses for shorter periods than the spectacle wearers wore their spectacles, but the total vision correction-wearing time (spectacle and contact lens wearing

time total) was similar between the groups. On average, the contact lens wearers wore them for 74 hours per week, suggesting that contact lenses are a viable primary alternative mode of correction for children.

Children and teens can be very successful with contact lenses in terms of initial trial, adaptation, continuing lens wear and wearing times.

Use this in your practice to:

- Build your own confidence in fitting contact lenses to children and teens
- Explain to children and their parents that up to nine out of 10 can succeed with contact lenses
- Reinforce the message that contact lens wear can be satisfying and trouble-free at any age

How do children benefit from contact lenses?

The visual benefits of contact lenses for children and teens may be self-evident, but recent studies have investigated less tangible, non-visual benefits with some interesting results. Physical appearance, athletic competence, and social acceptance self-perceptions all improved more for 8-11 year-old children who wore contact lenses than children who wore spectacles. Eye care practitioners should therefore consider

Contact lenses

the social as well as visual benefits of contact lens wear (Figure 1).⁶

Another recent study compared the quality of life benefits of contact lens wear between 8-12 year-old children and 13-17 year-old teens. Subjects also answered questions regarding wearing time and satisfaction with contact lenses during specific activities. Contact lenses improved quality of life similarly between children and teens. The subjects' quality of life showed the biggest improvement in appearance and participation in activities, leading to dramatic improvement in satisfaction with their visual correction when they wore contact lenses.

As well as improving vision, contact lenses have many less tangible but very real benefits over spectacles for young patients.

Use this in your practice to:

- Remind you that vision is not the only factor to consider when choosing mode of correction
- Explain that contact lenses can improve quality of life and many aspects of self-perception
- Emphasise that children and teens switching from spectacles to contact lenses feel more confident in their appearance, athletic abilities and social acceptance

When should children start wearing contact lenses?

Interest in contact lenses starts at an early age, and there are many visual and lifestyle indications for contact lens wear in young children. However, the average age for which practitioners start to prescribe contact lenses is 13 years,⁷ despite evidence that suggests younger children are capable of independent contact lens wear.¹⁻⁶

In fact, the decision whether a child is ready for contact lenses should not be determined by age. There are more important factors to consider, such as motivation, maturity, and the role of the mother (the '3Ms').

Concerns about lens handling and compliance may be among the reasons for failing to recommend contact lenses to younger children, yet recent studies provide evidence that they can be as successful with contact lenses as teens. Eight to 11 year-old children are as capable as 12-17 year-old teens when it comes to caring for their contact lenses, which results in similar ocular health findings between the two groups.² Once trained in insertion and



Figure 1 Practitioners should consider the social as well as the visual benefits of contact lens wear

removal, the two age groups also wear their lenses for similar amounts of time (80 hours and 84 hours per week, respectively).

Age should not be used to determine whether a child is a suitable contact lens candidate. Motivation and maturity of the child and commitment of the mother are far more important factors for determining whether a child should be fitted with contact lenses.

Use this in your practice to:

- Extend the age range of your contact lens patients
- Explain to parents and children that the '3Ms' are more important considerations than age
- Reassure them that young children find contact lenses as successful and beneficial as teens

What type of lens is best?

The advantages and disadvantages of different lens types have been covered in detail in a previous review,⁸ however, recent studies have revealed more evidence on which to base our prescribing decisions.

The CLAMP Study has shown that children can comfortably wear both rigid gas-permeable (RGP) and soft contact lenses but long-term adaptation to soft lenses is more likely.⁹

Approximately 93 per cent of children fitted with either daily disposable or two-week frequent replacement contact lenses continued to wear them for three years,⁵ compared to just 55 per cent of RGP lens wearers.⁹ Furthermore, the wearing time of the soft contact lens wearers was 87 hours per week compared to 76 hours per week for the RGP lens wearers, which may be due to a higher prevalence of symptoms experienced by RGP lens wearers.

Concerns that soft contact lenses might increase the progression of myopia are unfounded. There was no clinically relevant increase in axial length, corneal curvature, or myopia progression with soft contact lenses relative to spectacle lens wear.¹⁰

Today, soft lenses are the most likely choice of contact lens for young wearers. Modality, material, replacement frequency, handling properties and incorporation of UV protection are factors to bear in mind when choosing the most appropriate lens.¹¹ Lifestyle needs, eye health and budget should also be considered.¹²

Eye care practitioners often debate the merits of daily disposable versus silicone hydrogel contact lenses, but this debate may be irrelevant due to the advent of daily disposable silicone hydrogel contact lenses. Future research will no doubt investigate the clinical performance of these lenses in younger patients.

In terms of cost, the cost-per-wear of two-weekly and monthly replacement soft lenses has recently been shown to be almost identical.¹² Daily disposable lenses are equally cost-effective as reusable lenses when worn five days a week and more economical when used 1-4 days a week.

