LEARNING DOMAINS

CLINICAL PRACTICE

SPECIALTY: CONTACT LENS OPTICIANS

PROFESSIONAL GROUPS

Dispensing opticians – CPD PROVIDER – General Optical Council

Optometrists – CPD PROVIDER – General Optical Council

Contact lens opticians – CPD PROVIDER – General Optical Council

CPD CODE: C-104875

MCQs AVAILABLE ONLINE: 1 April 2023

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ANSWERS PUBLISHED: August 2023

This CPD session is open to all FBDO members and associate member optometrists. Successful completion of this CPD session will provide you with a certificate of completion of one non-interactive CPD point. The multiple-choice questions (MCQs) are available online only from Saturday 1 April 2023. Visit **www.abdo.org.uk**. After member login, scroll down and you will find CPD Online within your personalised dashboard. Six questions will be presented in a random order. Please ensure that your email address and GOC number are up-to-date. The pass mark is 60 per cent.

Myopia management update

By Tina Arbon Black BSc (Hons) FBDO CL

In last month's continuing professional development (CPD) article, Keith Tempany discussed the importance of evidence-based practice and patient communication in the field of myopia management. This article will provide an update on what has happened in the last 18 months – since this author's 'Myopia progression and management' article was published in *Dispensing Optics* in May 2021[1]. It will also consider the specific fitting criteria and importance of understanding paediatric frame and facial measurements when dispensing myopia management spectacle lenses.

This author's previous article highlighted the role of relative peripheral refraction in stimulating axial eye growth, existing myopia management interventions as well as reviewed the supporting evidence. Even though there is now an extensive amount of research on myopia and interventions for myopia management, and considerable CPD sessions freely available to optometrists and dispensing opticians, some practitioners have yet to fully integrate myopia management as part of routine optometric practice[2]. Whether due to what can appear to be an overwhelming amount of research, time restrictions or costs, as registered and regulated healthcare professionals, optometrists, contact lens opticians and dispensing opticians are expected, as part of the General Optical Council (GOC) Standards of Practice for Optometrists and Dispensing Opticians, to keep knowledge and skills up to date[3] (**Figure 1**).

Myopia management has put a spotlight on paediatric eyecare – although it is becoming evident that many children are not having regular eye examinations. Swystun and Davey[4] found that, in Essex, only 34.4 per cent of children received an NHS eye examination over an 18-month period, with the average age of a child's first examination being between six and seven years of age. This is particularly concerning, as the school vision

5.3 Be aware of current good practice, taking into account relevant developments in clinical research, and apply this to the care you provide.

FIGURE 1: GOC Standards of Practice: 5. Keep your knowledge and skills up to date[3]

CPD CODE: C-104875

screening service is inconsistent across England. Greater education for parents of young children is needed now more than ever on the importance of regular eye examinations.

SPECTACLE LENS DESIGNS

All currently available myopia management spectacle lenses utilise the mechanism of the *peripheral defocus theory* as the basis of lens designs. In common with multifocal contact lenses, they adopt a simultaneous vision approach. This creates a clear foveal image as well as peripheral myopic defocus – reducing the stimulus for eye growth. Like simultaneous vision multifocal contact lenses, it is essential that manufacturers' guidelines relating to fitting criteria are followed to ensure optimum performance of each myopia control spectacle lens design.

Hoya MiYOSMART

Using Defocus Incorporated Multi Segment (DIMS) technology, Hoya MiYOSMART was launched in the UK in February 2021 – with data from a three-year double-masked randomised controlled trial[5] (RCT). Since then, there has been a three-year follow-up study with results showing a sustained myopia control effect[6]. The second study consisted of 128 children; those in the original DIMS group continued to wear the DIMS lens but children from the single vision (SV) control group were switched to the DIMS lens for a one-year period.

Compared to the historical control group, the DIMS lens group showed a (mean difference) reduction in myopia progression of -0.18D and axial length of 0.08mm. The control-to-DIMS compared to the historical control showed a reduction in myopia progression of -0.30D axial length of 0.12mm.

In June 2022, an abstract publication giving six-year results of data from 90 children, also showed that for children wearing the DIMS lens throughout the six years (n=36) the lens maintained its effect of slowing myopia progression[7]. Children who wore SV lenses for the first two years (n=18) then switched to the DIMS lens until 3.5 to six years, at which point they stopped DIMS lens wear and exhibited faster myopic progression. At present, there is no published research on the rebound effect of MiYOSMART.

