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Scleral Lenses in Corneal Opacities

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Abstract

***Objective:** To describe vision-correction benefits of gas-permeable scleral contact lenses in the management of corneal opacities.*

***Materials and Methods:** Fourteen patients (15 eyes) with corneal opacities were referred initially for corneal graft. Butdue to the lack of grafts, we proposed scleral lenses for vision correction as a temporary solution.*

***Results:** The most common indication for lenses fitting was keratoconus with opacity in patients who had to stop wearing other types of corneal lenses and referred for corneal graft (8 eyes). Other indications included interstitial keratitis, herpetic keratitis, ocular scars from Stevens-Johnson syndrome and acid burn. Mean follow-up period was 14 months (2-24). The opacity was central in 9 patients and paracentral in 5. Mean use time of scleral lenses was 12 hours per day. Average logMAR visual acuity without correction and with lenses was 1,7 and 0,3 respectively. A gain of three or more Snellen lines was observed in 92,85% of eyes. The scleral lenses were well tolerated in all patients. One patient had problems with lenses manipulation. The scleral lenses had no effect on the evolution of the opacities.*

***Conclusion:** Gas permeable scleral lenses provide successful visual solutions for corneal opacity when corneal grafts are not available.*

Keywords: *scleral lenses; opacity; cornea.*

Introduction

Corneal scarring leads to a decline of visual acuity either by light scatter due to an irregular cornea or by direct obscuration of rays. [1] The ideal treatment for such cases would be corneal grafting, but scarcity of corneas donors limits this option in developing countries like ours. Keratoplasty is a new technique at the University Hospital MED VI in Marrakech. The first graft was performed in 2008, but we still have a shortage of grafts and a long waiting list.

Scleral lenses have large-diameter, they are rigid and gas-permeable devices supported completely by the sclera, they measurably vault the cornea and limbus, and that maintain a fluid reservoir in the space between the posterior surface of the lens and the anterior surface of the cornea. [2] The unique fitting characteristics of scleral lenses enable protection of the ocular surface from shear forces generated by eyelid movements over the cornea and provide continuous hydration of ocular surface. [3-6]

This type of lenses might provide an acceptable visual acuity in patients with important astigmatism or corneal opacity, and it can be proposed to patients waiting for a corneal graft as a temporary solution.

Material and Methods

A total of 14 patients (15 eyes) were evaluated for scleral lenses fitting between June 1st, 2014 and June 1st, 2015. All patients presented corneal opacity and were referred for keratoplastyto university hospital Mohammed VI, Marrakesh, Morocco. Due to the lack of grafts, we proposed scleral lenses for vision correction as a temporary solution. An ophthalmic examination was performed on all patients and it included the assessment of uncorrected and corrected logMAR

visual acuities, anterior eye bio-microscopy, fundus examination and corneal topographic analysis.

All eyes were fit with scleral lenses, with initial diagnostic lenses selected according to the manufacturer's fitting guidelines. The choice of the first diagnostic lenses was based on the sagittal depth of the cornea. All lenses were 16, 5 mm of diameter. Lens fitting was immediately evaluated; and when the corneal clearance, limbal clearance or scleral zone alignment was unsatisfactory, additional diagnostic lenses were applied until an appropriate fitting relationship was established. The lens was allowed to settle on the eye for 30 minutes, during which time spherocylindrical over-refraction was performed to determine appropriate lens power and to provide an estimation of visual acuity that could be expected through scleral lenses. If by the end of this period, appropriate clearance had been sustained, the initial evaluation is considered complete. However, when the depth of the post-lens fluid reservoir was reduced to less than one-third of the corneal thickness after settling period, a lens with increased vault was applied and allowed to settle. The process was repeated until an appropriate lens was identified.

Once the ordered lenses arrived, patients were scheduled for a dispensing visit. If the lenses provided an acceptable fit, the patient was taught how to insert and remove lenses with the plunger, how to clean and maintain them with a multipurpose solution and a weekly protein remover. A lens fit was considered optimal when the patient experienced satisfactory vision, comfort and lenses did not compromise the ocular health.

Statistical Analysis

Descriptive statistics were applied to most outcomes. Visual acuity before scleral lens fitting was compared with visual acuity with scleral lenses by using SPSS 15.0 software (SPSS Inc., Chicago, IL, USA). All visual acuities were converted to logMAR for statistical analysis.

