An introduction to modern scleral lenses

The subject of scleral lenses seems to divide eye care practitioners more than just about any other type of contact lens. Views range considerably—some believing them to be no more than a piece of optics history, that they would need training in taking impressions to fit them (which is no longer the case) or that the fitting process is too lengthy and complex to be used in every day practice. At the other end of the scale are eye care practitioners who are regularly identifying the most suitable cases for these lenses and enjoying fitting them with great success and happy patients. Interestingly, these are also customers that are not an obvious target for the multiples or internet sellers of contact lenses so in addition to being interesting to fit and having significant clinical benefits to some of your patients, they also represent a great business opportunity for the independent practitioner.

Why do we still need scleral lenses?

To fully understand the role of scleral lenses in today’s contact lens market, we need to firstly be clear on the roles of other lenses that are likely to be more familiar. It’s probably fair to say that soft lenses account for the majority of the contact lens business in most practices and rightly so. These lenses are fantastic, generally very easy to fit, ‘patient friendly’ and if structured well, ‘business friendly’ too.

So what about when there isn’t a suitable soft lens available? There may usually appear to be, but is it really the right lens for the job or just the nearest thing you have to it that’s convenient to use? Think about the number of presbyopic patients you have. Almost half of them will have cylinder of 0.75D or above in at least one eye. This then takes them out of range of most manufacturers’ fitting guidelines for soft multifocals. There are one two toric multifocals around but the process starts to become more complex, as trials usually need to be made to order, stability can be an issue and costs increase. Monovision is sometimes an option but does represent a compromise and research shows that multifocals outperform monovision in real world situations. Combined with the fact that we know the presbyopic age range is subject to the highest rate of drop outs, using a compromise as a starting point can only increase the chances of this unfortunate outcome.

Gas permeable multifocal lenses can give your patient excellent distance and near vision, and can be toric if required without complicating the fitting process. Ordered empirically using accurate measurements and the appropriate fitting guide, these lenses will land on your desk in 2–3 days and most of the time the first pair will be successful.
Many cases of early keratoconus or other corneal irregularities can be managed well with corneal gas permeable lenses too, and there are specific designs available to help further in these cases.

Why then do we need scleral lenses? They are available in a much wider range of prescriptions than most mass produced lenses as each pair is individually made to order, and available in spheres, clys and multifocals. When keratoconus becomes more advanced and the cornea is protruding further, it can be more difficult to get a good fit and good comfort for your patient. The ideal situation in these cases is to take the bearing off the cornea completely and rest it on a tougher, less sensitive surface and this is the primary feature of the scleral lens.

Scleral lenses are effectively fitted to the sclera (via the conjunctiva) and vault over the cornea, having absolutely no direct interaction with it at all-in fact it could be argued that if we are referring to the cornea it’s not technically a ‘contact’ lens at all! This results in comfort comparable with a soft lens even immediately after application, due to bearing on the less sensitive sclera rather than the cornea, and also having also eliminated any lid interaction with the lens edge-two of the main causes of contact lens awareness. This is what we are trying to achieve (figure 1).

A commonly reported symptom of contact lens related discomfort during the wearing day is dryness. Scleral lenses address this impressively and could be another reason you may choose to fit them. The lens is filled with unpreserved sterile saline which is sealed in behind the lens, therefore ensuring that the cornea is protected all day long by this liquid reservoir. Lack of tear exchange is not the concern it would have once been due to the use of modern high dk gas permeable materials. The measurable vision with these lenses is usually better than with any of the possible alternatives, and your patient likely to report fewer visual symptoms such as fluctuations with blink, haloes and streaks.
Fitting

So now we have established why these lenses are useful so let’s look at how to fit them.

Fitting is done by sag rather than the more traditional BCOR, and as a general guide, the more the cornea protrudes, the larger the sag required to vault over it and the larger the overall diameter will need to be to support the lens.

The fitting process consists of 4 simple steps using a simple trial set and fitting guide. It is essential that the steps are followed in the correct order to achieve a good fit whilst minimising chair time.

Step 1

Diameter

Start with a trial lens that’s around 4-5mm larger than HVID. The ideal lens will have no limbal touch-seen here as a darker crescent on the left of the cornea (Figure 2). If this is observed, the overall diameter of the lens needs to be increased.

Figure 2
There should also be a 1mm complete ring of limbal clearance visible as a bright band surrounding the cornea. This ensures no interference with the function of the limbal stem cells. (Figure 3)

Step 2: Sag & Vault (Clearance)

The trial set should come with a fitting guide which will tell you where to begin. Remember these lenses are fitted by sag rather than BCOR which involves a slight alteration to your approach. Generally normal corneas or cases of early keratoconus will require starting with a lens with a smaller sag and more protruding or more irregular corneas will require a larger sag to enable it to vault over and totally clear the cornea.

For example:

Clearance should be a minimum of around 250-300 microns initially, settling back to around 150 after about 30 minutes. The cornea is around 500 microns thick so you can use this as a guide, but if you are aware of the thickness of your trial lens (for example Bausch & Lomb Maxim CV is 250 microns) this can make comparing the thickness of the liquid layer with something of a known thickness more accurate.
The back surface of the cornea, just visible (Figure 4), can be seen to be roughly the same thickness as the liquid layer which would imply it measures around 500 microns, so too thick, it should be closer to half this value. This means the sag needs to be smaller.

Excess clearance or vault may also result in bubbles or debris visible with the slit lamp, and can also make the lens less comfortable. This would mean a smaller sag is required. (Figure 5)
Central touch (too little vault or corneal clearance) is sometimes easier to see when new to fitting these lenses so it can be helpful to err on the side of smaller sag to begin with. For every 1mm of touch observed, you will need to increase the sag by around 0.10mm (Figure 6).

Step 3: Edge

The edge should sit flat across the sclera and should not cause impingement/blanching or compression of the conjunctival vessels. If it does then it is too tight and you would need to ask the manufacturer to make a looser edge (Figure 7).
Bubbles should not be visible under the edge, nor should any lifting be observed. These are signs the edge is too loose (Figure 8).

A well-fitting edge (Figure 9)
Step 4

Over refraction, essentially the same as with any other lens, sphere first, cyl if needed but do be careful not to over minus and remember to compensate for BVD-the over refractions you are dealing with here may be larger than usual so it can be quite significant.

Manufacturers provide excellent technical support to assist you when you are getting started with these lenses, and practical, CET accredited training is available to help build your confidence if required.

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