

Extended-wear aphakic soft contact lenses and corneal ulcers

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SUMMARY A review of 100 aphakic extended-wear soft contact lenses is presented for the period July 1980 to August 1981. Four previously successfully fitted patients with either American Optical Company's Sofcon or Cooper Laboratories' Permalens for extended wear developed corneal ulcers either directly under the lenses or shortly after removal. Three of the female patients were well controlled diabetics without retinopathy, one of whom sustained severe visual loss and neovascular glaucoma after a pseudomonas ulcer. Another patient, who had developed a *Serratia marcescens* ulcer 3 months later, developed metastatic carcinoma of the bowel. Special attention to diabetic aphakic patients being fitted with extended-wear soft contact lenses is suggested.

The feasibility of extended-wear aphakic soft contact lenses has been shown in several studies.¹⁻⁴ Problems related to corneal infiltrates, corneal oedema, vascularisation, papillary hypertrophy, and unsatisfactory fit or poor vision were felt to have been minimal.^{3,4} Stark and associates³ reported a 91% success rate in fitting the extended-wear aphakic lenses without significant complication in over 100 eyes.

Other reports focused on some of the complications associated with extended-wear of soft contact lenses.^{5,6} Murphy described a patient who developed a sterile endophthalmitis associated with the extended wear of an aphakic soft contact lens.⁷ In an analysis of over 300 spoiled soft contact lenses Tripathi *et al.* found various sources of deterioration ranging from mucoprotein and calcium deposits to cosmetics and microbial invasion.⁸

This study reviews our experience with several types of extended-wear soft contact lenses in 100 aphakic patients over the course of a year. We present 3 case reports of patients who sustained visual loss from corneal ulcers associated with the use of the extended-wear aphakic soft contact lenses. Three of the patients out of 4 who developed corneal ulcers under the extended-wear aphakic soft contact lens were diabetics.

Patients and methods

From July 1980 to August 1981 a total of 131 aphakic soft contact lenses were fitted in 100 patients. The 100 patients were selected from among 125 patients, all of whom were seen in the private practice of Dr Morris Feldstein. Admission criteria were: (1) sufficient tears, adequate blink, and healthy corneal epithelium; (2) absence of anterior segment infection, blepharitis, corneal disease, glaucoma, uveitis, or debilitating systemic disease; (3) reliability to attend follow-up examinations. All 100 of the aphakic patients were fitted either by Dr M. Feldstein or by Dr J. Eichenbaum. Lenses were fitted by standard trial lens techniques, with attention to patient comfort and visual acuity.

When possible the patients were instructed in insertion and removal. Cleaning of lenses was performed when mucoprotein build-up was prominent, either on slit-lamp examination or because of symptomatic irritation. Cleaning was achieved with one of the commercially available detergents, such as, Preflex.

However, the majority of the patients were examined monthly, regardless of their ability to insert, remove, and clean their contact lenses. A careful history was taken for symptoms of lens intolerance, visual acuity was examined, lens fit was assessed, and

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anterior segment changes were noted on follow-up visits. Attention was directed to corneal changes and vascularisation. Visual acuities remained fairly stable and were within the range of the achievable spectacle correction in most instances. The great majority were within the 20/40 to 20/80 range.

Dr Morris Feldstein had fitted 135 aphakic patients in 1978 in the same age group with cataract glasses, 8 of whom were adult onset diabetics. None of these diabetics developed corneal ulcers.

Seventy-two of the aphakic patients were fitted with AO Sofcon contact lens, 25 with Permalens, and 3 with Hydrocurve. With the exception of 3 patients who were adult-onset noninsulin-dependent idiopathic diabetics (1979 American Diabetes Association criteria), all under adequate control, and one other patient who had a history of surgically treated closed-angle glaucoma several years prior to her cataract extraction, the elderly aphakic patients were in relatively good health. There were no other diabetics in the time interval of the study, though several patients developed corneal problems afterwards. The patient who had a history of closed-angle glaucoma several years prior to the cataract extraction did not require any treatment of her ocular tensions after the cataract extractions.

Although the AO Sofcon and the Hydrocurve aphakic soft contact lenses are only 55% water, while the Permalens is 71% water, the number of lenses required for satisfactory fit, the replacement of damaged lenses, and the frequency of unscheduled visits for conjunctivitis or problems related to contact lenses was about the same in each category.

Corneal vascularisation and mucoprotein and calcium deposits were similar in extent during the study for each of the types of contact lenses fitted. In fact the problem of lens calcium deposits seems to have been related more to the individual patient than to the type of contact lens. In 4 patients, in whom initial fittings were with either AO Sofcon or Permalens and calcium deposits developed on the lens, switching to the other lens did not result in any reduction in tendency to form deposits on the lens. Within 3 to 4 months dense white flecks appeared on the new lens regardless of the type of lens used.