Ethical Considerations

The study was conducted according to the principles of the declaration of Helsinki. Patients were recruited in corneal specialist consultation. The consent was obtained in the same consultation. Confidentiality of data was ensured.

Results

It is a prospective study, eight males (57, 2%) and six females (42, 8%) with corneal opacity were included in the fitting trial (15 eyes). The mean age +/- SD was 28, 4 +/- 11,2 years (range 18 – 42). The most common indication for fitting lenses was keratoconus with opacity in patients who had to stop wearing other types of corneal lenses and referred for corneal grafting (8 eyes), other indications included interstitial keratitis (1 case), herpetic keratitis (2 cases) (Figure 1), ocular scars post Stevens-Johnson syndrome (1 case) and acid burn (2 cases) (figure 2). Table 1 shows the etiologies of corneal opacity for all patients. The opacity was central in 9 patients and paracentral in 5.

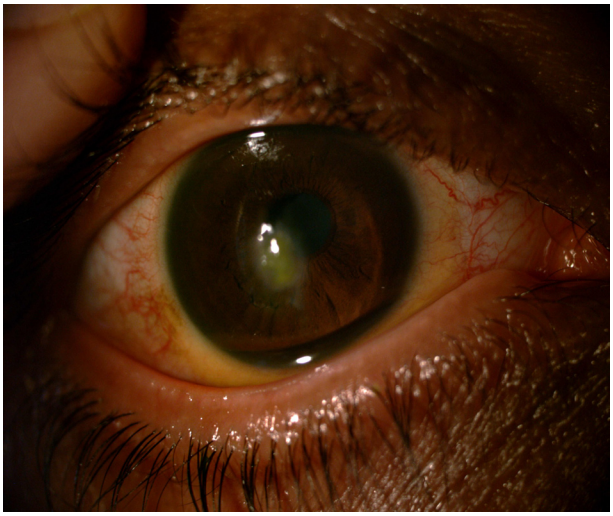

Figure1 (a). *A case presenting keratoconus with opacity.*

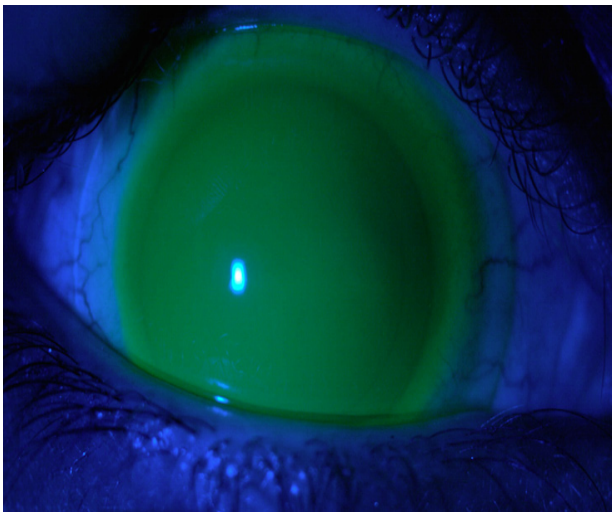

Figure1 (b). *Successful fit in patient with keratoconus*

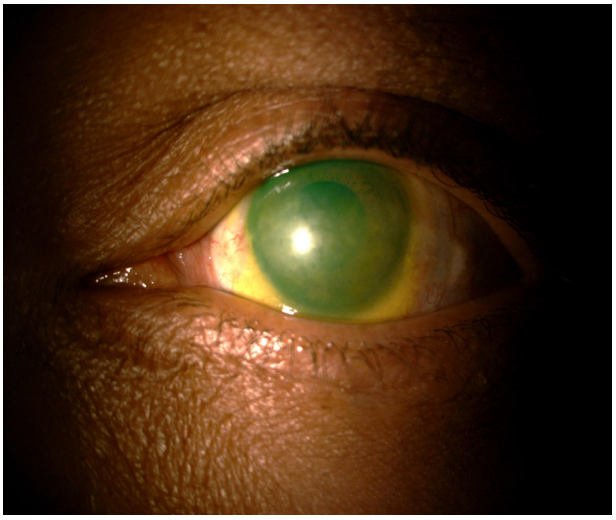

Figure2 (a). *A case presenting scars of acid burn*

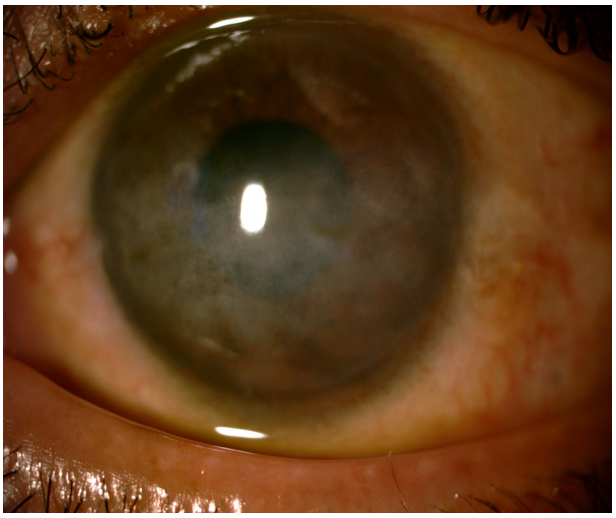

Figure2 (b). *Successful fit in patient with scars of acid burn*

Table1. *Indications for sclerallenses*

Indication for sclerallens	Eye (%)
Keratoconus	8 (57.1%)
Interstitialkeratitis	1 (7.1%)
Herpetickeratitis	2 (14.2%)
Stevens Johnson syndrom	1 (7.1%)
Acidburn	2 (14.2%)

The average logMAR visual acuity without correction and with the scleral lens was 1.7 and 0.3 respectively. Improvement in BCVA, defined as a gain of three or more decimal acuity lines, was observed in 13 eyes (92.85%).

Mean sagittal vault of lenses was 4, 60 mm (range 4, 20-4, and 80), all lenses were 16, 5 mm of diameter. An average of 2,5 +/- 0,4 visits (range 2-4) were necessary to carry out the lenses fitting. An average of 2,2 +/- 1,3 trial lenses (range 1-4) were needed to decide the ordered lenses. 6 eyes were successfully fitted with the first ordered lenses. Waiting period for receiving the lenses is normally 1–2 months, but it increased to more than 4 months sometimes during this study due to economic sanctions.

Mean follow-up was 14 months (2-24). The mean use time was 9.3 ± 1.2 h a day (range 8–12). 12 were successfully fitted, as defined by success criteria able to use the lenses for more than 10 h a day, and 2 patients achieved partial success with SCL. The scleral lenses were well tolerated in all patients. One patient had problems with lens handling and broke it during the follow-up period.

