Soft toric contact lenses

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Fitting soft toric lenses is much easier these days than practitioners might imagine due to the variety of options available, so we should be giving the patient their best acuity, which, if not being corrected, is one of the main reasons for contact lens dropout. Current designs are more plentiful, both in monthly and daily disposable form, so dealing with small amounts of astigmatism is more successful and worthwhile. Toric soft contact lenses are prescribed, not to improve the physical fitting, as with rigid lenses, but usually to provide good visual acuity where spherical lenses are unable to achieve this, or better vision in the situation of small cylindrical corrections.

This article describes when to fit soft toric lenses, the various stabilisation methods, how to choose a lens and adjust the fitting for lens rotation.

About the author
Judith Morris is senior lecturer in contact lens education at City University, London and senior contact lens practitioner at the Institute of Optometry. She is also an honorary life member of the BCLA and honorary life fellow of the College of Optometrists. Ms Morris is co-author of the Contact Lens Manual, now in its fourth edition.

Learning objectives

Understanding the different designs currently available in soft toric contact lenses (Group 5.1.1)

Know how to adjust the parameters of a soft toric lens order once the lens behaviour is observed on eye

Understand potential problems and how these may be resolved

Know how any mislocation of a toric lens may be recorded (Group 2.2.4)

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When to fit soft torics

The usual indications would be that the vision is unsatisfactory with a spherical soft lens. The starting point would be when the astigmatism is 0.75DC or greater. A contraindication may be that the patient is an existing rigid lens wearer with their astigmatism purely corneal and rigid lens tolerance is good. But also less easy to deal with are those with irregular astigmatism. The main challenges are people who have less sphere than cyl in their spectacle prescription (Rx) as lens stability becomes more important because the astigmatism is the major part of what needs correcting.

Problems from fluctuations in vision arise for those who are monocular, or the astigmatism is only in the dominant eye. These fluctuations in vision may be more difficult to tolerate with high crcyls and can be exacerbated by poor tear quality affecting the stabilisation of the design in the one good eye. If both eyes are toric, the one with the higher cylindrical power may cause more visual issues if it is the dominant eye, due to either stabilisation factors or tear film issues or both. Also, we must remember that some practitioners will avoid trying a toric design due to the misconception that it will be difficult to obtain a successful fitting. Yes, it may need more chair time, but is well worth the effort.

What is available?

Numerous designs have evolved and now soft toric lenses come in a variety of materials. The soft toric tends to wrap onto the cornea and so, in principle, will always be a bitoric, but as there are no optical principles to calculate, as one would do with rigid lenses, the ocular astigmatism is corrected by incorporating a cylinder in the back vertex power (BVP) of the lens, and the design will be based on manufacturing technique. Most soft torics now fitted are disposable and say they are a back surface toric with either stabilising factors on the front surface or use an aspheric design to manipulate the spherical aberrations of the eye. Conventional or custom-made lenses are mainly used for very high prescriptions outside the range of mass production, or where some specific design feature is required. Torics tend to have greater thickness so silicone hydrogels are frequently the first lens of choice because of their superior physiological properties.

Stabilisation

When considering stabilisation techniques, what has to be taken into account is what influences lens behaviour. With soft torics, the main influences for lens orientation are the method of stabilisation and its relationship with the patient’s lids. Eyelids are important in respect of the following:

- Position of lower lid
- Lid angles, whether sloping upwards or downwards
- Size of vertical palpebral aperture
- Lid tension
- Force of blink
- Direction of movement on blinking.

There are several other factors that have some effect on lens behaviour, such as gravity, water content, material elasticity, lens thickness and hydrostatic pressure, so finding the right design for a patient is not always a simple exercise. Also, one of the most important clinical features is the quality of the tear film and the smoothness of the tarsal plate. If either of these is in question, then stability can be compromised, whichever design is chosen.

Methods of stabilisation

Various techniques are possible, either on their own or in combination.

Prism ballast

Prism ballast usually employs 1 or 1.5 prism dioptres base down. The upper limit is approximately 3 prism dioptres. Modern refinements of lens design reduce the thickness previously associated with this method. The modified prism ballast balances the vertical thickness profile, to minimise rotational effects and minimise differences in stabilisation between different powers and axes, so one gets a constant horizontal thickness (Figure 1). The action of the lids on the lens edge has been compared to squeezing a watermelon seed; in other words they control the ultimate lens position, even if the head is inverted.\(^1\)

Prism-free optics or peri-ballast is used to incorporate the stabilising prism only in the peripheral areas of the lens, for example UltraVision LiteWave (Figure 2) and the slab-off prisms give equal thickness at both the base and 3 and 9 o’clock positions.

