COMPETENCIES COVERED

DISPENSING OPTICIANS
Standards of Practice, Contact Lenses, Refractive Management

CONTACT LENS OPTICIANS
Standards of Practice, Verification and Identification, Contact Lenses

OPTOMETRISTS
Standards of Practice, Contact Lenses

This CET has been approved for 1 point by the GOC. It is open to all FBDO members, and associate member optometrists. The multiple-choice questions (MCQs) for this month's CET are available **online only**, to comply with the GOC's Good Practice Guidance for this type of CET. Insert your answers to the six MCQs online at www.abdo.org.uk. After member login, go into the secure membership portal and CET Online will be found on the L menu. **Questions will be presented in random order**. Please ensure that your email address and GOC number are up-to-date. The pass mark is 60 per cent. The answers will appear in the June 2020 issue of Dispensing Optics. The closing date is 6 May 2020.

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Contact Lenses and myopia management

A specialism or a responsibility?

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There is little doubt that myopia represents an increasing problem worldwide. While figures from 2010 show that 1.5 billion people are affected with myopia globally, this figure is expected to rise to almost five billion people, or 50 per cent of the world's population by 2050[1,2] (Figure 1).

In many countries, myopia has already reached epidemic levels, with some Asian communities showing upwards of 80 per cent incidence of myopia[3,4]. However, while the figures aren't as high in Europe, there is evidence of up to 50 per cent prevalence in some communities[5].

In cases of high myopia (defined as -5.00D or more)[6], while this figure is lower (currently around 2.7 per cent but expected to rise to 9.8 per cent by 2050)[1], there is a suggestion that almost one billion people globally will have a high risk of sight-threatening pathology[2]. This leads to concern that myopia could become the most common cause of irreversible blindness worldwide[1]. It is worth noting that myopia is already the sixth most common cause of blindness worldwide[1].

There is evidence that high levels of myopia lead to an increased risk of retinal detachment, glaucoma, cataract and myopic maculopathy or myopic macular degeneration[7-10]. For example, the risk of retinal detachment , while only 0.015 per cent in patients with myopia less than 4.75D, this figure rises to 3.2 per cent for patients with myopia over 6.00D[11,12].

Because of this logarithmic increase in risk depending on the severity of the

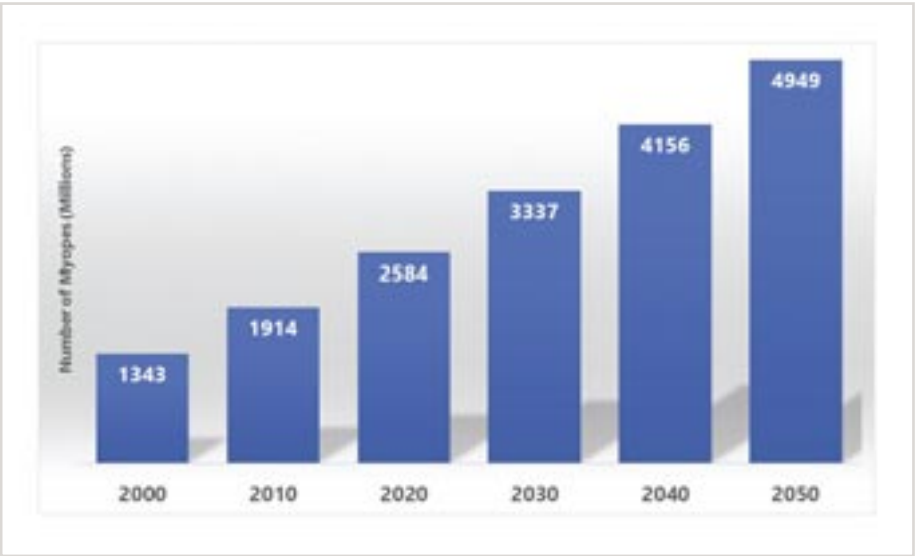

Figure 1. Number of cases of myopia globally between 2000 and 2050 (adapted from Holden et al 2016)

myopia, it is clear that keeping myopia to low levels will reduce this risk. For instance, a 3.00D myope is four times more likely to develop myopic macular degeneration and three times more likely to develop retinal detachment than a 1.00D myope[13]. Therefore, the issue of myopia control, or myopia management has become increasingly important.