The following 3 case reports describe the rather sudden onset of corneal ulcers under the extended-wear soft contact lenses in patients who had done well from 4 to 18 months previously. Two of the patients presented here had well controlled adult-onset diabetes mellitus. A third woman, not described here, who was 85 and a well controlled adult-onset diabetic, but with early background diabetic retinopathy and a similar course to the second case presented, also developed an *Enterobacter cloacae* superocentral corneal ulcer which responded to

intensive gentamicin drops. Although the vision after treatment of the ulcer hovered near 20/200, the patient had a prior history of senile macular degeneration with a previous vision of 20/200 +1.

Case reports

CASE 1

A 63-year-old obese white female with well-controlled diabetes mellitus and hypertension, but without evidence of diabetic or hypertensive retinopathy, underwent uneventful intracapsular cataract extraction on her right eye on 11 January 1979. Apart from symptomatic vitreous floaters the patient had a benign postoperative course. Three months later she was fitted with an AO Sofcon contact lens that, together with over-refraction, resulted in a visual acuity of 20/40 with comfortable wear. The patient was instructed in insertion and removal as well as cleaning technique with H₂O₂ and isotonic saline weekly. Over the course of the next 1½ years the patient did well with the lens, with weekly removals and cleanings. Monthly examinations were unremarkable.

On 30 September 1980 the patient presented with pain and redness in the right eye of one day's duration. The conjunctiva was markedly injected, and the lens was removed. The cornea stained diffusely with fluorescein. The patient was started on bacitracin ointment b.i.d. The next day, although the corneal staining had decreased, the conjunctiva was still quite injected and the eye was painful. Neodecadron (neomycin sulphate 3.5 mg to 0.1% dexamethasone sodium phosphate ophthalmic solution every 2 hours was added to the regimen. During the next 3 days the pain, conjunctival reaction, and corneal staining all decreased.

Six days after removal of the soft contact lens the patient presented with acute pain, lid oedema, marked conjunctival infection, and an inferotemporal paracentral corneal ulcer. Gentamicin eye drops every 2 hours were started.

The following day the ulcer bed had enlarged, and a hypopyon with a fluid level below the pupillary border was noted. The patient was admitted to the hospital, where a repeat culture was obtained. Treatment consisted of 60 mg gentamicin intravenously daily for 4 days, and gentamicin drops alternating with Neosporin (neomycin sulphate, gramicidin, and polymyxin B sulphate) every half hour around the clock.

The cultures grew *Pseudomonas* sensitive to gentamicin and carbenicillin. Alternating drops of carbenicillin and gentamicin in concentrated form in Tearisol were administered at half-hour intervals around the clock for 2 weeks according to the regimen

of Baum.⁹ The ulcer margins and corneal oedema receded, but seclusio pupillae, iris bombé, and rubeosis iridis developed, along with a neovascular glaucoma. Acetazolamide, 500 mg every 8 hours, was required to maintain the ocular tension below 20 mmHg. The central two-thirds of the cornea developed dense scar tissue and sporadic hyphaemas, which cleared spontaneously during the next several weeks.

Three months after the removal of the soft contact lens the cornea had opacified, with ocular tensions near 50 mmHg. The visual acuity fell to bare light perception without colour.

CASE 2

A 65-year-old white female with a history of bilateral macular drusen and well-controlled diabetes mellitus without evidence of diabetic retinopathy underwent intracapsular cataract extraction on the right eye. There was slight liquid vitreous loss on lens delivery, which was cleared with Weckcell sponges and Vannas scissors. The patient had an uneventful postoperative course, and 5 weeks later was fitted with a Permalens that produced a visual acuity of 20/40 with over-refraction. She had a benign postoperative course, returning monthly over the next 9 months for examinations and lens cleaning. Nine months later she underwent uneventful intracapsular cataract extraction on the left eye.

One month later the patient presented with a history of several hours of pain, redness, and decrease in vision in the right eye, which had been operated on 10 months earlier. The visual acuity had decreased to 20/200, and a 2 mm central ulcer was present under the lens. The lens was removed, and a culture obtained from the centre and margins of the ulcer. She was admitted to the hospital, and concentrated gentamicin drops were administered every hour round the clock according to the regimen of Baum.⁹

Over the next week the ulcer margins receded, and the anterior segment reaction decreased markedly. *Staphylococcus epidermidis* grew out of the central ulcer bed as well as the margins; it was found to be sensitive to gentamicin.

The gentamicin was tapered off over the next several weeks. The patient was discharged with regular spectacle correction, achieving a visual acuity of 20/70+. There was a residual paracentral stromal scar.

CASE 3

An 86-year-old white female, who had prior bilateral closed-angle glaucoma attacks treated medically and then with peripheral iridectomies, underwent an uneventful intracapsular cataract extraction on her right eye. The postoperative course was benign. Four

weeks later she was fitted with a Permalens, achieving a visual acuity of 20/40 with overcorrection.

The patient made every effort to learn insertion and removal of the lens, but was unsuccessful because of rheumatoid arthritis. She was followed up weekly, when her lens was cleaned, and she did well for 3 months, at which time she developed herpes zoster in the left thoracic region. At the same time mild signs of overwear, superior corneal vascularisation, and superficial punctate erosions developed. Usage of the Permalens was discontinued for 12 days.