Evidence points to UV radiation posing a significant long term hazard to eyes.¹³ Children are particularly vulnerable to UV damage, with few wearing eye protection outdoors, and larger pupils and clear crystalline lenses meaning more UV reaches the retina. Also it has been calculated that an individual has had around a quarter of their lifetime UV exposure by the time they are 18.¹⁴ Hence practitioners should educate patients from a young age on ocular UV protection and recommend UV-blocking CLs to this group of wearers.

More children are capable of adapting to soft contact lens wear than gas permeable contact lens wear, and daily disposables and reusable lenses are both successful soft lens options for children.

Use this in your practice to:

- Inform your prescribing decisions for this age group
- Help prevent children dropping out from contact lens wear
- Watch out for new information on the benefits of different soft lens types for children

Are children easy to fit?

Despite studies that show children and teens are capable of wearing various contact lens modalities successfully, practitioners may tend to assume younger children are more difficult and time-consuming to fit. However, the total chair time for 8-12 year-old children was only 15 minutes longer than 13-17 year-old teens.²

Most of the difference can be explained by the longer time spent teaching children insertion and removal. Insertion and removal is generally taught by staff members, so the eye care practitioner's time with patients is similar between children and teens. Furthermore, there is a lot of overlap in terms of the time spent teaching children and teens about contact lens care. The primary reason for the difference in times was due to a few children who required several visits to learn insertion. Eliminating these outliers by comparing median times reduced the difference between children and teens to only five minutes.

Investigators were able to determine whether it would take longer to work with a particular subject based on their initial impressions of the child's motivation, anxiety, maturity, hygiene and palpebral aperture size, as well as parental enthusiasm.

Children are easier to fit than might be expected and young children take only slightly more chair time than teens.

Use this in your practice to:

- Overcome concerns about increased chair time with younger children
- Schedule chair time according to individual patient needs rather than age
- Delegate insertion and removal teaching to support staff

Can children care for contact lenses?

Difficulty following instructions and taking care of lenses are primary

concerns among parents and practitioners, yet recent evidence shows these concerns are largely misguided.

Children and teens are equally adept at handling soft lenses and have an excellent understanding of lens care.² In a previous study, 90 per cent of children aged 8-11 years fitted with daily disposable lenses said they either 'never had a problem' or 'usually did not have a problem' handling the lenses.¹⁵ Other authors have found that compliance levels in young children are no worse than in other wearers, and that they are quite capable of handling lenses and managing lens wear and care (Figure 2).¹⁶

A survey of 11-13 year-olds wearing soft lenses over six months also found a high level of compliance and ability to follow instructions. About 90 per cent knew that daily cleaning was necessary, 96 per cent understood about lens disinfection, and 99 per cent were able to express confidence in caring for their lenses.⁷

As with all contact lens wearers, it is important to reinforce instructions at each aftercare visit. Children and teens both answered questions about contact lens care correctly approximately 93 per cent of the time at the dispense visit, but at the three-month visit scores among the younger age group fell slightly to 88 per cent, while teens' scores remained slightly higher at 92 per cent.¹⁷

Children and teens are well able to handle contact lenses and compliance levels are high but instructions should be reinforced, especially for younger children.

Use this in your practice to:

- Reinforce the message that even young children are capable of looking after contact lenses
- Ask patients to show you how they care for lenses at each visit
- Consider a simple written quiz to test children's knowledge of care procedures and use the answers to highlight areas that need emphasising

Is it safe for children to wear contact lenses?

The CLIP Studies have found good ocular health in children fitted with contact lenses. In the US study there was no difference in slit-lamp findings between the two age groups and no serious adverse events were reported.² Only conjunctival staining was



Figure 2
Young children are quite capable of managing lens wear and care

significantly greater at all follow-up visits than at baseline, and most biomicroscopy signs decreased to or below baseline prevalence by three months.

A new large-scale survey from the CLAY group supports the view that younger children can safely wear contact lenses.¹⁸ The retrospective review of 3,549 soft lens wearers aged 8-33 years from visits between 2006 and 2009 found 522 events which interrupted contact lens wear among 426 wearers.

The percentage of visits with an event was less than 3 per cent at each end of the age distribution (8-13 year-olds and 30-33 year-olds). Among the 14-25 year-olds, there was an event in 5 per cent of visits with the maximum risk among 20 to 22 year-olds. The authors suggest that the risk of events that interrupt soft contact wear peaks in adolescence and early adulthood. Relative to teens and young adults, children under 14 years old present with fewer interruptions in lens wear, possibly because a greater portion of them wear daily disposable contact lenses, which are associated with a reduced risk.