CAUSES AND MECHANISMS OF MYOPIA

So, what causes the progression of myopia? The progression of myopia appears to be multifactorial and affected by both genetic and environmental components[14, 15]. While the exact mechanisms of myopia progression are not yet fully understood[2], and appear to be highly individualised[14], it has been suggested that genetic factors may account for up to 70 per cent of myopic refractive variance[16-19].

Studies have found that children with one myopic parent are 2.91 times more likely to develop myopia. This increases to 7.79 times more likely if both parents were myopic[20]. Despite this strong link to genetics, studies suggest that the remaining 30 per cent of refractive variance is due to environmental factors[16-19].

Although some of the studies indicating environmental factors remain disputed, there is research which posits that myopia is more prevalent in urban areas[20], and myopia increase is greater in the winter months than in the summer months, although the reasons for this remain unclear.

Exposure to sunlight has also been suggested as a means of delaying myopia progression[21], which would indicate that a lack of sunlight may be a factor in myopia progression. There are also studies that show higher incidence of myopia among students, professionals and computer users. The obvious link between these may appear to be increased use of near vision[22-24] however, this link is somewhat controversial[25].

Regardless of the causes, it is important to try to understand the mechanism that leads to the progression of myopia. A widely accepted theory is that myopia is due to an increase in the axial length of the eye[26], caused by an abnormal growth of the choroid and sclera[27]. This increase in axial length may be regulated at least partly by the peripheral retina, where hyperopic defocus (**Figure 2**) stimulates eye growth[28,29], even if myopic defocus is presented on to the fovea[30].

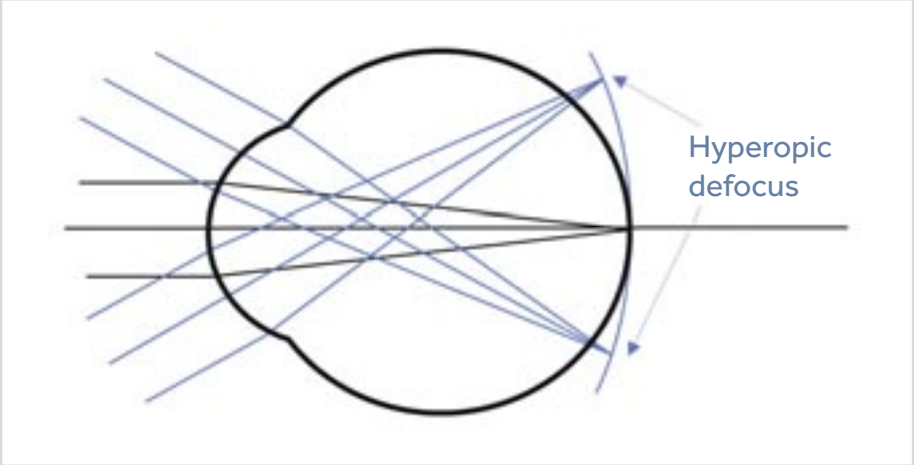

Figure 2: Off-axis defocus image shells when foveal fixation (in black) is maintained for on-axis distant objects (adapted from https://contactlensupdate.com/2011/11/16/use-of-contact-lenses-in-myopia-control-a-case-study)

While some studies have posited a more complex process than the one described above, this article will concentrate on this basic theory, and how it can be addressed in contact lens wear in an attempt to slow down or control the progression of myopia.

OPTIONS FOR MYOPIA MANAGEMENT

There are a number of potential options available to the practitioner in order to slow down the progression of myopia. While atropine use and orthokeratology have been shown to have some effectivity[3] , these approaches are beyond the scope of many practitioners. However, this does not mean that myopia control is for specialist practice only.

There are a number of options and approaches that all practitioners have available to them. These options include a number of both spectacle lens and contact lens options. This article, however, will focus on the contact lens options available.

If we accept that peripheral hyperopic defocus contributes to an increase in myopia, then it is fair to accept that contact lenses that reduce peripheral hyperopic defocus may have an effect on slowing myopia progression. In recent years, there have been a number of studies examining the effect of using contact lenses that have aspheric or multifocal optics, which have been shown to slow down the progression of myopia[32-34]. The aim of this article is to discuss how all contact lens practitioners could become involved in myopia management, and the potential methods that may be adopted.