The scleral lenses had no effect on the evolution of opacities in 10 patients, apart from 4 patients who had a reduction of the corneal opacity. Two patients of them had a kertaoplasty later (2 cases of keratoconus).

Discussion

In a developing country like ours where corneal scarring accounts for more than 1/5th of the total burden of blindness [7] and good corneas are in short supply, any suitable alternative to keratoplasty is welcomed. [8] In the present study, scleral contact lenses improved VA in patients with corneal opacities compared to VA without correction. They can be a solution in patients waiting for keratoplasty. A study by Smiddy et al found that 69% of patient who were referred for keratoplasty could be successfully fitted with contact lenses delaying the need for surgery. [9]

Corneal transplantation is a new procedure in Marrakesh, the first keratoplasty was performed in 2008, and until now, we still have a lack of grafts because of social and religious issues. 49% of patients waiting the surgery have a bilateral involvement. Scleral lenses were proposed to provide a decent visual acuity and improve the quality of life of those patients.

In the last decade, improvements in RGP materials and manufacturing processes have generated an interest in large diameter lenses. [10,11] Large diameter RGP contact lenses provide excellent levels of VA and respect corneal health, regardless the diameter of the lens. [12–15]

Limited studies have reported visual rehabilitation with RGP lenses in corneal scarring where spectacle correction failed to do so. [16–18] On analyzing different studies, it was found that successful fitting over these distorted corneas dictated use of large overall diameter lenses as they centered better. The experience suggests that contact lens fitting should be attempted with guarded prognosis in cases with dense central opacities.

It was not surprising that the waiting period for receiving the lenses was long (4 months sometimes), this period was similar to some reports but it exceeded the average period compared to others. Our center is a governmental one and most of our patients are from low income status, in addition to that, the lens expenses are not covered by insurance companies.

The main limitation of our study was its small sample.

To summarize, Gas permeable scleral lenses provide successful visual solutions for corneal opacity when corneal grafts are not available. The successful practice of employing contact lenses in scarred corneas reduces the dependence on keratoplasty which is a highly appreciated step in a country where demand for donor cornea far exceeds the supply.

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