

**FITTING AND MANAGEMENT
OF
THERAPEUTIC
CONTACT LENSES**

by

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Fitting and Management of Therapeutic Contact Lenses

Forward

This document was written by Mr. Chris Steele, on behalf of the Association of Optometrists, Hospital Optometrists Committee as part of the Hospital Optometrists Information Series. It is not intended as a definitive statement but should be read in conjunction with all other available texts and manufacturers product advice.

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Introduction

Therapeutic contact lenses (TCLs) have proved to be an effective tool in the management of a wide variety of ophthalmic disorders. Conditions recalcitrant to other treatment modalities may heal readily with the use of a TCL. With proper patient selection, observation and management, TCLs provide an extremely effective therapeutic adjunct.

The aims of these guidelines are to enable the relatively inexperienced practitioner to fit and manage a variety of ophthalmic disorders with the use of TCLs when this option is considered appropriate.

It must be emphasised that the use of TCLs in the treatment of a variety of conditions is not necessarily the treatment option of first choice. Instead they should be considered as one of a number of possible treatment options.

THE DECISION TO USE A TCL SHOULD BE CAREFULLY CONSIDERED, AS THE RISKS, PARTICULARLY MICROBIAL INFECTION, ARE SUBSTANTIAL.

Definition of a TCL

The term “therapeutic” is derived from the Greek word “therapeuein” meaning to take care of, or to heal. The term “therapeutic” is often used as if it applied to a specific type of contact lens, when in reality, nearly every lens type can be used in a therapeutic capacity.

The aims of therapeutic contact lens wear

The aims of therapeutic contact lens (TCL) wear are diverse and there are often several options available to achieve a specific therapeutic goal.

The use of such lenses for visual improvement is not included in this guide although this can be a secondary benefit from TCLs.

The five main aims of therapeutic contact lenses are summarised as:

- 1. Relief of ocular pain;**
- 2. Promotion of corneal healing;**
- 3. Mechanical protection and support;**
- 4. Maintenance of corneal epithelial hydration;**
- 5. Drug delivery.**

Of these the first three are probably the most common aims of use in the UK.

Often, the aims of therapeutic lens wear are a combination of the above.

Classification of TCL types

The different types of therapeutic lenses presently available are summarised below:

- Hard (PMMA) and gas permeable scleral lenses;
- Hard scleral rings;
- Low water content hydrogel soft lens (38%-45%);
- Mid-water content hydrogel soft lens (45%-55%);
- High water content hydrogel soft lens (67%-80%);
- Silicone rubber and silicone hydrogels (38%);
- Collagen shields (Dk/L = 63% H₂O soft lens) - currently unavailable in the UK.

The choice of lens depends on a consideration of: -

1. The aims of lens use, which may be a combination of the above;
2. The physiological requirements of a diseased eye can be quite different from that of a normal cornea;
3. More than one option often being available;
4. Progress **must** be closely monitored;
5. If necessary, the lens design or material should be changed, perhaps several times, to obtain the clinical effect best suited to the corneal condition concerned;

NOTE. Owing to the much lower costs, “disposable” contact lenses provide a cost-effective option. However the parameters in which disposable lenses are available are limited and not suitable in all cases.

Essentials of Fitting a TCL

Fitting a bandage lens should not be too difficult if the following guide is used.

This guide refers mainly to soft TCLs as these are most commonly fitted: -

- Keratometry is often not much help owing to the irregular mires associated with any underlying condition, therefore trial fitting is recommended. However K readings of the other eye may prove helpful;
- Wherever possible avoid the use of topical anaesthetics as this may mask the pain associated with a poor fitting lens. In certain circumstances the use of topical anaesthetic is unavoidable;
- The lens fit should be assessed after approximately 20 minutes and ideally again after approximately 60 minutes (owing to lens dehydration effects);
- Peripheral lens fit is also very important as e.g. flared lens edges may give rise to discomfort etc.;
- A well fitting TCL should have good corneal coverage with appropriate mobility characteristics for the underlying condition being managed (see later sections);
- Many textbooks state that by increasing the BOZR of soft TCL this will provide a flatter fit and vice-versa. This is not necessarily the case as the edge design of a soft lens has the greatest influence;
- Therefore always have a selection of lens designs with similar parameters because where one design fails to achieve the desired fit, another may well succeed;
- Generally, a large lens with a fitting erring on the flat side, that centres well is the preferred option in cases such as e.g. corneal oedema and conditions where the cornea epithelium is not in tact;
- Generally, steeper fitting lenses are better for eyes with irregular corneal topography, for vaulting or splinting of the corneal surface or where pain relief is a main aim. Particularly steep fitting lenses should however be avoided unless specifically indicated in very rare occasions (see below).

REMEMBER - There are always exceptions to the rules!