IDENTIFYING PATIENTS

The first stage is identifying potential subjects that may benefit from myopia management. As younger children who present with myopia are more likely to develop high myopia[35] the initial decision faced by the practitioner concerns the correct age to start with myopia control measures.

The incidence of myopia in patients under six years old is likely to be less than five per cent[36] and, therefore, younger children may not appear to be ideal candidates for myopia management. However, it has been suggested that children who have low levels of hypermetropia (<+0.75) around six to eight years old are at risk of developing myopia[37,38].

McDonnell[39] has suggested monitoring such patients closely, as potential subjects for myopia management. Furthermore, McDonnell states that any myope under the age of 16 is a candidate for myopia control[39]. In addition to refractive error, a sight test should also assess the patients binocular vision status as there may be a correlation between esophoria and myopia. An assessment of accommodative lag, where high levels may be associated with myopia progression, should also be conducted[40].

A full patient and family history should be taken, with special attention

Figure 3: MiSight 1 Day contact lenses

paid to the refractive error of the parents, as well as the amount of time the patient spends outside or performing near vision tasks, as these are also potential risk factors[40].

Assuming that potential patients have been identified, it is vitally important to keep the patient and/or the parents fully informed of the process involved. Any myopia management plan using contact lenses will be a long term treatment plan, likely to last several years and, as such, is likely to have a high cost impact to the patient. Furthermore, there is no guarantee of a particular level of success, as the process of myopia is so individualised.

As far as the patient (or parent) is concerned, they will never know to what extent any myopia has been prevented or slowed, as we would not be able to say with any certainty the level of myopia that would occur without the management in place. For this reason, it is vital that the parent is aware of the mechanism of myopia progression, how you will use contact lenses to try to counteract this, as well as the limitations of myopia management.

The aim of the treatment is to slow down the progression of myopia, and it is vital that the parent understands this, as a parent may expect a prevention (or even reversal) of myopia unless fully informed.

Written consent should be obtained, as is normal for all contact lens wearers. However, any consent form should be tailored for myopia management to include such information. Once the parent is happy with the information given and willing for their child to undergo a contact lens myopia management plan, then fitting can commence.

It is important to remember that it is the child who is being fitted with the lenses, so the child must also be willing to wear contact lenses and consent must be obtained. This initial discussion is critical and is likely to take some considerable time. Therefore, care must be taken that enough time is allocated within the fitting appointment to allow for this discussion to take place. In some busy practices, this can be quite a significant issue, so clinic management is a must if myopia management is to be considered as a contact lens treatment option.

CONTACT LENS OPTIONS

Even if the use of orthokeratology is beyond the scope of the practice, there are a number of options open to the contact lens practitioner willing to implement myopia management. MiSight by CooperVision is a daily disposable lens specifically for the purposes of myopia management (**Figure 3**). It uses a dual-focus optical design with a centre distance portion along with alternating additional positive power (myopic defocus) and distance zones.

The purpose of this dual focus is to provide good distance acuity by fully correcting the distance refractive error, but also to create myopic defocus in all directions of gaze[41]. A three-year randomised clinical trial[41] demonstrated that MiSight significantly reduced myopia progression (almost 0.75D) over the three-year period when compared to single vision soft contact lenses, as well as reducing axial elongation (0.32mm) that is associated with refractive error progression over the same three year period. The study involved children from eight years of age and it has been suggested that children of this age can be fitted successfully[41].

MiSight is a hydrogel lens (omafilcon A 2) made from the same material as the Proclear family of lenses, with a water content of 60 per cent and a Dk of 25.

It is available in powers from -0.25D to -6.00D, so is available for a range of myopic prescriptions and has a CE mark for myopia management.

An alternative approach has been taken by Visioneering Technologies Inc (VTI) with their NaturalVue Multifocal 1 Day (**Figure 4**). Distributed in the UK by Positive Impact, this multifocal lens uses a centre distance principle to create an extended depth of focus.