One-year results Huang *et al*[10]

PARAMETERS	Combination group	DIMS monotherapy	SV group
Myopia progression (D)	0.49D	0.79D	1.07D
Axial length increase (mm)	0.28mm	0.41mm	0.52mm

TABLE 1: Combined 0.01 per cent atropine and DIMS lens study results

Essilor Stellest lens two-year results[13]

PARAMETERS	HAL group	SAL group	SV group
Myopia progression (D)	0.66D	1.04D	1.46D
Axial length increase (mm)	0.34mm	0.51mm	0.69mm

TABLE 2: Aspherical lenslets study results

MiYOSMART fitting criteria[8,9]

The MiYOSMART lens design requires the selected frame to have a vertex distance of 10mm or less, with a pantoscopic angle close to zero and face form angle no more than 5°. The frame needs a B size of more than 25mm with at least 12mm above the pupil ensuring a sufficient area of defocus. Lens centration measurements are taken in the same way as progressive lenses by locating the pupil centre. The material is polycarbonate, refractive index n= 1.59 with a multicoat. Adaption time can vary between children, but is usually around one to two weeks.

A recently published retrospective cohort study Huang *et al*[10] using medical records of Chinese children who underwent a combination treatment consisting of 0.01 per cent atropine and DIMS lenses simultaneously produced promising results. The study used three groups: DIMS and 0.01 per cent atropine (combination group); DIMS monotherapy (DIMS group); and a control single vision group (SV group) (**Table 1**).

Clearly, combining these two treatments, applying both peripheral myopic defocus, pharmacological action and synergistic effects, increased the total myopia control effect. The study points out that 0.01 per cent atropine on its own produces 'weak' myopia control but combined with optical methods, presents a good choice for children.

Interestingly, the subjects in the DIMS only group compared to the SV group showed myopia progression reduced by 26 per cent – a lower effect than found by Lam *et al*[6]. It was noted that children in eastern mainland China experience earlier myopia onset, which progresses faster than children in Hong Kong. This suggests perhaps a higher myopic defocus may be required in some groups where there is earlier onset and faster myopic progression[10].

Essilor Stellest

Essilor Stellest lenses use Highly Aspherical Lenslet Target (HALT) technology, consisting of a central single distance zone with aspherical lenslets spread on 11 concentric rings formed by contiguous aspherical lenslets having a diameter of 1.1mm[11] with a clear central zone of 9mm[12]. The design of the aspherical lenslets creates a volume of myopic defocus (VoMD), which ensures visual signals focus in front of the retina following the retinal profile reducing stimulus for eye growth[11].

Two-year results from a double-masked RCT of 157 Chinese children were divided into three groups: lenses with highly aspherical lenslets (HAL); slightly aspherical lenslets (SAL); and SV spectacle lenses[13] (**Table 2**). With a wearing time of at least 12 hours (full-time wear), the study reported a dose-response relationship with HAL group efficacy at 0.99D and 0.41mm for full-time wearers. The best corrected visual acuity did not significantly differ at distance or near between the SV group and those in either the HAL or SAL group[10] – although low contrast visual acuity and reading speed were reduced[14].

Stellest fitting criteria

Lens centration measurements are again taken in the same way as progressive lenses with monocular centration and vertical heights. The centration point = the reference point, which is also used for prescription verification. The lens material is Airwear polycarbonate n= 1.59[15].

SightGlass Vision EssilorLuxottica | CooperVision DOT 0.2 lens

Diffusion Optics Technology (DOT) uses microscopic diffusers applied to the lens surface to scatter the light, reducing retinal contrast[16]. Each diffuser is irregular in shape and translucent, with a diameter of ≈ 0.14mm and height 0.2mm. There is a 5mm aperture outside, and the entire lens is integrated with microscopic diffusers in a Trivex lens material. Children aged six to 10 years, which is younger than other studies, wore assigned spectacles constantly (more than 10 hours per day).

A multicentre (14 sites in North America) double-blind, RCT has published 12-month results. CYPRESS study[16] subjects were randomised into three groups: a SV control group; Test-1 marketed as DOT 0.2 0.365mm; and Test-2 0.240mm more closely spaced (**Table 3**). The results show a faster progression in the younger age group.

