Soft Lenses*

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SUMMARY

A series of cases fitted with Bionite soft lenses is described. Good results were obtained in bullous keratopathy, dry eyes, early and moderately advanced Stevens-Johnson syndrome and pemphigoid, and some cases of indolent corneal ulcers.

The lenses appear to be a most effective replacement for tarsorrhaphy, haptic lenses and epikeratoprostheses.

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In 1960, Wichterle[1] introduced the concept of a soft contact lens. These lenses have since captured the imagination of the lay public and the serious investigator alike, and have become one of the greatest advances of the decade in contact lens design.

At present, two types of soft lens material are in use:[2] Polyhema - 2 Hydroxymethylmethacrylate—the Bausch & Lomb soft lens; and Bionite-hydrophilic copolymers of acrylate type. A comparison of the two lenses is shown in Table I, listing their advantages and disadvantages.

Silicon rubber is another material which is permeable to gases, but not hydrophilic, and therefore not well tolerated.

Over the last six months, we have investigated the use of the Griffin Bionite lens in cases of corneal and conjunctival disease. The results were considered successful when symptoms or signs were relieved, and comfortable wear for most of the day was achieved. Both these factors are required, as the one may be present without the other.

TABLE I. COMPARISON OF THE ADVANTAGES AND DISADVANTAGES OF THE TWO LENSES

Polyhema	Bionite
Low water content—30 - 40% therefore less well tolerated.	High water content—60 - 80%.
Impermeable to gases.	Poor permeability—but twice as high as Polyhema.
Low elasticity and therefore optics not good.	High elasticity and therefore good optics.
Subject to stress and strain especially when drying.	High percentage breakage.
Easily infected.	Deterioration of material over a long period.
	Deposition of salts and foreign material causing spoiling.

FITTING DETAILS

The lenses are available in base curves from 7,2 to 8,7 mm in 0,3 mm steps. The diameter varies from 13,0 to 15,0 mm. Generally, a lens 5 dioptres flatter than the flattest K reading, is used. The diameter should be 2 - 3 mm larger than the corneal diameter. Therapeutic fitting technique is, however, different from cosmetic fitting.

INVESTIGATION OF 29 CASES

A total of 29 patients were fitted with therapeutic lenses; in all, 31 eyes were involved (Table II).

TABLE II. ANALYSIS OF 29 CASES

Condition	No. of patients	Result
Bullous keratopathy	2	1 success
Aphakia	Children 3	1 success
	Adult 1	1 success
Exposure keratitis due to 7th nerve palsy	1	1 success
Neurotropic keratitis	1	1 success
Benign mucosal pemphigus	(4 eyes) 2	4 success
Keratitis and corneal ulceration		
Radiation	1	1 success
Novesine	4	3 failure; 1 success
Postherpetic	1	1 failure
Chemical	2	1 success; 1 failure
Postzoster guttate degeneration	1	1 failure
Xeroderma pigmentosa	1	1 failure
Idiopathic indolent ulceration	4	1 success; 3 failure
Postgraft corneal ulcer	1	1 success
Stevens-Johnson syndrome	3 (2 patients: both eyes)	2 failure; 3 success
Keratoconjunctivitis sicca	1	1 success

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Bullous Keratopathy

Two cases were referred for this reason. The first was a case of bullous keratopathy following intra-ocular implant; his symptoms were immediately relieved. No improvement in visual acuity occurred, although this has been noted.[3] The patient wears his lens successfully for one week continuously, removes it for cleaning and then resumes wear for one week.

The second patient developed bullous keratopathy following a corneal graft; his symptoms were immediately relieved on using the lens, but previously quiet ghost vessels became very active. It was felt that the lens was not flat enough and a new, flatter lens was advised.

Aphakia

Most cases of aphakia can be fitted with hard contact lenses. However, where marked corneal astigmatism and scarring exist, a hard lens may be extremely unstable. Formerly, such cases were fitted with a haptic lens. Such a case, following a severe traumatic corneal laceration, was fitted with a soft lens. The patient wears this 24 hours a day and has a vision of 6/12, despite a large astigmatic error.

The most challenging use of soft lenses is in children with unilateral aphakia. The great problem with these cases is the almost inevitable amblyopia which follows. This could be prevented with hard contact lenses, but requires exceptional parent and patient co-operation, moulding facilities in theatre and a full-time contact lens technician.

Soft lenses would appear to offer an easy solution to this problem. We have fitted 3 such children with contact lenses—2 following trauma, and one following aspiration of a unilateral congenital cataract. Unfortunately, the last case was already amblyopic, however, the child manages successful 12-hour wear.

The other 2 cases cannot manage longer than 12-hour wear. The lenses are easily extruded, and one child lost 3 successive lenses. This child is a failure, but the other is successful, with 8-hour use.

Seventh Nerve Palsy

One patient with an acoustic neuroma had a severe exposure keratitis, which was successfully treated. Tolerance was good and her symptoms improved.

Fifth Nerve Palsy

One patient with a neurotropic keratitis, secondary to loss of corneal sensation following a severe herpes zoster infection, was successfully treated. The lens is worn during the day and removed at night. It is dangerous in such patients to allow longer wearing, as infection may occur. This happened in this patient, who originally wore the lens one week at a time. He developed a severe ulcer; but since then his keratitis has been controlled with daily wear.