The principle is to achieve peripheral myopia without compromising vision[42]. It is a daily disposable hydrogel lens, made with etafilcon A material, which is the same material used to make the one-day Acuvue lens (Johnson & Johnson Vision). It has a water content of 58 per cent and a Dk of 28. As it is CE marked for use in presbyopia as well as myopia management, it is available in plus powers up to 4.00D as well as minus powers up to -12.25D.

It is perhaps surprising that these two daily lens options are available as hydrogels with a relatively low Dk. This may be due to the timeframe in developing, researching and testing these products being prohibitively long to enable more modern, high Dk materials to be used. Because of the relatively low Dk value, care must be taken to ensure that the cornea is receiving sufficient oxygen.

Mark'ennovy has developed a lens CE marked specifically for myopia management, which is available in a silicone hydrogel material. The Mylo lens (**Figure 5**) is a monthly disposable lens made of filcon V 3, which is a 75 per cent

Figure 4. NaturalVue Multifocal 1 Day

Figure 5. Mylo myopia management contact lenses

water content, 60Dk material. Available in powers of -0.25D to -15.00D, it is also available in a wide range of base curves and diameters. Like the NaturalVue Multifocal 1 Day, this lens is also based on an extended depth of focus approach.

Currently, there is not a particularly large choice of lenses specifically for myopia management, and access to some of these products is limited for many practitioners. However, there is evidence to suggest that the use of multifocal contact lenses (more significantly centre-distance multifocal lenses) can slow the progression of myopia when compared to single vision correction[43].

The use of lenses to serve a different purpose than originally intended is often referred to as fitting a lens 'off-label'. The use of multifocal contact lenses in children to prevent myopia progression is one example of this. Lenses such as the Proclear multifocal by CooperVision are available as a centre distance zonal aspheric design, and has been shown to reduce the progression of myopia[6]. The same multifocal design is also available in silicone hydrogel Biofinity material (comfilcon A).

The Acuvue Oasis for Presbyopia lens by Johnson & Johnson Vision is another centre distance zonal aspheric lens, which has also been posited as a possible lens for use in myopia management[44]. The use of multifocal lenses fitted off-label can be controversial, therefore, it is important to base fitting choices on evidence of clinical trials[45].

One area where evidence-based practice can be used is under-correcting as a method of myopia management. Under-correction has been used by some practitioners in the belief that this will relax accommodation[46]. However, studies have suggested that under-correction of myopia may even accelerate myopia rather than slow its progression[47].

AFTERCARE

If the decision has been agreed with all parties to commence the fitting of contact lenses with the aim of reducing the progression of myopia, then a clear plan needs to be agreed with the patient and parent. A clear wearing schedule needs to be agreed (for example, six days per week and 10 hours per day is a recommended schedule for MiSight), as well as a commitment to regular aftercare and review.

These reviews are vital to assess the effectivity of treatment both in terms of anterior eye health and myopic progression. Should the treatment not effectively slow the progression of myopia, then alternative treatments may need to be considered. Of course, results can only be monitored over a period of time, so it is important not to make quick judgements on the effectivity of the treatment based on small increases in myopia.

Conversely, should the treatment prove to be successful in slowing the progression of myopia, a decision will need to be made in terms of when to stop treatment. While it has been suggested that treatment should continue until at least 17 years of age[39], there is evidence that myopia can progress into the early 20s[48], which might suggest that treatment should continue until this time.

Care must be taken once treatment is completed to ensure that there is no rebound effect. Should such a rebound effect be noted in the period of around six months after completion of treatment, regardless of the age of the patient, then consideration should be made to resume the myopia management[39].

CONCLUSION

Wolffsohn has suggested that early intervention is vital, and that practitioners are too conservative in their approach to myopia management by not applying techniques early enough[2]. As soft (multifocal) contact lenses can have a similar level of success as orthokeratology[46] yet have a lower risk of infection, they could be an ideal method of slowing the progression of myopia[27]. However, the potential drawbacks of this treatment (such as costs, risk of infection, reduced visual quality over single vision correction, etc) may lead to practitioners being reluctant to pursue myopia management.

However, the reduction of myopia progression is fast becoming an obligation for the practitioner rather than an option. The future is likely to see increased contact lens options and data in the area of myopia management, which may lead to increased practitioner confidence to fit lenses for this purpose. While there is no single solution to control myopia, soft contact lenses remain an excellent option that could become standard rather than specialist fitting.

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