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**Figure 1** Prism ballast.

**Figure 2** LiteWave.

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Dynamic stabilisation
The term dynamic stabilisation (DS) may be used for those techniques which depend on the interaction between the lids and front surface of the lens.

Dual thin zones or double slab off
Top and bottom portions of the lens are chamfered to reduce the thickness where the stabilisation zones fit beneath the lids. The optic portion is the central band which lies within the palpebral aperture. Lenses usually have the ‘DS’ axis marked in the 3 and 9 o’clock positions. The thickness differential is related to the lens BVP; low powered lenses, therefore, do not stabilise as reliably as high minus powers and against-the-rule astigmatism works better than with-the-rule or oblique astigmatism. A refinement of thin zones is to have a smaller independent optic which gives greater consistency across the power range.

Accelerated stabilisation design (ASD)
Lenses employing the accelerated stabilisation design (J&J Acuvue range of toric lenses) have four stability zones (Figure 3). This construction utilises the blink action to rotate the lens in to place so is designed to stabilise independently of the lid/eye position.

Lens elevations
Other methods include lens elevations (delta shaped profiles) in the 3 and 9 o’clock positions (Lunelle Rx Toric Tdi).

Truncation
Truncation is now rarely used with soft lenses as it does not lend itself to the mass production moulding methods required by disposable lenses. At the same time, other methods of stabilisation have improved. Truncation is usually single, removing a 1-1.5mm chord from the lower edge of the lens (Figure 4 page 54). In general they give excellent stability but can be uncomfortable.

Toric back surface
A calculated toric back surface with conventional usage has a natural stabilising effect when placed in apposition to an equivalently toroidal cornea, because least elastic distortion occurs when the lens is correctly aligned. A much more stable result is achieved when used in conjunction with another stabilising design, for example prism ballast.

Assessing lens rotation
Lenses employing the accelerated stabilisation design (ASD) have a smaller independent optic which gives greater consistency across the power range.

Assessing lens rotation
In order to assess any rotation on the eye, soft toric lenses are marked with reference points - what is observed can give an excellent clue as to the lens being worn.

The following markings are commonly used:
- Radial engravings at the base of the lens. They can be a single line of various thickness or dominance, or are a set of three usually separated by either 15° or 30° (PureVision Toric) with the central one of greater dominance
- Two lines in the vertical plane; one inferior, one superior (1 day Acuvue Moist for Astigmatism)
- A single dot, usually at the base of the prism (mark’ennovy 4T)
- Horizontal markings in the 3 and 9 o’clock positions, either a pattern of dots (Focus Dailies Toric) or thin lines (Figure 5, page 54)
- Horizontal elevations in the 3 and 9 o’clock positions (Lunelle Rx Toric Tdi)
- A combination of horizontal and base markings (Air Optix for Astigmatism) where the base line is usually more prominent. The benefit of horizontal markings is that they are easier to see without the need to manipulate the lower lid.

Lens orientation and measuring rotation
Whichever soft toric lens is used, its orientation on the eye is crucial and compensation to the cylinder axis is frequently needed. In most patients, 5º of lens rotation, which is more often nasal, is acceptable. It is due mostly to the movement of the lower lid predominately nasally on a blink. Since disposable lenses are almost invariably produced with 10º axis steps, a tolerance of 5º is often unavoidable. Daily disposables have even fewer options. Success is unlikely if the rotation is more than about 30º, even if consistent, and it is usually better to try a different fitting or lens type.

Orientation can only be clearly observed with the slit lamp. Rotation can be measured by:
- Assessing radial markings by observation alone
- Rotating a fine slit lamp beam to align with lens engravings and reading the instrument’s external protractor scale. Horizontal markings tend to be easier to assess than vertical
- A graticule, either internal or surrounding the slit lamp eyepiece.

By over-refraction is a possibility, although not everyone’s technique of choice. Mislocation of the cylinder axis gives an over-refraction in the form of a plus sphere with minus cylinder of approximately twice the power (for example, +0.50/–1.00) at a different axis. The degree of rotation can then be calculated by a computer program. Consistency can be evaluated by rotating the lens in either direction and observing whether the lens engravings return to the same position with blinking.

The decision of the next lens to choose is decided by mnemonics:
- The LARS mnemonic is useful for lenses with the markings at 6 o’clock: Rotation LEFT = ADD, rotation RIGHT = SUBTRACT
- The CAAS mnemonic is useful for lenses with markings at 3 and 9 o’clock: Rotation CLOCKWISE = ADD, rotation ANTICLOCKWISE = SUBTRACT.
There are some manufacturer-designed aids and even Apps to help with deciding on the mislocation and what to choose next.