Indications for use of therapeutic contact lenses

Therapeutic contact lenses have been utilised in a large variety of corneal diseases and have been found to be useful in many of them. The following section discusses some relatively common conditions encountered. The relief of pain is the common aim of treatment in ocular conditions causing corneal epithelial abnormalities.

Aim 1: Relief of pain

BULLOUS KERATOPATHY

Three common scenarios where TCL use could be considered in Bullous keratopathy are: -

1. In a patient with a painful eye with no visual potential:

Action:

- This is best fitted with a TCL as soon as possible. Some pain may persist due to the epithelial swelling causing a stretching of the nerve endings.
- Lens movement in bullous keratopathy should be minimised (but sufficient to allow adequate tear flow) and is best achieved by the employment of a large, hydrogel lens with high water content (e.g. Duragel 75, Lunelle ES70, Troy 85) to maintain the maximum oxygen permeability for continuous wear.

2. In a patient who is not fit for graft surgery.

Action: - as above.

3. As a temporary measure where a patient is going to have a penetrating keratoplasty at some future date.

Action:

- A thin high water content TCL is indicated due to the reduced risk of producing corneal vascularisation.

FILAMENTARY KERATITIS

Many cases of filamentary keratitis are self-limiting with “dry” filamentary keratitis being treated with artificial tears and lubricants. Secondary and idiopathic “wet” filamentary keratitis do not respond to lubricant therapy and usually the filaments return even after mechanical removal. Severe persistent cases may benefit from the use of TCLs in conjunction with steroids and atropine, or removal of the filaments.

Action:

- Consider the use of disposable contact lenses (e.g. Wessley Jessen Precision UV, Acuvue, B&L Soflens 66 & PureVision.). Resolution of filaments within 4 days and complete disappearance within 2 weeks are possible, but they can recur.

Aim 1: Relief of pain (continued)

THYGESON'S SUPERFICIAL PUNCTATE KERATITIS

Thygeson's superficial punctate keratitis consists of recurrent episodes of fine superficial grey-white punctate corneal opacities of presumed viral aetiology. The corneal opacities distort the epithelial surface and may even reduce visual acuity.

Action:

- In severe cases a high water content TCL could be considered where the main function is to act as a pressure bandage thus relieving pain and foreign body sensation. Often a low water content thin lens e.g. B&L 04 works better

SUPERIOR LIMBIC KERATOCONJUNCTIVITIS

Action:

- TCLs are very effective in alleviating both signs and symptoms of the disease.
- Consider a relatively large TD soft TCL.

Aim 2: Promotion of corneal healing

RECURRENT CORNEAL EROSION: - Anterior membrane dystrophies

Anterior membrane dystrophies can frequently produce intermittent epithelial breakdown and are associated with corneal surface and wetting problems. Map-dot-finger dystrophy is a main cause of corneal erosion problems. Although most patients remain asymptomatic throughout life, approximately 10% develop recurrent erosion syndrome. As with nearly all corneal dystrophies this produces foreign body sensations, pain and photophobia.

Usually recurrent erosions are treated with lubricants and hypertonic saline if microcysts are present.

Warning:

Although TCLs may be useful here, they should only be considered as a last resort as the risks of complications have to be carefully considered.

Action:

- Consider a TCL used on an extended wear basis for 2, 3 or even 6 months, with removal and/or replacement only as necessary.
- Ultra-thin TCLs are contraindicated due to possible buckling or wrinkling of the lens with lid movement, thus producing an ineffective corneal splint action.
- A thick, high water content extended wear lens is preferred which will produce an effective splint and not over compromise corneal metabolism. "Disposable" lenses are recommended for the management of corneal erosion.
- Recurrent corneal erosions may benefit from Excimer laser phototherapeutic keratectomy (PTK)

TRAUMATIC CORNEAL ABRASIONS

Abrasions over 4mm may benefit from the use of TCLs, where the epithelium reportedly heals more quickly, compared to conventional methods of treatment, i.e. topical medication and eye pad.

Action:

- The use of disposable lenses is indicated, particularly in the treatment of corneal erosions with good success.

Aim 2: Promotion of corneal healing (continued)

PERSISTENT CORNEAL EPITHELIAL DEFECTS (PEDs)

Persistent corneal epithelial defects (PEDs) can be a chronic management problem. In these cases the cornea is more vulnerable to infection and therefore PED is associated with a high rate of ulceration and perforation.

Action:

- TCLs (e.g. “disposables”) can provide mechanical protection from the lids whilst new epithelium re-attaches to the newly secreted basement membrane.
- Collagen shields hydrated in acidic fibroblast growth factor (α FGF) have been shown to promote epithelial wound healing in such cases (but these are not currently available).