DOT 0.2 fitting criteria

This lens design is also measured like a progressive lens, accurately locating the pupil centre so that the 5mm clear aperture is aligned with the pupillary axis, with the eye in the primary position.

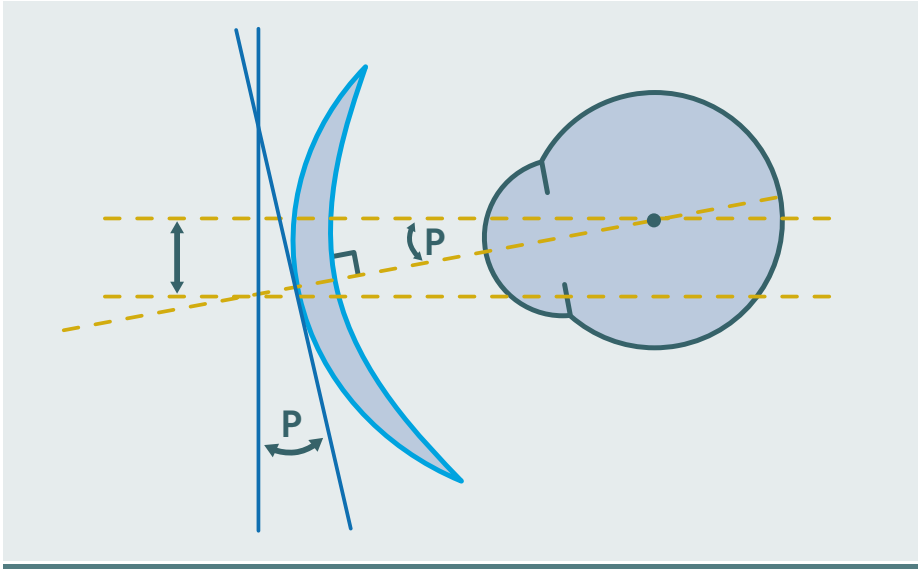

FIGURE 2: Pantoscopic angle

The pantoscopic angle should be flat (i.e. as close to zero as possible), so that the centre of rotation condition is satisfied and oblique astigmatism is avoided.

Norville My-Nor lens

A recent feature in *Optician*[17] discussed My-Nor and a comparative study where on average a 40 per cent reduction in myopia progression was found. The study consisted of 94 children aged seven to 14-years split into two groups – a SV group and a treatment group – over a period of five years. This lens is available in a range of indices and has a freeform back surface design with horizontal progression, creating relative peripheral myopic defocus in the horizontal meridian. There is clear correction at the centre, and horizontal peripheral defocus starts at 6mm nasally and 4mm temporally.

12-month results CYPRESS study[16]			
12 months mean change	Test 1	Test 2	SV control group
Myopia progression (D)	0.14D	0.22D	0.54D
Axial length increase (mm)	0.15mm	0.2mm	0.3mm
Age groups and myopic change			
12 months mean change	Test 1	Test 2	SV control group
Myopic progression (SER) 6-7 years	0.19D	0.33D	0.75D
Myopic progression (SER) 8-10 years	0.12D	0.19D	0.44D

TABLE 3: Diffusion Optics Technology study results

My-Nor fitting criteria[17]

Once again, lens centration measurements are taken in the same way as a progressive lens, but when selecting a suitable frame there must be least 5mm above pupil centre and 12mm below. There should also be a minimum boxed size of 37mm x 17mm to enable >25mm temporally and >12mm nasally from the pupil centre.

On collection, explaining the lens design and location of the defocus areas is essential as well as the need to look centrally through the lenses which will help the child to adapt more easily. Adaption is usually within a day but can take up to two weeks. Correct frame fit is essential and the child and parent/carer should be advised to return to the practice for adjustment if there is any slip, or the frame becomes out of alignment.

This spectacle lens is a new addition to myopia management, and training and support is available from the manufacturer.