As the systemic herpetic zoster defervesced, the corneal vascularisation and erosions disappeared. The lens was replaced 12 days later. The patient was followed up weekly and did reasonably well except for loss of appetite and weight. A gastrointestinal examination for a neoplasm by the patient's internist was refused.

The patient presented 4 weeks later with redness and pain in the right eye of several hours' duration. The visual acuity had decreased to finger counting at 2 feet (60 cm). A large central corneal ulcer was present under the lens, which was immediately removed. Central and marginal scrapings were obtained from the ulcer. Having recently been discharged from the hospital the patient refused the advised return to hospital for treatment of the ulcer. However, she retained full-time private duty nursing at home. Gentamicin drops were administered every 2 hours during waking hours, and the patient was seen daily by her doctor. Culture produced *Serratia marcescens* sensitive to gentamicin. The ulcer healed gradually over the course of the next 3 weeks, leaving a small inferocentral stromal scar and a delle. The visual acuity decreased to 20/60.

About 2 months later the patient presented with weakness, anorexia, and dysphagia. She had lost 15 lb (6.8 kg) weight. She was admitted to hospital and died 2 weeks later. The clinical diagnosis was metastatic carcinoma of the colon.

Discussion

While relative success was achieved in rehabilitating most of the elderly patients with the extended-wear soft contact lens, the diabetic patient particularly fared poorly. Under the same clinical regimen as the otherwise healthy patients, 2 of the 3 aphakic diabetics successfully fitted with extended-wear soft contact lenses suddenly developed Gram-negative corneal ulcers. In the third a staphylococcal ulcer with an abrupt onset appeared.

It is true, however that in the first case the use of topical corticosteroids on a de-epithelialised corneal after removal of the soft contact lens may have lowered an already decompensated set of host

defences. But it is interesting that in the third case no recurrent corneal difficulties were noted despite the fact that she was suffering from metastatic carcinoma of the colon during the last 2 months of her life. The patient had insisted upon wearing her lenses although advised not to do so.

Tripathi and associates have pointed out that contact lenses with higher water content seemed more susceptible to spoilage.⁸ However, exactly how that factor, as well as lens cleaning, individual ocular hygiene, lens deposits, and the host's immune capabilities, interrelate is not clear. Schwartz¹⁰ and Foulks *et al.*¹¹ found decreased corneal sensitivity in diabetics. However, Foulks *et al.* felt that a reduction in corneal sensitivity was not a sufficiently reliable guide by itself to predict the development of corneal abnormalities. Corneal problems had not developed in a number of diabetic patients who had decreased sensitivity.¹¹

Foulks *et al.*¹¹ implicated the triad of diabetes decreased corneal touch sensitivity, and the need for intraoperative corneal epithelial removal to produce eventual corneal complications in more than 80% of the closed vitrectomy cases. In addition, their finding of sorbitol pathway intermediates in the corneal epithelium of stressed diabetics and not in normal persons suggests some distinct metabolic abnormality in the stressed diabetic cornea. They point out that in an unstressed state the effects of sorbitol accumulation must be minimal.

Few primary corneal abnormalities have been described in diabetes mellitus. Hyndink *et al.*¹² reported several cases of neurotrophic ulcers in juvenile diabetics. While several possible explanations were offered, no specific aetiology could be determined. Pardos and Drachmer, questioning the possible role of decreased endothelial cell density or function in the diabetic population in the pathogenesis of corneal decompensation after closed vitrectomy, found no significant difference between nonvitrectomised diabetic and control populations.¹³ However, J. Orellana *et al.* (personal communication) noted a significant difference in preoperative endothelial cell density of the diabetic versus nondiabetic in their vitrectomy study. They also showed that diabetics have a greater trend towards increased postoperative corneal thickness. Although the thickness eventually returns to base-line levels, they postulate that the disparity observed between diabetics and nondiabetics suggests a poor endothelial response to trauma in the diabetic group.

In line with the findings of Foulks *et al.*¹¹ and Orellana *et al.* (personal communication), the sudden onset of redness and pain with corneal ulceration under the extended-wear soft contact lens in the aphakic diabetics may represent the endpoint on a

spectrum for the stressed diabetic cornea. Reduction of endothelial cell density or functional alteration may also underlie the greater susceptibility of the diabetic cornea. If corneal sensitivity is reduced to begin with, and epithelial oedema ensues because of the accumulation of undesirable metabolic products or endothelial decompensation, the epithelium and stroma are more susceptible to infection.

However, this is not entirely clear. Others (L. A. Wilson, personal communication) have observed adverse reactions to extended-wear hydrogel contact lenses for the correction of aphakic vision in nondiabetic patients. This phenomenon has been described as 'tight lens syndrome.' The reaction consists in the sudden onset of ocular inflammation in the early morning hours after weeks to months of uneventful wear. The corneal epithelium becomes oedematous and on occasion infected. (L. A. Wilson, personal communication).

Although the advantages of extended-wear aphakic soft contact lenses generally outweigh their disadvantages, the authors believe that careful patient selection and follow-up are essential. When one considers the relatively high surgical success rate of cataract extraction, the possible ill effects of extended-wear soft contact lenses must be cautiously weighed against their benefits in each patient. Special attention must be paid to diabetic patients.

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