CHEMICAL INJURIES

Chemical injuries may suffer severe stromal ulceration due to the collagenolytic activity unleashed. The presence of a TCL may inhibit the passage of certain proteolytic enzymes present in the tear fluid to the stroma, thus preventing the progressive ulcerative process following chemical injuries.

Action:

A chemical burn to the eye is often associated with chemosis as well as the epithelial damage. Therefore: -

- A small total diameter TCL is the lens of first choice (TD~12.5mm).
- If there is a peripheral corneal ulcer with an epithelial defect, a low water content TCL is advocated in order to promote corneal vascularisation. In peripheral corneal ulceration's, such as chemical injuries, Mooren's ulcers and corneal melts caused by connective tissue disease, the anoxia and slight trauma caused by a TCL may stimulate vascular in-growth. Subsequent stromal vascularisation may arrest the ulcerative process.
- If the lids are involved, a scleral lens may be better.

Aim 2: Promotion of corneal healing (continued)

POST OPERATIVE EPITHELIAL DISORDERS

Many ophthalmic surgical procedures can result in temporary corneal epithelial defects.

These include:

- Vitrectomy (in ~25% of diabetics);
- Post penetrating keratoplasty in the early post operative period;
- Epikeratoplasty;
- Kerato-refractive procedures e.g. PRK, LASIK;
- Cataract extraction (wound leakage i.e. positive seidel's test).

Action:

- Soft and collagen TCLs may be utilised in order to minimise post surgical epithelial trauma, provide a stable healing environment and promote rapid healing.

PENETRATING KERATOPLASTY (PK)

Where an existing graft has perforated:

Action:

- A silicone rubber TCL may be used to reform the anterior chamber.

Other possible uses post PK include:

1. Delayed epithelial healing of more than one week;
2. Epithelial filament formation;
3. Steps in host graft junction;
4. Loose sutures.

Aim 3: Mechanical protection and support

The mechanical effects of a TCL are numerous and encompass the use of a variety of TCL designs and materials. Structural support is provided by a hydrophilic TCL, in the form of a “splint”, in cases of corneal thinning, perforation or partial wound dehiscence.

Scleral lenses and rings and silicone rubber lenses are also included in this application. The use of TCLs in this way can often delay or even alleviate the need for immediate surgery or grafting.

CORNEAL LACERATION

Action:

- With small perforations (less than 2mm) without tissue loss, structural support may be achieved and the integrity of the eye maintained, by the utilisation of a TCL.
- The healing rate is quicker in small lacerations and for those, which are not infected. Perforations close to the limbus and those in vascularised areas respond most favourably to the application of TCLs.
- Some clinicians advocate the use of cyano-acrylate (tissue) glue as the treatment of first choice in cases of corneal perforation. A thin low water content TCL will provide protection to this adhesive plug over the corneal wound and from the shearing effects of lid action. This can be a temporary measure prior to surgical repair.
- Partial thickness corneal lacerations involving stroma, with the wound edges well appositioned can be treated with a TCL quite successfully with resulting small scars at the entrance sites. A small perforation near the visual axis may heal with less resultant astigmatism if a TCL rather than a suture is used. A thin low water content soft lens would be the lens of first choice.

Aim 3: Mechanical protection and support (continued)

CORNEAL WOUND LEAKAGE POST OPHTHALMIC SURGERY: (Cataract surgery and post keratoplasty)

Cataract surgery involving e.g. the extracapsular technique (ECCEs) and particularly following penetrating keratoplasty may produce some wound leakage of aqueous (positive Seidels).

Action:

- A thin low water content TCL may be fitted, which provides mechanical splinting of the wound and so aids sealing of the leaking wound.

Action:

- A hydrophilic soft TCL may be used to help re-appose the wound and also to promote vascularisation in an area of dehiscence and expedite long term healing.
- Collagen shields can be applied at the time of surgery followed by placement of a hydrophilic TCL, 24 hours later.
- The hydrogel TCL may even be piggy backed onto a post surgical 12-hour collagen shield which has previously been soaked in corticosteroids and/or other drugs.

Warning:

Complete anterior to posterior wound dehiscence represents a contraindication to the use of TCLs as this may form a potential entry route to microorganisms leading to intraocular infection.

TRABECULECTOMY

A leaking drainage bleb in the initial post operative period or perhaps several days or even weeks later.

Action:

Large (total diameter 20.5mm) “Megasoft” 76.5% water content TCLs can be fitted to press over the leaking bleb.

Aim 3: Mechanical protection and support (continued)

CORNEAL THINNING

A patient with a thinned cornea, in which a perforation is imminent, often presents with a descemetocele.

Action:

- Fit a hydrophilic TCL to act as a corneal splint, which can retard or even stop the rate of thinning and hence prevent perforation.
- As this often occurs in dry eyes, silicone rubber lenses may be better.