FRAME SELECTION FOR MYOPIA CONTROL LENSES

With all spectacle lenses, vertical centration should take into account the centre of rotation condition, so that the visual axis intersects the optical centre of the lens normally, enabling the optical axis and visual axis to coincide, and oblique astigmatism aberration to be minimised (**Figure 2**). With conventional SV lenses, including aspherics, this means measuring pantoscopic angle and heights to the pupil

FIGURE 3: Measuring pantoscopic angle

centre and then compensating for tilt by dropping the optical centres 0.5mm for every degree of tilt.

Experience tells us that pantoscopic tilt in children is very much less than in adult patients. Frames must be designed to take into account a less developed bridge and naturally chubbier cheeks if the frame is to fit well, without resting on the cheeks. **Figure 3** shows how to measure pantoscopic tilt, in this case using a Zeiss pantoscopic gauge. However, all major manufacturers offer such devices.

Often the instructions say to remove the dummy lens in order to ensure a clean contact with the rims and an accurate measurement. However, in cases where the lens cannot be removed (rimless and supra styles) or combination frame designs where the top rim is much thicker than the bottom, this is not appropriate, and care must be taken to ensure an equal gap at top and bottom of the lens. It should be noted that despite what can be found online, pantoscopic tilt is an 'as worn' measurement with the frame on the face and is not the same as angle of side[18].

The nature of all lenses designed specifically for myopia management means that there is a small central aperture, which must be positioned very accurately with the optical centre on pupil centre so that the area responsible for peripheral defocus is effective. It should be clear, therefore, that when dispensing frames to be fitted with myopia management lenses, the only pantoscopic angle that is appropriate is one of zero degrees.

Manufacturers offer centration tolerances of 1mm vertically and 0.5mm horizontally regardless of lens power which, in effect, means the pantoscopic tilt can be between -2 and +2 degrees with the OC on pupil centre. Using **Figure 3** as an example, a frame fitting as shown in the image with a pantoscopic tilt of 10 degrees would be unsuitable to consider for myopia management, since once adjusted to a tilt of zero there will be a large gap between the cheeks and bottom rim. Additionally, the B measurement (vertical box height ens depth) needs to be ≥ 25mm if a Hoya MiYOSMART lens was dispensed.

Understanding the differing lens designs is essential to ensure areas of peripheral defocus can be fully effective. For example, the Norville My-Nor lens requires at least 12mm nasally and 25mm temporally from pupil centre, although a minimum eyesize of 37mm is unlikely to be problematic.

It is important that the child looks through the lenses for all visual tasks, and does not, for example, look below the bottom rim for close tasks. Therefore, it is important to select a frame that is sufficiently deep without touching the cheeks. Because of the fine tolerances involved, even in low powers it is important that the frame can be easily adjusted both for pantoscopic tilt and, ideally, vertical centration. Altering centre heights after manufacture would, of course, require adjustable nose pads, which can also be helpful in allowing adjustment of back vertex distance.

Regardless of lens power, back vertex distance is an important consideration and, as is the general rule for all dispensing, lenses should be fitted as close as possible to the eye without touching the eyelashes, with manufacturers stipulating 10mm or less as required. The principle here is the same as for progressive lenses where a keyhole effect is in operation. Whether this is the intermediate zone on a varifocal or, as here, the central zone on a myopia management lens, the closer the eye is to the keyhole then the wider the field of view, and the easier the lens will be to use with less head movement required for optimum vision.

Some frame suppliers have started to develop frame ranges with specific features designed for myopia management lenses, and some lens manufacturers offer complete package value pricing for specialist lens and frame combinations. For example, Wolf Eyewear's Wolf Cubs MY collection includes design features such as extra lens depth and joints positioned to give a flat pantoscopic tilt as is required for Hoya MiYOSMART lenses, as well as a range of colours and sizes and optional clip-on sunglasses on some models (**Figure 4**).

FIGURE 4: Wolf Eyewear Wolf Cub frame

Following new research in paediatric facial anatomy and spectacle fit[19], it is anticipated that there will soon be available new frame ranges that also specifically consider the facial anatomy of children and the final fit of the frame.

CONTACT LENS DESIGNS

The article in *Dispensing Optics* May 2021 discussed the designs and treatment actions of contact lenses available for the management of myopia. Next we shall look at the research available since that time.