The CLAY group also looked at risk factors for significant and serious events in the same cohort of soft lens wearers. Soft lens use in young patients aged 8-13 years was associated with a low risk of corneal infiltrative events or



infections compared to teens and young adults.¹⁹ A new study of risk factors for microbial keratitis in daily disposable lens wear shows that younger age, and more frequent check-ups, may have a protective effect against serious infection in this modality.²⁰

A recently published study in the US²¹ highlighted the rate of emergency room visits linked to contact lenses, including abrasions and conjunctivitis. The study reviewed medical records over two years from 100 hospitals and estimated that 23 per cent of medical-device associated cases a year were linked with lens wear. The majority occurred in those aged 16-21, followed by children between the ages of 11 and 15. While the cases were generally superficial and did not require hospitalisation, many of these injuries were preventable. The most common risk factors were alteration of the recommended wearing or replacement schedules and non-compliance with lens wear and care regimens, underlining the need to involve parents during the fitting and aftercare process and to reinforce compliance and prevent potential complications. Limitations of this study included lack of estimation of lens wear prevalence in the population, combining several adverse events common in children, such as corneal abrasions and conjunctivitis, and not examining the rate of events in non-contact lens wearing adolescents.

Adverse events are rare among children wearing contact lenses and are less likely to interrupt wear in young children than in teens and young adults.

Use this in your practice to:

- Reassure parents that the incidence of health problems in young contact lens wearers is low
- Consider the relative risk of adverse events among wearers of different age groups
- Remind patients and parents to contact their practitioner right away if they encounter any problems

How do parents feel about contact lenses for children?

Parental influence has long been known to be a factor in whether children wear contact lenses, but recent research has shed more light on parents' attitudes to vision correction.

In a US survey, more than half (56 per cent) of parents of vision-corrected children aged 8-17 years said their child was interested in contact lenses, yet nearly a third had never considered contact lenses for their child.²² Four in 10 were not comfortable with contact lenses for children, and their main concern was that contact lenses were more difficult to clean and look after than glasses.

A CLESG study conducted in Italy, Spain and Portugal looked at how parents influence their children's attitudes to contact lenses and surveyed adolescents aged 12-18 years and their parents.²³

Most adolescents (77 per cent) and parents (66 per cent) expressed a high interest in contact lens wear, although none of the adolescents wore contact lenses. Both groups agreed that contact lenses met an aesthetic need in

adolescents. Parents, but not adolescents, perceived that contact lenses were significantly less safe in adolescents than in the general population.

As expected, parents who wear contact lenses themselves were more likely to agree to their child's request to wear lenses, and mothers, who often accompany adolescents to the eye examination, were especially concerned about handling and safety.

Parents can be a barrier to contact lens wear in children, and mothers, in particular, are concerned about handling and safety.

Use this in your practice to:

- Educate parents on the benefits, ease of use and safety of contact lenses
- Address the concerns of mothers, in particular, about contact lenses
- Provide practical demonstrations of lens handling to parents as well as children

Can CLs control myopia?

Recent developments in myopia control have fuelled even more interest in paediatric contact lens fitting and the role of contact lenses in treating as well as correcting refractive error. Rigid lenses, soft lenses, corneal reshaping lenses and now anti-myopia soft lenses have all been investigated.

Overnight corneal reshaping (orthokeratology) has received attention in the recent literature. The COOKI Study has shown that children can experience clear vision throughout the

day while wearing corneal reshaping lenses during sleep, and they experienced no adverse events over six months.²⁴ Two studies (LORIC and CRAYON) have investigated corneal reshaping contact lens myopia control, and they both found that the lenses slow the growth of the eye approximately 50 per cent, although there was significant inter-subject variation in effect.^{25,26} However, a randomised clinical trial still must be conducted to determine the true effects of corneal reshaping contact lenses on the growth of the eyes.

Although orthokeratology is effective in slowing eye growth there are potential limitations to the modality. Principally the risk of microbial keratitis (MK) in orthokeratology is unknown. However, it is believed to be similar to overnight wear of any type of contact lens.²⁷

Approaches to controlling myopia in children with daily wear soft lenses have also been reported recently based on the finding that peripheral hyperopic retinal defocus may act as a signal for increased eye growth and precede the onset of myopia.²⁸

The Vision CRC Myopia Control Study Group reported that, after six months of wear, progression of myopia with a contact lens designed to reduce peripheral hyperopia was 54 per cent less than with standard spectacle lenses in Chinese children aged 7-14 years.²⁹ Researchers in New Zealand have described a dual-focus soft lens with a central correction zone and concentric treatment zones which significantly reduced myopic progression over 10 months in children aged 11-14 years when compared with a standard single-vision contact lens.³⁰ Longer experience with these lenses is needed but they show some early promise for controlling myopia with soft contact lenses in future.

Corneal reshaping lenses appear to slow the progression of myopia for many children, although further studies are needed, and other approaches under investigation show promise for the future.

Use this in your practice to:

- Be aware of the current status of research into contact lenses and myopia control
- Manage parents' expectations and advise them that lifestyle and other factors also play a role
- Make your practice more child-friendly in anticipation of increased interest in this area

In summary, contact lenses for children are a major focus for current and future research, with new findings constantly emerging. Eye care practitioners need to be familiar with the latest developments to answer questions that parents and children frequently ask and to ensure that practice procedures accurately reflect current thinking.

What these studies tell us is that children and teens can wear contact lenses successfully and enjoy the many significant benefits of contact lens wear. Children of all ages should be given the opportunity to try contact lenses, which should be presented as a vision correction option as early as possible. ●

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