**Fitting**

Lenses may be custom-made to a precise Rx, but more usually selected from a simplified range of parameters predetermined by the laboratory. In all cases, the total diameter is larger than the spherical equivalent design to help stability on the eye.

**Disposable torics**

Using disposable soft torics enables rapid fitting from either practitioner or laboratory stock, since parameters are carefully restricted. Cylinder powers usually have an upper range of 2.25DC, but some monthlies will go up as high as 5.75DC (Proclear Toric XR) or a maximum of 8.00DC in one silicone hydrogel material (Saphir Rx Monthly Toric). They are all limited to 0.50DC steps except one with an 0.75DC step (Focus Dailies Toric). Axes are usually in 10° steps but may be restricted to 20° either side of horizontal or vertical in daily disposables, as oblique cylinders are generally more difficult to fit so frequently omitted.

**Custom-made lenses**

Custom-made lenses permit the fitting of most prescriptions which are technically feasible to manufacture, with a comprehensive range of lens parameters, water contents, spherical and cylinder powers, axis positions and methods of stabilisation. The main disadvantages are the greater time required to obtain lenses and additional costs, particularly where changes to the prescription are necessary. Laboratories currently providing a full range of custom made toric lenses include Cantor+Nissel, CooperVision, mark’ennovy and UltraVision International.

**Fitting routine**

Assess spectacle Rx in relation to ‘K’ readings

Most varieties of disposable torics do not offer a choice of parameters, so the method of stabilisation is frequently determined by the choice of lens.

Power is determined either empirically by considering the ocular refraction in both meridians or by over-refraction using a spherical lens from the same manufacturer. Always obtain a lens near to the correct BVP for fitting purposes to help assess the lens behaviour correctly.

If the cyl axis of the spectacle Rx is at a 5° value, the best way to choose the first contact lens axis value is to put up the spectacle Rx and ask the patient which is
better between the 10º value either side, or remember the usual nasal 5º swing due to the lower lid and compensate by that fact.

If there is a choice between two possible cylinders, it is generally correct to select the lower power (under-correct rather than over-correct astigmatism). This is because you want to limit the thickness differential over the lens as much as possible.

The lens fitting is the same as any standard soft lens criteria, but choosing a lens that centres well is more important for torics than accepting a slightly decentred option, which might have been fine in normal spherical circumstances. When inserting a lens, it helps to use the orientation markings to ensure more rapid and more comfortable settling.

Once the lens has settled, the acuity can be checked and only a minor spherical over-refraction is necessary. If the vision is reduced and the over-refraction does not improve, the main reason is likely to be lens mislocation. The fitting is then viewed in the normal way and, if accepted, the orientation mark is observed and any mislocation recorded. Using the mnemonics previously mentioned, the next axis is chosen.

For example, a lens of BVP -2.00/-1.25 x10 is observed on the eye and the orientation mark is sitting 10º temporally on the right eye (Figure 6, J&J toric design). This means it is mislocated clockwise and the value of mislocation needs to be added. The next lens to be inserted will be one with an axis of 20.

The most important aspect of toric fitting is understanding that if the axis compensation has been made, because of lens rotation at the initial fitting, the next prescription lens should also settle with exactly the same degree of mislocation. If it does not, your compensation value is useless and one needs to try a different design to get a more stable result.

Any rotation of the lens should be routinely recorded in relation to the axis identification markings. This reveals any discrepancy between a trial lens and a prescription lens and builds up a history of how lenses locate on the cornea.

Depending on the type of axis markings, the position at which a lens settles on the cornea can be recorded in many ways. My suggestion is the cross for centration with orientation marking indicated (Figure 7).

A successful fitting usually returns consistently to the same orientation within one or two blinks after rotational displacement. You can digitally rotate the lens off axis and check it returns to its original position with quick, smooth and consistent recovery.

Where a lens mislocates on the eye, rather than attempt to change its orientation by, say, tightening the fit, assume firstly that the various stabilising factors will always act on the lens in a similar way. Compensate the axis of the correcting cylinder for any lens rotation on the eye and see what happens. A steeper fit may only make it harder to get the lens to orientate correctly and the patient will end up moving the lens a certain number of times in the day when it goes off axis and stays off axis. If no other fitting option is available, then a new design should be tried. With some people, especially those with tear film issues, they will always be prepared to move the lens into the correct position during the day especially after hours staring at a computer.

Remember
- Fitting is less reliable with oblique cylinders
- Take particular care when fitting high cyls and low spherical corrections, monovision, or essentially monocular, patients. They are much more disturbed by any instability of vision caused by temporary lens rotation on blinking
- If no success is achieved after the second lens for a particular eye, try a different design.