CooperVision MiSight 1day

CooperVision MiSight 1day is a dual-focus soft contact lens with a central distance zone (3.36mm) surrounded by a treatment zone that creates 2.00D of peripheral myopic defocus; this alternating pattern is then repeated[20]. Chamberlain *et al*[21] have been carrying out one of the longest running continuous myopia management studies, which now provides data for MiSight over a six-year period.

This study began as a three-year double-blind multicentre RCT of children aged eight to 12 years with two groups: a control using Proclear 1day lenses; and the treatment group wearing MiSight 1day. Part two was again three years but all subjects wore MiSight 1day lenses so there was no longer a control group for comparison and analysis of efficacy.

The two cohorts remained separate becoming the T6 group (children who had received six-years of MiSight 1day treatment lens) and the T3 group (children who had switched from the Proclear 1day control lens to MiSight receiving three years of the treatment lens).

Looking at the six-year results, the T3 group progressed by an average of -1.55D and in the T6 group, for 23 per cent of eyes, there was no clinically significant change over the six-year period. Mean axial length progression for the T3 group increased by an average of 0.81mm and in the T6 groip increased by an average of 0.49mm over the total trial period.

This study provides longitudinal evidence of efficacy as well as the beneficial effects of myopia management even when treatment is started at an older age. Whilst there is limited research covering rebound effects in optical treatment, Ruiz-Pomeda *et al*[22] showed that in cessation of MiSight 1day for a one-year period there was no rebound effect.

3.1 Obtain valid consent before examining a patient, providing treatment or involving patients in teaching and research activities. For consent to be valid it must be given:

3.1.4 By an informed person. Informed consent means explaining what you are going to do and ensuring that patients are aware of any risks and options in terms of examination, treatment, sale or supply of optical appliances or research they are participating in.

FIGURE 5: GOC Standards of Practice: 3. Obtain valid consent[28]

A rebound effect is where, on the cessation of a myopia management treatment, the myopia progresses faster to the level it is thought it would have progressed to without treatment. Higher dose atropine therapy has hitherto demonstrated a significant rebound effect[23] whereas less invasive optical interventions do not appear to create a rebound effect[24]. However, this is an area where more research is needed.

Visioneering Technologies NaturalVue Multifocal 1 day, Menicon Bloom Day

This lens is a centre distance, simultaneous vision, extended depth of focus lens. A RCT known as PROTECT is currently being undertaken by Visioneering Technologies, which expects to publish one-year follow up data in the last quarter of 2023[25]. Current evidence for this lens by Cooper *et al*[26] consists of a retrospective case series analysis, which found that for 75 per cent of children myopic progression stopped. Interestingly, results for 6.25 per cent of children showed refraction regressed, and 90.6 per cent of children showed a 70 per cent decrease or greater in myopic progression.

Whilst this study does provide real-world data, the authors themselves acknowledged that it lacked the scrutiny provided by a RCT. There was no control group, and a lack of full baseline refractive status or axial length measurements.

ORTHOKERATOLOGY

Orthokeratology remains an effective treatment option for myopia management. A recent review concluded that orthokeratology slowed myopic progression from 32 per cent to 63 per cent compared to SV spectacles[27]. There is still a lack of data regarding rebound effects although there is evidence suggesting that orthokeratology lens wear should be continued until after 14 years of age to avoid a more rapid increase in axial length[28].

PHARMACOLOGICAL INTERVENTIONS

Atropine is currently still not licensed in the UK although there are a small number of private clinics that offer this method of treatment off label[30]. There are clinical trials being undertaken; CHAMP UK (Childhood Atropine for Myopia Progression in the United Kingdom) is evaluating the efficacy of low dose (0.01 per cent) atropine eye drops over a two-year period at several UK sites including Cambridge, Belfast, Birmingham, Glasgow and London[31].

There is also emerging research for combination treatments where different myopia control mechanisms are combined (DIMS + 0.01 per cent atropine). Peripheral myopic defocus, pharmacological action and the synergistic effects increase the total myopia control effect. A recent systematic review combining 0.01 per cent atropine with orthokeratology also found there was a synergistic effect showing similar efficacy to high dose (0.5-1 per cent) atropine[32].

ENVIRONMENTAL FACTORS

Increasing time spent outdoors has shown to delay myopia onset – but whether it slows the progression of already myopic eyes is still a topic of debate[33]. The mechanism is thought to be linked to the release of dopamine from the retina arising from brighter daylight conditions, which acts as an inhibitor for eye growth[34].