PROTECTION OF THE CORNEA (Cranial nerve palsies)

Action:

- TCLs and particularly scleral lenses are very useful in providing protection and comfort in e.g. Trigeminal (5th) nerve palsy, Facial (7th) nerve palsy;
- Consider a pre-formed scleral lens e.g. Innovative Sclerals.

Other situations include: -

- Lid deformities with eye exposure,
- Entropion,
- Trichiasis
- Scarred lids.

Aim 4: Maintenance of corneal hydration

CICATRIZING CONJUNCTIVAL DISEASE

Corneal involvement associated with cicatrization of the conjunctiva occurs in conditions such as e.g. Stevens-Johnson syndrome, ocular pemphigoid, chemical burns, trachoma and dry eye.

Action:

- In Stevens Johnson syndrome scleral lenses may be particularly useful, as they will also retain a reasonable tear layer which prevents corneal dehiscence and keratinization;
- A large (15-20mm TD), low or medium water content thick lens may be considered where it will prevent adhesions forming or reforming;
- A silicone rubber can also prove effective.

CHEMICAL BURNS

Strong alkali burns can inflict the worst damage to the eye due to their potential for penetration and continuing effect long after affected tissues have been irrigated.

Action:

- “Megasoft” 20.50 mm TD bicurve TCLs can prevent e.g. symblepharon reformation following surgical reconstruction of the lower fornix;
- Scleral lenses or scleral rings can also prevent symblepharon;
- TCLs are not necessarily indicated in the initial treatment phase but may be considered later in order to promote epithelial healing by e.g. protecting the fornix from mechanical forces of the lids.

THE DRY EYE

In marginal to severely dry eyes hydrophilic TCLs are not recommended and may well prove to be counter-productive. Silicone rubber lenses may be considered.

Aim 5: Drug delivery and contact lenses

Hydrogel TCLs alter the pharmacokinetics and effectiveness of topically applied drugs. Hydrogel lenses soaked in medication and then placed on the eye generally give very high ocular levels of medication that diminish with time which are superior to frequent topical application of drops alone. Medication impregnated lenses are appropriate for short-term use when corneal protection and therapeutic levels of specific medications are desired.

Caution:

In the UK many ophthalmologists are reluctant to use TCLs for drug delivery because of the high risk of producing toxic reactions e.g. keratopathies due to prolonged direct corneal exposure to certain drugs.

Complications associated with therapeutic contact lenses (TCLs)

The complications of extended wear TCLs are similar to those of cosmetic extended wear lenses. The compromised nature of the eye needing therapeutic application of lenses does not seem to significantly alter the incidence of lens complications as a whole.

The use of prophylactic antibiotics with TCLs may be beneficial in the short term, although this remains highly controversial. Microbial keratitis is the most serious complication of contact lens wear and ulcers induced by TCL wear pose a serious problem.

It is also important to look out for giant papillary conjunctivitis (GPC) and neovascularisation in particular at aftercare visits.

See attached summary table.

Fitting and Management of Therapeutic Contact Lenses

Therapeutic contact lens characteristics

HYDROGELS

Manufacturer	Series	Material	Water content	Diameter (mm)
Bausch & Lomb	O4	HEMA	38.6%	14.00
Bausch & Lomb	Plano	Polymacon	38.6%	13.50/14.50
Lunelle ES70	Plano	MMA/PV	70%	15.00
Troy	Plano		62/70/74/85%	15.00-20.00
Igel 67	Igel67/77		67 / 77%	14.50

“DISPOSABLE”EXAMPLES ONLY

Manufacturer	Series	Material	Water content	Diameter (mm)
Wessley Jessen Precision UV	Monthly Disposables	Vasurfilcon A	74%	14.50
Hydron	Actifresh 400	MMA/VP	55%	14.30
Proclear		Omafilcon A	62%	14.20
B&L Soflens66	Monthly Disposables	Alphafilcon A	66%	14.20
B&L Purevision	Silicone Hydrogel	Balafilcon A	36%	14.00
Acuvue, J&J	Vistavue	Genfilcon	48%	14.00
CibaVision	Dailies	Nelfilcon A	69%	13.80

COLLAGEN SHIELDS (Not currently available in the UK)

Manufacturer	Series	Material	Water content	Diameter (mm)
Bio-Cor	---	Type 1 (porcine)		
Chiron	---	Type 1 (bovine)		

Therapeutic contact lens characteristics (continued)

SILICONE RUBBER

Manufacturer	Series	Material	Water content	Diameter (mm)
Wohlk	Silflex	Polysiloxane	0	11.70-13.70

SCLERAL LENSES

Manufacturer	Series	Material	Water content	Diameter (mm)
Innovative Sclerals	Sealed			~22.00
David Thomas	GP Centres	60Dk		Various