Conjunctival Shrinkage

Two cases of early benign mucosal pemphigus were fitted. The one case was extremely sucessful and he now wears the lens 24 hours per day and works at his normal post without any difficulty and without red, irritated eyes. There has been a 9-month follow-up. The second patient has recently been fitted, and she is extremely comfortable with her present lenses.

Three cases of Stevens-Johnson syndrome have been fitted. One mild case, with minimal lid scarring and corneal involvement, has done well. The second case was a young child with severe vascularization of both corneas and marked trichiasis. Since the use of the lenses, the child has been able to return to school and despite a low visual acuity, she copes adequately.

The third case had severe dry eyes and was blind, due to corneal scarring. Despite an initial improvement with one week of continuous wear, she later became intolerant of the lenses, which became dry and hard, and developed a protein deposit on the surface of the lenses. The lenses were discontinued, because of being easily displaced by the abnormal eyelids.

Keratitis and Corneal Ulcers

This group presented us with extremely difficult problems, and the results were often disappointing.

One patient with postradiation keratitis was comfortable for two weeks, before being lost to follow up.

Of two patients with lime burns, the one experienced severe irritation with the lens, and had to discontinue wearing the lens. The other, despite a progressive increase of his corneal opacity, was extremely comfortable with the lens. His photophobia and irrritation were relieved.

One patient with postherpetic keratitis developed a marked increase of the vascularization of his cornea, and had to discontinue wear.

One patient with a post-zoster corneal marginal erosion, developed an increase in the vascularization and opacification of the surrounding cornea, and wear was discontinued.

Two patients with idiopathic indolent superficial ulcers developed severe irritation, redness and pain; and despite varying the base-curve of the lenses, wear had to be discontinued. A third patient, however, was very comfortable and the cornea slowly healed.

One patient with recurrent ulcers due to an old measles infection, developed the symptoms of an extremely tight lens fit within hours. As the lens was flattened, so did the length of wearing time increase, but because of eventual severe discomfort, wear was discontinued.

Four patients with severe Novesine keratitis were treated. Three of these had severe corneal ulcers as well as deep keratitis. In all, there was immediate relief of the irritation. The patients were treated as outpatients. In two of them, the ulcers perforated and wear was discontinued. In one, a severe corneal abscess with hypopyon developed and wear was discontinued.

One patient, who was treated as an inpatient, rapidly improved, and after two weeks the lenses were discontinued because of almost complete clearing of the keratitis.

One patient, with sicca, after varying her wearing time, eventually achieved comfort and improvement in vision by wearing the lenses 48 hours at a time. Another patient with a postgraft epithelial defect healed rapidly with a lens.

DISCUSSION

These lenses represent an important form of therapy in corneal disease. They act as a protective shield against lashes and roughened conjunctiva, prevent drying and supply moisture. They may help to splint the cornea and allow epithelial regeneration. They may save tarsorrhaphy and haptic lens moulding. They do not cure endothelial disease, nor do they cure viral or deep corneal disease.

Aquavella *et al.*[4] report relief of pain and improvement in vision with the Bionite lens, while Buxton and Locke[5] report no improvement with the soft lens. In our experience the vision has not improved; provided that the lens is only used for the relief of pain and irritation, the lenses are invariably successful.

The poor results in the group with corneal ulcers and severe keratitis does not mean that the lenses are of no use. We consider that this rather represents poor fitting technique. The lenses should be varied according to the symptoms. Gaseous interchange is inadequate for normal epithelial respiration and a large steep lens will cause 'tight lens' complications. Hence good blinking is important as the 'pump' mechanism aids respiration. However, where there is a large epithelial defect, it may be considered better to vault the lesion, and thus a 'tight' lens would be fitted. A change of lens must be based on the appearance and symptoms. The patients should only wear the lenses intermittently, and should be under continuous inpatient management, especially if an active disease process is present.

Increase of vascularization has been noted in a few patients. This is a sign for immediate cessation of wear, but may be due to incorrect lens fitting. Fitting on the flattest K (3) is not always advisable.

A build-up of wearing time may be indicated where vascularization is already present, or where difficulties are experienced. Topical medication has been discouraged because of the dangers of concentration of the drop and its preservative. However, over-night storage will allow any drug to effuse from the lens, and we have allowed patients to continue topical medication where considered essential, without untoward effect. In fact, the lens may be used as a technique of ensuring high continuous concentration of a drug in the eye, similar to iontophoresis.

A recent study has confirmed this aspect. Podos *et al.*[6] showed that egress of pilocarpine was completed by 4 hours of wearing time and produced an effective drop of intra-ocular pressure. The lens was pre-soaked in pilocarpine. Furthermore, it has been shown that bionite lenses and pilocarpine were more effective, than pilocarpine alone in lowering intra-ocular pressure. These studies were done without the usual preservatives, and so no comment can be made on the adverse effect of these agents.

Our experiences with advanced Stevens-Johnson syndrome and aphakia in children, are similar to those of other authors. The small fornices of the child prevent retention of the lens, and so it is often displaced. With the use of smaller lenses and better parent co-operation, the bugbear of unilateral aphakic amblyopia in children may be solved. In fact, this may well be a solution to many cases of aneisoeikonic amblyopia.

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