2.1 Give patients information in a way they can understand. Use your professional judgement to adapt your language and communication approach as appropriate.

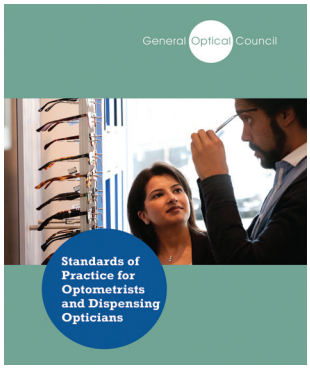

FIGURE 6: GOC Standards of Practice: Communicate effectively with your patients[34]

Increasing time spent outdoors has many health and mental health benefits as well as being free. In order to maximise the efficacy of a prescribed myopia management treatment, parents/children should be made aware of the potential beneficial effects of increasing time spent outdoors.

OBTAINING VALID CONSENT

It is essential to obtain informed valid consent from patients (and parents/carers) when dispensing any optical appliance[29] before proceeding with myopia management (**Figure 5**).

TALKING TO PARENTS AND CHILDREN

It is clear from the growing evidence base surrounding myopia progression, and the availability of effective interventions that can slow progression, discussion for those at risk of myopia progression should take place at the earliest opportunity. This can be challenging as discussions need to be tailored to each individual child and parent/carer; some may have a greater knowledge and understanding than others particularly if the parents are myopic. Remember to keep it simple: many parents and children will not understand the terminology used.

Start with the good news that the child's eyes are healthy then move on to the rate of eye growth. Here, a clear understanding of the emmetropisation process is essential. By explaining that when eye growth happens too quickly, it is later in life that consequences occur. Most importantly, reassure the parent and child that there are 'safe and effective' treatments that can slow myopic progression.

There are great resources available for practitioners, which were identified in last month's CPD article, along with excellent leaflets produced by manufacturers. The key point is to explain and reassure both the parent and child (**Figure 6**).

We have already seen financial sanctions levied on the employers of eyecare practitioners who have failed to treat amblyopia in a timely fashion[35], and it is likely that practices who do not engage with treating myopia progression will also find themselves liable in the future. We owe it to our patients to offer the latest evidence-based solutions[36].

CONCLUSION

Whilst no intervention can provide a cure for myopia progression, there are now safe and effective spectacle and contact lens treatment options. The spectacle lens industry has seen most change, with more lens designs now commercially available. There has been considerable research published in the last 18 months and the evidence base has grown.
It is essential that all eyecare practitioners include the management of myopia in routine optometric practice. Remember: it is incumbent on all registered opticians to remain up-to-date, appraised of current research evidence, and to obtain informed valid consent from patients (and parents) when dispensing any optical appliance.
Discussions with parents and children should happen at the earliest opportunity. By following and using evidence-informed practice, healthcare practitioners can make the best clinical decisions and improve patient outcomes.
Professional guidance can be found on the ABDO website at ***www.abdo.org.uk/regulation-and-policy/advice-and-guidelines***. The ABDO Clinical Hub is an excellent resource at ***www.abdo.org.uk/dashboard/clinical-hub/focuson-2/myopia-management-overview***

TINA ARBON BLACK is co-founder of accredited CPD provider Orbita Black, which provides optical, retail and business improvement training and advice to the optical sector and assists over 30 manufacturers and suppliers in the provision of CPD to their customers – registered opticians. She is an ABDO practical examiner, practice visitor/auditor/assessor and theory exam script marker, and a distance learning tutor for ABDO College. In 2019, Tina graduated from Canterbury Christ Church University with first class honours in Vision Science.

LEARNING OUTCOMES FOR THIS CPD ARTICLE

DOMAIN: Clinical Practice

5.3: *Be aware of the latest research behind myopia management treatment options and consider how you will apply this knowledge in your day-to-day clinical practice.*

7.5: *Provide effective patient care and treatments for myopic paediatric patients based on current good practice.*

DOMAIN: CL speciality

Understand the mechanisms and limits of contact lenses designed for the management of myopia, based on the research evidence, alongside other treatment options that may be available to support myopic paediatric patients.

CLINICAL PRACTICE

SPECIALTY: CONTACT LENS OPTICIANS

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